

PALM BEACH COUNTY, FLORIDA

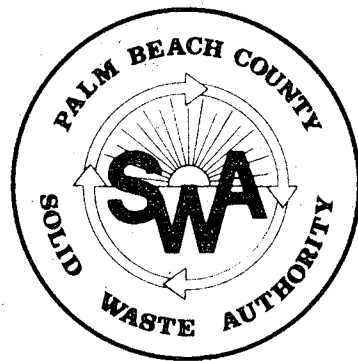
SOLID WASTE RESOURCE RECOVERY FACILITY

**APPLICATION FOR
POWER PLANT SITE CERTIFICATION**

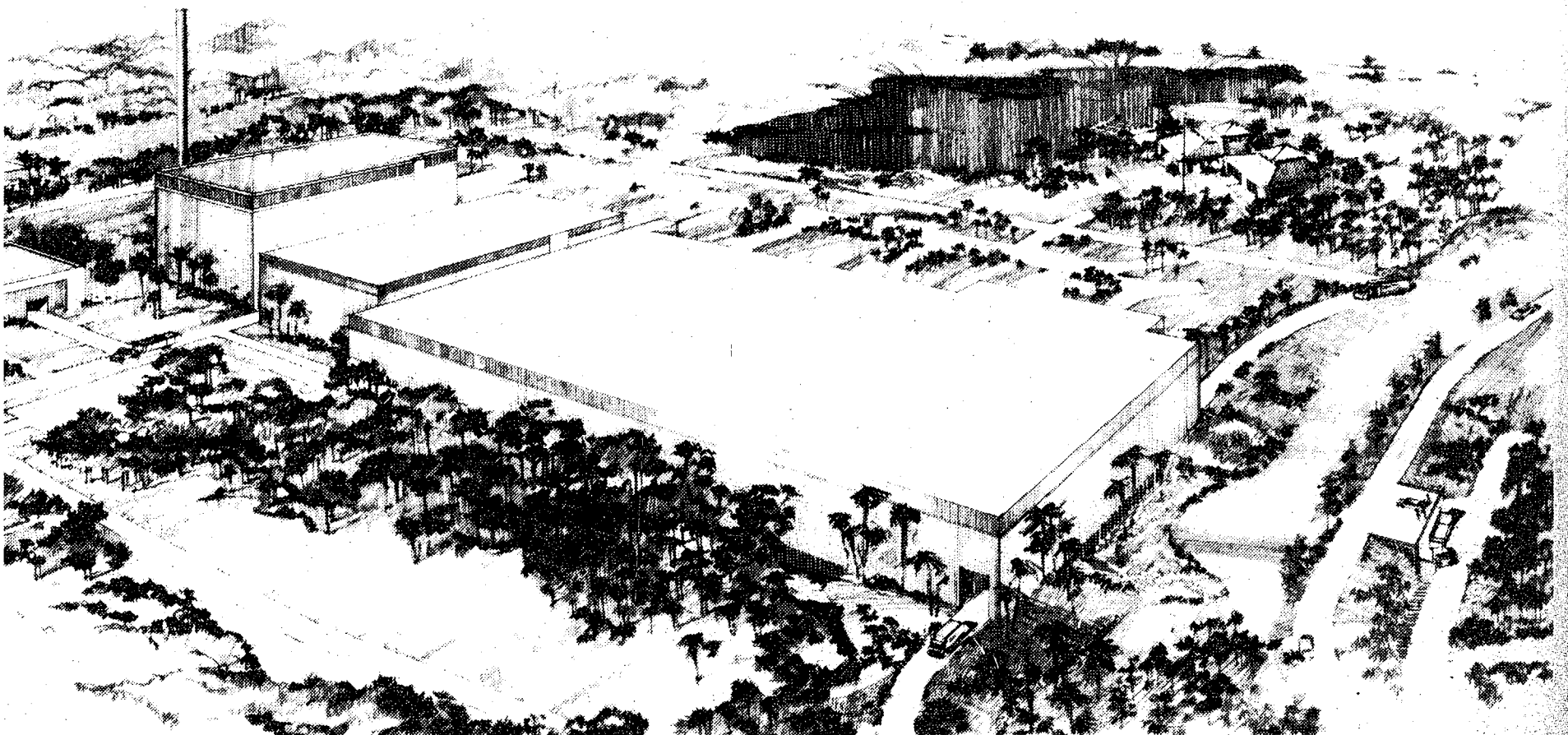
VOLUME I - APPLICATION

SUBMITTED BY

THE PALM BEACH COUNTY SOLID WASTE AUTHORITY



APRIL, 1985



PALM BEACH COUNTY
FLORIDA

**SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION**

VOLUME I
APPLICATION

Received DER

JUN 18 1985

P P S



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PALM BEACH COUNTY SOLID WASTE AUTHORITY



State of Florida
Department of Environmental Regulation
Division of Environmental Permitting
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Attn: Mr. Hamilton Oven, P.E.
Power Plant Siting Section

Re: Application for Power Plant Site Certification
Palm Beach County Solid Waste Authority
Resource Recovery Facility

Gentlemen:

Transmitted herewith is the Palm Beach County Solid Waste Authority's Application for an Electrical Power Plant Siting Certification which is submitted in accordance with Rules of the Florida Department of Environmental Regulation, Chapter 17-17 F.A.C.

The Solid Waste Authority welcomes the opportunity to work with the Department of Environmental Regulation and other agencies involved in reviewing this application for site certification.

We anticipate that the information contained herein provides all that is necessary to permit a thorough evaluation of our application. However, if you find that additional data or clarification is required, please contact me at your earliest convenience.

Also enclosed is our check for \$22,500.00 to cover the application fee.

Very truly yours,

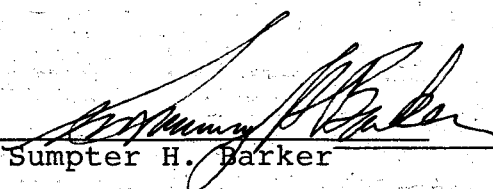
A handwritten signature in black ink, appearing to read "Timothy F. Hunt, Jr.", written in a cursive style.

Timothy F. Hunt, Jr.
Executive Director

TH/pc
enclosure

State of Florida
Dept. of Environmental Regulation
Page Two

Engineer Submitting Application: _____


Sumpter H. Barker

Florida Registration Number: _____

#12839

12839



P. O. Box 107
140 North County Road
Palm Beach, Florida 33480

P B C SOLID WASTE AUTH-ACQ&CONSTR FD

63-659
670

No. 15584

DATE 6/7/85

***22,500.00

PAY TWENTY-TWO THOUSAND FIVE HUNDRED AND NO/100

To
the
order
of

STATE OF FLORIDA DEPARTMENT OF
ENVIROMENTAL REGULATION
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

TRUST DEPARTMENT

Robert M. Doolittle
AUTHORIZED SIGNATURE

FIRST AMERICAN BANK AND TRUST - TRUST DEPARTMENT

DETACH AND RETAIN THIS STATEMENT

ACCOUNT NUMBER [REDACTED]	ACCOUNT NAME P B C SOLID WASTE AUTH-ACQ&CONSTR FD	DATE 6/7/85	1186
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DESCRIPTION

DISTRIBUTION PER REQUEST
APPLICATION FEE - POWER PLANT SITE
CERTIFICATION CENTRAL RESOURCE RECOVERY
FACILITY

*****22,500.00

P \$ _____
I \$ _____
Code _____

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PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY APPLICATION FOR POWER PLANT SITE CERTIFICATION

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ABBREVIATIONS AND ACRONYMS

AAL	—	Ambient air level
AADT	—	Average annual daily traffic
AAQS	—	Ambient air quality standard
ADT	—	Average daily traffic
agl	—	Above grade level
AQCR	—	Air Quality Control Region
AQS	—	Air quality standards
Authority	—	Palm Beach County Solid Waste Authority
BACT	—	Best available control technology
Be	—	Beryllium
BCC	—	Palm Beach County Board of County Commissioners
CARB	—	California Air Resources Board
CDMOC	—	Long term urban dispersion program
CDS	—	Compliance data system
CEC	—	Cation exchange capacity
CO	—	Carbon monoxide
CO ₂	—	Carbon dioxide
Complex I	—	Complex terrain dispersion program
CPC	—	Palm Beach County Planning Commission
CRYSTER	—	Single source dispersion model
CUPS	—	Consumptive Use Permits
CY	—	Cubic yards
DAHRM	—	Division of Archives History and Records Management (Florida Department of State)
dba	—	Decibel (A-weighted scale)
DER	—	Department of Environmental Regulation
DNR	—	Department of Natural Resources
DO	—	Dissolved oxygen
DRI	—	Development of Regional Impact
DSCF	—	Dry standard cubic foot
EDS	—	Environmental Data Service
EPA	—	United States Environmental Protection Agency
ESP	—	Electrostatic precipitator
FAA	—	Federal Aviation Administration
FAAQs	—	Florida Ambient Air Quality Standards
FAC	—	Florida Administrative Code
FDER	—	Florida Department of Environmental Regulation
FEMA	—	Federal Emergency Management Agency
FGFWFC	—	Florida Game and Freshwater Fish Commission
FHwA	—	Federal Highway Administration
FIRM	—	Flood Insurance Rate Map
FLUCCS	—	Florida Land Use and Cover Classification System

FP&L	—	Florida Power & Light Company
FS	—	Florida Statutes
GEP	—	Good engineering practice of stack height
gpd	—	Gallons per day
gpm	—	Gallons per minute
gr/dscf	—	Grains per dry standard cubic foot
HCL	—	Hydrochloric acid
Hf	—	Hydroflouric acid
Hg	—	Mercury
HHV	—	Higher heating value
HSI	—	Highest second highest concentration
HUD	—	Federal Department of Housing and Urban Development
Hz	—	Hertz
ISC	—	Industrial Source Complex Dispersion Model
ISCLT	—	Industrial source complex long term dispersion model
ISCST	—	Industrial source complex short term dispersion model
JTU	—	Jackson Turbidity Units
kips	—	kilopounds (1000 pounds)
km	—	kilometers
kv	—	kilovolt
kw	—	kilowatt
LAER	—	Lower available emission rate
LCD	—	Local climatological data
Leq	—	Energy equivalent noise level
LOS	—	Level of service
m ³	—	Cubic meter
MCL	—	Maximum contaminant level
mgd	—	Million gallons per day
mps	—	Meters per second
MPTER	—	Multiple point gaussian disperssion program
MSL	—	Mean sea level
MSW	—	Municipal Solid Waste
MW	—	Megawatts
NAAQS	—	National Ambient Air Quality Standards
NCC	—	National climatic center, Asheville, N.C.
NEDS	—	National emissions data system
NGVD	—	National Geodetic Vertical Datum
NHPA	—	National Historic Preservation Act
NOAA	—	National Oceanic & Atmospheric Administration
NO _x	—	Nitrogen oxides
NPDES	—	National Pollutant Discharge Elimination System
NSPS	—	New Source Performance Standards
NTIS	—	National Technical Information Service
NWI	—	National Wetlands Inventory
OCC	—	Organic carbon concentration
OSHA	—	Occupational Safety and Health Administration
O ₂	—	Oxygen
Oz	—	Ozone
Pb	—	Lead
PFU	—	Plaque forming units

PM	—	Particulate matter
ppm	—	Parts per million
PSD	—	Prevention of Significant Deterioration
psi	—	Pounds per square inch
PTDIS	—	Interactive version of point source dispersion program
PTMAX	—	Interactive version of point source dispersion program
PTMTP	—	Interactive version of point source dispersion program
PTPLU	—	Single source gaussian dispersion program
PUD	—	Planned Unit Development
PURPA	—	Public Utility Regulatory Policies Act
PZB	—	Palm Beach County Department of Planning, Zoning & Building
RAM	—	Short term urban dispersion program
RCRA	—	Resource Conservation & Recovery Act
RDF	—	Refuse derived fuel
RFP	—	Requests for proposals
SCC	—	Source classification code
SCS	—	Soil Conservation Service
SHPO	—	State Historic Preservation Officer
SHORTZ	—	Short term dispersion program for ground-level concentrations
SIA	—	Significant impact area
SIC	—	Standard industrial classification code
SIL	—	Significant impact level
SIP	—	State Implementation Plan
SO ₂	—	Sulfur dioxide
SR	—	State Road
SFWMD	—	South Florida Water Manage District
STAR	—	Wind distribution by Pasquill stability classes
tpd ₇	—	Tons per day; seven days per week
tpy	—	Tons per year
TSP	—	Total suspended particulates
UG/M3	—	Micrograms per cubic meter
USDA	—	United States Department of Agriculture
USDEP. COMM.	—	United States Department of Commerce
USEPA	—	United States Environmental Protection Agency
USFWS	—	United States Fish and Wildlife Service
VOC	—	Volatile organic compounds
vpd	—	Vehicles per day
vph	—	Vehicles per hour
WCA	—	City of West Palm Beach Water Catchment Area

APPLICATION INFORMATION

Applicant's Official Name:

Palm Beach County
Solid Waste Authority

Address:

5114 Okeechobee Blvd.
Suite 2-C
West Palm Beach, FL 33417

Name, Title and Phone Number
of Official Representative Responsible
for Obtaining Certification:

Mr. Timothy F. Hunt, Jr.
Executive Director
(305) 471-5770

Site Location:

Palm Beach County

Nearest Incorporated City:

West Palm Beach

Latitude & Longitude:

26° 46' 00" N
80° 08' 45" W

UTM Zone 17:

0585820 meters East
2960180 meters North

Section	Township	Range
22	42S	42E
27	42S	42E
34	42S	42E
2	43S	42E
3	43S	42E

Location of any directly
associated transmission facility:

Palm Beach County

Name Plate Generating Capacity:

50 megawatts

Ultimate Capacity for Certification:

75 megawatts

APPLICANT INFORMATION

Remarks: The Palm Beach County Solid Waste Authority was created by the Florida Legislature under the Palm Beach County Solid Waste Act, Chapter 75-473, Laws of Florida. In creating the Authority, the legislative intent was to form a countywide authority for a coordinated management of solid waste in order to meet expanding problems within Palm Beach County relating to safe and sanitary processing and disposal of solid waste and to require the municipalities and county to plan for and develop adequate solid waste collection systems. The Authority may require that all waste disposed of by public and/or private agencies from any municipality or unincorporated area of the county be transported to Authority designated processing and disposal facilities in a manner and form as mandated in accordance with the Solid Waste Act.

The Authority does not operate, maintain nor construct facilities for the purpose of electric power generation. Neither does the Authority distribute electrical energy generated at facilities operated by others. The sole purpose of the proposed facility is to dispose of solid waste and recover energy and materials. The proposed facility will provide Palm Beach County with a method of solid waste disposal that will replace present traditional landfilling operations.

EXECUTIVE SUMMARY

INTRODUCTION

In Palm Beach County, there has been an increased interest in solid waste disposal with emphasis on the concept of resource recovery. This has been stimulated by a greater awareness of the environmental and siting problems associated with landfill disposal methods, and by the potential for recovering energy and recyclable materials from solid waste. Landfilling, while suitable in other locations, has become increasingly difficult as a primary disposal method in Palm Beach County. Areas which are environmentally and economically suitable for sanitary landfilling in this rapidly urbanizing county are quickly diminishing. Palm Beach County can no longer rely on conventional landfilling as its only method of solid waste disposal and is, therefore, developing an alternative primary disposal method — a refuse derived fuel (RDF) Resource Recovery Facility.

The decision to build a Resource Recovery Facility is the culmination of nine years of dedicated solid waste management planning. Since 1975, the Palm Beach County Solid Waste Authority (the Authority) has been working to find a long-term alternative to sanitary landfilling. The Authority started its effort shortly after the State of Florida enacted legislation (Chapter 403.706 Florida Statutes, FS) requiring heavily populated counties like Palm Beach to submit resource recovery and management plans. Numerous studies, commissioned by the Authority since 1975, have concluded that resource recovery is the prudent long-term solution to the County's refuse disposal needs. By using the energy obtainable from solid waste to generate electricity, resource recovery makes the most sense economically and environmentally.

SITE LOCATION

Pursuant to Section 403.505 FS, Palm Beach County is applying for certification of a resource recovery plant with landfills at a 1,320 acre site located in the unincorporated north-central area of the county. The site is bounded on the north by the Beeline Highway (SR 710), on the east by the Florida Turnpike, on the south by a line approximately 610 feet south of 45th Street, on the west by the City of West Palm Beach Water Catchment Area, and on the northwest by a large privately-owned property. The site is due west (across the Turnpike) of the existing Dyer Boulevard Landfill and is within 2 miles of a Florida Power & Light Company (FP&L) transmission line corridor. A 73 acre parcel east of the southernmost portion of the site will serve as the corridor for the 138 kv transmission line from the resource recovery plant to the existing FP&L transmission line corridor.

PURPOSE OF THE PROPOSED FACILITY

The primary purpose of the facility is to dispose of the municipal solid waste generated within the County. Non-combustibles and inert ash residue resulting from the plant's combustion process will be disposed of on the site. The power derived from the combustion

of the refuse is an additional benefit. Its sale to FP&L will help offset the overall cost of operating the facility. An affirmative determination of need from the Florida Public Service Commission has been applied for as part of this document. Other materials may be recovered as market conditions warrant.

The Authority will contract with a full-service vendor to design, construct, and operate the plant. The Authority will own the facility.

The proposed project is designed to help achieve the State's goal of enhancing environmental quality and preserving natural resources. To protect its groundwater and surface water resources, Palm Beach County is striving to limit sanitary landfilling of solid waste and plans to utilize resource recovery, an environmentally sound and economically advantageous method of solid waste disposal.

FACILITY DESCRIPTION

The proposed project will be a RDF Resource Recovery Facility with an initial continuous design rate processing capacity of 2,000 tons per day of municipal solid waste (MSW) and a gross electrical generating capacity of approximately 50 megawatts (MW). In anticipation of future disposal needs, Palm Beach County is seeking certification for ultimate site electrical generating capacity of approximately 75 MW (gross), using 3,000 tons per day of MSW.

The landfill associated with the Resource Recovery Facility will consist of a 150 acre Class I landfill of double-liner technology with a leachate collection system and a 235 acre Class III landfill of single-liner technology with a leachate collection system. Borrow lakes consisting of approximately 243 acres will be developed over the life of the landfill to provide fill for construction and cover material for the landfill contents.

APPLICATION OVERVIEW

This application has been prepared in accordance with Chapter 17-17, FAC (Electrical Power Plant Siting) and follows the format prescribed in DER Form 17-1.211 (1), FAC (Instruction Guide for Certification Applications: Electrical Power Plant Site, Associated Facilities, and Associated Transmission Lines).

The application consists of four (4) volumes:

Volume I (Application) — contains the Applicant Information sheet, Chapters 1 through 9 as presented in the DER Instruction Guide, and the listing of references.

Volume II and III (Appendices) — contain the appendices of the application (Chapter 10). In addition to those appendices specifically required in the DER Instruction Guide, included are thirteen (13) additional appendices which are more appropriately included in Volume II or III than in the application text of Volume I.

Volume IV (Air Quality) — contains DER Form 17-1.202(1), Application to Operate/Construct Air Pollution Sources; the specific requirements of the Prevention of Significant Deterioration (PSD) review; a Best Available Control Technology (BACT) analysis and an air quality impact analysis.

As required by Chapter 17-17.121(3)(a) FAC, also submitted, under separate cover, are three (3) copies of materials which show the procedures taken to accomplish compliance of the site with existing land use plans and zoning ordinances. This compilation of information is referred to as the "Compliance Document".

PRINCIPAL FINDINGS

The proposed facility will be designed and operated to meet all applicable Federal, State and County Standards. As intended, the facility will have a minimal impact on the surrounding environment. The analysis presented in the application supports this conclusion:

- Air Quality — As discussed in the Appendix 10.1.5 — Air Quality Impact Analysis, the combustion process for the facility will be environmentally sound. The results of the Prevention of Significant Deterioration (PSD) analysis indicate:
 - Best Available Control Technology (BACT) for the proposed source is the use of emission controls inherent to the system design with an Electrostatic Precipitator (ESP) designed to meet an outlet grain loading of 0.03 gr/dscf corrected to 12% CO₂;
 - The facility will operate in compliance with the Prevention of Significant Deterioration (PSD) increments, National Ambient Air Quality Standards (NAAQS), and Florida Ambient Air Quality Standards (FAAQS) for all criteria pollutants;
 - Fugitive dust created during construction of the facility is addressed in Section 4.5. With suggested standard mitigative measures there will be no adverse effects due to fugitive emissions.
 - Total Suspended particulates (TSP) are examined in Section 5.6.1 and Appendix 10.1.5. The proposed resource recovery plant emissions will result in an ambient impact equal to approximately 1.3 percent of the Florida Ambient Air Quality Standard for TSP;
 - As discussed in Section 3.4.1, the tipping area and RDF plant will be enclosed and under negative air pressure. Thus, odors will not be able to leave the resource recovery plant. Odors within the building will be drawn into the furnace and destroyed in the combustion process; and
 - The emissions from the facility will not have an adverse effect on surrounding soils, vegetation or visibility.
- Land Use and Zoning — (Section 2.2.2 and Compliance Document) A series of advertised formal public hearing have been conducted concerning the awarding of a Special Exception to the Agricultural Residential Zoning of the site. At those hearings public input, testimony and documents were entered into the official record as land use and zoning issues were evaluated. Even though the Palm Beach County

Planning Commission (CPC) voted against the requested Special Exception, the staff of the County Planning, Zoning and Building Department had recommended to the CPC approval of the Special Exception, indicating that the requested use conformed to the County Zoning Code and the Land Use Plan. The Board of County Commissioners (BCC) concluded that the proposed Resource Recovery Facility is compatible with the Land Use Plan and zoning patterns in the area. Accordingly, the Board of County Commissioners approved the Special Exception with a number of conditions.

- Noise — The Environmental Noise Study (Section 5.7 and Appendix 10.15) indicated that the predicted noise levels resulting from the operation of the facility will not exceed recommended noise level criteria for any location off of the Resource Recovery Facility site. There are a few areas on-site where the level of noise will exceed recommended levels; however these areas are localized or enclosed and no personnel would work within any of the areas for extended periods of time. The effects of these noise levels can be mitigated using standard equipment and procedures.
- Traffic — (Section 5.9.1 and Appendix 10.16) The potential traffic impact which the proposed Resource Recovery Facility would have on the adjacent roadway network was determined. The facility will meet the County's Traffic Performance Standards as a Category C Project. The Authority has committed itself to construct or upgrade a number of vicinity roads, insuring continued acceptable levels of service.
- Groundwater — This facility will lie over portions of the Turnpike Aquifer, a principal source of drinking water in Palm Beach County. Thorough hydro-geologic investigations were conducted to determine existing groundwater quality and to serve as a basis for future monitoring programs (Section 2.3.1). The current groundwater quality beneath the site is good. A plume of mineralized water has been identified beneath the existing Dyer Boulevard Landfill, adjacent to the site. Some of the non-potable water for the resource recovery plant use will be drawn from this plume, eliminating what could have become a serious problem. (Section 3.5)
- Surface Water — Existing hydraulic connections of on-site and adjacent waters were identified and the surface water quality on site was determined by sampling and analysis. (Section 2.3.4) The only problems identified related to color and turbidity, otherwise the surface water quality was satisfactory. The design of the resource recovery plant and landfills will insure adequate retention and natural treatment of stormwater run-off on-site. This same surface water management plan is closely tied to the site wetlands mitigation scheme. Any long-term effects on surface water associated with the operation of the Resource Recovery Facility will not be adverse. (Sections 3.8, 4.2 and 5.3.1)
- Soil And Foundation Conditions — Preliminary investigations have indicated that there appears to be a competent bearing layer starting at a depth of 50 to 70 feet over most of the site. Piles or piers placed into this stratum will be used as the foundation for major structures. However, the present position, density, composition and degree of cementation of the soils beneath the site are quite variable, particularly in reference to depth. Therefore, a careful determination will be made of the subsurface conditions in order to insure adequate foundation design for the resource recovery plant and associated facilities. (Section 2.3.1.1 and 2.3.1.2.2)

- Plant and Animal Communities — (Sections 2.3.5 and 2.3.6) The presence of extensive wetlands within a 5 mile radius of the site increases the possibility that important species associated with wetlands may occur. However, this site presents no outstanding or exceptional features to attract important species. The populations that utilize the site would be present in approximately equal amounts in any similar area in the region. Although the development of the Resource Recovery Facility will have a significant effect on the ecology of the site it does not pose a threat to any plant or animal communities.

- Archaeological Sites and Historic Preservation Areas — (Section 5.10) There are no historical or prehistoric resources known to be present within the project site boundaries as confirmed by field investigations. Projected use of the project site will not impact any historic or prehistoric cultural resources.

PROJECT STATUS

The Palm Beach County solid waste energy recovery facility will be designed, constructed and operated by a full-service vendor under contract to the Authority. The selected contractor will have to guarantee compliance with the terms and all conditions of the site certification and rezoning conditions. As currently envisioned, construction of the facility will begin in 1986 with startup expected in 1989.

Need for Power and the Proposed Facilities

CHAPTER 1: NEED FOR POWER AND THE PROPOSED FACILITIES

The primary objective of the proposed Resource Recovery Facility is to dispose of all municipal solid waste (MSW) generated in Palm Beach County. After several years of investigation into alternative methods of disposal including the present practice of landfilling solid waste with its accelerating costs and undesirable economic and environmental consequences led to the Authority's decision to construct a Resource Recovery Facility.

Presently, most of the solid waste (88%) disposed of in Palm Beach County is delivered to the Authority's two active landfills, the Lantana Road and Dyer Boulevard facilities. Both facilities accept Class I materials (garbage; putrescible waste) as well as Class III materials (trash/yard trash; nonputrescible wastes) for disposal. The City of Lake Worth presently operates the only other Class I landfill in the County, which is scheduled to close in 1986. Upon closure of the Lake Worth Landfill, it is estimated that the Authority's disposal facilities will be processing 92.5% of the total waste stream of Palm Beach County.

The capacity in the Lantana Road Landfill will be exhausted by the middle of 1986, leaving the Dyer Boulevard Landfill as the only permitted Class I sanitary landfill in Palm Beach County. At the anticipated rate of utilization following the closure of all other Class I landfills in the County, the Dyer Boulevard Landfill is estimated to reach its capacity by late 1987.

Because of the depleting landfill capacity, the Authority has provided plans for Class I and Class III waste disposal at a new site by the end of 1987. The selected site is centrally located within the County and of adequate size to accommodate a Class I and a Class III sanitary landfill operation, together with the planned Resource Recovery Facility. The site contains approximately 1,320 acres and is located west of Florida's Turnpike and east of the West Palm Beach Water Catchment Area.

It has been determined that the traditional means of disposing of MSW is inadequate to meet the needs of this rapidly growing county for two primary reasons: (1) there is a paucity of land which could feasibly be used for landfilling and land which is available is inordinately expensive; (2) the landfilling of putrescible garbage poses a serious long-term threat to the quality of the groundwater which supplies the domestic water needs of county residents. The best alternative for Palm Beach County to eliminate these concerns is through the construction of a Resource Recovery Facility. The volume of the MSW processed through the Resource Recovery Facility would be reduced by up to 90% (weight is reduced up to 80%) resulting in the life of the co-located landfill being extended by 4 to 6 times. Moreover, the inert ash rather than putrescible garbage will be the material landfilled, reducing the potential for degradation of water quality, gas generation and attendant risks to public health.

The combustion of refuse derived fuel (RDF) from MSW produces steam. Since there are no steam customers available in Palm Beach County, the generation of electricity represents the most feasible alternative for implementation of the resource recovery operation. The electric power derived from the MSW is beneficial resulting in the net effect of stabilizing or possibly reducing the rapidly escalating cost of solid waste disposal.

In Chapter 84-198, Laws of Florida (1984), the Florida Legislature has declared that "it is critical to encourage energy conservation in order to protect the health, prosperity, and general welfare of this State and its citizens". The Legislature has further declared that the "combustion of solid waste by small power production facilities for the production of electricity not only represents conservation efforts well directed towards that goal, but also represents an environmentally preferred alternative to conventional solid waste disposal in this State".

The 2,000 TPD of MSW expected to be processed at initial operations replaces the need of 600,000 barrels of oil per year for electric energy generation. In addition, the ash generated from the combustion process will require less landfill space, reduce leachate generation, and eliminate methane gas generation. This will conserve land, improve the environment, and result in greater protection to water quality than continued sanitary landfilling in Palm Beach County.

The proposed resource recovery plant will also recover marketable materials such as ferrous metals and aluminum. The system has the flexibility to recover other materials as market conditions may warrant.

Under Section 403.501, FS, (Electrical Power Plant Siting), the Legislature has charged the Florida Public Service Commission with the responsibility of determining whether construction of a proposed electrical generating facility is necessary to meet the present or expected need for electricity in penninsular Florida as a whole. Certification under the Act must be obtained for the construction of any generating facility greater than 50 megawatts (MW), and may be obtained for a small facility under Section 403.503, Florida Statutes and Chapter 75-473, Laws of Florida, Special Acts of 1975, as amended and supplemented. (Palm Beach County Solid Waste Act.)

The Authority is seeking certification of its proposed 75 MW small power production facility, and is filing a petition with the Public Service Commission. The Commission's report to the Florida Department of Environmental Regulation, as required by Section 403.507(1)(b) of the Florida Electrical Power Plant Siting Act is expected to conclude that the proposed facility will increase electrical system reliability and integrity and will maintain the supply of adequate electricity at a reasonable cost while reducing our dependence on fossil fuel. In addition, the construction of such a plant is a conservation measure which may mitigate the need for additional construction by electric utilities.

The Authority is filing an application with the Federal Energy Regulatory Commission (FERC) for certification of its proposed resource recovery plant as a qualifying small power production facility pursuant to Section 201 of the Public Utility Regulatory Policies Act of 1978 (PURPA) and rules promulgated by FERC.

Site and Vicinity Characterization

CHAPTER 2: SITE AND VICINITY CHARACTERIZATION

2.1 SITE AND ASSOCIATED FACILITIES DELINEATION

2.1.1 Site Location

The location of the proposed Resource Recovery Facility within Palm Beach County is illustrated in Figure 2.1-1. The 1,320 acre site is bordered on the north by the Beeline Highway, on the east by Florida's Turnpike, on the south by a line approximately 610 feet south of 45th Street, on the west by the City of West Palm Beach Water Catchment Area, and on the northwest by the Grier Property. A topographical map (showing site perimeter) of the site is included in Appendix 10.4.

The transmission corridor to the existing Florida Power and Light Company (FP & L) transmission lines will traverse the south side of the 73 acre parcel east of Florida's Turnpike and south of 45th Street (Figure 2.1-2). A detailed description of this parcel is contained in Chapter 6.

2.1.2 Existing Uses

At present, there is limited use of the property proposed for development. An occupied house located on a 6.6 acre parcel in the south central portion of the site will be purchased and removed in the course of site development. In the vicinity of the house, there is an operational radio transmission tower. This tower will remain in place during and after construction of the plant and all facilities. A privately-owned unoccupied 10 acre parcel in the southwestern portion of the site may be acquired in the future, but is not essential to the development of the facility. Past and present property use has changed the topography of the site in certain areas. In the northeast portion of the site, there is a 82-acre (approximately) borrow lake which supports an active dredge operation. Dredged material is used for construction fill and cover material at the Dyer Boulevard Landfill located east of Florida's Turnpike. Areas to the north of this borrow lake have been scraped below natural ground elevations, including a 22-acre flooded area which has been excavated to an elevation of three feet below the natural ground elevation. A similar condition exists in the east central portion of the site, approximately 4,000 feet north of 45th Street where a 6.2-acre flooded parcel has been excavated to an elevation of three feet below the natural ground elevation.

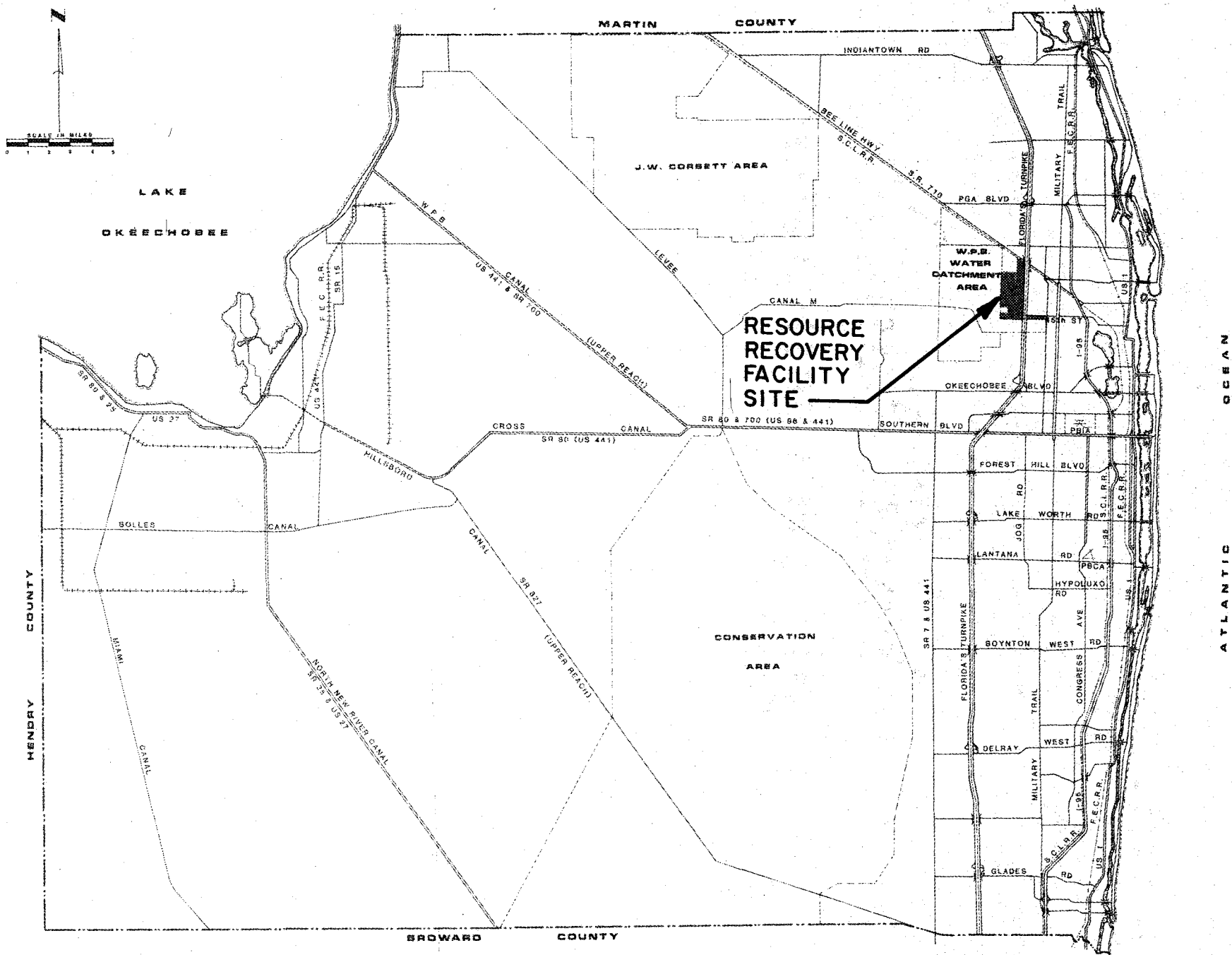
Three abandoned shell pit operations, which encompass approximately 171 acres, occupy the southwest corner of the site north of 45th Street. The bottom of the shell pits are approximately six feet below surrounding ground elevations; and the elevations of the berms adjacent to the shell pits are approximately six feet above ground elevations.

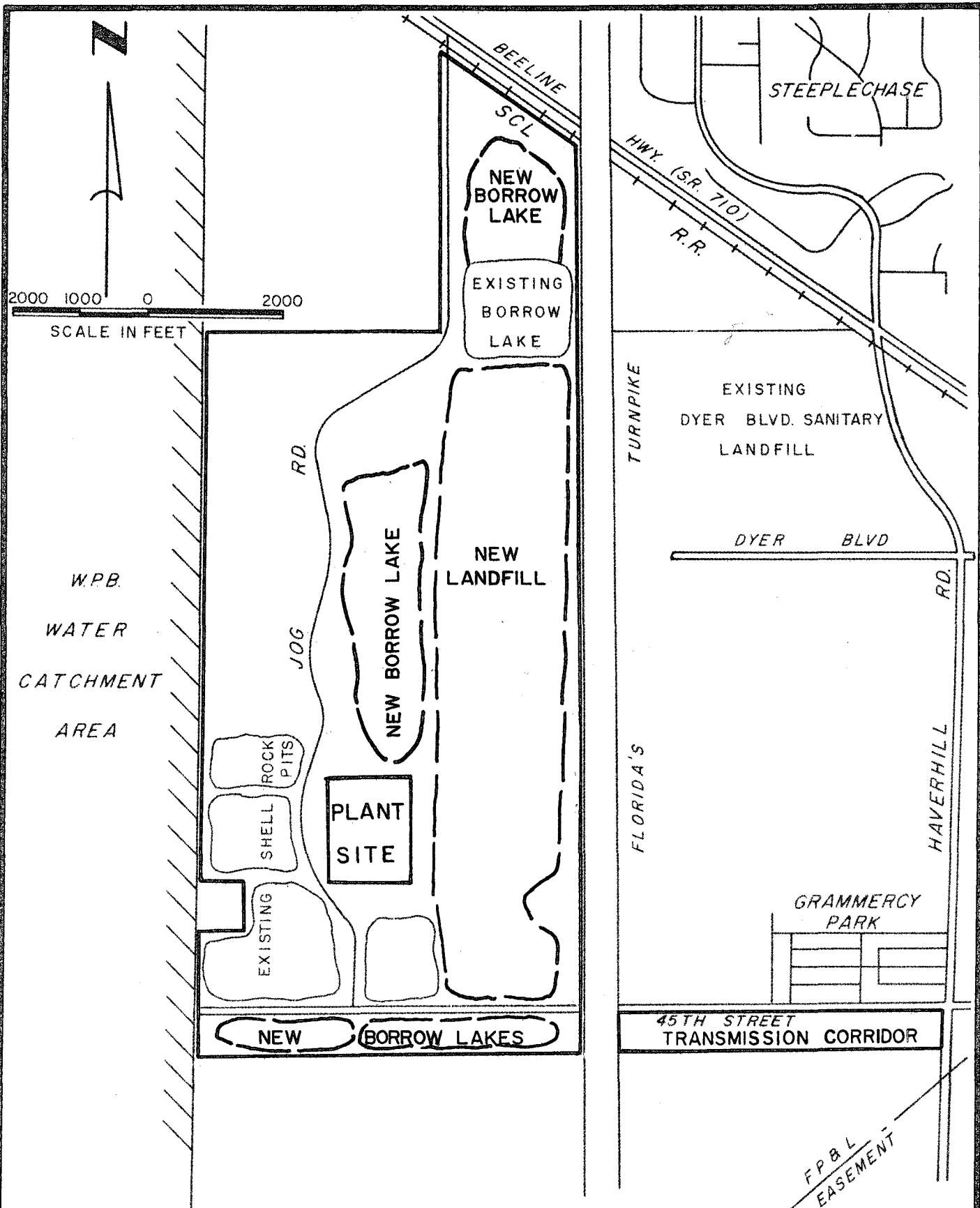
**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**LOCATION OF RESOURCE RECOVERY
FACILITY WITHIN PALM BEACH COUNTY**

FIG. 21-1





**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**RESOURCE RECOVERY FACILITY
AND ADJACENT PROPERTIES**

FIG. 2.1-2

Access to the site is made from 45th Street by traveling north on a shell rock road located between the two shell pits bordering on 45th Street. At the northern boundary of the shell pits, this road proceeds east to the eastern site boundary. Within the site, the road meanders in a northerly direction, terminating at the active borrow lake.

2.1.3 Site Modifications

The proposed site development plan for the site is shown in Figure 2.1-2. Space has been allocated for Class I and Class III Sanitary Landfills, a north-south roadway, borrow lakes, the resource recovery plant, and perimeter buffer zones. The western portion of the site will serve as a multiple-purpose conservation area — habitat preservation, buffer, stormwater retention and wetlands mitigation will all be accomplished in this area. Throughout the rest of the text, these specific usages are discussed with no general reference to the conservation area.

In accordance with the Water Quality Assurance Act of 1983, a landfill cannot be constructed within 3,000 feet of a Class I water body. The West Palm Beach Water Catchment Area (WCA) is classified as a Class I surface water body. (DER Docket Number 83-32R, Rule Number 17-3.161, Classified Waters.) Therefore, all landfill activities will occur within the eastern 1,900 feet of the site in order to comply with these minimum setback requirements. The existing borrow lake in the northeast portion of the site will be expanded to allow maximum utilization of the designated area for dredging fill material to be used at the Dyer Boulevard Landfill, as well as the landfill areas to be constructed on the site.

The western region of the site within the 3,000-foot setback from the WCA will be utilized to accommodate the 40-acre resource recovery plant, including a laydown area, employee parking, wastewater treatment plant and other associated facilities, roadway right-of-way, additional borrow areas, wetlands mitigation and stormwater management. Two borrow lakes will be developed on the property south of 45th Street within the boundaries of the site while allowing for the extension of the north-south roadway south of 45th Street. An access service road for the landfill will be maintained within the 200-foot setback west of the Turnpike canal.

The landfill height has been established to provide the capacity for a Class I and a Class III landfill to serve the County in excess of twenty years. Existing ground elevations on the site average + 17.5 feet NGVD (National Geodetic Vertical Datum) (± 1 foot). The base of landfill operation will begin at an elevation of + 30 feet NGVD. The proposed final elevations of the designated Class I and Class III landfill areas of the site are + 130 feet NGVD.

The proposed land use for the site is summarized as follows:

Class I Landfill	150 acres
Class III Landfill	235 acres
Borrow Lakes	243 acres
Roadway	30 acres
Conservation Area	427 acres
Resource Recovery Plant	40 acres
Buffer, Roads, Ditches, etc.	195 acres
TOTAL SITE	1,320 acres

After the landfill capacity has been exhausted, the landfill area is planned to be developed as a recreation facility.

2.1.4 100-Year Flood Zone

As indicated in Figure 2.1-3, none of the proposed site lies within a 100-Year Flood Zone.

2.2 SOCIO-POLITICAL ENVIRONMENT

2.2.1 Governmental Jurisdictions

Available maps and literature were examined to identify local, regional, State and Federal areas stipulated in the application guide. In addition to this review, the governmental units listed in Table 2.2-1 were contacted to provide supplemental information.

Information on the special category areas is listed in Table 2.2-2 and shown graphically in Figure 2.2-1 and Figure 2.2-2. Local parks of the Cities of Palm Beach Gardens, Riviera Beach and West Palm Beach, and the Towns of Lake Park and Mangonia Park are located within 5 miles of the site. None of these lie within 1 mile of the plant. The City of West Palm Beach Water Catchment Area is directly adjacent to the western border of the site. This area of approximately 19 square miles is the drinking water source for West Palm Beach, and is a wetland area. While it is not strictly a private holding as indicated in Table 2.2-2, the catchment area is managed for environmental protection by the City.

The existing Dyer Boulevard Landfill is scheduled for closure in 1987. This area is planned to be developed as a recreational facility, and is anticipated to be managed as a Palm Beach County Park.

Table 2.2-1
Agencies Contacted in Survey of Governmental Jurisdictions

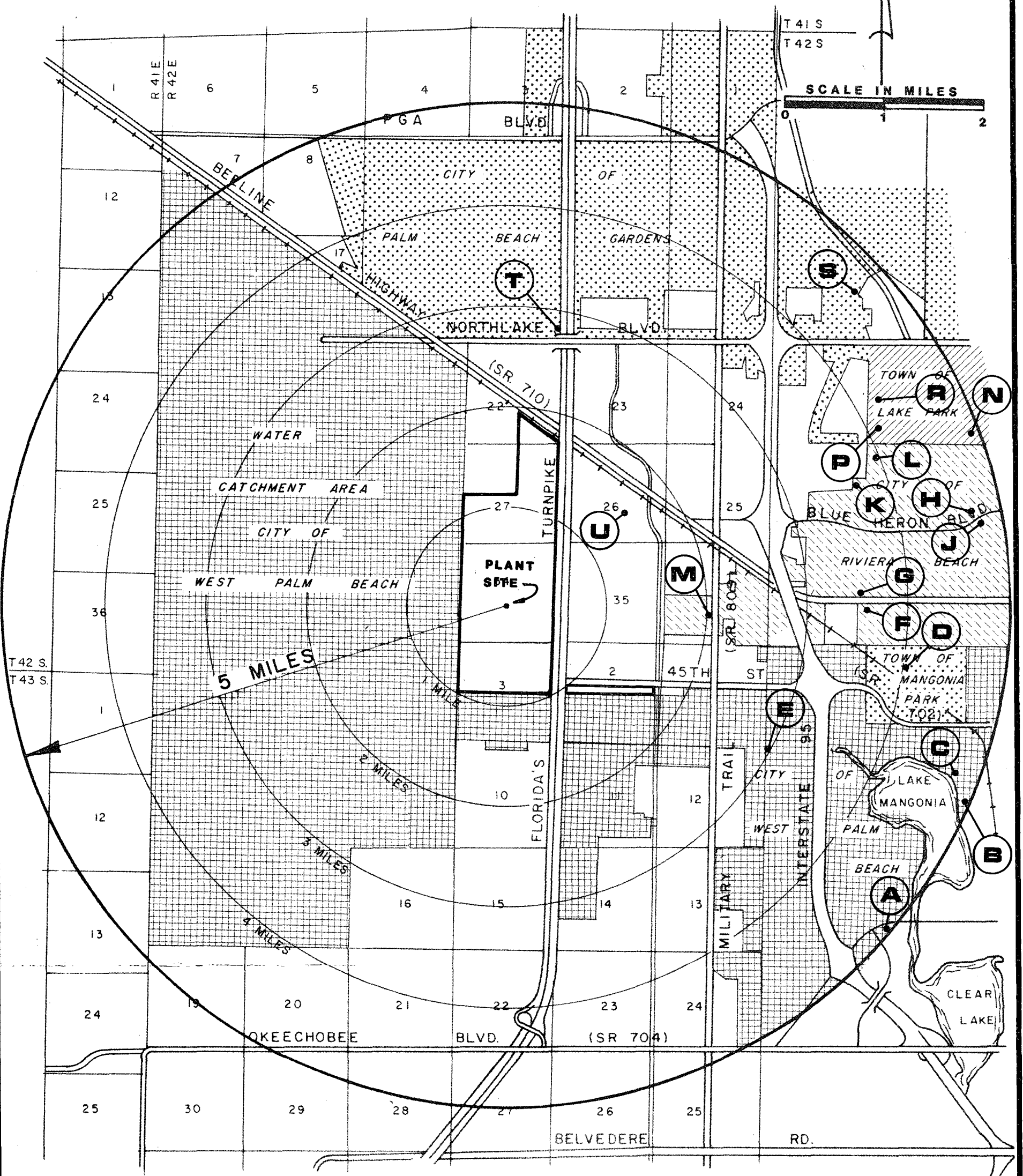
FEDERAL	U.S. Fish and Wildlife Service
STATE	Florida Department of State -Bureau of Historical Preservation Florida Department of Natural Resources -Recreation and Parks Division Florida Agricultural and Consumer Services -Forestry Division Florida Game and Freshwater Fish Commission
COUNTY	Parks and Recreation Department Planning, Zoning and Building Department -Planning Division
LOCAL	City of Palm Beach Gardens City of Riviera Beach City of West Palm Beach Town of Lake Park Town of Mangonia Park

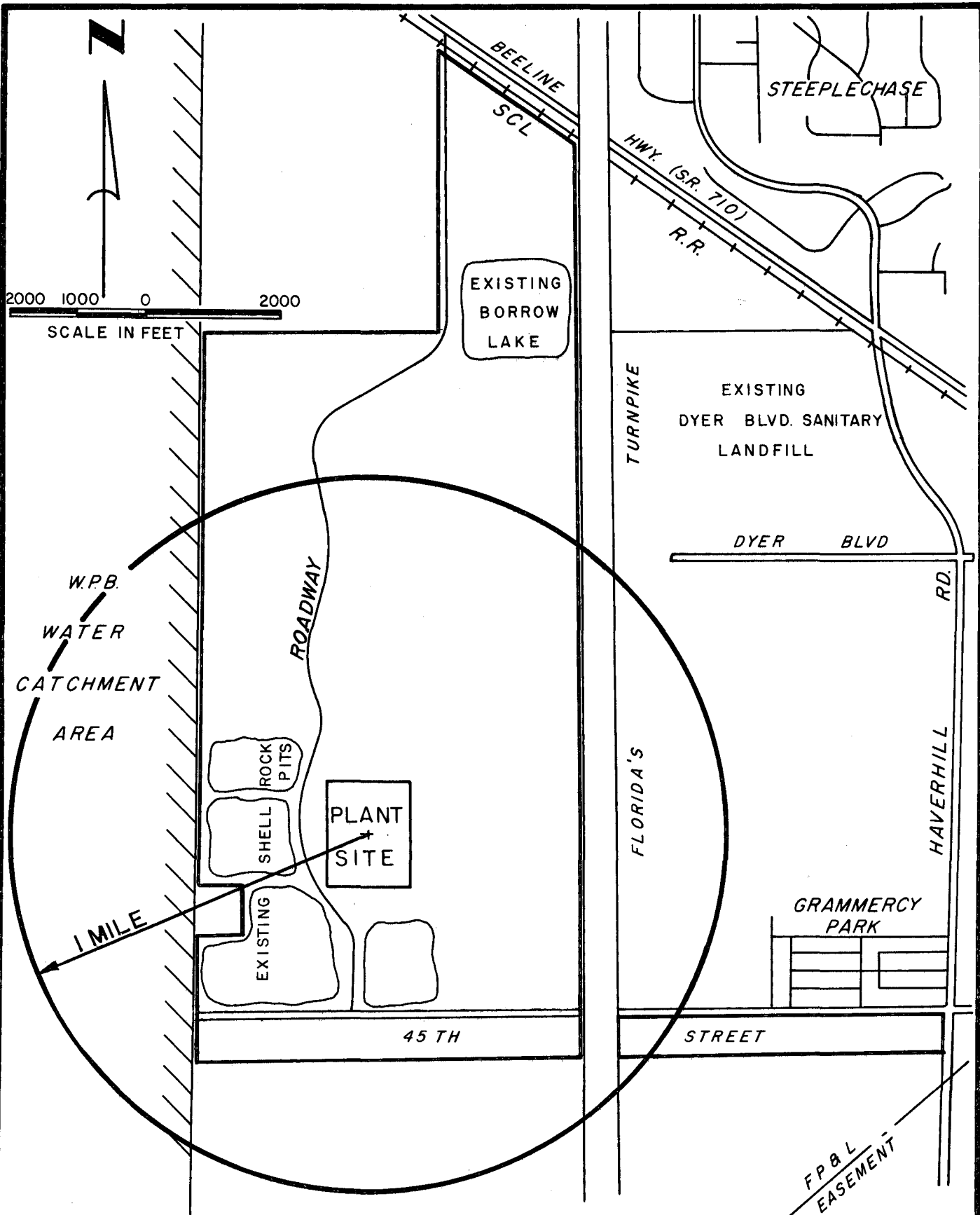
GENERALIZED FLOOD PRONE AREAS

This map illustrates the Fort Lauderdale area, highlighting three specific regions: the J.W. Corbett Area, the W.P.S. Water Catchment Area, and the Conservation Area. The map is bounded by Martin County to the north, Hendry County to the west, and Broward County to the south. Major transportation routes include I-95 running north-south and US-1 running east-west. The map also shows several canals, including the Hillsboro Canal, Cross Canal, and the South New River Canal. The Atlantic Ocean is located to the east of the land area. A scale bar in the top left corner indicates distances in miles (0 to 5), and a north arrow is also present.

LEGEND

- | | | |
|---------------------------------------|------------------------------|---|
| (A) WEST PALM BEACH MUNICIPAL STADIUM | (G) TATE COMPLEX | (N) BANYON PARK |
| (B) LAKE MANGONIA RAMP | (H) WELLS RECREATION COMPLEX | (P) (PROPOSED PARK) |
| (C) LOST CREEK PARK | (J) MONROE HEIGHTS PARK | (R) PROPOSED PARK |
| (D) MUNICIPAL PARK | (K) CUNNINGHAM PARK | (S) LAKE CATHERINE PARK |
| (E) BEAR LAKES PARK (PROPOSED) | (L) GOODMARK PARK | (T) PGA PARK (PROPOSED) |
| (F) GEORGE STREET PARK | (M) LONE PINE PARK | (U) DYER BLVD. LANDFILL (PROPOSED PARK) |





PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



SPECIAL CATEGORY AREAS WITHIN
1 MILE OF PLANT

FIG. 2.2-2

TABLE 2.2-2
OCCURRENCE OF SPECIAL-CATEGORY WITHIN 5 MILES OF THE SITE*

Type of Area	Located within 5 miles
National Parks	NO
National Forests	NO
National Seashores	NO
National Wildlife Refuges	NO
Wilderness Areas	NO
National Monuments	NO
National Memorials	NO
National Marine Sanctuaries	NO
National Estuarine Sanctuaries	NO
RARE Areas	NO
National Wild and Scenic Rivers	NO
Critical Habitat for Endangered Species	NO
State Parks	NO
State Forests	NO
Game Management Areas	NO
Areas of Critical State Concern	NO
Conservation and Recreation Lands	NO
Save our Rivers Lands	NO
State Archeological Landmarks	NO
State Archeological Landmark Zones	NO
Aquatic Preserves	NO
Outstanding Florida Waters	NO
State Wild and Scenic Rivers	NO
Indian Reservations	NO
Military Lands	NO
County Parks	YES (See Text)
Local Parks	YES (See Text)
Private Holdings for Environmental Protection	YES (See Text)

* (See Section 2.2.1 for explanations)

2.2.2 Zoning and Land use Plans

Palm Beach County adopted its Comprehensive Plan, Palm Beach County Ordinance 80-8, effective August 4, 1980. The Land Use Plan provides a system of growth management for Palm Beach County based on land use and residential densities related to the ability of the County to provide adequate community facilities. Some land uses are not specifically regulated by the Plan, including public or semi public activities, utilities, public recreation, and agriculture. These are regulated by the Zoning Ordinance. All requests for change in zoning classification must be consistent with the Comprehensive Plan in addition to meeting all requirements of the Palm Beach County Zoning Ordinance and other applicable county, state and federal laws.

The Authority has requested and received a Special Exception to the Agricultural Residential zoning of the property to allow its use for the Resource Recovery Facility. Three copies of the approved application for Special Exception and all supporting documents have been submitted to FDER under separate cover in the Compliance Document. A brief summary of the rezoning process will be given to indicate steps taken to insure compliance with the Comprehensive Plan for Palm Beach County.

There was a good deal of local controversy during the rezoning process. Because of the sensitive location of the proposed project, in a wetlands area, over the Turnpike Aquifer, adjacent to the City of West Palm Beach Water Catchment Area and within one to two miles of residential areas, the Authority worked closely with local, County, State and Federal agencies as well as concerned citizens in an effort to thoroughly consider all aspects of the proposed project.

The completed application was submitted on August 1, 1984 to the Palm Beach County Department of Planning, Zoning and Building (PZB) and was assigned Petition No. 84-134. At the prehearing workshop with the staff of PZB on August 9, 1984, the consultants working for the Authority addressed a number of questions raised concerning the application. The PZB staff then accepted the application as complete with a few requested modifications.

After a lengthy discussion on September 6, 1984, the Palm Beach County Planning Commission voted to recommend that the Palm Beach County Board of County Commissioners (BCC) deny the request for a Special Exception to the Agricultural Residential zoning. It should be noted that this recommendation was made in spite of the PZB staff's finding that the application was satisfactory, technically acceptable and in keeping with the long-range goals of the County Zoning Ordinance and Comprehensive Plan.

Because of the public interest in this project and time consideration, the BCC chose to deal with this rezoning request at a special meeting on October 10, rather than include it with other rezoning requests at the normally scheduled meeting on September 27, 1984.

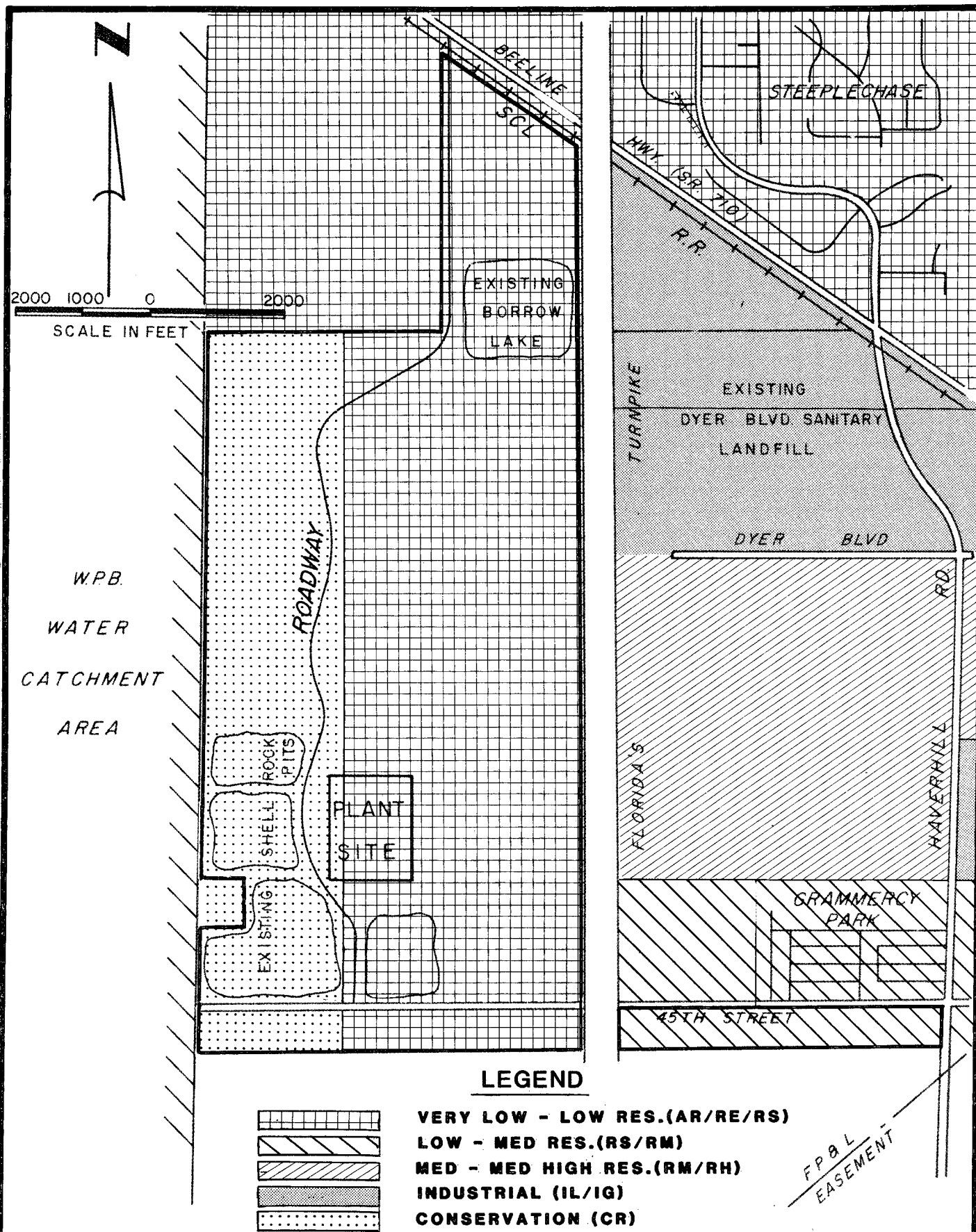
At the Board of County Commissioners meeting, held on October 10, 1984, the BCC approved the request for special exception (See Resolution No. R-85-51 in the Compliance Document.) after thoroughly considering all testimony for and against the proposed usage, the compatibility of the Resource Recovery Facility with the County Zoning Ordinance and Comprehensive Plan, and the long-range MSW disposal needs of the County. In approving the special exception, the BCC attached sixteen (16) conditions to the approved rezoning application. The Authority accepted all conditions with the intent that every effort be made to make this project technically excellent and a "good neighbor" to all the citizens of the County.

Figure 2.2-3 indicates the interaction of the Resource Recovery Facility with the Comprehensive Plan land use categories. The planned conservation area occupying the western 2000 + feet of the site will be maintained as a high-quality wetlands area with the north-south roadway occupying part of it.

2.2.3 Demography and Ongoing Land Use

2.2.3.1 Existing Populations

The existing populations of towns and cities at least partially within 5 miles of the Resource Recovery Facility are depicted in Table 2.2-3.



**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**INTERACTION OF
RESOURCE RECOVERY FACILITY
WITH COMPREHENSIVE PLAN**

FIG. 2.2-3

TABLE 2.2-3

Municipality	1980 Census
Palm Beach Gardens	14,407
North Palm Beach	11,344
Lake Park	6,909
Riviera Beach	26,489
Mangonia Park	1,419
West Palm Beach	63,305
Golfview	210
TOTAL	117,083

2.2.3.2. Existing Land Use

Figure 2.2-4 indicates the existing land use within a 5 mile radius from the resource recovery plant.

2.2.3.3 Projected Land Uses and Trends

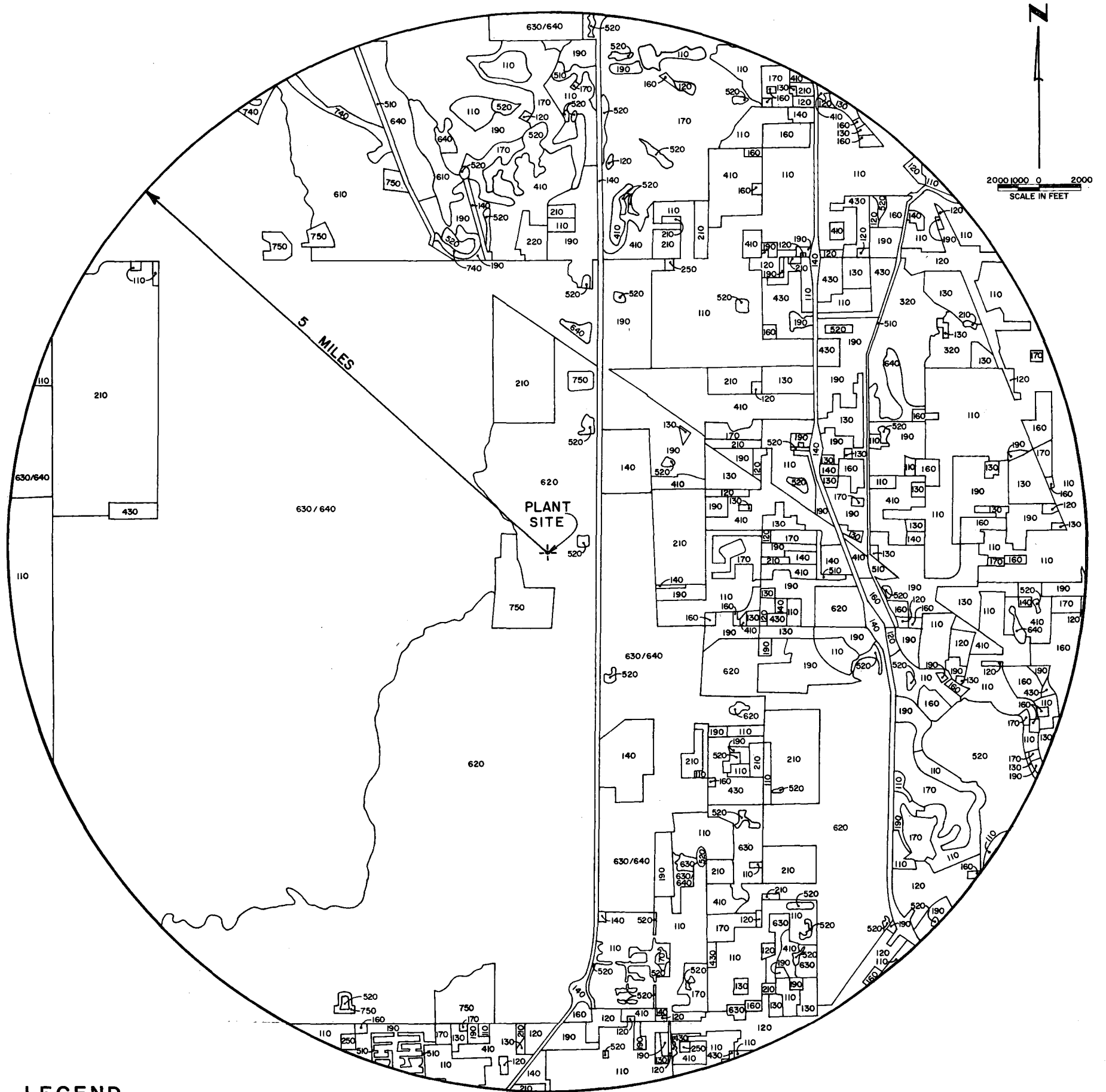
The Land Use Plan for Palm Beach County (Compliance Document) indicates development of light industry and very-low to medium-high residential development within 5 miles of the proposed resource recovery plant. This activity closely correlates with the projected land use throughout the County and is presented in greater detail in Section 2.2.7. The planned conservation areas near the site will not be adversely affected by the operations of the Resource Recovery Facility.

2.2.4 Easements, Title, Agency Works

The site consists of three parcels of property under different ownership. All three parcels are presently being acquired by the Authority. Two parcels comprising 1,313 acres of the total site have an executed Agreement for Sale and Purchase between the owners and the Authority. The Authority will close and have ownership of the site after all permits are obtained. The acquisition of the remaining parcel comprising 7 acres is presently being negotiated with the owner; and in absence of a negotiated agreement will be the subject of eminent domain proceedings. The owner has given permission to include the property in this application.

As a condition to rezoning, the Authority has agreed to grant right-of-way and fund construction of a roadway through the western portion of the site. This road will have to cross the Seaboard Coastline Railroad right-of-way to join the Beeline Highway. The electrical transmission lines will have to cross over Florida's Turnpike in order to reach the existing Florida Power & Light Company easement. Neither of these crossings will call for a change in the existing right-of-way features. The transmission lines will be discussed in more detail in Chapter 6.

Works of
Water Mgt District?



LEGEND

110 RESIDENTIAL
120 COMMERCIAL & SERVICES
130 INDUSTRIAL
140 TRANSPORTATION
160 INSTITUTIONAL
170 RECREATIONAL
190 OPEN LAND & OTHERS

210 CROPLAND & PASTURELAND
220 ORCHARDS, GROVES
250 SPECIALTY FARMS
320 SHRUB & BRUSHLAND
410 CONIFEROUS FOREST
430 MIXED FOREST
510 CANALS & STREAMS

520 LAKES & RESERVOIRS
610 WETLANDS-CONIFEROUS FOREST
620 WETLANDS- HARDWOOD MARSH
630 WETLANDS- MIXED FORESTED
640 WETLANDS- NONFORESTED
740 ALTERED LANDS
750 EXTRACTIVE

PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



LAND USE CLASSIFICATIONS
WITHIN 5 MILES OF PLANT

2.2.5 Regional Scenic, Cultural and Natural Landmarks

Based on the survey described in Section 2.2.1 "Governmental Jurisdictions", the following areas are found within five miles of the site:

- County Parks
- Municipal Parks
- Holdings for Environmental Protection

None of these areas of cultural interest will be adversely impacted by construction of the proposed plant.

2.2.6 Archaeological and Historic Sites

A request was made to the Florida Department of State, Division of Archives, History and Records Management (DAHRM) for a cultural resource assessment of the site. Their review concluded there are no archaeological or historic sites in the area proposed, and that it is unlikely significant unrecorded sites occur. The facility will in their opinion have no effect on archaeological or historical sites.

2.2.7 Socioeconomics and Public Services

The following discussion will concentrate on the area within a 5-mile radius of the plant; however, related information will be given in less detail for the entire County where appropriate. Palm Beach County had a population of over 652,000 in 1983 (U of FL est.), of which approximately 77,000 (12%) live within a traffic analysis zone that falls, at least partially, within the 5-mile radius from the plant and approximately 7,600 (1.2%) persons live within a traffic analysis zone that falls, at least partially, within a 3-mile radius from the plant. Table 2.2-4 depicts the relevant population information.

TABLE 2.2-4
POPULATIONS LOCATED NEAR THE SITE

	Total	White	Black	Other	Dwelling Units
1 Mile	1,597	1,479	88	30	524
		92.6%	5.6%	1.9%	3.05
2 Mile	1,865	1,797	35	33	718
		96.4%	.9%	1.8%	2.6
Cumulative	3,462	3,276	123	63	1,248
		94.6%	3.6%	1.8%	2.79
3 Mile	4,105	3,997	56	52	2,246
		97.4%	1.4%	1.3%	1.83
Cumulative	7,567	7,273	179	115	3,488
		96.1%	2.4%	1.5%	2.17
4 Mile	31,105	19,350	11,575	180	15,059
		62.2%	37.2%	0.6%	2.06
Cumulative	38,672	26,623	11,754	295	18,547
		68.8%	30.4%	0.8%	2.09
5 Mile	38,301	29,534	8,299	468	16,098
		77%	21.7%	1.2%	2.4
Cumulative	76,973	56,157	20,053	763	34,645
		73.0%	26.1%	1.0%	2.22

Source: Area Planning Board of Palm Beach County, 1984.

2.2.7.1 Social and Economic Characteristics

As of 1983, the labor force in Palm Beach County consisted of approximately 236 thousand persons. Figure 2.2-5 depicts the employment distribution by occupational area.

The employment projections indicate significant growth in the trade and services areas as Palm Beach County itself grows, while growth in other occupational areas is expected to follow population growth rather closely. The twenty largest major employers in the County are listed in Table 2.2-5. It should be noted that none of these firms lie closer than 4 miles to the RRF. Of the 129 major employers in the County, 19 lie within 5 miles of the plant and none of these firms are closer than 3 miles. However, the number of industrial parks existing within 5 miles of the plant (6 of 26 with 559 acres of 3,648 acres total) are indicative of potential and planned industrial growth near the Resource Recovery Facility.

**TABLE 2.2-5
LARGEST MAJOR EMPLOYERS IN PALM BEACH COUNTY, OCTOBER 1983**

Rank	Employer	No. of Employees
1	IBM Corporation	7,500
2	Pratt & Whitney Aircraft	7,200
3	Sugar Cane Growers Cooperative of Florida	2,930*
4	Southern Bell	2,338
5	U.S. Sugar Corporation	2,100*
6	South Bay Growers, Inc.	2,000*
7	Florida Power & Light Company	1,869
8	Osceola Farms Company	1,510*
9	Duda & Sons Cooperative Association	1,350*
10	Motorola, Inc.	1,200
11	Gulf & Western Food Products Company	1,100*
12	Palm Beach Newspapers, Inc.	1,056
13	Mepco/Electra, Inc.	714**
14	Solitron Devices, Inc.	680**
15	Northern Telecom, Inc.	650**
16	Siemens Corporation	630
17	Mitel, Inc.	575
18	Atlantic Sugar Association	560*
19	Dubois Farms	525
20	Talisman Sugar Corporation	500*

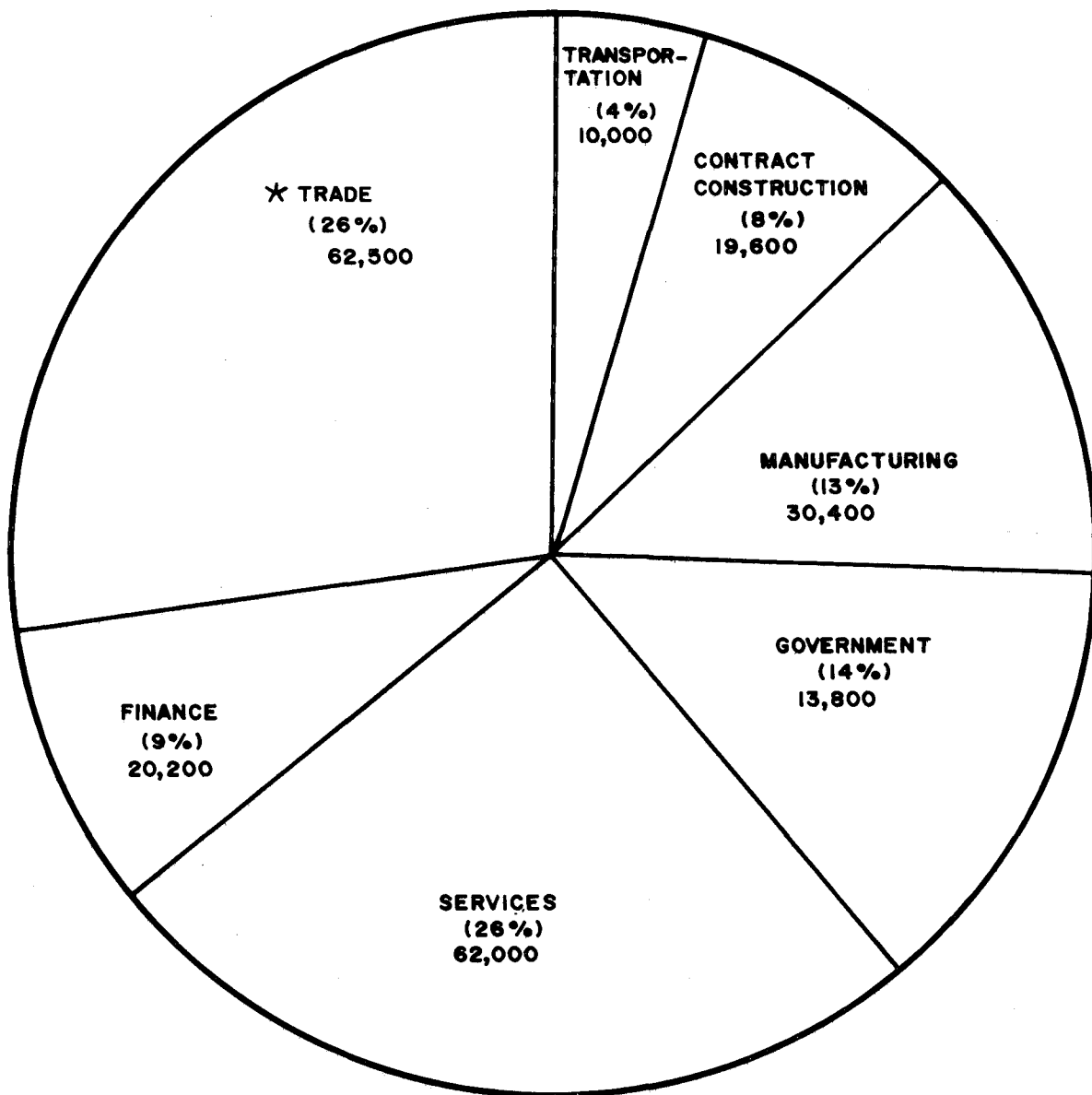
* In-Season.

** Located approximately 4 miles from the stack.

SOURCE: Area Planning Board of Palm Beach County.

The average earnings per capita in the County was \$14,150 in 1982.

There were 295,536 dwelling units in the County in 1980, with a population of 576,813, or 1.95 persons per dwelling unit. As presented in Table 2.2-4, 34,645 dwelling units lay within 5 miles of the proposed plant stack. The population within this area was 76,973, or 2.22 persons per dwelling unit. Again, it should be noted that only 3,488



dwelling units, 7567 persons (2.17 persons per dwelling unit) lay within the 3-mile radius. There has been a significant growth in the number of dwelling units in the County since the 1980 census, commensurate with the population jump from 577,000 persons in 1980 to 652,000 persons in 1983. Based on the 1984 major residential development activity in the County there is a potential of adding (approximately 100,000) dwelling units, most of which are currently under construction. Of these, 35,575 dwelling units are planned, approved or under construction in residential areas within 5 miles of the plant. Only 7,474 of these lie within the 3-mile radius. There is no planned residential construction activity within 1 mile of the facility. The housing costs in Palm Beach County average \$89,500 with a typically wide range.

2.2.7.2 Public Services and Utilities

There are no existing educational facilities within 3 miles of the site; however, there are 23 within 5 miles of the site. Similarly, there are no hospitals within 3 miles of the site, but 2 within the 5-mile radius. There are no recreational areas lying within 1 mile of the site. There are two golf courses within 3 miles of the site and 4 additional golf courses, 1 major recreational facility and 4 planned major recreational facilities within the 5-mile radius. One of these 4 planned facilities is the park to be constructed at the existing Dyer Boulevard Landfill after closure. The Authority has agreed to dedicate not less than 6 acres on site for a Fire/Rescue Department facility; however, there is no provision for public transportation on site. Police protection will be provided by the County Sheriff's Office and the Florida Highway Patrol. Electrical power will be produced on site in addition to being available through FP&L lines should the combustion plant be temporarily shut down. Water supply will be furnished through on-site potable wells. Although the City of West Palm Beach Wastewater Treatment Plant lies approximately 2 miles southeast of the site, current plans are to dispose of all domestic and industrial wastewater on site via deep well injection. Solid waste disposal is not an issue because that is the primary purpose of the Resource Recovery Facility.

2.2.7.3 Procedures in Case of Extended Plant Shut Down

The Resource Recovery Facility is composed of two main elements:

- RDF Manufacturing Plant (Fuel Preparation)
- Combustion Plant and Power Generation

Plans for the Combustion Plant include two combustion units and one turbo-generator, and space for one additional combustion unit and an additional turbo-generator. The combustion plant will be in operation 24 hours per day, seven days per week.

The RDF Manufacturing Plant will have three RDF processing lines of which two will be operating 16 hours per day, 6 days per week, and the third on standby.

Several scenarios are possible for the plant shut downs, depending whether there is total or partial shut down.

- **Scenario 1 (Total Plant Shut Down)**

With the complete shut down of all elements of the resource recovery plant, refuse would go directly to the adjacent Class I and III Landfills. There is sufficient space to landfill Class I refuse in excess of 20 years. But additional Class III space would be required and is planned for a south county landfill. Existing landfill space allotted for Class III would be transferred for use of Class I and constructed in accordance with all applicable requirements.

- **Scenario 2 (Total Combustion Shut Down)**

Total combustion plant shut down could occur in initial years with the loss of the turbine generator or with the simultaneous loss of both boilers.

The RDF manufacturing plant would continue to process refuse and stockpile RDF in the storage facility until it reached capacity (2 to 3 days). Additional RDF would then be sent to the Class I Landfill. The RDF, being shredded, would not require daily cover, would compact better, and would have recoverable materials removed, all of which would allow more efficient use of the available landfills.

A partial loss of the combustion facility (1 boiler) would only require that portion of RDF that cannot be combusted or stored to be sent to the Class I landfill.

- **Scenario 3 (Total RDF Manufacturing Plant Shut Down)**

Total loss of the RDF manufacturing plant is extremely unlikely, since 100% redundancy is planned in that facility. The tipping floor has storage space for approximately 3000 tons of refuse, and once that had been fully utilized it would be necessary to send refuse directly to landfill as depicted in scenario 1.

2.3 BIO-PHYSICAL ENVIRONMENT

2.3.1 Hydrogeology

The hydrogeologic investigations at the site were conducted to determine the physical controls on ground-water movement and the surface-water/ ground-water relationship, as well as geochemical controls on the ambient quality of the ground water. Upon implementing the investigations, pertinent data and reports were reviewed and information was extracted for use in refining details of the site-specific testing and data collection program. The methods used for the investigations included well construction, geophysical well logging, surface-resistivity surveys, soil penetration tests, water and soil sampling and analysis, pumping tests, and water-level monitoring.

2.3.1.1 Geologic Description of the Site

Subsurface conditions in the vicinity of the site have been described in reports prepared by the USGS (U.S. Geological Survey) and various geotechnical and engineering consultants. The USGS reports have been generally broad in scope and relate to all or large portions of Palm Beach County; a few published and unpublished reports deal with the site of the nearby Dyer Boulevard Landfill and by association, the site area. Consultants' reports generally address the hydrogeologic conditions at sites of proposed or existing water-supply sources.

Geologically, the materials within several thousand feet of the land surface in south Florida are sedimentary rocks. The subsurface material pertinent to these investigations lies at depths less than about 125 feet, and consists predominantly of sand, shell, sandstone, and limestone. It is unlikely that any contaminant emanating from the land surface and migrating downward could penetrate deeper than 125 feet, because of a reduction in permeability below 125 feet. Consequently, detailed attention to deeper sediments is omitted from consideration in this report.

The Pamlico Sand, of Pleistocene age, is present from land surface to a depth of about 12 feet. The Pamlico Sand generally consists of fine, gray and brown sand, although organic materials and silt are occasionally encountered. The Anastasia Formation, of Pleistocene age, underlies the Pamlico and includes the entire shallow aquifer. The shallow aquifer is the name given to near-surface sediments that have sufficient permeability to yield water to wells in much of southern Florida. The Anastasia Formation is composed of gray and tan quartz sand and shells; between about 50 to 100 feet in depth, these deposits generally are cemented to form a coquina or sandstone. Scott (1977) marks the bottom of the shallow aquifer in the vicinity of the site at a depth of about 125 feet. Below about 125 feet, the Anastasia contains fine-grained materials in a sandy limestone or sandstone. The Anastasia Formation extends to a depth of about 250 feet (Fisher, 1980). Beneath the Anastasia Formation are the Tamiami and Hawthorn Formations that, in the vicinity of the site, have a low permeability and serve to confine the underlying Floridan aquifer. The top of the Floridan aquifer lies at a depth of about 1,000 feet. The Floridan aquifer in the vicinity of the site contains brackish water suitable only for certain types of irrigation uses.

The Anastasia Formation contains the shallow aquifer, the principal source of drinking water in Palm Beach County. A particularly permeable portion of the shallow aquifer occurs in a band of sandstone several miles wide in the east-west direction, and extends nearly the entire length of the County in the north-south direction. This zone tends to underlie the area in the vicinity of Florida's Turnpike at depths that vary between approximately 50 feet and 150 feet. This zone has been called the cavity-riddled zone, or alternately, the Turnpike aquifer; it contains cavities up to 2 inches in diameter that quite frequently are filled with sand. Portions of this cavity-riddled zone underlie the site.

The construction site is located in an area where the near-surface soils were deposited during the fluctuations of sea level that occurred in the last major period of glaciation. During the Pleistocene epoch, which occurred over the time period from 2 million to about 10,000 years ago, worldwide climatic changes were caused by the glaciers that periodically covered up to one-third of the earth's continental surface. Sediments already existing on the plateau were eroded and reworked while new sediments were deposited. Shell beds and lime stones were formed in the shallow seas. In some places, they have become hardened and cemented while in other places, they are unconsolidated.

Since the deposits in the vicinity of the proposed site are the result of many erratic changes in climate and fluctuations of sea levels, a careful determination will be made of the subsurface conditions with borings and penetration tests in order to avoid prematurely terminating foundation elements such as piles and footings in very thin strata that may cause high penetration resistance for a short distance followed by very low impedance in underlying soft or loose strata.

2.3.1.2 Detailed Site Lithologic Description

2.3.1.2.1 General

Subsurface conditions that govern the occurrence and quality of ground water were investigated using a number of techniques that also yield lithologic information; the techniques included: (1) examination of rock cuttings collected during well construction (Wells 1, 2, 3, and 4); (2) collection and analysis of split-spoon samples (at the sites of Wells 5 through 14), (3) performance of pumping tests and analyzing the

data, (4) inspection of logs of other wells, (5) collection and interpretation of water-level measurements and (6) chemical analyses of ground-water samples. The data were assembled and geologic cross sections, ground-water contour maps, and ground-water flow diagrams were compiled and evaluated.

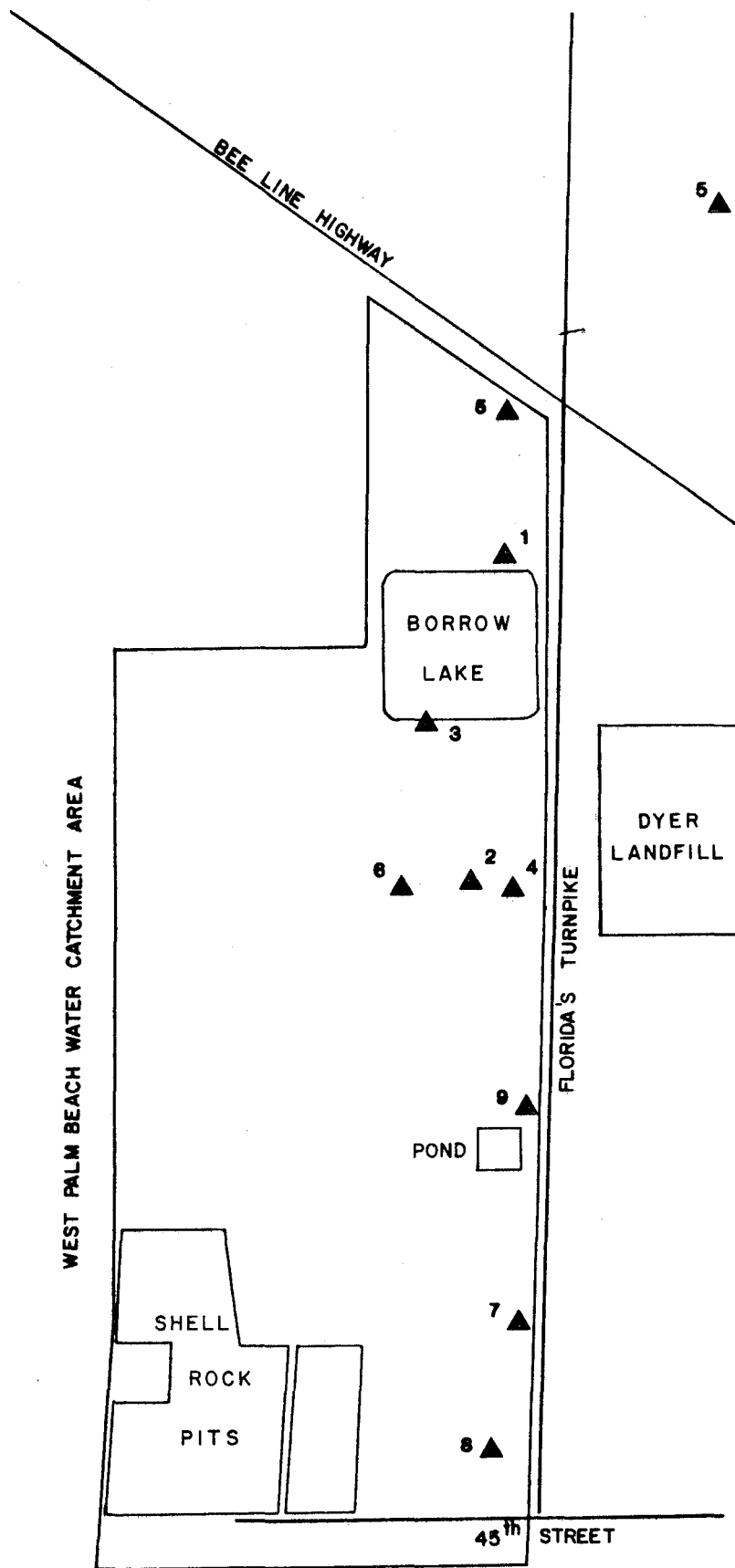
2.3.1.2.1.1 Resistivity Surveys

Early in April 1984, surface-resistivity surveys were conducted at nine locations on the site. These surveys were performed to document the existing earth resistivity and establish the geoelectrical properties of the site. The survey method consists of inducing an electrical current into the earth and simultaneously measuring the resistance of the earth materials to the flow of electrical current; the method is commonly used to supplement information gained from well construction and sampling because it is rapid and comparatively inexpensive.

The resistivity of sediments depends to a large degree on the relative quantity and quality of water that fills the voids between sediment particles or in the sediment matrix. If the water is salty, has characteristics of a leachate, or otherwise contains abundant free ions, then the electrical resistivity of the sediments containing that water will be low (and the conductivity of the water will be high). Also, water-saturated clays, because of the ionic properties of clay, produce low resistivities. Sediments containing water with a relatively low concentration of dissolved matter or those having a low porosity will have a relatively higher resistivity. Using these relationships, an area underlain by leachate-bearing sediments can be defined by its relatively low resistivity in comparison to surrounding higher resistivities.

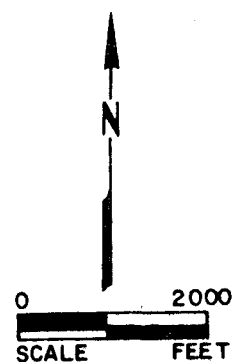
The method employed to determine resistivity is referred to as resistivity sounding, wherein one pair of electrodes that induces current through the ground and another electrode pair which measures voltage potential are gradually expanded symmetrically from a center point with readings taken at each point. The method employed a "Wenner" array in which the distance between the current electrodes, referred to as the distance "AB", is three times the distance between the potential electrodes (USGS, 1974). The locations of the nine resistivity soundings are shown on Figure 2.3-1. Graphs showing the logarithm of the resistivities versus the logarithm of one-half the current electrode spacing ("AB/2") are presented in Appendix 10.14.2 for each of the nine resistivity soundings. The exact locations of the center and one end of the soundings have been surveyed to determine their horizontal coordinates; these coordinates are also provided in Appendix 10.14.2.

The resistivity soundings were interpreted by comparisons with geologic logs (prepared from wells later installed adjacent to some of the soundings); these comparisons are described in the section below on geologic conditions. Assuming that the water quality within any vertical section remains constant from the top to the bottom in the section, then the variations in resistivity must be attributed to variations in sediment materials and porosities. That assumption was verified and is reported below in the section on ground-water quality. With this information, interpretation of the resistivity soundings focused on variations in sediment characteristics. (Many interpreters of resistivity soundings consider the depth representative of any particular resistivity reading to bear a simple relationship to the current electrode spacing; this practice can be risky because theoretical resistivity values are a function of many variables. Multiple thin sedimentary beds, in particular, present the most difficult interpretive problem. In practice however, an empirical relationship can be employed. The depth represented by any particular resistivity measurement is assumed to be from 1/4 to 1/2 of the AB distance.)



LEGEND

5 ▲ RESISTIVITY SOUNDING



**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**LOCATIONS OF
RESISTIVITY SOUNDINGS**

FIG. 2.3-1

The resistivity soundings showed that earth resistivities generally range from about 30 to about 800 ohm-feet. Several individual higher and lower measurements or "spikes" occurred but are believed to be due to erratic influences that may include instrument sensitivity, especially at the greatest electrode spacings. RS1 (Resistivity Sounding 1), RS3, RS4, RS6, and RS7 and RS8 showed increasing trends with depth. With the exception of RS2, these trends are slight along their course. The RS2 profile shows a relatively strong increasing resistivity trend with depth and is believed to be due to a ditch filled with water near the center of the electrode array, causing low resistivities at short spacings and becoming less influential at greater spacings.

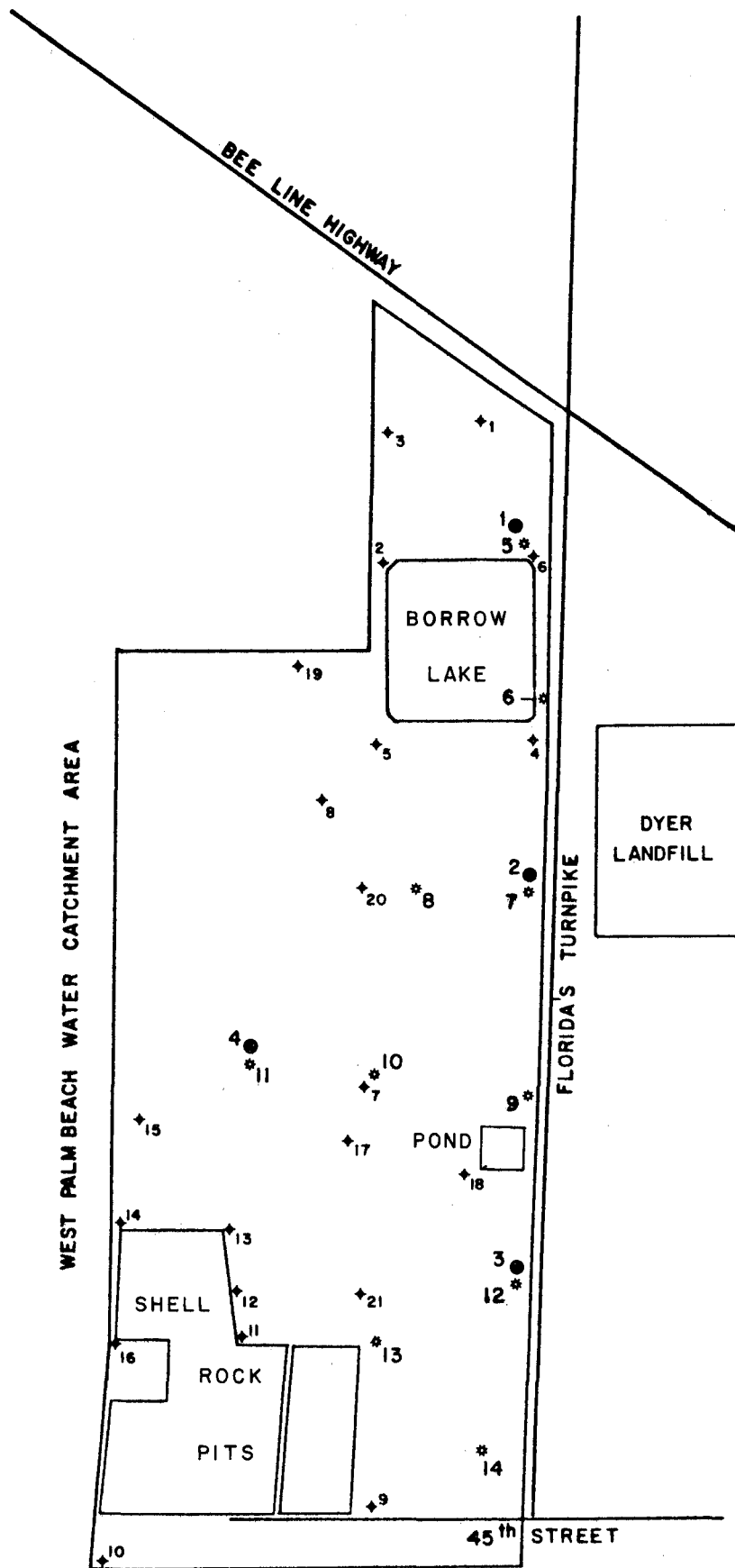
Another noteworthy anomaly was the predominantly low resistivities encountered on RS6 where all apparent resistivities were less than 200 ohm-feet. RS6 was further west than any of the surveys where ground-water levels are closer to land surface than they are to the east (this was verified by ground-water level measurements). This nearness between electrodes and the water table may be responsible for the generally low resistivities detected at RS6.

The practical value of the soundings lies in their documentation of existing conditions. If, in the future, leachate emanates from the Dyer Boulevard Landfill or the proposed landfill on the site due to accidental causes, a resistivity survey could be used to aid in detecting and delineating the plume. Resistivity soundings can be repeated in exactly the same locations using the same spacings to check for any changes in subsurface resistivities that may result from the presence of leachate. The locations of resistivity measurements and spacings between measurements are indicated in Appendix 10.14.2.

It is not certain that all the specific sites of the resistivity soundings will be accessible again following the commencement of landfill operations. If it is feasible (in an environment where fences, pipelines, overhead lines, fill material, and other interfering factors may exist) several profiles of resistivity could be conducted along the periphery of the proposed landfill prior to landfill operations. Such profiles would be conducted by using a "Wenner" array in a line consisting of resistivity measurements taken at one specific and constant electrode configuration. Information on the subsurface resistivity would therefore be continuous along a line, providing complete coverage. It is suggested that the relatively shallow sediments (less than 50 feet deep) be examined using a AB distance of about 150 feet.

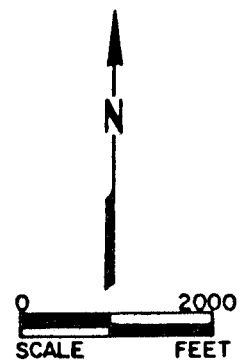
2.3.1.2.1.2 Drilling and Well Construction

Between April 18 and May 5, 1984, fourteen wells were constructed on the site by the mud-rotary method and tested to gather geologic and hydrogeologic information. Well locations were selected to provide representative hydrogeologic information with emphasis on the easternmost 2000 feet of the site. Details of the completed wells are presented on Table 2.3-1. Top-of-casing elevations and horizontal coordinates of the wells are shown on Table 2.3-2. Geologic logs are contained in Appendix 10.14.1. In addition, Dutch Cone penetration tests were conducted at 21 locations to determine the suitability of the soil and rock for dredging and use as landfill cover; the results of these tests are presented in Appendix 10.14.3. The penetration tests were conducted between July 5, and July 9, 1984. The locations of boreholes, wells, and tests are shown on Figure 2.3-2.



LEGEND

- 1● DEEP WELL (Numbers 1 Through 4)
- 7* SHALLOW WELL (Numbers 5 Through 14)
- 3+ PENETRATION TEST (Numbers 1 Through 21)



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



LOCATIONS OF SHALLOW AND
DEEP WELLS AND
SOIL PENETRATION TESTS

FIG. 2.3-2

TABLE 2.3-1
DETAILS OF WELLS CONSTRUCTED ON THE SITE

Well Number	Total Depth of Borehole	Bottom of Casing Depth	Screened Interval
1	130	79	79 -88
2	120	60	60 -90
3	130	60	60 -90
4	120	60	60 -90
5 through 14	15 -16	5	5-15

Notes:

1. All depths are in feet referenced to ground level.
2. Drilling rates were highly variable because of the various degrees of rock consolidation and types of encountered within small vertical intervals.
3. The well casing in Well 1 is 6-inch-diameter PVC and the well screen is 4-inch-diameter PVC; the well casings and screens in Wells 2 through 4 are 4-inch-diameter PVC; the well casings and screens in Wells 5 through 14 are 2-inch-diameter PVC.
4. Wells 1 through 4 have 6-inch-diameter protective steel sleeves extending 3 feet above grade; Wells 5 through 14 have 3-inch-diameter protective steel sleeves extending 3 feet above grade.

TABLE 2.3-2
ELEVATIONS AND HORIZONTAL COORDINATES OF WELLS CONSTRUCTED ON THE SITE

Well Number	Elevations (in feet above NGVD)			Horizontal Coordinates*** (in feet)	
	Top PVC Casing*	Top Steel Sleeve**	Ground Level	North	East
1	None	19.89	17.4	894,613.7	782,913.4
2	19.78	19.92	16.9	890,222.9	782,743.7
3	19.02	19.42	16.3	885,710.4	782,491.4
4	18.97	19.11	16.9	888,482.8	779,441.8
5	19.80	19.84	17.3	894,606.1	782,913.3
6	19.63	19.67	17.1	892,296.2	782,912.2
7	19.47	19.52	17.3	890,222.8	782,747.9
8	19.74	19.78	16.9	890,294.7	780,597.4
9	18.98	19.02	16.2	887,714.1	782,655.1
10	18.91	18.96	16.6	888,112.1	780,827.8
11	19.40	19.43	16.9	888,490.9	779,440.5
12	18.89	18.96	16.4	885,719.4	782,505.7
13	20.55	20.61	17.9	885,045.5	780,675.5
14	19.08	19.09	16.5	884,541.5	781,478.4

* Top of PVC casing serves as water-level measuring point except for Well 1; top of steel sleeve is measuring point for Well 1.

** Steel protective sleeve fits over PVC casing.

*** Horizontal coordinates based upon Palm Beach County Survey of Sections, from Post, Buckley, & Jernigan, Inc.

Wells 1, 2, 3, and 4 were initially drilled as boreholes to depths ranging between 120 and 130 feet; these are subsequently referred to as the deep wells. Rock cuttings from the boreholes were collected and inspected by a hydrogeologist on the site and the most permeable interval was selected in which to install well screens. The screened intervals generally showed few signs of being cavity-riddled and contained considerable amounts of sand. Evidence gathered during drilling of the first of the deep wells suggested that the sand was unstable; for this reason, well screens and gravel packs were installed. The shallow wells, Wells 5 through 14, also were constructed with screens and gravel packs and tap the shallow sediments between depths of 5 and 15 feet. The reader should note that geologic logs are not provided for Wells 5, 7, 11 and 12 in Appendix 10.14.1 because these wells are adjacent to "deep" Wells 1, 2, 4 and 3, respectively.

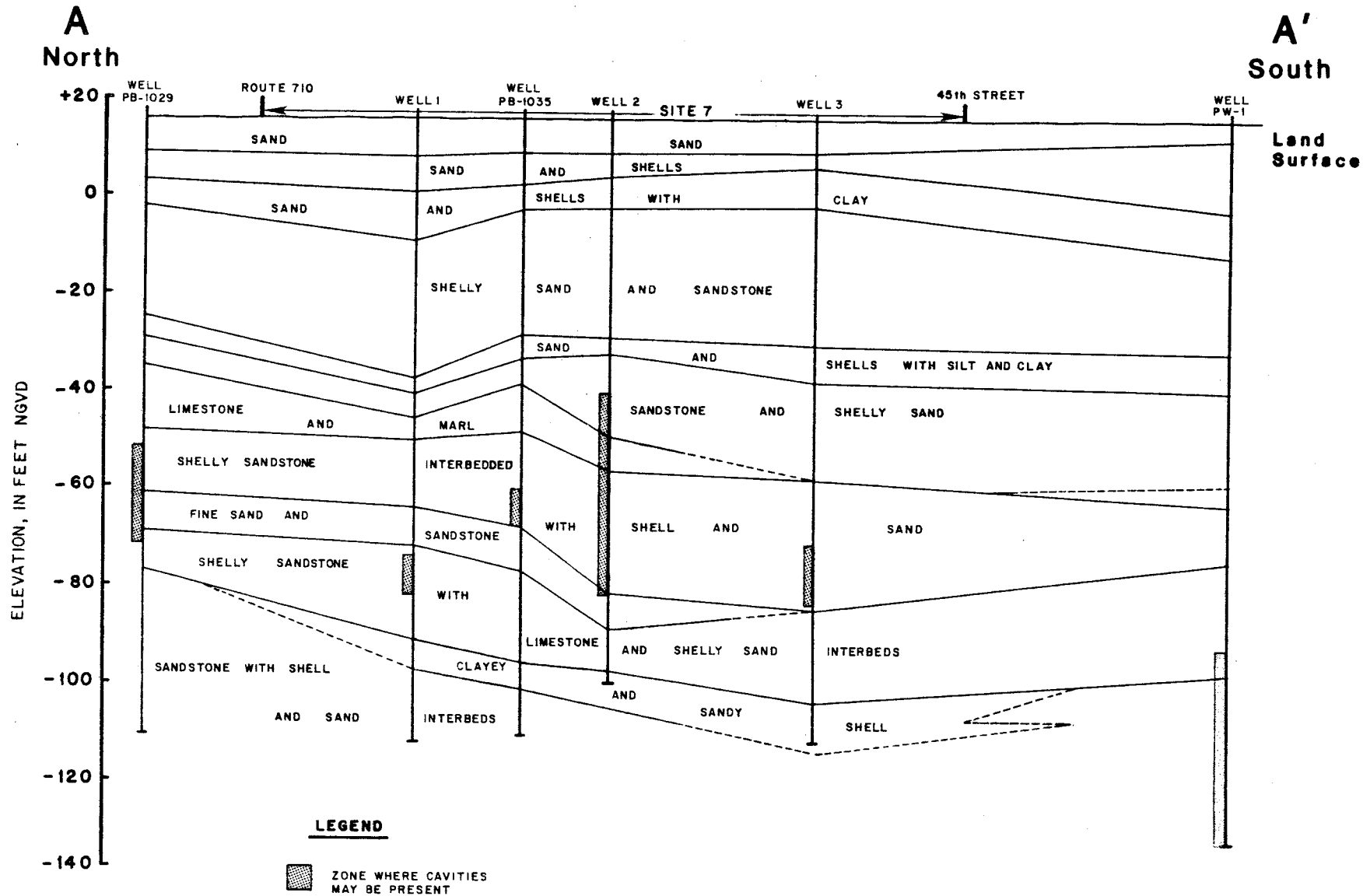
Following their construction, all wells were developed by pumping until the water produced was free of turbidity. The deep wells then were tested by pumping at constant rates for two hours and the shallow wells were pumped for one half hour. During and after each of these pumping tests water levels in the well were measured and the data analyzed to determine aquifer characteristics. Following the pumping tests, the fourteen wells were purged by removing a volume of water equal to 10 times the volume standing in the well and sampled. Finally, well-head elevations and horizontal coordinates were surveyed.

At locations adjacent to the ten shallow wells, split-spoon sampling was conducted to determine the soil composition. Descriptions of split-spoon samples were incorporated into geologic logs presented in Appendix 10.14.1. Also, selected soil samples were analyzed for their organic carbon content, cation-exchange capacity, and bulk density. The results of these analyses are necessary for predicting the behavior and attenuation of pollutants, should any enter the ground-water system. The significance of the analyses are discussed under Section 5.3.2 of this application.

2.3.1.2.1.3 Geologic Conditions

Rock cuttings collected during well construction were described and geologic logs were prepared and correlated with existing logs prepared by other investigators. Two copies of the geologic logs prepared as part of this investigation are presented in Appendix 10.14.1. Generalized geologic cross sections are shown on Figure 2.3-3 and 2.3-4; the location of the sections are shown on Figure 2.3-5. The sections show that most major stratigraphic units can be traced across the site and beyond its boundaries in the north-south and east-west directions. Because of the orientation of the Florida coastline and the influence it had on sediment deposition during Pleistocene time, there is much more conformity in thickness and extent of individual strata in the north-south than in the east-west direction. The cross sections show that the sediments consist of sand, shells, fine-sized particles (marl, clay, silt), sandstone, and limestone. Various strata are distinguished by dominant types.

The deepest layer noted on the sections is sandstone interbedded with shells, sand and finer-sized particles. Significant amounts of clay and marl were encountered in Wells 2, 3, and 4 at depths of 117, 120, and 109 feet, respectively. Beneath all of the site, the approximate bottom of the shallow aquifer is considered to be at a depth of 125 feet, in accordance with the analysis by Scott (1977). The rocks above the deepest layer and up to depths of 50 to 60 feet are predominantly sandstone with shell and loose sand. Across the mid-section of



NOTES: WELLS PB-1029 AND
PB-1035 FROM SWAZY (1980)

WELL W.P.B. PW-1 FROM
GERAGHTY & MILLER (1981)

CROSS-SECTION LOCATION
SHOWN ON FIGURE 1

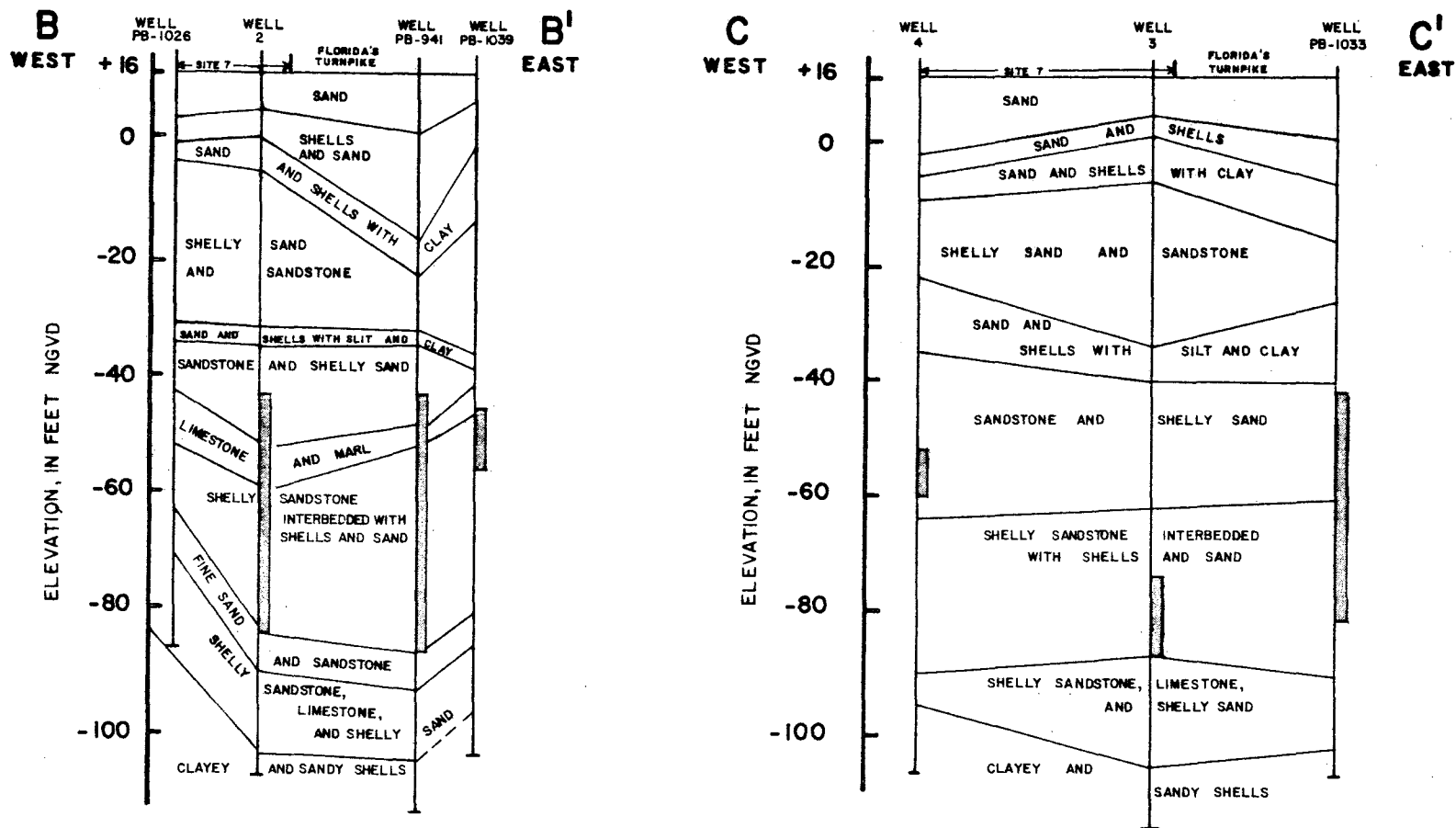
HORIZONTAL SCALE

0 2000 FT



**GEOLOGIC CROSS SECTIONS
FROM WEST TO EAST**

FIG. 2.3-4



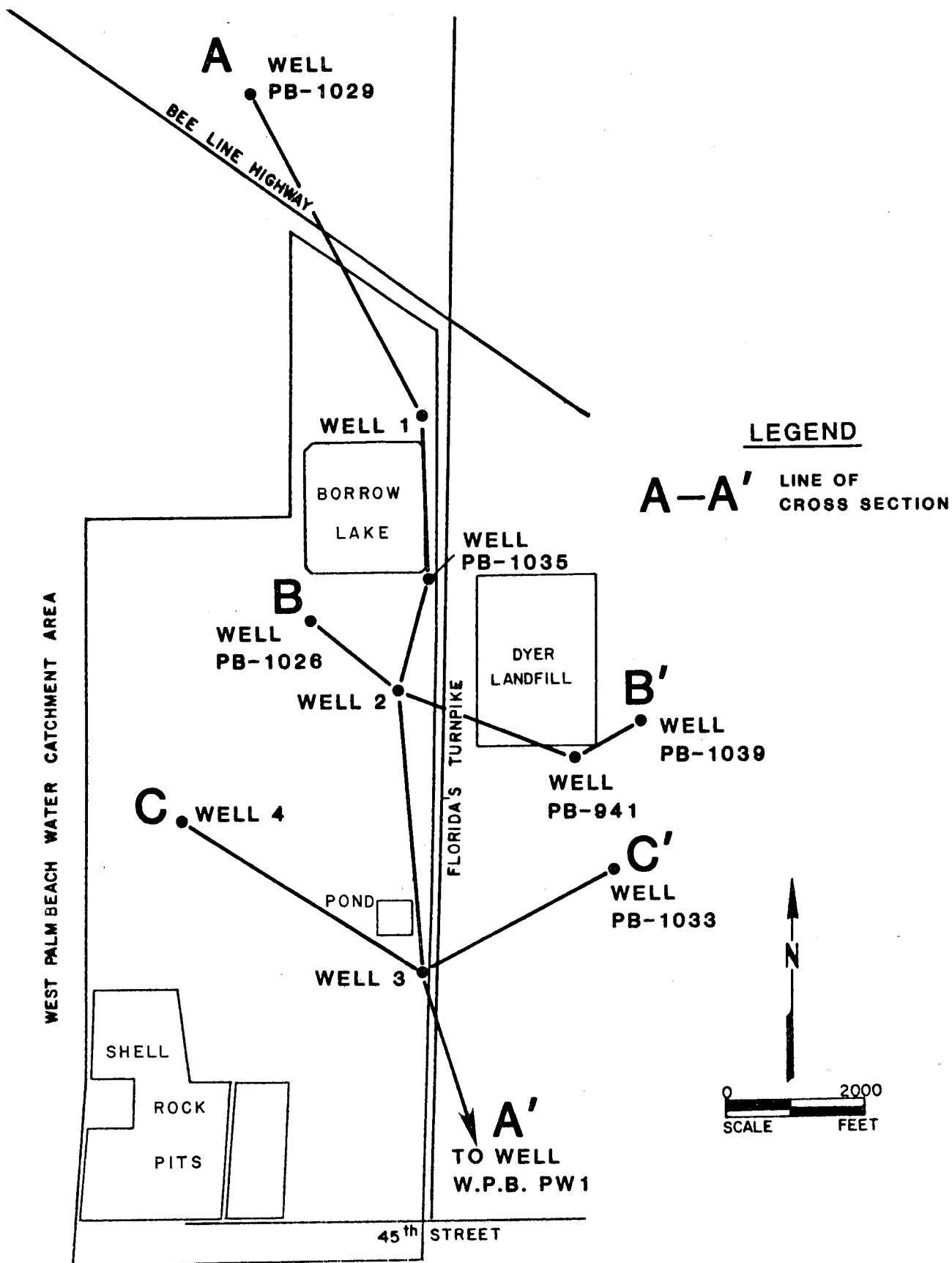
LEGEND

☐ ZONE WHERE CAVITIES
MAY BE PRESENT

NOTES: WELLS PB-1026, PB-941, PB-1039,
AND PB-1033 FROM SWAZYE (1980)
AND FISCHER (1980)

HORIZONTAL SCALE

0 2000 FT



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LOCATIONS OF GEOLOGIC
CROSS SECTIONS

FIG. 2.3-5

the site, the sandstone dips toward the east and thickens slightly (Section B-B' of Figure 2.3-5); the thickness continues eastward of Florida's Turnpike. Within the sandstone layers are a marly limestone bed and a layer of fine sand that enter from the north and pinch out beneath the site. The sandstone layers also contain the cavity-riddled zone described by Fischer (1980) or its stratigraphic equivalent. Hydrogeologically, the sandstone is considered the principal portion of the shallow aquifer -the portion that would yield water most readily if tapped by a well.

Predominantly unconsolidated sand and shell beds are present above the sandstone layers; two of these beds contain significant amounts of silt and clay (Figures 2.3-3 and 2.3-4). The sand and shell beds also contain sandstone layers in places. Dutch Cone penetration tests performed at 21 locations on and near the site to determine the thickness of unconsolidated sediments and its suitability as landfill cover material showed that several relatively hard layers of sandstone are present predominantly in the northeastern and southwestern parts of the site. These layers range in depth between about 29 feet and 52 feet below grade, but have thicknesses of only a few feet. The most persistent lie between depths of 29 and 36 feet below grade. These layers can be correlated only generally between test sites and appear to have a limited extent (Appendix 10.14.3).

The uppermost of the sand and shall beds containing silt and clay lies between depths of 10 and 25 feet below grade. The lower one occurs between 25 and 57 feet below grade. These layers probably retard the vertical movement of ground water. The uppermost layer of sediment is sand. Silt and organic materials are encountered in this sand between depths of 2 and 12 feet grade.

The sandstone that forms the most permeable part of the shallow aquifer showed little sign of being cavity-riddled as described further east by Fischer (1980). Some evidence was shown and included lost circulation of drilling fluids (in Well 4), the presence of calcite crystal faces in the cuttings indicating the presence of voids, and the appearance of etched surfaces on cuttings that are characteristic of dissolution. The zones indicating these signs are shown on the cross sections. These zones generally occur in the sandstone. Evidence from the short-term pumping tests (Section 2.3.2.1) suggests that the rock cavities that may be present are filled with sand, thus resulting in permeabilities that are lower than those that occur elsewhere.

From a hydraulic perspective, the materials described in the geologic logs as shown in Appendix 10.4.1, have "grain sizes" that range from clay size to consolidated masses of limestone. Sands, where they occur, are fine to medium in size. Shells apparently occur in broken dime-size fragments and smaller. The porosities of clay, marl, and silt-sized materials are estimated to range from 40 to 50 percent. Sand-size materials are estimated to have porosities between 30 and 40 percent. Intergranular porosities of sandstone and secondary porosities of limestones are estimated to range from 10 to 20 percent, except where large cavities have developed; cavity zones could have porosities as high as 40 percent. The only occurrences of the loss of drilling mud was at 65 and 72 feet below grade in Well 4; approximately 50 gallons was lost at each depth. The porosities estimated above are based on information provided by Walton (1970) and inspections of drill cuttings derived during well construction.

With few exceptions, geologic information obtained in well construction shows only a general correlation with the surface resistivity data, primarily because of a lack of contrast in the electrical properties of the material. Well 1 lies about 600 feet from RS1. Resistivities from near land surface to perhaps 100 feet below grade vary generally in a range between

130 and 500 ohm-feet. Two low resistivity measurements occur at a 1/2 AB distance (not depth) near 90 feet and appear to reflect the marly materials present from 63 to 68 feet in depth. A spike of high resistivity at a 1/2 AB distance of 260 feet cannot be attributed to any particular layer and probably is related to performance of the equipment. Well 2 lies adjacent to RS4. The resistivities decrease generally to a level of 110 ohm-feet at a 1/2 AB distance of 160 feet suggestive of the increasing clay content below a depth of 97 feet. Well 3 was constructed near RS7. The resistivity ranges generally between 185 and 460 ohm-feet; two exceptions suggest clayey layers at a 1/2 AB distance of 39 and 105 feet. These may correspond to a silty shell bed from 17 to 18 feet in depth and a clay bed from 47 to 54 feet depth. Again, the many thin layers of sediment that probably have different resistivities tend to complicate the resistivity sounding and make it difficult to attribute specific resistivity characteristics to specific sediments.

Gamma ray logs were made in Wells 1, 2, and 3 following well construction. By correlation with geologic logs prepared during well construction, the zones of major gamma ray activity were revealed to contain phosphate mineral. Such occurrences are observed in the rock cuttings by gray and black sand and shell; these minerals are common in most of Florida. On the site, the phosphatic minerals were encountered generally in the shallow unconsolidated sediments and also in a shelly sand layer in the generally consolidated sediments between depths of 68 and 75 feet in Well 1. Gamma ray logs are presented in Appendix 10.14.5.

The geologic information on the site discussed above indicates that the sediments present above a depth of 50 feet are generally unconsolidated and have a permeability lower than the more consolidated sediments between 50 and 100 feet. On this basis, the most rapid lateral flow of ground water will occur in the zone from 50 to 100 feet below grade; however, sediments above 50 feet also are capable of transmitting lateral flow but at a lower rate. The upper sediments are more important in conducting water vertically between the surface and the deeper more permeable zone. As discussed in Section 2.3.2.1 of this application, the vertical direction of water movement depends on the water-level relationship between the two zones.

2.3.1.2.1.4 Injection Zone

Wastewater generated on the site will be injected into the highly permeable "boulder zone" that lies between depths of about 3,000 and 3,800 feet. The use of the boulder zone for the injection of wastewater has become common in southern Florida (Florida Department of Environmental Regulation, 1983). The boulder zone consists of dolomite that has been extensively altered by fracturing and dissolution, thus creating caverns. This zone contains water having similar chemical quality to sea water and is isolated from overlying less saline ground water of the Floridan aquifer by about 800 feet of relatively low-permeability limestone. The temperature of water in the boulder zone is about 52 degrees Fahrenheit (Geraghty & Miller, Inc., 1980).

The boulder zone occurs within the Cedar Keys Formation and Oldsmar Limestone of Paleocene and Lower Eocene age, respectively (Chen, 1964). Thick confining units overlie the injection zone and underlie the shallow aquifer. Above the boulder zone and below the shallow aquifer are rocks of Upper Eocene age, Oligocene age, and Miocene age.

2.3.1.2.1.5 **Soils**

The soils of the site were described by the U.S. Department of Agriculture (1978). The soils types and their descriptions that occur on the site are listed on Table 2.3-3. Of a total of 16 soil types, four have a dominant presence on the site and occupy 50 percent of the entire site. Existing rock pits comprise about 22 percent of the entire site. Acreages of the major soils types also are listed on the table. These soils generally lie nearly level and are poorly drained.

**TABLE 2.3-3
DESCRIPTION OF THE SITE SOILS**

Soils Types That Comprise Fifty Percent of The Site

Basinger and Myakka sands, depressional: 112 acres; very poorly drained, soils in shallow depressions.

Hallandale sand: 101 acres; poorly drained, sandy soil that has a dark colored, weakly cemented layer below a depth of 30 inches over a loamy layer.

Riviera sand, depressional: 221 acres; poorly drained soil that has a loamy sub-occurs in shallow, well defined depressions.

Soils Types That Comprise Twenty-Eight Percent of The Site

Anclote fine sand: very poorly drained, deep sand soil.

Arents -urban land complex: somewhat poorly drained sandy soil.

Basinger fine sand: poorly drained, deep sandy soil.

Boca fine sand: poorly drained, with loamy subsoil.

Chobee fine sandy loam: very poorly drained, with layer of dark colored fine loam and subsoil of sandy clay loam.

Floridana fine sand: very poorly drained, with thick, black sandy surface layer and loamy subsoil.

Holopaw fine sand: poorly drained, with a thick sandy surface layer and loamy soil.

Okeelanta muck: very poorly drained organic soil with sandy mineral material depth of 40 inches.

Pinellas fine sand: poorly drained, with sandy calcareous subsurface layer and loamy subsoil.

Riviera sand: Poorly drained, with thick sandy subsurface layer that tongues into loamy subsoil.

Tequesta muck: very poorly drained, with thin organic layer on surface overlying a mineral soil.

Winder fine sand: poorly drained, with sandy subsurface layer that tongues into a loamy subsoil.

2.3.1.2.1.6 Additional Information

Other information requested in the application guidelines under Section 2.3.1.2 (Detailed Site Lithologic Description) are discussed for the purpose of continuity under the following items: Section 2.3.2.1 - vertical and horizontal permeabilities (hydraulic conductivities), and Section 5.3.2 - cation-exchange capacities.

2.3.1.2.2 The Resource Recovery Plant Site

2.3.1.2.2.1 Preliminary Soil Investigations

Preliminary soil investigations in the vicinity of the proposed site include four wash borings taken (Appendix 10.13) and 21 cone penetration tests (Appendix 10.14.3). In addition, detailed geologic logs are available from ten wells in the vicinity of the site (Appendix 10.14.1). The following discussion is based on information contained in the cited appendices.

The boring logs and the geologic logs of the wells contain detailed descriptions of the soils encountered at various depths. In addition, the boring logs contain a record of the number of hammer blows required to drive a standard sampler through four successive six-inch increments of depth during the process of obtaining each sample. Samples are normally taken every 5 feet of depth and at intermediate depths where major changes of soil type occur. Because the same driving energy (a 140-pound hammer falling 30 inches) and the same type of sampler (1-3/8 inch I.D. by 2 inch O.D. split spoon) is used almost universally in this country, it is possible to correlate the number of blows required to drive a fixed distance (1 foot) from site to site with the relative density for granular soils or the consistency of clay soils. Thus, the standard penetration resistance, N (the number of blows required to drive the sampler one foot) has become an important predictive tool in foundation design. At each sample location, the weighted average number of blows per foot is interpreted from the three or four records of blows per six inches that are observed at each sample location.

In the cone penetration test, also called a Dutch Cone test, a special conical probe is slowly pushed into the ground and the resistance to penetration is recorded at close intervals (every 20 cm) until the full depth of the investigation is attained. The probe consists of a conical tip mounted on an inner rod and a "friction jacket" which fits over a concentric outer rod. The whole assembly is first pushed to the desired test depth after which the cone is extended 3.5 cm while the jacket remains stationary. The whole assembly (jacket and cone) is then advanced another 3.5 cm as a unit. During both of these operations, the penetration resistance is measured using hydraulic gauges located at the surface. After each pair of readings, the cone is retracted into the jacket and the unit is pushed to the next sampling depth. The penetration resistance of the cone moving alone and moving with the friction jacket are both used to infer the type of soil being penetrated and the relative density and consistency of the material at the depth of the tip.

The Dutch Cone tests have been used extensively in Europe for many years and many correlations between cone resistance and soil properties have been made. In recent years, its use has greatly increased in the United States and it has been proved to be a very useful and reliable method of soil exploration. The one disadvantage is that samples of soil are not avail-

able for visual inspection or testing. An excellent comparison and correlation between the standard penetration test and the cone penetrating test has been given by Schmertmann (1970).

The cone penetration tests, the geologic logs of wells, and the borings indicate that the area is covered by a layer of shelly sand to a depth of about 50 to 70 feet. Small amounts of clay and silt are mixed with the sand in some cases. Within this thick stratum, there are a number of substrata where the penetration resistance (to both the cone penetrometer and the standard sampling spoon) increases over short increments of depth indicating that varying degrees of cementation and/or densification have occurred. These strata are often only a few feet thick and appear to overlay very loose sand in some cases. In the remainder of this stratum, the blow counts on the sampling spoon, which generally fall in the range of 9 to 20, and the cone penetration resistance, typically in the range of 20 to 40 tons per square foot (tsf), suggest that the relative density is fairly low. Because of the wide separation between boring and penetrometer sites, only very limited substrata correlation in the horizontal direction is possible.

Generally, between depths of 50 to 70 feet, penetration resistance increases dramatically, indicating the top of a sandstone bed. Borings were extended to a depth great enough to ensure the presence of this layer; adequate support for deep foundations supporting major structural elements will be provided by this layer.

2.3.1.2.2.2 **Factors Affecting Foundation Design**

As indicated above, there appears to be a competent bearing layer starting at a depth in the range from 50 to 70 feet over most of the site. Piles or piers driven or socketed into this stratum will be used for the foundations of major structures.

Smaller lightweight structures will either be founded on spread footings or shorter piles driven to depths such that the tips are located in one of the shallow sub-strata where the borings indicate higher penetration resistance to either the sampling spoon or static cone penetrometer. However, because of the variability of the penetration resistance, it will be necessary to perform borings and possibly cone penetration tests at the precise locations chosen for each of the structures. These borings would also reveal any isolated zones of cohesive soils that are sometimes found in this type of deposit. In particular, care will be taken to insure that there are no very loose or soft compressible zones immediately under the thin strata where the pile tips are located. Because most of the samples from the borings and wells contained significant amounts of shells or shell fragments which may be more compressible than ordinary sands or gravels, this factor will be taken into account in estimating settlements of the facilities with shallower foundations.

In the cases where the footings or short piles are utilized, full consideration will be taken of the fact that vibrational loading of either the footing itself or nearby structures, or subsequent construction involving nearby pile driving, has the potential of causing a considerable amount of unpredictable settlement owing to the low relative density of the cohesionless soils that form a large part of the upper strata. Thus, care and planning in designing both present and future facilities will be exercised to avoid damage to such structures. Moreover, settlement that may be caused by vibratory loads can also produce additional loads on foundations which utilize longer piles because of the potential for dragdown resulting from negative skin friction on the upper portions of the piles.

In planning foundations for major structures on longer piles, specifications will provide for pile and hammer capacity sufficient to permit overdriving to punch through any thin substrata that are encountered in the upper 50 to 70 feet. The final driving resistance that will ensure a satisfactory pile capacity will depend in part on the crushing strength of the underlying sandstone. Since this rock may be fairly porous and rather lightly cemented, tests to reliably determine point resistance will be conducted.

2.3.1.3 Geologic Maps

The major structures to be installed on the site are the resource recovery plant and the landfills. The geologic conditions beneath the proposed sites of these structures are not unique on the site as a whole; geologic conditions on the entirety of the site are substantially uniform. The land surface elevation generally varies between +17 and +18 feet NGVD (National Geodetic Vertical Datum) and averages about +17.5 feet NGVD. Infrared and conventional aerial photographs of the site show no signs of fracture traces nor are they known to exist or expected.

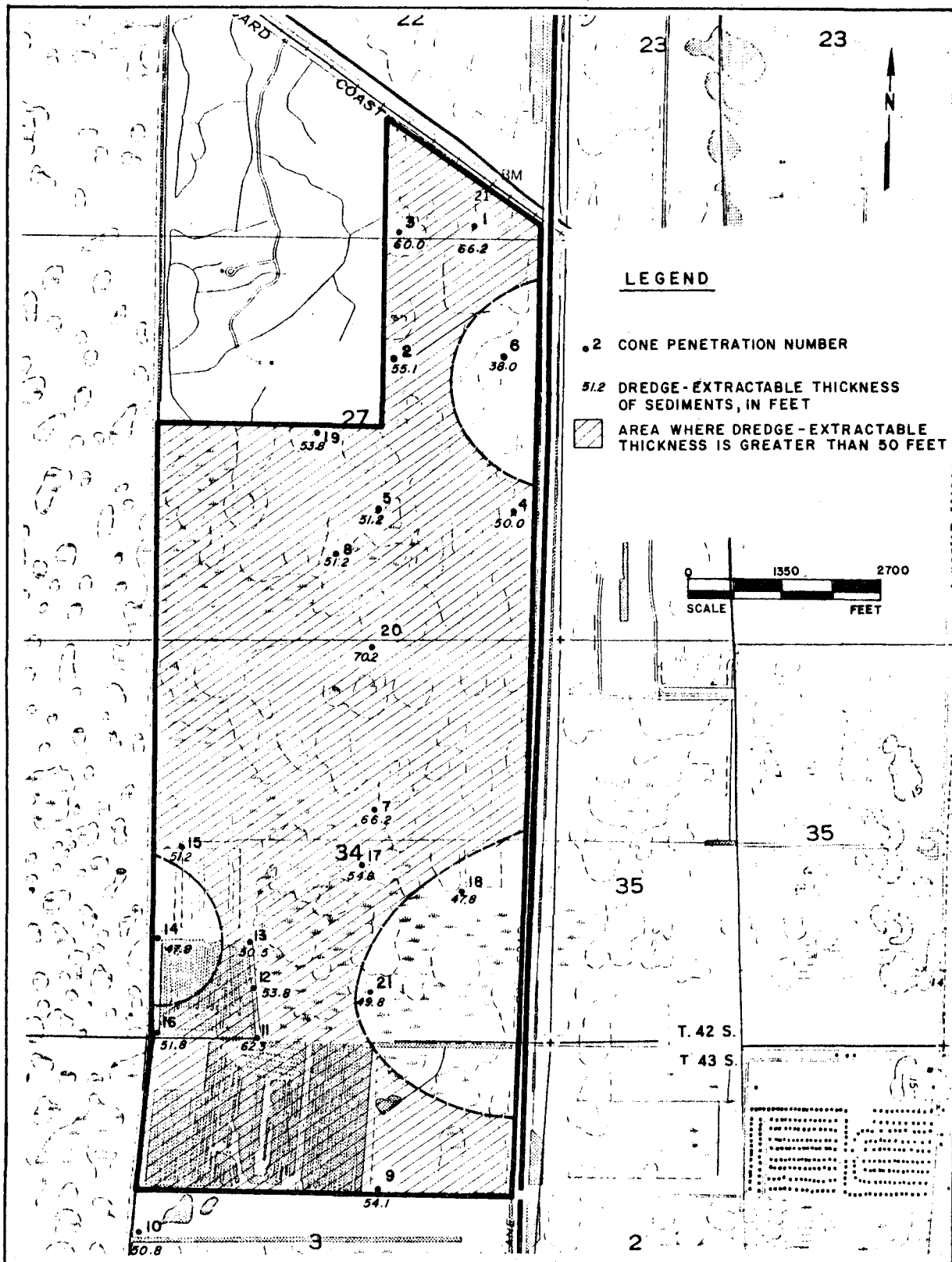
The thickness of unconsolidated sediments appropriate for dredging as landfill cover material beneath the site was investigated by making 21 Dutch Cone penetration tests distributed over the entire site [Appendix 10.14.3]. These tests were performed in locations chosen to be uniformly distributed on the site to the extent allowed by established access and access by four-wheel drive vehicles. The thickness of generally unconsolidated sediments beneath the site varies little over the site as shown on Figure 2.3-6. The thickness averages approximately 50 feet.

The capacity of soils and geologic materials beneath the site to attenuate contaminants was investigated by split-spoon soil sampling at the sites of Wells 5 through 14. At each of these wells, samples were derived approximately at two-foot intervals to a depth of 10 feet, then at five-foot intervals to 20 feet, and at 10-foot intervals to total depth. The total depth was determined at the point where sediment hardness prevented further sampling. At three of the 10 sites (adjacent to Wells 1, 2 and 4), samples were taken at depths greater than 30 feet below grade.

Soil samples were analyzed for their organic carbon concentration and their cation-exchange capacity. The significance of these analyses relative to contaminant attenuation is discussed under Section 5.3.2 of this application and the results of analyses are reported in Appendix 10.14.4. With regard to the OCC (organic carbon concentration), the depth of approximately 30 feet separates shallow soils having an average OCC of 1.22 percent from those at greater depths which have an average OCC of 2.19 percent. The higher average OCC soils have a greater capacity to attenuate contaminants. There was little discernible difference between CEC (cation-exchange capacities) values above and below a depth of 30 feet. The average CEC for all soil samples is 3.70 milli-equivalents per 100 grams. There is no basis for mapping the distribution of attenuation properties of the area.

2.3.2 Subsurface Hydrology

The borrow lakes are the principal feature of the proposed resource recovery plant, landfills and associated facilities that will affect subsurface waters. By design, there will be no effect on subsurface water by effluent. Borrow lakes will be excavated into the uppermost 50 feet of sediments on the site. The hydrogeologic characteristics of these sediments are described under Section 2.3.2.1 of this application.



PALM BEACH COUNTY
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RESOURCE RECOVERY FACILITY



THICKNESS OF DREDGE-
EXTRACTABLE SEDIMENTS

FIG. 2.3-6

Hydrogeologic investigations undertaken on the site included well construction, pumping tests, water-level monitoring, and water sampling and analysis. Data generated by these testing methods were compiled to characterize hydraulic properties of the aquifer, ground-water flow rates and directions, and ground-water quality in the context of the geological setting.

2.3.2.1 Subsurface Hydrologic Data for the Site

The hydraulic character of an aquifer system is described in terms of parameters referred to as the transmissivity, porosity, storage coefficient, and depending on the nature of the aquifer, the specific yield or leakance coefficient. These parameters are determined by analyses of data obtained from pumping tests. The transmissivity is a measure of the ease of water flow through the aquifer. The transmissivity of an aquifer equals the horizontal permeability multiplied by the aquifer thickness. Porosity is a measure of the open space within a volume of rock. The "effective" porosity refers to rock openings that are interconnected. The storage coefficient is the volume of water released from storage per unit surface area of the aquifer per unit change in head. The specific yield of an aquifer is the ratio of water volume that can be drained from a specific volume of aquifer, to the aquifer volume affected. The leakance coefficient is a property of confining material; it is the vertical permeability of the confining unit divided by the vertical thickness of the confining unit. With known aquifer parameters, water levels and flow rates in the aquifer can be predicted in response to any stress on the aquifer such as pumping or recharge. Additionally, the direction and rate of movement of ground water and solutes (dissolved substance) can be determined.

Following the construction and development of the "deep" wells (Wells 1 through 4), pumping and recovery tests were conducted on each well. Analyses of data from the deep wells by a method devised by Cooper and Jacob (Walton, 1970), yielded aquifer transmissivities that ranged from 30,000 to 70,000 gpd/ft (gallons per day per foot) and averaged 50,000 gpd/ft. Transmissivities determined from analyses of the pumping test data are listed on Table 2.3-4. The wells tap the cavity-riddled zone or its stratigraphic equivalent. Well screens were installed between depths of 60 and 90 feet, below the silty and clayey layers that lie above 50 feet, and above the less permeable and interbedded layers that lie 100 feet and below. Because the tests were short in duration and pumping is not likely to have affected the aquifer at depths shallower than 50 feet or deeper than 100 feet, the thickness of the aquifer affected during the tests averages 50 feet. The horizontal permeability of the cavity-riddled zone is estimated to average 1,000 gpd/sq. ft. (gallons per day per square foot). The horizontal permeability of the deep zone is lower on the site than a few miles northeast and southeast. A probable reason for the relatively low permeability of the deep zone is that sand fills the poorly-developed existing cavities, thus resulting in a reduced permeability relative to a truly cavity-riddled rock. The vertical permeability of the deep zone cannot be estimated based on the pumping tests data, but because of the sedimentary layering encountered, it is judged to be between 0.1 and 0.2 of the horizontal permeability. Based on observations of drill cuttings collected during well construction, the porosity is estimated to be about 20 percent.

The recovery portions of the pumping-test data from Wells 5 through 14 also were analyzed by the Cooper and Jacob method and yielded transmissivities that ranged from 6,000 to 15,000 gpd/ft and averaged 9,000 gpd/ft. Four of the ten tests performed on shal-

low wells produced erratic data and could not be analyzed. The wells tap sand and shell beds through the interval from 5 feet to 15 feet below grade; because the water table was about two feet below land surface and because of the underlying clayey bed, the thickness of the zone affected by the pumping was about 13 feet. The average horizontal permeability of this zone is calculated to be 700 gpd/sq.ft.

The vertical permeability of sediment in the upper 15 feet was estimated based on the soil permeability within about 50 inches of the land surface. The materials in the uppermost 50 inches are similar in composition to those between 50 inches and 20 feet below grade. Of the dominant soils types found within the area of the site (these include the Halendale, Oldsmar, and Riviera soils), all have vertical permeabilities that average about 160 gpd/sq.ft. (U.S. Department of Agriculture, 1978). This vertical permeability is about 0.2 of the average horizontal permeability determined in the shallow-well pumping tests.

The transmissivity of the entire aquifer thickness between the water table and its bottom at 125 feet was estimated based on the analyses above and the geologic logs. Based on apparently similar lithologic characteristics, the sand and shell beds between the approximate depths of 15 and 50 feet (including those that contain silt and clay) are estimated to have an average horizontal permeability equal to the beds above 15 feet, or 700 gpd/sq.ft. On the same basis, this permeability also is estimated for sediments between 100 and 125 feet. Multiplying the various permeabilities by their respective thicknesses and summing the results yields a transmissivity for the entire aquifer thickness of 101,000 gpd/ft. A map showing the distribution of the regional transmissivity is shown on Figure 2.3-7 and is based on the test results from the site and data from other tests in the area.

TABLE 2.3-4
AQUIFER TRANSMISSIVITIES DETERMINED FROM
SHORT-TERM PUMPING TESTS CONDUCTED ON THE SITE WELLS

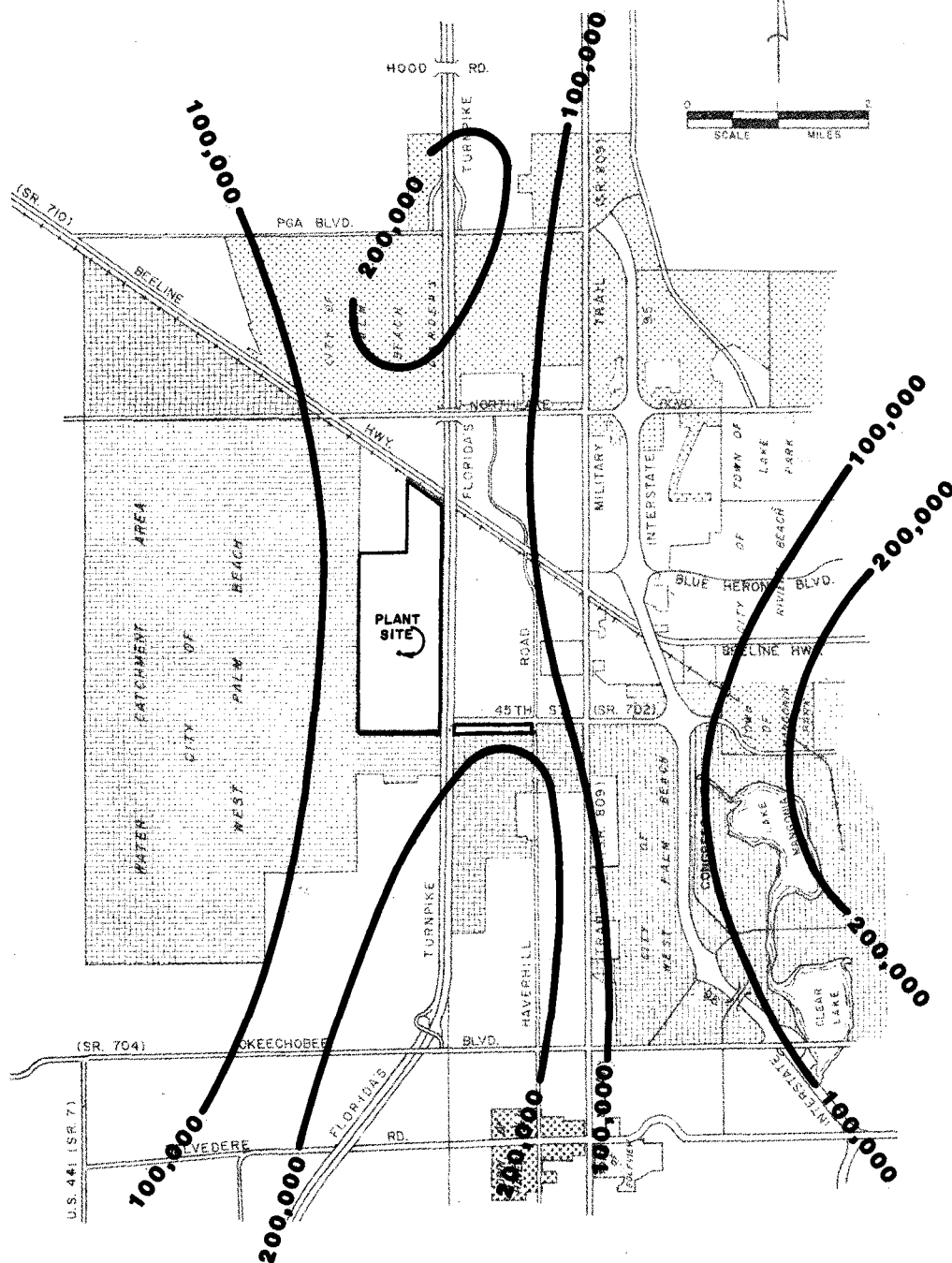
Well Number	Coefficient of Transmissivity (a)
1	48,000 gallons per day per foot
2	54,000 gallons per day per foot
3	30,000 gallons per day per foot
4	70,000 gallons per day per foot
5	15,000 gallons per day per foot
6	(b)
7	(b)
8	(b)
9	24,000 gallons per day per foot
10	15,000 gallons per day per foot
11	13,000 gallons per day per foot
12	17,000 gallons per day per foot
13	12,000 gallons per day per foot
14	22,000 gallons per day per foot

(a) derived by use of the water-level recovery data and the Cooper and Jacob method (Walton, 1970)

(b) test results were inconclusive

LEGEND

—200,000— **AQUIFER TRANSMISSIVITY**
CONTOUR, IN GALLONS PER
DAY PER FOOT



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APPROXIMATE DISTRIBUTION
OF TRANSMISSIVITY IN THE
SHALLOW AQUIFER

FIG. 2.3-7

Based on a comparison of water levels in the shallow (0 to 15 feet) and deep (50 to 100 feet) zones discussed below, the aquifer is concluded to behave as an unconfined system. As discussed below, there is generally only a small difference between shallow and deep water levels. Therefore, in addition to the aquifer transmissivity, the specific yield (analogous to the storage coefficient) must be estimated to allow the prediction of the aquifer response to stress such as pumping.

The specific yield of unconfined aquifers in south Florida generally ranges from 0.10 to 0.20. The particle-size distribution of the site soils (including the Hallendale, Oldsmar, and Riviera soil types) were analyzed according to a method described by Fetter (1980) and concluded to have a specific yield of about 0.20. Because it is the unconsolidated sand that would be dewatered during pumping from the principal aquifer, a specific yield of 0.20 is concluded to be representative of the unconfined aquifer at the site.

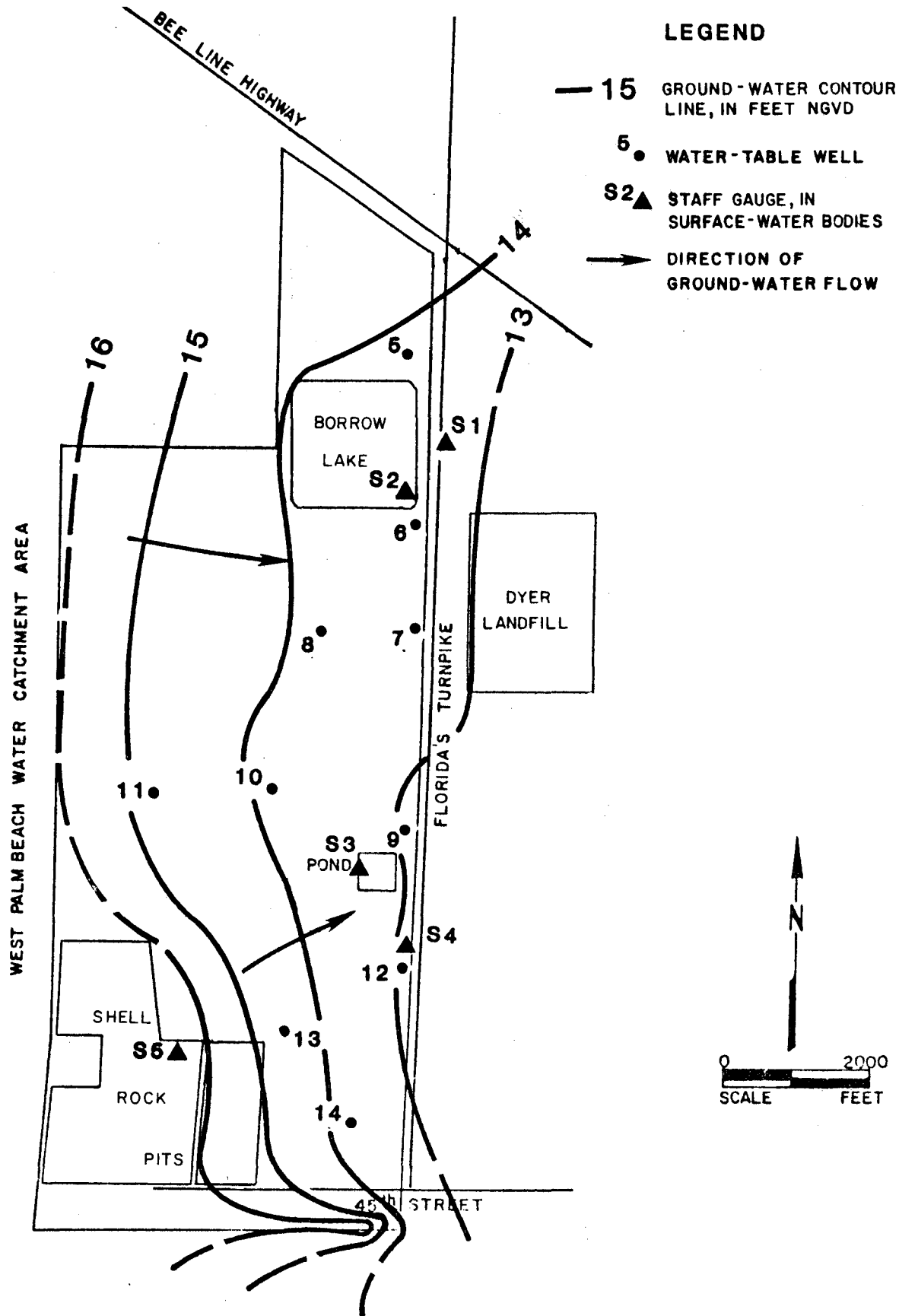
In contrast to findings on the site, aquifer tests conducted about 3/4-mile east of Florida's Turnpike (Fischer, 1980) and about 1 mile east near Military Trail suggested that the aquifer behaves as a leaky confined aquifer. The distinction between an unconfined aquifer and a leaky confined aquifer is related to the vertical permeability of the zone above the principal aquifer, the thickness of that zone, and the transmissivity of the aquifer.

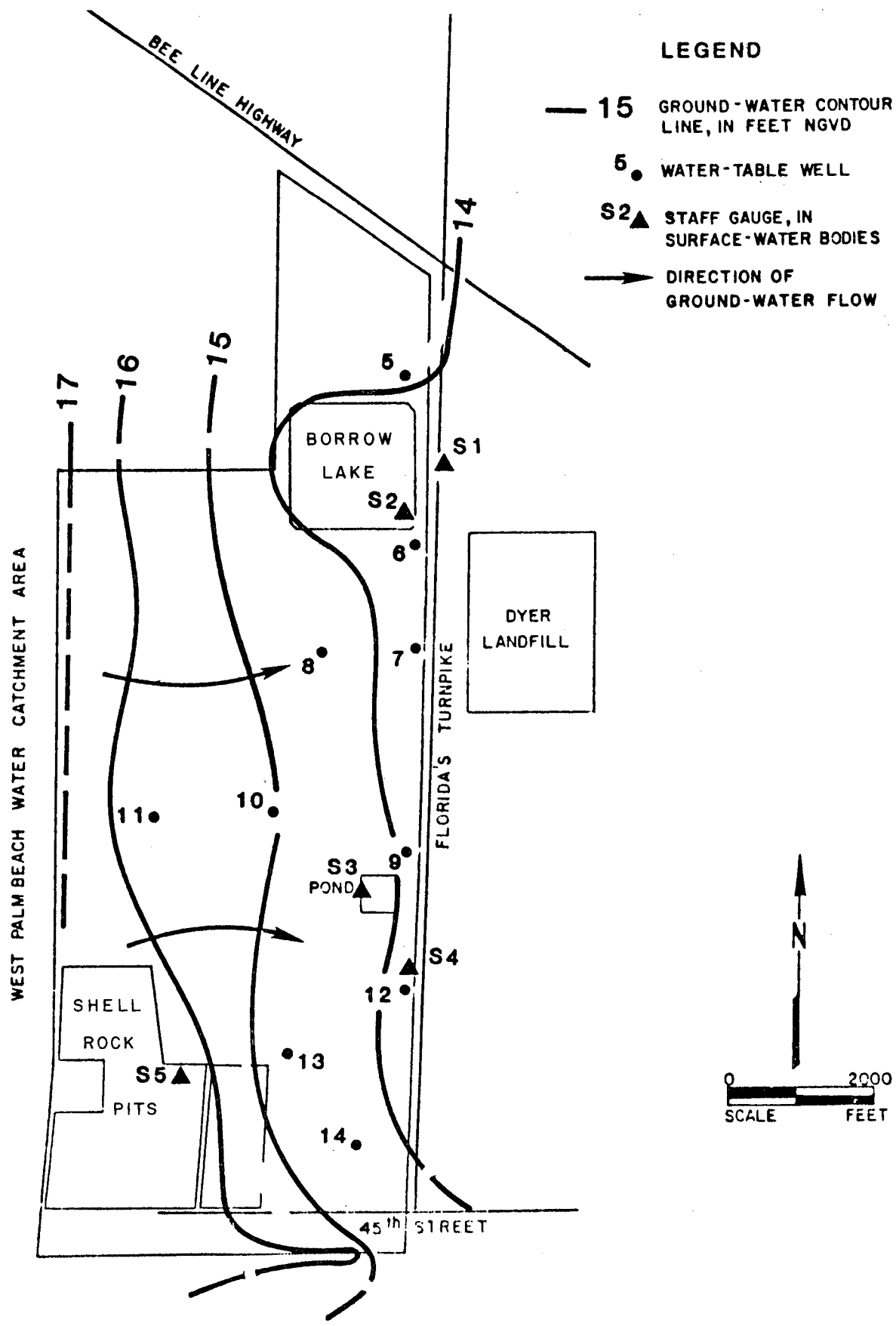
2.3.2.1.1 **Ground-Water Levels, Flow Paths and Fluctuations**

Ground-water levels were measured both manually and automatically during the period from May 15 to July 23, 1984. In addition, five staff gauges for measuring surface-water levels and three rain gauges were installed and monitored during the same period. Included in the network of wells was an existing well (Well PB-1035) installed in 1977 by the U.S. Geological Survey. Wells 1 through 4, that tap the principal aquifer, were fitted with automatic water-level recorders. Water levels in Wells 5 through 14, Well PB-1035, the staff gauges, and the rain gauges, were measured twice per week and following significant rainfall events. The tops of casings of all the wells and the tops of the staff gauges were surveyed to determine their elevations with reference to NGVD (National Geodetic Vertical Datum). Data generated during monitoring are presented in Appendix 10.14.6.

Ground-water levels measured in wells on the site fluctuated generally through a range from +13 feet to +17.5 feet NGVD depending on location. The pattern of fluctuations and the ranges in water-level elevations in the deep wells compared to the shallow wells were similar but distinct; differences between the two depended upon the time in question relative to the incidence of rainfall. The influence of the WCA (West Palm Beach Water Catchment Area) and other surface-water bodies also were apparent in the water-level data. The WCA has a major influence on the ground-water elevations and the gradient across the site. The effects of alternating rainfall and dry periods are superimposed on water levels dominantly controlled by the WCA.

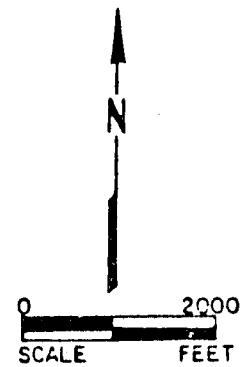
Figures 2.3-8 and 2.3-9 are contour maps showing elevations of ground-water levels as measured in shallow wells and surface-water bodies on May 23, and July 19, 1984. Water levels on those dates are representative of relatively stable conditions over the entire site at the end of moderately dry periods. Although the actual levels at any particular point are different on each of the selected dates, water-level contours on both dates form a similar and





LEGEND

- 15 GROUND-WATER CONTOUR LINE, IN FEET NGVD
- 5 WATER-TABLE WELL
- S2▲ STAFF GAUGE, IN SURFACE-WATER BODIES
- DIRECTION OF GROUND-WATER FLOW



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WATER-TABLE CONTOUR MAP

JULY 19, 1984

FIG. 2.3-9

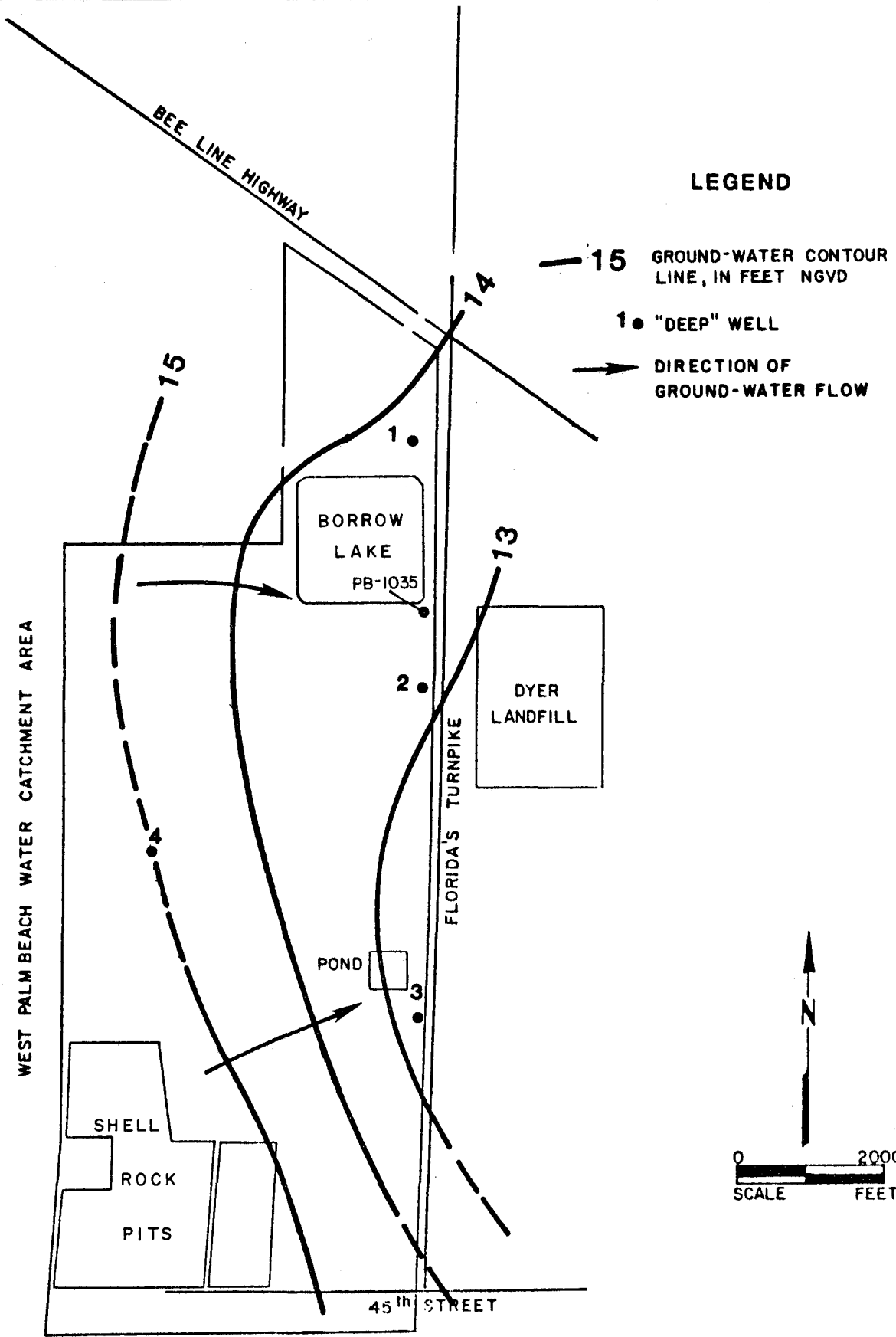
consistent pattern. Water-level contours following a significant rainfall indicate a rapidly changing pattern and would reflect the distribution of rainfall over the site. During the data-collection period, water levels in shallow wells fluctuated between elevations shown on Figure 2.3-8 and a level that was an average of 2.27 feet higher. Arrows shown on the figures indicate the direction of ground-water flow through shallow sediments.

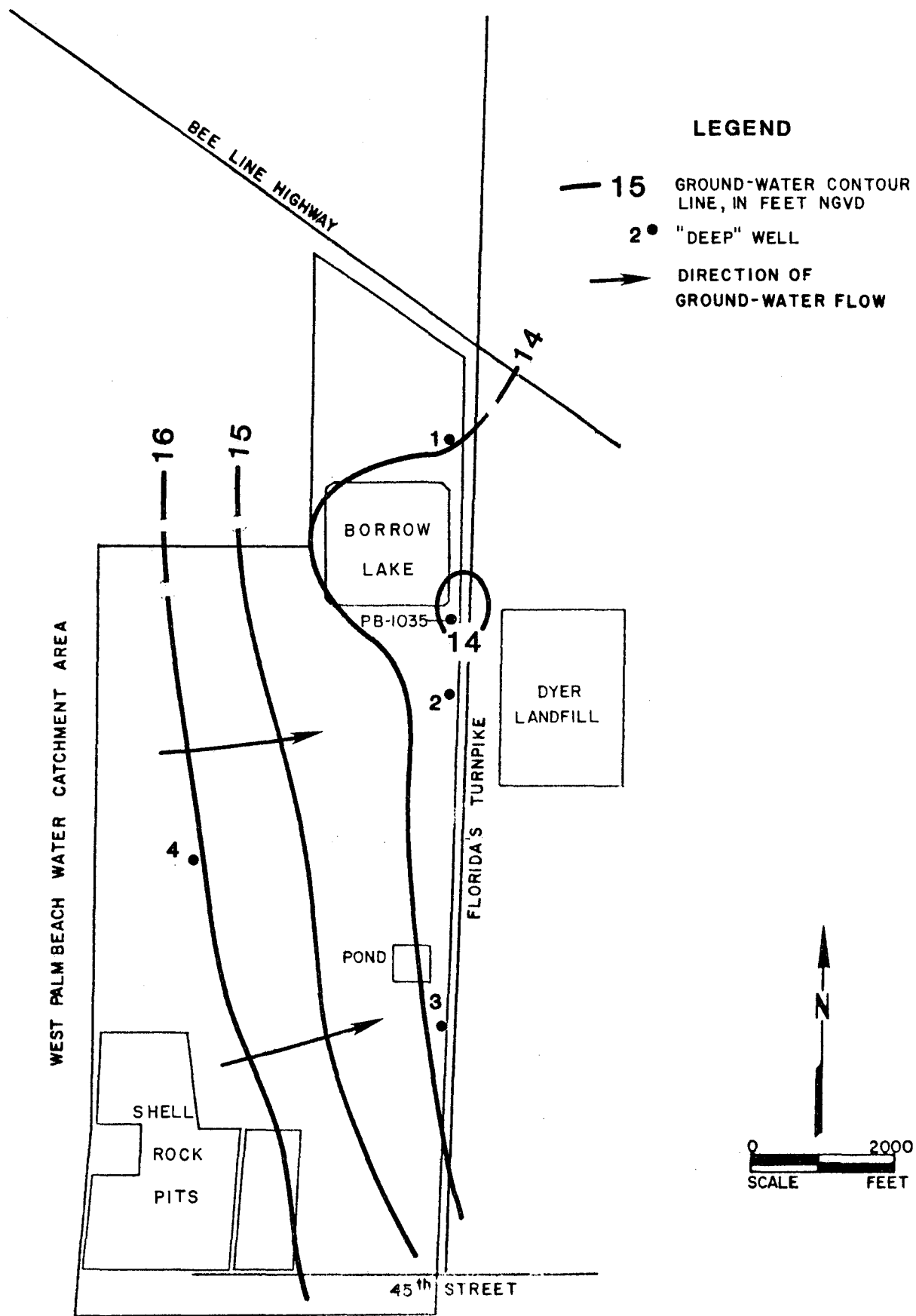
The data show that water-level elevations in shallow sediments decrease from the WCA (on the west) to the eastern border of the site. The water in the WCA is held artificially at a level generally greater than + 17.5 feet NGVD by the City of West Palm Beach for use in the municipal water system. Seepage occurs from the WCA and into the shallow and deep sediments toward the east. The abandoned borrow lakes in the southwest corner of the site apparently are hydraulically connected through permeable soils to the WCA because they tend to have a water level similar to the WCA. Water levels in the active borrow lake in the northeastern corner of the site are depressed an average of 0.84 feet relative to the adjacent Well 5 because of pumping of water from the lake. This is because of water losses in the slurry route between the Dyer Boulevard Landfill and the return point at the borrow lake. Ground-water from the shallow zone flows into the lake because the water level is lower in the lake than the adjacent shallow zone. On the other hand, the water levels in the canals along Florida's Turnpike and in a long-abandoned pond near the east-central part of the site are higher than in adjacent shallow sediments. On average, the water levels in these surface-water bodies are 0.21 feet higher than the adjacent Well 12. Water levels in those surface-water bodies remain above the water-table level for several possible reasons. Among the reasons are: surface-water bodies receive more recharge by surface-water runoff; they are less effected by plant transpiration; and they probably have a poor hydraulic connection to the sandy sediments because of a developed organic mat along their bottoms.

Figure 2.3-10 and 2.3-11 show contours indicative of water levels in the deep wells on May 23, and July 19, 1984. Water-level contours on both dates are similar and show a consistent pattern. The water levels in the deep zone are quite similar to those in the shallow zone. Again the ground-water flow direction is from west to east because of the influence on the WCA. Although muted somewhat, the surface-water features (lakes and canals) are shown to be influential in the deep zone, and in the same manner as in the shallow zone. This is expected in an unconfined aquifer. Given that the horizontal ground-water gradients in the two zones are approximately equal and that the permeability in the deep zone is higher, the rate of lateral flow through the deep zone is greater than in the shallow zone.

Relationships of the water levels in the shallow and deep zones are shown on Figure 2.3-12 and 2.3-13. These figures are hydrographs reflecting water levels measured during the study period on adjacent deep and shallow wells. Hydrographs of Wells 4 (deep) and 11 (shallow) shown on Figure 2.3-12 are representative of conditions in the interior of the site, where water is frequently ponded at land surface. The hydrographs show that near the end of relatively dry periods (May 23, June 15, and June 22 and July 19) the water levels in the deep zone are higher than in the shallow zone. During and after periods of rainfall, the opposite is true. This is because rainfall, first incident on the shallow zone, moves downward because of the resulting higher water levels in the shallow zone. As evapotranspiration occurs from the shallow zone (in excess of rainfall), water levels there are lowered and water from the deep zone moves upward. Rainfall, therefore, recharges the shallow and deep zones and dry periods deplete water from both zones by evapotranspiration.

A similar relationship between the shallow and deep zones is shown by data from Wells 2 (deep) and 7 (shallow) shown on Figure 2.3-13; these wells are located in the east-central part of the site where standing water is not common. The distinction between water-



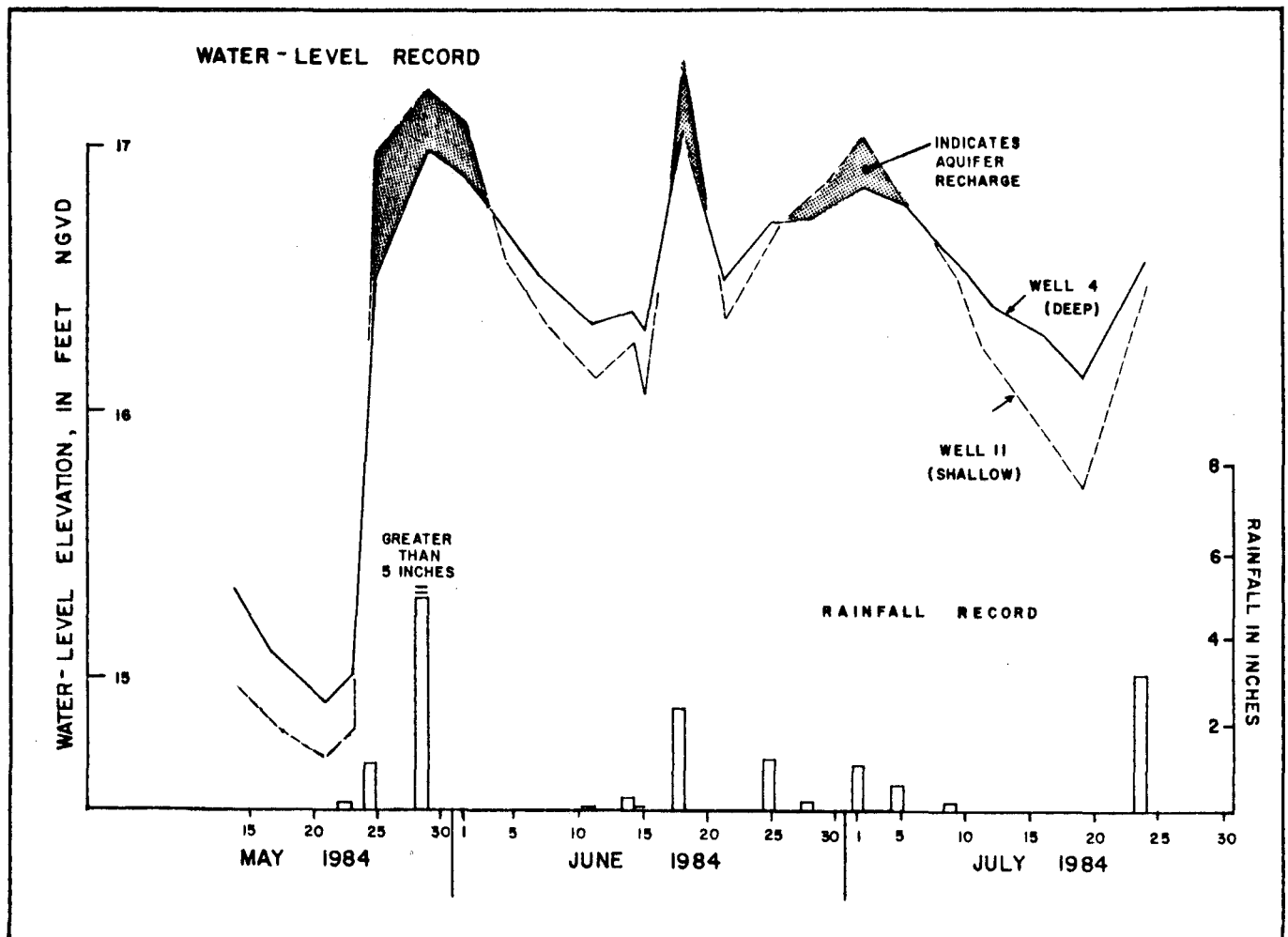


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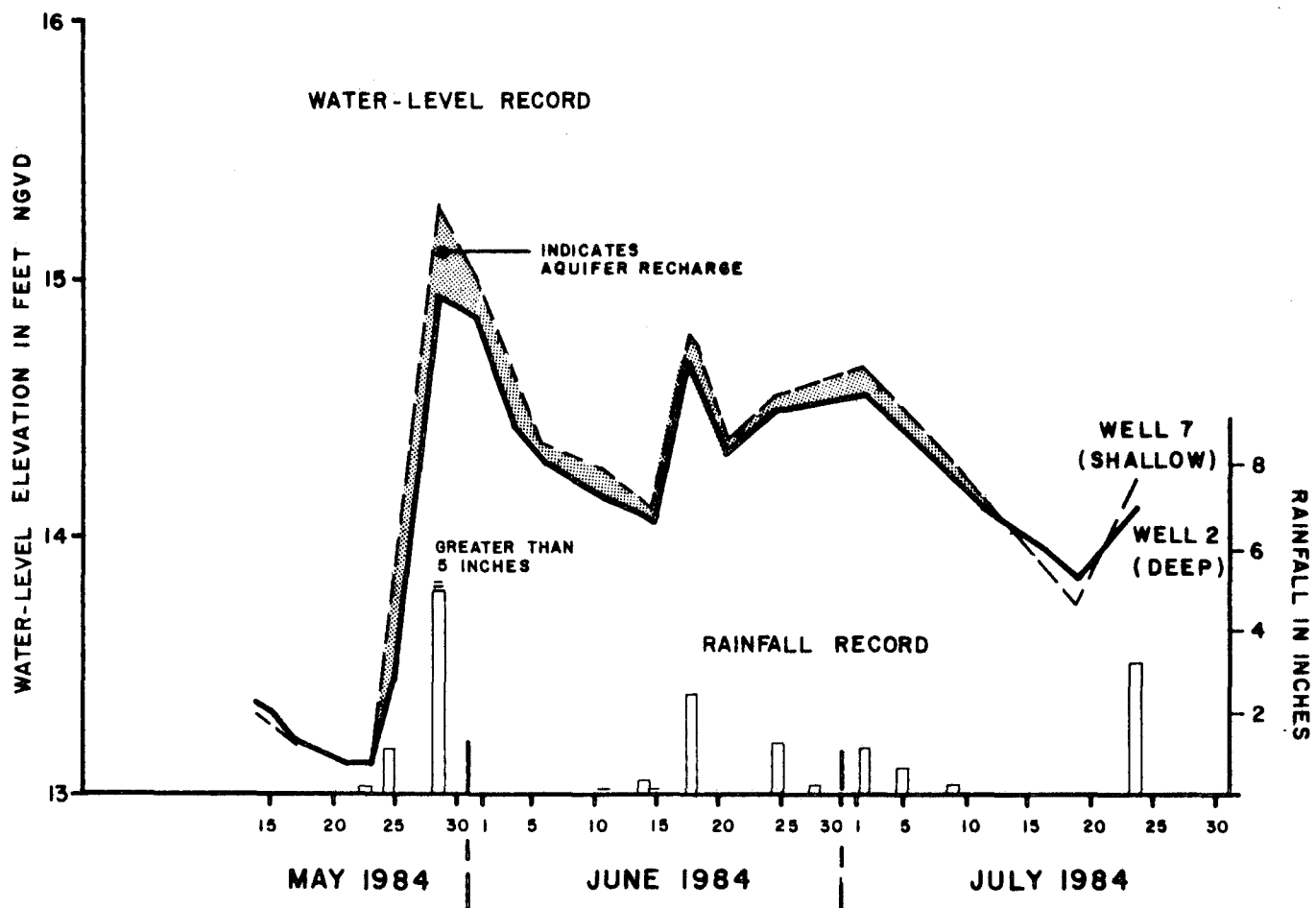


GROUND-WATER CONTOUR MAP
DEEP ZONE
JULY 19, 1984

FIG. 2.3-11



NOTE: WATER LEVELS AND ACCUMULATED
RAINFALL WERE MEASURED
TWICE WEEKLY



level elevations in shallow and deep zones, however, is not as great as further west. Only during the longest dry periods when evapotranspiration lowers water levels in the shallow zone, do water levels in the deep zone exceed those in the shallow zone. In contrast to the site of Wells 4 and 11, water levels at this site are maintained higher in the shallow zone because of the permanent nearby surface-water bodies discussed above.

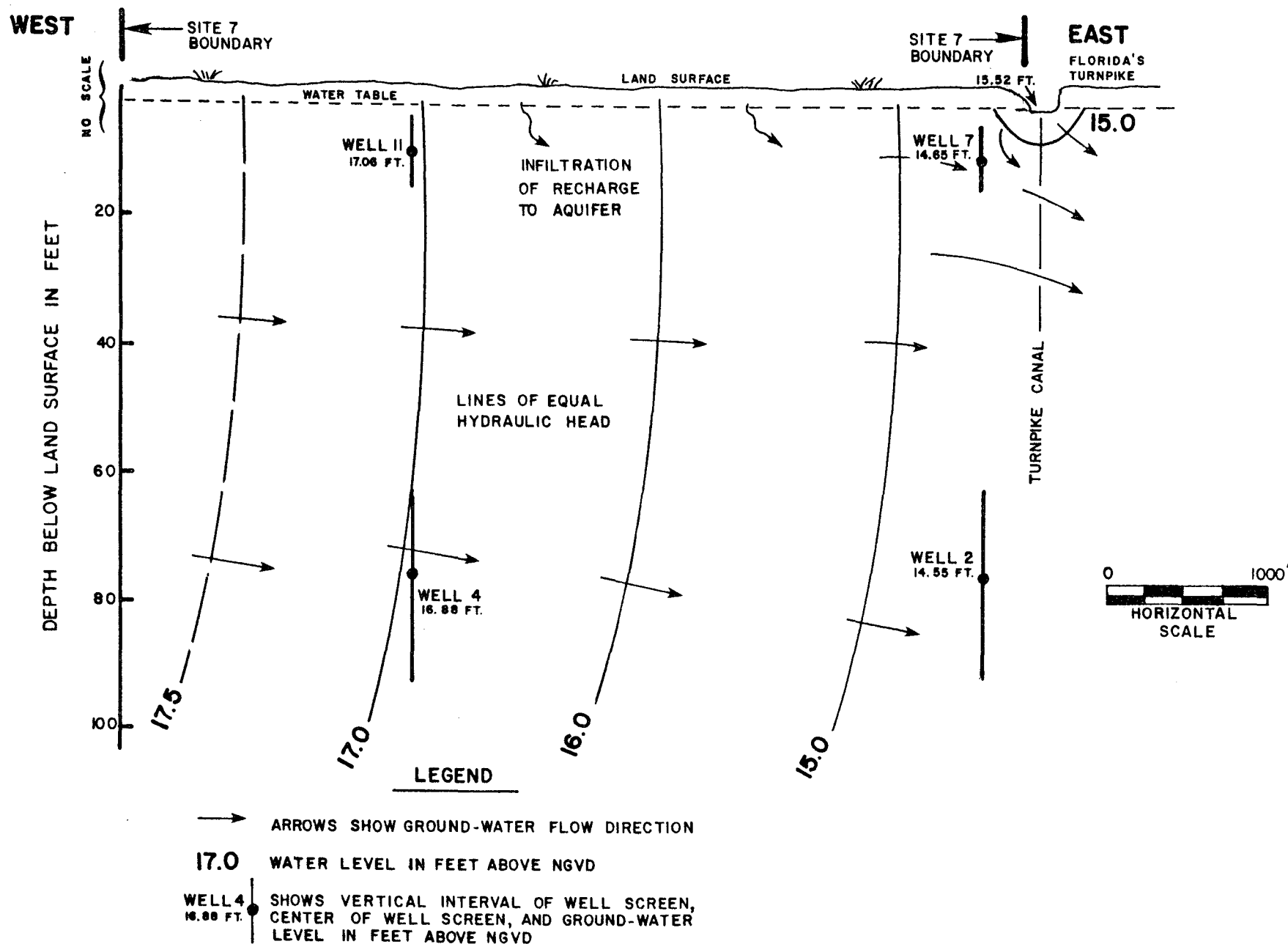
Figure 2.3-14 shows the shallow-deep zone relationship in cross section on July 2nd following a one-inch rainfall. The lines of equal hydraulic head (equivalent to ground-water contours) show the effect of rainfall by the higher levels in the shallow zone and that water flows downward as well as toward the east during this period. The shallow-deep relationship on July 19th, near the end of a dry period, is shown on Figure 2.3-15. The lines of equal head show that water flows upward from the deep to the shallow zone, and of course, toward the east. The dry-period depiction indicates that water in the deep zone is readily available from the west because of the WCA and its relatively high and constant hydraulic head. Both Figures 2.3-14 and 2.3-15 indicate that seepage from the west to the shallow ("shallow" is used in the regional context) aquifer occurs at all times as water from the WCA percolates into the shallow and the deep zones and eastward.

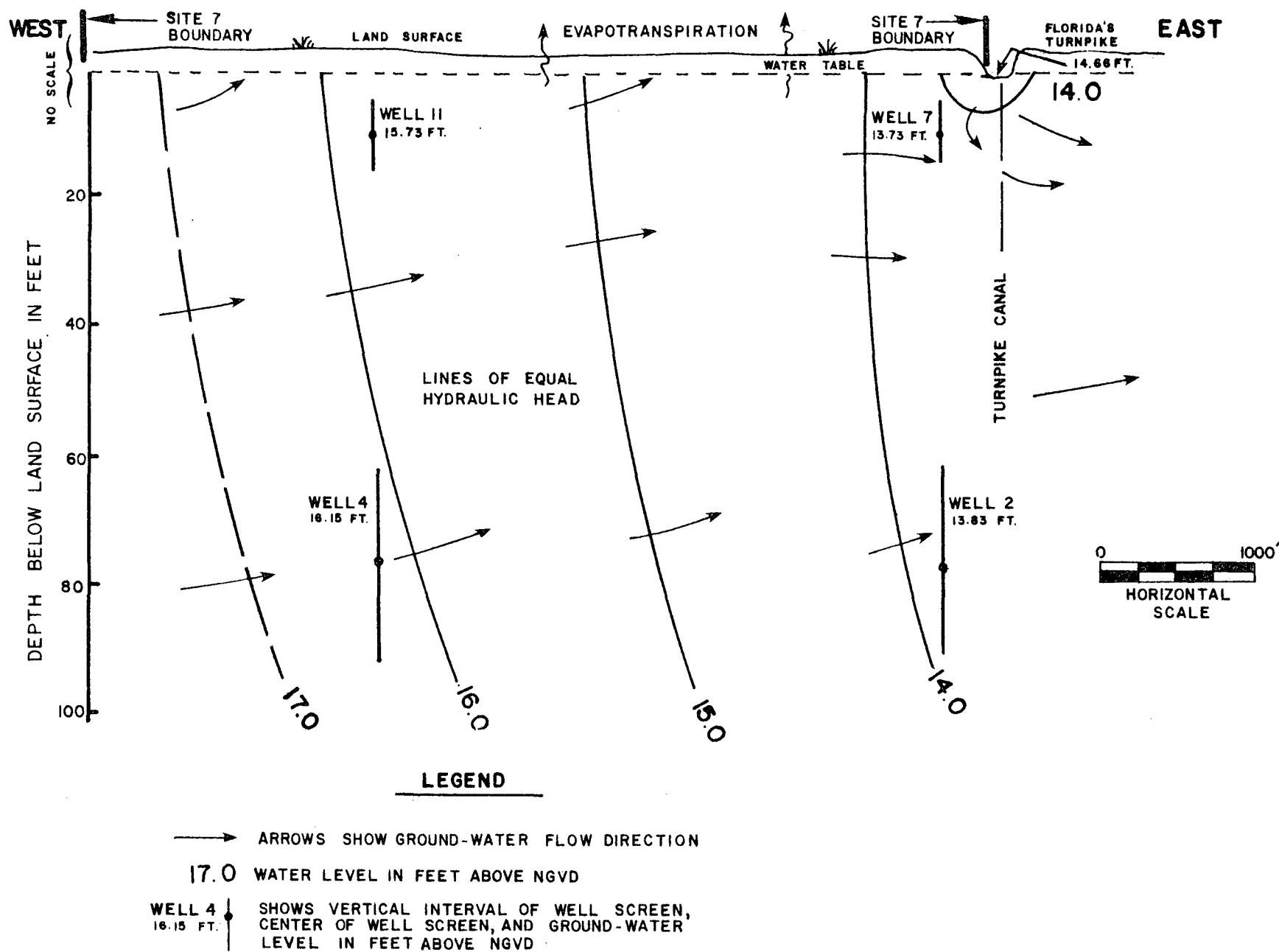
Based on water-level data and the results of pumping tests, it is possible to estimate the ground-water flow through the shallow aquifer from west to east using Darcy's Law (Walton, 1970). That relationship states that the ground-water flow velocity is directly proportional to the permeability and ground-water gradient and inversely proportional to the porosity. In the shallow zone (to a depth of 50 feet), an average permeability of 700 gpd/sq.ft. (gallons per day per square foot), an average gradient of 0.0007 ft./ft. (from Figure 2.3-15), and an average porosity (approximately equal to the storage coefficient) of 0.20, result in an average ground-water flow velocity of 0.33 feet per day. In the deep zone (50 to 100 feet in depth), the average permeability is 1,000 gpd/sq.ft., and the gradient and porosity are 0.0007 ft./ft. and 0.20, respectively, resulting in an average ground-water flow velocity of 0.47 feet per day. Ground-water would flow through the deep zone across the west-east extent of the site (approximately one mile) in a period of about 30 years under these conditions.

There are no other aquifers that potentially may be impacted by the proposed facilities on the site. The underlying Floridan aquifer exhibits a potentiometric surface about 20 feet above land surface in the area of the site (Franks, 1982). Confining units that occur between the top of the Floridan aquifer and the bottom of the shallow aquifer are as much as 875 feet thick and allow only an immeasurably small upward migration of water from the Floridan aquifer.

2.3.2.1.2 Ground-Water Quality

Following the pumping tests on Wells 1 through 14, water was purged from each well by pumping and water samples were collected and analyzed. Before and during well drilling, precautions were taken to ensure that water samples to be pumped from the wells would not be affected by construction practices. Drilling rigs and accompanying equipment were steam cleaned before entering the site. Only water from a nearby public water supply well and bentonite were used in drilling fluids. Sections of the PVC well casings were joined with stainless steel screws and no PVC glue was used. Gravel pack material was washed with potable water before installation. To prevent surface water from mixing with ground-water, the annulus of each well was grouted with neat cement between land surface and the bottom of the casing.





After each water sample was collected, the water temperature, pH and specific conductance were measured in the field. The samples were preserved and taken to the laboratory for analysis. Samples from all wells were analyzed for parameters listed in the Primary and Secondary Drinking Water Regulations (Rules of the Florida Department of Environmental Regulation, Chapter 17-22). Samples from Wells 1, 2, 3, 4, 5, 6, 7, 9, and 12 were also analyzed for 130 Priority Pollutants (Florida Department of Environmental Regulation) including the general categories of Purgeable Organics, Base Neutrals, Acid-Extractable Organics, and Pesticides/PCB's. The results of the analyses are reported in Appendix 10.14.4.

The quality of ground-water beneath the site is good; it is characteristically hard for water in a limestone environment. The deep wells produce water samples with higher average total hardness than shallow wells; the total hardness (as calcium carbonate) range for all wells was from 164 to 467 mg/l (milligrams per liter). The pH of all samples ranged from 6.8 to 7.2 as measured in the field. The concentrations of total dissolved solids (TDS) found in deep wells ranged from 370 to 522 mg/l. Only the sample from Well 2 contained a TDS concentration greater than the 500-mg/l limit recommended by the FDER (Florida Department of Environmental Regulation) as the MCL (Maximum Contaminant Level) for public water supply systems. The TDS range for samples from the shallow wells was from 235 to 485 mg/l. The concentration of chloride ranged from 24.2 to 65.4 mg/l in the deep wells; again, the highest value occurred in Well 2. In shallow wells, the chloride range was from 5.8 to 35.9 mg/l.

None of the 130 Priority Pollutants were detected in any of the samples with the exception of zinc. Where detected, the concentrations of zinc were 0.01 mg/l which is the limit of detection. Zinc apparently occurs naturally. There were no instances of a well sample exceeding the MCL of any Primary Drinking Water standard.

There were several instances where MCL's of the Secondary Drinking Water standards were exceeded. The parameters are the saturation index, color, odor threshold, turbidity, iron, manganese, and the single case in which the MCL for TDS was exceeded as discussed above. The amounts by which these parameters exceeded the MCLs are not significant in that such concentrations are natural and can be reduced by common treatment processes. In the instance where the TDS concentration exceeds the MCL (Well 2), higher-than-background concentrations of chloride (47.6 mg/l) and sodium (65.4 mg/l) also were contained in the sample and explain this anomaly. These concentrations of chloride and sodium, however, are well below their respective MCLs and may have resulted from one of many piles of illegally disposed trash on the site.

In summary, the quality of ground water beneath the site is good and the water can and will be used as a potable supply for the facility. There are no significant instances where drinking-water MCLs are exceeded. In the few cases where MCLs are exceeded, they are only secondary standards, and the subject parameters can be handled by treatment.

2.3.2.2 Karst Hydrogeology

There are no known or expected paleokarst features that may cause a change in the hydrologic regime beneath the site. Infrared and black and white aerial photography were inspected and with the exception of wetland drainage sloughs near the center of the site, no apparent lineation of surficial features were deciphered. These sloughs conduct sheet flow toward the southeast and northeast from the west-central part

of the site; the center of the sloughs are as much as one foot lower than land on either side. These drainageways appear to be entrenched where sandy surficial sediments were slightly lower upon deposition. No evidence exists suggesting that these sloughs are founded in subsided or faulted rock. Likewise, no apparent evidence of vertical or potentially hazardous karstic development was exhibited in the results of the resistivity surveys.

Data generated during well construction revealed cavity zones at depths of 65 and 72 feet only at the location of Well 4. While such zones are common at approximately that depth in the region of the site, the development of cavities generally is confined to a horizontal bed and not extensive in a vertical direction; the supporting capability of near-surface soils and geologic materials is therefore not compromised.

Aerial photographs and topographic maps show that the site contains numerous circular-shaped depressions in the soil surface. These are typically 400 to 800 feet in diameter and are occupied by Basinger soils (sand, depressional) and Riviera soils (sand, depressional) (U.S. Department of Agriculture, 1978). These circular-shaped features apparently were natural depressions in the surface of the Pamlico Sand Formation that received runoff from adjacent higher land. Because of the uniform nature of the surficial sands, surficial erosion apparently took place uniformly around the depression until a circular-shape depression resulted. There is no evidence that these depressions are traceable to depths greater than about five feet.

2.3.3 Site Water Budget and Area Uses

The factors influencing the groundwater resources of the site are appropriately described in a water budget. The annual average rainfall on the site is 62 inches (MacVicar, 1981). The annual evapotranspiration from the water table on the site is estimated to be 39.5 inches; this number is a refinement of an evapotranspiration estimation based on a method described by Dohrenwend (1977), as derived from a site-specific groundwater flow model described fully in Appendix 10.14.7. Considered in the initial estimate for evapotranspiration were the temperature, the climatic type, and the vegetative type and density. The annual gross recharge to the aquifer is estimated to be 30 inches (Camp, Dresser & McKee, 1980). Because the water table evapotranspiration rate exceeds the estimated gross aquifer recharge as indicated in the cited model, there is no net aquifer recharge on the site during the average year. The reason for this is that the water table lies within three feet of the land surface causing a high rate of evapotranspiration from the water table. Ground-water levels are maintained high because of the WCA (West Palm Beach Water Catchment Area); water constantly seeps eastward from the WCA. One probable exception to this analysis occurs in the extreme eastern part of the site where the canals along Florida's Turnpike receive some surface water runoff and have levels generally above the underlying water table; net recharge to the aquifer may occur in this area. East of the site, ground-water levels and water table evapotranspiration rates are lower; net groundwater recharge occurs in these areas.

Surface water runoff from the site is restricted to a single outlet in the southeastern part of the site where a connection to the EPB-10 canal (east of the Turnpike) exists. This outlet drains surface water from the abandoned shell pits in the southern part of the site. Because of the restricted outlet and apparently small effect this outlet has on surface-water and ground-water levels, the annual rate of surface-water runoff considering the water budget for all of the site is estimated to be about 5 inches.

The remaining component of the water budget is the evapotranspiration that occurs from the unsaturated soil and surface water of the site. This residual in the water budget must equal 17.5 inches (rainfall of 62 inches equals the water table evapotranspiration of 39.5 inches plus surface water runoff of 5 inches, plus above water table evapotranspiration of 17.5 inches). This figure appears to be reasonable because of the large wetland areas present on the site.

The subsurface flow of ground-water beneath the site from west to east is estimated to be one million gallons per day during moderately dry periods. This flow is based on the application of Darcy's Law and includes use of the average ground-water gradient (0.0007) measured on May 23 and June 19, 1984 (when moderately dry conditions prevailed, the transmissivity of the shallow aquifer (101,000 gallons per day per foot), and the length of the site normal to the ground-water flow direction (14,000 feet). This flow is regarded as the base flow and originates from the WCA.

Other factors not included in the water budget discussed above but requested under Section 2.3.3 of this application are the annual distribution of rainfall and temperature on a monthly basis and the annual lake evaporation rate; these are shown on Table 2.3-5. The rainfall data were adapted from a document by the South Florida Water Management District (1977); the temperature data are from the Water Information Center, Inc. (1974). The annual lake evaporation is 49 inches per year (Florida Department of Natural Resources, 1974).

**TABLE 2.3-5
ANNUAL DISTRIBUTION OF RAINFALL AND
TEMPERATURE IN THE VICINITY OF THE SITE**

Month	Rainfall in Inches	Temperature (F)
January	1.24	66.9
February	1.86	67.6
March	2.48	70.0
April	3.10	73.6
May	4.96	77.0
June	11.16	80.2
July	8.68	81.5
August	9.92	82.0
September	9.92	81.0
October	5.58	77.4
November	1.86	72.0
December	1.24	68.2
Mean	5.16	74.8
Standard Deviation	3.63	5.5

In the general region of the site are water-supply sources for municipal and private utilities; these sources include one from a surface-water reservoir while the balance are from the shallow aquifer. The West Palm Beach Water Catchment Area (WCA) is located along the western border of the site. Water captured from rainfall within this area is used to provide drinking water to the City of West Palm Beach. The WCA has been designated a Class I water by the Florida Department of Environmental Regulation, and as such, a 3,000-foot setback distance is required between the WCA and the nearest point of a Class I or III Land-

fill. Water within the WCA is controlled at elevations generally between + 17.5 and + 18.5 feet NGVD (National Geodetic Vertical Datum).

Within five miles of the site, the shallow aquifer is tapped by wells that are used to supply water to the utility systems shown on Figure 2.3-16. The systems indicated include all those operated under conditions of a Consumptive Water Use Permit issued by the South Florida Water Management District. Table 2.3-6 shows the system names and their respective permitted withdrawal rates (from the files of the South Florida Water Management District). Water-supply sources shown on Table 2.3-6 are keyed to Figure 2.3-16.

TABLE 2.3-6
PERMITTED PUBLIC WATER SUPPLY SOURCES
LOCATED WITHIN FIVE MILES OF THE SITE

No. on Figure 2.3-16	System Name and Average Daily Water Use (g)	Transmissivity Coefficient (gpd/ft)	Storage Coefficient (unitless)	Leakage Coefficient (gpd/cu.ft)
1	Century Utilities, Inc. 1.62 mgd	1,000,000 (a)	0.013 (b)	(c)
2	Consolidated Utilities, Inc. 0.24 mgd	84,000 (b)	(c)	0.017 (b)
3	Mangonia Park Utilities, Inc. 0.57 mgd	84,000 (b)	(c)	0.0068 (b)
4	Palm Beach Co., System 1 6.50 mgd	1,300,000 (g)	0.013 (g)	(c)
5	City of Riviera Beach Wellfield A—1.76 mgd	84,000 (g)	(c)	0.0068 (d)
6	Wellfield B—1.18 mgd	84,000 (b)	(c)	0.0068 (b)
7	Wellfield C—1.61 mgd	84,000 (b)	(c)	0.0068 (b)
8	Wellfield D—1.40 mgd	84,000 (b)	(c)	0.0068 (b)
9	Seacoast Utilities, Inc. Wellfield A—12.30 mgd	400,000 (d)	0.0004 (d)	(c)
10	Wellfield B—2.52 mgd	54,000 (d)	(c)	1.017 (d)
11	Wellfield C—4.51 mgd	66,000 (d)	(c)	1.0 (e)
12	City of West Palm Beach Water Catchment Area,	(f)	(f)	(f)
13	M-Canal,	(f)	(f)	(f)
14	Lake Mangonia,	(f)	(f)	(f)
15	Clear Lake	(f)	(f)	(f)

(a) based on specific capacity test, from SFWMD files.

(b) based on determination from nearby pumping test

(c) not available or not measured

(d) determined from pumping test, from G&M files

(e) based on interpretation of regional data from G&M files

(f) not applicable, water is from surface source

(g) from SFWMD files

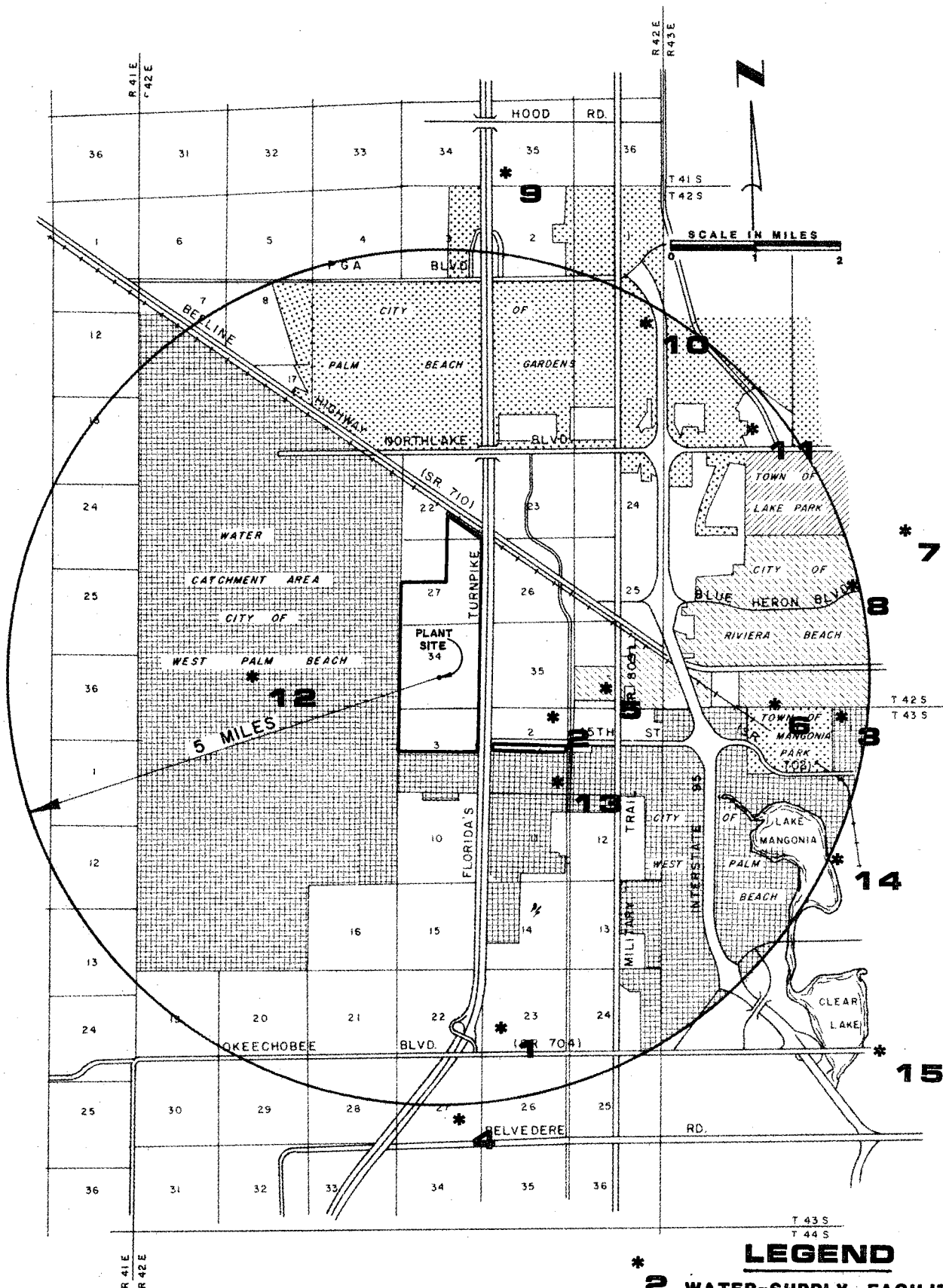
Abbreviations:

SFWMD, abbreviates South Florida Water Management District

G&M, abbreviates Geraghty & Miller, Inc.

gpd/cu.ft., abbreviates gallons per day per cubic foot

mgd, abbreviates millions of gallons per day



**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**PERMITTED PUBLIC
WATER-SUPPLY FACILITY
WITHIN FIVE MILES**

FIG. 2.3-16

Potable wells located within one mile of the site are shown on Figure 2.3-17. With the exception of the well of Consolidated Utilities, Inc. (also shown on Figure 2.3-16), these wells are private domestic wells or wells used by small businesses that are pumped at rates probably less than 1,000 gallons per day. These wells are generally two to six inches in diameter and tap the shallow aquifer.

2.3.4 Surficial Hydrology

2.3.4.1 Hydrologic Characterization

Surface water flow on the site is influenced by wetland areas present at the site. The average depth of standing water typically occurring in the wetlands is approximately one foot.

Recent aerial photographs depict wetlands in the center of the project site. At one time, there existed a hydraulic connection between the surface waters in these wetlands and the area to the west of the site designated as the West Palm Beach Water Catchment Area (WCA). However, this historical connection is now disrupted by a dike that runs along the eastern boundary of the WCA.

Wetlands in the central portion of the site are hydraulically interconnected, directing flow from west to east across the site. This wetland network presently has three discharge points on the eastern boundary of the site, releasing excess surface water into the canal along Florida's Turnpike as shown in Figure 2.3-18. The Turnpike canal, in the vicinity of the site, is not part of any drainage system and has no outlet. It is believed that the installation of this canal was for the primary purpose of interception and ground-water recharge of runoff from the southbound lanes of the Turnpike. The hydraulic connections that presently exist between the wetlands on the site and the Turnpike canal will be interrupted by landfill construction.

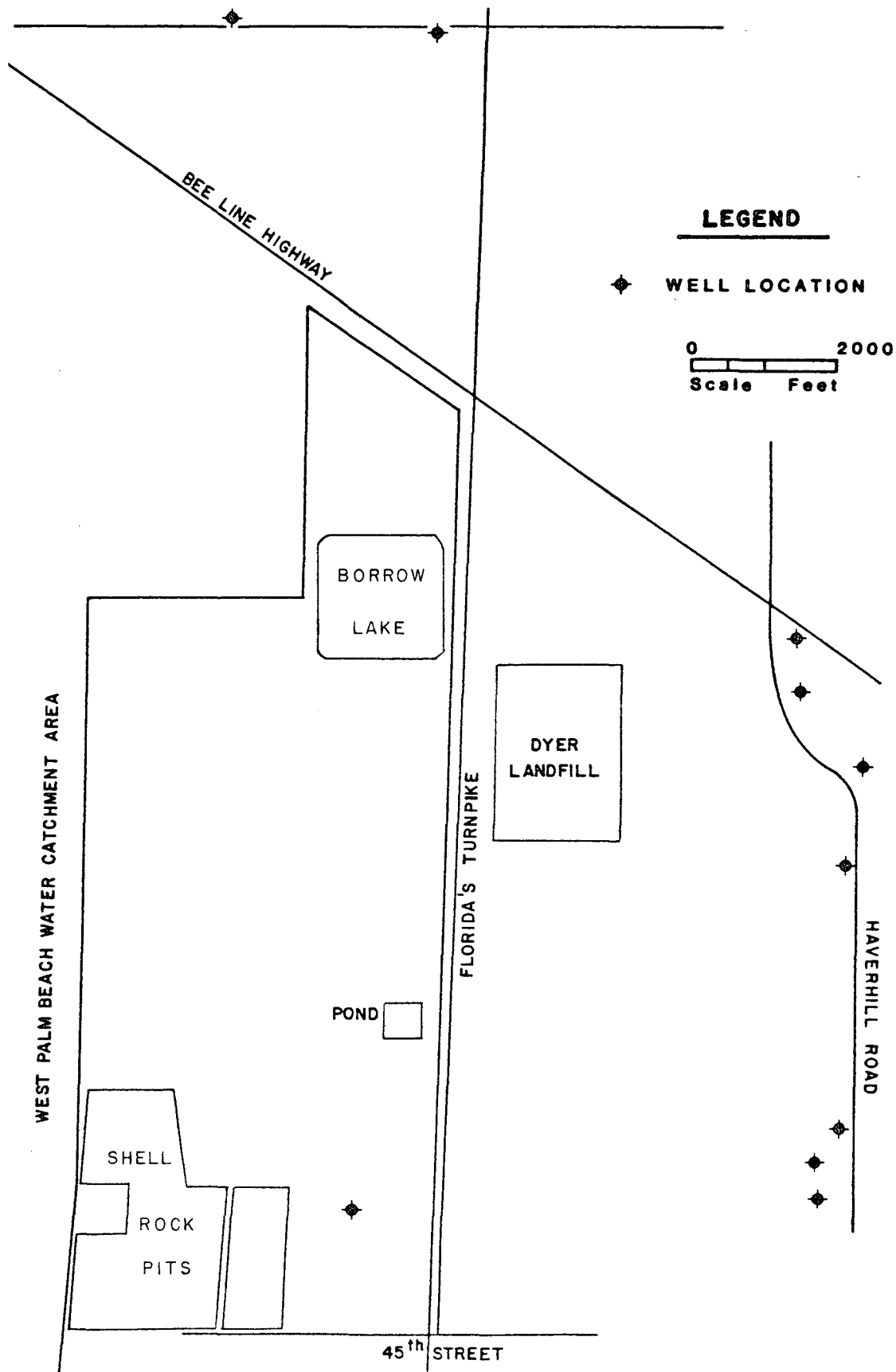
A canal in the southeast portion of the site, running east from the abandoned shell pits and under the Turnpike, hydraulically connects limited areas of the site with the EPB-10 Canal. The elevation in the EPB-10 canal controls, to a certain extent, the surface water elevations on the site. The EPB-10 Canal is part of the Northern Palm Beach Water Control District system which ultimately flows into the C-17 Canal (part of the South Florida Water Management District System).

One other canal is present on the site. This large canal forms the southern boundary of the Gladstone tract south of 45th Street to intercept runoff from property north of the City of West Palm Beach property. This canal has no apparent hydraulic connections with any surface water body or control ditches.

2.3.4.2 Measurement Programs

The background surface-water quality of the site was established by analysis of surface waters found at eleven selected sample locations on the site. The sample points were located so as to: (1) determine if there was any surface-water quality differential across the site; (2) reveal any change in water quality within an existing wetland network; and (3) allow evaluation of changes in surface-water quality once facility construction and/or operation begins.

Sampling and analyses were performed with the analytical results summarized in Tables 2.3-7a through 2.3-7d.



PALM BEACH COUNTY
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LOCATION OF
POTABLE WATER WELLS
WITHIN ONE MILE OF SITE

FIG. 2.3-17

As listed in Table 2.3-7a, the surface-water quality is satisfactory when compared to Florida State drinking water regulations. Organic and metals levels are satisfactory. The only problems at the sample locations are color and to a lesser extent, turbidity. The color levels for samples SW-3, 4, 5, 6, 9, 10 and 12 are all well over the color standard (15 Pt-Co Units). Coliform counts at SW-4, 6 and 10 are high.

TABLE 2.3-7a
GENERAL WATER ANALYSIS FOR SECONDARY DRINKING WATER REGULATIONS

Methods: This water was analyzed according to "Standards Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF

DETERMINATION	(MCL)	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-8	SW-9	SW-10	SW-11	SW-12
Total Dissolved Solids, TDS	(500)	224	90	94	58	84	158	124	252	166	162	220
Phenolphthalein Alkalinity, CaCO ₃		0	0	0	0	0	0	0	0	0	0	0
Total Alkalinity, CaCO ₃		151	20.0	47.6	59.8	49.7	110	70.0	151	106	90.5	80.0
Carbonate Alkalinity, CaCO ₃		0	0	0	0	0	0	0	0	0	0	0
Bicarbonate Alkalinity, CaCO ₃		151	20.0	47.6	59.8	49.7	110	70.0	151	106	90.5	80.0
Carbonates, CaCO ₃		0	0	0	0	0	0	0	0	0	0	0
Bicarbonates, HCO ₃		184	24.8	58.1	72.9	60.6	134	85.4	184	129	110	98
Hydroxides, as OH		0	0	0	0	0	0	0	0	0	0	0
Carbon Dioxide, CO ₂		6.16	4.19	1.94	12.2	2.03	7.11	2.26	3.09	1.72	2.32	3.28
Chloride, Cl	(250)	26.2	11.1	18.9	4.7	3.7	21.0	5.8	15.5	20.1	23.7	42.6
Sulfate, SO ₄	(250)	2.7	<1.0	<1.0	<1.0	<1.0	<1.0	5.0	3.0	<1.0	4.6	7.5
Fluoride, F	(1.4-2.4)	0.164	0.054	0.076	0.043	0.023	0.075	0.055	0.373	0.087	0.162	0.135
pH (Laboratory)	(6.5-8.5)	7.7	7.0	7.7	7.0	7.7	7.5	7.8	8.0	8.1	7.9	7.7
pHs	7.49	9.21	8.31	8.47	8.27	7.75	8.04	7.38	7.77	7.87		7.95
Stability Index		7.28	11.4	8.92	9.94	8.85	8.00	8.27	6.77	7.43	7.83	8.2
Saturation Index, corrosivity	(±0.2)	0.21	-2.21	-0.61	-1.47	-0.57	-0.25	-0.24	0.62	0.33	0.03	-0.25
Color, PCU	(15)	10	40	60	>100	80	50	40	>100	50	10	60
Odor Threshold	(3)	1	1	1	1	1	1	1	1	1	1	1
Turbidity, NTU	(5)	0.7	1.9	1.6	1.1	0.9	0.2	1.3	89	0.4	1.1	2.4
Hydrogen Sulfide, H ₂ S	(F-F)	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Specific Conductance, umhos		320	63	155	91	140	225	150	310	248	230	290
Foaming Agents (MBAS)	(0.5)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium, Na	(160)	19.6	6.49	7.17	3.25	7.20	12.6	4.25	13.0	12.8	18.1	32.95
Nitrate Nitrogen, N	(10)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.39	<0.02	<0.02	<0.02
Total Hardness, CaCO ₃		153	23.1	59.8	33.9	<61.21	105	<78.9	191	105	103	105
Calcium Hardness, CaCO ₃		139	16.6	55.7	29.8	57.1	96.4	74.8	181	96.9	91.2	80.3
Magnesium Hardness, CaCO ₃		13.7	6.54	<4.12	4.15	<4.12	8.47	<4.12	10.6	8.49	11.9	24.9
Calcium, Ca		55.9	6.64	22.3	11.9	22.84	38.6	29.9	72.2	38.8	36.5	32.1
Magnesium, Mg		3.32	1.59	<1.00	1.01	<1.00	2.06	<1.00	2.58	2.06	2.90	6.04
Magnesium Hardness, CaCO ₃		13.7	6.54	4.12	4.15	4.12	8.47	<4.12	10.6	8.49	11.9	24.9
Calcium, Ca		55.9	6.64	22.3	11.9	22.84	38.6	29.9	72.2	38.8	36.5	32.1
Magnesium, Mg		3.32	1.59	1.00	1.01	1.00	2.06	<1.00	2.58	2.06	2.90	6.04
Iron, Fe	(0.3)	0.20	<0.10	0.21	0.17	<0.10	<0.10	<0.10	1.44	<0.10	0.13	0.11
Manganese, Mn	(0.05)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Copper, Cu	(1.0)	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc, Zn	(5)	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01

Results expressed in Mg/l unless otherwise designed.

< = Less Than.

> = Greater Than.

MCL = Maximum Contaminant Levels

TABLE 2.3-7b
PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORGANIC AND INORGANIC)

*METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV
 Wednesday, December 24, 1975. U.S. Environmental Protection Agency,
 National Interim Primary Drinking Water Regulations.*

RESULTS												
CONTAMINANT	(MCL)	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-8	SW-9	SW-10	SW-11	SW-12
INORGANIC:												
Arsenic, As	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Barium, Ba	1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium, Cd	0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium, Cr	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead, Pb	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury, Hg	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Selenium, Se	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver, Ag	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride, F	1.4-2.4	0.164	0.054	0.076	0.043	0.023	0.075	0.055	0.373	0.087	0.162	0.135
Turbidity, NTU	5	0.7	1.9	1.6	1.1	0.9	0.2	1.3	8.9	0.4	1.1	2.4
Nitrate Nitrogen, NO ₃ -N	10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.39	<0.02	<0.02	<0.02
ORGANIC:												
Endrin	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lindane	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methoxychlor	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2, 4-D	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2, 4,5-TP (Silvex)	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Results are expressed in mg/l (ppm).

MCL = Maximum Contaminant Levels < = Less Than

TABLE 2.3-7c
REPORT OF ANALYSIS

ACID EXTRACTABLE ORGANICS	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-8	SW-9	SW-10	SW-11	SW-12
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Nitrophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Nitrophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2, 4-Dinitrophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Chlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4-Dichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4-Dimethylphenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methyl-4,6-Dinitrophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Chloro-3-Methyl Phenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	—	—	—	<0.01	<0.01	<0.01	—	—	<0.01	—	—
BASE NEUTRALS											
bis(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Di-n-octyl phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dimethyl phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diethyl phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Di-n-butyl phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Butyl benzyl phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PCB'S											
Aroclor 1016	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aroclor 1221	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aroclor 1232	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aroclor 1242	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aroclor 1248	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aroclor 1254	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aroclor 1260	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Results expressed in mg/l unless otherwise designated.

< = Less Than.

TABLE 2.3-7d
REPORT OF ANALYSIS

MISCELLANEOUS	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-8	SW-9	SW-10	SW-11	SW-1
Ammonia, ionized	0.04	0.07	0.04	0.50	1.47	0.07	0.04	0.07	0.30	0.04	0.16
Ammonia, unionized	0.014	0.0007	0.0005	<0.03	0.07	<0.03	0.0005	0.03	0.03	0.0005	0.0013
Total Kjeldahl											
Nitrogen, TKN	0.86	2.07	0.81	4.37	4.16	1.0	0.81	0.98	1.08	0.98	1.30
Total Nitrogen, TN	0.86	2.07	0.81	4.37	4.16	1.0	0.81	0.98	1.08	0.98	1.30
Nitrate Nitrogen, N (NO ₂ -N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrogen, N											
N (NO ₃ -N)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.39	<0.02	<0.02	<0.02
Organic Nitrogen, ON	0.82	2.0	0.77	3.87	2.62	0.93	0.77	0.91	0.75	0.94	1.14
Fecal Coliform/ 100 ml (MFT)	<1	<1	<1	6	11	53	1	<1	300	6	<1
Total Coliform/ 100 ml (MFT)	5	2	<1	3,700	80	500	1	3	600	7	2
Oil & Grease, infrared	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
BOD ₅ -day	7.9	5.4	4.2	6.2	1.8	0.7	4.2	2.9	0.9	5.0	12.0
Cyanide, CN	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005
Chemical Oxygen Demand, COD	26.0	61.0	27.0	95	72	55	27.0	48.0	51	38.0	65.0
Dissolved Oxygen, DO (Field-Fixed)	7.9	5.8	9.8	5.6	11.7	4.4	9.8	*	9.4	9.55	0.5
Total Phosphate, P (T-PO ₄ -P)	0.32	0.32	0.32	<0.03	<0.03	<0.03	0.16	0.22	<0.03	0.16	<0.03
Fecal Streptococci/ 100 ml (MFT)	—	—	19,700	—	—	—	—	—	—	—	—
MISCELLANEOUSMETALS											
Beryllium, Be	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium Trivalent, Cr ⁺³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium Hexavalent, Cr ⁺⁶	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel, Ni	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01

* Sample not field-fixed, no value.

Results expressed in mg/l unless otherwise designated.

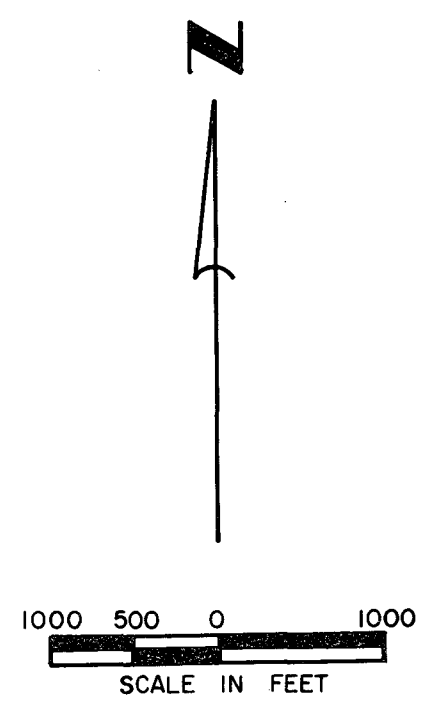
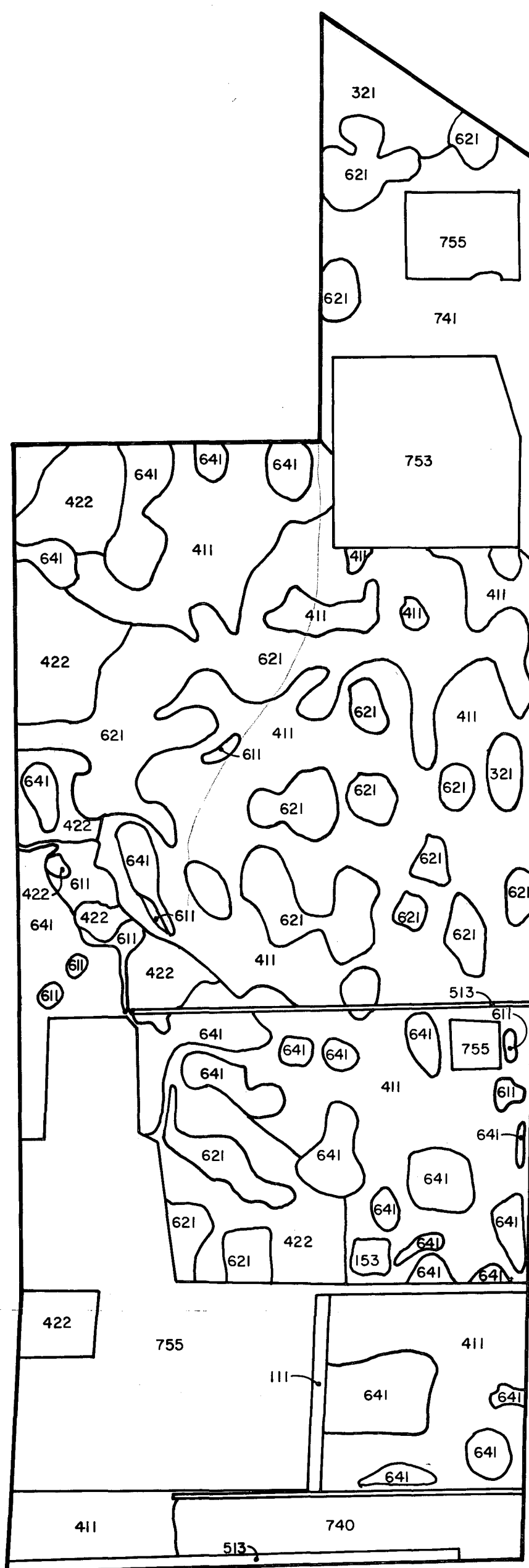
< = Less Than.

2.3.5 Land Use and Vegetation

Twelve major land use and vegetation types have been identified on the site, as depicted in Figure 2.3-18. These types are classified to level III of the **Florida Land Use and Cover Classification System**. These types are: Single Unit, Low Density Housing (111), Broadcasting Tower (153), Palmetto Prairies (321), Pine Flatwoods (411), Other Hardwoods (422), Canals (513), Cypress Wetland Forest (611), Freshwater Swamp (621), Freshwater Marsh (641), Scraped Areas (741), Sand, Gravel or Clay Extractive (753), and Abandoned Extractive (755).

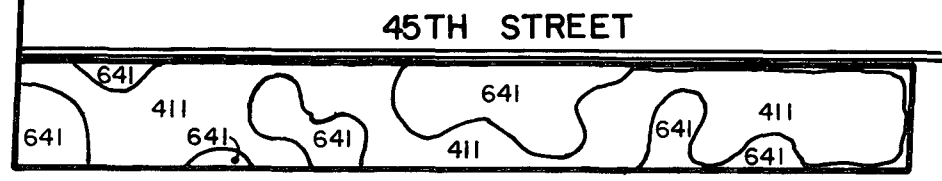
The only area of low density housing (111) is the Roane parcel at the south end of the site. The size of this parcel (6.6 acres) requires that it be included in the land use map required for the power plant siting permit.

The Broadcasting Tower (153) use includes the small area surrounding the broadcasting tower at the south end of the site. The total area in this land use is less than the 10 acres required for inclusion in the power plant siting permit application.

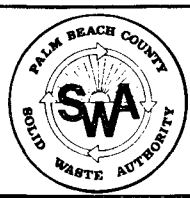


LEGEND

- 111** SINGLE UNIT , LOW DENSITY HOUSING
- 153** BROADCASTING TOWER
- 321** PALMETTO PRAIRIES
- 411** PINE FLATWOODS
- 422** OTHER HARDWOODS
- 513** CANALS
- 611** CYPRESS WETLAND FOREST
- 621** FRESHWATER SWAMP
- 641** FRESHWATER MARSH
- 740** ALTERED LANDS
- 741** SCRAPED AREAS
- 753** SAND , GRAVEL OR CLAY EXTRACTIVE
- 755** ABANDONED EXTRACTIVE



**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



LAND USE CLASSIFICATIONS

The area of the active dredge lake at the north end of the site falls into two land use categories. The lake itself is Extractive use (753). The cleared area surrounding the active borrow lake is a Scraped (741) or Altered land use (740), as is most of the area south of 45th Street. The vegetative cover of the northern scraped area is a mixture of herbs and grasses that have established themselves since the area was disturbed. The dredge lake itself may also be classified in the Lake land use class (521) but this is secondary to the extractive use.

Three areas within the site fall into the Abandoned Extractive class (755). The abandoned lakes at the southern end of the site, the small abandoned lake 4,000 feet north of 45th Street and adjacent to the Turnpike and the abandoned lake north of the currently active dredge lake all fall into the Abandoned Extractive category (755). The drier portions of the southern area are dominated by brazilian pepper and australian pine; the wetter segments by cattail, spatterdock and duckweed. The other areas are dominated by cattail, grasses and sedges. Abandoned Extractive is the primary land use classification, but these areas may also be classified as lakes, similar to the active lake.

The Canal class (513) covers three areas. The drainage canal at the southern end of the site, running from the abandoned borrow lakes under the Turnpike is one canal. The large canal that forms the southern border of the Gladstone tract south of 45th Street is the other large canal on the site. The system of drainage ditches connecting the internal marshes at the center of the project is the third system in this land use class. Vegetation in these canals is a mixture of spatterdock, cattail, spikerush and pickerelweed.

The remaining six classes identify the areas of relatively undisturbed vegetative cover on the site. Pine flatwoods (411) occupies a large portion of the uplands on the site. The dominant tree species is slash pine, with an understory of saw palmetto, and myrtle in wetter areas. Andropogons and other grasses are mixed with a number of herbs, including many polygalas, in the groundlayer. Much of the flatwoods area on the site is stocked with pole size or smaller pines. These areas are not the optimal quality habitat for this type. Past grazing and disturbance may have played a role in reducing the quality of these areas.

Palmetto prairies (321) occur in an admixture with the pine flatwoods. Palmetto dominates this community, with grasses in the understory and gallberry and occasionally myrtle sharing the canopy with palmetto. The palmetto and pine flatwoods occur in close association, with definite boundaries difficult to determine, and indicated in part by a reduction in the cover of the overstory pines.

Pine flatwoods intergrade with Sabal Palm hammocks (422) on the site. Epiphytic ferns and orchids occur in this plant community. Ferns are the dominant groundlayer plants in these hammocks. Vines, such as smilax, woodbine and poison ivy are also abundant in this community. Many of these hammocks are relatively intact and undisturbed.

The upland flatwoods and hammocks intergrade with wetter habitats on the site. In the transitional areas between upland and wetland, strands of Cypress forest (611) occur. This community type also occupies depressional pockets in the uplands, and forms cypress heads in some of the larger wetland areas. Cypress is, of course, the dominant species. Bromeliads are abundant in this community. Willow and maple may occur as understory species. The groundlayer is a mixture of upland and wetland herbs and grasses, with the dominant group varying with moisture conditions prevailing at each specific location.

Inland ponds and sloughs are the Freshwater swamp (621) vegetation types occurring on the site. Maple and willow dominate the wetter phases of this type, and myrtle the drier phases. Many of the myrtle dominated areas have little or no groundlayer flora. Pickerelweed, arrowhead, and sawgrass dominate the groundcover of the wetter areas. Most of the wetland areas that have been drained or disturbed in the central region of the site are myrtle dominated freshwater swamps.

There are two distinct types of Freshwater marsh (641) occurring on the site. Wet prairie is the marsh community that occupies the drier phases of the marsh type. Grasses and sedges, such as andropogon and rhynchospora occur abundantly in this type. St. John's wort and cocoplum are abundant shrubs. Slash pine occurs as scattered and stunted individuals in the wet prairies. Fringes of wet prairie surround many of the freshwater swamp areas on the site.

The wetter phase of this community type occurs as either sawgrass marsh, or marsh dominated by spikerush and pickerelweed. The most notable feature of this community is the absence of trees and woody vegetation. Many of the least disturbed wetland areas on the site are this type of marsh. These marshes often occur with a surrounding cypress strand.

2.3.6 Ecology

A single species on the Federal threatened species list was directly observed on the site during the surveys. This was the American Alligator (**Alligator mississippiensis**). This species is also on the Florida Game and Freshwater Fish Commission (FGFWFC) species of special concern list. This species was observed in the larger canals and in the abandoned borrow lake area. Many of the marsh areas on the site are lacking water of a depth great enough to provide optimal alligator habitat.

Four other species identified as species of special concern by the FGFWFC were directly observed on the site. All are bird species. They are: Little Blue Heron (**Florida caerulea**), Snowy Egret (**Egretta thula**), Tricolor Heron (**Hydranassa tricolor**), and Limpkin (**Aramus quarauna pictus**). All of the species are closely associated with wetland habitats. Our surveys indicate that the areas most heavily utilized by these species on the site are the large marshes at the west end of the site. The swamp areas in the central portion of the site appear to be used for foraging after heavy rains.

Five species considered game or furbearers were observed on the site. Game animals were White-tailed Deer (**Odocoileus virginianus**) and Wild Hog (**Sus scrofa**). Furbearers observed were Opossum (**Didelphis marsupialis**), Raccoon (**Procyon lotor**), and Bobcat (**Lynx rufus**). Each of these species typically have ranges that cover both upland and wetland habitats. All are common to undeveloped areas in this part of the state.

All species of orchids are on the Florida threatened species list. Two species were observed on the site and several more may be present. The Wild Pine Bromeliad (**Tillandsia fasciculata**) was observed on the site and is listed as endangered, primarily because of heavy pressure from plant collectors. All other species of bromeliads, except Spanish Moss and Ball Moss are listed as threatened. One other threatened bromeliad was observed, and several other probably occur mainly within the cypress woods that are scattered over the site.

Two species on the Federal and State Endangered lists were not observed on the site during the initial survey. The Wood Stork (**Mycteria americana**) may occasionally visit the site for foraging, but there is a low probability any nesting or long term residence takes place. The situation is similar for the Snail Kite (**Rostrhamus sociabilis**). Both of these species would more likely make use of wetlands in the adjacent water catchment area, and visit the site on a more or less chance basis. Snail kites were observed in the conservation area on April 27, 1985, during an Authority sponsored wilderness walk hosting local environmental groups. It appears that the snail kites are not nesting on site, but are in the area because of the recent drought.

The Red-Cockaded Woodpecker (**Picoides borealis**) is listed as endangered Federally, and threatened by the State. It was not observed on the site. This species is dependent on mature stands of pine for its habitat. The pine flatwoods present on the site are a marginal habitat for this bird, and only a slight change of its occurrence on or use of the site exists.

The Southeastern kestrel (**Falco sparverius paulus**) is listed as threatened by the State of Florida. It was not observed on the site, but may utilize the area on an irregular basis. Kestrel's occur in the area but it is difficult to determine if the individuals are part of the threatened population or migrants from other populations passing through the area.

A portion of the fauna of the site was not extensively surveyed, due to the season in which the surveys were conducted. Bird species that may utilize the site during migration may not have been present during the survey period. This type of use undoubtedly occurs on a transient basis. All habitats are likely to receive use by migratory birds. The only two important species with any probability of using the site are Bachman's warbler (**Vermivora bachmanii**) and Kirtland's warbler (**Dendroica kirtlandii**). These species migrate through Florida and the Gulf States. The site is in the general migration corridor, but has no exceptional features to attract these species. The probability of their using the site is very remote.

The discussion above identifies the important species that may occur within 5 miles of the site. As stated, the presence of extensive wetlands in this 5 mile area increases the probability that important species associated with wetlands will occur. This site presents no outstanding or exceptional features to attract important species. The populations that utilize the site would be present in approximately equal abundance in any similar area in the region.

The single most comprehensive work on the ecology of the area is the 1974 publication **Environments of South Florida: Present and Past** (Gleason 1974). This compendium of work by a number of authors covers features from hydrology and soils through wildlife.

Several more specific works on the vegetation of the area include Long (1974), Austin (1976) and Richardson's detailed analysis of the vegetation of western Palm Beach County (Richardson 1977). All of these works are included in the citation list at the end of this report. These papers were published in the **Florida Scientist**, which contains a number of other papers that pertain to a lesser degree to the area. This journal is the best sources of material concerning the ecology of the area.

2.3.6.1 Species-Environmental Relationships

Based on a visual evaluation of the site during the various surveys, the abundance and balance of species within the communities on the site is typical for the region. Factors that are effecting the general habitat value of the site are outlined in the sections on Ecology (Section 2.3.6), and Pre-existing Stresses (Section 2.3.6.2).

The vegetation of the site creates a mixture of uplands, wetlands and edge habitats that are utilized by the fauna of the area. Sufficient populations of predators are present to keep prey populations in check. While the site has suffered some disturbance, as discussed in Section 2.3.6.2, the communities and populations on the site have retained some ability to adapt to conditions as they exist on the site, or that may occur as the site is developed.

There are no species endemic or unique to the site. The species and habitats on the site are ubiquitous and typical of Palm Beach County and South Florida. The close proximity of the City of West Palm Beach Water Catchment area increases the chances of having the more uncommon species such as the Wood Stork and Snail Kite make use of the site. The Catchment area serves as a refuge area that a number of species may utilize as a base, when foraging in surrounding areas.

2.3.6.2 Pre-Existing Stresses

The existing conditions at the site are in part due to the interaction of several past or existing stresses. Pollutant stress does not play a major role at the site. Most of the impact is the result of man's alteration of the land use, drainage and species composition of the site. Many of the perturbations have caused major shifts in the ecological balance of the site.

One of the most dramatic changes that has occurred on the site is the alteration of land use in the creation of dredge lakes. The removal of natural biotic communities, primarily wetlands, and their replacement with the deepwater habitat of the borrow lakes and the disturbed areas that surround them has altered a large area of the site. The negative impacts of this shift have been to eliminate viable and productive upland and wetland. Much of the disturbed area has provided a habitat for introduced and pest species.

There is a positive benefit that has resulted from some of this alteration. The creation of deepwater habitat for fish and aquatic species has provided a recreational resource that is utilized on a regular basis despite access restrictions. The second benefit is very localized, but highly significant. One of the abandoned pits at the south end of the site receives heavy use by White Ibis (**Eudocius albus**), as a roost and rookery. Any consideration of wildlife habitat on the site will have to include this area.

A second major stress that man has imposed on the site is the establishment of a network of ditches and culverts to drain the wetlands at the interior of the site. This alteration has caused a shift in the species composition of these areas. Myrtle (**Myrica cerifera**) dominates many of the wetlands that have been drained. Willow (**Salix caroliniana**), sawgrass (**Cladium jamaicensis**) and a number of other herbaceous wetland species are underrepresented in these drainage wetlands. The drainage of these wetlands has imposed a stress that has altered the species composition, reduced the vigor of species present, and probably reduced the overall quality of these drained areas.

A third stress evident at the site is the presence of several introduced species. Brazilian pepper (***Schinus terebinthefolius***), Melaleuca (***Melaleuca quinquenervia***) and Australian pine (***Casuarina Equisetifolia***) are all present at the site. Australian pine and Brazilian pepper dominate many of the disturbed areas on the site. Melaleuca is encroaching on many of the wetland areas and is established on several upland sites. The aggressive nature of these species in displacing native flora constitutes a major stress at the site; one which will undoubtedly increase with time.

Wild hog, although considered a game mammal, is an introduced species. Hogs can cause considerable disturbance of ground cover flora by rooting. Ground dwelling birds, animals and their young may suffer predation. Wild hogs prey heavily on native species of snakes. The fact that the area is closed to hunting eliminates a check on the population. This species may constitute a stress on the biota of the site.

The last stress on the site is caused by the presence of man. The activity on the access road, the presence of trespassing fishermen, the use of the area by off-road vehicles and the probable hunting and poaching on the site all have an impact on the biota. The network of trails on the site makes much of the area accessible to vehicles, with a resultant impact on the flora. The more sensitive and secretive wildlife species are probably excluded from parts of the site by man's presence. The current and continuing use and alteration of the site by man exerts a significant impact.

2.3.6.3 Measurement Programs

Plant species were surveyed through a series of on-site visits. The time period for these surveys was from March to May 1984. Over eight separate surveys were conducted, totalling over 60 observer hours. Initially, aerial photographs of the site were examined to delineate major communities. Examples of each community type were visited by jeep and on foot. Random walk surveys were taken, and a species list compiled. Dominance was estimated visually. Unknown specimens were collected and pressed in the field. Specimens not in flower were usually identified to the genus level based on vegetative characteristics. The manuals used as ecological and taxonomic guides are listed in the reference section at the end of the report.

Wildlife surveys were conducted on four days: 14 and 15 April, and 1 and 2 June, 1984. Observations were made on foot and from vehicles. The entire site was covered each day but a more concentrated effort was made to survey the marshes and hammocks at the western end of the site, and the pine flatwoods in the middle section. Random walk surveys were conducted. Species were identified by direct observation, songs or calls, and scats, tracks or sign. Total observer hours for the survey exceeded 60 hours. Manuals used as ecological and taxonomic guides are listed in the reference section at the end of the report.

Natural variations in ecological conditions will be monitored through observation of selected plant species (Table 2.3-8). Plant species were selected to simplify the survey and assessment procedure. The major thrust of this monitoring effort will be concentrated in the conservation area at the west side of the site.

The list of indicators will be reviewed to determine if any change in abundance or condition has occurred. These indicators fall into two groups: positive and negative. The positive group contains species indicative of high quality habitat or conditions. The negative group indicates habitat conditions which may be being adversely affected. The negative group also includes introduced and pest species.

It is anticipated that a survey of the site will be conducted on an annual basis. If the monitoring program indicates a decline in positive species abundance or conditions, or an increase in negative species abundance, more detailed analysis will be initiated to determine the causes for the change and potential solutions.

**TABLE 2.3-8
INDICATOR SPECIES**

Positive Species	Negative Species
Cypress	Melaleuca
Sawgrass	Torpedograss
Spikerush	Brazilian Pepper
Red Maple	Hydrilla
Willow	Cattails
Slash Pine	Myrtle

NOTE: No correspondence between positive and negative species is implied by their position in the table.

2.3.7 Meteorology and Ambient Air Quality

2.3.7.1 Meteorology

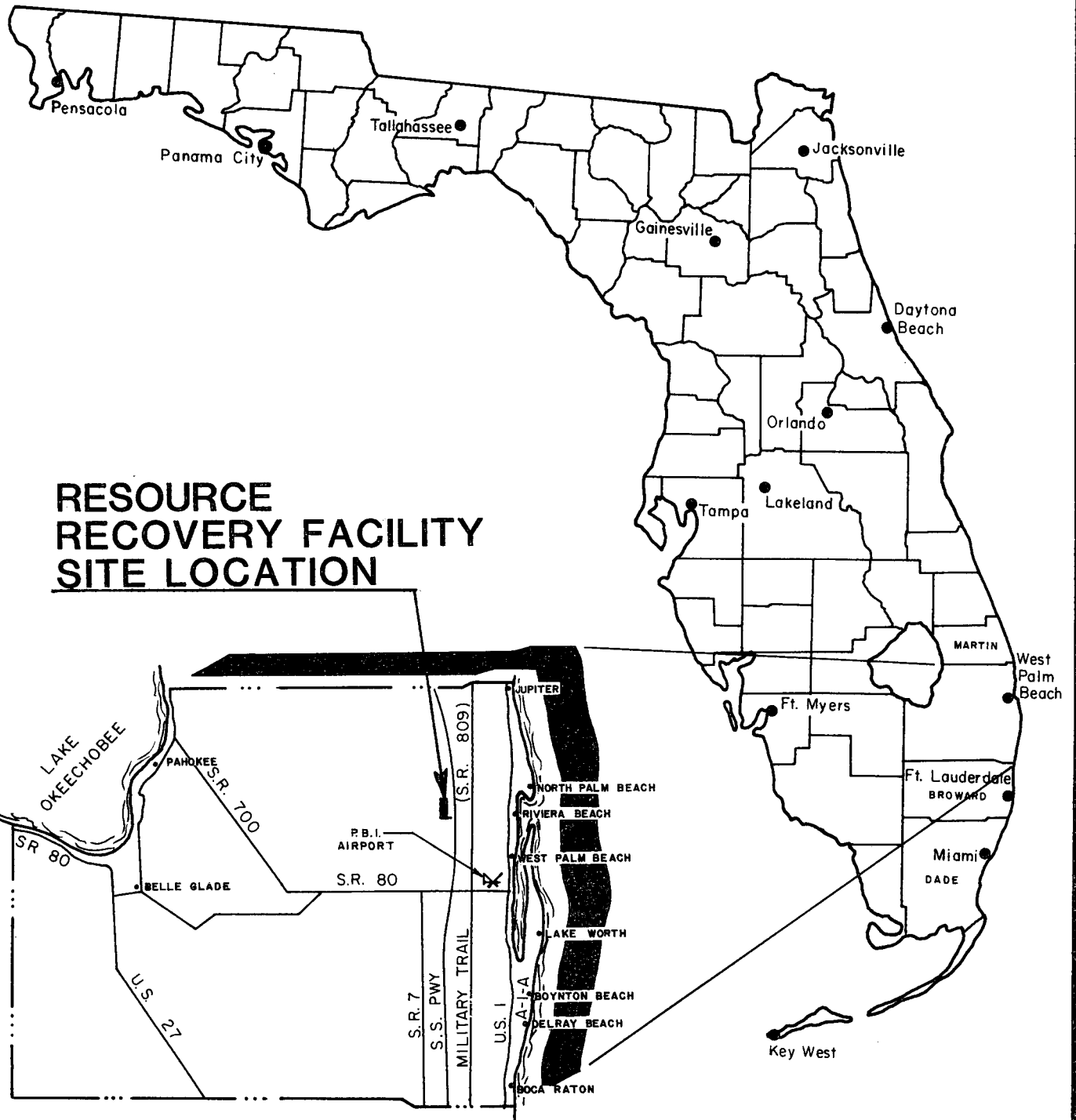
The proposed Resource Recovery Facility is to be located in Palm Beach County in the lower east coast climatological regime of Florida (Figure 2.3-19). The site is approximately 10 kilometers west of the Intercoastal Waterway and 11.5 kilometers from the Atlantic Ocean shoreline. There is no significant relief to the terrain in the vicinity.

Summer temperatures are warm and humid while the winter temperatures are moderated slightly by an occasional influx of cool air from the north. The region is dominated by the effects of the Gulf Stream which flows northward following the contours of the lower east coast and a dominant trade wind that blows from east to west (Figures 2.3-20 and 2.3-21).

The water trajectory is a moderating influence that cools the region in the summer and gives warmth in the winter. The local seawater temperature is approximately 75°F in February and 84°F in August (Neumann & Pierson, **Principles of Oceanography**, 1966). Average mean winter (January) and summer (July) maximum and minimum temperatures for Florida are shown in Figures 2.3-22 and 2.3-23.

The primary rainy season occurs during the six month period from May through October when the daytime ambient air temperatures exceed that of the water temperature. With an easterly flow instability results in most of the precipitation being associated with thunderstorms. The maximum average rainfalls are during the months of September and October. The heaviest rains may be associated with tropical storms. The chances of hurricane force winds at West Palm Beach, in any given year, are 1 in 7.

Meteorological conditions that aggravate air pollution are least likely to occur in the lower east coast region due to the prevailing easterly trade winds and the overall prevailing instability of the air. The trade winds are sufficiently pervasive so as to minimize any true sea breeze effect.



