Martin Plant Peaking Units

Request for Modification of Site Certification #PA89-27

FPL

February 2000

Prepared by

FOSTER WHEELER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

FLORIDA POWER & LIGHT COMPANY

MARTIN PLANT

PEAKING UNITS

REQUEST FOR MODIFICATION OF SITE CERTIFICATION # PA89-27

Florida Power & Light Company
700 Universe Blvd.
Juno Beach, FL 33408

February 2000

Prepared by:

Foster Wheeler Environmental Corporation
759 South Federal Highway, Suite 100
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1.1 APPLICANT INFORMATION

Applicant's Name and Address:	Tom Young, Project General Manager Florida Power & Light Company 700 Universe Blvd. Juno Beach, FL 33408 Telephone: (561) 694-3963
Name, Mailing Address and Telephone Number of Official Responsible for Obtaining Approvals:	Richard G. Piper, Project Licensing Manager Florida Power & Light Company 700 Universe Blvd. Juno Beach, FL 33408 Telephone: (561) 691-7058
Project Name:	Martin Peaking Units
Site Location:	Martin Power Plant State Road 710, Martin County, seven miles northwest of Indiantown, FL
Nearest Incorporated City:	Okeechobee, FL
Latitude and Longitude:	Lat. 27° 3' 13" N, Long. 80° 33' 46" W
Name of Waterway at Site:	Wetlands and Drainage Area of St. Lucie Canal
Section, Township, Range:	Sections 19, 20, 21, 28, 29, and 30; Township 39S; Range 37E
Proposed Addition/Capacity:	Two General Electric MS7001FA (GE Frame 7 FA) gas turbines with air-cooled generators/340 MW (Nominal) total capacity
Dates of Construction/Operation:	Construction commencing August 1, 2000; ending June 2001/Operation commencing June 2001

1.2 INTRODUCTION

Florida Power & Light Company (FPL) is one of the nation's largest investor-owned utilities. As such, it serves nearly half of Florida's population of 15 million. Power is delivered from 34 major generating units, plus non-utility sources, over approximately 66,000-miles (mi) of transmission lines. Annualized customer growth from year-end 1993 through 1998 was 1.9 percent in FPL's service area compared to 1.3 percent nationally. In order to meet existing and projected increases in demand, FPL has initiated a 3,600-megawatt (MW) system expansion designed to meet customer needs during the next decade. This will be accomplished in part by repowering four older oil-fired power plants with high-efficiency, gas-fired, combined cycle generators (FPL Group, 1999).

In addition to meeting this ongoing growth in demand for electrical services, FPL has agreed to increase its generating reserve margin from the currently used planning guideline of 15 percent to 20 percent. Reserve margin is the difference between a system's capability to provide electricity and the peak demand for power during a specific period. While FPL believes that the current reserve margin has been adequate to date, increasing the margin should assure there is an adequate reserve to meet the state's electrical demands and should alleviate any concerns about availability of capacity for emergencies. FPL plans to meet the higher margin by adding 1,500-MW of capability to its system by year-end 2005 (FPL, 1999).

Included in the FPL plan to meet the higher generating reserve margin is the construction of two simple-cycle peaking gas turbine units at the Martin Plant, located at its Martin Site in southeastern Florida. These "peaking" units will be installed for an in-service date of June 2001 and will be used to provide power during times of high demand.

By locating the two new peaking units at the existing Martin Plant, FPL will utilize existing power plant infrastructure, such as the transmission line and natural gas pipeline, without requiring the use of additional land. Also, because they will be located on an existing power plant site, the two peaking units will have minimal environmental impact. Existing land use in the vicinity of the Plant will remain relatively unchanged, as it has since FPL's application for Certification of the Martin Coal Gasification/Combined Cycle (CG/CC) Project was submitted to the Florida Department of Environmental Protection (DEP) in December 1989.

In February 1991, FPL received Certification for the first phase of its CG/CC Project at the Martin Plant. As a result, Units 3 and 4 and associated facilities were constructed at the Martin Site and placed into service in February and April of 1994, respectively. Also proposed as part of the CG/CC Project, combined-cycle, natural gas-fired Units 5 and 6 are still planned for construction in 2006 and 2007, respectively. The Martin Site Certification has been modified five times, once in each of the years 1993, 1994, 1995, 1996 and 1998. FPL intends to permit the peaking units as the sixth modification of the existing Site Certification, in accordance with procedures outlined in Section 403.516 of the Florida Statutes (FS) and Rules 62-17.211 and 62-17.031 (4) of the Florida Administrative Code (FAC).

The Martin Plant is located in Martin County, approximately 40-miles northwest of West Palm Beach, 5-miles east of Lake Okeechobee, and 7-miles northwest of Indiantown, an unincorporated town. Figure 1.2-1, Site Location, shows the approximate location of the Martin Site.

1.3 PROJECT DESCRIPTION

1.3.1 General Description

As shown on Figure 1.3-1, Plot Plan, the existing Martin Plant occupies a portion of the approximately 11,300-acre (ac) Martin Site, which is wholly owned by FPL. The Site is comprised of a 6,800-ac cooling pond (6,500-ac of water surface and 300-ac of embankment area) and approximately 400-ac for the existing Units 1 through 4 and associated facilities. These facilities include the sanitary and process wastewater treatment systems, raw water wellfield and treatment facility, diked fuel oil storage tanks, switchyard, and plant offices. The remaining area of the Martin Site consists of the Barley Barber Swamp and other undeveloped land used for agricultural purposes prior to development of the Martin Site. A 1,200-ac portion of this undeveloped land, known as the Northwest Parcel, is used as a wetland mitigation site by FPL.

Existing generating units at the Martin Site consist of Units 1 and 2, which are conventional steam-electric generating units, and Units 3 and 4, which are combined-cycle units. Units 1 and 2, which fire either residual oil or natural gas, are not certified under the Florida Power Plant Siting Act. However, Units 3 and 4, and proposed Units 5 and 6, have been certified under the

Act. Existing Units 3 and 4 currently fire primarily natural gas, but also are permitted to fire either No. 2 distillate fuel oil or coal-derived gas.

This project involves the construction of proposed Martin Peaking Units A and B, which will consist of simple-cycle combustion turbines (CTs) utilizing dry low NO_X combustors. These two units, as shown on Figure 1.3-1, will have a combined generating capacity of 340-MW (nominal) and will be fueled by either natural gas or No. 2 distillate fuel oil. Figure 1.3-2, Proposed Site Plan for Combustion Turbines, presents the arrangement of the proposed CTs and their ancillary facilities. Figure 1.3-3, Combustion Turbine Site Profile, presents a building profile for the proposed CTs. Addition of the new CTs will not result in expansion of the steam generating capacity of the Martin Plant.

Each of the peaking units will operate up to 3,390-hours per year, during periods of high demand or as otherwise needed by FPL. Peaking CTs can be brought into service more quickly than conventional steam units and the dry low NO_X technology of the GE Frame 7 FA gas turbine offers reduced environmental impacts when compared to older generating equipment.

1.3.2 Ancillary Facilities

No new ancillary facilities are proposed as part of the Martin Peaking Unit Project. However, FPL will evaluate the condition of the existing on-site railroad spur for construction deliveries and will undertake any necessary repairs as part of normal maintenance of the Martin Site.

1.3.3 Transmission System

FPL will be constructing a 0.7-mile interconnection between the new CT switchyard and the existing 230-kilovolt (kV) system switchyard. No transmission additions will be required outside of the existing Martin Plant property.

1.4 FUEL DELIVERY AND STORAGE REQUIREMENTS

1.4.1 Fuel Delivery System

Only minor changes will be made to the existing Martin Plant fuel delivery system (other than connections) because Peaking Units A and B will use some of the same fuels as Units 1 through 4 (natural gas or No. 2 distillate fuel oil). The primary change will be the expansion of the

existing natural gas yard that serves Units 3 and 4 (see Figure 1.3-1). The only off-site activities will be minor equipment replacement on the FPL-owned lateral.

1.4.2 Fuel Storage System

There is an existing 50,000-barrel (bbl) (nominal) distillate oil tank onsite. A new No. 2 distillate fuel oil storage tank may be constructed at the Martin Plant as part of the Peaking Unit Project. This new tank will be either a 50,000-bbl tank or a 100,000-bbl tank. The possible locations of these proposed tanks are shown on Figure 1.3-2.

1.5 WATER AND WASTEWATER MANAGEMENT

1.5.1 Water Supply and Treatment

The proposed units will result in only minor changes to the existing water and wastewater management systems at the Martin Plant. Primarily, these changes involve the connection of the CT units to the existing process water pretreatment system and the existing wastewater treatment system. No new potable water treatment will be required.

1.5.2 Water Consumption

The NO_X control system for the peaking units will be a dry system and will not utilize water when the units are fueled by natural gas. Operation of the Units on No. 2 distillate fuel oil will require demineralized water makeup to the peaking units to replace water consumed for NO_X control. Additionally, the peaking units will require demineralized water for use as compressor wash water, for inlet air foggers and for use during power augmentation, which is expected to occur less than 500 hours per year. Steam for power augmentation will come from one or more of the existing Martin Plant steam generators. The total demineralized water requirement for these uses is estimated to be a maximum of 29-million gallons per year (mgy). This water will be supplied by the existing process water system, which uses the Martin Cooling Pond as its source. This volume of water represents a worst case scenario and is only 0.3 percent of the existing permitted process water consumptive use of the Martin Site. The only additional water use will be for service water (hoses, etc.) at the peaking units.

FPL plans to use air coolers for component cooling water instead of water-cooled equipment. This will eliminate the need for additional cooling water.

1.5.3 Wastewater Generation

Operation of the peaking units will result in an increase in process wastewater at the Martin Plant. There will be additional process wastewater associated with demineralized water requirements for the peaking units, as discussed previously. These additional process waste waters will consist of carbon filter backwash, reverse osmosis (RO) wastewater (brine), and demineralizer regeneration wastes, and are estimated to total less than 9-mgy (17.1-gpm). The additional process wastewater will be treated by the existing process wastewater treatment system. This volume of wastewater is within the permitted treatment capacity of the Martin Site.

There will be no significant permanent additional process or sanitary wastewater generated at the Martin Plant as a result of the construction or operation of the peaking units. Construction sanitary wastes will be managed using temporary holding tanks and pump trucks, in accordance with local requirements.

1.6 AIR EMISSIONS

The proposed project will consist of the construction of two General Electric Frame 7FA CTs and associated facilities. The annual maximum capacity factor of the plant will be 39 percent, which is equivalent to operating 3,390 hours per year at full load. Natural gas will be used as the primary fuel and fuel oil will be used as a backup fuel. Fuel oil usage will be limited to the equivalent of 500 hours per year at full load. Peak capability and power augmentation operation, when firing natural gas, will not exceed an equivalent to 500-hours per year. This type of operation is referred to as higher power modes (HPM) and is utilized to supply power above 100 percent base load when firing natural gas.

Plant performance with General Electric 7FA CTs was developed for natural gas (base load and higher power modes) and oil; at 50-, 75-, and 100-percent load; and at 35 degrees Fahrenheit (°F), 59°F, and 95°F compressor inlet temperatures. Combustion turbine performance is based on a performance envelope developed from General Electric data and has been adjusted to reflect degradation when the units operate over time and performance improvements beyond that provided by the manufacturer's guarantee. In particular, the combustion turbine emission estimates account for 5 percent higher power output and 6 percent degradation. This 11 percent was used to increase mass flow of the turbine. The CTs will be capable of operating from 50 to 100 percent of base load. The efficiency of the CTs decreases at part load. As a result, FPL will

have an economic incentive to dispatch the plant to keep the units operating as near base load as possible.

Air emissions control will consist of using state-of-the-art DLN burners in the CTs when firing natural gas. Each General Electric Frame 7FA will be equipped with a General Electric DLN-2.6 combustion system that regulates the distribution of fuel delivery to a multi-nozzle, total premix combustor arrangement. The fuel flow distribution to each combustion system fuel nozzle is regulated to maintain unit load and minimize turbine emissions. The DLN-2.6 combustion system consists of six fuel nozzles per combustion can, with each operating as a fully premixed combustor. Of the six nozzles, five are located radially and one is in the center. The fuel system is fully automated and sequences the DLN-2.6 combustion system through a number of staging modes prior to reaching full load. The General Electric Frame 7FA has 14 combustors per turbine.

Water injection will be used for NO_x control when firing distillate fuel oil. The SO_2 emissions will be controlled by the use of low-sulfur fuels. Good combustion practices and clean fuels will also minimize potential emissions of PM_{10}, CO, VOC, and other pollutants (e.g., trace metals). These engineering and environmental designs maximize control of air emissions while minimizing economic, environmental, and energy impacts. The pollutant gaseous emission concentrations and PM_{10} emission rates for the proposed CTs operating at full load are summarized below:

Pollutant	Natural Gas	Distillate Oil
NO_x, ppmvd @ 15 percent O_2	10.5 (base); 15 (HPM)	42
CO, ppmvd	12 (base); 15 (HPM)	20
VOC as CH_4, ppmvd (gas), ppmvw (oil)	1.5	3.5
SO_x as SO_2	Calculated based on fuel (1.0 grains S/100 SCF)	Calculated based on fuel (0.05 percent sulfur)
PM_{10} lb/hr (dry filterable)	10	17
Notes: VOC emissions are exclusive of background concentrations lb/hr = pound per hour ppmvd = parts per million volume dry ppmvw = parts per million volume wet		

The estimated maximum hourly emissions and exhaust information representative of the proposed CT operating at base load conditions (100 percent load) are presented in Tables 1.6-1 and 1.6-2 for natural gas and distillate oil, respectively. Table 1.6-3 presents information for the higher power modes. Information is presented in these tables for one unit operating in simple

cycle operation, based on natural gas combustion and fuel oil combustion. The data are presented for compressor inlet temperatures of 35°F, 59°F, and 95°F. These temperatures represent the range of ambient temperatures that the CTs are most likely to experience. The maximum short-term emission rates (lb/hr) generally occur at base load, 35°F operation, where the CT has the greatest output and greatest fuel consumption.

Based on a compressor inlet temperature of 59°F, the emission rates used to calculate maximum potential annual emissions for the proposed facility for regulated air pollutants are presented in Table 1.6-4 for one and two CTs. To produce the maximum potential annual emissions, the CTs are being permitted to operate at base load for 3,390-hours (39 percent capacity factor), firing natural gas at base load for 2,390-hours, firing natural gas in HPM for 500-hours and fuel oil for 500-hours. The potential annual emissions are based on the 59°F compressor inlet air condition, since it represents a nominal average between the higher emission levels at the 35°F compressor inlet conditions (winter) and the relatively infrequent 95°F compressor inlet condition (summer).

The natural gas must be heated to about 300°F for the dry low-NO_x combustors to operate effectively. This will be accomplished, during simple cycle operation, by installing direct fired natural gas heaters (one per CT). Only natural gas will be used in the direct fired heaters.

1.7 SOLID WASTE MANAGEMENT

During construction, minor amounts of solid waste will be generated. The construction contractors will dispose of these wastes in accordance with applicable regulations. During operation of the peaking units, minimal solid wastes will be produced. These wastes will be disposed of properly in an approved landfill.

1.8 HAZARDOUS WASTE MANAGEMENT

Hazardous waste generated through the use of paints, thinners, solvents, or other maintenance chemicals will be collected and stored in appropriate containers for a period not to exceed 90-days. If small quantities (i.e., less than 1,000-kilograms [kg] per month) are generated, they will be collected and stored in appropriate containers for a period not

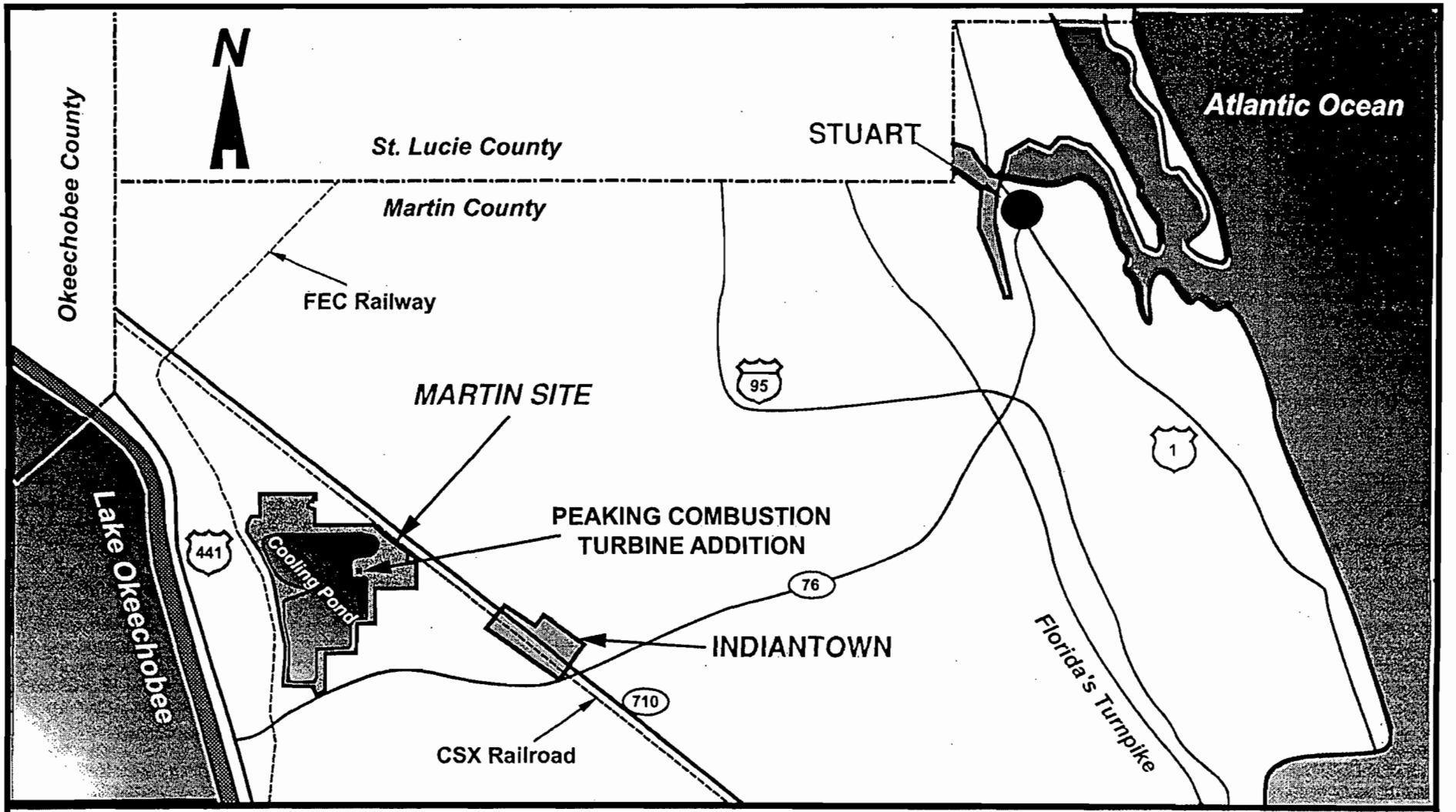
to exceed 180-days. These wastes will be treated or disposed offsite by a licensed contractor.

1.9 STORM WATER MANAGEMENT

Figure 1.9-1, Site Drainage Basins, shows the drainage areas that will be affected by the Project. Storm water management at all other locations within the Site Boundary will remain essentially unchanged. Two new drainage ditches will be installed running north-south along both sides of the area immediately around the new combustion turbines (Area I). Runoff from Area I will be conveyed by these two new ditches to the existing Martin Plant power block drainage system. The western Laydown Area (Area II) will also drain into the westernmost new ditch. The western portion of the eastern Laydown Area (Area III) will drain into the easternmost new ditch, while the remainder of that area will drain into existing ditches. The area at the gas yard will drain into an existing ditch. The acreages of these affected areas are:

Area	Acres
I	4.6
II	2.8
III	10.0
IV	0.1
Total	17.5

The existing storm water management system was designed in accordance with South Florida Water Management District (SFWMD) regulations. A copy of the Surface Water Management Report, including calculations and engineering drawings, is included in this Application as Appendix A.



Source: Foster Wheeler Environmental Corp.; 2000

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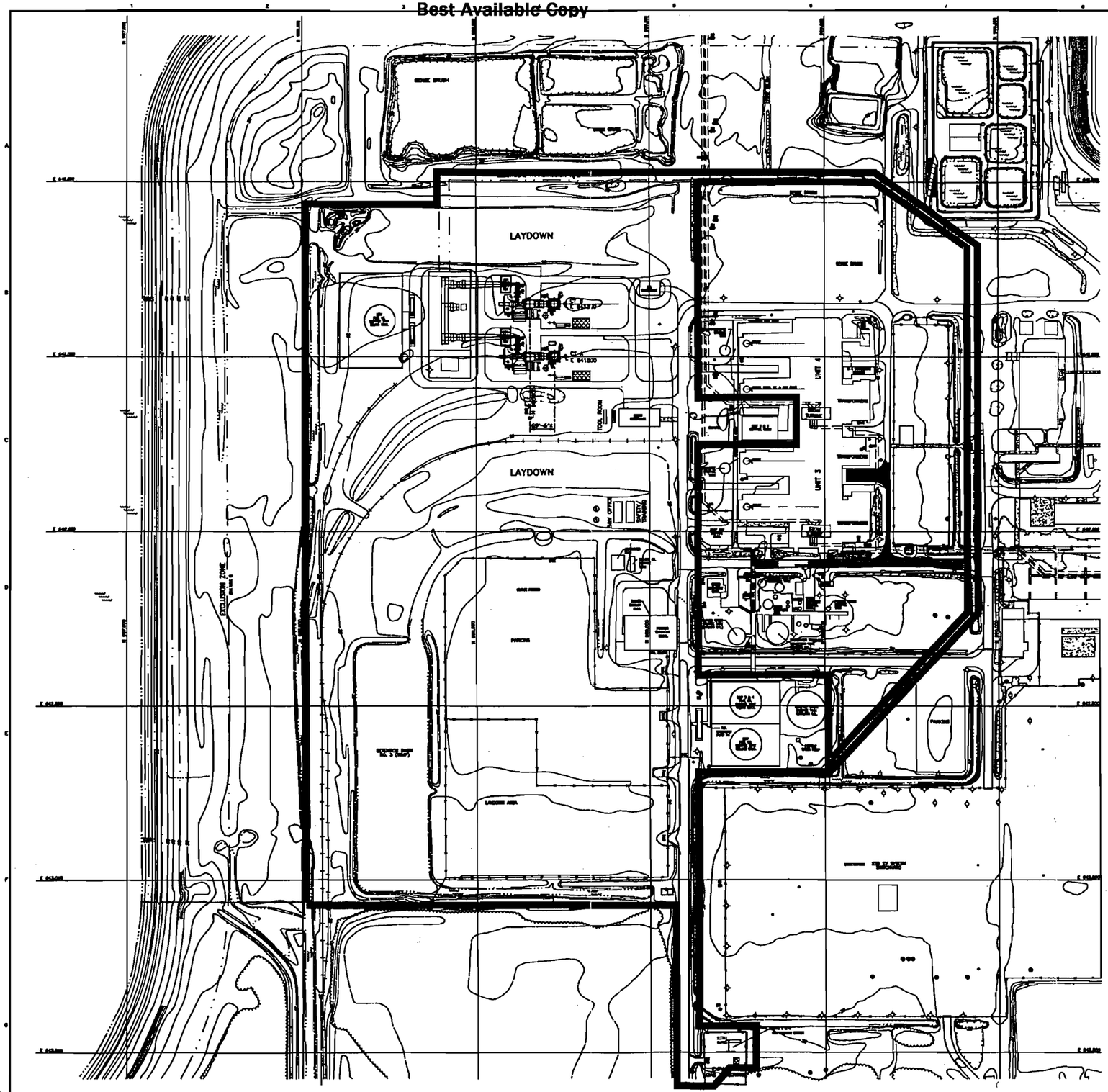
February 9, 2000

Figure 1.2-1
SITE LOCATION

FPL

Martin Peaking Units



SYMBOL LEGEND

1. A COOLING POND CONSTRUCTION EXCLUSION ZONE 200' FROM THE C OF THE DIKE SHALL BE MAINTAINED. ANY ENCROACHMENT MUST BE APPROVED BY THE CIVIL ENGINEERING AND TECHNICAL SERVICES MANAGER.

