Long-Range Dredged Material Management Plan for the Intracoastal Waterway in Indian River County, Florida

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Long-Range Dredged Material Management Plan for The Intracoastal Waterway in Indian River County, Florida

Prepared for

FLORIDA INLAND NAVIGATION DISTRICT

by

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EXECUTIVE SUMMARY

The identification and permitting of suitable dredged material management areas for the Intracoastal Waterway in Florida have become increasingly difficult. This has resulted from the nature of dredging, the requirements of handling and storing dredged material, and the environmentally sensitive and rapidly developing areas in which these operations are performed. In response to this situation, the Florida Inland Navigation District (FIND) initiated, in 1986, a program of long-range dredged material management. When fully implemented this program will provide a permanent infrastructure of management facilities for all maintenance material dredged from the 370 miles of Intracoastal Waterway channel connecting Fernandina Harbor in Nassau County with Miami Harbor in Dade County.

The FIND's program, executed in close cooperation with the Jacksonville District Corps of Engineers, comprises three main elements: (1) a two-phased plan development and property acquisition element, (2) a facility permitting and construction element, and (3) a facility operation element. Program execution begins with the development of long-range dredged material management plans for the Waterway on a county-by-county basis (Phase I of the planning and property acquisition process). Upon finalization of each plan, Phase II of the planning and property acquisition process begins with site boundary surveys. The process continues with detailed environmental site characterizations, soils testing, topographic surveys, preliminary facilities design and site plans, site operation and management plans, and a summary of expected costs for site development and operation. All of this information is then used for property acquisition and facilities permitting.

This report presents the Long-Range Dredged Material Management Plan for the Intracoastal Waterway in Indian River County. Similar plan documents have been completed and approved for the Waterway in Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Martin, and Palm Beach Counties. In addition, comparable plan documents are nearing completion for the Waterway in St. Lucie County. Phase II of the plan development and property acquisition program element will develop the site specific documentation described above for the recommended primary sites. Barring unforeseen circumstances and changes in conditions at the time of this report, the FIND will then actively pursue acquisition of these sites during Phase II.

The methods used in the development of the long-range dredged material management plan for the Intracoastal Waterway in Indian River County are based on those used in the development of previous plan

documents for the Waterway in Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Martin, and Palm Beach Counties. The major tasks performed as part of the present effort were as follows: (1) establishment of the 50-year material storage requirement within the Indian River County project area based on historic maintenance dredging volumes and subsequent examination surveys; (2) evaluation of the remaining or potential storage capacity of existing easements and FIND-owned tracts within the project area; (3) development of a management concept or strategy appropriate to specific engineering and operational requirements, and environmental and land-use constraints; (4) identification of additional candidate sites consistent with the management concept; and (5) evaluation of all candidate sites based on a standard set of criteria. These criteria were developed within the framework of the management concept and reflect engineering, operational, environmental, and land-use considerations.

To begin this process, engineering records at the Jacksonville District Office, U.S. Army Corps of Engineers were reviewed and data from the FIND's 1996 ICWW channel survey were analyzed to develop estimates for the 50-year maintenance dredging and material storage requirements of the 23.31 miles of channel within the study area. The analysis showed a projected total storage requirement of 602,541 cubic yards of bulked material distributed over three channel reaches. Preliminary assessment was then made of the 22 tracts totaling over 3,303 acres the FIND holds under perpetual easement or fee simple ownership. This assessment revealed that only six sites contained within seven existing easements or FIND-owned sites met the most basic criteria of reasonable upland acreage and thereby showed potential for continued use as a dredged material management area. All six of these sites were retained as a candidate sites for further evaluation. Five of the sites, located on islands in the Indian River, were retained for further evaluation despite the lack of road access.

With the maintenance characteristics and the projected 50-year material storage requirement of the Waterway within the Indian River County project area thus established, a management concept was then developed to guide the identification and evaluation of alternative candidate sites consistent with the unique characteristics of the project area and the projected channel maintenance requirements. In this manner, unrealistic and impractical alternatives were eliminated so that the identification of more reasonable alternatives could proceed logically. The principles of the management concept adopted for Indian River County are as follows:

(1) In all segments of the Waterway, dredged material will be placed in diked upland management facilities having existing or potential road access.

(2) Centralized upland sites will be established in a minimum number of locations per operating reach of the Waterway.

(3) Sites will be operated and maintained as permanent facilities in which dredged material will be actively managed.

Within this framework a total of 29 alternative candidate sites were identified. Each of the 29 alternative sites, as well as each of the six existing sites, was then field inspected and evaluated under a standard set of criteria addressing engineering, operational, environmental, and land-use considerations. By this process, eight sites were selected to form a site bank of three primary (first-choice) options and five secondary alternatives. All of the area contained in the three primary sites represents newly identified properties not presently controlled by the FIND. Of the secondary alternatives, two of the sites, representing 31 acres, are currently owned by the FIND.

A vital element in the plan development process was the participation of key federal and state agency representatives, as well as representatives of local government and interested public citizens. At key points during Phase I of the project, a Technical Advisory Committee consisting of representatives from the FIND, the Florida Department of Environmental Protection (FDEP), the Florida Department of Community Affairs (DCA), and the Jacksonville District, U.S. Army Corps of Engineers met with the contractor to monitor work in progress and review technical decisions for the execution of future tasks. These meetings were supplemented with continuing dialogue with key agency personnel. In addition, a Citizens' Advisory Committee appointed by the Indian River County Commission periodically reviewed the specific plan as it developed. Finally, at key stages in the plan development process, the results of all efforts to that point were presented to the general public at Public Information Workshops held in the Indian River County Commission chambers in Vero Beach. At the workshops, comment was actively solicited from representatives of local government, civic groups, and interested citizens. Input and guidance received from all those who participated in the committee meetings and workshops proved invaluable to the successful completion of the project.

Experience gained from the earlier long-range dredged material management studies completed for the Waterway in Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Martin, and Palm Beach Counties has demonstrated the importance of systematic documentation of dredged material management alternatives and the basis upon which these alternatives are evaluated. This Phase I report provides such information for the long-range dredged material management plan for the Intracoastal Waterway in Indian River County and

documents all work performed under this contract. A companion set of 14 photobase engineering plans summarize pertinent channel and site information. Phase II of this project will develop all of the detailed engineering, environmental, and survey information necessary to design, permit, and construct permanent dredged material management facilities on each of the primary sites selected. Phase II will also address cost considerations associated with these actions and will develop detailed site operation and management plans. A detailed scope of work for Phase II of the project is presented in Chapter 5.0 of this report.

ACKNOWLEDGEMENTS

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1.0 INTRODUCTION

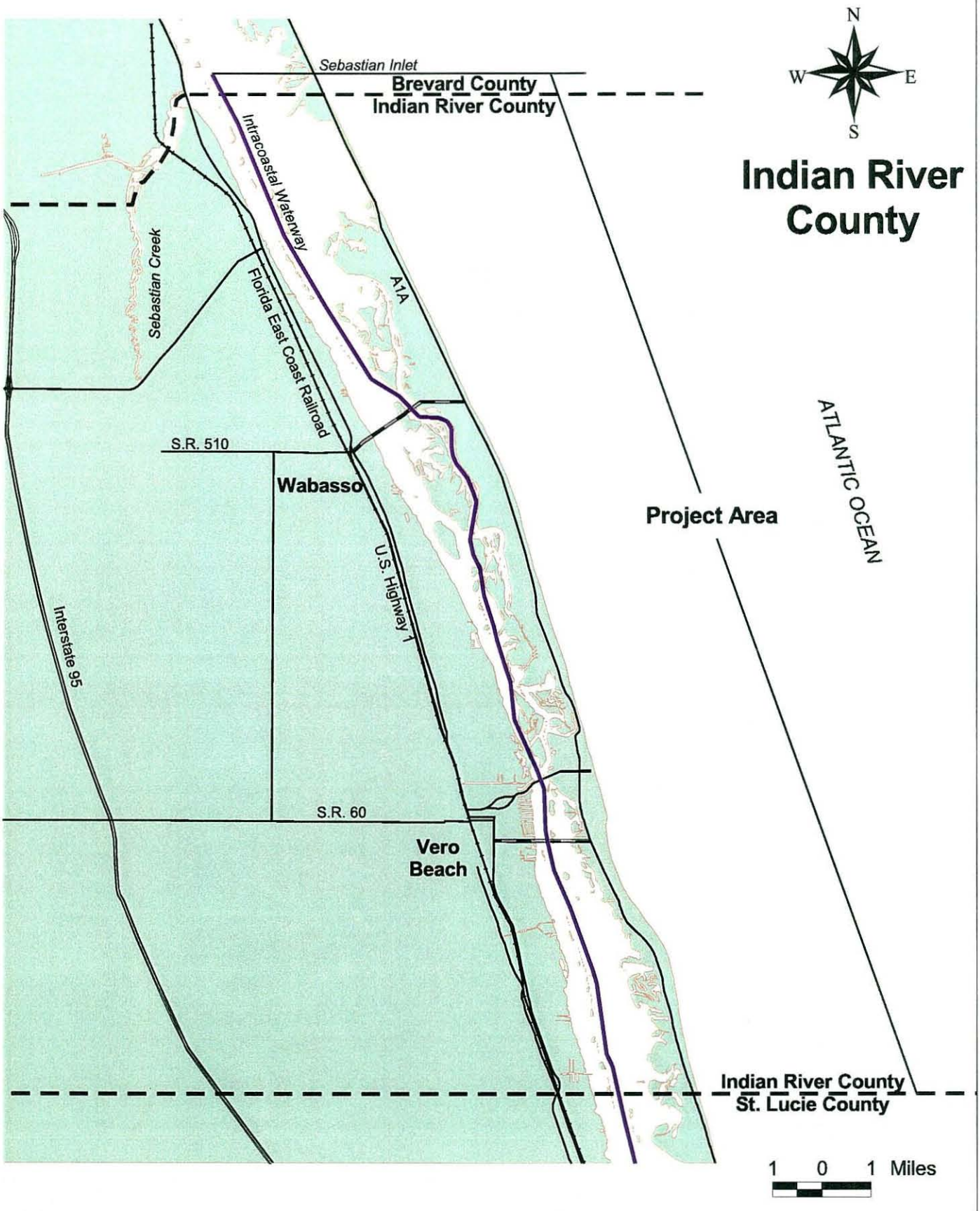
This report documents Phase I of a two-phased effort to develop a 50-year plan for the management of maintenance material dredged from Intracoastal Waterway (ICWW or Waterway) channels in Indian River County, Florida (Figure 1.1). Phase I focused on the development of basic plan concepts, the definition of long-term dredging requirements, and the identification of suitable management alternatives which satisfy preliminary environmental, engineering, and operational criteria. Phase II will focus on obtaining and documenting detailed site-specific information required for the preparation and submission of permit applications for the primary or first-choice sites identified in Phase I. In addition, Phase II will address the design of site facilities and will plan the construction and continuing operation and maintenance of these sites as permanent dredged material management facilities.

The methods used in the performance of the work reported herein are based on a study (Taylor and McFetridge, 1986) which addressed similar needs of the ICWW within Nassau and Duval Counties, Florida. This earlier effort, performed under the sponsorship of the Florida Inland Navigation District (FIND), served as a pilot study for the FIND's 15-year Atlantic Intracoastal Waterway Maintenance and Management Plan. Phase II of the Nassau-Duval study is now complete. With the acquisition of seven upland sites, the FIND will construct dredged material management facilities intended to serve the needs of the ICWW within Nassau and Duval Counties for a minimum of 50 years. With minor modification, the same method has more recently been applied to St. Johns, Flagler, Volusia, Brevard, Martin and Palm Beach Counties. Phase II has been completed in all these counties as well.

Experience gained from these earlier projects has demonstrated the importance of documenting the evaluation process used to identify management alternatives. This report provides such documentation for the long-range dredged material management plan for the ICWW in Indian River County.

1.1 Background

Since its formation in 1927, the FIND has served as the state governmental body responsible for maintaining the ICWW channel along Florida's east coast between Fernandina Harbor and Miami. As such, the FIND must provide the U.S. Army Corps of Engineers (COE) with sites suitable for placing material dredged from the authorized federal navigation channel.



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 1.1 Project Area Long Range Dredged Material Management Plan, Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

Prior to the increased environmental awareness of the 1970's and the recognition by various federal and state regulatory agencies of the value of estuarine wetlands, a short-term economic approach guided management of dredged material. Engineering, cost, and operational considerations determined the design and execution of channel maintenance projects. To this end, the Trustees of the Internal Improvement Trust Fund granted to the FIND perpetual easements to significant acreage along the Waterway. A majority of these easements were located entirely within the sovereign waters of the state and included both open water areas and expanses of pristine salt marsh and mangrove wetlands. Additionally, many landowners with holdings adjoining the Waterway sought to improve the development potential of wetlands by granting disposal easements and allowing the unconfined placement of maintenance material. This approach, combined with the desire of the dredging contractor to maximize operational efficiency, resulted in the proliferation of numerous small spoil mounds and islands lining the Waterway.

As a result of society's increased environmental awareness and the scientific knowledge supporting it, the unconfined placement of dredged material within wetland areas is no longer a responsible approach to the maintenance of the ICWW. Neither is it a realistic approach given present-day agency imposed permitting constraints. Current state and federal legislation mandates that all dredging and dredged material management activities satisfy a spectrum of environmental requirements dealing with water quality, habitat protection, threatened and endangered species, and the filling of wetlands. Specific prohibitions against the unconfined placement of dredged material in wetlands are contained in Sections 301 and 404 of the Clean Water Act (33 U.S.C. 403) administered by the U.S. Environmental Protection Agency; Section 10 of the Rivers and Harbors Act administered by the U.S. Army Corps of Engineers; and Chapters 253, 258, and 403 Florida Statutes and Chapters 17-4, 18-20, and 18-21 of the Florida Administrative Code administered by the Florida Department of Environmental Protection. In addition, local county and municipal governments typically address dredge-and-fill issues in local comprehensive planning documents within guidelines established by the state. The long-range implications of these constraints have become more apparent in the ensuing years as existing sites reach capacity and as the identification and permitting of dredged material management sites become increasingly difficult. Moreover, the intensive development pressure being experienced throughout coastal Florida has made the acquisition of additional sites an ever more expensive proposition.

In order to secure its ability to maintain the ICWW within the existing framework of engineering, operational, and environmental constraints, the FIND initiated a 15-year program of long-term planning and site acquisition to provide a means for accommodating all maintenance material dredged from the Waterway during the next 50 years and beyond. The first program element addressed the needs of the Waterway within

Nassau and Duval counties, as discussed in Chapter 1.0. The program continues, now guided by a prioritization of Waterway segments, county by county, based on each county's need for immediate channel maintenance, as well as on the difficulty of providing appropriate sites within each county. This prioritization, jointly decided upon by the FIND and the Jacksonville District COE, identified two counties — Indian River and St. Lucie — as the fourth group of counties in need of long-range dredged material management plans. This Phase I report documents the development of the long-range dredged material management plan for the Intracoastal Waterway in Indian River County.

1.2 Project Overview

Phase I development of the long-range dredged material management plan for the ICWW in Indian River County consists of four components: (1) the determination of projected 50-year channel maintenance and dredged material storage requirements; (2) the formation of an appropriate management strategy or concept for satisfying these requirements; (3) the identification of candidate sites designed to meet the projected storage requirements within the framework of the management concept; and (4) the evaluation of each site based on a set of criteria consistent with the management concept. This report documents each of these plan components.

1.2.1 Advisory Committees and Public Workshops

The prosecution of this project included, by design, a four-tiered involvement of outside reviewers and interested members of the public who commented on the long-range dredged material management plan as it developed. These four sources of input consisted of (1) a Technical Advisory Committee comprising representatives from the Florida Inland Navigation District staff, the Jacksonville District Corps of Engineers, the Florida Department of Environmental Protection, and the Florida Department of Community Affairs; (2) a Citizens' Advisory Committee comprising community representatives appointed by the Indian River County Commission; (3) the Board of Commissioners for the FIND; and (4) the general public. The manner in which these groups were involved in the development of the long-range dredged material plan is described below.

The Technical Advisory Committee met with members of the Taylor Engineering staff a total of four times during the course of the project to monitor work in progress and review technical decisions for the execution of future tasks. The first meeting of the Technical Advisory Committee was held October 13, 1995, at the Jacksonville District offices of the U.S. Army Corps of Engineers. At this meeting, the Committee

reviewed long-term Waterway requirements, the inventory of existing easements and their ability to meet these requirements, the development of the management concept, the preliminary identification of alternative candidate sites, and the establishment of a preliminary site bank consisting of both existing easements which demonstrated some potential for continued use and newly identified alternative sites. The second meeting of the Technical Advisory Committee was held February 29, 1996, at the offices of the FDEP in Tallahassee. At this meeting, the Committee reviewed the results of the field inspection of all sites within the preliminary site bank, as well as the preliminary assessment of the preferred alternative sites for each reach of the project area. The need to complete a comprehensive survey of the ICWW, including the Indian River County segment, to update and augment existing channel survey data delayed the third meeting of the committee until March 6, 1997. Again held at the offices of the FDEP in Tallahassee, this meeting reviewed the results of the additional survey data, the revised material storage requirements based on this data, and the revised site bank of primary and secondary alternatives for each reach of the project area based on the revised requirements. The fourth and final meeting of the Technical Advisory Committee, held June 4, 1997, at the offices of the Jacksonville District Corps of Engineers, reviewed the final draft of the present report prior to its finalization and approval by the FIND Board of Commissioners at its August 1997 meeting. The plan presented in this report reflects the valued contribution of this group.

Immediately following each Technical Advisory Committee meeting, a meeting was held with the Marine Advisory/Narrows Watershed Action Committee (MANWAC; Appendix F), a standing committee appointed by the Indian River County Commission that also served as the Citizens' Advisory Committee for the FIND project. A total of four meetings of this committee were held to review project work: October 16, 1995; March 5, 1996; March 17, 1997; and July 24, 1997. Each meeting took place in the Indian River County Administration Building in Vero Beach. The material discussed and reviewed at these meetings paralleled that covered in the Technical Advisory Committee meetings. Most importantly, additional input was received from the members of the Citizens' Advisory Committee regarding the relative practicality and desirability of developing specific candidate sites as permanent dredged material management facilities. As a result, many valuable suggestions were received and, in many cases, acted upon to the betterment of the final plan. The contributions of these individuals were a key factor in the successful completion of the project.

In addition, a series of presentations and workshops were carried out to inform both the citizens of Indian River County and their elected officials of the FIND's intended action. To begin, the staffs of FIND and Taylor Engineering made a presentation to the Indian River County Commission on September 12, 1995, to introduce the FIND program of long-range dredged material management for the Intracoastal Waterway, to

inform the Commission that they had initiated a planning effort for the Waterway in Indian River County, and to request the appointment of a Citizens' Advisory Committee.

To inform the citizens of Indian River County and to receive additional input, four Public Information Workshops were held. Each of these workshops were advertised in the display and legal notice sections of the *Vero Beach Press-Journal* newspaper. Additionally, an FIND-initiated mailing list that included government representatives in Indian River County and other interested parties was used to distribute meeting notices and status reports (Appendix F). Held at the Vero Beach City Hall on October 16, 1995, and at the Indian River County Administration Building in Vero Beach on March 5, 1996, March 17, 1997, and July 24, 1997, these workshops presented the work accomplished to date and set forth the direction of the plan at that time. Input received from both the Technical Advisory and Citizens' Advisory Committees was incorporated in the information presented and discussed at the public workshops.

Finally, progress made in the development of the Long-Range Dredged Material Management Plan for the Intracoastal Waterway in Indian River County was discussed at the regularly scheduled public Board meetings of the Florida Inland Navigation District. These public meetings are held monthly on a rotating basis in each of the 11 counties comprising the District. During Phase I of the Indian River County project, progress reports and updates were presented and discussed by the FIND Board at eleven public meetings and workshops to date. These include the four FIND public workshops held in Daytona Beach (Volusia County) on October 21, 1995, in Ft. Pierce (St. Lucie County) on February 17, 1996, in Hollywood (Broward County) on April 20, 1996, and in Palm Beach Shores (Palm Beach County) on August 24, 1996, as well as the seven FIND Board meetings held in Vero Beach (Indian River County) on December 8, 1995, in Ponte Vedra Beach (St. Johns County) on January 26, 1996, in Port Salerno (Martin County) on March 22, 1996, in Marineland (Flagler County) on May 17, 1996, in Jacksonville (Duval County) on July 19, 1996, in Miami (Dade County) on September 6, 1996, and in Stuart (Martin County) on March 21, 1997. The final report is scheduled to be formally adopted by the Board at its meeting of August 1997.

The constructive and valuable input received from each of the above described sources contributed greatly to the successful completion of the Long-Range Dredged Material Management Plan for the Intracoastal Waterway in Indian River County.

1.3 Plan Document

The entire planning process is documented in the remaining sections of this report. Chapter 2.0 describes the establishment of 50-year material management requirements for various reaches of the Waterway. This was accomplished by the use of historic data, and the comparison of projected dredging locations and material storage requirements with the capacities of existing disposal easements. Chapter 3.0 discusses the management concept, the identification of alternative sites, and the field inspection and initial evaluation of all candidate sites, comprising both existing easements and alternative sites. Chapter 4.0 describes the final site evaluation process and includes the evaluation criteria used and the formation of the site bank of first- and second-choice options from the list of candidate sites. Finally, Chapter 5.0 presents a specific scope of work for plan implementation in Phase II.

2.0 50-YEAR MATERIAL STORAGE REQUIREMENT

2.1 Historic Analysis

2.1.1 Methodology

Fifty-year dredging and material storage requirements for the Indian River County segment of the Waterway were projected from documented shoaling in the Waterway channel. Baseline shoal volumes, in turn, were derived from two quantities: (1) the estimated volume of material removed from the Waterway channel in all maintenance dredging operations since the present channel project depth was established, and (2) the estimated volume of shoaling presently within the authorized channel, based on a 1996 examination survey of the entire Atlantic Intracoastal/Intracoastal Waterway in Florida, including the St. Lucie County channel segment. The latter quantity represents the volume of shoaling which has occurred since the last maintenance operation or which has occurred in areas not covered by later channel maintenance.

The first quantity, the volume of historic maintenance dredging, is derived from COE records, as previously stated. The estimated quantity is based on the analysis of all plans and supporting documents for channel maintenance performed in the Indian River County segment of the ICWW since the channel was deepened to its present project depth of 12 ft below Mean Low Water (-12 ft MLW). Within Indian River County, the deepening of the channel was performed in two phases — from Melbourne in Brevard County southward to Wabasso (Cut IR-5, sta 0+00; ICWW mile 202.18) in 1957, and from Wabasso southward to Ft. Pierce in St. Lucie County between early 1959 and late 1960.

To estimate the volume of historic dredging activity, a comprehensive analysis was then conducted of all maintenance dredging occurring in the ICWW in Indian River County since 1957. All available sources of dredging information within the Jacksonville District COE were consulted to ensure accuracy, consistency, and completeness. Preliminary sources included the annual Office of the Chief of Engineers (OCE) Reports, previous COE summaries of maintenance dredging within the project area, and interviews with COE personnel. The primary sources of information, however, were archival maintenance plan documents and examination surveys.

The compilation and reduction of historic dredging information from the various preliminary sources was a difficult task. No single source had complete information, and the resolution of inconsistencies among

sources was necessary prior to locating dredging plans. This task accomplished, the records then had to be physically located under several filing systems within the district office archives and missing plans recalled from inter-division loan or from alternate storage at the Jacksonville District Dredge Depot. All relevant dredging information was verified by reference to the original plan sheets or microfiche versions of the original engineering drawings. Additional information contained in the dredging plans included shoaling areas and limits of planned dredging (referenced to the existing longitudinal stationing), the estimated dredging volume for each shoal and, in many cases, the location of material placement.

The archival records express the volume of material dredged in previous channel maintenance operations in two forms. The first is the pre-dredging estimate, or the design volume, of required dredging. This estimate is obtained by comparing the results of a detailed pre-dredging examination survey of the authorized channel to the project design depth, plus the required advanced maintenance or overdepth dredging. The plan for the dredging operation and the bids of the dredging contractors are based on this estimate. The second estimate is recorded as the pay volume. This estimate determines the dollar amount the dredging contractor receives for the work. It is based on the comparison of detailed pre- and post-dredging examination surveys, and therefore closely corresponds to the actual volume of material removed from the channel. Because of past contracting and recording procedures, pay volumes do not always link dredging quantities to specific dredging locations. In those maintenance operations for which the pay volume is unavailable, the pay volume was estimated by multiplying the design volume by a correction factor. Derived from all dredging records evaluated thus far in the FIND's long-range program, the correction factor of 1.19 represents the ratio of pay volume to design volume in those channel maintenance operations for which both quantities are known.

This procedure established that no maintenance dredging has been performed in the Indian River County segment of the Waterway since the establishment of the present project depths. However, as discussed later in this section, the lack of channel maintenance does not necessarily indicate an absence of shoaling. Factors unrelated to shoaling often determine the scheduling of channel maintenance. These include contracting procedures, the availability of funding and equipment and, most relevant to the present study, the availability of suitable dredged material management sites. As discussed in Section 2.3, Indian River County has suffered from a lack of placement sites appropriate to receive dredged material under today's regulatory criteria.

More recent channel survey data supports the contention that the lack of channel maintenance in Indian River County is attributable more to the lack of appropriate placement sites rather than the absence of shoaling.

The most recent COE survey data by which to characterize shoaling within Indian River County is contained in the results of the COE's October 1987 channel centerline survey. This survey identified a number of shoals throughout the Indian River County segment of the Waterway. However, the survey — performed to established COE criteria for an *examination-level* survey — does not contain the horizontal or vertical control, nor the level of detail, felt necessary to clearly establish existing patterns of shoaling on which a reasonable projection of future dredging and material storage requirements could be based.

To augment and update existing data on shoaling within the Indian River County segment of the Waterway, the FIND undertook a comprehensive survey of the entire Atlantic Intracoastal/Intracoastal Waterway from Fernandina Harbor in Nassau County southward over 370 channel miles to Biscayne Bay in Dade County. Performed by Sea Systems, Inc. under the direction of Taylor Engineering, Inc., the triple sweep survey encompassed the centerline of the authorized channel and two parallel offset lines to characterize the entire channel width. Horizontal and vertical control was maintained throughout the survey in accordance with Corps of Engineers specifications. Taylor Engineering then developed mathematical routines to integrate the three lines of survey data and calculate shoal volumes in approximately 25 ft square grids for the entire channel. Shoal locations were identified as those areas in which the surveyed depths were less than the established project depth for that segment of the Waterway. Shoal volumes were then calculated based on additional 1 ft of overdepth dredging in accordance with COE practice. The values for individual grids were then summed to obtain individual shoal volumes. The resulting volumes were taken as the *design volume* for which a corresponding *pay volume* was derived by the method described above.

The development of plan elements which address the needs of the ICWW in Nassau, Duval, St. Johns, Volusia, Brevard, Martin and Palm Beach Counties has demonstrated that a necessary first step in the analysis of dredging records and survey data is to establish an accurate and consistent system for cross-referencing a particular location along the ICWW to both cut and station (sta), and channel mile. Moreover, such a system must resolve inconsistencies between project descriptions found in older engineering records and those of more recent origin. These inconsistencies were resolved by adopting current designations of channel cut and station and referencing them to ICWW channel mileage. The system is therefore derived from Jacksonville District control data, as well as the original navigation project record document which accompanied the establishment of the 12-ft MLW project depth in Indian River County between 1957 and 1959. Consistency with the previous plan elements was maintained by measuring channel mileage from the southern boundary of the Jacksonville Harbor project (ICWW mile 0.0).

Notably, the 1996 channel survey introduced a necessary correction to the framework of channel mileage used in all previous plan documents comprising the long-range dredged material management program. The survey provided for the first time an accurate measurement of an uncontrolled segment of the Waterway through St. Augustine in St. Johns County. This uncontrolled section, within which no authorized channel location has been designated, was previously estimated to be 18.80 miles in length as scaled from aerial photographs, NOAA nautical charts, and USGS topographic quadrangle maps. The 1996 channel survey determined the length of the uncontrolled section to be 19.62 miles, based on the present position of the navigation aids through the uncontrolled section. This framework, referenced to the revised ICWW mileage, was used throughout the remainder of the study. Accordingly, to be consistent with the revised ICWW mileage framework, all locations south of St. Augustine in St. Johns County referenced to ICWW channel mile in previous plan documents comprising the long-range dredged material management program should be increased by 0.82 miles.

Inspection of Table 2.1 shows that the ICWW within the Indian River County project area comprises 35 straight line segments, or cuts, totalling 23.31 miles. This total includes 33 cuts — designated Cuts IR-2 through IR-34 — entirely within Indian River County. It also includes Cut IR-1 that begins in southern Brevard County 2,375 ft north of the Brevard/Indian River County line and extends an additional 3,635 ft into Indian River County. The segment of the Waterway extending northward from the northern end of Cut IR-1 was previously addressed in the development of a long-range dredged material management plan for the Intracoastal Waterway in Brevard County. Also included in the Indian River County project area is the northernmost 3,150 ft of Cut IR-35. Cut IR-35 begins in Indian River County but extends across the county line into St. Lucie County. The remaining 2,434 ft of Cut IR-35 that lies within St. Lucie County is addressed in the development of a dredged material management plan for St. Lucie County.

