

2.0 THE SITE

2.1 SITE LOCATION AND LAYOUT

This section of Chapter 2.0 provides information concerning the geographic location of the proposed site, pertinent published maps which include the area, communities in the vicinity, adjacent properties, anticipated uses of the site in comparison to existing uses, modifications expected, and special environmental features.

2.1.1 Site Location

The Stanton Energy Center site is located in Orange County, Florida. The geographic coordinates of the center of the site are 28° 29' north latitude and 81° 10' west longitude. According to the U.S. Geological Survey topographic survey, the site consists of sections 13 and 24 and the E 1/2 of sections 14 and 23, R31E, T23S and sections 18 and 19, R32E, T23S. These sections all are shown on the USGS 7-1/2' Narcoosee NW Quadrangle. The site location relative to the Orlando, Florida area is shown on Figure 2.1-1. Site railroad and road access are also shown on Figure 2.1-1. The site location relative to adjacent properties is shown on Figure 2.1-2.

2.1.2 Site Modification

The site consists of 3,280 acres. The initial development of the site will involve the use of approximately 960 acres with the ultimate development utilizing approximately 1,100 acres. The arrangement of the plant on the site and the area to be modified by development of the site are shown on Figures 2.1-3 and 2.1-4.

2.1.3 Existing and Proposed Uses

Presently, the site primarily is used as a livestock range with most of the site also leased for hunting. A half section and an adjacent quarter section on the western edge of the site have been plotted into residential lots. The plotting has not been recorded. No developments exist on the

lots or any other portions of the site. Several hunter stands have been found on site.

Once the site is developed, approximately 1,100 acres of the site will be used or occupied by the plant facilities. The remaining acreage may be leased for livestock grazing.

Several trees on site have nest cavities of the red-cockaded woodpecker. The developed area of the site will include some of these trees, but no active trees will be removed for Unit 1 development and one active tree removed for ultimate site development. The ultimate site development with respect to cavity trees and wetlands is shown on Figure 2.1-5.

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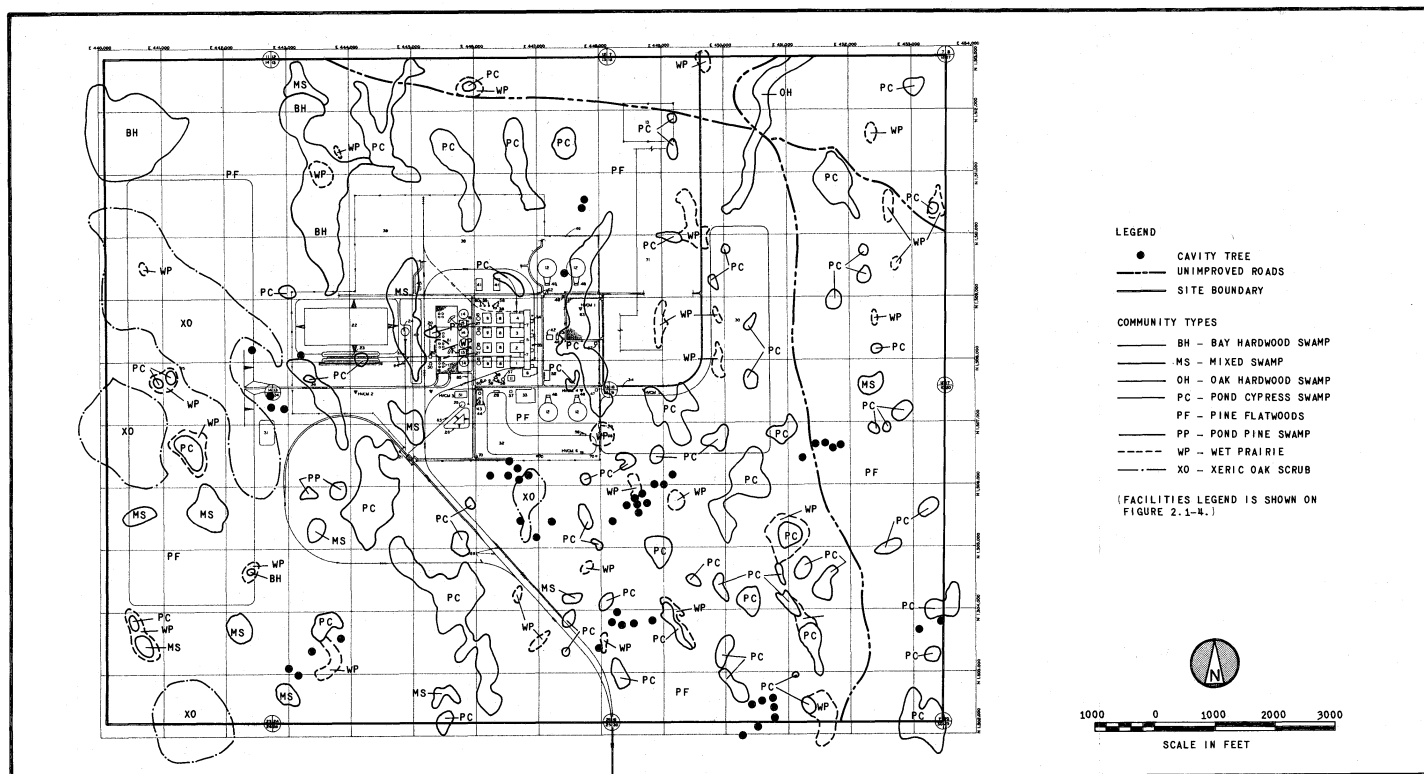


FIGURE 2.1-5. SITE ARRANGEMENT
IN RELATION TO
RED-COCKADED WOODPECKER
CAVITY TREES AND
WETLANDS OF THE SITE

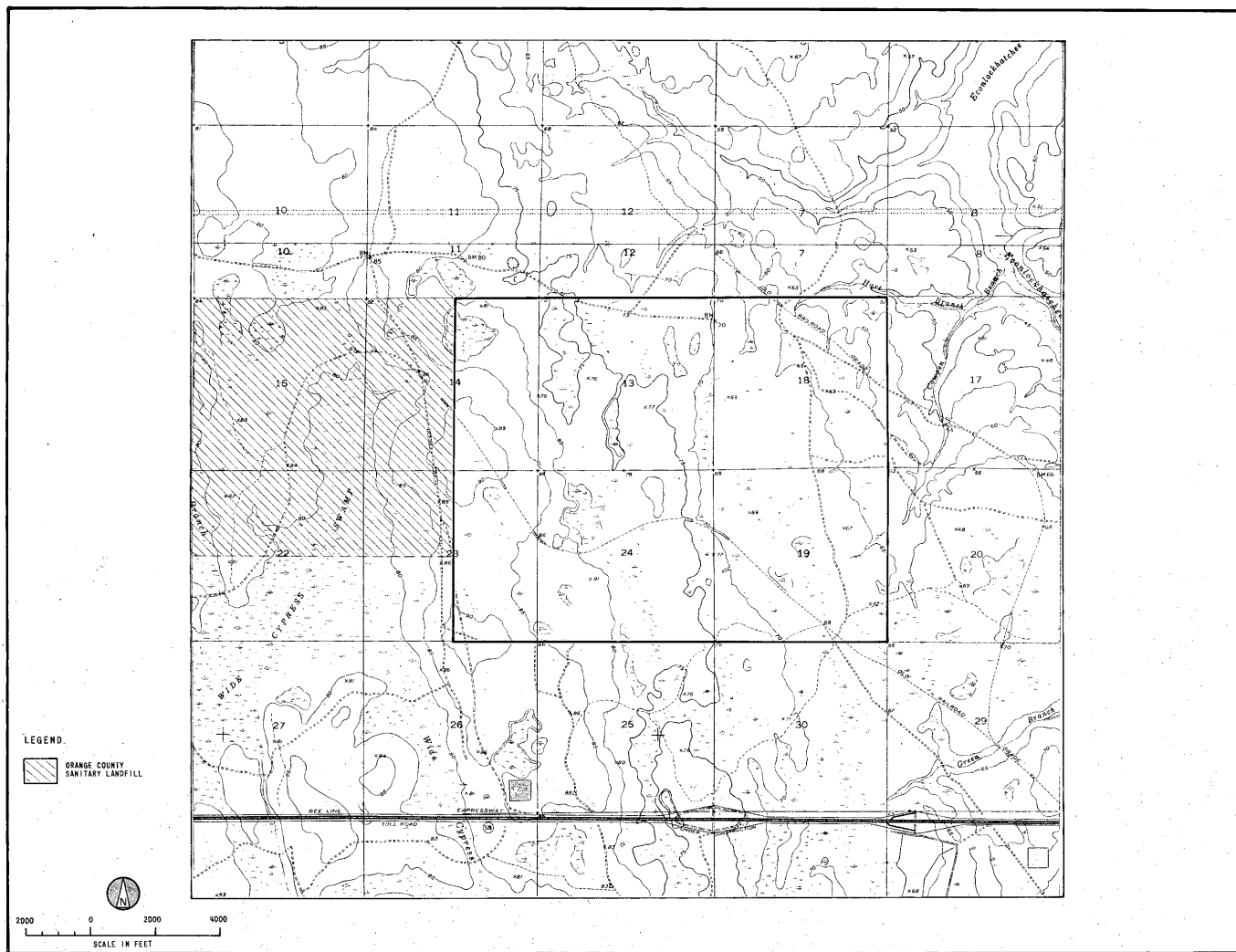
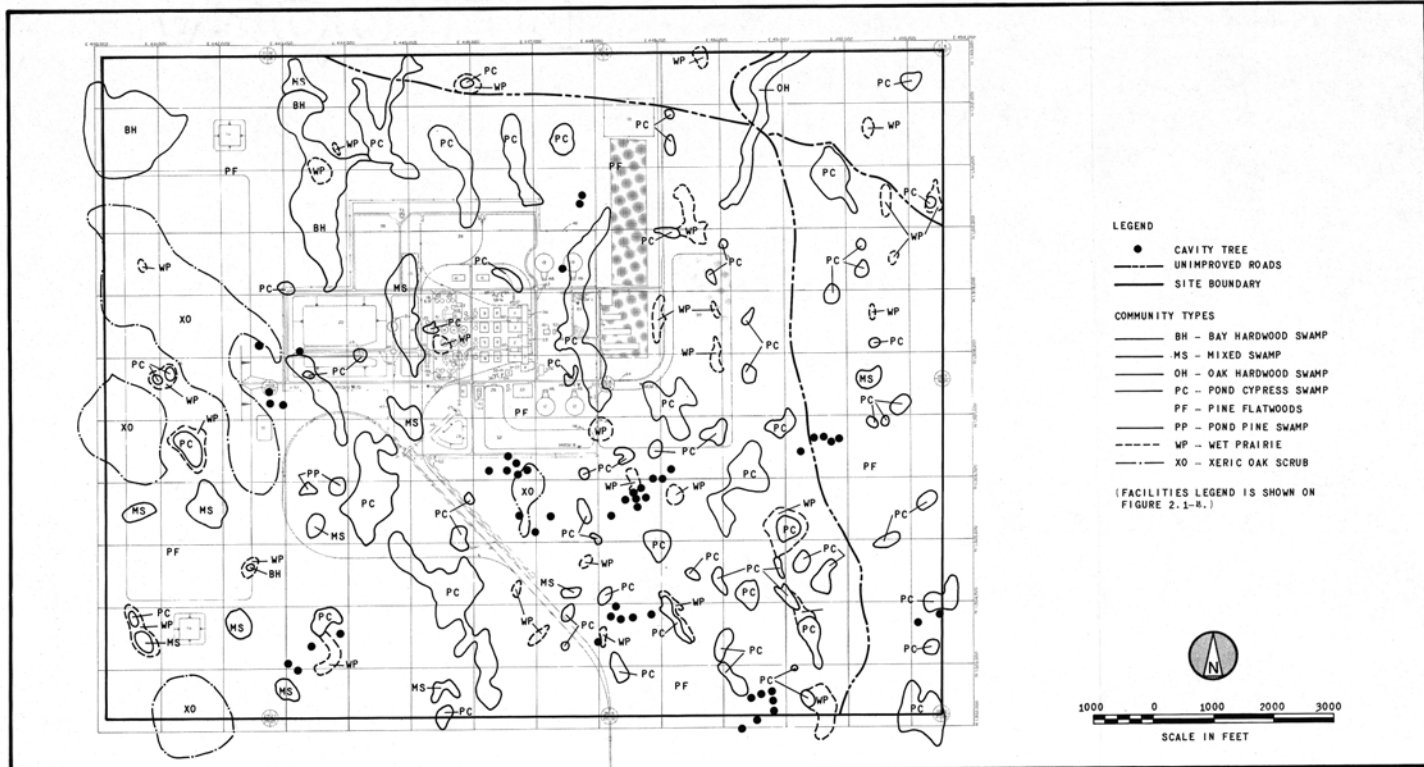


FIGURE 2.1-2. CURTIS H. STANTON ENERGY CENTER AND ADJACENT TERRAIN

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FIGURE 2.1-5. SITE ARRANGEMENT
IN RELATION TO
RED-COCKADED WOODPECKER
CAVITY TREES AND
WETLANDS OF THE SITE

2.2 REGIONAL DEMOGRAPHY, LAND AND WATER USE

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2.2.1 Demography

There are no existing residences on the proposed plant site. Therefore, no relocation or displacement of people will be involved.

According to the Orange County Planning Department, in 1980 there were 447 dwelling units within an approximate 5-mile radius of the proposed stack location. The 1980 population within that 5-mile radius was estimated at 783.⁽¹⁾ There are no incorporated communities within the area.

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2.2.2 Land Use

2.2.2.1 Site and Corridors. Under natural and undisturbed conditions, the site and transmission line, access road, railroad and water supply pipeline. corridor lands are suitable for native or improved pasture and forest. These natural conditions are referred to as flatwoods. Wetlands, serving as drainageways to larger swamp or lake areas or isolated and poorly drained areas, are frequently encountered in the flatwoods. A detailed discussion of the existing vegetation is presented in Section 2.7.

The site has been used for the grazing of livestock. There are scattered wooded and wet areas on the site. The east half of Sections 13 and 14 and the northeast quarter of Section 23 have been under lease for hunting purposes. There are no residences on the site. There are some wooded areas on the site. While lumbering activities have been occurring near the site, no lumbering activities have been observed on the site.

Approximately 960 acres of the site will be occupied or modified by the plant construction. The proposed site layout is shown on Figures 2.1-3 and 2.1-4. As a result of the presence of "endangered" Red Cockaded Woodpeckers on the site, considerations in modification of the site are to

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minimize any adverse effect on this species' habitat as well as to minimize wetland impacts.

The railroad access route will cross approximately 2.5 miles of wetlands, comprising 14 per cent of the total route length. Trestle construction across some of the wetlands would reduce the extent of disturbance of these areas. Details of this construction is presented in Subsection 4.1.2 The remaining 86 per cent of the route length is comprised of more typical, better drained, flatwoods. The route will not traverse any prime or unique farmlands identified by the U.S. Department of Agriculture Soil Conservation Service. The transmission line will span a small existing citrus grove.

Approximately 3.5 miles of the railroad access route will parallel existing road right-of-way (ROW), which represents 20 per cent of the total route length.

There are 21 residences or other structures located within 1,320 feet of the route centerline. Seventeen of the structures, or 81 per cent, are located within 4.5 miles of the intertie with the railroad mainline. These structures are located in Sections 17 and 21 of Township 24 South, Range 31 East.

The modified water supply pipeline route is presented in Section 3.9. It will be approximately 4 miles long immediately adjacent to and parallel to the new Orange County road between the Stanton Energy Center and the Orange County Easterly Subregional Wastewater Treatment Plant. The entire 4 miles of pipeline will be installed on land previously disturbed by the road construction. The pipeline will not traverse any prime or unique farmlands identified by the U.S. Department of Agriculture Soil Conservation Service. The pipeline route will not disturb any existing citrus groves.

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The new transmission corridor will parallel the existing transmission line corridor for 5.5 miles of its total 6-mile route. The new transmission corridor will parallel the new Orange County road and pipeline corridor for about one-half mile.

The new transmission corridor will traverse approximately 1.5 miles of wetlands, comprising 25 per cent of the total route length. The remaining 75 per cent of the route length is comprised of more typical, better drained, flatwoods and a small citrus grove. The transmission lines will not traverse any prime or unique farmlands identified by the U.S. Department of Agriculture Soil Conservation Service. The transmission lines will span the small existing citrus grove.

There are two residences adjacent to the south side of the existing transmission corridor. Since corridor expansion is to the north, these residences will not be disturbed.

2.2.2.2 Regional Land Uses. The site is located four and three-fourths miles south of Highway 50 and one mile north of Bee Line Highway in eastern Orange County, Florida. The Econlockhatchee River is about three-fourths mile east of the northeast corner of the site boundary. The Orange County Solid Waste Disposal facility is adjacent to the site along the west boundary.

There are no incorporated areas within five miles of the plant. The community of Bithlo, near the five-mile periphery, was incorporated from about 1920 to 1977. In 1977, the incorporation was dissolved and the area reverted back to Orange County, which now provides the zoning and services for the area.

Figure 2.2-1 shows the site area with one mile increment circles drawn from the center of the plant site. The one-mile radius from the plant is almost entirely within the plant site boundaries. No existing or currently proposed development within three miles of the plant is known to occur.

Existing ordinances provide approval for the development of four new residential areas to the northwest of the site. Included in these developments are High Point Road, Dean Road Condominiums, Gulf Stream and, Colony East. Construction is currently underway on Phase I of the High Point Road development and Gulf stream. Housing units nearest the site are proposed in the Dean Road development three miles north-northwest of the plant. The other three developments will extend northwesterly past the four-mile radius.

Existing development in the Bithlo area begins about three and one half miles north-northeast of the plant. The density of residential development increases between the four- and five-mile radii. About four and one-fourth miles to the east of the plant, is a residential development tract identified as Cape Orlando which has been plotted and approved by the County, and consists of nearly 10 full sections of land. Some building sites have been sold, but not much actual development has occurred. Most of this tract is outside the five-mile radius of the plant, however, some of the tract is within the east-northeast to east-southeast direction between the four- and five-mile radii. To the south and west of the plant, there is no residential development within five miles of the plant.

The Orange County Planning Department estimates future dwelling units within 5-miles of the plant to total 469 in 1985 and 537 in 1990, with population increasing to 930 in 1985 and 1,261 in 1990.⁽¹⁾

There are some logging activities in areas near the plant site. These logging operations are rather limited.

Current zoning of the plant site and within a five-mile radius of the plant is mostly classified as "A-2," which is defined as a Ranch and Farmland Rural District with one-half acre lot size. Exceptions are the Bithlo area northeast of the plant, the Cape Orlando area east and southeast of the plant, and the proposed development area northwest of the plant. The Bithlo and Cape Orlando areas are predominately classified as "R-1A" which is defined as a Single Family Residential District with 7,500 square feet lot size. A portion of the Cape Orlando area is zoned R-1AA which is Single Family Residential with 10,000 square feet lot size. The area of

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proposed development to the northwest of the plant is classified "P-D" which is defined as a Planned Development District.

The zoning within the railroad corridor, located south and west of the plant site and beyond the five-mile radius, is mostly classified as "A-2." However, at the junction of the Seaboard Coast Line mainline and the plant rail line, there is a small segment of "I-4," which is defined as General Industrial District. Adjoining the "I-4" classification and the Orlando International Airport is an area classified as "I-5," which is defined as Airport Industrial District.

The zoning within the pipeline corridor, located north and west of the plant site and beyond the five-mile radius is multi-classification. These classifications include "R-1" (Single Family Residential with a minimum 6,000 square feet lot size) and "C-1" (Neighborhood Retail Commercial District) south of Highway 50. The two one-mile sections south of the Orange/Seminole County boundary are "R-3" classification which is defined as a Multiple Family Residential District. In Seminole County, north of the county boundary, there is a combination of "U-C," "R-M-Z," and "A-1" districts. The "U-C" classification is defined as a University Community; "R-M-Z" as a Residential Mobile Home District; and "A-1" as a Citrus Rural District, with minimum one-half acre lot size.

Zoning along the transmission line corridor, which is located north of the plant site going east and west, is mostly "A-2" within the five-mile radius. There is a small segment of "P-D" classification adjacent to the five-mile radius northwest of the plant site. The remainder of the corridor to the substation is predominately "R-1A."

An application for a special exception for a utility plant will be filed and pursued later with the County Zoning Board of Adjusters and County Commissioners. This application will include all offsite facilities as appropriate.

There is an existing 220 foot-wide transmission line corridor one-fourth mile north of the plant site boundary. This corridor contains two

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sets of transmission lines which connect Indian River Power Plant, near Titusville, Florida, and Pershing Substation at Orlando, Florida. One set of lines consists of two 115 kV lines on wooden structures and the other set is a 230 kV line on steel structures. The corridor extends beyond the five-mile radius both east and west. It is proposed that power from this plant will be transmitted to Pershing Substation via this corridor. There are no other existing nor proposed corridors within the five-mile radius.

Citrus groves occur between the four- and five-mile radii to the northeast, southeast, and northwest of the plant site. There are no citrus groves located within four miles of the plant location. There are no prime or unique farmlands, as identified by the U.S. Department of Agriculture Soil Conservation Service, within five miles of the plant site.

There are no state or federally owned lands within five miles of the plant site.

2.2.3 Water Use

Water resources in the site vicinity (5 mile radius) include the Econlockhatchee and Little Econlockhatchee Rivers and the Floridan aquifer. These resources are east and west of the site, respectively, while the Floridan aquifer underlies all of Orange County. See Figure 2.2-1 for the location of surface waters within the site vicinity. No major streams are on the plant site. A small segment of the Hart Branch of the Econlockhatchee River extends into the northeast portion of the site which will not be disturbed by construction or operational activities. The Floridan aquifer will supply plant service and potable water, and the Orange County Easterly Subregional Wastewater Treatment Plant will supply cooling tower makeup.

Major water uses onsite, and in the site vicinity, are for agricultural purposes such as irrigation, livestock watering, and various rural domestic uses. No irrigated lands are onsite, and only a very few are present in the site vicinity. Most irrigated lands are found in the western portion of the county, where specialty citrus and vegetable crops are grown. Although no data exist on agricultural water uses for the site vicinity specifically, historical data are available on a county-wide

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basis.⁽²⁾ Over 46,300 acres in Orange County were irrigated in 1977, using over 68,900 acre-feet of water. Rural domestic and livestock uses were 9.3 mgd for the same year. More than 80 per cent of the water used for agricultural purposes in 1977 came from ground water sources.

No known industrial water users are onsite, or in the site vicinity. One major water user in the county is the citrus processing industry. This industry used an average of 5.2 million gallons per day (mgd) in 1977, self-supplied from deep wells into the Floridan aquifer.⁽²⁾ The space industry and related activities, although located out of the county, used over 1 mgd, partially obtained from within Orange County.⁽³⁾ Another major industrial water user in the county is the Lake Highland power plant. This power plant used Lake Highland as a source of once-through cooling water. This plant is scheduled for retirement in 1982.

No municipal water supply or wastewater facilities are located onsite. One municipal water supply facility is within the site vicinity, the Cocoa well field area.⁽⁴⁾ This well field, located south and southeast of the site, is owned and operated by the city of Cocoa, and supplies about 15.5 mgd to central Brevard County. In 1977, municipalities within Orange County withdrew 67 mgd from the Floridan aquifer for water supply.⁽²⁾

Recreational opportunities on surface waters within 10 miles of the site are primarily of local importance. Lake Hart, Lake Mary Jane, and the numerous smaller lakes in that area, provide ample opportunities for recreational activities. The Econlockhatchee and Little Econlockhatchee River receive limited use, primarily by local residents.

No reservoirs or natural lakes are onsite, or within the 5-mile site vicinity, but many natural lakes exist just outside the vicinity. Numerous small lakes to the west and south of the site are used for recreation and irrigation water supply. The Disston Canal is located beyond the site vicinity, but diverts water from Lake Hart and Lake Mary Jane in the Kissimmee River Basin, into the Econlockhatchee River.

No transportation activities are known to occur on surface waters of the site vicinity.

2.2.4 References

- (1) Memorandum dated July 1, 1981, Tracy Watson, Planning Director, Orange County Planning Department, to Board of Zoning Adjustment, Orange County, Florida.
- (2) Estimated Water Use in Florida, 1977. S. D. Leach and H. G. Healy. USGS Water Resources-Investigations 79-112. January 1980.
- (3) Florida Water and Related Land Resources in the St. Johns River Basin; Florida Dept. Nat. Res., 1970.
- (4) Ground Water Hydrology of the Cocoa Well-Field Area, Orange County, Florida; USGS and City of Cocoa, 1976.

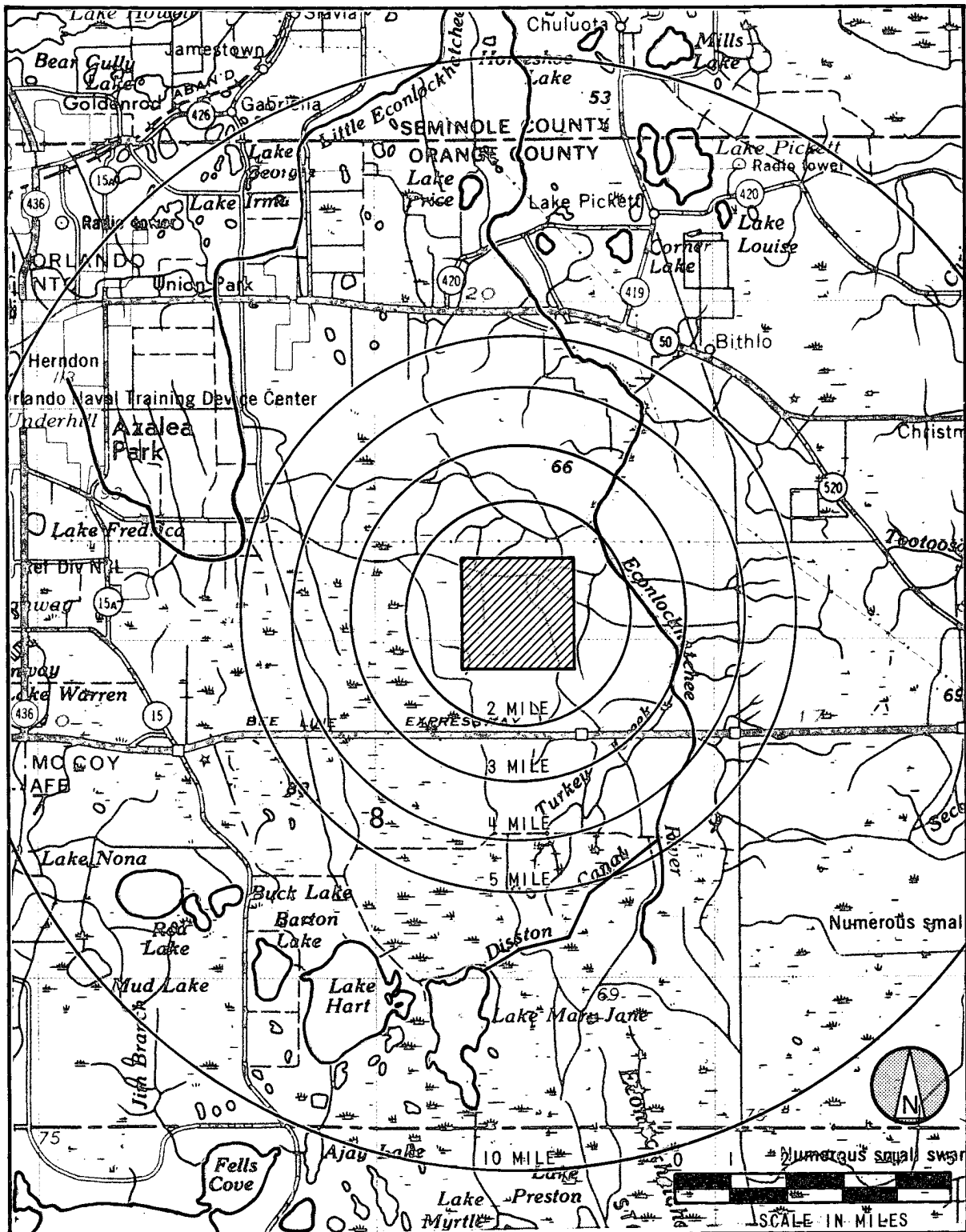


FIGURE 2.2-1. MAJOR WATER BODIES AT THE SITE AND SURROUNDING AREA

2.3 REGIONAL HISTORIC, SCENIC, CULTURAL AND NATURAL LANDMARKS

There are no recorded historic, scenic, cultural or natural landmarks located on the plant site. The nearest recognized sites are located in or near Orlando. The National Register of Historic Places currently lists the following sites located in Orange County, Florida.

- (1) Orlando--Old Orlando Railroad Depot.
- (2) Orlando--First Church of Christ Scientist.
- (3) Orlando--The Tinker Building.
- (4) Winter Park--The Parsonage.

The National Registry of Natural Landmarks does not include any sites for Orange County, Florida.

An archaeological and historic survey of the Stanton Energy Center site was conducted in two stages. Sections 13 and 24, and the eastern halves of Sections 14 and 23 of Township 23 South, Range 31 East, initially were surveyed. When access later became available, the remainder of the site also was examined for the presence of archaeological and cultural resources. The site survey was conducted by personnel from the Florida Secretary of State, Division of Archives, History, and Records Management.

Four sites were found during the surveys. Three were prehistoric archaeological sites, and one was an historic hunting lodge from about the early 20th century. This lodge is located just off the site near the southwest corner of the proposed property line. The Division of Archives, History and Records Management concluded that the sites did not represent significant archaeological or historical resources. A copy of a letter from Mr. L. Ross Morrell, Director, Division of Archives, History and Records Management concerning the initial survey is presented as Exhibit 2.3-1.

The railroad corridor has been modified to include additional area southeast of Mud Lake, Lake Nona, and Red Lake. The Florida Department of State has reviewed the modification and has determined that no archaeological or historic sites have been recorded within the corridor modification. The Department of State also has concluded that the probability for significant, unrecorded sites to be present is low and that the project may proceed

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without further involvement of the Department of State. Exhibit 2.3-2 presents the pertinent documentation of this investigation.

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Secretary of State

STATE OF FLORIDA
THE CAPITOL
TALLAHASSEE 32304

GEORGE FIRESTONE
SECRETARY OF STATE

DIVISION OF ARCHIVES, HISTORY
AND RECORDS MANAGEMENT
L. Ross Morrell, Director
(904) 488-1480

March 13, 1981

In reply refer to:

Mr. John Scarry
Archaeology Supervisor
(904) 487-2333

Mr. George R. Savage
Black & Veatch Consulting Engineers
P. O. Box 8405
Kansas City, Missouri 64114

Re: Archaeological and Historical Survey
Econlockhatchee South Tract - Staunton Energy Center
Orange County, Florida

Dear Mr. Savage:

This agency recently surveyed those portions of the Econlockhatchee South Tract (The Staunton Energy Center property) which were accessible to the Orlando Utilities Commission. Specifically, we surveyed Sections 13 and 24 and the eastern halves of Sections 14 and 23 of Township 23 South, Range 31 East. We were unable to survey the remainder of the tract, i.e. that portion included in Sections 18 and 19 of Township 23 South, Range 32 East.

Four sites were located during the survey. Three of these were prehistoric archaeological sites; the final site is an historic hunting lodge dating to the first part of the 20th century. Based on the physical remains which constitute these sites, it is our opinion that they do not represent significant archaeological or historical resources. Therefore, construction of the proposed Staunton Energy Center will not adversely impact any significant archaeological or historical resources.

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EXHIBIT 2.3-1. LETTER FROM L. ROSS MORRELL

Letter to Mr. Savage
March 13, 1981
Page Two

In accordance with the agreement between this agency and Black & Veatch, we will survey the remaining portions of the survey area as the Orlando Utilities Commission acquires access to them. Until that time, however, we cannot make an assessment of the archaeological and historical resources of that area.

Secretary of State George Firestone and I thank you for your cooperation in protecting the irreplaceable historic resources of Florida.

Sincerely,

A handwritten signature in dark ink, appearing to read "L. Ross Morrell", written in a cursive style.

L. Ross Morrell, Director
Division of Archives, History
and Records Management

LRM/JFS/hs

EXHIBIT 2.3-1. LETTER FROM L. ROSS MORRELL

RECEIVED
BLACK & VEATCH



SEP 1 1982 FLORIDA DEPARTMENT OF STATE
George Firestone
Secretary of State
SYSTEMS ENG. DEPT.
LEGAL-ENV. GROUP
August 20, 1982

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ORLANDO UTILITIES COMMISSION
STANTON ENERGY CENTER - PROJECT 1
S.A. Armbruster E.A. Pretz
E.C. Buckheit D.D. Schultz
F.P. Chael R.I. Unruh
S.F. Danner K.E. Weiss
S.H. Day E.C. Windisch
C.K. Graham P.H. Woodard
G.J. Moore G. Savage
Received 8-31-82 File 12.1203
In Reply Refer to:

Ms. Juanita W. Crudele
Historic Sites Specialist
(904) 487-2333

Mr. E. C. Windisch
Black and Veatch Consulting Engineers
Post Office Box 8405
Kansas City, Missouri 64114

Re: Your Letter of August 4, 1982
Cultural Resource Assessment Request
Survey of Railroad Realignment, Stanton Energy Center
Unit 1, Orlando Utilities Commission, Orange County,
Florida

Dear Mr. Windisch:

As per your request we have reviewed the proposed realigned rail corridor to the Stanton Energy Center. A review of the Florida Master Site File indicates that no archaeological or historical sites are recorded within the project study area. Furthermore, a review of the information contained in the 1981 archaeological and historic site report by Randy Daniel and Paco de la Fuente for the originally proposed railroad corridor indicates that construction within the proposed realignment area - 300 feet on either side of the surveyed corridor - will have no impact on any significant archaeological resources and the project may proceed without further involvement with this agency.

If you have any questions concerning this matter, please do not hesitate to contact us.

Sincerely,

George W. Percy, Chief
Bureau of Historic Sites
and Properties

GWP:Ceb

cc: H. S. Oven

FLORIDA-State of the Arts

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2.4 GEOLOGY

A description of the site geology is presented in this section. The description is based on information from published literature, open-file data, a preliminary subsurface site investigation, aerial photographs, and visual observations on the site. The description includes the topography, geomorphology, stratigraphy, structure and earthquake history of the site. The subsurface investigation for the plant access road, railroad line, makeup and return water pipelines and transmission lines has not been completed at this date. The general subsurface conditions for these outside facilities are anticipated to be similar to those at the site. A detailed subsurface investigation will be performed onsite at the locations of structures and auxiliary facilities.

2.4.1 Topography

The topography of the site is shown on Figure 2.4-1. The elevation on the site varies from approximately 92 feet mean sea level (MSL) in the southwest to approximately 52 feet MSL in the northeast. The terrain is generally level with gradients of 15 feet per mile to the northeast.

2.4.2 Geomorphology

The site is located within the Florida section of the Coastal Plain geomorphic province.⁽¹⁾ The Florida section is a youthful, recently emergent, terraced coastal plain. Karst features are extensively developed.

The Florida section is further subdivided by the Florida Bureau of Geology into northern, central, and southern geomorphic zones. The central zone, in which the site is located, is "... characterized by highlands in the form of subparallel ridges separated by broad valleys".⁽²⁾ The ridges are above the piezometric surface of the surficial aquifer, and the valley floors are below it. Broad shallow lakes are common on the valley floors.

Numerous depressions are present within the site boundaries with the major ones shown on Figure 2.4-2. The depressions tend to have an alignment and elongation along azimuths north 40° west, north 15° west, north 30°

east, and north 50° east. The depressions are the result of longshore current modifications of former sandbars or may have developed from solution action begun in depressions formed by hurricane winds and water. Some contain cypress trees and some contain water during the rainy seasons.

There are two minor asymmetric ridges that extend north-south across the central and western portions of the site and that are roughly parallel. The steep slopes on these ridges face approximately east. These ridges can be seen on Figure 2.4-1.

2.4.3 Stratigraphy

The stratigraphy beneath the site was determined from published literature, open-file data, and a preliminary subsurface investigation. The subsurface investigation consisted of 11 widely-spaced borings at various locations across the site. The boring logs and laboratory test results are presented as Exhibits 2.4-1 and 2.4-2, respectively. Most borings were drilled to 50 feet below ground surface. Two borings extended to 209 feet below the ground surface. Laboratory tests were completed on selected samples of soil and rock from these borings. The locations of the borings are shown on Figure 2.4-2.

The strata beneath the site to a depth of 209 feet are divided into five stratigraphic layers: a surficial sand layer, an intermediate cohesive layer, a lower sand layer, a lower cohesive layer, and limestone bedrock. A detailed description of each of these units is included below. Stratigraphic cross-sections are shown on Figures 2.4-3 and 2.4-4.

The surficial sand layer consists of a heterogeneous arrangement of loose to dense sand, silty sand, and clayey sand with an intermittent thin clay layer. At the boring locations, this surficial layer varies in thickness from 32 feet in Boring 3 to 71 feet in Boring 6. The granular soil is generally fine grained above elevation 45± feet MSL, grading to medium and coarse grained with occasional shell fragments below that elevation. An intermittent cohesive layer of soft to stiff highly plastic clay and sandy clay, less than 4 feet thick, was encountered at depths between 32 and 35 feet in Boring 7. The limestone was cored for 12 feet in Boring 6 and 10 feet in Boring 7. The limestone is white to olive gray in color and is medium to thin bedded. It is argillaceous, fossiliferous, and fresh to

slightly weathered. The limestone has voids between elevations -126 feet and -129 feet in Boring 6, and between elevations -130 feet and -131 feet in Boring 7.

2.4.4 Structure

The site is located on the east flank of the Peninsula arch.⁽⁴⁾ As mentioned in Section 2.4.2, numerous surface depressions and small ponds are anticipated to be indications of sinkholes and joint systems within and surrounding the site. Prominent indications of possible sinkholes at the site are found in the northwest corner and the north-central area. The ground depressions and shallow lakes within and surrounding the site appear to be positioned above suspected joints in the limestone. An analysis of surface expressions of suspected sinkholes and joint patterns within and around the site is illustrated in Figure 2.4-5. The orientations of joints appear to be N 40° W, N 15° W, N 30° E, and N 50° E. |4

2.4.5 Earthquake History

Florida is an area which has experienced little historic seismic activity. Eleven earthquake epicenters with Modified Mercalli intensities of from I to VII have been located in Florida as of mid-1980. Eighteen earthquakes outside of the state have had shocks great enough to be felt in Florida. A list of earthquakes that have affected Florida is given in Table 2.4-1 and epicentral locations for those located in and near the state are presented in Figure 2.4-6.

The largest recorded earthquake in Florida occurred in 1879, north of Ocala with an intensity of VII. The largest earthquake near the site was an intensity V event in 1973 south of Orlando. The eighteen earthquakes with epicenters located outside of the state have resulted in isoseismal projections of intensities of less than V in central Florida.

Historic evidence indicates that the Stanton Energy Center site has been exposed to only small seismically induced ground motions due to earthquakes originating in Florida or adjacent regions.

slightly weathered. The limestone has voids between elevations -126 feet and -129 feet in Boring 6, and between elevations -130 feet and -131 feet in Boring 7.

2.4.4 Structure

The site is located on the east flank of the Peninsula arch.⁴ As mentioned in Section 2.4.2 there are numerous surface depressions present on the site. In addition to these surface depressions, there are many lineaments which cross the site in a generally northwest and northeast direction (Figure 2.4-5). Based on the subsurface data collected during the site investigation, these on-site lineaments are the result of variations in overburden material, changes in underlying rock texture, and/or variations in primary porosity. Their minimal impact on the site is expressed by their lack of correspondence with the longitudinal axes of the on-site depressions and the lack of hydrologic data from the subsurface investigation showing any kind of water table depressions.

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Historic evidence indicates that the Stanton Energy Center site has been exposed to only small seismically induced ground motions due to earthquakes originating in Florida or adjacent regions.

TABLE 2.4-1. LIST OF EARTHQUAKES AFFECTING FLORIDA

Date	Location	Modified Mercalli Intensity	Comments (Ref.)
10-29-1727	--	--	Severe Earthquake felt in St. Augustine, Florida (5)
10-29-1727	New England	--	Severe shock about 10:40 a.m. (5)
10-29-1727	Martinique	VI	Reported (1, 5)
12-16-1811	New Madrid, Mo.	XII	(6)
1-23, 2-7, 1812	New Madrid, Mo.	XII	(6)
2-8-1843	West Indies (N Lat. 16, W Long. 62)	VII	Felt in U.S. (2, 5)
1-12-1879	Northern Florida (N Lat. 29.5 W Long. 82.0)	VII	Felt from line drawn from Punta Rassa to Daytona on the south to line drawn from Tallahassee to Savannah on the north (1, 5)
1-22, 23-1880	Vuelto Abajo, Cuba (N Lat. 22.8 W Long. 80.8)	VIII	Felt in Florida (2, 5)
1-27-1880	Vuelto Abajo, Cuba	VII to VIII	Several shocks felt in Key West, Florida (1, 5)
8-31-1886	Charleston, South Carolina	X	Severe shocks felt along Florida NE coast; bells rang in St. Augustine; felt as far south as Tampa; MM V to VI in North Florida (1, 5)
9-1, 3, 5, 8, 9-1886	Charleston, South Carolina	--	Jacksonville, Florida tremors MM IV (1, 5)
10-22-1886	Charleston, South Carolina	--	Jacksonville, Florida tremor MM V (1, 5)
10-31-1900	Jacksonville, Florida	V	USC and G.S. record (1, 5)
1-23-1903	Tybee Island, Georgia	VI	(2, 5)
6-12-1912	Savannah, Georgia	--	Felt strongly
6-20-1920	Savannah, Georgia	V	(2, 5)

TABLE 2.4-1 (Continued). LIST OF EARTHQUAKES AFFECTING FLORIDA

<u>Date</u>	<u>Location</u>	<u>Modified Mercalli Intensity</u>	<u>Comments (Ref.)</u>
7-14-1930	--	V	Felt over wide area near Labell, Fort Meyers, and Marco Island. May have been explosions (1, 5)
7-19-1930	Ft. Myers-Everglades	IV	(6)
11-13-1935	Palatka, Florida	IV or V	Two tremors. Second also felt at St. Augustine and Anastacia Island (1, 5)
1-19-1942	Near Lake Okeechobee	IV	Several tremors felt at Miami, Everglades, and For Meyers (1, 5)
12-22-1945	Miami Beach, Hollywood	I - III	(3, 5)
11-8-1948	Captiva, Florida	IV	Doors and windows rattled (4)
11-18-1952	Quincy, Florida	IV	Windows and dishes rattled (4)
10-27-73	Orlando, Florida	V	Windows cracked in Cocoa Beach, Dundee and Osteeni sheetrock cracked at Winter Springs (7)
12-4-75	Near Daytona Beach	III - IV	(7)

Fig 2.4-1

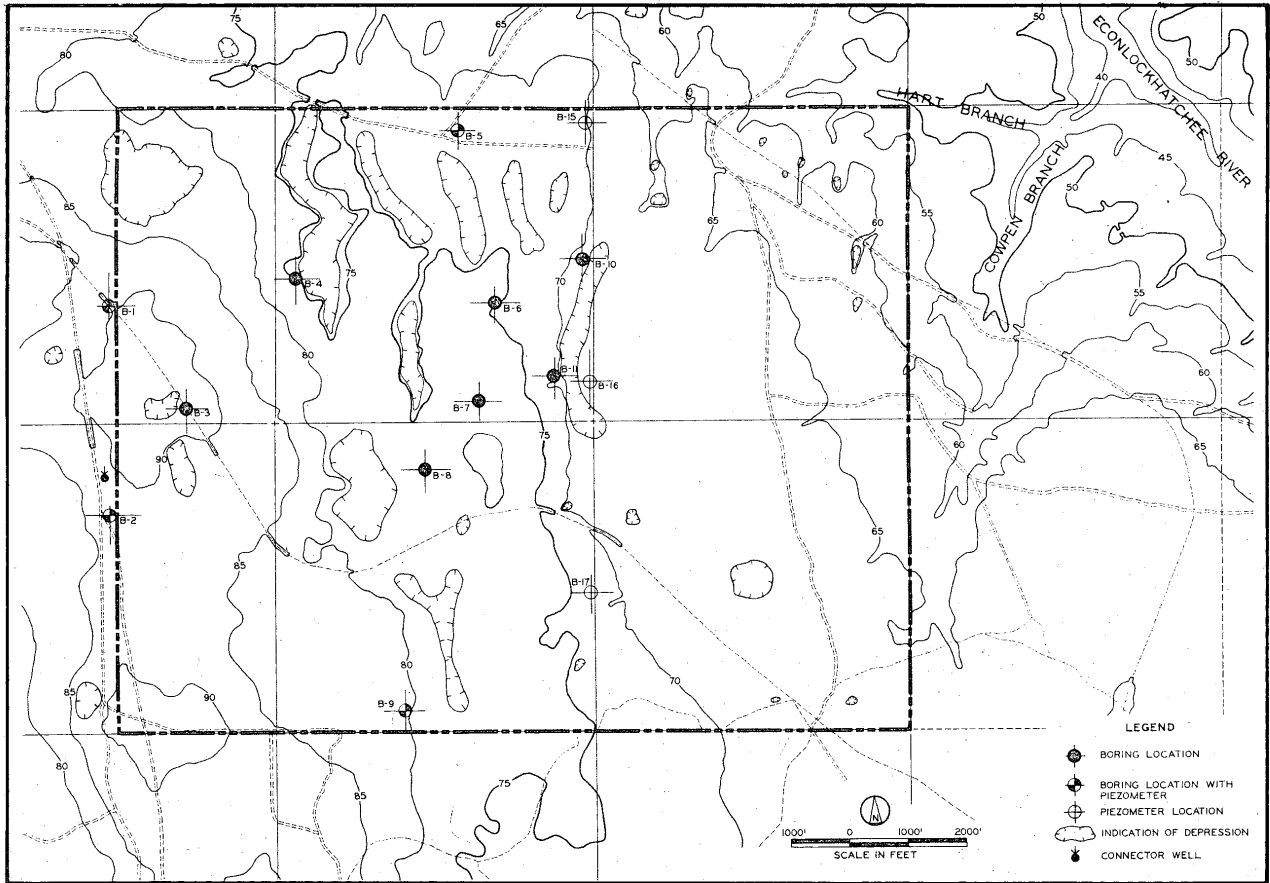


FIGURE 2.4-2. MAJOR DEPRESSIONS WITHIN THE SITE BOUNDARY

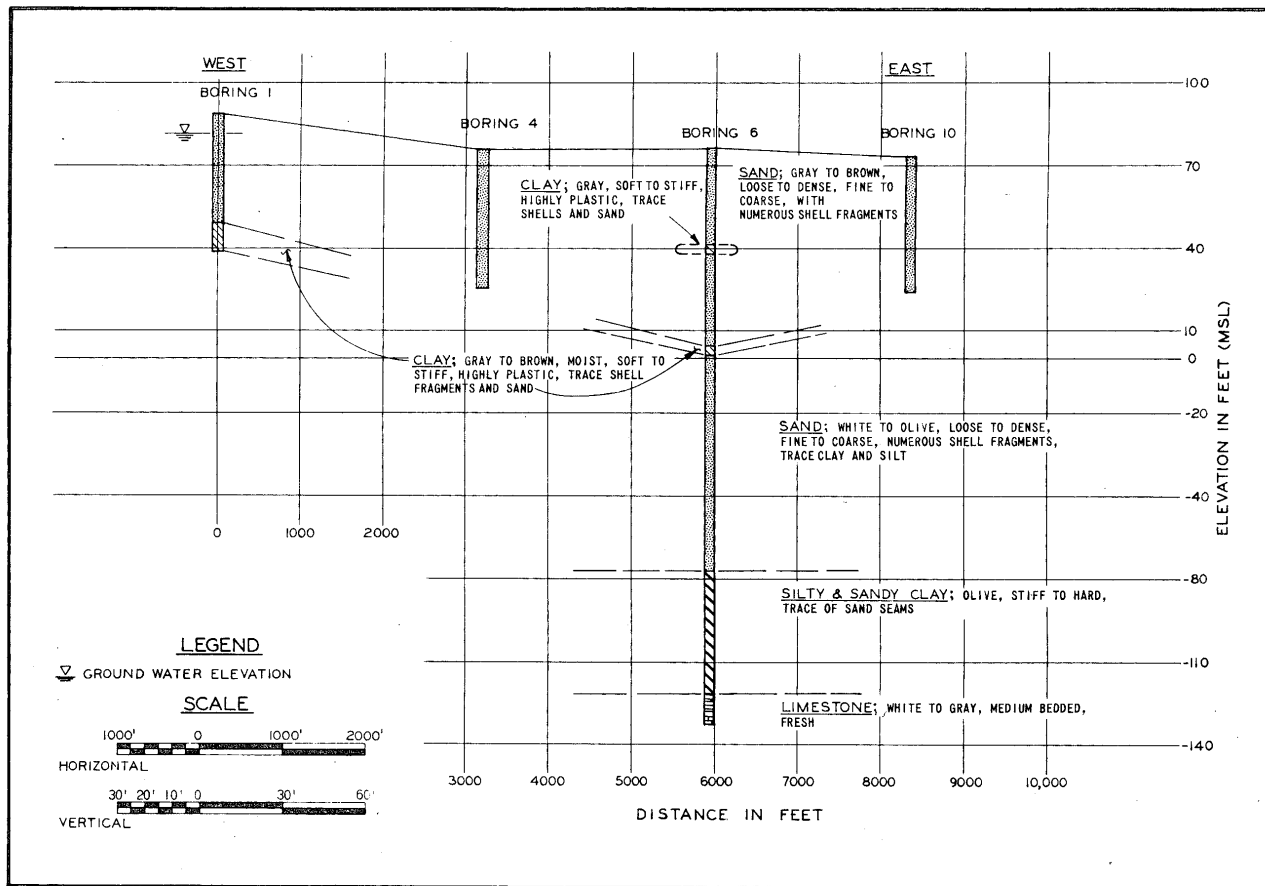


FIGURE 2.4-3. STRATIGRAPHIC PROFILE BENEATH THE SITE

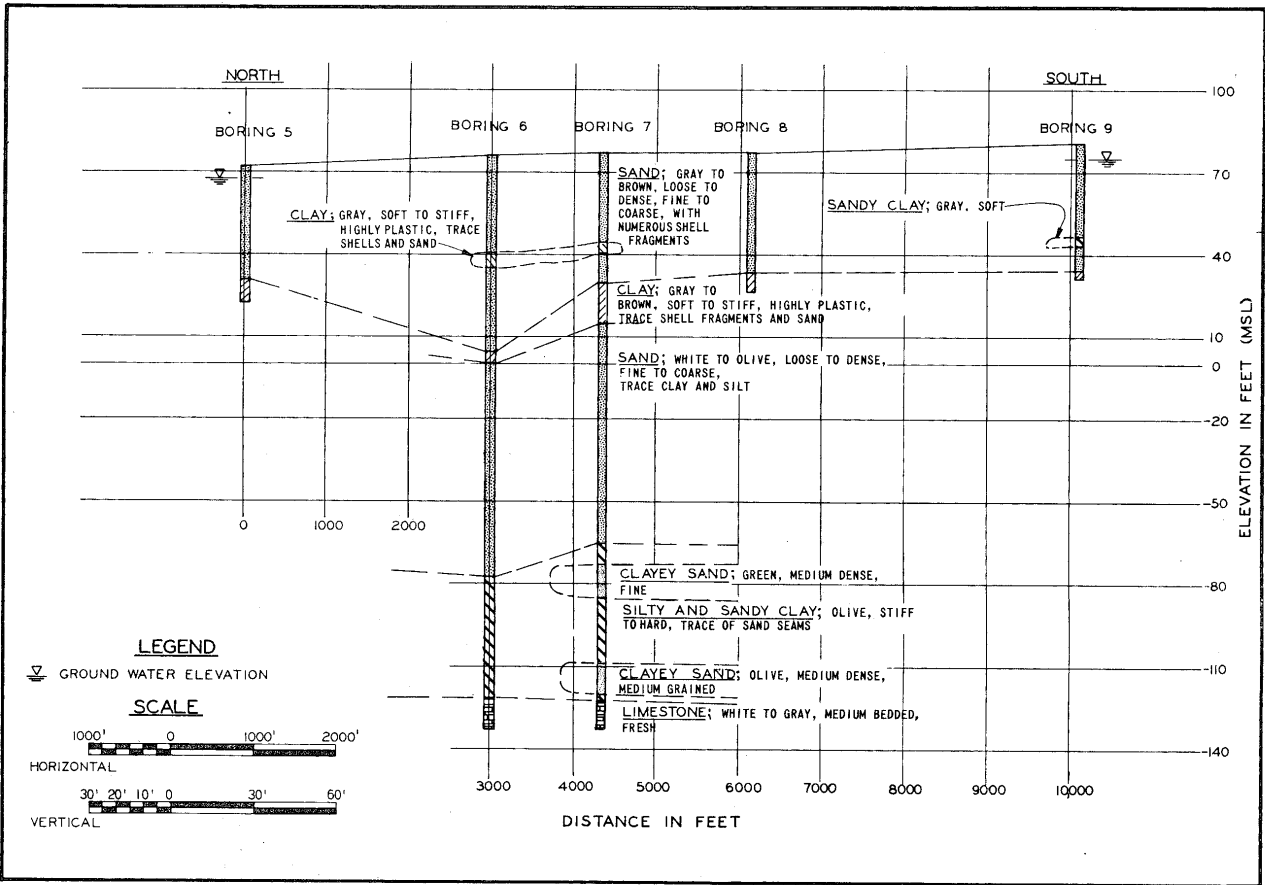
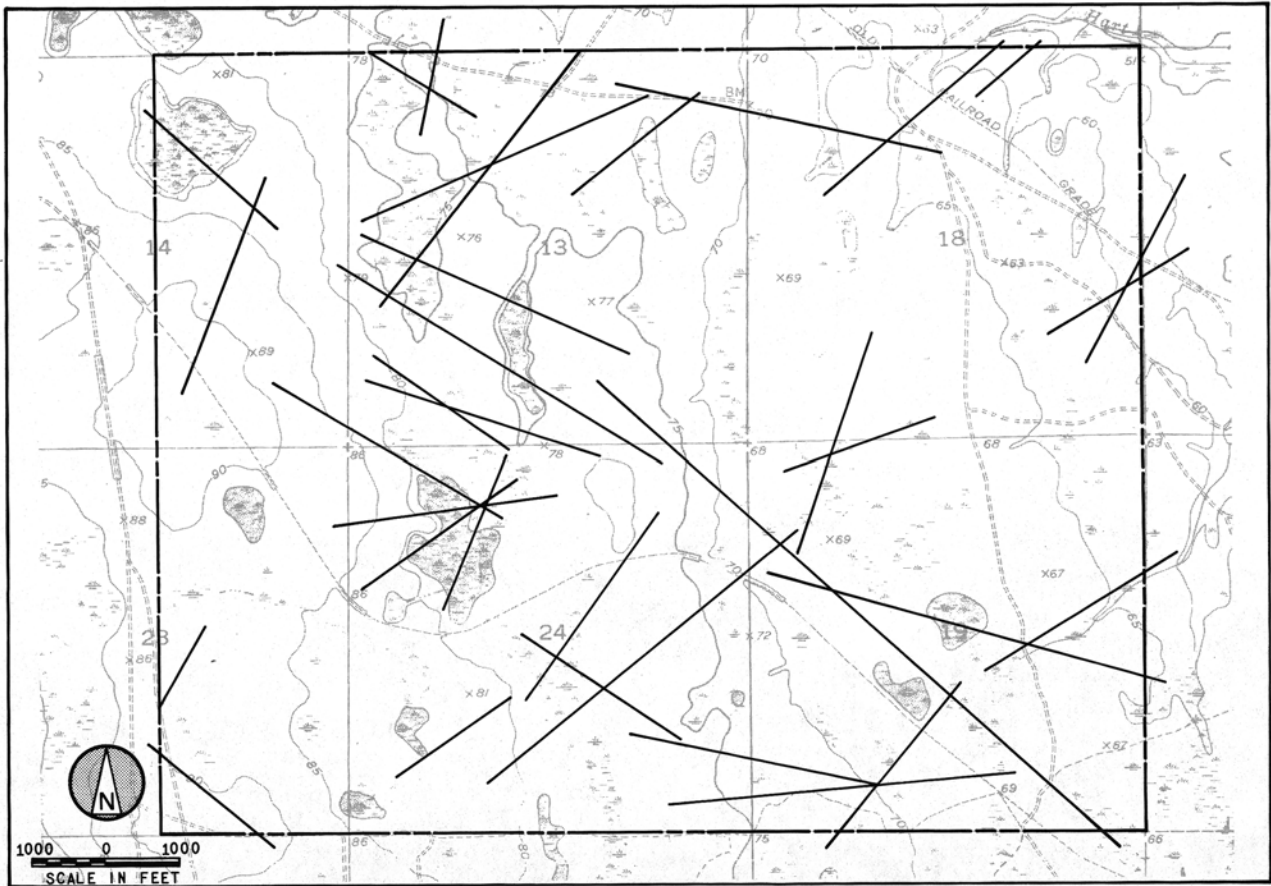


FIGURE 2.4-4. STRATIGRAPHIC PROFILE BENEATH THE SITE



SOURCE: SINKHOLE EVALUATION POTENTIAL
JAMMAL & ASSOCIATES, INC.

FIGURE 2.4-5. LINEAMENTS IN THE SITE AREA

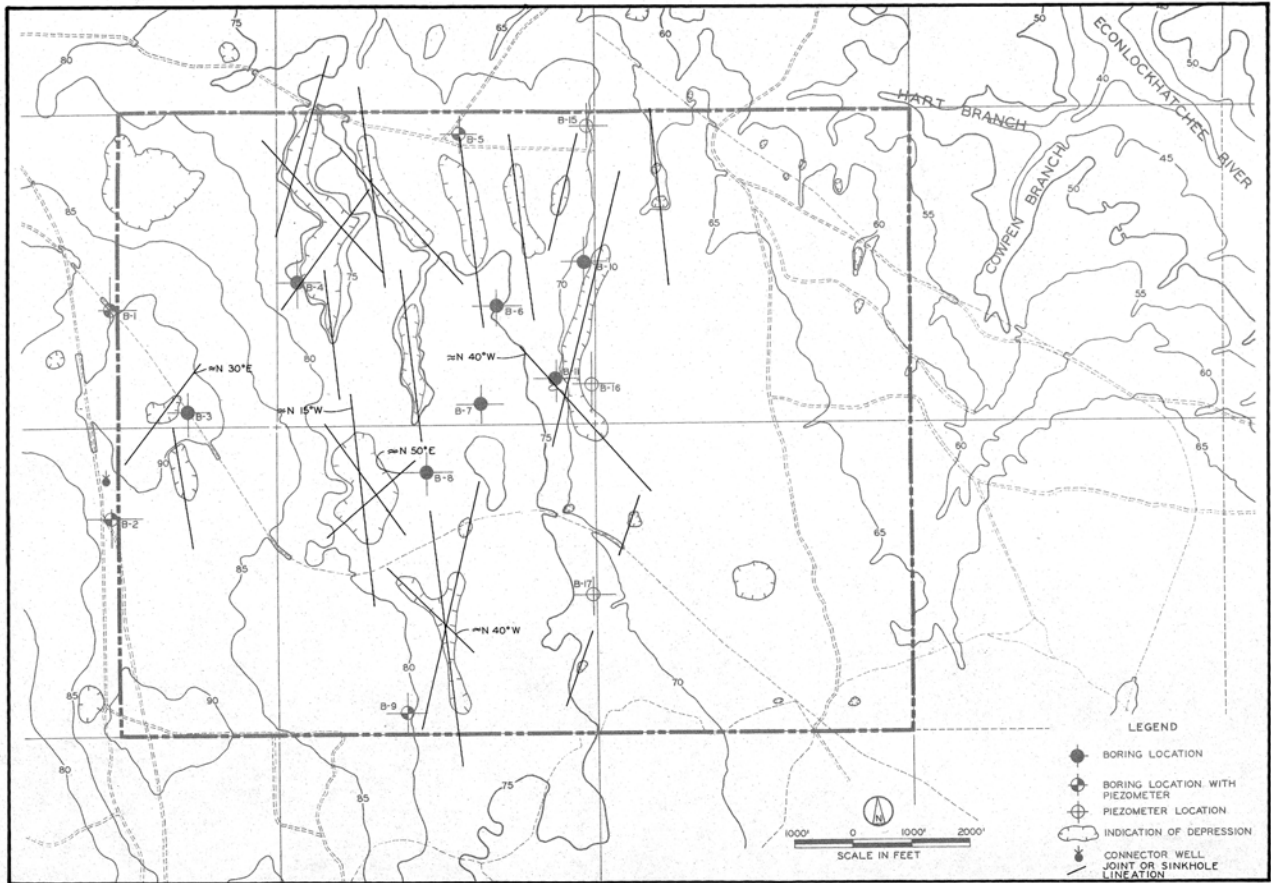


FIGURE 2.4-5. JOINT OR SINKHOLE LINEATIONS IN THE SITE AREA

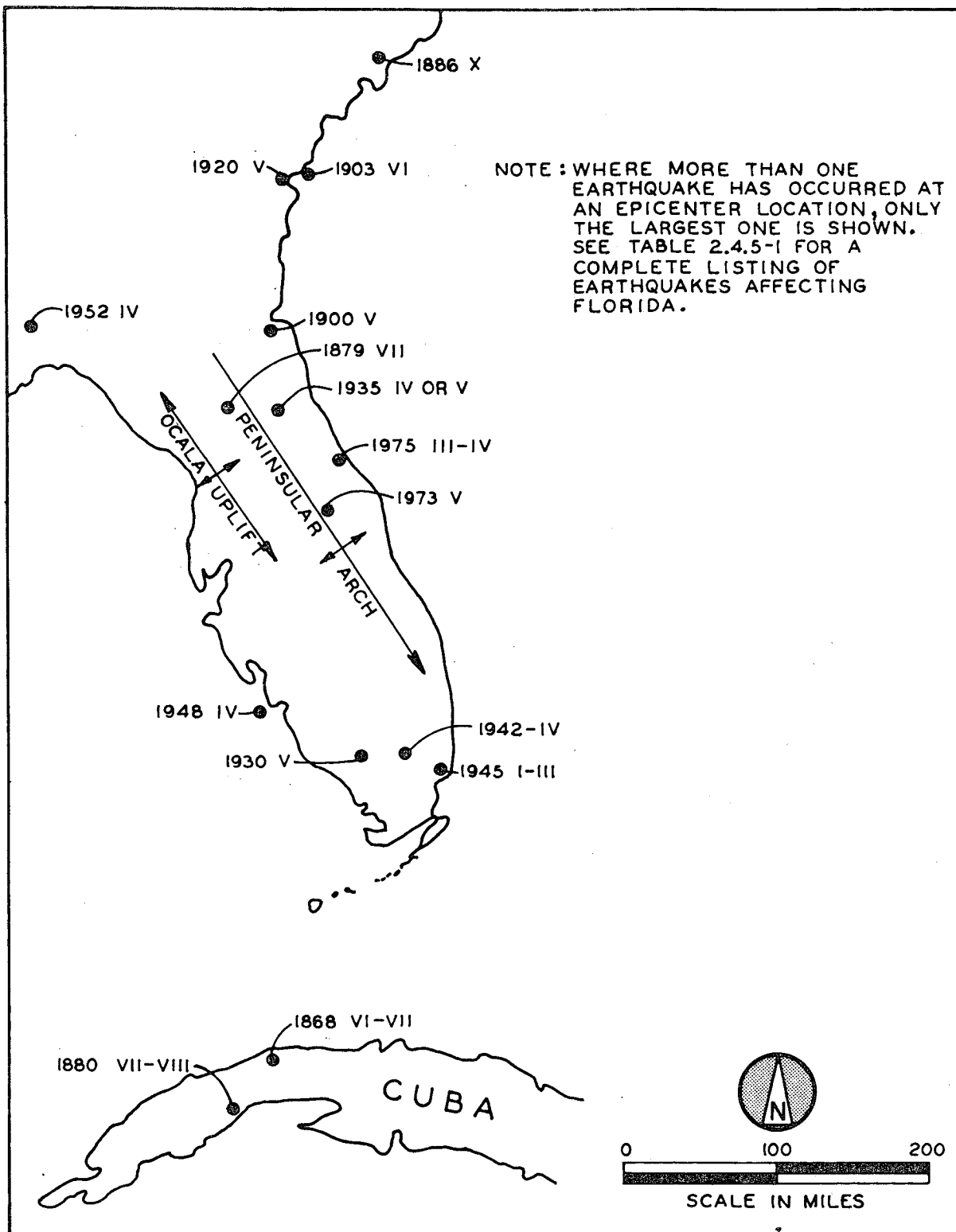


FIGURE 2.4-6. HISTORIC EARTHQUAKE OCCURRENCE

EXPLANATION OF BORING LOG TERMINOLOGY

GENERAL

PP	- COMPRESSIVE STRENGTH AS DETERMINED BY PENETROMETER
TV	- COMPRESSIVE STRENGTH AS DETERMINED BY TORVANE
GRAVEL	- UP TO 3 INCHES IN DIAMETER
COBBLE	- 3 INCHES TO 12 INCHES IN DIAMETER
BOULDER	- GREATER THAN 12 INCHES IN DIAMETER
60°	- REPRESENTS 60 DEGREES MEASURED FROM A PLANE PERPENDICULAR TO THE LONGITUDINAL AXIS OF THE CORE
TRACE	- REPRESENTS 0 TO 5 PER CENT BY VOLUME
OCCASIONAL OR SOME	- REPRESENTS 5 TO 10 PER CENT BY VOLUME
NUMEROUS	- REPRESENTS 10 TO 50 PER CENT BY VOLUME
N VALUE	- INDICATES THE NUMBER OF BLOWS REQUIRED TO DRIVE A STANDARD SPLIT SPOON SAMPLER 12" WITH A 140-POUND WEIGHT FALLING 30 INCHES
REC	- RECOVERY INDICATES TOTAL AMOUNT OF CORE RECOVERED FOR EACH RUN, EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF THE CORE RUN
RQD	- A MODIFIED CORE RECOVERY IN WHICH ALL PIECES OF SOUND CORE OVER 4 INCHES IN LENGTH ARE COUNTED AS RECOVERY. THE MODIFIED SUM OF CORE RECOVERED IS THEN EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF THE CORE RUN
---	- DASHED LINE IN CLASSIFICATION COLUMN INDICATES APPROXIMATE OR GRADATIONAL CHANGE

WEATHERING

FRESH	- THE ROCK SHOWS NO DISCOLORATION, LOSS OF STRENGTH, OR ANY OTHER EFFECT DUE TO WEATHERING (UNWEATHERED ROCK)
SLIGHTLY WEATHERED	- ROCK IS SLIGHTLY DISCOLORED WITH A SLIGHTLY LOWER STRENGTH THAN UNWEATHERED ROCK
MODERATELY WEATHERED	- ROCK IS CONSIDERABLY DISCOLORED WITH A SIGNIFICANTLY LOWER STRENGTH THAN UNWEATHERED ROCK
HIGHLY WEATHERED	- ROCK IS DISCOLORED AND WEAKENED SO INTENSELY THAT 2-INCH DIAMETER ROCK CORES CAN BE BROKEN READILY BY HAND. WET STRENGTH IS USUALLY MUCH LOWER THAN DRY STRENGTH

BEDDING

LAMINATED	- LESS THAN 0.001 FOOT TO 0.01 FOOT (.1 INCH)
THIN BEDDED	- 0.01 FOOT TO 0.1 FOOT (.1 TO 1.2 INCH)
MEDIUM BEDDED	- 0.1 FOOT TO 1.0 FOOT (1.2 TO 12 INCH)
THICK BEDDED	- GREATER THAN 1.0 FOOT
MASSIVE	- DENOTES NO DISCERNIBLE INTERNAL BEDDING STRUCTURE

ABBREVIATIONS

s - sand	matl - material
br - brown	mod - moderately
calc - calcareous	occ - occasional
Cl - Clay	org - organics
Cob - Cobble	PP - pocket penetrometer
xln - crystalline	Sa - Sand
Dol - Dolomite	Ss - Sandstone
ft - fest	sat - saturated
Gr - Gravel	Sh - shale
gr - gray	Sl - Silt
grn - green	TV - torvane
lam - laminated	w/ - with
Ls - Limestone	yel - yellow

SAMPLE SYMBOLS

Bag or Grab Sample 	California 	Piston 
Pitcher 	Split Barrel 	Thin Wall 

FIGURE 1

EXHIBIT 2.4-1. SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-1

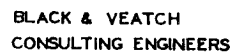
CLIENT			PROJECT NO.		ELEVATION	SHEET OF		
Orlando Utilities Commission			8927		88.9	1 2		
PROJECT			LOCATION		DATE: START FINISH			
Stanton Energy Center			N-1,509,544.5E-439,960.5		6-11-80 6-11-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0					Sand; light brownish-gray; loose;			Boring drilled w/3-7/8" di- ameter tricone roller bit using bentonite mud as drilling fluid Water encoun- tered @ 4.5'
1			6		fine grained; moist; w/numerous roots			
2								
3			9		grading brown; wet; w/some roots		SP	
4								
5			9		grading dark brown			
6								
7			8		grading very dark grayish-brown; w/trace roots	78.4		
8								
9			11		Sand; black; medium dense; fine grained; wet; w/trace silt			
10								
1			37		grading dense; w/some silt		SP	
2								
3			39		grading dark reddish-brown; moist			
4								
5			46					
6						67.6		
7			28		Sand; dark yellowish-brown; medium dense; fine grained; wet			
8								
9			25					
10								
1								
2								
3			13		grading yellowish-brown		SP	
4								
5								
6								
7								
8			31		grading dense			
9								
10								
1								
2								
3								
4			12		Sand; gray; medium dense; fine grained; wet	50.2	SP	
5								
6								
7								
8								
9								
10								
Continued on next page								

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FIGURE 2

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

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BORING NO. B-1FIGURE 3

(3 OF 41)



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-2

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		87.8		1 2	
PROJECT				LOCATION		DATE: START FINISH			
Stanton Energy Center				N-1,506,051.5E-439,908.0		6-10-80 6-10-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Sand; grayish-brown; loose; fine			Boring drilled w/3-7/8" di- ameter tricone roller bit using bentonite mud as drilling fluid
1			7			grained; moist; w/some roots		SP	
2							84.3		
3									
4			27			Sand; dark brown; medium dense;			
5						fine grained; wet; w/trace roots		SP	
6			19			& silt	79.8		
7						grading very dark brown; roots			
8						grade out			
9			9			Sand; dark gray; loose; fine			Water encoun- tered @ 3.6'
10						grained; wet; w/trace silt			
11									
12			12			grading black; medium dense			
13								SP	
14			13			grading w/more silt			
15									
16			10						
17									
18			18				68.2		
19						Sand; very dark brown; medium			
20						dense; fine grained; moist; w/		SP	
21			13			trace silt			
22						grading wet; silt grades out	64.3		
23			30			Sand; black; dense; fine grained;		SP	
24						moist; w/trace silt			
25							61.3		
26						Clayey Sand; yellowish-brown;		SC	
27						medium dense; fine grained; wet			
28			23			Sand; pale yellow; medium dense;	59.0		
29						fine grained; wet; w/trace clay		SP	
30									
31							55.3		
32						Sand; light gray; very dense;		SP	
33			53			fine grained; wet			
34							52.3		
35									
36						Sand; pale green; loose; fine			
37						grained; moist; calcareous; occa-		SP	
38						sionally clayey; occasionally			
39			10			cemented			
40									
Continued on next page									

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FIGURE 4

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-2

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 87.8		SHEET OF 2 2	
PROJECT Stanton Energy Center				LOCATION N-1,506,051.5E-439,908.0		DATE: START FINISH 6-10-80 6-10-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
40 1 2 3 4 5 6 7 8 9 50			14		grading light gray; medium dense; clay grades out grading w/some shell fragments		SP		
			6		Clay; green; firm; moist; cal- careous; occasionally sandy	39.0 37.8	CH		
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0								Bottom of boring @ 50.0' Water level @ 5.9' on 6-13-80	

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FIGURE 5

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-3

CLIENT				PROJECT NO.		ELEVATION	SHEET OF		
Orlando Utilities Commission				8927		90.8	1 2		
PROJECT				LOCATION		DATE: START FINISH			
Stanton Energy Center				N-1,507,822.0E-441,280.5		6-9-80 6-9-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Sand; dark gray; loose; fine	89.3	SP	Boring drilled
1						grained; wet; w/numerous organics			w/3-7/8" di-
2			6			& roots			ameter tricone
3						Sand; pinkish-gray; loose; fine	87.8	SP	roller bit
4						grained; moist; w/some roots			using bentonite
5			13			Sand; dark brown; medium dense;			mud as drilling
6						Fine grained; moist; w/trace silt		SP	fluid
7			10			& roots			
8						grading wet; silt grades out	82.8		Water encoun-
9			9			Sand; very dark gray; loose; fine			tered @ 4.6'
10						grained; wet; w/trace silt			
11									
12			14			grading black; medium dense			
13									
14			28						
15									
16			32			grading dense		SP	
17									
18			55			grading very dense			
19									
20									
21			34			grading w/some dark brown; dense	67.8		
22									
23			44			Sand; dark yellowish-brown;			
24						dense; fine grained; wet			
25									
26									
27								SP	
28									
29			32			grading brownish-yellow			
30									
31									
32									
33							58.3		
34			12			Clay; gray; stiff; moist; sandy			
35						in part; calcareous			
36								CH	
37									
38									
39			3			grading soft; sand grades out			
40									
Continued on next page									

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FIGURE 6

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-3

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 90.8		SHEET OF 2 2	
PROJECT Stanton Energy Center				LOCATION N-1,507,822.0E-441,280.5		DATE: START FINISH 6-9-80 6-9-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
4 1 2 3 4 5 6 7 8 9 50			10		Sand; gray; loose; fine grained; wet; calcareous; w/some shell fragments grading medium dense	49.8	SP		
1 2 3 4 5 6 7 8 9 60			20		grading moist; w/trace shell fragments	39.3		Bottom of boring @ 51.5' Water level not recorded	

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FIGURE 7

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-4

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		77.7		1 2	
PROJECT				LOCATION		DATE:		START FINISH	
Stanton Energy Center				N-1,510,005.2E-443,136.8		6-12-80		6-12-80	
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
0					Sand; dark gray; loose; fine	76.0	SP	Boring drilled w/3-7/8" di- ameter tricone roller bit using bentonite mud as drilling fluid	
1			6		grained; wet; w/numerous roots				
2					Sand; black; medium dense; fine				
3			12		grained; wet; w/some silt; trace roots				
4									
5			13		grading very dark gray mottled				
6									
7									
8									
9			1		grading gray; very loose; roots				
10					grade out				
11			7		grading very dark brown; loose		SP- SM		
12									
13									
14			15		grading black; medium dense				
15									
16									
17			33		grading dense				
18									
19			18		grading dark reddish-brown; med- ium dense; silt grades out				
20						57.2			
21					Sand; dark yellowish-brown;				
22			18		medium dense; fine grained; wet				
23									
24			21		grading yellowish-brown		SP		
25									
26									
27									
28									
29			19						
30									
31						45.7			
32					Sand; light gray; medium dense;				
33			20		fine grained; wet				
34									
35							SP		
36									
37									
38									
39									
40			21		grading light brownish-gray				
Continued on next page									

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FIGURE 8

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-4

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 77.7		SHEET OF 2 2	
PROJECT Stanton Energy Center				LOCATION N-1,510,005.2E-443,136.8		DATE: START FINISH 6-12-80 6-12-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
4 1 2 3 4 5 6 7 8 9 50			28 6		grading dark gray grading dark grayish-brown; loose	27.7	SP		
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0								Bottom of boring @ 50.0' Water level not recorded	

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FIGURE 9

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

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BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-5

CLIENT			PROJECT NO.		ELEVATION	SHEET OF		
Orlando Utilities Commission			8927		72.1	1 2		
PROJECT			LOCATION		DATE: START FINISH			
Stanton Energy Center			N-1,512,483.5E-445,792.0		6-9-80 6-9-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0					Sand; gray; loose; fine grained; wet; w/some roots	70.6	SP	Boring drilled
1								w/3-7/8" di-
2			4		Sand; black; loose; fine grained; wet; w/trace silt & roots	69.1	SP	ameter tricone
3								roller bit
4			3		Sand; dark brown; very loose; fine grained; wet; w/trace silt & roots		SP	using bentonite
5					grading very dark brown; loose	65.3		mud as drilling
6			5					fluid
7					Sand; light brownish-gray; loose; fine grained; moist; w/trace clay		SP	Water encoun-
8			15		grading medium dense	60.8		tered @ 3.3'
9								
10			18		Sand; white to light gray; medium dense; fine grained; wet			
11					grading light brownish-gray; fine grained; moist			
12			11					
13					grading pale olive; wet		SP	
14			14					
15					grading light gray			
16			16					
17								
18			19					
19								
20			16					
21								
22			20		Sand; gray; medium dense; fine grained; wet; calcareous	45.1		
23							SP	
24					grading light gray; moist; partially cemented			
25			20					
26								
27					Shelly Sand; light gray; medium dense; fine to coarse grained; wet; calcareous	35.1	SP	
28			19					
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
Continued on next page								

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FIGURE 10

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-5

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 72.1		SHEET OF 2 2	
PROJECT Stanton Energy Center				LOCATION N-1,512,483.5E-445,792.0		DATE: START FINISH 6-9-80 6-9-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
4 1 2 3 4 5 6 7 8 9 50			4		Clay; dark gray; soft; moist; calcareous	31.1	CH		
			5		grading silty	22.1			
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0								Bottom of boring @ 50.0' Water level @ 4.0' on 6-13-80	

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FIGURE 11

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

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BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-6

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		74.4		1 6	
PROJECT				LOCATION		DATE: START FINISH			
Stanton Energy Center				N-1,509,586.0E-446,508.0		5-20-80 5-28-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Sand; light gray; loose; fine grained; moist; slightly calcareous	73.1	SP	Boring drilled w/5-1/8" diameter tricone roller bit using bentonite mud as drilling fluid
1			7			Sand; dark brown; loose; fine grained; moist; w/some silt; trace organics & wood fibers			
2									
3			8					SP-SM	
4						grading dense; wood grades out			
5									
6									
7									
8									
9			16			Sand; dark yellowish-brown; medium dense; fine grained; wet	65.4		
10						grading light yellowish-brown; w/occasional light gray sand pockets; w/some clay			
11						grading yellowish-brown			
12			10			grading light yellowish-brown; loose; wet; light gray sand pockets grade out			
13			9			grading moist; w/light gray sand pockets		SP	
14						grading light gray; medium dense; wet			
15			13			grading light brownish-gray			
16			17			grading light gray; loose			
17			5						
18									
19									
20									
21									
22			3			Sand; olive gray; very loose; fine grained; wet; w/trace clay	44.4	SP	
23						grading cemented			
24									
25									
26			4			Clay; olive gray; soft; occasionally sandy	39.2	CH	
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40						Shelly Sand; olive gray; loose; coarse grained; wet; highly calcareous; w/some silt	35.7		
Continued on next page									

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FIGURE 12

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-6

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		74.4		2 6	
PROJECT				LOCATION		DATE: START FINISH			
Stanton Energy Center				N-1,509,586.0E-446,508.0		5-20-80 5-28-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
40									
1									
2									
3			12			grading medium dense		SP-SM	
4									
5									
6									
7							27.9		
8			100			Sand; gray; very dense; fine grained; moist; calcareous; w/num erous shell fragments			
9									
50			67			grading light brownish-gray; med- ium grained; highly calcareous		SP	
1									
2									
3									
4									
5									
6			90			grading coarse grained	18.4		
7									
8						Sand; gray; very dense; fine grained; moist; calcareous; w/trace shell fragments			
9									
60			26			grading medium dense		SP	
1									
2									
3									
4									
5							9.4		
6			9			Clayey Sand; gray; loose; fine to coarse grained; moist; calcareous; w/numerous shell fragments; trace silt		SC	
7									
8						grading fine grained; w/trace shell fragments			
9									
70			10			Clay; gray; stiff; moist; calcareous	3.2	CH	
1									
2						Sandy Clay; gray; stiff; calcare- ous; w/numerous shell fragments	1.4	CL	PP = 1.5 tsf
3									
4							-0.6		
5									
6						Sand; gray; medium dense; fine to coarse grained; wet; calcareous; partially cemented; w/numerous shell fragments; trace clay		SP	
7			21						
8									
9									
80							-5.1		
Continued on next page									

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FIGURE 13

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-6

CLIENT		PROJECT NO.	ELEVATION	SHEET OF				
Orlando Utilities Commission		8927	74.4	3	6			
PROJECT		LOCATION	DATE: START FINISH					
Stanton Energy Center		N-1,509,586.0E-446,508.0	5-20-80 5-28-80					
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
80			10		Silty Sand; olive gray; loose; fine to coarse grained; moist; calcareous; w/numerous shell fragments			
1								
2			22		grading gray; medium dense			
3								
4								
5								
6								
7								
8								
9							SM	
90			*		grading loose; fine grained			*sample pushed
1								
2					shell fragments grade out			
3								
4								
5								
6								
7								
8			74		Sand; olive; very dense; fine grained; moist; calcareous; w/some shell fragments	-23.1		
9								
100			119		grading w/trace shell fragments			
1								
2								
3								
4								
5								
6			61		grading slightly calcareous			
7								
8								
9								
110							SP	
1			64		grading wet			
2								
3								
4								
5								
6			63		grading calcareous; w/some shell fragments			
7								
8								
9								
120								
Continued on next page								

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FIGURE 14

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-6

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 74.4		SHEET OF 4 6	
PROJECT Stanton Energy Center				LOCATION N-1,509,586.0E-446,508.0		DATE: START FINISH 5-20-80 5-28-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
12 0			53		grading w/trace shell fragments				
1 1									
2 2									
3 3									
4 4									
5 5			32		grading dense; w/some silt; shell fragments & calcareousness grade out		SP		
6 6									
7 7									
8 8									
9 9									
13 0			60		grading very dense; w/trace phosphate & silt				
1 1									
2 2									
3 3									
4 4									
5 5			83		Sand; pale olive; very dense; medium to coarse grained; wet; calcareous w/numerous shell fragments; some silt	-60.9	SP		
6 6						-61.4			
7 7					Sand; white; very dense; medium grained; wet; calcareous; partially cemented; w/trace phosphate				
8 8									
9 9									
14 0			314/105'		grading light gray				
1 1									
2 2									
3 3									
4 4									
5 5			207/7.5'				SP		
6 6									
7 7									
8 8									
9 9									
15 0			261						
1 1									
2 2									
3 3									
4 4									
5 5			18		Sandy Clay; olive green; very stiff; moist; calcareous	-78.6	CL		
6 6									
7 7									
8 8									
9 9					hard @ 159.0'				
16 0									

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Continued on next page

FIGURE 15

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

(15 OF 41)