Project Area Boundary

Figure 1.3-1
Plot Plan

Martin Peaking Units

FPL

NOT TO BE USED FOR CONSTRUCTION

REV	DATE	REVISIONS AND RECORD OF ISSUE	BY	CHK	APP'D
D	02/03/00	INCORPORATED FINAL COMMENTS	DX		
C	02/02/00	INCORPORATED FINAL COMMENTS	TCH		
B	1/19/00	ISSUED FOR COMMENTS	TCH		
A	1/12/00	ISSUED FOR OWNERS REVIEW	TCH		
F	02/04/00	INCORPORATED FINAL COMMENTS	TCH	DX	
E	02/04/00	INCORPORATED FINAL COMMENTS	TCH	DX	

SCALE: 1"=100'

BLACK & VEATCH

FLORIDA POWER & LIGHT
MARTIN PEAKING UNITS

SITE ARRANGEMENT

PROJECT 69633-CBSA-M1000

DRAWING NUMBER FIGURE 1.3-1

REV F

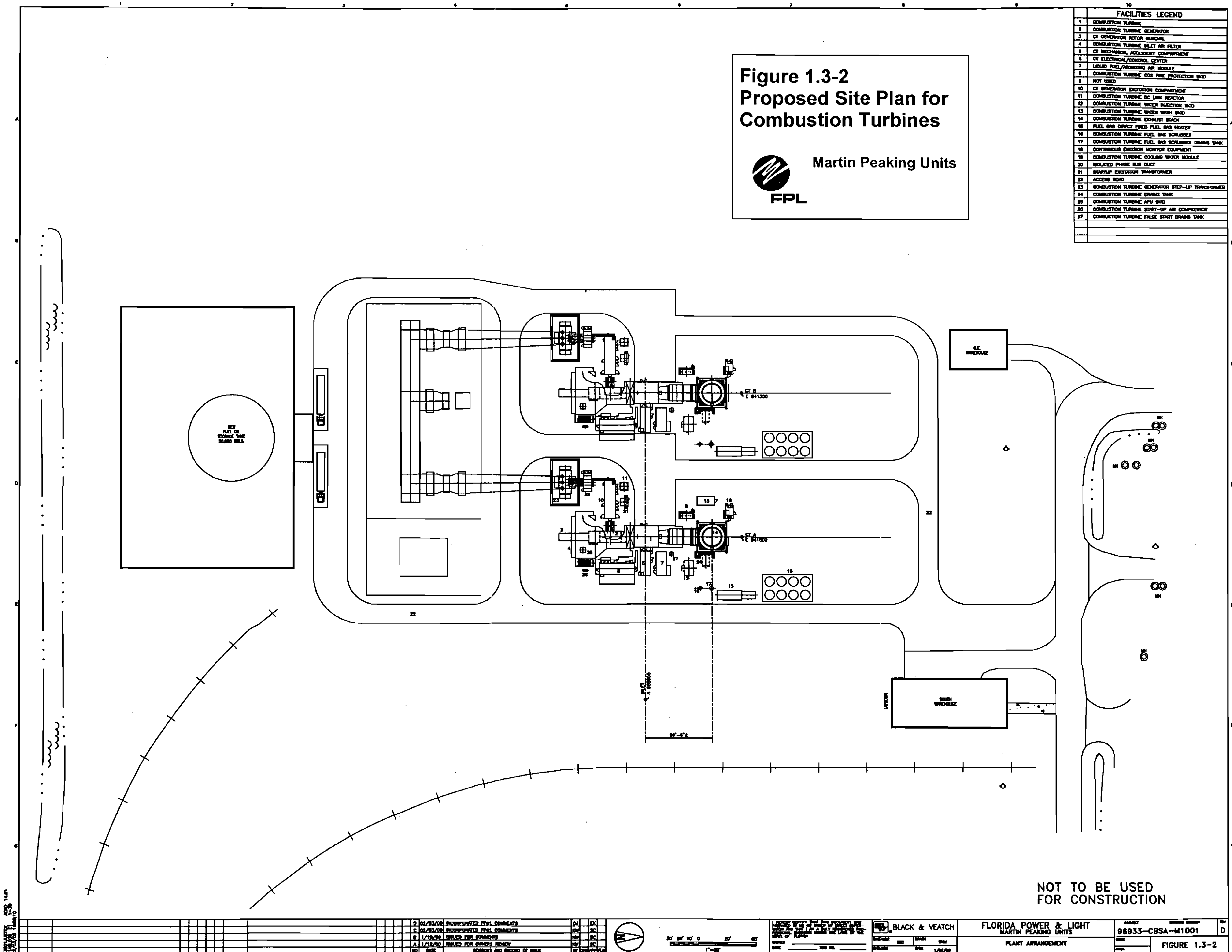
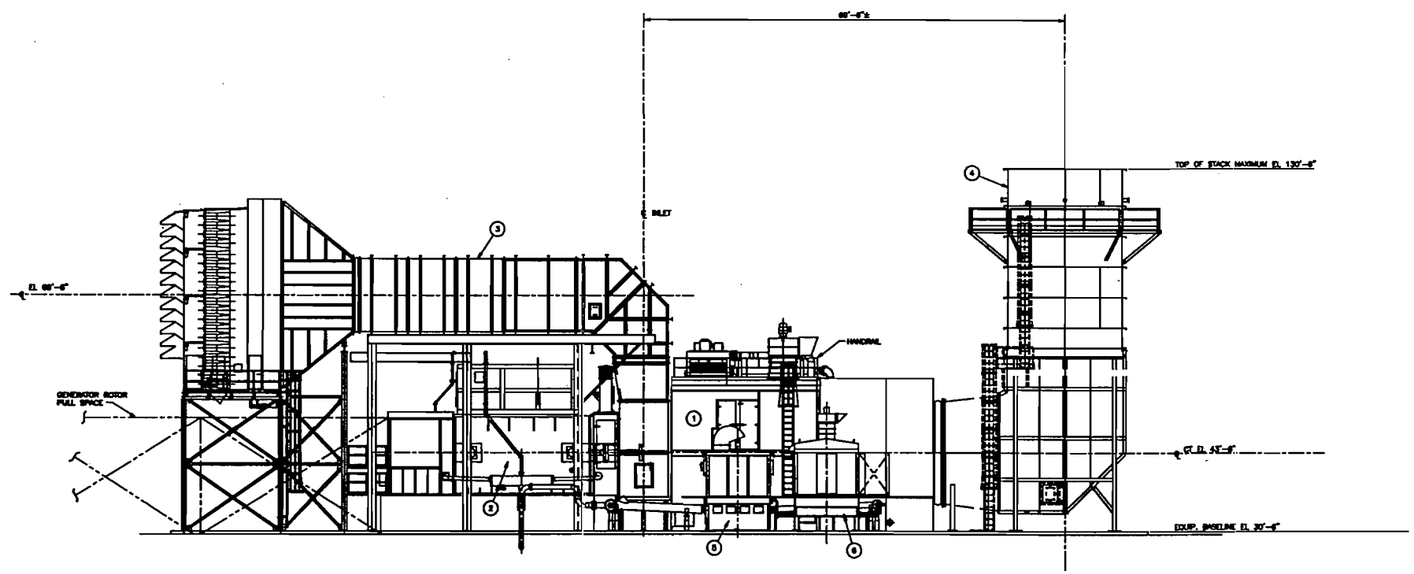


Figure 1.3-2
Proposed Site Plan for Combustion Turbines
Martin Peaking Units
FPL
FACILITIES LEGEND
1 COMBUSTION TURBINE
2 COMBUSTION TURBINE GENERATOR
3 CT GENERATOR ROTOR REMOVAL
4 COMBUSTION TURBINE INLET AIR FILTER
5 CT MECHANICAL ACCESSORY COMPARTMENT
6 CT ELECTRICAL/CONTROL CENTER
7 LIQUID FUEL/ATOMIZING AIR MODULE
8 COMBUSTION TURBINE CO2 FIRE PROTECTION SKID
9 NOT USED
10 CT GENERATOR EXCITATION COMPARTMENT
11 COMBUSTION TURBINE DC LINK REACTOR
12 COMBUSTION TURBINE WATER INJECTION SKID
13 COMBUSTION TURBINE WATER WASH SKID
14 COMBUSTION TURBINE EXHAUST STACK
15 FUEL GAS DIRECT FIRED FUEL GAS HEATER
16 COMBUSTION TURBINE FUEL GAS SCRUBBER
17 COMBUSTION TURBINE FUEL GAS SCRUBBER DRAINS TANK
18 CONTINUOUS EMISSION MONITOR EQUIPMENT
19 COMBUSTION TURBINE COOLING WATER MODULE
20 ISOLATED PHASE BUS DUCT
21 STARTUP EXCITATION TRANSFORMER
22 ACCESS ROAD
23 COMBUSTION TURBINE GENERATOR STEP-UP TRANSFORMER
24 COMBUSTION TURBINE DRAINS TANK
25 COMBUSTION TURBINE APU SKID
26 COMBUSTION TURBINE START-UP AIR COMPRESSOR
27 COMBUSTION TURBINE FALSE START DRAINS TANK
NOT TO BE USED
FOR CONSTRUCTION
BLACK & VEATCH
FLORIDA POWER & LIGHT
MARTIN PEAKING UNITS
PLANT ARRANGEMENT
96933-CBSA-M1001
FIGURE 1.3-2

EQUIPMENT IDENTIFICATION LIST		
REF. No.	EQUIPMENT NUMBER	EQUIPMENT NAME
1		COMBUSTION TURBINE
2		GENERATOR
3		INLET AIR FILTER
4		STACK
5		ACCESSORY MODULE
6		FUEL OIL/ATOMIZING AIR MODULE
7		
8		
9		
10		
11		
12		
13		
14		
15		



SECTION A-A
(LOOKING WEST)

Figure 1.3-3
Combustion Turbine Site Profile

Martin Peaking Units

FPL

NOT TO BE USED FOR CONSTRUCTION

REV	DATE	REVISIONS AND RECORD OF ISSUE	BY	CHK'D	APP'D
C	02/03/00	INCORPORATED FPSL COMMENTS	RJV	EK	
B	02/03/00	INCORPORATED FPSL COMMENTS	RJV	RC	
A	1/19/00	ISSUED FOR COMMENTS	RJV	RC	

SCALE 1/8"=1'-0"

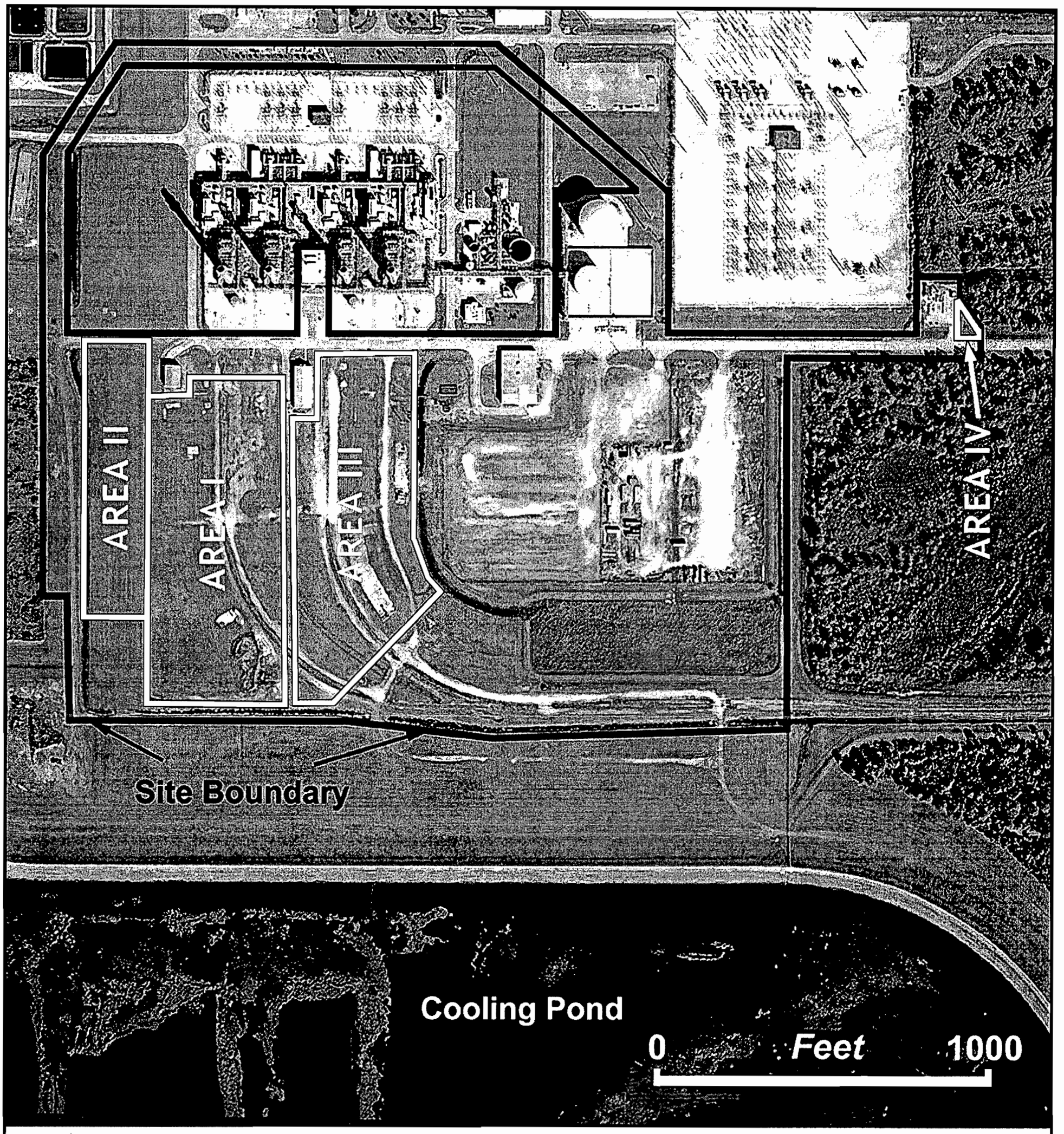
BLACK & VEATCH

FLORIDA POWER & LIGHT
MARTIN PEAKING UNITS

PLANT ARRANGEMENT
TURBINE ELEVATION

96933-CBSA-M1007 C

FIGURE 1.3-3



Sources: Florida Power and Light Co. (2000)
Foster Wheeler Environmental (2000)

Figure 1.9-1
SITE DRAINAGE BASINS

FPL

Martin Peaking Units

February 16, 2000
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TABLE 1.6-1

STACK, OPERATING AND EMISSION DATA FOR PROPOSED GE 7FA COMBUSTION TURBINE WITH DLN COMBUSTORS, FIRING NATURAL GAS-BASE LOAD OPERATION

Parameter		Operating and Emission Data[a] for Ambient Temperature 35°F	59°F	95°F
Stack Data (ft)				
Height (minimum)		60	60	60
Diameter (maximum)		22	22	22
Operating Data				
Temperature (°F)		1,095	1,116	1,143
Velocity (ft/sec)		119.7	116.3	109.5
Maximum Hourly Emission per Unit[b]				
SO_2	lb/hr	5.1	4.9	4.4
	Basis	1.0 grain S/100CF	1.0 grain S/100CF	1.0 grain S/100CF
PM/PM_{10}	lb/hr	10	10	10
	Basis	Dry filterables	Dry filterables	Dry filterables
NO_x	lb/hr	79.4	76.0	68.8
	Basis	10.5 ppmvd at 15% O_2	10.5 ppmvd at 15% O_2	10.5 ppmvd at 15% O_2
CO	lb/hr	44.8	42.6	38.8
	Basis	12 ppmvd	12 ppmvd	12 ppmvd
VOC (as methane)	lb/hr	3.2	3.0	2.8
	Basis	1.54 ppmvd	1.54 ppmvd	1.54 ppmvd
Sulfuric Acid Mist	lb/hr	0.39	0.38	0.34
	Basis	5% SO_2	5% SO_2	5% SO_2

Source: Golder Associates, Inc., 2000

Notes: VOC emissions are exclusive of background concentrations
ppmvd = parts per million volume dry
O_2 = oxygen
S = sulfur
CF = cubic feet

(a) Refer to air permit application for detailed information

(b) Other regulated pollutants are assumed to have minor to negligible emissions. These pollutants include lead, reduced sulfur compounds, hydrogen sulfide, fluorides, beryllium, mercury, municipal waste combustor (MWC) organics, MWC metals and MWC acid gases.

TABLE 1.6-2

STACK, OPERATING AND EMISSION DATA FOR PROPOSED GE 7FA COMBUSTION TURBINE WITH WATER INJECTION, FIRING DISTILLATE FUEL OIL-BASE LOAD OPERATION

Parameter		Operating and Emission Data[a] for Ambient Temperature 35°F	59°F	95°F
Stack Data (ft)				
Height (minimum)		60	60	60
Diameter (maximum)		22	22	22
Operating Data				
Temperature (°F)		1,074	1,098	1,131
Velocity (ft/sec)		123.5	119.9	111.4
Maximum Hourly Emission per Unit[b]				
SO_2	lb/hr	103.1	98.6	89.1
	Basis	0.05 % S	0.05 % S	0.05 % S
PM/PM_{10}	lb/hr	17.0	17.0	17.0
	Basis	Dry filterables	Dry filterables	Dry filterables
NO_x	lb/hr	370.6	354.3	316.1
	Basis	42 ppmvd at 15% O_2	42 ppmvd at 15% O_2	42 ppmvd at 15% O_2
CO	lb/hr	75.6	71.8	64.6
	Basis	20 ppmvd	20 ppmvd	20 ppmvd
VOC (as methane)	lb/hr	8.5	8.1	7.4
	Basis	3.5 ppmvw	3.5 ppmvw	3.5 ppmvw
Sulfuric Acid Mist	lb/hr	7.9	7.6	6.8
	Basis	5% SO_2	5% SO_2	5% SO_2

Source: Golder Associates, Inc., 2000

Notes: VOC emissions are exclusive of background concentrations
ppmvd = parts per million volume dry
ppmvw = parts per million volume wet
O_2 = oxygen
S = sulfur
CF = cubic feet

(a) Refer to air permit application for detailed information

(b) Other regulated pollutants are assumed to have minor to negligible emissions. These pollutants include lead, reduced sulfur compounds, hydrogen sulfide, fluorides, beryllium, mercury, municipal waste combustor (MWC) organics, MWC metals and MWC acid gases.

TABLE 1.6-3

STACK, OPERATING AND EMISSION DATA FOR PROPOSED GE 7FA COMBUSTION TURBINE WITH DLN COMBUSTORS, FIRING NATURAL GAS-POWER MODES OF OPERATION

Parameter		Operating and Emission Data[a] for Ambient Temperature 35°F	59°F	95°F
Stack Data (ft)				
Height (minimum)		60	60	60
Diameter (maximum)		22	22	22
Operating Data				
Temperature (°F)		1,109	1,130	1,158
Velocity (ft/sec)		121.1	118.5	114.4
Maximum Hourly Emission per Unit[b]				
SO_2	lb/hr	5.3	5.1	4.8
	Basis	1.0 grain S/100CF	1.0 grain S/100CF	1.0 grain S/100CF
PM/PM_{10}	lb/hr	10	10	10
	Basis	Dry filterables	Dry filterables	Dry filterables
NO_x	lb/hr	116.7	112.4	106.0
	Basis	15 ppmvd at 15% O_2	15 ppmvd at 15% O_2	15 ppmvd at 15% O_2
CO	lb/hr	44.9	53.3	49.6
	Basis	15 ppmvd	15 ppmvd	15 ppmvd
VOC (as methane)	lb/hr	3.2	3.1	2.8
	Basis	1.5 ppmvd	1.5 ppmvd	1.5 ppmvd
Sulfuric Acid Mist	lb/hr	0.41	0.39	0.37
	Basis	5% SO_2	5% SO_2	5% SO_2

Source: Golder Associates, Inc., 2000

Notes: VOC emissions are exclusive of background concentrations
ppmvd = parts per million volume dry
O_2 = oxygen
S = sulfur
CF = cubic feet

(a) Refer to air permit application for detailed information

(b) Other regulated pollutants are assumed to have minor to negligible emissions. These pollutants include lead, reduced sulfur compounds, hydrogen sulfide, fluorides, beryllium, mercury, municipal waste combustor (MWC) organics, MWC metals and MWC acid gases.

TABLE 1.6-4

MAXIMUM POTENTIAL EMISSIONS FOR MARTIN PEAKING UNITS

			Load at 59°F Compressor Inlet					Load at 59°F Compressor Inlet		
Pollutant	CT Units	Hours	100%	75%	50%	CT Units	Hours	100%	75%	50%
Natural Gas Firing[a]										
PM	1	3,390	17.0	17.0	17.0	2	2,390	23.9	23.9	23.9
SO_2	1	3,390	8.3	6.7	5.4	2	2,390	11.7	9.5	7.6
NO_x	1	3,390	128.7	103.4	82.2	2	2,390	181.5	145.8	116.0
CO	1	3,390	72.2	59.0	49.0	2	2,390	101.8	83.1	69.1
VOC	1	3,390	5.2	4.2	3.5	2	2,390	7.3	5.9	4.9
Distillate Oil Firing[b]										
PM	1	500	4.3	4.3	4.3	2	500	8.5	8.5	8.5
SO_2	1	500	24.6	19.7	15.7	2	500	49.3	39.4	31.3
NO_x	1	500	88.6	70.1	55.2	2	500	177.2	140.2	110.4
CO	1	500	17.9	17.2	21.0	2	500	35.9	34.5	42.0
VOC	1	500	2.0	1.6	1.3	2	500	4.0	3.2	2.7
Higher Power Modes[c]										
PM	1	500	2.5	NA	NA	2	500	5.0	NA	NA
SO_2	1	500	1.3	NA	NA	2	500	2.6	NA	NA
NO_x	1	500	28.1	NA	NA	2	500	56.2	NA	NA
CO	1	500	13.3	NA	NA	2	500	26.7	NA	NA
VOC	1	500	0.8	NA	NA	2	500	1.5	NA	NA
Total Potential Emissions[d]										
PM	1	3,390	18.7	18.7	18.7	2	3,390	37.4	37.4	37.4
SO_2	1	3,390	31.8	25.4	20.3	2	3,390	63.6	50.9	40.5
NO_x	1	3,390	207.5	158.2	125.3	2	3,390	414.9	316.4	250.6
CO	1	3,390	82.2	67.5	62.8	2	3,390	164.3	135.0	125.6
VOC	1	3,390	6.4	5.2	4.3	2	3,390	12.8	10.4	8.6

Source: Golder Associates, Inc., 2000

Notes: Emissions are in tons per year (TPY)
VOC emissions are exclusive of background concentrtions
(Refer to air permit application for details and Tables referenced below.)

[a] 3,390 hours per year operation as shown for one unit in Tables B-2, B-6 and B-10
[b] 500 hours per year of oil firing as shown for one unit in Tables B-14, B-18 and B-22
[c] 500 hours of higher power modes firing gas firing as shown for one unit in Table B-26
[d] For 75% and 50% load the emissions are based on 2,890 hours gas firing and 500 hours of oil firing

2. SITE DESCRIPTION AND ENVIRONMENT

The 1989 Site Certification Application (SCA) for the Martin CG/CC Project (FPL, 1989) contains extensive descriptions of on-site and off-site conditions at the Martin Site. This application for modification of the Martin Site Certification addresses on-site conditions and describes off-site conditions only when applicable.

2.1 GENERAL DESCRIPTION

The Martin Site consists of 11,300 acres and is located in Martin County, approximately 40 miles northwest of West Palm Beach, 5-miles east of Lake Okeechobee, and 7-miles northwest of Indiantown. The Site is bounded on the west by the Florida East Coast (FEC) Railway and the SFWMD Canal L-65, on the south and southeast by the St. Lucie Canal (C-44 or Okeechobee Waterway) and privately-owned agricultural land, on the northeast by State Road (SR) 710 and the CSX Railway, and on the north by privately-owned agricultural and undeveloped land.

The Martin Peaking CT Addition will be located on a 68-ac Project Site within the power plant area of the existing Martin Site (Fig. 1.3-1). The Project Site has been developed as an industrial site and is basically level, at an elevation of 30 feet (ft) above mean sea level (MSL).

2.2 CLIMATOLOGY/AIR QUALITY

The average annual ambient temperature of about 73°F at the Martin Site reflects the subtropical climate of the area. Midday and nighttime relative humidities show little variation throughout the year, with a daytime reading close to 60 percent and an annual predawn maximum of 80 percent. The least humid month is April, while the highest humidity occurs during midsummer. Data collected at Port Mayaca, location of the nearest National Weather Service observation station, indicate the occurrence of a precipitation maximum at the Martin Site in summer as a result of heavy, short-duration convective showers and thunderstorms. Local effects of Lake Okeechobee influence rainfall in the vicinity of the Martin Site. Sixty percent of the total annual average rainfall occurs from June through September. Port Mayaca reports a normal average annual precipitation of approximately 48-inches and a maximum average annual precipitation of 60.65-inches. Prevailing winds at the Martin Site are from east to east-southeast throughout most of the year. Thunderstorms occur with great frequency in the area and can be locally intense, with high

winds, heavy rain, occasional hail, and frequent lightning. The Site experiences 80 to 90 thunderstorms per year, 65 percent of which occur in the summer season (FPL, 1989).

Background air quality and air quality impacts of the operation of the Martin Plant have been the subject of numerous monitoring programs by FPL. These monitoring programs have been conducted to establish baseline concentrations of pollutants and to monitor the emissions associated with operation of the Plant in order to comply with state and federal Prevention of Significant Deterioration (PSD) regulations. These regulations determine the magnitude of air quality deterioration allowable in an area by establishing classifications, area designations and allowable PSD increments for each regulated pollutant in each classification.

PSD Class I areas include international parks, national wilderness areas, memorial parks larger then 5,000-ac, and national parks larger than 6,000-ac. The nearest PSD Class I area is the Everglades National Park, located approximately 144-kilometers (km) south of the Martin Site. PSD Class II areas include all other areas not designated as Class I areas. Martin County and the surrounding counties are designated as PSD Class II areas for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and total suspended particulates (TSP).

FPL has conducted air quality monitoring for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and total suspended particulates (TSP) at the Martin Site since 1973. Data collected in this monitoring program indicate good background air quality, as demonstrated by low concentrations of SO_2, NO_2, and TSP. In addition, during an on-site air quality monitoring program conducted during 1988 and 1989, in support of the SCA and its associated PSD Permit application, SO_2, NO_2, ozone, and particulate matter (PM_{10}) concentrations were measured at concentrations well below the allowable National and Florida Ambient Air Quality Standards (AAQS) (FPL, 1989).

The Florida Department of Environmental Protection (DEP) supports an air-monitoring network throughout the state. The closest monitoring stations to the FPL Martin site are located in Indiantown for PM_{10} and Palm Beach County for SO_2 and NO_2. These data indicate compliance with the AAQS in the region. Available data for 1997 and 1998 for PM_{10} in Indiantown ranged from 15-to 18-$\mu g/m^3$ annual average compared to the AAQS of 50-$\mu g/m^3$. The maximum 24-hour concentrations of PM_{10} in Indiantown ranged from 25-to 40-$\mu g/m^3$ annual average compared to the AAQS of 150-$\mu g/m^3$. Annual average concentrations of NO_2 in Palm Beach

County from 1997 through the second quarter of 1999 ranged from 23-to 28-$\mu g/m^3$ compared to the AAQS of 100-$\mu g/m^3$. From 1997 through the second quarter of 1999, the annual average concentrations of SO_2 in Palm Beach County ranged from 3-to 5-$\mu g/m^3$ compared to the AAQS of 60-$\mu g/m^3$. Maximum 3-hour and 24-hour concentrations of SO_2 in Palm Beach County during this same period ranged from 31-to 165-$\mu g/m^3$ and 10-to 50-$\mu g/m^3$, respectively. These maximums are much less than the AAQS of 1,300-and 260-$\mu g/m^3$, for the 3-hour and 24-hour averaging times, respectively (DEP, 1997–1999).