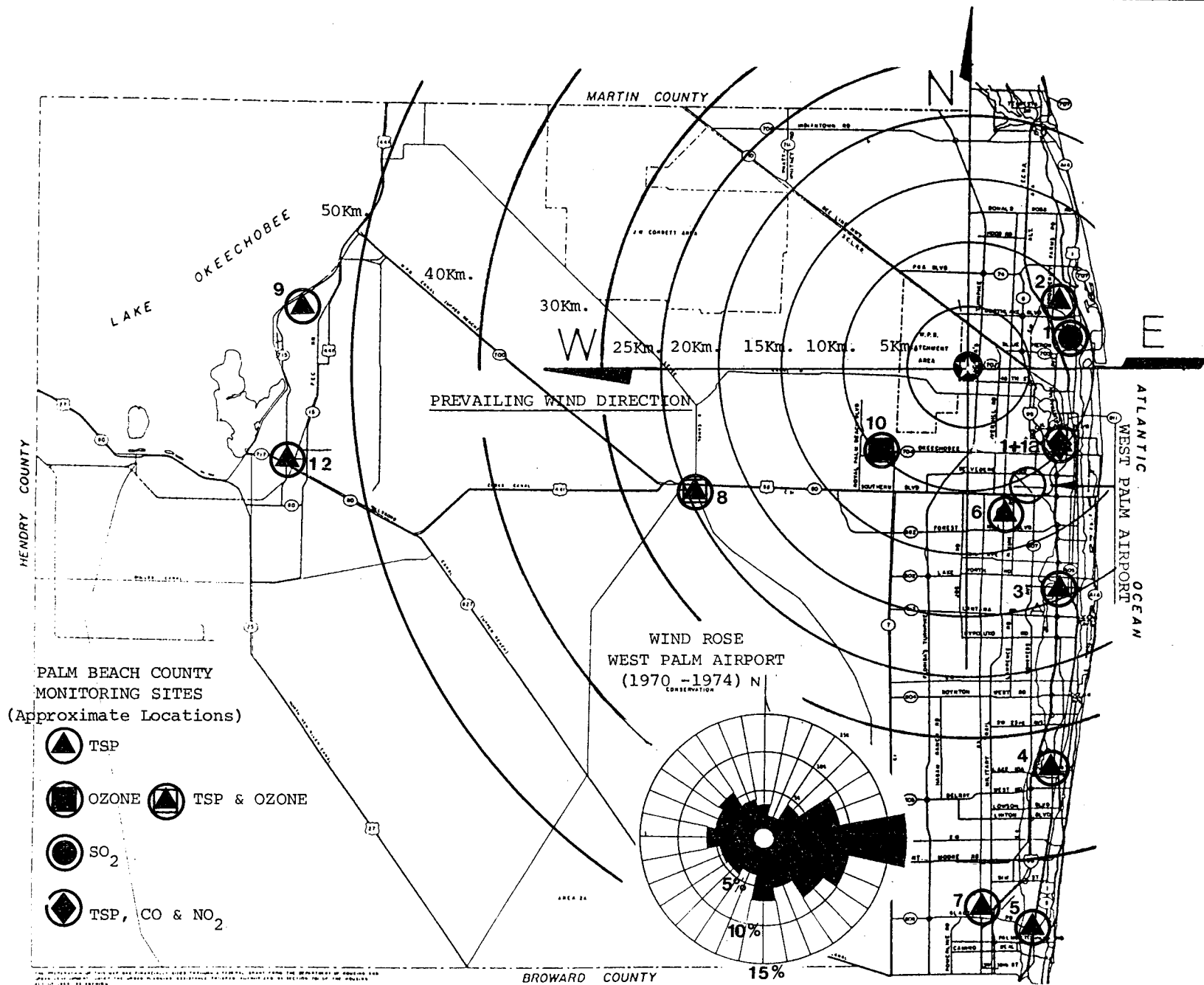
**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**

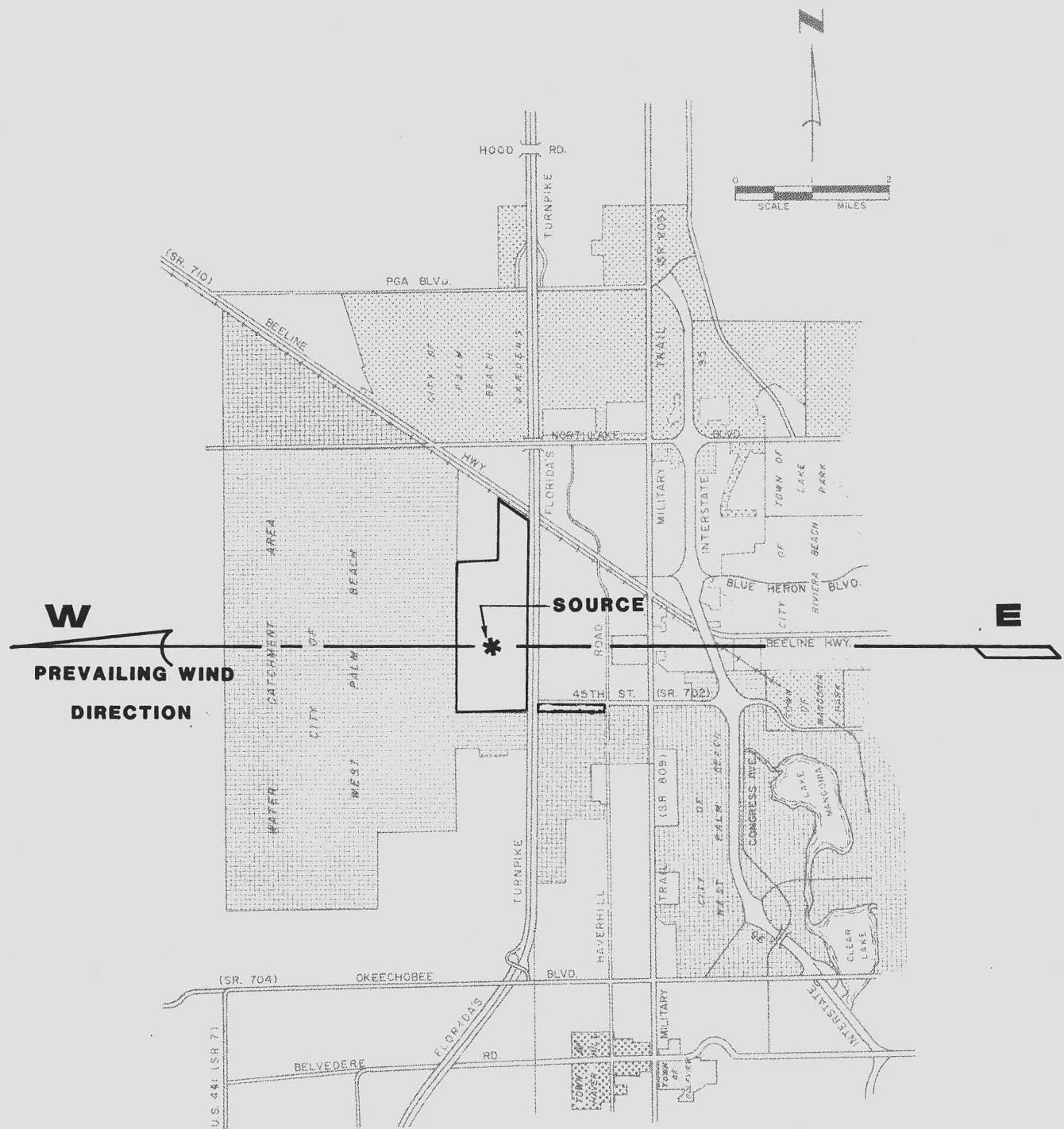


LOCATION MAP

FIG. 2.3-19

FIG. 2.3-20





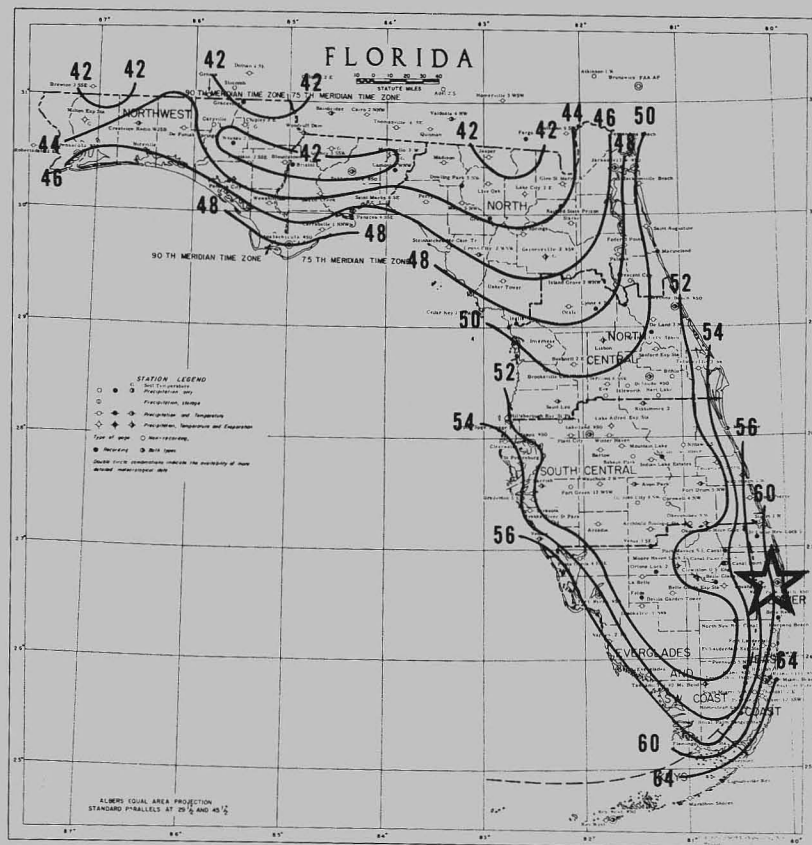
**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



PREVAILING WIND DIRECTION

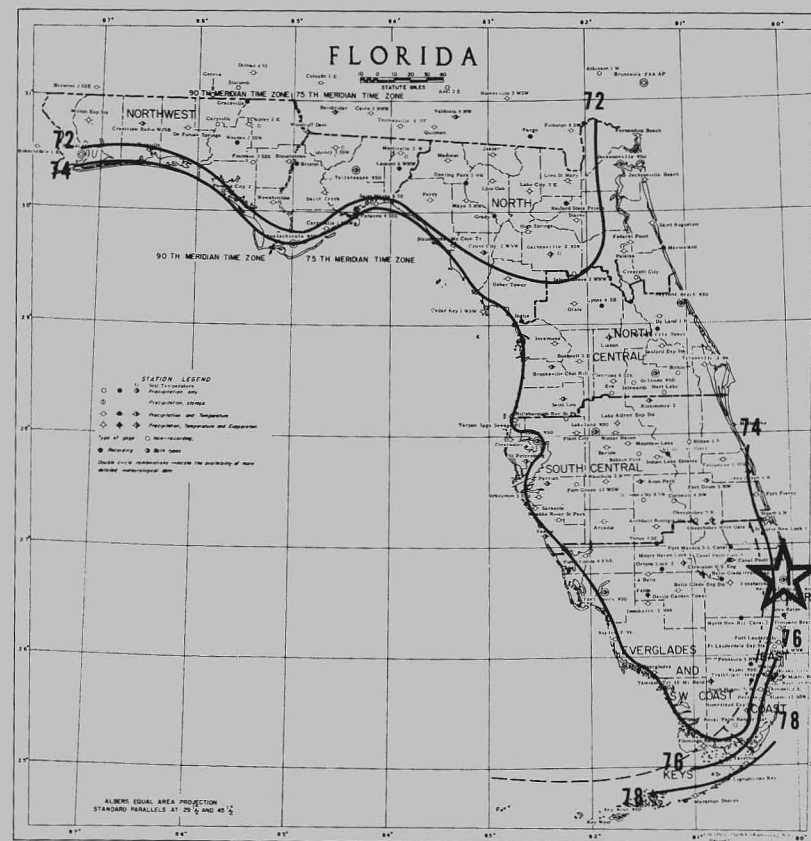


MEAN MINIMUM TEMPERATURE (°F.), JANUARY



Data are based on the period 1931-52. Isolines are drawn through points of approximately equal value. Caution should be used in interpolating on these maps.

MEAN MINIMUM TEMPERATURE (°F.), JULY



Data are based on the period 1931-52. Isolines are drawn through points of approximately equal value. Caution should be used in interpolating on these maps.

2.3.7.1.1 Regional Climatology

There are two full time, full service weather stations within 100 km of the proposed facility:

- Palm Beach International Airport
- Miami International Airport

The Palm Beach International Airport is approximately 9.5 kilometers (5.9 miles) southeast of the proposed facility. The Miami International Airport is approximately 100 kilometers (62 miles) south of the proposed facility. Both stations lie within the Florida lower east coast climatological regime. Meteorological normals for these two stations are shown in Tables 2.3-9 and 2.3-10.

2.3.7.1.2 Atmospheric Dispersion

Local atmospheric dispersion is a function of wind speed, wind direction, atmospheric stability and mixing heights. Five years (1970-1974) of pre-processed hourly data have been provided by the Florida DER in a format suitable for diffusion analyses in the West Palm Beach vicinity. These data are based on surface weather observations from Palm Beach International Airport and upper air data from Miami International Airport.

Wind speed, wind direction and atmospheric stability data for the same years were also available in "Star" format. In these data local atmospheric stability are derived from wind speed, local sky cover and time of day, in accordance with the procedures of B. Turner (Journal Applied Meteorology, Feb. 1964).

A wind frequency distribution, summarized for the data collection period from 1970-1974, is available for the Palm Beach International Airport. The joint distributions of these data as a function of wind speed and direction are shown in Figure 2.3-24. A directional summary of these data, in wind rose format, is shown in Figure 2.3-25, along with the average speed for each direction.

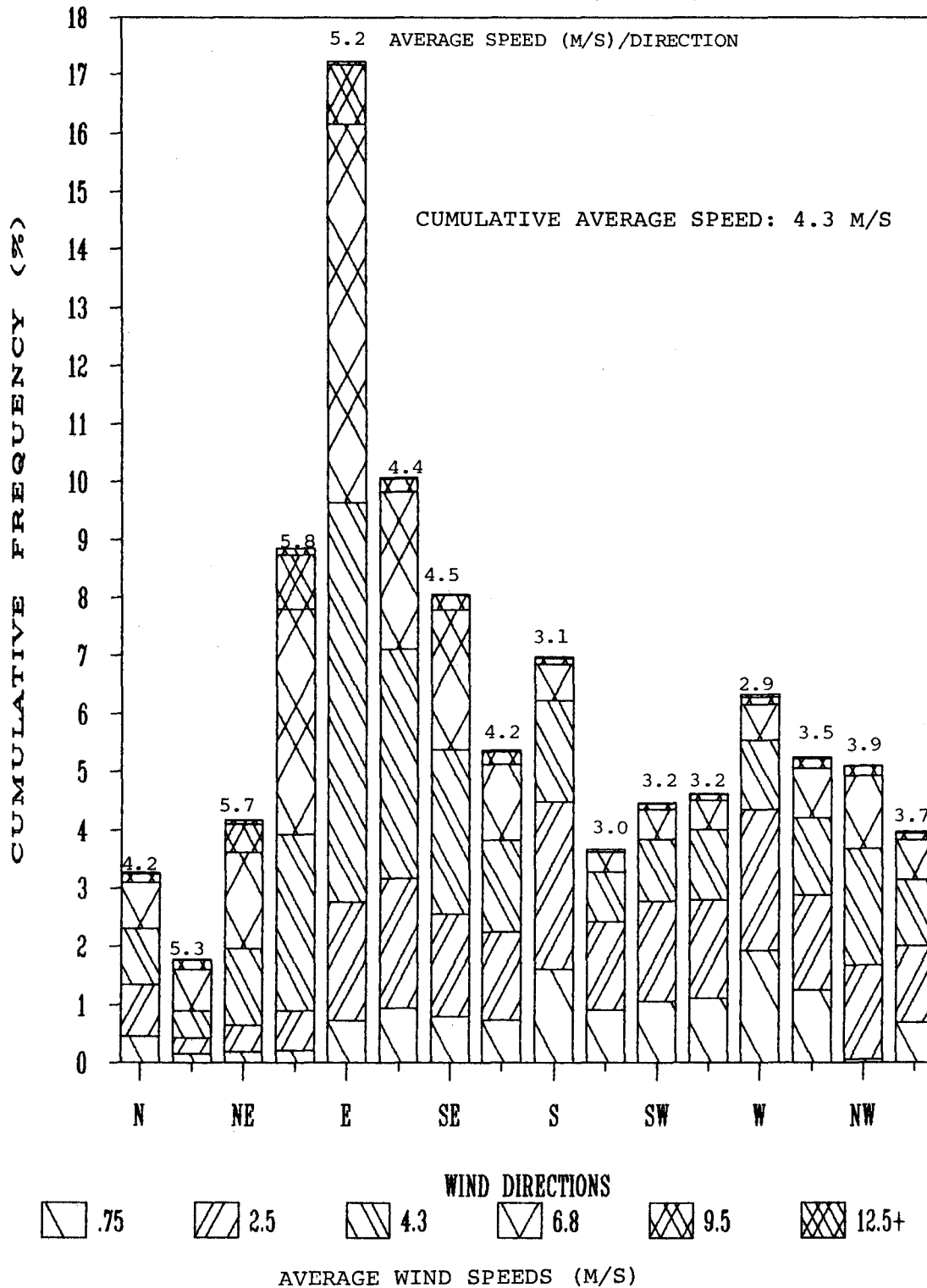
The annual average wind speed derived from the 1970-1974 summary wind frequency distribution is approximately 4.3 m/s (9.6 mph). The highest average speed as a function of wind direction is approximately 5.8 m/s (13.0 mph) for winds from the ENE. The winds with the highest annual frequency of occurrence are from the E (17.2%). Winds from the E and ESE account for 27.3% of all occurrences and winds from an expanded sector ENE through SE account for 44.2% of all occurrences.

The summary joint distributions of the wind directions and stability classes are shown in Figure 2.3-26 and 2.3-27. Stability classes 1-6 correspond to Pasquill categories A-F respectively, where 1 (A) is extremely unstable and 6 (F) is stable. The proportion of stable stability classes 5 and 6 per total frequency for each wind direction exceeds 50% for the directions SSW through NW. These two classes are 62% of all the winds from the west (W). These two classes represent less than 20% of the observations for winds from the NNE through E. For extremely unstable to neutral (1-4) stability classes, 39% out of a possible 48% total wind frequency are from the NE through SW wind directions.

The wind distribution, average speeds and stability category data are based on USDEP COMM, NOAA, EDS, NCC STAR Program results.

WIND SPEED FREQUENCY DISTRIBUTIONS

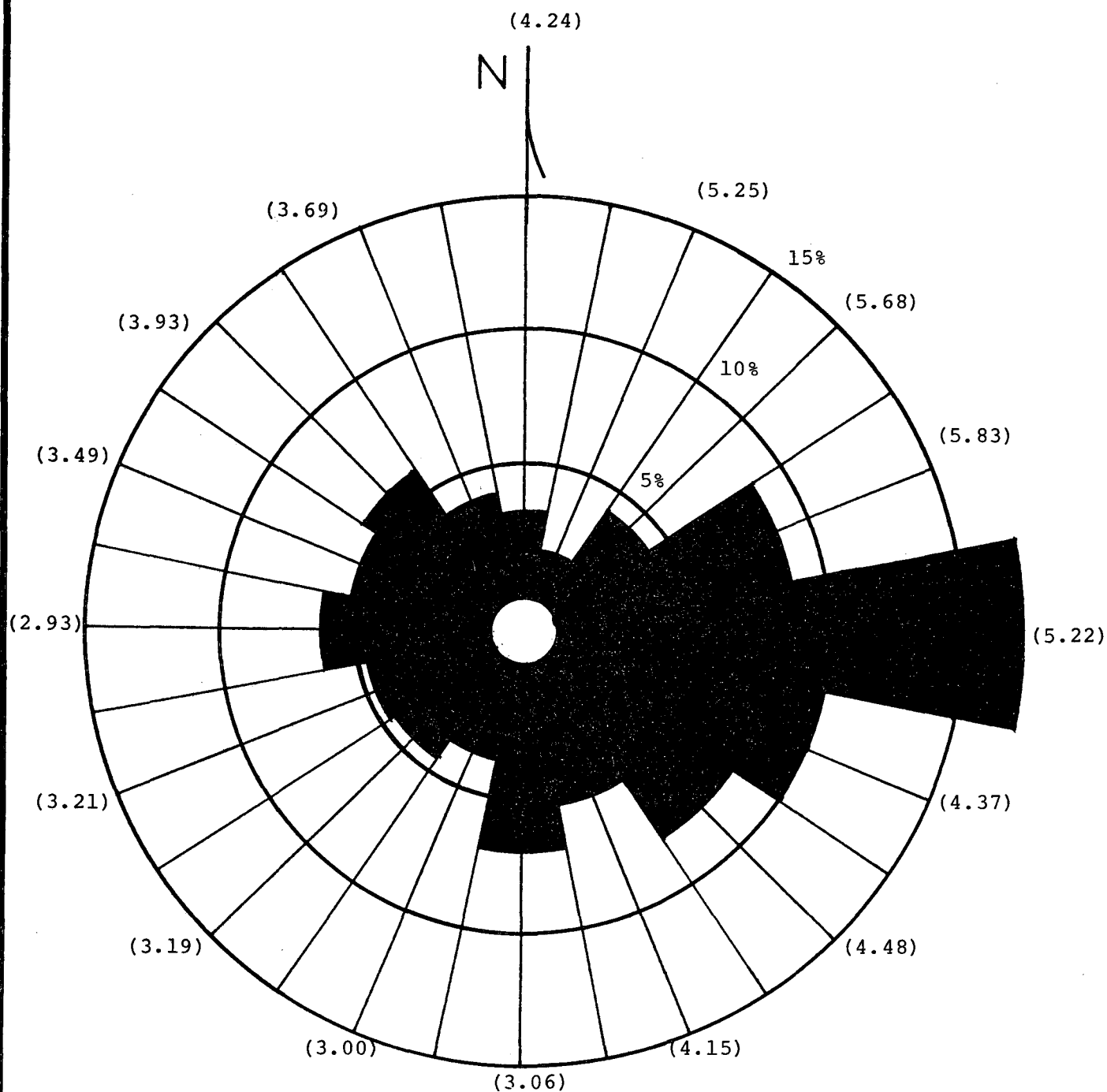
WEST PALM BEACH, FL. (1970-1974)



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



WIND SPEED FREQUENCY DISTRIBUTIONS
WEST PALM BEACH, FL. (1970-1974)



Average Wind Speed: (4.3 m/s)

**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**

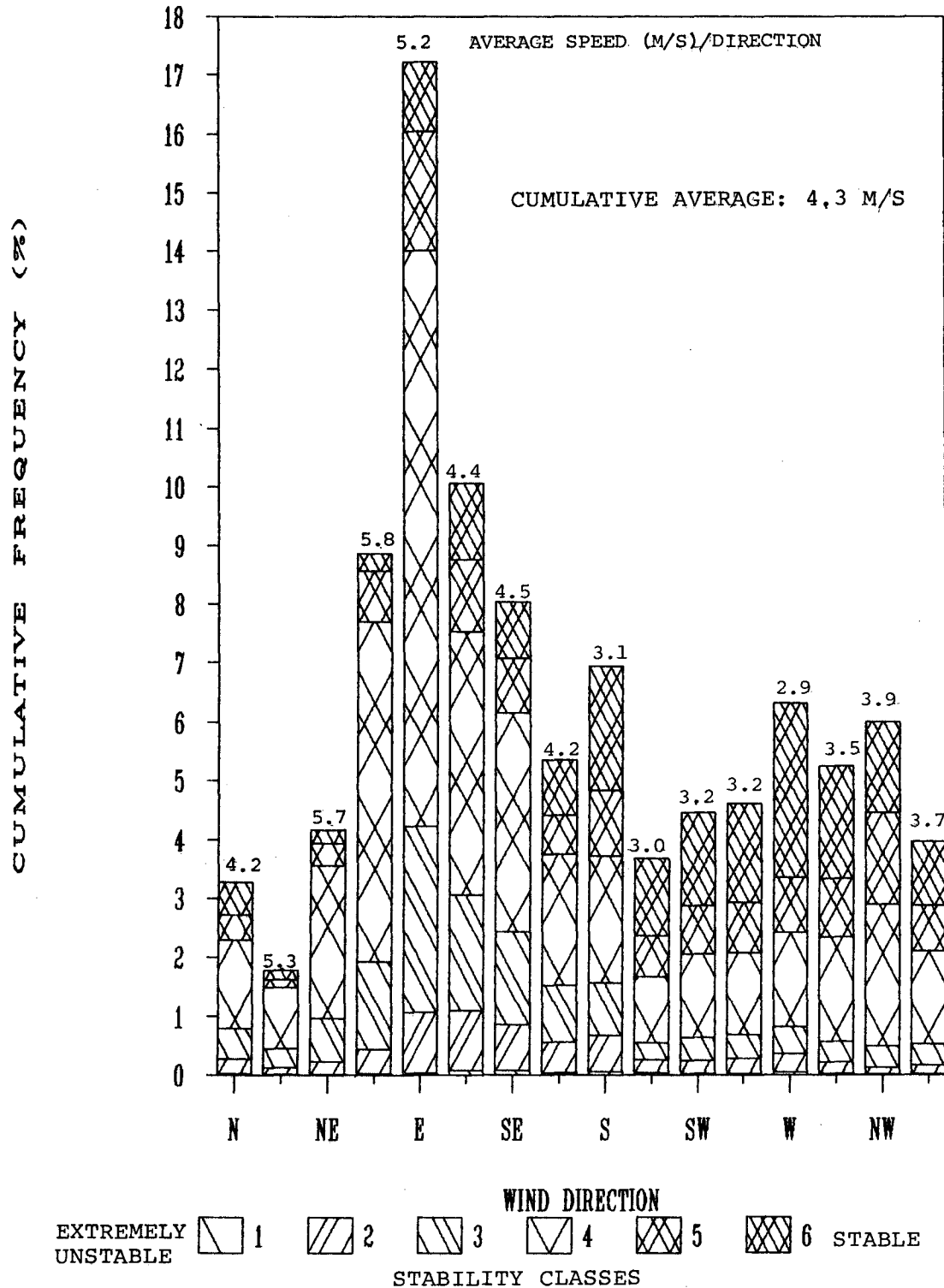


**WIND DIRECTION FREQUENCY DISTRIBUTION
WEST PALM BEACH, FL. (1970-1974)**

FIG. 2.3-25

STABILITY CLASS FREQUENCY DISTRIBUTIONS

WEST PALM BEACH, FL. (1970-1974)



PALM BEACH COUNTY
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RESOURCE RECOVERY FACILITY



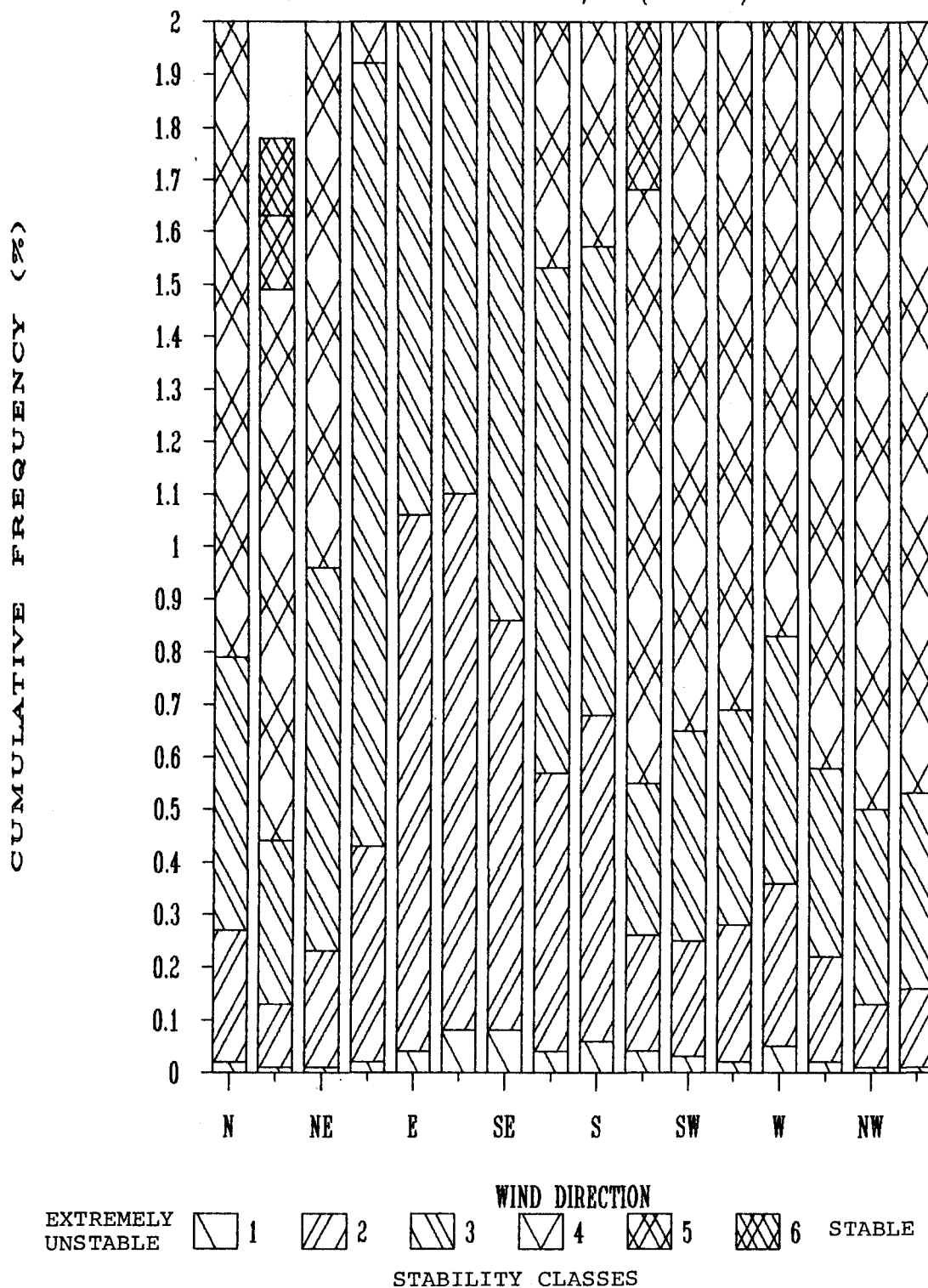
STABILITY CLASS FREQUENCY DISTRIBUTIONS
WEST PALM BEACH, FL. (1970-1974)

FIG. 2.3 - 26

STABILITY CLASS FREQUENCY DISTRIBUTIONS

UNSTABLE CLASS EXTENTIONS

WEST PALM BEACH, FL. (1970-1974)



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



STABILITY CLASS FREQUENCY DISTRIBUTIONS
UNSTABLE CLASS EXTENTIONS
WEST PALM BEACH, FL. (1970-1974)
FIG. 2.3 - 27

TABLE 2.3-9
NORMALS, MEANS, AND EXTREMES

Station: MIAMI, FLORIDA				INTERNATIONAL AIRPORT												Standard time used: EASTERN				Latitude: 25° 48' N		Longitude: 80° 16' W		Elevation (ground): 7 feet																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Month	Temperature						Normal heating degree days (Base 65°)	Precipitation										Relative humidity		Wind &				Pct. of possible sunshine	Mean sky cover	Mean sunrise to sunset	Mean number of days										Average daily solar radiation - langley																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	Normal			Extremes				Normal total	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs.	Year	Snow, ice pellets				Hour 01	Hour 07	Hour 13	Hour 19	Mean speed				Prevailing direction	Fastest mile		Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, ice pellets 1.0 inch or more	Thunderstorms	Heavy fog		Temperatures																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest									Year	Mean total	Maximum monthly	Year										Maximum in 24 hrs.	Year									Hour	Hour	Hour	Hour	Speed	Direction	Year	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°

Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows:
Highest temperature 100 in July 1942; lowest temperature 28 in January 1940; maximum precipitation in 24 hours 12.58 in April 1942. Old City Office:
Lowest temperature 27 in February 1917; maximum precipitation in 24 hours 15.10 in November 1925.

Station:		WEST PALM BEACH, FLORIDA		PALM BEACH INTERNATIONAL AP		Standard time used: EASTERN		Latitude: 26° 41' N		Longitude: 80° 06' W		Elevation (ground): 15 feet																																																																																																																																																																																																																																																																																																										
Month	Temperature						Normal heating degree days (Base 65°)	Precipitation										Relative humidity		Wind &				Pct. of possible sunshine	Mean sky cover	Mean number of days										Average daily solar radiation - langley																																																																																																																																																																																																																																																																																		
	Normal			Extremes				Normal total	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs.	Year	Mean total	Maximum monthly	Year	Maximum in 24 hrs.	Year	Hour 01	Hour 07	Hour 13	Hour 19			Mean speed	Prevailing direction	Fastest mile				Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more		Snow, ice pellets 1.0 inch or more	Thunderstorms	Heavy fog	Temperatures																																																																																																																																																																																																																																																																														
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest																						Year	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets									Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice 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pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets	Snow, ice pellets

For period February 1964 through the current year.
Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows:
Highest temperature 101° in July 1942.

REFERENCE NOTES APPLYING TO ALL "NORMALS, MEANS, AND EXTREMES" TABLES

- Length of record, years, based on January data. Other months may be for more or fewer years if data have been broken in the record.
- Climatological standard normals (1931-1960).
- Less than one-half.
- Also on earlier dates, months, or years.
- Trace, as indicated by small numbers.
- Below zero temperatures are preceded by a minus sign.
- The prevailing direction for wind in the Normals, Means, and Extremes table is from records through 1963.
- At Alabaha stations.
- ° F 70° at Alabaha stations.

Unless otherwise indicated, dimensional units used in this bulletin are: temperature in degrees F.; precipitation, including snowfall, in inches; wind movement in miles per hour; and relative humidity in percent. Heating degree day totals are the sum of positive departures of average daily temperature from 65° F. Cooling degree day totals are the sum of positive departures of average daily temperature from 65° F. Snow was included in snowfall totals beginning July 1960. The term "ice pellets" includes sleet, graupel, and hail, and particles consisting of more pellets encased in a thin layer of ice. Heavy fog reduces visibility to 1/4 mile or less.

Sky cover is expressed in a range of 0 for no clouds or obscuring phenomena to 10 for complete sky cover. The number of clear, partly cloudy, and cloudy days is based on average cloudiness 0-3, partly cloudy days 4-7, and cloudy days 8-10 hours.

Solar radiation data are the averages of direct and diffuse radiation on a horizontal surface. The langley denotes one gram calorie per square centimeter.

Figures (instead of letters) in a direction column indicate direction in degrees from true North, 1-9, 09-E,

The Summary by Hour analyses given in the monthly Local Climatological Data (LCD) for West Palm Beach for the period 1970-1974 were used to generate seasonal diurnal distributions for the resultant wind directions and average wind speeds. Winter consists of all available data for the months of December, January and February. Spring consisted of all available data for the months of March, April and May. The derived seasonal diurnal variations for wind direction are shown in Figure 2.3-28.

The diurnal variations of the wind directions for the spring and summer seasons are almost identical and uniquely different from the diurnal curve for the fall season. The winter season curve is erratic, particularly during the early morning hours, but tends to correspond with that of the fall season during the daylight and early evening hours.

The diurnal wind direction patterns give no indication of a diurnal shift that would be consistent with a persistent ocean sea breeze. They confirm instead the dominant easterly trade winds that were observed in the annual wind direction frequency roses. The seasonal diurnal wind speed distributions shown in Figure 2.3-29 all have the same general form. The minimum wind speeds occurred at or between 0400-0700. The minimum average speed was 1.9 m/s (4.3 mph) at 0400 during the summer season. The maximum wind speeds occurred at 1300. The highest average speed was 6.6 m/s (14.8 mph) during the spring season. The spring season (except at 0400) has the highest diurnal average wind speeds and the summer season (without exception) has the lowest diurnal average wind speeds.

Seasonal mixing heights for the West Palm Beach, based on G.C. Holtzworth, differ slightly from those of Miami when they are extracted from Holtzworth's isopheth maps. These values are given in Table 2.3-11.

TABLE 2.3-10
*** NORMALS BY CLIMATOLOGICAL DIVISIONS**

Taken from "Climatography of the United States No. 81-4, Decennial Census of U. S. Climate"

TEMPERATURE (°F)														PRECIPITATION (In.)												
STATIONS (By Divisions)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANN	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANN
LOWER EAST COAST																										
FORT LAUDERDALE	67.8	68.4	70.7	74.3	77.5	80.4	81.8	82.6	81.5	77.9	72.6	69.0	75.4	2.20	2.06	2.84	4.19	5.29	7.42	5.96	6.88	8.98	8.39	3.18	2.90	60.29
HOMESTEAD EXP STA	65.6	66.5	69.2	72.8	75.9	79.2	80.2	80.7	80.0	76.3	70.7	66.9	73.7	1.75	1.71	2.38	3.69	6.46	8.77	8.81	8.29	10.61	8.72	2.28	1.22	64.69
MIAMI BEACH	69.1	69.6	71.6	74.9	78.2	81.1	82.3	82.9	81.7	78.4	73.8	70.3	76.2	1.68	1.65	1.95	2.92	4.54	5.63	4.45	5.06	7.36	6.71	2.53	1.78	46.26
MIAMI WSO	66.9	67.9	70.5	74.2	77.6	80.8	81.8	82.3	81.3	77.8	72.4	68.1	75.1	2.03	1.87	2.27	3.88	6.44	7.37	6.75	6.97	9.47	8.21	2.83	1.67	59.76
MIAMI 12 SSW	66.5	67.8	70.4	74.2	77.5	80.4	81.6	82.0	81.0	77.2	71.6	67.7	74.8	2.05	1.80	2.44	3.75	6.13	7.00	6.58	6.25	9.03	8.23	2.59	1.63	57.48
WEST PALM BEACH WSO	66.9	67.6	69.9	73.9	77.6	81.0	82.6	83.0	82.1	78.2	72.5	68.2	75.3	2.48	2.35	3.44	4.34	5.11	7.53	6.66	6.74	9.66	7.96	2.86	2.57	61.70
DIVISION	66.9	67.6	70.0	73.6	77.0	80.2	81.5	82.0	81.0	77.4	72.0	68.2	74.8	2.16	2.02	2.82	3.90	5.49	7.44	6.65	6.82	9.47	8.15	2.84	2.17	60.00
KEYS																										
KEY WEST WSO	69.6	70.4	72.5	75.8	79.0	81.8	83.3	83.6	82.3	79.0	74.1	70.6	76.8	1.53	1.98	1.77	2.48	2.73	3.97	4.16	4.33	6.73	5.82	2.80	1.69	39.99
KEY WEST	70.4	71.3	73.6	77.1	80.2	82.8	84.0	84.3	83.0	79.6	74.9	71.4	77.7	1.49	2.00	1.73	2.51	2.77	4.01	4.16	4.25	6.53	5.87	2.81	1.71	39.84
DIVISION	70.2	71.0	73.3	76.6	79.8	82.4	83.5	83.8	82.5	79.2	74.5	71.2	77.3	1.71	1.88	1.92	2.29	3.10	4.33	4.54	4.68	7.05	6.73	2.43	1.88	42.55

* Normals for the period 1931-1960. Divisional normals may not be the arithmetical average of individual stations published, since additional data for shorter period stations are used to obtain better areal representation.

CONFIDENCE - LIMITS

In absence of trend or record changes, the chances are 9 out of 10 that the true mean will lie in the interval formed by adding and subtracting the values in the following table from the means for any station in the State. Because of the wider variation in mean precipitation, the corresponding monthly means and annual mean must be substituted for "p" in the precipitation table below to obtain mean precipitation confidence limits.

1.3	1.3	1.1	.5	.5	.4	.4	.3	.4	.5	.8	1.2	.4	39√p	37√p	44√p	48√p	47√p	48√p	38√p	43√p	53√p	59√p	44√p	35√p	44√p
-----	-----	-----	----	----	----	----	----	----	----	----	-----	----	------	------	------	------	------	------	------	------	------	------	------	------	------

COMPARATIVE DATA

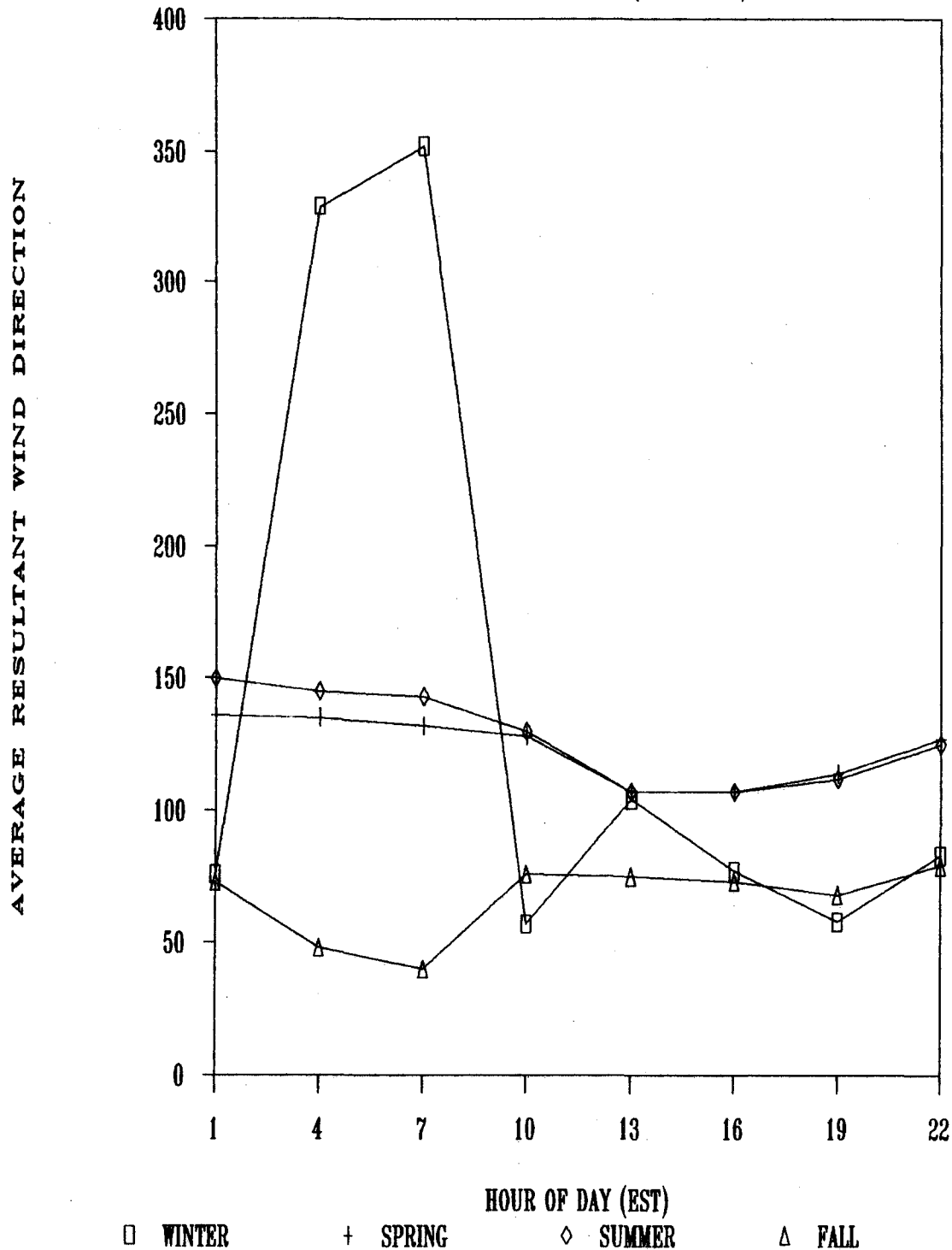
Data in the following table are the mean temperature and average precipitation for St. Leo's Abbey, Florida, for the period 1901-1930 and are included in this publication for comparative purposes.

60.3	61.7	66.3	70.6	75.8	79.2	80.5	80.7	79.2	73.2	65.4	60.3	71.1	2.87	2.54	2.90	2.20	4.44	8.19	8.22	8.48	6.91	3.70	2.20	2.51	55.16
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	-------

Data Source: CLIMATE OF THE STATES, Vol. 1, Water Information Center, Inc., 1974

SEASONAL DIURNAL WIND DIRECTIONS

WEST PALM BEACH, FL. (1970-1974)



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY

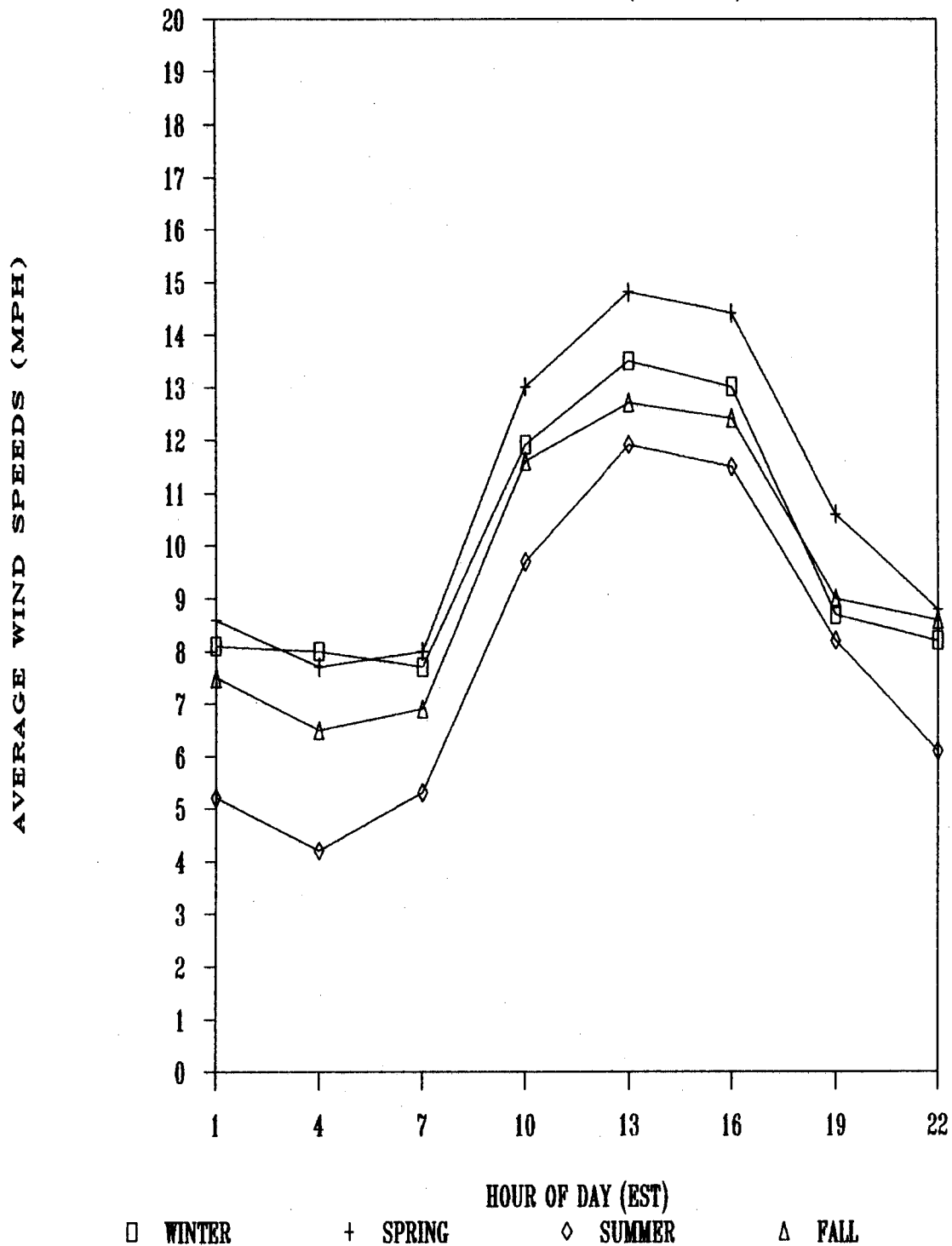


SEASONAL DIURNAL WIND DIRECTIONS
WEST PALM BEACH, FL. (1970-1974)

FIG. 2.3-28

SEASONAL DIURNAL WIND SPEEDS

WEST PALM BEACH, FL. (1970-1974)



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



SEASONAL DIURNAL WIND SPEEDS
WEST PALM BEACH, FL. (1970-1974)

FIG. 2.3 - 29

Processed hourly meteorological data and stabilities, as derived from the Palm Beach Airport and Miami Airport, were used to generate hourly and 24 hour air quality impacts. These data are presented, by year in Appendix IV.

The meteorological data from the Palm Beach Airport, along with upper air data from Miami Airport, can be considered as sufficiently representative of the proposed RRF site so as to preclude the need for additional on-site monitoring.

TABLE 2.3-11
HOLTZWORTH* MIXING HEIGHTS FOR WEST PALM BEACH AND MIAMI

Period	Morning		Afternoon	
	West Palm	Miami#	West Palm	Miami#
ANNUAL	800	923	1,375	1,351
SPRING	800	980	1,400	1,457
SUMMER	900	1,071	1,400	1,383
FALL	800	933	1,350	1,341
WINTER	700	707	1,175	1,221

* G.C. Holtzworth, Mixing Heights, Winds Speeds, and Potential for Urban Air pollution Throughout the tiguous United States; USEPA AP-101, January, 1972.

#Appendix B, Table B-1; all cases, Holtzworth, 1972.

2.3.7.2 Ambient Air Quality

In accordance with Rule 17-2.500(5)(f)(FAC), pollutants subject to New Source Review (NSR) may require ambient air monitoring to define background concentrations. These concentrations are used to assess the extent that the emissions from the proposed source may contribute to violations of applicable ambient air quality standards and/or the extent to which applicable PSD allowable increments may be consumed.

The Florida DER requested emission estimates for sixteen (16) pollutants including the criteria pollutants. These estimates have been prepared. In addition, estimates of dioxin (2,3,7,8-TCSS) have been prepared. The estimates have been prepared based on design total capacities of 1800 and 2100 TPD through-puts of RDF generated from the processing of 3,000 TPD of municipal solid waste (MSW). The total emission rates are compared to PSD significant levels in Table 2.3-12. Significant levels are exceeded for TSP, CO, NO_x, SO₂, VOC, mercury and fluorides.

Particulate matter, particulate lead, beryllium and particulate mercury (Hg) will be controlled by BACT – tentatively, an electrostatic precipitator (ESP) with an outlet grain loading of 0.03 gr/dscf at 12% CO₂. Low sulfur auxiliary fuel is, tentatively, the BACT for SO₂ and acid gases. NO_x, CO and VOC will be controlled by good combustion design and practices.

Source may be exempt from air quality monitoring if the impact of a given pollutant falls below the specified minimum concentrations [17-2.500(3)(e) (FAC)]. Air quality diffusion analyses were conducted using the EPA-ISCST and ISCLT models and five years of meteorological data (1970-1974). The highest second highest impact concentrations generated are compared to these de-minimus values in Table 2.3-13 for those pollutants that did not meet de-minimus levels based on emission potential. From these results only SO₂ is found to exceed its de-minimus value.

TABLE 2.3-12
SIGNIFICANT EMISSION RATES AND TOTAL FACILITY
POTENTIAL TO EMIT (THREE UNITS AT 600 TPD EACH)
VALUES FOR PSD REGULATED POLLUTANTS

Pollutant	Significant Emission* Rates (Tons/Year)	Potential to # Emit (Tons/Year)
Particulate Matter (TSP)	25	214
Carbon Monoxide (CO)	100	3,942
Nitrogen Oxides (NO _x)	40	1,314
Sulfur Dioxide (SO ₂)	40	2,957
Ozone (VOC)	40	65.6
Lead (Pb)	0.6	0.46
Asbestos	7.0 E-2	—
Beryllium (Be)	4.0 E-3	3.0 E-3
Mercury (Hg)	0.1	0.98
Vinyl Chloride	1.0	—
Fluorides	3.0	13.2
Sulfuric Acid Mist	7.0	0.131
Total Reduced Sulfur (including H ₂ S)	10	—
Reduced Sulfur (including H ₂ S)	10	—
Hydrogen Sulfide (H ₂ S)	10	—
Hydrogen Chloride	—	1,150
2,3,7,8-TCDD	—	1.8 E-5

* 17.2 (V) Table 500.2

1,800 TPD RDF fired (based on 3 units at 600 TPD each)

TABLE 2.3-13
COMPARISON OF IMPACT OF PALM BEACH COUNTY RDF FIRED
SPREADER STOKER FURNACES TO DE-MINIMUS LEVELS (ISC MODEL)
SIGNIFICANT MONITORING CONCENTRATIONS

Pollutant	Averaging Time	De-Minimus Guidelines ug/m ³	Highest 2nd High- est# Concentration ug/m ³ *	Distance (km) From Source to De-Minimus Level	
				High	H ₂ ndH
TSP	24 Hour	10	2.0	##	##
SO ₂	24 Hour	13	27.9	9.0	9.0
CO	8 Hour	575	81.1	##	##
NO _x	24 Hour	14	12.3	1.5	##
Ozone (VOC)	1 Hour	*	3.0**	##	##
Mercury	24 Hour	0.25	9.3E-3	##	##
Fluorides	24 Hour	0.25	0.12	##	##
Lead	24 Hour	0.1	4.3E-3	##	##
Beryllium	24 Hour	5.0E-4	9.9E-5	##	##

* No value established. Ambient air standard: 235 ug/m³ not to be exceeded on more than an average of of one day per year over a three year period.

Model analyses for SO₂ based on 2,100 TPD and 9% S. Concentrations for other pollutants based on on their emissions ratio to SO₂. *controlled emission factor of 9 lbs/Hon*

** Assumes all VOC becomes ozone.

Less than de-minimus values at all distances greater than 0.6 km from the source. Minimum distance tance from RDF source to site boundary: 0.73 km.

There are thirteen active ambient air quality monitoring sites with a range of 50 km from the proposed RDF facility. These sites are listed in Table 2.3-14. The maximum and second highest maximum concentrations and their sites as measured in 1983, are shown in Table 2.3-15 along with the Federal and Florida ambient air quality standards. It has been determined by the Florida DER that the existing monitoring facilities are sufficient to provide ambient air background in the study area. Pre-construction monitoring is not required.

TABLE 2.3-14
MONITORING STATION LOCAL ADDRESSES, UTM COORDINATES AND LOCATION
(DISTANCE & ANGLE) RELATIVE TO THE PROPOSED PALM BEACH COUNTY RDF
FIRED WATERWALL FURNACE FACILITY

(FACILITY UTM COORDINATES 2960180N; 585820E; UTM ZONE 17)

Site No.	Address (Monitoring Capability)	UTM Coordinates Zone 17	Distance From Proposed Facility (Meters)	Direction Relative To Proposed Facility (North = 0(360) Degrees (Degrees)
1	West Palm Beach Water Treatment Plant First St. & Tamarind Ave. West Palm Beach, Florida (CO, NO ₂ , Meteorology)	2955030N 0593232E	9,026	125
1A	Palm Beach County Health Dept. 901 Evernia Street West Palm Beach, Florida (Suspended Particulate)	2955030N 0593232E	9,026	125
2	North Palm Beach Water Treatment Plant 603 Anchorage Drive North Palm Beach, Florida (Suspended Particulate)	2965817N 0592780E	8,956	51
3	Lake Worth Water Treatment Plant 301-303 College Street Lake Worth, Florida (Suspended Particulate)	2943537N 0592793E	18,045	157
4	Delray Beach Water Treatment Plant 202 NW First Street Delray Beach, Florida (Suspended Particulate)	2927488N 0592195E	33,308	169

TABLE 2.3-14 (Continued)

Site No.	Address (Monitoring Capability)	UTM Coordinates Zone 17	Distance From Proposed Facility (Meters)	Direction Relative To Proposed Facility (North = 0(360) Degrees (Degrees)
5	Boca Raton Fire Station #1 1151 North Federal Highway Boca Raton, Florida (Suspended Particulate)	2915768N 05913137E	44,750	173
6	Southwest Fire Department 1180 S. Military Trail West Palm Beach, Florida (Suspended Particulate)	2949018N 0588207E	11,414	168
7	College of Boca Raton 1151 North Federal Highway Boca Raton, Florida (Suspended Particulate)	2918354N 0587320E	41,853	178
8	South Florida Water Mgmt. Pump Station Twenty Mile Bend State Road 80 (Suspended Particulate, Ozone, Meteorology)	2951402N 0562879E	24,563	249
9	Pahokee Sewage Treatment Plant 1050 McClure Road Pahokee, Florida (Suspended Particulate)	2964200N 0532300E	53,671	274
10	Royal Palm Beach R.V. Area 10999 Okeechobee Blvd. Royal Palm Beach, Florida (Ozone, Meteorology)	2954150N 0578100E	9,796	232
11	Palm Beach County Health Department Warehouse 2030 Avenue "L" Riviera Beach, Florida (Sulfur Dioxide)	2962350N 0592480E	7,005	72
12	Belle Glade Health Dept. 1024 NW Avenue "D" Belle Glade, Florida (Suspended Particulate)	2953082N 0533160E	53,136	262

**TABLE 2.3-15
AMBIENT AIR QUALITY STANDARDS**

Pollutant	Federal Primary	Federal Secondary	State	Maximum Concentration Measured in 1983 (Site #)	Maximum 2nd Max Concentration(3) Measured in 1983 (Site #)
Sulfur Dioxide					
Max 3-hr Concentration	No Standard	1300 UG/M ³ (0.5 PPM)	1300 UG/M ³ (0.5 PPM)	65 UG/M ³ (11) (0.025 PPM)	63 UG/M ³ (11) (0.024 PPM)
Max 24-Hr Concentration	365 UG/M ³ (0.14 PPM)	No Standard	260 UG/M ³ (0.1 PPM)	39 UG/M ³ (11) (0.015 PPM)	29 UG/M ³ (11) (0.011 PPM)
Annual Arithmetic Mean	80 UG/M ³	No Standard (0.03 PPM)	60 UG/M ³ (0.02 PPM)	7 UG/M ³ (11) (0.0027 PPM)	
Particulate Matter					
Max 24-Hr Concentration (2)	260 UG/M ³	150 UG/M ³	150 UG/M ³	134 UG/M ³ (5)	107 UG/M ³ (4)
Annual Geometric Mean	75 UG/M ³	60 UG/M ³	60 UG/M ³	43.1 UG/M ³ (12)	
Nitrogen Dioxide					
Annual Arithmetic Mean	100 UG/M ³	100 UG/M ³ (.05 PPM)	100 UG/M ³ (.05 PPM)	20 UG/M ³ (1) (.05 PPM)	(0.01 PPM)
Ozone					
Daily Max 1-Hr Concentration (1)	235 UG/M ³ (0.12 PPM)	235 UG/M ³ (0.12 PPM)	235 UG/M ³ (0.12 PPM)	180 UG/M ³ (10) (0.092 PPM)	172 UG/M ³ (10) (0.088 PPM)
Lead					
Quarterly Arithmetic Mean	No Standard	No Standard	1.5 UG/M ³	Not Monitored	
Carbon Monoxide					
Max 1-Hr Concentration	40000 UG/M ³ (35 PPM)	40000 UG/M ³ (35 PPM)	40000 UG/M ³ (35 PPM)	10171 UG/M ³ (1) (8.9 PPM)	9943 UG/M ³ (1) (8.7 PPM)
Max 8-Hr Concentration(2)	10000 UG/M ³ (10 PPM)	10000 UG/M ³ (10 PPM)	10000 UG/M ³ (10 PPM)	6600 UG/M ³ (1) (6.6 PPM)	4500 UG/M ³ (1) (4.5 PPM)

1. The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 PPM is equal to or less than 1.
2. Concentration limits not to be exceeded more than once per year.
3. Since short term concentration limits are not to be exceeded more than once per year, the values presented in column (5) for short short term concentrations reflect the highest values of the second highest concentration measured at the monitoring station.

2.3.8 Noise

An Environmental Noise Study for the Resource Recovery Facility has been completed and is contained in its entirety in Appendix 10.15.

The first phase of the study includes: 1) surveying the area as to land use; 2) identifying noise-sensitive areas; and 3) characterizing existing noise levels for those areas. The noise-sensitive areas are depicted on Figure 2.3-30 and the existing noise level of each is indicated on Table 2.3-16. The characteristics of each of these areas are discussed in Appendix 10.15

The noise levels in the sensitive areas were measured during the daytime hours in order to relate to the anticipated hours during which the facility would be receiving MSW and during which the landfills would be in operation. Noise levels were found to be dominated by the existing vehicular traffic on vicinity roads. None of the existing noise levels exceeded the Federal Highway Administration (FHWA) or Department of Housing and Urban Development (HUD) recommended sound levels.

**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**AMBIENT NOISE LEVEL
MONITORING LOCATIONS**

FIG. 2.3-30

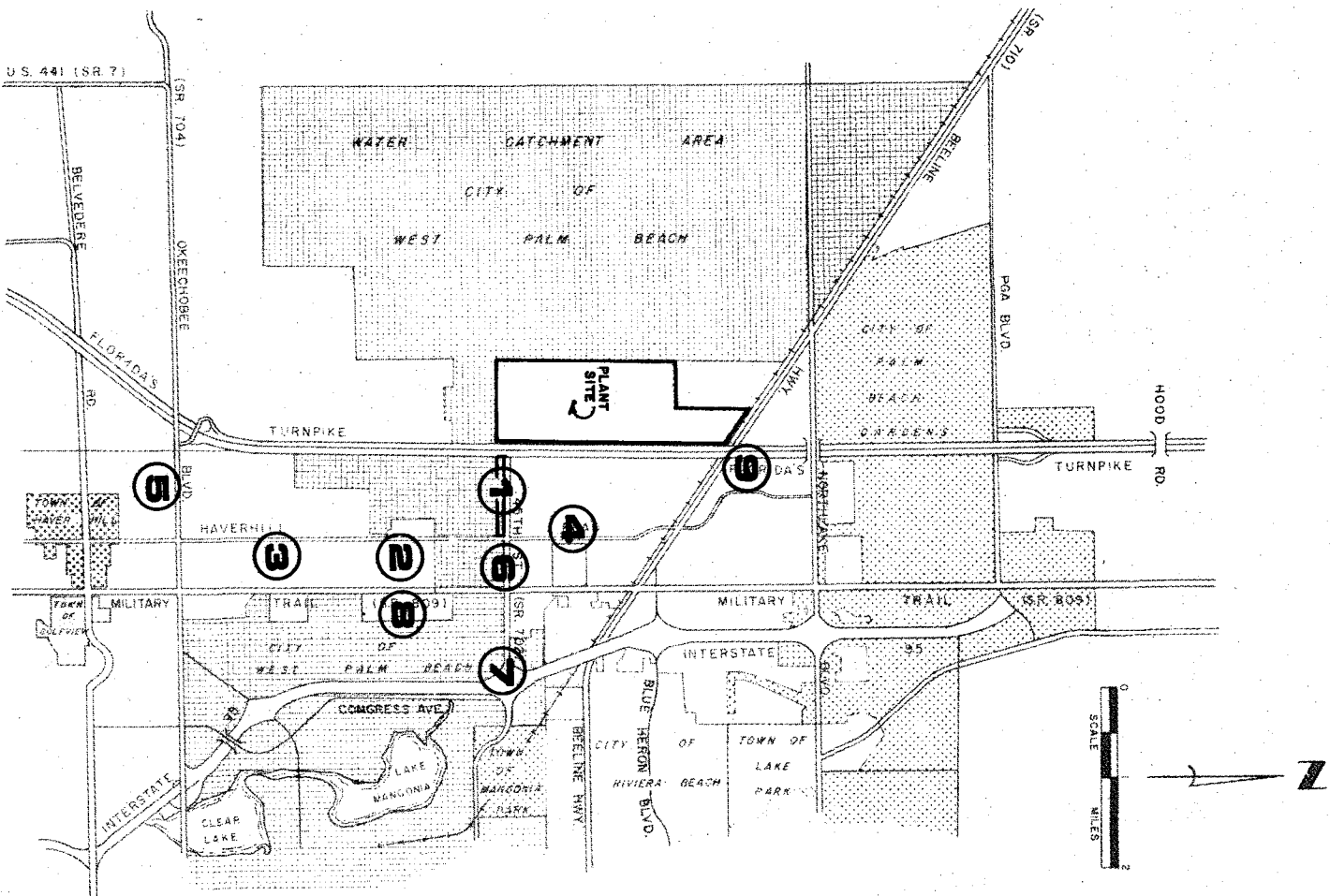


TABLE 2.3-16
AREAS WITHIN THE OVERALL PROJECT AREA WITH
REPRESENTATIVE EXISTING WEEKDAY SOUND LEVELS

	AREA	DISTANCE TO MAJOR ROAD	WEEKDAY SOUND LEVEL LEQ (dBA)
1.	45th St., West of Haverhill	100'	54
2.	Haverhill, 45th to Roebuck	100'	62
3.	Haverhill, Roebuck to South of 12th	100'	60
4.	Haverhill, 45th to Port Road (Bee Line)	100'	58
5.	Okeechobee, Turnpike to Haverhill	100'	65
6.	45th, Military Trail to Haverhill	100'	58
7.	45th, I-95 to Military Trail	100'	63
8.	Military Trail, Roebuck to Port Road (Bee Line)	100'	60
9.	North of Port Road and East of Turnpike	150'	55

2.3.9 Other Environmental Features

2.3.9.1 Transportation

2.3.9.1.1 Existing Conditions

Existing transportation facilities and characteristics in the vicinity of the proposed Resource Recovery Facility were inventoried in order to provide an input needed to define the extent of transportation impacts related to the facility. Data obtained for this analysis included the following:

2.3.9.1.1.1 Roadway Network

The existing principle street and highway system serving the proposed site is depicted on Figure 2.3-31. Major north-south roadways serving the site include I-95, Military Trail, Haverhill Road, Florida's Turnpike, and a north-south roadway. Major east-west roadways which will serve the site include Blue Heron Boulevard, Beeline Highway, 45th Street, and Okeechobee Boulevard. The cross-section of each of these facilities was determined and the number of through lanes are noted on Figure 2.3-31. In addition to the general cross-section characteristics, critical intersections were inventoried to determine turn lane provisions for capacity analyses which are discussed under Sections 4.6.3 and 5.9.1 of this application.

2.3.9.1.1.2 Traffic Volumes

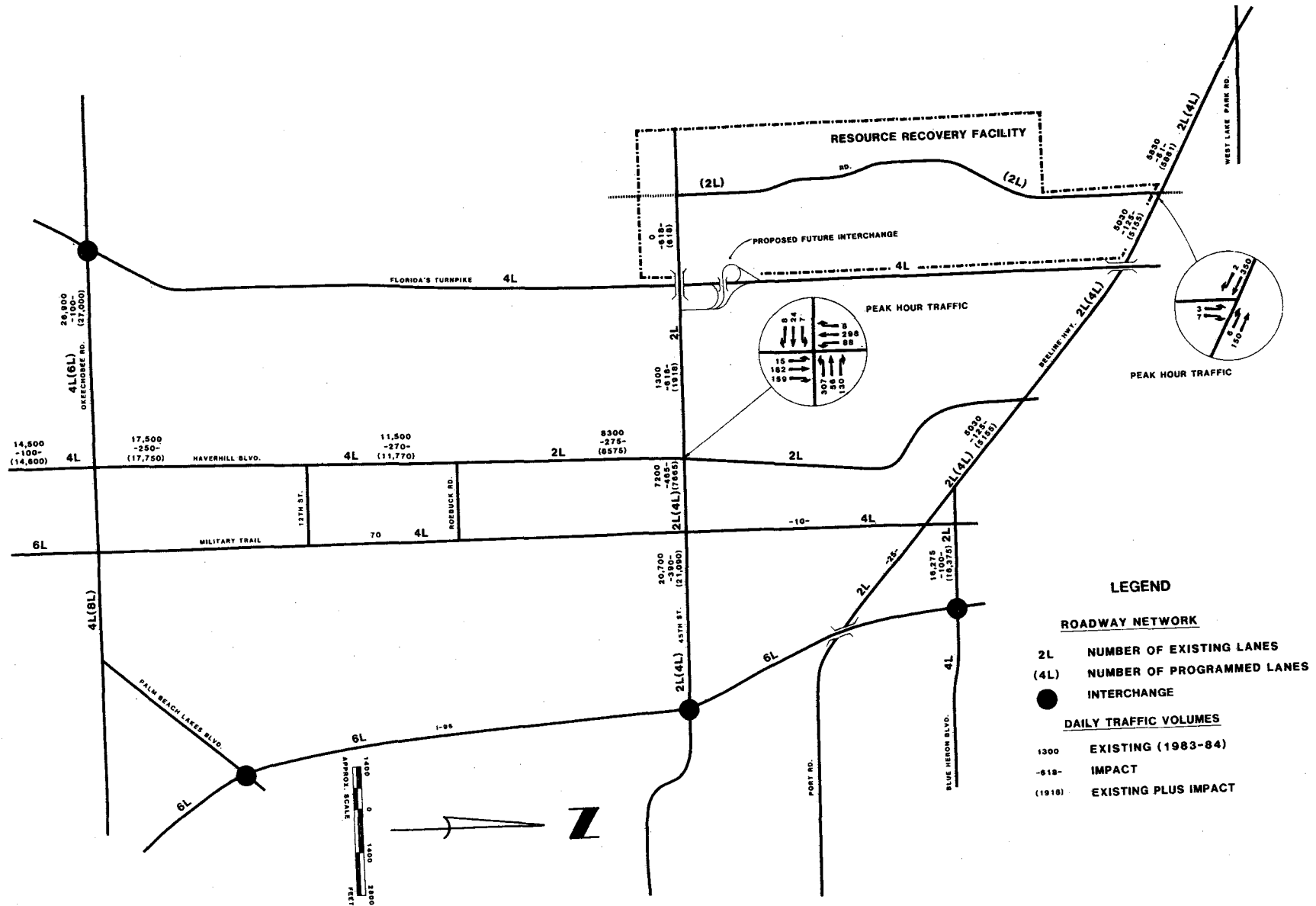
Existing traffic volumes on the roadway network were obtained from Palm Beach County and from field studies performed by Kimley-Horn and Associates, Inc. These data include peak hour (afternoon) intersection turning movements, 1983-84 24-hour traffic volumes and background traffic volumes related to expected area growth (the background traffic volumes were required by Palm Beach County for the zoning application).

PALM BEACH COUNTY
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RESOURCE RECOVERY FACILITY



TRAFFIC ASSIGNMENT

FIG. 2.3 - 31



2.3.9.1.1.3 Planning Data – Land Use and Development Data

Land use and development data were provided on a copy of the conceptual plan dated October 18, 1984. The project is scheduled to begin operation in 1989.

In addition, information was provided on the operational characteristics of the proposed Resource Recovery Facility. This included the location of the solid waste transfer facilities and the actual number of trips from each transfer facility, and from the direct haul service area to the Resource Recovery Facility. The solid waste management facility locations are shown on Figure 2.3-32.

2.3.9.1.2 Future Conditions

A list of programmed roadway improvements was completed by reviewing the County Transportation Improvement Program which includes funded projects. Travel growth expected in the area also was estimated based on traffic impact analyses required for Palm Beach County Zoning Application related to future conditions include the following:

2.3.9.1.2.1 Roadway Network

Several roadway improvements are scheduled, or under construction within the vicinity of the proposed Resource Recovery Facility. Some of these improvements are required to meet existing travel demand, while others will serve the growth that will continue to impact the area. The programmed roadway improvements are depicted on Figure 2.3-31. The only north-south roadway programmed is the construction of a roadway from 45th Street to Beeline Highway through the Resource Recovery Facility site. This will be constructed by the Palm Beach County Solid Waste Authority. Major east-west roadways in the vicinity which are scheduled for improvement include Okeechobee Boulevard (4 lanes to 8 lanes and 6 lanes), 45th Street (2 lanes to 4 lanes), and Beeline Highway (2 lanes to 4 lanes). The limits of these improvements are depicted on Figure 2.3-31.

2.3.9.1.2.2 Traffic Volumes

Future traffic volumes were estimated based on traffic impact analyses. These analyses are discussed in Chapters 4 and 5 and in Appendix 10.16.

2.3.0.1.2.3 Land Use Data

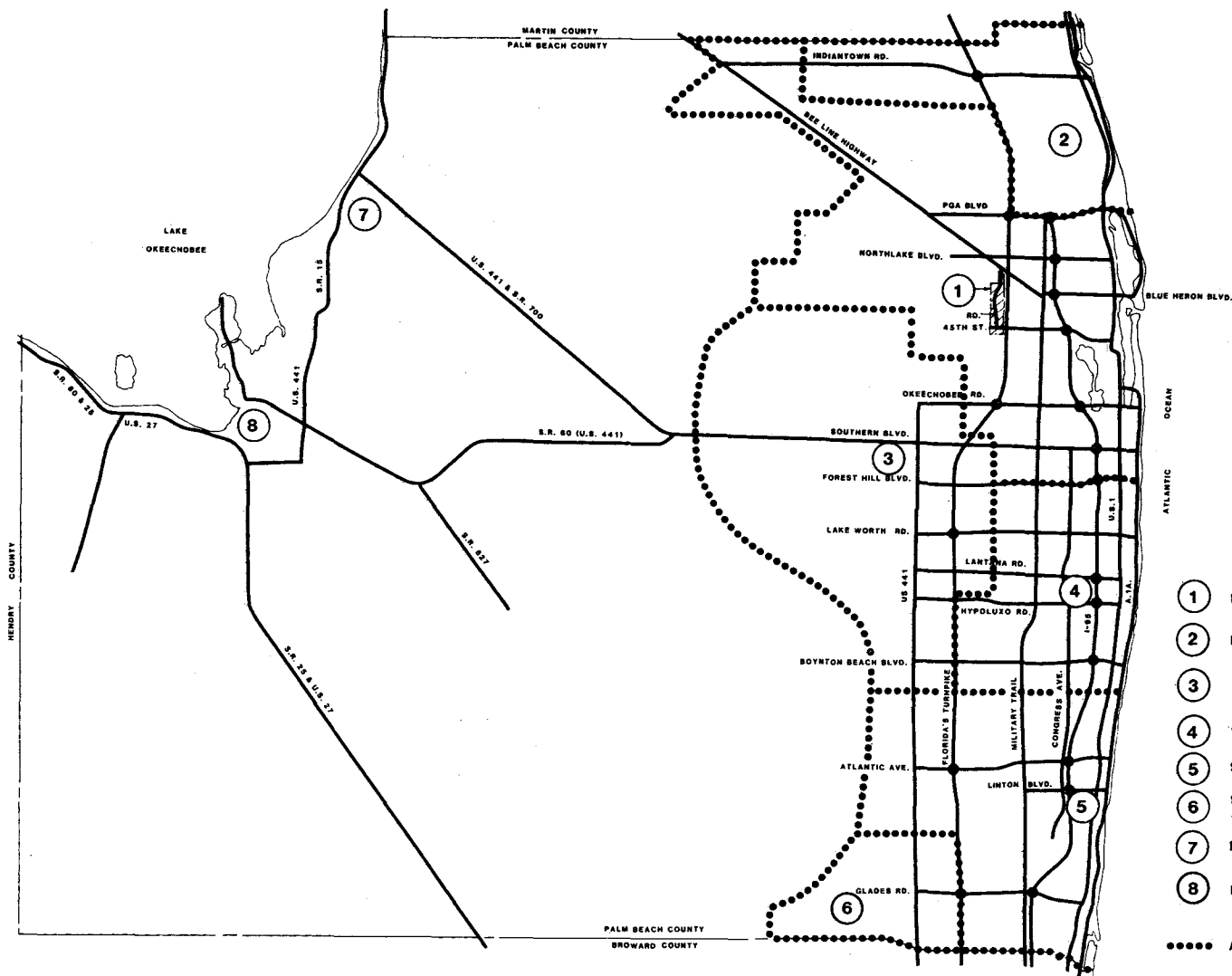
Future land use data related to other growth expected as the Resource Recovery Facility is developed was available from the Palm Beach County Planning Department. These data were used to develop "background traffic volumes" discussed in Appendix 10.16 of this application.

**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**SOLID WASTE MANAGEMENT
FACILITY LOCATIONS**

FIG. 2.3-32



LEGEND

- 1** RESOURCE RECOVERY FACILITY
- 2** NORTH COUNTY TRANSFER FACILITY
- 3** WEST CENTRAL COUNTY TRANSFER FACILITY
- 4** SOUTH CENTRAL TRANSFER FACILITY
- 5** SOUTH COUNTY TRANSFER FACILITY
- 6** SOUTHWEST COUNTY TRANSFER FACILITY & CLASS III LANDFILL
- 7** PAHOKEE LANDFILL FACILITY
- 8** BELLE GLADE LANDFILL & TRANSFER FACILITY
- AREAS SERVED BY FACILITIES

2.3.9.1.3 Roadway Capacity Analyses

Using the roadway inventory data, and the traffic volume data traffic capacity analyses were completed to determine the level of service of the roadways which will be impacted by the development of the Resource Recovery Facility. Under existing and "after" conditions, levels of service on the major north-south roadways are as follows:

	Existing	After
I-95	C	C
Military Trail	D	D
Haverhill Blvd.	A to D	B to F
Florida's Turnpike	A	A

while major east-west roadways have levels of service as follows:

Blue Heron Blvd.	C	C
Beeline Highway	C	A to C
45th Street	F	A
Okeechobee Blvd.	D	C

Although the impact of growth expected in the vicinity of the Resource Recovery Facility will mean increased traffic volumes, capacity analyses completed for the programmed improved conditions indicate Levels of Service "A" will be provided at any location where the Resource Recovery Facility will have a significant traffic impact.

The Plant and Directly Associated Facilities

CHAPTER 3: THE PLANT AND DIRECTLY ASSOCIATED FACILITIES

3.1 BACKGROUND

3.1.1 General

There has been and continues to be rapid growth in Palm Beach County with its attendant problems; one being the disposal of municipal solid waste (MSW). The present and past practices of conventional landfilling with its environmental and siting problems had prompted the Authority to study alternative methods of disposal. This included shredding refuse for landfilling, composting, and resource recovery with mass burn, RDF/Combustion, and modular combustion options. These alternatives are described in Chapter 8.

With the oil shortage in the 1970's, dramatic increases in the prices of energy and recyclable materials occurred and the resource recovery option became economically viable for Palm Beach County. Feasibility studies were prepared and the RDF/Combustion technology was selected as the preferred technology for the Palm Beach County Solid Waste Authority Resource Recovery Facility. The study also concluded that resource recovery is the key to a positive and successful long term solid waste management system.

Currently the Authority operates two transfer stations and is planning for four additional transfer stations to service the County. This allows all areas of the County to have a disposal site within 10 to 12 miles, and reduces overall collection and disposal costs on a County-wide basis.

The Authority presently operates two landfills; Dyer Boulevard Landfill in the north end of the County and Lantana Landfill in the south end. These landfills accommodate both Class I and Class III refuse, but are both scheduled for closure; Lantana in 1986, and Dyer in 1987. The Authority is acquiring new sites; one 1,320 acre site in the north end of the County which is the subject of this application and one site already selected in the south end of the County. The North County Site will have the first resource recovery plant in addition to the Class I and Class III landfills. The South County Site will have a Class III landfill and space allocated for the second resource recovery plant, when required, along with a facility for disposal of ash and rejects.

The system as planned will accommodate the projected growth in Palm Beach County and have sufficient space to dispose of solid wastes beyond 20 years.

3.1.2 Description of the Resource Recovery Facility with Landfills

3.1.2.1 The Resource Recovery Plant

The ever growing waste stream in Palm Beach County and lack of available land to continue conventional landfilling required this alternative method of disposal. The nominal 2,000 tpd Resource Recovery Facility was selected to process all of Palm

Beach County's Class I MSW and a portion of the Class III MSW. This is to be processed in the plant outlined as follows and consists of:

- 3 -RDF manufacturing lines
- 1 -OBW and ferrous processing line
- 2 -Spreader stoker boilers
- 1 -50 MW turbo generator

The primary purpose of the facility described in this chapter will be to dispose of municipal solid waste material (as an alternative to conventional landfilling) while recovering certain marketable materials and generating electrical energy. The plant is designed to receive and process garbage, rubbish, refuse and other discarded solid or semi-solid materials resulting from domestic, commercial, industrial, agricultural and governmental operations. It will not process solids or dissolved materials in domestic sewage or other significant pollutants in water resources such as silt, dissolved or suspended solids in industrial wastewater effluents, dissolved materials in irrigation return flows, or other common water pollutants. Pathological, biological and other hazardous wastes will not be processed in the facility.

All waste material received at the facility will be processed to produce RDF (refuse derived fuel) which will be burned in the boilers. Certain materials classified as non-processible will be separated out in the process and will be disposed in the landfill. Non-processible items include non-combustible construction and demolition debris as well as certain other items described later in this section.

Municipal collection vehicles, commercial collection vehicles, private trucks, transfer trailers, and private citizens will enter the facility site from the north-south roadway and proceed to the scales. There will be a private citizens' dumping area located beyond the scales where any private citizen can dump refuse into containers which in turn will be hauled into the plant tipping area by Authority personnel. This will eliminate potential hazards resulting from having private automobiles and other small hand-unloaded vehicles maneuvering near the large vehicles using the facility tipping area. It will also aid in reducing the turn-around time for all vehicles.

Three 60 ton capacity electronic truck scales with 10 feet by 60 feet platforms will be provided to weigh the incoming refuse trucks. Automobiles and pick up trucks will be charged a set fee. Each account truck will have its assigned number affixed to the window of the truck allowing the weighmaster to enter the number into the computer. The scales will be equipped with a computer which shall store all pertinent information by the account truck number. There will be one incoming by-pass lane.

Upon arrival at the scale, one or two weighmasters will enter the truck number into the computer and press the weigh button. The truck will be weighed and a ticket will be printed showing truck number, type of refuse, account, time, gross tare and net weight, and date. This ticket will be given to the driver. The computer will store the same information for central processing of invoices to customers accounts.

The weighmaster will direct the incoming load of material to the resource recovery plant or to the appropriate landfill operation (Class I or Class III) in the case of non-processibles.

Two scales on the exit side of scale house will be used to determine tare weights of empty departing vehicles or act as a back up scale for entering vehicles. There will also be one outgoing by-pass lane.

The trucks directed to the resource recovery plant will proceed directly to the enclosed receipt building designed to receive residential, commercial and industrial solid waste. Figure 3.1-1 graphically outlines the materials flow and Figure 3.1-2 the mass balance. The tipping area will provide high speed/high volume unloading capacity to minimize truck unloading and transfer time. The area is large enough to handle peak traffic of 60 trucks per hour and able to simultaneously dump fifteen (15) trucks. There will be floor storage capacity for one (1) day's peak receipt of municipal solid waste (MSW) or 3,000 tons.

MSW containing non-processible materials such as rugs, ~~tires~~, cables and mattresses will be separated on the storage room floor. This material will be removed and sent to landfill from the loadout area on the MSW storage floor. Potentially hazardous items will be handled as described in Section 3.7.2. *Tires will be shredded + burned, or whole tires will be landfilled*

The MSW, after removal of non-processible materials, will be fed by front-end loaders to the refuse derived fuel (RDF) processing lines. The infeed apron conveyors will transport the MSW past picking stations where a second inspection for non-processible items will take place prior to entering the primary shredder room.

The flail mill will be housed in a shredder room constructed with 12" thick reinforced concrete walls to withstand occasional explosions that may occur when undetected explosives or volatile gases are received. The flail mill will be designed with an explosion vent which discharges through the roof. The "picked" MSW will be discharged into the primary flail mill that is designed as a low energy system to open bags of refuse, break glass (not pulverize) and prepare refuse for magnetic separation of ferrous and screening of glass and grit. The shredder room will be maintained under a negative pressure by an exhaust fan discharging to a dust collector to avoid fugitive dust and litter.

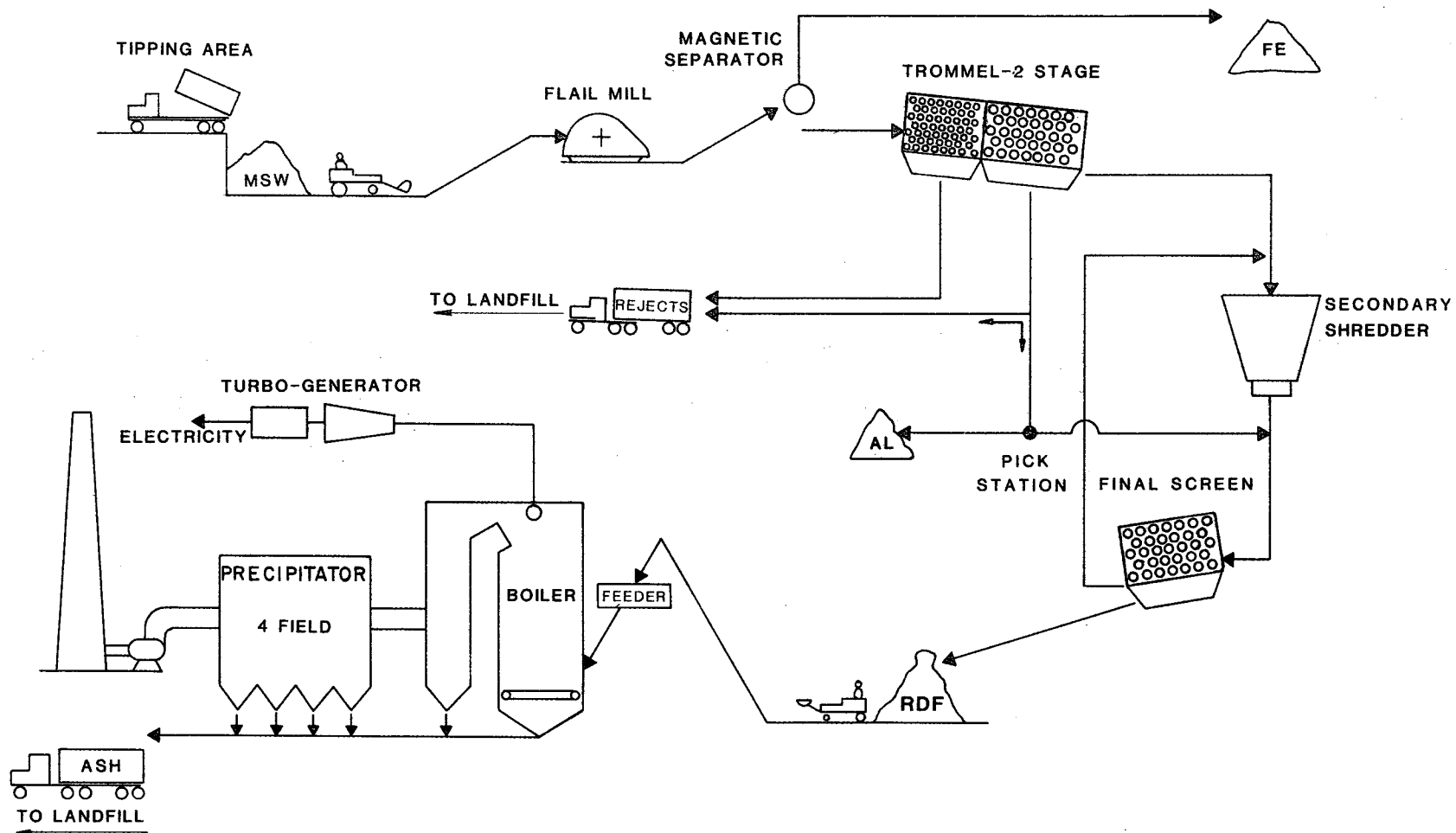
The flail shredded MSW will be conveyed to a magnetic separation system that will remove in excess of 93% of the ferrous in the stream. Each magnetic separation system will include two magnetic wheels that will remove the ferrous from the stream and convey by chute and belt conveyors to a point for stockpiling. The estimated 120 tpd of ferrous separated through this process will be stockpiled prior to being processed in the ferrous processing line.

The shredded MSW, less ferrous, will discharge into the rotary trommel for screening. The oversized material (overs) will be conveyed to the secondary shredder for size reduction into RDF. The undersized material (unders) will be discharged in two streams:

- Section 1 (small openings) primary discharges will be glass, fines, and small sized heavies.
- Section 2 (large openings) will be designed to discharge mainly beverage cans (aluminum).

The collection conveyors under each section will have an air knife at each head pulley to recover any light fraction material in the unders streams.

The Section 1 unders will be sent to landfill as rejects. The Section 2 unders are conveyed past an aluminum picking station where aluminum is removed. Tramp materials will then be returned to the RDF stream. This conveyor is reversible and will allow Section 2 unders to be discharged to the reject stream if market conditions warrant. The rejects (glass and grit) will be conveyed by a collection belt to a truck loading station for delivery of the rejects to Class I landfill.

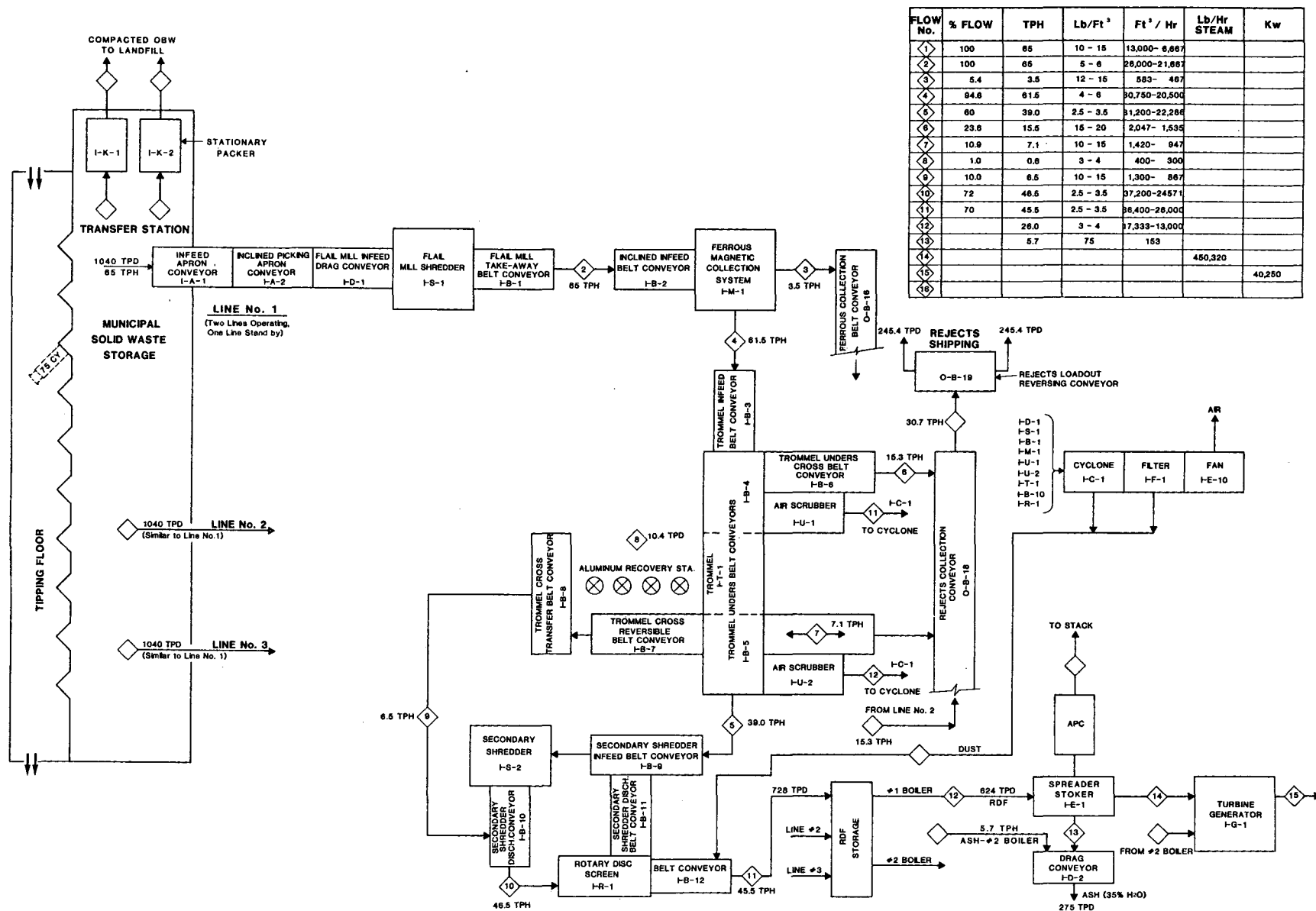


**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



MASS BALANCE

FIG. 3.1-2



The Secondary shredder will be air swept and reduce the overs from the two stage rotary trommel. Optimum size will be determined but will be in a range from minus 2 by minus 2 by minus 2 to minus 4 by minus 4 by minus 4. The output of the secondary shredder and tramp materials from Section 2 of the trommel will be conveyed to a final screen from which the overs will be returned to the secondary shredder for reduction. The unders from this final screen will comprise the RDF stream for delivery to the RDF Energy Plant storage building.

The RDF stream from each line will discharge to a collection conveyor which will transfer to a combination tripper and shuttle conveyor system to build a storage pile of sufficient fuel for operation of the boilers for two days. The enclosed RDF storage building will have a fire protection system with sprinklers, hose racks, and smoke arrestors. Front end loaders will be used to maintain the storage pile and feed the boiler infeed conveyors.

The RDF will be combusted in waterwall spreader stoker furnace systems. Each independent boiler will be a natural circulation, drum type design provided with an economizer section for feedwater heating. The furnace feed system will consist of stokers of the pneumatic spreader type with continuous ash discharge, forward traveling grates and a wet trough drag conveyor residue system for handling bottom ash including siftings and flyash. The residue removal system will include 2 conveyors, each of which is designed to individually handle all the residue, siftings and flyash. Each conveyor system will consist of a drag chain and flights riding in a water trough with an inclined section to simultaneously dewater and elevate the residual solids for discharge from the ash pit. The ash will discharge into 40 CY open top ash trucks and be delivered to the Class I landfill for disposal.

The steam turbine-electric generating plant will be operated in conjunction with the boiler plant. The closed loop cooling system will utilize a cooling tower for dissipation of heat.

The 138 KV transmission line will link the switchyard at the resource recovery plant with Florida Power & Light's existing transmission lines. See Chapter 6 for details.

The ferrous fraction that has been recovered and stockpiled will be processed in the ferrous processing line. The process includes shredding, magnetic separation, air scrubbing, and baling of the cleaned ferrous to produce a #2 bundle.

The aluminum cans which will be hand picked will also be shredded in a separate process. They may also be baled for compaction or shipped shredded depending upon the market requirements.

3.1.2.2 The Landfills

The acreage requirements for support facilities associated with development of the proposed Resource Recovery Facility at the site such as the Class I landfill, Class III landfill, borrow lakes drainage and stormwater management systems, etc., have been estimated based on a number of assumptions, including the landfill operating periods, resource recovery plant startup and expansion dates, and South County Class III Landfill start-up date.

It appears that at the present rate of use the Dyer Boulevard Landfill will close in 1987. Therefore, all Class I and Class III waste managed by the Authority will be disposed in the new landfills possibly starting prior to closure of the Dyer facility. Under the

assumption that the Resource Recovery Facility landfills will both become operational in 1987, the new Class I and Class III landfills will be operated over the planned lifetime of the facility.

Once the resource recovery plant is operational, the Class I landfill will receive three types of wastes: ash, process rejects, and by-pass (unprocessed due to facility capacity or shutdown). The resource recovery plant will initially have capacity exceeding the incoming Class I waste quantity at plant startup in 1989, and again at expansion in 1999. In these instances some selected Class III material will be processed and combusted. Otherwise, Class III material will be landfilled.

The size of the landfills developed on the site will directly affect the acreage occupied by borrow lakes throughout the site development and at closure. The existing borrow lake will be expanded and several borrow lakes will be created on the site to support site preparation and landfill operation. It is estimated that approximately 12,860,000 cubic yards of sand/soil will be required to construct and operate the landfills on the site. Uses of the borrow material include: construction fill for landfill base, internal leachate containment berm construction, perimeter access roads construction, daily and/or intermediate cover for landfill lifts, and final cover landfill. The Dyer Boulevard Landfill will also continue to utilize borrow material from the existing lake on the site until landfill closure at the Dyer site is complete. This demand is estimated to equal approximately 1,630,000 cubic yards from July 1984 through closure (scheduled for late 1987). *402,400 cy. Fill Per RRF*

In meeting the total demand for borrow material (14,490,000 cubic yards), approximately 243 acres will be occupied by borrow lakes (to be excavated to a depth of 50 feet) after the closure of the landfills on the site.

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3.2 SITE LAYOUT

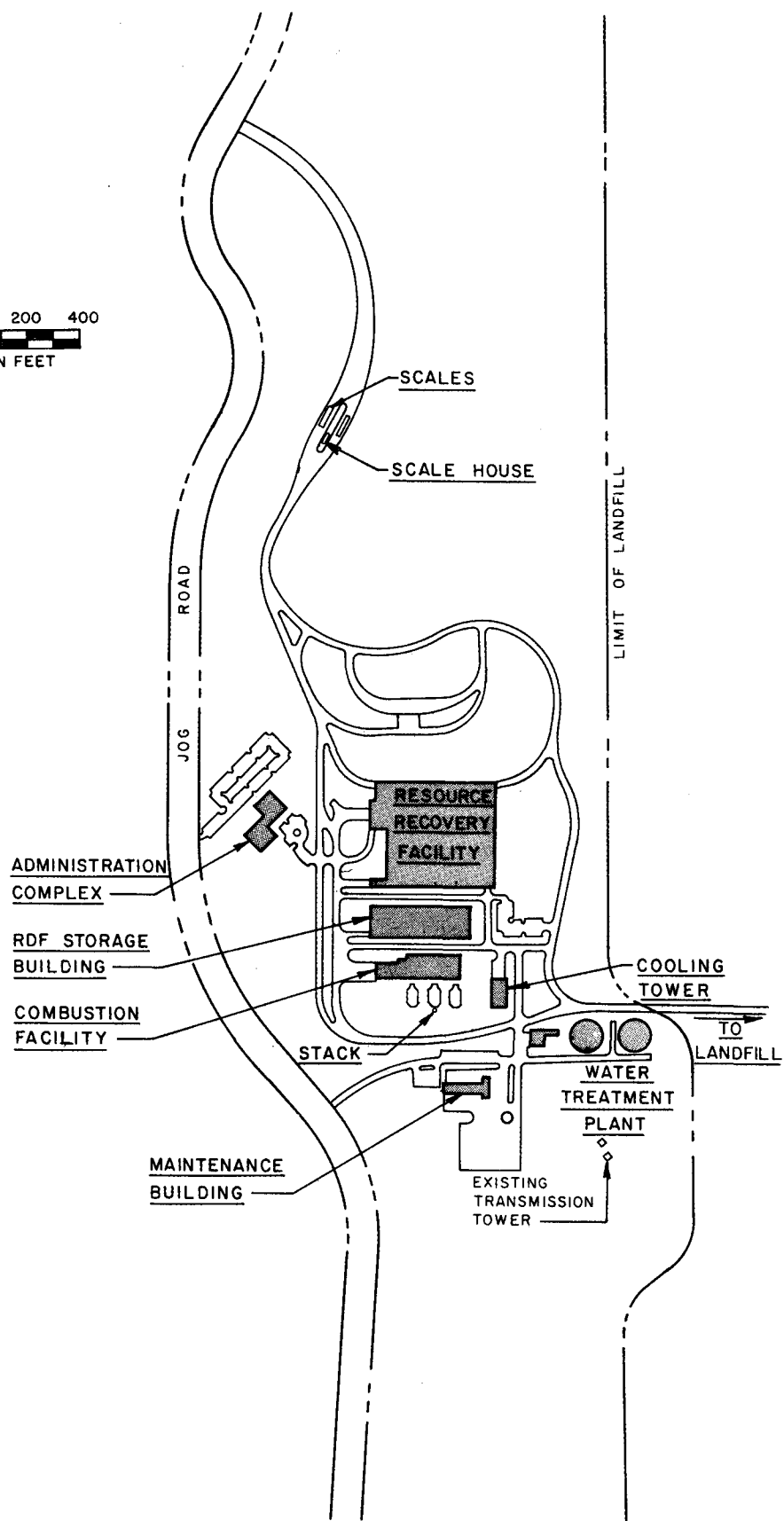
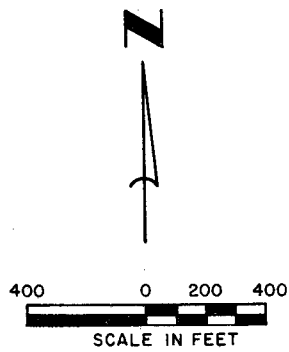
3.2.1 Layout of the Resource Recovery Plant

The general site development plan is shown in Figure 3.2-1, and depicts the conceptual building layout with the location of the stack where gaseous wastes leave the plant. All structures will be set back a minimum of 150 feet from all property lines, with the resource recovery plant and wastewater treatment plant set back a minimum of 450 feet. The total site area is approximately 40 acres.

The Authority, located in the Administration building, will operate the landfills, wastewater treatment plant, maintenance facilities, the water supply wells and the injection well for disposal of effluents. A full service contractor under contract to the Authority will operate the resource recovery plant. The facility design and layout coordinates for efficient operation (entrances, roadways, fences, retention basins, buffers, signs, etc.) of the separately operated units.

Figure 3.2-2 shows the profile of the resource recovery plant, which will be composed of three separate structures. The 250 foot high stack where gaseous waste leaves the plant is shown in relation to the surrounding structures.

Liquid wastes do not leave the site but will be disposed of by deep well injection. Refer to Section 3.5.1.5 and Appendix 10.8 for a detailed description.



PALM BEACH COUNTY
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RESOURCE RECOVERY FACILITY



RESOURCE RECOVERY PLANT
SITE PLAN

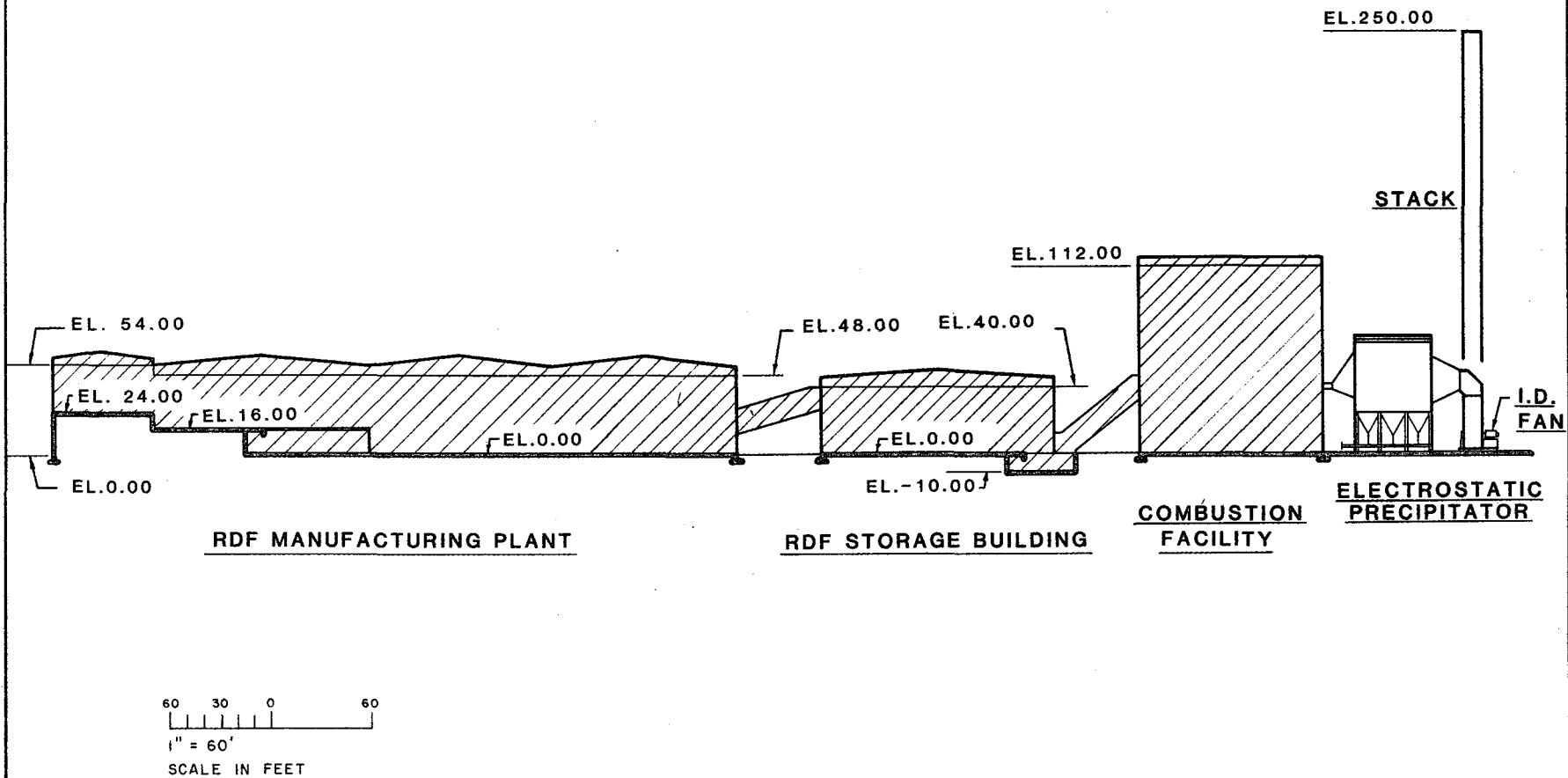
FIG. 3.2-1

PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



TYPICAL SECTION THROUGH
RESOURCE RECOVERY FACILITY

FIG. 3.2-2



3.2.2 Layout of the Landfills

The proposed preliminary site development plan for the site is shown in Figure 3.2-3. Space has been allocated for Class I and Class III landfills, the north-south roadway, borrow lakes, the resource recovery plant, a conservation area and perimeter buffer zones.

In accordance with the Water Quality Assurance Act of 1983, a landfill cannot be constructed within 3,000 feet of a Class I water body. Because the West Palm Beach Water Catchment Area (WCA) is classified as a Class I surface water body, all landfill activities must occur within the eastern 1,900 feet of the site in order to comply with these minimum setback requirements. The existing borrow lake in the northeast portion of the site will be expanded to allow maximum utilization of the designated area for dredging fill material to be used at the Dyer Boulevard Landfill as well as the landfill areas on the site.

The area of the site within the 3,000 foot setback from the WCA will be utilized to accommodate the resource recovery plant, the north-south roadway, additional borrow lakes, and a conservation area which includes wetlands mitigation and stormwater management. Two borrow lakes will be developed on the property south of 45th Street within the boundaries of the site, while allowing for the extension of the roadway south of 45th Street.

Within the limited area for landfill base available within the eastern region of the site which is suitable for waste disposal, the landfill height must be established to provide the volume required for 22 years of Class I landfill operation and 22 years of Class III landfill operation. Existing ground elevations on the site average + 17.5 feet NGVD (± 1 foot). The proposed peak final elevation of the designated Class I and Class III landfill areas is 130.0 feet NGVD.

The landfilling operation will be set back a minimum of 200 feet from all borrow lake/water body edges. Within this 200-foot-wide area the property will be graded, landscaped, and planted to buffer landfill and resource recovery plant operations from public view.

Site buffering will also be provided along the northern boundary of the site in keeping with one of the conditions that has been placed on the zoning special exception by the Palm Beach County Board of County Commissioners.

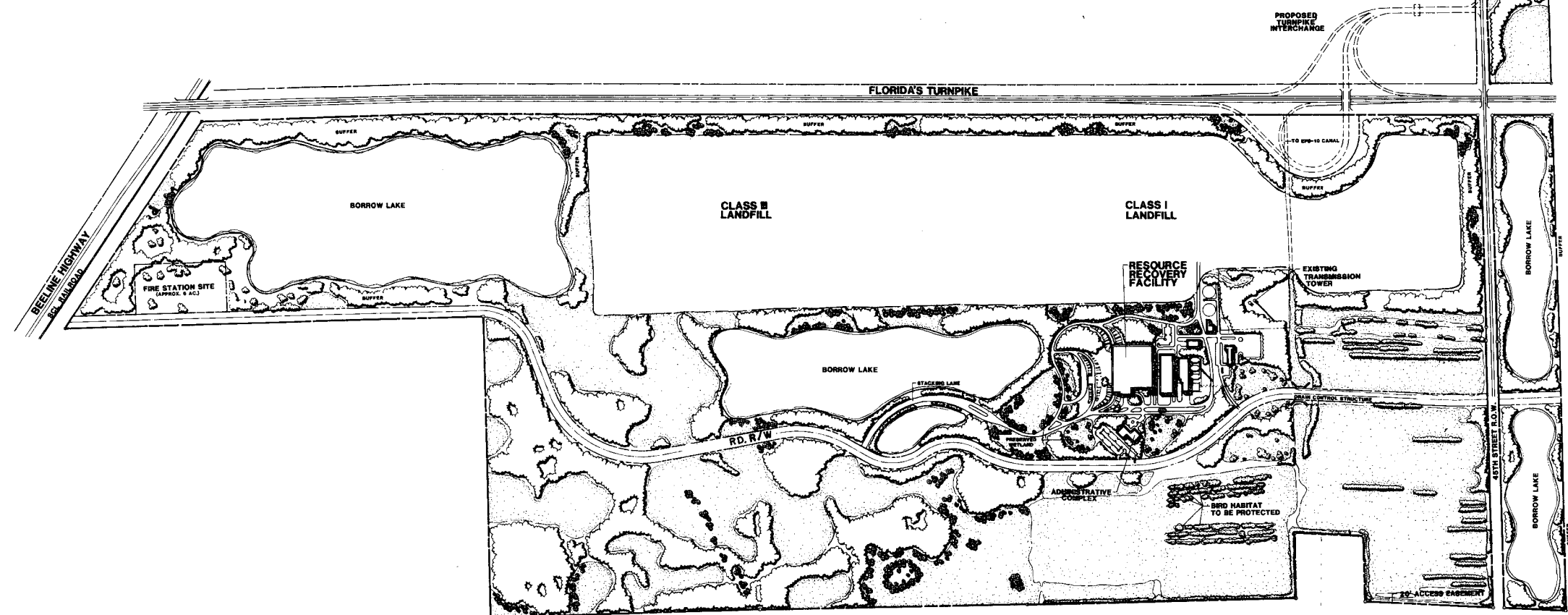
Natural site drainage is to the east. Site construction will alter this drainage pattern. However, any outfall from the site will ultimately flow to the eastern boundary of the site for release.

Maximum side slopes at time of closure on the landfill will be four horizontal to one vertical (4:1). With every 20-foot change of elevation incurred in landfill operation, a 30-foot drainage terrace will be accommodated. Drainage swales on the terraces will intercept stormwater runoff flowing down the side slopes and direct this flow to drainage spillways which will traverse the side slope and terminate at the base of the landfill, discharging intercepted runoff into a landfill perimeter canal. The landfill side slope will be vegetated to minimize erosion and filtration. The drainage terrace will be planted and landscaped to improve the appearance of the landfill. Stormwater runoff from the closed cells of the landfill, roadways, resource recovery plant and parking areas will be directed to sedimentation basins then released into wetland areas. Leachate generated from the landfills will be collected separately by the leachate collection system. (Section 3.5.6) A more complete description of the on-site stormwater management system is provided in Section 3.8.

Forty-Fifth Street will be used by waste collection/transfer vehicles to access the Resource Recovery Facility. The 45th Street right-of-way will be 120 feet wide. A turn lane

LEGEND

-  BORROW LAKE
-  PRESERVED FRESH WATER SWAMP OR SLOUGH
-  PRESERVED FRESH WATER MARSH OR WET PRAIRIE
-  PRESERVED & RELOCATED CYPRESS
-  PRESERVED & RELOCATED UPLAND VEGETATION



will be provided at the site entrance. A north-south roadway will be constructed from 45th Street to the Beeline Highway. A 120-foot right-of-way for the roadway will be accommodated in the site layout.

Landfill access roads will be provided at the base of the landfill. The roadways will be 12 feet wide, with an 8-foot shoulder on each side and will have a design speed of 30 miles per hour. Roadways extending from the landfill base to the working face of the fill operation will have a maximum slope of seven percent (7%), a width of 40 feet, and a design speed of 20 MPH.

At least six acres of the site will be reserved to be conveyed to Fire Service at the time of closing. This parcel will probably be located near the intersection of the north-south roadway and the Beeline Highway. Approximately nine acres will be reserved in the vicinity of 45th Street for a Turnpike interchange.

The site will contain the following structures in addition to the Class I and Class III Landfills:

- Resource Recovery Plant
- Maintenance Building
- Administrative Building
- Wastewater Treatment Plant
- Scale House
- Potable Water Storage Tank
- Hazardous Waste Storage and Transfer Building
- Electrical Substation

It is planned that there be three entrances from the north-south roadway: to the administration building; to the maintenance building (controlled gate); and to the scale house, resource recovery plant, citizen's convenience area, and landfills.

This separation allows public and employee access to the Administration complex without mixing with refuse delivery vehicles. Also, the service vehicles with business in the maintenance area would have separate access through a controlled gate. A parking area will be provided in the vicinity of resource recovery plant. The number of parking spaces provided will accommodate resource recovery plant personnel and landfill personnel. Shift overlap will be considered. A parking area will be provided near the administration building to accommodate administrative personnel and visitors.

The structures have been located to preserve wetlands, woodlands, and ponds to present an attractive appearance. The site will be graded, landscaped, and bermed to provide screening where needed.

3.3 FUEL

Diesel fuel will be stored on-site in the designated maintenance area to be utilized by the vehicles operating at the resource recovery plant and the landfills. Areas in which fuels are stored and dispensed will be equipped with emergency sumps from which any spilled fuels can be collected and then properly disposed.

The generating plant will use refuse derived fuels (RDF) for combustion which will be manufactured from MSW as discussed in Section 3.1.2.1. ^{no} provision is made for auxiliary fuel, ^{except for} natural gas which is expected to be used for a start-up ^{fuel} and shutdown of the furnace/stoker/boiler system and also to assist combustion when RDF is wet or otherwise difficult to burn.

close out of Dyer Boulevard Landfill, substantial quantities of landfill gas (methane and carbon dioxide) are expected to be generated for many years. This gas will be collected and could be an excellent additional fuel source to be burned in the boilers.

The Resource Recovery Facility will be initially constructed to process 12,000 tons of solid waste per week (624,000 tpy). With the addition of a third boiler this capacity will be increased by 50% (936,000 tpy). Listed below are the projected quantities of solid waste available to the Authority from Palm Beach County:

Year	Class I	Class III	Total
1984	455,000	435,000	890,000
1994	675,000	645,000	1,320,000
2004	1,000,000	955,000	1,955,000

All Class I and a portion of Class III is expected to be processed through the resource recovery plant throughout the life of the project.

Table 3.3-1 shows the characteristics of the RDF as used in the design criteria. Table 3.3-2 shows a typical analysis of rejects and Table 3.3-3 an analysis for ash.

TABLE 3.3-1
DESIGN SPECIFICATION OF THE REFUSE DERIVED FUEL
FOR THE AUTHORITY RESOURCE RECOVERY FACILITY

ANALYSIS (WET BASIS) %

Carbon	34.73
Hydrogen	4.69
Nitrogen	0.55
Sulphur	0.22
Chlorine	0.73
Oxygen	25.46
Inorganic	13.62
Water	20.00
BTU per pound (dry)	7,705
BTU per pound (as fired)	6,164

TABLE 3.3-2
TYPICAL ANALYSIS AND COMPOSITION OF
RDF MANUFACTURING PLANT REJECTS

ANALYSIS (WET BASIS) %

Carbon	10.50
Hydrogen	1.46
Nitrogen	0.33
Sulphur	0.06
Chlorine	0.19
Oxygen	7.98
Inorganic	60.20
Water	19.27

TABLE 3.3-3
ANTICIPATED ANALYSIS OF
BOILER DISCHARGE MATERIAL
% BY WEIGHT (WET)

Ash	61.75
Unburned Carbon	3.25
Moisture	35.00

The future estimate of quantities available to the Authority is based on future population projections. The plant has been arranged to allow for the addition of a third boiler to increase capacity by 50%. It is evident a second plant will also be required if population and waste generation quantities are realized. A close tracking of growth will determine when the expansion and the new plant are justified.

The Authority has by law the right to dispose of, or have disposed of, all the solid waste within the boundaries of Palm Beach County.

3.4 AIR EMISSIONS AND CONTROLS

3.4.1 Resource Recovery Plant

3.4.1.1 Air Emissions Types and Sources

The proposed resource recovery plant is a new facility to be located in Palm Beach County. *initial ?*

At ultimate size, the facility as planned would contain three boilers each with a rated capacity of 700 tpd of RDF for a total of 2100 tpd. The flue from each of the boilers will be encased in a common stack. The MSW and RDF storage areas will be enclosed and under negative pressure with combustion air being taken from these areas. There will be no on-site storage of either refuse or residue except within controlled areas. Loading and unloading of trucks will take place within these enclosed areas. A complete description of the development of the stack emissions is contained in Appendix 10.1.5. An emissions inventory for the proposed facility is contained in Table 3.4-1.

3.4.1.2 Air Emission Controls

Air pollution control technologies, which could be used to control particulate matter and trace metals are: electrostatic precipitator (ESP), fabric filtration system (baghouse), and wet venturi scrubber. The technologies available to control SO₂ and acid gases (H₂SO₄, HCL, and HF) include: dry scrubber/ESP, ESP/wet scrubber, and dry scrubber/fabric filter. These systems and their operating characteristics are fully described in the BACT analysis in Appendix 10.1.5.

TABLE 3.4-1
CONTROLLED EMISSION FACTORS DEVELOPMENT
FOR RDF FIRED SPREADER STOKER FURNACES

(ANNUAL AVERAGE BASED ON 1,800 TPD RDF FIRED)

<u>POLLUTANT</u>	<u>d/o</u> <u>RDF</u>	<u>LBS/HR</u>	<u>TONS/YEAR</u>	<u>GM/SEC@</u> <u>1,800 TPD</u>	<u>GM/SEC@</u> <u>2,100 TPD</u>
Carbon Monoxide	12.0	900.	3,942.	113.	132.
Nitrogen Dioxide	4.0	300.	1,314.	37.8	44.1
Sulfur Dioxide	9.0	675.	2,957.	85.1	99.3
Chlorides	3.5	263.	1,150.	33.1	38.6
Volatile Organic Compounds	.20	15.0	65.6	1.89	2.21
Particulate Matter	.65	48.8	214.	6.14	7.16
Sulfuric Acid Mist	.0004	.030	.131	.0038	.0044
Flourides	.04	3.00	13.2	.38	.44
Lead	.0014	.105	.46	.0132	.0154
Mercury	.003	.225	.98	.0284	.0331
Beryllium	9.0 E-06	6.8 E-04	3.0 E-03	8.5 E-05	9.9 E-05
2,3,7,8-TCDD	8.5 E-08	6.4 E-06	2.8 E-05	8.0 E-07	9.3 E-07

3.4.1.3 Best Available Control Technology (BACT)

The BACT Analysis, presented in the Prevention of Significant Deterioration (PSD) Permit Application, Appendix 10.1.5, evaluates the environmental, economic, and energy aspects of alternative control techniques and methods. Air quality is monitored by the Palm Beach County Health Department, which prepares an annual report and documents the findings on air quality for Palm Beach County. Based on the latest report, 1983, Palm Beach County is presently in compliance for all regulated pollutants. However, EPA does not consider the County to be in compliance with ozone, in spite of the data, until EPA completes its own ozone monitoring which is presently ongoing. The control device which meets the requirements for the criteria pollutants is the electrostatic precipitator at 0.025 grains per dry standard cubic feet (gr/dscf) corrected to 12 percent CO₂. The complete discussion of the BACT selection process is presented in Appendix 10.1.5.

3.4.1.4 Design Data for Control Equipment

Pollution control design parameters for the proposed spreader stoker/ refuse derived fuel (RDF) fired boiler/electrostatic precipitator (ESP) systems relevant to Best Available Control Technology (BACT) analysis are discussed in Section 3.0 of Appendix 10.1.5. These and additional facility parameters are based on conceptual design of facilities and are subject to verification and refinement as the project is advanced through its procurement and detailed design phases. The following descriptive material provides preliminary data on the proposed designs:

3.4.1.4.1 Furnace/Stoker/Boiler Systems

3.4.1.4.1.1 General

The technology proposed for the RDF combustion/energy recovery system is the waterwall boiler spreader stoker furnace system. This technology has been successfully applied to RDF combustion in municipal applications (e.g. Hamilton, Ontario, Canada; Dade County, FL; Ames, IO; Wilmington, DE; Columbus, OH; Lawrence, MA) and has been extensively utilized in industrial applications for combustion of solid fuels including coal and wood chips, either alone or in combination with other materials.

Spreader stoker systems properly designed and installed are no longer considered a high risk technology. There are no major areas of project design and operation that represent significant new technology innovation.

The specific type of furnace/stoker/boiler system selected for firing the RDF will be dependent on the negotiations with the vendor for the furnace/stoker/boiler/ESP system.

Each boiler will be a natural circulation, drum type design provided with an economizer section for feedwater heating. The configuration of the boiler will depend on the particular design of the selected vendor. It should be noted, however, that the predicted performance of this system is essentially the same for all of the approved vendors of this technology.

3.4.1.4.1.2 Design Criteria

Requirements of the furnace/ stoker/ boiler system are as follows:

1. Highest order of dependability.
2. Acceptable burnout of RDF, destruction of odors and toxic hydrocarbons and combustion of volatiles, minimal emissions of fly ash.
 - a. Maximum putrescible material in residue. . . 0.2%.
 - b. Maximum combustible material in residue. . . 5.0%.
 - c. Maximum furnace emissions. . . 100 lbs fly ash per ton of RDF.
3. System will be designed for minimal demands on operating and maintenance personnel. Automation of systems and equipment may be provided where benefits derived justify their inclusion.
4. Furnace enclosure will be designed dust tight with clean external profiles to facilitate housekeeping.
5. Provisions will be made to assist the combustion process when refuse is wet or otherwise difficult to burn by the use of gas-fired auxiliary burners and by preheating combustion air to the furnaces.

6. Integral waterwall furnace construction boiler systems and auxiliaries will be provided to reduce furnace gas temperatures to levels suitable for cleaning gases by means of an ESP system before discharge to atmosphere. Primary design criteria for steam systems are maximum simplicity, safety and reliability.
7. Steam produced will be expanded in a steam turbine electric generator of the extraction-condensing type to generate electrical power for in plant use and for sale to the Florida Power & Light Company. The generator will be rated 50 MW. Turbine extraction steam will be used for deaerator/feedwater heating to 250°F and for preheating combustion air to 375°F. See Heat and Material Balance Diagram, Figure 3.4-1.

3.4.1.4.1.3 Design Conditions

Furnaces: Two 700 ton/day units.

RDF: The Furnace/Boiler/ESP system will be suitable for the following as received fuel characteristics:

- Average Design Gross Heating Value: 6164 Btu/lb., consisting of 66.4% combustibles by weight; 13.6% non-combustibles, by weight; 20% free moisture, by weight.
- Range of RDF characteristics as received: Gross heating value; 5,500 Btu/lb. to 7,500 Btu/lb. continuous basis, up to 8,500 Btu/lb. on short-time (10 minute) basis.
- Free moisture content: 10% to 35%.

3.4.1.4.1.4 Reference Fuel

A typical analysis and composition of refuse derived fuel (RDF) is displayed in Table 3.4-2. This RDF is termed the Reference Fuel and will be used as a reference base in gauging furnace/boiler performance guarantees.

3.4.1.4.1.5 Gas Products of Combustion

Based on the Reference Fuel given in Table 3.4-2 for combustion in the design range of 40% to 80% excess air, gas products, of combustion are as shown in the following tables.

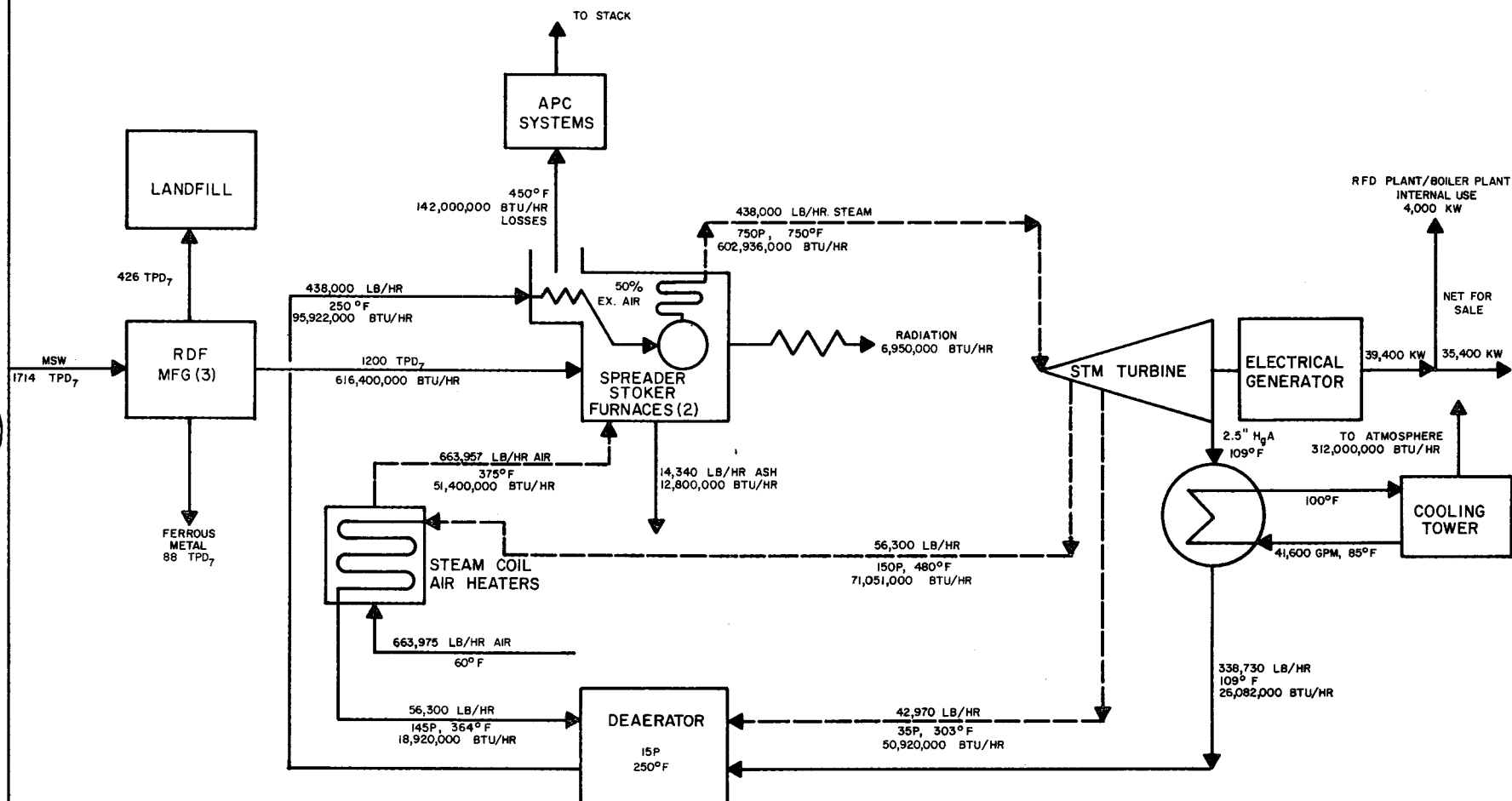


TABLE 3.4-2
TYPICAL ANALYSIS AND COMPOSITION OF REFUSE DERIVED FUEL (RDF)
PERCENT BY WEIGHT

Component	Recovery Rate(%)	Moist- ture	Inor- ganic	Carbon	Hydro- gen	Oxygen	Nitro- gen	Chlor- ine	Sulfur	HHV Total	BTU/LB
Corrugated Board	99.0	1.35	0.16	2.64	0.36	2.54	0.01	0.01	0.02	7.10	447.0
Newspaper	99.0	4.68	0.36	8.50	1.08	7.38	0.03	0.03	0.04	22.09	1445.0
Magazines	99.0	0.71	0.60	1.50	0.21	1.50	0.00	0.01	0.01	4.54	253.0
Other Paper	99.0	5.3	2.32	8.31	1.16	7.67	0.08	0.16	0.05	25.06	1406.0
Plastics	98.0	1.02	0.88	5.75	0.79	0.82	0.09	0.31	0.03	9.68	1180.0
Rubber, Leather	98.0	0.18	0.61	1.18	0.15	0.32	0.04	0.14	0.03	2.64	230.0
Wood	8.0	0.13	0.03	0.48	0.06	0.40	0.00	0.00	0.00	1.11	81.0
Textiles	95.0	0.37	0.10	1.81	0.24	1.32	0.15	0.01	0.01	4.01	320.0
Yard Waste	80.0	0.43	0.12	0.27	0.03	0.20	0.01	0.00	0.00	1.07	46.0
Food Waste	60.0	0.64	0.29	1.01	0.14	0.72	0.06	0.02	0.00	2.88	183.0
Mixed Combustibles	60.0	5.09	1.13	3.23	0.45	2.55	0.08	0.05	0.02	12.59	563.0
Ferrous	7.0	0.01	0.52	0.01	0.00	0.01	0.00	0.00	0.00	0.54	1.0
Aluminum	35.0	0.01	0.86	0.01	0.00	0.01	0.00	0.00	0.00	0.90	2.0
Other Non- Ferrous	10.0	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.0
Glass	35.0	0.08	5.61	0.03	0.00	0.02	0.00	0.00	0.00	5.75	5.0
TOTALS	2	0.00	13.63	34.73	4.67	25.46	0.55	0.74	0.21	100.01	6164.0

Heat Value as Produced (20.0% H₂O) = 6164

Heat Value of Dry Solids = 7705

Heat Value of Combustibles = 9287

Ash as Produced (20.0% H₂O) = 13.6%

Density = 2.5 to 3.5 pounds/cubic foot

Size = Minus 2" X Minus 2" X Minus 2"

TABLE 3.4-3a
COMBUSTION PRODUCTS OF GASES AT 40% EXCESS AIR

	Pounds	Moles	% by Weight	% by Volume	% by Volume Dry
Water	0.69727	0.03870	9.83	15.56	0.00
CO ₂	1.24627	0.02832	17.58	11.38	13.48
Nitrogen	4.72577	0.16870	66.64	67.80	80.29
SO ₂	0.00440	0.00007	619.86 PPM	275.77 PPM	326.57 PPM
HCL	0.00751	0.00021	1,058.72 PPM	827.59 PPM	980.04 PPM
Oxygen	0.40990	0.01281	5.78	5.15	6.10
TOTAL	7.09112	0.24880	100.00	100.00	100.00

Air Supply required at 60°F and 0. inches of water = 137,713. ACFM and Gas Specific Volume = 13.253 ACF/LB.

Gas volume at 2,737°F and 0. inches of water = 967,275. ACFM and Gas Specific Volume = 81.844 ACF/LB.

Gas Volume at 450°F and 0. inches of water = 275,344. ACFM and Gas Specific Volume = 23.298 ACF/LB.

TABLE 3.4-3b
COMBUSTION PRODUCTS OF GASES AT 50% EXCESS AIR

	<u>Pounds</u>	<u>Moles</u>	<u>% by Weight</u>	<u>% by Volume</u>	<u>% by Volume Dry</u>
Water	0.70299	0.03902	9.33	14.76	0.00
CO ₂	1.24627	0.02832	16.54	10.71	12.57
Nitrogen	5.06291	0.18073	67.18	68.37	80.21
SO ₂	0.00440	0.00007	583.24 PPM	259.55 PPM	304.49 PPM
HCL	0.00751	0.00021	996.17 PPM	778.89 PPM	913.77 PPM
Oxygen	0.51237	0.01601	6.80	6.06	7.11
TOTAL	7.53644	0.26436	100.00	100.00	100.00

Air Supply required at 60°F and 0. inches of water = 147,550. ACFM and Gas Specific Volume = 13.253 ACF/LB.

Gas volume at 2,620°F and 0. inches of water = 990,120. ACFM and Gas Specific Volume = 78.827 ACF/LB.

Gas Volume at 450°F and 0. inches of water = 292,558. ACFM and Gas Specific Volume = 23.291 ACF/LB.

TABLE 3.4-3c
COMBUSTION PRODUCTS OF GASES AT 60% EXCESS AIR

	<u>Pounds</u>	<u>Moles</u>	<u>% by Weight</u>	<u>% by Volume</u>	<u>% by Volume Dry</u>
Water	0.70870	0.03934	8.88	14.05	0.00
CO ₂	1.24627	0.02832	15.61	10.12	11.77
Nitrogen	5.40004	0.19277	67.65	68.87	80.13
SO ₂	0.00440	0.00007	550.70 PPM	245.12 PPM	285.21 PPM
HCL	0.00751	0.00021	940.59 PPM	735.61 PPM	855.90 PPM
Oxygen	0.61484	0.01921	7.70	6.86	7.99
TOTAL	7.98176	0.27991	100.00	100.00	100.00

Air Supply required at 60°F and 0. inches of water = 157,386. ACFM and Gas Specific Volume = 13.253 ACF/LB.

Gas volume at 2,514°F and 0. inches of water = 1,012,373. ACFM and Gas Specific Volume = 76.101 ACF/LB.

Gas Volume at 450°F and 0. inches of water = 309,771. ACFM and Gas Specific Volume = 23.286 ACF/LB.

TABLE 3.4-3d
COMBUSTION PRODUCTS OF GASES AT 70% EXCESS AIR

	<u>Pounds</u>	<u>Moles</u>	<u>% by Weight</u>	<u>% by Volume</u>	<u>% by Volume Dry</u>
Water	0.71442	0.03966	8.48	13.42	0.00
CO ₂	1.24627	0.02832	14.79	9.58	11.07
Nitrogen	5.73717	0.20480	68.08	69.31	80.06
SO ₂	0.00440	0.00007	521.60 PPM	232.22 PPM	268.22 PPM
HCL	0.00751	0.00021	890.88 PPM	696.89 PPM	804.92 PPM
Oxygen	0.71731	0.02242	8.51	7.59	8.76
TOTAL	8.42707	0.29547	100.00	100.00	100.00

Air Supply required at 60°F and 0. inches of water = 167,223. ACFM and Gas Specific Volume = 13.253 ACF/LB.

Gas volume at 2,418°F and 0. inches of water = 1,034,110. ACFM and Gas Specific Volume = 73.628 ACF/LB.

Gas Volume at 450°F and 0. inches of water = 326,985. ACFM and Gas Specific Volume = 23.281 ACF/LB.

TABLE 3.4-3e
COMBUSTION PRODUCTS OF GASES AT 80% EXCESS AIR

	<u>Pounds</u>	<u>Moles</u>	<u>% by Weight</u>	<u>% by Volume</u>	<u>% by Volume Dry</u>
Water	0.72013	0.03997	8.12	12.85	0.00
CO ₂	1.24627	0.02832	14.05	9.10	10.45
Nitrogen	6.07430	0.21684	68.46	69.72	80.00
SO ₂	0.00440	0.00007	495.42 PPM	220.61 PPM	253.14 PPM
HCL	0.00751	0.00021	846.17 PPM	662.04 PPM	759.67 PPM
Oxygen	0.81978	0.02562	9.24	8.24	9.45
TOTAL	8.87239	0.31102	100.00	100.00	100.00

Air Supply required at 60°F and 0. inches of water = 177,060. ACFM and Gas Specific Volume = 13.253 ACF/LB.

Gas volume at 2,330°F and 0. inches of water = 1,055,394. ACFM and Gas Specific Volume = 71.372 ACF/LB.

Gas Volume at 450°F and 0. inches of water = 344,198. ACFM and Gas Specific Volume = 23.277 ACF/LB.

3.4.1.4.1.6 **Stack Emission Data & Composition**

Stack emission data predictions for the resource recovery plant are given in Section 4.0 of Appendix 10.1.5.

Metal composition predictions for particulate stack emissions, based on test data from a prototype RDF spreader stoker/waterwall boiler/ESP plant is given in Table 3.4-4.

TABLE 3.4-4
METALS COMPOSITION FOR PARTICULATE EMISSION

Element	% by Weight
Potassium	8.25
Silicon	5.86*
Calcium	4.75
Sodium	4.15
Aluminum	3.40
Zinc	2.70
Iron	1.00
Lead	0.57
Titanium	0.43*
Magnesium	0.14
Cadmium	0.14
Manganese	0.12
Boron	0.011*
Tin	0.11
Copper	0.07
Nickel	0.067
Chromium	0.06
Mercury	0.03
Strontium	0.012*
Barium	0.005
Moly bendum	0.004*
Zirconium	0.003*
Antimony	0.003*
Bismuth	0.003*
Vanadium	0.002*
Cobalt	0.001*
Silver	0.001*
Gallium	0.001*
Arsenic	0.001
Phosphorus	—

10007

* Semi-quantitative by emission spectrography.

Based on a particulate emission sample collected on an EPA filter analyzed for composition of metals. The total metals content was about 32% of the total sample on the filter.

Test No. 1 at Solid Waste Reduction Unit at Hamilton, Ontario, Canada reported in Proceedings of 1978 ASME National Waste Processing Conference: Table 6, "Flue Gas, Emissions from a Shredded Municipal Refuse Fired Steam Generator", Reid and Heber.

The total metals content in the test reported amounts to 32% by weight of the flyash emissions. The metals appear as oxidized compounds which together with minor quantities of chlorides, sulphides, etc. make up the combined weight of the inorganic fraction of the flyash. The inorganic fraction is usually in the order of 80% by weight of the total flyash emissions. The 20% plus or minus organic fraction is unburned carbon.

3.4.1.4.1.7 **Furnace Feed System**

The stokers will be of the pneumatic spreader type with continuous ash discharge, forward traveling grates suitable for burning the specified RDF and a wet trough drag conveyor residue system for handling the bottom ash including siftings and flyash. Each pneumatic spreader stoker feeder is supplied by connecting chutes; each connecting chute will be furnished with a counter-weighted balance draft assembly which will act as an air seal during periods when RDF is not being fed to the furnace.

Each pneumatic spreader stoker feeder will be of heavy cast iron construction complete with air damper to distribute finer and lighter density RDF into the surface.

3.4.1.4.1.8 **Traveling Grate System**

The grate heat release will not exceed 750,000 Btu per hour per square foot when burning RDF at maximum continuous rating. The grate will be made of heavy duty heat resisting ductile iron. The grate will be specially designed for spreader stoker firing of RDF and will be of high resistance, air metering type with closely and uniformly spaced tapered, self-cleaning air openings. The air openings in the grates will effect proper metering of the air to the fuel bed. Lubrication connections, if required, will be routed to a single point outside the grate on the operating floor for visual observation of discharge while lubricant is being added. The stoker will be provided with under-grate seals to be fabricated of cast iron, counter-weighted and to be in close contact with the undersides of the grate. The stoker is to be provided with air seals to allow for downward expansion of the boiler while maintaining an effective seal. The front end of the grate, where the ash is discharged into the ash hopper will be enclosed with a steel dust tight enclosure protected with refractory and provided with access doors, observation ports, and provisions will be made for the grate observation television system.

3.4.1.4.1.9 **Residue Discharge**

Residue discharge equipment to flap gates will be arranged for full width of furnace to eliminate sloped surfaces that may accumulate residue and cause bridging and inadvertent furnace shutdown. Dual residue conveyors and flap gates will be furnished. Each of the residue conveyors will operated in a water filled trough which provides the furnace draft seal while quenching the ash.

3.4.1.4.1.10 **Steam Generation**

Each boiler will be rated 250,000 lb/hr. Steam will be 750 psig and 750°F superheat with 250°F feedwater temperature delivered to the boiler economizer. Exit gas temperature is 450°F. Boiler continuous blowdown values will be as follows: Design 2%, Normal 1%.

3.4.1.4.1.11 Waterwall Furnace

The furnace configuration in plan will be rectangular to coordinate with the geometry of the stoker. The furnace enclosure will be all waterwall construction. Other criteria will be as follows:

(1) In the area of the residue dropoff from the travelling grate stoker, the furnace wall construction will be 10-inch abrasion resistant extra strength, high heat duty quality castable refractory, also backed by 2 inches of heat resistant, alloy wire reinforced, plastic insulating sealant. This wall will be sectionally supported by a heat resistant, high temperature chromium-nickel alloy anchor and seat system. Hangers and seats will be coated with 1/8 inch thickness of mastic before castable refractory will be placed. An air lane for natural draft ventilation will be created behind the superduty and castable walls by providing insulated steel casing panels, built out flush with the panels of the waterwall sections of the furnace enclosure. Grilled openings will be provided in the bottom sections of the casing panels to admit air for cooling.

(2) The furnace volume and configuration will be determined by the criteria that sufficient furnace waterwall heating surface, termed effective projected radiant surface (EPRS), be provided to reduce the average flue gas temperatures to 1,400°F before the gases enter the screen tube section of the boiler to avoid slagging the tubes. The calculation for this determination assumes 6,164 Btu/lb waste burning at 60 percent excess air and clean waterwall surfaces. A corollary requirement is a minimum of one second combustion gas residence time calculated at 1,800°F after secondary air injection.

(3) The surface area, computed in accordance with the above criteria and the corresponding furnace volume derived therefrom, will be sufficient to burn clean all gases evolved in the combustion process under normal conditions of operation. However, to provide for various operating conditions other than normal (startup, shutdown, low or excessively high British thermal unit wastes and for in-service fouling of the waterwall fireside surfaces), the waterwall furnace will incorporate the following features:

a. Gas stratification control by air jet nozzles arranged to create a mixing action of the flue gases.

b. Afterburners. The combined capacity of a minimum of two afterburners for each furnace will correspond to about 50% of the gross heating value of the RDF through-put of the furnace. Specifications for the afterburners shall include the following requirements:

1. Adjustable flame direction, pattern and fuel-air ratio.
2. Turndown ratio control.
3. Natural gas and/or oil firing.
4. Air admission louvers to modulate automatically with changes in firing rate and not be tight closing, but designed to allow 10 percent leakage air to purge and cool the burner setting when burner will be not in operation.
5. Fireside metal material of extra corrosion and heat-resistant alloy, Incoloy 825 or approved equal.
6. Burner throat formed of high alumina refractory, extra resistant to spalling, oxide attack, and slagging.

7. Ignitor located in each burner assembly so as to minimize fouling by flyash and provided with a compressed air connection to purge the ignitor clean when required, as before light-off.

8. Flame safeguard control system as follows: local and remote panels to check all limit controls and to provide supervisory, automatic nonrecycling startup of each burner and automatic temperature control after start; flame failure scanners on each burner to monitor its respective ignitor and main flame, and to discriminate between its own monitored flames and those of the other burners; scanners to be provided with compressed air purge connections, pressure seal, lenses, and swivel mounts; system shall comply with latest regulations of Factory Mutual, Factory Insurance Association, and National Fire Protection Association.

9. Tertiary air nozzles will be used for injecting cooling air into the flue gas stream. In the waterwall furnace, the nozzles will be located at the furnace mid-height; they supply air when required to cool the flue gases before they enter into the screen tube section of the boiler to prevent slagging on these tubes.

(4) Boiler Construction: The waterwall construction will provide a gas-tight membrane of welded, fintube walls, made of tubes with extruded fins, requiring only one weld seam to connect two tubes, or a single carbon steel flat bar not less than 1/4-inch thick may be welded to both tubes with a full penetration weld to produce a completely homogeneous 100 percent metal connection between tubes and fin. Tubes will be seamless or electric resistance welded low carbon steel conforming to ASME Boiler Code Material Specifications SA-192 or SA-178, grade A. Minimum wall thickness will be as required by ASME Code plus an additional 0.060 inch allowance.

(5) Boiler Design: The boiler design will be single pass with 2 drums, steam (upper) and mud (lower). Boiler tubes will be arranged to run only vertically and in-line in both directions and provide ample clearance between tubes to prevent the bridging of tubes by flyash.

a. The design, materials, construction, and inspection of all steam generating pressure parts will comply with the requirements of the **ASME Boiler and Pressure Vessel Code**, latest edition. The steam generator will be stamped with the ASME Code symbol and the stamp of the National Board of Boiler and Pressure Vessel INSPECTORS.

b. The steam drum internals will be designed for assembly into small units to permit complete internal drum inspections. Both steam and mud drums will be equipped with an access manhole on each end. Gaskets will be of such material as to withstand acid cleaning agents. The drum internals will be designed to accommodate sudden load changes without carryover.

(6) Insulation and casing systems: The exterior of the waterwall furnace enclosure and all exterior boiler surfaces will be insulated with a minimum of 3 inches of 8 pound density, mineral wool blankets with galvanized wire mesh on both sides. Casing systems will consist of panels, secured to the exterior of the buck stays or supporting steel. The panels will be formed of minimum No. 18 gage galvanized steel sheets, fluted or ribbed to provide adequate stiffening. Insulation materials and construction will insure a maximum exterior surface temperature of 140°F with ambient temperature of 100°F.

(7) Accessories: The following accessories will be provided for each waterwall boiler system.

- Safety valves.
- Water column and valves.
- Drum level gauges (flat glass type; 2 at each drum).
- Low water alarm and cutoff, high water alarm.
- Blowoff and drain valves.
- Continuous blowdown valves and connection.
- Soot blower system, steam blowing, steam control, and shutoff valves.
- Feedwater regulating valve with 3 valve bypass.
- Boiler chemical feed connection and valves.
- Sampling and test connections and valves; vent valves.
- Auxiliary afterburners and controls.
- Furnace temperature sensors.
- Fireside boiler tube maintenance system per paragraph below.
- Headers, equalizer, and miscellaneous piping.
- Access doors and observation ports.
- Penetrations for air nozzles and instruments.

(8) Fireside tube maintenance: There will be ease of access to the fireside of all waterwall and boiler tube surfaces for routine cleaning and maintenance of these surfaces during furnace shutdown periods. Capped sleeve penetrations will be provided through the membrane type construction in the ceiling of the furnace and also in the ceiling of the boiler above the sootblowing lanes for the passage of hoisting cable to be used for attachment of 2-man portable lift platforms. A substantial anchor, designed for quick engagement and quick disengagement of the hoist cables will be secured to the furnace steel structure adjacent to each sleeve penetration.

3.4.1.4.1.12 Air Supply Distribution and Turbulence

Data on the various types of air supply distribution and turbulence systems are as follows:

(1) Underfire Air: The furnace primary air supply will be obtained via the stoker system underfire air compartments. Underfire air fans will have a high static pressure, at least 15-inch water column, in order to maintain a relatively constant preset flow rate of underfire air through the waste on the grates to optimize the combustion process. The consistency will be maintained regardless of voids in the waste or whether the waste material will be light or dense. The relatively high static pressure output of the fan in combination with a high resistance duct and damper system will stabilize airflows to overcome the varying resistance of the waste.

(2) Overfire Air: A system of nozzles will be provided in the walls of the furnace to inject high velocity air into the furnace over the burning waste, to create turbulence and deliver air (oxygen) to assist in completing the combustion of organic gases and carbonaceous particulate matter rising from the burning waste material on the grates. The jets will be designed to penetrate two-thirds across the furnace width, crossfiring from both walls. The nozzles will be positioned at slightly different elevations in opposite sidewalls, and will be aimed at about a 15 degree declination from horizontal toward the grate, to create a

rolling action for recycling incomplete products of combustion into the flames without the jets impinging on the burning waste material. The overfire air supply complements the underfire air supply, which together provide sufficient air to complete the combustion process in a turbulent and high excess air atmosphere.

(3) **Tertiary Air:** Tertiary air nozzles are used for injecting cooling air into the flue gas stream. In the waterwall furnace, the nozzles will be located in the furnace above and downstream of the auxiliary afterburners; they supply air when required to cool the flue gases to 1,400°F before they enter into the screen tube section of the boiler to prevent slagging on these tubes. Static pressure for the tertiary air fans will be 8-inch water column.

(4) **Inlet Vane Control:** All supply air fans will be provided with inlet vanes to permit control and adjustment of fan output characteristics to suit varying operational requirements. These vanes and their control motors, when used, will be isolated from the fan to avoid the possibility of fan vibration from carrying into the vane mechanism and its control. This will be accomplished by a flexible connection in the duct system and the provision of a rigid, independent mount system for the vane and its control.

(5) **Fan Capacity Proportionment.** Underfire Air (UA), Overfire Air (OA) and Tertiary Air (TA) fans will be proportional in ratings to suit the following requirements.

OA = 120% UA.

OA + UA + TA = 300% of Theoretical Air Requirement.

OA + UA = 220% of Theoretical Air Requirement.

Service factors for fans (maximum to normal ratings) will be 1.20.

3.4.1.4.2 **Electrostatic Precipitator (ESP) System**

The equipment consists of two (2) ESP's, one for each furnace complete with accessories as follows and including all supporting structural steel, ductwork, platforms, stairways, handrailings, ash hoppers, control panels, ventilation equipment and other specified items.

Each ESP will include but not be limited to the following:

(1) Design provisions such as vanes and baffles will be provided at the precipitator inlet in order to insure uniform gas flow and distribution across the face of the precipitator in addition to any such provisions in the ductwork. Collecting surfaces will be rolled forward in order to prevent re-entainment of the dust as it falls. The duration of the rapping cycle and interval cycles will be controlled by automatic timers.

(2) The collection plates and the high voltage discharge electrodes will be constructed of materials to withstand long service and prevent corrosion or erosion problems.

(3) Each precipitator will be segmented into a minimum of four electrical sections in the direction of gas flow, each section being provided with a separate power supply, each composed of a transformer and silicon diode rectifier combination (T/R) arranged to provide a double half or full wave 50 kv (average DC) output for precipitator energization. Each self-cooled T/R unit will be enclosed in a steel tank. Each T/R set will be provided with a microprocessor-based control unit contained in a free-standing modified NEMA 12 enclosure designed for indoor installation.

(4) All electrical equipment will be furnished in accordance with pertinent ASA, AIEE and NEMA standards as well as the National Electric Code. The precipitator control

cubicles will be self-contained units with 120 volt control circuits. Power to the precipitator will be controlled automatically by means of a spark sensitive transistorized circuit. The high voltage electrical set, comprising rectifier and transformer will be liquid cooled.

(5) The control system of the precipitator will provide thyristor (SCR) control of the A.C. power to the primary of the ESP high voltage transformer rectifier supply. The control system will be designed to provide regulation, protection and monitoring of the T/R unit. The precipitator control will be operable in auto or manual mode through a control room panel-mounted manual/auto station and a potentiometer. APC supplier will provide performance guarantee curves of collection efficiency with all fields in operation and also with one field out of service.

(6) All high voltage equipment will be mounted outside of the flue gas stream. The floor of the penthouse, which is the top of the flue gas treatment zone will be suitably insulated and provided with transit walkways.

(7) The trough hoppers located below the treatment zone of each precipitator will each contain a dust level indicator complete with indicating light, and a provision for a remote alarm to indicate high dust level in each hopper, as well as anvil strike blocks, poke holes and blanket-type heaters to compensate for the heat loss through the hopper insulation.

(8) Each precipitator will be furnished with ladders, stair towers, and walkways in accordance with Occupational Safety and Health Administration (OSHA) requirements.

(9) A key interlock system will be provided to prevent energization of high voltage sets while any of the access doors are opened.

3.4.1.4.3 **Stack**

The stack will be free standing concrete chimney enclosure with three (3) independent insulated flues of acid-resistant construction. Sufficient ports and access platforms will be provided for gas sampling in accordance with U.S. Environmental Protection Agency (EPA) and Florida Department of Environmental Regulation (FDER) requirements.

An obstruction lighting system will be provided in accordance with Federal Aviation (FAA) Regulations.

3.4.1.4.4 **Instrumentation and Control**

3.4.1.4.4.1 **General**

Centralized instrumentation and controls will be provided in a windowed control room located to afford maximum visibility of the operating areas. The central panel will be interconnected with a series of satellite control stations to facilitate local control of components. Alarming and status reporting will be by graphic display on a Cathode Ray Tube (CRT) terminal. Critical alarms will be duplicated on window type annunciators. A supplementary printer will provide a permanent record of

essential operating and alarm data. Color TV camera-monitor systems will be provided to monitor MSW receipt facilities, residue removal operations, and other critical areas that cannot be viewed directly from the control room.

The operator interface will be via a CRT/Keyboard station rather than the conventional instrumentation/control panel system. This microprocessor based system enables the operator to keep closer control over an installation, plus having the advantage of flexibility. Loop set points and alarm set points are contained in the software. All control algorithms are also in the software. Changes, including alterations in control strategy, are made from the operator's keyboard. The loop displays and graphics are displayed on the CRT.

The control system will also include:

- (1) A printer for alarm messages and periodic reports that may be required.
- (2) An auxiliary operator's CRT/Keyboard control station in the rack area for maintenance, calibration, and trouble shooting purposes.
- (3) A trend recording system to provide a hard copy record of any system analog input signal when it is required.

3.4.1.4.4.2 Field Instrumentation

All necessary field instrumentation will be terminated into the system input/output racks, both analog and digital. The analog system will use a conventional 4-20 ma dc signal system.

The electrical classification for field-mounted instruments will be dictated by each process requirement. Each instrument for outdoor service will be selected with enclosure suitable for the exposure.

Level instruments will generally be differential pressure transmitters, flanged type, with steel bodies and stainless steel elements. In areas where corrosion may occur, the piping specification will govern the type of materials.

Flow instruments will generally be differential pressure type, with stainless steel bodies and stainless steel elements. In areas where corrosion may occur the piping specification will govern the type materials.

Thermowells will be provided for liquid service where corrosive conditions exist. Resistance bulbs will be included for low temperature service and thermocouples for high temperature service. Boiler tube temperature monitoring and flue gas monitoring will require special consideration for sheathing and method of attachment or insertion.

Orifice plates will be square edge, type 316 SS. Flow nozzles will be used for main steam and feedwater flows.

Pressure instruments will utilize direct pressure taps for clean applications and sealed connections for slurries. The sensing element will be stainless steel.

Measuring devices for physical properties such as pH, density, specific gravity, opacity, SO₂, viscosity, conductivity, feedwater analysis, steam, water, air and flue gas flows, etc. will be selected based on performance history and experience.

Control valve materials will be equal to or better than the piping specifications. Valve positioners will be used where necessary.

Actuators will be the diaphragm type, sized to meet pressure requirements with a 3-15 psig air signal.

For general water service and other non-corrosive services, cast iron bodies with stainless steel trim will be used.

For general steam service, carbon steel bodies with hardened stainless steel trim will be used. When pressure drops dictate, special alloy trim will be used.

For chemical services, 316 stainless steel bodies and trim will be used.

3.4.1.4.4.3 **Control Panels**

Control panels will be fabricated from mild sheet steel and painted. They will be of the console or vertical type. Console types will have light gauge, stainless steel, hinged console tops.

Where the panels are subject to weather or corrosion, the panel material will be stainless steel or an approved substitute, suitable for outdoor use. Nameplates on the front of panels will be black with white engraving.

The control room will be air conditioned, and the air will be filtered. It will be constructed to allow the use of general purpose electrical classification for instruments. All wiring and piping to and from the control system will enter through the floor. The floor will be designed for cable and tube routing beneath.

3.4.1.4.4.4 **Transmission Lines**

Single tubing for local pneumatic loops will be PVC coated 1/4 inch copper tubing. All tubing will be supported in aluminum tube trays or raceways.

Instrument air distribution mains 1/2 inch and larger will be galvanized steel with block valves as defined in the piping requirements.

Electronic transmission wire will be No. 18 AWG, twin conductor, with aluminum Mylar Shield, copper drain wire, and polyvinyl chloride jacket.

Thermocouple extension wire will be No. 16 gauge twisted pair conductors, Teflon over single conductor and Teflon overall. Extension wire will be of the same type as the thermocouple to which it is connected.

3.4.1.4.4.5 **Instrumentation System**

The instrumentation system provided will include capabilities to measure, indicate and/or record the following loops:

MEASUREMENT LOOPS:

- (1) RDF feed into each furnace.
- (2) Status, trips and alarms of the flame safety system to include gas flow and totalization.
- (3) The temperature and differential pressure at the discharge of the underfire, overfire and tertiary air fans. Temperatures and pressure will be measured upstream and downstream of all steam coil air preheaters.
- (4) The differential pressure at each undergrate air plenum, overfire air supply zone and tertiary air cooling ducts.
- (5) The pressure, temperature and flow of feedwater into each steam generating system.
- (6) The pressure and temperature of the gases leaving the furnace superheater, boiler bank, economizer and precipitator.
- (7) The pressure, temperature, and flow of the steam from each boiler and in the main steam header.
- (8) The pressure, temperature and flow of inlet steam to the turbine-generator.
- (9) The pressure, temperature, and flow of steam at the turbine extraction points.
- (10) The pressure and temperature at the turbine condenser.
- (11) Out of range audio/visual alarm for each parameter critical to the safe operation of the equipment train and its sub-system.
- (12) The concentration of CO and O₂ in the gas outlet of each boiler (prior to any heat traps or air pollution control devices). Reference Paragraph on Control Loops.
- (13) The opacity of the stack gases.
- (14) The flow of make-up water to the deaerator.
- (15) The flow and pH of wastewater discharge into the sanitary sewer.
- (16) The WATTS, VARS and AMPS of the power produced, power transmitted and power used in-plant.
- (17) The flows and temperatures of water to and from the cooling tower.
- (18) The conductivity of the steam leaving each boiler.

CONTROL LOOPS:

1. Boiler Controls

Loop 1: Drum level control utilizing the classic three element scheme.

Loop 2: Furnace draft control utilizing variable speed on the induced draft fan and trimmed by variable vane dampers.

Loop 3: Furnace temperature control utilizing steam coil air preheaters and supplemented by automatically firing gas under low furnace temperature conditions.

Loop 4: Steam flow control utilizing variable RDF feeder control and featuring combustion air ratio control.

Loop 5: Excess air control.

Loop 6: Superheat Steam Temperature Control by attemperator spray water.

2. Turbine Controls

Loop 1: Inlet pressure control utilizing the throttle valve governor.

Loop 2: Condenser pressure control utilizing condenser cooling water flow:

3. Support Controls

Loop 1: Deaerator level.

Loop 2: Deaerator steam pressure.

Loop 3: Condensate tank level.

Loop 4: CBD tank level.

4. Combustion Quality Control

For each boiler train, carbon monoxide, oxygen and opacity are to be measure continuously by in-situ instrumentation which meets the applicable requirements of 40 CFR Part 60, Appendix B. The carbon monoxide instrument shall be analog-based, capable of selective high resolution absorption of IR energy with solid waste electronics and chopper stabled optics with $\pm$ % linearity. It shall have sapphire windows, an air curtain and incorporate an airpurge system for the zero-calibration checks without disrupting boiler operations. In addition, approved SO₂ and NO_x stack monitoring equipment shall be provided. Measurement point for carbon monoxide and oxygen shall be upstream of the ESP. Measurement points for opacity, SO₂, and NO_x shall be downstream of the ESP.

Opacity data shall be output to an L&N Speedomax Charter Recorder for use in ESP rapper adjustment. Additionally, opacity, carbon monoxide, SO₂, NO_x and oxygen shall be output to a Datalogger for recording average and peak value.

5. Electrostatic Precipitator Controls

See Section 3.4.1.4 regarding the Electrostatic Precipitator System.

Control data functions to include ESP spark rates and monitoring of D.C. Kilovolt and Milliamperes.

3.4.1.5 Design Philosophy

The proposed control technology, electrostatic precipitator at 0.025 gr/dscf corrected to 12 percent CO₂, is designed to capture particulate matter entrained in the flue gas from the spreader stoker/boiler. The particulate matter is collected in a dry form to avoid wastewater disposal, corrosion, and stack gas reheat problems. The ESP is also a fully automated system with very low operations and maintenance requirements in comparison with other air pollution control devices.

3.4.2 Landfills

3.4.2.1 Air Emissions and Controls

The types of air emissions commonly attributed to landfill construction and operation include: fugitive dust from access roads, refuse compaction, and cover material placement; carbon monoxide and nitrous oxide emissions from the exhaust systems of vehicles and construction equipment; and carbon dioxide, nitrogen and methane gas from the decomposition of waste.

Dust generated by traffic on access roads can be reduced by using shellrock to surface the road. A water truck equipped with a spray bar will spray water on the road to reduce the amount of dust generated as is currently practiced at the Dyer Boulevard and Lantana Landfills.

The landfill base will be developed in segments in order to reduce the amount of barren surface (void of vegetation) from which fugitive dust can be emitted. Vegetation will be established on finished grades, such as road embankments and landfill side slopes, as soon as possible to reduce fugitive dust emissions. A tree line serving as buffer to the landfill will aid in dust control by reducing wind speed across the site.

Vehicle emissions are another source of impact to air quality. The vehicles normally associated with the landfill operation are comprised of two general categories: the waste delivery vehicles and the landfill construction/ operation equipment. The proposed landfill on the site is across Florida's Turnpike from the existing Dyer Boulevard Landfill. The landfill construction and operation equipment will be moved from the Dyer Boulevard Landfill to the new landfill after closure of the Dyer Boulevard Landfill. With the start up of operations of the resource recovery plant, the landfill operations will lessen, since the volume of the ash and reject material from the resource recovery plant is substantially less than the volume of raw garbage to be landfilled. This will lessen the air pollution from these vehicles due to fewer pieces of equipment being in operation fewer hours.

The waste delivery vehicles delivering waste to the Dyer Boulevard Landfill site will be redirected to the new site. No appreciable change in vehicular air emissions is expected.

Gases generated in landfill areas via anaerobic decomposition of solid waste disposed in the landfill include the major components of methane, carbon dioxide and nitrogen. The rate of landfill gas production is influenced in part by the moisture content in the landfill. Therefore, removing liquids which have entered the landfill by the leachate collection system should reduce the rate of gas generation.

Gas production in landfills can create serious safety problems because methane is highly explosive in concentrations of 5 to 15 percent in the presence of air (oxygen). In the absence of controls, landfill gas may migrate laterally in the landfill site, become trapped, highly concentrated and explode. A gas collection system will be included in the design of landfill areas on the site to provide a controlled and safe pathway for collection and venting, flaring, and/or recovery of landfill gas at this site.

Also, off-site migration of landfill gas will be monitored through the installation of gas monitoring points around the landfill perimeter.

3.5 PLANT WATER USE

Both potable and non-potable water will be supplied to the facility. Wells will be installed for both supplies, with the non-potable wells being located along the eastern boundary of the site landfills and in the Dyer Boulevard Landfill area where mineralized water has been identified. A hydrological study (Appendix 10.14.7) determined that the existing and potential plumes can be controlled and supply the required non-potable water for the proposed facility.

Figure 3.5-1 depicts the design water use rates for normal and peak load operation of the facility. The flows of the heat dissipation, sanitary wastewater, potable water, process water, and leachate collection systems are all presented. The facility will be designed and constructed so that it can be modified, if necessary, to process septage either through the wastewater treatment system or through a composting process.

3.5.1 Heat Dissipation System

3.5.1.1 System Design

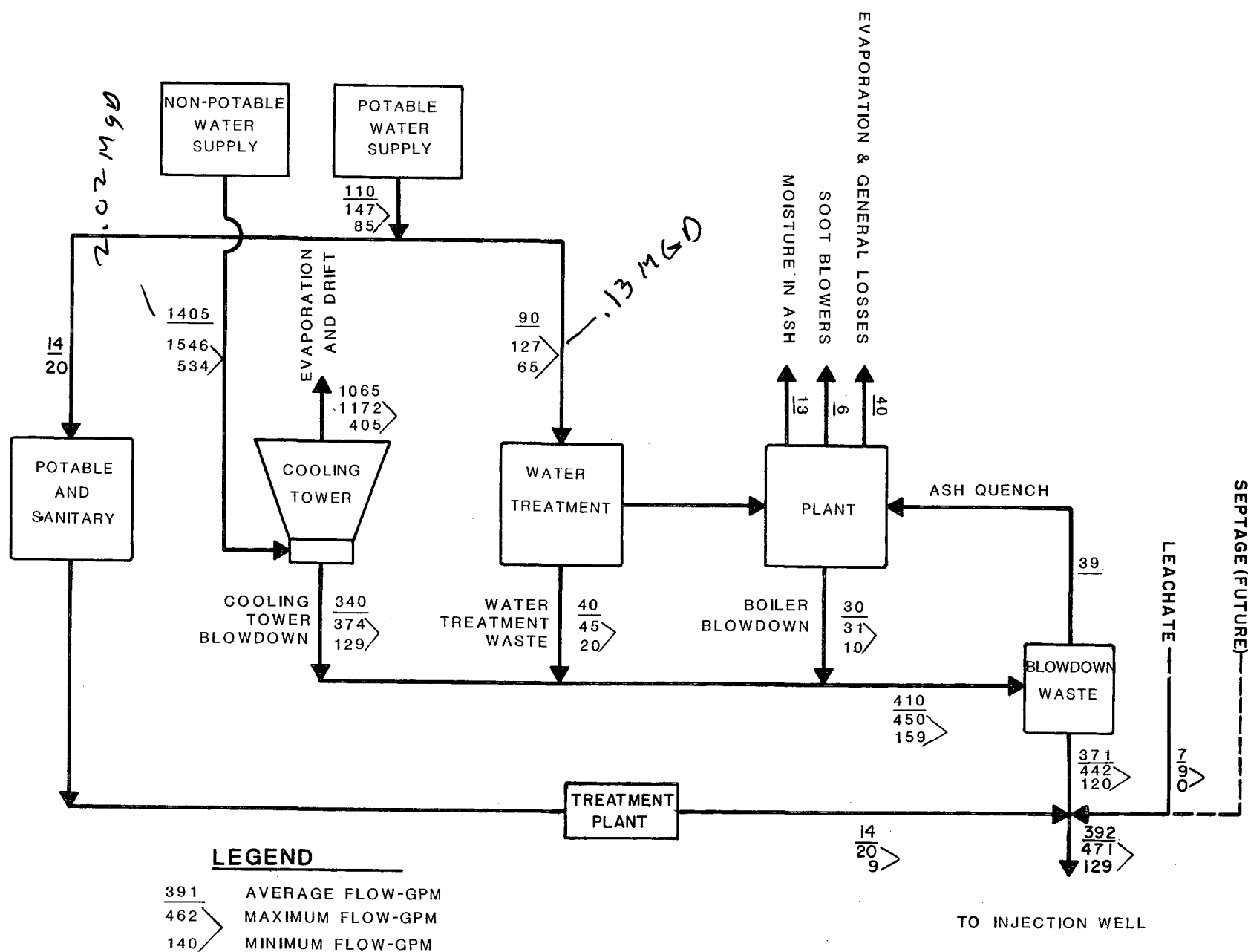
The electric generating portion of the resource recovery plant will use water cooled condensers to condense the low pressure steam discharged from the turbine. The cooling water will circulate in a closed loop system at a rate of approximately 41,600 GPM and will leave the condenser at approximately 109°F. The cooling water will pass through a wet mechanical draft cross flow cooling tower for the dissipation of the waste heat. The design outlet temperature of the tower is 85°F with an ambient wet bulb temperature of 80°F. The cooling tower system will dissipate 312 million BTU/hr at the normal operating rate.

Blowdown from the tower will be conveyed to a sump where it is combined with boiler blowdown, demineralizer, and reverse osmosis reject waters from which ash quench water will be drawn. The water remainder will be combined with treated sanitary system effluent and leachate and then discharged by deep well injection.

The quantities of non-potable water are shown in Figure 3.5-1. The average potable withdrawal is 110 GPM (maximum = 147 GPM and minimum = 85 GPM). The average non-potable withdrawal is 1,405 GPM (maximum 1,546 GPM and minimum 534 GPM).

The consumptive usage rate for the system is shown in Figure 3.5-1. The consumptive use of water by the facility is through cooling tower losses in the form of evaporation and drift. The average loss will be 1,065 GPM (maximum = 1,172 GPM and minimum = 405 GPM).

The location of the cooling tower is shown on the facility layout (Figure 3.2-3). The cooling tower system will consist of a four (4) cell group of Class 600 Marley cross flow towers or approved substitutes. The average blowdown rate for the towers is 340 GPM (maximum = 374 GPM and minimum = 129 GPM). The cooling tower blowdown will accumulate along with boiler demineralization back flush water (Average flow 40 GPM, maximum = 45 GPM, minimum = 20 GPM), and boiler blowdown water (Average flow 30 GPM, maximum = 31 GPM, minimum = 10 GPM) for a total process blowdown average flow of 410 GPM (Maximum = 450 GPM, minimum = 159 GPM). The water that is used to quench the ash discharged from the boiler grates will be drawn from the process blowdown cumulative flow leaving an average process discharge rate of 371 GPM. Minimum and maximum process flows are 120 GPM and 442 GPM respectively. Sanitary flow discharged at a rate of 20 GPM will be added to the process flow for an average total discharge of 391 GPM (Minimum = 140 GPM, maximum = 462 GPM).



TO INJECTION WELL

The cooling water will increase in temperature from 85°F to 109°F in the process of condensing the exhaust steam from the turbine. The water will then be cooled by evaporation in the cooling tower. The maximum flow rate through the cooling tower is 41,600 GPM, and the evaporation rate from the tower will average 1,020 GPM or approximately 2.4 % of the circulation rate.

3.5.1.2 Source of Cooling Water

The source of the cooling water for the cooling tower will be from wells that will tap the shallow aquifer at depths between 50 and 100 feet at locations along the eastern boundary of the site landfills and in the Dyer Boulevard Landfill (Section 4.2.2.1 and Appendix 10.14.7). These wells will be located to reduce and control the mineralized water from the Dyer Boulevard Landfill and to prevent the spread of any mineralized water from the new site. The cooling water will be a blend of water as from Well USGS-1025 (about 13%) and water similar to the potable well on the new site (about 87%). The chemical quality of each is shown in Table 3.5-1. Changes in temperature over the course of a year are not likely to be significant and there is no reason to suspect significant stratification in water quality within the zone to be tapped by the cooling-water well.

TABLE 3.5-1
CHEMICAL CHARACTERISTICS OF FACILITY
WATER INFLUENT (1984)

CHEMICAL CONSTITUENT	(WELL USGS-1025) NON-POTABLE DYER WELL	(WELL DW 10A) POTABLE SITE 7 WELL	BLEND TO BE USED
pH	6.6	7.6	7.46
Total hardness as ppm CaCO ₃	376	333	338
Calcium hardness as ppm CaCO ₃	347	322	325
Total alkalinity as ppm CaCO ₃	368	303	311
P-Alkalinity as ppm CaCO ₃	0	0	0
OH-Alkalinity as ppm CaCO ₃	0	0	0
Total dissolved solids, ppm	600	370	400
Suspended Solids, ppm	4	<1	1
Conductivity, mcmhos/cm	1,104	492	572
Calcium, ppm Ca	137	129	130
Magnesium, ppm Mg	7.92	2.90	3.55
Ferric iron, ppm Fe	<0.10	<0.10	<0.10
Bicarbonate, ppm HCO ₃	449	369	379
Carbonate, ppm CO ₃	0	0	0
Sulfate, ppm SO ₄	2.4	1.3	1.4
Chloride, ppm Cl	82	30.5	37.2
Zinc, ppm Zn	<0.01	<0.01	<0.01

3.5.1.3 Dilution System

All cooling water will be part of a closed loop cooling water circulation system. The incoming non-potable well water will be added to the system, and blow-down discharged to deep well injection following treatment; therefore, resulting in no dilution to cooling water.

3.5.1.4 Blowdown and Trash Disposal

Blowdown will be from the boilers, the cooling towers and the demineralizers as described in Section 3.5.1.1 above. This cumulative flow, less the 39 GPM which goes to quench the ash, is discharged by deep well injection. Characteristics of the blowdown mixture are shown in Table 3.5-2.

TABLE 3.5-2
CHARACTERISTICS OF BLOWDOWN MIXTURE

	COOLING						REVERSE						EFFLUENT		
	BOILER BLOWDOWN			TOWER BLOWDOWN*			DEMINERALIZER			OSMOSIS REJECT					
	GPM	Mg/L	#/Day	GPM	Mg/L	#/Day	GPM	Mg/L	#/Day	GPM	Mg/L	#/Day	GPM	Mg/L	#/Day
Ca as CaCO ₃	30	0	0	340	411	1,680	5	36	2	35	236	99	410	361	1,781
Mo as CaCO ₃	30	0	0	340	5	22	5	0	0	35	0	0	410	4	22
Mg as CaCO ₃	30	0	0	340	24	98	5	5	1	35	17	7	410	21	106
Na as CaCO ₃	30	350	127	340	190	777	5	3,398	204	35	248	104	410	246	1,212
HCO ₃ as CaCO ₃	30	100	36	340	1,167	4,770	5	144	9	35	266	112	410	1,000	4,927
CO ₃ as CaCO ₃	30	0	0	340	180	736	5	0	0	35	0	0	410	149	736
SO ₄ as CaCO ₃	30	0	0	340	7	29	5	6,277	377	35	118	50	410	92	456
CL as CaCO ₃	30	100	36	340	246	1,006	5	144	9	35	266	112	410	236	1,163
PO ₄ as CaCO ₃	30	40	14	340	6	25	5	5	1	35	9	4	410	9	44
TDS	30	800	289	340	1,800	7,358	5	10,194	612	35	1,137	562	410	1,773	8,821
TSS	30	100	36	340	12	49	5	0	0	35	50	21	410	22	106
pH	—	10.5	—	—	7.6	—	—	8.5	—	—	6.5	—	—	7.7	—

Temperature 180°F 80°F

39 GPM of 410 GPM total flow into sump is recycled as ash quench — Combined effluent concentration is based on 410 GPM.

*3 Concentratins (Cooling Tower)

3.5.1.5 Injection Well

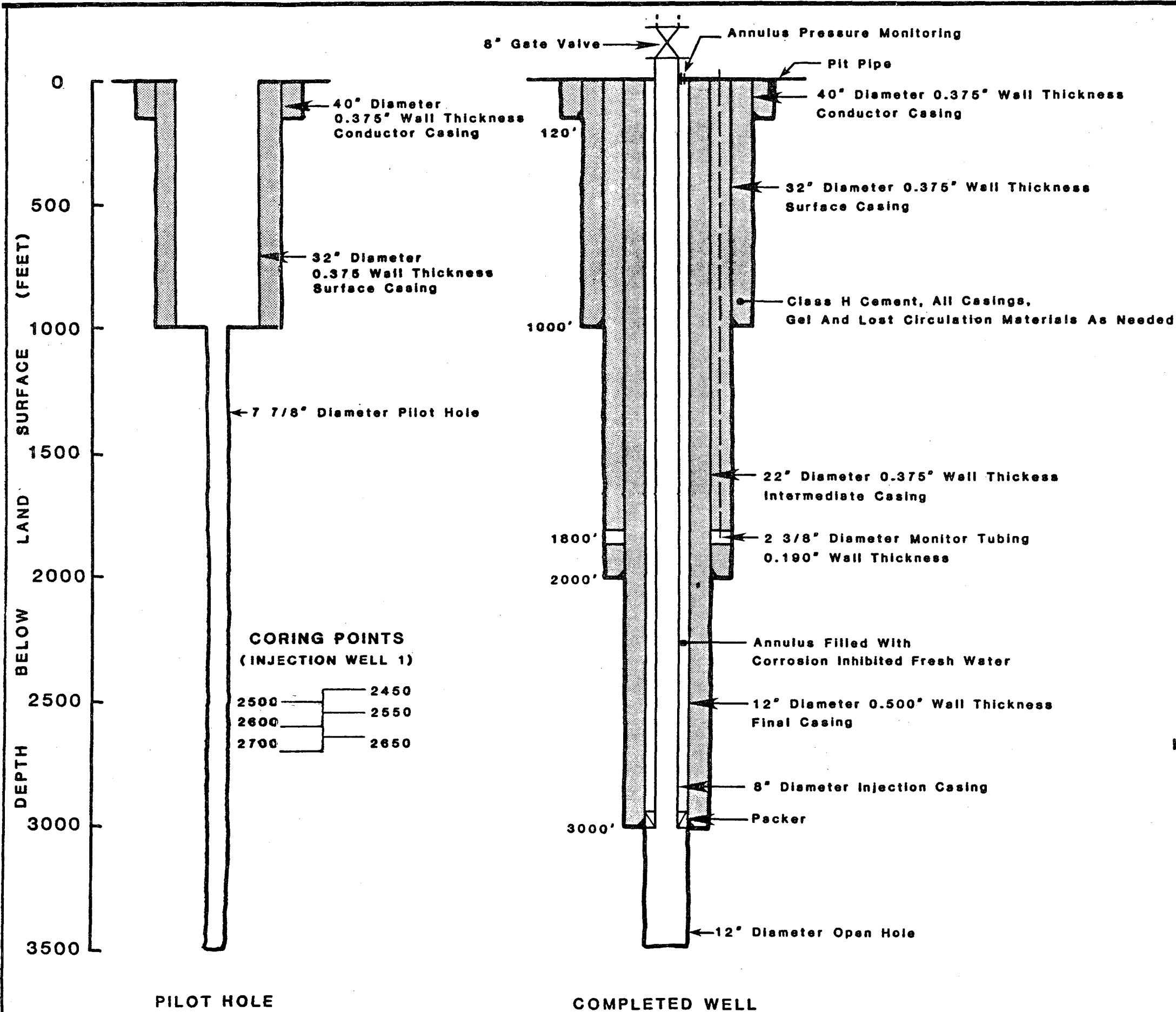
Two injection wells will be constructed on the site to dispose of approximately one million gallons per day of wastewater. All information on the injection wells, customarily contained in an application for permit to construct, is contained in Appendix 10.8. Injected waters will consist of leachate from the landfills, process wastewater from the resource recovery plant and treated domestic wastewater generated at the plant. Wastewater will be injected into the "boulder zone", a highly permeable horizon saturated with saline water that exists at an approximate depth of 3,000 feet below grade. The characteristics of the wastewater to be injected are shown in Table 3.5-3.

**TABLE 3.5-3
PROJECTED TREATED EFFLUENT WATER QUALITY**

Flow	
Average	773,000 gallons/day
Maximum	965,000 gallons/day
Minimum	229,000 gallons/day
Chemical/Physical Characteristics	
Parameter	Concentration(1)
Ca	379
Mg	23
Na	239
HCO ₃	600
CO ₃	250
SO ₄	10
Chlorides	420
PO ₄	18
TDS	2,900
SS	20
NH ₃	8
COD	60
BOD ₅	20
pH	7.2
Temperature	106°F

(1) Expressed in terms of mg/l except pH and Temperature.

The City of West Palm Beach previously installed and currently operates five injection wells about one mile south of the site that tap the boulder zone to dispose of municipal sewage effluent. Knowledge gained during the construction of these wells will serve as a basis for the preliminary design of the proposed injection wells. The final design of the new wells will depend upon hydrogeologic testing to be conducted during well construction. The testing program to determine the final injection well design is fully outlined in Appendix 10.8. A diagram of the preliminary well design is shown on Figure 3.5-2. Monitoring of the water quality and water levels in the first permeable zone above the injection zone will be conducted in monitor tubes constructed within the annuli of the injection wells as shown on the figure. The location of the injection wells will be in the southern portion of the property designated for the resource recovery plant.



CASING SCHEDULE

Conductor 40-Inch Diameter,
Casing: 0.375 Inch Wall Pipe
May Be Spiral Wound,
ERW, Or DSAW Pipe,
Welded Joints

Surface 32- Inch Diameter,
Casing: 0.375 Inch Wall Pipe
May Be Spiral Wound,
ERW, Or DSAW Pipe,
Welded Joints

Intermediate 22- Inch Diameter,
Casing: 0.375 Inch Wall Pipe
May Be Spiral Wound,
ERW, Or DSAW Pipe,
Welded Joints

Final 12- Inch Diameter,
Casing: 0.500 Inch Wall,
ERW, Welded Joints

Injection 8- Inch Diameter,
Casing: 0.352 Inch Wall,
Threaded And Coupled

INJECTION WELL DESIGN
AND DETAILS OF THE CORING
AND TESTING PROGRAM



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY

3.5.2 Domestic/Sanitary Wastewater

Sanitary waste flows will be generated within the plant in the personnel service areas and washdown of the facility and equipment (mobile and stationary).

The plant will employ about 140 people in the course of normal operation, with fluctuating staff increases from time to time as contractors and other specialty staff are retained for work in the plant on a task specific basis. Visitors are expected at the plant, so the wastewater treatment system will be built to handle additional wastewater.

The liquid (sanitary) waste stream produced by personnel within the facility will be an insignificant amount when compared to the total facility water consumption. It is estimated it will not exceed 20,000 gallons per day including wastewater from washdown of the facilities. Suitable oil and grease traps and separation units will be provided in the washdown area, as needs dictate. As discussed in Appendix 10.7 this wastewater will be treated before being combined with process wastewater and leachate for deep well injection.

3.5.3 Potable Water Systems

Potable water for use by personnel of the Resource Recovery Facility will be supplied by on-site water wells that tap the shallow aquifer between depths of 50 and 100 feet below grade. Two wells will be constructed; one will be a backup well. The well casings will have an 8-inch-diameter which will be fully grouted from land surface to about ten feet above the well screen; well screens will be gravel packed.

Demands for potable water at the site are estimated to average 110 gpm with peak usage of 147 gpm.

The potable water supply source is Well DW 10A located on the site. Water quality of the supply well is given in Table 3.5-1. The analyses indicate that the water is high in calcium carbonate hardness and moderate in iron content.

Treatment of such water to render it as aesthetically suitable for human consumption is best accomplished by prechlorination, aeration, settling and post chlorination. Generally, color can be reduced significantly with this treatment scheme. Should the color exist primarily due to the presence of organic acids, carbon filters may be necessary in order to arrive at a suitable product.

The untreated well water will be prechlorinated at a rate of 2-5 mg/l Cl_2 at a location in the raw water piping in order to give the chlorine a maximum contact time with the water. A static cone type aerator will be used to complete the iron oxidation process and to drive off hydrogen sulfide. A 60 minute detention basin will be provided following aeration and post chlorination to allow for settling out of particulate matter that may form and to provide contact time for the post chlorination step.

Treated water will be pumped from the settling tank into a pressure storage tank. Distribution to the various demand points will be accomplished through a simple network of underground piping.

The following is a summary of the basic design parameters for the treatment system.

SUPPLY WELL:

Capacity	150 gpm
Diameter	8-inch
Type	gravel pack
Depth	100' estimated
Discharge Pipe	6-inch

TREATMENT PLANT:**Aerator:**

Aerator Type	Static Cone
Capacity	150 gpm

Settling Tank:

Capacity	9,000 gal
Diameter	12'
Depth	10.5'
Construction	Reinforced Concrete

Chlorination:

Number Required	2
Capacity	20 lbs/day each
Type	Gas 150 lbs cylinder V-notch

Distribution Pumps:

Type	Horizontal Centrifugal
Number Required	2
Capacity	1 at 100 gpm 1 at 150 gpm

Pressure Tank:

Geometry	Horizontal
Construction	Steel ASME Rated
Operating Pressure	40 psi
Controls	Pressure

3.5.4 Process Water Systems

From Figure 3.5-1 it is seen that process water requirement averages about 2,000,000 gallons per day, with a peak requirement of 1,546 GPM compared to an average rate of 1,405 GPM. Treatment, usage and disposal of process water is discussed in Section 3.5.1.

3.5.5 Fire Protection Water System

Water requirements for fire protection systems have been calculated as described by the Insurance Services Office based on the type of fire hazards. The fire protection system will consist of a 500,000 gallon ground storage tank with pumping facility, transmission water mains on site, fire hydrants, and sprinkler systems within the structures.

3.5.6 Leachate Management System

Water which has been directly in contact with solid waste or which mixes thoroughly with other water previously in contact with solid waste, must be considered leachate. Proper management of leachate resulting from the operation of a sanitary landfill is essential to ensure protection of the ground and surface waters about the site. Treatment and/or disposal of landfill leachate in a manner protective of the environment is often difficult, and invariably costly. Sound landfill design practice should include measures to minimize the generation of leachate, thus reducing future treatment/disposal costs.

In an effort to reduce the requirements for treating leachate, several specific measures to minimize the production of leachate will be incorporated into the design of the secure landfill cells to be constructed at the site. A phased or segmented approach to landfill development will minimize the active areas of solid waste disposal directly exposed to incident precipitation. An extensive system of perimeter and interior berms will be used to prevent mixing of the surface runoff with solid waste. Prompt closure of completed phases or segments of landfill cells will further minimize the amount of rainfall which can penetrate the landfill surface and percolate through the waste cells to produce leachate.

Several predictive models are available for estimating the quantity of leachate that will be produced as a result of landfill development. The "Water Balance Method", a widely used and accepted empirical method for calculating the amounts and times of first appearance of landfill leachate, can be tailored to reflect site-specific conditions during the construction of landfill areas on the site. This method can be used to predict peak monthly flows of leachate, upon which a management (i.e., collector, treatment, disposal) system can be designed.

Several iterations of the selected water balance method were performed during the landfill design to best examine leachate generation during various operational phases. The following conditions were evaluated:

1. Intermediate cover material in place with new vegetation established, precipitation as per the average (60.88 inches per year average from 1940 to 1980 by NOAA).

2. Intermediate cover material in place with new vegetation established, precipitation as per the worst case year (108.64 inches in 1947).
3. Daily cover material in place, no vegetation established, precipitation as per the average year.
4. Daily cover material in place, no vegetation established, precipitation as per the worst case year.
5. Final cover material and landfill cap in place, vegetation established, precipitation as per the average year.
6. Final cover material and landfill cap in place, vegetation established, precipitation as per the worst case year.

Using data generated in compilation of these water balances, (Tables 3.5-4a, b & c) a scenario has been developed resulting in a conservative (safe) design of a leachate management system. This system will provide collection through the life of the facility. The leachate collection system has been designed in accordance with U.S. EPA guidelines (SW-869) recommending a maximum head (1'-0") of leachate over the liner not be exceeded.

TABLE 3.5-4a
WATER BALANCE
DAILY COVER AND AVERAGE RAINFALL

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean Temperature, F	65.9	66.4	70.2	74	77.7	80.7	82.4	82.7	81.5	77.6	71.9	67.6	74.88
Heat Index	7.45	7.62	8.92	10.3	11.7	12.89	13.57	13.69	13.21	11.66	9.53	8.02	—
Precipitation	2.64	2.41	2.93	3.47	5.76	7.89	6.37	6.52	9.53	7.74	3.14	2.48	60.88
Coefficient of Runoff	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
Runoff	.264	.241	.293	.347	.576	.789	.637	.652	.953	.774	.314	.248	6.088
Potential													
Evapo transpiration	1.93	1.84	2.78	3.85	5.57	6.21	6.73	6.44	5.81	4.75	2.97	2.16	51.04
Infiltration	2.376	2.169	2.637	3.123	5.184	7.101	5.733	5.868	8.577	6.966	2.826	2.232	54.79
Infiltration Loss	.446	.329	-.143	-.727	-.386	.891	-.997	-.572	2.767	2.216	-.144	.072	3.752
Cumulative Potential													
Water Loss	0	.775	.186	-.87	-1.11	.505	-.106	-1.57	2.195	4.983	2.027	-.072	6.986
Soil Moisture													
Storage Capacity	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	
Change in Storage	0	0	0	0	0	0	0	0	0	0	0	0	
Actual													
Evapotranspiration	1.93	1.84	2.637	3.123	5.184	6.21	5.733	5.868	5.81	4.75	2.826	2.16	48.07
Percolation	.446	.329	0	0	0	.891	0	0	2.767	2.216	0	.072	6.721

TABLE 3.5-4b
WATER BALANCE
INTERMEDIATE COVER AND AVERAGE RAINFALL

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean Temperature, F	65.9	66.4	70.2	74	77.7	80.7	82.4	82.7	81.5	77.6	71.9	67.6	74.88
Heat Index	7.45	7.62	8.92	10.3	11.7	12.89	13.57	13.69	13.21	11.66	9.53	8.02	—
Precipitation	2.64	2.41	2.93	3.47	5.76	7.89	6.37	6.52	9.53	7.74	3.14	2.48	60.88
Coefficient of Runoff	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.175
Runoff	.264	.241	.293	3.47	.576	.789	.637	.652	.953	.774	.314	.248	9.211
Potential													
Evapo transpiration	1.93	1.84	2.78	3.85	5.57	6.21	6.73	6.44	5.81	4.75	2.97	2.16	51.04
Infiltration	2.376	2.169	2.637	0	5.184	7.101	5.733	5.868	8.577	6.966	2.826	2.232	51.79
Infiltration Loss	.446	.329	-.143	-3.85	-.386	.891	-.997	-.572	2.767	2.216	-.144	.072	.629
Cumulative Potential													
Water Loss	0	.775	.186	-3.99	-4.24	.505	-.106	-.157	2.195	4.983	2.072	-.072	.74
Soil Moisture Storage													
Capacity	1	1	.86	.38	.25	.68	.22	.12	.1	.1	.86	.93	
Change in Storage	0	0	-.14	-.48	-.13	.43	-.46	-.1	-.02	0	.076	.07	
Actual													
Evapotranspiration	1.93	1.84	2.777	.48	5.314	6.21	6.193	5.968	5.81	4.75	2.066	2.16	45.50
Percolation	.446	.329	0	0	0	.461	0	0	2.787	2.216	0	.002	6.241

TABLE 3.5-4c
WATER BALANCE
FINAL COVER AND AVERAGE RAINFALL

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean Temperature, F	65.9	66.4	70.2	74	77.7	80.7	82.4	82.7	81.5	77.6	71.9	67.6	74.88
Heat Index	7.45	7.62	8.92	10.3	11.7	12.89	13.57	13.69	13.21	11.66	9.53	8.02	—
Precipitation	2.64	2.41	2.93	3.47	5.76	7.89	6.37	6.52	9.53	7.74	3.14	2.48	60.88
Coefficient of Runoff	.27	.27	.27	.27	.27	.27	.27	.27	.27	.27	.27	.27	.27
Runoff	.7128	.6507	.7911	.9369	1.555	2.130	1.720	1.760	2.573	2.090	.8478	.6696	16.44
Potential													
Evapo transpiration	1.93	1.84	2.78	3.85	5.57	6.21	6.73	6.44	5.81	4.75	2.97	2.16	51.04
Infiltration	1.927	1.759	2.139	2.533	4.205	5.760	4.650	4.760	6.957	5.650	2.292	1.810	44.44
Infiltration Loss	-.003	-.081	-.641	-1.32	-1.37	-.450	-2.08	-1.68	1.147	.9002	-.678	-.350	-6.60
Cumulative Potential													
Water Loss	0	-.084	-.722	-1.96	-2.68	-1.82	-2.53	-3.76	-.534	2.047	.2224	-1.03	-12.8
Soil Moisture													
Storage Capacity	1.07	1.92	1.36	.67	.32	.25	.41	.18	1.33	1.87	1.3	1.07	
Change in Storage	0	.85	-.56	-.69	-.35	-.07	.16	-.23	1.15	.54	-.57	-.23	
Actual													
Evapotranspiration	1.927	.9093	2.699	3.223	4.555	5.830	4.490	4.990	5.81	4.75	2.862	2.040	44.09
Percolation	0	0	0	0	0	0	0	0	-.003	.3602	0	0	.3571

Based on the water balance analyses it is evident that the landfill facility will generate a significant amount of leachate. During initial landfill cell operations, approximately 3 gpm (maximum) per acre of active landfill area will be generated. This is based on one-half of the maximum average monthly rainfall. However, once final cover and a cap is applied to a landfill cell, a less significant amount of leachate is expected to be generated. Table 3.5-5 lists the expected leachate by year. The leachate generated in the landfill cells will be collected via the leachate collection system and pumped to an equalization tank after which it will be combined with process wastewater and treated domestic wastewater prior to deep well injection. Table 3.5-6 identifies the constituents commonly found in leachate and composition from various sources. It is expected that the composition of the leachate generated at the site will fall within the range of values shown in the table. The leachate obtained from ash is expected to contain a lower BOD₅ in comparison with leachate generated by unprocessed solid waste.

**TABLE 3.5-5
PREDICTED LEACHATE QUANTITIES**

Years	Phase/	AET	Evap	Perc	Leach	Area	Leach gals	Rate	Total Leach/Day	
							Per Year	Day	W/O Cap	With Cap by Year
1988	IA				58.07	29.40	46357748	127008	127008	127008
1989	IA	45.50	33.22	6.24	18.53	29.40	14788147	40515	40515	40515
1990	IA	45.50	33.22	6.24	18.53	29.40	14788147	40515	40515	40515
1991	IA	45.50	33.22	6.24	18.53	29.40	14788147	40515	40515	40515
1992	IA	45.50	33.22	6.24	18.53	29.40	14788147	40515		
1992	IB	48.07	35.09	6.72	19.70	23.80	12729963	34876	75392	75392
1993	IA	45.50	33.22	6.24	18.53	29.40	14788147	40515		
1993	IB	45.50	33.22	6.24	18.53	23.80	11971357	32798		
1993	IIA	48.07	35.09	6.72	19.70	14.70	7862624	21541		
1993	IIB	48.07	35.09	6.72	19.70	9.60	5134775	14067	108923	35609
1994	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
1994	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
1994	IIA	45.50	33.22	6.24	18.53	14.70	7394073	20257		
1994	IIB	45.50	33.22	6.24	18.53	9.60	4828782	13229	82012	33487
1995	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
1995	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
1995	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
1995	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756	70689	22164
1996	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
1996	IB	44.09	32.19	0.36	12.26	23.80	4894018	13408		
1996	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
1996	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
1996	IIIA	48.07	35.09	6.72	19.70	20.00	10697448	29308	91697	29308
1997	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
1997	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
1997	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
1997	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
1997	IIIA	45.50	33.22	6.24	18.53	20.00	10059964	27561	98251	27561
1998	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
1998	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
1998	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
1998	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
1998	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242	88932	18242
1999	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
1999	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
1999	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
1999	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
1999	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242		
1999	IIIB	44.09	32.19	0.36	12.26	20.00	6658528	18242	107174	36485
2000	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
2000	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
2000	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
2000	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
2000	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242		
2000	IIIB	44.09	32.19	0.36	12.26	20.00	6658528	18242	107174	36485
2001	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
2001	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
2001	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
2001	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		

TABLE 3.5-5
(Continued)
PREDICTED LEACHATE QUANTITIES

Years	Phase/	AET	Evap	Perc	Leach	Area	Leach gals Per Year	Rate Day	Total Leach/Day	
									W/O Cap	With Cap by Year
2001	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242	107174	36485
2001	IIIB	44.09	32.19	0.36	12.26	20.00	6658528	18242		
2002	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
2002	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
2002	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
2002	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
2002	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242	107174	36485
2002	IIIB	44.09	32.19	0.36	12.26	20.00	6658528	18242		
2003	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
2003	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
2003	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
2003	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
2003	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242	107174	36485
2003	IIIB	44.09	32.19	0.36	12.26	20.00	6658528	18242		
2004	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
2004	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
2004	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
2004	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
2004	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242	107174	36485
2004	IIIB	44.09	32.19	0.36	12.26	20.00	6658528	18242		
2005	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
2005	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
2005	IIA	44.09	32.19	0.36	12.26	14.70	4893978	13408		
2005	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
2005	IIIA	44.09	32.19	0.36	12.26	20.00	6658474	18242	107174	36484
2005	IIIB	44.09	32.19	0.36	12.26	20.00	6658474	18242		
2006	IA	44.09	32.19	0.36	12.26	29.40	9790352	26822		
2006	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
2006	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
2006	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756		
2006	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242	140889	33704
2006	IIIB	44.09	32.19	0.36	12.26	20.00	6660103	18246		
2006	IVA	48.07	35.09	6.72	19.70	23.00	12302065	33704		
2007	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816		
2007	IB	44.09	32.19	0.36	12.26	23.80	7923649	21708		
2007	IIA	44.09	32.19	0.36	12.26	14.70	4894018	13408		
2007	IIB	44.09	32.19	0.36	12.26	9.60	3196093	8756	172575	65400
2007	IIIA	44.09	32.19	0.36	12.26	20.00	6658528	18242		
2007	IIIB	44.09	32.19	0.36	12.26	20.00	6658528	18242		
2007	IVA	45.50	33.22	6.24	18.53	23.00	11568958	31695		
2007	IVB	48.07	35.09	6.72	19.70	23.00	12302065	33704		
2008	IA	44.09	32.19	0.36	12.26	29.40	9788037	26816	151092	52674
2008	IB	44.09	32.19	0.36	12.26	23.80	7923584	21708		
2008	IIA	44.09	32.19	0.36	12.26	14.70	4893978	13408		
2008	IIIA	44.09	32.19	0.36	12.26	20.00	6658474	18242		
2008	IIIB	44.09	32.19	0.36	12.26	20.00	6658474	18242		
2008	IVA	44.09	32.19	0.36	12.26	23.00	7657308	20978		
2008	IVB	45.50	33.22	6.24	18.53	23.00	11568958	31695		

**TABLE 3.5-6
LEACHATE COMPOSITION AS REPORTED BY VARIOUS SOURCES**

Analysis (1)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
pH	5.6	5.9	8.3	—	—	—	—	—	7.63	5.60	7.4	6.4	4.9	5.6	8.4	5.7	6.3	6.48	5.88
Total Hardness (as CaCO ₃)	8,120	3,260	537	—	8,700	500	900	290	8,120	650	—	—	2,500	30	—	—	7,600	13,100	10,950
Total Alkalinity (as CaCO ₃)	8,100	1,700	1,290	—	—	—	—	—	9,520	730	—	—	—	—	9,450	100	10,630	16,200	20,850
Total Iron	305	336	219	1,000	—	—	40	2	305	6	—	206	152	28	—	—	175	546	860
Sodium	1,805	350	600	—	—	—	—	—	1,805	85	—	1,200	1,100	300	—	—	584	1,428	1,439
Potassium	1,860	655	—	—	—	—	—	—	1,860	28	—	—	920	110	—	—	1,050	2,535	3,770
Sulfate	630	1,200	99	—	940	24	225	100	730	248	248	940	970	65	—	—	615	1,002	768
Chloride	2,240	—	300	2,000	1,000	220	—	—	2,350	90	1,845	1,100	1,600	485	12,300	280	951	2,000	2,310
NO ₃ Nitrogen	—	5	18	—	—	—	—	—	—	—	—	—	196	10	—	—	—	—	—
NH ₃ Nitrogen	845	141	—	—	—	—	160	100	845	0.2	668	—	—	—	—	—	473	756	1,106
TON	550	152	—	—	—	—	—	—	550	2	101	—	—	—	—	—	288	664	1,416
COD	—	7,130	—	750,000	—	—	3,850	246	—	—	—	35,700	21,120	282	—	—	—	—	—
BOD	32,400	7,050	—	720,000	—	—	1,800	18	33,100	81	5,491	—	—	—	7,330	5.9	14,760	26,940	33,360
TDS	—	9,190	2,000	—	11,254	2,075	—	—	—	—	—	11,254	15,830	1,740	—	—	—	—	—
Specific Conductance	—	—	—	—	—	—	3,000	2,500	—	—	—	—	—	—	—	—	—	—	—

(1) All analyses in mg/l except pH and specific conductance.

Source: Pohland, F.C., "Landfill Stabilization with Leachate Recycle," Annual Progress Report, EPA No. EP-00658, July 1972.

3.6 CHEMICAL AND BIOCIDES WASTE

Both anti-corrosion and anti-fouling agents will be used at the facility in the boilers and in the cooling towers. There are listed below:

A. Corrosion Inhibitors

- (1) Boiler — Hydrazine oxygen scavenger. Concentration in the boiler will be maintained at 1.5 ppm.
- (2) Cooling Tower — Non Polluting Polysilicate/Organic Polymer based inhibitors plus scale and foulant control (Zimmit ZD — 300 series or equivalent).

B. Chemical and Biological Anti-Fouling Agent

- (1) Boiler — Deposition and caustic corrosion control-sodium Di- and Tri-phosphates 10 ppm.
- (2) Cooling Tower
 - Scale and corrosion inhibitor — (Lester Hydrofene 21).
 - Biocide — (Lester 30).

NOTE: Refer to Appendix 10.7 for Lester Product specifications.

3.7 SOLID WASTES

The resource recovery plant will primarily process and combust Class I municipal solid waste (MSW). If the capacity of the facility allows, Class III MSW will also be processed. The estimated annual quantities of solid waste which are anticipated to be received at the Class I and Class III landfill areas over the facility's design operating period (i.e., 1987 to 2008) are given in Table 3.7-1.

TABLE 3.7-1
ANNUAL QUANTITIES OF SOLID WASTE

Landfill	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Generation (1000 Tons)	516	536	*558	580	603	627	652	679	706	734	763	794	826	859	893	929	966	1005	1045	1087	1130	1175	17672
Class I																							
Ash (2500PCY)			86.4	86.4	86.4	86.4	86.4	113	117	122	127	129	129	129	129	129	129	129	129	129	129	129	2338
Rejects			141	141	141	141	141	184	192	199	207	211	211	211	211	211	211	211	284	297	307	317	4179
By-Pass	1032	1073				7.58	57.8										60.9	138					2370
Sub-Total	1032	1073	227	227	227	235	285	297	309	322	335	341	341	341	341	341	402	479	414	427	437	447	8886
Cover (5%)	154	160	11.3	11.3	11.3	11.7	14.2	14.8	15.4	16.1	16.7	17.0	17.0	17.0	17.0	17.0	20.1	23.9	20.7	21.3	21.8	22.3	655
TOTAL (CY)	1186	1233	238	238	238	246	299	312	325	338	351	358	358	358	358	358	422	503	434	448	458	469	9541
Class III (X 1000 Tons)																							
Trash	210	218	227	236	245	255	265	276	287	298	310	323	336	349	363	378	393	409	425	442	460	478	7192
Demolition	213	221	230	239	249	259	269	280	291	303	315	327	341	354	368	383	398	414	431	448	466	485	7295
Vegetative	30	31.2	32.4	33.7	35.0	36.4	37.9	39.4	41.0	42.6	44.4	46.1	48.0	49.9	51.9	54.0	56.1	58.4	60.7	63.2	65.7	68.3	1027
Class III (X 1000 CY)																							
Trash	420	437	140	196	256	308	320	166	172	180	186	194	202	266	350	438	472	492	256	266	276	288	6281
Demolition	283	295	306	319	331	345	358	373	388	403	419	436	454	472	491	510	531	552	574	597	621	646	9702
Sub-Total	703	731	446	515	587	653	678	539	560	583	605	630	656	738	841	948	1003	1044	830	863	897	934	15983
Cover (15%)	105	110	67	77	88	98	102	81	84	87	91	95	98	111	126	142	150	157	124	129	135	140	2397
TOTAL (CY)																							
CLASS III	809	841	513	592	676	751	780	620	644	671	696	725	754	848	967	1090	1153	1200	954	992	1031	1074	18380
GRAND TOTAL VOLUME																							27922

3.7.1 Non-Hazardous Wastes

Three categories of solid waste will be generated from plant operations in the following quantities based on the 2,000 TPD operations:

Rejects	580 TPD ₆	(3,480 TPW)
Ash (Wet, 35% moisture)	258 TPD ₇	(1,806 TPW)
Non-Processible MSW	47 TPD ₆	(280 TPW)

Additionally two products are expected to be produced and marketed in addition to the generation of electric power.

Ferrous Metals (#2 bundle)	120 TPD ₆	(720 TPW)
Aluminum	23 TPD ₆	(138 TPW)

The three waste products will all be landfilled in the double lined Class I landfill adjacent to the plant site. The ash may be used as daily cover for rejects and non-processible items and weekly cover for Class III landfill (with prior district DER approval).

Rejects are primarily composed of the non-combustible fraction of MSW that is screened out in the RDF manufacturing process. A typical analysis is shown in Table 3.3-2. Rejects are about 80% moisture and inorganic materials.

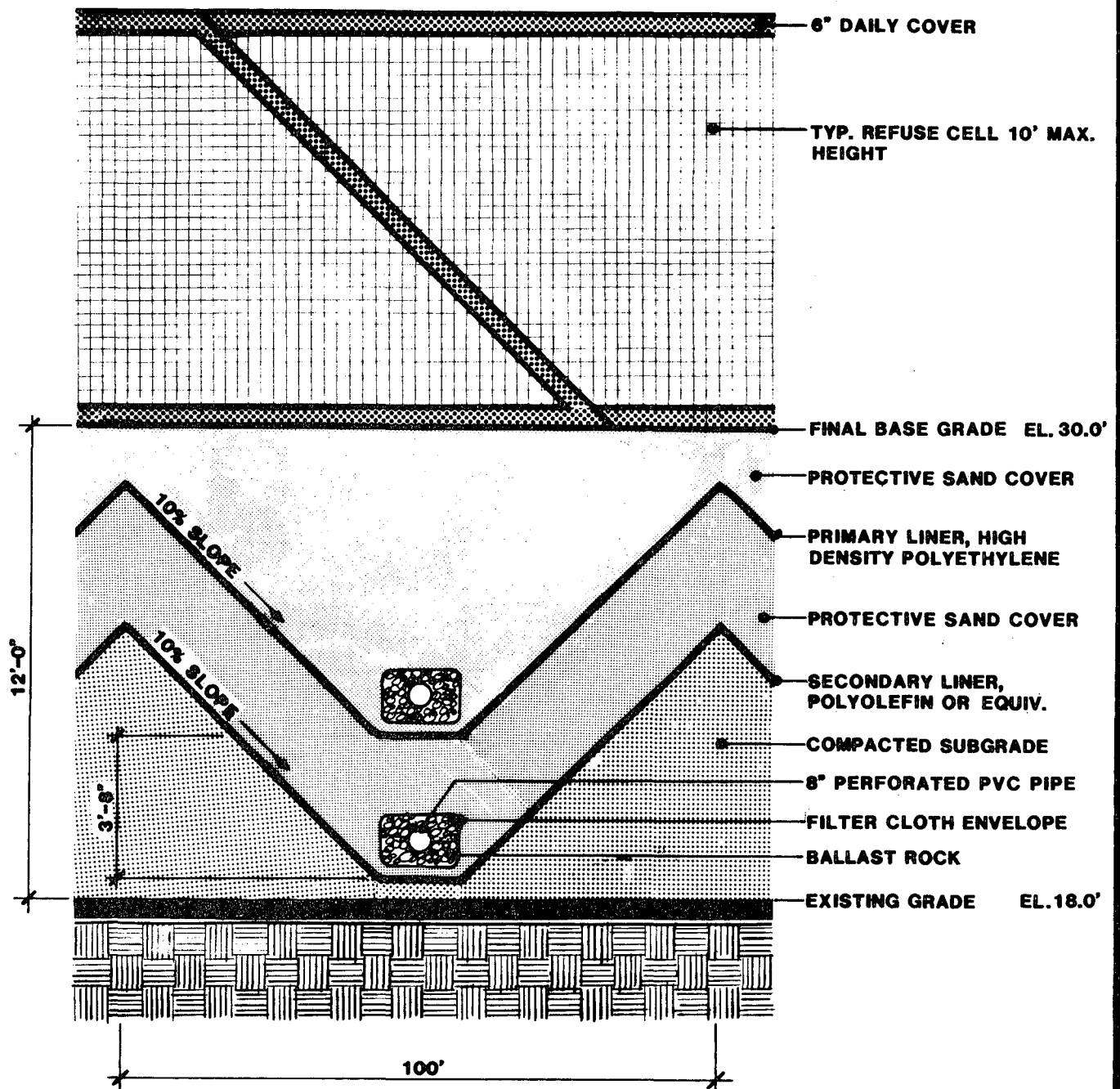
Ash is the residue of the combustion of the RDF which has been produced from the combustible fraction of the MSW stream, and consists of noncombustible by-products, fly ash, and siftings. The residue removal system will be designed to remove these materials from the combustion system for disposal. The bottom ash and siftings from the combustible units shall be water quenched and dewatered. Redundant capacity for the main residue conveyors will be provided. Fly ash removal conveyors will be supplied to convey fly ash from the boilers and electrostatic precipitators to the residue water quenches.

The residue removal system will consist of totally enclosed truck loading areas with two (2) loading bays. The system will incorporate a bifurcated chute to serve the two loading bays. Residue will be hauled from the facility by truck to the adjacent double-lined Class I Landfill.

Non-processible material is made up of such items as mattresses, rugs, tires, tree trunks, potentially dangerous materials (Section 3.7.2) and oversized bulky waste.

3.7.1.2 Landfill Design

In order to effectively contain and collect leachate generated by waste placed at the facility for disposal and thereby to protect the local environment from contamination, the area designated for Class I waste disposal will be equipped with a double-lined landfill bottom liner system. The system will consist of: 1) primary liner of synthetic material; (2) primary leachate collection and removal system; (3) leak detection/secondary leachate evacuation system; and, (4) secondary liner of synthetic material. Drainage layers will be constructed above the liners as part of the leachate control and leak detection systems. A cross-section of a typical double liner system is shown in Figure 3.7-1.



PALM BEACH COUNTY
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CROSS SECTION OF DOUBLE LINER SYSTEM

FIG 3.7-1

The synthetic materials used for liners will be selected to be compatible with the waste and leachate to be contained. Polymeric as well as plastic membrane liners will be considered for use as bottom liner materials. Specific design criteria recommended by EPA for liners are summarized below.

- Synthetic liners should be a minimum 36 mil in thickness when not reinforced, but a minimum 30 mil if reinforced. They must be carefully selected for compatibility with the waste and leachate to be contained.
- Soil liners should be constructed of a minimum two foot compacted layer of soil materials with a permeability of 1.00 E-07 cm/sec by EPA test methods.

Protection of the liner involves proper preparation of the subgrade and placement of protective soil layers. The secondary liner will be placed over a prepared base containing at least six inches of graded and compacted sand. Once the secondary liner is in place, the leak detection system will be installed on it. This system will consist of a network of perforated pipes surrounded by a porous medium, which comprises the detection and drainage layer. The primary liner will be placed over a prepared secondary drainage layer containing at least 6 inches of graded and compacted sand (SP) bedding for the primary liner. The liner will then be covered with an additional 24 inches of sand (SP) for protection from earth moving equipment, and to serve as a leachate collection medium/drainage layer in conjunction with the remainder of the leachate collection system.

The leachate collection system is designed to collect all leachate which may be generated as a result of landfill operations. Its components include a graded base with impermeable synthetic liner, perforated PVC collection pipe, manholes with submersible pumps, and force mains which discharge into the equalization tank. Perforated collection pipes are to be installed on top of the impermeable synthetic liner and covered with two feet of clean sand just prior to the introduction of solid waste in each phase. This piping serves to enhance the flow of leachate from the landfill's interior to the collection points located about the landfill perimeter. Adjacent to each of the perimeter collection points, a manhole and submersible pump are to be installed. Flow to the manholes will occur by gravity from the collection points, via solid piping which is to be installed through the leachate containment berm. Submersible pumps (pump station) installed in manholes will pump the leachate to the equalization tank (Appendix 10.7).

3.7.2 Hazardous Wastes

The Florida Legislature has prohibited the land disposal of hazardous wastes within the State of Florida. Therefore, any hazardous wastes, as defined by EPA or FDER, delivered to the facility and any waste products of the resource recovery plant which are classified as hazardous waste will be manifested in accordance with the Federal Resource Conservation and Recovery Act of 1976 (RCRA) and shipped off-site for proper treatment, storage and ultimate disposal in accordance with RCRA and the current Florida laws and regulations. All personnel involved in processing MSW will be trained to identify potentially hazardous materials and separate them from the waste stream. Trained hazardous waste response personnel will determine which are hazardous materials and transport these to the Hazardous Waste Storage and Transfer Building, located adjacent to the maintenance building, for temporary storage until the hazardous materials can be properly

removed for safe disposal. All hazardous materials identified at the Authority's transfer stations throughout the County will be handled in the same manner. All hazardous materials will be shipped to an approved hazardous waste treatment, storage and disposal facility.

The Hazardous Waste Storage and Transfer Facility will contain a locker for toxic wastes, an equipment storage locker, absorbant storage with a closed tank to collect spillage, isolation areas for barrels of incompatible wastes and an emergency shower.

3.8 ON-SITE DRAINAGE

3.8.1 Landfills

All runoff from the developed areas of the site will be collected and conveyed from these areas through a network of drainage swales and ditches to be constructed concurrent with site development. The final grading plan will be designed to shed precipitation from the capped landfill through the construction an integrated system of grassed swales, concrete drainage channels, and culverts, draining into a series of perimeter drainage channels. The sides of the landfill will be constructed at 4:1 slope. The side slopes will be broken at 20-foot intervals to accommodate 30-foot ($\pm$) wide terraces which will include drainage swales and vegetative buffer zones. The drainage swales will carry intercepted runoff to the drainage spillways installed on the side slopes. The spillways or culvert will meet the landfill perimeter ditch at the base of the landfill. The landfill perimeter ditch will then convey the runoff away from the landfill area to the conservation area west of the north-south roadway.

Sedimentation of runoff from the site will occur within basins along the landfill perimeter prior to the release of runoff from the on-site drainage network into the conservation area. The wetlands located in the conservation area will be used in the stormwater management plan to provide natural treatment of stormwater runoff.

Off-site discharge would be released through a drainage control structure (an appropriately sized weir) to the EPB-10 canal located east of Florida's Turnpike. The EPB-10 canal flows easterly, terminating at an outfall into the South Florida Water Management District (SFWMD) C-17 canal. See Appendix 10.5 for a computerized printout of the hydrograph of this site for a 25 year, 72 hour storm event. All calculations for surface runoff are in Appendix 10.5. Drawings 18 through 20 of Appendix 10.4 depict the stormwater management plan.

3.8.2 Resource Recovery Plant

The stormwater runoff for the resource recovery plant will be discharged into wetlands preserved within the 40 acre parcel and adjacent to the plant site. This discharge of stormwater runoff will be used to approximate normal hydroperiods and will provide natural treatment of the runoff prior to discharge into the conservation area. The routing of the stormwater will be by swales and/or drain pipes. Baffles, skimmers or other mechanisms will be employed to preclude the discharge of petroleum products into the adjacent wetlands from parking areas and other locations in which such pollutants may be present.

Water from within the plant will be processed separately from the stormwater runoff, as part of the wastewater system (Section 3.5.2).

3.9 MATERIALS HANDLING

3.9.1 Landfill

The fill material required for landfill base construction, intermediate and final landfill cover, and roadway construction will be obtained from the on-site borrow lakes. A pipeline will be installed from the dredge to convey material to a designated stockpile area, where the material will be allowed to dewater. A return line will carry the stockpile runoff back to the dredge lake. Panscrapers will carry the dewatered dredge material to areas of the site where fill is required. The fill will be placed by bulldozers. The liners used in landfill cell construction will be brought to the site on pallets by semi-trailer. Once the liner is brought to the site, it will be protected from the elements until it is laid within the landfill cells. The conditions of roadways leading to the site should not restrict shipment of materials required for landfill construction or operation. One of the first steps in site development will be to prepare the access roads to be used in facility construction and operation.

3.9.2 Resource Recovery Plant

All equipment for the resource recovery plant will be transported to the site by trucks. The larger units such as the boilers will be shipped as sub-assemblies and assembled at the site. The storage and laydown areas will only require 2 to 3 acres adjacent to the structure and movement around the site will be minimal.

Access to the site will be from 45th Street which is a main east-west roadway from I-95. The roadway (State Road 702) was constructed to Department of Transportation and County standards.

All installed equipment will be housed inside a building, and all maintenance will be carried out within the building. The turbo-generator building will have an overhead crane for installation and maintenance of the turbo-generator.

Effects on Site
Preparation and Plant and
Associated Facilities Construction

CHAPTER 4: ENVIRONMENTAL EFFECTS OF SITE PREPARATION, AND PLANT AND ASSOCIATED FACILITIES CONSTRUCTION

4.1 LAND IMPACT

4.1.1 General Construction Impacts

4.1.1.1 Resource Recovery Plant

4.1.1.1.1 Impact on Solid Waste Generation and Disposal

During the construction of the Resource Recovery Facility a variety of solid wastes will be generated and will need to be disposed of periodically. These wastes will include vegetative matter, wood, paper products, concrete, scrap metal and lumber, and miscellaneous oils and fluids required for equipment operation.

The site clearing procedures will generate debris which include vegetative matter and wood. Slash and wood debris resulting from the removal of trees and existing structures will be burned on-site or hauled to the Authority landfill for disposal. Small quantities of waste oils and solvents may be generated on-site as a result of equipment maintenance and various construction activities.

Contractors working on the facility will be required to properly identify and manage any hazardous wastes they handle or generate. As part of their contracts, they will be required to meet all State and Federal regulations in regard to hazardous waste management.

It is anticipated that roll-off containers will be utilized for the collection and haul of non-recyclable materials to the Authority landfill. It is estimated that the generation rate will not exceed 10 tons/month. An initial peak generation of waste associated with site preparation and land clearing would occur, after which generation of waste can be expected in line with the general level of construction and installation activities.

4.1.1.1.2 Staging, Material and Lay-Down Areas

Approximately 40 acres will be improved with structures, roadways and landscaped areas. With the large number of construction activities taking place on the site, the staging, materials lay-down and storage and work force parking areas must be designated where construction activities are minimal, but due to the availability of large acreage this can be easily accommodated.

The lay down area will be located in the future landfill area adjacent to the resource recovery plant.

4.1.1.1.3 Land Disturbance

The use of explosives is not contemplated during construction.

A discussion on the construction activities that will disturb existing terrain is presented in this chapter under the various subsections. A review of this discussion reveals that at least two major activities occur during construction that will disturb existing terrain. These activities are listed below:

1. Initial site clearing and construction of access road.
2. Fill placement for tipping floor.

It should be noted that both of these terrain-disturbing activities are typical for the construction of a project of this nature.

4.1.1.2 Landfill

The total site consists of approximately 1,320 acres. Of that acreage, approximately 625 acres lie east of the 3,000-foot setback line relative to the City of West Palm Beach Water Catchment Area. This 625 acre area will be occupied by sanitary landfill cells or borrow lakes created as a result of landfill cell construction and operation. The area west of the 3,000-foot setback line will be utilized for wetlands mitigation/stormwater management, and will also be occupied by the resource recovery plant, a north-south roadway, and access roads for the landfill. No landfilling of waste will be permitted west of the 3,000-foot setback.

Clearing, excavating and filling of land will be necessary to construct the landfill cells and related access roads. The existing terrain east of the 3,000-foot setback line, although presently displaying little topographic relief, will be altered through construction so that there is a level subgrade for the landfill base. Areas presently designated as wetlands will be filled in, and thus require mitigation elsewhere on-site in accordance with restoration plans discussed in Sections 4.2 and 4.4 and Appendix 10.12.

Regrading of the perimeter surrounding the landfill cells will improve site drainage. Other improvements to site drainage will be made throughout the site as well.

4.1.2 Roads

A landfill access road will be constructed around the southern and eastern perimeter of the sanitary landfill area. The roadway will consist of two lanes, each twelve feet wide, with eight-foot wide shoulders on each side of the roadway. The road design will include a stabilized subbase and a limerock base.

4.1.3 Flood Zones

As illustrated in Figure 2.1-3, the facility site does not lie within the 100 year flood zone. Therefore, compliance with local flood program regulations is achieved.

4.1.4 Topography and Soils

4.1.4.1 Landfill

4.1.4.1.1 Existing Condition

The general topography of the proposed landfill area of the site is relatively flat with moderate slopes and depressions toward the northeast with a maximum surface elevation of 17.5 and the lowest surface elevation being approximately 15.5. See Sheets 1 through 25 of the Construction Permit Application (Appendix 10.4). As illustrated in these drawings, a borrow lake exists toward the northeast section of the site. The topography at the southwest portion of the site is irregular because of the abandoned 171-acre shell pit operation. The shell pit bottoms are approximately 6 feet below surrounding ground elevation. The elevation of the berms at the perimeter of the shell pit areas are 6 feet above ground surface elevation.

Areas to the north of the borrow area have been scraped below natural ground surface, including a 22-acre flooded area. This flood area has been excavated to an elevation of 3 feet below the natural ground elevation.

4.1.4.1.2 Future Conditions

The topography of the site will change once the resource recovery plant and landfill construction begins. The landfill construction and operation will modify the overall topography within the landfill boundaries to a maximum elevation of +130 feet. Side slopes of 4:1 will be used with terracing every 20 feet in elevation. The terracing will minimize the soil loss through erosion. The 30-foot wide terraces will also assist in the conveyance of stormwater runoff from a 25-year storm event.

The landfill has been phased to reduce the quantity of leachate as well as improve the aesthetic appearance of a major construction effort. Table 4.1-1 identifies the years of activity and the respective cells to be constructed. Construction will begin simultaneously at the north end and the south end of the site. The north end of the site will contain activities related to the Class III landfill while the south end of the site will contain activities related to Class I landfilling. The Class I landfill will require a double liner with a leachate collection and leak detection systems. The Class III landfill will utilize a single liner with a leachate collection system.

TABLE 4.1-1
CELL CONSTRUCTION TIME-TABLE

CLASS I	Year Open	Acres
Phase I		
Cell A	1987 (Early)	29.4
Cell B	1987 (Late)	23
Phase II		
Cell A	1990 (Early)	14.7
Cell B	1991 (Late)	9.6
Phase III		
Cell A	1995 (Early)	20
Cell B	1998 (Early)	20
CLASS III		
Phase I		
Cell A	1987 (Early)	25
Cell B	1989 (Late)	25
Phase II		
Cell A	1994 (Late)	25
Cell B	1996 (Late)	25
Phase III		
Cell A	2001 (Mid)	25
Cell B	2003 (Early)	25
Phase IV		
Cell A	2004 (Late)	23
Cell B	2007 (Mid)	23

A 200-foot buffer zone on the east side of the landfill site will be provided. The buffer zone will contain screening, a landfill access road with a width of 24 feet and 8 feet of shoulder on each side, and a 12-foot bottom-width trapezoidal ditch with 2:1 side slopes.

During construction siltation ponds will be installed to collect eroded material and protect the surface water bodies on-site. In active cell areas leachate will be collected via the leachate collection system, therefore protecting the groundwater beneath the site from potential pollution.

4.1.4.2 Resource Recovery Plant and General Site

The topography and soils of the site will be altered by the construction of the resource recovery plant and the landfills, the loss and concomitant replacement of wetlands, the creation of the borrow lakes, and the construction of roads and related service facilities. Natural soils will be covered by impermeable surfaces in areas of the plant, landfills, and roads. Soils will be removed in areas of borrow lakes. In wetland areas to be replaced, soils will be removed; in replacement wetlands, landcover will consist of suitable materials similar to natural soils. Each of the alterations will affect runoff and percolation rates.

There will be no alterations to topography and soils that will affect the (negligible) potential for subsidence or sink-hole development. Likewise, no alterations will affect the soil bearing strength, or soil stability. However, the alterations will affect the aesthetics of the site. The presence of the Resource Recovery Facility will significantly alter the nearly level topography. Also, the borrow lakes will affect the aesthetic values of the site. With the exception of the resource recovery plant the cited facilities could be regarded as aesthetically beneficial in a naturally flat terrain.

As construction progresses, more and more of the site area will be covered with impervious surfaces, e.g. roads and buildings. When completed, the site will comprise a maximum of 945,000 square feet of impervious surfaces. Approximately 325,000 square feet will be covered by buildings and other facility components and the remaining 620,000 square feet will be covered by roads and parking lot surfaces. The area of general construction will cover about 40 acres.

No subsurface construction is contemplated and only load bearing piles will be installed underneath those areas of the structure requiring support. The exact number, type, spacing and length of the piles has not been defined. This information will be developed with final design.

The bearing capacity of these areas of the site will be improved with the use of the piles to support heavy structures and associated components. No long-term problems are associated with this change in site subsurface conditions.

The construction activities described will affect the site's topography and will have some potentially negative aesthetic impacts. Since the site is remote (nearest resident 1 mile away) and the adjacent property is undeveloped, the visual impacts should be very limited since there are no existing viewsheds which could be adversely affected. Most of the activities described in this section will occur at grade resulting in very limited visibility from nearby roadways and the closest residential area. However, backfilling to bring existing grade up to the planned tipping floor elevation will result in activities occurring at twenty-four feet above existing ground levels. The backfilling operation and resulting mound should not be visible from the residences one mile away. This will result in a minor visual impact, if any.

4.2 IMPACT ON SURFACE WATER BODIES AND USES

4.2.1 Impact Assessment

The landfill will ultimately extend from 45th Street to the existing borrow lake, and water bodies which exist within this area will be eliminated. The six-acre abandoned pit 4,000 feet north of 45th Street will be filled with clean fill to a predetermined elevation when the landfill operation expands into this area. Similarly, any wetlands which exist within this area will eventually be replaced by landfill cells.

Current law requires that mitigative action be taken in regards to any wetlands destroyed or disturbed, to offset adverse impacts to this aquatic resource. If a wetland area is disturbed because no practicable alternatives are available, mitigation will be used to remedy adverse impacts on the aquatic resource. Mitigation of wetlands is typically accomplished through either creation or restoration. Wetlands may be created by contouring the

margins of lakes or canals to provide areas for the establishment of wetland vegetation. Restoration through reflooding or replanting of wetlands previously drained, filled, or otherwise disturbed is a second form of mitigation. If an existing hydraulic connection to a wetland is disrupted, steps must be taken to direct surface water to the area by another route.

Redirection of surface water into wetland areas in the western and southern portions of the site will be used to upgrade their condition. It is the intent to use the wetlands on the site as areas of stormwater retention and treatment. This use will restore wetlands areas which have suffered because of existing site drainage.

Additional wetlands will be created in open spaces on the property west of the proposed landfill area and the north-south roadway. Wetlands will also be created by contouring the perimeters of the borrow lakes and drainage canals in such a manner as to provide areas for the establishment of wetlands vegetation. The new wetland areas will also serve as stormwater retention areas. Various storm events have been analyzed and are presented in Appendix 10.5.

Surface water flow to the Turnpike Canal will be reduced. The three hydraulic connections from the internal wetlands areas previously described (Section 2.3.4.1) to this canal will be eliminated due to the presence of the landfill. Perimeter ditches on the east side of the landfill will intercept runoff from the landfill, preventing its discharge to the Turnpike Canal.

The existing borrow lake will be expanded and several borrow lakes will be created on the site to support site preparation and landfill operation. It is estimated that approximately 12,860,000 cubic yards of sand/soil will be required to construct and operate the landfills on the site. Uses of the borrow material include: construction fill for landfill base, internal leachate containment berm construction, perimeter access roads construction, daily and/or intermediate cover for landfill lifts, and final cover landfill. The Dyer Boulevard Landfill will also continue to utilize borrow material from the existing lake on the site until landfill closure at the Dyer site is complete. This demand is estimated to equal approximately 1,630,000 cubic yards from July 1984 through closure (scheduled for late 1987).

The expansion of existing and/or creation of new borrow lakes on the site will be done in such a way as to minimize the impacts on the local ecology. The side slopes of the borrow lakes will be developed in such a way that the lake perimeter will serve as wetland areas when development is complete.

The shell pits in the southwest corner of the site will not be directly affected by landfill construction and operation. However, they do provide a suitable area for wetlands mitigation in the form of improvement and will be incorporated into the stormwater management system. Many high areas will be removed and graded to provide a more suitable wetland area.

Plans ?

The EPB-10 Canal will be a part of the surface water management plan and will be used for the release of stormwater runoff from the site after a permit is received by the Northern Palm Beach County Water Control District from the South Florida Water Management District. The extension of the EPB-10 canal onto the site will be realigned to facilitate landfill operations. Any on-site discharge to the EPB-10 Canal as it extends on the site, as well as any flow of the EPB-10 Canal as it travels east from the site, will be controlled by weirs and floodgates constructed as part of the surface water management system. The allowable discharge for the entire 1,320-acre site is 129 cubic feet per second.

Erosion of cover material and siltation of drainage ditches and other surface water management facilities could affect the surface water bodies on the site if not controlled. A number of measures will be taken to prevent these negative effects. During the development of the landfill, siltation of surface water is expected as a result of erosion of cover material prior to establishment of vegetation. A system of drainage terraces, ditches and sedimentation basins will be included in the design of landfill areas to control erosion and siltation of surface water runoff. Drainage terraces on the landfill embankments will prevent runoff from traveling more than twenty feet of elevation down the embankment before being intercepted by a drainage terrace. In this manner erosion will be minimized by preventing excessive velocities in the runoff water. These terraces will carry the runoff to paved waterways which connect the terraces with drainage ditches at the toe of the landfill. The perimeter drainage ditches will carry this runoff to sedimentation basins located at the discharge points at the landfill perimeter. During construction these basins will be of temporary design removing silt deposited by the runoff from unvegetated areas of the landfill and borrow pits. The sedimentation basins would accommodate a 25-year storm without overtopping. In the event of a storm greater than the design storm, the ponds would still provide removal of silt from stormwater passing through them but at a reduced efficiency.

Temporary measures are proposed for completed areas for control of erosion and for limiting siltation from unvegetated areas. These measures include placement of hay bales in major ditches and periodic maintenance of the drainage system according to standards established by the USDA Soil Conservation Service. The placement of final cover on the embankments of the landfill may cause a certain amount of surface water siltation from erosion of cover material during wet weather. This condition will be temporary and will be eliminated when vegetation has been established. Siltation of off-site surface waters can be minimized by employment of temporary erosion control measures such as drainage checks, and the permanent siltation basins and filtering system.

4.2.2 Measuring and Monitoring Program

4.2.2.1 Groundwater Monitoring Program

The groundwater monitoring program was prepared on the basis of the current plans for the design and location of the site facilities and the hydrogeological information developed from the recent groundwater investigation. The purpose of the program is to detect any groundwater contaminants or potential contaminants that may be generated by the facility and to establish background information on groundwater levels and quality. Groundwater monitoring will begin before site preparation and continue through the years of operation and into the future as required in the course of prudent management.

The monitoring program is designed to protect the quality of water. The program will protect both groundwater and surface-water bodies including: the WCA (West Palm Beach Water Catchment Area) and the M Canal (3,000 feet south of the proposed landfill); the municipal and private wells and well fields to the north, south and east; the nearby surface-water bodies including the proposed borrow lakes; and, the locations where new wells and well fields may be installed.

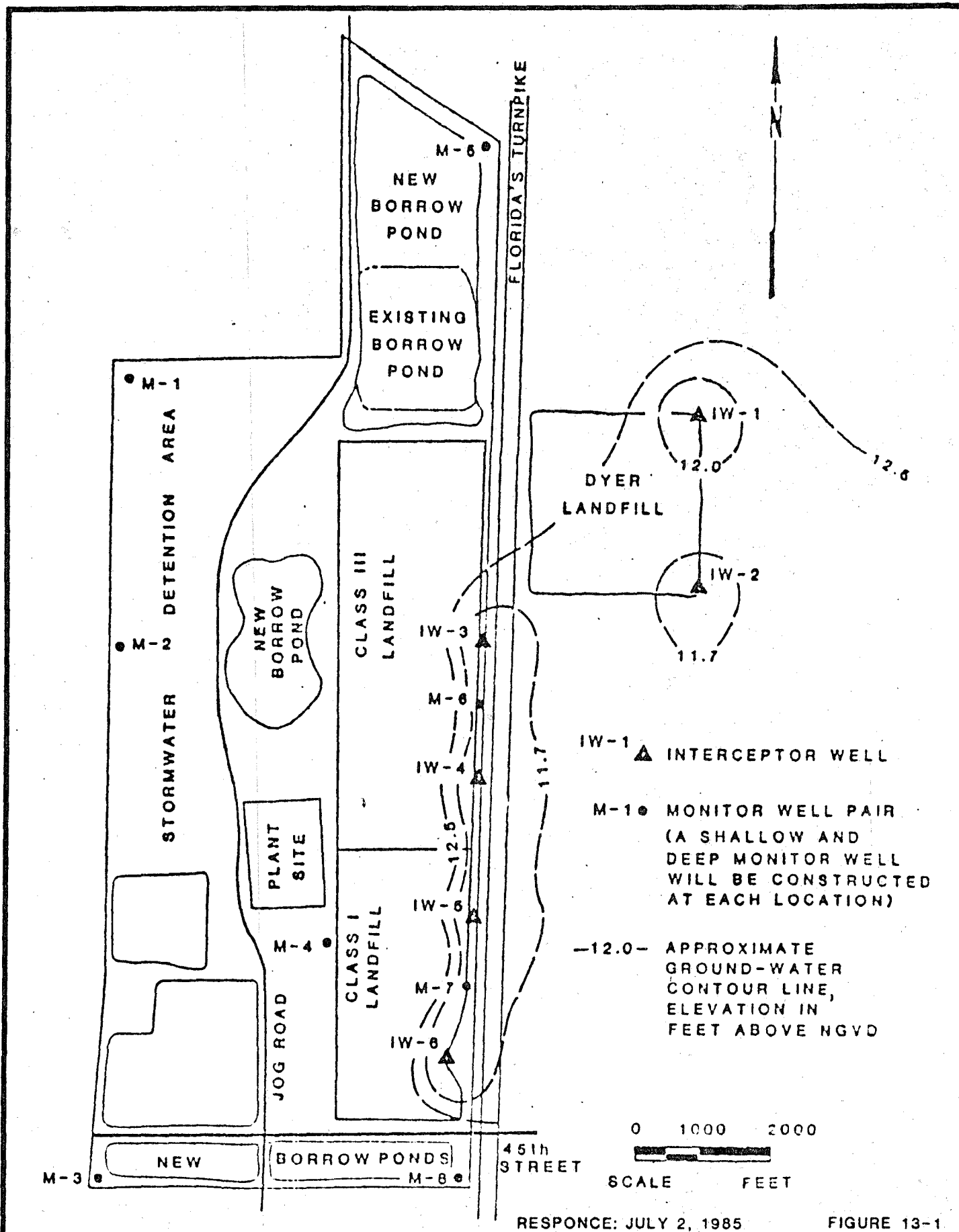
A major facet of the monitoring program is the continuous pumping of four wells aligned along the eastern side of the Class I and Class III landfills as shown on Figure 4.2-1. Together with two wells pumping continuously at the Dyer Boulevard Landfill, these wells will provide water to the resource recovery plant for the purpose of cooling and boiler use. All six wells will serve to create cones of depression in the water table of the shallow aquifer that will cause any potential contaminant from the site landfills and mineralized ground water from the Dyer Boulevard Landfill area to migrate toward these wells. The rationale for developing the locations and pumping rates of these wells is discussed fully in Appendix 10.14.7. The extent of the cones of depressions that will be created by these wells is also shown on Figure 4.2-1. The cones of depression depicted on the figure reflect pumping at a total rate of 2.0 million gallons per day under average water-availability conditions.

The six interceptor wells generally will ensure that potential and existing degraded groundwater will be contained within the vicinity of the landfills. In order to verify the proper operation of the interceptor wells, eight pairs of monitor wells will be installed on and along the periphery of the site as shown on Figure 4.2-1. There are already numerous existing monitor wells in the vicinity of the Dyer Boulevard Landfill. Monitor wells on the Resource Recovery Facility site will serve to provide data on groundwater levels and groundwater quality within two different vertical intervals within the shallow aquifer.

The Class I landfill design includes a double liner and double drain leachate collection system. In the event of a leak of the upper liner, a clear signal of the leak would be provided by the leachate-detection drains below the upper liner. The underdrains will be sloped from the center of the landfill toward the sides; they will be parallel and spaced about 400 feet apart along the entire perimeter of the landfill. Each underdrain would intercept leachate from an area of 7.7 acres, thus isolating the location of a leak to the drainage area (7.7 acres) of the drain indicating leachate. Evidence of leaking of the upper liner immediately would signal the start of appropriate remedial action; escaped leachate will be recovered in the underdrains. Remedial actions that may be considered include injecting sealant to the area of the liner determined to be leaking, removing the fill (if thin) and patching the liner, or capping the fill with a synthetic impermeable layer to eliminate infiltration of rainfall. A breach of the second, or lower liner, could provide a route for the migration of leachate to the top of the aquifer. In the unlikely event that this should happen, the leachate will migrate toward one of the interceptor wells.

The Class III landfill design includes a single liner and drain system. Any breach of this liner would cause leachate to migrate to the top of the aquifer; this leachate also would migrate to the interceptor wells.

Two monitor wells will be constructed at each location shown on Figure 4.2-1. One will tap the upper and one the lower zone of the aquifer. The upper-zone monitor well will tap the interval from 5 to 50 feet; the lower-zone well will tap the interval between 50 and 125 feet. Tapping the aquifer in the shallow and deep zones separately will cover the entire saturated thickness of the aquifer and make it possible to monitor the vertical as well as horizontal groundwater gradients. Water-level monitoring at each of the eight locations will provide data indicating the effectiveness of the interceptor wells. The operating interceptor-well system will produce a large elongated cone of depression having its center and near-lowest water levels at and between monitor well pairs M-6 and M-7 as shown on Figure 4.2-1.

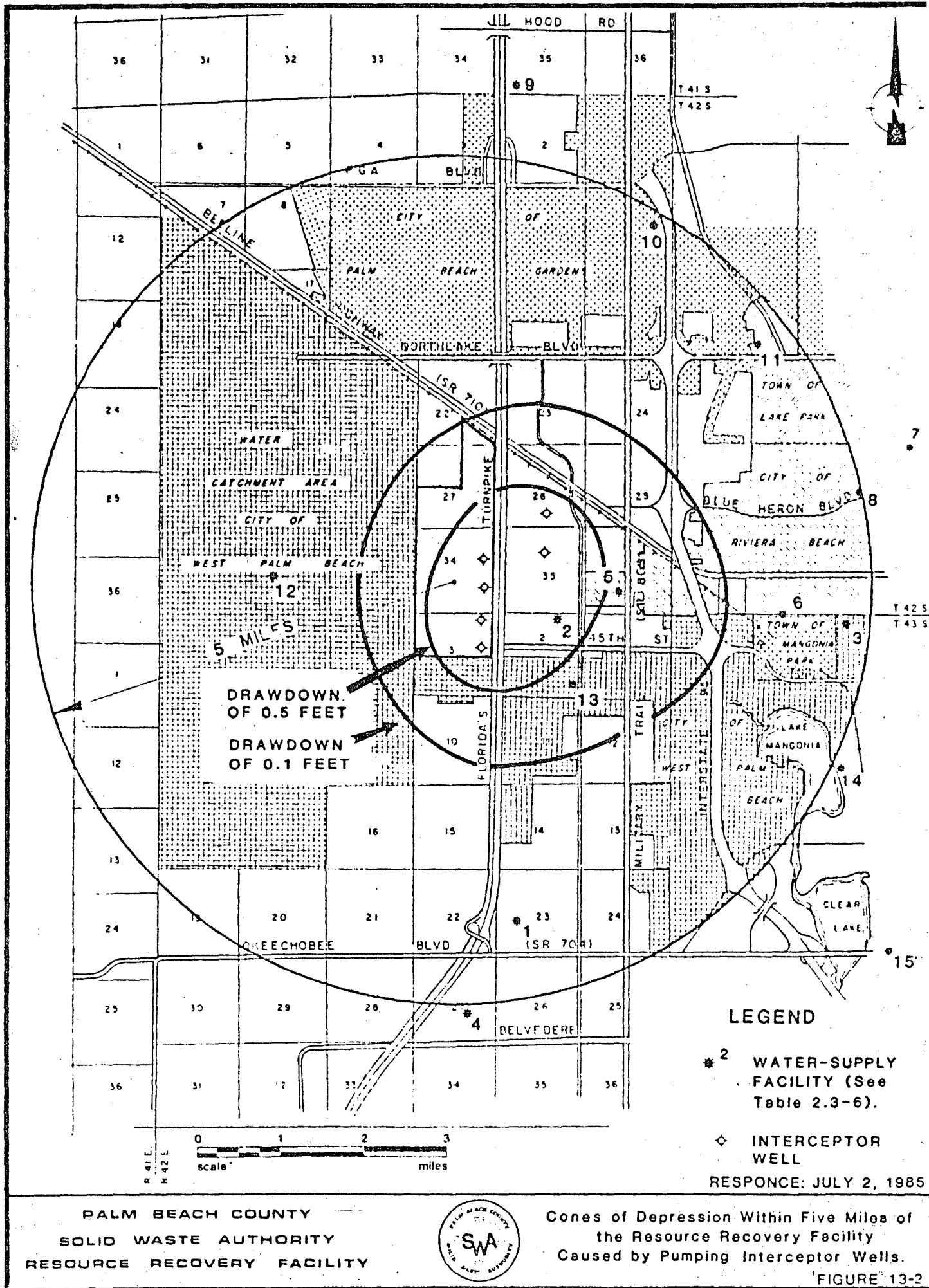


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INTERCEPTOR AND MONITOR WELL
LOCATIONS AND APPROXIMATE
CONES OF DEPRESSION

Figure 4.2-1



Cones of Depression Within Five Miles of
the Resource Recovery Facility
Caused by Pumping Interceptor Wells.

Water levels in each of the eight monitor well pairs and pumping water levels in each of the interceptor wells will be measured quarterly. These levels will be represented on a groundwater contour map demonstrating the status of the interceptor well system. Any indication that interceptor wells are not causing their intended result will initiate adjustment of interceptor-well pumping rates or the installation of additional interceptor wells such that the desired cone of depression is re-established and maintained.

In addition to water-level measurements in monitor wells, water samples will be collected for each of the monitor wells (16 wells) and interceptor wells (8 wells) on a semi-annual basis. Samples will be analyzed for the Indicator Parameters shown on Table 4.2-1 to establish background concentrations. Samples also will be analyzed for Indicator Parameters routinely unless signs of leachate are detected. If a sign of leachate is detected in a well sample, monthly sampling will be instituted and analyses will be conducted for parameters characterizing leachate; these also are listed on Table 4.2-1. The actual parameters to be analyzed will be selected from this list.

The monitor wells will be purged by pumping prior to sampling to ensure representative data are collected. Prior to well purging for sampling, a specific conductance profile will be performed in each monitor well. The specific conductance will be measured by lowering the detector probe in the well and taking measurements at 10-foot intervals. This will help ensure that leachate will be detected in the event the pumped sample is diluted.

All monitor wells will be located to minimize the influence of nearby surface-water bodies on water levels measured in the wells. The monitor wells constructed during the Resource Recovery Facility site groundwater investigations will be incorporated into the monitoring program to the extent possible (if they are not used, they will be plugged).

In the unlikely event that leachate is detected in any Resource Recovery Facility site monitor well sample, its vertical and horizontal extent will be defined to provide the information necessary to evaluate the potential impact of the identified plume and develop appropriate mitigative action. Because groundwater flows at a very low velocity, sufficient time to implement remedial action will be available to stop the spread of leachate near its source. At all times during the operating life of the facility, managerial and technical flexibility will be maintained to respond directly to any situation that may threaten groundwater quality.

4.2.2.2 Surface Water Monitoring Program

Surface water samples will be drawn from six locations on a monthly basis: three at locations before the surface water leaves the landfill area; one at the resource recovery plant outfall; one at the control structure prior to discharge from the Resource Recovery Facility site; and, one at the EPB 10 canal, east of the Florida Turnpike.

Each sample will be analysed for the following constituents:

Dissolved Oxygen	Biochemical Oxygen Demand
pH	Total Organic Carbon
Specific Conductance	Ammonia
Total Hardness	Nitrate
Total Suspended Solids	Total Phosphorus
Total Coliform	Chloride
Fecal Coliform	Total Iron

Oil and grease will be checked on a quarterly basis for the first year and annually thereafter unless a problem is detected.

TABLE 4.2-1
GROUNDWATER QUALITY PARAMETERS
TO BE USED AS LEACHATE INDICATORS

INDICATOR PARAMETERS *

pH **	chemical oxygen demand
specific conductance **	color
temperature **	turbidity
chloride	total iron
total organic carbon (TOC) ***	total dissolved solids (TDS) ***
sulfate ***	zinc ***
bicarbonate ***	calcium ***
magnesium ***	manganese ***
organic nitrogen ***	total nitrogen ***
ammonia ***	ammonium ***
nitrate ***	

LEACHATE-CHARACTERIZATION PARAMETERS

Physical	Inorganic Chemicals	Biological
appearance	volatile solids	biochemical oxygen
oxidation-reduction	chloride	demand (BOD)
potential	phosphate	coliform bacteria
odor	alkalinity and acidity	(total, fecal;
	sodium	fecal
	hardness	streptococcus)
Organic Chemicals	lead	standard plate
phenols	copper	count
chemical oxygen	nickel	
demand (COD)	chromium	
volatile acids	cadmium	
tannins, lignins	iron	
ether soluble	silicon	
(oil and grease)	mercury	
MBAS	arsenic	
organic functional	selenium	
groups as required	barium	
chlorinated	silver	
hydrocarbons	potassium	

Notes:

*Indicator Parameters are referred to as the "Key Indicator Group" and Leachate-Characterization parameters as the "Extended Indicator Group" by the U.S. Environmental Protection Agency (1977).

**Will be measured when well sample is collected.

***These parameters are added as per FDER memorandum of December 5, 1983 by Bill Buzick, on Solid Waste and Groundwater Monitoring Plan Guidance.

4.3 GROUNDWATER IMPACTS

Construction of the proposed facilities will modify factors that affect groundwater levels and availability. Modifications to the groundwater resource during site preparation are discussed below for each land use.