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-6

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		74.4		5 6	
PROJECT				LOCATION		DATE: START FINISH			
Stanton Energy Center				N-1,509,586.0E-446,508.0		5-20-80 5-20-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
160					grading w/trace phosphate			PP = 3.75 tsf	
1									
2									
3									
4									
5									
6			33		grading hard; w/some phosphate		CL		
7									
8									
9									
170									
1									
2						-97.6			
3					Silty Clay; olive; hard; dry; w/trace phosphate				
4					extremely hard from 172.0'-174.0'				
5			73				CL		
6									
7									
8									
9									
180									
1									
2									
3						-108.6			
4					Sandy Clay; olive; hard; moist; calcareous; interlayered w/Clayey				
5					Sand; olive; very dense; medium		CL& SC		
6			54		grained; moist; calcareous				
7									
8									
9									
190									
1									
2						-116.0			
3					Silty Clay; olive; hard; dry; calcareous; w/trace fine grained		CL		
4					sand seams & phosphates				
5					extremely hard @ 194.0'				
6					grading sandy; w/numerous				
7					phosphates				
8						-121.7			
9					Limestone; sandy; light gray; medium to thick bedded; fine			Set 4" diameter	
200	42	35			grained; vugs to 0.05'; fresh			steel casing to 198.5'	
Continued on next page									

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FIGURE 16

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-6

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 74.4		SHEET OF 6 6	
PROJECT Stanton Energy Center				LOCATION N-1,509,586.0E-446,508.0		DATE: START FINISH 5-20-80 5-28-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
200									
1						-126.1			
2					Void from 200.5'-203.5'			Boring contin-	
3								ued w/NX double	
4						-128.6		tube core bar-	
5					Limestone; argillaceous; fossiliferous; white; medium bedded;			rel w/diamond	
6	100	70			granular; w/vugs to 0.01'; fresh			bit using water	
7					30° joints @ 204.9', 205.3',			as drilling	
8					205.5', & 207.5'			fluid	
9						-134.1		Losing water @	
210								200.5'	
1								Bottom of	
2								boring @ 208.5'	
3								Water level	
4								not recorded	
5									
6									
7									
8									
9									
220									
1									
2									
3									
4									
5									
6									
7									
8									
9									
230									
1									
2									
3									
4									
5									
6									
7									
8									
9									
0									

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FIGURE 17

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

(17 OF 41)



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-7

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		78.4		1 6	
PROJECT				LOCATION		DATE: START FINISH			
Stanton Energy Center				N-1,507,918.0E-446,265.0		5-29-80 6-5-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
0					Sand; light gray; medium dense; fine grained; moist; w/trace roots	75.4	SP	Boring drilled w/5-1/8" di- ameter tricone roller bit using bentonite mud as drilling fluid Water encoun- tered @ 3.7'	
1			11						
2									
3									
4			12		Sand; dark reddish-brown; medium dense; fine grained; moist; w/trace silt & wood fibers	65.4			
5									
6			70		grading very dense				
7									
8			86		grading strong brown; wood & silt grade out	62.9	SP		
9									
10			65						
11									
12					Sand; dark yellowish-brown; very dense; fine grained; wet; w/trace silt	60.4	SP		
13			20		Sand; light yellowish-brown; med- ium dense; fine grained; wet				
14			25		Sand; white; medium dense; fine grained; wet				
15									
16			24		grading w/some light gray	48.4			
17									
18			23		light gray grades out				
19									
20						45.4			
21			14						
22									
23			9		Sand; dark gray; loose; fine grained; wet; very slightly calcareous; w/trace clay 0.05' calcite layer @ 32.45'				
24					Clay; gray; stiff; moist; occa- sionally sandy; w/some sand; trace shell fragments	41.7	CH		
25			9						
26									
27									
28					Shelly Sand; olive gray; medium dense; coarse grained; wet; highly calcareous; w/some clay		SP		
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
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314									
315									
316									
317									
318									
319									
320				</					

LOG OF BORING

BORING NO. B-7

CLIENT		PROJECT NO.		ELEVATION		SHEET OF		
Orlando Utilities Commission		8927		78.4		2 6		
PROJECT			LOCATION		DATE: START FINISH			
Stanton Energy Center			N-1,507,918.0E-446,265.0		5-29-80 6-5-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
40			28		Sand; pale olive; medium dense; fine grained; moist; highly calcareous; partially cemented	37.6	SP	
1								
2								
3								
4								
5			5		Silty Sand; gray; loose; fine grained; moist; highly calcareous; w/some clay	33.4	SM	
6						31.4		
7								
8					Clay; gray; firm; moist; calcareous			PP = 1.0 tsf
9								
50			8		grading interlayered w/fine silty sand		CH	
1								
2								
3								
4								
5								
6					sand grades out			
7								
8								
9								
60								
1								PP = 1.2 tsf
2					Silty Sand; gray; medium dense; fine grained; moist; calcareous; w/numerous shell fragments; some clay	16.9	SM	
3								
4						14.4		
5								
6			12		Shelly Sand; gray; fine to coarse grained; medium dense; moist; calcareous; w/some silt			
7								
8								
9								
70			30		grading dense; medium to coarse grained		SP- SM	
1								
2								
3								
4								
5						4.9		
6			31		Sand; gray; very dense; fine grained; moist; calcareous; w/some shell fragments		SP	
7								
8								
9								
80					Clayey Sand; gray; medium dense; fine to coarse grained; moist; calcareous; w/numerous shell fragments	0.4	SC	
					Continued on next page			

FIGURE 19



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-7

CLIENT Orlando Utilities Commission		PROJECT NO. 8927	ELEVATION 78.4	SHEET OF 3 6				
PROJECT Stanton Energy Center		LOCATION N-1,507,918.0E-446,265.0	DATE: START FINISH 5-29-80 6-5-80					
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
80 1 2 3 4 5 6 7 8 9 90 1 2 3 4 5 6 7 8 9 100 1 2 3 4 5 6 7 8 9 110 1 2 3 4 5 6 7 8 9 120			29					
			41		Sand; gray; very dense; fine to coarse grained; moist; calcareous; w/numerous shell fragments; trace clay	-4.6	SP	
			26		grading medium dense; wet; clay grades out			
			20		Sand; gray; medium dense; fine grained; wet; calcareous; w/some shell fragments	-14.6	SP	
			19		Clayey Sand; gray; medium dense; fine to coarse grained; wet; calcareous; w/numerous shell fragments	-19.6	SC	
			14		grading w/trace phosphate			
			61		Sand; olive; very dense; fine grained; wet; calcareous; w/some shell fragments; trace phosphate	-30.6		
			54		shell fragments grade out		SP	
Continued on next page								

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FIGURE 20

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-7

CLIENT	PROJECT NO.	ELEVATION	SHEET OF
Orlando Utilities Commission	8927	78.4	4 6
PROJECT	LOCATION	DATE: START	FINISH
Stanton Energy Center	N-1,507,918.0E-446,265.0	5-29-80	6-5-80

DEPTH (FEET)	PERCENT RECOVERY	ROD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
120			52		grading slightly calcareous; w/trace silt			
1								
2								
3								
4								
5			37		grading w/trace shell fragments			
6								
7								
8								
9								
130			41		calcareousness & shell fragments grade out			
1								
2								
3								
4								
5			14		Clayey Sand; olive; medium dense; fine grained; moist	-56.1		
6								
7								
8					hard from 138.0'-138.5'		SC	
9								
140			22			-63.6		
1								
2					Sandy Clay; olive green; very stiff; dry; w/trace fine sand pockets			
3								
4								
5			25				CL	
6								
7								
8								
9								
150			22		Clayey Sand; olive green; medium dense; fine grained; dry; w/trace phosphate	-71.6		
1								
2								
3								
4								
5			24		grading interlayered w/Sandy Clay; olive green; very stiff; moist; calcareous		SC	
6			26					
7								
8								
9					grading w/numerous phosphates			
160					0.1' limestone layer @ 160.3'			
					Continued on next page			

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FIGURE 21

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-7

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		78.4		5 6	
PROJECT				LOCATION		DATE:		START	FINISH
Stanton Energy Center				N-1,507,918.0E-446,265.0		5-29-80		6-5-80	
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
160			20		Silty Clay; olive green; very stiff; moist; w/some phosphate	-82.3			
1									
2									
3									
4									
5									
6			35		grading hard; slightly calcareous; w/numerous phosphate				
7									
8									
9									
170			25		grading dark gray; very stiff; dry; sandy w/phosphates				
1									
2									
3									
4									
5									
6			37		grading olive; partially cemented		CL		
7					hard from 178.0'-180.0'				
8									
9									
180			54		grading hard; moist; w/numerous sand pockets; sandiness, calcareousness grade out				
1									
2									
3									
4									
5									
6			40		grading occasionally sandy; very slightly calcareous				
7									
8									
9						-109.6			
190			25		Clayey Sand; olive; medium dense; medium grained; moist; very slightly calcareous		SC		
1									
2									
3									
4					extremely hard @ 194.0'				
5									
6									
7			33		Sandy Clay; olive; hard; dry; slightly calcareous; w/trace phosphate	-117.0	CL		
8									
9					0.05' limestone layer @ 196.2'				
200					numerous thin hard layers from 196.5'-199.5'	-121.1			
Continued on next page									

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FIGURE 22

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-7

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		78.4		6 6	
PROJECT				LOCATION		DATE:		START	FINISH
Stanton Energy Center				N-1,507,918.0E-446,265.0		5-29-80		6-5-80	
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
200	55	17				Limestone; sandy; highly fossiliferous; light olive gray to light gray; medium bedded; >10% vugs from pinpoint to 0.1'; slightly weathered	-129.4		Boring continued w/NX double tube core barrel w/diamond bit using water as drilling fluid
1									
2									
3									
4	38	18				vertical fracture 199.9'-201.4' grading w/0.2' layers of Limestone; light gray; medium bedded; fine grained; w/10% vugs pinpoint to 0.05' @ 199.5' & 201.2'	-130.3		Losing some water throughout Run 2
5									
6									
7									
8						Limestone; sandy; light gray; medium bedded; fine grained; >30% vugs pinpoint to 0.05'; fresh	-130.8		Bottom of boring @ 209.2'
9									
210									
1									
2						Void from 208.7' to 209.2' w/rock @ 209.2'			Water level not recorded
3									
4									
5									
6									
7									
8									
9									
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
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FIGURE 23

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
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LOG OF BORING

BORING NO. B-8

CLIENT			PROJECT NO.		ELEVATION	SHEET OF		
Orlando Utilities Commission			8927		77.4	1 2		
PROJECT			LOCATION		DATE:	START	FINISH	
Stanton Energy Center			N-1,506,756.0E-445,310.0		6-12-80	6-12-80		
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0					Sand; very dark brown; loose; fine grained; wet; w/numerous roots & organics	75.9	SP	Boring drilled w/3-7/8" diameter tricone roller bit using bentonite mud as drilling fluid Water encountered @ 2.8'
1			7				SP	
2					Sand; very dark brown; loose; fine grained; wet; w/some roots; trace silt	74.4		
3			9				SP	
4					Sand; black; loose; fine grained; wet; w/some silt; trace roots	71.9		
5			45		Sand; dark reddish-brown; dense; fine grained; moist; w/trace silt & roots		SP	
6			29		grading w/some black; medium dense			
7						66.9		
8			32		Sand; light yellowish-brown; dense; fine grained; wet; w/some silt		SP-	
9			26		grading yellowish-brown; medium dense; w/trace clay		SM	
10						61.3		
11			16		Sand; light gray; medium dense; fine grained; wet			
12								
13			14				SP	
14								
15			13					
16			15					
17						50.4		
18					Sand; light olive gray; medium dense; fine grained; wet; w/trace silt			
19			13				SP	
20						45.4		
21								
22			15		Sand; light gray; medium dense; fine to medium grained; wet; calcareous; partially cemented; w/phosphate; some silt		SP-	
23							SM	
24								
25			25					
26								
27								
28								
29								
30								
31								
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FIGURE 24

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-8

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 77.4		SHEET OF 2 2	
PROJECT Stanton Energy Center				LOCATION N-1,506,756.0E-445.310.0		DATE: START FINISH 6-12-80 6-12-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS	
40 1 2 3 4 5 6 7 8 9 50									
					Clay; gray; soft; moist; calcar- eous; w/numerous large (>0.1') shells	34.9	CH		
			5		grading dry; shells grade out	27.4			
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0								Bottom of boring @ 50.0' Water level not recorded	

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FIGURE 25

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

(25 OF 41)



BORING NO. B-9

[illegible]

FIGURE 26

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

(26 OF 41)



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-9

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 8.0		SHEET OF 2 2	
PROJECT Stanton Energy Center				LOCATION N-1,502,640.2E-444,961.7		DATE: START FINISH 6-13-80 6-13-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
40									
1									
2									
3									
4			66			Shelly Sand; light gray; very dense; fine to coarse grained; wet; calcareous	38.0	SP	
5									
6									
7									
8						Clay; dark gray; firm; moist; calcareous; w/trace shell fragments	34.0	CH	
9			5						
50							31.0		Bottom of boring @ 50.0'
1									Water level not recorded
2									
3									
4									
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FIGURE 27

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

(27 OF 41)



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-10

CLIENT				PROJECT NO.		ELEVATION		SHEET OF	
Orlando Utilities Commission				8927		69.5		1 2	
PROJECT				LOCATION		DATE: START FINISH			
Stanton Energy Center				N-1,510,342.0E-448,020.0		6-6-80 6-6-80			
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Sand; grayish-brown; loose; fine grained; wet; w/trace roots	68.0	SP	Boring drilled w/3-7/8" diameter tricone roller bit using bentonite mud as drilling fluid
1			5			Sand; dark brownish-gray to very dark grayish-brown; loose; fine grained; moist; w/trace roots		SP	
2						grading dark brown; very loose; wet			
3			2			grading black	62.9		
4						Sand; pinkish-gray; loose; fine grained; moist; w/trace clay			Water encountered @ 3.0'
5			7			grading medium dense; wet; clay grades out			
6						grading light gray; moist; w/trace roots			
7			13			grading wet; roots grade out		SP	
8									
9			12						
10						grading grayish-brown mottled			
11			10						
12						Sand; dark gray to light gray; very loose; fine grained; wet	49.0	SP	
13			3						
14						Sand; gray; loose; fine to medium grained; wet; calcareous; w/numerous shell fragments; some silt	46.5	SP-SM	
15			6						
16									
17									
18									
19									
20									
21			12			Gravel; gray; medium dense; wet; calcareous; w/some shell fragments	41.0		losing drilling fluid @ 28.5'
22									
23									
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FIGURE 28

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
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LOG OF BORING

BORING NO. B-10

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 69.5	SHEET OF 2 2	
PROJECT Stanton Energy Center				LOCATION N-1,510,342.0E-448,020.0		DATE: START FINISH 6-6-80 6-6-80		
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
4 0 1 2 3 4 5 6 7 8 9 50			9 21		grading medium dense; w/more shell fragments	19.5	SP	
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0								Bottom of boring @ 50.0' Water level not recorded

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FIGURE 29

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



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LOG OF BORING

BORING NO. B-11

CLIENT				PROJECT NO.		ELEVATION	SHEET OF	
Orlando Utilities Commission				8927		69.5	1 2	
PROJECT				LOCATION		DATE: START FINISH		
Stanton Energy Center				N-1,508,352.5E-447,512.0		6-5-80 6-6-80		
DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0					Sand; very dark grayish-brown; loose; fine grained; wet; w/some silt; trace roots & organics		SP	Boring drilled w/3-7/8" di- ameter tricone roller bit using bentonite mud as drilling fluid Water encoun- tered @ 2.5'
1			5			66.5		
2								
3								
4			26		Sand; grayish-brown; medium dense; fine grained; moist; w/trace roots	64.0	SP	
5								
6								
7			13		Sand; dark grayish-brown & light olive gray; medium dense; fine grained; moist; w/some clay; trace roots		SP	
8								
9			18		grading very dark grayish-brown; w/trace silt; clay grades out	59.0		
10								
11			11		Sand; light gray; medium dense; fine grained; moist; w/trace clay	56.5	SP	
12								
13			11		Sand; very dark grayish-brown; medium dense; fine grained; wet; w/trace silt	54.0	SP	
14								
15			4		Sand; gray; loose; fine grained; moist		SP	
16								
17			2		grading very loose; calcareous	49.0		
18								
19								
20			7		Sand; olive gray; loose; fine grained; wet; calcareous; w/num- erous shell fragments; trace silt	46.5	SP	
21								
22			7		Sand; olive gray; loose; fine grained; wet; calcareous; cemented; w/some olive gray clayey sand		SP	
23					grading medium dense	41.5		
24								
25								
26			6		Sand; olive gray; loose; fine grained; wet; calcareous; w/num- erous shell fragments; some clay	35.5	SP	
27								
28								
29								
30								
31			18		Sand; light olive gray; medium dense; fine grained; wet; cal- careous; partially cemented; w/some shell fragments	31.5	SP	
32								
33								
34								
35								
36								
37								
38								
39								
40					Silty Sand; gray; loose; fine grained; wet; calcareous		SM	
Continued on next page								

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FIGURE 30

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS



BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-11

CLIENT Orlando Utilities Commission				PROJECT NO. 8927		ELEVATION 69.5		SHEET OF 2 2	
PROJECT Stanton Energy Center				LOCATION N-1,508,352.5E-447.512.0		DATE: START FINISH 6-5-80 6-6-80			

DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
40			4					
1								
2								
3								
4								
5								
6			10					
7						22.8		
8					Clay; gray; firm; moist; calcareous; w/some shell fragments			
9					shell fragments grade out		CH	PP = .75 tsf
50						19.5		
1								Bottom of boring @ 50.0'
2								Water level not recorded
3								
4								
5								
6								
7								
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9								
60								
1								
2								
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8								
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0								

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FIGURE 31

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

PIEZOMETERS

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

(32 OF 41)

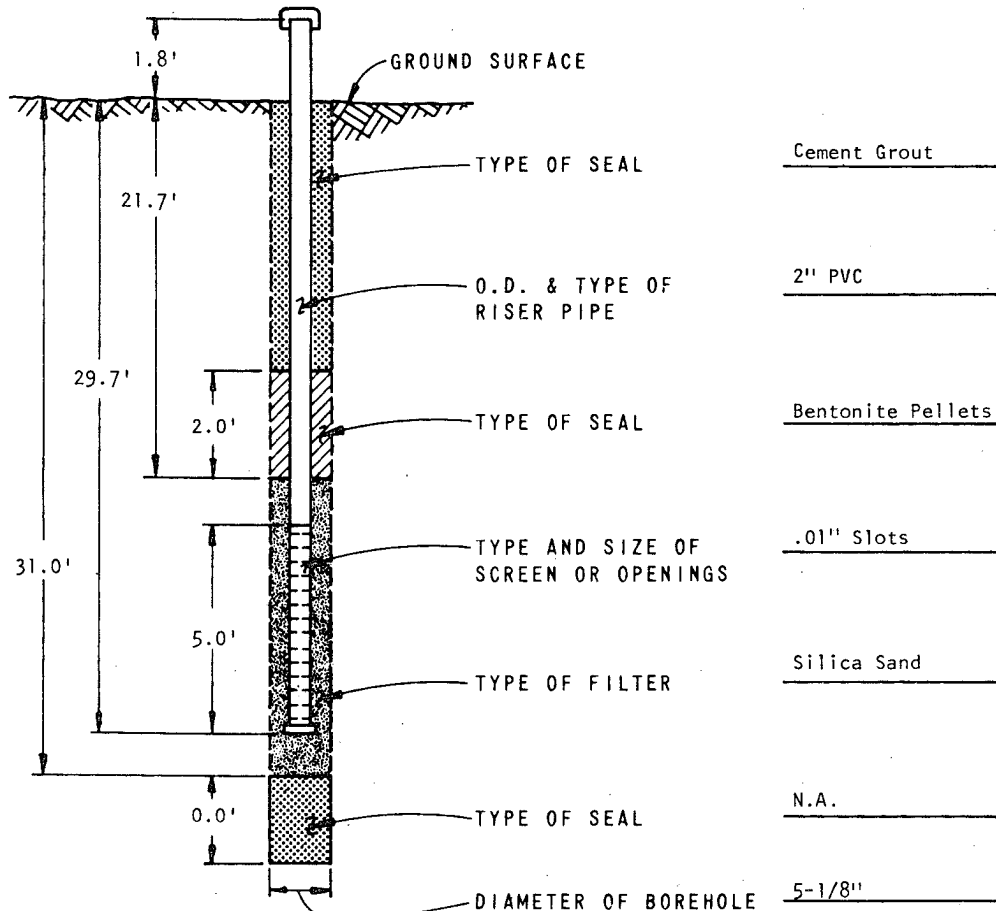


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CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-1

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center		PROJECT NO. 8927
PROJECT LOCATION Orlando, Florida		COORDINATES N-1,509,545 E-439,961	GROUND ELEVATION 88.9	DATE 6-11-80
STRATUM MONITORED Sand			INSPECTOR S. J. Casey	
CHECKED BY S. J. Casey		APPROVED BY R. H. Herzog		



METHOD OF INSTALLATION:

Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal; grouted to ground surface.

REMARKS:

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

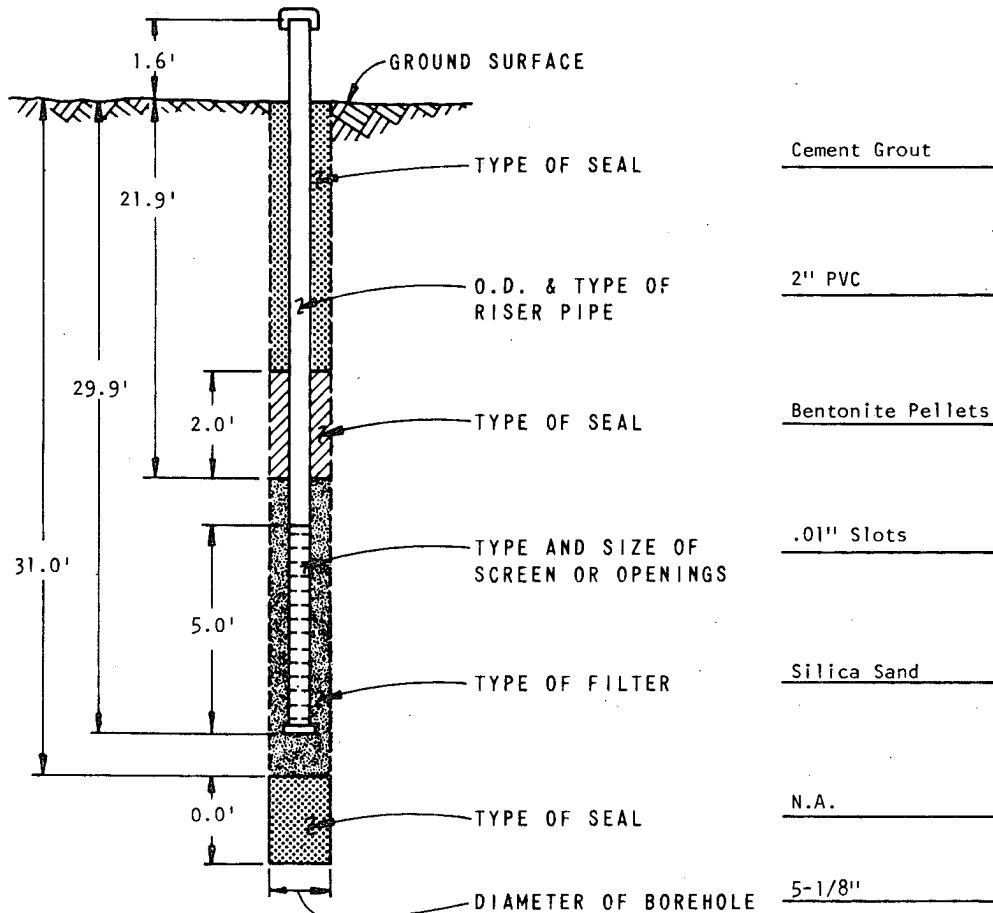


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CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-2

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center	PROJECT NO. 8927
PROJECT LOCATION Orlando, Florida	COORDINATES N-1,506,052 E-439,908	GROUND ELEVATION 87.8	DATE 6-10-80
STRATUM MONITORED Sand		INSPECTOR S. J. Casey	
CHECKED BY S. J. Casey		APPROVED BY R. H. Herzog	



METHOD OF INSTALLATION:

Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal; grouted to ground surface.

REMARKS:

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

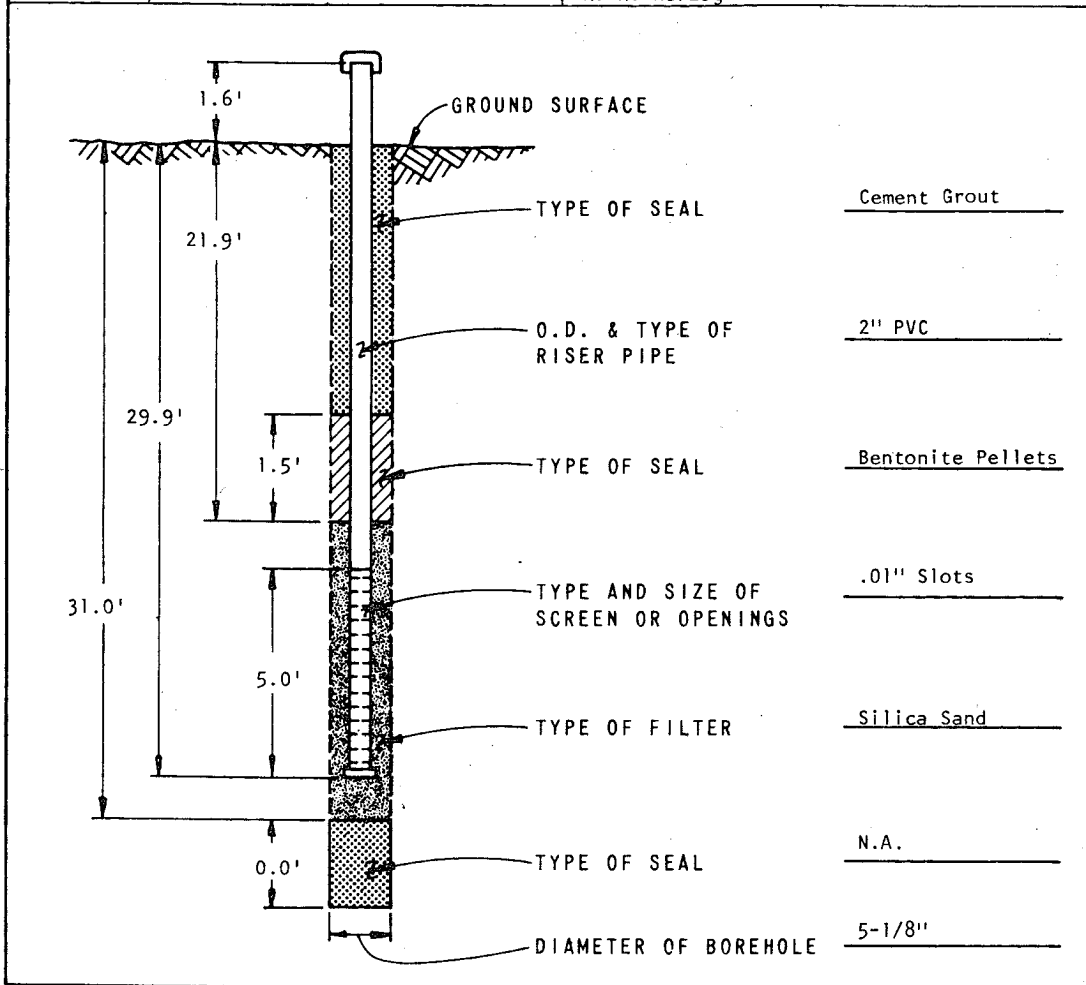


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CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-5

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center		PROJECT NO. 8927
PROJECT LOCATION Orlando, Florida	COORDINATES N-1,512,484 E-445,792	GROUND ELEVATION 72.1	DATE 6-10-80	
STRATUM MONITORED Sand		INSPECTOR S. J. Casey		
CHECKED BY S. J. Casey		APPROVED BY R. H. Herzog		



METHOD OF INSTALLATION:
Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal; grouted to ground surface.

REMARKS:

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

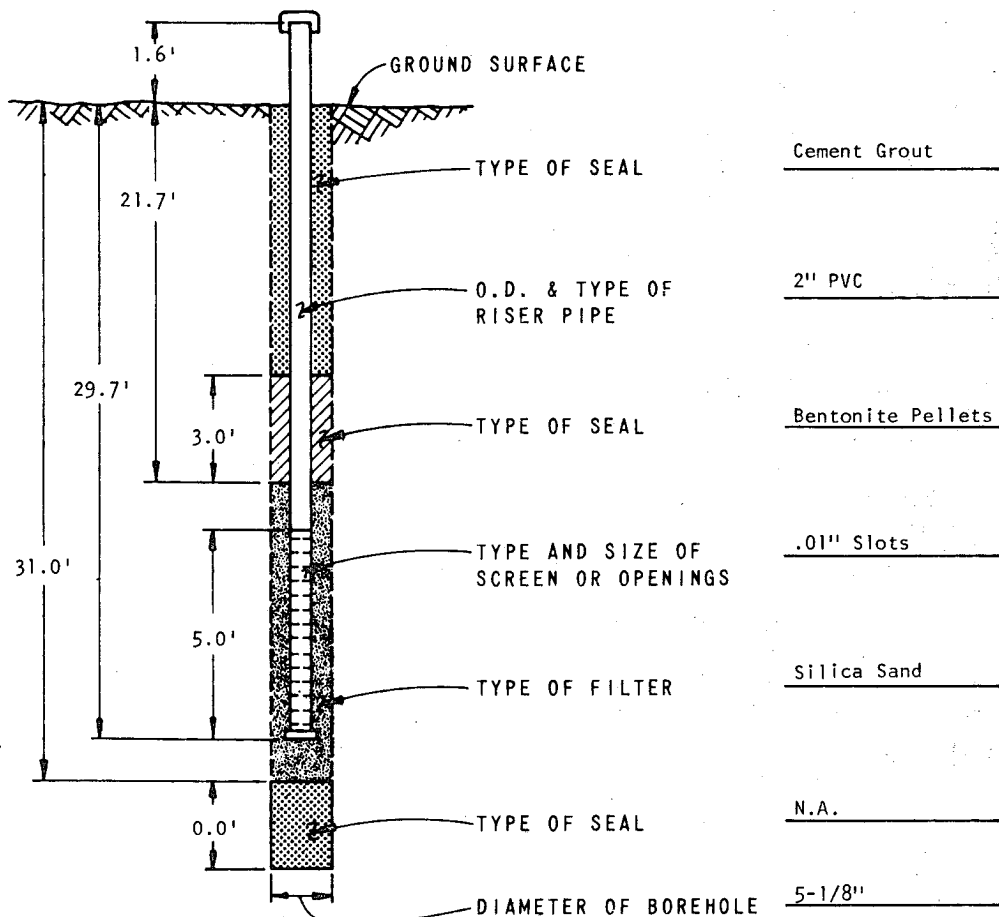


BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-9

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center		PROJECT NO. 8927
PROJECT LOCATION Orlando, Florida		COORDINATES N-1,502,640 E-444,962		GROUND ELEVATION 81.0'
DATE 6-13-80		STRATUM MONITORED Sand		
INSPECTOR S. J. Casey		CHECKED BY S. J. Casey		
APPROVED BY R. H. Herzog				



METHOD OF INSTALLATION:

Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal; grouted to ground surface.

REMARKS:

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

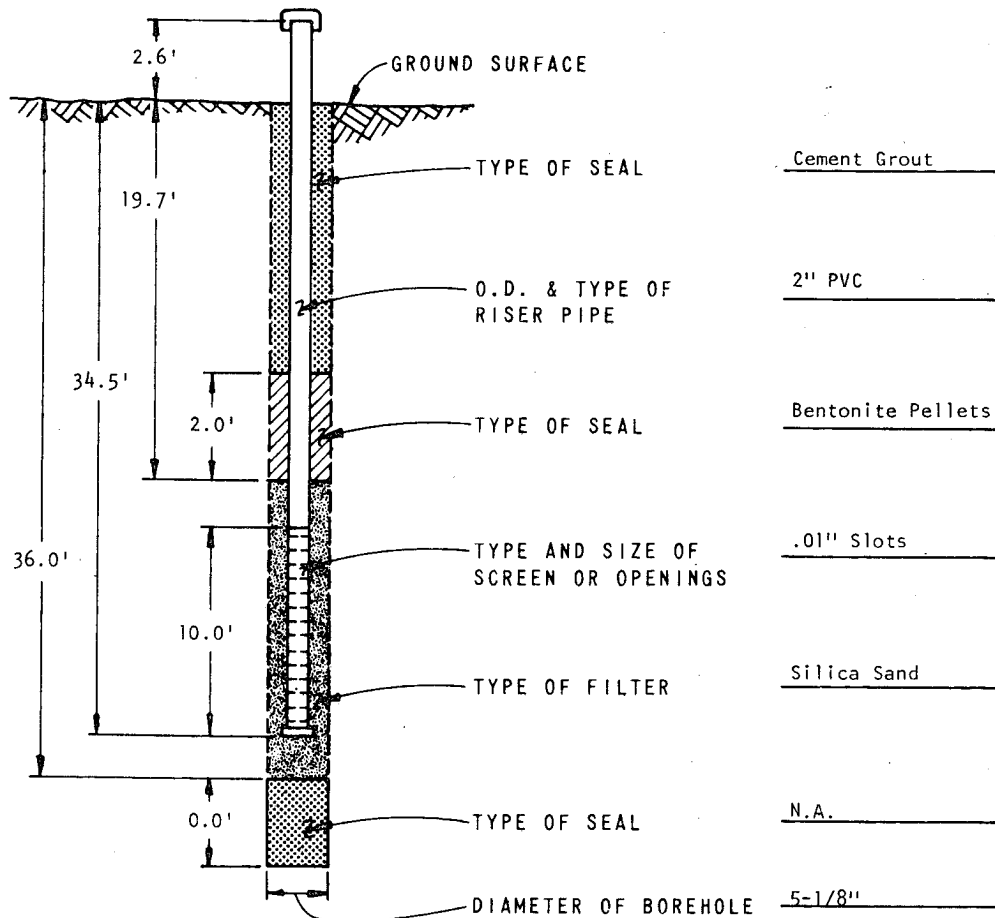


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PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-13

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center		PROJECT NO. 8927
PROJECT LOCATION Orlando, Florida		COORDINATES N-1,515,420 E-451,310	GROUND ELEVATION 50.6'	DATE 1-29-81
STRATUM MONITORED Sand with shell fragments			INSPECTOR R. W. Pinker	
CHECKED BY S. J. Casey		APPROVED BY R. H. Herzog		



METHOD OF INSTALLATION: Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal; grouted to ground surface.	
REMARKS:	

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

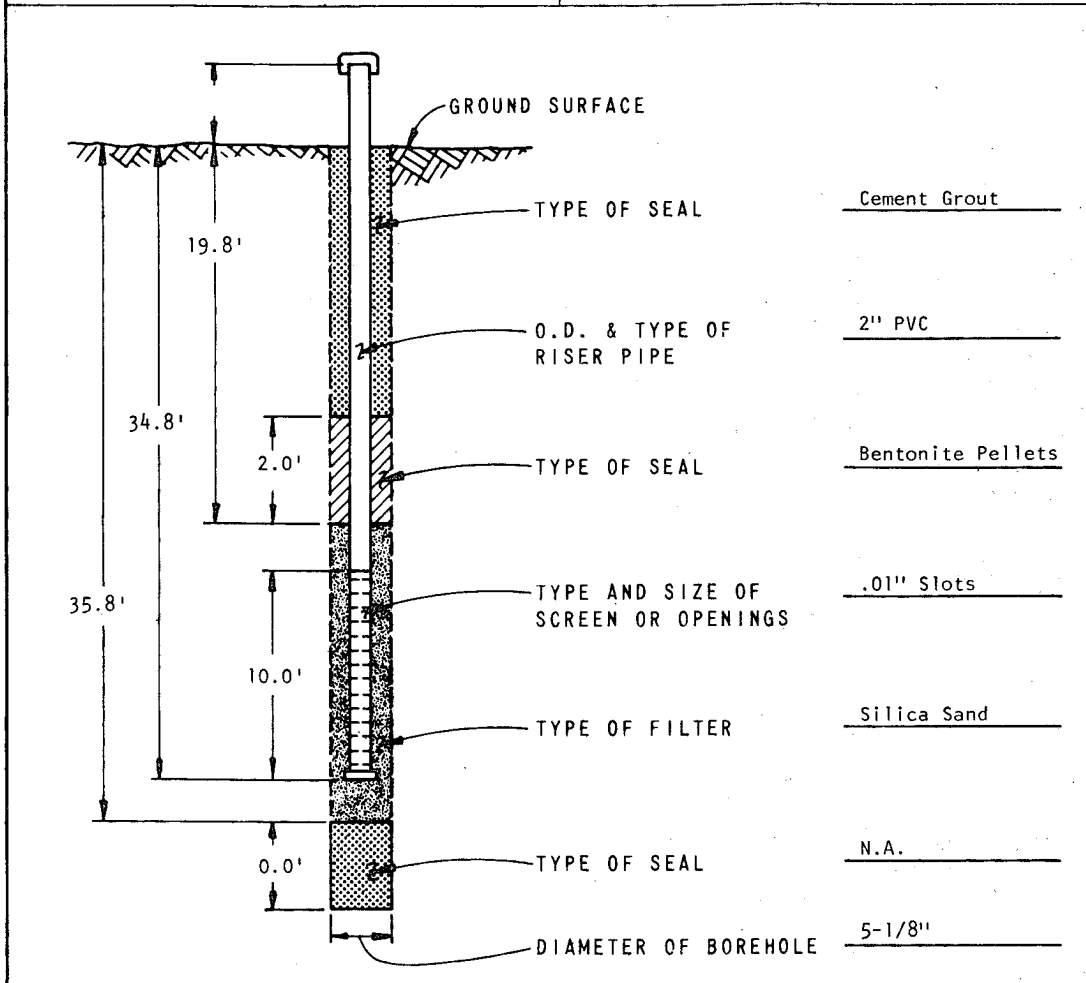


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CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-14

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center		PROJECT NO. 8927
PROJECT LOCATION Orlando, Florida		COORDINATES N-1,515,425 E-453,425	GROUND ELEVATION 55.2	DATE 1-28-81
STRATUM MONITORED Sand			INSPECTOR R. W. Pinker	
CHECKED BY S. J. Casey		APPROVED BY R. H. Herzog		



METHOD OF INSTALLATION:
Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal

REMARKS:
Boring blocked off with bentonite pellets at depth 11.8' then grouted to ground surface.

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

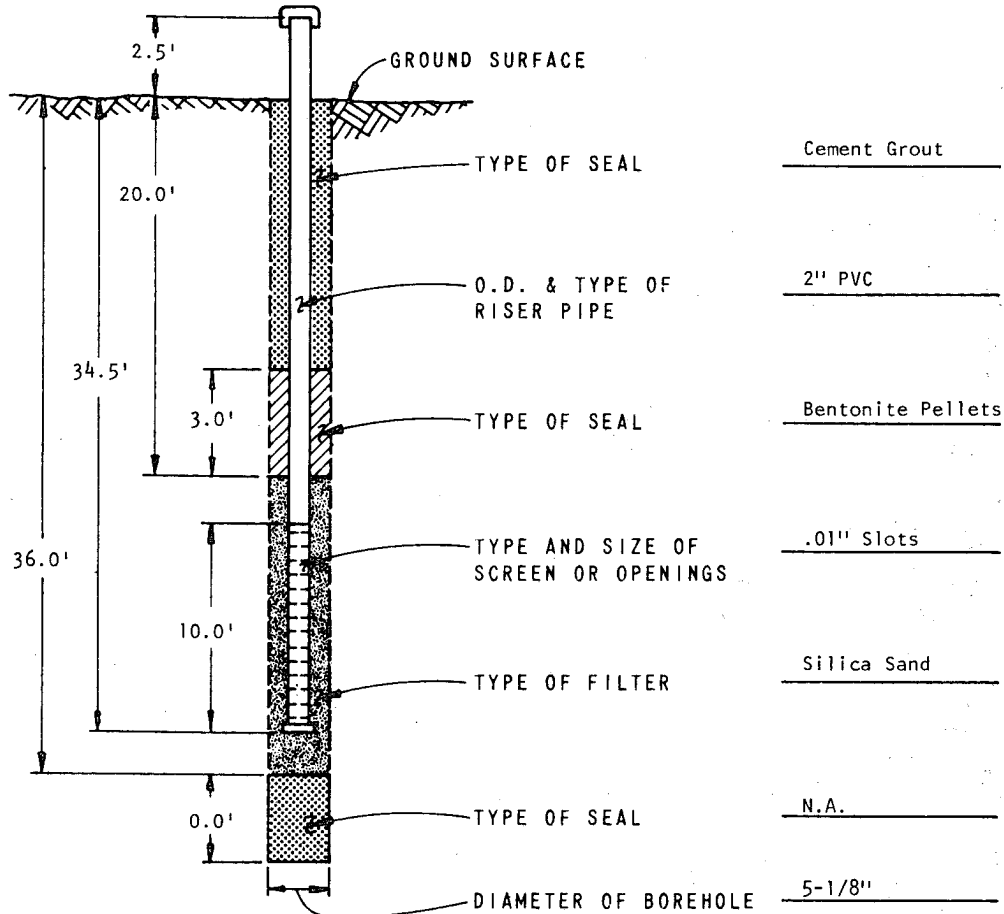


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CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-15.

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center		PROJECT NO. 8927
PROJECT LOCATION Orlando, Florida		COORDINATES N-1,512,690 E-448,070	GROUND ELEVATION 69.5	DATE 1-29-81
STRATUM MONITORED Sandy clay, cemented sand and clay w/shell fragments			INSPECTOR R. W. Pinker	
CHECKED BY S. J. Casey		APPROVED BY R. H. Herzog		



METHOD OF INSTALLATION:

Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal; grouted to ground surface.

REMARKS:

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

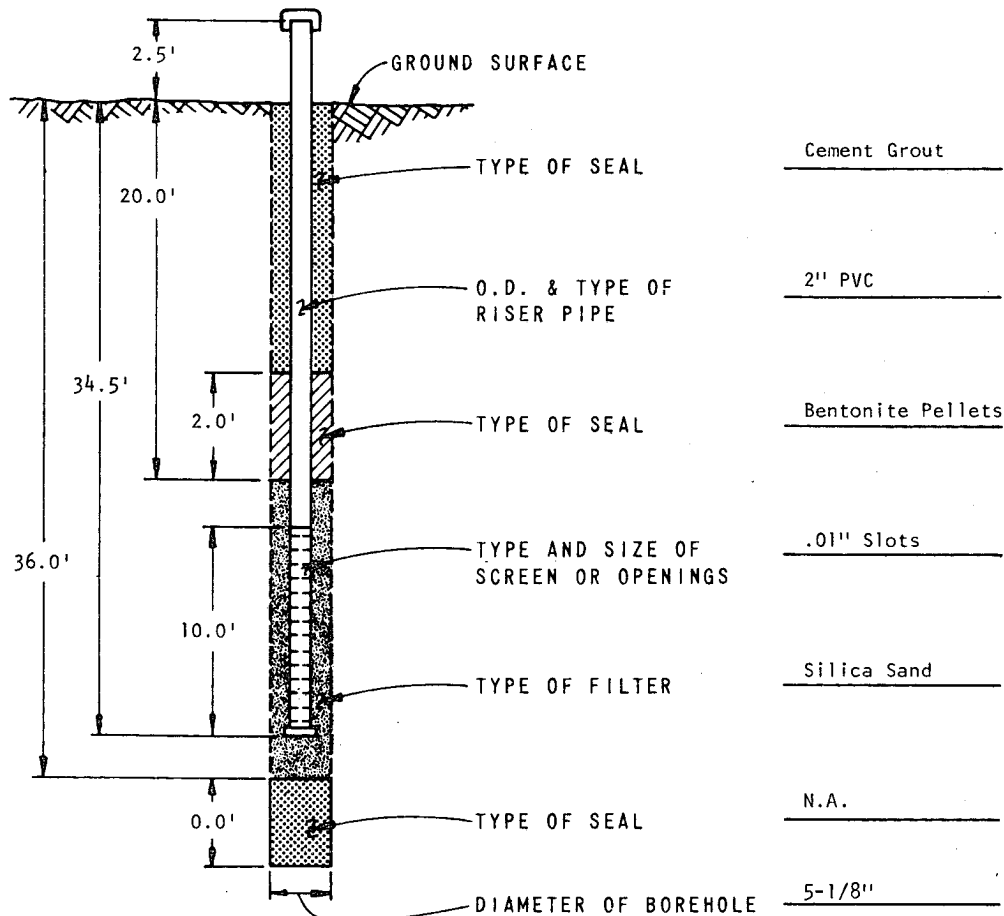


BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-16

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center		PROJECT NO 8927
PROJECT LOCATION Orlando, Florida	COORDINATES N-1,508,265 E-448,020		GROUND ELEVATION 69.4	DATE 1-29-81
STRATUM MONITORED Cemented sand w/shell fragments			INSPECTOR R. W. Pinker	
CHECKED BY S. J. Casey		APPROVED BY R. H. Herzog		



METHOD OF INSTALLATION:
Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal; grouted to ground surface.

REMARKS:

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

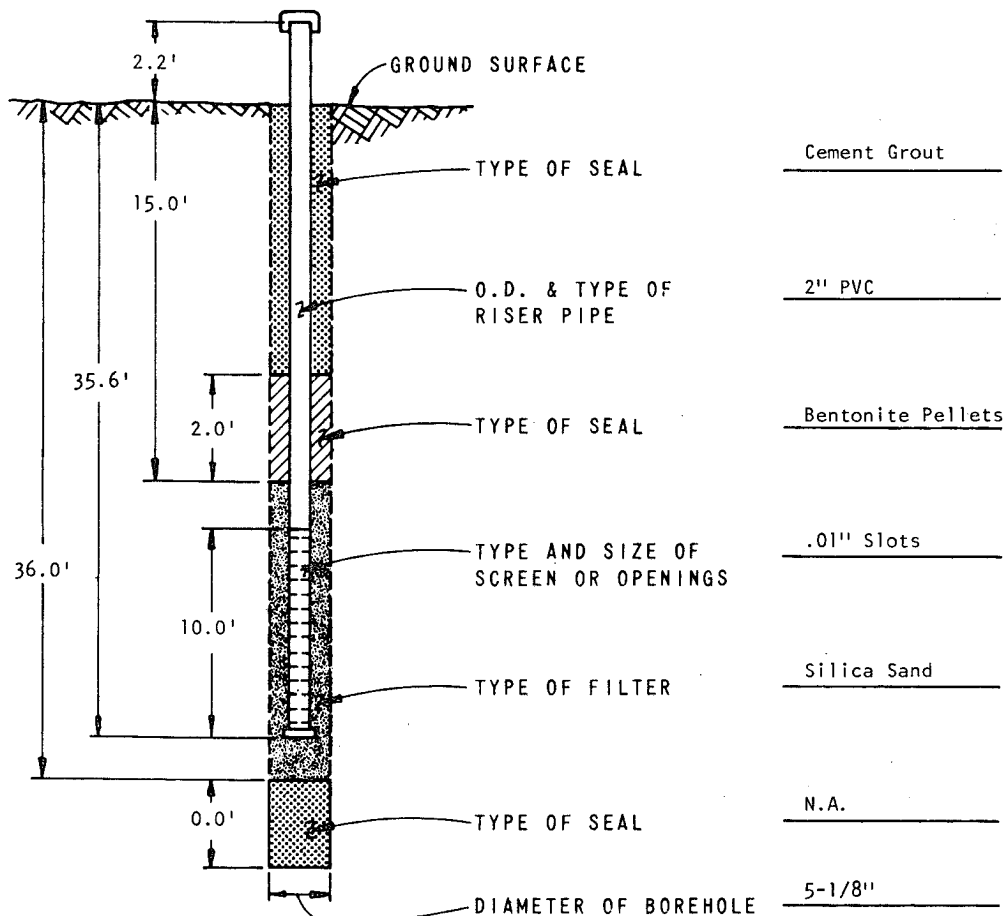


BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. B-17

CLIENT Orlando Utilities Commission		PROJECT Stanton Energy Center		PROJECT NO. 8927
PROJECT LOCATION Orlando, Florida		COORDINATES N-1,504,630 E-448,050	GROUND ELEVATION 72.9	DATE 1-29-81
STRATUM MONITORED Sand and Cemented Sand			INSPECTOR R. W. Pinker	
CHECKED BY S. J. Casey				
			APPROVED BY R. H. Herzog	



METHOD OF INSTALLATION

Boring advanced to completion with 5-1/8" diameter tricone roller bit using Revert as drilling fluid; set piezometer; placed filter and seal; grouted to ground surface.

REMARKS

Bottom 5' of piezometer is not slotted; slotted interval is from depth 20.5' to 30.5'.

P-ST-021B

EXHIBIT 2.4-1 (CONTINUED). SOIL BORING LOGS

LABORATORY TESTING
ORLANDO UTILITIES COMMISSION
CURTIS H. STANTON PLANT
ORLANDO, FLORIDA

SEPTEMBER 10, 1980



Ardaman & Associates, Inc.

OFFICES

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American Concrete Institute
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Association of Soil and Foundation Engineers
Florida Institute of Consulting Engineers
Professional Engineers in Private Practice

**EXHIBIT 2.4-2. SOIL BORING LABORATORY
TEST REPORTS**

(1 OF 34)

TABLE OF CONTENTS

Boring Number	Sample Type	Depth of Sample (Ft)	Type of Test*	Section of Report
B-1	TW	48.5-50.5	W, Att, γ_d UC	Table I Table II
B-3	TW	41.0-43.0	W, γ_d SA Perm	Table I Figures 1-1 & 1-2 Table III
B-4	SPT	6.0-7.5	SA	Figure 1-3
B-6	TW	6.0-8.0	W, γ_d SA Perm	Table I Figures 1-4 & 1-5 Table III
B-6	TW	13.5-15.5	W, γ_d SA Perm	Table I Figure 1-6 Table III
B-6	TW	37.0-39.0	W, γ_d , Att UU Consol	Table I Figure 1-6 Figures 3-1-A&B
B-6	SPT	42.0-43.5	SA	Figure 1-7
B-6	TW	72.0-74.0	W, γ_d UU	Table I Figure 2-1
B-6	SPT	80.0-81.5	SA	Figure 1-8
B-6	TW	160.0-161.9	W, γ_d UU	Table I Figure 2-2
B-6	NX	198.5-203.5	UC	Table II
B-6	NX	203.5-208.5	UC	Table II
B-7	TW	47.0-49.0	W, γ_d , Att UU Consol	Table I Figure 2-3 Figures 1-9, 3-2-A&B
B-7	TW	60.0-62.0	W, γ_d , Att UU	Table I Figure 2-4

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY TEST REPORTS

TABLE OF CONTENTS (Continued)

Boring Number	Sample Type	Depth of Sample (Ft)	Type of Test*	Section of Report
B-7	SPT	65.0-66.5	SA	Figure 1-10
B-7	SPT	70.0-71.5	SA	Figure 1-11
B-7	SPT	80.0-81.5	SA	Figure 1-12
B-7	SPT	100.0-101.5	SA	Figure 1-13
B-7	NX	199.5-204.5	UC	Table II
B-8	SPT	33.5-35.0	SA	Figure 1-14
B-8	SPT	38.5-40.0	SA	Figure 1-15
B-8	TW	43.5-45.5	W, γ_d , Att UU	Table I Figure 2-5
B-10	SPT	23.5-25.0	SA	Figure 1-16
B-10	SPT	28.5-30.0	SA	Figure 1-17
B-11	TW	48.0-50.0	W, γ_d , Att UC	Table I Table II

Legend:

γ_d	=	Dry density
Consol	=	Consolidation test
Perm	=	Permeability Test (Constant Head)
SA	=	Sieve Analysis
W	=	Natural Moisture Content
Att	=	Atterberg Limits (LL, PL, PI)
UC	=	Unconfined Compressive Strength Test
UU	=	Triaxial Shear Test (Unconsolidated-Undrained)

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY TEST REPORTS

ATTERBERG LIMITS

Boring Number	Depth (Ft.)	Unified Class.	Natural Moisture Content	Plastic Limit	Liquid Limit	Plasticity Index	d ³ Lbs/ft ³
B-1	48.5-50.5	--	45.5	--	--	--	--
B-1	48.5-50.5	--	42.9	--	--	--	--
B-1	48.5-50.5	--	34.4	--	--	--	--
B-1	48.5-50.5	--	38.4	--	--	--	--
B-1	48.5-50.5	CH	32.8	19.6	51.0	31	80.9
B-3	41.0-43.0	--	33.2	--	--	--	92.0
B-3	41.0-43.0	--	29.5	--	--	--	--
B-3	41.0-43.0	--	25.9	--	--	--	--
B-3	41.0-43.0	--	27.4	--	--	--	--
B-6	6.0-8.0	--	25.3	--	--	--	95.4
B-6	6.0-8.0	--	24.1	--	--	--	--
B-6	6.0-8.0	--	25.6	--	--	--	--
B-6	6.0-8.0	--	26.3	--	--	--	--
B-6	13.5-15.5	--	20.7	--	--	--	105.9
B-6	13.5-15.5	--	20.2	--	--	--	--
B-6	13.5-15.5	--	18.3	--	--	--	--
B-6	13.5-15.5	--	19.6	--	--	--	--
B-6	37.0-39.0	--	46.0	--	--	--	--
B-6	37.0-39.0	--	43.7	--	--	--	--
B-6	37.0-39.0	--	30.9	--	--	--	--
B-6	37.0-39.0	--	36.9	--	--	--	--
B-6	37.0-39.0	CH	43.9	16.2	55.2	39	84.4
B-6	72.0-74.0	--	45.3	--	--	--	77.5
B-6	72.0-74.0	--	41.6	--	--	--	--
B-6	72.0-74.0	--	45.1	--	--	--	--
B-6	72.0-74.0	--	37.5	--	--	--	--
B-6	160.0-161.0	--	28.7	--	--	--	87.9
B-6	160.0-161.0	--	31.2	--	--	--	--
B-6	160.0-161.0	--	37.6	--	--	--	--
B-6	160.0-161.0	--	41.7	--	--	--	--

File Number 80-6072

Table I-1

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY TEST REPORTS

ATTERBERG LIMITS

Boring Number	Depth (Ft.)	Unified Class.	Natural Moisture Content	Plastic Limit	Liquid Limit	Plasticity Index	d Lbs/ft ³
B-7	47.0-49.0	--	38.8	--	--	--	--
B-7	47.0-49.0	--	40.1	--	--	--	--
B-7	47.0-49.0	--	47.0	--	--	--	--
B-7	47.0-49.0	--	44.1	--	--	--	--
B-7	47.0-49.0	CH	50.8	20.8	61.1	40	76.1
B-7	60.0-62.0	--	97.9	--	--	--	--
B-7	60.0-62.0	--	82.4	--	--	--	--
B-7	60.0-62.0	--	42.8	--	--	--	--
B-7	60.0-62.0	CH	73.6	30.9	104.5	74	55.8
B-8	43.5-45.0	--	57.1	--	--	--	--
B-8	43.5-45.0	--	45.8	--	--	--	--
B-8	43.5-45.0	--	44.0	--	--	--	--
B-8	43.5-45.0	--	47.9	--	--	--	--
B-8	43.5-45.0	CH	56.0	18.8	77.0	58	71.4
B-11	48.0-50.0	--	55.5	--	--	--	--
B-11	48.0-50.0	--	84.7	--	--	--	--
B-11	48.0-50.0	--	88.8	--	--	--	--
B-11	48.0-50.0	--	90.1	--	--	--	--
B-11	48.0-50.0	CH	88.0	28.8	107.0	78	57.1

File Number 80-6072

Table I-2

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

UNCONFINED COMPRESSIVE STRENGTH TEST

<u>Boring Number</u>	<u>Depth of Sample (Ft.)</u>	<u>Diameter (In.)</u>	<u>Length After Capping (In.)</u>	<u>Load (Lbs)</u>	<u>Compressive Strength (psi)</u>
B-1	48.5-50.5	1.5	3.1	16.48	9.32 (0.67 tsf)
B-6	199	2	5.25	3,110	990
B-6	205	2	4.75	2,100	668
B-7	207	2	4.56	23,300	7414
B-11	48.0-50.0	1.5	3.2	8.91	5.04 (0.363 tsf)

File Number 80-6072

Table II

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

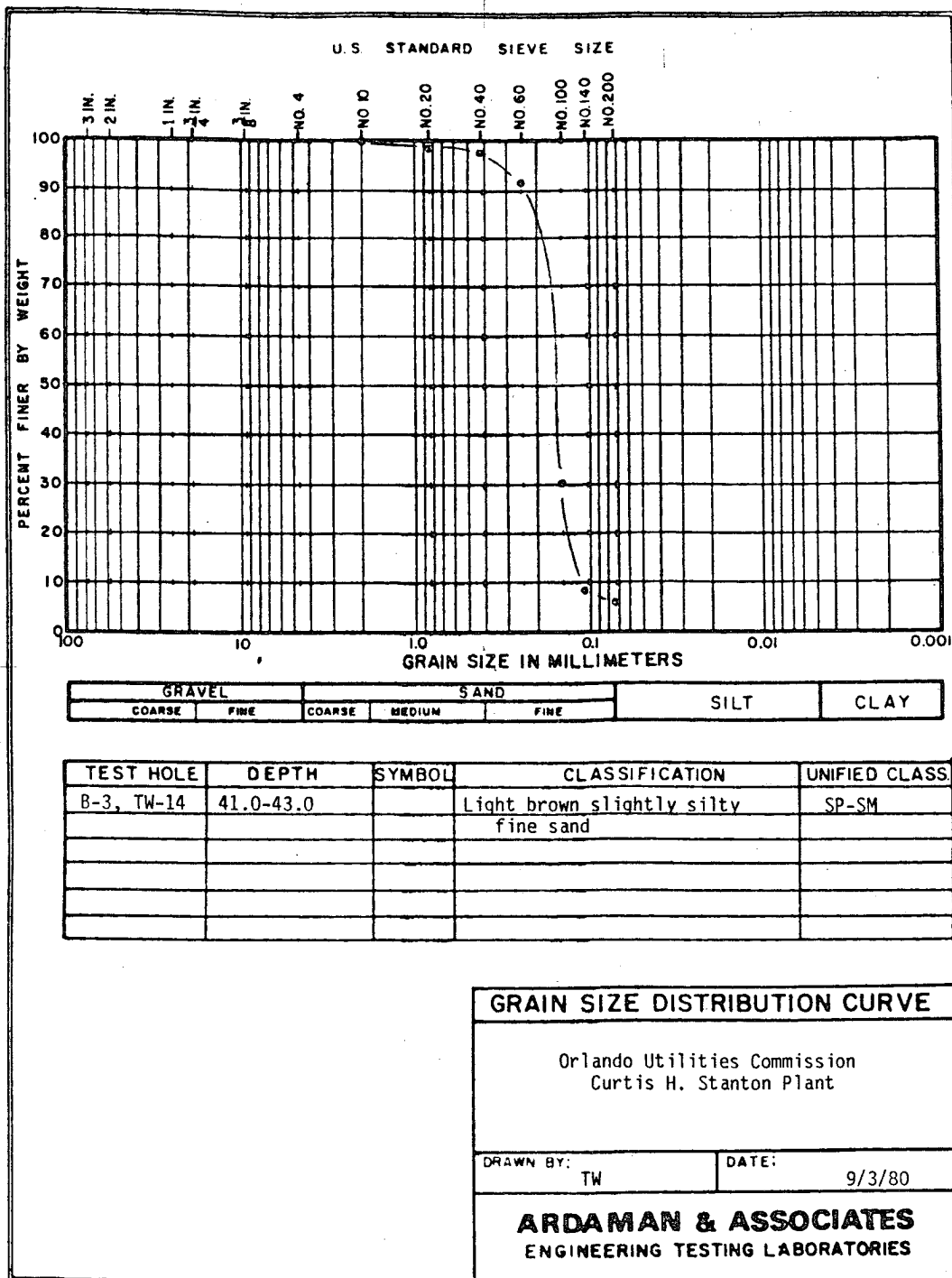
CONSTANT HEAD PERMEABILITY TEST

Boring Number	Depth of Sample (Ft.)	K, cm/sec
B-3	41.0-43.0	2.6×10^{-5}
B-6	6.0-8.0	1.1×10^{-3}
B-6	13.5-15.5	1.2×10^{-4}

File Number 80-6072

Table III

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS



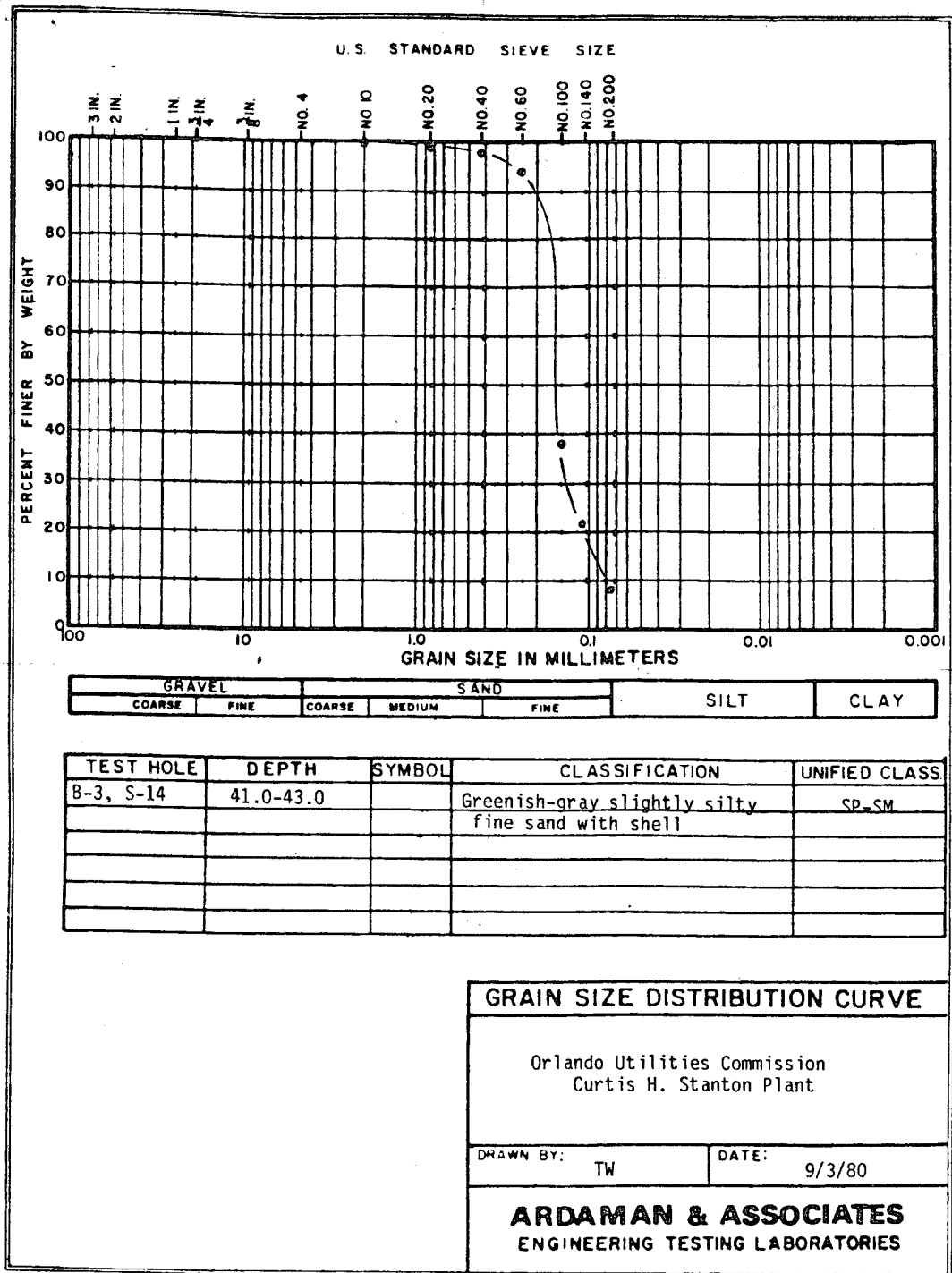
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Ardaman & Associates, Inc.

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(8 OF 34)

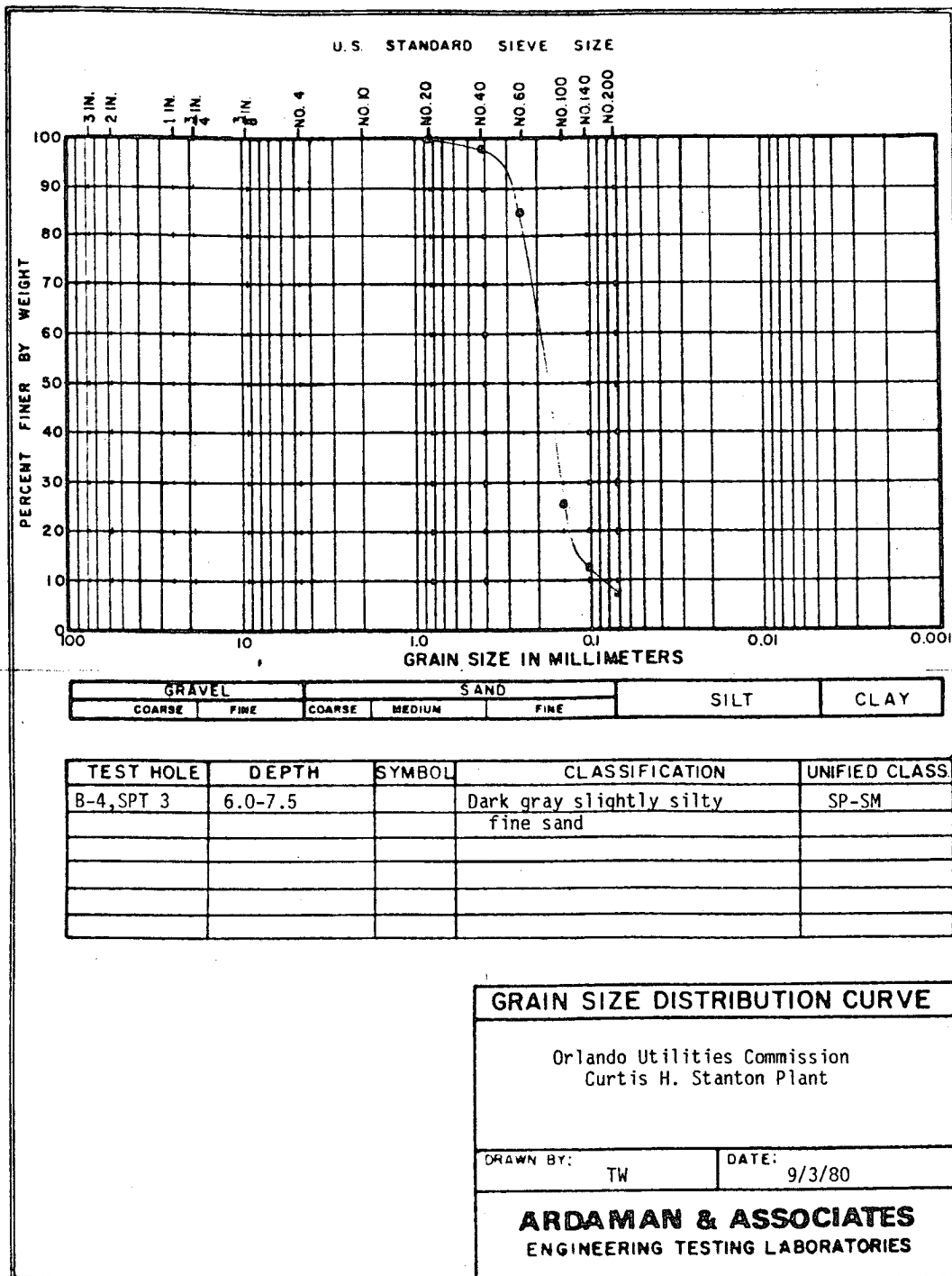


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Ardaman & Associates, Inc.

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS



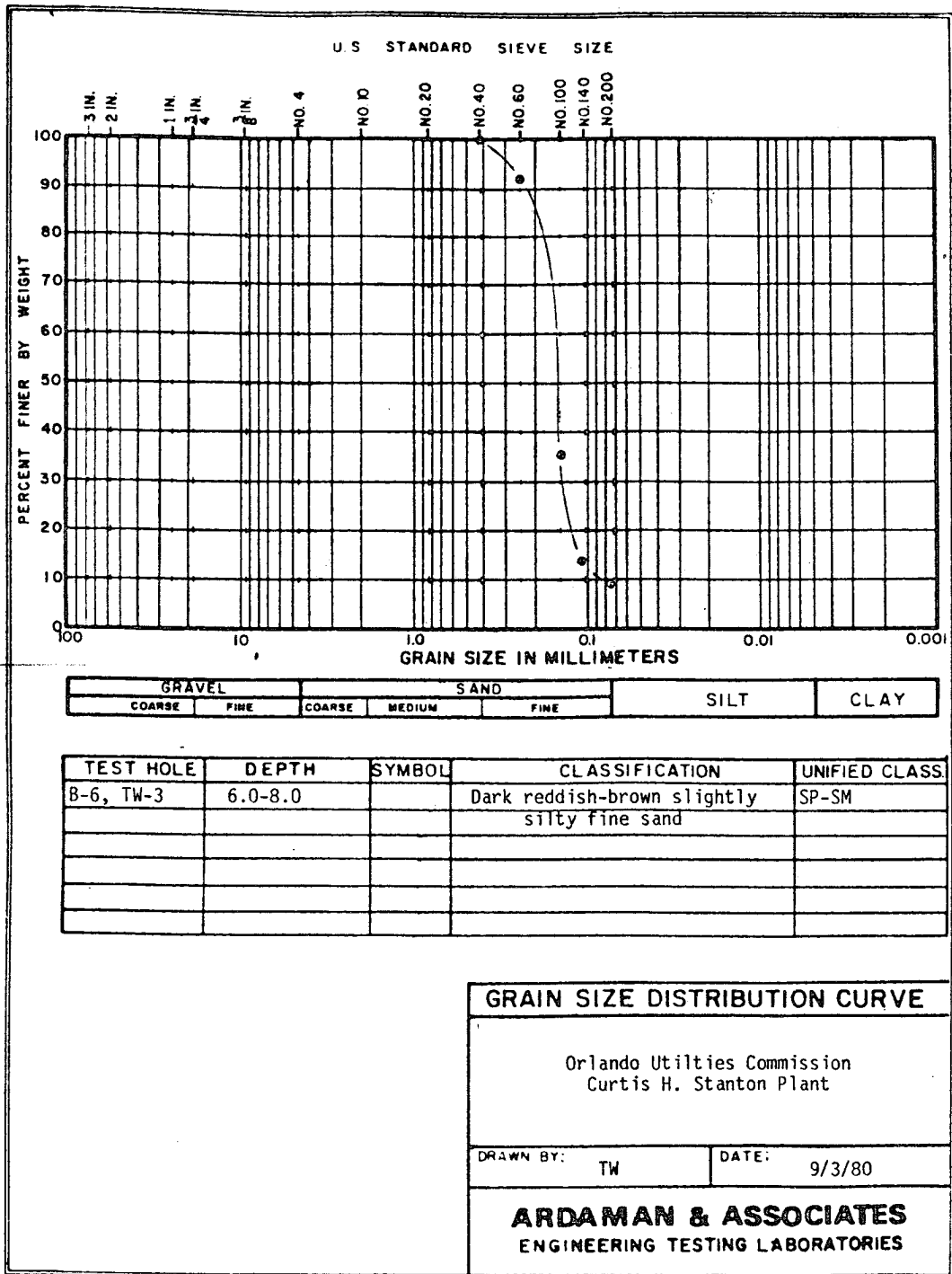
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(10 OF 34)

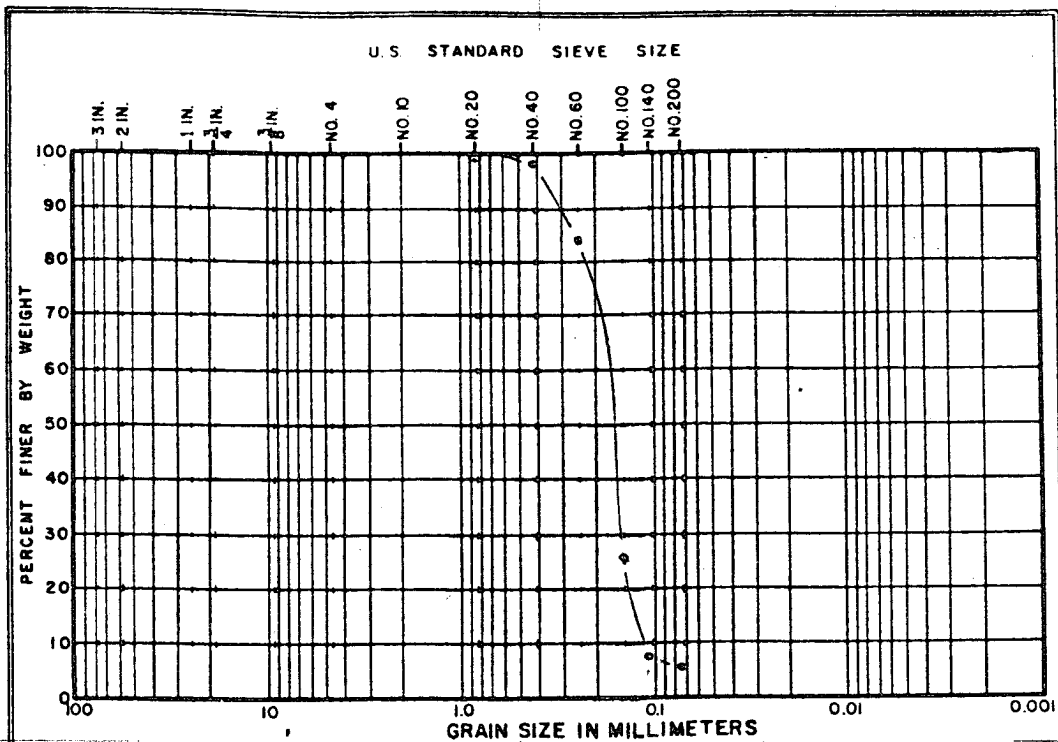


File Number 80-6072

1-4

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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST HOLE	DEPTH	SYMBOL	CLASSIFICATION	UNIFIED CLASS
B-6, TW-3	6.0-8.0		Very light brown slightly silty fine sand	SP-SM

GRAIN SIZE DISTRIBUTION CURVE

Orlando Utilities Commission
Curtis H. Stanton Plant

DRAWN BY:

TW

DATE:

9/3/80

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ENGINEERING TESTING LABORATORIES

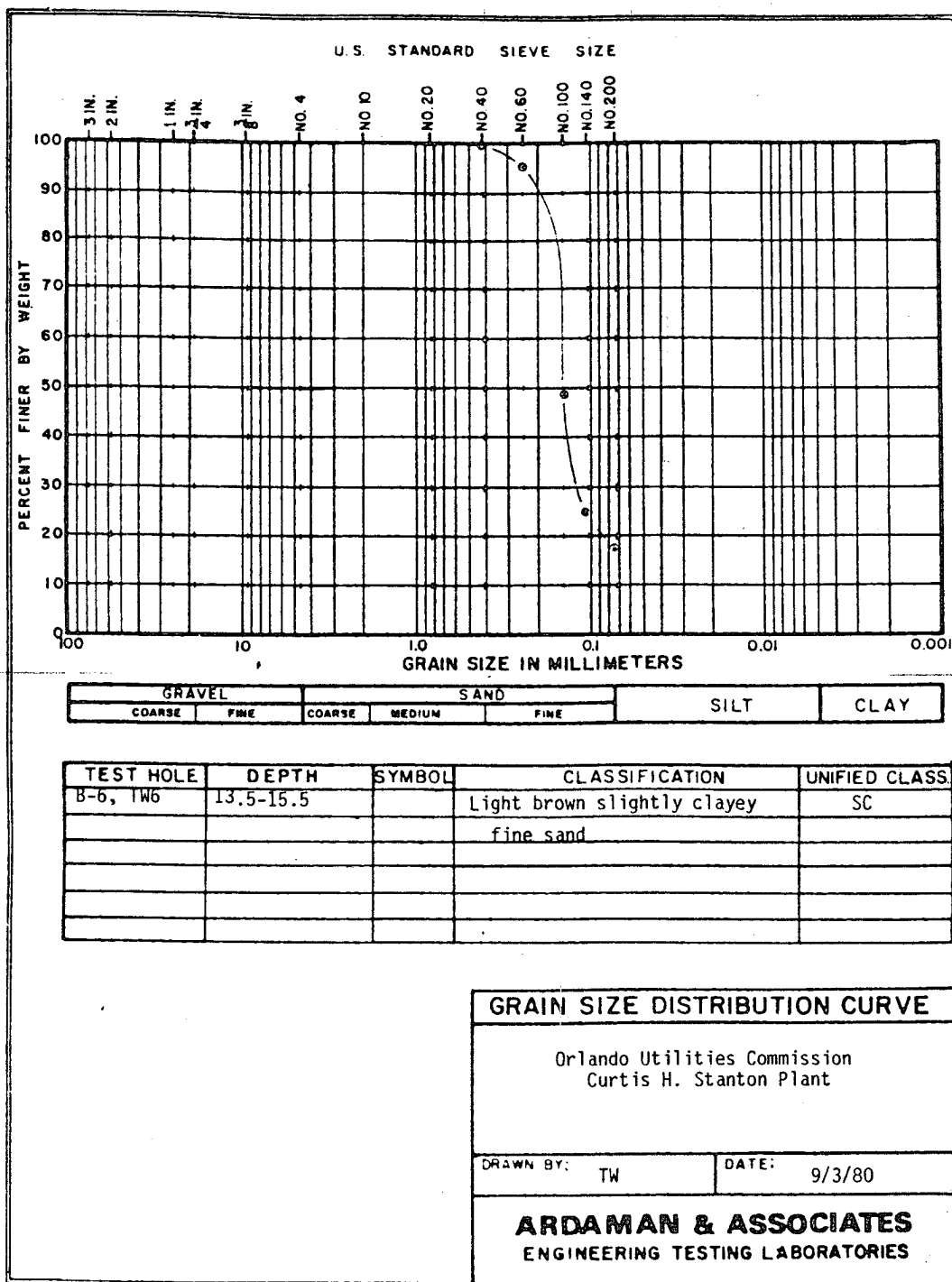
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(12 OF 34)

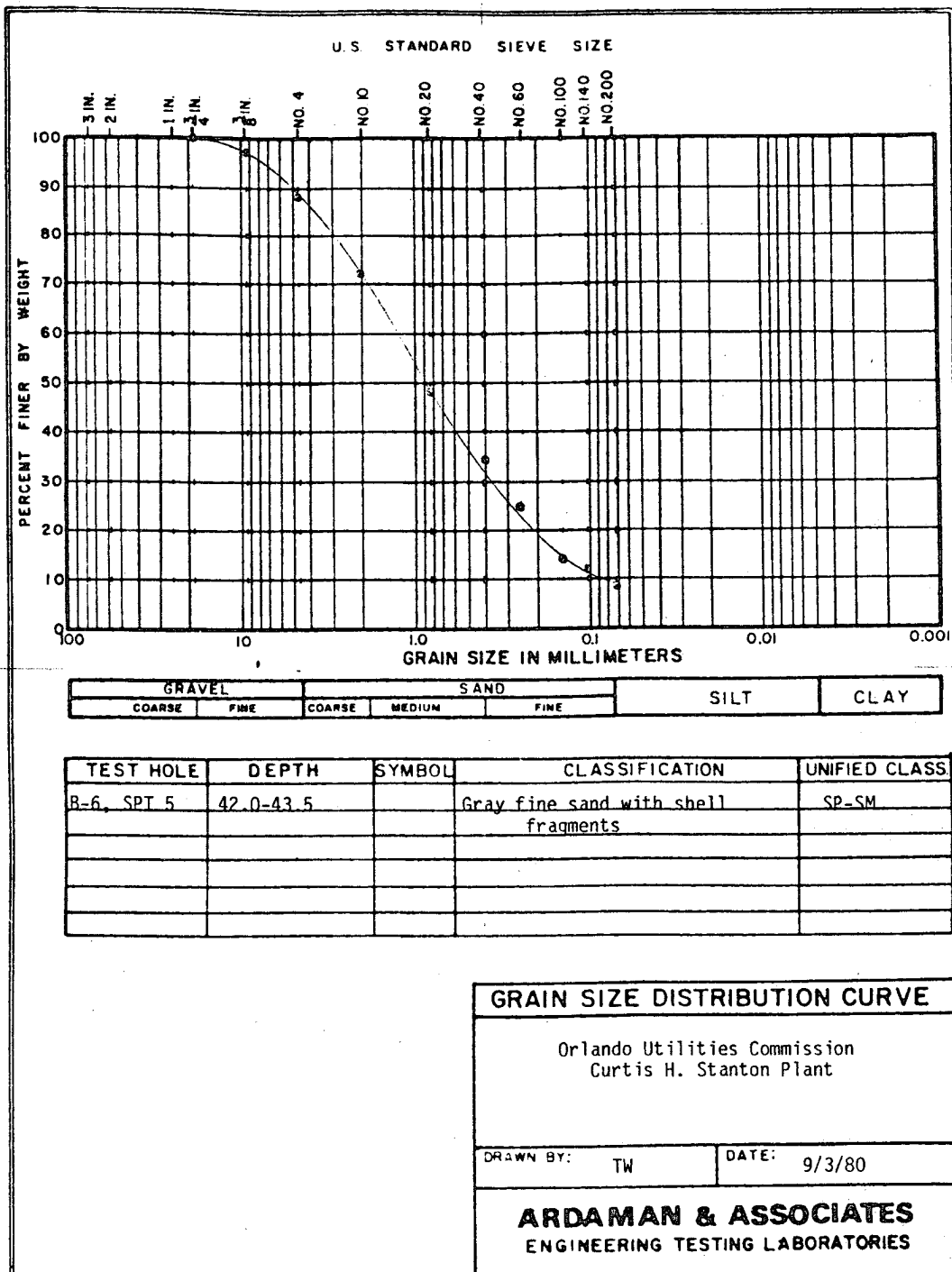


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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS



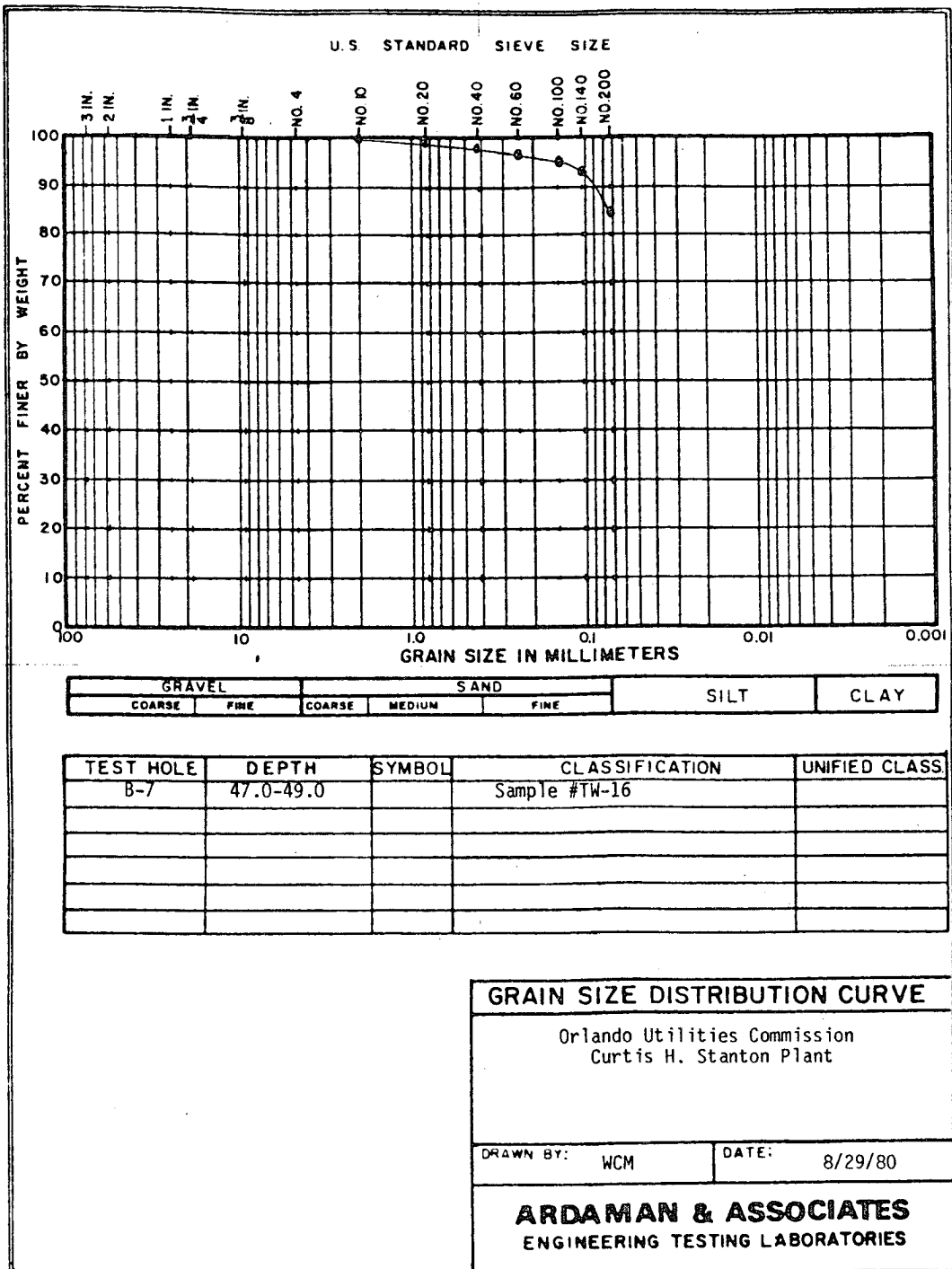
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(14 OF 34)



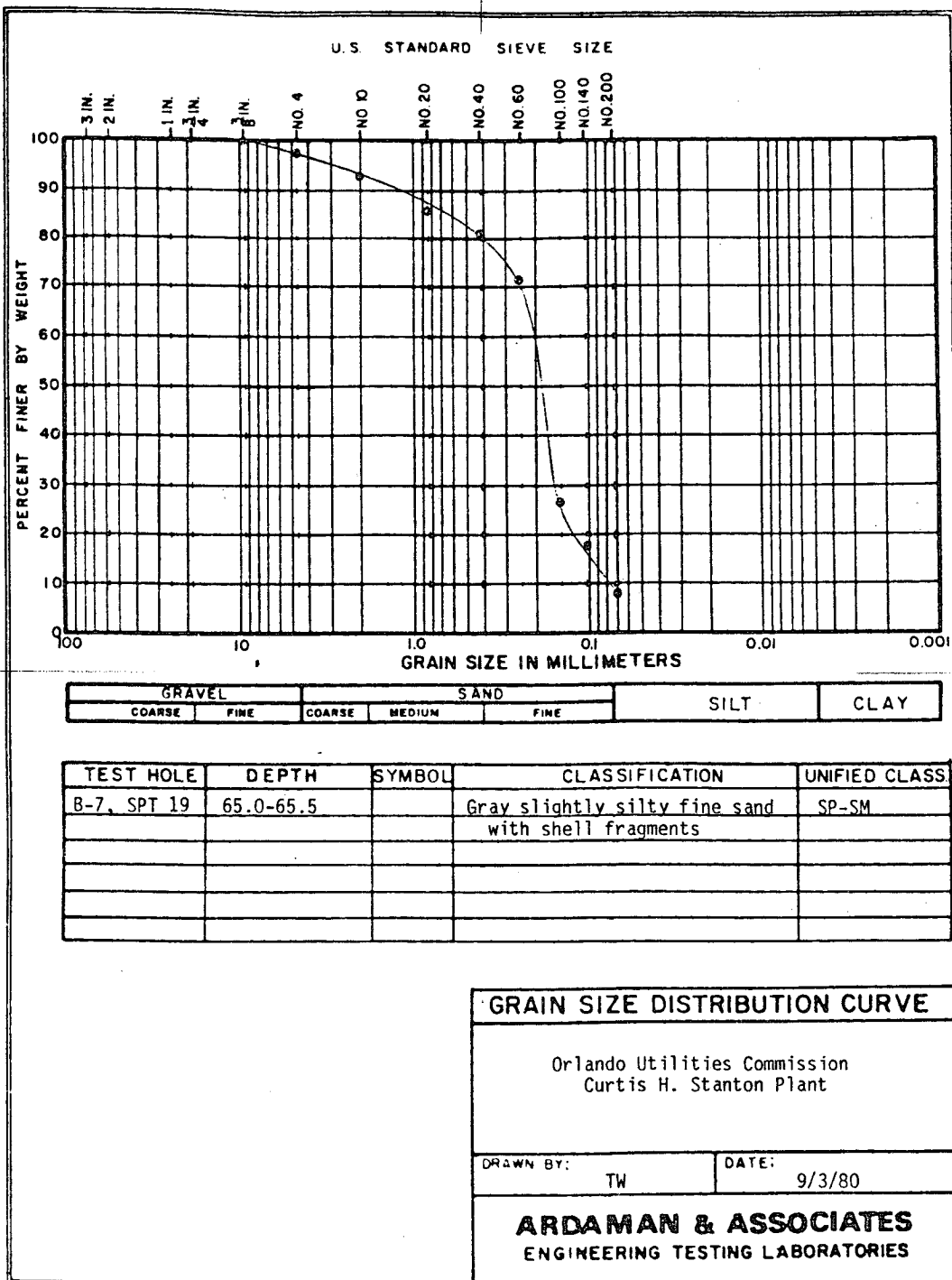
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(16 OF 34)



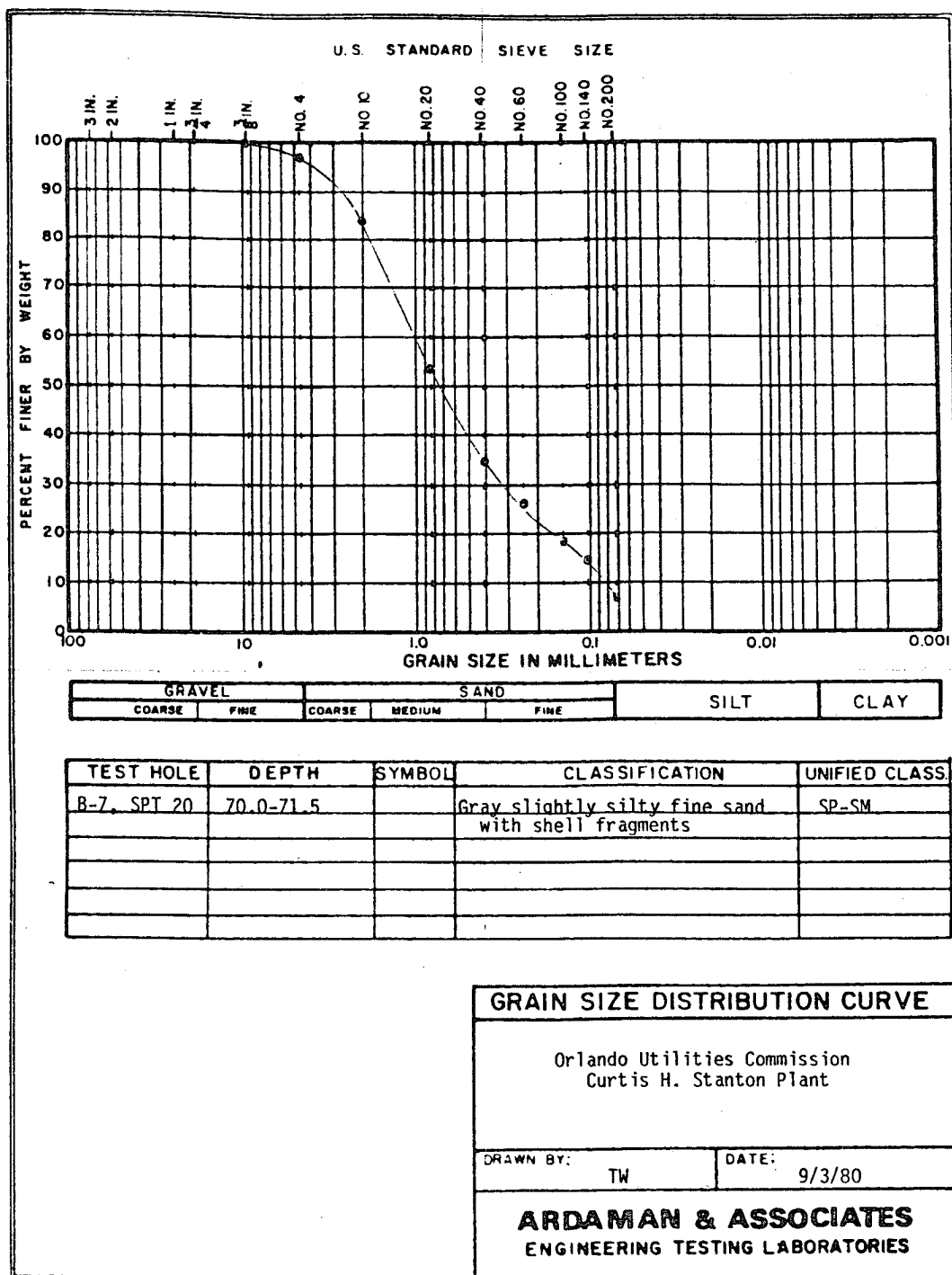
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(17 OF 34)



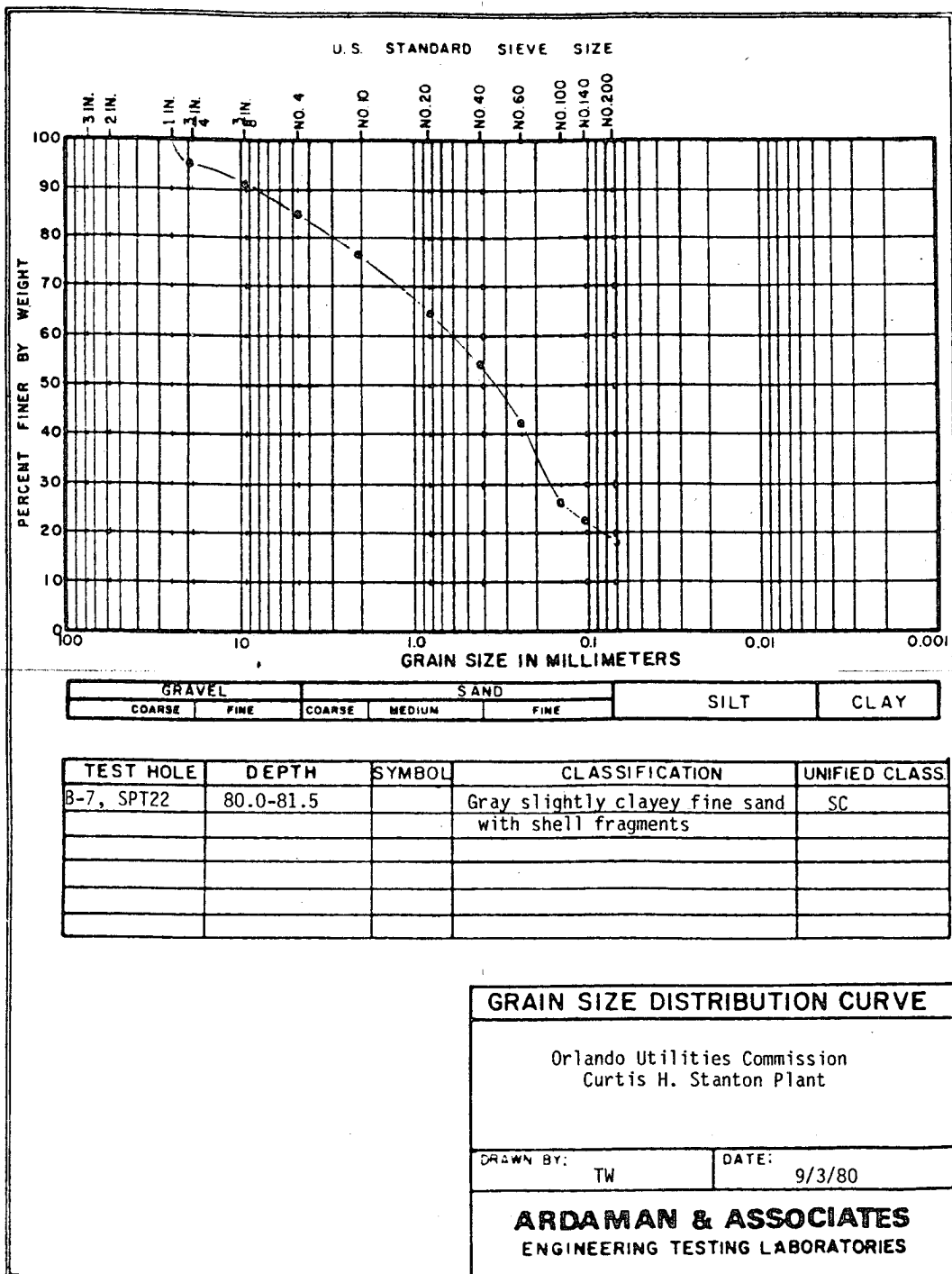
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(18 OF 34)



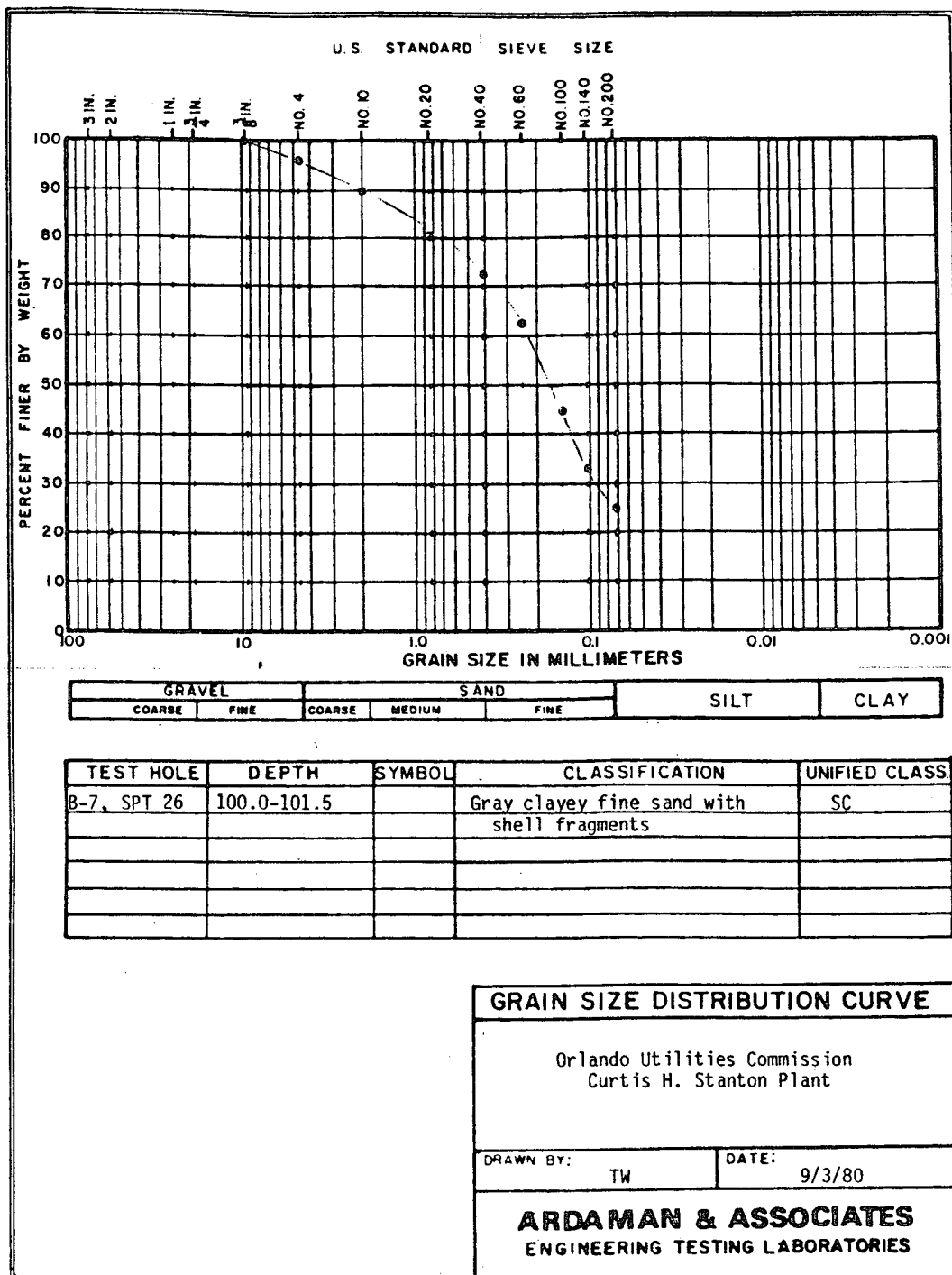
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(19 OF 34)



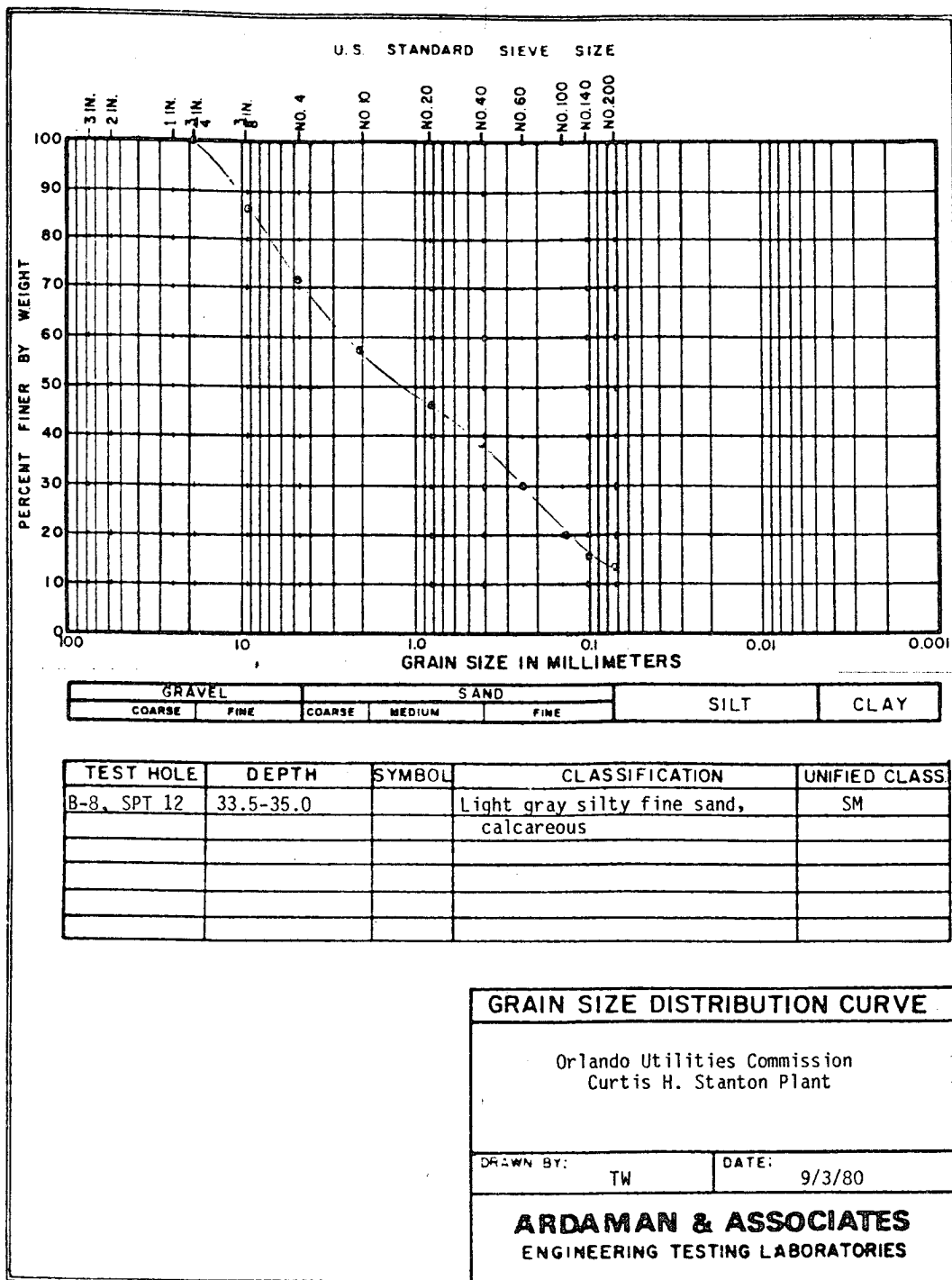
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(20 OF 34)



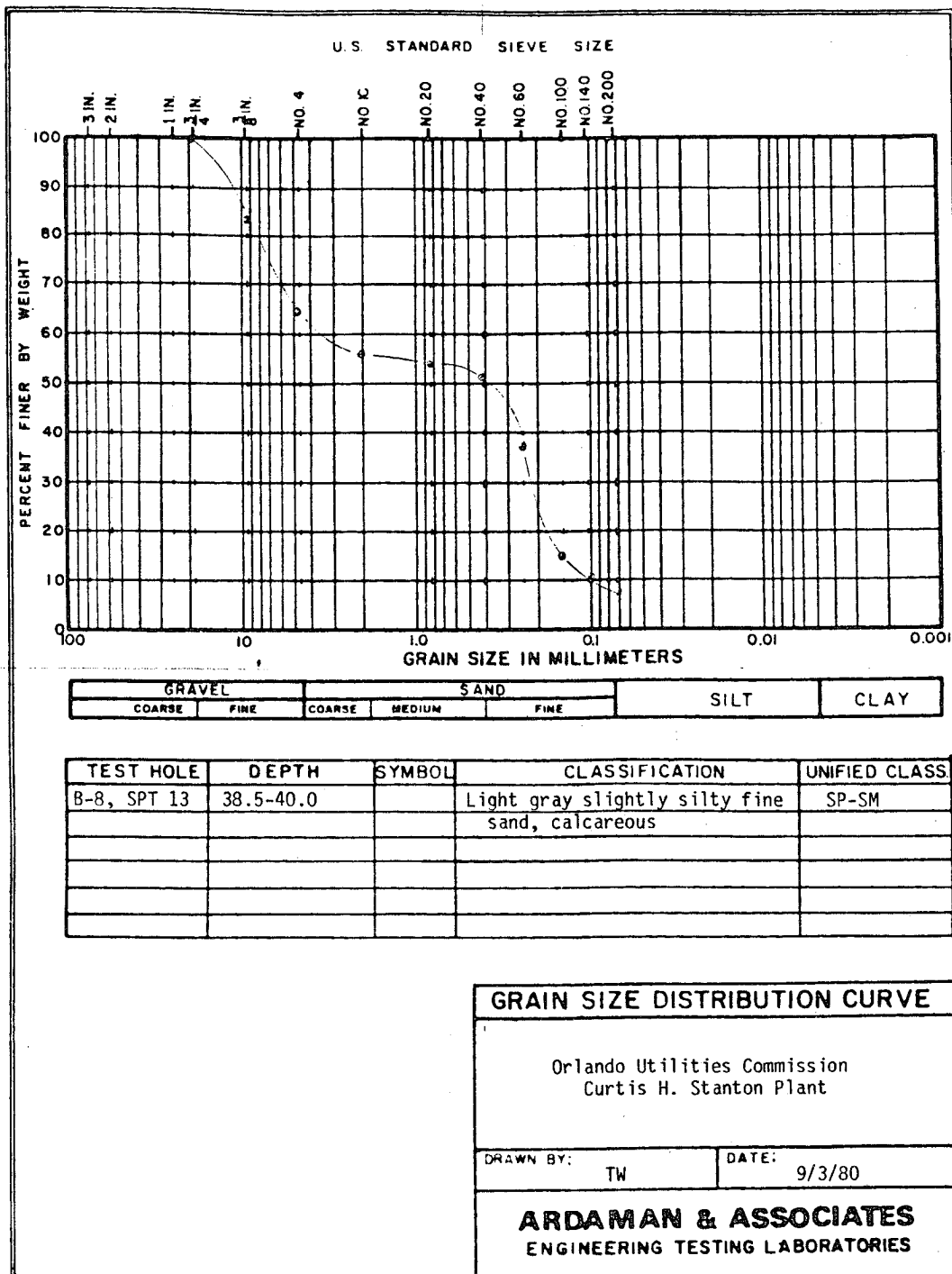
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(21 OF 34)



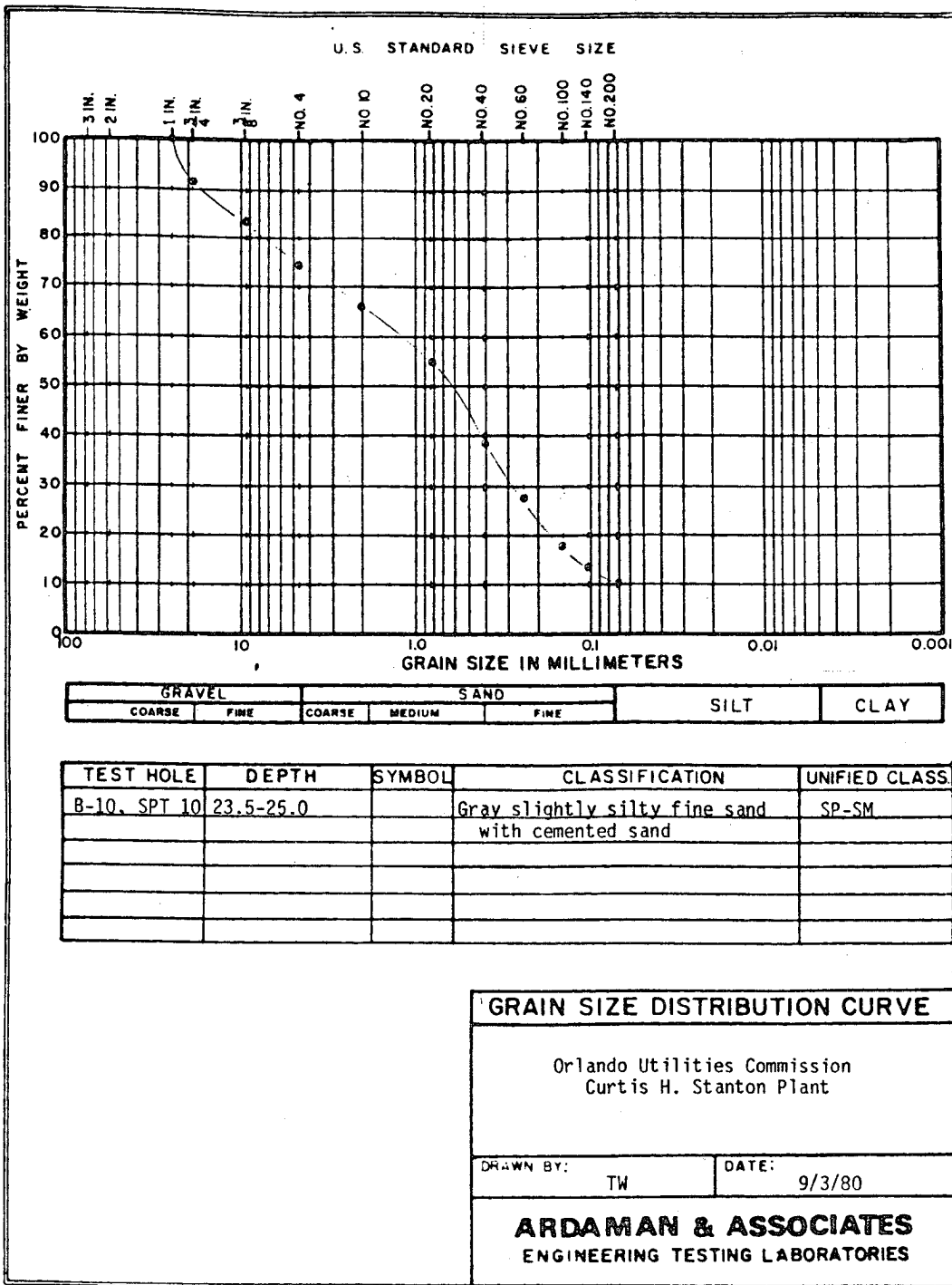
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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(22 OF 34)

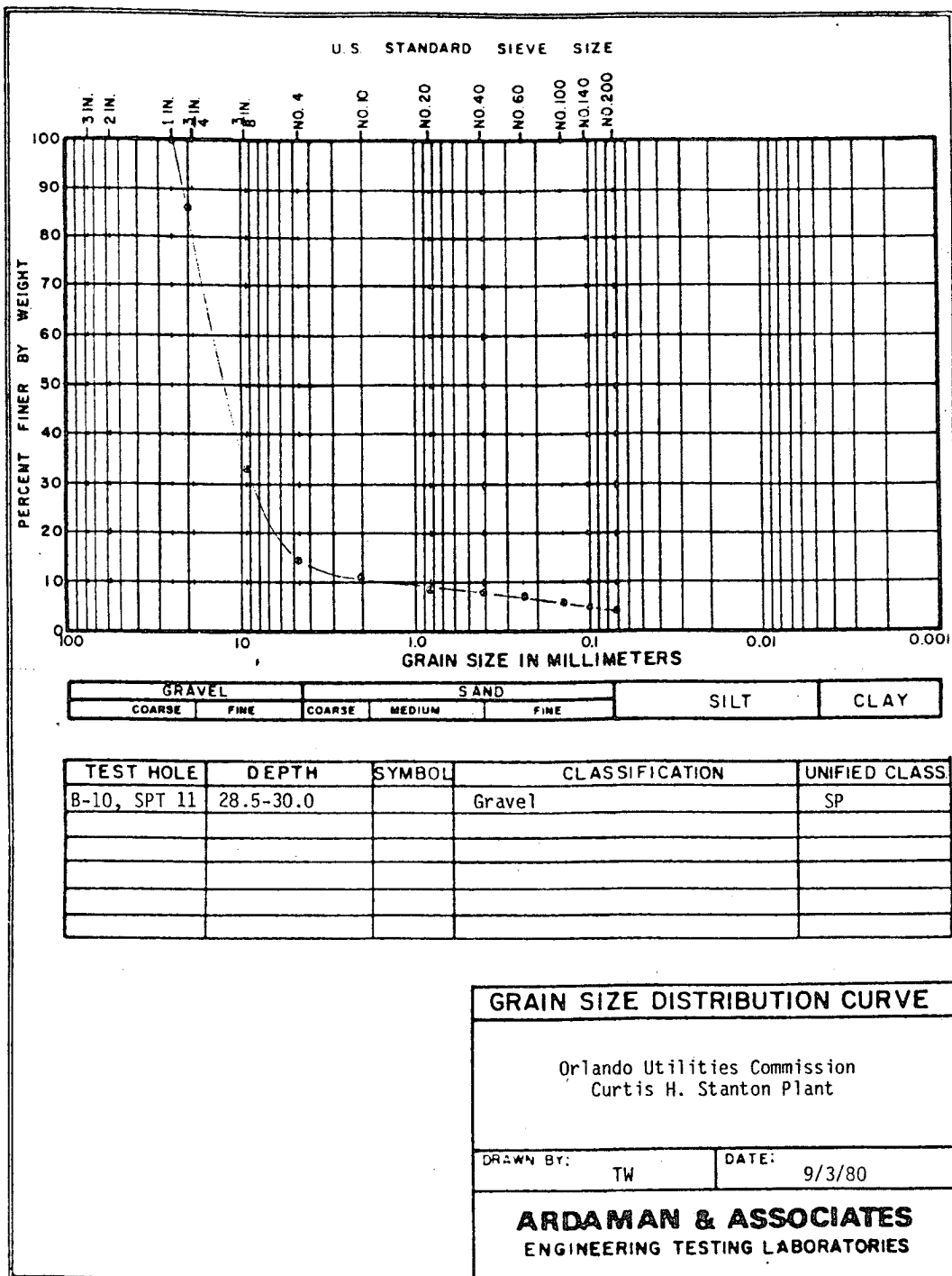


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1-16

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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS



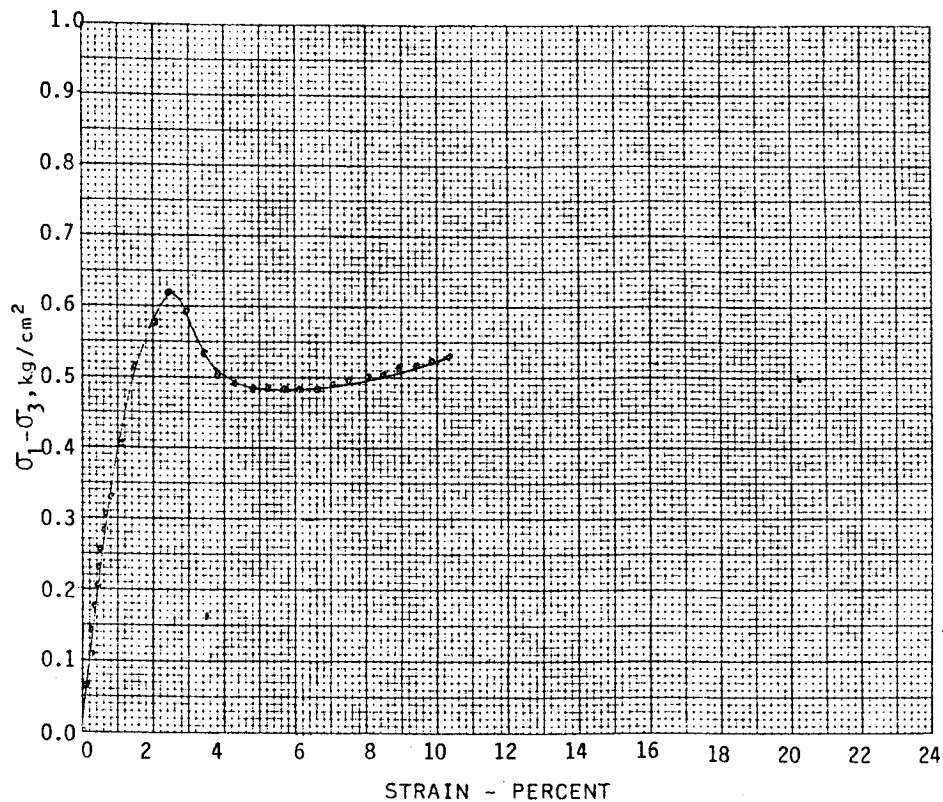
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1-17

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EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS

(24 OF 34)



TEST NUMBER _____ σ_c 2.11 kg/cm²
 BORING NUMBER B-6 $\dot{\epsilon}$ 1.0 % /min.
 SAMPLE NUMBER TW-22
 DEPTH (FEET) 72.0-74.0
 CLASSIFICATION _____

INITIAL
 $\gamma_d =$ 72.7 lb/ft³
 M.C. = 46.7 %
 SAT. = 94.8 %
 B = N/A

NOTES: Extruded into
1.4" SS tube



TYPE OF FAILURE _____

Orlando Utilities Commission
 Curtis H. Stanton Plant

UNCONSOLIDATED - UNDRAINED
 TRIAXIAL COMPRESSION TEST

TESTED BY: _____ DATE _____ FILE NO _____

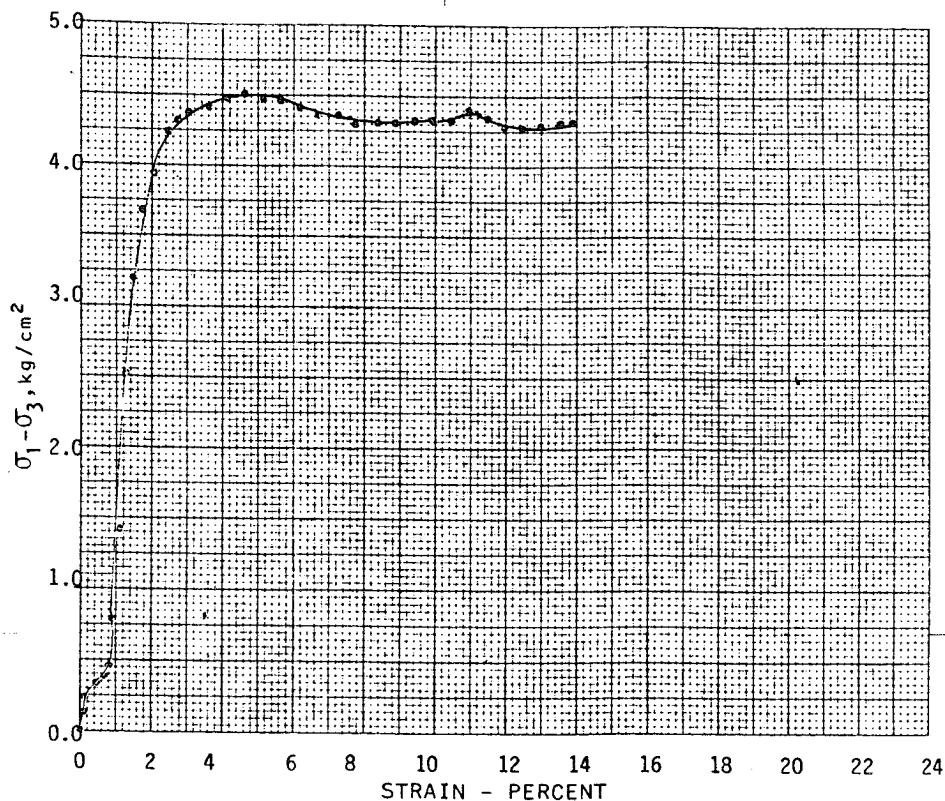
ARDAMAN & ASSOCIATES
 ENGINEERING, TESTING & SURVEYING

2-1

AS
ETC ARDAMAN & ASSOCIATES

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
 TEST REPORTS

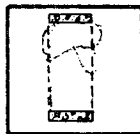
(25 OF 34)



TEST NUMBER _____ σ_c 4.57 kg/cm²
 BORING NUMBER B-6 $\dot{\epsilon}$ 1.0 % /min.
 SAMPLE NUMBER TW-41
 DEPTH (FEET) 160.0-164.8
 CLASSIFICATION _____

INITIAL
 γ_d = 88.1 lb/ft³
 M.C. = 33.4 %
 SAT. = 97.6 %
 B = N/A %

NOTES: Extruded into 1.4"
SS tube; top of sample
matrix, bottom clay



TYPE OF FAILURE

Orlando Utilities Commission
 Curtis H. Stanton Plant

UNCONSOLIDATED - UNDRAINED
 TRIAXIAL COMPRESSION TEST

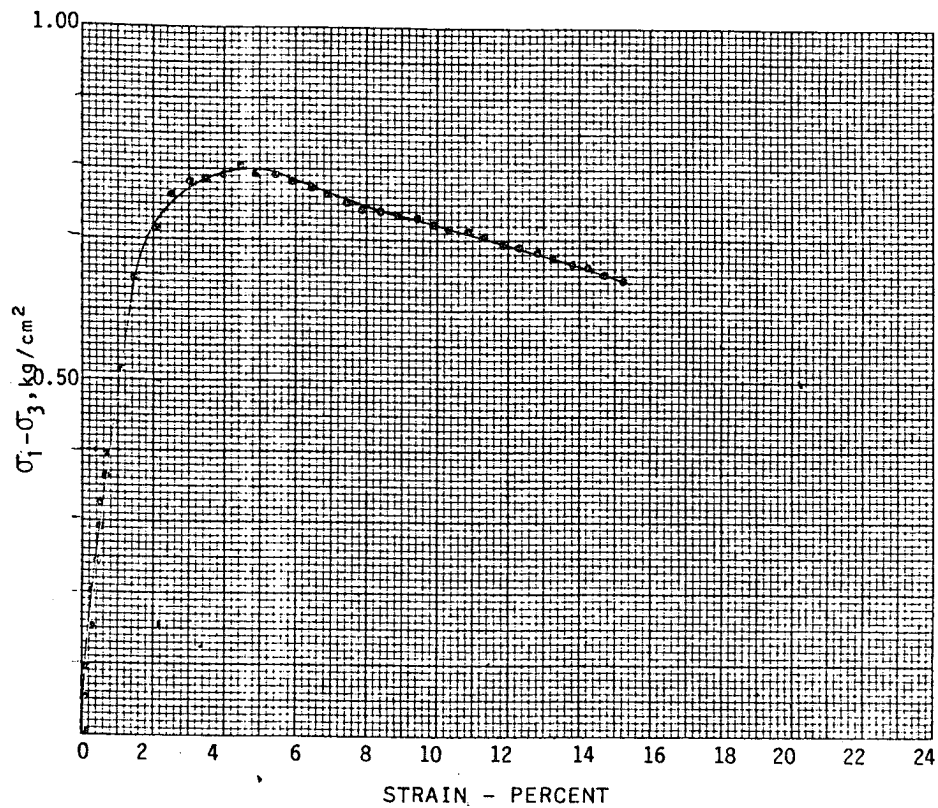
TESTED BY: P.E.	DATE 8/11/80	FILE NO. 80-6072

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AS
EIC ARDAMAN & ASSOCIATES

2-2

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
 TEST REPORTS



TEST NUMBER _____ σ_c 1.406 kg/cm^2
 BORING NUMBER B-7 $\dot{\epsilon}$ 1.0 % /min.
 SAMPLE NUMBER TW-16
 DEPTH (FEET) 47.0-49.0
 CLASSIFICATION _____

INITIAL
 $\rho_d =$ 61.1 lb/ft^3
 M.C. = 63.0 %
 SAT. = 96.4 %
 B = N/A %

NOTES: Extruded into
1.4" SS tube



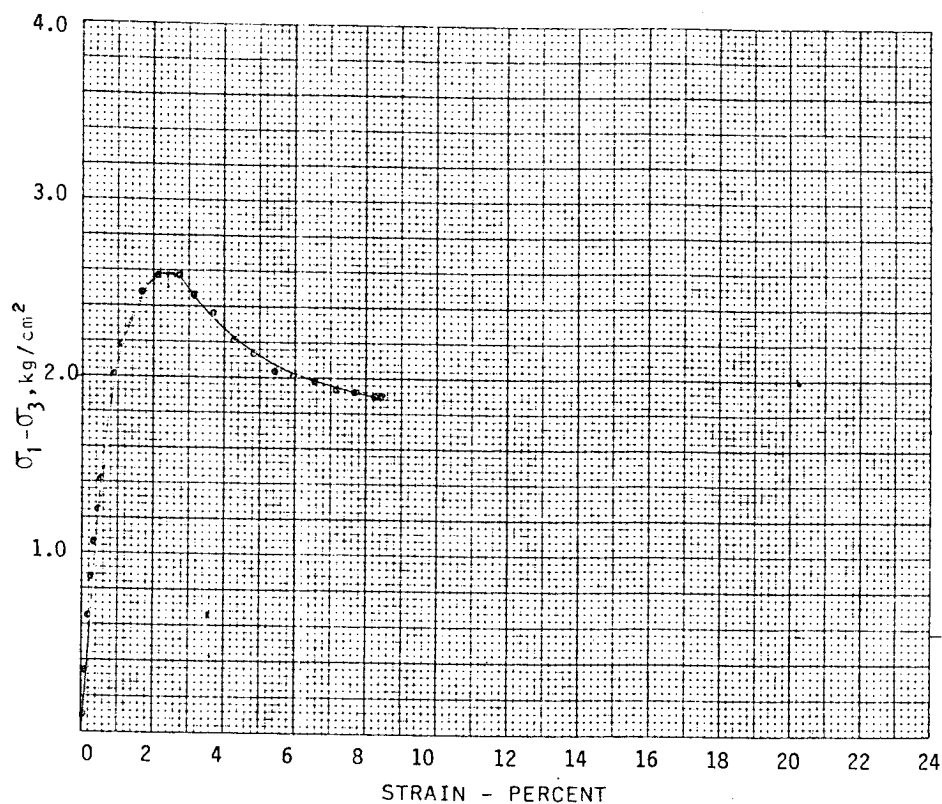
TYPE OF FAILURE

Orlando Utilities Commission
 Curtis H. Stanton Plant

UNCONSOLIDATED - UNDRAINED
 TRIAXIAL COMPRESSION TEST

TESTED BY: P.E. DATE 8/29/80 FILE NO. 80-6072

ARDAMAN & ASSOCIATES
 ENGINEERING TESTING LABORATORIES



TEST NUMBER _____ σ_c 1.76 kg/cm^2
 BORING NUMBER B-7
 SAMPLE NUMBER TW-18 $\dot{\epsilon}$ 1.0 % /min.
 DEPTH (FEET) 60.0-62.0
 CLASSIFICATION _____

INITIAL
 $\gamma_d =$ 50.5 lb/ft^3
 M.C. = 89.8 %
 SAT. = 99.5 %
 B = N/A %

NOTES: Trimmed from _____
 tube sample section



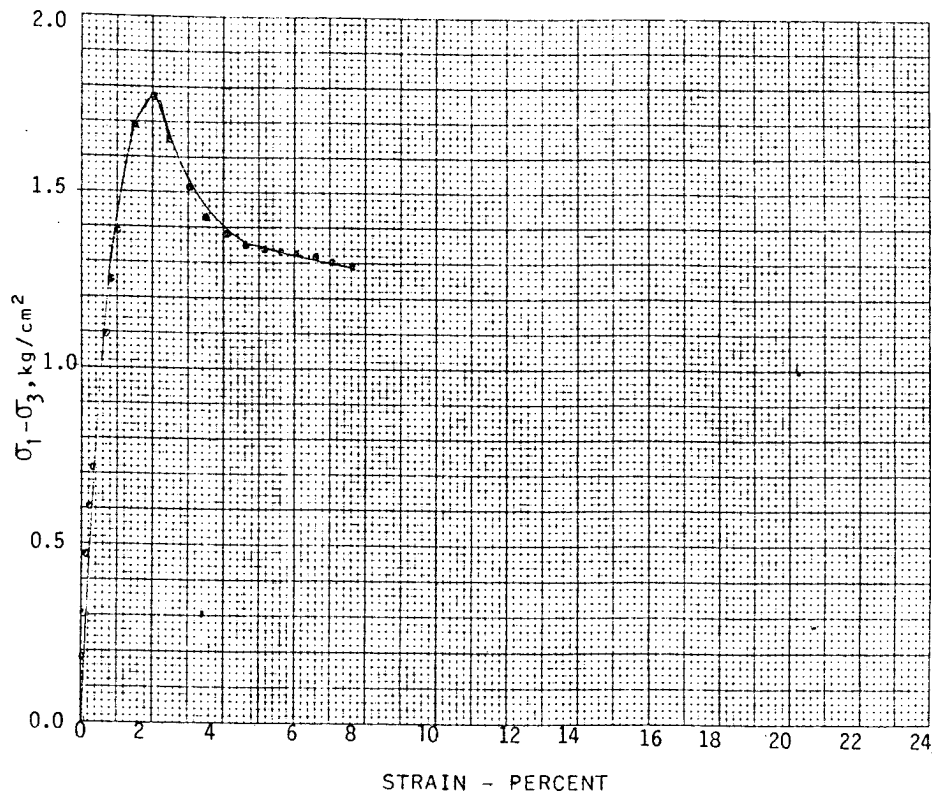
TYPE OF FAILURE

Orlando Utilities Commission
 Curtis H. Stanton Plant

UNCONSOLIDATED - UNDRAINED
 TRIAXIAL COMPRESSION TEST

TESTED BY:	DATE	FILE NO.
P.E.	8/11/80	60-6072

ARDAMAN & ASSOCIATES



TEST NUMBER _____ σ_c 1.05 kg/cm^2
 BORING NUMBER B-8 $\dot{\epsilon}$ 1.0 % /min.
 SAMPLE NUMBER TW-14
 DEPTH (FEET) 43.5-45.0
 CLASSIFICATION _____

INITIAL
 $\rho_d =$ 65.0 lb/ft^3
 M.C. = 58.8 %
 SAT. = 98.7 %
 B = N/A %

NOTES: Trimmed from
tube sample section TYPE OF FAILURE _____

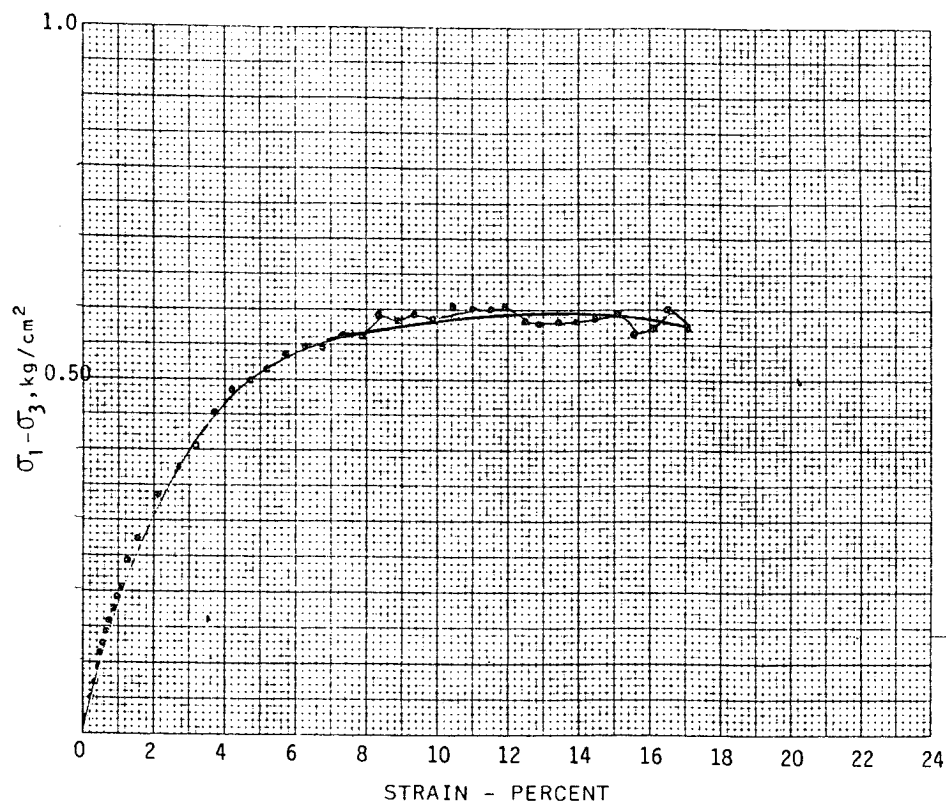


Orlando Utilities Commission
 Curtis H. Stanton Plant

UNCONSOLIDATED - UNDRAINED
 TRIAXIAL COMPRESSION TEST

TESTED BY:	DATE	FILE NO.
P.E.	8/11/80	80-6072

ARDAMAN & ASSOCIATES



TEST NUMBER _____ σ_c .703 kg/cm^2
 BORING NUMBER B-6 $\dot{\epsilon}$ 1.0 % /min.
 SAMPLE NUMBER TW-14
 DEPTH (FEET) 37.0-39.0
 CLASSIFICATION _____

INITIAL
 $\gamma_d = 83.5 \text{ lb/ft}^3$
 M.C. = 36.3 %
 SAT. = 96.4 %
 B = N/A %

NOTES: Extruded into 1.4" tube; heavy shell are at failure zone; fissured



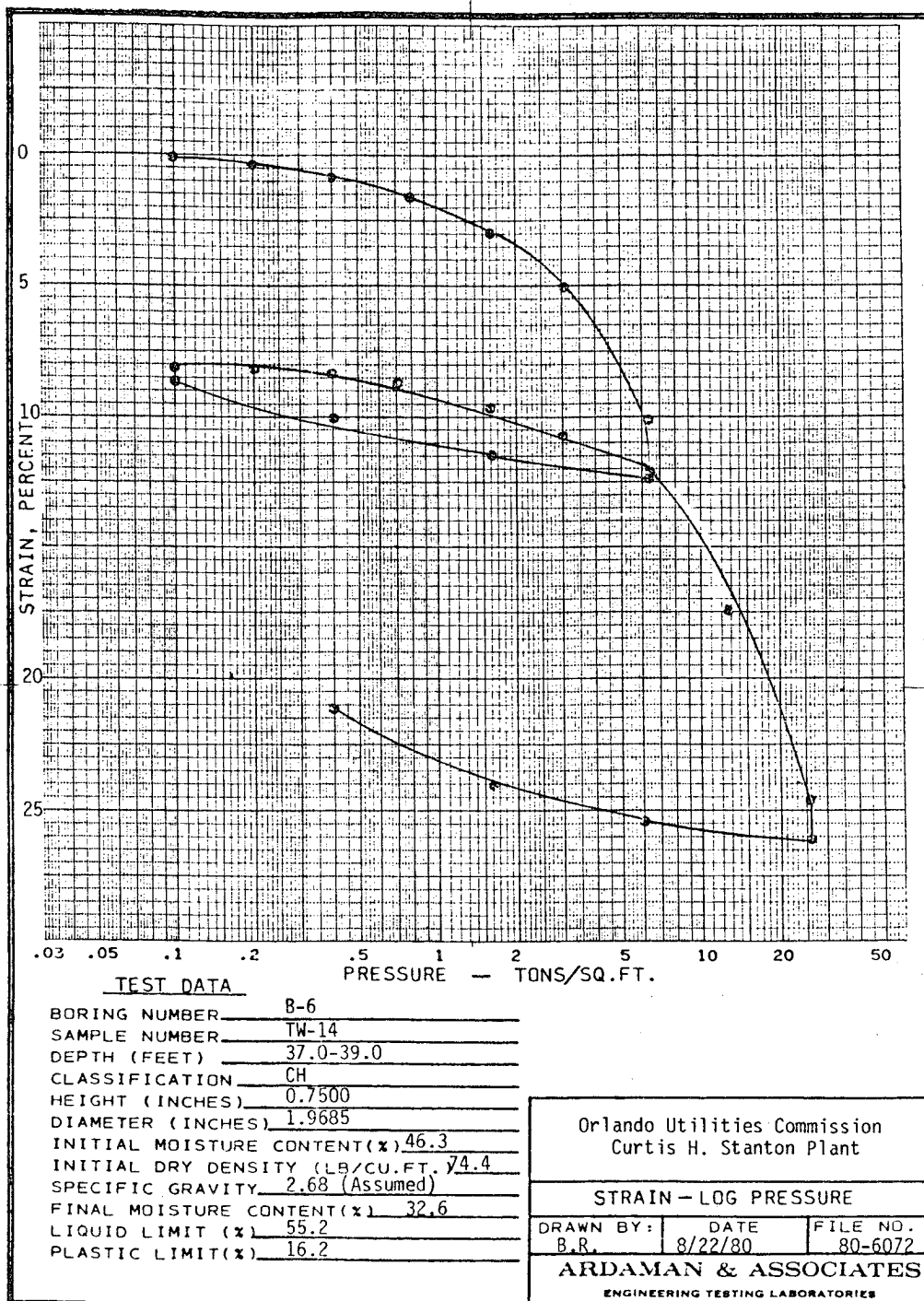
Orlando Utilities Commission
 Curtis H. Stanton Plant

UNCONSOLIDATED - UNDRAINED
 TRIAXIAL COMPRESSION TEST

TESTED BY:	DATE	FILE NO.
P.E.	8/29/80	80-6072

ARDAMAN & ASSOCIATES

ENGINEERS & GEOTECHNICAL CONSULTANTS

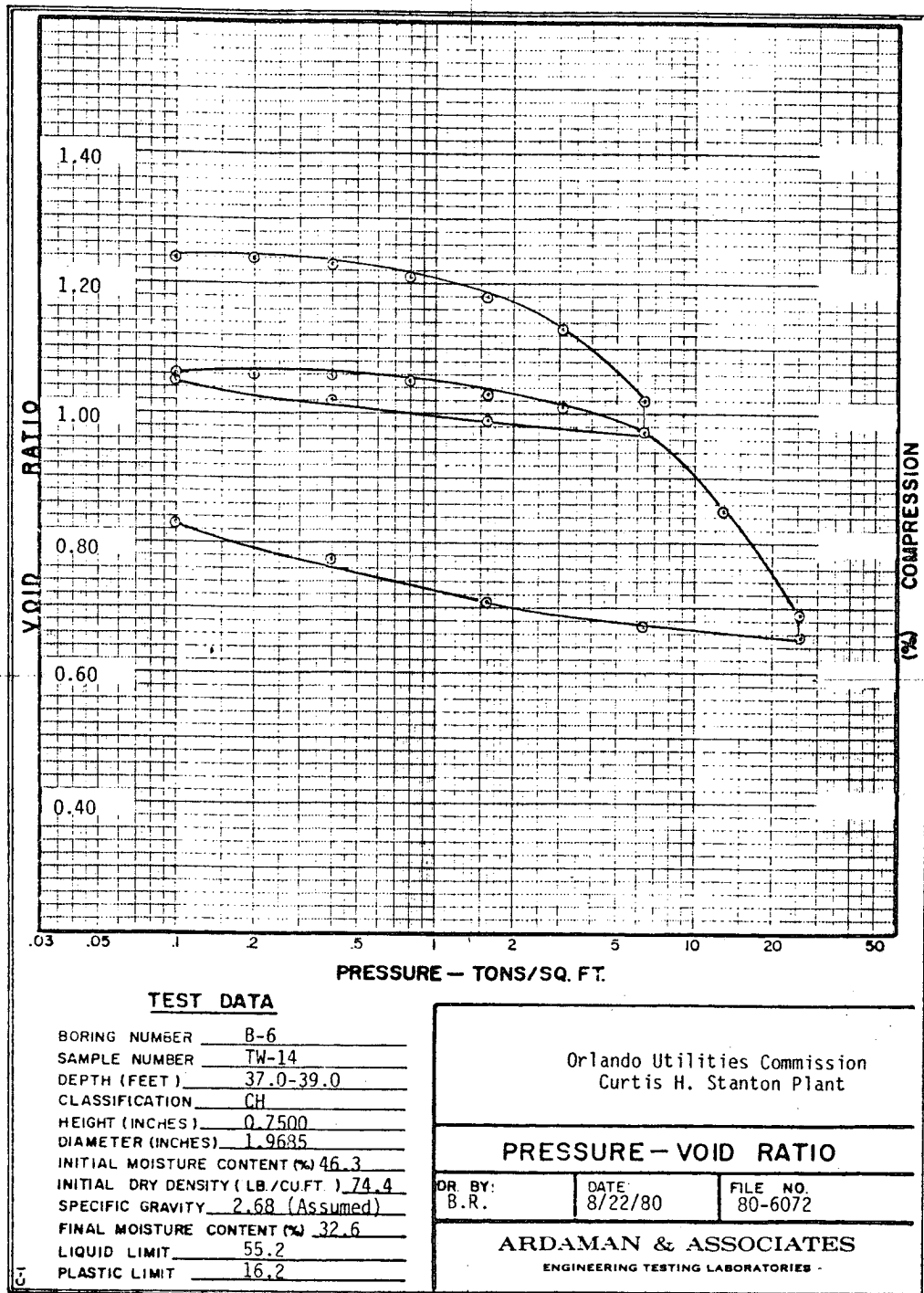


FILE NUMBER

3-1-A

ARDAMAN & ASSOCIATES

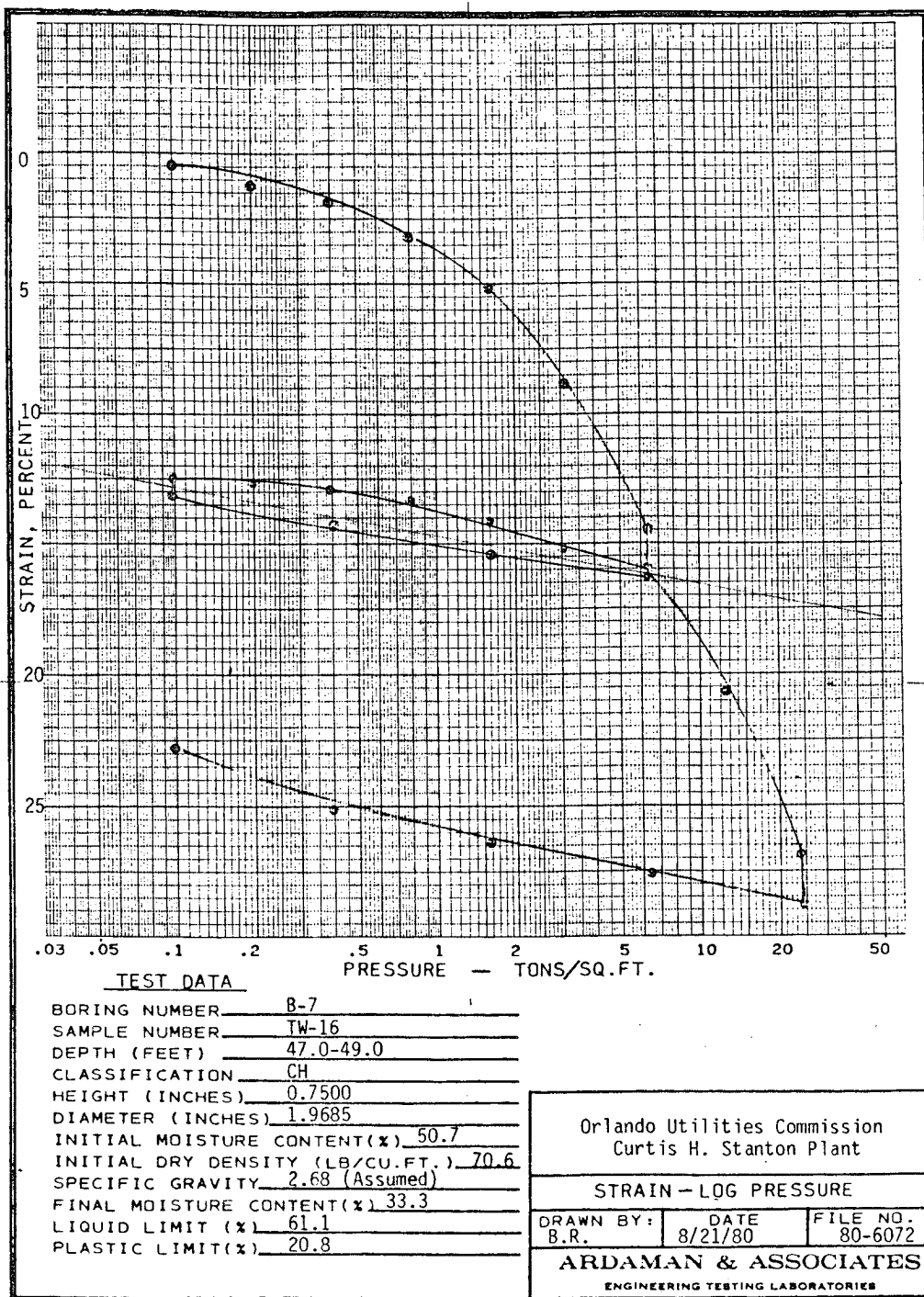
EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS



3-1-B

ARDAMAN & ASSOCIATES

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY TEST REPORTS

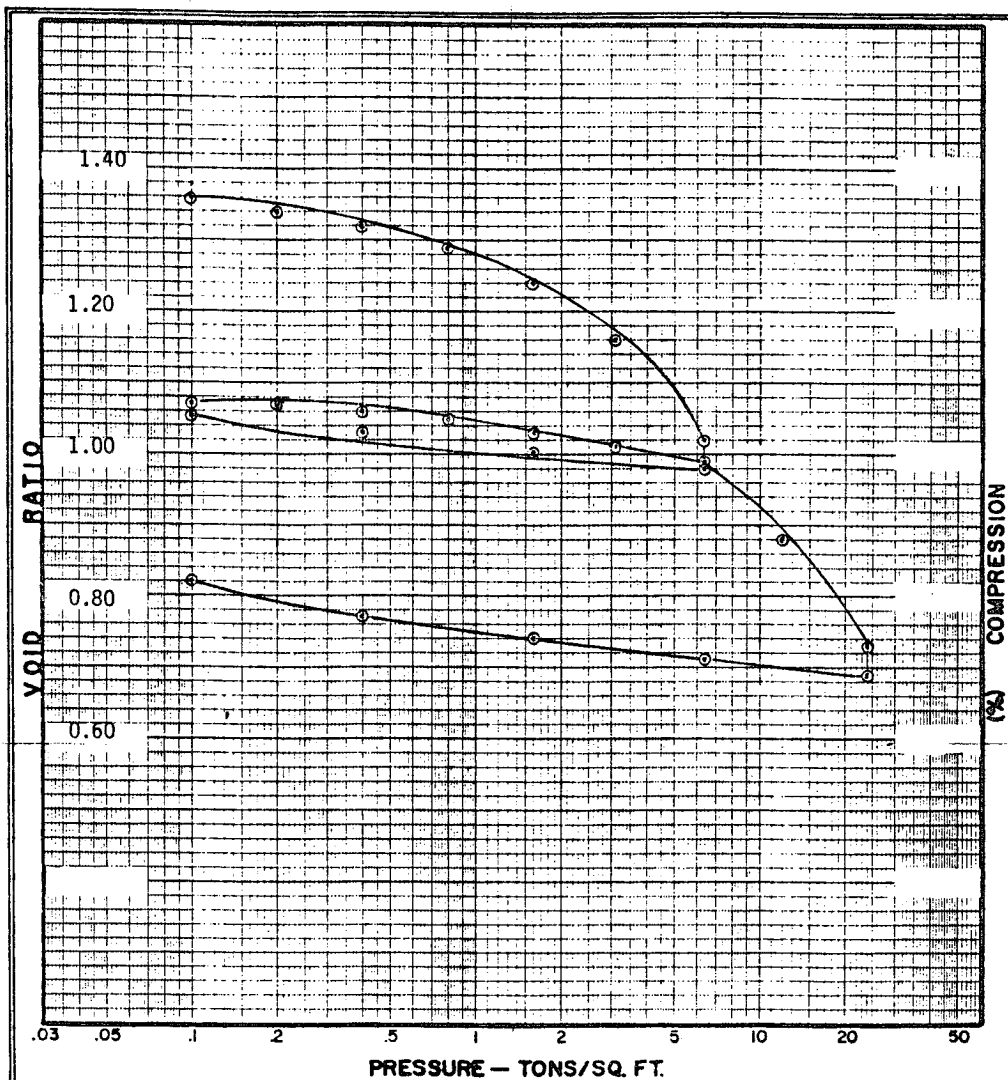


FILE NUMBER

3-2-A

ARDAMAN & ASSOCIATES
ENGINEERING TESTING LABORATORIES

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
TEST REPORTS



TEST DATA

BORING NUMBER B-7
 SAMPLE NUMBER TW-16
 DEPTH (FEET) 47.0-49.0
 CLASSIFICATION CH
 HEIGHT (INCHES) 0.7500
 DIAMETER (INCHES) 1.9685
 INITIAL MOISTURE CONTENT (%) 50.7
 INITIAL DRY DENSITY (LB./CU.FT.) 70.6
 Specific gravity 2.68 (Assumed)
 FINAL MOISTURE CONTENT (%) 33.3
 LIQUID LIMIT 61.1
 PLASTIC LIMIT 20.8

Orlando Utilities Commission
 Curtis H. Stanton Plant

PRESSURE-VOID RATIO

DR. BY:
 B.R.

DATE:
 8/21/80

FILE NO.
 80-6072

ARDAMAN & ASSOCIATES

ENGINEERING TESTING LABORATORIES

3-2-B

ARDAMAN & ASSOCIATES

EXHIBIT 2.4-2 (CONTINUED). SOIL BORING LABORATORY
 TEST REPORTS

2.5 HYDROLOGY

The information requested in DER Form 17-1.122 Sections 2.5.1 through 2.5.6 is contained entirely within the following two sections entitled 2.5.1 Surface Water and 2.5.2 Ground Water.

2.5.1 Surface Water

2.5.1.1 Regional Hydrology. The proposed plant site, railroad, access road, and makeup and return water pipelines are located within the St. Johns River and the South Florida Water Management Districts as shown on Figure 2.5-1. Within the St. Johns River Water Management District, project facilities are located within the Econlockhatchee and Little Econlockhatchee River basins. The railroad spur is located within the Boggy Creek and Ajay-East Tohopekaliga Canal basins in the South Florida Water Management District. Figures 2.5-2 to 2.5-4 indicate the locations of the proposed plant site, railroad, access road, and makeup and return water pipelines with respect to these drainage basins. Numerous small ponds and wet depressions, as well as several small unnamed intermittent streams are located throughout the region.

Precipitation within the region averages about 51 inches annually and varies throughout the year. A detailed discussion of rainfall patterns is presented in Section 2.6. Annual runoff within the region varies from a basin average of 7.7 inches within Boggy Creek basin to 15.8 inches within the Econlockhatchee River basin.⁽¹⁾ Average annual runoff within each drainage basin could vary significantly due to differences in areal topography and geology.

The United States Geological Survey (USGS) maintains several lake stage and stream gaging stations within the region. The major characteristics of the gaged streams and lakes within the vicinity of the proposed plant site and access corridors are summarized in Tables 2.5-1 and 2.5-2 respectively.

2.5.1.2 Boggy Creek Drainage Basin. The Boggy Creek drainage basin is part of the Kissimme River Basin and includes approximately 85 square miles of Orange and Osceola Counties in and south of Orlando. An area of about 11 square miles in the upper portion of the basin has no surface outlet and drains underground.⁽²⁾ The extreme southern portion of the basin is located within Osceola County, where Boggy Creek drains into East Lake Tohopekaliga. Periodic discharge measurements of Boggy Creek near Kissimmee were made from January, 1955 to September, 1959. Since September, 1959 continuous records of discharge have been obtained near Taft (USGS 02262900). The drainage area above this station is 83.6 square miles and the average discharge for the period of record (20 years) is 47.6 cubic feet per second (cfs) or 0.6 cubic feet per second per square mile (cfs/m). The maximum and minimum recorded flowrates are 3,680 cfs (44.0 cfs/m) and 0.1 cfs.

Altitudes within the basin range from about 60 feet, mean sea level (msl) at East Lake Tohopekaliga to 125 feet, msl in the upper basin. The lower portion of the basin is flat and contains many swamps and marshes, but relatively few lakes. The upper portion contains rolling hills with many lakes.

2.1.5.3 Ajay-East Tohopekaliga Canal Drainage Basin. This canal drains approximately 171 square miles, of which 54.5 square miles are in Orange County and 116.5 square miles are in Osceola County. Altitudes within Orange County range from 60 to 90 feet, msl. The topography is fairly flat and is characterized by swamps in the northern part and by lakes in the southern part.

Periodic flow measurements were made from November, 1942 to May, 1961 for the Ajay-East Tohopekaliga Canal near Narcoossee. The maximum recorded discharge within the canal was 1,420 cfs. A reverse flow of 0.25 cfs was measured in February, 1946. The average discharge, based on average unit runoff characteristics at several points on the Kissimmee River, is estimated to be about 170 cfs or 1.0 cfs/m.

The flow into Orange County from Osceola County was measured in the Myrtle-Mary Jane Canal near Narcoossee (USGS 02261500) from October, 1949

to January, 1968. The maximum flow into Orange County through this canal was 990 cfs. In September, 1956 the flow reversed for two days and flowed to Osceola County at the rate of 17 cfs. The average discharge for the period of record was 105 cfs or 0.95 cfs. Average annual runoff is approximately 13.5 inches and is fairly uniform throughout the basin.

2.5.1.4 Little Econlockhatchee River Drainage Basin. The Little Econlockhatchee River drains approximately 71 square miles of Orange County east of Orlando. The river is formed near the center of Orange County and flows generally northward through the County. The lower portion of the basin lies within Seminole County, where the Little Econlockhatchee River joins the Econlockhatchee River near Chuluota. Altitudes in the basin range from about 35 feet, msl near the county line to 127 feet, msl at the eastern edge of Orlando. Many swamps and marshes temporarily store runoff within the basin, thereby reducing the magnitude of peak flows in the river.

A gaging station exists on the Little Econlockhatchee River near Union Park (USGS 02233200). Streamflow data has been collected at this location since October, 1959. The drainage area at this location is 27.1 square miles and the average discharge is 25.1 cfs or 0.9 cfs. The maximum and minimum flowrates recorded at this station are 1,640 cfs (60.5 cfs) and 0.1 cfs.

2.5.1.5 Econlockhatchee River Drainage Basin. The Econlockhatchee River drains approximately 260 square miles of the western slope of the St. Johns River basin between Orlando and Bithlo. The headwaters are an elongated swamp within Orange and Osceola Counties from which drainage is slow and evapotranspiration losses are high.⁽³⁾ From its headwaters, the Econlockhatchee River flows in a generally northward direction through Orange County and into Seminole County where it is joined by its largest tributary, the Little Econlockhatchee River. Thereafter, the river flows in an easterly direction to its confluence with the St. Johns River.

Two streamflow gaging stations are currently maintained along the Econlockhatchee River. The most upstream gaging station is located approximately six river miles upstream from the proposed plant site at Magnolia

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Ranch 7 miles south of Bithlo (USGS 02233001). Streamflow records have been obtained since October, 1972. The drainage area above this station is 32.9 square miles and the average discharge for the period of record (7 years) is 18.4 cfs or 0.6 cfs. The maximum recorded discharge is 281 cfs (8.5 cfs). The river experiences no flow at this station many days each year. The other existing gaging station is located downstream from the confluence of the Econlockhatchee and Little Econlockhatchee Rivers near Chuluota (USGS 02233500). Streamflow records have been obtained since October, 1935. The drainage area above this station is 241 square miles and the average discharge for the period of record (44 years) is 266 cfs or 1.1 cfs. The maximum recorded streamflow is 11,000 cfs (45.6 cfs) and the minimum flow is 6.7 cfs.

In addition to the two existing gaging stations, a partial record station was located near Bithlo (USGS 02233100) from September, 1959 to May, 1965. This partial record station was located approximately six miles downstream from the proposed plant site with a drainage area of 119 square miles. Based on available records, the estimated average flow at this station is 88 cfs or 0.74 cfs.⁽²⁾ The maximum recorded discharge was 7,840 cfs (65.9 cfs) and the river experiences zero flow at this station in most dry years.

The channel of the Econlockhatchee River is well developed in its lower reach. In this reach, the channel is incised into the water-table aquifer so that the river derives some base flow from the shallow aquifer during even the most severe droughts. In addition, streamflows are augmented by effluent from the Orlando sewage plant and flows diverted from Lake Mary Jane in the Kissimmee River Basin through Disston Canal.

2.5.1.6 Local Hydrology.

Proposed Plant Site

The proposed plant site will be located approximately 3,500 feet southwest of the Econlockhatchee River, about ten miles southeast of Orlando and five miles southwest of Bithlo. The majority of the plant site lies within the Econlockhatchee River Basin. A portion of the site along the west site boundary lies within the Ajay-East Tohopekaliga Canal Basin.

Predominant surface hydrologic features in the vicinity of the general site area include Wide Cypress Swamp to the west, an unnamed tributary of the Econlockhatchee River to the north, Hart Branch and Cowpen Branch to the east, and Green Branch to the southeast. Hart, Cowpen, and Green Branch are tributaries of the Econlockhatchee River for which discharge records are not available. Wide Cypress Swamp lies within the Ajay-East Tohopekaliga Canal drainage basin. Approximate drainage areas of the above mentioned tributaries of the Econlockhatchee River are summarized in Table 2.5-3. The location of the proposed plant site with respect to local surface hydrologic features is shown on Figure 2.5-5.

Site elevations vary from approximately 54 feet at the northeastern corner to 92 feet near the west site boundary. Soils are composed of fine sands with variable organic content. Surface runoff from approximately 257 acres in the northwest corner of the site is directed in a northeasterly direction to an unnamed tributary of the Econlockhatchee River (Figure 2.5-5). Runoff from approximately 984 acres within the north central portion of the site flows in a northeasterly direction to Hart Branch. Approximately 1,305 acres comprising the central and eastern portions of the site are drained in a predominantly easterly direction to Cowpen Branch. Runoff from approximately 695 acres within the southwest portion of the site flows in a southeasterly direction to Green Branch. Surface runoff from about 39 acres along the western site boundary flows in a westerly direction to the Green Cypress Swamp area of the Ajay-East Tohopekaliga Canal drainage basin. Many areas characterized as swamps or wooded marshes are located throughout the area.

The maximum recorded flows for the Econlockhatchee River occurred in March, 1960. Peak flows of 11,000 cfs and 7,840 cfs were observed at the USGS gaging stations near Chuluota and Bithlo, respectively. The area drained at the Bithlo station is 119 square miles, while it is estimated that the Econlockhatchee River drains 74 square miles just above its confluence with Cowpen Branch, northeast of the site. The Bithlo gaging station was the nearest operating station in 1960 and was located approximately six miles downstream from the proposed site. If it is assumed that the unit runoff (65.9 cfs/mi) observed at the Bithlo station during the peak

flood of record is representative of the basin hydrologic conditions for the Econlockhatchee River above Cowpen Branch during the same period of time, then a peak discharge of about 4,875 cfs would have occurred within the Econlockhatchee River near the site. The predominant type of flooding that may occur at the proposed plant site is known as sheet flooding. United States Geological Survey Flood-Prone Area Maps indicate inundated areas during a flood having a 100-year recurrence interval. These flood-prone areas are shown for the proposed site in Figure 2.5-6.

The nearest existing gaging station is located approximately six river miles upstream from the proposed site on the Econlockhatchee River at Magnolia Ranch (USGS 02233001). Periods of zero flow have been recorded at this station as well as the discontinued station near Bithlo, located approximately six river miles downstream from the site. This indicates that periods of zero flow can be expected within the Econlockhatchee River, as well as within the local tributaries near the site during drought conditions.

The majority of precipitation experienced within the area is lost through the process of evapotranspiration. The remaining available moisture either runs off or percolates to the underlying water table aquifer. Average annual runoff from the entire Econlockhatchee River basin above the gaging station near Chuluota is approximately 15 inches. A portion of this runoff results from ground water recharge to the Econlockhatchee River throughout the lower reaches. Within the lower portions of the basin, the Econlockhatchee River is incised into the nonartesian aquifer and the actual direct surface runoff would be less than that computed from stream flow measurements. It has been estimated⁽²⁾ that average annual runoff is ten inches per year within the Econlockhatchee River basin above the gaging station at Magnolia Ranch. Knochenmus⁽⁴⁾ indicates an average annual water loss by runoff to be between 10 and 25 per cent of average annual precipitation for the general site area. Evapotranspiration is estimated to be between 72 and 87 per cent of average precipitation. Knochenmus states that the average annual water loss from evapotranspiration plus surface runoff is probably nearly uniform throughout the region: areas having lower rates of surface runoff have higher rates of evapotranspiration. The total of

these two losses is estimated to be about 97 per cent of precipitation, leaving three per cent, or about 1.5 inches available for percolation.

Continuous streamflow records for the Econlockhatchee River near the site are available for the gaging station at Magnolia Ranch only since 1972. Longer records are available for the Econlockhatchee River near Chuluota (1935-present) and for the Little Econlockhatchee River near Union Park (1959-present). Average annual runoff will vary throughout a drainage basin due to variations in precipitation, topography, and water table conditions. Table 2.5-4 indicates total runoff (surface and ground water recharge) computed at the three existing gaging stations within the Econlockhatchee River Basin. The relatively large amounts of total runoff measured at Chuluota and Union Park are due in part to ground water recharge during low flow periods. Also contributing to larger values of runoff is the fact that average precipitation was greater during the periods of record for these two stations. The role of ground water recharge can be seen by noting the characteristics of the flow-duration curves for the Econlockhatchee River near Bithlo and Chuluota, Figure 2.5-7. The flow-duration curve for the station near Chuluota is based on the period 1935-1962 while that for the partial record station near Bithlo is estimated based on available records. The shape of the flow-duration curve is determined by the hydrologic and geologic characteristics of a drainage area.⁽⁵⁾ The flat slope of the lower end of the curve representing the drainage area above Chuluota indicates the availability of perennial ground water storage within the lower portion of the basin. In contrast, the relatively steep slope of the lower end of the curve representing the basin above Bithlo indicates a negligible amount of ground water storage that contributes to streamflow during low flow periods.

As previously mentioned, average annual runoff is in part a function of average annual precipitation. Figure 2.5-8 shows the variation in total annual runoff (surface and ground water recharge) at selected stations within the Econlockhatchee River basin in comparison with total annual precipitation at Orlando for water years 1973 through 1979. During this time period, three continuous gaging stations were in operation within the

basin. With the exception of 1974, average annual runoff is seen to follow the same general trend as average annual precipitation at all three gaging stations. An increase in runoff along with a decrease in precipitation during water year 1974 could be the result of carryover ground water storage produced by above average precipitation during water year 1973. The proposed site lies approximately six river miles downstream from the gaging station at Magnolia Ranch. As a result, the rainfall-runoff relationship for this station is considered to be the most representative for that at the site. The average annual runoff at this station for the period of record is 7.6 inches corresponding to an average annual precipitation of 48 inches at Orlando. Based on this fact, and the above mentioned considerations dealing with the rainfall-runoff relationships within the area, it is estimated 10 inches of direct surface runoff will be experienced at the proposed site location during a year having an average annual amount of precipitation (about 51 inches). It is further estimated that during average conditions about 39.5 inches of moisture is lost through evapotranspiration and slightly more than 1.5 inches percolates to the underlying nonartesian aquifer.

Proposed Access Corridors

The proposed routing of the plant railroad, plant access road, power transmission lines, and makeup and return water pipelines are shown in Figures 2.5-2 through 2.5-4. The plant railroad extends south from the site approximately two miles within the Econlockhatchee River drainage basin through several areas of wooded marsh. Surface runoff within the area flows in an easterly direction to Green Branch and Turkey Creek. The railroad then turns to a southwesterly direction through the Ajay-East Tohopekaliga Canal drainage basin. The railroad crosses Hart Branch (a small tributary of Lake Hart) approximately 1-1/2 miles north of Lake Hart and then passes between Barton Lake and Buck and Red Lakes near the drainage basin divide. The majority of runoff within the area flows in a southerly direction to Crosby Island Marsh, Barton Lake, Lake Hart, and Lake Mary Jane. Approximately one mile south of Lake Nona, the railroad passes into

Boggy Creek drainage basin just north of its divide with Jim Branch drainage basin. Approximately 3/4 mile south of Mud Lake, the railroad turns to a northwesterly direction for approximately 3-1/2 miles. Thereafter, the railroad heads west to a turnout at the Seaboard Coast Line Railroad. Within Boggy Creek drainage basin, the railroad crosses Boggy Creek as well as several unnamed tributaries. It also crosses a drainage canal serving the Orlando International Airport and northern portions of the drainage basin.