2.1.2 Material Quantities and Locations

Table 2.2 presents the locations and calculated volumes of shoals identified in the 1996 survey of the Indian River County segment of the Waterway channel. All shoal locations are referenced both to channel cut and station and to the revised framework of ICWW mileage discussed in the previous section and presented in Table 2.1. Shoal locations are also depicted in Figure 2.1.

Table 2.1 Intracoastal Waterway, Indian River County

			Mileage		
End of Cut	End Station (ft)	Length (mi)	0.0 @ Cut IR-1, Sta. 0+00	ICWW Mileage 0.0 @ DU-1	0.00 @ South Side of FHP (Beginning of AIWW)
BV-37	36+72	0.70	-	195.15	217.46
IR-1	60+10	1.14	1.14	196.29	218.60
IR-2	130+21	2.47	3.61	198.75	221.06
IR-3	89+27	1.69	5.30	200.45	222.75
IR-4	91+85	1.74	7.04	202.18	224.49
IR-5	35+50	0.67	7.71	202.86	225.16
IR-6	31+31	0.59	8.30	203.45	225.76
IR-7	21+65	0.41	8.71	203.86	226.17
IR-8	9+32	0.18	8.89	204.04	226.34
IR-9	8+98	0.17	9.06	204.21	226.51
IR-10	20+52	0.39	9.45	204.60	226.90
IR-11	9+43	0.18	9.63	204.77	227.08
IR-12	9+27	0.18	9.80	204.95	227.26
IR-13	20+25	0.38	10.18	205.33	227.64
IR-14	18+55	0.35	10.54	205.68	227.99
IR-15	8+16	0.15	10.69	205.84	228.15
IR-16	41+07	0.78	11.47	206.62	228.92
IR-17	17+12	0.32	11.79	206.94	229.25
IR-18	15+70	0.30	12.09	207.24	229.54
IR-19	30+03	0.57	12.66	207.81	230.11
IR-20	35+10	0.66	13.32	208.47	230.78
IR-21	15+53	0.29	13.62	208.77	231.07
IR-22	31+03	0.59	14.21	209.35	231.66
IR-23	16+26	0.31	14.51	209.66	231.97
IR-24	41+00	0.78	15.29	210.44	232.74
IR-25	59+78	1.13	16.42	211.57	233.88
IR-26	22+12	0.42	16.84	211.99	234.30
IR-27	43+87	0.83	17.67	212.82	235.13
IR-28	13+44	0.25	17.93	213.07	235.38
IR-29	30+66	0.58	18.51	213.66	235.96
IR-30	45+20	0.86	19.36	214.51	236.82
IR-31	71+88	1.36	20.72	215.87	238.18
IR-32	14+20	0.27	20.99	216.14	238.45
IR-33	76+46	1.45	22.44	217.59	239.90
IR-34	14+54	0.28	22.72	217.86	240.17
IR-35	55+84	1.06	23.77	218.92	241.23

Table 2.2 Summary of Historical Maintenance Dredging/Recent Shoaling
Intracoastal Waterway, Indian River County, 1957 - 1996

ICWW Mileage From	ICWW Mileage To	Cut/Station From	Cut/Station To	Length (ft)	Year	Design Volume (cy)	Pay Volume (cy)
195.15	196.11	IR-1 / 0+00	IR-1 / 50+74	5,074	1996*	51,893	*61,778*
196.26	196.27	IR-1 / 58+70	IR-1 / 59+01	32	1996*	110	*131*
196.37	196.37	IR-2 / 3+99	IR-2 / 3+99		1996*	22	*26*
196.44	196.50	IR-2 / 8+09	IR-2 / 11+07	301	1996*	156	*186*
196.61	198.66	IR-2 / 16+79	IR-2 / 124+98	10,819	1996*	62,847	*74,820*
198.74	198.77	IR-2 / 129+20	IR-3 / 0+57	180	1996*	405	*482*
198.87	198.90	IR-3 / 5+78	IR-3 / 7+15	137	1996*	147	*175*
198.95	198.99	IR-3 / 9+90	IR-3 / 11+93	201	1996*	152	*181*
199.04	199.17	IR-3 / 14+94	IR-3 / 21+52	660	1996*	1,317	*1,567*
199.42	199.47	IR-3 / 34+89	IR-3 / 37+54	264	1996*	206	*246*
199.59	199.60	IR-3 / 43+95	IR-3 / 44+31	37	1996*	133	*158*
199.76	199.76	IR-3 / 52+98	IR-3 / 52+98		1996*	55	*66*
200.55	200.83	IR-4 / 5+24	IR-4 / 19+89	1,468	1996*	6,281	*7,478*
202.17	202.73	IR-4 / 90+69	IR-5 / 28+74	2,988	1996*	7,950	*9,465*
202.91	203.06	IR-6 / 2+70	IR-6 / 10+38	771	1996*	1,906	*2,269*
203.23	203.24	IR-6 / 19+40	IR-6 / 20+11	74	1996*	148	*176*
203.30	203.35	IR-6 / 23+06	IR-6 / 25+65	259	1996*	441	*525*
203.40	203.45	IR-6 / 28+34	IR-6 / 31+27	290	1996*	2,849	*3,392*
206.33	206.34	IR-16 / 25+97	IR-16 / 26+29	32	1996*	113	*134*
206.51	206.52	IR-16 / 35+49	IR-16 / 36+11	63	1996*	74	*88*
209.19	209.19	IR-22 / 21+98	IR-22 / 21+98		1996*	42	*50*
209.79	209.79	IR-24 / 6+82	IR-24 / 6+82		1996*	51	*61*
211.83	211.83	IR-26 / 13+92	IR-26 / 13+92		1996*	42	*50*
212.78	212.86	IR-27 / 41+49	IR-28 / 2+03	433	1996*	565	*673*
212.92	212.92	IR-28 / 5+11	IR-28 / 5+11		1996*	44	*53*
212.98	215.46	IR-28 / 8+61	IR-31 / 49+98	13,063	1996*	45,682	*54,385*
215.56	215.62	IR-31 / 55+36	IR-31 / 58+56	317	1996*	240	*286*
215.72	215.77	IR-31 / 63+82	IR-31 / 66+35	253	1996*	223	*266*
216.03	216.05	IR-32 / 8+35	IR-32 / 9+24	90	1996*	206	*246*
216.12	216.12	IR-32 / 13+04	IR-32 / 13+35	32	1996*	140	*167*
216.28	216.31	IR-33 / 7+57	IR-33 / 8+89	132	1996*	211	*251*
216.40	216.40	IR-33 / 13+44	IR-33 / 13+44		1996*	82	*98*
216.46	216.48	IR-33 / 17+05	IR-33 / 17+71	63	1996*	239	*285*
216.54	216.60	IR-33 / 21+27	IR-33 / 24+21	296	1996*	509	*606*
216.67	216.68	IR-33 / 27+82	IR-33 / 28+51	69	1996*	112	*133*

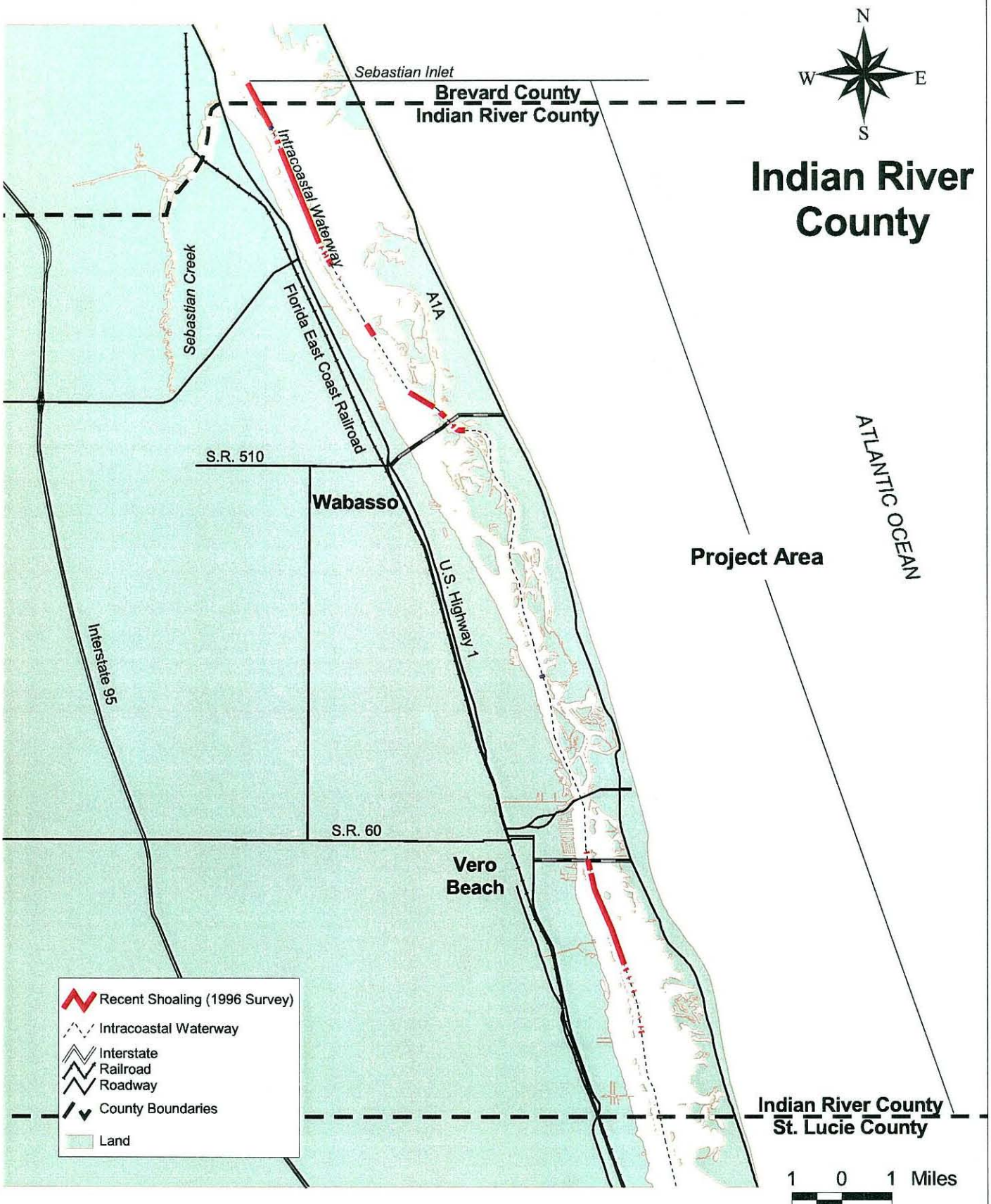
Total Design Volume:	185,596	
Total Pay Volume:	220,952	
Dredging Volume/yr:	5,605	cy
50-yr Dredging Requirement:	280,252	cy
50-yr Disposal Requirement:	602,541	cy

Numbers in *italic* are based on the relationship:

Pay Volume = 1.19 x Design Volume

* : Data from 1996 channel survey performed by Sea Systems, Inc. for the Florida Inland Navigation District.

TABLE2-2.xls



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 2.1 Areas of Historic Mainteance Dredging/ Recent Shoaling Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

Table 2.2 reveals that the estimated total volume of shoaling throughout the county since the channel was deepened to its present depths is 220,952 cy. All of this volume represents material documented by the 1996 channel survey and thus presently remains within the channel. Approximately 95 percent (210,195 cy) of the total volume of shoaling occurs within four discreet shoals. The northernmost, representing approximately 28 percent (61,778 cy) of the county total, is located within the first one mile south of the northern limits of the project area (Cut IR-1, sta 0+00 to sta 50+74, ICWW mile 195.15 to mile 196.11). Located an additional 0.5 miles southward, the second major shoal represents 34 percent (74,820 cy) of the total and extends approximately two miles from ICWW mile 196.61 to mile 198.66 (Cut IR-2, sta 16+79 to sta 124+98). The third major shoal, containing a volume of 19,212 cy, or approximately eight percent of the total shoal volume for the county, extends from ICWW mile 200.55 three miles southward to ICWW mile 203.06 (Cut IR-4, sta 5+24 to Cut IR-6, sta 10+38) to a point immediately north of the Wabasso (S.R. 510) Bridge. The fourth and southernmost major shoal is located approximately 1.5 miles south of the S.R. 60 Bridge and extends 2.5 miles southward (Cut IR-28, sta 8+61 to Cut IR-31, sta 49+98; ICWW mile 212.98 to mile 215.46). The 1996 channel survey documented this shoal to contain 54,385 cy of material, representing 25 percent of the total volume of shoaling for the county. The remaining five percent (10,757 cy) of documented shoaling occurs in minimal shoals closely associated with the larger shoals listed above. Over one-third (3,917 cy) of the volume not contained in the four major shoals occurs within 1,100 ft south of the Wabasso Bridge (Cut IR-6, sta 23+06 to sta 31+07; ICWW mile 203.30 to mile 203.45).

As stated, in terms of the estimated *pay volume,* the 1996 channel survey documented a county-wide shoaling volume of 220,952 cy. Because the channel within Indian River County was deepened to its presently authorized depth in two stages, this total volume of shoaling reflects two periods of record — 40 years (1957–1996, inclusive) for the segment from Wabasso northward (specifically, from Cut IR-5, sta 0+00; ICWW mile 202.18 northward) and 38 years (1959–1996, inclusive) for the segment southward from the same location. To project the corresponding 50-year maintenance requirement, this figure was then apportioned upward by linear extrapolation. The resulting projected dredging volume of 280,252 cy corresponds to the in situ or unbulked volume of dredging anticipated to be required throughout the county over the next 50 years.

To translate the projected 50-year in situ volume of anticipated dredging into the volume of storage required to handle the dredged material, the bulking characteristics of the material must be considered. Bulking refers to the expansion of consolidated sediment that occurs as a result of dredging. Hydraulic dredging leads to material bulking by increasing the water content of the dredged material compared to its in situ, consolidated state. After dredging and placement in the containment area, the dredged material will begin

to consolidate under its own weight. Given appropriate conditions and sufficient time, the material may approach its original pre-dredging volume. The degree to which the material expands (bulks) depends on the physical characteristics of the sediment, as well as its relative consolidation prior to dredging. For this study a factor of 2.0 was used to account for the increase in volume of the in situ shoal material as it is dredged. An additional allowance of 15 percent of the original in situ volume accounts for anticipated non-pay volume or unauthorized overdredging. The selection of these conservative values is based upon Jacksonville District, U.S. Army Corps of Engineers experience and recommendation. Multiplying the projected 50-year volume of shoaling by the effective bulking factor of 2.15 yields a projected 50-year material storage requirement of 602,541 cy for Indian River County.

Significantly, this projected 50-year material storage requirement is among the lowest projected storage requirement among the ten counties addressed thus far in the FIND's long-ranged dredged material management program. Only St. Lucie County, addressed in a companion report, has recorded a lower projected requirement. The previous low was projected for Flagler County. As revised by the results of the 1996 channel survey, Flagler County is projected to require a material storage capacity of 2,419,836 cy to serve the needs of its segment of the Waterway over the next 50 years, a volume over four times that required by Indian River County. For comparison, the highest storage requirement is projected for Volusia County. Again as revised by the results of the 1996 channel survey, Volusia County is projected to require a material storage capacity of over 10.7 million cy, or almost 18 times the requirement projected for Indian River County.

2.1.3 Material Quality

In addition to projected material quantities, a dredged material management plan must also consider the chemical and physical properties of the sediment to be dredged. Techniques employed to maintain water quality during dredging and dewatering are highly dependent on sediment chemistry and the physical characteristics of the dredged material (i.e., particle size, specific gravity, etc.). Also, the chemical and physical properties of the dredged material determine its potential for reuse and, therefore, influence the effective life of the site. In a procedure similar to that used to establish historic dredging volumes, all available sediment chemistry and physical data were reviewed. To augment the limited data on Indian River County sediments, a program of sediment sampling and analysis was performed specifically for the present planning effort. Both the historic and more recent sediment data are discussed in the following paragraphs.

2.1.3.1 Sediment Chemistry

This section focuses on chemical characteristics of Indian River County sediments. Sediment chemistry is used to determine whether sediments to be dredged from the ICWW are likely to contain contaminants, necessitating special handling of the sediments. Some sediment constituents, such as metals, are natural components of sediments and should only be considered contaminants when their concentrations exceed natural levels. Others, such as pesticides, do not occur naturally and can be considered contaminants if present at any concentration. However, the presence of a contaminant does not necessarily indicate that it will cause adverse effects during dredging or dredged material placement. Expression of contaminant effects depends on a variety of factors, including the contaminant concentration and chemical properties and other sediments characteristics. In this section, historical sediment quality information and additional sediment data recently collected for this Phase I study are evaluated using tools developed by the FDEP and others to interpret sediment quality. The section includes discussion of the distribution of fine *muck* sediments since accumulations of muck sediment have been identified in the ICWW channel in Indian River County and since contaminants have an affinity for the fine-grained sediments.

- *Historical Sediment Information*

The Jacksonville District COE has no sediment quality information for the ICWW in Indian River County in its files. The Florida Department of Environmental Protection (FDEP) has published an atlas of coastal sediment contaminant data that includes some information from Indian River County (Seal et al., 1994). However, none of the FDEP sampling stations are in the ICWW. Information about muck sediment distribution was obtained from Trefry et al. (1990) and Trefry et al. (1987).

- *Sediment Grain Size and Muck Distribution*

Trefry et al. (1990) and Trefry et al. (1987) described the distribution of muck sediments in the Indian River Lagoon. As defined by Trefry et al. (1990), muck sediment is a fine, black sediment containing more than 60 percent silts and clays, more than 50 percent water, and more than 10 percent organic matter. In their initial work, Trefry et al. (1987) found muck sediments in the ICWW and adjacent lagoon sediments for an area extending about one mile north and south of the mouth of Sebastian Creek. Muck sediment was not present in the only other Indian River County sediments sampled, between Wabasso and Vero Beach. In subsequent, more extensive sampling, Trefry et al. (1990) found muck sediments in the ICWW at several

locations in Indian River County. Thick (>30 cm) muck deposits occurred from the mouth of Sebastian Creek about one-half mile southward. Another thick muck deposit, about three-quarters of a mile long, occurred north of the town of Sebastian and a thin (0.2 to 5 cm), one-half mile long muck deposit occurred near the south end of Sebastian. A thick, three-quarter mile long muck deposit was present immediately north of the S.R. 510 Bridge at Wabasso. The remaining muck deposits in the Indian River section of the ICWW are located from Vero Beach south to Oslo, where about half of the waterway channel contained thick or moderate (10–30 cm) muck deposits.

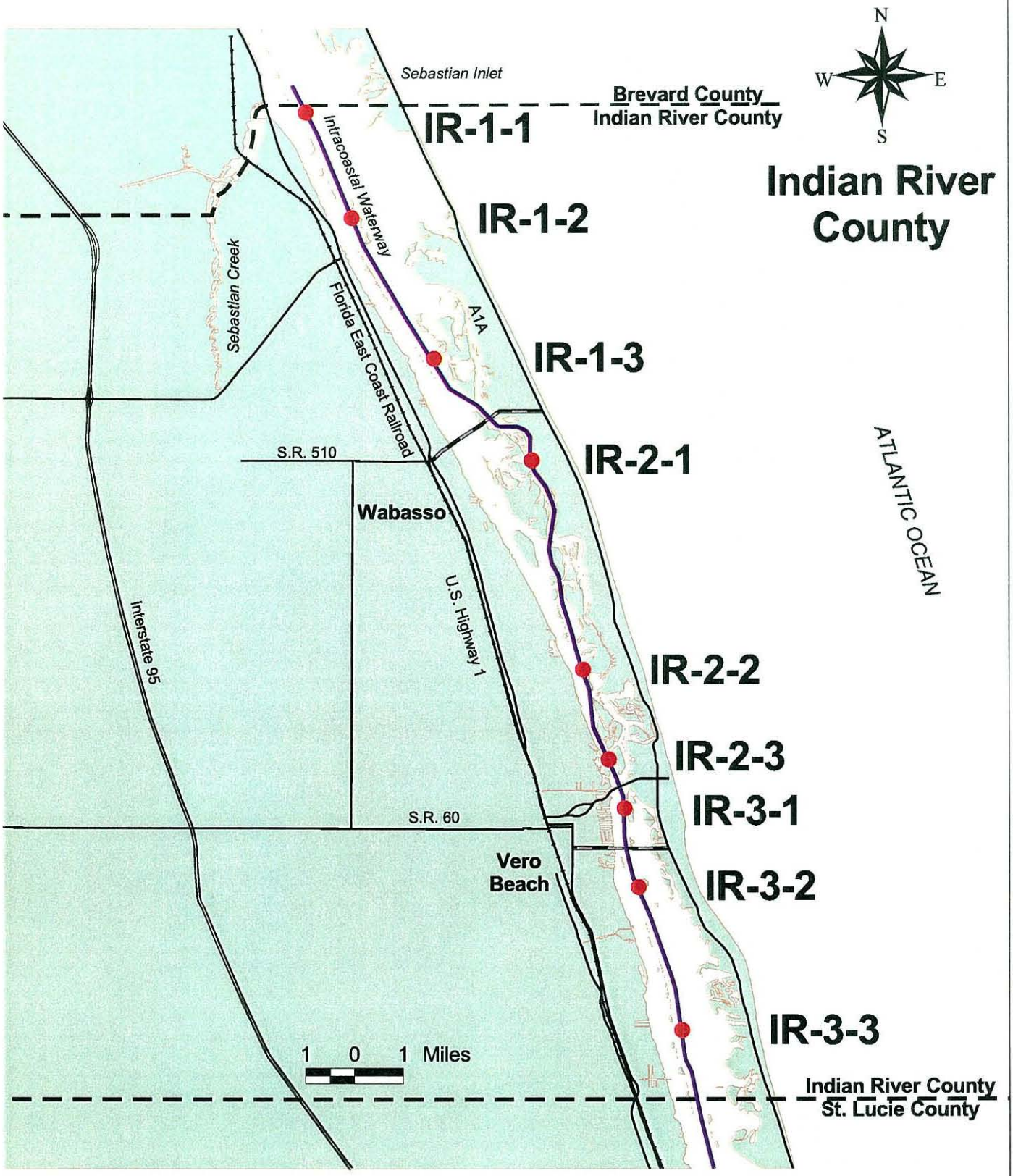
- *Recently Collected Data*

Due to the lack of information about sediments in St. Lucie County, Taylor Engineering obtained and analyzed a limited number of sediment samples from selected locations in the ICWW channel. The objective of this sediment sampling program was to screen sediments for potential contaminants and to verify the presence of muck sediments in areas previously determined to have accumulated fine sediments. This section describes the results from those samples.

- *Sampling Methods and Analyses*

Nine sediment samples were collected from the designated ICWW channel throughout Indian River County (Figure 2.2). Three (one each from the northern, central, and southern portions of the county) were analyzed for metals (aluminum, arsenic, cadmium, chromium, copper, iron, lead, nickel, zinc, and mercury), organochlorine pesticides and polychlorinated biphenyls (PCB), polynuclear aromatic hydrocarbons (PAH), total organic carbon, total Kjeldahl nitrogen, carbonate, and grain size. The six remaining samples were analyzed for grain size only. The samples were collected October 11 and 12, 1995. Specific locations are listed in Table 2.3. Where possible, sediments for chemical analyses were collected from areas of previously described accumulations of fine-grained sediments near potential sources of contamination (e.g., urban areas). These locations were selected to represent potential worst case scenarios for sediment contamination.

Sediment was collected using a stainless steel petite Ponar grab sampler and transferred to pre-cleaned containers using a stainless steel spatula. A subsample of each grab was placed in a separate container for grain size analyses. The sample containers were placed on ice for shipment to the analytical laboratories. Savannah Laboratories & Environmental Services, Inc. performed the chemical analyses using U.S. Envi-



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 2.2 Sediment Sampling Locations Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

Table 2.3 ICWW Sediment Sampling Locations in Indian River County

Station	Reach	ICWW Channel Mile	Analyses[a]	Latitude/ Longitude	Location[b]
IR-1-1	1	195.78	C, GS	27°51.121' N 80°28.665' W	600 ft south of G"61"
IR-1-2	1	198.10	GS	27°49.241' N 80°27.743' W	R"66A"
IR-1-3	1	201.52	GS	27°46.716' N 80°26.094' W	R"74"
IR-2-1	2	204.69	GS	27°44.891' N 80°24.144' W	R"92"
IR-2-2	2	208.99	GS	27°41.125' N 80°23.135' W	600 ft north of G"25"
IR-2-3	3	210.89	C, GS	27°39.525' N 80°22.632' W	G"135"
IR-3-1	3	212.24	C, GS	27°38.645' N 80°22.321' W	G"143"
IR-3-2	3	213.93	GS	27°37.234' N 80°22.046' W	R"150"
IR-3-3	3	217.01	GS	27°34.661' N 80°21.183' W	G"161"

[a]C = Chemistry, GS = Grain size

[b]Samples were taken in the ICWW near the indicated channel marker

ronmental Protection Agency methods. Metals were analyzed by inductively-coupled plasma spectrocopy following total sediment digestion using hydrofluoric acid. Ellis & Associates, Inc. performed the grain size analyses. The analytical results, included in Appendix E, are summarized below.

- *Sediment Grain Size and Muck Distribution*

Of particular interest in the Indian River is the distribution and composition of fine-grained, organic-carbon rich sediments. These sediments, commonly called muck, are of concern because of their potential effects on water quality and benthic communities and for their tendency to accumulate pollutants. As noted

earlier, Trefry et al. (1987) and Trefry et al. (1990) reported that muck sediment was present in several parts of the ICWW in Indian River County.

Mean grain size, silt and clay content, and water content of the Indian River County sediments are listed in Table 2.4. Three of the samples were classified as silts while the remaining six were classified as fine sands. Sediment in the northern part of Reach 1(IR-1-1, IR-1-2) generally contained the greatest proportion of fine-grained material. Station IR-3-2, south of Vero Beach, also contained a high proportion of fine-grained material.

Table 2.4 Physical Characteristics of Indian River County ICWW Sediment

	Mean Grain Size		USC[a] Size	Silt + clay	Water[b]	Organic Matter[c]
Station	(phi)	(mm)		(%)	(%)	(%)
IR-1-1	4.92	0.033	Silt	65	60	14
IR-1-2	5.57	0.021	Silt	87	NA[d]	NA
IR-1-3	3.11	0.116	Fine Sand	19	NA	NA
IR-2-1	2.73	0.151	Fine Sand	12	NA	NA
IR-2-2	2.86	0.137	Fine Sand	4	NA	NA
IR-2-3	3.53	0.086	Fine Sand	13	36	3
IR-3-1	3.72	0.076	Fine Sand	19	35	3
IR-3-2	5.01	0.031	Silt	80	NA	NA
IR-3-3	3.27	0.104	Fine Sand	14	NA	NA

[a]USC = Unified Soil Classification

[b]Water content = 100 - solids(%)

[c]Organic Matter = Total organic carbon * 2.5 (Trefry et al., 1990)

[d]NA = Not applicable; relevant test not conducted on these samples

Stations IR-1-1, IR-3-1, and IR-3-2 were located in areas identified by Trefry et al. (1990) as containing muck deposits. Using Trefry et al.'s (1990) definition of muck, sediment at station IR-1-1 (65 percent silts and clays, 14 percent organic matter, and 60 percent water) is a muck sediment. Sediment at station IR-3-1

is classified as fine sand and does not fit the definition of muck. Only grain size measurements were done at station IR-3-2. The 80 percent silt and clay content of the sediment at this station, however, suggests that it could be classified as muck. These results confirm earlier reports of fine-grained sediments in parts of the ICWW channel.

The presence of fine sediments, whether or not classified as muck, imposes physical constraints on dredged material handling. Since pollutants have an affinity for fine sediments, the presence of these sediments also raises concerns about possible chemical contamination. The results of the chemical analyses of Indian River County ICWW sediment are discussed below.

- *Sediment contaminants*

Metals are natural components of sediments whose concentration may be enriched by man's activities. Only when metal concentrations exceed natural levels should they be considered pollutants. The natural occurrence of metals at variable concentrations complicates the evaluation of metal values. However, the FDEP has described a method for determining natural ranges of metal concentrations based on statistical relationships between metals and a common reference element, aluminum (Schropp and Windom, 1988). The relationships shown in that document permit the calculation of metal enrichment ratios (i.e., the ratio of measured metal concentration to maximum predicted natural concentration), where enrichment ratios greater than one indicate metal contamination.