2.3 HYDROLOGY/WATER QUALITY

The following information is provided for background understanding of the Martin Site and its existing operations. Changes and impacts to these systems are described in Section 3.3.

2.3-1 Water Resources

Sources of water to the existing plant are ground water from the shallow aquifer, surface water from the St. Lucie Canal, and precipitation. Figure 2.3-1 shows the existing plant permitted water balance. Present operation of combined cycle Units 3 and 4 results in an average withdrawal of approximately 28.2-mgd (19,591-gpm) from the St. Lucie Canal for makeup to the closed-cycle Cooling Pond to account for evaporative losses and process water use. An additional 28.4-mgd (19,722-gpm) is withdrawn to replace seepage from the Pond. The Cooling Pond provides process water to the existing units and functions as a heat sink for the dissipation of condenser cooling waste heat. An average of 1.6-mgd (1,087-gpm) is withdrawn from the Cooling Pond via two 1,500-gpm pumps for use as process water for the existing units. Process waste waters are treated prior to discharge to the Cooling Pond. Water for domestic (drinking and sanitary) use is withdrawn from the surficial aquifer via a dedicated well at an average flow rate of approximately 0.028-mgd (19.4-gpm). Sanitary waste waters are treated prior to recycling to the Cooling Pond.

2.3-2 Process Water Management

Existing process water uses include service (washdown) water, inlet air foggers, fire protection water, makeup to the demineralizer, filter backwashes, miscellaneous plant demands, and chemical lab water. Waste water from the backwashes of well water pressure filters, activated carbon filters, and potable water carbon filters, and blowdown from the CC units' heat recovery

steam generators (HRSGs) is blended with the process water prior to treatment. The pretreatment system for process waters includes chlorination, clarification and softening, pressure filtration, reverse osmosis (RO) and demineralization.

Process water wastes generated in the CC units consist primarily of carbon filter backwash, RO waste water (brine), and high and low TDS demineralizer regeneration wastes. These waste waters, along with service (washdown) waters and waste waters from floor drains, demineralizer regeneration, and HRSG metal cleaning are collected and treated via neutralization, clarification, and filtration prior to discharge to the cooling pond.

2.3.3 Effluent Disposal

The Martin Site is "zero-discharge" with respect to industrial waste waters, meaning that no effluent is discharged directly to surface or ground waters. All process waste waters are treated as described above prior to recycle to the Cooling Pond.

2.3.4 Onsite Drainage

The Martin Site surface water management system includes dry detention ponds and water level control structures. The existing on-site conveyance ditch system directs runoff to the existing flow-way, which in turn discharges into the St. Lucie Canal.

2.4 ECOLOGICAL RESOURCES

Following is a description of the existing ecological conditions at the proposed Peaking Unit Project Site. This discussion is based on recent Project Site visits.

2.4.1 Wetlands and Other Vegetative Communities

The 68-ac Project Site is located in the southwest corner of the existing Martin CG/CC Project Site on land that was cleared in the early 1990's and has been maintained since that time for placement of power plant facilities. Currently, the Project Site is primarily a grassed area that is mowed periodically. As shown in Figure 2.4-1, the dike/ditch system that surrounds the Martin Cooling Pond lies to the west and south of the Project Site, and existing power plant facilities lie to the east and north. A small stand of pine trees is situated in a flatwoods area about 300-yards to the southeast of the proposed location of the peaking units.

2.4.2 Threatened and Endangered Species

Foster Wheeler Environmental Corporation (FWENC) ecologists inspected the Peaking Units Project Site in December 1999 and February 2000. These inspections were conducted to identify habitat and the presence of species listed as threatened or endangered by the U. S. Fish and Wildlife Service, animals listed as threatened or endangered or Species of Special Concern by the Florida Fish and Wildlife Conservation Commission, and plants listed as endangered by the Florida Department of Agriculture and Consumer Services. Table 2.4-1 lists the species and their habitats that were sought during the site visit. This list consists of species that prefer habitats that might be affected by Project development.

The Project Site has, at best, marginal habitat for populations of protected animal species listed by the above agencies. Habitat conditions are not present for any listed plant species. Rooting of feral hogs has disturbed these flatwoods habitats. The Project Site represents a small area available for feeding by some of the listed species. However, FWENC personnel observed none of the protected species listed in Table 2.4-1 during either site visit.

2.5 NOISE

2.5.1 Noise Ordinances

Neither the federal government nor the State of Florida has established environmental noise standards applicable to the Project. The U. S. Environmental Protection Agency (EPA) has issued noise guidelines to protect public health and welfare from noise sources (EPA, 1974). The existing Planned Unit Development (PUD) Zoning Agreement between Martin County and FPL provides that the Martin Site facilities are not to cause unreasonable sound levels to reach the boundary of any adjacent residential district. In October 1998, the Martin Board of County Commissioners adopted Ordinance No. 531, which established numerical noise standards within the unincorporated areas of Martin County. These standards are established for various land use designations, but do not apply to the Project Site because of the specific standards established by the PUD agreement

2.5.2 Noise Measurement Procedures

A comprehensive ambient noise-monitoring program was performed to assess the existing ambient noise levels in the vicinity of the Project. Procedures used during this monitoring

program are outlined in Appendix B of this document. Figure 2.5-1 shows the location of the six monitoring sites used in this monitoring program.

2.5.3 Noise Survey Results

The daytime and nighttime ambient noise levels, measured as an equivalent sound pressure level (L_{eq}), for each of the six monitoring sites range from 35.6-dBA to 56.4-dBA. At the four noise monitoring locations located along the property boundary of the Martin Plant (Sites 3, 4, 5 and 6), the minimum L_{eq} noise levels ranged from 34.2-dBA to 54.6-dBA for daytime and nighttime measurements. These minimum values represent the noise levels generated by the operations of the Martin Plant. The maximum L_{eq} noise levels measured at the sites for daytime and nighttime ranged from 48.6-dBA to 64.5-dBA, indicating external and intermittent noise sources, such as insects, traffic, aircraft and railroads influenced the measurements. Indeed, at the Barley Barber Swamp site, the nearest sensitive receptor, the minimum L_{eq} values ranged from 34.2-dBA during the daytime to 34.4-dBA during the nighttime. The maximum noise levels measured at Site 1, for daytime and nighttime periods, were 46.9-dBA and 39.4-dBA, respectively. These noise levels are significantly lower than the Martin County noise standards for all land use categories.

2.6 SOCIOECONOMICS

FPL has operated the Martin Power Plant since 1980 and the need for power in the FPL service area has continued to grow throughout this period of time. The increase in population growth in Florida and the increased need for power brought about by this growth have resulted in a need to expand the generating capacity of the Martin Plant as well as other FPL facilities. In December 1998, FPL served an estimated seven million customers, almost half of the state's population of 15 million. Annualized customer growth from year-end 1993 through 1998 was 1.9 percent in FPL's service area, compared to 1.3 percent nationally. FPL plans to add 3,600-MW of new generating power by upgrading four older oil-fired power plants to be high efficiency gas-fired combined-cycle units. The proposed Martin peaking units are part of an FPL plan to increase its generating capacity by twenty percent within ten years (FPL, 1999).

Addition of the two peaking units to the Martin Plant will provide additional tax revenue to Martin County. FPL already pays over ten million dollars per year in property taxes for the

Martin facility and installation of the new equipment is estimated to increase total future property taxes to nearly twelve million dollars per year.

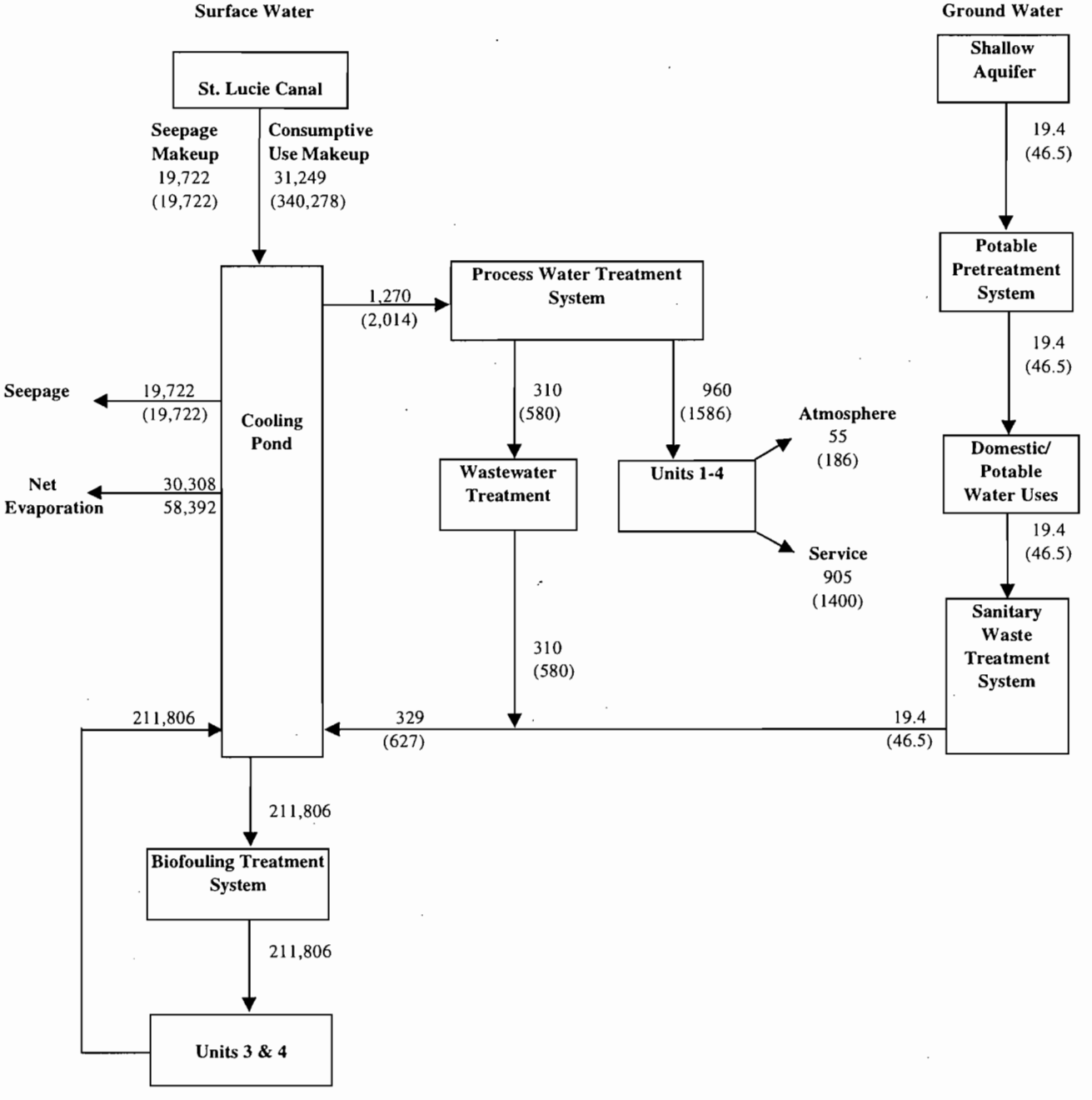
2.7 LAND USE/ZONING

The entire Martin Site is designated Public Utilities-Major Power Generation Facilities on the Martin County Future Land Use Map. The area in which the proposed peaking units will be located is included in the 2,192-ac site that was rezoned to Industrial Planned Unit Development [PUD(i)] in 1989. Specifically, the new peaking units will be located in the area of the approved Master Plan designated "New Power Block Area." As described in Attachment 2 to Exhibit F of the PUD Agreement, the New Power Block Area was planned to include combustion turbines. Most of the Special Conditions pertaining to permitted uses, potable water, wastewater treatment, upland preserve and restoration areas, size and dimension criteria, performance standards, wetlands, bikepath, hazardous waste management, excavation and fill, landscaping, noise, archaeological artifacts, protection of endangered plants and animals, and locally available employment applications, have already been addressed during earlier phases of development at the Martin Site. To the extent the special conditions in the PUD Agreement are applicable to the development of the proposed peaking units, they will be met.

In conclusion, the proposed peaking combustion turbine units will be developed in accordance with the approved PUD(i) Master Plan and PUD Agreement, and no modifications to that agreement are necessary to accommodate the proposed development.

2.8 CULTURAL RESOURCES

No cultural, scenic, or state or national landmarks have been identified or designated at the location of the proposed peaking units at the Martin Power Plant. A Cultural Resources Assessment was performed at the Martin Site in 1989 to determine the potential impact on cultural resources of the Martin CG/CC Project. The Martin peaking units will be located within the area set aside in the CG/CC Project for the gasifier. As discussed in the SCA for the Martin CG/CC Project, there were no cultural resources within the area proposed for the CG/CC Project, therefore the peaking units will have no impact on cultural resources.

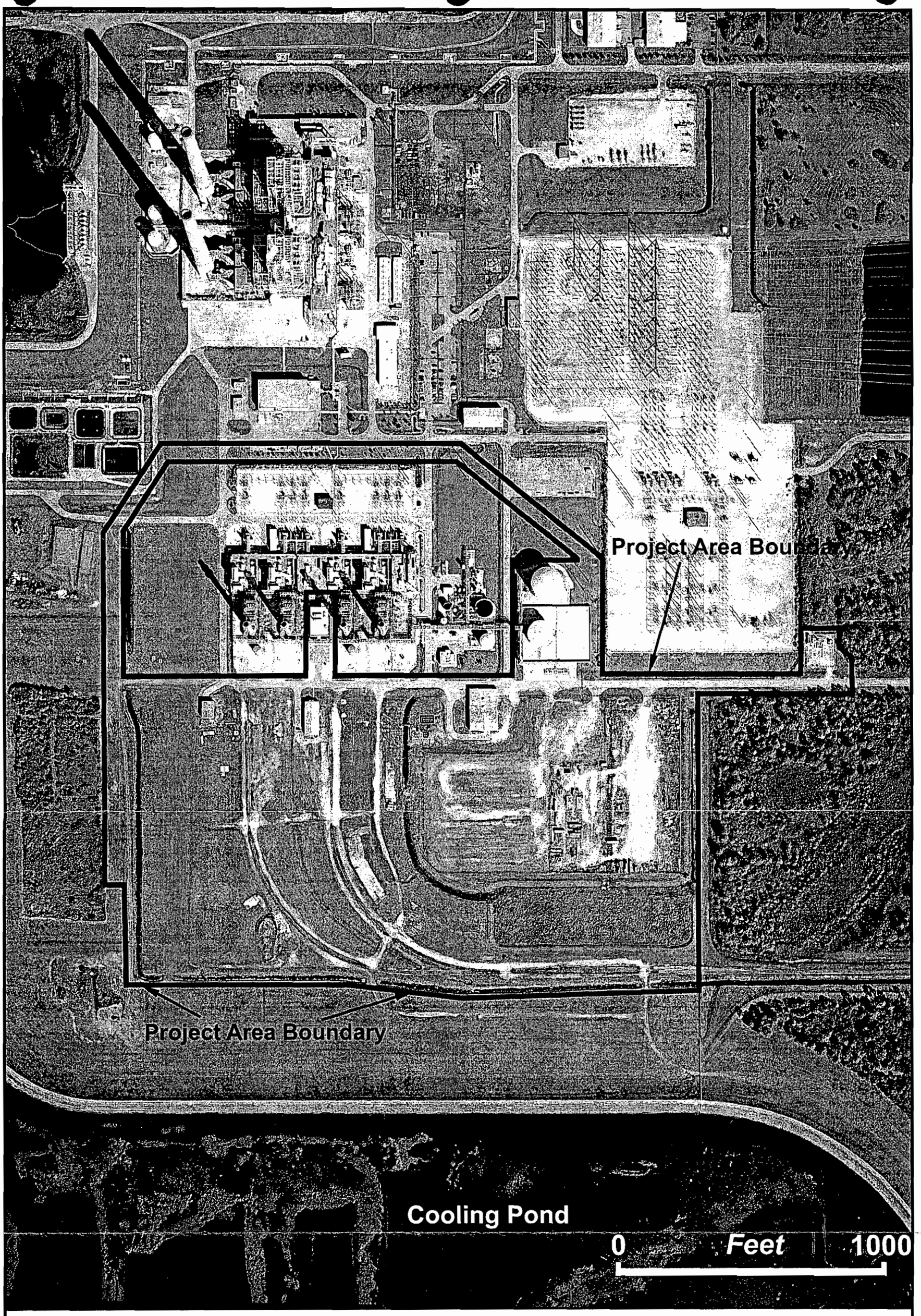


Source: FWENC, 2000

Notes: Flows in gpm
Peak flows in parentheses

FIGURE 2.3-1

EXISTING WATER BALANCE



Sources: Florida Power and Light Co. (2000)
Foster Wheeler Environmental (2000)

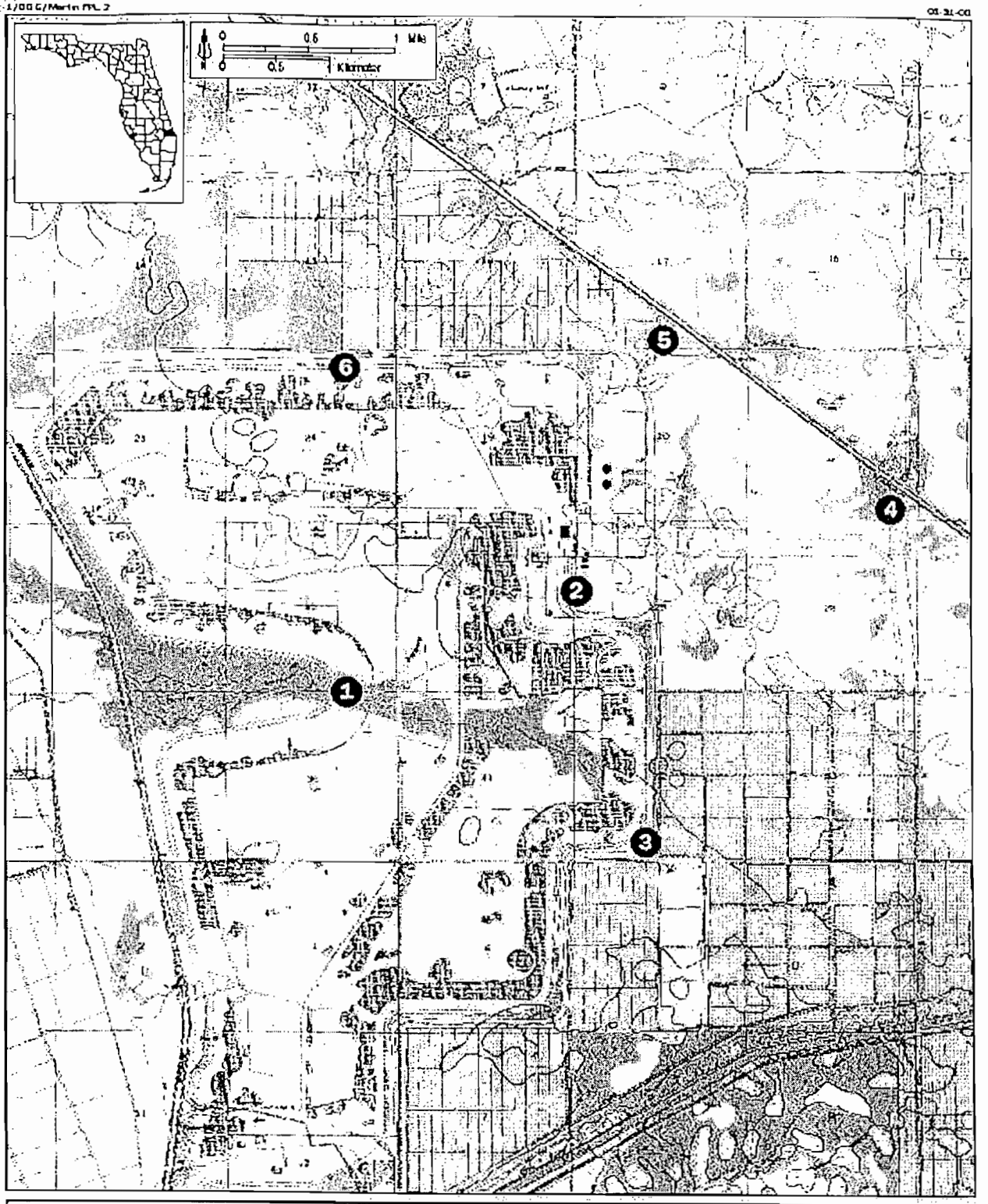
N

Figure 2.4-1
COMBUSTION TURBINE SITE
AERIAL PHOTOGRAPH

Martin Peaking Units

FPL

February 14, 2000
Sca241.tif



Sources: USGS, 1983
Golder Associates, Inc., 2000

FIGURE 2.5-1
NOISE MONITORING SITES

Martin Peaking Units
FPL

TABLE 2.4-1

THREATENED AND ENDANGERED SPECIES AND SPECIES OF SPECIAL CONCERN POTENTIALLY OCCURRING ON AND ADJACENT TO THE MARTIN PEAKING UNIT PROJECT SITE

Species	Status	Habitat	Project Site Habitat Status
Gopher Frog *Rana capito*	SSC	Flatwoods	Site habitat unsuitable, nearby habitat marginal, species not observed
Gopher Tortoise *Gopherus polyphemus*	SSC	Upland flatwoods, Old fields	Site habitat present, species not observed
Southeastern American Kestrel *Falco sparverius*	T-S	Various terrestrial habitats	Site and adjacent habitats suitable, species not observed
Florida Sandhill Crane *Grus canadensis pratensis*	T-S	Prairies	Site habitats suitable for feeding, species not observed

Source: Florida Fish and Wildlife Conservation Commission, 1997

Status: T – Threatened
S – Florida Fish and Wildlife Conservation Commission listing
SSC – Species of Special Concern (Florida only)

3. IMPACT ANALYSIS FOR CONSTRUCTION AND OPERATION

3.1 GENERAL

The Martin peaking units will be operated in conjunction with the existing units at the Martin Plant. The CT units will be integrated fully with the existing generating facilities and will not require additional staff to operate. Following are descriptions of the anticipated environmental and other impacts expected as a result of the construction and operation of the peaking units.

3.2 AIR QUALITY

3.2.1 Construction

Construction activities will result in the generation of small quantities of fugitive particulate matter (PM) emissions and vehicle exhaust emissions. Fugitive PM emissions will result primarily from land clearing activities and vehicular traffic over paved and unpaved roads. Vehicular traffic will include heavy-equipment traffic and traffic due to construction workers entering and leaving the Martin Plant site. Construction personnel and equipment will enter the site primarily over paved roads. Exposed land areas may also generate fugitive dust due to wind erosion.

Emission of fugitive PM from these activities is extremely difficult to quantify due to their variable nature. Such emissions are dependent upon a number of factors, including specific activities conducted, level of activity, meteorological conditions and control measures. For fugitive PM emissions, control measures such as those described in DEP Rule 62-296.320(c), F.A.C., would mitigate air quality impacts from fugitive PM emissions. For the proposed project, a number of control measures specified by the DEP Rule will be implemented to minimize impacts. Land clearing activities will be kept to a minimum due to the nature of the project and existing conditions at the site. This will reduce the possibility of wind generated fugitive PM emissions due to soil erosion. After grading, open or lightly traveled areas will be paved or vegetated to further minimize fugitive PM emissions. Heavily traveled construction and laydown areas will be stabilized with shell or rock. Watering will be performed on an as-needed basis to minimize fugitive PM emissions from these areas.

Air emissions will be generated by onsite construction equipment, including cranes, trucks, compressors, etc. that use diesel or gasoline engines. This equipment will produce emissions of

carbon monoxide, nitrogen oxides, volatile organic compounds, PM and sulfur dioxide. Emissions of these pollutants are not expected to exceed approximately 10-tons/year. Given the rural nature of the site and the distance to the nearest property boundary, these emissions will not impact air quality in the area. Open burning activities are not expected for the proposed project due to the lack of areas with significant vegetation.

3.2.2 Operation

Under federal and State of Florida Prevention of Significant Deterioration (PSD) review requirements, all new or modified major sources of air pollutants regulated under the Clean Air Act (CAA) must be reviewed and a permit issued before the commencement of construction. The EPA has approved Florida's State Implementation Plan (SIP), which contains PSD regulations, therefore, PSD approval authority has been granted to DEP. PSD review is used to determine whether significant air quality deterioration will result from the new or modified facility. Federal PSD requirements are contained in the Code of Federal Regulations, 40 CFR 52.21, *Prevention of Significant Deterioration of Air Quality*. The State of Florida PSD regulations are contained in DEP Rule 62-212.400, F.A.C.

A "major facility" is defined as any one of 28 named source categories that have the potential to emit 100-tons per year (TPY) or more, or any other stationary facility that has the potential to emit 250-TPY or more, of any pollutant regulated under the CAA. "Potential to emit" means the capability, at maximum design capacity, to emit a pollutant after the application of control equipment. Subject to certain exceptions, a "major modification" is defined under PSD regulations as a physical or operational change at an existing major facility that increases the facility's emissions by an amount that is greater than the defined significant emission rates.

EPA's regulations identify certain increases above an air quality baseline concentration level of SO_2, PM_{10}, and NO_2 concentrations that would constitute significant deterioration. These are defined as PSD Increments and are applicable to two types of areas. PSD Class I areas are large national parks and wilderness areas and have the most stringent level of protection. In Florida there are four PSD Class I areas; there is also one PSD Class I area in Georgia that is near the northeast Florida border. The remaining areas in Florida are PSD Class II areas. The State of Florida has adopted the EPA Class designations and allowable PSD increments for SO_2, PM_{10}, and NO_2 increments.