The new Orange County road and makeup and return pipelines extend north from the proposed site approximately one-half mile to a point within an existing transmission line right-of-way. The facilities then turn northwest for approximately 4,100 feet to a point on the east-west section line between Sections 1 and 12, T23S, R31E. The county road and pipelines follow the section line west for about one mile to a point near the half section of Sections 2 and 11. The road and pipelines then turn north-northwest for slightly more than one mile to the northwest corner of Section 2 where they turn west and extend to the site of the new Orange County Plant. The county road turns northerly and extends to State Highway 50. The pipeline turns south near the Orange County Plant for about 450 feet where it terminates at the plant facilities. All of the modified pipeline route is within the Econlockhatchee River drainage basin and is parallel to the county road. The road will be constructed prior to the pipelines, therefore the pipelines will be installed on previously disturbed land.

RFM-1

2.5.1.7 Surface Water Quality. The chemical character of the surface water throughout the region differs from stream to stream and varies seasonally and daily in individual streams due to natural causes and development. Suspended sediment is not a serious problem in peninsular Florida. Dissolved minerals, water temperature, and color are the natural and man-influenced water quality phenomena significant to water use within the proposed site area. Surface water is generally low in mineral content if it is direct runoff or seepage from nonartesian aquifers and generally high in dissolved minerals if it was derived from the artesian aquifer⁽⁶⁾. Color of the surface water is extremely variable throughout the region and normally ranges from zero to about 200 Hazen units. After heavy rainfall, when highly colored water is flushed into small streams from swampy areas, the color may reach 300 to 600 units. Table 2.5-5 indicates the observed extremes in quality of surface water at selected stations within the vicinity of the proposed plant site and access corridors.

A continuous record of conductivity from October, 1959 to June, 1962 and analysis of water collected periodically to July, 1963 from the Econlockhatchee River near Bithlo (USGS 02233100) show the water to be high in color, soft, and low in mineral content. The color is always greatest during the early part of high-flow periods. The pH of the water was as low as 5.7 during high-flow periods, indicating that the water would be slightly corrosive. Analyses of water collected from the Little Econlockhatchee River near Union Park indicate that the quality is similar to the Econlockhatchee River.

The water in Boggy Creek is soft, low in mineral content, and high in color. Analytical data on water from the station near Taft indicates that most of the streamflow is direct surface runoff. Water from Lake Hart has high color, low pH values, and low dissolved mineral content. Lake Hart is in a swampy area containing a large amount of decaying organic material which causes the high color in the water. Decaying organic material usually contains weak organic acids which cause low pH. The mineral content of the water within Lake Hart is low because the soil in the area is relatively insoluble.

2.5.2 Ground Water

This section describes the ground water aquifers beneath the site. The description is based on published data and data from piezometers installed at various locations on and around the site. Effects on the aquifers from construction and plant operation are discussed in Section 5.0, monitoring systems are discussed in Section 6.0.

The three aquifers present beneath the site are the upper non-artesian aquifer, the intermediate secondary artesian aquifer, and the lower Floridan artesian aquifer. The secondary artesian aquifer is limited in continuity and is contained within the confining layer between the non-artesian aquifer and the artesian Floridan aquifer. Interconnection between the three aquifers is minimal.

Figure 2.5-9 illustrates the different patterns of water-level fluctuations and hydraulic interrelationships of the three aquifers. The top sawtooth pattern indicates rapid water level fluctuations in the non-artesian aquifer in response to direct infiltration of local rainfall. The secondary artesian sinusoidal pattern indicates gradual long-term declines and rises of the potentiometric surface, corresponding in general to dry and wet periods. This pattern also indicates that water enters and leaves the aquifer slowly and that the hydraulic connections to the overlying and underlying aquifers are very poor. The lower artesian sinusoidal pattern displays small sawtooth fluctuations of the potentiometric surface superimposed on a sequence of gradual long-term declines and rises. The small fluctuations indicate response to recharge by rainfall over distant areas; the gradual fluctuations indicate response to seasonal rainfall trends (Tibbals & Frazee, 1976).

The non-artesian aquifer is an unconfined water table aquifer occurring throughout the site area. The aquifer consists of fine sand and varies in thickness from 32 to 71 feet. In eastern Orange County, the stratum is generally 40 to 80 feet thick (Bush, 1979). This aquifer is referred to as the "shallow aquifer," the "unconfined aquifer" or the non-artesian aquifer" in literature.

The non-artesian aquifer is recharged from direct infiltration of precipitation. Water levels in the surface aquifer fluctuate in a seasonal pattern, responding mainly to local rainfall. During most years low rainfall occurs from November through February, and high rainfall occurs from June through September. Piezometer data indicate the water table is generally within five feet of the surface. The piezometric surface as interpolated from site piezometers is shown on Figure 2.5-10. The contours on the piezometric surface indicate a ground water divide exists near the western margin of the site. A connector well adjacent to the west-central site boundary, and the topography are anticipated to cause the westward slope of the piezometric surface of approximately 10.6 feet per mile. East of the divide and at the center of the site the water table generally slopes eastward at a gradient of approximately 13.8 feet per mile. At the eastern side of the site the general water table slopes northeastward at approximately 11.6 feet per mile. The aquifer discharges to intermittent streams within and around the site, including Cowpen and Hart Branches of the Econlockhatchee River.

Data on the hydraulic properties of the non-artesian aquifer is available from a U.S. Geological Survey connector well located immediately west of the site (Bush, 1979, P. 32). According to Bush, the unconfined aquifer has a transmissivity of approximately 590 ft²/day, a storage coefficient of 0.01, a vertical coefficient of permeability (K_v) of 0.4 foot per day and a horizontal coefficient of permeability (K_h) of 15.7 feet per day. The vertical coefficient of permeability has been confirmed to be representative by laboratory tests performed in conjunction with the preliminary subsurface investigation.

Available water-analysis data for the Floridan aquifer beneath the Orange County Landfill at the western perimeter of the site are presented in Exhibit 2.5-1. Chemical analyses of ground water samples from the shallow aquifer beneath the site are given in Exhibits 2.5-2 and 2.5-3. The water classification of the ground water as designated

The non-artesian aquifer is recharged from direct infiltration of precipitation. Water levels in the surface aquifer fluctuate in a seasonal pattern, responding mainly to local rainfall. During most years low rainfall occurs from November through February, and high rainfall occurs from June through September. Piezometer data indicate the water table is generally within five feet of the surface. The piezometric surface as interpolated from site piezometers is shown on Figure 2.5-10. The contours on the piezometric surface indicate a ground water divide exists near the western margin of the site. A connector well adjacent to the west-central site boundary, a suspected sinkhole in the northwest portion of the site and the topography are anticipated to cause the westward slope of the piezometric surface of approximately 10.6 feet per mile. East of the divide and at the center of the site the water table generally slopes eastward at a gradient of approximately 13.8 feet per mile. At the eastern side of the site the general water table slopes northeastward at approximately 11.6 feet per mile. The aquifer discharges to intermittent streams within and around the site, including Cowpen and Hart Branches of the Econlockhatchee River.

Data on the hydraulic properties of the non-artesian aquifer is available from a U.S. Geological Survey connector well located immediately west of the site (Bush, 1979, P. 32). According to Bush, the unconfined aquifer has a transmissivity of approximately $590 \text{ ft}^2/\text{day}$, a storage coefficient of 0.01, a vertical coefficient of permeability (K_v) of 0.4 foot per day and a horizontal coefficient of permeability (K_H) of 15.7 feet per day. The vertical coefficient of permeability has been confirmed to be representative by laboratory tests performed in conjunction with the preliminary subsurface investigation.

Available water-analysis data for the ground water in the shallow aquifer beneath the Orange County Landfill at the western perimeter of the site are presented in Exhibit 2.5-1. Total dissolved-solids average concentrations are less than 340 milligrams per liter. Chemical analyses of ground water samples from the shallow aquifer beneath the site are given in Exhibits 2.5-2 and 2.5-3. The water classification of the ground water as designated

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in the Florida Administrative Code, Chapter 17.3, is Class I-B. This classification is applied to ground water with levels of total dissolved solids less than 10,000 milligrams per liter.

The secondary artesian aquifer is limited in continuity and is contained within the confining layer between the non-artesian aquifer and the Floridan artesian aquifer. The confining layer ranges in thickness from 125 feet to 156 feet beneath the site. It is composed of interbedded and interfingered sand, clayey sand, silty and sandy clay and clay units. Where the sand units are extensive, they can be secondary artesian aquifers (Knochenmus, 1975, p. 8).

As shown in Figure 2.5-9, the secondary artesian aquifer acts as an aquitard. Ground water moves into and out of this aquifer at a very slow rate. Knochenmus, 1975, pp. 8-10, indicates..."The finer grained strata of the confining layer and of the material above it retard the downward movement of water from the non-artesian aquifer to the Floridan." Tibbals and Frazee, 1976, pp. 13, indicate the "Secondary artesian aquifers are recharged by leakage from above, and they discharge by leakage downward to the Floridan aquifer, and where tapped by wells."

Tibbals and Frazee, 1976, p. 22, indicate the secondary artesian aquifer can yield up to 700 gallons per minute to properly constructed wells. Chemical analyses of water from the secondary artesian aquifer at locations surrounding the site are given in Table 2.5-6. The maximum dissolved solids concentration is 400 milligrams per liter.

The principal aquifer beneath the site is the Floridan artesian aquifer which consists of approximately 2,000 feet of limestone and dolomitic limestone (Lichtler and others, 1968). The limestone is extensively solutioned increasing the secondary porosity. The solution channels are interconnected providing increased secondary permeability. Voids or solution cavities were encountered in Boring 6 and 7. The top of the Floridan aquifer at the site is at 196 feet of depth in Boring 6 and 199 feet of depth in Boring 7. A confining layer, containing the secondary artesian aquifers discussed above, overlies the Floridan aquifer.

The Floridan aquifer is recharged primarily from infiltration of precipitation in its outcrop area. Minor amounts of recharge are also provided from leakage through the overlying confining layer and via connector and drainage wells constructed through the confining layer that hydraulically join the non-artesian aquifer and the Floridan aquifer.

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The artesian pressure in the Floridan aquifer is created by 1) the difference in elevation between the surface of the Floridan aquifer in its primary recharge area and at the site and 2) the presence of the confining layer above the Floridan aquifer at the site. Although the top of the Floridan aquifer is at elevation -121 feet MSL, the pressure or potentiometric surface of the Floridan aquifer is approximately 45 feet MSL. Contours of this surface as of 1980 are shown on Figure 2.5-11. Contours of this surface in 1961 are shown on Figure 2.5-12. Comparison of these figures indicates the contour of the potentiometric surface in southern Orange County has been influenced by the Cocoa well field which was constructed from 1957 through 1968. The gradient of the potentiometric surface is to the northeast at approximately 2 feet/mile. The aquifer discharges to the St. John's River located about 18 miles east of the site where the potentiometric surface is above the ground surface, and artesian wells flow at the surface (Lichtler and others, 1968).

Pump tests at the Cocoa well field indicate the Floridan aquifer has a transmissivity ranging from 29,000 to 750,000 ft²/day and a storage coefficient of 0.0003 to 0.00007 (Tibbals and Frazee, 1976).

Chemical quality of the ground water in the Floridan aquifer in the area surrounding the site is given in Table 2.5-6. The chemical quality for the ground water in the Floridan aquifer beneath the Orange County Landfill is presented in Exhibit 2.5-1; the location of "Landfill Well A" is shown on Figure 2.5-10a. The chemical quality of the ground water in the Floridan aquifer is better in the western than in the eastern part of Orange County. The concentration of dissolved solids near the St. John's River is greater than 2,000 mg/l. The concentration of dissolved solids in the Floridan aquifer beneath Orange County is shown on Figure 2.5-13.

5

The Floridan aquifer is recharged primarily from infiltration of precipitation in its outcrop area. Minor amounts of recharge are also provided from leakage through the overlying confining layer, through sink-holes penetrating the confining layer, and via connector wells constructed through the confining layer that hydraulically join the non-artesian aquifer and the Floridan aquifer.

The artesian pressure in the Floridan aquifer is created by 1) the difference in elevation between the surface of the Floridan aquifer in its primary recharge area and at the site and 2) the presence of the confining layer above the Floridan aquifer at the site. Although the top of the Floridan aquifer is at elevation -121 feet MSL, the pressure or potentiometric surface of the Floridan aquifer is approximately 45 feet MSL. Contours of this surface as of 1980 are shown on Figure 2.5-11. Contours of this surface in 1961 are shown on Figure 2.5-12. Comparison of these figures indicates the contour of the potentiometric surface in southern Orange County has been influenced by the Cocoa well field which was constructed from 1957 through 1968. The gradient of the potentiometric surface is to the northeast at approximately 2 feet/mile. The aquifer discharges to the St. John's River located about 18 miles east of the site where the potentiometric surface is above the ground surface, and artesian wells flow at the surface (Lichtler and others, 1968).

Pump tests at the Cocoa well field indicate the Floridan aquifer has a transmissivity ranging from 29,000 to 750,000 ft^2/day and a storage coefficient of 0.0003 to 0.00007 (Tibbals and Frazee, 1976).

Chemical quality of the ground water in the Floridan aquifer in the area surrounding the site is given in Table 2.5-6. The chemical quality of the ground water in the Floridan aquifer is better in the western than in the eastern part of Orange County. The concentration of dissolved solids near the St. John's River is greater than 2,000 mg/l. The concentration of dissolved solids in the Floridan aquifer beneath Orange County is shown on Figure 2.5-13.

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TABLE 2.5-1. USGS STREAM DATA IN VICINITY OF PROPOSED PLANT SITE AND ACCESS CORRIDORS

<u>Station Name</u>	<u>USGS ID Number</u>	<u>Period of Record</u>	<u>Max. Flow (cfs)</u>	<u>Avg. Flow (cfs)</u>	<u>Avg. Flow (in/yr)</u>	<u>Min. Flow (cfs)</u>
Econlockhatchee River at Magnolia Ranch near Bithlo, Florida	02233001	10/72 to Present	281	18.4	7.6	0
Econlockhatchee River near Bithlo, Florida (partial record station)	02233100	9/59 to 5/65	7,840	88 ⁽¹⁾	10.0	0
Little Econlockhatchee River near Union Park, Florida	02233200	10/59 to Present	1,640	25.1	12.6	0.1
Econlockhatchee River near Chuluota, Florida	02233500	10/35 to Present	11,000	266	15.0	6.7
Myrtle-Mary Jane Canal near Narcoossee, Florida	02261500	10/49 to 1/68	990	105	12.8	-17 ⁽²⁾
Boggy Creek near Taft, Florida	02262900	10/59 to Present	3,680	47.6	7.7	0.10
Ajay-East Tohopekaliga Canal near Narcoossee (partial record station)		11/42 to 5/61	1,420	170 ⁽¹⁾	13.5	-0.25

(1) Estimated.

(2) Negative value indicates reverse flow.

TABLE 2.5-2. LAKE STAGES IN VICINITY OF PROPOSED PLANT SITE AND ACCESS CORRIDORS.*

<u>Station Name</u>	<u>USGS ID Number</u>	<u>Drainage₂ Area (mi²)</u>	<u>Surface Area (acres)</u>	<u>Period of Record</u>	<u>Maximum Elevation (ft)</u>	<u>Minimum Elevation (ft)</u>
Lake Mary Jane near Narcoossee, Florida	02261900	124	1,161	11/49 to Present	64.81	57.64
Lake Hart near Narcoossee, Florida	02262200	166	1,841	11/41 to 9/69	64.87	56.45

*Subsequent to 1962, lake stages have been partially regulated.

TABLE 2.5-3. DRAINAGE AREAS OF ECONLOCKHATCHEE RIVER TRIBUTARIES WITHIN VICINITY OF PROPOSED SITE

<u>Tributary</u>	<u>Drainage Area (square miles)</u>
Unnamed tributary north of site	7.8
Hart Branch (Econlockhatchee River tributary)	2.0
Cowpen Branch	2.8
Green Branch	4.2

TABLE 2.5-4. AVERAGE TOTAL RUNOFF AT EXISTING GAGING STATIONS WITHIN THE ECONLOCKHATCHEE RIVER BASIN*

<u>Gaging Station Name</u>	<u>Period of Record</u>	<u>Average Precipitation for Period of Record inches/water year</u>	<u>Drainage Area square miles</u>	<u>Average Runoff for Period of Record inches/water year</u>
Econlockhatchee River at Magnolia Ranch near Bithlo, Florida	10/72 to 9/79	48.0	32.9	7.60
Econlockhatchee River near Chuluota, Florida	10/35 to 9/79	51.2	241	14.99
Little Econlockhatchee River near Union Park, Florida	10/59 to 9/79	49.2	27.1	12.58

*Precipitation recorded at Orlando, Florida.

TABLE 2.5-5. OBSERVED EXTREMES IN SURFACE WATER QUALITY WITHIN VICINITY OF PROPOSED SITE, PERIOD 1952-1965*

Source	Silica (SiO ₂)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO ₃)	Sulfate (SO ₄)	Chloride (Cl)	Fluoride (F)	Nitrate (NO ₃)	Dissolved Solids		Hardness as CaCO ₃		Specific Conductance micromhos at 25 C)	ph	Color
												Calculated	Residue	Calcium, Magnesium	Non- Carbonate			
Econlockhatchee River near Bithlo	.0-8.9	.02-.50	2.6-26	.2-2.7	1.8-15	.2-1.6	8-83	0-6.4	3.0-23	.0-.8	.0-1.3	16-108	32-163	8-74	0-19	24-197	5.7-7.8	35-400
Econlockhatchee River near Chuloota	1.7-12	.00-.60	3.6-51	1.0-14		.7-112**	10-112	1.0-58	8.0-179	.2-.6	.0-14	31-468	--	13-162	5-74	55-873	6.2-7.6	40-600
Little Econlockhatchee River near Union Park	.3-11	.01-.77	5.4-16	.6-4.8	5.2-16	.2-2.4	9-51	1.2-6.8	9.5-20	.0-.4	.0-.8	35-75	69-146	16-48	4-20	58-146	5.6-8.0	20-400
Rogey Creek near Taft	.8-10	.01-.33	3.8-8.8	0.7-4.3	5.5-14	0.8-2.3	9-34	1.2-6.4	9-18	.1-.7	.0-.9	29-73	59-134	13-30	0-14	55-121	6.2-8.0	4-210
Hart Lake near Narcoossee	.5-4.1	.00-.31	1.7-8.8	.5-2.9		.9-11**	3-13	.2-16	7.5-16	--	.0-1.4	20-52	--	9-31	6-20	38-110	5.4-6.3	30-170

*Chemical constituents in milligrams per liter.

**Combined Sodium and Potassium.

TABLE 2.5-6. CHEMICAL ANALYSES OF WATER FROM AQUIFERS IN EASTERN ORANGE COUNTY

Name or Well No.	Sample Date	(SiO ₂)	(Fe)	(Ca)	(Mg)	(Na)	(K)	(HCO ₃)	(SO ₄)	(Cl)	(F)	(NO ₃)	Dissolved Solids	Hardness	Specific Conductance (micromhos at 26 C)	pH	Color	Well Depth (feet)
Non-artesian aquifer																		
283353N0811042.1	7/1/71	6.9	.72	9.4	2.3	7.8	.9	48	10	12	.1	.0	95	33	138	6.0	80	22
283249N0810532.3	10/63-4/70 (6 analyses)	3.1-4.2	.00-.71	23-50	1.1-1.8	5.0-8.0	.1-.5	96-164	.0-1.6	8.0-11	.0-.1	.0-1.0	107-157	84-132	202-288	6.9-7.9	5-10	15
283212N0810107.1	12/20/63	9.9	4.5	26	.7	7.4	1.2	78	.6	15	.0	.2	98	68	175	7.0	5	24
283126N0811436.1	9/10/62	7.0	2.0	6.4	.2	6.0	1.4	17	2.4	12	.1	.0	54	.7	74	6.6	50	8
283127N0811439.1	9/10/62	20	.79	70	1.8	9.2	.7	218	.0	12	.4	.0	252	182	366	7.8	45	19
282019N0811042.1	7/1/71	3.8	1.5	.6	1.0	11	.2	45	.0	18	.1	.0	85	6	127	5.9	50	17
282952N0815952.1	12/20/63	2.5	.00	.4	1.0	4.3	.6	5	.0	8.0	.1	.0	26	5	39	6.9	5	22
282531N0810822.2	7/1/71	7.1	11	85	7.8	31	2.0	238	59	43	.1	.0	380	245	612	6.9	160	8
282510N0810545.4	7/1/71	3.0	26	16	7.0	38	9.6	40	83	29	.1	.0	225	69	377	6.1	5	40
282336N0810143.1	7/1/71	9.7	1.2	9.8	2.5	24	1.3	48	.8	44	.1	.0	146	35	230	6.1	5	20
Secondary Artesian Aquifer																		
283249N0810532.2	10/63-4/70 (5 analyses)	12-18	.00-.47	107-120	1.1-2.9	8.4-13	.9-2.7	352-382	.0-7.2	9.0-22	.2-.6	.0-1.6	321-400	279-316	550-620	7.5-8.2	0-20	75
282530N0810542.3	1/69-4/70 (6 analyses)	18-20	--	63-112	3.4-3.7	15-16	1.0-4.1	--368	.0-.4	15-18	.1-.2	.0-.7	237-360	172-296	386-602	7.9-8.4	0-10	172
Floridan Aquifer																		
283407N0811341.1	4/27/70	13	--	36	7.2	7.4	1.0	120	8.8	10	.2	.0	153	120	275	7.3	0	434
283249N0810532.1	4/21/70	19	--	62	15	35	1.9	194	46	63	.3	.0	353	218	592	7.1	5	492
283214N0805835.1	5/12/69	20	.09	155	55	350	13	218	268	660	.4	2.0	1,640	619	2,810	7.9	0	200
282847N0810137.4	4/21/70	25	--	58	33	45	2.1	218	69	90	.6	.0	419	283	765	7.5	0	495
282623N0811438.1	4/20/70	32	--	61	8.8	16	1.3	236	.4	21	.5	.0	267	189	423	7.7	5	435
282531N0810756.1	5/15/69	22	.10	108	5.6	33	2.1	299	50	54	.3	.0	422	294	720	7.8	10	509
282348N0805647.1	4/27/70	27	--	93	27	162	3.0	204	51	348	.9	.0	995	345	1,500	7.6	5	390

¹ Sample taken from water tap, maybe contaminated from plumbing.

Table modified from Knochenmous (1975).

NOTE:

SiO ₂ - Silica	HCO ₃ - Bicarbonate
Fe - Iron	SO ₄ - Sulfate
Ca - Calcium	Cl - Chloride
Mg - Magnesium	F - Fluoride
Na - Sodium	NO ₃ - Nitrate
K - Potassium	

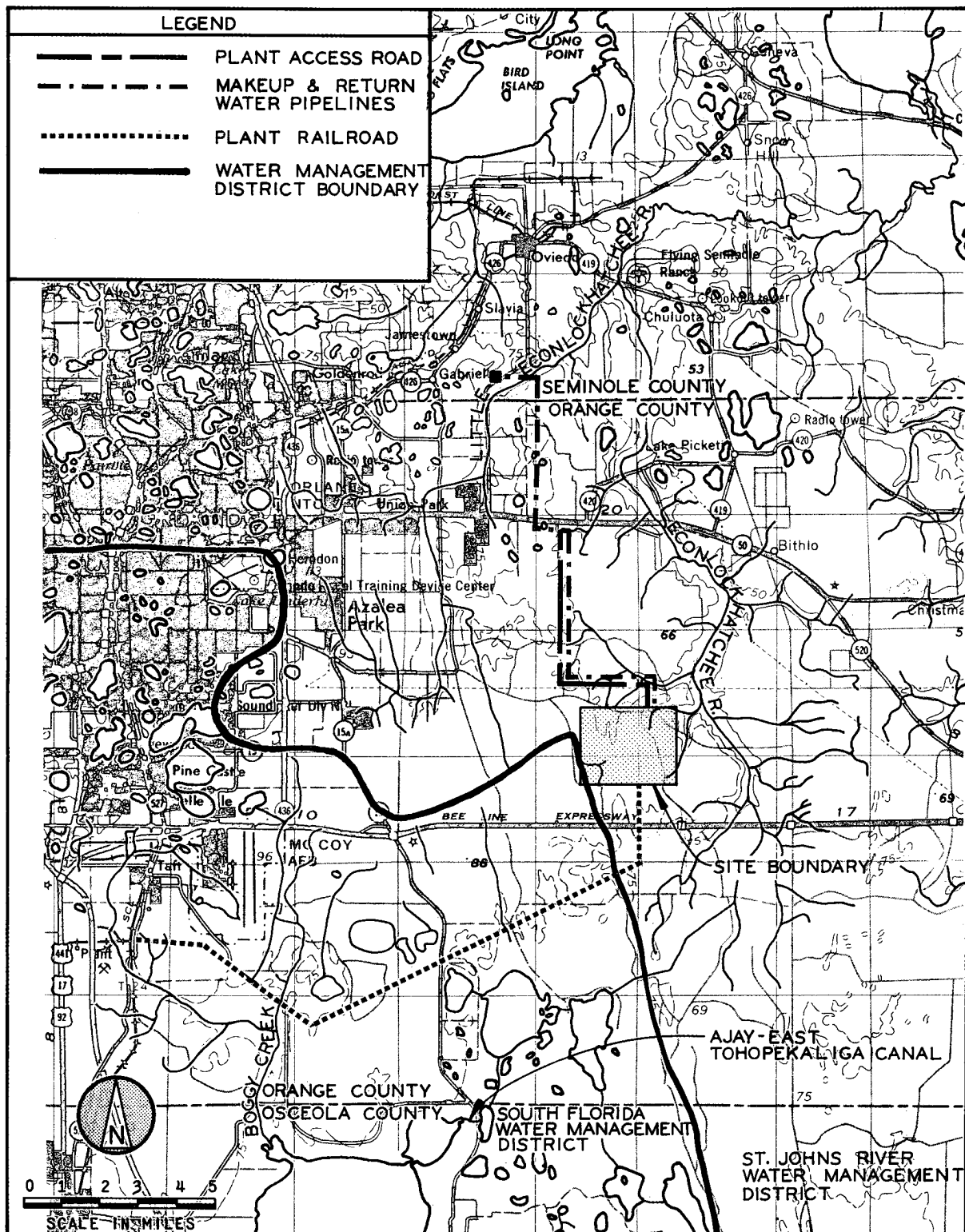
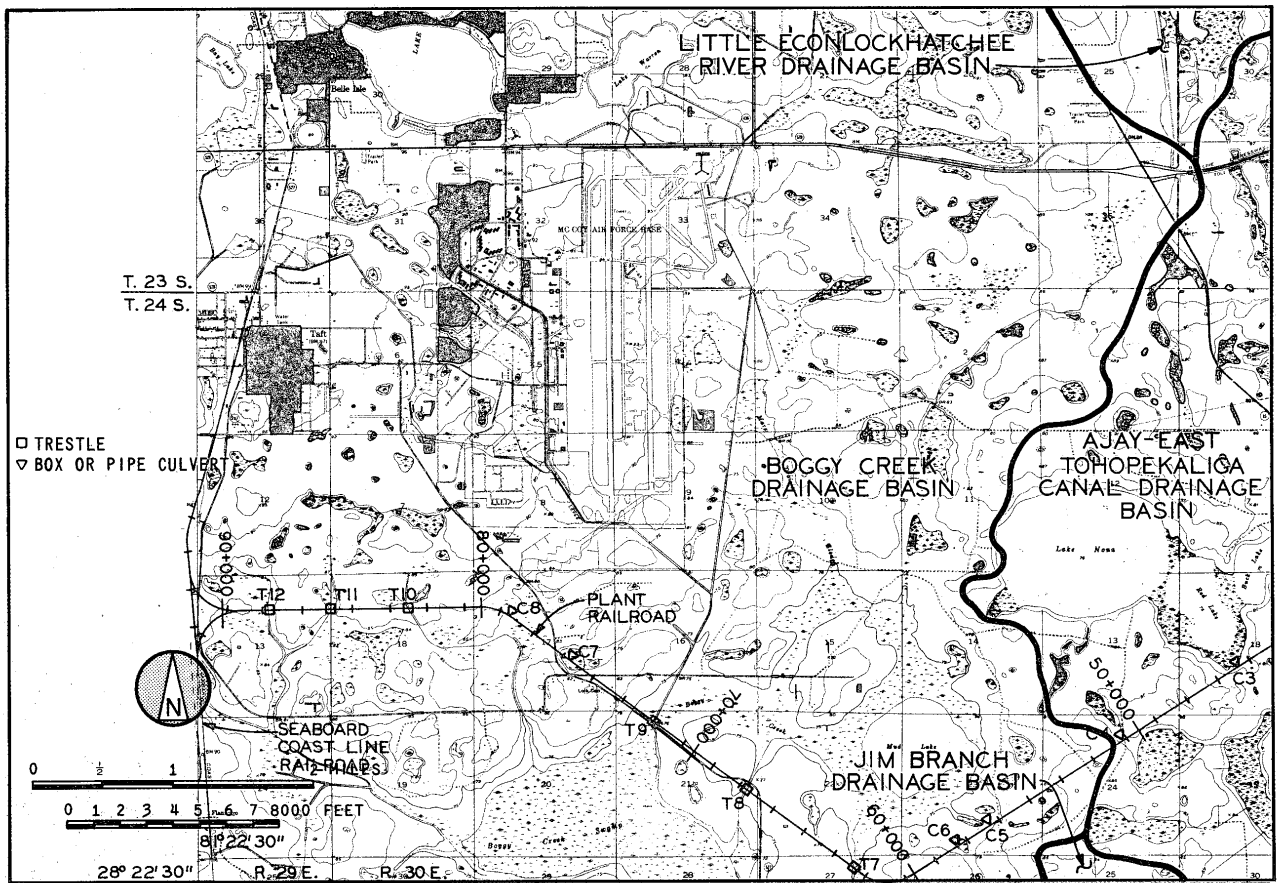


FIGURE 2.5-1. REGIONAL MAP OF WATER MANAGEMENT DISTRICTS



PINE CASTLE QUADRANGLE
 FLORIDA-ORANGE CO.
 7.5 MINUTE SERIES

FIGURE 2.5-3. DRAINAGE BASINS OF THE RAIL SPUR CORRIDOR

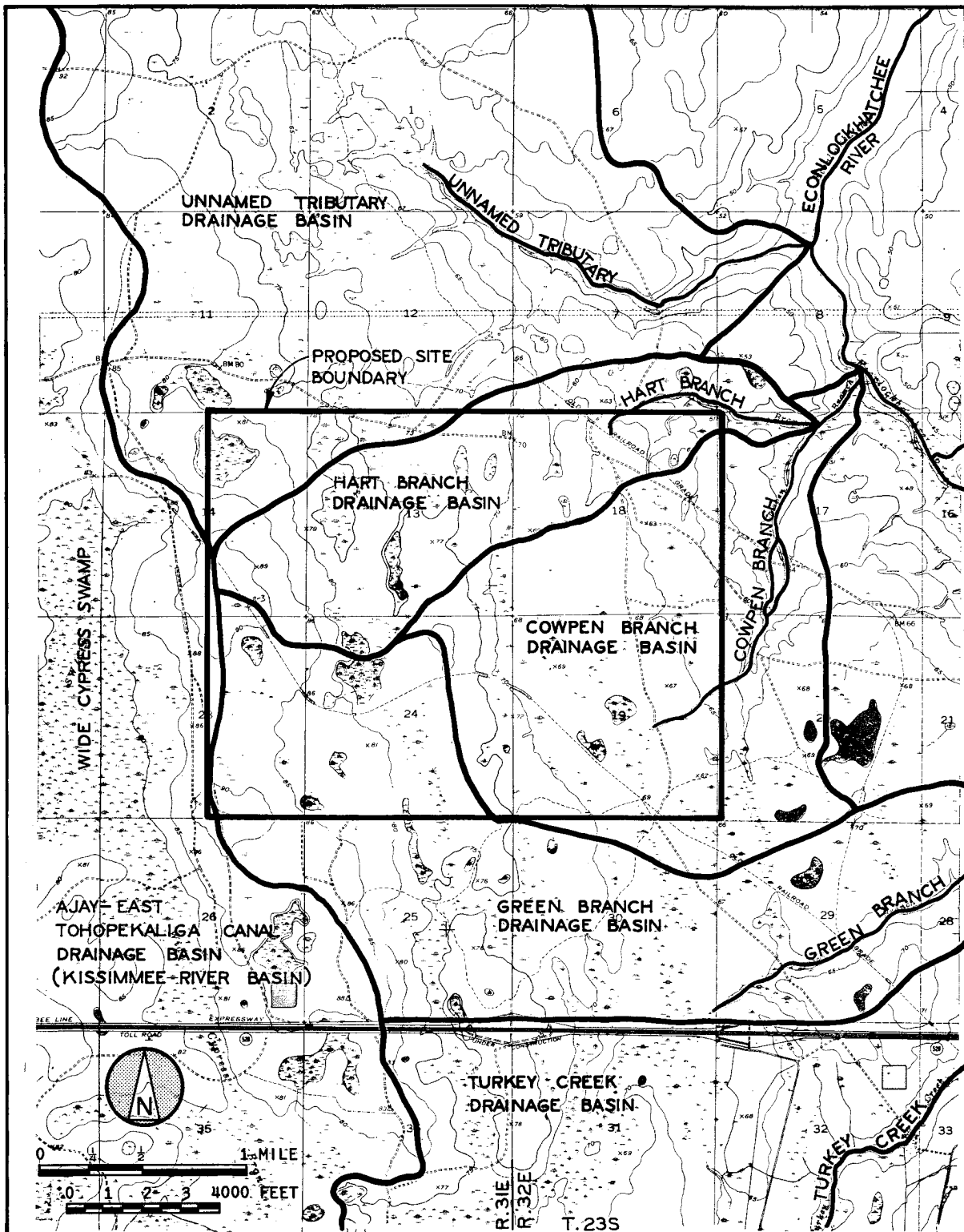


FIGURE 2.5-5. LOCAL SURFACE
HYDROLOGIC FEATURES
WITHIN THE VICINITY
OF THE PROPOSED SITE

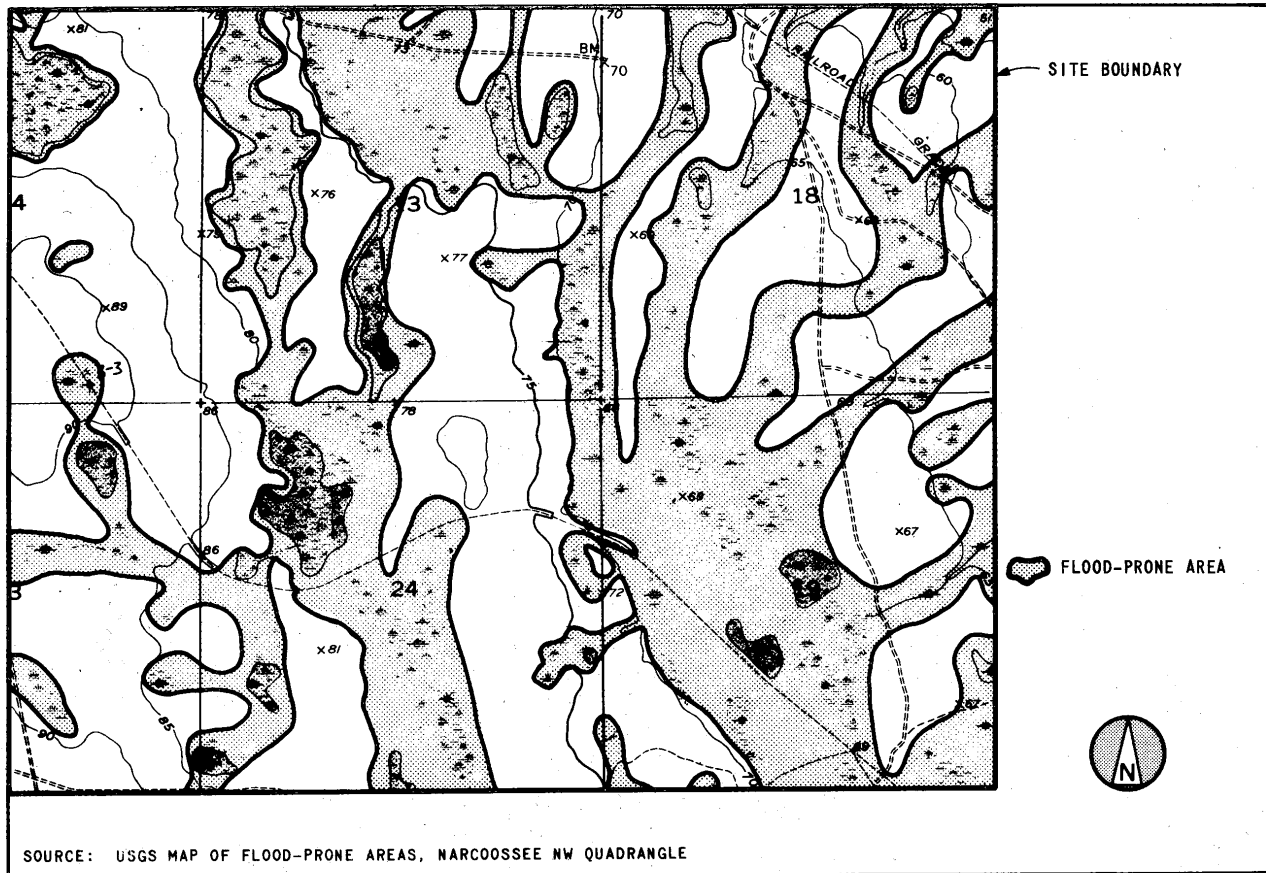


FIGURE 2.5-6. 100 YEAR FLOOD-PRONE AREAS
AT THE PROPOSED SITE

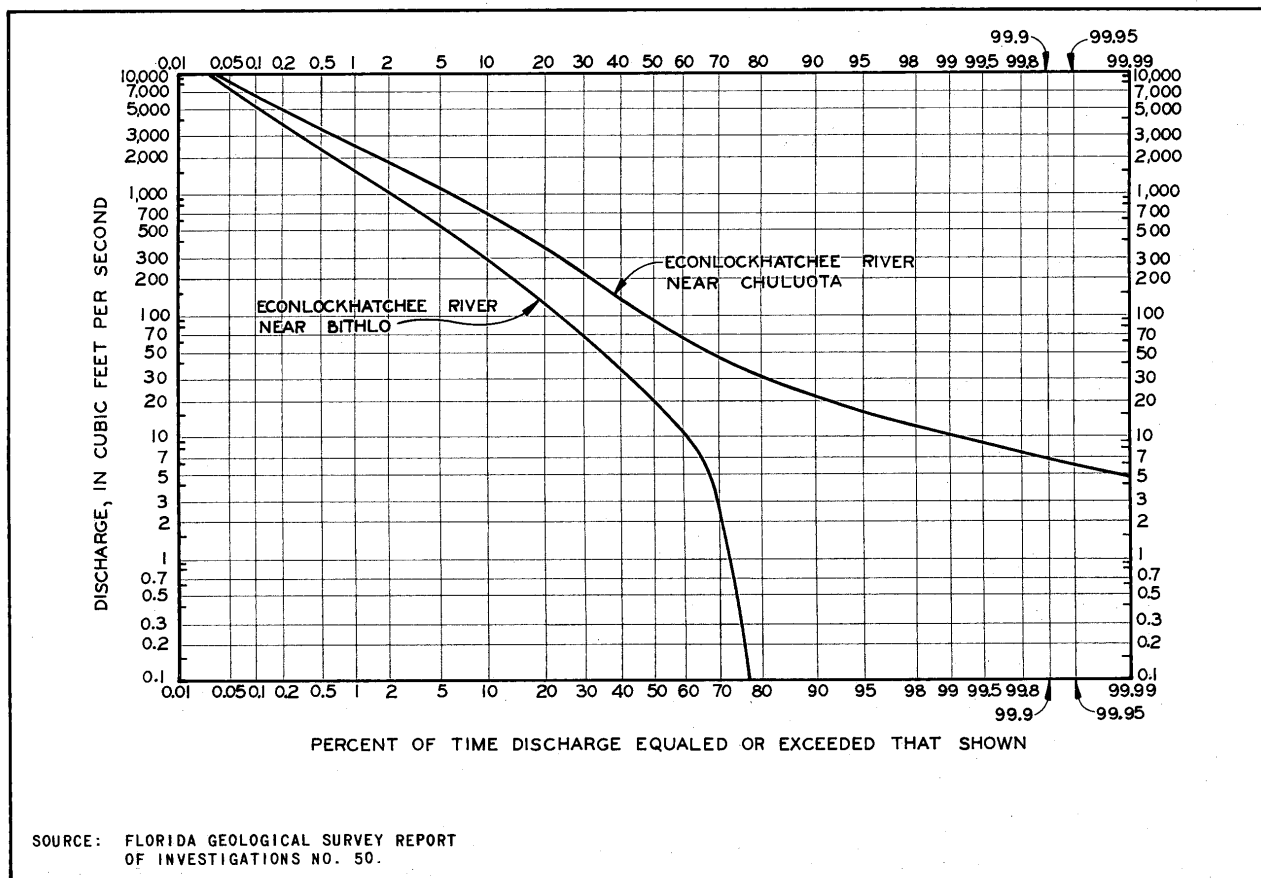
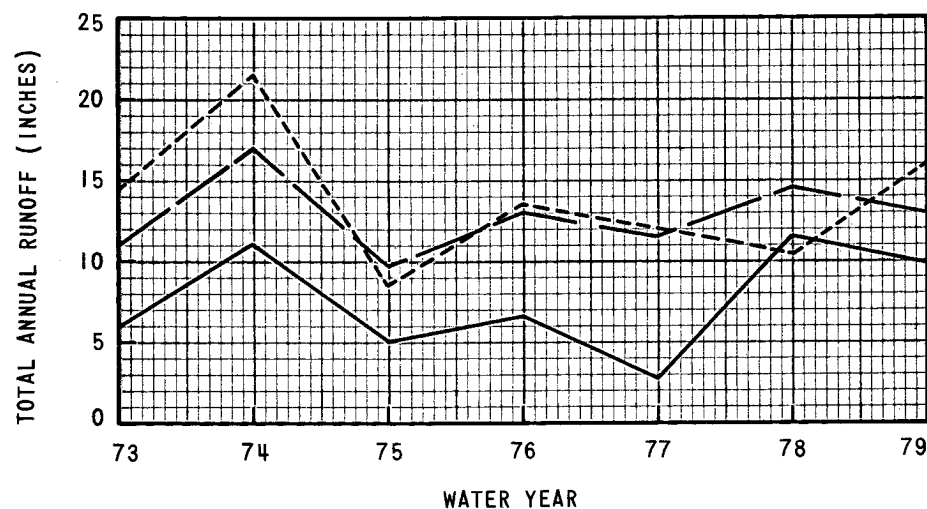
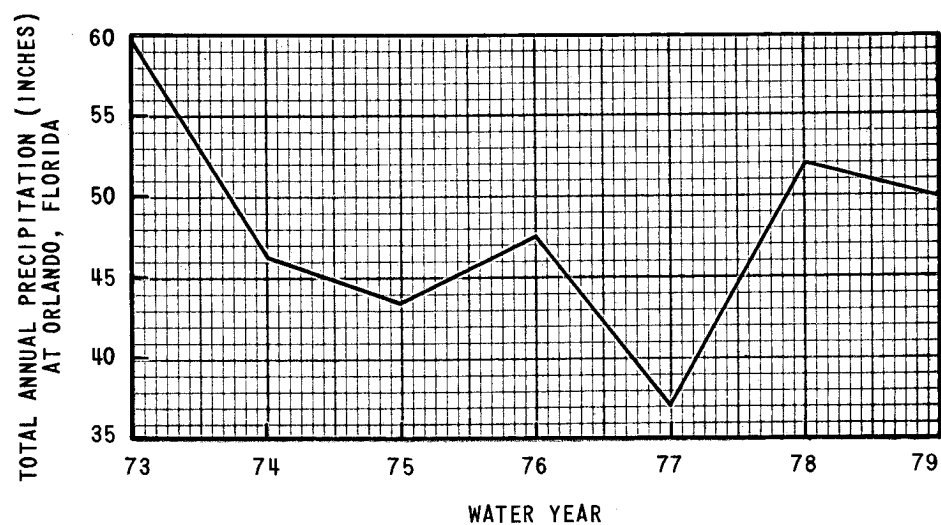


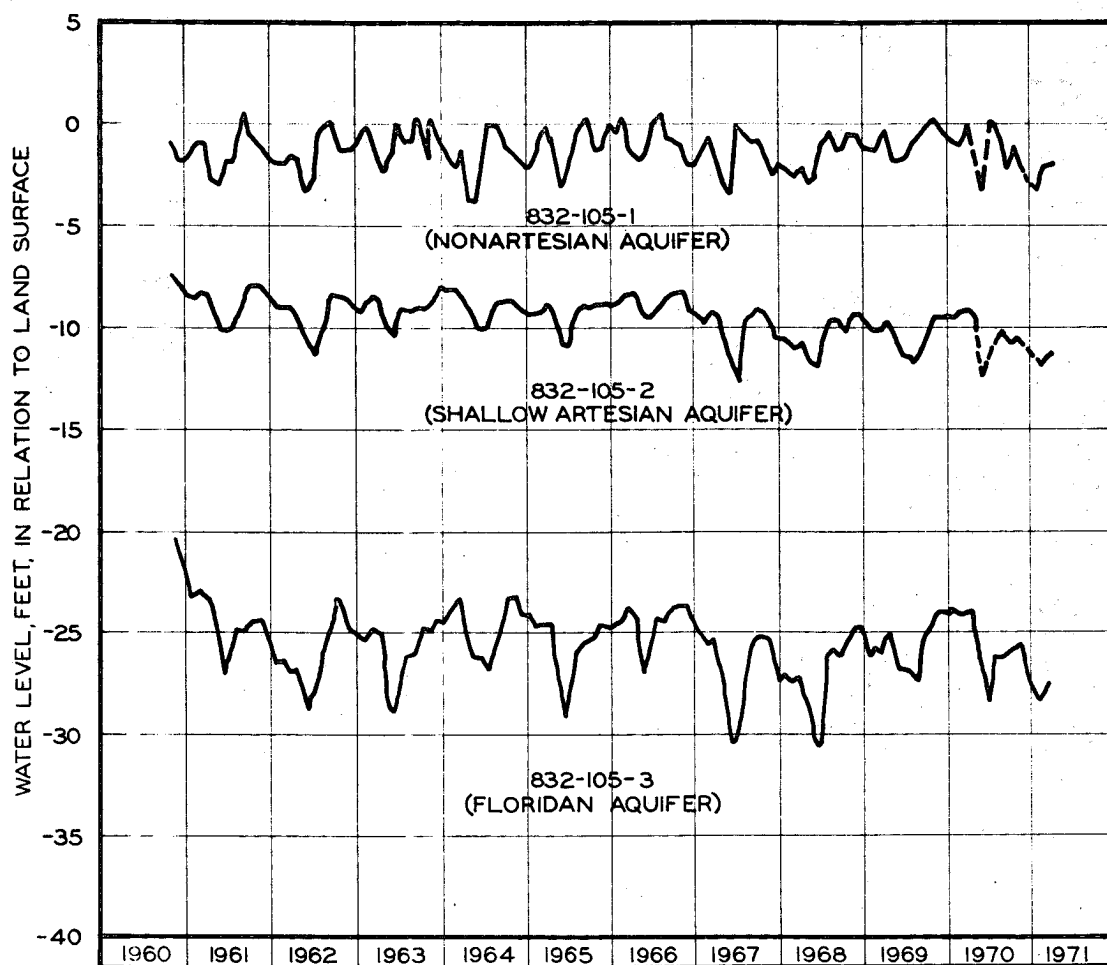
FIGURE 2.5-7. FLOW DURATION CURVES FOR GAGING STATIONS ALONG THE ECONLOCKHATCHEE RIVER



LEGEND (TOTAL ANNUAL RUNOFF)

- LITTLE ECONLOCKHATCHEE RIVER NEAR UNION PARK
- ECONLOCKHATCHEE RIVER NEAR CHULUOTA
- ECONLOCKHATCHEE RIVER AT MAGNOLIA RANCH NEAR BITHLO

FIGURE 2.5-8. TOTAL ANNUAL RUNOFF AND PRECIPITATION WITHIN THE ECONLOCKHATCHEE RIVER BASIN WATER YEARS 1973-1979



WELL HYDROGRAPH

SOURCE: KNOCHENMUS, 1975

FIGURE 2.5-9. HYDROGRAPHS OF WELLS
TAPPING THE NONARTESIAN,
SHALLOW ARTESIAN AND
FLORIDAN AQUIFER NEAR
BITHLO, FLORIDA

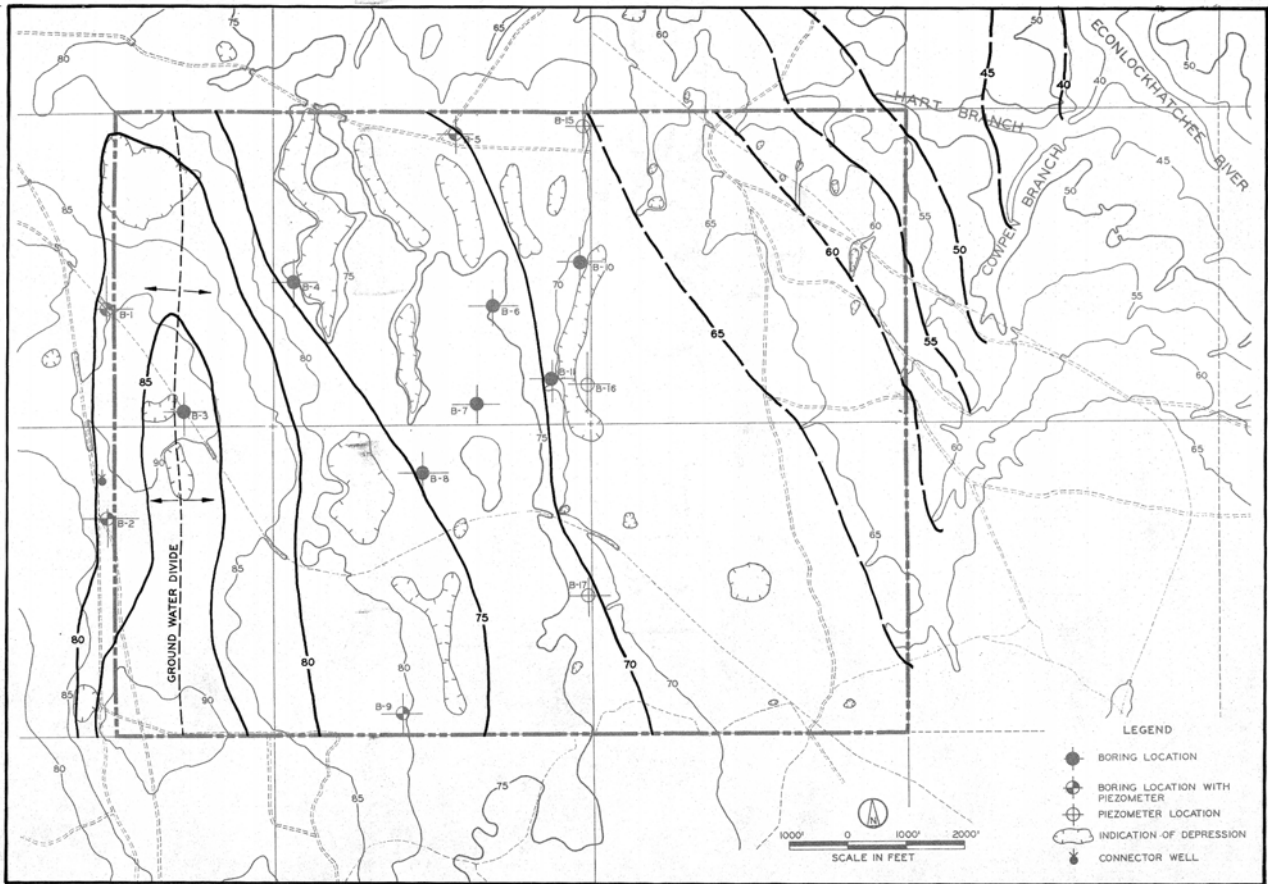
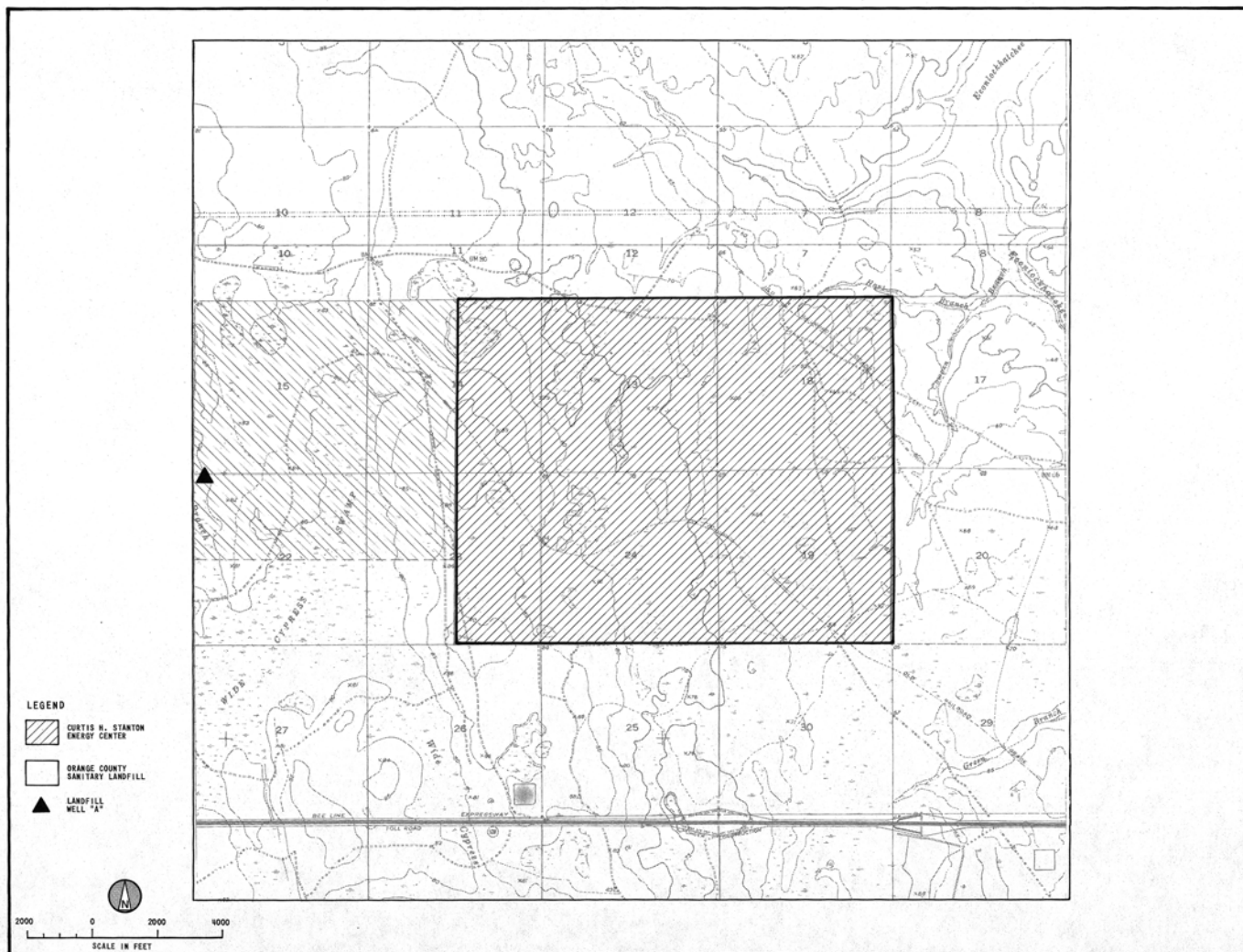
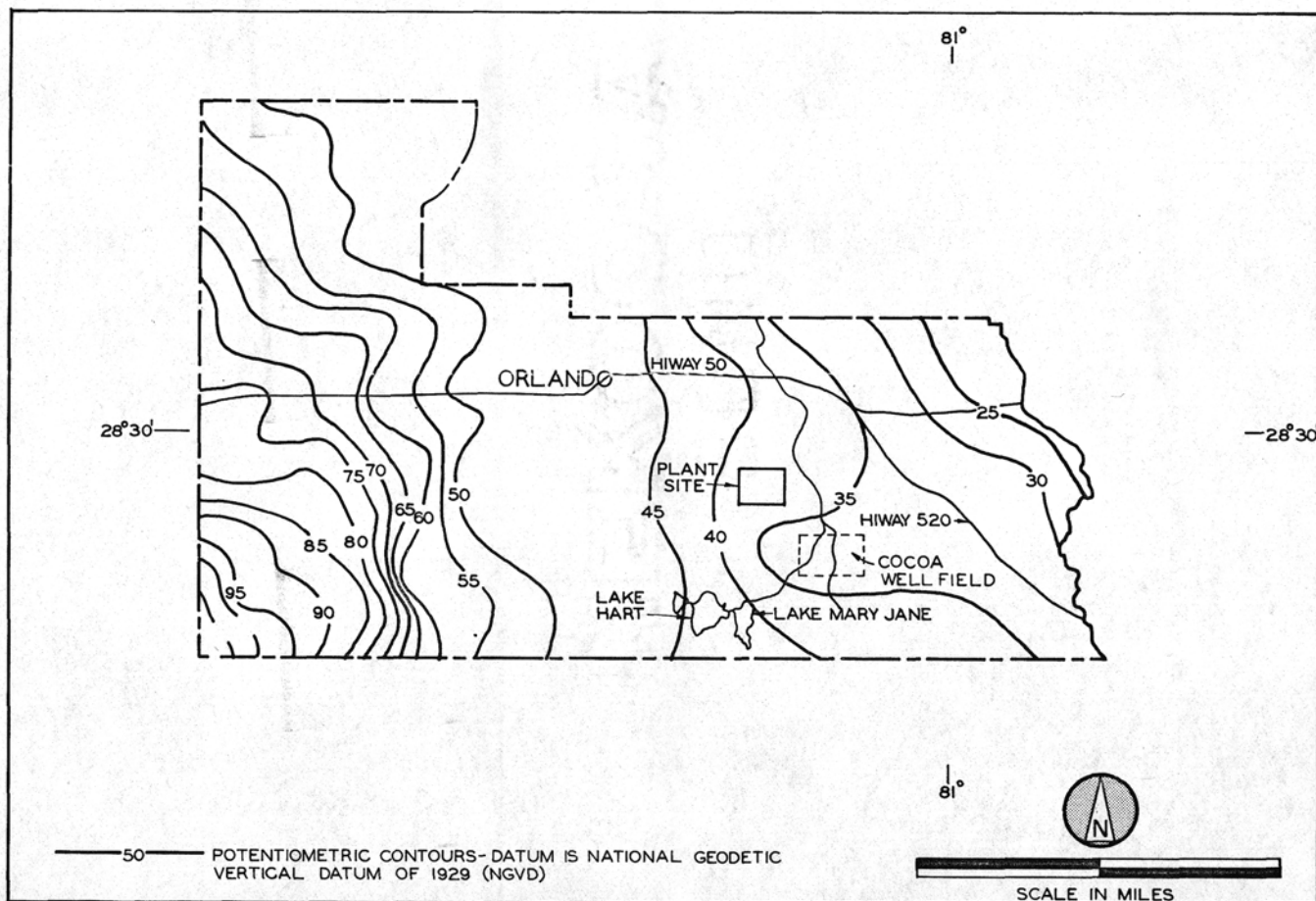


FIGURE 2.5-10. PIEZOMETRIC CONTOURS OF THE NON-ARTESIAN AQUIFER



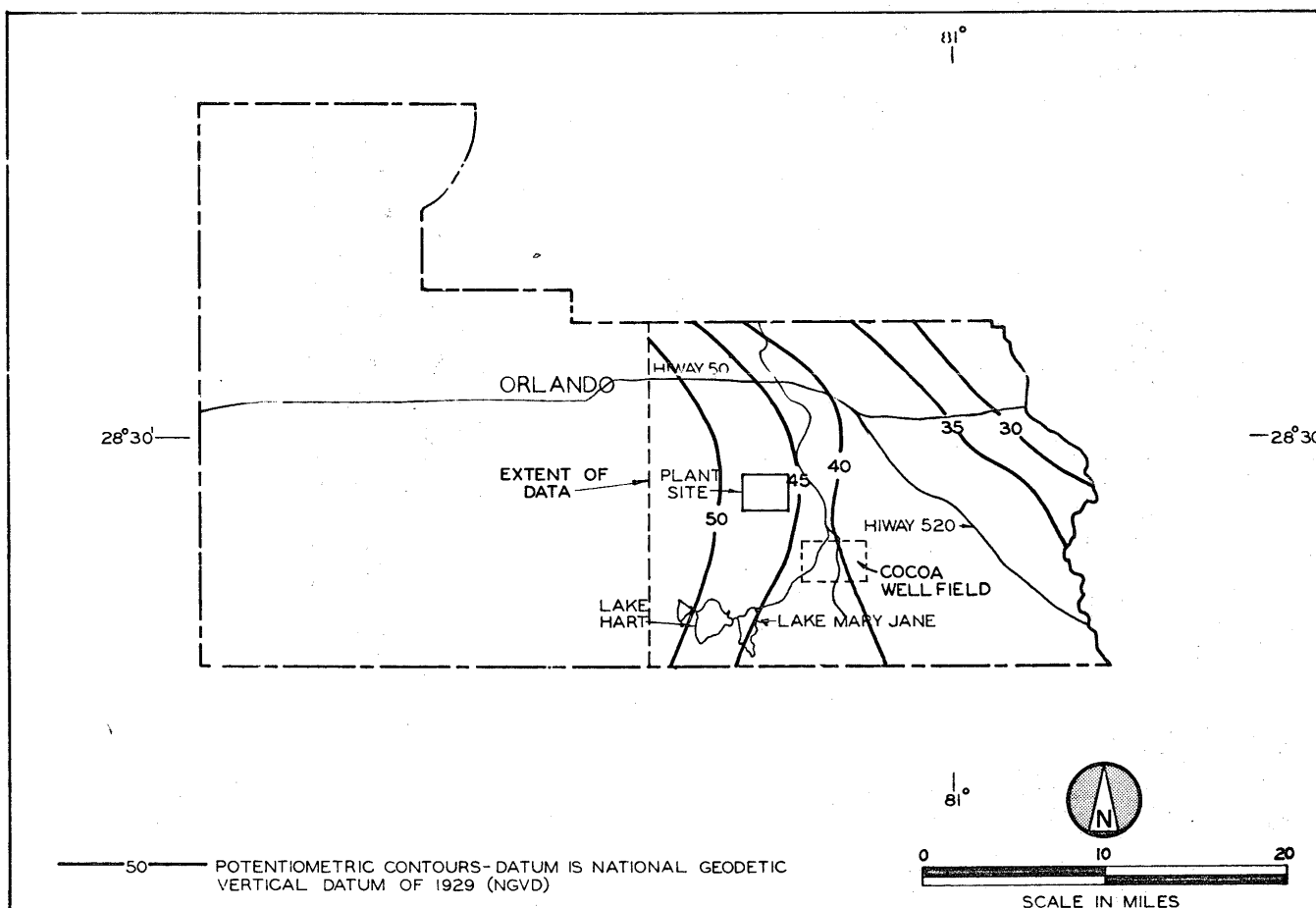
AMENDMENT 5
000362

FIGURE 2.5-10a. LOCATION OF ORANGE COUNTY
LANDFILL WELL "A"



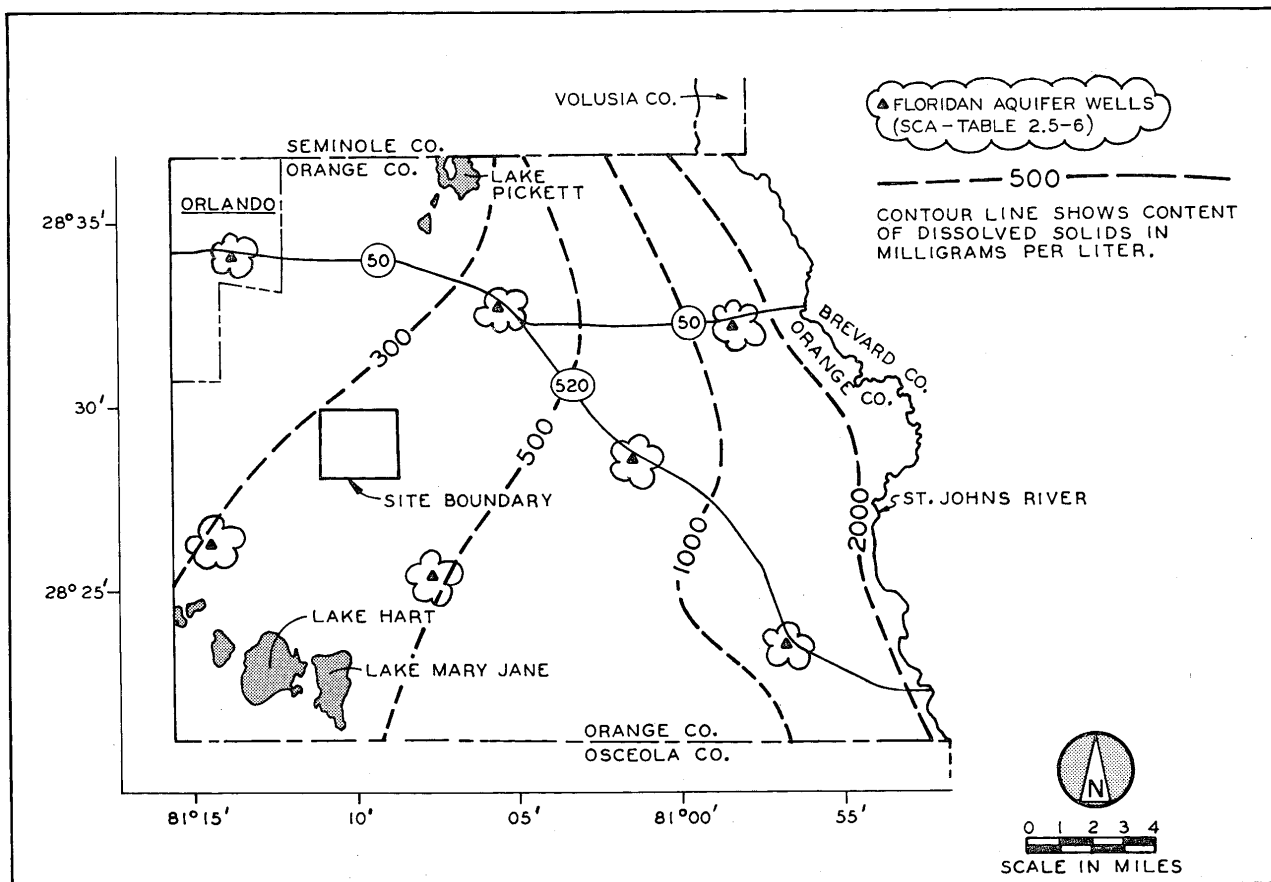
SOURCE: FROM USGS OPEN-FILE
REPORT 81-136, 1980

FIGURE 2.5-11. POTENTIOMETRIC SURFACE MAP OF THE
FLORIDAN AQUIFER, ORANGE COUNTY,
FLORIDA SEPTEMBER 1980



SOURCE: KNOCHENMUS, 1975

FIGURE 2.5-12. POTENTIOMETRIC SURFACE MAP OF THE FLORIDAN AQUIFER, ORANGE COUNTY, FLORIDA JULY 1961



SOURCE: FROM KNOCHENMUS, 1975

FIGURE 2.5-13. EASTERN ORANGE COUNTY WELLS AND DISSOLVED SOLIDS CONCENTRATION IN THE UPPER PART OF THE FLORIDAN AQUIFER 1960-1962

COLLECTED BY: <u>Richard Dunham</u>		SOURCE: 1 <u>Orange County Sanitary</u>	
DATE COLLECTED: <u>8-18-80</u>		2 <u>Landfill Well "A"</u>	
SET UP BY: _____		ANALYZED BY: _____	
		10:22 A	
		5	

	1	2	3	4	5
	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH
✓ Ca (2.50) mg/l	111.8				
✓ Mg (4.11) "	2.6				
✓ Na (2.17) "	8.6				
✓ K (1.28) "	0.6				
TOTAL CATIONS					
✓ M Alk mg/l	286				
✓ SO ₄ (1.04) "	1.0				
✓ Cl (1.41) "	13.0				
✓ NO ₃ (0.81) "	0.01				
CO ₂ (1.14)*					
✓ SiO ₂ (0.835)**	14.3				
TOTAL ANIONS					
HCO ₃					
CO ₃					
OH					
✓ P Alk mg/l	0				
✓ H Total "	294				
✓ Fe "	1.7				
✓ Mn "	0.1				
✓ pH	6.90				
✓ SPEC. COND. μS	515				
✓ TDS mg/l	332				
✓ TURBIDITY N.T.U.	5.4				
✓ COLOR Pt-Co	28				
ORTHO PHOS					
TOTAL PHOS					
Al					
✓ F mg/l	.18				
REMARKS					
*CO ₂ - Conversion bicarbonate to CaCO ₃ equivalent. **SiO ₂ - Conversion bisilicate to CaCO ₃ equivalent.					

BLACK & VEATCH CONSULTING ENGINEERS 	 Richard A. Dunham	Orlando Utilities
	DATE 8-27-80!	
PROJECT	WATER ANALYSIS	

**EXHIBIT 2.5-1. GROUND WATER QUALITY NEAR
PROPOSED PLANT SITE**

COLLECTED BY: <u>R. Dunham</u>		SOURCE: 1 <u>Orange County Sanitary</u>	
DATE COLLECTED: <u>9-30-80</u>		DATE ANALYZED: <u>9/24-9/30/80</u>	
SET UP BY: _____		ANALYZED BY: _____ 9:55 A	

	1	2	3	4	5
	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH
✓ Ca (2.50) mg/l	87.4				
✓ Mg (4.11) "	5.5				
✓ Na (2.17) "	9.2				
✓ K (1.28) "	0.9				
TOTAL CATIONS					
✓ M Alk mg/l	235				
✓ SO ₄ (1.04) "	5.0				
✓ Cl (1.41) "	14.3				
✓ NO ₃ (0.81) "	0.01				
CO ₂ (1.14)*					
✓ SiO ₂ (0.835)** "	14.0				
TOTAL ANIONS					
HCO ₃					
CO ₃					
OH					
✓ P Alk mg/l	0				
✓ H Total "	243				
✓ Fe "	1.2				
✓ Mn "	0.08				
✓ pH	7.0				
✓ SPEC. COND. μS	525				
✓ TDS mg/l	325				
✓ TURBIDITY NTU	2.8				
✓ COLOR Pt-Co	18				
ORTHO PHOS					
TOTAL PHOS					
Al					
✓ F mg/l	0.23				

REMARKS

RECEIVED
BLACK & VEATCH
 OCT 04 1980
 SYSTEMS ENG. DEPT.
 LEGAL-ENV. GROUP

*CO₂ - Conversion bicarbonate to CaCO₃ equivalent. **SiO₂ - Conversion bisilicate to CaCO₃ equivalent.	BLACK & VEATCH CONSULTING ENGINEERS PROJECT	<i>Richard A. Dunham</i> Richard A. Dunham, Chemist Orlando Utilities Commission WATER ANALYSIS	DATE 10-1-80

EXHIBIT 2.5-1 (CONTINUED). GROUND WATER QUALITY NEAR PROPOSED PLANT SITE

COLLECTED BY: R. Dunham		SOURCE: 1 Orange County Sanitary	
DATE COLLECTED: 10/21/80		2 Landfill Well "A"	
SET UP BY: ANALYZED BY: 1:00 P		4	
		5	

	1	2	3	4	5	
	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃
✓ Ca (2.50) mg/l	78.9					
✓ Mg (4.11) "	5.7					
✓ Na (2.17) "	9.4					
✓ K (1.28) "	0.9					
TOTAL CATIONS						
✓ M Alk mg/l	208					
✓ SO ₄ (1.04) "	6.5					
✓ Cl (1.41) "	5.7					
✓ HCO ₃ (0.81) "	0.01					
CO ₂ (1.14)*						
✓ SiO ₂ (0.835)** "	10.5					
TOTAL ANIONS						
HCO ₃						
CO ₃						
OH						
✓ P Alk mg/l	0					
✓ H Total "	236					
✓ Fe "	0.84					
✓ Mn "	0.03					
✓ pH	6.98					
✓ SPEC. COND. μS	450					
✓ TDS mg/l	310					
✓ TURBIDITY NTU	8.3					
✓ COLOR Pt-Co	12					
ORTHO PHOS						
TOTAL PHOS						
Al						
✓ F mg/l	0.17					
REMARKS						
*CO ₂ - Conversion bicarbonate to CaCO ₃ equivalent. **SiO ₂ - Conversion bisilicate to CaCO ₃ equivalent.						

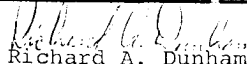
BLACK & VEATCH CONSULTING ENGINEERS 	 Richard A. Dunham, Chemist Orlando Utilities Commission WATER ANALYSIS	DATE 10-28-80
	PROJECT	

EXHIBIT 2.5-1 (CONTINUED). GROUND WATER QUALITY NEAR PROPOSED PLANT SITE

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.

COLLECTED BY: <u>R. Dunham</u>		SOURCE: <u>Orange County Sanitary</u>	
DATE COLLECTED: <u>11-25-80</u>		ANALYZED <u>11/26-12/11</u>	
SET UP BY: _____		ANALYZED BY: _____ 9:35 A	

	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃
✓ Ca (2.50)	105.4									
✓ Mg (4.11)	3.0									
✓ Na (2.17)	8.8									
✓ K (1.28)	1.0									
TOTAL CATIONS										
✓ M ALK	245									
✓ SO ₄ (1.04)	< 1.0									
✓ Cl (1.24)	13.6									
✓ CO ₃ (1.1)	0.01									
✓ SiO ₂ (0.005)**	14.0									
TOTAL ANIONS										
✓ P ALK	0									
✓ F (0.001)	271									
✓ Fe	2.4									
✓ Mn	< 0.05									
✓	6.56									
✓ SPEC. COND.	AS 550									
✓ TDS	332									
✓ TURB DITY	6.7									
✓ COLOR	30									
✓ ORTHO PHOS										
✓ TOTAL PHOS										
✓ F	0.20									

REMARKS:

*CO₂ - Conversion bicarbonate to CaCO₃ equivalent.
 **SiO₂ - Conversion bicarbonate to CaCO₃ equivalent.

ANALYST: Richard A. Dunham
 Richard A. Dunham, Chemist
 DATE 12-11-80

PROJECT: WATER ANALYSIS
 Orlando Utilities Commission

EXHIBIT 2.5-1 (CONTINUED). GROUND WATER QUALITY NEAR PROPOSED PLANT SITE

COLLECTED BY: <u>R. Dunham</u>		SOURCE: 1 <u>Orange County Sanitary</u>	
DATE COLLECTED: <u>12-17-80</u>		2 <u>Landfill Well "A"</u>	
SET UP BY: _____		3 _____	
ANALYZED BY: _____		4 <u>9:25 A</u>	
5 _____			

	1	2	3	4	5	
	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃
✓ Ca (2.50) <i>mg/l</i>	107.4					
✓ Mg (4.11) "	2.7					
✓ Na (2.17) "	8.5					
✓ K (1.28) "	0.6					
TOTAL CATIONS						
✓ H Alk <i>mg/l</i>	271					
✓ SO ₄ (1.04) "	<1.0					
✓ Cl (1.41) "	13.8					
✓ NO ₃ (0.81) "	-					
CO ₂ (1.14)*						
✓ SiO ₂ (0.835)**	13.3					
TOTAL ANIONS						
HCO ₃						
CO ₃						
OH						
✓ P Alk <i>mg/l</i>	0					
✓ H Total	292					
✓ Fe "	1.7					
✓ Mn "	<0.05					
✓ pH	6.70					
✓ SPEC. COND. <i>µS</i>	500					
✓ TDS <i>mg/l</i>	317					
✓ TURBIDITY <i>NTU</i>	7.1					
✓ COLOR <i>Pt-Co</i>	27					
ORTHO PHOS						
TOTAL PHOS						
Al						
✓ F <i>mg/l</i>	0.16					
REMARKS						
*CO ₂ - Conversion bicarbonate to CaCO ₃ equivalent. **SiO ₂ - Conversion bisilicate to CaCO ₃ equivalent.						
BLACK & VEATCH CONSULTING ENGINEERS 		<i>Richard A. Dunham</i> Richard A. Dunham, Chemist			DATE 1-8-81.	
		WATER ANALYSIS Orlando Utilities Commission				

EXHIBIT 2.5-1 (CONTINUED). GROUND WATER QUALITY NEAR PROPOSED PLANT SITE

COLLECTED BY: <u>R. Dunham</u>		SOURCE: 1 <u>Orange County Sanitary</u>	
DATE COLLECTED: <u>1-20-81</u> DATE ANALYZED: _____		2 <u>Landfill Well "A"</u>	
SET UP BY: _____ ANALYZED BY: _____		3 _____	
		4 _____	
		5 _____	

	1	2	3	4	5					
	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃
✓ Ca (2.50) mg/l	106.9									
✓ Mg (4.11) "	3.2									
✓ Na (2.17) "	8.8									
✓ K (1.28) "	0.6									
TOTAL CATIONS										
✓ M Atk mg/l	267									
✓ SO ₄ (1.04) "	<1.0									
✓ Cl (1.41) "	12.7									
✓ NO ₃ (0.81) "	<0.02									
CO ₂ (1.14)*										
✓ SiO ₂ (0.835)** "	15.1									
TOTAL ANIONS										
HCO ₃										
CO ₃										
OH										
✓ P Atk mg/l	0									
✓ H Total "	328									
✓ Fe "	1.5									
✓ Mn "	<0.02									
✓ pH	6.88									
✓ SPEC. COND. μS	550									
✓ TDS mg/l	326									
✓ TURBIDITY NTU	8.0									
✓ COLOR Pt-Co	15.									
ORTHO PHOS										
TOTAL PHOS										
Al										
✓ F mg/l	0.16									
REMARKS										
*CO ₂ - Conversion bicarbonate to CaCO ₃ equivalent. **SiO ₂ - Conversion bisilicate to CaCO ₃ equivalent.										

BLACK & VEATCH CONSULTING ENGINEERS 	<i>Richard A. Dunham</i> Richard A. Dunham, Chemist	DATE 1-30-81
	PROJECT Orlando Utilities Commission WATER ANALYSIS	

EXHIBIT 2.5-1 (CONTINUED). GROUND WATER QUALITY NEAR PROPOSED PLANT SITE

COLLECTED BY: <u>R. Dunham</u>		SOURCE: 1 <u>Orange County Sanitary</u>	
DATE COLLECTED: <u>2-24-81</u>		2 <u>Landfill Well "A"</u>	
SET UP BY: _____		3 _____	
ANALYZED BY: _____		4 _____	
		5 _____	

	1	2	3	4	5
	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH
✓ Ca (2.50) mg/l	84.6				
✓ Mg (4.11) "	4.0				
✓ Na (2.17) "	9.5				
✓ K (1.28) "	0.8				
TOTAL CATIONS					
✓ M Alk mg/l		225			
✓ SO ₄ (1.04) "	1.0				
✓ Cl (1.41) "	16.0				
✓ NO ₃ (0.81) "	2.01				
CO ₂ (1.14)*					
✓ SiO ₂ (0.835)**	14.5				
TOTAL ANIONS					
HCO ₃					
CO ₃					
OH					
✓ P Alk mg/l		0			
✓ H Total		234			
✓ Fe	2.3				
✓ Mn	0.02				
✓ pH	6.95				
✓ SPEC. COND. μ S	495				
✓ TDS mg/l	270				
✓ TURBIDITY NTU	9.6				
✓ COLOR Pt-Co	32				
ORTHO PHOS					
TOTAL PHOS					
Al					
✓ F	0.20				

REMARKS

*CO₂ - Conversion bicarbonate to CaCO₃ equivalent.
 **SiO₂ - Conversion bisilicate to CaCO₃ equivalent.