4.3.1 Impact Assessment

The conditions influencing the groundwater resource that will be modified are appropriately described in a water budget. The following describes the water budget of the Resource Recovery Facility site.

The annual average rainfall on the site is 62 inches (MacVicar, 1981). The annual evapotranspiration from the water table is estimated to be 39.5 inches. This number is a refinement of an evapotranspiration estimation based on a method described by Dohrenwend (1977), as derived from a site-specific groundwater flow model described fully in Appendix 10.14.7. Considered in the initial estimate for evapotranspiration were the temperature, the climatic type, and the vegetative type and density. The annual gross recharge to the aquifer is estimated to be 30 inches (Camp, Dresser & McKee, 1980). Because the water-table evapotranspiration rate exceeds the estimated gross aquifer recharge as indicated in the cited model, there is no net aquifer recharge on the site during the average year. The reason for this is that the water table lies within three feet of the land surface causing a high rate of evapotranspiration from the water table. Groundwater levels are maintained high because of the presence of the WCA (West Palm Beach Water Catchment area); water constantly seeps eastward from the WCA. One probable exception to this analysis occurs in the extreme eastern part of the site where the canals along Florida's Turnpike receive some surface-water runoff and have levels generally above the underlying water table; net recharge to the aquifer may occur in this area. East of the site, groundwater levels and water-table evapotranspiration rates are lower; net groundwater recharge occurs in these areas.

Surface-water runoff from the site is restricted to a single outlet in the southeastern part of the site where a connection to the EPB-10 canal (east of the Turnpike) exists. This outlet drains surface water from the abandoned shell pits in the southern part of the site. Because of the restricted outlet and apparently small effect this outlet has on surface-water and groundwater levels, the annual rate of surface-water runoff considering the water budget for all of the site is estimated to be about 5 inches.

The remaining component of the water budget is the evapotranspiration that occurs from the unsaturated soil and surface water of the site. This residual in the water budget must equal 17.5 inches (rainfall of 62 inches equals water-table evapotranspiration of 39.5 inches plus surface-water runoff of 5 inches plus above water-table evapotranspiration of 17.5 inches). This figure appears to be reasonable because of the wetland areas present on the site.

The flow of groundwater beneath the site from west to east is estimated to be one million gallons per day during moderately dry periods. This flow is based on the application of Darcy's Law and includes use of the average groundwater gradient (0.0007) measured on May 23 and June 19, 1984 (when moderately dry conditions prevailed), the transmissivity of the shallow aquifer (101,000 gallons per day per foot), and the length of the site normal to the groundwater flow direction (14,000 feet). This flow is regarded as the base flow and originates from the WCA.

460 During site preparation and construction of facilities on the site, land will be cleared for the construction of buildings, roadways, landfill cells, and work areas. The stormwater detention area of 427 acres also will be bermed and graded as necessary. About 59 acres of land will be hard-surfaced (building and roadways) and 20-acre landfill cells will be cleared and lined in two areas.

Within areas designated for the hard surfaces of buildings and roadways, and areas cleared and lined for the initial landfill cells, evapotranspiration will cease and surface-water runoff will increase. In the areas to be affected in this manner, the total annual reduction in evapotranspiration from the water table is estimated to be 53 acre feet; this estimate is based on the groundwater model referred to above. This quantity of water will remain in the aquifer, thus adding to the groundwater availability.

Also during site preparation, two injection wells, two water-supply wells, and six interceptor wells will be constructed. The injection well will tap the "boulder zone" at a depth of approximately 3,000 feet. The wells will serve to dispose of water including leachate from the landfill, industrial wastewater from the resource recovery plant and domestic wastewater. Multiple well casings, each sealed with sulfate-resistant cement, will isolate the injected fluid from the shallow aquifer. The water-supply wells will be located near the resource recovery plant; one will be pumped at an average rate of about 158,400 gpd (gallons per day) to provide water for plant personnel and other plant uses requiring high-quality water. The six interceptor wells will be constructed as discussed under Section 4.2.2 and Appendix 10.14.7 of this application. Four of these wells will be aligned along the eastern boundary of the proposed landfills and two will be on the Dyer Boulevard Landfill property. Upon plant operation, these wells will be pumped to satisfy a total peak demand of about 3.2 mgd (million gallons per day) for cooling and boiler uses, as well as for irrigation.

Surface-water runoff will be collected and routed to the conservation area where it will be stored until the water level exceeds a bleeder invert elevation of 16.90 feet above NGVD. When the water level exceeds this elevation, water will be discharged through the wier (or bleeder) and enter the EPB-10 canal east of Florida's Turnpike (Sections 3.8 and 4.2.1). Water not discharged will remain in the conservation area to approximate natural hydrologic conditions in that area. Areas to be landscaped will have no significant effect on the groundwater resource. The net effect of site preparation on the groundwater resource will be small.

4.3.2 Measurement and Monitoring Programs

The assessment of effects on the groundwater resource was based upon data collected in the field, reported in existing literature, and on the results of a calibrated groundwater flow model (Appendix 10.14.7). The influence of project facilities construction on groundwater were considered in light of conditions on the site as discussed above (Section 4.3.1).

The monitoring program (Section 4.2.2) was prepared to aid in the elimination of any potential adverse impacts due to the construction and operation of the Resource Recovery Facility. Specifically, it ensures that groundwater quality will not be degraded off site and will not persist on site, should such degradation occur. This assurance is gained by the use of groundwater interceptor wells and by measuring groundwater levels and groundwater quality at selected locations.

4.4 ECOLOGICAL IMPACTS

4.4.1 Impact Assessment

The construction of this Resource Recovery Facility will have a significant ecological impact on the site. Species diversity and composition, and the proportion of various habitats on the site will undergo both short and long term alterations.

When construction begins, diversity and composition will be affected. Secretive and sensitive animal species will leave the site. The catchment area and the undeveloped area south of the site may serve as a refuge for those taxa that seek to escape. The size of the site and the length of time required to develop it will influence the rate at which this shift occurs. Areas left undisturbed will not have a shift as immediate or dramatic as the first areas to be altered.

Following this short-term phenomenon, the species composition and diversity on the site will go through a longer readjustment period. As the amount of various habitat types on the site shifts, so will species composition. The greatest amount of habitat loss is expected to be from the upland communities.

Pine flatwoods will be the native vegetation community most significantly reduced in acreage on the site.

Since most or all of the wetland areas eliminated will be replaced, the long term diversity of the wetland communities will not experience as great a disruption. There will be a shift in the proportion of various wetland types. The shrub dominated swamps, particularly those dominated by myrtle, will be reduced and the proportion of marshes will increase. The proportion of cypress forest on the site will be slightly reduced.

The large conservation area on the west side of the site designated as a buffer and mitigation area should retain much of its diversity and productivity, or regain it relatively soon. The catchment area will provide a source of colonization of the area. Although there will be minor disturbance in this western portion, it will recover its diversity and ecological value quickly.

The area encompassed by the resource recovery plant itself (approximately 40 acres) will be significantly altered. The areas encompassing the landfills will also be changed. In the short term, the habitats and communities taken by these facilities will be lost. However, the project has a definite life span, and some of the habitat loss will be made up when the project is completed and the closed facility is put to other uses.

The amount of deepwater and lake habitat on the site will be increased. The existing dredge lake will be expanded and additional areas will be created. These areas should provide fish habitat at the termination of the project, and the margins of the lakes will provide littoral zones and wetland habitat.

4.4.2 Measuring and Monitoring Programs

The monitoring program for ecological conditions is discussed in Section 2.3.6.3.

Routine inspections of the site will occur as a result of various other monitoring programs. It is anticipated that evaluation of the general ecological conditions of the site will be made coincidentally to these other monitoring programs. Efforts will be made to ensure that individuals making these inspections report any disturbance such as disease or pest outbreaks to appropriate persons in the Solid Waste Authority for corrective measures.

4.5 AIR IMPACT

4.5.1 Landfill Construction

This has been discussed thoroughly in Section 3.4.2.

4.5.2 Resource Recovery Plant Construction

4.5.2.1 Emission Rates

Construction activities have the potential for causing localized, short-term adverse air quality impacts. Possible impacts include: fugitive dust emissions from land clearing and site preparation activities, and mobile source emissions from construction at the construction site.

Although emissions will continue throughout all phases of construction, the greatest impact from fugitive dust emissions will occur during the site preparation phase when the largest number of acres of the site will be exposed. The greatest impact from the mobile sources will occur during the facility construction phase when the amount of equipment on site is the greatest.

The emissions from present construction across the Turnpike at the Dyer Boulevard Landfill site for expansion and closure would approximate what might be expected at the new site, and therefore not further degrade air quality in the general area.

4.5.2.2 Mitigating Measures for Particulate Emissions

The construction site is located in an attainment area. The emissions are expected to have a short term impact that are typical of those found with other construction activities.

Construction requirements for fill and concrete will result in truck traffic along the site access road. This makes the unpaved roads a source of particulate matter. Several mitigating measures are available to reduce these emissions. Routine watering of the roadway will provide a reduction of roadway emissions of about 50 percent. A watering truck is usually on site for various other activities. Partial dedication of this truck or the addition of a second truck will be accomplished. Surface treatment with penetrating chemicals would provide a 50 percent reduction depending on the frequency of application. The application of penetrating chemicals is more costly than a routine watering but fewer applications are required. The purchase of chemicals, time to mix the chemicals, and the partial use of a watering truck or some other vehicle would contribute to the cost. Soil stabilization alone

How?

can achieve a 50 percent emission reduction by binding up surface soil. The advantage to soil stabilization is that the roadway becomes more drivable. Soil stabilization is done once, as soon as the roadway is developed. Additional emission reductions could be obtained if oil or penetrating chemicals were spread over the stabilized area. Paving achieves the greatest reduction in emissions, 85 percent, and represents the most stringent emission limitation. Road paving can be done either by soil compaction and adding base coarse material or by soil stabilization with an asphalt cap, whichever is most appropriate for the site. Good construction practice requires a developed access road for the number of trucks hauling fill. Since a road capable of handling heavy trucks must eventually be built, any dust control measure less than building the access road up to base coarse level would have to be torn up. Thus the development of the access road is not an excess cost but part of good construction, its early construction is cost effective, and is the recommended method for reducing particulate emissions.

*What kind of chemical
How much, how often*

General site emissions, particulate emissions across open and active construction areas, are best controlled by a comprehensive watering program. This method can reduce emissions by 50 percent. Other methods used to control emissions are not practical because soil is usually in a state of transition. An excessive amount of penetrating chemicals would be required and binding agents would continually be broken up. However, since a watering truck is available onsite for other construction activities, its added utilization will not represent a significant cost. Completed cut and fill areas which are vegetated or covered with chemical binders can reduce particulate emissions by 65 to 80 percent. Since these areas are not active and would not receive traffic, vegetation can grow undisturbed and chemical binders need only infrequent applications. Embankments brought up to grade and no longer subject to construction activity will be immediately landscaped or vegetated. Till piles or embankments requiring future activity will be treated with a readily available binder. Good site maintenance practice will be observed. Although not quantifiable, covering trucks carrying fill or loose material and watering down the access road can greatly reduce dust problems. The practices are not costly and what extra effort may be required usually is greatly outweighed by the benefits.

4.6 IMPACT ON HUMAN POPULATIONS

The construction of the proposed Resource Recovery Facility will result in both positive and negative effects in the local and regional population. Positive effects are primarily regional in nature and result from construction jobs created, material purchases and tax revenues. The next section presents a review of potential negative effects on human populations.

4.6.1 Sensitive Receptors

Sensitive receptors are defined as individuals or organizations/ institutions which are located close enough to the project site to have the potential to be affected by the construction process. A comprehensive description of the land use and demographic features of the area surrounding the site is presented in Section 2.2.

As indicated in Section 3.2 major land uses adjacent to the project site include wetlands, residential, light industrial and the existing Dyer Boulevard Landfill. Only the residential areas and the City of West Palm Beach Water Catchment Area (WCA) are considered sensitive receptors for the purpose of this analysis.

There are three residential areas within one mile of the proposed landfill, none within one mile of the proposed resource recovery plant. The Grier property, bordering the site on the northwest, contains two homes, neither of which is within one-half mile of the proposed landfill. Each is at least 7,000 feet from the proposed plant. The Steeplechase/Horseshoe Acres development lies to the northeast of the proposed site, the closest home lying barely within a mile of the northern edge of the proposed landfill and 2 miles from the proposed plant location. The Gramercy Park development lies 3,000 feet to the east of the southernmost section of the proposed landfill and approximately 6,000 feet from the proposed plant. The WCA lies 3,000 feet west of the proposed landfill and approximately 2,300 feet west of the proposed plant.

There are no schools, hospitals, churches or other potentially sensitive institutions or activities within the site vicinity.

4.6.2 Work Force

4.6.2.1 Resource Recovery Plant

The total construction work force for the plant is expected to average 160 for the 36 months of the plant construction. The lowest work force of 50 will be in place during the initial phase of construction while peak levels of work force are expected to be 350 to 400 during critical stages of construction. It is estimated that up to 700 to 800 different jobs will be available during the project period. The estimated levels of work force over the duration of the Resource Recovery Facility construction are indicated on Figure 4.6-1.

4.6.2.2 Landfill

The landfill work force will remain fairly consistent throughout the life of this facility, with land clearing, excavation, access road construction, cell construction and closeout, all continuing on a regular basis throughout the life of the landfill. The landfill workers are included in the work force estimate during the construction of the plant in order to accurately represent the total work force during that period.

4.6.2.3 Workshifts

The majority of activities required for the construction of the resource recovery facility will take place on an eight hour per day, five days a week schedule. Dewatering and continuous placement of concrete may be required on a 24 hour basis for short periods, based on final design and the method of construction being utilized. All remaining construction activities will be conducted on an eight hour per day basis.

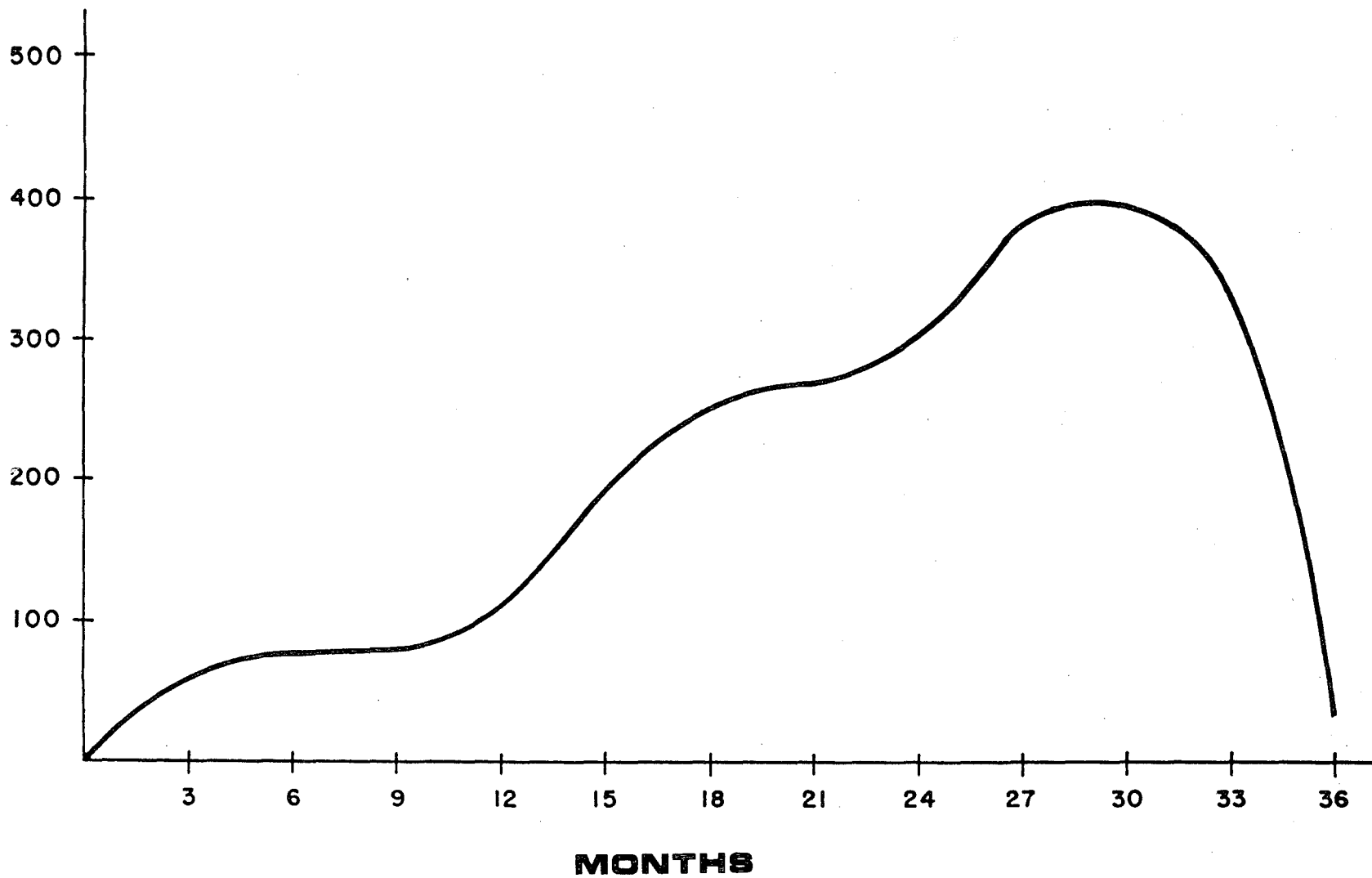
PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



ESTIMATED WORK FORCE
DURING CONSTRUCTION

FIG. 4.6-1

PERSONNEL



4.6.2.4 **Work Force Revenues**

The construction of the Resource Recovery Facility will provide the economic benefits of a \$200,000,000 construction project to the area. Direct economic benefits include jobs for the construction of the facility and for the manufacturing of capital items to be installed in the facility. Indirect economic benefits include increased earnings and jobs for the companies providing materials and services to the firms actually involved in the construction.

4.6.2.5 **Work Force Availability**

Most of the personnel requirements for the construction of the proposed facility will be met by the available labor pool in Martin, Palm Beach, and Broward Counties. No significant relocation of construction workers and their families is expected. Therefore, no impact on housing, schools or other community support assets is expected.

4.6.3 **Traffic Associated with Construction**

Construction of the Resource Recovery Facility will impact the level of traffic at the site access located on 45th Street, but it will not result in a significant traffic impact on 45th Street between the site and I-95. However, levels of service along this route will improve due to the programmed four-laning.

The traffic impact of construction is associated with the number of vehicles which will enter and exit the facility site per day over the duration of construction. The four general categories of traffic which will enter and exit the site include vehicles associated with the general work force, delivery of construction equipment, construction materials, and equipment for installation. The traffic anticipated on the peak days during construction will not exceed 200 vehicles per day. This will result in a less than significant traffic impact. Capacity analyses completed for the full operation facility indicated acceptable levels of service can be made with impacts almost four times as great as during construction (Section 5.9.1). Therefore, the traffic impact of site construction will not affect the area.

4.7 **IMPACT ON LANDMARKS AND SENSITIVE AREAS**

There are no landmarks or sensitive areas within the limits of the site. None of the areas identified in Section 2.2.1 or 2.2.5 will be impacted by site preparation, or plant and associated facilities construction.

4.8 **IMPACT ON ARCHAEOLOGICAL AND HISTORIC SITES**

No archaeological or historic sites were identified in the DAHRM survey of the site and vicinity (Section 2.2.6). It is highly unlikely that any significant, unrecorded sites exist in the vicinity. No impact to archaeological or historic sites will result from site preparation of construction.

In the unlikely event an undiscovered site exists, the routine supervision and inspection of construction will reveal it. If a site is found, DAHRM will be notified and necessary measures taken to assure conservation of the site until an assessment of its nature can be made.

4.9 SPECIAL FEATURES

The fill to achieve design elevations for the landfill and resource recovery plant will be dredged from dredge lakes planned on the site. It is not anticipated that the dredge operation will adversely effect ground water.

During construction certain quantities of solid and liquid waste will be generated. This waste may take the form of discarded packaging materials, refuse produced by construction workers, earth spoils, sanitary wastes, or waste oils. Proper handling (Section 4.1.1.1) and disposal of these wastes on site will maintain the aesthetic and ecological integrity of the site and surrounding areas.

4.10 BENEFITS FROM CONSTRUCTION

The primary benefits from construction of the proposed Resource Recovery Facility are related to the employment of construction workers (and, therefore, the creation of jobs) and the benefits to personal income due to work force revenues. These benefits are discussed in Section 4.6.2.

Moreover, site preparation and construction of facilities will benefit the groundwater resource to the extent that 53 acre-feet of water per year will be salvaged from the existing water-table evapotranspiration and become available in the shallow aquifer.

4.11 VARIANCES

No variances from standards or guidelines are anticipated.

Effects of Plant Operations

CHAPTER 5: EFFECTS OF PLANT OPERATION

This chapter addresses effects of the operation of the Resource Recovery Facility on the environment and the Authority's procedures for monitoring any potential environmental impacts resulting from these operations. Environmental effects that are considered unavoidable but are short-term are distinguished from those which are considered unavoidable and irreversible. In addition, mitigation alternatives for each potential environmental impact are discussed.

5.1 EFFECTS OF THE OPERATION OF THE HEAT DISSIPATION SYSTEM

Cooling towers will be used to cool the process water for this facility (Section 3.5.1). There will be no thermal discharges and therefore, 316 Demonstrations are not applicable.

5.1.1 Temperature Effects on Receiving Body of Water

No heated effluent will be discharged into a receiving body of surface water. Water derived from the cooling facility along with water from other sources (Section 5.2) will be injected into the "boulder zone" (Section 3.5.1.5). The peak rate of injection will be about one mgd. Following the injection of the wastewater into the boulder zone, the wastewater will tend to rise to within the upper portions of the boulder zone and spread horizontally. This will take place because of the difference in density between ambient boulder-zone water and the injected water. These density differences are due to the higher salinity and lower temperature of water native to the boulder zone.

5.1.2 Effects on Aquatic Life

This section does not apply to this application. See Section 5.1.1, above, for rationale.

5.1.3 Biological Effects of Modified Circulation

The source of cooling water for the plant operation will be interception wells located along the eastern boundary of the site and at the existing Dyer Boulevard Landfill (Section 3.5.1.2). The plant effluent will be disposed of via deep well injection (Section 3.5.1.5). Hence, there will be no modified circulation as a result of the plant operation.

However, the Surface Water Management Plan, in conjunction with the landfill design and the wetlands mitigation plan (Sections 3.8, 4.2 and 5.3), does call for major alteration of the circulation patterns throughout the site.

5.1.4 Effects of Offstream Cooling

The cooling tower of the proposed facility will use 2,000,000 gallons per day of mineralized well water pumped from interceptor wells along the east side of the site landfills and the Dyer Boulevard Landfill site as "make up" for water lost to evaporation, drift and blow down. A small portion (0.006%) or about 3670 gallons per day of the circulated water would be lost as drift from the cooling tower as proposed. The analysis of the make up water is listed in Table 3.5-1 and the treated cooling tower water in Table 3.5-2. The drift would be of approximately the same quality as the treated cooling tower water.

The droplets of water comprising the drift are carried away from the cooling tower a distance depending on wind direction, velocity, and droplet size. The wooded site and distance to the boundary (2,500 ft.) would essentially preclude droplets leaving the site. The nearest residence is 1 mile and away from the prevailing wind direction.

Fogging is expected to occur 10% of the time when the turbine is fully loaded, with the heaviest occurrences during the winter months. Florida's Turnpike is on the eastern border about 2,500 feet distance and we would not expect it to be affected by the fog.

5.1.5 Measurement Program

A program for monitoring the effect of injection well operation will consist of measuring the temperature and quality of water in monitor wells. These "wells" will be installed within the annulus of each injection well in order to avoid construction of a separate monitor well (Appendix 10.8). The monitor wells will tap the first permeable zone above the confining sequence that overlies the boulder zone. Water samples will be drawn from the monitor wells on a quarterly basis. In addition to measuring the temperature of the sampled water, these samples will be analyzed for parameters that will allow a comparison of injected wastewater, water in the boulder zone, and the background water quality in the monitor zone.

5.2 EFFECTS OF CHEMICAL AND BIOCIDES DISCHARGES

5.2.1 Industrial Wastewater Discharges

There will be no off-site industrial discharges to surface waters from the operation of the resource recovery plant and adjacent landfill. Effluents from the Resource Recovery Facility will be disposed of via deep well injection. (Section 3.5.1.5.)

Effluent discharge from the Resource Recovery Facility will primarily consist of:

- Cooling Tower Blowdown
- Boiler Blowdown
- Water Treatment Back Wash
- Sanitary Wastes Generated by Employees
- Washdown Water
- Landfill Leachate

The expected quantities are shown in Figure 3.5-1, and the contaminants in Tables 3.5-2 and 3.5-6. As shown, a portion of the cooling tower and boiler blowdown is used as make up for the ash quench system. In general, the concentrations of solids leaving the cooling tower and boiler blowdown will be magnified due to evaporation and the addition of ecologically safe inhibitors for control of corrosion and scale.

5.2.2 Cooling Tower Blowdown

Cooling tower blowdown has been discussed in Section 5.2.1 and 3.5.1.1 with the expected analysis shown in Table 3.5-2. A scale and corrosion inhibitor ecologically safe such as Lester Laboratories Hydrofene 21 (technical bulletin in Appendix 10.7) is used in conjunction with an anti-microbial such as Lester Laboratories, Lester 30, (technical bulletin in Appendix 10.7) for control of bacteria and fungi.

This effluent along with the others will be disposed of by deep well injection.

5.2.3 Measurement Programs

A measurement program is not required for this project because there will be no off-site process discharges to surface waters.

5.3 IMPACTS ON WATER SUPPLIES

Sources of water supplies in the vicinity of the site include the WCA (West Palm Beach Water Catchment Area) and the shallow aquifer. These sources, including individual well sites, are shown on Figure 2.3-16 and 2.3-17. There are no planned discharges to the WCA or the shallow aquifer. Accidental discharges will not migrate to the WCA because it is hydrologically upgradient and the direction of groundwater flow will not change. Water supplies drawn from the shallow aquifer will be protected by the multi-liner landfill design, an extensive array of interceptor wells (Appendix 10.14.7), and a groundwater monitoring program (Section 4.2.2). The interceptor-well system was designed to protect existing water-supply wells and wells proposed by the City of Riviera Beach in an area within one mile of the site. Based on the groundwater flow model, the interceptor wells will have an impact on the nearest neighboring water well of less than 0.4 feet of drawdown. This is insignificant compared to the available drawdown in neighboring wells.

5.3.1 Surface Water

The borrow lakes existing at the site will be expanded to support construction and operation activities at the site. During periods of dredge activity, the turbidity of the water within the borrow lakes will increase. The fill material will be transported from the borrow lakes to settling basins as a slurry in pipes. The water will be piped from the settling basins back to the borrow lakes, forming a closed system. Hence, there will be no inflows or outflows of water from the borrow lakes. Therefore the turbidity of the borrow lakes will not affect off-site surface water.

The wetlands areas on the site will be incorporated in the stormwater management plan. Runoff from the resource recovery plant and landfill will be directed through siltation mechanisms, then released to the conservation area. The conservation area will be interconnected as discussed in Chapter 4. Detention and/or retention of surface water in the conservation area will provide some treatment.

A control structure (weir) will be installed at the site outfall into the EPB-10 Canal, to limit the surface water discharge. Previously, surface water discharge from the undeveloped site into the EPB-10 Canal was uncontrolled.

Any long-term effects on surface water associated with the operation of the proposed Resource Recovery Facility will not be adverse.

5.3.2 Groundwater

Wastewater generated by the Resource Recovery Facility will be disposed via injection wells (Section 3.5.1.5) in the boulder zone, a widely used and highly permeable geologic zone that occurs at a depth of about 3,000 feet below grade beneath a thick confining sequence of dense limestone.

Natural water within the boulder zone has chemical characteristics similar to sea water. The Regional Wastewater Treatment Plant (City of West Palm Beach), located about one mile south of the site, incorporates five wells that penetrate the boulder zone to dispose of wastewater. Additional injection wells are being planned throughout Palm Beach County and South Florida by private and public enterprises. Because of the hydrogeologic conditions in the boulder zone and the fact that it is presently used as an injection zone, no attempts were made to simulate the effects of wastewater injection beneath the site.

There will be no discharges made to the shallow aquifer, so there will be no water-quality degradation. In the event that accidental leaks or spills of contaminants do occur on the site, they will be removed from the aquifer by the interceptor-well system (Section 4.2.2). In addition, there are many natural properties of the soil and geologic materials that would attenuate or eliminate contaminants from the groundwater flow system; these are described in the following section.

5.3.2.1 Factors that Control Solute Movement

There are several natural processes that will take place in solution and in the soils and sediments and influence the behavior of solutes that enter the groundwater system. In general, they tend to lessen the solute concentration with respect to distance from the source, and retard their movement. The processes are of three major types—dilution, immobilization by chemical interaction, and biodegradation.

Dilution, as used in this respect, includes diffusion and dispersion and occurs as a solute begins to move within the porous medium. Generally, a solute will move in the direction and at approximately the same rate as the groundwater. Chemical diffusion and dispersion tend to create a “halo” of diluted solute around the main body. Diffusive and dispersive characteristics are highly variable. Although the basic mathematical relationships governing dispersion and diffusion generally are understood and may be used to extrapolate solute concentrations and rates of migration into the future, this is only possible in a situation where sufficient historical and baseline data exist. At present, it is only possible to state that any solute on the site generally would migrate at a velocity less than that of groundwater; the maximum velocity of groundwater on the site is estimated to be about 172 feet per year.

The process of immobilization of contaminants by chemical interactions includes adsorption and cation exchange reactions. With regard to organic chemicals, adsorption takes place predominantly as the dissolved (in groundwater) substance becomes electrically attracted and attached to organic carbon particles in the soil or sediment of the aquifer. The susceptibility of a particular organic molecule to be adsorbed from groundwater solution depends on its partitioning coefficient, the fraction of organic carbon in the soil, the soil density, and the soil porosity. The octanol-water is the commonly-used partitioning coefficient, a measure of the propensity of a molecule to be in aqueous solution as opposed to association with octanol, an organic liquid. Molecules having higher solubilities in water tend to have lower octanol-water partitioning coefficients and are, therefore, more mobile in the groundwater environment than those with a greater coefficient.

A functional relationship has been developed that describes the adsorption process and permits estimates of the velocity retardation of a solute, compared to the average groundwater velocity (Freeze and Cherry, 1979). The useful term yielded by this relationship is called the retardation factor; the velocity of a particular compound in groundwater solution is estimated by dividing the groundwater velocity by the retardation factor.

As an example, the results of calculations of the retardation factors for various compounds based on site soil properties indicate that the velocity of benzene as it is transported in groundwater solution will be 2.3 times less than that of the groundwater; the velocity of benzene would be 0.14 feet per day through the shallow sediments of the site. As an example of a very slow-moving contaminant, DDT is predicted to move at a velocity 0.00063 of the groundwater velocity. The organic carbon concentrations determined for site soils are summarized in Appendix 10.14.4.

The adsorption of inorganic chemicals also occurs and is particularly important relative to the heavy metals. The adsorptive mechanism is similar to that for organic substances. The main factors affecting the adsorption of trace elements are the organic carbon content of the soil and the pH and ionic strength of the soil solution. The trace elements include cadmium, lead, and zinc, among others. An empirical method to predict the retardation of flow velocity of these trace elements was developed as a function of the organic carbon in the soil and the pH of the groundwater solution by Gerritse and Van Driel (1984). Their observations were based on a large number of observations under various conditions in temperate soils. Recognizing that climatic and other possible differences may influence the applicability of the method in South Florida, calculations were made to estimate qualitatively the potential for the adsorption of metals using the data collected at the site. On the basis of calculated retardation factors, the velocity of cadmium, lead, and zinc through the shallow sediments are estimated to be 0.24, 0.12, and 0.23 feet per day.

Another process, a specific type of adsorption, involves the nearly simultaneous adsorption of solute ions and the release of a previously adsorbed ion on a soil particle. The process is referred to as ion exchange and is particularly common in sediments containing appreciable quantities of clay. The adsorptive retardation factor, at least for solutes that occur in trace quantities in solution, can be shown to be proportional to the cation exchange capacity (Gillham and others, 1980) and a variety of other more elusive parameters. Because of the complex relationships requiring evaluation, the retardation factor of any particular cation cannot be estimated directly. The cation exchange capacity values derived from site soils suggest that retardation due to cation exchange would occur at a rate comparable to kaolin clay. The cation exchange capacities determined for soils on the site are summarized in Appendix 10.14.4.

Of the major processes that tend to reduce the level of organic contaminants in groundwater, biodegradation is the least understood but may be quite important. Only recently has the high degree of bacteriological presence in groundwater systems been recognized. The digestion by bacteria of a wide range of organic compounds has been shown in the laboratory (Kobayashi and Rittman, 1982); the compounds prone to digestion include pesticides, halogenated hydrocarbons, aromatics, amines, and alcohols. Because of the extremely high number of variables and environmentally-specific conditions that control biodegradation, it is not practical to attempt prediction of the rate of degradation.

The processes described above can be beneficial in retarding as well as stopping the spread of contaminants in groundwater solution and some knowledge of how they function is necessary to understand their potential influence at the site. The state of the art in understanding the complex chemistry and the ability to predict the fate of contaminants is being rapidly advanced; the baseline data generated from this study will aid in that understanding.

5.3.2.2 Changes in the Water Budget

Impacts to the groundwater resource due to the operation of the site facilities were determined on the basis of changes in the water budget; the major changes result as new land uses are created and the interceptor wells are operated. The water budget for the site is described above under Section 4.3.1.

Over the operating life of the Resource Recovery Facility, the landfill and borrow lake areas will increase in size continually. The impact of excavation for borrow in existing wetlands will be mitigated within the conservation area. The landfill area will be isolated hydraulically from the underlying aquifer with liners. Landfill areas will increase in 20-acre increments (one cell); upon closure, each will be capped with a compacted cover, then seeded and mulched. The borrow lakes will have an average total depth of 50 feet below grade. Ultimately, land use on the site will be proportioned as follows:

Class I Landfill	121	150 acres	121
Class III Landfill	192	235 acres	
Borrow Lakes (new & existing)	248	243 acres (82 acres existing)	
Conservation Area	460	427 acres	
Resource Recovery Plant		40 acres	
Road Rights-of-Way, Buffer Areas, Ditches, etc.	223	195 acres	
TOTAL AREA		1,320 acres	

Another factor not contained in the water budget cited above, under Section 4.3.1, will become important to the groundwater resource upon operation of facilities on the site. This is the evaporation from lake surfaces, estimated to be 49 inches per year in the vicinity of the site (Florida Department of Natural Resources, 1974). Surface-water runoff from hard-surfaced areas and the capped fill is discussed under Section 3.8 and 4.2.1.

Based on the relationships established among water-budget factors and the addition of interceptor-well pumping, impacts on groundwater were estimated as they relate to the completed project. These impacts exclude the effects of site preparation previously addressed. Impacts at any particular time during the operating life of the facility will be proportionally less than those stated, depending on the specific time in question. The major modifications to the groundwater resource of the site involve evapotranspiration, lake evaporation, aquifer recharge and withdrawals from interceptor wells and potable water wells.

Within the landfill areas, the existing evapotranspiration will cease. Landfill areas that are fully utilized will be capped (and become nearly impermeable), seeded and mulched; evapotranspiration from the top of the landfills will occur at a reduced rate compared to the natural condition. The rate of surface-water runoff from the landfill areas will increase substantially; this runoff will be routed to the conservation area. The water level in the conservation area will be regulated such that near-natural levels are maintained. Evapotranspiration that formerly took place from the natural land surface will cease, thus increasing groundwater availability. Based on the groundwater flow model described in Appendix 10.14.7, the increased availability is estimated at 161 acre-feet per year.

166
179 Within borrow lake areas, evapotranspiration will cease and lake evaporation will take place. Surface-water runoff also will cease and net aquifer recharge will occur. Over the 168 acres of new borrow lakes to be excavated, groundwater recharge will occur at a rate of 182 acre-feet per year. 7780

Creation of the borrow lakes also will cause an increase in stored water in the uppermost 50 feet of the aquifer. The water stored in the lakes to be excavated will be 11,900 acre-feet greater than that presently held within the sediments to be extracted. Accumulation of water in storage will occur from rainfall as the lakes are excavated.

The proposed borrow lakes will be operated in a manner similar to that of the Dyer Boulevard Landfill where a slurry of water and borrow material is pumped to a stockpile area some distance from the borrow lakes. During the course of the groundwater investigation, it was noted that the water level in the operating borrow lake for the Dyer Boulevard Landfill was lowered because of pumping of the water- sand slurry and the water losses inherent in the water-circulation loop. These losses are due principally to seepage and evaporation as the water is returned to the lake. Based on the experience at the existing slurry-pumping operation, when the proposed borrow lakes are relatively small and shallow, there will be "drawdown" in the lakes as much as one foot below the water levels in the water- table aquifer; drawdown will be limited to within about 500 feet of each lake. As the lake area and depth increase, this drawdown will decrease. The increase in net recharge in the borrow lakes and the seepage of water along the slurry route will offset the minimal effect of the drawdown.

Groundwater levels on the site will be reduced by pumping from the interceptor wells. These declines in water level will cause a reduction in the evapotranspiration rate from portions of the site not occupied by the landfills and borrow lakes. As a result, water previously lost by evapotranspiration will be salvaged and become available to the aquifer. The amount of water salvaged was calculated, based on the groundwater flow model described in Appendix 10.14.7, by summing all reduced evapotranspiration components on a node-by-node basis. The result provides an estimate of the increase in groundwater availability equal to 303 acre-feet per year.

203 The operation of the interceptor wells along the eastern side of the site landfills will lower groundwater levels on the site and reduce groundwater availability. The long-term

average withdrawal rate from the four on site wells will be 1.7 mgd during the operating life of the facilities. The portion of water pumped from these wells that will be derived from beneath the site was estimated based on the distribution of groundwater gradients resulting from the groundwater flow model. Because the natural groundwater flow is toward the east, the major portion of groundwater pumped will be from the west; it is estimated to be 73 percent of 1.7 mgd, or 1,380 acre-feet per year.

Operation of the injection wells will have no impact on the shallow aquifer at the site. The existing pressure head in the injection zone (the "boulder zone") will increase in proportion to the rate of injection. Based on the experience of the City of West Palm Beach (the City operates five injection wells approximately one-mile southeast of the site), the injection zone pressure will increase by less than one pound per square inch due to pumping one mgd (million gallons per day). The intended injection zone lies beneath a confining sequence of low-permeability limestone approximately 800 feet thick. No adverse effects are known to exist due to the injection of wastewater into the boulder zone, and none are expected to occur at the site.

Water-supply wells on the site will be pumped at an average rate of 0.158 mgd. Based on aquifer coefficients of the water-table aquifer discussed above, the theoretical drawdown that will be caused in the well(s) will be about 2.2 feet. Pumping the water-supply well(s) will reduce the groundwater availability on the site by 177 acre-feet per year.

5.3.2.3 Net Change in the Site Groundwater Budget

596
961
7780
The combined effect on the groundwater resource due to site preparation and operation will be to reduce the groundwater availability on the site by 858 acre-feet per year (279 million gallons). The total annual increase in groundwater availability is estimated to be 699 acre-feet; whereas the total annual reduction in availability is estimated to be 1,557 acre-feet. The water storage on the site is estimated to increase by a volume of 11,900 acre-feet. Water stored within the uppermost 125 feet of sediments underlying the property (under natural conditions) is estimated to be about 33,000 acre-feet; hence, the water stored on the site as a result of the proposed facilities will increase by 36 percent.

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5.3.2.4 Changes in Groundwater Levels

Changes to groundwater levels will occur on the site because of pumping from the interceptor wells. The groundwater flow model indicated that declines in groundwater levels will average approximately 1.8 feet along the eastern boundary of the site. Declines will average about 0.3 feet along the western boundary. These declines are predicted based on differences in groundwater levels under natural conditions and under conditions of pumping an average of 1.7 mgd from the site interceptor wells. There will be no significant impacts of lowering groundwater levels by the amounts stated.

5.3.2.5 Changes in the Direction of Groundwater Flow

Following the construction and during the operating life of facilities, the groundwater flow direction will basically remain as it is under the existing natural condition – toward the east. A minor change may occur in the immediate vicinity of the

active borrow lake. Based on observations of groundwater levels around the borrow lake presently active and serving the Dyer Boulevard Landfill, groundwater levels may be drawn down in the area peripheral to the lake. Locally, groundwater flow may be directed to the active borrow lake from all directions.

Pumpage from the interceptor wells will cause an elongated cone of depression oriented in the north-south direction (Figure 4.2-1). West of this depression, groundwater will flow toward the east and into the depression. North and south of the depression and within several thousands of feet, groundwater will flow toward the depression. Groundwater will flow toward the depression from about 1,500 feet east of the interceptor wells.

5.3.2.6 Impact on the West Palm Beach Water Catchment Area due to the Operation of the Resource Recovery Facility

Operation of the Resource Recovery Facility will have a minor effect on the WCA (West Palm Beach Water Catchment Area). Because groundwater gradients from the WCA toward the east will be increased due to operation of the interceptor wells, seepage from the WCA will be increased. The increase in the groundwater gradient along the western side of the site, due to the operation of the interceptor wells, was determined in the groundwater model to be about 0.0002. With an aquifer transmissivity of 101,000 gallons per day per foot, the increase in seepage from the WCA is indicated to be 0.21 mgd, representing an increase of about 21 percent. If this water were considered to be derived from the 19 square miles of the WCA, it would lower the water level in the WCA by about 0.02 feet in the course of a year.

The conservation area in the western portion of the site will be separated from the WCA by a berm higher than the maximum anticipated level in the conservation area. The width of the crest of the berm will be 25 feet and its sides will be sloped at a 1 to 4 ratio (Section 3.8). During a 72-hour storm having a 100-year return frequency, water levels in the conservation area will exceed those in the WCA by a maximum of about 0.54 feet during a period of 29.75 hours. This estimate is based on flood-routing studies for the conservation area and an assumed pre-storm elevation in the WCA of 17.5 feet. The 17.5-foot elevation in the WCA is the minimum elevation as per the regulation schedule adopted by the City of West Palm Beach. If the peak elevation in the conservation area is assumed to last the full 29.75 hours, the extent of seepage from east to west through the berm can be estimated using Darcy's Law. Assuming the berm width is 33 feet (and the conservation area water level is one foot below the top of the berm), the permeability of berm material is 100 gallons per day per square foot (in the high end of the range for available materials according to Scott [1977]), and the effective porosity of the berm material is 0.15, then the stormwater will penetrate 1.81 feet into the berm in a period of 29.75 hours. This extent of penetration is not significant; within hours of the maximum penetration, the seepage direction will be reversed and eastward seepage will once again take place. Water from the conservation area will not, therefore, enter the WCA.

5.3.2.7 Impacts on the Groundwater Quality due to Operation of the Resource Recovery Facility

Impacts on the groundwater quality are not anticipated. Presently the quality of groundwater beneath the site is good. The landfill liners will serve as barriers against groundwater contamination and a leachate detection system will be incorporated in the facility design. In the unlikely event that leachate did migrate to the water table, it would

be drawn into the interceptor wells and disposed. The only predictable impacts of the proposed facilities on groundwater quality will be to increase the turbidity in the surface-water runoff entering the conservation area, and the suspension of fine-grained sediments within the borrow lakes caused by dredging. Water that may enter the aquifer in this manner would cease to be turbid as the fine-grained particles settle in the pore spaces of the soil within a few feet from the lake's edge. Fine silt-sized particles will settle from moving groundwater at a velocity about 30 times greater (Gray, 1970) than the maximum groundwater velocity estimated for the site. Surface-water runoff also could contain minor concentrations of constituents that would be removed by the vegetation and bottom sediments in the wetlands (U.S. Army Corps of Engineers, 1983). Processes that take place in the soils also would effect the removal and retardation of such constituents (Section 5.3.2.1).

5.3.3 Drinking Water

Because of the relatively small rate of withdrawal (0.158 mgd) from the shallow aquifer, the well(s) to be used to provide drinking water on the site will have an insignificant impact on groundwater levels in the vicinity. The interceptor wells that will provide water for the Resource Recovery Facility (Section 4.2.2.1), will have only a minor impact on water levels at nearby existing water wells and those that are proposed. The operation of the interceptor well will increase the drawdown in the potable well by approximately 0.6 feet (Appendix 10.6). Based on the groundwater flow model (Appendix 10.14.7), the water levels in the neighboring existing and proposed water wells would be lowered less than 0.4 feet by the interceptor wells under the severe conditions of the 1 in 10 year drought.

Operation of the interceptor wells will recover and prevent the spread of mineralized water in the shallow aquifer that has been and probably will continue to be generated by leaching from the Dyer Boulevard Landfill. They will also serve to maintain the existing water quality beneath the site.

5.3.4 Leachate and Runoff

5.3.4.1 Leachate

The landfill areas of the site will be lined with a synthetic liner to prevent leachate contamination of groundwater. The portion designated to receive Class I waste will be constructed with two liners. The top or primary liner is intended to collect all of the leachate percolating through the solid waste. A leachate collection system, consisting of a network of PVC collection pipes, will collect the leachate and route it to manholes from which it will be conveyed by gravity and then pumped for disposal as described in Section 3.5.6. Two feet beneath the primary liner will be a secondary liner. The purpose of the second liner will be to detect leachate in the event that a breach occurs in the primary liner. A PVC pipe network connected to a separate manhole system will direct and collect any leachate filtering through the primary liner. Any leachate collected in this system will be disposed of as described in Section 3.5.6.

The portion of the landfill designated to receive Class III waste will be lined with a single synthetic liner. The Class III landfill, like the Class I landfill, also will have a leachate collection and pumping system directing the flow to the disposal system.

The leachate collection system for both the Class III and Class I landfills was designed based on state-of-the-art engineering principles and design methods. The proposed landfills' rectangular shape dictated a saw-tooth pattern for the base and leachate collection system. Assumptions made for the system design were as follows:

1. Leachate collection soil layers would be constructed of sand dredged on-site with a saturated permeability of 1×10^{-3} cm/sec.
2. Collection soil over the primary liner will be 2 feet thick.
3. The maximum hydraulic head allowable over the liner is 1 foot.
4. Leachate generation rate would be at a maximum of one-half the mean monthly rainfall averaged by National Oceanic and Atmospheric Administration (NOAA) over the forty-year period from 1940 to 1980.
5. Collection layer sand would have a porosity of 0.32.
6. Using the above assumptions, the spacing between leachate collection pipes was calculated utilizing a computer program based on an equation recommended by the EPA in Publication No. SW-869 dated April, 1983.¹ The equation is based on saturated Darcy flow within the drain layer.

$$H_{\max} = \frac{L}{2n} (e/k_{sl} + \tan^2 A)^{1/2} - \tan A$$

where:

- | | |
|------------|--|
| L | = distance between drain pipes in meters |
| n | = porosity |
| $H_{\max}$ | = allowable head in meters |
| e | = percolation rate in centimeters per second (cm/sec.) |
| k_{sl} | = saturated permeability in centimeters per second (cm/sec.) |
| A | = slope angle of the drain layer surface |

A number of trials were made varying the drain layer slope. It was determined that with a slope of 10 percent, the maximum allowable pipe spacing would be approximately 76 feet. The landfill base grading plan was then developed based on this 76-foot maximum spacing. It should be noted that the final design may change if it is determined that use of alternative materials is more cost-effective. However, the criteria will be in accordance with EPA guidelines.

Limiting the head over the liner to 1 foot provides a safety factor of 100 percent of a 1 foot buffer layer between the maximum leachate level and the bottom of the solid waste layer. This design criteria assures that the solid waste on the lower levels will come into contact with the leachate only once, as it passes through to the collection system, and minimizes leachate concentration.

Based on the assumption that one-half of the incident rainfall percolates through the landfill volume and reaches the primary liner, the average rainfall percolation rate will be 3 gallons per minute per acre of active landfill. Once waste is placed in the landfill cells, the rainfall percolation rate should decrease considerably due to runoff and evaporation as illustrated in Table 3.5-3.

¹ Landfill and Surface Impoundment Performance Evaluation, U.S. EPA, April 1983

The collection system is designed to handle leachate generated once landfilling has begun. Leachate isolation berms will isolate stormwater from leachate thus minimizing the amount of leachate that has to be disposed. The leachate collection and detection systems in this sanitary landfill plan have been designed to prevent leachate discharge into the groundwater. The resource recovery plant will use refuse derived fuel (RDF) so there will be no coal stored on-site. Fuel materials (i.e., solid waste) will be stored within the plant and will not produce runoff. Any leachate percolating through the pile will be collected and disposed of in the same manner as the landfill leachate.

Ash generated at the resource recovery plant will be landfilled at the Class I sanitary landfill site. The incinerator bottom ash can be used as landfill daily cover to reduce the amount of borrow material required. Leachate from this ash will be collected and disposed of along with the rest of the leachate. The ash is expected to be predrained prior to disposal and thus the ash quenching water will not contribute to the leachate quantity.

5.3.4.2 Runoff

During operation, the landfill top will be graded away from the working face at 4 percent. This grade will promote clean rainfall runoff and minimize leachate generation with a minimum amount of soil erosion. It is recommended that areas which will not receive solid waste for a period of one year receive one foot of intermediate sand cover, stabilized wastewater treatment plant sludge and be seeded with grass. The grass will, through evapotranspiration, eliminate much of the incident rainfall.

Upon reaching final landfill design grades, an impermeable liner and final cover will be applied. The closed out portions of landfill will be graded to shed rainfall and a drainage collection, routing, and treatment system will be provided. Terraces placed at 20-foot vertical intervals will serve to minimize erosion. Sedimentation ponds will be provided to collect eroded soil and protect wetland areas. Runoff will then be routed to the conservation area to provide retention for the design storm of 25 years and 72-hour duration.

5.3.4.3 Erosion and Soil Loss

The landfill design also accounts for the potential loss of soil due to erosion. Erosion has two major impacts: loss of cover material and generation of unwanted sedimentation.

The landfill is designed to minimize both the quantity of leachate and the loss of soil due to erosional mechanisms. As the slope of the landfill increases, the velocity of runoff increases and the rate of percolation decreases. This is an important consideration during the construction and operation of the landfill where the uncapped landfill can generate leachate by infiltration of precipitation that would otherwise run off.

The soil condition and erosion factor for this site was assumed to be 2.0 based on the guidelines provided by the USDA Soil Conservation District publication.

Also, from this publication, the average yearly rainfall index was found to be 450. The cover factor varied from 0.35 to 0.01 depending upon the time expired from the time of seeding. The length/slope factor was determined for each phase and cell of the landfill. All of these factors are combined to produce the Universal Soil Loss Equation.

Soil loss quantities are given in Table 5.3-1. These quantities typically reach a peak tonnage and decrease to a constant yearly loss value. This value stabilization occurs three years after each cell closure. Because of increased and established vegetative cover, the landfill will erode minimally as the effects of rainfall energy are dissipated.

Total equivalent soil depth lost to erosional mechanisms does not exceed several inches. Thus, the integrity of the surface cover will not be substantially degraded.

TABLE 5.3-1
SOIL LOSS SUMMARY

Units ? tons/yr.

Year	Date	Class I Landfill				Class III Landfill	
		Phase I	Phase II	Phase III	Phase IV	Phase I	Phase II
1	1988	8280					
2	1989	1182				4150	
3	1990	235				4743	
4	1991	235				711	
5	1992	235				2965	
6	1993	235				626	4150
7	1994	235	4038			313	4743
8	1995	235	577			313	711
9	1996	235	114	3320		313	2965
10	1997	235	114	474		313	626
11	1998	235	114	95		313	313
12	1999	235	114	3415		313	313
13	2000	235	114	569		313	313
14	2001	235	114	190		313	313
15	2002	235	114	190		313	313
16	2003	235	114	2358		313	313
17	2004	235	114	500		313	313
18	2005	235	114	252		313	313
19	2006	235	114	252	3818	313	313
20	2007	235	114	252	4363	313	313
21	2008	235	114	252	3043	313	313
22	2009	235	114	252	577	313	313
23	2010	235	114	252	288	313	313
TOTALS		14397	6325	12623	12089	18516	17264

To recover losses of soil during construction, siltation/sedimentation ponds will temporarily be installed to collect eroded material. This material will be reused as intermediate cover. Table 5.3-1 lists conservatively the expected tonnage of eroded material over the life of this facility.

5.3.5 Measurement Programs

5.3.5.1 Surface Water

For surface water monitoring, refer to Section 4.2.2.2.

5.3.5.2 Groundwater

Groundwater levels and groundwater quality will be monitored according to the program described under Section 4.2.2.1.

5.4 SOLID/HAZARDOUS WASTE DISPOSAL IMPACTS

5.4.1 Solid Waste

The proposed Resource Recovery Facility which is based on the RDF/com-bustion technology will have a beneficial impact on solid waste disposal in Palm Beach County. The three main areas of benefits are:

- Refuse (renewable resource) used to generate power
- Materials recovery (metals and minerals)
- Preservation of land

This technology separates the combustible fraction from MSW (municipal solid waste) and produces a fuel (RDF) for combustion. The RDF has better fuel characteristics than raw garbage, which allows for better combustion control to achieve more efficient furnace operation and reduced air pollution.

The front end recovery of recycleable materials from the non-combustible fraction is generally determined by market conditions. Ferrous and aluminum have good markets and provisions are included for recovery of these constituents.

By recovering metals and combusting RDF, a reduction of 80% by weight (90% by volume) can be expected in the incoming refuse (MSW). This in turn reduces landfill requirements by 4 to 6 times. A saving of over 1,000,000 cubic yards of space per year can be expected.

Impacts to the topography of the site due to solid waste disposal have been addressed in Section 4.1.4.

5.4.2 Hazardous Waste

During construction and operations, equipment fuel will be stored on-site in a secured area for use with operational equipment. No other flammables and toxicants are expected.

The facility will accept only municipal solid waste which includes residential, commercial, and non-hazardous industrial (e.g., office and package wastes) wastes. Public and private users of the facility will be instructed on these limitations. Signs will be posted at the weigh station providing information on wastes accepted at the facility. Additionally, routine visual inspections by the personnel at the weigh station will monitor types of wastes received.

The tipping floor front end loader operator will remove potentially hazardous and non-processible items from the waste stream. Hazardous wastes will be processed as discussed in Section 3.7.2.

A chemical and EP toxicity analysis of the combined ash residue will be conducted after commencement of operation to determine toxicity or hazard (includes both combustion residue and Air Pollution Control (APC) device residues).

It will be the responsibility of the facility operator to determine if the ash residue is classified as hazardous according to EPA or DER regulations. Experience at other similar facilities has shown that the bottom and fly ash can pass the EP toxicity test; i.e., considered a non-hazardous waste material. This waste material would be suitable for disposal in a permitted Class I sanitary landfill.

A chemical analysis of the combustion residue will be conducted after commencement of operation to ensure compatibility for disposal in a sanitary landfill.

5.5 SANITARY AND OTHER WASTE DISCHARGES

Solid waste generated by plant operations (employee refuse, packaging materials, etc.) will be collected in receptacles located throughout the plant and fed into the main solid waste stream. All sanitary wastewater will be treated and disposed of as described in Section 3.5.2.

5.6 AIR QUALITY IMPACTS

5.6.1 Impact Assessment

Air quality modeling analysis was conducted in three phases: screening, refined-RDF facility only, and refined-RDF facility plus other sources. Screening analyses were used to determine operational worst-case load conditions for the RDF facility, to identify those pollutants which had significant impacts, to locate the area(s) of maximum probable impact, and to define the screening area. The screening was performed using hypothetical meteorological data. EPA Models PTPLU and PTDIS were used for screening purposes. Based on the significant levels as defined in Table 5.6-1, there were no significant impacts at distances greater than 25 kilometers from the source.

TABLE 5.6-1
SIGNIFICANCE LEVELS FOR AIR QUALITY IMPACTS

Pollutant	Averaging Time	Sign. Level Conc. (ug/m ³)	Distance (km) from source To Significance Level	
			Highest	High Second High
Sulfur Dioxide	3 Hour	25	25.0	24.5
	24 Hour	5	25.0	20.0
	Annual	1	15.0	NA
Total Suspended Particulate	24 Hour	5	#	#
	Annual	1	#	NA
Nitrogen Dioxide	Annual	1	5.0	NA
Carbon Monoxide	8 Hour	2,000	#	#
	Annual	500	#	NA

NA Not Applicable.

Less than significant levels at all distances. Minimum boundary line distance from RDF Source: 0.73 km.

A minimum distance of 730 meters has been designated from the source itself to the source property boundary line. The distance of the source to its property boundary line is a variable based on direction. The maximum distance is approximately 3,000 meters to the north of the source.

Subsequent refined modeling was accomplished including three additional major emission sources with an area of 25 kilometers relative to the proposed facility. These sources and their emissions characteristics were provided by the Florida DER. Two analyses were accomplished with these sources:

- Effect of proposed source on existing sources.
- Effect of existing sources downwind of the proposed site.

An additional screening area was, however, defined for additional sources to be considered for inclusion in subsequent refined modeling analyses. This area extended to at least 50 kilometers (31 miles) from the applicant's source.

Refined modeling was accomplished using EPA's Industrial Source Complex Model (ISC) in both its short and long term form. The refined modeling used five years of meteorological data for the years 1970-1974. Surface weather data were from the climatological record of the Palm Beach International Airport and the appropriate upper air data were from the climatological records of the Miami International Airport. These data were supplied in pre-processed format by the Florida DER.

The initial refined modeling was restricted to impact determination from the RDF facility. A detailed discussion of the procedures and results are contained in Appendix 10.1.5.

All impacts were determined for the pollutant sulfur dioxide (SO_2). Impact concentrations for all other pollutants were determined by adjustment of SO_2 impacts by the emission rate of the pollutants to the emission rate of SO_2 .

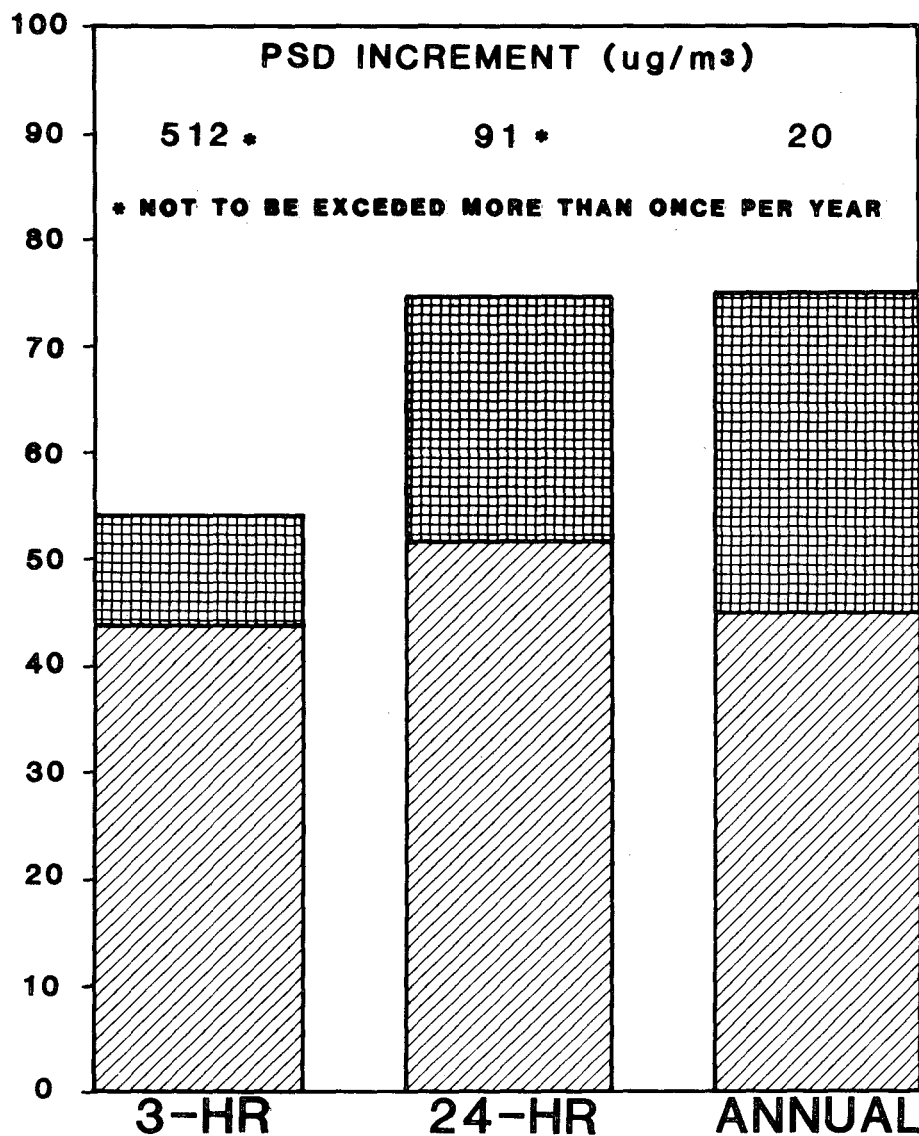
The air quality standards as noted in Table 2.3-14 are not violated until a receptor exceeds the relevant standard twice in a given year. Therefore, the highest value is not the value compared to the air quality standards. The next highest value, or "highest second highest value," is the one for which impact is evaluated. Hence, the highest second highest impact concentrations have been chosen for presentation, although the highest values were determined and have been presented in Appendix 10.1.5.

Sulfur dioxide (SO_2) is the only pollutant whose impact exceeds significant levels (Sec. 2.3.7.2). PSD (Prevention of Significant Deterioration) regulations have established limits for increases in concentrations of two pollutants, total suspended particulate and sulfur dioxide. The maximum limits are shown in Table 5.6-2. These values may be decreased by any major sources constructed since January 6, 1975 and to the extent that these increments will cause or accelerate violations of applicable ambient air quality standards. In a given area, the starting point for tracking of PSD increment consumption is the date after January 6, 1975 on which the first PSD source permit application was submitted for regulatory review. This date defines the base line for the given area. No major source has triggered a base line date in Palm Beach County. On this basis, the full increment is available provided the ambient air quality standards are not jeopardized.

Figure 5.6-1 shows the percent of SO_2 PSD increment consumed by the proposed RDF source at the point of maximum composite impact (RDF facility plus other major sources).

SULFUR DIOXIDE IMPACT

PERCENT CONSUMED



AIR QUALITY STANDARD

OTHER SOURCES

RDF

%
CONSUMED

3-HR	43.8	10.4
24-HR	51.6	23.1
ANNUAL	45.0	25.0

PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



PSD INCREMENT

FIGURE 5.6-1

TABLE 5.6-2
ALLOWABLE PSD INCREMENTS
(ug/m³)

	Class I Area	Class II Area	Class III Area
Sulfur Dioxide			
* Annual	2	20	40
* 24-Hour	5*	91*	182*
* 3-Hour	25*	512*	700*
Total Suspended Particulate Matter			
* Annual	5	19	37
* 24-Hour	10*	37*	75*

* Not to be exceeded more than once a year.

Figure 5.6-2 shows the percent the proposed source will effect the appropriate Federal and Florida ambient air quality standards for SO₂ at the point of maximum facility and major sources impacts when combined with the highest second highest concentrations measured locally in 1983.

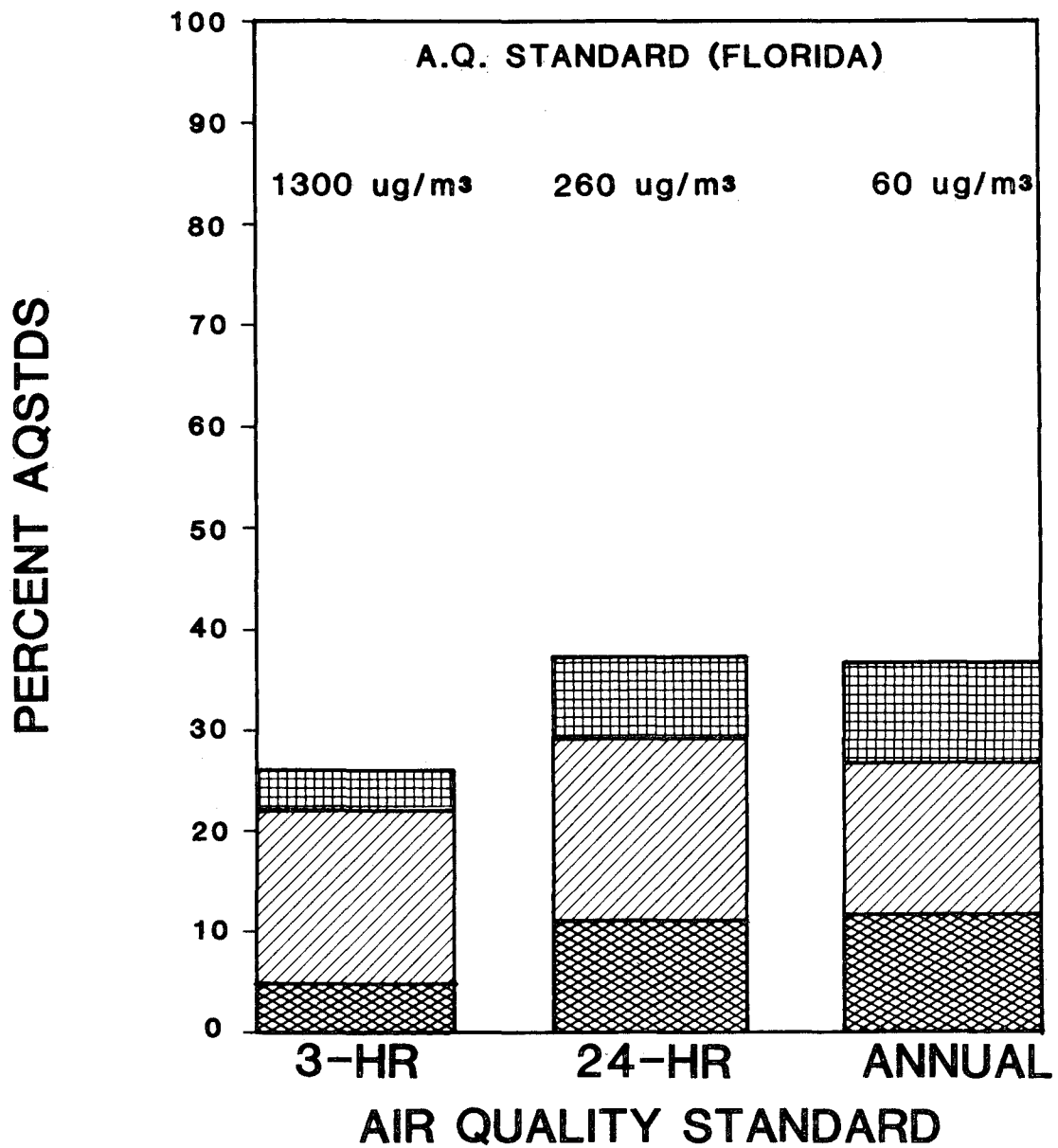
As shown in Figure 5.6-1, the proposed RDF facility itself will consume approximately 10% of the available 3 hour PSD increment and 25% or less of the 24 hour and annual increments at the point of maximum combined impact. In relation to the Florida SO₂ ambient air quality standards, the proposed source will be an increase of only 4-8% in the background concentrations at the point of maximum combined sources impact.

Assuming that all VOC emissions are converted to ozone, the maximum 1 hour source impact in any year would be .002 ppm. Based on local 1982-83 ambient air quality data as background, this maximum impact would not exceed the ozone standard.

There are no existing legal ambient air quality standards for the compound 2,3,7,8-TCDD. The New York State Department of Environmental Conservation in its Air Guide No. 1 (revised 12/15/83) has recommended an acceptable ambient air level (AAL) on an annual average basis of 9.2×10^{-8} ug/m³. The maximum annual impact generated by the conservative assumptions of this report is 3.4×10^{-8} ug/m³.

Based on conservative assumptions, the proposed RDF facility will not significantly increase background levels of criteria or designated pollutants beyond the boundaries of the facility complex, with the exception of SO₂, and then only to the extent as has been noted. On an annual basis, all impacts on the West Palm Beach Catchment Basin area will be less than any established de-minimus levels.

SULFUR DIOXIDE IMPACT



%				
CONSUMED	3-HR	4.8	17.2	4.1
	24-HR	11.1	18.1	8.1
	ANNUAL	11.7	15.0	8.3

PALM BEACH COUNTY
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CONTRIBUTIONS TO AQSTD

5.6.2 Monitoring Programs

The Monitoring Stations listed in Table 2.3-14 will continue to monitor ambient air quality after the resource recovery plant begins operations. No significant change in the program for collecting data will be expected or needed.

Stack monitoring equipment shall be provided to continuously monitor carbon monoxide, oxygen, SO₂, NO_x, and opacity. This equipment is described in Section 3.4.1.4.4.5 (Control Loops, 4. Combustion Quality Control). The equipment shall be installed, calibrated and maintained in accordance with FAC 17-2.710 and 40 CFR 51, Appendix P. Compliance Testing shall be in accordance with FAC 17-2.700 and 40 CFR 60.

**TABLE 5.6-3
SUMMARY OF MAXIMUM AIR QUALITY IMPACTS OF THE
PROPOSED PALM BEACH COUNTY WASTE TO ENERGY FACILITY**

Pollutant	FL Ambient Air Quality Standard (ug/m ³)	Prevention of Significant Deterioration (PSD) Increment (ug/m ³)	Background Concentration (ug/m ³)(2)	Palm Beach County Waste to Energy Facility Impact (ug/m ³)(3)	Total Point Source Impact (ug/m ³)(5)
SULFUR DIOXIDE					
Max 3-Hour Concentration	1,300 (1)	512	63	72	277
Max 24-Hour Concentration	260 (1)	91	29	28	68
Annual Arithmetic Mean	60	20	7	4	15
PARTICULATE MATTER					
Max 24-Hour Concentration	150 (1)	37	107	2	NC
Annual Geometric Mean	60	19	43	0.3	NC
NITROGEN DIOXIDE					
Annual Arithmetic Mean	100	No Standard	20	2	22 (6)
OZONE					
Daily Max 1-Hour Concentration	235 (1)	No Standard	172	NE	NA
LEAD					
Quarterly Arithmetic Mean	1.5	No Standard	NM	4.3E-03 (4)	1.1E-02 (4)
CARBON MONOXIDE					
Max 1-Hour Concentration	40,000 (1)	No Standard	9,943	182	NC
Max 8-Hour Concentration	10,000 (1)	No Standard	4,500	81	NC

NA = Not Applicable; NC = Not Calculated Since Proposed Facility's Impact is Below Significance Level;
NE = Not Emitted; NM = Not Monitored.

1. Concentration limits not to be exceeded more than once per year.
2. Background information is based upon data compiled by the Palm Beach County Annual Report Dated 1983.
3. Detailed modeling results for the proposed source covering 5 years of hourly meteorological data.
4. Quarterly mean not generated. Value cited is 24-hour maximum 2nd-high.
5. Total impacts are inclusive of the proposed source.
6. Total impacts were assumed to be equal to background levels since NO₂ emission levels of other sources were not readily available and the proposed source's impact was virtually at the significance level (1.6 ug/m³ vs. 1.0 ug/m³).

TABLE 5.6-4
MAXIMUM PROJECTED IMPACTS ON
PALM BEACH COUNTY AIR QUALITY MONITORING SITES

Site No.	Saroad No.	(ug/m ³) Parameter	Aver. Period	Summary of Ambient Air Data				RDF Source	
				1982		1983		Max. Impact	
				H	HSH	H	HSH	H	HSH
11	3840-003-G	SO ₂	3 Hr	140	112	65	63	24.0	21.0
			24 Hr	112	53	40	29	6.0	5.9
			Annual	10	NA	7	NA	0.32	NA
1A	4760-003-G	TSP	24 Hr	72	60	124	103	0.55	0.45
			Annual	33	NA	33	NA	0.03	NA
2	3060-001-G	TSP	24 Hr	59	59	117	101	0.37	0.32
			Annual	26	NA	26	NA	0.02	NA
3	2220-001-G	TSP	24 Hr	121	95	130	98	0.31	0.26
			Annual	35	NA	35	NA	0.02	NA
4	1000-002-G	TSP	24 Hr	76	74	126	107	0.15	0.13
			Annual	33	NA	34	NA	0.01	NA
5	0280-001-G	TSP	24 Hr	70	69	134	90	0.21	0.15
			Annual	33	NA	33	NA	0.01	NA
6	0280-002-G	TSP	24 Hr	62	56	116	82	0.44	0.32
			Annual	25	NA	27	NA	0.02	NA
7	3340-001-G	TSP	24 Hr	85	79	100	86	0.15	0.13
			Annual	39	NA	38	NA	0.00	NA
8	3420-006-G	TSP	24 Hr	72	70	122	104	0.30	0.25
			Annual	36	NA	40	NA	0.03	NA
9	3420-006-G	TSP	24 Hr	128	50	73	69	0.29	0.17
			Annual	24	NA	25	NA	0.02	NA
12	0240-003-G	TSP	24 Hr	87	81	102	84	0.17	0.17
			Annual	45	NA	43	NA	0.01	NA
1	4760-001-G	NO ₂	Annual	-	NA	20	NA	0.20	NA
1	4760-001-G	CO	1 Hr	24E3	20E3	10E3	10E3	0.07	0.06
			8 Hr	9E3	8E3	8E3	8E3	0.02	0.02

Site No.	Saroad No.	(ug/m ³) Parameter	Aver. Period	Summary of Ambient Air Data						RDF Source*	
				H	1982		1983			Max. Impact	
					HSH	HTH	H	HSH	HTH	H	HSH
8	3420-006-G	Ozone	1 Hr	.08	.08	.08	.09	.08	.07	3.4E-4	2.7E-4
10	3420-007-G	Ozone	1 Hr	.12	.09	.09	.09	.09	.08	5.6E-4	3.4E-4

H Highest

HSH Highest Second Highest

HTH Highest Third Highest

NA Not Applicable

* Assumes total conversion of volatile organics to ozone.

5.7 NOISE

5.7.1 Noise from On-Site Sources

The on-site ambient noise level for the Resource Recovery Facility is not expected to exceed 76 dBA, according to the Environmental Noise Study (Appendix 10.15). Taking into consideration the nature of sound propagation from the facility site, areas at distances of greater than some 300 feet from the facility are expected to experience insignificant changes in their ambient noise levels. Noise levels from the facility would then be reduced to levels in the range of 50 dBA or less. These sound levels would be comparable to or less than presently existing traffic noise levels in areas in the vicinity of the site.

The predicted ambient noise level off-site falls well below recommended sound levels as developed by the Department of Housing and Urban Development (Table 10.12-2), and the noise level limits from the Palm Beach County Noise Ordinance (Table 10.12-3). Hence, the noise impact of the Resource Recovery Facility on the surrounding areas is insignificant and, in places, non-existent.

5.7.2 Noise from Vehicular Traffic

Based on the predicted traffic flow patterns, the Federal Highway Administration (FHWA) Traffic Noise Prediction Model was employed to predict traffic-generated noise levels by the facility-related traffic over and above the existing levels. The prediction may be considered conservative because it includes the growth in traffic expected regardless of the development of the facility. Hence, the noise impact of the facility-related traffic will actually be less than modeled. Table 5.7-1 summarizes the projected exterior sound levels and their impacts at key locations in the vicinity of the site. None of these predicted levels exceed the recommended sound levels developed by FHWA or HUD (Appendix 10.15, Tables 10.12-1 and 2). However, the study does indicate a significant increase in sound levels at the residential area located along 45th Street west of Haverhill Boulevard. This route currently carries very little traffic, and the majority of the facility-related traffic will use this route. If necessary, mitigative measures as described in the Environmental Noise Study will be employed.

TABLE 5.7-1
PROJECT STUDY AREAS WITH EXISTING AND PROJECTED EXTERIOR
SOUND LEVELS AND ASSESSED IMPACT FOR WEEKDAY PERIODS

AREA	EXISTING SOUND LEVEL LEQ (dBA)	PROJECTED SOUND LEVEL LEQ (dBA)	SOUND LEVEL CHANGE/IMPACT
1. Residential, 45 St. West of Haverhill	54	62	8 dB/ Moderate to Significant Impact
2. Haverhill, 45th To Roebuck	62	64	2.5 dB/ Slight Impact
3. Haverhill, Roebuck to 12th	60	62	1.5 dB/ No Impact
4. Haverhill, 12th South	60	62	1.5 dB/ No Impact
5. Okeechobee Turnpike to Haverhill	65	66	1 dB/ No Impact
6. 45th, Military Trail to Haverhill	58	62	4 dB/ Slight Impact
7. 45th, I-95 to Military Trail	63	65	1.5 dB/ No Impact
8. North of Port Road East of Turnpike	55	56	1 dB/ No Impact
9. Military Trail, Port Road (Bee Line) to Roebuck	60	61	1 dB/ No Impact
10. Haverhill, Port Road (Bee Line) to 45th	58	59	1 dB/ No Impact

5.8 CHANGES IN NON-AQUATIC SPECIES POPULATIONS

5.8.1 Impacts

The major impacts of this facility on non-aquatic species populations will result from construction rather than operation. Those impacts are discussed in Sections 4.2.1 and 4.4.1. To briefly reiterate, the main habitat loss will be pine flatwoods. Animal populations in this community will be reduced on the site. Wetland communities will be maintained at approximately the same total acreage with perhaps an increase in marsh habitat and a slight decrease in total acreage of wet prairie. Operation of the Resource Recovery Facility will not pose any serious or long-term environmental impact.

5.8.2 Monitoring

The monitoring program for ecological conditions is discussed in Section 2.3.6.3.

5.9 OTHER PLANT OPERATION EFFECTS

5.9.1 Transportation

The potential traffic impact which the proposed Resource Recovery Facility would have on the adjacent roadway network was determined. A supplemental transportation analysis was also conducted which responds to specific requirements by Palm Beach County for a traffic analysis related to Solid Waste Authority's Resource Recovery Facility Rezoning Application. That supplemental analysis is incorporated in the following sections and included in its entirety in Appendix 10.16.

5.9.1.1 Traffic Generation of Proposed Action

Truck traffic associated with the delivery of refuse to the facility and the removal of ash residue for disposal will be the major contributor to vehicle traffic. A much smaller volume will be added as a result of commuting employees and administrative and support functions for the Resource Recovery Facility.

5.9.1.2 Truck Traffic Generation

Seven solid waste generation planning regions were defined and utilized for this transportation analysis. The solid waste generation regions are listed and described on Figure 2.3-32. Based on information regarding existing solid waste facilities in Palm Beach County the truck traffic trip generation potential for the Resource Recovery Facility was determined to be as follows:

Resource Recovery Facility Direct Haul	500 trucks per day
Authority Transfer Facilities	170 trucks per day

5.9.1.3 Traffic Impact of Proposed Action

The impact traffic of the project at full build-out was assigned to adjacent roadways and was added to existing traffic.

Based on information regarding hours of operation, there will be negligible project impact during the peak hour of the adjacent streets. The traffic generated from the transfer facilities occurs from 8:00 a.m. to 4:00 p.m. and is evenly distributed during this period. The traffic from the Resource Recovery Facility direct-haul service area occurs from 10:00 a.m. to 2:00 p.m. Daily and peak hour traffic volumes were depicted in Figure 2.3-31.

In addition to this traffic assignment which was accomplished to identify the roadway improvement needs to serve the project's impact, a Traffic Performance Standards Analysis was completed. This analysis is a specific requirement of Palm Beach County to evaluate the traffic impact which is anticipated from all previously approved land development as well as that from the project. To accomplish this analysis, the following work was performed:

Traffic count data and estimates of traffic impacts were developed and used to evaluate County Traffic Performance Standards. This evaluation of the standard in accordance with the County's Ordinance No. R-81 involved an evaluation of the traffic levels of service of all roadways within the impact area of the proposed project.

A. Traffic Levels of Service

Two level-of-service (measure of volume/capacity ratios) evaluations were provided:

1. Existing traffic.
2. Existing traffic, plus the project impact, plus impact of other approved, but uncompleted, projects.

B. Traffic Classifications (Performance Standard Categories)

Based on these levels of service, classification of all roadways were completed in accordance with the County's ordinance:

Category A — Existing traffic volumes exceed Level of Service "D" and the project has significant impact.

Category B — Existing, project, and other project traffic volumes exceed Level of Service "D" and the project has a significant impact.

Category C — Level of Service "D" is not exceeded with the total traffic volume defined for Category B.

No Category — Where impacts of the project are insignificant.

The results of the Performance Analysis, depicted on Figure 10.16-3 in Appendix 10.16, indicate that the Resource Recovery Facility meets the County's Traffic Performance Standards as a Category C Project.

5.9.1.4 Roadway Improvements

Roadway sections with significant impact, and the intersection of 45th Street at Haverhill Road were examined to determine if there was sufficient capacity to allow operation at Level of Service "C" during the peak hours with existing and development traffic. All capacity calculations were carried out following the criteria found in the Transportation Research Circular No. 212 "Interim Material on Highway Capacity" (Transportation Research Board, January 1980). The peak hour directional volumes on Figure 10.16.3 were used for the capacity analyses.

Using the above criteria, the intersection of 45th Street and Haverhill Road currently operates and will continue to operate at Level of Service "A", while the proposed intersection of Beeline Highway and the north-south roadway will also operate at Level of Service "A" while serving the Resource Recovery Facility traffic.

To reduce traffic congestion on 45th Street, this facility will be widened to four lanes from I-95 west through Haverhill Road. Further, a roadway will be constructed to Beeline Highway, thus providing access to the Resource Recovery Facility from the north via Beeline Highway, which will also reduce traffic congestion on 45th Street.

Figure 2.3-31 shows the number of lanes which will exist on the roadways serving the Resource Recovery Facility after the roadways are constructed or improved based on the Solid Waste Authority's commitments and other construction presently underway.

5.9.2 Downstream Impacts

As discussed in Section 4.2, the allowable discharge for the 1320 acre Resource Recovery Facility site will be 129 cubic feet per second (cfs). No stormwater runoff from the resource recovery plant or the landfills will be discharged directly from the site, but all water will be directed, after passing through sedimentation mechanisms, into the conservation area on the western portion of the site. This water will enhance the wetlands quality in the conservation area and receive natural treatment.

Moreover, leachate produced in the landfill will be completely contained by the leachate management system (Section 5.3.4). Therefore, there will be no mixing of leachate with stormwater runoff. Hence, any water discharged from the site into EPB-10 Canal will be of good quality, similar to that described in Section 2.3.4. The EPB-10 Canal flows from the easterly right of way of Florida's Turnpike east to the South Florida Water Management District's C-17 Canal. The C-17 Canal discharges into Earman River which discharges into Lake Worth which is connected to the Atlantic Ocean. An analysis of the flows from the site and the C-17 Canal indicates that the discharge would have negligible effects. The site discharge (129 cfs) is approximately 6 percent of the total discharge allowed from the C-17 Canal (2,100 cfs).

5.10 ARCHAEOLOGICAL SITES

No archaeological sites will be impacted by the operation of the facility. No post-construction monitoring will be required. See section 4.8 for details.

5.11 RESOURCES COMMITTED

Land cover types or plant communities lost or altered due to the construction and operation of the Resource Recovery Facility will be primarily upland. There will be no net loss of wetlands. (Sections 4.4 and 5.8).

With regard to groundwater resources, the only irreversible and irretrievable commitments of resources will result from the removal of the uppermost 50 feet of aquifer material in an area of 168 acres and the hard surfacing of 405 acres (landfills and road surface). Filtration processes of the soil and geologic materials within the area affected by the lakes will be lost permanently but this loss will be offset to the extent that bottom sediments serve

in a filtration capacity. Water storage within the volume to be excavated will increase five-fold by virtue of the borrow lakes created. The long-term effects will be some reduction in soil filtration benefits while the short-term availability of water will be substantially increased due to the increase in water stored in the borrow lakes. (Sections 4.3 and 5.3.)

The creation of hard surfaces on landfills and roadways will permanently reduce the water-table evapotranspiration rate and concomitantly increase groundwater availability on the site to a minor extent. (Section 4.3.)

The money spent to obtain permitting, purchase land, finance and construct the Resource Recovery Facility represents an irreversible commitment. However, as discussed in Chapters 1 and 7, this project is probably less costly and certainly poses less danger to Florida's environment than would a continued commitment to dispose of all of Palm Beach County's municipal solid waste by traditional sanitary landfilling. Therefore, the money spent of this project will be, to a great extent, an investment in our future.

5.12 VARIANCES

It is not expected that any variances from applicable standards will be sought in connection with the operation of the facility.

Transmission Lines and Other Linear Facilities

CHAPTER 6: TRANSMISSION LINES AND OTHER LINEAR FACILITIES

6.1 TRANSMISSION LINES

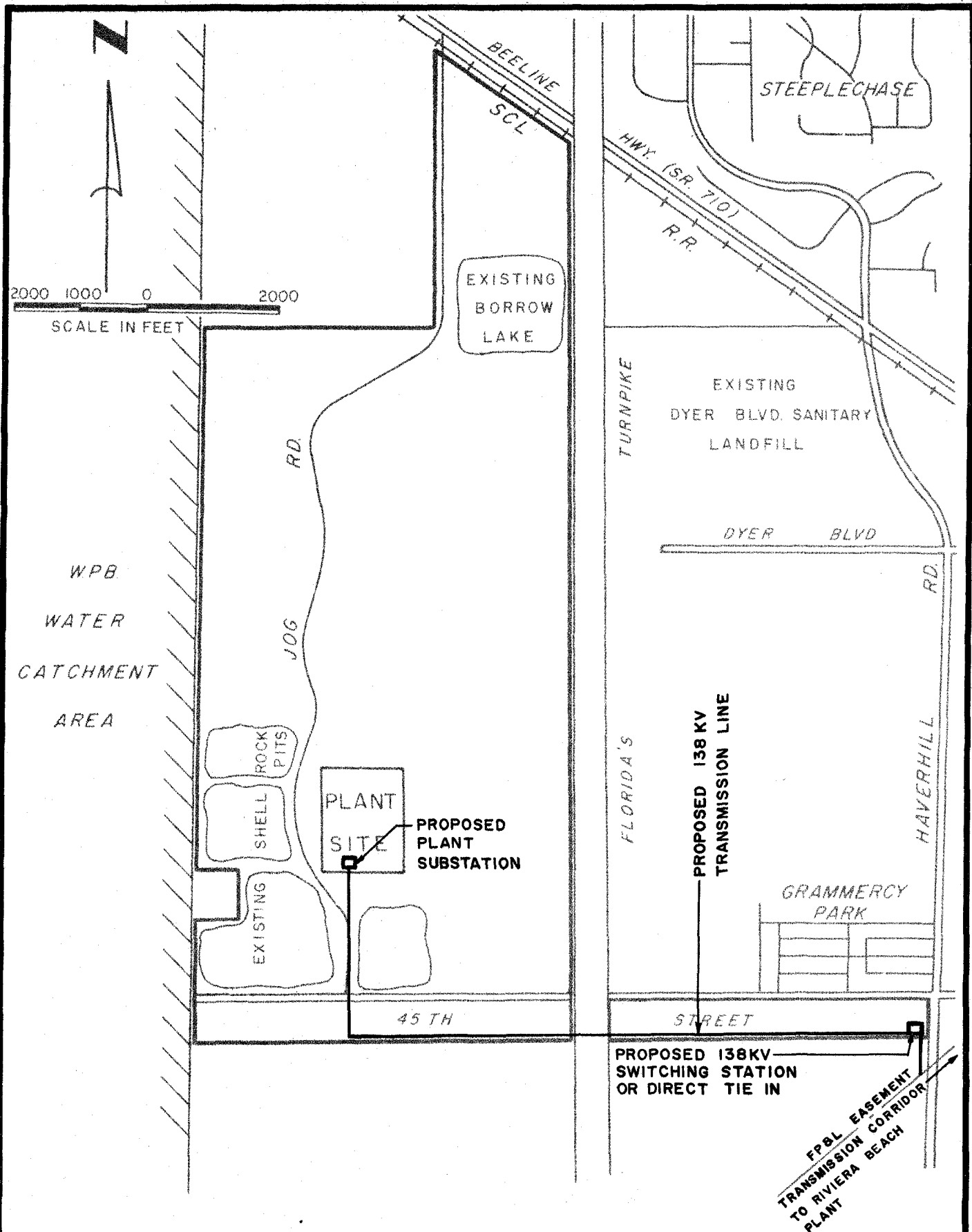
6.1.1 Project Introduction

The project is in the Florida Power and Light Company (FP&L) service area, therefore, the Solid Waste Authority has communicated with FP&L concerning the best means of interconnecting with their system. FP&L is presently considering three (3) alternatives, which are as follows:

1. 138 kV transmission line from the resource recovery plant substation south along the roadway across 45th Street to the south edge of the Authority's property, east along the south edge of the property across Florida's Turnpike to Haverhill Boulevard, south on the west side of Haverhill Boulevard right-of-way to the existing FP&L transmission corridor. Connection to the transmission line would be by gang operated disconnect switches. The Solid Waste Authority line would be protected as a part of the FP&L line by means of remote tripping.
2. This alternative is the same as No. 1 except that a switching station would be required at the corridor.
3. The transmission line route is the same as No. 1 and after reaching the FP&L corridor, the transmission line would be continued north-east down the corridor approximately three (3) miles to the Riviera Beach Plant.

It should be noted that regardless of which alternative is decided upon, the only new corridor off of the main site will run west to east for a length of approximately 1 mile on the south side of 45th Street from the west side of Florida's Turnpike to the west side of Haverhill Boulevard and south along the west side of Haverhill Boulevard until it intersects the existing FP&L transmission corridor approximately 1,000 feet south of 45th Street.

The second alternative involves construction of a switching station approximately 100 feet west of Haverhill Boulevard and 500 feet south of 45th Street. This switching station would preclude the planned construction of an FP&L switching station approximately one mile northeast and adjacent to the existing FP&L transmission corridor. The Authority has acquired the 600 foot wide strip lying to the south of 45th Street between the Florida Turnpike and Haverhill Boulevard. The transmission corridor and switching



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TRANSMISSION LINE CORRIDOR

FIG. 6.1-1

station will be located within this property as depicted in Figure 6.1-1. Also indicated on Figure 6.1-1 are the existing power lines on the property in the existing FP&L transmission corridor. The right-of-way width will be approximately 50 feet.

6.1.2 Corridor Location and Layout

See attached Figure 6.1-2 for corridor layout and location.

6.1.3 Transmission Line and Road Design Characteristics

The transmission line will be 138,000 volts phase to phase, and will be sized to carry the ultimate output of the plant (75 megawatts) continuously. Construction will be single concrete pole construction with horizontal post insulators in a delta configuration with an overhead static conductor for lightning protection. Figures 6.1-3a through 6.1-3d indicate typical details. Clearances shall, as a minimum, meet National Electrical Safety Code Standards and typically shall be 26 feet above ground adjacent to roadways and 30 feet above ground crossing roadways.

There will be one 12 to 15 foot wide, shell rock access road running the length of the corridor, adjacent to the concrete power poles.

6.1.4 Cost Projections

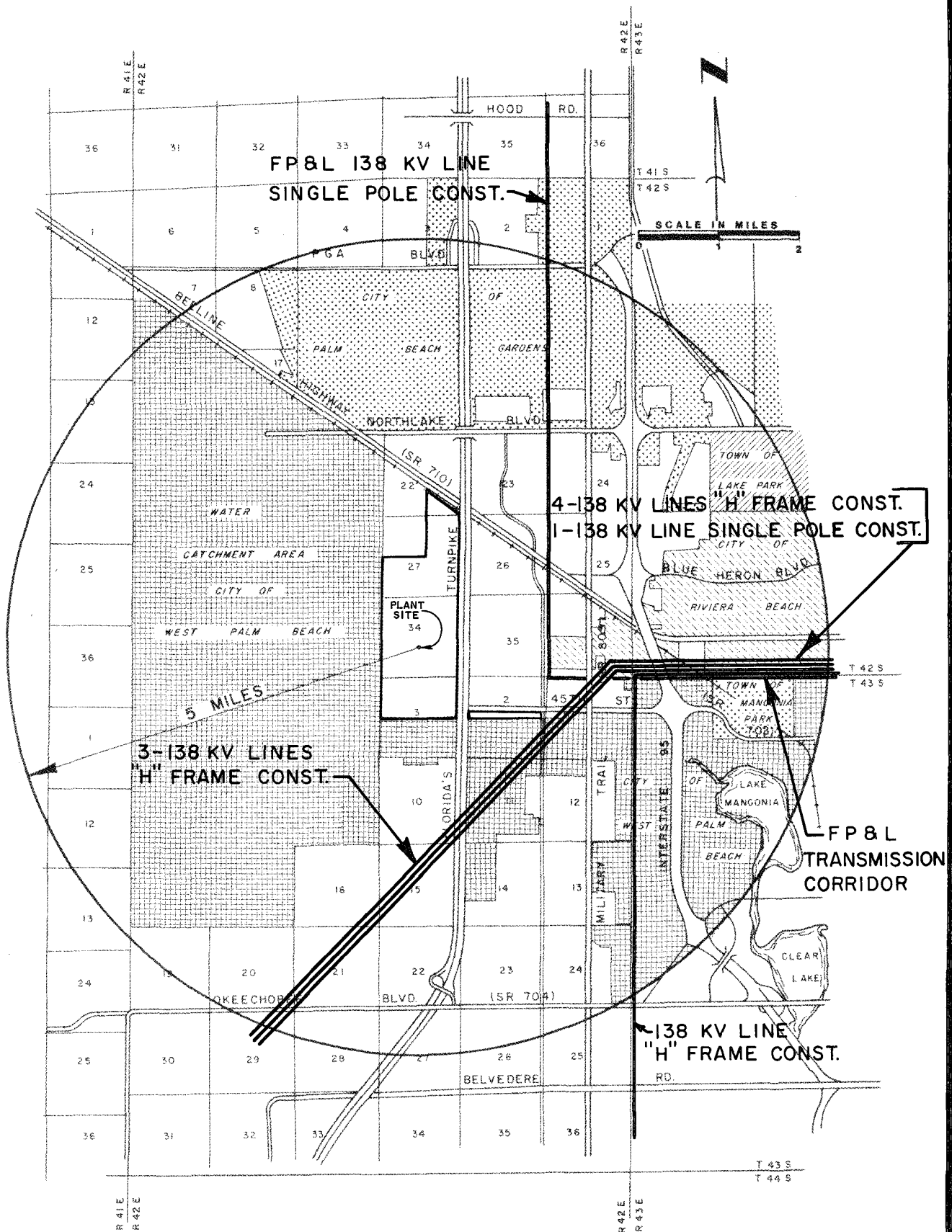
The transmission line from the plant to the FP&L transmission corridor is 2.2 miles and total construction cost is estimated to be \$400,000. This is based on a cost of \$150,000 per mile plus \$20,000 per right angle pole and \$15,000 per dead-end. The switching station, if required, will cost approximately 1.8 million dollars. The additional transmission line to the FP&L Riviera Beach Plant, if required, will cost approximately \$750,000.

6.1.5 Corridor Selection

Primary factors considered in selecting the transmission line route were 1) avoid unnecessary filling in wetlands, 2) allow for future use and development of the 600 foot-wide property, 3) where possible, run the transmission line adjacent to existing road right-of-ways to avoid construction of new roads for maintenance, and 4) coordinate with FP&L to determine a suitable location for interconnection.

Initial discussions with FP&L narrowed the number of alternatives considerably. Because of the size of the load and the generating capacity of the plant, it was determined the facility should be interconnected with FP&L transmission facilities. Florida Power and Light Company has four 138 kV transmission lines within 2 miles of the plant; one of these lines has several distribution substations connected to the line and it does not have the capacity required for the plant's total generation. Therefore, that line was eliminated from consideration. The other three (3) lines are in an existing major transmission line corridor and it is one of these lines with which we will interconnect. Three (3) possible routes from the plant to the transmission corridor were considered.

Route A was a route running directly south of the plant to interconnect with the FP&L corridor. This route was eliminated because of the wetlands between the plant and the corridor and the need for building a road through this area in order to maintain the line. Route B was south out of the plant to 45th Street, then east across the Turnpike, then south along the eastern edge of the Turnpike to the intersection of the corridor. This route was eliminated because of the cost of obtaining the right-of-way along the east side of the Turnpike

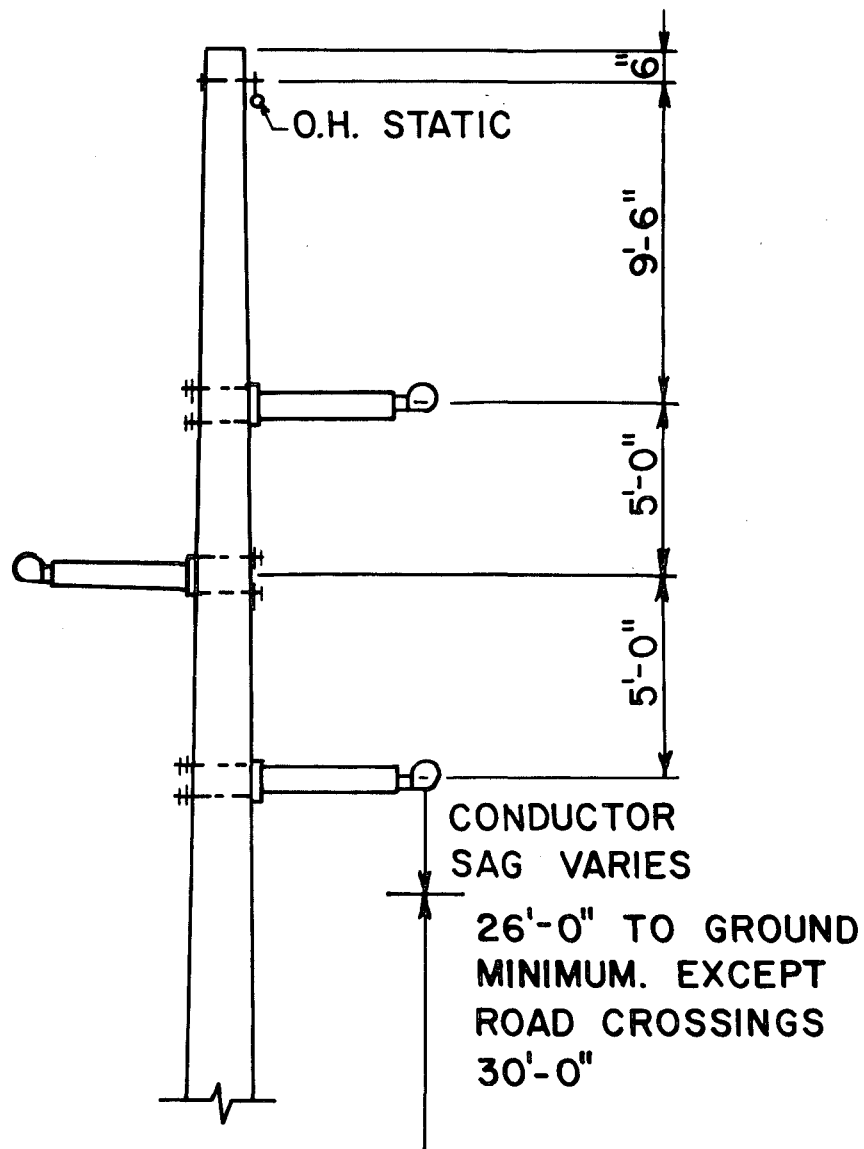


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EXISTING TRANSMISSION LINES

FIG. 6.I-2



138 KV TRANSMISSION LINE

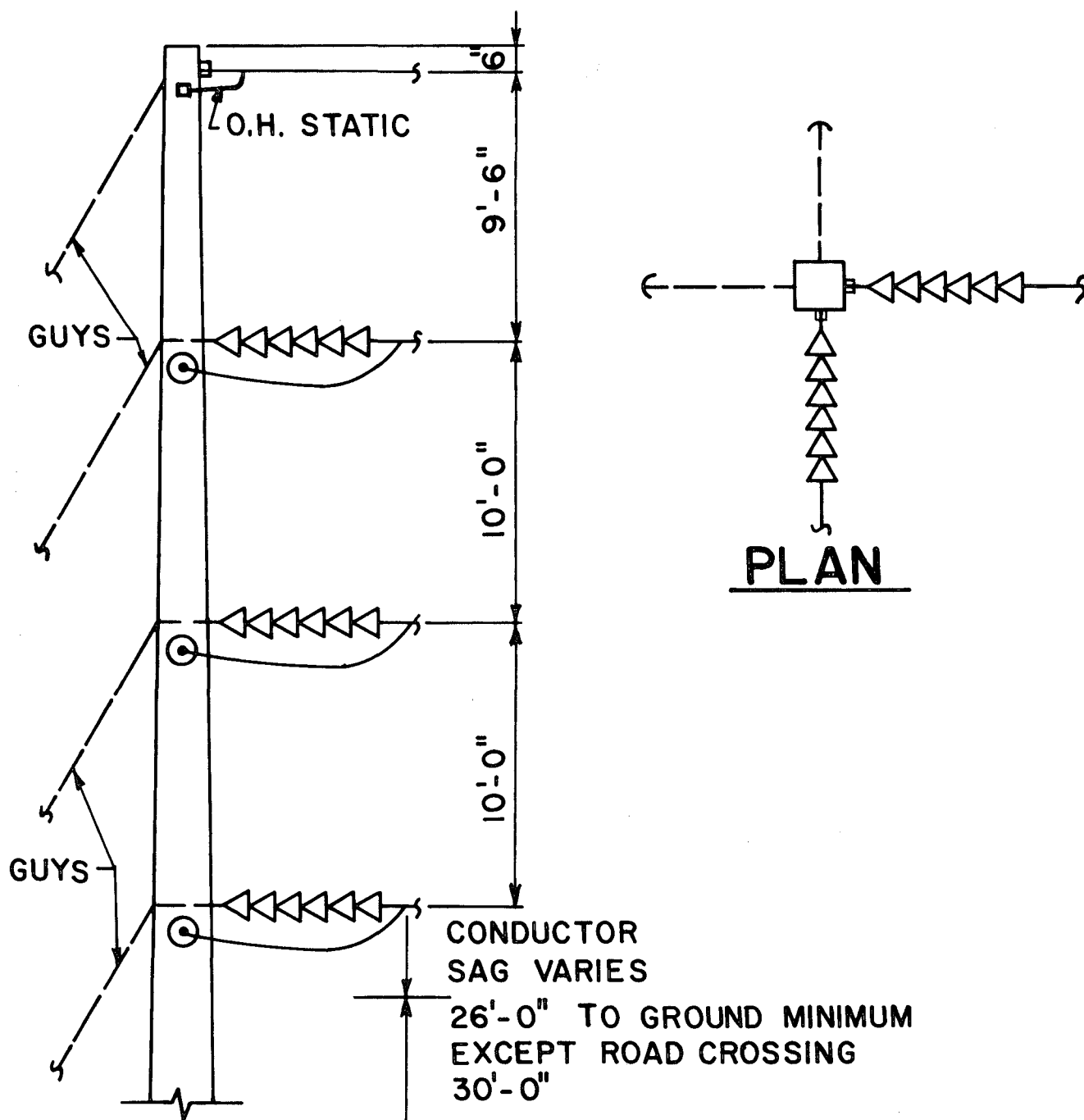
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TYPICAL STRUCTURE
TANGENT

LINE ANGLE 0° TO 7°

FIG. 6.1 - 3A



138 KV TRANSMISSION LINE

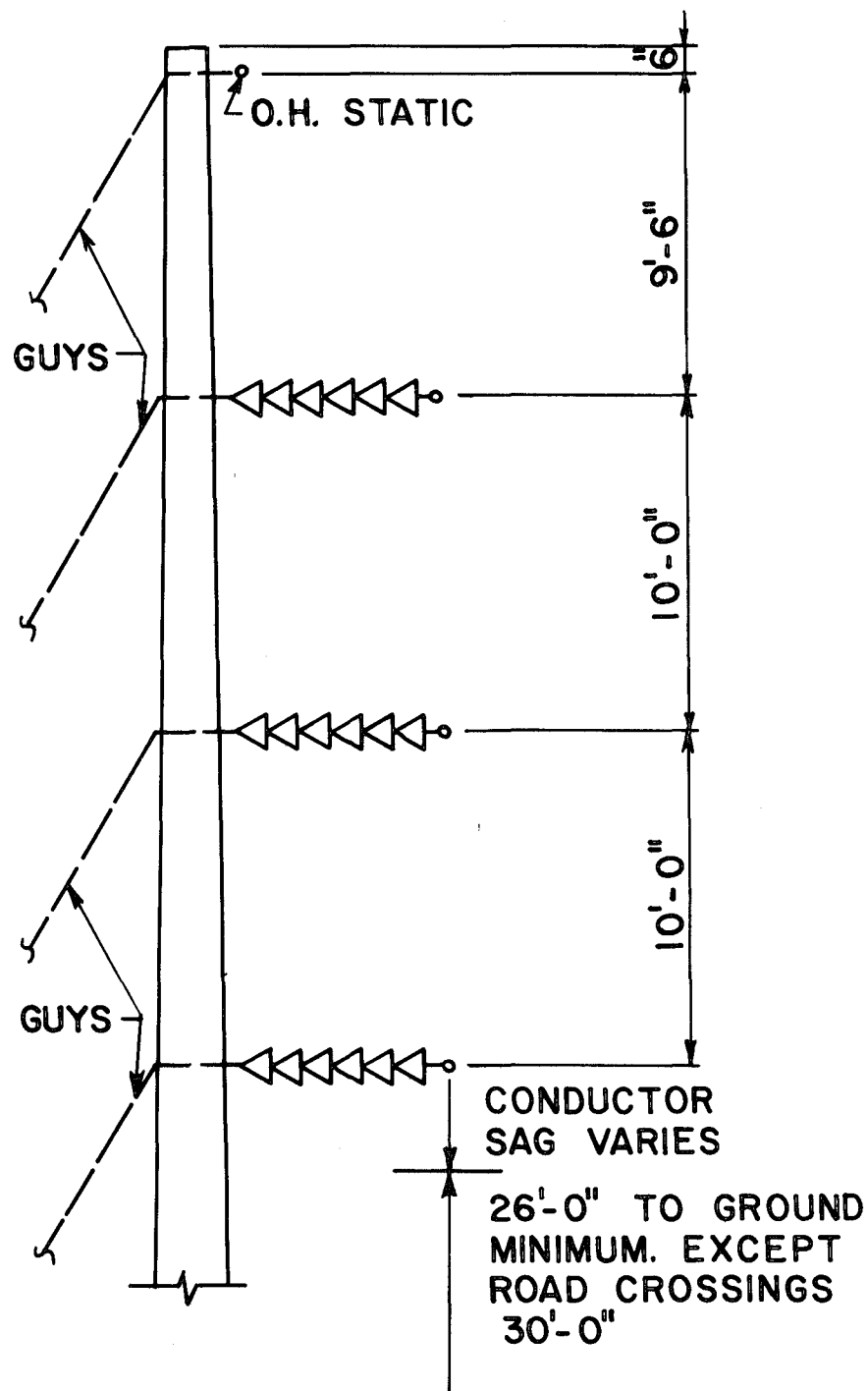
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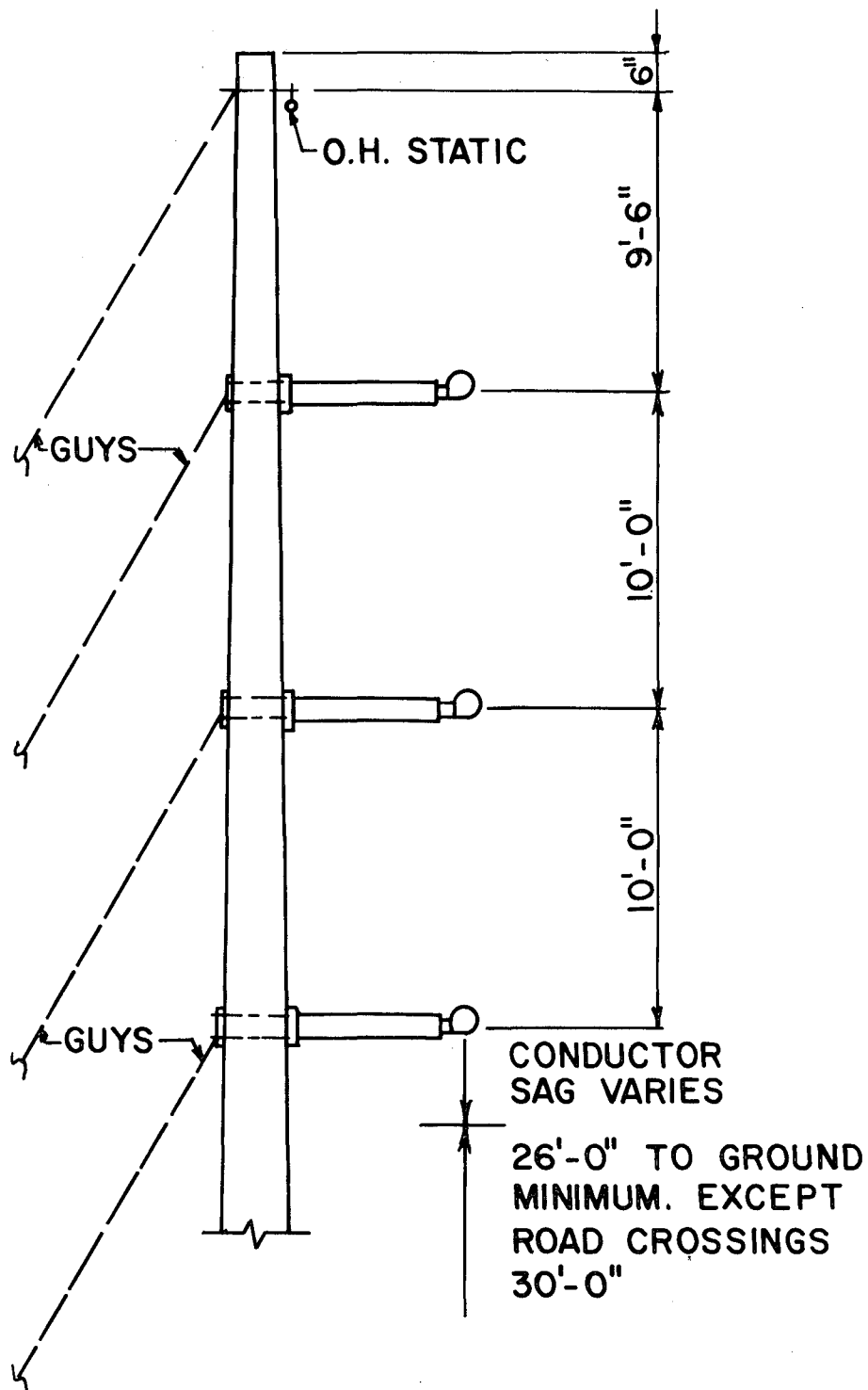
TYPICAL STRUCTURE
CORNER

LINE ANGLE 60° TO 90°

FIG. 6.1-3B



138 KV TRANSMISSION LINE



138 KV TRANSMISSION LINE

and the need for constructing a road to maintain this portion of the line. The route which was selected, indicated on Figure 6.1-1, is to proceed south from the plant substation along the north-south roadway across 45th Street to the south edge of the Authority's property, east along the south edge of the property across Florida's Turnpike to Haverhill Boulevard, south on west side of Haverhill Boulevard right-of-way to the existing Florida Power and Light Company transmission line corridor. The route was selected because it is relatively inexpensive and minimizes environmental impact. The line is constructed almost entirely on Authority property, and a substantial buffer is provided between the line and the nearest residential area.

6.1.6 Socio-Political Environment of the Corridor Area

6.1.6.1 Governmental Jurisdictions

As shown on Figure 6.1-1, the corridor will cross property of the City of West Palm Beach, the Water Catchment Area; and, if the third alternative is selected, the transmission lines will fall in the existing corridor within the property of the City of Riviera Beach. Except for the Water Catchment Area, none of the special category areas listed in Section 2.2.1 (Figure 2.2-1) lie within mile of the proposed corridor (unless alternative 3 is chosen, in which case 2 parks of the City of Riviera Beach and the Town of Mangonia park lie within mile of the existing FP&L corridor).

6.1.6.2 Zoning and Land Use Plans

As indicated on Figure 2.2-3, the property over which the corridor will pass is zoned RS (Residential Single-Family). If negotiations with FP&L result in the requirement for a switching station, the Authority will need to receive a Special Exception to the RS zoning, as indicated in the Palm Beach County Zoning Code.

The County Land Use Plan indicates the long-range use of this property to remain low to medium residential, equivalent to its current zoning category.

6.1.6.3 Easement, Title, Agency Works

The transmission lines will cross Florida's Turnpike south of the 45th Street Bridge. In addition, an easement will be acquired from the City of West Palm Beach for the FP&L access route from their existing corridor to the proposed switching station (Section 6.1.3.2).

6.1.6.4 Vicinity Regional Scenic, Cultural and Natural Landmarks

Based on the survey described in Section 2.2.1 "Governmental Jurisdictions", the following are found within five miles of the corridor area:

- County Parks
- Municipal Parks
- Holdings for Environmental Protection

None of these areas of cultural interest will be adversely impacted by construction of the powerline and associated corridor.

6.1.6.5 Archaeological and Historical Sites

A request was made to the Florida Department of State, Division of Archives, History and Records Management (DAHRM) for a cultural resource assessment of the powerline corridor. This review was incorporated in the site review discussed in Section 2.2.6. Their review concluded there are no archaeological or historic sites in the area proposed, and that it is unlikely significant unrecorded sites occur. The facility will in their opinion have no effect on archaeological or historical sites.

6.1.7 Bio-Physical Environment of the Corridor Area

6.1.7.1 Land Use/Vegetation

Figure 6.1-4 indicates land uses and vegetation types within one-quarter mile of the edges of the corridor. A portion of this area is included in the site land use/vegetation map discussed in Section 2.3.5.

Most of the land uses within one-quarter mile of the corridor also occur on the site, and have been discussed previously. The predominant natural vegetation communities adjacent to the corridor are pine flatwoods (411) and fresh water marshes (641). These marshes occur as both drier phase wet prairies and wetter phase marshes. A notable feature of the natural vegetation communities adjacent to the corridor is the many areas colonized by melaleuca. In many areas this noxious invader has completely replaced the native flora.

Two other land uses occur in the corridor area. One is the single unit, high density dwelling area (113) of Gramercy Park, which is north of the corridor. The second is the long distance transmission lines (152) of the FP&L power network. These are the lines to which the transmission corridor runs.

6.1.7.2 Affected Waters and Wetlands

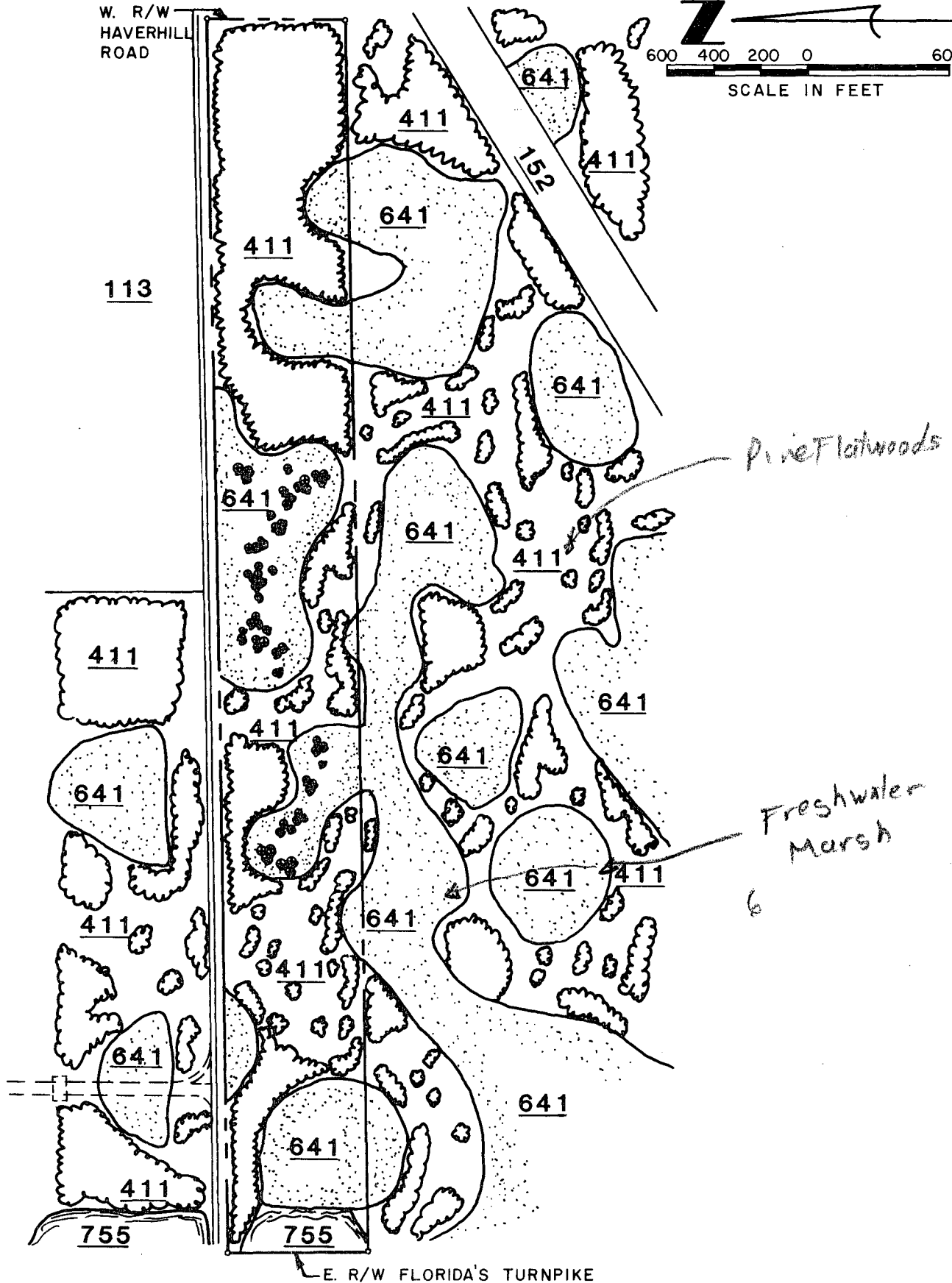
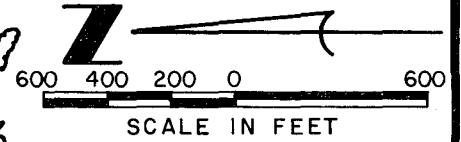
The transmission corridor will cross a small dredge lake (assumed to be Class III water) associated with Florida's Turnpike. The lake is approximately 200 feet wide and no affect upon it is anticipated. Several small wetland areas, marshes or wet prairies, will be crossed by this corridor. No dredging will occur in these wetlands. Filling activities will be required to stabilize the power poles and for the access road. Culverts will be installed in wetland areas where necessary to maintain hydraulic connections. The total area of wetland to be impacted by the access road and pole installation in this corridor will be approximately 0.7 acres.

6.1.7.3 Ecology

The flora and fauna surveys of the corridor area were conducted concurrently with the surveys of the power plant site. No Federal endangered species were observed in the corridor area. Although American Alligator may occur in the corridor area, no evidence of its presence was found. No critical habitat features of Federally endangered or threatened species were found within 1,500 feet of the corridor.

The four bird species of special concern identified on the power plant site in Section 2.3.6 were also observed in the vicinity of the corridor. The close proximity of the corridor to the power plant site and the mobility of these birds explains their occurrence in the corridor area. Some of the wet prairies in the parcel the corridor runs through are probably used by these birds as foraging areas.

W. R/W
HAVERHILL
ROAD



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



LAND USE AND VEGETATION WITHIN
1/4 MILE OF CORRIDOR

FIG 6.1-4

Of the five species of game and furbearers that were found on the power plant site, only two, the Opossum and Raccoon, were observed in the corridor area. The smaller size of the area, the proximity to 45th Street, and nearby residential areas reduce the chance of larger or more secretive animals such as deer, wild hog, or bobcat occurring in the corridor area.

The Wild Pine Bromeliad was observed in the corridor and also occurred on the power plant site. As stated in Section 2.3.6 this species is listed as endangered by the State of Florida primarily because of heavy pressure from plant collectors. This species occurs in most habitats where cypress and palm occur, particularly in hammocks. Other bromeliads were observed in the corridor area, and are listed as threatened.

Five Federally endangered species and one Florida endangered species were discussed in Section 2.3.6 with regards to the possibility of their occurring on the site. Because of the proximity of the corridor to the power plant site, and the wetland areas within a five mile radius around the site, there is a possibility that the corridor may also be used by Wood Storks, Snail Kites, Red-Cockaded Woodpeckers, Backman's Warblers, Kirtland's Warblers, or Florida Kestrels. However, the actual probability of any use or even visitation of the corridor area is extremely small, due to the size and location of the corridor area. No critical habitat features for these species occur within 1,500 feet of the corridor.

6.1.7.4 Other Environmental Features

All significant environmental features are addressed in other sections of this chapter. No significant downstream or offsite environmental impacts are expected. The short length and relatively small size of the transmission corridor limits the potential of off-site environmental impacts.

6.1.8 Effects of Right-of-Way Preparation and Transmission Line Construction

6.1.8.1 Construction Techniques

Standard techniques will be followed in the construction of the transmission lines and the access road. Concrete poles will be placed in holes for stabilization. The access road will be constructed with shell rock, with culverts located where necessary to maintain hydraulic connection of wetlands. (See Figure 6.1-5.) Typical equipment will be employed.

6.1.8.2 Impact on Waterbodies and Uses

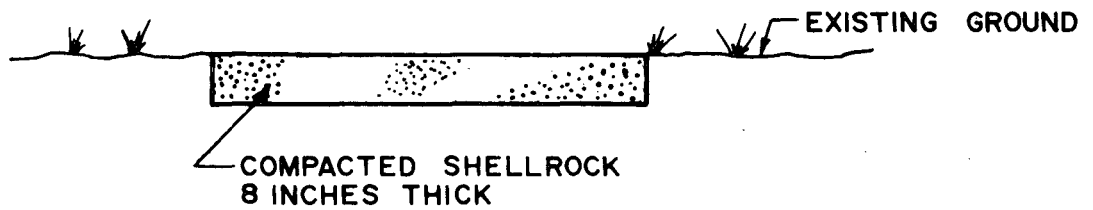
This transmission corridor does not cross any water bodies other than the dredge lake and wetland areas. The impact on these wetlands is discussed in Section 6.1.8.4.

The construction and use of transmission lines will have no effect on groundwater resources.

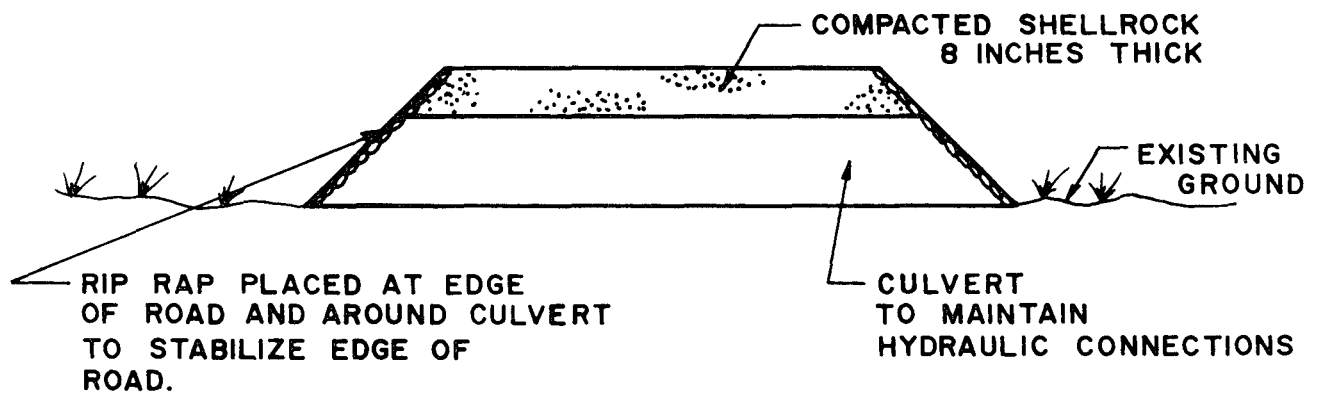
6.1.8.3 Solid Wastes

Debris from construction will be disposed of in the co-located Class III landfill and will pose no problem.

UPLANDS



WETLANDS



NOTE: WIDTH OF ROAD TO BE A MINIMUM
OF 12 FEET.

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

The construction of this transmission line will not have an major ecological impact. The total length of the corridor and its relatively small size limit any potential impacts. Because of the minimal impact to vegetation, wildlife and aquatic life, no mitigative measures are planned. No changes to endangered or threatened species will occur. The proximity of the larger FPL corridor and powerlines ecologically overshadows this corridor, particularly with regard to nesting or migratory route interference.

Species diversity and composition, particularly plant species and the proportion of various habitats on or within the corridor will experience some shifts. Within the corridor itself, most tall woody vegetation will be removed. Edge habitat potentially valuable to wildlife will be created. The creation of the access road and clearing of the right-of-way will require removal or alteration of approximately 6 acres of vegetation.

Several small wetland areas will be impacted by this corridor. These areas are marshes or wet prairies. Impact on these areas will be minimal. No significant impact to aquatic life is anticipated, due to the small size of the corridor and the small wetland area effected.

6.1.8.5 **Impact on Human Population**

Construction operations for this corridor will occur simultaneously with the construction of the resource recovery plant, adding negligibly to other construction effects. The construction will be visible to the residents of Gramercy Park; however, there will be approximately 400 feet of vegetated land separating the nearest residence from the construction activities. Hence, there will be minimal disturbance to residents.

6.1.8.6 **Impact on Regional Scenic, Cultural and Natural Landmarks**

There are no regional scenic, cultural or natural landmarks or other sensitive areas within the limits of the power line corridor. None of the areas identified in Section 2.2.1 or 2.2.5. will be impacted by direct or indirect effects from the powerline and its associated corridor.

6.1.8.7 **Impact on Archaeological and Historical Sites**

No archaeological or historic sites were identified in the DAHRM survey of the power plant site and the power line corridor (Sections 2.2.6 and 6.1.6.5). It is reported in this survey that it is highly unlikely that any significant, unrecorded sites exist in the vicinity. No impact to archaeological or historic sites will result from the development and use of this corridor.

In the unlikely event an undiscovered site exists, the routine supervision and inspection during construction will reveal it. If a site is found, DAHRM will be notified and necessary measures taken to assure conservation of the site until an assessment of its nature can be made.

6.1.9 Post-Construction Impacts and Effects of Maintenance

6.1.9.1 Maintenance Techniques

Mowing and/or herbicides will be employed along the right-of-way. Burning will not be used. Fire lanes will not be required because of existing access to the right-of-way. Herbicides used will be of the type for control of broadleaf/woody vegetation, registered for use in right-of-way control by the Florida Department of Agriculture. If used, herbicides will be applied twice per year in accordance with label concentrations using certified applicators. If herbicide control of vegetation is required in wetland areas, only herbicides registered for aquatic use by the Florida Department of Agriculture will be used. No aerial application will be employed.

This method of application will minimize effects on flora and fauna. The main shift will be from high stature to low stature vegetation.

6.1.9.2 Multiple Uses

No multiple uses will be allowed in the right-of-way.

6.1.9.3 Changes in Species Populations

Maintenance of the transmission corridor should not cause significant decreases in the important species identified as occurring in the corridor area in Section 2.3.6 and 6.1.7.3. Changes will occur in habitat available in the vicinity. Alterations that effect general habitat or other resources such as food will also be minimal.

The maintenance of the right-of-way corridor should cause neither a long-term increase nor decrease in important species populations. The small size of the corridor, the smaller area that will be altered due to maintenance, and the large amount of available habitat in the surrounding area effectively eliminate meaningful impact.

6.1.9.4 Effects of Public Access

There is currently a great deal of unauthorized public access throughout the corridor site. Once the project is completed, access to the corridor site will be restricted to official use. The resulting reduction in public access should have a positive effect on site habitats.

6.1.10 Other Post-Construction Effects

6.1.10.1 Electro-Magnetic Effects

There has been some concern in recent years as to the possible health effects to persons or animals adjacent to high voltage transmission lines. There has been a great deal of investigation in this area, but most of the studies have been done on transmission lines 230 kV or higher voltage. It is generally agreed that the electric and magnetic fields in the vicinity of lines below 230 kV are relatively low compared to the higher voltage lines and, therefore, little study has been done on these.

Recently the Florida Electric Power Coordinating Group set up the Florida Electric and Magnetic Field Science Advisory Commission to evaluate the potential for adverse effects of exposure to electro-magnetic fields associated with power transmission lines. The report of the Advisory Commission, which was submitted March, 1985, addressed only lines 230 kV and above. After a full review of available scientific evidence by its members, the Commission concluded that "It is unlikely that human exposure to 60 Hertz electric and magnetic fields can lead to public health problems". The Commission further recommended the "Florida Utilities should adhere to the National Electrical Safety Code or to an equivalent State Code".

In view of the findings of this Commission and due to the fact that the transmission line is only 138 kV and will be constructed primarily on Solid Waste Authority's property, the transmission line should not present a health hazard.

6.1.10.2 Electrical Discharges

Another area of concern is the occurrence of electrical discharges along the transmission line causing the production of corona (an avalanche of ionization and air surrounding the line which in turn may produce ozone, audible noise, and radio frequency noise). Modern transmission line design incorporates techniques which reduce corona effects to a minimum.

6.2 ASSOCIATED LINEAR FACILITIES

There are no other linear facilities extending over mile from the main site.

Economic and Social Effects of Plant Construction and Operation

CHAPTER 7: ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION

7.1 SOCIO-ECONOMIC BENEFITS

The Authority has committed its resources to provide a system for the disposal of solid waste which is ecologically sound, will recovery useable materials, will generate electrical energy from municipal solid waste (MSW), will drastically reduce the amount of land required for the landfilling of the MSW, and will decrease the likelihood of compromising the quality of the groundwater.

The Resource Recovery Facility is rated at 2,000 TPD and is expected to process 624,000 tons per year of MSW. All Class I (garbage) and about half of the Class III (trash fraction) will be processed to produce a refuse derived fuel (RDF). The RDF is then combusted to produce steam to power the 50 MW turbo-generator. The remaining Class III (demolition fraction) is not suitable for processing and is routed to the landfill for disposal.

The ash and rejects from the processing of refuse is sent to landfill, and represent a 90% reduction by volume and 80% reduction by weight from the incoming refuse. This substantial reduction in the volume and tonnage represents a corresponding reduction in the acres required for landfilling.

At least four times the space allocated for disposal of the residue from the processing plant would be required for the disposal of unprocessed refuse. It is estimated about 100 acres of Class I landfill space is needed for the proposed facilities for ash and rejects disposal over 20 years. For each acre of landfill space, another acre is required for buffering, borrow lakes, set backs, roads, etc. Hence, by processing the refuse in a resource recovery plant a saving of 600 acres can be achieved. At today's cost of at least \$15,000 per acre for land, an overall saving of at least \$9,000,000 can be realized. Additional savings of landfill and borrow lake space may be realized if the ash can be used as cover material, or sold as aggregate to the concrete plants.

The ash from combustion of RDF is relatively inert and exhibits low readings on the EP toxicity tests; consequently, there is no methane generation and reduced leachate generation as compared to landfilling raw garbage. The reject fraction that is landfilled does contain some organics (see Table 3.3-2), but since it is 80% inorganic and water, the generation of methane and leachate is minimal, and the material exhibits very low readings in EP toxicity tests.

In addition to reducing the amount of material to be landfilled, the facility is designed to produce electricity and recover recycleable materials. Approximately 500 kwh of net energy can be expected from each ton of refuse that is processed. Based on a 2,000 TPD input (624,000 TPY), 312,000,000 kwh per year will be produced for sale to the Florida

Power and Light Company generating revenues of about \$15,000,000 per year. Additionally, the 624,000 tons of refuse will replace about 26,200,000 gallons of oil, which will help decrease our dependency on imported oil.

The materials to be recovered are ferrous and aluminum and represent 5% and 1% of the waste stream respectively. The 28,000 GT of ferrous will be processed into a #2 bundle for sale to steel mills or foundries and would generate \$1,500,000 to \$2,000,000 annually. The 6,000 tons of aluminum has the potential of producing revenues of \$5,000,000 to \$6,000,000 annually. However, the aluminum found in the waste stream is primarily beverage cans and if passage of a bottle bill were to occur, the vast majority of aluminum would disappear.

Operation of the RDF/Combustion Plant will require a staff of approximately 140 full-time people. The resulting annual payroll will inject approximately \$3,000,000 (1984) into the local economy. On a short-term basis, the facility construction will provide the benefits of a \$150,000,000 construction project, enhancing the local economy.

Groundwater investigations conducted on the site have served to enhance knowledge of the shallow aquifer. This information gained may be used in the future to help plan water supply systems, contaminant recovery systems, and to aid in the interpretation of the regional flow of surface and groundwater. Also, groundwater monitoring that will be conducted will aid in assessments of groundwater availability and to provide early warning should a contamination hazard arise.

7.2 SOCIO-ECONOMIC COSTS

Temporary external costs associated with the construction and start-up of the Resource Recovery Facility will involve primarily increased usage of certain local highways with an attendant increase in noise. Because the site is isolated, there should be no temporary aesthetic disturbances and only one resident will be required to relocate. Construction workers on the project will be primarily local and should cause no significant increase in demand on housing or social services.

The increased usage of the local highways will have insignificant adverse effect because of the fact that the current Dyer Boulevard Landfill has essentially the same routes of access. The only exception will involve traffic past the Gramercy Park residential area facing 45th Street, west of Haverhill Road. Noise during both the construction and operational phases of the facility may require mitigative action. The mitigative measures are described in Appendix 10.15. The cost of this mitigative action will be several million dollars and will be borne by the Authority, and indirectly by the users of the facility.

The major economic cost for this project will be the commitment of about \$230,000,000 to purchase the 1,320 acre site and construct the resource recovery plant, landfills and associated facilities.

Economic comparisons have been made between the costs of operation of a Resource Recovery Facility for disposal of refuse versus the continued landfilling of raw refuse. The present practice of landfilling has seen escalating costs which have necessitated annual increases in the tipping fee. This trend would be expected to continue at a rate at least equal to the rate of inflation (rates the last 3 years have greatly exceeded the inflation rate).

Projections have been made for the costs associated with a resource recovery plant and these projections indicate that the tipping fee would stabilize and very possibly decrease over time. The tipping fee projections for 1989, the anticipated start up date for the resource recovery plant, would be very close to those expected for landfilling refuse, with landfilling continuing to escalate, resulting in an ever increasing cost differential.

Moreover, the Resource Recovery Facility should be operable after the bond issue has been retired and worth a high percentage of its initial cost.

Overall, with good operational and maintenance procedures, the long-term cost of the Resource Recovery Facility is projected to be lower than the costs associated with traditional landfilling.

Site and Design Alternatives

CHAPTER 8: SITE AND PLANT DESIGN ALTERNATIVES

8.1 ALTERNATIVE SITES

Since the establishment of the Palm Beach County Solid Waste Authority in 1974, diligent efforts have been made by the Authority personnel and consultants to develop an integrated, County-wide solid waste management program. The program involves recycling, resource and energy recovery, transfer stations and landfill facilities, with a major task of the program being identification and acquisition of land suitable for these facilities. Suitable land is a land mass that is technically viable, economically feasible, environmentally sound and socio-politically acceptable.

Facility siting has been the most rigorously developed aspect of the Authority's solid waste management program. A comprehensive site evaluation process has been pursued by the Authority since 1978. A September 1983, report describing this process, which included the involvement of the concerned citizens, and the resulting recommendation to the Board of the Solid Waste Authority that the current site chosen, is included as part of the Compliance Document. A second report, dated July 11, 1984, which considered alternatives to the designated site is also included in the Compliance Document.

8.2 PROPOSED SITE DESIGN ALTERNATIVES

Alternate plant designs investigated during the feasibility studies are as follows:

- Resource Recovery Plant — RDF/Combustion
- Resource Recovery Plant — Mass Burn
- Split System — Central RDF Manufacturing Plant
 Lake Worth Utilities Combustion Plant
- Multiple Modular Combustion Units (MCU)

The first study concluded that the MCU should not be considered for further study since:

- Economics were poor (tipping fees substantially higher)
- Multiple siting problems
- Low efficiency system.

From an economic standpoint the Split System appeared to be the most desirable, since steam would be sold to the Lake Worth Utilities Authority (LWUA) to drive existing turbines. This alternative was abandoned since siting the combustion facility in the LWUA site adjacent to the junior and senior high schools raised great opposition mainly because of potential traffic and perceived threat of pollution (air and water).

The next study compared the RDF/Combustion and Mass Burn technologies with the final selection for the RDF/Combustion technology. The major reasons for this selection were:

- Ability to recovery materials for recycling
- Somewhat better economics (lower tipping fee)
- Better air pollution control (better combustion control)
- Greater system flexibility
- Greater system availability and reliability
- Less landfill space required

8.2.1 Cooling System

There are no alternatives to using the cooling tower that is planned since there are no bodies of water of sufficient size to handle the heat load.

The design of the cooling tower will be such as to reduce drift and conserve water by controlling blowdown effluent quantities by using 3 concentrations.

8.2.2 Biological Fouling Control

In place of shock treatment with chlorine for control of bacteria and fungi in the recirculating cooling water, Lester Laboratories Lester 30 is currently planned. Specific concentrations have not been recommended yet. The specifications for Lester 30 are in the Appendix 10.7.

The cooling tower blowdown is combined with other factory effluents for disposal by deep well injection.

8.2.3 Intake System

The proposed cooling-water intake system incorporates a water well that also will "purge" the shallow aquifer of mineralized water apparently generated at the Dyer Boulevard Landfill. Alternatives to this system would include (1) a water well tapping the shallow aquifer on the site, (2) a water well tapping the Floridan aquifer, (3) withdrawal from the M-canal, or (4) withdrawal from a borrow lake. A comparison of ground-water impacts due to the proposed intake system with the impacts of alternatives is provided on Table 8.2-1. Except for the "moderate" cost of implementation, the proposed system provides the lowest adverse effects and the highest beneficial effects.

TABLE 8.2-1
COMPARATIVE GROUND-WATER IMPACTS DUE TO THE
PROPOSED INTAKE SYSTEM AND ALTERNATIVES

	As Proposed	Shallow Well on Site 7	Floridan Aquifer Well	M-Canal Intake	Borrow Lake Intake
Affect on the Availability of Potable Water	L	M	L	H	M
Affect of Existing Public Water Supplies	L	L	L	H	L
Expense of Implementation	M	L	H	M	L
Benefit in Purging Mineralized Water at Dyer Landfill	H	N	N	N	N

Key: N = no benefit
 L = low affect or expense
 M = moderate affect or expense
 H = high affect or expense

8.2.4 Discharge System

The combined flow of the domestic, process and leachate wastewater, as described in Appendix 10.7 and Section 3.5 of the main application, will be ultimately discharged by a deep well injection system. The only alternative discharge system available to handle this combined flow is the West Palm Beach Regional Wastewater Treatment Facility, located approximately two miles southeast of the resource recovery plant.

However, the wastewater from the Resource Recovery Facility is classified as industrial and requires a different well design than those injection wells at the Regional Wastewater Treatment Facility whose wells are designed to handle only domestic wastewater.

8.2.5 Chemical Waste Treatment

The corrosion and scale inhibitor planned for use in the cooling tower is Lester Laboratories Hydrofene 21. The inhibitor is ecologically safe and specifications are included in the Appendix 10.7.

8.2.6 Sanitary Waste System

The combined sanitary, process and leachate wastewater system has been discussed in Section 8.2.4. Handling each flow separately would be more costly and would provide no environmental benefits over the proposed system.

8.2.7 Solid Waste Disposal Systems

8.2.7.1 Ash Wastes

Acid gas control is not presently planned and FGD sludge would therefore not be produced. The water quenched bottom and fly ash would be disposed of in the adjacent Class I landfill, and used for cover of the rejects from the RDF manufacturing operation. The analysis of ash and rejects is listed in Tables 3.3-2 and 3.3-3.

8.2.7.2 Other Solid Wastes

A small percentage of the MSW received is not processible and would be disposed of in the Class I landfill. This would include rugs, cables, mattresses, and other large objects. Also included are the rejects discussed in Section 8.2.7.1.

8.2.8 Multiple Uses

8.2.8.1 Landfill Gas

The proposed location of the resource recovery plant is less than 5,000 ft. from the existing Dyer Boulevard Landfill that is scheduled for closure in 1987. Substantial quantities of landfill gas will be generated at the Dyer site, similar to what is being experienced at the Lantana Landfill that was recently tested.

Tentative plans would be to co-fire the landfill gas with RDF in the planned combustion units. The landfill gas is of good quality (55% to 60% methane) and would not have to be upgraded for this application, resulting in a very cost-effective system.

Collection and productive use of the landfill gas will help control the migration of the gas that could result in odors, air pollution, and general degradation of the environment.

8.2.8.2 Composting

Modest quantities of sludge (12% solids minimum) are received at the landfill for mixing with the cover material (sand) as a soil enhancer to aid in the growth of vegetation on the top of landfills being closed.

With sufficient quantities of sludge a composting operation is proposed to produce humus. The reject portion from RDF manufacturing and vegetative waste would be used as a bulking agent in the compost operation with sludge.

This environmentally sound operation would extend the life of the landfill by removing the reject portion from landfilling; upgrade a waste product, sludge; and produce a useful product, humus, for Authority or community use or for sale.

Coordination

CHAPTER 9: COORDINATION

Site selection, rezoning and preparation of this application for the proposed Resource Recovery Facility has necessitated coordination with individuals and private firms as well as federal, state, regional, county and local governmental agencies. Assistance and information has been provided to the Palm Beach County Solid Waste Authority and to the members of the engineering consulting team.

Table 9-1 lists the individuals and agencies with which coordination was accomplished and the primary topic of coordination.

Table 9-2 lists the lead members of the consulting team and their responsibilities in connection with this project.

TABLE 9-1

Federal		
Agency	Individual	Subject
United States Fish and Wildlife Service Post Office Box 2676 Vero Beach, FL 32961	Bob Pennington Joe Carroll Joe Johnston	Environmental/Ecological Environmental Effects of Facility
United States Army Corps of Engineers, Miami	Mike Slayton	Wetlands
United States Army Corps of Engineers, Stuart	Chris Dowling	Wetlands
United States Army Corps of Engineers, Jacksonville	Marie Grigsby John Adams	Wetlands
United States Environmental Protection Agency, Atlanta	Eric Hughes	Wetlands
United States Geological Survey, Miami	Ellis Dunskey	Surface Water Management Plan
State		
Agency	Individual	Subject
Florida Department of Environmental Regulation West Palm Beach	Larry O'Donnell Steve Burian Joe Lurix John Guidry	Ecology Surface Water Management Plan Wetlands

State (Continued)

Agency	Individual	Subject
Florida Department of Environmental Regulation Tallahassee	Mike Nagy	Ecology Surface Water Management Plan Wetlands
Florida Game and Freshwater Fish Commission, West Palm Beach	Biff Lampton	Ecology
Florida Game and Freshwater Fish Commission, Vero Beach	Steve Lau	Ecology
Florida Department of Transportation, Tallahassee	Claude White	Turnpike Access
Florida Turnpike Authority	Sam Roddenberry	Turnpike Access

Regional

Agency	Individual	Subject
South Florida Water Management District Post Office Box V 3301 Gun Club Road West Palm Beach, FL 33402 (305)686-8800	Charles W. Pemble, P.E. Richard S. Tomasello, P.E. Charles A. Padera Bill Hellfrich Sally Lockhard	Surface Water Management Plan Wetlands

County

Agency	Individual	Subject
Palm Beach County Planning, Zoning & Building Div. 3400 Bevedere Road West Palm Beach, FL 33406 (305)471-3500	Robert E. Basehart Patsy McKernan John Lehner Pat Bush	Rezoning
Palm Beach County Health Department 901 Evernia Street West Palm Beach, FL 33401 (305)837-3052	Frank J. Gargiulo, P.E.	Water & Sewer Services, Rezoning
Northern Palm Beach County Water Control District 5725 Corporate Way, Suite 203 West Palm Beach, FL 33407 (305)471-4105	Peter L. Pimentel	Surface Water Management Plan Drainage Outfall

Local

Agency	Individual	Subject
City of West Palm Beach	Richard Simmons, City Manager Allan Frefry	Water Catchment Area

Private Firms

Agency	Individual	Subject
Babcock & Wilcox 400 S. Tyson Street Charlotte, NC 28285 (704) 334-4742	Dennis Williams	Operation of Resource Recovery Plant
CSI Resource Systems, Inc. 88 Broad Street Boston, MA 02110 (617)542-3070	Clovis Pendergast, P.E. Richard D. Larson, P.E. James J. Binder, P.E.	3rd Party Review
Florida Power & Light Co. Distribution Engineering Department Post Office Box 529100 Miami, FL 33152	Robert H. Stevens, P.E.	Electrical Power Transmission Route
Foster Wheeler 110 South Orange Avenue Livingston, NJ 07039 (201) 533-3231	Walter Murray	Operational Characteristics of RDF/Combustion Plant
Resources Recovery (Dade County), Inc. Post Office Box 524056 Miami, FL 33152 (305)593-7000	Brian Rundle James H. Todd	Operational Characteristics of RDF/Combustion Plant — Noise
Southern Bell Engineering Division 715 South Dixie Highway West Palm Beach, FL 33401	Kirt Danielson	Utility Easement
Mock, Roos & Associates, Inc. 5720 Corporate Way West Palm Beach, FL 33407	Mark Williams Alan Wertepny	Drainage Outfall

TABLE 9-2
MEMBERS OF CONSULTING TEAM

Agency	Individual	Responsibility
Barker, Osha & Anderson, Inc. 860 U.S. Highway One Suite 202 North Palm Beach, FL 33408 (305)626-4653	Sumpter(Sam)H. Barker,P.E. Michael Schenk, P.E. Mic Jackson, Ph.D.	Project Director Project Manager Editor
Hayden/Wegman, Inc. 5114 Okeechobee Blvd. Suite 2-B West Palm Beach, FL 33417 (305)471-0444	Gary L. Smith, P.E. Stanley G. Timmerman Lou Terracciano, P.E.	Plant Design Air Quality Analysis

TABLE 9-2 (Continued)
MEMBERS OF CONSULTING TEAM

Agency	Individual	Responsibility
York Services, Inc. 1 Research Drive Stamford, CT 06906 (203) 325-1371	Edward Kaplin, Ph.D.	Air Quality Analysis
Post, Buckley, Schuh & Jernigan, Inc. 889 North Orange Ave. Orlando, FL 33801-1088 (305)423-7275	David Deans, P.E. Albert R. Capellini, P.E. Carolyn Kulwicki	Landfill Design, Surface Water Management Plan Conceptual Plan
Geraghty & Miller, Inc. 2700 PGA Boulevard Suite 104 Palm Beach Gardens, FL 33410 (305)694-0300	Vincent P. Amy Paul Jakob James A. Wheatley	Geohydrological Analysis Injection Well Design
Joyce Environmental Consultants, Inc. 619 Industrial Street Lake Worth, FL 33461 (305)582-4317	Robert D. Blackburn, Ph.D. Marc C. Bruner, Ph.D.	Environmental/Ecological
Kimley-Horn & Associates, Inc. 5800 Corporate Way West Palm Beach, FL 32407 (305)683-5500	James R. Zook, P.E.	Traffic Analysis
Dunn & Associates, Inc. P.O. Box 2408 Boca Raton, FL 33427-2408 (305)487-6898	Stanley E. Dunn, Ph.D. Joseph M. Cuschieri, Ph.D	Noise Analysis
GBS Architects 1080 E. Indiantown Rd. Suite 205 Jupiter, FL 33458 (305)747-6330	George Gentile, A.S.L.A. Don E. Hearing, A.S.L.A.	Site Plan, Landscaping
Burke & Chappell Engineers, Inc. 2324 S. Congress Avenue West Palm Beach, FL 33406 (305)968-4800	Tom Chappell, P.E.	Transmission Corridor Coordination with FP&L
Gibson & Adams Professional Association Florida National Bank Bldg. 303 First St., Suite 400 West Palm Beach, FL 33402-1629 (305)655-8686	Herbert C. Gibson, Attorney at Law James M. Adams, Attorney at Law	Legal Assistance

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PALM BEACH COUNTY, FLORIDA

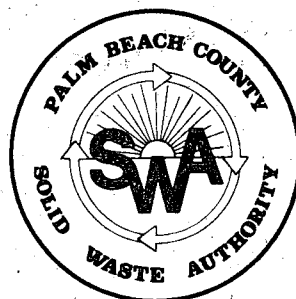
SOLID WASTE RESOURCE RECOVERY FACILITY

**APPLICATION FOR
POWER PLANT SITE CERTIFICATION**

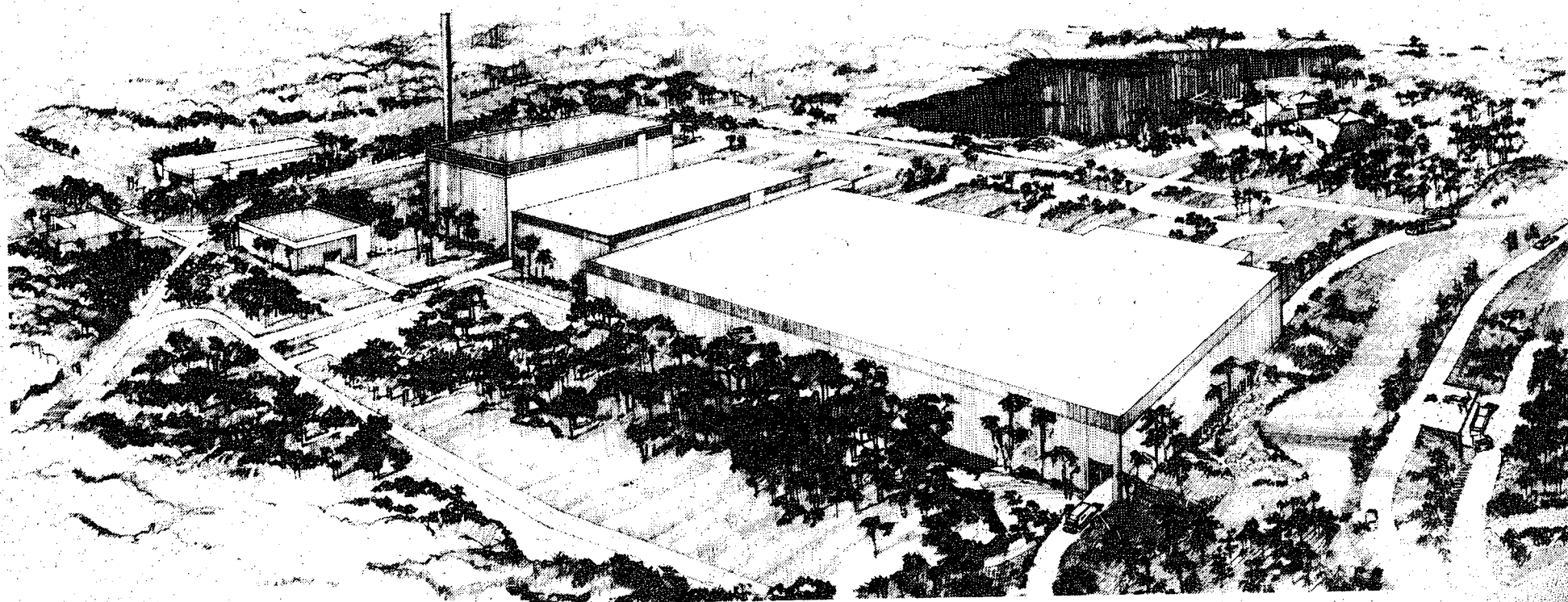
VOLUME II - APPENDICES

SUBMITTED BY

THE PALM BEACH COUNTY SOLID WASTE AUTHORITY



APRIL, 1985



PALM BEACH COUNTY
FLORIDA

**SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION**

VOLUME II
APPENDICES

Appendices

APPENDIX 10.1

FEDERAL PERMIT APPLICATIONS OR APPROVAL

APPENDIX 10.1.1

316 DEMONSTRATION

Demonstrations pursuant to Section 316(a) and (b) of the Clean Water Act are not applicable to this project.

APPENDIX 10.1.2

NPDES APPLICATION/PERMIT

There will be no discharge to surface waters other than uncontaminated stormwater during peak storm events throughout the construction and operation of the Resource Recovery Facility. All leachate, sanitary and process wastewater will be treated and disposed of via deep well injection on site (Appendix 10.8).

Hence, there is no requirement for a permit for a National Pollutant Discharge Elimination System.

APPENDIX 10.1.3

HAZARDOUS WASTE DISPOSAL APPLICATIONS/PERMITS

There are no hazardous waste disposal applications/permits pursuant to the Resource Recovery and Conservation Act that are applicable to this project. No hazardous waste will be accepted, stored, or disposed of at the Resource Recovery Facility. Any hazardous wastes identified in the municipal solid waste (MSW) stream will be isolated and transferred to an approved hazardous waste treatment, storage and disposal facility (Section 3.7.2).

APPENDIX 10.1.4

SECTION 10 OR 404 APPLICATIONS/PERMITS

JOINT APPLICATION
DEPARTMENT OF THE ARMY/FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
For Activities in the Waters of the State of Florida

CORPS APPLICATION NUMBER (official use only)

DER APPLICATION NUMBER (official use only)

1. APPLICANT'S NAME AND ADDRESS

P | . | B | . | C | o | . | | S | o | l | i | d | | W | a | s | t | e | | A | u | t | h | o | r | i | t | y |
NAME

5 | 1 | 1 | 4 | | O | k | e | e | c | h | o | b | e | e | | B | l | v | d | | S | u | i | t | e | | 2 | C |
STREET

W | e | s | t | | P | a | l | m | | B | e | a | c | h | | | | F | L | 3 | 3 | 4 | 0 | 9 | | | |
CITY STATE ZIP

TELEPHONE NUMBER (Day) (305) 471-5770 (Night) ()

2. Name, address, zip code and title of applicant's authorized agent for permit application coordination

Mr. Herbert C. Gibson, Esquire
Attorney at Law
303 First Street, Suite 400
West Palm Beach, FL 33402
Telephone Number (305) 655-8686

3. NAME OF WATERWAY AT LOCATION OF THE ACTIVITY. Florida's Turnpike and the City of West Palm Beach Water Catchment Area, Palm Beach County, Florida

DER Code. _____
W/W Code _____

4. LOCATION WHERE PROPOSED ACTIVITY EXISTS OR WILL OCCUR.

45th St. & Beeline Hwy., west of Turnpike
Street, road or other descriptive location

3 43S 42E
22/27/34 42S 42E
Section Township Range

Incorporated city or town

Latitude

Longitude

Palm Beach
County

Tax Assessors Description: (if known)

Map No.

Subdiv. No.

Lot No.

5. NAME AND ADDRESS INCLUDING ZIP CODE OF ADJOINING PROPERTY OWNERS WHOSE PROPERTY ALSO ADJOINS THE WATERWAY.

See Attachment A

6. PROPOSED USE

Private Single Dwelling [] Private Multi-dwelling [] Public [X]
Commercial [] Other [] (Explain in remarks)

7. DESCRIPTION OF PROJECT (Use additional sheets, if necessary)

A. Structures: 1. New work ☐ Maintenance of existing structure ☐

2. Piers, docks and use: Commercial ☐ Private ☐ Public ☐

COE Work Code				
<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>				

a. Single pier ☐ length _____ width _____

b. Number of piers ☐ length _____ width _____

c. Number of boat slips ☐ length _____ width _____

d. Number of finger piers ☐ length _____ width _____

e. Other (please describe) _____

3. Seawalls, revetments, bulkheads: length _____

a. Type: Vertical ☐ Riprap ☐ Slope: _____ Horizontal: _____ Vertical

b. Material to be used _____

4. Other type of structure _____

B. Excavation or Dredging: New Work ☒ Maintenance work ☐ Total acreage involved 153

1. Access Channel ☐ or Canal ☐ Length _____ ft. Width _____ ft. Depth _____ ft.

2. Boat Basin ☐ or Boat Slip ☐ Length _____ ft. Width _____ ft. Depth _____ ft.

3. Other Borrow Lakes (See Item 10) Length _____ ft. Width _____ ft. Depth _____ ft.

4. Cubic yards: Total for project 14,944,200

a. 0 cyd. waterward/14,944,200 cyd. landward of ordinary/mean high water

b. Type of material to be excavated/dredged Sand/Shellrock Fill

C. Fill:

1. Amount of material

DER Code
<u>253</u>
<u>403</u>

a. Cubic yards placed waterward of ordinary/mean high water 0

b. Cubic yards placed landward of ordinary/mean high water 14,944,200

c. Total acreage to be filled 575.2 Total acreage of wetlands involved 157.9

2. Containment for fill

a. Dikes ☐ b. Seawall, etc. ☐ c. Other (please explain) See Item 10.3
and 10.4 for discussion of erosion and siltation control measures

3. Type of fill material to be used sand/shellrock fill

4. Source of fill material to be used Borrow Lakes on site (See Item 7B)

8. Date activity is proposed to commence 1986 ; to be completed 1989 .

9. Previous permits for this project have been

DER #

Corps #

A. Denied (date) _____

B. Issued (date) _____

C. Other (please explain) DER Power Plant Siting (Concurrent Application)

Differentiate between existing work and proposed work on the drawings.

10. Remarks (See Instruction Pamphlet for additional information required for all applications and certain activities. Use additional sheets if necessary.)

See Attachment C

11. AFFIDAVIT OF OWNERSHIP OR CONTROL of the property on which the proposed project is to be undertaken

I CERTIFY THAT: (please check appropriate space)

[] I am the record owner, lessee, or record easement holder of the property described below.

[X] I am not the record owner, lessee, or record easement holder of the property described below, but I will have before undertaking the proposed work the requisite property interest. (Please explain what the interest will be and how it will be acquired.)

LEGAL DESCRIPTION OF PROPERTY SITUATED IN Palm Beach COUNTY, FLORIDA
(Use additional sheets if necessary)

Negotiations for purchase of these properties are complete; however, the purchase will not be finalized until successful completion of the permitting process.

The legal descriptions of the properties is included in the Attachment B.

Engineer Submitting Application:

Sumpter H. Barker

Florida Registration Number:

#12839
12839

James J. Hunt
Signature
Exec. Dir. P.B.Co. Solid Waste Authority

Sworn and subscribed before me at Palm Beach County,

Florida, this 5th day of June, 1986.

Betty Ann Schmid
NOTARY PUBLIC

My commission expires:

January 11, 1987

12. Application is made for a permit(s) to authorize the activities described herein.

- A. I authorize the agent listed in Item #2 to negotiate modifications or revisions, when necessary, and accept or assent to any stipulations on my behalf.
- B. I understand I may have to provide any additional information/data that may be necessary to provide reasonable assurance or evidence to show that the proposed project will comply with the applicable State Water Quality Standards or other environmental standards both before construction and after the project is completed.
- C. In addition, I agree to provide entry to the project site for inspectors with proper identification or documents as required by law from the environmental agencies for the purpose of making preliminary analyses of the site. Further, I agree to provide entry to the project site for such inspectors to monitor permitted work if a permit is granted.
- D. Further, I hereby acknowledge the obligation and responsibility for obtaining all of the required state, federal or local permits before commencement of construction activities. I also understand that before commencement of this proposed project I must be granted separate permits or authorizations from the U.S. Corps of Engineers, the U.S. Coast Guard, the Department of Environmental Regulation, and the Department of Natural Resources, as necessary.

I CERTIFY that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities.

James H. Miller
Signature of Applicant

6/5/85
Date

NOTE: THIS APPLICATION MUST BE SIGNED by the person who desires to undertake the proposed activity or by an authorized agent. If an agent is applying on behalf of the applicant, attach proof of authority for the agent to sign and bind the applicant.

18 U.S.C. Section 1001 provides that: Whoever in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than \$10,000 or imprisoned not more than five years, or both.

NOTICE TO PERMIT APPLICANTS

This is a Joint Application; it is NOT a Joint Permit!

You Must Obtain All Required Local, State, and Federal

Authorizations or Permits Before Commencing Work!!

For your information: Section 370.034, Florida Statutes, requires that all dredge and fill equipment owned, used, leased, rented or operated in the state shall be registered with the Department of Natural Resources. Before selecting your contractor or equipment you may wish to determine if this requirement has been met. For further information, contact the Chief of the Bureau of Licenses and Motorboat Registration, Department of Natural Resources, 3900 Commonwealth Boulevard, Tallahassee, Florida 32303. Telephone Number 904/488-1195. THIS IS NOT A REQUIREMENT FOR A PERMIT FROM THE DEPARTMENT OF ENVIRONMENTAL REGULATION.

ATTACHMENT A
OWNERSHIP LIST

	<u>Name</u>	<u>Address</u>
1.	City of West Palm Beach	P.O. Box 3366 West Palm Beach, FL 33402
2.	Arthur <u>Gladstone</u>	2295 S. Ocean Blvd. Palm Beach, FL 33480
3.	Nelson L. and Eugena H. <u>Roane</u>	6501 45th St. P.O. Box 2790 West Palm Beach, FL 33402
4.	S.R. and Lenore R.M. <u>Ombres</u>	120 Everglades Ave. Palm Beach, FL 33480
5.	Shaker Corporation	1001 Park Avenue Lake Park, FL 33403
6.	Robert W. Grier	2256 N. Haverhill Rd. West Palm Beach, FL 33409

ATTACHMENT B

LEGAL DESCRIPTION

LEGAL DESCRIPTION

OWNERSHIP NO. 1

JOHN E. CORBALLY, JAMES M. FURMAN AND JAMES M. MURDOCH TRUSTEES UNDER THE
MACARTHUR LIQUIDATING TRUST AGREEMENT DATED DECEMBER 28, 1983.

DESCRIPTION

PARCEL A:

A tract of land lying in Sections 22 and 27, Township 42 South, Range 42 East, Palm Beach County, Florida, and more particularly described as follows:

All that part of Section 22, lying South of the Southerly right-of-way line of the Seaboard Coastline Railroad, and the North one-half of Section 27, Township 42 South, Range 42 East, lying East of a line running North and South which line commences at a point located in the North section line of Section 22, 2,000 feet West of the point at which said North section line is intersected by the Westerly right-of-way of the Sunshine State Parkway, as recorded in Deed Book 1110, Page 583, in the Public Records of Palm Beach County, Florida, and which line terminates at a point situated on the East/West half section of section line of Section 27, 2,000 feet West of a point at which the West right-of-way line of the Sunshine State Parkway intersects said half section line, LESS that part described in Official Record Book 2399, Page 713, in the Public Records of Palm Beach County, Florida, and LESS the right-of-way of said Sunshine State Parkway as conveyed in Deed Book 1110, Page 583, in the Public Records of Palm Beach County, Florida, and as laid out and in use. Also described as: The Easternmost 2,000 feet of Section 22, lying South of the right-of-way of the Seaboard Coastline Railroad, and of the North one-half of Section 27, lying immediately West of the West right-of-way of Sunshine State Parkway, LESS that part described in Official Record Book 2399, Page 713, in the Public Records of Palm Beach County, Florida, and LESS the right-of-way of said Sunshine State Parkway as conveyed in Deed Book 1110, Page 583, in the Public Records of Palm Beach County, Florida, and as laid out and in use.

PARCEL B:

The South half of Section 27 and all of Section 34, Township 42 South, Range 42 East, Palm Beach County, Florida; LESS right-of-way of Sunshine State Parkway as vested in the Florida State Turnpike Authority by Final Judgment in MCC Book 74, Page 662, Public Records of Palm Beach County, Florida, and as laid out and in use.

PARCEL C:

The West 2,632 feet of the North half of Section 3, lying North of State Road 702, LESS the Northwest Quarter of the Northwest Quarter of the Northwest Quarter of said Section 3, all in Township 43 South, Range 42 East, Palm Beach County, Florida.

PARCEL D:

The North one-half of the Northeast quarter of the Northwest quarter of the Northeast quarter of Section 27, Township 42 South, Range 42 East, Palm Beach County, Florida.

OWNERSHIP NO. 2

ARTHUR GLADSTONE, TRUSTEE

DESCRIPTION

PARCEL A:

The North Half of Section 3, Township 43 South, Range 42 East, Palm Beach County, Florida, lying North of the North Right-of-way line of 45th Street (State Road 702) and West of the West right-of-way line of the Sunshine State Parkway, LESS therefrom the West 2,779.41 feet; measured at right angles thereto.

PARCEL B:

The North Half of Section 3, Township 43 South, Range 42 East, Palm Beach County, Florida, lying South of the South right-of-way of 45th Street (State Road 702) and West of the West right-of-way line of the Sunshine State Parkway.

PARCEL C:

That portion of the north half of Section 2, Township 43 South, Range 42 East, Palm Beach County, Florida, lying south of 45th Street and west of Haverhill Road, said parcel containing 73.40 acres, net, and being more particularly described as follows:

Beginning at the quarter section corner in the east line of said Section 2, which is on the centerline of Haverhill Road, as now laid out and in use; thence, run westerly on the south line of said north half of Section 2, angling 93°28'05" from said centerline, from north to west, a distance of 5,296.30 feet to the quarter section corner in the west line of said Section 2, which point is on the easterly right-of-way line of the sunshine state parkway (now known as the Florida Turnpike); thence, run northerly, along said right-of-way line, which is also the west line of said Section 2, angling 87°00'25" from east to north, a distance of 659.85 feet to a point on the centerline of 45th Street, as now laid out and in use; thence, run easterly on said centerline, parallel to the said south line of the north half of Section 2, a distance of 5,301.79 feet to a point on said east line of Section 2, the said centerline of Haverhill Road; thence, run southerly on said centerline, angling 86°31'55" from west to south, a distance of 660.16 feet to the point of beginning; less the north 50 feet thereof and the east 50 feet thereof for road rights-of-way.

SUBJECT TO: Easement to Florida Power & Light Company dated and filed and record on April 20, 1971, recorded in official record book 1891, page 1098, Palm Beach County, Florida records; right-of-way to county of Palm Beach, dated April 15, 1964, recorded in official record book, 1018, page 365, Palm Beach County, Florida records.

SUBJECT TO: Rights-of-way, easements and other matters of record.

ATTACHMENT C

ITEM 10 - REMARKS

10.1 NEED FOR PROPOSED WORK

In Palm Beach County, there has been an increased interest in solid waste disposal with emphasis on the concept of resource recovery. This has been stimulated by a greater awareness of the environmental and siting problems associated with landfill disposal methods, and by the potential for recovering energy and recyclable materials from solid waste. Landfilling, while suitable in other locations, has become increasingly difficult as a primary disposal method in Palm Beach County. Areas which are environmentally and economically suitable for sanitary landfilling in this rapidly urbanizing county are quickly diminishing. Palm Beach County can no longer rely on conventional landfilling as its only method of solid waste disposal and is, therefore, developing an alternative primary disposal method - a refuse derived fuel (RDF) Resource Recovery Facility.

The decision to build a Resource Recovery Facility is the culmination of nine years of dedicated solid waste management planning. Since 1975, the Palm Beach County Solid Waste Authority (the Authority) has been working to find a long-term alternative to sanitary landfilling. The Authority started its effort shortly after the State of Florida enacted legislation (Chapter 403.706 Florida Statutes, FS) requiring heavily populated counties like Palm Beach to submit resource recovery and management plans. Numerous studies, commissioned by the Authority since 1975, have concluded that resource recovery is the prudent long-term solution to the County's refuse disposal needs. By using the energy obtainable from solid waste to generate electricity, resource recovery makes the most sense economically and environmentally.

The primary purpose of the facility is to dispose of the municipal solid waste generated within the County. Non-combustibles and inert ash residue

resulting from the plant's combustion process will be landfilled on the site. The power derived from the combustion of the refuse is an additional benefit. Its sale to FP&L will help offset the overall cost of operating the facility. An affirmative determination of need from the Florida Public Service Commission has been applied for. Other materials may be recovered as market conditions warrant.

The proposed project is designed to help achieve the State's goal of enhancing environmental quality and preserving natural resources. To protect its groundwater and surface water resources, Palm Beach County is striving to limit sanitary landfilling of solid waste and plans to utilize resource recovery, an environmentally sound and economically advantageous method of solid waste disposal.

10.2 ALTERNATIVE SITES (Section 8.1 of the Power Plant Siting Application.)

Since the establishment of the Palm Beach County Solid Waste Authority in 1974, diligent efforts have been made by Authority personnel and consultants to develop an integrated, County-wide solid waste management program. The program involves recycling, resource and energy recovery, transfer stations and landfill facilities, with a major task of the program being identification and acquisition of land suitable for these facilities. Suitable land is a land mass that is technically viable, economically feasible, environmentally sound and socio-politically acceptable.

Facility siting has been the most rigorously developed aspect of the Authority's solid waste management program. A comprehensive site evaluation process has been pursued by the Authority since 1978. A September 1983 report describing this process, which included the involvement of the concerned citizens, and the resulting recommendation to the Board of Solid Waste Authority that the current site be chosen, is included as part of the Compliance Document.

A second report, dated July 11, 1984, which considered alternatives to the designated site is also included in the Compliance Document.

No site investigated was judged perfect from an environmental or socio-political viewpoint; however, the designated site earned the best overall rating.

10.3 MAINTENANCE OF WATER QUALITY

Existing Conditions (Section 2.3 of the Power Plant Siting Application).

Surface water flow on the site is influenced by wetland areas present at the site. The average depth of standing water typically occurring in the wetlands is approximately one foot.

Recent aerial photographs depict wetlands on the project site. At one time, there existed a hydraulic connection between the surface waters in some of these wetlands and the area to the west of the site designated as the West Palm Beach Water Catchment Area (WCA). However, this historical connection is now disrupted by a dike that runs along the eastern boundary of the WCA.

Wetlands in the central portion of the site are hydraulically interconnected by a series of man-made channels, directing flow from west to east across the site. This wetland network presently has three discharge points on the eastern boundary of the site, releasing excess surface water into the canal along Florida's Turnpike. The Turnpike canal, in the vicinity of the site, is not part of any drainage system and has no outlet. It is believed that the installation of this canal was for the primary purpose of interception and groundwater recharge of runoff from the southbound lanes of the Turnpike. The hydraulic connections that presently exist between the wetlands on the site and the Turnpike canal will be interrupted by landfill construction.

A canal in the southeast portion of the site, running east from the abandoned shell pits and under the Turnpike, hydraulically connects limited areas of

the site with the EPB-10 Canal. The elevation in the EPB-10 canal controls, to a certain extent, the surface water elevations on the site. The EPB-10 Canal is part of the Northern Palm Beach Water Control District system which ultimately flows into the C-17 Canal (part of the South Florida Water Management District System).

One other canal is present on the site. This large canal forms the southern boundary of the Gladstone tract south of 45th Street to intercept runoff from property north of the City of West Palm Beach property. This canal has no apparent hydraulic connections with any surface water body or control ditches.

The background surface-water quality of the site was established by analysis of surface waters found at eleven selected sample locations on the site. The sample points were located so as to: (1) determine if there was any surface-water quality differential across the site; (2) reveal any change in water quality within an existing wetland network; and (3) allow evaluation of changes in surface-water quality once facility construction and/or operation begins.

Sampling and analyses were performed with the analytical results summarized in the concurrent Power Plant Siting Application.

The surface water quality is satisfactory when compared to Florida State drinking water regulations. Organic and metals levels are satisfactory. The only problems at the sample locations are color and to a lesser extent, turbidity. The color levels for samples SW-3, 4, 5, 6, 9, 10 and 12 are all over the color standard (15 Pt-Co Units). Coliform counts at SW-4, 6 and 10 are high.

Surface Water Management (Sections 3.5, 3.8, 5.3)

All runoff from the developed areas of the site will be collected and conveyed from these areas through a network of drainage swales and ditches to be constructed concurrent with site development. The final grading plan will be

designed to shed precipitation from the capped landfill through the construction an integrated system of grassed swales, concrete drainage channels, and culverts draining into a series of perimeter drainage channels. The sides of the landfill will be constructed at 4:1 slope. The side slopes will be broken at 20-foot intervals to accommodate 30-foot ($\pm$) wide terraces which will include drainage swales and vegetative buffer zones. The drainage swales will carry intercepted runoff to the drainage spillways installed on the side slopes. The spillways or culvert will meet the landfill perimeter ditch at the base of the landfill. The landfill perimeter ditch will then convey the runoff away from the landfill are to the conservation area.

Sedimentation of runoff from the site will occur within basins along the landfill perimeter prior to the release of runoff from the on-site drainage network into the conservation area. The wetlands located in the conservation area will be used in the stormwater management plan to provide treatment of the stormwater runoff.

Off-site discharge will be released through a drainage control structure (an appropriately size weir) to the EPB-10 canal located east of Florida's Turnpike. The bleeder notch of the weir will be at 16.9 feet NGVD. This corresponds to the average wet season water elevation in the wetlands areas in the conservation area. The crest of the weir will be at 17.3 feet NGVD (Appendix 10.5 of the Power Plant Siting Application). The EPB-10 canal flows easterly terminating at a outfall into the South Florida Water Management District (SFWMD) C-17 canal.

The stormwater runoff for the resource recovery plant area will be directed initially to the wetlands adjacent to the plant site. The routing of the stormwater will be by swales and/or drainage pipes. Baffles, skimmers or other mechanisms will be employed to preclude the discharge of petroleum products into

the adjacent wetlands from parking areas and other locations which such pollutants may be present. From these wetlands the surface water will be directed into the conservation area, providing additional natural treatment of stormwater runoff.

The borrow lakes existing at the site will be expanded to support construction and operation activities at the site. During periods of dredge activity, the turbidity of the water within the borrow lakes will increase. The fill material will be transported from the dredge lakes to settling basins as a slurry in pipes. The water will be piped from the settling basins back to the dredge lakes, forming a closed system. Hence, there will be no inflows or outflows of waters from the borrow lake. Therefore the turbidity will not affect off-site surface water.

Any long-term effects on surface water associated with the operation of the proposed Resource Recovery Facility will not be adverse.

Leachate Management (Section 3.5.5)

Surface water and leachate will be handled in two completely separate systems. Water which has been directly in contact with solid waste or which mixes with other water previously in contact with solid waste, will be considered leachate. Proper management of leachate resulting from the operation of a sanitary landfill is essential to ensure protection of the ground and surface waters near the site. Treatment and/or disposal of landfill leachate in a manner protective of the environment is often difficult, and invariably costly. Sound landfill design practice should include measures to minimize the generation of leachate, thus reducing future treatment/disposal costs.

In an effort to reduce the requirements for treating leachate, several specific measures to minimize the production of leachate will be incorporated into the design of the secure landfill cells to be constructed at the site. A

phased or segmented approach to landfill development will minimize the active areas of solid waste disposal directly exposed to incident precipitation. An extensive system of perimeter and interior berms will be used to prevent mixing of the surface runoff with solid waste. Prompt closure of completed phases or segments of landfill cells will further minimize the amount of rainfall which can penetrate the landfill surface and percolate through the waste cells to produce leachate.

Hazardous Materials (Section 5.4.2)

Florida law prohibits the land disposal of hazardous wastes. Users of the Resource Recovery Facility will be prohibited from delivering any hazardous wastes to the facility for disposal. All personnel involved in receiving and processing municipal solid waste will be trained to identify and remove potential hazardous items in the waste stream. Hazardous wastes will be stored in a specially designed facility until removed for safe disposal.

A chemical and EP toxicity analysis of the combined ash residue will be conducted after commencement of operation to determine toxicity or hazard (includes both combustion residue and Air Pollution Control (APC) device residues). A chemical analysis of the combustion residue will be conducted after commencement of operation to ensure compatibility for disposal in a sanitary landfill.

It will be the responsibility of the facility operator to determine if the ash residue is classified as hazardous according to EPA or DER regulations. Experience at other similar facilities has shown that the bottom and fly ash can pass the EP toxicity test; i.e., considered a non-hazardous waste material. This waste material would be suitable for disposal in a permitted Class I sanitary landfill.

Downstream Impacts (Section 5.9.2)

As discussed in Section 4.2, the allowable discharge for the 1,320 acre Resource Recovery Facility site will be 129 cubic feet per second (cfs). No stormwater runoff from the resource recovery plant or the landfills will be discharged directly from the site, but all water will be directed, after passing through sedimentation mechanisms, into the conservation area on the western portion of the site. This water will enhance the wetlands quality in the conservation area and receive natural treatment.

Moreover, leachate produced in the landfill will be completely contained by the leachate management system (Section 5.3.4). Therefore, there will be no mixing of leachate with stormwater runoff. Hence, any water discharged from the site into EPB-10 Canal will be of good quality, similar to that described in Section 2.3.4. The EPB-10 Canal flows from the easterly right-of-way of Florida's Turnpike east to the South Florida Water Management District's C-17 Canal. The C-17 Canal discharges into Earman River which discharges into Lake Worth which is connected to the Atlantic Ocean. An analysis of the flows from the site and the C-17 Canal indicates that the discharge would have negligible effects. The site discharge (129 cfs) is approximately 6 percent of the total discharge allowed from the C-17 Canal (2,100 cfs) and is negligible in comparison to the discharge allowed from the Earman River.

10.4 WETLANDS

Five basic wetland types occur on the site. Four are palustrine, one lacustrine. These types are: Palustrine, open water; Palustrine, emergent; Palustrine, shrub-scrub; Palustrine, forested; Lacustrine, open water. A more detailed discussion of the composition and condition of the wetlands can be found in Section 2.3.5 of the Power Plant Siting Application.

Both the Army Corps of Engineers and the Florida DER have jurisdiction over wetlands on this site. The Corps of Engineers has jurisdiction over approximately 391 acres of wetland. This figure is an estimate based on several meetings and an on-site visit with a representative from the Corps of Engineers Stuart Regulatory Office. DER has authority over approximately 195 acres of wetlands. This acreage estimate was determined after an on-site visit with a representative from DER and a meeting with DER Dredge and Fill permitting personnel in the Southeast Florida District Office.

Yardage of material dredged from uplands and wetlands is shown in Table I. The dimensions of the dredge lakes are indicated on Table II. The existing borrow lake covers 82 acres.

Consumption of fill material obtained through these dredging operations is also shown in Table I. Note that some of the fill material obtained will be used in the current operation and closure of the existing Dyer Boulevard Land-fill, which is scheduled for closure in 1987. The other construction activities noted involve placing fill on already filled areas to bring them to design specifications.

Acreage of upland and wetland dredged is shown in Table III. Acreage of upland and wetland to be filled is also shown in Table III. The difference in wetland acreages between Corps and DER is because of differences in jurisdictional limits.

Mitigation for dredging and filling activities in wetlands is proposed in two areas. The first area is incorporated into the 427 acre conservation area. The conservation area consists of 159 acres of undisturbed wetlands and 90 acres of uplands, and approximately 178 acres of abandoned shellrock mining pits and adjacent disturbed areas. The shellrock pits will be reclaimed as a mitigation effort. This will be accomplished by pushing spoil material in existing piles

into the deeper areas (approximately 6 - 12 feet in depth) as backfill. The spoil piles will be scraped down to 1 to 3 feet below average maximum wet season water depth. This shallow littoral zone will then be planted with appropriate wetland vegetation (Drawing 3D).

These reclaimed areas will be hydrologically connected to adjacent wetlands within the conservation area. The entire 427 acre area would serve as a retention area for surface water runoff from the developed portions of the site. Details concerning the design on operation of the conservation area and the stormwater management system are included in Sections 4.2, 5.3 and Appendix 10.5 of the Power Plant Siting Application.

The second mitigation activity involves the creation of 12 acres of seasonally flooded littoral zone along the margins of the proposed dredge lakes. These areas would extend landward of the normal slopes required on dredge lakes and would be constructed with an elevation that allows for seasonal drying of the wetlands with hydroperiods typical for the region (Drawing 3D).

Revegetation of both of these areas will be accomplished through a combination of transplanting, mulching, and natural processes. Materials from wetlands on site that will be disturbed through site development will be used as a source wherever possible.

TABLE I
DREDGE AND FILL QUANTITIES

A. YARDAGE DREDGED

<u>Location</u>	<u>Yardage</u>
Existing Lake Expansion	8,851,300
Lake West of Landfill	4,833,800
Lakes South of 45th Street	<u>1,259,100</u>
TOTAL CUBIC YARDS	14,944,200

B. YARDAGE CONSUMED

<u>Operation</u>	<u>Yardage</u>
Dyer Boulevard Landfill Closure	1,634,300
Landfill Construction and Operation	12,857,300
Resource Recovery Plant Construction	259,000
North-South Roadway Construction	131,000
Other Construction *	<u>62,600</u>
TOTAL CUBIC YARDS	14,944,200

* Includes 45th Street construction, west property line berm maintenance, conservation area berms.

TABLE II
DIMENSION OF DREDGE LAKES

	<u>Length (ft)</u>	<u>Width (ft)</u>	<u>Depth (ft)</u>
Existing Lake	2,000	1,500	25
(current) Expansion	3,900	1,600	50
Lake West of Landfill	3,200	850	50
Lakes South of 45th Street (East)	2,550	450	50
(West)	1,900	450	50

TABLE III
DREDGE AND FILL ACREAGES

A. ACREAGE DREDGED

<u>Location</u>	<u>Upland</u>	<u>Wetland</u>	
		<u>COE</u>	<u>DER</u>
Existing Lake Expansion	37.0	8.0	5.9
Lake West of Landfill	43.3	24.7	22.3
Lakes South of 45th Street	<u>40.0</u>	<u>--</u>	<u>--</u>
TOTAL ACREAGE	120.3	32.7	28.2

B. ACREAGE FILLED

<u>Use</u>	<u>Upland</u>	<u>Wetland</u>	
		<u>COE</u>	<u>DER</u>
Landfill	253.9	131.1	91.0
Resource Recovery Plant	35.0	14.6	--
North-South Roadway *	<u>29.4</u>	<u>12.2</u>	<u>12.0</u>
TOTAL ACREAGE	417.3	157.9	103.0

* Acreages of wetlands disturbed by construction of the north-south roadway are approximate depending upon final alignment.

10.5 DREDGING

A barge-mounted hydraulic dredge with a nozzle capable of penetrating thin layers of consolidated sand will be used to withdraw sand and shellrock dredge material to a maximum depth of 50 feet.

10.6 FILLING

Three primary types of structures will be placed on the sand and shellrock fill: the resource recovery plant, the north-south road and the Class I and Class III landfills. These facilities and their construction are discussed in Section 3.2 of the Power Plant Siting Application. Although the activity is not strictly water dependent, no practical alternatives to the activity on this site exist. (See paragraph 10.2 concerning alternative sites.) Items 10.3 and 10.4 of this application describe procedures to be followed to insure that construction and operation of the Resource Recovery Facility will not cause a permanent, unacceptable disruption of the aquatic ecosystem. See Sections 3.5, 3.8, 4.2, 4.3, 5.1, 5.2, 5.3, 5.4 and 5.5 and Appendices 10.4, 10.5, 10.6, 10.7, 10.8 and 10.14 of the Power Plant Siting Application for a more detailed presentation of information related to the aquatic ecosystem.

ATTACHMENT D

PICTURES AND DRAWINGS

Notes on Drawings 1 through 3

1. The location of the plant is approximately:

Latitude: 26° 46' 00" N

Longitude: 80° 08' 45" W

2. The extent of wetlands is shown on Drawing 2B with approximate locations and size of facilities indicated on Drawing 2A. Dredge and fill cubic yards and acreages are indicated on Tables I and II under Item 10 of this application. All acreages are landward of the ordinary high water line.

3. The water elevation on site will be maintained at approximately 16.9' NGVD using a wier control structure on the eastern boundary on the site.

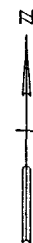
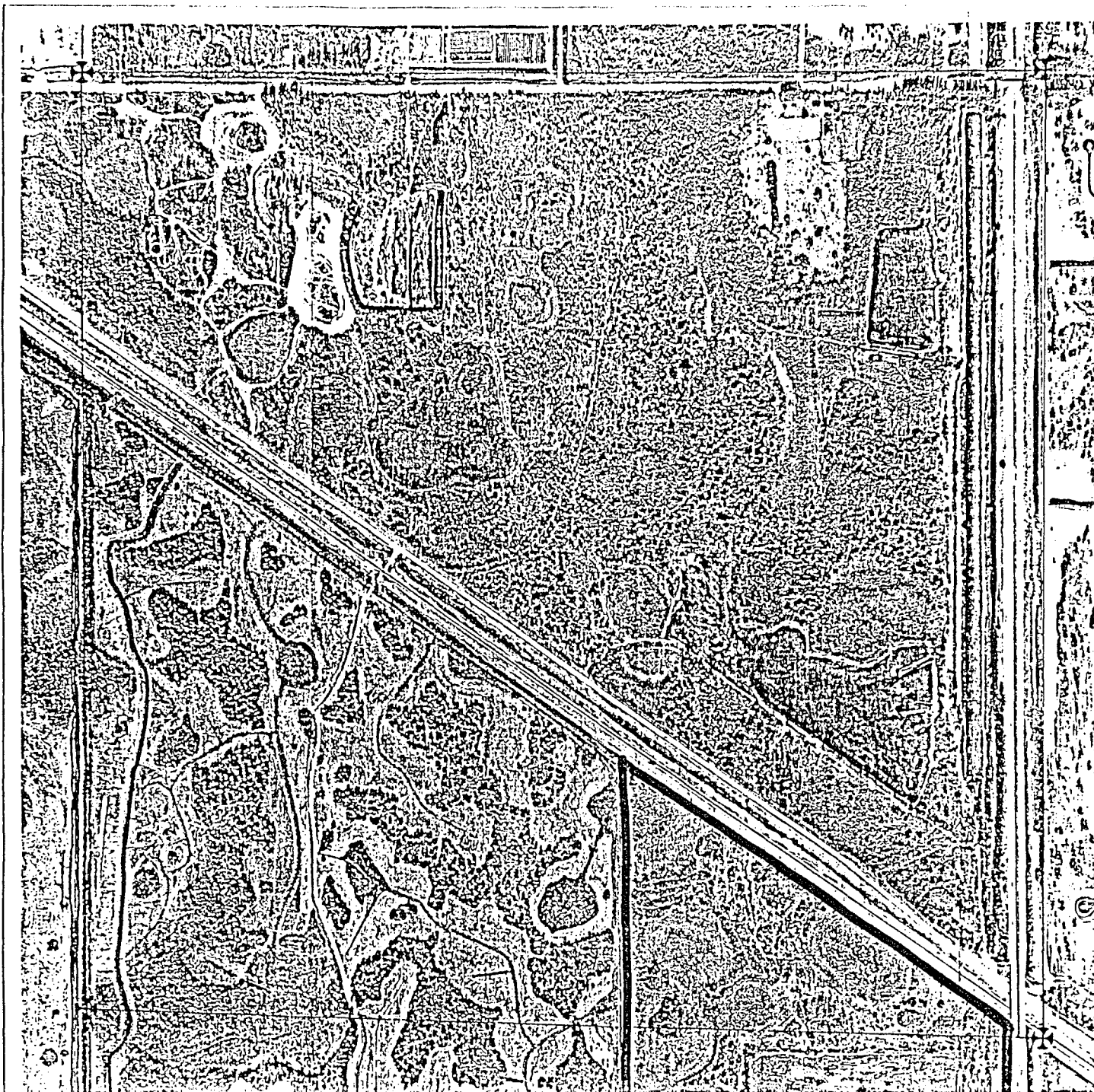
A typical landfill cross section is shown in Drawing 3A with proposed landfill planting pictured on Drawing 3B.

Typical plant elevations are depicted on Drawing 3C.

Typical wetlands cross sections are indicated on Drawing 3D.

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.

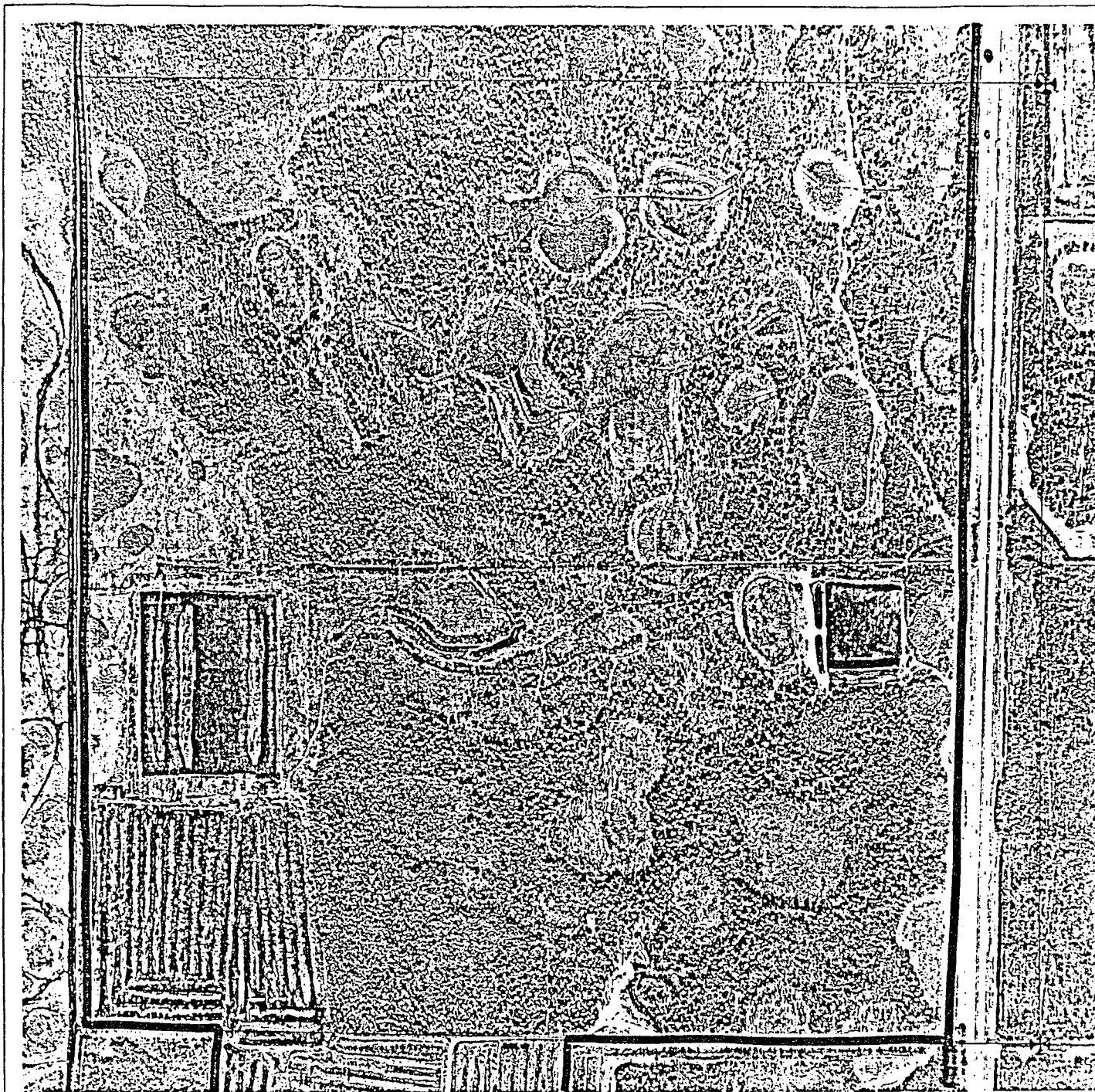


NOTE
 THIS MAP IS APPROXIMATE IN
 SIZE AND SCALE BY COMPARE
 TO THE ACTUAL SIZE OF THE
 PALM BEACH COUNTY
 PROPERTY APPRAISAL
 MAP AND THE ACTUAL SIZE
 OF THE PROPERTY IS NOT TO BE
 USED FOR ANY OTHER PURPOSE

**PALM BEACH
 COUNTY**

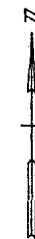
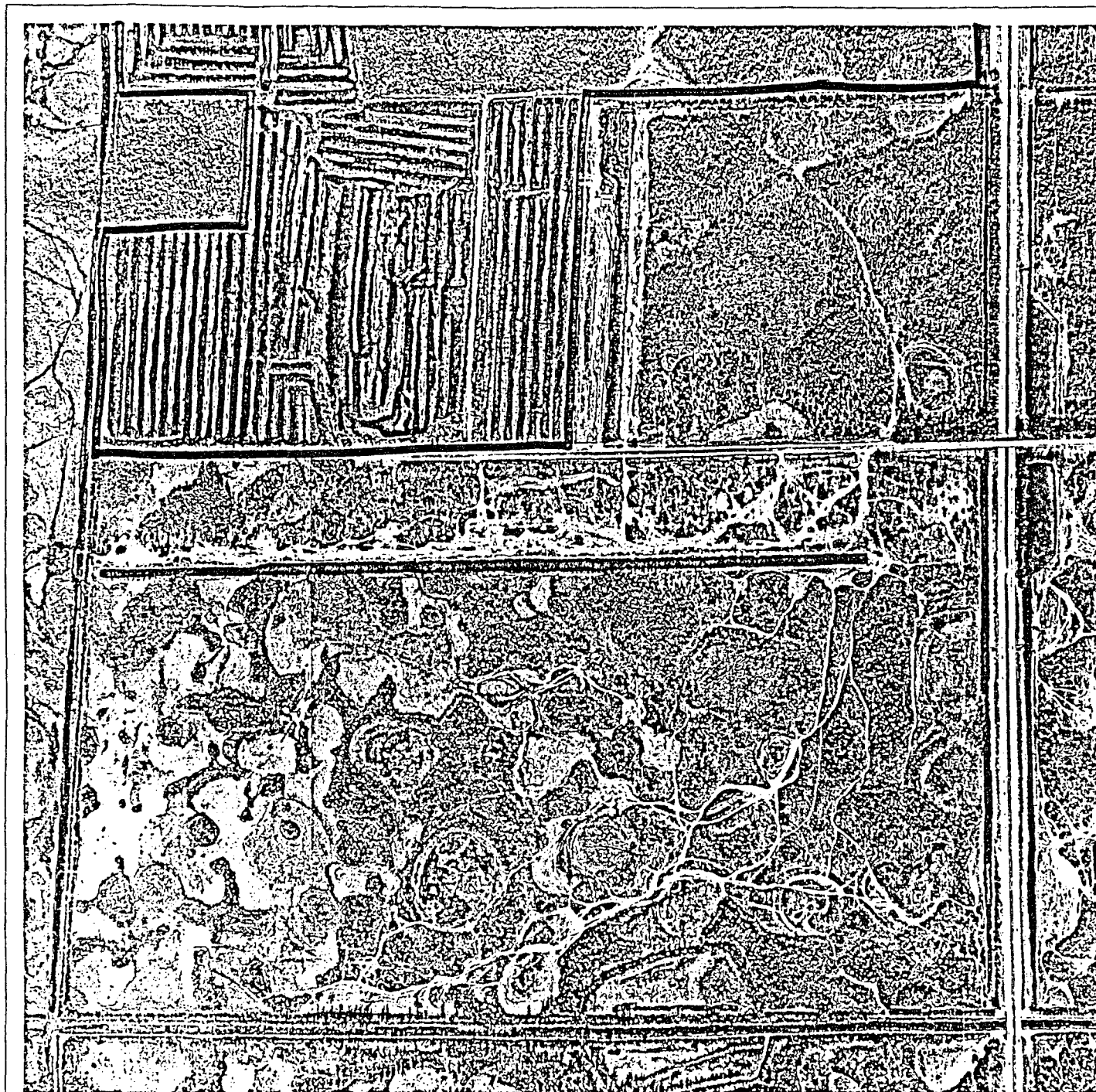
PROPERTY APPRAISAL

AGE	VAL	AC	AC
42	42	22*	42-33



NOT TO BE REPRODUCED IN
ANY FORM WITHOUT THE WRITTEN
PERMISSION OF THE
PALM BEACH COUNTY
PROPERTY APPRAISER
DATE: 10/1/83
BY: [Signature]

PALM BEACH COUNTY			
PROPERTY APPRAISER			
42	42	34	42-34
SCALE 1"=200'			
DRAWN BY: [Signature]			



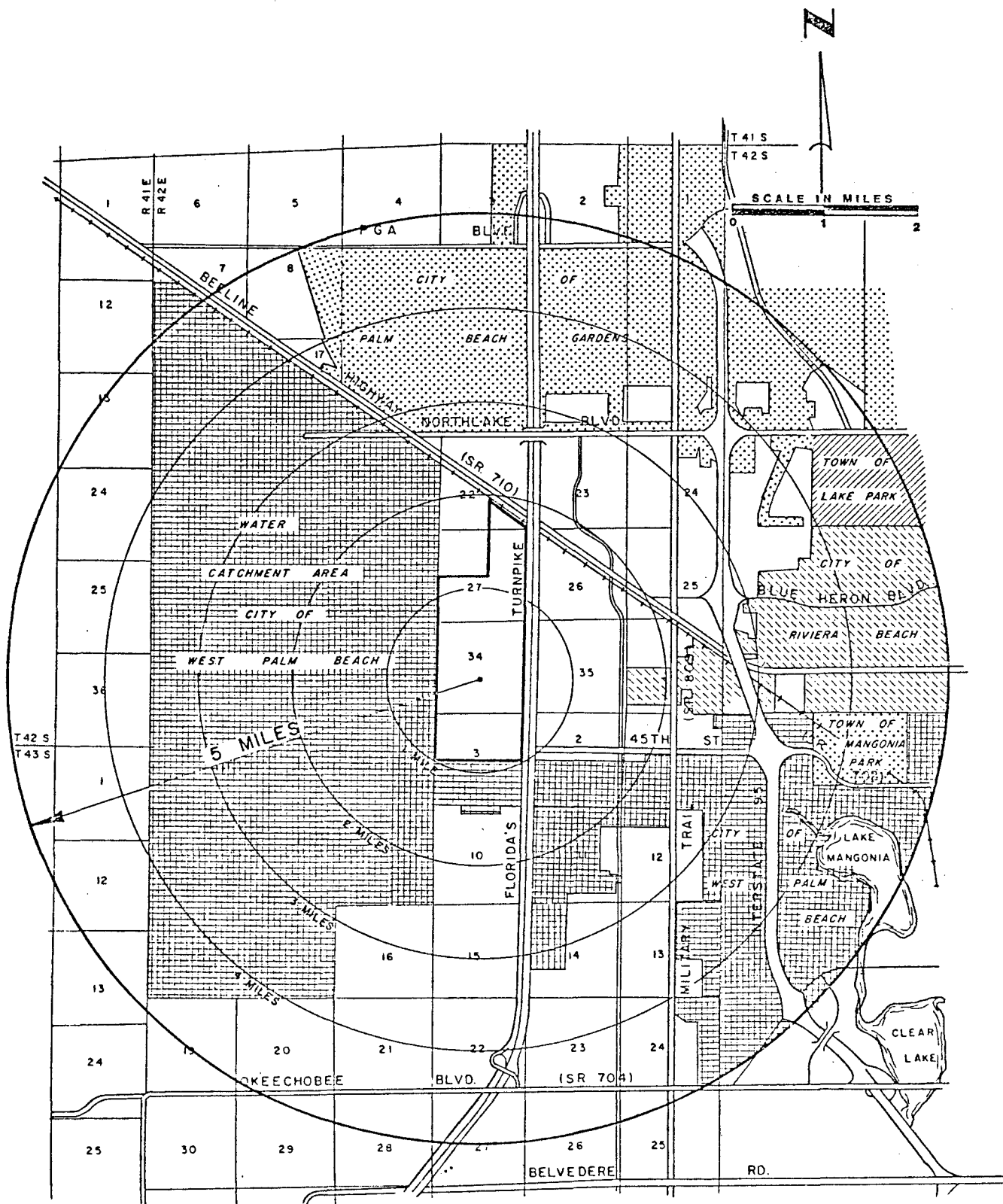
1. This map is prepared by
 2. the Department of Public Works
 3. and is subject to the approval
 4. of the Board of Public Works
 5. and the Board of Commissioners
 6. of the County of Palm Beach
 7. and the State of Florida
 8. and is subject to the approval
 9. of the Board of Public Works
 10. and the Board of Commissioners
 11. of the County of Palm Beach
 12. and the State of Florida

PALM BEACH COUNTY

PROPERTY APPRAISER

AGE	TWP	SIC	RENTAL
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SCALE 1"=200'			
DRAWN BY			
DATE			

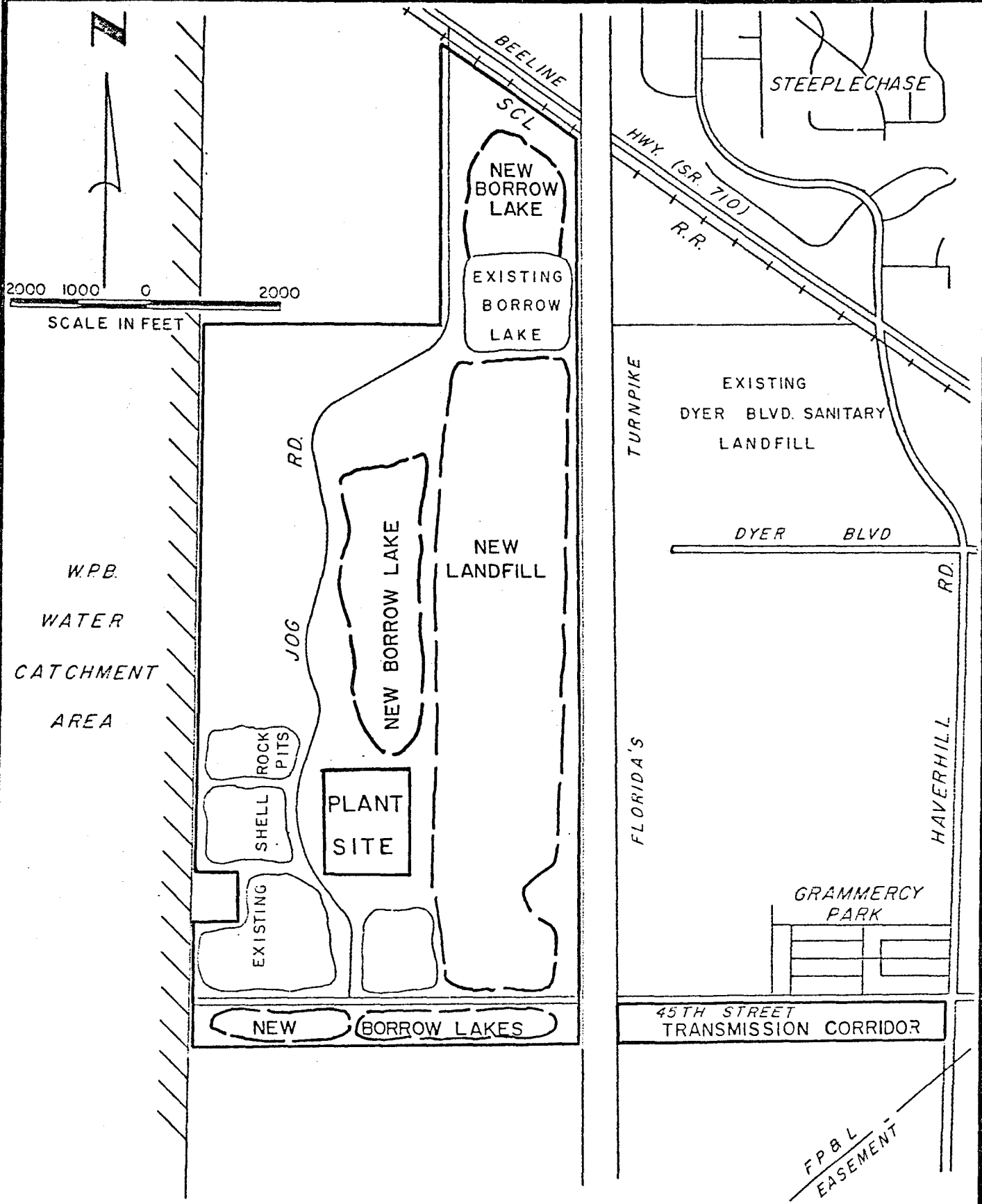
PLATTING DATE: JANUARY 10, 1981



**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**VICINITY MAP - WETLANDS ADJACENT
TO FLORIDA'S TURNPIKE 8 & THE CITY OF
WEST PALM BEACH WATER CATCHMENT AREA
DWG. 1**

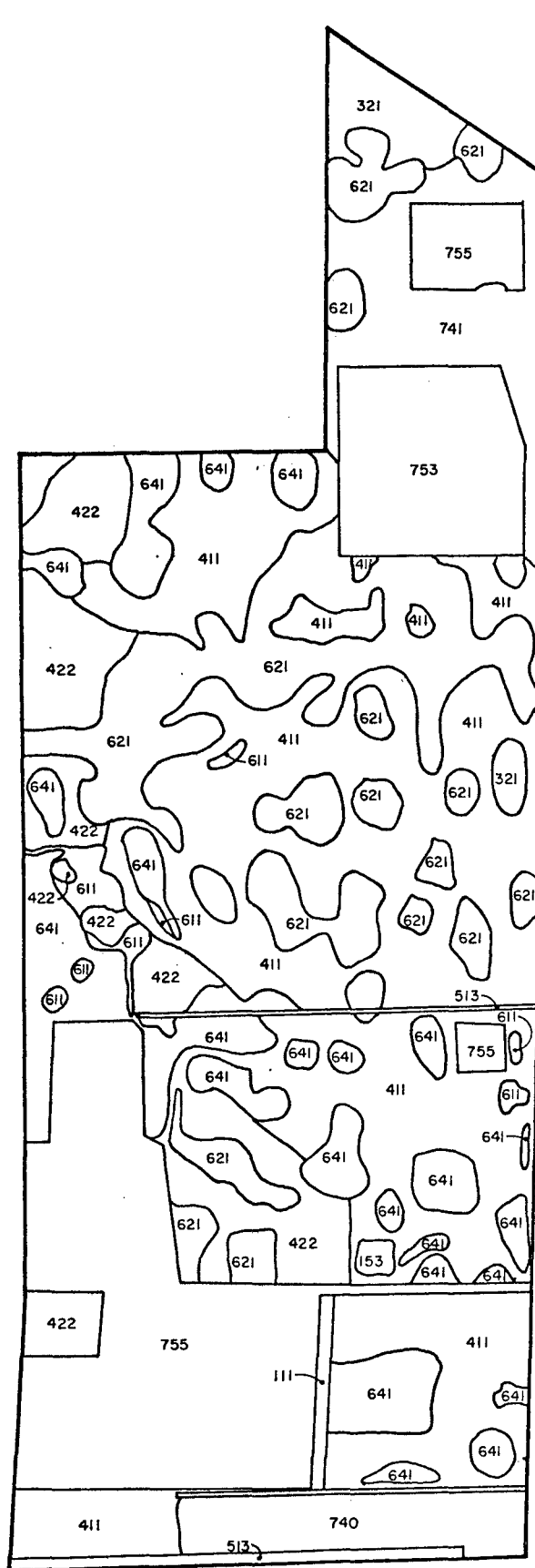


PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY

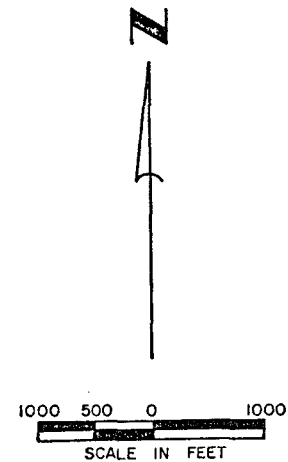


PLAN VIEW-FACILITIES TO BE CONSTRUCTED

DWG. 2A



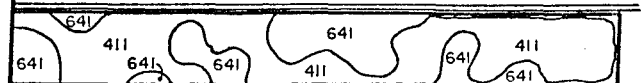
FLORIDA'S TURNPIKE



LEGEND

- 111 SINGLE UNIT , LOW DENSITY HOUSING
- 153 BROADCASTING TOWER
- 321 PALMETTO PRAIRIES
- 411 PINE FLATWOODS
- 422 OTHER HARDWOODS
- 513 CANALS
- 611 CYPRESS WETLAND FOREST
- 621 FRESHWATER SWAMP
- 641 FRESHWATER MARSH
- 740 ALTERED LANDS
- 741 SCRAPED AREAS
- 753 SAND , GRAVEL OR CLAY EXTRACTIVE
- 755 ABANDONED EXTRACTIVE

45TH STREET

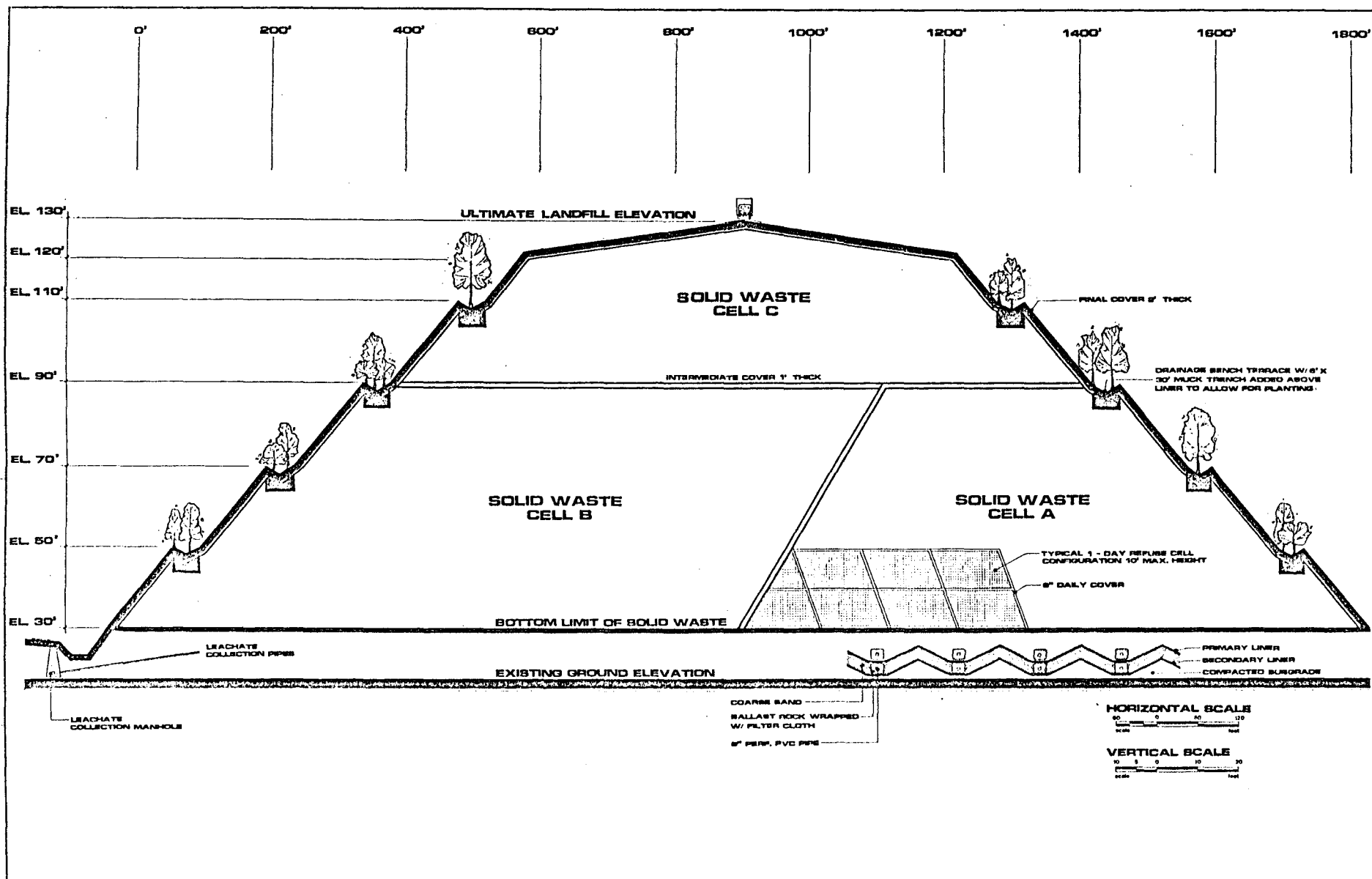


**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



**PLAN VIEW - LOCATION OF
WETLANDS**

DWG. 2 B



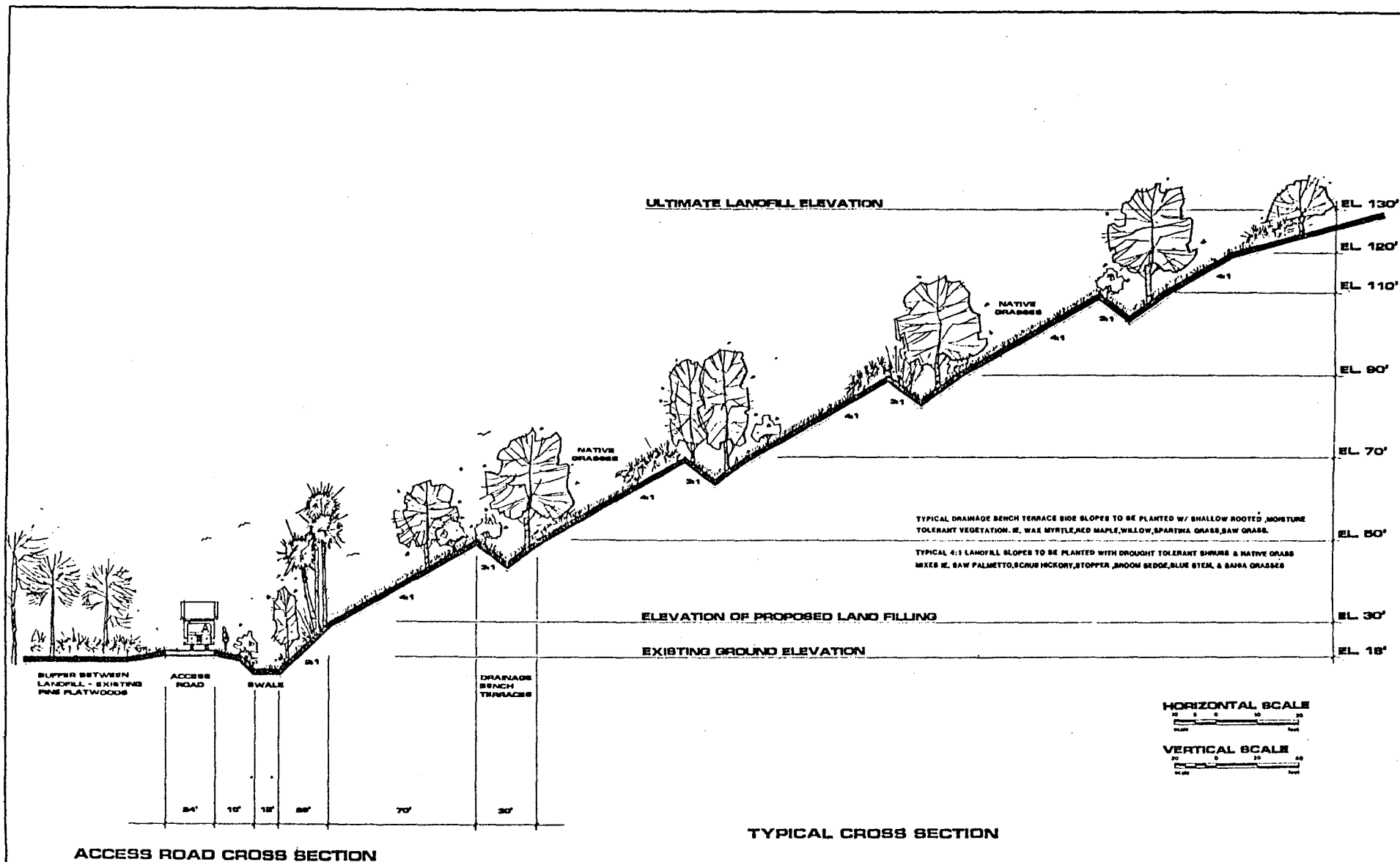
PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



TYPICAL LANDFILL CROSS SECTION

DWG. 3A



PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



PROPOSED LANDFILL PLANTINGS

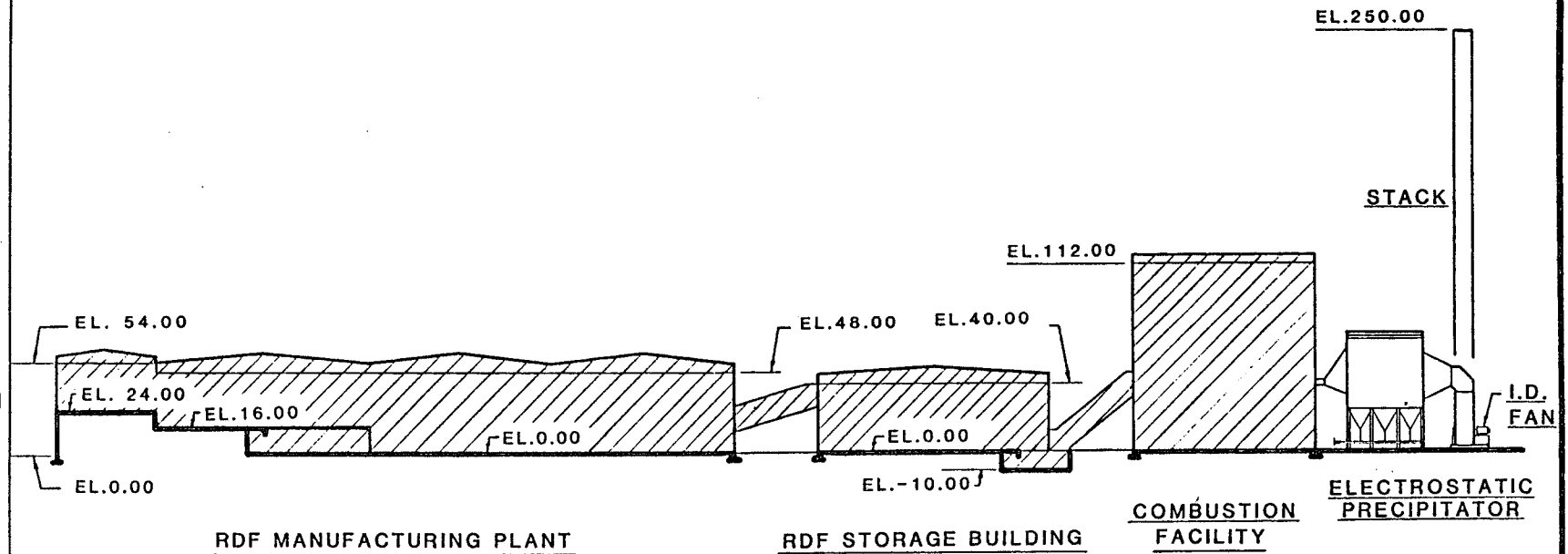
DWG. 3B

PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY

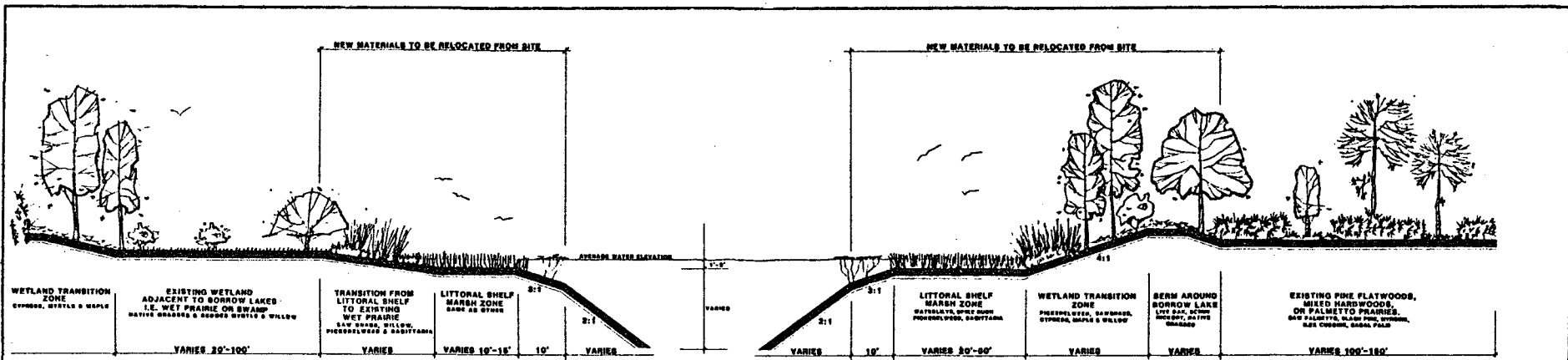


TYPICAL SECTION THROUGH
RESOURCE RECOVERY FACILITY

DWG. 3 C

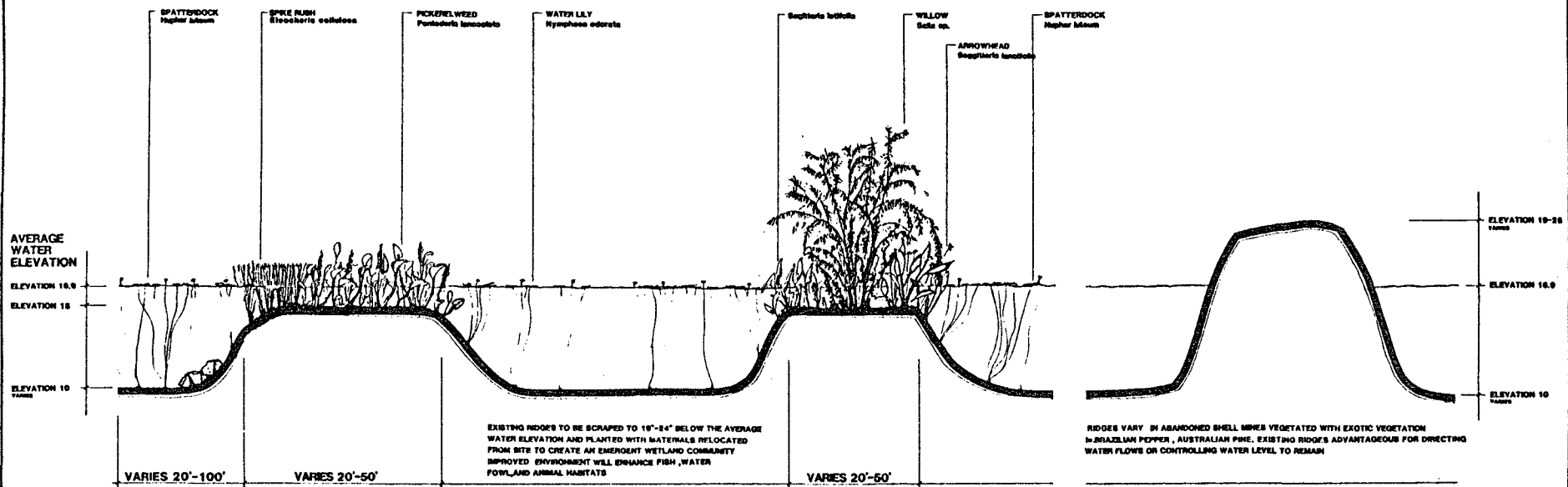


60 30 0 60
1" = 60'
SCALE IN FEET



LITTORAL ZONE ESTABLISHMENT WHEN LAKE IS ADJACENT TO EXISTING WETLAND

LITTORAL ZONE ESTABLISHMENT



PROPOSED WETLAND ESTABLISHMENT

EXISTING CONDITIONS

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



WETLAND ESTABLISHMENT

DWG. 30

APPENDIX 10.1.6

COASTAL ZONE MANAGEMENT CERTIFICATIONS

APPENDIX 10.1.6

COASTAL ZONE MANAGEMENT CERTIFICATIONS

According to the Florida Coastal Management Program (FCMP) Federal Consistency Evaluation Procedures (15 CFR 930.50), all federal permits for which there are no analogous state permits require evaluation and certification as to their consistency with the FCMP.

The only federal permit subject to this process is the Stack Height Permit (U.S. Department of Transportation, Federal Aviation Administration, SS.14 CFR 77. The information required for this evaluation includes: a written and pictorial description of the project; a statement of the project's consistency with the FCMP, signed by the applicant; and, an assessment of the probable effects of the project as they relate the relevant FCMP statutes.

The information required for evaluation and certification of consistency with the FCMP must be sent to the appropriate federal agency (FAA) along with the permit applications. Moreover, 10 copies must be submitted to the Federal Consistency Coordinator of the Florida State Planning and Development Clearinghouse, FDER. (15 CFR 930.58)

Florida DER evaluation begins upon receipt of the consistency certification and application, with a response to be made to the applicant "at the earliest practicable time". The applicant may presume consistency if no objection is received from the state within 6 months from the beginning of the evaluation (15 CFR 930.63). If the state affirms the consistency, the federal agency may grant the permit to the applicant. If the state objects to the applicant's consistency certification, any objections must specify how the project is inconsistent with the FCMP and any possible alternatives which would allow the project to be ruled consistent with the FCMP (15 CFR 930.64).

A copy of the permit application and the evaluation information is included in this appendix.

FAA

FLORIDA COASTAL ZONE MANAGEMENT CERTIFICATION

PALM BEACH COUNTY SOLID WASTE AUTHORITY



Federal Coordinator
Florida Department of
Environmental Regulation
Division of Permitting
2600 Blair Stone Road
Tallahassee, Florida 32301

Attn: Richard Smith, DER Federal Consistency Coordinator

Re: Palm Beach County Solid Waste Authority Resource
Recovery Facility: FAA-Coastal Zone
Management Certification

Dear Mr. Smith:

According to Florida Coastal Management Program (FCMP) Federal Consistency Evaluation Procedures (15 CFR 930.50), all Federal permits for which there are no analogous State permits require certification of compliance with the FCMP.

A Federal permit applicable to the proposed project for which no analogous State permit exists is the U.S. Department of Transportation Federal Aviation Administration (FAA) stack height permit (SS.14 CFR 77). In accordance with the requirements of the Federal Consistency Evaluation Procedures, this permit application must be accompanied by a consistency certification. The certification package includes:

- * a written and pictorial description of the project;
- * a signed statement (by the applicant) of the proposed project's consistency with the FCMP; and,
- * an assessment of the probable project impacts with respect to relevant FCMP statutes.

As specified in 15 CFR 930.58, the certification package and permit application (FAA Form 7460.1) must be sent to the appropriate Federal agency (FAA) and ten (10) copies must be submitted to the Federal Consistency Coordinator of the Florida State Planning and Development Clearinghouse, DER. Copies of the permit application and certification are enclosed. Under separate cover, the certification package and permit application has been sent to the FAA Regional Office in Atlanta for their review.

Federal Coordinator
Page Two

As required by your office, the Solid Waste Authority is submitting the enclosed FAA permit application and the consistency certification package for the Authority's Resource Recovery Facility.

If, after reviewing there materials, you have questions or require additional information, please contact this office at (305) 471-5770.

Very truly yours,

A handwritten signature in cursive script, appearing to read "Timothy F. Hunt, Jr.", written in dark ink.

Timothy F. Hunt, Jr.
Executive Director

TH/pc
enclosure
cc: Richard Tucker, DER
Office of Coastal Zone Management

APPLICATION PACKAGE

SUBMITTED TO FEDERAL AVIATION ADMINISTRATION
IN MARCH, 1985
(NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION)

PALM BEACH COUNTY SOLID WASTE AUTHORITY



Chief of Air Traffic Division
Federal Aviation Administration
ASO-Southern Region
3400 Norman Berry Drive
Post Office Box 20636
Atlanta, GA 30320

Attn: ASO-530

Gentlemen:

Pursuant to Federal Aviation Regulations, Part 77.13, Subchapter B, the Palm Beach County Solid Waste Authority is hereby notifying the Federal Aviation Administration of the proposed construction of a solid waste resource recovery facility to serve the Palm Beach County. Attached please find one signed copy of FAA Form 7460-1, "Notice of Proposed Construction or Alteration".

As specified in the Federal Consistency Evaluation Procedures (15 CFR 930.50), all Federal permits for which there are not analogous State permits require certification of compliance with the Federal Coastal Zone Management Program. The Federal Aviation Administration "Stack Height Permit" has no analogous State of Florida permit. Therefore, in accordance with the requirements of the Federal Consistency Evaluation Procedures, this previously approved notice is accompanied by an "FAA Florida Coastal Zone Management Certification". As specified in 15 CFR 930.58, ten (10) copies of the signed FAA Form 7460-1 and the "FAA Florida Coastal Zone Management Certification" have been sent under separate cover to the Federal Consistency Coordinator of the Florida State Planning and Development Clearinghouse, Department of Environmental Regulation.

We trust that the information accompanying the signed FAA Form 7460-1 will be useful and satisfactory to you. Please contact this office (305) 471-5770 if you have any additional questions.

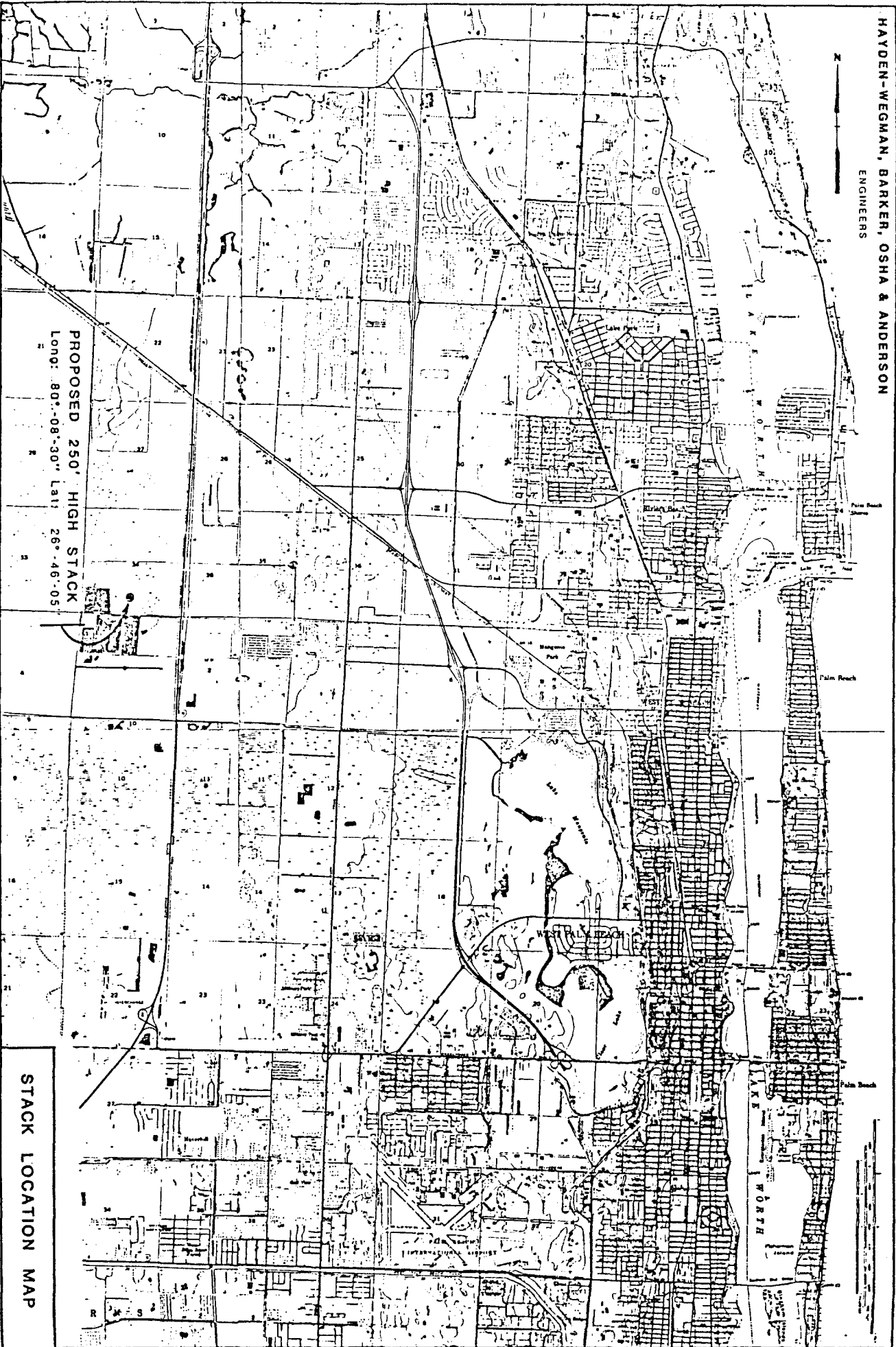
Very truly yours,

A handwritten signature in dark ink, appearing to read "Timothy F. Hunt, Jr.", is written over a horizontal line.

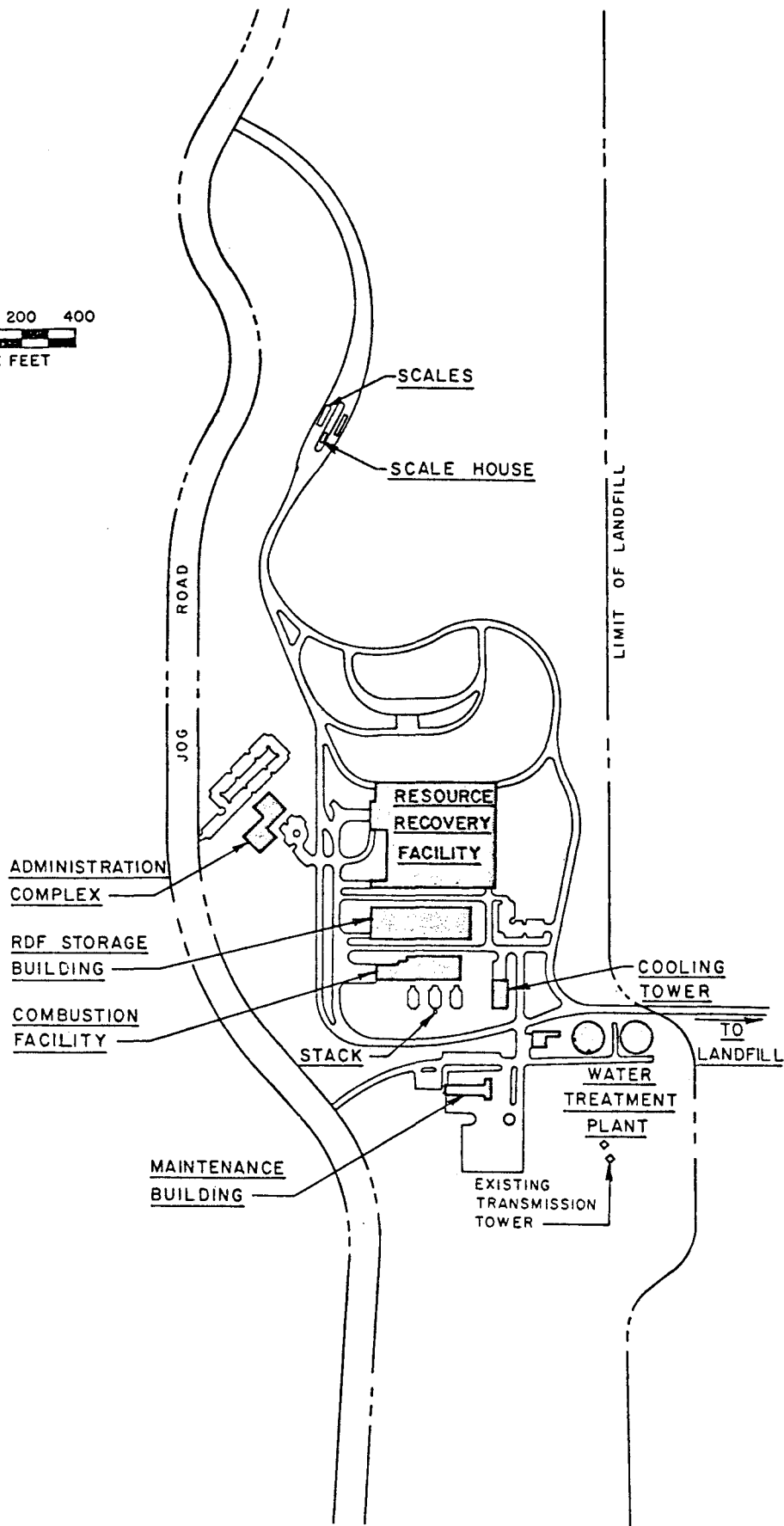
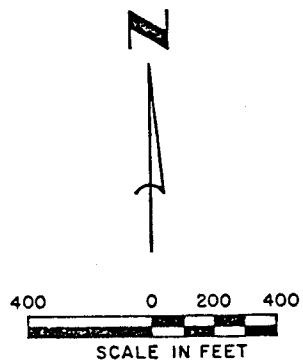
Timothy F. Hunt, Jr.
Executive Director

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION			Aeronautical Study Number
U.S. Department of Transportation Federal Aviation Administration 35 MAR 85			85-ASO-451-OE
1. Nature of Proposal		2. Complete Description of Structure	
A. Type ☒ New Construction ☐ Alteration	B. Class ☒ Permanent ☐ Temporary (Duration _____ months)	C. Work Schedule Dates Beginning <u>Jan 1988 Est.</u> End <u>July 1988 Est.</u>	
3A. Name and address of individual, company, corporation, etc. proposing the construction or alteration. (Number, Street, City, State and Zip Code) (305) <u>471-3770</u> area code Telephone Number PALM BEACH COUNTY SOLID WASTE AUTHORITY 5114 OKEECHOBEE BLVD., SUITE 2-C WEST PALM BEACH, FL 33409		A. Include effective radiated power and assigned frequency of all existing, proposed or modified AM, FM, or TV broadcast stations utilizing this structure. B. Include size and configuration of power transmission lines and their supporting towers in the vicinity of FAA facilities and public airports. C. Include information showing site orientation, dimensions, and construction materials of the proposed structure. Masonry or Steel Stack with 5.69 Ft I.D. x 250 Ft. high (Attached Site Layout)	
B. Name, address and telephone number of proponent's representative if different than 3 above. S. G. Timmerman (305) 471-0444 Hayden-Wegman/Barker, Osha & Anderson 5114 Okeechobee Blvd., Suite 2-B West Palm Beach, FL 33409		(If more space is required, continue on a separate sheet.)	
4. Location of Structure		5. Height and Elevation (Complete to the nearest foot)	
A. Coordinates (To nearest second) 26° 46' 05" Latitude 80° 08' 30" Longitude	B. Nearest City or Town, and State Riviera Beach, FL 1.5 Miles	C. Name of nearest airport, heliport, flight park, or seaplane base W. Palm Beach International (1) Distance from structure to nearest point of nearest runway 28,500 Ft (2) Direction from structure to airport Southeast	
D. Description of location of site with respect to highways, streets, airports, prominent terrain features, existing structures, etc. Attach a U.S. Geological Survey quadrangle map or equivalent showing the relationship of construction site to nearest airport(s). (If more space is required, continue on a separate sheet of paper and attach to this notice.) 2600 FT West Florida Turnpike (Attached Location Maps) 2900 FT North 45th Street 800 FT Northwest 591 FT High Radio Antenna (Station WEAT)		A. Elevation of site above mean sea level 20 Ft. B. Height of Structure including all appurtenances and lighting (if any) above ground, or water if so situated 250 Ft. C. Overall height above mean sea level (A + B) 270 Ft.	
Notice is required by Part 77 of the Federal Aviation Regulations (14 C.F.R. Part 77) pursuant to Section 1101 of the Federal Aviation Act of 1958, as amended (49 U.S.C. 1101). Persons who knowingly and willingly violate the Notice requirements of Part 77 are subject to a fine (criminal penalty) of not more than \$500 for the first offense and not more than \$2,000 for subsequent offenses, pursuant to Section 902(a) of the Federal Aviation Act of 1958, as amended (49 U.S.C. 1472(a)).			
I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to obstruction mark and/or light the structure in accordance with established marking & lighting standards if necessary.			
Date	Typed Name/Title of Person Filing Notice		Signature
March 1985	Timothy F. Hunt, Jr., Executive Director		<i>Timothy F. Hunt Jr.</i>
FOR FAA USE ONLY			
The Proposal: ☐ Does not require a notice to FAA. ☒ Is not identified as an obstruction under any standard of FAR, Part 77, Subpart C, and would not be a hazard to air navigation. ☐ Is identified as an obstruction under the standards of FAR, Part 77, Subpart C, but would not be a hazard to air navigation. ☒ Should be obstruction marked, lighted per FAA Advisory Circular 70/7460-1, Chapter(s) <u>4, 5 & 9</u> ☐ Obstruction marking and lighting are not necessary.		Supplemental Notice of Construction FAA Form 7460-2 is required any time the project is abandoned, or ☒ At least 48 hours before the start of construction. ☒ Within five days after the construction reaches its greatest height. This determination expires on <u>10/29/86</u> unless: (a) extended, revised or terminated by the issuing office; (b) the construction is subject to the licensing authority of the Federal Communications Commission and an application for a construction permit is made to the FCC on or before the above expiration date. In such case the determination expires on the date prescribed by the FCC for completion of construction, or on the date the FCC denies the application. NOTE: Request for extension of the effective period of this determination must be postmarked or delivered to the issuing office at least 15 days prior to the expiration date. If the structure is subject to the licensing authority of the FCC, a copy of this determination will be sent to that Agency.	
Remarks:			
Issued In	Signature		Date
<i>Atlanta Georgia</i>	<i>Timothy F. Hunt Jr.</i>		<u>4/29/85</u>

HAYDEN-WEGMAN, BARKER, OSHA & ANDERSON
ENGINEERS



STACK LOCATION MAP



DESCRIPTION OF THE PROJECT

BACKGROUND INFORMATION

In Palm Beach County, there has been an increased interest in solid waste disposal with emphasis on the concept of resource recovery. This has been stimulated by a greater awareness of the environmental and siting problems associated with landfill disposal methods, and by the potential for recovering energy and recyclable materials from solid waste. Landfilling, while suitable in other locations, has become increasingly difficult as a primary disposal method in Palm Beach County. Areas which are environmentally and economically suitable for sanitary landfilling in this rapidly urbanizing county are quickly diminishing. Palm Beach County can no longer rely on conventional landfilling as its only method of solid waste disposal and is, therefore, developing an alternative primary disposal method - a refuse derived fuel (RDF) Resource Recovery Facility.