Major facilities and major modifications are required to undergo PSD review that involves the following analyses related to each pollutant emitted in significant amounts:

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

In addition to these analyses, a new unit also must be reviewed with respect to Good Engineering Practice (GEP) stack height regulations. Each of these requirements has been addressed in the Air Construction Permit and PSD Application for the Peaking Unit Project. This section summarizes information contained in the PSD Application.

The Martin Plant is a major source, and emissions from the proposed project will exceed the significant emission rate for at least one PSD pollutant. For the proposed project, PSD review is applicable to emissions of NO_x, SO_2, CO, and PM/PM_{10}. The maximum potential annual emissions of these pollutants from the proposed GE 7FA CTs are summarized below:

Pollutant Emissions (TPY)	
Pollutant	**2 GE 7FA CTs/PSD Significant Emission Rate [a]**
NO_x	414.9/40
SO_2	63.6/40
CO	164.3/100
PM/PM_{10}	37.4/25-15

[a] Maximum emissions based on firing natural gas for 2,390 hours at base load, firing natural gas in higher power modes for 500 hours and firing distillate fuel oil for 500 hours at base load conditions; turbine inlet at 59°F for all operations.

In recent permitting actions, DEP has established Best Available Control Technology (BACT) for heavy-duty industrial gas turbines used in peaking mode such as the ones proposed for the Martin Peaking Unit Project. DEP's decisions have been based on the use of advanced DLN combustors for limiting NO_x and CO emissions and clean fuels (natural gas and distillate oil) for control of other emissions, including SO_2. BACT proposed for the CTs to be used for the project is consistent with these recent DEP permits. The proposed project will have three modes of operation for which a BACT analysis has been performed. This analysis concluded that the following controls are BACT for the project:

- Natural Gas Fired - The CTs will utilize state-of-the-art DLN combustion technology which will achieve gas turbine exhaust NO_x levels of no greater than 10.5-ppmvd (corrected to 15 percent O_2). CO emissions will be limited to 12-ppmvd at base load.
- Fuel Oil Fired - The CTs will utilize water injection to achieve gas turbine exhaust NO_x levels of no greater than 42-ppmvd (corrected to 15 percent O_2). CO emissions will be limited to 20-ppmvd at base load.
- Higher Power Modes - The CTs will utilize state-of-the-art DLN combustion technology which will achieve gas turbine exhaust NO_x levels of no greater than 15-ppmvd (corrected to 15 percent O_2). CO emissions will be limited to 15-ppmvd at base load.

For SO_2, PM/PM_{10} and sulfuric acid mist, the proposed BACT is the use of clean fuels, i.e., natural gas and low sulfur (0.05 percent) distillate low. These techniques have been determined by DEP to represent BACT for simple cycle combustion turbines.

The PSD regulations require that an air quality analysis must be conducted for each criteria and noncriteria pollutant subject to PSD review prior to construction. Criteria pollutants are those pollutants for which AAQS have been established. Noncriteria pollutants are those pollutants that may be regulated by emission standards, but no AAQS have been established. This analysis may be performed by the use of modeling and/or by monitoring the air quality. The ambient monitoring analysis is not required if it can be demonstrated that the proposed source's maximum air quality impacts will not exceed the PSD *de minimis* concentration levels. The air quality analysis must also demonstrate that the proposed project does not cause or contribute to a violation of the ambient air quality standards (AAQS) or PSD Increments. The analysis must also use an approach that utilizes EPA approved models and procedures.

The general modeling approach for the Martin Peaking Unit Project followed EPA and DEP modeling guidelines for determining compliance with AAQS and PSD increments. A modeling analysis is required for all applicable pollutants that have emission increases exceeding the PSD significant emission rate. For the proposed project, a modeling analysis was required for NO_x, SO_2, CO, PM/PM_{10}.

A significant impact analysis was first performed to determine whether the project alone will result in predicted impacts that will exceed the EPA significant impact levels at any off-plant property areas in the vicinity of the plant. Significant impact levels establish a threshold of impacts regarding the modeling analysis. If the project's impacts are above the significant impact levels, then a more detailed air modeling analysis, that includes other air pollution sources, is

performed. If the impacts are less than the significant impact levels, no further analysis is required.

Current DEP policies stipulate that the highest annual average and highest short-term (i.e., 24-hours or less) concentrations are to be compared to the applicable significant impact levels. Based on the screening modeling analysis results, additional modeling refinements with a denser receptor grid are performed, as necessary, to obtain the maximum concentration.

For this project, the significant impact levels were calculated in the vicinity of the plant following DEP policies. The Industrial Source Complex Short-Term (ISCST3, Version 99155) dispersion model (EPA, 1999) was used to evaluate the pollutant impacts due to the proposed CTs. This model is maintained by the EPA on its Internet website, Support Center for Regulatory Air Models (SCRAM), within the Technical Transfer Network (TTN). Meteorological data used in the ISCST3 model to determine air quality impacts consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) station at the Palm Beach International Airport at West Palm Beach, Florida. The 5-year period of meteorological data was from 1987 through 1991. These data are the most recent 5-year period of meteorological data that have been approved by DEP for use in the modeling. The NWS station at West Palm Beach is located approximately 45-km (28-miles) southeast of the Martin Plant site.

If a new project is within 150-km of a PSD Class I area, then a significant impact analysis is performed for the PSD Class I area. The National Park Service (NPS) has recommended significant impact levels for PSD Class I areas. The recommended levels have not been promulgated as rules. EPA also has proposed, as rules, PSD Class I significant impact levels that have not been finalized as of this application. Currently, the EPA-recommended levels are used by DEP in evaluating impacts to Class I areas. The NPS has recognized these levels as appropriate for Florida. Because the proposed project site is approximately 144-km from the Everglades National Park PSD Class I area, a significant impact modeling analysis has been performed.

The emission and stack operating parameters presented for 35°F and 95°F ambient temperatures for both natural gas and distillate fuel oil were used in the modeling to determine the maximum air quality impacts for a range of possible operating conditions.

Six modeling scenarios per fuel type were considered:

- Base operating load at an inlet temperature of 35°F;
- Base operating load at an inlet temperature of 95°F;
- 75 percent operating load at an inlet temperature of 35°F;
- 75 percent operating load at an inlet temperature of 95°F;
- 50 percent operating load at an inlet temperature of 35°F; and
- 50 percent operating load at an inlet temperature of 95°F.

The proposed peaking units will have a minimum stack height of 60-ft and a maximum inner stack diameter of 22-ft. Because distillate oil firing has the highest emission rates for all pollutants, these impacts represent worst-case impacts. Distillate oil firing is only being requested for a maximum equivalent of 1,000-hours per year. Since the modeling assumes emissions occur 8,760-hours per year over the 5 years of meteorological data, the impacts are especially conservative when natural gas is used as the primary fuel.

The maximum predicted PM, SO_2, NO_x, and CO impacts in the vicinity of the Martin Plant due to the operation of the proposed CTs firing distillate fuel oil are presented in Table 3.2-1. For all pollutants, the impacts are below the significant impact levels. Because the proposed source will not have a significant impact upon the air quality in the vicinity of the Plant, more detailed modeling analyses involving the impacts of other sources in determining compliance with the AAQS and PSD Class II increments are not required. As shown in Table 3.2-1, the maximum predicted PM, SO_2, NO_x, and CO impacts are also below the *de minimis* monitoring levels. Because the proposed source will not have predicted impacts greater than *de minimis* levels, preconstruction monitoring data are not required as part of the PSD review.

The maximum predicted SO_2, NO_2, and PM impacts in the Everglade National Park are also all below EPA's proposed PSD Class I significant impact levels. Therefore, more detailed modeling analyses for determining compliance with the AAQS and PSD Class II increments are not required for these pollutants.

The results of the modeling analyses and the use of screening techniques for assessing the impacts to visibility from the project in the Everglades National Park was used to assess impacts to Air Quality Related Values (AQRVs). The results of the evaluation determined that the

proposed project would not significantly impact AQRVs or the soil, vegetation and wildlife in the vicinity of the plant.

3.3 HYDROLOGY/WATER QUALITY

3.3.1 Construction

Construction will not affect any of the water-related systems except for the addition of two new drainage ditches, which will connect to the existing Martin Plant drainage system as indicated in Figure 1.9-1.

Construction of the peaking units will take place adjacent to the existing combustion turbines. Thus, construction laydown areas will be within the existing Plant area. The on-site drainage system will be sufficient to prevent any construction-related erosion. Minimal dewatering will be required during underground and foundation work. This will be accomplished by construction of temporary ditches around the areas where the foundations are to be constructed and installation and operation of sump pumps, which will discharge groundwater into the new drainage ditches located in the vicinity of the peaking units.

3.3.2 Operation

The new units will utilize water injection for NO_x control during oil firing, for inlet air foggers, for compressor wash water and, via one or more of the existing units, for power augmentation. Water for these uses will be supplied by the existing process water system, which uses the Cooling Pond as its source. Figure 3.3-1 presents the proposed permitted water balance, which includes operation of the peaking units and shows no increase in permitted values.

3.4 ECOLOGICAL RESOURCES

No significant impacts are expected to occur to ecological resources on or adjacent to the Martin Site as a result of the construction and operation of the peaking units. Wetland and aquatic resources are separated from the Project Site by power generating facilities and other manmade barriers such as roads, berms- and ditches. The Project Site is located in an area of the Martin Site that was developed previously for additional power generating and ancillary facilities and has been maintained in the developed state. The disturbed setting and relatively small habitat

area of the Project Site limit potential use by protected species. No protected species were observed during recent site visits.

3.5 NOISE

Noise impact modeling was performed to predict the maximum noise levels produced by the proposed and existing noise sources with and without background noise levels. Appendix B of this document contains a summary description of the methods used to conduct this modeling. Atmospheric attenuation was assumed for all Sites. The source data used in the analysis are contained in Table 3.5-1. Background L_{eq} levels measured during the baseline noise study were included in the predicted maximum SPLs calculations

3.5.1 Construction

The impacts of construction generated noise on human populations are dependent upon the proximity of the receptors to construction activities as well as the type and extent of noise sources. The nearest residence and ecologically sensitive receptor (i.e., critical impact point) is located approximately 1.5 mi north-northwest and approximately 1.4 mi west of the proposed peaking units.

The two major phases of the peaking unit construction project are site preparation and construction. Major sources of construction noise will be heavy machinery such as cranes, bulldozers, graders, front-end loaders, and air compressors used during these two construction phases. These sources have maximum noise levels ranging from about 82- to 90-dBA (measured at a distance of 50-ft).

The noise propagation computer program was run to predict the maximum noise levels produced by a combination of likely noise sources with and without background noise levels. A conservative estimate of the number and types of construction equipment was assumed to calculate construction noise levels. For the purpose of the construction noise impact analyses, all of the construction equipment was assumed to be operating simultaneously at peak power. This analysis, therefore, would represent a worst-case noise impact scenario. The noise levels resulting from these combinations of equipment were input as multiple sources to the model. Octave bands were estimated from *Power Plant Construction Noise Guidelines* (BBN, 1977). It is unlikely that all the equipment would be operating simultaneously and continuously and,

therefore, this impact assessment is conservative. Background SPL values were incorporated into the model to calculate impacts at the residential (critical) receptor identified as being closest to the construction activities. Only the atmospheric attenuation option was enabled during the noise modeling runs.

The predicted construction noise impacts for the off-site monitoring sites are presented in Table 3.5-2. The predicted impacts reflect the calculated noise levels without the influence of intermittent and unregulated sources, such as highway traffic noise on SR 710. As shown in this table, the estimated noise levels at the off-site receptors during the construction phase of the project are predicted to be less than 55-dBA. Most of the heavy construction activities are expected to occur during the daytime hours. Mechanical and electrical installation activities may occur at night. However, these activities have minimum noise levels and are much less than the existing plant. The daytime construction-phase noise level predicted near the closest residence is 52.9-dBA (Site 6). The model predictions are conservative and include only atmospheric attenuation, therefore, actual noise levels due to construction should be lower than predicted.

3.5.2 Operation

Table 3.5-1 lists the peaking units and their octave band and overall SPLs. Noise levels of the existing Units 1 through 4 were measured during the baseline noise measurement portion of the impact evaluation, as described in Section 2.5.2. Evaluation of the operational noise impacts of the peaking units was performed using the same methodology described above for the evaluation of the construction noise impacts. The critical receptors included in the operational impact analysis consisted of four residential/agricultural land use areas, one ecologically sensitive area (Barley Barber Swamp), and one onsite (industrial) monitoring location, where the new units will be located (see Figure 2.5-1).

The calculated maximum SPLs, including the new units, at the nearest critical receptors (Sites 1 and 6), using the background L_{eq} SPL values obtained from ambient measurements as baseline conditions, are shown in Table 3.5-3. As described in Table 3.5-3, all maximum predicted noise levels are below 55-dBA. The nearest sensitive receptor is Site 1 (Barley Barber Swamp), which is located west of the Power Plant. The predicted noise impact level at that receptor due to the peaking units is 40.1-dBA. Indeed, the next closest critical receptor (Site 6) has a predicted noise level of 52.7 dBA. These predicted noise impacts include the noise generated by the existing

Martin generating units as well as the peaking units. With the addition of the peaking units, the Martin Site will continue to comply with the PUD agreement requirement that the "plant shall be operated so as not to cause any unreasonable levels of sound to reach the boundary of any currently existing adjacent residential districts." These noise levels are also below the County Noise Ordinance limit for all land use categories in the vicinity of the Martin Plant.

3.6 SOCIOECONOMICS

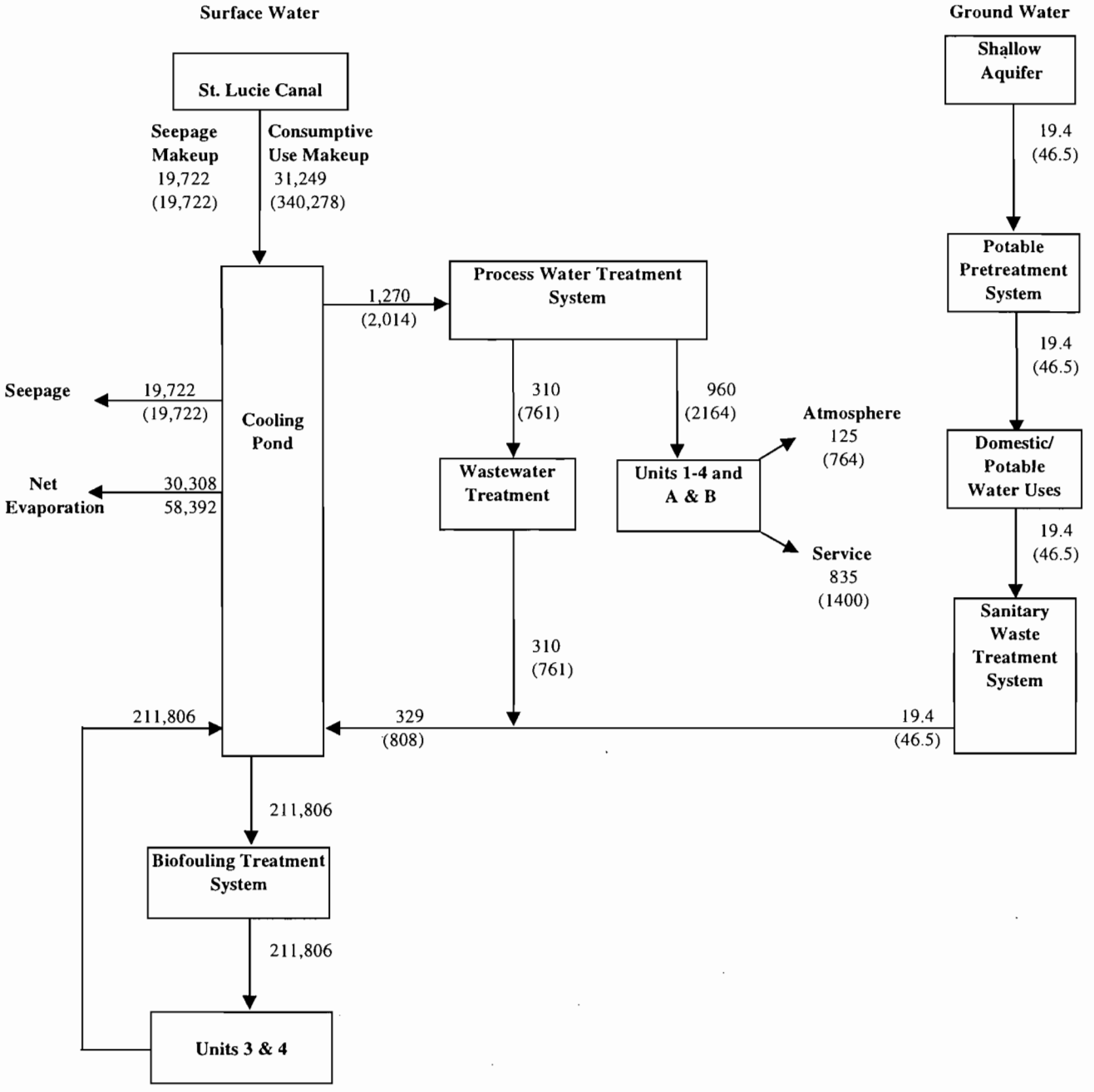
Construction of the proposed project within the Martin Site will not significantly impact the demographics or economics of the region during the relatively short construction period. Approximately 153 workers will be employed at the peak of construction and 96 workers, on average, will be employed during the 12-month construction project. Operation of the peaking units will have no impact on population or workforce but will provide economic opportunities by supporting the projected electrical power needs of the growing region. Addition of the peaking units at the Martin Plant will provide approximately two million dollars per year in additional property taxes to Martin County.

3.7 LAND USE/ZONING

There will be no impact to land use or zoning as a result of development of the proposed peaking units. The Project Site will be developed with utility facilities compatible with the existing Martin Plant Site.

3.8 CULTURAL RESOURCES

The site of the proposed peaking units was part of the Cultural Resources Assessment that was conducted in 1989 and discussed previously in Section 2.8 of this application. No cultural resources were identified in or around the Project Site during the 1989 Assessment and the Project Site was disturbed during construction of Martin Units 3 and 4 for the Martin CG/CC Project. Therefore, there will be no impact to cultural resources during the construction or operation of the proposed peaking units.



Source: FWENC, 2000

Notes: Flows in gpm
Peak flows in parentheses

FIGURE 3.3-1

PROPOSED WATER BALANCE
MARTIN UNITS 1-4, A & B

TABLE 3.2-1

MAXIMUM PREDICTED POLLUTANT CONCENTRATIONS FOR TWO SIMPLE CYCLE CTS FIRING DISTILLATE FUEL OIL COMPARED TO EPA SIGNIFICANT IMPACT LEVELS, DE MINIMIS MONITORING LEVELS AND PROPOSED PSD CLASS I SIGNIFICANT IMPACT LEVELS

Pollutant	Averaging Time	Maximum Predicted Impacts Near FPL Martin Plant ($\mu g/m^3$)	EPA Significant Impact Levels ($\mu g/m^3$)	De Minimis Monitoring Concentration ($\mu g/m^3$)	Maximum Predicted Impacts at Everglades National Park ($\mu g/m^3$)	Proposed EPA Class I Significant Impact Levels ($\mu g/m^3$)
SO_2	Annual	0.035	1	-	0.003	0.1
	24-Hour	.52	5	13	0.13	.2
	3-hour	2.6	25	-	.65	1
NO_x	Annual	.124	1	14	0.01	0.1
PM_{10}	Annual	0.01	1	-	0.001	.2
	24-Hour	0.11	5	10	0.03	.3
CO	8-Hour	1.6	500	575	NA	NA
	1-Hour	9	2,000	-	NA	NA

Source: Golder Associates, Inc., 2000

Note: Concentrations are based on the highest predicted concentration using 5-years of meteorological data (1987-1991) from National Weather Service Station at Palm Beach International Airport.

TABLE 3.5-1

NOISE SOURCE DATA

Power Block Sources	Source Location [a]		Source Height [b] (m)	Sound Power Level (dB) for Octave Band Center Frequency (Hz)[c]									Overall Sound Power Level	
	X (m)	Y (m)		31.5	63	125	250	500	1K	2K	4K	8K	(dB)	(dBA)
Peaking Unit A	-12.9	-51.8	9.1	120.8	122.7	117.2	113.5	108.2	107.2	104.9	101.0	96.9	126.0	112.9
Peaking Unit B	-14.0	-56.2	9.1	120.8	122.7	117.2	113.5	108.2	107.2	104.9	101.0	96.9	126.0	112.9

Source: Golder Associates, Inc., 2000

[a] Power block source locations relative to the Unit 4B stack location.
[b] Source height used for modeling analysis only and does not necessarily represent the physical height of the source.
[c] Octave band reflects reductions due to building absorption and transmission loss through walls.

TABLE 3.5-2

PREDICTED CONSTRUCTION NOISE IMPACTS

Site No.[a]	L_{eq} Daytime Background Value (dBA)[b]	Predicted Impacts (dBA) (includes all equipment operating at same time)	
		Construction Only	Total[c]
1	38.5	42.4	43.8
3	54.0	41.8	54.4
4	51.3	36.5	51.4
5	50.4	39.2	50.7
6	52.6	40.7	52.9

Source: Golder Associates, Inc., 2000

[a] Site 2 is not included in the table since it is located at the proposed site.
[b] Construction will mainly occur during the daytime.
[c] Includes background and predicted construction noise impacts, excludes intermittent transportation noises

TABLE 3.5-3

PREDICTED OPERATIONS NOISE IMPACTS

Site No.[a]	L_{eq} Maximum Background Value (dBA)[b]	Predicted Impacts (dBA)	
		Operations Only Impacts	Total[c]
1	38.5	35.1	40.1
3	54.2	33.8	54.2
4	51.3	29.8	51.3
5	50.4	33.0	50.5
6	52.6	34.5	52.7

Source: Golder Associates, Inc., 2000

(a) Site 2 is not included in the table since it is located at the proposed site.
(b) Construction will mainly occur during the daytime.
(c) Includes background and predicted construction noise impacts.

4. REFERENCES

BBN, 1977; Power Plant Construction Noise Guidelines: Bolt Beranek and Newman, Inc., Report No. 3321; 1977

DEP, 1997-1999; Florida Department of Environmental Protection, Aerometric Information Retrieval System, Air Quality Subsystem, Quick Look Report. 1997-1999

EPA, 1974; U.S. Environmental Protection Agency; Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety; EPA 550019-74-004; 1974

EPA, 1999; U.S. Environmental Protection Agency; Industrial Source Complex Short-Term Model, Version III; Technical Transfer Network; 1999

FPL, 1989; Site Certification Application-Martin Coal Gasification/Combined Cycle Project; December 29, 1989

FPL, 1999; FPL Corporate Communications Department, Press Release; " FPL Agrees to Increase Generating Reserve Margin With New Capacity"; November 2, 1999

FPL Group, 1999; 1999 Fact Sheet; 1999

APPENDIX A

SURFACE WATER MANAGEMENT REPORT
FOR
MARTIN PEAKING UNITS

SURFACE WATER MANAGEMENT REPORT

FOR

MARTIN PEAKING UNITS

Prepared For:
Florida Power & Light Company

Prepared By:

Harold A. Frediani, Jr.
Florida P.E. Number 36394
Foster Wheeler Environmental Corp.
Certificate of Authorization Number 7130
759 S. Federal Highway
Stuart, FL 34994

February 13, 2000

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LIST OF FIGURES

1.0 Project Location

The project is located at the FPL Martin Power Plant, on State Road 710, Martin County, seven miles northeast of Indiantown, FL.

2.0 Project Description

The project will consist of the installation of two simple cycle combustion turbines, within the existing Martin Plant power block area.

3.0 Site Conditions

In February 1991, FPL received Certification for the first phase of its CG/CC Project at the Martin Plant. Additionally, the Martin Site was certified at the same time for an ultimate site capacity of 1,600 MW fueled by coal-derived gas, natural gas and fuel oil. As a result, Units 3 and 4 and associated facilities were constructed at the Martin Site and placed into service in February and April of 1994, respectively. Combined-cycle, natural gas-fired Units 5 and 6, also proposed as part of the CG/CC Project, are still planned for construction in 2006 and 2007, respectively.

During the certification process, FPL provided the design and analysis of the Surface Water Management System for the ultimate site capacity. Figure A-1 depicts the pre-development drainage basins that were analyzed. Figure A-2 illustrates the drainage basins at ultimate site development. At the same time, the storm water discharges from the project were permitted under the facility's NPDES permit. Figure A-3 shows that drainage plan, also addressing the site at ultimate buildout. Figure A-4 is the associated storm water flow diagram. Figure A-5 shows the power block site layout that was permitted for ultimate site capacity. The design met all SFWMD, DEP, and U.S. EPA requirements, and still does today.

During the construction of Martin Units 3 and 4, all of the storm water facilities associated with the new power block were constructed. Those facilities include ponds D1 (Dry Pond No. 2 on Figure A-5), E (Dry Pond No. 1 on Figure A-5), F, and G, and their associated ditches, outfalls, etc. Temporary construction runoff pond G has since been abandoned but temporary construction runoff pond F is still functional.

The Peaking Units will be located within the New Power Block area shown on Figure A-2, which is within Pre-Development Drainage Basin 6 on Figure A-1. Analysis presented during the CG/CC Project Certification indicated that depth to water table, possible maximum retention S, and percent impervious areas for the post-development cases for the power block were:

Depth to Water Table (ft)	S (in.)	% Impervious
5.5	3.7	54

To date, the coal gasification facilities and Units 5 and 6 have not been built. Based on Figure A-5, the percent of the ultimate site capacity that has been built, on an areal basis, is about 53%. The remaining 47% needs to remain less than or equal to 54 % impervious for the existing ultimate capacity storm water management system to still meet design criteria.