Metal enrichment ratios for the Indian River County ICWW sediments are listed in Table 2.5. Metal enrichment ratios in all of the tested samples were less than one, indicating that metals in these sediments are within natural ranges. Another approach to interpreting metal concentrations is based on the likelihood of a metal causing adverse effects on aquatic organisms. MacDonald (1995) has calculated *Threshold Effects Levels* (TEL) and *Probable Effects Levels* (PEL) for several metals and other compounds. The TEL indicates metal concentrations below which adverse biological effects are unlikely. The PEL represents a concentration above which adverse effects are usually or always observed. The PEL, TEL, and range of measured metal concentrations are shown in Table 2.6. All metal concentrations are below the TEL, indicating that they are unlikely to cause adverse biological effects.

Organochlorine pesticides, PAH, and PCB concentrations were below detectable limits in all samples. The specific compounds analyzed and their detection limits are listed in Appendix E.

Table 2.5 Metal Enrichment Ratios

Station	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury
IR-1-1	0.06	<0.39	0.39	0.33	0.58	<0.39	0.51	0.19
IR-2-3	0.04	<0.27	0.22	0.38	0.53	<0.27	0.39	0.08
IR-3-1	0.05	<0.28	0.23	0.41	0.65	<0.3	0.42	0.1

Table 2.6 TEL, PEL, and Measured Values ($\mu g\ g^{-1}$) for Metals

Station	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury
TEL	7.24	0.676	52.3	18.7	30.2	15.9	124	0.13
PEL	41.6	4.21	160	108	112	42.8	271	0.696
Measured Range	1.7 - 3.1	<0.15 - <0.25	15 - 36	9.2 - 9.8	11 - 15	<6.2 - <10	18 - 33	0.017 - 0.040

- *Other Sediment Components*

In addition to the chemicals discussed above, several other components of the sediment were examined to ascertain whether the ICWW contains atypical concentrations of chemicals. Total organic carbon and total Kjeldahl nitrogen were compared to the results of statewide sediment data collected by the FDEP from natural coastal sediment from 1984 through 1990. Figure 2.3 shows the results from Indian River sediments superimposed over the FDEP data. A regression equation and 95 percent confidence intervals were calculated for log-transformed FDEP data to establish typical ranges for organic carbon and nitrogen in Florida sediments. The Indian River sediments contain organic carbon and nitrogen typical of those in natural Florida sediments. Concentrations of both organic carbon and nitrogen at Station IR-1-1 in Reach 1 were, however, near the high ends of the natural ranges.

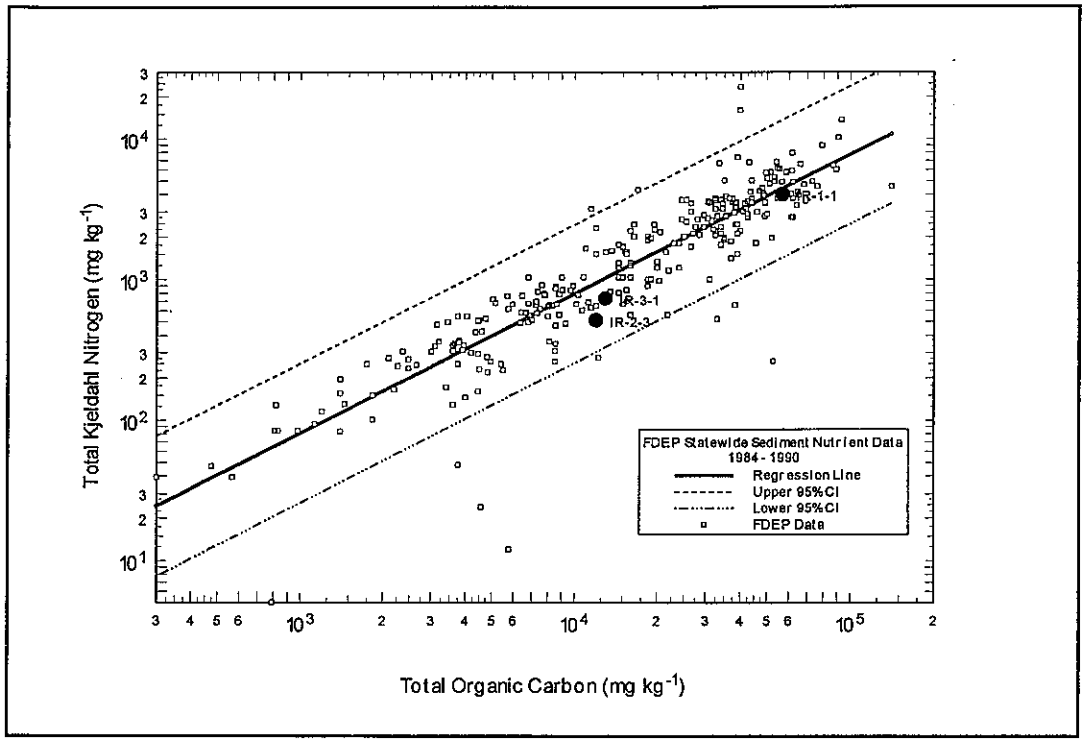


Figure 2.3 Organic Carbon and Nitrogen in Indian River County ICWW Sediment

Oil and grease in sediments have natural as well as pollutant origins. Oil and grease values in the Indian River County ICWW sediments ranged from than 27 to 44 mg kg^{-1}. By comparison, Lyman et al. (1987) reported oil and grease concentrations ranging from 200 to 170,000 mg kg^{-1} in a number of coastal sediments known to be polluted. The Indian River County ICWW sediments, with oil and grease values well below those reported by Lyman et al. (1987), do not appear to be contaminated with oil and grease.

- *Summary*

ICWW sediments in Indian River County have variable physical texture. Recent samples and previous work indicate substantial areas of fine-grained or muck sediment in the northern half of Reach 1, the southern part of Reach 1 north of the S.R. 510 bridge, and in at least part of Reach 3 south of Vero Beach. These fine sediments are likely to accumulate contaminants, if sources of contaminants are present. Sediment in other parts of the ICWW in Indian River County consist of fine sands.

Sediment samples collected for this project suggest that sediment in the Indian River County part of the ICWW do not contain substantial quantities of contaminants. Metals were within natural ranges; pesticides and PCBs were below detectable limits. These samples were taken in areas considered most likely to be contaminated due to the presence of fine sediments and proximity to urban areas. The number of samples was limited, however, and additional chemical testing of ICWW channel sediment will likely be required prior to dredging.

2.1.3.2 Physical Characteristics

The only source of sediment data by which to characterize the physical characteristics of the sediments to be dredged in Indian River County comes from the same program of sediment sampling and analysis described in the preceding section. Samples obtained in all nine locations identified in Table 2.3 and shown in Figure 2.2 were also analyzed for grain-size distribution. The resulting grain-size distribution curves, summarized in Table 2.4, are presented in Appendix E.

The mean grain sizes of the nine samples range from 0.021 mm to 0.151 mm (Table 2.4). Six of the nine samples were classified as fine sand under the Unified Soils Classification (USC) system (i.e., possessing a mean grain diameter greater than 0.074 mm). These include the five samples from the central portion of the county, from just north of the Wabasso Bridge (Sample IR-1-3) to just south of the S.R. 60 Bridge (Sample IR-3-1), as well as the sample from the southernmost station just north of the Indian River/St. Lucie County line (Sample IR-3-3). The remaining three samples, including the two samples from the northernmost stations (IR-1-1 and IR-1-2) and the sample from the station located approximately two miles south of the S.R. 60 Bridge (IR-3-2), are classified as silt (i.e., possessing a mean grain diameter less than 0.074 mm). The coarsest sediment in terms of mean grain diameter was found at Station IR-2-1, located 1.3 miles south of the Wabasso Bridge. The coarsest sediments in terms of possessing the smallest component of silt-size particles were found an additional four miles southward at Station IR-2-2. Only the sediment from this last station contained less than five percent (by weight) of silt-sized particles. All other samples recorded silt-sized fractions from 12 percent (Sample IR-2-1) to 87 percent (Sample IR-1-2). The five samples classified by their mean grain diameter as fine sand contained a mean silt-sized fraction of 13.5 percent. The three samples classified by their mean grain diameter as silt contained a mean silt component of 77.3 percent. Only the sample (Sample IR-2-1) contained a shell component greater than 10 percent.

Of the nine sampling locations, four (Stations IR-1-1, IR-1-2, IR-3-1, and IR-3-2) are located within or near documented shoals. Additional sediment quality data will be required to adequately characterize documented shoals which may be specifically scheduled for maintenance during the next dredging cycle. Core borings will be obtained in connection with a detailed examination survey of each shoal before contracting procedures are begun. Sediment chemistry typically is not analyzed unless such data is required to obtain the necessary Water Quality Certificate from the Florida DEP.

2.2 Existing Sites

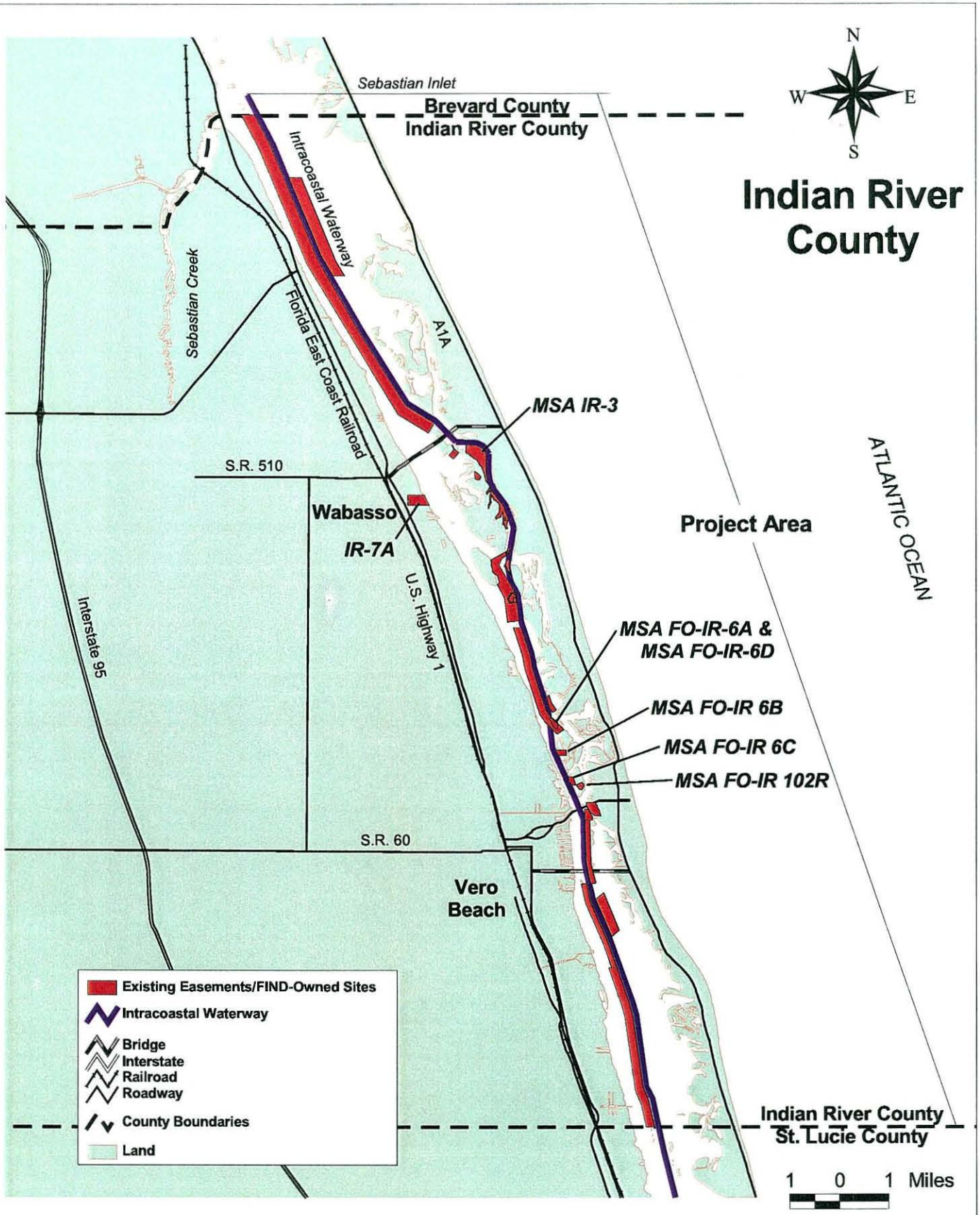
Review of Jacksonville District COE Real Estate Maps (Drawing No. RE-C 12,214) and 1994 FIND aerial blueline basemaps (1" = 200 ft) of the project area reveals that the FIND controls 22 tracts available for dredged material placement. These are identified in Table 2.7 and shown in Figure 2.4. The FIND holds five of these tracts, totalling 100.62 acres, under fee simple ownership, while it holds the remaining 17 privately or publicly owned parcels, totalling 3,208.56 acres, under perpetual easement.

A preliminary evaluation of the remaining 22 disposal easements and FIND-owned tracts was then performed. In addition to the COE Real Estate Maps and FIND aerial basemaps, four other resources were used to perform the evaluation. These include: (1) 1:24,000 scale (1" = 2,000 ft) color-infrared aerial photography, flown March 1983 and March 1984 from the National High Altitude Photography Program of the U.S. Geological Survey (USGS); (2) 1:24,000 scale (1" = 2,000 ft) USGS Topographic Quadrangle Maps, 7.5-minute series; and (3) 1:24,000 scale (1" = 2,000 ft) National Wetlands Inventory maps from the U.S. Fish and Wildlife Service.

Consideration of the most basic operational and site evaluation criteria eliminated all but seven of these tracts from further consideration. The full range of site evaluation criteria are presented in detail in Chapter 4.0 and discussed throughout the remainder of this report. However, at this preliminary level of the site evaluation process, two criteria were of primary consideration — (1) that, to the greatest extent possible, the placement of dredged material must be confined to upland areas; and (2) that a site must contain sufficient upland area to allow the construction of earthen dikes to dewater and store the dredged material. Examination of Table 2.7 confirms that most of the tracts were eliminated because they contained insufficient contiguous upland area, either as a result of minimal overall acreage (e.g., less than five acres) or because the tract consisted primarily of wetlands, most notably mangroves or salt marsh. The seven remaining properties, comprising two perpetual easements and five FIND-owned tracts, therefore exhibited at least some potential for development and use as dredged material management areas.

Table 2.7 Inventory of Disposal Easements/FIND-Owned Sites, Intracoastal Waterway, Indian River County, Florida

FIND Designation	COE Tract No.	ICWW Mile	Total Acreage	Useable Upland Acreage	Containment Capacity (cy)	Comments
MSA-IR-1	366	195.61-203.25	1,170.08	0	0	Open water
MSA-IR-2	367	197.04-199.21	328.56	0	0	Open water
MSA-IR-3	369	203.64-204.78	198.50	7.1	72,100	Contains group of small islands
IR-7A	---	204.13	42.95	20.7	41,074	aka Ryall Groves property
MSA IRIC-2R	377	206.30	0.88	0	0	Open water
MSA IR-4	393	206.30-207.95	163.42	0	0	Contains group of small islands
MSA IR-1A	8100E-1	203.46	12.23	0	0	Marsh, no useable upland
------	8200E-1	206.21	5.02	0	0	Open water
------	8200E-2	206.30	13.67	0	0	Includes portion of Gem Island
MSA FO-IR-4A	8201E	207.25	17.91	0	0	Contains northern Sisters Island
MSA-IR-6	398	207.94-210.77	347.11	0	0	Open water
MSA-FO-IR-6A	------	210.66	15.50	11.6	104,300	Adjacent to MSA IR-6-D Containment capacity given includes both parcels
MSA IR-102-R	403	211.30	7.47	6.5	28,500	Contains portion of Fritz Island
MSA IR-104-R	406	211.68	26.0	0	0	Entire easement in marsh
MSA IR-7	407	211.81-212.06	130.15	0	0	Contains several small islands
MSA IR-6E	8302-1	209.36	14.92	0	0	Contains relic spoil islands
MSA IR-6D	8302-2	210.44	12.09	6.8	---	See MSA FO-IR-6-A
MSA FO-IR-6B	8404E-1	210.24	13.08	8.9	38,700	Useable upland located on island
MSA FO-IR-6C	8404E-2	211.13	11.18	5.5	18,300	Useable upland located on island
MSA IR-8	408	212.06-214.52	209.37	0	0	Contains relic spoil island
MSA IR-9	409	214.52	432.74	0	0	Contains relic spoil island
MSA IR-8A	F608E-2	213.83-218.48	136.35	0	0	Contains relic spoil islands



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 2.4 Existing FIND Easements/ FIND-Owned Sites Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

As identified in Figure 2.4, the seven remaining tracts, combined to form six separate sites, are located south of the Wabasso Bridge and north of the S.R. 60 Bridge; i.e., within the central 7.5 miles of the project area. No viable easements or FIND-owned tracts lie north of the Wabasso Bridge (within project area's northern 8.5 miles) or south of the S.R. 60 Bridge (within the project area's southern 7.3 miles). In the remainder of this section, the seven tracts with at least minimal capability to receive dredged material, as well as the 15 tracts eliminated from further consideration, are discussed in more detail.

Southward from the Brevard/Indian River County line (ICWW mile 195.60) to the Wabasso Bridge (ICWW mile 203.24), two easements, each 1,250 ft wide, parallel the 500-ft right-of-way for the ICWW channel. Adjoining the right-of-way on its western side, MSA IR-1 extends the entire 7.7-mile distance between the two landmarks, and encompasses over 1,170 acres. To the east, MSA IR-2 extends 2.2 miles from ICWW mile 197.03 to mile 199.20 and encompasses 328.56 acres. These tracts consist almost entirely of open water, with the only upland consisting of minimal spoil islands (less than five acres). A portion of Wabasso Island, previously within MSA IR-1, has since been released and, therefore, this upland parcel cannot be considered available for dredged material placement.

In consideration of the release of Wabasso Island, the FIND received title to the Ryall Groves property, a 42.95-acre parcel located on the western shoreline of the Indian River approximately 0.6 miles south of S.R. 510. This property, later designated as candidate Site IR-7A (Section 3.3), contains approximately 20.7 acres of uplands presently in citrus production. The remainder of the property lying east of the grove area is classified as wetlands (mangrove swamp).

Immediately south of the Wabasso Bridge lies easement MSA IR-3. This 198.50-acre easement contains extensive open water and mangrove areas but also includes a chain of 10 spoil islands or mounds separated by tidally inundated mangrove flats. The mounds contain a combined upland area of approximately 19 acres. The largest contiguous block of upland within the chain is approximately 7.1 acres. Continuing southward, a series of eight predominantly open water tracts (total area — 575.16 acres) also contain a number of small islands, at least some of which are formed from dredged material. The largest of the islands, located within MSA FO-IR-4A, is known as Northern Sisters Island. Containing approximately two acres of upland within one apparent spoil mound, this island does not appear to have any potential for containment facility development.

Immediately north of the new S.R. 60 Bridge lies a series of four relatively large islands known as the Fritz Island group. Five tracts, three owned by the FIND — MSA FO-IR-6A, MSA FO-IR-6B, and MSA FO-

IR-6C — and two held under perpetual easement — MSA IR-6D and MSA IR-102R — encumber portions of three of these islands. All of the islands, including the easements and the FIND-owned tracts are vegetated primarily with exotics (Australian pine and Brazilian pepper) with a shoreline fringe of mangroves. Two of these tracts — MSA IR-6D and MSA FO-IR-6A — are located at the northern tip of the northernmost island. Totalling 27.59 acres, these adjacent tracts contain approximately 18.4 acres of upland. A portion of MSA FO-IR-6A has been developed as Joe Earman Park in honor of a former FIND commissioner. The central portion of the west central island contains MSA FO-IR-6B with a total area of 13.08 acres, approximately 8.9 acres of which are upland. The southernmost island includes two separate tracts — MSA FO-IR-6C and MSA IR-102R. Totalling 18.65 acres, the former tract contains approximately 5.5 acres of upland and the latter, 6.5 acres. Continuing southward from the S.R. 60 bridge, the situation is similar to that found north of the Wabasso Bridge. Four easements — MSA IR-7, MSA IR-8, MSA IR-8A, and MSA IR-9 — extend south to the Indian River/St. Lucie County line. Varying in width from 800 ft to over 1400 ft with a total area of 908.61 acres, these easements are predominantly open water with only small spoil islands, each with an upland area of less than four acres.

2.3 Existing Storage Capacity

As discussed above, only seven the 22 tracts controlled by the FIND were determined to have potential for development and continued used as dredged material management areas. As shown in Figure 2.3, these are the Ryall Groves property (IR-7A), MSA IR-3, MSA FO-IR-6A, MSA FO-IR-6B, MSA FO-IR-6C, MSA IR-6D, and MSA IR-102R. Of these, all but two — MSA IR-3 and MSA IR-102R — are FIND-owned tracts.

To further evaluate the six sites contained within seven existing easements or FIND-owned tracts determined to possess some potential for future use, an analysis was performed to determine their maximum potential material storage capacity. The useable upland area of each site was first estimated by inspection of the 1994 FIND aerial basemaps (1" = 200 ft), guided by color-infrared photography, and USFWS wetland inventory maps. This initial estimate of useable upland area was later refined by on-site inspection as discussed in Section 3.4. Further analysis then established whether the useable upland area could provide adequate material for dike construction and whether the resulting capacity within this area supported further consideration of the site. A set of relationships were developed (Appendix C) in which the required volume of dike material, the volume of dike material available on-site, and the resulting storage capacity are expressed in terms of a set of independent variables including dike crest elevation above grade, mean site elevation, depth of excavation, dike side slope, width of dike crest, and required minimum freeboard. During Phase II of the project, dike geometry will be specific to each site. However, for the purposes of this preliminary evaluation,

a standard dike geometry was applied. Selected parameter values are within the range of standard practice for similar sites used for previous maintenance events. Typically, these include a 15-foot crest elevation above grade, a 1V:3H side slope, a 12-foot crest width, a 20-foot setback of the interior excavation from the inside toe of the dike, and a minimum freeboard plus ponding allowance of four feet. Calculations were based on a realistic dike configuration (i.e., a three- to five-sided polygon), which utilizes the maximum available upland area as delineated by photogrammetry. The mean grade elevation for each site was estimated from survey transects, if available, or from USGS Quadrangle maps. In the case of the relatively small sites within Indian River County considered to have some potential for future development, small upland acreage and low mean grade elevation restricted the available dike material, and thereby limited the height of the dike crest to 12 ft or less above the existing grade. The result of the preliminary capacity analysis, presented in Table 2.7, indicates that the maximum capacity achievable within the seven tracts (six sites) is approximately 303,000 cy.

Comparison of the estimated capacity of existing easements or FIND-owned tracts (303,000 cy) with the 50-year projected capacity requirement for the Indian River County segment of the ICWW (602,541 cy, Table 2.2) shows that the existing capacity represents 50 percent of the long-term requirement. As discussed in the preceding section, all of this capacity lies within the county's central 7.5 miles, i.e., between the Wabasso Bridge and the S.R. 60 Bridge. No existing capacity is available within the northern 8.5 miles or the southern 7.3 miles of the project area. As discussed in Section 2.1.2, these latter channel segments have most of the shoaling documented within the Indian River County project area. Moreover, the development of six relatively small sites may not be the most cost-effective and operationally efficient means of meeting the long-term needs of the ICWW in Indian River County.

The lack of sufficient, appropriate storage capacity within the county suggests that additional sites must be identified. The characteristics of the most appropriate long-term plan for the Waterway in Indian River County, in turn, dictate the criteria by which these sites are identified and evaluated. The characteristics of this plan — the *Management Concept* — for Indian River County are discussed in the following chapter.

3.0 DREDGED MATERIAL MANAGEMENT ALTERNATIVES

3.1 Management Concept

Inherent in every maintenance dredging operation is a set of guiding principles that reflects the attitudes and constraints of the project sponsor, the project engineer, and the contractor. Historically, these principles (i.e., the *Management Concept*) have not been explicitly stated but rather have evolved primarily through the desire to maximize operational efficiency and short-term economy. Thus, prior to the initiation of this program in 1986, minimal consideration was given to environmental issues or, indeed, any long-term goals. Within Florida, including Indian River County, this approach resulted in the numerous small mounds and islands now lining the ICWW as the dredging contractor sought to place material as close as possible to the dredging area. For the extensive mangrove-estuarine system of the Intracoastal Waterway in southeast Florida, this concept often led to the unconfined placement of dredged material within mangroves and the loss of estuarine habitat. The effluent from these areas would then return directly to the receiving waters with, perhaps, unacceptably high levels of elutriates and turbidity.

With increased environmental awareness this approach is no longer desirable, nor even possible, given present-day agency reviews and permitting requirements. Concerns about water quality have led to the placement of dredged material within diked areas to increase retention time and ensure that return water quality meets established standards. Wetlands, particularly mangrove swamps, are now recognized as among the most biologically productive ecosystems and resources that must be conserved. However, preservation of mangroves requires acquisition of upland sites and, in a high growth corridor such as that along the ICWW, developmental pressures and land-use conflicts make such acquisitions increasingly difficult and expensive. It has become apparent that these conflicts can only be resolved through long-range planning and the development of a dredged material management concept which addresses both environmental and operational concerns. As such, the management concept constitutes the foundation upon which the management plan is built.

3.1.1 Management Alternatives for Indian River County

The central issue guiding the development of a management concept for the ICWW in Indian River County is the selection of the most appropriate material management strategy. Four basic alternatives are available for consideration:

- o Ocean Disposal
- o Open Water Disposal (Spoil Island Creation)
- o Beach Placement
- o Centralized Upland Storage

Each of these is discussed in the following paragraphs with respect to its applicability to the unique requirements of Indian River County.

Ocean disposal of material dredged from the ICWW is not a realistic option for the Indian River County project area. Ocean disposal requires the transport of dredged material from the dredging site to an authorized offshore disposal area. In the case of Indian River County, this operational requirement poses a very costly and difficult task for the following reasons. First, the material must be loaded into hopper barges capable of transitting the relatively shallow depths of the ICWW. This consideration places severe limits on hopper capacity. Regulatory restrictions on hopper overflow during filling further limit hopper capacity. These barges must then proceed to an inlet for passage to sea. Ft. Pierce Inlet, located more than 7 miles south of the Indian River/ St. Lucie County line, offers the closest deep-water offshore access. Sebastian Inlet, although much closer to most areas of the Indian River County project area, does not provide a viable alternate route as no authorized, maintained channel connects the inlet to the Intracoastal Waterway. Once reaching Ft. Pierce, the material must then be transferred to deep-draft seagoing barges for transport to an authorized offshore disposal area. A review of offshore disposal areas currently authorized by the U.S. Environmental Protection Agency to receive dredged material identified an approved offshore placement site 4.4 miles east of Fort Pierce Inlet. Nevertheless, the costs associated with this type of operation, and the likely increase in future regulatory restrictions on the use of ocean dumping, together make reliance on this method of material disposition inappropriate for the long-term maintenance of the Waterway within Indian River County.

A second management strategy for dredged material is referred to as open water disposal. This particular method of material disposition was perhaps the most widely used approach prior to the evolution of today's environmental regulatory programs addressing wetlands protection. Discussions with representatives of the relevant regulatory agencies have confirmed that this approach carries unacceptable environmental impacts in terms of the degradation or destruction of wetlands. In addition, the intent of the FIND's dredged material management program is to provide a permanent infrastructure of material management facilities. The creation or expansion of open water islands represents a one-time opportunity for material placement and does not lend itself to active material management practices which require upland

access for equipment and personnel. As a result, the use of open water disposal was not considered an acceptable dredged material management strategy for Indian River County.

The third material management alternative considered for Indian River County is beach placement. Beach placement — i.e., placing on the beach dredged material compatible with the native beach sands — is an approach to dredged material management that the State of Florida encourages. The FIND also includes this approach as an essential part of dredged material management for channel reaches which, based on historic data, are likely to contain beach quality sediments. These conditions are most typically encountered immediately adjacent to tidal inlets where Waterway shoals are formed primarily by sand driven through the inlet by waves and tides. The only tidal inlet within or adjacent to the Indian River County project area is Sebastian Inlet located at the extreme northern limit of the project area. However, the ICWW channel lies almost two miles west of the Sebastian Inlet entrance, separated by extensive shallow flood shoals. No maintained channel connects the ICWW with the inlet to provide a conduit through which littoral material can enter the Waterway. Moreover, as discussed in Section 2.1.3.2, sediments sampled in this reach of the Waterway (Stations IR-1-1 and IR-1-2) were classified as silt and contained 64 and 87 percent silt-sized particles, respectively. These findings suggest that the shoals in this area of the Waterway are derived from sediments entering the channel from Sebastian Creek to the west, rather than through Sebastian Inlet to the east. Material of this quality is clearly unsuitable for beach placement. Of the nine sampling locations from which sediment was analyzed, only one (Station IR-2-2) produced sediment with a silt-sized fraction less than five percent. Five percent is the threshold the State of Florida typically regards as indicative of beach-quality material. Because Station IR-2-2 lies almost 14 miles south of Sebastian Inlet, channel sediment in this location is likely derived from erosion of uplands or redistribution of sediment already within the Indian River estuary. As a result, the future compatibility of shoal material in this location with native beach sands is uncertain. Prudence dictates that within Indian River County beach placement should not be relied upon as the primary strategy of dredged material management. However, should event-specific analysis document that ICWW shoal material is suitable for beach placement, the FIND will cooperate with local interests in placing that material on the beach.