BLACK & VEATCH CONSULTING ENGINEERS 	 Richard A. Dunham, Chemist	DATE 3-13-81
	PROJECT Orlando Utilities Commission WATER ANALYSIS	

EXHIBIT 2.5-1 (CONTINUED). GROUND WATER QUALITY NEAR PROPOSED PLANT SITE

COLLECTED BY: <u>R. Dunham</u>		SOURCE: 1 <u>Orange County Sanitary</u>	
DATE COLLECTED: <u>3-24-81</u> DATE ANALYZED: _____		2 <u>Landfill Well "A"</u>	
SET UP BY: _____ ANALYZED BY: _____		3 _____	
		4 _____	
		5 _____	

	1		2		3		4		5	
	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃	AS SUCH	AS CaCO ₃
✓ Ca (2.50)	103.4									
✓ Mg (4.11)	3.0									
✓ Na (2.17)	8.4									
✓ K (1.28)	0.6									
TOTAL CATIONS										
✓ M Alk		275								
✓ SO ₄ (1.04)	<1.0									
✓ Cl (1.41)	11.0									
✓ NO ₃ (0.81)	<.02									
✓ CO ₂ (1.14)*										
✓ SiO ₂ (0.835)**	14.0									
TOTAL ANIONS										
HCO ₃										
CO ₃										
OH										
✓ P Alk		0								
✓ H Total		291								
✓ Fe	2.0									
✓ Mn	<0.02									
✓ pH	6.95									
✓ SPEC. COND. μS	535									
✓ TDS	316									
✓ TURBIDITY	12									
✓ COLOR	35									
ORTHO PHOS										
TOTAL PHOS										
Al										
✓ F	0.24									
REMARKS										
*CO ₂ - Conversion bicarbonate to CaCO ₃ equivalent. **SiO ₂ - Conversion bisilicate to CaCO ₃ equivalent.										
BLACK & VEATCH CONSULTING ENGINEERS 		<i>Richard A. Dunham</i> Richard A. Dunham, Chemist					DATE 4-7-81			
		Orlando Utilities Commission WATER ANALYSIS								

EXHIBIT 2.5-1 (CONTINUED). GROUND WATER QUALITY NEAR PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: August 26, 1980

PARAMETER	B-1	B-2	B-5	B-9
TIME SAMPLED	11:00 A	12:05 A	1:30 P	2:30 P
TEMPERATURE, °C	21.0	22.0	22.0	23.0
WATER ELEVATION	7'0"	6'8"	4'5"	6'0"
SATURATION INDEX	+2.88	+2.09	-0.57	-3.57
CONDUCTIVITY, μ S	25	45	490	105
pH	4.92	4.13	6.90	5.61
TOTAL ALKALINITY	0	0	240	34
P-ALKALINITY	0	0	0	0
TOTAL HARDNESS	10	6	249	35
CHLORIDE	4.6	11.8	23.7	13.0
FLUORIDE	0.10	0.10	0.16	0.14
H ₂ S FIELD/LAB	0.2/-	0.3/-	0.2/-	0.1/-
NITROGEN, NH ₃ -N	0.76	0.69	0.85	0.82
NITROGEN, NO ₃ -N	0.036	0.036	0.039	0.041
NITROGEN, TOTAL KjEL.	1.2	1.1	1.2	1.3
OXYGEN DEMAND, CHEMICAL	168	544	100	288
PO ₄ TOTAL FILTERABLE	0.10	0.20	0.35	0.14
PO ₄ TOTAL NONFILTERABLE	0.10	0.20	0.22	0.23
SILICA	4.2	3.2	3.6	8.0
SOLIDS, TOTAL	25.0	61.0	255.0	201.0
SOLIDS, TOTAL SUSPENDED	1.0	34.0	24.0	57.6
SULFATE	<1.0	<1.0	<1.0	<1.0
ALUMINUM	0.7	1.0	11.6	26.5
ARSENIC	0.003	0.021	0.050	0.150
BARIUM	<0.5	<0.5	<0.5	<0.5
BERYLLIUM	<0.05	<0.05	<0.05	<0.05
CADMIUM	<0.001	<0.001	<0.001	<0.001
CALCIUM	<1.0	<1.0	47.0	5.7
CHROMIUM, TOTAL	<0.001	<0.001	0.003	0.006
COBALT	<0.05	<0.05	<0.05	<0.05
COPPER	<0.10	<0.10	<0.10	<0.10
IRON, FIELD/LAB	0.3/0.2	0.8/0.7	1.3/1.6	1.0/1.3
MAGNESIUM	0.8	0.8	2.8	0.8
MANGANESE, FIELD/LAB	<0.5/0.05	<0.5/0.05	<0.5/0.05	<0.5/0.05
LEAD	0.002	0.002	0.002	0.004
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005
MOLYBDENUM	<0.2	<0.2	<0.2	<0.2
NICKEL	<0.3	<0.3	<0.3	<0.3
POTASSIUM	0.1	0.2	2.0	0.7
SELENIUM	0.001	0.007	0.030	0.060
SILVER	<0.001	<0.001	<0.001	<0.001
SODIUM	2.6	3.6	14.6	6.4
VANADIUM	<0.6	<0.6	<0.6	0.8
ZINC	<0.05	<0.05	<0.05	<0.05
COLIFORM, FECAL	none	none	none	none
COLIFORM, TOTAL	-1	-1	-1	-1

Richard A. Dunham
Richard A. Dunham, Chemist

EXHIBIT 2.5-2. GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: October 13, 1980

PARAMETER	B-1	B-2	B-5	B-9
TIME SAMPLED	11:00 A	12:00 P	1:45 P	2:50 P
TEMPERATURE, °C	22.0	23.5	22.0	23.0
WATER ELEVATION	6'6"	6'5"	5'5"	4'1"
SATURATION INDEX	-1.61	-5.93	-0.32	-3.41
CONDUCTIVITY, uS	25	35	600	110
pH	5.14	5.56	6.91	5.57
TOTAL ALKALINITY	0.4	1.0	237	30
P-ALKALINITY	0	0	0	0
TOTAL HARDNESS	0.5	0.5	240	32
CHLORIDE	5.3	6.5	20.3	13.4
FLUORIDE	<0.1	<0.1	<0.1	<0.1
H ₂ S FIELD/LAB	0.2/<0.1	0.3/0.2	0.1/<0.1	0.1/<0.1
NITROGEN, NH ₃ -N	0.59	0.61	0.58	0.58
NITROGEN, NO ₃ -N	<0.01	0.01	<0.01	<0.01
NITROGEN, TOTAL K ₂ Cr ₂ O ₇	0.79	1.15	0.89	0.82
OXYGEN DEMAND, CHEMICAL	25	35	15	35
PO ₄ TOTAL FILTERABLE	.077	.065	.102	.072
PO ₄ TOTAL NONFILTERABLE	.112	.230	.130	.285
SILICA	3.0	4.0	13.2	4.4
SOLIDS, TOTAL	38.0	94.0	365.0	240.0
SOLIDS, TOTAL SUSPENDED	2.8	28.8	44.4	84.8
SULFATE	<1.0	<1.0	<1.0	<1.0
ALUMINUM	1.2	5.3	6.6	14.0
ARSENIC	0.002	0.042	0.044	0.132
BARIUM	<0.5	<0.5	0.7	0.7
BERYLLIUM	<0.05	<0.05	<0.05	<0.05
CADMIUM	<0.001	<0.001	<0.001	<0.001
CALCIUM	<1.0	<1.0	91.4	10.4
CHROMIUM, TOTAL	<0.001	0.004	<0.001	<0.001
COBALT	<0.25	<0.25	<0.25	<0.25
COPPER	<0.1	<0.1	0.1	<0.1
IRON, FIELD/LAB	0.7/0.6	1.5/1.7	1.4/1.9	1.0/1.5
MAGNESIUM	0.8	0.7	3.2	0.8
MANGANESE, FIELD/LAB	<0.5/<0.05	<0.5/<0.05	<0.5/0.05	<0.5/<0.05
LEAD	0.002	0.001	0.002	0.002
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005
MOLYBDENUM	<0.2	<0.2	<0.2	<0.2
NICKEL	<0.3	<0.3	<0.3	<0.3
POTASSIUM	0.2	0.3	2.2	0.7
SELENIUM	<0.002	0.010	0.012	0.038
SILVER	<0.001	<0.001	<0.001	<0.001
SODIUM	2.4	4.2	14.6	6.7
VANADIUM	0.9	1.2	0.9	1.1
ZINC	<0.05	0.05	<0.05	<0.05
COLIFORM, FECAL	none	none	none	none
COLIFORM, TOTAL	-1	-1	-1	-1

Richard A. Dunham
Richard A. Dunham, Chemist

EXHIBIT 2.5-2 (CONTINUED). GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: Oct. 21, 1980

PARAMETER	B-1	B-2	B-5	B-9
TIME SAMPLED	1:45 p	2:20 p	12:10p	10:30 a
TEMPERATURE, °C	21.5	24.0	22.0	22.5
WATER ELEVATION	7'0"	7'4"	5'4"	5'0"
SATURATION INDEX	+2.50	-2.22	-0.48	-3.17
CONDUCTIVITY, uS	25	100	495	100
pH	4.53	4.02	6.80	5.58
TOTAL ALKALINITY	0	0	222	24
P-ALKALINITY	0	0	0	0
TOTAL HARDNESS	0	3.5	241	32
CHLORIDE	23.7	162.5	22.8	13.2
FLUORIDE	<.10	<.10	0.16	0.11
H ₂ S FIELD/LAB	0.2/-	0.3/-	0.1/-	0.1/-
NITROGEN, NH ₃ -N	0.50	0.47	0.48	0.48
NITROGEN, NO ₃ -N	<0.01	<0.01	0.020	0.015
NITROGEN, TOTAL KJEL.	0.61	0.61	0.62	0.63
OXYGEN DEMAND, CHEMICAL	19	10	19	25
PO ₄ TOTAL FILTERABLE	0.170	0.180	0.570	0.180
PO ₄ TOTAL NONFILTERABLE	0.102	0.46	0.039	0.049
SILICA	0.3	3.5	8.3	3.3
SOLIDS, TOTAL	25.0	73.0	389.0	214.0
SOLIDS, TOTAL SUSPENDED	4.4	9.2	68.4	37.6
SULFATE	<1.0	<1.0	<1.0	<1.0
ALUMINUM	2.3	4.3	4.3	2.9
ARSENIC	<0.002	0.004	0.006	0.004
BARIUM	<0.5	<0.5	<0.5	<0.5
BERYLLIUM	<0.05	<0.05	<0.05	<0.05
CADMIUM	<0.001	<0.001	<0.001	<0.001
CALCIUM	<1.0	3.0	220	23
CHROMIUM, TOTAL	<0.001	<0.001	<0.001	<0.001
COBALT	<0.25	<0.25	<0.25	<0.25
COPPER	<0.05	<0.05	<0.05	<0.05
IRON, FIELD/LAB	0.5/0.46	1.4/1.35	1.8/2.24	1.1/1.25
MAGNESIUM	1.0	1.1	3.5	1.4
MANGANESE, FIELD/LAB	<0.5/<0.05	<0.5/<0.05	<0.5/<0.05	<0.5/<0.05
LEAD	<0.001	<0.001	0.002	<0.001
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005
MOLYBDENUM	<0.2	<0.2	<0.2	<0.2
NICKEL	<0.3	<0.3	<0.3	<0.3
POTASSIUM	0.2	0.2	2.0	0.5
SELENIUM	<0.002	<0.002	0.005	0.003
SILVER	<0.001	<0.001	<0.001	<0.001
SODIUM	2.6	3.9	13.2	6.2
VANADIUM	<0.6	<0.6	<0.6	<0.6
ZINC	<0.05	<0.05	<0.05	<0.05
* COLIFORM, FECAL	none	none	none	none
* COLIFORM, TOTAL	-1	-1	-1	-1

1:10 Dilution

Richard A. Dunham
Richard A. Dunham, Chemist

EXHIBIT 2.5-2 (CONTINUED): GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

Would
not pump

DATE: 11-25-80

PARAMETER	B-1	B-2	B-5	B-9	
TIME SAMPLED			12:00 N	1:10 P	
TEMPERATURE, °C			23.0	23.0	
WATER ELEVATION	6'8"	6'11"	4'4"	3'6"	
SATURATION INDEX					
CONDUCTIVITY, uS			500	100	
pH			6.42	5.21	
TOTAL ALKALINITY			222	18.1	
P-ALKALINITY			0	0	
TOTAL HARDNESS			271	260	
CHLORIDE			22.5	13.8	
FLUORIDE			0.18	0.15	
H ₂ S FIELD/LAB			0.1/-	0.1/-	
NITROGEN, NH ₃ -N			0.18	0.16	
NITROGEN, NO ₃ -N			0.029	0.026	
NITROGEN, TOTAL KJEL.			0.20	0.19	
OXYGEN DEMAND, CHEMICAL			< 10	< 10	
PO ₄ TOTAL FILTERABLE			0.200	0.060	
PO ₄ TOTAL NONFILTERABLE			.005	.075	
SILICA			12.8	7.5	
SOLIDS, TOTAL			341.2	156.2	
SOLIDS, TOTAL SUSPENDED			29.2	21.2	
SULFATE			< 1.0	< 1.0	
ALUMINUM			1.7	2.9	
ARSENIC			0.005	0.004	
BARIUM			< 0.5	< 0.5	
BERYLLIUM			< 0.05	< 0.05	
CADMIUM			< 0.001	< 0.001	
CALCIUM			26.3	22.3	
CHROMIUM, TOTAL			< 0.001	< 0.001	
COBALT			< 0.25	< 0.25	
COPPER			< 0.05	< 0.05	
IRON, FIELD/LAB			0.8/1.8	0.6/1.0	
MAGNESIUM			3.4	2.1	
MANGANESE, FIELD/LAB			< 0.5/0.05	< 0.5/0.05	
LEAD			0.003	0.001	
MERCURY			< 0.0005	< 0.0005	
MOLYBDENUM			< 0.2	< 0.2	
NICKEL			< 0.3	< 0.3	
POTASSIUM			1.1	0.7	
SELENIUM			0.006	0.004	
SILVER			< 0.001	< 0.001	
SODIUM			14.8	6.2	
VANADIUM			< 0.6	< 0.6	
ZINC			< 0.05	< 0.05	
COLIFORM, FECAL			none	none	
COLIFORM, TOTAL			-1	-1	

Richard A. Dunham
Richard A. Dunham, Chemist

EXHIBIT 2.5-2 (CONTINUED). GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: Dec. 17, 1980

PARAMETER	B-1	B-2	B-5	B-9
TIME SAMPLED	10:15 A	11:00 A	12:30 P	1:16 P
TEMPERATURE, °C	22.5	22.5	22.5	23.0
WATER ELEVATION	6'3"	6'3"	4'0"	3'10"
SATURATION INDEX	2.36	2.71	-0.53	-1.63
CONDUCTIVITY, µS	25	25	475	100
pH	4.40	4.75	6.70	5.60
TOTAL ALKALINITY	0	0	236	24
P-ALKALINITY	0	0	0	0
TOTAL HARDNESS	0	0	245	62
CHLORIDE	5.7	6.6	21.8	12.7
FLUORIDE	< 0.1	< 0.1	0.13	< 0.1
H ₂ S FIELD/LAB	0.2/-	0.5/-	0.1/-	0.2/-
NITROGEN, NH ₃ -N	0.44	0.34	0.48	0.60
NITROGEN, NO ₃ -N	< 0.01	< 0.01	< 0.01	0.01
NITROGEN, TOTAL KJEL.	< 0.05	< 0.05	< 0.05	< 0.05
OXYGEN DEMAND, CHEMICAL	< 10	< 10	< 10	25
PO ₄ TOTAL FILTERABLE	< 0.01	0.068	0.468	0.040
PO ₄ TOTAL NONFILTERABLE	< 0.01	0.204	< 0.01	0.295
SILICA	2.5	3.8	10.0	5.5
SOLIDS, TOTAL	29	28	340	320
SOLIDS, TOTAL SUSPENDED	< 1	< 1	4.4	46.8
SULFATE	< 1.0	< 1.0	< 1.0	< 1.0
ALUMINUM	0.6	0.6	0.8	0.9
ARSENIC	< 0.002	< 0.002	0.003	0.004
BARIUM	< 0.2	< 0.2	< 0.2	< 0.2
BERYLLIUM	< 0.05	< 0.05	< 0.05	< 0.05
CADMIUM	< 0.001	< 0.001	< 0.001	< 0.001
CALCIUM	< 1.0	< 1.0	92.2	11.2
CHROMIUM, TOTAL	< 0.001	< 0.001	< 0.001	< 0.001
COBALT	< 0.05	< 0.05	< 0.05	< 0.05
COPPER	< 0.05	< 0.05	< 0.05	< 0.05
IRON, FIELD/LAB	0.8/0.43	1.2/0.59	1.8/1.4	1.3/1.4
MAGNESIUM	0.6	0.8	3.2	0.7
MANGANESE, FIELD/LAB	< 0.5/0.02	< 0.5/0.02	< 0.5/0.02	< 0.5/0.02
LEAD	< 0.001	< 0.001	0.003	0.001
MERCURY	< 0.0005	< 0.0005	< 0.0005	< 0.0005
MOLYBDENUM	< 0.2	< 0.2	< 0.2	< 0.2
NICKEL	< 0.3	< 0.3	< 0.3	< 0.3
POTASSIUM	0.1	0.1	1.7	0.5
SELENIUM	< 0.002	< 0.002	0.002	0.002
SILVER	< 0.001	< 0.001	< 0.001	< 0.001
SODIUM	2.2	3.0	12.9	6.3
STRONTIUM	< 0.6	< 0.6	< 0.6	< 0.6
TUNG	< 0.02	< 0.02	< 0.02	< 0.02
COLIFORM, FECAL	NO GROWTH			
COLIFORM, TOTAL	-1	-1	-1	-1

Richard A. Dunham
Richard A. Dunham

EXHIBIT 2.5-2 (CONTINUED). GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: Jan. 20, 1981

PARAMETER	B-1	B-2	B-5	B-9
TIME SAMPLED	9:52 A	10:40 A	12:00 P	12:52 P
TEMPERATURE, °C	22.0	22.0	22.0	22.5
WATER ELEVATION	6'11"	6'11"	4'4"	4'6"
SATURATION INDEX	-2.10	-6.28	-0.42	-3.31
CONDUCTIVITY, uS	25	25	525	95
PH	4.51	4.90	6.80	5.71
TOTAL ALKALINITY	0	2	234	28
P-ALKALINITY	0	0	0	0
TOTAL HARDNESS	0	0	280	26
CHLORIDE	4.1	5.4	20.9	11.3
FLUORIDE	<0.10	<0.10	0.16	<0.10
H ₂ S FIELD/LAB	0.3/-	0.5/-	<0.1/-	0.3/-
NITROGEN, NH ₃ -N	0.9	0.2	0.4	<0.1
NITROGEN, NO ₃ -N	<.02	<.02	<.02	<.02
NITROGEN, TOTAL KJEL	<0.10	0.10	<0.10	0.34
OXYGEN DEMAND, CHEMICAL	<10	<10	<10	<10
PO ₄ TOTAL FILTERABLE	.390	.402	.362	.045
PO ₄ TOTAL NONFILTERABLE	.299	.287	.270	.110
SILICA	4.0	5.3	13.9	10.3
SOLIDS, TOTAL	59	58	331	138
SOLIDS, TOTAL SUSPENDED	2	7	17	17
SULFATE	<1.0	<1.0	<1.0	<1.0
ALUMINUM	0.6	0.6	0.8	0.9
ARSENIC	<0.002	<0.002	<0.002	<0.002
BARIUM	<0.1	<0.1	<0.1	<0.1
BERYLLIUM	<0.05	<0.05	<0.05	<0.05
CADMIUM	<0.001	<0.001	<0.001	<0.001
CALCIUM	1.2	0.8	95.5	9.7
CHROMIUM, TOTAL	<0.001	<0.001	<0.001	0.003
COBALT	<0.05	<0.05	<0.05	<0.05
COPPER	<0.05	<0.05	<0.05	<0.05
IRON, FIELD/LAB	0.5/0.3	0.7/0.6	1.5/1.1	0.8/0.6
MAGNESIUM	0.6	0.8	3.0	1.1
MANGANESE, FIELD/LAB	<0.5/0.02	<0.5/0.02	<0.5/0.02	<0.5/0.02
LEAD	<0.001	<0.001	0.001	0.001
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005
MOLYBDENUM	<0.2	<0.2	<0.2	<0.2
NICKEL	<0.3	<0.3	<0.3	<0.3
POTASSIUM	0.1	0.1	1.7	0.6
SELENIUM	<0.002	<0.002	<0.002	<0.002
SILVER	<0.001	<0.001	<0.001	<0.001
SODIUM	2.2	3.0	12.3	5.8
VANADIUM	<0.6	<0.6	<0.6	<0.6
ZINC	<0.02	<0.02	<0.02	<0.02
COLIFORM, FECAL	NO GROWTH*			
COLIFORM, TOTAL	-1	-1	-1*	-1*

*1:10 dilution

Richard Dunham, Chemist

EXHIBIT 2.5-2 (CONTINUED). GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: 2-24-81

PARAMETER	B-1	B-2	B-5	B-9 (2/17)
TIME SAMPLED	2:11 P	2:19 P	1:00 P	11:06 A
TEMPERATURE, °C				
WATER ELEVATION	6'6"	6'1"	1'7"	2'2"
SATURATION INDEX				
CONDUCTIVITY, uS				
pH				
TOTAL ALKALINITY				
P-ALKALINITY				
TOTAL HARDNESS				
CHLORIDE				
FLUORIDE				
H ₂ S FIELD/LAB				
NITROGEN, NH ₃ -N				
NITROGEN, NO ₃ -N				
NITROGEN, TOTAL KJEL.				
OXYGEN DEMAND, CHEMICAL				
PO ₄ TOTAL FILTERABLE				
PO ₄ TOTAL NONFILTERABLE				
SILICA				
SOLIDS, TOTAL				
SOLIDS, TOTAL SUSPENDED				
SULFATE				
ALUMINUM				
ARSENIC				
BARIUM				
BERYLLIUM				
CADMIUM				
CALCIUM				
CHROMIUM, TOTAL				
COBALT				
COPPER				
IRON, FIELD/LAB				
MAGNESIUM				
MANGANESE, FIELD/LAB				
LEAD				
MERCURY				
MOLYBDENUM				
NICKEL				
POTASSIUM				
SELENIUM				
SILVER				
SODIUM				
VANADIUM				
ZINC				
COLIFORM, FECAL				
COLIFORM, TOTAL				

EXHIBIT 2.5-2 (CONTINUED). GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

2-17-81

DATE: 2-23-81

PARAMETER	B-15	B-16	B-17	B-13	B-14
TIME SAMPLED	1:52 P	10:30 A	12:30 P	1:35 P	1:20 P
TEMPERATURE, °C	23.0	23.0	22.0		
WATER ELEVATION	3'3"	1'6"	1'8"	22"	5'5"
SATURATION INDEX	+0.02	+0.18	-0.57	above	
CONDUCTIVITY, uS	540	500	525	ground	
pH	7.15	7.45	6.71		
TOTAL ALKALINITY	270	218	218		
P-ALKALINITY	0	0	0		
TOTAL HARDNESS	275	228	230		
CHLORIDE	11.8	11.8	15.1		
FLUORIDE	0.20	0.25	0.13		
H ₂ S FIELD/LAB	0.5/-	0.3/-	0.1/-		
NITROGEN, NH ₃ -N	0.50	0.48	0.54		
NITROGEN, NO ₃ -N	0.017	<0.01	.016		
NITROGEN, TOTAL KJEL.	<0.02	0.02	0.04		
OXYGEN DEMAND, CHEMICAL	50	25	10		
PO ₄ TOTAL FILTERABLE	0.59	0.14	0.21		
PO ₄ TOTAL NONFILTERABLE	0.22	<0.01	0.01		
SILICA	13.7	22.4	14.9		
SOLIDS, TOTAL	375	316	348		
SOLIDS, TOTAL SUSPENDED	28	26	35		
SULFATE	<1.0	<1.0	<1.0		
ALUMINUM	0.5	0.8	0.8		
ARSENIC	0.005	0.006	0.006		
BARIUM	<0.1	<0.1	<0.1		
BERYLLIUM	<0.05	<0.05	<0.05		
CADMIUM	<0.001	<0.001	<0.001		
CALCIUM	106.2	89.0	88.1		
CHROMIUM, TOTAL	0.001	<0.001	<0.001		
COBALT	<0.05	<0.05	<0.05		
COPPER	<0.05	<0.05	<0.05		
IRON, FIELD/LAB	2.0/2.0	0.7/0.7	1.4/1.2		
MAGNESIUM	2.0	1.7	1.6		
MANGANESE, FIELD/LAB	<0.5/0.02	<0.5/0.02	<0.5/0.02		
LEAD	0.001	0.002	0.002		
MERCURY	<0.0005	<0.0005	<0.0005		
MOLYBDENUM	<0.2	<0.2	<0.2		
NICKEL	<0.3	<0.3	<0.3		
POTASSIUM	1.7	1.3	1.3		
SELENIUM	0.002	0.003	0.003		
SILVER	<0.001	<0.001	<0.001		
SODIUM	12.1	8.2	6.9		
VANADIUM	<0.6	<0.6	<0.6		
ZINC	<0.02	<0.02	<0.02		
COLIFORM, FECAL	ND	ND	ND		
COLIFORM, TOTAL	*-H	*-H	*-H		

(50 ml sample)

Richard A. Dunham
Richard A. Dunham, Chemist

EXHIBIT 2.5-2 (CONTINUED). GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: 3-24-81

PARAMETER	B-1	B-2	B-5	B-9
TIME SAMPLED	9:10 A	9:45 A	10:45 A	11:30 A
TEMPERATURE, °C	22.0	22.0	22.5	22.5
WATER ELEVATION	6'10"	6'9"	3'0"	2'8"
SATURATION INDEX	-2.44	-1.32	-0.57	+3.81
CONDUCTIVITY, uS	20	25	485	75
pH	4.61	4.80	6.65	5.55
TOTAL ALKALINITY	0	0	233	16
P-ALKALINITY	0	0	0	0
TOTAL HARDNESS	6	4	251	25
FLUORIDE	5.4	6.2	22.0	12.2
FLUORIDE	<0.10	<0.10	0.18	<0.10
H ₂ S FIELD/LAB	1.0/-	0.4/-	<0.1/-	<0.1/-
NITROGEN, NH ₃ -N	0.2	0.1	0.3	0.20
NITROGEN, NO ₃ -N	<0.2	<0.2	0.3	0.2
NITROGEN, TOTAL KJEL.	0.06	0.11	0.06	0.13
OXYGEN DEMAND, CHEMICAL	<10	<10	10	33
PO ₄ TOTAL FILTERABLE	0.19	0.04	0.40	0.12
PO ₄ TOTAL NONFILTERABLE	0.02	<0.01	<0.01	0.03
SILICA	3.8	4.8	12.5	6.5
SOLIDS, TOTAL	33	24	319	212
SOLIDS, TOTAL SUSPENDED	<1	<1	12	57
SULFATE	<1.0	<1.0	<1.0	<1.0
ALUMINUM	<0.4	<0.4	<0.4	1.0
ARSENIC	<0.002	<0.002	0.004	0.007
BARIUM	<0.1	<0.1	<0.1	<0.1
BERYLLIUM	<0.05	<0.05	<0.05	<0.05
CADMIUM	<0.001	<0.001	<0.001	<0.001
CALCIUM	<1	3.2	93.0	8.0
CHROMIUM, TOTAL	<0.001	<0.001	<0.001	<0.001
COBALT	<0.05	<0.05	<0.05	<0.05
COPPER	<0.05	<0.05	<0.05	<0.05
IRON, FIELD/LAB	0.8/0.5	0.8/0.6	1.5/1.4	1.2/0.9
MAGNESIUM	0.6	0.7	3.2	1.3
MANGANESE, FIELD/LAB	<0.5/<0.02	<0.5/<0.02	<0.5/<0.02	<0.5/<0.02
LEAD	<0.001	<0.001	0.001	0.001
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005
MOLYBDENUM	<0.2	<0.2	<0.2	<0.2
NICKEL	<0.3	<0.3	<0.3	<0.3
POTASSIUM	0.1	0.1	1.8	0.5
SELENIUM	<0.002	<0.002	0.002	<0.002
SILVER	<0.001	<0.001	<0.001	<0.001
SODIUM	2.2	3.1	13.0	6.2
VANADIUM	<0.6	<0.6	<0.6	<0.6
ZINC	<0.02	<0.02	<0.02	<0.02
COLIFORM, FECAL	NO GROWTH			
COLIFORM, TOTAL	-1	-1	-1	-1

Richard A. Dunham

EXHIBIT 2.5-2 (CONTINUED). GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: 3-24-81

PARAMETER	B-13	B-14	B-15	B-16	B-17
TIME SAMPLED			2:00 P	1:15 P	12:15 P
TEMPERATURE, °C			22.5	22.5	21.5
WATER ELEVATION	above	6'4"	3'6"	1'9"	1'8"
SATURATION INDEX	ground		+0.26	+0.32	-0.82
CONDUCTIVITY, uS			450	525	450
pH			7.05	7.21	6.68
TOTAL ALKALINITY			238	271	222
P-ALKALINITY			0	0	0
TOTAL HARDNESS			252	295	236
CHLORIDE			9.2	10.5	11.8
FLUORIDE			0.29	0.23	0.17
H ₂ S FIELD/LAB			0.5/-	0.2/-	40.1/-
NITROGEN, NH ₃ -N			0.1	0.26	0.44
NITROGEN, NO ₃ -N			.03	.03	.03
NITROGEN, TOTAL KJEL.			0.28	0.03	0.02
OXYGEN DEMAND, CHEMICAL			<10	13	13
PO ₄ TOTAL FILTERABLE			0.61	0.29	0.29
PO ₄ TOTAL NONFILTERABLE			<.01	<.01	<.01
SILICA			14.8	22.5	14.0
SOLIDS, TOTAL			290	236	271
SOLIDS, TOTAL SUSPENDED			19	38	20
SULFATE			<1.0	<1.0	<1.0
ALUMINUM			0.6	0.8	0.9
ARSENIC			0.002	0.003	0.003
BARIUM			<0.1	<0.1	<0.1
BERYLLIUM			<0.05	<0.05	<0.05
CADMIUM			<0.001	<0.001	<0.001
CALCIUM			71.3	34.5	48.1
CHROMIUM, TOTAL			<0.001	<0.001	<0.001
COBALT			<0.05	<0.05	<0.05
COPPER			<0.05	<0.05	<0.05
IRON, FIELD/LAB			1.8/1.8	1.2/1.2	1.0/0.9
MAGNESIUM			2.1	3.1	2.1
MANGANESE, FIELD/LAB			<0.5/0.02	<0.5/0.02	<0.5/0.02
LEAD			0.002	0.002	0.002
MERCURY			<0.0005	<0.0005	<0.0005
MOLYBDENUM			<0.2	<0.2	<0.2
NICKEL			<0.3	<0.3	<0.3
POTASSIUM			1.2	1.5	1.3
SELENIUM			<0.002	<0.002	<0.002
SILVER			<0.001	<0.001	<0.001
SODIUM			8.1	6.9	6.6
VANADIUM			<0.6	<0.6	<0.6
ZINC			<0.02	<0.02	<0.02
COLIFORM, FECAL			NO GROWTH		
COLIFORM, TOTAL			*/H	*/H	*/H

Richard A. Dunham
Richard A. Dunham, Chemist

EXHIBIT 2.5-2 (CONTINUED). GROUND WATER QUALITY
ON PROPOSED PLANT SITE

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: April 21, 1981

PARAMETER	B-1	B-2	B-5	B-9	B-13
TIME SAMPLED	9:53 A	11:00 A	12:10 P	12:35 P	11:45 A
TEMPERATURE, °C					
WATER ELEVATION	7'3"	6'11"	4'4"	4'0"	Ground level
SATURATION INDEX					
CONDUCTIVITY, uS					
pH					
TOTAL ALKALINITY					
P-ALKALINITY					
TOTAL HARDNESS					
CHLORIDE					
FLUORIDE					
H ₂ S FIELD/LAB					
NITROGEN, NH ₃ -N					
NITROGEN, NO ₃ -N					
NITROGEN, TOTAL KJEL.					
OXYGEN DEMAND, CHEMICAL					
PO ₄ TOTAL FILTERABLE					
PO ₄ TOTAL NONFILTERABLE					
SILICA					
SOLIDS, TOTAL					
SOLIDS, TOTAL SUSPENDED					
SULFATE					
ALUMINUM					
ARSENIC					
BARIUM					
BERYLLIUM					
CADMIUM					
CALCIUM					
CHROMIUM, TOTAL					
COBALT					
COPPER					
IRON, FIELD/LAB					
MAGNESIUM					
MANGANESE, FIELD/LAB					
LEAD					
MERCURY					
MOLYBDENUM					
NICKEL					
POTASSIUM					
SELENIUM					
SILVER					
SODIUM					
VANADIUM					
ZINC					
COLIFORM, FECAL					
COLIFORM, TOTAL					

EXHIBIT 2.5-3. SUPPLEMENTAL GROUND
WATER QUALITY ON
PROPOSED PLANT SITE

(1 OF 8)

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/l

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: April 21, 1981

PARAMETER	B-14	B-15	B-16	B-17
TIME SAMPLED	11:52A	3:31 P	2:45 P	1:30 P
TEMPERATURE, °C		21.5°	21.5°	20.0
WATER ELEVATION	7'6"	4'11"	3'3"1	3'7"
SATURATION INDEX		-0.10	+0.08	+0.35
CONDUCTIVITY, uS		460	540	480
pH		7.10	7.18	6.82
TOTAL ALKALINITY		242	278	239
P-ALKALINITY		0	0	0
TOTAL HARDNESS		250	292	252
CHLORIDE		7.8	9.2	9.9
FLUORIDE		0.30	0.20	0.16
H ₂ S FIELD/LAB		0.3/-	0.2/-	0.1/-
NITROGEN, NH ₃ -N		0.32	0.40	0.36
NITROGEN, NO ₃ -N		.02	.05	.11
NITROGEN, TOTAL KJEL.		0.03	<0.02	0.08
OXYGEN DEMAND, CHEMICAL		20.9	20.1	22.8
PO ₄ TOTAL FILTERABLE		.67	.13	.38
PO ₄ TOTAL NONFILTERABLE		<.01	<.01	<.01
SILICA		13.1	18.9	11.7
SOLIDS, TOTAL		303	344	281
SOLIDS, TOTAL SUSPENDED		20	15	7
SULFATE		<1.0	<1.0	<1.0
ALUMINUM		<0.4	<0.4	<0.4
ARSENIC		0.003	0.003	0.003
BARIUM		<0.1	<0.1	<0.1
BERYLLIUM		<0.05	<0.05	<0.05
CADMIUM		<0.001	<0.001	0.001
CALCIUM		94.9	104.5	98.5
CHROMIUM, TOTAL		<0.001	<0.001	<0.001
COBALT		<0.05	<0.05	<0.05
COPPER		<0.05	<0.05	<0.05
IRON, FIELD/LAB		1.5/1.6	1.2/1.2	0.9/0.9
MAGNESIUM		2.0	3.0	2.3
MANGANESE, FIELD/LAB		<0.5/<0.02	<0.5/<0.02	<0.5/<0.02
LEAD		0.001	0.001	0.001
MERCURY		<0.0005	<0.0005	<0.0005
MOLYBDENUM		<0.2	<0.2	<0.2
NICKEL		<0.3	<0.3	<0.3
POTASSIUM		1.1	1.4	1.3
SELENIUM		<0.002	<0.002	<0.002
SILVER		<0.001	<0.001	<0.001
SODIUM		7.5	7.3	7.3
VANADIUM		<0.6	<0.6	<0.6
ZINC		<0.05	<0.05	<0.05
COLIFORM, FECAL		-1	-1	-1
COLIFORM, TOTAL		*,H	*,H	*,H

Richard A. Dunham, Chemist
Richard A. Dunham

EXHIBIT 2.5-3. SUPPLEMENTAL GROUND
WATER QUALITY ON
PROPOSED PLANT SITE

(2 OF 8)

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: May 26, 1981

PARAMETER	B-1	B-2	B-5	B-9
TIME SAMPLED	8:34 A	9:07 A	10:07 A	10:51 A
TEMPERATURE, °C	21°	22°	22°	23°
WATER ELEVATION	7'9"	7'11"	4'9"	5'3"
SATURATION INDEX	+2.73	+1.0	-0.03	-3.49
CONDUCTIVITY, μ S	20	20	490	50
pH	4.80	5.12	6.95	5.78
TOTAL ALKALINITY	0	4	235	21
P-ALKALINITY	0	0	0	0
TOTAL HARDNESS	3	5	247	36
CHLORIDE	3.3	4.1	20.0	11.3
FLUORIDE	<0.10	0.13	0.20	0.13
H ₂ S FIELD/LAB	0.2/-	0.7/-	0.1/-	0.2/0
NITROGEN, NH ₃ -N	0.10	0.06	0.50	0.68
NITROGEN, NO ₃ -N	.042	.038	.037	.048
NITROGEN, TOTAL KJEL.	0.28	0.24	<0.02	<0.02
OXYGEN DEMAND, CHEMICAL	<10	<10	<10	<10
PO ₄ TOTAL FILTERABLE	.06	.14	.44	.20
PO ₄ TOTAL NONFILTERABLE	.02	.02	.05	.12
SILICA	2.8	4.1	10.5	13.3
SOLIDS, TOTAL	46	32	41	207
SOLIDS, TOTAL SUSPENDED	2	<1	24	25
SULFATE	<1.0	<1.0	<1.0	<1.0
ALUMINUM	<0.4	<0.4	<0.4	<0.4
ARSENIC	<0.002	<0.002	0.003	0.004
BARIUM	<0.1	<0.1	<0.1	<0.1
BERYLLIUM	<0.05	<0.05	<0.05	<0.05
CADMIUM	<0.001	<0.001	<0.001	<0.001
CALCIUM	<5	<5	92.8	7.1
CHROMIUM, TOTAL	<0.001	<0.001	<0.001	<0.001
COBALT	<0.05	<0.05	<0.05	<0.05
COPPER	<0.05	<0.05	<0.05	<0.05
IRON, FIELD/LAB	0.4/0.23	0.7/0.40	1.5/1.2	0.9/0.56
MAGNESIUM	0.7	0.7	3.3	1.2
MANGANESE, FIELD/LAB	<0.5/0.02	<0.5/0.02	<0.5/0.02	<0.5/0.02
LEAD	0.003	0.002	0.003	0.002
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005
MOLYBDENUM	<0.2	<0.2	<0.2	<0.2
NICKEL	<0.3	<0.3	<0.3	<0.3
POTASSIUM	0.1	0.1	1.7	0.4
SELENIUM	<0.002	<0.002	<0.002	<0.002
SILVER	<0.001	<0.001	<0.001	<0.001
SODIUM	2.5	3.6	14.1	7.6
VANADIUM	<0.6	<0.6	<0.6	<0.6
ZINC	<0.05	<0.05	<0.05	<0.05
COLIFORM, FECAL	no growth			
COLIFORM, TOTAL	-1	-1	-1	-1

EXHIBIT 2.5-3. SUPPLEMENTAL GROUND
WATER QUALITY ON
PROPOSED PLANT SITE

(3 OF 8)

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: May 26, 1981

PARAMETER	B-13	B-14	B-15	B-16	B-17
TIME SAMPLED	1:31 P	1:37 P	1:05 P	12:23 P	11:36 A
TEMPERATURE, °C			22.0	23.0	21.0
WATER ELEVATION	2'0"	9'0"	6'2"	4'8"	4'8"
SATURATION INDEX			-0.20	+0.21	-0.31
CONDUCTIVITY, uS			450	525	450
pH			6.95	7.30	6.92
TOTAL ALKALINITY			241	283	234
P-ALKALINITY			0	0	0
TOTAL HARDNESS			278	296	244
CHLORIDE			6.9	7.8	10.0
FLUORIDE			0.33	0.20	0.18
H ₂ S FIELD/LAB			0.2/-	0.1/-	<0.1/-
NITROGEN, NH ₃ -N			0.30	0.20	0.48
NITROGEN, NO ₃ -N			.037	.031	.031
NITROGEN, TOTAL KJEL.			0.03	<0.02	<0.02
OXYGEN DEMAND, CHEMICAL			<10	<10	<10
PO ₄ TOTAL FILTERABLE			.74	.21	.29
PO ₄ TOTAL NONFILTERABLE			.02	.03	.03
SILICA			12.8	17.5	12.0
SOLIDS, TOTAL			313	364	309
SOLIDS, TOTAL SUSPENDED			21	19	13
SULFATE			<1.0	<1.0	<1.0
ALUMINUM			<0.4	<0.4	<0.4
ARSENIC			<0.002	0.003	<0.002
BARIUM			<0.1	<0.1	<0.1
BERYLLIUM			<0.05	<0.05	<0.05
CADMIUM			<0.001	<0.001	<0.001
CALCIUM			94.4	111.1	91.3
CHROMIUM, TOTAL			<0.001	<0.001	<0.001
COBALT			<0.05	<0.05	<0.05
COPPER			<0.05	<0.05	<0.05
IRON, FIELD/LAB			1.5/1.4	0.9/0.32	0.7/0.56
MAGNESIUM			2.0	2.8	2.1
MANGANESE, FIELD/LAB			<0.5/<0.02	<0.5/<0.02	<0.5/<0.02
LEAD			<0.001	<0.001	0.001
MERCURY			<0.0005	<0.0005	<0.0005
MOLYBDENUM			<0.2	<0.2	<0.2
NICKEL			<0.3	<0.3	<0.3
POTASSIUM			0.9	1.3	1.1
SELENIUM			<0.002	0.002	<0.002
SILVER			<0.001	<0.001	<0.001
SODIUM			9.3	8.9	9.0
VANADIUM			<0.6	<0.6	<0.6
ZINC			<0.05	<0.05	<0.05
COLIFORM, FECAL			no growth		
COLIFORM, TOTAL			-1	-1	-1

Richard A. Dunham, Chemist

Richard A. Dunham

EXHIBIT 2.5-3. SUPPLEMENTAL GROUND
WATER QUALITY ON
PROPOSED PLANT SITE

(4 OF 8)

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: 6-23-81

PARAMETER	B-1	B-2	B-5	B-9	
TIME SAMPLED	10:20 A	10:38 A	11:15 A	11:35 A	
TEMPERATURE, °C					
WATER ELEVATION	6'11"	7'3"	4'7"	4'4"	
SATURATION INDEX					
CONDUCTIVITY, uS					
PH					
TOTAL ALKALINITY					
P-ALKALINITY					
TOTAL HARDNESS					
CHLORIDE					
FLUORIDE					
H ₂ S FIELD/LAB					
NITROGEN, NH ₃ -N					
NITROGEN, NO ₃ -N					
NITROGEN, TOTAL KJEL.					
OXYGEN DEMAND, CHEMICAL					
PO ₄ TOTAL FILTERABLE					
PO ₄ TOTAL NONFILTERABLE					
SILICA					
SOLIDS, TOTAL					
SOLIDS, TOTAL SUSPENDED					
SULFATE					
ALUMINUM					
ARSENIC					
BARIUM					
BERYLLIUM					
CADMIUM					
CALCIUM					
CHROMIUM, TOTAL					
COBALT					
COPPER					
IRON, FIELD/LAB					
MAGNESIUM					
MANGANESE, FIELD/LAB					
LEAD					
MERCURY					
MOLYBDENUM					
NICKEL					
POTASSIUM					
SELENIUM					
SILVER					
SODIUM					
VANADIUM					
ZINC					
COLIFORM, FECAL					
COLIFORM, TOTAL					

EXHIBIT 2.5-3. SUPPLEMENTAL GROUND
WATER QUALITY ON
PROPOSED PLANT SITE

(5 OF 8)

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/l

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: 6-23-81

PARAMETER	B-13	B-14	B-15	B-16	B-17
TIME SAMPLED			2:00 P	1:15 P	12:00 P
TEMPERATURE, °C			22.0	23.0	21.0
WATER ELEVATION			4'11"	3'5"	3'6"
SATURATION INDEX			-0.03	-0.08	-0.53
CONDUCTIVITY, uS			460	530	460
pH			7.15	6.98	6.68
TOTAL ALKALINITY			240	293	235
P-ALKALINITY			0	0	0
TOTAL HARDNESS			250	255	244
CHLORIDE			12.0	6.8	9.2
FLUORIDE			0.26	0.18	0.16
H ₂ S FIELD/LAB			0.3/-	0.1/-	0.1/-
NITROGEN, NH ₃ -N			0.30	0.26	0.32
NITROGEN, NO ₃ -N			.060	.047	.043
NITROGEN, TOTAL KjEL.			0.21	0.26	0.27
OXYGEN DEMAND, CHEMICAL			< 10	< 10	< 10
PO ₄ TOTAL FILTERABLE			.722	.268	.505
PO ₄ TOTAL NONFILTERABLE			< .01	< .01	< .01
SILICA			14.0	20.0	13.3
SOLIDS, TOTAL			280	351	283
SOLIDS, TOTAL SUSPENDED			2	10	6
SULFATE			< 1	< 1	< 1
ALUMINUM			< 0.4	< 0.4	< 0.4
ARSENIC			0.004	0.003	0.002
BARIUM			0.20	0.24	0.11
BERYLLIUM			< 0.05	< 0.05	< 0.05
CADMIUM			< 0.001	< 0.001	< 0.001
CALCIUM			98.6	110.6	94.6
CHROMIUM, TOTAL			< 0.001	< 0.001	< 0.001
COBALT			< 0.05	< 0.05	< 0.05
COPPER			< 0.05	< 0.05	< 0.05
IRON, FIELD/LAB			1.5/1.5	1.0/1.1	0.8/0.8
MAGNESIUM			1.5	2.5	1.8
MANGANESE, FIELD/LAB			< 0.5/< 0.02	< 0.5/< 0.02	< 0.5/< 0.02
LEAD			0.002	0.001	0.001
MERCURY			< 0.0005	< 0.0005	< 0.0005
MOLYBDENUM			< 0.2	< 0.2	< 0.2
NICKEL			< 0.3	< 0.3	< 0.3
POTASSIUM			1.0	1.4	1.3
SELENIUM			< 0.002	< 0.002	< 0.002
SILVER			< 0.001	< 0.001	< 0.001
SODIUM			9.6	9.1	9.4
VANADIUM			< 0.6	< 0.6	< 0.6
ZINC			< 0.05	< 0.05	< 0.05
COLIFORM, FECAL			Not determined		
COLIFORM, TOTAL			Not determined		

Richard A. Dunham, Chemist

EXHIBIT 2.5-3. SUPPLEMENTAL GROUND
WATER QUALITY ON
PROPOSED PLANT SITE

(6 OF 8)

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: July 21, 1981

PARAMETER	B-1	B-2	B-5	B-9
TIME SAMPLED	9:52 A	10:51 A	11:31 A	12:23 P
TEMPERATURE, °C	21.5	21.5	21.5	22.0
WATER ELEVATION	7'5"	7'4"	5'6"	5'0"
SATURATION INDEX	+0.33	+0.32	+0.78	+3.08
CONDUCTIVITY, uS	30	30	520	100
pH	5.29	5.41	6.41	5.92
TOTAL ALKALINITY	13	10	247	31
P-ALKALINITY	0	0	0	0
TOTAL HARDNESS	5	4	250	30
CHLORIDE	5.0	12.5	16.3	15.0
FLUORIDE	<0.10	<0.10	0.14	<0.10
H ₂ S FIELD/LAB	<0.1/ -	0.2/ -	<0.1/ -	0.1/ -
NITROGEN, NH ₃ -N	<0.1	<0.1	0.44	<0.1
NITROGEN, NO ₃ -N	.025	.021	.095	.030
NITROGEN, TOTAL KJEL	0.41	0.32	0.39	0.44
OXYGEN DEMAND, CHEMICAL	12	<10	18	34
PO ₄ TOTAL FILTERABLE	.08	.07	.30	.10
PO ₄ TOTAL NONFILTERABLE	.03	.03	.06	.07
SILICA	<0.5	<0.5	4.5	<0.5
SOLIDS, TOTAL	24	23	293	169
SOLIDS, TOTAL SUSPENDED	<1	<1	16	20
SULFATE	<1.0	<1.0	<1.0	<1.0
ALUMINUM	<0.4	<0.4	<0.4	<0.4
ARSENIC	<0.002	<0.002	0.003	0.003
BARIUM	<0.1	<0.1	<0.1	<0.1
BERYLLIUM	<0.05	<0.05	<0.05	<0.05
CADMIUM				
CALCIUM	0	0	93.6	9.5
CHROMIUM, TOTAL	<0.001	<0.001	<0.001	<0.001
COBALT	<0.05	<0.05	<0.05	<0.05
COPPER	<0.05	<0.05	<0.05	<0.05
IRON, FIELD/LAB	0.5/0.4	0.5/0.4	1.3/1.2	0.8/0.6
MAGNESIUM	0.7	0.7	1.2	0.6
MANGANESE, FIELD/LAB	<0.5/<0.02	<0.5/<0.02	<0.5/<0.02	<0.5/<0.02
LEAD	0.001	0.001	0.001	0.002
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005
MOLYBDENUM	<0.2	<0.2	<0.2	<0.2
NICKEL	<0.3	<0.3	<0.3	<0.3
POTASSIUM	0.2	0.2	1.6	0.5
SELENIUM	<0.002	<0.002	0.002	0.002
SILVER	<0.001	<0.001	<0.001	<0.001
SODIUM	2.7	3.7	15.7	8.3
VANADIUM	<0.6	<0.6	<0.6	<0.6
ZINC	<0.05	<0.05	<0.05	<0.05
COLIFORM, FECAL	NO GROWTH			
COLIFORM, TOTAL	*-H	*-H	*-H	*-H

Richard A. Dunham
Richard A. Dunham, Chemist

EXHIBIT 2.5-3. SUPPLEMENTAL GROUND
WATER QUALITY ON
PROPOSED PLANT SITE

(7 OF 8)

ORLANDO UTILITIES COMMISSION WATER ANALYSIS

RESULTS IN Mg/L

CURTIS H. STANTON ENERGY CENTER
GROUNDWATER MONITORING PROGRAM

DATE: July 21, 1981

PARAMETER	B-15	B-16	B-17		
TIME SAMPLED		1:45 P	1:01 P		
TEMPERATURE, °C		22.0	21.0		
WATER ELEVATION	6'1"	4'6"	4'4"		
SATURATION INDEX	WOULD	+0.25	+0.49		
CONDUCTIVITY, uS	NOT	625	525		
pH	PUMP	6.75	6.70		
TOTAL ALKALINITY		306	250		
P-ALKALINITY		0	0		
TOTAL HARDNESS		305	254		
CHLORIDE		14.5	22.5		
FLUORIDE		0.13	0.12		
H ₂ S FIELD/LAB		0.1/-	0.1/-		
NITROGEN, NH ₃ -N		0.28	0.24		
NITROGEN, NO ₃ -N		.054	.080		
NITROGEN, TOTAL KjEL.		0.33	0.32		
OXYGEN DEMAND, CHEMICAL		10	10		
PO ₄ TOTAL FILTERABLE		.26	.27		
PO ₄ TOTAL NONFILTERABLE		.07	.06		
SILICA		11.8	6.3		
SOLIDS, TOTAL		328	293		
SOLIDS, TOTAL SUSPENDED		21	7		
SULFATE		1.0	1.0		
ALUMINUM		0.4	0.4		
ARSENIC		0.002	0.002		
BARIUM		0.2	0.1		
BERYLLIUM		0.05	0.05		
CADMIUM		0.001	0.001		
CALCIUM		119.0	96.0		
CHROMIUM, TOTAL		0.001	0.001		
COBALT		0.05	0.05		
COPPER		0.05	0.05		
IRON, FIELD/LAB		1.0/0.9	0.7/0.6		
MAGNESIUM		2.5	1.9		
MANGANESE, FIELD/LAB		0.5/0.02	0.5/0.02		
LEAD		0.001	0.001		
MERCURY		0.0005	0.0005		
MOLYBDENUM		0.2	0.2		
NICKEL		0.3	0.3		
POTASSIUM		1.4	1.3		
SELENIUM		0.002	0.002		
SILVER		0.001	0.001		
SODIUM		8.6	8.9		
VANADIUM		0.6	0.6		
ZINC		0.05	0.05		
COLIFORM, FECAL		NO GROWTH			
COLIFORM, TOTAL		*-H	*-H		

Richard A. Dunham
Richard A. Dunham, Chemist

EXHIBIT 2.5-3. SUPPLEMENTAL GROUND
WATER QUALITY ON
PROPOSED PLANT SITE

(8 OF 8)

2.6 METEOROLOGY

2.6.1 General Climate

The prevailing subtropical marine climate of the central Florida region results from the influence of the Atlantic Ocean and the Bermuda high pressure system. Long, warm, humid summers and short, mild winters prevail. Because of the southerly location and marine influences, this area has a notably equable climate, evidenced by small annual and diurnal temperature variations. Rainfall is moderate to heavy during the summer and light during the winter. Well developed extratropical migratory high and low pressure centers usually travel north of the region.

Winds are of moderate speed, and blow from the southeast to southwest during the warmer half of the year (May through October). During the cooler months, the predominant directions are north and north-northeast. Along the coastal areas of east central Florida, local land-sea breeze circulations modify regional wind patterns by superimposing an easterly wind component during the daytime hours and a westerly component at night.

The average annual rainfall in this region is over 51 inches. Summer precipitation due to frequent afternoon thundershowers exceeds winter precipitation due to frontal systems, pre-frontal squall lines, and wave disturbances along fronts stalled over the Florida peninsula. Summer precipitation is mostly of the convective types, resulting in frequent summertime afternoon thundershowers in this region. Tropical disturbances periodically cause significant precipitation during the summer and fall seasons.

Extremely hot weather is rare because of the ocean influence; maximum temperatures over a summer usually do not exceed the middle 90's. Winter temperatures are mild, interrupted only a few times per season by northerly or northwesterly advection of polar air. Inland locations generally display a greater range of temperatures due to the rapid heating and cooling of ground surfaces as compared with water bodies.

The dispersion characteristics of the region are generally good because of sea breeze circulations, good ventilation, and flat terrain. This is

especially true for coastal areas due to higher wind speeds and infrequent ground level inversions.

2.6.2 Site Climatology

Weather patterns for locations not directly on the coastline are generally similar throughout central Florida. There are no existing local meteorological data with long periods of record for the immediate area of the Stanton Energy Center site. However, the Stanton Energy Center site is approximately 10 miles east-northeast of the Orlando/McCoy International (Jetport) Airport and 10 miles east-southeast of Herndon Field. The official National Weather Service (NWS) weather station was moved from Herndon Field to Orlando/McCoy Jetport on January 31, 1974. Thus, the long term meteorological data base has data from both locations. The meteorological data for these two NWS stations are considered representative of the Stanton Energy Center site and are used to describe the local site climatology. Lisbon, Florida is the closest location which has evaporation data that were considered representative of the Stanton Energy Center. Lisbon is approximately 40 miles northwest of the proposed site area.

Meteorological measurements are currently being made as part of the onsite air monitoring program. This program began on May 1, 1980. Wind speed, dry-bulb temperature, and humidity data have been collected and reduced for the period from May 1, 1980 to April 30, 1981; however, the wind direction and precipitation instruments were out of service for several months due to a series of problems that developed after a direct lightning strike on September 9, 1980. Because of the short period (i.e., one year) covered by the onsite data, primary emphasis for the characterization of the site area climate is placed on the NWS data from Orlando. However, onsite data are included for comparison in some discussions within this section.

2.6.2.1 Temperature and Humidity. Table 2.6-1 presents average monthly dry-bulb and wet-bulb temperatures for a 19-year period(1) as well as the 30-year dry-bulb temperature normals and extremes(2) for Orlando, Florida. For comparison, the temperature data from the onsite air monitoring program

have also been included. Typically, the maximum temperatures for the Orlando area exceed 90 F about two days in three during the summer months. The hottest month is August with an average temperature of 81.8 F. The extreme highest temperature for the period from 1941 to 1979 was 102 F. January is the coldest month with an average temperature of 60.3 F. Average monthly wet-bulb temperatures range from 74.8 F in August to 53.8 F in January. The 1 per cent wet-bulb temperature is defined as the temperature which is only exceeded 1 per cent of the time and similarly, the 5 per cent wet-bulb temperature is exceeded 5 per cent of the time. The 1 per cent and 5 per cent wet-bulb temperatures for the Stanton Energy Center site, based on the average summer season (June through September), are 79 F and 78 F, respectively.(3) The 1 per cent and 5 per cent dry-bulb temperatures are 93 F and 90 F, respectively.(3)

The atmosphere in central Florida is moist, with an average relative humidity of about 75 per cent. Table 2.6-2 presents monthly and annual averages of relative humidity observed at the Orlando NWS station for the hours 0100, 0700, 1300, and 1900 local time.(4) Although not directly comparable, the average monthly relative humidity data from the onsite monitoring program have been included. The mean number of days per month with heavy fog (visibility less than 1/4 mile) are also included.(4) Relative humidities are generally highest during the early morning hours, typically ranging between 80 and 90 per cent, compared to about 50 or 60 per cent during the afternoon. Mean relative humidities tend to be lowest in the spring months and highest in the summer months; however, the seasonal differences are small.

2.6.2.2 Precipitation and Evaporation. Average monthly precipitation totals for Orlando are shown on Table 2.6-3(4) and in Figure 2.6-1. The average number of days with thunderstorm occurrences and measurable precipitation are also included.(4) Annual precipitation averages 51.21 inches with the majority of the precipitation falling during thunderstorms in June through September. Thunderstorms occur almost every afternoon during the summer but only last an hour or two.

Weather conditions have been dry over much of Florida during the past year. Precipitation totals during the first year of operation of the onsite measurement program were significantly less than normal values. Rainfall at the Orlando NWS station during the period May 1, 1980 through March 31, 1981 (April data were not yet available) was 37.96 inches, more than 10 inches below the normal amount for the same 11-month period.

1

2.6-3a

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Table 2.6-4 shows the maximum 24-hour precipitation amounts for return periods of 2, 5, 10, 25, 50, and 100 years for the site area. These vary from 4.80 inches for a two-year return period to 10.90 inches for a 100-year return period.(5) Mean annual gross lake evaporation is estimated to be 47 inches based on the period 1946 through 1955.(6) Table 2.6-5 presents an estimated monthly distribution of evaporation data for Lisbon, Florida. This distribution is considered representative of the Stanton Energy Center Site.

2.6.2.3 Wind, Stability, and Dispersion Characteristics. Seasonal and annual wind roses for the period 1948 to 1978 at Orlando are presented in Figures 2.6-2 through 2.6-6. These wind roses are considered appropriate in describing the general wind flow at the Stanton Energy Center site. Predominant wind directions are southerly and easterly in the summer and northerly during the winter. Mean wind speeds for each direction are shown on the wind roses. For regional comparison, the monthly and annual prevailing wind patterns for various Florida National Weather Service locations are presented in Figures 2.6-7 and 2.6-8.(7)

A general comparison was made of the meteorological data collected during the onsite ambient air monitoring period and data for the same period from the National Weather Service office at Orlando. Various equipment problems limited the onsite wind data collection to the periods May 1 through September 8, 1980 and January 25 through April 30, 1981. The onsite equipment problems are summarized in Subsection 2.8.2.1.

The onsite wind data for May 1 through September 8, 1980 and January 25 through April 30, 1981 and Orlando data for the same periods except for April (not yet available) are presented in Figures 2.6-9 and 2.6-10, respectively. The two wind roses have general similarities. The onsite wind rose and the Orlando wind rose show a high occurrence of westerly and easterly wind directions. The directions with the higher average wind speeds are west, west-northwest, and east for the onsite location and west and west-southwest for Orlando. The occurrence of calm winds for the onsite and Orlando data is 5.0 and 4.4 per cent, respectively. The data similarities are expected since the two locations are only 10 miles apart

and there are no complex topographic features in between. Differences in the data can be attributed to the fact that the Orlando wind rose consists of data collected at 3-hour intervals while the onsite wind rose is developed using hourly averages.

Atmospheric Dispersion

Atmospheric dispersion depends primarily on four meteorological parameters, as follows.

- (1) Mixing height.
- (2) Wind speed within the mixed layer.
- (3) Frequency of low level inversions.
- (4) Atmospheric stability.

Holzworth has estimated mean mixing depths and average wind speed within the mixed layer for 62 National Weather Service radiosonde stations within the 48 contiguous states.(8) The morning and afternoon mixing depths are calculated from the twice daily vertical temperature profiles and the morning and afternoon surface temperatures. Below this level, relatively vigorous mixing occurs. Diffusion above this height is inhibited due to thermal buoyancy considerations. The worst dispersion conditions occur when both the mixing depth and wind speed are low. In general, Florida has the best atmospheric dispersion conditions of any area in the 48 contiguous states. The area typically has greater mixing depths and higher wind speeds than other areas. Table 2.6-6 presents values of seasonal and annual morning and afternoon mixing depths and wind speed for the central Florida region.

Hosler has determined the frequency of inversions with bases below 500 feet for National Weather Service upper air stations in the contiguous United States.(9) Table 2.6-5 lists inversion frequency data for central Florida as interpolated from Hosler's work.

Atmospheric stability, in conjunction with general wind patterns, indicates the potential of the atmosphere to disperse airborne pollutants. Atmospheric conditions are typically categorized as unstable, neutral, or stable. An unstable atmosphere is one in which rapid diffusion takes place

in both the horizontal and vertical direction. Viewed in terms of changes in temperature with height, an unstable atmosphere is characterized by a sharp decrease in temperature with height. Neutral conditions are common in the atmosphere and are associated with moderate diffusion rates. Temperatures also decrease with height in a neutral atmosphere but not as rapidly as under unstable conditions (in accordance with the adiabatic lapse rate). A stable atmosphere is characterized by slight decreases, or even increases of temperature with height, and greatly reduced diffusion rates in comparison with unstable or neutral atmospheres.

The stability classifications presented in this section are based on the well-known Turner or STAR method, which assigns a stability on the basis of surface wind speed, cloud cover, and solar altitude. The joint frequency distribution wind speed, wind direction, and stability for 1970 at Orlando is summarized in Table 2.6-8.(10)

For general comparison, stabilities were determined for the limited onsite data (May 1 through September 8, 1980 and January 25 through April 30, 1981). The onsite stability classifications are based on a method which utilizes wind direction fluctuations (σ_θ) as described in the Nuclear Regulatory Commission (NRC) Regulatory Guide 1.23.(11) A joint frequency distribution of wind speed, wind direction, and stability derived from the data measured onsite is presented in Table 2.6-9.

2.6.2.4 Severe Weather.

Thunderstorms and Hail

Thunderstorms normally occur every month. Based on a 35-year period of observation at Orlando, thunderstorms can be expected to occur on about 82 days a year in the vicinity of the site. About 90 per cent of this thunderstorm activity occurs in the warmest six months of the year and is usually associated with summertime land mass heating and low level convergence of moist air by sea-breeze effects. Also, thunderstorms are produced by tropical storms as they approach the Florida coast.

Hail is occasionally present during thunderstorms but is not considered a significant hazard. There were only 14 reports of hail 3/4 inch or greater in diameter in the 1-degree longitude-latitude square containing the Stanton Energy Center site during the period 1955 through 1967.(12)

Windstorms

Strong, gusty surface winds often occur in association with severe thunderstorm activity, well-developed cold fronts, and tropical cyclones. Winds in excess of 40 mph have been recorded in every month of the year at Orlando. The fastest mile of wind on record at Orlando is 64 mph.(7)

2.6.3 References

- (1) United States Air Force, Air Weather Service, Revised Uniform Summary of Surface Weather Observations Parts A-F, Orlando, Florida/McCoy AFB, National Climatic Center, Asheville, North Carolina, October 1968.
- (2) United States Department of Commerce, Monthly Normals of Temperature, Precipitation, and Cooling Degree Days 1941-1970, Comparative Climatic Data through 1977, National Climatic Center, Asheville, North Carolina, May 1978.
- (3) The Marley Company, Cooling Tower Fundamentals and Application Principles, Kansas City, Missouri, 1967, 74 pp.
- (4) United States Department of Commerce, Local Climatological Data 1979 Orlando, Florida, Annual Summary With Comparative Data, National Climatic Center, Asheville, North Carolina.
- (5) United States Weather Bureau, Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24-Hour and Return Periods from 1 to 100 Years, Technical Paper No. 40, Washington, D.C., May 1961, 71 pp.
- (6) United States Department of Commerce NOAA, Climatic Atlas of the United States, National Climatic Center, Asheville, North Carolina, June 1968, 1974, 80 pp.
- (7) James T. Bradley, "The Climate of Florida," in Climates of the States, U.S. Department of Commerce, Washington, D.C., 1974, pp. 45-70.
- (8) George C. Holzworth, Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States, Publication No. AP-101, USEPA, Office of Air Programs, Research Triangle Park, NC, January 1972.
- (9) Charles R. Hosler, Low-Level Inversion Frequency in the Contiguous United States, Monthly Weather Review, 319-339, September 1961.

- (10) United States Department of Commerce, Wind Distribution by Pasquill Stability Classes(5)-STAR Program, Orlando/McCoy, Florida, Station 12815, 1970.
- (11) U.S. Atomic Energy Commission, "Onsite Meteorological Programs," Safety Guide 1.23, USAEC, Washington, D.C., February 1972.
- (12) Environmental Science Services Administration, "Severe-Local Storm Occurrence, 1955-1967," Technical Memorandum WBTM FCST 12, United States Department of Commerce, Silver Springs, Maryland, September 1969.

DIRECTIONS FOR INSERTING AMENDMENT 6, NOVEMBER 30, 1984

Remove

Insert

Volume I

No Changes

Volume II

Figure 3.10-1

Figure 3.10-1

Volume III

No Changes

Amendment 6
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TABLE 2.6-1. MONTHLY TEMPERATURES FOR THE ORLANDO, FLORIDA AREA

Month	NWS 30-Year "Normal" Data*			Onsite Mean** Dry-Bulb	NWS Mean*** Dry-Bulb	NWS Mean*** Wet-Bulb
	Normal F	Highest F	Lowest F			
January	60.3	87	20	50.7	58.8	53.8
February	61.5	90	28	61.5	62.0	56.5
March	65.9	92	31	62.4	65.9	59.5
April	71.3	96	39	72.0	71.1	63.7
May	76.4	102	49	73.6	75.7	68.1
June	80.2	100	60	77.2	78.8	72.6
July	81.4	100	66	79.9	79.9	74.2
August	81.8	99	64	79.3	79.9	74.8
September	80.1	97	56	81.3	78.6	73.5
October	74.3	95	43	73.2	72.6	67.0
November	66.6	89	29	65.5	66.0	60.5
December	61.3	90	20	58.5	59.6	54.7
Annual	71.8	102	20	69.6	70.9	65.1
1 Per Cent	--	--	--	--	93	79
5 Per Cent	--	--	--	--	90	78

*Based on the years 1941-1970.

**Based on the period May 1, 1980 - April 30, 1981.

***Based on the years 1944-1946, 1952-1967.

TABLE 2.6-2. MEAN RELATIVE HUMIDITY AND OCCURRENCES OF HEAVY FOG*

Month	Relative Humidity, Per Cent NWS Orlando Hourly Average**				Onsite Monthly Average***	Mean Number of Days With Heavy Fog**
	Local Time					
	0100	0700	1300	1900		
January	85	88	57	69	51.6	6
February	81	85	52	62	57.6	3
March	83	86	50	60	48.9	3
April	82	87	46	57	55.9	1
May	84	87	49	62	63.3	2
June	87	88	57	71	64.8	1
July	88	89	59	74	67.7	1
August	90	91	60	77	M	1
September	89	90	60	76	M	1
October	85	86	56	73	62.2	2
November	84	87	54	70	61.9	3
December	85	86	56	71	60.9	5
Annual	85	88	54	69	59.5	29

*Defined as visibility 1/4 mile or less.

**Based on the years 1941-1970.

***Based on the period May 1, 1980 - April 30, 1981.

NOTE: M = Missing monitoring data.

TABLE 2.6-3. MONTHLY AVERAGED PRECIPITATION FOR ORLANDO, FLORIDA*

<u>Month</u>	<u>Precipitation Total inches</u>	<u>Thunderstorms no. of days</u>	<u>Precipitation 0.01 Inch or More no. of days</u>
January	2.28	1	6
February	2.95	1	7
March	3.46	3	8
April	2.72	3	5
May	2.94	8	9
June	7.11	14	14
July	8.29	20	18
August	6.73	17	16
September	7.20	10	14
October	4.07	3	9
November	1.56	1	5
December	1.90	1	6
Annual	51.21	82	116

*Based on the years 1941-1970.

TABLE 2.6-4. MAXIMUM 24-HOUR PRECIPITATION AMOUNTS FOR SELECTED RETURN PERIODS

<u>Return Period</u> years	<u>Precipitation</u> inches
2	4.80
5	6.50
10	7.50
25	8.50
50	9.60
100	10.80

TABLE 2.6-5. AVERAGE MONTHLY SHALLOW LAKE EVAPORATION AT LISBON STATION,
FLORIDA*

<u>Month</u>	<u>Monthly Evaporation, inches</u>
January	2.51
February	2.43
March	3.89
April	4.86
May	5.40
June	5.07
July	5.36
August	5.36
September	3.88
October	3.82
November	2.57
December	<u>1.85</u>
Annual	47.00

*Derived from 20-year annual average and distributed based on 1960 monthly evaporation data.

TABLE 2.6-6. MIXING DEPTHS AND AVERAGE WIND SPEEDS THROUGH THE MIXED LAYER

<u>Season</u>	<u>Morning</u>		<u>Afternoon</u>	
	<u>Mixed Depth</u> feet	<u>Wind Speed</u> mph	<u>Mixed Depth</u> feet	<u>Wind Speed</u> mph
Winter	1,804	13.4	3,609	15.7
Spring	2,133	12.3	4,921	15.7
Summer	2,297	11.2	5,249	12.3
Fall	1,640	13.4	4,593	14.6
Annual	1,968	13.4	4,593	14.6

TABLE 2.6-7. INVERSION FREQUENCY IN CENTRAL FLORIDA

<u>Season</u>	<u>Per Cent of Total Hours</u>	<u>Per Cent of Days With Inversion Occuring</u>
Winter	37	70
Spring	30	62
Summer	25	60
Fall	40	75
Annual	33	65

TABLE 2.6-8. FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY (ORLANDO/McCOY, FLORIDA 1970)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	9	8	0	0	0	0	3.5	17
NNE	2	3	0	0	0	0	3.4	5
NE	0	2	0	0	0	0	4.5	2
ENE	5	3	0	0	0	0	3.3	8
E	3	9	0	0	0	0	3.9	12
ESE	5	10	0	0	0	0	3.9	15
SE	4	9	0	0	0	0	3.7	13
SSE	5	9	0	0	0	0	3.7	14
S	12	12	0	0	0	0	3.5	24
SSW	10	11	0	0	0	0	3.5	21
SW	3	2	0	0	0	0	3.4	5
WSW	6	5	0	0	0	0	3.6	11
W	5	6	0	0	0	0	3.6	11
WNW	2	4	0	0	0	0	3.8	6
NW	4	1	0	0	0	0	3.2	5
NNW	6	7	0	0	0	0	3.6	13
Average Speed	2.6	4.4	0.0	0.0	0.0	0.0	2.8	
Total	81	101	0	0	0	0		

Number of Occurrences of A Stability = 236

Number of Calms with A Stability = 54

TABLE 2.6-8 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ORLANDO/MCCOY, FLORIDA 1970)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	33	46	20	0	0	0	4.7	99
NNE	17	18	10	0	0	0	4.6	45
NE	15	8	6	0	0	0	4.1	29
ENE	35	16	16	0	0	0	4.3	67
E	20	31	34	0	0	0	5.5	85
ESE	22	25	25	0	0	0	5.2	72
SE	9	19	12	0	0	0	5.3	40
SSE	16	16	8	0	0	0	4.6	40
S	21	31	22	0	0	0	5.1	74
SSW	15	31	19	0	0	0	5.2	65
SW	9	15	9	0	0	0	5.1	33
WSW	8	20	16	0	0	0	5.6	44
W	23	21	16	0	0	0	4.8	60
WNW	16	10	7	0	0	0	4.3	33
NW	15	12	4	0	0	0	4.2	31
NNW	15	17	10	0	0	0	4.7	42
Average Speed	2.5	5.2	7.4	0.0	0.0	0.0	4.4	
Total	289	336	234	0	0	0		

Number of Occurrences of B Stability = 964

Number of Calms with B Stability = 105

TABLE 2.6-8 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ORLANDO/MCCOY, FLORIDA 1970)

<u>Direction</u>	<u>Speed (Knots)</u>						<u>Average Speed</u>	<u>Total</u>
	<u>1-3</u>	<u>4-6</u>	<u>7-10</u>	<u>11-16</u>	<u>17-21</u>	<u>Greater Than 21</u>		
N	33	46	20	0	0	0	4.7	99
NNE	17	18	10	0	0	0	4.6	45
NE	15	8	6	0	0	0	4.1	29
ENE	35	16	16	0	0	0	4.3	67
E	20	31	34	0	0	0	5.5	85
ESE	22	25	25	0	0	0	5.2	72
SE	9	19	12	0	0	0	5.3	40
SSE	16	16	8	0	0	0	4.6	40
S	21	31	22	0	0	0	5.1	74
SSW	15	31	19	0	0	0	5.2	65
SW	9	15	9	0	0	0	5.1	33
WSW	8	20	16	0	0	0	5.6	44
W	23	21	16	0	0	0	4.8	60
WNW	16	10	7	0	0	0	4.3	33
NW	15	12	4	0	0	0	4.2	31
NNW	15	17	10	0	0	0	4.7	42
Average Speed	2.5	5.2	7.4	0.0	0.0	0.0	4.4	
Total	289	336	234	0	0	0		

Number of Occurrences of B Stability = 964

Number of Calms with B Stability = 105

TABLE 2.6-8 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ORLANDO/McCOY, FLORIDA 1970)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	10	32	63	5	0	0	7.1	110
NNE	5	23	37	0	0	0	6.9	65
NE	4	18	21	3	0	0	6.6	46
ENE	7	40	57	6	0	0	7.1	110
E	9	37	120	14	0	0	7.8	180
ESE	7	23	64	3	0	0	7.5	97
SE	4	14	32	1	0	0	7.3	51
SSE	5	15	15	2	0	0	6.6	37
S	4	33	38	3	0	0	7.0	78
SSW	5	35	44	6	0	0	7.1	90
SW	4	12	21	3	1	0	7.6	41
WSW	4	13	25	1	0	0	7.0	43
W	2	23	45	6	0	0	7.6	76
WNW	2	11	20	1	0	0	7.2	34
NW	0	7	27	1	0	0	7.7	35
NNW	4	22	37	2	0	0	7.2	65
Average Speed	2.5	5.1	8.6	11.6	18.0	0.0	6.8	
Total	76	358	666	57	1	0		

Number of Occurrences of C Stability = 1,227

Number of Calms with C Stability = 69

TABLE 2.6-8 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ORLANDO/McCOY, FLORIDA 1970)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	10	32	122	105	4	0	9.8	273
NNE	5	27	63	43	0	0	9.0	138
NE	6	18	33	20	0	0	8.5	77
ENE	5	34	60	36	0	0	8.5	135
E	6	41	97	50	0	0	8.7	194
ESE	4	26	82	35	0	0	8.8	147
SE	4	21	43	26	1	0	8.6	95
SSE	5	15	35	24	2	1	9.0	82
S	7	32	73	65	11	2	10.0	190
SSW	4	20	33	38	2	0	9.4	97
SW	4	15	36	28	1	0	9.4	84
WSW	8	19	46	28	4	0	9.0	105
W	6	34	64	67	6	0	9.8	177
WNW	5	21	35	55	5	0	10.3	121
NW	8	13	31	24	5	0	9.5	81
NNW	2	15	34	58	4	0	10.7	113
Average Speed	2.6	5.1	8.7	12.8	18.2	28.7	9.1	
Total	89	383	887	702	45	3		

Number of Occurrences of D Stability = 2,179

Number of Calms with D Stability = 70

TABLE 2.6-8 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ORLANDO/MCCOY, FLORIDA 1970)

Direction	Speed (Knots)					Greater Than 21	Average Speed	Total
	1-3	4-6	7-10	11-16	17-21			
N	92	126	77	0	0	0	5.0	295
NNE	112	78	20	0	0	0	3.8	210
NE	106	76	14	0	0	0	3.6	196
ENE	131	91	5	0	0	0	3.4	227
E	139	113	20	0	0	0	3.8	272
ESE	81	72	21	0	0	0	4.0	174
SE	53	61	14	0	0	0	4.2	128
SSE	55	58	8	0	0	0	3.8	121
S	102	76	18	0	0	0	3.7	196
SSW	38	43	8	0	0	0	4.0	89
SW	27	56	3	0	0	0	4.1	86
WSW	38	39	6	0	0	0	3.8	83
W	68	94	17	0	0	0	4.2	179
WNW	45	42	17	0	0	0	4.3	104
NW	32	43	20	0	0	0	4.8	95
NNW	19	22	30	0	0	0	5.8	71
Average Speed	2.4	4.7	8.1	0.0	0.0	0.0	2.5	
Total	1,138	1,090	298	0	0	0		
Number of Occurrences of E Stability = 4,141								
Number of Calms with E Stability = 1,615								

TABLE 2.6-9. FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY (ONSITE DATA MAY 1 - SEPTEMBER 8, 1980 AND JANUARY 25 - APRIL 30, 1981)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	36	26	13	1	0	0	4.0	76
NNE	17	14	0	0	0	0	2.9	31
NE	15	7	0	0	0	0	2.6	22
ENE	10	6	0	0	0	0	2.8	16
E	14	10	0	0	0	0	2.7	24
ESE	13	9	0	0	0	0	2.8	22
SE	24	8	0	0	0	0	2.6	32
SSE	17	11	0	0	0	0	2.9	28
S	16	12	0	0	0	0	2.9	28
SSW	8	9	0	0	0	0	3.6	17
SW	15	8	1	0	0	0	3.2	24
WSW	20	9	0	0	0	0	2.9	29
W	16	14	0	0	0	0	3.1	30
WNW	16	9	1	0	0	0	3.3	26
NW	11	9	0	0	0	0	3.0	20
NNW	21	16	5	0	0	0	3.6	42
Total	269	177	20	1	0	0		

Number of Occurrences of A Stability = 519

Number of Calms with A Stability = 52

TABLE 2.6-9 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ONSITE DATA MAY 1 - SEPTEMBER 8, 1980 AND JANUARY 25 - APRIL 30, 1981)

1

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	18	29	34	6	0	0	5.9	87
NNE	10	12	12	0	0	0	5.0	34
NE	8	11	3	0	0	0	4.1	22
ENE	9	15	5	0	0	0	4.4	29
E	12	9	8	0	0	0	3.9	29
ESE	10	13	3	0	0	0	4.1	26
SE	10	15	8	0	0	0	4.4	33
SSE	7	12	1	0	0	0	3.8	20
S	3	10	0	0	0	0	4.4	13
SSW	12	8	4	0	0	0	3.8	24
SW	12	11	3	0	0	0	3.8	26
WSW	12	23	6	0	0	0	4.4	41
W	8	11	8	0	0	0	4.4	27
WNW	9	7	6	0	0	0	4.2	22
NW	7	7	4	0	0	0	3.9	18
NNW	21	12	23	0	0	0	5.0	56
Total	168	205	128	6	0	0		

Number of Occurrences of B Stability = 536

Number of Calms with B Stability = 29

1

TABLE 2.6-9 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ONSITE DATA MAY 1 - SEPTEMBER 8, 1980 AND JANUARY 25 - APRIL 30, 1981)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	41	21	7	5	0	0	4.0	74
NNE	17	13	13	6	0	0	5.5	49
NE	18	18	35	1	0	0	5.9	72
ENE	17	21	59	13	0	0	6.9	110
E	26	36	118	14	0	0	6.9	194
ESE	21	41	75	8	0	0	6.5	145
SE	18	27	37	7	0	0	6.2	89
SSE	25	16	15	0	0	0	4.4	56
S	18	12	13	5	0	0	5.3	48
SSW	25	27	28	9	0	0	5.9	89
SW	39	51	35	8	1	0	5.3	134
WSW	29	37	43	5	2	0	5.8	116
W	21	24	55	30	3	0	7.8	133
WNW	14	12	37	18	1	0	7.5	82
NW	16	12	23	2	0	0	5.4	53
NNW	37	29	24	3	0	0	4.6	93
Total	382	397	617	134	7	0		

Number of Occurrences of C Stability = 1,612

Number of Calms with C Stability = 75

TABLE 2.6-9 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ONSITE DATA MAY 1 - SEPTEMBER 8, 1980 AND JANUARY 25 - APRIL 30, 1981)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	64	5	0	1	0	0	2.1	70
NNE	50	10	76	12	0	0	4.5	88
NE	52	30	41	21	0	0	5.9	144
ENE	81	62	38	10	0	0	4.7	191
E	55	39	27	1	0	0	4.2	122
ESE	48	41	25	0	0	0	4.3	114
SE	65	39	18	0	0	0	3.8	122
SSE	76	21	15	6	0	0	3.7	118
S	74	19	8	8	1	0	3.8	110
SSW	83	17	1	1	0	0	2.6	102
SW	113	30	0	0	0	0	2.7	143
WSW	87	63	19	4	0	0	3.9	173
W	54	66	42	16	2	0	5.5	180
WNW	36	25	48	7	1	0	5.8	117
NW	70	37	10	4	0	0	3.6	121
NNW	59	25	21	2	0	0	3.8	107
Total	1,067	529	329	93	4	0		

Number of Occurrences of D Stability = 2,077

Number of Calms with D Stability = 55

TABLE 2.6-9 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ONSITE DATA MAY 1 - SEPTEMBER 8, 1980 AND JANUARY 25 - APRIL 30, 1981)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	20	0	0	0	0	0	1.9	20
NNE	37	10	2	0	0	0	2.8	49
NE	33	5	0	0	0	0	2.4	38
ENE	9	1	0	0	0	0	2.0	10
E	5	0	0	0	0	0	1.9	5
ESE	2	0	0	0	0	0	1.5	2
SE	3	0	0	0	0	0	1.0	3
SSE	7	0	0	0	0	0	1.5	7
S	17	1	0	0	0	0	2.1	18
SSW	6	1	0	0	0	0	2.4	7
SW	4	0	0	0	0	0	1.9	4
WSW	25	8	0	0	0	0	3.0	33
W	24	14	0	0	0	0	3.0	38
WNW	28	12	1	0	0	0	2.7	41
NW	28	5	0	0	0	0	2.5	33
NNW	26	2	0	0	0	0	1.7	28
Total	274	59	3	0	0	0		

Number of Occurrences of E Stability = 350

Number of Calms with E Stability = 14

TABLE 2.6-9 (Continued). FREQUENCY DISTRIBUTION OF WIND SPEED, WIND DIRECTION, AND STABILITY
(ONSITE DATA MAY 1 - SEPTEMBER 8, 1980 AND JANUARY 25 - APRIL 30, 1981)

Direction	Speed (Knots)						Average Speed	Total
	1-3	4-6	7-10	11-16	17-21	Greater Than 21		
N	1	0	0	0	0	0	0.7	1
NNE	2	0	0	0	0	0	1.8	2
NE	3	0	0	0	0	0	2.2	3
ENE	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0
S	1	0	0	0	0	0	1.4	1
SSW	0	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0
WNW	2	0	0	0	0	0	2.5	2
NW	0	0	0	0	0	0	0	0
NNW	1	0	0	0	0	0	1.1	1
Total	10							