4.0 Proposed Storm Water Management Plan

The permitted storm water management plan calls for dry detention of one inch of runoff. The post-development peak runoff (25-year, 72-hour design storm of 7 inches) into the East Perimeter Ditch from the power block area will not exceed 96 cfs. The hydrographic analysis was performed using the Santa Barbara Urban Hydrograph Method.

Attachment 1 includes the proposed grading and drainage for the Project. The area immediately surrounding the combustion turbines and the northernmost new laydown area will be drained by two new north/south ditches connected to the existing east/west

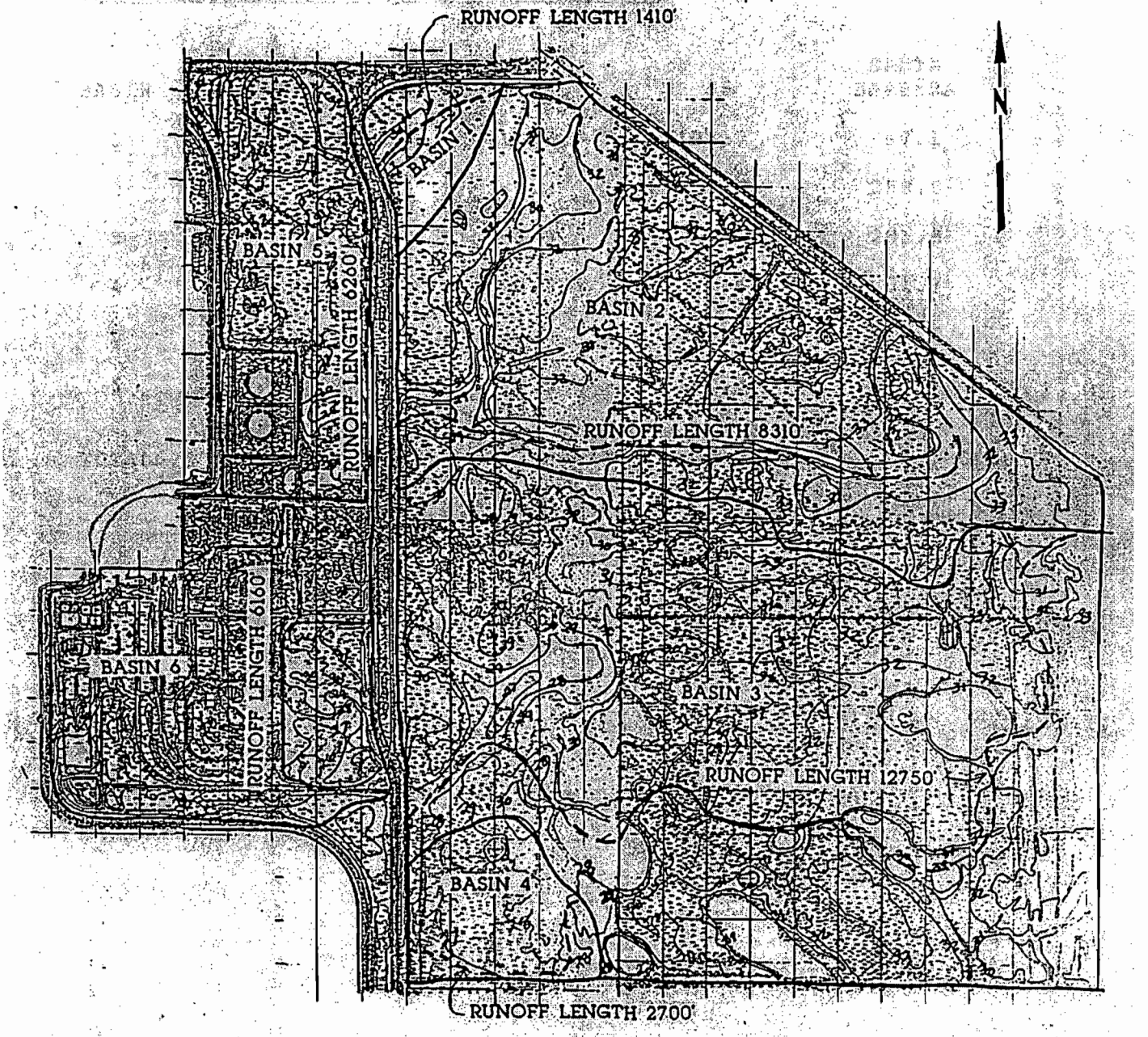
ditch draining to the existing dry detention pond (E on Figure A-3 and A-4, Dry Pond No. 1 on Figure A-5). The southernmost new laydown area will drain to the same existing east/west ditch. This pond and associated ditches were constructed to serve the ultimate site capacity.

Based on the Black & Veatch calculations in Attachment 1, the areas in which the percent of impervious area will be affected by the project will be the immediate area around the combustion turbines (see Attachment 1 for layout figure S3000), the new laydown areas, and a small area at the existing gas yard. The total impervious area to be added is about 17 acres. The existing undeveloped area of consists of about 115 acres, of which approximately 16.3 acres is presently impervious. Thus its present percent impervious is about 15 %. Converting another 17 acres to be impervious will raise that ratio to about 32 %. This is well below the permitted 54%.Therefore, the proposed project falls within the envelope already permitted for the ultimate site capacity.

5.0 Calculations

Attachment 1 contains the calculations for the detailed site areas affected by the Project. Black & Veatch prepared these calculations.

Attachment 2 contains the calculations performed for the power block area during the CG/CC Project Site Certification. Howard L. Searcy, P.E., Consulting Engineer, Inc prepared these calculations.



PRE-DEVELOPMENT DRAINAGE BASINS
FP&L POWER PLANT EXPANSION 4/18/90

Source: Howard L. Searcy, P.E.
Consulting Engineer, Inc.
April, 1990

FIGURE A-1
PRE-EXISTING DRAINAGE

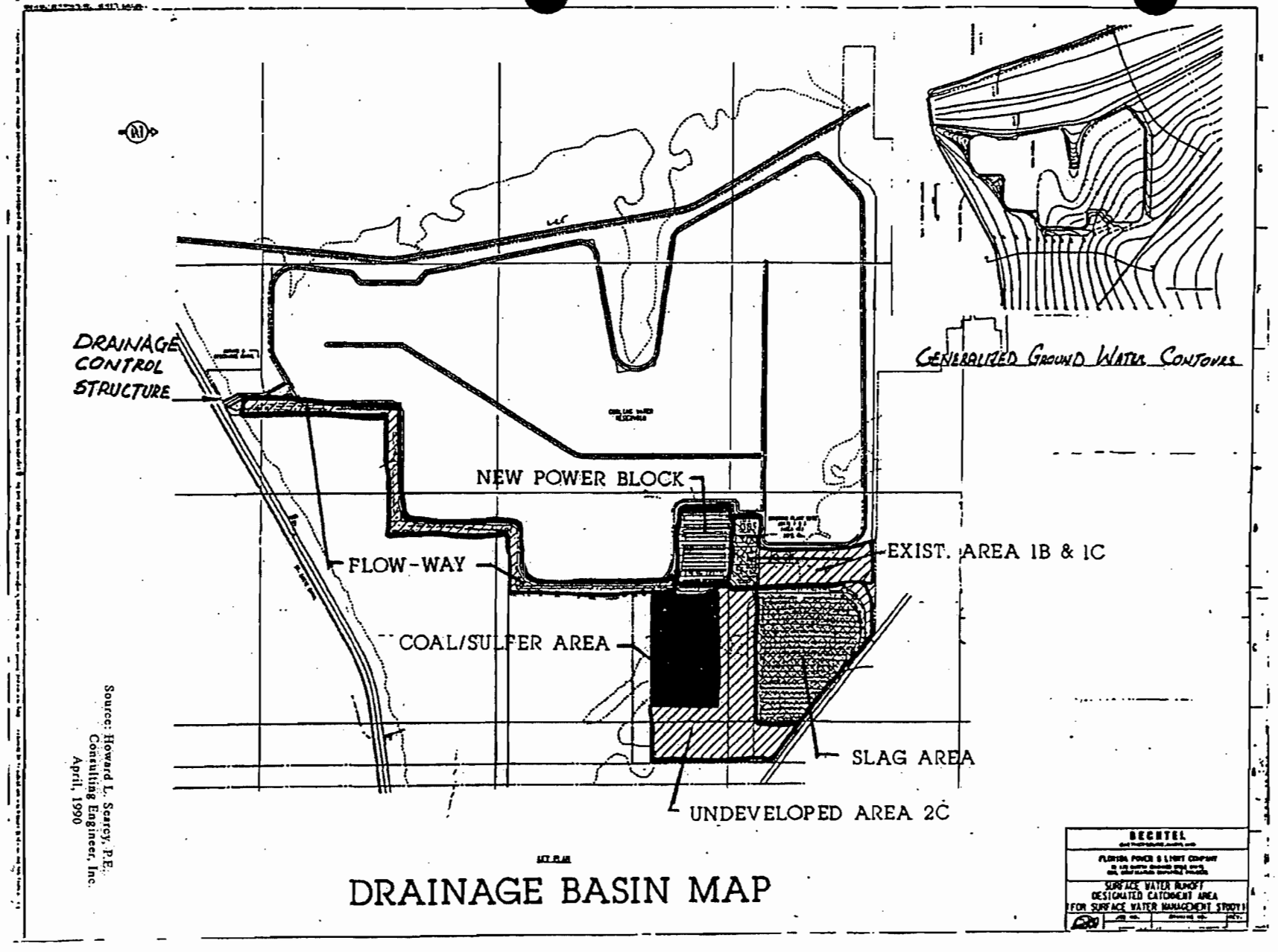
Martin Peaking Units

FPL

BEST AVAILABLE COPY

FIGURE A-2

POST-DEVELOPMENT DRAINAGE



DRAINAGE BASIN MAP

FP&L POWER PLANT EXPANSION

Martin Peaking Units

FPL

A-2

4/18/90

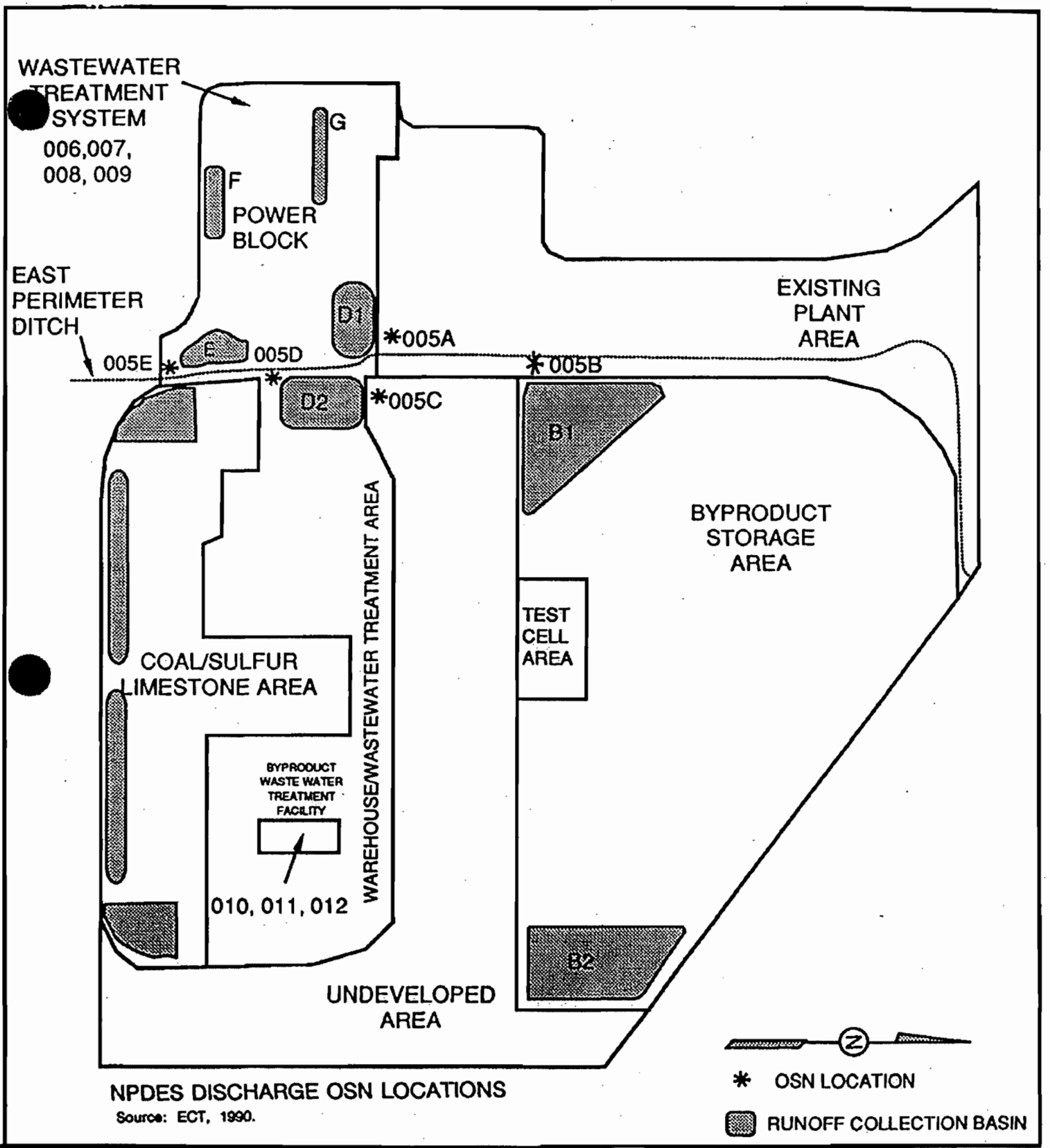
SITE DRAINAGE CALCULATIONS

FLORIDA POWER AND LIGHT

MARTIN PEAKING UNITS

Black & Veatch
P.O. Box 33396
Raleigh, North Carolina 27636
Certificate of Authority No. 8132
B&V Project No. 96933.0040

Edward S. Kochick
P.E. No. 47269



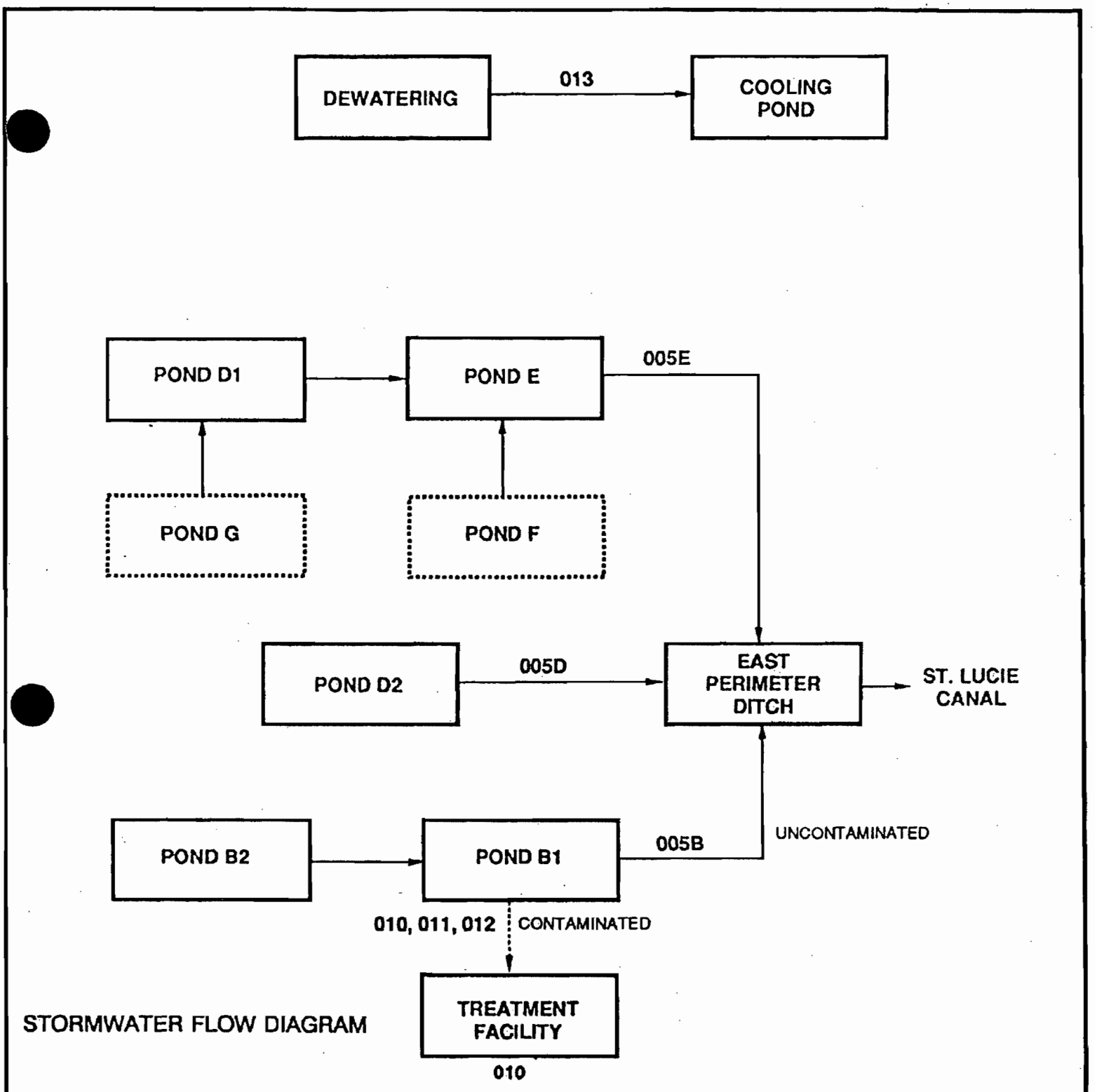
NPDES DISCHARGE OSN LOCATIONS

Source: ECT, 1990.

FIGURE A-3
MARTIN CG/CC PROJECT
DRAINAGE PLAN

Martin Peaking Units

FPL



NOTE: PONDS G AND F ARE TEMPORARY CONSTRUCTION BASINS. THE REMAINING PONDS REPRESENT CONSTRUCTION BASINS WHICH BECOME PERMANENT DURING PLANT OPERATIONS

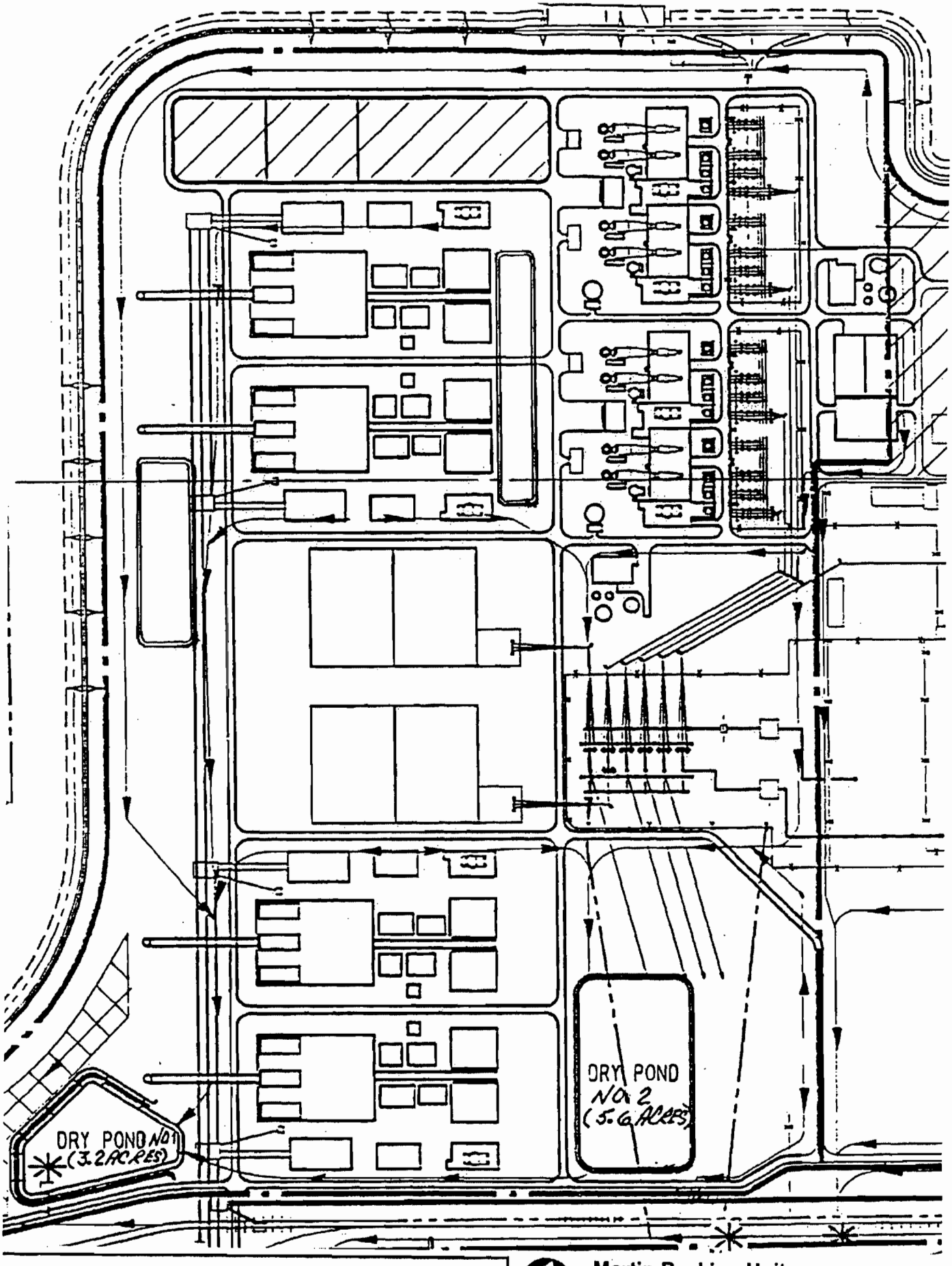
Source: ECT, 1990.

FIGURE A-4

POST-DEVELOPMENT DRAINAGE

Martin Peaking Units

FPL



Martin Peaking Units

FPL

FIGURE A-5
ULTIMATE SITE
CAPACITY LAYOUT
POWER BLOCK

ATTTACHMENT 1

BLACK & VEATCH

Calculation Record

____ Nuclear Safety Related
X Not Nuclear Safety Related

Client Name: Florida Power & Light Page 1 of 25

Project Name: Martin Plant Unit:

Project Number: 96933.040 File Number:

Calculation Title: Site Drainage

Calculation Is: ☐ Preliminary ☐ Final ☐ Other

Quality Record: ☐ Yes ☐ No

Objective

Unverified Assumptions Requiring Subsequent Verification			
No.	Assumption	Verified By	Date

See Page ____ of this calculation for additional assumptions.

This Section Used for Computer Generated Calculations

Program Number/Name: TR 55 Urban Hydrology for Small Watersheds Version: 2

Run Date: Run Time:

Number of Pages:

Review and Approval							
Rev	Revised Pages	Prepared By	Date	Verified By	Date	Project Engineer Approval	Date
0		E. Kochick	2/5/00				
1	2	E. Kochick	2/12/00				
2		E. Kochick	2/14/00				

Storm Water Design for Martin Peaking Units

Predevelopment Conditions

This calculation addresses the immediate area around the proposed combustion turbines, the laydown areas, and the fuel gas supply yard. The total disturbed area involved is approximately 17.4 acres. The design rainfall amount is 9.5 inches, based on a 25 year, 72 hour storm event (reference South Florida Water Management District Manual).

The current site is an undeveloped grassy area. For the gas turbine area, drainage is accomplished by sheet flow to the two existing drainage ditches to the west and south of the proposed site. In the laydown areas and gas metering area the storm water flows to ditches adjacent to these areas. The storm water then flows through the drainage ditches to a large sedimentation basin on site.

Post-development Conditions

For the post-development design the site was divided into 12 sub-areas (see drawing SS-1001). With the exception of the roads and the equipment foundations the area within the enclosing ring of roads will be covered with limerock. The area around the fuel oil tank is a containment structure and is surrounded by a concrete wall and is covered under the industrial wastewater permit. This area is not included in the runoff calculations. The water from sub-areas 1 through 10 is conducted to new drainage ditches, which are located east and west of the CT site and run in a north-south direction. These ditches discharge the stormwater into the existing drainage ditch at the south end of the site. Drainage from SA11 goes to an existing drainage swale and is then carried to an existing detention pond. The water from the Gas Metering area drains to an existing ditch along the road. For the post-development rate of discharge for all areas see attached calculations. During construction silt fencing will surround all of the disturbed areas of the site. Reference attached drawing SS1001. Due to the relatively flat gradients and limited topographic relief, the storm water runoff has a low flow velocity so that the silt fencing is effective in containing the sediment.

The existing plant storm water system has been designed for much more development than is presently constructed. Therefore the amount of water from the 17.4-acre site can be accommodated by the existing system.