For all areas of the Indian River County project area, centralized upland storage remains the preferred method of dredged material management. Upland storage, as applied here, is the use of a diked containment area with appropriate outlet flow control structures. The dredged material is pumped in a sediment-water slurry to one end of the containment area, which thus serves as a settling basin within which the dredged sediment settles out of the transporting water. The residual water is then returned to the Waterway via the basin outlet structure and return pipeline.

Upland storage offers a number of significant advantages over the other available methods: (1) upland storage provides an efficient means of dredged material management without the excessive costs of transportation and material rehandling involved with the use of ocean disposal; (2) provided suitable upland sites can be identified, upland storage avoids most wetland impact issues inherent in the use of open water disposal; and (3) unlike beach disposal, the use of upland sites does not depend upon the physical characteristics of the dredged material.

The use of a limited number of centralized upland sites has additional economic, operational, and environmental advantages over the use of a greater number of smaller sites: (1) fewer, larger sites reduce the total acreage required and thereby reduce the total cost of site acquisition; (2) developing and constructing fewer, larger sites is more cost effective than developing and constructing a number of smaller sites; (3) the use of centralized sites allows for improved site security and requires the allocation of fewer operating personnel; and (4) the use of fewer, larger sites reduces the total impact to upland habitat and allows for improved effluent and stormwater control, as well as the institution of more efficient and comprehensive monitoring procedures.

The use of fewer centralized sites as discussed above also facilitates the active management of these sites as permanent operating facilities. This represents a significant departure from the historic practice of more or less abandoning sites after limited use. Operating sites as permanent facilities allows for the implementation of a suite of management procedures and techniques with long-term operational and environmental benefits. Example management measures include improved detention area design; material handling and processing to increase dewatering efficiency (e.g., mechanical grading, trenching, stormwater control); and the use of natural buffer areas and dike vegetation to improve their appearance. Most importantly, the permanency of the sites encourages exploring ways to remove and reuse the dewatered material. Alternatively, if no market for the material is found, it could be removed and stored in less ecologically sensitive upland areas further inland. Road access, existing or potential, is therefore essential. Sites managed as intermediate processing areas rather than one-time holding facilities will serve the needs of the ICWW in perpetuity. This approach, in combination with effective site management measures, will establish the long-term material management capability required.

3.1.2 Management Concept for Indian River County

The preceding discussion leads to the following definition of the dredged material management concept for the Intracoastal Waterway in Indian River County:

(1) In all segments of the Waterway, dredged material will be placed in diked upland management facilities having existing or potential road access.

(2) Centralized upland sites will be established in a minimum number of locations per operating reach of the Waterway.

(3) Sites will be operated and maintained as permanent facilities in which dredged material will be actively managed.

The dredged material management concept, defined above, provides an essential focus to the planning process by establishing minimum standards and criteria for the identification and evaluation of candidate sites to be used for dredged material management.

3.1.3 Beneficial Use of Dredged Material

The beneficial use of the material dredged from the ICWW channel will complement, but not replace, the need to secure and develop centralized upland containment facilities as described above. Typically, beneficial use of dredged material provides for only a single disposition of the material and thus does not replace the need for a permanent management facility. Examples of one-time beneficial use options include the creation or restoration of wetland or upland (i.e., spoil island) habitat. Moreover, such beneficial uses typically require the dredged material first be processed (e.g., dewatered) in an containment facility. The FIND encourages the approved reuse of the material stored in its containment facilities. Indeed, the reuse of dredged material directly benefits the FIND by restoring containment basin capacity and thereby extending the design service life of its containment facilities. However, beneficial reuse of dredged material cannot, in itself, provide the needed long-term management capability for the ICWW in Indian River County.

3.2 Delineation of Channel Reaches

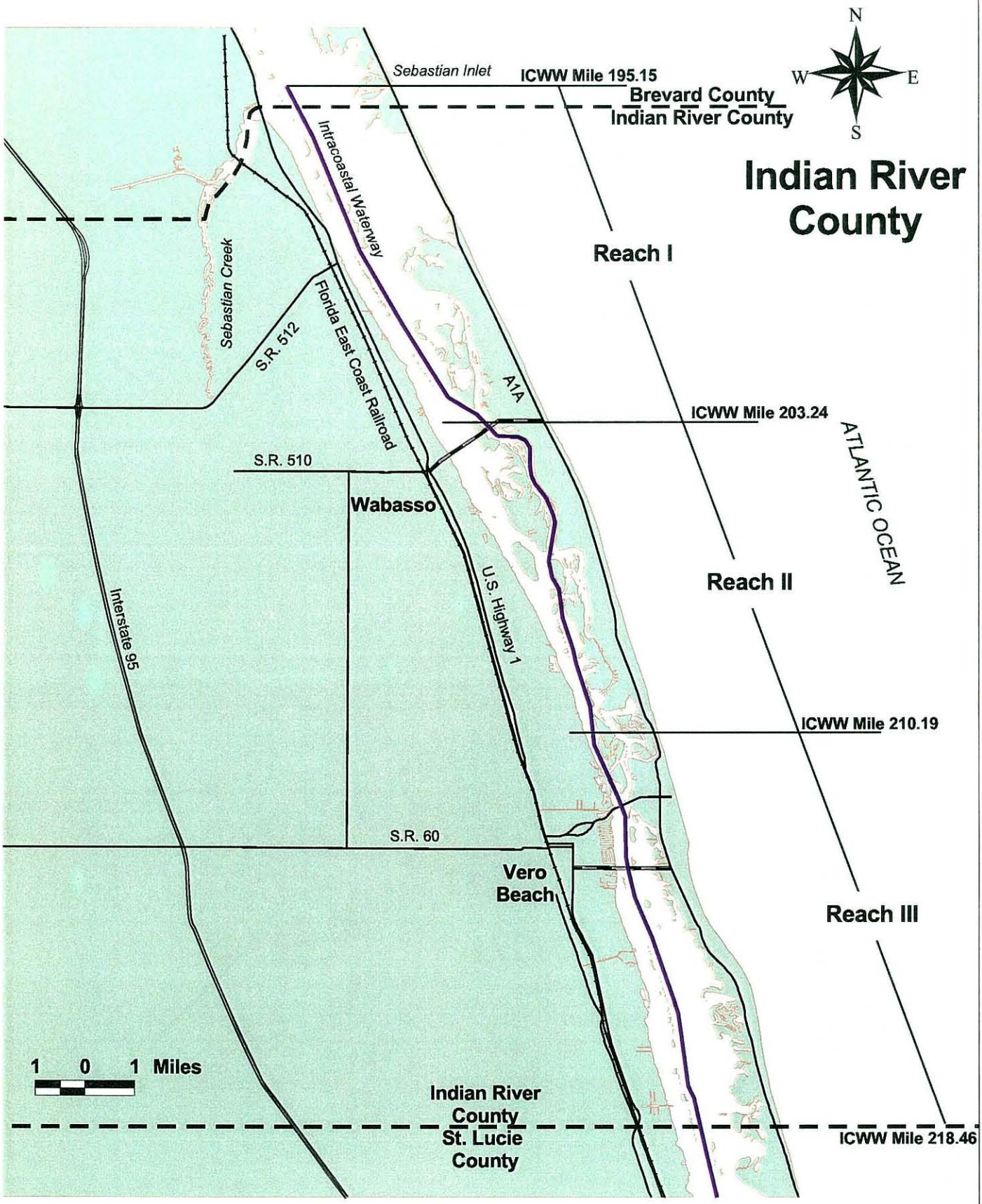
Having defined the dredged material management concept, it then became possible to define operating reaches of the Waterway. Guided by the fundamental criteria embodied in the management concept, the overall character of the Waterway channel and its surroundings was examined in terms of historic shoaling patterns, sediment quality, projected material storage requirements, material handling and pumping distance constraints, area demographics, and site availability. When considered collectively, the individual constraints

imposed by each of these factors dictated the logical segmentation of the channel for the management of dredged material. The channel segments or reaches defined by this process are described below.

Three reaches, ranging from 6.95 miles to 8.27 miles in length, were defined within the Indian River County project area. The resulting delineation is presented in Figure 3.1 and summarized in Table 3.1 . Figure 3.2 presents the locations of previous maintenance dredging and documented shoals by channel reach. Table 3.2 organizes the previous summary of ICWW channel shoaling as presented in Table 2.2 by channel reach. Also presented in Table 3.2 are estimates of the projected maintenance dredging volumes. The corresponding 50-year material storage requirements are also included for each reach. As an indication of the relative shoaling rate within each reach, the mean volume of maintenance dredging required annually per channel mile is also included.

The northernmost reach, Reach I, extends from a point 0.45 miles north of the Brevard/Indian River County line (Cut IR-1, sta 0+00, ICWW mile 215.15) southward 8.09 miles to the Wabasso (S.R. 510) Bridge (Cut IR-6, sta 20+30, ICWW mile 203.24). As shown in Table 3.2, the 1996 channel survey documented a total in situ shoal volume for this reach of 159,205 cy, yielding a projected 50-year material storage requirement of 427,862 cy. Almost 98 percent (155,810 cy) of the total volume of documented shoaling within Reach I occurs within three discreet shoals. The northernmost, representing approximately 39 percent (61,778 cy) of the reach total, is located within the first one mile south of the reach's northern limits (Cut IR-1, sta 0+00 to sta 50+74, ICWW mile 195.15 to mile 196.11). The second major shoal within the reach is located an additional 0.5 miles southward. Extending approximately two miles from ICWW mile 196.61 to mile 198.66 (Cut IR-2, sta 16+79 to sta 124+98), this shoal contains 47 percent (74,820 cy) of the total volume of shoaling reported for Reach I. The third major shoal within the reach extends from ICWW mile 200.55 three miles southward to ICWW mile 203.06 (Cut IR-4, sta 5+24 to Cut IR-6, sta 10+38) to a point immediately north of the Wabasso (S.R. 510) Bridge. By the methodology described in Section 2.1.2, the total in situ volume of 159,205 cy translates to a projected 50-year material storage requirement 427,862 cy. None of the existing easements or FIND-owned tracts possessing some potential for future use are located within this reach.

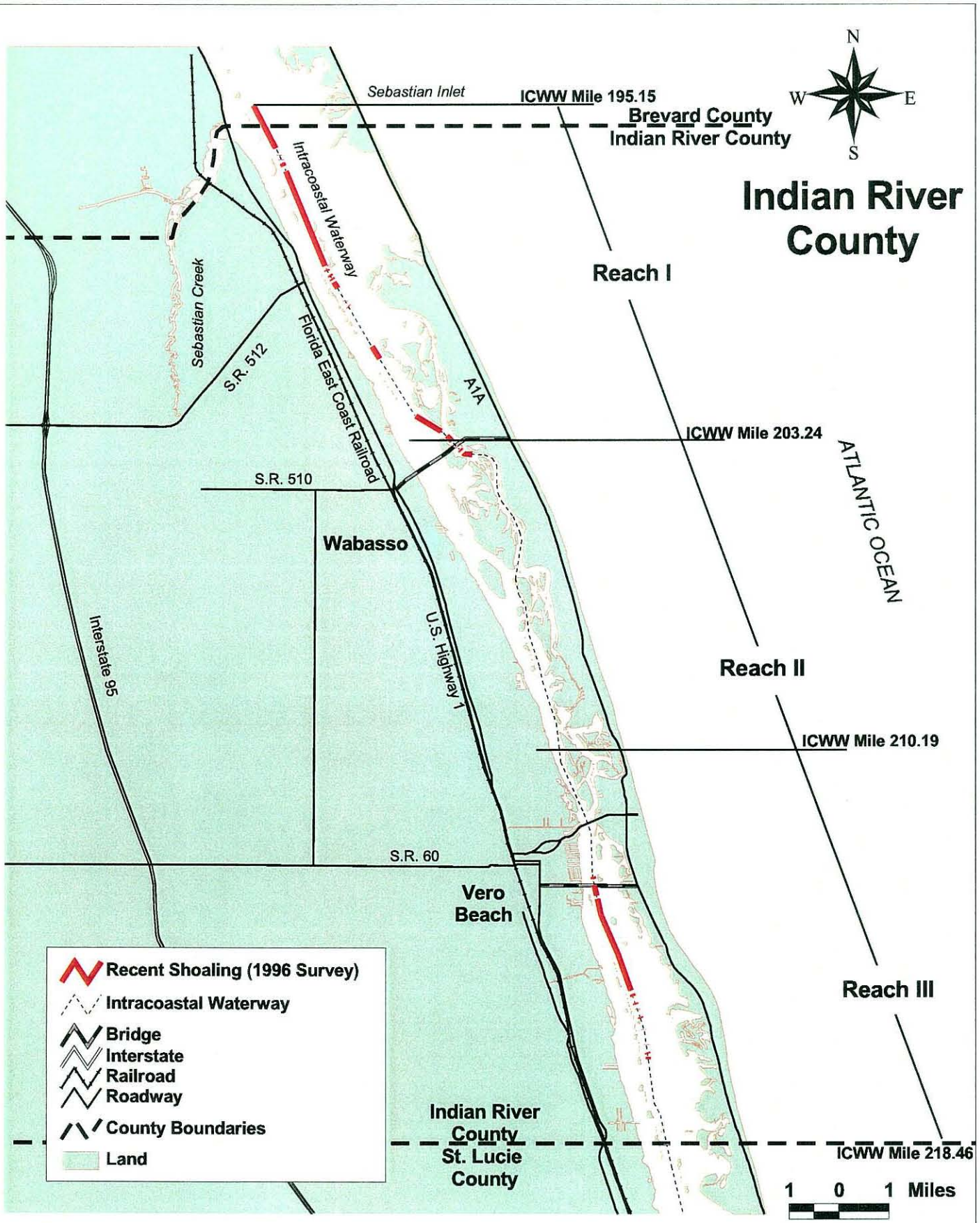
Reach II, the middle channel reach, extends southward 6.95 miles from the Wabasso Bridge to a point approximately 1.4 miles north of the new Merrill P. Barber (S.R. 60) Bridge in Vero Beach (Cut IR-24, sta 28+00; ICWW mile 210.19). The 1996 channel survey documented a total *in situ* shoal volume of 4,249 cy, yielding a projected 50-year material storage requirement of 12,021 cy. Over 92 percent (3,917 cy) of the *in situ* volume of shoaling for the reach is located immediately south of the Wabasso Bridge (Cut IR-6, sta 23+06 to sta 31+27; ICWW mile 203.30 to mile 203.45). Three of seven existing easements or FIND-owned tracts



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 3.1 Dredeged Material Management Channel Reaches Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

Table 3.1 Delineation of Operational Channel Reaches,
Intracoastal Waterway, Indian River County

Reach	From	To	Length (mi)
I	Sebastian Inlet ICWW Mile 195.15 Cut IR-1/Station 0+00	Wabasso (S.R. 510) Bridge ICWW Mile 203.24 Cut IR-6/Station 20+30	8.09
II	Wabasso (S.R. 510) Bridge ICWW Mile 203.04 Cut IR-6/Station 20+30	Vero Beach ICWW Mile 210.19 Cut IR-24/Station 28+00	6.95
III	Vero Beach ICWW Mile 210.19 Cut IR-24/Station 28+00	Indian River/St. Lucie Co. Line ICWW Mile 218.46 Cut IR-35/Station 31+50	8.27
		TOTAL	**23.31**



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 3.2 Areas of Recent Shoaling Based on 1996 Channel Survey Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

Table 3.2 Summary of Historical Maintenance Dredging/Recent Shoaling by Channel Reach, Intracoastal Waterway, Indian River County, 1957 - 1996

Reach	Previous Maintenance/Recent Shoaling								Reach Summary				
	ICWW Mileage		Cut/Station		Length		Design Vol.	Pay Vol.	Total Vol.	Vol/Yr	Vol/Yr/Mi	50-yr Unbulked Vol.	50-yr Storage Requirement
	From	To	From	To	(ft)	Year	(cy)	(cy)	(cy)	(cy)	(cy)	(cy)	(cy)
I: Sebastian Inlet to Wabasso (S.R. 510) Bridge. ICWW Mile 195.15 to 203.24.	195.15	196.11	IR-1 / 0+00	IR-1 / 50+74	5,074	1996*	51,893	*61,778*					
	196.26	196.27	IR-1 / 58+70	IR-1 / 59+01	32	1996*	110	*131*					
	196.37	196.37	IR-2 / 3+99	IR-2 / 3+99		1996*	22	*26*					
	196.44	196.50	IR-2 / 8+09	IR-2 / 11+07	301	1996*	156	*186*					
	196.61	198.66	IR-2 / 16+79	IR-2 / 124+98	10,819	1996*	62,847	*74,820*					
	198.74	198.77	IR-2 / 129+20	IR-3 / 0+57	180	1996*	405	*482*					
	198.87	198.90	IR-3 / 5+78	IR-3 / 7+15	137	1996*	147	*175*					
	198.95	198.99	IR-3 / 9+90	IR-3 / 11+93	201	1996*	152	*181*					
	199.04	199.17	IR-3 / 14+94	IR-3 / 21+52	660	1996*	1,317	*1,567*					
	199.42	199.47	IR-3 / 34+89	IR-3 / 37+54	264	1996*	206	*246*					
	199.59	199.60	IR-3 / 43+95	IR-3 / 44+31	37	1996*	133	*158*					
	199.76	199.76	IR-3 / 52+98	IR-3 / 52+98		1996*	55	*66*					
	200.55	200.83	IR-4 / 5+24	IR-4 / 19+89	1,468	1996*	6,281	*7,478*					
	202.17	202.73	IR-4 / 90+69	IR-5 / 28+74	2,988	1996*	7,950	*9,465*					
	202.91	203.06	IR-6 / 2+70	IR-6 / 10+38	771	1996*	1,906	*2,269*					
	203.23	203.24	IR-6 / 19+40	IR-6 / 20+11	74	1996*	148	*176*	159,205	3,980	492	199,006	427,862
II: Wabasso (S.R. 510) Bridge to Vero Beach. ICWW Mile 203.24 to 210.19.	203.30	203.35	IR-6 / 23+06	IR-6 / 25+65	259	1996*	441	*525*					
	203.40	203.45	IR-6 / 28+34	IR-6 / 31+27	290	1996*	2,849	*3,392*					
	206.33	206.34	IR-16 / 25+97	IR-16 / 26+29	32	1996*	113	*134*					
	206.51	206.52	IR-16 / 35+49	IR-16 / 36+11	63	1996*	74	*88*					
	209.19	209.19	IR-22 / 21+98	IR-22 / 21+98		1996*	42	*50*					
	209.79	209.79	IR-24 / 6+82	IR-24 / 6+82		1996*	51	*61*	4,249	112	16	5,591	12,021
III: Vero Beach to Indian River/St. Lucie County Line. ICWW Mile 210.19 to 218.46.	211.83	211.83	IR-26 / 13+92	IR-26 / 13+92		1996*	42	*50*					
	212.78	212.86	IR-27 / 41+49	IR-28 / 2+03	433	1996*	565	*673*					
	212.92	212.92	IR-28 / 5+11	IR-28 / 5+11		1996*	44	*53*					
	212.98	215.46	IR-28 / 8+61	IR-31 / 49+98	13,063	1996*	45,682	*54,385*					
	215.56	215.62	IR-31 / 55+36	IR-31 / 58+56	317	1996*	240	*286*					
	215.72	215.77	IR-31 / 63+82	IR-31 / 66+35	253	1996*	223	*266*					
	216.03	216.05	IR-32 / 8+35	IR-32 / 9+24	90	1996*	206	*246*					
	216.12	216.12	IR-32 / 13+04	IR-32 / 13+35	32	1996*	140	*167*					
	216.28	216.31	IR-33 / 7+57	IR-33 / 8+89	132	1996*	211	*251*					
	216.40	216.40	IR-33 / 13+44	IR-33 / 13+44		1996*	82	*98*					
	216.46	216.48	IR-33 / 17+05	IR-33 / 17+71	63	1996*	239	*285*					
	216.54	216.60	IR-33 / 21+27	IR-33 / 24+21	296	1996*	509	*606*					
	216.67	216.68	IR-33 / 27+82	IR-33 / 28+51	69	1996*	112	*133*	57,498	1,513	183	75,655	162,658

NOTES: Numbers in *italic* are based on the relationship:

Pay Volume = 1.19 x Design Volume

* : Data from 1996 channel survey performed by Sea Systems, Inc. for the Florida Inland Navigation District.

determined to possess some potential material storage capacity are located at the southern end of this reach. The initial estimate of the combined capacity of these three tracts (two sites) is 176,400 cy.

Reach III, the southernmost reach, extends from Vero Beach southward 8.27 miles to the Indian River/St. Lucie County line (Cut IR-35, sta 31+50; ICWW mile 218.46). The projected 50-year material storage requirement for this reach is 162,658 cy, based on a total shoal volume of 57,498 cy documented by the 1996 channel survey. Over 94 percent (54,385 cy) of the total in situ volume of shoaling for the reach is contained within its central 2.5 miles (Cut IR-28, sta 8+61 to Cut IR-31, sta 49+98; ICWW mile 212.98 to mile 215.46). The remaining three existing easements or FIND-owned tracts determined to possess some potential material storage capacity are located at the extreme northern end of this reach, just north of the S.R. 60 Bridge. The initial estimate of the combined capacity of these three tracts is 85,500 cy. This represents approximately 53 percent of the projected 50-year material storage requirement for Reach III.

3.3 Identification of Candidate Sites

Defining the management concept and delineating logical channel reaches provided the means to evaluate existing easements with respect to the long-term needs of the Waterway in Indian River County. As discussed in Section 2.3, the initial estimate of the storage capacity of the existing easements or FIND-owned tracts (261,900 cy) represents less than 44 percent of the projected 50-year requirement for Indian River County (602,541 cy). Moreover, significant capacity deficits remain in Reach I and Reach III. None of the existing easements or FIND-owned tracts possessing some potential for future use are located within Reach I, resulting in existing capacity deficit for this reach of 427,862 cy. Within Reach III, the initial estimate of the combined capacity of the three existing easements or FIND-owned tracts (85,500 cy) represents only 53 percent of the projected 50-year material storage requirement for this reach (162,658 cy), resulting in an existing capacity deficit for this reach of 77,158 cy. In Reach II, the initial estimate of the combined capacity of the three existing easements or FIND-owned tracts (176,400 cy) compared to the projected 50-year material storage requirement (12,021 cy) suggests a significant capacity surplus. However, the three existing sites — located on islands and therefore lacking road access — may not represent the best management option for serving this reach. Therefore, to meet established program criteria and provide for the long-term maintenance of the Indian River County segment of the Waterway, identification and evaluation of additional alternative sites was necessary.

The process began with the identification of all areas within reasonable distance of the ICWW with the potential to satisfy the requirement of centralized material storage within uplands with existing or potential

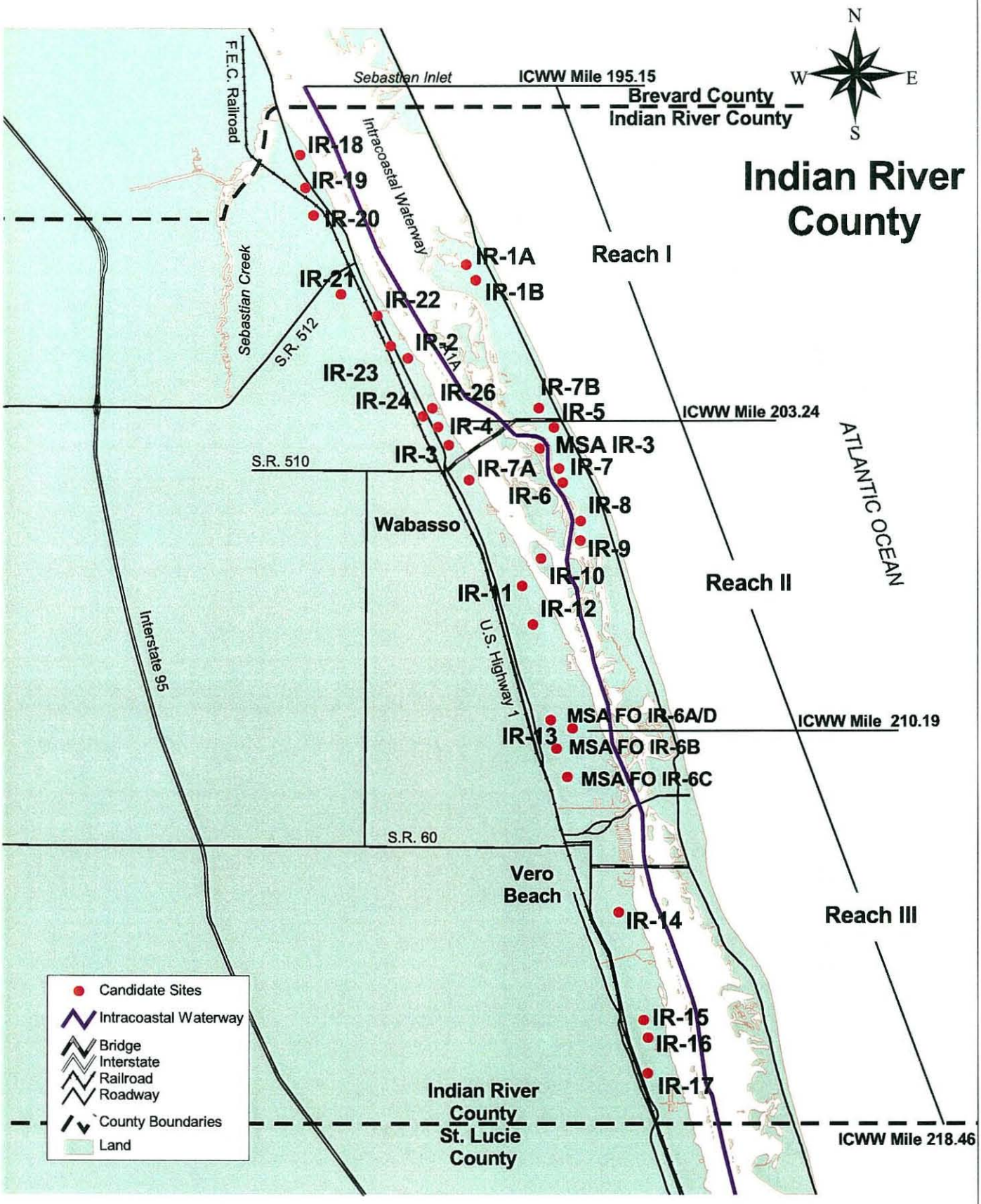
upland road access to meet the demands of ongoing site management. Also considered was the degree to which the area had been previously disturbed by land clearing, logging, agriculture, or mining. Additional environmental considerations, such as the quality of existing habitat or the diversity of vegetation, were not included in the initial site identification. However, these factors were considered in the final site evaluation and are discussed in Section 4.1. In some instances adjacent land-use conflicts (such as adjoining high-density residential development) or operational limitations (such as excessive overland pipeline access) eliminated sites from further consideration.

Preliminary identification and evaluation of the sites was accomplished through the use of all available resource materials listed previously. These include 1984 USGS NHAP color-infrared aerials (1:24,000), 1994 FIND blueline aerials (1:2,400), and 1994 FIND black-and-white contact prints (1:24,000); base maps including USGS 7.5-minute series topographic quadrangle maps (1:24,000), U.S. Fish and Wildlife Service Wetland Inventory maps (1:24,000), and U.S. Soil Conservation Service maps (various scales). The future land use maps that accompany the comprehensive plan documents for Indian River County and the cities of Sebastian, Vero Beach, and Indian River Shores were also used to guide site identification. By these resources a total of 29 alternate candidate sites — or from four to 15 sites within each reach — were identified. All 29 alternate candidate sites are shown in Figure 3.3.

Tracings were made from the 1994 FIND black-and-white contact prints or blueline aerials of the initial delineation of useable upland area of each site. An initial determination of the maximum containment capacity of each site (as described in Section 2.3) was then made based on the most efficient, realistic dike configuration attainable within the delineated upland. This was done to ensure that each site possessed potential capacity appropriate to each respective reach requirement. Within each reach, the total potential capacity of the candidate sites greatly exceeded the corresponding material storage requirement. The overages in capacity were retained to provide the greatest flexibility prior to final site selection. Also, subsequent field inspection of the sites would likely result in total elimination of some sites and reduction of the usable acreage of others. The site inspection procedure is discussed in the following section.