The decision to build a solid waste Resource Recovery Facility is the culmination of nine years of dedicated solid waste management planning. Since 1975, the Palm Beach County Solid Waste Authority (the Authority) has been working to find a long-term alternative to sanitary landfilling. The Authority started its effort shortly after the State of Florida enacted legislation (Chapter 403.706 Florida Statutes, F.S. requiring heavily populated counties like Palm Beach to submit resource recovery and management plans. Numerous studies, commissioned by the Authority since 1975, have concluded that resource recovery is the prudent long-term solution to the County's refuse disposal needs. By using the energy obtainable from solid waste to generate electricity, resource recovery makes the most sense economically and environmentally.

SITE LOCATION

Pursuant to Section 403.505 FS, Palm Beach County is applying for certification of a solid waste energy recovery facility with landfills at a 1,320 acre site located in the unincorporated north-central area of the county. The site is bounded on the north by the Beeline Highway (SR 710), on the east by the Florida Turnpike, on the south by a line approximately 610 feet south of 45th Street, on the west by the City of West Palm Beach Water Catchment Area, and on the northwest by a large privately-owned property. The site is due west (across the Turnpike) of the existing Dyer Boulevard Landfill and is within 2 miles of a Florida Power & Light Company (FP&L) transmission line corridor.

PURPOSE OF THE PROPOSED FACILITY

The primary purpose of the facility is to dispose of the municipal solid waste generated within the County. Non-combustibles and inert ash residue resulting from the plants' combustion process will be landfilled on the site. The derived power from the combustion of the refuse is an additional benefit. Its sale to FP&L will help offset the overall cost of operating the facility. An affirmative determination of need from the Florida Public Service Commission has been applied for coincident with the submission of this document. Other materials may be recovered as market conditions warrant.

The proposed project is designed to help achieve the State's goal of enhancing environmental quality and preserving natural resources. To protect its groundwater and surface water resources, Palm Beach County is striving to limit sanitary landfilling of solid waste and plans to utilize resource recovery, an environmentally sound and economically advantageous method of solid waste disposal.

PROCESS DESCRIPTION

A materials flow diagram for a typical RDF Resource Recovery Facility is depicted in Figure 1. The municipal solid waste (MSW) will be delivered by truck to the enclosed tipping area of the RDF manufacturing plant (Figure 2). The MSW will then be processed into a homogeneous fuel with recycleable materials being removed for sale to others and certain unprocessable wastes (large cans, glass, etc.) sent to the co-located landfill directly. The processed RDF will be stored in a separate building (Figure 2) until it is transferred to the combustion facility.

Each boiler in the combustion facility will be equipped with an electrostatic precipitator (ESP) device for control of particulate emissions. The boilers will also be designed to eliminate or minimize potential for formation of other harmful by-products of combustion. The efficiency of all emission control aspects of the combustion facility have been discussed fully in the Air Quality Appendix (BACT/PSD) of the application for a Power Plant Siting (Chapter 403, Part II, F.S.) permit being prepared for this facility. The emissions will meet all Federal, State, regional and local air quality standards.

The ash by-product of the combustion of the RDF will be placed in a double-liner technology Class I landfill adjacent to the resource recovery plant. The landfilling aspects of this project are also being permitted as part of the Power Plant Siting process, and will therefore, meet all Federal, State, regional and local standards.

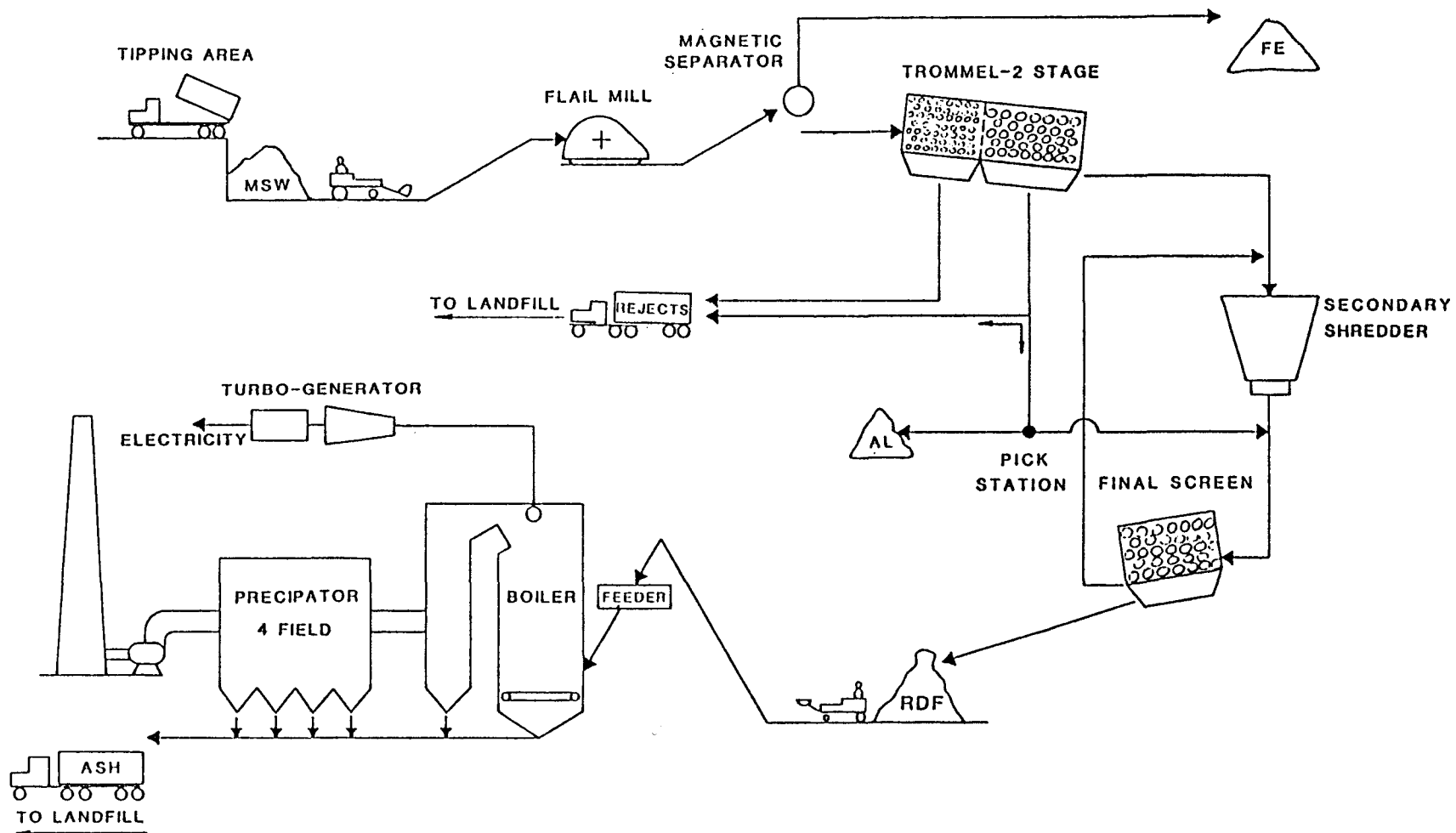
The process water for the plant will be taken from a series of wells located to intercept any possible mineralized groundwater from the existing Dyer Boulevard Landfill as well as the new co-located Class I and Class III landfills. The effluent from the process will be disposed of via deep well injection on site.

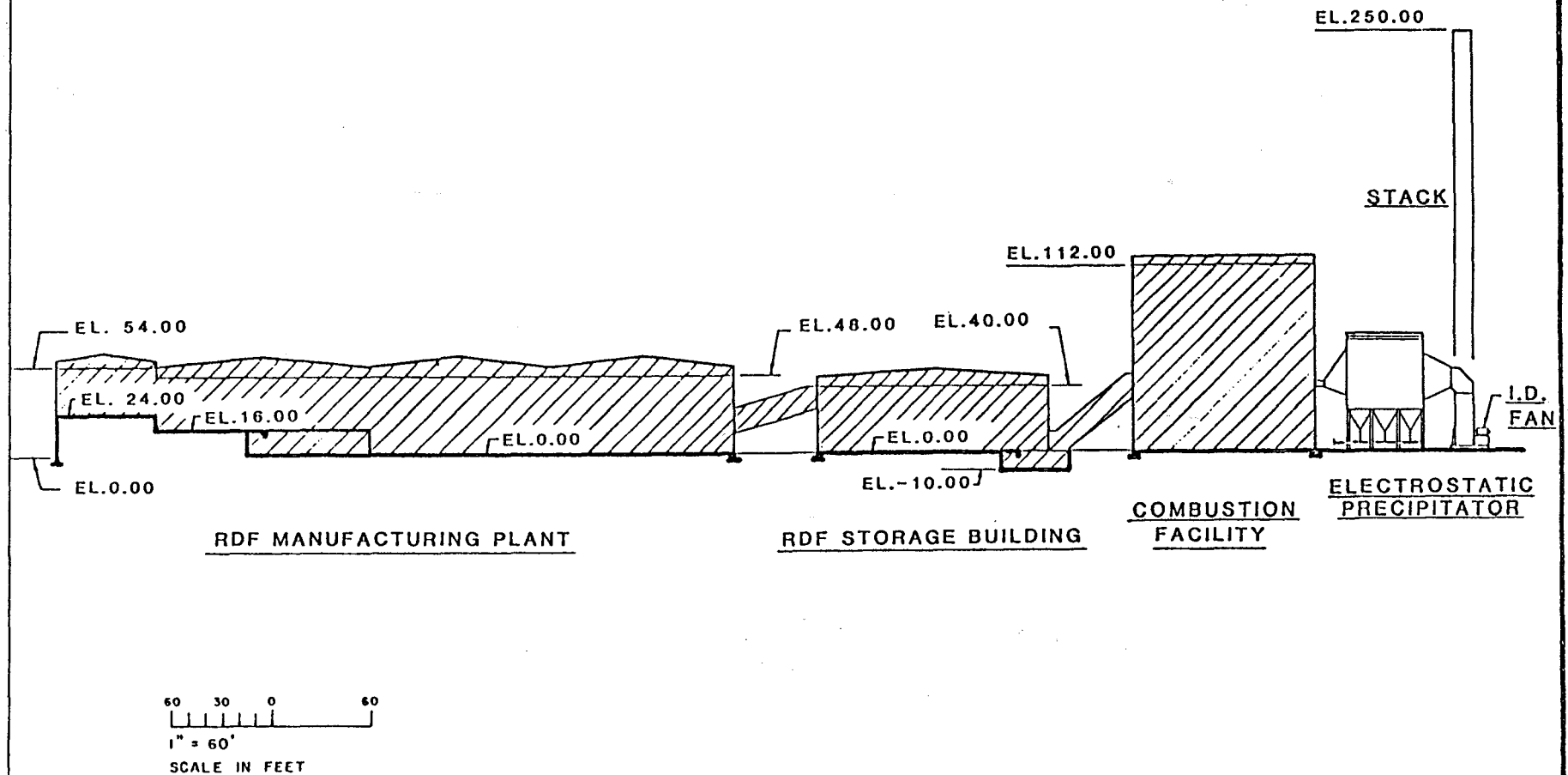
PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



RESOURCE RECOVERY FACILITY
MATERIALS FLOW DIAGRAM

FIGURE 1





PROJECT CERTIFICATION

Florida has adopted legislation, the Florida Electrical Power Plant Siting Act (Florida Statutes, Chapters 403.501 - 403.517), as amended, through Chapter 17-17 of the Florida Administrative Code (FAC) "to provide efficient, centralized review of the needs for increased electrical power generation and the effects of generator-related activities on human health and the environment and ecology of the lands and waters within the state." The Florida Department of Environmental Regulation (FDER) implements this Act.

This Act provides for a certification process which is a "one stop" centralized permitting procedure. Under the Act, the Authority may elect to obtain each required permit separately, or to file an application for certification which would expedite the review and coordinate the permit application process. The Authority is pursuing Site Certification under the Florida Electrical Power Plant Siting Act.

Once the site is certified by the State, no other State permits will be required for the project. Although the rated continuous design capacity of the project will be 2,000 tons per day (generating about 50 megawatts), site certification is being sought for an ultimate continuous design rated capacity of 3,000 tons per day (generating about 75 megawatts) since it is anticipated that the Authority will expand the project in the future.

ASSESSMENT OF PROBABLE PROJECT IMPACTS

As stipulated under 15 CFR 930.58, an assessment of the probable project effects on the coastal zone was conducted in relation to the relevant statutes the Florida Coastal Management Program (FCMP).

The most applicable state statute is Chapter 403, F.S. (Environmental Control). Resource recovery, potential for air and/or water pollution, and dredging and filling are discussed in detail as part of the Power Plant Siting

Application. Existing conditions at the site and potential effects of the construction and operation of the facility were analyzed with the conclusion that the facility, as designed, will have minimal impact on the surrounding environment.

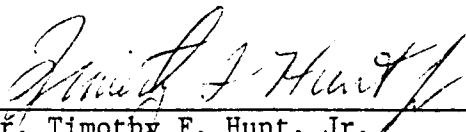
Chapter 253, F.S. (Dredging and Filling in Submerged Lands and Wetlands) applied to this project, also. As part of the Power Plant Siting Application, a joint dredge/fill application is being made to the Florida Department of Environmental Regulation (FDER) and the U.S. Army Corps of Engineers, assuring that all applicable Federal and State guidelines will be complied with.

Chapter 267, F.S. (Archives, History and Records Management) is also applicable to this project. The Division of Archives, History and Records Management (DAHRM) has reviewed the proposed site area for archaeological and historical sites, concluding that no significant cultural resources would be affected by the proposed facility.

Chapter 373, F.S. (Water Resources) also is relevant to this project. The South Florida Water Management District is reviewing the project for a consumptive use permit, the surface water management plan and other water resources impacts. Monitoring wells will be installed to provide for identification and interception of any groundwater contamination.

CONSISTENCY CERTIFICATION

The proposed activity complies with Florida Coastal Management Program and will be conducted in a manner consistent with that program.


Mr. Timothy F. Hunt, Jr.
Executive Director
Palm Beach County Solid
Waste Authority

APPENDIX 10.2

ZONING DESCRIPTIONS

APPENDIX 10.2

ZONING DESCRIPTIONS

Pursuant to Rule 17-17.121(FAC), the Palm Beach County Solid Waste Authority is submitting a separate "Compliance Document" in three copies. The Compliance Document describes procedures followed to accomplish compliance of the site, under the proposed use, with the Palm Beach County Comprehensive Plan and applicable Zoning Ordinances. (See Section 2.2.2 of the Application).

APPENDIX 10.3

LAND USE PLAN DESCRIPTIONS

APPENDIX 10.3

LAND USE PLAN DESCRIPTIONS

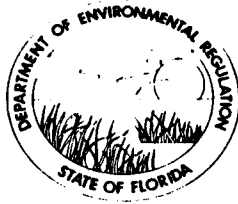
Pursuant to Florida Administrative Code Chapter 17-17.21, the Palm Beach County Solid Waste Authority is submitting to DER, unattached to this application, three copies of a compilation of information specifying the procedures taken to accomplish compliance of the site, including associated facilities, with existing land use plans and zoning ordinance. The compilation, titled the "Compliance Document" includes copies of all applicable portions of ordinances, regulations or land use plans involved.

The material presented in this appendix is discussed in Section 2.2.2 of the Application for Power Plant Site Certification (Volume 1).

APPENDIX 10.4

CLASS I & III SANITARY LANDFILL CONSTRUCTION AND OPERATION DATA

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION



APPLICATION FOR PERMIT TO CONSTRUCT ☒
OPERATE ☐
A SOLID WASTE RESOURCE RECOVERY AND MANAGEMENT FACILITY

GENERAL REQUIREMENTS

Resource Recovery and Management Facilities must be permitted pursuant to Section 403.707, Florida Statutes. Separate applications for each permit, four copies each, should be submitted to the District office of the Department of Environmental Regulation. Complete appropriate sections of the application for the type of facility proposed.

Each application shall be accompanied by an application (check) fee of \$100 payable to "State of Florida, Department of Environmental Regulation."

Applicant has the responsibility to provide copies of the application to appropriate city, county and/or regional pollution control agencies, established pursuant to Section 403.182, Florida Statutes. Applicant shall also clear the application through appropriate local planning agencies. Comments from any of these agencies shall be forwarded with the application to the Department.

Information contained in the application shall conform to requirements of Chapter 17-7, Florida Administrative Code. All entries should be typed or printed in ink. If additional space is needed, separate, properly identified sheets of paper may be attached. All blanks shall be filled or marked as not applicable.

Applicant Name (operating authority): Palm Beach County Solid Waste Authority

Street Address: 5114 Okeechobee Boulevard, Suite 2-C
West Palm Beach, FL 33409

Authorized Agent: Timothy F. Hunt, Jr., Executive Director

Mailing Address (if different from above): (same)

City _____ County _____ Zip _____
Telephone Number: (305) 471-5770

Facility Location: 45th Street and Florida's Turnpike
(Name of Access Road and Crossroad)

S 22,27,34, T 42S, R 42E /Latitude 26 ° 46 ' _____ " Longitude 80 ° 07 ' _____ "
section township range
3 43S 42E

Towns and Areas to be Served: Palm Beach County

Population to be Served: 843,500 (1987)

Acres within Waste Site Boundary: 314

Acres within Property Boundary: 1,320

Volume of Solid Waste to be received: 4,520 (1987) cu. yds/day ~~ton/day gallon~~

Date Site Ready to Receive Solid Waste: 1987

Landowner (if different than applicant): (see attached ownership list)

Address of Landowner: (see attached ownership list)

Facility Type:

Sanitary Landfill:

- ☒ Class I, more than 50 cy or 20 tons waste/day
- ☐ Class II, less than 50 cy or 20 tons waste/day
- ☒ Class III:
 - ☒ trash/yard trash
 - ☐ yard trash composting
- ☐ Landspreading
 - ☐ Grade III
 - ☐ Grade IV
- ☐ Other Facility not shown _____

Volume Reduction:

- ☐ Composting
- ☐ Transfer Station
- ☐ Shredder
- ☐ Incinerator
- ☒ Resource Recovery:
 - ☒ Energy
 - ☒ Materials

**REQUIRED ATTACHMENTS FOR
RESOURCE RECOVERY AND MANAGEMENT FACILITY PERMITS**

Construction Permits:

- A. Class I and Class II Landfills; Submit items 1 (if appropriate), 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11.
- B. Class III Landfills; 1 (if appropriate), 3, 4, 5, 7, 8 (a, b, c, h, j, k), 9, and 11.
- C. Volume Reduction; 4, 5, 6 (a, e), 7 (a, d, e, g, h, j), 8 (a, b, c, g, h, j, k), 9, and 12.

Operation Permits:

NOTE: For facilities that have been satisfactorily constructed, in accordance with their construction permit, the information in A, B, and C, above does not have to be resubmitted for an operation permit if the information has not changed during the construction period.

- D. Class I and II Landfills; all of the items in A above, plus item 13.
- E. Class III Landfills; all items in B above plus item 13.
- F. Volume Reduction; all items in C above plus item 13.

ATTACHMENT ITEMS

1. Bonds (17-7.03(1), Florida Administrative Code) and/or other assurances.

- a. Copy of bond, or
- b. Copy of waiver of bond requirement.

NOTE: This requirement only applies to privately owned and operated disposal sites. It does not apply to sites operated by counties, municipalities, other governmental agencies, or persons operating a county or municipally owned facility under contract.

- c. Agreement between landowner and applicant, if not the same. Identify and explain the terms of lease or contract; duration, and who will be responsible for site closure and continued monitoring until released by the department.

2. Soil Survey (17-7.05(2)(a), Florida Administrative Code)

NOTE: This information is not required if the information is included in the hydrogeological report in item #3.

- a. Degree of limitation of soil
- b. Soil series
- c. Soil drainage class
- d. Permeability

OWNERSHIP LIST, SITE 7

<u>Name</u>	<u>Address</u>
1. Arthur <u>Gladstone</u>	2295 S. Ocean Blvd. Palm Beach, FL 33480
2. Nelson L. and Eugena H. <u>Roane</u>	6501 45th St. P.O. Box 2790 West Palm Beach, FL 33402
3. Shaker Corporation	1001 Park Avenue Lake Park, FL 33403
4. JCM Inc.	1001 Lake Park Avenue Lake Park, FL 33403

- e. Slope
- f. Soil texture
- g. Depth to bedrock

3. Hydrogeological Survey (17-7.05(2)(b), Florida Administrative Code)

NOTE: For Class II and Class III landfills these requirements may be satisfied by providing the best available information from Water Management Districts, the U.S. Geological Survey, the Florida Bureau of Geology, or other acceptable sources. For Class I site this information shall be obtained from on-site soil borings.

- a. Thickness and character of overburden (soil)
- b. Character of bedrock
- c. Depth of water table and potentiometric surfaces
- d. Depth to shallow ground water aquifer and artesian aquifer
- e. Local and regional ground water flow systems indicating direction of ground water flow
- f. Frequency and extent of flooding of the area (17-7.04(3)(a), Florida Administrative Code)

4. Evidence that the Facility is in conformance with local zoning (17-7.05(2)(c)4., Florida Administrative Code)

5. Map or Aerial Photograph taken within one year of permit application (17-7.05(3)(a), Florida Administrative Code), showing land use and zoning within ¼ mile of the proposed facility, using the Florida Land Use Cover and Forms Classification System (available from the Department). Map shall be of sufficient scale to show all homes, industrial buildings, wells, water courses, dry runs, rock out-croppings, roads and other significant details.

6. Plot Plan (17-7.05(3)(b), Florida Administrative Code)

NOTE: The plot plan should be drawn on a scale not greater than 200 feet to the inch showing the following:

- a. Dimensions and legal description of the site
- b. Location and depth corrected to MSL of soil borings
- c. Proposed trenching plan
- d. Cover stock piles
- e. Fencing or other measures to restrict access
- f. Cross sections showing both original and proposed fill elevations
- g. Location, depth corrected to MSL and construction details of monitoring wells

7. Design Drawings and Maps (17-7.05(3)(c), Florida Administrative Code)

NOTE: The design drawings and maps, which may be combined with the plot plan (item #6), should be drawn on a scale not greater than 200 feet to the inch showing the following:

- a. Topographic map with five foot contour intervals
- b. Proposed fill area
- c. Borrow area
- d. Access roads
- e. Grades required for proper drainage
- f. Typical cross sections of disposal site including lifts, borrow areas and drainage controls
- g. Special drainage devices

- h. Fencing
 - i. Equipment facilities
 - j. Other pertinent information based on intended use of facility
8. Report (17-7.05(3)(d), Florida Administrative Code)
- a. Estimated population and area served by the proposed site with basis for the estimate.
 - b. Anticipated type, annual quantity, and source of solid waste with rationale for estimate, expressed in tons or cubic yards of compacted material. Specify the type and amounts of solid wastes to be received from industrial and commercial sources.
 - c. Anticipated life of site
 - d. Geological formations and ground water elevations corrected to MSL to a depth of at least ten feet below proposed excavations and lowest elevation of the site. Such data shall be obtained by soil borings or other appropriate means. **This information is not required for Class III sites.** This information may be submitted in the hydrogeological survey (Item #3).
 - e. Soil map, interpretive guide sheets, and a report giving the suitability of the site for such an operation. This information may be submitted in the soil survey (Item #2).
 - f. Source and characteristics of cover material
 - g. Contingency plan, including waste handling and disposal methods, in case of an emergency such as equipment failure, natural disaster or fire.
 - h. Persons responsible for actual operation and maintenance of the site and intended operating procedures.
 - i. A plan for gas control if gas generation from the site is expected.
 - j. Operational plans to direct and control the use of the site.
 - k. Plans for controlling the type of waste received at the site; plans shall specify inspection procedures to be followed if prohibited types of waste are discovered.
9. Water Quality Standards (17-7.05(3)(e), 17-7.05(4)(f), and 17-7.05(4)(g), Florida Administrative Code)
- Indicate by discussion or drawings or both how the site is designed to meet water quality standards of 17-3 and 17-4, Florida Administrative Code, at the site boundary.
10. Background Water Quality (17-7.05(4)(a)3, Florida Administrative Code) — Ground water and any on-site water shall be tested for the following parameters:
- a. Conductivity
 - b. Nitrates
 - c. Iron
 - d. Chemical Oxygen Demand
 - e. Others as determined necessary
11. Solid Waste Disposal Facility Data Form.
12. Solid Waste Volume Reduction and Resource Recovery Facility Data Form.
13. Certification of Construction Completion

SOLID WASTE DISPOSAL FACILITY DATA FORM

Permit No.: _____ Issue Date: _____ Expires: _____

Facility No. (DER Identification): _____

DER ACTION: ☐ Add ☐ Delete ☐ Change ☐ Deactivate Site ☐ Other

1. County Palm Beach		2. Site Name Site 7	
3. Date Form Completed April 1, 1985		4. Facility Address 45th St., West Palm Beach, Florida	
4a. Facility Phone No.		4b. Facility Site Supervisor Mr. Mark Hammond, Director of Ops.	
5a. 26° 46' " 80° 07' " Latitude Longitude		5b. 42/43 S 42E 22, 27, 34/3 Township Range Section	
6. Operating Authority Name Palm Beach County Solid Waste Authority		8. Operating Authority Address 5114 Okeechobee Blvd., Suite 2-C West Palm Beach, FL 33409	
7. Phone Number (305) 471-5770		11. Address of Owner See attached list.	
9. Owner of Site Property (if different from operator) See attached list			
10. Phone Number of Owner See list.			
12. Facility Type ☒ Class I, Sanitary Landfill ☐ Class II, Sanitary Landfill ☒ Class III ☒ Trash/Yard Trash ☐ Trash & Trash Composting ☐ Sludge disposal facility ☐ Other Facility Not Shown (Lagoon, Pit, etc.)			
13. Month/Year Begun January /1987		14. Disposal Area 314 Acres	
15. Population Served 289,000			
16. Expected Useful Lifetime 22 Years		17. Weighing Scales ☒ Yes ☐ No	
18. Security to Prevent Unauthorized Use ☒ Yes ☐ No			
19. Depth of Water Table MSL 15.0 Ft.		20. Quantity of Waste/Day Tons or 4520 Yd³	
21. Charge \$ yd/ton 1985			
22. Surrounding Land Use Zoning ☒ Residential ☐ None ☒ Agricultural ☐ Commercial ☐ Industrial ☐ Other			
23. Types of Waste Received ☒ Residential ☐ Agricultural ☐ Hazardous ☐ Industrial Sludge ☒ Commercial ☐ Septic Tank ☒ Yard Trash/Trash ☐ Hospital ☒ Incinerator Residue ☐ Industrial ☐ Sewage Sludge ☐ Other ☐ Pathological/Infectious ☐ Water/Air Treat Sludge			
24. Number of Monitoring Wells 14		25. Number of Surface Monitoring Points 11	
26. Gas Control System ☒ Yes ☐ No		27. Salvaging Permitted ☐ Yes ☒ No	
28. Attendant ☒ Yes ☐ No			
29. Leachate Control Method Liner Type: ☐ Natural ☐ Emplaced Clay ☒ Plastic ☐ None ☐ Other Collection Method: ☐ Well Point ☐ Perimeter Ditch ☐ None ☒ Under Site Drains ☐ Other Treatment Method: ☐ Oxidation ☐ Recirculated ☐ Chemical ☐ Advanced ☐ None ☐ Other			
30. Leachate Discharge ☐ Yes ☒ No See note.		Class of Receiving Water ---	
31. Site Located in ☐ Floodplain ☒ Wetlands ☐ Other:			
32. Surface Runoff Collected ☒ Yes ☐ No		Type of Runoff Treatment Filtration via Wetlands	
33. Property Recorded as a Solid Waste Disposal Site in County Land Records ☐ Yes ☒ No		Class of Receiving Waters EPB IV - cond	
34. Days of Operation 7		Days of Cover 7	
Hours of Operation 7 a.m. - 6 p.m.			
35. Name and Title of Person Completing Form Albert R. Capellini, P.E., Project Manager, PBSJ			

Note: All blanks must be filled or marked as not applicable.

Note: Deep well injection via treatment.

DER Form 17-1.206(1) Effective November 30, 1982

STATEMENTS BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

A. Applicant

The undersigned owner or authorized representative of The Palm Beach County Solid Waste Authority

is aware that statements made in this form and attached exhibits are an application for a Solid Waste Resource

Recovery and Management Facility Construction

Permit from the Florida Department of Environmental Regulation and certifies that the information in this application is true, correct and complete to the best of his knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department. It is understood that the Permit is not transferable, and, the Department will be notified prior to the sale or legal transfer of the permitted establishment.

Signature of Owner or Agent

Timothy F. Hunt, Jr., Executive Director

Name and Title

Date: _____

Attach letter of authorization if agent is not a governmental official, owner, or corporate officer.

B. Professional Engineer Registered in Florida or Public Officer as Required in Chapter 403.707 and 403.707(5), Florida Statutes

This is to certify that the engineering features of this resource recovery and management facility have been designed/examined by me and found to conform to engineering principals applicable to such facilities. In my professional judgement, this facility, when properly maintained and operated, will comply with all applicable statutes of the State of Florida and rules of the Department. It is agreed that the undersigned will provide the applicant with a set of instructions for proper maintenance and operation of the facility.

Albert R. Capellini
Signature

Albert R. Capellini, P.E., Project Manager

Name and Title (Please Type)

35158

Florida Registration No.

(please affix seal)

889 N. Orange Avenue

Mailing Address

Orlando, FL 32801

City, State, Zip Code

(305) 422-7275

Telephone No.

Date: _____

Construction Cost Estimate: \$40,000,000.00

Permit Number: _____

Issue Date: _____

Review Date: _____

Expiration Date: _____

SOLID WASTE VOLUME REDUCTION AND RESOURCE RECOVERY FACILITY DATA FORM

Permit No.: _____ Issue Date: _____ Expires: _____

Facility No. (DER Identification): _____

DER ACTION: ☐ Add ☐ Delete ☐ Change ☐ Deactivate Site ☐ Other
--

1. County <u>Palm Beach</u>		2. Site Name <u>Site 7</u>	
3. Date Form Completed <u>April 1, 1985</u>		4. Facility Address <u>45th Street, West Palm Beach, Florida</u>	
4a. Facility Phone No. <u>N/A</u>		4b. Facility Site Supervisor <u>Not available at this time.</u>	
5a. <u>26</u> <u>46</u> " <u>80</u> <u>07</u> " Latitude Longitude		5b. <u>42/43 S</u> <u>42E</u> <u>22,27,34/3</u> Township Range Section	
6. Operating Authority Name <u>Palm Beach County Solid Waste Authority</u>		8. Operating Authority Address <u>5114 Okeechobee Blvd., Suite 2-C</u> <u>West Palm Beach, FL 33409</u>	
7. Phone Number <u>(305) 471-5770</u>		11. Address of Owner	
9. Owner of Site Property (if different from Operator) <u>See list</u>		10. Phone Number of Owner <u>See list</u>	
10. Phone Number of Owner <u>See list</u>		11. Address of Owner <u>Same as above</u>	
12. Facility Type (check one or more) ☐ Incinerator Only ☐ Biomass Gas Production ☐ Pyrolysis ☐ Other: ☐ Sludge Concentration ☐ Baler (compactor) ☐ Composting Plant ☐ Transfer Station ☒ Waterwall Incinerator ☐ Shredder (pulverizer)			
13. Month/Year Begun <u>1989</u>		14. Disposal Area <u>314</u> Acres	
15. Population Served		16. Expected Useful Lifetime <u>20</u> Years	
17. Weighing Scales ☒ Yes ☐ No		18. Waste Processed Per Operational Day tons/gal/yd	
19. Charge/_____		20. Days Operated S M T W T F S	
21. Hours/Day Operated <u>7 a.m. - 6 p.m.</u>		22. Maximum Processing Rate tons/day	
23. Material Recovered, Tons/Week _____ Paper _____ Glass Other: <u>See Power Plant Certification</u> _____ Ferrous Metals _____ Non-Ferrous Metals _____ Aluminum _____ Plastics			
24. Energy Recovery, in units shown _____ High Pressure Steam-lb/hr _____ Chilled Water-gal/hr _____ Gas-ft ³ /hr _____ Low Pressure Steam-lb/hr _____ Oil-gal/hr _____ Gas-BTU/hr ☒ Electricity-kw/hr _____ Oil-BTU/hr Other:			
25. Process Water Recycled ☒ Yes ☐ No		Treatment Method Used	
Discharged to: ☐ Surface Waters ☒ Underground		Class Receiving Water	
26. Final Residue is _____ % of waste intake		Residue is disposed of at (Site Name) <u>Site 7</u>	
27. Supplementary Fuel Used			
Type		Quantity Used/Hour	
28. Estimated Operating Costs Material — Energy Revenue \$		Total Cost/Ton \$	
29. Number of Staff		Net Cost/Ton \$	
30. State Pollution Control Bond Financing Amount \$		31. Estimated Amount of Tax Exemptions that will be Requested \$	
32. Name and Title of Person Completing Form <u>Albert R. Capellini, P.E., Project Manager</u>			

Note: All blanks must be filled or marked as not applicable.

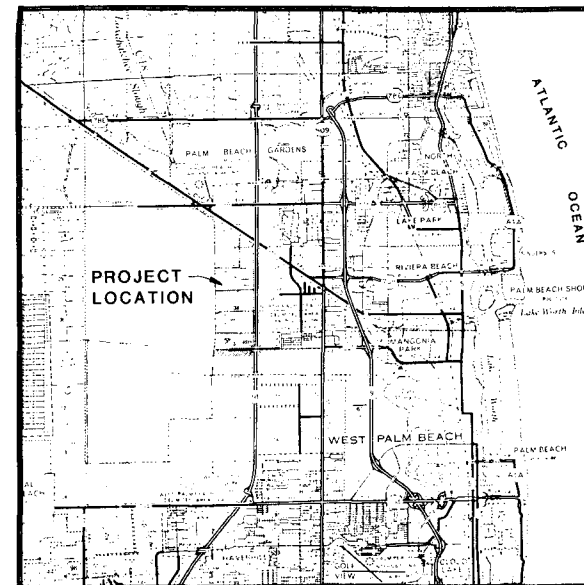
APPENDIX 10.4.1

LINER AND LEACHATE COLLECTION SYSTEM

PALM BEACH COUNTY SOLID WASTE AUTHORITY



POWER PLANT
SITING APPLICATION
RESOURCE RECOVERY FACILITY
SANITARY LANDFILL
SURFACE WATER MANAGEMENT PLAN



PROJECT MAP

INDEX OF DRAWINGS

SHEET NO.	TITLE
1-9	EXISTING CONDITIONS
10-12	LEACHATE COLLECTION SYSTEM & PHASING PLAN
13-16	PROPOSED CONTOURS
17	OPERATIONAL PLAN
18-20	STORMWATER MANAGEMENT & DRAINAGE
21-25	SECTIONS & DETAILS



POST, BUCKLEY, SCHUH & JERNIGAN, INC.
CONSULTING ENGINEERS & PLANNERS

ENGINEER'S PROJECT NO. 958-001.00

CONSERVATION (W) ZONING DISTRICT

WEST PALM BEACH
WATER CATCHMENT
AREA

PROPOSED
FIRE STATION 6
ACRES

PROPOSED
BORROW LAKE
EXPANSION

EXISTING DREDGE LAKE
(PROPOSED
BORROW LAKE)

PROPOSED JOG ROAD R/W

SEABOARD COASTLINE RAILROAD
S.R. 70

BEELINE HIGHWAY

FLORIDA'S TURNPIKE

NEW CLASS II
LANDFILL

RESIDENTIAL ESTATE ZONING
DISTRICT

NOTE:
ZONING AGRICULTURAL RESIDENTIAL
UNLESS OTHERWISE NOTED.

PBS&J/SAHWG
493-02850

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



BOSWORTH AERIAL SURVEYS, INC.
Photogrammetric Specialists

POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
EXISTING CONDITIONS

DESIGN CLK
DRAWN A.M.S.
CHECKED ARG
D.C. K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.

0 50 100 200 400 FEET

SHEET 1 OF 25

KEY MAP

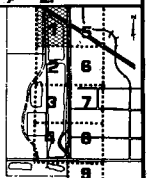


PHOTO DEC. 0, 1984

CONSERVATION (W) ZONING DISTRICT

WEST PALM BEACH
WATER CATCHMENT
AREA

EXISTING DREDGE LAKE
(PROPOSED
BORROW LAKE)

PROPOSED CLASS III LANDFILL

PROPOSED
BORROW LAKE

RETURN
LINE FOR
DREDGE
MATERIAL

DREDGE MAT'L
SUPPLY LINE TO
DYER LANDFILL

EXISTING LANDFILL (CLOSED)
PUBLIC OWNERSHIP ZONING
DISTRICT

EXISTING C.I.
PIPES (TO BE
REMOVED)

NOTE:
ZONING AGRICULTURAL RESIDENTIAL
UNLESS OTHERWISE NOTED.

FLORIDA'S TURNPIKE

EXISTING ACCESS ROAD

SETBACK
200'

3000' SETBACK TO PROPOSED LANDFILL LIMIT

PBS&J/SAHWG
494-02850

PALM BEACH COUNTY SOLID WASTE AUTHORITY

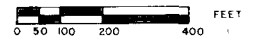
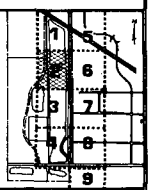
RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
EXISTING CONDITIONS

DESIGN CLK
DRAWN AMS
CHECKED ARC
D.C. K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.



SHEET 2 OF 25

CONSERVATION (W) ZONING DISTRICT

WEST PALM BEACH
WATER CATCHMENT
AREA

PROPOSED CLASS III LANDFILL AREA

PROPOSED
RESOURCE RECOVERY
FACILITY (R.R.F.)

ABANDONED
BORROW LAKE
AREA
(TO BE FILLED)

PROPOSED CLASS I LANDFILL

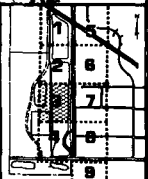
EXISTING LANDFILL
(CLOSED)
PUBLIC OWNERSHIP
ZONING DISTRICT

EXISTING
C.I. PIPES
(TO BE
REMOVED)

EPB-9 CANAL

FLORIDA'S TURNPIKE

NOTE:
ZONING INDUSTRIAL
UNLESS OTHERWISE NOTED.



0 50 100 200 400 FEET

SHEET 3 OF 25

A.R. CAPELLINI, P.E., PROJ. MGR.

DESIGN CLK
DRAWN AMS
CHECKED ARC
D.C. K.J.C.

POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
EXISTING CONDITIONS



PALM BEACH COUNTY SOLID WASTE AUTHORITY

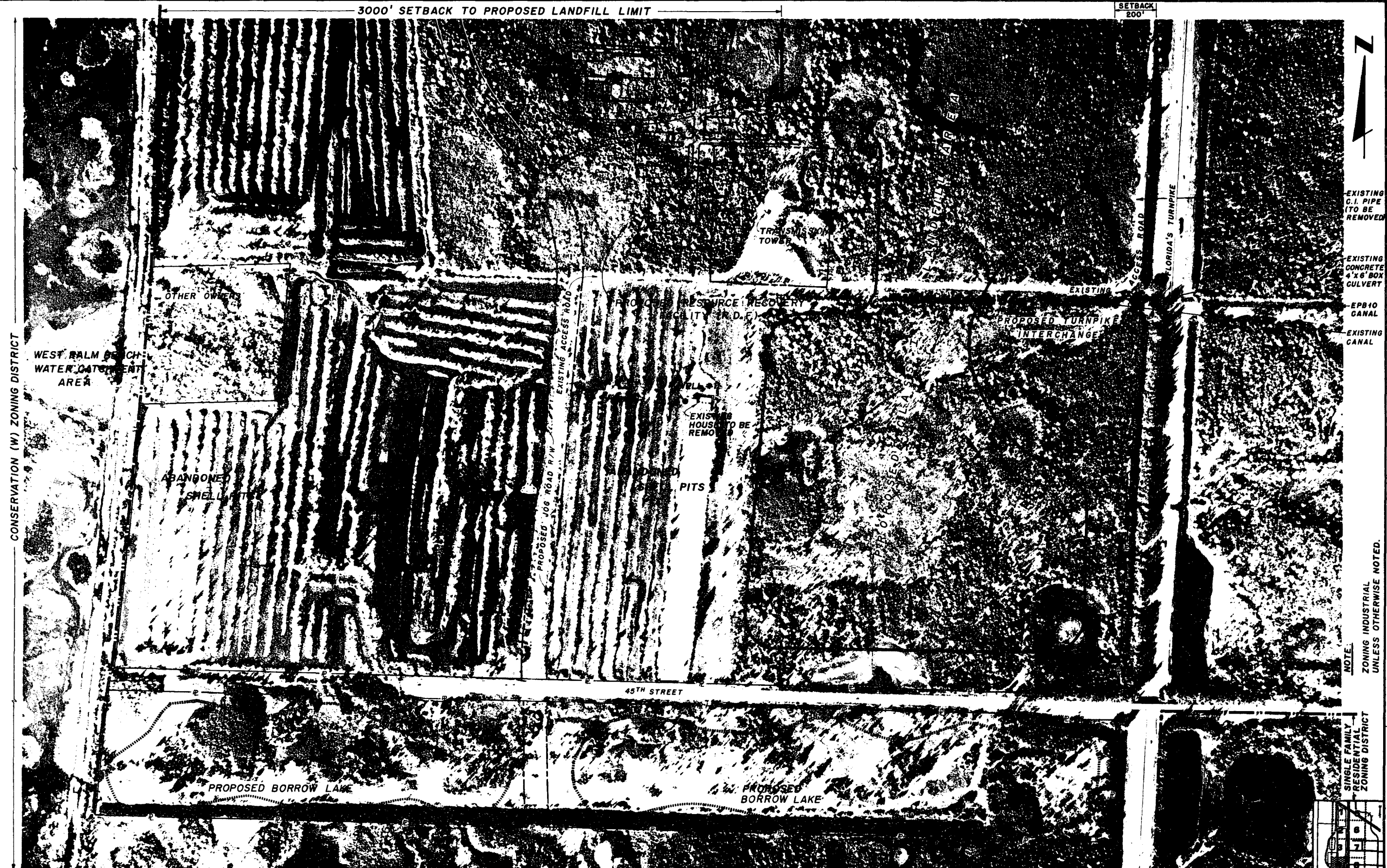
RESOURCE RECOVERY FACILITY

3000' SETBACK TO PROPOSED LANDFILL LIMIT

SETBACK
200'

PBS&J/S&HWG
455-02850

PHOTO DEC. 0 1984



NOTE:
ZONING INDUSTRIAL
UNLESS OTHERWISE NOTED.

PBSAJ/SAHWG
486-02850

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
EXISTING CONDITIONS

DESIGN: CLK
DRAWN: AMS
CHECKED: ARC
BY: KJC

A.R. CAPELLINI, P.E., PROJ. MGR.

0 50 100 200 400 FEET

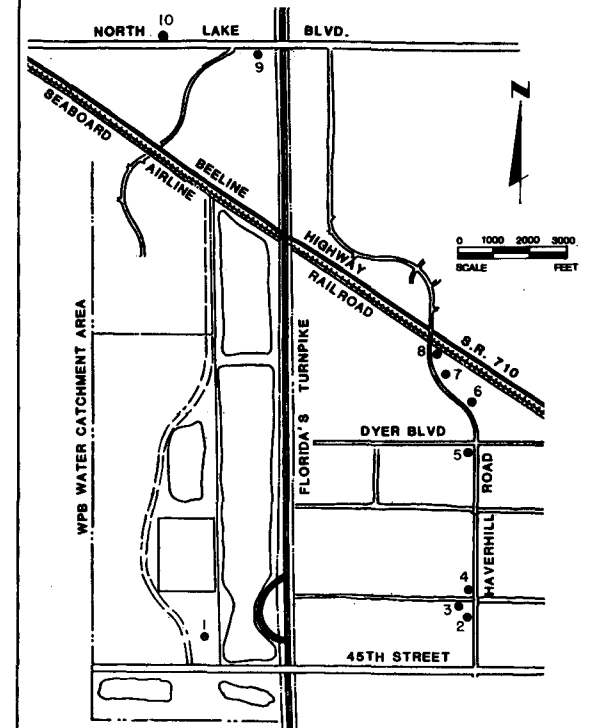
SHEET 4 OF 25

KEY MAP





NOTE:
ZONING AGRICULTURAL RESIDENTIAL
UNLESS OTHERWISE NOTED.



WELL NO.	LOCATION	TYPE OF USE
1	6501 45TH STREET	PRIVATE RESIDENCE
2	NORTH HAVERHILL	MAJOR SUPPLY WELL
3	6161 N. HAVERHILL	STABLES/PRIVATE RESIDENCE
4	6200 N. HAVERHILL	STABLES/RODEO/PRIVATE RESIDENCE
5	6784 N. HAVERHILL	STABLES/TRAILERS
6	7030 N. HAVERHILL	INDUSTRIAL BUSINESS (POMA)
7	7200 N. HAVERHILL	INDUSTRIAL BUSINESS (DAVIS METER & SUPPLY CO.)
8	7392 N. HAVERHILL	INDUSTRIAL BUSINESS (BRADCO SUPPLY)
9	NORTH LAKE BLVD.	BAR-L RANCH
10	6700 N. LAKE BLVD.	RMT NUSERY

PBS&J/SAHWG
497-0288D

PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
EXISTING CONDITIONS

DESIGN **CLK**
DRAWN **AMS**
CHECKED **ARG**
O.C. **KJC**

A.R. CAPPELLINI, P.E., PROJ. MGR.

KEY MAP
0 50 100 200 400 FEET
SHEET 5 OF 25



NOTE:

ZONING AGRICULTURAL RESIDENTIAL
UNLESS OTHERWISE NOTED.

PBS&J/S&HWG
488-02880

PALM BEACH COUNTY SOLID WASTE AUTHORITY

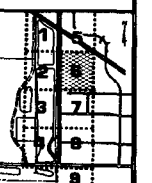
RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
EXISTING CONDITIONS

DESIGN CLK
DRAWN AMS
CHECKED ARC
O.C. KJC

A.R. CAPELLINI, P.E., PROJ. MGR.



KEY MAP

0 50 100 200 400 FEET

SHEET 6 OF 25

PROPOSED CLASS III LANDFILL AREA

PROPOSED CLASS I LANDFILL AREA

FLORIDA'S TURNPIKE

PUBLIC OWNERSHIP ZONING DISTRICT

EXISTING LANDFILL
(CLOSE)

DYER BLVD.

P.O. ZONE

EPB-9A
CANAL

EPB-9 CANAL

NOTE:

ZONING AGRICULTURAL RESIDENTIAL
UNLESS OTHERWISE NOTED.

PBS&J/SAHWG
499-0285D

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



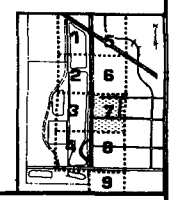
POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
EXISTING CONDITIONS

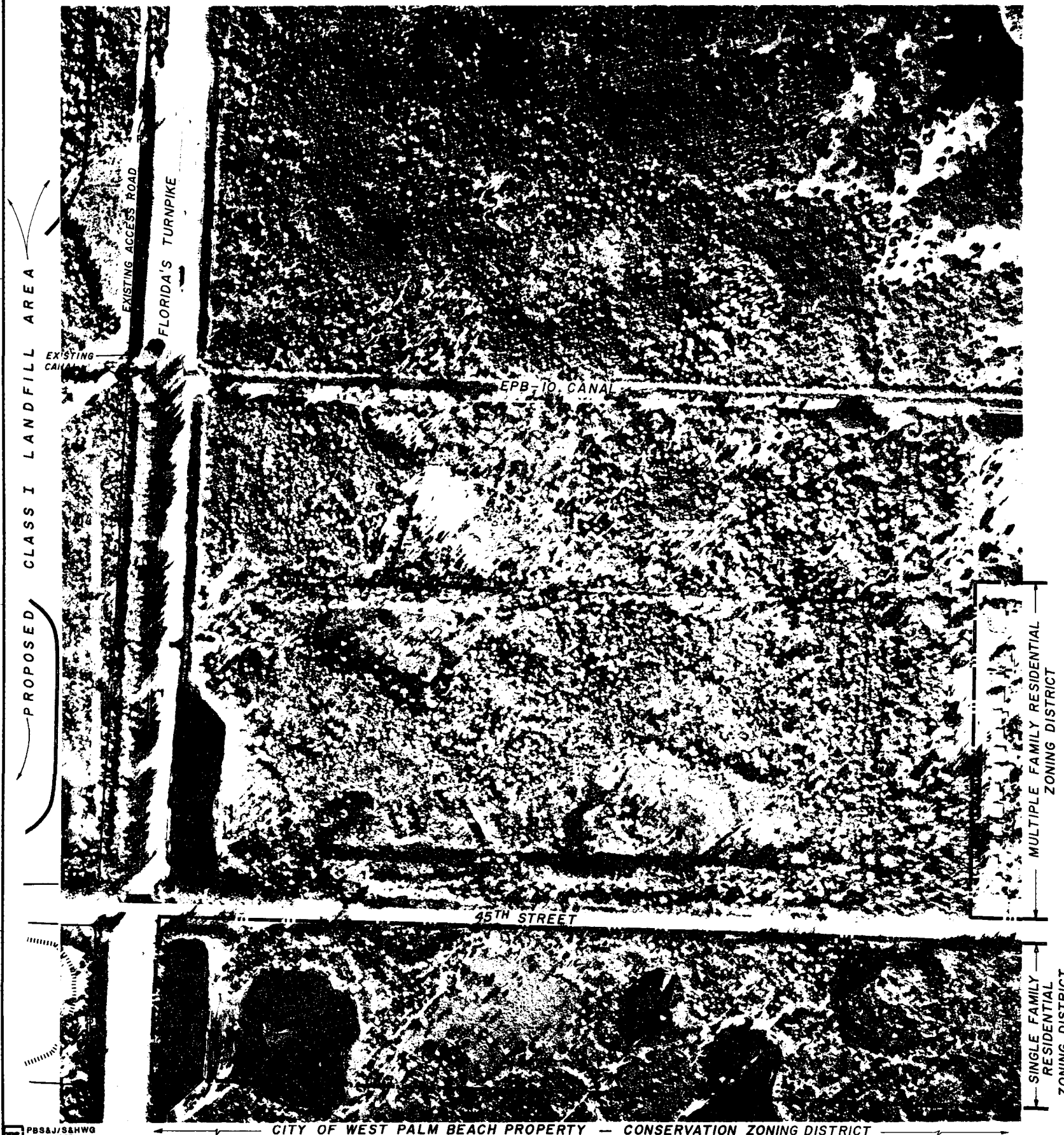
DESIGN CLK
DRAWN AMS
CHECKED APC
D.C. KJC

A.R. CAPELLINI, P.E., PROJ. MGR.

0 50 100 200 400 FEET

SHEET 7 OF 25





NOTE:
 ZONING INDUSTRIAL
 UNLESS OTHERWISE NOTED.

PBS&J/S&HWG
 500-0285D

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



BOROWATH AERIAL SURVEYS, INC.
 PHOTOGRAPHIC SURVEYS

POWER PLANT SITING APPLICATION
 RESOURCE RECOVERY FACILITY

EXISTING CONDITIONS

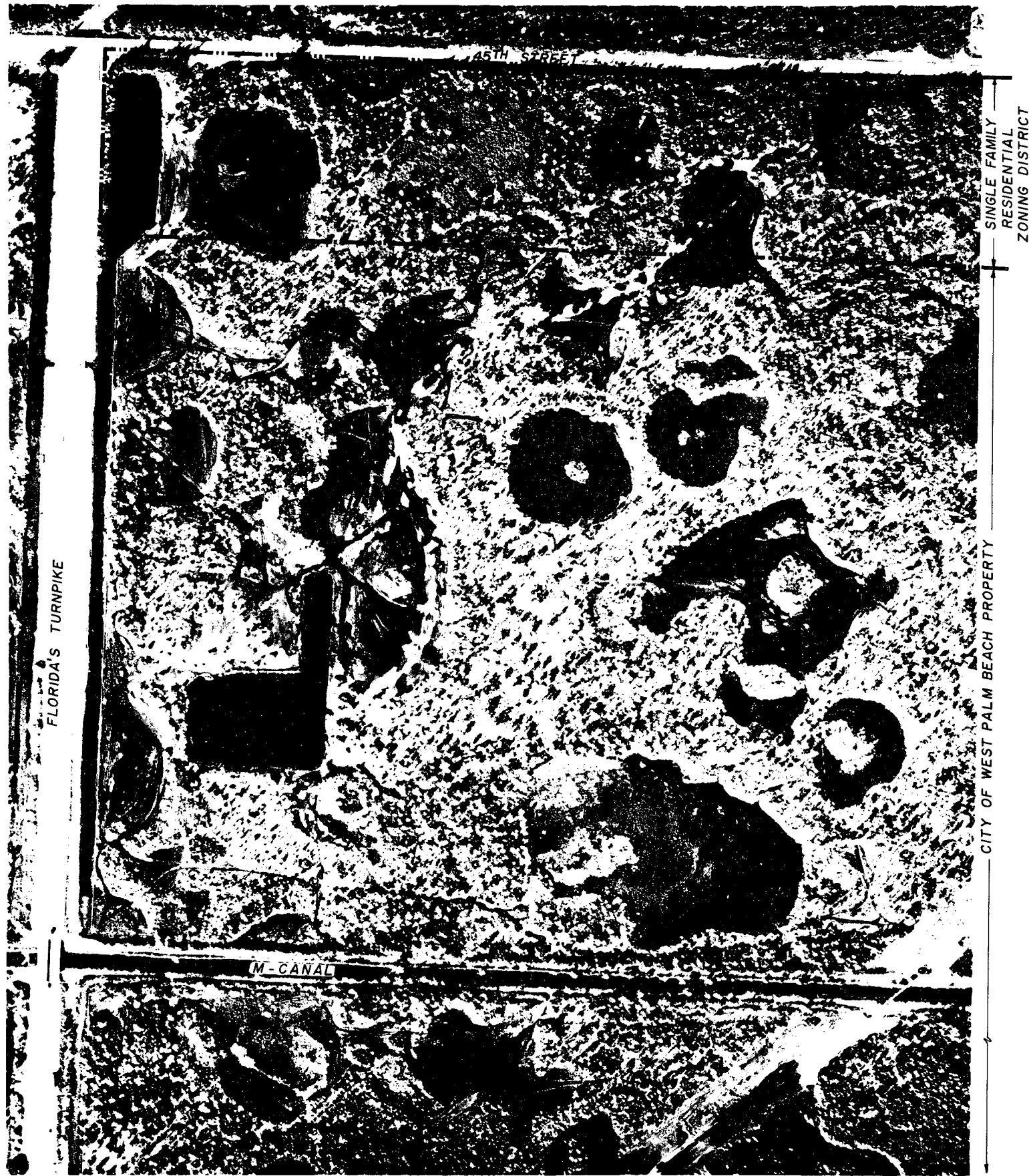
DESIGN GLK
 DRAWN AMS
 CHECKED ARC
 D.C. K J C

A.R. CAPELLINI, P.E., PROJ. MGR.

KEY MAP

0 50 100 200 400 FEET

SHEET 8 OF 25



NOTE:
ZONING AGRICULTURAL RESIDENTIAL
UNLESS OTHERWISE NOTED.

PBS&J/S&HWG
501-02RAD

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



**POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
EXISTING CONDITIONS**

DESIGN CLK
DRAWN AMS
CHECKED ARC
D.C. K J C

A.R. CAPELLINI, P.E., PROJ. MGR.

KEY MAP
0 50 100 200 400 FEET
SHEET 9 OF 25

NOTE:

THE LEACHATE COLLECTION SYSTEM IS DESIGNED IN ACCORDANCE WITH EPA GUIDELINES SW. THIS DESIGN ILLUSTRATES ONE ALTERNATIVE BASED ON A PERMEABILITY OF 1×10^{-3} cm/sec AT A POROSITY OF 32 PERCENT AND A MAX DENSITY (AASHTO T-180) OF 100 PERCENT. EACH PHASE DESIGN WILL BE REEVALUATED FOR COST-EFFECTIVENESS DEPENDING ON MATERIAL AND LABOR COST.

EXISTING DREDGE LAKE
(PROPOSED
BORROW LAKE)

LEGEND

- LEACHATE COLLECTION RIDGE LINE
- 8" DIA. SOLID P.V.C. PIPE
- 8" DIA. PERFORATED P.V.C. PIPE
- SOLID WALL P.V.C. PIPE (GRAVITY FLOW)
- LEACHATE COLLECTION MANHOLE
- CLEANOUT
- ARROW HAT INDICATES DIRECTION OF VIEW
- SECTION NUMBER
- SECTION INDICATOR
- SHEET NUMBER
- DETAIL LETTER
- DETAIL INDICATOR
- SHEET NUMBER

WEST PALM BEACH
WATER CATCHMENT
AREA

CONSERVATION (W) ZONING DISTRICT

COVER MATERIAL / STOCKPILE AREA

NOTE:
LEACHATE PUMP
STATION AND FORCE
MAIN LOCATIONS WILL
BE DETERMINED
DURING FINAL DESIGN.

EXISTING LANDFILL (CLOSED)
PUBLIC OWNERSHIP ZONING
DISTRICT

FLORIDA'S TURNPIKE

PROPOSED
BORROW LAKE

PROPOSED CLASS III LANDFILL

CELL A
OPEN EARLY 1991
23 ACRES

CELL B
OPEN LATE 1991
23 ACRES

CELL C
OPEN EARLY 1992
23 ACRES

CELL D
OPEN LATE 1992
23 ACRES

CELL E
OPEN EARLY 1993
23 ACRES

CELL F
OPEN LATE 1993
23 ACRES

CELL G
OPEN EARLY 1994
23 ACRES

CELL H
OPEN LATE 1994
23 ACRES

CELL I
OPEN EARLY 1995
23 ACRES

CELL J
OPEN LATE 1995
23 ACRES

CELL K
OPEN EARLY 1996
23 ACRES

CELL L
OPEN LATE 1996
23 ACRES

CELL M
OPEN EARLY 1997
23 ACRES

CELL N
OPEN LATE 1997
23 ACRES

CELL O
OPEN EARLY 1998
23 ACRES

CELL P
OPEN LATE 1998
23 ACRES

CELL Q
OPEN EARLY 1999
23 ACRES

CELL R
OPEN LATE 1999
23 ACRES

CELL S
OPEN EARLY 2000
23 ACRES

CELL T
OPEN LATE 2000
23 ACRES

CELL U
OPEN EARLY 2001
23 ACRES

CELL V
OPEN LATE 2001
23 ACRES

CELL W
OPEN EARLY 2002
23 ACRES

3000' SETBACK TO PROPOSED LANDFILL LIMIT

SETBACK
200'

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
LEACHATE COLLECTION SYSTEM
& PHASING PLAN

DESIGN CLK, JHD
DRAWN AMS
CHECKED ARG
D C K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.

0 50 100 200 400 FEET

SHEET 10 OF 25

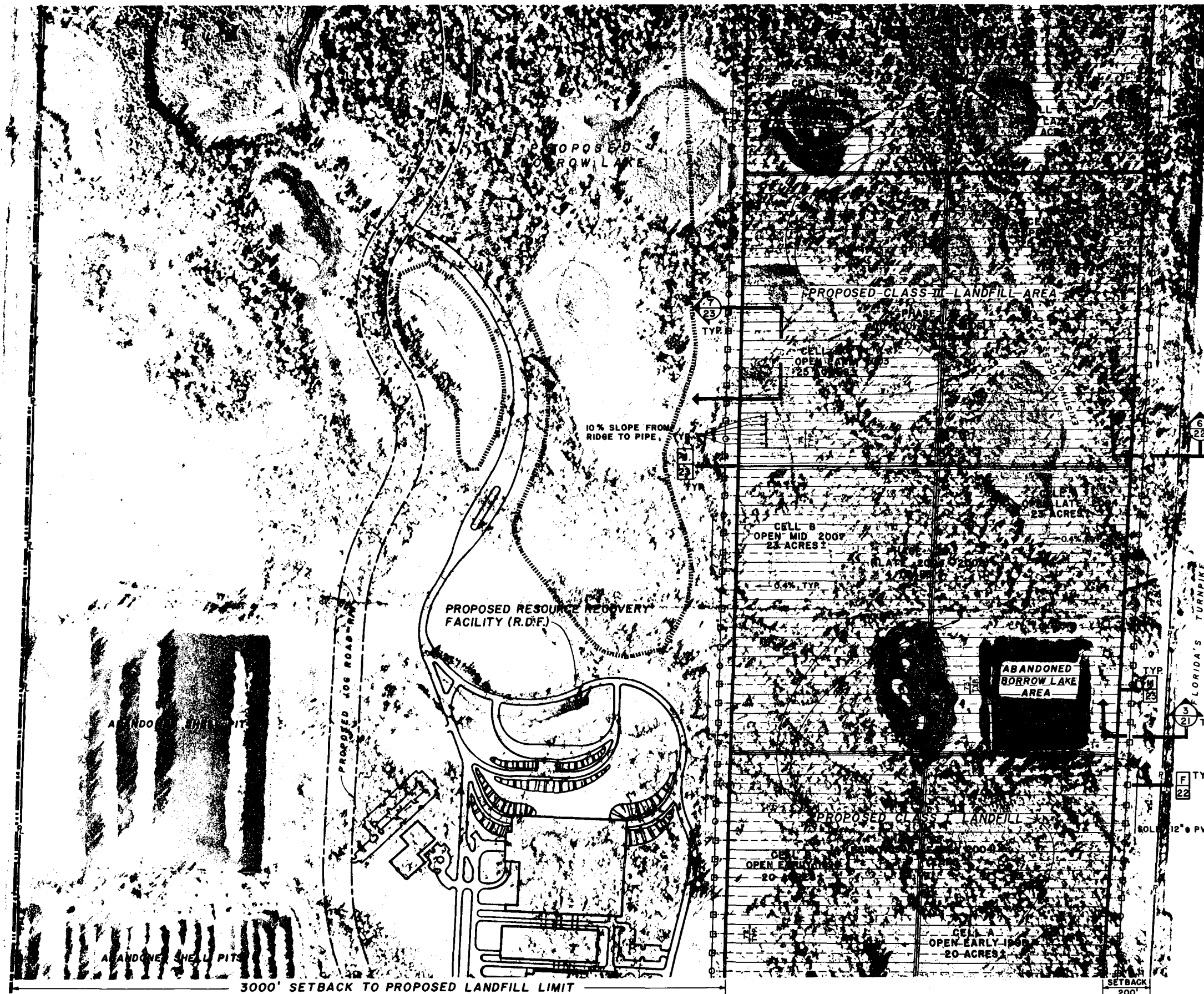
PBSAJ/SAHWG
502-02830

PHOTO DEC 10, 1984

BORWORTH AERIAL SURVEYS, INC.
Photogrammetric / Topographic

CONSERVATION (W) ZONING DISTRICT

WEST PALM BEACH
WATER CATCHMENT
AREA



LEGEND

- LEACHATE COLLECTION RIDGE LINE
- 12" DIA. SOLID P.V.C. PIPE
- 12" DIA. PERFORATED P.V.C. PIPE
- 12" DIA. WALL P.V.C. PIPE (GRAVITY FLOW)
- LEACHATE COLLECTION MANHOLE
- 12" DIA. INDICATES DIRECTION OF VIEW
- SECTION NUMBER
- SECTION INDICATOR
- SHEET NUMBER
- DETAIL LETTER
- DETAIL INDICATOR
- SHEET NUMBER

NOTE

LEACHATE PUMP STATION AND FORCE MAIN LOCATIONS WILL BE DETERMINED DURING FINAL DESIGN.

EPB-9 CANAL

FLORIDA'S TURNPIKE

SETBACK 200'

PBS&J/SAHWG
503-02850

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY

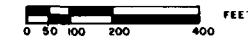


POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
LEACHATE COLLECTION SYSTEM
& PHASING PLAN

DESIGN CLK, JND
DRAWN AMS
CHECKED ARC
K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.

KEY MAP



SHEET 11 OF 25

CONSERVATION (W) ZONING DISTRICT

WEST PALM BEACH
WATER CATCHMENT
AREA

OTHER OWNERS

ABANDONED
SHELL PITS

3000' SETBACK TO PROPOSED LANDFILL LIMIT

TRANSMISSION
TOWER

PROPOSED RESOURCE RECOVERY
FACILITY (R.D.F.)

WELL #1
EXISTING HOUSE TO BE
REMOVED

ABANDONED
SHELL PITS

10% SLOPE
FROM RIDGE
TO PIPE (TYP.)

SOLID 12" PVC
0.22% SLOPE, TYP.

CELL B PHASE III CELL A

CELL B
OPEN LATE 1991
23.6 ACRES

CELL A
OPEN LATE 1991
23.4 ACRES

CELL B
OPEN LATE 1987
23.6 ACRES

CLASS I LANDFILL
PHASE I
(1987-1990)
3 YEARS

CELL A
OPEN LATE 1987
23.4 ACRES

SETBACK
200'

ACCESS ROAD
FLORIDA'S TURNPIKE

EPB10
CANAL

LEGEND

- LEACHATE COLLECTION
RIDGE LINE
- 8" DIA. SOLID P.V.C. PIPE
- 8" DIA. PERFORATED
P.V.C. PIPE
- SOLID WALL P.V.C. PIPE
(GRAVITY FLOW)
- LEACHATE COLLECTION
MANHOLE
- LEACHATE
- "ARROW HAT" INDICATES
DIRECTION OF VIEW
SECTION NUMBER
SHEET NUMBER
- DETAIL LETTER
DETAIL INDICATOR
SHEET NUMBER

NOTE:
LEACHATE PUMP STATION AND
FORCE MAIN LOCATIONS WILL BE
DETERMINED DURING FINAL DESIGN.

PROPOSED
BORROW LAKE

PROPOSED BORROW LAKE

45TH STREET

CITY OF WEST PALM BEACH PROPERTY - CONSERVATION (W) ZONING DISTRICT

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
LEACHATE COLLECTION SYSTEM
& PHASING PLAN

DESIGN CLK, JMD
DRAWN AMS
CHECKED ARC
BY K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.

KEY MAP
0 50 100 200 400 FEET
SHEET 12 OF 25

PBS&J/SAHWG
504-02850

PHOTO DEC 10, 1984

BOSWORTH AERIAL SURVEYS INC.
Photogrammetry for Transportation

LEGAL DESCRIPTION

OWNERSHIP NO. 1

ARTHUR GLADSTONE
ORB 3369, PAGES 1325-1328
DESCRIPTION:

Parcel 4: The North Half of Section 3, Township 43 South, Range 42 East, Palm Beach County, Florida, lying North of the North Right-of-Way line of 45th Street (State Road 702) and West of the West Right-of-Way line of the Sunshine State Parkway, LESS therefrom the West 2779.41 feet; measured at right angles thereto.

Parcel 5: The North Half of Section 3, Township 43 South, Range 42 East, Palm Beach County, Florida, lying South of the South Right-of-Way of 45th Street (State Road 702) and West of the West Right-of-Way line of the Sunshine State Parkway.

SUBJECT TO: Existing first mortgage of record; agreements, resolutions, easements, reservations and restrictions of record; agreement from Goldcoast Builders, Inc., to Consolidated Utility Co. as shown in Official Record Book 660, Page 412, Palm Beach County, Florida Records; roads, streets, ways, streams, waterways or easements, if any, not shown of record; real estate taxes for 1980; zoning and/or restrictions and prohibitions imposed by governmental authority.

Amended 8-7-84

OWNERSHIP NO. 2

NELSON LEE ROANE AND EUGENIA H. ROANE, HIS WIFE
ORB 2743, PAGE 299
DESCRIPTION:

A parcel of land in Section 3, Township 43 south, Range 42 East, Palm Beach County, Florida; more particularly described as follows:

The East 147.41 feet of the West 2,779.41 feet of that part of the North Half of said Section 3, lying North of the North Right-of-Way line of State Road 702 (45th Street).

SUBJECT TO easements, restrictions and reservations of record and taxes subsequent to the year of 1975.

OWNERSHIP NO. 3

EXHIBIT A, PAGE 1 OF 2, TO CONTRACT FOR SALE AND PURCHASE BETWEEN JOHN E. CORBALLY, JAMES M. FURMAN AND DAVID M. MURDOCH, AS TRUSTEES, ETC., AND PALM BEACH COUNTY SOLID WASTE AUTHORITY

PARCEL B

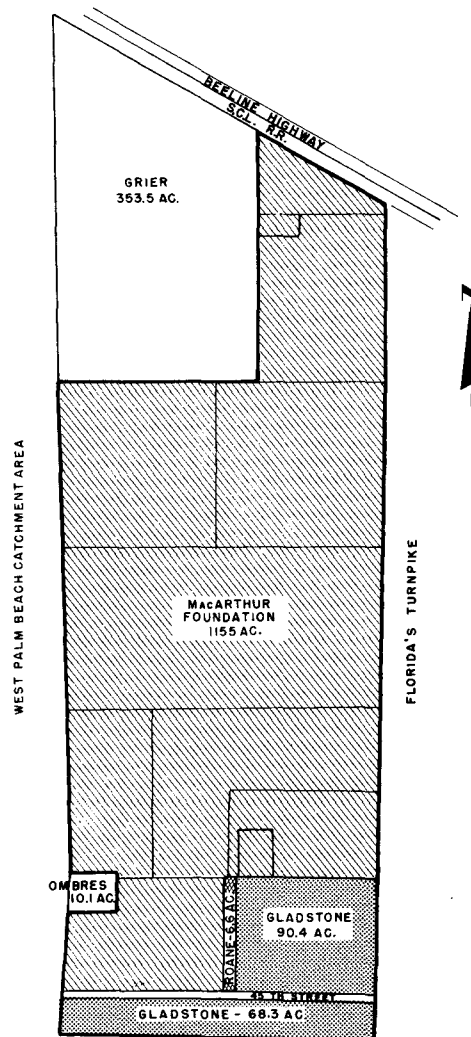
A tract of land lying in Sections 22 and 27, Township 42 South, Range 42 East, Palm Beach County, Florida, and more particularly described as follows:

All that part of Section 22, lying South of the Southerly right-of-way line of the Seaboard Coast Line Railroad, and the North one-half of Section 27, Township 42 South, Range 42 East, lying East of a line running North and South which line commences at a point located in the North section line of Section 22, 2,000 feet West of the point at which said North section line is intersected by the Westerly right-of-way of the Sunshine State Parkway, as recorded in Deed Book 1110, Page 583, in the Public Records of Palm Beach County, Florida, and which line terminates at a point situated on the East/West half section of section line of Section 27, 2,000 feet West of a point at which the West right-of-way line of the Sunshine State Parkway intersects said half section line, LESS that part described in Official Record Book 2399, Page 713, in the Public Records of Palm Beach County, Florida, and LESS the right-of-way of said Sunshine State Parkway as conveyed in Deed Book 1110, Page 583, in the Public Records of Palm Beach County, Florida, and as laid out and in use. Also described as: The Easternmost 2,000 feet of Section 22, lying South of the right-of-way of the Seaboard Coastline Railroad, and of the North one-half of Section 27, lying immediately West of the West right-of-way of Sunshine State Parkway, LESS that part described in Official Record Book 2399, Page 713, in the Public Records of Palm Beach County, Florida, and LESS the right-of-way of said Sunshine State Parkway as conveyed in Deed Book 1110, Page 583, in the Public Records of Palm Beach County, Florida, and as laid out and in use.

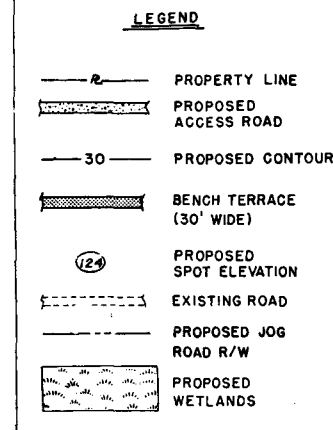
The South half of Section 27 and all of Section 34, Township 42 South, Range 42 East, Palm Beach County, Florida; LESS right-of-way of Sunshine State Parkway as vested in the Florida State Turnpike Authority by Final Judgment in MEC Book 74, Page 662, Public Records of Palm Beach County, Florida, and as laid out and in use.

The West 2,632 feet of the North half of Section 3, lying North of State Road 702, LESS the Northwest Quarter of the Northwest Quarter of the Northwest Quarter of said Section 3, all in Township 43 South, Range 42 East, Palm Beach County, Florida.

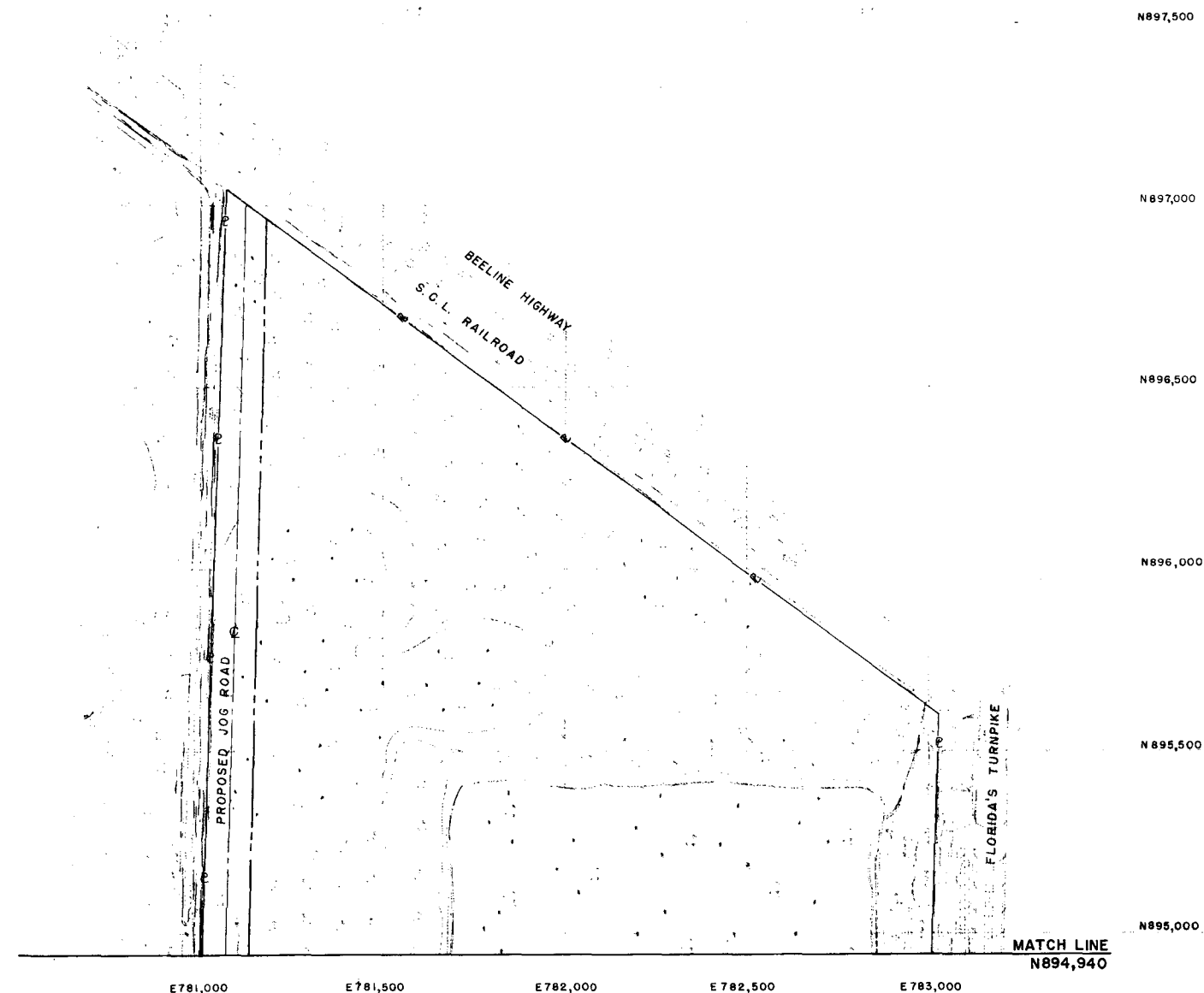
The North 1/2 of the Northeast 1/4 of the Northwest 1/4 of the Northeast 1/4 of Section 27, Township 42 South, Range 42 East, Palm beach County, Florida.



PROPERTY OWNERSHIP



FLIGHT DATE: JUNE 20, 1984

MATCH LINE
N894,940

PBS&J/S&HWG
505-0285D

PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY

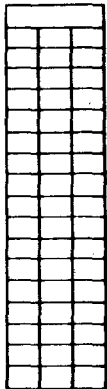


POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
PROPOSED CONTOURS

DESIGN **AJE, ARC**
DRAWN **AMS**
CHECKED **ARC**
D.C. **K.J.C.**

A.R. CAPELLINI, P.E., PROJ. MGR.

0 50 100 200 400 FEET
SHEET **13** OF **25**



MATCH LINE
N894,940

C
21
TYP.

FLIGHT DATE:
JUNE 20, 1984

NOTE:
LANDFILL GAS COLLECTION POINT
CONTROLS MAY BE FLARED, VENTED
TO OPEN AIR, OR MANIFOLDED INTO
A COLLECTION SYSTEM. ALL OPTIONS
WILL BE BASED ON ENVIRONMENTAL
AND ECONOMIC IMPACT STUDIES.

EXISTING BORROW LAKE

LEGEND

- "ARROW HAT" INDICATES
DIRECTION OF VIEW
- SECTION NUMBER
SECTION INDICATOR
SHEET NUMBER
- DETAIL LETTER
DETAIL INDICATOR
SHEET NUMBER
- PROPERTY LINE
- PROPOSED
ACCESS ROAD
- 30' PROPOSED
CONTOUR
- BENCH TERRACE
(30' WIDE)
- PROPOSED
SPOT ELEVATION
- EXISTING ROAD
- PROPOSED JOG
ROAD R/W
- PROPOSED
WETLANDS
- DEEP M. WELL
- MONITOR WELL
- LANDFILL GAS
EXTRACTION PT.
(SEE NOTE)

ACCESS ROAD

LIMIT OF LANDFILL

MATCH LINE
N890,700

N893,000

N892,500

N892,000

N891,500

N891,000

N894,500

N894,000

N893,500

BERM
ELEV. 20.0

BERM
ELEV. 20.0

PROPOSED JOG ROAD
ELEV. 20.3

FLOW
TO BE GRADED
FOR OVERLAND FLOW

N 0
24 24
TYP.

BERM
ELEV. 20.0

BERM TO
25 YR. ELEV.
72 HR.

PROPOSED
BORROW LAKE

BERM
ELEV. 18.9

PROPOSED
FINAL LANDFILL
ACCESS ROAD

5
22

4
22

PRSAJ/SAHWG
508-0285D
E777,500

E777,500

E778,000

E778,500

E779,000

E779,500

E780,000

E780,500

E781,000

E781,500

E782,000

E782,500

E783,000

PALM BEACH COUNTY SOLID WASTE AUTHORITY

RESOURCE RECOVERY FACILITY



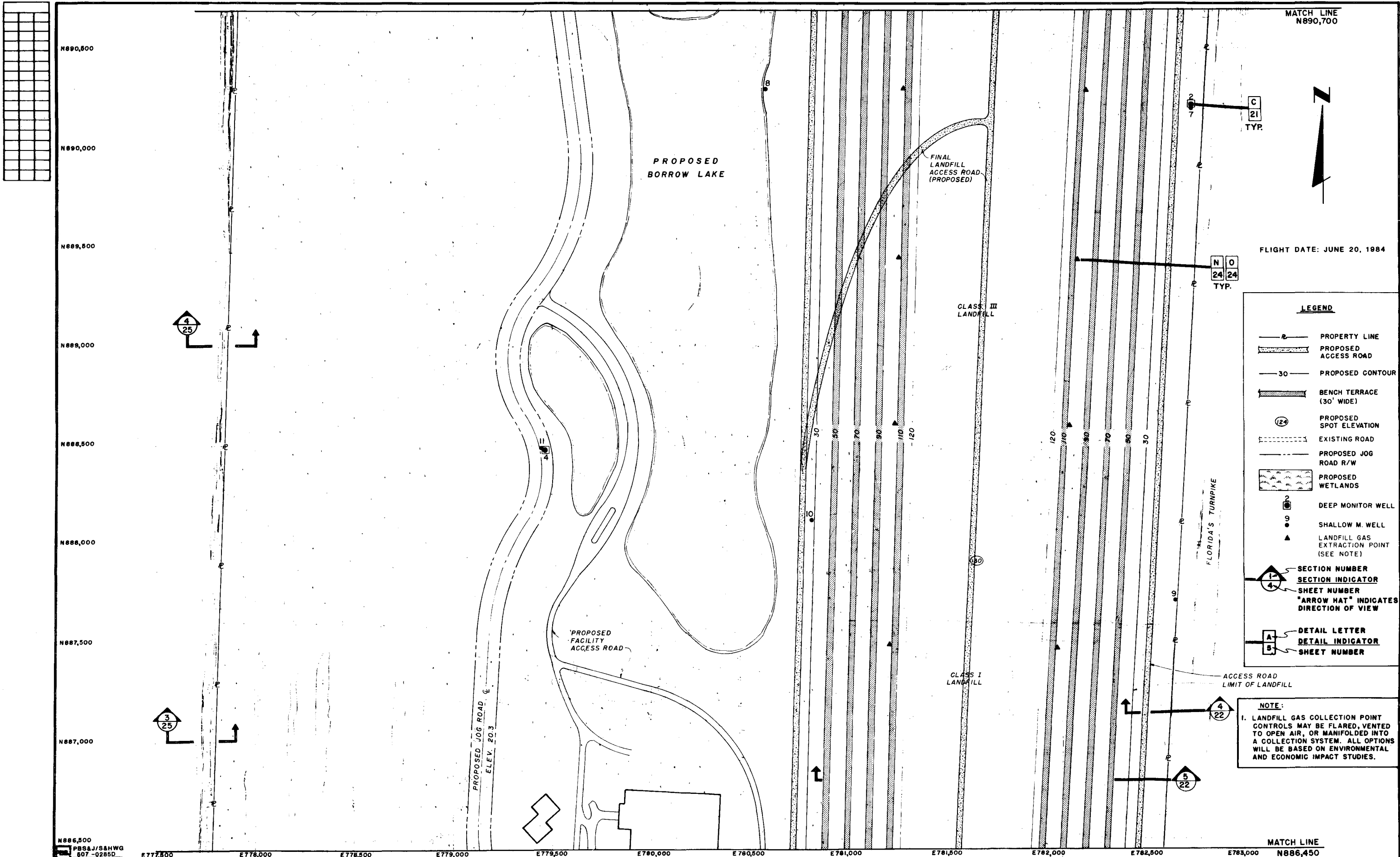
POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
PROPOSED CONTOURS

DESIGN: A.J.E., ARC
DRAWN: AMS
CHECKED: ARC
D.C.: K.J.C.

A.R. CAPPELLINI, P.E., PRD-A: MGR.

0 50 100 200 400 FEET

SHEET 14 OF 25



- LEGEND**
- P — PROPERTY LINE
 - 30 — PROPOSED ACCESS ROAD
 - 30 — PROPOSED CONTOUR
 - 30 — BENCH TERRACE (30' WIDE)
 - (124) PROPOSED SPOT ELEVATION
 - EXISTING ROAD
 - PROPOSED JOG ROAD R/W
 - [Pattern] PROPOSED WETLANDS
 - 2 DEEP MONITOR WELL
 - 9 SHALLOW M. WELL
 - ▲ LANDFILL GAS EXTRACTION POINT (SEE NOTE)
 - 1-4 SECTION NUMBER SECTION INDICATOR
 - 4-22 SHEET NUMBER "ARROW HAT" INDICATES DIRECTION OF VIEW
 - A-8 DETAIL LETTER DETAIL INDICATOR SHEET NUMBER

NOTE:
1. LANDFILL GAS COLLECTION POINT CONTROLS MAY BE FLARED, VENTED TO OPEN AIR, OR MANIFOLDED INTO A COLLECTION SYSTEM. ALL OPTIONS WILL BE BASED ON ENVIRONMENTAL AND ECONOMIC IMPACT STUDIES.

N886,500
N887,000
N887,500
N888,000
N888,500
N889,000
N889,500
N890,000
N890,500

E777,500 E778,000 E778,500 E779,000 E779,500 E780,000 E780,500 E781,000 E781,500 E782,000 E782,500 E783,000

PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
PROPOSED CONTOURS

DESIGN: A.J.E., ARC
DRAWN: AMS
CHECKED: ARC
BY: K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.

0 50 100 200 400 FEET
SHEET 15 OF 25

MATCH LINE
N886,450

FLIGHT DATE: JUNE 20, 1984



EXISTING 4x6' BOX CULVERT
ELEV. 14.0
DISCHARGE TO EPB 10

LEGEND

- P — PROPERTY LINE
- PROPOSED ACCESS ROAD
- 30 — PROPOSED CONTOUR
- BENCH TERRACE (30' WIDE)
- ②4 PROPOSED SPOT ELEVATION
- EXISTING ROAD
- PROPOSED JOG ROAD R/W
- PROPOSED WETLANDS
- ② DEEP MONITOR WELL
- SHALLOW M. WELL
- ▲ LANDFILL GAS EXTRACTION POINT (SEE NOTE)
- "ARROW HAT" INDICATES DIRECTION OF VIEW
- ①- SECTION NUMBER
- ④- SECTION INDICATOR SHEET NUMBER
- ①- DETAIL LETTER
- ⑧- DETAIL INDICATOR SHEET NUMBER

NOTE:
LANDFILL GAS COLLECTION POINT CONTROLS MAY BE FLARED, VENTED TO OPEN AIR, OR MANIFOLDED INTO A COLLECTION SYSTEM. ALL OPTIONS WILL BE BASED ON ENVIRONMENTAL AND ECONOMIC IMPACT STUDIES.

N886,000

N885,500

N885,000

N884,500

N884,000

N883,500

N883,000

N882,500

PROPOSED JOG ROAD
ELEV. 20.3

45TH STREET

PROPOSED BORROW PIT

PROPOSED BORROW PIT

LEASE PROPERTY

FINAL LANDFILL
ACCESS ROAD
(PROPOSED)

RESERVED FOR
PROPOSED FLORIDA
TURNPIKE INTERCHANGE

N 0
24 24
TYP.

LIMIT OF
LANDFILL

ACCESS ROAD
ELEV. 23.0

④
22

PBSAJ/SAHWG
608-02850

E777,500

E778,000

E778,500

E779,000

E779,500

E780,000

E780,500

E781,000

E781,500

E782,000

E782,500

E783,000

PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



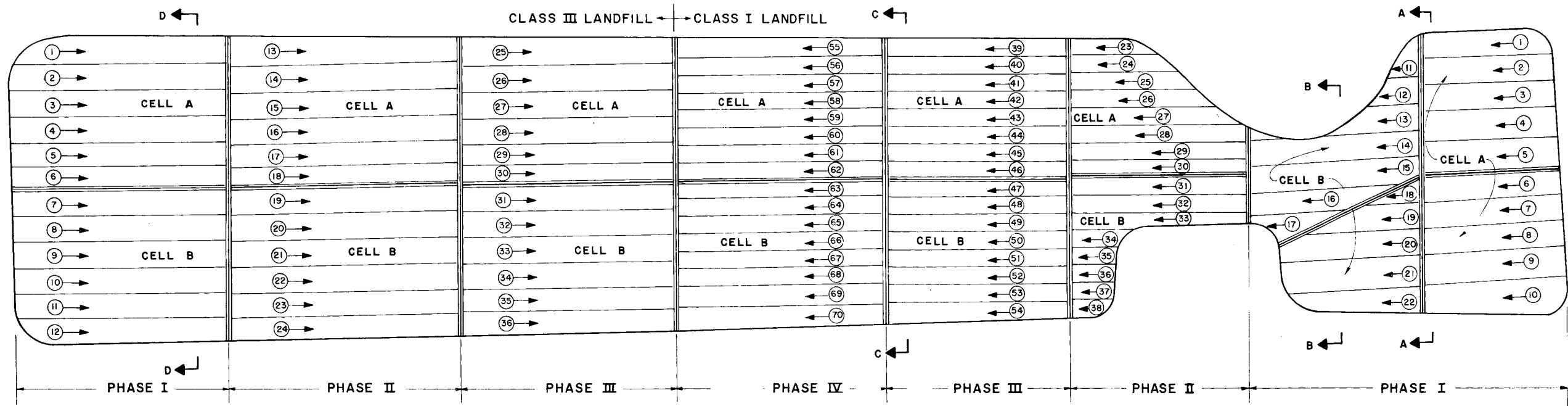
POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
PROPOSED CONTOURS

DESIGN: AJE, ARC
DRAWN: AMS
CHECKED: ARC
O.C.: K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.

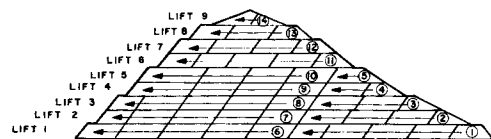


SHEET 16 OF 25



NOTES

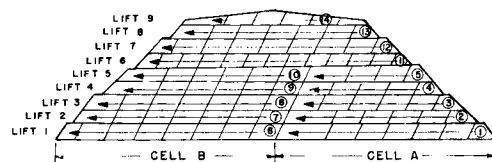
- ① denotes direction and sequence of row development.
- Working face (row) width for Class I, Phase I will be 150 feet.
- Working face (row) width for Class I, Phase II, III, and IV will be 100 feet.
- Working face (row) width for Class III, all phases will be 100 feet.
- Lift height will be 10 feet.
- For each phase, Lifts 1 through 5 will be completed before Lift 6 is begun.
- A temporary impermeable cover will be placed over Lift 5, Cell A for all phases, Class I and Class III.
- Temporary access roads will be constructed as landfilling proceeds. The slope on access roads will be 7%.
- ② denotes sequence of cell and lift development in section.



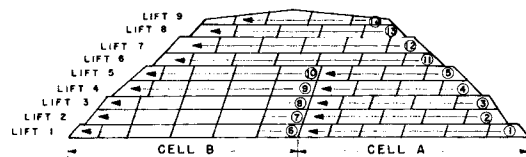
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

SECTIONS

SCALE: HORIZ: 1" = 300'
VERT: 1" = 60'

PLAN VIEW

SCALE: 1" = 300'

MATERIAL FOR SEEDING MULCH, FERTILIZER DURING OPERATION AND AT CLOSURE

Seed

Grass seed shall be a mixture of 20 parts of Bermuda seed and 80 parts of Argentine Bahia. The separate types of seed used shall be thoroughly dry mixed immediately before sowing. Seed which has become wet shall not be used.

The Bermuda seed shall be an equal mixture of hulled and unhulled seed. The Argentine Bahia seed shall be scarified seed, having a minimum active germination of 40 percent and a total germination of 85 percent. All seed shall meet the requirements of the State Department of Agriculture and Consumer Services and all applicable state laws, and shall be approved by the Engineer before being sown.

Mulch

Dry Mulch: The mulch material used shall normally be dry mulch. Dry mulch shall be straw or hay, consisting of oat, rye or wheat straw; or of pangola, peanut, coastal Bermuda or Bahia grass hay. Only undeteriorated mulch which can be readily cut into the soil shall be used.

Green Mulch: Green mulch shall consist of live coastal Bermuda, or other approved type of grass, and shall be free from weeds and obnoxious or undesirable grasses.

Commercial Fertilizer

Commercial fertilizers shall comply with the state fertilizer laws.

The numeral designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water soluble potash, contained in the fertilizer.

Type I fertilizer shall be used unless Type II fertilizer or another designation is specifically called for on the Drawings or authorized by the Engineer. Liquid fertilizer will not be permitted.

a. Type I Fertilizer: The chemical designation of this fertilizer shall be 12-8-8, with at least 50 percent of the nitrogen from a non-water-soluble organic source. The nitrogen source may be a urea-formaldehyde source provided it is not derived from a waste product of the plastic industry.

b. Type II Fertilizer: The chemical designation of the fertilizer shall be 12-12-8 and at least 50 percent of the nitrogen shall be from a urea-formaldehyde source and at least 50 percent of the phosphoric acid shall be from regular superphosphate.

Water for Grassing

The water used in the grassing operations may be obtained from any approved on-site or off-site water system. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance which might be harmful to plant growth or obnoxious to traffic. Salt water shall not be used.

Fertilizer Application Rate

The fertilizer shall be spread uniformly over the area to be seeded, at the rate of 800 - 1000 pounds per acre. On steep slopes or other areas where machine spreading may not be practicable, the spreading may be done by hand. Immediately after the fertilizer is spread, it shall be mixed with the soil to a depth of approximately 4-inches.

Seeding

While the soil is still loose and moist, the seed shall be scattered uniformly over the grassing area at a rate of 100 pounds per acre.

When so directed by the Engineer, seed of an approved quick growing species of grass, such as rye, Italian rye, millet or other cereal grass, shall be spread at a rate of 30 pounds per acre in conjunction with the permanent type seed mixture.

Mulching

Approximately 2-inches, loose thickness, of the mulch material shall be applied uniformly over the seeded area, and the mulch material cut into the soil with the equipment specified, so as to produce a loose mulched thickness of 3-inches to 4-inches. Care shall be exercised that the materials are not cut too deeply into the soil.

When green mulch is used, it shall be incorporated into the soil not later than 2 days after being cut and no artificial watering of the mulch shall be done before it is applied.

Rolling

Immediately after completion of the seeding, the entire seeded and mulched area shall be rolled thoroughly.

PBS&J/S&HWG
509-0285D

PALM BEACH COUNTY SOLID WASTE AUTHORITY RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
OPERATIONAL PLAN

DESIGN: CLK
DRAWN: AMS
CHECKED: ARC
O.C.: K.J.C.
A.R. CAPELLINI, P.E., PROJ. MGR.

SHEET 17 OF 25

DITCH SCHEDULE *

DITCH NO.	FLOW DIR.	SLOPE	MAX FLOW CFS	FLUID VELOCITY FPS	WATER SURFACE WIDTH FT	FLOW DEPTH FT	CHANNEL LENGTH FT	DITCH NO.	FLOW DIR.	SLOPE	MAX FLOW CFS	FLUID VELOCITY FPS	WATER SURFACE WIDTH FT	FLOW DEPTH FT	CHANNEL LENGTH FT
1	S	.0010	51.89	1.59	19.8	3.3	1940	31	N	.0010	8.85	1.02	10.2	1.7	1320
2	N	.0010	51.89	1.59	19.8	3.3	1940	32	N	.0010	8.85	1.02	10.2	1.7	1320
3	N	.0010	51.89	1.59	19.8	3.3	1940	33	N	.0010	13.65	1.14	12.0	2.0	1660
4	S	.0010	51.89	1.59	19.8	3.3	1940	34	N	.0010	15.54	1.17	12.6	2.1	1700
5	S	.0010	51.89	1.59	19.8	3.3	1940	35	N	.0010	17.60	1.21	13.2	2.2	1520
6	N	.0010	51.89	1.59	19.8	3.3	1940	36	N	.0010	17.60	1.21	13.2	2.2	1520
7	N	.0010	51.89	1.59	19.8	3.3	1940	37	N	.0010	22.19	1.28	14.4	2.4	1900
8	S	.0010	51.89	1.59	19.8	3.3	1940	38	N	.0010	24.75	1.32	15.0	2.5	1900
9	S	.0010	56.19	1.62	20.4	3.4	1270	39	N	.0010	19.81	1.25	13.8	2.3	1800
10	S	.0010	56.19	1.62	20.4	3.4	1270	40	N	.0010	19.81	1.25	13.8	2.3	1800
11	N	.0010	40.24	1.49	18.0	3.0	1200	41	N	.0010	17.60	1.21	13.2	2.2	1800
12	N	.0010	30.38	1.39	16.2	2.7	1150	42	N	.0010	22.19	1.28	14.4	2.4	1900
13	S	.0010	10.30	1.06	10.2	1.8	1940	43	N	.0010	22.19	1.28	14.4	2.4	1900
14	N	.0010	10.30	1.06	10.2	1.8	1940	44	N	.0010	22.19	1.28	14.4	2.4	1900
15	N	.0010	10.30	1.06	10.2	1.8	1940	45	S	.0010	13.65	1.14	12.0	2.0	1250
16	S	.0010	10.30	1.06	10.2	1.8	1940	46	S	.0010	15.54	1.17	12.6	2.1	1600
17	N	.0010	24.75	1.32	15.0	2.5	1940	47	S	.0010	15.54	1.17	12.6	2.1	1150
18	S	.0010	24.75	1.32	15.0	2.5	1940	48	S	.0010	17.60	1.21	13.2	2.2	1550
19	S	.0010	24.75	1.32	15.0	2.5	1940	49	S	.0010	10.30	1.06	10.8	1.8	820
20	N	.0010	24.75	1.32	15.0	2.5	1940	50	S	.0010	10.30	1.06	10.8	1.8	750
21	S	.0010	24.75	1.32	15.0	2.5	1940	51	S	.0010	17.60	1.21	13.2	2.2	600
22	N	.0010	24.75	1.32	15.0	2.5	1940	52	S	.0010	15.54	1.17	12.6	2.1	650
23	N	.0010	24.75	1.32	15.0	2.5	1940	53	N	.0010	13.65	1.14	12.0	2.0	600
24	S	.0010	24.75	1.32	15.0	2.5	1940	54	N	.0010	13.65	1.14	12.0	2.0	600
25	N	.0010	24.75	1.32	15.0	2.5	1940	55	N	.0010	11.90	1.10	11.4	1.9	1100
26	S	.0010	24.75	1.32	15.0	2.5	1940	56	N	.0010	11.90	1.10	11.4	1.9	800
27	S	.0010	24.75	1.32	15.0	2.5	1940	57	N	.0010	15.54	1.17	12.6	2.1	1350
28	N	.0010	24.75	1.32	15.0	2.5	1940	58	N	.0010	13.65	1.14	12.0	2.0	1100
29	N	.0010	8.85	1.02	10.2	1.7	1200	59	N	.0010	22.19	1.28	14.4	2.4	1400
30	N	.0010	8.85	1.02	10.2	1.7	1400	60	N	.0010	15.54	1.17	12.6	2.1	1300

* SEE DESIGN DETAIL SCHEDULE, SHT. 21

MATCH LINE
N894,940

C
21
TYP.

FLIGHT DATE:
JUNE 20, 1984

NOTE:
LANDFILL GAS COLLECTION POINT CONTROLS MAY BE FLARED, VENTED TO OPEN AIR, OR MANIFOLDED INTO A COLLECTION SYSTEM. ALL OPTIONS WILL BE BASED ON ENVIRONMENTAL AND ECONOMIC IMPACT STUDIES.

EXISTING BORROW LAKE

N893,000

N892,500

N892,000

N891,500

N891,000

PROPOSED
RETENTION
WETLANDS

PROPOSED JOG ROAD
ELEV. 20.3

BERM
ELEV. 20.0

CULVERT OUTFALL
2-6'-1X4'-7" PIPE ARCHES

FLOW
TO BE GRADED
FOR OVERLAND FLOW

N
24
24
TYP. H.P.

INV. ELEV.
17.2

BERM
ELEV. 20.0

BERM TO
25 YR. ELEV.
17.2 H.P.

PROPOSED
BORROW LAKE

BERM
ELEV. 18.9

BERM ELEV. 20.3 2' WIDE PERIMETER DITCH

SPILLWAY E

PROPOSED
FINAL LANDFILL
ACCESS ROAD

32.8' WIDE
PERIMETER
DITCH

ACCESS ROAD

LIMIT OF LANDFILL

LEGEND

- "ARROW HAT" INDICATES DIRECTION OF VIEW
- SECTION NUMBER
- SECTION INDICATOR
- SHEET NUMBER
- DETAIL LETTER
- DETAIL INDICATOR
- SHEET NUMBER
- PROPERTY LINE
- PROPOSED ACCESS ROAD
- PROPOSED CONTOUR
- BENCH TERRACE (30' WIDE)
- PROPOSED SPOT ELEVATION
- EXISTING ROAD
- PROPOSED JOG ROAD R/W
- PROPOSED WETLANDS
- DEEP M. WELL
- MONITOR WELL
- LANDFILL GAS EXTRACTION PT. (SEE NOTE)

PBS&J/SAHWG
610-0285D

E777,500

E778,000

E778,500

E779,000

E779,500

E780,000

E780,500

E781,000

E781,500

E782,000

E782,500

E783,000

MATCH LINE
N890,700

PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



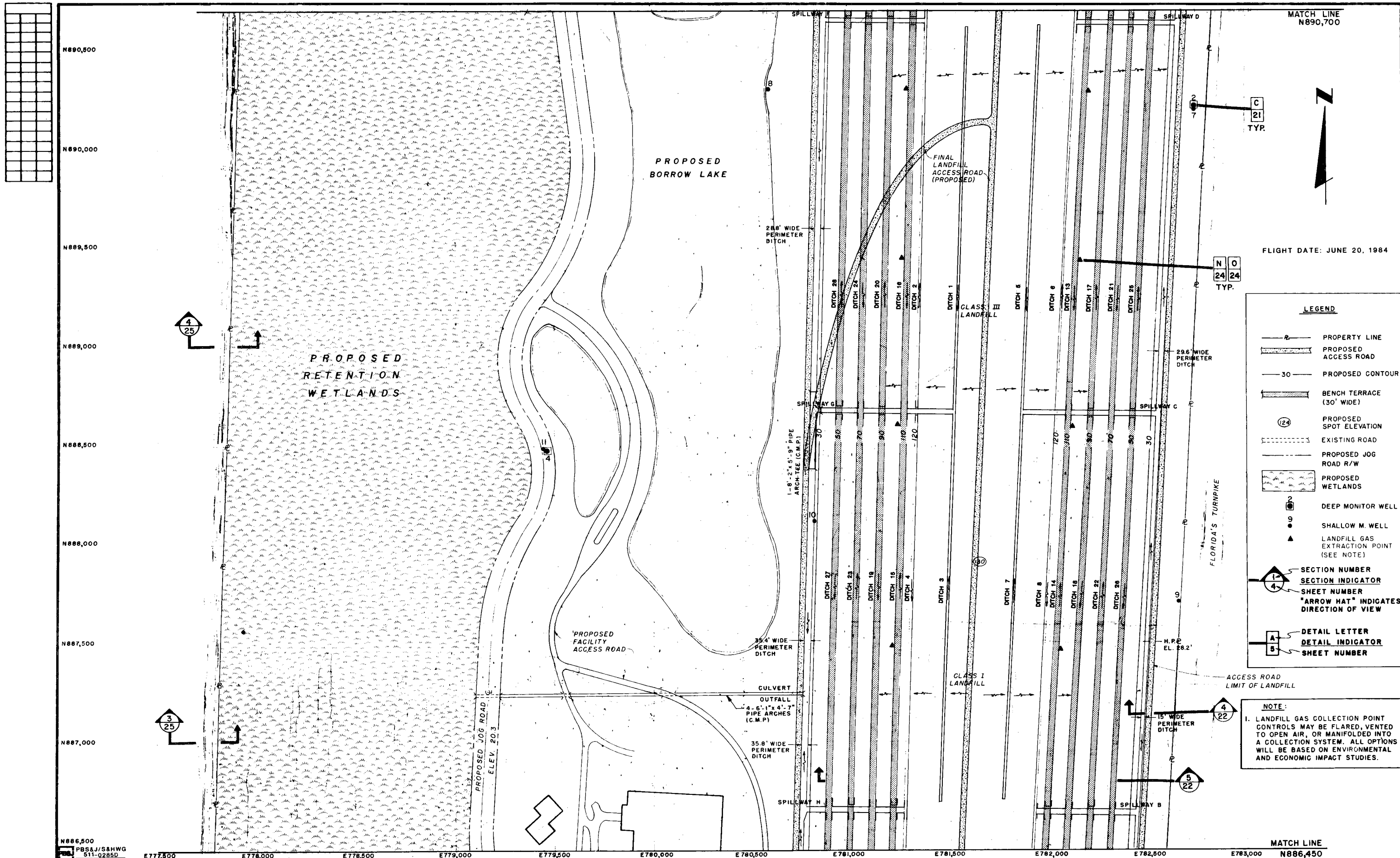
POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
SURFACE WATER MANAGEMENT
AND DRAINAGE CONTROL PLAN

DESIGN: A.J.E., ARC
DRAWN: AMS
CHECKED: ARC
O.C.: K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.

0 50 100 200 400 FEET

SHEET 18 OF 25



PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
SURFACE WATER MANAGEMENT
AND DRAINAGE CONTROL PLAN

DESIGN: A.J.E., ARC
DRAWN: AMS
CHECKED: ARC
O.C.: K.J.C.
A.R. CAPELLINI, P.E., PROJ. MGR.

0 50 100 200 400 FEET
SHEET 19 OF 25

MATCH LINE
N886,450

FLIGHT DATE: JUNE 20, 1984

LEGEND

- PROPERTY LINE
- PROPOSED ACCESS ROAD
- PROPOSED CONTOUR
- BENCH TERRACE (30' WIDE)
- PROPOSED SPOT ELEVATION
- EXISTING ROAD
- PROPOSED JOG ROAD R/W
- PROPOSED WETLANDS
- DEEP MONITOR WELL
- SHALLOW M. WELL
- LANDFILL GAS EXTRACTION POINT (SEE NOTE)
- "ARROW HAT" INDICATES DIRECTION OF VIEW
- SECTION NUMBER
- SECTION INDICATOR
- SHEET NUMBER
- DETAIL LETTER
- DETAIL INDICATOR
- SHEET NUMBER

NOTE:
1. LANDFILL GAS COLLECTION POINT CONTROLS MAY BE FLARED, VENTED TO OPEN AIR, OR MANIFOLDED INTO A COLLECTION SYSTEM. ALL OPTIONS WILL BE BASED ON ENVIRONMENTAL AND ECONOMIC IMPACT STUDIES.

N886,000

N885,500

N885,000

N884,500

N884,000

N883,500

N883,000

N882,500

E777,500

E778,000

E778,500

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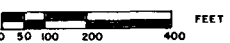
PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



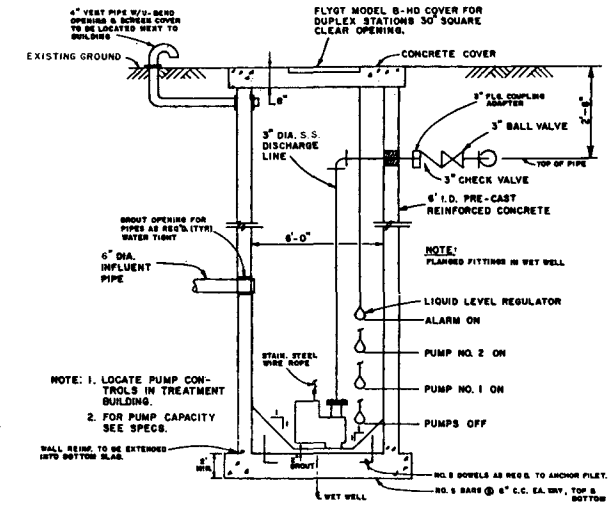
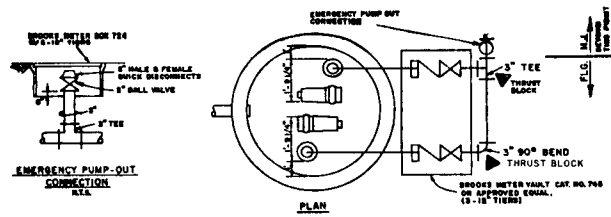
POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
SURFACE WATER MANAGEMENT
AND DRAINAGE CONTROL PLAN

DESIGN: A.J.E., A.R.C.
DRAWN: A.M.S.
CHECKED: A.R.C.
O.C.: K.J.C.

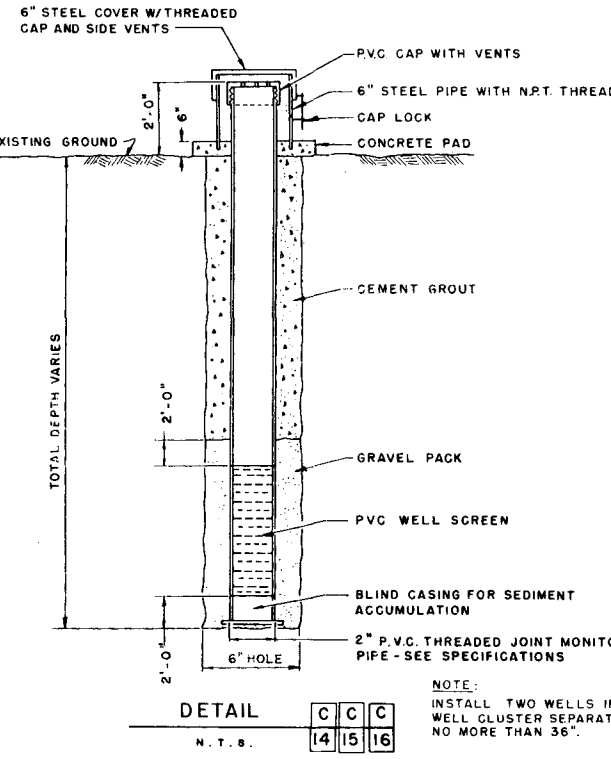
A.R. CAPELLINI, P.E., PROJ. MGR.



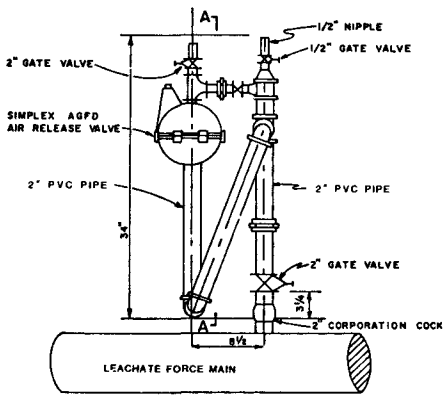
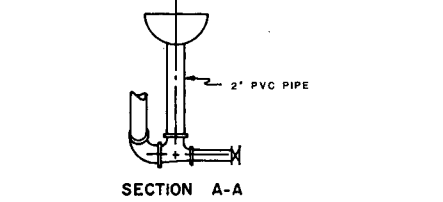
SHEET 20 OF 25



ON SITE PUMP STATION
N.T.S.

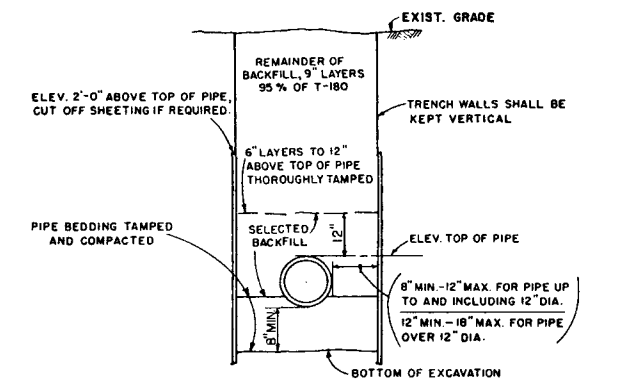


TYPICAL MONITORING WELL
N.T.S.

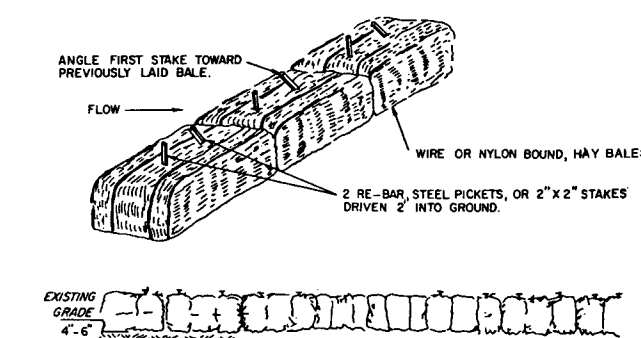


DETAIL A A A
N.T.S.

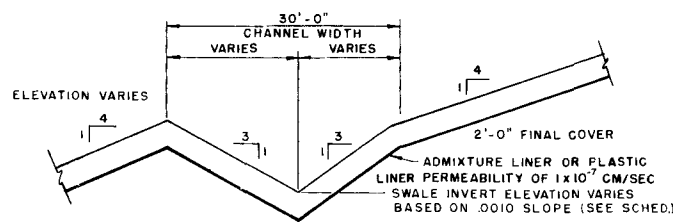
AUTOMATIC AIR RELEASE VALVE FOR LEACHATE FORCE MAIN (AS REQ'D)



TYPICAL TRENCH SECTION
(DRY TRENCH-FOR FORCE MAINS)
N.T.S.



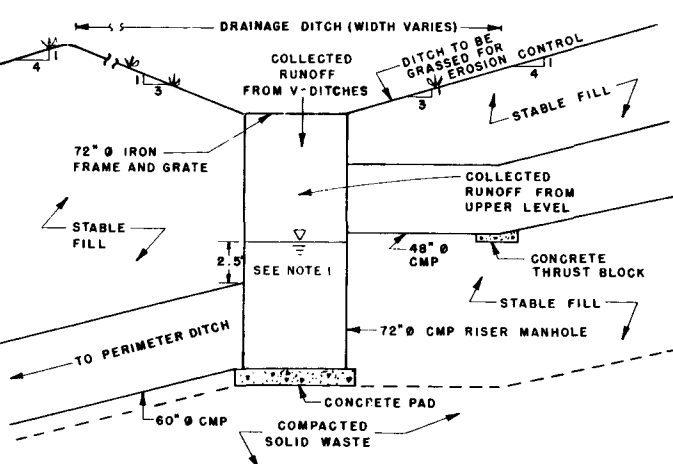
HAY BALE DETAILS
N.T.S.



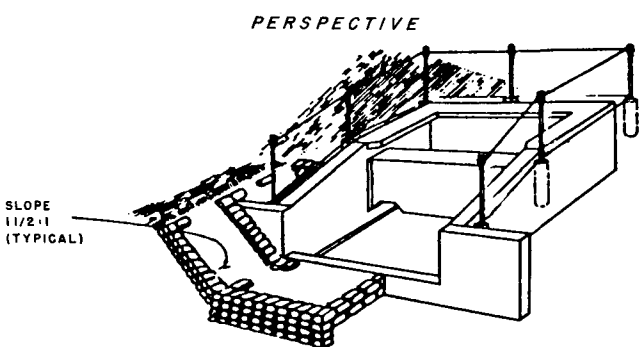
TERRACE / SWALE CROSS - SECTION
N.T.S.

DESIGN DETAIL SCHEDULE												
DITCH NO.	CHANNEL TOP WIDTH FT.	CHANNEL DEPTH FT.	INVERT ELEVATIONS		DITCH NO.	CHANNEL TOP WIDTH FT.	CHANNEL DEPTH FT.	INVERT ELEVATIONS				
			HIGH POINT FT.	LOW POINT FT.				HIGH POINT FT.	LOW POINT FT.			
1	25.8	4.3	121.7	119.7	31	16.2	2.7	107.3	106.1			
2	25.8	4.3	115.7	113.8	32	16.2	2.7	107.3	106.1			
3	25.8	4.3	121.7	119.7	33	18.0	3.0	87.0	85.3			
4	25.8	4.3	115.7	113.8	34	18.6	3.1	86.9	85.2			
5	25.8	4.3	121.7	119.7	35	19.2	3.2	86.8	85.3			
6	25.8	4.3	115.7	113.8	36	19.2	3.2	86.8	85.3			
7	25.8	4.3	121.7	119.7	37	20.4	3.4	66.6	64.7			
8	25.8	4.3	115.7	113.8	38	21.0	3.5	66.5	64.6			
9	26.4	4.4	115.6	114.3	39	19.8	3.3	66.7	64.9			
10	26.4	4.4	115.6	114.3	40	19.8	3.3	66.7	64.9			
11	24.0	4.0	116.0	114.8	41	19.2	3.2	46.8	45.0			
12	22.2	3.7	116.3	115.2	42	20.4	3.4	46.6	44.7			
13	16.8	2.8	107.2	105.3	43	20.4	3.4	46.6	44.7			
14	16.8	2.8	107.2	105.3	44	20.4	3.4	46.6	44.7			
15	16.8	2.8	107.2	105.3	45	18.0	3.0	67.0	65.8			
16	16.8	2.8	107.2	105.3	46	18.6	3.1	66.9	65.3			
17	21.0	3.5	86.5	84.6	47	18.6	3.1	46.9	45.8			
18	21.0	3.5	86.5	84.6	48	19.2	3.2	46.8	45.3			
19	21.0	3.5	86.5	84.6	49	16.8	2.8	87.2	86.4			
20	21.0	3.5	86.5	84.6	50	16.8	2.8	87.2	86.5			
21	21.0	3.5	66.5	64.6	51	19.2	3.2	106.8	106.2			
22	21.0	3.5	66.5	64.6	52	18.6	3.1	106.9	106.3			
23	21.0	3.5	66.5	64.6	53	17.4	2.9	107.1	106.5			
24	21.0	3.5	66.5	64.6	54	18.0	3.0	107.0	106.4			
25	21.0	3.5	46.5	44.6	55	17.4	2.9	87.1	86.0			
26	21.0	3.5	46.5	44.6	56	17.4	2.9	87.1	86.0			
27	21.0	3.5	46.5	44.6	57	18.6	3.1	66.9	65.6			
28	21.0	3.5	46.5	44.6	58	18.0	3.0	67.0	65.9			
29	16.2	2.7	107.3	106.1	59	20.4	3.4	46.6	45.2			
30	16.2	2.7	107.3	106.1	60	18.6	3.1	46.9	45.6			

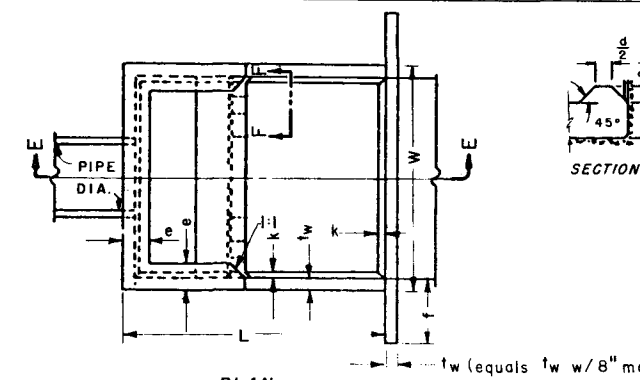
NOTE:
DITCH NUMBERS REFER TO DRAINAGE PLAN (SHEETS 18, 19, & 20)



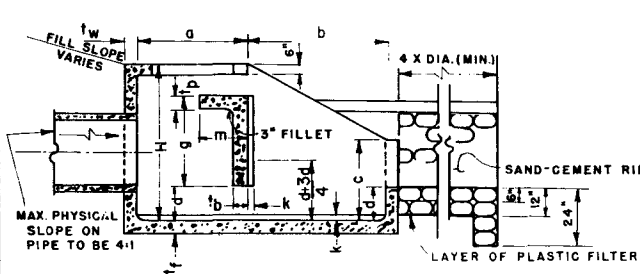
TYPICAL SPILLWAY INLET / MANHOLE DETAIL
N.T.S.



SIZE	PIPE	MAX. DISCHARGE	FEET AND INCHES										CONCRETE	REIN. STEEL	SAND CEMENT RIPRAP
DIA. INCHES	AREA SQ. FT.	Q	16"	10"	18"	24"	30"	36"	42"	48"	54"	60"	6"	4"	1/2"
60	19.63	238											34.48	5.932	32.9



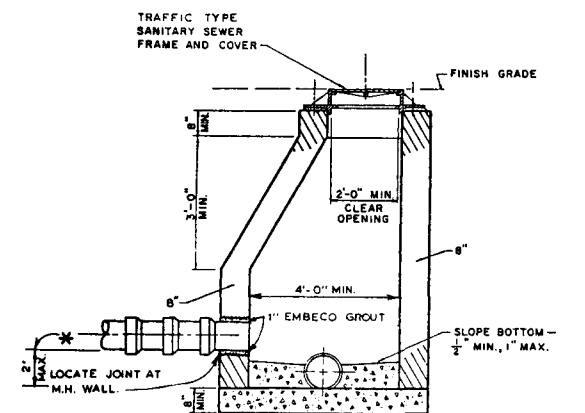
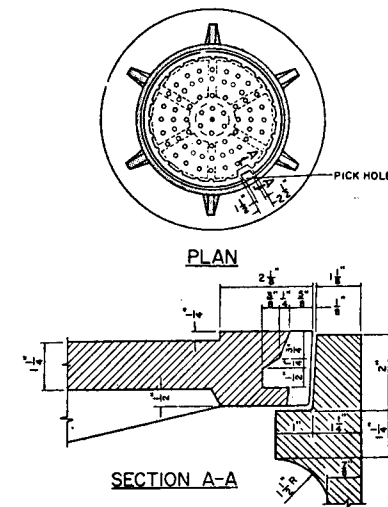
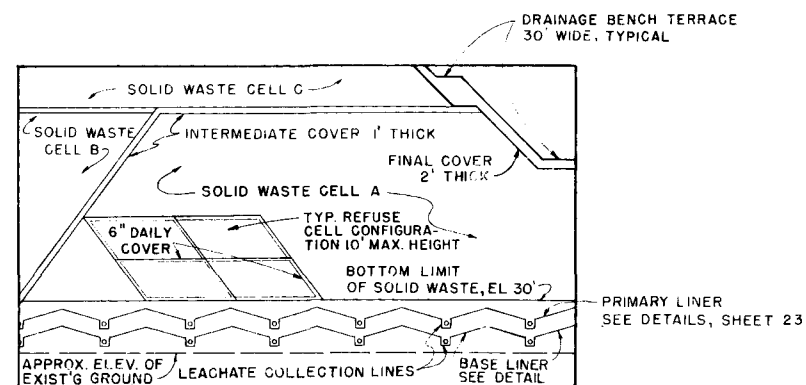
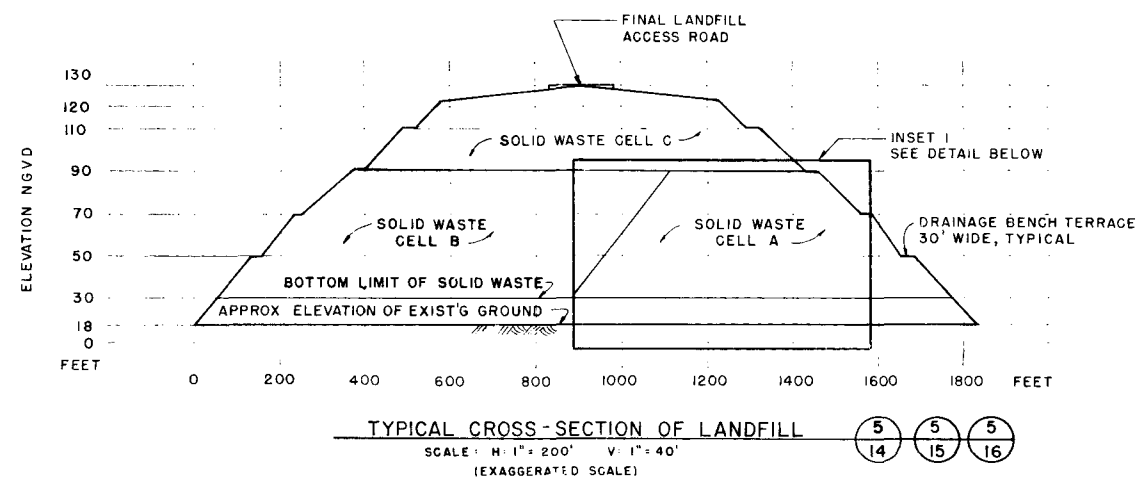
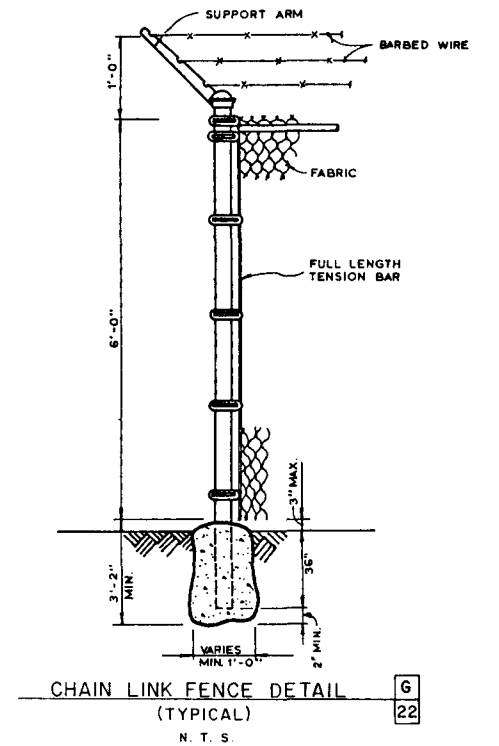
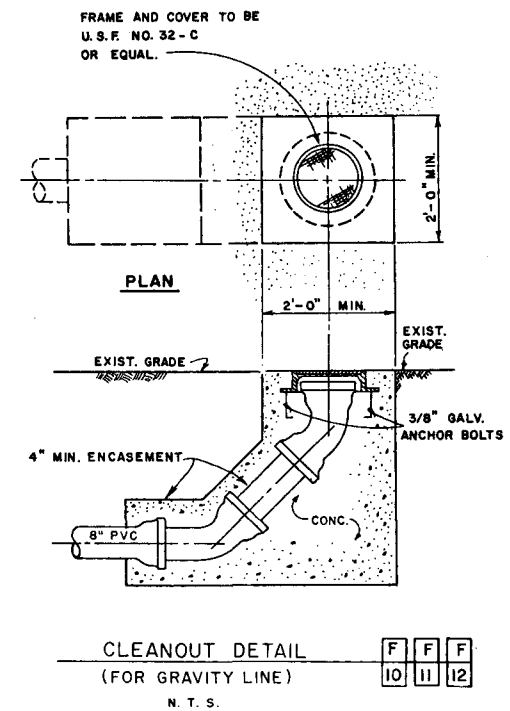
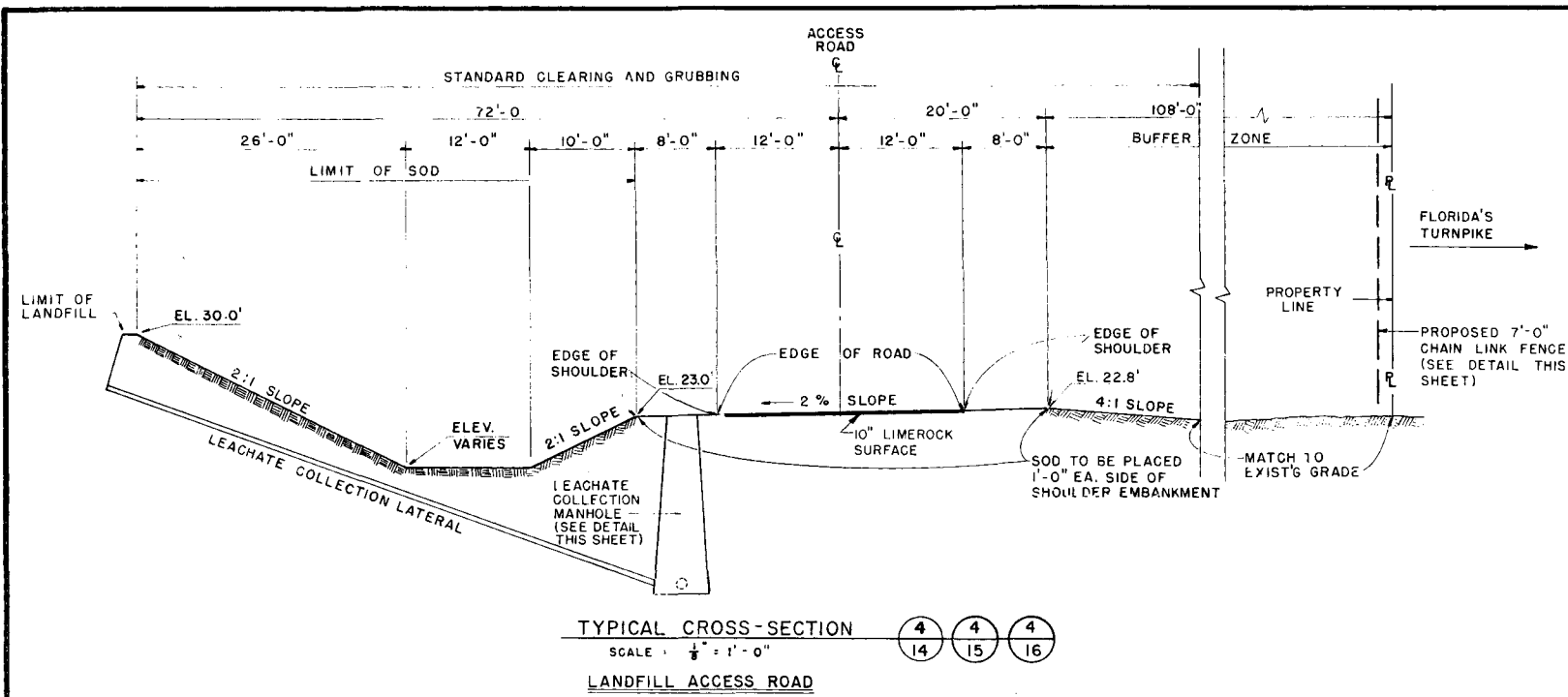
U-TYPE CONCRETE ENDWALL ENERGY DISSIPATOR - 60" PIPE
N.T.S.



NOTES:
1. FOR 25 YEAR STORM, INLET CONTROL HEAD OVER TOP OF DISCHARGE PIPE = 2.5' (MAXIMUM).
2. MANHOLE DEPTH NOT TO EXCEED 12'.
3. PIPES AND MANHOLE TO BE SET IN STABLE FILL MATERIAL.

TYPICAL SPILLWAY INLET / MANHOLE DETAIL
N.T.S.





- NOTES:**
1. BEADS TO BE 1/2" HIGH WITH A RADIUS OF 1/2" AT BOTTOM AND 1/2" AT TOP
 2. ALL BEARING SURFACES TO BE MACHINED.
 3. MIN. WEIGHTS:
COVER: 168 LBS.
FRAME: 365 LBS.

- NOTES:**
1. USE CONCENTRIC CONE FOR MANHOLE LESS THAN 4'-0" IN DEPTH. USE ECCENTRIC CONE, AS SHOWN, AT DEPTH OF 4'-0" OR MORE.
 2. BRICK MASONRY TO BE STUCCOED WITH 1/2" MORTAR INSIDE AND OUTSIDE.

PBS&J/SAHWG
514-0285D

PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY

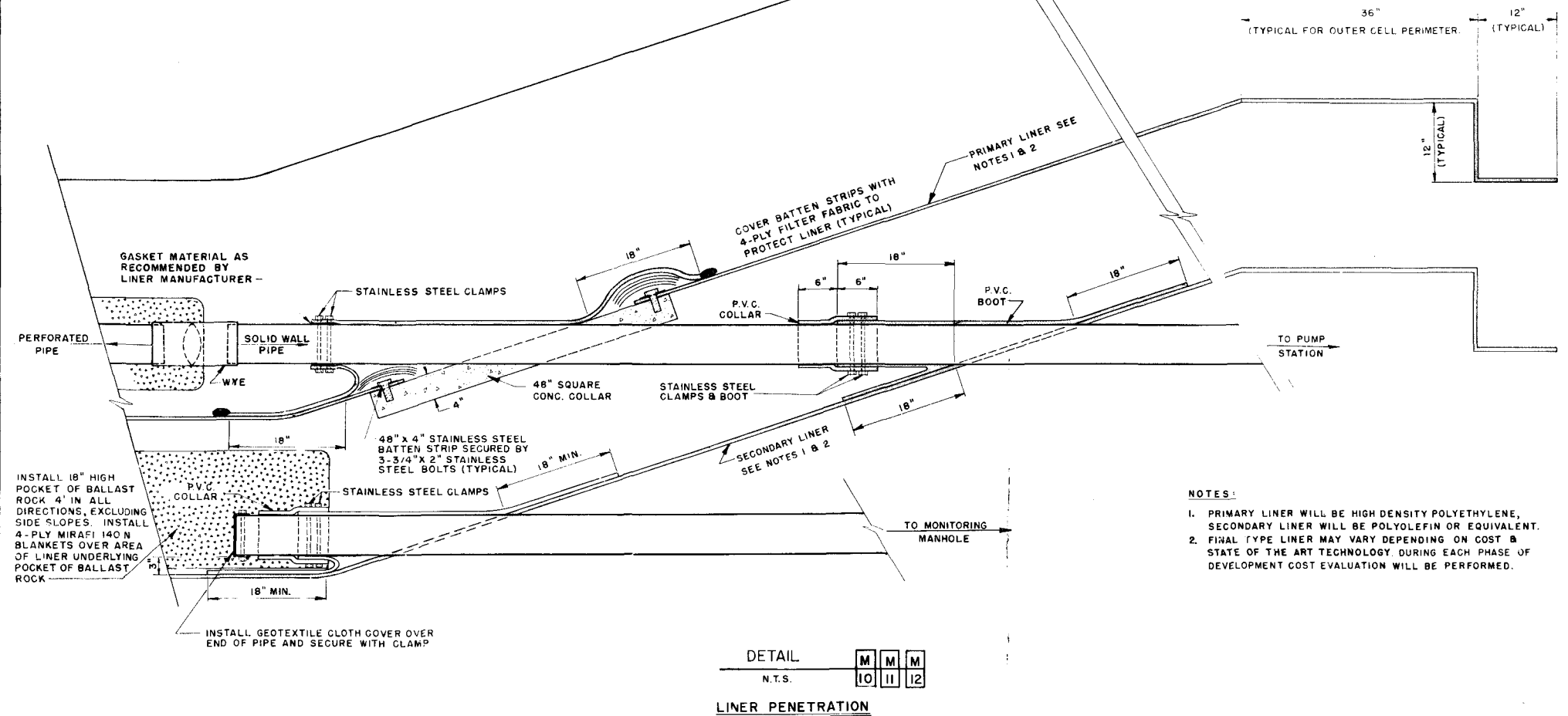
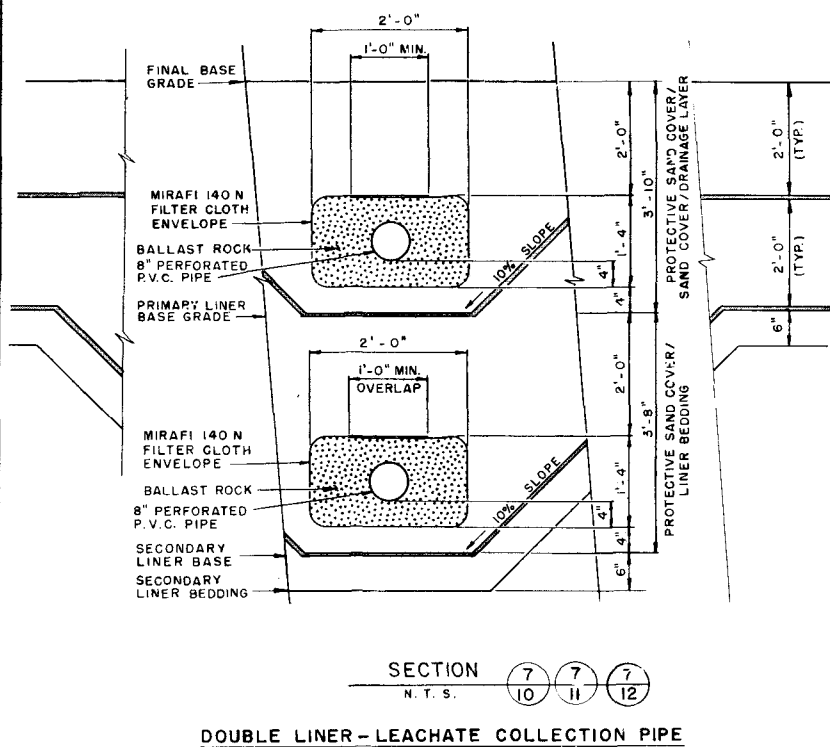
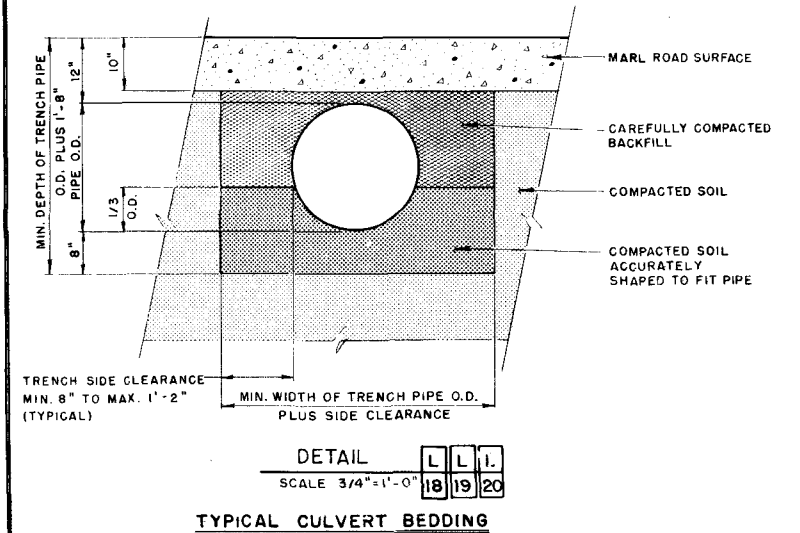
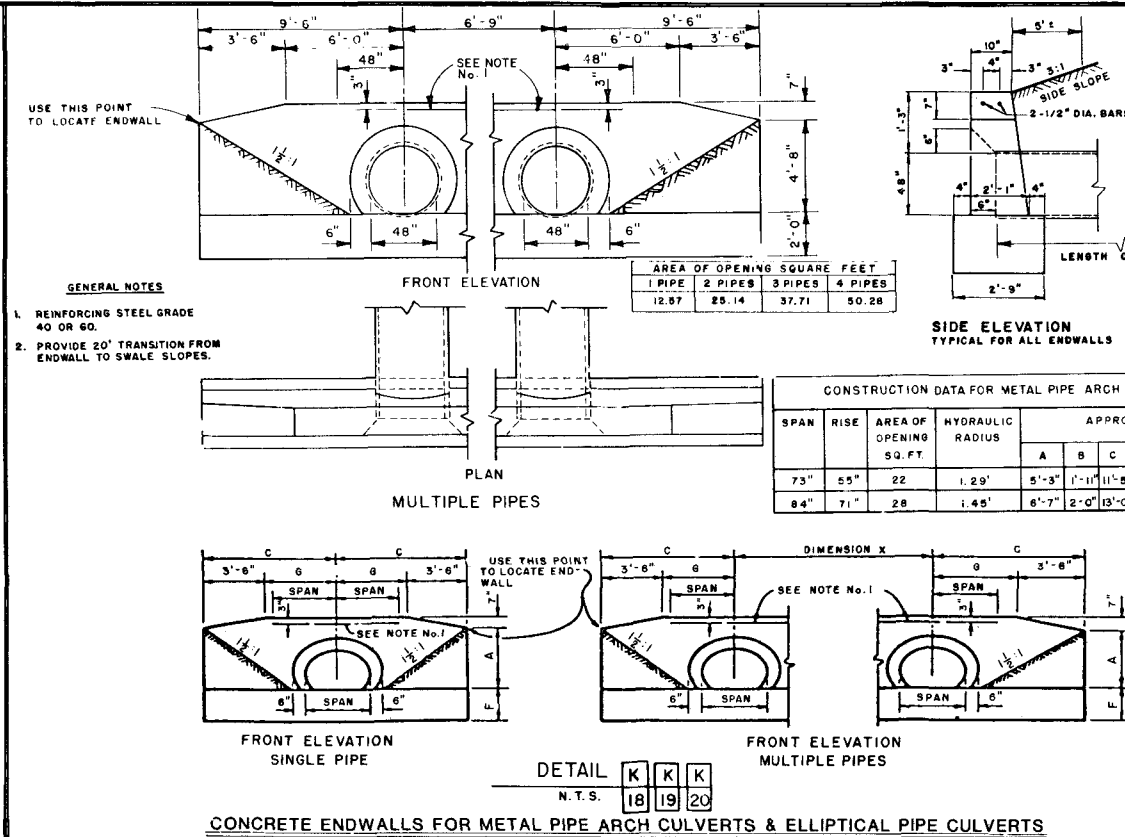
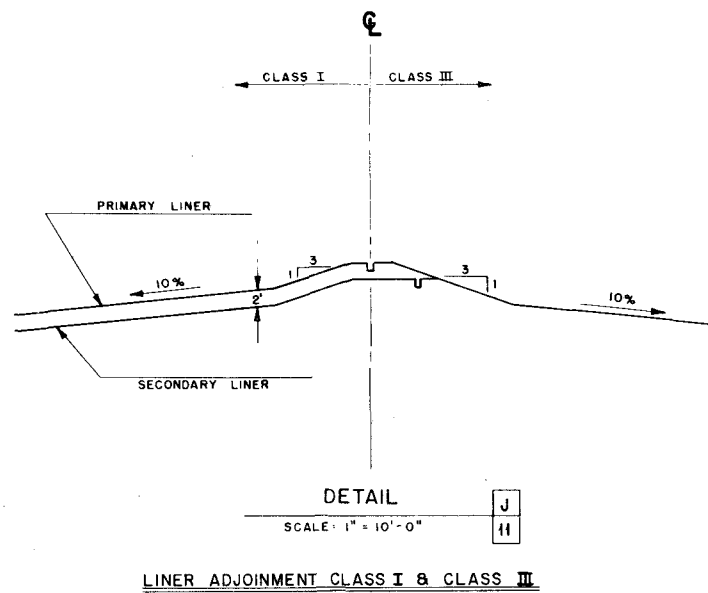


POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
SECTIONS & DETAILS

DESIGN: AEJ
DRAWN: AMS
CHECKED: ARC
D.C.: K.J.C.
A.R. CAPELLINI, P.E., PROJ. MGR.

SHEET 22 OF 25

- NOTES:
1) 3 FT. ISOLATION BERM BETWEEN CL. I & CL. III.
2) 3:1 SIDESLOPE ON ISOLATION BERM.



- NOTES:
1. PRIMARY LINER WILL BE HIGH DENSITY POLYETHYLENE, SECONDARY LINER WILL BE POLYOLEFIN OR EQUIVALENT.
2. FINAL TYPE LINER MAY VARY DEPENDING ON COST & STATE OF THE ART TECHNOLOGY. DURING EACH PHASE OF DEVELOPMENT COST EVALUATION WILL BE PERFORMED.

PBS&J/SAHWG
515-0285D

PALM BEACH COUNTY SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY

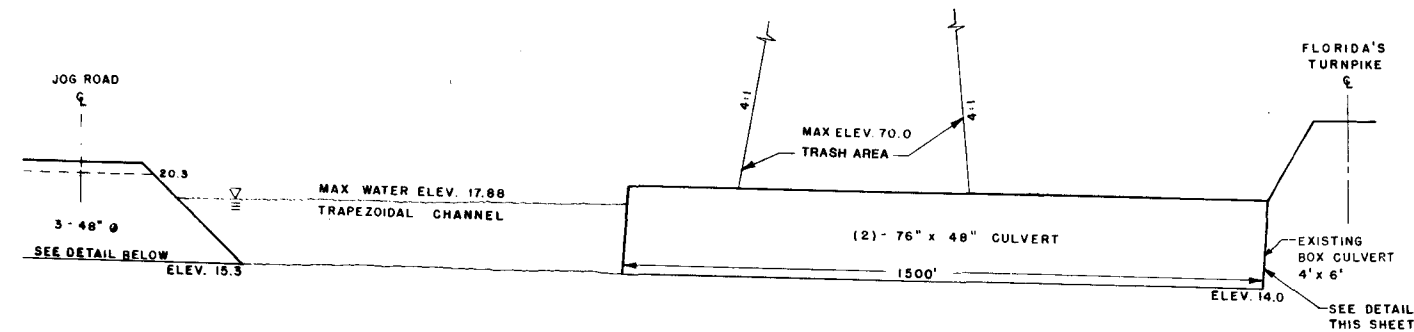


POWER PLANT SITING APPLICATION
RESOURCE RECOVERY FACILITY
SECTIONS & DETAILS

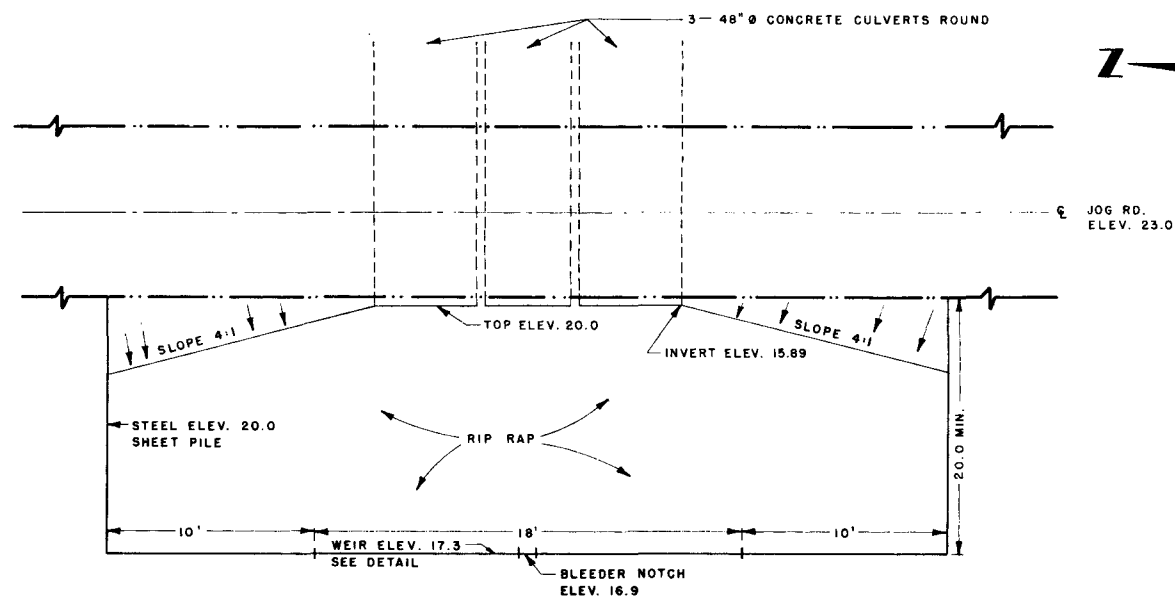
DESIGN: JHD, ARC, AJE
DRAWN: AMS
CHECKED: ARC
O.C.: K.J.C.

A.R. CAPELLINI, P.E., PROJ. MGR.

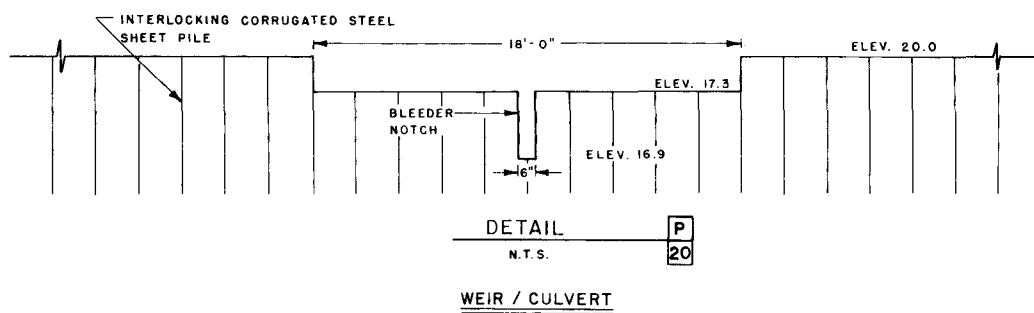
SHEET 23 OF 25



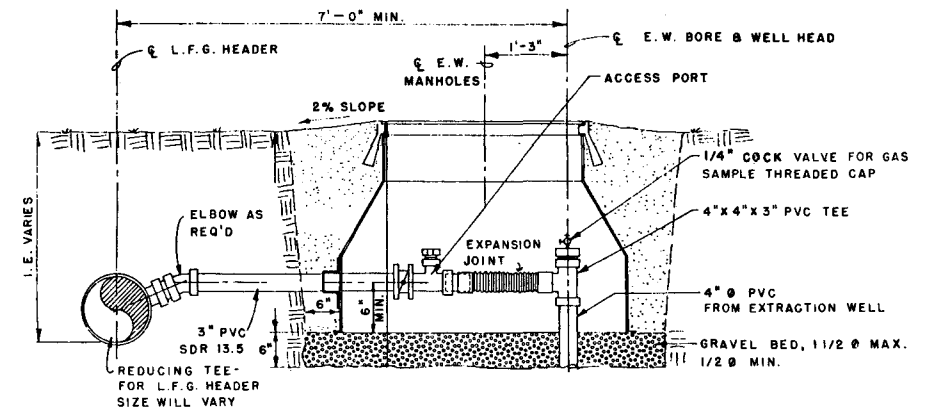
PROFILE
SCALE:
H: 1" = 200' V: 1" = 4'
STORMWATER DISCHARGE STRUCTURE



PLAN VIEW
N.T.S.

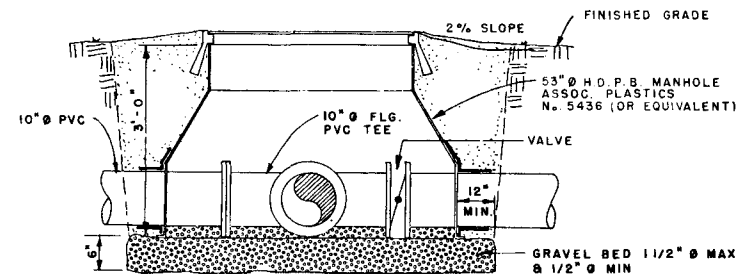


DETAIL
N.T.S.
WEIR / CULVERT



GAS COLLECTION DETAIL
N.T.S.

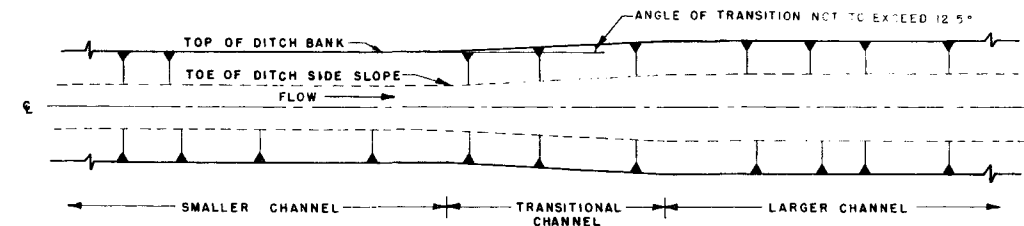
EXTRACTION WELL CONNECTION TO THE MAIN HEADER



MANHOLE DETAIL
N.T.S.

GAS COLLECTION SYSTEM

- NOTES:**
1. PIPING SIZES & VALVE LOCATIONS VARY PER MANHOLE.
 2. ADDITIONAL LEVELING CONES MAY BE REQ'D AT SOME LOCATIONS.

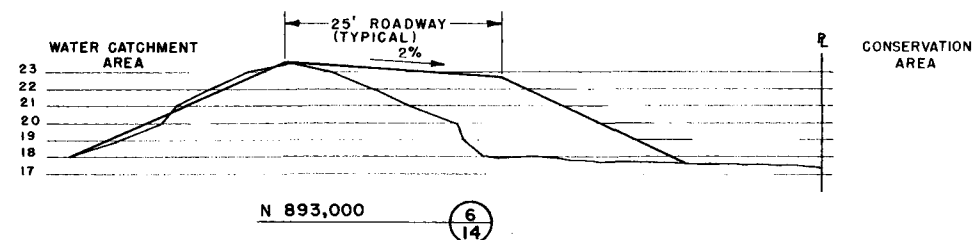
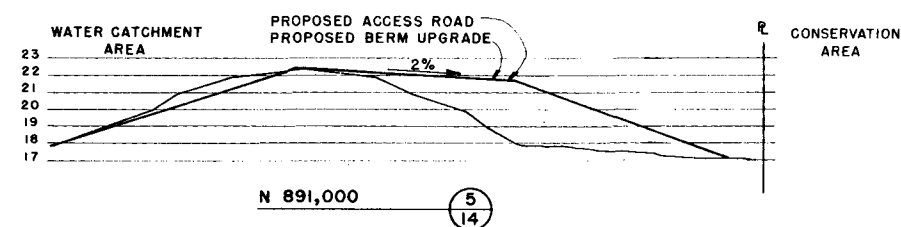
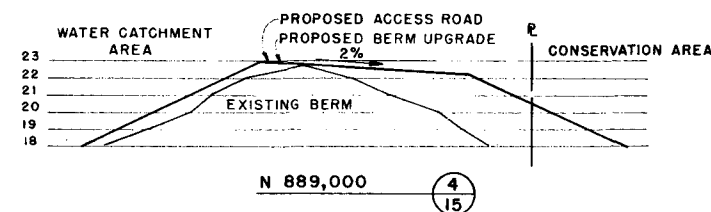
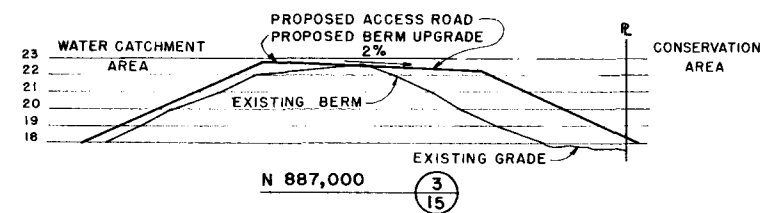
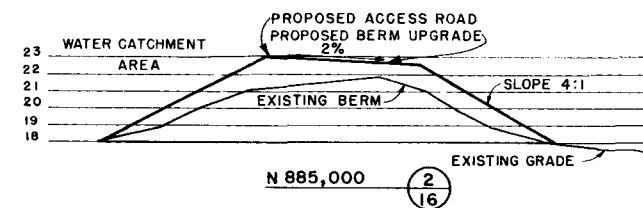
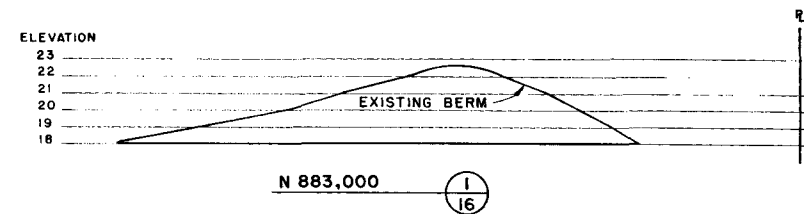


* FLOWING NORTH
** FLOWING SOUTH

SEGMENT	TRANSITION	ANGLE OF TRANSITION	TRANSITIONAL CHANNEL LENGTH
NW	15.8' → 29.6'	12.5°	62.7'
NW	29.6' → 32.8'	12.5°	14.5'
NW	32.8' → 36.2'	12.5°	15.5'
SW	15.0' → 29.6'	12.5°	66.4'
SW	29.6' → 33.0'	12.5°	15.5'
W(N)*	13.6' → 26.4'	12.5°	58.2'
W(N)*	26.4' → 35.8'	12.5°	42.7'
W(S)**	15.4' → 28.8'	12.5°	60.9'
W(S)**	28.8' → 35.4'	12.5°	30.0'

PERIMETER DITCH TRANSITION DETAIL
N.T.S.

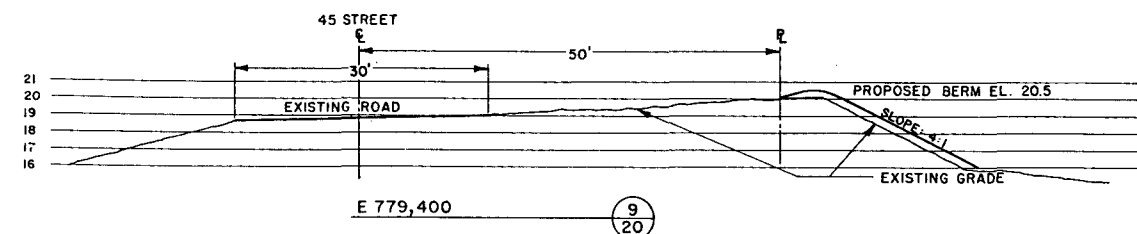
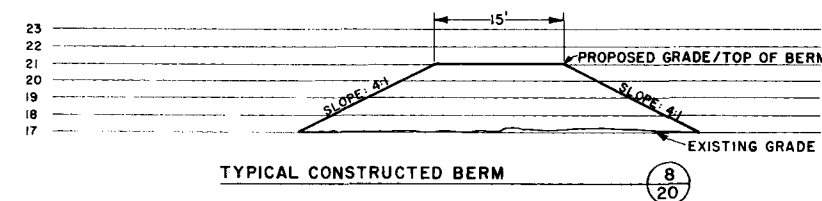




CROSS-SECTION OF WATER CATCHMENT AREA BERM

SCALE: HORIZ. 1" = 10' - 0"
VERT. 1" = 5' - 0"

NOTE
ALL SIDE SLOPE TO BE
SEEDED AS PER INSTRU-
CTIONS ON SHEET 17.



NOTE

The permeability of the berm will be sufficiently low to prevent significant seepage from east to west during peak levels in the retention area, and to prevent failure by piping in either direction. The locally available soils, upon compaction, will be suitable for berm construction. These types of soils were used to construct the existing berm, which has performed well in the past in maintaining water in the water catchment area at levels higher than to the east of the existing berm. The dominant soil permeability on Site 7 ranges from 6 to 20 inches per hour.



APPENDIX 10.4.2

SURFACE WATER RUNOFF CALCULATIONS

SUBJECT: SITE 7 DRAINAGE CALCS

25 YR 24 HR

FOR A 19.8' WIDE V-DITCH WITH 3 ON 1 SIDE SLOPE AND A CHANNEL SLOPE OF .0010, FLOW = 51.89 CFS @ FLUID VELOCITY OF 1.59 FPS.

ASSUME $t_c = 10$ minutes, FROM THE TABLE $i = 8$ in/hr

$$Q = C i A$$

$$51.89 = .95 \cdot 8 \cdot A$$

$$A = 6.83 \text{ ACRES OR } 175' \times 1700'$$

CHECK t_c : $1700 / 1.59 = 1069 \text{ sec} = 17.8 \text{ minutes}$

REVISE USING NEW t_c : FOR $t_c = 17.8$ minutes, $i = 7.2$ in/hr

$$Q = C i A$$

$$51.89 = .95 \cdot 7.2 \cdot A$$

$$A = 7.58 \text{ ACRES OR } 175' \times 1888'$$

CHECK t_c : $1888 / 1.59 = 1187 \text{ sec} = 19.8 \text{ minutes}$

REVISE USING NEW t_c : FOR $t_c = 19.8$ minutes, $i = 7$ in/hr

$$Q = C i A$$

$$51.89 = .95 \cdot 7 \cdot A$$

$$A = 7.8 \text{ ACRES OR } 175' \times 1942'$$

DRAINAGE AREA = $175' \times 1942'$ OR 7.8 ACRES

THIS DESIGN WILL SERVE FOR DITCHES 1-8

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-12-85

SHEET NO.: 2 of 15

JOB NO.: 958-001.70

25 YR 24 HR STORM

DITCH SPECIFICATIONS SCHEDULE

DITCH NO.	FLOW DIR.	SLOPE	MAX FLOW CFS	VELOCITY FS	WIDTH F	DEPTH F	LENGTH F
1	S	.0010	51.89	1.59	19.8	3.3	1942
2	N	.0010	51.89	1.59	19.8	3.3	1942
3	N	.0010	51.89	1.59	19.8	3.3	1942
4	S	.0010	51.89	1.59	19.8	3.3	1942
5	S	.0010	51.89	1.59	19.8	3.3	1942
6	N	.0010	51.89	1.59	19.8	3.3	1942
7	N	.0010	51.89	1.59	19.8	3.3	1942
8	S	.0010	51.89	1.59	19.8	3.3	1942
9	S	.0010	56.19	1.62	20.4	3.4	1270
10	S	.0010	56.19	1.62	20.4	3.4	1270
11	N	.0010	40.24	1.49	18.0	3.0	1200
12	N	.0010	30.38	1.39	16.2	2.7	1150
13	S	.0010	10.30	1.06	10.2	1.8	1940
14	N	.0010	10.30	1.06	10.2	1.8	1940
15	N	.0010	10.30	1.06	10.2	1.8	1940
16	S	.0010	10.30	1.06	10.2	1.8	1940
17	N	.0010	24.75	1.32	15.0	2.5	1940
18	S	.0010	24.75	1.32	15.0	2.5	1940
19	S	.0010	24.75	1.32	15.0	2.5	1940
20	N	.0010	24.75	1.32	15.0	2.5	1940
21	S	.0010	24.75	1.32	15.0	2.5	1940
22	N	.0010	24.75	1.32	15.0	2.5	1940
23	N	.0010	24.75	1.32	15.0	2.5	1940
24	S	.0010	24.75	1.32	15.0	2.5	1940
25	N	.0010	24.75	1.32	15.0	2.5	1940
26	S	.0010	24.75	1.32	15.0	2.5	1940
27	S	.0010	24.75	1.32	15.0	2.5	1940

SUBJECT: SITE 7 DRAINAGE CALCS

FOR DITCHES 9 & 10, EACH DITCH MUST DRAIN 7.64 ACRES

CHANNEL LENGTH = 1270'

$$t_c(\text{OVERLAND}) = \frac{400}{1.4} = 286 \text{ SEC} = 4.76 \text{ MIN}$$

$$t_c(\text{CHANNEL}) = 1270 / 1.59 = 799 \text{ SEC} = 13.31 \text{ MIN}$$

$$t_c = 18 \text{ MIN} \quad i = 7.2 \text{ in/hr}$$

$$Q = C i A$$

$$Q = .95 \cdot 7.2 \cdot 7.64$$

$$Q = \underline{52.25 \text{ CFS}}$$

FOR A DITCH 3.4' DEEP, 20.40' WIDE, A FLOW OF 56.19 CFS
AT 1.62 FPS IS POSSIBLE.

FOR DITCH 11, THIS DITCH MUST DRAIN 5.75 ACRES

CHANNEL LENGTH = 1200'

$$t_c(\text{OVERLAND}) = 750 / 1.4 = 536 \text{ SEC} = 8.93 \text{ MIN}$$

$$t_c(\text{CHANNEL}) = 1200 / 1.59 = 755 \text{ SEC} = 12.57 \text{ MIN}$$

$$t_c = 21.5 \text{ MIN} \quad i = 6.8 \text{ in/hr}$$

$$Q = C i A$$

$$Q = .95 \cdot 6.8 \cdot 5.75$$

$$Q = \underline{37.15 \text{ CFS}}$$

USE A DITCH 3.0' DEEP, 18.00' WIDE, WHICH WILL FLOW 40.24 CFS
AT 1.49 FPS.

FOR DITCH 12, THIS DITCH MUST DRAIN 4.59 ACRES

CHANNEL LENGTH = 1150'

$$t_c(\text{OVERLAND}) = 750 / 1.4 = 8.93 \text{ MIN}$$

$$t_c(\text{CHANNEL}) = 1150 / 1.5 = 12.77 \text{ MIN}$$

$$t_c = 21.7 \text{ MIN} \quad i = 6.8 \text{ in/hr}$$

$$Q = C i A$$

$$Q = .95 \cdot 6.8 \cdot 4.59$$

$$Q = \underline{29.65}$$

SUBJECT: SITE 7 DRAINAGE CALCSTRY A 2.7' DEEP, 16.2' WIDE DITCH @ 1.39 FPS $Q_m = 30.38$ RECALCULATE t_c : $1150/1.39 = 13.78 \text{ MIN} + 8.93 \text{ MIN} = 22.71$ $t_c = 22.71$ $i = 6.6 \text{ in/hr}$

$$Q = C i A$$

$$= .95 \cdot 6.6 \cdot 4.59$$

$$Q = \underline{28.78 \text{ CFS}} \text{ O.K.}$$

DITCH 13 MUST SERVE 1.78 ACRES

CHANNEL LENGTH = 1940'

$$t_c (\text{OVERLAND}) = 40/1.4 = 28.6 \text{ SEC} = .47 \text{ MIN}$$

$$t_c (\text{CHANNEL}) = 1940/1.14 = 1701.7 \text{ SEC} = 28.36 \text{ MIN}$$

$$t_c = 28.8 \text{ MIN} \quad i = 6.2 \text{ in/hr}$$

$$Q = C i A$$

$$Q = .95 \cdot 6.2 \cdot 1.78$$

$$Q = 10.48$$

TRY A V-CHANNEL 1.8' DEEP, 10.8' WIDE, $Q_m = 10.3$

$$t_c (\text{CHANNEL}) = 1940/1.1 = 1764 \text{ SEC} = 29.4 \text{ MIN}$$

$$t_c = 29.86 \text{ MIN} \quad i = 6.0 \text{ in/hr}$$

$$Q = C i A$$

$$= (.95)(6)(1.78)$$

$$= \underline{10.15 \text{ CFS}} \text{ O.K.}$$

THIS DESIGN ALSO SERVES FOR DITCHES 14, 15, AND 16.

DITCH 17 MUST DRAIN 3.56 ACRES

CHANNEL LENGTH = 1940'

$$t_c (\text{OVERLAND}) = 80/1.4 = 57.1 \text{ SEC} = .95 \text{ MIN}$$

$$t_c (\text{CHANNEL}) = 1940/1.5 = 1293 \text{ SEC} = 21.55 \text{ MIN}$$

$$t_c = 22.5 \quad i = 6.8 \text{ in/hr}$$

$$Q = C i A$$

$$= .95 \cdot 6.8 \cdot 3.56$$

$$Q = 22.99$$

TRY A 2.5' DEEP, 15' WIDE DITCH $V = 1.32 \text{ FPS}$ $Q_m = 24.75 \text{ CFS}$

$$\text{RECALC } t_c (\text{CHANNEL}) (1940/1.32 + 57.1)/60 = 25.45 \text{ MIN}$$

$$i = 6.6 \text{ in/hr}$$

$$Q = C i A$$

$$= .95 \cdot 6.6 \cdot 3.56$$

$$Q = \underline{22.32 \text{ CFS}} \text{ O.K.}$$

THIS DESIGN ALSO SERVES FOR DITCHES 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 & 28

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-13-85

SHEET NO.: 5 OF 15

JOB NO.: 958-001.76

SUBJECT: SITE 7 DRAINAGE CALCS

25 YR 24 HR

DITCH SPECIFICATIONS SCHEDULE

DITCH NO.	FLOW DIR.	SLOPE	MAX FLOW CFS	VELOCITY FS	W.S. WIDTH F	MAX FLOW DEPTH F	CHANNEL LENGTH F
28	N	.0010	24.75	1.32	15.0	2.5	1940
29	N	.0010	8.85	1.02	10.2	1.7	1200
30	N	.0010	8.85	1.02	10.2	1.7	1400
31	N	.0010	8.85	1.02	10.2	1.7	1320
32	N	.0010	8.85	1.02	10.2	1.7	1320
33	N	.0010	13.65	1.14	12.0	2.0	1660
34	N	.0010	15.54	1.17	12.6	2.1	1700
35	N	.0010	17.60	1.21	13.2	2.2	1520
36	N	.0010	17.60	1.21	13.2	2.2	1520
37	N	.0010	22.19	1.28	14.4	2.4	1900
38	N	.0010	24.75	1.32	15.0	2.5	1900
39	N	.0010	19.81	1.25	13.8	2.3	1800
40	N	.0010	19.81	1.25	13.8	2.3	1800
41	N	.0010	17.60	1.21	13.2	2.2	1800
42	N	.0010	22.19	1.28	14.4	2.4	1900
43	N	.0010	22.19	1.28	14.4	2.4	1900
44	N	.0010	22.19	1.28	14.4	2.4	1900
45	S	.0010	13.65	1.14	12.0	2.0	1250
46	S	.0010	15.54	1.17	12.6	2.1	1600
47	S	.0010	15.54	1.17	12.6	2.1	1150
48	S	.0010	17.60	1.21	13.2	2.2	1550
49	S	.0010	10.30	1.06	10.8	1.8	820
50	S	.0010	10.30	1.06	10.8	1.8	750
51	S	.0010	17.60	1.21	13.2	2.2	600
52	S	.0010	15.54	1.17	12.6	2.1	650
53	N	.0010	11.90	1.10	11.4	1.9	650
54	N	.0010	13.65	1.14	12.0	2.0	600

SUBJECT: SITE 7 DRAINAGE CANALS

DRAINAGE DITCH 29 MUST SERVE .96 ACRES
CHANNEL LENGTH = 1200'
OVERLAND MAX FLOW LENGTH = 110'
ASSUME $v = 1.5$

$$T_c = T_{c1} + T_{c2}$$

$$T_{c1} = 1200/1.5 = 800 \text{ sec} = 13.33 \text{ min}$$

$$\text{overland} \rightarrow T_{c2} = 110/1.4 = 78.6 = 1.30 \text{ min}$$

$$T_c = 14.64 \quad i = 7.75 \text{ in}$$

$$Q = c i A$$

$$= .95(7.75)(.96)$$

$$Q = 7.07 \text{ CFS}$$

Try ditch 1.7' deep, 10.2' wide $v = 1.02 \quad Q_m = 8.85$

$$T_c = 21 \text{ min} \quad i = 7 \text{ in}$$

$$Q' = c i A$$

$$= .95(7)(.96)$$

$$Q' = 6.38 \text{ CFS O.K.}$$

DRAINAGE DITCH 30 MUST SERVE 1.29 ACRES
CHANNEL LENGTH = 1400'
OVERLAND MAX FLOW LENGTH = 110'

ASSUME $v = 1.1$

$$T_c = T_{c1} + T_{c2}$$

$$T_{c1} = 1400/1.1 = 1273 \text{ sec} = 21.21 \text{ min}$$

$$\text{overland} \rightarrow T_{c2} = 1.30 \text{ min}$$

$$T_c = 22.5 \quad i = 6.6$$

$$Q = c i A$$

$$= .95(6.6)(1.29)$$

$$Q = 8.08$$

Try ditch 1.7' deep, 10.2' wide $v = 1.02 \quad Q_m = 8.85$

$$T_c = 24.4 \text{ min} \quad i = 6.4 \text{ in}$$

$$Q' = c i A$$

$$= .95(6.4)(1.29)$$

$$Q' = 7.84 \text{ CFS O.K.}$$

DRAINAGE DITCH 31 MUST SERVE 1.09 ACRES
CHANNEL LENGTH = 1320'
OVERLAND MAX FLOW LENGTH = 40'
ASSUME $v = 1.02$

$$T_c = T_{c1} + T_{c2}$$

$$T_{c1} = 1320/1.02 = 1294 \text{ sec} = 21.56 \text{ min}$$

$$T_{c2} = 40/1.4 = .97$$

$$T_c = 22 \text{ min} \quad i = 6.6$$

$$Q = c i A$$

$$= .95(6.6)(1.09)$$

$$= 6.83 \text{ CFS O.K.}$$

USE SAME DITCH AS 30

THIS DESIGN SUFFICIENT FOR DITCH 32

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CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-13-85

SHEET NO.: 6A OF 15

JOB NO.: 958-001.70

SUBJECT: SITE 7 DRAINAGE CALCS

DRAINAGE DITCH 33 MUST SERVE 2.27 ACRES
CHANNEL LENGTH: 1660
MAX OVERLAND FLOW: 230

assume $v = 1.5$

$TC1 = 18.4 \text{ min}$

$TC2 = 2.7 \text{ min}$

$TC = 21.13 \text{ min}$

$i = 6.8$

$Q = C i A$

$= .95(6.8)(2.27)$

$Q = 14.66 \text{ CFS}$

try a ditch 2.1' deep, 12.6' wide, $v = 1.17$, $Q_m = 15.54$

$TC' = 26.3$

$i = 6.2$

$Q = C i A$

$= .95(6.2)(2.27)$

$Q = 13.37 \text{ CFS}$

try a ditch 2' deep, 12.0' wide, $v = 1.14$, $Q_m = 13.65$

$TC'' = 26.9$

$i = 6.2$

$Q = 13.37 \text{ CFS}$ O.K.

DRAINAGE DITCH 34 MUST SERVE 2.59 ACRES
CHANNEL LENGTH: 1700
MAX OVERLAND FLOW: 230

assume $v = 1.17$

$TC1 = 24.2 \text{ min}$

$TC2 = 2.7 \text{ min}$

$TC = 26.9$

$i = 6.2$

$Q = C i A$

$= .95(6.2)(2.59)$

$Q = 15.25 \text{ CFS}$

USE a 2.1' deep, 12.6' wide, $v = 1.17$, $Q_m = 15.54$ ditch

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CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: A.R.C

DATE: 2-13-85

SHEET NO.: 7 OF 15

JOB NO.: 958-001.70

SUBJECT: SITE 7 DRAINAGE CALCS

DRAINAGE DITCH 35 MUST SERVE 2.42 ACRES

CHANNEL LENGTH = 1520'

MAX OVERLAND FLOW LENGTH = 80'

assume $v = 1.25$

$$T_{c1} = 1520 / 1.25 = 1216 \text{ sec} = 20.26 \text{ min}$$

$$T_{c2} = 80 / 1.4 = 57.1 \text{ sec} = .95 \text{ min}$$

$$T_c = 21.2 \quad i = 6.8 \text{ in/ft}$$

$$Q = C i A$$

$$= .95(6.8)(2.42)$$

$$Q = 15.63 \text{ CFS}$$

try a ditch 22' deep, 13.2' wide, $v = 1.21 \text{ fps}$, $Q_m = 17.60$ O.K.

THIS DESIGN ALSO SUITABLE FOR DITCH 36

DRAINAGE DITCH 37 MUST SERVE 3.43 ACRES

CHANNEL LENGTH = 1900'

MAX OVERLAND FLOW LENGTH = 100'

assume $v = 1.5$

$$T_{c1} = 1900 / 1.5 = 1267 \text{ sec} = 21.1 \text{ min}$$

$$T_{c2} = 100 / 1.4 = 71.4 \text{ sec} = 1.1 \text{ min}$$

$$T_c = 22.2 \quad i = 6.6$$

$$Q = C i A$$

$$= .95(6.6)(3.43)$$

$$Q = 21.5 \text{ CFS}$$

try a ditch 2.4' deep, 14.4' wide, $v = 1.28$, $Q_m = 22.19$ O.K.

recalc using T_c

$$T_c' = 25.8 \quad i = 6.2$$

$$Q = C i A = .95(6.2)(3.43)$$

$$= 20.2 \text{ CFS} \quad \text{O.K.}$$

DRAINAGE DITCH 38 MUST SERVE 3.82 ACRES

CHANNEL LENGTH = 1900'

MAX OVERLAND FLOW LENGTH = 100'

assume $v = 1.28$

$$T_c = 25.8 \quad i = 6.2$$

$$Q = C i A$$

$$= .95(6.2)(3.82)$$

$$= 22.49 \text{ CFS}$$

try a ditch 2.5' deep, 15.0' wide, $v = 1.32$, $Q_m = 24.75$

$$T_c' = 25.2 \quad i = 6.5$$

$$Q = C i A$$

$$= .95(6.5)(3.82)$$

$$= 23.58 \text{ CFS} \quad \text{O.K.}$$

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CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-13-85

SHEET NO.: 8 OF 15

JOB NO.: 958-001.70

SUBJECT: SITE 7 DRAINAGE CALCS

DRAINAGE DITCH 39 MUST SERVE 2.91 ACRES

CHANNEL LENGTH: 1800'

MAX OVERLAND FLOW LENGTH: 80'

assume $v = 1.28$

$$TC_1 = 1800 / 1.28 = 1406.25 \text{ sec} = 23.44 \text{ min}$$

$$TC_2 = 80 / 1.0 = 57.14 \text{ sec} = .95 \text{ min}$$

$$TC = 24.4 \text{ min} \quad i = 6.4$$

$$Q = C i A$$

$$Q = .95(6.4)(2.91) = 17.7 \text{ CFS}$$

Try a ditch 2.3' deep, 13.8' wide, $v = 1.25$, $Q_m = 19.81$

$$TC' = 24.95 \quad i = 6.4$$

$$Q = C i A$$

$$= .95(6.4)(2.91)$$

$$Q = 17.7 \text{ CFS O.K.}$$

THIS DESIGN IS ALSO SUITABLE FOR DITCH 40

DRAINAGE DITCH 41 MUST SERVE 2.85 ACRES

CHANNEL LENGTH: 1800'

MAX OVERLAND FLOW LENGTH: 80'

assume $v = 1.25$

$$TC = 24.95 \quad i = 6.4$$

$$Q = C i A$$

$$= .95(6.4)(2.85)$$

$$Q = 17.33$$

try a ditch 2.2' deep, 13.2' wide, $v = 1.21$, $Q_m = 17.6$

$$TC' = 25.74 \quad i = 6.2$$

$$Q = C i A$$

$$= .95(6.2)(2.85)$$

$$Q = 16.79 \text{ CFS O.K.}$$

DRAINAGE DITCH 42 MUST SERVE 3.39 ACRES

CHANNEL LENGTH: 1900'

MAX OVERLAND FLOW LENGTH: 80'

assume $v = 1.28$

$$TC_1 = 1900 \text{ sec} = 24.73 \text{ min}$$

$$TC_2 = 57 \text{ sec} = .95 \text{ min}$$

$$TC = 25.68 \text{ min} \quad i = 6.2$$

$$Q = C i A$$

$$= .95(6.2)(3.39)$$

$$Q = 19.96 \text{ CFS O.K.}$$

try a ditch 2.4' deep, 14.4' wide, $v = 1.28$, $Q_m = 22.19$

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COMP. BY: AJE

CHK. BY: ARC

DATE: 2-13-85

SHEET NO.: 9 OF 15

JOB NO.: 95B-001.70

SUBJECT: SITE 7 DRAINAGE CALCS

DRAINAGE DITCH 43 MUST SERVE 3.35 ACRES
CHANNEL LENGTH = 1900'
MAX OVERLAND FLOW = 80'

(ESSENTIALLY SAME AS DITCH 42)

THIS DESIGN IS SUITABLE FOR DITCH 44

DRAINAGE DITCH 45 MUST SERVE 1.97 ACRES
CHANNEL LENGTH = 1250'
MAX OVERLAND FLOW = 80'

assume $n = 1.0$

$TC1 = 1250 \text{ sec} = 20.83 \text{ min}$

$TC2 = 80/1.4 = 57 \text{ sec} = .95 \text{ min}$

$TC = 21.78 \text{ min}$ $i = 6.7$

$Q = C i A$

$= .95(6.7)(1.97) = 12.53$

try a ditch 2' deep, 12' wide, $n = 1.19 \text{ fps}$, $Q_m = 13.65$

$TC' = 19.22 \text{ min}$ $i = 7.0$

$Q = C i A$

$= .95(7.0)(1.97) = 13.10 \text{ CFS O.K.}$

DRAINAGE DITCH 46 MUST SERVE 2.30 ACRES
CHANNEL LENGTH = 1600'
MAX OVERLAND FLOW = 80'

assume $n = 1.2$

$TC1 = 1333 \text{ sec} = 22.22 \text{ min}$

$TC2 = 57 \text{ sec} = .95$

$TC = 23.17 \text{ min}$ $i = 6.4$

$Q = C i A$

$= .95(6.4)(2.3)$

$= 13.98 \text{ CFS}$

try a ditch 2.1' deep, 12.6' wide, $n = 1.17$, $Q_m = 15.54$

$TC' = 22.8$ $i = 6.6$

$Q = C i A$

$= .95(6.6)(2.3)$

$Q = 14.42 \text{ CFS O.K.}$

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COMP. BY: AJE

CHK. BY: ARC

DATE: 2-13-85

SHEET NO.: 10 OF 15

JOB NO.: 958-001.70

SUBJECT: SITE 7 DRAINAGE CALCS

DRAINAGE DITCH A7 MUST SERVE 2.20 ACRES

CHANNEL LENGTH: 1150'

MAX OVERLAND FLOW LENGTH: 80'

assume $n = 1.21$

TC1 = 950 sec = 15.8 min

TC2 = 57 sec = .95 min

TC = 16.75 $i = 7.4$

$Q = C i A$

$= .95(7.4)(2.20)$

$= 15.46$

try a ditch 2.1' deep, 12.6' wide, $n = 1.17$, $Q_m = 15.54$

TC = 17.33 $i = 7.0$

$Q = C i A$

$= .95(7.0)(2.2)$

$Q = 14.63$ CFS O.K.

DRAINAGE DITCH A8 MUST SERVE 2.82 ACRES

CHANNEL LENGTH: 1550'

MAX OVERLAND FLOW LENGTH: 80'

assume $n = 1.21$

TC1 = 1281 sec = 21.35 min

TC2 = .95

TC = 22.3 $i = 6.6$

$Q = C i A$

$= .95(6.6)(2.82)$

$Q = 17.68$ CFS ≈ 17.60 CFS O.K.

USE 2.2' deep, 13.2' wide, $n = 1.21$, $Q_m = 17.60$ type ditch

DRAINAGE DITCH A9 MUST SERVE 1.27 ACRES

CHANNEL LENGTH: 820'

MAX OVERLAND FLOW LENGTH: 80'

assume $n = 1.0$

TC1 = 820 sec = 13.67 min

TC2 = 57 sec = .95 min

TC = 14.6 min $i = 7.5$

$Q = C i A$

$= .95(7.5)(1.27)$

$Q = 9.05$ CFS

try a 1.8' deep, 10.8' wide, $n = 1.06$, $Q_m = 10.30$ type ditch

TC = 13.8

$i = 7.75$

$Q = C i A$

$= .95(7.75)(1.27)$

$= 9.35$ CFS O.K.

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COMP. BY: AJE

CHK. BY: ARC

DATE: 2-13-85

SHEET NO.: 11 OF 15

JOB NO.: 958-201.70

SUBJECT: SITE 7 DRAINAGE CALCS

DRAINAGE DITCH S0 MUST SERVE 1.25 ACRES

CHANNEL LENGTH = 750'

MAX OVERLAND FLOW = 80'

assume $v = 1.0$

$TC = 13.5 \text{ min}$

$i = 7.8$

$Q = C i A$

$= .95(7.8)(1.25)$

$= 9.26 \text{ CFS}$

try a 1.8' deep, 10.8' wide, $v = 1.06$, $Q_m = 10.3 \text{ CFS ditch}$

$TC' = 12.7 \text{ min}$

$i = 8$

$Q = C i A$

$= .95(8)(1.25)$

$= 9.5 \text{ CFS O.K.}$

DRAINAGE DITCH S1 MUST SERVE 2.02 ACRES

CHANNEL LENGTH = 600'

MAX OVERLAND FLOW = 80'

assume $v = 1.0$

$TC = 10.0 \text{ min}$

$i = 8.7$

$Q = C i A$

$= .95(8.7)(2.02)$

$= 16.69$

try a 2.2' deep, 13.2' wide, $v = 1.21$, $Q_m = 17.6 \text{ CFS ditch}$

$TC' = 9.2 \text{ min}$

$i = 8.8$

$Q = C i A$

$= .95(8.8)(2.02)$

$= 16.88 \text{ CFS O.K.}$

DRAINAGE DITCH S2 MUST SERVE 1.77 ACRES

CHANNEL LENGTH = 650'

MAX OVERLAND FLOW = 200'

assume $v = 1.21$

$TC1 = 650/1.21 = 8.95 \text{ min}$

$TC2 = 200/1.4 = 2.38$

$TC = 11.33$

$i = 8.25$

$Q = C i A$

$= .95(8.25)(1.77)$

$Q = 13.87 \text{ CFS}$

try a ditch 2.1' deep, 12.6' wide, $v = 1.17$, $Q_m = 15.54$

$TC' = 11.64$

$i = 8.2$

$Q = C i A$

$= .95(8.2)(1.77)$

$Q = 13.78 \text{ CFS O.K.}$

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COMP. BY: AJE

CHK. BY: ARC

DATE: 2-13-85

SHEET NO.: 12 OF 15

JOB NO.: 958-001.76

SUBJECT: SITE 7 DRAINAGE CALCS

DRAINAGE DITCH 53 MUST SERVE 1.38 ACRES

CHANNEL LENGTH = 650'

MAX OVERLAND FLOW = 300'

assume $v = 1.10$

TC1 = 9.84 min

TC2 = 3.57 min

TC = 13.41 $i = 7.9$

$Q = C i A$

$= .95(7.9)(1.38)$

$Q = 10.36$ CFS

USE a ditch 1.9' deep, 11.4' wide, $v = 1.10$, $Q_m = 11.9$

DRAINAGE DITCH 54 MUST SERVE 1.79 ACRES

CHANNEL LENGTH = 600'

MAX OVERLAND FLOW = 400'

assume $v = 1.10$

TC1 = 9.09 min

TC2 = 4.76 min

TC = 13.85 $i = 7.75$

$Q = C i A$

$= .95(7.75)(1.79)$

$Q = 13.18$ CFS

try a ditch 2' deep, 12' wide, $v = 1.10$, $Q_m = 13.65$

TC = 13.53

$i = 7.8$

$Q = .95(7.8)(1.79)$

$Q = 13.26$ CFS O.K.

DRAINAGE DITCH 55 MUST SERVE 1.59 ACRES

CHANNEL LENGTH = 1100'

MAX OVERLAND FLOW = 80'

assume $v = 1.32$

TC1 = 13.89 min

TC2 = .95 min

TC = 14.84 min $i = 7.6$

$Q = C i A$

$= .95(7.6)(1.59)$

$Q = 11.47$ CFS

try a 2' deep, 12' wide, $v = 1.10$

try a 1.9' deep, 11.4' wide, $v = 1.10$, $Q_m = 11.9$

TC1 = 15.40

TC2 = .95

TC = 16.36 $i = 7.4$

$Q = C i A$

$= .95(7.4)(1.59)$

$Q = 11.17$ CFS O.K.

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COMP. BY: AJE

CHK. BY: ARC

DATE: 2/14/85

SHEET NO.: 13 OF 15

JOB NO.: 958-001.70

SUBJECT: SITE 7 DRAINAGE CALCS

DRAINAGE DITCH 56 MUST SERVE 1.47 ACRES

CHANNEL LENGTH: 800
MAX OVERLAND FLOW: 80

assume $v = 1.10$

$TC1 = 12.12$ min

$TC2 = .95$ min

$TC = 13.07$ $i = 8$

$Q = C i A$

$= .95(8)(1.47)$

$Q = 11.17$ CFS

USE SAME DITCH AS NO. 55

DRAINAGE DITCH 57 MUST SERVE 2.11 ACRES

CHANNEL LENGTH: 1350
MAX OVERLAND FLOW: 80

assume $v = 1.17$

$TC1 = 19.23$

$TC2 = .95$

$TC = 20.18$ $i = 6.8$

$Q = C i A$

$= .95(6.8)(2.11)$

$Q = 13.63$ CFS

USE A DITCH 2.1' DEEP, 12.6' WIDE, $v = 1.17$, $q_m = 15.54$

DRAINAGE DITCH 58 MUST SERVE 1.80 ACRES

CHANNEL LENGTH: 1100
MAX OVERLAND FLOW: 80

assume $v = 1.14$

$TC1 = 16.08$

$TC2 = .95$

$TC = 17.03$ $i = 7.25$

$Q = C i A$

$= .95(7.25)(1.80)$

$Q = 12.39$ CFS

USE A DITCH 2.0' DEEP, 12.0' WIDE, $v = 1.14$, $q_m = 13.65$

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COMP. BY: AJE

CHK. BY: ARC

DATE: 2-14-85

SHEET NO.: 14 OF 15

JOB NO.: 958-001.70

SUBJECT: SITE 7 DRAINAGE CANALS

DRAINAGE DITCH 59 SERVES 3.03 ACRES

CHANNEL LENGTH: 1400
MAX OVERLAND FLOW: 80

assume $v = 1.21$

TC1 = 19.44 min

TC2 = .95

TC = 20.39

$i = 6.8$

$Q = C i A$

$= .95(6.8)(3.03)$

$Q = 19.5$ CFS

try a ditch 2.3' deep, 13.8' wide, $v = 1.25$, $Q_m = 19.81$

TC1 = 19.6

$i = 7$

$Q = C i A$

$= .95(7)(3.03)$

$Q = 20.14$ CFS

try a 2.4' wide, 14.4' wide, $v = 1.28$, $Q_m = 22.19$

TC1 = 19.17

$i = 7$

$Q = 20.14$ O.K.

DRAINAGE DITCH 60 MUST SERVE 2.24 ACRES

CHANNEL LENGTH: 1300
MAX OVERLAND FLOW: 80

assume $v = 1.17$

TC1 = 18.5 min

TC2 = .95

TC = 19.45

$i = 7$

$Q = C i A$

$= .95(7)(2.24)$

$Q = 14.84$ CFS O.K.

USE A 21' deep, 12.6' wide, $v = 1.17$, $Q_m = 15.54$

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CHK. BY: ARC

SHEET NO.: 15 OF 15

JOB NO.: 958-001.76

SUBJECT: SITE 7 DRAINAGE[illegible]

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COMP. BY: ARC

CHK. BY: ARC

DATE: 2/19/85

SUBJECT: DISCHARGE CULVERT

SHEET NO.: _____

JOB NO.: 958-001

DISCHARGE CULVERT FROM CONTROL STRUCTURE
INLET CONTROL $S_o > 0.003$
IN ORDER TO AVOID CULVERT CONTROL
FROM WEIR ASSUME DESIGN FLOW AT APPROX.
 $1/2$ HEAD DESIGN.

DESIGN 4 FEET

SIZE CULVERT TO PASS 129 CFS AT $3/2$ FT.

TRY 2 (4'-0") CONCRETE SQUARE EDGE W/ HEADWALL

$$HW/D = 0.92$$

$$HW = 0.92 \times 4'-0"$$

$$HW = 3.68$$

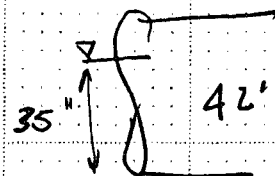
TRY 2 (4'-0") CONCRETE GROVE & PROJECTING

$$HW = 3.5'$$

TRY 3 (42") CONCRETE GROVE & PROJECTING

$$HW/D = 0.84$$

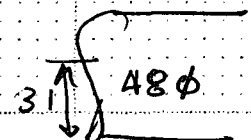
$$HW = 2.94'$$



TRY 3 (48")

$$SLOPE > S_f \quad HW = 0.66 \times 4 = 2.64 \Rightarrow 31"$$

MIN. $\geq 0.003/64$ USE 3-48" ϕ CONCRETE



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SHEET NO.:

JOB NO.: 958-001

SUBJECT: DISCHARGE CULVERT

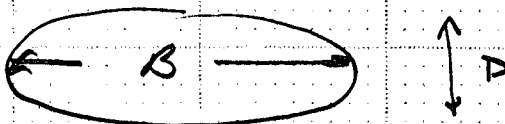
SELECT CULVERT DESIGN UNDER LANDFILL

USE OVAL PIPE

INLET CONTROL

1/2 DESIGN HEAD OF PIPE

DISCHARGE 129 CFS



TRY 2 (76" x 48")

CFS = 65.0/PIPE
GROVE PROTECTED

$$HW/D = 0.67$$

$$HW = 0.67 \times 4'0" = 2.68' -$$

GOOD

USE 2 76" x 48"

OVAL CONCRETE

SLOPE OF CHANNEL & CULVERT

MIN. > 0.008 fwi loss / FT.

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CONSULTING ENGINEERS and PLANNERS

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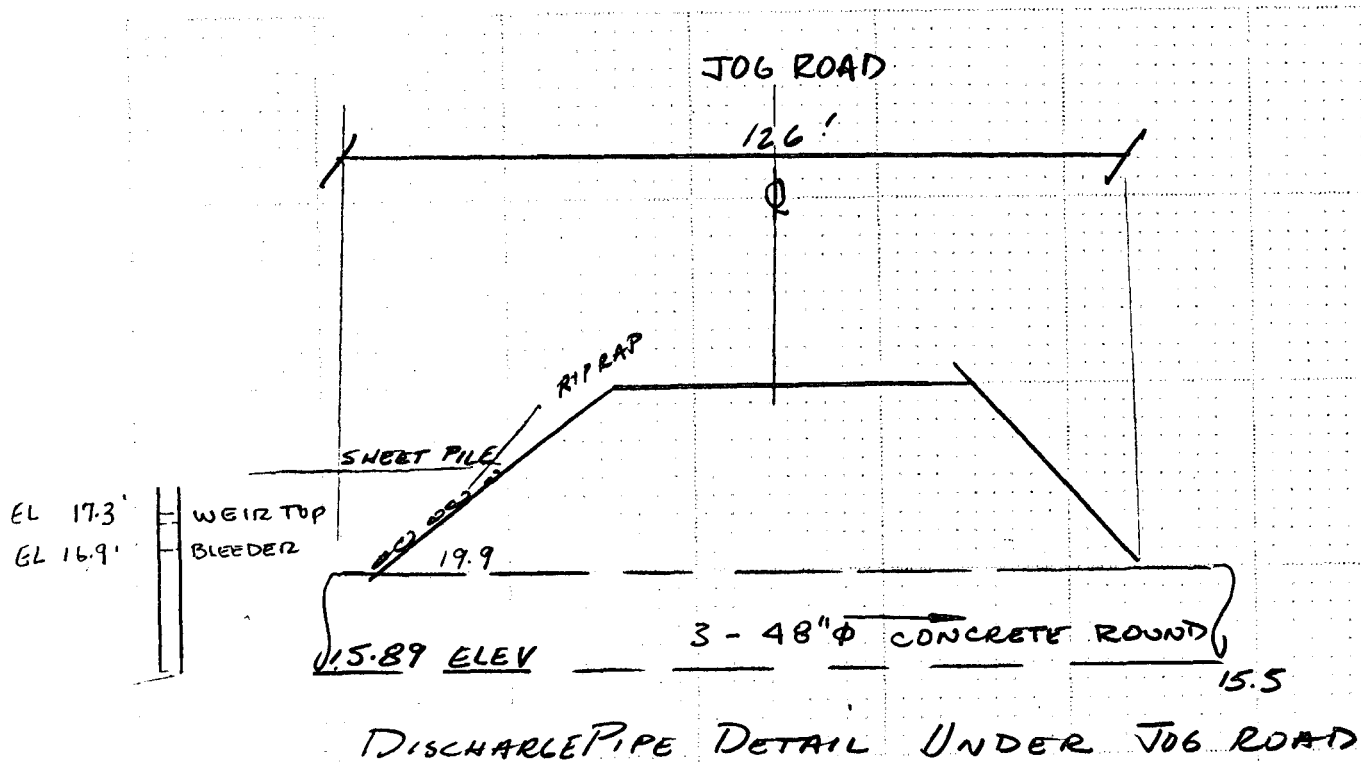
CHK. BY: ARC

DATE: 2/18/85

SHEET NO.: 31

JOB NO.: 958-001

SUBJECT: DISCHARGE CULVERTS



INVERT OF BOX CULVERT

$$\text{ELEV } 15.5 - 14.0 = 1.5$$

$$\text{TOTAL LENGTH} = 2670'$$

$$\frac{1.5}{2670} = 0.00056 \text{ SLOPE MAX.}$$

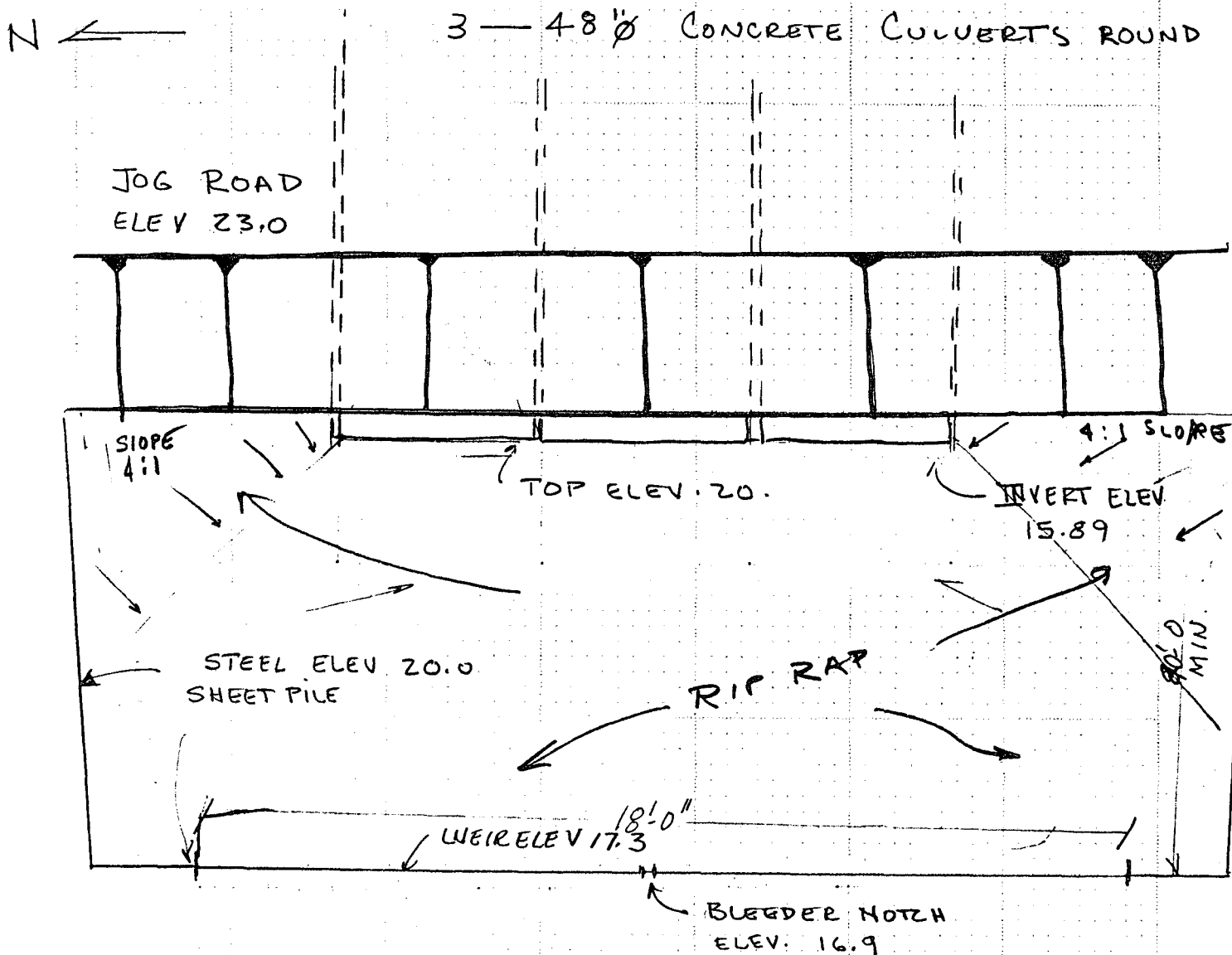
USE OPEN CHANNEL TRAPEZOID

2:1 SLOPE

$n = 0.04$

WIDTH = 12-0

SUBJECT: STORM WATER DISCHARGE
CULVERT CROSSING JOG ROAD.



1" = 4'-0"

WEIR CULVERT DETAIL

Post, Buckley, Schuh & Jernigan, Inc.

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COMP. BY: ARC

CHK. BY: _____

DATE: 2/19/85

SHEET NO.: 5

JOB NO.: 958-001

SUBJECT: STORMWATER DISCHARGE
CHECK CAPACITY OF BOX CULVERT

CHECK CAPACITY FOR 4'x6' BOX CULVERT
UNDER FLORIDA TURNPIKE

FLOW = 129 CFS

SLOPE = 2.0

INLET CONTROL

$$Q/B = \frac{129}{6} = 21.5$$

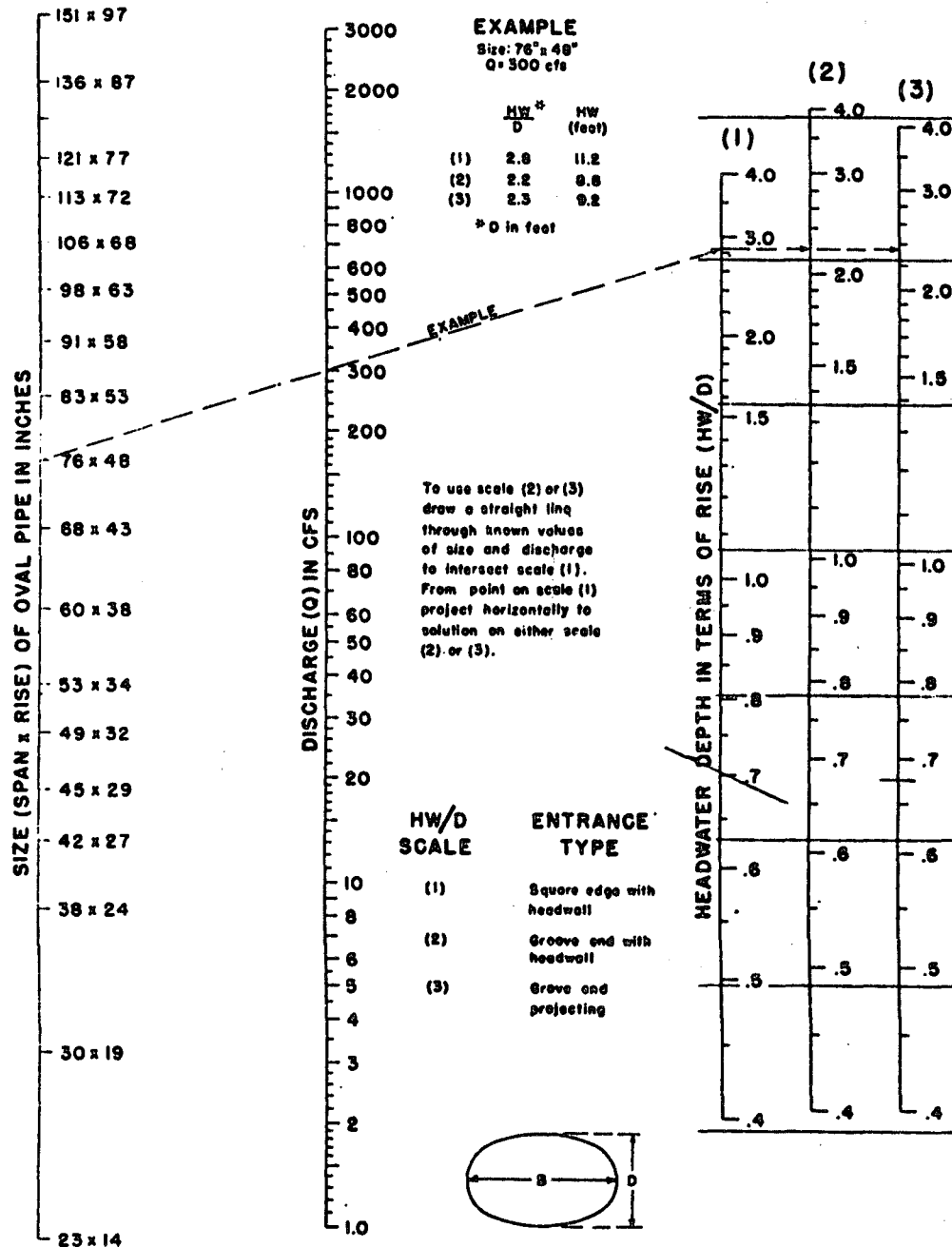
BUREAU OF PUB. ROAD

HW/D = 0.925

$$HW = 0.925 \times 4 = 3.7'$$

USE CHART WITH
ANGLE WINGWALL
BECAUSE OF TRANSITION

CHART 3

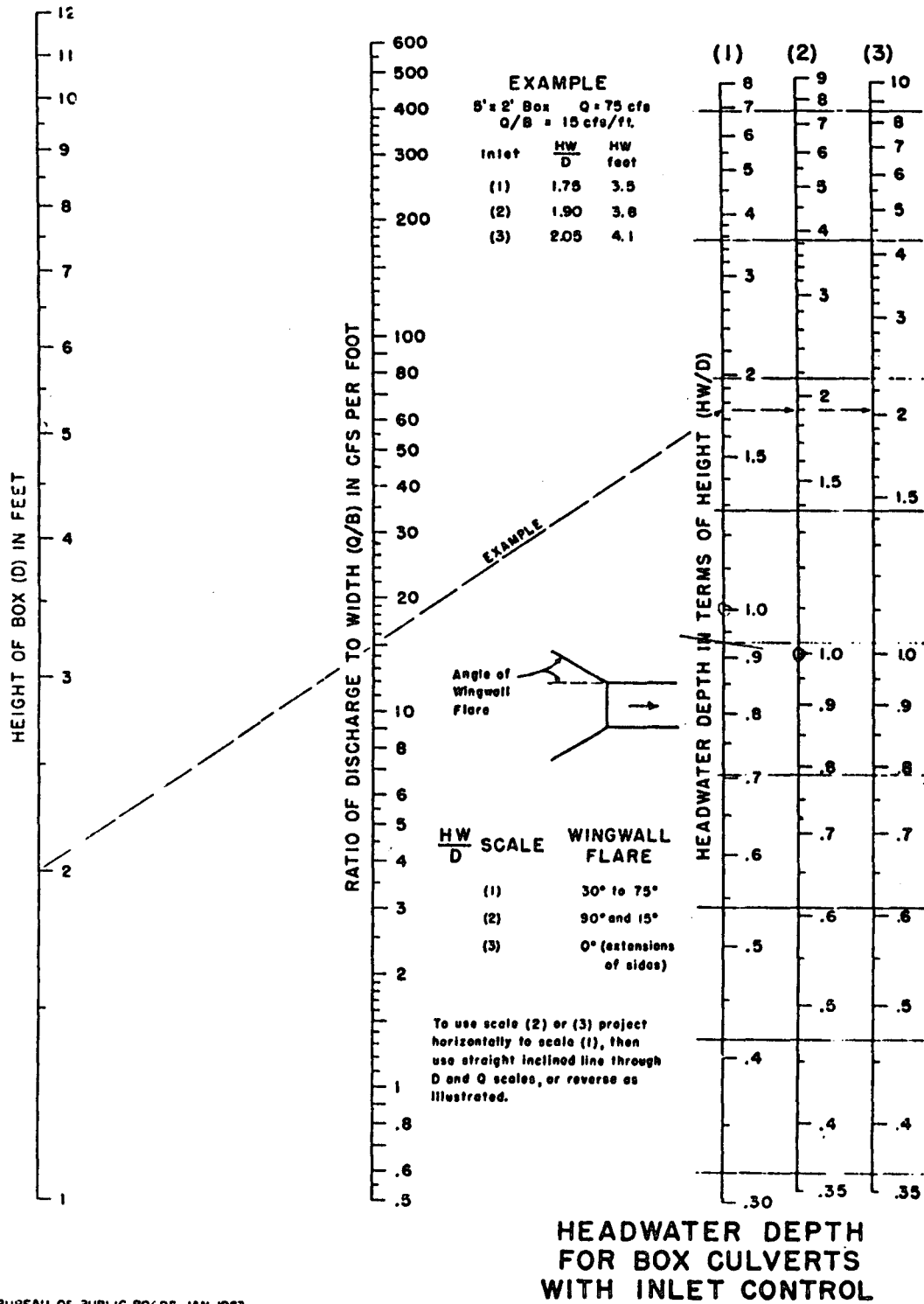


HEADWATER DEPTH FOR
OVAL CONCRETE PIPE CULVERTS
LONG AXIS HORIZONTAL
WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

CHART I



BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 36

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: A.R.C

DATE: 2-15-85

SHEET NO.: 1 OF 2

JOB NO.: 958-001.70

SUBJECT: SITE 7 SPILLWAY FLOW QUANTITIES

25 YR	24 HR	STORM			
<u>SPILLWAY A</u>					
FED BY DITCHES 45, 47, 50, 52, 53, 55, 57, 59			(15.3 acres)	(8)	
$Q_m = (13.10 + 14.63 + 9.50 + 13.78 + 10.36 + 11.17 + 13.63 + 20.14)$					
$Q_m = 106.3$			CFS		
<u>SPILLWAY B</u>					
FED BY DITCHES 8, 12, 29, 18, 33, 37, 26, 41			(28.05 acres)	(8)	
$Q_m = (51.89 + 28.78 + 6.38 + 22.32 + 13.37 + 20.2 + 22.32 + 16.79)$					
$Q_m = 182.05$			CFS		
<u>SPILLWAY C</u>					
FED BY DITCHES 5, 7, 13, 14, 21, 22			(26.28 acres)	(6)	
$Q_m = (51.89 + 51.89 + 10.15 + 10.15 + 22.32 + 22.32)$					
$Q_m = 168.72$			CFS		
<u>SPILLWAY D</u>					
FED BY DITCHES 6, 10, 17, 25			(22.56 acres)	(4)	
$Q_m = (51.89 + 52.25 + 22.32 + 22.32)$					
$Q_m = 148.78$			CFS		
<u>SPILLWAY E</u>					
FED BY DITCHES 31, 32, 35, 36, 39, 40, 43, 44			(19.4 acres)	(8)	
$Q_m = (6.83 + 6.83 + 15.63 + 15.63 + 17.7 + 17.7 + 19.96 + 19.96)$					
$Q_m = 120.24$			CFS		
<u>SPILLWAY F</u>					
FED BY DITCHES 2, 9, 20, 28			(22.56 acres)	(4)	
$Q_m = (51.89 + 52.25 + 22.32 + 22.32)$					
$Q_m = 148.78$			CFS		

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-15-85

SHEET NO.: 2 OF 2

JOB NO.: 95B-001.70

SUBJECT: SITE 7 SPILLWAY FLOW QUANTITIES

SPILLWAY G

FED BY DITCHES 1, 3, 15, 16, 23, 24

(26.28 acres) (6)

$$Q_m = (51.89 + 51.89 + 10.15 + 10.15 + 22.32 + 22.32)$$

$$Q_m = 168.72 \text{ CFS}$$

SPILLWAY H

FED BY DITCHES 4, 11, 30, 34, 19, 38, 27, 42

(38.31 acres)

(8)

$$Q_m = (51.89 + 37.15 + 7.84 + 15.25 + 22.32 + 23.58 + 22.32 + 19.96)$$

$$Q_m = 200.31 \text{ CFS}$$

SPILLWAY I

FED BY DITCHES 51, 54, 49, 56, 46, 58, 48, 60

(15.71 acres) (8)

$$Q_m = (10.88 + 13.26 + 9.35 + 11.17 + 14.42 + 12.39 + 17.68 + 14.89)$$

$$Q_m = 110.04 \text{ CFS}$$

DRAINAGE QUANTITY NOT SERVED BY SPILLWAYS

AREA BELOW LOWEST COLLECTION DITCH: 25.3 ACRES

DETERMINE Q

$$TC = 80/1.4 = 57 \text{ SEC} \approx 1 \text{ MIN} \quad C = 9.5/1.4$$

$$Q = C \cdot i \cdot A$$
$$= .95(8)(25.3)$$

$$Q = 192.78 \text{ CFS}$$

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: DJE

CHK. BY: ARC

DATE: 2-19-85

SHEET NO.: 1 OF 3

JOB NO.: 958-001.76

SUBJECT: SITE 7 DRAINAGE & SPILLWAY

DESIGN SCHEDULE				
DITCH	CHANNEL TOP WIDTH	CHANNEL DEPTH	INVERT ELEVATION	
			HIGH POINT	LOW POINT
1	25.8	4.3	121.7	119.7
2	25.8	4.3	115.7	113.8
3	25.8	4.3	121.7	119.7
4	25.8	4.3	115.7	113.8
5	25.8	4.3	121.7	119.7
6	25.8	4.3	115.7	113.8
7	25.8	4.3	121.7	119.7
8	25.8	4.3	115.7	113.8
9	26.4	4.4	115.6	114.3
10	26.4	4.4	115.6	114.3
11	24.0	4.0	116.0	114.8
12	22.2	3.7	116.3	115.2
13	16.8	2.8	107.2	105.3
14	16.8	2.8	107.2	105.3
15	16.8	2.8	107.2	105.3
16	16.8	2.8	107.2	105.3
17	21.0	3.5	86.5	84.6
18	21.0	3.5	86.5	84.6
19	21.0	3.5	86.5	84.6
20	21.0	3.5	86.5	84.6
21	21.0	3.5	66.5	64.6
22	21.0	3.5	66.5	64.6
23	21.0	3.5	66.5	64.6
24	21.0	3.5	66.5	64.6
25	21.0	3.5	46.5	44.6
26	21.0	3.5	46.5	44.6
27	21.0	3.5	46.5	44.6

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-14-85

SHEET NO.: 2 OF 3

JOB NO.: 958-001.70

SUBJECT: SITE 7 DRAINAGE

DITCH	CHANNEL TOP WIDTH	CHANNEL DEPTH	INVERT HIGH POINT	ELEVATION LOW POINT
28	21.0	3.5	46.5	44.6
29	16.2	2.7	107.3	106.1
30	16.2	2.7	107.3	106.1
31	16.2	2.7	107.3	106.1
32	16.2	2.7	107.3	106.1
33	18.0	3.0	87.0	85.3
34	18.6	3.1	86.9	85.2
35	19.2	3.2	86.8	85.3
36	19.2	3.2	86.8	85.3
37	20.4	3.4	66.6	64.7
38	21.0	3.5	66.5	64.6
39	19.8	3.3	66.7	64.9
40	19.8	3.3	66.7	64.9
41	19.2	3.2	46.8	45.0
42	20.4	3.4	46.6	44.7
43	20.4	3.4	46.6	44.7
44	20.4	3.4	46.6	44.7
45	18.0	3.0	67.0	65.8
46	18.6	3.1	66.9	65.3
47	18.6	3.1	46.9	45.8
48	19.2	3.2	46.8	45.3
49	16.8	2.8	87.2	86.4
50	16.8	2.8	87.2	86.5
51	19.2	3.2	106.8	106.2
52	18.6	3.1	106.9	106.3
53	17.4	2.9	107.1	106.5
54	18.0	3.0	107.0	106.4

CONSULTING ENGINEERS and PLANNERS

JOB NO.: 958-001.70

DITCH	CHANNEL TOP WIDTH	CHANNEL DEPTH	INVERT HIGH POINT	ELEVATION LOW POINT
55	17.4	2.9	87.1	86.0
56	17.4	2.9	87.1	86.0
57	18.6	3.1	66.9	65.6
58	18.0	3.0	67.0	65.9
59	20.4	3.4	46.6	45.2
60	18.6	3.1	46.9	45.6

SUBJECT: CULVERT DESIGN - UNDER L.F. ACCESS Rd
FOR ACCESS ROAD ABOVE L.F.

ROAD WIDTH = 24'

ROAD - WATERBODY INTERSECTION

CULVERT 1	DITCH 1
CULVERT 2	DITCH 2
CULVERT 3	DITCH 10
CULVERT 4	DITCH 20
CULVERT 5	DITCH 24
CULVERT 6	DITCH 28
CULVERT 7	SPILLWAY 6
CULVERT 8	CROSSING OF PERIMETER DITCH

CULVERT 1

Q_M FOR DITCH 1 = 51.89 CFS (AT LOW POINT OF 119.7')

CALCULATE Q AT CULVERT INLET:

ASSUME CULVERT LENGTH: 63.75'

DRAINAGE AREA = 430.175 = 1.73 A_{CU}

TC = 7.6

i = 8.5

$$Q = C i A$$

$$= .95 (8.5) (1.73)$$

$$= 13.9 \text{ CFS}$$

USE NOMOGRAPH FOR PRELIM SIZING: TRY 36" $\tau = 1.7$ $Q = 12.0$

USE MANNING FOR 36" PIPE $R = \frac{r^2}{4.74} = \frac{1}{2} = .5$

$$v = \frac{1.49}{.024} \left(.75^{2/3} \right) \left(.0010^{1/2} \right)$$

$$= (62.08) (.82) (.032)$$

$$v = 1.63 \text{ M.G.}$$

TRY 42" PIPE

$$v = (62.08) (.875^{2/3}) (.032)$$

$$= (62.08) (.914) (.032)$$

$$v = 1.81$$

$$Q = v A = (1.81) \pi (1.75^2) = 17.4 \text{ CFS O.K.}$$

USE 42" PIPE

SUBJECT: CULVERT DESIGN UNDER L.F. ACCESS Rd
FOR ACCESS ROAD ABOVE L.F.

CULVERT 2

Qm FOR DITCH 2 = 51.89 (AT LOW POINT OF 113.8')
 CALCULATE Q AT CULVERT INLET:

CULVERT LENGTH = $40 + 20 = 60.0'$

DRAINAGE AREA = $(1290) \times (175) = 5.18$ ACRES

TC1 = $1290 / 1.5 = 14.33$ MIN

TC2 = $175 / 1.4 = 2.08$ MIN

TC = 16.41 $i = 7.4$

$$Q = C i A$$

$$= .95 (7.4) (5.18)$$

$$Q = 36.4 \text{ CFS}$$

USING NOMOGRAPH PIPE DIA = 54" @ 2.19 FPS

CHECK BY MANNINGS:

$$V = \frac{1.49}{n} (R^{2/3} S^{1/2})$$

$$2.19 = \frac{1.49}{.029} (R^{2/3}) (.0010^{1/2})$$

$$2.47 = R^{2/3}$$

$$R = 1.83$$

$$1.83 = \frac{1/2 \pi r^2}{\pi} = .5 r$$

$$r = 3.66'$$

$$d = 27.8" \text{ (WALL FULL)}$$

$$Q = VA$$

$$36.4 = 2.19 A$$

$$A = 16.62 \text{ FT}^2$$

$$A = \pi r^2$$

USE $r = 2.3'$ $d = 4.6' = 55"$ USE 60" pipe (FULL)

SUBJECT: CULVERT DESIGN UNDER L.F. ACCESS Rd.
FOR ACCESS ROAD ABOVE L.F.

CULVERT 3

Qm FOR DITCH 16 = 10.3 CFS (AT LOW POINT OF 105.3) $\tau = 1.06$

ASSUME CULVERT LENGTH = 120'

DRAINAGE AREA = $300 \times 40 = .28$ Acres

TC = 10

$i = 8.5$

$$Q = C i A$$

$$= .95(8.5)(.275)$$

$$Q = 2.22 \text{ CFS}$$

NOMOGRAPH SIZING: 19" DIA PIPE @ 1 FPS

USING MANNING

$$V = \frac{1.49}{n} (R^{2/3}) (S^{1/2})$$

$$1 = 62.08 (R^{2/3}) (.0316)$$

$$R^{2/3} = .509'$$

$$R_H = .364'$$

$$R_H = \frac{r}{2} \quad r = .72' = 8.74''$$

$$d = 17.47'' \text{ PIPE}$$

USE 18.0" DIA PIPE

CULVERT 4

Qm FOR DITCH 20 = 24.75 CFS (AT LOW POINT 84.6') $\tau = 1.32'$

ASSUME CULVERT LENGTH = 120'

DRAINAGE AREA = $980 \times 80 = 1.79$ Acres

TC = 13.3

$i = 7$

$$Q = C i A$$

$$= .95(7)(1.79)$$

$$= 11.9 \text{ CFS}$$

NOMOGRAPH SIZING 36" PIPE

USING MANNING

$$1.32 = 62.08 (R^{2/3}) (.0316)$$

$$R^{2/3} = .672$$

$$R_H = .552'$$

$$R_H = \frac{r}{2} \quad r = 1.104' \quad d = 2.208'$$

$$Q = VA$$

$$11.9 = V(\pi)(1.104)^2$$

$$V = 3.29 \text{ TOO HIGH}$$

$$12 = 1.5A$$

$$A = 8'$$

$$A = \pi r^2$$

$$\tau = 1.62$$

$$r = 1.59'$$

$$d = 3.19' = 38.3''$$

USE 36"

SUBJECT: CULVERT DESIGN UNDER L.F. ACCESS Rd
FOR ACCESS ROAD ABOVE L.F.

CULVERT 5

Q_m FOR DITCH 2A = 24.75 CFS (AT LOW POINT OF 64.6') $v = 1.32$ FPS

ASSUME CULVERT LENGTH = 110'

DRAINAGE AREA = $1100 \times 80 = 2.02$ ACRES

$TC = 14.5$ MIN

$C = 7.75$

$$Q = C I A$$

$$= .95(7.75)(2.02)$$

$$= 14.8 \text{ CFS}$$

USING NOMOGRAPH: PIPE SIZE = 38" $v = 1.6$ ($Q =$)

USING MANNINGS:

$$1.32 = 62.08(R^{2/3})(.0316)$$

$$R^{2/3} = .672$$

$$R_H = .552$$

$$r_p = 2R_H = 1.104' \quad (A = 3.82)' \quad (Q = 5.04)$$

$$Q = VA$$

$$14.8 = 1.32 A$$

$$A = 11.2 = \pi r^2$$

$$r = 1.8'$$

TRY 42" PIPE

$$Q = (1.79)(\pi 1.75^2)$$

O.K. USE 42" PIPE

CULVERT 6

Q_m FOR DITCH 2B = 24.75 CFS (AT LOW POINT OF 44.6') $v = 1.32$ FPS

ASSUME CULVERT LENGTH = 100'

DRAINAGE AREA = $420 \times 80 = .77$ ACRES

$TC = 5.9$ min

$C = 9$

$$Q = C I A$$

$$= .95(9)(.77)$$

$$= 6.5 \text{ CFS}$$

USING NOMOGRAPH: PIPE SIZE = 29" $v = 1.4$

USING MANNINGS:

$$1.4 = 62.08(R^{2/3})(.0316)$$

$$R^{2/3} = .714$$

$$R = .60$$

$$r_p = 1.2'$$

PIPE DIA = 28.8"

$$Q = VA$$

$$= (1.4)(\pi)(1.2)^2$$

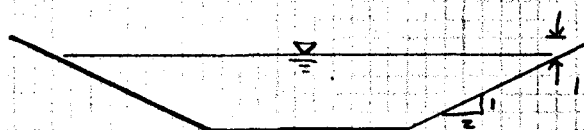
$$= 6.33$$

USE 30" DIA PIPE

SUBJECT: PERIMETER DITCH SIZING
SITE 7

DESIGN A SERIES OF TRAPEZOIDAL DITCHES WITH THE FOLLOWING REQUIREMENTS:

1. USE 2 ON 1 SIDE SLOPES
2. MAINTAIN 1 FOOT OF FREEBOARD AT MAX FLOW
3. MAINTAIN BETWEEN 1 - 2 FPS



NW LEG TRAP. CHANNEL SIZING

MAX FLOW AT LOW POINT = 291 CFS

MANNINGS FORMULA:

$$V = \frac{1.49}{n} (R_H^{2/3}) (S^{1/2})$$

TO CALCULATE R_H , LET Y = FLOW DEPTH = VARIES

b = BOTTOM WIDTH = 12'

z = SIDE SLOPE = 2'

S = CHANNEL SLOPE = .0020 (FIRST TRY)

n = MANNINGS COEF = .04

$R_H = \frac{A}{P}$, WHERE A IS AREA & P IS WETTED PERIMETER.

FOR A TRAPEZOID, $R_H = \frac{(b+zy)Y}{b+2y\sqrt{1+z^2}}$

TRY $Y = 4'$

$$R_H = \frac{(12+8)4}{12+8\sqrt{5}} = \frac{80}{29.8} = 2.68'$$

$$V = \left(\frac{1.49}{.04}\right) (2.68^{2/3}) (.0020^{1/2})$$

$$V = (37.25)(1.94)(.0447) = 3.23 \text{ FPS (TOO HIGH, BUT CHECK Q)}$$

$$\begin{aligned} Q &= VA \quad \text{WHERE } A = (b+zy)Y = (12+8)4 = 80 \text{ FT}^2 \\ &= (3.23)(80) \\ &= 258.4 \text{ CFS} \end{aligned}$$

TRY $Y = 5'$

$$R_H = \frac{110}{34.4} = 3.19'$$

$$V = (37.25)(3.19^{2/3})(.0447) = 3.62 \text{ FPS}$$

$$Q = VA = 3.62(110) = 398 \text{ CFS (MUCH TOO HIGH)}$$

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-19-85

SHEET NO.: 2057

JOB NO.: 958-0017

SUBJECT: PERIMETER DITCH SIZING
SITE 7

TRY A 4.3' DEEP, 15' ^{BOTTOM} WIDE, .0015 SLOPE DITCH

$$R_H = \frac{(15 + 8.6) 4.3}{15 + 8.6 \sqrt{5}} = \frac{101.48}{34.23} = 2.96'$$

$$V = (37.25)(2.96^{2/3})(.0015^{1/2})$$

$$V = 2.98 \text{ FPS}$$

$$Q = VA$$

$$= 2.98(101.48) = 302.4 \text{ CFS O.K.}$$

USE FOR SPILL E → OUTFALL

MAX FLOW FROM SPILL D → SPILL E = 244.2 CFS
TRY A 4.2' DEEP, 12' ^{BOTTOM} WIDE, .0015 SLOPE DITCH

$$R_H = \frac{(12 + 8.4) 4.2}{12 + 8.4 \sqrt{5}} = \frac{85.68}{30.78} = 2.78'$$

$$V = (37.25)(2.78^{2/3})(.0015^{1/2})$$

$$= 2.86 \text{ FPS}$$

$$Q = VA$$

$$= 2.86(85.68) = 245.22 \text{ CFS O.K.}$$

USE FOR SPILL D → SPILL E

MAX FLOW FROM SPILL C → SPILL D = 182.5 CFS
TRY A 3.9' DEEP, 10' ^{BOTTOM} WIDE, .0015 SLOPE DITCH

$$R_H = \frac{(10 + 7.8) 3.9}{10 + 7.8 \sqrt{5}} = \frac{69.42}{27.44} = 2.53'$$

$$V = (37.25)(2.53^{2/3})(.0015^{1/2})$$

$$= 2.68 \text{ FPS}$$

$$Q = VA$$

$$= (2.68)(69.42)$$

$$= 186.5 \text{ CFS O.K.}$$

USE FOR SPILL C → SPILL D

SUBJECT: PERIMETER DITCH SIZING
SITE 7

MAX FLOW FROM HIGH PT → SPILLWAY C = 20.5 CFS
 TRY A 1.7' DEEP, 5' BOTTOM WIDTH, .0015 CHANNEL SLOPE DITCH

$$R_H = \frac{(5+3.4)1.7}{5+3.4\sqrt{5}} = \frac{14.28}{12.60} = 1.13$$

$$V = (37.25)(1.13^{2/3})(.0015^{1/2}) = 1.57 \text{ FPS}$$

$$V = 1.57 \text{ FPS}$$

$$Q = VA$$

$$= 1.57(14.28)$$

$$= 22.42 \text{ CFS O.K.}$$

SW LEG TRAP CHANNEL SIZING

MAX FLOW FROM SPILLWAY A → OUTFALL = 204.3 CFS
 TRY A 3.5' DEEP, 15' BOTTOM WIDTH, .0015 CHANNEL SLOPE DITCH

$$R_H = \frac{(15+7)3.5}{15+7\sqrt{5}} = \frac{77}{30.65} = 2.51$$

$$V = (37.25)(2.51^{2/3})(.0015^{1/2})$$

$$V = 2.67 \text{ FPS}$$

$$Q = VA$$

$$= (2.67)(77) = 205.8 \text{ CFS O.K.}$$

MAX FLOW FROM SPILLWAY B → SPILLWAY A = 181.3 CFS
 THIS SOLUTION IS ESSENTIALLY THE SAME AS
 THE SOL'N ON PAGE 2 OF FOR A FLOW OF 182.5 CFS.
 CONSEQUENTLY, A 3.9' DEEP, 10' BOTTOM WIDTH, .0015 SLOPE DITCH
 WILL SUFFICE.

MAX FLOW FROM HIGH PT → SPILL B = 16.7 CFS
 TRY A 1.5' DEEP, 5' BOTTOM WIDTH, .0015 CHANNEL SLOPE DITCH

$$R_H = \frac{(5+3)1.5}{5+3\sqrt{5}} = \frac{12}{11.7} = 1.025$$

$$V = (37.25)(1.025^{2/3})(.0015^{1/2})$$

$$V = 1.47 \text{ FPS}$$

$$Q = VA$$

$$= (1.47)(12) = 17.64 \text{ CFS O.K.}$$

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-19-85

SHEET NO.: 4 OF 7

JOB NO.: 958-001.70

SUBJECT: PERIMETER DITCH SIZING

SITE 7

SEGMENT	W.S. WIDTH	CHANNEL WIDTH	FLOW DEPTH	CHANNEL DEPTH (T.O.-B)
HP - SP C	11.80	15.8	1.70	2.70 (30.85)
SPC - SPD	25.60	29.6	3.90	4.90
SPD - SPE	28.80	32.8	4.20	5.20
SPE - OUTFALL	32.20	36.2	4.30	5.30
H.P. INV. EL = 28.15 L.P. INV. EL = 19.0				
HP - SP B	11.00	15.00	1.50	2.50 (30.65)
SPB - SPA	25.60	29.60	3.90	4.90
SPA - OUTFALL	29.00	33.00	3.50	4.50
H.P. INV. EL = 28.15 L.P. INV. EL = 18.48				
HP - SP I	9.60	13.60	1.15	2.15 (27.75)
SPI - SP H	22.40	26.40	3.10	4.10
SPH - OUTFALL	31.80	35.80	4.20	5.20
H.P. INV. EL = 25.6 L.P. INV. EL = 19.0				
HP - SP F	11.4	15.4	1.60	2.60 (27.60)
SPF - SP G	24.8	28.8	3.70	4.70
SPG - OUTFALL	31.4	35.4	4.10	5.10
H.P. INV. EL = 25.0 L.P. INV. EL = 19.0				

BJECT: PERIMETER DITCH SIZINGSITE 7WEST LEGS TRAP CHANNELS SIZINGHEADING NORTH

MAX FLOW FROM HIGH PT → SPILL I = 9.5 CFS

TRY A 1.25' DEEP, 5' BOTTOM WIDTH, SLOPE = .0015 DITCH

$$R_H = \frac{(5+2.5)1.25}{5+2.5\sqrt{5}} = \frac{9.375}{10.59} = .885'$$

$$V = (37.25)(.885^{2/3})(.0015^{1/2})$$

$$V = 1.33 \text{ FPS}$$

$$Q = VA$$

$$= (1.33)(9.375)$$

$$= 12.46 \text{ TOO LARGE}$$

TRY A 1.0' DEEP, 5' BOTTOM WIDTH, SLOPE = .0015 DITCH

$$R_H = \frac{(5+2)1}{5+2\sqrt{5}} = \frac{7}{9.47} = .739'$$

$$V = (37.25)(.739^{2/3})(.0015^{1/2})$$

$$V = 1.18 \text{ FPS}$$

$$Q = VA$$

$$= (1.18)(7)$$

$$= 8.26 \text{ TOO SMALL}$$

TRY A 1.15' DEEP, 5' BOTTOM WIDTH, SLOPE = .0015 DITCH

$$R_H = \frac{(5+2.3)1.15}{5+2.3\sqrt{5}} = \frac{8.4}{10.14} = .828'$$

$$V = (37.25)(.828^{2/3})(.0015^{1/2})$$

$$V = 1.27$$

$$Q = VA$$

$$= (1.27)(8.4) = 10.67 \text{ CFS O.K.}$$

MAX FLOW FROM SPILL I → SPILL H = 117.8 CFS

TRY A 3.10' DEEP, 10' BOTTOM WIDTH, SLOPE = .0015 DITCH

$$R_H = \frac{(10+6.2)3.1}{10+6.2\sqrt{5}} = \frac{50.22}{23.86} = 2.10'$$

$$V = (37.25)(2.10^{2/3})(.0015^{1/2})$$

$$V = 2.37 \text{ FPS}$$

$$Q = VA$$

$$= (2.37)(50.22)$$

$$Q = 119.0 \text{ CFS O.K.}$$

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: ARC

DATE: 2-19-85

SHEET NO.: 6 OF 7

JOB NO.: 958-001.70

SUBJECT: PERIMETER DITCH SIZING

SITE 7

MAX FLOW FOR SPILL H → OUTFALL = 279.2 CFS

TRY A 4.2' DEEP, 15' BOTTOM WIDTH, SLOPE = .0015 DITCH

$$R_H = \frac{(15 + 8.4) 4.2}{15 + 8.4 \sqrt{5}} = \frac{98.3}{33.8} = 2.9'$$

$$V = (37.25)(2.9^{2/3})(.0015^{1/2})$$

$$V = 2.94 \text{ FPS}$$

$$Q = VA$$

$$Q = (2.94)(98.3) = 289.0 \text{ CFS O.K.}$$

HEADING SOUTH

MAX FLOW FOR HIGH PT → SPILL F = 18.6 CFS

TRY A 1.6' DEEP, 5' BOTTOM WIDTH, SLOPE = .0015 DITCH

$$R_H = \frac{(5 + 3.2) 1.6}{5 + 3.2 \sqrt{5}} = \frac{13.12}{12.15} = 1.08'$$

$$V = (37.25)(1.08^{2/3})(.0015^{1/2})$$

$$V = 1.52$$

$$Q = VA$$

$$Q = (1.52)(13.12) = 19.94 \text{ CFS O.K.}$$

MAX FLOW FOR SPILL F → SPILL G = 162.5 CFS

TRY A 3.7' DEEP, 10' BOTTOM WIDTH, SLOPE = .0015 DITCH

$$R_H = \frac{(10 + 7.4) 3.7}{10 + 7.4 \sqrt{5}} = \frac{64.38}{26.54} = 2.43'$$

$$V = (37.25)(2.43^{2/3})(.0015^{1/2})$$

$$V = 2.62 \text{ FPS}$$

$$Q = VA$$

$$Q = (2.62)(64.38) = 168.68 \text{ CFS O.K.}$$

Post, Buckley, Schuh & Jernigan, Inc.