TABULAR HYDROGRAPH METHOD Version 2.00

2/14/00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area

Total watershed area: 0.020 sq mi Rainfall type: III Frequency: 25 years

	Subareas				
	SA1	SA2	SA3	SA4	SA5
Area(sq mi)	0.00*	0.00*	0.00*	0.00*	0.00*
Rainfall(in)	9.5	9.5	9.5	9.5	9.5
Curve number	98*	98*	98*	98*	98*
Runoff(in)	9.26	9.26	9.26	9.26	9.26
Tc (hrs)	0.19*	0.21*	0.15*	0.18*	0.13*
(Used)	0.20	0.20	0.20	0.20	0.10
TimeToOutlet	0.00	0.00	0.00	0.00	0.00
Ia/P	0.00	0.00	0.00	0.00	0.00
(Used)	0.10	0.10	0.10	0.10	0.10

Time	Total	Subarea Contribution to Total Flow (cfs)				
(hr)	Flow	SA1	SA2	SA3	SA4	SA5
11.0	3	0	0	0	0	0
11.3	6	0	0	0	0	0
11.6	7	0	0	0	0	0
11.9	29	1	1	1	1	1
12.0	39	1	1	1	1	2
12.1	70	2	2	2	2	4
12.2	107P	3	3	3	3	5P
12.3	95	4P	4P	4P	4P	4
12.4	67	3	3	4	4	3
12.5	50	2	2	3	3	2
12.6	37	2	2	2	2	2
12.7	23	1	1	1	1	1
12.8	20	1	1	1	1	1
13.0	16	1	1	1	1	1
13.2	14	1	1	1	1	1
13.4	9	0	0	0	0	1
13.6	7	0	0	0	0	0
13.8	7	0	0	0	0	0
14.0	7	0	0	0	0	0
14.3	6	0	0	0	0	0
14.6	6	0	0	0	0	0
15.0	5	0	0	0	0	0
15.5	4	0	0	0	0	0
16.0	3	0	0	0	0	0
16.5	3	0	0	0	0	0
17.0	3	0	0	0	0	0
17.5	2	0	0	0	0	0
18.0	2	0	0	0	0	0
19.0	2	0	0	0	0	0
20.0	2	0	0	0	0	0
[illegible]0	1	0	0	0	0	0
26.0	0	0	0	0	0	0

P - Peak Flow * - value(s) provided from TR-55 system routines

TABULAR HYDROGRAPH METHOD Version 2.00

2/14/00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area

Continuation of subarea information

	Subareas				
	SA6	SA7	SA8	SA9	SA10
Area(sq mi)	0.00*	0.00*	0.00*	0.01*	0.00*
Rainfall(in)	9.5	9.5	9.5	9.5	9.5
Curve number	98*	98*	98*	98*	40
Runoff(in)	9.26	9.26	9.26	9.26	1.97
Tc (hrs)	0.16*	0.09*	0.14*	0.10*	0.24*
(Used)	0.20	0.10	0.10	0.10	0.20
TimeToOutlet	0.00	0.00	0.00	0.00	0.00
Ia/P	0.00	0.00	0.00	0.00	0.32
(Used)	0.10	0.10	0.10	0.10	0.32

Time	Subarea Contribution to Total Flow (cfs)				
(hr)	SA6	SA7	SA8	SA9	SA10
11.0	0	0	1	2	0
11.3	0	1	2	3	0
11.6	0	1	2	4	0
11.9	1	3	7	13	0
12.0	1	4	10	18	0
12.1	2	7	17	32	0
12.2	3	11P	26P	50P	0
12.3	4P	9	21	40	1P
12.4	3	6	14	26	1
12.5	2	4	11	20	1
12.6	2	3	8	14	0
12.7	1	2	5	10	0
12.8	1	2	4	8	0
13.0	1	1	3	6	0
13.2	0	1	3	5	0
13.4	0	1	2	5	0
13.6	0	1	2	4	0
13.8	0	1	2	4	0
14.0	0	1	2	4	0
14.3	0	1	2	3	0
14.6	0	1	2	3	0
15.0	0	1	1	3	0
15.5	0	1	1	2	0
16.0	0	0	1	2	0
16.5	0	0	1	2	0
17.0	0	0	1	2	0
17.5	0	0	1	1	0
18.0	0	0	1	1	0
19.0	0	0	1	1	0
20.0	0	0	1	1	0
23.0	0	0	0	1	0
26.0	0	0	0	0	0

P - Peak Flow * - value(s) provided from TR-55 system routines

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Title: Postdevelopment CT Area
Subarea : SA1

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	.48(98)	-	-	-
Total Area (by Hydrologic Soil Group)	.48			

SUBAREA: SA1 TOTAL DRAINAGE AREA: .48 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Title: Postdevelopment CT Area
Subarea : SA2

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres	(CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	.48	(98)	-	-
Total Area (by Hydrologic Soil Group)	.48			

SUBAREA: SA2 TOTAL DRAINAGE AREA: .48 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area
Subarea : SA3

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	.51(98)	-	-	-
Total Area (by Hydrologic Soil Group)	.51			

SUBAREA: SA3 TOTAL DRAINAGE AREA: .51 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area
Subarea : SA4

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres	(CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	.51	(98)	-	-
Total Area (by Hydrologic Soil Group)	.51			

SUBAREA: SA4 TOTAL DRAINAGE AREA: .51 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area
Subarea : SA5

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	.57(98)	-	-	-
Total Area (by Hydrologic Soil Group)	.57			

SUBAREA: SA5 TOTAL DRAINAGE AREA: .57 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area
Subarea : SA6

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	.44 (98)	-	-	-
Total Area (by Hydrologic Soil Group)	.44			
	====			

SUBAREA: SA6 TOTAL DRAINAGE AREA: .44 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Title: Postdevelopment CT Area
Subarea : SA7

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	1.17(98)	-	-	-
Total Area (by Hydrologic Soil Group)	1.17			
	====			

SUBAREA: SA7 TOTAL DRAINAGE AREA: 1.17 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Title: Postdevelopment CT Area
Subarea : SA8

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres	(CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	2.76	(98)	-	-	-
Total Area (by Hydrologic Soil Group)	2.76			

SUBAREA: SA8 TOTAL DRAINAGE AREA: 2.76 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: ____
Title: Postdevelopment CT Area
Subarea : SA9

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres	(CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	5.21	(98)	-	-
Total Area (by Hydrologic Soil Group)	5.21			

SUBAREA: SA9 TOTAL DRAINAGE AREA: 5.21 Acres WEIGHTED CURVE NUMBER: 98

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area
Subarea : SA10

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	fair	.45(49)	-	-	-
Total Area (by Hydrologic Soil Group)		.45			

SUBAREA: SA10 TOTAL DRAINAGE AREA: .45 Acres WEIGHTED CURVE NUMBER: 49

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area

---------- Subarea #1 - SA1 ----------

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	140	.0036	A					0.030
Open Channel		835	.0033		.05	13	16		0.156
						Time of Concentration =			0.19*
									=====
Shallow Concent'd		140	.0036	p					0.032
Open Channel		835	.0033		.05	13	16		0.156
							Travel Time =		0.19*
									=====

---------- Subarea #2 - SA2 ----------

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	140	.0036	A					0.030
Open Channel		835	.0025		.05	13	16		0.179
						Time of Concentration =			0.21*
									=====
Open Channel		835	.0025		.05	13	16		0.179
							Travel Time =		0.18*
									=====

---------- Subarea #3 - SA3 ----------

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	140	.0036	A					0.030
Open Channel		640	.0033		.05	13	16		0.119
						Time of Concentration =			0.15*
									=====
Shallow Concent'd		140	.0036	p					0.032
Open Channel		440	.0033		.05	13	16		0.082
							Travel Time =		0.11*
									=====

* - Generated for use by TABULAR method

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment CT Area

Subarea #4 - SA4

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	140	.0036	A					0.030
Open Channel		680	.0025		.05	13	16		0.146
					Time of Concentration =				0.18*
									=====
Shallow Concent'd		140	.0036	p					0.032
Open Channel		680	.0025		.05	13	16		0.146
							Travel Time =		0.18*
									=====

Subarea #5 - SA5

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	170	.0029	A					0.039
Open Channel		505	.0033		.05	13	16		0.094
					Time of Concentration =				0.13*
									=====
Open Channel		280	.0033		.05	13	16		0.052
							Travel Time =		0.05*
									=====

Subarea #6 - SA6

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	190	.0037	A					0.038
Shallow Concent'd		40	.0037	P					0.009
Open Channel		505	.0025		.05	13	16		0.108
					Time of Concentration =				0.16*
									=====
Shallow Concent'd		135	.0037	p					0.030
Open Channel		505	.0025		.05	13	16		0.108
							Travel Time =		0.14*
									=====

Subarea #7 - SA7

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	150	.0033	A					0.033
Shallow Concent'd		55	.045	P					0.004
Open Channel		307	.0033		.05	13	16		0.057
					Time of Concentration =				0.09*

Shallow Concent'd	55	.045	P				0.004
Open Channel	40	.0033		.05	13	16	0.007
						Travel Time =	0.01*

* - Generated for use by TABULAR method

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : FPL-Martin User: ESK Date: ~~01-23-99~~ 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Title: Postdevelopment CT Area

Subarea #8 - SA8

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	150	.0033	A					0.033
Open Channel		500	.0025		.05	13	16		0.107
						Time of Concentration =			0.14*
									=====
Open Channel		500	.0025		.05	13	16		0.107
							Travel Time =		0.11*
									=====

Subarea #9 - SA9

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	110	.0091	A					0.017
Open Channel		450	.0033		.05	13	16		0.084
						Time of Concentration =			0.10*
									=====
Open Channel		300	.0033		.05	13	16		0.056
							Travel Time =		0.06*
									=====

Subarea #10 - SA10

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	90	.0056	F					0.211
Open Channel		140	.0033		.05	13	16		0.026
						Time of Concentration =			0.24*
									=====
Shallow Concent'd		90	.0056	U					0.021
Open Channel		140	.0033		.05	13	16		0.026
							Travel Time =		0.05*
									=====

--- Sheet Flow Surface Codes ---

A Smooth Surface	F Grass, Dense	--- Shallow Concentrated ---
B Fallow (No Res.)	G Grass, Burmuda	--- Surface Codes ---
C Cultivated < 20 % Res.	H Woods, Light	P Paved
D Cultivated > 20 % Res.	I Woods, Dense	U Unpaved
E Grass-Range, Short	J Range, Natural	

* - Generated for use by TABULAR method

TABULAR HYDROGRAPH METHOD Version 2.00

Project : FPL-Martin User: ESK Date: 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment-East Laydown Area

Total watershed area: 0.007 sq mi Rainfall type: III Frequency: 25 years

---------- Subareas ----------

	SA11
Area(sq mi)	0.01*
Rainfall(in)	9.5
Curve number	98*
Runoff(in)	9.26
Tc (hrs)	0.20*
TimeToOutlet	0.00
Ia/P	0.00
(Used)	0.10

Time (hr)	Total Flow	Subarea Contribution to Total Flow (cfs) SA11
11.0	2	2
11.3	2	2
11.6	3	3
11.9	8	8
12.0	12	12
12.1	18	18
12.2	31	31
12.3	39P	39P
12.4	33	33
12.5	25	25
12.6	19	19
12.7	13	13
12.8	9	9
13.0	6	6
13.2	5	5
13.4	4	4
13.6	4	4
13.8	4	4
14.0	4	4
14.3	3	3
14.6	3	3
15.0	3	3
15.5	2	2
16.0	2	2
16.5	2	2
17.0	1	1
17.5	1	1
18.0	1	1
19.0	1	1
20.0	1	1
22.0	1	1
[illegible]0	0	0

P - Peak Flow * - value(s) provided from TR-55 system routines

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date: 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment-East Laydown Area
Subarea : SA11

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	4.76(98)	-	-	-
Total Area (by Hydrologic Soil Group)	4.76			
	====			

SUBAREA: SA11 TOTAL DRAINAGE AREA: 4.76 Acres WEIGHTED CURVE NUMBER: 98

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : FPL-Martin User: ESK Date: 2/14/00
County : Martin State: Fl Checked: ____ Date: _____
Subtitle: Postdevelopment-East Laydown Area

Subarea #1 - SA11

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	250	.008	A					0.035
Open Channel		650	.0015		.05	33	36.3		0.167
						Time of Concentration =			0.20*
									=====
Shallow Concent'd		250	.008	P					0.038
Open Channel		650	.0015		.05	33	36.3		0.167
							Travel Time =		0.20*
									=====

--- Sheet Flow Surface Codes ---

A Smooth Surface	F Grass, Dense	--- Shallow Concentrated ---
B Fallow (No Res.)	G Grass, Burmuda	--- Surface Codes ---
C Cultivated < 20 % Res.	H Woods, Light	P Paved
D Cultivated > 20 % Res.	I Woods, Dense	U Unpaved
E Grass-Range, Short	J Range, Natural	

* - Generated for use by TABULAR method

TABULAR HYDROGRAPH METHOD Version 2.00

Project : FPL-Martin User: ESK Date:
County : Martin State: Fl Checked: ____ Date: _____
Title: Postdevelopment-Gas Metering Station

Total watershed area: 0.000 sq mi Rainfall type: III Frequency: 25 years

Subareas

	SA12
Area(sq mi)	0.00*
Rainfall(in)	9.5
Curve number	98*
Runoff(in)	9.26
Tc (hrs)	0.02*
(Used)	0.10
TimeToOutlet	0.00
Ia/P	0.00
(Used)	0.10

Time (hr)	Total Flow	Subarea Contribution to Total Flow (cfs) SA12
11.0	0	0
11.3	0	0
11.6	0	0
11.9	0	0
12.0	0	0
12.1	0	0
12.2	1P	1P
12.3	1	1
12.4	0	0
12.5	0	0
12.6	0	0
12.7	0	0
12.8	0	0
13.0	0	0
13.2	0	0
13.4	0	0
13.6	0	0
13.8	0	0
14.0	0	0
14.3	0	0
14.6	0	0
15.0	0	0
15.5	0	0
16.0	0	0
16.5	0	0
17.0	0	0
17.5	0	0
18.0	0	0
19.0	0	0
20.0	0	0
22.0	0	0
26.0	0	0

P - Peak Flow * - value(s) provided from TR-55 system routines

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : FPL-Martin User: ESK Date:
County : Martin State: Fl Checked: ____ Date: _____
Title: Postdevelopment-Gas Metering Station
Subarea : SA12

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Impervious Areas				
Paved parking lots, roofs, driveways	.069(98)	-	-	-
Total Area (by Hydrologic Soil Group)	.069			

SUBAREA: SA12 TOTAL DRAINAGE AREA: .069 Acres WEIGHTED CURVE NUMBER: 98

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : FPL-Martin User: ESK Date:
County : Martin State: Fl Checked: _____ Date: _____
Title: Postdevelopment-Gas Metering Station

Subarea #1 - SA12

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	9.5	100	.005	A					0.020
								Time of Concentration =	0.02*
									=====
Shallow Concent'd		100	.005	P					0.019
								Travel Time =	0.02*
									=====

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated < 20 % Res.
D Cultivated > 20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Burmuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated Surface Codes ---

P Paved
U Unpaved

* - Generated for use by TABULAR method

ATTACHMENT 2

PRE-DEVELOPMENT DISCHARGE CALCULATIONS
FOR
FP&L MARTIN COUNTY POWER PLANT

BASIN # 6

SOUTH FLORIDA WATER MANAGEMENT DISTRICT SHEETFLOW CURVES

AREA = 291.5 ACRES (.4175 SQ. MILES)

EXISTING AREAS THAT POND = 7.5 ACRES (2.5 %)

SLOPE: (31.5 - 31) / (150) = .0033

(31 - 30) / (360) = .00277

(30 - 28) / (10) = .2

(28 - 25) / (5640) = .00053

AVERAGE WEIGHED SLOPE = .00104 FT/FT (5.56 FT/MI)

FOR SFWMD SHEETFLOW CURVES USE SLOPE = 5 FT/MI

RUNOFF LENGTH = 6160 FT (1.66 MILES)

AVERAGE DEPTH TO WATER TABLE = 2', "S" = 1.25" (ASSUME 50% OF AREA IS IMPERVIOUS)

DESIGN STORM EVENT = 25 YEAR - 3 DAY

24 HR RAINFALL = 7"

FROM SFWMD SHEETFLOW CURVES (FIGURE C-II-2)

Q = 78 CSM

Q = (78 CSM) (.455 SQ. MI) = 35.5 CFS

ADJUST FOR SITE STORAGE (PONDING)

PONDING FACTOR = .93

Q = (35.5 CFS) (.93) = 33.0 CFS

Q = 33.0 CFS

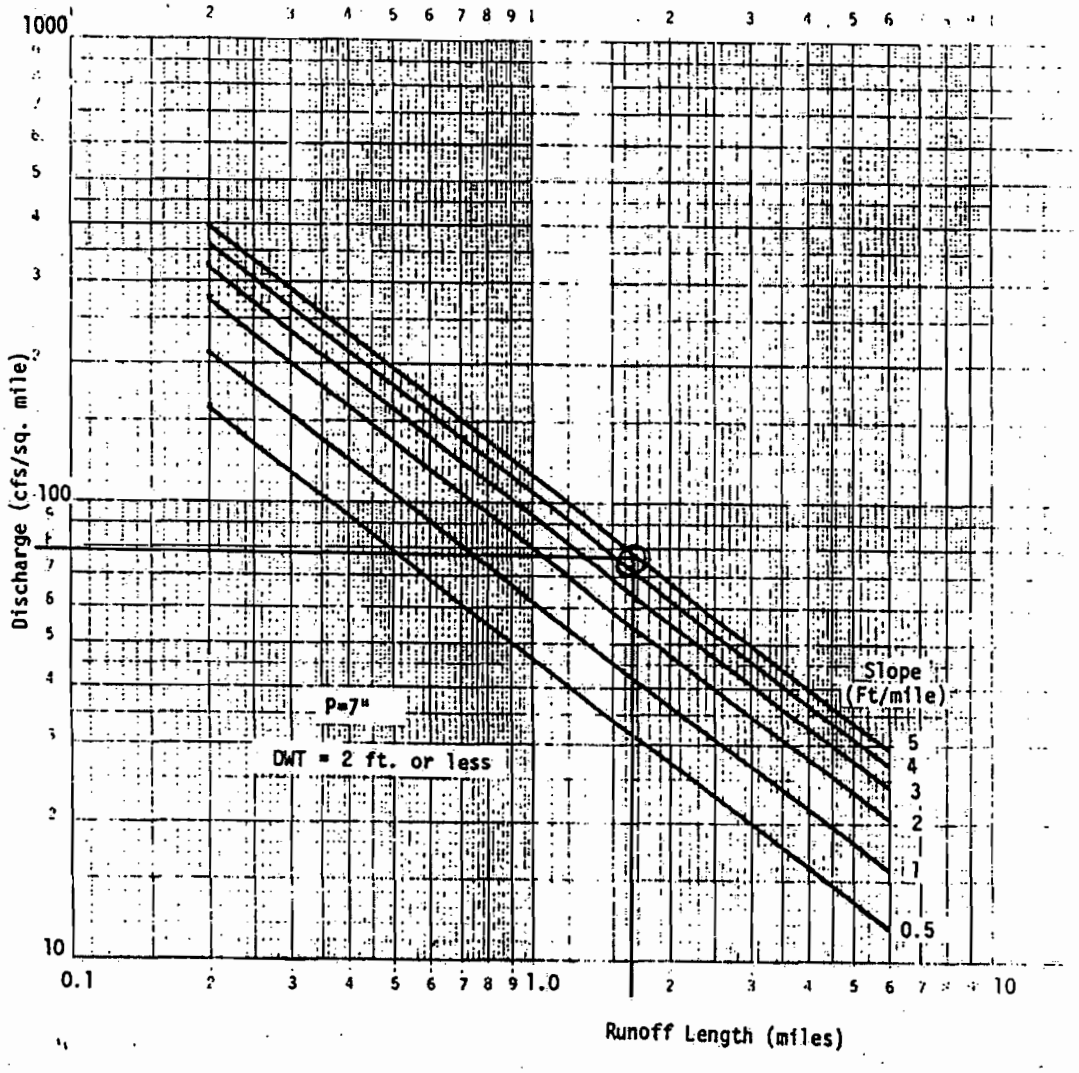


Figure C-II-2

PREDEVELOPMENT BASIN 6

FP&L MARTIN COUNTY POWER PLANT EXPANSION

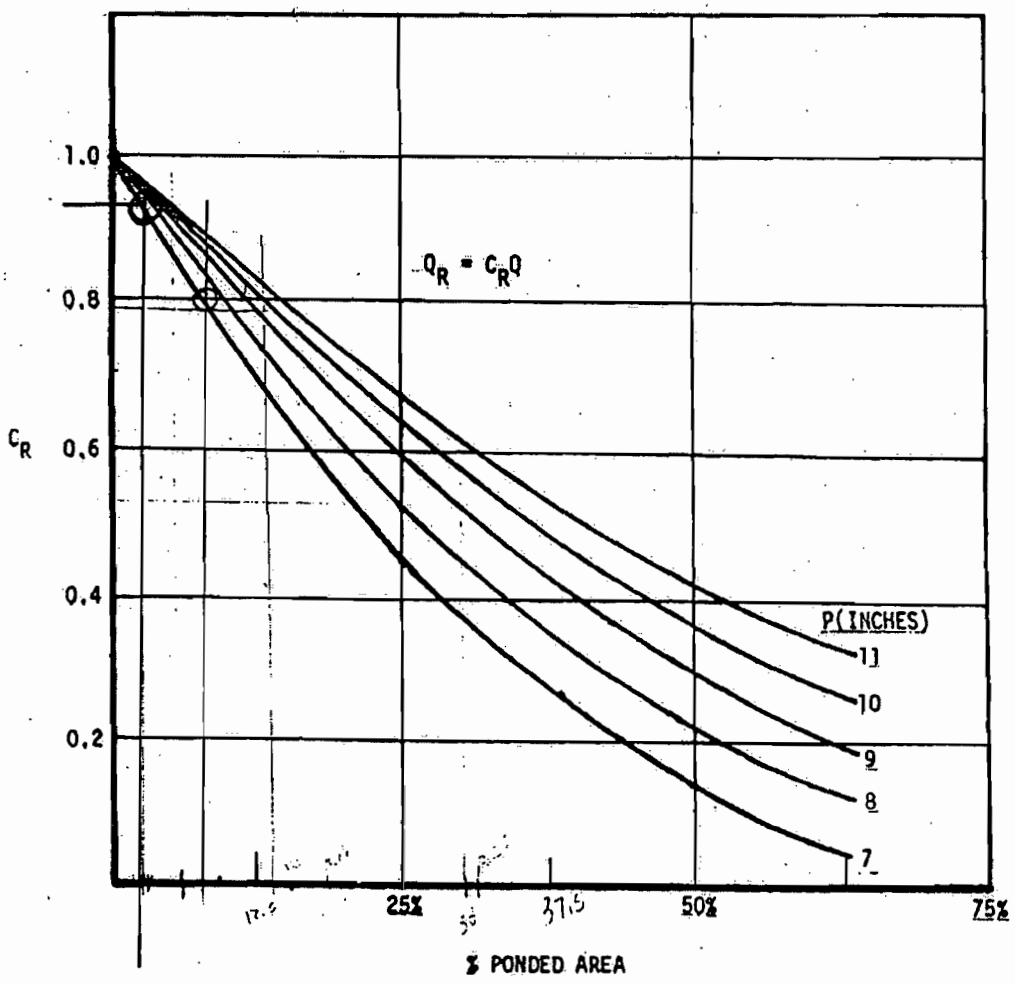


Figure C-II-17

C-II-21 PREDEVELOPMENT BASIN 6

FP&L MARTIN COUNTY POWER PLANT EXPANSION

PRE-DEVELOPMENT DISCHARGE CALCULATIONS
FOR
FP&L MARTIN COUNTY POWER PLANT

BASIN # 6

CYPRESS CREEK

AREA = 291.5 ACRES (.455 SQ. MILES)

EXISTING AREAS THAT POND = 7.5 ACRES

DESIGN STORM EVENT = 25 YEAR - 3 DAY

DESIGN 72HR RAINFALL = 9.51"

AVERAGE DEPTH TO WATER TABLE = 2', "S" = 1.25"

RAINFALL EXCESS: $\frac{(P72 - .2S)^2}{(P72 + .8S)}$ = 8.15 INCHES

CYPRESS CREEK FORMULA: $Q = C\ M^{.833}$

C = (16.39) + (14.75) (RAINFALL EXCESS)
(C VALUE MAY ALSO BE OBTAINED FROM GRAPH)

C = 136.73

$Q = (136.73)\ (.455)^{.833}$ = 70.9 CFS

TO ADJUST FOR SITE STORAGE, ADJUST RAINFALL EXCESS.

ASSUME 1' OF SITE STORAGE ON AREAS THAT POND = 7.5 AC-FT

RAINFALL EXCESS = 7.05 INCHES

(7.05 IN) / (12 IN/FT) (291.5 AC) = 197.9 AC-FT

SUBTRACT SITE STORAGE:

(197.9 AC-FT) - (7.5 AC-FT) = 190.4 AC-FT

ADJUST RAINFALL EXCESS:

(190.4 AC-FT) / (291.5 AC) (12 IN/FT) = 7.83 IN

C = (16.39) + (14.75) (7.83) = 132.0

$Q = (132.0)\ (.455)^{.833}$ = 68.5 CFS

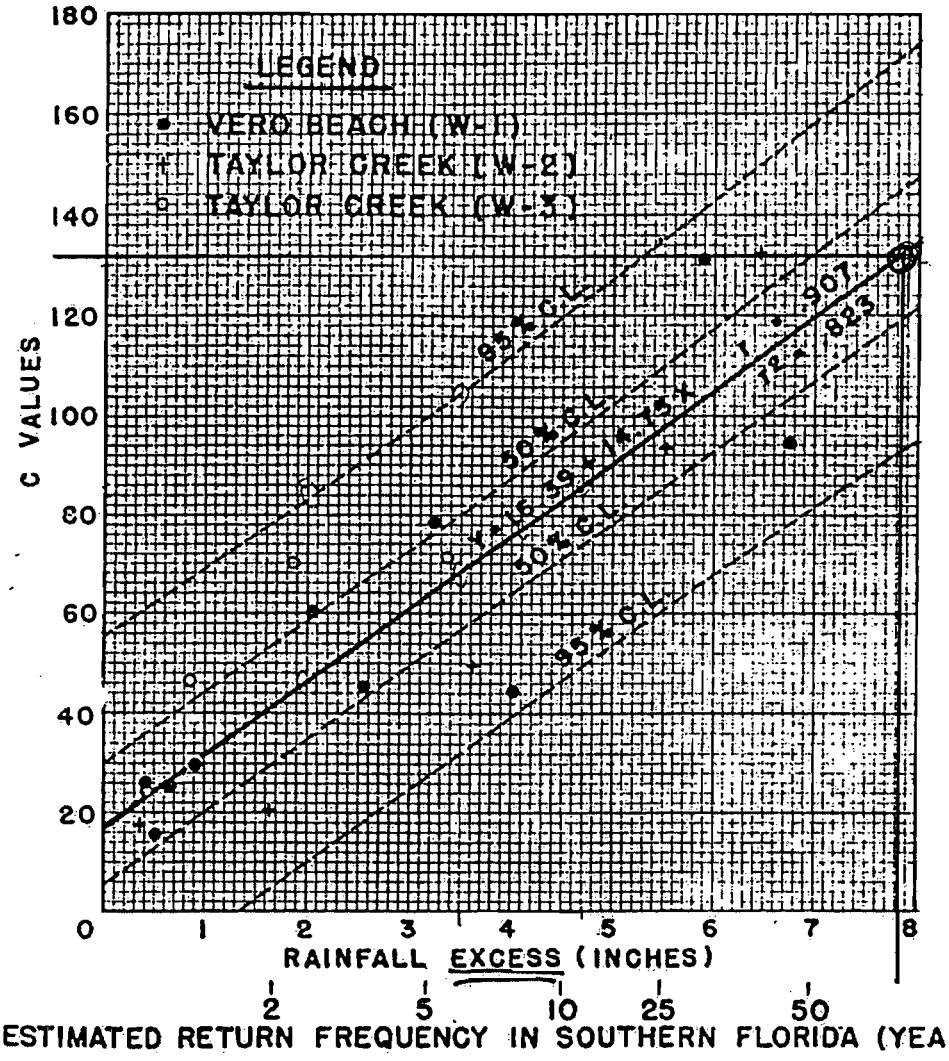


Figure 3.--Values of C in the Cypress Creek formula, $Q = C M^{5/6}$, versus rainfall excess for three experimental watersheds in southern Florida.