3.4 Site Inspections

Field inspection of the 34 candidate sites initially identified, including the 29 newly identified candidate sites and the five potentially viable sites within six existing easements or FIND-owned tracts, was performed during November 1995. The basic objectives of the field inspections, each conducted by a biologist and an engineer, were to document and evaluate the environmental characteristics and the existing and adjacent



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 3.3 Candidate Sites Dredeged Material Management Plan Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

land-use of each site and to assess its general suitability for site development. Specific objectives included preliminary delineation of wetlands and the initial assessment of vegetation communities, habitat, and environmental constraints including the presence of protected wildlife. Also noted during the site inspections were site topography, general soil conditions, existing or potential road access, possible pipeline routes, and obvious archeological features, if present. In addition, a video camera was used to record significant features of each site and to document the on-site and adjacent land-use at the time of the inspection.

Within each site, ecological conditions were assessed by combined aerial photogrammetry and ground-truthing as necessary to identify and map vegetation communities. Aerial coverage included the same resource materials discussed in Section 2.2, specifically, 1994 FIND blueline aerial photography (1"=200 ft), 1994 FIND black and white aerial photography (1"=2,000 ft) from which the preceding blueline aerials were derived, and 1984 color infrared aerial photography (1" = 2,000 ft). In addition, 1994 Indian River County blueline aerials (1"=200 ft) were also obtained for all candidate sites and used as the primary resource. In addition to pedestrian surveys, ground-truthing was carried out using 4-wheel-drive vehicles accessing adjacent roads or on-site dirt roads and trails. Dominant or significant photographic signatures were identified on aerials and visited by truck or on foot. Vegetation associations and other salient site features were mapped in the field by drawing on the county blueline aerials. Other sources of information, such as USGS 7.5' quadrangles and U.S. Fish and Wildlife Service Wetland Inventory Maps and soils surveys, were checked to aid in the interpretation of site conditions. Observations of significant wildlife species were also noted when encountered on-site. These included the presence or sign of wildlife species protected by the state or federal government.

Following each site inspection, the original site tracings were modified to exclude sensitive areas. The most common modification was to withdraw from areas possessing wetland or transitional vegetation. Specifically excluded were mangrove or other wetland or transitional areas contiguous with the ICWW or its tributaries. Because of this latter consideration which establishes the jurisdiction of FDEP permitting, all drainage features were examined for evidence of this contiguity. Isolated wetlands or drainage features still within the permitting jurisdiction of the COE and the St. Johns River Water Management District (SJRWMD) were excluded where feasible. However, if the exclusion of a minimal isolated wetland made an otherwise viable site unusable, some wetland impacts may be unavoidable.

A second analysis of maximum potential storage capacity was then performed for each site based on its field-verified configuration. Results of this analysis are presented in Table 3.3. The combined potential capacity of the newly identified candidate sites exceeds the material storage requirement for each reach. Be-

Table 3.3 Candidate Sites, Long-Range Dredged Material Management Plan, Indian River County (page 1 of 3)

Reach	Site	Location (ICWW Mile)	Mapped Area (ac)	Containment Area (ac)	Capacity (cy)	Max. Pumping Distance (mi)	Comp. Plan Designation	Predominant Habitat	Limiting Factors
I	IR-Inlet	195.93	6.9	3.6	6,632	7.32	Con./Rec.	Disturbed Lands, DMMA	Inadequate Area
	IR-1A	198.92	482.5 (w/IR-1B)	41.8	660,243	5.41	L-1	Citrus	Adjacent Land-Use
Sebastian Inlet to Wabasso (S.R. 510) Bridge	IR-1B	198.87	482.5 (w/IR-1A)	117.3	2,098,225	6.05	L-1	Citrus	-----
	IR-2	200.96	181.7	33.15	378,563	5.66	L-2	Citrus	-----
ICWW Mile 195.15 to 203.24	IR-3	202.99	26.1	7.0	60,600	7.85	L-2	Citrus	Inadequate Area
	IR-5	203.02	85.2	18.2	233,655	8.84	L-2	Citrus, Tropical/Temperate Hardwoods	Adjacent Land-Use
	IR-18	196.53	43.4	5.4	31,263	7.84	M-1	Upland Forest	Inadequate Area, Adjacent Land-Use
	IR-19	197.24	45.5	N/A	N/A	6.64	CG/Cons.	Commercial Development	Existing Development
	IR-20	197.76	147.6	N: 33.0 S: 13.8	520,164 138,203	6.09	Ind./Mixed R.	Pine Flatwoods	Wetlands, Proposed Public Acquisition
	IR-21	199.42	170	N: 21.7 S: 31.7	210,437 499,276	5.71	Res. (SF)	Citrus (fallow)	Adjacent Land-Use, Pipeline Access
	IR-22	200.02	12.3	N/A	N/A	5.28	Com./Ind.	Mixed Hardwood Wetlands	Inadequate Upland
	IR-23	200.84	22.7	N/A	N/A	6.02	Com./Ind.	Mixed Upland/Wetland	Inadequate Upland
	IR-24	202.56	118.2	N/A	N/A	8.44	Com./Ind.	Residential/Commercial Development	Inadequate Area
	IR-25	202.14	38.1	N/A	N/A	8.66	L-2	Citrus	Inadequate Area
	IR-26	202.61	38.8	N/A	N/A	7.66	L-2	Citrus/Disturbed Wetlands	Inadequate Upland

Table 3.3 Candidate Sites, Long-Range Dredged Material Management Plan, Indian River County (page 2 of 3, continued)

Reach	Site	Location (ICWW Mile)	Mapped Area (ac)	Containment Area (ac)	Capacity (cy)	Max. Pumping Distance (mi)	Comp. Plan Designation	Predominant Habitat	Limiting Factors
II	IR-4	203.50	38.8	N/A	N/A	9.75	L-2	Citrus/Mangroves	Inadequate Upland
	IR-6	204.35	109.4	13.8	137,342	7.31	L-2	Mixed Wetland/Forested Upland	Public Acquisition
Wabasso (S.R. 510) Bridge to Vero Beach	IR-7A	204.93	39.2	14.7	137,900	9.20	L-2/M-1	Citrus	-----
	IR-7B	204.62	101.9	29.0	331,054	6.84	L-1/IRS	Citrus	Adjacent Land-Use
ICWW Mile 203.24 to 210.19	IR-8	205.41	86.8	36.2	624,922	6.13	L-1/IRS	Citrus, Non-Native Vegetation	Adjacent Land-Use
	IR-9	205.68	126.1	30.9	486,840	5.81	IRS	Mixed Hardwood Forests	Adjacent Land-Use
	IR-10	206.04	137.4	N/A	N/A	5.47	IRS	Mangroves	Inadequate Upland
	IR-11	206.64	217.3	11.8	117,940	4.78	L-1/Com.	Citrus/Residential	Residential Development
	IR-12A	207.22	337.1	61.0	1,059,929	4.78	L-2	Citrus/Residential	Residential Development
	IR-12B	208.03	350.8	136.7	2,391,700	5.43	L-2	Citrus	-----
	IR-13	210.05	92.4	41.1	707,760	7.27	M-1	Citrus	-----
	MSA IR-3	203.94	38.5	N/A	N/A	7.52	C_{pub}	Mangroves/Non-Native Vegetation	Inadequate Upland
	MSA IR-FO-6A/6D	209.69	40.4	20.0	200,405	6.81	Cons./Rec.	Non-Native Vegetation	Island Site

Table 3.3 Candidate Sites, Long-Range Dredged Material Management Plan, Indian River County (page 3 of 3, continued)

Reach	Site	Location (ICWW Mile)	Mapped Area (ac)	Containment Area (ac)	Capacity (cy)	Max. Pumping Distance (mi)	Comp. Plan Designation	Predominant Habitat	Limiting Factors
III Vero Beach to Indian River/St. Lucie Co. Line ICWW Mile 210.19 to 218.46	MSA IR-FO-6B	210.24	61.4	26.3	338,438	7.26	Cons.	Non-Native Vegetation	Island Site
	MSA IR-FO-6C	210.88	59.2	16.4	210,426	7.75	Cons./Rec.	Non-Native Vegetation	Island Site
	IR-14	213.61	108.2	N: 10.5 S: 29.6	75,369 509,980	4.97	M-2	Non-Native Vegetation	Public Acquisition
	IR-15	216.07	83.7	8.2	58,963	5.53	M-2	Hardwood Forest/Mangrove	Public Acquisition
	IR-16	216.41	131.0	5.5	18,264	5.45	L-2	Forested Uplands/Wetlands	Public Acquisition
	IR-17	218.00	87.5	23.6	337,581	6.72	L-2	Forested Uplands	Public Acquisition

cause the projected material storage requirements for Reach II is relatively low, each candidate site was evaluated based on its ability to provide a containment basin of 10 acres — determined to be the minimum size for efficient site construction and operation — plus an appropriate buffer to surround the containment basin and separate the basin from adjacent properties. However, at this preliminary stage the maximum site acreage was retained to provide the greatest flexibility in locating the required acreage within the larger initial site. During the final site evaluation, described in the following section, the acreages of those sites judged to be the most suitable for development as permanent dredged material management areas are reduced such that their capacities match the reach requirements.

4.0 ESTABLISHMENT OF SITE BANK

The final evaluation of 34 candidate sites, including the 29 newly identified sites and the five sites within existing easements or FIND-owned tracts, was accomplished by assessing the ability of each site to satisfy a standard set of evaluation criteria. Through this process a group of eight sites was selected to form a site bank serving the three reaches of the Intracoastal Waterway channel within the Indian River County project area. The site bank consists of three primary (first-choice) sites and five secondary (second-choice) alternatives for the long-term management of dredged material removed from ICWW channels.

4.1 Evaluation Criteria

A standard set of criteria was used to perform the final site evaluation. However, no matrix analysis was performed to quantify the relative merits of each evaluation criterion. Although such an approach is sometimes useful, it was deemed inappropriate in this case. Rather, the sites received a holistic evaluation which allowed for some subjectivity. In evaluating a site, each criterion was then given more or less weight based on the effect the specific information pertinent to that criterion had on the overall suitability of the site. The remaining portions of Chapter 4.0 describe the evaluation procedure, including the specific evaluation criteria used and the final bank of primary and secondary sites compiled via this procedure.

Each site was evaluated by its ability to satisfy criteria in three broad areas:

- o Engineering/Operational Considerations
- o Environmental Considerations
- o Socioeconomic or Cultural Considerations

Individual criteria considered in each of these areas are described below.

4.1.1 Engineering/Operational Considerations

- Capacity — The primary objective of the Phase I planning effort was to identify suitable dredged material management sites of adequate capacity to meet the projected 50-year material storage requirements of the Waterway in the Indian River County project area. Therefore, the potential capacity of a site was a fundamental site evaluation criterion. In keeping with the management concept which emphasized centralized sites, all alternative sites were selected and existing sites were retained

based on their ability to provide the required capacity with a minimum number of sites. Typically, one site possessing sufficient capacity was selected to serve each reach. However, as will be discussed, within Reach II and Reach III two sites were selected to serve as secondary alternatives.

- Adequate Dike Material — Closely related to site capacity is the on-site availability of adequate dike material to construct the containment basin as employed in the preliminary capacity analysis (Appendix C). As discussed in Section 2.3, small upland acreage or low mean grade elevation sometimes precludes the construction of a 15-ft dike without excavating the basin interior to an unreasonable depth. In such cases, the dike height was limited to that which could be constructed from the material above a reasonable depth of excavation. An insufficient on-site supply of dike material can be circumvented by one of two methods: (1) trucking in additional material from off-site sources or (2) using dewatered dredged material to build the dike in increments to its ultimate design elevation. However, the expense of obtaining and transporting material from off-site sources and the possibility that the dewatered dredged material may be unsuitable for dike construction make an adequate on-site supply of material preferable.

- Pumping Distance — Pumping distance from the area to be dredged to the area of placement is also a criterion affecting a site's suitability. Although booster pumps can significantly extend pumping distance, the increase is achieved only through a significant reduction in dredging efficiency and a corresponding increase in operating costs. In discussions with representatives of the Jacksonville District COE, a pumping distance of three to six miles was determined to be a preferred limit for efficient operation. However, should extraordinary circumstances require increased distances, 10 miles was established as the absolute maximum pumping distance acceptable to the COE. Therefore, selecting a site requiring the shortest possible pumping distance must be balanced with the need to keep the total number of sites to a minimum.

- Pipeline Access — A site affording the greatest ease of pipeline access from the Waterway, as well as the return of effluent to the Waterway, is also preferred. Apart from the potential for environmental impacts to sensitive mangrove or other wetlands (discussed in Section 4.1.2), difficult pipeline access adds to mobilization-demobilization costs and reduces operating efficiency. Examples of pipeline access difficulties include extensive wetland crossings, significant elevation changes, or the crossing of road or railroad rights-of-way. Moreover, difficult pipeline access may require the costly acquisition of additional pipeline easements.

- Upland Access — Upland access with existing or potential road service is desirable for initial site construction and is required if the site is to be managed as a permanent operating facility, as intended. Notably, existing or potential upland road access was a requirement for the identification of new candidate sites.

- Soil Properties — On-site soil properties (e.g., load bearing capacity, resistance to piping, etc.) and the depth of the water table below grade are additional factors included as criteria for site evaluation. However, these determinations require field testing not included in the initial phase of the project. Therefore, data supporting on-site soil properties and geohydrology will be obtained during Phase II. Observations made during Phase I field inspections revealed no obvious areas of concern in those sites forming the final site bank.

4.1.2 Environmental Considerations

The environmental criteria used for site evaluation are intended to minimize the environmental permitting constraints of site development by minimizing adverse impacts to sensitive habitats, while providing suitable sites to serve the needs of the Waterway. The resulting criteria may be organized under two categories reflecting FIND's management principle of restricting the placement and storage of dredged material to upland areas: (1) criteria for the avoidance of wetland areas to the greatest extent possible and (2) criteria for minimizing unavoidable impacts to upland habitats.

- Wetland Impacts — Avoidance of wetlands, a primary consideration throughout the site selection process, has largely been achieved by use of USFWS Wetlands Inventory maps and color-infrared photography, augmented by field verification and preliminary delineation of on-site wetlands. However, where a question remained or where avoidance of isolated or transitional wetland areas would have precluded the use of a site, several specific criteria were used to weigh the relative success in minimizing wetland impacts.

  Mangroves and other wetland areas exhibiting salt water characteristics, clearly indicative of tidal wetlands contiguous with state waters, are recognized by all state and federal agencies to be an extremely valuable and biologically productive habitat. Therefore, the degree to which a site's development could be accomplished while avoiding impacts to mangrove areas is obviously a crucial criterion in site selection. Closely related to this is the sometimes unavoidable impact related to accessing the site via pipeline. If no other avenue is available (e.g., floating the pipeline in a tidal

creek), crossing mangroves or salt marsh vegetation may be required. This practice, a necessary consideration in site selection, was minimized wherever possible.

Isolated freshwater wetlands, also a valuable biological community, can afford a system of filtering runoff and recharging groundwater supplies. Nevertheless, such wetlands receive less protection under FDEP permitting criteria. However, such wetlands are under the jurisdiction of the COE and the St. Johns River Water Management District (SJRWMD). The presence of these isolated wetlands was considered in the evaluation of a particular site, and their disruption was avoided wherever possible. Experience gained in previous plan development efforts suggests that the sacrifice of small, isolated areas possessing wetland vegetation may be acceptable if required to provide an adequate containment area. However, mitigation may be required to offset such impacts, if incurred. Somewhat independent of the extent of an interior wetland is the habitat quality it may afford or the unusual vegetation it may support. Thus, the quality of impacted wetlands was also a criterion of site selection and will affect any mitigation which may be required.

- Upland Impacts — The use of uplands for the development of dredged material management areas minimizes impacts to wetlands. However, upland site development requires the removal of existing upland vegetation and habitat within the footprint of the containment basin, as well as along the associated pipeline access route and the access and perimeter service roads. Again, the quality of the impacted uplands can vary widely, and therefore assessments of the relative ecological value of the existing upland communities are useful site evaluation criteria. Specific assessments include the quality of habitat; the presence or potential presence of threatened or endangered species; the uniqueness, maturity, and aesthetic quality of the existing vegetation (e.g., mature hardwood canopy vs. second-growth saplings); and the extent to which a site was disturbed by previous human activities (e.g., clearing, logging, drainage, etc.).

- Buffer Area — Also considered was the ability of a site to provide a buffer of undisturbed vegetation outside the containment area while still maintaining adequate storage capacity. Primarily, the buffer acts as a visual barrier. However, other potential benefits include the preservation of areas of particular environmental value such as maritime hammock, coastal scrub, or transitional wetlands which could otherwise fall to development. Moreover, the preservation of a buffer region within a dedicated conservation easement may facilitate the permitting required for site construction by mitigating the impacts of site development.

- Archeological Value — While not strictly an environmental consideration, the relative archeological value of each site was an evaluation criterion. Phase I of the project does not include a formal archeological survey of each candidate site. However, during the preliminary inspection of each candidate site, obvious evidence of early habitation or other cultural resources (e.g., shell middens) was noted. The presence of a documented archeological site, common to upland regions within the study area, is being investigated only for the final site bank of primary and secondary alternatives. A request for a records search of the Florida Master File of historical and archeological sites and the National Register of Historical Places will soon be forwarded to the Division of Historical Resources, Florida Department of State, to identify potential conflicts. The presence of a verified archeological or historical site may necessitate a formal site survey or documentation effort prior to containment area construction. However, the discovery of such a site may not preclude the use of an otherwise viable management area.

- Groundwater Conditions — The final environmental evaluation criterion, groundwater conditions, addresses the possibility that local groundwater supplies may be impacted as a direct result of site development and operation. As discussed in Section 2.1.3.1, all existing data indicates that the Waterway channel sediments in Indian River County are not contaminated and do not pose an environmental threat. In addition, the sediment to be dredged will undergo further analysis, including elutriate testing, before each future dredging operation. Should elevated levels of contaminants be identified, permitting procedures will require taking appropriate measures to ensure these contaminants remain sequestered with the dredged material. Therefore, contamination of local groundwater by materials contained in channel sediments is not anticipated.

The primary source of potential impacts to local groundwater is salt — specifically, saltwater mixed with the sediment and pumped from the Waterway to the site. Saltwater will be held in the containment area only during the relatively short and infrequent periods of active dredging and dewatering. Nevertheless, specific safeguards against the occurrence of saltwater contamination of the local shallow aquifer are an essential part of the design and operation of each site. In addition, each site will include a comprehensive program of groundwater monitoring before, during, and after each dredging operation. These safeguards, addressed in detail in the site-specific documentation developed during Phase II, minimize the possibility of saltwater contamination. However, the possibility that saltwater may enter the local shallow aquifer cannot be totally eliminated except by extremely costly methods. Therefore, the relative isolation of a site, both in terms of its hydrology and its geographic

separation from adjacent development, was a criterion in site evaluation. As such, this criterion is closely related to adjacent land use, an issue addressed in the following section.

4.1.3 Socioeconomic or Cultural Considerations

- Land Use — The third major category of site evaluation criteria considers the socioeconomic issues of on-site or adjacent land use, current comprehensive plan and zoning designations, local governmental jurisdictions, and site ownership. Every effort was made during the initial identification of new candidate sites to select areas of suitable existing on-site land use. For obvious reasons, areas of minimal development were preferred. Moreover, areas previously disturbed by clearing, excavation, timber harvesting, or drainage were given priority because of their reduced environmental value. Managed timberlands or other agricultural areas were not excluded from consideration, however. Similarly, existing adjacent land use was an important consideration. The objective was to select areas isolated from existing residential or, in some cases, commercial or retail development.

  Because of the rapid pace of development in some areas, available aerial photography often did not accurately depict current on-site or adjacent land use. In several cases, field inspections revealed on-site residential or commercial development which required site reconfiguration or abandonment. Adjacent land-use conflicts were not so easily resolved, and in areas with limited upland acreage, such conflicts may remain. To the maximum extent possible, these conflicts were reduced by a buffer zone to separate the containment area from residential or commercial development.

- Zoning and Comprehensive Plans — In addition to field inspection of each site, on-site and adjacent land use was also investigated through the determination of existing zoning (county or municipal) and comprehensive plan future land-use designations. The present long-range planning effort, because it is being performed in support of a federal navigation project, is not subject to local zoning regulations. Moreover, the provision for dredged material management areas has not been addressed in local comprehensive plans. In many cases, comprehensive plans have not even recognized pre-existing dredged material disposal easements. This oversight is now being corrected by legislation. Notwithstanding the lack of clear guidelines in this matter, the FIND intends to recognize and address community concerns embodied in zoning and comprehensive planning laws. Thus, in the identification of new sites and the evaluation of existing easements, priority was given to those areas designated for industrial or agricultural uses.

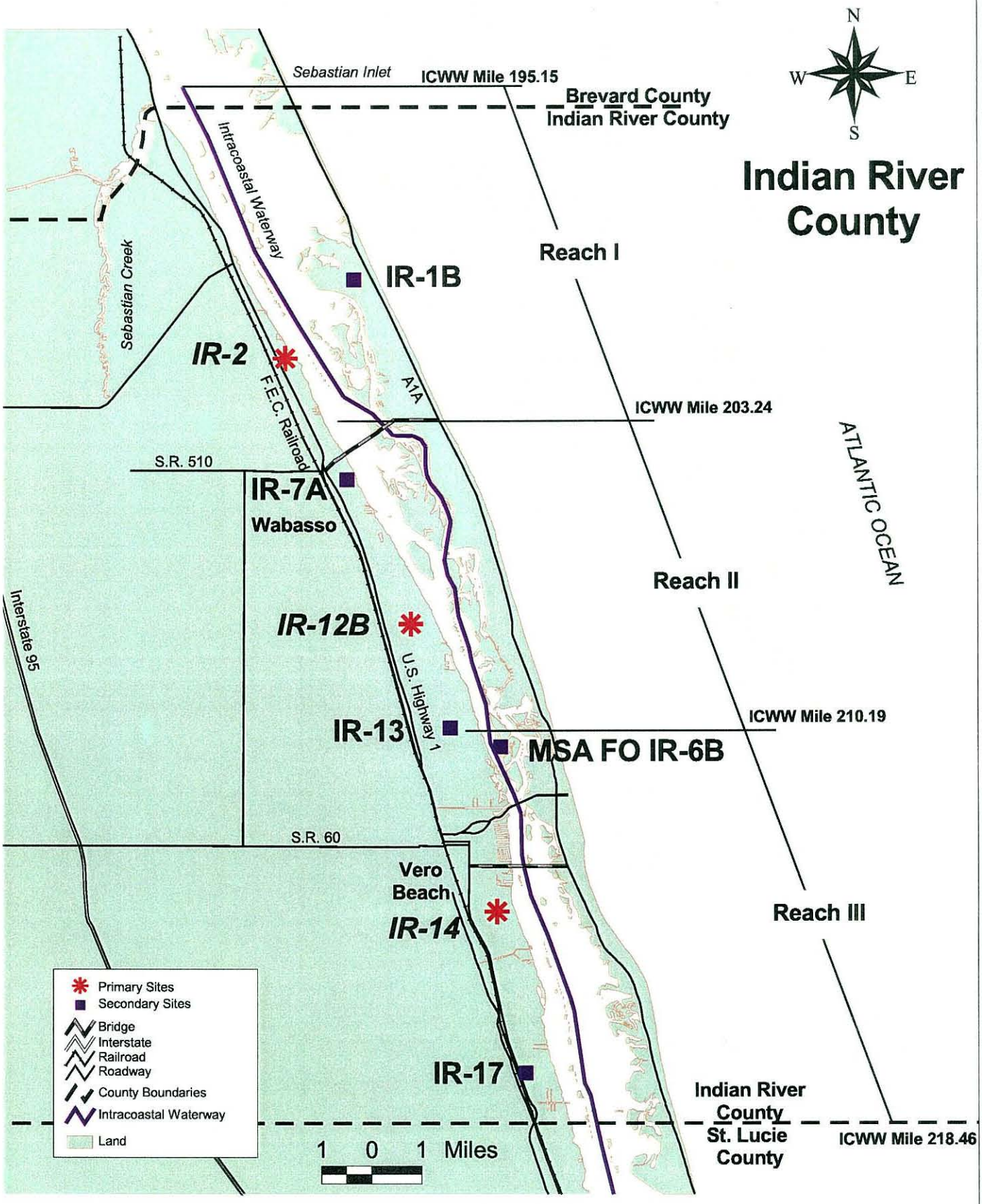
- Property ownership — Property ownership was investigated and established for primary and secondary sites to obtain authorized access to these sites required for the more detailed Phase II plan implementation effort. In addition, site ownership and recorded parcel boundaries were considered in the establishment of site boundaries and, when appropriate, to reduce the number of individual property owners involved. Property ownership information for all primary and secondary sites is presented in Appendix D.

4.2 Site Bank

Following the final evaluation of all candidate sites, a total of eight sites were selected to form the site bank to serve the three reaches of the Intracoastal Waterway channel within the Indian River County project area. These sites are shown in Figure 4.1, and listed in Table 4.1 along with key site parameters. Of these, three sites represent primary or first-choice options, and five sites provide secondary dredged material management alternatives should use of one or more of the primary sites prove infeasible.

Each of the three channel reaches within the Indian River County project area has been assigned one primary and at least one secondary site. Reach II and Reach III each have two designated secondary alternatives. As their names imply, these eight sites represent the three best and five second-best alternatives after consideration of all engineering, operational, environmental, and socioeconomic factors influencing site selection. With one exception, both the primary and secondary sites are well-suited to serve the requirements of their designated channel reach. The exception is as follows. Within Reach III, one of the two designated secondary sites — MSA FO-IR-6B — does not alone contain sufficient storage capacity to provide the entire reach requirement. However, as discussed later in this section, proposed public acquisition of portions of both the primary site and the remaining secondary site within this reach suggest that this FIND-owned tract be retained to provide additional storage capacity, if required.