CONSULTING ENGINEERS and PLANNERS

COMP. BY: AJE

CHK. BY: A.R.C

DATE: 2-20-85

SHEET NO.: 7 OF 7

JOB NO.: 958-001.70

SUBJECT: PERIMETER DITCH SIZING

SITE 7

MAX FLOW FOR SPILL $Q \rightarrow$ OUTFALL = 276.0 CFS
TRY A 4.1' DEEP, 15' BOTTOM WIDTH, SLOPE = .0015 DITCH

$$R_H = \frac{(15 + 8.2)4.1}{15 + 8.2\sqrt{5}} = \frac{95.12}{33.34} = 2.85'$$

$$V = (37.25)(2.85^{2/3})(.0015^{1/2})$$

$$V = 2.91 \text{ FPS}$$

$$Q = VA$$

$$Q = (2.91)(95.12)$$

$$Q = 276.8 \text{ CFS O.K.}$$

TRIAL SOLUTION FOR MANNING EQUATION

TRAPEZIODAL SECTION

GIVEN : $b = 4.00$
 $z = 2.00$
 $s = 0.000150$
 $n = 0.04$

Y	A	P	$R^{2/3}$	V	Q	T
$(b+zy)y$	$b+2y(1+z^2)^{1/2}$	$(a/p)^{2/3}$	$1.49/n*s^{1/2}*r^{2/3}$	a^3/v	$b+2zy$	
3.75	43.13	20.771	1.628	0.7425	32.0209	19.00
3.85	45.05	21.218	1.652	0.7536	33.9465	19.40
3.95	47.01	21.665	1.676	0.7646	35.9406	19.80
4.05	49.01	22.112	1.700	0.7755	38.0041	20.20
4.15	51.04	22.559	1.724	0.7863	40.1379	20.60
4.25	53.12	23.007	1.747	0.7970	42.3429	21.00
4.35	55.24	23.454	1.770	0.8077	44.6201	21.40
4.45	57.40	23.901	1.794	0.8182	46.9703	21.80
4.55	59.60	24.348	1.816	0.8287	49.3944	22.20
4.65	61.84	24.795	1.839	0.8391	51.8933	22.60

solve for y critical of a trapezoidal section of q 270.00 cfs

y	A^3	T	$q^2/32.2$	a^3/t	DELTA
$((b+zy)y)^3$	$b+2zy$				
1.00	216.000	8.00	2263.98	27.0000	2237.0
1.10	317.215	8.40		37.7636	2226.2
1.20	452.985	8.80		51.4755	2212.5
1.30	631.629	9.20		68.6553	2195.3
1.40	862.801	9.60		89.8751	2174.1
1.50	1157.625	10.00		115.7625	2148.2
1.60	1528.824	10.40		147.0023	2117.0
1.70	1990.866	10.80		184.3394	2079.6
1.80	2560.108	11.20		228.5811	2035.4
1.90	3254.952	11.60		280.5993	1983.4
2.00	4096.000	12.00		341.3333	1922.6
2.10	5106.219	12.40		411.7919	1852.2
2.20	6311.112	12.80		493.0556	1770.9
2.30	7739.892	13.20		586.2700	1677.7

TRIAL SOLUTION FOR MANNING EQUATION

TRAPEZOIDAL SECTION

GIVEN : b = 5.00
z = 2.00
s = 0.001500
n = 0.04

Y	A	P	$R^{2/3}$	V	Q	T
	$(b+zy)y$	$b+2y(1+z^2)^{1/2}$	$(a/p)^{2/3}$	$1.49/n*s^{1/2}*r^{2/3}$	$a*v$	$b+2zy$
1.50	12.00	11.708	1.017	1.4666	17.5987	11.00
1.60	13.12	12.155	1.052	1.5180	19.9166	11.40
1.70	14.28	12.603	1.087	1.5680	22.3913	11.80
1.80	15.48	13.050	1.121	1.6167	25.0259	12.20
1.90	16.72	13.497	1.153	1.6641	27.8233	12.60
2.00	18.00	13.944	1.186	1.7104	30.7869	13.00
2.10	19.32	14.391	1.217	1.7557	33.9196	13.40
2.20	20.68	14.839	1.248	1.8000	37.2246	13.80
2.30	22.08	15.286	1.278	1.8435	40.7050	14.20
2.40	23.52	15.733	1.307	1.8862	44.3639	14.60

solve for y critical of a trapezoidal section of q 21.00 cfs

y	A^3	T	$q^2/32.2$	a^3/t	DELTA
	$((b+zy)y)^3$	$b+2zy$			
0.00	0.000	5.00	13.70	0.0000	13.7
0.10	0.141	5.40		0.0260	13.7
0.20	1.260	5.80		0.2172	13.5
0.30	4.742	6.20		0.7648	12.9
0.40	12.487	6.60		1.8920	11.8
0.50	27.000	7.00		3.8571	9.8
0.60	51.479	7.40		6.9566	6.7
0.70	89.915	7.80		11.5276	2.2
0.80	147.198	8.20		17.9510	-4.3
0.90	229.221	8.60		26.6536	-13.0
1.00	343.000	9.00		38.1111	-24.4
1.10	496.793	9.40		52.8503	-39.2
1.20	700.227	9.80		71.4517	-57.8
1.30	964.430	10.20		94.5520	-80.9
1.40	1302.171	10.60		122.8463	-109.2

TRIAL SOLUTION FOR MANNING EQUATION

TRAPEZOIDAL SECTION

GIVEN : b = 10.00
z = 2.00
s = 0.001500
n = 0.04

Y	A	P	R ^{2/3}	V	Q	T
(b+zy)y	b+2y(1+z ²) ^{1/2}	(a/p) ^{2/3}	1.49/n*s ^{1/2} *r ^{2/3}	a*v	b+2zy	
2.00	28.00	18.944	1.298	1.8720	52.4150	18.00
2.10	29.82	19.391	1.332	1.9221	57.3170	18.40
2.20	31.68	19.839	1.366	1.9710	62.4422	18.80
2.30	33.58	20.286	1.399	2.0188	67.7929	19.20
2.40	35.52	20.733	1.432	2.0656	73.3711	19.60
2.50	37.50	21.180	1.464	2.1114	79.1791	20.00
2.60	39.52	21.628	1.495	2.1564	85.2192	20.40
2.70	41.58	22.075	1.525	2.2004	91.4937	20.80
2.80	43.68	22.522	1.555	2.2437	98.0050	21.20
2.90	45.82	22.969	1.585	2.2862	104.7554	21.60

solve for y critical of a trapezoidal section of q 0.00 cfs

y	A ³	T	q ^{2/32.2}	a ^{3/t}	DELTA
((b+zy)y) ³	b+2zy				
1.00	1728.000	14.00	0.00	123.4286	-123.4
1.10	2416.894	14.40		167.8398	-167.8
1.20	3294.646	14.80		222.6112	-222.6
1.30	4394.826	15.20		289.1333	-289.1
1.40	5754.585	15.60		368.8837	-368.9
1.50	7414.875	16.00		463.4297	-463.4
1.60	9420.669	16.40		574.4310	-574.4
1.70	11821.189	16.80		703.6422	-703.6
1.80	14670.139	17.20		852.9151	-852.9
1.90	18025.946	17.60		1024.2015	-1024.2
2.00	21952.000	18.00		1219.5556	-1219.6
2.10	26516.910	18.40		1441.1364	-1441.1
2.20	31794.758	18.80		1691.2105	-1691.2
2.30	37865.359	19.20		1972.1541	-1972.2
2.40	44814.533	19.60		2286.4557	-2286.5

TRIAL SOLUTION FOR MANNING EQUATION

TRAPEZOIDAL SECTION

GIVEN : b = 10.00
 z = 2.00
 s = 0.001500
 n = 0.04

Y	A	P	$R^{2/3}$	V	Q	T
$(b+zy)y$	$b+2y(1+z^2)^{1/2}$	$(a/p)^{2/3}$	$1.49/n*s^{1/2}*r^{2/3}$	a^3v	$b+2zy$	
3.00	48.00	23.416	1.614	2.3281	111.7474	22.00
3.10	50.22	23.864	1.642	2.3692	118.9834	22.40
3.20	52.48	24.311	1.670	2.4098	126.4657	22.80
3.30	54.78	24.758	1.698	2.4497	134.1969	23.20
3.40	57.12	25.205	1.725	2.4891	142.1794	23.60
3.50	59.50	25.652	1.752	2.5280	150.4156	24.00
3.60	61.92	26.100	1.779	2.5663	158.9080	24.40
3.70	64.38	26.547	1.805	2.6042	167.6591	24.80
3.80	66.88	26.994	1.831	2.6416	176.6713	25.20
3.90	69.42	27.441	1.857	2.6786	185.9472	25.60

solve for y critical of a trapezoidal section of q 185.00 cfs

y	A^3	T	$q^2/32.2$	a^3/t	DELTA
$((b+zy)y)^3$	$b+2zy$				
1.00	1728.000	14.00	1062.89	123.4286	939.5
1.10	2416.894	14.40		167.8398	895.0
1.20	3294.646	14.80		222.6112	840.3
1.30	4394.826	15.20		289.1333	773.8
1.40	5754.585	15.60		368.8837	694.0
1.50	7414.875	16.00		463.4297	599.5
1.60	9420.669	16.40		574.4310	488.5
1.70	11821.189	16.80		703.6422	359.2
1.80	14670.139	17.20		852.9151	210.0
1.90	18025.946	17.60		1024.2015	38.7
2.00	21952.000	18.00		1219.5556	-156.7
2.10	26516.910	18.40		1441.1364	-378.2
2.20	31794.758	18.80		1691.2105	-628.3
2.30	37865.359	19.20		1972.1541	-909.3
2.40	44814.533	19.60		2286.4557	-1223.6

TRIAL SOLUTION FOR MANNING EQUATION

TRAPEZOIDAL SECTION

GIVEN : $b = 12.00$
 $z = 2.00$
 $s = 0.001500$
 $n = 0.04$

Y	A	P	$R^{2/3}$	V	Q	T
$(b+zy)y$	$b+2y(1+z^2)^{1/2}$	$(a/p)^{2/3}$	$1.49/n*s^{1/2}*r^{2/3}$	a^3/v	$b+2zy$	
3.50	66.50	27.652	1.795	2.5897	172.2125	26.00
3.60	69.12	28.100	1.822	2.6290	181.7147	26.40
3.70	71.78	28.547	1.849	2.6678	191.4925	26.80
3.80	74.48	28.994	1.876	2.7061	201.5480	27.20
3.90	77.22	29.441	1.902	2.7439	211.8836	27.60
4.00	80.00	29.889	1.928	2.7813	222.5015	28.00
4.10	82.82	30.336	1.953	2.8182	233.4042	28.40
4.20	85.68	30.783	1.979	2.8547	244.5938	28.80
4.30	88.58	31.230	2.004	2.8909	256.0728	29.20
4.40	91.52	31.677	2.029	2.9266	267.8434	29.60

solve for y critical of a trapezoidal section of q 245.00 cfs

y	A^3	T	$q^{2/32.2}$	a^3/t	DELTA
$((b+zy)y)^3$	$b+2zy$				
1.00	2744.000	16.00	1864.13	171.5000	1692.6
1.10	3811.036	16.40		232.3803	1631.8
1.20	5159.780	16.80		307.1298	1557.0
1.30	6837.363	17.20		397.5211	1466.6
1.40	8895.477	17.60		505.4248	1358.7
1.50	11390.625	18.00		632.8125	1231.3
1.60	14384.366	18.40		781.7590	1082.4
1.70	17943.573	18.80		954.4454	909.7
1.80	22140.698	19.20		1153.1614	711.0
1.90	27054.036	19.60		1380.3080	483.8
2.00	32768.000	20.00		1638.4000	225.7
2.10	39373.401	20.40		1930.0687	-65.9
2.20	46967.732	20.80		2258.0640	-393.9
2.30	55655.459	21.20		2625.2575	-761.1
2.40	65548.321	21.60		3034.6445	-1170.5

TRIAL SOLUTION FOR MANNING EQUATION

TRAPEZOIDAL SECTION

GIVEN : b = 15.00
z = 2.00
s = 0.001500
n = 0.04

Y	A	P	R ^{2/3}	V	Q	T
(b+zy)y	b+2y(1+z ²) ^{1/2}	(a/p) ^{2/3}	1.49/n*s ^{1/2} *r ^{2/3}	a*v	b+2zy	
3.50	77.00	30.652	1.848	2.6661	205.2860	29.00
3.60	79.92	31.100	1.876	2.7068	216.3253	29.40
3.70	82.88	31.547	1.904	2.7469	227.6657	29.80
3.80	85.88	31.994	1.932	2.7866	239.3093	30.20
3.90	88.92	32.441	1.959	2.8257	251.2580	30.60
4.00	92.00	32.889	1.985	2.8643	263.5138	31.00
4.10	95.12	33.336	2.012	2.9024	276.0789	31.40
4.20	98.28	33.783	2.038	2.9401	288.9553	31.80
4.30	101.48	34.230	2.064	2.9774	302.1451	32.20
4.40	104.72	34.677	2.089	3.0142	315.6504	32.60

solve for y critical of a trapezoidal section of q 290.00 cfs

y	A ³	T	q ² /32.2	a ³ /t	DELTA
((b+zy)y) ³		b+2zy			
1.00	4913.000	19.00	2611.80	258.5789	2353.2
1.10	6772.724	19.40		349.1095	2262.7
1.20	9103.145	19.80		459.7548	2152.0
1.30	11977.552	20.20		592.9481	2018.9
1.40	15475.479	20.60		751.2369	1860.6
1.50	19683.000	21.00		937.2857	1674.5
1.60	24693.015	21.40		1153.8792	1457.9
1.70	30605.553	21.80		1403.9245	1207.9
1.80	37528.080	22.20		1690.4541	921.3
1.90	45575.805	22.60		2016.6286	595.2
2.00	54872.000	23.00		2385.7391	226.1
2.10	65548.321	23.40		2801.2103	-189.4
2.20	77745.137	23.80		3266.6024	-654.8
2.30	91611.865	24.20		3785.6142	-1173.8
2.40	107307.307	24.60		4362.0857	-1750.3

TRIAL SOLUTION FOR MANNING EQUATION

TRAPEZIODAL SECTION

GIVEN : b = 15.00
z = 2.00
s = 0.001500
n = 0.04

Y	A	P	$R^{2/3}$	V	Q	T
$(b+zy)y$	$b+2y(1+z^2)^{1/2}$	$(a/p)^{2/3}$	$1.49/n*s^{1/2}*r^{2/3}$	$a*v$	$b+2zy$	
3.50	77.00	30.652	1.848	2.6661	205.2860	29.00
3.60	79.92	31.100	1.876	2.7068	216.3253	29.40
3.70	82.88	31.547	1.904	2.7469	227.6657	29.80
3.80	85.88	31.994	1.932	2.7866	239.3093	30.20
3.90	88.92	32.441	1.959	2.8257	251.2580	30.60
4.00	92.00	32.889	1.985	2.8643	263.5138	31.00
4.10	95.12	33.336	2.012	2.9024	276.0789	31.40
4.20	98.28	33.783	2.038	2.9401	288.9553	31.80
4.30	101.48	34.230	2.064	2.9774	302.1451	32.20
4.40	104.72	34.677	2.089	3.0142	315.6504	32.60

DATE 2/13/82

PROJECT SITE 7

CHECKED BY _____

RUNOFF COEFFICIENT: 10.1 NR

TIME = MIN

Flows For Storm Drainage Design - Rational Method

N.W.		CUMULATIVE		TIME		CUMULATIVE		INTENSITY		FLOW CFS	
NODE	AREA	RUNOFF(C)	AREA	$\Delta = 1/V$	CUMULATIVE	INTENSITY	FLOW CFS				
HIGH PT → SPILLWAY G	21.7	.95	21.7	12.7	12.7	80	20.5				
SPILL C → SPILL D	30.9	.95	33.6	21.5	34.3	56	182.5				
SPILL D → SPILL E	27.6	.95	61.2	23.3	57.6	4.2	244.2				
SPILL E → OUTFALL	21.5	.95	82.7	9.7	67.4	3.7	290.7				
S.W.											
HIGH PT → SPILL B	2.0	.95	2.0	9.5	9.5	88	16.7				
SPILL B → SPILL A	34.7	.95	36.7	31.1	40.6	5.2	181.3				
SPILL A → OUTFALL	21.8	.95	56.6	30.3	70.9	3.8	204.3				
W											
HIGH PT → SPILL I	1.0	.95	1.0	4.4	4.4	100	9.5				
SPILL I → SPILL H	23.8	.95	24.8	37.7	42.1	50	117.8				
SPILL H → OUTFALL	40.5	.95	65.3	10.2	52.3	45	279.2				
HIGH PT → SPILL F	2.3	.95	2.3	10.5	10.5	85	18.6				
SPILL F → SPILL G	27.2	.95	29.5	21.5	32.0	58	162.5				
SPILL G → OUTFALL	28.9	.95	58.1	12.2	44.2	50	276.0				

APPENDIX 10.5

SURFACE WATER MANAGEMENT PLAN

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
P.O. BOX "V"
WEST PALM BEACH, FL. 33402
TELEPHONE: (305) 686-8800 TOLL FREE: 1-800-432-2045

(FOR USE BY SFWMD PERSONNEL ONLY) DATE REC'D: _____

APPL. NO.: _____

APPLICATION TO SOUTH FLORIDA WATER MANAGEMENT DISTRICT FOR A PERMIT FOR:

- () WATER USE
(X) SURFACE WATER MANAGEMENT (DRAINAGE) ([] CONCEPTUAL APPROVAL)
() UTILIZATION OF DISTRICT WORKS
() MODIFICATION OF EXISTING PERMIT NUMBER: _____

OWNER'S NAME: See attached list.

ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____ PHONE: _____

DEVELOPER'S NAME: Palm Beach County Solid Waste Authority

ADDRESS: 5114 Okeechobee Boulevard, Suite 2-C

CITY: West Palm Beach STATE: FL ZIP: 33409 PHONE: (305) 471-5770

PROJECT ENGINEER: Albert R. Capellini, P.E.

ADDRESS: Post, Buckley, Schuh & Jernigan, Inc., 889 North Orange Avenue

CITY: Orlando STATE: FL ZIP: 32801 PHONE: (305) 422-7275

PROJECT NAME: Central Resource Recovery and Landfill Facility

LOCATION: Palm Beach 22, 27, 34; 3 42; 43 S 42 E
CITY COUNTY SECTION(S) TOWNSHIP(S) RANGE(S)

PURPOSE: Solid Waste Management ZONING: Agricultural Residential
(RESIDENTIAL, AGRICUL., PUB. WTR. SUPPLY, ETC.)

PROJECT SIZE: 1320 ACRES

PROJECT IS: (X) PROPOSED () EXISTING () TO BE MODIFIED

IF THIS APPLICATION IS FOR WATER USE, WHAT IS THE SOURCE OF WATER? N/A

IF THIS APPLICATION IS FOR DRAINAGE, WHERE WILL THE WATER DISCHARGE? _____
Into Northern Palm Beach County Water Control District EPB-10 Canal

IF THIS IS A REQUEST TO MODIFY AN EXISTING PERMIT, DESCRIBE THE REQUESTED CHANGES: NO

IF THIS APPLICATION INCLUDES USE OF DISTRICT WORKS, DESCRIBE THE USE: N/A

(CULVERT, BOAT DOCK, FENCE, BEAUTIFICATION, ETC. NOTE! INCLUDE CANAL NAME)

NOTE! IN ALL CASES AN ACCURATE LOCATION MAP WITH THE PROJECT BOUNDARIES CLEARLY SHOWN MUST BE SUBMITTED. ALSO, IF THIS IS A PROPOSED OR EXPANDED PROJECT SUBMIT A CURRENT AERIAL PHOTOGRAPH SHOWING THE PROJECT BOUNDARIES.

RULES 40E-2.101, 40E-4.101, and 40E-6.101 F.A.C. SPECIFY DATA REQUIREMENTS TO CONSTITUTE A COMPLETE PERMIT APPLICATION. A LIST OF THE REFERENCED RULES IS PROVIDED ON THE BACK OF THIS FORM. ANY NECESSARY CHECKLIST MAY BE OBTAINED FROM THE DISTRICT AT THE ABOVE ADDRESS.

DATE: _____
OWNER'S SIGNATURE (IF NOT THE OWNER, CERTIFY BELOW)

I HEREBY CERTIFY THAT I AM AN AUTHORIZED AGENT OF THE OWNER:

Executive Director,
TITLE: Palm Beach County Solid Waste Authority

NOTE! MANY PROJECTS ALSO REQUIRE APPROVAL BY OTHER STATE AND FEDERAL AGENCIES. SFWMD INFORMS SOME AGENCIES OF PERMIT APPLICATIONS RECEIVED BUT THE RESPONSIBILITY FOR REQUESTING APPROVALS RESTS WITH THE OWNER.

POST, BUCKLEY, SCHUH AND JERNIGAN

SURFACE WATER MANAGEMENT PROGRAM

P.B.C. SITE 7 (05Y24HR)

* INPUT DATA * GENERATE SCS HYDROGRAPH NO. 1

***** THE CURVE NUMBER IS GIVEN

CURVE NUMBER = 90.00

TOTAL AREA = 1041.00 ACRES

FREQUENCY OF DESIGN STORM = 5. YEARS

DURATION OF DESIGN STORM = 24.0 HOURS

RAINFALL DISTRIBUTION IS TYPICAL

RAINFALL FOR THE DESIGN FREQUENCY AND 24 HOURS = 7.5 INCHES

TIME (HOUR)	RAINFALL (INCHES)
0.00	0.00
4.00	0.36
8.00	0.90
10.00	1.36
11.00	1.76
11.50	2.12
12.00	4.97
13.00	5.79
16.00	6.60
20.00	7.14
24.00	7.50

TIME OF CONCENTRATION = 0.50 HOURS

TIME STEP FOR WRITING THE RAINFALL TABULATION = 0.25 HOURS

TIME STEP FOR WRITING THE HYDROGRAPH = 0.25 HOURS

TIME INTERVAL FOR COMPUTATION WAS GIVEN AS 0.25 HOURS

AND ADJUSTED TO 0.25 HOURS

 * CUTFUT *

SOIL PARAMETERS
 ABSTRACTION = 1.11 INCHES
 GROUND STORAGE = 96.3889 ACRE-Feet

HYDROGRAPH PARAMETERS
 DURATION OF UNIT EXCESS RAINFALL = 0.25 HOURS
 TIME TO PEAK OF UNIT HYDROGRAPH = 0.43 HOURS

RAINFALL TABULATION

TIME (HOURS)	ACCUMULATED RAINFALL (INCHES)	ACCUMULATED RUNOFF (INCHES)	INCREMENTAL RUNOFF (INCHES)	REVERSED INCREMENTAL RUNOFF (INCHES)
0.00	0.00	0.00000	0.00000	0.02210
0.25	0.02	0.00000	0.00000	0.02210
0.50	0.05	0.00000	0.00000	0.02210
0.75	0.07	0.00000	0.00000	0.02210
1.00	0.09	0.00000	0.00000	0.02210
1.25	0.11	0.00000	0.00000	0.02209
1.50	0.14	0.00000	0.00000	0.02209
1.75	0.16	0.00000	0.00000	0.02209
2.00	0.18	0.00000	0.00000	0.02209
2.25	0.20	0.00000	0.00000	0.02208
2.50	0.23	0.00001	0.00001	0.02208
2.75	0.25	0.00056	0.00056	0.02208
3.00	0.27	0.00197	0.00141	0.02208
3.25	0.29	0.00418	0.00221	0.02208
3.50	0.32	0.00715	0.00297	0.02207
3.75	0.34	0.01084	0.00369	0.02207
4.00	0.36	0.01520	0.00436	0.03310
4.25	0.39	0.02294	0.00774	0.03310
4.50	0.43	0.03201	0.00907	0.03309
4.75	0.46	0.04232	0.01031	0.03308
5.00	0.50	0.05377	0.01145	0.03308
5.25	0.53	0.06626	0.01251	0.03307
5.50	0.56	0.07978	0.01350	0.03307
5.75	0.60	0.09420	0.01442	0.03306
6.00	0.63	0.10948	0.01528	0.03305
6.25	0.66	0.12556	0.01608	0.03305
6.50	0.70	0.14239	0.01683	0.03304
6.75	0.73	0.15993	0.01754	0.03304
7.00	0.76	0.17813	0.01820	0.03303
7.25	0.80	0.19695	0.01882	0.03302
7.50	0.83	0.21636	0.01941	0.03302
7.75	0.87	0.23632	0.01996	0.03301
8.00	0.90	0.25680	0.02048	0.06600
8.25	0.96	0.29261	0.03581	0.06597
8.50	1.01	0.32970	0.03709	0.06594
8.75	1.07	0.36797	0.03827	0.06592
9.00	1.13	0.40730	0.03934	0.06589
9.25	1.19	0.44763	0.04032	0.06585
9.50	1.24	0.48885	0.04123	0.06582
9.75	1.30	0.53091	0.04206	0.06579
10.00	1.36	0.57375	0.04283	0.06576
10.25	1.46	0.65129	0.07755	0.06572
10.50	1.56	0.73080	0.07951	0.06569
10.75	1.66	0.81203	0.08123	0.06565
11.00	1.76	0.89480	0.08276	0.19854
11.25	1.94	1.04520	0.15040	0.19816

11.50	2.12	1.19913	0.15394	0.19774
11.75	3.55	2.49245	1.29332	0.19728
12.00	4.97	3.94979	1.35734	1.35734
12.25	5.18	4.04707	0.19728	1.29332
12.50	5.38	4.24481	0.19774	0.15394
12.75	5.59	4.44297	0.19816	0.15040
13.00	5.79	4.64151	0.19854	0.09276
13.25	5.86	4.70716	0.06565	0.08123
13.50	5.93	4.77285	0.06569	0.07951
13.75	5.99	4.83857	0.06572	0.07755
14.00	6.06	4.90433	0.06576	0.04283
14.25	6.13	4.97012	0.06579	0.04206
14.50	6.20	5.03595	0.06582	0.04123
14.75	6.26	5.10180	0.06585	0.04032
15.00	6.33	5.16769	0.06589	0.03934
15.25	6.40	5.23360	0.06592	0.03827
15.50	6.47	5.29955	0.06594	0.03709
15.75	6.53	5.36552	0.06597	0.03581
16.00	6.60	5.43152	0.06600	0.02048
16.25	6.63	5.46453	0.03301	0.01996
16.50	6.67	5.49755	0.03302	0.01941
16.75	6.70	5.53057	0.03302	0.01882
17.00	6.74	5.56360	0.03303	0.01820
17.25	6.77	5.59664	0.03304	0.01754
17.50	6.80	5.62968	0.03304	0.01683
17.75	6.84	5.66273	0.03305	0.01608
18.00	6.87	5.69578	0.03305	0.01528
18.25	6.90	5.72884	0.03306	0.01442
18.50	6.94	5.76191	0.03307	0.01350
18.75	6.97	5.79498	0.03307	0.01251
19.00	7.01	5.82806	0.03308	0.01145
19.25	7.04	5.86115	0.03308	0.01031
19.50	7.07	5.89424	0.03309	0.00907
19.75	7.11	5.92733	0.03310	0.00774
20.00	7.14	5.96043	0.03310	0.00436
20.25	7.16	5.98250	0.02207	0.00369
20.50	7.19	6.00458	0.02207	0.00297
20.75	7.21	6.02665	0.02208	0.00221
21.00	7.23	6.04873	0.02208	0.00141
21.25	7.25	6.07081	0.02208	0.00056
21.50	7.28	6.09289	0.02208	0.00001
21.75	7.30	6.11497	0.02208	0.00000
22.00	7.32	6.13706	0.02209	0.00000
22.25	7.34	6.15915	0.02209	0.00000
22.50	7.37	6.18124	0.02209	0.00000
22.75	7.39	6.20333	0.02209	0.00000
23.00	7.41	6.22543	0.02210	0.00000
23.25	7.43	6.24753	0.02210	0.00000
23.50	7.45	6.26963	0.02210	0.00000
23.75	7.48	6.29173	0.02210	0.00000
24.00	7.50	6.31383	0.02210	0.00000

UNIT HYDROGRAPH

TIME (HOURS)	FLOW (CFS)
0.00	0.00
0.25	1181.16
0.50	1748.85

0.75	768.19
1.00	298.45
1.25	113.87
1.50	44.13
1.75	17.76
2.00	5.45

 * CUTPUT *

GENERATED SCS HYDROGRAPH NO. 1 *

TIME (HOUR)	UNIT HYDROGRAPH (CFS)	FLOW (CFS)	MASS DIAGRAM (CF)
0.00	0.00	0.00	0.
0.25	1181.16	0.00	0.
0.50	1748.85	0.00	0.
0.75	768.19	0.00	0.
1.00	298.45	0.00	0.
1.25	113.87	0.00	0.
1.50	44.13	0.00	0.
1.75	17.76	0.00	0.
2.00	5.45	0.00	0.
2.25		0.00	0.
2.50		0.00	0.
2.75		0.01	4.
3.00		0.67	308.
3.25		2.64	1796.
3.50		5.50	5459.
3.75		8.62	11815.
4.00		11.73	20972.
4.25		14.73	32877.
4.50		20.81	48870.
4.75		29.17	71361.
5.00		35.88	100634.
5.25		41.55	135480.
5.50		46.58	175141.
5.75		51.17	219129.
6.00		55.40	267087.
6.25		59.33	318718.
6.50		62.98	373759.
6.75		66.40	431980.
7.00		69.59	493175.
7.25		72.58	557154.
7.50		75.39	623743.
7.75		78.03	692784.
8.00		80.51	764130.
8.25		82.85	837646.
8.50		102.58	921093.
8.75		131.59	1026469.
9.00		147.25	1151946.
9.25		156.23	1288511.
9.50		162.33	1431863.
9.75		167.13	1580120.
10.00		171.24	1732386.
10.25		174.87	1888137.
10.50		218.33	2065077.
10.75		282.37	2290388.
11.00		314.89	2559154.
11.25		331.73	2850132.
11.50		420.21	3188503.
11.75		546.14	3623357.
12.00		1951.43	4747260.
12.25		4043.04	7444769.
12.50		3668.92	10915150.
12.75		2033.34	13481165.
13.00		1293.70	14978333.
13.25		1007.02	16013659.
13.50		742.17	16800796.
13.75		466.43	17344668.

14.00	344.38	17709534.
14.25	298.60	17998876.
14.50	283.63	18260882.
14.75	277.92	18513580.
15.00	275.70	18762706.
15.25	275.10	19010566.
15.50	275.23	19258218.
15.75	275.36	19505986.
16.00	275.48	19753864.
16.25	275.60	20001850.
16.50	236.72	20232394.
16.75	179.06	20419496.
17.00	153.76	20569266.
17.25	143.94	20703228.
17.50	140.21	20831096.
17.75	138.78	20955642.
18.00	138.22	21081294.
18.25	138.07	21205624.
18.50	138.09	21329896.
18.75	138.12	21454190.
19.00	138.14	21578508.
19.25	138.17	21702848.
19.50	138.19	21827210.
19.75	138.22	21951594.
20.00	138.24	22076000.
20.25	138.26	22200426.
20.50	125.25	22319008.
20.75	105.97	22423056.
21.00	97.51	22514620.
21.25	94.22	22600898.
21.50	92.98	22685138.
21.75	92.50	22768602.
22.00	92.31	22851768.
22.25	92.26	22934828.
22.50	92.27	23017870.
22.75	92.28	23100920.
23.00	92.29	23183978.
23.25	92.30	23267046.
23.50	92.31	23350122.
23.75	92.32	23433206.
24.00	92.33	23516298.
24.25	92.34	23599398.
24.50	66.24	23670756.
24.75	27.58	23712974.
25.00	10.60	23730156.
25.25	4.01	23736730.
25.50	1.49	23739202.
25.75	0.51	23740102.
26.00	0.12	23740388.

 * INPUT DATA * NO TRANSMITTED HYDROGRAPH IS CONSIDERED
 ***** THE LAST GENERATED HYDROGRAPH IS THE INFLOW HYDROGRAPH

* INPUT DATA *

DO NOT GENERATE A STAGE-STORAGE CURVE
WATER ELEVATION MAINTAINED IN THE BASIN = 17.30 FT
RAINFALL FOR 100-YEAR, 24-HOUR = 13.00 INCHES
MINIMUM FLOOR ELEVATION = 25.00 FT

STAGE (FT)	STORAGE (ACRE-FT)
16.90	0.00
17.95	462.00
18.65	775.00
19.17	1010.20
19.52	1165.90
20.40	1575.00
22.15	2373.00

* INPUT DATA *

NO INFILTRATION IN THE LAKE IS CONSIDERED

* CONTROL SECTION NO. 1 CHARACTERISTICS *

CONTROL SECTION IS A WEIR

WEIR LENGTH = 18.00 FEET

TOTAL AREA CORRESPONDING TO THIS WEIR = 1041.00 ACRES

LAKE AREA INSIDE GOLF AREA CORRESPONDING TO THIS WEIR = 440.00 ACRES

LAKE AREA CORRESPONDING TO THIS WEIR = 440.20 ACRES

ALLOWABLE DISCHARGE = 130.00 CFS

WEIR CREST ELEVATION = 17.30 FEET

THE WEIR HAS A RECTANGULAR BLEEDER

BLEEDER INVERT = 16.90 FEET

WIDTH OF BLEEDER = 0.50 FEET

TAILWATER IS CONSTANT

TAILWATER ELEVATION = 16.00 FEET

 * OUTPUT *

STAGE-DISCHARGE CURVE

STAGE (FEET)	DISCHARGE (CFS)	CONTROL
16.90	0.00	NONE
18.35	65.00	WEIR
18.97	130.00	WEIR
19.50	195.00	WEIR
19.96	260.00	WEIR
20.39	325.00	WEIR
20.79	390.00	WEIR
21.17	455.00	WEIR
21.54	520.00	WEIR
21.88	585.00	WEIR
22.22	650.00	WEIR
22.54	715.00	WEIR
22.85	780.00	WEIR
23.16	845.00	WEIR
23.46	910.00	WEIR
23.75	975.00	WEIR
24.03	1040.00	WEIR
24.31	1105.00	WEIR
24.58	1170.00	WEIR
24.85	1235.00	WEIR
25.11	1300.00	WEIR

 * INPUT DATA * TIME STEP FOR ROUTING = 0.25 HOUR
 ***** TIME STEP FOR PRINTED HYDROGRAM COORDINATES = 0.25HOURS
 EXTEND ROUTING TIME 48.00 HOURS MORE

 * OUTPUT *

*WORKING TABLE COORDINATES *

ELEVATION (FEET)	DISCHARGE (CFS)	STORAGE (ACRE-FT)	WORKING VALUE (CFS)
16.90	0.00	0.00	0.00
17.44	24.21	237.60	11511.95
17.98	48.42	475.41	23034.24
18.52	82.72	716.87	34737.95
19.06	140.69	960.45	46555.93
19.60	209.30	1203.09	58334.25
20.14	286.60	1454.13	70523.16
20.68	371.39	1702.68	82595.42
21.22	463.18	1948.92	94559.32
21.76	561.91	2195.16	*****
22.30	666.57	24.63	1525.29
22.84	776.97	24.62	1580.06
23.38	893.15	24.61	1637.72
23.92	1014.50	24.60	1697.96
24.46	1140.87	24.59	1760.71
25.00	1272.10	24.58	1825.88

ROUTING TABLE

TIME (HOUR)	INSTANTANEOUS INFLOW (CFS)	AVERAGE INFLOW (CFS)	WORKING VALUE (CFS)	ROUTED HYDROGRAPH (CFS)	MASS DIAGRAM OF ROUTED HY. (CF)	WATER ELEVATION IN THE LAKE (FT)	MASS DIAGRAM OF INFILTRAT. (CF)
0.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.75	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.75	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.75	0.01	0.00	0.0	0.00	0.	16.90000	0.
3.00	0.67	0.34	0.3	0.00	0.	16.90001	0.
3.25	2.64	1.65	2.0	0.00	3.	16.90009	0.
3.50	5.50	4.07	6.1	0.01	10.	16.90028	0.
3.75	8.62	7.06	13.1	0.03	28.	16.90061	0.
4.00	11.73	10.17	23.3	0.05	63.	16.90109	0.
4.25	14.73	13.23	36.4	0.08	119.	16.90171	0.
4.50	20.81	17.77	54.1	0.11	205.	16.90254	0.
4.75	29.17	24.99	79.0	0.17	331.	16.90371	0.
5.00	35.88	32.53	111.4	0.23	511.	16.90522	0.
5.25	41.55	38.72	149.8	0.32	758.	16.90703	0.
5.50	46.58	44.07	193.6	0.41	1083.	16.90908	0.
5.75	51.17	48.88	242.1	0.51	1496.	16.91135	0.
6.00	55.40	53.29	294.8	0.62	2004.	16.91383	0.
6.25	59.33	57.37	351.6	0.74	2615.	16.91649	0.
6.50	62.98	61.16	412.0	0.87	3338.	16.91933	0.
6.75	66.40	64.69	475.8	1.00	4178.	16.92232	0.
7.00	69.59	67.99	542.8	1.14	5142.	16.92546	0.
7.25	72.58	71.09	612.8	1.29	6236.	16.92874	0.
7.50	75.39	73.99	685.5	1.44	7465.	16.93215	0.
7.75	78.03	76.71	760.7	1.60	8833.	16.93568	0.
8.00	80.51	79.27	838.4	1.76	10347.	16.93933	0.
8.25	82.85	81.68	918.3	1.93	12009.	16.94308	0.
8.50	102.58	92.72	1009.1	2.12	13833.	16.94734	0.
8.75	131.59	117.09	1124.1	2.36	15852.	16.95273	0.
9.00	147.25	139.42	1261.1	2.65	18109.	16.95916	0.
9.25	156.23	151.74	1410.2	2.97	20637.	16.96615	0.
9.50	162.33	159.28	1566.5	3.29	23454.	16.97348	0.
9.75	167.13	164.73	1728.0	3.63	26572.	16.98106	0.
10.00	171.24	169.18	1893.5	3.98	30000.	16.98882	0.
10.25	174.87	173.06	2062.6	4.34	33743.	16.99675	0.
10.50	218.33	196.60	2254.9	4.74	37829.	17.00577	0.
10.75	282.37	250.35	2500.5	5.26	42330.	17.01720	0.
11.00	314.89	298.63	2793.8	5.88	47340.	17.03105	0.
11.25	331.73	323.31	3111.3	6.54	52928.	17.04594	0.
11.50	420.21	375.97	3480.7	7.32	59167.	17.06327	0.
11.75	546.14	483.17	3956.6	8.32	66205.	17.08559	0.
12.00	1951.43	1248.78	5197.0	10.93	74967.	17.14378	0.
12.25	4043.04	2997.23	8183.3	17.21	87530.	17.28386	0.
12.50	3668.92	3855.98	12022.1	25.28	106651.	17.46391	0.
12.75	2033.34	2851.13	14847.9	31.22	132076.	17.59634	0.
13.00	1293.70	1663.52	16480.2	34.65	161717.	17.67284	0.
13.25	1007.02	1150.36	17595.9	36.99	193956.	17.72513	0.
13.50	742.17	874.60	18433.6	38.75	229742.	17.76439	0.
13.75	466.43	604.30	19999.1	39.94	263454.	17.79089	0.
14.00	344.38	405.41	19364.6	40.71	298747.	17.80802	0.
14.25	298.60	321.49	19645.3	41.30	336650.	17.82118	0.

14.50	283.63	291.12	19895.2	41.82	374056.	17.83296	0.
14.75	277.92	280.78	20134.1	42.33	411923.	17.84403	0.
15.00	275.70	276.31	20368.6	42.82	450238.	17.85507	0.
15.25	275.10	275.40	20601.2	43.31	488695.	17.86597	0.
15.50	275.23	275.17	20833.0	43.79	528191.	17.87684	0.
15.75	275.36	275.30	21064.5	44.28	567825.	17.88769	0.
16.00	275.48	275.42	21295.7	44.77	607897.	17.89852	0.
16.25	275.60	275.54	21526.5	45.25	648405.	17.90934	0.
16.50	236.72	256.16	21737.4	45.69	686331.	17.91922	0.
16.75	179.06	207.89	21899.6	46.04	730609.	17.92682	0.
17.00	153.76	166.41	22019.9	46.29	772155.	17.93246	0.
17.25	143.94	148.85	22122.5	46.50	813911.	17.93727	0.
17.50	140.21	142.07	22218.1	46.70	855855.	17.94175	0.
17.75	138.78	139.50	22310.9	46.90	897577.	17.94610	0.
18.00	138.22	138.50	22402.5	47.09	940274.	17.95039	0.
18.25	138.07	138.14	22493.5	47.28	982743.	17.95466	0.
18.50	138.09	138.08	22584.3	47.47	1025384.	17.95891	0.
18.75	138.12	138.11	22674.9	47.66	1068196.	17.96316	0.
19.00	138.14	138.13	22765.4	47.85	1111180.	17.96740	0.
19.25	138.17	138.16	22855.7	48.04	1154334.	17.97163	0.
19.50	138.19	138.18	22945.8	48.23	1197660.	17.97586	0.
19.75	138.22	138.20	23035.8	48.42	1241156.	17.98010	0.
20.00	138.24	138.23	23125.6	48.60	1284856.	17.98597	0.
20.25	138.26	138.25	23215.2	48.95	1328793.	17.99183	0.
20.50	125.25	131.76	23298.0	49.19	1372957.	17.99724	0.
20.75	105.97	115.61	23364.4	49.39	1417318.	18.00159	0.
21.00	97.51	101.74	23416.8	49.54	1461836.	18.00501	0.
21.25	94.22	95.86	23463.1	49.68	1506483.	18.00804	0.
21.50	92.98	93.60	23507.0	49.81	1551250.	18.01091	0.
21.75	92.50	92.74	23549.9	49.93	1596131.	18.01371	0.
22.00	92.31	92.41	23592.4	50.06	1641125.	18.01649	0.
22.25	92.26	92.29	23634.6	50.18	1686231.	18.01925	0.
22.50	92.27	92.27	23676.7	50.30	1731448.	18.02200	0.
22.75	92.28	92.28	23718.7	50.43	1776776.	18.02475	0.
23.00	92.29	92.29	23760.6	50.55	1822214.	18.02748	0.
23.25	92.30	92.30	23802.3	50.67	1867763.	18.03021	0.
23.50	92.31	92.31	23844.0	50.79	1913422.	18.03294	0.
23.75	92.32	92.31	23885.5	50.91	1959190.	18.03565	0.
24.00	92.33	92.32	23926.9	51.04	2005068.	18.03836	0.
24.25	92.34	92.33	23968.2	51.16	2051055.	18.04106	0.
24.50	66.24	79.29	23996.3	51.24	2097133.	18.04290	0.
24.75	27.58	46.91	23992.0	51.23	2143243.	18.04261	0.
25.00	10.60	19.09	23959.8	51.13	2189305.	18.04051	0.
25.25	4.01	7.30	23916.0	51.00	2235266.	18.03765	0.
25.50	1.49	2.75	23867.8	50.86	2281106.	18.03449	0.
25.75	0.51	1.00	23817.9	50.72	2326817.	18.03123	0.
26.00	0.12	0.32	23767.5	50.57	2372395.	18.02794	0.
26.25	0.00	0.06	23717.0	50.42	2417840.	18.02464	0.
26.50	0.00	0.00	23666.6	50.27	2463152.	18.02134	0.
26.75	0.00	0.00	23616.3	50.13	2508332.	18.01805	0.
27.00	0.00	0.00	23566.2	49.98	2553379.	18.01478	0.
27.25	0.00	0.00	23516.2	49.83	2598294.	18.01151	0.
27.50	0.00	0.00	23466.4	49.69	2643077.	18.00825	0.
27.75	0.00	0.00	23416.7	49.54	2687729.	18.00500	0.
28.00	0.00	0.00	23367.1	49.40	2732250.	18.00176	0.
28.25	0.00	0.00	23317.7	49.25	2776640.	17.99853	0.
28.50	0.00	0.00	23268.5	49.11	2820901.	17.99531	0.
28.75	0.00	0.00	23219.4	48.96	2865032.	17.99210	0.
29.00	0.00	0.00	23170.4	48.82	2909033.	17.98890	0.
29.25	0.00	0.00	23121.6	48.68	2952906.	17.98571	0.
29.50	0.00	0.00	23072.9	48.53	2996649.	17.98253	0.
29.75	0.00	0.00	23024.4	48.40	3040269.	17.97954	0.
30.00	0.00	0.00	22976.0	48.30	3083782.	17.97727	0.

30.25	0.00	0.00	22927.7	48.20	3127204.	17.97501	0.
30.50	0.00	0.00	22879.5	48.00	3170534.	17.97275	0.
30.75	0.00	0.00	22831.4	47.99	3213774.	17.97049	0.
31.00	0.00	0.00	22783.4	47.89	3256922.	17.96824	0.
31.25	0.00	0.00	22735.5	47.79	3299980.	17.96600	0.
31.50	0.00	0.00	22697.7	47.68	3342948.	17.96376	0.
31.75	0.00	0.00	22640.0	47.59	3385825.	17.96152	0.
32.00	0.00	0.00	22592.4	47.48	3428612.	17.95930	0.
32.25	0.00	0.00	22545.0	47.39	3471310.	17.95707	0.
32.50	0.00	0.00	22497.6	47.29	3513917.	17.95485	0.
32.75	0.00	0.00	22450.3	47.19	3556435.	17.95263	0.
33.00	0.00	0.00	22403.1	47.09	3598864.	17.95042	0.
33.25	0.00	0.00	22356.0	46.99	3641203.	17.94821	0.
33.50	0.00	0.00	22309.0	46.90	3683454.	17.94601	0.
33.75	0.00	0.00	22262.1	46.80	3725616.	17.94381	0.
34.00	0.00	0.00	22215.3	46.70	3767689.	17.94162	0.
34.25	0.00	0.00	22168.6	46.60	3809674.	17.93943	0.
34.50	0.00	0.00	22122.0	46.50	3851570.	17.93725	0.
34.75	0.00	0.00	22075.5	46.41	3893379.	17.93507	0.
35.00	0.00	0.00	22029.1	46.31	3935099.	17.93289	0.
35.25	0.00	0.00	21982.8	46.21	3976732.	17.93072	0.
35.50	0.00	0.00	21936.6	46.11	4018278.	17.92856	0.
35.75	0.00	0.00	21890.5	46.02	4059736.	17.92640	0.
36.00	0.00	0.00	21844.4	45.92	4101107.	17.92424	0.
36.25	0.00	0.00	21798.5	45.82	4142392.	17.92209	0.
36.50	0.00	0.00	21752.7	45.73	4183589.	17.91994	0.
36.75	0.00	0.00	21707.0	45.63	4224700.	17.91780	0.
37.00	0.00	0.00	21661.3	45.53	4265725.	17.91566	0.
37.25	0.00	0.00	21615.8	45.44	4306663.	17.91352	0.
37.50	0.00	0.00	21570.4	45.34	4347516.	17.91139	0.
37.75	0.00	0.00	21525.0	45.25	4388282.	17.90927	0.
38.00	0.00	0.00	21479.8	45.15	4428963.	17.90715	0.
38.25	0.00	0.00	21434.6	45.06	4469559.	17.90503	0.
38.50	0.00	0.00	21389.6	44.96	4510069.	17.90292	0.
38.75	0.00	0.00	21344.6	44.87	4550494.	17.90081	0.
39.00	0.00	0.00	21299.7	44.78	4590834.	17.89871	0.
39.25	0.00	0.00	21255.0	44.68	4631089.	17.89661	0.
39.50	0.00	0.00	21210.3	44.59	4671260.	17.89452	0.
39.75	0.00	0.00	21165.7	44.49	4711346.	17.89243	0.
40.00	0.00	0.00	21121.2	44.40	4751348.	17.89034	0.
40.25	0.00	0.00	21076.8	44.31	4791266.	17.88826	0.
40.50	0.00	0.00	21032.5	44.21	4831100.	17.88619	0.
40.75	0.00	0.00	20988.3	44.12	4870951.	17.88411	0.
41.00	0.00	0.00	20944.2	44.03	4910518.	17.88205	0.
41.25	0.00	0.00	20900.1	43.94	4950101.	17.87998	0.
41.50	0.00	0.00	20856.2	43.84	4989602.	17.87792	0.
41.75	0.00	0.00	20812.3	43.75	5029019.	17.87587	0.
42.00	0.00	0.00	20768.6	43.66	5068354.	17.87382	0.
42.25	0.00	0.00	20724.9	43.57	5107606.	17.87177	0.
42.50	0.00	0.00	20681.4	43.48	5146775.	17.86973	0.
42.75	0.00	0.00	20637.9	43.38	5185862.	17.86769	0.
43.00	0.00	0.00	20594.5	43.29	5224867.	17.86566	0.
43.25	0.00	0.00	20551.2	43.20	5263790.	17.86363	0.
43.50	0.00	0.00	20508.0	43.11	5302632.	17.86161	0.
43.75	0.00	0.00	20464.9	43.02	5341391.	17.85959	0.
44.00	0.00	0.00	20421.9	42.93	5380070.	17.85757	0.
44.25	0.00	0.00	20378.9	42.84	5418667.	17.85556	0.
44.50	0.00	0.00	20335.1	42.75	5457183.	17.85355	0.
44.75	0.00	0.00	20293.4	42.66	5495618.	17.85155	0.
45.00	0.00	0.00	20250.7	42.57	5533972.	17.84955	0.
45.25	0.00	0.00	20208.1	42.48	5572245.	17.84755	0.
45.50	0.00	0.00	20165.6	42.39	5610438.	17.84556	0.
45.75	0.00	0.00	20123.2	42.30	5648551.	17.84357	0.

46.00	0.00	0.00	20090.9	42.21	5686584.	17.84159	0.
46.25	0.00	0.00	20038.7	42.13	5724537.	17.83961	0.
46.50	0.00	0.00	19996.6	42.24	5762410.	17.83764	0.
46.75	0.00	0.00	19954.6	41.95	5800204.	17.83567	0.
47.00	0.00	0.00	19912.6	41.86	5837918.	17.83370	0.
47.25	0.00	0.00	19870.8	41.77	5875553.	17.83174	0.
47.50	0.00	0.00	19829.0	41.68	5913109.	17.82978	0.
47.75	0.00	0.00	19787.3	41.60	5950586.	17.82783	0.
48.00	0.00	0.00	19745.7	41.51	5987985.	17.82588	0.
48.25	0.00	0.00	19704.2	41.42	6025304.	17.82393	0.
48.50	0.00	0.00	19662.8	41.34	6062546.	17.82199	0.
48.75	0.00	0.00	19621.4	41.25	6099700.	17.82006	0.
49.00	0.00	0.00	19580.2	41.16	6136794.	17.81812	0.
49.25	0.00	0.00	19539.0	41.08	6173801.	17.81619	0.
49.50	0.00	0.00	19497.9	40.99	6210730.	17.81427	0.
49.75	0.00	0.00	19457.0	40.90	6247562.	17.81235	0.
50.00	0.00	0.00	19416.1	40.82	6284356.	17.81043	0.
50.25	0.00	0.00	19375.2	40.73	6321053.	17.80852	0.
50.50	0.00	0.00	19334.5	40.65	6357673.	17.80661	0.
50.75	0.00	0.00	19293.9	40.56	6394216.	17.80470	0.
51.00	0.00	0.00	19253.3	40.48	6430682.	17.80280	0.
51.25	0.00	0.00	19212.8	40.39	6467072.	17.80091	0.
51.50	0.00	0.00	19172.4	40.31	6503385.	17.79901	0.
51.75	0.00	0.00	19132.1	40.22	6539622.	17.79712	0.
52.00	0.00	0.00	19091.9	40.14	6575782.	17.79524	0.
52.25	0.00	0.00	19051.8	40.05	6611867.	17.79336	0.
52.50	0.00	0.00	19011.7	39.97	6647876.	17.79148	0.
52.75	0.00	0.00	18971.8	39.88	6683809.	17.78961	0.
53.00	0.00	0.00	18931.9	39.80	6719656.	17.78774	0.
53.25	0.00	0.00	18892.1	39.72	6755448.	17.78587	0.
53.50	0.00	0.00	18852.4	39.63	6791156.	17.78401	0.
53.75	0.00	0.00	18812.7	39.55	6826786.	17.78216	0.
54.00	0.00	0.00	18773.2	39.47	6862345.	17.78030	0.
54.25	0.00	0.00	18733.7	39.38	6897828.	17.77845	0.
54.50	0.00	0.00	18694.3	39.30	6933236.	17.77661	0.
54.75	0.00	0.00	18655.0	39.22	6968559.	17.77477	0.
55.00	0.00	0.00	18615.8	39.14	7003829.	17.77293	0.
55.25	0.00	0.00	18576.7	39.05	7039014.	17.77109	0.
55.50	0.00	0.00	18537.6	38.97	7074126.	17.76926	0.
55.75	0.00	0.00	18498.6	38.89	7109163.	17.76744	0.
56.00	0.00	0.00	18459.8	38.81	7144127.	17.76561	0.
56.25	0.00	0.00	18420.9	38.73	7179018.	17.76379	0.
56.50	0.00	0.00	18382.2	38.65	7213835.	17.76198	0.
56.75	0.00	0.00	18343.6	38.56	7248579.	17.76017	0.
57.00	0.00	0.00	18305.0	38.48	7283250.	17.75836	0.
57.25	0.00	0.00	18266.5	38.40	7317848.	17.75656	0.
57.50	0.00	0.00	18228.1	38.32	7352373.	17.75476	0.
57.75	0.00	0.00	18189.8	38.24	7386826.	17.75296	0.
58.00	0.00	0.00	18151.6	38.16	7421207.	17.75117	0.
58.25	0.00	0.00	18113.4	38.08	7455515.	17.74938	0.
58.50	0.00	0.00	18075.3	38.00	7489751.	17.74760	0.
58.75	0.00	0.00	18037.3	37.92	7523916.	17.74582	0.
59.00	0.00	0.00	17999.4	37.84	7558008.	17.74404	0.
59.25	0.00	0.00	17961.6	37.76	7592029.	17.74227	0.
59.50	0.00	0.00	17923.8	37.68	7625979.	17.74050	0.
59.75	0.00	0.00	17886.1	37.60	7659857.	17.73873	0.
60.00	0.00	0.00	17848.5	37.52	7693664.	17.73697	0.
60.25	0.00	0.00	17811.0	37.44	7727400.	17.73521	0.
60.50	0.00	0.00	17773.5	37.37	7761065.	17.73345	0.
60.75	0.00	0.00	17736.2	37.29	7794659.	17.73170	0.
61.00	0.00	0.00	17698.9	37.21	7828193.	17.72996	0.
61.25	0.00	0.00	17661.7	37.13	7861636.	17.72821	0.
61.50	0.00	0.00	17624.6	37.05	7895019.	17.72647	0.

61.75	0.00	0.00	17587.5	36.98	7928332.	17.72474	0.
62.00	0.00	0.00	17550.5	36.90	7961575.	17.72300	0.
62.25	0.00	0.00	17513.6	36.82	7994748.	17.72127	0.
62.50	0.00	0.00	17476.8	36.74	8027851.	17.71955	0.
62.75	0.00	0.00	17440.1	36.67	8060885.	17.71782	0.
63.00	0.00	0.00	17403.4	36.59	8093849.	17.71611	0.
63.25	0.00	0.00	17366.8	36.51	8126744.	17.71439	0.
63.50	0.00	0.00	17330.3	36.43	8159570.	17.71268	0.
63.75	0.00	0.00	17293.9	36.36	8192327.	17.71097	0.
64.00	0.00	0.00	17257.5	36.28	8225015.	17.70927	0.
64.25	0.00	0.00	17221.2	36.21	8257635.	17.70757	0.
64.50	0.00	0.00	17185.0	36.13	8290186.	17.70587	0.
64.75	0.00	0.00	17148.9	36.05	8322668.	17.70418	0.
65.00	0.00	0.00	17112.8	35.98	8355083.	17.70249	0.
65.25	0.00	0.00	17076.9	35.90	8387429.	17.70080	0.
65.50	0.00	0.00	17041.0	35.83	8419777.	17.69912	0.
65.75	0.00	0.00	17005.1	35.75	8451917.	17.69744	0.
66.00	0.00	0.00	16969.4	35.68	8484060.	17.69577	0.
66.25	0.00	0.00	16933.7	35.60	8516135.	17.69409	0.
66.50	0.00	0.00	16898.1	35.53	8548143.	17.69242	0.
66.75	0.00	0.00	16862.6	35.45	8580084.	17.69076	0.
67.00	0.00	0.00	16827.1	35.38	8611957.	17.68910	0.
67.25	0.00	0.00	16791.7	35.30	8643763.	17.68744	0.
67.50	0.00	0.00	16756.4	35.23	8675503.	17.68579	0.
67.75	0.00	0.00	16721.2	35.16	8707175.	17.68414	0.
68.00	0.00	0.00	16686.1	35.08	8738782.	17.68249	0.
68.25	0.00	0.00	16651.0	35.01	8770322.	17.68084	0.
68.50	0.00	0.00	16616.0	34.93	8801706.	17.67920	0.
68.75	0.00	0.00	16581.0	34.86	8833204.	17.67757	0.
69.00	0.00	0.00	16546.2	34.79	8864546.	17.67593	0.
69.25	0.00	0.00	16511.4	34.71	8895822.	17.67430	0.
69.50	0.00	0.00	16476.7	34.64	8927032.	17.67268	0.
69.75	0.00	0.00	16442.0	34.57	8958176.	17.67105	0.
70.00	0.00	0.00	16407.5	34.50	8989255.	17.66943	0.
70.25	0.00	0.00	16373.0	34.42	9020269.	17.66781	0.
70.50	0.00	0.00	16338.5	34.35	9051218.	17.66620	0.
70.75	0.00	0.00	16304.2	34.28	9082101.	17.66459	0.
71.00	0.00	0.00	16269.9	34.21	9112920.	17.66298	0.
71.25	0.00	0.00	16235.7	34.14	9143674.	17.66138	0.
71.50	0.00	0.00	16201.6	34.06	9174363.	17.65978	0.
71.75	0.00	0.00	16167.5	33.99	9204988.	17.65819	0.
72.00	0.00	0.00	16133.5	33.92	9235548.	17.65659	0.
72.25	0.00	0.00	16099.6	33.85	9266044.	17.65500	0.
72.50	0.00	0.00	16065.7	33.78	9296476.	17.65342	0.
72.75	0.00	0.00	16032.0	33.71	9326844.	17.65183	0.
73.00	0.00	0.00	15998.3	33.64	9357148.	17.65025	0.
73.25	0.00	0.00	15964.6	33.57	9387389.	17.64868	0.
73.50	0.00	0.00	15931.1	33.49	9417566.	17.64710	0.
73.75	0.00	0.00	15897.6	33.42	9447680.	17.64553	0.
74.00	0.00	0.00	15864.1	33.35	9477730.	17.64397	0.

MAXIMUM VOLUME STORED IN THE BASIN = 495.3224 ACRE-FT
 MAXIMUM FLOW THROUGH THE CONTROL SECTION = 51.23 CFS
 TIME OF MAXIMUM FLOW = 24.60 HOUR

OPA0:.,SYSTEM 08:37:42.48
 SYSTEM SHUTDOWN IN 0 MINUTES; UP 40. LOGINS ARE DISABLED; PLEASE LOG OUT.
 SYSTEM BACKUP

BATCH,SYSTEM 10:20:16.01
 PES&J DATA CENTER - VAX/VMS IS INITIALIZED
 OPA0:.,4747 08:27:09.60
 YCU MAY NOW LOGIN

POST, PUCKLEY, SCHUH AND JERNIGAN
SURFACE WATER MANAGEMENT PROGRAM
P.B.C. SITE 7 (25Y24HR)

* INPUT DATA * GENERATE SCS HYDROGRAPH NO. 1

***** THE CURVE NUMBER IS GIVEN

CURVE NUMBER = 90.00

TOTAL AREA = 1041.00 ACRES

FREQUENCY OF DESIGN STORM = 25. YEARS

DURATION OF DESIGN STORM = 24.0 HOURS

RAINFALL DISTRIBUTION IS TYPICAL

RAINFALL FOR THE DESIGN FREQUENCY AND 24 HOURS = 10.0 INCHES

TIME (HOUR)	RAINFALL (INCHES)
0.00	0.00
4.00	0.48
8.00	1.20
10.00	1.81
11.00	2.35
11.50	2.83
12.00	6.63
13.00	7.72
16.00	8.80
20.00	9.52
24.00	10.00

TIME OF CONCENTRATION = 0.50 HOURS

TIME STEP FOR WRITING THE RAINFALL TABULATION = 0.25 HOURS

TIME STEP FOR WRITING THE HYDROGRAPH = 0.25 HOURS

TIME INTERVAL FOR COMPUTATION WAS GIVEN AS 0.25 HOURS AND ADJUSTED TO 0.25 HOURS

 * C U T P U T *

SOIL PARAMETERS
 ABSTRACTION = 1.11 INCHES
 GROUND STORAGE = 96.3889 ACRE-FEET

HYDROGRAPH PARAMETERS
 DURATION OF UNIT EXCESS RAINFALL = 0.25 HOURS
 TIME TO PEAK OF UNIT HYDROGRAPH = 0.43 HOURS

RAINFALL TABULATION

TIME (HOURS)	ACCUMULATED RAINFALL (INCHES)	ACCUMULATED RUNOFF (INCHES)	INCREMENTAL RUNOFF (INCHES)	REVERSED INCREMENTAL RUNOFF (INCHES)
0.00	0.00	0.00000	0.00000	0.02969
0.25	0.03	0.00000	0.00000	0.02968
0.50	0.06	0.00000	0.00000	0.02968
0.75	0.09	0.00000	0.00000	0.02968
1.00	0.12	0.00000	0.00000	0.02968
1.25	0.15	0.00000	0.00000	0.02968
1.50	0.18	0.00000	0.00000	0.02968
1.75	0.21	0.00000	0.00000	0.02967
2.00	0.24	0.00028	0.00028	0.02967
2.25	0.27	0.00197	0.00169	0.02967
2.50	0.30	0.00509	0.00312	0.02967
2.75	0.33	0.00953	0.00444	0.02967
3.00	0.36	0.01520	0.00567	0.02966
3.25	0.39	0.02201	0.00681	0.02966
3.50	0.42	0.02988	0.00787	0.02966
3.75	0.45	0.03875	0.00887	0.02966
4.00	0.48	0.04854	0.00979	0.04449
4.25	0.53	0.06484	0.01630	0.04448
4.50	0.57	0.08291	0.01807	0.04448
4.75	0.62	0.10258	0.01968	0.04447
5.00	0.66	0.12373	0.02115	0.04447
5.25	0.70	0.14623	0.02250	0.04446
5.50	0.75	0.16996	0.02373	0.04446
5.75	0.80	0.19483	0.02487	0.04445
6.00	0.84	0.22075	0.02592	0.04445
6.25	0.88	0.24763	0.02680	0.04444
6.50	0.93	0.27542	0.02778	0.04444
6.75	0.97	0.30403	0.02861	0.04443
7.00	1.02	0.33341	0.02939	0.04443
7.25	1.06	0.36352	0.03010	0.04442
7.50	1.11	0.39429	0.03078	0.04442
7.75	1.15	0.42570	0.03140	0.04441
8.00	1.20	0.45768	0.03199	0.08880
8.25	1.25	0.51312	0.05544	0.08878
8.50	1.35	0.56997	0.05685	0.08876
8.75	1.43	0.62810	0.05813	0.08874
9.00	1.50	0.68738	0.05928	0.08871
9.25	1.58	0.74771	0.06033	0.08869
9.50	1.66	0.80900	0.06128	0.08866
9.75	1.73	0.87115	0.06215	0.08863
10.00	1.81	0.93410	0.06295	0.08860
10.25	1.94	1.04731	0.11321	0.08858
10.50	2.08	1.16250	0.11519	0.08855
10.75	2.21	1.27942	0.11691	0.08852
11.00	2.35	1.39784	0.11842	0.26781
11.25	2.59	1.61154	0.21370	0.26750

11.50	2.83	1.82864	0.21710	0.26715
11.75	4.73	3.61638	1.78774	0.26676
12.00	6.63	5.46086	1.84448	1.84448
12.25	6.90	5.72762	0.26676	1.78774
12.50	7.18	5.99477	0.26715	0.21710
12.75	7.45	6.26226	0.26750	0.21370
13.00	7.72	6.53007	0.26781	0.11842
13.25	7.81	6.61859	0.08852	0.11691
13.50	7.90	6.70714	0.08855	0.11519
13.75	7.99	6.79571	0.08858	0.11321
14.00	8.08	6.88432	0.08860	0.06295
14.25	8.17	6.97295	0.08863	0.06215
14.50	8.26	7.06161	0.08866	0.06128
14.75	8.35	7.15029	0.08869	0.06033
15.00	8.44	7.23901	0.08871	0.05928
15.25	8.53	7.32774	0.08874	0.05813
15.50	8.62	7.41650	0.08876	0.05685
15.75	8.71	7.50528	0.08878	0.05544
16.00	8.80	7.59409	0.08880	0.03199
16.25	8.85	7.63850	0.04441	0.03140
16.50	8.89	7.68292	0.04442	0.03078
16.75	8.94	7.72734	0.04442	0.03010
17.00	8.98	7.77176	0.04443	0.02939
17.25	9.03	7.81620	0.04443	0.02861
17.50	9.07	7.86063	0.04444	0.02778
17.75	9.12	7.90508	0.04444	0.02689
18.00	9.16	7.94952	0.04445	0.02592
18.25	9.20	7.99398	0.04445	0.02487
18.50	9.25	8.03843	0.04446	0.02373
18.75	9.30	8.08289	0.04446	0.02250
19.00	9.34	8.12736	0.04447	0.02115
19.25	9.39	8.17183	0.04447	0.01968
19.50	9.43	8.21631	0.04448	0.01807
19.75	9.48	8.26079	0.04448	0.01630
20.00	9.52	8.30527	0.04449	0.00979
20.25	9.55	8.33493	0.02966	0.00887
20.50	9.58	8.36459	0.02966	0.00787
20.75	9.61	8.39426	0.02966	0.00681
21.00	9.64	8.42392	0.02966	0.00567
21.25	9.67	8.45359	0.02967	0.00444
21.50	9.70	8.48326	0.02967	0.00312
21.75	9.73	8.51293	0.02967	0.00169
22.00	9.76	8.54260	0.02967	0.00028
22.25	9.79	8.57228	0.02967	0.00000
22.50	9.82	8.60195	0.02968	0.00000
22.75	9.85	8.63163	0.02968	0.00000
23.00	9.88	8.66131	0.02968	0.00000
23.25	9.91	8.69099	0.02968	0.00000
23.50	9.94	8.72067	0.02968	0.00000
23.75	9.97	8.75036	0.02968	0.00000
24.00	10.00	8.78005	0.02969	0.00000

UNIT HYDROGRAPH

TIME (HOURS)	FLOW (CFS)
0.00	0.00
0.25	1181.16
0.50	1748.85

0.75	768.19
1.00	298.45
1.25	113.87
1.50	44.13
1.75	17.76
2.00	5.45

 * OUTPUT *

GENERATED SCS HYDROGRAPH NO. 1 *

TIME (HOUR)	UNIT HYDROGRAPH (CFS)	FLOW (CFS)	MASS DIAGRAM (CF)
0.00	0.00	0.00	0.
0.25	1181.16	0.00	0.
0.50	1748.85	0.00	0.
0.75	768.19	0.00	0.
1.00	298.45	0.00	0.
1.25	113.87	0.00	0.
1.50	44.13	0.00	0.
1.75	17.76	0.00	0.
2.00	5.45	0.00	0.
2.25		0.33	149.
2.50		2.49	1416.
2.75		6.85	5619.
3.00		12.08	14140.
3.25		17.40	27405.
3.50		22.51	45362.
3.75		27.33	67788.
4.00		31.84	94415.
4.25		36.06	124970.
4.50		46.65	162191.
4.75		61.33	210783.
5.00		71.79	270686.
5.25		79.82	338911.
5.50		86.56	413781.
5.75		92.49	494354.
6.00		97.85	580010.
6.25		102.74	670275.
6.50		107.21	764750.
6.75		111.34	863099.
7.00		115.16	965026.
7.25		118.71	1070268.
7.50		122.00	1178585.
7.75		125.06	1289760.
8.00		127.91	1403596.
8.25		130.57	1519914.
8.50		160.11	1650723.
8.75		203.56	1814374.
9.00		225.85	2007605.
9.25		237.64	2216172.
9.50		245.01	2433363.
9.75		250.44	2656316.
10.00		254.92	2883727.
10.25		258.76	3114882.
10.50		320.67	3375629.
10.75		411.96	3705314.
11.00		456.47	4096110.
11.25		477.94	4516598.
11.50		600.82	5002039.
11.75		775.60	5621425.
12.00		2711.54	7190634.
12.25		5556.98	10911466.
12.50		5011.18	15667140.
12.75		2769.41	19168406.
13.00		1756.14	21204904.
13.25		1362.91	22608476.
13.50		1002.84	23673062.
13.75		629.64	24407680.

14.00	464.44	24900016.
14.25	402.50	25290136.
14.50	382.22	25643258.
14.75	374.43	25983750.
15.00	371.36	26319356.
15.25	370.49	26653190.
15.50	370.60	26986680.
15.75	370.70	27320264.
16.00	370.80	27653940.
16.25	370.90	27987706.
16.50	318.53	28297950.
16.75	240.93	28549708.
17.00	206.85	28751210.
17.25	193.63	28931426.
17.50	188.60	29103426.
17.75	186.66	29272290.
18.00	185.89	29439936.
18.25	185.67	29607138.
18.50	185.69	29774250.
18.75	185.71	29941380.
19.00	185.73	30108528.
19.25	185.75	30275696.
19.50	185.77	30442882.
19.75	185.79	30610084.
20.00	185.81	30777304.
20.25	185.83	30944542.
20.50	168.33	31103914.
20.75	142.41	31243748.
21.00	131.03	31366796.
21.25	126.61	31482736.
21.50	124.93	31595932.
21.75	124.29	31708080.
22.00	124.03	31819822.
22.25	123.96	31931418.
22.50	123.97	32042984.
22.75	123.97	32154556.
23.00	123.98	32266134.
23.25	123.99	32377720.
23.50	124.00	32489312.
23.75	124.00	32600912.
24.00	124.01	32712518.
24.25	124.02	32824130.
24.50	88.96	32919970.
24.75	37.04	32976670.
25.00	14.24	32999746.
25.25	5.38	33008574.
25.50	2.00	33011894.
25.75	0.69	33013104.
26.00	0.16	33013486.

* INPUT DATA * NO TRANSMITTED HYDROGRAPH IS CONSIDERED

***** THE LAST GENERATED HYDROGRAPH IS THE INFLOW HYDROGRAPH

* INPUT DATA * NO TRANSMITTED HYDROGRAPH IS CONSIDERED
***** THE LAST GENERATED HYDROGRAPH IS THE INFLOW HYDROGRAPH

* INPUT DATA * DO NOT GENERATE A STAGE-STORAGE CURVE
***** WATER ELEVATION MAINTAINED IN THE BASIN = 17.30 FT
RAINFALL FOR 100-YEAR, 24-HOUR = 13.00 INCHES
MINIMUM FIOCR ELEVATION = 25.00 FT

STAGE (FT)	STORAGE (ACRE-FT)
16.90	0.00
17.95	462.00
18.65	775.00
19.17	1010.20
19.52	1165.90
20.40	1575.00
22.15	2373.00

NO INFILTRATION IN THE LAKE IS CONSIDERED

* CONTROL SECTION NO. 1 CHARACTERISTICS *

CONTROL SECTION 1A A WEIR

WEIR LENGTH = 18.00 FEET

TOTAL AREA CORRESPONDING TO THIS WEIR = 1041.00 ACRES

LAKE AREA INSIDE GOLF AREA CORRESPONDING TO THIS WEIR = 440.00 ACRES

LAKE AREA CORRESPONDING TO THIS WEIR = 440.00 ACRES

ALLOWABLE DISCHARGE = 130.00 CFS

WEIR CREST ELEVATION = 17.30 FEET

THE WEIR HAS A RECTANGULAR BLEEDER

BLEEDER INVERT = 16.90 FEET

WIDTH OF BLEEDER = 0.50 FEET

TAILWATER IS CONSTANT

TAILWATER ELEVATION = 16.00 FEET

* OUTPUT *

STAGE-DISCHARGE CURVE

STAGE (FEET)	DISCHARGE (CFS)	CONTROL
16.90	0.00	NONE
18.35	65.00	WEIR
18.97	130.00	WEIR
19.50	195.00	WEIR
19.96	260.00	WEIR
20.39	325.00	WEIR
20.79	390.00	WEIR
21.17	455.00	WEIR
21.54	520.00	WEIR
21.88	585.00	WEIR
22.22	650.00	WEIR
22.54	715.00	WEIR
22.85	780.00	WEIR
23.16	845.00	WEIR
23.46	910.00	WEIR
23.75	975.00	WEIR
24.03	1040.00	WEIR
24.31	1105.00	WEIR
24.58	1170.00	WEIR
24.85	1235.00	WEIR
25.11	1300.00	WEIR

* INPUT DATA *

TIME STEP FOR ROUTING = 0.25 HOUR
TIME STEP FOR PRINTED HYDROGRAM COORDINATES = 0.25 HOURS
EXTEND ROUTING TIME 72.00 HOURS MORE

* CUTFUT *

*WORKING TABLE COORDINATES *

ELEVATION	DISCHARGE	STORAGE	WORKING VALUE
(FEET)	(CFS)	(ACRE-FT)	(CFS)
16.90	0.00	0.00	0.00
17.44	24.21	237.60	11511.95
17.98	48.42	475.41	23034.24
18.52	82.72	716.87	34737.95
19.06	140.69	960.45	46555.93
19.60	209.30	1203.09	58334.25
20.14	286.60	1454.13	70523.16
20.68	371.39	1702.68	82595.42
21.22	463.18	1948.92	94559.32
21.76	561.91	2195.16	*****
22.30	666.57	24.63	1525.29
22.84	776.97	24.62	1580.06
23.38	893.15	24.61	1637.72
23.92	1014.50	24.60	1697.96
24.46	1140.87	24.59	1760.71
25.00	1272.10	24.58	1825.88

ROUTING TABLE

TIME (HOUR)	INSTANTANEOUS INFLOW (CFS)	AVERAGE INFLOW (CFS)	WORKING VALUE (CFS)	ROUTED HYDROGRAPH (CFS)	MASS DIAGRAM OF ROUTED HY. (CF)	WATER ELEVATION IN THE LAKE (FT)	MASS DIAGRAM OF INFILTRAT. (CF)
0.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.75	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.75	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.25	0.33	0.17	0.2	0.00	0.	16.90001	0.
2.50	2.49	1.41	1.6	0.00	2.	16.90007	0.
2.75	6.85	4.67	6.2	0.01	9.	16.90029	0.
3.00	12.08	9.47	15.7	0.03	30.	16.90074	0.
3.25	17.40	14.74	30.4	0.06	74.	16.90143	0.
3.50	22.51	19.95	50.3	0.11	150.	16.90236	0.
3.75	27.33	24.92	75.1	0.16	269.	16.90352	0.
4.00	31.84	29.58	104.5	0.22	439.	16.90490	0.
4.25	36.06	33.95	138.3	0.29	668.	16.90648	0.
4.50	46.65	41.36	179.3	0.38	969.	16.90841	0.
4.75	61.33	53.99	232.9	0.49	1359.	16.91093	0.
5.00	71.79	66.56	299.0	0.63	1862.	16.91403	0.
5.25	79.82	75.81	374.2	0.79	2500.	16.91755	0.
5.50	86.56	83.19	456.6	0.96	3286.	16.92142	0.
5.75	92.48	89.53	545.2	1.15	4234.	16.92557	0.
6.00	97.85	95.17	639.2	1.34	5355.	16.92998	0.
6.25	102.74	100.29	738.1	1.55	6658.	16.93462	0.
6.50	107.21	104.97	841.5	1.77	8153.	16.93947	0.
6.75	111.34	109.28	949.1	2.00	9847.	16.94452	0.
7.00	115.16	113.25	1060.3	2.23	11749.	16.94974	0.
7.25	118.71	116.94	1175.0	2.47	13864.	16.95512	0.
7.50	122.00	120.35	1292.9	2.72	16200.	16.96065	0.
7.75	125.06	123.53	1413.7	2.97	18761.	16.96631	0.
8.00	127.91	126.48	1537.2	3.23	21554.	16.97211	0.
8.25	130.57	129.24	1663.2	3.50	24583.	16.97802	0.
8.50	160.11	145.34	1805.1	3.80	27865.	16.98467	0.
8.75	203.56	181.83	1983.1	4.17	31450.	16.99302	0.
9.00	225.85	214.70	2193.6	4.61	35403.	17.00290	0.
9.25	237.64	231.74	2420.8	5.09	39770.	17.01355	0.
9.50	245.01	241.32	2657.0	5.59	44575.	17.02463	0.
9.75	250.44	247.73	2899.1	6.10	49833.	17.03599	0.
10.00	254.92	252.68	3145.7	6.62	55554.	17.04756	0.
10.25	258.76	256.84	3395.9	7.14	61744.	17.05930	0.
10.50	320.67	289.72	3678.5	7.74	68439.	17.07255	0.
10.75	411.96	366.32	4037.1	8.49	75741.	17.08937	0.
11.00	456.47	434.22	4462.8	9.29	83755.	17.10934	0.
11.25	477.94	467.21	4920.7	10.35	92665.	17.13082	0.
11.50	600.82	539.38	5449.7	11.46	102479.	17.15563	0.
11.75	775.60	688.21	6126.4	12.88	113434.	17.18738	0.
12.00	2711.54	1743.57	7857.1	16.52	126668.	17.26856	0.
12.25	5556.98	4134.26	11974.8	25.16	145436.	17.46169	0.
12.50	5011.13	5284.08	17233.7	36.23	173072.	17.70816	0.
12.75	2769.41	3690.30	21087.8	44.33	209325.	17.88878	0.
13.00	1756.14	2262.77	23306.3	49.22	251421.	17.99778	0.
13.25	1362.91	1559.52	24816.6	53.64	297708.	18.09652	0.
13.50	1002.64	1182.87	25945.3	56.95	347477.	18.17035	0.
13.75	629.64	816.24	26705.1	59.18	399736.	18.21999	0.
14.00	464.44	547.04	27192.9	60.61	453641.	18.25188	0.
14.25	402.50	433.47	27565.8	61.70	508681.	18.27626	0.

14.50	382.22	392.36	27896.5	62.67	564648.	18.29787	0.
14.75	374.43	378.32	28212.1	63.60	621468.	18.31851	0.
15.00	371.36	372.89	28521.4	64.50	679113.	18.33873	0.
15.25	370.49	370.93	28827.8	65.40	737569.	18.35367	0.
15.50	370.60	370.55	29133.0	66.30	796632.	18.36226	0.
15.75	370.70	370.65	29437.3	67.19	856899.	18.37093	0.
16.00	370.80	370.75	29740.9	68.08	917768.	18.37937	0.
16.25	370.90	370.85	30043.7	68.96	979437.	18.38789	0.
16.50	318.53	344.72	30319.4	69.77	1041868.	18.39565	0.
16.75	240.93	279.73	30529.4	70.39	1104941.	18.40156	0.
17.00	206.85	223.89	30682.9	70.84	1168492.	18.40588	0.
17.25	193.63	200.24	30812.3	71.22	1232417.	18.40952	0.
17.50	188.60	191.11	30932.2	71.57	1296671.	18.41290	0.
17.75	166.66	187.63	31048.2	71.91	1361235.	18.41616	0.
18.00	185.89	186.27	31162.6	72.24	1426104.	18.41938	0.
18.25	185.67	185.78	31276.1	72.58	1491274.	18.42257	0.
18.50	185.69	185.68	31389.2	72.91	1556742.	18.42576	0.
18.75	185.71	185.70	31502.0	73.24	1622508.	18.42893	0.
19.00	185.73	185.72	31614.5	73.57	1688571.	18.43210	0.
19.25	185.75	185.74	31726.7	73.90	1754931.	18.43520	0.
19.50	185.77	185.76	31838.6	74.23	1821586.	18.43840	0.
19.75	185.79	185.78	31950.1	74.55	1888536.	18.44154	0.
20.00	185.81	185.80	32061.4	74.88	1955780.	18.44467	0.
20.25	185.83	185.82	32172.3	75.20	2023316.	18.44780	0.
20.50	168.33	177.08	32274.2	75.50	2091134.	18.45056	0.
20.75	142.41	155.37	32354.0	75.74	2159191.	18.45291	0.
21.00	131.03	136.72	32415.0	75.91	2227434.	18.45463	0.
21.25	126.61	128.82	32467.9	76.07	2295827.	18.45612	0.
21.50	124.93	125.77	32517.6	76.22	2364356.	18.45752	0.
21.75	124.29	124.61	32566.0	76.36	2433014.	18.45888	0.
22.00	124.03	124.16	32613.8	76.50	2501798.	18.46022	0.
22.25	123.96	123.99	32661.3	76.64	2570709.	18.46156	0.
22.50	123.97	123.96	32708.7	76.78	2639744.	18.46289	0.
22.75	123.97	123.97	32755.9	76.91	2708905.	18.46422	0.
23.00	123.98	123.98	32802.9	77.05	2778189.	18.46554	0.
23.25	123.99	123.98	32849.8	77.19	2847598.	18.46686	0.
23.50	124.00	123.99	32896.7	77.33	2917130.	18.46818	0.
23.75	124.00	124.00	32943.3	77.46	2986785.	18.46950	0.
24.00	124.01	124.01	32989.9	77.60	3056563.	18.47080	0.
24.25	124.02	124.01	33036.3	77.74	3126464.	18.47211	0.
24.50	88.96	106.49	33065.0	77.82	3196464.	18.47292	0.
24.75	37.04	63.00	33050.2	77.76	3266483.	18.47250	0.
25.00	14.24	25.64	32998.1	77.62	3336413.	18.47104	0.
25.25	5.38	9.61	32930.3	77.42	3406185.	18.46913	0.
25.50	2.00	3.69	32856.5	77.21	3475770.	18.46705	0.
25.75	0.69	1.34	32780.7	76.99	3545158.	18.46492	0.
26.00	0.16	0.43	32704.1	76.76	3614345.	18.46276	0.
26.25	0.00	0.08	32627.4	76.54	3683330.	18.46060	0.
26.50	0.00	0.00	32550.9	76.31	3752113.	18.45845	0.
26.75	0.00	0.00	32474.6	76.09	3820694.	18.45630	0.
27.00	0.00	0.00	32398.5	75.87	3889074.	18.45416	0.
27.25	0.00	0.00	32322.6	75.64	3957254.	18.45203	0.
27.50	0.00	0.00	32247.0	75.42	4025233.	18.44990	0.
27.75	0.00	0.00	32171.5	75.20	4093014.	18.44777	0.
28.00	0.00	0.00	32096.3	74.98	4160596.	18.44566	0.
28.25	0.00	0.00	32021.4	74.76	4227980.	18.44355	0.
28.50	0.00	0.00	31946.6	74.54	4295166.	18.44144	0.
28.75	0.00	0.00	31872.1	74.32	4362156.	18.43935	0.
29.00	0.00	0.00	31797.7	74.11	4428949.	18.43726	0.
29.25	0.00	0.00	31723.6	73.89	4495546.	18.43517	0.
29.50	0.00	0.00	31649.7	73.67	4561948.	18.43309	0.
29.75	0.00	0.00	31576.1	73.46	4628156.	18.43102	0.
30.00	0.00	0.00	31502.6	73.24	4694169.	18.42895	0.

30.25	0.00	0.00	31429.4	73.03	4759989.	18.42689	0.
30.50	0.00	0.00	31356.3	72.81	4825816.	18.42483	0.
30.75	0.00	0.00	31283.5	72.60	4891051.	18.42278	0.
31.00	0.00	0.00	31210.9	72.39	4956294.	18.42074	0.
31.25	0.00	0.00	31138.6	72.17	5021345.	18.41870	0.
31.50	0.00	0.00	31066.4	71.96	5086206.	18.41667	0.
31.75	0.00	0.00	30994.4	71.75	5150877.	18.41465	0.
32.00	0.00	0.00	30922.7	71.54	5215359.	18.41263	0.
32.25	0.00	0.00	30851.1	71.33	5279651.	18.41061	0.
32.50	0.00	0.00	30779.8	71.12	5343755.	18.40861	0.
32.75	0.00	0.00	30708.7	70.91	5407671.	18.40661	0.
33.00	0.00	0.00	30637.8	70.71	5471400.	18.40461	0.
33.25	0.00	0.00	30567.1	70.50	5534942.	18.40262	0.
33.50	0.00	0.00	30496.5	70.29	5598297.	18.40064	0.
33.75	0.00	0.00	30426.3	70.09	5661467.	18.39866	0.
34.00	0.00	0.00	30356.2	69.88	5724452.	18.39669	0.
34.25	0.00	0.00	30286.3	69.68	5787252.	18.39472	0.
34.50	0.00	0.00	30216.6	69.47	5849863.	18.39276	0.
34.75	0.00	0.00	30147.2	69.27	5912300.	18.39080	0.
35.00	0.00	0.00	30077.9	69.06	5974550.	18.38885	0.
35.25	0.00	0.00	30008.8	68.86	6036617.	18.38691	0.
35.50	0.00	0.00	29940.0	68.66	6098502.	18.38497	0.
35.75	0.00	0.00	29871.3	68.46	6160206.	18.38304	0.
36.00	0.00	0.00	29802.8	68.26	6221729.	18.38111	0.
36.25	0.00	0.00	29734.6	68.06	6283071.	18.37919	0.
36.50	0.00	0.00	29666.5	67.86	6344234.	18.37726	0.
36.75	0.00	0.00	29598.7	67.66	6405218.	18.37537	0.
37.00	0.00	0.00	29531.0	67.46	6466023.	18.37346	0.
37.25	0.00	0.00	29463.5	67.26	6526649.	18.37156	0.
37.50	0.00	0.00	29396.3	67.07	6587098.	18.36967	0.
37.75	0.00	0.00	29329.2	66.87	6647370.	18.36773	0.
38.00	0.00	0.00	29262.3	66.67	6707465.	18.36590	0.
38.25	0.00	0.00	29195.7	66.48	6767384.	18.36403	0.
38.50	0.00	0.00	29129.2	66.28	6827127.	18.36216	0.
38.75	0.00	0.00	29062.9	66.09	6886695.	18.36029	0.
39.00	0.00	0.00	28996.8	65.90	6946089.	18.35843	0.
39.25	0.00	0.00	28930.9	65.70	7005308.	18.35658	0.
39.50	0.00	0.00	28865.2	65.51	7064354.	18.35473	0.
39.75	0.00	0.00	28799.7	65.32	7123227.	18.35288	0.
40.00	0.00	0.00	28734.4	65.13	7181928.	18.35104	0.
40.25	0.00	0.00	28669.3	64.94	7240456.	18.34840	0.
40.50	0.00	0.00	28604.3	64.75	7298812.	18.34415	0.
40.75	0.00	0.00	28539.6	64.56	7356998.	18.33992	0.
41.00	0.00	0.00	28475.0	64.37	7415013.	18.33570	0.
41.25	0.00	0.00	28410.7	64.18	7472858.	18.33149	0.
41.50	0.00	0.00	28346.5	63.99	7530533.	18.32730	0.
41.75	0.00	0.00	28282.5	63.80	7588040.	18.32311	0.
42.00	0.00	0.00	28218.7	63.62	7645378.	18.31894	0.
42.25	0.00	0.00	28155.1	63.43	7702548.	18.31478	0.
42.50	0.00	0.00	28091.6	63.24	7759550.	18.31063	0.
42.75	0.00	0.00	28028.4	63.06	7816395.	18.30650	0.
43.00	0.00	0.00	27965.3	62.87	7873054.	18.30238	0.
43.25	0.00	0.00	27902.5	62.69	7929556.	18.29827	0.
43.50	0.00	0.00	27839.8	62.50	7985893.	18.29417	0.
43.75	0.00	0.00	27777.3	62.32	8042065.	18.29008	0.
44.00	0.00	0.00	27715.0	62.14	8098072.	18.28601	0.
44.25	0.00	0.00	27652.8	61.96	8153915.	18.28195	0.
44.50	0.00	0.00	27590.9	61.78	8209595.	18.27789	0.
44.75	0.00	0.00	27529.1	61.59	8265111.	18.27386	0.
45.00	0.00	0.00	27467.5	61.41	8320464.	18.26983	0.
45.25	0.00	0.00	27406.1	61.23	8375655.	18.26582	0.
45.50	0.00	0.00	27344.8	61.05	8430664.	18.26181	0.
45.75	0.00	0.00	27283.8	60.88	8485552.	18.25782	0.

46.00	0.00	0.00	27222.9	60.70	8540259.	18.25384	0.
46.25	0.00	0.00	27162.2	60.52	8594806.	18.24987	0.
46.50	0.00	0.00	27101.7	60.34	8649193.	18.24592	0.
46.75	0.00	0.00	27041.4	60.16	8727321.	18.24197	0.
47.00	0.00	0.00	26981.2	59.99	8757492.	18.23804	0.
47.25	0.00	0.00	26921.2	59.81	8811402.	18.23412	0.
47.50	0.00	0.00	26861.4	59.64	8865152.	18.23021	0.
47.75	0.00	0.00	26801.8	59.46	8918747.	18.22631	0.
48.00	0.00	0.00	26742.3	59.29	8972185.	18.22242	0.
48.25	0.00	0.00	26683.0	59.11	9025468.	18.21854	0.
48.50	0.00	0.00	26623.9	58.94	9078591.	18.21468	0.
48.75	0.00	0.00	26564.9	58.77	9131560.	18.21082	0.
49.00	0.00	0.00	26506.2	58.60	9184374.	18.20699	0.
49.25	0.00	0.00	26447.6	58.42	9237033.	18.20315	0.
49.50	0.00	0.00	26389.2	58.25	9289539.	18.19933	0.
49.75	0.00	0.00	26330.9	58.08	9341989.	18.19552	0.
50.00	0.00	0.00	26272.8	57.91	9394086.	18.19173	0.
50.25	0.00	0.00	26214.9	57.74	9446130.	18.18794	0.
50.50	0.00	0.00	26157.2	57.57	9498022.	18.18417	0.
50.75	0.00	0.00	26099.6	57.40	9549762.	18.18040	0.
51.00	0.00	0.00	26042.2	57.24	9601350.	18.17665	0.
51.25	0.00	0.00	25985.0	57.07	9652787.	18.17291	0.
51.50	0.00	0.00	25927.9	56.90	9704073.	18.16918	0.
51.75	0.00	0.00	25871.0	56.73	9755209.	18.16546	0.
52.00	0.00	0.00	25814.3	56.57	9806195.	18.16175	0.
52.25	0.00	0.00	25757.7	56.40	9857031.	18.15805	0.
52.50	0.00	0.00	25701.3	56.24	9907718.	18.15436	0.
52.75	0.00	0.00	25645.0	56.07	9958257.	18.15069	0.
53.00	0.00	0.00	25589.0	55.91	10008648.	18.14702	0.
53.25	0.00	0.00	25533.1	55.74	10058891.	18.14336	0.
53.50	0.00	0.00	25477.3	55.58	10109087.	18.13972	0.
53.75	0.00	0.00	25421.7	55.42	10158936.	18.13609	0.
54.00	0.00	0.00	25366.3	55.25	10208739.	18.13246	0.
54.25	0.00	0.00	25311.1	55.09	10258390.	18.12885	0.
54.50	0.00	0.00	25256.0	54.93	10307907.	18.12525	0.
54.75	0.00	0.00	25201.0	54.77	10357273.	18.12166	0.
55.00	0.00	0.00	25146.3	54.61	10406494.	18.11808	0.
55.25	0.00	0.00	25091.7	54.45	10455571.	18.11451	0.
55.50	0.00	0.00	25037.2	54.29	10504504.	18.11095	0.
55.75	0.00	0.00	24982.9	54.13	10553294.	18.10740	0.
56.00	0.00	0.00	24928.8	53.97	10601941.	18.10386	0.
56.25	0.00	0.00	24874.8	53.81	10650445.	18.10033	0.
56.50	0.00	0.00	24821.0	53.66	10698807.	18.09681	0.
56.75	0.00	0.00	24767.3	53.50	10747027.	18.09330	0.
57.00	0.00	0.00	24713.8	53.34	10795106.	18.08981	0.
57.25	0.00	0.00	24660.5	53.19	10843044.	18.08632	0.
57.50	0.00	0.00	24607.3	53.03	10890841.	18.08284	0.
57.75	0.00	0.00	24554.3	52.87	10938498.	18.07938	0.
58.00	0.00	0.00	24501.4	52.72	10986016.	18.07592	0.
58.25	0.00	0.00	24448.7	52.57	11033394.	18.07247	0.
58.50	0.00	0.00	24396.1	52.41	11080634.	18.06903	0.
58.75	0.00	0.00	24343.7	52.26	11127735.	18.06561	0.
59.00	0.00	0.00	24291.5	52.10	11174699.	18.06219	0.
59.25	0.00	0.00	24239.4	51.95	11221523.	18.05879	0.
59.50	0.00	0.00	24187.4	51.80	11268211.	18.05539	0.
59.75	0.00	0.00	24135.6	51.65	11314762.	18.05200	0.
60.00	0.00	0.00	24084.0	51.50	11361177.	18.04863	0.
60.25	0.00	0.00	24032.5	51.35	11407456.	18.04526	0.
60.50	0.00	0.00	23981.1	51.19	11453599.	18.04190	0.
60.75	0.00	0.00	23929.9	51.04	11499607.	18.03856	0.
61.00	0.00	0.00	23878.9	50.89	11545480.	18.03522	0.
61.25	0.00	0.00	23828.0	50.75	11591219.	18.03189	0.
61.50	0.00	0.00	23777.2	50.60	11636824.	18.02857	0.

61.75	0.00	0.00	23726.6	50.45	11682295.	18.02527	0.
62.00	0.00	0.00	23676.2	50.30	11727633.	18.02197	0.
62.25	0.00	0.00	23625.9	50.15	11772838.	18.01368	0.
62.50	0.00	0.00	23575.7	50.01	11817910.	18.01540	0.
62.75	0.00	0.00	23525.7	49.86	11862850.	18.01213	0.
63.00	0.00	0.00	23475.9	49.71	11907658.	18.00887	0.
63.25	0.00	0.00	23426.2	49.57	11952335.	18.00562	0.
63.50	0.00	0.00	23376.6	49.42	11996881.	18.00236	0.
63.75	0.00	0.00	23327.2	49.28	12041297.	17.99915	0.
64.00	0.00	0.00	23277.9	49.13	12085582.	17.99593	0.
64.25	0.00	0.00	23228.8	48.99	12129738.	17.99272	0.
64.50	0.00	0.00	23179.8	48.85	12173764.	17.98951	0.
64.75	0.00	0.00	23130.9	48.70	12217661.	17.98632	0.
65.00	0.00	0.00	23082.2	48.56	12261429.	17.98314	0.
65.25	0.00	0.00	23033.7	48.42	12305069.	17.97997	0.
65.50	0.00	0.00	22985.2	48.32	12348600.	17.97770	0.
65.75	0.00	0.00	22936.9	48.22	12392039.	17.97544	0.
66.00	0.00	0.00	22888.7	48.11	12435397.	17.97318	0.
66.25	0.00	0.00	22840.6	48.01	12478644.	17.97092	0.
66.50	0.00	0.00	22792.6	47.91	12521810.	17.96867	0.
66.75	0.00	0.00	22744.7	47.91	12564885.	17.96643	0.
67.00	0.00	0.00	22696.9	47.71	12607870.	17.96419	0.
67.25	0.00	0.00	22649.1	47.61	12650765.	17.96195	0.
67.50	0.00	0.00	22601.5	47.51	12693569.	17.95972	0.
67.75	0.00	0.00	22554.0	47.41	12736283.	17.95749	0.
68.00	0.00	0.00	22506.6	47.31	12778908.	17.95527	0.
68.25	0.00	0.00	22459.3	47.21	12821443.	17.95305	0.
68.50	0.00	0.00	22412.1	47.11	12863889.	17.95084	0.
68.75	0.00	0.00	22365.0	47.01	12906246.	17.94864	0.
69.00	0.00	0.00	22318.0	46.91	12948514.	17.94643	0.
69.25	0.00	0.00	22271.0	46.82	12990693.	17.94423	0.
69.50	0.00	0.00	22224.2	46.72	13032783.	17.94204	0.
69.75	0.00	0.00	22177.5	46.62	13074785.	17.93985	0.
70.00	0.00	0.00	22130.9	46.52	13116698.	17.93766	0.
70.25	0.00	0.00	22084.4	46.42	13158523.	17.93548	0.
70.50	0.00	0.00	22038.0	46.33	13200261.	17.93331	0.
70.75	0.00	0.00	21991.6	46.23	13241911.	17.93114	0.
71.00	0.00	0.00	21945.4	46.13	13283473.	17.92897	0.
71.25	0.00	0.00	21899.3	46.03	13324948.	17.92681	0.
71.50	0.00	0.00	21853.2	45.94	13366336.	17.92465	0.
71.75	0.00	0.00	21807.3	45.84	13407637.	17.92250	0.
72.00	0.00	0.00	21761.5	45.75	13448851.	17.92035	0.
72.25	0.00	0.00	21715.7	45.65	13489979.	17.91821	0.
72.50	0.00	0.00	21670.1	45.55	13531020.	17.91607	0.
72.75	0.00	0.00	21624.5	45.46	13571975.	17.91393	0.
73.00	0.00	0.00	21579.0	45.36	13612844.	17.91180	0.
73.25	0.00	0.00	21533.7	45.27	13653627.	17.90968	0.
73.50	0.00	0.00	21488.4	45.17	13694324.	17.90755	0.
73.75	0.00	0.00	21443.2	45.08	13734936.	17.90544	0.
74.00	0.00	0.00	21398.2	44.98	13775462.	17.90332	0.
74.25	0.00	0.00	21353.2	44.89	13815903.	17.90122	0.
74.50	0.00	0.00	21308.3	44.79	13856259.	17.89911	0.
74.75	0.00	0.00	21263.5	44.70	13896530.	17.89701	0.
75.00	0.00	0.00	21218.8	44.61	13936717.	17.89492	0.
75.25	0.00	0.00	21174.2	44.51	13976819.	17.89283	0.
75.50	0.00	0.00	21129.7	44.42	14016837.	17.89074	0.
75.75	0.00	0.00	21085.3	44.32	14056771.	17.88866	0.
76.00	0.00	0.00	21040.9	44.23	14096621.	17.88658	0.
76.25	0.00	0.00	20996.7	44.14	14136387.	17.88451	0.
76.50	0.00	0.00	20952.6	44.05	14176070.	17.88244	0.
76.75	0.00	0.00	20908.5	43.95	14215670.	17.88038	0.
77.00	0.00	0.00	20864.6	43.86	14255186.	17.87832	0.
77.25	0.00	0.00	20820.7	43.77	14294619.	17.87626	0.

77.50	0.00	0.00	20777.0	43.68	14333969.	17.87421	0.
77.75	0.00	0.00	20733.3	43.58	14373237.	17.87216	0.
78.00	0.00	0.00	20689.7	43.49	14412422.	17.87012	0.
78.25	0.00	0.00	20646.2	43.40	14451525.	17.86808	0.
78.50	0.00	0.00	20602.6	43.31	14490546.	17.86605	0.
78.75	0.00	0.00	20559.5	43.22	14529485.	17.86402	0.
79.00	0.00	0.00	20516.3	43.13	14568342.	17.86199	0.
79.25	0.00	0.00	20473.1	43.04	14607117.	17.85997	0.
79.50	0.00	0.00	20430.1	42.95	14645811.	17.85796	0.
79.75	0.00	0.00	20387.1	42.86	14684424.	17.85594	0.
80.00	0.00	0.00	20344.3	42.77	14722955.	17.85393	0.
80.25	0.00	0.00	20301.5	42.68	14761405.	17.85193	0.
80.50	0.00	0.00	20258.8	42.59	14799775.	17.84993	0.
80.75	0.00	0.00	20216.3	42.50	14838064.	17.84793	0.
81.00	0.00	0.00	20173.8	42.41	14876273.	17.84594	0.
81.25	0.00	0.00	20131.3	42.32	14914401.	17.84395	0.
81.50	0.00	0.00	20089.0	42.23	14952449.	17.84197	0.
81.75	0.00	0.00	20046.8	42.14	14990417.	17.83999	0.
82.00	0.00	0.00	20004.7	42.05	15028305.	17.83802	0.
82.25	0.00	0.00	19962.6	41.97	15066114.	17.83605	0.
82.50	0.00	0.00	19920.6	41.88	15103843.	17.83408	0.
82.75	0.00	0.00	19878.8	41.79	15141493.	17.83212	0.
83.00	0.00	0.00	19837.0	41.70	15179064.	17.83016	0.
83.25	0.00	0.00	19795.3	41.61	15216556.	17.82820	0.
83.50	0.00	0.00	19753.7	41.53	15253969.	17.82625	0.
83.75	0.00	0.00	19712.1	41.44	15291304.	17.82431	0.
84.00	0.00	0.00	19670.7	41.35	15328560.	17.82236	0.
84.25	0.00	0.00	19629.3	41.27	15365738.	17.82043	0.
84.50	0.00	0.00	19588.1	41.18	15402838.	17.81849	0.
84.75	0.00	0.00	19546.9	41.09	15439860.	17.81656	0.
85.00	0.00	0.00	19505.8	41.01	15476824.	17.81464	0.
85.25	0.00	0.00	19464.8	40.92	15513671.	17.81272	0.
85.50	0.00	0.00	19423.9	40.83	15550460.	17.81080	0.
85.75	0.00	0.00	19383.0	40.75	15587172.	17.80888	0.
86.00	0.00	0.00	19342.3	40.66	15623807.	17.80697	0.
86.25	0.00	0.00	19301.6	40.58	15660365.	17.80507	0.
86.50	0.00	0.00	19261.1	40.49	15696846.	17.80317	0.
86.75	0.00	0.00	19220.6	40.41	15733250.	17.80127	0.
87.00	0.00	0.00	19180.2	40.32	15769576.	17.79938	0.
87.25	0.00	0.00	19139.8	40.24	15805829.	17.79749	0.
87.50	0.00	0.00	19099.6	40.15	15842004.	17.79560	0.
87.75	0.00	0.00	19059.4	40.07	15878103.	17.79372	0.
88.00	0.00	0.00	19019.4	39.98	15914126.	17.79184	0.
88.25	0.00	0.00	18979.4	39.90	15950074.	17.78997	0.
88.50	0.00	0.00	18939.5	39.82	15985946.	17.78810	0.
88.75	0.00	0.00	18899.7	39.73	16021743.	17.78623	0.
89.00	0.00	0.00	18859.9	39.65	16057465.	17.78437	0.
89.25	0.00	0.00	18820.3	39.57	16093111.	17.78251	0.
89.50	0.00	0.00	18780.7	39.48	16128683.	17.78066	0.
89.75	0.00	0.00	18741.2	39.40	16164180.	17.77881	0.
90.00	0.00	0.00	18701.8	39.32	16199602.	17.77696	0.
90.25	0.00	0.00	18662.5	39.23	16234950.	17.77512	0.
90.50	0.00	0.00	18623.3	39.15	16270224.	17.77328	0.
90.75	0.00	0.00	18584.1	39.07	16305423.	17.77144	0.
91.00	0.00	0.00	18545.1	38.99	16340548.	17.76961	0.
91.25	0.00	0.00	18506.1	38.91	16375600.	17.76778	0.
91.50	0.00	0.00	18467.2	38.82	16410576.	17.76596	0.
91.75	0.00	0.00	18428.4	38.74	16445483.	17.76414	0.
92.00	0.00	0.00	18389.6	38.66	16480314.	17.76233	0.
92.25	0.00	0.00	18351.0	38.58	16515072.	17.76052	0.
92.50	0.00	0.00	18312.4	38.50	16549757.	17.75871	0.
92.75	0.00	0.00	18273.9	38.42	16584369.	17.75690	0.
93.00	0.00	0.00	18235.5	38.34	16618908.	17.75510	0.

93.25	0.00	0.00	18197.1	38.26	16653375.	17.75331	0.
93.50	0.00	0.00	18158.9	38.18	16687769.	17.75151	0.
93.75	0.00	0.00	18120.7	38.10	16722091.	17.74972	0.
94.00	0.00	0.00	18082.6	38.02	16756341.	17.74794	0.
94.25	0.00	0.00	18044.6	37.94	16790520.	17.74616	0.
94.50	0.00	0.00	18006.6	37.86	16824626.	17.74438	0.
94.75	0.00	0.00	17968.8	37.78	16858660.	17.74260	0.
95.00	0.00	0.00	17931.0	37.70	16892624.	17.74083	0.
95.25	0.00	0.00	17893.3	37.62	16926516.	17.73907	0.
95.50	0.00	0.00	17855.7	37.54	16960336.	17.73730	0.
95.75	0.00	0.00	17818.2	37.46	16994086.	17.73554	0.
96.00	0.00	0.00	17780.7	37.38	17027764.	17.73379	0.
96.25	0.00	0.00	17743.3	37.30	17061372.	17.73204	0.
96.50	0.00	0.00	17706.0	37.22	17094910.	17.73029	0.
96.75	0.00	0.00	17668.8	37.15	17128376.	17.72854	0.
97.00	0.00	0.00	17631.6	37.07	17161772.	17.72680	0.
97.25	0.00	0.00	17594.6	36.99	17195098.	17.72507	0.
97.50	0.00	0.00	17557.6	36.91	17228354.	17.72333	0.
97.75	0.00	0.00	17520.7	36.83	17261540.	17.72160	0.
98.00	0.00	0.00	17483.8	36.76	17294656.	17.71988	0.

MAXIMUM VOLUME STORED IN THE BASIN = 682.3826 ACRE-FT
 MAXIMUM FLOW THROUGH THE CONTROL SECTION = 77.81 CFS
 TIME OF MAXIMUM FLOW = 24.55 HOUR

POST, PUCKLEY, SCHUH AND JERNIGAN
SURFACE WATER MANAGEMENT PROGRAM
P.F.C. SITE 7 (25Y72HR)

* INPUT DATA * GENERATE SCS HYDROGRAPH NO. 1
***** THE CURVE NUMBER IS GIVEN
CURVE NUMBER = 90.00
TOTAL AREA = 1041.00 ACRES
FREQUENCY OF DESIGN STORM = 25. YEARS
DURATION OF DESIGN STORM = 72.0 HOURS
RAINFALL DISTRIBUTION IS TYPICAL
RAINFALL FOR THE DESIGN FREQUENCY AND 24 HOURS = 10.0 INCHES

TIME (HOUR)	RAINFALL (INCHES)
0.00	0.00
24.00	1.46
48.00	3.59
58.00	5.72
59.00	6.28
60.00	10.15
61.00	11.26
72.00	13.59

TIME OF CONCENTRATION = 0.50 HOURS
TIME STEP FOR WRITING THE RAINFALL TABULATION = 0.25 HOURS
TIME STEP FOR WRITING THE HYDROGRAPH = 0.25 HOURS
TIME INTERVAL FOR COMPUTATION WAS GIVEN AS 0.25 HOURS
AND ADJUSTED TO 0.25 HOURS

 * OUTPUT *

SOIL PARAMETERS

ABSTRACTION = 1.11 INCHES
 GROUND STORAGE = 96.3889 ACRE-Feet

HYDROGRAPH PARAMETERS

DURATION OF UNIT EXCESS RAINFALL = 0.25 HOURS
 TIME TO PEAK OF UNIT HYDROGRAPH = 0.43 HOURS

RAINFALL TABULATION

TIME (HOURS)	ACCUMULATED RAINFALL (INCHES)	ACCUMULATED RUNOFF (INCHES)	INCREMENTAL RUNOFF (INCHES)	REVERSED INCREMENTAL RUNOFF (INCHES)
0.00	0.00	0.00000	0.00000	0.05264
0.25	0.02	0.00000	0.00000	0.05264
0.50	0.03	0.00000	0.00000	0.05264
0.75	0.05	0.00000	0.00000	0.05264
1.00	0.06	0.00000	0.00000	0.05263
1.25	0.08	0.00000	0.00000	0.05263
1.50	0.09	0.00000	0.00000	0.05263
1.75	0.11	0.00000	0.00000	0.05262
2.00	0.12	0.00000	0.00000	0.05262
2.25	0.14	0.00000	0.00000	0.05262
2.50	0.15	0.00000	0.00000	0.05262
2.75	0.17	0.00000	0.00000	0.05262
3.00	0.18	0.00000	0.00000	0.05261
3.25	0.20	0.00000	0.00000	0.05261
3.50	0.21	0.00000	0.00000	0.05261
3.75	0.23	0.00003	0.00003	0.05260
4.00	0.24	0.00039	0.00036	0.05260
4.25	0.26	0.00115	0.00076	0.05260
4.50	0.27	0.00228	0.00113	0.05260
4.75	0.29	0.00378	0.00150	0.05259
5.00	0.30	0.00563	0.00185	0.05259
5.25	0.32	0.00781	0.00218	0.05259
5.50	0.33	0.01032	0.00251	0.05258
5.75	0.35	0.01314	0.00282	0.05258
6.00	0.37	0.01626	0.00312	0.05258
6.25	0.38	0.01967	0.00341	0.05258
6.50	0.40	0.02336	0.00369	0.05257
6.75	0.41	0.02731	0.00396	0.05257
7.00	0.43	0.03153	0.00422	0.05257
7.25	0.44	0.03600	0.00447	0.05256
7.50	0.46	0.04072	0.00471	0.05256
7.75	0.47	0.04566	0.00495	0.05256
8.00	0.49	0.05084	0.00517	0.05255
8.25	0.50	0.05623	0.00539	0.05255
8.50	0.52	0.06184	0.00561	0.05255
8.75	0.53	0.06765	0.00581	0.05254
9.00	0.55	0.07366	0.00601	0.05254
9.25	0.56	0.07986	0.00620	0.05254
9.50	0.58	0.08625	0.00639	0.05253
9.75	0.59	0.09283	0.00657	0.05253
10.00	0.61	0.09957	0.00675	0.05252
10.25	0.62	0.10649	0.00692	0.05252
10.50	0.64	0.11357	0.00708	0.05252
10.75	0.65	0.12081	0.00724	0.05251
11.00	0.67	0.12821	0.00740	0.27512
11.25	0.68	0.13576	0.00755	0.27501

11.50	0.70	0.14345	0.00770	0.27489
11.75	0.71	0.15129	0.00784	0.27476
12.00	0.73	0.15927	0.00798	0.95676
12.25	0.75	0.16738	0.00811	0.95447
12.50	0.76	0.17562	0.00824	0.95138
12.75	0.78	0.18399	0.00837	0.94702
13.00	0.79	0.19248	0.00849	0.13657
13.25	0.81	0.20110	0.00861	0.13643
13.50	0.82	0.20983	0.00873	0.13628
13.75	0.84	0.21867	0.00884	0.13612
14.00	0.85	0.22763	0.00896	0.05173
14.25	0.87	0.23669	0.00906	0.05171
14.50	0.88	0.24586	0.00917	0.05168
14.75	0.90	0.25514	0.00927	0.05166
15.00	0.91	0.26451	0.00937	0.05163
15.25	0.93	0.27398	0.00947	0.05160
15.50	0.94	0.28355	0.00957	0.05157
15.75	0.96	0.29320	0.00966	0.05154
16.00	0.97	0.30295	0.00975	0.05152
16.25	0.99	0.31279	0.00984	0.05149
16.50	1.00	0.32272	0.00992	0.05145
16.75	1.02	0.33273	0.01001	0.05142
17.00	1.03	0.34282	0.01009	0.05139
17.25	1.05	0.35299	0.01017	0.05135
17.50	1.06	0.36324	0.01025	0.05132
17.75	1.08	0.37356	0.01033	0.05128
18.00	1.10	0.38396	0.01040	0.05125
18.25	1.11	0.39444	0.01047	0.05121
18.50	1.13	0.40498	0.01055	0.05117
18.75	1.14	0.41560	0.01062	0.05113
19.00	1.16	0.42628	0.01068	0.05109
19.25	1.17	0.43703	0.01075	0.05105
19.50	1.19	0.44785	0.01082	0.05100
19.75	1.20	0.45873	0.01088	0.05096
20.00	1.22	0.46967	0.01094	0.05091
20.25	1.23	0.48068	0.01100	0.05087
20.50	1.25	0.49174	0.01106	0.05082
20.75	1.26	0.50286	0.01112	0.05077
21.00	1.28	0.51404	0.01118	0.05071
21.25	1.29	0.52528	0.01124	0.05066
21.50	1.31	0.53657	0.01129	0.05060
21.75	1.32	0.54791	0.01134	0.05055
22.00	1.34	0.55931	0.01140	0.05049
22.25	1.35	0.57076	0.01145	0.05043
22.50	1.37	0.58226	0.01150	0.05036
22.75	1.38	0.59381	0.01155	0.05030
23.00	1.40	0.60540	0.01160	0.05023
23.25	1.41	0.61705	0.01165	0.05016
23.50	1.43	0.62874	0.01169	0.05009
23.75	1.44	0.64048	0.01174	0.05001
24.00	1.46	0.65226	0.01178	0.02082
24.25	1.48	0.66953	0.01727	0.02080
24.50	1.50	0.68689	0.01736	0.02079
24.75	1.53	0.70434	0.01745	0.02077
25.00	1.55	0.72188	0.01754	0.02076
25.25	1.57	0.73950	0.01762	0.02074
25.50	1.59	0.75720	0.01770	0.02073
25.75	1.62	0.77498	0.01778	0.02071
26.00	1.64	0.79284	0.01786	0.02070
26.25	1.66	0.81077	0.01793	0.02068
26.50	1.68	0.82878	0.01801	0.02067
26.75	1.70	0.84685	0.01808	0.02065
27.00	1.73	0.86500	0.01815	0.02064

27.25	1.75	0.88322	0.01822	0.02062
27.50	1.77	0.90150	0.01828	0.02060
27.75	1.79	0.91985	0.01835	0.02059
28.00	1.82	0.93826	0.01841	0.02057
28.25	1.84	0.95673	0.01847	0.02055
28.50	1.86	0.97526	0.01853	0.02053
28.75	1.88	0.99385	0.01859	0.02051
29.00	1.90	1.01250	0.01865	0.02050
29.25	1.93	1.03120	0.01870	0.02048
29.50	1.95	1.04996	0.01876	0.02046
29.75	1.97	1.06877	0.01881	0.02044
30.00	1.99	1.08763	0.01886	0.02042
30.25	2.01	1.10654	0.01891	0.02040
30.50	2.04	1.12551	0.01896	0.02038
30.75	2.06	1.14452	0.01901	0.02036
31.00	2.08	1.16358	0.01906	0.02034
31.25	2.10	1.18268	0.01911	0.02031
31.50	2.13	1.20183	0.01915	0.02029
31.75	2.15	1.22103	0.01920	0.02027
32.00	2.17	1.24027	0.01924	0.02025
32.25	2.19	1.25955	0.01928	0.02022
32.50	2.21	1.27887	0.01932	0.02020
32.75	2.24	1.29823	0.01936	0.02018
33.00	2.26	1.31764	0.01940	0.02015
33.25	2.28	1.33708	0.01944	0.02013
33.50	2.30	1.35656	0.01948	0.02010
33.75	2.33	1.37608	0.01952	0.02008
34.00	2.35	1.39563	0.01955	0.02005
34.25	2.37	1.41522	0.01959	0.02002
34.50	2.39	1.43485	0.01963	0.02000
34.75	2.41	1.45451	0.01966	0.01997
35.00	2.44	1.47420	0.01969	0.01994
35.25	2.46	1.49393	0.01973	0.01991
35.50	2.48	1.51369	0.01976	0.01988
35.75	2.50	1.53348	0.01979	0.01985
36.00	2.53	1.55330	0.01982	0.01982
36.25	2.55	1.57315	0.01985	0.01979
36.50	2.57	1.59303	0.01988	0.01976
36.75	2.59	1.61294	0.01991	0.01973
37.00	2.61	1.63288	0.01994	0.01969
37.25	2.64	1.65285	0.01997	0.01966
37.50	2.66	1.67285	0.02000	0.01963
37.75	2.68	1.69287	0.02002	0.01959
38.00	2.70	1.71292	0.02005	0.01955
38.25	2.72	1.73300	0.02008	0.01952
38.50	2.75	1.75310	0.02010	0.01948
38.75	2.77	1.77323	0.02013	0.01944
39.00	2.79	1.79338	0.02015	0.01940
39.25	2.81	1.81356	0.02018	0.01936
39.50	2.84	1.83376	0.02020	0.01932
39.75	2.86	1.85399	0.02022	0.01928
40.00	2.88	1.87424	0.02025	0.01924
40.25	2.90	1.89451	0.02027	0.01920
40.50	2.92	1.91480	0.02029	0.01915
40.75	2.95	1.93511	0.02031	0.01911
41.00	2.97	1.95545	0.02034	0.01906
41.25	2.99	1.97581	0.02036	0.01901
41.50	3.01	1.99618	0.02038	0.01896
41.75	3.04	2.01658	0.02040	0.01891
42.00	3.06	2.03700	0.02042	0.01886
42.25	3.08	2.05744	0.02044	0.01881
42.50	3.10	2.07790	0.02046	0.01876
42.75	3.12	2.09838	0.02048	0.01870

43.00	3.15	2.11887	0.02050	0.01865
43.25	3.17	2.13939	0.02051	0.01859
43.50	3.19	2.15992	0.02053	0.01853
43.75	3.21	2.18047	0.02055	0.01847
44.00	3.24	2.20104	0.02057	0.01841
44.25	3.26	2.22162	0.02059	0.01835
44.50	3.28	2.24223	0.02060	0.01828
44.75	3.30	2.26284	0.02062	0.01822
45.00	3.32	2.28348	0.02064	0.01815
45.25	3.35	2.30413	0.02065	0.01808
45.50	3.37	2.32480	0.02067	0.01801
45.75	3.39	2.34548	0.02068	0.01793
46.00	3.41	2.36618	0.02070	0.01786
46.25	3.43	2.38690	0.02071	0.01778
46.50	3.46	2.40763	0.02073	0.01770
46.75	3.48	2.42837	0.02074	0.01762
47.00	3.50	2.44913	0.02076	0.01754
47.25	3.52	2.46990	0.02077	0.01745
47.50	3.55	2.49069	0.02079	0.01736
47.75	3.57	2.51149	0.02080	0.01727
48.00	3.59	2.53231	0.02082	0.01178
48.25	3.64	2.58232	0.05001	0.01174
48.50	3.70	2.63241	0.05009	0.01169
48.75	3.75	2.68257	0.05016	0.01165
49.00	3.80	2.73280	0.05023	0.01160
49.25	3.86	2.78309	0.05030	0.01155
49.50	3.91	2.83346	0.05036	0.01150
49.75	3.96	2.88388	0.05043	0.01145
50.00	4.02	2.93437	0.05049	0.01140
50.25	4.07	2.98492	0.05055	0.01134
50.50	4.12	3.03552	0.05060	0.01129
50.75	4.18	3.08618	0.05066	0.01124
51.00	4.23	3.13689	0.05071	0.01118
51.25	4.28	3.18766	0.05077	0.01112
51.50	4.34	3.23848	0.05082	0.01106
51.75	4.39	3.28934	0.05087	0.01100
52.00	4.44	3.34025	0.05091	0.01094
52.25	4.50	3.39121	0.05096	0.01088
52.50	4.55	3.44222	0.05100	0.01082
52.75	4.60	3.49327	0.05105	0.01075
53.00	4.66	3.54436	0.05109	0.01068
53.25	4.71	3.59549	0.05113	0.01062
53.50	4.76	3.64666	0.05117	0.01055
53.75	4.81	3.69787	0.05121	0.01047
54.00	4.87	3.74912	0.05125	0.01040
54.25	4.92	3.80040	0.05128	0.01033
54.50	4.97	3.85172	0.05132	0.01025
54.75	5.03	3.90308	0.05135	0.01017
55.00	5.08	3.95447	0.05139	0.01009
55.25	5.13	4.00589	0.05142	0.01001
55.50	5.19	4.05734	0.05145	0.00992
55.75	5.24	4.10883	0.05149	0.00984
56.00	5.29	4.16034	0.05152	0.00975
56.25	5.35	4.21189	0.05154	0.00966
56.50	5.40	4.26346	0.05157	0.00957
56.75	5.45	4.31506	0.05160	0.00947
57.00	5.51	4.36669	0.05163	0.00937
57.25	5.56	4.41835	0.05166	0.00927
57.50	5.61	4.47003	0.05168	0.00917
57.75	5.67	4.52174	0.05171	0.00906
58.00	5.72	4.57347	0.05173	0.00896
58.25	5.86	4.70960	0.13612	0.00884
58.50	6.00	4.84588	0.13628	0.00873

58.75	6.14	4.98231	0.13643	0.00861
59.00	6.28	5.11886	0.13657	0.00849
59.25	7.25	6.06590	0.94702	0.00837
59.50	8.22	7.01728	0.95138	0.00824
59.75	9.18	7.97175	0.95447	0.00811
60.00	10.15	8.92850	0.95676	0.00798
60.25	10.43	9.20326	0.27476	0.00784
60.50	10.70	9.47815	0.27489	0.00770
60.75	10.98	9.75316	0.27501	0.00755
61.00	11.26	10.02829	0.27512	0.00740
61.25	11.31	10.08080	0.05251	0.00724
61.50	11.37	10.13332	0.05252	0.00708
61.75	11.42	10.18584	0.05252	0.00692
62.00	11.47	10.23836	0.05252	0.00675
62.25	11.52	10.29089	0.05253	0.00657
62.50	11.58	10.34342	0.05253	0.00639
62.75	11.63	10.39596	0.05254	0.00620
63.00	11.68	10.44850	0.05254	0.00601
63.25	11.74	10.50104	0.05254	0.00581
63.50	11.79	10.55359	0.05255	0.00561
63.75	11.84	10.60614	0.05255	0.00539
64.00	11.90	10.65869	0.05255	0.00517
64.25	11.95	10.71125	0.05256	0.00495
64.50	12.00	10.76381	0.05256	0.00471
64.75	12.05	10.81637	0.05256	0.00447
65.00	12.11	10.86893	0.05257	0.00422
65.25	12.16	10.92150	0.05257	0.00396
65.50	12.21	10.97408	0.05257	0.00369
65.75	12.27	11.02665	0.05258	0.00341
66.00	12.32	11.07923	0.05258	0.00312
66.25	12.37	11.13181	0.05258	0.00282
66.50	12.43	11.18439	0.05258	0.00251
66.75	12.48	11.23698	0.05259	0.00219
67.00	12.53	11.28957	0.05259	0.00185
67.25	12.58	11.34217	0.05259	0.00150
67.50	12.64	11.39476	0.05260	0.00113
67.75	12.69	11.44736	0.05260	0.00076
68.00	12.74	11.49996	0.05260	0.00036
68.25	12.80	11.55256	0.05260	0.00003
68.50	12.85	11.60517	0.05261	0.00000
68.75	12.90	11.65778	0.05261	0.00000
69.00	12.95	11.71039	0.05261	0.00000
69.25	13.01	11.76301	0.05262	0.00000
69.50	13.06	11.81563	0.05262	0.00000
69.75	13.11	11.86825	0.05262	0.00000
70.00	13.17	11.92087	0.05262	0.00000
70.25	13.22	11.97349	0.05262	0.00000
70.50	13.27	12.02612	0.05263	0.00000
70.75	13.33	12.07875	0.05263	0.00000
71.00	13.38	12.13138	0.05263	0.00000
71.25	13.43	12.18402	0.05264	0.00000
71.50	13.48	12.23665	0.05264	0.00000
71.75	13.54	12.28929	0.05264	0.00000
72.00	13.59	12.34193	0.05264	0.00000

UNIT HYDROGRAPH

TIME (HOURS)	FLOW (CFS)
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0.00	0.00
0.25	1181.16
0.50	1748.85
0.75	768.19
1.00	298.45
1.25	113.87
1.50	44.13
1.75	17.76
2.00	5.45

 * CUTPUT *

GENERATED SCS HYDROGRAPH NO. 1 *

TIME (HOUR)	UNIT HYDROGRAPH (CFS)	FLOW (CFS)	MASS DIAGRAM (CF)
0.00	0.00	0.00	0.
0.25	1181.16	0.00	0.
0.50	1748.85	0.00	0.
0.75	768.19	0.00	0.
1.00	298.45	0.00	0.
1.25	113.87	0.00	0.
1.50	44.13	0.00	0.
1.75	17.76	0.00	0.
2.00	5.45	0.00	0.
2.25		0.00	0.
2.50		0.00	0.
2.75		0.00	0.
3.00		0.00	0.
3.25		0.00	0.
3.50		0.00	0.
3.75		0.00	0.
4.00		0.04	17.
4.25		0.48	250.
4.50		1.55	1165.
4.75		2.95	3190.
5.00		4.44	6518.
5.25		5.94	11191.
5.50		7.40	17194.
5.75		8.81	24491.
6.00		10.18	33039.
6.25		11.49	42791.
6.50		12.76	53705.
6.75		13.98	65738.
7.00		15.16	78850.
7.25		16.29	93003.
7.50		17.39	109160.
7.75		18.45	124287.
8.00		19.47	141350.
8.25		20.46	159317.
8.50		21.41	178159.
8.75		22.34	197847.
9.00		23.23	218352.
9.25		24.10	239649.
9.50		24.93	261712.
9.75		25.74	284516.
10.00		26.53	308040.
10.25		27.29	332259.
10.50		28.03	357153.
10.75		28.74	382701.
11.00		29.44	408884.
11.25		30.11	435683.
11.50		30.77	463079.
11.75		31.40	491055.
12.00		32.02	519595.
12.25		32.62	548681.
12.50		33.20	578299.
12.75		33.77	608434.
13.00		34.32	639072.
13.25		34.85	670197.
13.50		35.37	701798.
13.75		35.88	733861.

14.00	36.37	766374.
14.25	36.85	799324.
14.50	37.32	832701.
14.75	37.77	866493.
15.00	38.22	900689.
15.25	38.65	935279.
15.50	39.07	970253.
15.75	39.48	1005601.
16.00	39.88	1041314.
16.25	40.27	1077383.
16.50	40.65	1113799.
16.75	41.02	1150553.
17.00	41.39	1187637.
17.25	41.74	1225044.
17.50	42.09	1262766.
17.75	42.42	1300795.
18.00	42.75	1339123.
18.25	43.07	1377745.
18.50	43.39	1416653.
18.75	43.70	1455840.
19.00	44.00	1495301.
19.25	44.29	1535029.
19.50	44.58	1575018.
19.75	44.86	1615262.
20.00	45.13	1655756.
20.25	45.40	1696494.
20.50	45.66	1737471.
20.75	45.92	1778682.
21.00	46.17	1820121.
21.25	46.42	1861784.
21.50	46.66	1903666.
21.75	46.89	1945763.
22.00	47.12	1988069.
22.25	47.35	2030581.
22.50	47.57	2073295.
22.75	47.79	2116206.
23.00	48.00	2159309.
23.25	48.21	2202603.
23.50	48.41	2246081.
23.75	48.61	2289742.
24.00	48.81	2333581.
24.25	49.00	2377595.
24.50	55.62	2424673.
24.75	65.38	2479119.
25.00	69.88	2539982.
25.25	71.85	2603759.
25.50	72.82	2668860.
25.75	73.41	2734665.
26.00	73.85	2800933.
26.25	74.21	2867561.
26.50	74.54	2934500.
26.75	74.86	3001727.
27.00	75.16	3069236.
27.25	75.46	3137019.
27.50	75.76	3205070.
27.75	76.04	3273380.
28.00	76.32	3341944.
28.25	76.59	3410756.
28.50	76.86	3479809.
28.75	77.12	3549097.
29.00	77.37	3618615.
29.25	77.61	3688358.
29.50	77.85	3758319.

29.75	78.09	3828493.
30.00	78.32	3898876.
30.25	78.54	3969462.
30.50	78.76	4040248.
30.75	78.97	4111227.
31.00	79.18	4182397.
31.25	79.38	4253752.
31.50	79.58	4325288.
31.75	79.78	4397001.
32.00	79.97	4468888.
32.25	80.16	4540945.
32.50	80.34	4613167.
32.75	80.52	4685551.
33.00	80.69	4758094.
33.25	80.86	4830793.
33.50	81.03	4903643.
33.75	81.19	4976643.
34.00	81.35	5049788.
34.25	81.51	5123076.
34.50	81.66	5196503.
34.75	81.81	5270068.
35.00	81.96	5343766.
35.25	82.11	5417596.
35.50	82.25	5491554.
35.75	82.39	5565639.
36.00	82.52	5639847.
36.25	82.65	5714177.
36.50	82.79	5788625.
36.75	82.91	5863189.
37.00	83.04	5937868.
37.25	83.16	6012659.
37.50	83.28	6087567.
37.75	83.40	6162568.
38.00	83.52	6237683.
38.25	83.63	6312901.
38.50	83.75	6388221.
38.75	83.86	6463641.
39.00	83.96	6539159.
39.25	84.07	6614774.
39.50	84.17	6690483.
39.75	84.28	6766285.
40.00	84.38	6842178.
40.25	84.47	6918161.
40.50	84.57	6994232.
40.75	84.67	7070390.
41.00	84.76	7146632.
41.25	84.85	7222958.
41.50	84.94	7299366.
41.75	85.03	7375855.
42.00	85.12	7452423.
42.25	85.20	7529068.
42.50	85.29	7605790.
42.75	85.37	7682588.
43.00	85.45	7759459.
43.25	85.53	7836404.
43.50	85.61	7913420.
43.75	85.69	7990506.
44.00	85.77	8067661.
44.25	85.84	8144885.
44.50	85.92	8222175.
44.75	85.99	8299532.
45.00	86.06	8376953.
45.25	86.13	8454438.

45.50	86.20	8531986.
45.75	86.27	8609596.
46.00	86.33	8687267.
46.25	86.40	8764998.
46.50	86.47	8842788.
46.75	86.53	8920636.
47.00	86.59	8998541.
47.25	86.65	9076502.
47.50	86.72	9154519.
47.75	86.78	9232590.
48.00	86.84	9310715.
48.25	86.89	9388893.
48.50	121.42	9482634.
48.75	172.59	9614937.
49.00	195.24	9780458.
49.25	204.22	9960215.
49.50	207.83	10145638.
49.75	209.40	10333390.
50.00	210.19	10522204.
50.25	210.62	10711566.
50.50	210.87	10901236.
50.75	211.12	11091135.
51.00	211.37	11281255.
51.25	211.60	11471589.
51.50	211.82	11662130.
51.75	212.05	11852872.
52.00	212.26	12043809.
52.25	212.46	12234935.
52.50	212.67	12426244.
52.75	212.86	12617731.
53.00	213.05	12809390.
53.25	213.23	13001216.
53.50	213.41	13193205.
53.75	213.58	13385352.
54.00	213.75	13577652.
54.25	213.91	13770101.
54.50	214.07	13962695.
54.75	214.23	14155429.
55.00	214.38	14348300.
55.25	214.52	14541305.
55.50	214.67	14734440.
55.75	214.80	14927701.
56.00	214.94	15121084.
56.25	215.07	15314587.
56.50	215.20	15508207.
56.75	215.32	15701940.
57.00	215.44	15895783.
57.25	215.56	16089734.
57.50	215.68	16283791.
57.75	215.79	16477950.
58.00	215.90	16672209.
58.25	216.01	16866566.
58.50	315.76	17105860.
58.75	463.57	17456558.
59.00	528.86	17903150.
59.25	554.60	18390706.
59.50	1521.88	19325122.
59.75	2948.28	21336694.
60.00	3583.70	24276082.
60.25	3837.52	27615628.
60.50	3131.93	30751882.
60.75	1978.32	33051496.
61.00	1470.41	34603424.

61.25	1272.21	35837600.
61.50	932.12	36829548.
61.75	512.91	37479816.
62.00	329.87	37859068.
62.25	259.75	38124396.
62.50	234.42	38346772.
62.75	224.62	38553340.
63.00	220.68	38753724.
63.25	219.48	38951800.
63.50	219.50	39149340.
63.75	219.51	39346896.
64.00	219.53	39544464.
64.25	219.54	39742044.
64.50	219.55	39939636.
64.75	219.57	40137240.
65.00	219.58	40334860.
65.25	219.60	40532492.
65.50	219.61	40730136.
65.75	219.62	40927792.
66.00	219.64	41125460.
66.25	219.65	41323140.
66.50	219.66	41520828.
66.75	219.67	41718528.
67.00	219.69	41916240.
67.25	219.70	42113964.
67.50	219.71	42311700.
67.75	219.72	42509448.
68.00	219.73	42707204.
68.25	219.75	42904968.
68.50	219.76	43102744.
68.75	219.77	43300532.
69.00	219.78	43498328.
69.25	219.79	43696136.
69.50	219.80	43893956.
69.75	219.81	44091784.
70.00	219.82	44289620.
70.25	219.83	44487468.
70.50	219.85	44685324.
70.75	219.86	44883188.
71.00	219.87	45081064.
71.25	219.88	45278952.
71.50	219.89	45476848.
71.75	219.90	45674752.
72.00	219.91	45872664.
72.25	219.92	46070584.
72.50	157.75	46240532.
72.75	65.69	46341076.
73.00	25.25	46381996.
73.25	9.54	46397652.
73.50	3.54	46403540.
73.75	1.22	46405684.
74.00	0.29	46406364.

* INPUT DATA *

DO NOT GENERATE A STAGE-STORAGE CURVE
WATER ELEVATION MAINTAINED IN THE BASIN = 17.30 FT
RAINFALL FOR 100-YEAR, 24-HOUR = 13.00 INCHES
MINIMUM FLOOR ELEVATION = 25.00 FT

STAGE (FT)	STORAGE (ACRF-FT)
16.90	0.00
17.95	462.00
18.65	775.00
19.17	1010.20
19.52	1165.90
20.40	1575.00
22.15	2373.00

* INPUT DATA *

NO INFILTRATION IN THE LAKE IS CONSIDERED

* CONTROL SECTION NO. 1 CHARACTERISTICS *

CONTROL SECTION IA A WEIR

WEIR LENGTH = 18.00 FEET

TOTAL AREA CORRESPONDING TO THIS WEIR = 1041.00 ACRES

LAKE AREA INSIDE GOLF AREA CORRESPONDING TO THIS WEIR = 440.00 ACRES

LAKE AREA CORRESPONDING TO THIS WEIR = 440.00 ACRES

ALLOWABLE DISCHARGE = 130.00 CFS

WEIR CREST ELEVATION = 17.30 FEET

THE WEIR HAS A RECTANGULAR BLEEDER

BLEEDER INVERT = 16.90 FEET

WIDTH OF BLEEDER = 0.50 FEET

TAILWATER IS CONSTANT

TAILWATER ELEVATION = 16.00 FEET

* OUTPUT *

STAGE-DISCHARGE CURVE

STAGE (FEET)	DISCHARGE (CFS)	CONTROL
16.90	0.00	NONE
18.35	65.00	WEIR
18.97	130.00	WEIR
19.50	195.00	WEIR
19.96	260.00	WEIR
20.39	325.00	WEIR
20.79	390.00	WEIR
21.17	455.00	WEIR
21.54	520.00	WEIR
21.88	585.00	WEIR
22.22	650.00	WEIR
22.54	715.00	WEIR
22.85	780.00	WEIR
23.16	845.00	WEIR
23.46	910.00	WEIR
23.75	975.00	WEIR
24.03	1040.00	WEIR
24.31	1105.00	WEIR
24.58	1170.00	WEIR
24.85	1235.00	WEIR
25.11	1300.00	WEIR

ROUTING EXTENSION OF 72.00 HOURS HAS BEEN REDUCED TO THE MAXIMUM ALLOWABLE
THE TOTAL ROUTING TIME WILL BE ONLY 118.50 HOURS

* INPUT DATA * TIME STEP FOR ROUTING = 0.25 HOUR
***** TIME STEP FOR PRINTED HYDROGRAM COORDINATES = 0.25 HOURS

* OUTPUT *

*WORKING TABLE CCORDINATES *

ELEVATION	DISCHARGE	STORAGE	WORKING VALUE
(FEET)	(CFS)	(ACRE-FT)	(CFS)
16.90	0.00	0.00	0.00
17.44	24.21	237.60	11511.95
17.98	48.42	475.41	23034.24
18.52	82.72	716.87	34737.95
19.06	140.69	962.45	46555.93
19.60	209.30	1203.09	58334.25
20.14	286.60	1454.13	70523.16
20.68	371.39	1702.68	82595.42
21.22	463.18	1948.92	94559.32
21.76	561.91	2195.16	*****
22.30	666.57	24.63	1525.29
22.84	776.97	24.62	1580.06
23.38	893.15	24.61	1637.72
23.92	1014.50	24.60	1697.96
24.46	1140.87	24.59	1760.71
25.00	1272.10	24.58	1825.88

ROUTING TABLE

TIME (HOUR)	INSTANTANEOUS INFLOW (CFS)	AVERAGE INFLOW (CFS)	WORKING VALUE (CFS)	ROUTED HYDROGRAPH (CFS)	MASS DIAGRAM OF ROUTED FY. (CF)	WATER ELEVATION IN THE LAKE (FT)	MASS DIAGRAM OF INFILTRAT. (CF)
0.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
0.75	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
1.75	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
2.75	0.00	0.00	0.0	0.00	0.	16.90000	0.
3.00	0.00	0.00	0.0	0.00	0.	16.90000	0.
3.25	0.00	0.00	0.0	0.00	0.	16.90000	0.
3.50	0.00	0.00	0.0	0.00	0.	16.90000	0.
3.75	0.00	0.00	0.0	0.00	0.	16.90000	0.
4.00	0.04	0.02	0.0	0.00	0.	16.90000	0.
4.25	0.48	0.26	0.3	0.00	0.	16.90001	0.
4.50	1.55	1.02	1.3	0.00	2.	16.90006	0.
4.75	2.95	2.25	3.5	0.01	6.	16.90017	0.
5.00	4.44	3.70	7.2	0.02	17.	16.90034	0.
5.25	5.94	5.19	12.4	0.03	35.	16.90058	0.
5.50	7.40	6.67	19.1	0.04	65.	16.90089	0.
5.75	8.81	8.11	27.1	0.06	109.	16.90127	0.
6.00	10.18	9.50	36.6	0.08	169.	16.90171	0.
6.25	11.49	10.84	47.3	0.10	248.	16.90222	0.
6.50	12.76	12.13	59.3	0.12	349.	16.90278	0.
6.75	13.98	13.37	72.6	0.15	474.	16.90340	0.
7.00	15.16	14.57	87.0	0.18	625.	16.90408	0.
7.25	16.29	15.73	102.6	0.22	804.	16.90481	0.
7.50	17.39	16.84	119.2	0.25	1014.	16.90559	0.
7.75	18.45	17.92	136.8	0.29	1257.	16.90642	0.
8.00	19.47	18.96	155.5	0.33	1533.	16.90730	0.
8.25	20.46	19.96	175.2	0.37	1846.	16.90822	0.
8.50	21.41	20.94	195.7	0.41	2197.	16.90918	0.
8.75	22.34	21.88	217.2	0.46	2598.	16.91019	0.
9.00	23.23	22.78	239.5	0.50	3020.	16.91123	0.
9.25	24.10	23.66	262.7	0.55	3495.	16.91232	0.
9.50	24.93	24.51	286.6	0.60	4015.	16.91344	0.
9.75	25.74	25.34	311.4	0.65	4581.	16.91461	0.
10.00	26.53	26.14	336.8	0.71	5195.	16.91580	0.
10.25	27.29	26.91	363.1	0.76	5857.	16.91703	0.
10.50	28.03	27.66	389.9	0.82	6570.	16.91829	0.
10.75	28.74	28.39	417.5	0.88	7334.	16.91958	0.
11.00	29.44	29.09	445.7	0.94	8151.	16.92091	0.
11.25	30.11	29.78	474.6	1.00	9022.	16.92226	0.
11.50	30.77	30.44	504.0	1.06	9948.	16.92364	0.
11.75	31.40	31.08	534.0	1.12	10930.	16.92505	0.
12.00	32.02	31.71	564.6	1.19	11970.	16.92649	0.
12.25	32.62	32.32	595.8	1.25	13068.	16.92794	0.
12.50	33.20	32.91	627.4	1.32	14225.	16.92943	0.
12.75	33.77	33.48	659.6	1.39	15443.	16.93094	0.
13.00	34.32	34.04	692.2	1.46	16723.	16.93247	0.
13.25	34.85	34.58	725.4	1.53	18064.	16.93402	0.
13.50	35.37	35.11	758.9	1.60	19469.	16.93560	0.
13.75	35.88	35.63	793.0	1.67	20937.	16.93720	0.
14.00	36.37	36.13	827.4	1.74	22471.	16.93881	0.
14.25	36.85	36.61	862.3	1.81	24070.	16.94045	0.

14.50	37.32	37.09	897.6	1.89	25736.	16.94210	0.
14.75	37.77	37.55	933.2	1.96	27468.	16.94378	0.
15.00	38.22	38.00	969.3	2.04	29269.	16.94547	0.
15.25	38.65	38.43	1005.7	2.11	31138.	16.94717	0.
15.50	39.07	38.86	1042.4	2.19	33076.	16.94890	0.
15.75	39.48	39.28	1079.5	2.27	35004.	16.95064	0.
16.00	39.88	39.68	1116.9	2.35	37162.	16.95239	0.
16.25	40.27	40.08	1154.6	2.43	39312.	16.95416	0.
16.50	40.65	40.46	1192.7	2.51	41533.	16.95594	0.
16.75	41.02	40.84	1231.0	2.59	43827.	16.95774	0.
17.00	41.39	41.20	1269.6	2.67	46194.	16.95955	0.
17.25	41.74	41.56	1308.5	2.75	48633.	16.96138	0.
17.50	42.09	41.91	1347.7	2.83	51147.	16.96321	0.
17.75	42.42	42.25	1387.1	2.92	53735.	16.96507	0.
18.00	42.75	42.59	1426.8	3.00	56399.	16.96692	0.
18.25	43.07	42.91	1466.7	3.08	59136.	16.96880	0.
18.50	43.39	43.23	1506.8	3.17	61950.	16.97068	0.
18.75	43.70	43.54	1547.2	3.25	64840.	16.97257	0.
19.00	44.00	43.85	1587.8	3.34	67807.	16.97448	0.
19.25	44.29	44.14	1628.6	3.42	70851.	16.97639	0.
19.50	44.58	44.43	1669.6	3.51	73972.	16.97832	0.
19.75	44.86	44.72	1710.8	3.60	77171.	16.98025	0.
20.00	45.13	44.99	1752.2	3.68	80448.	16.98219	0.
20.25	45.40	45.26	1793.8	3.77	83804.	16.98414	0.
20.50	45.66	45.53	1835.5	3.86	87239.	16.98610	0.
20.75	45.92	45.79	1877.5	3.95	90753.	16.98807	0.
21.00	46.17	46.04	1919.5	4.04	94346.	16.99004	0.
21.25	46.42	46.29	1961.8	4.13	98019.	16.99202	0.
21.50	46.66	46.54	2004.2	4.21	101772.	16.99401	0.
21.75	46.89	46.77	2046.8	4.30	105606.	16.99601	0.
22.00	47.12	47.01	2089.5	4.39	109520.	16.99801	0.
22.25	47.35	47.24	2132.3	4.48	113516.	17.00002	0.
22.50	47.57	47.46	2175.3	4.57	117592.	17.00204	0.
22.75	47.79	47.68	2218.4	4.67	121750.	17.00406	0.
23.00	48.00	47.89	2261.6	4.76	125990.	17.00609	0.
23.25	48.21	48.10	2305.0	4.85	130311.	17.00812	0.
23.50	48.41	48.31	2348.4	4.94	134715.	17.01016	0.
23.75	48.61	48.51	2392.0	5.03	139201.	17.01220	0.
24.00	48.81	48.71	2435.7	5.12	143770.	17.01425	0.
24.25	49.00	48.90	2479.5	5.21	148422.	17.01631	0.
24.50	55.62	52.31	2526.6	5.31	153159.	17.01851	0.
24.75	65.38	60.50	2581.7	5.43	157993.	17.02110	0.
25.00	69.88	67.63	2643.9	5.56	162939.	17.02402	0.
25.25	71.85	70.86	2709.2	5.70	168005.	17.02708	0.
25.50	72.82	72.34	2775.9	5.84	173196.	17.03021	0.
25.75	73.41	73.12	2843.2	5.98	178513.	17.03337	0.
26.00	73.85	73.63	2910.8	6.12	183959.	17.03654	0.
26.25	74.21	74.03	2978.7	6.26	189532.	17.03972	0.
26.50	74.54	74.38	3046.8	6.41	195234.	17.04292	0.
26.75	74.86	74.70	3115.1	6.55	201066.	17.04612	0.
27.00	75.16	75.01	3183.6	6.70	207027.	17.04933	0.
27.25	75.46	75.31	3252.2	6.84	213117.	17.05255	0.
27.50	75.76	75.61	3321.0	6.98	219338.	17.05578	0.
27.75	76.04	75.90	3389.9	7.13	225689.	17.05901	0.
28.00	76.32	76.18	3458.9	7.27	232170.	17.06225	0.
28.25	76.59	76.46	3528.1	7.42	238782.	17.06550	0.
28.50	76.86	76.73	3597.4	7.57	245526.	17.06875	0.
28.75	77.12	76.99	3666.9	7.71	252400.	17.07200	0.
29.00	77.37	77.24	3736.4	7.86	259406.	17.07527	0.
29.25	77.61	77.49	3806.0	8.00	266544.	17.07853	0.
29.50	77.85	77.73	3875.7	8.15	273814.	17.08180	0.
29.75	78.09	77.97	3945.6	8.30	281216.	17.08508	0.
30.00	78.32	78.20	4015.5	8.44	288750.	17.08836	0.

30.25	78.54	78.43	4085.5	8.59	296416.	17.09164	0.
30.50	78.76	78.65	4155.5	8.74	304215.	17.09493	0.
30.75	78.97	78.87	4225.6	8.89	312147.	17.09822	0.
31.00	79.18	79.08	4295.8	9.03	320211.	17.10151	0.
31.25	79.38	79.28	4366.1	9.16	328408.	17.10480	0.
31.50	79.58	79.48	4436.4	9.33	336738.	17.10810	0.
31.75	79.78	79.68	4506.7	9.46	345202.	17.11140	0.
32.00	79.97	79.87	4577.1	9.63	353798.	17.11470	0.
32.25	80.16	80.06	4647.6	9.77	362528.	17.11801	0.
32.50	80.34	80.25	4718.0	9.92	371392.	17.12131	0.
32.75	80.52	80.43	4788.5	10.07	380388.	17.12462	0.
33.00	80.69	80.60	4859.1	10.22	389518.	17.12793	0.
33.25	80.86	80.78	4929.6	10.37	398762.	17.13124	0.
33.50	81.03	80.94	5000.2	10.52	408179.	17.13455	0.
33.75	81.19	81.11	5070.8	10.66	417710.	17.13786	0.
34.00	81.35	81.27	5141.4	10.81	427374.	17.14117	0.
34.25	81.51	81.43	5212.0	10.96	437172.	17.14449	0.
34.50	81.66	81.59	5282.7	11.11	447104.	17.14780	0.
34.75	81.81	81.74	5353.3	11.26	457170.	17.15111	0.
35.00	81.96	81.89	5423.9	11.41	467369.	17.15442	0.
35.25	82.11	82.03	5494.5	11.56	477701.	17.15774	0.
35.50	82.25	82.18	5565.2	11.70	488168.	17.16105	0.
35.75	82.39	82.32	5635.8	11.85	498768.	17.16436	0.
36.00	82.52	82.45	5706.4	12.00	509502.	17.16767	0.
36.25	82.65	82.59	5777.0	12.15	520369.	17.17098	0.
36.50	82.79	82.72	5847.5	12.30	531370.	17.17430	0.
36.75	82.91	82.85	5918.1	12.45	542505.	17.17760	0.
37.00	83.04	82.98	5988.6	12.59	553773.	17.18091	0.
37.25	83.16	83.10	6059.1	12.74	565174.	17.18422	0.
37.50	83.28	83.22	6129.6	12.89	576709.	17.18753	0.
37.75	83.40	83.34	6200.1	13.04	588377.	17.19083	0.
38.00	83.52	83.46	6270.5	13.19	600179.	17.19414	0.
38.25	83.63	83.58	6340.9	13.33	612114.	17.19744	0.
38.50	83.75	83.69	6411.2	13.48	624182.	17.20074	0.
38.75	83.86	83.80	6481.5	13.63	636383.	17.20403	0.
39.00	83.96	83.91	6551.8	13.78	648717.	17.20733	0.
39.25	84.07	84.02	6622.1	13.93	661184.	17.21063	0.
39.50	84.17	84.12	6692.3	14.07	673785.	17.21392	0.
39.75	84.28	84.22	6762.4	14.22	686518.	17.21721	0.
40.00	84.38	84.33	6832.5	14.37	699383.	17.22050	0.
40.25	84.47	84.43	6902.6	14.52	712381.	17.22378	0.
40.50	84.57	84.52	6972.6	14.66	725512.	17.22707	0.
40.75	84.67	84.62	7042.5	14.81	738776.	17.23035	0.
41.00	84.76	84.71	7112.4	14.96	752171.	17.23363	0.
41.25	84.85	84.81	7182.3	15.10	765699.	17.23691	0.
41.50	84.94	84.90	7252.1	15.25	779359.	17.24018	0.
41.75	85.03	84.99	7321.8	15.40	793151.	17.24345	0.
42.00	85.12	85.08	7391.5	15.54	807076.	17.24672	0.
42.25	85.20	85.16	7461.1	15.69	821131.	17.24998	0.
42.50	85.29	85.25	7530.7	15.84	835319.	17.25325	0.
42.75	85.37	85.33	7600.2	15.98	849638.	17.25651	0.
43.00	85.45	85.41	7669.6	16.13	864089.	17.25976	0.
43.25	85.53	85.49	7739.0	16.28	878671.	17.26302	0.
43.50	85.61	85.57	7808.3	16.42	893384.	17.26627	0.
43.75	85.69	85.65	7877.5	16.57	908228.	17.26952	0.
44.00	85.77	85.73	7946.6	16.71	923204.	17.27276	0.
44.25	85.84	85.80	8015.7	16.86	938310.	17.27600	0.
44.50	85.92	85.88	8084.8	17.00	953546.	17.27924	0.
44.75	85.99	85.95	8153.7	17.15	968914.	17.28247	0.
45.00	86.06	86.02	8222.6	17.29	984412.	17.28570	0.
45.25	86.13	86.09	8291.4	17.44	1000040.	17.28893	0.
45.50	86.20	86.16	8360.1	17.58	1015798.	17.29215	0.
45.75	86.27	86.23	8428.8	17.73	1031686.	17.29538	0.

46.00	86.33	86.30	8497.3	17.27	1047704.	17.29859	0.
46.25	86.40	86.37	8565.8	18.01	1063852.	17.30181	0.
46.50	86.47	86.43	8634.3	18.16	1086130.	17.30501	0.
46.75	86.53	86.50	8702.6	18.30	1096537.	17.30822	0.
47.00	86.59	86.56	8770.9	18.45	1113073.	17.31142	0.
47.25	86.65	86.62	8839.0	18.59	1129738.	17.31462	0.
47.50	86.72	86.69	8907.1	18.73	1146532.	17.31781	0.
47.75	86.78	86.75	8975.1	18.87	1163455.	17.32100	0.
48.00	86.84	86.81	9043.1	19.02	1180507.	17.32419	0.
48.25	86.89	86.86	9110.9	19.16	1197687.	17.32737	0.
48.50	121.42	104.16	9195.9	19.34	1215012.	17.33136	0.
48.75	172.59	147.00	9323.6	19.61	1232538.	17.33735	0.
49.00	195.24	183.91	9487.9	19.85	1250340.	17.34506	0.
49.25	204.22	199.73	9667.7	20.33	1268469.	17.35349	0.
49.50	207.83	206.03	9853.4	20.72	1286942.	17.36220	0.
49.75	209.40	208.61	10041.3	21.12	1305770.	17.37101	0.
50.00	210.19	209.79	10229.9	21.51	1324953.	17.37986	0.
50.25	210.62	210.40	10418.8	21.91	1344494.	17.38872	0.
50.50	210.87	210.74	10607.7	22.31	1364393.	17.39758	0.
50.75	211.12	211.00	10796.3	22.70	1384649.	17.40643	0.
51.00	211.37	211.24	10984.9	23.10	1405262.	17.41528	0.
51.25	211.60	211.48	11173.3	23.50	1426231.	17.42411	0.
51.50	211.82	211.71	11361.5	23.89	1447557.	17.43294	0.
51.75	212.05	211.94	11549.5	24.29	1468239.	17.44176	0.
52.00	212.26	212.15	11737.4	24.68	1489127.	17.45057	0.
52.25	212.46	212.36	11925.1	25.08	1513669.	17.45936	0.
52.50	212.67	212.57	12112.5	25.47	1536416.	17.46815	0.
52.75	212.86	212.76	12299.8	25.87	1559518.	17.47692	0.
53.00	213.05	212.95	12486.9	26.26	1582974.	17.48569	0.
53.25	213.23	213.14	12673.8	26.65	1606783.	17.49445	0.
53.50	213.41	213.32	12860.5	27.04	1630945.	17.50320	0.
53.75	213.58	213.50	13046.9	27.44	1655461.	17.51194	0.
54.00	213.75	213.67	13233.2	27.83	1680328.	17.52067	0.
54.25	213.91	213.83	13419.2	28.22	1705546.	17.52938	0.
54.50	214.07	213.99	13604.9	28.61	1731119.	17.53809	0.
54.75	214.23	214.15	13790.5	29.00	1757041.	17.54679	0.
55.00	214.38	214.30	13975.8	29.39	1783314.	17.55547	0.
55.25	214.52	214.45	14160.9	29.78	1809937.	17.56414	0.
55.50	214.67	214.59	14345.7	30.16	1836909.	17.57281	0.
55.75	214.80	214.73	14530.2	30.55	1864231.	17.58146	0.
56.00	214.94	214.87	14714.6	30.94	1891902.	17.59009	0.
56.25	215.07	215.00	14898.6	31.33	1919921.	17.59872	0.
56.50	215.20	215.13	15082.4	31.71	1948288.	17.60733	0.
56.75	215.32	215.26	15266.0	32.10	1977002.	17.61594	0.
57.00	215.44	215.38	15449.3	32.48	2006063.	17.62453	0.
57.25	215.56	215.50	15632.3	32.87	2035471.	17.63310	0.
57.50	215.68	215.62	15815.0	33.25	2065224.	17.64167	0.
57.75	215.79	215.73	15997.5	33.63	2095323.	17.65022	0.
58.00	215.90	215.84	16179.7	34.02	2125766.	17.65876	0.
58.25	216.01	215.95	16361.7	34.40	2156554.	17.66729	0.
58.50	315.76	265.88	16543.1	34.89	2187732.	17.67813	0.
58.75	463.57	389.66	16947.9	35.63	2219465.	17.69476	0.
59.00	528.86	496.21	17408.5	36.60	2251969.	17.71635	0.
59.25	554.60	541.73	17913.6	37.66	2285386.	17.74002	0.
59.50	1521.88	1038.24	18914.2	39.76	2320227.	17.78691	0.
59.75	2948.28	2235.08	21109.5	44.38	2358089.	17.88980	0.
60.00	3583.70	3265.99	24331.1	52.22	2401557.	18.06479	0.
60.25	3837.52	3710.61	27989.5	62.94	2453381.	18.30396	0.
60.50	3131.93	3484.73	31411.3	72.97	2514544.	18.42638	0.
60.75	1978.32	2555.13	33893.5	80.25	2583493.	18.49623	0.
61.00	1470.41	1724.36	35537.6	86.65	2658595.	18.55766	0.
61.25	1272.21	1371.31	36822.2	92.95	2739412.	18.61816	0.
61.50	932.12	1102.16	37831.5	97.90	2825291.	18.66569	0.

61.75	512.91	722.52	38456.1	120.96	2914777.	18.69511	0.
62.00	329.87	421.39	38776.5	102.53	7006349.	18.71020	0.
62.25	259.75	294.81	38968.8	103.48	3099052.	18.71925	0.
62.50	234.42	247.09	39112.4	104.18	3192497.	18.72602	0.
62.75	224.62	229.52	39237.7	104.79	3286536.	18.73192	0.
63.00	220.68	222.65	39355.6	105.37	3381111.	18.73747	0.
63.25	219.48	220.08	39470.3	105.94	3476199.	18.74287	0.
63.50	219.50	219.49	39583.9	106.49	3571792.	18.74822	0.
63.75	219.51	219.51	39696.9	107.05	3667884.	18.75354	0.
64.00	219.53	219.52	39809.4	107.60	3764475.	18.75884	0.
64.25	219.54	219.53	39921.3	108.15	3861560.	18.76411	0.
64.50	219.55	219.55	40032.7	108.69	3959139.	18.76936	0.
64.75	219.57	219.56	40143.6	109.24	4057208.	18.77458	0.
65.00	219.58	219.58	40253.9	109.78	4155765.	18.77978	0.
65.25	219.60	219.59	40363.7	110.32	4254808.	18.78495	0.
65.50	219.61	219.60	40473.0	110.85	4354335.	18.79010	0.
65.75	219.62	219.62	40581.8	111.39	4454343.	18.79522	0.
66.00	219.64	219.63	40690.0	111.92	4554830.	18.80032	0.
66.25	219.65	219.64	40797.7	112.45	4655794.	18.80539	0.
66.50	219.66	219.66	40904.9	112.97	4757232.	18.81044	0.
66.75	219.67	219.67	41011.6	113.50	4859143.	18.81546	0.
67.00	219.69	219.68	41117.8	114.02	4961523.	18.82046	0.
67.25	219.70	219.69	41223.5	114.53	5064371.	18.82544	0.
67.50	219.71	219.71	41328.7	115.05	5167684.	18.83039	0.
67.75	219.72	219.72	41433.3	115.56	5271461.	18.83532	0.
68.00	219.73	219.73	41537.5	116.07	5375698.	18.84023	0.
68.25	219.75	219.74	41641.2	116.58	5480394.	18.84511	0.
68.50	219.76	219.75	41744.3	117.09	5585547.	18.84997	0.
68.75	219.77	219.76	41847.0	117.59	5691154.	18.85480	0.
69.00	219.78	219.78	41949.2	118.09	5797213.	18.85962	0.
69.25	219.79	219.79	42050.9	118.59	5903722.	18.86441	0.
69.50	219.80	219.80	42152.1	119.09	6010679.	18.86917	0.
69.75	219.81	219.81	42252.8	119.58	6118021.	18.87392	0.
70.00	219.82	219.82	42353.0	120.07	6225927.	18.87864	0.
70.25	219.83	219.83	42452.8	120.56	6334215.	18.88334	0.
70.50	219.85	219.84	42552.1	121.05	6442942.	18.88801	0.
70.75	219.86	219.85	42650.9	121.54	6552106.	18.89266	0.
71.00	219.87	219.86	42749.2	122.02	6661705.	18.89729	0.
71.25	219.88	219.87	42847.1	122.50	6771738.	18.90190	0.
71.50	219.89	219.88	42944.4	122.98	6882201.	18.90649	0.
71.75	219.90	219.89	43041.4	123.45	6993093.	18.91105	0.
72.00	219.91	219.90	43137.8	123.92	7104412.	18.91560	0.
72.25	219.92	219.91	43233.8	124.39	7216155.	18.92012	0.
72.50	157.75	188.83	43298.2	124.71	7328253.	18.92315	0.
72.75	65.69	111.72	43285.2	124.65	7440464.	18.92254	0.
73.00	25.25	45.47	43206.1	124.26	7552472.	18.91881	0.
73.25	9.54	17.39	43099.2	123.73	7664069.	18.91378	0.
73.50	3.54	6.54	42982.0	123.16	7775172.	18.90826	0.
73.75	1.22	2.39	42861.2	122.57	7885749.	18.90257	0.
74.00	0.29	0.75	42739.4	121.97	7995791.	18.89683	0.
74.25	0.00	0.14	42617.6	121.37	8105295.	18.89110	0.
74.50	0.00	0.00	42496.2	120.78	8214263.	18.88538	0.
74.75	0.00	0.00	42375.4	120.18	8322696.	18.87969	0.
75.00	0.00	0.00	42255.3	119.60	8430597.	18.87403	0.
75.25	0.00	0.00	42135.7	119.01	8537969.	18.86840	0.
75.50	0.00	0.00	42016.7	118.42	8644814.	18.86279	0.
75.75	0.00	0.00	41898.2	117.84	8751135.	18.85722	0.
76.00	0.00	0.00	41780.4	117.27	8856935.	18.85167	0.
76.25	0.00	0.00	41663.1	116.69	8962216.	18.84615	0.
76.50	0.00	0.00	41546.4	116.12	9066950.	18.84065	0.
76.75	0.00	0.00	41430.3	115.55	9171230.	18.83519	0.
77.00	0.00	0.00	41314.8	114.98	9274965.	18.82974	0.
77.25	0.00	0.00	41199.8	114.42	9378199.	18.82432	0.

77.50	0.00	0.00	41085.4	113.86	9480923.	18.81894	0.
77.75	0.00	0.00	40971.5	113.32	9583143.	18.81357	0.
78.00	0.00	0.00	40958.2	112.74	9684862.	18.80824	0.
78.25	0.00	0.00	40745.5	112.19	9786082.	18.80293	0.
78.50	0.00	0.00	40633.3	111.64	9886805.	18.79764	0.
78.75	0.00	0.00	40521.6	111.09	9987034.	18.79239	0.
79.00	0.00	0.00	40410.5	110.55	10086772.	18.78716	0.
79.25	0.00	0.00	40300.2	110.00	10186020.	18.78195	0.
79.50	0.00	0.00	40190.0	109.47	10284782.	18.77677	0.
79.75	0.00	0.00	40080.5	108.93	10383059.	18.77161	0.
80.00	0.00	0.00	39971.6	108.39	10480854.	18.76649	0.
80.25	0.00	0.00	39863.2	107.86	10578169.	18.76138	0.
80.50	0.00	0.00	39755.3	107.33	10675007.	18.75630	0.
80.75	0.00	0.00	39648.0	106.81	10771370.	18.75124	0.
81.00	0.00	0.00	39541.2	106.28	10867260.	18.74621	0.
81.25	0.00	0.00	39434.9	105.76	10962680.	18.74121	0.
81.50	0.00	0.00	39329.2	105.24	11057632.	18.73623	0.
81.75	0.00	0.00	39223.9	104.73	11152119.	18.73127	0.
82.00	0.00	0.00	39119.2	104.21	11246141.	18.72634	0.
82.25	0.00	0.00	39015.0	103.70	11339703.	18.72143	0.
82.50	0.00	0.00	38911.3	103.19	11432806.	18.71655	0.
82.75	0.00	0.00	38808.1	102.69	11525452.	18.71169	0.
83.00	0.00	0.00	38705.4	102.18	11617644.	18.70685	0.
83.25	0.00	0.00	38603.2	101.69	11709384.	18.70204	0.
83.50	0.00	0.00	38501.5	101.18	11800674.	18.69725	0.
83.75	0.00	0.00	38400.3	100.69	11891516.	18.69248	0.
84.00	0.00	0.00	38299.7	100.19	11981912.	18.68774	0.
84.25	0.00	0.00	38199.5	99.70	12071865.	18.68302	0.
84.50	0.00	0.00	38099.8	99.21	12161377.	18.67833	0.
84.75	0.00	0.00	38000.5	98.73	12250450.	18.67365	0.
85.00	0.00	0.00	37901.8	98.24	12339086.	18.66900	0.
85.25	0.00	0.00	37803.6	97.76	12427287.	18.66438	0.
85.50	0.00	0.00	37705.8	97.28	12515055.	18.65977	0.
85.75	0.00	0.00	37608.5	96.80	12602393.	18.65519	0.
86.00	0.00	0.00	37511.7	96.33	12689302.	18.65063	0.
86.25	0.00	0.00	37415.4	95.86	12775785.	18.64610	0.
86.50	0.00	0.00	37319.5	95.39	12861844.	18.64158	0.
86.75	0.00	0.00	37224.2	94.92	12947481.	18.63709	0.
87.00	0.00	0.00	37129.2	94.45	13032698.	18.63262	0.
87.25	0.00	0.00	37034.8	93.99	13117497.	18.62817	0.
87.50	0.00	0.00	36940.8	93.53	13201860.	18.62374	0.
87.75	0.00	0.00	36847.3	93.07	13285849.	18.61934	0.
88.00	0.00	0.00	36754.2	92.61	13369406.	18.61496	0.
88.25	0.00	0.00	36661.6	92.16	13452553.	18.61060	0.
88.50	0.00	0.00	36569.4	91.71	13535292.	18.60625	0.
88.75	0.00	0.00	36477.7	91.26	13617626.	18.60194	0.
89.00	0.00	0.00	36386.5	90.81	13699556.	18.59764	0.
89.25	0.00	0.00	36295.7	90.36	13781084.	18.59336	0.
89.50	0.00	0.00	36205.3	89.92	13862212.	18.58911	0.
89.75	0.00	0.00	36115.4	89.48	13942942.	18.58487	0.
90.00	0.00	0.00	36025.9	89.04	14023276.	18.58066	0.
90.25	0.00	0.00	35936.9	88.60	14103216.	18.57646	0.
90.50	0.00	0.00	35848.2	88.17	14182764.	18.57229	0.
90.75	0.00	0.00	35760.1	87.74	14261922.	18.56814	0.
91.00	0.00	0.00	35672.3	87.31	14340692.	18.56401	0.
91.25	0.00	0.00	35585.0	86.88	14419075.	18.55989	0.
91.50	0.00	0.00	35498.2	86.45	14497074.	18.55580	0.
91.75	0.00	0.00	35411.7	86.03	14574690.	18.55173	0.
92.00	0.00	0.00	35325.7	85.61	14651925.	18.54768	0.
92.25	0.00	0.00	35240.1	85.19	14728762.	18.54365	0.
92.50	0.00	0.00	35154.9	84.77	14805262.	18.53964	0.
92.75	0.00	0.00	35070.1	84.35	14881366.	18.53564	0.
93.00	0.00	0.00	34985.8	83.94	14957097.	18.53167	0.

93.25	0.00	0.00	34901.8	83.53	15032457.	18.52772	0.
93.50	0.00	0.00	34918.3	83.12	15107447.	18.52378	0.
93.75	0.00	0.00	34735.2	82.72	15182072.	18.51992	0.
94.00	0.00	0.00	34652.5	82.47	15256407.	18.51760	0.
94.25	0.00	0.00	34570.2	82.23	15330524.	18.51527	0.
94.50	0.00	0.00	34487.8	81.99	15404424.	18.51296	0.
94.75	0.00	0.00	34405.6	81.75	15478107.	18.51065	0.
95.00	0.00	0.00	34324.0	81.51	15551574.	18.50835	0.
95.25	0.00	0.00	34242.5	81.27	15624626.	18.50606	0.
95.50	0.00	0.00	34161.2	81.03	15697863.	18.50377	0.
95.75	0.00	0.00	34080.2	80.80	15770686.	18.50149	0.
96.00	0.00	0.00	33999.4	80.56	15843295.	18.49922	0.
96.25	0.00	0.00	33918.9	80.32	15915692.	18.49695	0.
96.50	0.00	0.00	33838.5	80.09	15987876.	18.49469	0.
96.75	0.00	0.00	33758.4	79.85	16059849.	18.49244	0.
97.00	0.00	0.00	33678.6	79.62	16131611.	18.49019	0.
97.25	0.00	0.00	33599.0	79.39	16203163.	18.48795	0.
97.50	0.00	0.00	33519.6	79.15	16274505.	18.48571	0.
97.75	0.00	0.00	33440.4	78.92	16345638.	18.48348	0.
98.00	0.00	0.00	33361.5	78.69	16416562.	18.48126	0.
98.25	0.00	0.00	33282.8	78.46	16487278.	18.47905	0.
98.50	0.00	0.00	33204.4	78.23	16557787.	18.47684	0.
98.75	0.00	0.00	33126.1	78.00	16628089.	18.47464	0.
99.00	0.00	0.00	33048.1	77.77	16698185.	18.47244	0.
99.25	0.00	0.00	32970.4	77.54	16768076.	18.47026	0.
99.50	0.00	0.00	32892.8	77.32	16837762.	18.46807	0.
99.75	0.00	0.00	32815.5	77.09	16907244.	18.46590	0.
100.00	0.00	0.00	32738.4	76.86	16976522.	18.46373	0.
100.25	0.00	0.00	32661.6	76.64	17045598.	18.46157	0.
100.50	0.00	0.00	32584.9	76.41	17114470.	18.45941	0.
100.75	0.00	0.00	32508.5	76.19	17183140.	18.45726	0.
101.00	0.00	0.00	32432.3	75.97	17251610.	18.45511	0.
101.25	0.00	0.00	32356.4	75.74	17319878.	18.45298	0.
101.50	0.00	0.00	32280.6	75.52	17387946.	18.45084	0.
101.75	0.00	0.00	32205.1	75.30	17455816.	18.44872	0.
102.00	0.00	0.00	32129.8	75.08	17523486.	18.44660	0.
102.25	0.00	0.00	32054.7	74.86	17590958.	18.44449	0.
102.50	0.00	0.00	31979.9	74.64	17658232.	18.44238	0.
102.75	0.00	0.00	31905.2	74.42	17725308.	18.44028	0.
103.00	0.00	0.00	31830.8	74.20	17792188.	18.43818	0.
103.25	0.00	0.00	31756.6	73.98	17858872.	18.43610	0.
103.50	0.00	0.00	31682.6	73.77	17925360.	18.43402	0.
103.75	0.00	0.00	31608.8	73.55	17991654.	18.43194	0.
104.00	0.00	0.00	31535.3	73.34	18057754.	18.42987	0.
104.25	0.00	0.00	31462.0	73.12	18123660.	18.42780	0.
104.50	0.00	0.00	31388.8	72.91	18189372.	18.42575	0.
104.75	0.00	0.00	31315.9	72.69	18254892.	18.42370	0.
105.00	0.00	0.00	31243.2	72.48	18320220.	18.42165	0.
105.25	0.00	0.00	31170.8	72.27	18385356.	18.41961	0.
105.50	0.00	0.00	31098.5	72.06	18450302.	18.41758	0.
105.75	0.00	0.00	31026.4	71.84	18515058.	18.41555	0.
106.00	0.00	0.00	30954.6	71.63	18579624.	18.41353	0.
106.25	0.00	0.00	30883.0	71.42	18644000.	18.41151	0.
106.50	0.00	0.00	30811.5	71.21	18708188.	18.40950	0.
106.75	0.00	0.00	30740.3	71.01	18772188.	18.40750	0.
107.00	0.00	0.00	30669.3	70.80	18836000.	18.40550	0.
107.25	0.00	0.00	30598.5	70.59	18899624.	18.40351	0.
107.50	0.00	0.00	30527.9	70.38	18963062.	18.40152	0.
107.75	0.00	0.00	30457.5	70.18	19026314.	18.39954	0.
108.00	0.00	0.00	30387.4	69.97	19089382.	18.39756	0.
108.25	0.00	0.00	30317.4	69.77	19152264.	18.39559	0.
108.50	0.00	0.00	30247.6	69.56	19214962.	18.39363	0.
108.75	0.00	0.00	30178.1	69.36	19277476.	18.39167	0.

109.00	0.00	0.00	30108.7	69.15	19339806.	18.38972	0.
109.25	0.00	0.00	30239.5	68.95	19401954.	18.38778	0.
109.50	0.00	0.00	29970.6	68.75	19463920.	18.38583	0.
109.75	0.00	0.00	29901.8	68.55	19525704.	18.38390	0.
110.00	0.00	0.00	29833.3	68.35	19587308.	18.38197	0.
110.25	0.00	0.00	29764.9	68.15	19648730.	18.38005	0.
110.50	0.00	0.00	29696.8	67.95	19709972.	18.37813	0.
110.75	0.00	0.00	29628.9	67.75	19771036.	18.37622	0.
111.00	0.00	0.00	29561.1	67.55	19831920.	18.37431	0.
111.25	0.00	0.00	29493.6	67.35	19892626.	18.37241	0.
111.50	0.00	0.00	29426.2	67.15	19953154.	18.37051	0.
111.75	0.00	0.00	29359.0	66.96	20013504.	18.36862	0.
112.00	0.00	0.00	29292.1	66.76	20073678.	18.36674	0.
112.25	0.00	0.00	29225.3	66.57	20133676.	18.36486	0.
112.50	0.00	0.00	29158.8	66.37	20193498.	18.36299	0.
112.75	0.00	0.00	29092.4	66.18	20253144.	18.36112	0.
113.00	0.00	0.00	29026.2	65.98	20312616.	18.35926	0.
113.25	0.00	0.00	28960.2	65.79	20371912.	18.35740	0.
113.50	0.00	0.00	28894.4	65.60	20431036.	18.35555	0.
113.75	0.00	0.00	28828.8	65.40	20489986.	18.35370	0.
114.00	0.00	0.00	28763.4	65.21	20548764.	18.35186	0.
114.25	0.00	0.00	28698.2	65.02	20607368.	18.35003	0.
114.50	0.00	0.00	28633.2	64.83	20665800.	18.34604	0.
114.75	0.00	0.00	28568.4	64.64	20724062.	18.34180	0.
115.00	0.00	0.00	28503.7	64.45	20782152.	18.33758	0.
115.25	0.00	0.00	28439.3	64.26	20840072.	18.33336	0.
115.50	0.00	0.00	28375.0	64.07	20897822.	18.32916	0.
115.75	0.00	0.00	28311.0	63.89	20955404.	18.32497	0.
116.00	0.00	0.00	28247.1	63.70	21012816.	18.32080	0.
116.25	0.00	0.00	28183.4	63.51	21070060.	18.31663	0.
116.50	0.00	0.00	28119.9	63.33	21127136.	18.31248	0.
116.75	0.00	0.00	28056.5	63.14	21184046.	18.30834	0.
117.00	0.00	0.00	27993.4	62.95	21240788.	18.30421	0.
117.25	0.00	0.00	27930.4	62.77	21297364.	18.30010	0.
117.50	0.00	0.00	27867.7	62.59	21353774.	18.29599	0.
117.75	0.00	0.00	27805.1	62.40	21410020.	18.29190	0.
118.00	0.00	0.00	27742.7	62.22	21466100.	18.28782	0.
118.25	0.00	0.00	27680.5	62.04	21522016.	18.28375	0.
118.50	0.00	0.00	27618.4	61.86	21577768.	18.27970	0.

MAXIMUM VOLUME STORED IN THE BASIN = 893.4254 ACRF-FT
 MAXIMUM FLOW THROUGH THE CONTROL SECTION = 124.69 CFS
 TIME OF MAXIMUM FLOW = 72.59 HOUR

POST, BUCKIEY, SCHUH AND JERNIGAN

SURFACE WATER MANAGEMENT PROGRAM

P.P.C. SITE 7 (100Y72HR)

* INPUT DATA * GENERATE SCS HYDROGRAPH NO. 1

***** THE CURVE NUMBER IS GIVEN

CURVE NUMBER = 90.00

TOTAL AREA = 1041.00 ACRES

FREQUENCY OF DESIGN STORM = 1. YEARS

DURATION OF DESIGN STORM = 72.0 HOURS

RAINFALL DISTRIBUTION IS TYPICAL

RAINFALL FOR THE DESIGN FREQUENCY AND 24 HOURS = 13.2 INCHES

TIME (HOUR)	RAINFALL (INCHES)
0.00	0.00
24.00	1.93
48.00	4.74
58.00	7.55
59.00	8.29
60.00	13.40
61.00	14.86
72.00	17.94

TIME OF CONCENTRATION = 0.50 HOURS

TIME STEP FOR WRITING THE RAINFALL TABULATION = 0.25 HOURS

TIME STEP FOR WRITING THE HYDROGRAPH = 0.25 HOURS

TIME INTERVAL FOR COMPUTATION WAS GIVEN AS 0.25 HOURS

AND ADJUSTED TO 0.25 HOURS

 * OUTPUT *

SOIL PARAMETERS
 ABSTRACTION = 1.11 INCHES
 GROUND STORAGE = 96.3889 ACRE-Feet

HYDROGRAPH PARAMETERS
 DURATION OF UNIT EXCESS RAINFALL = 0.25 HOURS
 TIME TO PEAK OF UNIT HYDROGRAPH = 0.43 HOURS

RAINFALL TABULATION

TIME (HOURS)	ACCUMULATED RAINFALL (INCHES)	ACCUMULATED RUNOFF (INCHES)	INCREMENTAL RUNOFF (INCHES)	REVERSED INCREMENTAL RUNOFF (INCHES)
0.00	0.00	0.00000	0.00000	0.06965
0.25	0.02	0.00000	0.00000	0.06965
0.50	0.04	0.00000	0.00000	0.06965
0.75	0.06	0.00000	0.00000	0.06965
1.00	0.08	0.00000	0.00000	0.06965
1.25	0.10	0.00000	0.00000	0.06964
1.50	0.12	0.00000	0.00000	0.06964
1.75	0.14	0.00000	0.00000	0.06964
2.00	0.16	0.00000	0.00000	0.06964
2.25	0.18	0.00000	0.00000	0.06964
2.50	0.20	0.00000	0.00000	0.06964
2.75	0.22	0.00000	0.00000	0.06963
3.00	0.24	0.00031	0.00031	0.06963
3.25	0.26	0.00131	0.00100	0.06963
3.50	0.28	0.00296	0.00165	0.06963
3.75	0.30	0.00523	0.00227	0.06962
4.00	0.32	0.00810	0.00286	0.06962
4.25	0.34	0.01152	0.00343	0.06962
4.50	0.36	0.01548	0.00396	0.06962
4.75	0.38	0.01995	0.00447	0.06961
5.00	0.40	0.02491	0.00496	0.06962
5.25	0.42	0.03033	0.00542	0.06961
5.50	0.44	0.03619	0.00586	0.06961
5.75	0.46	0.04247	0.00628	0.06961
6.00	0.48	0.04916	0.00669	0.06961
6.25	0.50	0.05623	0.00707	0.06960
6.50	0.52	0.06368	0.00744	0.06960
6.75	0.54	0.07147	0.00780	0.06960
7.00	0.56	0.07961	0.00814	0.06959
7.25	0.58	0.08808	0.00846	0.06959
7.50	0.60	0.09685	0.00878	0.06959
7.75	0.62	0.10593	0.00908	0.06959
8.00	0.64	0.11529	0.00937	0.06958
8.25	0.66	0.12494	0.00964	0.06958
8.50	0.68	0.13485	0.00991	0.06958
8.75	0.70	0.14501	0.01017	0.06958
9.00	0.72	0.15542	0.01041	0.06957
9.25	0.74	0.16607	0.01065	0.06957
9.50	0.76	0.17695	0.01088	0.06957
9.75	0.78	0.18805	0.01110	0.06956
10.00	0.80	0.19936	0.01131	0.06956
10.25	0.82	0.21088	0.01152	0.06956
10.50	0.84	0.22260	0.01172	0.06956
10.75	0.86	0.23451	0.01191	0.06955
11.00	0.88	0.24660	0.01209	0.06943
11.25	0.90	0.25887	0.01227	0.06943

11.50	0.92	0.27132	0.01244	0.36424
11.75	0.94	0.28393	0.01261	0.36414
12.00	0.96	0.29670	0.01277	1.26962
12.25	0.98	0.30963	0.01293	1.26677
12.50	1.00	0.32272	0.01308	1.26425
12.75	1.02	0.33595	0.01323	1.26267
13.00	1.04	0.34932	0.01337	0.18204
13.25	1.06	0.36283	0.01351	0.18192
13.50	1.08	0.37647	0.01364	0.18180
13.75	1.10	0.39024	0.01377	0.18167
14.00	1.12	0.40414	0.01390	0.06906
14.25	1.14	0.41816	0.01402	0.06904
14.50	1.16	0.43230	0.01414	0.06902
14.75	1.18	0.44655	0.01425	0.06900
15.00	1.20	0.46091	0.01436	0.06898
15.25	1.22	0.47539	0.01447	0.06895
15.50	1.24	0.48996	0.01458	0.06893
15.75	1.26	0.50465	0.01468	0.06890
16.00	1.28	0.51943	0.01478	0.06888
16.25	1.30	0.53430	0.01488	0.06885
16.50	1.32	0.54928	0.01497	0.06883
16.75	1.35	0.56434	0.01506	0.06880
17.00	1.37	0.57949	0.01515	0.06877
17.25	1.39	0.59473	0.01524	0.06874
17.50	1.41	0.61006	0.01532	0.06871
17.75	1.43	0.62546	0.01541	0.06868
18.00	1.45	0.64095	0.01549	0.06865
18.25	1.47	0.65652	0.01557	0.06862
18.50	1.49	0.67216	0.01564	0.06859
18.75	1.51	0.68787	0.01572	0.06855
19.00	1.53	0.70366	0.01579	0.06852
19.25	1.55	0.71952	0.01586	0.06848
19.50	1.57	0.73545	0.01593	0.06845
19.75	1.59	0.75144	0.01600	0.06841
20.00	1.61	0.76751	0.01606	0.06837
20.25	1.63	0.78363	0.01613	0.06833
20.50	1.65	0.79982	0.01619	0.06828
20.75	1.67	0.81607	0.01625	0.06824
21.00	1.69	0.83238	0.01631	0.06819
21.25	1.71	0.84874	0.01637	0.06815
21.50	1.73	0.86517	0.01642	0.06810
21.75	1.75	0.88165	0.01648	0.06805
22.00	1.77	0.89818	0.01653	0.06800
22.25	1.79	0.91477	0.01659	0.06795
22.50	1.81	0.93140	0.01664	0.06789
22.75	1.83	0.94809	0.01669	0.06783
23.00	1.85	0.96483	0.01674	0.06777
23.25	1.87	0.98162	0.01679	0.06771
23.50	1.89	0.99846	0.01684	0.06765
23.75	1.91	1.01534	0.01688	0.06758
24.00	1.93	1.03226	0.01693	0.02814
24.25	1.96	1.05704	0.02478	0.02813
24.50	1.99	1.08191	0.02487	0.02812
24.75	2.02	1.10686	0.02496	0.02810
25.00	2.04	1.13191	0.02504	0.02809
25.25	2.07	1.15703	0.02513	0.02808
25.50	2.10	1.18224	0.02521	0.02806
25.75	2.13	1.20753	0.02529	0.02805
26.00	2.16	1.23289	0.02536	0.02804
26.25	2.19	1.25833	0.02544	0.02802
26.50	2.22	1.28384	0.02551	0.02801
26.75	2.25	1.30942	0.02558	0.02800
27.00	2.28	1.33507	0.02565	0.02798

27.25	2.31	1.36079	0.02572	0.02797
27.50	2.34	1.38657	0.02578	0.02795
27.75	2.37	1.41242	0.02584	0.02794
28.00	2.40	1.43832	0.02591	0.02792
28.25	2.43	1.46429	0.02597	0.02790
28.50	2.45	1.49031	0.02602	0.02789
28.75	2.48	1.51639	0.02608	0.02787
29.00	2.51	1.54253	0.02614	0.02786
29.25	2.54	1.56872	0.02619	0.02784
29.50	2.57	1.59496	0.02624	0.02782
29.75	2.60	1.62125	0.02629	0.02781
30.00	2.63	1.64760	0.02634	0.02779
30.25	2.66	1.67399	0.02639	0.02777
30.50	2.69	1.70043	0.02644	0.02775
30.75	2.72	1.72691	0.02649	0.02773
31.00	2.75	1.75344	0.02653	0.02771
31.25	2.78	1.78002	0.02657	0.02769
31.50	2.81	1.80664	0.02662	0.02767
31.75	2.84	1.83330	0.02666	0.02765
32.00	2.86	1.86000	0.02670	0.02763
32.25	2.89	1.88674	0.02674	0.02761
32.50	2.92	1.91352	0.02678	0.02759
32.75	2.95	1.94034	0.02682	0.02757
33.00	2.98	1.96719	0.02686	0.02755
33.25	3.01	1.99408	0.02689	0.02752
33.50	3.04	2.02101	0.02693	0.02750
33.75	3.07	2.04797	0.02696	0.02748
34.00	3.10	2.07497	0.02700	0.02745
34.25	3.13	2.10200	0.02703	0.02743
34.50	3.16	2.12906	0.02706	0.02741
34.75	3.19	2.15616	0.02709	0.02738
35.00	3.22	2.18328	0.02713	0.02735
35.25	3.25	2.21044	0.02716	0.02733
35.50	3.27	2.23763	0.02719	0.02730
35.75	3.30	2.26484	0.02722	0.02727
36.00	3.33	2.29209	0.02725	0.02725
36.25	3.36	2.31936	0.02727	0.02722
36.50	3.39	2.34666	0.02730	0.02719
36.75	3.42	2.37399	0.02733	0.02716
37.00	3.45	2.40134	0.02735	0.02713
37.25	3.48	2.42872	0.02738	0.02709
37.50	3.51	2.45613	0.02741	0.02706
37.75	3.54	2.48356	0.02743	0.02703
38.00	3.57	2.51101	0.02745	0.02700
38.25	3.60	2.53849	0.02748	0.02696
38.50	3.63	2.56599	0.02750	0.02693
38.75	3.66	2.59352	0.02752	0.02689
39.00	3.68	2.62107	0.02755	0.02686
39.25	3.71	2.64864	0.02757	0.02682
39.50	3.74	2.67623	0.02759	0.02678
39.75	3.77	2.70384	0.02761	0.02674
40.00	3.80	2.73147	0.02763	0.02670
40.25	3.83	2.75913	0.02765	0.02666
40.50	3.86	2.78680	0.02767	0.02662
40.75	3.89	2.81450	0.02769	0.02657
41.00	3.92	2.84221	0.02771	0.02653
41.25	3.95	2.86994	0.02773	0.02649
41.50	3.98	2.89769	0.02775	0.02644
41.75	4.01	2.92546	0.02777	0.02639
42.00	4.04	2.95325	0.02779	0.02634
42.25	4.07	2.98106	0.02781	0.02629
42.50	4.09	3.00888	0.02782	0.02624
42.75	4.12	3.03672	0.02784	0.02619

43.00	4.15	3.06458	0.02786	0.02614
43.25	4.18	3.09245	0.02787	0.02608
43.50	4.21	3.12034	0.02789	0.02602
43.75	4.24	3.14825	0.02790	0.02597
44.00	4.27	3.17617	0.02792	0.02591
44.25	4.30	3.20410	0.02794	0.02584
44.50	4.33	3.23206	0.02795	0.02578
44.75	4.36	3.26002	0.02797	0.02572
45.00	4.39	3.28800	0.02798	0.02565
45.25	4.42	3.31600	0.02800	0.02558
45.50	4.45	3.34401	0.02801	0.02551
45.75	4.48	3.37203	0.02802	0.02544
46.00	4.50	3.40007	0.02804	0.02536
46.25	4.53	3.42812	0.02805	0.02529
46.50	4.56	3.45619	0.02806	0.02521
46.75	4.59	3.48426	0.02808	0.02513
47.00	4.62	3.51235	0.02809	0.02504
47.25	4.65	3.54046	0.02810	0.02496
47.50	4.68	3.56857	0.02812	0.02487
47.75	4.71	3.59670	0.02813	0.02478
48.00	4.74	3.62484	0.02814	0.01693
48.25	4.81	3.69242	0.06758	0.01688
48.50	4.88	3.76007	0.06765	0.01684
48.75	4.95	3.82779	0.06771	0.01679
49.00	5.02	3.89556	0.06777	0.01674
49.25	5.09	3.96340	0.06783	0.01669
49.50	5.16	4.03129	0.06789	0.01664
49.75	5.23	4.09923	0.06795	0.01659
50.00	5.30	4.16723	0.06800	0.01653
50.25	5.37	4.23528	0.06805	0.01648
50.50	5.44	4.30338	0.06810	0.01642
50.75	5.51	4.37153	0.06815	0.01637
51.00	5.58	4.43973	0.06819	0.01631
51.25	5.65	4.50797	0.06824	0.01625
51.50	5.72	4.57625	0.06828	0.01619
51.75	5.79	4.64458	0.06833	0.01613
52.00	5.86	4.71294	0.06837	0.01606
52.25	5.93	4.78135	0.06841	0.01600
52.50	6.00	4.84979	0.06845	0.01593
52.75	6.07	4.91828	0.06848	0.01586
53.00	6.14	4.98679	0.06852	0.01579
53.25	6.21	5.05535	0.06855	0.01572
53.50	6.29	5.12393	0.06859	0.01564
53.75	6.36	5.19255	0.06862	0.01557
54.00	6.43	5.26121	0.06865	0.01549
54.25	6.50	5.32989	0.06868	0.01541
54.50	6.57	5.39860	0.06871	0.01532
54.75	6.64	5.46735	0.06874	0.01524
55.00	6.71	5.53612	0.06877	0.01515
55.25	6.78	5.60492	0.06880	0.01506
55.50	6.85	5.67375	0.06883	0.01497
55.75	6.92	5.74260	0.06885	0.01488
56.00	6.99	5.81148	0.06888	0.01478
56.25	7.06	5.88038	0.06890	0.01468
56.50	7.13	5.94931	0.06893	0.01458
56.75	7.20	6.01826	0.06895	0.01447
57.00	7.27	6.08724	0.06898	0.01436
57.25	7.34	6.15623	0.06900	0.01425
57.50	7.41	6.22525	0.06902	0.01414
57.75	7.48	6.29429	0.06904	0.01402
58.00	7.55	6.36335	0.06906	0.01390
58.25	7.74	6.54502	0.18167	0.01377
58.50	7.92	6.72682	0.18180	0.01364

58.75	8.10	6.90874	0.18192	0.01351
59.00	8.29	7.09077	0.18204	0.01337
59.25	9.57	8.35144	1.26067	0.01323
59.50	10.84	9.61569	1.26425	0.01308
59.75	12.12	10.88246	1.26677	0.01293
60.00	13.40	12.15108	1.26862	0.01277
60.25	13.76	12.51522	0.36414	0.01261
60.50	14.13	12.87946	0.36424	0.01244
60.75	14.50	13.24381	0.36434	0.01227
61.00	14.86	13.60824	0.36443	0.01209
61.25	14.93	13.67780	0.06955	0.01191
61.50	15.00	13.74735	0.06956	0.01172
61.75	15.07	13.81691	0.06956	0.01152
62.00	15.14	13.88647	0.06956	0.01131
62.25	15.21	13.95604	0.06956	0.01110
62.50	15.28	14.02561	0.06957	0.01088
62.75	15.35	14.09518	0.06957	0.01065
63.00	15.42	14.16475	0.06957	0.01041
63.25	15.49	14.23433	0.06958	0.01017
63.50	15.56	14.30391	0.06958	0.00991
63.75	15.63	14.37350	0.06958	0.00964
64.00	15.70	14.44308	0.06958	0.00937
64.25	15.77	14.51267	0.06959	0.00908
64.50	15.84	14.58226	0.06959	0.00878
64.75	15.91	14.65185	0.06959	0.00846
65.00	15.98	14.72145	0.06959	0.00814
65.25	16.05	14.79104	0.06960	0.00780
65.50	16.12	14.86064	0.06960	0.00744
65.75	16.19	14.93025	0.06960	0.00707
66.00	16.26	14.99985	0.06961	0.00669
66.25	16.33	15.06946	0.06961	0.00628
66.50	16.40	15.13907	0.06961	0.00586
66.75	16.47	15.20868	0.06961	0.00542
67.00	16.54	15.27830	0.06962	0.00496
67.25	16.61	15.34791	0.06961	0.00447
67.50	16.68	15.41753	0.06962	0.00396
67.75	16.75	15.48716	0.06962	0.00343
68.00	16.82	15.55678	0.06962	0.00286
68.25	16.89	15.62640	0.06962	0.00227
68.50	16.96	15.69603	0.06963	0.00165
68.75	17.03	15.76567	0.06963	0.00100
69.00	17.10	15.83530	0.06963	0.00031
69.25	17.17	15.90493	0.06963	0.00000
69.50	17.24	15.97457	0.06964	0.00000
69.75	17.31	16.04421	0.06964	0.00000
70.00	17.38	16.11384	0.06964	0.00000
70.25	17.45	16.18349	0.06964	0.00000
70.50	17.52	16.25313	0.06964	0.00000
70.75	17.59	16.32278	0.06964	0.00000
71.00	17.66	16.39243	0.06965	0.00000
71.25	17.73	16.46208	0.06965	0.00000
71.50	17.80	16.53173	0.06965	0.00000
71.75	17.87	16.60138	0.06965	0.00000
72.00	17.94	16.67104	0.06965	0.00000

UNIT HYDROGRAPH

TIME (HOURS)	FLOW (CFS)
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0.00	0.00
0.25	1181.16
0.50	1748.85
0.75	768.19
1.00	298.45
1.25	113.87
1.50	44.13
1.75	17.76
2.00	5.45

 * OUTPUT *

GENERATED SCS HYDROGRAPH NO. 1 *

TIME (HOUR)	UNIT HYDROGRAPH (CFS)	FLOW (CFS)	MASS DIAGRAM (CF)
0.00	0.00	0.00	0.
0.25	1181.16	0.00	0.
0.50	1748.85	0.00	0.
0.75	768.19	0.00	0.
1.00	298.45	0.00	0.
1.25	113.87	0.00	0.
1.50	44.13	0.00	0.
1.75	17.76	0.00	0.
2.00	5.45	0.00	0.
2.25		0.00	0.
2.50		0.00	0.
2.75		0.00	0.
3.00		0.00	0.
3.25		0.36	164.
3.50		1.72	1101.
3.75		3.93	3644.
4.00		6.43	8308.
4.25		8.96	15236.
4.50		11.42	24408.
4.75		13.79	35752.
5.00		16.04	49175.
5.25		18.20	64583.
5.50		20.25	81884.
5.75		22.21	100988.
6.00		24.07	121813.
6.25		25.86	144282.
6.50		27.56	168322.
6.75		29.20	193864.
7.00		30.76	220842.
7.25		32.25	249196.
7.50		33.69	278868.
7.75		35.06	309804.
8.00		36.38	341952.
8.25		37.64	375262.
8.50		38.86	409690.
8.75		40.03	445191.
9.00		41.15	481723.
9.25		42.23	519248.
9.50		43.27	557727.
9.75		44.28	597125.
10.00		45.24	637409.
10.25		46.17	678545.
10.50		47.07	720504.
10.75		47.94	763257.
11.00		48.77	806774.
11.25		49.58	851031.
11.50		50.36	896001.
11.75		51.11	941660.
12.00		51.84	987986.
12.25		52.54	1034956.
12.50		53.22	1082549.
12.75		53.88	1130745.
13.00		54.52	1179524.
13.25		55.14	1228868.
13.50		55.73	1278760.
13.75		56.31	1329181.

14.00	56.88	1380117.
14.25	57.42	1431551.
14.50	57.95	1483468.
14.75	58.46	1535854.
15.00	58.96	1588695.
15.25	59.44	1641978.
15.50	59.91	1695689.
15.75	60.37	1749817.
16.00	60.81	1804350.
16.25	61.24	1859276.
16.50	61.66	1914584.
16.75	62.07	1970264.
17.00	62.47	2026306.
17.25	62.85	2082699.
17.50	63.23	2139435.
17.75	63.59	2196504.
18.00	63.95	2253897.
18.25	64.29	2311606.
18.50	64.63	2369623.
18.75	64.96	2427939.
19.00	65.28	2486548.
19.25	65.59	2545441.
19.50	65.90	2604612.
19.75	66.19	2664054.
20.00	66.48	2723759.
20.25	66.77	2783722.
20.50	67.04	2843936.
20.75	67.31	2904396.
21.00	67.57	2965095.
21.25	67.83	3026027.
21.50	68.08	3087188.
21.75	68.33	3148572.
22.00	68.57	3210173.
22.25	68.80	3271987.
22.50	69.03	3334009.
22.75	69.25	3396233.
23.00	69.47	3458657.
23.25	69.68	3521274.
23.50	69.89	3584082.
23.75	70.09	3647075.
24.00	70.29	3710249.
24.25	70.49	3773601.
24.50	70.90	3841275.
24.75	93.79	3919433.
25.00	100.10	4006685.
25.25	102.78	4097984.
25.50	104.03	4191049.
25.75	104.72	4284985.
26.00	105.20	4379450.
26.25	105.58	4474299.
26.50	105.90	4569462.
26.75	106.21	4664911.
27.00	106.52	4760639.
27.25	106.81	4856638.
27.50	107.10	4952900.
27.75	107.38	5049418.
28.00	107.65	5146184.
28.25	107.92	5243192.
28.50	108.18	5340435.
28.75	108.43	5437908.
29.00	108.67	5535603.
29.25	108.91	5633516.
29.50	109.14	5731641.

29.75	109.37	5829971.
30.00	109.59	5928503.
30.25	109.80	6027230.
30.50	110.01	6126148.
30.75	110.22	6225252.
31.00	110.42	6324538.
31.25	110.61	6424001.
31.50	110.80	6523637.
31.75	110.99	6623441.
32.00	111.17	6723409.
32.25	111.34	6823539.
32.50	111.52	6923825.
32.75	111.68	7024264.
33.00	111.85	7124853.
33.25	112.01	7225588.
33.50	112.17	7326466.
33.75	112.32	7427484.
34.00	112.47	7528638.
34.25	112.61	7629926.
34.50	112.76	7731344.
34.75	112.90	7832890.
35.00	113.04	7934561.
35.25	113.17	8036354.
35.50	113.30	8138266.
35.75	113.43	8240295.
36.00	113.56	8342439.
36.25	113.68	8444694.
36.50	113.80	8547060.
36.75	113.92	8649533.
37.00	114.03	8752111.
37.25	114.15	8854792.
37.50	114.26	8957574.
37.75	114.37	9060455.
38.00	114.47	9163433.
38.25	114.58	9266506.
38.50	114.68	9369672.
38.75	114.78	9472929.
39.00	114.88	9576276.
39.25	114.98	9679710.
39.50	115.07	9783231.
39.75	115.16	9886836.
40.00	115.25	9990524.
40.25	115.34	10094293.
40.50	115.43	10198142.
40.75	115.52	10302069.
41.00	115.60	10406073.
41.25	115.68	10510152.
41.50	115.77	10614305.
41.75	115.85	10718531.
42.00	115.93	10822828.
42.25	116.00	10927195.
42.50	116.08	11031631.
42.75	116.15	11136134.
43.00	116.23	11240704.
43.25	116.30	11345339.
43.50	116.37	11450038.
43.75	116.44	11554800.
44.00	116.50	11659623.
44.25	116.57	11764507.
44.50	116.64	11869451.
44.75	116.70	11974454.
45.00	116.77	12079515.
45.25	116.83	12184632.

45.50	116.89	12289805.
45.75	116.95	12395033.
46.00	117.01	12500315.
46.25	117.07	12605650.
46.50	117.13	12711037.
46.75	117.18	12816475.
47.00	117.24	12921964.
47.25	117.29	13027503.
47.50	117.35	13133091.
47.75	117.40	13238726.
48.00	117.45	13344409.
48.25	117.50	13450139.
48.50	164.13	13576874.
48.75	233.20	13755674.
49.00	263.70	13979281.
49.25	275.71	14222015.
49.50	280.45	14472285.
49.75	282.43	14725580.
50.00	283.37	14980192.
50.25	283.82	15235428.
50.50	284.04	15490966.
50.75	284.26	15746701.
51.00	284.47	16002628.
51.25	284.67	16258741.
51.50	284.87	16515033.
51.75	285.06	16771498.
52.00	285.24	17028132.
52.25	285.42	17284928.
52.50	285.59	17541880.
52.75	285.76	17798986.
53.00	285.92	18056240.
53.25	286.07	18313636.
53.50	286.23	18571172.
53.75	286.37	18828842.
54.00	286.52	19086642.
54.25	286.66	19344570.
54.50	286.79	19602622.
54.75	286.92	19860794.
55.00	287.05	20119082.
55.25	287.17	20377482.
55.50	287.29	20635992.
55.75	287.41	20894608.
56.00	287.52	21153328.
56.25	287.63	21412150.
56.50	287.74	21671070.
56.75	287.85	21930086.
57.00	287.95	22189194.
57.25	288.05	22448394.
57.50	288.15	22707682.
57.75	288.24	22967056.
58.00	288.33	23226514.
58.25	288.42	23486054.
58.50	421.49	23805514.
58.75	618.60	24273554.
59.00	705.49	24869392.
59.25	739.55	25519658.
59.50	2026.75	26764490.
59.75	3922.45	29441630.
60.00	4762.34	33349786.
60.25	5094.23	37785244.
60.50	4154.96	41947384.
60.75	2623.47	44997680.
61.00	1949.12	47055348.

61.25	1685.80	48691767.
61.50	1234.92	50005384.
61.75	679.47	50866860.
62.00	436.94	51369244.
62.25	344.03	51720680.
62.50	310.47	52015208.
62.75	297.48	52288784.
63.00	292.25	52554164.
63.25	290.66	52816472.
63.50	290.67	53078068.
63.75	290.68	53339676.
64.00	290.69	53601296.
64.25	290.70	53862924.
64.50	290.71	54124560.
64.75	290.73	54386208.
65.00	290.74	54647968.
65.25	290.75	54909536.
65.50	290.76	55171212.
65.75	290.77	55432896.
66.00	290.78	55694592.
66.25	290.79	55956300.
66.50	290.80	56218016.
66.75	290.81	56479740.
67.00	290.82	56741472.
67.25	290.83	57003212.
67.50	290.84	57264964.
67.75	290.85	57526724.
68.00	290.86	57788492.
68.25	290.87	58050268.
68.50	290.87	58312052.
68.75	290.88	58573844.
69.00	290.90	58835644.
69.25	290.90	59097456.
69.50	290.91	59359272.
69.75	290.92	59621096.
70.00	290.93	59882928.
70.25	290.93	60144768.
70.50	290.94	60406612.
70.75	290.96	60668468.
71.00	290.96	60930332.
71.25	290.97	61192200.
71.50	290.98	61454076.
71.75	290.99	61715960.
72.00	290.99	61977852.
72.25	291.00	62239748.
72.50	208.73	62464628.
72.75	86.92	62597668.
73.00	33.41	62651816.
73.25	12.62	62672532.
73.50	4.69	62680324.
73.75	1.62	62683164.
74.00	0.38	62684064.

* INPUT DATA * NO TRANSMITTED HYDROGRAPH IS CONSIDERED
 ***** THE LAST GENERATED HYDROGRAPH IS THE INFLOW HYDROGRAPH

INPUT DATA *

DO NOT GENERATE A STAGE-STORAGE CURVE

WATER ELEVATION MAINTAINED IN THE BASIN = 17.30 FT

RAINFALL FOR 100-YEAR, 24-HOUR = 13.00 INCHES

MINIMUM FLOOR ELEVATION = 25.00 FT

STAGE (FT)	STORAGE (ACRE-FT)
16.90	0.00
17.95	462.00
18.65	775.00
19.17	1010.20
19.52	1165.90
20.40	1575.00
22.15	2373.00

* INPUT DATA *

NO INFILTRATION IN THE LAKE IS CONSIDERED

* CONTROL SECTION NO. 1 CHARACTERISTICS *
CONTROL SECTION IA A WEIR
WEIR LENGTH = 18.00 FEET
TOTAL AREA CORRESPONDING TO THIS WEIR = 1041.00 ACRES
LAKE AREA INSIDE GOLF AREA CORRESPONDING TO THIS WEIR = 440.00 ACRES
LAKE AREA CORRESPONDING TO THIS WEIR = 440.00 ACRES
ALLOWABLE DISCHARGE = 130.00 CFS
WEIR CREST ELEVATION = 17.30 FEET
THE WEIR HAS A RECTANGULAR BLEEDER
BLEEDER INVERT = 16.00 FEET
WIDTH OF BLEEDER = 0.50 FEET
TAILWATER IS CONSTANT
TAILWATER ELEVATION = 16.00 FEET

* OUTPUT *

STAGE-DISCHARGE CURVE

STAGE (FEET)	DISCHARGE (CFS)	CONTROL
16.90	0.00	NONE
18.35	65.00	WEIR
18.97	130.00	WEIR
19.50	195.00	WEIR
19.96	260.00	WEIR
20.39	325.00	WEIR
20.79	390.00	WEIR
21.17	455.00	WEIR
21.54	520.00	WEIR
21.88	585.00	WEIR
22.22	650.00	WEIR
22.54	715.00	WEIR
22.85	780.00	WEIR
23.16	845.00	WEIR
23.46	910.00	WEIR
23.75	975.00	WEIR
24.03	1040.00	WEIR
24.31	1105.00	WEIR
24.58	1170.00	WEIR
24.85	1235.00	WEIR
25.11	1300.00	WEIR

THE ROUTING EXTENSION OF 48.00 HOURS HAS BEEN REDUCED TO THE MAXIMUM ALLOWABLE
THE TOTAL ROUTING TIME WILL BE ONLY 118.50 HOURS

* INPUT DATA * TIME STEP FOR ROUTING = 0.25 HOUR
***** TIME STEP FOR PRINTED HYDROGRAM COORDINATES = 0.25 HOURS

OUTPUT *

*WORKING TABLE COORDINATES *

ELEVATION	DISCHARGE	STORAGE	WORKING VALUE
(FEET)	(CFS)	(ACRE-FT)	(CFS)
16.90	0.00	0.00	0.00
17.44	24.21	237.60	11511.95
17.98	48.42	475.41	23034.24
18.52	82.72	716.87	34737.95
19.06	140.69	960.45	46555.93
19.60	209.30	1203.09	58334.25
20.14	286.60	1454.13	70523.16
20.68	371.39	1702.68	82595.42
21.22	463.18	1948.92	94559.32
21.76	561.91	2195.16	*****
22.30	666.57	24.63	1525.29
22.84	776.97	24.62	1580.06
23.38	893.15	24.61	1637.72
23.92	1014.50	24.60	1697.96
24.46	1140.87	24.59	1760.71
25.00	1272.10	24.58	1825.88

ROUTING TABLE

TIME (HOUR)	INSTANTANEOUS INFLOW (CFS)	AVERAGE INFLOW (CFS)	WORKING VALUE (CFS)	ROUTED HYDROGRAPH (CFS)	MASS DIAGRAM OF ROUTED HY. (CFS)	WATER ELEVATION IN THE LAKE FT	MASS DIAGRAM OF INFILTRAT. (CF)
0.00	0.00	0.00	0.0	0.00	0.	16.92020	0.
0.25	0.00	0.00	0.0	0.00	0.	16.92020	0.
0.50	0.00	0.00	0.0	0.00	0.	16.92020	0.
0.75	0.00	0.00	0.0	0.00	0.	16.92020	0.
1.00	0.00	0.00	0.0	0.00	0.	16.92020	0.
1.25	0.00	0.00	0.0	0.00	0.	16.92020	0.
1.50	0.00	0.00	0.0	0.00	0.	16.92020	0.
1.75	0.00	0.00	0.0	0.00	0.	16.92020	0.
2.00	0.00	0.00	0.0	0.00	0.	16.92020	0.
2.25	0.00	0.00	0.0	0.00	0.	16.92020	0.
2.50	0.00	0.00	0.0	0.00	0.	16.92020	0.
2.75	0.00	0.00	0.0	0.00	0.	16.92020	0.
3.00	0.00	0.00	0.0	0.00	0.	16.92020	0.
3.25	0.36	0.18	0.2	0.00	0.	16.92021	0.
3.50	1.72	1.04	1.2	0.00	2.	16.92026	0.
3.75	3.93	2.83	4.0	0.01	5.	16.92019	0.
4.00	6.43	5.18	6.2	0.02	19.	16.92043	0.
4.25	8.96	7.70	16.9	0.04	44.	16.92079	0.
4.50	11.42	10.19	27.1	0.06	85.	16.92127	0.
4.75	13.79	12.62	39.6	0.08	143.	16.92186	0.
5.00	16.04	14.91	54.4	0.11	237.	16.92255	0.
5.25	18.22	17.12	71.4	0.15	357.	16.92335	0.
5.50	20.25	19.22	90.5	0.19	510.	16.92425	0.
5.75	22.21	21.23	111.5	0.23	701.	16.92523	0.
6.00	24.07	23.14	134.5	0.28	934.	16.92631	0.
6.25	25.86	24.97	159.1	0.33	1212.	16.92746	0.
6.50	27.56	26.71	185.5	0.39	1578.	16.92870	0.
6.75	29.20	28.38	213.5	0.45	1915.	16.91002	0.
7.00	30.76	29.98	243.0	0.51	2347.	16.91140	0.
7.25	32.25	31.50	274.0	0.56	2837.	16.91285	0.
7.50	33.69	32.97	306.4	0.64	3396.	16.91437	0.
7.75	35.06	34.37	340.1	0.72	3999.	16.91595	0.
8.00	36.38	35.72	375.1	0.79	4675.	16.91760	0.
8.25	37.64	37.01	411.4	0.87	5419.	16.91930	0.
8.50	38.86	38.25	448.9	0.94	6233.	16.92105	0.
8.75	40.03	39.45	487.3	1.02	7119.	16.92286	0.
9.00	41.15	40.59	526.8	1.11	8079.	16.92471	0.
9.25	42.23	41.69	567.4	1.19	9114.	16.92661	0.
9.50	43.27	42.75	609.0	1.28	10227.	16.92857	0.
9.75	44.28	43.78	651.5	1.37	11420.	16.93056	0.
10.00	45.24	44.76	694.9	1.46	12694.	16.93259	0.
10.25	46.17	45.71	739.1	1.55	14051.	16.93467	0.
10.50	47.07	46.62	784.2	1.65	15493.	16.93678	0.
10.75	47.94	47.50	830.0	1.75	17021.	16.93893	0.
11.00	48.77	48.35	876.6	1.84	18636.	16.94112	0.
11.25	49.58	49.17	924.0	1.94	20340.	16.94334	0.
11.50	50.36	49.97	972.2	2.04	22134.	16.94559	0.
11.75	51.11	50.73	1020.7	2.15	24020.	16.94788	0.
12.00	51.84	51.47	1070.0	2.25	25998.	16.95019	0.
12.25	52.54	52.19	1119.9	2.36	28071.	16.95253	0.
12.50	53.22	52.88	1170.5	2.46	30238.	16.95490	0.
12.75	53.86	53.55	1221.6	2.57	32502.	16.95730	0.
13.00	54.52	54.20	1273.2	2.68	34863.	16.95972	0.
13.25	55.14	54.83	1325.3	2.79	37322.	16.96217	0.
13.50	55.73	55.44	1378.0	2.90	39880.	16.96464	0.
13.75	56.31	56.02	1431.1	3.01	42539.	16.96713	0.
14.00	56.88	56.60	1484.7	3.12	45296.	16.96964	0.
14.25	57.42	57.15	1538.7	3.24	48159.	16.97219	0.

14.50	57.95	57.69	1593.2	3.35	51123.	16.97473	?
14.75	58.46	58.21	1648.0	3.47	54151.	16.97730	?
15.00	58.96	58.71	1703.3	3.58	57362.	16.97990	?
15.25	59.44	59.20	1758.9	3.70	60639.	16.98251	?
15.50	59.91	59.68	1814.9	3.82	64021.	16.98513	?
15.75	60.37	60.14	1871.2	3.94	67509.	16.98777	?
16.00	60.81	60.59	1927.9	4.05	71104.	16.99043	?
16.25	61.24	61.03	1984.8	4.17	74807.	16.99310	?
16.50	61.66	61.45	2042.1	4.29	78619.	16.99579	?
16.75	62.07	61.87	2099.7	4.42	82579.	16.99849	?
17.00	62.47	62.27	2157.5	4.54	86566.	17.00121	?
17.25	62.85	62.66	2215.7	4.66	90705.	17.00393	?
17.50	63.23	63.04	2274.2	4.78	94954.	17.00667	?
17.75	63.59	63.41	2332.7	4.91	99313.	17.00942	?
18.00	63.95	63.77	2391.5	5.03	103794.	17.01218	?
18.25	64.29	64.12	2450.6	5.15	108367.	17.01495	?
18.50	64.63	64.46	2509.9	5.28	113061.	17.01773	?
18.75	64.96	64.80	2569.4	5.40	117868.	17.02053	?
19.00	65.29	65.12	2629.2	5.53	122789.	17.02333	?
19.25	65.59	65.44	2689.1	5.66	127821.	17.02614	?
19.50	65.90	65.75	2749.2	5.78	132967.	17.02896	?
19.75	66.19	66.05	2809.4	5.91	138228.	17.03178	?
20.00	66.48	66.34	2869.9	6.04	143602.	17.03462	?
20.25	66.77	66.63	2930.4	6.16	149091.	17.03746	?
20.50	67.04	66.90	2991.2	6.29	154695.	17.04031	?
20.75	67.31	67.18	3052.1	6.42	160414.	17.04317	?
21.00	67.57	67.44	3113.1	6.55	166249.	17.04603	?
21.25	67.83	67.70	3174.3	6.68	172199.	17.04890	?
21.50	68.08	67.96	3235.5	6.80	178265.	17.05177	?
21.75	68.33	68.20	3296.9	6.93	184447.	17.05465	?
22.00	68.57	68.45	3358.5	7.06	190745.	17.05754	?
22.25	68.82	68.68	3420.1	7.19	197160.	17.06043	?
22.50	69.03	68.91	3481.8	7.32	203692.	17.06332	?
22.75	69.25	69.14	3543.6	7.45	210340.	17.06622	?
23.00	69.47	69.36	3605.5	7.58	217106.	17.06913	?
23.25	69.68	69.58	3667.5	7.71	223929.	17.07203	?
23.50	69.89	69.79	3729.6	7.84	230989.	17.07495	?
23.75	70.09	69.99	3791.7	7.97	238107.	17.07786	?
24.00	70.29	70.19	3853.9	8.10	245343.	17.08078	?
24.25	70.49	70.39	3916.2	8.24	252696.	17.08370	?
24.50	70.69	70.59	3983.2	8.38	260172.	17.08664	?
24.75	70.89	70.79	4051.7	8.54	267785.	17.08952	?
25.00	71.09	70.99	4120.1	8.73	275556.	17.09247	?
25.25	71.29	71.19	4189.5	8.92	283499.	17.09542	?
25.50	71.49	71.39	4259.3	9.12	291519.	17.09835	?
25.75	71.69	71.59	4329.5	9.32	299918.	17.10129	?
26.00	71.89	71.79	4399.2	9.52	308398.	17.10424	?
26.25	72.09	71.99	4469.4	9.72	317059.	17.10719	?
26.50	72.29	72.19	4539.2	9.93	325902.	17.11014	?
26.75	72.49	72.39	4609.2	10.13	334927.	17.11309	?
27.00	72.69	72.59	4679.4	10.33	344133.	17.11604	?
27.25	72.89	72.79	4749.7	10.53	353522.	17.11899	?
27.50	73.09	72.99	4819.2	10.74	363094.	17.12194	?
27.75	73.29	73.19	4889.7	10.94	372848.	17.12489	?
28.00	73.49	73.39	4959.2	11.14	382764.	17.12784	?
28.25	73.69	73.59	5029.9	11.35	392804.	17.13079	?
28.50	73.89	73.79	5099.2	11.55	402908.	17.13374	?
28.75	74.09	73.99	5169.7	11.75	413092.	17.13669	?
29.00	74.29	74.19	5239.2	11.96	423361.	17.13964	?
29.25	74.49	74.39	5309.7	12.16	433713.	17.14259	?
29.50	74.69	74.59	5379.2	12.36	444133.	17.14554	?
29.75	74.89	74.79	5449.7	12.57	454619.	17.14849	?
30.00	75.09	74.99	5519.2	12.77	465169.	17.15144	?

30.25	109.80	109.77	6168.6	12.97	489454.	17.19947	0.
30.50	110.01	109.91	6266.5	17.18	492223.	17.19395	0.
30.75	112.22	110.12	6363.4	13.30	504176.	17.19950	0.
31.00	112.42	110.32	6460.4	13.50	516311.	17.22334	0.
31.25	110.61	110.51	6557.3	13.79	528631.	17.22759	0.
31.50	110.80	110.71	6654.2	13.99	541134.	17.21214	0.
31.75	110.99	110.90	6751.1	14.20	553970.	17.21668	0.
32.00	111.17	111.08	6848.0	14.40	566690.	17.22122	0.
32.25	111.34	111.25	6944.9	14.61	579743.	17.22577	0.
32.50	111.52	111.43	7041.7	14.81	592879.	17.23031	0.
32.75	111.68	111.60	7138.5	15.01	606398.	17.23485	0.
33.00	111.85	111.77	7235.2	15.22	620001.	17.23939	0.
33.25	112.01	111.93	7331.9	15.42	633787.	17.24393	0.
33.50	112.17	112.09	7428.6	15.62	647755.	17.24846	0.
33.75	112.32	112.24	7525.2	15.83	661907.	17.25299	0.
34.00	112.47	112.39	7621.8	16.03	676242.	17.25752	0.
34.25	112.61	112.54	7718.3	16.23	690759.	17.26205	0.
34.50	112.76	112.69	7814.8	16.43	705459.	17.26657	0.
34.75	112.90	112.83	7911.2	16.64	720341.	17.27110	0.
35.00	113.04	112.97	8007.5	16.84	735406.	17.27561	0.
35.25	113.17	113.10	8103.7	17.04	750653.	17.28013	0.
35.50	113.30	113.24	8199.9	17.24	766082.	17.28464	0.
35.75	113.43	113.37	8296.1	17.45	781693.	17.28915	0.
36.00	113.56	113.49	8392.1	17.65	797486.	17.29366	0.
36.25	113.68	113.62	8488.1	17.85	813461.	17.29816	0.
36.50	113.80	113.74	8584.0	18.05	829617.	17.30265	0.
36.75	113.92	113.86	8679.8	18.25	845955.	17.30715	0.
37.00	114.03	113.98	8775.5	18.46	862473.	17.31164	0.
37.25	114.15	114.09	8871.1	18.66	879173.	17.31613	0.
37.50	114.26	114.20	8966.7	18.86	896054.	17.32061	0.
37.75	114.37	114.31	9062.1	19.06	913116.	17.32509	0.
38.00	114.47	114.42	9157.5	19.26	930359.	17.32956	0.
38.25	114.58	114.53	9252.8	19.46	947781.	17.33403	0.
38.50	114.68	114.63	9347.9	19.66	965394.	17.33849	0.
38.75	114.78	114.73	9443.0	19.86	983167.	17.34295	0.
39.00	114.88	114.83	9538.0	20.06	1001130.	17.34740	0.
39.25	114.98	114.93	9632.8	20.26	1019272.	17.35186	0.
39.50	115.07	115.02	9727.6	20.46	1037594.	17.35630	0.
39.75	115.16	115.12	9822.3	20.66	1056095.	17.36074	0.
40.00	115.25	115.21	9916.9	20.86	1074775.	17.36518	0.
40.25	115.34	115.30	10011.3	21.05	1093635.	17.36961	0.
40.50	115.43	115.39	10105.6	21.25	1112672.	17.37403	0.
40.75	115.52	115.47	10199.8	21.45	1131888.	17.37845	0.
41.00	115.60	115.56	10293.9	21.65	1151283.	17.38287	0.
41.25	115.68	115.64	10387.9	21.85	1170855.	17.38727	0.
41.50	115.77	115.73	10481.8	22.04	1190605.	17.39166	0.
41.75	115.85	115.81	10575.6	22.24	1210533.	17.39608	0.
42.00	115.93	115.89	10669.2	22.44	1230638.	17.40047	0.
42.25	116.00	115.96	10762.7	22.63	1250921.	17.40486	0.
42.50	116.08	116.04	10856.1	22.83	1271380.	17.40924	0.
42.75	116.15	116.11	10949.4	23.03	1292016.	17.41361	0.
43.00	116.27	116.19	11042.6	23.22	1312828.	17.41798	0.
43.25	116.30	116.26	11135.6	23.42	1333813.	17.42235	0.
43.50	116.37	116.33	11228.5	23.61	1354981.	17.42671	0.
43.75	116.44	116.40	11321.3	23.81	1376321.	17.43106	0.
44.00	116.50	116.47	11414.0	24.00	1397837.	17.43541	0.
44.25	116.57	116.54	11506.5	24.20	1419529.	17.43975	0.
44.50	116.64	116.60	11598.9	24.39	1441394.	17.44408	0.
44.75	116.70	116.67	11691.2	24.59	1463435.	17.44840	0.
45.00	116.77	116.73	11783.4	24.78	1485650.	17.45272	0.
45.25	116.83	116.80	11875.4	24.97	1508039.	17.45703	0.
45.50	116.89	116.86	11967.7	25.17	1530602.	17.46134	0.
45.75	116.95	116.92	12059.0	25.36	1553338.	17.46564	0.

46.02	117.01	116.99	12152.6	25.55	1576248.	17.46993	0.
46.25	117.07	117.04	12242.1	25.74	1599331.	17.47422	0.
46.50	117.13	117.10	12333.5	25.94	1622547.	17.47852	0.
46.75	117.18	117.15	12424.7	26.13	1646016.	17.48278	0.
47.00	117.24	117.21	12515.8	26.32	1669617.	17.48705	0.
47.25	117.29	117.27	12606.7	26.51	1693300.	17.49131	0.
47.50	117.35	117.32	12697.5	26.70	1717335.	17.49556	0.
47.75	117.40	117.37	12788.2	26.89	1741452.	17.49981	0.
48.00	117.45	117.43	12878.7	27.08	1765739.	17.50406	0.
48.25	117.50	117.48	12969.1	27.27	1790199.	17.50829	0.
48.50	164.13	140.92	13062.7	27.51	1814850.	17.51361	0.
48.75	233.20	198.67	13253.8	27.87	1839771.	17.52154	0.
49.00	263.70	248.45	13474.4	28.33	1865062.	17.53197	0.
49.25	275.71	269.70	13715.8	28.84	1890790.	17.54329	0.
49.50	280.45	278.08	13965.0	29.36	1916982.	17.55497	0.
49.75	282.43	281.44	14217.1	29.89	1943648.	17.56679	0.
50.00	283.77	282.90	14470.1	30.43	1970792.	17.57864	0.
50.25	283.82	283.60	14723.3	30.96	1998414.	17.59050	0.
50.50	284.04	283.93	14976.2	31.49	2026515.	17.60236	0.
50.75	284.26	284.15	15228.9	32.02	2055093.	17.61420	0.
51.00	284.47	284.36	15481.3	32.55	2084150.	17.62602	0.
51.25	284.67	284.57	15733.3	33.08	2113682.	17.63784	0.
51.50	284.87	284.77	15985.0	33.61	2143692.	17.64963	0.
51.75	285.06	284.96	16236.3	34.14	2174177.	17.66141	0.
52.00	285.24	285.15	16487.3	34.66	2205137.	17.67317	0.
52.25	285.42	285.32	16738.0	35.19	2236572.	17.68492	0.
52.50	285.59	285.50	16988.3	35.72	2268480.	17.69665	0.
52.75	285.76	285.67	17238.3	36.24	2300861.	17.70837	0.
53.00	285.92	285.84	17487.9	36.77	2333714.	17.72007	0.
53.25	286.07	286.00	17737.1	37.29	2367039.	17.73174	0.
53.50	286.23	286.15	17985.9	37.81	2400835.	17.74341	0.
53.75	286.37	286.30	18234.4	38.33	2435101.	17.75505	0.
54.00	286.52	286.44	18482.5	38.86	2469837.	17.76669	0.
54.25	286.66	286.59	18730.3	39.38	2505041.	17.77829	0.
54.50	286.79	286.72	18977.6	39.90	2540714.	17.78988	0.
54.75	286.92	286.86	19224.6	40.42	2576854.	17.80146	0.
55.00	287.05	286.99	19471.2	40.93	2613461.	17.81301	0.
55.25	287.17	287.11	19717.3	41.45	2650533.	17.82455	0.
55.50	287.29	287.23	19963.1	41.97	2688071.	17.83607	0.
55.75	287.41	287.35	20208.5	42.49	2726073.	17.84757	0.
56.00	287.52	287.47	20453.5	43.00	2764539.	17.85905	0.
56.25	287.63	287.58	20698.1	43.51	2803468.	17.87051	0.
56.50	287.74	287.69	20942.2	44.02	2842858.	17.88196	0.
56.75	287.85	287.80	21186.0	44.54	2882710.	17.89338	0.
57.00	287.95	287.90	21429.4	45.05	2923023.	17.90479	0.
57.25	288.05	288.00	21672.3	45.56	2963796.	17.91617	0.
57.50	288.15	288.10	21914.9	46.07	3005027.	17.92754	0.
57.75	288.24	288.19	22157.0	46.58	3046717.	17.93889	0.
58.00	288.33	288.28	22398.7	47.08	3088854.	17.95021	0.
58.25	288.42	288.38	22640.0	47.59	3131468.	17.96152	0.
58.50	421.49	354.96	22897.4	48.24	3174591.	17.97593	0.
58.75	618.62	520.84	23419.2	48.55	3218594.	18.00517	0.
59.00	705.49	662.04	24031.7	51.34	3263995.	18.04521	0.
59.25	739.55	722.52	24702.8	53.31	3311099.	18.08909	0.
59.50	2226.75	1383.15	26032.7	57.21	3360922.	18.17603	0.
59.75	3922.45	2974.60	28950.1	65.76	3416153.	18.35711	0.
60.00	4762.34	4742.40	33226.7	78.29	3490951.	18.47747	0.
62.25	5094.23	4938.28	38276.7	99.10	3567805.	18.67724	0.
62.50	4154.96	4624.60	42602.2	121.30	3659987.	18.89037	0.
60.75	2623.47	3380.22	45870.1	137.33	3776368.	19.03292	0.
61.00	1949.12	2286.32	49219.1	149.21	3905310.	19.12862	0.
61.25	1685.80	1817.46	49687.3	158.92	4043975.	19.20686	0.
61.50	1234.92	1460.36	50988.8	166.51	4190423.	19.26789	0.

61.75	679.47	557.19	51779.5	171.12	4342356.	19.37497	0.
62.00	436.94	553.22	52166.5	173.37	4457376.	19.32317	0.
62.25	344.03	790.49	52783.7	174.64	4653950.	19.33331	0.
62.50	310.47	727.25	52536.3	175.53	4811553.	19.34047	0.
62.75	297.49	703.97	52664.7	176.37	4969892.	19.34649	0.
63.00	292.25	294.86	52783.3	176.96	5129519.	19.35205	0.
63.25	290.66	291.45	52897.8	177.32	5299397.	19.35742	0.
63.50	290.67	292.66	53010.9	178.29	5449552.	19.36272	0.
63.75	290.68	290.67	53123.2	178.94	5609307.	19.36799	0.
64.00	290.69	290.69	53235.0	179.60	5770650.	19.37323	0.
64.25	290.70	290.70	53346.1	180.24	5932577.	19.37844	0.
64.50	290.71	290.71	53456.5	180.99	6095085.	19.38362	0.
64.75	290.73	290.72	53566.4	181.53	6258170.	19.38877	0.
65.00	290.74	290.73	53675.6	182.16	6421829.	19.39389	0.
65.25	290.75	290.74	53784.1	182.79	6586059.	19.39899	0.
65.50	290.76	290.75	53892.1	183.42	6750857.	19.40405	0.
65.75	290.77	290.76	53999.4	184.25	6916219.	19.40908	0.
66.00	290.79	290.77	54106.2	184.67	7082143.	19.41409	0.
66.25	290.79	290.78	54212.3	185.29	7248624.	19.41907	0.
66.50	290.80	290.80	54317.8	185.90	7415660.	19.42401	0.
66.75	290.91	290.91	54422.7	186.51	7583247.	19.42893	0.
67.00	290.92	290.91	54527.0	187.12	7751383.	19.43382	0.
67.25	290.93	290.92	54630.7	187.73	7920064.	19.43869	0.
67.50	290.94	290.93	54733.8	188.33	8089287.	19.44352	0.
67.75	290.95	290.94	54836.3	188.92	8259049.	19.44833	0.
68.00	290.96	290.95	54938.3	189.52	8429347.	19.45311	0.
68.25	290.97	290.96	55039.6	190.11	8600178.	19.45786	0.
68.50	290.97	290.97	55140.4	190.69	8771539.	19.46259	0.
68.75	290.98	290.98	55240.6	191.28	8943426.	19.46729	0.
69.00	290.99	290.99	55340.2	191.86	9115837.	19.47196	0.
69.25	290.99	290.99	55439.2	192.43	9288769.	19.47661	0.
69.50	290.91	290.91	55537.7	193.01	9452219.	19.48122	0.
69.75	290.92	290.91	55635.6	193.58	9636193.	19.48582	0.
70.00	290.93	290.92	55732.9	194.15	9810659.	19.49038	0.
70.25	290.93	290.93	55829.7	194.71	9985644.	19.49492	0.
70.50	290.94	290.94	55925.9	195.27	10161135.	19.49920	0.
70.75	290.96	290.95	56021.6	195.83	10337129.	19.50320	0.
71.00	290.96	290.96	56116.8	196.38	10513623.	19.50718	0.
71.25	290.97	290.97	56211.3	196.93	10690614.	19.51114	0.
71.50	290.98	290.97	56305.4	197.48	10868100.	19.51508	0.
71.75	290.99	290.99	56398.9	198.03	11046077.	19.51899	0.
72.00	290.99	290.99	56491.9	198.57	11224543.	19.52288	0.
72.25	291.00	291.00	56584.3	199.10	11403495.	19.52675	0.
72.50	290.73	249.86	56675.0	199.40	11582823.	19.52868	0.
72.75	86.92	147.82	56583.5	199.10	11762148.	19.52672	0.
73.00	33.41	60.16	56444.5	199.29	11940974.	19.52090	0.
73.25	12.62	23.02	56269.3	197.27	12118976.	19.51357	0.
73.50	4.69	9.66	56080.6	196.17	12296025.	19.50567	0.
73.75	1.62	3.15	55887.6	195.05	12472073.	19.49759	0.
74.00	0.39	1.00	55693.6	193.92	12647107.	19.48953	0.
74.25	0.00	0.19	55499.8	192.79	12821124.	19.47945	0.
74.50	0.00	0.00	55307.1	191.67	12994129.	19.47041	0.
74.75	0.00	0.00	55115.4	190.55	13166124.	19.46142	0.
75.00	0.00	0.00	54924.9	189.44	13337118.	19.45249	0.
75.25	0.00	0.00	54735.4	188.34	13507116.	19.44360	0.
75.50	0.00	0.00	54547.1	187.24	13676124.	19.43477	0.
75.75	0.00	0.00	54359.8	186.15	13844148.	19.42599	0.
76.00	0.00	0.00	54173.7	185.06	14011193.	19.41726	0.
76.25	0.00	0.00	53988.6	183.99	14177265.	19.40859	0.
76.50	0.00	0.00	53804.6	182.91	14342369.	19.39995	0.
76.75	0.00	0.00	53621.7	181.85	14506512.	19.39137	0.
77.00	0.00	0.00	53439.9	180.79	14669699.	19.38284	0.
77.25	0.00	0.00	53259.1	179.74	14831935.	19.37436	0.

77.50	0.00	0.00	53079.4	178.60	14993226.	19.76593	0.
77.75	0.00	0.00	52900.7	177.65	15153578.	19.35755	0.
78.00	0.00	0.00	52723.0	176.61	15312095.	19.34922	0.
78.25	0.00	0.00	52546.4	175.58	15471434.	19.34094	0.
78.50	0.00	0.00	52370.8	174.56	15629052.	19.33270	0.
78.75	0.00	0.00	52196.3	173.54	15785589.	19.32452	0.
79.00	0.00	0.00	52022.7	172.53	15941433.	19.31638	0.
79.25	0.00	0.00	51850.2	171.53	16096261.	19.30829	0.
79.50	0.00	0.00	51678.6	170.53	16251187.	19.30024	0.
79.75	0.00	0.00	51508.1	169.54	16403217.	19.29225	0.
80.00	0.00	0.00	51338.6	168.55	16555355.	19.28432	0.
80.25	0.00	0.00	51170.0	167.57	16706647.	19.27639	0.
80.50	0.00	0.00	51002.5	166.59	16858978.	19.26853	0.
80.75	0.00	0.00	50835.9	165.62	17026474.	19.26072	0.
81.00	0.00	0.00	50670.3	164.66	17155098.	19.25295	0.
81.25	0.00	0.00	50505.6	163.72	17302656.	19.24527	0.
81.50	0.00	0.00	50341.9	162.74	17449754.	19.23755	0.
81.75	0.00	0.00	50179.2	161.80	17595796.	19.22992	0.
82.00	0.00	0.00	50017.4	160.85	17740998.	19.22233	0.
82.25	0.00	0.00	49856.5	159.92	17885334.	19.21479	0.
82.50	0.00	0.00	49696.6	158.98	18028640.	19.20729	0.
82.75	0.00	0.00	49537.6	158.06	18171510.	19.19987	0.
83.00	0.00	0.00	49379.6	157.14	18313348.	19.19242	0.
83.25	0.00	0.00	49222.4	156.22	18454360.	19.18505	0.
83.50	0.00	0.00	49066.2	155.31	18594550.	19.17772	0.
83.75	0.00	0.00	48910.9	154.41	18733924.	19.17044	0.
84.00	0.00	0.00	48756.5	153.51	18872486.	19.16320	0.
84.25	0.00	0.00	48603.2	152.61	19012240.	19.15600	0.
84.50	0.00	0.00	48450.4	151.72	19147192.	19.14884	0.
84.75	0.00	0.00	48298.6	150.84	19289346.	19.14173	0.
85.00	0.00	0.00	48147.8	149.96	19418708.	19.13465	0.
85.25	0.00	0.00	47997.2	149.09	19553282.	19.12762	0.
85.50	0.00	0.00	47848.7	148.22	19687072.	19.12063	0.
85.75	0.00	0.00	47700.5	147.36	19820082.	19.11368	0.
86.00	0.00	0.00	47553.2	146.50	19952318.	19.10677	0.
86.25	0.00	0.00	47406.7	145.65	20083782.	19.09990	0.
86.50	0.00	0.00	47261.0	144.80	20214482.	19.09307	0.
86.75	0.00	0.00	47116.2	143.95	20344420.	19.08628	0.
87.00	0.00	0.00	46972.3	143.12	20473600.	19.07952	0.
87.25	0.00	0.00	46829.2	142.28	20602026.	19.07281	0.
87.50	0.00	0.00	46686.9	141.45	20729708.	19.06614	0.
87.75	0.00	0.00	46545.4	140.64	20856648.	19.05959	0.
88.00	0.00	0.00	46404.8	139.85	20982912.	19.05303	0.
88.25	0.00	0.00	46264.8	139.26	21108556.	19.04650	0.
88.50	0.00	0.00	46125.6	138.58	21233584.	19.04000	0.
88.75	0.00	0.00	45987.2	137.90	21358000.	19.03353	0.
89.00	0.00	0.00	45849.1	137.22	21481806.	19.02709	0.
89.25	0.00	0.00	45711.9	136.55	21605274.	19.02067	0.
89.50	0.00	0.00	45575.3	135.88	21727568.	19.01427	0.
89.75	0.00	0.00	45439.4	135.21	21849592.	19.00791	0.
90.00	0.00	0.00	45304.2	134.55	21970954.	19.00157	0.
90.25	0.00	0.00	45169.7	133.89	22091782.	19.00525	0.
90.50	0.00	0.00	45035.8	133.23	22211988.	19.00897	0.
90.75	0.00	0.00	44902.6	132.58	22331604.	19.00271	0.
91.00	0.00	0.00	44770.0	131.93	22450634.	19.00647	0.
91.25	0.00	0.00	44638.0	131.28	22569080.	19.00026	0.
91.50	0.00	0.00	44506.8	130.64	22686944.	18.99408	0.
91.75	0.00	0.00	44376.1	130.00	22804230.	18.98792	0.
92.00	0.00	0.00	44246.1	129.35	22920942.	18.98179	0.
92.25	0.00	0.00	44116.8	128.73	23037050.	18.97567	0.
92.50	0.00	0.00	43988.0	128.09	23152650.	18.96956	0.
92.75	0.00	0.00	43859.9	127.47	23267652.	18.96346	0.
93.00	0.00	0.00	43732.5	126.84	23382050.	18.95736	0.

93.25	0.00	0.00	43675.6	126.22	27495006.	19.93763	0.
93.50	0.00	0.00	43479.4	125.90	27609284.	19.93169	0.
93.75	0.00	0.00	43353.9	124.98	23722246.	19.92577	0.
94.00	0.00	0.00	43228.9	124.37	23834256.	19.91999	0.
94.25	0.00	0.00	43174.5	123.73	23945516.	19.91403	0.
94.50	0.00	0.00	42980.7	123.15	24257276.	19.90822	0.
94.75	0.00	0.00	42857.6	122.55	24167594.	19.90240	0.
95.00	0.00	0.00	42735.7	121.95	24277618.	19.89663	0.
95.25	0.00	0.00	42613.1	121.35	24387122.	19.89088	0.
95.50	0.00	0.00	42491.7	120.76	24496050.	19.88517	0.
95.75	0.00	0.00	42370.9	120.16	24604464.	19.87946	0.
96.00	0.00	0.00	42250.8	119.57	24712346.	19.87382	0.
96.25	0.00	0.00	42131.2	118.99	24819698.	19.86819	0.
96.50	0.00	0.00	42012.2	118.40	24926524.	19.86259	0.
96.75	0.00	0.00	41893.9	117.82	25032828.	19.85701	0.
97.00	0.00	0.00	41776.0	117.24	25138606.	19.85146	0.
97.25	0.00	0.00	41658.7	116.67	25243868.	19.84594	0.
97.50	0.00	0.00	41542.1	116.12	25348614.	19.84044	0.
97.75	0.00	0.00	41426.0	115.53	25452846.	19.83498	0.
98.00	0.00	0.00	41310.5	114.96	25556566.	19.82954	0.
98.25	0.00	0.00	41195.5	114.40	25659778.	19.82412	0.
98.50	0.00	0.00	41081.1	113.84	25762484.	19.81874	0.
98.75	0.00	0.00	40967.3	113.28	25864686.	19.81337	0.
99.00	0.00	0.00	40854.0	112.72	25966396.	19.80804	0.
99.25	0.00	0.00	40741.3	112.17	26067598.	19.80273	0.
99.50	0.00	0.00	40629.1	111.62	26168292.	19.79745	0.
99.75	0.00	0.00	40517.5	111.07	26268502.	19.79219	0.
100.00	0.00	0.00	40406.4	110.53	26368222.	19.78696	0.
100.25	0.00	0.00	40295.9	109.98	26467452.	19.78175	0.
100.50	0.00	0.00	40185.9	109.45	26566196.	19.77659	0.
100.75	0.00	0.00	40076.4	108.91	26664456.	19.77142	0.
101.00	0.00	0.00	39967.5	108.37	26762234.	19.76629	0.
101.25	0.00	0.00	39859.2	107.84	26859532.	19.76119	0.
101.50	0.00	0.00	39751.3	107.31	26956352.	19.75611	0.
101.75	0.00	0.00	39644.0	106.79	27052698.	19.75105	0.
102.00	0.00	0.00	39537.2	106.26	27148570.	19.74603	0.
102.25	0.00	0.00	39431.0	105.74	27243972.	19.74102	0.
102.50	0.00	0.00	39325.2	105.22	27338906.	19.73604	0.
102.75	0.00	0.00	39220.0	104.71	27433376.	19.73108	0.
103.00	0.00	0.00	39115.3	104.19	27527382.	19.72615	0.
103.25	0.00	0.00	39011.1	103.69	27620926.	19.72125	0.
103.50	0.00	0.00	38907.4	103.17	27714012.	19.71636	0.
103.75	0.00	0.00	38804.2	102.67	27806642.	19.71150	0.
104.00	0.00	0.00	38701.6	102.16	27898816.	19.70667	0.
104.25	0.00	0.00	38599.4	101.66	27990536.	19.70186	0.
104.50	0.00	0.00	38497.7	101.16	28081910.	19.69707	0.
104.75	0.00	0.00	38396.6	100.67	28172836.	19.69230	0.
105.00	0.00	0.00	38295.9	100.17	28263416.	19.68756	0.
105.25	0.00	0.00	38195.7	99.68	28353552.	19.68285	0.
105.50	0.00	0.00	38096.0	99.19	28442449.	19.67815	0.
105.75	0.00	0.00	37996.8	98.71	28531504.	19.67349	0.
106.00	0.00	0.00	37898.1	98.22	28620124.	19.66883	0.
106.25	0.00	0.00	37799.9	97.74	28708308.	19.66421	0.
106.50	0.00	0.00	37702.2	97.26	28796060.	19.65962	0.
106.75	0.00	0.00	37604.9	96.79	28883382.	19.65502	0.
107.00	0.00	0.00	37508.1	96.31	28970276.	19.65046	0.
107.25	0.00	0.00	37411.8	95.84	29056744.	19.64593	0.
107.50	0.00	0.00	37316.0	95.37	29142788.	19.64141	0.
107.75	0.00	0.00	37222.6	94.90	29228410.	19.63692	0.
108.00	0.00	0.00	37125.7	94.44	29313612.	19.63245	0.
108.25	0.00	0.00	37031.3	93.97	29398396.	19.62801	0.
108.50	0.00	0.00	36937.3	93.51	29482764.	19.62353	0.
108.75	0.00	0.00	36843.8	93.05	29566718.	19.61917	0.

109.00	0.00	0.00	36750.7	92.60	29650260.	18.61479	0.
109.25	0.00	0.00	36658.1	92.14	29733392.	18.61043	0.
109.50	0.00	0.00	36566.0	91.69	29816116.	18.60609	0.
109.75	0.00	0.00	36474.3	91.24	29898434.	18.60177	0.
110.00	0.00	0.00	36383.1	90.79	29980348.	18.59748	0.
110.25	0.00	0.00	36292.3	90.35	30061860.	18.59320	0.
110.50	0.00	0.00	36201.9	99.90	30142974.	18.58895	0.
110.75	0.00	0.00	36112.0	89.46	30223690.	18.58471	0.
111.00	0.00	0.00	36022.6	89.02	30304010.	18.58050	0.
111.25	0.00	0.00	35933.5	88.59	30383936.	18.57631	0.
111.50	0.00	0.00	35844.9	88.15	30463470.	18.57214	0.
111.75	0.00	0.00	35756.8	87.72	30542614.	18.56798	0.
112.00	0.00	0.00	35668.1	87.29	30621370.	18.56385	0.
112.25	0.00	0.00	35581.8	86.86	30699738.	18.55974	0.
112.50	0.00	0.00	35494.9	86.44	30777722.	18.55565	0.
112.75	0.00	0.00	35408.5	86.01	30855324.	18.55158	0.
113.00	0.00	0.00	35322.5	85.59	30932546.	18.54753	0.
113.25	0.00	0.00	35236.9	85.17	31009388.	18.54350	0.
113.50	0.00	0.00	35151.7	84.75	31085854.	18.53949	0.
113.75	0.00	0.00	35067.0	84.34	31161944.	18.53550	0.
114.00	0.00	0.00	34982.6	83.92	31237662.	18.53152	0.
114.25	0.00	0.00	34898.9	83.51	31313008.	18.52757	0.
114.50	0.00	0.00	34815.2	83.10	31387994.	18.52364	0.
114.75	0.00	0.00	34732.1	82.71	31462599.	18.51983	0.
115.00	0.00	0.00	34649.4	82.46	31536924.	18.51751	0.
115.25	0.00	0.00	34566.9	82.22	31611032.	18.51519	0.
115.50	0.00	0.00	34484.7	81.98	31684924.	18.51287	0.
115.75	0.00	0.00	34402.7	81.74	31758598.	18.51057	0.
116.00	0.00	0.00	34321.0	81.50	31832056.	18.50827	0.
116.25	0.00	0.00	34239.5	81.26	31905300.	18.50597	0.
116.50	0.00	0.00	34158.2	81.02	31978328.	18.50369	0.
116.75	0.00	0.00	34077.2	80.79	32051142.	18.50140	0.
117.00	0.00	0.00	33996.4	80.55	32123744.	18.49913	0.
117.25	0.00	0.00	33915.8	80.31	32196132.	18.49686	0.
117.50	0.00	0.00	33835.5	80.08	32268309.	18.49460	0.
117.75	0.00	0.00	33755.5	79.84	32340272.	18.49235	0.
118.00	0.00	0.00	33675.6	79.61	32412026.	18.49010	0.
118.25	0.00	0.00	33596.0	79.38	32483570.	18.48786	0.
118.50	0.00	0.00	33516.6	79.14	32554904.	18.48563	0.

MAXIMUM VOLUME STORED IN THE BASIN = ***** ACRF-FT
 MAXIMUM FLOW THROUGH THE CONTROL SECTION = 199.38 CFS
 TIME OF MAXIMUM FLOW = 72.52 HOUR

APPENDIX 10.6

EXISTING STATE PERMITS

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
APPLICATION TO CONSTRUCT/OPERATE AIR POLLUTANT EMISSION SOURCE

APIS

1. Type of Application					2. Source Identification/Jurisdiction					
Construction Init. Modif.	Operation Init. Renewal	Site Cert.	Amend- ment		District	Office	County	Facility	Source	
☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	
3. Facility Owner (Company Name) PALM BEACH COUNTY SOLID WASTE AUTH.					4. Facility Owner- ship Code U		5. Facility Name/Location 2900 FT. WEST FLORIDA TURNPIKE 2600 FT. NORTH 45th STREET			
6. City N/A		7. County PALM BEACH		8. Facility 33412		9. Facility Codes				
10. Facility Zone UTM Coordi- nates (km)		East 17 585.8		North 2960.2		11. Facility Lat./Long. (°, ', ")		Latitude 26° 46' 05"		
12. Authorized Agent (Address and Telephone)		Name S. G. TIMMERMAN		Title ASSOCIATE		Organization/Firm HAYDEN-WEGMAN, INC.				
Street or P.O. Box 5114 OKEECHOBEE BLVD. 2-B					City W. PALM BEACH		St. FL		Zip 33409, Telephone 305-471-0444	
13. STATEMENT BY OWNER OR AUTHORIZED AGENT I, the undersigned, am the owner or authorized representative* of the facility described above. I certify that the statements made in this application for a permit are true, correct, and complete to the best of my knowledge and belief. Further, I agree to operate and maintain the air pollution source and pollution control equipment described in this application so as to comply with all provisions of Chapter 403, Florida Statutes, and all applicable rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable, and I will promptly notify the department upon sale or legal transfer of the permitted source. *Attach letter of authorization *Signed: <u>Samuel L. Hunt</u> *Date: <u>April 25, 1985</u>										
14. Prof. Engi- neer (Address and Telephone)		Name GEORGE E. CRANSTON		Fla. Regis. No. 21733		Organization/Firm HAYDEN-WEGMAN, INC.				
Street or P.O. Box 330 W. 42nd STREET					City NEW YORK		St. NY		Zip 10036 Telephone 212-563-6900	
15. STATEMENT BY PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.) I, the undersigned, certify that the engineering features of this project have been designed or examined by me and found to be in conformity with modern engineering principles applicable to the control of emissions of the air pollutants characterized in this permit application. There is reasonable assurance, in my professional judgment, that the air pollution source and the pollution control equipment, when properly operated and maintained, will comply with all applicable statutes of the State of Florida and all applicable rules and regulations of the department. Signed: <u>George E. Cranston</u> Date: <u>4-24-85</u> (Affix Seal)										
16. Facility Comment										

17. Permit Application Processing Information	Fee Paid	Permit/PPS Number Assigned This App.	Date Comp. YY/MM/DD	Date issued YY/MM/DD	Date Exp. YY/MM/DD	AGR Req.	
18. Description of Source Addressed in This Application			19. Current DER Permit No.				
250 FT. HIGH STACK FOR 2-350 MILLION BTU/HR REFUSE DERIVED FUEL FIRED BOILERS			No. N/A				
			20. Init. Const. Date - YY/MM/DD 87/00/00				
21. Date(s) and Description(s) of Any Previous Modification(s) to Source N/A							
22. Nature and Extent of Proposed Project PROJECT IS A SOLID WASTE RESOURCE RECOVERY FACILITY WHICH SHALL GENERATE ELECTRIC POWER FROM COMBUSTION OF REFUSE DERIVED FUEL AND RECOVER RECYCLABLE MATERIALS. THE POLLUTION CONTROL SHALL BE A FOUR FIELD ELECTROSTATIC PRECIPITATOR AND SHALL MEET BACT FOR ALL APPLICABLE POLLUTANTS.							
23. Projected Dates of Initiation and Completion of Construction 87/00/00 - 89/00/00							
24. Source Codes	SIC	Type	25. Source Regs.	NSPS	NESHAP	111(d) PSD NAA NSR RACT	
26. Boiler Data	Type	SPREADER STOKER	Design Heat Input Rate (10 ⁶ Btu/hr)	2 UNITS 350 EACH	27. Generator Design Output (gross MW)	50	
28. Pct. fuel for space heat							
29. Incinerator Data	Type	Design Capacity (tpd)	Type of Waste	Dwell Time (sec.)	After-burner Temp. °F		
30. Liq. Storage Tank Data	Type	Capacity (10 ³ bbl)	Product	Condition			
31. Normal Operating Schedule	hr/dy	dy/wk	wk/yr	32. Normal % Operation By Season	DJF	MAM JJA SON	
	24	7	50		25	25 25 25	
33. Re-quested Limit(s)	hr/dy	dy/wk	wk/yr	hr/yr	34. Allow-able Oper. Limit(s)	hr/dy dy/wk wk/yr hr/yr	
	24	7	52	8760			
35. Emission Point	36. Stack Ht. (ft.)	37. Exit Diam. (ft.)	38. Exit Temp. (°F)	39. Water Vapor (%)	40. Actual Volumetric Flow Rate (acfm)	41. Dry Standard Flow Rate (dscfm)	42. Plume Ht. (ft.)
Type ID on Diagram							
3	250	6.69 EACH	450	8% BY WEIGHT	172,377 EACH	88,650	0
43. Bldg. Dimensions (ft.)	Ht. 120	Width 110	44. Point UTM Coordinates	East North	45. Source Numbers with Common Stack		
46. Source Comment							

47. Description of Process

SPREADER STOKER FURNACES (2) FIRED WITH REFUSE DERIVED FUEL
MANUFACTURED FROM MUNICIPAL SOLID WASTE.