From runoff frequency.--The method of obtaining return frequency of various size runoff events from storm frequencies was checked by the Hazen method, that is, the maximum 24-hour-average flow rate for each year was plotted on logarithmic, normal-probability paper. The resultant flood-frequency line indicated the size of flood expected.

PRE-DEVELOPMENT DISCHARGE CALCULATIONS
FOR
FP&L MARTIN COUNTY POWER PLANT

BASIN # 6

SCS - TR55

AREA = 291.5 ACRES

RUNOFF LENGTH = 6160 FT

AVERAGE SLOPE = .00104 FT/FT X 100 = .104%

EQUIVALENT AREA (FIGURE E-1 TR55) = 280 ACRES

SLOPE ADJUSTMENT FACTOR (TABLES E-1 TR55) = .42

PONDING % = 2.5

PONDING ADJUSTMENT FACTOR (TABLES E2-4 TR55) = .76

AVERAGE DEPTH TO WATER TABLE = 2', "S" = 1.25"

CURVE NUMBER (C) = (1000) / ("S" + 10) = 88

PEAK FLOW (FIGURE D-2 TR55) = 90 CFS/INCH OF RUNOFF

EQUIVALENT PEAK FLOW:

(90) (291.5/280) = 93.6 CFS/ INCH OF RUNOFF

EQUIVALENT PEAK FLOW ADJUSTED FOR SLOPE AND PONDING:

(93.6) X (.42) (.76) = 29.9 CFS/INCH OF RUNOFF

25 YEAR - 3 DAY RAINFALL = 9.51 INCHES

RUNOFF (TABLE 2-1 TR55) = 7.05 INCHES

EQUIVALENT DISCHARGE:

(29.9 CFS/INCH) (7.05 INCHES) = 210.8 CFS

Q = 210.8 CFS

PRE-DEVELOPMENT DISCHARGE CALCULATIONS
FOR
FP&L MARTIN COUNTY POWER PLANT

BASIN # 6

SANTA BARBARA

AREA = 291.5 ACRES

AVERAGE DEPTH TO WATER TABLE = 2', "S" = 1.25

SITE GRADING:

AREA	LINEAR (L) OR VERTICAL (V)	STORAGE FROM EL	TO EL
11.5	L	25	27
1.4	L	25.5	26
7.9	L	26	27
38.6	L	27	28
.5	V	28	
57.7	L	28	29
5.3	V	29	
.9	L	29	29.5
50.4	L	29	30
1.7	V	30	
42.7	L	30	31
72.9	L	31	32.5

TIME OF CONCENTRATION:

RUNOFF LENGTH = 6160 FT

AVERAGE SLOPE = .104%

IF VELOCITY = 1 FT/SEC, TC = 1.7 HRS
IF VELOCITY = .5 FT/SEC, TC = 3.4 HRS
VELOCITY FROM DOT CURVE = 49 FT/MIN, TC = 2.0 HRS

USE TC = 2 HR

OUTFALL:

AREA DISCHARGES INTO AN EXISTING DITCH VIA GRAVITY THROUGH A V DITCH WITH A TOP WIDTH OF ~10' AND A DEPTH OF 1'. BOTTOM OF DITCH IS AT OR NEAR ELEVATION 25.0'. ABOVE 26.0' FLOW DISCHARGES OVERLAND TO THE DITCH. FOR FLOOD ROUTING, USE INVERTED TRIANGLE WITH A TOP WIDTH OF 10', HEIGHT OF 1' SET AT INVERT ELEVATION 25.0' AND A 10' WIDE WEIR SET AT ELEVATION 26.0'.

Q = 121.0 CFS

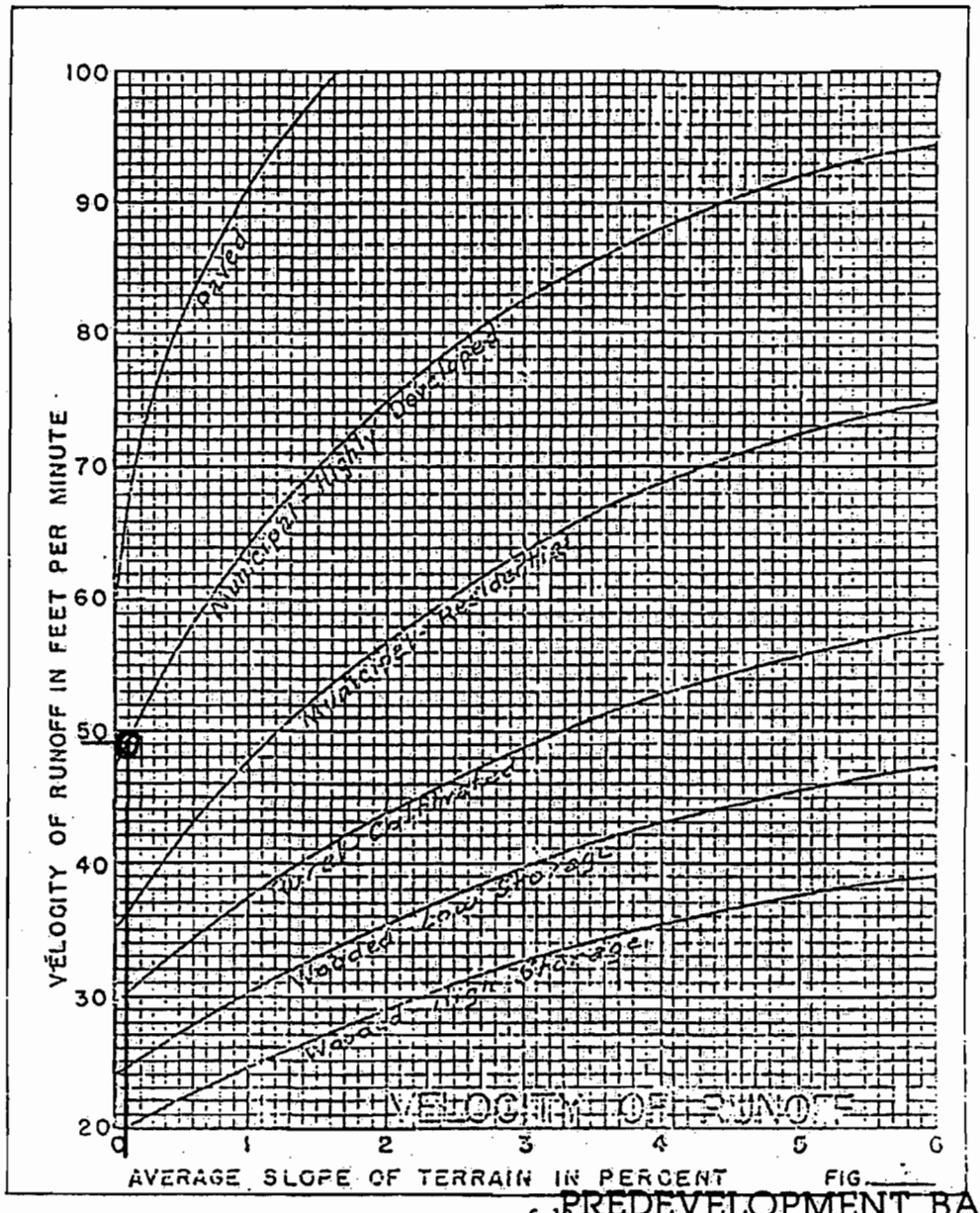


FIG. 6-15

PREDEVELOPMENT BASIN 6

FP&L MARTIN COUNTY POWER PLANT EXPANSION

Company Name.....: Howard L. Searcy
Execution Date.....: 04-17-1990

Computation Type.....: STAGE-STORAGE

Project Name.....: FPL POWER PLANT
Engineer's Name.....: PREDEVELOPMENT BASIN 6

Name	DITCHE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
Area	11.50	1.40	7.90	38.60	0.50	57.70	5.30	0.90	
S.Elev	25.00	25.50	26.00	27.00	28.00	28.00	29.00	29.00	
E.Elev	27.00	26.00	27.00	28.00	0.00	29.00	0.00	29.50	
Stage Feet NGVD	Linear Storage ac-ft	Linear Storage ac-ft	Linear Storage ac-ft	Linear Storage ac-ft	Vert. Storage ac-ft	Linear Storage ac-ft	Vert. Storage ac-ft	Linear Storage ac-ft	Tota Storag ac-f
25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
25.50	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.7
26.00	2.88	0.35	0.00	0.00	0.00	0.00	0.00	0.00	3.2
26.50	6.47	1.05	0.99	0.00	0.00	0.00	0.00	0.00	8.5
27.00	11.50	1.75	3.95	0.00	0.00	0.00	0.00	0.00	17.2
27.50	17.25	2.45	7.90	4.82	0.00	0.00	0.00	0.00	32.4
28.00	23.00	3.15	11.85	19.30	0.00	0.00	0.00	0.00	57.3
28.50	28.75	3.85	15.80	38.60	0.25	7.21	0.00	0.00	94.4
29.00	34.50	4.55	19.75	57.90	0.50	28.85	0.00	0.00	146.0
29.50	40.25	5.25	23.70	77.20	0.75	57.70	2.65	0.22	207.7
30.00	46.00	5.95	27.65	96.50	1.00	86.55	5.30	0.67	269.6
30.50	51.75	6.65	31.60	115.80	1.25	115.40	7.95	1.13	331.5
31.00	57.50	7.35	35.55	135.10	1.50	144.25	10.60	1.57	393.4
31.50	63.25	8.05	39.50	154.40	1.75	173.10	13.25	2.02	455.3
32.00	69.00	8.75	43.45	173.70	2.00	201.95	15.90	2.47	517.2
32.50	74.75	9.45	47.40	193.00	2.25	230.80	18.55	2.92	579.1

Company Name.....: Howard L. Searcy
Execution Date.....: 04-17-1990

Computation Type.....: STAGE-DISCHARGE

Project Name.....: FPL POWER PLANT
Engineer's Name.....: PREDEVELOPMENT BASIN 6

Bleeder Type — Inverted Triangle
Triangle Height = 1
Triangle Width = 10
Bleeder Invert = 25

Weir Information — Weir Length = 10
Elevation = 26
Coefficient = 2.65

Stage Elev. (ft)	Head (ft)	Weir Flow (cfs)	Bleeder Flow (cfs)	Culvert Flow (cfs)	Structure Flow (cfs)
25.00	0.00	0.00	0.00	0.00	0.00
25.50	0.50	0.00	2.46	0.00	2.46
26.00	1.00	0.00	13.90	0.00	13.90
26.50	1.50	9.37	21.98	0.00	31.35
27.00	2.00	26.50	27.81	0.00	54.31
27.50	2.50	48.68	32.60	0.00	81.29
28.00	3.00	74.95	36.78	0.00	111.74
28.50	3.50	104.75	40.53	0.00	145.28
29.00	4.00	137.70	43.96	0.00	181.66
29.50	4.50	173.52	47.15	0.00	220.67
30.00	5.00	212.00	50.13	0.00	262.13
30.50	5.50	252.97	52.94	0.00	305.91
31.00	6.00	296.28	55.61	0.00	351.89
31.50	6.50	341.81	58.16	0.00	399.97
32.00	7.00	389.47	60.60	0.00	450.07
32.50	7.50	439.15	62.95	0.00	502.10

Company Name.....: Howard L. Searcy
Execution Date.....: 04-17-1990

Program Name.....: Santa Barbara -- (05/03/85)

Project Name.....: FPL POWER PLANT
Engineer's Name.....: PREDEVELOPMENT BASIN 6
Project Area.....: 291.5 acres
Ground Storage.....: 1.25 inches
Termination Discharge.....: 25 cfs
Time of Concentration.....: 2 hours
Distribution Type.....: SFWMD
Return Frequency.....: 25 years
Rainfall Duration.....: 3 -day
24-hr Rainfall.....: 7 inches
Reporting Sequence.....: Standardized

Bleeder Information.....: Invert Height Width
Inverted Triangle.....: 25 1 10
Weir Information.....: length Elevation Coefficient
10 26 2.65

Storage Information.....:

	Component Name	Storage Type	Area (acres)	Start Elev (NGVD-ft)	Ending Elev (NGVD-ft)
Entry No. 1.....	DITCHES	L	11.5	25	27
Entry No. 2.....	AREA	L	1.8	25.5	26
Entry No. 3.....	AREA	L	38.6	27	28
Entry No. 4.....	AREA	V	.5	28	
Entry No. 5.....	AREA	L	57.7	28	29
Entry No. 6.....	AREA	V	5.3	29	
Entry No. 7.....	AREA	L	.9	29	29.5
Entry No. 8.....					

Point No.	Stage (ft)	Storage (af)	Discharge (cfs)
1	25.00	0.00	0.00
2	25.50	0.72	2.46
3	26.00	3.22	13.90
4	26.50	8.51	31.35
5	27.00	17.20	54.31
6	27.50	32.42	81.29
7	28.00	57.30	111.74
8	28.50	94.46	145.28
9	29.00	146.05	181.66
10	29.50	207.73	220.67
11	30.00	269.63	262.13
12	30.50	331.52	305.91
13	31.00	393.42	351.89
14	31.50	455.33	399.97
15	32.00	517.22	450.07
16	32.50	579.13	502.10

					RESERVOIR				
Time (hr)	Rain fall (in)	Accum. Runoff (in)	Basin Dischge (cfs)	Accum. Inflow (af)	Volume (af)	Accum. Outflow (af)	Instant Dischge (cfs)	Average Dischge (cfs)	Stage (ft)
0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	25.00
4.00	0.17	0.00	0.0	0.0	0.0	0.0	0.0	0.0	25.00
8.00	0.34	0.01	0.6	0.0	0.0	0.0	0.1	0.0	25.02
12.00	0.51	0.05	2.8	0.6	0.4	0.2	1.3	0.6	25.27
16.00	0.68	0.11	4.7	1.9	1.0	0.9	3.3	2.2	25.54
20.00	0.85	0.20	6.2	3.7	1.4	2.4	5.1	4.3	25.62
24.00	1.02	0.29	7.2	6.0	1.7	4.3	6.5	5.8	25.68
28.00	1.27	0.46	11.5	9.2	2.4	6.9	9.4	7.8	25.80
32.00	1.52	0.64	13.1	13.4	2.9	10.4	11.9	10.8	25.91
36.00	1.77	0.83	14.1	17.9	3.3	14.6	13.4	12.7	25.98
40.00	2.02	1.03	14.8	22.7	3.5	19.2	14.2	13.8	26.01
44.00	2.26	1.24	15.3	27.7	3.7	24.0	14.8	14.5	26.03
48.00	2.51	1.46	15.8	32.8	3.8	29.0	15.3	15.1	26.04
52.00	2.83	1.74	20.7	38.7	4.4	34.3	17.2	16.0	26.09
56.00	3.47	2.32	43.4	49.1	7.8	41.3	27.5	21.2	26.39
58.00	4.00	2.82	62.4	57.9	11.3	46.6	37.0	32.1	26.62
59.00	4.40	3.19	79.4	63.8	13.9	49.9	43.4	40.0	26.76
59.50	4.75	3.52	101.4	67.7	15.9	51.8	48.2	45.7	26.87
59.75	5.93	4.65	179.3	71.4	18.6	52.8	53.1	50.7	26.97
60.00	7.11	5.80	315.9	78.0	24.0	54.0	60.5	56.8	27.11
60.50	7.62	6.30	365.7	93.3	36.3	56.9	81.4	70.9	27.50
61.00	7.88	6.56	325.9	107.2	46.6	60.6	94.6	88.2	27.72
62.00	8.24	6.91	240.3	129.6	60.4	69.2	112.3	104.3	28.01
64.00	8.67	7.33	128.3	157.7	68.9	88.7	121.0	118.1	28.14
68.00	9.18	7.83	49.1	182.2	55.0	127.3	108.3	116.6	27.94
72.00	9.51	8.16	27.8	193.7	34.7	159.0	83.8	95.9	27.54
79.50	9.51	8.16	0.7	198.2	6.1	192.0	23.5	53.3	26.27

Maximum Stage = 28.14 feet
Maximum Discharge = 121.08 cfs

SURFACE WATER MANAGEMENT CALCULATIONS
FOR
FP&L MARTIN COUNTY POWER PLANT EXPANSION

BASIN NEW POWER BLOCK AREA 1A

AREA

PROJECT AREA = 224 ACRES

LANDUSE

ITEM	AREA	IMPERVIOUS	PERVIOUS
DETENTION PONDS	8.8	--	8.8
DITCHES	6.9	6.9	--
ROAD/PARKING	25.1	25.1	--
BUILDING	37.8	37.8	--
OPEN-GRAVEL	86.2	43.1	43.1
OPEN-GREEN	47.3	--	47.3
COAL CONVEYER	3.7	3.7	--
TOTALS	215.8*	116.6	99.2

*8.2 ACRE WWTP WILL DISCHARGE INTO COOLING POND ALONG WITH PORTIONS OF POWER PLANT BUILDINGS. HOWEVER, AT THIS TIME THE AREAS DRAINING TO WWTP ARE UNKNOWN.

% IMPERVIOUS = 116.6/215.8 = 54%

SOIL STORAGE

AVERAGE GROUND ELEVATION = 30.5
CONTROL ELEVATION = 25.0
DEPTH TO WATER TABLE = 5.5

"S" = (10.9 (.75) (90.4/207) = 3.55"

FOR DETENTION POND, DWT = 1'

"S" = (.6) (.75) (8.8/8.8) = .45"

WEIGHED "S" = 3.27"

SURFACE WATER MANAGEMENT CALCULATIONS
FOR
FP&L MARTIN COUNTY POWER PLANT

BASIN NEW POWER PLANT CONT

WATER QUALITY

DETAIN FIRST INCH OF RUNOFF OR THE RUNOFF CALCULATED BY 2.5 TIMES THE % OF IMPERVIOUSNESS - WHICHEVER IS THE GREATER AMOUNT. SINCE % IMPERVIOUS IS GREATER THAN 40%, 2.5 X % IMPERVIOUS GENERATES GREATER AMOUNT.

2.5 X % IMP. = 1.35"

SINCE DRY DETENTION IS PROPOSED, APPLY 25% REDUCTION CREDIT. DETAIN 1.0" = 18.2 AC-FT.

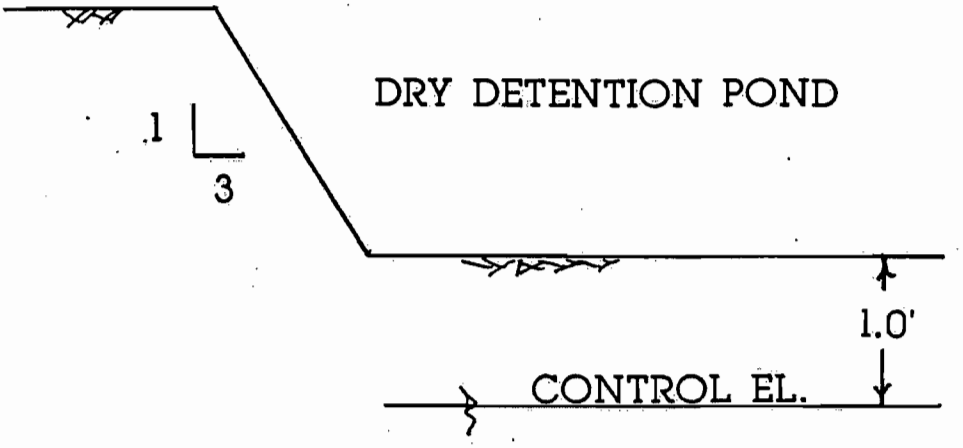
STAGE IN LAKE SYSTEM = 27.3' (H = 2.3')

SITE GRADING

.1 ACRES OF POND STORE VERTICAL FROM EL. 24.0
7.5 ACRES OF POND STORE VERTICAL FROM EL. 25.0
.6 ACRES OF POND STORE LINEAR FROM EL. 25.0 TO EL. 31.0
.6 ACRES OF POND STORE LINEAR FROM EL. 25.0 TO EL. 30.0
6.9 ACRES OF DITCH STORE VERTICAL FROM EL. 25.0
121.8 ACRES OF SITE* STORE LINEAR FROM EL. 30.0 TO EL. 31.0
11.7 ACRES OF SITE* STORE VERTICAL FROM EL. 31.0
25.1 ACRES OF ROAD/PARKING STORE LINEAR FROM EL. 30.0 TO EL. 31.0

*SITE INCLUDES:

86.2 ACRES OF OPEN GRAVEL
47.3 ACRES OF OPEN GREEN



TYPICAL DETAIL OF DRY DETENTION POND

FP&L POWER PLANT EXPANSION

4/18/90

Company Name.....: Howard L. Searcy
Execution Date.....: 01-08-2000

Computation Type.....: STAGE-STORAGE

Project Name.....: FPL POWER PLANT
Engineer's Name.....: NEW POWER BLOCK AREA 1A

Name	POND	POND	POND	POND	DITCH	SITE	SITE	RD/PK	
Area	0.10	7.50	0.60	0.60	6.90	121.80	11.70	25.10	
S.Elev	24.00	25.00	25.00	25.00	25.00	30.00	31.00	30.00	
E.Elev	0.00	0.00	30.00	31.00	0.00	31.00	0.00	31.00	
Stage Feet NGVD	Vert. Storage ac-ft	Vert. Storage ac-ft	Linear Storage ac-ft	Linear Storage ac-ft	Vert. Storage ac-ft	Linear Storage ac-ft	Vert. Storage ac-ft	Linear Storage ac-ft	Tota Storag ac-f
24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24.50	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
25.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1
25.50	0.15	3.75	0.02	0.01	3.45	0.00	0.00	0.00	7.3
26.00	0.20	7.50	0.06	0.05	6.90	0.00	0.00	0.00	14.7
26.50	0.25	11.25	0.14	0.11	10.35	0.00	0.00	0.00	22.1
27.00	0.30	15.00	0.24	0.20	13.80	0.00	0.00	0.00	29.5
27.50	0.35	18.75	0.38	0.31	17.25	0.00	0.00	0.00	37.0
28.00	0.40	22.50	0.54	0.45	20.70	0.00	0.00	0.00	44.5
28.50	0.45	26.25	0.74	0.61	24.15	0.00	0.00	0.00	52.2
29.00	0.50	30.00	0.96	0.80	27.60	0.00	0.00	0.00	59.8
29.50	0.55	33.75	1.22	1.01	31.05	0.00	0.00	0.00	67.5
30.00	0.60	37.50	1.50	1.25	34.50	0.00	0.00	0.00	75.3
30.50	0.65	41.25	1.80	1.51	37.95	15.23	0.00	3.14	101.5
31.00	0.70	45.00	2.10	1.80	41.40	60.90	0.00	12.55	164.4

SURFACE WATER MANAGEMENT CALCULATIONS
FOR
FP&L MARTIN COUNTY POWER PLANT

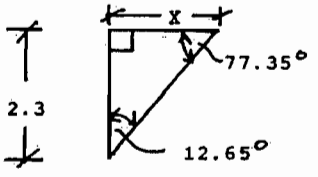
BASIN NEW POWER PLANT CONT.

BLEEDER

SIZE THE BLEEDER TO DISCHARGE 1/2" = 4.5 CFS

V-NOTCH

$\Theta = 2 \text{ TAN}^{-1} (Q / (2.5) (H^{2.5}))$
$Q = 4.5$, $H = 2.3$, $\Theta = 25.3$ DEGREES



$\frac{\text{SIN } 77.35^\circ}{2.3} = \frac{\text{SIN } 12.65^\circ}{X}$

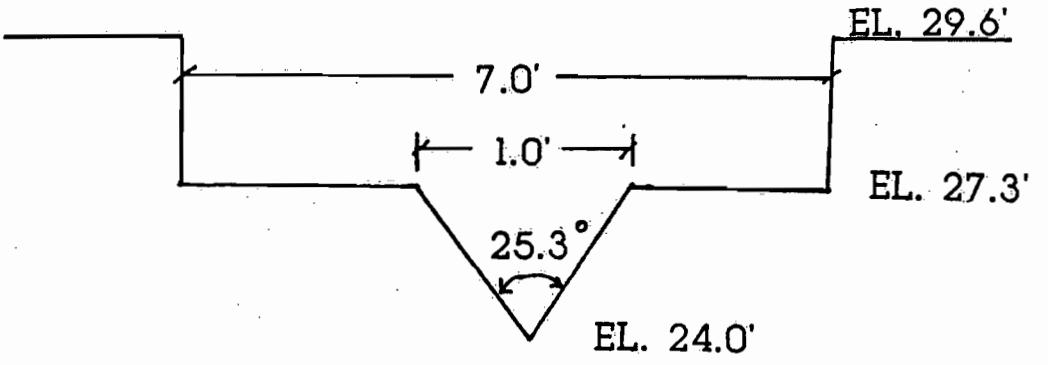
X = .51', L = 2X = 1.0'

OUTFALL STRUCTURE

1 - 25.3 DEGREE V-NOTCH BLEEDER SET AT INVERT ELEVATION 24.0'
AND 1 - 7.0' WIDE WEIR AT CREST ELEVATION 27.3'.