Detailed information for each primary and secondary site in the site bank is presented in Appendix A. For each site, a data summary sheet outlines significant information on site location and reach parameters. Other site characteristics listed include acreage requirements, preliminary site capacity, and additional operational considerations such as access easement requirements and land use designations. In addition, Appendix A presents a map of each site showing the initial site boundaries (tied to geographic landmarks) and major vegetation communities and land-use categories under the FLUCFCS (Florida Land Use, Cover and



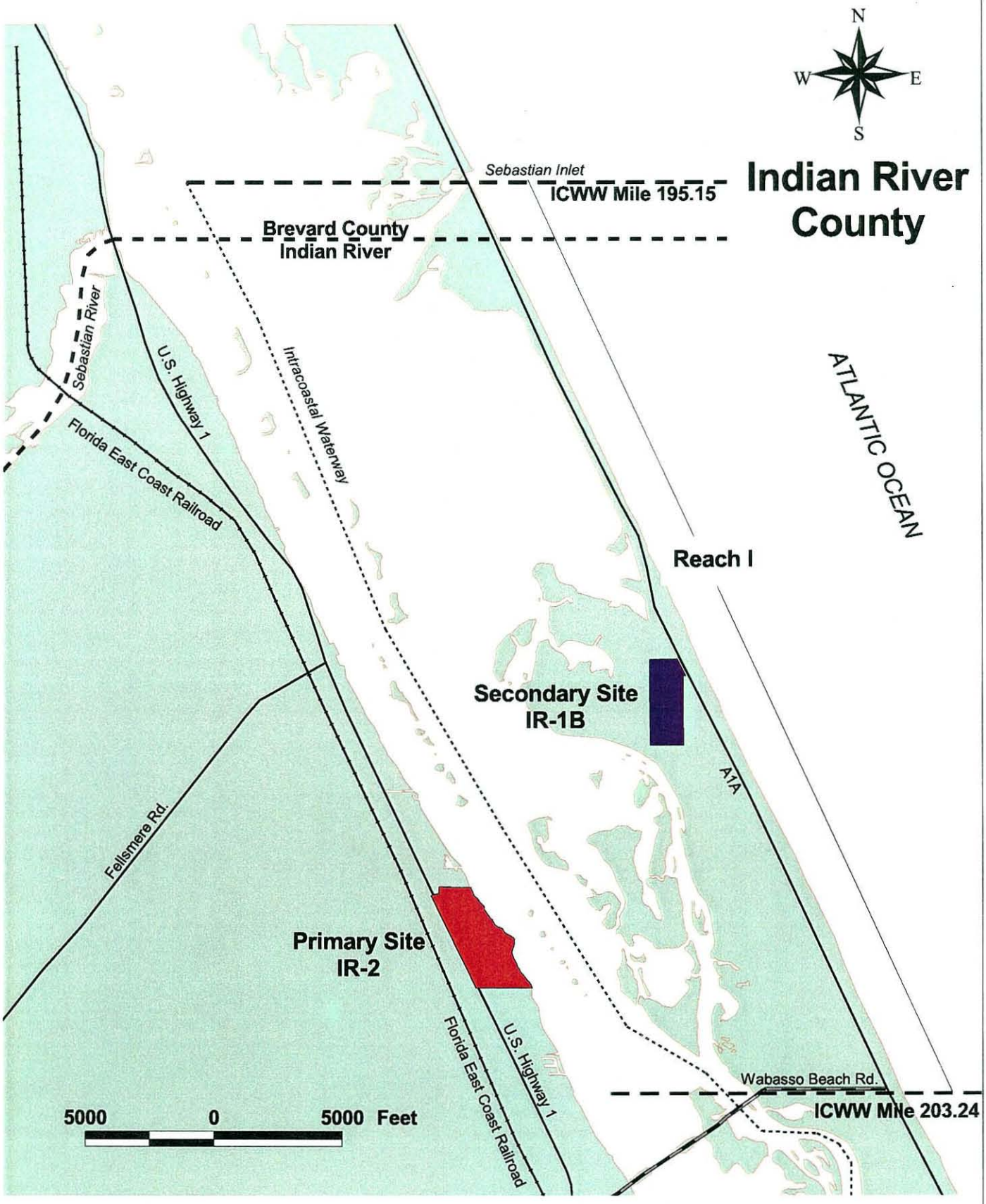
TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 4.1 Site Bank, Phase I, Long Range Dredged Material Management Plan, ICWW Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

Table 4.1 Site Bank, Long-Range Dredged Material Management Plan, Intracoastal Waterway, Indian River County

Reach	Site	Location (ICWW Mile)	Initial Site Area (ac)	Containment Area (ac)	Total Required Area (ac)	Containment Capacity (cy)	Maximum Pumping Distance (mi)	Comp. Plan Designation	Current Zoning	Comments
I Sebastian Inlet to Wabasso (SR 510) Bridge	**IR-1B** Secondary	198.87	182.5 (w/IR-1A)	35.8	98.9	461,040	6.05	L-1	A-1	Site fronts on both SRA1A and Jungle Trail; citrus groves
ICWW Mile 195.15 to 203.24	**IR-2** Primary	200.96	181.7	36.0	108.5	463,872	5.66	L-2	RS-1 RM-6 Con.-2	Maximum use of existing citrus area requires reduced western buffer
II Wabasso (SR510) Bridge to Vero Beach	**IR-12B** Primary	208.03	350.8	10.0	42.6	40,629	5.43	L-2	RS-1 RM-1 CG	Citrus Groves
	IR-7A Secondary	204.94	39.2	10.0	17.4	41,074	9.20	L-2/M-1	RS-1 RM-6	AKA Ryall Grove Property, already controlled by FIND
ICWW Mile 203.24 to 210.19	**IR-13** Secondary	210.05	92.4	10.0	44.1	41,143	7.27	M-1	RS-1 RS-6 RM-6	Citrus Groves
III Vero Beach to Indian River/St. Lucie County Line	**IR-14** Primary	213.61	108.2	14.4	55.0	163,740	4.97	M-2	RS-1 RM-8 RM-10	Use of site will require cooperative effort between FIND, Indian River Co., SJRWMD
	MSA FO IR-6B Secondary	210.24	61.4	5.3	13.1	38,748	7.26	Conservation	Conservation	Data reflect use of existing FIND easements only
ICWW Mile 210.19 to 218.46	**IR-17** Secondary	217.19	87.5	14.4	51.7	163,740	8.15	L-2	RS-1 RS-6 RM-6	Much of site proposed for acquisition by County/SJRWMD

Forms Classification System, Florida Department of Transportation, 1985) as verified by field inspection. Approximate acreages of each vegetation and land-use category are presented in tabular form. In each case, the site map (and its acreages tabulated by vegetation and land-use category) correspond to the initial site acreage listed in Table 4.1. Table 4.1 also lists the total required area for each site. The total required area, typically a small portion of the initial site area, represents a preliminary estimate of the acreage actually needed to provide a containment basin of adequate capacity plus an appropriate buffer area surrounding the containment basin. Finally, narratives accompanying each site summarize pertinent characteristics including general physiographic and environmental conditions, vegetative communities, and observed plant species typical of these communities. Appendix B presents similar information for the candidate sites not selected for the site bank. However, for this latter group of sites the listed site capacities and acreage requirements represent each site's maximum use. No attempt was made to bring these values into line with specific reach requirements. In the remainder of this section the key factors which led to the selection of the individual sites comprising the site bank are discussed, as well as the considerations which influenced the designation of the selected sites as either primary or secondary alternatives.

Within Reach I, Site IR-2 has been designated the primary site, while Site IR-1B has been designated the secondary site. Site locations are shown in Figure 4.2. Both sites, located in the south-central portion of Reach I, are active citrus groves. Because of their previous disturbance, either site's development as a permanent dredged material management area would carry minimal environmental constraints. Either can provide sufficient buffer areas to isolate their containment basins from future development. Site IR-2 was selected as the primary site for Reach I primarily because of Site IR-1B's more complex pipeline access, its proximity to publicly-owned conservation lands, and its likely much higher acquisition costs. Regarding pipeline access, Site IR-1B lies almost two miles east of the ICWW channel, separated from the channel by shallow flats, seagrass beds, and impounded mangrove areas. Accessing the site from the northwest via one of several open water sloughs can reduce mangrove impacts, but the pipelines must still cross a mangrove impoundment and adjacent uplands (the Korangy property) recently acquired for public conservation under the Indian River County Environmental Lands Program. Approaching the site from the southwest using open water to the greatest possible extent will necessarily bring the pipelines near Pelican Island National Wildlife Refuge, an historic sea bird rookery of national importance. Either route must also cross Jungle Trail, a locally-designated scenic and historic road that adjoins Site IR-1B along its western side. Located on the barrier island with expanding residential development to the southeast, Site IR-1B will likely carry a very high per acre cost.



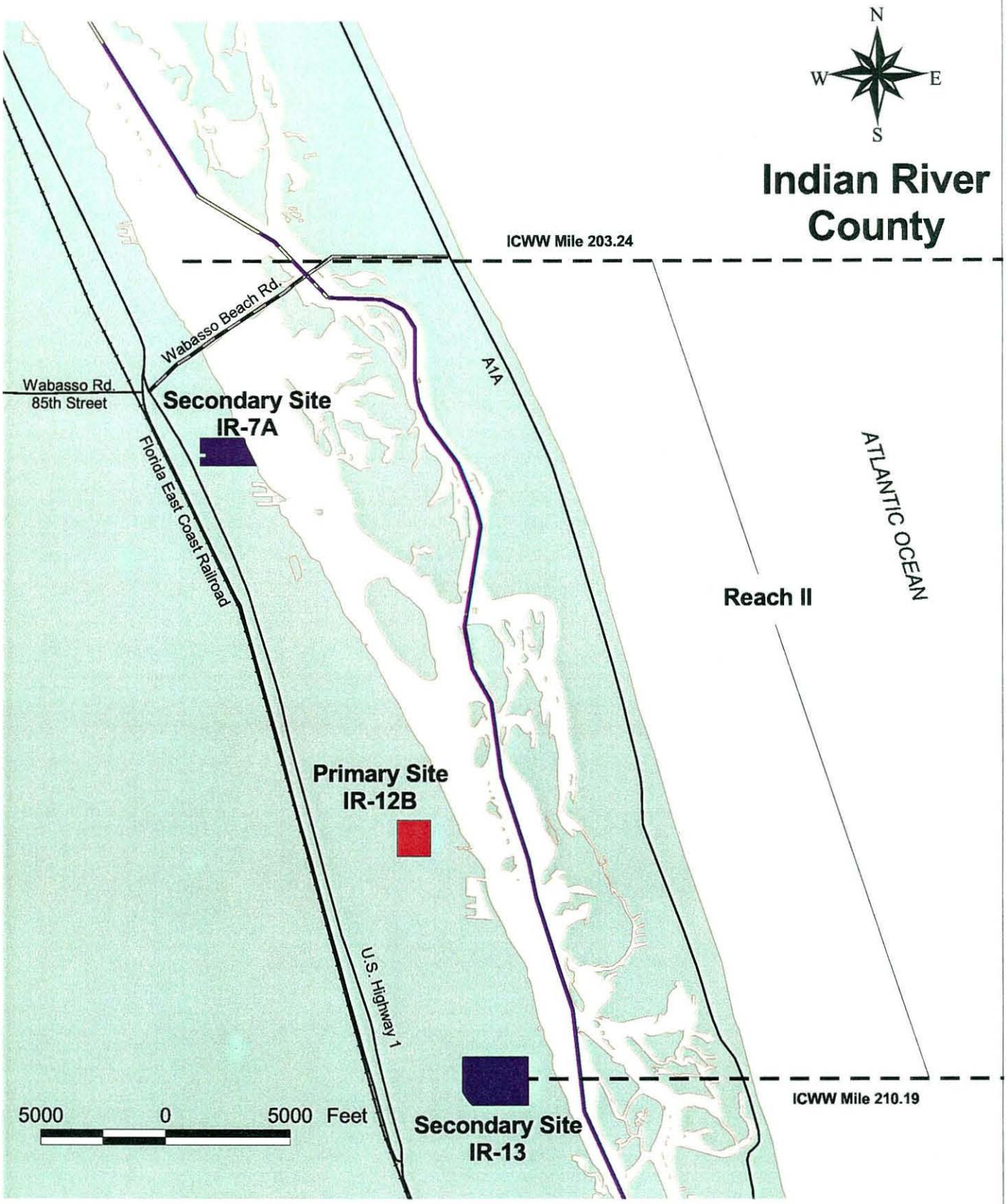
TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 4.2 Primary/Secondary Sites, Reach I, Phase I, Long Range Dredged Material Management Plan Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

In contrast, Site IR-2 offers relatively direct pipeline access, crossing a disturbed mangrove/mosquito impoundment via one of several previously filled corridors. No public roads lie between the site and the Indian River shoreline. Fronting U.S. Highway 1, Site IR-2 is already isolated from residential development to the west. Finally, the entire tract encompassing Site IR-2, the undeveloped property to the south, and (apparently) the mosquito impoundments to the east, are presently posted for sale.

The other candidate sites within Reach I that potentially could provide sufficient capacity to meet the reach requirements — Sites IR-20 and 21— would require the pipelines to pass through residential neighborhoods fronting the Indian River, as well as cross both U.S. 1 and the Florida East Coast (FEC) Railway. Both Sites IR-20 and 21 also adjoin residential developments, making the development of either site as a permanent dredged material management facility problematic.

Within Reach II, Site IR-12B has been designated as the primary site, while Site IR-13 and Site IR-7A will both serve as the secondary options (Figure 4.3). Because the projected material storage requirements for Reach II is relatively low, each candidate site was evaluated based on its ability to provide a containment basin of 10 acres — determined to be the minimum size for efficient site construction and operation — along with an appropriate buffer area surrounding the containment basin to separate the basin from adjacent properties. Site IR-12B and Site IR-13 are both large citrus areas located west of the Waterway and separated from the Indian River shoreline by impounded mangrove wetlands. As agricultural properties, either site's development as a permanent dredged material management area would carry minimal environmental constraints. Both sites can provide sufficient upland buffer areas to the north, west, and south of the containment basin, while the impounded wetlands provide a natural buffer to the east. Site IR-12B was selected as the primary site for Reach I primarily because its more central location compared to Site IR-13 reduces the pumping distance required to transport dredged material from Reach II's northern end.

Site IR-7A, a citrus grove located in the northern portion of the reach, will also serve as a secondary site for Reach II. Constrained by wetlands on the west and a residential outparcel within its western side, Site IR-7A would severely limit potential buffer areas surrounding the required 10-acre containment basin compared to Site IR-12B and Site IR-13. However, this property was recently acquired by the FIND as partial settlement in litigation regarding the unauthorized development of an existing FIND easement on Wabasso Island. The site was therefore retained in a secondary capacity should development of either primary Site IR-12B or secondary Site IR-13 prove infeasible.

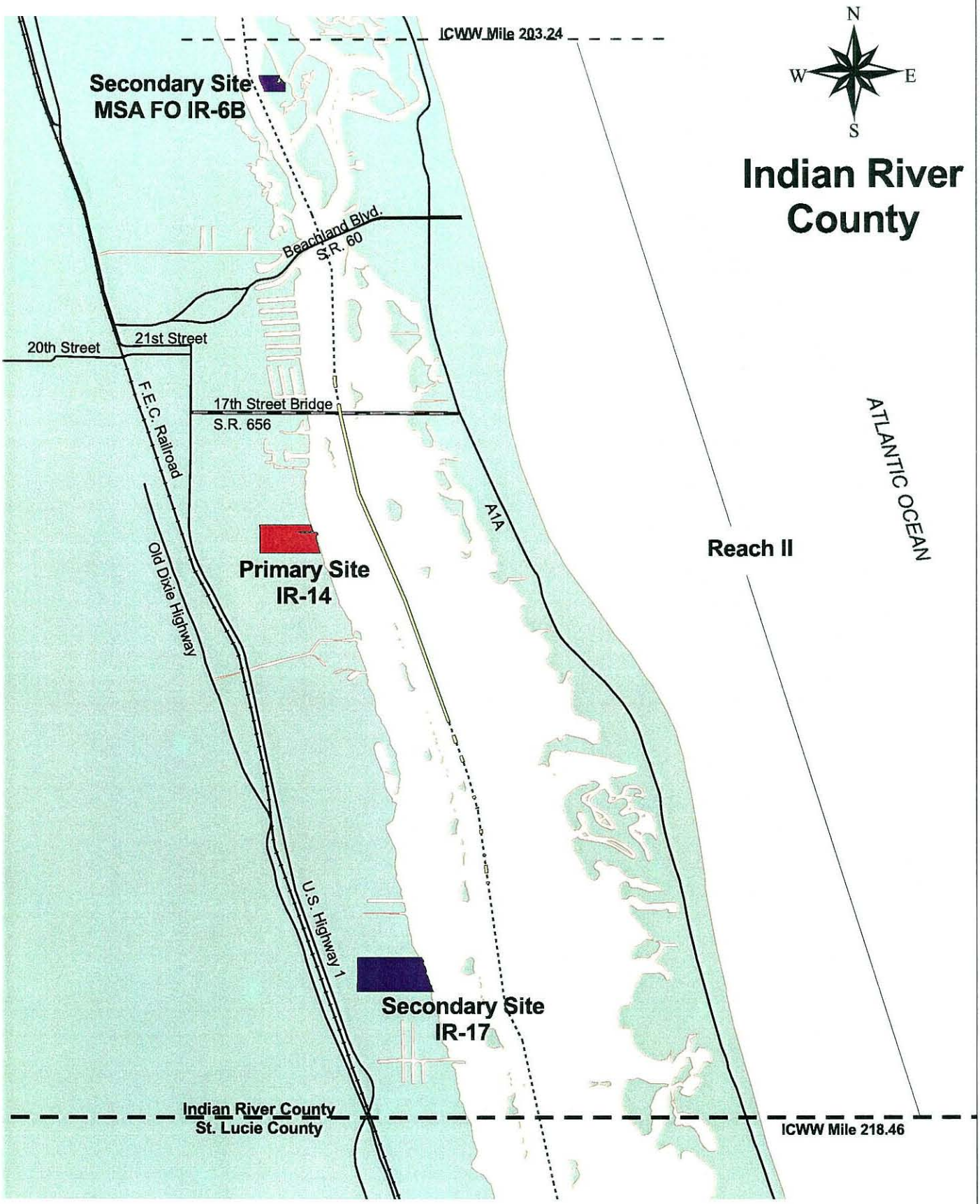


TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 4.3 Primary/Secondary Sites, Reach II, Phase I, Long Range Dredged Material Management Plan Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997

Neither of the two sites in Reach II that are contained within existing easements or FIND-owned tracts — MSA IR-3 and MSA FO-IR-6A/MSA IR-6D — are recommended for inclusion in the final site bank. Although either island site can potentially meet Reach II's minimal capacity requirements, the lack of upland road access can make site construction and management problematic. Moreover, off-loading material from either site to allow its continued use presents operational difficulties akin to the original dredging. Thus, the future use of these sites is not consistent with the FIND's objective of providing long-term dredged material management capability given the apparent availability of suitable alternatives.

Within Reach III, Site IR-14 is the designated primary site. Site IR-17 and Site MSA FO-IR-6B will both serve as secondary sites (Figure 4.4). Reach III offered limited options in the identification of viable dredged material management site alternatives. Of the four candidate sites identified within the reach, a portion of one — Sites IR-15 (also known as the Oslo Riverfront Conservation Area) — has already been jointly acquired by Indian River County and the SJRWMD for public conservation. Portions of the remaining three candidate sites — Site IR-14 (also known as the Indian River Blvd. South property), Site IR-16 (the Lowenstein/Salama property), and Site IR-17 (the Indian River Farms property) — are also slated for public acquisition.

Preliminary discussions with representatives of the county and the SJRWMD regarding Site IR-14 have indicated that their objectives and those of the FIND may be complementary. The SJRWMD is most interested in the mangrove impoundment that lies between Site IR-14 and the Indian River. The county is most interested in the areas of native vegetation (temperate hammock and cabbage palm) that lie in the southern one-third of Site IR-14's initial acreage. The disturbed wetland/Brazilian pepper area that lies north of the unnamed east-west dirt road is being viewed by the SJRWMD and the county as a potential mitigation/restoration area for a proposed private development west of Indian River Blvd. The remaining area — dominated by exotic vegetation (Australian pine and Brazilian pepper) but also containing limited acreage of native vegetation — can meet the capacity requirements of Reach III if less than optimal buffer widths are provided. Given the intended use of the adjacent properties, the reduced buffer widths may be acceptable. The SJRWMD and the county are presently engaged in ongoing negotiations with the owners of portions of Site IR-17. However, this site, similar in many respects to Site IR-14, may offer the same opportunities should the cooperative acquisition of Site IR-14 prove unsuccessful



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure 4.4 Primary/Secondary Sites, Reach III, Phase I Long Range Dredged Material Management Plan, Intracoastal Waterway Indaian River County, Florida	Project C9508 Revision Sheet Date May, 1997

As discussed previously, acreage and capacity limits inherent in the proposed cooperative purchase of either Site IR-14 or IR-17 suggest the need to retain additional storage capacity within Reach III. Site MSA FO-IR-6B, an island-based tract owned by the FIND, can provide such a backup capability. Although not possessing sufficient storage capacity to provide the entire reach requirement, Site MSA FO-IR-6B offers the best alternative among the existing easements or FIND-owned tracts within the reach to augment capacity shortfalls of either Site IR-14 or IR-17. Moreover, by expanding the existing tract to encompass the entire island, Site MSA FO-IR-6B can provide the needed additional capacity to serve the entire reach.

Preliminary acreage requirements, storage capacities, and operational factors for each site in the site bank are summarized in Table 4.1. The final determination of these parameter values will be made during Phase II of the project. However, the preliminary estimates presented here are felt to be both realistic and conservative. In each case, material storage capacities of both the primary sites and secondary options are sufficient to meet the projected 50-year requirements of the reach to be served.

In Table 4.1, the containment area for each site represents the acreage within a realistic dike configuration necessary to contain the stated material storage capacity for that site. For all sites the required dike configuration lies wholly within the initial site acreage. As stated previously, the total required area corresponds to the required containment area, plus an appropriate buffer to surround the diked containment basin. Refinement and finalization of the overall site boundaries during Phase II may result in the inclusion of additional buffer areas not presently included in the initial site area or the site maps.

The total required primary site acreage for the 23.31 miles of Waterway channel within the Indian River County project area is approximately 206 acres. This includes 60 acres of active containment area and 146 acres of buffer. In the corresponding total secondary site requirement of 226 acres, 76 acres are containment area and 150 acres are buffer. All of the area contained in the three primary sites represents newly identified properties not presently controlled by the FIND. Of the secondary alternatives, two of the sites, representing 31 acres, are currently owned by the FIND.

5.0 RECOMMENDED SCOPE OF WORK: PHASE II

Task I: Preparatory Documentation

The purpose of this task is to obtain all of the information and authorizations necessary to facilitate the detailed documentation of site conditions and facilities design in Task II and to document public record information concerning land use and zoning restrictions, taxes and assessed values, easements, and property ownership. This will be done for all primary and secondary sites subject to property acquisition proceedings. Specific subtasks are outlined below.

A. Public Information — From county tax rolls and related public records, verify and update, as necessary, site ownership and tax information including parcel size, boundaries, and assessed value. This information will be provided to the FIND at the earliest possible date to facilitate the FIND obtaining from all relevant property owners appropriate written permission as required for site access, survey work, field testing, and data collection.

B. Zoning — Verify and update, as necessary, existing zoning classification and permitted uses under that classification.

C. Other Site Encumbrances — Identify other restrictions which may limit the use of the site such as local or regional planning constraints, rights-of-way, easements, adjacent property constraints, or potential damages to adjacent properties.

D. Site Reconfiguration — Modify site boundaries, as necessary. Eliminate unusable or unnecessary acreage and finalize site configuration for performance of boundary survey.

Task II: Site Conditions

Obtain necessary engineering and environmental site information required for preliminary engineering design and permitting of *primary sites only* as modified by results of Task I.

A. Boundary Survey — Provide boundary survey of each primary site. Provide boundary surveys for additional pipeline and road access easements as required. Document results of each survey in sufficient detail to support legal and engineering actions required for acquisition of the site,

as well as acquisition of additional easements under consideration by the FIND, and for site development for the purposes of dredged material management. Provide final boundary survey drawings, written legal descriptions, and other supporting documents to the FIND for each site. Reference boundary information for each site and additional easement to the Florida State Plane Coordinate System.

B. Engineering Topographic Survey — Provide site topographic information necessary for site planning, permitting, and design purposes. Reference horizontal and vertical control of data to established bench marks and reference all elevations to NGVD.

C. Subsurface and Soils Survey — This task will be performed by the Jacksonville District, U.S. Army Corps of Engineers.

1. Soils Survey — By means of core borings and analysis, document site soil characteristics including boring logs, grain size distributions, specific gravity, organic content, Atterberg limits (where appropriate), shear strength, compaction, and consolidation.
2. Groundwater — Obtain groundwater table elevations at a sufficient number of locations to provide estimates of on-site water table potential surface elevations referenced to NGVD.

D. Environmental Survey — Perform field survey and data collection efforts to provide the following:

1. Detailed documentation of site vegetation communities, including species frequencies of occurrence, and the delineation of wetlands and transitional areas using state approved methods.
2. Detailed documentation of on-site animal species, including endangered or threatened species, and pertinent habitat information.
3. Documentation of existing vegetation communities and species habitats along proposed pipeline access and return drainage routes.
4. Documentation for a Phase I Site Environmental Assessment for concerns related to hazardous waste.

Task III: Preliminary Design and Analysis

With data obtained from Task II, develop site documentation and complete preliminary design necessary to prepare permit drawings.

A. Environmental — With information obtained from Task II-D, prepare the following:

1. Detailed site maps showing vegetation communities, species locations and habitats, revised usable boundaries, and wetland areas.
2. Detailed written text supporting (1) above.
3. Specific mitigation measures as required.
4. Archeological site locations as recorded in published records available from the Division of Historical Resources, Florida Department of State.
5. Recommended pipeline access and return water routes.
6. Phase I Site Environmental Assessment Report.

B. Engineering — With information obtained in Task II, prepare the following:

1. Site Capacity Analysis — Recalculate estimated site capacity and dike material requirements.
2. Site Topographic Map.
3. Engineering Report on Subsurface and Soils Conditions — Prepared by Jacksonville District, U. S. Army Corps of Engineers.
4. Preliminary design calculations and permit drawings of:
   - o Location/Reach Map
   - o Site Plan
   - o Pipeline Access and Return Routes
   - o Inlet Works
   - o Outlet Works
   - o Dike Section
   - o Internal Structures
   - o Equipment Ingress and Egress Features
   - o Vegetation and Buffer Area Plan
   - o Site Drainage Plans

5. Detailed written text supporting (1) — (4) above.

D. Agency Coordination — Obtain from pertinent state and federal agencies a preliminary statement on the acceptability of the proposed site plans based on the site engineering narrative, permit drawings, environmental report, and preliminary delineation of agency jurisdiction.

Task IV: Site Management Plans

Prepare a site management plan for each primary site in the Site Bank as modified by Task I. Each plan will address the following:

A. Design Features — Brief description of all site design features as they relate to the long-term operation of the site and the management of dredged material.

B. During-Dredging Procedures

1. Outlet Operations
2. Inlet Operations
3. Ponding Depth
4. Material Distribution
5. Monitoring

C. Post-Dredging Procedures

1. Dewatering
2. Surface Water Management
3. Material Handling/Reuse
4. Monitoring

Task V: Cost Considerations

For all primary sites, evaluate the following cost considerations:

A. Site Improvement Costs

B. Site Operation Costs

C. Site Maintenance Costs

Task VI: Documents and Deliverables

Prepare and submit the following project documents for each primary site:

A. Site boundary survey with legal description, with additional boundary surveys of pipeline and road access easements as required.

B. Site topographic survey, with additional topographic surveys of pipeline and road access easements as required.

C. Permit drawings and accompanying engineering narrative.

D. Subsurface and soils report prepared by Jacksonville District, U. S. Army Corps of Engineers.

E. Environmental Report.

F. Phase I Site Environmental Assessment Report.

G. Site Management Plan.

H. Cost Report.

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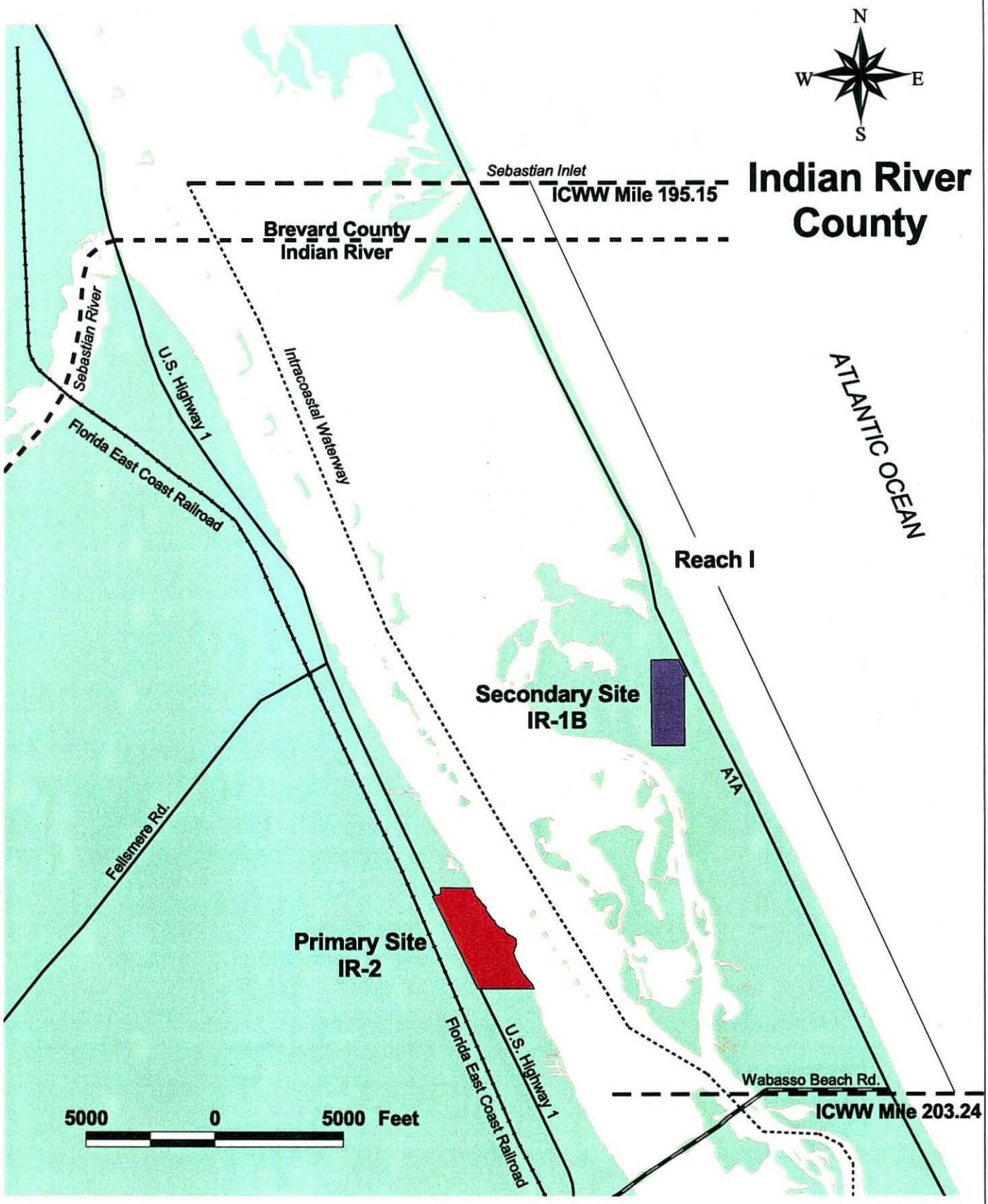
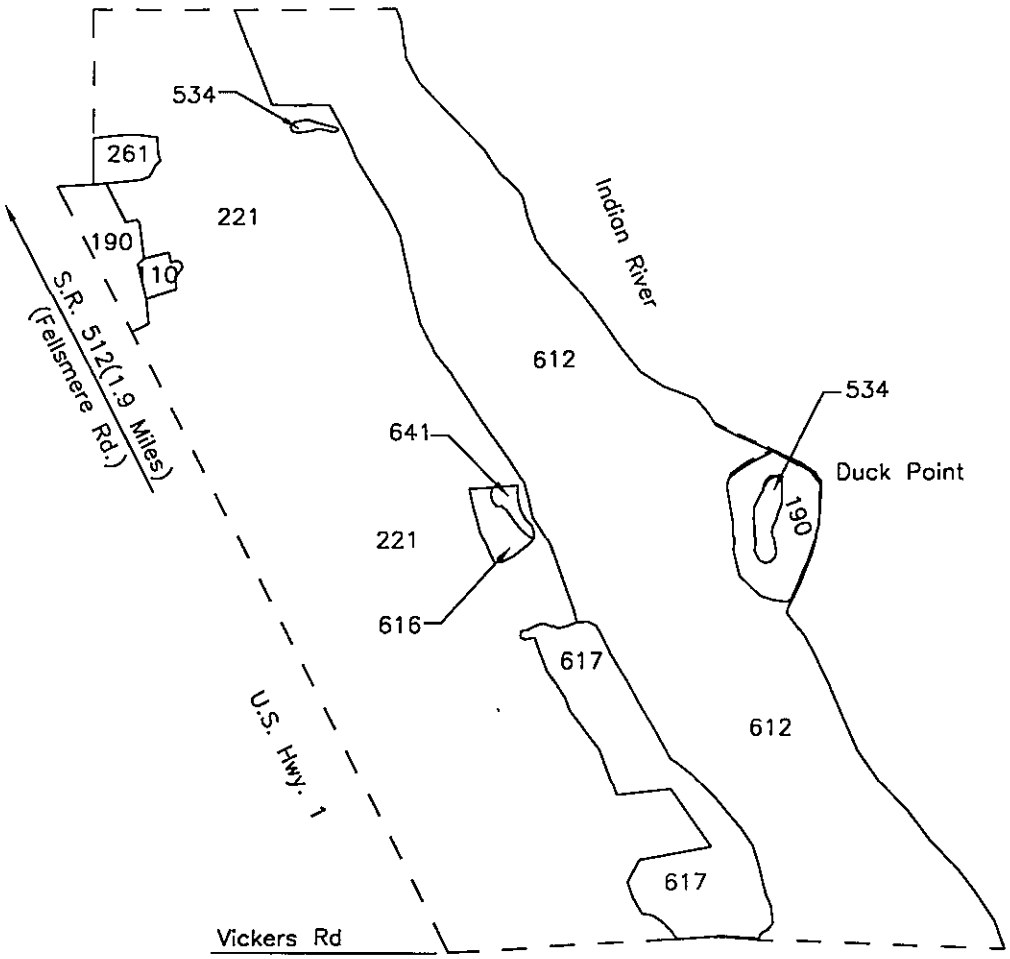
APPENDIX A

Site Bank (Primary and Secondary Sites)



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure A-1 Primary/Secondary Sites, Reach I, Phase I, Long Range Dredged Material Management Plan Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997



-- LEGEND --		
110	Residential, Low Density	0.48 Ac
190	Open Land	5.94 Ac
221	Citrus Groves	94.06 Ac
261	Fallow Cropland	1.12 Ac
534	Reservoirs Less than 10 Acres	0.83 Ac
612	Mangrove Swamp	68.11 Ac
616	Inland Ponds and Sloughs	0.94 Ac
617	Mixed Wetland Hardwoods	9.90 Ac
641	Freshwater Marsh	0.36 Ac
	Total Acreage	181.74 Ac

- — — — Area Boundary
- - - - - - - Interpolated Boundary
——— Road

N

Scale in Feet

0 400 800

SOURCE: W&AR Graphic 1996.