48a. Component 'a'

Process or Fuel

Type Employed

49a. Source Classification Code for Process/Fuel Type 'a'	50a. Process/Fuel Usage Rates					51a. Fuel Characteristics		
	Max. Hourly	Est. Annual	Requested Ann. Limit	Annual Limit	Unit Code	S (%)	Ash (%)	10 ⁶ Btu/Unit (As Fired)
	58.3 TONS	438,000 TONS	-		99 (RDF)	0.22	13.62	12.328 x 10 ⁶ TON RDF

52a. SCC Comment for Process/Fuel 'a'

48b. Component 'b'

Process or Fuel

Type Employed

49b. Source Classification Code for Process/Fuel Type 'b'	50b. Process/Fuel Usage Rates					51b. Fuel Characteristics		
	Max. Hourly	Est. Annual	Requested Ann. Limit	Annual Limit	Unit Code	S (%)	Ash (%)	10 ⁶ Btu/Unit (As Fired)

52b. SCC Comment for Process/Fuel 'b'

48c. Component 'c'

Process or Fuel

Type Employed

49c. Source Classification Code for Process/Fuel Type 'c'	50c. Process/Fuel Usage Rates					51c. Fuel Characteristics		
	Max. Hourly	Est. Annual	Requested Ann. Limit	Annual Limit	Unit Code	S (%)	Ash (%)	10 ⁶ Btu/Unit (As Fired)

52c. SCC Comment for Process/Fuel 'c'

48d. Component 'd'

Process or Fuel

Type Employed

49d. Source Classification Code for Process/Fuel Type 'd'	50d. Process/Fuel Usage Rates					51d. Fuel Characteristics		
	Max. Hourly	Est. Annual	Requested Ann. Limit	Annual Limit	Unit Code	S (%)	Ash (%)	10 ⁶ Btu/Unit (As Fired)

52d. SCC Comment for Process/Fuel 'd'

53. Description of Control Equipment										
FOUR FIELD ELECTROSTATIC PRECIPITATOR (SUPPLIER NOT SELECTED)										
54. Liquid/Solid Wastes Generated by Control Equipment and Methods/Locations of Disposal										
FLY ASH WILL BE QUENCHED WITH BOTTOM ASH; DEWATERED AND DISPOSED IN CLASS 1 LANDFILL										
55a. Pol- lutant 'a' Emitted	56a. Type Control Equipment		57a. Effi- ciency	58a. Maximum Emissions - Normal Cond.		59a. Emi. Meth.	60a. Re- quested Emi. Limit	61a. Allowable Emission	62a. Po- tential Emission	63a. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
PM	010		99	38	166	2				
64a. Requested Limit in Units Other Than lb/hr				0.03 GRAINS/DSCF @ 12% CO ₂				65a. Allowable Emission in Units Other Than lb/hr		66a. Reg. Code
55b. Pol- lutant 'b' Emitted	56b. Type Control Equipment		57b. Effi- ciency	58b. Maximum Emissions - Normal Cond.		59b. Emi. Meth.	60b. Re- quested Emi. Limit	61b. Allowable Emission	62b. Po- tential Emission	63b. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
SO ₂	0	0	0	525	2300	2				
64b. Requested Limit in Units Other Than lb/hr				65b. Allowable Emission in Units Other Than lb/hr				66b. Reg. Code		
55c. Pol- lutant 'c' Emitted	56c. Type Control Equipment		57c. Effi- ciency	58c. Maximum Emissions - Normal Cond.		59c. Emi. Meth.	60c. Re- quested Emi. Limit	61c. Allowable Emission	62c. Po- tential Emission	63c. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
CO	0	0	0	700	3066	2				
64c. Requested Limit in Units Other Than lb/hr				65c. Allowable Emission in Units Other Than lb/hr				66c. Reg. Code		
55d. Pol- lutant 'd' Emitted	56d. Type Control Equipment		57d. Effi- ciency	58d. Maximum Emissions - Normal Cond.		59d. Emi. Meth.	60d. Re- quested Emi. Limit	61d. Allowable Emission	62d. Po- tential Emission	63d. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
VOC	0	0	0	11.7	51	2				
64d. Requested Limit in Units Other Than lb/hr				65d. Allowable Emission in Units Other Than lb/hr				66d. Reg. Code		
55e. Pol- lutant 'e' Emitted	56e. Type Control Equipment		57e. Effi- ciency	58e. Maximum Emissions - Normal Cond.		59e. Emi. Meth.	60e. Re- quested Emi. Limit	61e. Allowable Emission	62e. Po- tential Emission	63e. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
NOX	0	0	0	233	1022					
64e. Requested Limit in Units Other Than lb/hr				65e. Allowable Emission in Units Other Than lb/hr				66e. Reg. Code		
67. Visible Emissions	68. Requested % Opacity limit				69. Allowable % Opacity				70. Test Freq.	71. Req.
VE	Normal Cond. Exceptional Cond.				Normal Cond. Exceptional Cond.					
#1 RINGELMAN	10 40 % 2 min/AM				% min/hr					
72. Fugitive Pollutant	73. Fugitive Emission Sources and Control Measures								74. Quantifi- able Fugitive Emissions	
ID	CYCLONES & BAG FILTERS ARE PROVIDED FOR EACH OF THE THREE (3) RDF MFG. TRAINS, OBW & FERROUS RECOVERY LINE. SEE ATTACHMENT 5								tpy	
PM									19.34	

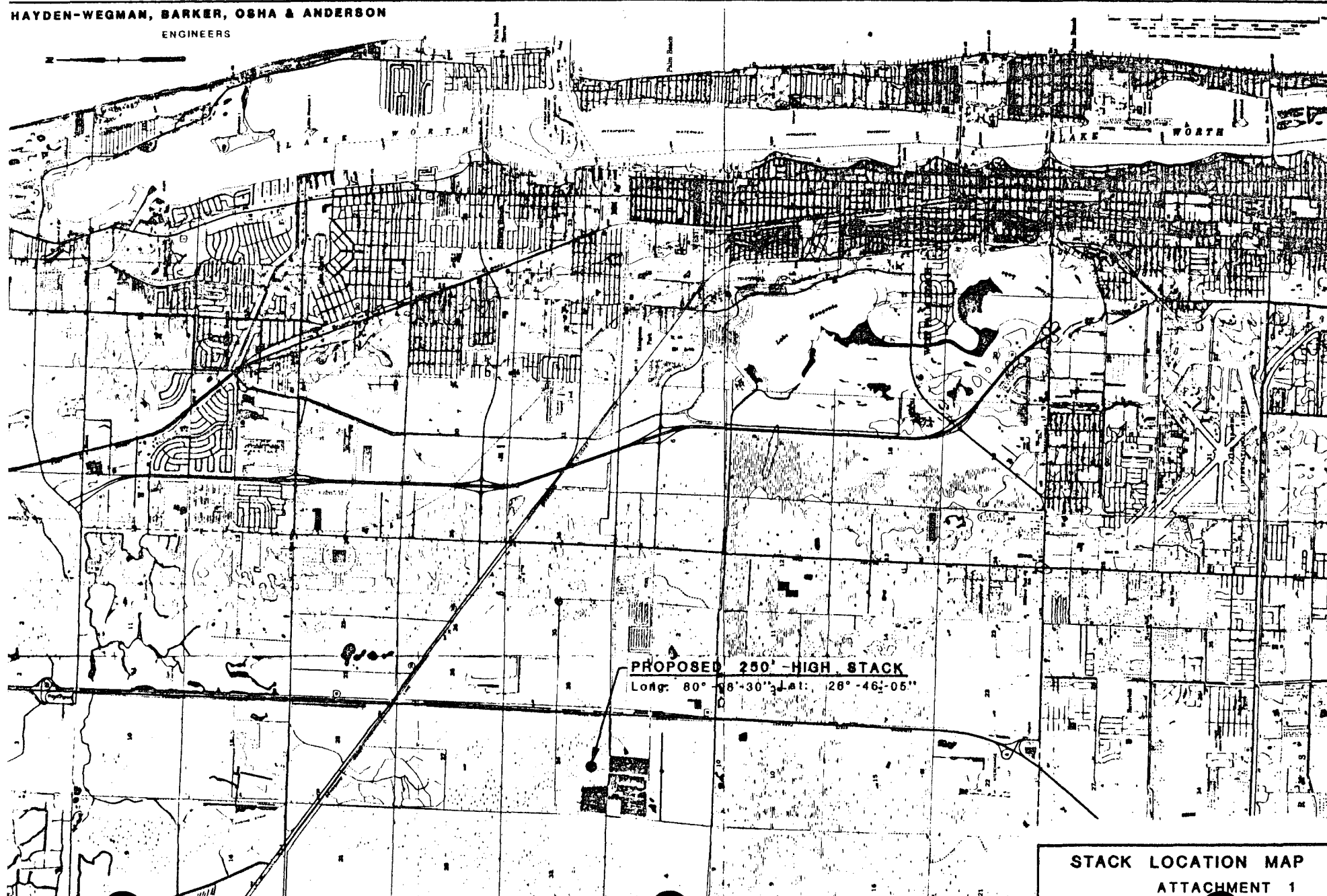
53. Description of Control Equipment										
54. Liquid/Solid Wastes Generated by Control Equipment and Methods/Locations of Disposal										
55f. Pol- lutant 'a' Emitted	56f. Type Control Equipment		57f. Effi- ciency	58f. Maximum Emissions - Normal Cond.		59f. Emi. Meth.	60f. Re- quested Emi. Limit	61a. Allowable Emission	62a. Po- tential Emission	63a. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
PB	0	0	0	0.082	0.36	2				
64f. Requested Limit in Units Other Than lb/hr					65a. Allowable Emission in Units Other Than lb/hr			66a. Reg. Code		
55g. Pol- lutant 'b' Emitted	56g. Type Control Equipment		57g. Effi- ciency	58g. Maximum Emissions - Normal Cond.		59g. Emi. Meth.	60g. Re- quested Emi. Limit	61b. Allowable Emission	62b. Po- tential Emission	63b. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
BE	0	0	0	5.3E-4	2.34E-3	2				
64c. Requested Limit in Units Other Than lb/hr					65b. Allowable Emission in Units Other Than lb/hr			66b. Reg. Code		
55h. Pol- lutant 'c' Emitted	56h. Type Control Equipment		57h. Effi- ciency	58h. Maximum Emissions - Normal Cond.		59h. Emi. Meth.	60h. Re- quested Emi. Limit	61c. Allowable Emission	62c. Po- tential Emission	63c. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
HG	0	0	0	0.18	0.76	2				
64c. Requested Limit in Units Other Than lb/hr					65c. Allowable Emission in Units Other Than lb/hr			66c. Reg. Code		
55i. Pol- lutant 'd' Emitted	56i. Type Control Equipment		57i. Effi- ciency	58i. Maximum Emissions - Normal Cond.		59i. Emi. Meth.	60i. Re- quested Emi. Limit	61d. Allowable Emission	62d. Po- tential Emission	63d. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
HCL	0	0	0	205	894					
64d. Requested Limit in Units Other Than lb/hr					65d. Allowable Emission in Units Other Than lb/hr			66d. Reg. Code		
54j. Pol- lutant 'e' Emitted	55j. Type Control Equipment		56j. Effi- ciency	57j. Maximum Emissions - Normal Cond.		59j. Emi. Meth.	60j. Re- quested Emi. Limit	61e. Allowable Emission	62e. Po- tential Emission	63e. Comp. Test Freq.
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	
FL	0	0	0	2.33	10.3	2				
64e. Requested Limit in Units Other Than lb/hr					65e. Allowable Emission in Units Other Than lb/hr			66e. Reg. Code		
67. Visible Emissions	68. Requested % Opacity limit				69. Allowable % Opacity				70. Test Freq.	71. Req.
	Normal Cond. Exceptional Cond.				Normal Cond. Exceptional Cond.					
VE										
	% min/hr				% min/hr					
72. Fugitive Pollutant	73. Fugitive Emission Sources and Control Measures								74. Quantifi- able Fugitive Emissions	
ID									tpy	

53. Description of Control Equipment										
54. Liquid/Solid Wastes Generated by Control Equipment and Methods/Locations of Disposal										
55k. Pol- lutant 'a' Emitted	56k. Type Control Equipment		57k. Effi- ciency	58k. Maximum Emissions - Normal Cond.		59k. Emi. Meth.	60a. Re- quested Emi. Limit	61a. Allowable Emission	62a. Po- tential Emission	63a. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
SAM	0	0	0	0.0233	0.102	2				
64a. Requested Limit in Units Other Than lb/hr						65a. Allowable Emission in Units Other Than lb/hr			66a. Reg. Code	
55b. Pol- lutant 'b' Emitted	56b. Type Control Equipment		57b. Effi- ciency	58b. Maximum Emissions - Normal Cond.		59b. Emi. Meth.	60b. Re- quested Emi. Limit	61b. Allowable Emission	62b. Po- tential Emission	63b. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
64b. Requested Limit in Units Other Than lb/hr						65b. Allowable Emission in Units Other Than lb/hr			66b. Reg. Code	
55c. Pol- lutant 'c' Emitted	56c. Type Control Equipment		57c. Effi- ciency	58c. Maximum Emissions - Normal Cond.		59c. Emi. Meth.	60c. Re- quested Emi. Limit	61c. Allowable Emission	62c. Po- tential Emission	63c. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
64c. Requested Limit in Units Other Than lb/hr						65c. Allowable Emission in Units Other Than lb/hr			66c. Reg. Code	
55d. Pol- lutant 'd' Emitted	56d. Type Control Equipment		57d. Effi- ciency	58d. Maximum Emissions - Normal Cond.		59d. Emi. Meth.	60d. Re- quested Emi. Limit	61d. Allowable Emission	62d. Po- tential Emission	63d. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
64d. Requested Limit in Units Other Than lb/hr						65d. Allowable Emission in Units Other Than lb/hr			66d. Reg. Code	
54e. Pol- lutant 'e' Emitted	55e. Type Control Equipment		56e. Effi- ciency	57e. Maximum Emissions - Normal Cond.		59e. Emi. Meth.	60e. Re- quested Emi. Limit	61e. Allowable Emission	62e. Po- tential Emission	63e. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
64e. Requested Limit in Units Other Than lb/hr						65e. Allowable Emission in Units Other Than lb/hr			66e. Reg. Code	
67. Visible Emissions	68. Requested % Opacity limit			69. Allowable % Opacity			70. Test		71.	
	Normal Cond. Exceptional Cond.			Normal Cond. Exceptional Cond.			Freq.		Req.	
VE										
72. Fugitive Pollutant	73. Fugitive Emission Sources and Control Measures								74. Quantifi- able Fugitive Emissions	
ID									tpy	

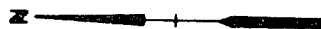
SUPPLEMENTAL REQUIREMENTS

1. Provide an 8 1/2" x 11" map (e.g., the relevant portion of a USGS topographic map) showing the location of the facility and points of air pollutant emissions in relation to residences, roads, and other features of the surrounding area.
2. Provide an 8 1/2" x 11" plot plan of the facility showing the location of manufacturing processes, stacks, vents, and sources of fugitive emissions.
3. Provide an 8 1/2" x 11" flow diagram which will identify, the individual operations and processes. Indicate where raw materials enter, where solid and liquid wastes exit, where gaseous and/or particulate emissions are evolved, and where finished products are obtained.
4. For each pollutant emitted by the source addressed in this application, provide an estimate of the maximum uncontrolled emission rate (in lb/hr) and show the derivation of each such estimate (e.g., AP-42 emission factor). For a construction permit application involving the combustion of any fuel other than distillate oil, liquefied petroleum gas, or natural gas, provide an ultimate analysis of the fuel to be used. The ultimate analysis should give the percent content by weight of carbon, hydrogen, oxygen, sulfur, nitrogen, ash, and moisture.
5. For a construction permit application, show the bases of the normal maximum (after controls) emission estimates (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and describe the proposed methods for showing proof of compliance with any applicable emission limiting standards. For an operation permit application, provide test results or methods used to show proof of compliance.
6. For a construction permit application, provide design details for all air pollution control systems (e.g., for baghouse, include cloth to air ratio; for scrubber, include cross-section sketch, design pressure drop, etc.) and show the derivation of the efficiency of each control device. Items 4, 5, and 6 should be consistent; i.e., $\text{Uncontrolled Emissions} = (\text{Normal Maximum Emissions}) / (1 - \text{Control Efficiency})$.
7. For a construction permit application subject to review under Rule 17-2.500, "Prevention of Significant Deterioration," or Rule 17-2.510, "New Source Review for Nonattainment Areas," provide all additional information required by the department under such rule (e.g., BACT or LAER evaluation, monitoring data, summary of modeling results, one copy of all pertinent model output, etc.).
8. For a permit application subject to the "Reasonably Available Control Technology" provisions of Rule 17-2.650, provide all additional information required by the department under that rule.
9. For a permit application involving the incineration of hazardous wastes, provide all additional information required by the department under Rule 17-30 and Chapter 403, Florida Statutes.
10. Submit the appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

HAYDEN-WEGMAN, BARKER, OSHA & ANDERSON
ENGINEERS



HAYDEN-WEGMAN, BARKER, OSHA & ANDERSON
ENGINEERS



3000 FT. SETBACK

SCALE HOUSE
SCALES

ADMINISTRATION
BUILDING

FUGITIVE DUST
CONTROL STACKS
(4)

RDF
MANUFACTURING
PLANT

COOLING
TOWER

STACK

SUBSTATION

COMBUSTION
FACILITY

RDF
STORAGE
BUILDING

LAKE

MAINTENANCE
BUILDING

OVERHEAD TRANSMISSION
LINES

WATER
TREATMENT
PLANT

EXISTING
TRANSMISSION
POWER

TO
LANDFILL

800 100 0 200
SCALE IN FEET
1" = 200'

ATTACHMENT 2



PALM BEACH SOLID WASTE AUTHORITY
SOLID WASTE MANAGEMENT PLAN

HEAT & MATERIAL BALANCE DIAGRAM AT DESIGN CONDITION

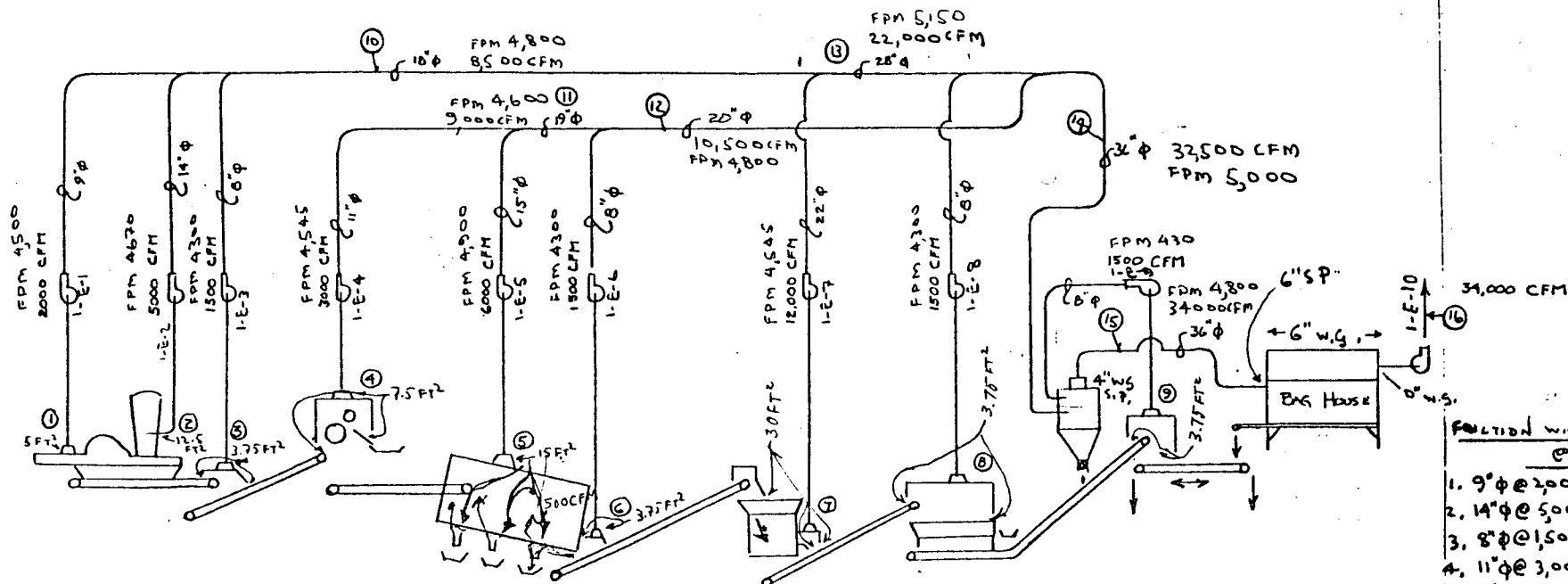


PROJECT Palm Beach
 OWNER SWA
 FEATURE RDF Plant - Dust Control

Wegman
 ENGINEERS

SHEET NO. 11 OF 11
 DATE 8-18-82 BY SGT
 CHKD. BY NO.

DUST CONTROL SYSTEM PER RDF MANUFACTURING LINE



1. FLAIL MILL INFEED
2. EXPLOSION VENT
3. FLAIL MILL DISCHARGE CONVEYOR
4. MAGNETIC SEPARATION HOOD
5. TROMMEL
6. TROMMEL DISCHARGE
7. SHREDDER DISCHARGE
8. DISC SCREEN
9. PACKER INFEED CONVEYOR

NOTES:

1. ALL EXHAUST FANS TO BE MATERIAL HANDLING (RD WHEELS)
2. ALL EXHAUST FANS TO BE VARIABLE SPEED
3. DUCT THRU 18" ϕ - 14 GAGE FITTINGS - 12 GAGE
 THRU 36" ϕ - 12 GAGE " - 10 GAGE
4. BAG HOUSE CLOTH AREA 8 TO 1 (RANGE LTOL /10 TO 1)
- 5 CYCLONE

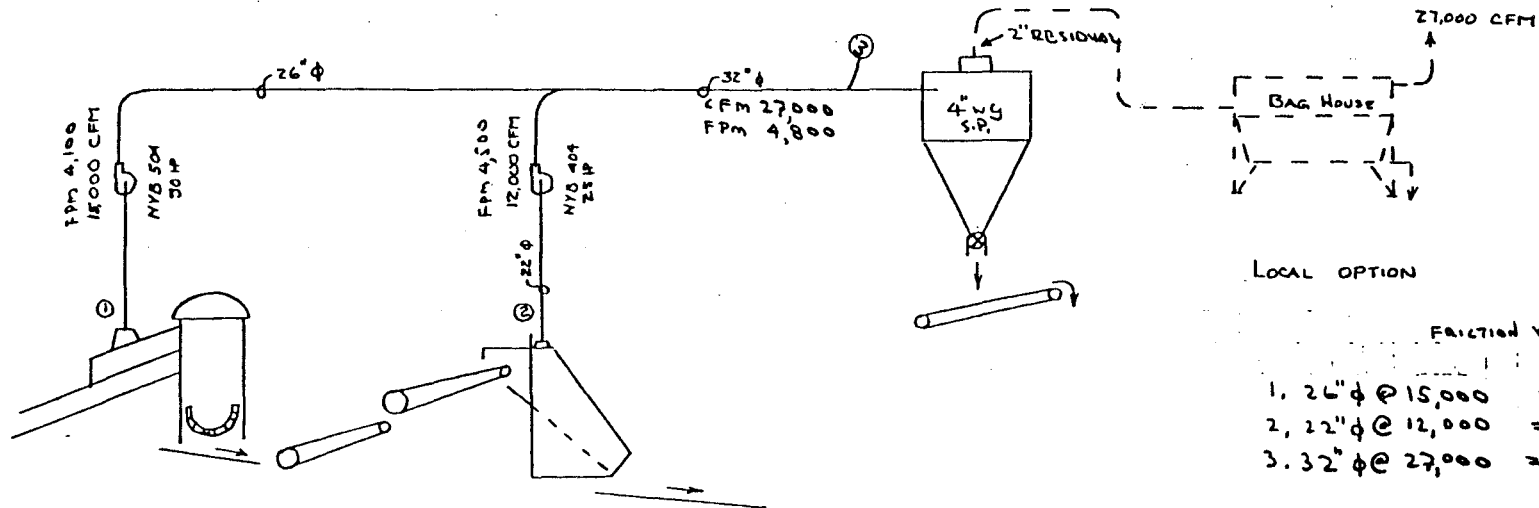
FUNCTION	W.G. INCHES	100 FT DUCT
@ STATED CFM		
1. 9" ϕ @ 2,000		3.3
2. 14" ϕ @ 5,000		2.1
3. 8" ϕ @ 1,500		3.6
4. 11" ϕ @ 3,000		2.7
5. 15" ϕ @ 6,000		2.1
6. 8" ϕ @ 1,500		3.6
7. 22" ϕ @ 12,000		1.15
8. 8" ϕ @ 1,500		3.6
9. 8" ϕ @ 1,500		3.6
10. 18" ϕ @ 8,500		1.6
11. 15" ϕ @ 9,000		1.4
12. 20" ϕ @ 10,500		1.35
13. 28" ϕ @ 22,000		1.1
14. 36" ϕ @ 32,500		0.55
15. 36" ϕ @ 34,000		0.55
16. @ 34,000		

PROJECT PALM BEACH
 OWNER SWA
 FEATURE RDF PLANT - DUST CONTROL

Wegman
 ENGINEERS

SHEET NO. 12 OF _____
 DATE 8-18-82 BY SGT
 CHKD. BY _____ NO. _____

DUST CONTROL SYSTEM OBW & FERROUS PROCESSING LINE



LOCAL OPTION

FRICTION W.S. INCHES/100 FT DUCT @ STATED C.F.M.		
1. 26" ϕ @ 15,000	=	0.56
2. 22" ϕ @ 12,000	=	1.15
3. 32" ϕ @ 27,000	=	0.56

1. SHREDDER INFEED
2. METAL AIR SCRUBBER

NOTES:

1. EXHAUST FANS TO BE MATERIAL HANDLING DESIGN (RD WHEELS)
2. METAL AIR SCRUBBER FAN TO BE VARIABLE SPEED
3. DUCT TO BE 12 GAGE - FITTINGS 10 GAGE
4. BAG HOUSE AIR TO CLOTH RATIO 3-1

HAYDEN/WEGMAN-BARKER, OSHA & ANDERSON
ENGINEERS
22-APR-1985

PALM BEACH SOLID WASTE AUTHORITY
SOLID WASTE MANGEMENT PLAN

ATTACHMENT 5 (SHEET 3 OF 3)
FIELD 73. FUGITIVE EMISSION SOURCES AND CONTROL MEASURES
TECHNICAL CALCULATIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EMISSION SOURCES	OPERATING HOURS PER DAY (HOUR)	OPERATING DAYS PER WEEK (DAYS)	UNCONTROLLED EMISSION FACTOR (GRAINS/SCF)	CYCLONE & BAGHOUSE DESIGN RATING (SCFM)	COLLECTION EFFICIENCY OF CYCLONE & BAGHOUSE (%)	MAXIMUM EMISSION (LB/HR)	ANNUAL EMISSION (TON/YEAR)
RDF MANUFACTURING TRAIN #1	16	6	5	34,000	99.8	2.91	6.18
RDF MANUFACTURING TRAIN #2	16	6	5	34,000	99.8	2.91	6.18
RDF MANUFACTURING TRAIN #3	16	2	5	34,000	99.8	2.91	2.06
OBW & FERROUS RECOVERY LINE	16	6	5	27,000	99.8	2.31	4.91
TOTAL						11.06	19.34

NOTES (REFER TO COLUMN NO. ABOVE):

(4) THE EMISSION FACTOR IS BASED ON HEAVY DUST CONCENTRATION OF THE ROCK
CRUSHING AND SCREENING OPERATION (WORST CASE).

(7) $= (4) \times (5) \times (1.00 - (6) / 100.00) \times (60 \text{ MIN/HR}) / (7000 \text{ GRAINS/LB})$

(8) $= (7) \times (2) \times (3) \times (52 \text{ WK/YR}) \times (0.85 \text{ AVAILABILITY FACTOR}) / (2000 \text{ LB/TON})$

APPENDIX 10.7

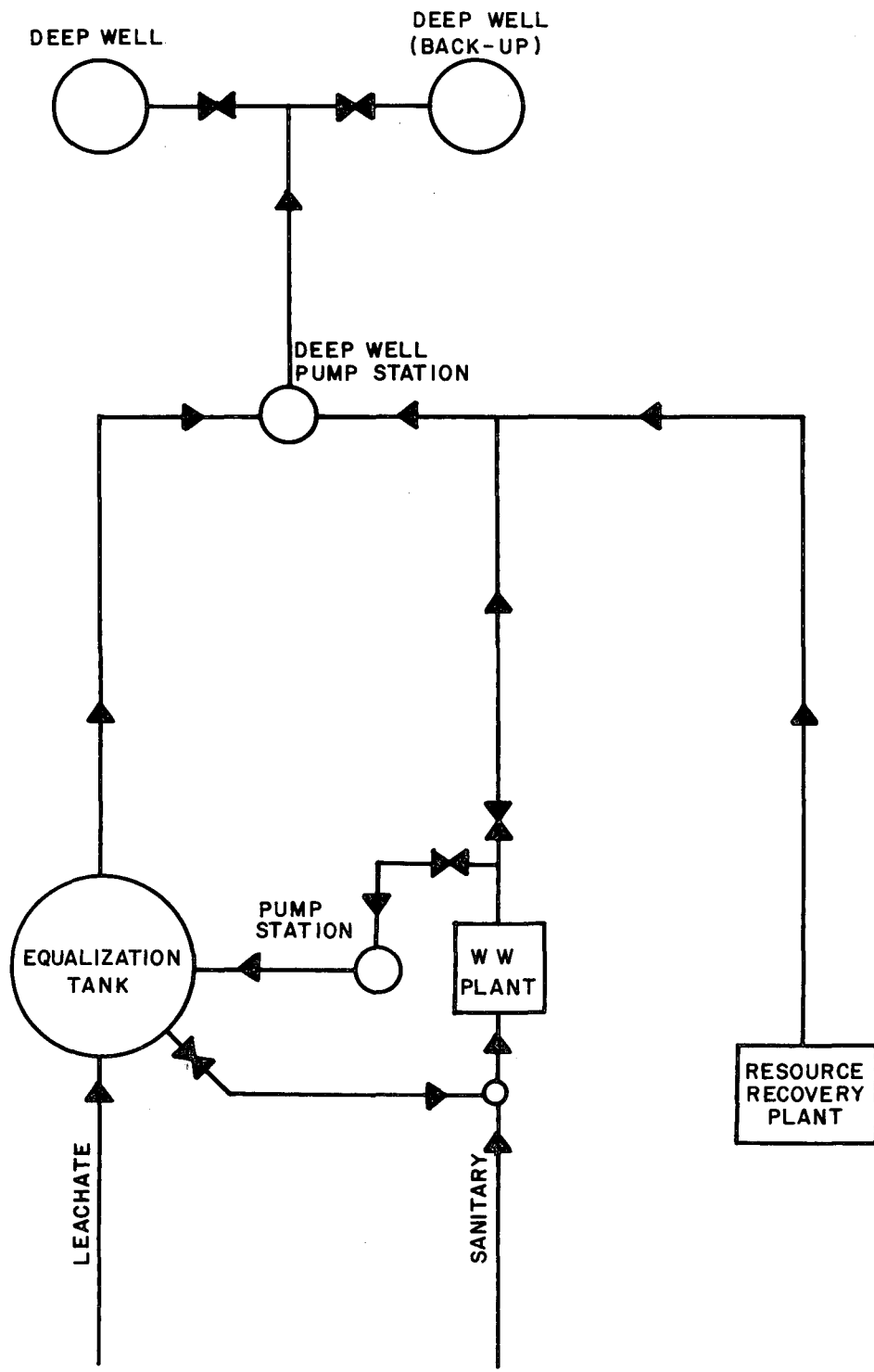
WASTEWATER TREATMENT FACILITY

APPENDIX 10.7

The projected flows of the domestic and process wastewater which will be generated at the Resource Recovery Facility have been discussed in Sections 3.5.1 and 3.5.2. The projected leachate quantities which will be produced as a result of landfill development have been discussed in Section 3.5.6. These flows; domestic, process and leachate, will be combined for ultimate disposal via the proposed deep well injection system. The plan for combining these flows is shown on the flow diagram figure included in this Appendix. A complete description of this plan is given in this Appendix.

The design of the wastewater disposal system as shown on the flow diagram combines the process, leachate and domestic flows prior to deep well injection. In order to inject the combined flows and meet the State standards for the process deep well injection system, each individual flow was analyzed. The design parameters utilized in the analysis of the combined flows are presented in this Appendix.

The domestic wastewater flow as previously described in Section 3.5.2 is estimated not to exceed 20,000 gallons per day. For this analysis this flow was considered an average daily flow. In order to size a treatment facility a peak flow of 20 gallons per minute was assumed. The size of the treatment facility to handle the projected flow would be a 29,000 gallon extended aeration package plant. The extended aeration process for the treatment of the domestic wastewater was selected due to its flexibility and ability to handle peak loads without upset, with removal rates of 90 percent or greater for BOD₅ and SS loading. Should the plant suffer an upset, the wastewater can be pumped to the leachate equalization basin for holding until the plant is returned to normal. The wastewater can then be bled back into the plant for treatment prior to disposal as shown on the flow diagram. The design parameters of the domestic



wastewater used for calculating the contribution of BOD₅ and SS that will be combined for deep well injection was based on an influent concentration of 200 mg/l for both BOD₅ and SS. Based on a removal rate of 90 percent, the BOD₅ and SS effluent concentration would be 20 mg/l.

The sludge generated by the treatment plant will be dewatered and disposed of by landfilling or utilized for composting.

The average process wastewater flow generated by the facility, as described in Section 3.5.1, is projected to be 410 gallons per minute (gpm). As described in the text, 39 gpm will be recycled leaving a flow of 371 gpm to be disposed of via the deep well injection system. As indicated in Table 3.5-2 the loading rate of BOD₅ and SS will be 0 mg/l and 22 mg/l respectively. Since 39 gpm will be recycled the SS loading rate to the deep well will only be 19.9 mg/l. The maximum flow is projected to be 442 gpm. It was assumed that during maximum flows the SS loading rate would remain 19.9 mg/l.

The leachate generated by the landfill development has been discussed in Section 3.5.6. As discussed, a maximum flow of 3 gpm per acre of leachate would be generated. Based on cell development of 40 acres at any one time, the maximum leachate flow would be 120 gpm. The projected average flow of leachate used in this analysis is 7 gpm.

The concentration of BOD₅ and SS, as indicated by the data on Table 3.5-6, vary from landfill to landfill. Therefore, in order to project the loading rates for leachate, results of the test conducted on Dyer Boulevard Landfill were utilized. Although the test results indicate chemical oxygen demand (COD), the value can be correlated to BOD₅. The test data has been included in this Appendix.

The conservative value of 1,000 gm/l of BOD₅ was used in the calculations based on the Dyer Boulevard Landfill test results. It was assumed that the SS would be negligible due to the construction methods proposed for the leachate collection system.

The variation of leachate flows from a maximum of 120 gpm to an average of 7 gpm with a concentration of 1,000 mg/l of BOD₅ required that a equalization basin be used to limit the contribution of leachate to the combined flows. The proposed equalization tank would be sized to hold 600,000 gallons. This size tank would be capable of holding 3 days of maximum leachate flow plus 29,000 gallons of domestic wastewater should an upset occur.

The analysis of these combined flows; domestic, process and leachate, indicate that based on the concentration values that the wastewater disposed via the deep well injection system would meet the State standards. The calculations, which are included in this Appendix, show that during average flows the BOD₅ and SS concentrations would be 18.6 mg/l and 19.5 mg/l respectively. Under maximum flow conditions the BOD₅ and SS concentration would be 20.0 mg/l and 19.5 mg/l respectively.

The one constraint which was placed on the combined maximum flows to injection is that the leachate would be limited to a flow of 9 gpm at an assumed concentration of 1,000 mg/l. Should actual results indicate that this concentration is conservative, the amount of leachate could be increased so long as the combined flows of domestic, process and leachate do not exceed State standards.

PROCESS, LEACHATE & SANITARY FLOWS COMBINED

NOTE: THE SANITARY FLOWS FOR THESE CALCULATIONS ARE BASED ON AN EXTENDED AERATION PLANT WITH EFFLUENT BEING DISCHARGED TO THE DEEP WELL FOR INJECTION.

Initial BOD₅ & SUSPENDED SOLIDS - 200 mg/L BOD₅
200 mg/L SS

EFFLUENT BOD₅ & SUSPENDED SOLIDS - 20 mg/L BOD₅

BOD₅ REMOVAL - 90%

20 mg/L SS

SS REMOVAL - 90%

SANITARY AVERAGE FLOW - 14 gpm

SANITARY MAXIMUM FLOW - 20 gpm

AVERAGE FLOW

	Flow (gpm)	SS	BOD ₅
PLANT EFFLUENT	371	19.9	0
LEACHATE	7	0	1,000.0
SANITARY	14	20.0	20.0

BOD₅

$$\frac{[(1,000.0 \text{ mg/L})(7 \text{ gpm}) + (20.0 \text{ mg/L})(14 \text{ gpm})] \times 1440 \frac{\text{min}}{\text{day}} \times \frac{3.785 \text{ L}}{\text{gal}}}{(371 + 7 + 14) \text{ gpm} \times 1440 \frac{\text{min}}{\text{day}} \times \frac{3.785 \text{ L}}{\text{gal}}}$$

$$\boxed{18.6 \text{ mg/L}}$$

SS

$$\frac{[(19.9 \text{ mg/L})(371 \text{ gpm}) + (20.0 \text{ mg/L})(14 \text{ gpm})] \times 1440 \frac{\text{min}}{\text{day}} \times \frac{3.785 \text{ L}}{\text{gal}}}{(371 + 7 + 14) \text{ gpm} \times 1440 \frac{\text{min}}{\text{day}} \times \frac{3.785 \text{ L}}{\text{gal}}}$$

$$\boxed{19.5 \text{ mg/L}}$$

MAXIMUM FLOW

	Flow (gpm)	SS	BOD ₅
PLANT EFFLUENT	442	19.9	0
LEACHATE	9	0	1,000.0
SANITARY	20	20.0	20.0

BOD₅

$$\frac{(1,000.0 \text{ mg/L})(9 \text{ gpm}) + (20.0 \text{ mg/L})(20 \text{ gpm}) \times 1440 \frac{\text{min}}{\text{day}} \times \frac{3.785 \text{ L}}{\text{gal}}}{(442 + 9 + 20) \text{ gpm} \times 1440 \frac{\text{min}}{\text{day}} \times \frac{3.785 \text{ L}}{\text{gal}}}$$

$$\boxed{20.0 \text{ mg/L}}$$

SS

$$\frac{(19.9 \text{ mg/L})(442 \text{ gpm}) + (20.0 \text{ mg/L})(20 \text{ gpm}) \times 1440 \frac{\text{min}}{\text{day}} \times \frac{3.785 \text{ L}}{\text{gal}}}{(442 + 9 + 20) \text{ gpm} \times 1440 \frac{\text{min}}{\text{day}} \times \frac{3.785 \text{ L}}{\text{gal}}}$$

$$\boxed{19.5 \text{ mg/L}}$$



Orlando Laboratories, Inc.

P. O. Box 19127 : Orlando, Florida 32814 • 305/898-8845

Palm Beach County Solid Waste Authority
Attn: Timothy F. Hunt, Jr.
5114 Okeechobee Blvd., Suite 2-C
West Palm Beach, Florida 33409

Report #: 42909 (5591)
Sampled by: O.L.I. (M. Smar/D. Bungo)
Date sampled: 10-16-84
Date received: 10-17-84
Date reported: 11-28-84

Page 2 of 5

PARAMETER MONITORING REPORT (Rule 17-3.402, 17-3.404 - 17-3.406)

GMS # _____

Sample Date 10-16-84 @ 1445 hrs.

Monitoring Well Leachate DL 1

Well Type: ☐ Background
☐ Site Boundary
☐ Intermediate
☐ Compliance

Classification of Groundwater _____

Well Developed* prior to
sample collection. (Yes/No) NO

Ground Water Elevation
(above MSL) _____ ft.

Water Condition: Very Dark - Strong Odor

Water Level: _____ ft.

Casing Height: _____ ft.

Total Depth: _____ ft.

Storet	Parameter Monitored	Sampling Method	Analysis Method	Analysis Results	Units	F-U	Preservatives
01002	Arsenic	Pumped	EPA 206.2	10.0	ug/l	U	HNO ₃
01007	Barium	Pumped	EPA 200.7	<100.0	ug/l	U	HNO ₃
01027	Cadmium	Pumped	EPA 213.2	<5.0	ug/l	U	HNO ₃
01034	Chromium	Pumped	EPA 218.2	<10.0	ug/l	U	HNO ₃
01051	Lead	Pumped	EPA 239.2	<10.0	ug/l	U	HNO ₃
71900	Mercury	Pumped	EPA 245.1	<0.50	ug/l	U	HNO ₃
01147	Selenium	Pumped	EPA 270.2	<5.0	ug/l	U	HNO ₃
01077	Silver	Pumped	EPA 272.2	<10.0	ug/l	U	HNO ₃
82079	Turbidity	Pumped	EPA 180.1	29	NTU	U	none
00951	Fluoride	Pumped	EPA 340.2	0.285	mg/l	U	none
00620	Nitrate Nitrogen	Pumped	EPA 352.1	<0.02	mg/l	U	none
00612	Ammonia Nitrogen	Pumped	EPA 350.1	364.0	mg/l	U	H ₂ SO ₄
00940	Chloride*	Pumped	SM 407A	335	mg/l	U	none
00080	Color	Pumped	EPA 110.2	40	PCU	U	none
00340	Chemical Oxygen Demand	Pumped	EPA 410.2	660	mg/l	U	none
00945	Sulfate	Pumped	EPA 375.4	50.5	mg/l	U	none
00085	Odor	Pumped	EPA 140.1	1	Threshold Number	U	none
70300	Total Dissolved Solids	Pumped	EPA 160.1	4200	mg/l	U	none
00400	pH, on site	Pumped	EPA 150.1	6.9	Units	U	none
00095	Specific Conductance on site	Pumped	EPA 120.1	6240	umhos @ 25°C	U	none
00010	Temperature, on site	Pumped	EPA 170.1	29.0	°C	U	none

Our Florida Department of Health & Rehabilitative Service Identification Number is 83141.

*Well development is the process of pumping the well prior to sampling in order to obtain representative ground water sample. DER Form 17-1.216 (2), Effective January 1, 1983.
(F) = Filtered, (U) = Unfiltered.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.



Orlando Laboratories, Inc.

P. O. Box 19127 : Orlando, Florida 32814 • 305/898-8845

Palm Beach County Solid Waste Authority
Attn: Timothy F. Hunt, Jr.
5114 Okeechobee Blvd., Suite 2-C
West Palm Beach, Florida 33409

Report #: 42909 (5591)
Sampled by: O.L.I.(M. Smar/D. Bungo)
Date sampled: 10-16-84
Date received: 10-17-84
Date reported: 11-28-84
Page 3 of 5

PARAMETER MONITORING REPORT (Rule 17-3.402, 17-3.404 - 17-3.406)

GMS # _____ Sample Date 10-16-84 @ 1435 hrs.
Monitoring Well Leachate DL 2 Well Type: ☐ Background
☐ Site Boundary
Classification of Groundwater _____ ☐ Intermediate
☐ Compliance
Well Developed* prior to Ground Water Elevation
sample collection. (Yes/No) NO (above MSL) _____ ft.
Water Condition: Dark - Strong Odor Water Level: _____ ft.
Casing Height: _____ ft. Total Depth: _____ ft.

Storet	Parameter Monitored	Sampling Method	Analysis Method	Analysis Results	Units	F-U	Preservatives
01002	Arsenic	Pumped	EPA 206.2	20.0	ug/l	U	HNO ₃
01007	Barium	Pumped	EPA 200.7	<100.0	ug/l	U	HNO ₃
01027	Cadmium	Pumped	EPA 213.2	<5.0	ug/l	U	HNO ₃
01034	Chromium	Pumped	EPA 218.2	<10.0	ug/l	U	HNO ₃
01051	Lead	Pumped	EPA 239.2	<10.0	ug/l	U	HNO ₃
71900	Mercury	Pumped	EPA 245.1	<0.50	ug/l	U	HNO ₃
01147	Selenium	Pumped	EPA 270.2	<5.0	ug/l	U	HNO ₃
01077	Silver	Pumped	EPA 272.2	<10.0	ug/l	U	HNO ₃
82079	Turbidity	Pumped	EPA 180.1	17	NTU	U	none
00951	Fluoride	Pumped	EPA 340.2	0.364	mg/l	U	none
00620	Nitrate Nitrogen	Pumped	EPA 352.1	0.02	mg/l	U	none
00612	Ammonia Nitrogen	Pumped	EPA 350.1	800.0	mg/l	U	H ₂ SO ₄
00940	Chloride	Pumped	SM 407A	900	mg/l	U	none
00080	Color	Pumped	EPA 110.2	80	PCU	U	none
00340	Chemical Oxygen Demand	Pumped	EPA 410.2	990	mg/l	U	none
00945	Sulfate	Pumped	EPA 375.4	57.3	mg/l	U	none
00085	Odor	Pumped	EPA 140.1	2	Threshold Number	U	none
70300	Total Dissolved Solids	Pumped	EPA 160.1	6120	mg/l	U	none
00400	pH, on site	Pumped	EPA 150.1	6.8	Units	U	none
00095	Specific Conductance on site	Pumped	EPA 120.1	11040	umhos @ 25°C	U	none
00010	Temperature, on site	Pumped	EPA 170.1	28.0	°C	U	none

Our Florida Department of Health & Rehabilitative Service Identification Number is 83141.

*Well development is the process of pumping the well prior to sampling in order to obtain representative ground water sample. DER Form 17-1.216 (2), Effective January 1, 1983.
(F) = Filtered, (U) = Unfiltered.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.

Chemist/Biologist

Chemist/Biologist

Chemist/Biologist



LESTER LABORATORIES, INC.

2370 LAWRENCE STREET

ATLANTA, GEORGIA 30344

TECHNICAL BULLETIN

HYDROFENE 21

Scale and Corrosion Inhibitor for Recirculating Cooling Water Systems using High Hardness Make-Up.

GENERAL DESCRIPTION

Lester HYDROFENE 21 is a concentrated, ecologically safe inhibitor for the control of corrosion and scale in recirculating cooling water systems. The HYDROFENE 21 blend of organic dispersants, scale inhibitors and corrosion inhibitors not only produces corrosion rates of less than 2.0 mils per year on steel, but greatly increases the efficiency of heat transfer due to its ability to dramatically lower the surface tension of recirculating water.

Industrial, commercial and institutional operators of recirculating cooling water systems enjoy the following advantages with HYDROFENE 21:

- * Highly effective even in high hardness water
- * Easy to feed liquid
- * Cleaner heat exchange surfaces
- * No nutrients for microbiotic growth

HYDROFENE SPECIFICATIONS

Appearance	Clear, pale yellow liquid
Odor	Faint, pleasant odor
Flash Point	None
Specific Gravity	1.1
Shelf life	One year (ambient temperature)

HANDLING

Lester HYDROFENE 21 is safe for handling when ordinary caution is exercised. Contact may cause slight irritation to eyes and skin. The use of safety glasses is recommended when handling. In case of eye or skin contact, simply flush with plenty of water. Avoid ingestion. Should the product be swallowed, give mild or egg whites and induce vomiting, then call a doctor.

DOSAGE

HYDROFENE 21 is designed to provide maximum scale and corrosion control at low treatment levels. An initial dosage of 250 to 500 ppm is recommended to allow complete monomolecular film formation. Following initial film formation, a HYDROFENE 21 residual of 125 ppm should be maintained in the system to insure scale and corrosion control.

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing,
Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME Lester Laboratories, Inc.		EMERGENCY TELEPHONE NO. 404/767-0277
ADDRESS (Number, Street, City, State, and ZIP Code) 2370 Lawrence Street, Atlanta, GA 30344		
CHEMICAL NAME AND SYNONYMS		TRADE NAME AND SYNONYMS Hydrofene 21
CHEMICAL FAMILY Alkaline Water Treatment	FORMULA Proprietary	

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS	0		BASE METAL	0	
CATALYST	0		ALLOYS	0	
VEHICLE	0		METALLIC COATINGS	0	
SOLVENTS	0		FILLER METAL PLUS COATING OR CORE FLUX	0	
ADDITIVES	0		OTHERS	0	
OTHERS	0				
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
None					

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	220	SPECIFIC GRAVITY (H ₂ O=1)	1.1
VAPOR PRESSURE (mm Hg.)	15	PERCENT, VOLATILE BY VOLUME (%)	80
VAPOR DENSITY (AIR=1)	1.0	EVAPORATION RATE (_____ = 1)	NA
SOLUBILITY IN WATER	infinite		
APPEARANCE AND ODOR	Pale Yellow, Mild Odor		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	none	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA	none			
SPECIAL FIRE FIGHTING PROCEDURES	none			
UNUSUAL FIRE AND EXPLOSION HAZARDS	none			

SECTION V - HEALTH HAZARD DATA	
THRESHOLD LIMIT VALUE	Acute LD ₅₀ (rats) 120g/KG body weight
EFFECTS OF OVEREXPOSURE	Mild Skin Irritation
EMERGENCY AND FIRST AID PROCEDURES	Flush affected area with water and soap
	Inhalations expose to fresh air.

SECTION VI - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid) Strong Acids			
HAZARDOUS DECOMPOSITION PRODUCTS Occurs above 180°C (356°F)			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES	
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	
Rinse into storm sewers	
WASTE DISPOSAL METHOD	Flush down storm sewers

SECTION VIII - SPECIAL PROTECTION INFORMATION			
RESPIRATORY PROTECTION (Specify type) none			
VENTILATION	LOCAL EXHAUST	SPECIAL	none
	MECHANICAL (General)	OTHER	
PROTECTIVE GLOVES Rubber Gloves		EYE PROTECTION Safety goggles	
OTHER PROTECTIVE EQUIPMENT none			

SECTION IX - SPECIAL PRECAUTIONS	
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	none
OTHER PRECAUTIONS	none



LESTER LABORATORIES, INC.

2370 LAWRENCE STREET

ATLANTA, GEORGIA 30344

TECHNICAL BULLETIN

LESTER 30

Carbamate Industrial Microbiocide For Use In Recirculating Cooling Water Systems, Evaporative Condensers and Air Washer Systems

GENERAL DESCRIPTION

LESTER 30 is a concentrated anti-microbial particularly effective for the cleaning and control of bacteria and fungi in recirculating cooling water systems, evaporative condensers and air washer systems.

Industrial, commercial and institutional operators of these water systems enjoy the following advantages with LESTER 30.

- *HIGHLY EFFECTIVE
- *ECONOMICAL, EASY TO FEED LIQUID
- *FAST ACTING
- *STABLE AT HIGH PH
- *CLEANER HEAT EXCHANGE SURFACES

LESTER 30 SPECIFICATION

Active Ingredients.....	Sodium Dimethyldithiocarbamate Nabam (disodium ethylene bisdithiocarbamate)
Appearance.....	Yellow green to green liquid
Odor.....	Pungent
Specific gravity.....	1.17
Flash point.....	none
pH.....	11.5 $\pm$ 1.0

HANDLING

The following handling precautions must be observed and are included on the LESTER 30 drum label:

Causes eye and skin irritation. Do not get in eyes, on skin or on clothing. Wear goggles or face shield and rubber gloves when handling. Harmful if swallowed. Avoid contamination of food.
(continued on page 2)

USE LESTER
NO. 1 IN WATER TREATMENT

(Handling continued)

In case of contact, flush eyes or skin with plenty of water for 15 minutes. If swallowed, drink promptly a large quantity of milk, egg whites, gelatin solution or if these are not available, drink large quantities of water. Call a physician immediately.

DOSAGE

Typical dosing levels of from 20 to 120 ppm effectively controls microbiotic growth. Specific dosage recommendations are listed on the drum label.

The use of LESTER DISPERSO followed by treatment with LESTER 30 often may eliminate the need for physical cleaning even in systems suffering extremely severe biofouling.

SERVICE

Lester is committed to working closely with customer plant personnel to assure the optimum cost/performance treatment results. Regular service is an important part of the total Lester program to improve customer operational efficiency and profitability.

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing,
Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME
LESTER LABORATORIES, INC.

EMERGENCY TELEPHONE NO.
404/767-0277

ADDRESS (Number, Street, City, State, and ZIP Code)
2370 Lawrence St., Atlanta, Georgia 30344

CHEMICAL NAME AND SYNONYMS
Substituted thiocarbamates

TRADE NAME AND SYNONYMS
LESTER-30

CHEMICAL FAMILY
Thiocarbamates

FORMULA
See below

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS	0		BASE METAL	0	
CATALYST	0		ALLOYS	0	
VEHICLE	0		METALLIC COATINGS	0	
SOLVENTS	0		FILLER METAL PLUS COATING OR CORE FLUX	0	
ADDITIVES Dimethylthiocarbamate	15%		OTHERS	0	
OTHERS Disodium EthyleneGiscdithiocarbamate					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
None					

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	220	SPECIFIC GRAVITY (H ₂ O=1)	1.15
VAPOR PRESSURE (mm Hg.)	15	PERCENT VOLATILE BY VOLUME (%)	70%
VAPOR DENSITY (AIR=1)	1.0	EVAPORATION RATE Less Than (— Water — =1) ethyl ether	
SOLUBILITY IN WATER	Infinite	pH = 11.5 ± 1.0	
APPEARANCE AND ODOR Yellow-green, rotten egg odor			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	None	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA				
SPECIAL FIRE FIGHTING PROCEDURES	None			
UNUSUAL FIRE AND EXPLOSION HAZARDS	None			

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE LD₅₀ greater than 2g/Kg (Mice)

EFFECTS OF OVEREXPOSURE None-corrosive to skin; slightly toxic via inhalation - nausea, vomiting; non-toxic via skin absorption

EMERGENCY AND FIRST AID PROCEDURES Drink milk, egg whites; flush with water; if in eyes, flush with water, simultaneously have someone call a physician. National Emergency Chemical Spill Number 1-800-424-9300

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	Not determined

INCOMPATIBILITY (Materials to avoid) Strong acid; excessive heat

HAZARDOUS DECOMPOSITION PRODUCTS Carbon disulfide, hydrogen sulfide, Ethylene thiourea, ethylene diamine

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	Not determined

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Flush with large amounts of water. For eyes, flush with water - call physician. Remove contaminated clothing. Rinse everything with water. Lower pH to 4.0, treat with lime.

WASTE DISPOSAL METHOD Wash with water to sewage lines. Aquatic toxicity: LC₅₀ 96 Hr. 0.2 ppm Bluegill Sunfish; LC₅₀ 96 Hr. 0.13 ppm Rainbow Trout.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) None; offensive but not hazardous in moderate amounts.

VENTILATION	LOCAL EXHAUST	Yes	SPECIAL
	MECHANICAL (General)		OTHER

PROTECTIVE GLOVES YES EYE PROTECTION Goggles

OTHER PROTECTIVE EQUIPMENT None

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Avoid freezing; avoid high temperatures.

OTHER PRECAUTIONS Wear goggles and rubber gloves; respiratory apparatus

Not required. EPA #337-58.

PALM BEACH COUNTY
FLORIDA

**SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION**

VOLUME III
APPENDICES

PALM BEACH COUNTY, FLORIDA

SOLID WASTE RESOURCE RECOVERY FACILITY

APPLICATION FOR

POWER PLANT SITE CERTIFICATION

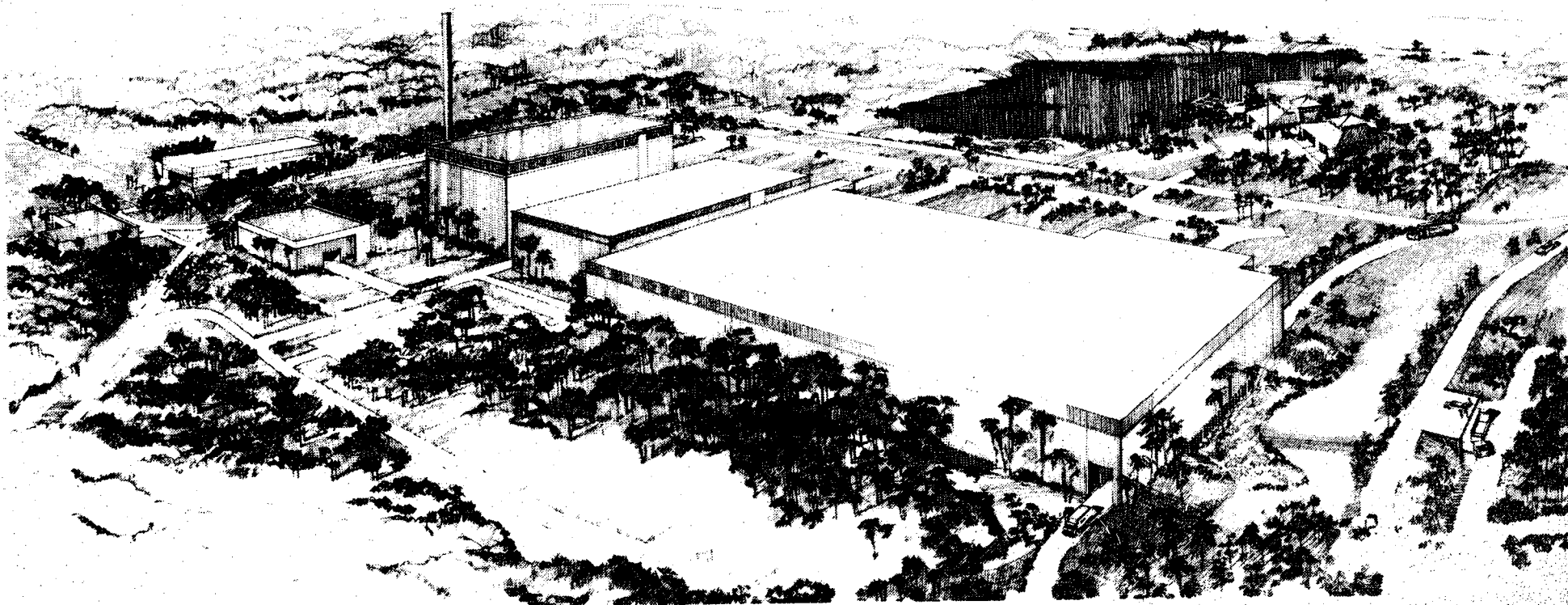
VOLUME III - APPENDICES

SUBMITTED BY

THE PALM BEACH COUNTY SOLID WASTE AUTHORITY



APRIL, 1985



Appendix 10.3

APPENDIX 10.8

UNDERGROUND INJECTION CONTROL

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BOARD OF COUNTY COMMISSIONERS
PALM BEACH COUNTY
SOLID WASTE AUTHORITY
SITE 7
INJECTION WELL CONSTRUCTION
AND TESTING PROGRAM

March 1985

Prepared for:
Hayden-Wegman/Barker, Osha & Anderson
A Joint Venture
860 U.S. Highway One
North Palm Beach, Florida 33408

Prepared by:
Geraghty & Miller, Inc.
Ground-Water Consultants
2700 PGA Boulevard, Suite 104
Palm Beach Gardens, FL 33410

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FIGURES

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FIGURE 2: Generalized Geologic Column, Palm Beach County Site 7	2
FIGURE 3: General Direction of Ground-Water Flow in the Surficial Aquifer	3
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APPENDICES

APPENDIX A: Well Inventory Data

APPENDIX B: Bibliography

BOARD OF COUNTY COMMISSIONERS
PALM BEACH COUNTY
SOLID WASTE AUTHORITY
SITE 7
INJECTION WELL CONSTRUCTION
AND TESTING PROGRAM

INTRODUCTION

Palm Beach County intends to construct a Class I Test/Injection Well System at the Site 7 Resource Recovery Facility. The injection well system will consist of two 8-inch-diameter, Class I wells each having a disposal capacity of 1 mgd. The injection well system will have 100% redundancy. The total disposal capacity required for the system is 1 mgd. Background geologic information, design of the injection well and details of the proposed hydrogeological testing program are presented in this report. The firm of Geraghty & Miller, Inc., will be responsible under a subcontract with the Joint Venture of Barker, Osha & Anderson, Inc., and Hayden-Wegman, Inc., for all aspects of the well design, construction, and testing. The Joint Venture of Barker, Osha & Anderson, Inc., and Hayden-Wegman, Inc., will be responsible for the design of the effluent pumping station, pipeline to the wells, instrumentation, surge protection and effluent reuse aspects of the project. A description of the surge protection features designed into the system will be provided by the Joint Venture. The information in this report is submitted in support of an application for a Class I Test/Injection Well Construction Permit as required by Section 17-28.33 (FAC).

Area of Review and Geologic Setting

In compliance with the requirements of Chapter 17-28, Section 17-28.33, F.A.C., an "area of review" was established for the well site. Information used in the area of review was obtained from public records, available literature, and geologic data contained in Geraghty & Miller, Inc., files. The results of this investigation revealed that: (1) there are no known faults within the area of review; and (2) there are no

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wells or boreholes of any kind known to penetrate the potential confining beds or the injection zone within the area of review.

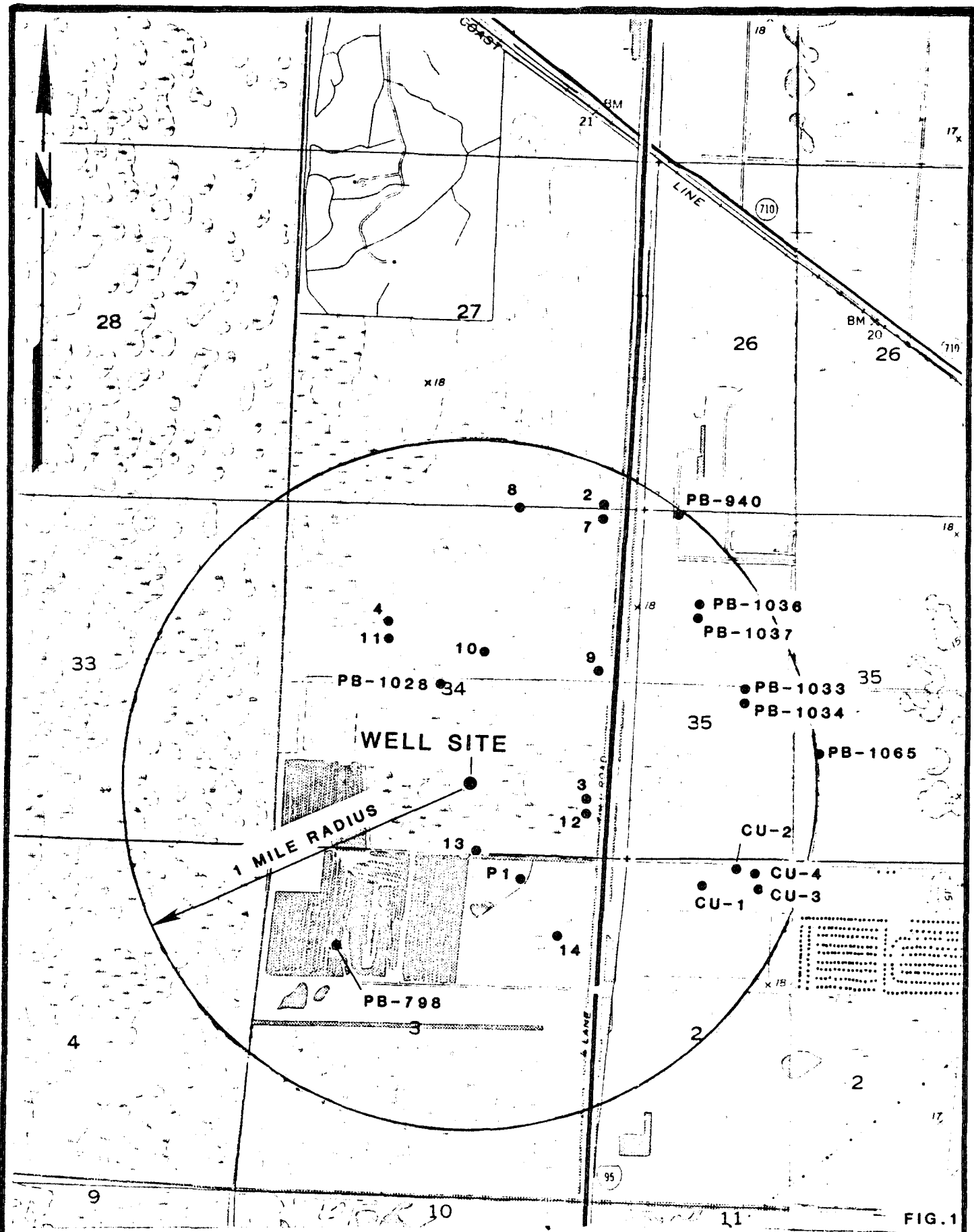
Wells Within Area of Review

There are 24 wells within a 1 mile radius from the well site (see Figure 1). Of these wells, three are used to produce water from the surficial aquifer for public supply. These wells are owned by the Consolidated Utilities Company. The Consolidated Utilities Company owns a fourth well; however, this well is abandoned. One well is privately owned and is used for domestic purposes. The remaining wells were installed by the Palm Beach County Solid Waste Authority and the United States Geological Survey. These wells are used for research and observation of the surficial aquifer and sediments. A summary of the available data on these wells is included in Appendix A.

HYDROGEOLOGIC SETTING

The geologic formations expected to be encountered beneath the site consist of a thick sequence of carbonate rocks of Eocene age overlain by sediments consisting of sand, shell, clay, and limestone ranging from Recent to Miocene age. Available information indicates that an injection zone exists approximately 3000 feet below land surface in fractured, cavernous dolomitic zones of the lower Eocene. Overlying these permeable dolomitic zones are middle Eocene zones of chalky limestone. These will serve as a confining sequence between the injection zone and the base of waters containing less than 10,000 mg/l of total dissolved solids. A generalized geologic column indicating the various formations underlying the area is presented in Figure 2. A brief description of the underlying strata follows. The Tamiami formation has been included with the Hawthorn formation as they both serve as a confining unit and are very similar lithologically. The Tampa and Suwannee formations have been included with the Ocala Group as they all comprise the upper Floridan aquifer and are also very similar lithologically.

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PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



TEST INJECTION WELL PROGRAM
SITE LOCATION
AND AREA OF REVIEW
PALM BEACH COUNTY SITE 7

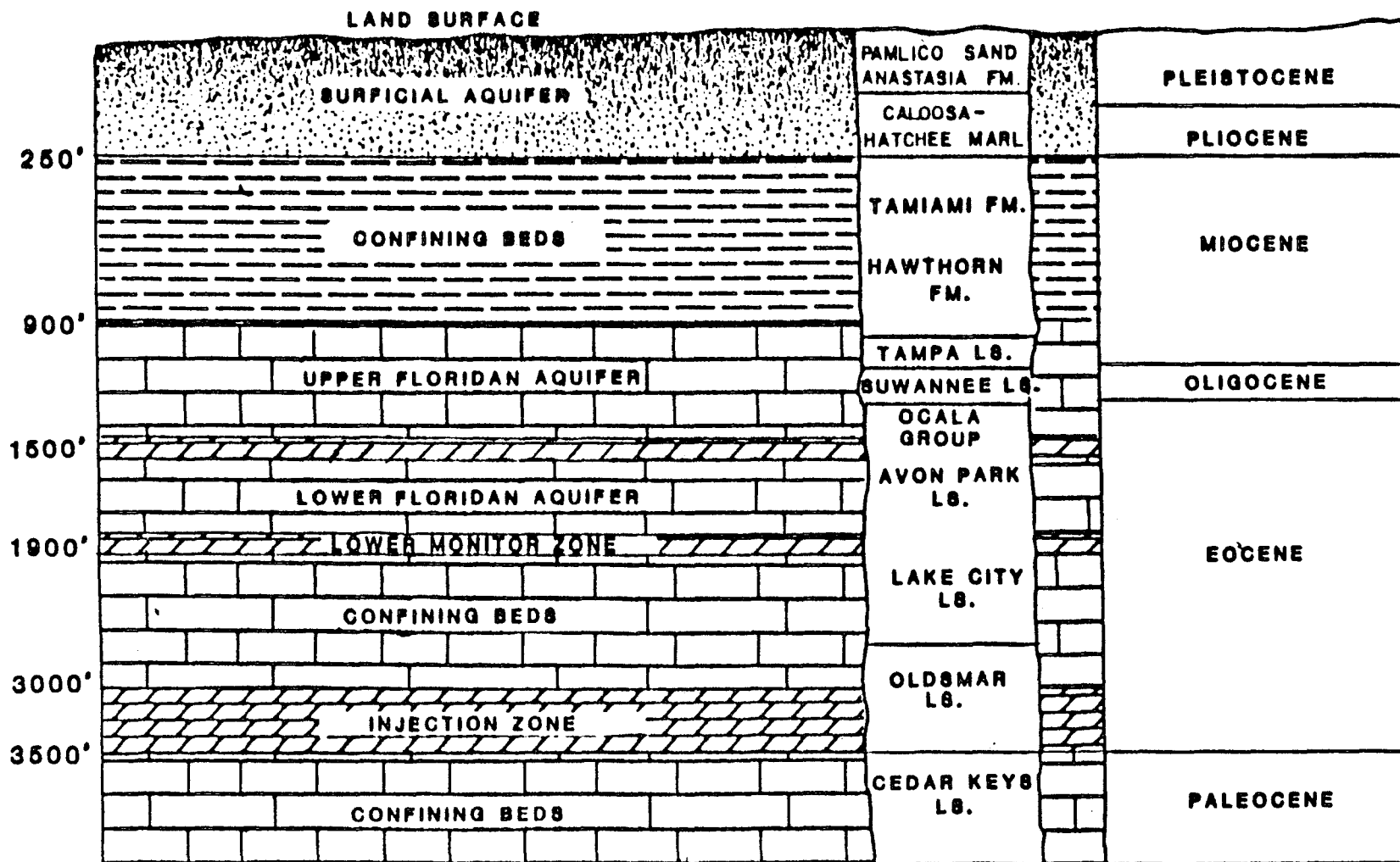
FIG. 1

RESOURCE RECOVERY FACILITY



ENERGIZED GEOLOGIC COLUMN
PALM BEACH COUNTY
SITE 7

APPROXIMATE DEPTH BELOW SURFACE



LEGEND

- | | | | |
|--|-------------------|--|-----------|
| | SAND, SHELL, SILT | | DOLOMITE |
| | CLAY, SANDY CLAY | | LIMESTONE |

NOT TO SCALE

FIG. 2

Surficial Sediments

The surficial deposits in the Site 7 area consist of unconsolidated to semiconsolidated beds of quartz sand, shells, calcareous clay and limestone. The surficial sediments extend to approximately 250 feet below land surface and range in age from Recent to Pliocene.

These sediments contain the surficial aquifer. This aquifer is used as a source of fresh water for public supply. The aquifer exists under water-table conditions and yields good quantities of water to wells. The aquifer is underlain by low permeability, late Miocene sediments of the Tamiami Formation. The general direction of ground-water flow in the surficial aquifer in this area is depicted on Figure 3.

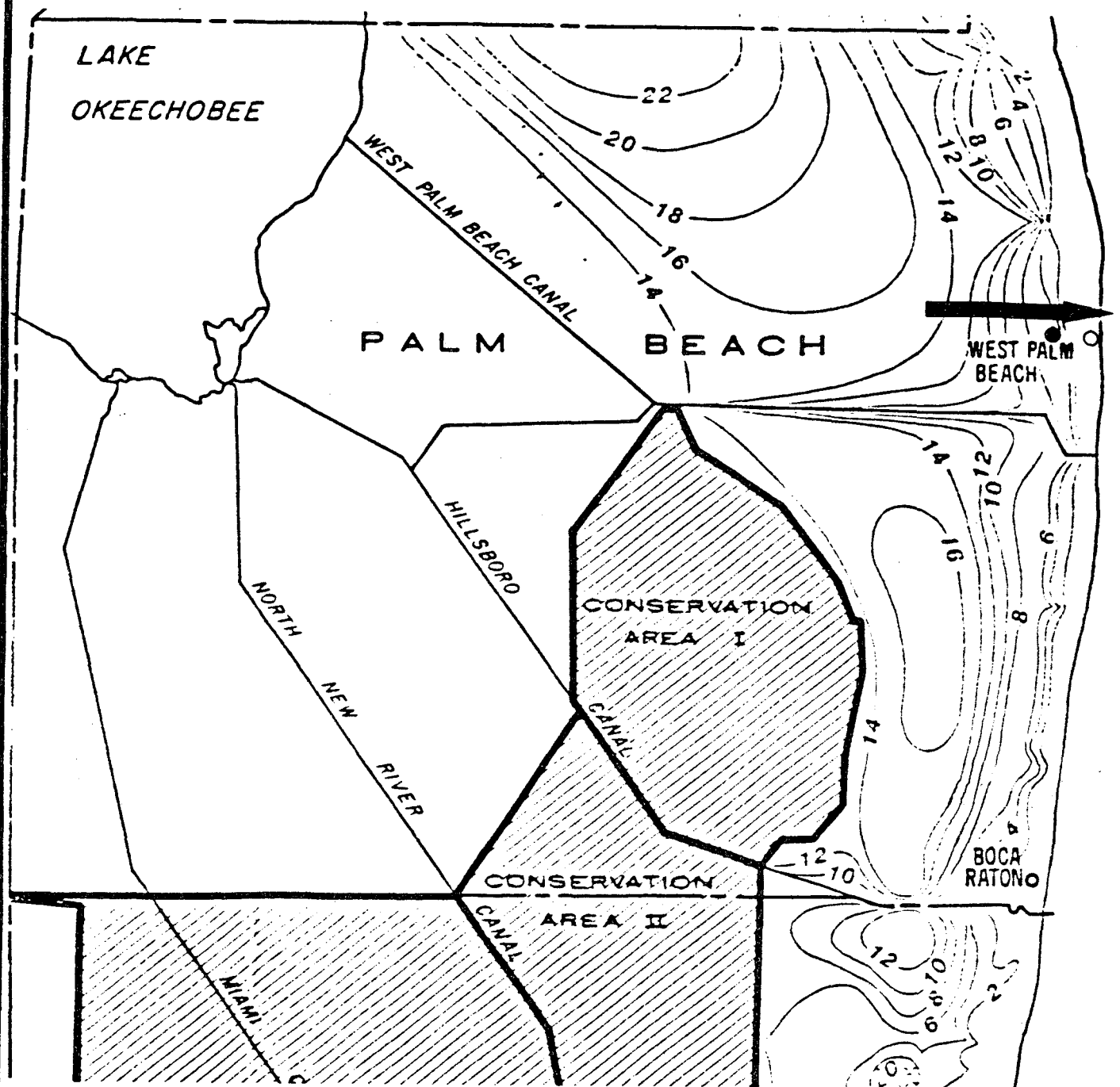
Hawthorn Formation

The Hawthorn Formation is of Miocene age and underlies the Tamiami Formation. The Hawthorn Formation is composed of greenish-gray, calcareous clay with varying amounts of quartz sand, phosphate, and limestone. The formation is relatively impermeable except for some limestone zones in the lower section. In general, the Tamiami and Hawthorn Formations have significantly less permeability than the underlying permeable limestone and provide good confinement for the Floridan aquifer. The lower Hawthorn and underlying Tampa Formation are considered part of the Floridan aquifer.

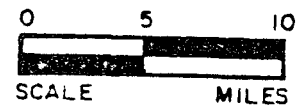
Ocala Group

The Ocala Group is of upper Eocene age and underlies the lower Miocene age Tampa Formation and Oligocene age Suwannee Formation. The Ocala Group consists of very permeable, fossiliferous limestone. The limestone is generally buff colored with loosely cemented fossils. The top of the limestone of the Ocala Group in this area of review occurs at approximately 1000 feet below land surface. The water present in this

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SOURCE: USGS WRI OPEN-FILE
REPORT 82-255



GENERAL DIRECTION OF FLOW →

● SITE LOCATION

FIG. 3

PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



GENERAL DIRECTION OF GROUND-
WATER FLOW IN THE SURFICIAL
AQUIFER PALM BEACH COUNTY
SITE 7

portion of the Floridan aquifer is brackish and is not considered to be potable except with advanced treatment. The general direction of ground-water flow in the Floridan aquifer, in this area, is depicted on Figure 4.

Avon Park Limestone

The Avon Park Limestone is of middle Eocene age and underlies the Ocala Group. The formation is expected to be found at approximately 1500 feet below land surface and is estimated to be 400 feet thick. The Avon Park is a fossiliferous limestone and dolomite. The limestone is light brown to buff colored, chalky, dense, with sections being highly fossiliferous. The dolomite is brown to dark brown, crystalline, with fossil remains and molds common. It is anticipated that the base of fresh water (total dissolved solids less than 10,000 mg/l) will be encountered within the Avon Park between 1700 feet and 1900 feet below land surface. The chalky limestones of the Avon Park will comprise part of a confining sequence overlying the injection zone.

Lake City Limestone

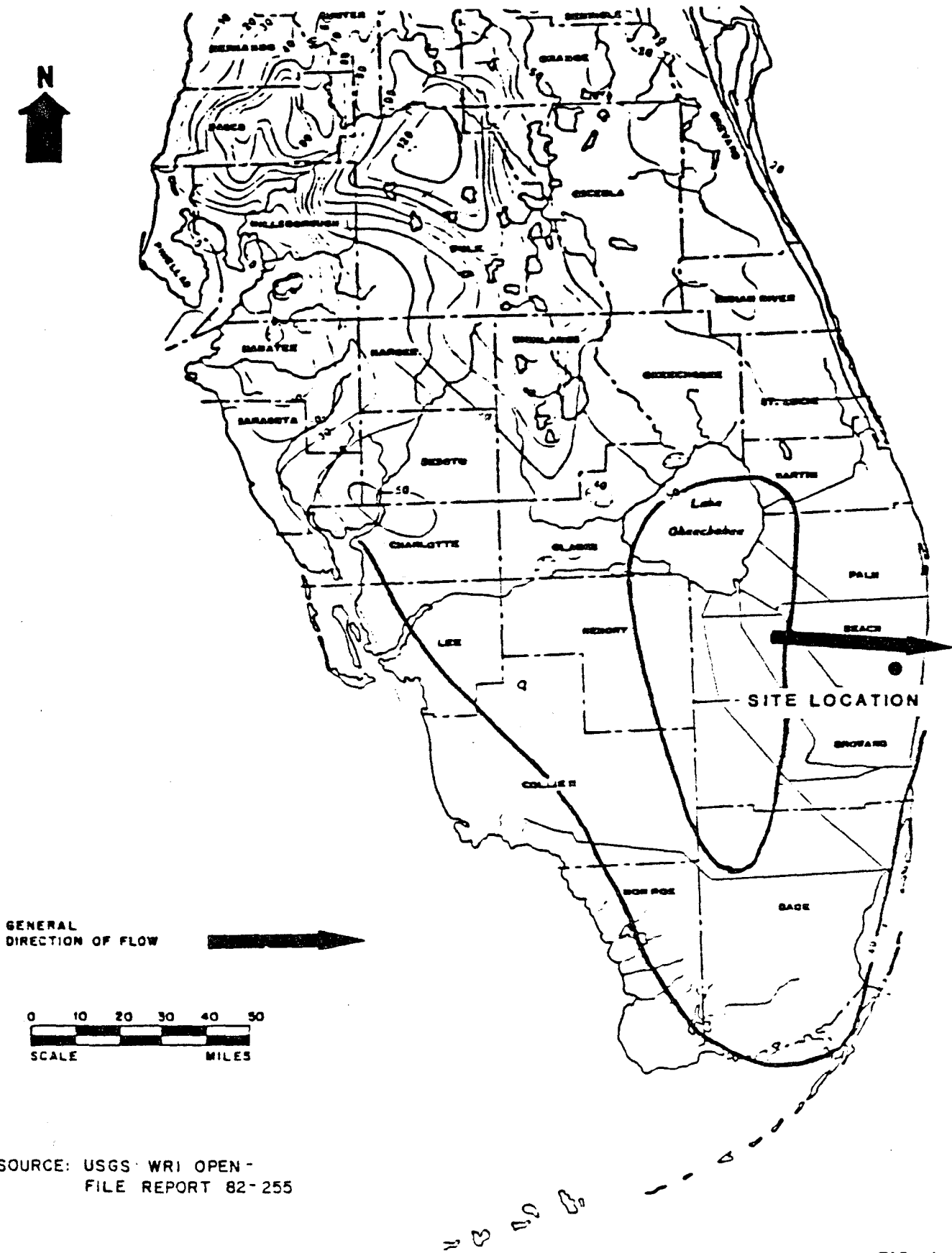
The Lake City Limestone is of middle Eocene age and conformably overlies the Oldsmar Limestone. The Lake City Limestone consists of chalky limestone with interbedded layers of dark brown, crystalline dolomite. The top of the Lake City Limestone should occur in this area at approximately 1900 feet and extend to approximately 2700 feet below land surface. Due to the chalky nature of the Lake City Limestone, portions will constitute an effective confining sequence for the injection zone.

Oldsmar Limestone

The Oldsmar Limestone is of lower Eocene age and the top is anticipated to be encountered at approximately 2700 feet below land surface. The Oldsmar Limestone consists of light brown to chalky white, fossiliferous limestone. Interbedded with the limestone is usually a dark brown,

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PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



GENERAL DIRECTION OF GROUND-
WATER FLOW IN THE FLORIDAN
AQUIFER PALM BEACH COUNTY
SITE 7

porous, crystalline dolomite with minor amounts of gypsum and anhydrite. Throughout much of south Florida, the lower part of the Oldsmar Limestone contains cavities ranging from 5 inches to 90 feet in thickness occurring in the dolomite layers. This section is referred to as the "Boulder Zone." Many successful injection wells have been completed in this zone in south Florida and it is the anticipated injection zone for this program.

INJECTION WELL DESIGN

The Site 7 wells are each designed for a disposal capacity of 1 mgd or 694 gpm (gallons per minute). At this injection rate, the average fluid velocity inside the injection casing will be approximately 4.9 ft/sec (feet per second). The injection tubing will be 8-inch-diameter new, threaded and coupled tubing having a wall thickness of 0.352 inches. It will extend from land surface to a depth of approximately 3000 feet below land surface. The bottom of the casing will be set near the bottom of the confining sequence. A retrievable external casing packer will be set near the bottom of the tubing. The annulus outside between the 8-inch-diameter injection tubing and the 12-inch-diameter final casing string will be filled with corrosion inhibited fresh water. The annulus will be placed under pressure and monitored in order to detect leaks. The open hole portion of the well will penetrate the boulder zone over a vertical thickness of about 500 feet. The diameter of the open hole will be a nominal 12 inches.

A 12-inch-diameter final casing string will extend from land surface to about 3000 feet below land surface and will consist of new seamless steel with a 0.500-inch wall thickness. The casing will be cemented in place with ASTM Type II or API Class B sulfate-resistant cement with gel and lost-circulation material as needed.

An intermediate casing will extend from land surface to about 2000 feet below land surface. The intermediate casing will be new steel, having a 0.375-inch wall thickness, and will be 22 inches in diameter. A

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2-3/8-inch-diameter monitor tube will be cemented in the annulus outside the intermediate casing. The monitor tube will extend to approximately 1800 feet below land surface. The bottom 30 feet of the tube will be perforated and gravel packed. Both the casing and monitor tube will be cemented in place with ASTM Type II or API Class B sulfate-resistant cement with gel and lost-circulation material as needed.

A surface casing will extend from land surface to approximately 1000 feet below land surface. The surface casing will be new steel with a 0.375-inch wall thickness, and be 32 inches in diameter. The casing will be cemented in place with ASTM Type II or API Class B sulfate-resistant cement with gel and lost-circulation material as needed.

A conductor casing will extend from land surface to approximately 120 feet below land surface. The conductor casing will be new steel with a 0.375-inch wall thickness, and be 40 inches in diameter. The casing will be cemented in place with ASTM Type II or API Class B sulfate-resistant cement with gel and lost-circulation material as needed.

The monitor tubing will be new, nominal 2-3/8-inch-diameter, 0.190-inch wall thickness. The monitor tubing will be an integral joint such as Hydril A-95 manufactured by Hydril Tubular Products Division. The monitor tubings will be installed in the annulus of the intermediate casings with the bottom 30 feet perforated or slotted. The monitor zones will be approximately 1800 feet below land surface. The monitor zones will be gravel packed with washed silica gravel. The final depths and lengths for the perforated sections will be based on data obtained during drilling and testing of the pilot holes.

The injection well design and details of the coring and testing program are shown in Figure 5.

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DRILLING PROGRAM

Site Preparation

Before drilling begins, site preparation will be completed by the Contractor. Items such as temporary access roads, water lines, and electrical power will be necessary before actual construction can begin. Included as part of the site preparation will be the installation of a pit casing and the construction of a drilling pad. The intent of the pit casing is to prevent the collapse of unconsolidated sediments during the initial drilling operations. The pit casing will be a section of pipe with an inside diameter sufficient to accommodate a 46-inch-diameter drilling bit. The material, length, and method of installation will be at the Contractor's option subject to approval by the Consultant.

Following the installation of the pit casing, a concrete drilling pad will be constructed. The pad site will be cleared, filled, graded, and compacted. Coarse material such as rocks and sticks will be removed. A reinforced concrete pad with curbing will be constructed. The Contractor will be required to maintain the pad in satisfactory condition during construction of the well.

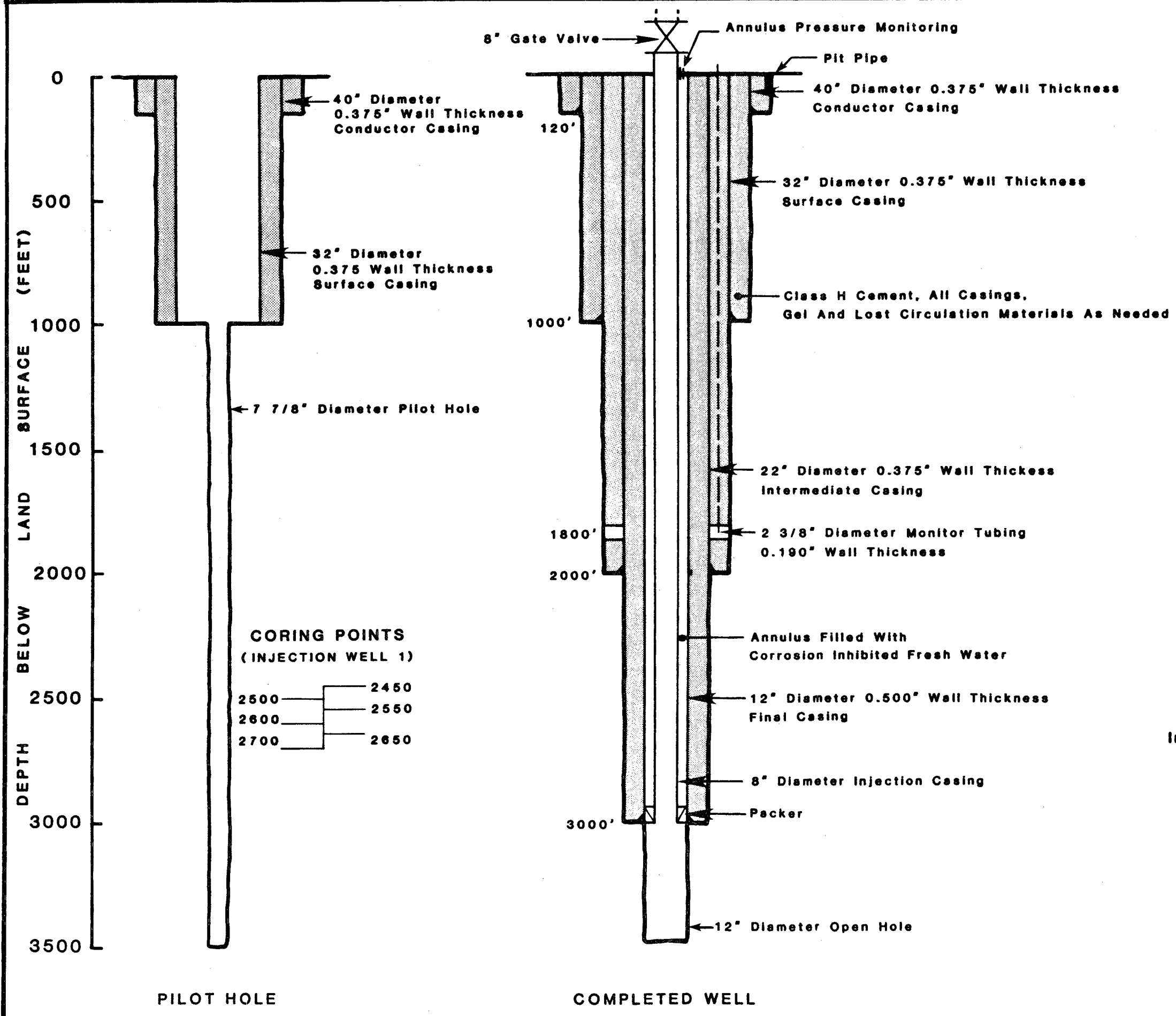
Water-Table Monitoring Wells

Four monitoring wells will be installed around the drilling pad in order to monitor the water quality of the shallow aquifer for increases in chlorides and/or other constituents due to any spills of salty or brackish water during drilling operations. These wells will be two inches in diameter, approximately 10 feet deep, with three feet of well screen. Construction details of the water-table monitoring wells can be found on Figure 6 and their typical locations are shown on Figure 7.

Water samples will be collected from each monitoring well on a weekly basis and analyzed for chloride concentrations. Samples will be

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CASING SCHEDULE

- Conductor** 40-Inch Diameter, Casing: 0.375 Inch Wall Pipe May Be Spiral Wound, ERW, Or DSAW Pipe, Welded Joints
- Surface** 32- Inch Diameter, Casing: 0.375 Inch Wall Pipe May Be Spiral Wound, ERW, Or DSAW Pipe, Welded Joints
- Intermediate** 22- Inch Diameter, Casing: 0.375 Inch Wall Pipe May Be Spiral Wound, ERW, Or DSAW Pipe, Welded Joints
- Final** 12- Inch Diameter, Casing: 0.500 Inch Wall, ERW, Welded Joints
- Injection** 8- Inch Diameter, Casing: 0.352 Inch Wall, Threaded And Coupled

collected prior to drilling to establish background values. These analyses will be performed by a Geraghty & Miller staff geologist using a field analysis kit. If, during the construction and testing of the test-injection wells, an increase in chloride concentration is observed in a monitoring well that can be attributed to a spill of drilling fluids or saline water, the Contractor will be required to restore the water quality to natural background conditions. This clean-up may be accomplished by pumping out the monitoring wells and properly disposing of the water. Additional wells may be necessary to facilitate an adequate clean-up and will be installed if needed.

Drilling Methods

The conventional mud-rotary drilling method will be employed for the first stage of drilling through the Surficial aquifer and confining unit to the underlying Floridan aquifer. For the remaining drilling, the reverse-circulation rotary drilling method will be employed with drilling mud and/or salt being used as the weight material. In all of the drilling phases, inclination or directional surveys will be performed at approximately 60-foot intervals.

During drilling, all fluids and cuttings will be contained in a closed-circulation system in which the cuttings are removed and the fluid returned to the borehole. The closed-circulation system will consist of leak-proof steel tanks with a minimum capacity for storing 2000 cubic feet (15,000 gallons) of fluid and cuttings. The circulation system also will contain suitable devices such as screens, shale shakers, and settling tanks, for the removal of cuttings from the drilling fluids.

During reverse circulation drilling, the borehole will be open to the Floridan aquifer and will tend to flow. The Contractor will be required to prevent the well from flowing at all times. A blow-out preventer will be kept on site at all times and will be placed on the well when no work is being performed below the Hawthorn Formation.

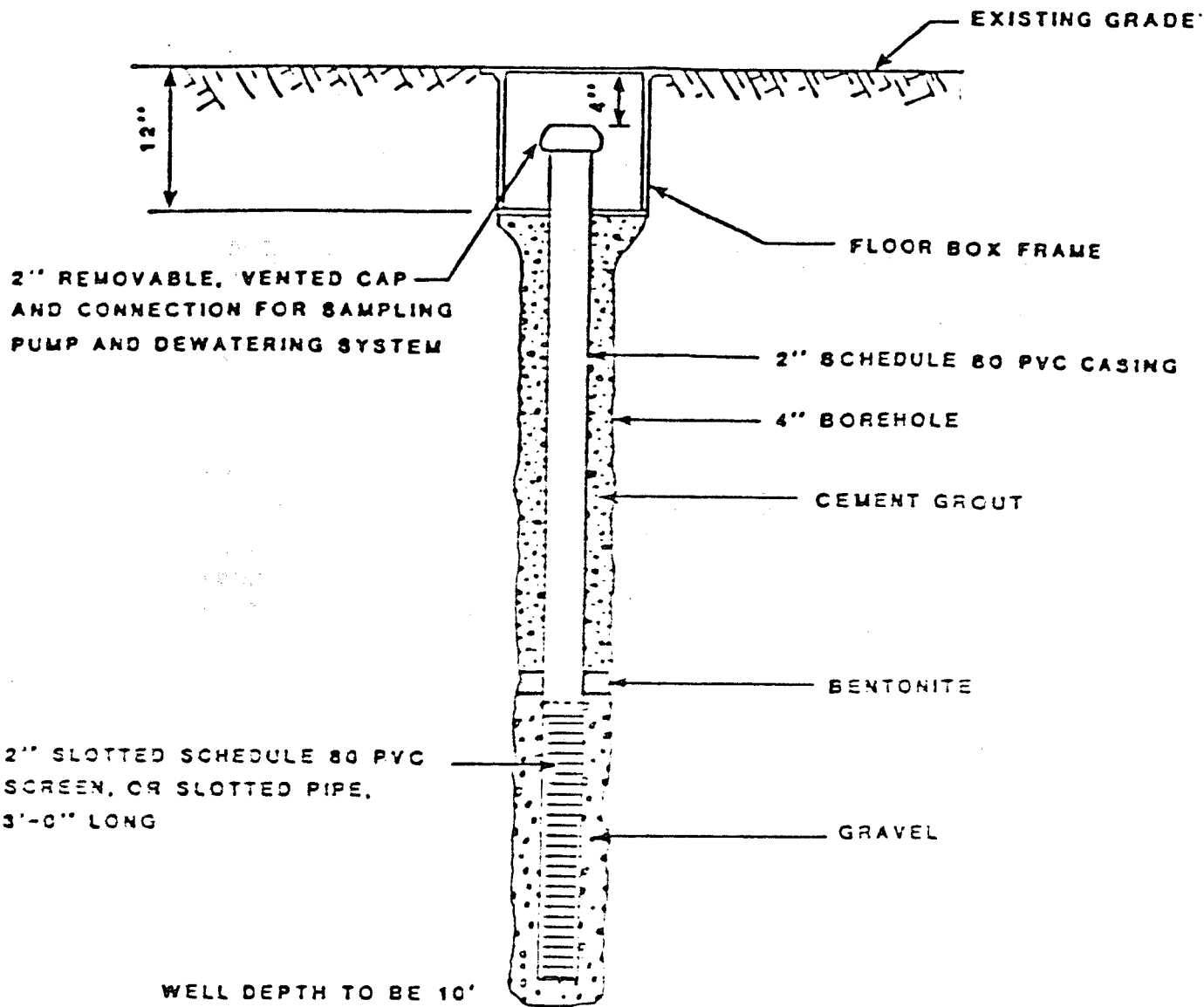


FIG. 6

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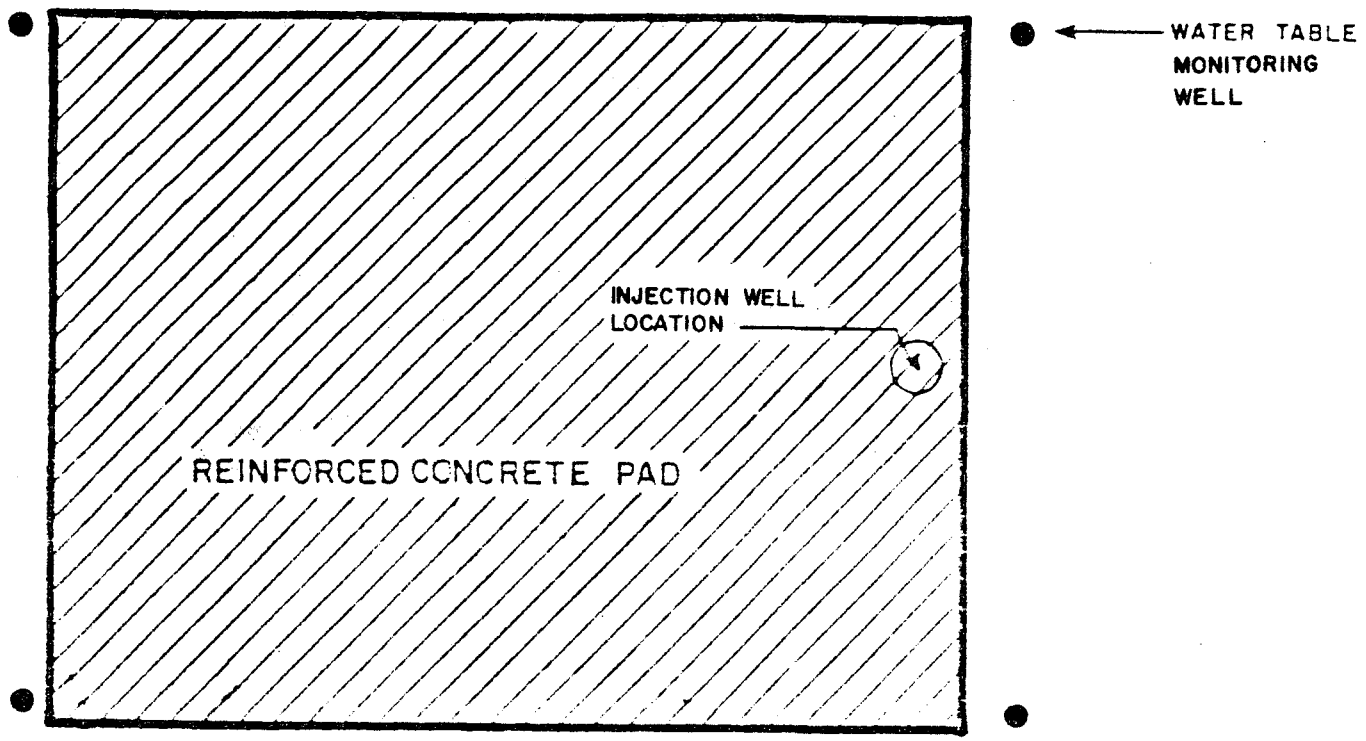


FIG. 7

PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



TYPICAL DRILL PAD
MONITORING WELL LOCATIONS
PALM BEACH COUNTY SITE 7

Drill cuttings, excess mud, and drilling fluid will be removed from the drilling site and disposed of at an approved location. The fluid displaced from the borehole during cementing operations will be considered as excess drilling fluid and will be disposed of at an approved location.

During all drilling, formation samples will be collected at ten-foot intervals and at formation changes or drilling breaks. Two complete sets of formation samples will be collected, preserved in well-marked bags, and stored on-site. Upon completion of the program, one complete set of samples will be furnished to the Florida Bureau of Geology. Additional sample sets will be collected, if requested by any interested agency or member of the TAC.

HYDROGEOLOGIC TESTING PROGRAM AND INJECTION WELL CONSTRUCTION OUTLINE

The following is a general outline of the drilling and testing programs for Injection Well 1 and Injection Well 2:

A. Site Preparation and Mobilization

1. Set pit pipe

(a) size and depth-Contractor's option

2. Pad and water-table monitoring well construction

3. Equipment set-up

B. Drilling

1. Drill 46-inch-diameter hole to approximately 120 feet below land surface. Conduct inclination surveys at 60-foot intervals
2. Set and cement in place 40-inch-diameter, 0.375-inch wall thickness steel conductor casing to approximately 120 feet below land surface
3. Drill a nominal 40-inch-diameter hole from 120 feet below land surface to approximately 1000 feet below land surface; conduct inclination surveys every 60 feet and run caliper log upon completion
4. Set and cement in place 32-inch-diameter, 0.375-inch wall thickness steel surface casing to approximately 1000 feet below land surface
5. Drill 7-7/8-inch-diameter pilot hole from bottom of 32-inch-diameter casing to 3500 feet below land surface
 - (a) Formation samples collected every 10 feet and at formation changes or drilling breaks
 - (b) Obtain 8 cores (6 in Injection Well 1 and 2 in Injection Well 2) from the confining sequence overlying the injection zones
 - (1) Proposed coring points (feet below land surface) for Injection Well 1
 - a. 2450
 - b. 2500
 - c. 2550
 - d. 2600
 - e. 2650
 - f. 2700

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(2) Coring points for Injection Well 2 will be based on results of pilot hole testing in Injection Well 1

(3) Core diameter 4 inches

(4) Core length 10 feet

(c) Conduct inclination surveys every 60 feet

C. Testing

1. Perform geophysical logging in pilot hole

- (a) Electric
- (b) Gamma ray
- (c) Temperature
- (d) Caliper
- (e) Dual Induction
- (f) Borehole-compensated sonic

NOTE: Logs to be performed by a qualified service company as part of the drilling contract

2. Packer Testing

(a) Perform straddle-packer tests (six) in Injection Well 1

(1) Determine water-quality distribution

(2) Determine confining sequence hydraulic properties

NOTE: Depth for straddle-packer tests will be determined from field data (i.e., cores, geologic and geophysical logs).

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3. Core Analyses

(a) Perform laboratory tests for:

- (1) Permeability (ASTM D2435)
- (2) Porosity
- (3) Specific gravity (ASTM D854)
- (4) Elastic modulus (ASTM D2938)
- (5) Compressive strength (ASTM D2938)

(b) Fracturing

(c) Core description

D. Well Completion and Mechanical Integrity Testing

1. Conduct gyroscopic survey of pilot hole
2. Set drillable plug at top of injection zone
3. Ream nominal 32-inch-diameter hole from bottom of 32-inch-diameter casing to approximately 2000 feet below land surface. Conduct combination inclination and directional surveys every 60 feet and run caliper log upon completion
4. Set approximately 2000 feet of 32-inch-diameter, 0.375-inch wall thickness intermediate casing and cement bottom $\pm$ 200 feet

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5. Install monitor tube to approximately 1800 feet and place gravel around the perforated or slotted section
6. Cement in place the 22-inch-diameter casing and monitor tube from the top of the monitor zone gravel pack to land surface
7. Ream nominal 22-inch-diameter hole from approximately 2000 feet to 3000 feet below land surface. Conduct combination inclination and directional surveys every 60 feet and run caliper log upon completion
8. Set and cement in place approximately 3000 feet of 12-inch-diameter, 0.500-inch wall thickness, steel casing
9. Conduct pressure test on 12-inch-diameter casing
10. Conduct cement bond log on 12-inch-diameter casing
11. Drill out cement plug and ream injection zone to approximately 3500 feet below land surface to a nominal 12-inch-diameter hole
12. Install 3000 feet of 8-inch-diameter 0.352-inch wall thickness, threaded and coupled tubing with a retrievable external casing packer set near the bottom
13. Fill annulus between 8-inch-diameter tubing and 12-inch-diameter casing with corrosion inhibited fresh water and pressure test annulus to 1.5 times the expected wellhead operating pressure (The expected wellhead operating pressure is about 62 pounds per square inch)
14. Conduct controlled injection test

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15. Perform color television survey of injection well from surface to total depth

Note: The Contractor should keep in mind that this is a test-injection program and that the depths are approximate and that actual depths will be determined based on site-specific data as required in Chapter 17-28 FAC. Also, the Contractor should be aware that the sequence of testing such as coring, straddle-packer tests, geophysical logging, and injection tests described in this outline may be changed in order of occurrence, or deleted, and additional testing may be added.

Borehole Testing

Following completion of the pilot-hole drilling, geophysical logs and straddle-packer tests will be conducted. A color television survey and injection test will be conducted upon completion of the wells. The data obtained from these tests, along with previously obtained data from the drill cuttings and cores, will be used to evaluate the thickness and the effectiveness of the confining sequence and injection zone.

Geophysical Logs

Geophysical well logging includes all techniques in which sensing devices are lowered into a borehole to record some physical parameter that indicates characteristics of the subsurface material or the fluids contained in the subsurface material. The purpose in running geophysical logs on the test-injection wells is to obtain data on the presence and thickness of potential injection zones and confining beds.

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The following series of geophysical logs will be conducted on the test-injection wells:

- (1) Electric
- (2) Gamma ray
- (3) Temperature
- (4) Caliper
- (5) Dual-induction
- (6) Borehole-compensated sonic

Logs will be performed by a qualified service company as part of the drilling contract.

Straddle-Packer Tests

The straddle-packer tests will be performed to isolate selected sections of the borehole for testing to determine their hydraulic characteristics and collect water quality data. Inflatable packers will be run into the hole on drill pipe and casing of sufficient diameter to house a submersible pump. After the testing equipment is in place and the packers are seated, a pump-out test will be conducted and drawdown and recovery data collected. During the pump-out test, the conductivity and temperature of the discharged water will be monitored. Just prior to the end of each pump-out test and upon confirmation that conductivity and temperature measurements have stabilized, a representative water sample will be collected for analysis by a qualified laboratory. The exact depths for the tests and packer settings will be determined from previously collected data (drill cuttings, cores, geophysical logs). Provision will be made in the drilling contract for six tests in Injection Well 1 with an allowance for additional tests in the event that field conditions warrant.

Injection Test

Following the completion of the wells, 24-hour injection tests will be conducted on each well. The tests will be conducted at a rate of 700 gpm (gallons per minute). Water will be pumped from one injection well into the other during these tests. The data that will be collected during the tests will consist of injection pressure (well head), injection rate, bottom hole pressure, and temperature and annulus pressure. Water levels and temperatures in the monitor zones will also be measured and recorded.

The bottom hole pressure will be continuously monitored by a pressure gauge and recording system capable of accurately measuring and detecting pressure changes of as little as 0.01 psi such as the Lynes RES-300 system. Twenty-four hours of continuous background data will be obtained before the tests are started and 12 hours of continuous data will be collected upon completion of each test.

Television Survey

Following completion of the injection tests, a color television survey will be performed on the wells from the top of the 8-inch-diameter injection tubing to the bottom of the borehole. A tape of the television survey will be made and copies furnished to the members of the TAC.

Monitor Tubes

The monitor tubing shall be new, unused, 2-3/8-inch-diameter, 4.7 pounds per foot, 0.190-inch wall thickness, and shall conform to API-J-55 standards. The monitor tubing shall be integral joint such as Hydril A-95 as manufactured by Hydril Tubular Products Division.

The monitor tubes shall be installed to depths of approximately 1800 feet below land surface in the annulus between the 32-inch-diameter

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boreholes and the 22-inch-diameter casings. Before installing the monitor tubes, the Contractor shall have the bottom 30 feet perforated or slotted. The Contractor must submit his proposed method and plans for perforating or slotting the tubing to the Consultant for approval. The bottom of the tubes, when installed, must be plugged in a manner acceptable to the Consultant.

In order to insure that representative formation water samples can be collected, the monitor tubes will be developed by pumping until conductivity measurements of the discharged water have stabilized. At a minimum, the tubes will be pumped until 5 times the calculated tube volume have been displaced. Water-quality data from the discharged water will be compared with the water-quality data obtained during the straddle-packer tests in order to confirm that representative samples of the native formation water are being produced. If the monitor tubes are not open to the formation and capable of producing representative formation water samples, the Contractor shall employ such procedures as are necessary to open up the monitor tubes to the formation.

Abandonment

In the event that no suitable confining unit or injection zone is found to exist in Test-Injection Well 1, the well would be abandoned. Geraghty & Miller would make a recommendation as to the number and depths of cement plugs to be used based on analysis of data collected during the drilling and testing and would forward its recommendation to members of the TAC for their comment and approval before proceeding.

It is not anticipated that cement plugs would be set in the permeable zones in the Floridan aquifer. These zones would be filled with crushed limestone gravel to reduce cement losses to the formation. The cement to be used in the plugs would consist of ASTM Type II or API Class B, sulfate-resistant cement grout with gel and lost circulation material as needed.

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CLOSING COMMENTS

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The techniques employed in the design of the wells and the features of their construction are proven and accepted. The mechanical integrity of the injection wells will be established initially by pressure testing and television survey. During operation, the mechanical integrity of the wells will be continuously evaluated by monitoring the annulus pressure of the injection casings. Provision will be included in the wellhead design to allow for the introduction of logging tools and a television camera while the wells are under pressure. The techniques used initially to evaluate mechanical integrity can be used in the injection well in the future to evaluate their condition. The wells have been designed so that mechanical integrity may be evaluated in accordance with the requirements of 17-28.13 (6). In the event that the injection wells are shown to lack mechanical integrity, a variety of techniques are available to restore them. As an example, squeeze cementing can be used, casing patches can be applied, or sections of the injection casing replaced. These are standard techniques, accepted in the industry, whose reliability has been tested by time.

During the course of the program, Geraghty & Miller will be responsible for keeping the TAC informed of progress. Daily construction/progress reports will be submitted to the TAC on a weekly basis. Additionally, the TAC will be informed of any problems when they occur. As the program progresses, regularly scheduled meetings will be held with the TAC. These meetings will be held after the pilot hole in Test-Injection Well 1 has been completed, logged, and tested; and following the completion of the injection wells and the mechanical integrity testing of the wells. The TAC will be kept advised of the scheduling of coring, logging, testing, and construction operations (casing and cementing) in the event any or all of the committee members wish to observe.

The final report to be prepared by Geraghty & Miller will serve as the supporting document for the operating permit for the wells. It will be a descriptive report interpreting the results of the various geophysical

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logs, core and test data demonstrating the adequacy of the injection zone and confining sequence. The quality of water in the injection and monitor zones also will be included. Copies of all logs, laboratory reports, and test data will be included, along with certifications of mechanical integrity and a plugging and abandonment program. Finally, recommendations will be presented regarding injection well operating procedures.

Respectfully submitted,
GERAGHTY & MILLER, INC.

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Lawrence S. Sims
Staff Scientist

James A. Wheatley

James A. Wheatley
Senior Scientist

March 1985

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APPENDIX A

WELL INVENTORY DATA

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APPENDIX A

WELLS WITHIN AREA OF REVIEW
PALM BEACH COUNTY
SYSTEM #7

Well Number	Diameter (inches)	Borehole Depth (feet)	Pumpage (gpm)	Owner
P1	—	—	—	6501 45th Street
2	4	120	—	Palm Beach County
3	4	130	—	Solid Waste Authority
4	4	120	—	" "
7	2	16	—	" "
8	2	16	—	" "
9	2	16	—	" "
10	2	16	—	" "
11	2	16	—	" "
12	2	16	—	" "
13	2	16	—	" "
14	2	16	—	" "
PB-798	—			" "
PB-940	—	65	—	" "
PB-1028	—		—	" "
PB-1033	—	115	—	" "
PB-1034	—	45	—	" "
PB-1036	—	42	—	" "
PB-1037	—	24	—	" "
PB-1065	—	115	—	" "
CU-1	8	120	300	Consolidated
CU-2	8	120	400	Utilities Company
CU-3	—	—	—	" "
CU-4	6	115	225	" "

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APPENDIX B

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CLASS 1 INJECTION WELL PROGRAM
TECHNICAL SPECIFICATIONS
PALM BEACH COUNTY SOLID WASTE AUTHORITY
SITE 7

March 1985

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TECHNICAL SPECIFICATIONS

PART 1 - GENERAL

1.01 SCOPE: The work described in these Specifications and accompanying plans is for the construction and testing of two injection wells for the Palm Beach County Solid Waste Authority at Site 7 west of West Palm Beach, Florida.

The wells shall be drilled into aquifers containing saline water under pressure. The shallow aquifer contains potable water at the well site; it is required that the saltier water from the deep aquifers be handled so that there shall be no spills upon the ground. Requirements will be set forth in these specifications regarding the handling of salty water, drilling fluids, and cuttings. Requirements also are set forth for controlling the flow of the wells during construction and providing a closed, steel-lined circulation system for all drilling operations. Drilling pads will be required and shall be constructed to retain spillage of water from drilling and related operations. Water-table monitor wells will be installed around each pad. Due precautions should be taken to prevent spills; any spillage of fluids shall be returned to the closed-circulation system.

At the completion of drilling, the Contractor shall remove the closed-circulation system and its appurtenances which are not part of the completed well and leave the site in good condition acceptable to the Consultant.

1.02 OUTLINE SPECIFICATIONS OF WELLS:

A. Site Preparation and Mobilization

1. Clearing, access-road construction, and grubbing
2. Set pit pipe

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3. Construction of pad and water-table monitor wells (IW-1)

4. Equipment set-up

B. Drilling and Testing (IW-1)

1. Drill nominal 46-inch-diameter hole to approximately 120 feet below land surface; conduct inclination surveys every 60 feet.

2. Set and cement in place 40-inch-diameter, 0.375-inch wall thickness steel casing to approximately 120 feet below land surface.

3. Drill a nominal 40-inch-diameter hole from 120 feet below land surface to approximately 1000 feet below land surface; conduct inclination surveys every 60 feet and run caliper log upon completion.

4. Set and cement in place 32-inch-diameter, 0.375-inch wall thickness steel surface casing to approximately 1000 feet below land surface.

5. Drill 7-7/8-inch-diameter pilot hole from approximately 1000 feet to approximately 3500 feet, collecting cores as directed by the Consultant; conduct inclination surveys every 60 feet.

6. Conduct geophysical logging as directed by the Consultant.

7. Conduct straddle-packer tests as directed by the Consultant.

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C. Well Completion (IW-1)

1. Set cement plug in pilot hole at the top of the injection zone approximately 3000 feet below land surface.
2. Conduct gyroscopic survey of pilot hole.
3. Drill nominal 32-inch-diameter hole from approximately 1000 feet to approximately 2000 feet below land surface; conduct directional surveys every 60 feet and run caliper log upon completion.
4. Set and cement in place 22-inch-diameter, 0.375-inch wall thickness steel casing to approximately 2000 feet below land surface with a 2-3/8-inch diameter monitor tube set in the annulus at approximately 1800 feet below land surface.
5. Drill nominal 22-inch-diameter hole from approximately 2000 feet to approximately 3000 feet below land surface; conduct directional surveys every 60 feet and run caliper log upon completion.
6. Set and cement in place 12-inch-diameter, 0.500-inch wall thickness seamless steel casing to approximately 3000 feet below land surface.
7. Conduct pressure test on 12-inch casing.
8. Conduct cement bond log on 12-inch casing.
9. Drill nominal 12-inch-diameter hole from approximately 3000 feet to approximately 3500 feet below land surface and develop the well.

10. Set approximately 3000 feet of 8-inch-diameter, 0.352-inch wall thickness, threaded and coupled injection tubing with a retrievable external casing packer.
11. Fill annulus between the 8-inch-diameter injection tubing and the 12-inch-diameter casing with corrosion inhibited fresh water.
12. Pressurize the annulus to 1.5 times the anticipated wellhead pressure during operation.

D. Pad Preparation (IW-2)

1. Set pit pipe.
2. Construction of pad and water-table monitor wells
3. Equipment set-up

E. Drilling (IW-2)

1. Drill 46-inch-diameter hole to approximately 120 feet below land surface; conduct inclination surveys every 60 feet.
2. Set and cement in place 40-inch-diameter, 0.375-inch wall thickness steel casing to approximately 120 feet below land surface.
3. Drill nominal 40-inch-diameter hole to approximately 1000 feet below land surface; conduct inclination surveys every 60 feet and run caliper log upon completion.
4. Set and cement in place 32-inch-diameter, 0.375-inch wall thickness steel casing to approximately 1000 feet below land surface.

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5. Drill 7-7/8-inch diameter pilot hole from approximately 1000 feet to 3500 feet below land surface collecting cores as directed by the Consultant; conduct inclination surveys every 60 feet.
6. Conduct geophysical logging as directed by the Consultant.
7. Conduct straddle-packer tests as directed by the Consultant.
8. Set cement plug at the top of the injection zone approximately 3000 feet below land surface.
9. Conduct gyroscopic survey of the pilot hole.
10. Drill nominal 32-inch-diameter hole to approximately 2000 feet below land surface; conduct directional surveys every 60 feet and run caliper log upon completion.
11. Set and cement in place 22-inch-diameter, 0.375-inch wall thickness steel casing to approximately 2000 feet below land surface with a 2-3/8-inch diameter monitor tube set in the annulus at approximately 1800 feet below land surface.
12. Drill nominal 22-inch-diameter hole from approximately 2000 feet to 3000 feet below land surface; conduct directional surveys every 60 feet and run caliper log upon completion.
13. Set and cement in place 12-inch-diameter, 0.500-inch wall thickness seamless steel casing to approximately 3000 feet below land surface.
14. Conduct cement bond log of the 12-inch casing.
15. Conduct pressure test on the 12-inch casing.

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16. Drill nominal 12-inch-diameter hole from approximately 3000 feet to 3500 feet below land surface and develop well.
17. Set approximately 3000 feet of 8-inch-diameter, 0.352-inch wall thickness threaded and coupled injection tubing with a retrievable external casing packer.
18. Fill annulus between the 8-inch-diameter injection tubing and the 12-inch-diameter casing with corrosion inhibited fresh water and pressure test to 1.5 times the anticipated operating wellhead pressure.

NOTE: The two injection wells must be completed before injection testing may be performed.

F. Injection Testing

1. Conduct controlled injection test on Injection Well 1.
2. Conduct controlled injection test on Injection Well 2.
3. Perform color television surveys on completed injection wells from total depth to surface.

NOTE: The Contractor should keep in mind that this is an injection well program and that the depths are approximate. Also, the Contractor should be aware that the sequence of testing such as coring, straddle-packer tests, geophysical logging, and injection tests described in this outline may be changed in order of occurrence, deleted, and additional testing may be added.

1.03 LOCAL GEOLOGIC CONDITIONS: It is anticipated that the boreholes will encounter beds of shells, sand, and clay to a depth of

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approximately 250 feet below land surface. Below this depth, clays, marl and limestone are present. Permeable zones contain brackish water under pressure and flowing conditions will be present. Below approximately 1400 feet, interbedded layers of limestone and dolomite should be found. Below approximately 2000 feet below land surface, cavities may be encountered.

Information regarding subsurface conditions is intended to assist the Contractor in preparing his bid. The Owner or Consultant does not guarantee its accuracy or that it is necessarily indicative of conditions to be encountered in drilling the well. The Contractor shall satisfy himself regarding all local conditions affecting his work by personal investigation and neither the information on local geology, nor that derived from maps or plans nor from the Owner or his agents or employees shall act to relieve the Contractor of any responsibility hereunder or from fulfilling any and all of the terms and requirements of the contract and Specifications.

1.04 SITE PREPARATION: Within the limits of the staging area as shown on the working drawings, the Contractor shall clear and grub trees as directed, stumps, brush, and other objects standing on or protruding from the ground. All roots shall be grubbed and removed to a minimum of 18 inches below the surface of the ground. Holes caused by grubbing operations shall be filled to the level of adjacent ground. All material and debris resulting from clearing and grubbing operations shall be burned or otherwise disposed of in a manner approved by the Consultant. It shall be the responsibility of the Contractor to obtain any permits that are required.

The cost for all site preparation shall be included in the lump sum price for Injection Well 1.

1.05 DRILLING PAD: At the site of the injection wells, the Contractor shall build suitable concrete pads as work floors for his drilling rigs. The pads shall be formed with curbing to contain spills of water and

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drilling fluids and a method of returning them to the required closed-circulation system as shown on the Contract Drawings. The Contractor shall submit for approval of the Engineer his pad design. Included on the Plan shall be the overall pad dimensions, curbs, method of drainage, and the amount of steel reinforcement needed to handle the greatest weight of rig and work load anticipated.

1.06 WATER SUPPLY: The responsibility shall be upon the Contractor to provide and maintain, at his own expense, an adequate supply of water for domestic consumption and construction at the construction site. The cost for all water supply shall be included in the lump sum price for the wells.

1.07 ELECTRICITY: All electric current required by the Contractor shall be furnished at his own expense. All temporary lines will be furnished, installed, connected, and maintained by the Contractor at his cost in a workmanlike manner satisfactory to the Owner and Consultant and shall be removed by the Contractor in like manner at his expense at the completion of the work.

1.08 WATER-TABLE MONITOR WELLS: The Contractor shall install four small-diameter monitor wells in the area around each injection well drilling pad. The purpose of these wells will be to monitor the water-table aquifer for increases in chlorides due to spills of salty water during drilling operations and (possibly) to pump out the shallow aquifer to reduce any contaminant level to normal if a spill occurs.

These wells shall be cased with 2-inch-diameter Schedule 80 PVC pipe to a depth of approximately 10 feet, or tapping the water table. The bottom three feet of PVC pipe shall be slotted as shown on contract drawings. The size of the slots shall be compatible with the gravel to be used, and shall be approved by the Consultant before installation.

PVC casings shall be lowered into a predrilled hole and cemented in place, in accordance with the detail shown on the drawings. Each well

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casing shall be provided with an access box at the surface as called for on the working drawings.

After completion, each monitor well shall be pumped until the water is clear, and a one-quart sample shall be collected, properly labeled, and transmitted to the Consultant. Cost of the monitor wells for the entire job will be included in the lump sum price for each injection well.

1.09 DAILY LOG: The Contractor shall maintain a detailed daily log of his operations during the drilling of the monitor and injection wells. The log shall give a complete description of all formations encountered, footage and size of hole drilled, depth and sizes of all casings installed in the wells, fluid losses, water-level changes and the depths at which they occurred, cementing operations, and other such pertinent data as may be requested by the Consultant. The daily log shall be maintained on the site and available for inspection by the Consultant at all times.

1.10 RECORD DRAWING: Upon completion of the work, the Contractor shall supply the Consultant with a reproducible record drawing of each well. The drawings shall show hole and casing diameters and depths and other information that may be required by the Consultant and regulatory agencies.

1.11 REMEDIAL WORK: If remedial work proves to be necessary to make a well acceptable and come within the Specifications because of accident, loss of tools, defective material, or for any other cause, the Contractor shall propose a method of correcting the problem, in writing. Suggested methods shall be reviewed and approved by the Consultant before work proceeds. Such work shall be performed at no additional cost to the Owner and it shall not extend the length of the Contract. The Contractor is notified that all specifications shall be met, including hole straightness and setting of casings and monitor tubes to the points designated by the Consultant.

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1.12 ABANDONMENT OF WELL BY CONTRACTOR: Any hole in which the Contractor voluntarily stops work, and/or fails to complete in a satisfactory manner, in accordance with the Specifications and approved changes, shall be considered as abandoned by him. If the Owner declares the hole abandoned by the Contractor, then no payment will be made for the abandoned hole. All abandoned holes shall be properly plugged and sealed by the Contractor at his own cost in accordance with state and local regulations. All salvageable material furnished by the Contractor may be removed and remain his property. The Contractor shall submit his plan of action for abandonment and plugging. Casings may be removed only with the permission and approval of the Consultant.

1.13 FIELD OFFICE: The Contractor shall provide a suitable, weatherproof field office for the use of the Consultant and his representatives. It shall be located in a position which in the opinion of the Consultant is adequate for supervision and inspection of the work. The Contractor shall furnish the field office with water, sanitary facilities, lighting, heating, air conditioning, telephone, and janitor service. The cost of this field office and maintenance thereof shall be included in the lump sum price of the wells.

1.14 GUARANTEE: The Contractor guarantees that the work and service to be performed under the Contract and all workmanship, materials, and equipment performed, furnished, used, or installed in the work shall be free from defects and flaws, and shall be performed and furnished in strict accordance with these Specifications and contract documents; that the strength of all parts of all manufactured equipment shall be adequate and as specified; and that performance test requirements of the Contract shall be fulfilled. The Contractor shall repair, correct, or replace all damage to the work resulting from failures covered by the guarantee. The guarantee shall remain in effect for one year from the date of completion.

1.15 STANDBY TIME: The Owner and/or Consultant may order the Contractor to stop his operations so that extra work not included in the

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Specifications such as logs can be run, tests performed, or data collected. The Consultant will advise the Contractor when he proposes to do this and will schedule his request so it causes a minimum of delay. The Contractor will be reimbursed at hourly rates which will be listed in the Bid Proposal Form. All extra work must be approved by the Consultant.

The Contractor shall include the cost of 120 hours of standby time in the lump sum price in each injection well. A credit or charge for more or less hours than the number specified will be taken into account in the unit price schedule of the Agreement.

PART 2 - OPERATING REQUIREMENTS

2.01 GENERAL: It is essential that salty or brackish water produced from any source during the drilling operations is prevented from contaminating the shallow aquifer which contains fresh water. Any water produced during the drilling shall be confined to the circulation system and drilling pad.

The drilling will be accomplished using a circulation system designed and constructed so that under no conditions shall there be an overflow. The Contractor shall be required to take all necessary steps to prevent accidental spillages from occurring. Tanks for the circulation system shall be steel and leakproof. The Contractor shall submit plans for the circulation system to the Consultant for approval. In no case will a system capable of storing less than 2000 cubic feet (15,000 gallons) of fluid and cuttings be considered. Written approval from the Consultant will be required before the Contractor is allowed to proceed.

Flowing conditions in the injection wells shall be kept under control at all times. Drilling mud and/or salt may be used as weight material to keep the drilling fluid at a density necessary to suppress the flow. No salt may be used until a well is cased to approximately 1000 feet below land surface. No naturally-occurring brines such as those produced from

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oil wells can be used as drilling fluid or weight material. As flowing conditions are anticipated during the drilling of the injection wells, the Contractor shall furnish and install a suitable blow-out preventer. The type of preventer shall be approved by the Consultant and shall be used during drilling operations below the Hawthorn Formation. When no work is being done on the well, the preventer shall be put in place.

Drill cuttings and drilling fluid shall be removed from the drilling site and disposed of at an approved location. The fluid displaced from the borehole during cementing operations shall be considered excess drilling fluid and shall be properly disposed of; all costs of disposal shall be included.

When all casings are being set and cemented in place, it is the Contractor's responsibility to insure that these operations are conducted in such a manner that the casing collapse and burst strengths are not exceeded and the casings are not caused to fail.

2.02 EQUIPMENT REQUIREMENTS: Equipment in first-class working order shall be provided. The Contractor shall use his own drilling equipment having the minimum capabilities necessary to do the described work. No unnecessary delays or work stoppages will be tolerated because of equipment failure. They will not be considered as a valid reason for extending the length of the contract. The Contractor shall be held responsible and payment may be withheld for damages to the well due to any cause of negligence, faulty operation, or equipment failure.

The Contractor shall provide and operate equipment capable of handling the largest load that will be placed upon the rig during this contract. If conditions develop in the field that prove the rig that has been supplied by the Contractor is incapable of completing the well, the Contractor will be required to provide a larger rig with the necessary capacity.

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The drilling rig employed in drilling the injection wells shall use a geolograph capable of recording drilling time and weight of the tool string. This information shall be recorded by the Contractor and records or copies furnished to the Consultant.

2.03 DRILLING METHODS: The conventional mud-rotary method will be employed for all drilling of the injection wells through the Hawthorn Formation, approximately 1000 feet below land surface. All drilling below this point shall be done by the reverse circulation rotary method, and there shall be no discharge of drilling fluids and/or formation fluids. During all reaming operations, the Contractor must incorporate the use of a lead bit or stinger and staged drilling assembly to facilitate the tracking of the pilot hole. If, in the opinion of the Contractor, conditions are found that would warrant the use of some other drilling method, he may propose the use of an alternative. Prior to implementing the proposed method, it shall be approved by the Consultant. A closed-circulation system shall be used for the drilling fluids employing suitable devices such as screens, shale shakers, and settling tanks to remove cuttings. There are no means of handling or disposing of drilling fluids on the site.

2.04 CONDITIONS AND HAZARDS: The Contractor should be advised and be aware of difficult drilling conditions and problems he may encounter during the drilling, construction, and testing of the well. Typical examples he may have to cope with include, but are not limited to, lost circulation and cavities in the Floridan aquifer; squeezing zones in the Hawthorn Formation; fractured zones, with attendant caving problems. A priority requirement of these Specifications is the drilling of straight holes and setting all casings and monitor tubes to specified depths. Hole straightness, which will permit casings to be set at specified depths and facilitate achieving a proper cement seal, shall not be sacrificed for drilling speed. These and other pertinent factors shall be taken into consideration by the Contractor in planning and executing the work.

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The goal of the program is the successful completion of the wells described in these Specifications. In the event of any problems or difficulty which may jeopardize the successful completion of a well in accordance with the Specifications and approved changes, it is the Contractor's responsibility to perform work required to successfully remedy any problem and perform such surveys as necessary to demonstrate the problem has been solved and that the well is in compliance with the Specifications. In the event a problem occurs, the Contractor will be notified in writing by the Consultant. The Contractor will submit to the Consultant his plan of action to identify and/or solve the problem and the Consultant will review the plan of action. In the event the problem is considered serious enough to jeopardize successful completion of the well, in accordance with the drawings and Specifications, the Consultant may request technical concurrence from the regulatory and scientific agencies. The Consultant will notify the Contractor that:

- a. Plan of action is acceptable;
- b. Plan of action is acceptable with Consultant's suggested modifications;
- c. Plan of action is not acceptable.

Under (a), the Contractor shall proceed with the plan of action. The Contractor shall bear all costs of surveys associated with detecting the problem, implementing his plan of action, and tests to confirm the plan of action was carried to successful completion and to obtain approval of the Consultant.

Under (b), the Contractor shall resubmit his plan of action with necessary backup and justification of revised plan of action. The Consultant shall notify the Contractor that the revised plan of action is (a) acceptable or (c) not acceptable.

If the plan of action is not acceptable to the Consultant and the Contractor elects to pursue the unacceptable plan of action, then two options exist for the Consultant.

OPTION 1: If the unacceptable plan of action jeopardizes the well construction, completion, or operation in the Consultant's opinion, and the Contractor elects to implement the unacceptable plan of action, the Consultant may declare the well abandoned by the Contractor. A determination shall be made by the Consultant whether to abandon the well or attempt to correct the existing well. The Contractor shall bear all costs of rig time, etc., from original verbal notification and all cost of either abandoning the well or taking steps to complete a successful well.

OPTION 2: If the unacceptable plan of action does not jeopardize the well construction, completion, or operation in the Consultant's opinion, the Contractor may, at his own risk, proceed with his plan of action. The Contractor shall bear all costs associated with his plan of action including testing, remedies, surveys, and programs to solve the problem. When completed, the Contractor shall notify the Consultant that the problem has been solved. The Contractor shall bear all costs of testing, surveys, and work deemed necessary by the Consultant to confirm that the problem has been solved. If the Consultant is satisfied that the problem has been solved by the Contractor, then the Contractor shall proceed with the construction of the well, bearing all costs of the plan of action and the Consultant's program to confirm successful completion.

2.05 STRAIGHT HOLE REQUIREMENTS: Priority requirements of these Specifications is the drilling of straight holes, positive documentable proof that all pilot holes have been wiped out or covered by the reaming operations, and setting the casing to the required depths. The

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Contractor will be required to perform the schedule of surveys as specified in this section. To insure that the casing and tubing can be set to the required depths and properly cemented, all of the holes shall be drilled so that they are straight. Hole straightness, which will allow setting the casing at the required depths and provides room for proper cementing, as well as for setting the monitor tubes, and provides positive documentable assurance that the pilot hole has been wiped out by the reaming operations shall not be sacrificed for drilling speed.

During all drilling in the injection wells, the Contractor shall perform inclination or combination inclination and directional surveys at intervals of 60 feet as the drilling and reaming progresses. Directional surveys shall be performed using a monel collar of sufficient length in the drilling tool assembly to assure that valid survey data are obtained. The Contractor shall provide the Consultant with written verification from the manufacturer of the survey equipment that the instrument will work properly in the Contractor's drilling assembly. These surveys shall be performed using a wire-line instrument equipped with an inclination unit having a range of from 0 to 2 degrees of inclination from the vertical and the survey record shall be capable of being read to the nearest 0.1 degrees.

All holes for the injection wells shall be round, straight, and true to line. No dog-legs or departures from a straight line shall be permitted which will interfere or prevent casing and tubing from being set to their required depths. The maximum allowable inclination from the vertical at any portion of a hole or survey point shall be one (1) degree; the maximum allowable difference between any two successive survey points shall be 0.5 degree (30 minutes). Any deviation greater than one (1) degree or difference greater than 0.5 degree (30 minutes) between two surveys shall be corrected by the Contractor at his own expense.

Should the inclination surveys or the results of the drilling of any of the pilot and/or reamed holes indicate that conditions have been or are

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being created that would prevent the casing and tubing from being set to their prescribed depths and properly cemented or prevent the well from being properly and successfully completed, the Contractor shall take steps to straighten the hole or correct the drift or deviation at his own expense so that casing and/or tubing can be installed to the prescribed depths and allow for proper cementing.

Unless he can demonstrate competence in the use of the surveying equipment, the Contractor shall utilize the services of a qualified technician employed by the survey equipment manufacturer to instruct in the performance of the survey and in the maintenance of the equipment. The technician shall remain on the job until the drilling crews are proficient in the use of the equipment, as judged by the Consultant. The equipment shall be kept on the job at all times. The costs for surveys described in this section, including those required to diagnose a problem and demonstrate the effectiveness of any remedial work, or demonstrate that no problem has occurred shall be the responsibility of the Contractor.

The following are the minimum survey requirements:

Injection Wells

1. Nominal 46-inch-diameter hole
 - A. Inclination survey every 60 feet.
2. Nominal 40-inch-diameter hole
 - A. Inclination survey every 60 feet
3. 7-7/8-inch-diameter pilot hole
 - A. Inclination survey every 60 feet

B. Gyroscopic survey upon completion

4. Nominal 32-inch-diameter hole

A. Combination inclination and directional survey every 60 feet

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Gyroscopic surveys shall be performed by a qualified service company specializing in this type of work. The survey shall be performed through the drill pipe with a bit of the same diameter as the hole. The bit shall be set as close as possible to bottom of each hole so the drill string will be centralized. Survey points shall be run over the entire length of the bore hole at intervals of 30 feet between survey points. The gyroscopic survey and combination inclination and directional survey data will be used to determine that the reamed holes are tracking and/or wiping out the pilot holes. If these data indicate that the reamed hole is not tracking and/or wiping out the pilot hole, it shall be the Contractor's responsibility to provide at his own cost positive documentable proof acceptable to the Owner, Consultant and regulatory authorities.

Directional surveys shall be performed during the reaming operations, every 60 feet, using conventional directional survey equipment capable of measuring a range of from 0 to 2 degrees of inclination from the vertical. A monel drill collar (non-magnetic) of suitable length and diameter shall be used.

During the drilling operation, the Contractor shall submit the film record of each inclination survey to the Consultant on the site. The Consultant shall analyze the data and shall attempt to notify the Contractor of the survey results within three hours. Normally, survey results should be available in thirty (30) minutes. In the event other duties delay the Consultant from interpreting the data, the Contractor should have a qualified crew member proficient in the interpretation of the raw data. The Contractor may continue drilling during this

three-hour period. In the event the survey data indicate hole drift or departure in excess of the specified limits, the Contractor shall take the following steps:

1. Run additional surveys to demonstrate that the hole is within the specified limits.
2. If instrument is indicating that the hole is not meeting the specified limits, then the Contractor shall re-ream the hole and repeat the directional survey. This process will be repeated or other actions taken by the Contractor to meet the specified limits.
3. If the Contractor feels that the instrument is in error, it will be his responsibility to obtain a new instrument to confirm the directional survey data. If a new instrument requires more than 24 hours to be shipped to the site, the Contractor may, with the Consultant's approval, continue the drilling operation. However, this does not relieve the Contractor of his responsibility of maintaining the hole within the specified limits. The Contractor shall bear all of the costs of repeated directional surveys, re-reaming the hole, or other steps required to meet hole alignment.

The Contractor shall provide ten copies of all the records of the gyroscopic directional surveys to the Consultant including the printout showing the various depths and inclination data and coordinate position of the hole at each survey point. This information shall be furnished to the Consultant for review prior to permission being granted to set casing in each hole.

The directional surveys shall be performed with equipment supplied by Sperry-Sun, Eastman Whipstock, or approved equal. The Contractor shall furnish copies of the film record of each survey to the Consultant.

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2.06 FORMATION SAMPLES: Cutting samples shall be collected at intervals of 10 feet and at every formation change, and shall be preserved in receptacles to be furnished by the Contractor. The sample containers shall be plainly marked with the well identification and shall show the depth below the ground surface from which they were taken.

Upon completion of drilling and upon authorization by the Consultant, the Contractor shall forward the formation samples to the Florida Bureau of Geology in Tallahassee. If sample storage becomes a problem on the site, samples may be forwarded to the Florida Bureau of Geology as work progresses following accepted procedures and with the approval of the Consultant.

2.07 CEMENTING PROCEDURES: Cementing will be completed by an approved company expert in well cementing such as Halliburton Services unless the Contractor can demonstrate that he has the equipment and expertise to perform these operations. Cementing will be accomplished in stages by means of a collarless tremie pipe. After each stage of cementing and before the next stage, the Contractor shall tag the top of the cement with a collarless tremie pipe. The method of cementing applies to all cementing procedures in all casing.

Cementing procedures shall be continuous for each stage after cementing begins. If loss of circulation or no return of cement is encountered, and the problem is not corrected in a reasonable period of time, the Consultant shall be notified immediately of what remedial measures are underway to re-establish the circulation and complete the cementing program according to well design and specifications.

If good bonding between casing, cement, and formation is not obtained, remedial work shall be done to the satisfaction of the Consultant. In addition, the Consultant may require temperature or cement bond logs to substantiate the effectiveness of any remedial grout work done. These operations shall be performed at the Contractor's expense.

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When the casings and tubings are being set and cemented in place, it is the Contractor's responsibility to insure that these operations are conducted in such a manner that the casing collapse and burst strengths are not exceeded and the casings are not caused to fail. Cement shall be pumped or placed so that excessive pressures will not result and affect the bond.

2.08 GRAVEL-PACKING PROCEDURES: Gravel shall be emplaced by pumping with a tremie pipe. A sufficient amount to fill the prescribed volumes will be used. The Contractor shall insure that the proper fill-up has been achieved by "tagging" the top of the gravel by a method acceptable to the Consultant.

After the pack has been emplaced, a cap of fine-grained sand, ten (10) feet thick, shall be put on top of the gravel. Its purpose shall be to prevent cement from invading the gravel pack and plugging it.

PART 3 - GEOPHYSICAL LOGGING AND TESTING

3.01 GEOPHYSICAL LOGGING: The Contractor shall employ the services of an approved company to obtain geophysical logs of the injection wells. The Contractor shall prepare and condition each hole to insure it is open and can be logged with a minimum of delay. The following logs shall be run at the stages listed and their cost shall be included. No payment will be made for logs which are unuseable or inaccurate due to poor performance of the logging equipment.

Following the completion of the 7-7/8-inch-diameter pilot hole below the 32-inch casing to approximately 3500 feet below land surface:

- Dual-induction
- Borehole-compensated sonic
- Long and short normal caliper
- Gamma ray
- Temperature

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Following the completion of cementing the 12-inch-diameter casings in place:

Cement bond

The Contractor shall furnish 15 field copies of the various logs to the Consultant and shall provide a field evaluation of their quality as well. Twenty copies of the finished logs shall be provided to the Consultant as soon as possible after the logging along with copies of the original films or mylars of the logs.

The Contractor will also perform caliper logs on the reamed holes before the installation of the 22-inch-diameter and 12-inch-diameter casings.

3.02 CORES: Cores shall be taken during the drilling of the 7-7/8-inch-diameter pilot hole in the injection wells. Four-inch-diameter cores, 10 feet long, shall be taken at points designated by the Consultant. A diamond core head and 10-foot barrel are to be as manufactured by the Christensen Diamond Products Company or approved equal. The taking of cores will be observed by technicians from the manufacturer of the coring tool unless the Contractor can demonstrate previous experience.

The cost of six cores is to be included in Injection Well 1 and the cost of two cores is to be included in Injection Well 2. A credit or charge for more or less than the specified number of cores will be taken into account in the unit price schedule of the Agreement.

Coring points are to be determined from information derived during drilling operations and as directed by the Consultant. All cores will be stored in wooden boxes marked with the depth from which they are taken. Tops and bottoms of the cores are to be marked. After collection, boxing, and labeling, each core will be furnished to the Consultant. The Consultant will then select a portion of each core on

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which the Contractor will have laboratory analyses conducted to determine the coefficients of permeability and porosity. The Contractor shall submit the name of the laboratory for approval to the Consultant before analyses. The cost of the six cores and six analyses is to be included in the lump sum price for Injection Well 1. The cost of two cores and two analyses is to be included in Injection Well 2.

3.03 TELEVISION SURVEY: Following completion of the final injection tests on the injection wells, the Contractor shall have a color television survey performed on the entire wells from the top of the 8-inch-diameter tubing to the bottom of the hole by a qualified service company using equipment capable of surveying and recording to the required depth. The Contractor may use his own equipment providing it is capable of surveying as required and the Contractor shall furnish proof of the capability of the equipment. The television camera shall be centralized within the borehole. Nine copies of the complete survey shall be provided by the Contractor for distribution.

To insure that the borehole fluid is of sufficient clarity to allow a color television survey to be conducted, the Contractor shall pump into the injection wells a quantity of water not less than two volumes of the entire borehole. It is the Contractor's responsibility to make all arrangements and scheduling for the television surveys.

While pumping in the water and during the television survey, the well may be under artesian pressure and may flow. The Contractor shall be required to provide and use a stripper head assembly and any other equipment necessary to keep any flow under control at all times.

Costs for pumping clear water into the borehole to achieve the desired level of clarity; for the television surveys and tapes (including time spent waiting for the television equipment); and for rig and crew labor for all activities associated with preparing for, performing, and dismantling equipment related to the television surveys shall be included in the lump sum price for each well.

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3.04 STRADDLE PACKER TESTS: Upon the completion of the geophysical logs in the 7-7/8-inch-diameter pilot hole to approximately 3500 feet in Injection Well 1, the Contractor shall perform six straddle-packer tests as directed by the Consultant. To perform the straddle-packer tests, the Contractor shall employ the services of an approved company recognized as expert in this form of testing, such as, but not limited to, Lynes or TAM International. The open-hole straddle-packer test shall be conducted such that the hydrologic properties of the formation can be determined and a water sample collected for analysis. The Consultant will select the depth intervals to be tested in conjunction with the service company representative based on evaluation of the geophysical logs and other available data.

The tests shall be performed using two inflatable packers with a section of perforated pipe between them installed in the borehole on drill pipe with the upper 250 feet consisting of casing or drill pipe with a six-inch inside diameter to facilitate the installation of a four-inch-diameter submersible pump which shall be set at an elevation of approximately 250 feet below land surface. The internal surfaces of drill pipe, casings, and other fittings used for the packer tests shall be free of rust, scale, and other material that could be dislodged and interfere with a test. Should a test fail because of the presence of any of these materials in the tools or pipe, the Contractor will not be reimbursed for the test and he will be required to clean the pipe, re-set it and the packer, and re-run the test successfully as part of the contract requirements.

After successfully inflating and setting the packers and before the Contractor conducts a four-hour pumping test and a two-hour recovery test for each straddle-packer test, he shall develop each zone so that it is free of any drilling mud to the satisfaction of the Consultant. It is anticipated that rates of between 20 and 50 gpm will be obtained during the pumping test. The water produced during the pumping test shall be confined to the closed-circulation system. The Contractor will

be responsible for providing all necessary pumps, prime movers, pipelines, meters, and gauges necessary for testing and will provide access for water-level measurements using an M-scope or tape. Just prior to the completion of each pumping test, the Contractor shall collect a water sample from the discharge and have the following analyses performed by a state-certified laboratory approved by the Consultant.

Total Dissolved Solids

Chloride

Conductivity

Sulfate

The service company representative shall provide a preliminary field evaluation of the data as soon as practical after the completion of each test. In addition, he shall prepare a formation evaluation report and submit five copies to the Consultant within seven days after the completion of each test. The report shall contain the basic data from the test and their interpretation. The Contractor shall include the cost for six straddle-packer tests and six sets of water-quality analyses in the lump sum price for Injection Well 1. If more or less tests are performed, a credit or charge will be provided for in the Agreement.

3.05 INJECTION TESTS: After the completion of both injection wells, injection tests shall be run for a 24-hour period on each injection well. Just prior to the completion of the first injection test, the Contractor shall have a water sample collected from the discharge of the pumped well and the following analyses performed by a state-certified laboratory approved by the Consultant.

Water Temperature	Total Phosphorus
pH	Total Nitrogen
Turbidity	Nitrate
Color	Nitrite
Sulfate	Organic Nitrogen
Iron	Ammonia
Total Dissolved Solids	Conductivity
Total Hardness	Calcium
Hydroxide	Magnesium
Hydrogen Sulfide	Carbon Dioxide
Non-carbonate Hardness	Carbonate
Bicarbonate	Potassium
Sodium	Chloride

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The Contractor shall be responsible for providing all necessary pumps, prime movers, pipelines, meters and gauges necessary for the testing and should include these in his base price. Each injection test will be performed at a rate of 700 gpm. A pump, capable of discharging the required volumes for the specified durations, will be placed in one well and water pumped into the other well via a pipeline. This test will be repeated by pumping water from the well that was injection tested into the well that was pumped. The Contractor shall provide a layout drawing of his piping for approval by the Consultant.

The test pump and prime mover shall be capable of not less than 24 hours of continuous pumping. If accidental shutdown occurs prior to 24 hours and invalidates the test data in the opinion of the Consultant, the Contractor shall make any necessary repairs and restart the test. No payment will be made for pumping time prior to any accidental shutdown if the test results are invalid.

The Contractor shall furnish and install in the pipeline a flow meter capable of recording instantaneous flow rates and of totalizing flow. The flow meter shall have an accuracy of five percent at the tested rate. The flow meter shall be sufficiently removed from obstructions in

the pipeline, valves, elbows, reductions, to allow the meter to perform within specifications.

To the extent possible, the speed of the pump and motor shall remain constant throughout the tests. The pumping rate shall be controlled and adjustable by means of a valve in the pipeline. The pumping rate shall not be adjusted by changing the speed of the motor or pump, except when absolutely necessary.

During the injection test, bottom-hole pressures and temperatures shall be monitored and recorded. The Contractor shall employ the services of a company specializing in furnishing and operating the equipment used in collecting this information. An approved pressure gauge and recording system capable of accurately measuring and detecting pressure changes of as little as 0.01 psi (pounds per square inch) such as the Lynes RES-300 or Geophysical Research Corp. EPG-520 system will be used. The Contractor shall provide the Consultant with technical data on the pressure-measuring and recording system before the injection tests. The system will be installed in the injection wells at the top of the injection zone at a depth determined by the Consultant.

The pressure-recording system will be operated for a period of 24 hours prior to the start of the injection test (to collect information on natural bottom-hole pressure fluctuations), during the injection test, and for a 12-hour period after the injection test. The Consultant shall be furnished a copy of all of the basic data recorded as part of the injection tests.

The costs for these services shall be included in the lump sum price of each well. For time spent more or less, the Contractor shall be paid or given credit on the basis of an hourly charge to be listed in the Agreement.

3.06 MONITOR TUBES WATER-QUALITY ANALYSIS: After the monitor tubes have been demonstrated to be functioning, they shall be pumped to remove

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any fluid that may have been introduced into the monitor zones during construction. Upon concurrence of the Consultant that representative water is being produced from the monitor tubes, the Contractor shall collect a sample from each tube and have the following analyses performed by a State-certified laboratory approved by the Consultant.

Water Temperature	Total Phosphorus
pH	Total Nitrogen
Turbidity	Nitrate
Color	Nitrite
Sulfate	Organic Nitrogen
Iron	Ammonia
Total Dissolved Solids	Conductivity
Total Hardness	Calcium
Hydroxide	Magnesium
Hydrogen Sulfide	Carbon Dioxide
Non-carbonate Hardness	Carbonate
Bicarbonate	Potassium
Sodium	Chloride

The Contractor shall include the cost for the collection and chemical analyses for one sample in the lump sum price of the monitor tube for each well.

3.07 ADDITIONAL TESTING BY OUTSIDE AGENCIES OR SERVICES: The Consultant and/or the Owner may issue written authorization for additional testing and for logging to be performed by outside agencies, the Consultant's staff, or competent testing firms. The Contractor shall be given due notification of the test program and the firm or agency performing the test. The Contractor shall be compensated for standby time during any such well testing or logging.

In the event a tool owned by the outside firm or agency is lost in the well and cannot be retrieved, the Contractor shall be compensated for correcting the situation (if necessary). The Contractor shall be

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reimbursed for all costs incurred for rental of extra tools and equipment needed for these measures. The Contractor shall furnish the Owner copies of invoices for all extra tools and equipment used during these operations.

The Contractor shall be responsible for and shall receive no additional compensation for cleaning the well of debris or loose wall material which is dislodged during the test. The condition of the well is the Contractor's responsibility and no compensation shall be made for maintaining a clean hole.

3.08 PRESSURE TESTING: Prior to conducting the cement bond logs, the 12-inch-diameter casing shall be pressure tested. The casing shall be filled with water and placed under approximately 85 pounds per square inch of pressure. No pressure decline is allowed in sixty minutes. If a slight (1- to 2-psi) pressure decline occurs which can be attributed to temperature or density variations, the test shall be repeated under controlled conditions to the satisfaction of the Consultant and the regulatory agencies. If the pressure declines or if there is some other indication of leakage, the Contractor shall take steps to locate the leak and make repairs using methods acceptable to the Consultant. Pressure testing shall be witnessed and certified in writing by the Consultant.

Following the installation of the 8-inch-diameter tubings and packer, the annulus shall be pressure tested following the same procedures as for the 12-inch-diameter casings.

The cost of pressure tests shall be included in the lump sum price of each injection well.

PART 4 - MATERIALS SPECIFICATIONS

4.01 CASING: All well casing and tubing shall be new. The Contractor may propose to the Consultant the use of well casing of a higher grade.

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The casing shall have minimum standards in the following specifications. Before casings are installed in the wells, the Contractor shall supply the Consultant with mill certificates.

4.02 CASING AND TUBINGS

4.021 PIT CASING: The Contractor shall install a pit casing with an inside diameter sufficient to accommodate a 46-inch-diameter drilling bit. The material, length, and method of installation shall be at the Contractor's option subject to approval by the Consultant. The cost of the pit casing shall be included in the lump sum price of each well.

4.022 CONDUCTOR CASING: The conductor casing shall be new, unused, steel, random length, 40-inch-diameter, 0.375-inch wall thickness, and shall conform to API 5L Grade B, ASTM A53 Grade B or Spiral Weld A139 Grade B standards. The casing shall be plain end and beveled for welding and shall be joined together by certified welders. The Contractor must provide the Consultant proof of welders' certifications before any welding may be started. The Contractor shall include the cost for 120 feet of conductor casing in each injection well.

4.023 SURFACE CASING: The surface casing shall be new, unused steel, random length, 32-inch-diameter, 0.375-inch wall thickness, and shall conform to either API 5L Grade B, ASTM A53 Grade B or Spiral Weld A139 Grade B standards. The casing shall be plain end and beveled for welding and shall be joined together by certified welders. The Contractor shall include the cost of 1000 feet of surface casing in each injection well.

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4.024 INTERMEDIATE CASING: The intermediate casing shall be new, unused steel, random length, 22-inch-diameter, 0.375-inch wall thickness, and shall conform to either API 5L Grade B, ASTM A53 Grade B or Spiral Weld A139 Grade B standards. The casing shall be plain end and beveled for welding and shall be joined together by certified welders. The Contractor shall include the cost of 2000 feet of intermediate casing in each injection well.

4.025 FINAL CASING: The final casing shall be new, unused seamless steel, random length, 12-inch-diameter, 0.500-inch wall thickness, and shall conform to either API 5L Grade B or ASTM A53 Grade B standards. The casing shall be plain end and beveled for welding and shall be joined together by certified welders. The Contractor shall include the cost of 3000 feet of final casing in each injection well.

4.026 INJECTION TUBING: The injection casing shall be new, unused, seamless, random length, 8-inch-diameter, 0.352-inch wall thickness, threaded and coupled and shall conform to either API 5L Grade B or ASTM A53 Grade B standards. The Contractor shall include the cost of 3000 feet of injection casing in the price of each injection well.

4.027 MONITOR TUBING: The monitor tubing shall be new, unused 2-3/8-inch outside diameter. The monitor tubing shall have an integral joint such as Hydril A-95 as manufactured by Hydril Tubular Products Division approved or equal. Before installing the monitor tubings, the Contractor shall have the bottom 30 feet perforated or slotted. The Contractor shall submit his proposed method and plans for perforating or slotting the tubing to the Consultant for approval. The bottom of the tubing, when installed, must be plugged in a manner acceptable to the Consultant.

Following the monitor tube completion and development, a test satisfactory to the Consultant shall be run to see that the monitor tubes are open and the perforated sections are in contact with adjacent formation materials. If the monitor tubes are not open to the

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formation, the Contractor shall employ such procedures as are necessary to open up the monitor tubes. These procedures shall be conducted at no additional cost to the Owner.

The Contractor shall include the cost of 1800 feet of monitor tubing, bottom plug, and 30 feet of perforations or slotting in his lump sum price for each injection well.

The cost of all coatings for the tubing shall be included in the lump sum price of the monitor well.

4.03 CENTRALIZERS: All casing of the injection wells shall be fitted with Halliburton-type centralizers with steel straps at 0, 90, 180, and 270 degrees around the casing at each position. The centralizers shall be located as follows:

1. One at 20 feet above the bottom end of the casing
2. Two at 40-foot intervals above the bottom centralizer
3. One at 20 feet below land surface

All other casings and tubings:

1. One at 20 feet above the bottom end of the casing
2. Three at 40-foot intervals above the bottom centralizer and at approximate intervals of 200 feet thereafter
3. The topmost centralizer to be at a depth of 20 feet below land surface

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All centralizers shall be in a precise vertical alignment, one above the other, to allow for the placement of monitor tubes and tremie pipes in the annuli. The cost of all centralizers shall be included in the lump sum price of each well.

4.04 CEMENT: Sulfate-resistant cement shall be used for all cementing of casings and hole plugging. Either ASTM Type II, API Class B, or Florida Class H can be used with additives and lost-circulation materials (Flocele and/or gilsonite) as necessary and approved by the Consultant. Gel may be used in concentrations up to a maximum of 12 percent. Cement emplaced at the bottom 200 feet of the surface and injection casings in the injection wells shall be neat; however, lost-circulation material such as Flocele and gilsonite may be used as needed. At the Contractor's option, the entire conductor casing may be cemented with neat cement. All cement mixtures shall be approved by the Consultant. Mixed cement shall include cement and all additives approved by the Consultant. The Contractor shall include the cost of 22,200 cubic feet of mixed cement in the lump sum price of each injection well.

4.05 PACKER: The 8-inch-diameter injection tubing shall have a retrievable external casing packer mounted as close as possible to the bottom of the casing. The packer shall be capable of sealing the annular space between the 8-inch and 12-inch-diameter injection tubings. The Contractor shall submit specifications for the packer to the Consultant for approval prior to installation. The Contractor shall include the cost of this item in his lump sum price for each injection well.

4.06 GRAVEL-PACKING MATERIALS: The material to be used for gravel packing the annular space around the perforated or slotted section of the monitor tubing shall be clean, washed, and well rounded. The gravel shall have a size gradation of 1/4 to 3/8 inch, and shall be free of sand. The sand placed on top of the gravel shall be finely-crushed limestone. The Contractor shall furnish the Consultant a five-pound

sample of the gravel and the sand materials for examination and approval before installation. The Contractor shall include the cost of 132 cubic feet of gravel and the cost of 44 cubic feet of sand in his lump sum price of the monitor well.

4.07 WELL HEAD COMPLETION: The Contractor shall finish the well heads with flanges, valves, and caps as shown in the working drawings. The Contractor shall include the cost of this item in his lump sum price for each well.

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Appendix 10.9

APPENDIX 10.9

MONITORING PROGRAM

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APPENDIX 10.9

MONITORING PROGRAM

Specific details of proposed monitoring programs, as well as baseline data, are presented in the appropriate sections of Volume 1 of this Application. Where necessary, data has been placed in related appendices.

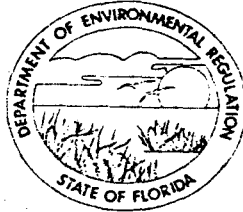
Appendix 10.10

APPENDIX 10.10

CORRESPONDENCE RELATED TO GOVERNMENTAL JURISDICTION

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STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION



SOUTHEAST FLORIDA
DISTRICT

P.O. BOX 3858
3301 GUN CLUB ROAD
WEST PALM BEACH, FLORIDA 33402-3858

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ROY M. DUKE
DISTRICT MANAGER

January 3, 1984

Mr. Timothy F. Hunt
Executive Director
Palm Beach County Solid Waste
Authority
5114 Okeechobee Boulevard
Suite 2C
West Palm Beach, FL 33409

D&F - Palm Beach County
Site #7 - Palm Beach
County Resources Recovery
Project Jurisdictional
Determination

Dear Mr. Hunt:

Re: Your letter of November 8, 1983 requesting that a
jurisdictional determination be made on proposed site number
7 for the Palm Beach County Resources Recovery Project

On December 5, 1983, a site survey was performed at the proposed
site number 7 and pursuant with the following, we have determined
that our dredge and fill jurisdiction would extend over most of
the proposed site; consequently, Dredge and Fill permits will be
required should this site be selected. Our determination was
based upon the connection of internal and peripheral wetland areas
of the site to existing waters of the State (Turnpike canal)
Chapter 403, Florida Statutes (F.S.) and the landward extent of
jurisdiction by vegetative index, pursuant to Chapter 17-4,
Florida Administrative Code (F.A.C.).

In addition, included for your own information is a brief summary
of the physical and biologic conditions of the site as they
presently exist.

If you have any questions regarding the above please contact Mr.
Steven K. Burian of this office, telephone 305/689-5800.

Sincerely,

Larry O'Donnell

Larry O'Donnell
Supervisor
Dredge & Fill Permitting

LEO:sbj/b

cc: Palm Beach County Health Department - Jim Barry
Sam Barker - Barker, Osha & Anderson, Inc.
Terrell K. Arline, Attorney

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Site 7 Biological - Physical Assessment

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Natural drainage patterns of the site have been altered to some extent by man. The construction of a berm along the western property boundary, functionally, isolates the surface waters of the site from those of the catchment area. Flow in and between depressional marsh and wet prairie areas throughout the central portion of the site have been altered by a series of shallow channels, which serve to connect them together. During wet periods these areas appear to be serially connected through uniform inundation. Presently, flow within this network of channels and depressions appears to be in a north-northeasterly direction.

Along the southern border of the site shallow marshes and wet prairie areas appear to drain in a southerly direction toward Forty-fifth street (45th). No connections across 45 Street were apparent and it is presumed that surface waters are isolated at this point; however, there may be some limited discharge from the eastern portion of this area to the Turnpike canal.

Wet prairie areas adjacent to and east of the borrow pit access road appear to drain in an easterly direction via culverts to the Turnpike canal. The point or line, along which the surface waters of the eastern half of the site change flow direction from north to east was not determined. It is entirely possible that some pine flatwood areas may be functioning as micro drainage basins, which provides drainage to the eastern wet prairie areas. If this is true these inputs supplement waters already entering these areas via the internal canal system.

Surface waters from depressional areas in the center of the site, previously noted to flow in a northerly direction at some point enter the borrow pit area. Waters from the borrow pit area in the northeastern portion of the site were observed to discharge via a small channel to the Turnpike canal. In addition, it appears that return flows to the borrow pit lake from the landfill are substantially less than those leaving the pit. This may be creating a minor decrease in surface and groundwater elevations of this area and could serve to influence flows in this direction. To summarize, connections to waters of the state are accomplished via culverts to the Turnpike canal and the connection of internal wetlands to peripheral wetlands, previously noted to be connected to waters of the state. The existence of the network of internal channels functionally eliminates most isolated wetlands.

Landward extent of our jurisdiction is determined pursuant to the presence and dominance of specific wetland plants in accordance with Section 17-4.02(17), Florida Administrative Code. Wet habitats in fact prevade most of the site. While soil classification is not technically a factor in our jurisdictional determinations, it does allow us to determine during dry periods the actual extent of seasonal inundation. Associated with this, plants indicative of these habitats often persist over these soils in the absence of standing waters. Based upon this, the site with the exception of some very dry upland areas, appears to receive some degree of inundation over the course of an average water year. Organic and mineral content of soils throughout the site appears as a mosaic of sands, mucks and sandy-loams. The U.S.D.A. has identified 15 different soil types from the site. Dominant plants of wet prairie, marsh-pond habitats and pine flatwoods - wet prairie ecotones are listed below:

Wet Prairie:	<u>Eleocharis</u> sp.	Marsh-Pond:	<u>Eleocharis</u> sp.
	<u>Juncus</u> sp.		<u>Cladium</u> sp.
	<u>Scirpus</u> sp.		<u>Taxodium</u> sp.
	<u>Cyperus</u> sp.		<u>Utricularia</u> sp.
	<u>Dichronema</u> sp.		<u>Sagitaria</u> sp.
	<u>Utricularia</u> sp.		<u>Lemna</u> sp.
	<u>Pontedaria</u> sp.		<u>Phragmites</u> sp.
	<u>Eriocaulon</u> sp.		<u>Typha</u> sp.
	<u>Ludwigia</u> sp.		<u>Panicum</u> sp.
	<u>Limnobiium</u> sp.		<u>Nuphar</u> sp.
	<u>Thalia</u> sp.		<u>Crinum</u> sp.
	<u>Salix</u> sp.		<u>Nymphaea</u> sp.
	<u>Aster</u> sp.		
	<u>Typha</u> sp.	Pine Flatwoods	
	<u>Hydrocotyle</u> sp.	Wet prairie:	
	<u>Lemna</u> sp.	Ecotone:	<u>Acer</u> sp.
	<u>Panicum</u> sp.		<u>Salix</u> sp.
	<u>Sagitaria</u> sp.		Southern Bay
	<u>Rhynchospora</u>		Myrsine
	Wax myrtle sp.		Strangler Fig
	<u>Proserpinaca</u> sp.		<u>Cyperus</u> sp.
			<u>Dichronema</u> sp.
			<u>Rhynchospora</u> sp.
			<u>Eleocharis</u> sp.
			<u>Juncus</u> sp.
			Pond apple

Consequently, based upon the presence and dominance of the above listed plant species and pursuant to those specified under Section 17-4.02(17), F.A.C. it appears that our jurisdiction will extend through most all wet prairie and marsh-open water areas. The magnitude of the proposed project is so great, that even should some part of the wetlands on-site be determined to be isolated, at some point the construction would impact jurisdictional areas.

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Analytical Laboratory, Aquatic Consultation and Research, Pollution Control, Marsh Restoration,
Aquatic Plant Control and Fisheries Management.

October 5, 1984

Mr. Larry O'Donnell, Supervisor
Dredge & Fill Permitting
Florida Department of Environmental Regulation
Southeast Florida District
P.O. Box 3858
W. Palm Beach, FL 33402-3858

RE: Jurisdictional Determination - Proposed Resource Recovery & Landfill
Facility. Palm Beach County Solid Waste Authority.

Dear Mr. O'Donnell:

Our firm has been working with the Solid Waste Authority in the Environmental Assessment of the proposed site. On March 20, 1984, I made an extensive survey of the site with Mr. Steve Burian of your office. On April 11th I met with you and Mr. Burian at your office to discuss the jurisdictional limits of DER on the site. At that time there was substantial agreement on the limits. A total of 195 acres was identified as jurisdictional wetland. This did not include the borrow lake or abandoned borrow pits.

The Solid Waste Authority is moving ahead with the permitting for this site. Our concern is that this jurisdictional determination may not be binding or may change under the new legislation. I know that some determinations made before the new law went into effect may be binding through a grandfather clause.

I would like to request that you determine if this jurisdiction can be made binding. I can supply the 1:3600 aerial photograph outlining the jurisdiction as discussed in our April 11th meeting. If I can be of any other assistance, please contact me. I look forward to hearing from you on this matter.

Yours truly,

Marc Bruner
Marc C. Bruner,
Aquatic Ecologist

MCB/jm

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To: Sam Barker

From: Marc Bruner *m/cb*

Date: May 8, 1984

Re: Report on USCOE, USFWS and EPA jurisdiction

I met with Chris Dowling of the Stuart Regulatory office of the US Army Corps of Engineers on May 4. We examined several wetland areas at Site 7 and discussed the jurisdictional limits of the Corps on the site. The results of these discussions leads to a conclusion that the Corps will have jurisdiction over virtually all wetland areas on the site. In addition to wetlands directly connected to other water bodies, the Corps has jurisdiction over wetland areas "adjacent" to water bodies. This includes wetlands at the western end of the project that do not drain from the site but are "adjacent" to the catchment area. In terms of wetland area, the jurisdiction of the Corps will be approximately double the DER's limit. In addition to the wetlands themselves, the Corps will have jurisdiction over the dredge lakes at the north of the site and the abandoned pits at the south end of the site.

On May 7 I visited Site 7 with Joe Johnston of the Vero Beach office of the US Fish and Wildlife Service. Our visit and discussions centered on wetland habitat and mitigation. The initial position of the Fish and Wildlife service will be a 1 to 1 mitigation of wetlands filled. Mr. Johnston also indicated concern that the site may receive use by several endangered and threatened species, most notably the wood stork. This use will be addressed in the final report.

I found in my discussions with Joe Johnston that although 1 to 1 replacement is the initial basis suggested for the potential mitigation plan, three additional factors may be considered. First, it may be possible to mitigate some of the wetland losses by off-site wetland creation or restoration. Second, areas of jurisdiction that are presently of poor quality (e.g., the abandoned borrow pits) may be restored as a form of mitigation. Third, replacement of stressed wetland with higher quality wetland may be done on a less than 1 to 1 basis in some cases.

On May 8 I contacted Eric Hughes with the EPA office in Atlanta. I discussed the general features of the project with him. It was his opinion the EPA will be involved with the Dredge and Fill permitting process through Section 404 of the Water Pollution Control Act. Eric suggested that Phyllis Korab of the Broward County Planning Division be contacted. She has been the individual coordinating the development of the Broward county resource recovery facility, and is familiar with the jurisdictional and permitting requirements. Phyllis Korab can be contacted at (305) 765-8068.

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Both Chris Dowling and Eric Hughes said that an important question to be addressed in the permitting process concerns the use of alternative upland sites. Before efforts to minimize wetland impacts and mitigate damage are considered, the Corps and EPA will require an analysis of why a site containing wetlands was chosen, if activities are not water dependent.

These meetings have resulted in a clearer definition of the Corps of Engineers jurisdiction and the involvement of FWS and EPA. The exact acreage of wetland jurisdiction has not been clarified, but it is substantial. The question of alternate upland sites will have to be addressed to the satisfaction of both the Corps and EPA. Nonetheless, there is a possibility to mitigate wetland losses to the satisfaction of the Corps, Fish and Wildlife Service, and EPA.

cc: Tim Hunt
Bob Blackburn

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Analytical Laboratory, Aquatic Consultation and Research, Pollution Control, Marsh Restoration,
Aquatic Plant Control and Fisheries Management.

April 23, 1984

U.S. Fish & Wildlife Service
P.O. Box 2676
Vero Beach, FL 32961

Attn: Mr. Bob Pennington

Dear Sir:

Reference our conversation of April 19, 1984. Enclosed is a 1:3600 RF air photo of the site under consideration for the Palm Beach County Landfill. The area being considered is outlined in blue. I have identified the major roads as landmarks.

I hope this will give you a sufficient preview of the site. I will call you next week to confirm our site visit on May 7th. If I can be of any assistance in the interim, please give me a call.

Yours truly,

Marc C. Bruner,
Aquatic Ecologist

Enclosure
CC: Sam Barker
Dr. Robert D. Blackburn

MCB/jm

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Live Oaks Blvd.
Casselberry, Florida 32707-3894
Phone: 305/834-3911

BRANCH OFFICE:
613 Industrial Street
Lake Worth, FL 33461
Phone: 305/582-4317

Analytical Laboratory, Aquatic Consultation and Research, Pollution Control, Marsh Restoration,
Aquatic Plant Control and Fisheries Management.

May 9, 1985

U.S. Fish & Wildlife Service
P.O. Box 2676
Vero Beach, FL 33261

Attn: Ellie Van Os

Dear Ellie:

Enclosed are the materials you requested after the April 27th field trip to the Resource Recovery facility location. The map accompanying the biological integrity and surface water quality data, shows the location of the sample points. The two I believe you are most interested in are BI-1, BI-2. The first of these samples is from the abandoned shellrock pit area, the second is from the perimeter canal of the water catchment area.

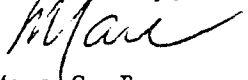
I have also enclosed a copy of our initial environmental assessment of the site. The results presented in this report form the basis for the information included into the Power Plant Siting permit application.

Also enclosed is a list of participants from the April 27th field trip.

The last thing you requested was a site development plan for the closed out landfill and Resource Recovery facility. Development of this plan has not been initiated. Development of this plan is a requirement of Palm Beach County, and it is anticipated that work will begin on this item shortly. In our conversations, you have suggested that the Fish and Wildlife Service would like to be involved in working on this site development plan. We would welcome receiving your input. If you wish, I can contact you once plan development begins.

I hope you find this information useful. If there is any way I can be of further assistance, please do not hesitate to call me.

Yours truly,


Marc C. Bruner,
Aquatic Ecologist

Enclosure

CC: w/o enclosure:
Tim Hunt, SWA
Tom Keith, SWA
Sam Barker, BOA
Dr. Robert D. Blackburn, JEC

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JOYCE ENVIRONMENTAL CONSULTANTS, INC.

"Nature's Guardians"



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Analytical Laboratory, Aquatic Consultation and Research, Pollution Control, Marsh Restoration,
Aquatic Plant Control and Fisheries Management.

M E M O

To: Mr. Tim Hunt
From: Marc C. Bruner *MCB*
RE: Snail kites on Site 7
Date: April 29, 1985

The fact that we observed snail kites on Site 7 on the April 27th field trip is potentially significant. The fact that this species is on the Federal endangered species list, means that the Federal agencies involved in reviewing the permit will be very concerned.

I firmly believe, however that this species was not on the site last year. We conducted our bird surveys on April 14 and 15 and June 1 and 2 of last year. We spent considerable time in the area where these birds were observed. If they had been on the site last year, we would have seen them.

In discussing this situation with Jean Takekawa, it seems to be her general opinion that the birds are on this site because of the drought earlier this year. I am sure she will be following the situation very closely.

All we can do for the moment is wait and see what direction the Fish and Wildlife Service will take. The snail kite was addressed in our initial Environmental Assessment. In that report, it was stated that snail kites were not observed, but may utilize the site. The statement adequately addressed the situation at that time. Now that snail kite have been observed on the site, things may change.

I think we can anticipate some response from the Fish and Wildlife Service soon, even before the permit application is submitted. I will inform you immediately if they contact me. If you have any questions or comments, please do not hesitate to call.

CC: Mr. Sam Barker, B.O.A.
Mr. Tom Keith, S.W.A.
Dr. Robert D. Blackburn, J.E.C.

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Appendix 10:11

APPENDIX 10.11

HISTORICAL AND ARCHAEOLOGICAL CORRESPONDENCE

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JOYCE E. 'IRONMENTAL CONSULT ITS, INC.

"Nature's Guardians"



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Analytical Laboratory, Aquatic Consultation and Research, Pollution Control, Marsh Restoration,
Aquatic Plant Control and Fisheries Management.

August 28, 1984

Mr. George Percy
Bureau of Historical Preservation
Division of Archives, History and Records Management
Florida Department of State - The Capitol
Tallahassee, FL 32301-8020

Dear Sir:

I wish to request a cultural resource assessment for a proposed resource recovery and landfill facility, and associated powerline transmission corridor in Palm Beach County. I would like the area evaluated to provide assessment acceptable for both State and Federal permitting procedures.

I have included a 1:12000 RF map of the area with the area for the proposed facility outlined in red. There are four (4) potential corridors under consideration, and these are shown by the dashed red lines. The facility will cover portions of Sections 22, 27, and 34 of T42S-R42E and Section 3 of T43S-R42E. The proposed corridors will run through parts of Sections 2, 3, 10 and 11 of T43S-R42E.

I hope this material is sufficient for you to initiate your assessment. If you require additional information or materials to complete this task, contact me at the Lake Worth, Florida address listed above. I thank you for your consideration in this matter.

Yours truly,

Marc C. Bruner

Marc C. Bruner,
Aquatic Ecologist

Enclosure

MCB/jm

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FLORIDA DEPARTMENT OF STATE

George Firestone

Secretary of State

DIVISION OF ARCHIVES,
HISTORY AND RECORDS MANAGEMENT
The Capitol, Tallahassee, Florida 32301-8020
(904) 488-1480

September 10, 1984

In Reply Refer to:

Mr. Louis D. Tesar
Historic Sites Specialist
(904) 487-2333

Mr. Marc C. Bruner
Joyce Environmental Consultants, Inc.
619 Industrial Street
Lake Worth, Florida 33461

RE: August 28, 1984 Letter and Map
Cultural Resource Assessment Request
Proposed Resource Recovery and Landfill Facility in Portions
of Secs. 22, 27 and 34, T42S-R42E; and Sec. 3, T43S-R42E; and
Four Potential Transmission Corridors through Parts of Secs.
2, 3, 10 and 11, T43S-R42E, Palm Beach County, Florida

Dear Mr. Bruner:

In accordance with the procedures contained in 36 C.F.R., Part 800 ("Procedures for the Protection of Historic and Cultural Properties"), we have reviewed the above referenced project for possible impact to archaeological and historical sites or properties listed, or eligible for listing, in the National Register of Historic Places. The authorities for these procedures are the National Historic Preservation Act of 1966 (Public Law 89-665) as amended by P.L. 91-243, P.L. 93-54, P.L. 94-422, P.L. 94-458 and P.L. 96-515, and Presidential Executive Order 11593 ("Protection and Enhancement of the Cultural Environment"). In addition we have reviewed this project in accordance with Department of Environmental Regulation Power Plant permitting procedures.

A review of the Florida Master Site File indicates that no archaeological or historical sites are recorded for the project area. Furthermore, because of the location of the project, it is considered highly unlikely that any significant, unrecorded sites exist in the vicinity. Therefore, it is the opinion of this office that the proposed project will have no effect on any sites listed, or eligible for listing, in the National Register of Historic Places, or otherwise of national, state or local significance.

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Mr. Marc C. Bruner
September 10, 1984
Page Two

If you have any questions concerning our comments, please do not hesitate to contact us.

Your interest and cooperation in helping to protect Florida's archaeological and historical resources are appreciated.

Sincerely,



for George W. Percy, Chief
Bureau of Historic Preservation

and

State Historic Preservation Officer

GWP/Tkp

cc: Hamilton S. Oven
Ron Fahs

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Appendix 10.12

APPENDIX 10.12

ECOLOGY

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Site 7 Ecological Survey
A Report to the Joint Venture
Barker, Osha and Anderson/Hayden-Wegman

Prepared by:
Joyce Environmental Consultants
619 Industrial Street
Lake Worth, Florida 33461

Introduction

The Palm Beach County Solid Waste Authority is considering the location known as Site 7 for a resource recovery and landfill facility. The important considerations in evaluating this site are the environmental impact of development and the probability of acquiring the necessary permits. Joyce Environmental Consultants Inc. was retained to perform an ecological survey of the site.

The purpose of this study was twofold. First, information on the vegetation and cover types, plants, and animal species was to be compiled to provide the information necessary to complete the required permit applications and assess the impact of site development. Second, the regulatory agencies involved in the permitting process were to be contacted and queried as to whether the site would be acceptable for permitting.

It was assumed that a DER power plant siting permit, and a DER/Corps dredge and fill permit would be required for the facility. Data were collected with the intent to satisfy requirements for both of these permits. Contact was established with the Florida Department of Environmental Regulation, the Army Corps of Engineers, the U. S. Fish and Wildlife Service, and the Environmental Protection Agency, for the purpose of determining dredge and fill jurisdiction and permit requirements. All contacts with these agencies were made relative only to dredge and fill permitting.

This report summarizes the results of our study. It is organized in six major sections. The first five contain information pertinent to specific points in the power plant siting permit application. The last section is a discussion of the wetland areas on the site, identifying the agencies having jurisdiction, the approximate extent of their authority, and potential avenues of approach for dredge and fill permitting and wetland mitigation.

In addition to the main body of the report, pertinent material is included in the appendices. These additions are the plant and animal species lists compiled from the on-site surveys. This material will be pertinent to both power plant and dredge and fill permitting. A 1:12000 RF map is also included as an attachment. Land Use and Cover types are delineated on this map.

Part 1 - Land Use and Vegetation

Twelve major land use and vegetation types have been identified

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on Site 7. These types are classified to level III of the Florida Land Use and Cover Classification System. These types are: Single Unit, Low Density Housing (111), Broadcasting Tower (153), Palmetto prairies (321), Pine Flatwoods (411), Other Hardwoods (422), Canals (513), Cypress Wetland Forest (611), Freshwater Swamp (621), Freshwater Marsh (641), Scraped Areas (741), Sand, Gravel or Clay Extractive (753), and Abandoned Extractive (755).

The only area of low density housing (111) is the Roane parcel at the south end of the site. The size of this parcel (6.6 acres) requires that it be included in the land use map required for the power plant siting permit.

The Broadcasting Tower (153) use includes the small area surrounding the broadcasting tower at the south end of the site. The total area in this land use is less than the five acres required for inclusion in the power plant siting permit application.

The area of the active dredge lake at the north end of the site falls into two land use categories. The pit itself is Extractive use (753). The cleared area surrounding the active borrow pit is a scraped (741) or altered land use (740), as is most of the area south of 45th street. The vegetative cover of the northern scraped area is a mixture of herbs and grasses that have established themselves since the area was disturbed. The dredge lake itself may also be classified in the Lake land use class (521) but this is secondary to the extractive use.

Three areas within the site fall into the abandoned extractive class (755). The abandoned pits at the southern end of the site, the small abandoned pit 4000 feet north of 45th street and adjacent to the turnpike and the abandoned pit north of the currently active dredge lake all fall into the abandoned extractive category. The drier portions of the southern area are dominated by brazilian pepper and austrailian pine; the wetter segments by cattail, spatterdock and duckweed. The other areas are dominated by cattail, grasses and sedges. Abandoned extractive is the primary land use classification, but these areas may also be classified as lakes, similar to the active lake.

The Canal class (513) covers three areas. The drainage canal at the southern end of the site, running from the abandoned borrow pits under the Turnpike is one canal. The large canal that that forms the southern border of the Gladstone tract south of 45th street is the other large canal on the site. The system of drainage ditches connecting the internal marshes at the center of the project is the third system in this land use class. Vegetation in these canals is a mixture of spatterdock, cattail, spikerush and pickerelweed.

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The remaining six classes identify the areas of relatively undisturbed vegetative cover on the site. Pine flatwoods (411) occupies a large portion of the uplands on the site. The dominant tree species is slash pine, with an understory of saw palmetto, and myrtle in wetter areas. Andropogons and other grasses are mixed with a number of herbs, including many polygalas, in the groundlayer. Much of the flatwoods area on the site is stocked with pole size or smaller pines. These areas are not the optimal quality habitat for this type. Past grazing and disturbance may have played a role in reducing the quality of these areas.

Palmetto prairies (321) occur in an admixture with the pine flatwoods. Palmetto dominates this community, with grasses in the understory and gallberry and occasionally myrtle sharing the canopy with palmetto. The palmetto and pine flatwoods occur in close association, with definite boundaries difficult to determine, and indicated in part by a reduction in the cover of the overstory pines.

Pine flatwoods intergrade with Sabal palm hammocks (422) on the site. Epiphytic ferns and orchids occur in this plant community. Ferns are the dominant groundlayer plants in these hammocks. Vines, such as smilax, woodbine and poison ivy are also abundant in this community. Many of these hammocks are relatively intact and undisturbed.

The upland flatwoods and hammocks intergrade with wetter habitats on the site. In the transitional areas between upland and wetland, strands of Cypress forest (611) occur. This community type also occupies depressional pockets in the uplands, and forms cypress heads in some of the larger wetland areas. Cypress is of course the dominant species. Bromeliads are abundant in this community. Willow and maple may occur as understory species. The groundlayer is a mixture of upland and wetland herbs and grasses, with the dominant group varying with moisture conditions prevailing at each specific location.

Inland ponds and sloughs are the Freshwater swamp (621) vegetation types occurring on the site. Maple and willow dominate the wetter phases of this type, and myrtle the drier phases. Many of the myrtle dominated areas have little or no groundlayer flora. Pickerelweed, arrowhead, and sawgrass dominate the groundcover of the wetter areas. Most of the wetland areas that have been drained or disturbed in the central region of the site are myrtle dominated freshwater swamps.

There are two distinct types of Freshwater marsh (641) occurring on the site. Wet prairie is the marsh community that occupies the drier phases of the marsh type. Grasses and sedges, such as andropogon and rhynchospora occur abundantly in this type. St. John's wort and cocoaplum are abundant shrubs. Slash

pine occurs as scattered, and stunted individuals in the wet prairies. Fringes of wet prairie surround many of the freshwater swamp areas on the site.

The wetter phase of this community type occurs as either sawgrass marsh, or marsh dominated by spikerush and pickerelweed. The most notable feature of this community is the absence of trees and woody vegetation. Many of the least disturbed wetland areas on the site are this type of marsh. These marshes often occur with a surrounding cypress strand.

Part 2 - Important Species/Species-Environmental Relationships

A single species on the Federal threatened species list was directly observed on the site during the surveys. This was the American Alligator (Alligator mississippiensis). This species is also on the Florida Game and Freshwater Fish Commission species of special concern list. This species was observed in the larger canals and in the abandoned borrow pit area. Many of the marsh areas on the site lack water of a deep enough to provide optimal alligator habitat.

Four other species identified as species of special concern by the FGFWFC were directly observed on the site. All are bird species. They are: Little Blue Heron (Florida caerulea), Snowy Egret (Egretta thula), Tricolor Heron (Hydranassa tricolor), and Limpkin (Aramus guarauna). All of the species are closely associated with wetland habitats. Our surveys indicated that the areas most heavily utilized by these species on the site are the large marshes at the west end of the site. The swamp areas in the central portion of the site appear to be used for foraging after heavy rains.

Five species considered game or furbearers were observed on the site. Game animals were White-tailed Deer (Odocoileus virginianus) and Wild Hog (Sus scrofa). Furbearers observed were Opossum (Didelphis marsupialis), Raccoon (Procyon lotor), and Bobcat (Lynx rufus). Each of these species typically have ranges that cover both upland and wetland habitats. All are common to undeveloped areas in this part of the state.

Two species on the Federal and State Endangered lists were not observed on the site, but may occur. The Wood Stork (Mycteria americana) may occasionally visit the site for foraging, but there is a low probability any nesting or long term residence takes place. The situation is similar for the Everglades Kite (Rostrhamus sociabilis). Both of these species would more likely make use of the adjacent water Catchment area, and visit the site on a more or less chance basis.

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The Red-Cockaded Woodpecker (Picoides borealis) is listed as endangered Federally, and threatened by the State. It was not observed on the site. This species is dependent on mature stands of pine for its habitat. The pine flatwoods present on the site are a marginal habitat for this bird, and only a slight chance of its occurrence on or use of the site exists.

All species of orchids are on the Florida threatened species list. Two species were observed on the site and several more may be present. The Wild Pine Bromeliad (Tillandsia fasciculata) was observed on the site and is listed as endangered, primarily because of heavy pressure from plant collectors. All other species of bromeliads, except Spanish Moss and Ball Moss are listed as threatened. One other threatened bromeliad was observed, and several others probably occur, mainly within the cypress woods that are scattered over the site.

There are no species endemic or unique to the habitat types on the site. The species and habitats on the site are ubiquitous and typical of Palm Beach County and South Florida. The close proximity of the Palm Beach Water Catchment area increases the chances of having the more uncommon species such as the Wood stork and Everglades Kite make use of the site. The Catchment area serves as a refuge area that a number of species may utilize as a base, when foraging in surrounding areas.

A portion of the fauna of the site was not surveyed. Bird species that may utilize the site during migration or as winter residence were not present during the survey period. There are no features of the site that would be particularly repellent or attractive to migrants. This type of use undoubtedly occurs, but the magnitude is unknown. The habitats that are most likely to receive use by these birds are the forested upland areas and shrub dominated areas, such as swamps and disturbed areas.

An exact census of vegetation or wildlife populations was not possible. Based on a visual evaluation of the site during the various surveys, the abundance and balance of species within the communities on the site is typical for the region. Factors that are effecting the general habitat value of the site are outlined in the following section.

Part 3 - Pre-existing Stresses

The existing conditions at Site 7 are in part do to the interaction of several past or existing stresses. Pollutant stress does not play a major role at the site. Most of the impact is the result of man's alteration of the land use,

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drainage and species composition of the site. Many of the perturbations have caused major shifts in the ecological balance of the site.

One of the most dramatic changes that has occurred on the site is the alteration of land use in the creation of borrow pits and dredge lakes. The removal of natural biotic communities, primarily wetlands, and their replacement with the deepwater habitat of the borrow pits and the disturbed areas that surround them has altered a large area of the site. The negative impacts of this shift have been to eliminate viable and productive upland and wetland. Much of the disturbed area has provided a habitat for introduced and pest species.

There is a positive benefit that has resulted from some of this alteration. The creation of deepwater habitat for fish and aquatic species has provided a recreational resource that is utilized on a regular basis despite access restrictions. The second benefit is very localized, but highly significant. One of the abandoned pits at the south end of the site receives heavy use by White Ibis (Eudocimus albus), as a roost and rookery. Any consideration of wildlife habitat on the site will have to consider this area.

A second major stress that man has imposed on the site is the establishment of a network of ditches and culverts to drain the wetlands at the interior of the site. This alteration has caused a shift in the species composition of these areas. Myrtle (Myrica cerifera) dominates many of the wetlands that have been drained. Willow (Salix caroliniana), sawgrass (Cladium jamaicensis) and a number of other herbaceous wetland species are underrepresented in these drained wetlands. The drainage of these wetlands has imposed a stress that has altered the species composition and probably reduced the overall quality of these drained areas.

A third stress evident at site 7 is the presence of several introduced species. Brazilian pepper (Schinus terbinthifolius), Melaleuca (Melaleuca quinquenervia) and Australian pine (Casuarina equisetifolia) are all present at the site. Australian pine and Brazilian pepper dominate many of the disturbed areas on the site. Melaleuca is encroaching on many of the wetland areas and is established on several upland sites. The aggressive nature of these species in displacing native flora constitutes a major stress at the site; one which will undoubtedly increase with time.

Wild hog, although considered a game mammal, is an introduced species. Hogs can cause considerable disturbance of ground cover flora by rooting, and ground dwelling birds, animals and their young may suffer predation. The fact that the area is closed to hunting eliminates a check on the population. This

species may constitute a stress on the biota of the site.

The last stress on the site is caused by the presence of man. The activity on the access road, the presence of trespassing fishermen, the use of the area by off-road vehicles and the probable hunting and poaching on the site all have an impact on the biota. The network of trails on the site makes much of the area accessible to vehicles, with a resultant impact on the flora. The more sensitive and secretive wildlife species are probably excluded from parts of the site by man's presence. The current and continuing use and alteration of the site by man exerts a significant impact.

Part 4 - Measurement Programs

Plant species were surveyed through a series of on-site visits. The time period for these surveys was from March to May 1984. Over eight separate surveys were conducted, totalling over 60 observer hours. Initially, aerial photographs of the site were examined to delineate major communities. Examples of each community type were visited by jeep and on foot. Random walk surveys were taken, and a species list compiled. Dominance was estimated visually. Unknown specimens were collected and pressed in the field. Specimens not in flower were usually identified to the genus level based on vegetative characteristics. The manuals used as ecological and taxonomic guides are listed in the reference section at the end of the report.

Wildlife surveys were conducted on four days: 14 and 15 April, and 1 and 2 June, 1984. Observations were made on foot and from vehicles. The entire site was covered each day but a more concentrated effort was made to survey the marshes and hammocks at the western end of the site, and the pine flatwoods in the middle section. Random walk surveys were conducted. Species were identified by direct observation, songs or calls, and scats, tracks or sign. Total observer hours for the survey exceeded 60 hours. Manuals used as ecological and taxonomic guides are listed in the reference section at the end of the report.

Part 5 - Ecological Impacts

The construction of a resource recovery and landfill facility on Site 7 will have a significant ecological impact on the site. Species diversity and composition, and the proportion of various habitats on the site will undergo both short and long term alterations.

When construction begins, diversity and composition will shift quickly and markedly. Secretive and sensitive animal species will leave the site. The Catchment area and the undeveloped area south of the site may serve as a refuge for those taxa that seek to escape. The size of the site and the length of time required to develop it will influence the rate at which this shift occurs. Areas left undisturbed will not have a shift as immediate or dramatic as the first areas to be altered. Those species unable to migrate from the site will either adapt to the disturbance, seek undisturbed areas on the site, or be extirpated.

Following this short-term phenomenon, the species composition and diversity on the site will go through a longer readjustment period. As the amount of various habitat types on the site shifts, so will species composition. The greatest amount of habitat loss is expected to be from the upland communities. Pine flatwoods, palm hammocks and palmetto prairies will probably be eliminated from the site.

Since most or all of the wetland areas eliminated will be replaced, The long term diversity of the wetland communities will not experience as great a disruption. There will be a shift in the proportion of various wetland types. The shrub dominated swamps, particularly those dominated by myrtle, will be reduced and the proportion of marshes will increase. The proportion of cypress forest on the site will probably be slightly reduced.

The large area on the west side of the site designated as a buffer and mitigation area should retain much of its diversity and productivity, or regain it relatively soon. The Catchment area will provide a source for colonization of the area. Although there will be disturbance in this western portion, it is the portion of the site most likely to recover.

The area encompassed by the resource recovery facility itself (approximately 45 acres) will be completely altered. The areas encompassing the landfills will also be changed. In the short term, the habitats and communities taken by these facilities will be lost. However, the project has a definite life span, and some of the habitat loss will be made up when the project is completed and the closed facility is put to other uses.

The amount of deepwater and lake habitat on the site will be increased. The existing dredge lake will be expanded and additional areas may be utilized. These areas should provide fish habitat at the termination of the project, and the margins of the lakes can provide wetland habitat.

Part 6 - Wetlands

Site 7 contains a variety of aquatic and wetland habitats. Dredge and fill activities that take place in these wetlands during the course of construction and operation of the proposed facility will require dredge and fill permits. The Florida Department of Environmental Regulation and the U.S. Army Corps of Engineers have regulatory authority for the issuance of these permits. DER gets its authority through Chapter 403 of the Florida statutes and Chapter 17-4 of the DER rules. The Corps regulatory function stems from the River and Harbor act of 1899 and Section 404 of the Water Pollution Control Act.

Both the Corps and DER have jurisdiction over wetland areas within Site 7. But the extent of their jurisdictions differ. Both agencies determine their jurisdiction by the presence of plant species characteristic of submerged or saturated habitats. If wetland species dominate an area and it is connected to a Water of the State, DER has jurisdiction and regulates permitting. If wetland species occur and the area is connected or adjacent to a Water of the United States (Water of the State), the Corps has authority. The result of this difference is that the Corps has a significantly greater area within it's jurisdiction on the site. There is also a significant area of overlap between the two agencies. They have in fact produced a joint permit application to expedite the coordination and review process.

DER has authority over approximately 195 acres of wetlands. This acreage estimate was determined after several site visits, an on-site visit with a representative from DER and a meeting with DER dredge and fill permitting personnel. This determination is informal and non-binding, and will only be finalized through the process of permit application.

The Corps of Engineers has a regulatory function over approximately 391 acres of wetland. This figure is an estimate based on several meetings and an on-site visit with a representative from the Corps Regulatory Office. This estimate will also be verified and finalized only through the permitting process.

Both agencies also have authority in several non-wetland areas. The Corps regulatory function includes the abandoned borrow pit areas at the Southwest corner of the site, the active dredge lake and the North end of the site, and the abandoned dredge lake North of the active lake. DER has jurisdiction over the two northern dredge lakes and the abandoned borrow pits that drain into the east flowing canal at the south end of the site.

At the Federal level, additional agencies will become involved in the permitting process. The U.S. Fish and Wildlife Service comments on dredge and fill permits submitted to the Corps, evaluating impact upon fish and wildlife habitat. The Environmental Protection Agency comments on applications with respect to compliance under Section 404 of the Clean Water Act. The active participation of these two agencies in the permit review process is certain.

One of the first steps in the Federal permit review process is a determination of the water dependency of the proposed project. If the project is not water dependent, the applicant must show that alternative upland sites are not practicable for the project, and give evidence that the construction will not result in unacceptable adverse impacts to the aquatic resource.

If a wetland site is approved because no practicable alternative upland sites are available, wetland mitigation is the remedy to adverse impacts to the aquatic resource. Both the State and Federal permits will undoubtedly require mitigation of wetlands disturbed or altered by the proposed project. Because of the difference in jurisdictional area, the amount of mitigation required by the Corps and DER will differ.

Mitigation of wetlands is typically accomplished in either of two ways. Creation of wetlands from upland sites can be done to replace acreage eliminated by dredge or fill. Wetlands may also be created by contouring the margins of lakes or canals to provide areas for the establishment of wetland vegetation. Restoration through reflooding or replanting of wetlands previously drained, filled, or otherwise disturbed is the second form of mitigation. It is important to note that the Corps of Engineers will not accept preservation alone as an alternative to mitigating wetland losses. A parcel of wetland cannot be purchased and set aside for preservation in lieu of wetland creation or restoration.

A mitigation program can either create or restore wetlands on-site or off-site. The tendency of the permitting agencies is to prefer as much on-site mitigation as possible. In addition, if off-site mitigation is proposed, the tendency is to prefer the location for mitigation be in the vicinity of the site of the dredge and fill project to the greatest extent possible.

The DER and the Corps will most likely indicate acre for acre mitigation of wetland acreage as their position for evaluating proposals for wetland replacement. There may be possibilities for a less than 1:1 ratio in some cases. If highly stressed or disturbed area is to be mitigated through creation or enhancement of high quality wetlands, the trade-off may not have to be equal. The process of determining acreage and estimating quality of wetlands will be done as part of the permitting

process. The basic assumption will likely be a 1:1 replacement, any other scheme would require negotiation with the agencies involved.

Whatever forms of mitigation are pursued, the regulating agencies will require some assurance that the areas created or restored will be preserved in perpetuity. Conservation easements, or the deeding of mitigation areas to non-profit conservation groups or governmental entities may be requested in the permitting process to guarantee the preservation or proper operation of the facilities.

After a review of the wetland areas of Site 7, several areas can be seen to hold potential as locations for mitigation. The existing dredge lake, and the expanded lake that will be developed in the future can be contoured to create shallow areas at the margins. These margins can be planted to create wetlands. The abandoned borrow pits at the south end of the site can be recontoured or backfilled in some way to improve their condition and restore a mixture of high quality wetland and deepwater habitat. A third area of potential is the 1000 foot buffer zone to be established between the facility and the Water Catchment Area. This area already contains high quality wetland, but it may be possible to create additional wetlands in this area by scraping down upland areas or reflooding some drained and disturbed areas.

Another alternative that may be explored is off-site mitigation. The existing Dyer Landfill may be a potential site for this type of program. In designing the landscape for the closed landfill, it may be possible to create wetlands at Dyer to replace wetlands lost in the development of the new facility.

A potential positive benefit of on-site mitigation areas is the possibility of using such areas to retain and condition stormwater runoff. Integrating wetland mitigation into the design, operation and closure of the facility will reduce the potential difficulties involved in any mitigation program.

Summary

The development of a resource recovery plant and landfill on site 7 will have a significant impact on the ecology of the site, based on the criteria evaluated in this study. The preponderance of this impact will be due to the the destruction of habitat and its replacement by the various components of the facility. Upland habitats will be the main loss. Wetland losses will be made up as a requirement for dredge and fill permitting.

3600000100100

No species on the Federal endangered species list were observed on the site. Those that may occur would use the site on only a transitory basis. The adjacent Catchment area would be more likely to be utilized by endangered species occurring in the area. The single species listed as threatened on the Federal level is a ubiquitous component of the regional fauna, and development of the facility would not be a serious threat for it. A single plant species on the Florida endangered species list was observed on the site. Development of this facility would not pose a serious threat to the existence of this species.

After consultation with the agencies responsible for dredge and fill permitting on the site, it appears there are no serious barriers to obtaining the necessary permits. Wetland destruction will have to be mitigated. Given the current condition of the wetlands on the site, there is a possibility for an overall improvement of wetland quality through the mitigation program.

Considerable effort will be necessary to minimize impact and satisfy permit requirements. Overall however, there are no fatal flaws in this site that would prevent its use, based on the criteria evaluated.

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Appendix I
Common Plant Species
of Site 7

Species	Common Name	Habitat	Status
<i>Acer rubrum</i>	Red maple	3	
<i>Aletris farinosa</i>	Colic root	1,3	
<i>Andropogon glomeratus</i>	Broom sedge	1,3	
<i>Andropogon sp.</i>	Beard grass	1,3	
<i>Annona glabra</i>	Fond apple	2,3	
<i>Ardisia escallonioides</i>	Marlberry	1	
<i>Asclepias curassavica</i>	Scarlet milkweed	1,3	
<i>Asclepias tuberosa</i>	Milkweed	1,3	
<i>Asplenium sp.</i>	Spleenwort	2	
<i>Baccharis halimifolia</i>	Baccharis	3	
<i>Bacopa caroliniana</i>	Bacopa	3	
<i>Bidens pilosa</i>	Spanish needle	1,3	
<i>Blechnum serrulatum</i>	Swamp fern	2	
<i>Calopogon barbatus</i>	Grass pink	1	4
<i>Cassia chamaecrista</i>	Partridge pea	1	
<i>Cassytha filiformis</i>	Dodder	1	
<i>Casuarina equisetifolia</i>	Australian pine	4	
<i>Cephalanthus occidentalis</i>	Buttonbush	3	
<i>Chloris glauca</i>	Fingergrass	3	
<i>Chrysobalanus icaco</i>	Cocoaplum	3	
<i>Cirsium vulgare</i>	Thistle	1,4	
<i>Coreopsis gladiata</i>	Tickseed	1,4	
<i>Cladium jamaicensis</i>	Sawgrass	2,3	
<i>Crinum americanum</i>	Swamp lily	3	
<i>Cyperus sp.</i>	Sedge	3	
<i>Dichromena colorata</i>	White tops	3	
<i>Dichromena latifolia</i>	White tops	3	
<i>Drosera brevifolia</i>	Sundew	1	
<i>Eleocharis cellulosa</i>	Spike rush	3	
<i>Eleocharis nigrescens</i>	Spike rush	3	
<i>Epidendrum tampensis</i>	Common orchid	2	4
<i>Eriocaulon compressum</i>	Hat pin	3	
<i>Eriocaulon ravenelii</i>	Hat pin	3	
<i>Eryngium yuccifolium</i>	Rattlesnake master	1	
<i>Eupatorium capillifolium</i>	Dog fennel	1	
<i>Fuirena squarrosa</i>	Umbrella grass	3	
<i>Flaveria linearis</i>	Yellowtops	3	
<i>Hydrocotyle umbellata</i>	Pennywort	3	
<i>Hypericum fasciculatum</i>	St. John's wort	1,3	
<i>Hypericum myrtifolium</i>	St. John's wort	1,3	
<i>Hypericum sp.</i>	St. John's wort	1,3	
<i>Hyptis sp.</i>	Musky mint	1	

Ipomoea sagittata	Morning glory	1
Ilex cassine	Dahoon holly	1,3
Ilex glabra	Galberry	1,3
Lacnantes caroliniana	Redroot	1
Lemna sp.	Duckweed	3
Lithospermum caroliniana	puccoon	1
Lobelia glandulosa	Glades lobelia	1
Ludwigia peruviana	Primrose willow	3
Lycopodium cernuum	Ground pine	1
Lygodium japonicum	Climbing fern	3
Lyonia ferruginea	Rusty lyonia	1,3
Lyonia lucida	Fetterbush	1,3
Melaleuca quinquenervia	Melaleuca	3,4
Myrica cerifera	Wax myrtle	1,3,4
Myrsine guianensis	Myrsine	1
Nuphar luteum	Spatterdock	3
Nymphaea odorata	Water lily	3
Nymphoides aquatica	Floating heart	3
Osmunda regalis	Royal fern	2
Oxypolis filiformis	Water dropwort	1
Panicum hemitomon	Maidencane	3
Panicum repens	Torpedo grass	3
Parthenocissus quinquefolia	Woodbine	1,2
Persea borbonia	Red bay	1
Phlebodium aureum	Golden polypody	2
Phragmites australis	Reed	3
Physalis angustifolia	Ground cherry	1
Pinus elliotii	Slash pine	1
Piriqueta caroliniana	Piriqueta	1,3
Plantago lanceolata	Plantain	4
Pluchea rosea	Marsh fleabane	3
Polygala baldunii	Bachelor button	1
Polygala cruciata	Drumheads	1
Polygala cymosa	Milkwort	1,3
Polygala lutea	Bog button	1,3
Polygala grandiflora	Polygala	1
Polygonum hydropiperoides	Smartweed	3
Pontederia lanceolata	Pickrelweed	3
Proserpinaca palustris	Mermaid weed	3
Psilotum nudum	Whisk fern	1
Psychotria nervosa	Wild coffee	1
Pteridium aquilinum	Bracken fern	1
Quercus myrtifolia	Myrtle oak	1
Rhexia lutea	Yellow rhexia	1,4
Rhexia alifanus	Tall meadow beauty	1
Rhynchospora corniculata	Beak rush	3
Rhynchospora tracyi	Beak rush	3
Rudbeckia hirta	Black-eyed susan	1,4
Sabal palmetto	Sabal Palm	1
Sabatia angularis	Sabatia	1,3
Sabatia grandiflora	Sabatia	1,3
Sagittaria lancifolia	Arrowhead	3

Salix caroliniana	Willow	3	
Schinus terbinthfolius	Brazilian pepper	4	
Scirpus sp.	Bulrush	3	
Serona repens	Palmetto	1	
Setaria sp.	Foxtail	1	
Simarouba glauca	Paradise tree	1	
Smilax bona-nox	Greenbrier	1,2	
Smilax laurifolia	Bamboo vine	1,2	
Stachys floridana	Stachys	3	
Stillingia sylvatica	Queen's delight	3	
Sisyrinchium atlantum	Blue-eyed grass	3	
Taxodium distichum	Cypress	2	
Tillandsia fasciculata	Pine bromeliad	2	3
Tillandsia usneoides	Spanish moss	2	
Tillandsia sp.	Bromeliad	2	4
Toxicodendron radicans	Poison Ivy	1,2	
Tribulus cystoides	Puncture weed	4	
Typha latifolia	Cattail	3	
Utricularia inflata	Big bladderwort	3	
Utricularia cornuta	Horned bladderwort	3	
Vittaria lineata	Shoestring fern	2	
Vitis rotundifolia	Grape	1	
Woodwardia virginica	Chain fern	1,2	
Xyris sp.	Yellow-eyed grass	3	

Habitats: 1 - Upland (Pine Flatwoods, Hammocks)
2 - Wetland (Cypress Woods)
3 - Wetland (Swamps, Marshes and Wet Prairies)
4 - Disturbed Areas

Status: 1 - Endangered (Federal)
2 - Threatened (Federal)
3 - Endangered (State)
4 - Threatened (State)
5 - Special Concern (State)

Appendix II

Amphibians, Reptiles and Mammals

Observed on Site 7

Species	Common Name	Status
<i>Acris gryllus</i>	Cricket Frog	
<i>Rana pipens</i>	Leopard Frog	
<i>Rana grylio</i>	Pig Frog	
<i>Kinosternon subrubum</i>	Striped Mud Turtle	
<i>Terrapene carolina bauri</i>	Box Turtle	
<i>Chrysemys floridana</i>	Florida Cooter	
<i>Anolis carolinensis</i>	Green Anole	
<i>Cnemidophorus sexilineatus</i>	Six-lined Racerunner	
<i>Coluber constrictor</i>	Racer	
<i>Agkistrodon piscivorus</i>	Cottonmouth	
<i>Crotalus adamanteus</i>	Eastern Diamondback	
<i>Alligator mississippiensis</i>	Alligator	2,4
<i>Didelphis marsupialis</i>	Opossum	F
<i>Dasypus novemcinctus</i>	Armadillo	
<i>Procyon lotor</i>	Raccoon	F
<i>Lynx rufus</i>	Bobcat	F
<i>Sus scrofa</i>	Wild Hog	G
<i>Odocoileus virginianus</i>	White-tailed Deer	G

Status:

- 1 - Endangered (Federal)
- 2 - Threatened (Federal)
- 3 - Endangered (State)
- 4 - Threatened (State)
- 5 - Special Concern (State)
- G - Game Animal
- F - Furbearing Animal

Appendix III

Birds Observed on

Site 7

Species	Common Name	Status
Podilymbus podiceps	Pied-billed Grebe	
Phalacrocorax carbo	Double-crested Cormorant	
Anhinga anhinga	American Anhinga	
Ardea herodias	Great Blue Heron	
Butorides virescens	Green Heron	
Florida caerulea	Little Blue Heron	5
Bubulcus ibis	Cattle Egret	
Egretta thula	Snowy Egret	5
Hydranassa tricolor	Tricolored Heron	5
Nycticorax nycticorax	Black-crowned Night Heron	
Nyctanassa violacea	Yellow-crowned Night Heron	
Eudocimus albus	White Ibis	
Anas fulva	Mottled Duck	
Aix sponsa	Wood Duck	
Cathartes aura	Turkey Vulture	
Coragyps atratus	Black Vulture	
Buteo lineatus	Red-shouldered Hawk	
Pandion halioetus	Osprey	
Aramus guarauna	Limpkin	5
Rallus elegans	King Rail	
Porphyryula martinica	Purple gallinule	
Gallinula chloropus	Common gallinule	
Charadrius vociferus	Killdeer	
Totanus melanoleucus	Greater Yellowlegs	
Larus atricilla	Laughing Gull	
Sterna albifrons	Least Tern	
Zenaidura macroura	Mourning Dove	
Columbigallina passerina	Common Ground Dove	
Otus asio	Screech Owl	
Bubo virginianus	Great Horned Owl	
Chordeiles minor	Common Nighthawk	
Megaceryle alcyon	Belted Kingfisher	
Centurus carolinus	Red-bellied Woodpecker	
Dendrocopus pubescens	Downy Woodpecker	
Corvus assifragus	Fish Crow	
Thyrothorus ludovicianus	Carolina Wren	
Mimus polyglottos	Mockingbird	
Dumetella caroliniensis	Gray Catbird	
Toxostoma rufum	Brown Thrasher	
Polioptila caerulea	Blue-gray Gnatcatcher	
Bombycilla cedorum	Cedar Waxwing	
Vireo griseus	White-eyed Vireo	

Mniotilta varia
Helmitheros vermivorus
Dendrocia discolor
Geothlypis trichas
Setophaga ruticilla
Sturnella magna
Agelaius phoeniceus
Cassidix mexicanus
Quiscalus quiscula
Richmondia cardinalis
Melospiza georgiana

Black and White Warbler
Worm-eating Warbler
Prairie Warbler
Common Yellowthroat
American Redstart
Eastern Meadowlark
Red-winged Blackbird
Boat-tailed Grackle
Common Grackle
Cardinal
Swamp Sparrow

Status: 1 - Endangered (Federal)
2 - Threatened (Federal)
3 - Endangered (State)
4 - Threatened (State)
5 - Special Concern (State)

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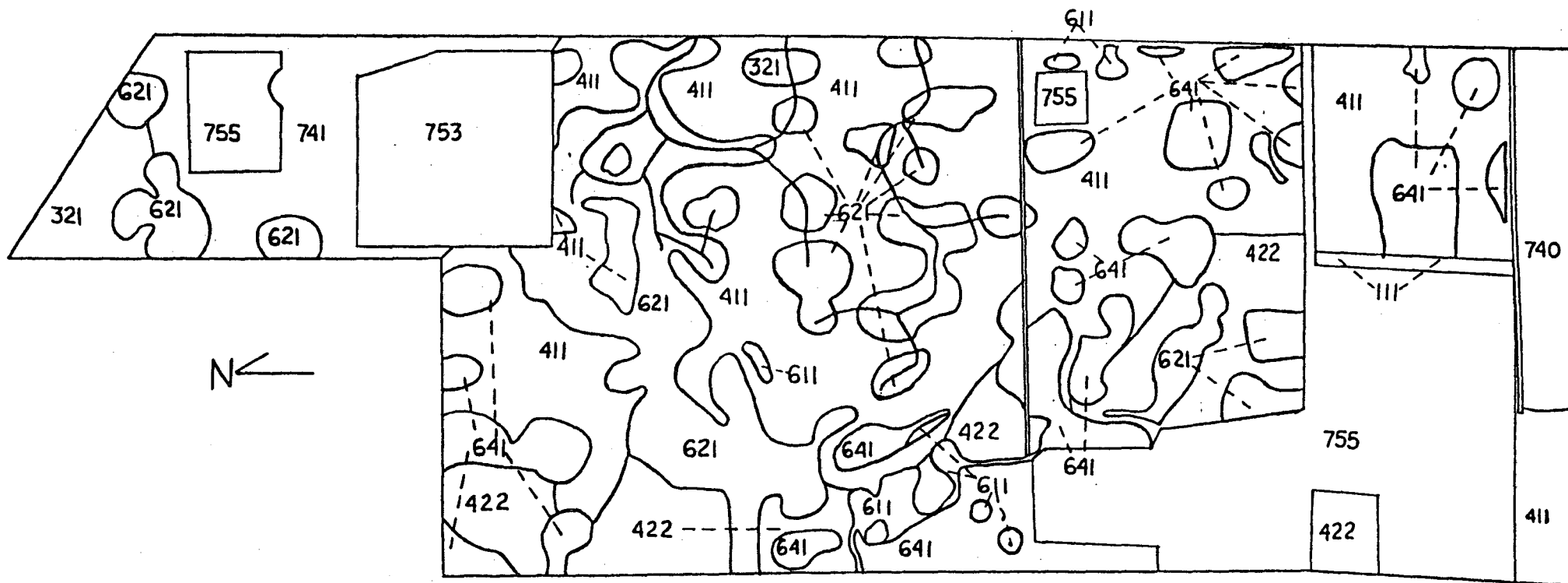
Figure 1.
Land Use Classes on Site 7

Class numbers from FLUCCS system

Solid lines separate classes

Dashed lines join classes

See Part 1 of text for details



LAND USE CLASSES

WETLANDS

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APPENDIX 10.13

GEOTECHNICAL INFORMATION IN RELATION TO THE RESOURCE RECOVERY PLANT SITE

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36000000100111

SUBSURFACE INVESTIGATION,
SITE 7 - PROPOSED
RESOURCE RECOVERY PLANT,
PALM BEACH COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

MEMBER

Associated Soil and Foundation Engineers, Inc.
American Consulting Engineers Council
National Society of Professional Engineers
Florida Institute of Consulting Engineers
American Society for Testing and Materials
American Concrete Institute

5640 Corporate Way, West Palm Beach, Florida 33407 ■ Telephone (305) 689-3400

JAMMAL & ASSOCIATES, INC. Consulting Engineers

February 25, 1985
Project No. 85-22005

TO: Hayden-Wegman Consulting Engineers
5114 Okeechobee Boulevard - Suite 2-B
West Palm Beach, Florida 33409

Attention: Mr. Stan Timmerman

SUBJECT: Subsurface Investigation,
Site 7-Proposed Resource Recovery Plant,
Palm Beach County, Florida.

Dear Mr. Timmerman:

As requested by you and Messrs. Smith and Kald of your New York office, we have completed a subsurface investigation at Site 7 of the proposed Resource Recovery Plant. The methods and results of our investigation are discussed in detail below and are summarized on Sheets 1 and 2, attached.

FIELD STUDY

We drilled a total of four test borings to depths of between 82 and 157-feet below the existing ground surface within the site. The borings were located generally around the site perimeter due to very heavy vegetation which prevented access into the site interior. The locations of the test borings are shown on Sheet 1.

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86000000100113

The borings were advanced between January 26 and February 4, 1985, by rotary drill methods using a 3 7/8-inch diameter tri-cone bit powered by a mobile B-61 drilling rig. Casing and bentonite slurry were used to stabilize the sides and bottoms of the holes. Standard penetration tests (ASTM D-1586) were conducted in each of the borings. Standard penetration resistance, "N-value", was recorded as the number of blows of a 140 pound hammer falling 30 inches required to drive a 24-inch long, 2-inch diameter (O.D.) split-spoon sampler a distance of 12-inches. The soil samples were collected from the split-spoon sampler, field classified and returned to our laboratory in sealed glass jars. Also, in boring B-1 a rock core run (ASTM D-2113) was made (with an HX, diamond-tip-core barrel between depths of 60 and 65 feet). The recovered core consisted of shelly sand but nonetheless was placed in a core box and returned to our laboratory.

SUBSURFACE CONDITIONS

The test borings encountered very loose to medium dense, relatively clean to slightly silty, and occasionally silty fine to medium sands underlain at depths of 40 to 50 feet by mostly dense to very dense slightly silty fine to medium sands with shell and rock fragments and intermittent, but relatively thin sandstone and limestone lenses. These dense, shelly, partially cemented sands extended to the bottoms of the borings.

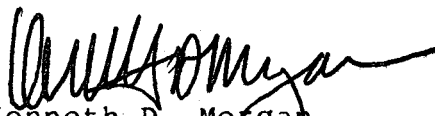
Drilling logs for each of the borings are presented within the appendix. Also, we summarized the boring results in the form of soil profiles depicted graphically on Sheet 2.

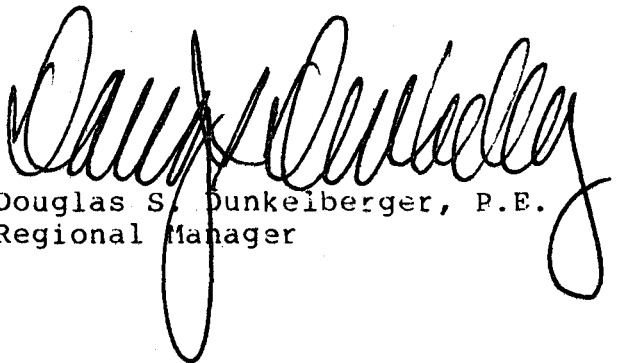


We trust this information is complete and sufficient to meet your needs. If you have any questions concerning the contents of this report or if you desire additional information, please feel free to give us a call.

Very truly yours,

JAMMAL & ASSOCIATES, INC.


Kenneth D. Morgan
Associate Engineer


Douglas S. Dunkelberger, P.E.
Regional Manager

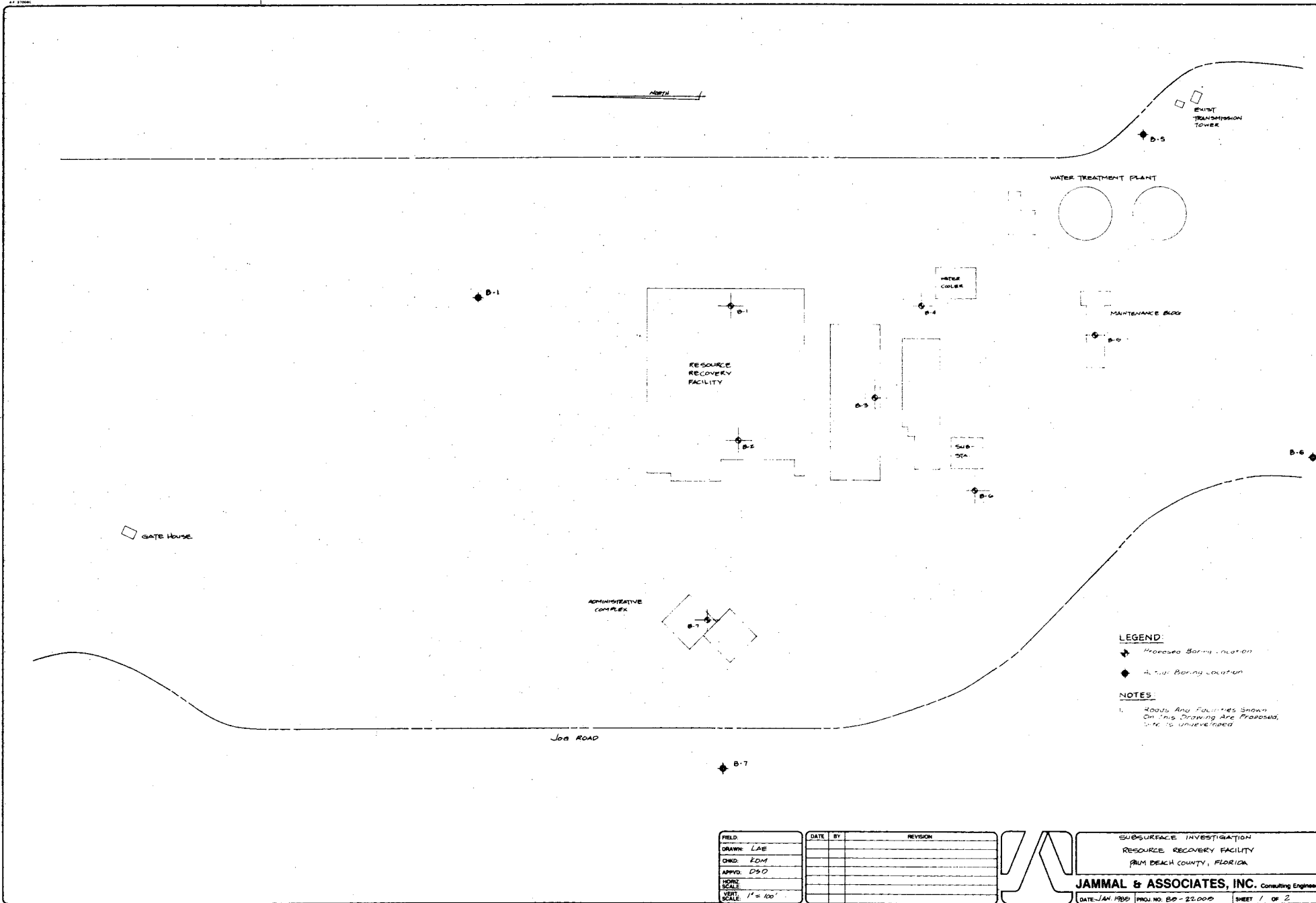
DSD/KDM:tl

cc: Mr. Lembit Kald

Palm Beach County Solid Waste Authority
Attention: Mr. Tom Keith



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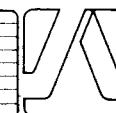
LEGEND

- ✕ Proposed Boring Location
- ◆ Actual Boring Location

NOTES

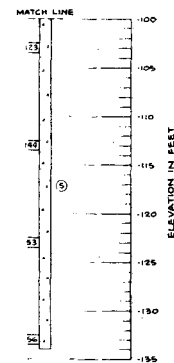
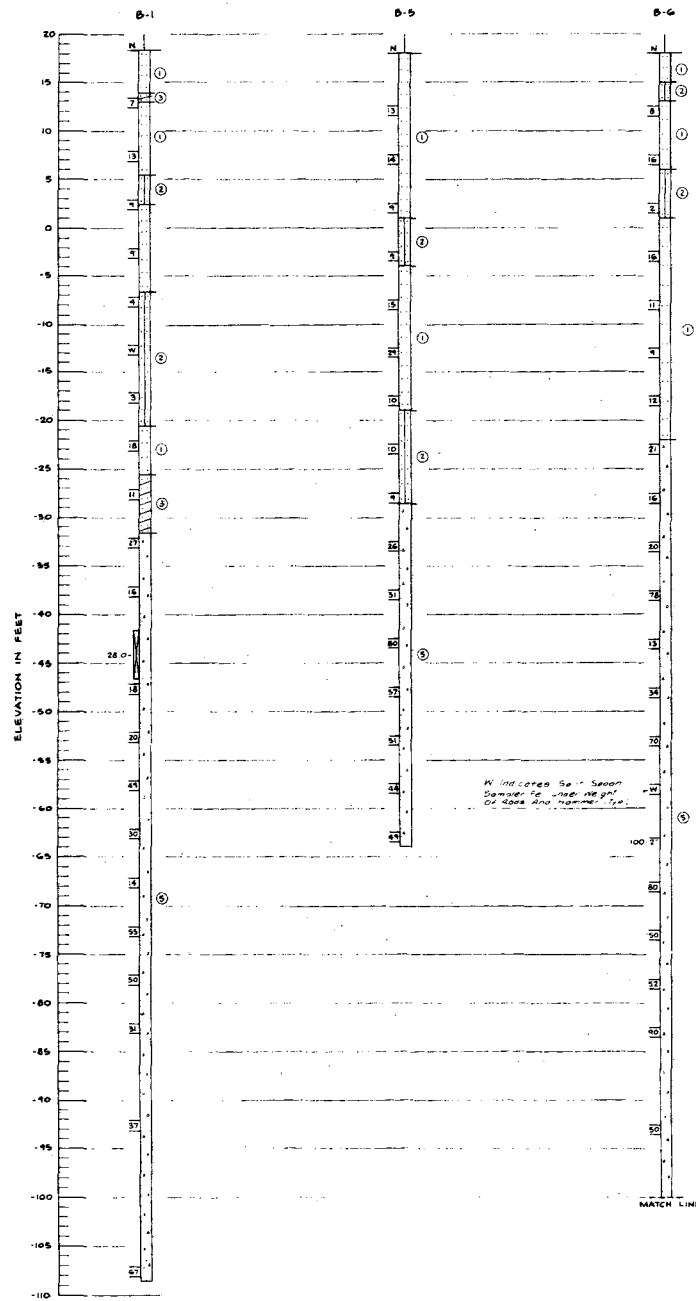
1. Roads And Facilities Shown On This Drawing Are Proposed, With No Underdevelopment

FIELD	DATE	BY	REVISION
DRAWN: LAE			
CHECKED: LDM			
APPROVED: DSO			
HORIZ. SCALE: 1" = 100'			
VERT. SCALE: 1" = 100'			



SUBSURFACE INVESTIGATION RESOURCE RECOVERY FACILITY PALM BEACH COUNTY, FLORIDA		
JAMMAL & ASSOCIATES, INC. Consulting Engineers		
DATE: JAN 1988	PROJ. NO. 88-22000	SHEET 1 OF 2

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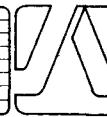


LEGEND:

- ① Gray To Brown To Tan Fine To Medium SAND Some With Small Shells And Shell Fragments (SP)
- ② Brown To Dark Brown And Gray To Dark Gray Slightly Silty Organic Stained Fine SAND With Some Suffered Shells And Shell Fragments (SP-SM)
- ③ Brown To Gray Silty Fine SAND With Thin Clay Lenses (SM)
- ④ Brown To Green Brown To Blue Only Clay Fine SAND With Some Small Shells And Shell Fragments (SC)
- ⑤ Gray To Green Gray To Blue Gray Reddish Clean To Silty Mostly Slightly Silty Fine To Medium SAND With Shells And Shell Fragments Some Calcareous With Small Calcite Crystals Slightly To Moderately Cemented With Thin (Less Than 1/2" Thick) Layers Of Limestone And Sandstone (SP-SM)
- ⑥ Standard Penetration Test "N" values in Blows Per Foot
- (SP) Unified Soil Classification Group Symbol
- 28.0 Indicates 28" Core Recovery Interval Indicates And Modified Penetration (MO) OF ONE MO IN 100 Times The Interval Length Of Sand Core Over 4" Long Divided By The Length Of Run Indicated

FIELD
DRAWN: RED
CHKD: DSD
APPVD: DSD
HORIZ SCALE
VERT SCALE: 1" = 6'

DATE	BY	REVISION



SUBSURFACE INVESTIGATION
RESOURCE RECOVERY FACILITY
PALM BEACH COUNTY, FLORIDA
JAMMAL & ASSOCIATES, INC. Consulting Engineers
DATE: JAN 1985 PROJ. NO. 85-22005 SHEET 2 OF 2

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APPENDIX

BORING LOGS



PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/26/85
 Depth 127' Completed on 1/28/85
 Hammer drop 30" weight 140 lb.
 Casing size 4"/3" length 40'/110'

BORING No. B-1 SHEET NO. 1 Of 5
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE _____
 GROUND ELEVATION 18.4' (MSL)
 Engineer: Inst. by KDM Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
0									
5		1A	brown to gray silty fine to medium SAND with traces of clay, trace roots.	5-5-2-4					
		1B	gray fine to medium SAND with a trace of silt; shell fragments.						
10		2	gray to tan fine to medium SAND with a trace of silt; shell fragments.	7-5-8-7					
15		3A	dark brown slightly silty fine to medium SAND; organic stained.	2-3-6-7					
		3B	gray to brown fine to medium SAND with a trace of silt; shell fragments.						
20		4	gray to brown fine to medium SAND with a trace of silt; shell fragments.	4-4-5-7					
25		5A	gray to tan fine to medium SAND with very thin clayey lenses.	5-2-2-3					

Remarks

 **JAMMAL & ASSOCIATES, INC.**
 Consulting Geotechnical Engineers

36000000100118

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/26/85
 Depth 127' Completed on 1/28/85
 Hammer drop 30" weight 140 lb.
 Casing size 4"/3" length 40'/110'

BORING No. B-1 SHEET NO. 2 of 5
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE _____
 GROUND ELEVATION 18.4' (MSL)
 Engineer: Inst. by KDM Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
25		5B	dark gray silty fine SAND.	5-2-2-3					
		5C	gray to dark gray slightly silty fine to medium SAND with silty lenses.						
30		6	dark gray silty fine SAND.	* W.O.H.					
35		7	gray to dark gray slightly silty fine to medium SAND with silty lenses.	1-1-2-4					
40		8	gray to light gray fine to medium SAND with a trace of silt.	6-7-11-11					
45		9A	blue-gray silty fine SAND.	2-3-8-10					
		9B	blue-gray CLAY with traces of sand and rock fragments.						
50		10	gray fine to medium SAND with numerous shell fragments; slightly calcareous.	10-13-14-16					

Remarks *Sampler fell under static weight of hammer and rods.

 JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

36000000100119

PROJECT NO. 85-22005 CLIENT Hayden-WegmanPROJECT Resource Recovery PlantDRILLED BY WG-KR Boring started on 1/26/85Depth 127' Completed on 1/28/85Hammer drop 30" weight 140 lb.Casing size 4"/3" length 40'/110'BORING No. B-1 SHEET NO. 3 of 5LOCATION OF BORING (See Plan)

DEPTH TO GROUND WATER TABLE _____

GROUND ELEVATION 18.4' (MSL)Engineer: Inst. by KDM Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
50				10-13- 14-16					
55		11	light gray slightly silty fine to medium SAND.	11-7-9-5					
60			blue-gray silty fine SAND with shell fragments.	NX core run 60'-65' 28% rec 9% RQD					
65		12	green-gray slightly silty fine SAND with shells and shell fragments; trace rock fragments.	8-6-12-10					
70		13	green-gray slightly silty fine SAND with shells and shell fragments; some cementation; slightly calcareous.	11-16- 14-11					
75		14	green-gray slightly silty fine SAND with shells and shell fragments; numerous rock fragments; slightly calcareous with some cementation.	24-24- 25-29					

Remarks

 JAMMAL & ASSOCIATES, INC.
Consulting Geotechnical Engineers

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/26/85
 Depth 127' Completed on 1/28/85
 Hammer drop 30" weight 140 lb.
 Casing size 4"/3" length 40'/110'

BORING No. B-1 SHEET NO. 4 of 5
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE _____
 GROUND ELEVATION 18.4' (MSL)
 Engineer: Inst. by KDM Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES 10 20 40 60 80
75				24-24- 25-29	
80		15	green-gray slightly silty fine SAND with shells and shell fragments; numerous rock fragments; slightly calcareous with some cementation.	32-15- 15-26	
85		16	green-gray slightly silty fine SAND with shells and shell fragments; limestone lenses.	10-6-8-10	
90		17	green-gray slightly silty fine SAND with shells and shell fragments; limestone lenses.	12-28- 27-66	
95		18	green-gray slightly silty fine SAND with shells and shell fragments; sandstone lenses.	10-15- 35-40	
100		19	green-gray slightly silty fine SAND with shells and shell fragments; numerous shell fragments.	16-14- 17-20	

Remarks

 JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

36000000100121

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/26/85
 Depth 127' Completed on 1/28/85
 Hammer drop 30" weight 140 lb.
 Casing size 4"/3" length 40'/110'

BORING No. B-1 SHEET NO. 5 Of 5
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE _____
 GROUND ELEVATION 18.4' (MSL)
 Engineer: Inst. by KDM Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES 10 20 40 60 80
100				16-14- 17-20	
105		20	green-gray slightly silty fine SAND with shells and shell fragments; calcite crystals.	24-18- 19-20	
110			rock layer 114.5' - 115.0'; other highly cemented lenses intermittent 115.0' to 125.0'.		
115					
120		21	green-gray slightly silty fine SAND with shells and shell fragments; trace of phosphate nodules.	25-26- 41-27	
125			bottom of boring at 127'.		

Remarks

 **JAMMAL & ASSOCIATES, INC.**
 Consulting Geotechnical Engineers

36000000100122

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/29/85
 Depth 82' Completed on 1/30/85
 Hammer drop 30" weight 140 lb.
 Casing size 3 1/4" length 80'/40'

BORING No. B-5 SHEET NO. 1 Of 4
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 18.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
0									
5		1	light gray to tan SAND, trace of silt; some shell fragments.	4-6-7-10					
10		2	light gray to tan SAND, trace of silt; some shell fragments.	6-7-7-11					
15		3	light gray to tan SAND, trace of silt, no shell.	2-3-6-11					
20		4	dark gray SAND, trace of silt; some shell fragments - slight organic stain.	2-2-7-10					
25		5	gray fine to medium SAND, trace of silt; some shell & rock fragments.	3-7-8-12					

Remarks

 **JAMMAL & ASSOCIATES, INC.**
 Consulting Geotechnical Engineers

36000000100123

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/29/85
 Depth 82' Completed on 1/30/85
 Hammer drop 30" weight 140 lb.
 Casing size 3"/4" length 80'/40'

BORING No. B-5 SHEET NO. 2 Of 4
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 18.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
25		5		3-7-8-12					
30		6	gray fine to medium SAND, trace of silt; numerous shells & shell fragments.	9-14-15-20					
35		7	green-brown fine SAND, trace of silt & trace of small shell fragments.	2-4-6-8					
40		8	green-brown fine SAND, trace of rock fragments.	6-5-5-6					
45		9	dark green-gray silty fine to medium SAND; numerous shell fragments, some rock fragments.	5-5-4-7					
50		10	gray fine to medium SAND, trace of silt; numerous shells & shell fragments.	11-11-15-21					

Remarks



JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

3600000100124

PROJECT NO. 85-22005 CLIENT Hayden-WegmanPROJECT Resource Recovery PlantDRILLED BY WG-KR Boring started on 1/29/85Depth 82' Completed on 1/30/85Hammer drop 30" weight 140 lb.Casing size 3"/4" length 80'/40'BORING No. B-5 SHEET NO. 3 Of 4LOCATION OF BORING (See Plan)DEPTH TO GROUND WATER TABLE -GROUND ELEVATION 18.0' (MSL)Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
50		10		11-11- 15-21					
55		11	gray fine to medium SAND, trace of silt numerous shells and shell fragments, trace of rock fragments.	18-13- 18-15					
60		12	gray to brown slightly silty fine SAND, some slightly cemented.	11-27- 53-71					
65		13	tan to gray slightly silty fine SAND, trace of small shell fragments; some pebble- size rock fragments.	13-23- 34-49					
70		14	light gray fine to medium SAND, trace of silt; numerous shell fragments.	15-21- 30-44					
75		15	light gray fine to medium SAND, trace of silt; numerous rock and shell fragments.	16-22- 22-25					

Remarks

 JAMMAL & ASSOCIATES, INC.
Consulting Geotechnical Engineers

3600000100126

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3600000100126

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/30/85
 Depth 152' Completed on 2/01/85
 Hammer drop 30" weight 140 lb.
 Casing size 3"/4" length 150'/85'

BORING No. B-6 SHEET NO. 1 of 6
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 18.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
0			"hardpan" 3.0' - 5.0'						
5		1	light green-gray to tan slightly silty fine SAND, small shell and limerock fragments.	4-4-4-4					
10		2	light green-gray to tan fine to medium SAND with a trace of silt; numerous shell fragments.	7-7-9-9					
15		3	dark gray/brown slightly silty fine SAND, traces of shell fragments, traces of roots.	1-1-1-4					
20		4	light gray-brown fine to medium SAND; trace of silt and slight iron stain.	4-6-10-12					
25		5	light gray-brown fine to medium SAND; trace of silt and slight iron stain; traces of very small shell fragments.	3-3-8-9					

Remarks

 JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

86000000100127

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/30/85
 Depth 152' Completed on 2/01/85
 Hammer drop 30" weight 140 lb.
 Casing size 3"/4" length 150'/85'

BORING No. B-6 SHEET NO. 2 of 6
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 18.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
25		5		3-3-8-9					
30		6A	light gray-brown fine to medium SAND; trace of silt and slight iron stain; traces of very small shell fragments.	1-2-7-17					
		6B	dark gray fine to medium SAND; trace of silt and some small shell fragments.						
35		7	dark gray fine to medium SAND; trace of silt and some small shell fragments; some light green-gray.	2-4-8-9					
40		8A	6" thick layer of gray SANDSTONE	21-11-10-10					
		8B	green-gray slightly silty fine SAND; traces of shell fragments.						
45		9	green-gray slightly silty fine SAND; traces of shell fragments.	3-8-8-10					
		10A	tan slightly silty fine to medium SAND; slightly calcareous with numerous shell fragments.	17-11-9-7					
50		10B	green-gray slightly silty fine SAND; traces of shell fragments.						

Remarks

 JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

36000000100128

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/30/85
 Depth 152' Completed on 2/01/85
 Hammer drop 30" weight 140 lb.
 Casing size 3"/4" length 150'/85'

BORING No. B-6 SHEET NO. 3 of 6
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 18.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
50		10		17-11- 9-7					
55		11	tan slightly silty fine to medium SAND; slightly calcareous with numerous shell frag- ments; gray SANDSTONE lenses.	22-38- 40-43					
60		12	gray fine to medium SAND; trace of silt; numerous shell fragments.	10-8-5 -7					
65		13	gray slightly silty fine to medium SAND; large shell fragments and some pebble-size rock fragments.	8-14-20 -25					
70		14	gray slightly silty fine to medium SAND; large shell fragments and some pebble-size rock fragments; very small shell fragments.	20-30- 40-46					
75		15	tan silty fine SAND; slightly calcareous with shell and rock fragments.	1-W.O.H.					

Remarks

 JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/30/85
 Depth 152' Completed on 2/01/85
 Hammer drop 30" weight 140 lb.
 Casing size 3"/4" length 150'/85'

BORING No. B-6 SHEET NO. 4 of 6
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 18.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
75		15		1-W.O.H.					
80		16	tan to gray fine to medium SAND; lenses of SANDSTONE; slightly calcareous with shell fragments.	30 - 75					
85		17	gray slightly silty fine SAND; some small rock and shell fragments.	34-35- 45-35					
90		18	gray slightly silty fine SAND; some small rock and shell fragments; lenses of SANDSTONE.	30-50- 100					
95		19A	green-gray fine to medium SAND; trace of silt calcareous with numerous shell fragments; and SANDSTONE lense.	35-23- 29-29					
		19B	tan slightly silty fine SAND; traces of small shell and rock fragments.						
		20A	tan to gray fine to medium SAND; lenses of SANDSTONE; slightly calcareous with shell fragments; foul odor.	31-35- 55-58					
100		20B	gray slightly silty fine SAND; some small rock and shell fragments; lenses of SANDSTONE.						

Remarks

 JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

86000000100130

PROJECT NO. 85-22005 CLIENT Hayden-WegmanPROJECT Resource Recovery PlantDRILLED BY WG-KR Boring started on 1/29/85Depth 152' Completed on 2/01/85Hammer drop 30" weight 140 lb.Casing size 3"/4" length 150'/85'BORING No. B-6 SHEET NO. 5 of 6LOCATION OF BORING (See Plan)DEPTH TO GROUND WATER TABLE -GROUND ELEVATION 18.0' (MSL)Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
100				31-35- 55-58					
105									
110		21A	tan to gray fine to medium SAND; lenses of SANDSTONE; slightly calcareous with shell fragments.	32-20- 30-24					
		21B	gray slightly silty fine SAND; some small rock and shell fragments.						
115									
120		22A	tan to gray fine to medium SAND; lenses of SANDSTONE; slightly calcareous with shell fragments.	30-45- 78-98					
		22B	tan to gray fine to medium SAND, lenses of SANDSTONE, slightly calcareous with shell fragments.						
125									

Remarks

JAMMAL & ASSOCIATES, INC.
Consulting Geotechnical Engineers

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 1/29/85
 Depth 152' Completed on 2/01/85
 Hammer drop 30" weight 140 lb.
 Casing size 3"/4" length _____

BORING No. B-6 SHEET NO. 6 Of 6
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 18.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
125									
130		23	gray slightly silty fine SAND; some pebble-size rock fragments and traces of very small shell fragments.	48-64- 80-105					
135			6" rock lense at 137'.						
140		24	tan to gray fine to medium SAND; lenses of SANDSTONE; slightly calcareous with shell fragments.	32-27- 26-15					
145			intermittant rock lenses 147' - 150'.						
		25A	tan to gray fine to medium SAND; lenses of SANDSTONE; slightly calcareous with shell fragments.	16-23- 33-40					
150		25B	same as 25A. bottom of boring @ 152'.						

Remarks

 JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

36000000100132

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 2/04/85
 Depth 82' Completed on 2/04/85
 Hammer drop 30" weight 140 lb.
 Casing size 3"/4" length 80'/40'

BORING No. B-7 SHEET NO. 1 Of 4
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 17.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
0			gray clayey fine to medium SAND, 0' - 4'.						
5		1	light gray to tan slightly silty fine to medium SAND; calcareous with numerous shell fragments.	6-6-7-8					
10		2	light gray to tan fine to medium SAND; calcareous with numerous shell fragments; trace of silt.	7-4-4-5					
15		3	brown to dark brown fine to medium SAND; trace of silt, some shell fragments; slight iron stain.	1-2-2-3					
20		4	brown to dark brown fine to medium SAND; trace of silt, some shell fragments; slight iron stain.	9-6-9-9					
25		5	dark gray fine to medium SAND with a trace of silt.	4-6-8-11					

Remarks



JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

36000000100133

PROJECT NO. 85-22005 CLIENT Hayden-WegmanPROJECT Resource Recovery PlantDRILLED BY WG-KR Boring started on 2/04/85Depth 82' Completed on 2/04/85Hammer drop 30" weight 140 lb.Casing size 3"/4" length 80'/40'BORING No. B-7 SHEET NO. 2 of 4LOCATION OF BORING (See Plan)DEPTH TO GROUND WATER TABLE -GROUND ELEVATION 17.0' (MSL)Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
25				4-6-8-11					
30		6	gray fine to medium SAND; trace of silt with numerous shells and shell fragments.	5-9-9-19					
35		7	gray fine to medium SAND; trace of silt with some shells and shell fragments; decreasing shell content.	7-8-12-17					
40		8	gray slightly silty fine SAND; some small shell fragments.	3-6-6-8					
45		9A	green-gray clayey fine SAND with large shell fragments.	4-4-6-8					
		9B	gray to tan fine to medium SAND; traces of silt and shell.						
50		10	gray fine to medium SAND; trace of silt with numerous shells and shell fragments; very thin SANDSTONE lenses.	14-24-22-22					

Remarks

JAMMAL & ASSOCIATES, INC.
Consulting Geotechnical Engineers

PROJECT NO. 85-22005 CLIENT Hayden-Wegman
 PROJECT Resource Recovery Plant
 DRILLED BY WG-KR Boring started on 2/04/85
 Depth 82' Completed on 2/04/85
 Hammer drop 30" weight 140 lb.
 Casing size 3"/4" length 80'/40'

BORING No. B-7 SHEET NO. 3 of 4
 LOCATION OF BORING (See Plan)
 DEPTH TO GROUND WATER TABLE -
 GROUND ELEVATION 17.0' (MSL)
 Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
50				14-24- 22-22					
55		11A	gray fine to medium SAND; trace of silt with numerous shells and shell fragments; very thin SANDSTONE lenses.	17-22- 32-34					
		11B	brown silty fine SAND; slightly calcareous with some shell and SANDSTONE lenses.						
60		12	light green-gray slightly silty, cemented fine to medium SAND; some shell and rock fragments.	24-36- 40-42					
65		13A	light green-gray slightly silty, cemented fine to medium SAND; some shell and rock fragments.	35-35- 25-40					
		13B	light green-gray slightly silty, cemented fine to medium SAND; some shell and rock fragments.						
70		14A	light green-gray slightly silty, cemented fine to medium SAND; some shell and rock fragments; foul odor.	43-33- 32-35					
		14B	gray silty fine SAND; slightly calcareous with some shell and SANDSTONE lenses.						
		15A	gray silty fine SAND; slightly calcareous with some shell and SANDSTONE lenses.	22-60- 100					
75		15B	tan silty fine SAND; slightly calcareous with some shell and SANDSTONE lenses.						

Remarks

 JAMMAL & ASSOCIATES, INC.
 Consulting Geotechnical Engineers

PROJECT NO. 85-22005 CLIENT Hayden-Wegman

PROJECT Resource Recovery Plant

DRILLED BY WG-KR Boring started on 2/04/85

Depth 82' Completed on 2/04/85

Hammer drop 30" weight 140 lb.