STAGE SUMMARY

STORM	STAGE	MISC.
10 YR - 1 DAY	27.5'	MINIMUM ROAD CROWN EL. 27.6'
25 YR - 3 DAY	29.6'	PEAK DISCHARGE = 95.7 CFS MINIMUM PERIMETER EL. 29.6'
100 YR - 3 DAY	30.8'	MINIMUM FLOOR EL. 30.9'



TYPICAL DETAIL OF OUTFALL STRUCTURE *

FOR NEW POWER PLANT AREA

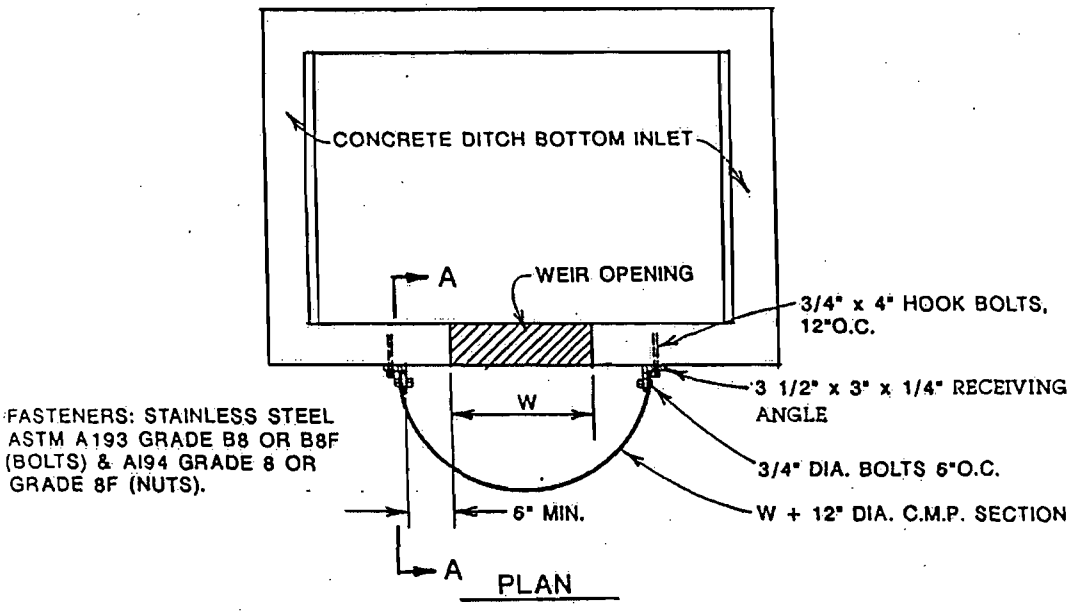
* DETAILED CONSTRUCTION DRAWINGS WILL INCLUDE A BAFFLE ON THE OUTFALL STRUCTURE

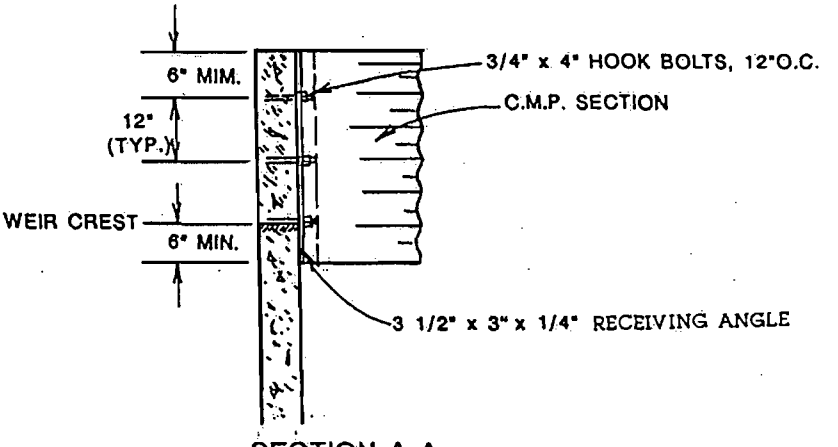
FP&L POWER PLANT EXPANSION

4/18/90

TYPICAL DETAIL OF
WATER CONTROL STRUCTURE

BAFFLE





SECTION A-A

FP&L POWER PLANT EXPANSION

45B

5/3/90

Company Name.....: Howard L. Searcy
Execution Date.....: 01-08-2000

Computation Type.....: STAGE-DISCHARGE

Project Name.....: FPL POWER PLANT
Engineer's Name.....: NEW POWER BLOCK AREA 1A

Bleeder Type: V-notch
Notch Angle = 25.3
Bleeder Invert = 24

Weir Information: Weir Length = 7.0
Elevation = 27.3
Coefficient = 3.13

Stage Elev. (ft)	Head (ft)	Weir Flow (cfs)	Bleeder Flow (cfs)	Culvert Flow (cfs)	Structure Flow (cfs)
24.00	0.00	0.00	0.00	0.00	0.00
24.50	0.50	0.00	0.10	0.00	0.10
25.00	1.00	0.00	0.56	0.00	0.56
25.50	1.50	0.00	1.55	0.00	1.55
26.00	2.00	0.00	3.17	0.00	3.17
26.50	2.50	0.00	5.54	0.00	5.54
27.00	3.00	0.00	8.75	0.00	8.75
27.50	3.50	1.96	13.38	0.00	15.34
28.00	4.00	12.83	15.74	0.00	28.57
28.50	4.50	28.80	17.79	0.00	46.59
29.00	5.00	48.56	19.63	0.00	68.20
29.50	5.50	71.50	21.31	0.00	92.81
30.00	6.00	97.20	22.87	0.00	120.07
30.50	6.50	125.42	24.33	0.00	149.75
31.00	7.00	155.94	25.70	0.00	181.64

Company Name.....: Howard L. Searcy
Execution Date.....: 01-08-2000

Program Name.....: Santa Barbara -- (05/03/85)

Project Name.....: FPL POWER PLANT
Engineer's Name.....: NEW POWER BLOCK AREA 1A
Project Area.....: 215.8 acres
Ground Storage.....: 3.7 inches
Termination Discharge.....: 25 cfs
Time of Concentration.....: .5 hours
Distribution Type.....: SFWMD
Return Frequency.....: 10 years
Rainfall Duration.....: 1 -day
24-hr Rainfall.....: 5.7 inches
Reporting Sequence.....: Standardized
Discharge Hydrograph.....: FPLN10

Bleeder Information.....: Invert 25.3 Angle Width
V-notch.....: 24
Weir Information.....: Length 27.3 Elevation 3.13 Coefficient
7.0

Storage Information.....:

	Component Name	Storage Type	Area (acres)	Start Elev (NGVD-ft)	Ending Elev (NGVD-ft)
Entry No. 1.....	POND	V	.1	24	
Entry No. 2.....	POND	V	7.5	25	
Entry No. 3.....	POND	L	.6	25	30
Entry No. 4.....	POND	L	.6	25	31
Entry No. 5.....	DITCH	V	6.9	25	
Entry No. 6.....	SITE	L	121.8	30	31
Entry No. 7.....	SITE	V	11.7	31	
Entry No. 8.....	RD/PK	L	25.1	30	31

Point No.	Stage (ft)	Storage (af)	Discharge (cfs)
1	24.00	0.00	0.00
2	24.50	0.05	0.10
3	25.00	0.10	0.56
4	25.50	7.38	1.65
5	26.00	14.71	3.17
6	26.50	22.10	5.54
7	27.00	29.54	8.75
8	27.50	37.04	15.34
9	28.00	44.59	28.57
10	28.50	52.20	46.59
11	29.00	59.86	68.20
12	29.50	67.58	92.81
13	30.00	75.35	120.07
14	30.50	101.53	149.75
15	31.00	164.45	181.64

					- - - - - R E S E R V O I R - - - - -				
Time (hr)	Rain fall (in)	Accum. Runoff (in)	Basin Dischge (cfs)	Accum. Inflow (af)	Volume (af)	Accum. Outflow (af)	Instant Dischge (cfs)	Average Dischge (cfs)	Stage (ft)
0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
4.00	0.26	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
8.00	0.78	0.00	0.1	0.0	0.0	0.0	0.0	0.0	24.01
10.00	1.21	0.05	8.0	0.6	0.6	0.1	0.6	0.3	25.03
11.00	1.53	0.14	17.9	1.7	1.6	0.1	0.7	0.7	25.09
11.50	1.82	0.24	32.5	2.9	2.7	0.1	0.9	0.8	25.16
11.75	2.78	0.72	112.7	5.2	5.0	0.2	1.1	1.0	25.26
12.00	3.74	1.34	259.0	10.6	10.4	0.2	1.6	1.3	25.52
12.50	4.16	1.64	224.8	21.2	20.9	0.3	4.4	2.9	26.26
13.00	4.37	1.80	132.7	27.5	27.0	0.5	7.1	5.7	26.74
14.00	4.66	2.02	58.8	34.0	32.7	1.3	11.0	9.0	27.17
16.00	5.02	2.29	29.7	40.0	36.5	3.5	14.6	13.2	27.45
20.00	5.43	2.62	17.9	46.4	37.7	8.6	16.2	15.6	27.53
24.00	5.70	2.84	12.1	50.6	36.8	13.8	15.0	15.6	27.48

Maximum Stage = 27.53 feet
Maximum Discharge = 16.26 cfs

Execution Date.....: 01-08-2000

Program Name.....: Santa Barbara -- (05/03/85)

Project Name.....: FPL POWER PLANT
Engineer's Name.....: NEW POWER BLOCK AREA 1A
Project Area.....: 215.8 acres
Ground Storage.....: 3.7 inches
Termination Discharge.....: 25 cfs
Time of Concentration.....: .5 hours
Distribution Type.....: SFWMD
Return Frequency.....: 25 years
Rainfall Duration.....: 3 -day
24-hr Rainfall.....: 7 inches
Reporting Sequence.....: Standardized
Discharge Hydrograph.....: FPLN25

Bleeder Information.....:	Invert	Angle	Width
V-notch.....:	24	25.3	
Weir Information.....:	Length	Elevation	Coefficient
	7.0	27.3	3.13

Storage Information.....:	Component Name	Storage Type	Area (acres)	Start Elev (NGVD-ft)	Ending Ele (NGVD-ft)
Entry No. 1.....:	POND	V	.1	24	
Entry No. 2.....:	POND	V	7.5	25	
Entry No. 3.....:	POND	L	.6	25	30
Entry No. 4.....:	POND	L	.6	25	31
Entry No. 5.....:	DITCH	V	6.9	25	
Entry No. 6.....:	SITE	L	121.8	30	31
Entry No. 7.....:	SITE	V	11.7	31	
Entry No. 8.....:	RD/PK	L	25.1	30	31

Point No.	Stage (ft)	Storage (af)	Discharge (cfs)
1	24.00	0.00	0.00
2	24.50	0.05	0.10
3	25.00	0.10	0.56
4	25.50	7.38	1.55
5	26.00	14.71	3.17
6	26.50	22.10	5.54
7	27.00	29.54	8.75
8	27.50	37.04	15.34
9	28.00	44.59	28.57
10	28.50	52.20	46.59
11	29.00	59.86	68.20
12	29.50	67.58	92.81
13	30.00	75.35	120.07
14	30.50	101.53	149.75
15	31.00	164.45	181.64

					- - - - - R E S E R V O I R - - - - -				
Time (hr)	Rain fall (in)	Accum. Runoff (in)	Basin Dischge (cfs)	Accum. Inflow (af)	Volume (af)	Accum. Outflow (af)	Instant Dischge (cfs)	Average Dischge (cfs)	Stage (ft)
0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
4.00	0.17	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
8.00	0.34	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
12.00	0.51	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
16.00	0.68	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
20.00	0.85	0.00	0.4	0.0	0.0	0.0	0.1	0.0	24.32
24.00	1.02	0.02	1.2	0.3	0.2	0.1	0.6	0.4	25.00
28.00	1.27	0.07	3.0	1.1	0.7	0.3	0.6	0.6	25.04
32.00	1.52	0.14	4.1	2.3	1.7	0.6	0.8	0.7	25.11
36.00	1.77	0.22	5.1	3.8	3.0	0.8	0.9	0.9	25.19
40.00	2.02	0.33	5.9	5.6	4.4	1.2	1.1	1.0	25.29
44.00	2.26	0.44	6.6	7.7	6.1	1.6	1.4	1.3	25.41
48.00	2.51	0.57	7.3	10.0	7.9	2.1	1.7	1.5	25.53
52.00	2.83	0.75	11.5	13.1	10.3	2.7	2.2	1.9	25.69
56.00	3.47	1.16	28.5	19.7	16.1	3.6	3.5	2.7	26.07
58.00	4.00	1.53	44.0	25.7	21.3	4.3	5.2	4.3	26.42
59.00	4.40	1.82	61.5	30.0	25.2	4.8	6.6	5.8	26.67
59.50	4.75	2.08	90.8	33.4	28.3	5.1	7.8	7.2	26.86
59.75	5.93	3.03	242.0	38.4	33.2	5.3	9.7	8.8	27.07
60.00	7.11	4.03	483.4	48.4	42.9	5.6	16.8	13.3	27.56
60.50	7.62	4.47	379.0	66.6	59.6	7.0	56.4	36.1	28.73
61.00	7.88	4.70	212.8	77.0	67.0	10.0	83.8	71.3	29.32
62.00	8.24	5.02	87.6	86.9	69.3	17.6	95.7	92.5	29.55
64.00	8.67	5.41	42.1	95.6	63.4	32.2	78.1	87.8	29.20
68.00	9.18	5.86	24.8	104.4	52.4	52.1	46.4	60.2	28.49
72.00	9.51	6.17	16.7	110.3	45.7	64.6	30.7	37.9	28.06
73.75	9.51	6.17	0.6	110.9	42.3	68.6	24.6	27.7	27.85

Maximum Stage = 29.55 feet
Maximum Discharge = 95.69 cfs

Company Name.....: Howard L. Searcy
Execution Date.....: 01-08-2000

Program Name.....: Santa Barbara -- (05/03/85)

Project Name.....: FPL POWER PLANT
Engineer's Name.....: NEW POWER BLOCK AREA 1A
Project Area.....: 215.8 acres
Ground Storage.....: 3.7 inches
Termination Discharge.....: 25 cfs
Time of Concentration.....: .5 hours
Distribution Type.....: SFWMD
Return Frequency.....: 100 years
Rainfall Duration.....: 3 -day
24-hr Rainfall.....: 8.7 inches
Reporting Sequence.....: Standardized

Storage Information.....:

	Component Name	Storage Type	Area (acres)	Start Elev (NGVD-ft)	Ending Elev (NGVD-ft)
Entry No. 1.....	POND	V	.1	24	
Entry No. 2.....	POND	V	7.5	25	
Entry No. 3.....	POND	L	.6	25	30
Entry No. 4.....	POND	L	.6	25	31
Entry No. 5.....	DITCH	V	6.9	25	
Entry No. 6.....	SITE	L	121.8	30	31
Entry No. 7.....	SITE	V	11.7	31	
Entry No. 8.....	RD/PK	L	25.1	30	31

Point No.	Stage (ft)	Storage (af)	Discharge (cfs)
1	24.00	0.00	0.00
2	24.50	0.05	0.00
3	25.00	0.10	0.00
4	25.50	7.38	0.00
5	26.00	14.71	0.00
6	26.50	22.10	0.00
7	27.00	29.54	0.00
8	27.50	37.04	0.00
9	28.00	44.59	0.00
10	28.50	52.20	0.00
11	29.00	59.86	0.00
12	29.50	67.58	0.00
13	30.00	75.35	0.00
14	30.50	101.53	0.00
15	31.00	164.45	0.00

Time (hr)	Rain fall (in)	Accum. Runoff (in)	Basin Dischge (cfs)	Accum. Inflow (af)	- - - - - R E S E R V O I R - - - - - Volume (af)	Accum. Outflow (af)	Instant Dischge (cfs)	Average Dischge (cfs)	Stage (ft)
0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
4.00	0.21	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
8.00	0.42	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
12.00	0.64	0.00	0.0	0.0	0.0	0.0	0.0	0.0	24.00
16.00	0.85	0.00	0.4	0.0	0.0	0.0	0.0	0.0	24.29
20.00	1.06	0.03	1.6	0.4	0.4	0.0	0.0	0.0	25.02
24.00	1.27	0.07	2.6	1.1	1.1	0.0	0.0	0.0	25.07
28.00	1.58	0.16	5.4	2.6	2.6	0.0	0.0	0.0	25.17
32.00	1.89	0.27	6.8	4.6	4.6	0.0	0.0	0.0	25.30
36.00	2.20	0.41	8.0	7.1	7.1	0.0	0.0	0.0	25.47
40.00	2.51	0.57	9.0	9.9	9.9	0.0	0.0	0.0	25.66
44.00	2.81	0.75	9.8	13.0	13.0	0.0	0.0	0.0	25.88
48.00	3.12	0.93	10.5	16.4	16.4	0.0	0.0	0.0	26.10
52.00	3.51	1.19	16.4	20.7	20.7	0.0	0.0	0.0	26.39
56.00	4.32	1.76	39.4	29.9	29.9	0.0	0.0	0.0	27.00
58.00	4.98	2.26	59.9	38.1	38.1	0.0	0.0	0.0	27.53
59.00	5.46	2.65	83.0	44.1	44.1	0.0	0.0	0.0	27.91
59.50	5.90	3.00	121.8	48.6	48.6	0.0	0.0	0.0	28.18
59.75	7.36	4.25	321.2	55.3	55.3	0.0	0.0	0.0	28.48
60.00	8.83	5.55	636.2	68.4	68.4	0.0	0.0	0.0	29.13
60.50	9.47	6.13	495.1	92.2	92.2	0.0	0.0	0.0	30.23
61.00	9.80	6.43	276.7	105.7	105.7	0.0	0.0	0.0	30.51
62.00	10.24	6.84	113.1	118.6	118.6	0.0	0.0	0.0	30.63
64.00	10.78	7.34	54.0	129.7	129.7	0.0	0.0	0.0	30.72
68.00	11.41	7.92	31.8	141.1	141.1	0.0	0.0	0.0	30.81
72.00	11.82	8.31	21.3	148.6	148.6	0.0	0.0	0.0	30.87

Maximum Stage = 30.87 feet
Maximum Discharge = 0.00 cfs

APPENDIX B

NOISE MONITORING AND EVALUATION PROCEDURES

AMBIENT NOISE MONITORING PROGRAM

A comprehensive ambient noise-monitoring program was performed to assess the existing ambient noise levels in the Project area and the Martin Plant Site. The field effort to collect the baseline noise level data was conducted on January 10 and 11, 2000. The sound pressure levels (SPLs) and octave band data were collected at six different locations using measurement techniques set forth by the American National Standard Institute (ANSI) S12.9-1993/Part 3. Table B-1 provides, in tabular format, the direction and distance of each of the noise-monitoring sites referenced to the proposed location of the Martin Peaking Unit Project.

Noise monitoring equipment used during the study included:

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

The Larson Davis sound level meter complies with Type I Precision Requirements set forth by ANSI S1.4-1983 for sound level meters. Equipment used to monitor baseline noise levels operated in the slow response mode to obtain accurate, integrated, A-weighted sound pressure levels. A windscreen was used because all measurements were taken outdoors. The microphone was positioned so that a random incidence response, as specified by ANSI, was achieved. The sound level meter and octave band analyzer were calibrated immediately prior to, and just after, the sampling period to provide a quality control check of the sound level meter's operation during monitoring. Integrated sound pressure level (SPL) data consisting of the following noise parameters were collected at each location:

- L_{eq} - the sound pressure level averaged over the measurement period; this parameter is the continuous steady sound pressure level that would have the same total acoustic energy as the real fluctuating noise over the same time period;
- Max - the maximum sound pressure level for the sampling period, and;
- Min - the minimum sound pressure level for the sampling period.

Monitoring was conducted using the sound level meter mounted on a tripod at a height of 1.2-m (4-ft) above grade. Local meteorological conditions (wind speed, wind direction and temperature) were measured during the monitoring periods. The operator recorded detailed field notes during monitoring and included major noise sources in the area. Four of the six monitoring locations, (Sites 3, 4, 5 and 6) were chosen to delineate the noise levels at or near the Martin Plant property boundaries. Sites 4, 5 and 6 are the nearest residential receptors to the Martin Plant. The two remaining monitoring sites (Sites 1 and 2) were selected to determine the existing noise levels within the Martin Plant property; at the two new CT's (Site 2) and the Barley Barber Swamp (Site 1). Noise monitoring was performed at the six sites during the daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.).

Ambient SPLs were measured at each of the six sites during the day and night time for a minimum of 15 consecutive minutes. The L_{eq} (equivalent sound pressure level averaged for the sampling period) and the maximum and minimum SPLs were recorded during each monitoring episode and are presented in Table B-2. The average minimum, maximum, and L_{eq} SPLs for each site were calculated. The SPL averages were calculated using the following formula:

$$\text{Average SPL} = 10 \text{ Log } \frac{\sum_{i-1}^{N} 10^{(SPL1/10)}}{N}$$

where: N = number of observations

SPL_i = individual sound pressure level in data set

Also included in Table B-2 are the wind speed, wind direction, and microphone orientation, as well as comments on events and observations occurring during the monitoring program. The SPL data were analyzed and reported in A-weighted decibels (dBA). The higher the decibel values, the louder the sound.

EVALUATION OF CONSTRUCTION NOISE IMPACTS

The noise impact evaluation of construction activities was performed using noise-propagation computer programs to estimate noise levels. When using this program, noise source levels are entered as octave band frequency levels. The user can specify coordinates, either rectangular or polar. All noise sources are assumed to be point sources; line sources can be simulated by several point sources. Sound propagation is calculated by accounting for hemispherical spreading and three other user-identified attenuation options: atmospheric attenuation, path-specific attenuation, and barrier attenuation. Atmospheric attenuation is calculated using the data specified by the American National Standard Institute Method for the Calculation of the Absorption of Sound by the Atmosphere[1]. Path specific attenuation can be specified to account for the effects of vegetation, foliage and wind shadow. Direction source characteristics and reflection can be simulated using path-specific attenuation. Barrier attenuation can be specified by giving the coordinates and height of the barrier and calculated by assuming an infinitely long barrier perpendicular to the source-receptor path. Total and A-weighted sound pressure levels (SPLs), filtered to approximate human hearing, are calculated. Background noise levels can be incorporated into the program and are used to calculate overall SPLs.

[1] ANSI, 1978; Method for Calculation of the Absorption of Sound by the Atmosphere; American National Standards Institute, Method S1.26-1978 (R1989); 1978

TABLE B-1 NOISE MONITORING SITE INFORMATION		
Site Description	**Direction from Peaking Units**	**Distance from Peaking Units**
Site 1 - Cooling Pond embankment at Barley Barber Swamp	West-northwest	7,425 feet
Site 2 - Between the two peaking units	--	75 feet
Site 3 - Cooling Pond embankment near residence	South-southeast	8,100 feet
Site 4 - Adjacent to SR710 at transmission line crossing	East-northeast	11,025 feet
Site 5 - Next to rail road on Amaryllis Road	Northeast	8,550 feet
Site 6 - Cooling Pond embankment near residence	North-northwest	7,650 feet

Source: Golder Associates, Inc., 2000

TABLE B-2

BASELINE AMBIENT SOUND PRESSURE LEVEL DATA
MARTIN PEAKING UNITS

Site	Date	Time	Wind Speed	Wind Direction	Microphone Orientation	Sound Pressure Levels (dBA)			Comments
						Min	Max	L_{eq}	
1	01/10/00	2200	Calm	N/A	090	34.4	39.4	35.6	Top of embankment; insect noises and frogs
	01/10/00	2112	1-3	090	090	34.2	46.9	38.5	Insect noises
					Average	34.3	43.2	37.1	
2	01/10/00	2240	1-3	300	000	54.6	59.3	56.4	At new unit location
	01/10/00	2042	1-3	Var.	000	53.7	59.0	55.1	All units (1, 2, 3A, 3B, 4A and 4B) operating
					Average	54.2	59.2	55.8	
3	01/11/00	2334	3-5	300	000	52.4	60.4	54.2	Discharge pump on 2 minutes; frogs
	01/11/00	0910	1-3	315	000	50.6	58.3	54.0	
					Average	51.5	59.4	54.1	
4	01/11/00	0018	3-5	Var.	270	39.0	48.6	41.2	Traffic; insect noises
	01/11/00	1104	Calm	N/A	270	44.6	64.5	51.3	Traffic; no train
					Average	41.8	56.6	46.3	
5	01/11/00	0002	3-5	330	270	41.9	54.1	45.0	Crickets; insect noises
	01/11/00	1130	3-5	315	270	42.3	62.9	50.4	Insect noises; traffic
					Average	42.1	58.5	47.7	
6	01/10/00	2238	5-8	215	180	49.0	53.8	50.0	Wind picking up
	01/11/00	2131	1-3	090	180	50.9	56.1	52.6	
					Average	50.0	55.0	51.3	

Source: Golder Associates Inc., 2000