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9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure A-2
Land Use and Vegetation of
Primary Site IR-2
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-2

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**200.15**	East/West of ICWW:	**West**
Section/Township/Range:	**S16/T31S/R39E, S17/T31S/R39E, S21/T31S/R39E, S20/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-1**		Reach Length (mi):	**8.09**	
ICWW Mileage:	**194.34**	to	**202.43**		
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**				

50-yr Requirements

Dredging (cy):	**199,006**
Storage (cy):	**427,862**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**181.7**		
Containment Area (ac):	**36.0**	North:	**300+**
Total Area Impacted (ac):	**44.5**	South:	**300**
Total Buffer Area (ac):	**64.0**	East:	**300+**
Buffer Outside Mapped Area (ac):	**5.8**	West:	**250**
Preliminary Total Site Area (ac):	**108.5**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**463,872**		
Dike Height (ft):	**12.0**		
Excavation Depth (ft):	**5.16**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**5.66**		

D. SITE CHARACTERISTICS

Public Road to Site:	**U.S. Hwy. 1**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**<1000**
Comprehensive Plan Designation:	**L-2 Medium Density Residential (Single Family)**		
Adjacent Land Use:	**citrus grove, open land (wetland), low density residential**		
Predominant Land Use Impacted:	**citrus grove**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**78.0**	Contiguous:	**0.0**
Isolated:	**2.1**	Isolated:	**0.0**

III Site Description

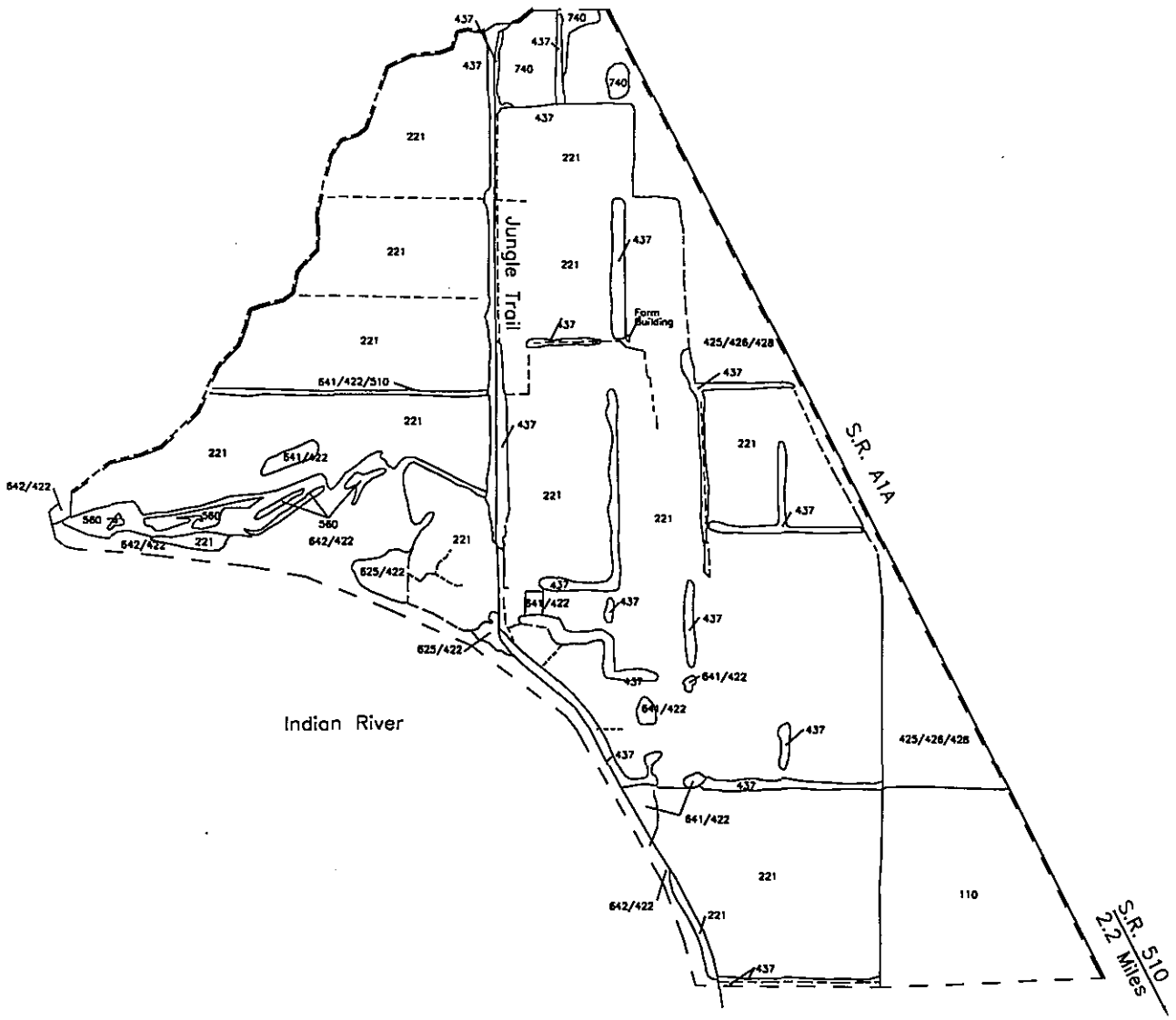
Site IR-2 is located on the western shore of the Indian River. U.S. Highway 1, which travels north to south, forms the site's western border.

An active citrus grove site (221) covers 52% of IR-2. The mature grove bears grapefruit. The grove's low groundcover contains a variety of grasses and weedy plants including lovegrass (*Eragrostis* sp.), panic grass (*Panicum* sp.), and Spanish needles (*Bidens bipinnata*). Shallow ditches occur throughout the site. Some ditches on the western side of the site contain sea oxeye (*Borrichia frutescens*), an indication of saline conditions.

An area of open land is located in the site's northwest portion. This area is also used as a parking area for truck trailers transporting citrus. Covered with low grasses, the area contains a few large slash pine trees (*Pinus elliottii*). An area of fallow cropland occurs nearby. The vegetation cover, periodically mowed, is typical of citrus grove groundcover species.

Two wetland areas occur on the east side of the citrus area. One wetland consists of a ponded, herbaceous marsh on the east and a forested wetland on the west. Marsh species include cattail (*Typha* sp.), primrose willow (*Ludwigia* sp.), duckweed (*Lemna* sp.), and sedge (*Cyperus* sp.). The forested portion contains Brazilian pepper (*Schinus terebinthifolius*), cabbage palm (*Sabal palmetto*), and sweetbay (*Magnolia virginiana*). An area approximately 10 acres in size located in the southeastern area of the site contains mixed wetland hardwood (617). A drainage ditch separates this area from the citrus grove. Common species found in this area include hackberry (*Celtis laevigata*), cabbage palm (*Sabal palmetto*), and sweetbay (*Magnolia virginiana*).

Mangrove swamp (612), the second largest cover type on IR-2, covers approximately 37% of the site. A drainage ditch separates the mangrove swamp, located in a wide band east of the citrus grove, from the grove. Swamp species found in this area include white mangrove (*Laguncularia racemosa*), Brazilian pepper (*Schinus terebinthifolius*), and giant leather fern (*Acrostichum danaeifolium*). The swamp borders the ICWW along the length of the site except at Duck Point, which features an upland area classified as open land (191) and a small constructed pond (534).



-- LEGEND --

110	Residential, Low Density	35.9 Ac
221	Citrus Groves	330.1 Ac
425/426/428	Temperate Hardwoods/Tropical Hardwoods/Cabbage Palm	42.8 Ac
437	Australian Pine	24.9 Ac
560	Slough Waters	2.6 Ac
625/422	Cabbage Palm/Brazilian Pepper	3.0 Ac
641/422	Freshwater Marshes/Brazilian Pepper	3.4 Ac
641/422/510	Freshwater Marshes/Brazilian Pepper/Streams and Waterways	1.5 Ac
642/422	Saltwater Marshes/Brazilian Pepper	31.2 Ac
740	Disturbed Lands	7.1 Ac
	Total Acreage	482.5 Ac
— — — —	Area Boundary	
--------	Ditches	——— Road

N

Scale in Feet

0 600 1200

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure A-3
Land Use and Vegetation of
Secondary Site IR-1B
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-1B

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**198.06**	East/West of ICWW:	**East**
Section/Township/Range:	**S3/T31S/R39E, S10/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-1**	Reach Length (mi):	**8.09**
ICWW Mileage:	**194.34** to **202.43**		
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**		

50-yr Requirements

Dredging (cy):	**199,006**
Storage (cy):	**427,862**

C. SITE PARAMETERS

Mapped Area (ac):	**482.5 (w/IR-1A)**	Buffer Width (ft)	
Containment Area (ac):	**35.8**	North:	**300**
Total Area Impacted (ac):	**43.4**	South:	**300**
Total Buffer Area (ac):	**55.5**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**98.9**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**461,040**		
Dike Height (ft):	**12.0**		
Excavation Depth (ft):	**3.96**		
Estimated Site Elevation (ft +NGVD):	**8.0**		
Maximum Pumping Distance (mi):	**6.05**		

D. SITE CHARACTERISTICS

Public Road to Site:	**S.R. A1A, Jungle Trail**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**N/A**
Comprehensive Plan Designation:	**L-1 Low Density Residential (Single Family)**		
Adjacent Land Use:	**citrus groves, open land (wetland), residential**		
Predominant Land Use Impacted:	**citrus groves**		

Wetlands (ac)

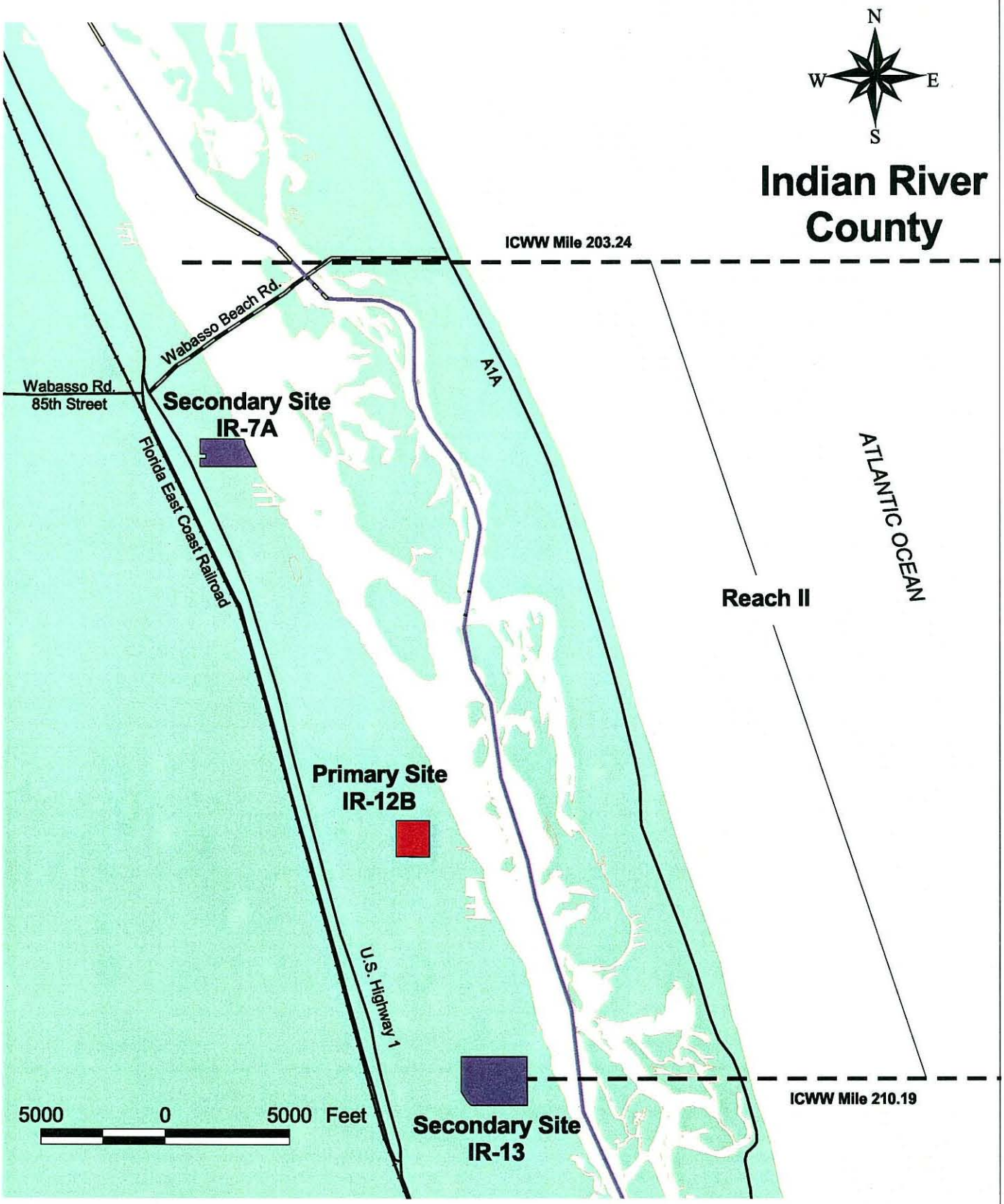
	On-Site		Impacted
Contiguous:	**42.8**	Contiguous:	**0.0**
Isolated:	**3.4**	Isolated:	**0.0**

III Site Description

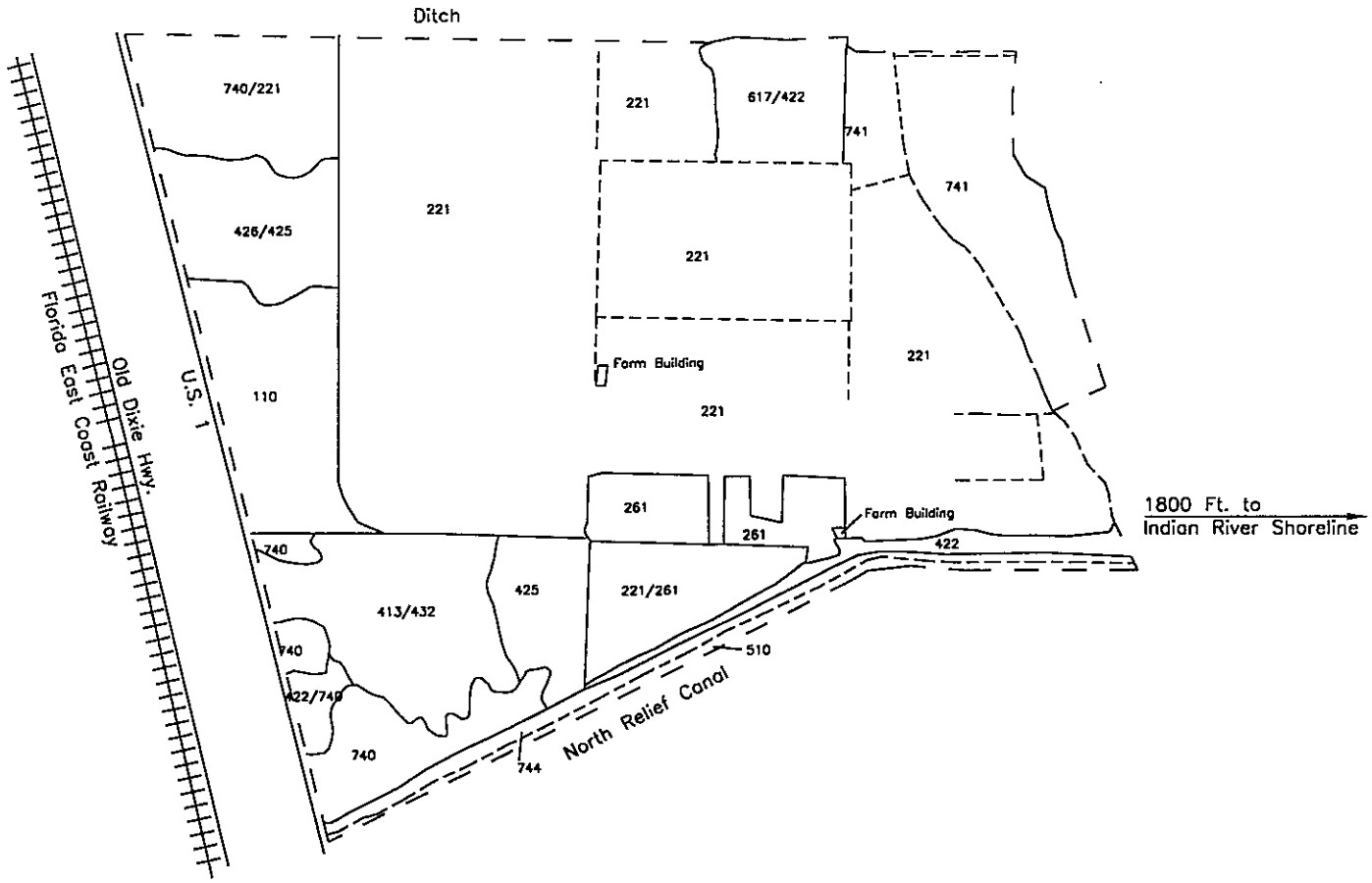
Site IR-1B, located south of the Brevard/Indian River County line, is primarily citrus grove (221) bordered on the west by the Indian River and Jungle Trail Road, an Indian River County designated scenic and historic dirt road. S.R. A1A borders the site on the east. A farm building is located in the southern portion of the northern one-third of the site.

Throughout the site occur small grassy swales and large flowing ditches, some associated with Australian pine communities (*Casuarina equisetifolia*; 437). Four small freshwater marsh/Brazilian pepper communities (*Schinus terebinthifolius*; 641/422) occur in the southwestern area of the site, and a tidally influenced saltwater marsh/Brazilian pepper (642/422) community occurs along the extreme southwestern boundary. Temperate hardwood/tropical hardwood/cabbage palm mixed communities (425/426/428) occur in the northeastern and southeastern areas of the site along SR A1A. Dominant vegetation in this community includes live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), saw palmetto (*Serenoa repens*), wild coffee (*Psychotria nervosa*), and marlberry (*Ardisia escallonioides*). Also, in the southeastern area of the site, low-density single-family residences (110) exist. The disturbed (740) northern area is possibly an old citrus grove regrown with weedy herbs and grasses. This area may be located within land designated as a national wildlife preserve.

The state-listed threatened species golden polypody fern (*Phlebodium aureum*) and shoestring fern (*Vittaria lineata*), occasional to locally common, grow near the tops of cabbage palms in the temperate hardwood/tropical hardwood/cabbage palm (425/426/428) community.



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure A-4 Primary/Secondary Sites, Reach II, Phase I, Long Range Dredged Material Management Plan Intracoastal Waterway Indian River County, Florida	Project C9508 Revision Sheet Date May, 1997



-- LEGEND --		
110	Residential, Low Density	18.9 Ac
221	Citrus Groves	183.6 Ac
221/261	Citrus Groves/Fallow Cropland	11.2 Ac
261	Fallow Cropland	10.0 Ac
413/432	Sand Pine/Sand Live Oak	20.7 Ac
422	Brazilian Pepper	5.3 Ac
422/740	Brazilian Pepper/Distrubed Land	2.2 Ac
425	Temperate Hardwoods	8.5 Ac
426/425	Tropical Hardwoods/Temperate Hardwoods	13.6 Ac
510	Streams and Waterways	4.5 Ac
617/422	Mixed Wetland Hardwoods/Brazilian Pepper	10.8 Ac
740	Disturbed Lands	12.3 Ac
740/221	Disturbed Lands/Citrus Groves	16.3 Ac
741	Rural Land in Transition without Positive Indicators of Intended Activity	26.7 Ac
744	Fill Areas	6.1 Ac
	Total Acreage	350.8 Ac

- — — — Area Boundary
---------- Ditch
——— Road
+++++++++ Railway

N

Scale in Feet
0 500 1000

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure A-5
Land Use and Vegetation of
Primary Site IR-12B
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-12B

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**207.22**	East/West of ICWW:	**West**
Section/Township/Range:	**S14/T32S/R39E, S15/T32S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-2**		Reach Length (mi):	**6.95**	
ICWW Mileage:	**202.43**	to	**209.38**		
Geographic:	**Wabasso (S.R. 510) Bridge to Vero Beach**				

50-yr Requirements

Dredging (cy):	**5,591**
Storage (cy):	**12,021**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**350.8**		
Containment Area (ac):	**10.0**	North:	**300**
Total Area Impacted (ac):	**13.3**	South:	**300**
Total Buffer Area (ac):	**29.3**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**42.6**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**40,629**		
Dike Height (ft):	**6.0**		
Excavation Depth (ft):	**1.74**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**5.43**		

D. SITE CHARACTERISTICS

Public Road to Site:	**U.S. Hwy. 1**	Additional Road Easement (ft):	**>700**
		Pipeline Easement (ft):	**>1500**
Comprehensive Plan Designation:	**L-2 Medium Density Residential (Single Family)**		
Adjacent Land Use:	**citrus groves, residential, open land**		
Predominant Land Use Impacted:	**citrus groves**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**15.3**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

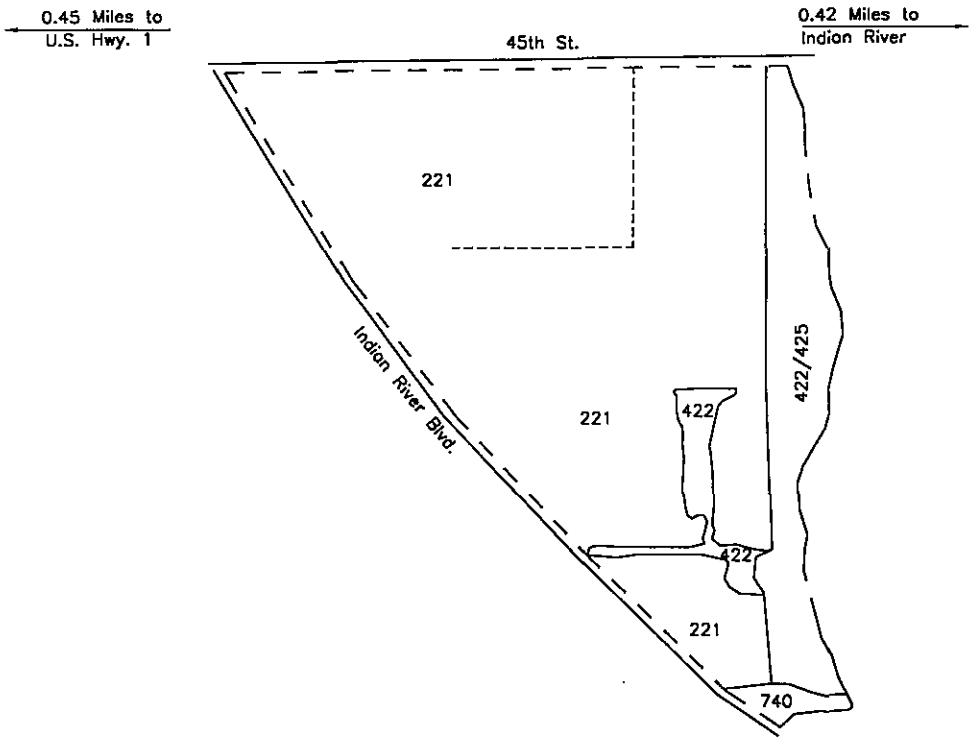
III Site Description

Site IR-12B is predominantly active citrus grove (221) and inactive citrus grove (fallow cropland; 261). Low-density residential (110) and various upland and small wetland communities intermingle with the citrus. The isolated residential areas are located in the south-central, northeast, northern-central, and northwest site areas.

Quay Dock Road (an Indian River County designated historic road) forms Site IR-12A's north boundary, U.S. Highway 1 the site's west boundary, and a large and deep ditch the south boundary. Ditches and swales (mostly grass) occur in most of the citrus areas. Brazilian pepper (*Schinus terebinthifolius*) vegetate some of the larger ditches. A dirt road (63rd street) oriented east to west traverses the center of the site.

Two areas of temperate hardwoods/tropical hardwoods (425/426) occur in the extreme southwest corner and west-central site areas. Typical vegetation in these areas include live oak (*Quercus virginiana*), laurel oak (*Q. laurifolia*), wild coffee (*Psychotria sulzneri* and *P. nervosa*), and cabbage palm (*Sabal palmetto*). State-listed threatened species occasionally found in this community include shoestring fern (*Vittaria lineata*) growing on cabbage palm and rein orchid (*Habenaria* sp.).

Wetlands (other than ditches and canals) designated as bay swamps/cabbage palm (611/625) occur in the center of the site. Cabbage palm (625) and mangrove swamps/Brazilian pepper (612/422) occur in the northeast site area, designated as reservoirs less than 10 acres (534). The reservoirs (534) are associated with a house located in the north central portion of the site along Quay Dock Road..