Casing size 3" / 4" length 80' / 40'

BORING No. B-7 SHEET NO. 4 Of 4

LOCATION OF BORING (See Plan)

DEPTH TO GROUND WATER TABLE _____

GROUND ELEVATION 17.0' (MSL)

Engineer: Inst. by PDW Rev. by DSD

DEPTH ft	SYMBOL	SAMPLE NO.	DESCRIPTION OF SOIL	BLOWS PER 6"	"N" VALUES				
					10	20	40	60	80
75				22-60-100					
80		16	light gray slightly silty fine to medium SAND; cemented with thin SANDSTONE lenses.	29-33-31-36					
85			bottom of boring @ 82'.						

Remarks



JAMMAL & ASSOCIATES, INC.
Consulting Geotechnical Engineers

Appendix 10:14

APPENDIX 10.14

SURFACE AND GROUNDWATER RELATED INFORMATION

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86000000100138

APPENDIX 10.14.1
GEOLOGIC LOGS OF TEST WELLS

GEOLOGIC LOG
OF
WELL 1
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND - Sand, 100%, quartz, pale yellowish brown, fine- to medium-grained, sub-angular to sub-rounded.	0 - 8	8
SHELLY SAND - Sand, 70%, colorless, fine-grained, sub-angular to sub-rounded; Shell, 30%, fragments, loose.	8 - 10	2
SAND AND SHELL - Shell, 60%, white, fragments, loose; Sand, 40%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded.	10 - 12	2
SHELL AND SAND - Shell, 70%, white, fragments, loose; Sand, 30%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Clay, trace, purplish brown, plastic.	12 - 15	3
SANDY CLAYEY SHELL - Shell, 40%, white and tan, small to medium-sized fragments and whole shells; Clay, 40%, moderate purplish brown to light gray, plastic, sandy; Sand, 20%, quartz, clear and frosted, medium to coarse-grained, sub-angular to sub-rounded.	15 - 25	10
SHELLY SAND - Sand, 70%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 30%, white and tan, large to medium-sized fragments and whole shells.	25 - 33	8

36000000100139

SHELLY SAND - Sand, 80%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 20%, white and tan, small to medium-sized fragments.

33 - 55 22

SILT AND SHELLY SAND - Silt, 50%, dark yellowish brown, plastic; Sand, 30%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 20%, white and tan, small to medium-sized fragments.

55 - 58 3

SHELLY SAND - Sand, 80%, quartz and phosphatic, clear, frosted and black, fine- to medium-grained, sub-angular to sub-rounded; Shell, 20%, white and tan, small to medium-sized fragments.

58 - 63 5

LIMESTONE AND MARL (interbedded) - Limestone, 60%, pale yellowish gray, fine-grained, moderately soft; Marl, 40%, pale yellowish gray, soft, silty.

63 - 68 5

SHELLY SAND - Sand, 60%, quartz and phosphatic, clear frosted, to black, fine- to medium-grained, sub-angular to sub-rounded; Shell, 40%, white and tan, small to medium-sized fragments and whole shells.

68 - 75 7

SHELLY SANDY LIMESTONE - Limestone, 50%, yellowish gray, fine-grained, moderately hard, shelly; Shell, 40%, tan, gray and white, fine- to medium-sized fragments and whole shells; Sand, 10%, quartz and phosphatic; clear and frosted to black, fine-grained, sub-angular to sub-rounded.

75 - 77 2

SANDSTONE AND SANDY SHELL - Sandstone, 60%, quartz, olive gray and white speckled, fine- to medium-grained, well cemented grains, sub-angular to angular; Shell, 40%, gray and white, small to medium-sized fragments.

77 - 81 4

8600000100140

SHELLY SAND AND SANDSTONE - Sand, 40%, quartz and phosphatic, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 30%, white, tan and gray, small to medium-sized fragments; Sandstone, 30%, quartz, olive gray and white speckled, fine-grained, moderately hard.

81 - 89 8

SANDSTONE, LIMESTONE AND SHELLY SAND - Sandstone, 30%, quartz, yellowish gray, fine-grained, moderately fine-grained, sub-angular to sub-rounded, weathered surfaces, worm casts; Limestone, 30%, yellowish gray, fine-grained, moderately hard, sandy; Sand, 20%, quartz and phosphatic, clear and frosted to black, fine- to medium-grained, sub-angular to sub-rounded; Shell, 20%, white, tan and gray, small to medium-sized fragments.

89 - 98 9

SHELLY SAND WITH SANDSTONE AND LIMESTONE - Sand, 50%, quartz and phosphatic, clear and frosted to black, fine- to medium-grained, sub-angular to sub-rounded; Shell, 30%, white and tan, small to medium-sized fragments; Sandstone, 10%, yellowish gray, fine-grained, moderately hard, sub-angular to sub-rounded grains; Limestone, 10%, yellowish gray, fine-grained, moderately hard, sandy.

98 - 109 11

LIMESTONE AND SHELLY SAND - Limestone, 50%, yellowish gray, fine-grained, moderately hard, sandy; Sand, 30%, quartz and phosphatic, clear and frosted to black, fine-grained, sub-angular to sub-rounded; Shell, 15%, white and tan, small fragments; Marl, 5%, pale yellowish gray, soft.

109 - 115 6

SHELLY SAND AND LIMESTONE - Sand, 40%, quartz, clear and frosted, fine-grained, sub-angular to sub-rounded; Shell, 40%, white and tan, small to medium-sized fragments; Limestone, 20%, yellowish gray, fine-grained, moderately hard, sandy.

115 - 124 9

36000000100141

SHELLY SAND, LIMESTONE AND SANDSTONE - Sand, 40%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 20%, white and tan, small to medium-sized fragments; Limestone, 20%, yellowish gray, fine-grained, moderately hard, sandy; Sandstone, 20%, quartz, yellowish gray to pinkish gray, fine- to medium-grained, sub-angular to sub-rounded grains, moderately hard.

124 - 130 6+

TOTAL DEPTH 130

86000000100142

GEOLOGIC LOG
OF
WELL 2
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND - Sand, 100%, quartz, clear and frosted, fine- to medium coarse-grained, sub-angular to sub-rounded; trace, roots etc.	0 - 2	2
SILTY SAND - Sand, 85%, quartz, pale yellowish brown, fine-grained, sub-angular to sub-rounded; Silt, 15%, dark yellowish brown.	2 - 4	2
SILTY CLAYEY SAND - Sand, 70%, quartz, colorless, fine- to medium-grained, sub-angular to sub-rounded; Clay, 20%, light medium gray, plastic; Silt, 10%, light gray to light medium gray.	4 - 9	5
SHELLY SAND - Sand, 60%, quartz, clear and frosted, sub-angular to sub-rounded; Shell, 40%, white, small to medium-sized fragments and whole shells.	9 - 14	5
SAND - Sand, 90%, quartz, colorless, fine-grained, sub-angular to sub-rounded; Silt, 5%, pale yellowish brown; Shell, 5%, white and tan, fragments.	14 - 15	1
CLAYEY SANDY SHELL - Shell, 60%, white and tan, small to medium-sized fragments and whole shells; Clay, 30%, yellowish gray, plastic, sandy; Sand, 10%, quartz, clear and frosted, fine-grained, sub-angular to sub-rounded.	15 - 18	3
SANDSTONE AND SHELLY SAND - Sandstone, 70%, quartz, clear and frosted, medium-grained, angular to sub-rounded grains, moderately hard; Sand, 20%, quartz, clear and frosted, fine- to medium-grained, angular to sub-rounded; Shell, 10%, white, small fragments.	18 - 35	17

3600000100143

SHELLY SAND AND SANDSTONE - Sand, 50%, quartz, clear and frosted, fine- to medium-grained, angular to sub-rounded; Shell, 20%, white, small-sized fragments; Sandstone, 30%, quartz, clear and frosted, medium-grained, angular to sub-rounded grains, moderately hard.

35 - 45 10

SANDSTONE AND SHELLY SANDY CLAY - Sandstone, 50%, quartz, clear and frosted, medium-grained, angular to sub-rounded; Clay, 30%, light gray, plastic, silty; Shell, 10%, white and tan, small-sized fragments; Sand, 10%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded.

45 - 48 3

SANDSTONE AND SANDY SHELL - Sandstone, 70%, quartz, clear and frosted, medium-grained, angular to sub-rounded; Shell, 20%, white and tan, small-sized to large-sized fragments; Sand, 10%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded.

48 - 56 8

SHELLY SANDSTONE AND SANDY SHELL - Sandstone, 70%, quartz, olive gray and white speckled, fine- to medium coarse-grained, sub-rounded to angular grains, moderately hard, shelly, weathered surfaces; Shell, 20%, white, small-sized fragments; Sand, 10%, quartz, clear and frosted, fine-grained, sub-angular to sub-rounded.

56 - 65 9

SHELLY SANDSTONE, SHELLY SAND AND MARL - Sandstone, 60%, quartz, olive gray and white speckled, fine- to medium coarse-grained, sub-rounded to angular grains, moderately hard, shelly, weathered surfaces; Sand, 20%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 10%, white, medium-sized fragments; Marl, 10%, yellowish gray, soft.

65 - 72 7

SHELLY SANDSTONE AND SHELLY SAND - Sandstone, 80%, quartz, olive gray and white speckled, fine- to medium coarse-grained, sub-rounded to

36000000100144

angular grains, moderately hard, shelly, weathered surfaces; Shell, 10%, white, small to medium-sized fragments; Sand, 10%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; trace, marl, yellowish gray.

72 - 87 15

SANDSTONE AND SHELLY SAND - Sandstone, 60%, quartz, olive gray and white, fine to medium coarse-grained, sub-rounded to angular grains, moderately hard, shelly, weathered surfaces; Sand, 20%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 20%, white, small to medium-sized fragments and whole shells; trace, marl, yellowish gray.

87 - 97 10

SANDSTONE AND SHELLY CLAYEY SAND - Sandstone, 30%, quartz, olive gray and white speckled, fine- to medium-grained, angular to sub-rounded grains, moderately hard, shelly; Sand, 30%, quartz, phosphatic, clear and frosted, coarse to medium-grained, sub-angular to sub-rounded; Clay, 20%, dark yellowish brown to moderate yellowish brown, plastic, silty; Shell, 20%, white, small fragments.

97 - 105 8

SANDSTONE AND SHELLY SANDY CLAY - Sandstone, 40%, quartz, olive gray and white speckled, fine- to medium-grained, angular to sub-rounded grains, moderately hard, shelly; Clay, 20%, moderate yellowish brown, plastic, sandy; Shell, 20%, white and tan, small to medium-sized fragments and whole shells; Sand, 20%, quartz and phosphatic, frosted, clear to black, fine-grained, sub-angular to sub-rounded.

105 - 117 12

SANDY SHELLY CLAY AND SANDSTONE - Clay, 35%, moderate yellowish brown, silty; Shell, 25%, white and tan, small to medium-sized fragments and whole shells; Sand, 20%, quartz, frosted and clear, fine-grained, sub-angular to sub-rounded; Sandstone, 20%, gray and white, fine to coarse-grained, shelly.

117 - 120 3+

TOTAL DEPTH 120

86000000100145

GEOLOGIC LOG
OF
WELL 3
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND - Sand, 100%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded.	0 - 2	2
SILTY SAND - Sand, 90%, quartz, colorless, fine-grained, sub-angular to sub-rounded; Silt, 10%, gray.	2 - 4	2
SILTY SAND - Sand, 80%, quartz, yellowish brown, fine-grained, sub-angular to sub-rounded; Silt, 20%, dark yellowish brown.	4 - 8	4
SILTY SAND - Sand, 90%, quartz, colorless, fine-grained, sub-angular to sub-rounded; Silt, 10%, dark yellowish brown to yellowish gray.	8 - 10	2
SHELLY SAND - Sand, 60%, quartz, colorless, fine- to medium-grained, sub-angular to sub-rounded; Shell, 40%, white and tan, fragments.	10 - 12	2
SHELLY SAND - Sand, 80%, quartz, light gray to colorless, fine-grained, sub-angular to sub-rounded; Shell, 20%, white and tan, fragments.	12 - 17	5
SHELLY SILTY SAND - Sand, 70%, quartz, pale yellowish brown, fine- to medium grained, sub-angular to sub-rounded; Silt, 20%, dark yellowish brown; Shell, 10%, white and gray, fragments.	17 - 18	1

36000000100146

SANDSTONE AND SANDY SHELL - Sandstone, 65%, quartz, clear and frosted, medium to coarse-grained, angular to sub-rounded grains, moderately hard; Shell, 20%, white and gray, small to medium-sized fragments; Sand, 15%, quartz, clear and frosted, medium to coarse-grained, sub-angular to sub-rounded.

18 - 29 11

SANDSTONE AND SAND - Sandstone, 60%, quartz, clear and frosted, medium to coarse-grained, angular to sub-rounded, moderately hard; Sand, 40%, quartz and phosphatic, clear and frosted to black, very fine to medium-grained, sub-angular to sub-rounded.

29 - 38 9

SANDSTONE AND SANDY SHELL - Sandstone, 70%, quartz, clear, frosted and gray, medium to coarse-grained, moderately hard; Shell, 20%, white and gray, small to medium-sized fragments; Sand, 10%, quartz and phosphatic, very fine to medium-grained, sub-angular to sub-rounded.

38 - 47 9

SANDSTONE AND SANDY SHELLY CLAY - Sandstone, 60%, quartz, clear and frosted, gray speckled, medium to coarse-grained, moderately hard, shelly; Clay, 20%, moderate gray, plastic, silty; Shell, 10%, white, small-sized fragments; Sand, 10%, quartz and phosphatic, clear and frosted to black, very fine to medium-grained, sub-angular to sub-rounded.

47 - 54 7

SANDSTONE AND SHELLY SAND - Sandstone, 80%, quartz and phosphatic, olive gray and white speckled, fine- to medium-grained, sub-angular to sub-rounded, moderately hard; Sand, 10%, quartz and phosphatic, fine- to coarse-grained, angular to sub-rounded; Shell, 10%, white, small fragments.

54 - 65 11

SANDSTONE AND SHELLY SAND (WITH MARL) - Sandstone, 75%, quartz and phosphatic, olive gray and white speckled, fine- to medium-grained, sub-angular to sub-rounded, moderately hard; Sand, 10%, quartz and phosphatic, fine- to coarse-grained, angular to sub-rounded; Shell, 10%, white, small fragments; Marl, 5%, yellowish gray, soft.

65 - 87 22

3600000100147

SANDSTONE AND SAND - Sandstone, 40%, quartz, moderate brown, fine-grained, hard; Sandstone, 40%, quartz, olive gray and white speckled, fine- to medium-grained, angular to sub-rounded grains, shelly, moderately hard; Sand, 10%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 5%, white, small fragments; Marl, 5%, yellowish gray, soft.

87 - 100 13

SANDSTONE AND SHELLY, MARLY SAND - Sandstone, 30%, quartz, gray and white speckled, fine- to medium-grained, angular to sub-rounded, shelly, moderately hard; Sandstone, 30%, quartz and phosphatic, olive gray and black speckled, very fine-grained, sub-angular to sub-rounded; Shell, 20%, gray and white, small fragments; Sand, 10%, quartz, clear and frosted, fine-grained, sub-angular to sub-rounded; Marl, 10%, yellowish gray, soft.

100 - 111 11

SANDSTONE AND SANDY MARLY SHELL - Sandstone, 40%, quartz and phosphatic, olive gray and black speckled, fine-grained, fairly soft, sub-angular to sub-rounded grains; Sandstone, 10%, quartz, fine- to medium-grained, fairly soft, sub-angular to sub-rounded grains; Shell, 20%, white and gray, small fragments; Sand, 20%, quartz and phosphatic, clear and frosted to black, very fine to medium-grained, sub-angular to sub-rounded; Marl, 10%, yellowish gray, soft.

111 - 120 9

MARLY SANDSTONE AND SANDY CLAYEY SHELL - Sandstone, 40%, quartz and phosphatic, olive gray and black speckled, fine-grained, fairly soft, sub-angular to sub-rounded grains; Sandstone, 10%, quartz, olive gray, fine- to medium-grained, fairly soft, sub-angular to sub-rounded grains; Shell, 20%, white and gray, small fragments; Sand, 10%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded; Clay, 10%, moderate gray, silty; Marl, 10%, yellowish gray, soft.

120 - 130 10+

TOTAL DEPTH 130

86000000100148

GEOLOGIC LOG
OF
WELL 4
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND - Sand, 100%, quartz, light gray, fine- to medium-grained, sub-angular to sub-rounded.	0 - 2	2
SILTY SAND - Sand, 85%, quartz, medium yellowish brown, fine-grained, sub-angular to sub-rounded; Silt, 15%, medium to dark yellowish brown.	2 - 6	4
SAND - Sand, 95%, quartz, light yellowish brown, fine-grained, sub-angular to sub-rounded; Silt, 5%, light to dark yellowish brown.	6 - 9	3
SHELLY SAND - Sand, 70%, quartz, clear to frosted, fine-grained, sub-angular to sub-rounded; Shell, 30%, white and tan, fragments, loose.	9 - 10	1
SHELLY SAND - Sand, 60%, quartz, clear to very light gray, fine- to medium-grained, sub-angular to sub-rounded; Shell, 40%, white and tan, fragments, loose.	10 - 18	8
SANDY CLAYEY SHELL - Shell, 50%, white, gray and tan, small to large-sized fragments; Clay, 30%, moderate brown, plastic, silty; Sand, 20%, quartz, clear and frosted, fine- to medium-grained, sub-angular to sub-rounded.	18 - 21	3
SHELLY SAND - Sand, 80%, quartz, clear and frosted, fine to coarse-grained, sub-angular to sub-rounded; Shell, 20%, white, tan and gray, small to medium-sized fragments.	21 - 35	14

8600000100149

SANDSTONE AND CLAYEY SAND - Sandstone, 60%, quartz, clear and frosted, fine to coarse-grained, angular to sub-rounded; Clay, 20%, moderate gray, plastic, sandy; Sand, 20%, quartz, clear and frosted, fine to medium-grained, sub-angular to sub-rounded.

35 - 42 7

SHELLY SAND - Sand, 80%, quartz, clear and frosted, fine to medium-grained, sub-angular to sub-rounded; Shell, 20%, white and tan, small to medium-sized fragments and whole shells.

42 - 44 2

CLAYEY SHELLY SAND - Sand, 45%, quartz and phosphatic, clear and frosted to black, fine-grained, sub-angular to sub-rounded; Shell, 30%, white, small-sized fragments; Clay, 25%, grayish olive, plastic, silty.

44 - 46 2

SANDSTONE AND CLAYEY SHELL SAND - Sandstone, 40%, quartz, clear, black and white speckled, fine to coarse-grained, angular to sub-rounded grains; Sand, 20%, quartz and phosphatic, clear and frosted to black, fine to medium-grained, sub-angular to sub-rounded; Shell, 20%, white, small to medium-sized fragments; Clay, 20%, grayish olive, plastic, silty.

46 - 48 2

SANDSTONE AND SHELLY SAND - Sandstone, 45%, quartz, clear, frosted and white, fine to coarse-grained, angular to sub-rounded, moderately soft, in matrix with small white shell fragments; Sand, 40%, quartz and phosphatic, clear frosted to white, fine to medium-grained, sub-angular to sub-rounded; Shell, 15%, white, fine fragments.

48 - 62 14

SANDSTONE AND SHELLY SAND - Sandstone, 60%, quartz, olive gray to white, gray and clear speckled, fine to coarse-grained, angular to sub-rounded, shelly, moderately soft; Sand, 20%, quartz and phosphatic, clear and frosted to black, very fine-grained, sub-angular to sub-rounded; Shell, 15%, white, very fine fragments; Marl, 5%, white, soft.

62 - 72 10

86000000100150

SANDSTONE AND SHELLY SAND - Sandstone, 75%, quartz, olive gray and clear to white, fine- to coarse-grained, angular to sub-rounded, shelly, moderately hard; Sand, 10%, quartz and phosphatic, clear and frosted to black, very fine-grained, sub-angular to sub-rounded; Shell, 10%, white, small fragments; Marl, 5%, white, soft.

72 - 76 4

SHELLY SAND WITH SANDSTONE - Sand, 50%, quartz and phosphatic, clear and frosted to black, very fine-grained, sub-angular to sub-rounded; Shell, 20%, white, small fragments; Sandstone, 25%, quartz, light gray and white speckled, fine- to medium-grained, moderately soft, sub-angular to sub-rounded grains; Marl, 5%, white, soft.

76 - 103 27

SANDSTONE AND SHELLY SAND - Sandstone, 80%, quartz and phosphatic, light gray to black, very fine-grained, sub-rounded grains, moderately hard; Shell, 10%, white, fine fragments; Sand, 10%, quartz and phosphatic, very fine-grained, sub-angular to sub-rounded.

103 - 109 6

SHELLY SAND WITH MARL AND SANDSTONE - Sand, 35%, quartz and phosphatic, clear and frosted to black, very fine-grained, sub-angular to sub-rounded; Shell, 20%, white, tan and gray, small to large-sized fragments; Sandstone, 30%, quartz, gray and white speckled, fine- to medium-grained, moderately soft, weathered surfaces; Marl, 15%, pale yellowish gray, soft.

109 - 120 11+

TOTAL DEPTH 120

86000000100151

GEOLOGIC LOG
OF
WELL 6
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND AND CLAY - Sand, 80%, quartz, pinkish gray, fine- to medium-grained, sub-angular to sub-rounded; Clay, 20%, dark gray, plastic.	0 - 2	2
SILTY SAND - Sand, 80%, quartz, pale yellowish brown, fine- to medium-grained, sub-angular to sub-rounded; Silt, 20%, dark yellowish brown.	2 - 4	2
CLAYEY SAND - Sand, 75%, quartz, clear to frosted, fine- to medium-grained, sub-angular to sub-rounded; Clay, 25%, dark gray, plastic.	4 - 6	2
SAND AND SHELL - Sand, 60%, quartz and calcareous, white to clear, fine-grained, sub-angular to sub-rounded; Shell, 40%, white, fragments, loose.	6 - 10	4
SAND AND SHELL - Sand, 70%, quartz, colorless, fine-grained, sub-angular to sub-rounded; Shell, 30%, white, fragments.	10 - 15	5+
	TOTAL DEPTH	15

86000000100152

GEOLOGIC LOG
OF
WELL 8
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND - Sand, 100%, quartz, tan, fine- to medium-grained, sub-angular to sub-rounded.	0 - 2	2
SILTY SAND - Sand, 80%, quartz, clear to medium yellowish brown, fine-grained, sub-angular to sub-rounded; Silt, 20%, medium yellowish brown.	2 - 4	2
CLAYEY SAND - Sand, 80%, quartz, clear to pale yellowish brown to light medium gray, fine-grained, sub-angular to sub-rounded; Clay, 20%, light medium gray, plastic.	4 - 6	2
SHELLY SAND - Sand, 85%, quartz, clear to very light gray, fine- to medium-grained, sub-angular to sub-rounded; Shell, 15%, white and tan, fragments, loose.	6 - 8	2
SHELLY SAND - Sand, 80%, quartz, clear to light gray, fine-grained, sub-angular to sub-rounded; Shell, 20%, white and tan, fragments, loose.	8 - 12	4
SHELLY SAND - Sand, 85%, quartz, clear to light gray, fine- to medium-grained, sub-angular to sub-rounded; Shell, 15%, white and tan, fragments, loose.	12 - 15	3+
	TOTAL DEPTH	15

8600000100153

GEOLOGIC LOG
OF
WELL 9
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND - Sand, 100%, quartz, medium gray, fine-grained, sub-angular to sub-rounded.	0 - 2	2
SAND - Sand, 95%, quartz, dark yellowish brown, fine-grained, sub-angular to sub-rounded; Silt, 5%, dark yellowish brown.	2 - 4	2
SILTY SAND - Sand, 85%, quartz, clear to frosted, fine- to medium-grained, sub-angular to sub-rounded; Silt, 15%, dark yellowish brown.	4 - 9	5
SHELLY SAND - Sand, 60%, quartz, clear to frosted, fine- to medium-grained, sub-angular to sub-rounded; Shell, 40%, white, fragments, loose.	9 - 16	7+
	TOTAL DEPTH	16

86000000100154

GEOLOGIC LOG
OF
WELL 10
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND - Sand, 100%, quartz, very light gray, fine- to medium-grained, sub-angular to sub-rounded.	0 - 2	2
SILTY SAND - Sand, 80%, quartz, light yellowish brown, fine-grained, sub-angular to sub-rounded; Silt, 20%, light yellowish brown.	2 - 6	4
CLAYEY SHELLY SAND - Sand, 80%, quartz, clear to frosted, fine-grained, sub-angular to sub-rounded; Shell 15%, white and tan, fragments, loose; Clay, 5%, light yellowish brown, plastic.	6 - 8	4
SANDSTONE - Sandstone, 100%, quartz, clear to white to very light gray, fine-grained, poorly cemented.	8 - 10	2
SHELLY SAND - Sand, 70%, quartz, clear to frosted, fine-grained, sub-angular to sub-rounded; Shell, 30%, white and tan, fragments, loose.	10 - 12	2
SHELLY SAND - Sand, 85%, quartz, clear to light gray, fine- to medium-grained, sub-angular to sub-rounded; Shell, 15%, white and tan, fragments, loose.	12 - 15	3+
	TOTAL DEPTH	15

8600000100155

GEOLOGIC LOG
OF
WELL 13
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
CLAYEY SAND - Sand, 90%, quartz, pale yellowish brown, fine-grained, sub-angular to sub-rounded; Clay, 10%, pale yellowish brown, plastic.	0 - 2	2
SILTY SAND - Sand, 90%, quartz, dark yellowish brown, fine- to medium-grained, sub-angular to sub-rounded; Silt, 10%, brown.	2 - 10	8
SAND AND SHELL - Sand, 60%, quartz, clear to frosted, fine-grained, sub-angular to sub-rounded; Shell, 40%, white to tan, fragments.	10 - 15	5+
	TOTAL DEPTH	15

86000000100156

GEOLOGIC LOG
OF
WELL 14
PALM BEACH COUNTY, FLORIDA

<u>Sample Description</u>	<u>Depth Interval (feet)</u>	<u>Thickness (feet)</u>
SAND - Sand, 100%, quartz, clear to light medium gray, fine- to medium-grained, sub-angular to sub-rounded.		
SILTY SAND - Sand, 80%, quartz, colorless to pale yellowish brown, fine-grained, sub-angular to sub-rounded; Silt, 20%, dark yellowish brown; Trace of clay, dark brown, plastic.	2 - 6	4
SAND AND SHELL - Sand, 60%, quartz, colorless, fine- to medium-grained, sub-angular to sub-rounded; Shell, 40%, white and tan, loose, fragments; Traces of sandstone, light gray, fine-grained, moderately hard.	6 - 12	6
SHELLY SAND - Sand, 90%, quartz, colorless to light gray, fine-grained, sub-angular to sub-rounded; Shell, 10%, white to tan to gray, loose, fragments.	12 - 15	3+
	TOTAL DEPTH	15

3600000100157

86000000100158

APPENDIX 10.14.2
SURFACE RESISTIVITY DATA

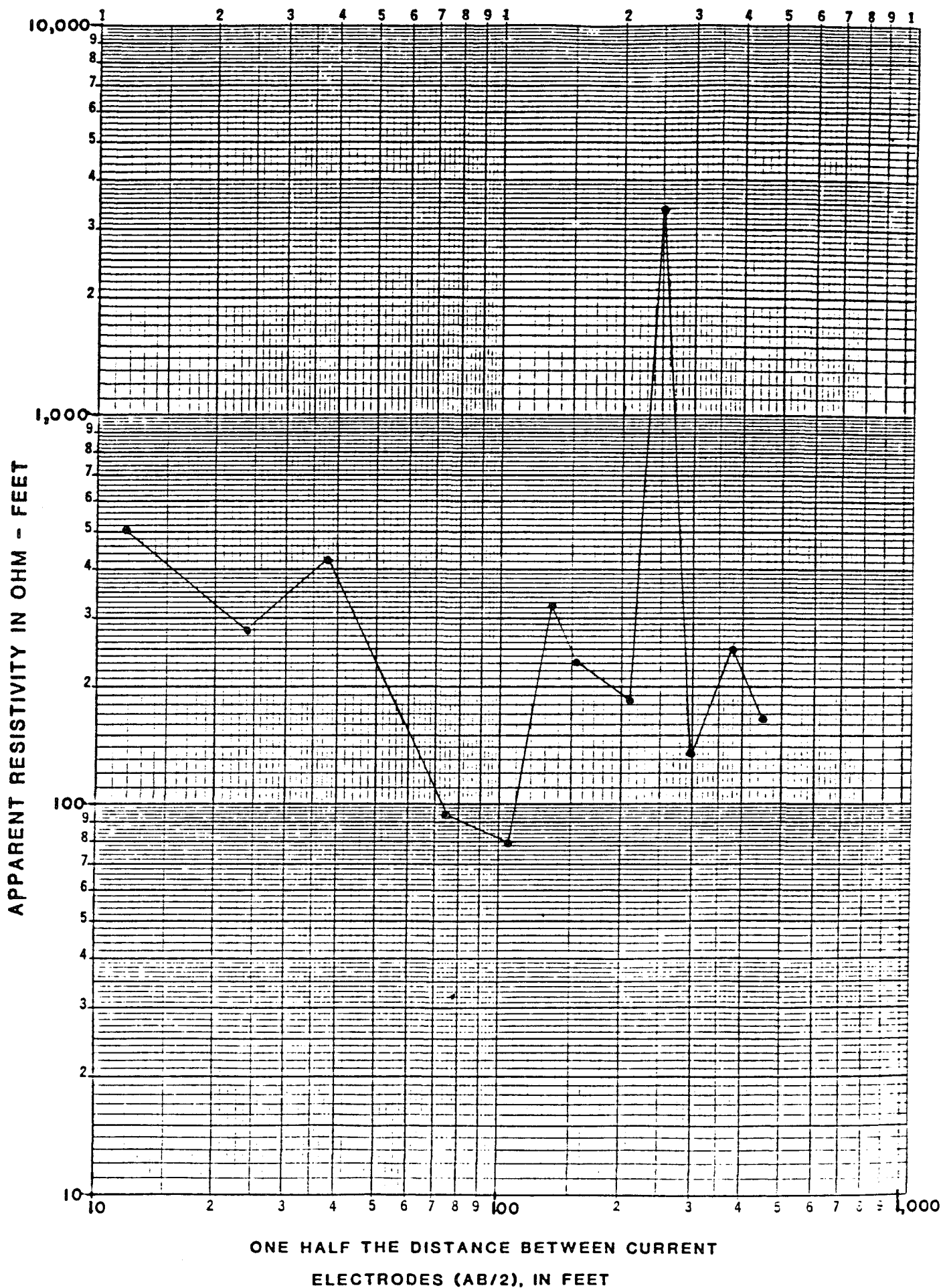
HORIZONTAL COORDINATES OF
RESISTIVITY SURVEY POINTS (a)

<u>Resistivity Survey Number</u>	<u>North End of Array</u>	<u>West End of Array</u>	<u>Center of Array</u>	<u>East End of Array</u>	<u>South End of Array</u>
1	N.		894,427.1	894,360.4	
	E.		782,239.2	782,673.4	
2	N. 890,829.5		890,557.3		
	E. 781,611.7		781,742.9		
3	N.	892,185.7	892,163.6		
	E.	781,298.6	781,690.9		
4	N.	890,232.1	890,222.0		
	E.	782,155.9	782,455.5		
5	N.		895,546.8	895,516.0	
	E.		782,235.9	782,665.1	
6	N.	890,276.4	890,275.3		
	E.	779,752.2	780,060.6		
7	N.		885,385.7		
	E.		782,474.0		
8	N.	884,547.2	884,604.8		
	E.	781,475.9	781,765.4		
9	N.			887,713.4	
	E.			782,536.6	

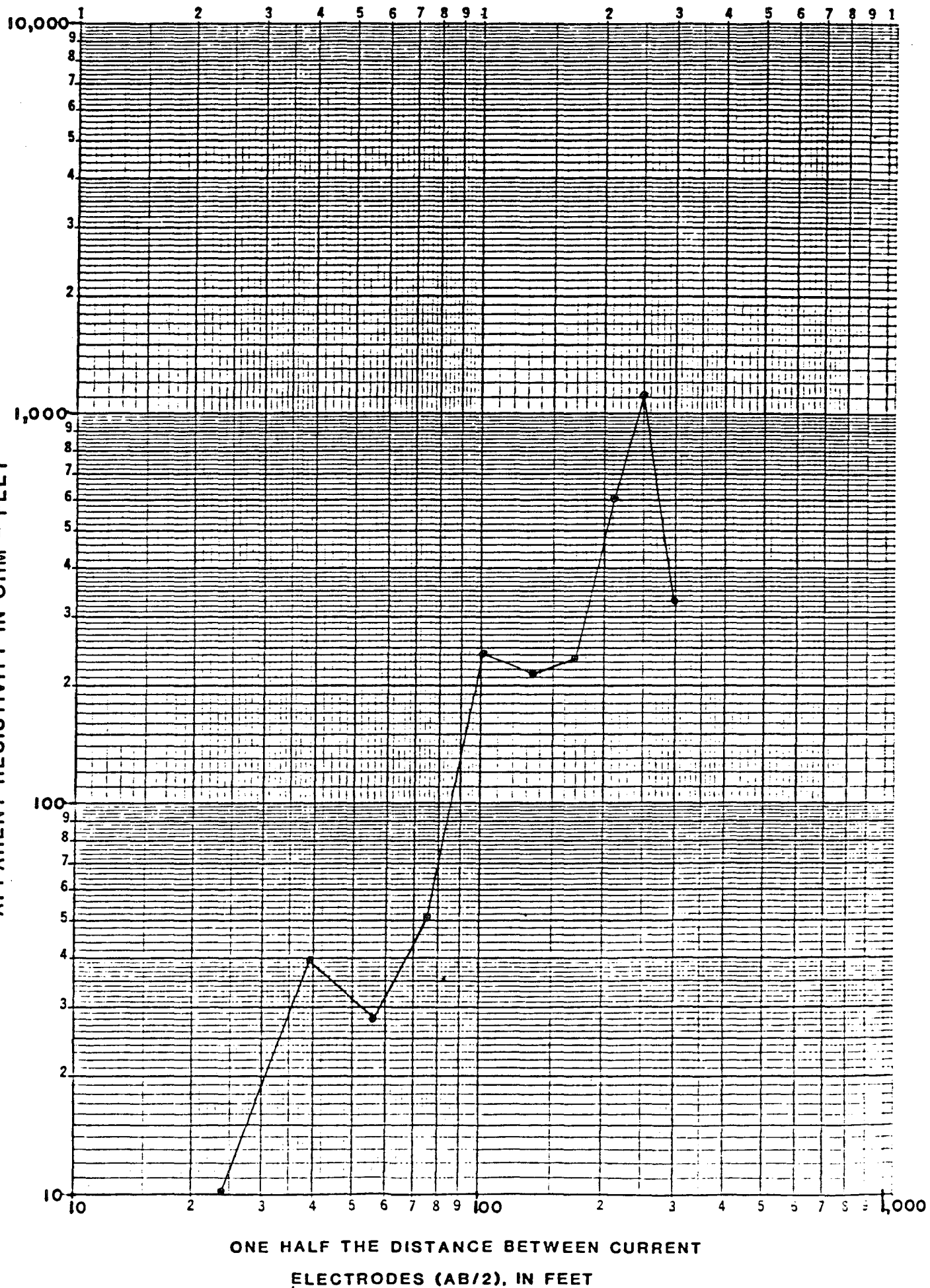
- (a) coordinates based upon Palm Beach County Survey of Sections, from Post, Buckley, Schuh & Jenrigan, Inc.
- (b) Resistivity Surveys were orientated either north-south, or east-west. Coordinates are shown for the center and either end except for surveys 7 and 9 where marker stakes were destroyed before survey was conducted.

86000000100159

RESISTIVITY SURVEY 1

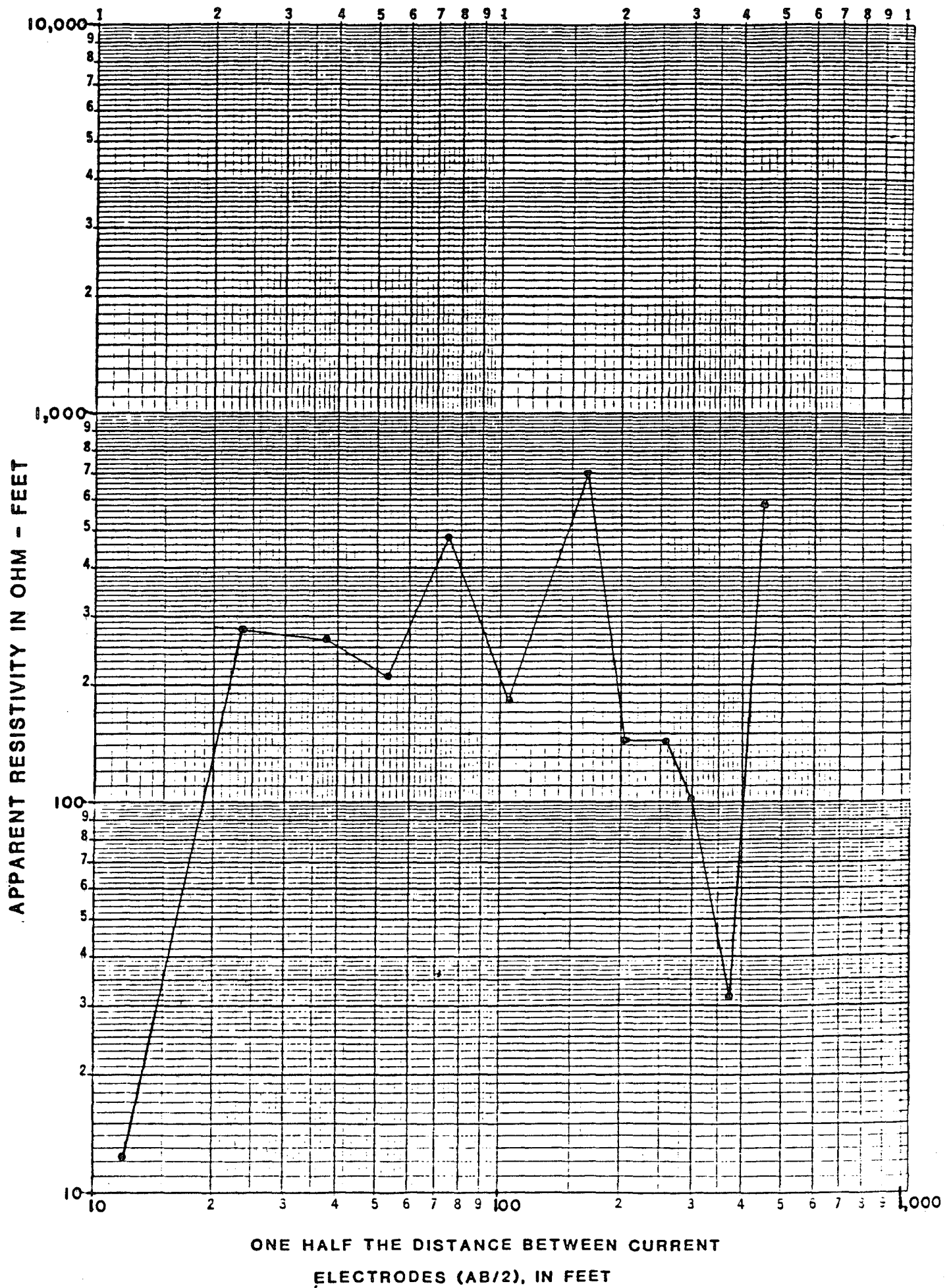


RESISTIVITY SURVEY 2

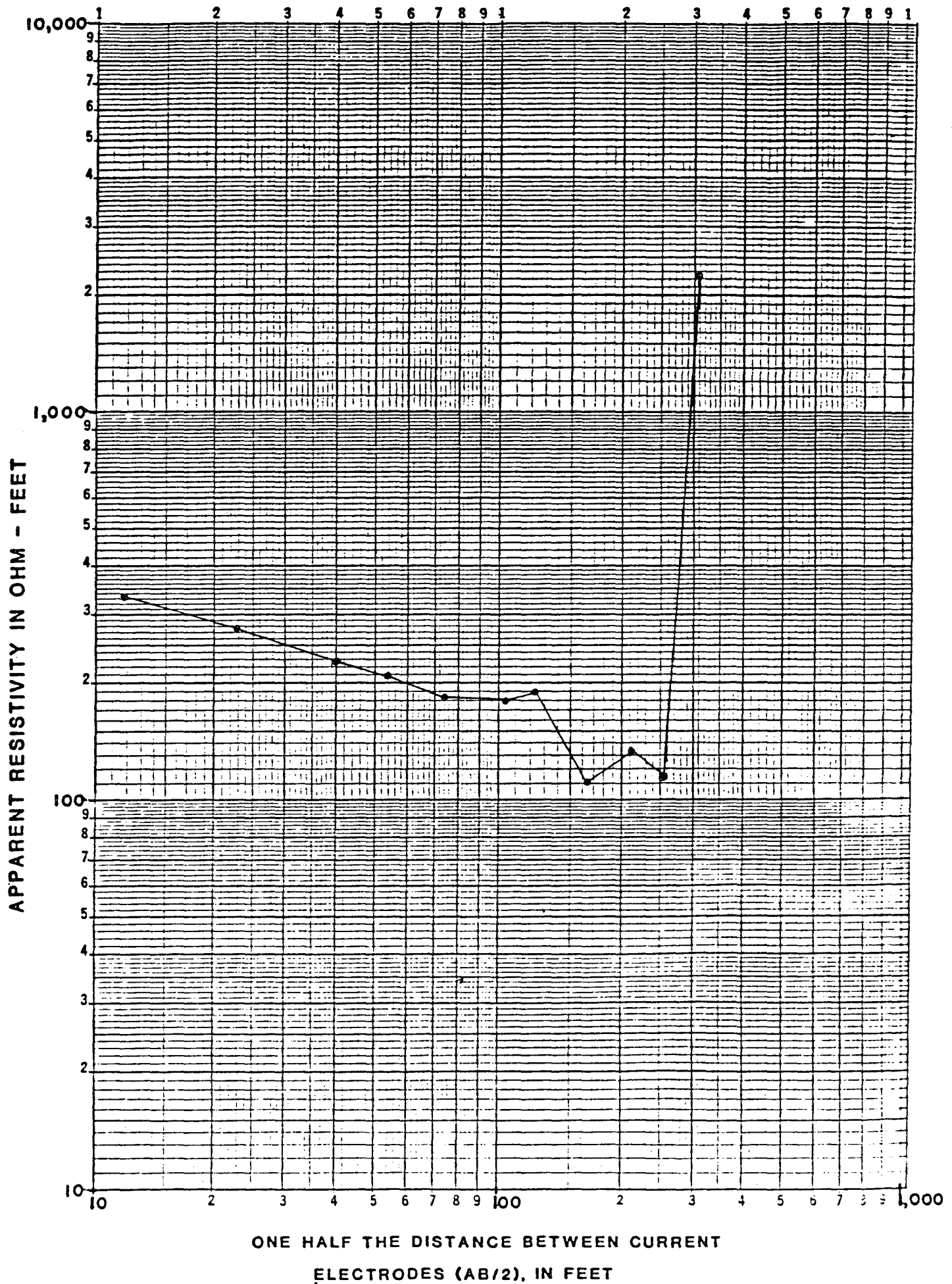


86000000100161

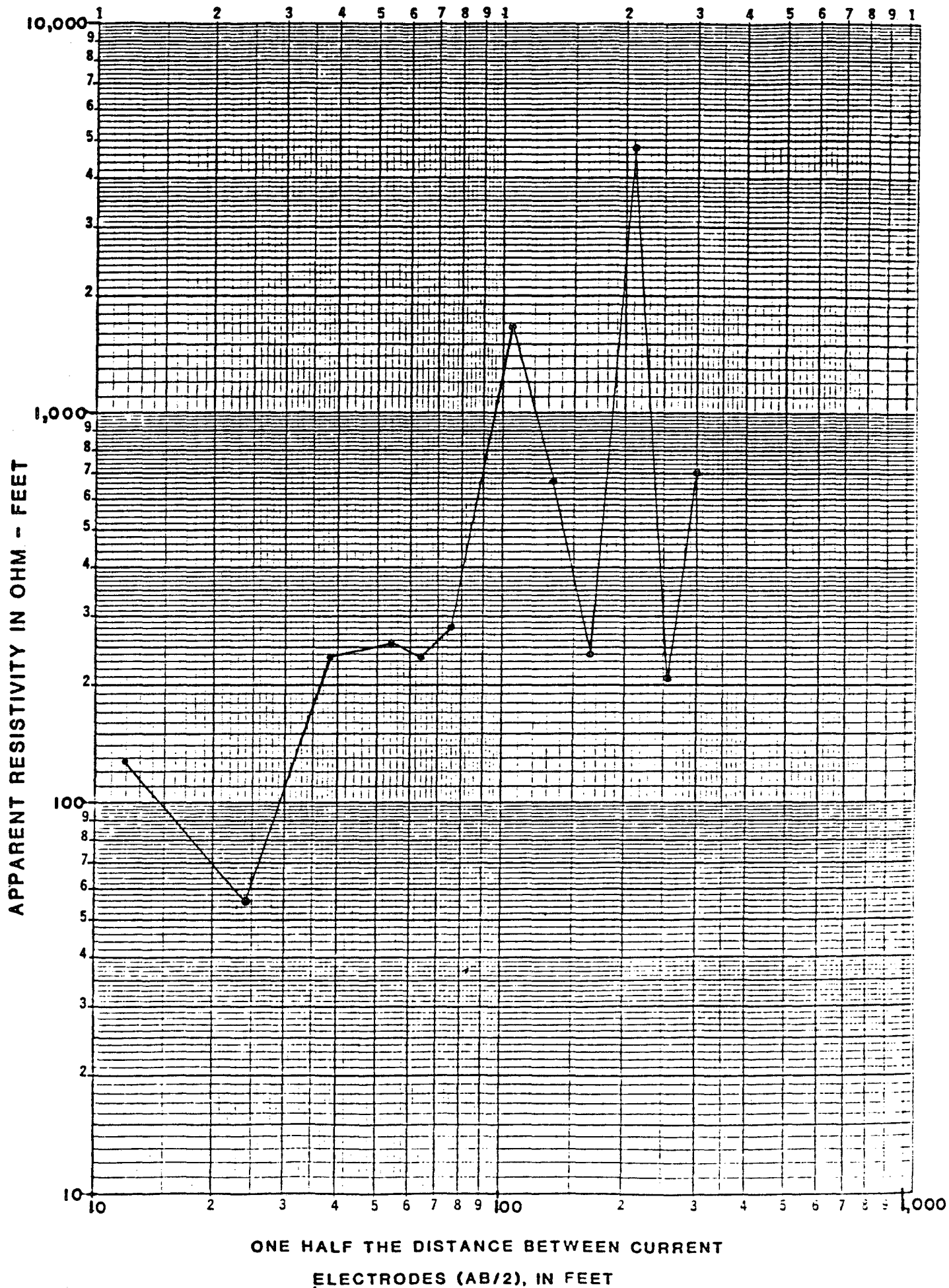
RESISTIVITY SURVEY 3



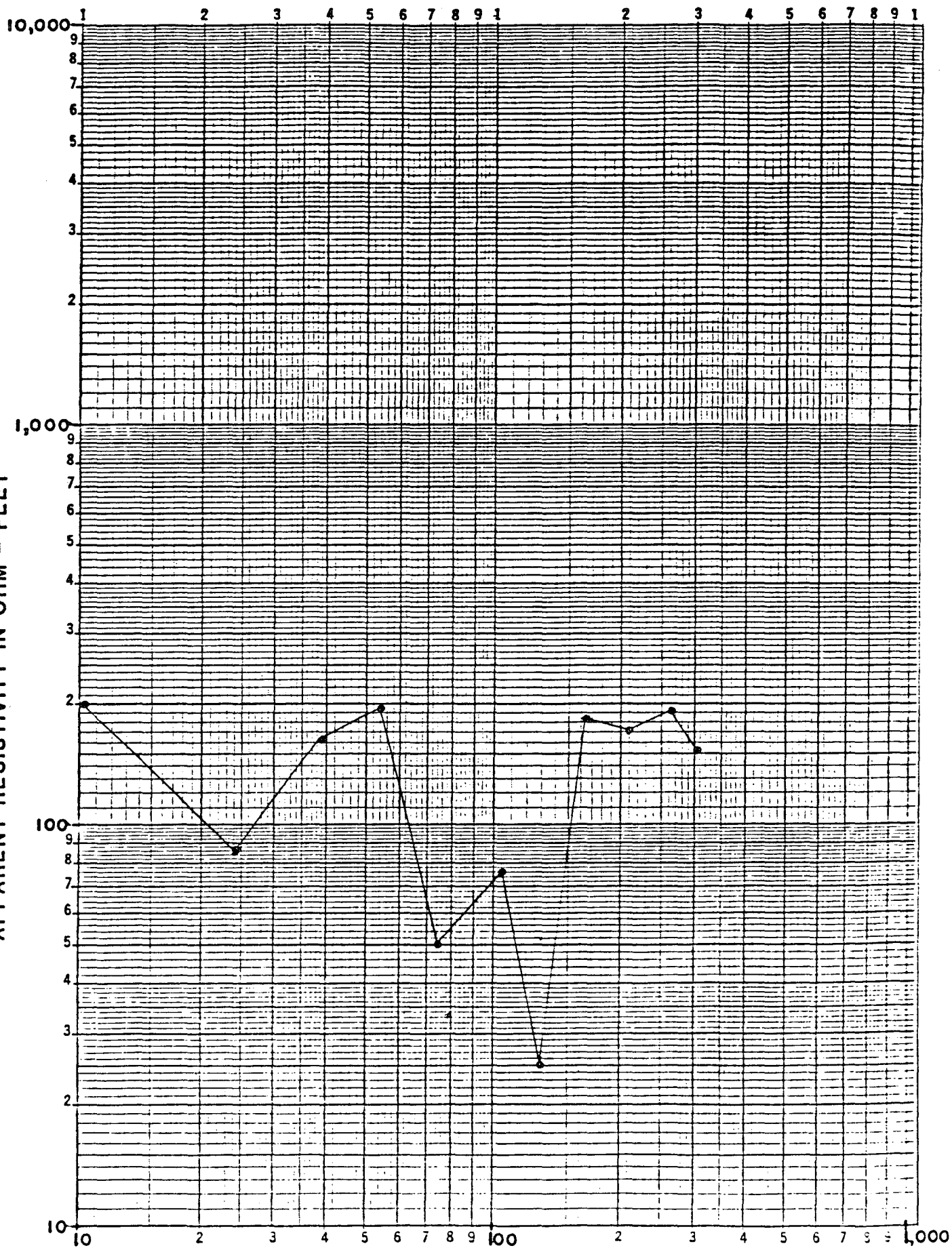
RESISTIVITY SURVEY 4



RESISTIVITY SURVEY 5



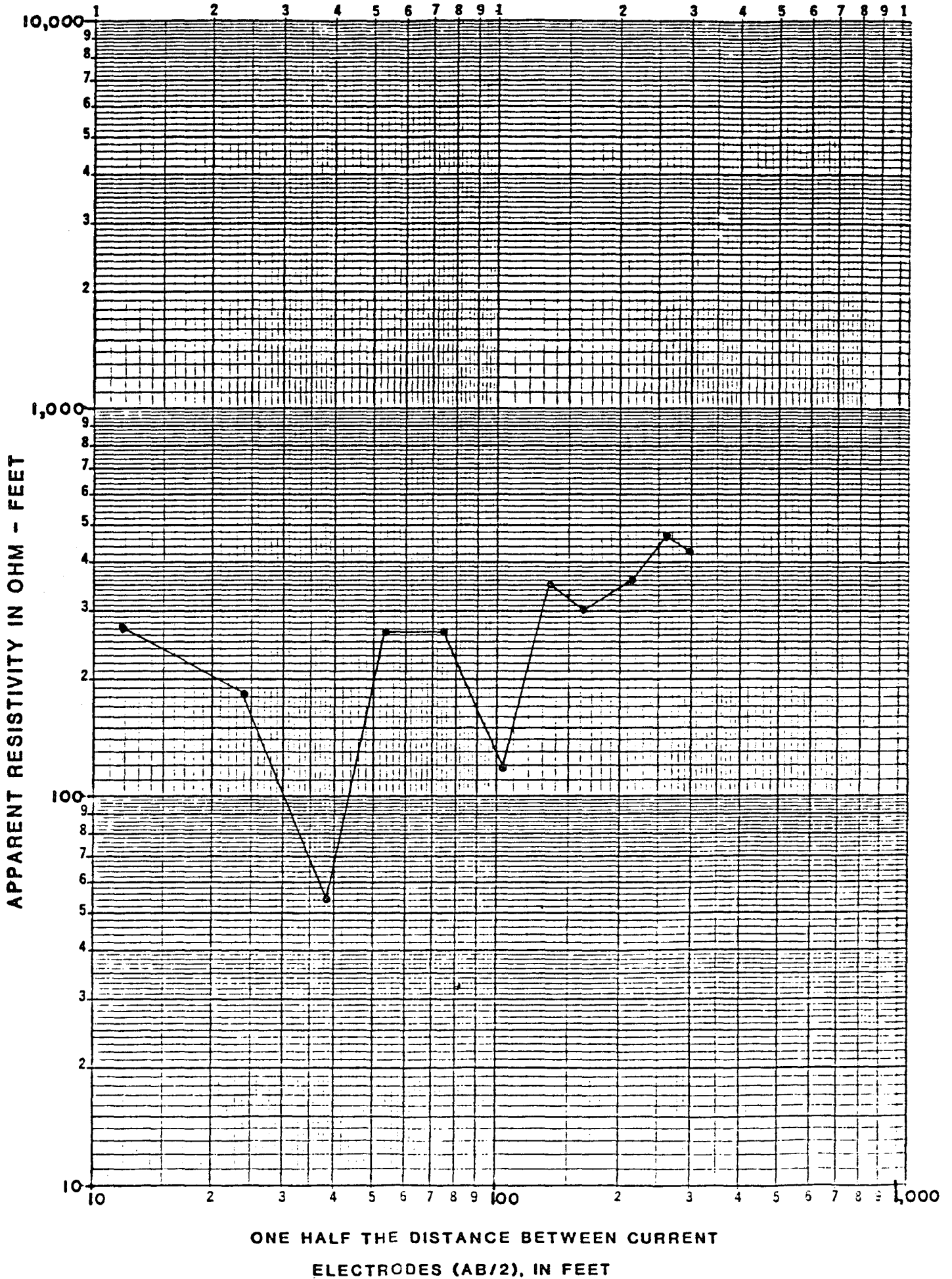
RESISTIVITY SURVEY 6



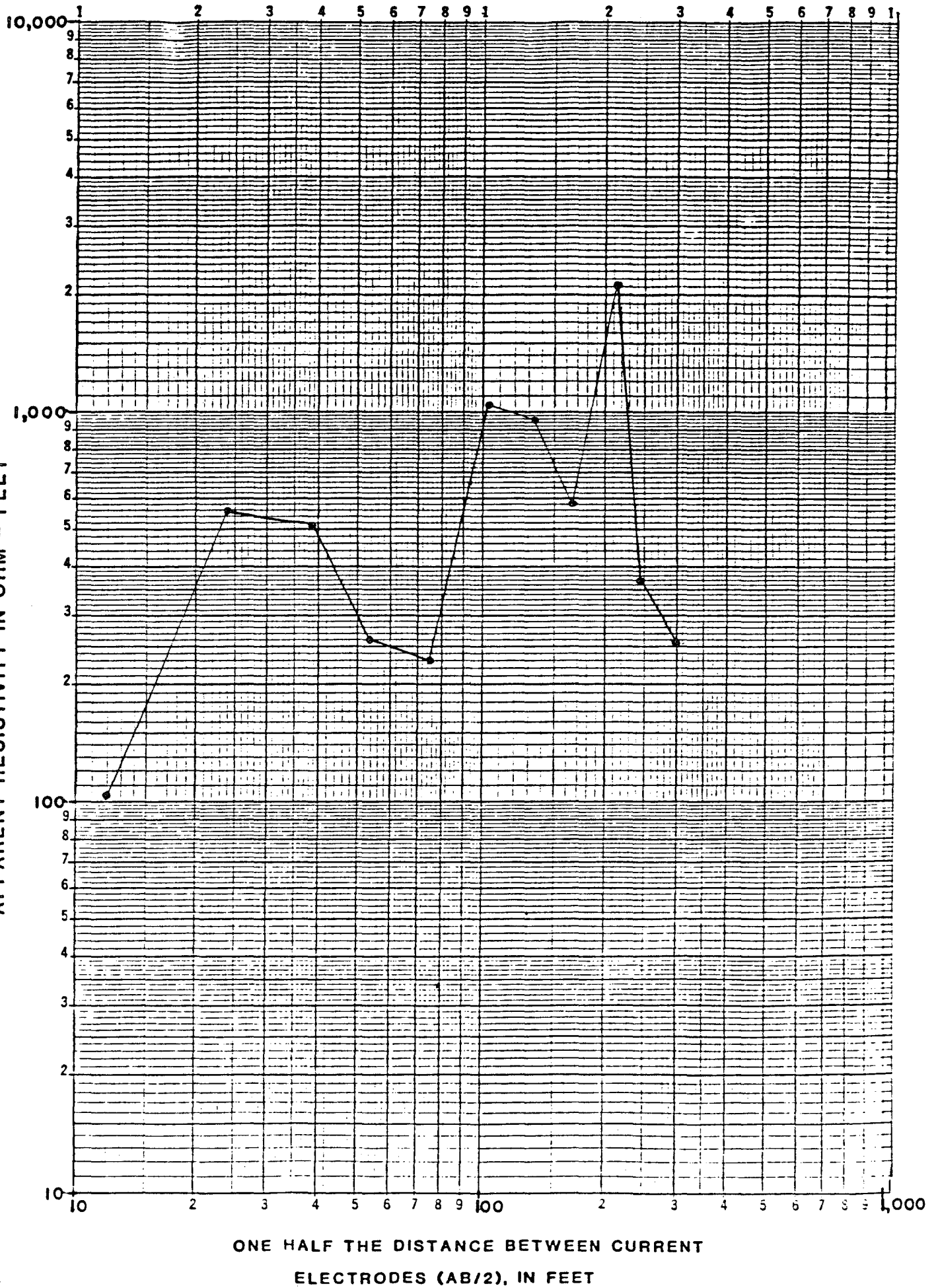
ONE HALF THE DISTANCE BETWEEN CURRENT
ELECTRODES (AB/2), IN FEET

86000000100165

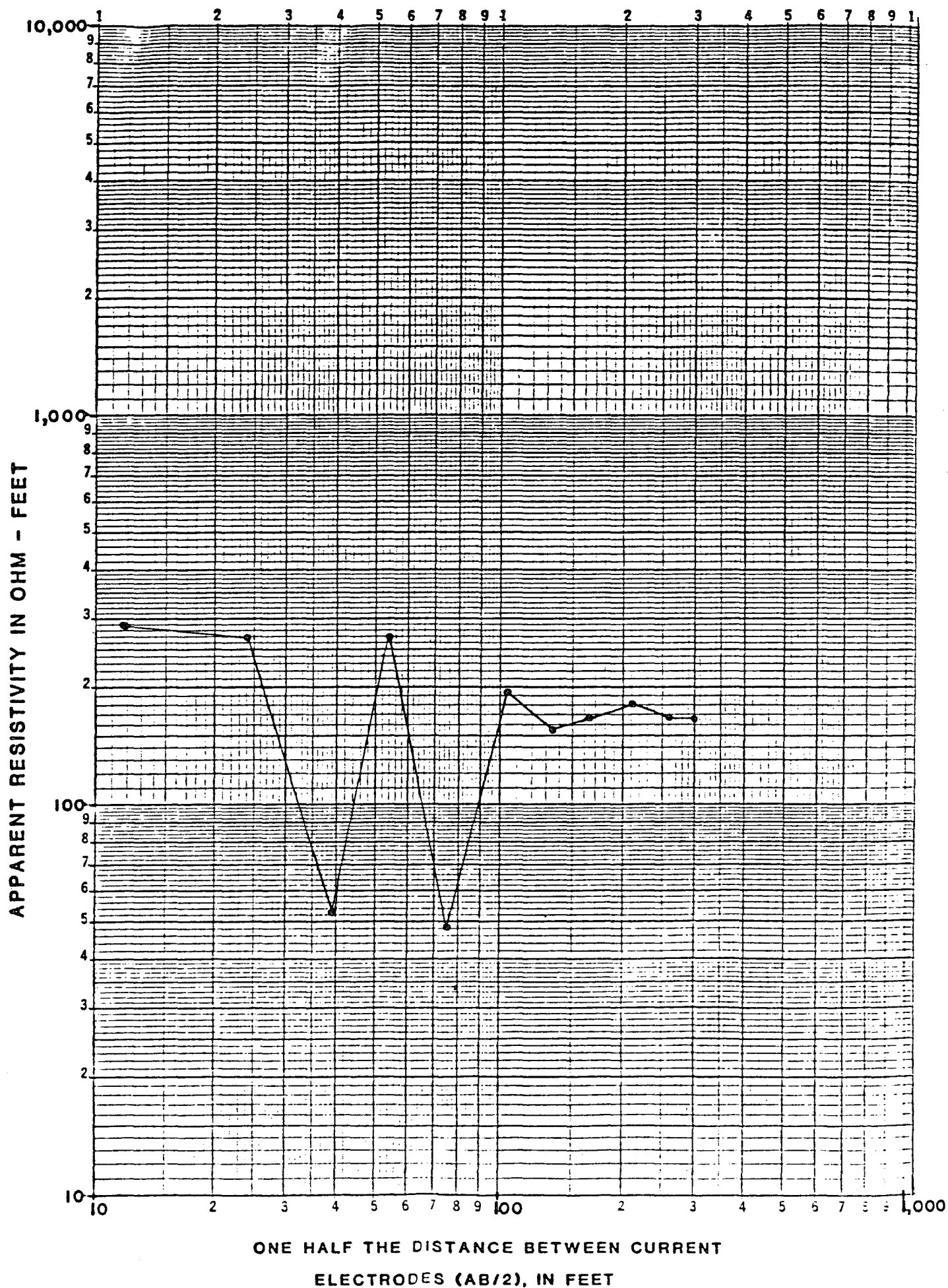
RESISTIVITY SURVEY 7



RESISTIVITY SURVEY 8



RESISTIVITY SURVEY 9



86000000100169

APPENDIX 10.14.3
REPORT ON AVAILABILITY
OF COVER MATERIAL

Geraghty & Miller, Inc.

Suite 104
2700 P.G.A. Boulevard
Palm Beach Gardens, Florida 33410

GROUND-WATER CONSULTANTS

Telephone: 305 / 694-0300

10 August 1984
P746BRI

Mr. Sumpter H. Barker
Barker, Osha & Anderson
860 U.S. Highway One
North Palm Beach, Florida 33408

Subject: Cover Material Survey Site 7, Palm Beach County

Dear Sam,

We have completed work to determine the thickness of dredge-extractable sediments overlying consolidated sediments at Site 7. The results of that effort are reported herein. We attempted to combine the existing information (from wells constructed under Geraghty & Miller, Inc. supervision in early April 1984 and data from wells constructed earlier by the U.S. Geological Survey) with the data recently developed from the Dutch Cone Penetration Tests. That effort showed that sandstone layers detected in the uppermost 50 feet, during well drilling with a conventional mud-rotary drilling rig, were relatively soft and probably extractable. Consequently, only the Dutch Cone Penetration Test data were used to prepare Figure 1 - a map showing the thickness of extractable sediments.

The distribution of the test points shown on Figure 1 was largely controlled by site accessibility. The west-central part of the site, in particular, was not extensively tested because of access problems. Fortunately, as discussed below, the information that was gathered in the vicinity of the west-central part of the site was very favorable, showing a greater thickness of dredgeable materials.

The data shown on Figure 1 represent the depth to consolidated rock below which consolidated rock appears to be continuous. Consolidated rock, the non-extractable rock, was defined as having a bearing strength greater than 200 tons per square foot. That figure is approximately equal to 50 blow counts per foot as expressed in the Standard Penetration Test. Data generated during the cone penetration tests are provided as Attachment A.

In a discussion with Mr. N. Cargile of American Marine Machinery, Inc. (Mr. Mark Hammond of the Palm Beach County Solid Waste Authority had been talking with Mr. Cargile about the purchase of a new dredge), we were told that sandstone having a bearing strength of 50 blow counts per foot can be extracted with his "standard" dredge, although the production rate in terms of cubic yards per day will be relatively low. The actual limit of the standard dredge to extract rock depends also on other factors including the degree of rock fracturing. Therefore, it is not possible to state definitively the capability of the rig in terms of bearing strength.

Syosset, NY

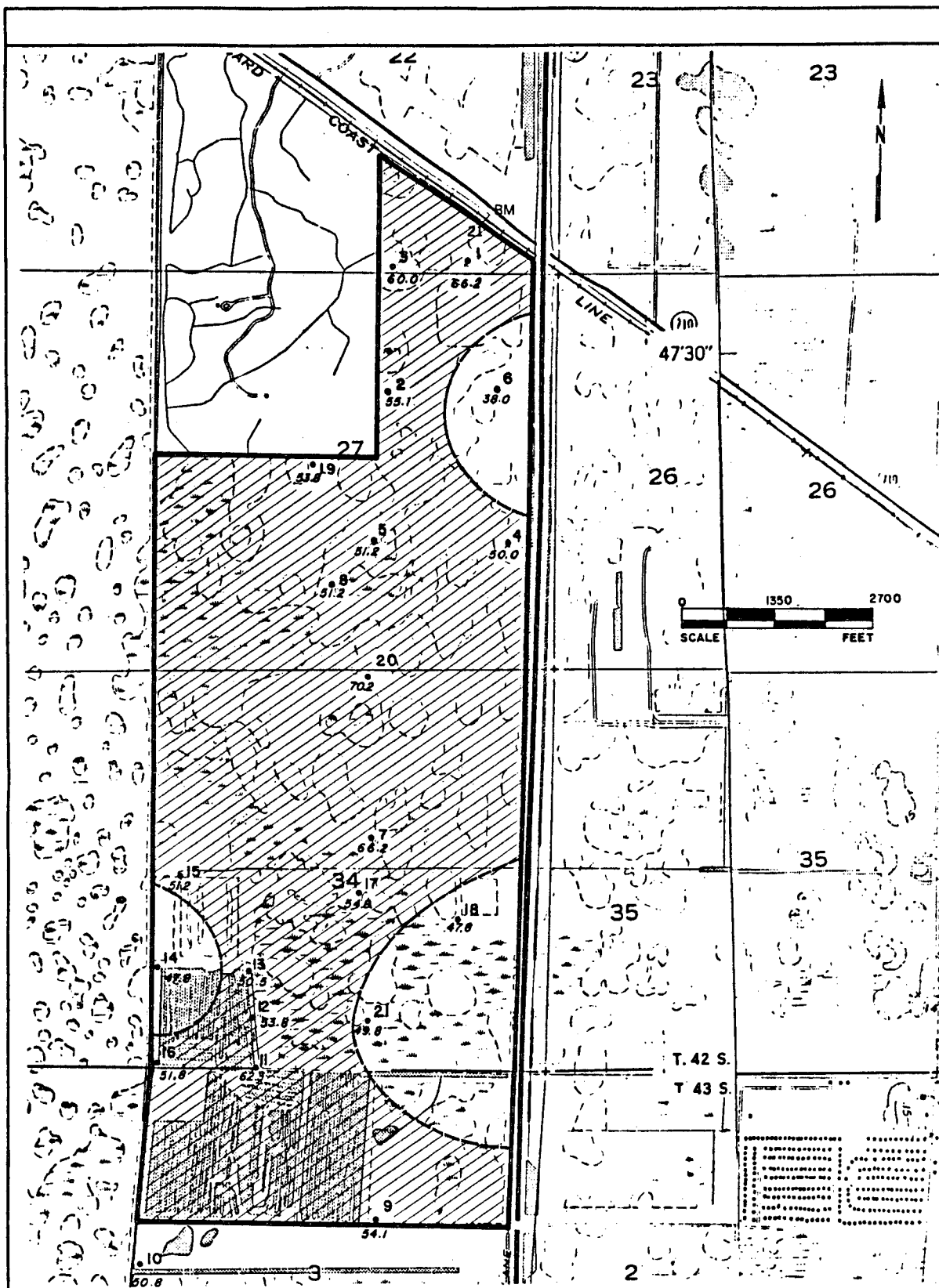
Annapolis, MD

Tampa, FL

Baton Rouge, LA

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36000000100171



LEGEND

2 CONE PENETRATION NUMBER

51.2 DREDGE-EXTRACTABLE THICKNESS OF SEDIMENTS, IN FEET

AREA WHERE DREDGE-EXTRACTABLE THICKNESS IS GREATER THAN 50 FEET

PREPARED FOR
HAYDEN-WEGMAN/BARKER,
OSHA & ANDERSON

TITLE
THICKNESS OF DREDGE-
EXTRACTABLE SEDIMENTS
AT SITE 7

COMPILED BY P. JAKOB	Geraghty & Miller, Inc.	DATE JULY 1984
CHECKED BY Y. DIMICK	Palm Beach Gardens, Florida	REVISED
CHECKED BY P. JAKOB	SCALE SHOWN	FIGURE 1

1 Aug 84

At depths shallower than those shown on Figure 1 are hardpan or sandstone layers having bearing strengths greater than 200 tons per square foot; these layers are relatively thin and probably can be dredged, although slowly. The depth intervals in which these layers occur are noted on Table 1. The layers occur at similar depths in several locations and may be persistent; generally, correlations based on a comparison of results for adjacent tests are poor. The layers were encountered more frequently in the northeastern part of Site 7. Close to the west-central part of the site, Tests 5, 6, 7, 15, 18, 19 and 20 indicated that no significant sandstone layers occurred above 50 feet below grade.

Based on available guidelines, the data indicate that, beneath about 85% of the site, greater than 50 feet of sediment is extractable by dredge. However, because of several relatively hard sandstone layers at depths less than 50 feet, it may be desirable to increase dredge operations or use material previously stockpiled when peak demands for borrow coincide with times when a lower production rate of borrow is foreseen because of slow dredging. In addition to the primary purpose of the penetration tests, the data may be useful in making preliminary estimates for foundation plans and in estimating the potential for subsidence due to the landfill. At Mr. Timmerman's request, I sent to him copies of the test data for his assessment of soil suitability for foundations.

Please let us know if we can be of further service with regard to this matter. We appreciate the opportunity to provide assistance to the Joint Venture in this investigation.

Sincerely,
GERAGHTY & MILLER, INC.



Paul G. Jakob
Senior Scientist

PGJ:gs
Attachment

cc: M. Hammond

36000000100172

TABLE 1

DEPTH INTERVALS OF SEDIMENT LAYERS
AND THE APPARENT
DEPTH TO SEDIMENTS HAVING A
BEARING STRENGTH GREATER THAN 200 TONS PER SQUARE FOOT

Penetration Test	Depth Interval, in feet, of Hardpan or Sandstone Layers at Each Test Site in Order Encountered				Depth of Apparent Bottom of Extractable Sediment
	1	2	3	4	
1	47.2-47.9	56.4-57.7			66.2
2	27.9-38.0	41.3-42.3			55.1
3	30.8-31.5	39.4-40.3	43.9-45.9		60.0
4	21.9-23.9	34.4-36.0	38.7-41.3	43.9-45.2	>49.5
5					51.2
6					38.0
7	53.4-54.1				66.2
8	37.4-40.3				51.2
9	31.5-38.4	51.2-51.5			54.1
10	31.4-33.7				50.8
11	29.5-31.5	42.6-44.6			62.3
12	31.2-32.1				53.8
13	1.6-2.9	32.0-45.6			50.5
14	37.0-39.6				47.8
15					51.2
16	29.1-30.8	32.5-33.4			51.8
17	0.9-2.6				54.8
18					47.8
19					53.8
20	51.2-53.1				70.2
21	30.1-30.5				49.8

NOTE: All depths are expressed in feet below land surface.

86000000100174

APPENDIX 10.14.4
WATER QUALITY DATA AND
RESULTS OF SOIL ANALYSES



Orlando Laboratories, Inc.

P. O. Box 19127 • Orlando, Florida 32814 • 305/896-6645

REPORT OF ANALYSIS

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date sampled: 05-10, 11-84
Date received: 05-11-84
Date reported: 07-02-84

Page 1 of 48

PALM BEACH COUNTY SITE 7, WELL SAMPLES

- Sample #1. Well #1 @ 0740 hrs, 05-11-84, Water level: 5.73 ft, Total Depth: 90.21 ft, Distance from top of casing to ground: 2.17 ft, Water evacuated: 170 gallons, Temperature: 25.2°C, pH: 7.1, Specific Conductance: 492 umhos, Water Condition: Clear.
- Sample #2. Well #2 @ 1735 hrs, 05-10-84, Water level: 6.50 ft, Total Depth: 92.92 ft, Distance from top of casing to ground: 2.81 ft, Water evacuated: 170 gallons, Temperature: 24.1°C, pH: 6.9, Specific Conductance: 1,080 umhos, Water Condition: Slightly Yellow.
- Sample #3. Well #3 @ 1415 hrs, 05-10-84, Water level: 6.08 ft, Total Depth: 93.67 ft, Distance from top of casing to ground: 2.83 ft, Water evacuated: 170 gallons, Temperature: 24.1°C, pH: 7.0, Specific Conductance: 900 umhos, Water Condition: Clear.
- Sample #4. Well #4 @ 1540 hrs, 05-10-84, Water level: 3.63 ft, Total Depth: 90.83 ft, Distance from top of casing to ground: 1.81 ft, Water evacuated: 170+ gallons, Temperature: 21.0°C, pH: 6.8, Specific Conductance: 936 umhos, Water Condition: Slightly Yellowish.
- Sample #5. Well #5 @ 0745 hrs, 05-11-84, Water level: 5.69 ft, Total Depth: 18.17 ft, Distance from top of casing to ground: 2.56 ft, Water evacuated: 6 gallons, Temperature: 24.8°C, pH: 7.2, Specific Conductance: 372 umhos, Water Condition: Clear.

Our Florida Department of Health & Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Chemist/Biologist

86000000100175

Geraghty & Miller
Attn: Paul Jakob

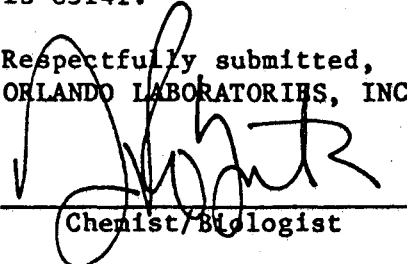
07-02-84

Report #: 41811 (4381)
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- Sample #6: Well #6 @ 1815 hrs, 05-10-84, Water level: 5.69 ft, Total Depth: 17.54 ft, Distance from top of casing to ground: 2.17 ft, Water evacuated: 6 gallons, Temperature: 24.5°C, pH: 6.9, Specific Conductance: 840 umhos, Water Condition: Clear.
- Sample #7: Well #7 @ 1725 hrs, 05-10-84, Water level: 6.25 ft, Total Depth: 17.33 ft, Distance from top of casing to ground: 2.0 ft, Water evacuated: 6 gallons, Temperature: 25.1°C, pH: 7.0, Specific Conductance: 287 umhos, Water Condition: Slightly Yellowish.
- Sample #8: Well #9 @ 1350 hrs, 05-10-84, Water level: 5.81 ft, Total Depth: 17.63 ft, Distance from top of casing to ground: 2.38 ft, Water evacuated: 6 gallons, Temperature: 24.5°C, pH: 7.0, Specific Conductance: 564 umhos, Water Condition: Clear.
- Sample #9: Well #12 @ 1125 hrs, 05-10-84, Water level: 5.58 ft, Total Depth: 18.25 ft, Distance from top of casing to ground: 2.56 ft, Water evacuated: 6 gallons, Temperature: 25.8°C, pH: 7.0, Specific Conductance: 540 umhos, Water Condition: Clear.
- Sample #10: Well #8 @ 1655 hrs, 05-10-84, Water level: 5.38 ft, Total Depth: 18.46 ft, Distance from top of casing to ground: 2.48 ft, Water evacuated: 6 gallons, Temperature: 24.5°C, pH: 6.8, Specific Conductance: 900 umhos, Water Condition: Clear.
- Sample #11: Well #10 @ 1505 hrs, 05-10-84, Water level: 4.56 ft, Total Depth: 17.0 ft, Distance from top of casing to ground: 2.08 ft, Water evacuated: 20 gallons, Temperature: 26.0°C, pH: 7.2, Specific Conductance: 624 umhos, Water Condition: Clear.
- Sample #12: Well #11 @ 1550 hrs, 05-10-84, Water level: 4.31 ft, Total Depth: 16.75 ft, Distance from top of casing to ground: 2.04 ft, Water evacuated: 6+ gallons, Temperature: 24.2°C, pH: 6.9, Specific Conductance: 780 umhos, Water Condition: Slightly Yellowish.

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07-02-84

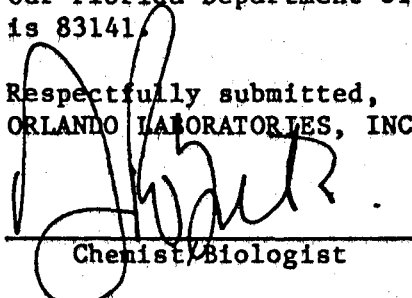
Report #: 41811 (4381)
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Sample #13: Well #13 @ 0925 hrs, 05-10-84, Water level: 6.17 ft, Total Depth: 18.0 ft, Distance from top of casing to ground: 2.79 ft, Water evacuated: 6 gallons, Temperature: 25.4°C, pH: 6.8, Specific Conductance: 984 umhos, Water Condition: Yellowish.

Sample #14: Well #14 @ 1900 hrs, 05-10-84, Water level: 5.17 ft, Total Depth: 17.77 ft, Distance from top of casing to ground: 2.25 ft, Water evacuated: 15 gallons, Temperature: 23.8°C, pH: 7.2, Specific Conductance: 546 umhos, Water Condition: Clear.

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Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

86000000100177

REPORT OF ANALYSIS

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2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

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Page 4 of 48

IDENTIFICATION: #1. Well #1 #2. Well #2 #3. Well #3 #4. Well #4

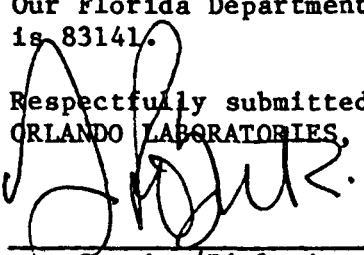
RESULTS OF ANALYSIS

<u>PURGEABLE ORGANICS</u>	#1	#2	#3	#4
Acrolein	*	*	*	*
Acrylonitrile	*	*	*	*
Benzene	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	<0.001	<0.001	<0.001	<0.001
Carbon tetrachloride	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	<0.001	<0.001	<0.001	<0.001
Chloroethane	<0.001	<0.001	<0.001	<0.001
2-Chloroethylvinyl ether	<0.001	<0.001	<0.001	<0.001
Chloroform	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane	<0.001	<0.001	<0.001	<0.001
Methylene chloride	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.001	<0.001	<0.001	<0.001

*Could not perform analysis due to equipment failure.

Results expressed in mg/l unless otherwise designated. < = Less Than
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 5 of 48

IDENTIFICATION: #1. Well #1 #2. Well #2 #3. Well #3 #4. Well #4

RESULTS OF ANALYSIS

PURGEABLE ORGANICS - cont.

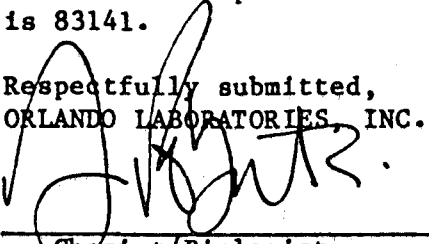
	#1	#2	#3	#4
Vinyl chloride	<0.001	<0.001	<0.001	<0.001
Bromomethane	<0.001	<0.001	<0.001	<0.001
Chloromethane	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene	<0.001	<0.001	<0.001	<0.001
cis- and trans-1,2-Dichloroethene	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.001	<0.001	<0.001	<0.001
trans-1,3-Dichloropropene	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	<0.001	<0.001	<0.001	<0.001
Trichloroethylene	<0.001	<0.001	<0.001	<0.001
n-Hexane	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloropropene	<0.001	<0.001	<0.001	<0.001
trans-1,2-Dichloropropene	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane	<0.001	<0.001	<0.001	<0.001
Toluene	<0.001	<0.001	<0.001	<0.001
Xylene	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene	<0.001	<0.001	<0.001	<0.001
Styrene	<0.001	<0.001	<0.001	<0.001
Ethylene Dibromide (ug/l)	<0.1	<0.1	<0.1	<0.1

BASE NEUTRALS

1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01
Hexachloroethane	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01
bis(2-Chloroethoxy)methane	<0.01	<0.01	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01
2-Chloronaphthalene	<0.01	<0.01	<0.01	<0.01
Isophorone	<0.01	<0.01	<0.01	<0.01

Results expressed in mg/l unless otherwise designated. < = Less Than.
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Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

Geraghty & Miller
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07-02-84

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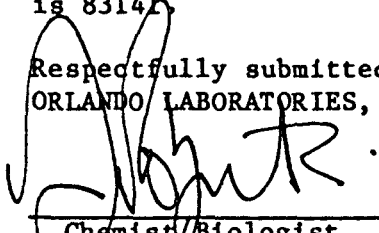
IDENTIFICATION: #1. Well #1 #2. Well #2 #3. Well #3 #4. Well #4

RESULTS OF ANALYSIS

BASE NEUTRALS - cont.	#1	#2	#3	#4
Nitrobenzene	<0.01	<0.01	<0.01	<0.01
2,4-Dinitrotoluene	<0.01	<0.01	<0.01	<0.01
2,6-Dinitrotoluene	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl phenyl ether	<0.01	<0.01	<0.01	<0.01
bis(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	<0.01
Di-n-octyl phthalate	<0.01	<0.01	<0.01	<0.01
Dimethyl phthalate	<0.01	<0.01	<0.01	<0.01
Diethyl phthalate	<0.01	<0.01	<0.01	<0.01
Di-n-butyl phthalate	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01
Butyl benzyl phthalate	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01
Ideno(1,2,3-c,d)pyrene	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01
4-Chlorophenyl phenyl ether	<0.01	<0.01	<0.01	<0.01
3,3-Dichlorobenzidine	<0.01	<0.01	<0.01	<0.01
Benzidine	<0.01	<0.01	<0.01	<0.01
bis(2-Chloroethyl)ether	<0.01	<0.01	<0.01	<0.01
1,2-Diphenylhydrazine	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	<0.01
N-Nitrosodimethylamine	<0.01	<0.01	<0.01	<0.01
N-Nitrosodi-n-propylamine	<0.01	<0.01	<0.01	<0.01

Results expressed in mg/l unless otherwise designated. < = Less Than.
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ORLANDO LABORATORIES, INC.


Chemist/Biologist

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 7 of 48

IDENTIFICATION: #1. Well #1 #2. Well #2 #3. Well #3 #4. Well #4

RESULTS OF ANALYSIS

BASE NEUTRALS - cont.

	#1	#2	#3	#4
bis(2-Chloroisopropyl)ether	<0.01	<0.01	<0.01	<0.01
2,3,7,8-Tetrachlorodibenzo- p-Dioxin (Dioxin)	<0.01	<0.01	<0.01	<0.01

ACID EXTRACTABLE ORGANICS

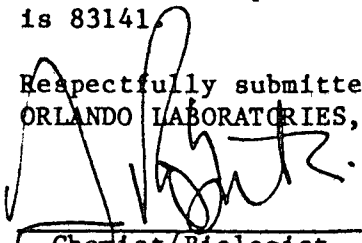
	#1	#2	#3	#4
Phenol	<0.01	<0.01	<0.01	<0.01
2-Nitrophenol	<0.01	<0.01	<0.01	<0.01
4-Nitrophenol	<0.01	<0.01	<0.01	<0.01
2,4-Dinitrophenol	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	<0.01	<0.01	<0.01	<0.01
2-Chlorophenol	<0.01	<0.01	<0.01	<0.01
2,4-Dichlorophenol	<0.01	<0.01	<0.01	<0.01
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.01
2,4-Dimethylphenol	<0.01	<0.01	<0.01	<0.01
2-Methyl-4,6-Dinitrophenol	<0.01	<0.01	<0.01	<0.01

PESTICIDES/PCB's

	#1	#2	#3	#4
o,p-DDT, DDE, & DDD	<0.001	<0.001	<0.001	<0.001
Endosulfan I	<0.001	<0.001	<0.001	<0.001
Endosulfan II	<0.001	<0.001	<0.001	<0.001
Endosulfan sulfate	<0.001	<0.001	<0.001	<0.001
a-BHC	<0.001	<0.001	<0.001	<0.001
b-BHC	<0.001	<0.001	<0.001	<0.001
d-BHC	<0.001	<0.001	<0.001	<0.001
g-BHC	<0.001	<0.001	<0.001	<0.001
Aldrin	<0.001	<0.001	<0.001	<0.001
Dieldrin	<0.001	<0.001	<0.001	<0.001
4,4'-DDE	<0.001	<0.001	<0.001	<0.001
4,4'-DDD	<0.001	<0.001	<0.001	<0.001
4,4'-DDT	<0.001	<0.001	<0.001	<0.001
Endrin	<0.001	<0.001	<0.001	<0.001
Endrin aldehyde	<0.001	<0.001	<0.001	<0.001

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Chemist/Biologist

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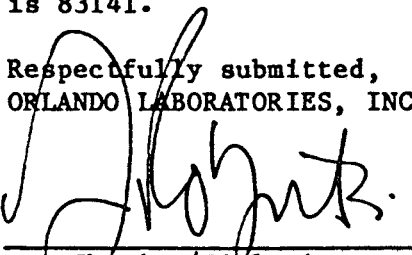
IDENTIFICATION: #1. Well #1 #2. Well #2 #3. Well #3 #4. Well #4

RESULTS OF ANALYSIS

PESTICIDES/PCB's - cont.	#1	#2	#3	#4
Heptachlor	<0.001	<0.001	<0.001	<0.001
Heptachlor epoxide	<0.001	<0.001	<0.001	<0.001
Chlordane	<0.001	<0.001	<0.001	<0.001
Toxaphene	<0.001	<0.001	<0.001	<0.001
Diazinon	<0.001	<0.001	<0.001	<0.001
Malathion	<0.001	<0.001	<0.001	<0.001
Parathion	<0.001	<0.001	<0.001	<0.001
Guthion	<0.001	<0.001	<0.001	<0.001
Kelthane (Dicofal)	<0.001	<0.001	<0.001	<0.001
Ethion	<0.001	<0.001	<0.001	<0.001
Trithion	<0.001	<0.001	<0.001	<0.001
Tedion	<0.001	<0.001	<0.001	<0.001
Aroclor 1016	<0.001	<0.001	<0.001	<0.001
Aroclor 1221	<0.001	<0.001	<0.001	<0.001
Aroclor 1232	<0.001	<0.001	<0.001	<0.001
Aroclor 1242	<0.001	<0.001	<0.001	<0.001
Aroclor 1248	<0.001	<0.001	<0.001	<0.001
Aroclor 1254	<0.001	<0.001	<0.001	<0.001
Aroclor 1260	<0.001	<0.001	<0.001	<0.001

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Chemist/Biologist

6000000100182

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IDENTIFICATION: #5. Well #5 #6. Well #6 #7. Well #7 #8. Well #9

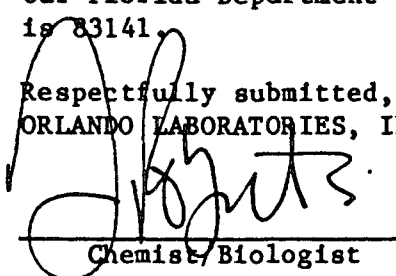
RESULTS OF ANALYSIS

<u>PURGEABLE ORGANICS</u>	#5	#6	#7	#8
Acrolein	*	*	*	*
Acrylonitrile	*	*	*	*
Benzene	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	<0.001	<0.001	<0.001	<0.001
Carbon tetrachloride	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	<0.001	<0.001	<0.001	<0.001
Chloroethane	<0.001	<0.001	<0.001	<0.001
2-Chloroethylvinyl ether	<0.001	<0.001	<0.001	<0.001
Chloroform	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane	<0.001	<0.001	<0.001	<0.001
Methylene chloride	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.001	<0.001	<0.001	<0.001

*Could not perform analysis due to equipment failure.

Results expressed in mg/l unless otherwise designated. < = Less Than
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100183

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 10 of 48

IDENTIFICATION: #5. Well #5 #6. Well #6 #7. Well #7 #8. Well #9

RESULTS OF ANALYSIS

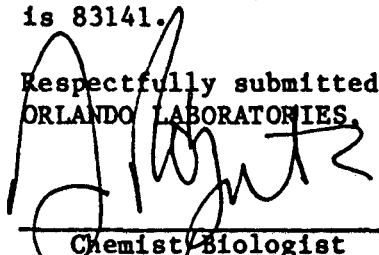
<u>PURGEABLE ORGANICS - cont.</u>	#5	#6	#7	#8
Vinyl chloride	<0.001	<0.001	<0.001	<0.001
Bromomethane	<0.001	<0.001	<0.001	<0.001
Chloromethane	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene	<0.001	<0.001	<0.001	<0.001
cis- and trans-1,2-Dichloroethene	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.001	<0.001	<0.001	<0.001
trans-1,3-Dichloropropene	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	<0.001	<0.001	<0.001	<0.001
Trichloroethylene	<0.001	<0.001	<0.001	<0.001
n-Hexane	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloropropene	<0.001	<0.001	<0.001	<0.001
trans-1,2-Dichloropropene	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane	<0.001	<0.001	<0.001	<0.001
Toluene	<0.001	<0.001	<0.001	<0.001
Xylene	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene	<0.001	<0.001	<0.001	<0.001
Styrene	<0.001	<0.001	<0.001	<0.001
Ethylene Dibromide (ug/l)	<0.1	<0.1	<0.1	<0.1

BASE NEUTRALS

1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01
Hexachloroethane	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01
bis(2-Chloroethoxy)methane	<0.01	<0.01	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01
2-Chloronaphthalene	<0.01	<0.01	<0.01	<0.01
Isophorone	<0.01	<0.01	<0.01	<0.01

Results expressed in mg/l unless otherwise designated. < = Less Than.
Our Florida Department of Health & Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100184

Geraghty & Miller

Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)

Page 11 of 48

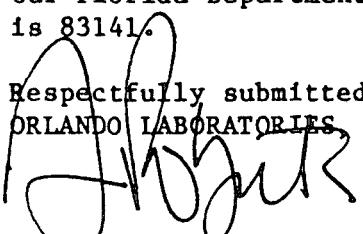
IDENTIFICATION: #5. Well #5 #6. Well #6 #7. Well #7 #8. Well #9

RESULTS OF ANALYSIS

BASE NEUTRALS - cont.	#5	#6	#7	#8
Nitrobenzene	<0.01	<0.01	<0.01	<0.01
2,4-Dinitrotoluene	<0.01	<0.01	<0.01	<0.01
2,6-Dinitrotoluene	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl phenyl ether	<0.01	<0.01	<0.01	<0.01
bis(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	<0.01
Di-n-octyl phthalate	<0.01	<0.01	<0.01	<0.01
Dimethyl phthalate	<0.01	<0.01	<0.01	<0.01
Diethyl phthalate	<0.01	<0.01	<0.01	<0.01
Di-n-butyl phthalate	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01
Butyl benzyl phthalate	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01
Ideno(1,2,3-c,d)pyrene	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01
4-Chlorophenyl phenyl ether	<0.01	<0.01	<0.01	<0.01
3,3-Dichlorobenzidine	<0.01	<0.01	<0.01	<0.01
Benzidine	<0.01	<0.01	<0.01	<0.01
bis(2-Chloroethyl)ether	<0.01	<0.01	<0.01	<0.01
1,2-Diphenylhydrazine	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	<0.01
N-Nitrosodimethylamine	<0.01	<0.01	<0.01	<0.01
N-Nitrosodi-n-propylamine	<0.01	<0.01	<0.01	<0.01

Results expressed in mg/l unless otherwise designated. < = Less Than.
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100185

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 12 of 48

IDENTIFICATION: #5. Well #5 #6. Well #6 #7. Well #7 #8. Well #9

RESULTS OF ANALYSIS

BASE NEUTRALS - cont.

	#5	#6	#7	#8
bis(2-Chloroisopropyl)ether	<0.01	<0.01	<0.01	<0.01
2,3,7,8-Tetrachlorodibenzo- p-Dioxin (Dioxin)	<0.01	<0.01	<0.01	<0.01

ACID EXTRACTABLE ORGANICS

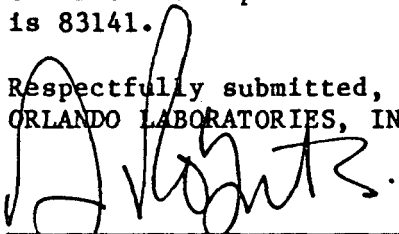
	#5	#6	#7	#8
Phenol	<0.01	<0.01	<0.01	<0.01
2-Nitrophenol	<0.01	<0.01	<0.01	<0.01
4-Nitrophenol	<0.01	<0.01	<0.01	<0.01
2,4-Dinitrophenol	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	<0.01	<0.01	<0.01	<0.01
2-Chlorophenol	<0.01	<0.01	<0.01	<0.01
2,4-Dichlorophenol	<0.01	<0.01	<0.01	<0.01
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.01
2,4-Dimethylphenol	<0.01	<0.01	<0.01	<0.01
2-Methyl-4,6-Dinitrophenol	<0.01	<0.01	<0.01	<0.01

PESTICIDES/PCB's

	#5	#6	#7	#8
o,p-DDT, DDE, & DDD	<0.001	<0.001	<0.001	<0.001
Endosulfan I	<0.001	<0.001	<0.001	<0.001
Endosulfan II	<0.001	<0.001	<0.001	<0.001
Endosulfan sulfate	<0.001	<0.001	<0.001	<0.001
a-BHC	<0.001	<0.001	<0.001	<0.001
b-BHC	<0.001	<0.001	<0.001	<0.001
d-BHC	<0.001	<0.001	<0.001	<0.001
g-BHC	<0.001	<0.001	<0.001	<0.001
Aldrin	<0.001	<0.001	<0.001	<0.001
Dieldrin	<0.001	<0.001	<0.001	<0.001
4,4'-DDE	<0.001	<0.001	<0.001	<0.001
4,4'-DDD	<0.001	<0.001	<0.001	<0.001
4,4'-DDT	<0.001	<0.001	<0.001	<0.001
Endrin	<0.001	<0.001	<0.001	<0.001
Endrin aldehyde	<0.001	<0.001	<0.001	<0.001

Results expressed in mg/l unless otherwise designated. < = Less Than.
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100186

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 13 of 48

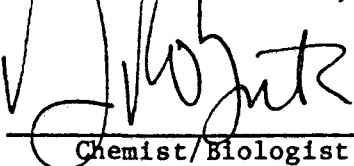
IDENTIFICATION: #5. Well #5 #6. Well #6 #7. Well #7 #8. Well #9

RESULTS OF ANALYSIS

<u>PESTICIDES/PCB's - cont.</u>	#5	#6	#7	#8
Heptachlor	<0.001	<0.001	<0.001	<0.001
Heptachlor epoxide	<0.001	<0.001	<0.001	<0.001
Chlordane	<0.001	<0.001	<0.001	<0.001
Toxaphene	<0.001	<0.001	<0.001	<0.001
Diazinon	<0.001	<0.001	<0.001	<0.001
Malathion	<0.001	<0.001	<0.001	<0.001
Parathion	<0.001	<0.001	<0.001	<0.001
Guthion	<0.001	<0.001	<0.001	<0.001
Kelthane (Dicofal)	<0.001	<0.001	<0.001	<0.001
Ethion	<0.001	<0.001	<0.001	<0.001
Trithion	<0.001	<0.001	<0.001	<0.001
Tedion	<0.001	<0.001	<0.001	<0.001
Aroclor 1016	<0.001	<0.001	<0.001	<0.001
Aroclor 1221	<0.001	<0.001	<0.001	<0.001
Aroclor 1232	<0.001	<0.001	<0.001	<0.001
Aroclor 1242	<0.001	<0.001	<0.001	<0.001
Aroclor 1248	<0.001	<0.001	<0.001	<0.001
Aroclor 1254	<0.001	<0.001	<0.001	<0.001
Aroclor 1260	<0.001	<0.001	<0.001	<0.001

Results expressed in mg/l unless otherwise designated. < = Less Than
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

6000000100187

REPORT OF ANALYSIS

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date sampled: 05-10,11-84
Date received: 05-11-84
Date reported: 07-02-84
Page 14 of 48

IDENTIFICATION: #9. Well #12

RESULTS OF ANALYSIS

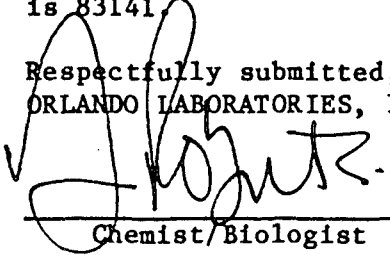
PURGEABLE ORGANICS

	#9
Acrolein	*
Acrylonitrile	*
Benzene	<0.001
Ethylbenzene	<0.001
Carbon tetrachloride	<0.001
Chlorobenzene	<0.001
1,2-Dichloroethane	<0.001
1,1,1-Trichloroethane	<0.001
1,1-Dichloroethane	<0.001
1,1,2-Trichloroethane	<0.001
1,1,2,2-Tetrachloroethane	<0.001
Chloroethane	<0.001
2-Chloroethylvinyl ether	<0.001
Chloroform	<0.001
1,2-Dichloropropane	<0.001
Methylene chloride	<0.001
Bromoform	<0.001
Bromodichloromethane	<0.001
Trichlorofluoromethane	<0.001
Dichlorodifluoromethane	<0.001
Dibromochloromethane	<0.001

*Could not perform analysis due to equipment failure.

Results expressed in mg/l unless otherwise designated. < = Less Than
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100188

Geraghty & Miller

Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)

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IDENTIFICATION: #9. Well #12

RESULTS OF ANALYSIS

PURGEABLE ORGANICS - cont.

#9

Vinyl chloride	<0.001
Bromomethane	<0.001
Chloromethane	<0.001
1,1-Dichloroethene	<0.001
cis- and trans-1,2-Dichloroethene	<0.001
cis-1,3-Dichloropropene	<0.001
trans-1,3-Dichloropropene	<0.001
Tetrachloroethene	<0.001
Trichloroethylene	<0.001
n-Hexane	<0.001
cis-1,2-Dichloropropene	<0.001
trans-1,2-Dichloropropene	<0.001
1,2-Dibromo-3-chloropropane	<0.001
Toluene	<0.001
Xylene	<0.001
1,2-Dichlorobenzene	<0.001
1,3-Dichlorobenzene	<0.001
1,4-Dichlorobenzene	<0.001
Styrene	<0.001
Ethylene Dibromide (ug/l)	<0.1

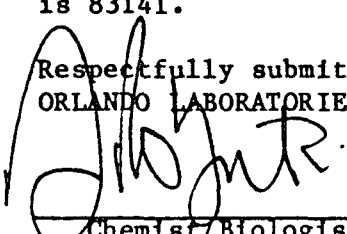
BASE NEUTRALS

1,2-Dichlorobenzene	<0.01
1,3-Dichlorobenzene	<0.01
1,4-Dichlorobenzene	<0.01
Hexachloroethane	<0.01
Hexachlorobutadiene	<0.01
Hexachlorobenzene	<0.01
1,2,4-Trichlorobenzene	<0.01
bis(2-Chloroethoxy)methane	<0.01
Naphthalene	<0.01
2-Chloronaphthalene	<0.01
Isophorone	<0.01

Results expressed in mg/l unless otherwise designated. < = Less Than.

Our Florida Department of Health & Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

Geraghty & Miller

Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)

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IDENTIFICATION: #9. Well #12

RESULTS OF ANALYSIS

BASE NEUTRALS - cont.

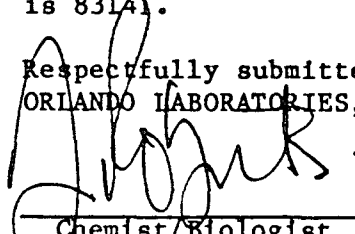
#9

Nitrobenzene	<0.01
2,4-Dinitrotoluene	<0.01
2,6-Dinitrotoluene	<0.01
4-Bromophenyl phenyl ether	<0.01
bis(2-Ethylhexyl)phthalate	<0.01
Di-n-octyl phthalate	<0.01
Dimethyl phthalate	<0.01
Diethyl phthalate	<0.01
Di-n-butyl phthalate	<0.01
Acenaphthylene	<0.01
Acenaphthene	<0.01
Butyl benzyl phthalate	<0.01
Fluorene	<0.01
Fluoranthene	<0.01
Chrysene	<0.01
Pyrene	<0.01
Phenanthrene	<0.01
Anthracene	<0.01
Benzo(a)anthracene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Benzo(a)pyrene	<0.01
Ideno(1,2,3-c,d)pyrene	<0.01
Dibenzo(a,h)anthracene	<0.01
Benzo(g,h,i)perylene	<0.01
4-Chlorophenyl phenyl ether	<0.01
3,3-Dichlorobenzidine	<0.01
Benzidine	<0.01
bis(2-Chloroethyl)ether	<0.01
1,2-Diphenylhydrazine	<0.01
Hexachlorocyclopentadiene	<0.01
N-Nitrosodiphenylamine	<0.01
N-Nitrosodimethylamine	<0.01
N-Nitrosodi-n-propylamine	<0.01

Results expressed in mg/l unless otherwise designated. < = Less Than.

Our Florida Department of Health & Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100190

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 17 of 48

IDENTIFICATION: #9. Well #12

RESULTS OF ANALYSIS

BASE NEUTRALS - cont.

#9

bis(2-Chloroisopropyl)ether	<0.01
2,3,7,8-Tetrachlorodibenzo- p-Dioxin (Dioxin)	<0.01

ACID EXTRACTABLE ORGANICS

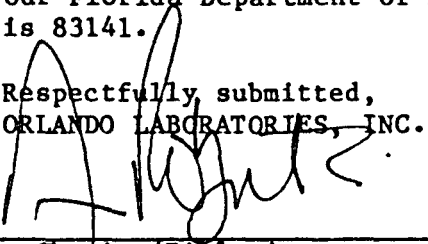
Phenol	<0.01
2-Nitrophenol	<0.01
4-Nitrophenol	<0.01
2,4-Dinitrophenol	<0.01
Pentachlorophenol	<0.01
2-Chlorophenol	<0.01
2,4-Dichlorophenol	<0.01
2,4,6-Trichlorophenol	<0.01
2,4-Dimethylphenol	<0.01
2-Methyl-4,6-Dinitrophenol	<0.01

PESTICIDES/PCB's

o,p-DDT, DDE, & DDD	<0.001
Endosulfan I	<0.001
Endosulfan II	<0.001
Endosulfan sulfate	<0.001
a-BHC	<0.001
b-BHC	<0.001
d-BHC	<0.001
g-BHC	<0.001
Aldrin	<0.001
Dieldrin	<0.001
4,4'-DDE	<0.001
4,4'-DDD	<0.001
4,4'-DDT	<0.001
Endrin	<0.001
Endrin aldehyde	<0.001

Results expressed in mg/l unless otherwise designated. < = Less Than.
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

6000000100191

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 18 of 48

IDENTIFICATION: #9. Well #12

RESULTS OF ANALYSIS

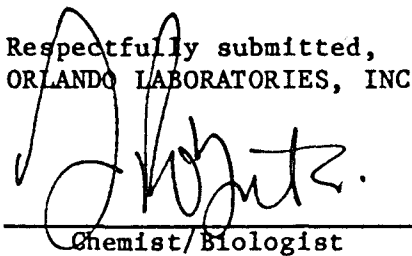
PESTICIDES/PCB's - cont.

#9

Heptachlor	<0.001
Heptachlor epoxide	<0.001
Chlordane	<0.001
Toxaphene	<0.001
Diazinon	<0.001
Malathion	<0.001
Parathion	<0.001
Guthion	<0.001
Kelthane (Dicofal)	<0.001
Ethion	<0.001
Trithion	<0.001
Tedion	<0.001
Aroclor 1016	<0.001
Aroclor 1221	<0.001
Aroclor 1232	<0.001
Aroclor 1242	<0.001
Aroclor 1248	<0.001
Aroclor 1254	<0.001
Aroclor 1260	<0.001

Results expressed in mg/l unless otherwise designated. < = Less Than
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

6000000100192

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 19 of 48

IDENTIFICATION: #1. Well #1 #2. Well #2 #3. Well #3 #4. Well #4
#5. Well #5 #6. Well #6 #7. Well #7 #8. Well #9
#9. Well #12.

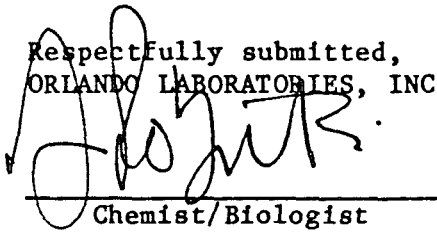
RESULTS OF ANALYSIS

<u>METALS</u>	#1	#2	#3	#4	#5
Antimony, Sb	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic, As	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium, Be	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium, Cd	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium, Cr	<0.01	<0.01	<0.01	<0.01	<0.01
Copper, Cu	<0.01	<0.01	<0.01	<0.01	<0.01
Lead, Pb	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury, Hg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Nickel, Ni	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium, Se	<0.005	<0.005	<0.005	<0.005	<0.005
Silver, Ag	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium, Tl	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc, Zn	<0.01	<0.01	<0.01	0.01	0.01

<u>METALS</u>	#6	#7	#8	#9
Antimony, Sb	<0.10	<0.10	<0.10	<0.10
Arsenic, As	<0.01	<0.01	<0.01	<0.01
Beryllium, Be	<0.01	<0.01	<0.01	<0.01
Cadmium, Cd	<0.005	<0.005	<0.005	<0.005
Chromium, Cr	<0.01	<0.01	<0.01	<0.01
Copper, Cu	<0.01	<0.01	<0.01	<0.01
Lead, Pb	<0.01	<0.01	<0.01	<0.01
Mercury, Hg	<0.0005	<0.0005	<0.0005	<0.0005
Nickel, Ni	<0.01	<0.01	<0.01	<0.01
Selenium, Se	<0.005	<0.005	<0.005	<0.005
Silver, Ag	<0.01	<0.01	<0.01	<0.01
Thallium, Tl	<0.10	<0.10	<0.10	<0.10
Zinc, Zn	0.01	<0.01	0.01	0.01

Results expressed in mg/l unless otherwise designated. < = Less Than
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

Geraghty & Miller
Attn: Paul Jakob

07-02-84

Report #: 41811 (4381)
Page 20 of 48

IDENTIFICATION: #1. Well #1 #2. Well #2 #3. Well #3 #4. Well #4
#5. Well #5 #6. Well #6 #7. Well #7 #8. Well #9
#9. Well #12.

RESULTS OF ANALYSIS

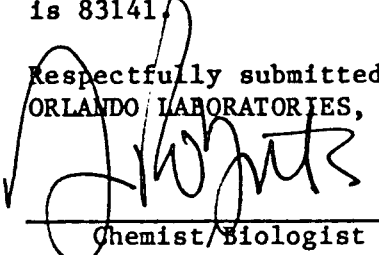
MISCELLANEOUS

CYANIDE PHENOLS

#1	<0.005	<0.01
#2	<0.005	<0.01
#3	<0.005	<0.01
#4	<0.005	<0.01
#5	<0.005	<0.01
#6	<0.005	<0.01
#7	<0.005	<0.01
#8	<0.005	<0.01
#9	<0.005	<0.01

Results expressed in mg/l unless otherwise designated. < = Less Than
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

6000000100194

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 21 of 48

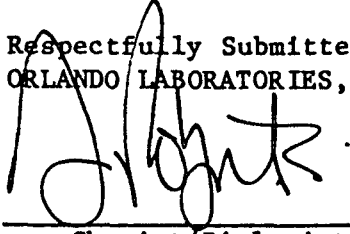
Identification: #1. Well #1, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.275
Turbidity, NTU	5	0.7
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100195

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 22 of 48

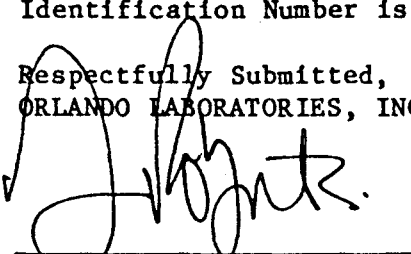
Identification: #2. Well #2, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.251
Turbidity, NTU	5	7.8
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100196

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84

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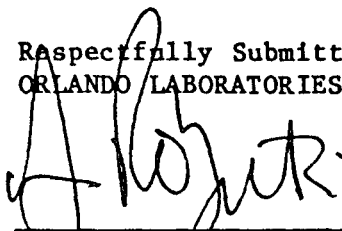
Identification: #3. Well #3, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.306
Turbidity, NTU	5	3.9
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 24 of 48

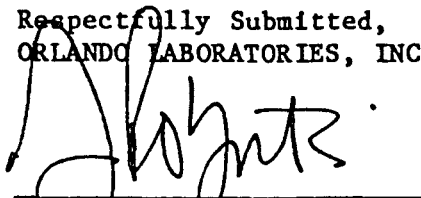
Identification: #4. Well #4, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.212
Turbidity, NTU	5	0.4
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 25 of 48

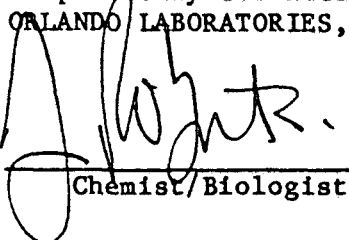
Identification: #5. Well #5, Water appearance: Slight color.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.154
Turbidity, NTU	5	0.4
Nitrate Nitrogen, NO ₃ -N	10	0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100199

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
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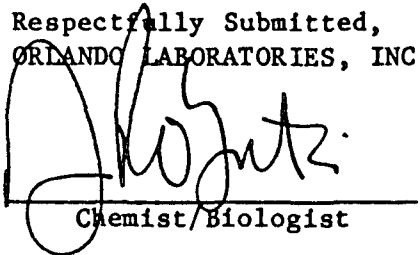
Identification: #6. Well #6, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.195
Turbidity, NTU	5	1.9
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100200

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
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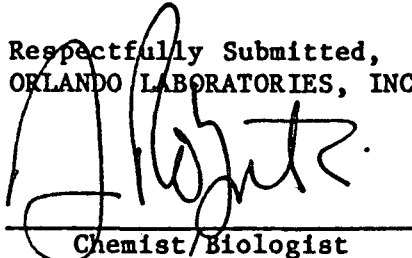
Identification: #7. Well #7, Water appearance: Yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.328
Turbidity, NTU	5	5.8
Nitrate Nitrogen, NO ₃ -N	10	0.04
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100201

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
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Identification: #8. Well #9, Water appearance: Yellow.

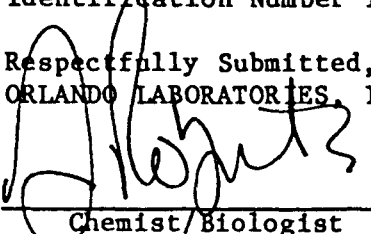
METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-
Wednesday, Decet IV-
Wednesday, December 24, 1975. U.S. Environmental Protection
Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.250
Turbidity, NTU	5	11.3
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01*
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

*NOTE: A trace appeared in this sample during analysis. It was resolved to be a laboratory contaminant.

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100202

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
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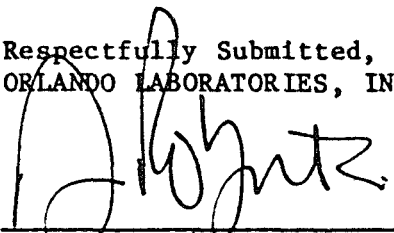
Identification: #9. Well #12, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.143
Turbidity, NTU	5	5.9
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-04
Page 30 of 48

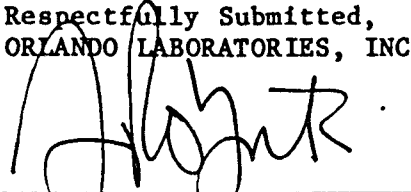
Identification: #10. Well #8, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.267
Turbidity, NTU	5	5.1
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 31 of 48

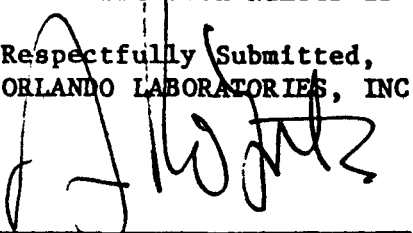
Identification: #11. Well #10, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-
Wednesday, December 24, 1975. U.S. Environmental Protection
Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.106
Turbidity, NTU	5	9.9
Nitrate Nitrogen, NO ₃ -N	10	0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100205

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 32 of 48

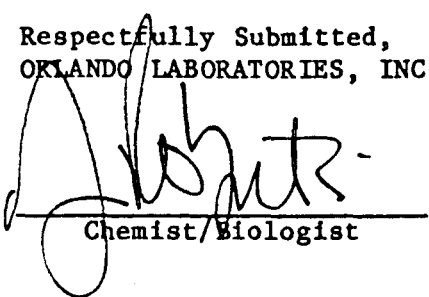
Identification: #12. Well #11, Water appearance: Yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.212
Turbidity, NTU	5	5.8
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 33 of 48

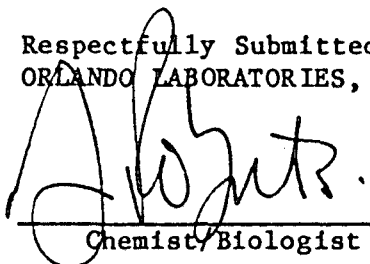
Identification: #13. Well #13, Water appearance: Yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.164
Turbidity, NTU	5	3.5
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100207

PRIMARY DRINKING WATER REGULATIONS ANALYSIS (ORG. & INORG.)

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41811 (4381)
Sampled by: Client
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 34 of 48

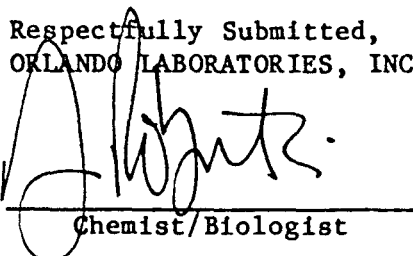
Identification: #14. Well #14, Water appearance: Slightly yellow.

METHODS & LIMITS: In accordance with Federal Register-Vol. 40, No. 248, Part IV-Wednesday, December 24, 1975. U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations.

<u>CONTAMINANT</u>	<u>*MCL</u>	<u>SAMPLE</u>
<u>INORGANIC:</u>		
Arsenic, As	0.05	<0.01
Barium, Ba	1.0	<0.10
Cadmium, Cd	0.010	<0.005
Chromium, Cr	0.05	<0.01
Lead, Pb	0.05	<0.01
Mercury, Hg	0.002	<0.0005
Selenium, Se	0.01	<0.005
Silver, Ag	0.05	<0.01
Fluoride, F	1.4 - 2.4	0.106
Turbidity, NTU	5	5.8
Nitrate Nitrogen, NO ₃ -N	10	<0.02
<u>ORGANIC:</u>		
Endrin	0.0002	<0.0001
Lindane	0.004	<0.001
Methoxychlor	0.1	<0.01
Toxaphene	0.005	<0.001
2,4-D	0.1	<0.01
2,4,5-TP (Silvex)	0.01	<0.001

Results are expressed in mg/l (ppm). *MCL - Maximum Contaminant Levels.
Our Florida Department of Health & Rehabilitative Services Laboratory
Identification Number is 83141.

Respectfully Submitted,
ORLANDO LABORATORIES, INC.


Chemist/Biologist

6000000100208

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 35 of 48

IDENTIFICATION: #1. Well #1, Water appearance: Slightly yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		370	Hydrogen Sulfide, H ₂ S [F-F]		0.03
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		480
Total Alkalinity, CaCO ₃		303	Foaming Agents (MBAS) (0.5)	<0.01	
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)	20.1	
Bicarbonate Alkalinity, CaCO ₃		303	Nitrate Nitrogen, N (10)	<0.02	
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		333
Bicarbonates, HCO ₃		369	Calcium Hardness, CaCO ₃		322
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		11.9
Carbon Dioxide, CO ₂		15.6	Calcium, Ca		129
Chloride, Cl (250)		30.5	Magnesium, Mg		2.90
Sulfate, SO ₄ (250)		1.3	Iron, Fe (0.3)	<0.10	
Fluoride, F (1.4-2.4)		0.275	Manganese, Mn (0.05)	<0.05	
pH (Laboratory) (6.5-8.5)		7.6	Copper, Cu (1.0)	<0.01	
pHs		6.84	Zinc, Zn (5)	<0.01	
Stability Index		6.09			
Saturation Index, corrosivity (+0.2)		0.76			
Color, PCU (15)		20			
Odor Threshold (3)		1			
Turbidity, NTU (5)		0.7			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 36 of 48

IDENTIFICATION: #2. Well #2, Water appearance: Slightly yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

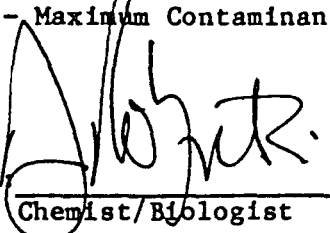
<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		522	Hydrogen Sulfide, H ₂ S [F-F]		3.05
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		570
Total Alkalinity, CaCO ₃		397	Foaming Agents (MBAS) (0.5)		<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		47.6
Bicarbonate Alkalinity, CaCO ₃		397	Nitrate Nitrogen, N (10)		<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		395
Bicarbonates, HCO ₃		484	Calcium Hardness, CaCO ₃		362
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		33.3
Carbon Dioxide, CO ₂		20.4	Calcium, Ca		145
Chloride, Cl (250)		65.4	Magnesium, Mg		8.08
Sulfate, SO ₄ (250)		<1.0	Iron, Fe (0.3)		0.23
Fluoride, F (1.4-2.4)		0.251	Manganese, Mn (0.05)		<0.05
pH (Laboratory) (6.5-8.5)		7.6	Copper, Cu (1.0)		<0.01
pHs		6.69	Zinc, Zn (5)		<0.01
Stability Index		5.78			
Saturation Index, corrosivity (+0.2)		0.91			
Color, PCU (15)		30			
Odor Threshold (3)		5			
Turbidity, NTU (5)		7.8			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed


Chemist/Biologist

6000000100210

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10, 11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 37 of 48

IDENTIFICATION: #3. Well #3, Water appearance: Slightly yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS	(500)	491	Hydrogen Sulfide, H ₂ S [F-F]		0.10
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		520
Total Alkalinity, CaCO ₃		332	Foaming Agents (MBAS)	(0.5)	<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na	(160)	31.2
Bicarbonate Alkalinity, CaCO ₃		332	Nitrate Nitrogen, N	(10)	<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		356
Bicarbonates, HCO ₃		405	Calcium Hardness, CaCO ₃		341
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		15.9
Carbon Dioxide, CO ₂		4.29	Calcium, Ca		136
Chloride, Cl	(250)	47.5	Magnesium, Mg		3.86
Sulfate, SO ₄	(250)	<1.0	Iron, Fe	(0.3)	0.18
Fluoride, F	(1.4-2.4)	0.306	Manganese, Mn	(0.05)	<0.05
pH (Laboratory)	(6.5-8.5)	8.2	Copper, Cu	(1.0)	<0.01
pHs		6.61	Zinc, Zn	(5)	<0.01
Stability Index		5.02			
Saturation Index, corrosivity (+0.2)		1.59			
Color, PCU	(15)	30			
Odor Threshold	(3)	1			
Turbidity, NTU	(5)	3.9			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
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Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 38 of 48

IDENTIFICATION: #4. Well #4, Water appearance: Slightly yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		442	Hydrogen Sulfide, H ₂ S [F-F]		0.39
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		510
Total Alkalinity, CaCO ₃		374	Foaming Agents (MBAS) (0.5)		<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		20.3
Bicarbonate Alkalinity, CaCO ₃		374	Nitrate Nitrogen, N (10)		<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		389
Bicarbonates, HCO ₃		456	Calcium Hardness, CaCO ₃		364
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		24.3
Carbon Dioxide, CO ₂		4.83	Calcium, Ca		146
Chloride, Cl (250)		24.2	Magnesium, Mg		5.90
Sulfate, SO ₄ (250)		1.0	Iron, Fe (0.3)		<0.10
Fluoride, F (1.4-2.4)		0.212	Manganese, Mn (0.05)		<0.05
pH (Laboratory) (6.5-8.5)		8.2	Copper, Cu (1.0)		<0.01
pHs		6.70	Zinc, Zn (5)		0.01
Stability Index		5.21			
Saturation Index, corrosivity (+0.2)		1.50			
Color, PCU (15)		20			
Odor Threshold (3)		1			
Turbidity, NTU (5)		0.4			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

600000100212

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 39 of 48

IDENTIFICATION: #5. Well #5, Water appearance: Slight Color.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS	(500)	235	Hydrogen Sulfide, H ₂ S [F-F]		<0.01
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		350
Total Alkalinity, CaCO ₃		171	Foaming Agents (MBAS) (0.5)		<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		9.29
Bicarbonate Alkalinity, CaCO ₃		171	Nitrate Nitrogen, N (10)		0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		164
Bicarbonates, HCO ₃		209	Calcium Hardness, CaCO ₃		160
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		<4.12
Carbon Dioxide, CO ₂		2.79	Calcium, Ca		63.8
Chloride, Cl (250)		11.6	Magnesium, Mg		<1.00
Sulfate, SO ₄ (250)		<1.0	Iron, Fe (0.3)		0.36
Fluoride, F (1.4-2.4)		0.154	Manganese, Mn (0.05)		<0.05
pH (Laboratory) (6.5-8.5)		8.1	Copper, Cu (1.0)		<0.01
pHs		7.38	Zinc, Zn (5)		0.01
Stability Index		6.65			
Saturation Index, corrosivity (+0.2)		0.72			
Color, PCU (15)		20			
Odor Threshold (3)		1			
Turbidity, NTU (5)		0.4			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

6000000100213

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 40 of 48

IDENTIFICATION: #6. Well #6, Water appearance: Slightly Yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS	(500)	418	Hydrogen Sulfide, H ₂ S [F-F]		0.01
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		495
Total Alkalinity, CaCO ₃		280	Foaming Agents (MBAS)	(0.5)	<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na	(160)	10.99
Bicarbonate Alkalinity, CaCO ₃		280	Nitrate Nitrogen, N	(10)	<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		375
Bicarbonates, HCO ₃		342	Calcium Hardness, CaCO ₃		344
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		30.6
Carbon Dioxide, CO ₂		11.4	Calcium, Ca		138
Chloride, Cl	(250)	12.6	Magnesium, Mg		7.43
Sulfate, SO ₄	(250)	78.7	Iron, Fe	(0.3)	0.71
Fluoride, F	(1.4-2.4)	0.195	Manganese, Mn	(0.05)	0.13
pH (Laboratory)	(6.5-8.5)	7.7	Copper, Cu	(1.0)	<0.01
pHs		6.84	Zinc, Zn	(5)	0.01
Stability Index		5.99			
Saturation Index, corrosivity (+0.2)		0.86			
Color, PCU	(15)	30			
Odor Threshold	(3)	1			
Turbidity, NTU	(5)	1.9			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.
MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10, 11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 41 of 48

IDENTIFICATION: #7. Well #7, Water appearance: Yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS	(500)	273	Hydrogen Sulfide, H ₂ S [F-F]		<0.01
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		335
Total Alkalinity, CaCO ₃		200	Foaming Agents (MBAS) (0.5)		0.08
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		18.4
Bicarbonate Alkalinity, CaCO ₃		200	Nitrate Nitrogen, N (10)		0.04
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		188
Bicarbonates, HCO ₃		244	Calcium Hardness, CaCO ₃		179
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		8.89
Carbon Dioxide, CO ₂		8.17	Calcium, Ca		71.8
Chloride, Cl	(250)	14.5	Magnesium, Mg		2.16
Sulfate, SO ₄	(250)	<1.0	Iron, Fe (0.3)		0.95
Fluoride, F	(1.4-2.4)	0.328	Manganese, Mn (0.05)		0.09
pH (Laboratory)	(6.5-8.5)	7.7	Copper, Cu (1.0)		<0.01
pHs		7.27	Zinc, Zn (5)		<0.01
Stability Index		6.83			
Saturation Index, corrosivity (+0.2)		0.43			
Color, PCU	(15)	100			
Odor Threshold	(3)	1			
Turbidity, NTU	(5)	5.8			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

6000000100215

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 42 of 48

IDENTIFICATION: #8. Well #9, Water appearance: Yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		321	Hydrogen Sulfide, H ₂ S [F-F]		0.03
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		400
Total Alkalinity, CaCO ₃		280	Foaming Agents (MBAS) (0.5)		<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		5.57
Bicarbonate Alkalinity, CaCO ₃		280	Nitrate Nitrogen, N (10)		<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		269
Bicarbonates, HCO ₃		342	Calcium Hardness, CaCO ₃		258
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		10.9
Carbon Dioxide, CO ₂		9.09	Calcium, Ca		103
Chloride, Cl (250)		5.8	Magnesium, Mg		2.64
Sulfate, SO ₄ (250)		<1.0	Iron, Fe (0.3)		1.89
Fluoride, F (1.4-2.4)		0.250	Manganese, Mn (0.05)		0.14
pH (Laboratory) (6.5-8.5)		7.8	Copper, Cu (1.0)		<0.01
pHs		6.97	Zinc, Zn (5)		0.01
Stability Index		6.14			
Saturation Index, corrosivity (+0.2)		0.83			
Color, PCU (15)		60			
Odor Threshold (3)		1			
Turbidity, NTU (5)		11.3			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.
MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

6000000100216

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 43 of 48

IDENTIFICATION: #9. Well #12, Water appearance: Slightly yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		297	Hydrogen Sulfide, H ₂ S [F-F]		0.17
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		375
Total Alkalinity, CaCO ₃		246	Foaming Agents (MBAS) (0.5)		<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		6.25
Bicarbonate Alkalinity, CaCO ₃		246	Nitrate Nitrogen, N (10)		<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		258
Bicarbonates, HCO ₃		300	Calcium Hardness, CaCO ₃		243
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		14.6
Carbon Dioxide, CO ₂		6.34	Calcium, Ca		97.4
Chloride, Cl (250)		7.8	Magnesium, Mg		3.55
Sulfate, SO ₄ (250)		1.0	Iron, Fe (0.3)		1.05
Fluoride, F (1.4-2.4)		0.143	Manganese, Mn (0.05)		0.21
pH (Laboratory) (6.5-8.5)		7.9	Copper, Cu (1.0)		<0.01
pHs		7.05	Zinc, Zn (5)		0.01
Stability Index		6.20			
Saturation Index, corrosivity (+0.2)		0.85			
Color, PCU (15)		40			
Odor Threshold (3)		1			
Turbidity, NTU (5)		5.9			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.
MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

600000100217

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 44 of 48

IDENTIFICATION: #10. Well #8, Water appearance: Slightly yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		448	Hydrogen Sulfide, H ₂ S [F-F]		<0.01
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		480
Total Alkalinity, CaCO ₃		394	Foaming Agents (MBAS) (0.5)		0.09
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		19.1
Bicarbonate Alkalinity, CaCO ₃		394	Nitrate Nitrogen, N (10)		<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		388
Bicarbonates, HCO ₃		481	Calcium Hardness, CaCO ₃		362
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		26.7
Carbon Dioxide, CO ₂		12.8	Calcium, Ca		145
Chloride, Cl (250)		20.3	Magnesium, Mg		6.48
Sulfate, SO ₄ (250)		<1.0	Iron, Fe (0.3)		0.81
Fluoride, F (1.4-2.4)		0.267	Manganese, Mn (0.05)		0.06
pH (Laboratory) (6.5-8.5)		7.8	Copper, Cu (1.0)		<0.01
pHs		6.69	Zinc, Zn (5)		0.01
Stability Index		5.57			
Saturation Index, corrosivity (+0.2)		1.11			
Color, PCU (15)		40			
Odor Threshold (3)		1			
Turbidity, NTU (5)		5.1			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

6000000100218

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10, 11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 45 of 48

IDENTIFICATION: #11. Well #10, Water appearance: Slightly yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS	(500)	351	Hydrogen Sulfide, H ₂ S [F-F]		0.03
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		420
Total Alkalinity, CaCO ₃		220	Foaming Agents (MBAS)	(0.5)	<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na	(160)	20.11
Bicarbonate Alkalinity, CaCO ₃		220	Nitrate Nitrogen, N	(10)	0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		254
Bicarbonates, HCO ₃		268	Calcium Hardness, CaCO ₃		242
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		11.8
Carbon Dioxide, CO ₂		7.13	Calcium, Ca		97.0
Chloride, Cl	(250)	35.9	Magnesium, Mg		2.86
Sulfate, SO ₄	(250)	<1.0	Iron, Fe	(0.3)	0.28
Fluoride, F	(1.4-2.4)	0.106	Manganese, Mn	(0.05)	<0.05
pH (Laboratory)	(6.5-8.5)	7.8	Copper, Cu	(1.0)	<0.01
pHs		7.10	Zinc, Zn	(5)	0.01
Stability Index		6.41			
Saturation Index, corrosivity (+0.2)		0.70			
Color, PCU	(15)	40			
Odor Threshold	(3)	1			
Turbidity, NTU	(5)	9.9			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.
MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

6000000100219

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10,11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 46 of 48

IDENTIFICATION: #12. Well #11, Water appearance: Yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		398	Hydrogen Sulfide, H ₂ S [F-F]		<0.01
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		510
Total Alkalinity, CaCO ₃		313	Foaming Agents (MBAS) (0.5)		<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		17.4
Bicarbonate Alkalinity, CaCO ₃		313	Nitrate Nitrogen, N (10)		<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		351
Bicarbonates, HCO ₃		382	Calcium Hardness, CaCO ₃		340
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		11.2
Carbon Dioxide, CO ₂		6.41	Calcium, Ca		136
Chloride, Cl (250)		28.1	Magnesium, Mg		2.72
Sulfate, SO ₄ (250)		<1.0	Iron, Fe (0.3)		2.27
Fluoride, F (1.4-2.4)		0.212	Manganese, Mn (0.05)		0.05
pH (Laboratory) (6.5-8.5)		8.0	Copper, Cu (1.0)		<0.01
pHs		6.81	Zinc, Zn (5)		0.01
Stability Index		5.62			
Saturation Index, corrosivity (+0.2)		1.19			
Color, PCU (15)		100			
Odor Threshold (3)		1			
Turbidity, NTU (5)		5.8			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10, 11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 47 of 48

IDENTIFICATION: #13. Well #13, Water appearance: Yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		485	Hydrogen Sulfide, H ₂ S [F-F]		1.49
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		580
Total Alkalinity, CaCO ₃		433	Foaming Agents (MBAS) (0.5)		<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		18.8
Bicarbonate Alkalinity, CaCO ₃		433	Nitrate Nitrogen, N (10)		<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		467
Bicarbonates, HCO ₃		528	Calcium Hardness, CaCO ₃		447
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		20.1
Carbon Dioxide, CO ₂		8.86	Calcium, Ca		179
Chloride, Cl (250)		14.5	Magnesium, Mg		4.88
Sulfate, SO ₄ (250)		<1.0	Iron, Fe (0.3)		0.47
Fluoride, F (1.4-2.4)		0.164	Manganese, Mn (0.05)		0.10
pH (Laboratory) (6.5-8.5)		8.0	Copper, Cu (1.0)		<0.01
pHs		6.56	Zinc, Zn (5)		0.01
Stability Index		5.11			
Saturation Index, corrosivity (+0.2)		1.44			
Color, PCU (15)		>100			
Odor Threshold (3)		3			
Turbidity, NTU (5)		3.5			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist

**GENERAL WATER ANALYSIS FOR
SECONDARY DRINKING WATER REGULATIONS**

Geraghty & Miller
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report: 41811 (4381)
Sampled by: OLI-M. Smar/D. Bungo
Date Sampled: 05-10-11-84
Date Received: 05-11-84
Date Reported: 07-02-84
Page 48 of 48

IDENTIFICATION: #14. Well #14, Water appearance: Slightly yellow.

METHODS

This water was analyzed according to "Standard Methods for the Examination of Water and Wastewater," Latest Edition, APHA, AWWA and WPCF.

RESULTS

<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>	<u>DETERMINATION</u>	<u>(MCL)</u>	<u>mg/l</u>
Total Dissolved Solids, TDS (500)		324	Hydrogen Sulfide, H ₂ S [F-F]		<0.01
Phenolphthalein Alkalinity, CaCO ₃		0	Specific Conductance, umhos		370
Total Alkalinity, CaCO ₃		226	Foaming Agents (MBAS) (0.5)		<0.01
Carbonate Alkalinity, CaCO ₃		0	Sodium, Na (160)		17.7
Bicarbonate Alkalinity, CaCO ₃		226	Nitrate Nitrogen, N (10)		<0.02
Carbonates, CaCO ₃		0	Total Hardness, CaCO ₃		246
Bicarbonates, HCO ₃		276	Calcium Hardness, CaCO ₃		235
Hydroxides, as OH		0	Magnesium Hardness, CaCO ₃		10.5
Carbon Dioxide, CO ₂		5.83	Calcium, Ca		94.1
Chloride, Cl (250)		29.1	Magnesium, Mg		2.56
Sulfate, SO ₄ (250)		1.0	Iron, Fe (0.3)		0.93
Fluoride, F (1.4-2.4)		0.106	Manganese, Mn (0.05)		0.08
pH (Laboratory) (6.5-8.5)		7.9	Copper, Cu (1.0)		<0.01
pHs		7.10	Zinc, Zn (5)		0.01
Stability Index		6.30			
Saturation Index, corrosivity (+0.2)		0.80			
Color, PCU (15)		40			
Odor Threshold (3)		1			
Turbidity, NTU (5)		5.8			

Our Florida Department of Health & Rehabilitative Services Identification Number is 83141.

Results expressed in mg/l unless otherwise designated. < = Less Than.

MCL - Maximum Contaminant Levels.

Signed: _____

Chemist/Biologist



Orlando Laboratories, Inc.

P. O. Box 19127 • Orlando, Florida 32814 • 305/896-6645

REPORT OF ANALYSIS

Geraghty & Miller, Inc.
Attn: Paul Jakob
2700 P.G.A. Blvd., Suite 104
Palm Beach Gardens, Florida 33410

Report #: 41812 (4380)
Sampled by: Client
Date sampled:
Date received: 05-14-84
Date reported: 06-29-84
Page 1 of 3

IDENTIFICATION: Soil samples identified as marked.

RESULTS OF ANALYSIS

<u>SAMPLES</u>	<u>TOTAL ORGANIC CARBON, TOC</u>	<u>CATION EXCHANGE *</u>
SS5, 4-6	362	0.59
SS5, 6-8	600	1.01
SS5, 8-10	859	1.72
SS5, 14-15	2,119	3.0
SS5, 20-22	683	2.98
SS5, 30-32	1,014	1.52
SS5, 50-52	2,542	4.98
SS5, 60-62	2,818	3.28
SS5, 70-72	4,067	3.0
SS6, 2-4	2,178	3.78
SS6, 4-6	3,309	5.38
SS6, 8-10	1,603	2.21
SS6, 14-15	599	2.31
SS7, 4-6	2,201	8.73
SS7, 6-8	1,103	1.66
SS7, 8-10	633	2.09
SS7, 14-15	1,008	3.63
SS7, 20-22	328	1.24
SS7, 30-32	2,050	1.66

Results expressed in mg/l unless otherwise designated. < = Less Than.
Our Florida Department of Health & Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Chemist/Biologist

Chemist/Biologist

Chemist/Biologist

6000000100223

Geraghty & Miller, Inc.
Attn: Paul Jakob

06-29-84

Report #: 41812 (4380)
Page 2 of 3

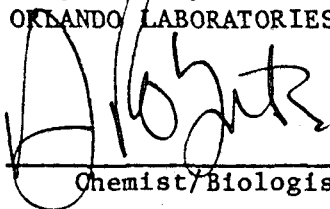
IDENTIFICATION: Soil samples identified as marked.

RESULTS OF ANALYSIS

<u>SAMPLES</u>	<u>TOTAL ORGANIC CARBON, TOC</u>	<u>CATION EXCHANGE *</u>
SS8, 2-4	431	3.63
SS8, 4-6	2,650	0.89
SS8, 8-10	470	3.1
SS8, 14-15	459	3.75
SS9, 4-6	691	2.02
SS9, 6-8	904	4.53
SS9, 9-10	397	3.23
SS9, 14-16	287	3.28
SS10, 4-6	718	4.48
SS10, 6-8	1,185	4.5
SS10, 8-10	258	4.95
SS10, 14-15	1,142	4.6
SS11, 2-4	462	3.68
SS11, 4-6	1,908	6.48
SS11, 8-10	688	5.1
SS11, 14-15	812	5.95
SS11, 20-22	591	3.8
SS11, 30-32	824	5.58
SS11, 40-42	2,599	0.54
SS11, 50-52	1,598	6.43
SS12, 4-6	3,261	5.1
SS12, 6-8	517	4.0
SS12, 8-10	421	5.13
SS12, 14-16	230	3.68
SS12, 16-18	549	3.73

Results expressed in mg/l unless otherwise designated. < = Less Than.
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

Chemist/Biologist

Chemist/Biologist

Geraghty & Miller, Inc.
Attn: Paul Jakob

06-29-84

Report #: 41812 (4380)
Page 3 of 3

IDENTIFICATION: Soil samples identified as marked.

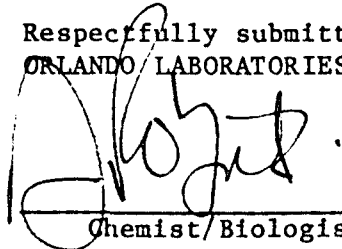
RESULTS OF ANALYSIS

<u>SAMPLES</u>	<u>TOTAL ORGANIC CARBON, TOC</u>	<u>CATION EXCHANGE</u> *
SS13, 2-4	2,697	2.16
SS13, 4-6	5,530	4.53
SS13, 8-10	1,232	3.2
SS13, 14-15	1,341	3.1
SS14, 4-6	3,183	9.28
SS14, 6-8	865	4.28
SS14, 8-10	912	4.6
SS14, 14-15	1,543	4.35

	<u>BULK DENSITY mg/m³</u>	<u>% MOISTURE</u>
SS5, 30-32	2.33	14.1
SS6, 14-15	2.66	12.4
SS7, 14-14	2.70	17.9
SS8, 14-15	2.68	16.2
SS9, 9-10	2.64	12.2
SS10, 4-6	2.34	18.5
SS11, 40-42	2.13	18.8
SS12, 14-16	2.85	13.0
SS13, 14-15	2.20	14.1
SS14, 4-6	3.02	16.9

Results expressed in mg/l unless otherwise designated. < = Less Than.
Our Florida Department of Health & Rehabilitative Service Identification Number
is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.



Chemist/Biologist

Chemist/Biologist

Chemist/Biologist

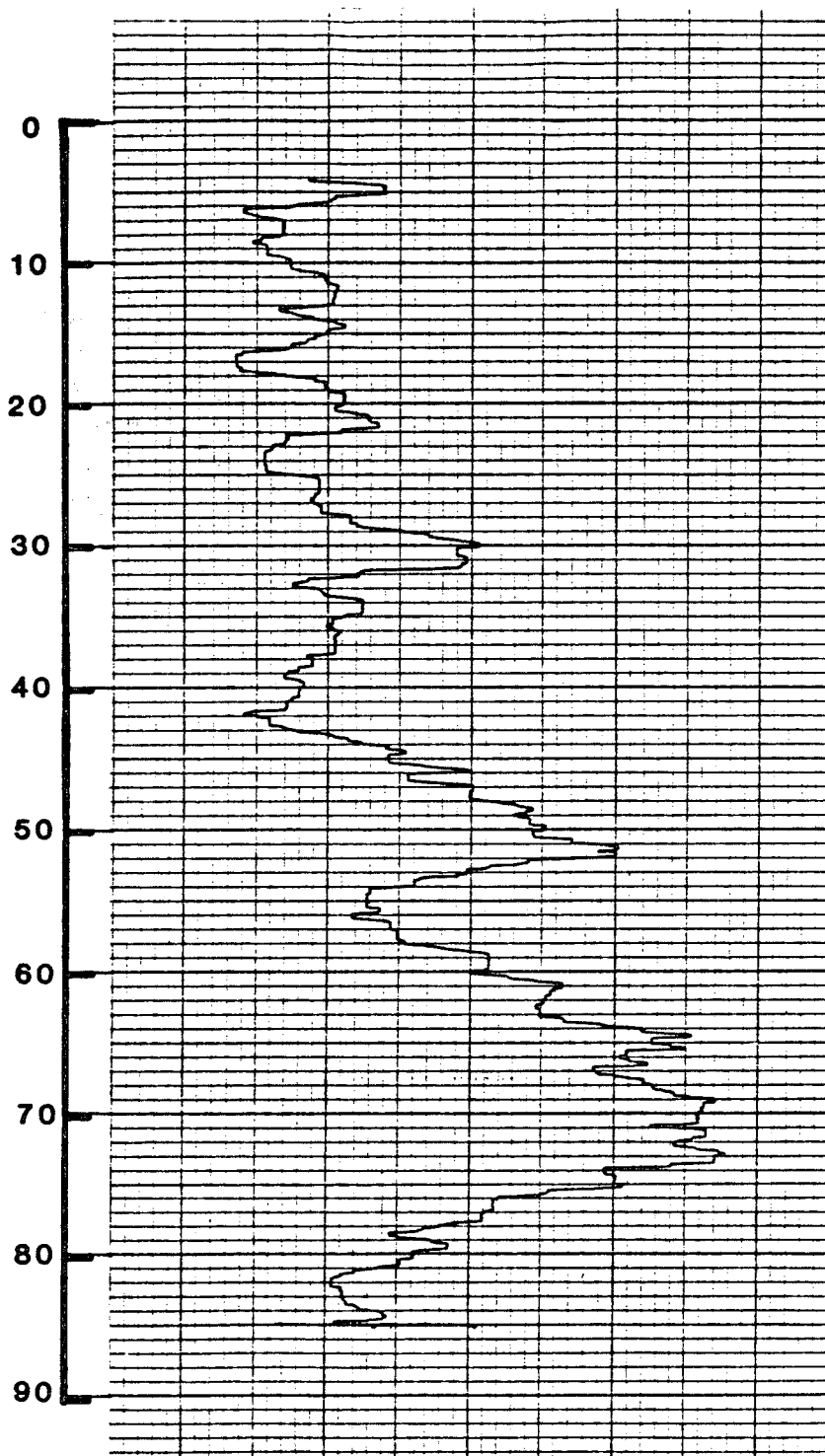
6000000100226

APPENDIX 10.14.5

GAMMA RAY LOGS OF TEST WELLS 1, 2, and 3

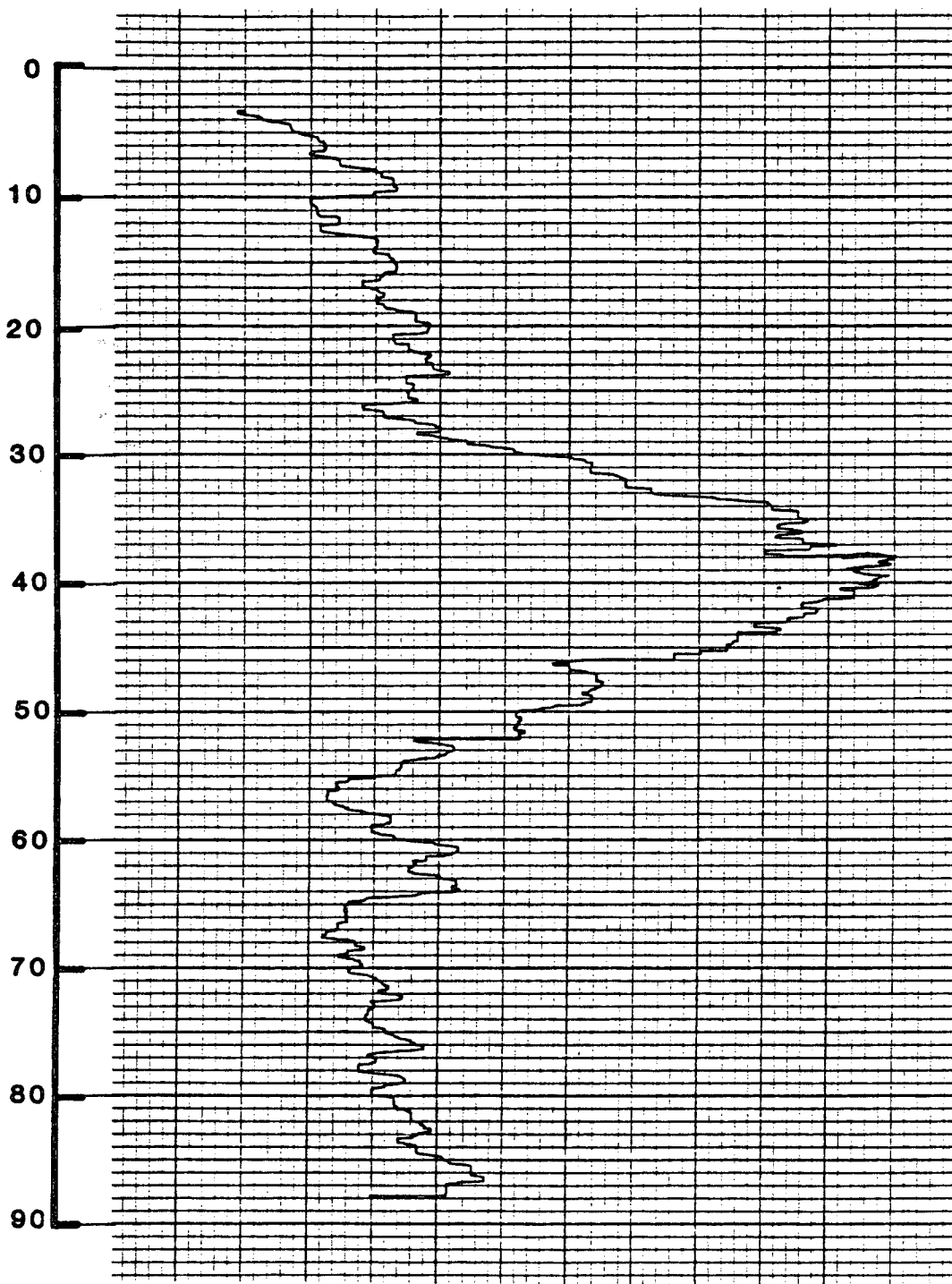
6000000100227

FEET BELOW GROUND LEVEL



SITE 7
GAMMA RAY LOG
WELL 1

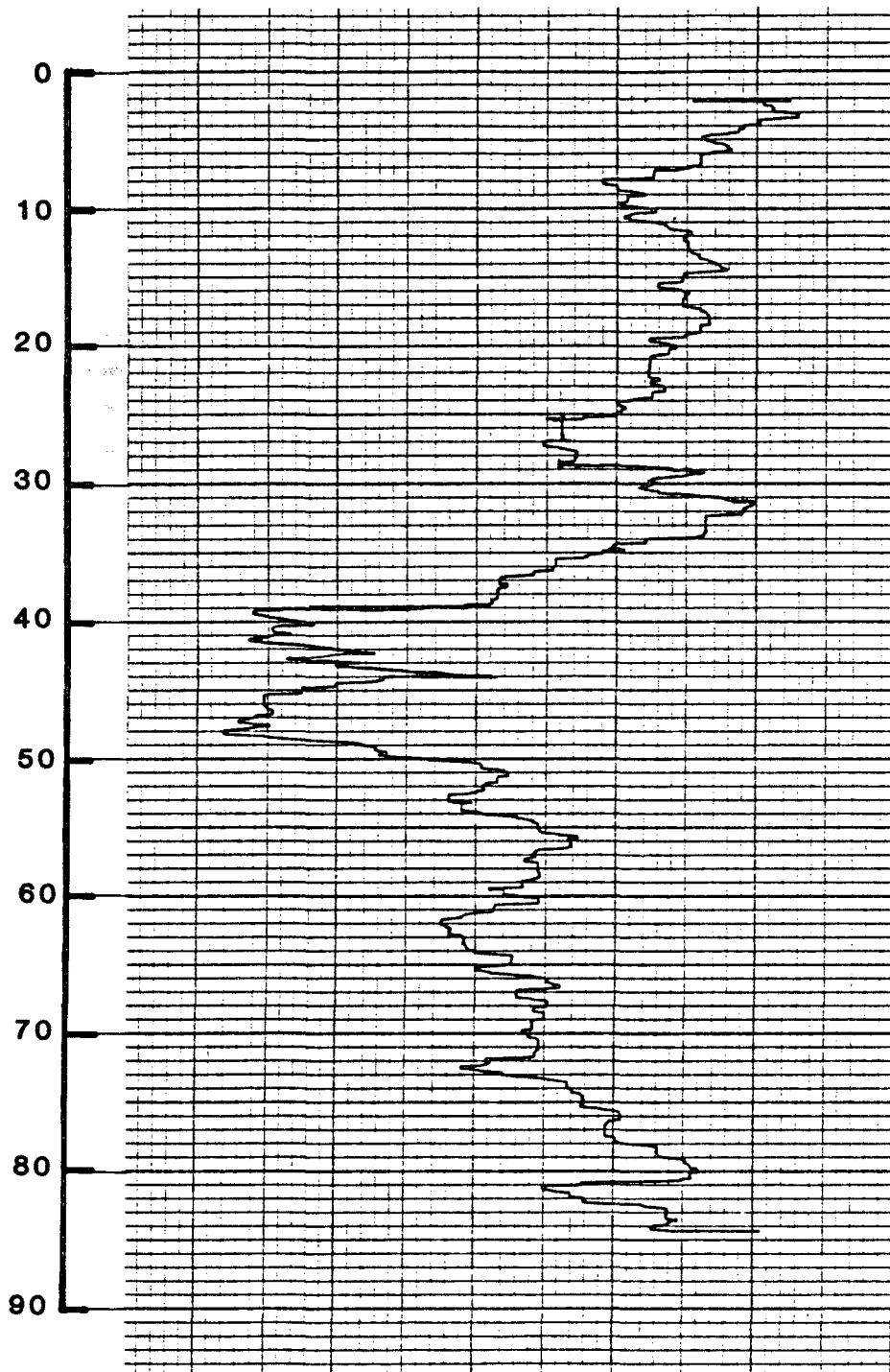
FEET BELOW GROUND LEVEL



SITE 7
GAMMA RAY LOG
WELL 2

86000000100228

FEET BELOW GROUND LEVEL



SITE 7
GAMMA RAY LOG
WELL 3

6000000100229

6000000100230

APPENDIX 10.14.6

WATER LEVEL AND RAINFALL DATA

GROUND-WATER LEVEL ELEVATIONS
in feet above mean sea level

Date	Well 1	Well 2	Well 3	Well 4	Well 5	Well 6	Well 7	Well 8	Well 9	Well 10	Well 11	Well 12	Well 13	Well 14	PB-1035
5/14/84	14.02	13.33	13.16	15.34	14.10	13.82	13.30	14.17	13.05	14.25	14.97	13.25	14.35	14.06	13.88
5/15/84	14.00	13.31	13.10	15.25	14.08	13.79	13.26	14.14	12.98	14.19	14.92	13.16	14.30	13.93	13.82
5/17/84	14.19	13.20	13.04	15.08	13.98	13.70	13.19	14.05	12.88	13.08	14.81	13.10	14.22	13.98	13.70
5/21/84	13.82	13.11	12.98	14.91	13.90	13.58	13.12	13.96	12.81	13.95	14.70	12.92	14.17	13.92	13.63
5/23/84	13.79	13.11	12.92	15.00	13.87	13.57	13.08	13.95	12.77	13.96	14.80	12.89	14.18	13.96	13.66
5/25/84	13.89	13.43	13.89	16.54	13.93	13.73	13.77	14.79	13.38	15.18	17.00	14.00	15.45	15.80	13.82
5/29/84	15.01	14.93	15.72	17.01	15.41	15.32	15.26	17.03	15.14	16.98	17.23	15.79	16.50	16.78	14.86
6/01/84	14.90	14.83	15.14	16.90	14.92	15.14	15.00	16.59	14.93	15.36	17.10	15.31	15.96	16.07	14.83
6/04/84	14.77	14.43	14.73	16.60	14.74	14.86	14.57	15.89	14.53	15.86	16.60	14.87	15.52	15.58	14.66
6/07/84	14.66	14.29	14.60	16.52	14.63	14.71	14.36	15.63	14.37	15.69	16.36	14.69	15.38	15.38	14.55
6/11/84	14.62	14.15	14.34	16.36	15.29	14.63	14.25	15.44	14.16	15.51	16.16	14.41	15.15	15.10	14.46
6/14/84	14.52	14.09	14.27	16.40	14.54	14.54	14.13	15.29	14.03	15.56	16.28	14.36	15.14	15.34	14.38
6/15/84	14.56	14.05	14.15	16.32	14.55	14.47	14.09	15.24	13.98	15.48	16.09	14.31	15.13	15.23	14.36
6/18/84	15.08	14.69	14.87	17.08	15.11	14.96	14.82	16.64	14.63	16.52	17.34	15.00	16.08	16.05	14.79
6/21/84	14.83	14.32	14.42	16.51	14.78	14.67	14.37	15.64	14.21	15.64	16.37	14.51	15.24	15.18	14.58
6/25/84	14.95	14.49	14.61	16.74	14.89	14.79	14.54	16.11	14.41	15.96	16.71	14.69	15.33	15.40	14.70
6/28/84	14.91	14.41	14.66	16.76	14.84	14.75	14.46	16.04	13.55	15.96	16.82	14.73	15.40	15.50	14.63
7/02/84	14.96	14.55	14.73	16.88	14.92	14.94	14.65	16.43	14.55	16.20	17.06	14.84	15.55	15.74	14.73
7/05/84	14.85	14.43	14.66	16.82	14.85	14.81	14.50	15.78	14.48	15.96	16.85	14.65	15.45	15.51	14.67
7/09/84	14.67	14.23	14.44	16.62	14.67	14.60	14.29	15.64	14.24	15.71	16.54	14.45	15.18	15.11	14.51
7/12/84	14.62	14.08	14.23	16.44	14.54	14.41	14.09	15.30	14.10	15.46	16.21	14.33	15.10	15.02	14.38
7/16/84	14.46	13.97	14.08	16.31	14.41	14.29	13.90	15.11	13.95	15.27	15.98	14.13	14.96	14.85	14.21
7/19/84	14.33	13.83	13.90	16.15	14.28	14.11	13.73	14.76	13.73	15.06	15.73	13.95	14.83	14.69	14.10
7/24/84	14.42	14.15	14.47	16.60	14.50	14.47	14.21	15.79	14.30	15.80	16.51	14.51	15.33	15.40	--

GROUND-WATER LEVEL ELEVATIONS
in feet above mean sea level

		Well 1	Well 2	Well 3	Well 4
Date	Time				
5/30/84	am	--	--	15.52	--
	pm	15.01	14.95	15.44	--
5/31/84	am	15.00	14.92	15.44	--
	pm	14.93	14.78	15.25	--
6/01/84	am	14.91	14.78	15.25	--
	pm	14.87	14.74	15.05	--
6/02/84	am	14.87	14.74	15.06	--
	pm	14.83	14.63	14.90	--
6/03/84	am	14.83	14.63	14.92	--
	pm	14.79	14.53	14.76	--
6/04/84	am	14.79	14.53	14.67	--
	pm	14.76	14.43	14.74	--
6/05/84	am	14.76	--	14.75	16.60
	pm	14.72	--	14.61	16.53
6/06/84	am	14.72	--	14.66	16.55
	pm	14.66	--	14.53	16.44
6/07/84	am	14.66	14.29	14.60	16.47
	pm	14.64	14.26	14.50	16.41
6/08/84	am	14.65	14.27	14.55	16.49
	pm	14.60	14.19	14.40	16.35
6/09/84	am	14.60	14.21	--	16.42
	pm	14.56	14.14	--	16.29
6/10/84	am	14.57	14.15	--	16.36
	pm	14.52	14.08	--	16.23
6/11/84	am	14.52	14.08	14.34	16.36
	pm	14.63	14.15	14.26	16.22
6/12/84	am	14.60	14.13	--	16.28
	pm	14.53	14.04	--	16.15
6/13/84	am	14.53	14.06	--	16.23
	pm	14.50	14.01	--	16.13
6/14/84	am	14.52	14.11	--	16.45
	pm	14.55	14.06	14.14	16.31
6/15/84	am	14.56	14.07	14.14	16.32
	pm	14.53	14.02	14.10	16.26
6/16/84	am	14.51	14.01	14.10	16.27
	pm	14.97	14.54	14.67	17.01
6/17/84	am	14.91	14.58	14.62	16.92
	pm	15.15	--	14.81	17.06
6/18/84	am	15.11	14.68	14.88	17.08
	pm	15.01	14.58	14.76	16.91
6/19/84	am	--	14.58	--	16.91
	pm	--	14.45	--	16.70

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GROUND-WATER LEVEL ELEVATIONS
in feet above mean sea level

		Well 1	Well 2	Well 3	Well 4
Date	Time				
6/20/84	am	--	14.45	--	--
	pm	--	14.35	--	--
6/21/84	am	--	14.35	15.02	16.51
	pm	14.81	14.32	--	16.48
6/22/84	am	14.79	14.31	--	16.54
	pm	15.11	14.65	14.04	17.08
6/23/84	am	15.11	14.74	14.83	17.08
	pm	15.03	14.62	14.88	16.89
6/24/84	am	15.03	14.62	--	16.89
	pm	14.96	14.51	--	16.76
6/25/84	am	14.94	14.52	14.61	16.77
	pm	14.99	14.43	14.86	16.61
6/26/84	am	14.99	14.61	14.93	17.02
	pm	14.94	14.51	14.79	16.91
6/27/84	am	14.91	--	14.72	16.91
	pm	14.95	--	14.83	16.83
6/28/84	am	14.94	14.41	14.77	16.83
	pm	14.86	14.35	14.57	--
6/29/84	am	14.87	14.37	14.61	--
	pm	14.80	14.28	14.47	--
6/30/84	am	14.83	14.35	14.63	--
	pm	14.77	14.24	14.49	--
7/01/84	am	14.76	14.23	14.46	--
	pm	14.96	14.55	14.77	--
7/02/84	am	14.96	14.57	14.78	16.91
	pm	14.91	14.46	14.63	16.76
7/03/84	am	14.90	14.62	14.69	16.86
	pm	15.04	14.56	14.89	17.03
7/04/84	am	14.98	14.59	14.85	16.93
	pm	14.92	14.46	14.69	16.77
7/05/84	am	14.90	14.43	14.70	16.77
	pm	14.79	14.38	14.58	16.72
7/06/84	am	14.79	14.38	14.59	16.73
	pm	14.76	14.37	14.57	16.68
7/07/84	am	14.76	14.37	14.57	16.69
	pm	14.72	14.32	14.46	16.62
7/08/84	am	14.72	14.32	14.53	16.75
	pm	14.67	14.25	14.42	16.62
7/09/84	am	14.67	14.25	14.46	16.64
	pm	14.62	14.18	14.33	16.49
7/10/84	am	14.62	14.18	14.38	16.55
	pm	14.57	14.11	14.24	16.41

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SURFACE-WATER LEVEL ELEVATIONS
in feet above mean sea level

Date	Staff 1	Staff 2	Staff 3	Staff 4	Staff 5
5/14/84	--	--	--	--	--
5/15/84	--	--	--	--	--
5/17/84	--	--	--	--	--
5/21/84	14.04	13.35	15.34	13.10	16.56
5/23/84	14.02	13.27	15.25	13.08	16.54
5/25/84	14.17	15.85	15.51	13.91	16.89
5/29/84	15.87	14.93	--	>15.60	--
6/01/84	15.96	13.76	--	>15.60	--
6/04/84	15.48	13.97	14.68	15.35	16.89
6/07/84	15.37	13.85	14.66	15.10	16.81
6/11/84	15.16	13.79	14.57	14.68	16.81
6/14/84	15.06	13.68	14.53	14.50	16.72
6/15/84	15.01	13.64	14.50	14.47	16.69
6/18/84	15.60	13.87	14.70	14.95	16.83
6/21/84	15.35	13.85	14.68	14.85	16.76
6/25/84	15.47	14.00	14.76	14.93	16.80
6/28/84	15.44	14.09	14.84	15.02	16.83
7/02/84	15.52	14.06	14.88	15.03	16.90
7/05/84	15.45	13.75	14.93	15.06	16.91
7/09/84	15.27	13.77	14.86	14.77	16.85
7/12/84	15.03	13.62	14.76	14.59	16.79
7/16/84	14.71	13.46	14.30	14.29	16.14
7/19/84	14.66	13.43	14.01	14.22	--
7/24/84	15.12	13.31	14.55	14.52	--

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SURFACE-WATER ELEVATIONS
in the
WEST PALM BEACH WATER CATCHMENT AREA (a)
in feet above mean sea level

Date of Week Ending	Average Elevation per Week
5/13/84	16.45
5/20/84	16.07
5/28/84	17.37
6/03/84	17.88
6/11/84	17.63
6/17/84	17.82
6/24/84	17.71
7/01/84	17.93
7/08/84	17.77
7/15/84	17.38
7/22/84	17.49
7/29/84	17.53

(a) measured by City of West Palm Beach at
Control No. 4

PRECIPITATION DATA
in inches

Date	Rain Gauge at Well 1	Rain Gauge at Well 4	Rain Gauge at Well 3
5/14/84	--	--	--
5/15/84	--	--	--
5/17/84	--	--	--
5/21/84	0.00	0.00	0.00
5/23/84	--	.12	.10
5/25/84	--	1.10	1.60
5/29/84	--	>5.00	>5.00
6/01/84	0.00	0.00	0.00
6/04/84	0.00	0.00	0.00
6/07/84	0.00	0.00	0.00
6/11/84	.70	.05	.05
6/14/84	.44	.30	.30
6/15/84	.30	.05	.10
6/18/84	2.50	2.40	2.20
6/21/84	0.00	0.00	0.00
6/25/84	1.10	1.20	1.10
6/28/84	.24	.20	.20
7/02/84	1.05	1.05	1.10
7/05/84	.60	.60	.60
7/09/84	.10	.20	.20
7/12/84	0.00	0.00	0.00
7/16/84	0.00	0.00	0.00
7/19/84	0.00	0.00	0.00
7/24/84	3.00	--	3.25

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APPENDIX 10.14.7
PROPOSED PLAN FOR THE RECOVERY
AND USE OF MINERALIZED GROUNDWATER
BY PUMPING AT THE DYER BOULEVARD SANITARY LANDFILL

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PROPOSED PLAN FOR THE RECOVERY
AND USE OF GROUND WATER BY PUMPING AT THE
DYER BOULEVARD AND THE PROPOSED SITE 7 LANDFILLS

March 1985

Prepared for:
Hayden-Wegman/Barker, Osha & Anderson
A Joint Venture
860 U.S. Highway One
North Palm Beach, Florida 33408

Prepared by:
Geraghty & Miller, Inc.
Ground-Water Consultants
2700 PGA Boulevard, Suite 104
Palm Beach Gardens, Florida 33410

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PROPOSED PLAN FOR THE RECOVERY
AND USE OF GROUND WATER BY PUMPING AT THE
DYER BOULEVARD AND THE PROPOSED SITE 7 LANDFILLS

INTRODUCTION

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The proposed plan and its rationale as described in this report was prepared for the Palm Beach County Solid Waste Authority and Hayden-Wegman/Barker, Osha & Anderson, A Joint Venture, by Geraghty & Miller, Inc. The purpose of the plan is to: (1) provide an efficient method of ameliorating the existing, relatively low degree of ground-water degradation at the Dyer Boulevard Sanitary Landfill, (2) prevent any possible degradation of ground water beneath the proposed Site 7 landfills, (3) provide water for cooling and boiler use at the proposed Site 7 Resource Recovery Facility, and (4) provide water for irrigation on the Dyer Landfill following its closure and on closed portions of the Site 7 landfills. The plan presented here includes a description of the existing plume of affected ground water at the Dyer Landfill and a description of the hydrogeologic characteristics of the area, based on all available information. That information was assessed and, with the aid of a ground-water flow model, a plan was formulated that includes recommended well locations and rates of pumping to remove any affected ground water from the shallow aquifer. This will ensure that the ground-water quality beneath Site 7 will remain in its natural condition, ensure minimal impact on proposed neighboring wells, and satisfy industrial and irrigation water demands.

SUMMARY

This report provides a plan for (1) the removal of mineralized ground water from beneath the Dyer Boulevard Landfill, (2) the creation of a cone of depression in the water table beneath the proposed Site 7 landfills to prevent any potential spread of leachate from those landfills, and (3) the use of the withdrawn water for industrial and irrigation applications. The extent of the plume of mineralized water beneath the Dyer Landfill was defined on the basis of concentrations of the chloride ion; the highest chloride concentration detected in the principal aquifer was 150 milligrams per liter. The hydraulic

properties of the aquifer were determined based on all available information.

A ground-water flow model was employed to evaluate the effect of withdrawals. The model was calibrated against known data and conditions representative of average rainfall, evapotranspiration and recharge. Simulated pumping from "interceptor" wells was introduced into the model at strategic locations to evaluate their effectiveness in controlling the flow of ground water in areas of existing and potential degradation. Also incorporated in the model was pumping from major existing and proposed wells that could be affected by the interceptor wells. Dry-season conditions also were evaluated by reducing water availability and increasing pumping to near-maximum levels.

The evaluations indicate that interceptor wells can serve to control the flow of all potential leachate with only a minor effect on neighboring ground-water users. Locations, pumping rates, and designs for interceptor wells are recommended for use on Site 7 and on the Dyer Landfill property.

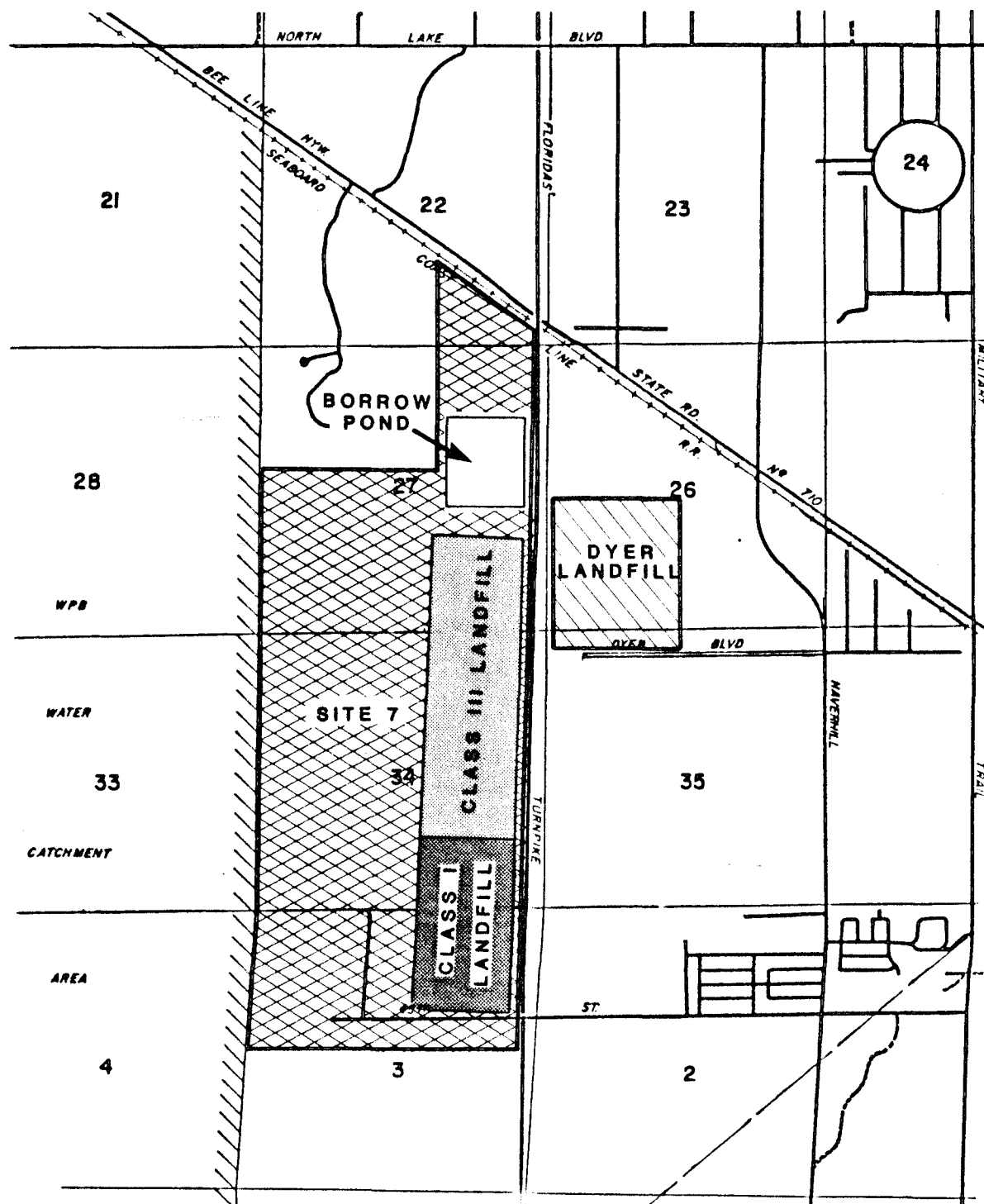
Background Information

The plan described below links a desirable ground-water withdrawal with a beneficial use of ground water. Water is proposed to be withdrawn where it has been degraded by leachate from the Dyer landfill and where it could be degraded (although it is very unlikely) from the Site 7 landfills. Use of the withdrawn water is proposed for cooling, in boilers, and for irrigation on Site 7. Water withdrawn from beneath the Dyer Landfill will be utilized for irrigation on that landfill and to meet water demands on Site 7. Figure 1 shows the relative locations of the landfills.

Because the industrial and irrigation demands for water are well quantified, the plan is predicated primarily on the demand. Two mgd (million gallons per day) of water are required for use in the cooling

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PREPARED FOR HAYDEN-WEGMAN
BARKER, OSHA & ANDERSON

TITLE

LOCATIONS OF THE DYER LANDFILL
AND PROPOSED SITE 7 LANDFILLS

0 2000 4000
SCALE FEET

COMPILED BY
P. JAKOB
DRAWN BY
R. PADULA
CHECKED BY
P. JAKOB

Geraghty & Miller, Inc.
Palm Beach Gardens, Florida

SCALE SHOWN

DATE
MARCH 1985
REVISED

FIGURE 1

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system and for boiler water on Site 7. In addition, approximately 1.2 mgd will be needed to irrigate grass on the Dyer Landfill following its closure and on the Site 7 landfills before and following their closure. The irrigation water is estimated to be necessary during three months of the dry season of each year (Mark Hammond, Palm Beach County Solid Waste Authority, personal communication). A single interconnected system of wells that tap the shallow aquifer will be installed to meet these water demands.

The principal criteria for selecting the location of wells is that the mineralized water beneath the Dyer Landfill be removed and any future water-quality degradation at Site 7 be prevented by the constant removal of ground water beneath the Site 7 landfills. This can be accomplished most effectively by defining the areal distribution and movement of the relatively poor-quality water (existing and potential), then pumping strategically located wells to remove the mineralized water.

Definition of the Area of Mineralized Water Beneath the Dyer Landfill

The site of the Dyer Boulevard Sanitary Landfill was previously a rock pit and open dump. Conditions for the generation of a leachate were favorable when the open dump existed. Since 1976, the site has been managed as a sanitary landfill. Ground-water monitoring to determine the presence of leachate began in about 1970 and was expanded considerably in 1976 by the USGS (U.S. Geological Survey). Between 1980 and 1983, monitoring was conducted by private analytical laboratories. In early 1984, the USGS once again became involved in ground-water monitoring at the landfill.

The boundaries of the area affected by leachate were defined by determining where ground water contains relatively high concentrations of chemical constituents that can be associated with landfill leachate. The chemical quality of ground water is determined by the analysis of samples collected from monitor wells open to the shallow aquifer system. The dissolved chemical constituent of ground water that is probably the

most reliable indicator of the development and growth of a leachate plume is the chloride ion; this is because of its propensity to remain unaffected in ground-water solution. Use of the chloride ion as an indicator also would result in a conservative estimate of the plume extent; the more objectionable contaminants that may be contained in a landfill leachate would lie in a plume of smaller extent due to ion adsorption and related processes. Furthermore, chloride is the constituent for which the most data are available. In the vicinity of the landfill, the shallow aquifer system includes unconsolidated sand and shell deposits that occur to depths of about 55 feet, and consolidated, relatively more permeable (often cavity-riddled) sandstone, that occurs between about 55 and 95 feet (principal aquifer).

The first step in defining the extent of the chloride plume was to determine the background concentration of chloride found in the aquifer system underlying the landfill site before disposal operations began. Chloride concentrations found in the area at the time of subsequent samplings were then compared to the background concentration. The extent of the plume at the time of each sampling then was estimated as the area where concentrations were significantly greater than the background level.

The most suitable data for establishing the background level are those collected from wells open to the principal aquifer. The earliest data from that zone are for the early 1970's (Miller and Lietz, 1976), which is about the time the dumping at the site began. Data from the cited publication show that chloride concentrations ranged from 22 mg/l (milligrams per liter) at Well 636, in December 1972, to 44 mg/l at Well 589, in December 1970. Although these data indicate a range in chloride concentrations of 100 percent (from 22 to 44 mg/l), the concentrations are low and considered natural. Three other wells in the area, first sampled in 1974, had chloride concentrations between 36 and 47 mg/l. The background level was taken as the average of these five wells, about 40 mg/l.

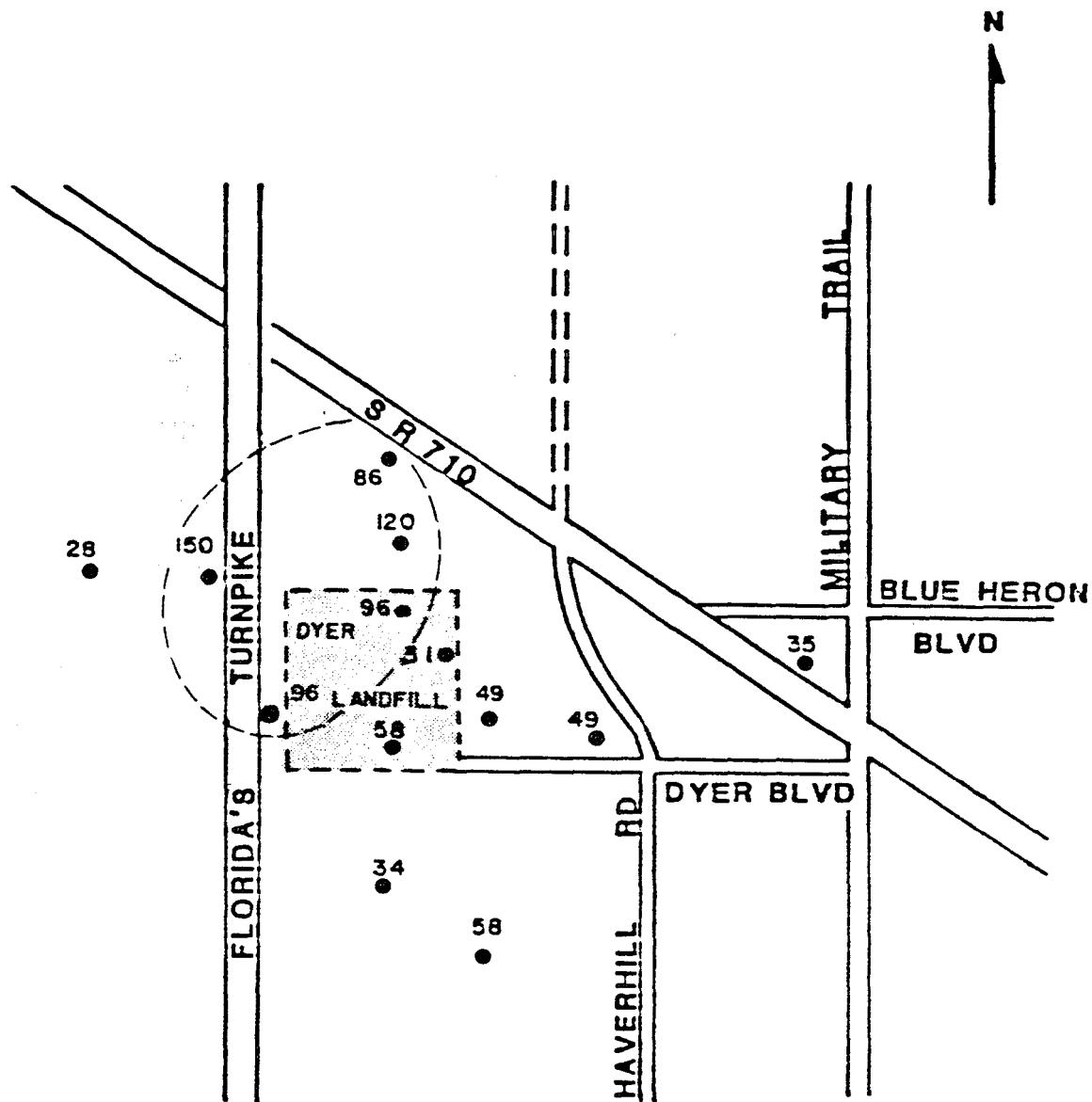
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Additional wells were installed in the area during 1977 and sampled periodically between 1977 and 1979 by the USGS. Analyses of these samples showed that chloride concentrations had increased significantly in some wells. A chloride concentration 100 percent greater than the background concentration of 40 mg/l was chosen to distinguish the plume from the unaffected area; such a contrast in concentrations is too great to be attributed to natural fluctuations. A map showing chloride concentrations in the principal aquifer during 1978-79 is shown in Figure 2. A plume is defined on the map in a small area centered north of the landfill in which chloride concentrations had more than doubled. Samples from the sand and shell deposits that overlie the principal aquifer also were collected in the period 1978-79. Figure 3 shows the approximate area in which the sand and shell deposits are estimated to contain chloride concentrations in excess of 80 mg/l. The area outlined on Figure 3 includes the single data point where the chloride exceeded 80 mg/l and the approximate area of the original landfill - the western half of the existing landfill. Although the area over which the 80-mg/l concentration occurs in the sand and shell deposits is smaller than in the principal aquifer, the concentration in that area is higher. This is because lateral spreading and dilution of the leachate can occur more rapidly in the underlying materials of relatively higher permeability.

Most well-sample analyses conducted after 1979 were of non-conservative constituents. Consequently, there are no significant data available to establish the present extent of the plume on the basis of chloride concentration. However, measurements of the specific conductance of samples pumped from several wells open to the aquifer were made as recently as 1984. Recognizing that the specific conductance is approximately proportional to the chloride concentration of a water sample, specific conductance also can be used to estimate the extent of the plume. The pre-1979 average background level of specific conductance was estimated to be 765 umhos/cm (micromhos per centimeter) by Fischer (1980, p.30). Figure 4 shows the specific conductance of ground-water samples collected in 1982 and the area where specific conductance has increased above the background level. It can be seen

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LEGEND

86
● CHLORIDE CONCENTRATION IN MGL
OCCURRING BETWEEN JUNE 1978
AND APRIL 1979 (MONITOR-WELL
SAMPLING DEPTHS, 42 TO 96 FEET
BELOW GRADE)

--- 80 - MGL ISCHLOR

0 2500
FEET

PREPARED FOR
HAYDEN-WEGMAN/BARKER,
OSHA & ANDERSON

TITLE
CHLORIDE CONCENTRATIONS
IN THE
PRINCIPAL AQUIFER
1978 - 79

COMPILED BY
P. JAKOB
DRAWN BY
Y. DIMICK
CHECKED BY
P. JAKOB

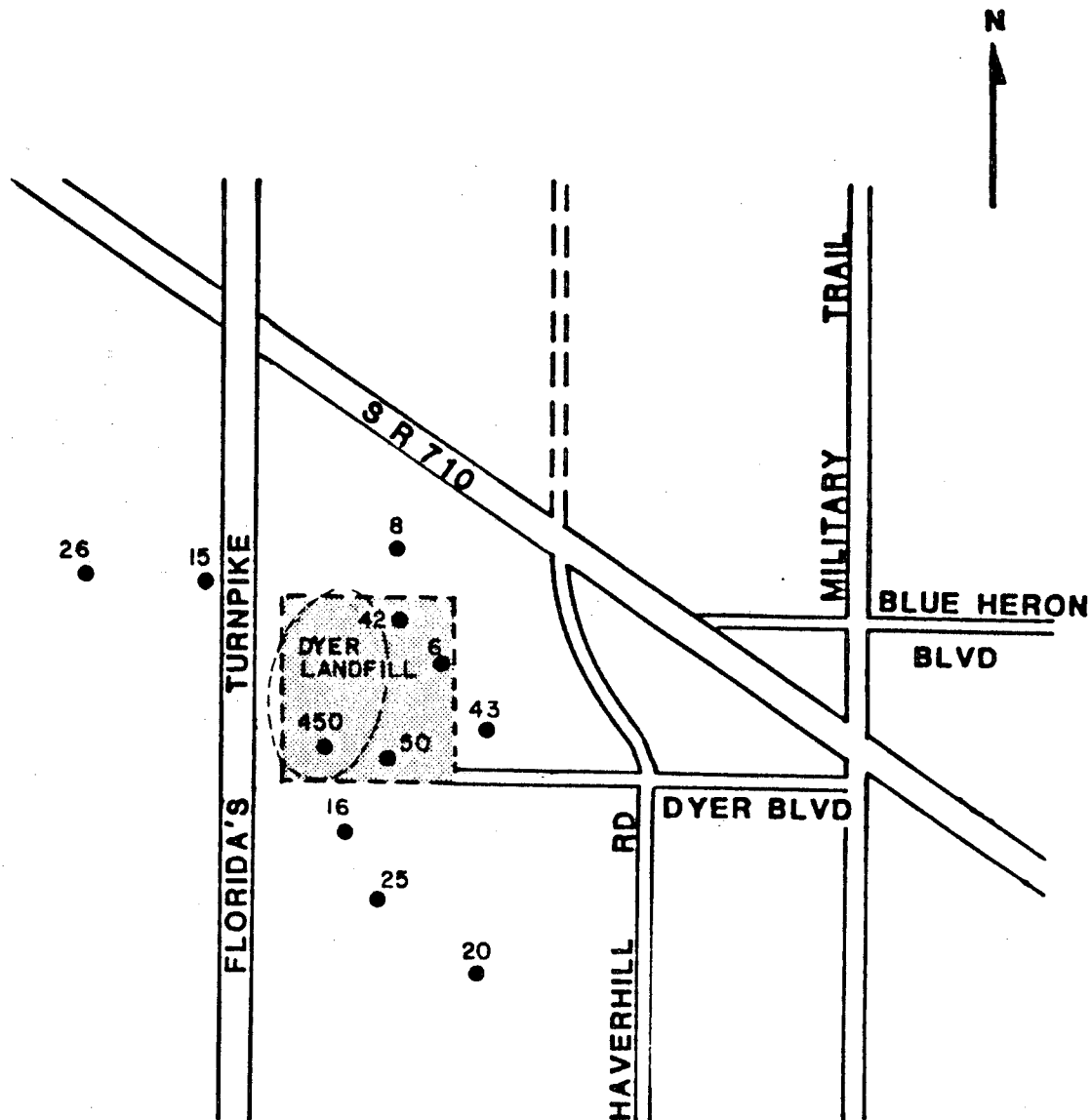
Geraghty & Miller, Inc.
Palm Beach Gardens, Florida

SCALE SHOWN

DATE
JULY 1984
REVISED
March 85

FIGURE 2

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LEGEND

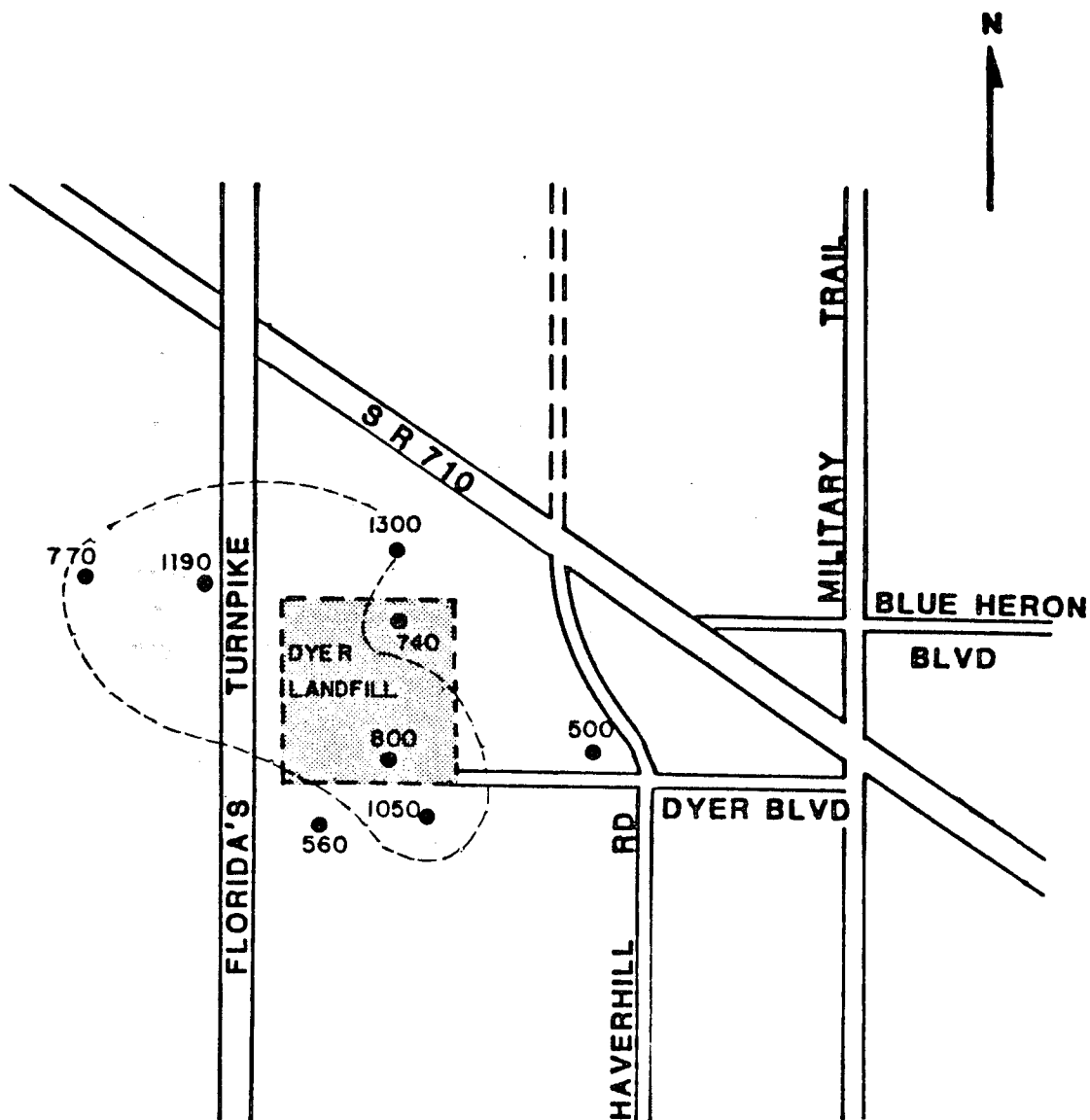
450 ● CHLORIDE CONCENTRATION IN MGL OCCURRING BETWEEN JUNE 1978 AND APRIL 1979 (MONITOR-WELL SAMPLING DEPTHS, 12 TO 37 FEET BELOW GRADE)

— 80 - MGL ISOCHLOR

0 2500
FEET

PREPARED FOR HAYDEN-WEGMAN/BARKER, OSHA & ANDERSON		
TITLE CHLORIDE CONCENTRATIONS IN THE SAND AND SHELL BEDS, 1978 - 79		
COMPILED BY P. JAKOB	Geraghty & Miller, Inc. Palm Beach Gardens, Florida	DATE JULY 1984
DRAWN BY Y. DIMICK		REVISED March 85
CHECKED BY P. JAKOB		FIGURE 3
SCALE		SHOWN

6000000100249



LEGEND

1300
● SPECIFIC CONDUCTANCE IN MICROMHOS PER CENTIMETER (MONITOR-WELL SAMPLING DEPTHS, 42 TO 80 FEET BELOW GRADE)

--- AREA WHERE SPECIFIC CONDUCTANCE EXCEEDS BACKGROUND LEVEL OF 765 MICROMHOS PER CENTIMETER

0 2500
FEET

PREPARED FOR
HAYDEN-WEGMAN/BARKER,
OSHA & ANDERSON

TITLE
SPECIFIC CONDUCTANCES
IN THE
PRINCIPAL AQUIFER,
APRIL 1982

COMPILED BY
P. JAKOB

DRAWN BY
Y. DIMICK

CHECKED BY
P. JAKOB

Geraghty & Miller, Inc.
Palm Beach Gardens, Florida

SCALE SHOWN

DATE
JULY 1984
REVISED
March 85

FIGURE 4

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from Figure 4 that none of the samples from the eight wells tapping the principal aquifer showed a specific conductance twice background. Specific conductance data collected in 1984 showed no expansion of the area where levels exceed background. This lack of growth despite continuing landfill operation may be explained by a reduction in the rate of leachate generation following placement of the final cover on the oldest part of the landfill and greater dilution of leachate already in the aquifer due to additional rainfall recharge during the early 1980's.

Ground-water quality data were generated in early 1984 in an investigation conducted by Geraghty & Miller, Inc. (report in preparation) west of the landfill and Florida's Turnpike. Two samples taken from the principal aquifer showed chloride concentrations of 30 and 65 mg/l and specific conductance values of 492 and 1080 umhos/cm, respectively. The well with the higher chloride concentration and specific conductance is located about 200 feet west of Florida's Turnpike and directly west of the landfill. In detailed analyses of more than 150 chemical parameters, including the "priority pollutants", samples taken at the same time showed no signs of pollution by organic chemicals.

The available data discussed above indicate that mineralized water presently lies in an area that is centered slightly north and west of the midpoint of the original landfill area as shown on Figure 2. This northwestern displacement of a portion of the plume probably results from the presence of the slurry route between the borrow pond (Figure 1), west of the Turnpike, and the northern edge of the Dyer Landfill. The slurry (of water, sand, shell, and crushed limestone) is pumped from the borrow pond in a pipeline to the landfill where the solids (cover material for the landfill) settle on stockpiles. Water that drains from the stockpiles is then routed to an open ditch on the east side of the Turnpike, then is returned to the borrow pond by pipeline. A significant portion of water used in this operation is lost enroute by evaporation and seepage. The evaporation tends to concentrate the

dissolved material in the return route and in the aquifer beneath the route. The portion of the plume extended to the northwest from the landfill underlies the slurry route.

Based on the present location of the body of mineralized water, interceptor wells should be located approximately in the northeast and southeast corners of the Dyer Landfill. Wells in these locations will intercept flow along the natural eastward gradient and reverse the slight north and south components of flow. The area of influence of interceptor wells can be estimated using the hydrogeologic parameters, the transmissivity and storage coefficient, in a "calibrated" ground-water flow model.

Definition of Hydrogeologic Parameters

Investigations that included four short-term pumping tests and monitoring of water levels in wells tapping the principal aquifer (between 60 and 90 feet) and the sand and shell beds (between 5 and 15 feet) were conducted by Geraghty & Miller, Inc., during 1984 on Site 7 (west of Florida's Turnpike from the Dyer Landfill). These investigations revealed that the transmissivity of the shallow aquifer is approximately 101,000 gpd/ft (gallons per day per foot) and that the aquifer responds as an unconfined aquifer having a storage coefficient of about 0.20. East of Florida's Turnpike near Haverhill Road and about 3000 feet south of the Dyer Landfill, Fischer (1980) determined a transmissivity 82,000 gpd/ft. At a site southeast of the Dyer Landfill near Military Trail, the South Florida Water Management District (Staff Report, Modification to Permit No. 50-00460-W) concluded that the transmissivity of the shallow aquifer is about 80,000 gpd/ft, based on data from a test conducted by Barker, Osha and Anderson. The District also concluded that the storage coefficient is 0.20. In the District staff report cited, the results of a computer model were presented in which the shallow aquifer was described as having a transmissivity of 100,000 gpd/ft west of Haverhill Road and 80,000 gpd/ft east of Haverhill Road. The entire area was described as an unconfined aquifer

with a storage coefficient of 0.20. This description is substantially consistent with all known information.

Site 7 and Dyer Landfill Water Demands

The demand for industrial uses at the Site 7 Resource Recovery Facility will be 2 mgd (million gallons per day) continuously through its useful life. The maximum irrigation water demand at Site 7 for closed portions of landfill will be about 0.6 mgd just prior to the time of closure; this corresponds to an application rate of about 0.6 inches per week on 273 acres. The Site 7 facility will be closed after 22 years of operation. The maximum irrigation water demand for the Dyer Landfill following closure (in 1987) also will be 0.6 mgd; this figure also corresponds to an application rate of 0.6 inches per week on 265 acres. Thus, the peak demand for water at Site 7 and the Dyer Landfill will be 3.2 mgd. These irrigation requirements are supplementary in nature and are estimated to prevent the loss of plants on the landfills during the dry season. The irrigation demands cited will be met for three months of the six-month dry season. An outline of water demands relative to the life of the Site 7 project is provided on Table 1.

On Site 7, all landfill areas (313 acres) except the last two landfill cells (20 acres each) will be irrigated during the same period of project operation as other water demands also are met. (About 20 years into project operations, about 273 acres of the Site 7 landfills will be closed and will require irrigation.) Upon complete closure of the Site 7 landfills, water previously used for cooling and in boilers will be used for irrigation to the extent needed. Also upon closure, the ground-water quality beneath all landfills will be evaluated and the ground-water monitoring plan for the landfills will be modified accordingly. The modifications may include the cessation or reduction of pumping from the interceptor wells, the installation of additional monitor wells and/or changing monitoring frequencies, and the implementation of state-of-art monitoring techniques that may be available at that time.

TABLE 1

WATER DEMANDS AT SITE 7
AND DYER LANDFILL DURING
AND AFTER THE USEFUL LIFE OF
SITE 7 LANDFILLS

<u>Facility</u>	<u>Year of Demand from Project Start</u>			
	<u>1 to 22</u>		<u>greater than 22</u>	
	<u>Wet</u> <u>Season</u>	<u>Dry</u> <u>Season</u>	<u>Wet</u> <u>Season</u>	<u>Dry</u> <u>Season</u>
Site 7 - Resource Recovery Facility and Landfills				
a) cooling and boiler water	2 mgd	2 mgd	None	None
b) irrigation water	None	0 to 0.6 mgd	None	0.6 mgd
Dyer Landfill				
a) irrigation water	None	0.6 mgd	None	0.6 mgd

- Notes: - demands are expressed in million gallons per day (mgd)
- expected useful life of Site 7 facilities is 22 years
- dry-season irrigation water demands are peak demands, estimated to be necessary for three months of the six-month dry season (November through April)

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Because the supplemental irrigation will be applied only when necessary between dry-season rainfalls, the rainfall will be relied upon to satisfy approximately one-half of the dry season irrigation demand. The average six-month dry-season rainfall is 18 inches (Mac Vicar, 1981); however, rainfall duration and intensity varies considerably. If 8 of 18 inches is utilized effectively for grass irrigation, rainfall also will provide 0.6 inches per week (8 inches per 13 weeks) to the landfills, as applied to three months of the six-month dry season.

Because it is necessary to extract water continuously from the Dyer Landfill plume of mineralized water for effective removal of that plume, wells placed on the Dyer Landfill property will be pumped continuously; discharge will be used at the Site 7 facility during the wet season and for irrigation during the dry season. In summary, an interconnected system of wells should be pumped at a rate of 2 mgd for nine months of the year and 3.2 mgd for (the equivalent of) three months of the year. A practical representation of the total demand, for the purpose of hydrogeologic modeling, is to consider the wet-season (six months) demand to be 2 mgd and the dry-season (six months) demand to be 2.3 mgd. The total volume of water withdrawn in the representative model will be the same as the total volume expected to be withdrawn in reality.

Design of the Interceptor Well System

The locations and pumping rates of wells in the interceptor well system were determined on the basis of the ground-water flow direction, the proposed presence of the Site 7 landfills, and the known presence of the Dyer Landfill leachate plume. In the area of investigation, ground water flows dominantly eastward; well sites therefore were selected east of the proposed Site 7 landfills and Dyer Landfill. Such placement of wells ensures that natural flow gradients will reinforce the change in ground-water gradients caused by pumping and thereby capture ground water that is known to be or may be degraded.

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Another consideration in determining the "location" of interceptor wells is that they tap the appropriate vertical interval. Figures 2 and 3 indicate that at depths less than about 37 feet, leachate at the Dyer Landfill is limited to the landfill area; however, some off-site migration occurs through the deposits below depths of 42 feet. The predominant leachate flow path is apparently downward into the principal aquifer from the water table underlying the landfill, then laterally into off-site areas through the principal aquifer. The concentration of chloride in the principal aquifer decreases with distance from the landfill due to dispersion and dilution by precipitation recharge. Accordingly, wells pumping from the sand and shell deposits above 37 feet would be most effective immediately beneath the landfill because a greater concentration of leachate, per gallon of water pumped, could be removed from the ground-water flow system. Wells tapping the sand and shell deposits, however, would be ineffective in intercepting leachate already in the principal aquifer. Another disadvantage is that such wells would have to be constructed through the landfill. Therefore, wells tapping the principal aquifer will provide the most efficient and beneficial leachate removal.

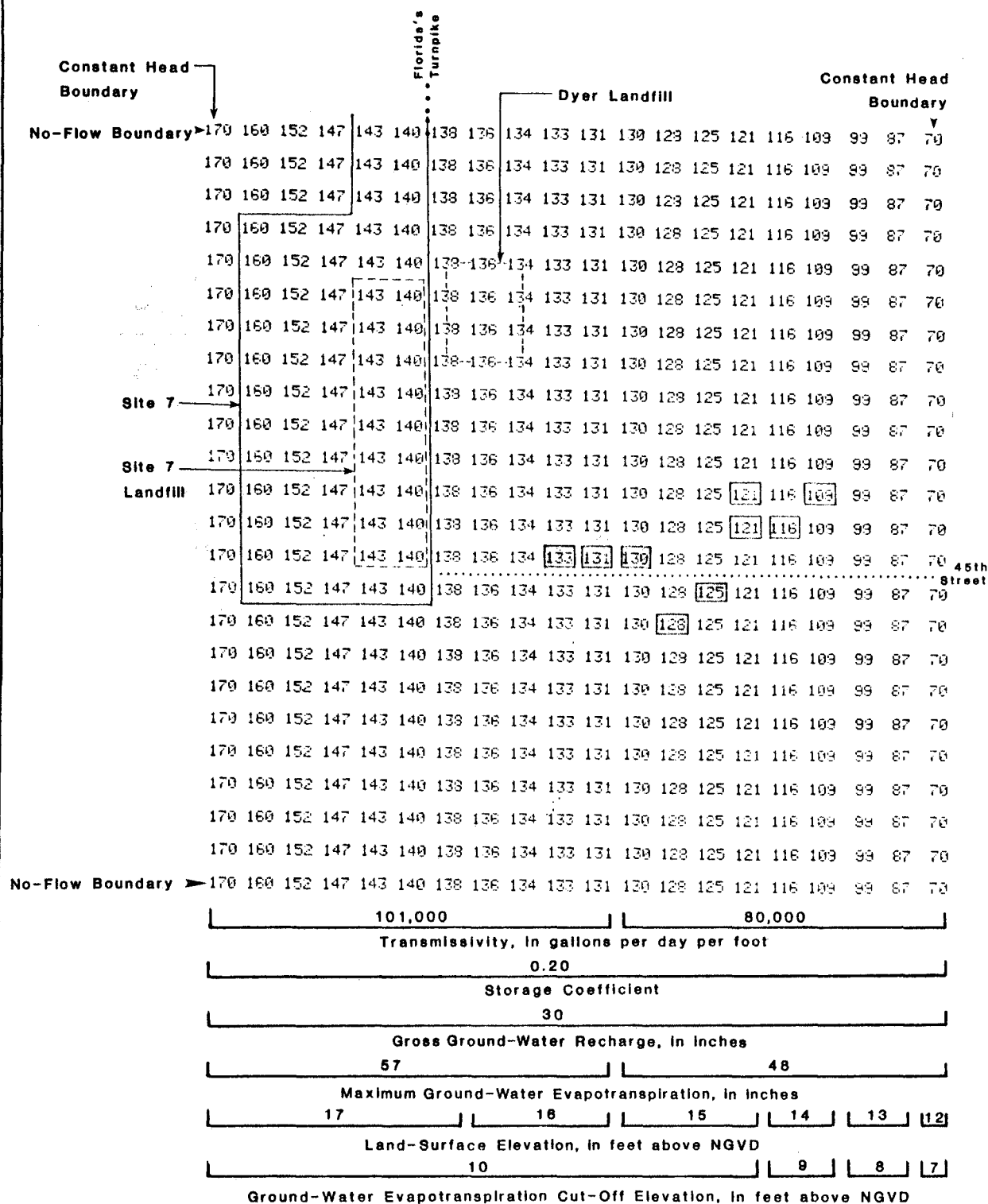
In order to optimize the design of the interceptor well system, ground-water flow was simulated with a computer model (Prickett and Lonquist, 1971). The aquifer parameters (transmissivity and storage coefficient) used were basically the same as those used by the SFWMD (South Florida Water Management District) as cited above. Interceptor well locations east of the landfill areas were selected and pumping rates were varied on a trial-and-error basis until an optimum number of wells were located and pumped at such rates to adequately intercept all potential leachate.

The flow system simulated is bounded on the west by the WCA (West Palm Beach Water Catchment Area) where a constant head of 17.0 feet above NGVD (National Geodetic Vertical Datum) was utilized to represent a dry-season level. Water levels in the WCA generally are maintained between 17.5 and 18.5 feet above NGVD. The eastern boundary of the

model is the Earman River (C-17) where a constant head of 7.0 feet above NGVD was input. This level is indicated to be the approximate dry-season elevation on maps by Land and others (1973) and by Rodis and Land (1976). The northern and southern boundaries of the model correspond to east-west lines located 5000 feet north of Blue Heron Boulevard and 9000 feet south of 45th Street, respectively. The northern and southern boundaries are sufficiently distant from the area of interest to have no significant effect on the model. The model employed nodal areas 1000 feet on each side. Figure 5 depicts the area evaluated with the flow model.

The model first was calibrated to conform with the approximate existing distribution of ground-water levels as determined in the Site 7 area by Geraghty & Miller, Inc., and as reported by Fischer (1980) and Land and others (1973). These conditions include dry-season boundaries (described above) but are regarded as representing average water-availability conditions. The process of model "calibration" refers to the trial-and-error method by which unknown or generalized parameters such as the evapotranspiration, recharge, and boundary conditions are adjusted to the point where (together with the known parameters of transmissivity and storage coefficient) the operation of the model reproduces the known distribution of ground-water levels in the modeled area. Evapotranspiration from the water table was incorporated in the model as a variable function of the depth of the water table below land surface. The maximum rates of evapotranspiration from the water table and factors controlling the variable rate of evapotranspiration are shown on Figure 5. The evapotranspiration was first estimated with the use of a method and data provided by Dohrenwend (1971). The depth of zero water-table evapotranspiration was approximated based on a report by the U.S. Army Corps of Engineers (1955), and adjusted to reflect the variable types of vegetation (deep or shallow root systems) in the area modeled. The gross annual rate of ground-water recharge was initially estimated to be 30 inches per year (this figure was ultimately used) based on work by Camp, Dresser & McKee (1980). The evapotranspiration and recharge rates were repeatedly

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LEGEND

- ☐ PRODUCTION WELL, CITY OF RIVIERA BEACH
(SHADING INDICATES PROPOSED WELL)

NOTE: EACH NODE REPRESENTS AN AREA 1000 FEET BY 1000 FEET. HEADS ARE INDICATED AT EACH NODE IN TENTHS OF FEET ABOVE NGVD

PREPARED FOR HAYDEN-WEGMAN		
BARKER, OSHA & ANDERSON		
TITLE GROUND-WATER FLOW MODEL PARAMETERS AND CALIBRATED HEADS/ STEADY-STATE CONDITIONS, NO PUMPING		
COMPILED BY P. JAKOB	Geraghty & Miller, Inc. Palm Beach Gardens, Florida	DATE MARCH '85
DRAWN BY R. PADULA		REVISED
CHECKED BY P. JAKOB	SCALE	FIGURE 5

adjusted to enable calibration of the model and therefore are regarded as representative of the modeled area.

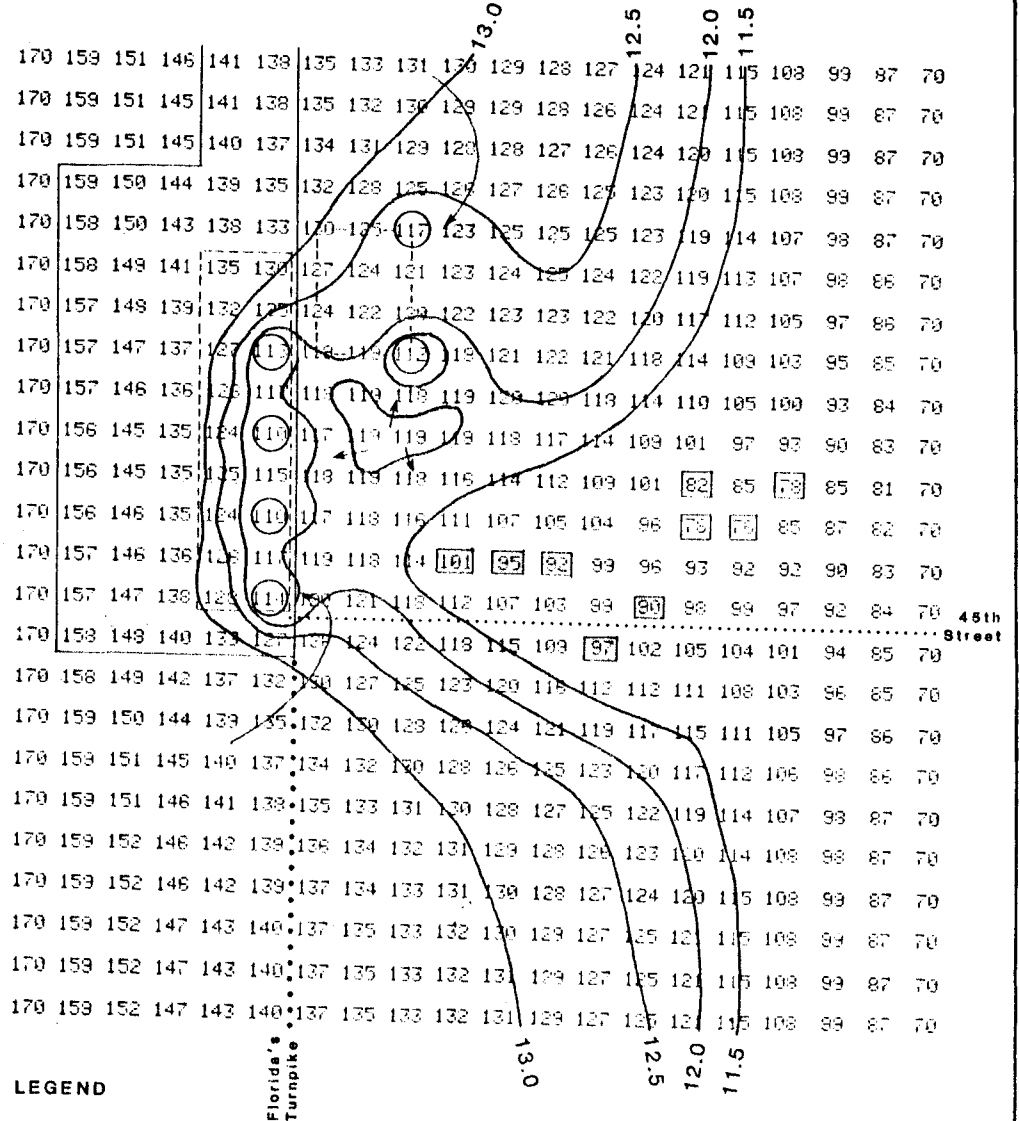
Another consideration that was incorporated into the model was pumpage from four existing wells and five wells proposed for the City of Riviera Beach by Barker, Osha & Anderson, Inc. The use of the proposed wells is currently being considered by the SFWMD. The existing and proposed well locations also are shown on Figure 5; they will extract about 3 mgd on an annual average basis and a peak of about 8 mgd during the dry season. Interceptor well locations and pumping rates were selected with use of the flow model so that any existing or potential leachate would not reach the RB (Riviera Beach) wells and so that the interceptor wells would not significantly reduce the capability of the RB wells to produce water.

Following "calibration" of the ground-water heads to known conditions and a steady-state (one that does not change with time) flow configuration (heads shown on Figure 5), six interceptor wells and nine RB wells were incorporated in the model simulating average water-availability conditions and total withdrawal rates of 2 mgd and 3 mgd, respectively. The distribution of heads, also at steady state, while pumping at these rates is shown on Figure 6. Six wells were determined to comprise the most efficient interceptor well system under these conditions. The interceptor wells remove all water from known and potential areas containing leachate and do not significantly impact the RB wells.

To test the effect of pumping interceptor wells and RB wells at times of dry-season demand, the flow model was evaluated beginning with heads shown on Figure 6 at time-zero, and by pumping the interceptor wells at a total of 2.6 mgd and the RB wells at a total of 3.825 mgd for a six-month period. Time-zero in this case is a condition representative of the end of average water-availability conditions and six months of pumping at 2 mgd and the start of the dry season. Gross aquifer recharge was estimated to be 3.5 inches over the six-month dry season.

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LEGEND

- 13.0 GROUND-WATER CONTOUR IN FEET ABOVE NGVD
- INTERCEPTOR WELL
- PRODUCTION WELL, CITY OF RIVIERA BEACH (SHADING INDICATES PROPOSED WELL)
- DIRECTION OF GROUND-WATER FLOW

NOTE: EACH NODE REPRESENTS AN AREA 1000 FEET BY 1000 FEET, HEADS ARE INDICATED AT EACH NODE IN TENTHS OF FEET ABOVE NGVD

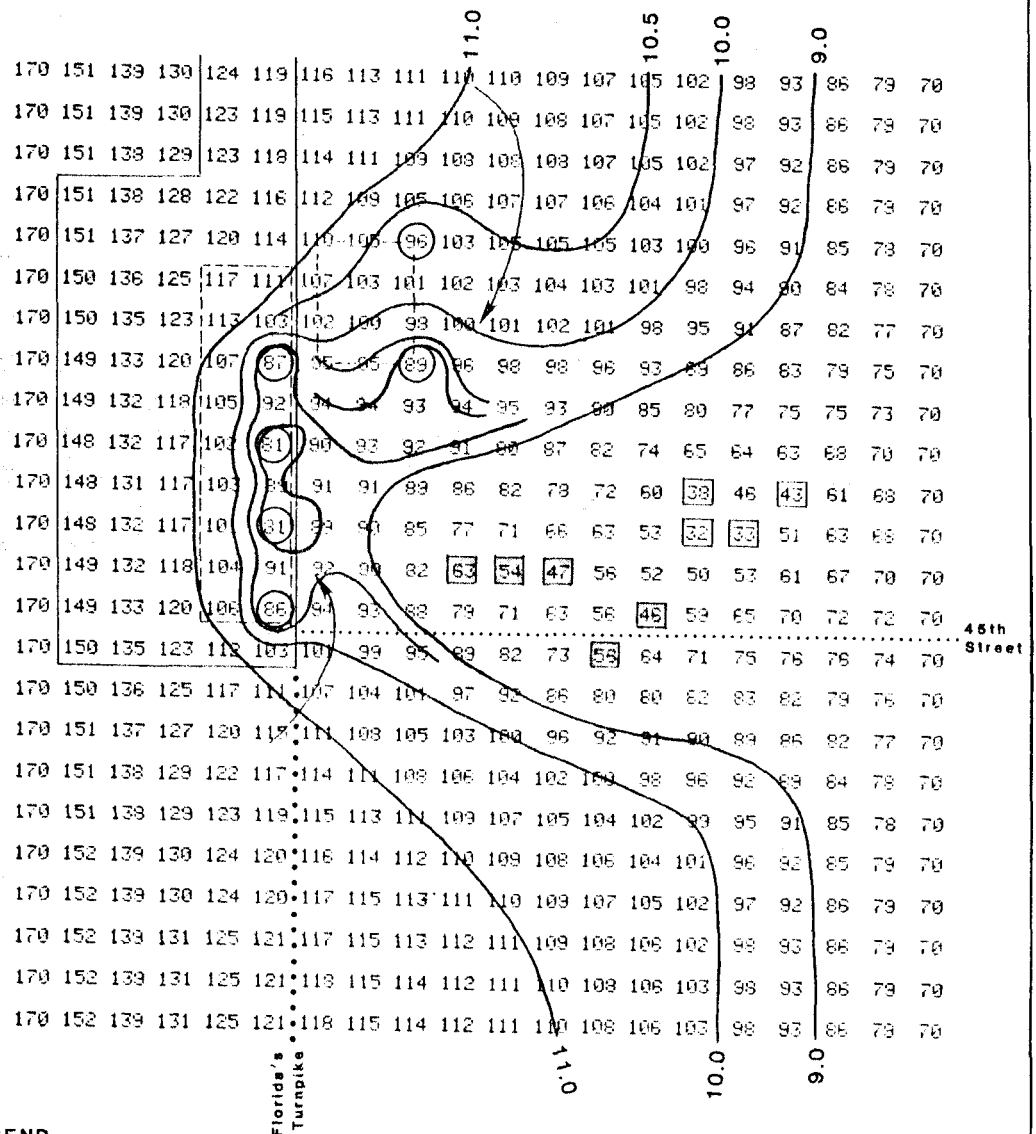
PREPARED FOR HAYDEN-WEGMAN		
BARKER, OSHA & ANDERSON		
TITLE GROUND-WATER CONTOURS		
WITH WET-SEASON PUMPING FROM ALL		
WELLS SHOWN/AVERAGE RECHARGE RATE,		
STEADY-STATE CONDITIONS		
COMPILED BY P. JAKOB	Geraghty & Miller, Inc.	DATE MARCH '85
CREATED BY R. PADULA		REVISED
CHECKED BY P. JAKOB	SCALE	FIGURE 6

This amount of recharge is one-half the rainfall expected during a 1-in-10-year dry-season drought (SFWMD, unpublished data). The 2.6-mgd withdrawal is the average dry-season demand for the interceptor wells. The 3.825-mgd withdrawal is 27.5 percent higher than the average demand of 3 mgd. This percentage increase above average corresponds to the percentage increase during the peak month of 1984, compared to annual average, experienced in the RB water system. It is considered to be the maximum peak-season demand and to impose the maximum probable stress on the aquifer over the six months tested on the model. A six-month period is regarded as the maximum continuous time that both well fields would be pumped at maximum-month rates.

Under the conditions described, the distribution of ground-water heads developed by the model after 180 days (and shown on Figure 7) indicates that ground water cannot flow from the area of the Site 7 landfills toward the proposed RB wells. On the basis of this analysis, it is concluded that no potential Site 7 leachate could flow toward the RB wells. The reason for this is that the heads near the locations of the Site 7 interceptor wells are lower than heads in the direction of the proposed RB wells. Thus, a ground-water divide is present, preventing leachate migration toward the proposed RB wells.

Figure 7 shows that pumping the interceptor wells during the dry season at maximum rates for a period of six months also prevents the known Dyer Landfill leachate from migrating toward the existing and proposed RB wells. Although a ground-water divide does not exist between the plume and the RB wells, ground water originating in the area of the plume will flow dominantly toward the interceptor wells as opposed to the RB wells. A minor quantity of ground water originating near the southern border of the landfill could flow toward the RB wells at a very low velocity and under the influence of a very low ground-water gradient. Because of the low velocity (less than 0.07 feet per day), such ground-water flow would not persist long enough for elements of the plume to reach the RB wells before average water-availability conditions are re-established as depicted on Figure 6. The effectiveness of the interceptor wells is

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LEGEND

—10.0 GROUND-WATER CONTOUR IN FEET ABOVE NGVD

○ INTERCEPTOR WELL

□ PRODUCTION WELL, CITY OF RIVIERA BEACH
(SHADING INDICATES PROPOSED WELL)

→ DIRECTION OF GROUND-WATER FLOW

NOTE: EACH NODE REPRESENTS AN AREA 1000 FEET
BY 1000 FEET, HEADS ARE INDICATED AT
EACH NODE IN TENTHS OF FEET ABOVE NGVD

PREPARED FOR HAYDEN-WEGMAN		
BARKER, OSHA & ANDERSON		
TITLE GROUND-WATER CONTOURS WITH DRY-SEASON PUMPING FROM ALL WELLS SHOWN/DRY SEASON RECHARGE RATE, AFTER SIX MONTHS OF CONTINUOUS PUMPING		
DESIGNED BY P. JAKOB	Geraghty & Miller, Inc. Palm Beach Gardens, Florida	DATE MARCH '85
CHECKED BY P. JAKOB		REVISIONS
SCALE	NONE	FIGURE 7

- 14 -

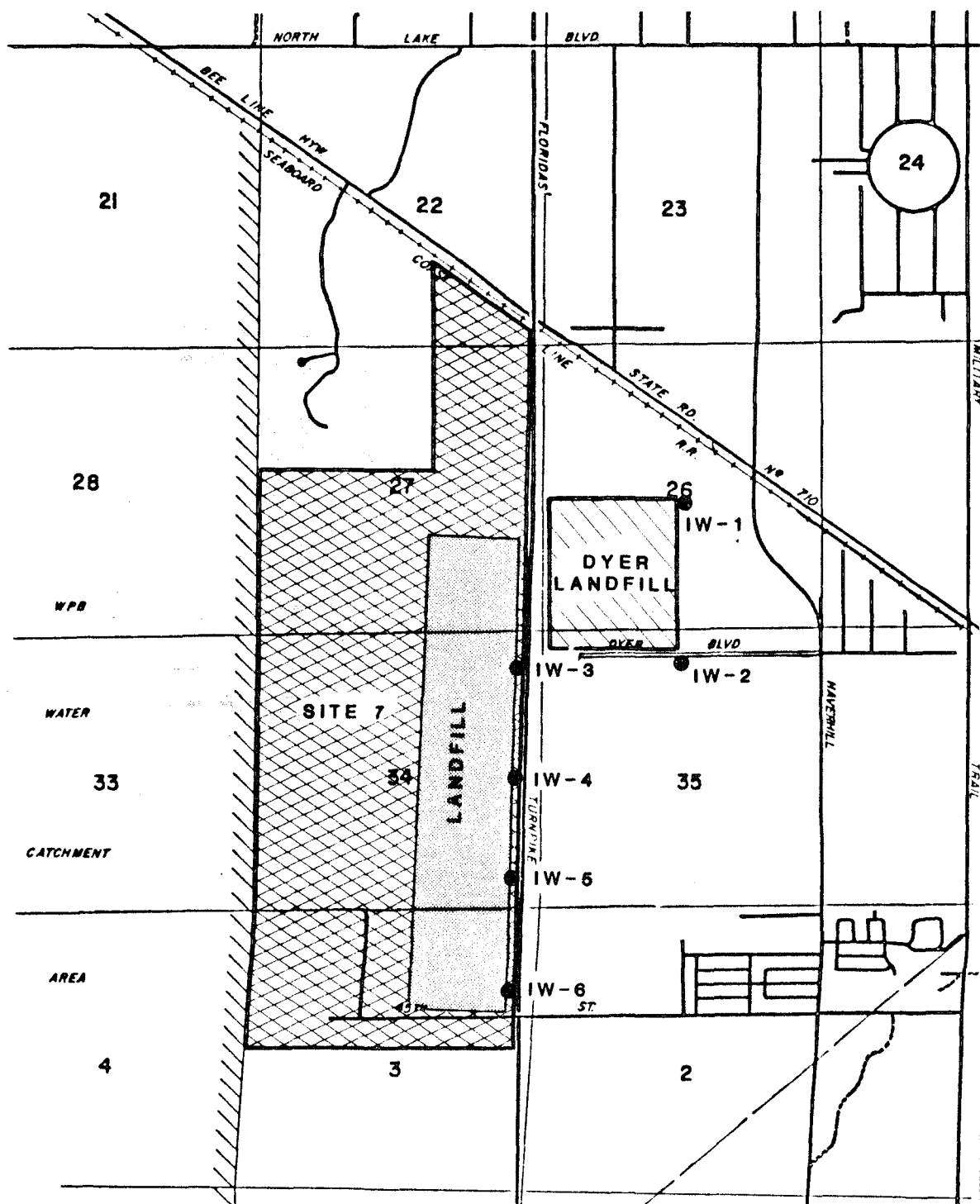
thus demonstrated even under conditions of prolonged pumping at peak-month rates during a 1-in-10-year drought.

To test the extent of drawdown in the RB wells due to pumping the interceptor wells at the end of the dry season, the same model configuration as described immediately above was run without the interceptor wells. The highest resulting head in the vicinity of the RB wells was only 0.4 feet higher at the end of dry-season pumping. Compared to the available drawdown in the RB wells (likely to be about 50 feet), the 0.4 feet of drawdown in the RB wells caused by the interceptor wells is less than one percent - an insignificant impact.

Operation of the interceptor wells will not adversely impact other neighboring ground-water users. Besides the RB wells, the nearest possible wells that could be affected are private wells located about 0.5 miles north from the most northern interceptor well. These private wells would experience a drawdown of about 0.2 feet due to pumping the interceptor wells after 180 days of dry-season pumping; this is not a significant impact. It is concluded from the ground-water model that six interceptor wells, in the locations and operating at pumping rates as described above, will: (1) intercept ground water known to be degraded and that which potentially may be degraded, (2) provide an industrial water supply for the Site 7 facilities, (3) provide irrigation water for the Dyer Landfill and Site 7 landfills, and (4) have no significant impact on existing and proposed wells of the City of Riviera Beach or private wells nearby.

The recommended locations of interceptor wells are shown on Figure 8. These locations can be adjusted by a few hundreds of feet without significantly affecting their performance; this may be necessary to avoid co-location with existing or other planned structures. The recommended average rates of pumping of the interceptor wells is shown on Table 2. Wells should be equipped with pumps capable of pumping 500 gpm (gallons per minute) each in order to provide managerial flexibility. Each of the four interceptor wells west of the Turnpike

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LEGEND

● IW-1 INTERCEPTOR WELL AND NUMBER

0 2000 4000
SCALE FEET

PREPARED FOR HAYDEN-WEGMAN
BARKER, OSHA & ANDERSON

TITLE

RECOMMENDED LOCATIONS OF
INTERCEPTOR WELLS

COMPILED BY
P. JAKOB
DRAWN BY
R. PADULA
CHECKED BY
P. JAKOB

Geraghty & Miller, Inc.
Palm Beach Gardens, Florida

SCALE SHOWN

DATE
MARCH 1985
REVISED

FIGURE 8

TABLE 2

RECOMMENDED PUMPING SCHEDULE
FOR INTERCEPTOR WELLS

<u>Well</u>	<u>Wet Season</u>	<u>Dry Season</u>
IW 1 and 2	500 gpm* for 10 hours per day for Site 7 use	500 gpm for 10 hours per day for Site 7 use or alternatively for irrigation on Dyer Landfill
IW 3, 4, 5 and 6	500 gpm for 11.67 hours per day for Site 7 use	500 gpm for 21.67 hours per day for Site 7 use; 0.6 mgd is designated for irrigation on Site 7 landfills
Total Pumping Rate	2.0 mgd**	3.2 mgd

* gallons per minute

** million gallons per day

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- 15 -

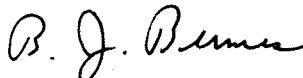
will be pumped at an average of 0.35 mgd during the wet season and 0.65 mgd during three months of the dry season. Each of the two interceptor wells at the Dyer Landfill will pump at an average of approximately 0.30 mgd.

Previous work conducted by Geraghty & Miller, Inc. (1982), south of the landfill indicated that interceptor wells well tapping the principal aquifer should be designed with a well screen and gravel pack. Well construction should be preceded by a pilot hole to determine the exact vertical interval for installation of the well screen; that interval should be approximately between 50 and 100 feet below grade. The well should be constructed with a grouted casing having a diameter of at least 12 inches extending from land surface to about 50 feet below grade. The well casing annulus should be grouted in its entire length to protect against entry of surface water. The well screen should have a diameter of at least 6 inches; it should be installed through the casing and be fitted on top with a riser pipe of the same diameter as the well screen and have a length of about 15 feet. The riser pipe should be situated inside the bottom portion of the casing. A suitable gravel pack should be installed in the annular space outside the well screen and about one half the height of the riser pipe. With an estimated well-friction loss in head of 5 feet, pumping any of the wells at a rate of 500 gpm would produce a drawdown in the well of approximately 15 feet.

Respectfully submitted,
GERAGHTY & MILLER, INC.



Paul G. Jakob
Senior Scientist



Boris J. Bermes
Senior Scientist

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GROUND-WATER LEVEL ELEVATIONS
in feet above mean sea level

		Well 1	Well 2	Well 3	Well 4
Date	Time				
7/11/84	am	14.56	14.12	14.29	16.48
	pm	--	14.06	14.19	16.46
7/12/84	am	14.56	14.08	14.02	16.64
	pm	14.53	14.05	13.96	16.55
7/13/84	am	14.54	14.07	--	16.61
	pm	14.51	14.01	--	16.50
7/14/84	am	14.51	14.02	--	16.56
	pm	14.48	13.98	--	16.49
7/15/84	am	14.49	14.01	--	16.59
	pm	14.45	13.96	--	16.45
7/16/84	am	14.47	13.97	13.88	16.51
	pm	14.41	13.89	13.76	16.36
7/17/84	am	14.41	13.90	13.82	16.45
	pm	14.38	13.85	13.71	16.32
7/18/84	am	14.38	13.85	13.77	16.39
	pm	14.33	13.78	13.64	16.24
7/19/84	am	14.34	13.78	13.70	16.15
	pm	--	13.83	13.78	--
7/20/84	am	--	13.64	13.81	--
	pm	--	13.79	14.21	--
7/21/84	am	--	13.90	14.21	--
	pm	--	13.97	14.36	--
7/22/84	am	--	13.98	14.48	--
	pm	--	14.06	14.44	--
7/23/84	am	--	14.05	14.43	--
	pm	--	14.14	14.55	--
7/24/84	am	--	14.12	14.48	--

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APPENDIX 10.15

ENVIRONMENTAL NOISE STUDY

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APPENDIX 10.15

FINAL REPORT

ENVIRONMENTAL NOISE STUDY

RESOURCE RECOVERY FACILITY

PALM BEACH COUNTY SOLID WASTE AUTHORITY

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A. INTRODUCTION

An environmental noise study of the proposed Resource Recovery Facility has been undertaken. The purpose of this study has been to identify significant noise-related impacts associated with the development and operation of the proposed facility. In characterizing these noise related situations attention has been paid to identifying adverse noise impacts which may occur and to identifying feasible noise mitigation schemes to address these problems.

The scope of this study addresses the development of the facility, its operation and the closing out of portions of the facility as time progresses into the future. The focus of this work includes noise impact on the surrounding areas including those areas nearby which might be affected by noise emanating from activities on the landfill site itself. Additionally, attention is given to the effect of surface transportation units as they go to and from the facility. This transportation effect comes about from the noise generated from vehicles using the roads in the surrounding areas.

Attention is given to noise levels at on-site locations as well. The operation of the landfill and resource recovery plant involves the use of large equipment capable of generating significant noise levels at operator positions. These factors are considered in the analysis of this subject.

In the development of this report the text material is organized as to noise impacts off the site from on-site sources and transportation sources and as to noise impacts on the site from on-site sources. Each individual section is further organized to include the ambient sound level conditions which could be expected if no noise sources related to the proposed facility were expected.

In order to assess the significance of noise from the proposed landfill facility recommended or required noise level criteria are included. Projected

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noise levels for noise-sensitive sites and situations on and around the facility are developed based on predictive models of known accuracy and from field data taken from other similar existing situations. Noise impacts have been ascertained based on a comparison of the noise levels anticipated from the proposed facility and both recommended or required criteria as well as noise levels which existed prior to the proposed facility. Where noise impacts have been identified their severity has been described and, where warranted, noise mitigation alternatives are presented.

The discussion now turns to the elements of the study. Following the order in which they are addressed, the text will discuss the subject of existing noise levels in the project area. Attention will then be given to noise impact in surrounding areas as a result of surface transportation units going to and from the landfill and resource recovery facility. Attention is then paid to the effect of noise radiated from the facility area into surrounding areas. Finally, the subject of noise impact on-site is considered. A summary is included as a final section which includes all findings and recommendations arising from this study.

As a final note, the sound levels used to describe environmental conditions will be described in terms of their amplitude and time character. A-weighted sound levels are employed as is the practice in environmental acoustics. The time-dependent characteristics of the sounds will be described in terms of the maximum sound levels, the equivalent energy levels or LEQ as well as the L10 and L50 levels.

The LEQ is a measure of the average energy over a period of time and is most often cited due to its relatability to community reaction. The L10 and L50 provide estimates of the sound levels which are exceeded 10% and 50% of a measurement period respectively. In traffic noise problems for example, an

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Activity Category	Design Noise Levels - Decibel (Hourly)		<u>Description of Activity Category</u>
	$L_{eg}(h)$	$L_{10}(h)$	
A	57	60	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheatres, particular parks or portions of parks, open spaces, or historic districts which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B	67	70	Picnic areas, recreation areas, playgrounds, active sports areas, and parks which are not included in category A and residences, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals.
C	72	75	Developed lands, properties or activities no included in categories A or B above.
D	--	--	
E	52	55	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

TABLE 10.12-1 Recommended sound levels as developed by
Federal Highway Administration (FHWA).

hourly period is employed. Figure 10.12-1 presents a selection of representative situations and their respective sound levels. Tables 10.12-1 and 10.12-2 and 10.12-3 include recommended design criteria for acceptable noise levels in decibels (dB).

In the text of the report, specific references will be made to appropriate recommended or required noise levels requisite for a desired degree of environmental quality. It should also be kept in mind that while impact may be incurred if those criteria levels are exceeded, changes in sound levels, if sufficiently great, may also constitute an impact. Generally a 1 dB to 3 dB change in sound level may not be perceptible. An increase from 3 dB to 5 dB becomes more so and under the appropriate conditions may cause public reaction. A 10 dB increase in the sound level will be clearly noticeable and when caused by a distinct change in the nature of the acoustic environment should be a matter for concern.

TABLE 10.12-2 Recommended Sound Levels as Developed by
Department of Housing and Urban Development

	Twenty-four hour day-night average sound level with 10 dB penalty for period from 10 PM to 7 AM
Acceptable	Not exceeding 65 dB
Normally Unacceptable	Above 65 dB but not exceeding 75 dB
Unacceptable	Above 75 dB

TABLE 10.12-3 Noise Level Limits from Palm Beach County Noise Ordinance for Fixed Mechanical and Other Noise Sources Excluding Vehicles on Public Roads

Maximum Permissible Sound Levels, General Prohibition

No person shall operate or cause to be operated any source of sound from any location in such a manner as to create a sound level which exceeds the limits set forth in Table 1 for inhabited residential receiving land more than ten percent (10%) of any measurement period, which period shall not be less than ten minutes when measured at or within the property boundary of the complaining property. A violation of this Ordinance shall have occurred without the occasion of the measurements being made as provided herein if circumstances are such that the offending sound, because of its very nature, is usually loud and obviously offensive to a reasonable prudent person or ordinary sensitivity situated upon the complaining property.

Sound Level Measurement shall be made with a Type 2 or better sound level meter using the A-Weighting Scale in accordance with the standards promulgated by the American National Standards Institute (ANSI).

Measurement Location: All measurements shall be made with a sound meter at or within the boundary of the complaining property.

TABLE 1

MAXIMUM PERMISSIBLE SOUND LEVELS
FOR INHABITED RESIDENTIAL RECEIVING LAND

<u>Receiving Land</u>	<u>Noise Source</u>	<u>Time</u>	<u>Sound Level Limit</u>
Inhabited Residential Land	Fixed Mechanical Equipment	Any Time	60 dBA
	All Others	7:00 AM - 11:00 PM	60 dBA
		11:00 PM - 7:00 AM	55 dBA

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B. EXISTING NOISE LEVELS

As a beginning to the project it was necessary to survey the area as to land use, identify noise-sensitive areas and to characterize existing noise levels. The areas of the project, together with their respective existing noise levels, are provided in Table 10.12-4.

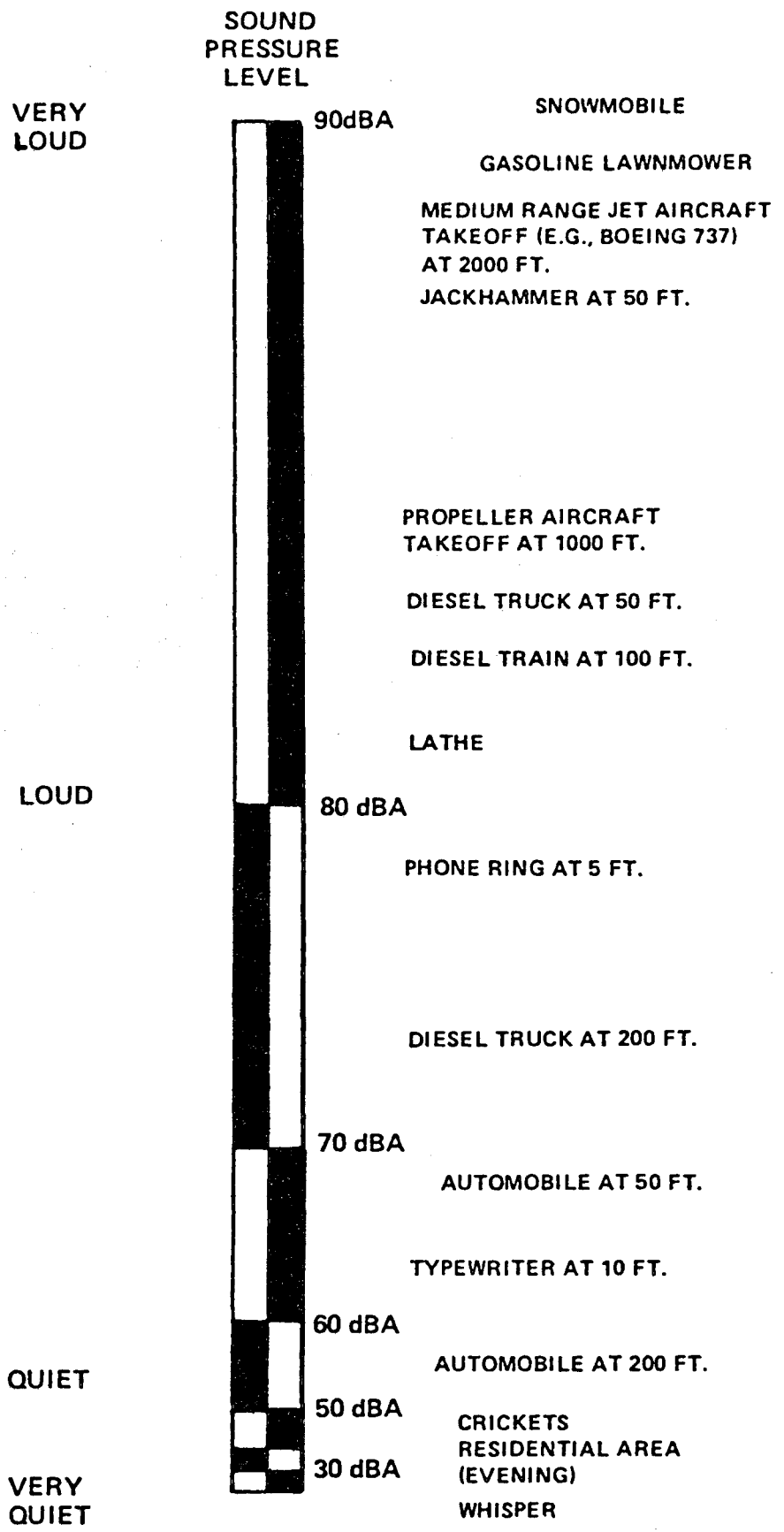
To summarize, one may orient relative to 45th Street which presently is the street heading to the entrance of the facility. On Haverhill Road, a developed residential area exists at the 45th Street-Haverhill Road intersection on the northwest corner. Further north, residential areas exist and then the character of the area tends to industrial. South on Haverhill from 45th Street, the area contains residential areas from around Roebuck Road to the south. Around the intersection of Haverhill and Okeechobee and south the development is a mixture of commercial and residential.

Well to the north the Bee Line Highway runs from West Palm Beach to the northwest. From the intersection of Bee Line and Haverhill and to the west to the Florida Turnpike a residential area lies to the north of the Bee Line. A substantial setback exists between this development and the Bee Line.

Military Trail is developed commercial north of 45th Street. South of 45th the development is a combination of residential, commercial and great extents of open areas. Okeechobee Boulevard to the south is a major east-west artery and is developed in a commercial fashion. Residential multi-family exists to the north but is set back from the road some distance.

On 45th Street, east of Haverhill Blvd., the development is a mixture of residential and commercial. A stretch of residential development exists on the north side of 45th Street west of Haverhill a portion of the distance to the Florida Turnpike.

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FIGURE

Selected Representative Activities and Associated Sound Levels.

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Noise levels in these areas were measured during the daytime hours in order to relate to the anticipated hours of operation of the landfill facility. These levels are included in Table 10.12-4. Noise levels were found to be dominated by the traffic which presently exists on Haverhill Road, Okeechobee Boulevard, Military Trail and 45th Street. The distances indicated in Table 10.12-4 are to indicate the distances from the road edge to the point where the measurements were taken.

The industrial and commercial areas along the roads in question here were not the subject of undue noise impact due to existing traffic noise. Residential areas along these roads were similarly within accepted FHWA recommended criteria for highway noise levels although certain houses located closer to the roads than others did receive noticeable traffic noise. Areas such as along Haverhill Road were found to be the subject of traffic noise pollution, however not to an extent which obviously exceeded FHWA or HUD recommended criteria.

The residential area north of the Bee Line receives some traffic noise from the Bee Line and the Florida Turnpike. This effect is felt primarily along the boundary properties of the area. Sound levels measured within this area were within federal guidelines and were lower as one moved into the area.

TABLE 10.12-4 Areas Within the Overall Project Area with
Representative Existing Weekday Sound Levels

<u>AREA</u>	<u>DISTANCE TO MAJOR ROAD</u>	<u>WEEKDAY SOUND LEVEL LEQ (dBA)</u>
45th St., West of Haverhill	100'	54
Haverhill, 45th to Roebuck	100'	62
Haverhill, Roebuck to South of 12th	100'	60
Haverhill, 45th to Port Road (Bee Line)	100'	58
Okeechobee, Turnpike to Haverhill	100'	65
45th, Military Trail to Haverhill	100'	58
45th, I-95 to Military Trail	100'	63
Military Trail, Roebuck to Port Road (Bee Line)	100'	60
North of Port Road and East of Turnpike	150'	55

C. NOISE IMPACT ON SURROUNDING AREAS DUE TO TRANSPORTATION UNITS MOVING TO AND FROM THE PROPOSED FACILITY

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The development and operation of the proposed Resource Recovery Facility will include the delivery of material to the facility, as well as the departure of these vehicles empty of material from the facility. These activities will be accomplished in large part through the use of a variety of trucks which will access the facility through its main entrance, the portion on N.W. 45th Street west of the Florida Turnpike. These vehicles in turn will move to and from N.W. 45th Street on a variety of roads. It is the purpose of this section to describe the analysis and findings of a study to determine the impact of the facility-related traffic on the areas through which it will pass.

Traffic flow patterns related to the proposed facility have been developed by the firm of Kimley-Horn and Associates. Based on their analysis which is presented in detail in another part of the complete report on the facility, traffic due to the facility is anticipated to occur on the surrounding roads including Haverhill Road, north and south of 45th Street, on Military Trail, north and south of 45th Street, on 45th Street and on Okeechobee Boulevard between Haverhill Road and the Florida Turnpike.

The traffic data developed by Kimley-Horn was employed in the FHWA Traffic Noise Prediction Model to predict traffic generated noise levels generated by the facility-related traffic over and above the existing levels. A growth in traffic on all the roads in question is expected to occur over existing traffic due to the growth of the area irregardless of the development of the facility. Thus the comparison of facility related noise impact to existing noise levels will be the more dramatic comparison.

With regard to the significance of these traffic levels, the Kimley-Horn traffic assessment indicates that the additional traffic related to the facility

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on Military Trail and on Haverhill Road north of 45th Street has an "Insignificant Effect" on the level of traffic expected. These traffic levels would similarly have an insignificant impact on the noise from these roads.

Sound levels in these cases in terms of LEQ and L10 would be increased by less than 1 dB over those which presently exist. This increase would not be discernible in the residential areas along Haverhill Road to the north of 45th Street. Further north along 45th Street the area becomes industrial and is not considered a noise-sensitive area. Further, the sound levels in this area are within acceptable limits insofar as recommended noise levels are concerned, thus no significant impact is expected. These traffic noise levels together with their associated noise impacts ratings are summarized in Table 10.12-5.