Number of Occurrences of F Stability = 12

Number of Calms with F Stability = 2

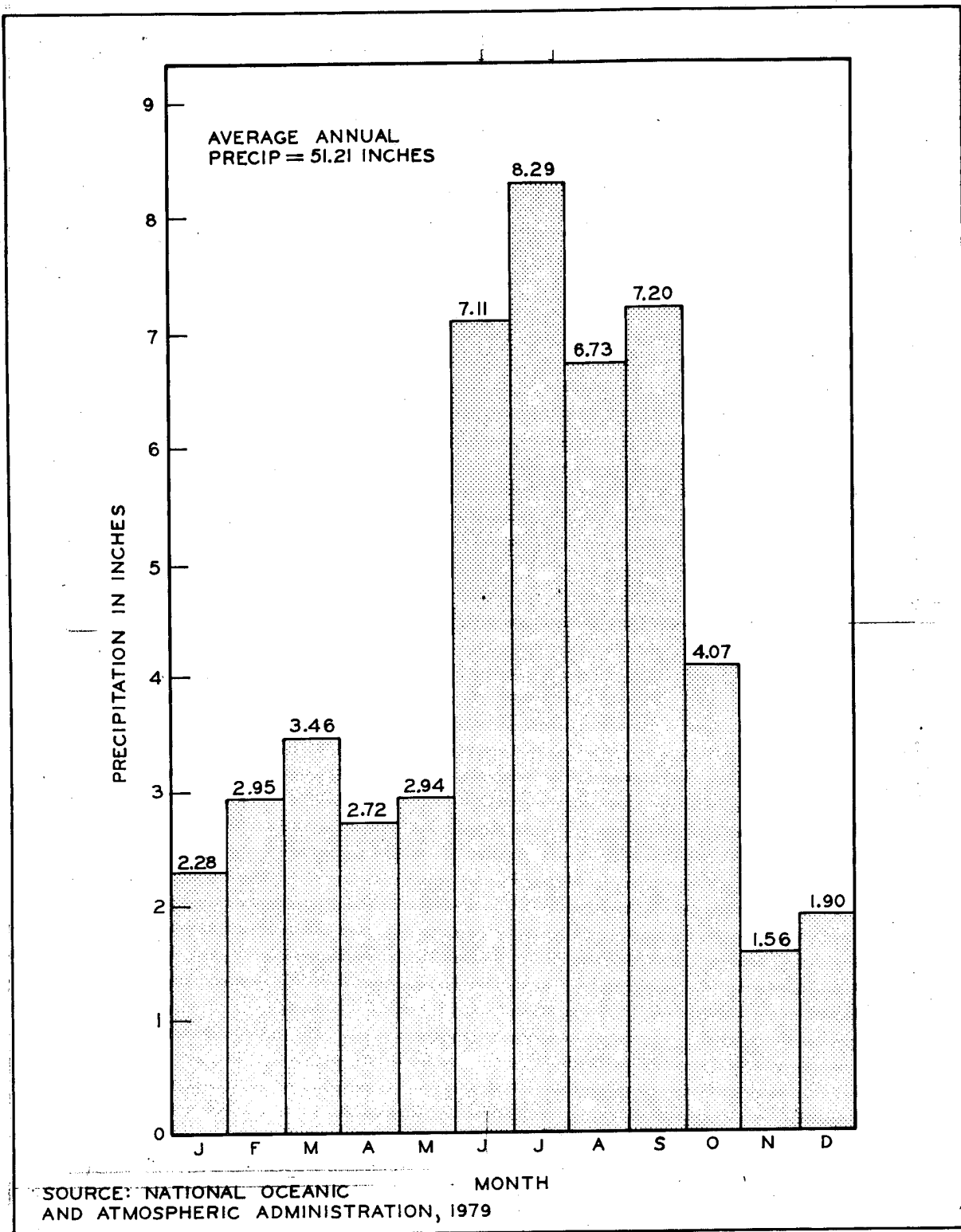


FIGURE 2.6-1. AVERAGE MONTHLY PRECIPITATION
AT ORLANDO, FLORIDA

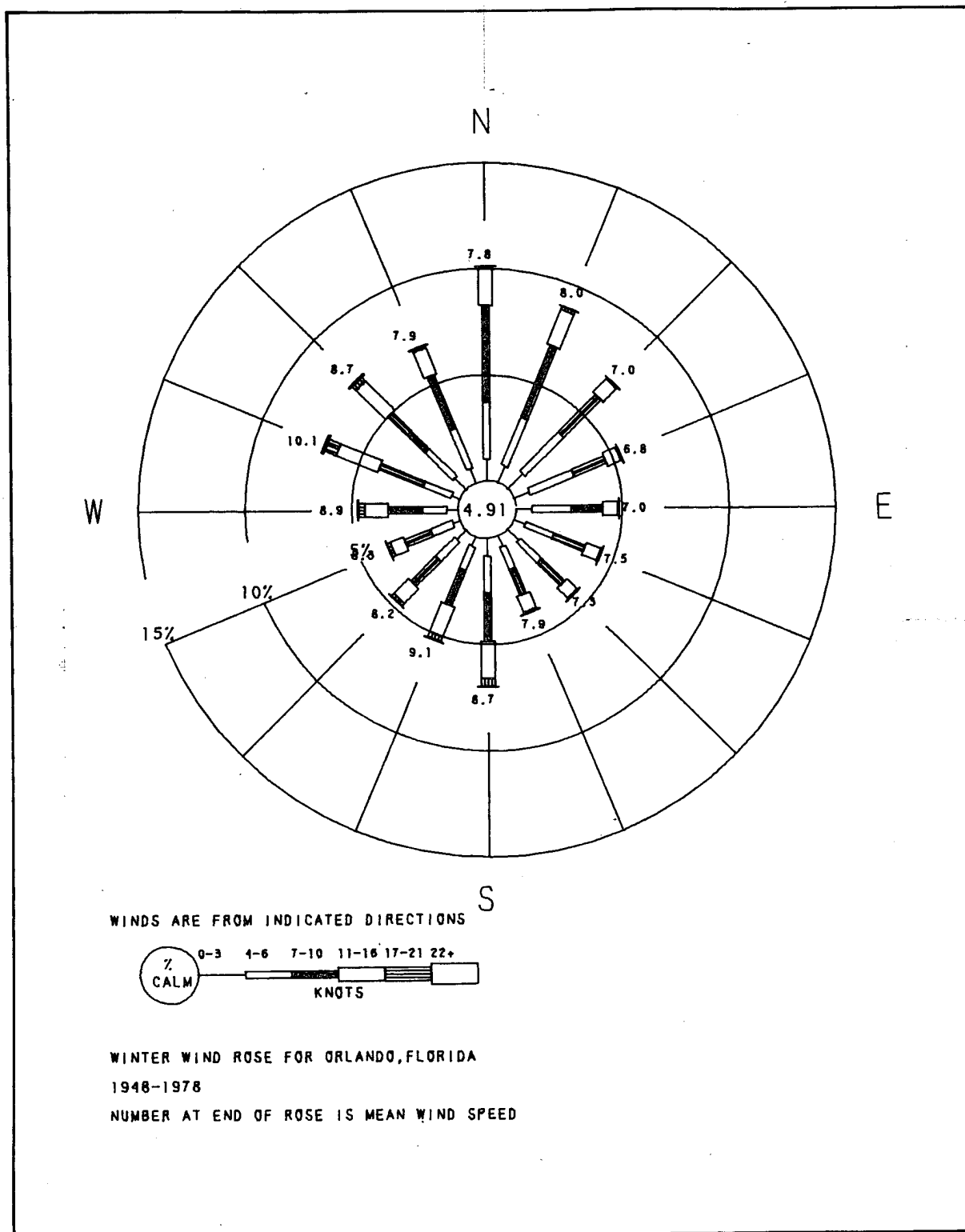
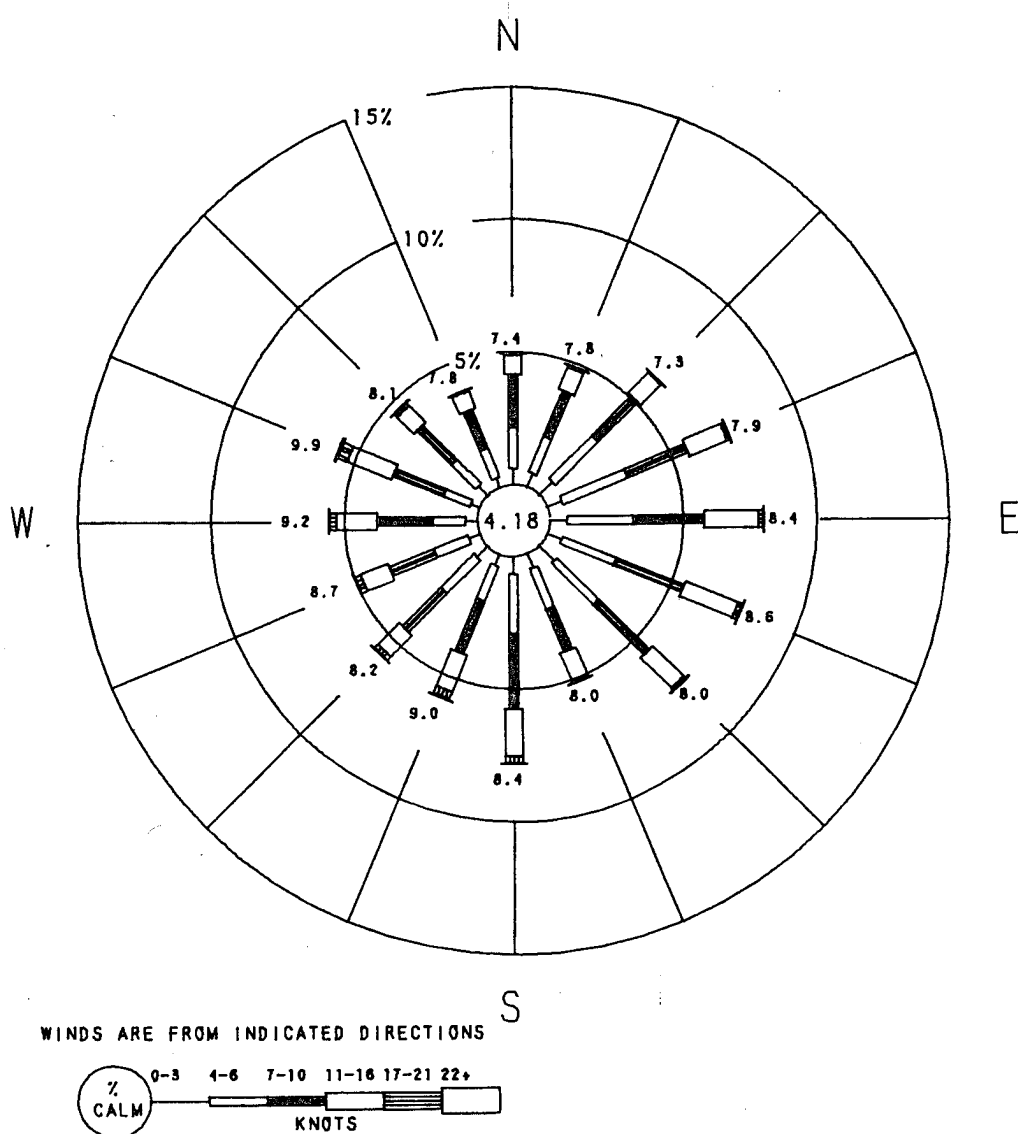


FIGURE 2.6-2. WINTER WIND ROSE
ORLANDO, FLORIDA



SPRING WIND ROSE FOR ORLANDO, FLORIDA
 1946-1978
 NUMBER AT END OF ROSE IS MEAN WIND SPEED

FIGURE 2.6-3: SPRING WIND ROSE
 ORLANDO, FLORIDA

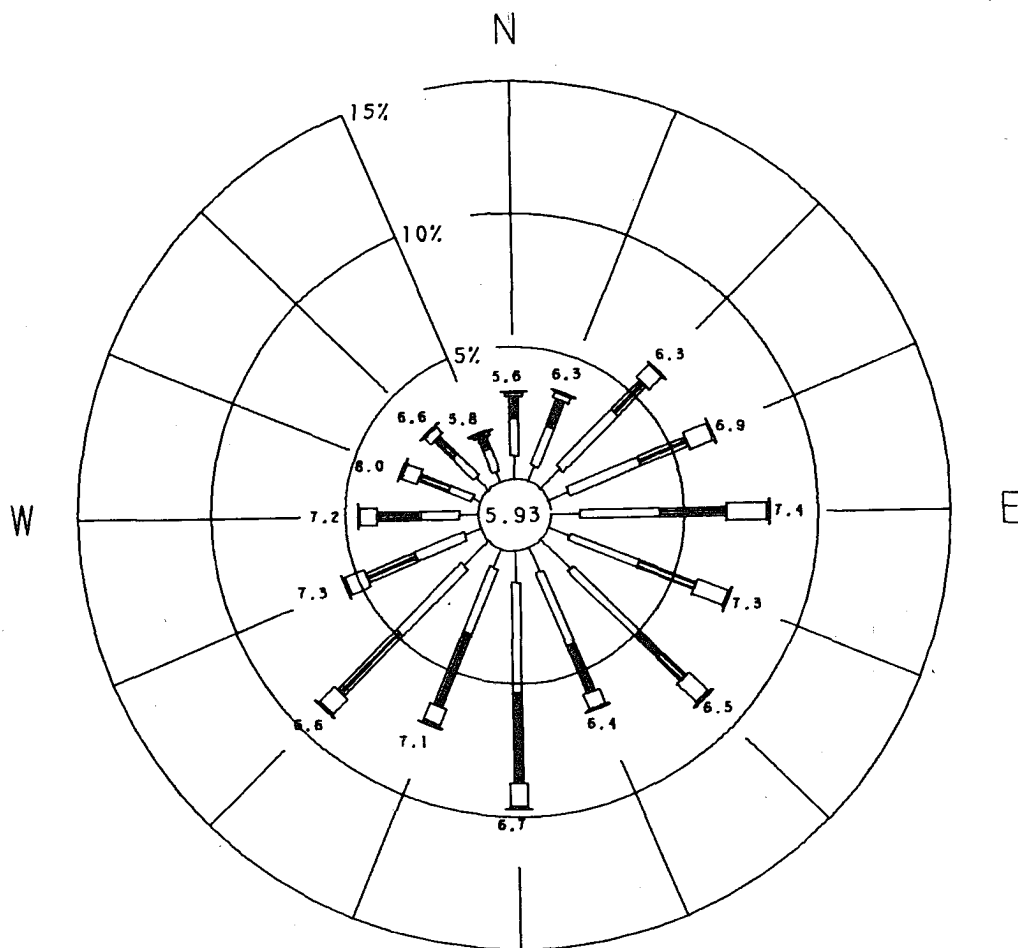
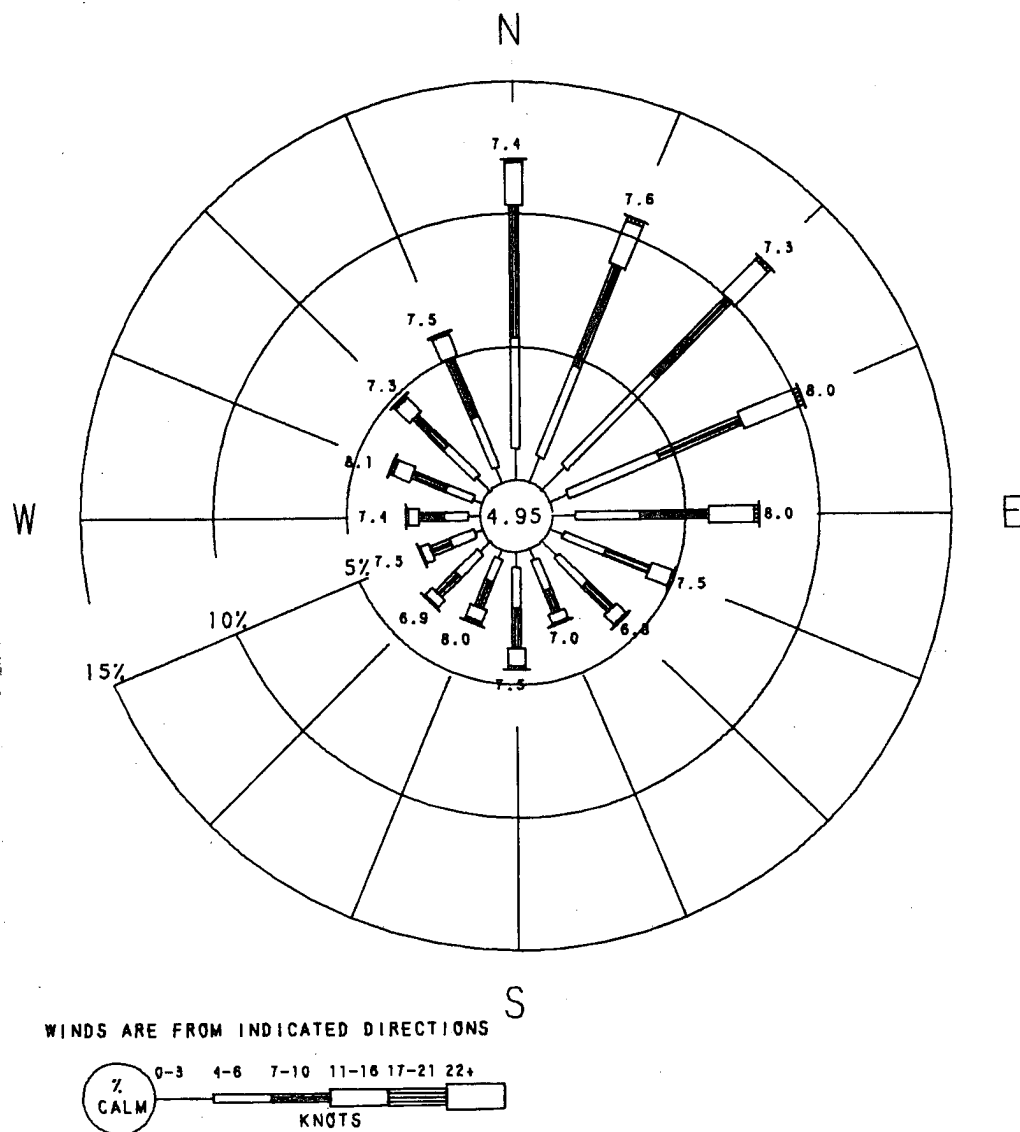


FIGURE 2.6-4. SUMMER WIND ROSE
ORLANDO, FLORIDA



FALL WIND ROSE FOR ORLANDO, FLORIDA
 1948-1978
 NUMBER AT END OF ROSE IS MEAN WIND SPEED

FIGURE 2.6-5. FALL WIND ROSE
 ORLANDO, FLORIDA

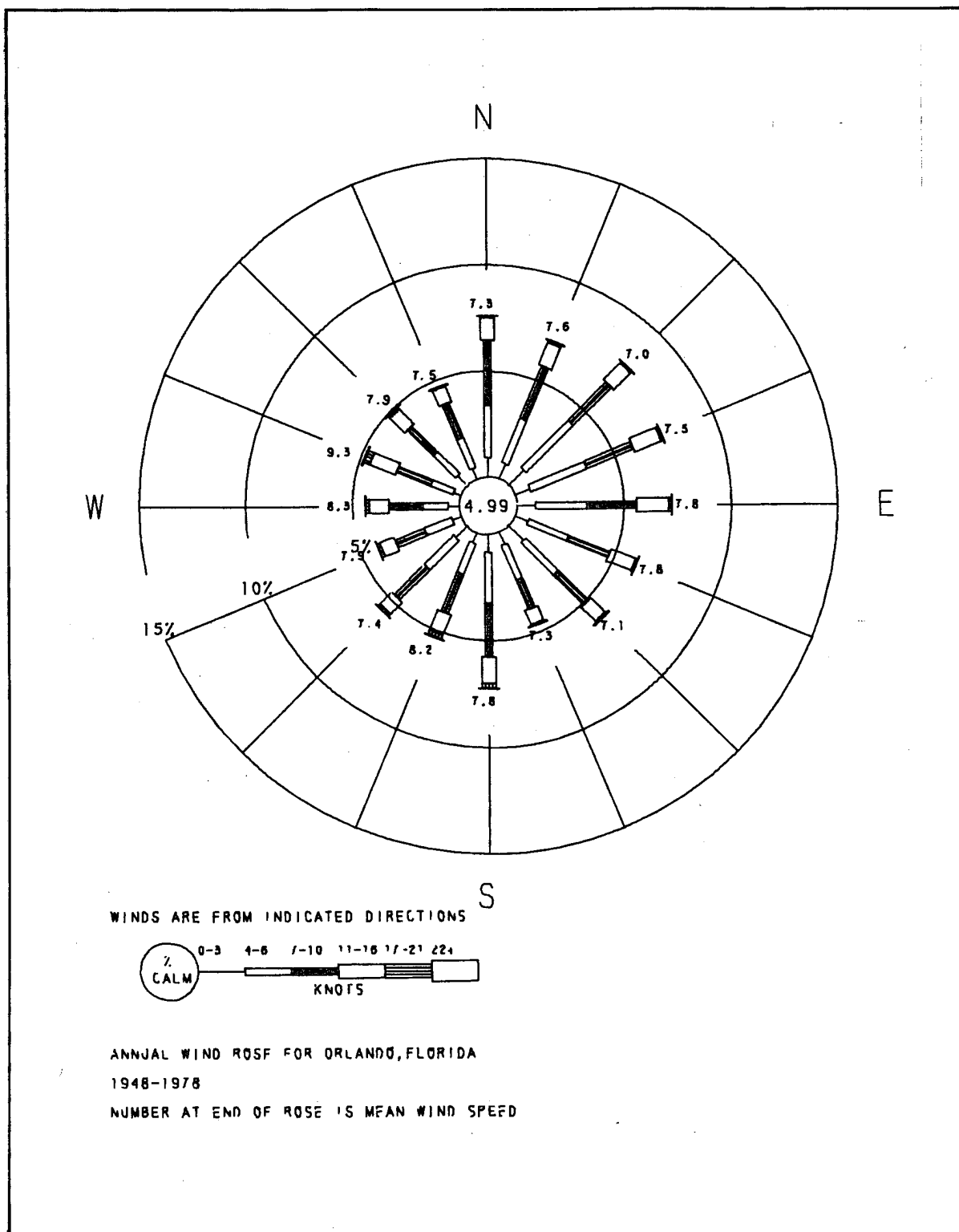
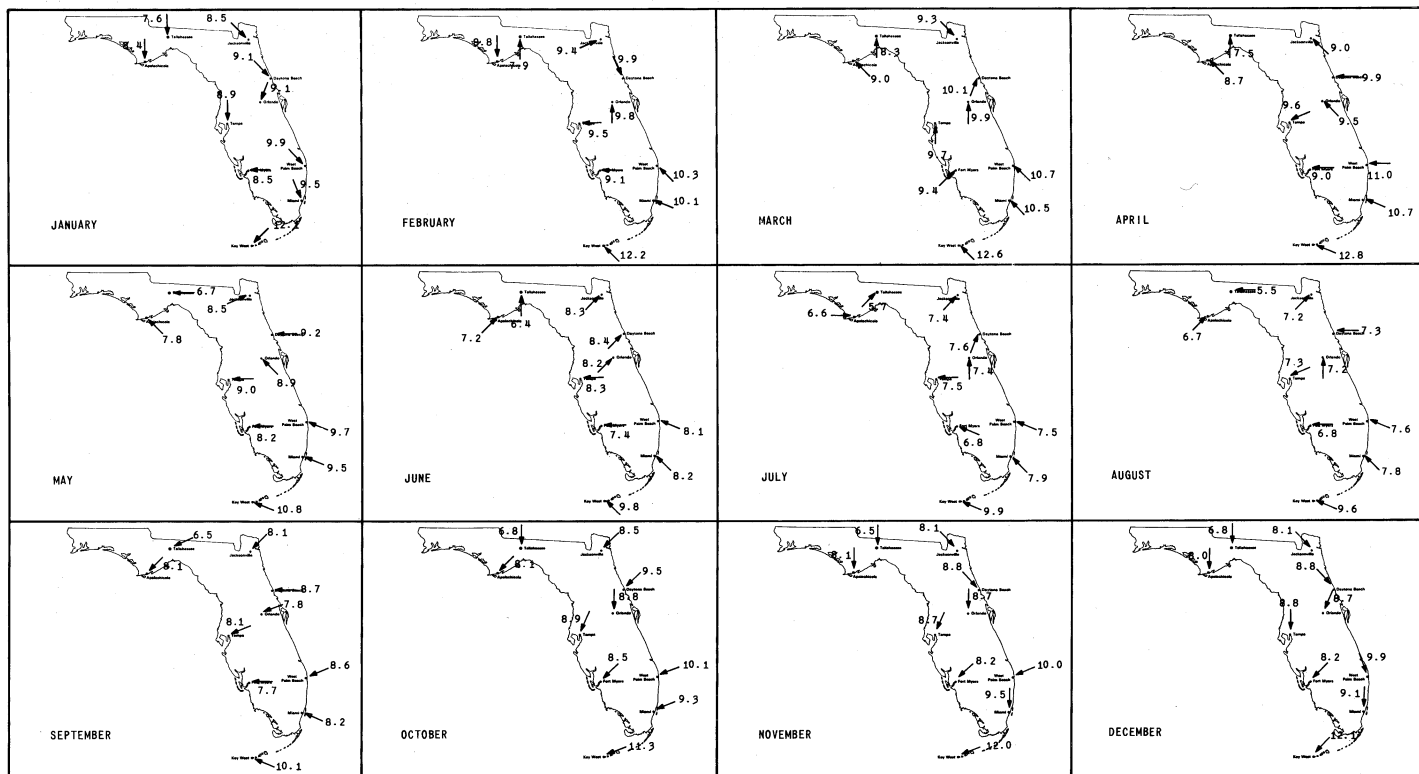


FIGURE 2.6-6. ANNUAL WIND ROSE
ORLANDO, FLORIDA



NOTE: NUMBERS GIVEN ARE SCALAR AVERAGE WIND SPEED IN MILES PER HOUR. ARROWS FLY WITH WIND.

FIGURE 2.6-7. MONTHLY AVERAGE WIND SPEED AND PREVAILING DIRECTION FOR SELECTED FLORIDA CITIES

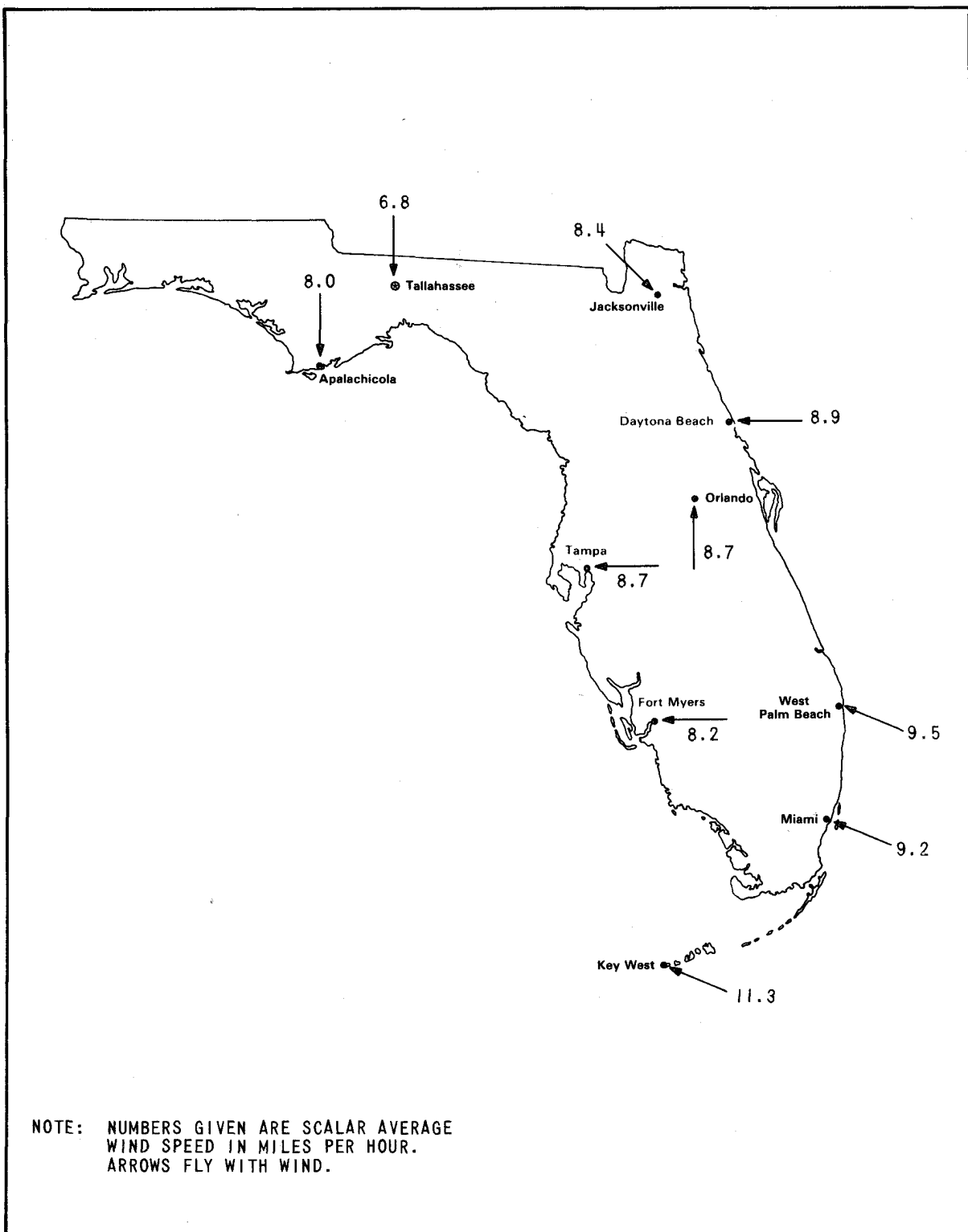
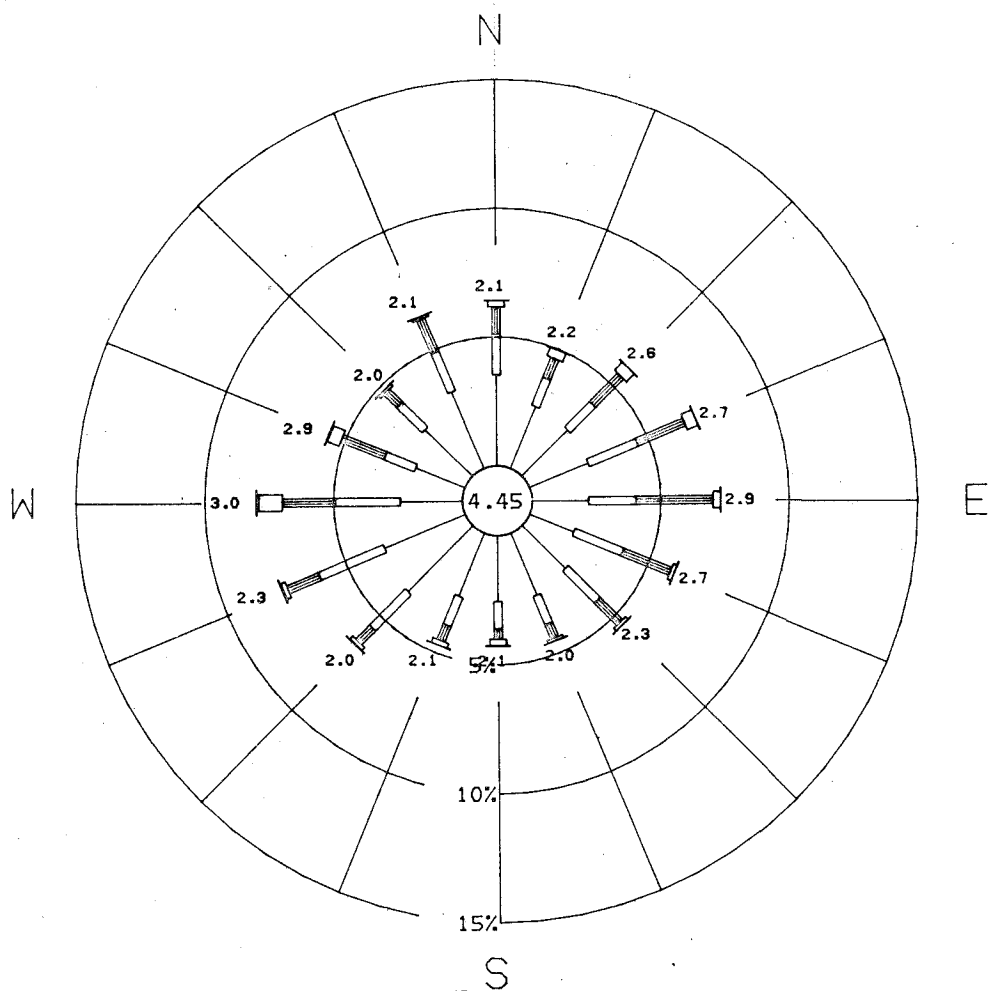
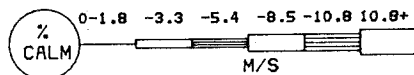


FIGURE 2.6-8. ANNUAL AVERAGE WIND SPEED AND PREVAILING DIRECTION FOR SELECTED FLORIDA CITIES



WINDS ARE FROM INDICATED DIRECTIONS

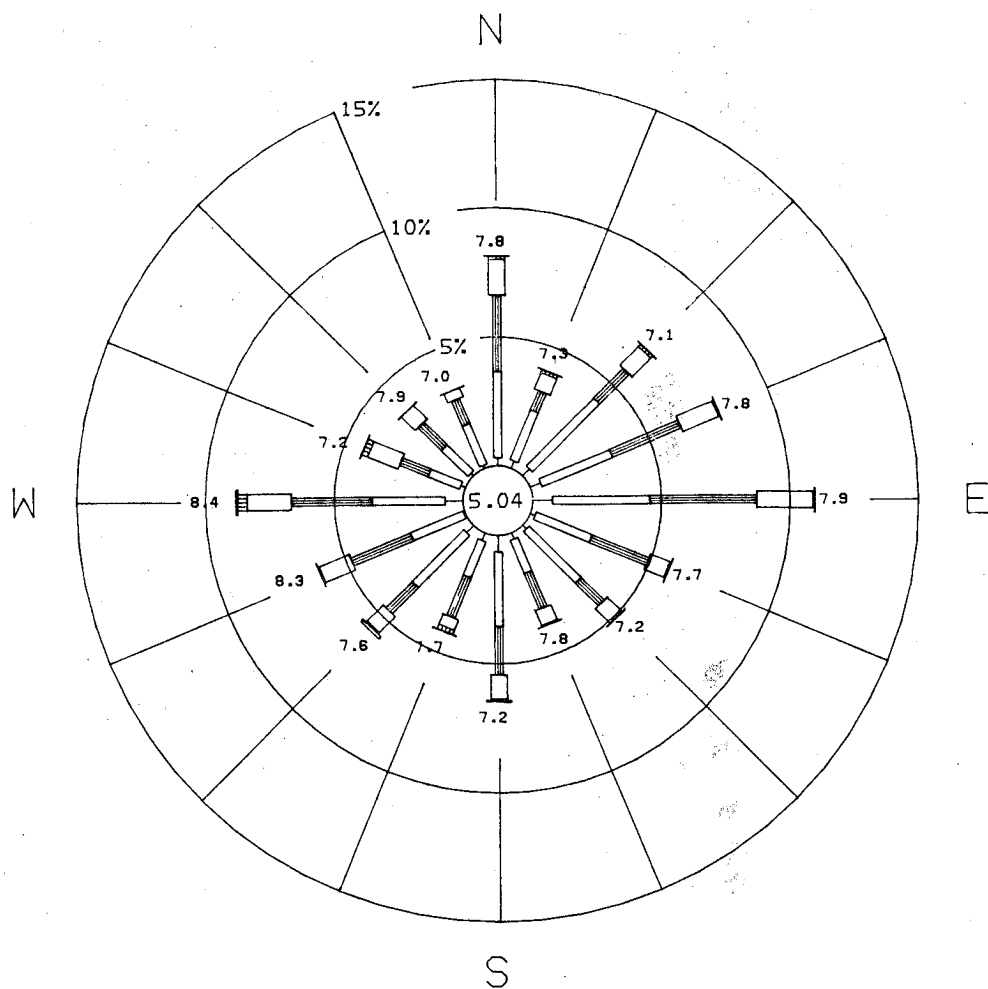


ANNUAL SUMMARY OF PSD AMBIENT AIR MONITORING

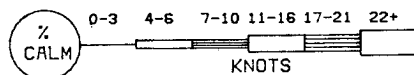
SUMMARY OF DATA FROM 1 MAY - 8 SEP 80 AND 25 JAN - 30 APR 81

AVERAGE SPEEDS (METERS/SECOND) SHOWN AT THE END OF EACH DIRECTION BAR

ALL STABILITY CLASSES INCLUDED



WINDS ARE FROM INDICATED DIRECTIONS

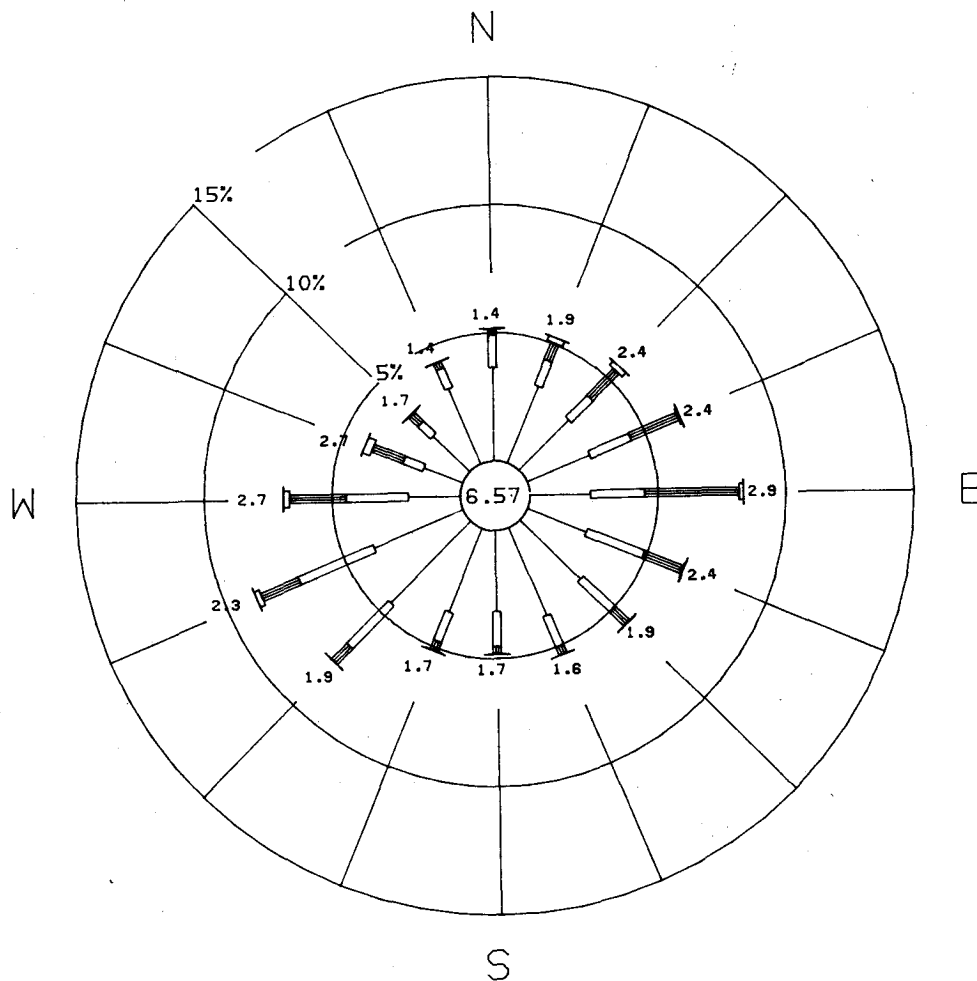


ANNUAL SUMMARY OF ORLANDO/MCCOY WIND DATA

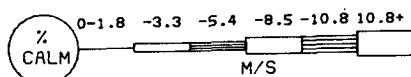
SUMMARY OF DATA FROM 1 MAY - 8 SEP 80 AND 25 JAN - 30 APR 81

AVERAGE SPEEDS ARE SHOWN AT THE END OF EACH DIRECTION BAR

ALL STABILITY CLASSES INCLUDED



WINDS ARE FROM INDICATED DIRECTIONS

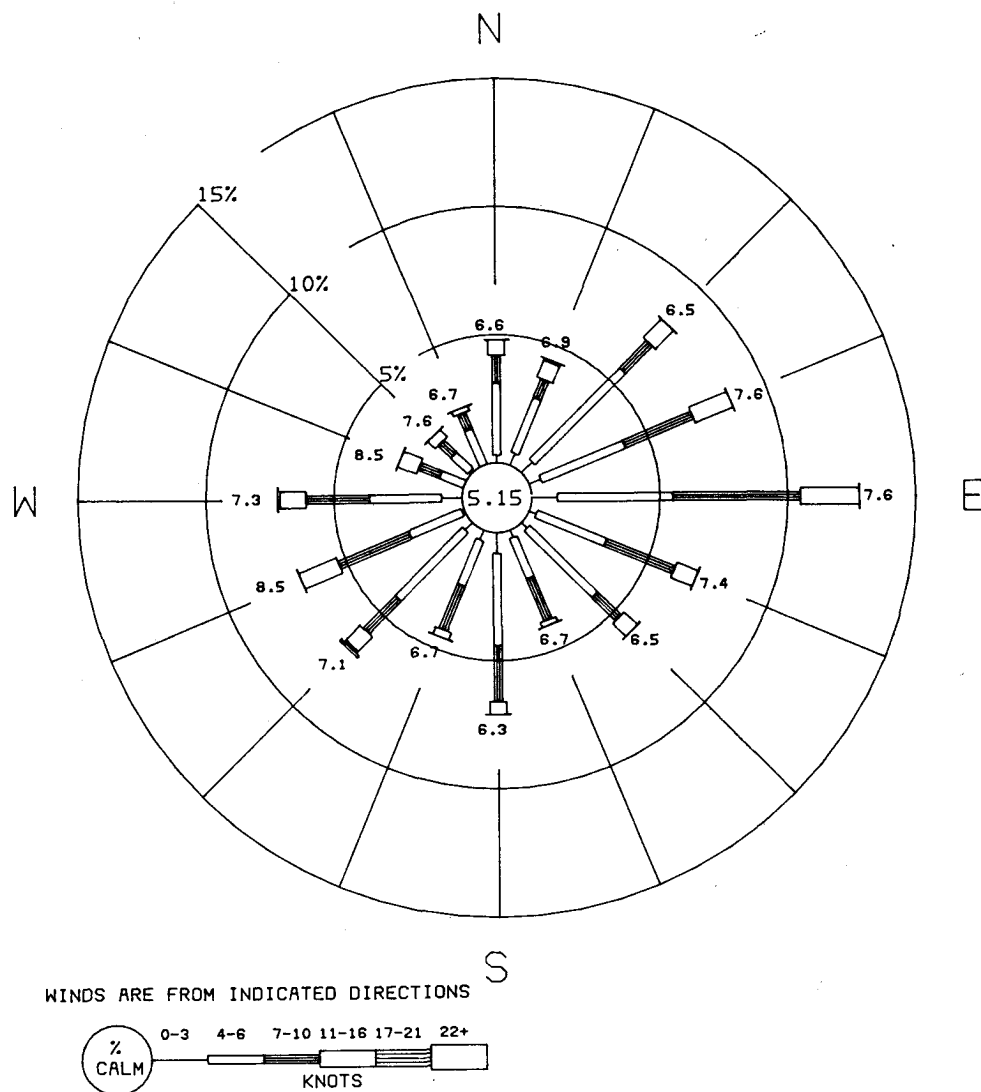


FIRST FOUR MONTHS (MAY THRU SEPT 8, 1980): PSD AMBIENT AIR MONITORING

AVERAGE SPEEDS (METERS/SECOND) SHOWN AT THE END OF EACH DIRECTION BAR

ALL STABILITY CLASSES INCLUDED

FIGURE 2.6-9. STANTON ENERGY CENTER
WIND ROSE FOR THE
PERIOD MAY 1 THROUGH
SEPTEMBER 8, 1980



AVERAGE WIND SPEEDS ARE SHOWN AT THE END OF EACH BAR

SUMMARY OF ORLANDO/MCCOY WIND DATA

PERIOD: MAY 1 THROUGH SEP 8 1980

FIGURE 2.6-10. ORLANDO/MC COY WIND
ROSE FOR THE PERIOD
MAY 1 THROUGH
SEPTEMBER 8, 1980

2.7 TERRESTRIAL ECOLOGY

2.7.1 Introduction and Definitions

To highlight the important ecological and environmental elements, the baseline terrestrial environmental analysis of the proposed plant site and associated facilities is divided into "Ecosystem Analysis" and "Important Species Analysis."

"Ecosystem Analysis" describes the structure of the site ecosystems in terms of community types, species present, and current environmental conditions, as well as the ecological forces and trends which determine present and future ecological conditions. The plant communities present are categorized in the report according to the Florida Land Use and Cover Classification, Level III, a system developed by eight state agencies to standardize terminology in environmental reports and permit applications.(1) Additional descriptions have been included in some categories to more specifically describe the communities. The natural values and values to man of these on-site ecosystem components are also discussed. Information developed from an ecological survey during 1980-1981 is used to describe the predicted future environment without the proposed facility.

"Important Species Analysis" describes state- or federally-recognized, commercially and recreationally valuable or endangered and threatened species.

2.7.2 Ecosystem Analysis--Plant Communities

2.7.2.1 Introduction. The proposed site is located within the Floridian section of the Atlantic Coastal Plain. This section consists of a series of old marine terraces, the result of at least four inundations by the ocean during the Pleistocene. To the west, the limit of the Atlantic Coastal Plain is defined by the Lake Wales Ridge, a unique series of high subparallel ancient dunes and valleys.(2) The dominant drainage in the

area is provided by the Econlockhatchee River, which flows in a northerly direction and terminates in the St. Johns River. Drainage from the site flows to this river via the Hart Branch and Cowpen Branch.

The soils on site have developed from sandy deposits exposed as the ocean receded. The 51-inch annual mean rainfall, characteristic of central Florida's humid subtropical climate, leaches plant nutrients from the soil. The high sand content of the soil provides it with little capacity for nutrient or water retention. Consequently, the soils are strongly acid and low in available nutrients; water drains rapidly except where organic pans occur under the surface. The pans are consolidated layers in which organic matter and minerals have accumulated. They usually occur from 14 to 60 inches below the surface. The degree of permeability varies, but water often moves through these pans much more slowly than it moves above and below the pan.(3)

" The natural communities on site are typical of the region. Nearly level flatwoods predominate, with scattered wetlands and low ridges on the western portion and in the center of the site. The wetlands, aligned in a north-south direction, are isolated; most of the surface flow is in a northeast direction toward the Econlockhatchee River. The low ridges, which support oak scrub, are also aligned in a north-south direction. Intermediate between these low ridges and wetlands (cypress stands) are longleaf pine flatwoods. A schematic cross section of the site illustrates how the communities are distributed (Figure 2.7-1).

" The plant community types are listed and described below. The area occupied by each community is shown in Table 2.7-1. Table 2.7A-1 in Appendix 2.7A presents the species composition of the various vegetative communities on the proposed site. Figure 2.7-2 graphically depicts the vegetative communities of the proposed site. A discussion of the interaction between successional processes and existing stresses which determine current and potential species composition and structure follows the descriptions.

COMMUNITY TYPES:

Forested Uplands

Pine Flatwoods

Xeric Oak Scrub

Wetlands (Forested Stands)

Pond Cypress

Pond Pine

Bay Hardwood

Oak Hardwood

Mixed

Wetlands (Nonforested)

Wet Prairie

2.7.2.2 Pine Flatwoods. "Longleaf pine (Pinus palustris) is the characteristic tree species in the flatwoods. The mean density was 18 trees per acre; the range was 9 to 25 trees per acre in twelve 3.7-acre sample plots. Basal areas ranged from 5 feet to 40 feet per acre. The extremely open canopy permits development of a rich understory of shrubs and herbaceous species. Saw palmetto (Serenoa repens) was the most abundant shrub in the flatwoods, with an importance value of 42 (Appendix 2.7A, Table 2.7A-2). Lyonia fruticosa and Lyonia lucida were also common, with importance values of 16.3 and 12.2, respectively. Wiregrass (Aristida stricta) dominated the herbaceous layer, but was accompanied by a very diverse array of forbs (see Appendix 2.7A, Table 2.7A-1).

The flatwoods occur on Leon soils, which have a fine, sandy, gray surface soil and a dark brown to black organic pan beginning at a depth of 14 to 30 inches. Leon soils have developed under conditions of poor to very poor drainage conditions from thick unconsolidated beds of sand.(4)

" Flat topography, the relatively impermeable pan, and sandy soil cause the flatwoods to flood from June through September, when the monthly rainfall averages 7.3 inches, and cause extreme dryness in winter and spring when the amount of precipitation is low (average monthly rainfall is 2.7 inches from October through May). The extreme dryness of the flatwoods and the easily flammable litter create a condition conducive to frequent fires.(5) Fire and cattle grazing have maintained the species composition and open structure of the flatwoods on site. If either cattle or fire were excluded for several years, hardwoods would invade, and the canopy would begin to close."

2.7.2.3 Xeric Oak Scrub.¹¹ A large area of oak scrub occurs on the western edge of the site; a smaller area is present on the central ridge (Figure 2.7-1). A total of 166 acres of this community is found on the site.¹¹ No tree layer occurred in the scrub, and wiregrass and lichens (Cladonia spp.) comprised the less than 1 per cent total herbaceous cover.

Most of the species present were shrubs less than 6 feet tall. Saw palmetto (with an importance value of 23.9), four species of oak (with importance values ranging from 7.8 to 23), and a variety of herbaceous shrubs characterized this community (Appendix 2.7A, Table 2.7A-3). Total shrub cover was 64.6 per cent.

¹¹ The oak scrub occurs on Pomello fine sand, a loose, white, fine, very porous sand low in organic matter. Nutrients and water drain readily through it.(6) ¹¹

2.7.2.4 Forested Wetlands.¹¹ These communities occur in poorly drained depressions which receive runoff, but have no natural outlet. The underlying soils are Plummer fine sand, Rutledge fine sand, and Rutledge mucky fine sand.¹¹ These soils occupy lower, wetter topographic positions than the Leon soils of the flatwoods. The Plummer soil has a gray to dark gray sandy surface, 2 to 6 inches deep, with lower gray horizons. The Rutledge series has a very dark gray to black fine sand, loamy fine sand, or mucky fine sand which may be from 8 to 15 inches deep. These acidic soils are often flooded in summer months and contain a variable amount of organic matter in the surface layer. The Rutledge mucky fine sand is in the lowest part, usually the center of the wetland.(7)

¹¹ Trees and shrubs in the wetlands form a denser canopy layer than in the flatlands. Species composition and abundance are influenced by past logging, moderate to heavy cattle grazing, and shallow drainage ditches which surround many of the wetland systems on the site; however, frequency of fire is the most important factor in determining the dominant tree species present.¹¹

2.7.2.5 Pond Cypress Stands.["] These domes or stands dominated by pond cypress (Taxodium ascendens) represented the most abundant wetland type. They ranged in size from 0.3 to 19.5 acres and comprised 55 per cent of the total wetland area described.["]

Pond cypress had an importance value of 72 in the overstory (Appendix 2.7A, Table 2.7A-4). Other trees present in much fewer numbers were pond pine (Pinus serotina), swamp tupelo (Nyssa biflora), and sweetbay magnolia (Magnolia virginiana). Pond pine was mostly on the edges.

["] Pond cypress trees were generally taller in the center of the stands and shortest at the edges. Possible reasons for the short trees on the edge are greater contact with flatwood fires, drier soil conditions, more intense competition with other species, and better physical conditions for seedling establishment.⁽⁸⁾["]

Large cypress trees were logged in this area, probably in the 1930s. Old rotting trunks 30 to 40 inches in diameter still remain in some of the domes, but the largest living trees had trunk diameters of about 8 to 12 inches. Average tree size and density varied between domes, and two distinct types of understory were found, depending on the degree of disturbance to which the system was subject.

Domes with a more shallow profile, affected by more frequent fires and/or heavy grazing, had a very sparse shrub cover, usually a few wax myrtles (Myrica cerifera) and Hypericum fasciculatum. Herbaceous cover was dense, homogeneous, and dominated by broomsedge (Andropogon virginicus), chain fern (Woodwardia virginica), and Rhynchospora fascicularis. Many species in these domes are associated with disturbed or mesic rather than hydric conditions: e.g., plume grass (Erianthus giganteus), gallberry (Ilex glabra), Solidago microcephala, dog fennel (Eupatorium capillifolium), and rayless goldenrod (Bigelovia nudata spp. australis). Two thirds of the cypress systems observed were of this type. They were found throughout the site, but were more concentrated in the eastern half.

The other domes had taller, more closed cypress canopies. They often included swamp tupelo (Nyssa biflora), sweetbay magnolia (Magnolia virginiana), and on the border, pond pine (Pinus serotina). Three domes near the eastern

boundary of the site contained oaks (Quercus nigra, Quercus virginiana, and Quercus alurifolia). No domes in any other section of the site had oaks.

Shrub cover was dense and species rich: Shiny lyonia (Lyonia lucida), wax myrtle, and Serenoa repens had the highest importance values (30.2, 25.2, and 19.3, respectively (see Appendix 2.7A, Table 2.7A-4). Dahoon (Ilex cassine), swamp bay (Persea palustris), blackberry (Rubus betulifolius), gallberry (Ilex glabra), Virginia willow (Itea virginica), and swamp blueberry (Vaccinium corymbosum) were commonly present. Vines were numerous and included grape (Vitis rotundifolia), greenbrier, (Smilax spp.), and climbing hempweed (Mikania scandens).

Leaf litter was thick, and ground cover, although patchy, was more diverse and more restricted to zones along the moisture gradient than the homogeneous cover in the disturbed domes. Characteristic species were Sphagnum spp., Blechnum serrulatum, sawgrass (Cladium jamaicense), Eriocaulon decangulare, pickerelweed (Pontederia cordata), Triadenum virginicum, several beak rushes (Rhynchospora spp.), camphorweed (Pluchea camphorata), and Lycopus rubellus (Appendix 2.7A, Table 2.7A-4). Some domes had herbaceous central zones. Bacopa caroliniana and Juncus repens occurred in the zones. Fire more severely injures trees in dome centers, often resulting in open herbaceous cover.(9)

Three domes sampled to provide the data summarized in Appendix 2.7A, Table 2.7A-4 represented the more diverse systems. Wildfire, which swept the site in December 1980, burned all the drier domes to which there was access and precluded plans to sample these communities.

2.7.2.6 Pond Pine Stands.["] Four wetlands were dominated by pond pine. They ranged from 0.5 to 8.5 acres and comprised 2.8 per cent of the total wetland area. They occurred on the western section of the site. Most of the pond pines on site are concentrated in the west either within the canopy or scattered along the borders of other wetland types.["] They were not quantitatively sampled because of their small total area and the very low species diversity of the stands. Gallberry and saw palmetto (Serenoa repens) were found in the shrub layer. Ground cover was very sparse,

except for sphagnum moss, because of the dense shrub and tree canopies. Pond pines, the largest of all the wetland trees on site, dominate wetter flats with low pH values; their mean basal area was 59.8 square inches.

2.7.2.7 Bay Hardwood Stands.["] Three bay-dominated wetlands of 33.5 acres, 7.6 acres, and 1.3 acres occurred in the western section of the site. They comprised 10.5 per cent of the total wetland area. Soils of bay hardwood stands are generally higher in organic matter than those of cypress stands. The water table does not fluctuate as widely because of the high moisture-holding capacity of these soils.["] The 7.6-acre stand was sampled quantitatively. The tree canopy was dominated by sweetbay magnolia with an importance value of 76.4 and loblolly bay (Gordonia lasianthus), having an importance value of 13.2 (Appendix 2.7A, Table 2.7A-5). Tree density (685 trees per acre) was higher than that in the cypress stands, which had a density of 460 trees per acre; however, the mean basal area of the trees was about half that in the cypress stands (Appendix 2.7A, Tables 2.7A-4 and 2.7A-5). Shrubs and herbaceous plants present in the bay stands were similar to those in the cypress except for bay species (magnolia, loblolly bay, and red bay) present in the shrub layer of the bay stand.

2.7.2.8 Oak Hardwood Stands.["] One oak hardwood stand, 12.2 acres, occurred in the southeastern section of the site. A channel in its center drained into Hart Branch. The channel was dry when observed.["]

The dominant tree was water oak (Quercus nigra), with an importance value of 64.8 (Appendix 2.7A, Table 2.7A-6). Other trees present were red maple (Acer rubrum), cabbage palm (Sabal palmetto), sweetbay magnolia, and live oak (Quercus virginiana).

Wax myrtle was dominant in the shrub layer with an importance value of 55.9. Persimmon (Diospyros virginiana), saw palmetto, and viburnum (Viburnum obovatum) were also present in the shrub layer.

Panicum lancearium was the dominant herb. Its importance value in the oak stand was 26.2; it was not observed elsewhere on the site.

Several other wetlands in this area of the site, although dominated by cypress, contained oaks (Quercus virginiana, Quercus laurifolia, Quercus nigra). Viburnum, cabbage palm, and red maple were also found in one of these wetlands. The latter three species were rare, and the oaks did not occur at all in wetlands in the rest of the site. These species do occur, however, in the floodplains of the Econlockhatchee and Little Econlockhatchee Rivers. These species are also associated with low fire frequency.(10) The soils underlying the communities with oaks are Rutledge fine sands, which also underlie wetlands containing only cypress and bays.

2.7.2.9 Mixed Forested Wetlands. "The canopy in these wetlands is a mixture of cypress, hardwoods, and pond pine, such that no one type dominates. Mixed forests comprised 17.8 per cent of the total wetland area and ranged in size from 0.3 to 31.6 acres. The shrub and herbaceous layers were similar to those of the undisturbed cypress domes and were the most species rich of any of the systems." Sagittaria lancifolia and the rare spoon flower (Peltandra sagittata) occurred in the largest mixed wetland. Most of these mixed communities were in the western half of the site.

2.7.2.10 Nonforested Wetlands. "These nonforested wetlands occurred on small, poorly drained depressions. They totaled 10.9 per cent of the wetland area, but they were scattered throughout the site, ranging in size from 0.2 to 3.1 acres." They were dominated by the low shrub (Hypericum fasciculatum) and had a dense cover of mesic herbaceous species such as broomsedge and Aristida spiciformis. A typical prairie of 1.5 acres had a mean Hypericum fasciculatum per cent cover of 39. A wax myrtle also was present. "There were often several trees, swamp gum or sometimes pond pine, in the midst of these prairies. These areas appear to be favored cattle grazing sites. This vegetation type occurred not only as separate islands in the flatwoods, but also formed a border or transition zone 10 to 50 yards wide around many of the forested wetlands." In these cases, they have been considered a part of the enclosed wetland. The December 1980 wildfire burned through the Hypericum bordering many wetlands, but stopped at the

edge of some of the circular prairies with high water tables. The prairies appear to be maintained by very high water tables, frequent fires, and grazing.

2.7.3 Ecosystem Analysis--Animal Communities

2.7.3.1 Introduction. "The distribution of animal communities on site also reflects the range of conditions described in Paragraph 2.7.2.1. Species found on the site, such as the Florida scrub jay and the red-cockaded woodpecker, are restricted primarily to the scrub oak and pine flatwood habitats, respectively. Other species, such as the rufous-sided towhee, while not confined to one habitat type, are more abundant in the dryer situations (xeric oak scrub). No unique species were found in the cypress stands; however, a greater number and variety of wildlife species were observed in these wetlands than in the pine flatwoods and oak scrub."

"During the 1980-81 field surveys, 16 species of mammals, 68 species of birds, 15 species of reptiles, and 9 species of amphibians were observed in the area of concern." The preferred habitat and relative abundance of mammals, reptiles, and amphibians are listed in Appendix 2.7A, Tables 2.7A-7 and 2.7A-8. Bird species encountered are listed in the following section under each of the wildlife habitat discussions. Common and scientific names for species are listed in the appropriate tables.

2.7.3.2 Pine Flatwoods. "Although logging activity has occurred in most on-site flatwoods, this disturbance has not drastically affected the diversity of wildlife present. Some sections, particularly those on the southern portion of the site, are dominated by relatively old-aged (80 years or more) pines. The presence of these older stands has provided habitat for the red-cockaded woodpecker and other species. Other typical flatwoods species included Bachman's sparrow, pine warbler, brown-headed nuthatch, and Sherman's fox squirrel. The central and northern portions of the site have been logged more intensively and are characterized by more open areas and younger stands. In these areas, there were fewer animal species."

" In pine flatwoods, breeding bird populations are dominated by eastern meadowlark, bobwhite, red-winged blackbird, mourning dove, rufous-sided towhee, and Bachman's sparrow.(11) Seasonal changes in species abundance and species richness (number of species) were apparent. Brown-headed nuthatcher, common yellowthroat, and red-winged blackbird were more abundant in the winter than in the late summer avifauna. With the arrival of winter residents (including palm warblers, yellow-rumped warblers, and yellow-bellied sapsuckers), species richness increased from 19 species in the late summer to 39 species in the winter. Correspondingly, estimated density increased from 135 birds per 100 acres in the late summer to 422 birds per 100 acres in the winter (Appendix 2.7A, Table 2.7A-9).

"The most commonly encountered herptiles were six-lined racerunner, green anole, oak toad, black racer, and gopher tortoise. The hispid cotton rat, a common mammal species, was observed during the study. Other mammals frequently encountered were nine-banded armadillo, cotton mouse, raccoon, and eastern cottontail. Larger mammals included all the wide ranging forms such as white-tailed deer, gray fox, bobcat, and raccoon.

2.7.3.3 Xeric Oak Scrub. " Conditions of the xeric oak scrub communities are extremely dry because of the absence of overstory vegetation and the presence of porous, well-drained sands. Oaks are the main source of food for wildlife. Functionally, the den of the gopher tortoise is extremely important to other animals as a retreat or hibernaculum. If this refuge were not present, many animals could not survive in these xeric communities during the dry, hot conditions of summer. "

The bird species observed in xeric oak scrub are listed in Appendix 2.7A, Table 2.7A-10. Species requiring a dense ground cover or a distinct under-story layer are likely to be found in this habitat. Species normally associated with full overstory canopy were generally not observed in such vegetation. Species richness and abundance observed along transects in this habitat were lower than other habitats of the proposed site. There was, however, a substantial increase in the number of species and abundance of birds from late summer to winter (Table 2.7A-10). " Generally, bird

species observed in the xeric oak scrub were the same as those occurring in pine flatwoods. The Florida scrub jay, the only characteristic bird of oak scrub, was encountered on site as well as on surrounding scrub areas."

" Breeding birds of this habitat include Florida scrub jay, rufous-sided towhee, great crested flycatcher, blue jay, and Carolina wren.(12) Common winter residents include yellow-rumped warbler, blue jay, and common yellow-throat.

" Amphibians and reptiles encountered were gopher tortoise, six-lined racerunner, black racer, and oak toad. Mammals observed were white-tailed deer, Virginia opossum, cotton rat, raccoon, and gray fox."

2.7.3.4 Forested Wetlands. " Forested wetlands (bayheads and cypress domes) on site are generally three-layered systems consisting of relatively open canopy, sparse understory, and ground cover. Because of the vegetation diversity and alteration of dry and wet habitats, this forested community offers a greater diversity of microhabitats than most other systems in the study area. The fauna of this habitat is generally a combination of species of aquatic habitats as well as species of the more upland habitats."

" Although isolated bayheads and cypress swamps on site are not generally inhabited by a diversity of wildlife, they are, nevertheless, important as feeding and watering sites. These wet areas serve as reserves for many animals during critical periods such as fire and drought." Wharton, et al.(13), characterized these types of systems as having extensive pulses in animal activity depending on reproduction and larval development, predation, and the flow of animals between adjoining swamps and associated upland habitats." Many of the species (tree frogs, leopard frogs, and newts) typically occur as adults in adjacent habitats (i.e., flatwoods). Some of these animals may be particularly important as a food source for many higher vertebrates."

" The avifauna of these communities consisted primarily of those species occurring in surrounding habitats (Appendix 2.7A, Table 2.7A-11). Thus, birds encountered consisted primarily of flatwoods species. Generally, the

number of birds and species in such forests was somewhat greater than that of surrounding flatwoods.

" The avian community of this habitat was characterized by a seasonal rise in species richness in the winter with a subsequent decline in the summer. Species richness in the winter was nearly twice that of the summer community and was dominated by blue-gray gnatcatcher, yellow-rumped warbler, palm warbler, and eastern bluebird. Compared to the other habitats, more species of warblers and other perching birds were sighted in these forests. " Density of birds increased from 113 per 100 acres in the later summer to 485 per 100 acres in the winter (Table 2.7A-11).

" An assortment of mammals was observed in these swamps, particularly along the edge. These species included many small rodents as well as fox squirrel, raccoon, deer, wild hog, opossum, and gray fox. Deer populations on the property use these areas as denning areas while foraging in associated flatwoods and other upland areas. "

" Few species of herptiles occur exclusively in these habitats although the indigo snake is considered an important species.(14) Some of the most common animals included southern leopard frog, five-lined skink, green tree frog, and squirrel tree frog. "

2.7.4 Interactions Between Successional Processes and Existing Stresses

2.7.4.1 Introduction. " The structure and composition of existing plant communities are a result of the interactions between successional processes and existing disturbances, particularly fire frequency and intensity.

" Almost all the communities on site, except the oak hardwood stands, are maintained by periodic fires. The plant populations comprising these communities have numerous adaptations for surviving fire, including:

- (1) Underground stems--Sawgrass, pickerelweed, saw palmetto;
- (2) Adventitious buds or root sprouts--Pond cypress, pond pine;
- (3) Thick bark--Longleaf pine, pond cypress; and
- (4) Cones which require heat to open--Pond pine.

These species are light demanding, often require a mineral soil for germination, and can tolerate low nutrient soil. Flatwoods and wetlands species are adapted to extreme water level fluctuations, and oak scrub species can tolerate the extreme dryness of the sands on which they occur."

If fire is excluded for 10 years or more, litter and humus accumulate, soil nutrients increase, and species more vulnerable to fire injury invade.(15) The changes that occur are illustrated in Figure 2.7-3. Some features and species of wetlands with frequent fires begin to decline several years after fire exclusion. These are represented by Curve A of Figure 2.7-3. Other species increase rapidly in response to absence of fire. These are illustrated by Curve B and include shrubs in the flatwoods, which gain in height and density, and bay species and deciduous hardwoods in the wetlands. These decline as improved fertility and water retention, which develop in the absence of fire, allow shade-tolerant oaks to dominate. As the canopy closes and becomes more dense, shrub and herbaceous species decrease in number and richness. Species and features that increase to a steady state with fire exclusion are represented by Curve C. Comparison of the cypress, bay, and oak communities on site agrees with Edmisten's findings (Table 2.7-2). Shrub and herbaceous cover in the oak stand were lower than in the cypress and bay stands. Basal area of canopy trees in the oak stand was higher and their density lower than in the other two communities.

Observation reveals that the site has been subjected to numerous fires, both deliberate (to improve grazing) and accidental. Wildfire burned about 75 per cent of the site in December 1980. Grazing maintains low shrub and woody seedling cover due to ingestion and trampling. Past logging and traffic on the numerous dirt roads throughout the site have also been factors in keeping the flatwoods open.

The xeric oak scrub does not appear subject to grazing or deliberate burning. Succession of this community to oak forest could take 100 to 200 years of fire exclusion because of the droughty substrate on which it occurs.(16) Fire exclusion for this long a period is unlikely even in the pristine state. However, Veno reported a trend toward more mesic vegetation in oak scrub communities after 20 years of fire exclusion.(17)

" The wetlands on site vary in shrub density, frequency of bays and oaks, and presence of peat which, while not measured, was apparent by its soft sponginess underfoot. More bay and shrub species were present in the wetter and larger systems which, because of their size, may be better protected from fire. Most of the domes in the eastern section were smaller, less diverse, and showed high tree mortality. The presence of oaks in a few domes in the east would not appear to be due to fire exclusion, because fires have obviously occurred there. This section drains directly to Hart Branch and Cowpen Creek and may be influenced both by greater surface flow and seed source from the oaks in the Hart Branch floodplain. Unfortunately, the 1980 summer season was exceptionally dry, and standing water was absent in most systems; therefore, relative differences in water depth between communities or between seasons could not be measured."

2.7.4.2 Value and Service-Forest Products. Large cypress trees were logged in the 1930s, and longleaf pine forests in the area have been thinned as recently as 1980. Although these species are abundant on the site, they are of poor value for commercial purposes. Proper management could increase the value of the trees, but since the site is currently managed for cattle grazing, forest products are currently of low value.

2.7.4.3 Value and Service--Cattle Grazing. Grasses and low shrubs on most of the site serve as unimproved pasture for beef cattle. This native vegetation furnishes poor to fair forage.(18)

2.7.4.4 Value and Service-Soil and Water Conservation. Vegetative cover provides important services of soil retention and erosion control. During the wet season, a sheet flow of water spreads in a thin layer over the soil-vegetation surface. The plants and organic matter accumulation filter suspended material, absorb water, and retard water flow. The forested wetlands serve as a reservoir system for runoff and direct precipitation by retaining water in peat and litter during the rainy season and slowly releasing stored waters through the organic pan into underlying sands in areas where ground water is in short supply (Figure 2.7-4).

These features have allowed cypress wetlands to be used for wastewater treatment both for storm runoff (19) and sewage wastewater.(20)

Plant communities are also important in nutrient retention through storage in biomass and humus layers accumulated from plant litter. When fire destroys biomass and humus, the species on site are particularly adapted for quick regrowth to take up the resulting available nutrients before excessive leaching occurs. This is particularly important in the sandy coastal plain soils which occur on site, since they lack nutrient-absorbing clays.(21)

2.7.4.5 The Future Environment Without the Proposed Facility. The natural communities on the site are in a dynamic equilibrium considering the nature of the stresses to which they are subject. Fire and, to a lesser extent, grazing have interacted with soil texture and drainage to shape the species composition and structure of the existing communities. Some of the very small, shallow, grass-dominated cypress stands may be invaded by flatwoods; on the other hand, wet prairies, which presently have a few cypress or Nyssa trees in their center, may show an increase in the number of trees. Forested stands in areas less subject to fires would show an increase in bay and shrub species; areas with greater fire frequency will be dominated by cypress, Xeric oak communities would remain as they are at present.

Pine density of the flatwoods may increase temporarily since many currently marketable trees already have been logged. In time, the currently unmarketable trees would be logged as they attained harvest size. Overall, pine density and size ranges would remain similar to those existing today.

Barring unforeseen changes in land use or fire frequency, the future environment without the proposed facility would be essentially the same as it is at present. Based on these assumptions, it is unlikely that most of the fauna in the area would change significantly in the near future. The only exception to this might be the status of the red-cockaded woodpecker. It seems unlikely that current forestry practices would eliminate this species. Surveys conducted in surrounding areas revealed fewer cavity trees, smaller populations of red-cockaded woodpeckers, and reduced foraging

habitat as compared to the site and the lands immediately south of the proposed project.

2.7.5 Important Species Analysis--Vegetation

2.7.5.1 Introduction. Two categories of important species are grouped in this section under the following headings: Commercially and Recreationally Important Species and Threatened and Endangered Species.

2.7.5.2 Commercially and Recreationally Important Species. The tree species historically or currently harvested in this area for forest products are longleaf pine and pond cypress. Although other species may be considered to have a monetary value in terms of the value of storm protection or natural water purification, these values have been discussed previously and are not covered here."

2.7.5.3 Endangered and Threatened Species. The Endangered Species Act of 1973 (PL 93-205), as amended, provides for the protection of endangered and threatened species. Under the rules and regulations of the Florida Game and Freshwater Fish Commission, the Commission must preserve and protect endangered and threatened species. This section (2.7) of the Florida Power Plant Site Certification Application must contain a report on the status of any endangered or threatened species which may be affected by the proposed action.

" Two plants native to Florida are on the most recent federal list of threatened and endangered species.(22) Neither of these species occurs on habitat types found in Orange County. The U.S. Fish and Wildlife Service has prepared a new proposed list of plant species.(23) The proposed list contains candidates currently being considered for inclusion in the final list. Approximately 200 plants that occur in Florida are on the proposed list, but none of these species were observed on the site.

" Nine plant species listed as rare, threatened, or endangered by the Florida Committee on Rare and Endangered Plants and Animals (FCREPA) (24)

are known to exist in Orange County (Table 2.7-3). The FCREPA list was prepared by conservation groups in cooperation with the Florida Game and Freshwater Fish Commission; however, it offers no legal protection for the plants listed. Habitat types on site likely to support threatened and endangered species have been systematically explored at each quarterly survey.

" Spoonflower (Peltandra sagittifolia), listed as rare, was observed in a hardwood bay stand in summer. A search will be made for other locations on site and other listed species in the spring."

2.7.6 Important Species Analysis--Wildlife

2.7.6.1 Introduction. Two categories of important species are grouped in this section under the following headings: Commercially and Recreationally Important Species, and Threatened and Endangered Species.

2.7.6.2 Commercially and Recreationally Important Species. " Important animal species of the proposed power plant site includes game animals and resident fur-producing species. Common small game species of wildlife consist of bobwhite quail, mourning dove, cottontail rabbit, marsh rabbit, and gray squirrel. Populations of white-tailed deer and feral swine are present in much of the area and some adjoining lands. The land seasonally attracts a few migratory species such as woodcock and common snipe. A wide variety of fur-bearing mammals occurs on the site. Apparently the white-tailed deer is the only species that is harvested significantly in the area, although limited harvesting of bobwhite quail occurs.

- (1) " Fur-Bearing Mammals. Fur-bearing mammals on the site include opossum, raccoon, gray fox, and bobcat. The opossum is common in nearly all wooded habitats on site." In mixed woodlands, raccoons prefer bottomlands for denning while foraging over uplands and aquatic systems. The gray fox is more often found in lowlands adjacent to bottom land forest. The bobcat is primarily found in hardwood bottomlands and swamps as well as forested

areas adjacent to these systems. Based on signs and sightings, these animals are fairly abundant in appropriate habitat types of the property. Table 2.7-4 lists some estimated densities for some of the mammals as well as other animals of the property as reported by various authors.

- (2) Large Mammals. Large game mammals consist of white-tailed deer and wild hogs. Current conditions in the area are conducive to supporting large populations of white-tailed deer. Although deer were sighted in a number of different habitats, concentrations appeared greater along various forested wetlands. In central Florida, Marchington and Jeter (25) estimated one deer per 17 acres in a mixture of longleaf pine/oak sandhill association. It would appear that deer populations on the proposed site approach this estimated population density. Because of a regular burning program for the flatwoods, it appears there is an abundant food supply in the form of forbs, grasses, and browse. The home range for most southeastern deer varies roughly from 150 to 250 acres. (26,27) The production of fawns per adult doe usually runs from 1.5 to 2.0 in a healthy herd. Nightlighting surveys on site revealed an average of 2.5 deer per mile of survey. Evening surveys along the existing transmission line averaged four deer per mile of transect. Annual harvest of deer (bucks only) for five sections (10, 11, 12, 13, and 14) in the area is near nine deer per season. During the 1980-81 season, 21 bucks were harvested from these five sections. (30)

The wild hog is primarily an inhabitant of hardwood swamps and marshes, although it also ranges into mixed hardwoods and pinelands. (28) Except for old boars traveling alone, feral hogs usually travel in small bands of eight or less. Of the habitats on the property, wild hogs or rootings were sighted more frequently in cypress domes or adjacent habitats. Based on rooting activity, there are no more than two to three bands of hogs on the property.

- (3) ^u Birds. Although there are some numbers of turkey in the area, population levels are not high enough to support significant hunting. The turkey population may be reduced due to the rather limited distribution of mixed hardwood forest.^u Willis (29) states that forests with less than 50 per cent deciduous trees will support few turkey. It is likely that other factors are involved, however, because turkey populations were reportedly moderately high in the area prior to the mid-1970s when the number observed drastically declined.(30) Powell (31) listed Orange County as having between 5,000 to 9,000 turkeys. The state-wide trend for turkey populations has been downward since the late-1960s.(32)

The bobwhite quail occurs throughout Florida around cut-over country, forest fringes, and old fields. Quail populations in this area of Florida are fragmented because of insufficient acreage of quality habitat. There is, however, fairly good habitat on the proposed site. Within these areas a fairly good blend of escape, nest, brood, and forage cover exists. In the Cecil Webb Wildlife Management Area (Charlotte County, Florida), densities are reported at two to six bobwhites per acre.(33) During the present study, two coveys (8 to 12 birds each) were sighted on the proposed site.

^u
2.7.6.3 Endangered and Threatened Species. The Endangered Species Act of 1973 (PL 93-205), as amended, provides for the protection of endangered and threatened species. Under the rules and regulations of the Florida Game and Freshwater Fish Commission, the commission must preserve and protect endangered and threatened species. Part 2.7 of the Florida Power Plant Site Certification Application requires the applicant to report on the status of any endangered or threatened species which might be affected by the proposed action.

Endangered and threatened animal species were identified from both state listings (34) and federal listings. Table 2.7-5 shows those animal

species which may occur in the area and their status. The following narrative describes the range, some life history, and occurrence on site. No critical habitat for federally listed species occurs within the proposed power plant site.

"There are several animal species which have ranges that include the proposed site that are not discussed in the following sections. None of these species were observed on site. It is unlikely that most of these animals would occur on the property because of lack of preferred habitat. Among this group are several wetland species (i.e., snowy egret, Louisiana heron). During the entire sampling program, there was little standing water in on-site wetlands. [Even during typical rainfall years it is doubtful that these species would occur other than as transient individuals.]

- (1) Florida Panther. The Florida panther is now primarily restricted to Florida with other small populations occurring along some large swamp-river systems in various parts of the Southeast.¹¹ In Florida, Layne (35) included the following counties as having valid reports: Dade, Broward, Palm Beach, Collier, Glades, Hendry, Highlands, Manatee, Pinellas, Martin, St. Lucie, Brevard, Polk, Levy, Alachua, Duval, Walton, and Sarasota.

According to Belden (36), resident populations of panthers in south Florida are centered in the Fakahatchee Strand and a portion of the Big Cypress Preserve. Records of sightings outside these areas, including the proposed site, probably consist of transient panthers.(37)

During terrestrial surveys, no sightings or tracks of the Florida panther were observed. The nearest confirmed sightings were from the Ocala National Forest and the areas west of Lake Okeechobee. Because of habitat disturbance and the lack of remoteness of the area, it is unlikely there would be resident panthers in this region.

- (2)¹¹ Wood Stork. The wood stork, the only American representative of the stork family (Ciconiidae), is a large white bird locally common in southern swamps, freshwater marshes, and ponds. Its

primary foods are fish, frogs, young alligators, and other aquatic animals. The current population appears to be declining throughout south Florida.(38) "

No wood stork were observed on site, and because of the lack of large freshwater marshes, streams, sloughs, or lakes, this species is not likely to occur in significant numbers on the property.

- (3) Red-Cockaded Woodpecker. The following list is a glossary of terms used in association with the red-cockaded woodpecker.(39)
- (a) Cavity. An excavation used by red-cockaded woodpeckers for roosting or nesting at some time during the life of the colony.
 - (b) Cavity Tree. A tree containing one or more red-cockaded woodpecker cavities.
 - (c) Clan. All the red-cockaded woodpeckers that inhabit a colony at a given point in time; generally a mated pair of red-cockaded woodpeckers, their offspring, and their associated helpers.
 - (d) Colony. The area prescribed by an aggregation of start holes and roost, nest, and old cavities habitually used by a clan.
 - (e) Glaze. The covering of resin surrounding a red-cockaded woodpecker cavity entrance or on an adjacent tree facing a cavity; results from deliberate excavation of resin wells by the birds.
 - (f) Nest Cavity. A cavity used by a pair of red-cockaded woodpeckers as a place in which to raise their young, usually the roosting cavity of a male.
 - (g) Nest Tree. A tree containing a nesting cavity.
 - (h) Old Cavity. An enlarged cavity with deteriorating glaze receiving little or no current use.
 - (i) Plate. The exposed wood surrounding a red-cockaded woodpecker cavity entrance.

- (j) Range. The area surrounding a nest cavity required by a clan to fulfill life-cycle requirements. This may include the colony, support stand, breeding territory, seasonal foraging area, or other definable units.
- (k) Resin Well. A hole, generally circular, in the bark of a cavity tree or a tree adjacent to a cavity tree from which resin extends.
- (l) Roost Cavity. A cavity used by a red-cockaded woodpecker only as a shelter, particularly at night and during inclement weather.
- (m) Start Hole. The beginning of a cavity; may never be finished, but if completed, excavation is usually over a period of several months.
- (n) Support Stand. The stand of timber in the immediate vicinity of a colony which may be ecologically definable on the basis of topography, vegetative types, land use patterns, stand conditions, or other logical entities.

Red-cockaded woodpeckers are characterized as inhabiting mature, open pine forests. However, this species will often occur in younger stands if good foraging habitat and a few old, relict trees are available.(40) This bird lives in southern pine forests throughout many of the southern Atlantic and Gulf states, including most of Florida. The decline of this species is due to its specialized habitat requirements, which conflict with the widespread forestry practices of intensive even-aged management in pine forests and culling of substandard trees. If the cavity trees are left undisturbed and if sufficient replacement cavity trees and suitable foraging habitat are available, survival of this species may continue."

Currently, there are 943 red-cockaded woodpecker colonies known to exist in Florida.(41) Of this total, seven colonies were known to occur in Orange County. Five of these colonies are located in the southwestern portion of the county and two in the

eastern. None of these colonies were previously known to occur on site. However, during this study, 19 unreported colonies were located on site or in the immediate vicinity of the project area.

The red-cockaded woodpecker is a non-migratory species. Clans (mated pair plus associated helpers) have been reported to exist through several generations in the same locale for as long as 30 or 40 years. Apparently they exist within a fairly well-defined home range, provided major habitat alterations do not occur within their range.

The home range consists of two aspects--the colony and the foraging habitat. The colony consists of stands of trees containing cavity trees as well as those trees immediately surrounding them. Although cavities may be located in a variety of pine species(42), those on site are located exclusively in longleaf pine. Colonies usually occur in mature (75 years or older), open stands of pines with 50 to 80 square feet of basal area per acre. Most cavities in longleaf pine occur in trees from 63 to 126 years old, usually infected with red heart disease.(43) Understory vegetation is generally less than 15 feet tall.

Most cavities are constructed facing in a westerly direction in living pines. Near the cavity, the birds flake away all bark forming the plate. Small holes (resin wells) are drilled above and below the cavity. Extensive pitch flows from both the plate and resin wells, giving the tree a white glazed appearance. Bark from the entire trunk is continually flaked away, giving the trunk a reddish appearance.

Red-cockaded woodpeckers are insectivorous, feeding mainly on ants, cockroaches, centipedes, spiders, and various insect eggs and larvae. Foraging is concentrated on trunks and limbs of living pine trees. Food is obtained by scaling bark and digging into dead limbs.

Foraging habitat may be over 200 acres in size.(44) Quality of the pine stand will influence the acreage of forage habitat

needed; however, in good stands consisting of pine trees 9 inches and larger in diameter at breast height (DBH), foraging habitat may be as small as 100 acres. Pole-size stands with trees 4 to 9 inches in diameter (DBH) may also be utilized. Sapling stands of pines or dense hardwood stands are seldom utilized by the woodpecker.

During surveys throughout the area, a total of 45 active cavity trees and 35 red-cockaded woodpeckers was observed in the vicinity of the proposed project. Twenty-five of these active cavity trees occur on site and represent nine colonies (see Figure 2.7-5). These nine colonies were visited during seasonal surveys. The number of birds observed per clan is listed in Table 2.7-6. Few red-cockaded woodpeckers were sighted in off-site colony areas; however, each of these identified colonies contained at least one active cavity tree. Four of these off-site clans occur between the southern boundary of the proposed site and the Bee Line Expressway.

Investigation of home range for on-site clans was initiated during the fall survey. As part of this investigation, the Florida Game and Freshwater Fish Commission assisted in banding 18 members of on-site clans. Estimated mean home range during the winter sampling period was 200 acres, with ranges from 126 acres to 380 acres. Home range for Clans A and G included both on-site and off-site lands, whereas the home range of Clans C and D is confined entirely to the site. The quality of habitat [based on basal area (BA) per acre] is variable among the clans, ranging from a BA of 20 (Clans D and G) to a BA of 10 (Clan A). Correspondingly, the home range of Clan A was significantly larger than the home ranges of Clans C, D, and G. Obviously, other factors (such as interclan pressure, individual clan variation, and the amount of preferred habitat) can affect home range size.

Birds were observed to forage in both pine flatwoods and cypress domes. During October and November 1980, approximately 75 per cent of foraging time was spent in pine flatwoods, the remainder in cypress domes. Surveys conducted in February 1981 revealed that approximately 94 per cent of foraging time was spent in pine flatwoods.

All cavities located to date occur exclusively in longleaf pine. Mean age of these trees is 115 years with a diameter (DBH) of 12 inches and a total height of 37 feet (Table 2.7-7). Mean basal area of all colony sites is 20 square feet per acre; the range was 5 to 40 square feet per acre. Basal area in pine flatwoods for the entire site is approximately 15 square feet per acre. For a more complete discussion of these and other parameters concerning red-cockaded woodpeckers, see the results section of the Management Plan for the red-cockaded woodpecker.

- (4) Southern Bald Eagle. In the Southeast, the Southern bald eagle nests primarily in estuaries, along large rivers, and around lakes. In Florida, nest sites are usually located in large pines; however, cypress and mangrove are also utilized. Although the eagle is very adaptable in its food habits, fish seem to be the preferred food.(45) Aside from requiring open water areas with an adequate supply of fish, the bald eagle also requires suitable nest trees close to water. There are currently about 500 pairs of breeding eagles in Florida. There is no known nesting activity in proximity to the proposed development. There have been two recent nesting locations in the eastern portion of Orange County. The Southern bald eagle was sighted on four occasions, just east of the property and along the existing transmission corridor. All four sightings were of adult birds. It is likely that these were transient birds since no other sightings were recorded, and no nests were found on the property.
- (5) Bachman's Warbler. The Bachman's warbler occurs erratically in the river swamps of the southeastern United States. Nesting

sites are usually heavily timbered swamps with dense undergrowth, including cane and palmetto." Because of the scarcity of this animal, it is unlikely that it would occur in the project area. Reasons for decline of this species are obscure, but may include extensive lumbering of bottomland swamps.

- (6) "Kirtland's Warbler. Kirtland's warbler may occur as a rare spring or fall transient throughout the southeastern United States. This warbler apparently breeds only in a restricted area of jack pine forest in southern Michigan." (46) Winter habitat is confined to pinewoods, broadleafed scrub, and Australian pine. This species might occur in the area occasionally during spring and fall migration.
- (7) "Florida Black Bear. Originally, the Florida Black bear ranged throughout Florida. Current populations are mainly centered in Apalachicola, Osceola, and Ocala National Forests, with remnant populations occurring in various parts of the state." According to Hamilton (47), secluded swamps and forests are areas of preferred habitation for bears. Major areas of occupied habitat within the region are located to the east along the St. Johns River and to the north along the Wekiva River. No sightings of bear or bear tracks were observed in the area. The habitat in this area does appear suitable for bears.
- (8) "Florida Scrub Jay. The Florida scrub jay is characteristic of oak scrub communities and is confined mainly to such habitats. The range of this subspecies is restricted to peninsular Florida, primarily along the east coast with scattered populations in the central portion and western coastline of Florida. No populations of Florida scrub jays were previously known to occur close to the proposed site. Because of the sedentary nature of this bird and continued encroachment into its habitat, populations of this subspecies have undergone a decline in recent times."

Surveys for this bird have been conducted in scrub oak communities within the project boundaries as well as some surrounding areas. During these surveys, the estimated number of family units encountered was from four to eight. Scrub jays were sighted on site and in adjacent areas. Several of the birds were observed in the west central and southwestern sections of the property. Since these areas contain discrete scrub oak communities, it is likely that they are occupied by at least two different family units and possibly four. Sightings off site also occurred in several different scrub communities. Thus, it seems that there are at least two different family units in surrounding scrub oak communities. Because of the relatively large amount of scrub oak communities in the area, it is very likely that a significant population of scrub jays exists throughout the region.

(9) American Alligator. The American alligator inhabits marshes and swamps throughout the southeastern United States and occurs regularly in central Florida. No alligators were found on site. In addition, it is unlikely that any significant numbers of alligators occur on site due to the relatively shallow nature of most wetlands and lack of lakes, ponds, or permanent streams. Although alligator populations originally declined due to heavy poaching and habitat destruction, populations in most of the southeastern United States have done well in recent years. Recently, the U.S. Fish and Wildlife Service (48) reclassified the alligator as threatened in all of Florida.

(10) Eastern Indigo Snake. The eastern indigo snake occurs in peninsular Florida, in a few widely scattered areas of the Georgia Coastal Plain, and in parts of the Florida Panhandle. This snake occupies a wide variety of habitat types. In xeric habitats, the shelter provided by gopher tortoise burrows apparently is a critical factor for the survival of this snake. No indigo snakes were observed on site, although one was sighted along the existing

transmission corridor. As with other animals associated with tortoise burrows, the snake collectors' practice of pouring gasoline into these burrows may have deleterious effects on this snake.

- (11) "Short-Tailed Snake. The range of the short-tailed snake is confined entirely to peninsular Florida from Highlands to Columbia Counties. This species occurs chiefly in longleaf pine/turkey oak associations and infrequently in upland oaks proximal to the former. The short-tailed snake is a burrowing animal, seldom occurring above ground except during the spring and fall. Encroachment by man into preferred habitat is the greatest threat to this species." In some instances, thermal stress caused by removal of overstory in sandhills communities has extirpated certain populations of this snake.(49) The forest association (mainly longleaf pine/turkey oak) inhabited by this species are not currently present on the proposed site.
- (12) "Sherman's Fox Squirrel. The range of the Sherman's fox squirrel is limited to peninsular Florida and, perhaps, southeastern Georgia. Longleaf pine/turkey oak forests seem to be the most frequently used habitat, but sand scrub, bayheads, pine flatwoods, and borders of cypress swamps are also used."

Although optimum habitat is not found on site, fox squirrels do inhabit some pine flatwoods and various flatwood-wetland ecotones. Too few fox squirrels were sighted to estimate population levels, but two were sighted along the transmission line and four were observed on the property, two in pine flatwoods and two in cypress domes.

- (13) "Gopher Tortoise. The gopher tortoise is locally distributed in the Coastal Plain from South Carolina and Florida to eastern Louisiana. In Florida, it may be encountered widely in northern sections with relict, scattered populations occurring in suitable habitats in the south. Preferred habitat consists of old field areas, longleaf pine sandhill, live oak hammock, and beach scrub,

usually with abundant herbaceous cover of several types.^h A few burrows may occur in maintained pastures, mixed swamp, and hydric hammock, but generally these habitats are not utilized. Some important burrow symbionts, which may occur in these same habitats, include the pine snake, indigo snake, Florida mouse, and Florida gopher frog. Other commensals include a large number of invertebrates, eastern diamondback rattlesnake, and various mammals. In xeric habitats (e.g., scrub, xeric hammock, and sandhills), the loss of gopher tortoise burrows as a refuge and hibernacula could adversely affect commensal organisms. Reasons for decline include destruction of habitat, fire prevention, unfavorable alteration of habitat by forestry, collection for food or for pet trade, and possibly the practice of introducing gasoline into gopher burrows to drive out snakes.

On-site populations of gopher tortoise are centered mainly on the higher elevation in the western and south-central portion of the property. In these areas, an average of seven active burrows was recorded per mile of survey.

2.7.7 Preferred Corridors--Plant Communities

Figure 2.7-6 shows an overview of the proposed railroad, transmission line, and pipeline corridors in relation to the plant site and surrounding lands. For purposes of this discussion, each corridor has been divided into sections (see Figures 2.7-7, 2.7-8, and 2.7-9). The following discussion on vegetative communities occurring in these corridors is presented in relation to the depicted sections.

2.7.7.1 Railroad Corridor--Section I. A vegetation map of the railroad corridor is shown on Figure 2.7-7. In this section, longleaf pine flatwoods (411) or isolated stands of swamp forest (611) alternate with cattle pasture (210). The swamp forest is dominated by pond cypress (Taxodium ascendens), with scattered slash pine (Pinus elliottii) and bays (Persea palustris, Gordonia lasianthus, Magnolia virginiana). Many of the domes have an open

usually with abundant herbaceous cover of several types. A few burrows may occur in maintained pastures, mixed swamp, and hydric hammock, but generally these habitats are not utilized. Some important burrow symbionts, which may occur in these same habitats, include the pine snake, indigo snake, Florida mouse, and Florida gopher frog. Other commensals include a large number of invertebrates, eastern diamondback rattlesnake, and various mammals. In xeric habitats (e.g., scrub, xeric hammock, and sandhills), the loss of gopher tortoise burrows as a refuge and hibernacula could adversely affect commensal organisms. Reasons for decline include destruction of habitat, fire prevention, unfavorable alteration of habitat by forestry, collection for food or for pet trade, and possibly the practice of introducing gasoline into gopher burrows to drive out snakes.

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depauperate grass understory, severely impacted by cattle. Six domes, scattered among the others, are more diverse and undisturbed. They contain red maple (Acer rubrum), bays, epiphytes (primarily Tillandsia spp.), toothed mid-sorus fern (Blechnum serrulatum), royal fern (Osmunda regalis), cinnamon fern (Osmunda cinnamomea), and other herbaceous species. Shrub cover is dense and consists of Lyonia lucida, dahoon (Ilex cassine), gallberry (Ilex glabra), wax myrtle (Myrica cerifera), and young bays.

Several small wet areas, about 90 to 150 feet in diameter, and dominated by Juncus sp., also occur in the pasture. They are not shown in Figure 2.7-7.

A few oak groves which occur within the flatwoods do not appear in Figure 2.7-7. Water oak (Quercus nigra), laurel oak (Quercus laurifolia), and large individuals of sand-live oak (Quercus geminata) with trunk diameters of 12 to 30 inches formed these groves. Saw palmetto (Serenoa repens) occurs in the understory as in the flatwoods.

2.7.7.2 Railroad Corridor--Section II. Much of the section is interspersed with pasture. The airport is north of the western boundary of the section. Boggy Creek, also in the west, is channelized here. It is clogged with water hyacinth (Eichornia crassipes) and bordered by Carolina willow (Salix caroliniana), groundsel-bush (Baccharis halimifolia), primrose willow (Ludwigia peruviana), and elderberry (Sambucus simpsonii), all indicator species of disturbed conditions. Near the Boggy Creek Road bridge, east of the juncture of Boggy Creek with a very large wetland, in Boggy Creek Swamp, the aquatic vegetation in the channel is more diverse. In addition to water hyacinth, the following species are common: marsh fern (Thelypteris paulstris), marsh pennywort (Hydrocotyle sp.), pellitory (Parietaria floridiana), false nettle (Boehmeria cylindrica), water fern (Salvenia rotundifolia), arrow arum (Peltandra sp.), and Begonia sp. Boggy Creek Swamp appears diverse and undisturbed. It is dominated by cypress and bays.

The western side is predominantly pasture with several small isolated cypress stands. The eastern side is pasture and xeric scrub oak, and also

contains several small cypress stands. Common scrub oak species are Chapman's oak (Quercus chapmanii) and myrtle oak (Quercus myrtifolia).

The railroad corridor has been modified in the eastern portion of Section II to deviate from the original corridor slightly more than 2,000 feet to the southeast. The modified portion lies between State Route 15 and the southernmost bend in the corridor south of Mud Lake. This added corridor area has been surveyed to identify terrestrial communities.

Plant communities in the area of the corridor modification are shown in Figure 2.7-7a. South of Mud Lake, the corridor consists primarily of pasture. Several scattered live oak (Quercus virginiana) and a small stand of longleaf pine (Pinus palustris) are present in the pasture. The central section of the modified corridor crosses longleaf pine flatwoods, a transmission line right-of-way, and xeric oak scrub. Common scrub oak species are Chapman's oak (Quercus chapmanii) and myrtle oak (Quercus myrtifolia). Turkey oak (Quercus laevis) occurs on the ecotone between pine flatwoods and xeric oak scrub. Scattered cypress (Taxodium ascendens) domes and sedge-Hypericum wet prairies occur within the oak scrub and pine communities.

The eastern section of the modified corridor bends northward to join the presently proposed route described in the SCA. Plant communities in this section of the modification are citrus groves, including an area of newly planted trees; longleaf pine flatwoods; and portions of three large cypress or mixed cypress-bay wetlands. Two large wetlands west of the citrus groves experienced a severe fire within the past year, as evidenced by charred cypress and longleaf pine trunks. The southern system has been more adversely affected by the fire. In many areas, 50 per cent of the cypress trees are dead, and shrubs are absent from the ground cover. Dense shrub cover has regrown in the burned portion of the northern wetland. Gallberry and pond pine fringe the northern mixed cypress-bay wetland.

The large mixed cypress-bay wetland in the middle of the citrus groves is surrounded by a canal. The citrus area has been drained, and most of the excess water is routed to this wetland. There are two isolated cypress domes just west of the point where the alternate route rejoins the presently proposed route.

RFM-1

Wildlife habitats occurring along the modified corridor reflect the plant communities present in the area. These habitats include pasture and other disturbed areas, longleaf pine flatwoods, xeric oak scrub, cypress wetlands, and wet prairies. The wildlife of these habitats (excluding pasture) are described in Section 2.7.7. The types of animals using pasture and other disturbed lands in this area often include many species which occur in surrounding habitats, such as longleaf pine flatwoods and xeric oak scrub. Generally, species diversity indices and abundance of wildlife in these disturbed habitats are lower than in surrounding natural communities.

Endangered and threatened plant species for Orange County are listed in Table 2.7-3. None of these listed species were observed during the survey. Plants listed as threatened that could potentially occur in the mixed cypress-bay wetlands are:

Spoon flower (Peltandra sagittifolia)

Florida willow (Salix floridana)

Fall-flowering ixia (Nemastylis floridana)

Hand fern (Opioglossum palmatum)

RFM-1

A survey of federal- and state-protected animal species lists showed a number of threatened and endangered species occurring or potentially occurring in the vicinity of the proposed route. These species and their status are listed in Section 2.7.7 of the SCA document.

The Southern bald eagle (Haliaeetus leucocephalus) was the only observed representative of the listed species, but no eagle nests were found. No red-cockaded woodpeckers (Picoides borealis) were sighted in this area. The relatively young age of most pine stands in this area precludes use of these trees for cavities. There were, however, a few scattered trees old enough to be used by red-cockaded woodpeckers. No cavities or other evidence of use by these woodpeckers were observed.

No evidence of nesting herons, egrets, ibis, or wood storks was observed in surveyed wetlands.

2.7.7.3 Railroad Corridor--Section III. This area is predominantly pasture with scattered cypress and bay stands. Near the western boundary of the section, the corridor intersects a large, mixed-species swamp (631) which borders Red Lake. | 5

2.7.7.4 Railroad Corridor-Section IV. The dominant cover in this portion of the corridor includes flatwoods (411) and pasture (210). Two cypress strands drain into a series of canals intersecting the pasture south of the corridor. Two sand pine communities (413), dominated by Pinus clausa and scrub oaks occur, as well as several isolated domes and wet prairies north of the Bee Line Expressway. | 5

2.7.7.5 Railroad Corridor--Section V. This section extends north of Section IV. It is primarily flatwoods with some xeric scrub oak areas. Several cypress domes are intersected by the corridor.

2.7.7.6 Transmission Line Corridor. The proposed transmission line corridor follows the existing corridor from the substation near Briar Bay Park to the proposed site. The corridor is bordered by pasture, generally too narrow to be shown on the map. The western portion near the substation is urbanized. As shown in Figure 2.7-8, isolated cypress domes (many too small to show on the map), and larger mixed-species swamps alternate with pasture, xeric oak scrub, and one citrus grove which is west of the Little Econlockhatchee River. The Little Econlockhatchee is channelized; high spoil banks covered with dog fennel and other weeds border the channel.

Red maple is the dominant woody plant. Water hyacinths and duckweed (Lemna) are the most abundant aquatic plants. Natural streams or sloughs occur east and west of the channel. Red maple, cypress, elm, and water oak dominate the stream floodplains. Thick leaf litter covers the ground. Wax myrtle is common in the shrub layer. A few tangerine trees, isolated from the citrus orchard west of the stream, are also present.

2.7-31b

The remaining part of the corridor, up to the Econlockhatchee River, consists of longleaf pine flatwoods alternating with cypress, mixed cypress-bay stands, and xeric scrub oak. Cattle graze on either side of the corridor.

2.7.7.7 Pipeline Corridor--Section I. (Deleted)

2.7.7.8 Pipeline Corridor--Section II. (Deleted)

2.7.7.9 Pipeline Corridor--Section III. (Deleted).

RFM-1

2.7.8 Preferred Corridors--Animal Communities

The following narrative describes the occurrence of threatened and endangered species along the railroad, transmission, and pipeline corridors. Figures 2.7-7 and 2.7-8 depict endangered and threatened species observed within these corridors.

All corridors were surveyed for the presence of threatened and endangered species (see Table 2.7-5 for listed species). Endangered species observed along the corridors include the southern bald eagle and red-cockaded woodpecker. Two bald eagles were observed near the existing transmission line corridor (see Figure 2.7-8). These areas were surveyed for nests, and none were observed. The occurrence of red-cockaded woodpecker colonies is indicated on Figures 2.7-7 and 2.7-8. Each colony contained at least one active cavity tree. Red-cockaded woodpeckers were observed in the two colonies depicted on the railroad corridor. None were observed in the colonies within the pipeline corridor.

Threatened species observed within these corridors include the indigo snake and Florida sandhill crane. Although the corridor has several areas of good foraging habitat for sandhill cranes, none contained preferred nesting habitat.

Wetlands within each corridor were also surveyed for nesting egrets, herons, wood storks, and ibis. None were observed.

Saw palmetto, gallberry, wax myrtle, and Lyonia lucida are common understory shrubs in the swamp forests. Saw palmetto is also frequent in the flatwoods. Violets (Viola affinis, Viola septemloba, Viola lanceolata) and sun bonnets (Chaptalia tomentosa) are also present in the flatwoods.

The most sensitive area of the corridor is the Little Econlockhatchee River which would have to be crossed by the pipeline.

Plants listed as threatened by FCREPA (50) that could occur in the area are:

Sandpine scrub	Curtiss milkweed (<u>Asclepias curtissii</u>), Florida bonamia (<u>Bonamia grandiflora</u>).
Longleaf pine flatwoods	
Wetland	Scrub buckwheat (<u>Eriogonum floridanum</u>) Spoon flower (<u>Peltandra sagittifolia</u>) Florida willow (<u>Salix floridana</u>) Fall-flowering ixia (<u>Nemastylis floridana</u>) Hand fern (<u>Ophioglossom palmatum</u>)

These species were not observed during the survey.

2.7.7.9 Pipeline Corridor--Section III. Pastures (210) form the primary land cover along Woodbury Road. Several bayheads (621) are present in the northern portion. Canopy species in the bayheads are pond pine (Pinus serotina), loblolly bay (Gordonia lasianthus), red maple (Acer rubrum), sweet bay (Magnolia virginiana), red bay (Persea palustris), and scattered cabbage palm (Sabal palmetto). Lyonia lucida, dahoon (Ilex cassine), saw palmetto, gallberry, and wax myrtle (Myrica cerifera) form a tall, dense understory. Sphagnum mats cover much of the ground. Drainage ditches border some of the pasture, young pickerelweed (Pontederia cordata) and Ludwigia sp. are present in the ditches. Wet prairies dominated by Hypericum fasciculatum also occur in the pastures.

South of Woodbury Road to the transmission corridor, little evidence of cattle grazing was observed. Xeric oak scrub (421), dominated by myrtle oak, Chapman's oak and sand live oak, alternate with swamp forest and

longleaf pine flatwoods (411). Cypress (611) and pondpine (612) or cypress (611) alone are dominant in the swamp forests.

A creek in this area has been dredged and as a result, the banks are disturbed and weedy. Dominant trees are live oak (Quercus virginiana), cabbage palm (Sabal palmetto), and water ash (Traxinus caroliniana). Bald cypress (Taxodium distichum), sweetbay (Magnolia virginiana), and sweet gum (Liquidambar styraciflua) are also present.

Common shrubs are jessamine (Gelsemium sempervirens), elderberry (Sambucus simpsonii), and viburnum (Viburnum obovatum).

2.7.8 Preferred Corridors--Animal Communities

The following narrative describes the occurrence of threatened and endangered species along the railroad, transmission, and pipeline corridors. Figures 2.7-7, 2.7-8, and 2.7-9 depict endangered and threatened species observed within these corridors.

All corridors were surveyed for the presence of threatened and endangered species (see Table 2.7-5 for listed species). Endangered species observed along the corridors include the southern bald eagle and red-cockaded woodpecker. Two bald eagles were observed near the existing transmission line corridor (see Figure 2.7-8). These areas were surveyed for nests, and none were observed. The occurrence of red-cockaded woodpecker colonies is indicated on Figures 2.7-7, 2.7-8, and 2.7-9. Each colony contained at least one active cavity tree. Red-cockaded woodpeckers were observed in the two colonies depicted on the railroad corridor. None were observed in the colonies within the pipeline corridor.

Threatened species observed within these corridors include the indigo snake and Florida sandhill crane. Although the corridor has several areas of good foraging habitat for sandhill cranes, none contained preferred nesting habitat.

Wetlands within each corridor were also surveyed for nesting egrets, herons, wood storks, and ibis. None were observed. ¹¹

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TABLE 2.7-1. PLANT COMMUNITIES ON THE PROPOSED CURTIS H. STANTON ENERGY CENTER SITE

<u>Community</u>	<u>Acres</u>	<u>Per Cent of Total Area</u>
Uplands		
Pine Flatwoods (411)*	2,631	82
Xeric Oak Scrub (421)	<u>166</u>	<u>5</u>
Total Uplands	2,797	87
Wetlands		
Pond Cypress (611)	221	7
Pond Pine (612)	12	<1
Bay Hardwood (621)	42	1
Oak Hardwood (621)	12	<1
Mixed Species (631)	72	2
Wet Prairie (641)	<u>44</u>	<u>1</u>
Total Wetlands	403	12

*Florida Land Use and Cover Classification designation in parentheses.

SOURCE: ESE, 1981.

TABLE 2.7-2. COMPARISON OF MAJOR FORESTED WETLAND COMMUNITIES

<u>Characteristic</u>	<u>Cypress Stand</u>	<u>Bay Stand</u>	<u>Oak Hardwood Stand</u>
Trees per acre	460	685	284
Mean basal area of two most dominant trees (in ²)	42,600	24,160	91,720
Number of tree species	5	5	10
Shrub percent cover	40	50	13
Number of shrub species	11	12	7
Herbaceous percent cover	52.7	34.3	15.4
Number of herbaceous species	26	19	18

SOURCE: ESE, 1981.

TABLE 2.7-3. RARE, THREATENED, AND ENDANGERED PLANT SPECIES KNOWN TO OCCUR IN ORANGE COUNTY

<u>Species</u>	<u>Family</u>	<u>Common Name</u>	<u>Favored Habitat</u>	<u>Status</u>
<u>Ophioglossum palmatum</u>	Ophioglossaceae	Hand Fern	Inside base of <u>Sabal palmetto</u> in moist, very shaded hammocks	Endangered
<u>Rhapidophyllum hystrix</u>	Palmae	Needle Palm	On limestone in deep hammocks or bottom of spring-fed stream bottoms	Threatened
<u>Peltandra sagittifolia</u>	Araceae	Spoonflower	Variety of wet areas	Rare
<u>Nemastylis florida</u>	Iridaceae	Full-flowering <u>Ixia</u>	Variety of wet habitats: hammocks, marshes, low flatwoods	Threatened
<u>Eriogonum floridanum</u>	Polygonaceae	Scrub Buckwheat	In association with longleaf pine on well-drained sandy soils	Threatened
<u>Salix floridana</u>	Salicaceae	Florida Willow	Very wet soils in dense, swampy woods	Rare
<u>Drosera intermedia</u>	Droseraceae	Water Sundew	Clear streams or ponds and bogs	Rare
<u>Asclepias curtissii</u>	Asclepiadaceae	Curtiss Milkweed	In scrub on leached white sand	Threatened
<u>Bonamia grandiflora</u>	Convolvulaceae	Florida Bonamia	In scrub on leached white sand	Threatened

SOURCES: Florida Committee on Rare and Endangered Plants and Animals, 1978.
ESE, 1981.

TABLE 2.7-4. COMMON MAMMALS ON THE PROPOSED CURTIS H. STANTON ENERGY CENTER SITE

<u>Species</u>	<u>Estimated Density</u>	<u>Habitat</u>
Opossum	0-2 per acre	Pine flatwoods
Raccoon	1 per 20 acres	Mixed habitat
Striped skunk	0-1 per acre	Pine flatwoods
Gray squirrel	6 per acre	Floodplain forest
Fox squirrel	2 per acre	Pine flatwoods
Cottontail rabbit	0-2 per acre	Old field/flatwoods
Marsh rabbit	1 per acre	Pine flatwoods
White-tailed deer	1 per 17 acres	Mixed habitat

SOURCE: ESE, 1981.

TABLE 2.7-5. STATUS OF ENDANGERED AND THREATENED SPECIES AND SPECIES OF SPECIAL CONCERN WHOSE RANGES INCLUDE THE PROPOSED SITE

Common Name	Scientific Name	Status*		Comments
		Federal	State	
REPTILES				
Gopher tortoise	<u>Gopherus polyphemus</u>	-	S	Occupies dry sandy soils; Habitat--flatwoods; Oak scrub--present.
American alligator	<u>Alligator mississippiensis</u>	T	S	Habitat--marsh, stream, pond--none observed.
Eastern indigo snake	<u>Drymarchon corais couperi</u>	T	T	Varied habitat--sighted on corridor.
BIRDS				
Wood stork	<u>Mycteria americana</u>	-	E	Wetlands---none observed.
Red-cockaded woodpecker	<u>Picoides borealis</u>	E	T	Restricted primarily to mature pine flatwoods; Present.
Bachman's warbler	<u>Vermivora bachmanii</u>	E	E	Possible only as a very rare migrant.
Kirtland's warbler	<u>Dendroica kirtlandii</u>	E	E	Possible only as a very rare migrant.
Southern bald eagle	<u>Haliaeetus l. leucocephalus</u>	E	T	No known nesting on site, but seen in area.
Southeastern American kestrel	<u>Falco sparverius paulus</u>	-	T	Site is within breeding range.
Florida sandhill crane	<u>Grus canadensis pratensis</u>	-	T	Nests in shallow emergent fresh marsh vegetation; Present.

(1 of 2)

TABLE 2.7-5 (Continued). STATUS OF ENDANGERED AND THREATENED SPECIES AND SPECIES OF SPECIAL CONCERN
WHOSE RANGES INCLUDE THE PROPOSED SITE

Common Name	Scientific Name	Status*		Comments
		Federal	State	
BIRDS (Continued)				
Florida scrub jay	<u>Aphelocoma c. coerulescens</u>	-	T	Restricted to xeric oak scrubs. Present.
Little blue heron	<u>Florida caerulea</u>	-	S	Wetlands, mainly marshes--none observed.
Great egret	<u>Casmerodius albus</u>	-	S	Wetlands, mainly marshes--none observed.
Snowy egret	<u>Egretta thula</u>	-	S	Wetlands, mainly marshes--none observed.
Louisiana heron	<u>Hydranassa tricolor</u>	-	S	Wetlands, mainly marshes--none observed.
Florida burrowing owl	<u>Athene cunicularia floridana</u>	-	S	None observed.
MAMMALS				
Florida panther	<u>Felis concolor coryi</u>	E	E	Varied habitat, no recent confirmed sightings.
Florida black bear	<u>Ursus americanus floridanus</u>	-	T	Preferred habitat is thick swamps. None observed.
Sherman's fox squirrel	<u>Sciurus niger shermani</u>	-	S	Flatwoods. Present.

*E = Endangered; S = Special concern; and T = Threatened.

SOURCES: Florida Game and Freshwater Fish Commission, 1979; U.S. Fish and Wildlife Service, 1980; and ESE, 1981.

TABLE 2.7-6. DATA DESCRIPTION OF RED-COCKADED WOODPECKER ON THE PROPOSED SITE

Clan	Number of Birds	Number of Cavity Trees		Area acres	Basal Area** ft ² /acre	Home Range	
		Active	Abandoned*			Pine Flatwoods %	Wetlands %
A	2	2	4	380	10	78	22
B	2	2	4	NA	NA	NA	NA
C	3	2	9	127	15	97	3
D	3	4	8	138	20	83	17
E	4	4	2	NA	NA	NA	NA
F	3	3	3	NA	NA	NA	NA
G	2	3	4	172	20	91	9
H	5	4	3	NA	NA	NA	NA
I	2	2	1	NA	NA	NA	NA
TOTAL	26	26	38	--	--	--	--
AVERAGE	3	2.9	4.2	204	--	87	13

*Abandoned and start hole cavity trees.

**Basal Area (BA) = Cross-sectional area of trees at breast height.

NOTE: NA = Not determined.

SOURCE: ESE, 1981.

TABLE 2.7-7. CHARACTERISTICS OF RED-COCKADED WOODPECKER COLONIES ON THE PROPOSED CURTIS H. STANTON ENERGY CENTER SITE

<u>Colony</u>	<u>No. of Cavity Trees*</u>	<u>Tree Diameter**</u>		<u>Average Tree Age years</u>	<u>Basal Area ft²/acre</u>
		<u>Average inches</u>	<u>Range inches</u>		
A	6	12.1	10.4-13.1	135	40
B	6	11.2	11.2	NA	5
C	11	11.0	9.7-13.6	88.5	15
D	12	14.6	11.4-16.9	135	25
E	6	10.5	8.7-11.5	108.5	15
F	6	9.9	7.9-11.4	120	5
G	7	15.4	14.6-16.6	125.5	30
H	7	10.9	10.0-11.3	NA	15
I	3	10.7	10.4-11.0	NA	15

*Includes active, inactive, and start hole cavity trees.

**Diameter at breast height.

NOTE: NA = Not determined.

SOURCE: ESE, 1981.

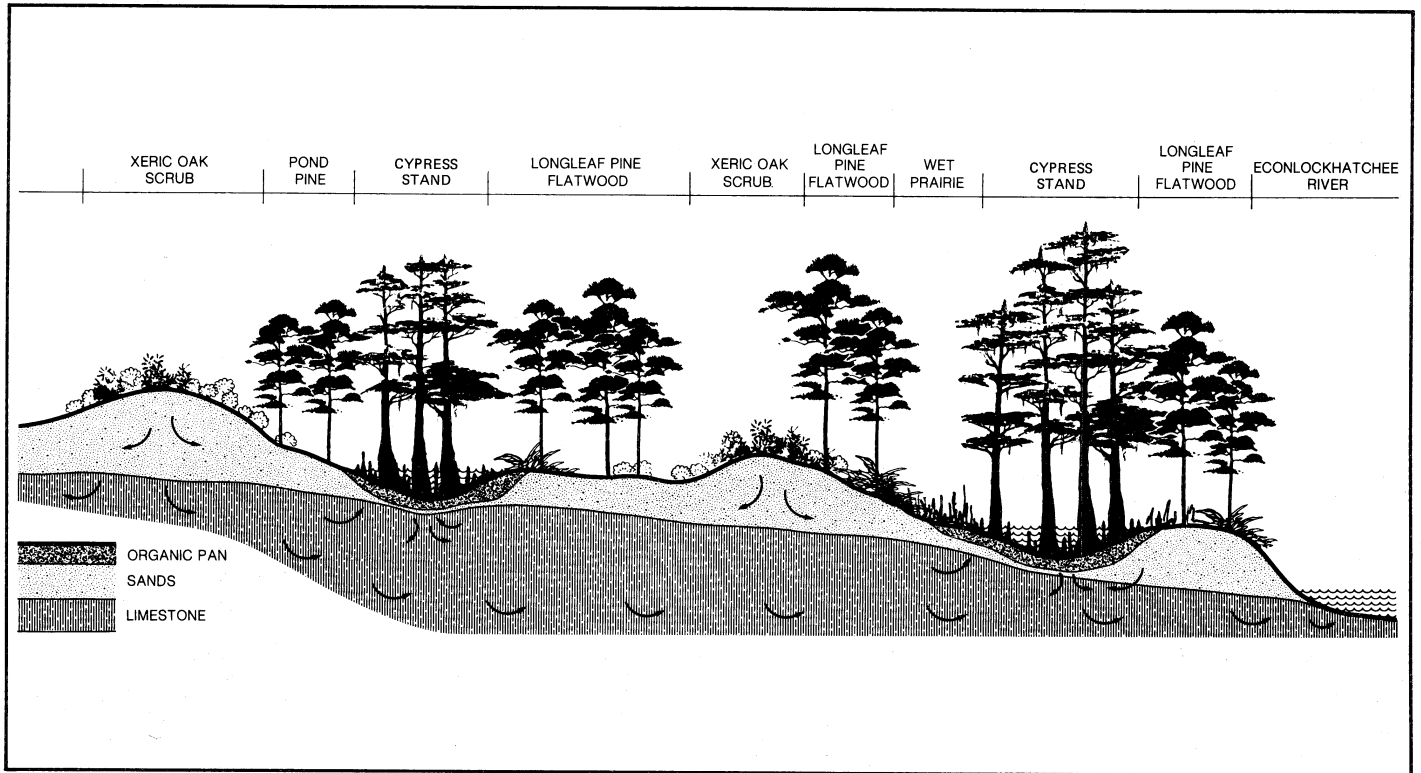


Figure 2.7-1 CROSS SECTION OF THE PROPOSED SITE-CONCEPTUALIZED PLANT/SOIL/WATER RELATIONSHIPS

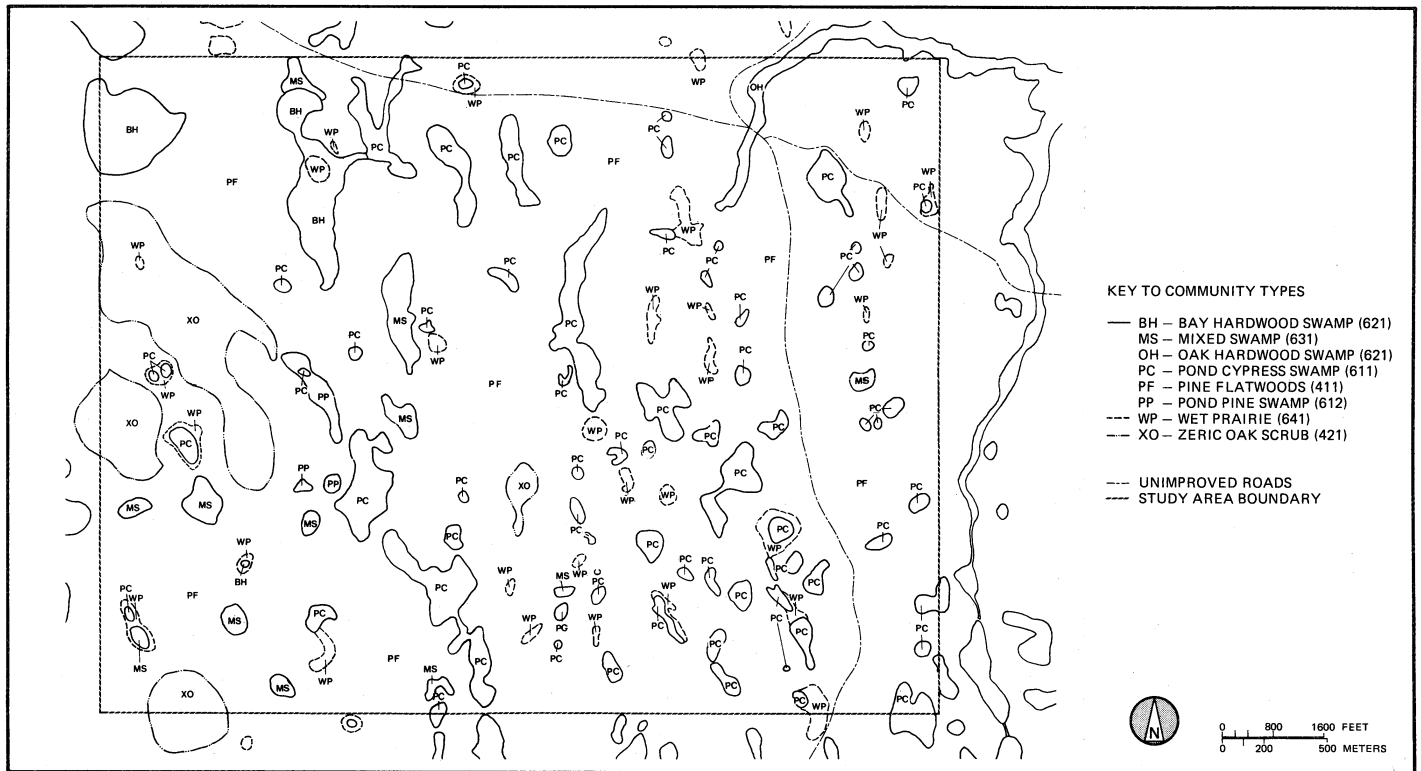
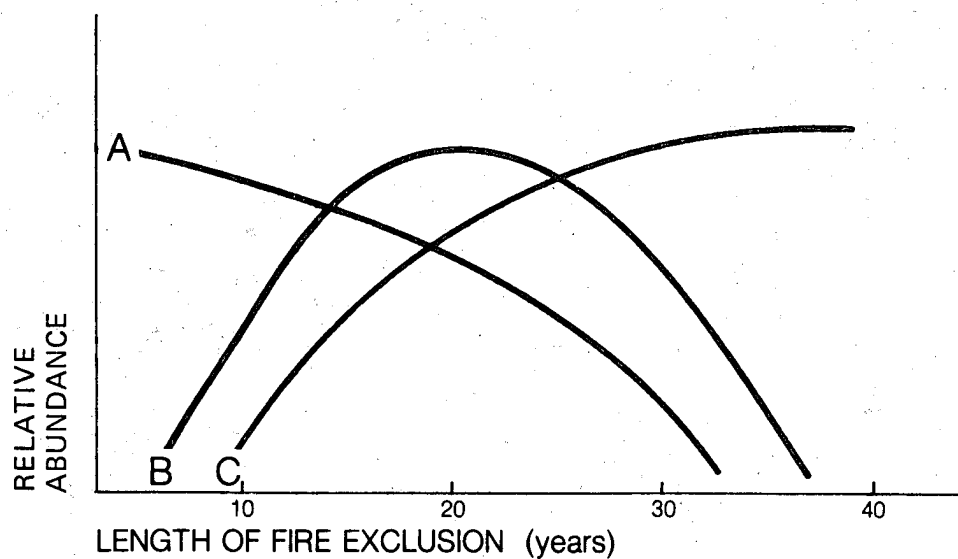
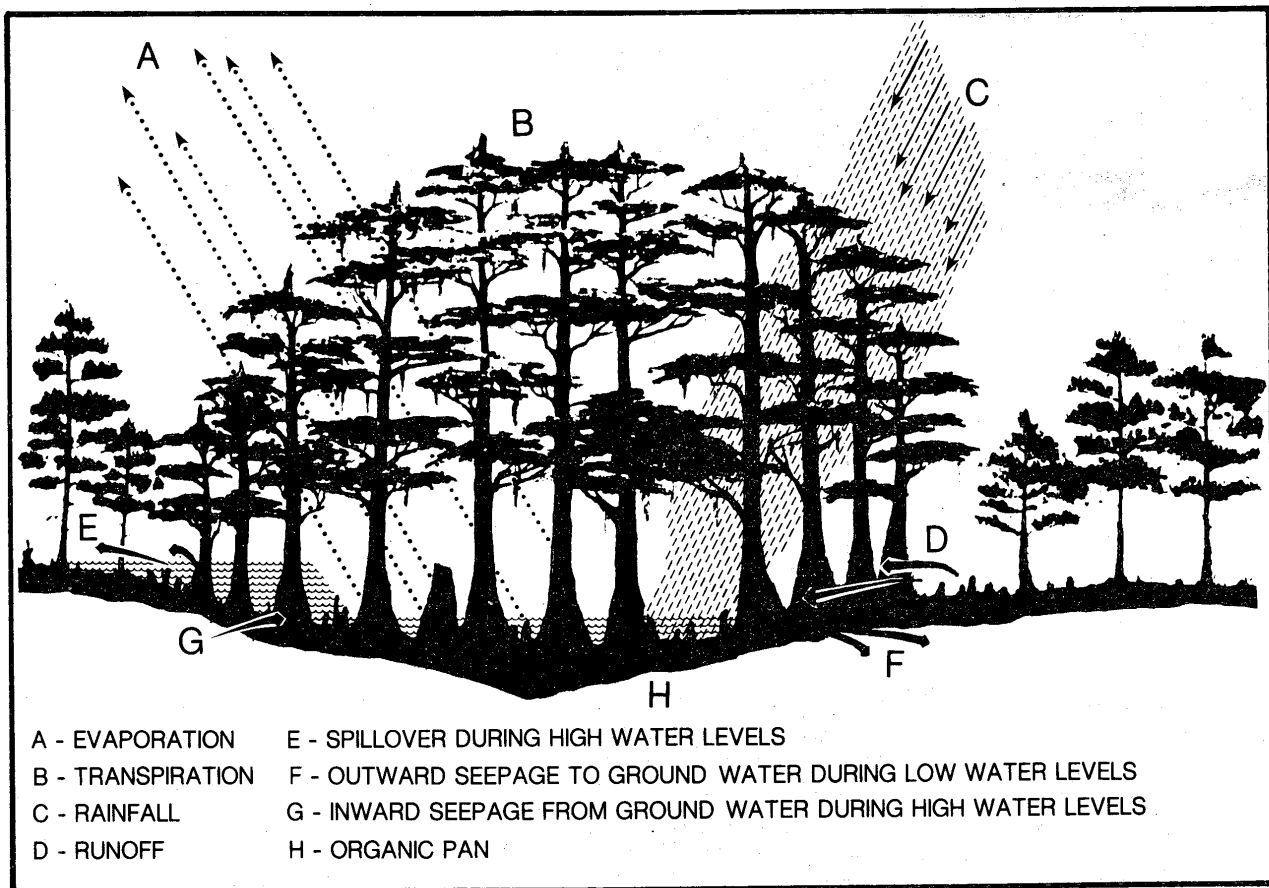


Figure 2.7-2 VEGETATIVE COMMUNITIES OF THE PROPOSED SITE



	A	B	C
FLATWOODS	Characteristic grasses and forbs Longleaf pine Pond pine (slower rate of decline than longleaf) Density of organic pan Extreme water level fluctuations	Sweet gum Saw palmetto Gallberry Lyonia Vaccinium Gaylussacia Species richness	Live oak Wax myrtle Laurel oak Soil organic matter Soil nitrate Soil calcium Total canopy cover Water retention capacity Microorganisms
WETLANDS	Cypress Pond pine	Bay species Swamp tupelo Red maple	Water oak Peat Laurel oak Live oak Persimmon
OAK SCRUB	Scrub oak species Lyonia		Live oak and other evergreen hardwoods

Figure 2.7-3 SUCCESSIONAL CHANGES IN THE ABSENCE OF FIRE



SOURCE: WHARTON et al , 1976.

Figure 2.7-4 WATER MOVEMENT THROUGH A CYPRESS DOME

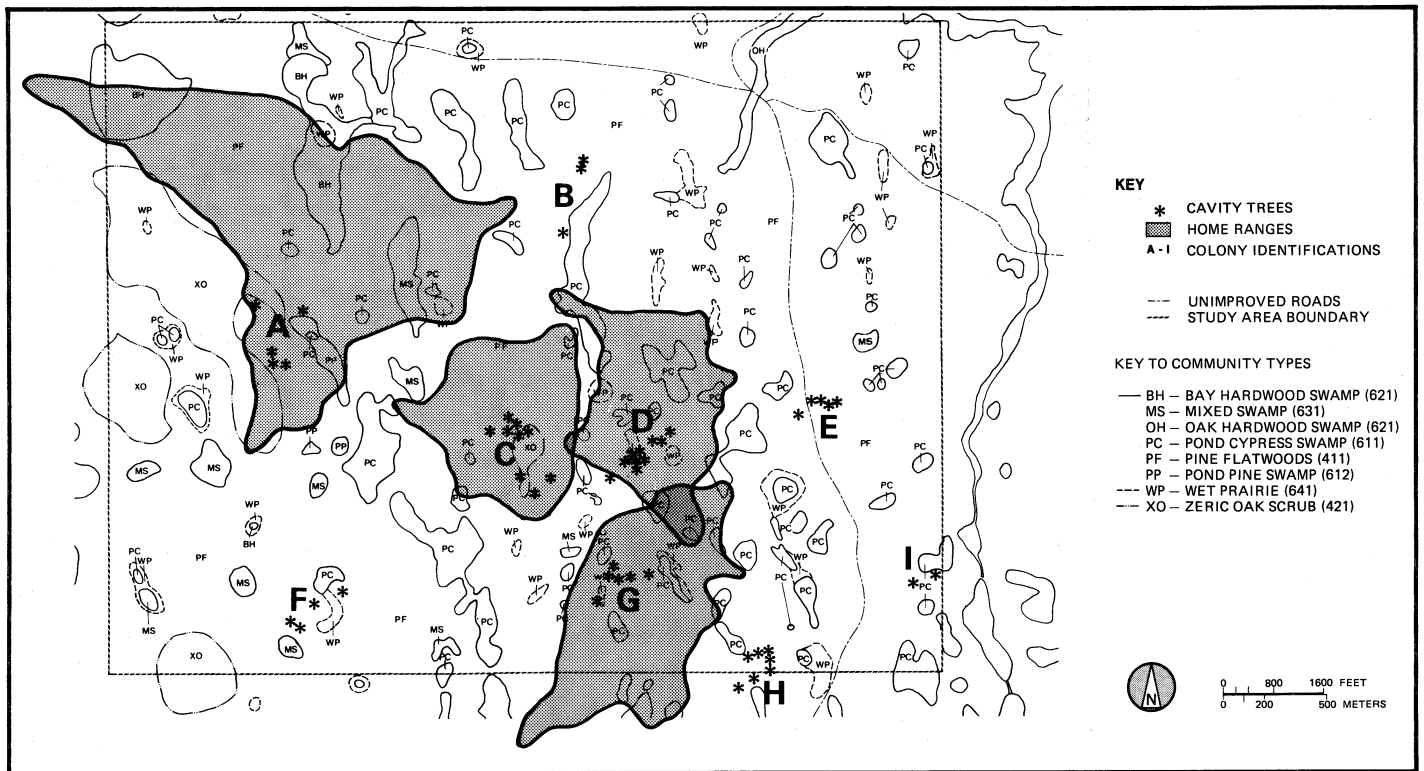


Figure 2.7-5 RED-CKADEED WOODPECKER COLONY SITES AND HOME RANGES ON THE PROPOSED SITE

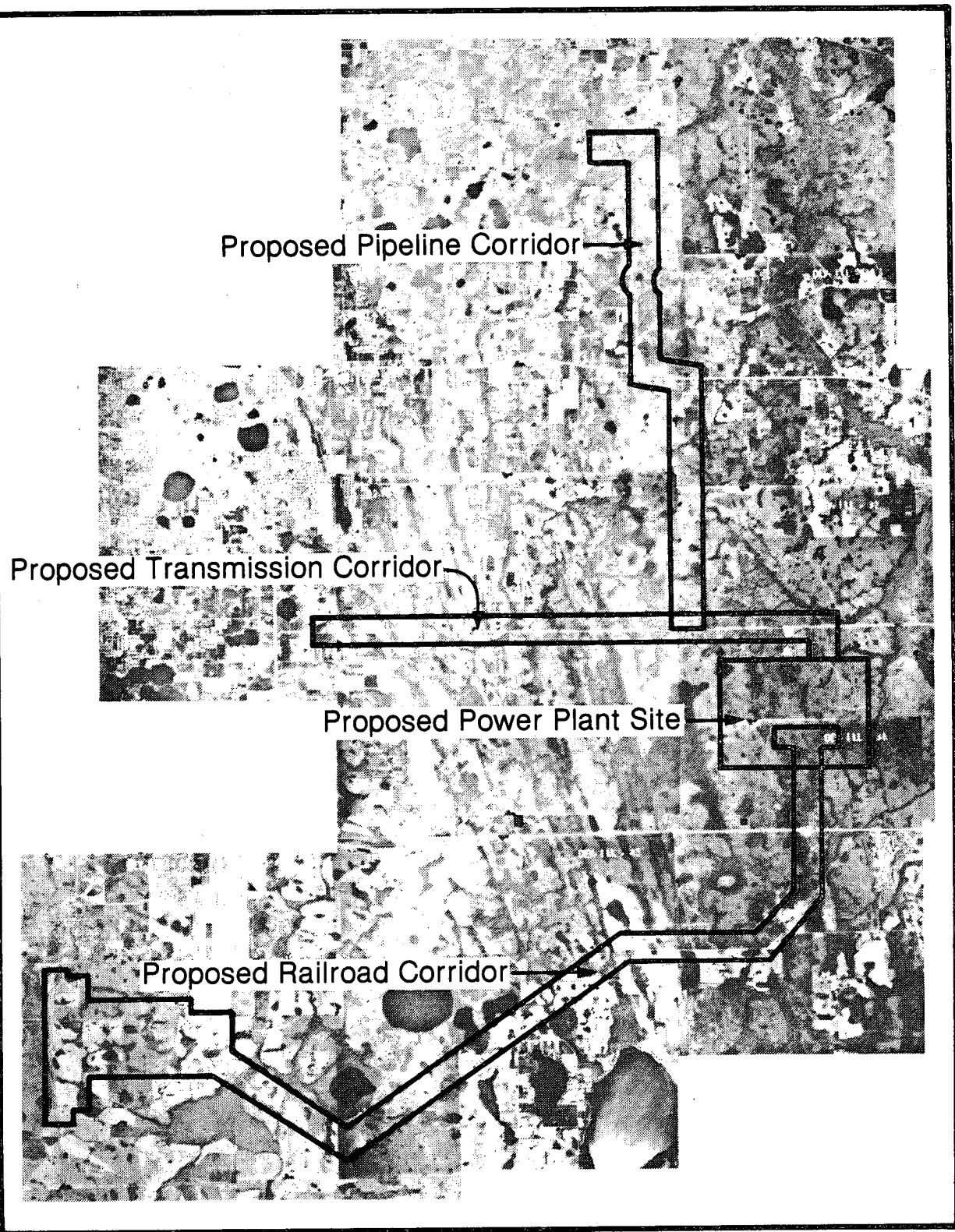


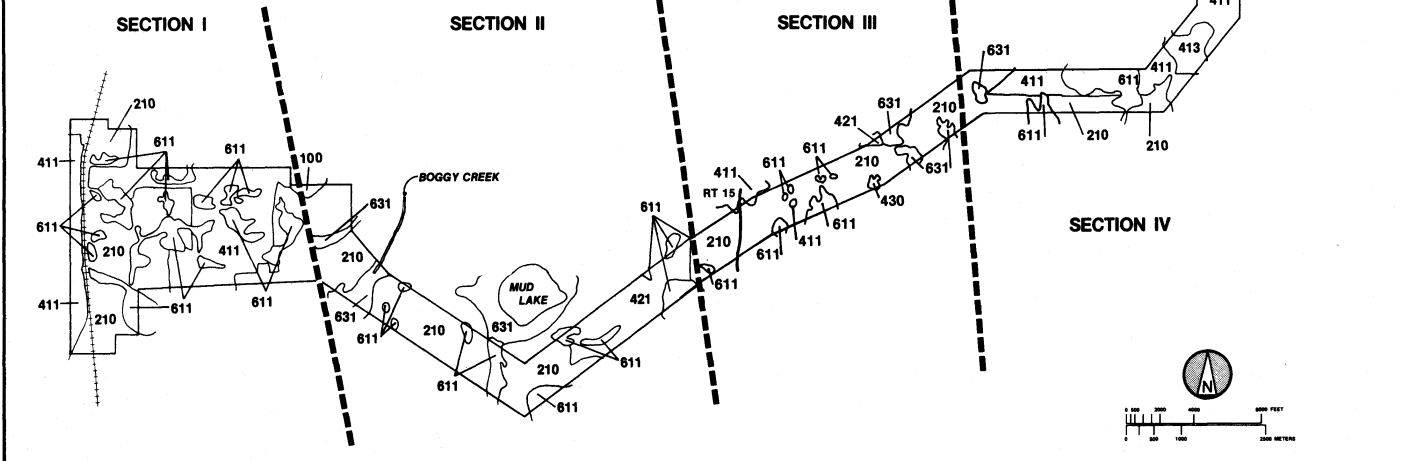
Figure 2.7-6. AERIAL PHOTO SHOWING LOCATIONS OF PROPOSED CORRIDORS AND PROPOSED POWER PLANT SITE

KEY TO COMMUNITY TYPES

- 100 - URBAN
- 210 - PASTURE OR CROPLAND
- 230 - CITRUS GROVES
- 411 - PINE FLATWOODS
- 412 - LONGLEAF PINE
- 413 - SAND PINE SCRUB
- 421 - XERIC OAK
- 563 - OTHER WATER AREAS
- 611 - CYPRESS
- 612 - POND PINE
- 621 - HARDWOOD FRESHWATER SWAMP
- 631 - MIXED FOREST
- 641 - FRESHWATER MARSH
- 430 - MIXED UPLAND FOREST

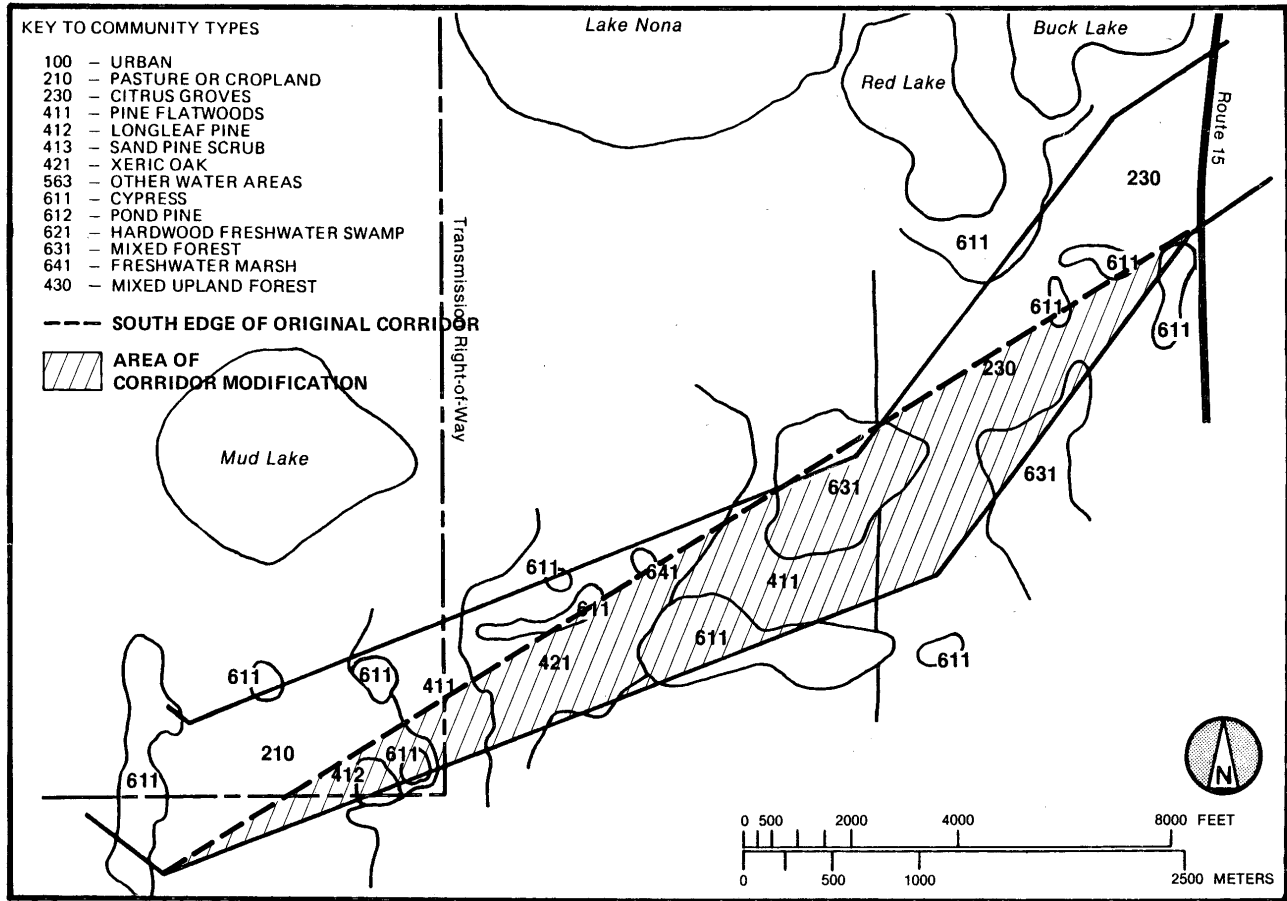
KEY TO OCCURRENCE OF ENDANGERED SPECIES

- ★ BALD EAGLE
- INDIGO SNAKE
- * RED COCKADED WOODPECKER COLONY



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Figure 2.7-7 VEGETATIVE COMMUNITIES AND OCCURRENCE OF ENDANGERED SPECIES WITHIN THE PROPOSED RAILROAD CORRIDOR



RFM-1

FIGURE 2.7-7a. VEGETATIVE COMMUNITIES WITHIN THE MODIFIED RAILROAD CORRIDOR

KEY TO COMMUNITY TYPES

- 100 - URBAN
- 210 - PASTURE OR CROPLAND
- 230 - CITRUS GROVES
- 411 - PINE FLATWOODS
- 412 - LONGLEAF PINE
- 413 - SAND PINE SCRUB
- 421 - XERIC OAK
- 563 - OTHER WATER AREAS
- 611 - CYPRESS
- 612 - POND PINE
- 621 - HARDWOOD FRESHWATER SWAMP
- 631 - MIXED FOREST
- 641 - FRESHWATER MARSH

KEY TO OCCURRENCE OF ENDANGERED SPECIES

- ★ BALD EAGLE
- INDIGO SNAKE
- * RED-COCKADED WOODPECKER COLONY

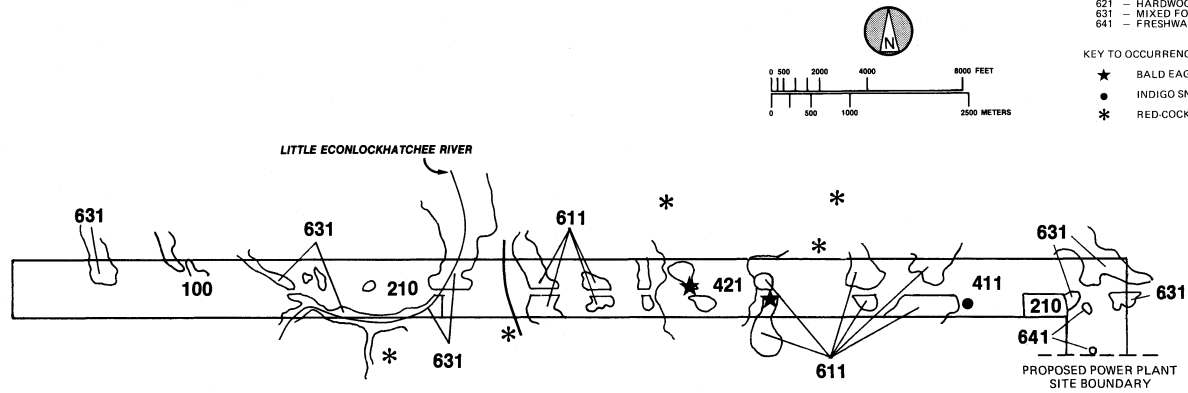


Figure 2.7-8 VEGETATIVE COMMUNITIES AND OCCURRENCE OF ENDANGERED SPECIES WITHIN THE PROPOSED TRANSMISSION LINE CORRIDOR

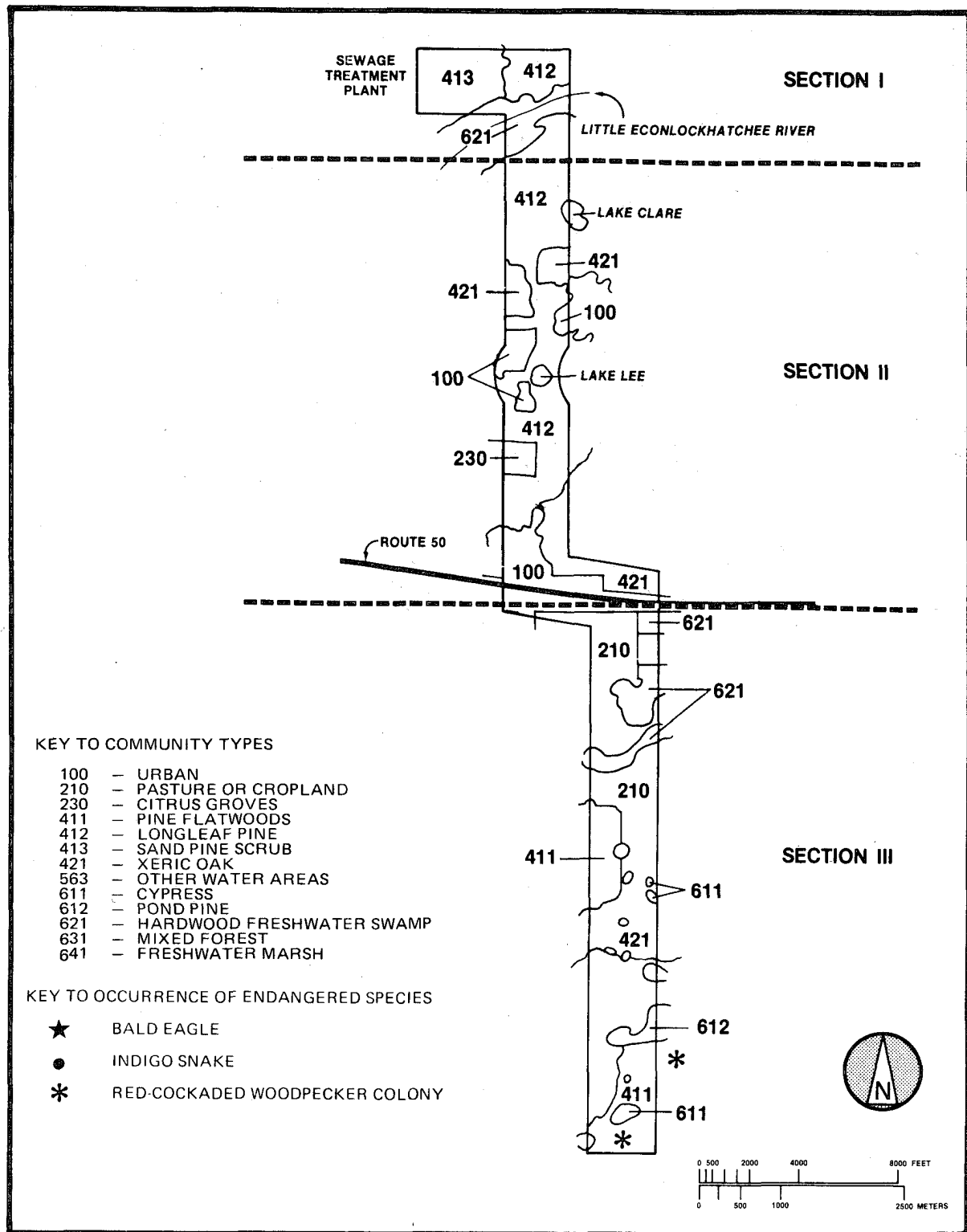


Figure 2.7-9 VEGETATIVE COMMUNITIES AND OCCURRENCE OF ENDANGERED SPECIES WITHIN THE PROPOSED PIPELINE CORRIDOR

APPENDIX 2.7A
SPECIES LISTS

TABLE 2.7A-1. SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
TREES							
<u>Acer rubrum</u> var. <u>trilobum</u>	Red maple						X
<u>Broussonetia papyrifera</u>	Paper mulberry						X
<u>Cornus foemina</u>	Stiff cornel dogwood						X
<u>Diospyros virginiana</u>	Persimmon						X
<u>Gordonia lasianthus</u>	Loblolly bay					X	
<u>Ilex cassine</u>	Dahoon holly			X	X	X	
<u>Magnolia virginiana</u>	Sweet bay magnolia			X		X	X
<u>Nyssa biflora</u>	Black gum			X		X	
<u>Persea palustris</u>	Swamp red bay					X	
<u>Pinus palustris</u>	Long-leaf pine	X					
<u>P. serotina</u>	Pond pine	X		X	X	X	
<u>Q. geminata</u>	Sand live oak		X				
<u>Q. laevis</u>	Turkey oak		X				
<u>Q. laurifolia</u>	Laurel oak						X
<u>Q. nigra</u>	Water oak						X
<u>Q. virginiana</u>	Live oak						X
<u>Sabal palmetto</u>	Cabbage palm	X					X
<u>Taxodium ascendens</u>	Pond cypress			X		X	

(1 of 12)

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
SHRUBS							
<u>Asimina reticulata</u>	Pawpaw	X					
<u>Baccharis halimifolia</u>	Groundsel bush			X			
<u>Befaria racemosa</u>	Tar flower	X	X				
<u>Callicarpa americana</u>	Beauty bush						X
<u>Cephalanthus occidentalis</u>	Button bush					X	
<u>Gaylussacia dumosa</u>	Dwarf huckleberry			X			
<u>G. frondosa</u>	Huckleberry	X					
<u>Hypericum cistifolium</u>	St. John's-wort	X		X			
<u>H. fasciculatum</u>	St. John's-wort	X		X		X	
<u>H. hypericoides</u>	St. John's-wort	X					X
<u>H. reductum</u>	St. John's-wort	X					
<u>H. tetrapetalum</u>	St. John's-wort	X					
<u>Ilex glabra</u>	Gallberry	X	X	X	X		
<u>Itea virginica</u>	Virginia willow			X		X	
<u>Licania michauxii</u>	Gopher apple		X				
<u>Lyonia ferruginea</u>	Rusty lyonia	X	X				
<u>L. fruticosa</u>	Staggerbush	X	X				
<u>L. lucida</u>	Shiny lyonia	X	X	X	X	X	

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
SHRUBS (Continued)							
<u>Myrica cerifera</u>	Wax myrtle			X		X	X
<u>M. pusilla</u>	Dwarf wax myrtle		X				
<u>Parthenocissus quinquefolia</u>	Virginia creeper						X
<u>Quercus chapmanii</u>	Chapman's oak		X				
<u>Q. minima</u>	Dwarf live oak	X	X				
<u>Q. myrtifolia</u>	Myrtle oak		X				
<u>Rhus copallina</u>	Southern sumac	X					
<u>Rubus betulifolius</u>	Swamp blackberry			X		X	
<u>Serenoa repens</u>	Saw palmetto	X	X	X	X	X	
<u>Smilax auriculata</u>	Greenbrier					X	
<u>S. bona-nox</u>	Catbrier						X
<u>S. laurifolia</u>	Bamboo-brier			X		X	
<u>S. walteri</u>	Coral greenbrier			X			
<u>Toxicodendron radicans</u>	Poison ivy					X	X
<u>Vaccinium corymbosum</u>	Swamp blueberry			X		X	
<u>V. darrowii</u>	Shiny blueberry	X					
<u>V. myrsinites</u>	Blueberry	X	X	X			

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
SHRUBS (Continued)							
<u>Viburnum obovatum</u>	Black haw						X
<u>Vitis rotundifolia</u>	Muscadine grape					X	X
HERBS							
<u>Aletris lutea</u>	Colic root	X					
<u>Ambrosia artemisiifolia</u>	Common ragweed	X					
<u>Amphicarpum muhlenbergianum</u>	Blue maidencane			X		X	
<u>Andropogon elliottii</u>	Broom-straw			X			
<u>A. virginicus</u> var. <u>glaucopsis</u>	Silver beardgrass			X			
<u>A. virginicus</u> var. <u>virginicus</u>	Beardgrass	X		X			
<u>Aristida spiciformis</u>	Wiregrass	X		X			
<u>A. stricta</u>	Wiregrass	X					
<u>Axonopus furcatus</u>	Carpet grass	X					X
<u>Bartonia virginica</u>	Bartonia	X					
<u>Bigelowia nudata</u> spp. <u>australis</u>	Bigelowia	X		X			

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
HERBS (Continued)							
<u>Blechnum serrulatum</u>	Toothed mid-sorus fern			X		X	
<u>Bulbostylis warei</u>	Bulbostylis		X				
<u>Calopogon tuberosa</u>	Grass pink	X					
<u>Carex glaucescens</u>	Sedge			X			
<u>Carpephorus odoratissimus</u>	Carpephorus	X					
<u>C. paniculata</u>	Carpephorus	X					
<u>Cassia fasciculata</u>	Partridge pea	X					
<u>Cenchrus incertus</u>	Sand spur	X					
<u>Centella asiatica</u>	Coinwort	X					X
<u>Chenopodium ambrosioides</u>	Mexican tea	X					
<u>Chrysopsis gossypina</u>	Golden Aster	X					
<u>Cirsium horridulum</u>	Purple thistle	X					
<u>Cladium jamaicense</u>	Sawgrass			X		X	
<u>Conyza canadensis</u> var. <u>pusilla</u>	Horseweed	X					
<u>Ctenium aromaticum</u>	Toothache grass	X					
<u>Cyperus haspan</u>	Galingale			X			

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
HERBS (Continued)							
<u>Dichanthelium aciculare</u>	Dichanthelium grass	X					
<u>D. dichotomum</u> var. <u>breve</u>	Dichanthelium grass	X					
<u>D. laxiflorum</u>	Dichanthelium grass	X					
<u>D. sabulorum</u> var. <u>patulum</u>	Dichanthelium grass	X					
<u>Dichromena latifolia</u>	Whitetop sedge					X	
<u>Diodia teres</u>	Buttonweed	X					
<u>D. virginiana</u>	Buttonweed	X					
<u>Drosera capillaris</u>	Pink sundew	X					
<u>Dulichium arundinaceum</u>	Dulichium						X
<u>Eleocharis baldwinii</u>	Clubrush			X			
<u>Encyclia tapensis</u>	Green-fly orchid					X	
<u>Eragrostis refracta</u>	Love grass	X					
<u>E. spectabilis</u>	Love grass	X					
<u>Erechtites hieracifolia</u>	Fireweed					X	
<u>Erianthus giganteus</u>	Beard grass			X			
<u>Erigeron quercifolius</u>	Fleabane	X					
<u>E. vernus</u>	Fleabane			X			
<u>Eriocaulon decangulare</u>	Greater pipewort	X		X			

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
HERBS (Continued)							
<u>Eryngium baldwinnii</u>	Eryngium	X					X
<u>Eupatorium aromaticum</u>	Thoroughwort	X					
<u>E. capillifolium</u>	Dog fennel			X			
<u>E. compositifolium</u>	Dog fennel	X					
<u>E. recurvans</u>	Thoroughwort	X					
<u>Fimbristylis caroliniana</u>	Fimbristylis	X					
<u>Fuirena brevisita</u>	Umbrella grass			X			
<u>Galactia</u> sp.	Milkpea	X					
<u>Gratiola subulata</u>	Hedge hyssop	X					
<u>Habenaria cristata</u>	Fringed orchid			X		X	
<u>Helianthus radula</u>	Sunflower	X					
<u>Hieracium gronovii</u>	Hawkweed	X					
<u>Hydrocotyle umbellata</u>	Pennywort			X		X	
<u>Hypoxis juncea</u>	Stargrass	X					
<u>Iris hexagona</u> var. <u>savannarum</u>	Blue flag			X			
<u>Juncus effusus</u> var. <u>solutus</u>	Soft rush			X		X	

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
HERBS (Continued)							
<u>J. repens</u>	Black rush			X			
<u>Lachnanthes caroliniana</u>	Red root			X		X	
<u>Lachnocaulon anceps</u>	Bog buttons	X					
<u>Lechea villosa</u>	Pinweed		X				
<u>Liatris tenuifolia</u>	Liatris	X					
<u>Lilium catesbaei</u>	Pine lily						
<u>Linum texanum</u> var. <u>medium</u>	Yellow flat	X					
<u>Ludwigia maritima</u>	Ludwigia	X					
<u>L. repens</u>	Lugwigia			X			
<u>Lycopodium alopecoroides</u>	Foxtail club moss	X					
<u>Lycopus rubellus</u> var. <u>americanus</u>	Lycopus			X		X	
<u>Mikania scandens</u>	Climbing hempweed					X	
<u>Mitreola sessilifolium</u>	Miterwort	X		X		X	
<u>Oplismenus setarius</u>	Woodgrass						X
<u>Osmunda cinnamomea</u>	Cinnamon fern			X		X	
<u>O. regalis</u> var. <u>spectabilis</u>	Royal fern			X		X	

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
HERBS (Continued)							
<u>Oxypolis filiformis</u>	Oxypolis			X			
<u>Panicum albo marginatum</u>	Panic grass	X					
<u>P. hemitomon</u>	Maidencane			X			
<u>P. lancearium</u>	Panic grass						X
<u>P. purpurascens</u>	Panic grass						
<u>Paspalum laeve</u>	Paspalum grass	X					
<u>P. notatum</u>	Bahia grass	X					
<u>P. setaceum</u>	Paspalum grass	X					
<u>Peltandra sagittifolia</u>	Spoon flower						
<u>P. virginica</u>	Arrow arum			X		X	
<u>Petalostemum carneum</u>	Prairie clover	X					
<u>Phobanthus grandiflora</u>	Phobanthus	X					
<u>Piloblephis rigida</u>	Savory pennyroyal		X				
<u>Pinguicula lutea</u>	Butterwort	X					
<u>P. pumila</u>	Butterwort	X					
<u>Pluchea foetida</u>	Camphorweed			X		X	
<u>P. rosea</u>	Marsh fleabane			X		X	X
<u>Pogonia ophioglossoides</u>	Rose pogonia	X					

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
HERBS (Continued)							
<u>Polygala cruciata</u>	Milkwort	X					
<u>P. cymosa</u>	Milkwort	X					
<u>P. lutea</u>	Milkwort	X					
<u>P. rugellii</u>	Milkwort	X					
<u>P. setacea</u>	Milkwort	X					
<u>Polypodium polypodioides</u>	Resurrection fern						X
<u>Pontederia cordata</u>	Pickernelweed						
<u>Proserpinaca pectinata</u>	Mermaid fern			X		X	
<u>Pteridium aquilinum</u>	Bracken fern	X					
<u>Pterocaulon virgatum</u>	Blackroot	X					
<u>Rhexia alifanus</u>	Meadow beauty	X					
<u>R. mariana</u> var. <u>mariana</u>	Meadow beauty	X					
<u>R. nashii</u>	Meadow beauty	X					
<u>R. nutallii</u>	Meadow beauty	X					
<u>R. petiolata</u>	Meadow beauty	X					
<u>Rhynchospora corniculata</u>	Beakrush			X		X	
<u>R. divergens</u>	Beakrush	X					
<u>R. fascicularis</u>	Beakrush	X		X			

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
HERBS (Continued)							
<u>R. miliacea</u>	Beakrush	X		X		X	
<u>Rudbeckia hirta</u>	Coneflower	X					
<u>Sabatia brevifolia</u>	Marsh pink	X					
<u>S. grandiflora</u>	Marsh pink	X					
<u>Sagittaria graminea</u>	Arrowhead	X					
<u>S. lancifolia</u>	Arrowhead					X	
<u>Sarracenia minor</u>	Pitcher plant	X					
<u>Saururus cernuus</u>	Lizard's tail			X		X	
<u>Scleria hirtella</u>	Nut rush	X					
<u>S. reticularis</u>	Nut rush	X					
<u>Sesbania vesicaria</u>	Bladderpod	X					
<u>Setaria geniculata</u>	Foxtail grass	X					
<u>Solidago microcephala</u>	Bush goldenrod	X					
<u>Sphagnum sp.</u>	Peatmoss			X	X	X	
<u>Stillingia sylvatica</u>	Queen Anne's delight	X					
<u>Sygonanthus flavidulus</u>	Bantam buttons	X					
<u>Tillandsia bartramii</u>	Airplant			X		X	
<u>T. fasciculata</u>	Cardinal air plant			X		X	

(11 of 12)

TABLE 2.7A-1 (Continued). SPECIES COMPOSITION OF VEGETATION COMMUNITIES ON THE PROPOSED SITE

Scientific Name	Common Name	Vegetation Communities					
		Pine Flatwoods	Xeric Oak	Pond Cypress Swamp	Pond Pine Swamp	Bay Hardwood Swamp	Oak Hardwood Swamp
HERBS (Continued)							
<u>T. usneoides</u>	Spanish moss			X		X	X
<u>T. utriculata</u>	Wild pine			X			
<u>Triadenum virginicum</u>	Pink St. John's-wort			X		X	
<u>Viola affinis</u>	Violet	X					X
<u>V. lanceolata</u>	Violet	X					
<u>V. septemloba</u>	Violet	X					
<u>Woodwardia areolata</u>	Net-veined chain						
	fern			X		X	
<u>W. virginica</u>	Marsh fern			X		X	
<u>Xyris ambigua</u>	Yellow-eyed grass	X					
<u>X. brevifolia</u>	Yellow-eyed grass	X					
<u>X. caroliniana</u>	Yellow-eyed grass	X					
<u>X. jupicai</u>	Yellow-eyed grass			X		X	

SOURCE: ESE, 1981.

TABLE 2.7A-2. PLANT SPECIES IN PINE FLATWOODS OF THE PROPOSED SITE

<u>Species</u>	<u>Importance Value</u> %	<u>Frequency</u> %	<u>Mean Percent Cover</u> %
Shrub Layer			
<u>Serenoa repens</u>	42.0	95.0	39.2
<u>Lyonia fruticosa</u>	16.3	87.5	6.9
<u>Lyonia lucida</u>	12.2	40.0	9.3
<u>Gaylussacia dumosa</u>	7.3	45.0	2.1
<u>Quercus minima</u>	7.1	10.7	3.5
<u>Hypericum reductum</u>	6.7	47.5	0.9
<u>Ilex glabra</u>	5.8	30.0	2.6
<u>Vaccinium myrsinites</u>	1.6	2.3	1.7
<u>Befaria racemosa</u>	0.4	0.6	0.2
<u>Myrica cerifera</u>	0.4	0.6	0.1
<u>Quercus chapmanii</u>	0.4	0.6	0.2
Total Percent Cover: 65.3			
Number of Species: 11			

SOURCE: ESE, 1981.

TABLE 2.7A-3. PLANT SPECIES IN XERIC OAK SCRUB OF THE PROPOSED SITE

<u>Species</u>	<u>Importance Value %</u>	<u>Frequency %</u>	<u>Mean Percent Cover %</u>
Shrub Layer			
<u>Serenoa repens</u>	23.9	85	17.5
<u>Quercus myrtifolia</u>	23.0	60	20.3
<u>Quercus minima</u>	11.8	70	4.1
<u>Quercus geminata</u>	10.0	15	10.5
<u>Quercus chapmanii</u>	7.8	35	4.5
<u>Lyonia lucida</u>	4.6	20	2.8
<u>Befaria racemosa</u>	4.4	30	0.9
<u>Gaylussacia dumosa</u>	3.5	25	0.6
<u>Licania michauxii</u>	2.9	15	1.3
<u>Myrica pumila</u>	2.1	15	0.3
<u>Lyonia fruticosa</u>	1.8	10	0.8
<u>Lyonia ferruginea</u>	1.6	10	0.5
<u>Ilex glabra</u>	1.5	10	0.3
<u>Piloblephis rigida</u>	0.7	5	0.1
<u>Vaccinium myrsinites</u>	0.7	5	0.1
Total Percent Cover: 64.6			
Number of Species: 15			

SOURCE: ESE, 1981.

TABLE 2.7A-4. PLANT SPECIES IN CYPRESS STANDS OF THE PROPOSED SITE

<u>Species</u>	<u>Importance Value</u> %	<u>Density Per Acre</u>	<u>Mean Basal Area</u> in ²	<u>Frequency</u> %	<u>Mean Percent Cover</u> %
Overstory Layer					
<u>Taxodium ascendens</u>	71.9	328.74	42.2	—	—
<u>Pinus serotina</u>	18.5	70.04	59.8	—	—
<u>Nyssa sylvatica</u>	5.6	28.74	31.9	—	—
<u>Myrica cerifera</u>	2.5	20.64	4.7	—	—
<u>Magnolia virginiana</u>	1.7	12.14	10.1	—	—
Total Trees Per Acre: 460					
Number of Species: 5					
Shrub Layer					
<u>Lyonia lucida</u>	30.2	—	—	56.7	10.8
<u>Myrica cerifera</u>	25.2	—	—	50.0	8.4
<u>Serenoa repens</u>	19.3	—	—	20.0	10.7
<u>Ilex glabra</u>	8.9	—	—	6.7	5.5
<u>Hypericum fasciculatum</u>	5.0	—	—	10.0	1.6
<u>Itea virginica</u>	3.9	—	—	6.7	1.5
<u>Vaccinium corymbosum</u>	2.6	—	—	6.7	0.5
<u>Ilex cassine</u>	1.6	—	—	3.3	0.5
<u>Pinus palustris</u>	1.4	—	—	3.3	0.3
<u>Smilax laurifolia</u>	1.1	—	—	3.3	0.1
<u>Smilax walterii</u>	1.1	—	—	3.3	0.1
Total Percent Cover: 40.0					
Number of Species: 11					
Herbaceous Layer					
<u>Blechnum serrulatum</u>	17.9	—	—	53.3	10.3
<u>Sphagnum sp.</u>	13.4	—	—	30.0	9.2
<u>Woodwardia virginica</u>	12.5	—	—	43.3	6.1

TABLE 2.7A-4 (Continued). PLANT SPECIES IN CYPRESS STANDS OF THE PROPOSED SITE

<u>Species</u>	<u>Importance</u> <u>Value</u> %	<u>Density</u> <u>Per</u> <u>Acre</u>	<u>Mean</u> <u>Basal</u> <u>Area</u> in ²	<u>Frequency</u> %	<u>Mean</u> <u>Percent</u> <u>Cover</u> %
Herbaceous Layer (Continued)					
<u>Eriocaulon decangulare</u>	11.1	—	—	26.7	7.3
<u>Cladium jamaicense</u>	8.0	—	—	23.3	4.7
<u>Rhynchospora</u> spp.	5.6	—	—	16.7	3.2
<u>Aristida</u> spp. (<u>stricta</u> and <u>spiciformis</u>)	4.9	—	—	6.7	4.0
<u>Hypericum fasciculatum</u>	3.1	—	—	16.7	0.6
<u>Panicum purpurascens</u>	3.1	—	—	6.7	2.1
<u>Lycopus rubellus</u>	2.9	—	—	16.7	0.3
<u>Pontederia cordata</u>	2.7	—	—	6.7	1.4
<u>Woodwardia areolata</u>	2.6	—	—	13.3	0.6
<u>Pluchea rosea</u>	1.8	—	—	10.0	0.2
<u>Panicum hermitomum</u>	1.5	—	—	6.7	0.4
<u>Eragrostis spectabilis</u>	0.8	—	—	3.3	0.3
<u>Eupatorium recurvans</u>	0.8	—	—	3.3	0.3
<u>Hypericum cistoides</u>	0.8	—	—	3.3	0.3
<u>Eleocharis baldwinii</u>	0.7	—	—	3.3	0.2
<u>Rhexia mariana</u>	0.7	—	—	3.3	0.2
<u>Eupatorium capillifolium</u>	0.7	—	—	3.3	0.3
<u>Iris hexagona</u> var. <u>austrina</u>	0.6	—	—	3.3	0.1
<u>Juncus repens</u>	0.6	—	—	3.3	0.1
<u>Lacnathes caroliniana</u>	0.6	—	—	3.3	0.1
<u>Xyris ambigua</u>	0.6	—	—	3.3	0.1
<u>Panicum</u> sp.	0.5	—	—	3.3	0.0

Total Percent Cover: 52.7

Number of Species: 26

SOURCE: ESE, 1981.