The Kimley-Horn studies project somewhat greater levels of facility-related traffic on Okeechobee Boulevard, Haverhill Road south of Okeechobee Boulevard, Haverhill Road between N.W. 12th Street and N.W. 45th Street and 45th Street between Military Trail and Haverhill Road. These facility-related traffic increases are rates as being "Insignificant Impact" by Kimley-Horn from a traffic point of view. Noise impacts from the traffic on Haverhill Road south of Roebuck Road, on Okeechobee Boulevard, and on 45th Street between I-95 and Military Trail can be expected to have little additional impact on the contiguous areas. Noise levels in terms of LEQ or L10 values should increase on the order of 1.5 dB over existing levels. This level of increase is not expected to be perceptible. Hence no significant impact is expected in these areas. Again, these situations are summarized in Table 10.12-5.

The area along Haverhill Road between Roebuck Road and 45th is projected to carry the same number of project-related vehicles as the remainder of Haverhill south to Okeechobee. Because existing traffic levels are somewhat lower, a lightly greater increase in noise level is expected. However, the increase

TABLE 10.12-5 Project Study Areas with Existing and Projected Exterior Sound Levels and Assessed Impact for Weekday Periods

<u>AREA</u>	<u>EXISTING SOUND LEVEL LEQ (dBA)</u>	<u>PROJECTED SOUND LEVEL LEQ (dBA)</u>	<u>SOUND LEVEL CHANGE/IMPACT</u>
Residential, 45 St. West of Haverhill	54	62	8 dB/Moderate to Significant Impact
Haverhill, 45th to Roebuck	62	64	2.5 dB/Slight Impact
Haverhill, Roebuck to 12th	60	62	1.5 dB/No Impact
Haverhill, 12th South	60	62	1.5 dB/No Impact
Okeechobee, Turnpike to Haverhill	65	66	1 dB/No Impact
45th, Military Trail to Haverhill	58	62	4 dB/Slight Impact
45th, I-95 to Military Trail	63	65	1.5 dB/No Impact
North of Port Road East of Turnpike	55	56	1 dB/No Impact
Military Trail, Port Road (Bee Line) to Roebuck	60	61	1 dB/No Impact
Haverhill, Port Road (Bee Line) to 45th	58	59	1 dB/No Impact

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itself should present a minor impact. This taken with the fact that sound levels are within recommended criteria for these areas and will be expected to remain so at noise-sensitive sites, indicates that no significant impact is anticipated along this part of Haverhill.

With regard to the length of 45th Street between I-95 and Haverhill, the stretch from I-95 to Military Trail is expected to experience a small sound level increase which should be difficult to notice over existing conditions. Thus the project presents no significant impact on the area along 45th Street.

For the length of 45th between Military Trail and Haverhill an increase of some 4 dB may be anticipated. This is characterized as a moderate increase in sound level. This area is mainly commercial with a small number of existing residences set well back from the road. Because projected levels at these sites are within recommended criteria no significant impact is projected in this area.

The portion of 45th Street west from Haverhill to the landfill entrance will act to convey all of the vehicles associated with the facility. Because very little traffic presently uses this road an increase in sound levels of some 8 dB is anticipated along this road. This increase in level is significant and is expected to be noticeable as existing sound levels in the residential development along 45th Street are within criteria and are subject only to existing traffic on Haverhill Road. However, even with the increase caused by the landfill vehicles the levels will continue to remain with recommended ranges of Tables 10.12-1 and 10.12-2 but rather toward the higher end. Thus the residential area along 45th Street west from the intersection of Haverhill Road will experience a moderate to significant noise impact because of the increase over existing levels. This can also be said of the residences in the immediate vicinity of the Haverhill and 45th Street intersection.

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The single family homes located along 45th Street are set back some 100 feet from the road due to a service road which lie between 45th Street and the houses. This helps to mitigate the effect of the anticipated noise on these homes. The houses along Haverhill just to the north of the intersection of 45th Street adjoin the Haverhill right-of-way and especially at the corner of 45th and Haverhill are close to the traffic noise sources.

The noise from the road will impact both front and rear areas of homes. Additionally, homes with open windows would be subject to increased levels of interior noise as well. This impact would be most significant along the nearest two rows of homes.

While recommended noise level criteria should not be exceeded some consideration as to how to mitigate the traffic noise is warranted. A noise wall between 45th Street and the residences is one alternative which could be used to some effect to reduce the noise from vehicles on 45th Street. Such a wall would be on the order of twelve feet in height or more and run at least the distance of the residential area along 45th Street. A detailed examination of the problem would be required and some consideration to wrapping the wall around at the east and west ends of the residential area would be advised.

Additionally, the landfill facility management could adopt a policy of not admitting any vehicles to the site of its engine exhaust system were in an improper state of repair, was unusually noisy or the engine and mechanical enclosures were in an improper state of repair. Such a policy, if adopted, would eliminate the unusually noisy vehicles from using 45th Street and thus reduce the impact on the residential neighborhood. Also, signs could be posted along 45th Street and Haverhill Road on all four sides of the intersection to caution truck drivers to operate their vehicles with a minimum amount of noise, consistent with safety.

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Another alternative to reduce the noise impact on these residences would be to move the traffic route to the south of the current 45th Street right-of-way. This could be accomplished by using undeveloped land to the south of 45th Street in which to locate an east-west access road to join to the present 45th Street near to the Turnpike overpass. Such a road would be placed at least 500 feet to the south in order to offset the effect of the traffic increase past the houses.

Additionally, the effect of the intersection could be offset by developing another route from 45th Street between Haverhill Road and Military Trail to the new access road. This could be accomplished by using the Florida Power & Light Company transmission right-of-way which cuts from 45th Street to the southwest through Haverhill Road. Truck traffic coming west on 45th could divert along this new road to a new intersection on Haverhill with the new site access road. Thus truck traffic associated with the facility could avoid the residential area at the corner of 45th and Haverhill and thus eliminate that noise impact.

In summary, over the majority of the roads affected by traffic related to the facility, little noise impact is anticipated. In the residential area at the corner of 45th and Haverhill Road, significant noise impact is expected especially for those houses along 45th Street. This can be mitigated or eliminated through several alternatives, the most effective of which is to develop a new access road and intersection at least 500 feet to the south of the existing 45th Street right-of-way. The alternative to establish a new access right-of-way uses distance to mitigate the expected noise impact. This approach is clearly the most reliable one of the several offered before and is recommended as such from a noise control point of view.

As a final note, the effect of resource recovery related vehicular traffic noise will, to a certain extent, be made less distinct due to the present of a

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traffic growth which will come about due to other demands. This is true, in varying degrees, over the entire extent of the project.

D. ON-SITE NOISE SOURCE ASSESSMENT

As part of the noise study of the proposed Resource Recovery Facility, a noise survey was done to estimate the on-site noise levels. The activity on-site can be divided into two parts; the refuse processing plant, which is stationary, and the landfilling activity which involves non-stationary equipment. To determine the projected noise levels both inside the refuse processing plant and outside, noise measurements were done at a similar facility. With regard to the noise from the non-stationary equipment measurements were done at the existing Haverhill landfill facility.

In general, based on noise levels as measured at an existing similar facility, the predicted sound levels can be expected to vary between 70 to 95 dBA (Table 10.12-6). In the areas where the noise levels are close to 90 dBA or higher no personnel are to be present in these areas without hearing protection. The controls of noisy equipment will be inside enclosed rooms which thus insulate the operator from the surrounding noise. A discussion of the noise levels in the different sections follow.

Tipping Areas: The noise levels at two tipping areas at the studied facility were measured. One of the tipping areas, handling non-household waste, was situated outside while the other tipping area for household garbage was situated within an enclosed building. Because of the different nature of the surroundings and the variety of operations in both tipping areas, the noise levels created where the dozer or trucks are in operation is different.

The measured noise level at the inside tipping area with the overhead crane and trommel in operation is approximately 75 dBA. The noise level increases when either the bulldozer is in operation or a truck unloads. With the dozer in

operation, at full load, the internal ambient level increases to 90 dBA. With only a truck unloading the internal ambient noise level is approximately 83 dBA. Since this area is enclosed with the walls acoustically hard the generated sound field is highly reverberant.

For the outside tip facility, the measured external ambient level with the shredder and lifting crane in operation is approximately 78 dBA. The noise from the dozer, operating at full load, at a distance of ten feet is approximately 94 dBA.

With regard to the operation of any outside shredder facility activities, the level of noise outside the control room will range from some 75 dBA to 95 dBA. Personnel hearing protectors can be employed for the higher level exposure areas as employees are not permanently located there. The recommended noise level in the control room should be about 60 dBA. This level is suggested so that the operator inside the control room will be able to maintain the necessary concentration to avoid explosive cylinders entering into the shredder.

Magnetic Separator and Rotary Trommel: Sound level values will vary in this area ranging from 70 dBA to 85 dBA depending on the proximity to particular pieces of equipment.

Turbo Generator Area: The noise level in the turbo generator building, as measured at the studied facility, is some 75 dBA. The building has acoustically hard walls and the measured noise field was highly reverberant. The noise levels were constant everywhere in the area. There are usually no working personnel in this area and the noise at the studied facility was contained within the building.

Boiler House: Inside the boiler house the measured noise level is some 90 dBA. Most of the generated noise within this area is due to the high velocity, secondary air supply which is used for the even distribution of the fuel inside

the furnace. The noise level in the boiler house as measured is mainly reverberant and thus independent of location.

As for the turbo generator area, no personnel are expected to be permanently near the boilers. All the controls will be inside a control room which is shielded from the boiler noise. It would be recommended that the noise level of the control room be about 55 dBA. The noise from the boilers is well contained inside the boiler house and it would be expected that it will not contribute significantly to the ambient noise level of the area.

Other Outside Equipment: Typical noise levels from other outside equipment were also obtained from measurements done at the studied example plant. The noise levels generated both by large cooling tower and by large fans were measured. The noise from the fans is some 70 dBA at a distance of 50 feet from the fan. The level was highly influenced by the background noise from most of the other equipment on site. The noise level from the cooling towers at a distance of 100 feet from the foot of the tower was also about 75 dBA. Thus it will be expected that the noise level at distances greater than 300 feet from the facility will not be impacted by the outside equipment of the plant.

The measured levels at the studied facility will be the predicted noise levels that will be radiated from the fixed on-site equipment at the new Palm Beach County facility. Although the ambient noise levels varied from 75 to 95 dBA the general ambient noise level outside of the plant was about 75 dBA. This ambient level was the prevailing level within the plant perimeter. That is, this will not be the noise level away from the facility site. The level that must be considered to determine the impact of the new facility on the existing environment will depend on the distance between the considered location and the facility site.

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Noise from Moving Equipment: The predicted noise levels from the moving equipment are based on measurements taken at the existing Haverhill facility. Included in the measurements are the noise levels of typical trucks after they leave the weighing platform.

At the existing Haverhill facility, the following equipment is presently being used: Bulldozers to spread and cover the waste; compactors; and pans to transport the dirt for covering. The maximum noise levels measured at indicated distance for the different equipment are listed in Table 10.12-7. The noise levels that were measured vary between 85 to 93 dBA at the indicated distances. The measurements were done when the equipment was operating at full load, and the high level of noise was not continuous.

With regard to the noise levels present near the weighting scales, due to the accelerating trucks, the levels were in the region of 70 to 83 dBA at a distance of 15 feet from the middle of the road.

The general ambient noise level present to this landfill facility from the moving equipment did not exceed 70 dBA. This is comparable to the level measured from the facility.

Assessment of Impact Off-Site

Both from the stationary and non-stationary equipment the ambient noise level on-site does not exceed 75 dBA. Thus the predicted ambient noise level for the proposed Resource Recovery Facility is not expected to exceed this noise level.

Taking into consideration the nature of sound propagation from the facility site, areas at distances of greater than some 300 feet from the facility are expected to experience insignificant changes in their ambient noise levels. Noise levels from the facility would then be reduced to levels in the range of some 50 dBA or less. These sound levels would be comparable to or less than pre-

TABLE 10.12-6 Facility Noise Levels

<u>LOCATION</u>		<u>NOISE LEVEL</u>
Trash Shredder:	ambient	78 dBA
	with bulldozer	
	in operation	94 dBA at 10 feet
	control room	65 dBA
	side of shredder	76 dBA
Garbage Tipping Area:	ambient	74 dBA*
	truck unloading	83 dBA*
	bulldozer	90 dBA*
Turbo-Generator:		74 dBA*
I.D. Fan:		73 dBA at 50 feet
Cooling Tower:		74 dBA at 100 feet
Boiler House:		89 dBA (max)*
Separators:		86 dBA 6 feet from conveyor

Noise impact will depend on exposure time.

* REVERBERANT FIELD

TABLE 10.12-7 Landfill Non-Stationary Equipment

<u>EQUIPMENT</u>	<u>NOISE LEVEL</u>
Pan	85 dBA at 20 feet 90 dBA at 10 feet
Caterpillar	93 dBA at 10 feet 94 dBA at 3 feet
Bulldozer	84 dBA at 50 feet
Compactor	86 dBA at 5 feet
Dredge	98 dBA at 3 feet 94 dBA at 5 feet
General Ambient	60 - 70 dBA
Trucks	63 - 82 dBA

Noise impact would depend on exposure time.

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sently existing traffic noise levels in areas in the vicinity of the proposed site.

The Grier ranch and houses are also at distances of greater than 300 feet from the facility. The buildings in this area are situated about 600 feet from the property line. Thus the distance between the facility site and any of these buildings is large enough so that no adverse noise impact will be created.

Therefore, it can be concluded that nowhere in the vicinity, except areas on-site, will high noise levels exist. The impact of the new facility on the surroundings is insignificant and, in places, non-existent.

Proposed Noise Control Measures On-Site

Although the facility will not have an adverse impact on the surrounding areas it is recommended that some landscaping be done around the perimeter of the facility. Trees and earthen berms can be used around the perimeter to screen the facility from direct visual sight. Also, the use of earthen berms could contribute to the noise reduction since these will act as noise barriers. This is not acoustically necessary, but will make the facility more acceptable and less noticable.

With regard to on-site equipment, a number of measures are recommended to reduce the predicted noise levels. It is commonly recommended that the noise exposure for an eight-hour working day does not exceed 90 dBA. Although such a high level is not predicted to be existent in manned areas at the Dyer Boulevard facility it is recommended that when maintenance work is scheduled for areas with a noise level greater than 85 dBA, earmuffs are provided. Noisy areas include the boiler house, the turbo generator plant and near the shredder machinery. The control room near the outside shredder and the control room near the boiler should have a sound reduction of some 35 dB.

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The noise in the turbo generator plant room is mostly reverberant and it is recommended that acoustically absorbing blocks be considered in the construction of this plant building. Sound absorbing blocks will not create a fire hazard. By the use of such sound absorbing blocks the level in this area of the facility will be reduced and this will result in a reduction of the ambient noise level.

For the enclosed tipping area, no personnel should be allowed to work in this area without wearing earmuffs. Equipment operators should either have an enclosed cab or alternatively supplied with ear protectors.

The noise level generated by all the moving equipment both for that used near the plant and that on the landfill, as predicted, may be more than the recommended level especially at the operator position. Thus it is recommended that all moving equipment will be of the enclosed cab type or the operator supplied with adequate ear protectors. For this purpose the earmuffs must have a high noise reduction because the levels will exceed 90 dBA at full load. An industrial noise control and hearing protection program for the facility would serve to manage the overall aspects of the noise control effort on site.

E. SUMMARY

As part of the environmental study of the proposed Resource Recovery Facility, an acoustic study was undertaken to identify significant noise-related impacts associated with the proposed project.

The acoustical study addressed three different areas:

1. The presently existing traffic-related noise levels on roads close to the proposed site.
2. The prediction of increased noise levels due to the increased volume of traffic going to and from the proposed facility, and
3. The noise impact both on-site and off-site from both on-site stationary sources and transportation sources operating on the site.

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The presently existing traffic noise levels were obtained from field measurement and the results compared to depicted levels using the FHWA recommended model to insure accuracy. This predictive model was used to estimate the levels that would be associated with the increased volume of traffic due to the proposed facility.

Together with the measurement of the existing noise levels, the surrounding area for the proposed facility was surveyed to identify land use and any particular sensitive residential areas. Measurement locations were considered at some twelve different noise-sensitive sites around the proposed facility and along roads which would carry traffic to the facility. Noise level comparisons are based on amplitude values using A-weighted decibel levels as is the practice in environmental noise studies.

Measured presently existing traffic noise levels are within accepted FHWA and HUD recommended criteria. The predicted future noise levels are based on projected traffic data as supplied by Kimley-Horn and Associates, Inc. The predicted level of noise, in all of the residential areas around the proposed facility, due to the increased traffic volume, did not exceed FHWA or HUD recommended noise level criteria. However, along two sections of roads, on 45th Street; west of Haverhill Road and between Military Trail and Haverhill, an increase in noise level of approximately 8 dB (west of Haverhill) and 4 dB (Military Trail-Haverhill) respectively, is expected over existing conditions. 45th Street west of Haverhill will convey all the traffic into the proposed facility, while at present only local traffic makes use of this road. In this case, mitigation alternatives which include either a noise wall or relocation of the facility access road to the south, have been recommended so as to alleviate the impact. With regard to the section of 45th Street, between Military Trail and Haverhill Road, this section is mainly commercial and all residential

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property is well set back so the resulting impact is slight. The increase in level at all other roads is less than 2dB, making the impact insignificant at those areas.

With regard to noise impact off-site from on-site sources, general ambient on-site noise levels were estimated by comparison to existing similar facilities through actual noise measurements. The general on-site ambient level at this facility is expected to be some 75 dBA (max). Locations at distances greater than 300 feet from the areas of activity in the facility will not suffer significant increases in noise levels due to on-site activities. Thus, there is no significant noise impact expected off-site from the on-site equipment.

With regard to the noise impact on-site from on-site equipment, while for the most part serious noise problems are not expected, there are areas where the level of noise exceeds recommended OSHA levels. However, in general, high noise level areas are localized or enclosed and no personnel work within the area for extended times. Where personnel are present, alternative mitigation procedures, including personal hearing protection, are possible to reduce personnel exposure to noise to within recommended levels and criteria. Noise control of heavy equipment for the operators will be available using enclosed operator cabs and current noise control accessories.

In summary, no fatal flaw has been identified with regard to environmental noise resulting from the proposed Resource Recovery Facility for Palm Beach County. For the most part, environmental noise impact is slight and for those situations where an impact is anticipated, reasonable noise control alternatives have been identified and recommended.

APPENDIX 10.16

TRANSPORTATION ANALYSIS

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APPENDIX 10.16

**TRAFFIC IMPACT ANALYSIS
RESOURCE RECOVERY FACILITY
PALM BEACH COUNTY, FLORIDA**

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**TRAFFIC IMPACT ANALYSIS
RESOURCE RECOVERY FACILITY
PALM BEACH COUNTY, FLORIDA**

**Prepared for:
Palm Beach County
Solid Waste Authority**

**Prepared by:
Kimley-Horn and Associates, inc.
West Palm Beach, Florida**

**Updated March 1985
July 1984
COPR Kimley-Horn
4167.04**

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Updated March 1985
July 11, 1984
4167.04/P85-1

Mr. Sumpter H. Barker
Barker, Osha & Anderson, Inc./
Hayden-Wegman, inc.
860 U.S. Highway One
North Palm Beach, Florida 33408

Dear Mr. Barker:

We are pleased to submit our updated traffic impact report for the Resource Recovery Facility to be located on 45th Street in central Palm Beach County, Florida. This updated report reflects revised access conditions relating to Jog Road and Beeline Highway (State Road 710), and to reflect detailed employment figures for the Resource Recovery Plant.

It has been a pleasure working with you and if you have any questions, please do not hesitate to call.

Very truly yours,

KIMLEY-HORN AND ASSOCIATES, INC.

James R. Zook, P.E.
Principal

JRZ/mes

Florida Registration
Number 11479

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INTRODUCTION

A Resource Recovery Facility is proposed to be located in Palm Beach County on the north side of 45th Street, west of Florida's Turnpike. Access will be provided to 45th Street and Beeline Highway (State Road 710) via Jog Road which will be constructed through the project by the Solid Waste Authority. Kimley-Horn and Associates, Inc. was retained to determine the potential traffic impact which the proposed project would have on the adjacent roadway network and to prepare a traffic performance standards analysis.

The Traffic Performance Standards Analysis was conducted in accordance with the requirements of Palm Beach County and included roadways within a five-mile radius of the site. The traffic impact analysis examined the intersection through which the majority of development traffic will travel. Both analyses utilized current data available from Palm Beach County, which was supplemented with data collected in the field. It was assumed that the development was 100 percent built out and, therefore, the magnitude of traffic impact evaluated is the maximum that can be expected.

INVENTORY AND PLANNING DATA

Inventory

The data utilized in this analysis were obtained from Palm Beach County and from field studies performed by Kimley-Horn. The data included:

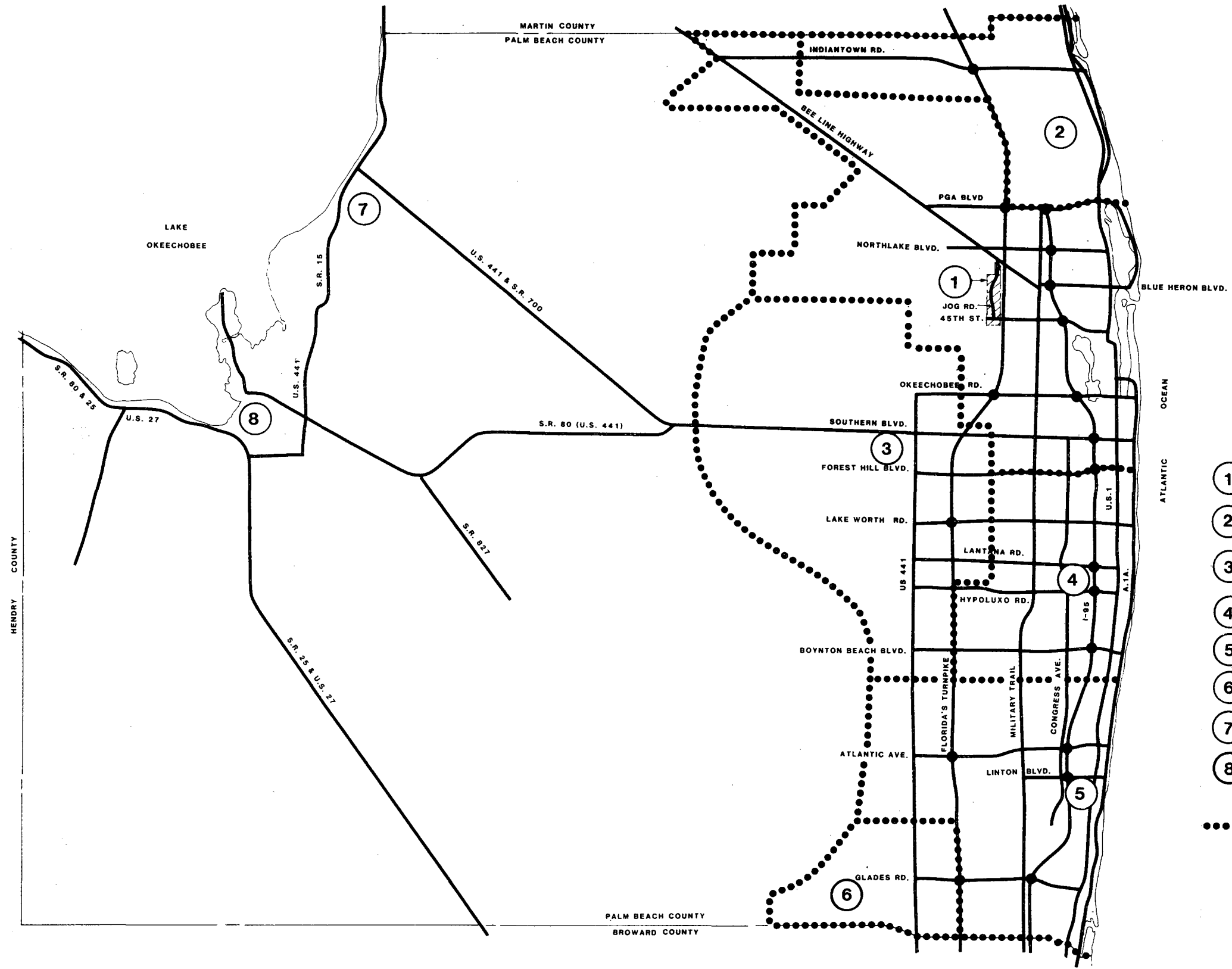
- o Peak hour turning movements (PM)
- o 1983 24-hour traffic volumes.
- o 1980 24-hour traffic volumes.
- o 1980 background traffic volumes.

Planning Data

Land use and development data were provided on a copy of the conceptual plan dated October 18, 1984, prepared by GBS Architects, Inc. The project is scheduled to begin operation in 1989.

In addition, information was provided on the operational characteristics of the proposed Resource Recovery Facility. This included the location of the transfer facilities and the actual number of trips from each transfer facility, and from the direct haul service area to the Resource Recovery Facility. The waste management facility locations are shown on Figure 10.16-1.

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- LEGEND**
- ① RESOURCE RECOVERY FACILITY
 - ② NORTH COUNTY TRANSFER FACILITY
 - ③ WEST CENTRAL COUNTY TRANSFER FACILITY
 - ④ SOUTH CENTRAL TRANSFER FACILITY
 - ⑤ SOUTH COUNTY TRANSFER FACILITY
 - ⑥ SOUTHWEST COUNTY TRANSFER FACILITY & CLASS III LANDFILL
 - ⑦ PAHOKEE LANDFILL FACILITY
 - ⑧ BELLE GLADE LANDFILL & TRANSFER FACILITY
 - AREAS SERVED BY FACILITIES

FIGURE 10.16-1
SOLID WASTE AUTHORITY
WASTE MANAGEMENT
FACILITY LOCATIONS

Kimley-Horn

TRAFFIC GENERATION, DISTRIBUTION AND ASSIGNMENT**Trip Generation**

The trip generation potential for this development was determined based on information provided by Palm Beach County Solid Waste Authority. Within the area directly served by the Resource Recovery Facility the project will generate approximately 500 daily truck trips. This is an area close to the Resource Recovery Facility and therefore not related to solid waste transfer. The trips attracted by the Resource Recovery Facility via transfer facilities totals only 170 truck trips per day. In addition, it is assumed the 124 employees at the Resource Recovery Facility will generate 248 vehicle trips per day. Table I lists the total from the direct haul service area, each transfer facility and the employee traffic. Also depicted in this table are the total trips generated by each transfer facility. None of the transfer facilities has a significant traffic impact.

TABLE I
WASTE MANAGEMENT FACILITIES TRIP GENERATION

	<u>Daily Trip Ends (VPD)</u> <u>To Resource Recovery Facility</u>
North County Transfer Facility	16
West Central County Transfer Facility	30
South Central Transfer Facility	44
South County Transfer Facility	54
Southwest County Transfer Facility	12
Belle Glade Landfill and Transfer Facility	14
R.R.F. Direct Haul Service Area	500
Subtotal (Truck traffic)	670
Plant Personnel (Auto traffic)	248
TOTAL	918

Trip Distribution

A trip distribution analysis was performed for the Resource Recovery Facility direct haul service area on a zone-to-zone basis utilizing 1990 population projections provided by Area Planning Board of Palm Beach County. Further consideration was given to the existing arterial network with its travel time characteristics. Figure 10.16-2 depicts the direct haul service area for the Resource Recovery Facility and the traffic analysis zones within the service area.

Other truck trips to the Resource Recovery Facility were distributed based on the trips generated by the transfer facilities. Trips generated by the plant personnel were distributed based on population densities.

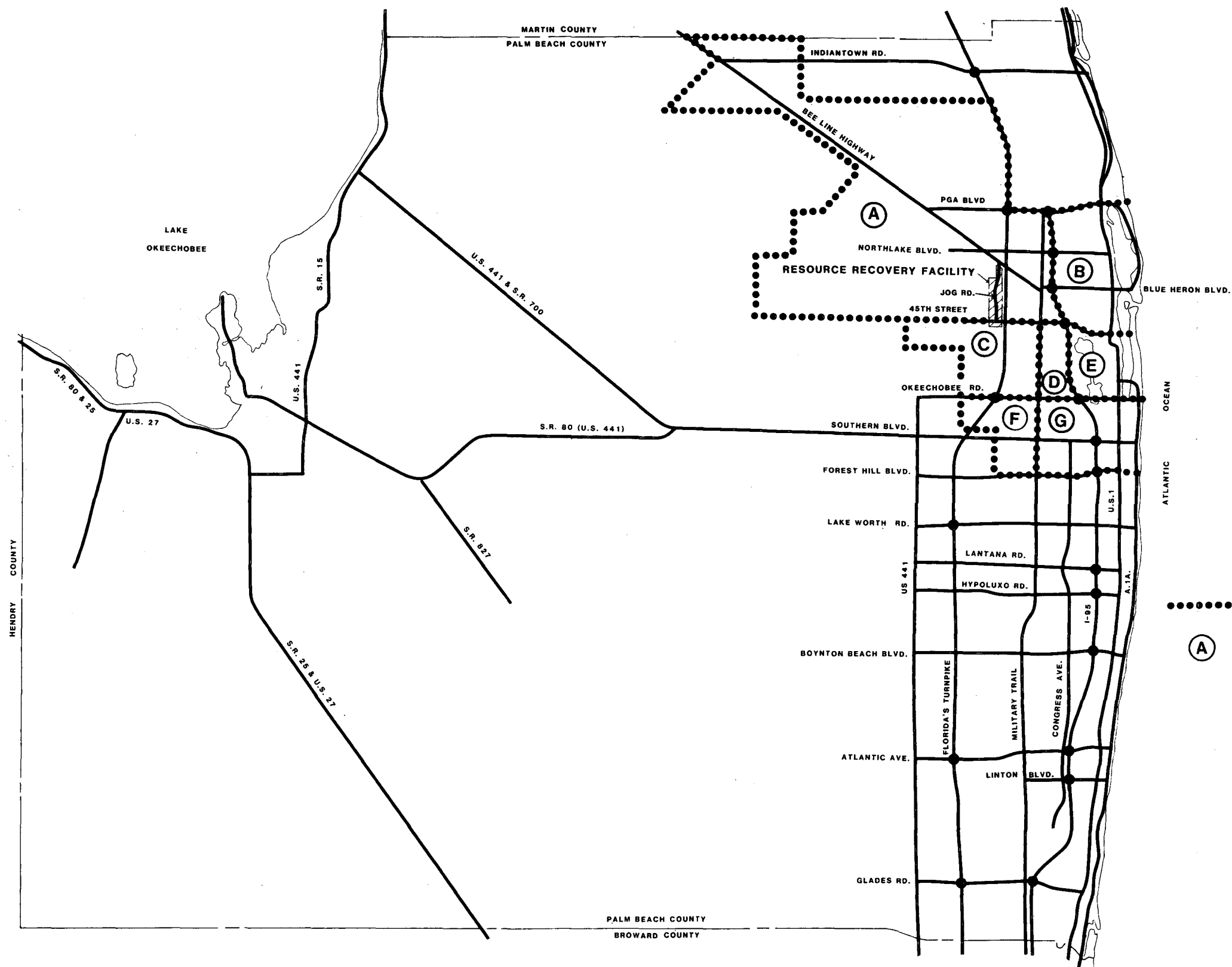
Traffic Assignment

The distributed traffic for the project at full build-out was assigned to adjacent roadways. This assignment was added to existing traffic.

Based on information regarding hours of operation, there will be negligible project impact during the peak hour of the adjacent streets. The traffic generated from the transfer facilities occurs from 8:00 a.m. to 4:00 p.m. and is evenly distributed during this period. The traffic from the Resource Recovery Facility direct haul service area occurs from 10:00 a.m. to 2:00 p.m.

Daily and peak hour traffic volumes are depicted on Figure 10.16-3.

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LEGEND

.....
TRAFFIC ANALYSIS ZONE BOUNDARY FOR
DIRECT HAUL SERVICE AREA

(A)
TRAFFIC ANALYSIS ZONE DESIGNATION

NOTE: TRIPS GENERATED WITHIN TAZ'S DO NOT UTILIZE TRANSFER
FACILITIES.

FIGURE 10.16-2
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY
SERVICE AREA

Kimley-Horn

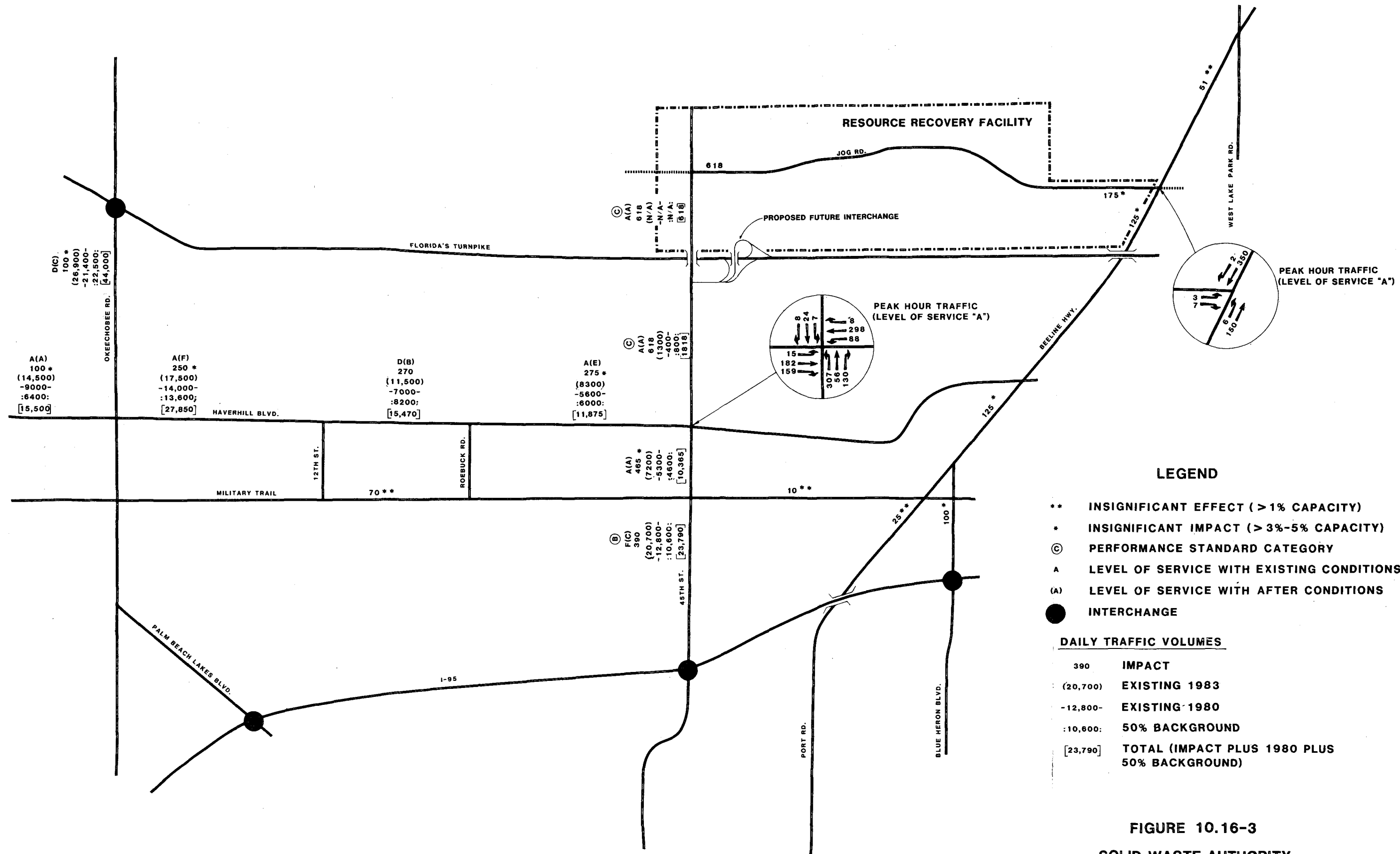
DETERMINATION OF PERFORMANCE STANDARD
CATEGORY AND LEVELS OF SERVICE

Traffic count data and estimates of traffic impacts were developed and used to evaluate County Performance Standard No. 3. This evaluation of the standard is in accordance with County Ordinance No. R-81.

An analysis of the 24 hour traffic volumes was performed. Volumes for 1980, project impact and 50 percent of other approved development traffic volumes (as required by Palm Beach County) were combined to produce the total traffic depicted on Figure 10.16-3. Further, 1983 volumes and levels of service are shown on the same graphic.

With the widening of 45th Street and the construction of Jog Road between 45th Street and Beeline Highway as discussed in the next section of this report, and the other programmed roadway improvements, the Resource Recovery Facility meets the County's Traffic Performance Standards as a Category C Project. This results from the fact that the project has a significant impact only on 45th Street, where a very good level of service will be provided.

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LEGEND

- ** INSIGNIFICANT EFFECT (> 1% CAPACITY)
- * INSIGNIFICANT IMPACT (> 3%-5% CAPACITY)
- Ⓢ PERFORMANCE STANDARD CATEGORY
- A LEVEL OF SERVICE WITH EXISTING CONDITIONS
- (A) LEVEL OF SERVICE WITH AFTER CONDITIONS
- INTERCHANGE

DAILY TRAFFIC VOLUMES

390	IMPACT
(20,700)	EXISTING 1983
-12,800-	EXISTING 1980
-10,600-	50% BACKGROUND
[23,790]	TOTAL (IMPACT PLUS 1980 PLUS 50% BACKGROUND)

FIGURE 10.16-3
SOLID WASTE AUTHORITY
TRAFFIC ASSIGNMENT

ROADWAY REQUIREMENTS

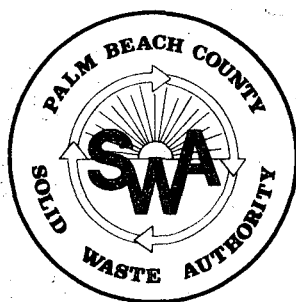
Roadway sections with significant impact, and the intersection of 45th Street at Haverhill Road and of Jog Road at Beeline Highway, were examined to determine if there was sufficient capacity to allow operation at Level of Service "C" during the peak hours with existing and development traffic. All capacity calculations were carried out following the criteria found in the Transportation Research Circular No. 212, "Interim Material on Highway Capacity", Transportation Research Board, January 1980. The peak hour directional volumes on Figure 10.16-3 were used for the capacity analyses.

Using the above criteria, the intersections of 45th Street and Haverhill Road and of Jog Road and Beeline Highway will operate at Level of Service "A".

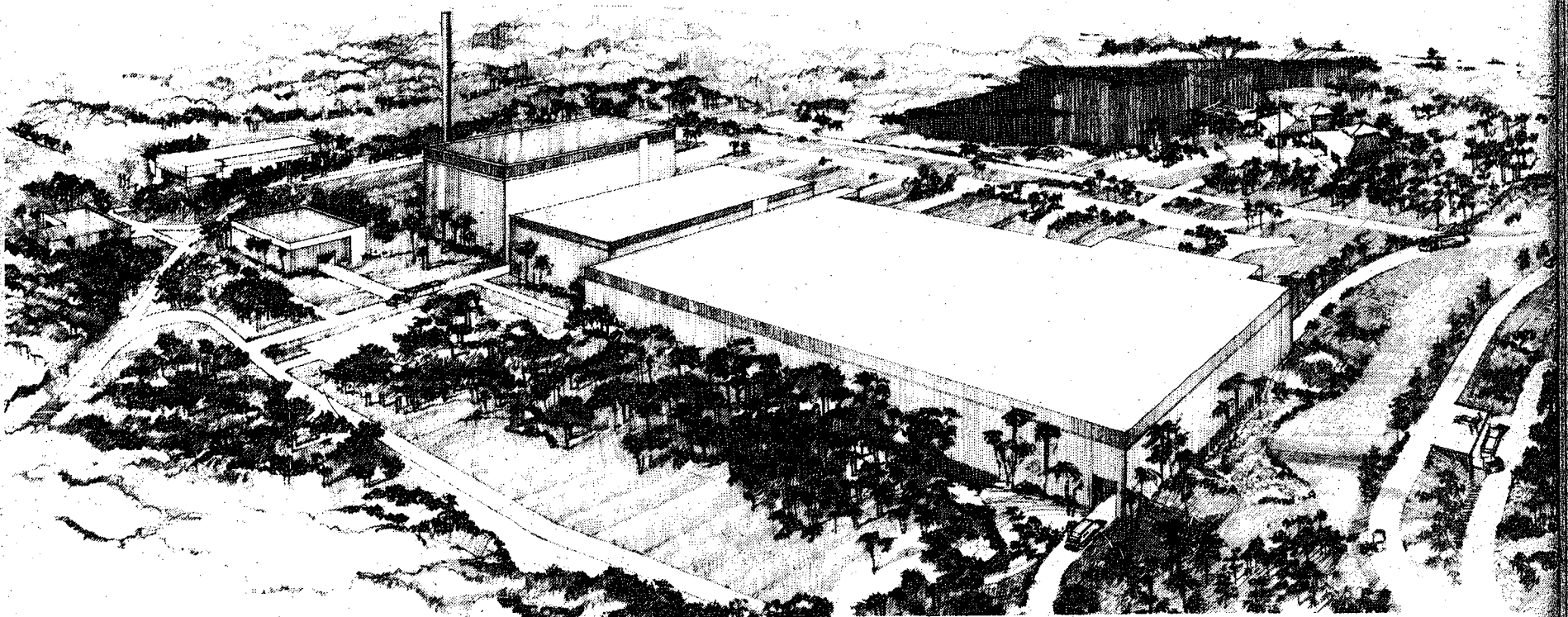
To reduce traffic congestion on 45th Street, this facility will be widened to four lanes from I-95 west to 200 feet west of Haverhill Road and 45th Street. Further, Jog Road will be constructed to Beeline Highway, thus providing access to the Resource Recovery Facility from the north via Beeline Highway which will also reduce traffic congestion on 45th Street.

PALM BEACH COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR
POWER PLANT SITE CERTIFICATION
VOLUME IV - AIR QUALITY

SUBMITTED BY
THE PALM BEACH COUNTY SOLID WASTE AUTHORITY



APRIL, 1985



PALM BEACH COUNTY
FLORIDA

**SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION**

VOLUME IV
AIR QUALITY

APPENDIX 10.1.5

PREVENTION OF SIGNIFICANT DETERIORATION

PALM BEACH COUNTY SOLID WASTE AUTHORITY

SOLID WASTE-TO-ENERGY FACILITY

REPORT ON AIR QUALITY IMPACTS ANALYSIS

November, 1984

Revised: March, 1985

PALM BEACH COUNTY SOLID WASTE AUTHORITY
SOLID WASTE-TO-ENERGY FACILITY
REPORT ON AIR QUALITY IMPACTS ANALYSIS

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PALM BEACH COUNTY SOLID WASTE AUTHORITY
SOLID WASTE-TO-ENERGY FACILITY

REPORT ON AIR QUALITY IMPACTS ANALYSIS

1.0 INTRODUCTION

The Palm Beach County Solid Waste Authority (PBCSWA) intends to construct a Resource Recovery Facility designed to convert 2000 tons per day (tpd) of municipal solid waste (MSW) into electricity for sale to the Florida Power and Light utility grid. This report describes the technical analyses that have been performed to determine the air quality impact of the proposed facility. Such analyses are required as a condition for obtaining a permit to construct and operate facilities that may emit air pollutants. The analyses reported upon herein have been performed in accordance with the requirements and specifications of the Florida Department of Environmental Regulation (FDER) and the United States Environmental Protection Agency (EPA).

This section of the report contains a brief description of the proposed facility, its location, the study area for air quality impacts produced by the proposed facility, and the current attainment status of the air quality standards in the study area. Section 2.0 provides a discussion of how state and federal laws and regulations regarding prevention of significant Deterioration (PSD) in air quality apply to the proposed facility. Section 3.0 is the analysis of the Best Available Control Tech (BACT). In Section 4.0, the pollutants that will be emitted by the proposed facility are identified and the pollutant emission rates are quantified. Section 5.0 presents a discussion of the dispersion modeling analyses that have been performed to determine the air quality impacts of the proposed facility and provides a detailed review of modeling results. Section 6.0 is a summary and conclusions of this report regarding the air quality impact of the proposed Palm Beach County Solid Waste-to-Energy Facility. Section 7.0 provides references utilized for this report.

1.1 Source Description

The initial Resource Recovery Facility construction involves the installation of 2000 TPD of MSW processing capacity. Within 5 years of initial construction an additional 1000 tpd of MSW processing capacity is planned. Accordingly, the PBCSWA and its consultants considered it prudent to file for permits for the ultimate plant capacity of 3000 tpd of MSW.

The MSW will be processed from 4500 Btu/lb heterogeneous MSW into a more homogenous 6200 Btu/lb Refuse Derived Fuel (RDF) in an RDF Manufacturing Facility located on a common site with the combustion facility. Table 1-1 provides a breakdown of MSW components and heating values. Table 1-2 provides a breakdown of RDF components and heating values. 1800 tpd₇ of RDF will be produced by the RDF Manufacturing Plant from the 3000 tpd₆ of MSW.

1.2 Source Location

The proposed waste-to-energy facility for Palm Beach County will be located on a 1320 acre parcel of land bounded on the north by the Beeline

Highway; on the south by 45th Street; on the east by the Florida Turnpike; and on the west by the West Palm Beach Water Catchment Area. The ground elevation at the proposed site is 17 feet above mean sea level as are the surrounding areas of the county.

1.3 Study Area

The land surface of Palm Beach County slopes gently to the south. Highest general elevations (approximately 25 feet above mean sea level) occur near the north county line. The southern Everglades have the lowest base level elevations at approximately 11 feet above mean sea level.

The proposed combustion facilities stack is located approximately 2600 ft to the west of the Florida Turnpike and 3300 ft to the north of 45th Street. Since the proposed waste-to-energy facility is subject to PSD regulations (see Section 2.0) the area considered as the study area for the air quality analyses included all PSD Class I areas located within a radius of 100 kilometers (62 miles). For PSD Class II, all areas within a radius of 50 kilometers (31 miles) comprise the study area, until a lesser radius of significant impact from the proposed source is determined. No PSD Class I area is located within the study area. Everglades National Park is the closest PSD Class I area and is located about 120 km to the southwest. Therefore the study area has been limited to 50 km radius and visibility analysis is not required pursuant to PSD regulations.

1.4 Air Quality Standard Attainment Status in the Study Area

The study area includes Palm Beach and Martin Counties. Air quality monitoring in Palm Beach County is performed by the Palm Beach County Health Department.

Based on the most recent information available (Palm Beach County Health Department's Annual Report Dated 1983), Palm Beach County is in attainment with all NAAQS standards. However, EPA does not consider the County to be in compliance with regard to ozone in spite of the monitoring data until EPA completes their own ozone monitoring program which is presently ongoing. Martin County has been assumed to be in compliance pending FDER information to the contrary.

HAYDEN-WEGMAN /
BARKER, OSHA & ANDERSON
ENGINEERS - PLANNERS

TABLE 1-1

PALM BEACH COUNTY SOLID WASTE COMPOSITION STUDY

ANALYSIS AND COMPOSITION OF MUNICIPAL SOLID WASTE (MSW)
PERCENT BY WEIGHT

COMPONENT	MOISTURE	INORGANIC	CARBON	HYDROGEN	OXYGEN	NITROGEN	CHLORINE	SULFUR	TOTAL	HHV BTU/LB
CORRUGATED BOARD	1.42	0.11	1.86	0.26	1.79	0.01	0.01	0.01	5.46	315.
NEWSPAPER	4.91	0.25	5.98	0.76	5.19	0.02	0.02	0.03	17.16	1017.
MAGAZINES	0.75	0.42	1.06	0.15	1.05	0.00	0.00	0.01	3.44	178.
OTHER PAPER	5.57	1.64	5.85	0.81	5.40	0.06	0.11	0.03	19.46	989.
PLASTICS	1.09	0.62	4.09	0.56	0.58	0.06	0.22	0.02	7.24	839.
RUBBER, LEATHER	0.19	0.44	0.84	0.10	0.22	0.03	0.10	0.02	1.94	164.
WOOD	0.13	0.02	0.34	0.04	0.29	0.00	0.00	0.00	0.83	58.
TEXTILES	0.40	0.07	1.33	0.18	0.97	0.11	0.01	0.01	3.07	235.
YARD WASTE	0.56	0.10	0.24	0.03	0.18	0.01	0.00	0.00	1.11	40.
FOOD WASTE	1.10	0.33	1.17	0.17	0.84	0.07	0.02	0.00	3.71	213.
MIXED COMBUSTIBLES	8.81	1.31	3.74	0.52	2.96	0.09	0.06	0.03	17.52	653.
FERROUS	0.11	5.15	0.08	0.01	0.08	0.00	0.00	0.00	5.43	14.
ALUMINUM	0.04	1.71	0.03	0.00	0.03	0.00	0.00	0.00	1.80	5.
OTHER NON-FERROUS	0.01	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.32	1.
GLASS	0.23	11.17	0.06	0.01	0.04	0.00	0.00	0.00	11.51	9.
TOTALS	25.30	23.64	26.65	3.61	19.61	0.46	0.55	0.17	100.00	4728.

HEAT VALUE AS RECEIVED (25.3% H₂O) = 4728; HEAT VALUE OF DRY SOLIDS = 6329; HEAT VALUE OF COMBUSTIBLES = 9261.

TABLE 1-2

PALM BEACH COUNTY SOLID WASTE COMPOSITION STUDY

TYPICAL ANALYSIS AND COMPOSITION OF REFUSE DERIVED FUEL (RDF)
PERCENT BY WEIGHT

COMPONENT	RECOVERY RATE (%)	MOISTURE	INORGANIC	CARBON	HYDROGEN	OXYGEN	NITROGEN	CHLORINE	SULFUR	TOTAL	HHV BTU/LB
CORRUGATED BOARD	99.0	1.48	0.17	2.72	0.38	2.62	0.01	0.01	0.02	7.39	461.
NEWSPAPER	99.0	5.10	0.37	8.76	1.11	7.60	0.03	0.03	0.04	23.03	1488.
MAGAZINES	99.0	0.78	0.62	1.55	0.22	1.54	0.01	0.01	0.01	4.72	260.
OTHER PAPER	99.0	5.78	2.39	8.56	1.19	7.90	0.08	0.16	0.05	26.12	1443.
PLASTICS	98.0	1.12	0.90	5.92	0.82	0.84	0.09	0.31	0.03	10.03	1215.
RUBBER, LEATHER	99.0	0.20	0.64	1.22	0.15	0.33	0.04	0.14	0.03	2.76	239.
WOOD	99.0	0.14	0.03	0.50	0.06	0.42	0.00	0.00	0.00	1.16	84.
TEXTILES	98.0	0.41	0.10	1.92	0.26	1.40	0.16	0.01	0.01	4.28	340.
YARD WASTE	85.0	0.50	0.13	0.30	0.04	0.22	0.01	0.00	0.00	1.19	51.
FOOD WASTE	60.0	0.69	0.29	1.04	0.15	0.74	0.07	0.02	0.00	3.01	189.
MIXED COMBUSTIBLES	40.0	3.70	0.77	2.21	0.31	1.75	0.05	0.04	0.02	8.85	386.
FERROUS	7.0	0.01	0.53	0.01	0.00	0.01	0.00	0.00	0.00	0.56	1.
ALUMINUM	35.0	0.01	0.88	0.01	0.00	0.01	0.00	0.00	0.00	0.93	2.
OTHER NON-FERROUS	10.0	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.
GLASS	35.0	0.08	5.78	0.03	0.00	0.02	0.00	0.00	0.00	5.92	5.
TOTALS		20.00	13.66	34.75	4.69	25.40	0.54	0.73	0.22	100.00	6171.

HEAT VALUE AS PRODUCED (20.0% H2O) = 6171.
HEAT VALUE OF DRY SOLIDS = 7714.
HEAT VALUE OF COMBUSTIBLES = 9302.

ASH AS PRODUCED (20.0% H2O) = 13.7%
DENSITY = 2.5 TO 3.5 POUNDS/CUBIC FOOT
SIZE = MINUS 2" X MINUS 2" X MINUS 2"

2.0 REGULATION APPLICABILITY

An air quality impact analysis begins with the determination of which regulations are applicable to the proposed source. The first step in the regulatory analysis is the determination of the applicability of PSD regulations. The issue of applicability involves determining whether the proposed source and its emissions are subject to PSD review and, if so, what analyses must be performed.

PSD regulations are only applicable in areas where National Ambient Air Quality Standards (NAAQS) for a given pollutant are met (or where monitoring is insufficient to determine compliance with NAAQS). In such areas, PSD regulations apply to the construction or modification of major air pollution sources. Although the general concept of an air pollution source is a stack, vent or other emission point, for PSD purposes a source is essentially defined as the aggregate of all such emission points that have the potential to emit a regulated pollutant at a given facility. A source's potential to emit is defined as its design capacity emission rate, after the application of any emission controls or other legally enforceable emission limitations. A proposed new source is considered major if it either falls within one of 28 specific source categories and has the potential to emit 100 tons per year of any regulated pollutant or if it falls in an unspecified source category and has the potential to emit 250 tons per year of any regulated pollutant.

The proposed Palm Beach County waste-to-energy facility falls within one of the 28 categories of sources subject to PSD review. As a municipal incinerator, it will be subject to review because it has the capability of charging more than 250 tons of RDF per day. Because the proposed Palm Beach County waste-to-energy facility will emit more than 100 tons per year of several regulated pollutants (see Section 4.0) it is subject to PSD review and related analyses for those pollutants. For each pollutant emitted at a rate in excess of 100 tons/year, three sets of analyses may be required: one for BACT; one for air quality impacts and one for additional types of impacts.

In some instances, ambient air quality monitoring may be required in support of the air quality impact analyses, but the Florida DER has determined that existing monitoring provides sufficient ambient air quality data for the study area. Air quality impact analyses and additional impacts analyses performed for the Palm Beach County waste-to-energy facility are discussed in subsequent sections of this report.

3.0 BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

The BACT analysis, required by PSD review, addresses energy, economic and environmental impacts for alternative emission control strategies. BACT is defined in the 40 CFR 52.21 as "An emission limitation based on the maximum degree of reduction of each pollutant emitted which the Department, taking into account, energy, environmental and economic impacts and other costs, determines on a case by case basis, is achievable through application of production processes and available methods, systems, and techniques, for control of each pollutant".

Technical feasibility is the important first step in this analysis. A technically feasible control technology is one that has been demonstrated to function on identical or similar processes in the U.S.

Once technically feasible control alternatives have been established, they are ranked by their environmental, economic and energy consumption impacts. The starting point for this process is a "base case" control level which is specified by the standard and regulations that would apply in the absence of PSD. They typically include New Source Performance Standards (NSPS).

Table 3-1 lists the air emissions for which an evaluation for BACT was conducted and control alternatives which are considered for the control of each of the pollutants. The air pollutants and the emission levels for which BACT must be determined are shown in Table 3-2.

TABLE 3-1

BACT POLLUTANTS AND CONTROL ALTERNATIVES

Air Emission Parameter	Control Alternatives
Particulate, Lead, Beryllium & Particulate Mercury	Electrostatic Precipitator (ESP) Fabric Filter Dry Scrubber
Sulfur Dioxide, Hydrogen Fluoride, Hydrogen Chloride & Gaseous Mercury	Dry Scrubber
Nitrogen Oxide	Amonia Injection Catalytic Reduction Design and Operating Procedures
Carbon Monoxide	Design and Operating Procedures

This BACT evaluation of the above described control alternatives considered their technical feasibility, energy usage and certain environmental factors. The proposed units are projected to be on-line approximately 80-85% of the time. Air pollution control equipment must be reliable to minimize contribution to unit downtime. Installation of air pollution control equipment increases the facility cost, but results in benefits to the

surrounding area and pollution. At some point, the cost of air pollution control equipment is not outweighed by the resulting benefits. To this end, the capital, operational and energy costs, were compared to the benefits.

TABLE 3-2
BACT POLLUTANTS AND ANNUAL EMISSIONS

Air Emission Parameter	Tons/Year
Particulate	214
Sulfur Dioxide	2957.
Nitrogen Oxide	1314.
Carbon Monoxide	3942.
Lead	0.46
Beryllium	0.003
Mercury (particulate & gaseous)	0.98
Hydrogen Fluoride	13.2
Hydrogen Chloride	1150.

3.1 BACT for Particulate, Lead, Beryllium and Particulate Mercury

3.1.1 Alternatives Not Considered

A number of technologies have been used to control particulate emissions from incinerators in addition to those listed in Table 3-1. These include venturi scrubbers, cyclone collectors and wet spray chambers. Of these only venturi scrubbers have been remotely capable of controlling particulate emissions to the EPA NSPS mandated level of 0.08 gr/dscf corrected to 12% CO₂. The venturi scrubbers were not considered as a viable control alternative for two reasons:

1. Their performance has been sketchy at best and they have had overall difficulty in satisfying the NSPS control level; and
2. Wet scrubbers produce an aesthetically undesirable water vapor plume. Accordingly, wet scrubbing is considered unacceptable and has been eliminated as a control option.

3.1.2 Fabric Filters (Baghouses)

Baghouses remove particulate by filtering the flue gas stream through a fabric. Actually, most of the effectiveness is attributed to filtering through a mat of particulate which has built-up on the surface of the fabric. Characteristics of baghouses are as follows:

- ° Particulate removal efficiencies as high as 99.8% have been demonstrated on coal fired units.
- ° Variations in flue gas flow rate and particulate composition do not generally effect performance.
- ° Pressure drop through unit is significant resulting in relatively high energy usage by fans.
- ° Available filter materials limit operating temperatures to less than 500°F.
- ° Sparks in flue gas can cause pinhole leaks and even fires within the filter.
- ° Consideration must be given to prevention of corrosion caused by acid gas condensation.
- ° Blinding of filter media.
- ° Experience on resource recovery facilities is very limited.

Although the TSP emission rate would be guaranteed less than 0.01 gr/dscf corrected to 12% CO₂, a baghouse used above is not considered appropriate primarily due to the incidence of fires caused by sparks and the filter media blinding.

3.1.3 Dry Scrubbers

Dry scrubbers are devices which are designed to remove SO₂ and acid gases from the flue gas stream, in addition to particulates. Aqueous solutions of lime are sprayed into the gas stream, which react with the SO₂ and acid gases. Heat from the reaction, and from the flue gas, dry the resultant products, which are then collected in a baghouse. Characteristics of dry scrubbers are the same as those for baghouses, except as follows:

- ° SO₂, acid gases and other flue gas constituents, that may condense with lower exist gas temperatures are controlled.
- ° Sparks in the flue gas are eliminated.
- ° Acid gas corrosion may be less a problem.
- ° Approximately twice as much residue is produced.
- ° Experience on resource recovery facilities is very limited.

Table 3-3 shows estimated costs for a dry scrubber and baghouse system, guaranteed for a TSP emission limit of 0.01 gr/dscf, corrected to 12% CO₂, and guaranteed to remove 70% of the SO₂ and 90% of the HCL in the flue gas stream.

3.1.4 Electrostatic Precipitator

Electrostatic precipitation functions by imparting a negative charge to particulates in the flue gas stream. The particulates are then attracted to positively charged plates, where they are collected. Characteristics of electrostatic precipitators include the following:

- ° Generally capable of particulate removal efficiencies greater than 98% with efficiencies as high as 99.8%.
- ° Can handle high temperature gases of over 600°F in special applications.
- ° Low pressure drop through units resulting in lower energy usage by fans.
- ° Performance is sensitive to actual vs. design flue gas flow rates (actual gas flow must be less than design) and particle resistivity.
- ° Consideration must be given to prevent corrosion caused by acid condensation. Acid mist condensation begins about 250°F.
- ° Recognized as the most reliable and efficient technology on resource recovery systems.

Table 3-4 shows estimated costs for electrostatic precipitators investigated for this project.

TABLE 3-3

DRY SCRUBBER COSTS1. Capital Cost

Capital Cost = Construction Cost x Bonding Factor

= \$5,000,000 x 1.6

= \$8,000,000

Bond Amortized over 20 years @ 11% interest (CRF = 0.12256)

Annual Capital Cost = \$8,000,000 x 0.12256

= \$980,000

2. Operations and Maintenance

a.	Electricity (3.5 million Kwh @ 5 cents)	\$175,000
b.	Water (50 gpm @ 0.70/1000 gal)	18,000
c.	Labor (8 men; two per shift @30000)	240,000
d.	O&M (incl. bag replacement) @ 2% of construction cost	100,000
e.	Lime 2000 tpy @ \$150/ton	300,000
f.	Waste Handling & Disposal (5915 TPY TSP; + 2000 TPY Chemicals; + 863 TPY SO ₂ & HCl; @ \$10/ton)	88,000
g.	Reheat Steam (5 MMBTUH @ \$6/MMBTUH)	263,000

Subtotal

\$1,184,000

Total Annual Cost (1. + 2.)

\$2,164,000

TABLE 3-4

ELECTROSTATIC PRECIPITATOR COSTS1. Capital Cost

$$\begin{aligned}\text{Capital Cost} &= \$2,300,000 \times 1.6 \\ &= \$3,680,000\end{aligned}$$

$$\begin{aligned}\text{Annual Capital Cost} &= \$3,680,000 \times 0.12256 \\ (i = 11; n = 20) &= \$462,000\end{aligned}$$

2. Operations & Maintenance

a. Electricity (920,000 KWH @ 5¢/KWH)	\$46,000
b. O&M (@ 2% of construction cost)	46,000
c. Labor (1/2 man for 4 shifts @ 30,000)	60,000
d. Water	- 0 -
e. Chemicals	- 0 -
f. Waste Disposal (8366 TPY @ \$10/ton)	84,000

Subtotal	\$236,000
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Total Annual Cost (1. + 2.).	\$698,000
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3.1.5 Particulate Lead, Beryllium and Particulate Mercury BACT Selected

An electrostatic precipitator (ESP) with an outlet particulate loading of 0.03 gr/dscf corrected to 12% CO₂ is selected based on analysis of all the control alternatives reviewed.

This selection is based upon the criteria of technical feasibility and the minimization of environmental, economic and energy impacts. Based on the information developed herein the ESP emerges as the alternative which best meets the BACT selection criteria.

3.2 BACT for Sulfur Dioxide (SO₂), Hydrochloric Acid (HCl) and Hydrofluoric Acid (HF)

Because of the low sulfur content of municipal solid waste (approximately 0.2 percent sulfur by weight), there have been no federal standards or regulations (NSPS) promulgated for control of SO₂ emissions from municipal incinerators. Similarly, the State of Florida has not promulgated regulations for control of SO₂ emissions from municipal incinerators.

In regard to control alternatives, control techniques for large sources of SO₂ emissions have been developed for fossil fuel-fired combustion units. These include methods for neutralizing acidic sulfur oxides either in gas-liquid (wet scrubbing) or gas-solid (dry scrubbing) devices. Both techniques produce solid waste by-products: sludge from wet scrubbing and dry ash from dry scrubbing. These technologies, however, have not been applied to large municipal incinerators in the U.S. because of the low sulfur content of municipal solid waste.

In addition to refuse, auxiliary fuel will also contribute to SO₂ emissions. The auxiliary fuel is used during start-up and shut-down. It is expected that auxiliary fuel usage for start-up and shut-down will constitute about 1.25% of heat input to each furnace and that either No. 2 oil (0.25% S) or natural gas (negligible S) will be used as the auxiliary fuel.

3.2.1 Use of Low Sulfur Fuel

SO₂ emissions are a function of the sulfur content in the fuel being burned. Low sulfur fuel is generally considered to have a sulfur content of 2% or less. Historically, fossil fuel burning plants have switched from the firing of high sulfur fuel (3.5 - 7%) to a low sulfur fuel as a means of complying with acid gas source emissions regulations. Since the refuse fuel (and auxiliary fuel) will have a sulfur content of about 0.2%, it is inherently within any current definition for low sulfur fuel. As such, both the federal and state of Florida regulatory authorities have not promulgated air emissions standards for the control of SO₂ from municipal incinerators.

3.2.2 Wet Scrubber Systems

Another technically viable but aesthetically preclusive alternative for SO₂ control is a wet scrubber system for SO₂ and acid gas control. As was mentioned for the particulate BACT analysis, wet scrubbing has been eliminated from consideration due to the dense water vapor plume which is generated (see Section 3.1 A 2. above).

3.2.3 Dry Scrubbers

A control alternative which was previously evaluated for particulate control is the use of a dry scrubber system to control SO₂ and acid gas emissions.

Dry scrubbers operate by injecting droplets of alkali reagent into the flue gas. The resulting reactions remove the sulfur dioxide as sulfites and sulfates in particulate form. The heat generated during the reaction plus flue gas heat evaporates the water carrying the alkali reagent. A bag filter is located downstream to remove the sulfate and sulfite particulates.

Table 3-5 provides comparative costs of controlling particulate and acid gases utilizing an ESP versus a dry scrubber.

3.2.4 SO₂ and Acid Gas BACT Selection

The use of low sulfur auxiliary fuel in conjunction with the inherent low sulfur content of the waste fuel is selected as BACT based on analysis of the viable alternatives.

This choice of alternatives best meets the selection criteria as required by EPA and the State of Florida DER and is consistent with the most recent BACT determinations for resource recovery facilities in other areas of the country.

3.3 BACT for Nitrogen Dioxide

No add-on type controls have been demonstrated for nitrogen oxides (NO_x) emissions from municipal incinerators in the U.S. Good combustion design and practices are the only demonstrated control alternative in the U.S.

The furnace units planned for Palm Beach County will employ advanced combustion systems in which the primary combustion air is added through multiple compartments located underneath the stokers. Uniform mixing of air and burning RDF eliminates high oxygen concentration gradients that favor the formation of NO_x. Secondary combustion air is introduced at high velocity through specially designed nozzles, into the gas stream along the front and rear walls of the combustion chamber. The temperature at the end of combustion chamber can thus be maintained at about 1800-2000°F. Significant NO_x emissions typically occur at temperatures greater than 2000°F.

The environmental impact due to NO_x emissions from the incinerator will not result in a violation of NAAQS.

Good combustion design and practice is proposed as BACT for NO_x.

3.4 BACT for Carbon Monoxide and Volatile Organic Compounds

No add-on type controls have been demonstrated for CO emissions from municipal incinerators. Good boiler design and proper operating conditions are the only effective emission control methodology.

TABLE 3-5

COST COMPARISON OF ELECTROSTATIC PRECIPITATORS VS DRY SCRUBBERS
750 TPD UNIT

	ELECTROSTATIC PRECIPITATOR	DRY SCRUBBER
Emission Limit gr/dscf @ 12% CO ₂	0.03	.01
Removal Efficiency, Percent	99.0	99.9
Capital Cost	\$3,680,000	\$8,000,000
Annual Cost:		
Net Debt Service	\$462,000	\$980,000
Operating and Maintenance Costs	<u>\$236,000</u>	<u>\$1,184,000</u>
Total	\$698,000	\$2,164,000
Unit Cost:		
Per Ton MSW (260,000 TPY)	\$2.69	\$8.32
Per Ton RDF (182,000 TPY)	\$3.84	\$11.89
Per Ton Particulate plus Acid	\$119.00	\$319.00
Incremental:		
Additional Tons Removed	base	917
Additional Annual Cost	base	\$1,508,000
Per Ton Removed		\$1,644
Per Ton MSW (260,000 TPY)		\$5.63
Per Ton RDF (182 000 TPY)		\$8.05

Notes:

1 - Particulate Removed annually by each precipitator =
 21400 Total Uncontrolled TPY x 0.83 Availability x 1 Unit/3 units x
 .99 efficiency = 5861 TPY removed.

2 - Particulate removed by dry scrubber =
 21400 x 0.83 x 1/3 x .999 = 5915 TPY removed.

Table 3-5 (continued)

Notes:

- 3 - Sulfur Dioxide Generated Annually per unit =
2957 Total - Uncontrolled TPY $\times 0.83 \times 1/3 = 818$ TPY
@ 70% control by dry scrubber SO_2 emission = $818 \times 0.3 =$
245 TPY Controlled and 573 TPY removed.
- 4 - HCl and HF Generated Annually per Unit =
 $(1150 + 13.2) \times 0.83 \times 1/3 = 322$ TPY uncontrolled
@ 90% control by dry scrubber = $322 \times 0.1 = 32.2$ TPY controlled
and 290 TPY removed.

The state-of-the-art design of the combustion chamber and the advance temperature control capability inherent in waterwall units will minimize formation of CO and volatile organic compounds (VOC). A continuous CO monitor will assist the plant operators maintain optimum combustion conditions, thereby further reducing CO and VOC formation.

Facility impacts will not cause a violation of NAAQS. Good equipment design and practice plus continuous CO monitors are therefore proposed as BACT for CO and VOC.

4.0 EMISSIONS DATA

The Florida DER requested emission estimates for sixteen pollutants. Six of these are criteria pollutants: 1) particulate; 2) sulfur dioxide (SO₂); 3) carbon monoxide (CO); 4) volatile organic compounds (VOC); 5) nitrogen oxides (NO_x); and 6) lead (Pb). The remaining 10 pollutants included: 7) chlorides (HCl); 8) ozone (O₃); 9) total reduced sulfur (including H₂S); 10) reduced sulfur compounds (including H₂S); 11) sulfuric acid mist; (12) fluorides (HF); 13) vinyl chloride; 14) mercury (Hg¹); 15) asbestos; and 16) beryllium (Be).

Most of the pollutants are emitted to a certain degree by the proposed Palm Beach County waste-to-energy facility. Ambient concentrations of the criteria pollutants are regulated through the implementation of NAAQS. The NAAQS have been incorporated in their entirety as part of the Florida State Implementation Plan (SIP).

Although no mention was made by the Florida DER of emissions of trace organic compounds, public attention has recently focused on dioxin emissions (2,3,7,8-TCDD) from waste to energy facilities. Therefore the County has voluntarily submitted available data on dioxin emissions.

Emission estimates of the aforementioned pollutants in conjunction with stack and facility operating parameters were then used as input data to an air quality dispersion models to predict facility impacts. These data are described in greater detail in Section 4.1.

Carbon monoxide (CO), as a pollutant, was considered only in terms of emissions potential from the facility itself. Mobile sources associated with the facility activity are negligible since there will be no significant increase in traffic beyond that which already exists in the area.

In order to adequately demonstrate compliance with the NAAQS and PSD increments, it is required that the applicant include in its modeling analysis the pollutant contributions from all existing and PSD sources having a significant impact within the modeling area of the applicant's source. Stack and emissions data for these other sources were developed in conjunction with FDER.

4.1 Emissions Data for the Palm Beach County Waste-to-Energy Facility

Table 4-1 lists the pollutants that will be emitted from the proposed facility. The table shows pollutant emission factors, design capacity emission rates on an annual basis, actual emission rates on an annual basis and design capacity emission rates on an hourly basis.

Emission factors are based on a higher heating value (HHV) of 6,200 Btu/lb for the RDF. Design capacity emission rates are derived from a waste throughput of 2100 tons/day or 766500 tons/year. Actual annual emission rates assume an availability factor of 0.8 and a resulting waste throughput of 613,200 tons/year. These values are totals for three units each rated at 700 tons/day.

Table 4-2 lists stack parameter data, including location coordinates adjacent building dimensions, height, diameter and volumetric flow rate and

temperature for the proposed waste-to-energy facility. For modeling purposes, the three flues in the one proposed stack were treated as a single stack with an inside diameter equal to that of one of the flues. The modeled emission rate for each pollutant was set equal to the sum from the three flues, and the modeled volume flow rates and temperatures were those of an individual flue. These actions ensured that the modeled plume rise was calculated correctly for the proposed stack.

The emission factors contained in Table 4-1 were derived from a detailed investigation of the literature. The criteria used for the emission factor selection included: similarity of the facility design, similarity of the chemical composition of the refuse, reliability of stack tests and availability of data from facilities incorporating state-of-the-art design and air pollution control technology. In the sections which follow, the rationale behind the selection of emission factors for each pollutant listed in Table 4-1 is provided.

4.1.1 Total Suspended Particulate (PM)

The emission factor is based upon the ability of the electrostatic precipitator manufacturer to not exceed a guaranteed grain loading of 0.03 grains/dscf at 12% CO₂. This emission level represents BACT for TSP.

4.1.2 Sulfur Dioxide (SO₂)

The SO₂ emission factor is based upon RDF fuel sulfur content which is assumed to be completely converted to SO₂.

4.1.3 Carbon Monoxide (CO)

Several data bases were investigated to develop an emission factor for CO. The value used was a median value between values cited by California Air Resources Board Report entitled "Air Pollution Control at Resource Recovery Facilities" and vendor information which indicated lower values. The principal reason for the difference is due to excess air design. Most of the spreader stoker furnaces cited by CARB were designed to fire RDF at about 40% excess air. Our investigations have indicated that a prudent operating point for RDF combustion to be at 50% excess air with a design point of 60% to accommodate variations in fuel moisture and heating value.

4.1.4 Volatile Organic Compounds (VOC)

The emission factor for VOC represents the non-methane portion of the total hydrocarbon emissions. Reference literature indicated a wide range of VOC emissions. This wide range is believed to be caused by the low excess air design cited for CO, inability to maintain sufficient temperature (especially those systems which fired pulped RDF which typically had a moisture content of 50% or above) and inadequate combustion controls. The proposed facility will utilize state-of-the-art combustion controls coupled with conservative furnace design in terms of excess air, gas temperature and dwell time to minimize VOC emissions. Accordingly, the VOC emission factor used was selected from mid-range data to provide sufficient conservatism and avoid understating possible facility emissions.

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TABLE 4-1

CONTROLLED EMISSION FACTORS DEVELOPMENT FOR RDF FIRED SPREADER STOKER FURNACES

(ANNUAL AVERAGE BASED ON 1800 TPD RDF FIRED)

POLLUTANT	LBS/TON RDF	LBS/HR	TONS/YEAR	GM/SEC @ 1800 TPD	GM/SEC @ 2100 TPD
CARBON MONOXIDE	12.0	900.	3942.	113.	132
NITROGEN DIOXIDE	4.0	300.	1314.	37.8	44.1
SULFUR DIOXIDE	9.0	675.	2957.	85.1	99.3
CHLORIDES	3.5	263.	1150.	33.1	38.6
VOLATILE ORGANIC COMPOUNDS	.20	15.0	65.6	1.89	2.21
PARTICULATE MATTER	.65	48.8	214.	6.14	7.16
SULFURIC ACID MIST	.0004	.030	.131	.0038	.0044
FLUORIDES	.04	3.00	13.2	.38	.44
LEAD	.0014	.105	.46	.0132	.0154
MERCURY	.003	.225	.98	.0284	.0331
BERYLLIUM	9.0 E-06	6.8 E-04	3.0 E-03	8.5 E-05	9.9E-5
2,3,7,8-TCDD	8.5 E-08	6.4 E-06	2.8 E-05	8.0 E-07	9.3E-7

TABLE 4-2

STACK PARAMETERS FOR EACH OF THREE SPREADER STOKER FURNACES
(TWO INITIALLY INSTALLED PLUS ONE FUTURE)

	ENGLISH	METRIC
LOCATION		UTM ZONE 17
X-COORDINATE		0585820 METERS EAST
Y-COORDINATE		2960180 METERS NORTH
BASE ELEVATION FOR MODEL INPUT	0.00 FEET	0.00 METERS
STACK DIAMETER	6.69 FEET	2.04 METERS
STACK HEIGHT	250 FEET	76.20 METERS
VOLUMETRIC FLOW		
100% CAPACITY	172377 ACFM	81.4 M3/SEC
75% CAPACITY	124311 ACFM	58.7 M3/SEC
50% CAPACITY	80033 ACFM	37.8 M3/SEC
EXIT VELOCITY		
100% CAPACITY	81.69 FEET/SECOND	24.90 METERS/SECOND
75% CAPACITY	58.91 FEET/SECOND	17.96 METERS/SECOND
50% CAPACITY	37.93 FEET/SECOND	11.56 METERS/SECOND
EXIT TEMPERATURE		
100% CAPACITY	450 FAHRENHEIT	505 KELVIN
75% CAPACITY	415 FAHRENHEIT	486 KELVIN
50% CAPACITY	385 FAHRENHEIT	469 KELVIN

4.1.5 Nitrogen Oxides (NO_x)

The NO_x emission factor was selected from the CARB report and is representative of the upper bound of the median values of the data bases used.

4.1.6 Lead (Pb)

The Pb emission factor was selected based upon detailed analyses conducted during facility permit work by Hayden-Wegman for North Santa Clara County, CA. Data bases provided only sparse information with median values which were either too low or too high to be considered representative of the proposed Palm Beach County project.

4.1.7 Beryllium (Be)

The Be emission factor is based on a weighted average of the values cited by CARB report and Hayden-Wegman for North Santa Clara.

4.1.8 Mercury (Hg)

Hg emission factor is based on the North Santa Clara Report which is higher than other data bases reviewed.

4.1.9 Chlorides (as HCl)

The HCl emission factor is based on North Santa Clara and data reported by Rinaldi, et al.

4.1.10 Fluorides (as HF)

The HF emission factor is based on the median value from the CARB Report.

4.1.11 Sulfuric Acid Mist (H₂SO₄)

H₂SO₄ emission factor is based on data from North Santa Clara, CA. Data bases are very sketchy. The controlled emission is based on 99% removal by the ESP.

4.1.12 Ozone (O₃), Total Reduced Sulfur, Reduced Sulfur Compounds, Vinyl Chloride and Asbestos

No emissions of ozone, total reduced sulfur, reduced sulfur compounds, vinyl chloride and asbestos are expected.

4.1.13 Dioxin (2,3,7,8 Tetra Chloro Dibenzo Dioxin)

The emission factor for 2,3,7,8-TCDD is derived from stack test data taken from Chicago, N.W. facility by the EPA and reported by Cleverly. The reason for using these data are as follows: (a) they represent a direct measurement of flue gas emission, (b) the data have been shown to be comparable to similar measurements made by the Swiss Environmental Agency and to measurements derived from independent analyses from fly ash collected from

U.S. and European waste-to-energy facilities; and (c) the data are conservative in that they show the highest emission rate (of the seven large scale waste to energy facilities for which data are available) for the tetra homologue which contains the isomer of greatest toxicity and concern. The emission factor was calculated from a conservative emission rate of 0.085 ug/sec for the 3000 tons/day Brooklyn Navy Yard facility. It is expected that this emission level will not be encountered at the proposed facility due to excellent combustion controls and auxiliary fuel systems that are designed to maintain exit gas temperatures at a level above the critical threshold where dioxin could be formed.

5.0 AIR QUALITY MODELING ANALYSES

5.1 Model Requirements

5.1.1 Determination of Worst-Case Load Conditions

A pollutant source does not generally operate or emit pollutants at a constant rate. Most facilities, particularly waste-to-energy facilities, operate at variable rates depending on supply and demand, weekday versus weekend or day versus night work schedules or other factors. Changes in source operating rates produce different pollutant emission rates and exhaust gas flow rates and temperatures. When flow rates and temperatures vary, so does pollutant dispersion (plume rise) such that different points of maximum pollutant impact are produced. As a result, screening modeling was performed to determine the source operating load that produces the worst-case impacts. Such screening modeling was performed for 100, 75 and 50 percent load. Model results indicated that 100% load produced worst case conditions.

5.1.2 Determination of the Modeling Area

The next required modeling analysis determined the territorial extent of significant impact of the proposed source. Significant impact levels have been defined for various averaging periods for specific pollutants as shown in Table 5-1. Significant monitored concentrations (De Minimus Values) have also been defined for other pollutants as shown in Table 5-2.

As screening analysis was performed first, using a screening-type model and a limited set of hypothetical meteorological data to define appropriate receptor locations (i.e., points where impacts are calculated). Once receptors were selected, other refined models and historical meteorological data could then be used to calculate source impacts for all averaging periods of concern.

TABLE 5-1
SIGNIFICANCE LEVELS FOR AIR QUALITY IMPACTS

<u>POLLUTANT</u>	<u>AVERAGING TIME</u>	<u>SIGN. LEVEL CONC. (ug/m³)</u>	<u>DISTANCE (KM) FROM SOURCE TO SIGNIFICANCE LEVEL</u>	
			<u>HIGHEST</u>	<u>HIGH SECOND HIGH</u>
Sulfur Dioxide	3 Hour	25	24.5	9.0
	24 Hour	5	25.0	20.0
	Annual	1	15.0	NA
Total Suspended Particulate	24 Hour	5	#	#
	Annual	1	#	NA
Nitrogen Dioxide	Annual	1	5.0	NA
Carbon Monoxide	8 Hour	2000	#	#
	Annual	500	#	NA

NA Not applicable

Less than significant levels at all distances. Minimum boundary line distance from RDF Source: 0.73 km.

TABLE 5-2
COMPARISON OF IMPACT OF PALM BEACH COUNTY RDF FIRED
SPREADER STOKER FURNACES TO DE-MINIMUS LEVELS (ISC MODEL)

SIGNIFICANT MONITORING CONCENTRATIONS

POLLUTANT	AVERAGING TIME	DE-MINIMUS GUIDELINES ug/m ³	HIGHEST 2ND HIGHEST# CONCENTRATION ug/m ³	DISTANCE (KM) FROM SOURCE TO DE-MINIMUS LEVEL	
				HIGH	H2NDH
TSP	24 Hour	10	2.0	##	##
SO ₂	24 Hour	13	27.9	9.0	9.0
CO	8 Hour	575	81.1	##	##
NO _x	24 Hour	14	12.3	1.5	##
Ozone (VOC)	1 Hour	*	3.0**	##	##
Mercury	24 Hour	0.25	9.3E-3	##	##
Fluorides	24 Hour	0.25	0.12	##	##
Lead	24 Hour	0.1	4.3E-3	##	##
Beryllium	24 Hour	5.0E-4	9.9E-5	##	##

* No value established. Ambient air standard: 235 ug/m³ not to be exceeded on more than an average of one day per year over a three year period.

Model analyses for SO₂ based on 2100 TPD and 9% S. Concentrations for other pollutants based on their emissions ratio to SO₂.

** Assumes all VOC becomes ozone.

Less than de-minimus values at all distances greater than 0.6 km from the source. Minimum distance from RDF source to site boundary: 0.73 km.

The circle enclosing the furthest radial distance to which significant impacts are found defines the "modeling area" for the applicant's source. Subsequent modeling analyses included all sources located within this area that have significant emissions of the criteria pollutants emitted (in significant amounts) by the applicant's source. Model results indicated that only SO₂ produced significant impacts in both short-term and long-term averaging periods.

5.1.3 Determination of the Screening Area

An additional "screening area" was defined for additional sources to be considered for inclusion in subsequent modeling analyses. This screening area was contained in the annular ring that extends 50 kilometers (31 miles) beyond the applicant's source's modeling area. Sources located in the screening area were included in subsequent modeling along with the applicant's source, if their impact within the applicant's source modeling area was as much as 1 ug/m³ on an annual basis or 5 ug/m³ on a 24-hour basis.

5.1.4 PSD Increment Consumption and NAAQS Analysis

The PSD regulations have established limits for increases in concentrations of two pollutants, PM on a 24-hour and annual basis, and SO₂ on a 3-hour, 24-hour and annual basis. These limits of concentration increases have been defined as increments which are shown in Table 5-3. The starting point for PSD increment consumption is January 6, 1975. In a given area, the starting point for tracking PSD increment consumption is the date thereafter on which the first PSD source permit application is submitted for regulatory review. The first PSD permit application date is defined as the baseline date for the given area. No major PSD increment consuming source has triggered the baseline date in the study area.

TABLE 5-3

ALLOWABLE PSD INCREMENTS
(ug/m³)

	Class I Area	Class II Area	Class III Area
Sulfur Dioxide			
. Annual	2	20	40
. 24-hour	5*	91*	182*
. 3-hour	25*	512*	700*
Total Suspended Particulate Matter			
. Annual	5	19	37
. 24-hour	10*	37*	75*

* Not to be exceeded more than once a year.

No multisource modeling for PSD increment consumption is required since no major source has been constructed since January 6, 1975 within the modeling area.

The sum of the impacts of the proposed PSD source emissions and all existing source emissions must also not produce concentrations that violate NAAQS. The NAAQS concentrations are shown in Table 5-4. Modeling for compliance with NAAQS must include: 1) all source emissions from the proposed PSD source, 2) actual emissions from all operating sources and all allowable emissions from permitted (but not operating) sources within the modeling area, and 3) actual emissions from all operating sources and all allowable emissions from permitted (but not operating) sources within the screening area, if such sources have significant impacts (>1 ug/m³, annual and >5 ug/m³, 24-hour) within the modeling area. Modeling impacts must be added to appropriate background levels to determine compliance with NAAQS.

5.1.5 Soils and Vegetation Impacts

The emission of pollutants listed in Table 5-1 are not expected to cause any harm to the vegetation or soils within the study area. For these pollutants, either all applicable NAAQS and state standards will be met, emissions will be less than de minimus values, or ambient impacts will be insignificant.

The potential impact to soil and vegetation resulting from emission from the proposed facility are discussed for the following specific compounds and materials: total suspended particulates (TSP); carbon monoxide (CO); sulfuric acid (H₂SO₄); sulfur dioxide (SO₂); nitrogen dioxide (NO₂).

Total Suspended Particulates. Particulate matter can interfere with plant metabolism when large enough quantities coat leaf surfaces causing the blockage of gas and light exchange mechanisms. The specific sensitivity of plants to particulate matter produced by resource recovery facilities is not known, nor have levels which produce plant injuries from other sources been documented.

The proposed facility will contribute a maximum annual average of 0.26 ug/m³ of TSP. The maximum observed level in 1983 was 134 ug/m³, to which the facilities emissions will add an insignificant amount of 0.2 ug/m³.

Carbon Monoxide. Plants appear to be resistant to high levels of CO. In most species tested, exposure to 115 mg/m³ for up to three weeks did not produce visible injury (Zimmerman, et al., 1983). More recently, exposure to less than 27 ug/m³ (Chakrabarti, 1976) also produce no visible injury.

The proposed facility will contribute a maximum annual concentration of 4.8 ug/m³. Total concentrations, as a result of the operation of the proposed facility, will thus be considerably below concentrations causing visible injury to vegetation.

Sulfuric Acid. H₂SO₄ is formed when gaseous SO₃ produced by the facility reacts with water droplets. the acidified water vapor can

result in acidic precipitation. It is difficult to predict the extent that H_2SO_4 produced by the facility will impact vegetation because (1) H_2SO_4 aerosols are neutralized by the presence of ammonia in the atmosphere (Huntzicher, et al., 1980); (2) when effects of acid precipitation on plants are observed they may be positive due to fertilization impacts of sulfur or negative due to the leaching of leaf surfaces; and (3) the impact of emissions of H_2SO_4 from a single facility on vegetation may be difficult to differentiate from the overall impacts of acid rain on vegetation.

Although evaluation of data relative to acidic precipitation impacts on vegetation is complex, the majority of crop species studied to date indicates the exposure to simulated acid rain has little or no adverse impact on vegetative growth and yield.

The proposed facility will add an annual average of $1.6\text{E}-4 \text{ ug/m}^3$ of H_2SO_4 . It is not anticipated that this concentration will contribute significantly to acidic precipitation when compared to existing concentrations and other major producers, such as fossil fuel power plants.

Sulfur Dioxide. Sensitivity of plant species to SO_2 appears to vary not only with climate of an area, but with the duration of exposure. Garsed and Rutter (1982) reported that various species of conifer (Pinus sp.) had markedly differing sensitivities to levels of SO_2 ranging from 200 ug/m^3 for 11 months to 8000 ug/m^3 for 6 hours. A 14% reduction in relative growth rate was seen in one pine species at the 200 ug/m^3 dosage level. A number of oak and pine species (black and red oak, white pine) have been reported to develop visible injury when exposed to concentrations of SO_2 between 786 and $1,572 \text{ ug/m}^3$ for three hours (Jones, et al. 1979), have reported a threshold value for foliar injury to certain species (blackberry winged sumac, other herbaceous species) at 340 ug/m^3 for 3 hours under environmental conditions which maximized plant sensitivity.

A maximum annual ground level concentration for SO_2 of 3.6 ug/m^3 is predicted for the authority facility. This value, when added to a background level of 10 ug/m^3 is considerably below the concentration causing a reduction in relative growth rate of a pine species. The maximum background level of SO_2 over a three hour averaging period, is 140 ug/m^3 to which the facility will add a maximum of 82 ug/m^3 . This maximum level does not exceed threshold value for certain sensitive species under worst-case conditions.

Nitrogen Dioxide. Nitrogen dioxide can be beneficial to vegetation in specific amounts. Uptake of NO_2 varies with a number of factors such as nutrient supply in the soil, fertilization, and rainfall. NO_2 can also be converted to nitric acid and contribute to acid precipitation. Natural biological cycling of nitrogen compounds produces greater acidity than does atmospheric decomposition (Frink, et al., 1976).

Short-term injury threshold for NO_2 -tolerant species, such as corn and sorghum, has been found to be $24,400 \text{ ug/m}^3 \text{ NO}_2$ for a one-hour exposure when grown in a controlled environment (Heck and Tingey, 1970). Continuous exposure throughout the growth period to 470 ug/m^3 reduced size and productivity and increased senescence in tomatoes and navel oranges (Taylor, et al., 1975; Spierings, 1971). The concentration of NO_2 has been found to be a greater influence on the extent of injury than the length of exposure.

The greater-than-additive effect of NO_2 and SO_2 in combination on crops species and varieties. In a recent study of yield reduction in soybeans, no adverse effect was observed at atmospheric concentrations of 481 ug/m^3 SO_2 in combination with 155 ug/m^3 of NO_2 (Amundson, 1983). The results of these investigations indicate that the presence of elevated levels of NO_2 in the atmosphere in combination with SO_2 above a threshold level can lead to adverse crop response. NO_2 concentrations below 120 ug/m^3 have not been reported to produce injury in the absence of other pollutants (Thompson, et al., 1974).

The proposed facility will produce a maximum annual NO_2 concentration of 1.06 ug/m^3 . The maximum annual ambient NO_2 concentration recorded in the county was 20 ug/m^3 . Total concentrations will thus be well below the estimated threshold level (120 ug/m^3) of injury to certain plants.

Hydrogen Chloride. Gaseous HCl will be emitted from the proposed facility as a result of the combustion of certain materials contained in the refuse (especially plastics). HCl fallout onto soil does not pose a serious risk to vegetation. HCl disassociates in soil, and the Cl which occurs in a dissolved form is generally leached from the soil with precipitation. Since it is therefore unavailable for uptake through plant roots, indirect injury to vegetation through the soil is unlikely.

Studies of plant growth in an environment containing gaseous HCl have reported that exposure on the order of $10,000 \text{ ug/m}^3$ for 1 to 2 hours will produced plant injury. Intermittent exposure to concentrations of approximately 50 ug/m^3 were found to pose minimal risk to sensitive vegetation. Concentrations ranging from approximately $6,000 \text{ ug/m}^3$ for 120 hours or below would provide for adequate protection from HCl injury.

The proposed facility will increase HCl concentrations by a 1-hour maximum of 57 ug/m^3 and an annual average of 1.4 ug/m^3 . Peak and long term concentrations are well below levels specifically documented to cause injury and those proposed as adequate for vegetation protection. Therefore, HCl emissions are not expected to adversely impact local vegetation.

5.2 Model Selection Criteria

5.2.1 Number of Emission Points

A number of models are available for the screening modeling analyses needed for selecting receptor locations and determining worst-case load impacts. PTMAX and PTPLU are applicable to individual sources and PTMTP and Valley are applicable to individual multiple sources. A number of models are also available for the more comprehensive modeling analyses needed to define the modeling area, compute PSD increment consumption, and assess compliance with NAAQS. The CRSTER model is only applicable to single or collocated sources. The MPTER, RAM, ISCST, ISCLT, Complex I, SHORTZ, LONGZ, and CDMQC models are applicable to multiple sources.

Since it was anticipated that the modeling and screening areas would contain sources that emit the same pollutants (in significant

amounts*) as will be emitted by the proposed facility (in significant amounts*) Hayden-Wegman planned, at the outset of this study, to use multiple source models for the refined modeling analyses. Upon consideration of the topography and demography of the study area and the type and number of sources to be modeled, the following dispersion models are utilized: PTPLU, PTDIS, ISCST and ISCLT.

These models are used with downwash option and in rural mode pursuant to FDER instructions.

* As defined in Table 5-1

TABLE 5-4

AMBIENT AIR QUALITY STANDARDS

POLLUTANT	FEDERAL PRIMARY	FEDERAL SECONDARY	STATE	MAXIMUM CONCENTRATION MEASURED IN 1983 (SITE #)	MAXIMUM 2ND MAX CONCENTRATION (3) MEASURED IN 1983 (SITE #)
SULFUR DIOXIDE					
MAX 3-HOUR CONCENTRATION (2)	NO STANDARD	1300 UG/M3 (0.5 PPM)	1300 UG/M3 (0.5 PPM)	65 UG/M3 (11) (0.025 PPM)	63 UG/M3 (11) (0.024 PPM)
MAX 24-HOUR CONCENTRATION	365 UG/M3 (0.14 PPM)	NO STANDARD	260 UG/M3 (0.1 PPM)	39 UG/M3 (11) (0.015 PPM)	29 UG/M3 (11) (0.011 PPM)
ANNUAL ARITHMETIC MEAN	80 UG/M3 (0.03 PPM)	NO STANDARD	60 UG/M3 (0.02 PPM)	7 UG/M3 (11) (0.0027 PPM)	
PARTICULATE MATTER					
MAX 24-HOUR CONCENTRATION (2)	260 UG/M3	150 UG/M3	150 UG/M3	134 UG/M3 (5)	107 UG/M3 (4)
ANNUAL GEOMETRIC MEAN	75 UG/M3	60 UG/M3	60 UG/M3	43 UG/M3 (12)	
NITROGEN DIOXIDE					
ANNUAL ARITHMETIC MEAN	100 UG/M3 (.05 PPM)	100 UG/M3 (.05 PPM)	100 UG/M3 (.05 PPM)	20 UG/M3 (1) (0.01 PPM)	
OZONE					
DAILY MAX 1-HOUR CONCENTRATION (1)	235 UG/M3 (0.12 PPM)	235 UG/M3 (0.12 PPM)	235 UG/M3 (0.12 PPM)	180 UG/M3 (10) (0.092 PPM)	172 UG/M3 (10) (0.088 PPM)
LEAD					
QUARTERLY ARITHMETIC MEAN	NO STANDARD	NO STANDARD	1.5 UG/M3	NOT MONITORED	
CARBON MONOXIDE					
MAX 1-HOUR CONCENTRATION	40000 UG/M3 (35 PPM)	40000 UG/M3 (35 PPM)	40000 UG/M3 (35 PPM)	10171 UG/M3 (1) (8.9 PPM)	9943 UG/M3 (1) (8.7 PPM)
MAX 8-HOUR CONCENTRATION (2)	10000 UG/M3 (10 PPM)	10000 UG/M3 (10 PPM)	10000 UG/M3 (10 PPM)	6600 UG/M3 (1) (6.6 PPM)	4500 UG/M3 (1) (4.5 PPM)

1. THE STANDARD IS ATTAINED WHEN THE EXPECTED NUMBER OF DAYS PER CALENDAR YEAR WITH MAXIMUM HOURLY AVERAGE AVERAGE CONCENTRATIONS ABOVE 0.12 PPM IS EQUAL TO OR LESS THAN 1.
2. CONCENTRATION LIMITS NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.
3. SINCE SHORT TERM CONCENTRATION LIMITS ARE NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR, THE VALUES PRESENTED IN COLUMN (5) FOR SHORT TERM CONCENTRATIONS REFLECT THE HIGHEST VALUES OF THE SECOND HIGHEST CONCENTRATION MEASURED AT THE MONITORING STATION.

5.2.2 Pollutant Averaging Periods

As discussed earlier, pollutant concentrations must be predicted on the basis of several averaging periods for PM (24-hour and annual) and SO₂ (3-hour, 24-hour and annual). Pollutant impacts must also be predicted on the basis of 1-hour and 8-hour averaging periods for CO and on a calendar quarter basis for lead.

The PTPLU, and PTDIS screening models can be used with hypothetical meteorological data to predict worst-case 1-hour impacts which can be converted to worst-case 3-hour, 8-hour and 24-hour impacts using scaling factors provided in EPA's Volume 10.

5.2.3 GEP Determination and Potential for Downwash

The relationship between a source's stack height and the dimensions of adjacent structures and terrain determine whether plume downwash will occur. EPA has developed criteria for constructing stacks with heights defined according to good engineering practice (GEP) criteria in order to minimize plume downwash. The ISC models are the only ones capable of calculating impacts caused by plume downwash. Modeling for downwash is required only if the applicant's stack is not constructed according to GEP criteria.

Hayden-Wegman performed a GEP analysis for the proposed source's stack. The analysis was performed in accordance with EPA regulations. Building dimensions are 233 ft long by 110 ft wide by 120 ft high. GEP stack height was determined to be 300 ft. Accordingly, the results of this analysis indicated that the proposed source stack was below GEP height so downwash modeling was performed.

5.3 Modeling Considerations

5.3.1 Highest, Second-Highest Concentrations

For the short term averaging periods, compliance with PSD increments and NAAQS is based on the highest, second-highest modeled (modeled plus background for NAAQS) concentrations. Such concentrations are determined by first obtaining the highest and second-highest concentrations at all the receptors within the study area. The highest, second highest concentration is defined as being the highest value from among the set of second highest concentrations for all the receptors. In this report, highest, second-highest concentrations are presented for all short-term averaging periods for the pollutants for which short-term NAAQS or PSD increments have been established.

5.3.2 Block Averaging Times

Compliance with short-term PSD increments and NAAQS is based on block averages. Block averages are those that start at midnight for all non-overlapping averaging periods until the following midnight. Thus, each day produces a single 24-hour block average, three 8-hour block averages, and eight 3-hour block averages. In this report all modeled short-term concentrations are presented as block averages.

5.3.3 Dispersion Coefficients

Dispersion coefficients are constants that are built into dispersion models for use in calculating the amount of horizontal and vertical plume spread depending on downwind atmospheric stability and distance. All of the models used contain Pasquill/Gifford coefficients. The Pasquill/Gifford coefficients are applicable to rural areas. In long term-models, the Pasquill/Gifford coefficients are applicable to rural areas. In long-term models, the Pasquill/Gifford coefficients are used to calculate pollutant dispersion in the vertical, but pollutant dispersion is calculated to be evenly distributed within a wind direction sector in the horizontal.

5.3.4 Stability Categories

There are several models available for determining stability categories. All the models discussed herein use stability classifications developed by the Pasquill/Turner method. The Pasquill/Turner method is based on measurements of cloud cover, isolation (solar heat) and wind speed. The stability classifications used for this study were developed using the CRSTER preprocessor which converts standard National Weather Service observations into the format required for model input.

5.3.5 Plume Rise

The standard algorithms for determining plume rise are those of Briggs and these algorithms are used in all the models that were used in this study. The Briggs algorithms calculate plume rise based on thermal buoyancy (exhaust gas temperature) and momentum (exhaust gas volume flow).

a. Buoyancy Induced Dispersion

If a large source has a thermally buoyant plume, dispersion will begin immediately upon its exit from the stack. This phenomenon is accounted for in algorithms for buoyance induced dispersion, which are available as an option in several of the models discussed herein. This option was employed in this study because the proposed source has a hot plume.

b. Stack Tip Downwash

Downwash of a plume can be induced by a stack if it is poorly constructed, or if the exhaust gas velocity is low. This option was employed for this study as a measure of conservatism although the proposed stack will be properly constructed and have adequate exhaust gas velocity.

c. Final Versus Transitional Plume Rise

Upon entering the atmosphere, a plume will rise as a function of its thermal buoyancy and momentum, as discussed above. The plume will rise until it loses its buoyancy and momentum. As the plume rises, it travels downwind until it reaches its equilibrium, or final height. Algorithms have been developed to account for this period of transitional plume rise and were utilized for model runs.

5.3.6 Chemical Transformation

Some pollutants undergo chemical transformations after their release into the atmosphere. Various methods can be used to account for these transformations, the most common of which makes use of an exponential decay or "half-life" term, that is dependent on travel time. Of the pollutants that will be emitted by the proposed facility, those most subject to chemical transformations in the atmosphere are sulfur oxides (SO_x), and NO_x . After entering the atmosphere, the amount of SO_2 in the SO_x emissions is slowly depleted. During the short travel times involved in the study area, this depletion is of minimal significance and was not considered. The conversion of NO_x to NO_2 is rapid so all NO_x emissions were treated as NO_2 . Therefore, although several of the models selected for this study contain "half-life" equations for calculating pollutant decay, this option was not used.

5.3.7 Particle Deposition

Large particles settle out of the atmosphere while smaller particles remain suspended. Modeled concentrations will be underpredictions if particle deposition is not calculated and source emissions do include particles that settle out before reaching the receptor. In air permitting analyses, the latter situation is allowed to occur, especially if particulate size distributions are not available, to ensure that ambient air quality standards are met. For this study, all particulate emissions were considered to be non-settleable.

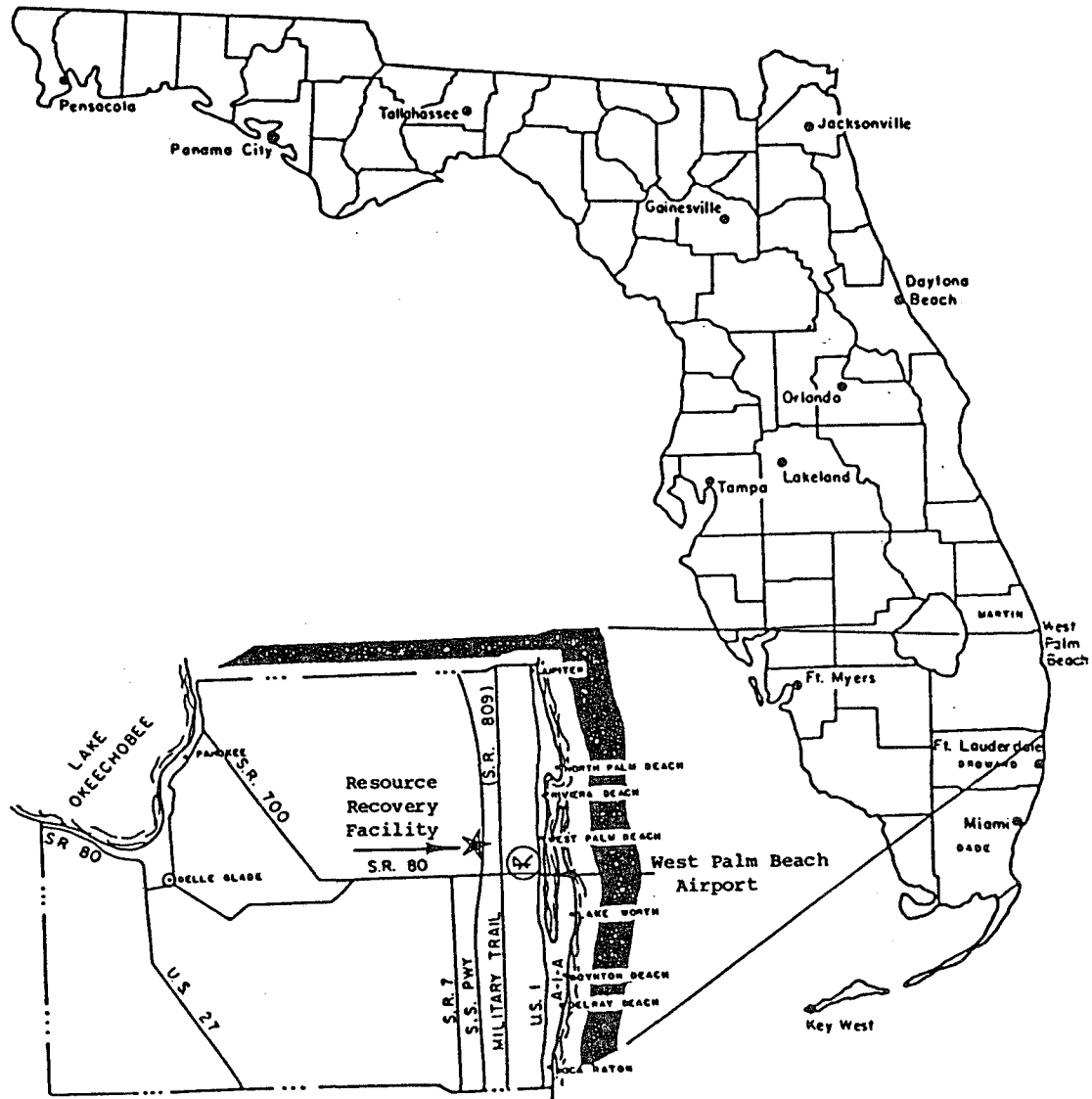
5.4 Meteorological and Climatology

5.4.1 Climatology

The proposed waste-to-energy facility is to be located in Palm Beach County in the lower east coast climatological regime of Florida (Figure 5.1). The site is approximately 10 kilometers west of the Intercoastal Waterway and 11.5 kilometers from the Atlantic Ocean shoreline. There is no significant terrain in the vicinity (Figure 5.2). Summer temperatures are warm and humid while the winter temperatures are moderated slightly by an occasional influx of cool air from the north. The region is dominated by the effect of the Gulf Stream which flows northward following the contours of the lower east coast and a dominant trade wind that blows from east to west. This water trajectory is a moderating influence that cools the region in the summer and gives warmth in the winter. Average mean winter (January) and summer (July) maximum temperatures for Florida are shown in Figure 5.3 and 5.4. The primary rainy season occurs during the six month period from May through October. Most of the precipitation is associated with thunderstorms. The maximum average rainfalls are during the months of September and October. These rains may be associated with tropical storms. The frequency of tropical storms, by year, for Florida is shown in Exhibit Table 5.1. The chances of hurricane force winds at West Palm Beach are 1 in 7. Meteorological conditions that aggravate air pollution are least likely to occur in the lower east coast region due to the prevailing easterly trade winds and the overall prevailing instability of the air. The trade winds are sufficiently pervasive so as to minimize any true sea breeze effect.

LOCATION MAP

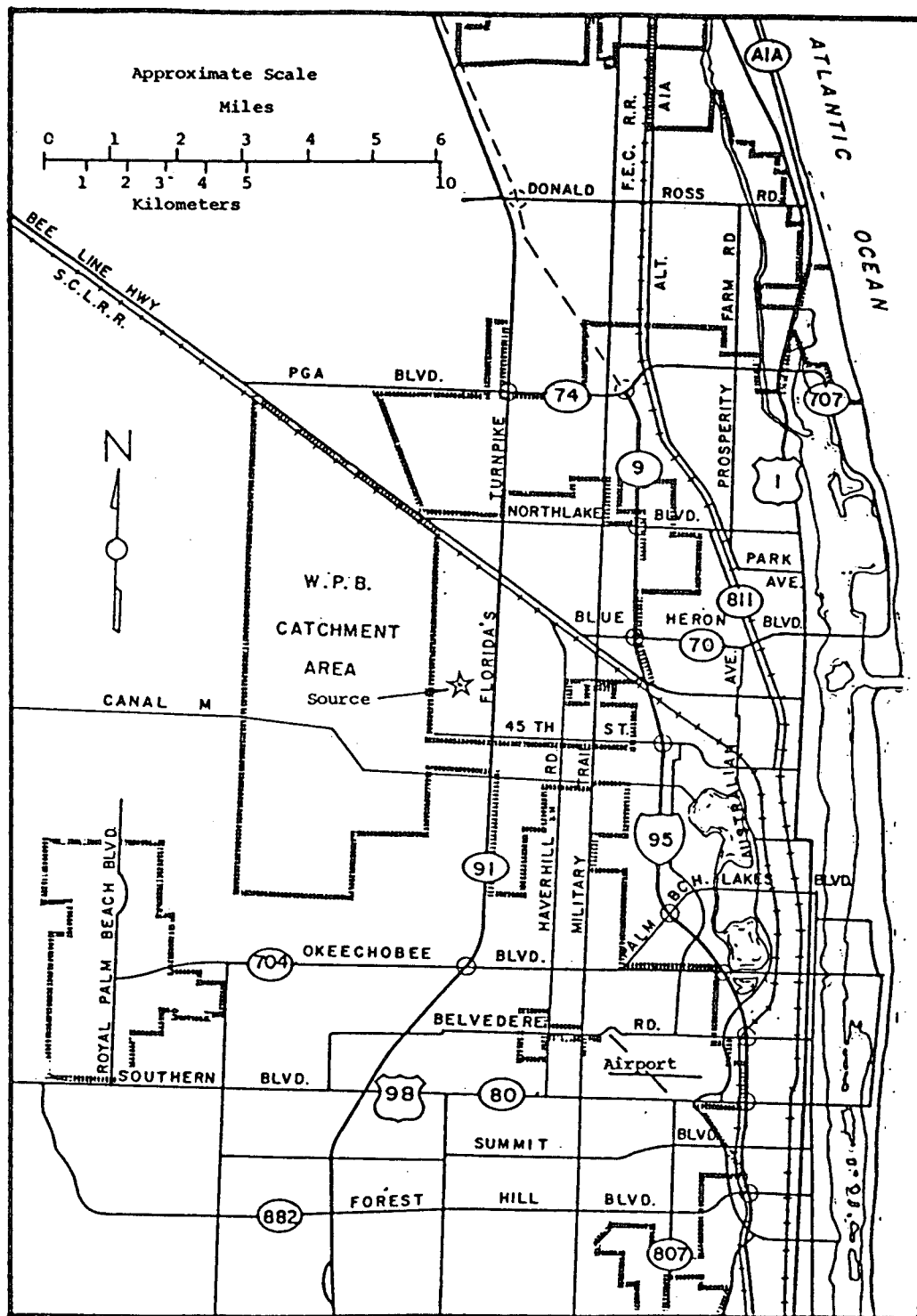
PALM BEACH COUNTY, FLORIDA



**PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY**



FIGURE 5.1



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY

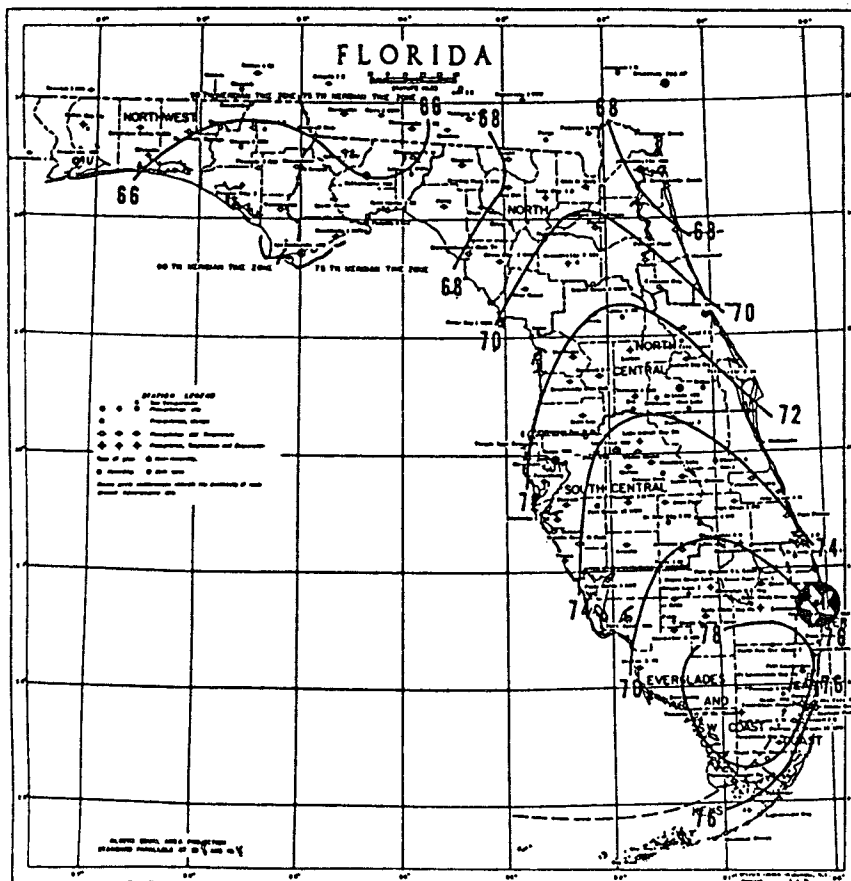


FIGURE 5.2



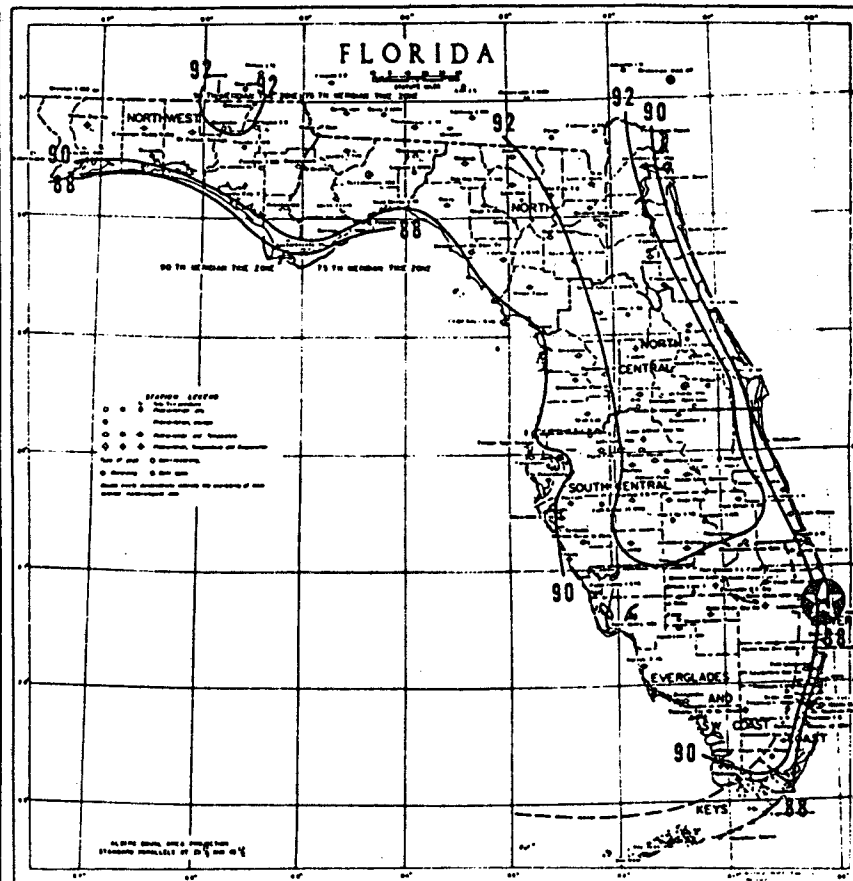
Data Source: CLIMATE OF THE STATES, Vol. 1, Water Information Center, Inc., 1974

MEAN MAXIMUM TEMPERATURE (°F.), JANUARY



Data are based on the period 1931-52. Isotherms are drawn through points of approximately equal value. Caution should be used in interpolating on these maps.

MEAN MAXIMUM TEMPERATURE (°F.), JULY



Data are based on the period 1931-52. Isotherms are drawn through points of approximately equal value. Caution should be used in interpolating on these maps.

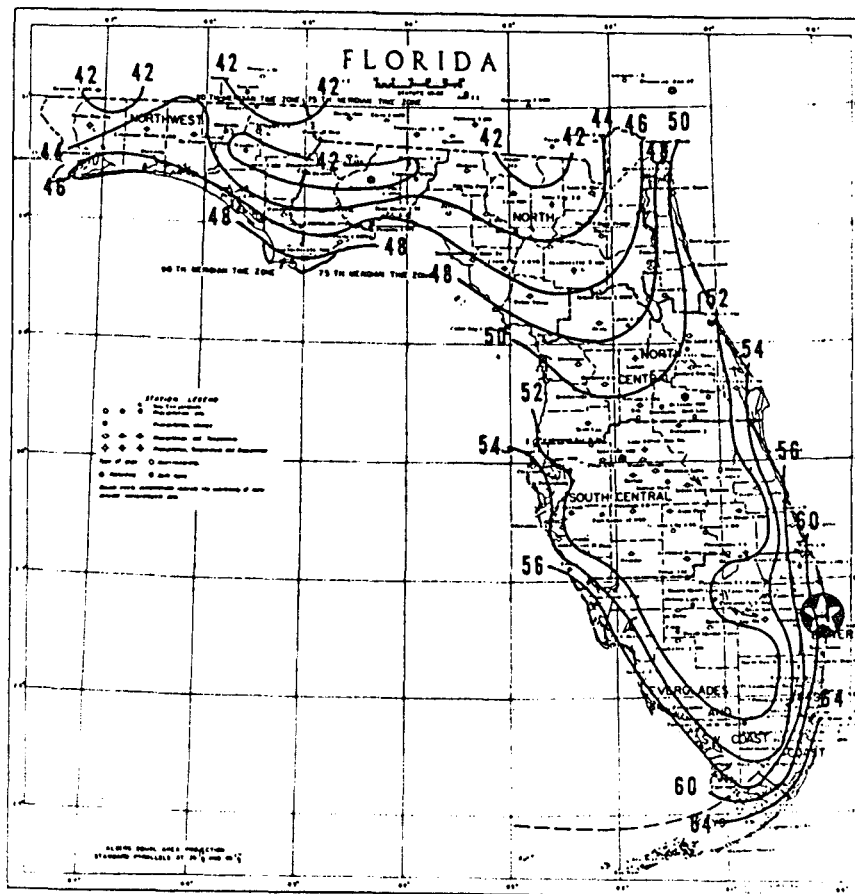
FIGURE 5.3



FIGURE 5.4

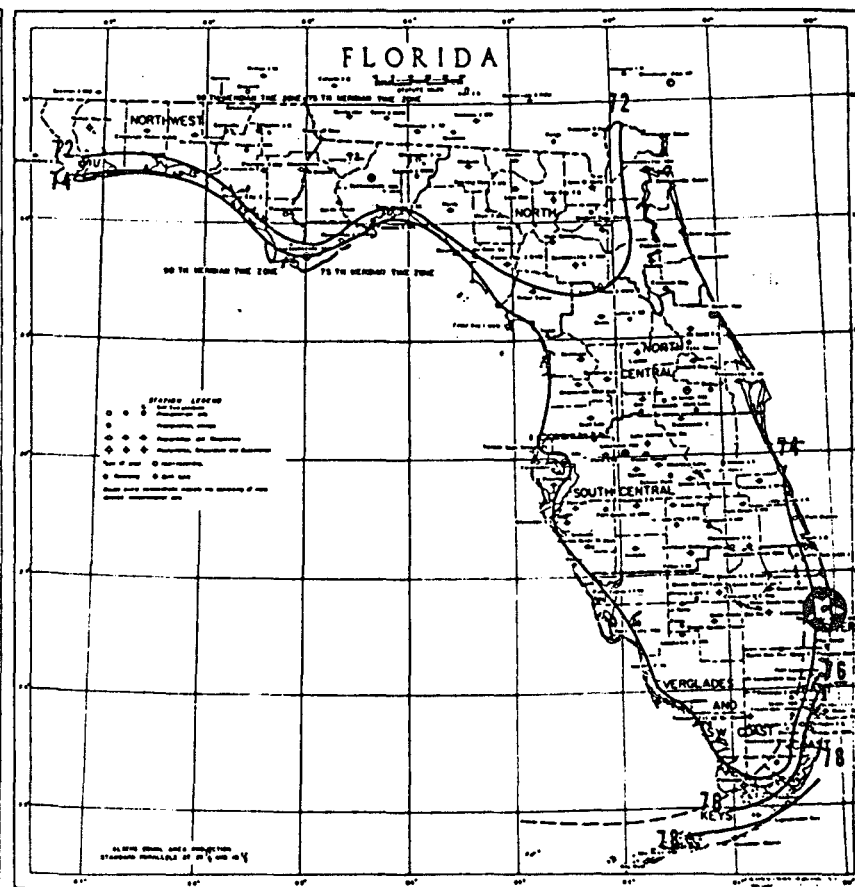
Data Source: CLIMATE OF THE STATES, Vol. 1, Water Information Center, Inc., 1974

MEAN MINIMUM TEMPERATURE (°F.), JANUARY



Data are based on the period 1931-52. Isotherms are drawn through points of approximately equal value. Caution should be used in interpolating on these maps.

MEAN MINIMUM TEMPERATURE (°F.), JULY



Data are based on the period 1931-52. Isotherms are drawn through points of approximately equal value. Caution should be used in interpolating on these maps.

FREQUENCY OF TROPICAL STORMS BY YEARS IN FLORIDA

Year	Of Known Hurricane Intensity	Not or Of Doubtful Hurricane Intensity	Total	Year	Of Known Hurricane Intensity	Not or Of Doubtful Hurricane Intensity	Total
1885	3	1	4	1930	0	1	1
1886	3	1	4	1931	0	0	0
1887	1	1	2	1932	1	1	2
1888	2	1	3	1933	2	2	4
1889	1	2	3	1934	0	0	0
1890	0	0	0	1935	3	0	3
1891	1	1	2	1936	1	2	3
1892	0	2	2	1937	0	3	3
1893	3	2	5	1938	0	1	1
1894	2	1	3	1939	1	1	2
1895	1	3	4	1940	0	0	0
1896	3	0	3	1941	1	1	2
1897	0	1	1	1942	0	0	0
1898	2	0	2	1943	0	0	0
1899	1	2	3	1944	1	0	1
1900	0	1	1	1945	2	1	3
1901	0	2	2	1946	1	1	2
1902	0	1	1	1947	2	1	3
1903	1	0	1	1948	2	0	2
1904	1	0	1	1949	1	0	1
1905	0	0	0	1950	2	2	4
1906	3	1	4	1951	0	1	1
1907	0	1	1	1952	0	1	1
1908	0	0	0	1953	1	2	3
1909	1	1	2	1954	0	0	0
1910	1	0	1	1955	0	0	0
1911	1	1	2	1956	1	0	1
1912	1	0	1	1957	0	3	3
1913	0	0	0	1958	0	1	1
1914	0	0	0	1959	0	2	2
1915	1	1	2	1960	1	2	3
1916	3	0	3	1961	0	0	0
1917	1	0	1	1962	0	0	0
1918	0	0	0	1963	0	1	1
1919	1	1	2	1964	3	2	5
1920	0	1	1	1965	1	1	2
1921	1	0	1	1966	2	0	2
1922	0	0	0	1967	0	0	0
1923	0	1	1	1968	4	0	4
1924	2	1	3	1969	1	1	2
1925	1	0	1	1970	1	1	2
1926	3	0	3	1971	0	0	0
1927	0	0	0				
1928	3	0	3				
1929	1	0	1	Total	84	66	150

CHANCES OF HURRICANE FORCE WINDS IN ANY GIVEN YEAR

City	Chances	City	Chances
Jacksonville	1 in 100	Key West	1 in 8
Daytona Beach	1 in 50	Fort Myers	1 in 11
Melbourne-Vero Beach	1 in 20	Tampa-St. Petersburg	1 in 25
Palm Beach	1 in 7	Apalachicola-St. Marks	1 in 17
Miami	1 in 6	Pensacola	1 in 8

Data Source: CLIMATE OF THE STATES, Vol. 1, Water Information Center, Inc., 1974

PALM BEACH COUNTY
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RESOURCE RECOVERY FACILITY



EXHIBIT TABLE 5.1

Regional Climatology

There are two full time, full service weather stations within 100 km of the proposed facility:

- ° Palm Beach International Airport
- ° Miami International Airport

The Palm Beach International Airport is approximately 9.5 kilometer (5.9 miles) southeast of the proposed facility. The Miami International Airport is approximately 100 kilometers (62 miles) south of the proposed facility. Both stations lie within the Florida lower east coast climatological regime.

Meteorological normals for these two stations are shown in Exhibit Tables 5.2 and 5.3. The meteorological data from the Palm Beach International Airport can be considered representative of the site location for the purpose for air quality modeling analyses. While surface weather data are available from the Palm Beach International Airport, Miami International Airport is the closest available station with recorded upper air data that can be considered as representative for modeling purposes.

A wind frequency distribution summarized for the data collection period from 1970-1974 is available for the Palm Beach International. The joint distribution of these data as a function of wind speed and direction are shown in Figure 5.5. A directional summary of these data in wind rose format is shown in Figure 5.6, along with the average speed for each direction.

The annual average wind speed derived from the 1970-1974 summary wind frequency distribution is approximately 4.27 m/s (9.6 mph). The highest average speed as a function of wind direction is approximately 5.83 m/s (13.0 mph) for winds from the ENE. The winds with the highest frequency of occurrence are from the E (17.2%). Winds from the E and ESE account for 27.3% of all occurrences and winds from an expanded sector ENE through SE account for 44.2% of all occurrences. The summary joint distributions of the wind directions and stability classes are shown in Figure 5.7 and 5.8. The proportion stable stability classes: 5 & 6 per total frequency for each wind direction exceeds 50% for the directions SSW through NW. These two classes are 62% of all the winds from the west (W). These two classes represent less than 20% of the observations for winds from the NNE through E.

The wind distribution, average speeds and stability category data are based on USDEP, COMM. NOAA, EDS, NCC STAR Program results. These data were used to generate annual impact concentrations.

The Summary by Hour analyses given in the monthly Local Climatological Data (LCD) for West Palm Beach for the period 1970 -1974 were used to generate seasonal diurnal distributions for the resultant wind directions and average wind speeds. Winter consists of all available data for the months of December, January and February. Spring consisted of all available data for the months of March, April and May, etc. The derived seasonal diurnal variations for wind direction are shown in Figure 5.9.

The diurnal variations of the wind directions for the spring and summer seasons are almost identical and uniquely different from the diurnal curve for

EXHIBIT TABLE 5.2

1973

Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows: Airport locations: Highest temperature 100 in July 1942; lowest temperature 26 in December 1934 (28 in January 1940); minimum precipitation 24 hours 12.58 in April 1942. City locations: Lowest temperature 27 in February 1917; maximum precipitation in 24 hours 15.10 in November 1923; fastest mile of wind 122 from the South in October 1930. Miami Beach (Allison Hospital): Fastest mile of wind 132 from the East, September 18, 1926.

1973

Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows:
Highest temperature 101° in July 1942.

NOAA, EDS, NCC, October, 1976

- NORMALS - Based on record for the 1941-1970 period.
 DATE OF AN EXTREME - The most recent in cases of multiple occurrence.
 PREVAILING WIND DIRECTION - Record through 1963.
 WIND DIRECTION - Numerals indicate tens of degrees clockwise from true north. 00 indicates calm.
 FASTEST MILE WIND - Speed is fastest observed 1-minute value when the direction is in tens of degrees.

* NORMALS BY CLIMATOLOGICAL DIVISIONS

Taken from "Climatology of the United States No. 81-4, Decennial Census of U. S. Climate"

	TEMPERATURE (°F)												PRECIPITATION (In.)													
STATIONS (By Divisions)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANN	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANN
LOWER EAST COAST																										
FORT LAUDERDALE	67.8	68.4	70.7	74.3	77.5	80.4	81.8	82.6	81.5	77.9	72.6	69.0	75.4	2.20	2.06	2.84	4.19	5.29	7.42	9.96	6.88	8.96	6.39	3.18	2.90	60.29
HOMESTEAD EXP STA	65.4	66.5	69.2	72.8	75.9	79.2	80.2	80.7	80.0	76.3	70.7	66.9	73.7	1.75	1.71	2.38	3.69	4.46	6.77	8.81	8.29	6.41	3.72	2.28	1.22	64.69
MIAMI BEACH	69.1	69.6	71.6	74.9	78.2	81.1	82.3	82.9	81.7	78.4	73.8	70.3	76.2	1.68	1.65	1.95	2.92	4.36	5.63	4.45	5.06	7.36	6.71	2.53	1.78	46.26
MIAMI WSO	66.9	67.9	70.5	74.2	77.6	80.8	81.8	82.3	81.3	77.8	72.4	68.1	75.1	2.03	1.87	2.27	3.88	6.44	7.37	6.75	6.97	9.47	8.21	2.83	1.67	59.76
MIAMI 12 SSW	66.5	67.4	70.4	74.2	77.5	80.4	81.6	82.0	81.0	77.2	71.6	67.7	74.8	2.05	1.80	2.44	3.75	6.13	7.00	6.58	6.25	9.03	8.23	2.59	1.63	57.48
WEST PALM BEACH WSO	66.9	67.6	69.9	73.9	77.6	81.0	82.6	83.0	82.1	78.2	72.5	68.2	75.3	2.48	2.35	3.44	4.34	5.11	7.53	6.66	6.74	9.66	7.96	2.86	2.37	61.70
DIVISION	66.9	67.6	70.0	73.6	77.0	80.2	81.5	82.0	81.0	77.4	72.0	68.2	74.8	2.16	2.02	2.82	3.90	5.49	7.44	6.65	6.82	9.47	8.15	2.84	2.17	60.00
KEYS																										
KEY WEST WSO	69.6	70.4	72.5	75.8	79.0	81.8	83.3	83.6	82.3	79.0	74.1	70.6	76.8	1.53	1.98	1.77	2.48	2.73	3.97	4.16	4.33	6.73	5.82	2.80	1.69	39.99
KEY WEST	70.4	71.3	73.6	77.1	80.2	82.8	84.0	84.3	83.0	79.6	74.9	71.4	77.7	1.49	2.00	1.73	2.51	2.77	4.01	4.16	4.25	6.53	5.87	2.81	1.71	39.84
DIVISION	70.2	71.0	73.3	76.6	79.6	82.4	83.5	83.8	82.5	79.2	74.5	71.2	77.3	1.71	1.88	1.92	2.29	3.10	4.33	4.54	4.68	7.05	6.73	2.43	1.88	42.55

* Normals for the period 1931-1960. Divisional normals may not be the arithmetical average of individual stations published, since additional data for shorter period stations are used to obtain better areal representation.

CONFIDENCE - LIMITS

In absence of trend or record changes, the chances are 9 out of 10 that the true mean will lie in the interval formed by adding and subtracting the values in the following table from the means for any station in the State. Because of the wider variation in mean precipitation, the corresponding monthly means and annual mean must be substituted for "p" in the precipitation table below to obtain mean precipitation confidence limits.

1.3 | 1.3 | 1.1 | .5 | .5 | .4 | .4 | .3 | .4 | .5 | .8 | 1.2 | .4 | 39/p | 37/p | 44/p | 48/p | 47/p | 48/p | 38/p | 43/p | 53/p | 59/p | 44/p | 35/p | 44/p

COMPARATIVE DATA

Data in the following table are the mean temperature and average precipitation for St. Leo's Abbey, Florida, for the period 1901-1930 and are included in this publication for comparative purposes.

60.3 | 61.7 | 66.3 | 70.6 | 75.8 | 79.2 | 80.5 | 80.7 | 79.2 | 73.2 | 65.4 | 60.3 | 71.1 | 2.87 | 2.54 | 2.90 | 2.20 | 4.44 | 8.19 | 8.22 | 8.48 | 6.91 | 3.70 | 2.20 | 2.51 | 55.16

Data Source: CLIMATE OF THE STATES, Vol. 1, Water Information Center, Inc., 1974

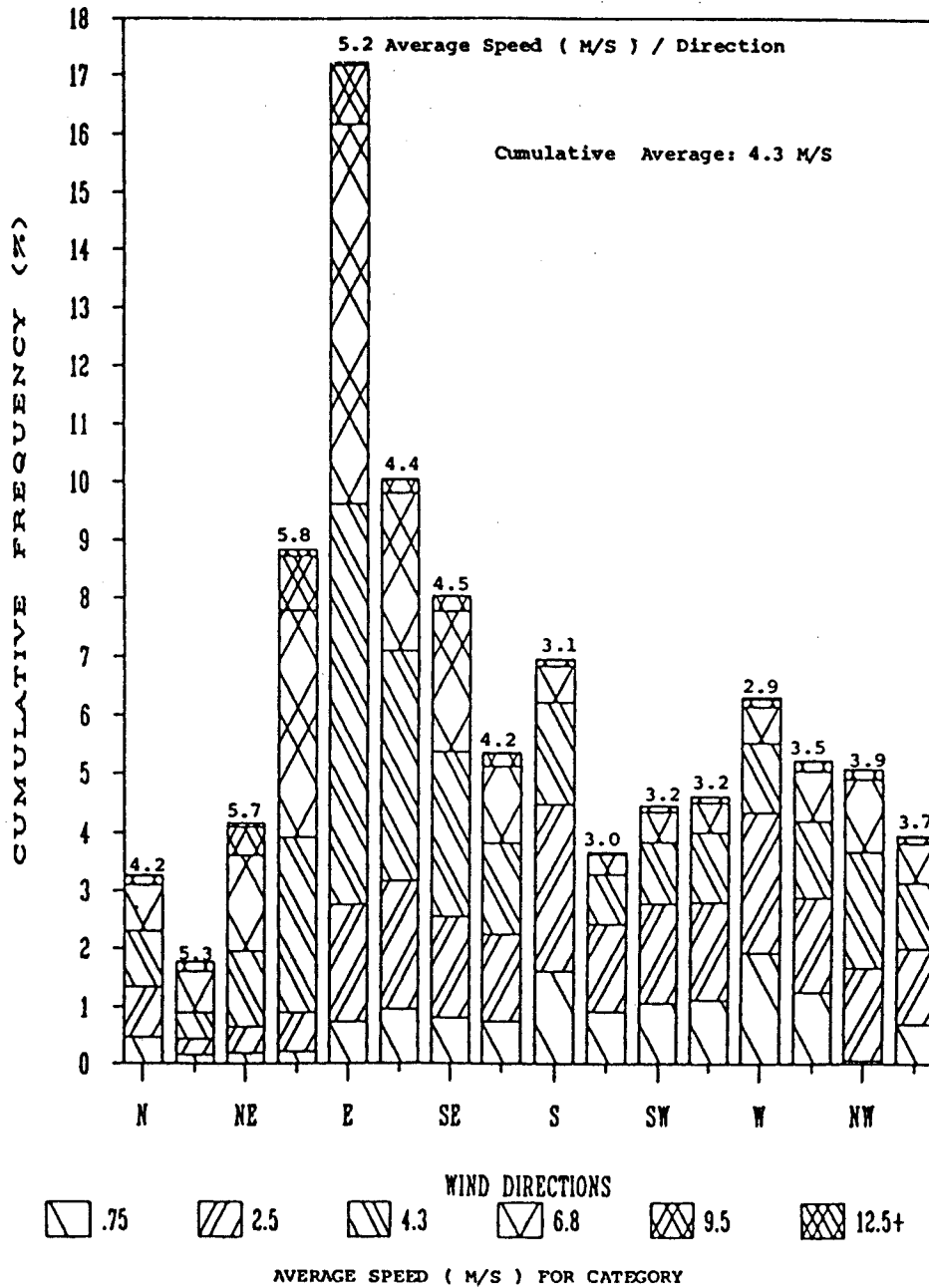
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EXHIBIT TABLE 5.3

WIND SPEED FREQUENCY DISTRIBUTIONS

WEST PALM BEACH, FL. (1970-1974)



PALM BEACH COUNTY
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RESOURCE RECOVERY FACILITY

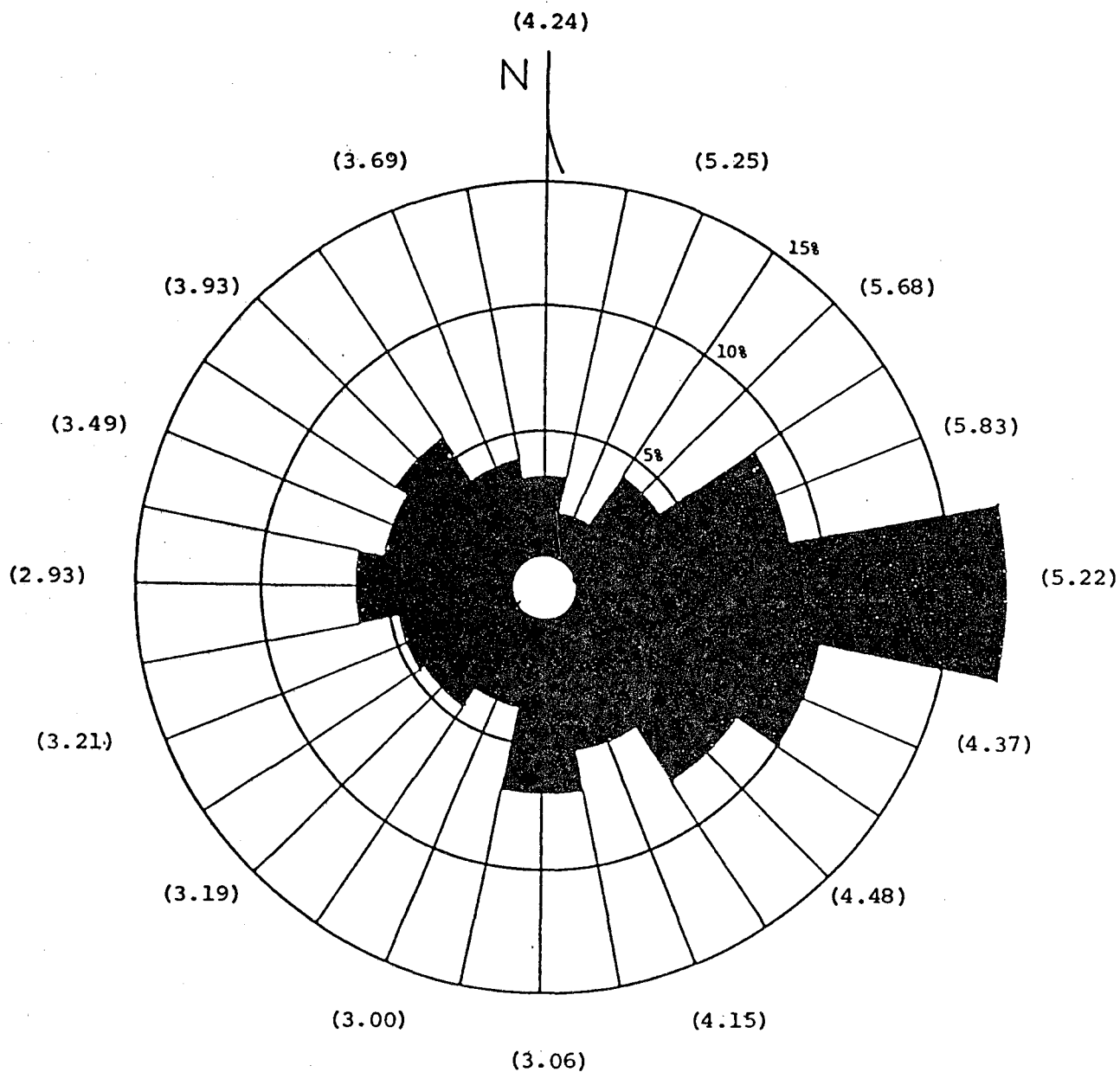


FIGURE 5.5

WIND DIRECTION FREQUENCY DISTRIBUTION

WEST PALM BEACH: 1970-1974

(Annual Average Wind Speed: 4.3 M/S)



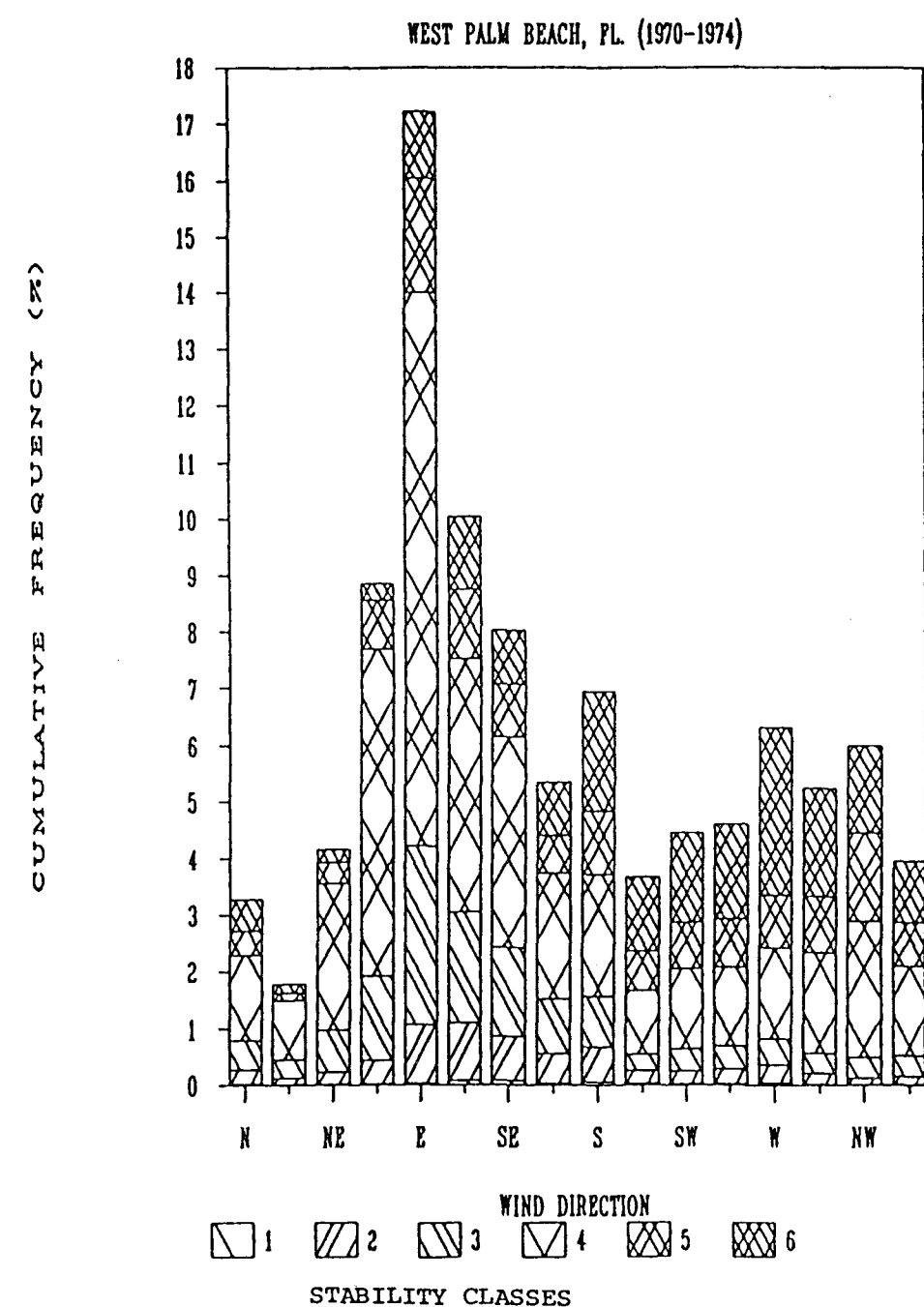
Average Wind Speed: (m/s)

PALM BEACH COUNTY
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FIGURE 5.6

STABILITY CLASS FREQUENCY DISTRIBUTIONS



PALM BEACH COUNTY
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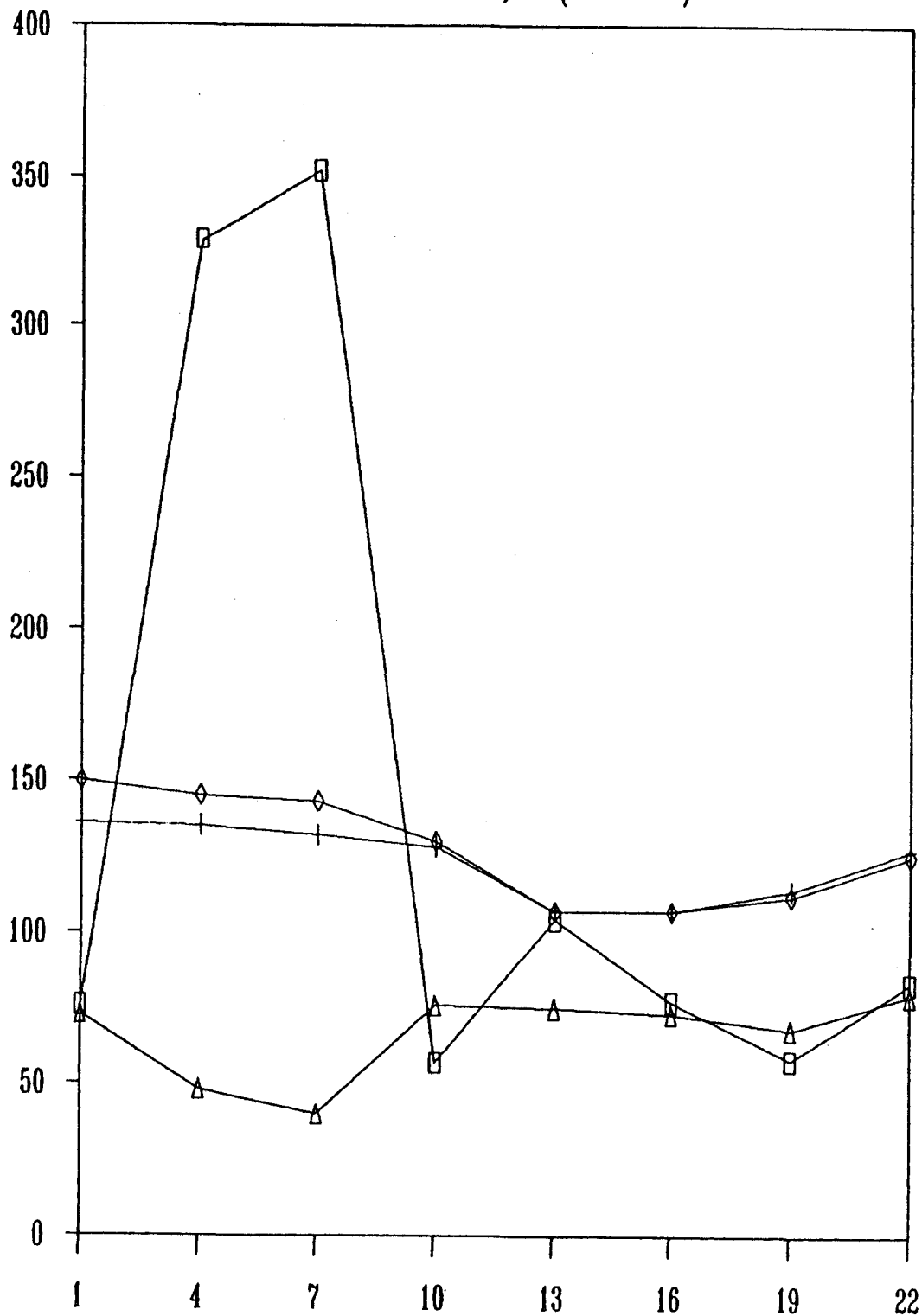


FIGURE 5.7

SEASONAL DIURNAL WIND DIRECTIONS

WEST PALM BEACH, FL. (1970-1974)

AVERAGE RESULTANT WIND DIRECTION



HOUR OF DAY (EST)

□ WINTER

+ SPRING

◇ SUMMER

△ FALL

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FIGURE 5.8

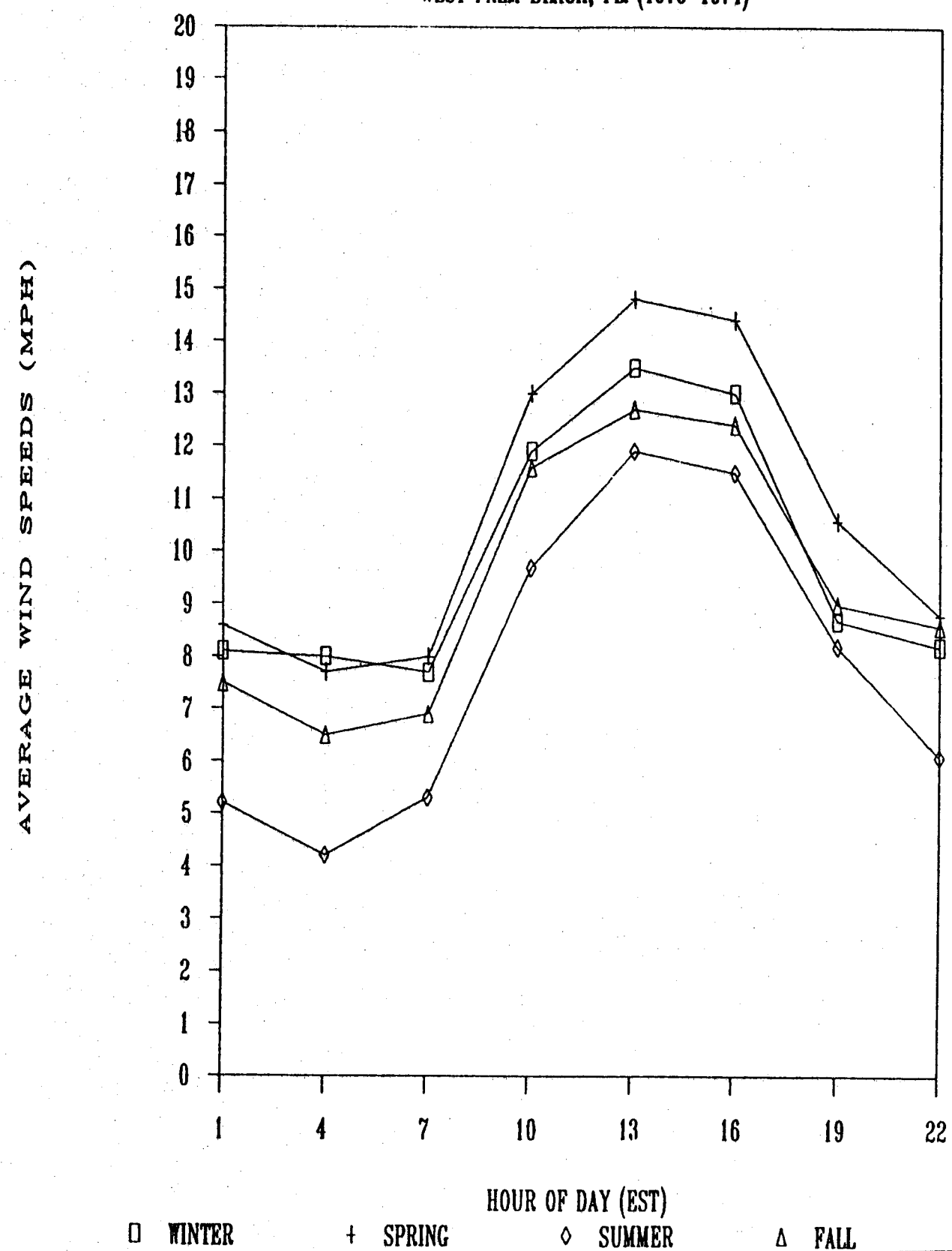
the fall season. The winter season curve is erratic particularly during the early morning hours, but tends to correspond with that of the fall season during the daylight and early evening hours.

The diurnal wind direction patterns give no indication of a diurnal shift that would be consistent with an ocean sea breeze. They, instead confirm the dominant easterly trade winds that were observed in the annual wind direction frequency roses. The seasonal diurnal wind speed distributions shown in Figure 5.9 all have the same general form. The minimum wind speeds occurred at or between 0400-0700. The minimum average speed was 1.9 m/s (4.3 mph) at 0400 during the summer season. The maximum wind speeds occurred at 1300. The highest average speed was 6.6 m/s (14.8 mph) during the spring season. The spring season (except at 0400) has the highest diurnal average wind speeds and the summer season (without exception) has the lowest diurnal average wind speed.

Seasonal mixing heights for the West Palm Beach, based on G.C. Holtzworth, differ slightly from those of Miami when they are extracted from Holtzworth's isopheth maps. These values are given in Exhibit Table 5.4.

SEASONAL DIURNAL WIND SPEEDS

WEST PALM BEACH, FL. (1970-1974)



PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



FIGURE 5.9

EXHIBIT TABLE 5.4

HOLTZWORTH* MIXING HEIGHTS FOR WEST PALM BEACH AND MIAMI

PERIOD	MORNING		AFTERNOON	
	WEST PALM	MIAMI#	WEST PALM	MIAMI#
ANNUAL	800	923	1375	1351
SPRING	800	980	1400	1457
SUMMER	900	1071	1400	1383
FALL	800	933	1350	1341
WINTER	700	707	1175	1221

*G.C. Holtzworth, Mixing Heights, Winds Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States: USEPA AP-101, January, 1972.

#APPENDIX B, Table B-1; all cases, Holtzworth, 1972.

5.4.2 Available Sources of Meteorological Data

When refined dispersion modeling analyses are performed, a full year (or more) of meteorological data is required. The short-term dispersion models require hour-by-hour meteorological data and the long-term models require seasonal or annual average data. The meteorological parameters needed include wind direction, wind speed, temperature, cloud cover, solar insolation, and mixing height. Mixing height is calculated using the CRSTER preprocessor program from surface temperature and upper air soundings of the rate of temperature change with height, the latter of which are usually obtained by balloon measurements.

The nearest NWS station to the proposed waste-to-energy facility is West Palm Beach Airport which is located 9.5 kilometers (5.9 miles) to the southeast. The nearest NWS station for upper air data is Miami Airport located 100 kilometers (62 miles) to the south. The Florida DER provided the most recent five-year surface and upper air meteorological data for the years 1970 thru 1974 inclusive and these data were used for the ISCST model runs.

5.4.3 Procedures for Using the Meteorological Data

Each of the five years of hourly meteorological data are used in separate refined modeling analyses to determine the maximum impacts of the proposed source by itself. The meteorological days which produced the 50 maximum 1, 3, 8 and 24-hour impacts for each of the 5 years were used in subsequent refined multisource modeling analyses to determine compliance with NAAQS consumption. Tables 5-5A thru E list these days for each of the years 1970 thru 1974.

5.5 Receptor Selection

5.5.1 Procedures for Receptor Selection

Receptor selection is an important part of the modeling analysis. Receptors must be selected in such a manner as to ensure that all possible locations of maximum impact are included in the analysis. This can be accomplished by developing receptor grids, supplemented by discrete receptors at critical locations, if necessary. Two types of receptor grids can be used, rectangular or polar.

With a rectangular grid, receptors are placed at the intersections of a selected set of equally spaced map coordinate lines, where the lines are oriented north/south and east/west. The selected set of receptors is usually centered on the proposed source and extends outward a prescribed distance. Available map coordinate systems include latitude/longitude, Universal Transverse Mercator (UTM) meters, and State grid feet. With a polar grid, receptors are placed at the intersections of radials that extend out from the proposed source. In order to develop a polar receptor grid, the PTPLU and PTDIS models were first used to predict maximum hourly impacts of the proposed source, based on PTPLU's built-in set of hypothetical meteorological data. For this analysis, the receptor elevation in PTPLU is set equal to the highest terrain elevation found within 1 kilometer of the proposed source's stack. The proposed source is modeled using PTPLU to determine the distances (without regard to direction) at which

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TABLE 5-5A

METEOROLOGICAL DAYS OF OCCURRENCE FOR THE 50 MAXIMUM IMPACTS FOR THE INDICATED TIME PERIOD
BASED ON INITIAL ISCST MODEL RUN FOR THE YEAR 1970

1-HOUR MAXIMUM DAY	3-HOUR MAXIMUM DAY	8-HOUR MAXIMUM DAY	24-HOUR MAXIMUM DAY	CUMULATIVE DAY	
49	20	60	33	20	215
155	32	61	60	32	216
161	33	73	61	33	218
164	60	76	121	49	224
175	73	121	129	60	226
176	121	152	242	61	228
180	139	194	269	73	231
187	218	211	270	76	239
190	224	215	279	121	241
216	226	226	280	129	242
306	228	231	292	139	269
318	231	241	328	152	270
	239	270	342	161	274
	241	291		164	279
	270	342		175	280
	274			176	291
	342			180	292
				187	306
				190	318
				194	328
				211	342

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TABLE 5-5B

METEOROLOGICAL DAYS OF OCCURRENCE FOR THE 50 MAXIMUM IMPACTS FOR THE INDICATED TIME PERIOD
BASED ON INITIAL ISCST MODEL RUN FOR THE YEAR 1971

1-HOUR MAXIMUM DAY	3-HOUR MAXIMUM DAY	8-HOUR MAXIMUM DAY	24-HOUR MAXIMUM DAY	CUMULATIVE DAY	
104	19	33	19	19	196
148	34	58	33	33	207
157	58	114	34	34	211
162	85	186	58	58	214
166	111	214	101	85	215
168	114	268	268	101	220
171	168	309	310	104	256
172	172	319	319	111	268
176	191	320	320	114	309
195	193	321	321	148	319
196	207	327	327	157	320
211	220	336	335	162	321
215	309	353	357	166	327
220	319	357		168	335
256	320	358		171	336
319	353	359		172	353
	356			176	356
	357			186	357
	359			191	358
				193	359
				195	

TABLE 5-5C

METEOROLOGICAL DAYS OF OCCURRENCE FOR THE 50 MAXIMUM IMPACTS FOR THE INDICATED TIME PERIOD
BASED ON INITIAL ISCST MODEL RUN FOR THE YEAR 1972

1-HOUR MAXIMUM DAY	3-HOUR MAXIMUM DAY	8-HOUR MAXIMUM DAY	24-HOUR MAXIMUM DAY	CUMULATIVE DAY	
40	16	71	71	16	183
75	17	81	101	17	193
88	62	95	119	40	195
103	71	100	120	62	206
170	94	101	127	71	209
172	95	126	168	75	212
183	100	127	170	81	215
193	101	170	174	88	218
195	119	209	285	94	225
206	126	280	295	95	228
215	127	285	296	100	232
218	133	286	306	101	233
225	169	287		103	280
228	170	294		119	285
232	171	295		120	286
233	193			126	287
	209			127	294
	212			133	295
	233			168	296
	280			169	306
	294			170	351
	295			171	353
	296			172	356
	351			174	
	353				
	356				

TABLE 5-5D

METEOROLOGICAL DAYS OF OCCURRENCE FOR THE 50 MAXIMUM IMPACTS FOR THE INDICATED TIME PERIOD
BASED ON INITIAL ISCST MODEL RUN FOR THE YEAR 1973

1-HOUR MAXIMUM DAY	3-HOUR MAXIMUM DAY	8-HOUR MAXIMUM DAY	24-HOUR MAXIMUM DAY	CUMULATIVE DAY	
119	17	17	17	17	177
132	29	29	32	29	179
142	33	32	74	32	182
143	64	33	84	33	186
167	94	74	105	64	189
177	97	84	106	74	191
182	104	97	107	84	209
186	105	104	108	94	217
187	107	106	110	97	221
189	108	107	111	104	234
191	110	108	284	105	258
209	111	111	285	106	259
217	112	121	294	107	261
221	132	122	295	108	262
234	179	123		110	266
258	186	179		111	267
262	259	287		112	284
266	261	294		119	285
267	266	314		121	287
	284	315		122	294
	285			123	295
	296			132	296
	314			142	314
	315			143	315
	355			167	355

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TABLE 5-5E

METEOROLOGICAL DAYS OF OCCURRENCE FOR THE 50 MAXIMUM IMPACTS FOR THE INDICATED TIME PERIOD
BASED ON INITIAL ISCST MODEL RUN FOR THE YEAR 1974

1-HOUR MAXIMUM DAY	3-HOUR MAXIMUM DAY	8-HOUR MAXIMUM DAY	24-HOUR MAXIMUM DAY	CUMULATIVE DAY	
80	39	65	74	39	197
90	47	73	101	47	201
127	73	74	110	65	204
133	74	101	111	73	205
155	83	102	277	74	208
158	92	103	278	80	211
173	101	110	285	83	222
197	102	111	294	90	229
201	111	115	295	92	231
204	115	137	357	101	234
205	130	184		102	247
208	161	278		103	256
211	170	279		110	265
222	184	294		111	267
229	265	295		115	277
231	277	296		127	278
234	278	330		130	279
247	284	357		133	284
256	295			137	285
267	306			155	294
				158	295
				161	296
				170	306
				173	330
				184	357

maximum impacts occur. All maximum impact distances (for each stability category) were input as rings to ISCST and additional rings were placed at prudent locations (three within and others between and beyond the PTPLU maximum impact distances). A total of 27 rings and 70 radials were input yielding 1890 receptors to determine the maximum impacts of the source alone.

Maximum impacts can be found using either a polar or rectangular receptor grid. The polar grid is preferable for single source analysis because it provides better impact resolution near the proposed source. The rectangular grid system is usually preferable for multisource analyses because the impact resolution is the same throughout the grid. However, in this study, because a polar grid was used in the screening modeling analyses performed to determine the size of the modeling area, the same type of grid was used for the refined multisource modeling analyses. Additional discrete receptors were also placed at all monitoring sites within the study area. Table 5-6 lists monitoring station sites together with their locations and pollutants monitored. No other additional discrete receptors were needed for this study.

5.6 Modeling Procedures and Preliminary Analysis Results

5.6.1 PTPLU and PTDIS Screening Modeling Analyses

The initial screening modeling analyses were performed to determine the critical downwind distances using PTPLU and PTDIS models. All receptors and the proposed facility were assumed to be at zero elevations. Maximum impacts depending on stability class were identified at 571, 926, 1046 and 1615 meters. 571 meters is within the Facility boundaries.

5.6.2 ISCST Modeling Analyses

Modeled impacts were calculated at 27 concentric rings of receptors centered on the proposed waste to energy facility stack and spaced at every 6° azimuth. The ring distances from the stack were selected based on the results of the earlier screening modeling analyses performed using the PTPLU model. The ring distances modeled were located 100, 250, 500, 571, 730, 926, 1046, 1500, 1615, 2000, 4000, 5000, 7005, 8956, 9026, 9796, 10000, 11414, 15000, 18045, 20000, 24563, 33308, 41853, 44750, 53136 and 53671 meters from the stack of the proposed waste-to-energy facility. SO₂ impacts were calculated on a 1-hour, 3-hour, 8-hour, 24-hour and annual average basis using ISCST. SO₂ impacts were calculated for each of the five years (1970 through 1974) of available meteorological data. The impacts of each of the other pollutants emitted by the facility were determined based on the ratio of the emission rate of the other pollutant versus the appropriate SO₂ emission rate. (Emission rates based on 2100 TPD except for all sources 1970: 1800 TPD.)

Refined multisource runs were performed for the existing sources in Table 5-7 to determine the maximum combined SO₂ impacts of all sources. Also included in Table 5-7 are the stack parameters and UTM coordinates for each source. Since single source ISCST modeling had determined that the proposed source did not produce significant short-term SO₂ impacts upon the existing sources (see Table 5-8) only the impacts of the existing sources in combination with the proposed source downwind of the proposed source were evaluated by ISCST and ISCLT. Downwind radials were located at the angle

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TABLE 5-6

MONITORING STATION LOCAL ADDRESSES, UTM COORDINATES AND LOCATION (DISTANCE & ANGLE)
RELATIVE TO THE PROPOSED PALM BEACH COUNTY RDF FIRED WATERWALL FURNACE FACILITY

(FACILITY UTM COORDINATES 2960180N; 585820E; UTM ZONE 17)

SITE NO.	ADDRESS (MONITORING CAPABILITY)	UTM COORDINATES ZONE 17	DISTANCE FROM PROPOSED FACILITY (METERS)	DIRECTION RELATIVE TO PROPOSED FACILITY (NORTH = 0 (360) DEGREES) (DEGREES)
1	WEST PALM BEACH WATER TREATMENT PLANT FIRST STREET & TAMARIND AVENUE WEST PALM BEACH, FLORIDA (CO, NO2, METEOROLOGY)	2955030N 0593232E	9026	125
1 A	PALM BEACH COUNTY HEALTH DEPARTMENT 901 EVERNIA STREET WEST PALM BEACH, FLORIDA (SUSPENDED PARTICULATE)	2955030N 0593232E	9026	125
2	NORTH PALM BEACH WATER TREATMENT PLANT 603 ANCHORAGE DRIVE NORTH PALM BEACH, FLORIDA (SUSPENDED PARTICULATE)	2965817N 0592780E	8956	51
3	LAKE WORTH WATER TREATMENT PLANT 301-303 COLLEGE STREET LAKE WORTH, FLORIDA (SUSPENDED PARTICULATE)	2943537N 0592793E	18045	157
4	DELRAY BEACH WATER TREATMENT PLANT 202 NW FIRST STREET DELRAY BEACH, FLORIDA (SUSPENDED PARTICULATE)	2927488N 0592195E	33308	169
5	BOCA RATON FIRE STATION #1 1151 NORTH FEDERAL HIGHWAY BOCA RATON, FLORIDA (SUSPENDED PARTICULATE)	2915768N 05913137E	44750	173

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TABLE 5.6 Cont'd

MONITORING STATION LOCAL ADDRESSES, UTM COORDINATES AND LOCATION (DISTANCE & ANGLE)
RELATIVE TO THE PROPOSED PALM BEACH COUNTY RDF FIRED WATERWALL FURNACE FACILITY

(FACILITY UTM COORDINATES 2960180N; 585820E; UTM ZONE 17)

SITE NO.	ADDRESS (MONITORING CAPABILITY)	UTM COORDINATES ZONE 17	DISTANCE FROM PROPOSED FACILITY (METERS)	DIRECTION RELATIVE TO PROPOSED FACILITY (NORTH = 0 (360) DEGREES) (DEGREES)
6	SOUTHWEST FIRE DEPARTMENT 1180 SOUTH MILITARY TRAIL WEST PALM BEACH, FLORIDA (SUSPENDED PARTICULATE)	2949018N 0588207E	11414	168
7	COLLEGE OF BOCA RATON 1151 NORTH FEDERAL HIGHWAY BOCA RATON, FLORIDA (SUSPENDED PARTICULATE)	2918354N 0587320E	41853	178
8	SOUTH FLORIDA WATER MANAGEMENT PUMP STATION TWENTY MILE BEND STATE ROAD 80 (SUSPENDED PARTICULATE, OZONE, METEOROLOGY)	2951402N 0562879E	24563	249
9	PAHOKEE SEWAGE TREATMENT PLANT 1050 McCLURE ROAD PAHOKEE, FLORIDA (SUSPENDED PARTICULATE)	2964200N 0532300E	53671	274
10	ROYAL PALM BEACH R.V. AREA 10999 OKEECHOBEE BOULEVARD ROYAL PALM BEACH, FLORIDA (OZONE, METEOROLOGY)	2954150N 0578100E	9796	232
11	PALM BEACH COUNTY HEALTH DEPARTMENT WAREHOUSE 2030 AVENUE "L" RIVIERA BEACH, FLORIDA (SULFUR DIOXIDE)	2962350N 0592480E	7005	72
12	BELLE GLADE HEALTH DEPARTMENT 1024 NW AVENUE "D" BELLE GLADE, FLORIDA (SUSPENDED PARTICULATE)	2953082N 0533160E	53136	262

TABLE 5-7

STACK PARAMETERS OF MAJOR SOURCES WITHIN 50 KM OF THE PROPOSED PALM BEACH COUNTY
RDF FIRED SPREADER STOKER FURNACE FACILITY

(FACILITY UTM COORDINATES 2960180N; 585820E; UTM ZONE 17)

SOURCE	EMISSION POINT NO.	VOLUMETRIC FLOW (M3/SEC)	STACK DIAMETER (METERS)	STACK HEIGHT (METERS)	EXIT VELOCITY (MPS)	EXIT TEMPERATURE (DEG K)	SO2 EMISSION (GPS)
PRATT & WHITNEY	UNIT 1	42.83	2.29	19.96	10.40	533.	67.95
	UNIT 2	42.83	2.29	19.96	10.40	533.	67.95
LAKE WORTH UTILITIES	UNIT S-1	12.34	1.52	18.29	6.80	433.	36.3
	UNIT S-2	11.25	1.52	18.29	6.20	434.	36.3
	UNIT S-3	27.44	2.13	38.10	7.70	408.	103.9
	UNIT S-4	39.95	2.29	38.10	9.70	408.	133.9
	UNIT S-5	133.70	3.05	22.86	18.30	450.	11.6
FLORIDA POWER AND LIGHT	UNIT 2	103.34	4.57	45.72	6.30	430.	54.2
	UNIT 3	353.50	4.88	90.83	18.90	408.	349.3
	UNIT 4	353.50	4.88	90.83	18.90	408.	349.3

TABLE 5-8

SO2 IMPACT OF THE PROPOSED FACILITY ON EXISTING MAJOR SO2 SOURCES
WITHIN THE MODELING AND SCREENING AREA

(FACILITY UTM COORDINATES 2960180N; 585820E; UTM ZONE 17)

SOURCE NO.	NAME & ADDRESS	DISTANCE (METERS)/ DIRECTION (DEGREES) (NORTH = 0 (360) DEGREES) RELATIVE TO PROPOSED FACILITY	MET YEAR	MAXIMUM IMPACT OF PROPOSED FACILITY ON THE EXISTING SOURCE (UG/M3)		
				3-HOUR	24-HOUR	ANNUAL MEAN
1	PRATT & WHITNEY 301-303 COLLEGE STREET LAKE WORTH, FLORIDA UTM ZONE 17; 2974400N; 0565500E	24801/305	1970	11.6	2.2	0.24
			1971	12.7	2.9	0.30
			1972	11.7	3.5	0.30
			1973	13.0	4.3	0.38
			1974	12.3	3.3	0.32
2	FLORIDA POWER & LIGHT RIVIERA BEACH, FLORIDA UTM ZONE 17; 2960600N; 0594200E	8391/ 87	1970	23.0	4.3	0.26
			1971	16.6	4.1	0.25
			1972	17.4	4.4	0.21
			1973	17.9	3.9	0.21
			1974	16.7	3.3	0.22
3	LAKE WORTH UTILITIES AUTHORITY TOM G. SMITH MUNICIPAL POWER PLANT 127 COLLEGE STREET LAKE WORTH, FLORIDA 33460 UTM ZONE 17; 2943700N; 0592800E	17897/157	1970	9.4	2.5	0.18
			1971	15.2	2.9	0.17
			1972	15.0	2.1	0.18
			1973	13.7	3.6	0.21
			1974	12.7	2.4	0.17

from each existing source to the proposed source and at 1° increments and decrements to + 5° or an 11° sector downwind of the proposed source. Rings were selected from the minimum fence line distance of 730 meters and for every 100 meters starting at 800 meters thru 1700 meters inclusive. This procedure yielded a total of 33 radials and 11 rings which were used for all the refined multisource ISCST and ISCLT model runs.

5.6.3 Modeling Results

The results of the five years of single source ISCST modeling analysis are summarized by year in Tables 5-9A thru E. Cumulative 5-year results are presented in Table 5-9F. The data in Table 5-9F show that the proposed facility will not produce any impacts that exceed ambient air quality standards or PSD requirements.

The results of five years of ISCST and ISCLT multisource modeling analysis are summarized in Table 5-10.

Table 5-11 provides an overall summary of both single and multisource impacts as well as background levels and the Air Quality and PSD standards and demonstrates that the proposed facility's air quality impact together with other sources will not exceed ambient air quality or PSD requirements. These results are portrayed in Figures 5-10 and 5-11.

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TABLE 5-9A

IMPACT OF PALM BEACH COUNTY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEOROLOGICAL YEAR 1970

HIGHEST 2ND HIGH MODELED CONCENTRATION (UG/M3) FOR THE INDICATED AVERAGING TIMES

	1-HOUR (1046M; 108D) (D175; P12)	3-HOUR (1500M; 264D) (D239; P05)	8-HOUR (1500M; 262D) (D231; P02)	24-HOUR (1500M; 252D) (D121)	ANNUAL ARITHMETIC MEAN (1) (1500M; 264D)
CARBON MONOXIDE	143.	96.0	81.1	34.2	4.80
NITROGEN DIOXIDE	47.7	32.0	27.0	11.4	1.60
SULFUR DIOXIDE	107.	72.0	60.9	25.6	3.60
CHLORIDES	41.7	28.0	23.7	10.0	1.40
VOLATILE ORGANIC COMPOUNDS	2.4	1.6	1.4	5.7E-01	8.0E-02
PARTICULATE MATTER	7.8	5.2	4.4	1.9	0.26
SULFURIC ACID MIST	4.8E-03	3.2E-03	2.7E-03	1.1E-03	1.6E-04
FLOURIDES	4.8E-01	3.2E-01	2.7E-01	1.1E-01	1.6E-02
LEAD	1.7E-02	1.1E-02	9.5E-03	4.0E-03	5.6E-04
MERCURY	4.8E-02	3.2E-02	2.7E-02	1.1E-02	1.6E-03
BERYLLIUM	1.1E-04	7.2E-05	6.1E-05	2.6E-05	3.6E-06
2,3,7,8-TCDD	1.0E-06	6.8E-07	5.7E-07	2.4E-07	3.4E-08

NOTES

1. THE ABOVE DATA WAS DEVELOPED BY MODELING THE IMPACTS OF THE SO2 EMISSION THEN MULTIPLYING THE RATIO OF THE COMPONENT EMISSION TO THE SO2 EMISSION BY THE MAXIMUM SO2 IMPACT TO DETERMINE THE COMPONENT'S IMPACT.

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TABLE 5-9B

IMPACT OF PALM BEACH COUNTY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEOROLOGICAL YEAR 1971

HIGHEST 2ND HIGH MODELED CONCENTRATION (UG/M3) FOR THE INDICATED AVERAGING TIMES

	1-HOUR (730M; 300D) (D215; P11)	3-HOUR (1500M; 276D) (D186; P04)	8-HOUR (1500M; 270D) (D214; P02)	24-HOUR (1500M; 258D) (D320)	ANNUAL ARITHMETIC MEAN (1) (1615M; 270D)
CARBON MONOXIDE	173.	88.8	54.7	34.6	3.10
NITROGEN DIOXIDE	57.9	29.6	18.3	11.5	1.03
SULFUR DIOXIDE	130.	66.6	41.1	26.0	2.33
CHLORIDES	50.6	25.9	16.0	10.1	0.90
VOLATILE ORGANIC COMPOUNDS	2.9	1.5	9.1E-01	5.8E-01	5.2E-02
PARTICULATE MATTER	9.4	4.8	3.0	1.9	1.7E-01
SULFURIC ACID MIST	5.8E-03	3.0E-03	1.8E-03	1.2E-03	1.0E-04
FLOURIDES	5.8E-01	3.0E-01	1.8E-01	1.2E-01	1.0E-02
LEAD	2.0E-02	1.0E-02	6.4E-03	4.0E-03	3.6E-04
MERCURY	5.8E-02	3.0E-02	1.8E-02	1.2E-02	1.0E-03
BERYLLIUM	1.3E-04	6.7E-05	4.1E-05	2.6E-05	2.3E-06
2,3,7,8-TCDD	1.2E-06	6.3E-07	3.9E-08	2.5E-07	2.2E-08

NOTES

1. THE ABOVE DATA WAS DEVELOPED BY MODELING THE IMPACTS OF THE SO2 EMISSION THEN MULTIPLYING THE RATIO OF THE COMPONENT EMISSION TO THE SO2 EMISSION BY THE MAXIMUM SO2 IMPACT TO DETERMINE THE COMPONENT'S IMPACT.

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TABLE 5-9C

IMPACT OF PALM BEACH COUNTY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEOROLOGICAL YEAR 1972

HIGHEST 2ND HIGH MODELED CONCENTRATION (UG/M3) FOR THE INDICATED AVERAGING TIMES

	1-HOUR (730M; 70D) (D236; P12)	3-HOUR (1500M; 282D) (D170; P04)	8-HOUR (1046M; 249D) (D127; P02)	24-HOUR (730M; 240D) (D295)	ANNUAL ARITHMETIC MEAN (1) (1615M; 270D)
CARBON MONOXIDE	178.	85.3	55.7	27.6	3.20
NITROGEN DIOXIDE	59.4	28.4	18.6	9.2	1.07
SULFUR DIOXIDE	134.	64.0	41.8	20.7	2.40
CHLORIDES	52.0	24.9	14.2	8.1	0.93
VOLATILE ORGANIC COMPOUNDS	3.0	1.4	9.3E-01	4.6E-01	5.3E-02
PARTICULATE MATTER	9.7	4.6	3.0	1.5	0.17
SULFURIC ACID MIST	5.9E-03	2.8E-03	1.9E-03	9.2E-04	1.1E-04
FLOURIDES	5.9E-01	2.8E-01	1.9E-01	9.2E-02	1.1E-02
LEAD	2.1E-02	1.0E-02	6.5E-02	3.2E-03	3.7E-04
MERCURY	5.9E-02	2.8E-02	1.9E-02	9.2E-03	1.1E-03
BERYLLIUM	1.3E-04	6.4E-05	4.2E-05	2.1E-05	2.4E-06
2,3,7,8-TCDD	1.3E-06	6.0E-07	3.9E-07	2.0E-07	2.3E-08

NOTES

1. THE ABOVE DATA WAS DEVELOPED BY MODELING THE IMPACTS OF THE SO2 EMISSION THEN MULTIPLYING THE RATIO OF THE COMPONENT EMISSION TO THE SO2 EMISSION BY THE MAXIMUM SO2 IMPACT TO DETERMINE THE COMPONENT'S IMPACT.

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TABLE 5-9D

IMPACT OF PALM BEACH COUNTY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEOROLOGICAL YEAR 1973

HIGHEST 2ND HIGH MODELED CONCENTRATION (UG/M3) FOR THE INDICATED AVERAGING TIMES					
	1-HOUR (730M; 120D) (D258; P13)	3-HOUR (730M; 110D) (D267; P04)	8-HOUR (1500M; 300D) (D163; P02)	24-HOUR (730M; 270D) (D107)	ANNUAL ARITHMETIC MEAN (1) (1615M; 270D)
CARBON MONOXIDE	182.	86.5	55.5	31.7	3.40
NITROGEN DIOXIDE	60.6	28.8	18.5	10.6	1.13
SULFUR DIOXIDE	136.	64.9	41.6	23.8	2.55
CHLORIDES	53.0	25.2	16.2	9.2	0.99
VOLATILE ORGANIC COMPOUNDS	3.0	1.4	9.3E-01	5.3E-01	5.7E-02
PARTICULATE MATTER	9.9	4.7	3.0	1.7	0.18
SULFURIC ACID MIST	6.1E-03	2.9E-03	1.9E-03	1.1E-03	1.1E-04
FLOURIDES	6.1E-01	2.9E-01	1.9E-01	1.1E-01	1.1E-02
LEAD	2.1E-02	1.0E-02	6.5E-03	3.7E-03	4.0E-04
MERCURY	6.1E-02	2.9E-02	1.9E-02	1.1E-02	1.1E-03
BERYLLIUM	1.4E-04	6.5E-05	4.2E-05	2.4E-05	2.6E-06
2,3,7,8-TCDD	1.3E-06	6.1E-07	3.9E-07	2.2E-07	2.4E-08

NOTES

1. THE ABOVE DATA WAS DEVELOPED BY MODELING THE IMPACTS OF THE SO2 EMISSION THEN MULTIPLYING THE RATIO OF THE COMPONENT EMISSION TO THE SO2 EMISSION BY THE MAXIMUM SO2 IMPACT TO DETERMINE THE COMPONENT'S IMPACT.

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TABLE 5-9E

IMPACT OF PALM BEACH COUNTY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEOROLOGICAL YEAR 1974

HIGHEST 2ND HIGH MODELED CONCENTRATION (UG/M3) FOR THE INDICATED AVERAGING TIMES

	1-HOUR (730M; 80D) (D127; P11)	3-HOUR (1500M; 276D) (D184; P05)	8-HOUR (926M; 258D) (D101; P02)	24-HOUR (730M; 260D) (D111)	ANNUAL ARITHMETIC MEAN (1) (1615M; 270D)
CARBON MONOXIDE	175.	91.9	59.3	37.2	3.53
NITROGEN DIOXIDE	58.2	30.7	19.8	12.4	1.18
SULFUR DIOXIDE	131.	69.0	44.5	27.9	2.64
CHLORIDES	50.1	26.8	17.3	10.9	1.03
VOLATILE ORGANIC COMPOUNDS	2.9	1.5	1.0	6.2E-01	5.9E-02
PARTICULATE MATTER	9.5	5.0	3.2	2.0	0.19
SULFURIC ACID MIST	5.8E-03	3.1E-03	2.0E-03	1.2E-03	1.2E-04
FLUORIDES	5.8E-01	3.1E-01	2.0E-01	1.2E-01	1.2E-02
LEAD	2.0E-02	1.1E-02	6.9E-03	4.3E-03	4.1E-04
MERCURY	5.8E-02	3.1E-02	2.0E-02	1.2E-02	1.2E-03
BERYLLIUM	1.3E-04	6.9E-05	4.4E-05	2.8E-05	2.6E-06
2,3,7,8-TCDD	1.2E-06	6.5E-07	4.2E-07	2.6E-07	2.5E-08

NOTES

1. THE ABOVE DATA WAS DEVELOPED BY MODELING THE IMPACTS OF THE SO2 EMISSION THEN MULTIPLYING THE RATIO OF THE COMPONENT EMISSION TO THE SO2 EMISSION BY THE MAXIMUM SO2 IMPACT TO DETERMINE THE COMPONENT'S IMPACT.

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TABLE 5-9F

PEAK SECOND-HIGH IMPACTS OF PALM BEACH COUNTY RDF FIRED SPREADER STOKER FURNACES ON AIR QUALITY
BASED ON ISCST MODEL FOR METEOROLOGICAL YEARS 1970-1974

PEAK MODELED SECOND-HIGH CONCENTRATION (UG/M3) FOR THE INDICATED AVERAGING TIMES AND (YEAR)					
	1-HOUR (1973) (730M; 120D) (D258; P13)	3-HOUR (1970) (1500M; 264D) (D239; P05)	8-HOUR (1970) (1500M; 262D) (D231; P02)	24-HOUR (1974) (730M; 260D) (D111)	ANNUAL ARITHMETIC MEAN (1) (1970) (1500M; 264D)
CARBON MONOXIDE	182.	96.0	81.1	37.2	4.80
NITROGEN DIOXIDE	60.6	32.0	27.0	12.4	1.60
SULFUR DIOXIDE	136.	72.0	60.9	27.9	3.60
CHLORIDES	53.0	28.0	23.7	10.9	1.40
VOLATILE ORGANIC COMPOUNDS	3.0	1.6	1.4	6.2E-01	8.0E-02
PARTICULATE MATTER	9.9	5.2	4.4	2.0	0.26
SULFURIC ACID MIST	6.1E-03	3.2E-03	2.7E-03	1.2E-03	1.6E-04
FLUORIDES	6.1E-01	3.2E-01	2.7E-01	1.2E-01	1.6E-02
LEAD	2.1E-02	1.1E-02	9.5E-03	4.3E-03	5.6E-04
MERCURY	6.1E-02	3.2E-02	2.7E-02	1.2E-02	1.6E-03
BERYLLIUM	1.4E-04	7.2E-05	6.1E-05	2.8E-05	3.6E-06
2,3,7,8-TCDD	1.3E-06	6.8E-07	5.7E-07	2.6E-07	3.4E-08

NOTES

1. THE ABOVE DATA WAS DEVELOPED BY MODELING THE IMPACTS OF THE SO2 EMISSION THEN MULTIPLYING THE RATIO OF THE COMPONENT EMISSION TO THE SO2 EMISSION BY THE MAXIMUM SO2 IMPACT TO DETERMINE THE COMPONENT'S IMPACT.

TABLE 5-10

CUMULATIVE IMPACTS OF PALM BEACH COUNTY RDF-FIRED
SPREADER STOKER FURNACES AND OTHER MAJOR
SOURCES OF SO₂ ON AIR QUALITY
(BASIS: RDF @ 2100 TPD, 9 LB S/TON RDF)

YEAR	AVERAGING TIME	ALL SOURCES PEAK CONCENTRATION		RDF SOURCE CONTRIBUTION		LOCATION	
		ug/m ³	MET. DAY	ug/m ³	MET. DAY	METERS	DEGREE
1970##	3 HR*	157	318/8	31	328/8#	1700	130
	24 HR*	63	269/1	21	269/1	730	269
	ANNUAL	14		5		1300	270
1971	3 HR*	118	168/5	53	220/4#	1300	269
	24 HR*	40	336/1	16	319/1#	730	262
	ANNUAL	11		3		1300	270
1972	3 HR*	110	218/4	56	60/5#	730	272
	24 HR*	52	168/1	17	211/1#	730	265
	ANNUAL	12		4		1400	270
1973	3 HR*	150	104/7	51	104/7	730	269
	24 HR*	63	17/1	22	17/1	1600	265
	ANNUAL	12		4		1400	270
1974	3 HR*	277	204/8	53	133/5#	1700	263
	24 HR*	68	357/1	21	74/1#	1200	269
	ANNUAL	12		4		1300	270

5 YEAR MAXIMUMS

1974	3 HR*	277	204/8	53	133/5#	1700	263
1974	24 HR*	68	357/1	21	74/1#	1200	269
1970	ANNUAL	14		5		1300	270

* Maximum 2nd high impact

Concentration for same location as all sources (NOT CONCURRENT OCCURENCES)

Based on 1800 TPD, 9 lb s/ton RDF

TABLE 5-11

SUMMARY OF MAXIMUM AIR QUALITY IMPACTS OF THE PROPOSED PALM BEACH COUNTY WASTE TO ENERGY FACILITY

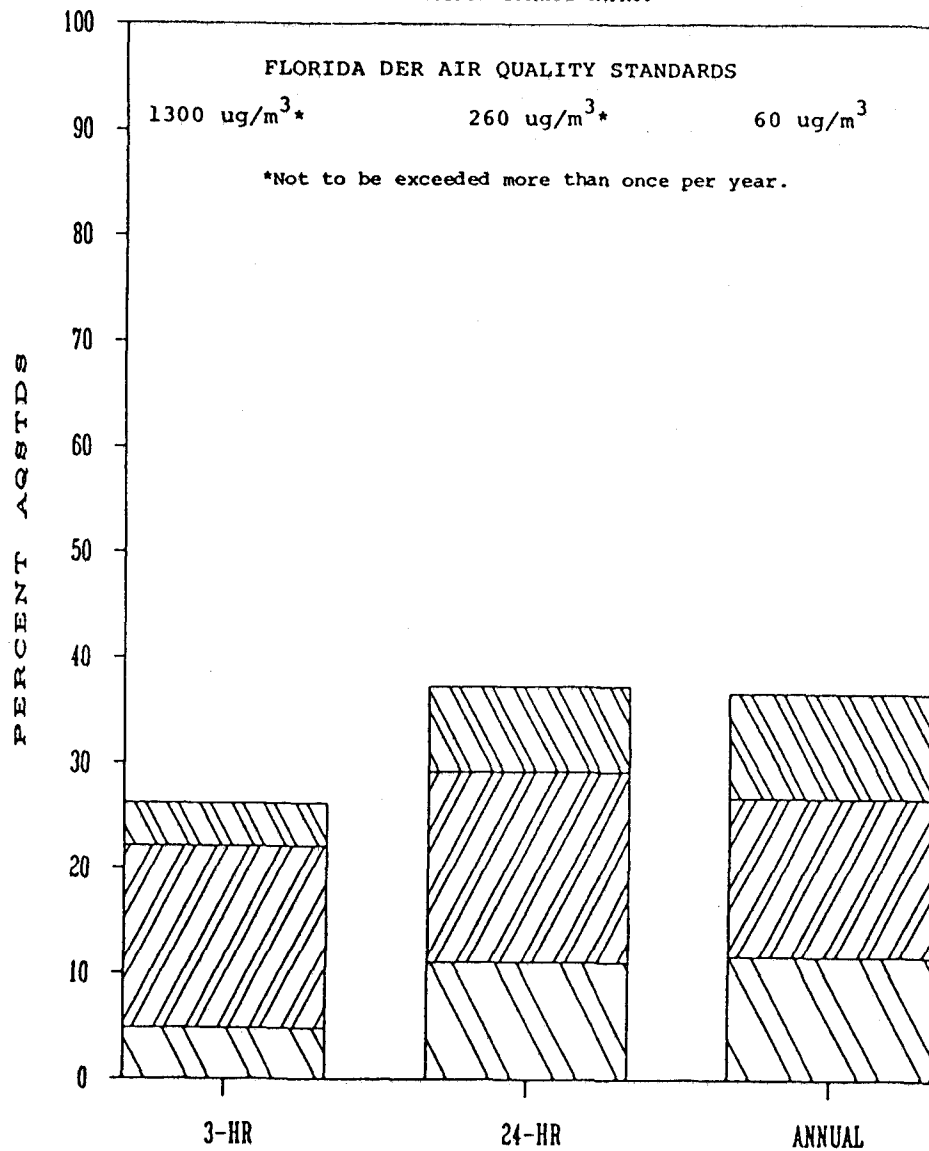
POLLUTANT	AMBIENT AIR QUALITY STANDARD (UG/M3)	PREVENTION OF SIGNIFICANT DETERIORATION (PSD) INCREMENT (UG/M3)	BACKGROUND CONCENTRATION (UG/M3) (2)	PALM BEACH COUNTY WASTE TO ENERGY FACILITY IMPACT (UG/M3) (3)	TOTAL POINT SOURCE IMPACT (UG/M3) (5)
SULFUR DIOXIDE					
MAX 3-HOUR CONCENTRATION	1300 (1)	512	63	72	277
MAX 24-HOUR CONCENTRATION	260 (1)	91	29	28	68
ANNUAL ARITHMETIC MEAN	60	20	7	4	15
PARTICULATE MATTER					
MAX 24-HOUR CONCENTRATION	150 (1)	37	107	2	NC
ANNUAL GEOMETRIC MEAN	60	19	43	0.3	NC
NITROGEN DIOXIDE					
ANNUAL ARITHMETIC MEAN	100	NO STANDARD	20	2	22 (6)
OZONE					
DAILY MAX 1-HOUR CONCENTRATION	235 (1)	NO STANDARD	172	NE	NA
LEAD					
QUARTERLY ARITHMETIC MEAN	1.5	NO STANDARD	NM	4.3E-03 (4)	1.1E-02 (4)
CARBON MONOXIDE					
MAX 1-HOUR CONCENTRATION	40000 (1)	NO STANDARD	9943	182	NC
MAX 8-HOUR CONCENTRATION	10000 (1)	NO STANDARD	4500	81	NC

NA = NOT APPLICABLE; NC = NOT CALCULATED SINCE PROPOSED FACILITY'S IMPACT IS BELOW SIGNIFICANCE LEVEL;
NE = NOT EMITTED; NM = NOT MONITORED.

1. CONCENTRATION LIMITS NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.
2. BACKGROUND INFORMATION IS BASED UPON DATA COMPILED BY THE PALM BEACH COUNTY ANNUAL REPORT DATED 1983.
3. DETAILED MODELING RESULTS FOR THE PROPOSED SOURCE COVERING 5 YEARS OF HOURLY METEOROLOGICAL DATA IS INCLUDED IN TABLES 5-9A THRU 9F. (EXIT VELOCITY = 24.9 M/S)
4. QUARTERLY MEAN NOT GENERATED. VALUE CITED IS 24-HOUR MAXIMUM 2ND-HIGH.
5. TOTAL IMPACTS ARE INCLUSIVE OF THE PROPOSED SOURCE. DETAILED INFORMATION IS INCLUDED IN TABLE 5-10. (VS = 21.34 M/S)
6. TOTAL IMPACTS WERE ASSUMED TO BE EQUAL TO BACKGROUND LEVELS SINCE NO2 EMISSION LEVELS OF OTHER SOURCES WERE NOT READILY AVAILABLE AND THE PROPOSED SOURCE'S IMPACT WAS VIRTUALLY AT THE SIGNIFICANCE LEVEL (1.6 UG/M3 VS 1.0 UG/M3).

CONTRIBUTIONS TO AQSTD

SULFUR DIOXIDE IMPACT



% Consumed:

3-Hr	4.8
24-Hr	11.1
Annual	11.7

AIR QUALITY STANDARD
OTHER SOURCES

17.2
18.1
15.0

RDF

4.1
8.1
8.3

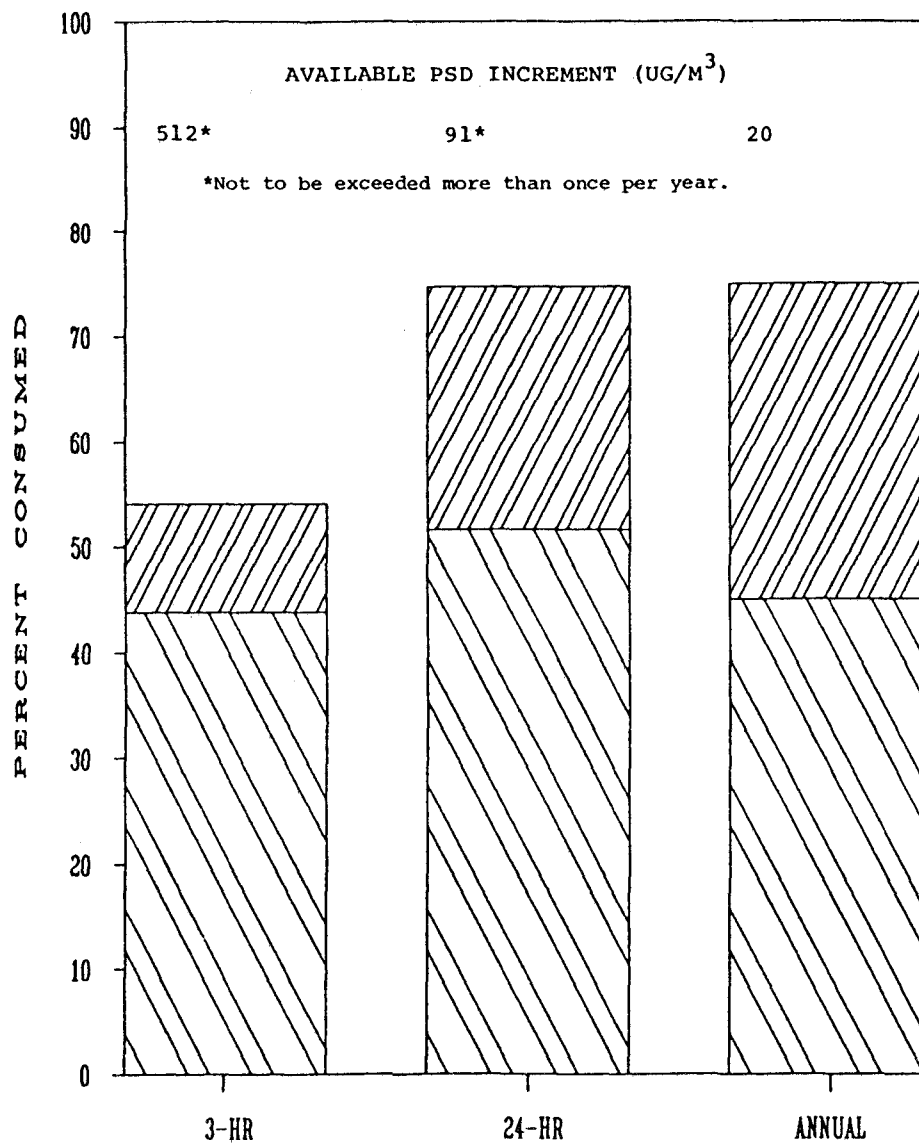
PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



FIGURE 5.10

PSD INCREMENT

SULPUR DIOXIDE IMPACT



AIR QUALITY STANDARD		
	OTHER SOURCES	RDF
% Consumed: 3-Hr	43.8	10.4
24-Hr	51.6	23.1
Annual	45.0	25.0

PALM BEACH COUNTY
SOLID WASTE AUTHORITY
RESOURCE RECOVERY FACILITY



FIGURE 5.11

6.0 SUMMARY AND CONCLUSIONS

An analysis of best available control technology and an evaluation of ambient impacts have been presented herein for the proposed Palm Beach County waste-to-energy facility. It has been determined that the proposed facility is subject to PSD review.

The results of the BACT analysis indicate that the only recommended add-on control device is an electrostatic precipitator for the control of particulate matter. Sulfur dioxide emissions will be minimized through the use of refuse derived fuel which inherently has a low sulfur content and by utilizing No. 2 fuel oil or natural gas as available as an auxiliary fuel. Good combustion design and practice is proposed as BACT for nitrogen oxides, carbon monoxide and volatile organic compounds.

Predicted concentrations of the acid gas pollutants are calculated to be well below state standards. Trace metal emissions will be controlled as particulate matter in the electrostatic precipitator.

An extensive air quality impact analyses has been performed. This analysis demonstrates that all applicable PSD increments, federal and state air quality standards will not be exceeded as a result of the proposed Palm Beach County waste-to-energy facility acting alone or in concert with other existing sources.

Assuming that all VOC emissions are converted to ozone, the maximum 1 hour source impact in any year would be .002 ppm. Based on local 1982-83 ambient air quality data as background, this maximum impact would not exceed the ozone standard.

There are no existing legal ambient air quality standards for the compound 2,3,7,8-TCDD. The New York State Department of Environmental Conservation in its Air Guide No. 1 (revised 12/15/83) has recommended an acceptable ambient air level (AAL) on an annual average basis of 9.2×10^{-8} ug/m³. The maximum annual impact generated by the conservative assumptions of this report is 3.4×10^{-8} .

On an annual basis, all impacts in the West Palm Beach Water Catchment Area will be less than any established de-minus levels. In making this determination, a variety of conservative assumptions were employed in the analysis. For example, maximum design capacity operations were assumed for all 8,760 hours of the year; other major sources were assumed to fire oil continuously when in fact natural gas which contain virtually no sulfur is predominantly used; and the other source category includes Florida Power and Light whose operations will be offset by the electrical output of the proposed facility. Because of these and other conservative assumptions, it can be stated with confidence that public health will be protected with an adequate margin of safety.

7.0 REFERENCES

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STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
APPLICATION TO CONSTRUCT/OPERATE AIR POLLUTANT EMISSION SOURCE

APIS

1. Type of Application Construction Init. ☒ Operation Init. ☒ Site Renewal ☐ Amend-ment ☐ Site Cert. ☒					2. Source Identification/Jurisdiction District Office County Facility Source				
3. Facility Owner (Company Name) PALM BEACH COUNTY SOLID WASTE AUTH.					4. Facility Owner-ship Code U		5. Facility Name/Location 2900 FT. WEST FLORIDA TURNPIKE 2600 FT. NORTH 45th STREET		
6. City N/A		7. County PALM BEACH		8. Facility Zip 33412		9. Facility Type CDS VOC			
10. Facility Zone East North UTM Coordi- 17 585.8 2960.2 nates (km)		11. Facility Latitude 26° 46' 05"		11. Facility Longitude 80° 08' 30"					
12. Authorized Agent (Address and Telephone) Name: S. G. TIMMERMAN Title: ASSOCIATE Organization/Firm: HAYDEN-WEGMAN, INC.					12. Authorized Agent (Address and Telephone) Street or P.O. Box: 5114 OKEECHOBEE BLVD. 2-B City: W. PALM BEACH St.: FL Zip: 33409 Telephone: 305-471-0444				
13. STATEMENT BY OWNER OR AUTHORIZED AGENT I, the undersigned, am the owner or authorized representative* of the facility described above. I certify that the statements made in this application for a permit are true, correct, and complete to the best of my knowledge and belief. Further, I agree to operate and maintain the air pollution source and pollution control equipment described in this application so as to comply with all provisions of Chapter 403, Florida Statutes, and all applicable rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable, and I will promptly notify the department upon sale or legal transfer of the permitted source. *Attach letter of authorization *Signed: <u>George E. Cranston</u> *Date: <u>April 25, 1985</u>									
14. Prof. Engineer (Address and Telephone) Name: GEORGE E. CRANSTON Fla. Regis. No.: 21733 Organization/Firm: HAYDEN-WEGMAN, INC.					14. Prof. Engineer (Address and Telephone) Street or P.O. Box: 330 W. 42nd STREET City: NEW YORK St.: NY Zip: 10036 Telephone: 212-563-6900				
15. STATEMENT BY PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.) I, the undersigned, certify that the engineering features of this project have been designed or examined by me and found to be in conformity with modern engineering principles applicable to the control of emissions of the air pollutants characterized in this permit application. There is reasonable assurance, in my professional judgment, that the air pollution source and the pollution control equipment, when properly operated and maintained, will comply with all applicable statutes of the State of Florida and all applicable rules and regulations of the department. Signed: <u>George E. Cranston</u> Date: <u>4-24-85</u> (Affix Seal)									
16. Facility Comment									

17. Permit Application Processing Information	Fee Paid	Permit/PPS Number Assigned This App.	Date Comp. YY/MM/DD	Date Issued YY/MM/DD	Date Exp. YY/MM/DD	AGR Req.				
18. Description of Source Addressed in This Application 250 FT. HIGH STACK FOR 2-350 MILLION BTU/HR REFUSE DERIVED FUEL FIRED BOILERS				19. Current DER Permit No. No. N/A						
20. Init. Const. Date - YY/MM/DD 87/00/00										
21. Date(s) and Description(s) of Any Previous Modification(s) to Source N/A										
22. Nature and Extent of Proposed Project PROJECT IS A SOLID WASTE RESOURCE RECOVERY FACILITY WHICH SHALL GENERATE ELECTRIC POWER FROM COMBUSTION OF REFUSE DERIVED FUEL AND RECOVER RECYCLABLE MATERIALS. THE POLLUTION CONTROL SHALL BE A FOUR FIELD ELECTROSTATIC PRECIPITATOR AND SHALL MEET BACT FOR ALL APPLICABLE POLLUTANTS.										
23. Projected Dates of Initiation and Completion of Construction 87/00/00 - 89/00/00										
24. Source Codes	SIC	Type	25. Source Regs.	NSPS	NESHAP	111(d)	PSD	NAA	NSR	RACT
26. Boiler Data	Type	SPREADER STOKER	Design Heat Input Rate (10 ⁶ Btu/hr)	2 UNITS	350 EACH	27. Generator Design Output (gross MW)	50	28. Pct. fuel for space heat		
29. Incinerator Data	Type	Design Capacity (tpd)	Type of Waste	Dwell Time (sec.)	After-burner Temp. (°F)					
30. Liq. Storage Tank Data	Type	Capacity (10 ³ bbl)	Product	Condition						
31. Normal Operating Schedule	hr/dy	dy/wk	wk/yr	32. Normal % Operation By Season	DJF	MAM	JJA	SON		
	24	7	50		25	25	25	25		
33. Re-quested Limit(s)	hr/dy	dy/wk	wk/yr	hr/yr	34. Allow-able Oper. Limit(s)	hr/dy	dy/wk	wk/yr	hr/yr	
	24	7	52	8760						
35. Emission Point	36. Stack Ht. (ft.)	37. Exit Diam. (ft.)	38. Exit Temp. (°F)	39. Water Vapor (%)	40. Actual Volumetric Flow Rate (acfm)	41. Dry Standard Flow Rate (dscfm)	42. Plume Ht. (ft.)			
Type ID on Diagram										
3		250	6.69 EACH	450	8% BY WEIGHT	172,377 EACH	88,650	0		
43. Bldg. Dimensions (ft.)	Ht.	Width	44. Point UTM Coordinates	East	North	45. Source Numbers with Common Stack				
	120	110								
46. Source Comment										

47. Description of Process								
SPREADER STOKER FURNACES (2) FIRED WITH REFUSE DERIVED FUEL MANUFACTURED FROM MUNICIPAL SOLID WASTE.								
48a. Component 'a' Process or Fuel Type Employed								
49a. Source Classification Code for Process/Fuel Type 'a'	50a. Process/Fuel Usage Rates					51a. Fuel Characteristics		
	Max. Hourly	Est. Annual	Requested Ann. Limit	Annual Limit	Unit Code	S (%)	Ash (%)	10 ⁶ Btu/Unit (As Fired)
	58.3 TONS	438,000 TONS	-		99 (RDF)	0.22	13.62	12.328 x 10 ⁶ TON RDF
52a. SCC Comment for Process/Fuel 'a'								
48b. Component 'b' Process or Fuel Type Employed								
49b. Source Classification Code for Process/Fuel Type 'b'	50b. Process/Fuel Usage Rates					51b. Fuel Characteristics		
	Max. Hourly	Est. Annual	Requested Ann. Limit	Annual Limit	Unit Code	S (%)	Ash (%)	10 ⁶ Btu/Unit (As Fired)
52b. SCC Comment for Process/Fuel 'b'								
48c. Component 'c' Process or Fuel Type Employed								
49c. Source Classification Code for Process/Fuel Type 'c'	50c. Process/Fuel Usage Rates					51c. Fuel Characteristics		
	Max. Hourly	Est. Annual	Requested Ann. Limit	Annual Limit	Unit Code	S (%)	Ash (%)	10 ⁶ Btu/Unit (As Fired)
52c. SCC Comment for Process/Fuel 'c'								
48d. Component 'd' Process or Fuel Type Employed								
49d. Source Classification Code for Process/Fuel Type 'd'	50d. Process/Fuel Usage Rates					51d. Fuel Characteristics		
	Max. Hourly	Est. Annual	Requested Ann. Limit	Annual Limit	Unit Code	S (%)	Ash (%)	10 ⁶ Btu/Unit (As Fired)
52d. SCC Comment for Process/Fuel 'd'								

53. Description of Control Equipment										
FOUR FIELD ELECTROSTATIC PRECIPITATOR (SUPPLIER NOT SELECTED)										
54. Liquid/Solid Wastes Generated by Control Equipment and Methods/Locations of Disposal										
FLY ASH WILL BE QUENCHED WITH BOTTOM ASH; DEWATERED AND DISPOSED IN CLASS 1 LANDFILL										
55a. Pollutant 'a' Emitted	56a. Type Control Equipment		57a. Efficiency (%)	58a. Maximum Emissions - Normal Cond.		59a. Emission Method	60a. Requested Emission Limit	61a. Allowable Emission	62a. Potential Emission	63a. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
PM	010		99	38	166	2				
64a. Requested Limit in Units Other Than lb/hr				0.03 GRAINS/DSCF @ 12% CO ₂				65a. Allowable Emission in Units Other Than lb/hr		66a. Reg. Code
55b. Pollutant 'b' Emitted	56b. Type Control Equipment		57b. Efficiency (%)	58b. Maximum Emissions - Normal Cond.		59b. Emission Method	60b. Requested Emission Limit	61b. Allowable Emission	62b. Potential Emission	63b. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
SO ₂	0	0	0	525	2300	2				
64b. Requested Limit in Units Other Than lb/hr				65b. Allowable Emission in Units Other Than lb/hr				66b. Reg. Code		
55c. Pollutant 'c' Emitted	56c. Type Control Equipment		57c. Efficiency (%)	58c. Maximum Emissions - Normal Cond.		59c. Emission Method	60c. Requested Emission Limit	61c. Allowable Emission	62c. Potential Emission	63c. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
CO	0	0	0	700	3066	2				
64c. Requested Limit in Units Other Than lb/hr				65c. Allowable Emission in Units Other Than lb/hr				66c. Reg. Code		
55d. Pollutant 'd' Emitted	56d. Type Control Equipment		57d. Efficiency (%)	58d. Maximum Emissions - Normal Cond.		59d. Emission Method	60d. Requested Emission Limit	61d. Allowable Emission	62d. Potential Emission	63d. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
VOC	0	0	0	11.7	51	2				
64d. Requested Limit in Units Other Than lb/hr				65d. Allowable Emission in Units Other Than lb/hr				66d. Reg. Code		
55e. Pollutant 'e' Emitted	56e. Type Control Equipment		57e. Efficiency (%)	58e. Maximum Emissions - Normal Cond.		59e. Emission Method	60e. Requested Emission Limit	61e. Allowable Emission	62e. Potential Emission	63e. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
NOX	0	0	0	233	1022					
64e. Requested Limit in Units Other Than lb/hr				65e. Allowable Emission in Units Other Than lb/hr				66e. Reg. Code		
67. Visible Emissions	68. Requested % Opacity limit				69. Allowable % Opacity				70. Test Freq.	71. Req.
VE	Normal Cond. Exceptional Cond.				Normal Cond. Exceptional Cond.					
#1 RINGELMAN	10 40 % 2 min/hr				% min/hr					
72. Fugitive Pollutant	73. Fugitive Emission Sources and Control Measures								74. Quantifiable Fugitive Emissions	
ID	CYCLONES & BAG FILTERS ARE PROVIDED FOR EACH OF THE THREE (3) RDF MFG. TRAINS, OBW & FERROUS RECOVERY LINE. SEE ATTACHMENT 5								tpy	
PM									19.34	

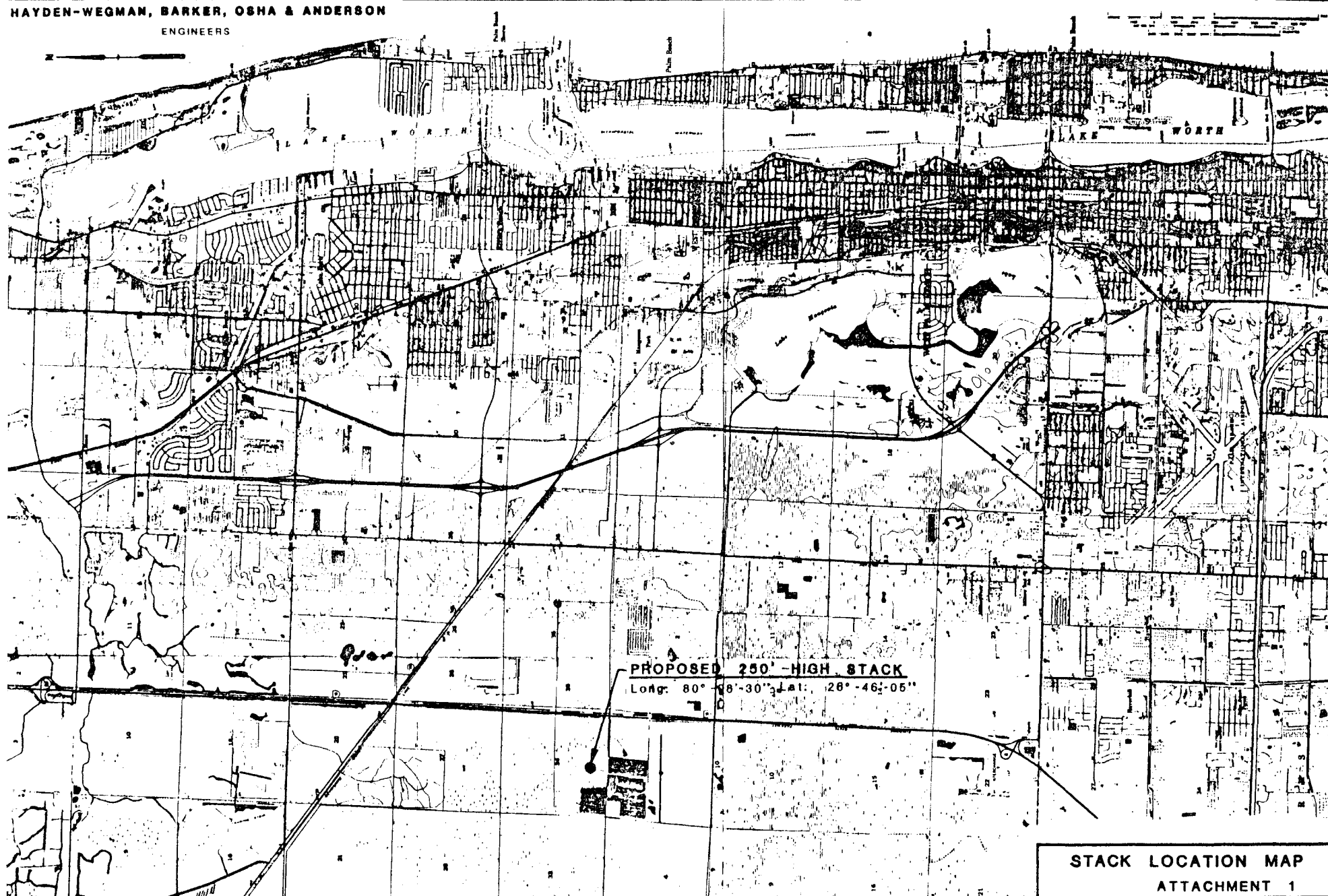
53. Description of Control Equipment										
54. Liquid/Solid Wastes Generated by Control Equipment and Methods/Locations of Disposal										
55f. Pol- lutant 'a' Emitted	56f. Type Control Equipment		57f. Effi- ciency	58f. Maximum Emissions - Normal Cond.		59f. Emi. Meth.	60f. Re- quested Emi. Limit	61a. Allowable Emission	62a. Po- tential Emission	63a. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
PB	0	0	0	0.082	0.36	2				
64f. Requested Limit in Units Other Than lb/hr						65a. Allowable Emission in Units Other Than lb/hr			66a. Reg. Code	
55g. Pol- lutant 'b' Emitted	56g. Type Control Equipment		57g. Effi- ciency	58g. Maximum Emissions - Normal Cond.		59g. Emi. Meth.	60g. Re- quested Emi. Limit	61b. Allowable Emission	62b. Po- tential Emission	63b. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
BE	0	0	0	5.3E-4	2.34E-3	2				
64g. Requested Limit in Units Other Than lb/hr						65b. Allowable Emission in Units Other Than lb/hr			66b. Reg. Code	
55h. Pol- lutant 'c' Emitted	56h. Type Control Equipment		57h. Effi- ciency	58h. Maximum Emissions - Normal Cond.		59h. Emi. Meth.	60h. Re- quested Emi. Limit	61c. Allowable Emission	62c. Po- tential Emission	63c. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
HG	0	0	0	0.18	0.76	2				
64h. Requested Limit in Units Other Than lb/hr						65c. Allowable Emission in Units Other Than lb/hr			66c. Reg. Code	
55i. Pol- lutant 'd' Emitted	56i. Type Control Equipment		57i. Effi- ciency	58i. Maximum Emissions - Normal Cond.		59i. Emi. Meth.	60i. Re- quested Emi. Limit	61d. Allowable Emission	62d. Po- tential Emission	63d. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
HCL	0	0	0	205	894					
64i. Requested Limit in Units Other Than lb/hr						65d. Allowable Emission in Units Other Than lb/hr			66d. Reg. Code	
55j. Pol- lutant 'e' Emitted	56j. Type Control Equipment		57j. Effi- ciency	58j. Maximum Emissions - Normal Cond.		59j. Emi. Meth.	60j. Re- quested Emi. Limit	61e. Allowable Emission	62e. Po- tential Emission	63e. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
FL	0	0	0	2.33	10.3	2				
64j. Requested Limit in Units Other Than lb/hr						65e. Allowable Emission in Units Other Than lb/hr			66e. Reg. Code	
67. Visible Emissions	68. Requested % Opacity limit				69. Allowable % Opacity				70. Test	71.
	Normal Cond. Exceptional Cond.				Normal Cond. Exceptional Cond.				Freq.	Req.
VE	% min/hr				% min/hr					
72. Fugitive Pollutant	73. Fugitive Emission Sources and Control Measures								74. Quantifi- able Fugitive Emissions	
ID									tpy	

53. Description of Control Equipment										
54. Liquid/Solid Wastes Generated by Control Equipment and Methods/Locations of Disposal										
55k. Pol- lutant 'a' Emitted	56k. Type Control Equipment		57k. Effi- ciency	58k. Maximum Emissions - Normal Cond.		59k. Emi. Meth.	60a. Re- quested Emi. Limit	61a. Allowable Emission	62a. Po- tential Emission	63a. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
SAM	0	0	0	0.0233	0.102	2				
64a. Requested Limit in Units Other Than lb/hr						65a. Allowable Emission in Units Other Than lb/hr			66a. Reg. Code	
55b. Pol- lutant 'b' Emitted	56b. Type Control Equipment		57b. Effi- ciency	58b. Maximum Emissions - Normal Cond.		59b. Emi. Meth.	60b. Re- quested Emi. Limit	61b. Allowable Emission	62b. Po- tential Emission	63b. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
.										
64b. Requested Limit in Units Other Than lb/hr						65b. Allowable Emission in Units Other Than lb/hr			66b. Reg. Code	
55c. Pol- lutant 'c' Emitted	56c. Type Control Equipment		57c. Effi- ciency	58c. Maximum Emissions - Normal Cond.		59c. Emi. Meth.	60c. Re- quested Emi. Limit	61c. Allowable Emission	62c. Po- tential Emission	63c. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
64c. Requested Limit in Units Other Than lb/hr						65c. Allowable Emission in Units Other Than lb/hr			66c. Reg. Code	
55d. Pol- lutant 'd' Emitted	56d. Type Control Equipment		57d. Effi- ciency	58d. Maximum Emissions - Normal Cond.		59d. Emi. Meth.	60d. Re- quested Emi. Limit	61d. Allowable Emission	62d. Po- tential Emission	63d. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
64d. Requested Limit in Units Other Than lb/hr						65d. Allowable Emission in Units Other Than lb/hr			66d. Reg. Code	
54e. Pol- lutant 'e' Emitted	55e. Type Control Equipment		56e. Effi- ciency	57e. Maximum Emissions - Normal Cond.		59e. Emi. Meth.	60e. Re- quested Emi. Limit	61e. Allowable Emission	62e. Po- tential Emission	63e. Comp. Test
ID	Pri.	Sec.	(%)	lb/hr	tpy	Code	lb/hr	lb/hr	tpy	Freq.
64e. Requested Limit in Units Other Than lb/hr						65e. Allowable Emission in Units Other Than lb/hr			66e. Reg. Code	
67. Visible Emissions	68. Requested % Opacity limit		69. Allowable % Opacity		70. Test Freq.		71. Req.			
VE	Normal Cond. Exceptional Cond.		Normal Cond. Exceptional Cond.							
72. Fugitive Pollutant	73. Fugitive Emission Sources and Control Measures								74. Quantifi- able Fugitive Emissions	
ID									tpy	

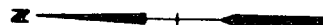
SUPPLEMENTAL REQUIREMENTS

1. Provide an 8 1/2" x 11" map (e.g., the relevant portion of a USGS topographic map) showing the location of the facility and points of air pollutant emissions in relation to residences, roads, and other features of the surrounding area.
2. Provide an 8 1/2" x 11" plot plan of the facility showing the location of manufacturing processes, stacks, vents, and sources of fugitive emissions.
3. Provide an 8 1/2" x 11" flow diagram which will identify, the individual operations and processes. Indicate where raw materials enter, where solid and liquid wastes exit, where gaseous and/or particulate emissions are evolved, and where finished products are obtained.
4. For each pollutant emitted by the source addressed in this application, provide an estimate of the maximum uncontrolled emission rate (in lb/hr) and show the derivation of each such estimate (e.g., AP-42 emission factor). For a construction permit application involving the combustion of any fuel other than distillate oil, liquefied petroleum gas, or natural gas, provide an ultimate analysis of the fuel to be used. The ultimate analysis should give the percent content by weight of carbon, hydrogen, oxygen, sulfur, nitrogen, ash, and moisture.
5. For a construction permit application, show the bases of the normal maximum (after controls) emission estimates (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and describe the proposed methods for showing proof of compliance with any applicable emission limiting standards. For an operation permit application, provide test results or methods used to show proof of compliance.
6. For a construction permit application, provide design details for all air pollution control systems (e.g., for baghouse, include cloth to air ratio; for scrubber, include cross-section sketch, design pressure drop, etc.) and show the derivation of the efficiency of each control device. Items 4, 5, and 6 should be consistent; i.e., $\text{Uncontrolled Emissions} = (\text{Normal Maximum Emissions}) / (1 - \text{Control Efficiency})$.
7. For a construction permit application subject to review under Rule 17-2.500, "Prevention of Significant Deterioration," or Rule 17-2.510, "New Source Review for Nonattainment Areas," provide all additional information required by the department under such rule (e.g., BACT or LAER evaluation, monitoring data, summary of modeling results, one copy of all pertinent model output, etc.).
8. For a permit application subject to the "Reasonably Available Control Technology" provisions of Rule 17-2.650, provide all additional information required by the department under that rule.
9. For a permit application involving the incineration of hazardous wastes, provide all additional information required by the department under Rule 17-30 and Chapter 403, Florida Statutes.
10. Submit the appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

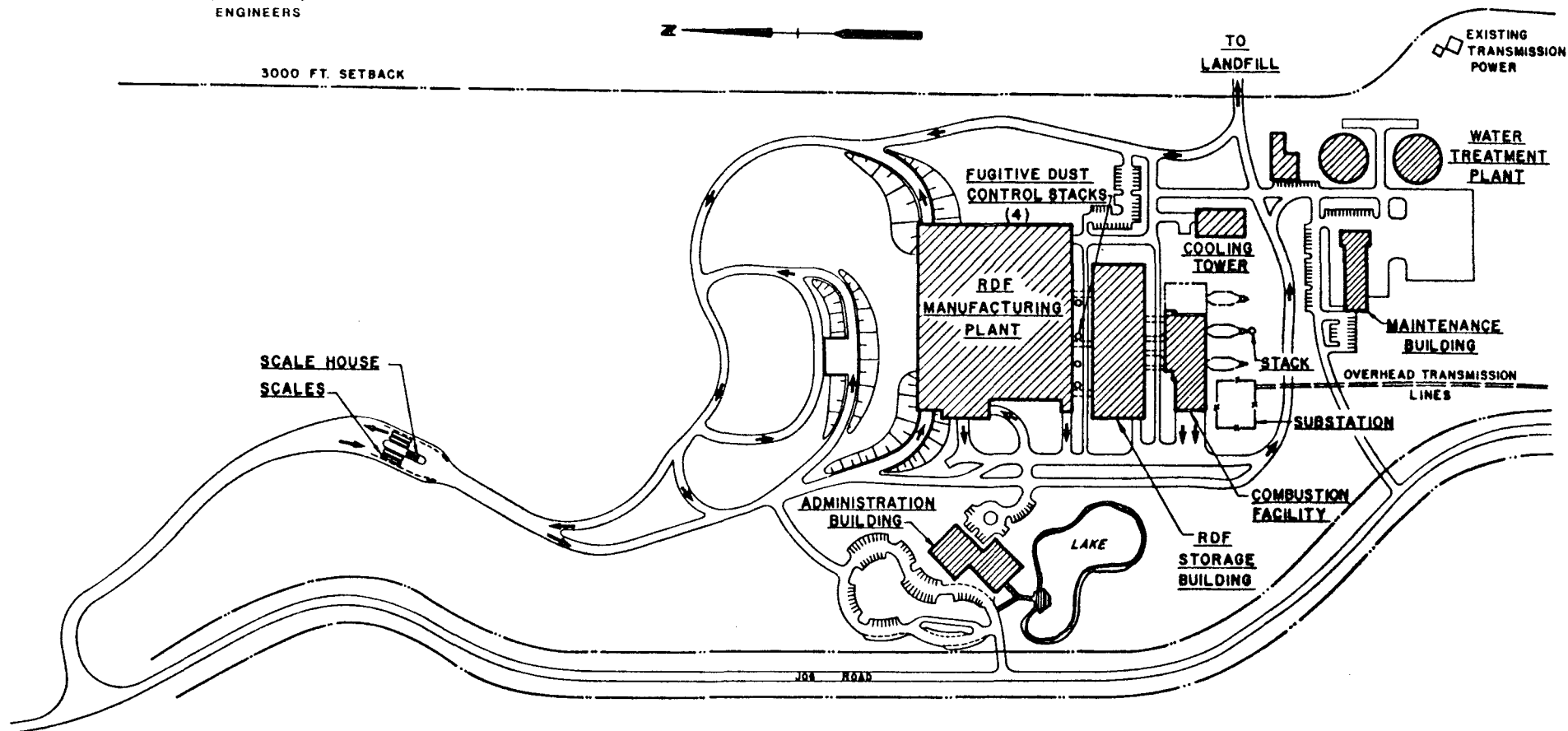
HAYDEN-WEGMAN, BARKER, OSHA & ANDERSON
ENGINEERS



HAYDEN-WEGMAN, BARKER, OSHA & ANDERSON
ENGINEERS



3000 FT. SETBACK

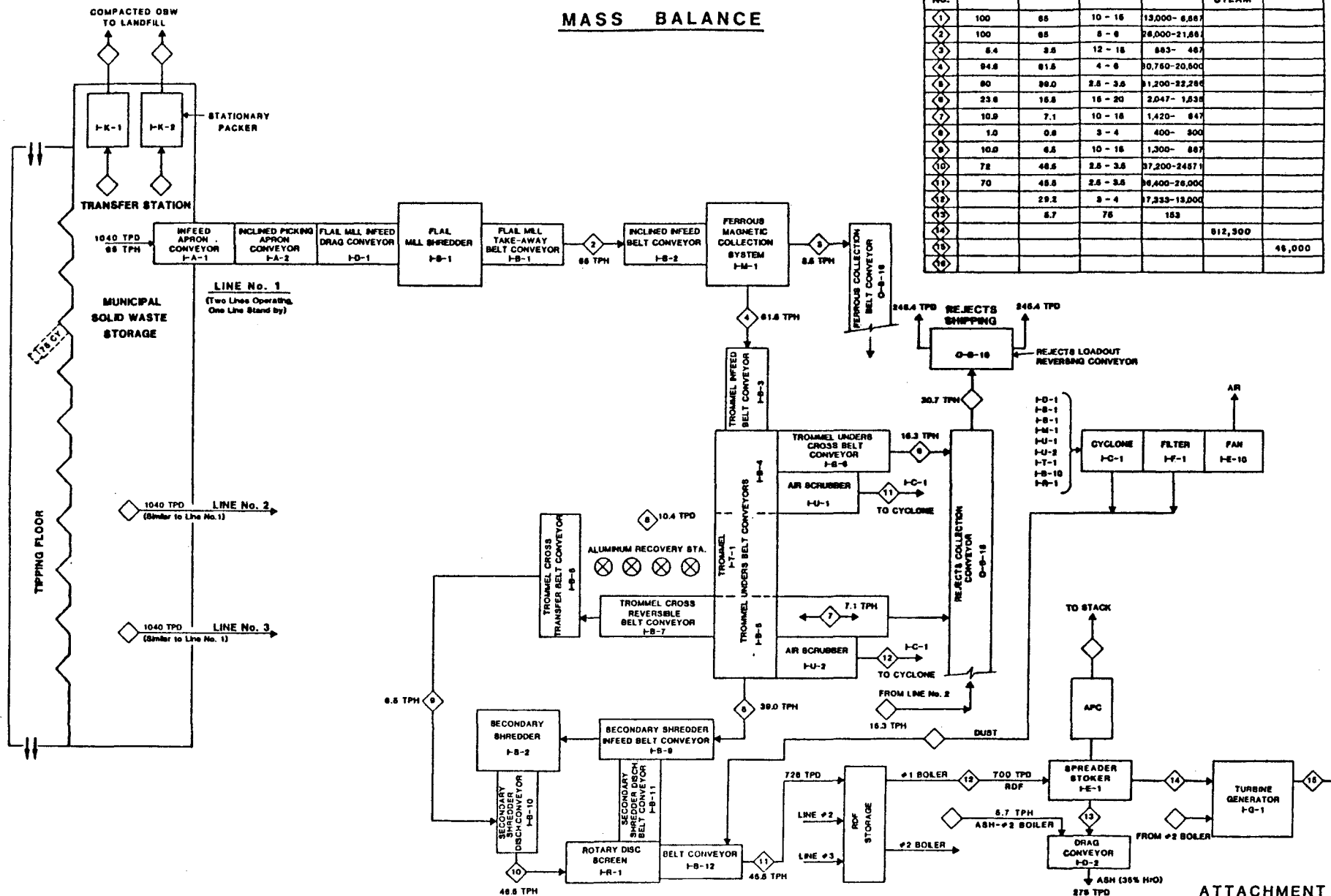


800 100 0 200
SCALE IN FEET
1" = 200'

ATTACHMENT 2

MASS BALANCE

FLOW No.	% FLOW	TPH	Lb/Ft ³	Ft ³ / Hr	Lb/Hr STEAM	Kw
1	100	65	10 - 15	19,000 - 6,667		
2	100	65	8 - 9	26,000 - 21,667		
3	8.4	5.5	12 - 15	883 - 467		
4	94.6	61.5	4 - 6	30,760 - 20,500		
5	90	59.0	2.5 - 3.5	31,200 - 32,280		
6	23.8	15.5	15 - 20	2,047 - 1,535		
7	10.9	7.1	10 - 15	1,420 - 847		
8	1.0	0.6	3 - 4	400 - 300		
9	10.0	6.5	10 - 15	1,300 - 867		
10	7.2	46.5	2.5 - 3.5	37,200 - 24,571		
11	7.0	45.5	2.5 - 3.5	36,400 - 25,000		
12		29.2	3 - 4	37,313 - 15,000		
13		6.7	75	153		
14					612,300	
15						46,000

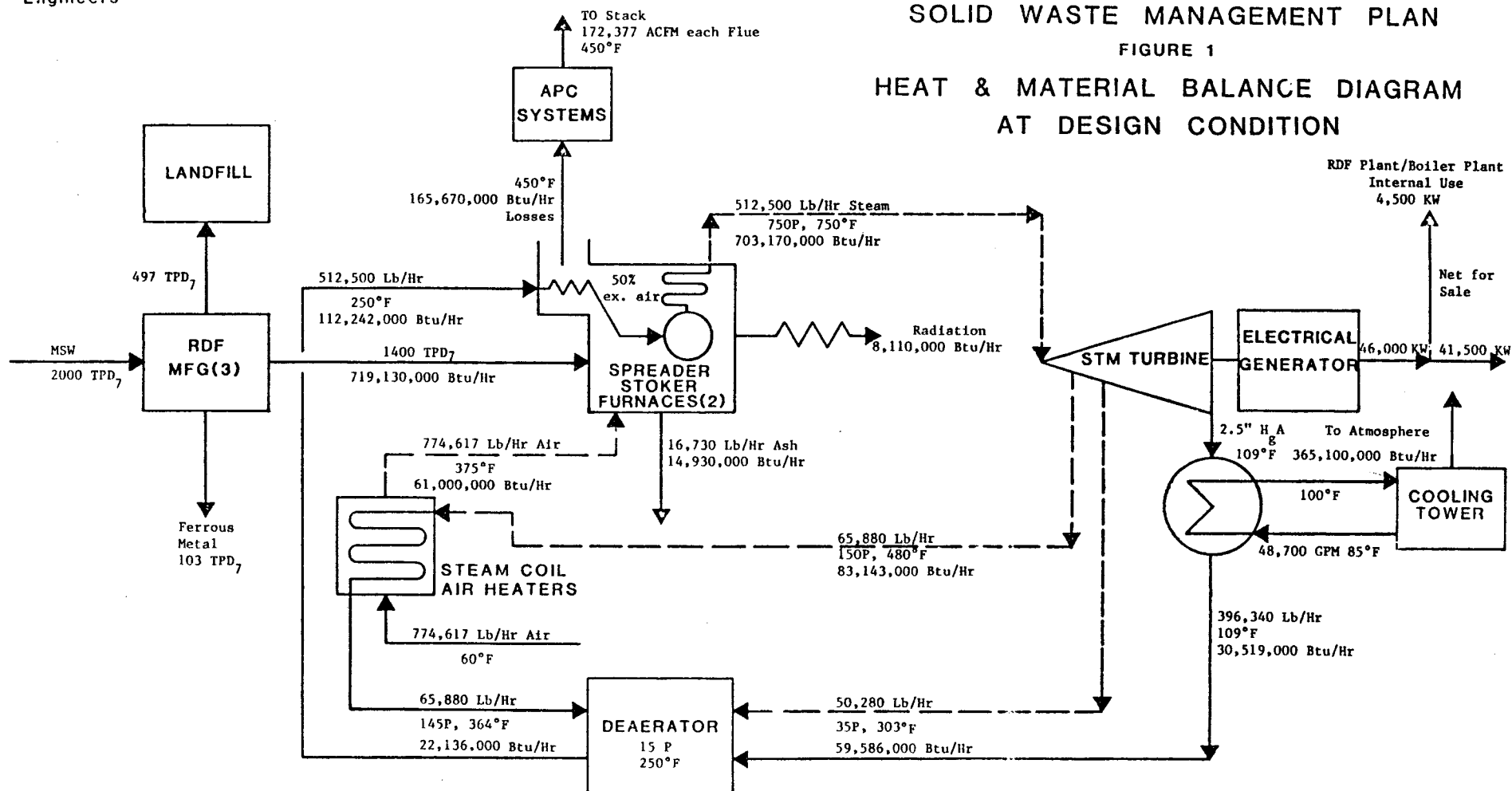


HAYDEN/WEGMAN-BARKER OSHA & ANDERSON
Engineers

PALM BEACH SOLID WASTE AUTHORITY
SOLID WASTE MANAGEMENT PLAN

FIGURE 1

HEAT & MATERIAL BALANCE DIAGRAM
AT DESIGN CONDITION

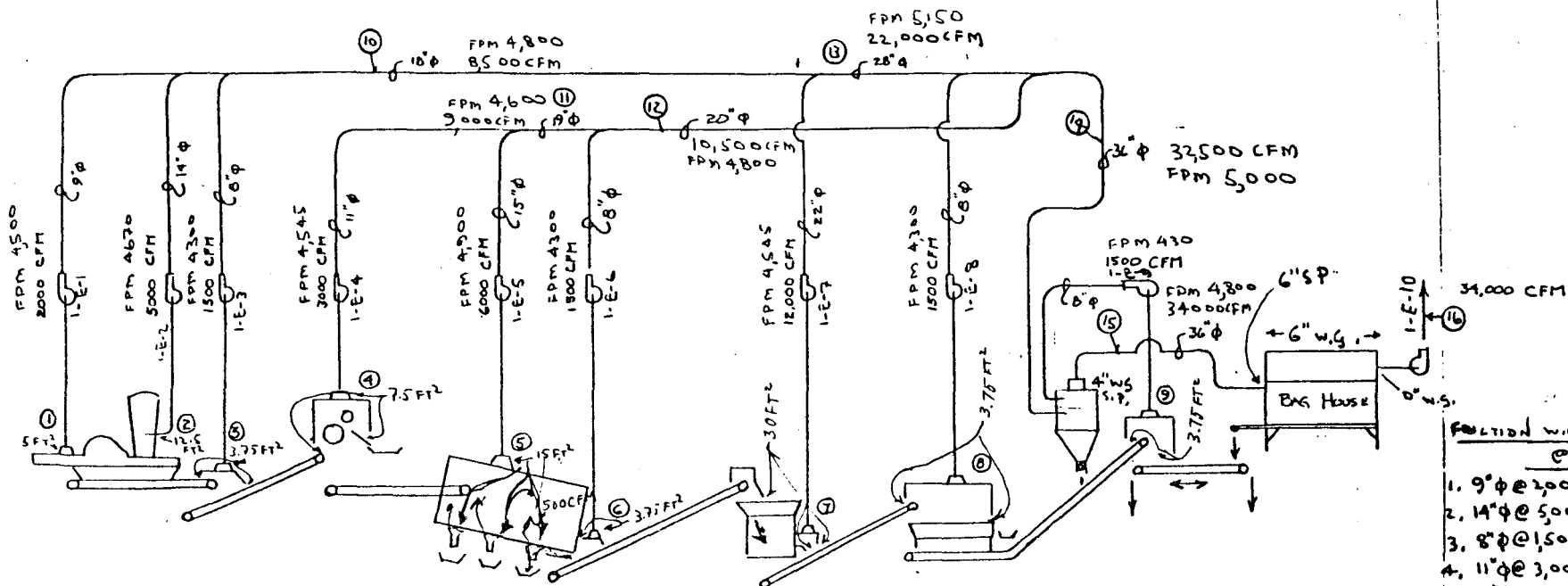


PROJECT PALM BEACH
 OWNER SWA
 FEATURE RDF PLANT - DUST CONTROL

Wegman
 ENGINEERS

SHEET NO. 11 OF 11
 DATE 8-18-82 BY SGT
 CHKD. BY NO.

DUST CONTROL SYSTEM PER RDF MANUFACTURING LINE



1. FLAIL MILL INFEEED
2. EXPLOSION VENT
3. FLAIL MILL DISCHARGE CONVEYTOR
4. MAGNETIC SEPARATION HOOD
5. TROMMEL
6. TROMMEL DISCHARGE
7. SHREDDER DISCHARGE
8. DISC SCREEN
9. PACKER INFEEED CONVEYDR

NOTES:

1. ALL EXHAUST FANS TO BE MATERIAL HANDLING (RD WHEELS)
2. ALL EXHAUST FANS TO BE VARIABLE SPEED
3. DUCT THRU 18" φ - 14 GAGE FITTINGS - 12 GAGE
 THRU 36" φ - 12 GAGE " - 10 GAGE
4. BAG HOUSE CLOTH AREA 8 TO 1 (RANGE 6 TO 1 / 10 TO 1)
- 5 CYCLONE

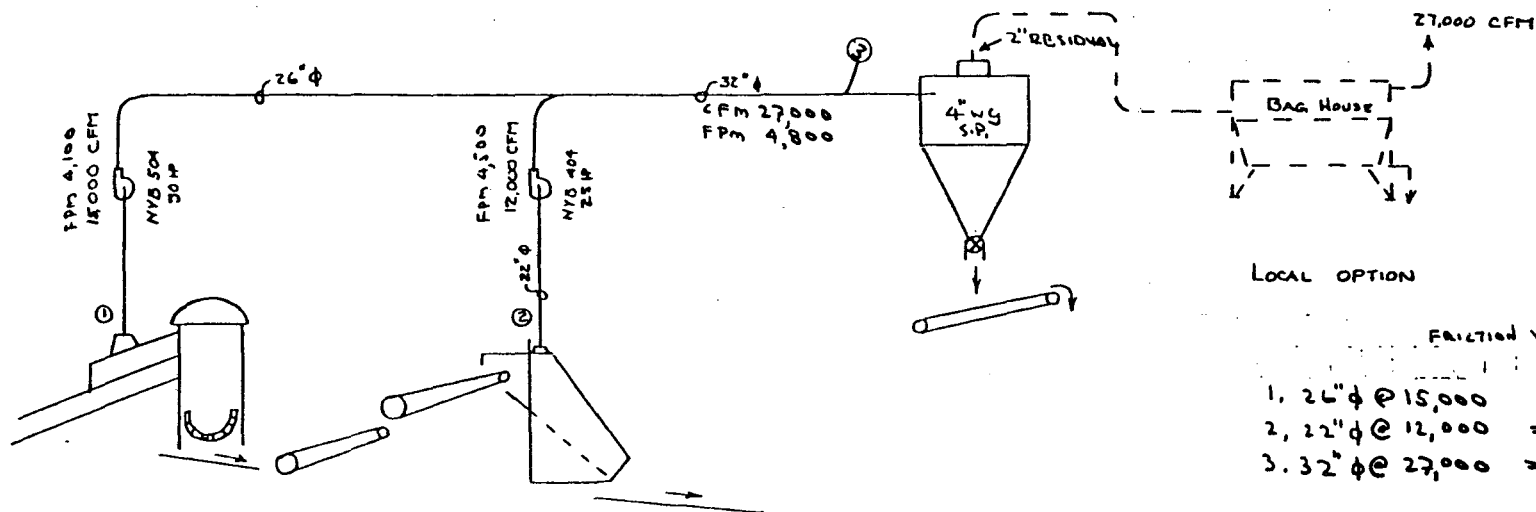
SECTION	W.G. INCHES	100 FT DUCT
@ STATED CFM		
1.	9" φ @ 2,000	3.3
2.	14" φ @ 5,000	2.1
3.	8" φ @ 1,500	3.6
4.	11" φ @ 3,000	2.7
5.	15" φ @ 6,000	2.1
6.	8" φ @ 1,500	3.6
7.	22" φ @ 12,000	1.15
8.	8" φ @ 1,500	3.6
9.	8" φ @ 1,500	3.6
10.	18" φ @ 85,000	1.6
11.	15" φ @ 9,000	1.4
12.	20" φ @ 10,500	1.35
13.	28" φ @ 22,000	1.1
14.	36" φ @ 32,500	0.55
15.	36" φ @ 34,000	0.55
16.	@ 34,000	

PROJECT PALM BEACH
 OWNER SWA
 FEATURE RDF PLANT DUST CONTROL

Wegman
ENGINEERS

SHEET NO. 12 OF _____
 DATE 8-18-82 BY SGT
 CHKD. BY _____ NO. _____

DUST CONTROL SYSTEM OBW & FERROUS PROCESSING LINE



LOCAL OPTION

FRICTION W.G. INCHES / 100 FT DUCT @ STATED C.F.M.		
1, 26" ϕ @ 15,000	=	0.56
2, 22" ϕ @ 12,000	=	1.15
3, 32" ϕ @ 27,000	=	0.56

1. SHREDDER INFEED
2. METAL AIR SCRUBBER

NOTES:

1. EXHAUST FANS TO BE MATERIAL HANDLING DESIGN (RED WHEELS)
2. METAL AIR SCRUBBER FAN TO BE VARIABLE SPEED
3. DUCT TO BE 12 GAGE - FITTINGS 10 GAGE
4. BAG HOUSE AIR TO CLOTH RATIO 8-1

HAYDEN/WEGMAN-BARKER, OSHA & ANDERSON
ENGINEERS
22-APR-1985

PALM BEACH SOLID WASTE AUTHORITY
SOLID WASTE MANGEMENT PLAN

ATTACHMENT 5 (SHEET 3 OF 3)
FIELD 73. FUGITIVE EMISSION SOURCES AND CONTROL MEASURES
TECHNICAL CALCULATIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EMISSION SOURCES	OPERATING HOURS PER DAY (HOUR)	OPERATING DAYS PER WEEK (DAYS)	UNCONTROLLED EMISSION FACTOR (GRAINS/SCF)	CYCLONE & BAGHOUSE DESIGN RATING (SCFM)	COLLECTION EFFICIENCY OF CYCLONE & BAGHOUSE (%)	MAXIMUM EMISSION (LB/HR)	ANNUAL EMISSION (TON/YEAR)
RDF MANUFACTURING TRAIN #1	16	6	5	34,000	99.8	2.91	6.18
RDF MANUFACTURING TRAIN #2	16	6	5	34,000	99.8	2.91	6.18
RDF MANUFACTURING TRAIN #3	16	2	5	34,000	99.8	2.91	2.06
OBW & FERROUS RECOVERY LINE	16	6	5	27,000	99.8	2.31	4.91
TOTAL						11.06	19.34

NOTES (REFER TO COLUMN NO. ABOVE):

(4) THE EMISSION FACTOR IS BASED ON HEAVY DUST CONCENTRATION OF THE ROCK
CRUSHING AND SCREENING OPERATION (WORST CASE).

(7) = (4) * (5) * (1.00 - (6) / 100.00) * (60 MIN/HR) / (7000 GRAINS/LB)

(8) = (7) * (2) * (3) * (52 WK/YR) * (0.85 AVAILABILITY FACTOR) / (2000 LB/TON)