TABLE 2.7A-5. PLANT SPECIES IN BAY STANDS OF THE PROPOSED SITE

<u>Species</u>	<u>Importance</u> <u>Value</u> %	<u>Density</u> <u>Per</u> <u>Acre</u>	<u>Mean</u> <u>Basal</u> <u>Area</u> in ²	<u>Frequency</u> %	<u>Mean</u> <u>Percent</u> <u>Cover</u> %
Overstory Layer					
<u>Magnolia virginiana</u>	76.4	496.76	23.9	—	—
<u>Gordonia lasianthus</u>	13.2	102.83	16.4	—	—
<u>Myrica cerifera</u>	4.5	51.41	4.0	—	—
<u>Persea palustris</u>	4.0	17.00	46.3 (1 tree)	—	—
<u>Ilex cassine</u>	2.1	17.00	13.4 (1 tree)	—	—

Total Trees Per Acre: 685

Number of Species: 5

Shrub Layer

<u>Lyonia lucida</u>	29.7	—	—	80.0	22.0
<u>Myrica cerifera</u>	23.8	—	—	80.0	16.0
<u>Vitis rotundifolia</u>	9.1	—	—	70.0	2.2
<u>Magnolia virginiana</u>	9.0	—	—	60.0	3.1
<u>Gordonia lasianthus</u>	6.6	—	—	40.0	2.7
<u>Smilax laurifolia</u>	5.9	—	—	50.0	1.0
<u>Cephalanthus occidentalis</u>	3.9	—	—	30.0	0.9
<u>Persea palustris</u>	3.6	—	—	30.0	0.6
<u>Toxicodendron radicans</u>	2.6	—	—	20.0	0.6
<u>Vaccinium corymbosum</u>	2.6	—	—	20.0	0.6
<u>Rubus betulifolius</u>	2.4	—	—	20.0	0.4
<u>Itea virginica</u>	1.2	—	—	10.0	0.2

Total Percent Cover: 50.3

Number of Species: 12

TABLE 2.7A-5 (Continued). PLANT SPECIES IN BAY STANDS OF THE PROPOSED SITE

<u>Species</u>	<u>Importance</u> <u>Value</u> %	<u>Density</u> <u>Per</u> <u>Acre</u>	<u>Mean</u> <u>Basal</u> <u>Area</u> <u>in²</u>	<u>Frequency</u> <u>%</u>	<u>Mean</u> <u>Percent</u> <u>Cover</u> <u>%</u>
Herbaceous Layer					
<u>Woodwardia virginica</u>	38.3	—	—	90.0	19.4
<u>Panicum sp.</u>	9.8	—	—	20.0	5.2
<u>Triadenum virginicum</u>	9.1	—	—	50.0	2.4
<u>Lyonia lucida</u>	7.5	—	—	50.0	1.3
<u>Osmonda cinnamomea</u>	6.1	—	—	40.0	1.1
<u>Peltandra sagittata</u>	5.1	—	—	30.0	1.2
<u>Woodwardia areolata</u>	4.3	—	—	30.0	0.6
<u>Cephalanthus occidentalis</u>	2.8	—	—	20.0	0.4
<u>Pluchea rosea</u>	2.8	—	—	20.0	0.4
<u>Lachnanthes caroliniana</u>	1.9	—	—	10.0	0.5
<u>Ilex cassine</u>	1.4	—	—	10.0	0.2
<u>Lycopus rubellus</u>	1.4	—	—	10.0	0.2
<u>Lycopus virginicus</u>	1.4	—	—	10.0	0.2
<u>Pontederia cordata</u>	1.4	—	—	10.0	0.2
<u>Rubus betulifolius</u>	1.4	—	—	10.0	0.2
<u>Toxicodendron radicans</u>	1.4	—	—	10.0	0.2
Unidentified (<u>Lamiaceae</u> family)	1.4	—	—	10.0	0.2
<u>Vaccinium corymbosum</u>	1.4	—	—	10.0	0.2
<u>Vitis rotundifolia</u>	1.4	—	—	10.0	0.2

Total Percent Cover: 34.3

Number of Species: 19

SOURCE: ESE, 1981.

TABLE 2.7A-6. PLANT SPECIES IN OAK HARDWOOD STANDS OF THE PROPOSED SITE

<u>Species</u>	<u>Importance</u> <u>Value</u> %	<u>Density</u> <u>Per</u> <u>Acre</u>	<u>Mean</u> <u>Basal</u> <u>Area</u> <u>in²</u>	<u>Frequency</u> <u>%</u>	<u>Mean</u> <u>Percent</u> <u>Cover</u> <u>%</u>
Overstory Layer					
<u>Quercus nigra</u>	64.8	439	177.73	91.0	—
<u>Acer rubrum</u>	10.4	79	31.98	71.5	—
<u>Sabal palmetto</u>	6.5	17	6.88	353.4	—
<u>Magnolia virginiana</u>	5.7	62	25.10	24.5	—
<u>Quercus virginiana</u>	5.6	17	6.88	293.1	—
<u>Cornus foemina</u>	2.7	35	14.17	5.2	—
<u>Nyssa sylvatica</u>	2.4	26	10.52	20.0	—
<u>Diospyros virginiana</u>	0.9	9	3.64	24.6	—
<u>Myrica cerifera</u>	0.8	9	3.64	20.6	—
<u>Broussonetia papyrifera</u>	0.7	9	3.64	7.0	—

Total Trees Per Acre: 284

Number of Species: 10

Shrub Layer

<u>Myrica cerifera</u>	55.9	—	—	65.0	7.6
<u>Diospyros virginiana</u>	14.3	—	—	20.0	1.6
<u>Serenoa repens</u>	8.4	—	—	10.0	1.1
<u>Viburnum obovatum</u>	7.6	—	—	10.0	0.9
<u>Cornus foemina</u>	5.2	—	—	5.0	0.8
<u>Callicarpa americana</u>	4.8	—	—	10.0	0.2
<u>Magnolia virginiana</u>	4.0	—	—	5.0	0.5

Total Percent Cover: 12.7

Number of Species: 7

TABLE 2.7A-6 (Continued). PLANT SPECIES IN OAK HARDWOOD STANDS OF THE PROPOSED SITE

Species	Importance Value %	Density Per Acre	Mean Basal Area in ²	Frequency %	Mean Percent Cover %
Herbaceous Layer					
<u>Panicum lancearium</u>	26.2	—	—	80.0	4.7
<u>Sedge</u>	24.2	—	—	65.0	4.7
<u>Quercus nigra</u>	7.1	—	—	35.0	0.7
<u>Acer rubrum</u>	7.1	—	—	35.0	0.7
<u>Axonopus furcatus</u>	5.8	—	—	25.0	0.7
<u>Myrica cerifera</u>	4.9	—	—	5.0	1.3
<u>Smilax bona-nox</u>	4.1	—	—	20.0	0.4
<u>Oplismenus setarius</u>	3.1	—	—	15.0	0.3
<u>Viburnum obovatum</u>	3.1	—	—	15.0	0.3
<u>Toxicodendron radicans</u>	2.0	—	—	10.0	0.2
<u>Pluchea rosea</u>	2.0	—	—	10.0	0.2
<u>Viola affinis</u>	2.0	—	—	10.0	0.2
<u>Centella asiatica</u>	2.0	—	—	10.0	0.2
<u>Woodwardia virginica</u>	2.0	—	—	10.0	0.2
<u>Diospyros virginiana</u>	1.7	—	—	5.0	0.3
<u>Parthenocissus quinquefolia</u>	1.1	—	—	5.0	0.1
<u>Hypericum hypericoides</u>	1.1	—	—	5.0	0.1
<u>Vitis rotundifolia</u>	1.1	—	—	5.0	0.1

Total Percent Cover: 15.4

Number of Species: 18

SOURCE: ESE, 1981.

TABLE 2.7A-7. MAMMALIAN SPECIES IN VARIOUS HABITATS OF THE PROPOSED SITE

<u>Species</u>	<u>Common Name</u>	<u>Xeric Oak Scrub</u>	<u>Bayhead Cypress Dome</u>	<u>Pine Flat- woods</u>
<u>Didelphis virginiana</u>	Virginia opossum	C		C
<u>Cryptotis parva</u>	Least shrew		R	R
<u>Scalopus aquaticus</u>	Eastern mole		C	R
<u>Pipistrellus subflavus</u>	Eastern pipistrelle	U	U	U
<u>Eptesicus fuscus</u>	Big brown bat	U	U	U
<u>Lasiurus borealis</u>	Red bat	U	U	U
<u>Lasiurus seminolus</u>	Seminole bat	U	U	U
<u>Lasiurus intermedius</u>	Northern yellow bat	U	U	U
<u>Nycticeius humeralis</u>	Evening bat	U	U	U
<u>Plecotus rafinesquii</u>	Rafinesque's big-eared bat	U	U	U
<u>Tadarida brasiliensis</u>	Brazilian free-tailed bat	U	U	U
<u>Dasypus novemcinctus</u>	Nine-banded armadillo	A	A	A
<u>Sylvilagus floridanus</u>	Eastern cottontail	C		C
<u>Sylvilagus palustris</u>	Marsh rabbit	C		C
<u>Oryzomys palustris</u>	Rice rat		R	R
<u>Reithrodontomys humilis</u>	Harvest mouse			R
<u>Peromyscus polionotus</u>	Old-field mouse			R
<u>Peromyscus gossypinus</u>	Cotton mouse	A	A	C
<u>Peromyscus nuttalli</u>	Golden mouse		R	R
<u>Sigmodon hispidus</u>	Cotton rat	A	R	A
<u>Neotoma floridana</u>	Eastern woodrat		R	
<u>Sciurus carolinensis</u>	Gray squirrel		O	
<u>Sciurus niger</u>	Fox squirrel		R	R
<u>Glaucomys volans</u>	Southern flying squirrel			C
<u>Vulpes vulpes</u>	Red fox			O
<u>Urocyon cinereoargenteus</u>	Gray fox	O	C	C
<u>Procyon lotor</u>	Raccoon	A	A	A

TABLE 2.7A-7 (Continued). MAMMALIAN SPECIES IN VARIOUS HABITATS OF THE PROPOSED SITE

<u>Species</u>	<u>Common Name</u>	<u>Xeric Oak Scrub</u>	<u>Bayhead Cypress Dome</u>	<u>Pine Flat- woods</u>
<u>Spilogale putorius</u>	Eastern spotted skunk	A	A	A
<u>Mephitis mephitis</u>	Striped skunk	A	A	A
<u>Lynx rufus</u>	Bobcat	O	O	O
<u>Sus scrofa</u>	Wild hog		O	O
<u>Odocoileus virginianus</u>	White-tailed deer	A	A	A

KEY: A = Abundant
 C = Common
 O = Occasional
 R = Rare
 U = Undetermined

SOURCE: ESE, 1981.

TABLE 2.7A-8. AMPHIBIAN AND REPTILIAN SPECIES IN VARIOUS HABITATS OF THE PROPOSED SITE

<u>Species</u>	<u>Common Name</u>	<u>Xeric Oak Scrub</u>	<u>Bayhead Cypress Dome</u>	<u>Pine Flat- woods</u>
<u>Notophthalmus viridescens</u>	Peninsula newt	X	X	X
<u>Scaphiopus holbrooki</u>	Eastern spadefoot toad	X		X
<u>Rana areolata</u>	Gopher frog	X		
<u>Rana grylio</u>	Pig frog		X	
<u>Rana utricularia</u>	Southern leopard frog		X	X
<u>Gastrophryne carolinensis</u>	Eastern narrow-mouth toad	X	X	X
<u>Bufo querecius</u>	Oak toad	X		X
<u>Bufo terrestris terrestris</u>	Southern toad	X	X	X
<u>Acris gryllus dorsalis</u>	Florida cricket frog	X	X	X
<u>Hyla cinerea cinerea</u>	Green treefrog	X	X	X
<u>Hyla femoralis</u>	Pine woods treefrog	X	X	X
<u>Hyla gratiosa</u>	Barking treefrog		X	X
<u>Hyla squirella</u>	Squirrel treefrog	X	X	X
<u>Pseudacris nigrita</u>	Chorus frog			X
<u>Limnaeodius ocularis</u>	Little grass frog		X	X
<u>Terrapene carolina bauri</u>	Florida box turtle	X		X
<u>Gopherus polyphemus</u>	Gopher tortoise	X		X
<u>Anolis sagrei</u>	Brown anole	X		
<u>Anolis carolinensis</u>	Green anole	X	X	X
<u>Sceloporus undulatus</u>	Fence lizard	X		
<u>Sceloporus woodi</u>	Florida scrub lizard	X		
<u>Leiopeltis lateralis</u>	Ground skink	X	X	X
<u>Eumeces inexpectatus</u>	Southeastern five-lined skink	X	X	
<u>Cnemidophorus sexlineatus</u>	Six-lined racerunner	X		
<u>Ophisaurus ventralis</u>	Eastern glass lizard			X
<u>Ophisaurus longicauda</u>	Slender glass lizard	X		X

TABLE 2.7A-8 (Continued). AMPHIBIAN AND REPTILIAN SPECIES IN VARIOUS HABITATS OF THE PROPOSED SITE

<u>Species</u>	<u>Common Name</u>	<u>Xeric Oak Scrub</u>	<u>Bayhead Cypress Dome</u>	<u>Pine Flat- woods</u>
<u>Nerodia sipedon</u>	Banded water snake		X	
<u>Virginia stripula</u>	Rough earth snake		X	X
<u>Storeria occipitomaculata</u>	Red-bellied snake	X		X
<u>Storeria dekayi</u>	Brown snake			X
<u>Heterodon platyrhinos</u>	Eastern hognose snake	X		
<u>Heterodon sinus</u>	Southern hognose snake	X		
<u>Diadophis punctatus</u>	Ringneck snake	X	X	X
<u>Farancia abacura</u>	Mud snake		X	
<u>Coluber constrictor</u>	Black racer	X	X	X
<u>Pituophis melanoleucus</u>	Pine snake		X	X
<u>Masticophis flagellum</u>	Eastern coachwhip	X		X
<u>Opheodrys aestivus</u>	Rough green snake	X	X	
<u>Elaphe obsoleta</u>	Rat snake		X	
<u>Drymarchon corais couperi</u>	Indigo snake	X	X	X
<u>Lampropeltis elapsoides</u>	Scarlet kingsnake	X	X	X
<u>Lampropeltis getulus getulus</u>	Eastern kingsnake		X	X
<u>Cemophora coccinea</u>	Scarlet snake	X		
<u>Tantilla relicta relicta</u>	Peninsula crowned snake	X		
<u>Micrurus fulvius fulvius</u>	Eastern coral snake	X		
<u>Agkistrodon piscivorus conanti</u>	Florida cottonmouth		X	
<u>Sistrurus miliarius barbouri</u>	Dusky pigmy rattlesnake	X	X	X
<u>Crotalus adamanteus</u>	Eastern diamondback rattlesnake	X		X

SOURCE: ESE, 1981.

TABLE 2.7A-9. SEASONAL OCCURRENCE OF BIRDS IN PINE FLATWOODS OF THE PROPOSED SITE

<u>Species</u>	<u>Common Name</u>	<u>Seasonal Status*</u>	<u>Season</u>		
			<u>Summer 1980</u>	<u>Winter 1980-81</u>	<u>Spring 1981</u>
<u>Bubulcus ibis</u>	Cattle egret	P	**	**	
<u>Cathartes aura</u>	Turkey vulture	P	**	**	
<u>Coragyps atratus</u>	Black vulture	P	**	**	
<u>Accipiter striatus</u>	Sharp-shinned hawk	P		**	
<u>Buteo jamaicensis</u>	Red-tailed hawk	P		1	
<u>Buteo lineatus</u>	Red-shouldered hawk	P	**	1	
<u>Circus cyaneus</u>	Marsh hawk	W		1	
<u>Pandion haliaetus</u>	Osprey	P		**	
<u>Falco sparverius</u>	American kestrel	W		**	
<u>Colinus virginianus</u>	Bobwhite	P	2	**	
<u>Charadrius vociferus</u>	Killdeer	P		3	
<u>Zenaida macroura</u>	Mourning dove	P	1		
<u>Columbina passerina</u>	Ground dove	P			
<u>Caprimulgus carolinensis</u>	Chuck-will's widow	S			
<u>Chordeiles minor</u>	Common nighthawk	S			
<u>Colaptes auratus</u>	Common flicker	P	2	1	
<u>Dryocopus pileatus</u>	Pileated woodpecker	P	2		
<u>Centurus carolinus</u>	Red-bellied woodpecker	P	12	7	
<u>Melanerpes erythrocephalus</u>	Red-headed woodpecker	P		1	
<u>Sphyrapicus varius</u>	Yellow-bellied sapsucker	W		1	
<u>Picoides villosus</u>	Hairy woodpecker	P		1	
<u>Picoides pubescens</u>	Downy woodpecker	P		1	
<u>Picoides borealis</u>	Red-cockaded woodpecker	P		4	
<u>Tyrannus tyrannus</u>	Eastern kingbird	S			
<u>Myiarchus crinitus</u>	Great crested flycatcher	S			
<u>Sayornis phoebe</u>	Eastern phoebe	W			
<u>Iridoprocne bicolor</u>	Tree swallow	W		**	

TABLE 2.7A-9 (Continued). SEASONAL OCCURRENCE OF BIRDS IN PINE FLATWOODS OF THE PROPOSED SITE

Species	Common Name	Seasonal Status*	Season		
			Summer 1980	Winter 1980-81	Spring 1981
<u>Cyanocitta cristata</u>	Blue jay	P		5	
<u>Corvus brachyrhynchos</u>	Common crow	P	5		
<u>Corvus ossifragus</u>	Fish crow	P			
<u>Parus carolinensis</u>	Carolina chickadee	W		2	
<u>Parus bicolor</u>	Tufted titmouse	P	2	2	
<u>Sitta pusilla</u>	Brown-headed nuthatch	P		3	
<u>Regulus calendula</u>	Ruby-crowned kinglet	W		1	
<u>Troglodytes aedon</u>	House wren	W		1	
<u>Thryothorus ludovicianus</u>	Carolina wren	P		2	
<u>Mimus polyglottos</u>	Mockingbird	P	3	3	
<u>Dumetella carolinensis</u>	Gray catbird	W			
<u>Turdus migratorius</u>	American robin	W		12	
<u>Sialia sialis</u>	Eastern bluebird	P	2	5	
<u>Poliophtila caerulea</u>	Blue-gray gnatcatcher	P	1	1	
<u>Lanius ludovicianus</u>	Loggerhead shrike	P		1	
<u>Vireo griseus</u>	White-eyed vireo	P			
<u>Dendroica coronata</u>	Yellow-rumped warbler	W		41	
<u>Dendroica pinus</u>	Pine warbler	P	7	6	
<u>Dendroica discolor</u>	Prairie warbler	W		1	
<u>Dendroica palmarum</u>	Palm warbler	W		12	
<u>Geothlypis trichas</u>	Common yellowthroat	P	1	9	
<u>Sturnella magna</u>	Eastern meadowlark	P		5	
<u>Agelaius phoeniceus</u>	Red-winged blackbird	P		30	
<u>Quiscalus major</u>	Boat-tailed grackle	P			
<u>Quiscalus quiscula</u>	Common grackle	P			
<u>Piranga rubra</u>	Summer tanager	S			
<u>Cardinalis cardinalis</u>	Cardinal	P	4	1	

TABLE 2.7A-9 (Continued). SEASONAL OCCURRENCE OF BIRDS IN PINE FLATWOODS OF THE PROPOSED SITE

Species	Common Name	Seasonal Status*	Season		
			Summer 1980	Winter 1980-81	Spring 1981
<u>Carduelis tristis</u>	American goldfinch	W			
<u>Pipilo erythrophthalmus</u>	Rufous-sided towhee	P	9	6	
<u>Passerculus sandvicensis</u> <u>sandvicensis</u>	Savannah sparrow	W			
<u>Aimophila aestivalis</u>	Bachman's sparrow	P	1	2	
Density per 100 Acres			135	422	
Number of Species			19	39	

*Seasonal Status: P = Permanent resident
W = Winter resident
S = Summer resident
T = Transient

**Observed on site but not during quantitative surveys.

SOURCE: ESE, 1981.

TABLE 2.7A-10. SEASONAL OCCURRENCE OF BIRDS IN XERIC SCRUB OAK OF THE PROPOSED SITE

Species	Common Name	Seasonal Status*	Season		
			Summer 1980	Winter 1980-81	Spring 1981
<u>Cathartes aura</u>	Turkey vulture	P			
<u>Coragyps atratus</u>	Black vulture	P			
<u>Accipiter striatus</u>	Sharp-shinned hawk	P		1	
<u>Buteo jamaicensis</u>	Red-tailed hawk	P		1	
<u>Buteo lineatus</u>	Red-shouldered hawk	P			
<u>Falco sparverius</u>	American kestrel	P			
<u>Colinus virginianus</u>	Bobwhite	P			
<u>Charadrius vociferus</u>	Killdeer	P		1	
<u>Zenaida macroura</u>	Mourning dove	P			
<u>Columbina passerina</u>	Ground dove	P			
<u>Chordeiles minor</u>	Common nighthawk	S			
<u>Colaptes auratus</u>	Common flicker	P	3		
<u>Centurus carolinus</u>	Red-bellied woodpecker	P	4	3	
<u>Picoides villous</u>	Hairy woodpecker	P			
<u>Picoides pubescens</u>	Downy woodpecker	P			
<u>Picoides borealis</u>	Red-cockaded woodpecker	P			
<u>Tyrannus tyrannus</u>	Eastern kingbird	S			
<u>Myiarchus crinitus</u>	Great crested flycatcher	S			
<u>Sayornis phoebe</u>	Eastern phoebe	W			
<u>Iridoprocne bicolor</u>	Tree swallow	W			
<u>Cyanocitta cristata</u>	Blue jay	P	4	11	
<u>Aphelocoma coerulescens</u>	Florida scrub jay	P	5	9	
<u>Corvus brachyrhynchos</u>	Common crow	P		2	
<u>Parus carolinensis</u>	Carolina chickadee	W			
<u>Parus bicolor</u>	Tufted titmouse	P			
<u>Sitta pusilla</u>	Brown-headed nuthatch	P			
<u>Regulus calendula</u>	Ruby-crowned kinglet	W		2	

TABLE 2.7A-10 (Continued). SEASONAL OCCURRENCE OF BIRDS IN XERIC SCRUB OAK OF THE PROPOSED SITE

Species	Common Name	Seasonal Status*	Season		
			Summer 1980	Winter 1980-81	Spring 1981
<u>Troglodytes aedon</u>	House wren	W			
<u>Thryothorus ludovicianus</u>	Carolina wren	P	3	1	
<u>Mimus polyglottos</u>	Mockingbird	P	2	1	
<u>Dumetella carolinensis</u>	Gray catbird	W			
<u>Toxostoma rufum</u>	Brown thrasher	P	1	5	
<u>Turdus migratorius</u>	American robin	W		2	
<u>Sialia sialis</u>	Eastern bluebird	P			
<u>Poliophtila caerulea</u>	Blue-gray gnatcatcher	P		1	
<u>Lanius ludovicianus</u>	Loggerhead shrike	P	1	1	
<u>Vireo griseus</u>	White-eyed vireo	P	2	1	
<u>Dendroica coronata</u>	Yellow-rumped warbler	W		25	
<u>Dendroica discolor</u>	Prairie warbler	W			
<u>Dendroica palmarum</u>	Palm warbler	W		3	
<u>Geothlypis trichas</u>	Common yellowthroat	P	1	8	
<u>Sturnella magna</u>	Eastern meadowlark	P	1		
<u>Agelaius phoeniceus</u>	Red-winged blackbird	P	7		
<u>Quiscalus quiscula</u>	Common grackle	P			
<u>Cardinalis cardinalis</u>	Cardinal	P	2		
<u>Pipilo erythrophthalmus</u>	Rufous-sided towhee	P	15	21	
<u>Aimophila aestivalis</u>	Bachman's sparrow	P			
Density of Birds per 100 Acres			128	248	
Number of Species			13	19	

*Seasonal Status: P = Permanent resident
W = Winter resident
S = Summer resident
T = Transient

SOURCE: ESE, 1981.

TABLE 2.7A-11. SEASONAL OCCURRENCE OF BIRDS IN FORESTED WETLANDS OF THE PROPOSED SITE

<u>Species</u>	<u>Common Name</u>	<u>Seasonal Status*</u>	<u>Season</u>		
			<u>Summer 1980</u>	<u>Winter 1980-81</u>	<u>Spring 1981</u>
<u>Cathartes aura</u>	Turkey vulture	P			
<u>Coragyps atratus</u>	Black vulture	P			
<u>Accipiter cooperii</u>	Cooper's hawk	P			
<u>Buteo lineatus</u>	Red-shouldered hawk	P		1	
<u>Colinus virginianus</u>	Bobwhite	P			
<u>Meleagris gallopavo</u>	Turkey	P			
<u>Philohela minor</u>	American woodcock	W			
<u>Coccyzus americanus</u>	Yellow-billed cuckoo	S			
<u>Otus asio</u>	Screech owl	P			
<u>Bubo virginianus</u>	Great horned owl	P			
<u>Strix varia</u>	Barred owl	P			
<u>Caprimulgus carolinensis</u>	Chuck-will's widow	S			
<u>Caprimulgus vociferus</u>	Whip-poor-will	W			
<u>Archilochus colubris</u>	Ruby-throated hummingbird	S			
<u>Colaptes auratus</u>	Common flicker	P	1		
<u>Dryocopus pileatus</u>	Pileated woodpecker	P	1	2	
<u>Centurus carolinus</u>	Red-bellied woodpecker	P	9	4	
<u>Sphyrapicus varius</u>	Yellow-bellied sapsucker	W		1	
<u>Picoides pubescens</u>	Downy woodpecker	P	1	1	
<u>Myiarchus crinitus</u>	Great crested flycatcher	S	1		
<u>Tyrannus tyrannus</u>	Eastern kingbird	S	2		
<u>Sayornis phoebe</u>	Eastern phoebe	W		1	
<u>Iridoprocne bicolor</u>	Tree swallow	W			
<u>Cyanocitta cristata</u>	Blue jay	P	1	1	
<u>Corvus brachyrhynchos</u>	Common crow	P			
<u>Corvus ossifragus</u>	Fish crow	P			
<u>Parus carolinensis</u>	Carolina chickadee	W		2	

TABLE 2.7A-11 (Continued) SEASONAL OCCURRENCE OF BIRDS IN FORESTED WETLANDS
OF THE PROPOSED SITE

<u>Species</u>	<u>Common Name</u>	<u>Seasonal Status*</u>	<u>Season</u>		
			<u>Summer 1980</u>	<u>Winter 1980-81</u>	<u>Spring 1981</u>
<u>Parus bicolor</u>	Tufted titmouse	P	4	5	
<u>Sitta pusilla</u>	Brown-headed nuthatch	P		4	
<u>Troglodytes aedon</u>	House wren	W		2	
<u>Thryothorus ludovicianus</u>	Carolina wren	P	2	3	
<u>Toxostoma rufum</u>	Brown thrasher	P			
<u>Turdus migratorius</u>	American robin	W		2	
<u>Sialia sialis</u>	Eastern bluebird	P	2	26	
<u>Catharus guttatus</u>	Hermit thrush	W			
<u>Catharus fuscescens</u>	Veery	T			
<u>Polioptila caerulea</u>	Blue-gray gnatcatcher	P	2		
<u>Regulus calendula</u>	Ruby-crowned kinglet	W		4	
<u>Vireo griseus</u>	White-eyed vireo	P	4	1	
<u>Vireo flavifrons</u>	Yellow-throat vireo	W			
<u>Vireo solitarius</u>	Solitary vireo	W			
<u>Vireo olivaceus</u>	Red-eyed vireo	T			
<u>Mniotilta varia</u>	Black and white warbler	W		1	
<u>Protonotaria citrea</u>	Prothonotary warbler	W			
<u>Parula americana</u>	Northern parula	T			
<u>Dendroica coronata</u>	Yellow-rumped warbler	W		101	
<u>Dendroica dominica</u>	Yellow-throated warbler	W		1	
<u>Dendroica palmarum</u>	Palm warbler	W		25	
<u>Geothlypis trichas</u>	Common yellowthroat	P	1	1	
<u>Setophaga ruticilla</u>	American redstart	T	1		
<u>Piranga rubra</u>	Summer tanager	S			
<u>Cardinalis cardinalis</u>	Cardinal	P	9	3	
<u>Carduelis tristis</u>	American goldfinch	W			
<u>Pipilo erythrophthalmus</u>	Rufous-sided towhee	P	9	1	

TABLE 2.7A-11 (Continued) SEASONAL OCCURRENCE OF BIRDS IN FORESTED WETLANDS
OF THE PROPOSED SITE

Species	Common Name	Seasonal Status*	Season		
			Summer 1980	Winter 1980-81	Spring 1981
<u>Aimophila aestivalis</u>	Bachman's sparrow	P	3		
<u>Melospiza georgiana</u>	Swamp sparrow	W		1	
Density of Birds per 100 Acres			133	485	
Number of Species			17	24	

*Seasonal Status: P = Permanent resident
W = Winter resident
S = Summer resident
T = Transient

SOURCE: ESE, 1981.

2.8 AMBIENT AIR QUALITY

One requirement in obtaining site certification and applicable air quality licenses is to demonstrate that the operation of the proposed facility will not cause Federal nor State ambient air quality standards to be violated. In addition, impacts of the plant operation must not exceed remaining allowable air quality increments dependent upon the existing air quality status. The existing air quality in the vicinity of the Stanton Energy Center is described in this section along with applicable standards and allowable incremental effects. The impact predictions resulting from the addition of the proposed source emissions are described in Section 5.5.

The onsite air quality measurements began on May 1, 1980. Twelve months of onsite data (through April 30, 1981) have been utilized to define baseline air quality levels. Applicable PSD monitoring guidelines were followed in the establishment and operation of the monitoring program. (1)(2)(3)

2.8.1 Air Quality Standards

Ambient air quality standards (AAQS) have been set to protect public health (primary standards) and public welfare (secondary standards). The Federal and State AAQS are given in Table 2.8-1.

In addition to ambient standards, the operation of the proposed units must not cause air quality impacts beyond those specified by Prevention of Significant Deterioration (PSD) criteria. The site area is classified as PSD Class II. No Class I areas exist within 100 kilometres of the site. Therefore, PSD Class II increments apply. These increments are given in Table 2.8-2. None of the increment has been consumed previously, as is described in Section 5.5.

2.8.2 Existing Air Quality

Background air quality conditions have been measured at a site representative of the vicinity of the proposed unit. The remote nature of the

site area, meaning that it is not close to any significant urban nor industrial sources of pollutants, allows the baseline air quality assessment to be made using data collected at one air monitoring site. Figure 2.8-1 shows the remote nature of the site vicinity. Florida DER and the onsite air monitoring stations are shown in this figure as triangles. Table 2.8-3 gives the locations and air quality parameters measured.

The topography in the immediate vicinity of the site is shown in Figure 2.8-2. Terrain in the area is noticeably flat, contributing to the representativeness of the one air quality monitoring site.

Based on the assumption of a homogenous distribution of pollutants, the actual monitoring site location was chosen to be near the location of maximum short-term impacts predicted by preliminary dispersion model analyses. The site is shown in Figures 2.8-1 and 2.8-2.

Seminole County, 15 km north of the project site, has been designated as nonattainment for particulate matter by the Environmental Protection Agency (EPA). Orange County, which includes the city of Orlando and the project site area, is designated nonattainment for ozone by EPA. These nonattainment status conditions are addressed in Section 5.5.

2.8.2.1 Description of Onsite Measurements. Air quality and meteorological parameters have been monitored continuously at the air monitoring site since May 1, 1980.

Sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and total suspended particulate matter (TSP) are the primary pollutants measured at the site because these are the criteria pollutants which may be emitted in significant amounts and for which impact assessments have been made. Additional air quality parameters measured and reported are nitric oxide (NO), the combined oxides of nitrogen (NO_x), and the inhalable and respirable portion of particulate matter (IP). While not directly used in the modeling of impact assessments, supplementary meteorological data have also been collected. These consist of wind data (at 10 metres), temperature,

dewpoint, and precipitation. Table 2.8-4 is a listing of parameters measured, the corresponding instruments utilized, and the data recovery rates for the first 12-month period of operation.

A complete description of the onsite air monitoring program is given in reports of the first four quarters of operation, (4)(5)(6)(6a) and in Section 6.2.1 of this Application. A description of the quality assurance aspects of the monitoring program are included in the Quality Assurance Plan.(7)

Data recovery rates of 80 per cent for air quality data and 90 per cent for meteorological data are required by PSD criteria according to EPA monitoring guidelines. Recovery rates for all air quality parameters except IP were over 80 per cent. An assembly error in manufacturing on the dichotomous sampler, which measures IP, went undetected until October, 1980, thereby, adversely affecting the data recovery.

Data recovery percentages for all meteorological parameters except temperature were less than 90 per cent. A direct lightning strike on September 9 was the beginning of a series of problems with the vector wind and precipitation data. Thus, these data recoveries are well below the guideline criteria. The meteorological data are supplementary and are not used as a basis for impact assessment. Therefore, the low data recovery rates do not adversely affect total acceptability of the data reporting results.

2.8.2.2 Air Quality Measurement Results. Air quality data taken at the ambient air monitoring site on the property of the proposed Stanton Energy Center Unit 1 are summarized in this section. The highest and "second highest" (according to the EPA definition) are reported in Table 2.8-5 for each measured pollutant and averaging time for which there is an applicable ambient air quality standard (AAQS). For purposes of determining compliance with the AAQS, the highest measured concentrations in Table 2.8-5 are used as background or "baseline" values. The results for each parameter in Table 2.8-5 are described below.

Sulfur Dioxide (SO₂). Highest and second highest 3-hour SO₂ averages in the 12-month reporting period were 124 and 115 µg/m³. Both occurred in

1

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January, 1981. The $124 \mu\text{g}/\text{m}^3$ was from hours 0900 through 1100, inclusive, on January 18, while the $115 \mu\text{g}/\text{m}^3$ is composed of the 2100 to 2300 period, inclusive, on January 7. The highest 3-hour average is less than 10 per cent of any applicable ambient air quality standard.

The two highest 24-hour averages were 44 and $41 \mu\text{g}/\text{m}^3$. The $44 \mu\text{g}/\text{m}^3$ value came from the period of hour 1300 on January 17 through hour 1200 on January 18, inclusive, while $41 \mu\text{g}/\text{m}^3$ is the average of hours 2100 on January 7 through hour 2000 on January 8, inclusive. The highest 24-hour average is only 17 per cent of the Florida AAQS, and only 12 per cent of the Federal Primary Standard.

Finally, there are two annual AAQS, 80 and $60 \mu\text{g}/\text{m}^3$ based on Federal and Florida regulations, respectively. The 12-month average concentration was computed to be $14.4 \mu\text{g}/\text{m}^3$. This concentration is heavily weighted by numerous $13 \mu\text{g}/\text{m}^3$ values which correspond to the 5 ppb value which was substituted for measured values below the 10 ppb instrument threshold. A vast majority of the data were from hours for which this substitution was made because of low ambient concentrations (less than instrument threshold). Nevertheless, the computed average is less than 25 per cent of the annual standard.

Nitrogen Dioxide (NO_2). No short term standards apply for NO_2 ; both the Federal and Florida AAQS are an annual arithmetic mean of $100 \mu\text{g}/\text{m}^3$. The measured 12-month average is $10.7 \mu\text{g}/\text{m}^3$, which is approximately 10 per cent of the standard. This computation has also been made with many of the values being substituted data because of measurements below the instrument threshold.

Carbon Monoxide (CO). The two highest 1-hour average CO concentrations were 10.6 and $10.5 \text{ mg}/\text{m}^3$. These values were associated with range fires near the monitoring site. Both concentrations are approximately 25 per cent of the applicable standards.

The two highest 8-hour average concentrations were 5.2 and $4.6 \text{ mg}/\text{m}^3$. Again, both cases occurred during periods with range fires in the area. These CO levels are approximately 50 per cent of the applicable ambient air quality standards.

Total Suspended Particulate Matter (TSP). Measurements of 24-hour average concentrations of TSP were taken during the 12 months of operation every third day. The highest and second highest values which are used as baseline air quality levels in air quality impact calculations are 105 and 90 $\mu\text{g}/\text{m}^3$. These occurred on March 5 and March 17, 1981, respectively. Both are well below the 150 $\mu\text{g}/\text{m}^3$ standard. Atmospheric conditions on the above two days were such that higher particulate levels would not be unexpected, as is shown below. The 12-month geometric mean was 34 $\mu\text{g}/\text{m}^3$ as compared to the Florida and Federal secondary annual standard of 60 $\mu\text{g}/\text{m}^3$, geometric mean.

While the highest reported measurement for TSP occurred on March 5, 1981, gaseous air quality measurements on the same day were quite low, indicating fugitive dust sources rather than industrial pollution. Winds were generally from the southwest. Hourly average wind speeds ranged from approximately 3 to 10 metres per second (m/s), the 24-hour average wind speed was 6.1 m/s, and relative humidity averaged 50 per cent. Similar air quality measurements were recorded on March 17, the date of the second highest TSP concentration reported. However on this date, winds were 2 to 3 metres per second from the northwest through southwest directions. The average relative humidity was 25 per cent.

Precipitation was below normal in Orlando during the entire year as is discussed in Section 2.6. The dry conditions coupled with the winds result in relatively dry soil conditions. Thus, fugitive dust levels slightly higher than normal would be expected.

There were two 24-hour TSP concentrations which were not reported in the background measurements because they were known to have occurred during periods of marked local influence. These TSP values were 150 and 112 $\mu\text{g}/\text{m}^3$ and were measured on October 15 and November 5, 1980, respectively. On October 15, 1980, a range fire burned to a location within approximately 50 metres of the monitoring site. The smoke plume was observed to drift across the air monitoring station for a few hours. Peak hourly concentrations of the continuously monitored gases occurred about 1500 EST. SO_2

concentrations reached $93 \mu\text{g}/\text{m}^3$, NO_2 was $91 \mu\text{g}/\text{m}^3$, and CO was $7.5 \text{ mg}/\text{m}^3$.

The particulate matter on the sample filter was analyzed using optical microscopy. This analysis showed that 55 per cent (by weight) of the material was burned wood and plant tissue; another 30 per cent was pollen, spores and miscellaneous plant tissue. Soot accounted for 5 per cent of this filter and the one discussed following also.

Range fires also occurred nearby on November 5, 1980. Peak hourly concentrations on that day occurred near 2100 EST. SO_2 concentrations reached $30 \mu\text{g}/\text{m}^3$, NO_2 reached $43 \mu\text{g}/\text{m}^3$, and CO was $5.2 \text{ mg}/\text{m}^3$. In addition, the grass field immediately north of the monitoring site was harvested on that same day. The optical microscopy analyses showed that 40 per cent of the filter material was burned wood and plant tissue and another 45 per cent was pollen, spores and miscellaneous plant tissue. Because of the noted fires and agricultural activities on October 15 and November 5, 1980, the measured values for TSP for those days are not included in the reported air quality data summary.

2.8.2.3 Other Air Quality Data. Air quality data collected at the onsite ambient air monitoring station have been compared in this section with data collected at Florida DER stations in the Orlando area with sufficient data for comparisons. Florida DER data from January through December, 1980 have been used for this comparison of TSP, but only through September, 1980 for the continuously collected parameters.

TSP. TSP data are the most plentiful and thus provide the most complete comparison. Three nearby DER sites are used in comparison with the OUC site. The site identifiers are 0001, 0003 and 0004 which correspond to numbers (4), (8) and (9) in Table 2.8-3, the list of DER sites. Monthly maximum 24-hour average concentrations and the monthly arithmetic means of the 24-hour values are given in Table 2.8-6.

Monthly maximum 24-hour average and monthly averages of 24-hour average TSP concentrations are usually lower at the onsite station than at the DER sites. Also, the trend of the changes from month to month are very similar.

The relationships between the data sets are more easily seen by comparing the monthly mean values, as this parameter is less susceptible to unusual occurrences at a given site. Figure 2.8-3 shows a plot of the monthly arithmetic mean values at the four sites given in Table 2.8-6.

Sulfur Dioxide. One DER station, Winter Park, has a continuous sulfur dioxide (SO_2) monitor, it has only operated since July, 1980. Between July and September, the highest and second highest one hour averages reported were 183 and $73 \mu\text{g}/\text{m}^3$ (70 and 28 ppb) respectively. The $183 \mu\text{g}/\text{m}^3$ occasion

contributed to a 3-hour average of $86 \mu\text{g}/\text{m}^3$ (33 ppb). Ninety-nine per cent of the data were below $15 \mu\text{g}/\text{m}^3$.

While the highest 3-hour average is somewhat below the highest onsite 3-hour average, the limited quantity of data restricts the comparison potential.

Carbon Monoxide. Carbon monoxide (CO) was monitored at three DER sites at different times. All one-hour averages were below $13 \text{ mg}/\text{m}^3$ (11 ppm), the overall averages are near $1.5 \text{ mg}/\text{m}^3$. The stations are located near major thoroughfares and the maximum levels observed occurred during morning "rush-hour" periods. Both the maximum and the average levels were higher at the DER sites than those measured onsite.

2.8.3 References

- (1) U. S. Environmental Protection Agency, Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), EPA-450/2-78-019, May, 1978.
- (2) U. S. Environmental Protection Agency, "Volume I Principles," Quality Assurance Handbook for Air Pollution Measurement Systems, EPA-600/9-76-005, March, 1976.
- (3) U. S. Environmental Protection Agency, "Volume II Ambient Air Specific Methods," Quality Assurance Handbook for Air Pollution Measurement Systems, EPA-600/4-77-027a, May, 1977.
- (4) Black & Veatch Consulting Engineers, Ambient Air Monitoring First Quarterly Report May, 1980 - July, 1980, prepared for Orlando Utilities Commission, 1980.
- (5) Black & Veatch Consulting Engineers, Ambient Air Monitoring Second Quarterly Report August, 1980 - October, 1980, prepared for Orlando Utilities Commission, 1980.
- (6) Black & Veatch Consulting Engineers, Ambient Air Monitoring Third Quarterly Report November, 1980 - January, 1981, prepared for Orlando Utilities Commission, 1980.
- (6a) Black & Veatch Consulting Engineers, Ambient Air Monitoring Fourth Quarterly Report February, 1981 - April, 1981, prepared for Orlando Utilities Commission, 1981.
- (7) Black & Veatch Consulting Engineers, Quality Assurance Plan for Ambient Air Quality and Meteorological Monitoring Program, prepared for Orlando Utilities Commission, 1980.
- (8) Letter dated March 25, 1981, Brian Kerchoff, Eng. Tech. III, Florida DER to P. M. Fransioli, Meteorologist, Black & Veatch.

TABLE 2.8-1 AMBIENT AIR QUALITY STANDARDS

Standard	Short-Term*	24-Hour* Average	Annual** Average
Sulfur Dioxide ($\mu\text{g}/\text{m}^3$)			
Federal Primary	--	365	80
Federal Secondary	1300 (3 hour)	--	--
Florida	1300 (3 hour)	260	60
Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)			
Federal Primary and Secondary	--	--	100
Florida	--	--	100
Carbon Monoxide (mg/m^3)			
Federal Primary and Secondary	40 (1 hour)	--	--
Federal Primary and Secondary	10 (8 hour)	--	--
Florida	Same as Federal	--	--
Total Suspended Particulate ($\mu\text{g}/\text{m}^3$)			
Federal Primary	--	260	75
Federal Secondary	--	150	60
Florida	--	150	60

*Not to be exceeded more than once per year; averaging times given in parentheses.

**The annual average for total suspended particulate is computed as a geometric mean, whereas the annual average for sulfur dioxide and nitrogen dioxide are computed as arithmetic means.

$\mu\text{g}/\text{m}^3$: micrograms per cubic metre at 25 C and 760 mm Hg

mg/m^3 : milligrams per cubic metre at 25 C and 760 mm Hg

TABLE 2.8-2. FEDERAL PSD (PREVENTION OF SIGNIFICANT DETERIORATION)
CLASS II INCREMENTS

<u>Pollutant</u>	<u>Increment</u> micrograms per cubic metre
Sulfur Dioxide (3-hour)	512*
Sulfur Dioxide (24-hour)	91*
Sulfur Dioxide (Annual)	20
Total Suspended Particulates (24-hour)	37*
Total Suspended Particulates (Annual)	19

*Not to be exceeded more than once per year.

TABLE 2.8-3. NEARBY AIR QUALITY MONITORING STATIONS

Site*	SAROAD No.	Site Name	Parameters	Notes
1	0380-004-F02	Tico Airport	Hi Vol, SO ₂ Bubbler	NO _x Bubbler removed 1/5/81
2	0930-001-F02	DeBary	Hi Vol	Open 2/9/81
3	2680-002-F01	Merrit Is. Courthouse	Hi Vol and SO ₂	
4	3240-001-F01	Sewage Trt. Plt., Taft	Hi Vol	
5	3240-003-F01	Pine Hills El. School	Hi Vol	Open 9/25/80
6	3240-004-F01	Zellwood El. School	Hi Vol	Open 9/25/80
7	3240-005-F01	SR50 and 436	CO, WS/WD	Open 7/16/80
8	3280-003-F01	W. Central & Parramore	Hi Vol	
9	3280-004-F01	595 N. Primrose	Hi Vol	SO ₂ and NO _x Bubblers removed 1/5/80
10	3280-005-F01	Orange and Central	CO	Open 10/29/80
11	4040-003-F02	Sanford City Hall	Hi Vol	
12	4140-002-F03	Orlando Dr., Sanford	O ₃ , WS/WD	O ₃ open 4/11/80 WS/WD open 5/7/80
13	4480-001-F02	611 Singleton-Titusville	Hi Vol	
14	4900-002-F01	Lake Isle Est. Winter Park	SO ₂ , O ₃ , WS/WD CO, THC, CH ₄ , NMHC	SO ₂ open 7/80 CO and all HC off 12/80
15	3240-002-J05	Stanton Energy Center	SO ₂ , CO, NO, NO ₂ , NO _x , Hi Vol Dichot-Samp., WS/WD, Temp., Dew Pt., Precip.	Open 5/1/80

*Site No. corresponds to locations in Figure 2.8-1.

Source: Reference (8)

TABLE 2.8-4. PARAMETERS MEASURED AND DATA RECOVERY RATES

<u>Parameter</u>	<u>Method</u>	<u>Manufacturer and Model</u>	<u>Data Recovery per cent</u>
1. SO ₂	Flame photometric	Meloy SA285E	89.2
2. NO/NO ₂ /NO _x	Chemiluminescence	CSI1600	92.2
3. CO	Non-dispersive infra-red	ML 8310	92.8
4. TSP	Hi-vol, gravimetric	GMWL 2000H	96.7
5. IP	Dichotomous sampler	Sierra 244	45.9
6. WS/WD	Anemometer, vane	MRI 1022	58.3
7. Scalar Speed	Anemometer	MRI 1022	87.4
8. Temperature	Thermistor	MRI 892-1	94.3
9. Dew Point Temperature	LiCl cell	MRI 892-1	83.0
10. Precipitation	Tipping bucket	MRI 302	57.2
11. Data Recording	Digital: Tape	SumX SX-410	--

TABLE 2.8-4. PARAMETERS MEASURED AND DATA RECOVERY RATES

<u>Parameter</u>	<u>Method</u>	<u>Manfuacterer and Model</u>	<u>Data Recovery* per cent</u>
1. SO ₂	Flame photometric	Meloy SA285E	86.3
2. NO/NO ₂ /NO _x	Chemiluminescence	CSI1600	91.0
3. CO	Non-dispersive infra-red	ML 8310	90.8
4. TSP	Hi-vol, gravimetric	GMWL 2000H	95.6
5. IP	Dichotomous sampler	Sierra 244	30.4
6. WS/WD	Anemometer, vane	MRI 1022	45.4
7. Temperature	Thermistor	MRI 892-1	93.0
8. Dew Point Temperature	LiCl cell	MRI 892-1	82.2
9. Precipitation	Tipping bucket	MRI 302	43.7
10. Data Recording	Digital: Tape	SumX SX-410	--

*Nine months.

TABLE 2.8-5. SUMMARY OF TWELVE MONTHS OF ONSITE AIR QUALITY DATA COMPARED
WITH AMBIENT AIR QUALITY STANDARDS

4

<u>Pollutant and Time Average</u>	<u>Highest</u>	<u>"Second Highest"</u>	<u>Most Stringent Standard</u>	
Sulfur Dioxide ($\mu\text{g}/\text{m}^3$)				
3-Hour	124	115	1,300	1
24-Hour	44	41	260	
Twelve Months	14.4	--	60 (Annual)	
Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)				1
Twelve Months	10.7	--	100 (Annual)	
Carbon Monoxide (mg/m^3)				
1-Hour	10.6	10.5	40	
8-Hour	5.2	4.6	10	
Total Suspended Particulate ($\mu\text{g}/\text{m}^3$)				
24-Hour	105*	90*	150	1
Twelve Months*	34**	--	60** (Annual)	

*Two 24-hour samples are not reported because of nonrepresentative local influences; see text.

**Geometric mean values.

TABLE 2.8-5. SUMMARY OF NINE MONTHS OF ONSITE AIR QUALITY DATA COMPARED WITH AMBIENT AIR QUALITY STANDARDS

<u>Pollutant and Time Average</u>	<u>Highest</u>	<u>"Second Highest"</u>	<u>Most Stringent Standard</u>
Sulfur Dioxide ($\mu\text{g}/\text{m}^3$)			
3-Hour	124	115	1,300
24-Hour	44	41	260
Twelve Months	14.4	--	60 (Annual)
Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)			
Twelve Months	10.7	--	100 (Annual)
Carbon Monoxide (mg/m^3)			
1-Hour	10.6	10.5	40
8-Hour	5.2	4.6	10
Total Suspended Particulate ($\mu\text{g}/\text{m}^3$)			
24-Hour	105*	90*	150
Twelve Months*	34**	--	60** (Annual)

*Two 24-hour samples are not reported because of nonrepresentative local influences; see text.

**Geometric mean values.

TABLE 2.8-5. SUMMARY OF NINE MONTHS OF ONSITE AIR QUALITY DATA COMPARED WITH AMBIENT AIR QUALITY STANDARDS

<u>Pollutant and Time Average</u>	<u>Highest</u>	<u>"Second Highest"</u>	<u>Most Stringent Standard</u>
Sulfur Dioxide ($\mu\text{g}/\text{m}^3$)			
3-Hour	124	116	1,300
24-Hour	44	41	260
Nine Months	14.7	--	60 (Annual)
Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)			
Nine Months	9.5	--	100 (Annual)
Carbon Monoxide (mg/m^3)			
1-Hour	10.6	10.5	40
8-Hour	5.2	4.6	10
Total Suspended Particulate ($\mu\text{g}/\text{m}^3$)			
24-Hour	82*	73*	150
Nine Months	32**	--	60** (Annual)

*Two 24-hour samples are not reported because of nonrepresentative local influences; see text.

**Geometric mean values.

TABLE 2.8-6. TSP DATA COMPARISONS BETWEEN ONSITE AND FLORIDA DER STATIONS

<u>Month</u>	<u>Parameter</u>	<u>Site 15 (Onsite)</u>	<u>Site 4</u>	<u>Site 8</u>	<u>Site 9</u>
Jan. 80	Max.			73	58
	Avg.			65	50
Feb.	Max.			78	76
	Avg.			56	62
Mar.	Max.		60	90	77
	Avg.		58	82	66
Apr.	Max.		69	59	57
	Avg.		48	58	50
May	Max.	82	54	63	60
	Avg.	39	36	50	55
Jun.	Max.	59	55	72	75
	Avg.	40	39	52	53
Jul.	Max.	73	54	73	68
	Avg.	35	42	53	55
Aug.	Max.	49	65	86	125
	Avg.	29	42	64	69
Sep.	Max.	22	37	49	43
	Avg.	17	26	41	39
Oct.	Max.	49	55	78	76
	Avg.	33	40	51	57
Nov.	Max.	71	61	85	86
	Avg.	35	37	54	48
Dec.	Max.	55	55	77	76
	Avg.	33	38	60	59
Jan. 81	Max.	63			
	Avg.	50			
Feb. 81	Max.	80			
	Avg.	37			

TABLE 2.8-6 (Continued). TSP DATA COMPARISONS BETWEEN ONSITE AND FLORIDA
DER STATIONS

<u>Month</u>	<u>Parameter</u>	<u>Site 15</u> <u>(Onsite)</u>	<u>Site 4</u>	<u>Site 8</u>	<u>Site 9</u>
Mar. 81	Max.	105			
	Avg.	67			
Apr. 81	Max.	47			
	Avg.	34			

Notes: All TSP values are in micrograms per cubic metre.

Site numbers correspond to those given in Table 2.8-3.

TABLE 2.8-6. TSP DATA COMPARISONS BETWEEN ONSITE AND FLORIDA DER STATIONS

<u>Month</u>	<u>Parameter</u>	<u>Site 15 (Onsite)</u>	<u>Site 4</u>	<u>Site 8</u>	<u>Site 9</u>
Jan. 80	Max.			73	58
	Avg.			65	50
Feb.	Max.			78	76
	Avg.			56	62
Mar.	Max.		60	90	77
	Avg.		58	82	66
Apr.	Max.		69	59	57
	Avg.		48	58	50
May	Max.	82	54	63	60
	Avg.	39	36	50	55
Jun.	Max.	59	55	72	75
	Avg.	40	39	52	53
Jul.	Max.	73	54	73	68
	Avg.	35	42	53	55
Aug.	Max.	49	65	86	125
	Avg.	29	42	64	69
Sep.	Max.	22	37	49	43
	Avg.	17	26	41	39
Oct.	Max.	49			
	Avg.	33			
Nov.	Max.	71			
	Avg.	35			
Dec.	Max.	55			
	Avg.	33			
Jan. 81	Max.	63			
	Avg.	50			

Notes: All TSP values are in micrograms per cubic metre.

Site numbers correspond to those given in Table 2.8-3.

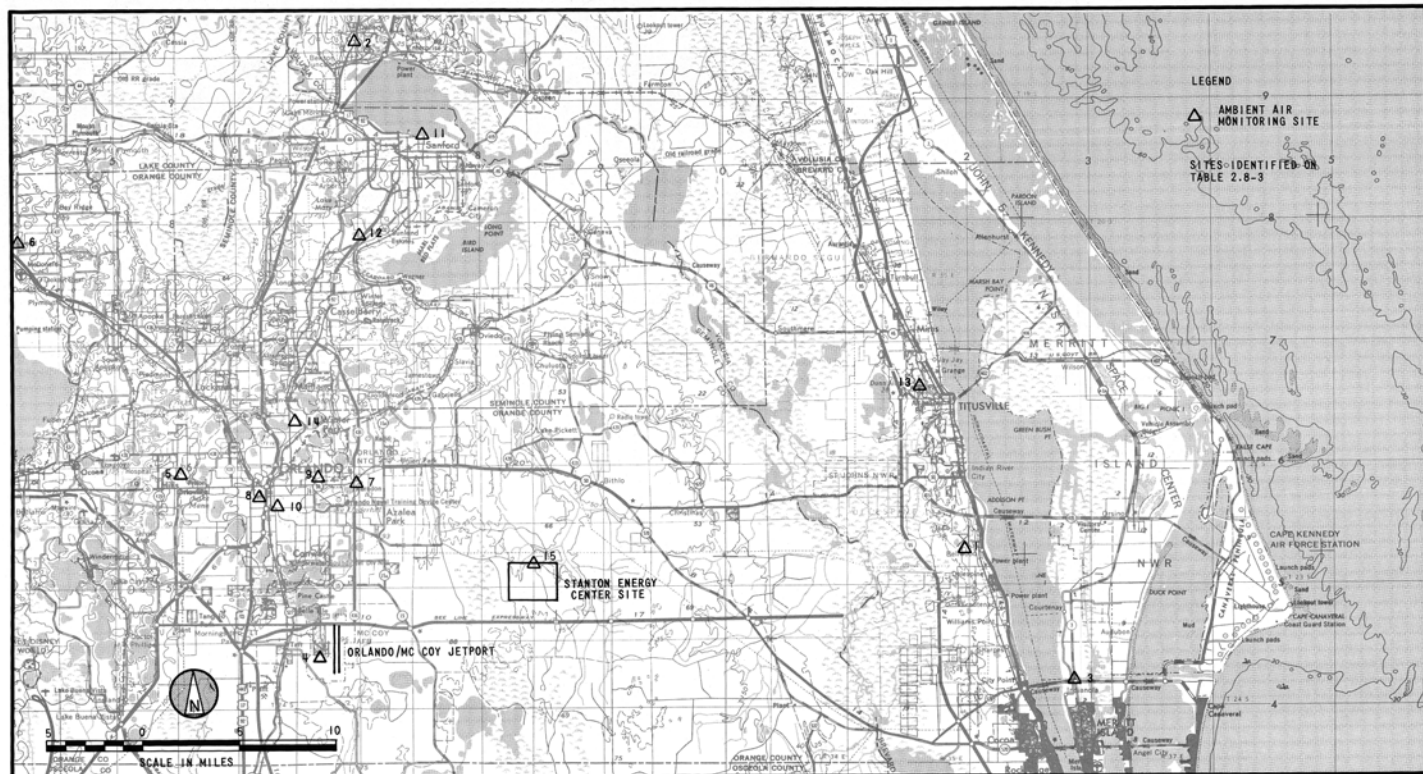


FIGURE 2.8-1. LOCATION OF NEARBY AIR QUALITY MONITORING STATIONS

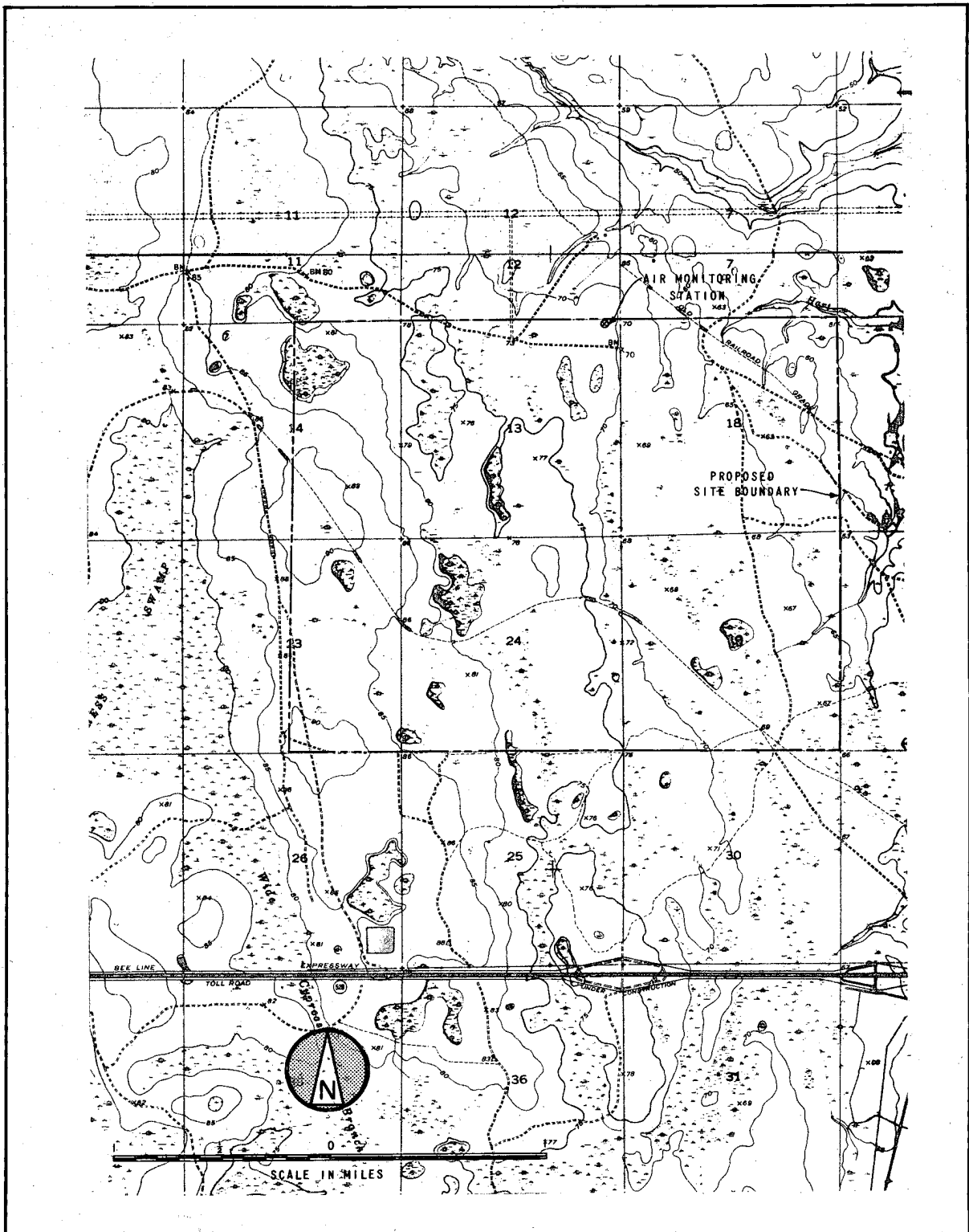
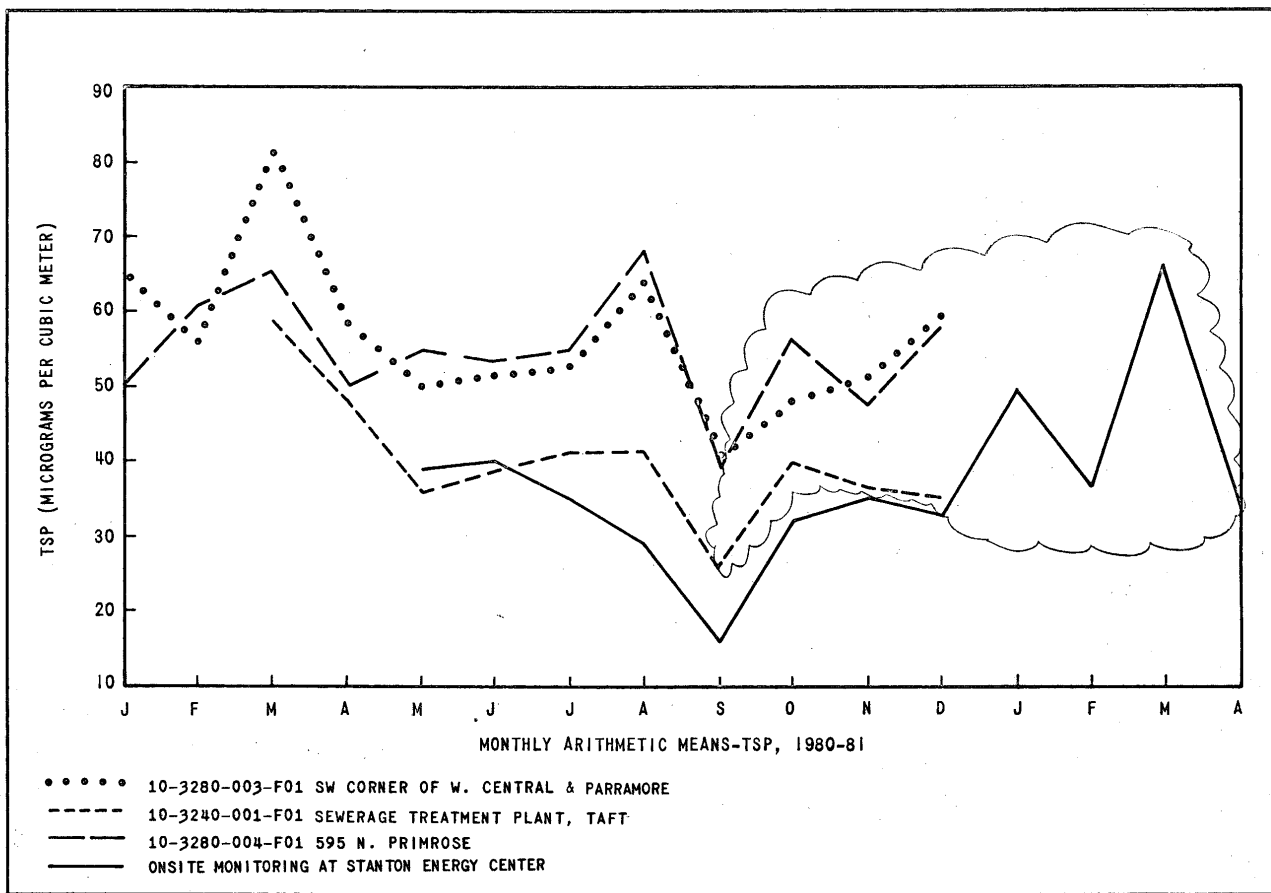


FIGURE 2.8-2. TOPOGRAPHY AROUND THE AIR MONITORING STATION



AMENDMENT 1
060581

FIGURE 2.8-3. MONTHLY MEAN TSP DATA
FROM ONSITE AND DER STATIONS

2.9 OTHER ENVIRONMENTAL FEATURES

2.9.1 Baseline Noise Levels

Ambient noise levels on the proposed project site and in the immediate vicinity were surveyed in May and December of 1980 in accordance with the methodology described in Section 6.3.1 Noise Survey Methodology. Three sampling stations were established for the noise survey as illustrated by Figure 2.9-1. Station 1 is located on the proposed site where little human activity presently occurs. Station 2 is located approximately 1,000 feet from the nearest active landfill area and 2,000 feet from the center of the landfill operation. Station 3 is located near the Beeline Expressway, a major source of noise.

During each noise survey, ambient sound pressure levels were monitored during daytime hours, in the evening, and during nighttime hours at Stations 1 and 3. Measurements were taken at Station 2 only during daytime hours (0700-2200) because landfill operation is confined to daytime.

The results of the noise level surveys have been analyzed for both statistical frequency of occurrence and for the sound pressure levels associated with 9 frequency bands which make up the sounds normally audible to the human ear. The statistical frequency of occurrence analyses for all ambient noise measurements address the per cent of time during which sound pressure levels in dBA were equalled or exceeded. Table 2.9-1 presents the results of these statistical analyses at the 1 per cent, 10 per cent, 50 per cent, 90 per cent, and 99 per cent values.

Baseline noise measurements for all stations were also analyzed for the sound pressure levels (L_p) in dBA for 9 frequency bands from 31 Hertz (cycles per second) to 8,000 (8K). Noise measurement data were also analyzed to obtain a 24-hour A-weighted sound level (L_{eq}) with acoustic energy equivalent to the accumulated time-varying noise for the same 24-hour period. Table 2.9-2 presents the results of these analyses.

The Orange County Landfill is a major source of noise near the site, but actual noise level measurements within 1 metre of the specific sources were not obtained. Measurements of sound pressure levels at Station 2 were

used in calculations which provided estimates of the sound power levels in dB and dBA values at the center of the landfill operations for the 9 frequency bands and a 15-hour L_{eq} (0700-2200). These estimates of acoustic energy originating from the landfill operations center were important input for the development of ambient 24-hour L_{eq} noise contours shown on Figure 2.9-2 and ambient 24-hour L_{dn} noise contours shown on Figure 2.9-3. Measurements of sound pressure levels were slightly higher in May than in December; therefore, the May measurements were used to develop the baseline noise contours to provide a conservatively high background level for construction and operation impact assessments presented in Sections 4.1.3 and 5.7.2.

Table 2.9-3 presents the values based on the May, 1980 measurements for Station Two.

At most stations, daytime noise levels were higher than nighttime levels. Background noises included insect sounds, livestock sounds, bird sounds, and rustling of leaves. Small aircraft flying over the stations resulted in readings up to 50 dBA while commercial aircraft caused readings up to 59 dBA.

At Station 2 near the landfill, no evening or nighttime measurements were taken since no landfill activity occurs then. It is probable that nighttime noise levels are similar to those measured at Station 1. Nighttime noise levels at Station 3 were significantly higher than either nighttime or daytime levels at Station 1 because of the continuous highway traffic on the Beeline Highway.

Ambient noises measured on the proposed site at Station 1 are relatively uniform in both the statistical sound pressure levels through the 24-hour periods and in the sound pressure levels found for each of the 9 frequency bands. Near the Beeline Highway at Station 3, slightly higher noise levels were found during daytime hours. Examination of the octave band sound pressure levels indicates that the vehicular noises from the highway contain higher sound pressure at the higher frequencies which are more noticed by humans.

2.9.2 Other Features

No other features pertinent to the environmental evaluation of the proposed project have been identified.

TABLE 2.9-1. BASELINE NOISE LEVELS IN dBA

	Statistical Sound Pressure Levels*				
	<u>L₉₉</u>	<u>L₉₀</u>	<u>L₅₀</u>	<u>L₁₀</u>	<u>L₁</u>
<u>Date and Station</u>					
<u>May 1980</u>					
<u>Station One</u>					
day (0700-1900)	41	42	43	46	50
evening (1900-2200)	40	41	42	44	47
night (2200-0700)	40	41	42	47	53
<u>Station Two</u>					
day (operating)	35	38	44	52	58
<u>Station Three</u>					
day (0700-1900)	43	47	56	73	82
evening (1900-2200)	45	47	54	67	80
night (2200-0700)	44	45	52	68	81
<u>December 1980</u>					
<u>Station One</u>					
day (0700-1900)	32	33	37	40	49
evening (1900-2200)	40	40	40	42	51
night (2200-0700)	40	40	41	41	43
<u>Station Two</u>					
day (operating)	45	45	46	49	33
<u>Station Three</u>					
day (0700-1900)	42	45	57	73	82
evening (1900-2200)	40	45	56	69	80
night (2200-0700)	28	37	50	65	79

*Per cent of time sound level equalled or exceeded.

Source: B&V.

TABLE 2.9-2. BASELINE OCTAVE BAND NOISE ANALYSIS IN dBA

	Frequency (Hertz)								
	<u>31</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>
<u>Date and Station</u>									
<u>May 1980</u>									
<u>Station One</u>									
day (0700-1900): Lp (dBA)	26	37	38	35	38	36	35	36	32
evening (1900-2200): Lp (dBA)	24	35	36	33	36	34	33	34	30
night (2200-0700): Lp (dBA)	24	35	36	33	36	34	33	34	30
<u>Station Two</u>									
operation Lp (dBA)	30	41	42	37	39	41	38	38	33
<u>Station Three</u>									
day (0700-1900): Lp (dBA)	32	38	54	58	67	64	59	51	51
evening (1900-2200): Lp (dBA)	30	36	52	56	65	62	57	49	49
night (2200-0700): Lp (dBA)	30	36	52	56	65	62	57	49	49
<u>December 1980</u>									
<u>Station One</u>									
day (0700-1900): Lp (dBA)	21	28	34	30	30	31	29	29	25
evening (1900-2200): Lp (dBA)	25	32	38	34	34	35	33	33	29
night (2200-0700): Lp (dBA)	24	31	37	33	33	34	32	32	28
<u>Station Two</u>									
day (operating): Lp (dBA)	16	29	35	30	31	41	45	35	28
<u>Station Three</u>									
day (0700-1900): Lp (dBA)	33	39	55	59	68	65	60	52	52
evening (1900-2200): Lp (dBA)	31	37	53	57	66	63	58	50	50
night (2200-0700): Lp (dBA)	28	34	50	54	63	60	55	47	47

*Lp.

**L_{eq} (24 hr) is the 24-hour A-weighted sound level having equivalent acoustic energy as the accumulated time-varying noise for the same 24-hour period.

Source: B&V.

TABLE 2.9-3. ESTIMATED OCTAVE BAND NOISE LEVELS--ORANGE COUNTY LANDFILL CENTER

	Frequency (Hertz)									L_{eq}
	<u>31</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	
day* (Average):										
L_w (dB)**	121	121	113	99	93	98	95	100	101	124
day* (Average):										
L_w (dBA)***	82	95	97	90	90	98	96	101	100	106

*Operation day is 0700 to 2200 hours.

** L_w (dB).

*** L_w (dBA).

Source: B&V.

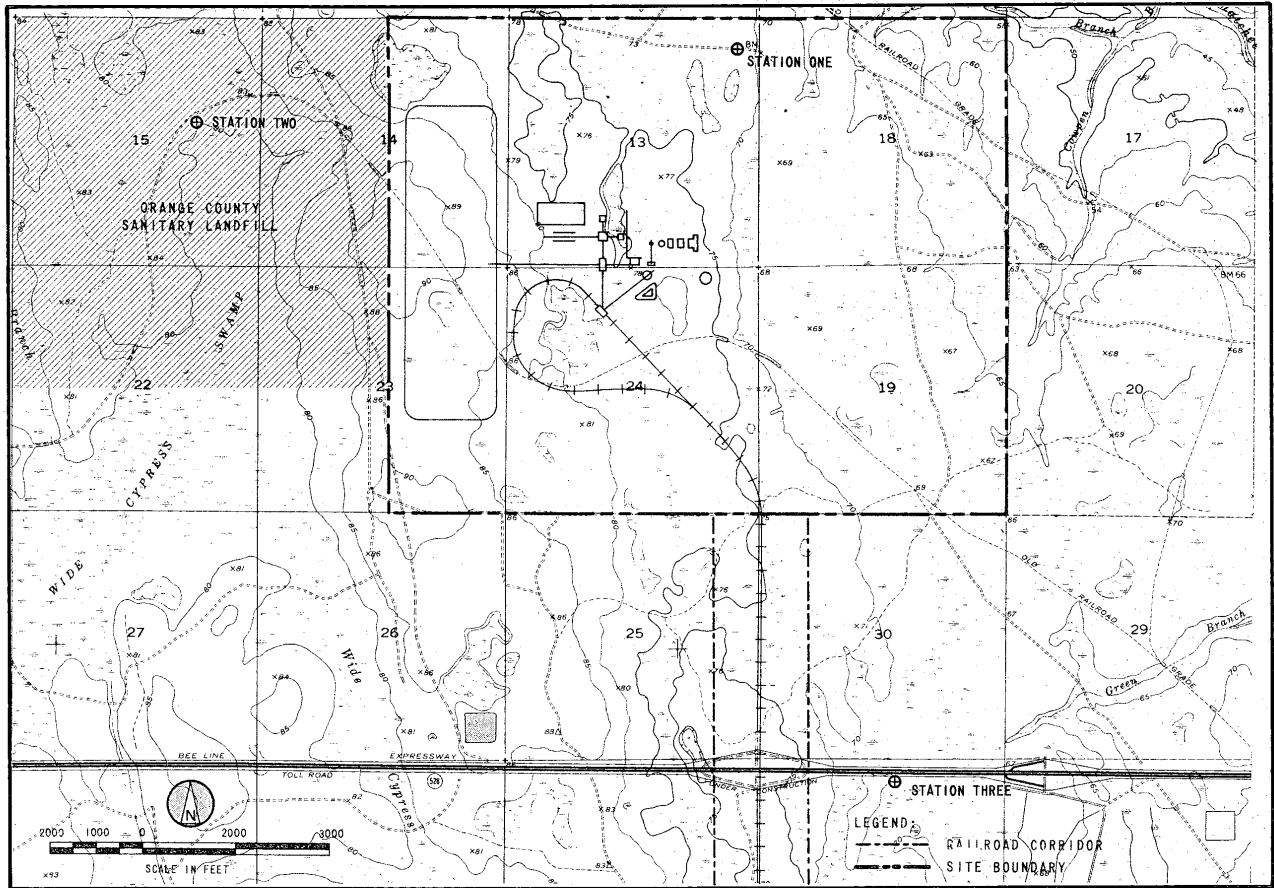


FIGURE 2.9-1. NOISE MONITORING STATIONS-
CURTIS H. STANTON ENERGY CENTER

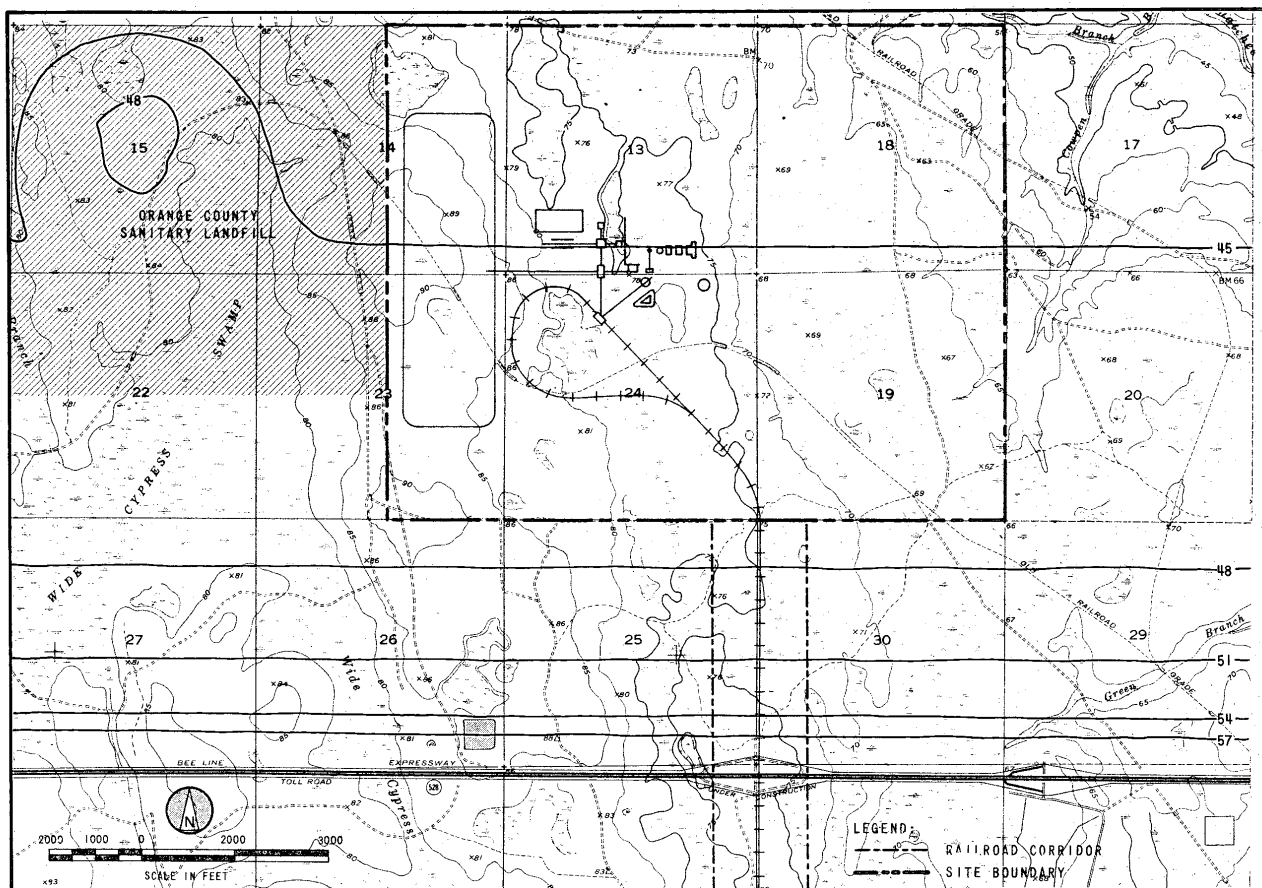


FIGURE 2.9-2. EXISTING L_{eq} (dBA) CONTOURS FOR THE VICINITY OF THE PROPOSED CURTIS H. STANTON ENERGY CENTER

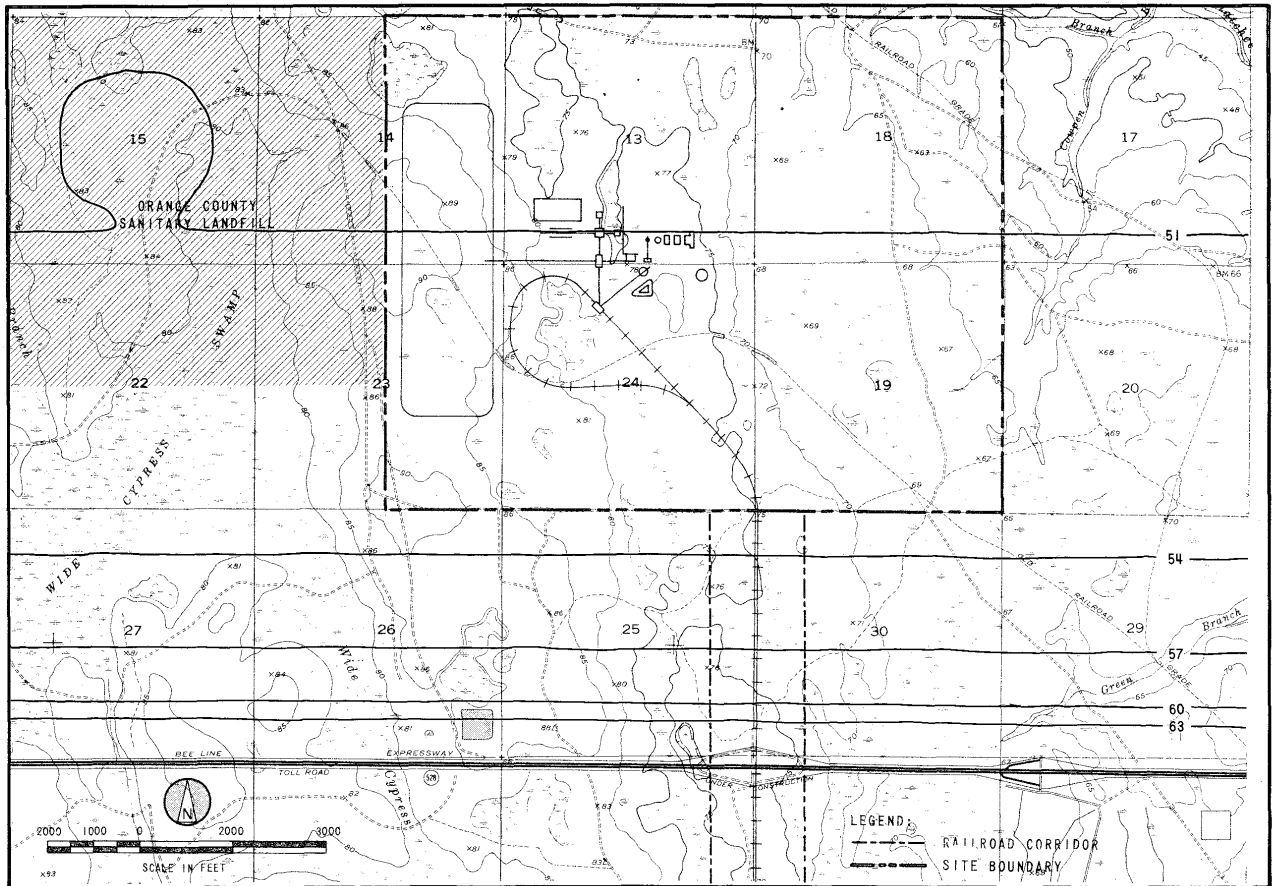


FIGURE 2.9-3. EXISTING L_{dn} (dBA) CONTOURS FOR THE VICINITY OF THE PROPOSED CURTIS H. STANTON ENERGY CENTER