-- LEGEND --

221	Citrus Groves	75.93 Ac
422	Brazilian Pepper	2.86 Ac
422/425	Brazilian Pepper/Temperate Hardwood	12.48 Ac
740	Disturbed Land	1.11 Ac
	Total Acreage	92.38 Ac

------ Ditch

- - - - Area Boundary

——— Road

N

Scale in Feet
0 400 800

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure A-6
Land Use and Vegetation of
Secondary Site IR-13
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-13

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**209.24**	East/West of ICWW:	**West**
Section/Township/Range:	**S25/T32S/R39E, S26/T32S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-2**	Reach Length (mi):	**6.95**
ICWW Mileage:	**202.43** to **209.38**		
Geographic:	**Wabasso (S.R. 510) Bridge to Vero Beach**		

50-yr Requirements

Dredging (cy):	**5,591**
Storage (cy):	**12,021**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**92.4**		
Containment Area (ac):	**10.0**	North:	**300**
Total Area Impacted (ac):	**13.5**	South:	**300**
Total Buffer Area (ac):	**30.6**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**44.1**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**41,143**		
Dike Height (ft):	**6.0**		
Excavation Depth (ft):	**1.93**		
Estimated Site Elevation (ft +NGVD):	**5.0**		
Maximum Pumping Distance (mi):	**7.27**		

D. SITE CHARACTERISTICS

Public Road to Site:	**Indian River Blvd.**	Additional Road Easement (ft):	**N/A**
	45th St.	Pipeline Easement (ft):	**>2000**
Comprehensive Plan Designation:	**M-1 Multi-Family Residential**		
Adjacent Land Use:	**citrus grove, open land**		
Predominant Land Use Impacted:	**citrus grove**		

Wetlands (ac)

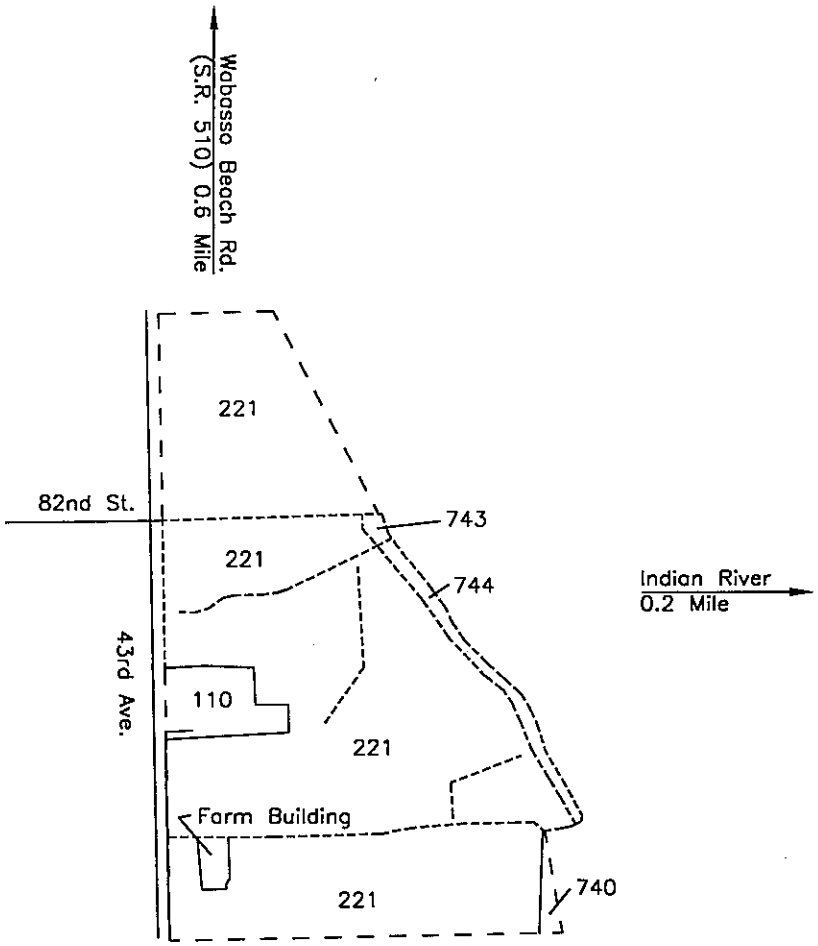
On-Site		Impacted	
Contiguous:	**0.0**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

Site IR-13 is located approximately 150 to 350 ft west of the ICWW. U.S. Highway 1 (oriented northwest to southeast) forms the site's southwest border.

Site IR-13 is primarily active citrus grove (221) with an adjacent small drainage ditch. Scattered areas of Brazilian pepper (*Schinus terebinthifolius*; 422), disturbed land (740), and Brazilian pepper/temperate hardwood (422/425) also are present.

The entire eastern boundary consists of the Brazilian pepper/temperate hardwood (422/425) community. The dominant vegetation is Brazilian pepper and live oak (*Quercus virginiana*). A small area of disturbed land (740) comprises the extreme southern tip of the site.



-- LEGEND --

110	Residential, Low Density	1.6 Ac
221	Citrus Groves	36.2 Ac
740	Disturbed Land	0.3 Ac
743	Spoil Area	0.2 Ac
744	Fill Areas <Highways-Railways>	0.9 Ac
	Total Acreage	39.2 Ac

- - - - - - Area Boundary

---------- Ditch

_____ Road

N

Scale in Feet

0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure A-7
Land Use and Vegetation of
Secondary Site IR-7A
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-7A (aka Ryall Groves)

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**204.13**	East/West of ICWW:	**West**
Section/Township/Range:	**S34/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-2** Reach Length (mi): **6.95**

ICWW Mileage: **202.43** to **209.38**

Geographic: **Wabasso (S.R. 510) Bridge to Vero Beach**

50-yr Requirements

Dredging (cy): **5,591**

Storage (cy): **12,021**

C. SITE PARAMETERS *(based on Alt. 3, ltr to David K. Roach, 4 oct 95)*

		Buffer Width (ft)	
Mapped Area (ac):	**39.2**		
Containment Area (ac):	**10.0**	North:	**50**
Total Area Impacted (ac):	**13.5**	South:	**50**
Total Buffer Area (ac):	**3.9**	East:	**50**
Buffer Outside Mapped Area (ac):	**.0**	West:	**50**
Preliminary Total Site Area (ac):	**17.4**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**41,074**		
Dike Height (ft):	**6.0**		
Excavation Depth (ft):	**1.91**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**9.2**		

D. SITE CHARACTERISTICS

Public Road to Site: **82nd St., 43rd Ave.** Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **<600**

Comprehensive Plan Designation: **L-2/M-1 Med Density Res (SF)/Multi Family Res**

Adjacent Land Use: **residential, citrus groves, open land (wetlands)**

Predominant Land Use Impacted: **citrus groves**

Wetlands (ac)

On-Site		Impacted	
Contiguous:	**0.0**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

Site IR-7A, aka Ryall Groves Property, is located 0.6 miles south of Wabasso Beach Road (County Road 510) on the west shore of the Indian River.

The western half of the property is currently under citrus cultivation (221). Grove vegetation includes mature grapefruit trees, a variety of grasses, and low-growing herbs. Species include Bermuda grass (*Cynodon dactylon*), Guinea grass (*Panicum maximum*), Spanish needles (*Bidens* sp.), ironweed (*Sida rhombdifolia*), and globe amaranth (*Gomphrena globosa*). The citrus trees are bedded in rows separated by shallow ditches. Buried pipes provide drainage from the beds to the ditches which in turn drain into a collector ditch located at the eastern edge of the groves.

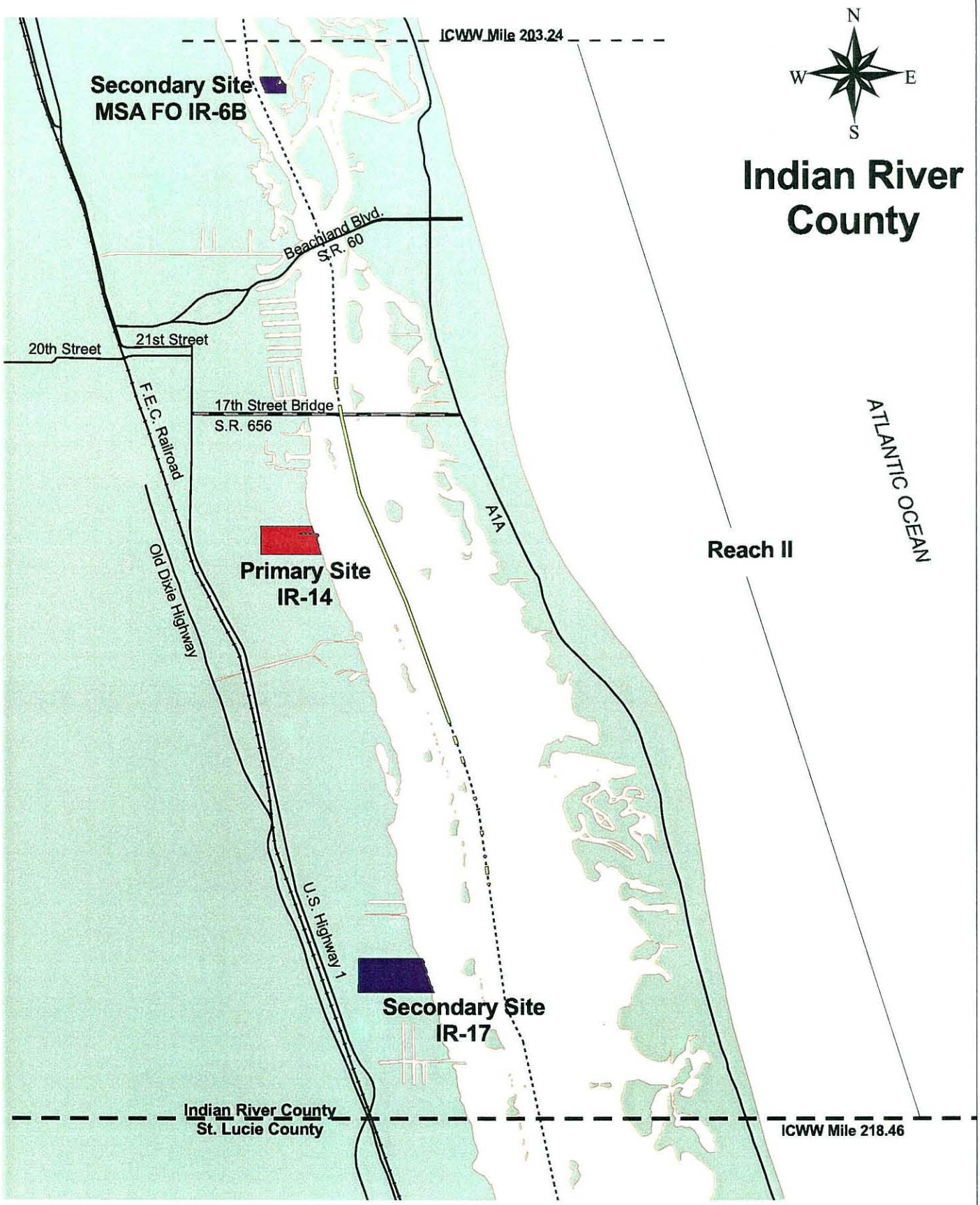
The collector ditch is the westernmost of two large parallel ditches that divide the west and east halves of the property. As discussed above, the western ditch serves as a collector for runoff from the groves. The eastern ditch, connected to other on- and off-site ditches, connects directly to the Indian River. Unidirectional flow from the western ditch to the eastern ditch is provided by a culvert with a flow-activated check gate. Both ditches contained water at the time of the site inspection. The ditches are separated by a narrow berm of excavated material covered by lantana (*Lantana camera*), Spanish needle, and caesarweed (*Urena lobata*).

The portion of the property east of the parallel ditches consists mainly of mangrove swamps (612) interspersed with stands of Brazilian pepper (*Schinus terebinthifolius*, 422) and small areas of open water. The mangrove swamps contain three types of mangrove — black (*Avicennia germinans*), red (*Rhizophora mangle*), and white (*Laguncularia racemosa*). The mangrove swamps and tidally connected ditches are subject to the permitting criteria of the U.S. Army Corps of Engineers and the Florida Department of Environmental Protection.

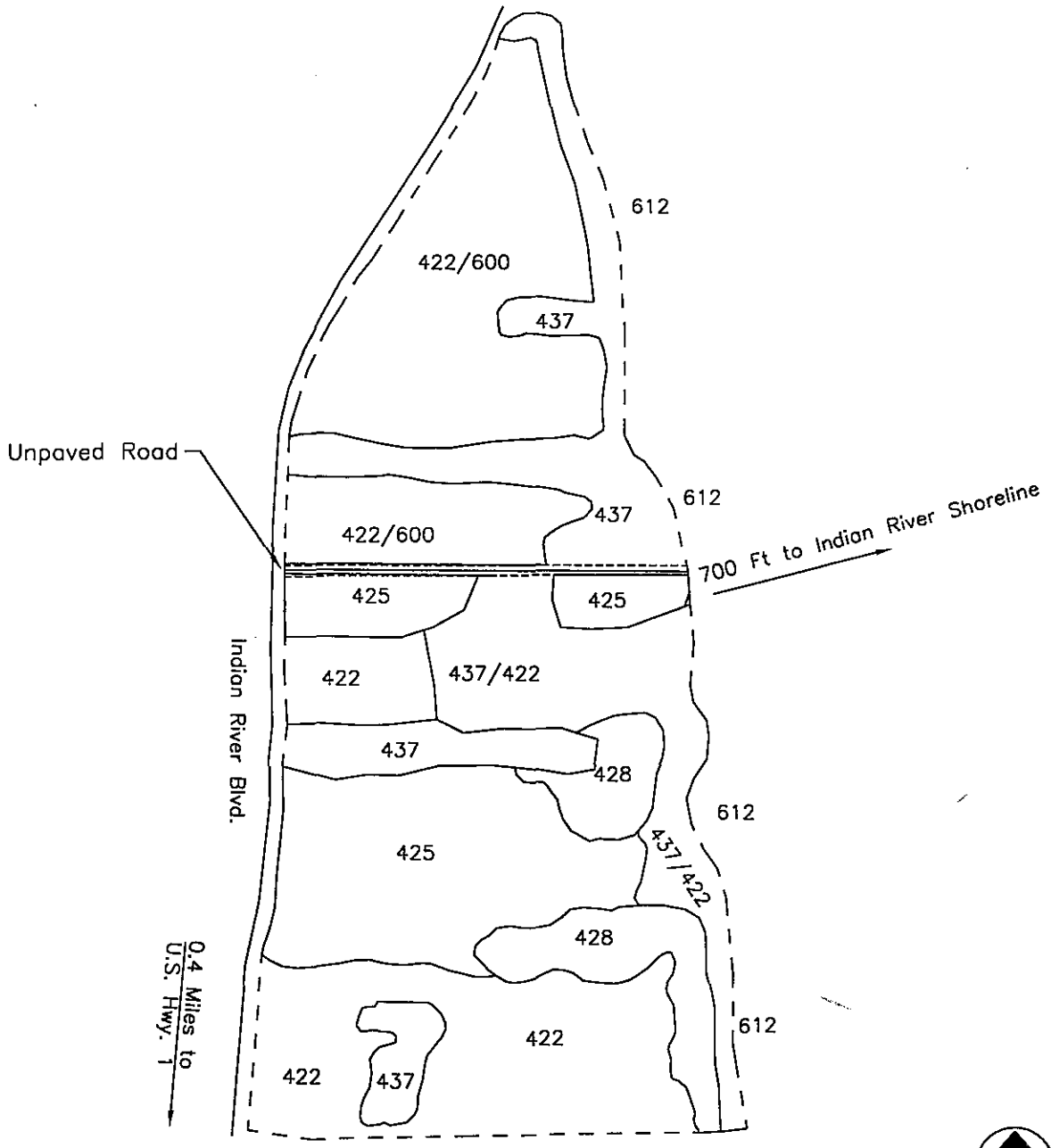
Two species of plants listed as threatened by the State of Florida were found on the property. Giant leather fern (*Acrostichum danaefolium*) grows in the mangrove swamp and along the banks of the tidal ditches. Hairy maiden fern (*Thelypteris hispidula*) grows in several locations within the grove ditch system.

Three irrigation wells were found on the property during the site inspection. All of the wells are located near the property boundaries. None of the wells have permanently installed pumps. A St. Johns Water Management District registration placard was affixed to each of the wells.

Examination of on-site ditch banks revealed the presence of a layer of hard pan material approximately 3 ft below the property surface. Observable portions of the layer vary from 4 to 8 in. in thickness. This material may account for the lateral drainage (i.e., buried pipes and ditching) observed in the bedded citrus rows. The hard pan formation appears to be extensive, as evidenced by its presence in the adjacent property north of the site.



TAYLOR ENGINEERING INC. 9086 Cypress Green Drive Jacksonville, Florida 32256	Figure A-8 Primary/Secondary Sites, Reach III, Phase I Long Range Dredged Material Management Plan, Intracoastal Waterway Indaian River County, Florida	Project C9508 Revision Sheet Date May, 1997



-- LEGEND --

422/600	Brazilian Pepper/Wetlands	54.79 Ac
425	Temperate Hammock	20.86 Ac
428	Cabbage Palm	2.89 Ac
437	Australian Pine	16.73 Ac
437/422	Australian Pine/Brazilian Pepper	12.97 Ac
612	Mangrove Swamps	0 Ac
	Total Acreage	108.24 Ac

- - - - Area Boundary

--------- Ditch

——— Road

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure A-9
Land Use and Vegetation of
Primary Site IR-14
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-14

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**212.80**	East/West of ICWW:	**West**
Section/Township/Range:	**S7/T33S/R40E, S18/T33/R40E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-3** Reach Length (mi): **8.28**

ICWW Mileage: **209.38** to **217.66**

Geographic: **Vero Beach to Indian River/St. Lucie County line**

50-yr Requirements

Dredging (cy): **75,655**

Storage (cy): **162,658**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	108.2		
Containment Area (ac):	14.4	North:	230
Total Area Impacted (ac):	18.3	South:	50
Total Buffer Area (ac):	36.7	East:	250
Buffer Outside Mapped Area (ac):	.0	West:	300+
Preliminary Total Site Area (ac):	55.0	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	163,740		
Dike Height (ft):	11.0		
Excavation Depth (ft):	4.57		
Estimated Site Elevation (ft +NGVD):	6.0		
Maximum Pumping Distance (mi):	4.97		

D. SITE CHARACTERISTICS

Public Road to Site: **Indian River Blvd.** Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **<1000**

Comprehensive Plan Designation: **M-2 High Density Residential (Multi Family)**

Adjacent Land Use: **open land (wetlands), residential**

Predominant Land Use Impacted: **Brazilian pepper, Australian pine**

Wetlands (ac)

	On-Site		Impacted
Contiguous:	54.8	Contiguous:	0.0
Isolated:	0.0	Isolated:	0.0

III Site Description

Site IR-14, a 108-acre tract dominated by exotic, lies east of Indian River Boulevard and west of impounded mangrove wetlands (612) bordering the Indian River. An unimproved east-west bike trail, bordered by cattail-(*Typha* sp.) filled ditches, bisects the site.

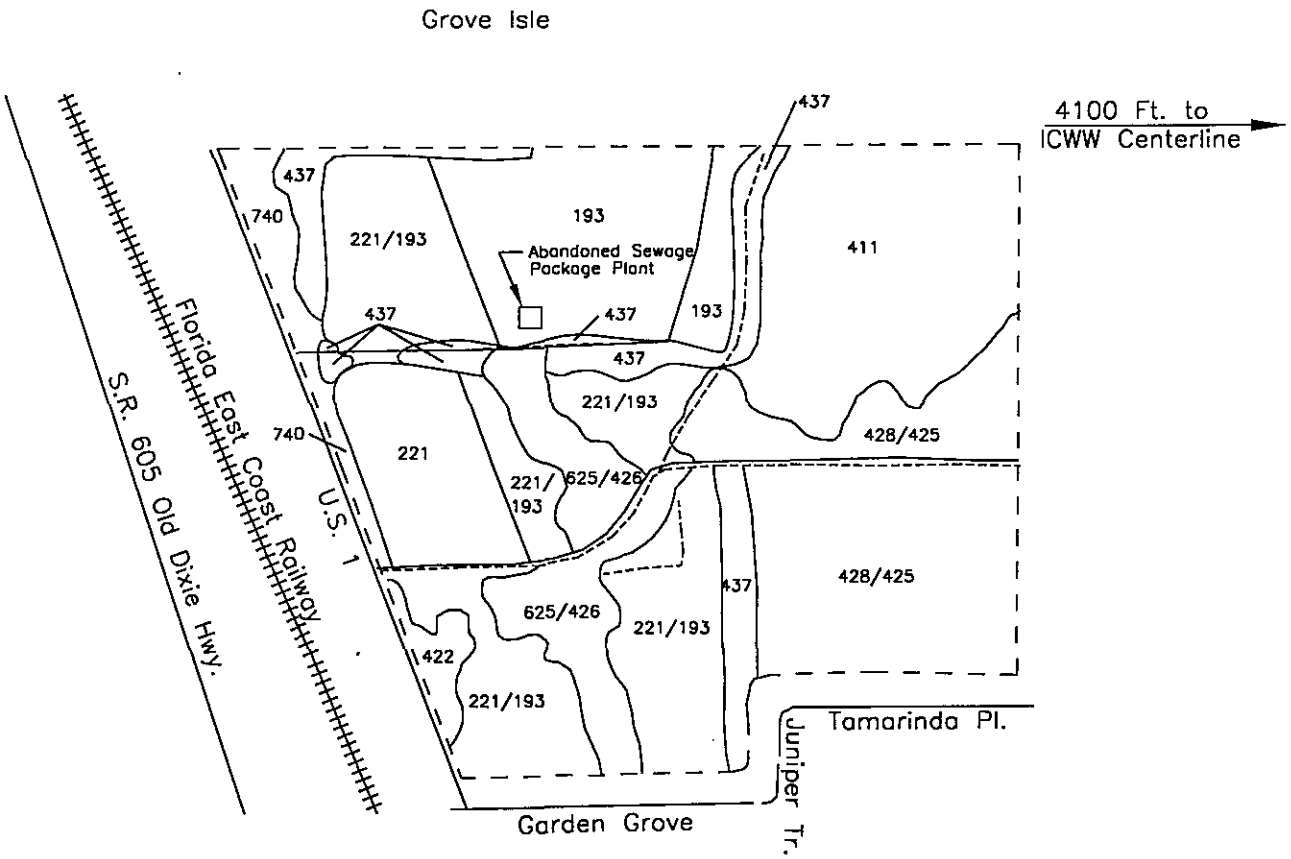
The northern Brazilian pepper/wetlands (422/600) community contains signs of previous ditching disturbance and clearing. The dominant overstory vegetation is Brazilian pepper (*Schinus terebinthifolius*). Natural vegetation in the community includes young cabbage palm (*Sabal palmetto*), day flower (*Commelina* sp.), and camphor weed (*Pluchea odorata*). The giant leather leaf fern (*Acrostichum danaeifolium*), a state-listed threatened species, occurs occasionally.

Surrounding the Brazilian pepper/wetlands community are large, linear, and monoculture stands of Australian pine (*Casuarina equisetifolia*; 437). Isolated patches of the Australian pine community also intermix with more natural communities in the south site area.

South of the unimproved trail, the vegetation communities are less disturbed. The temperate hammocks (425) are relatively intact except for the encroachment of Brazilian pepper in some areas. Temperate hardwood vegetation includes large live oaks (*Quercus virginiana*).

Temperate hardwood (425) and cabbage palm (428) communities, relatively intact and undisturbed, occur in the center of the site's southern half. In the cabbage palm areas, the vegetation is predominantly cabbage palm with understory species such as wild coffee (*Psychotria nervosa*) and marlberry (*Ardisia escallonioides*). State-listed threatened species often found in this community include the golden polypody fern (*Phlebodium aureum*) and shoestring fern (*Vittaria lineata*), which grow on cabbage palms.

In general, the wetlands in the site's north half are disturbed and predominantly filled with exotics. In contrast, many of the uplands in the southern half of the site likely represent the site's historic conditions.



-- LEGEND --

193	Urban Land in Transition without Positive Indicators of Activity	11.6 Ac
221	Citrus Groves	5.9 Ac
221/193	Citrus Groves/Urban Land in Transition without Positive Indicators of Activity	20.6 Ac
411	Pine Flatwoods	14.4 Ac
422	Brazilian Pepper	1.1 Ac
428/425	Cabbage Palm/Temperate Hardwoods	17.4 Ac
437	Australian Pine	7.2 Ac
625/426	Cabbage Palm/Tropical Hardwoods	6.9 Ac
740	Disturbed Land	2.4 Ac
	Total Acreage	87.5 Ac

Area Boundary — Railway
Ditch — Road

N

Scale in Feet
0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure A-10
Land Use and Vegetation of
Secondary Site IR-17
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-17

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**216.38**	East/West of ICWW:	**West**
Section/Township/Range:	**S30/T33S/R40E, S31/T33S/R40E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-3**		Reach Length (mi):	**8.28**
ICWW Mileage:	**209.38**	to **217.66**		
Geographic:	**Vero Beach to Indian River/St. Lucie County line**			

50-yr Requirements

Dredging (cy):	**75,655**
Storage (cy):	**162,658**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**87.5**		
Containment Area (ac):	**14.4**	North:	**300**
Total Area Impacted (ac):	**18.3**	South:	**300**
Total Buffer Area (ac):	**33.4**	East:	**300**
Buffer Outside Mapped Area (ac):	**5.9**	West:	**300**
Preliminary Total Site Area (ac):	**51.7**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**163,740**		
Dike Height (ft):	**4.57**		
Excavation Depth (ft):	**4.59**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**8.15**		

D. SITE CHARACTERISTICS

Public Road to Site:	**U.S. Hwy. 1**	Additional Road Easement (ft):	**<500**
		Pipeline Easement (ft):	**<800**
Comprehensive Plan Designation:	**L-2 Medium Density Residential**		
Adjacent Land Use:	**high density residential, open land (wetlands)**		
Predominant Land Use Impacted:	**pine flatwoods, cabbage palm, temperate hardwoods, Australian pine**		

Wetlands (ac)

On-Site		Impacted	
Contiguous:	**6.9**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

Site IR-17 site is located on the western shore of the Indian River. North Palm Road is located on the site's southern border; U.S. Highway 1 is located 180 to 280 ft west of the site.

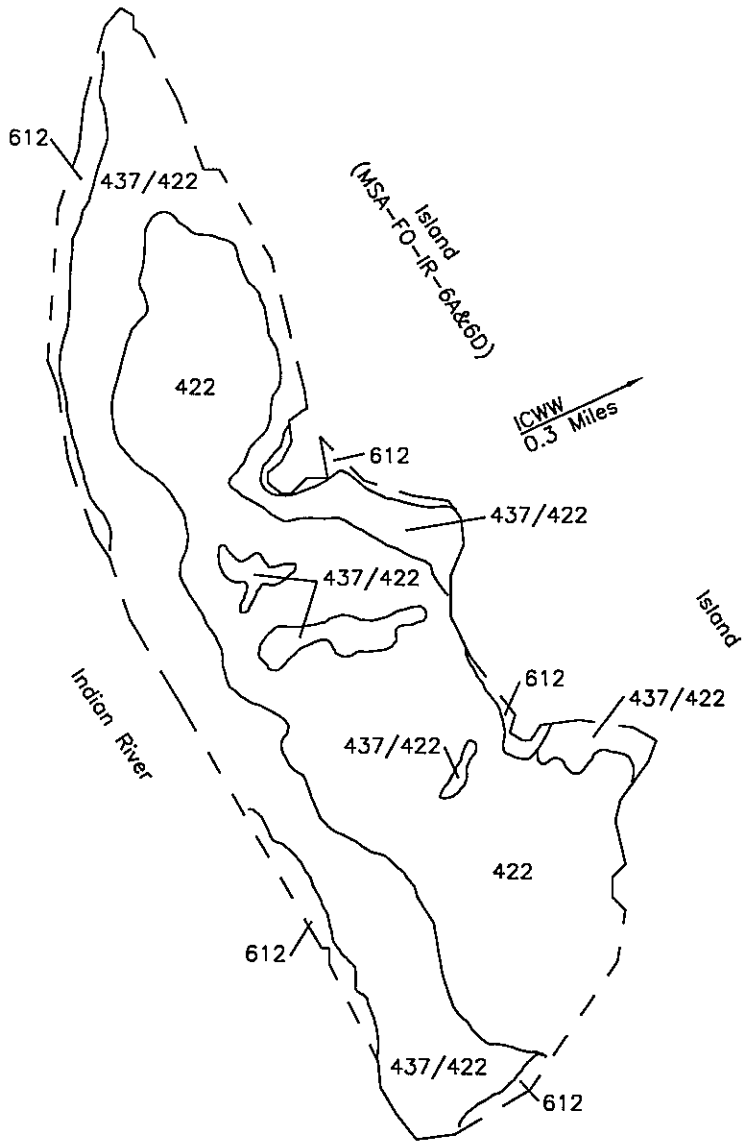
Site IR-17 contains a mixture of disturbed and natural communities. In its western half several areas of historic, currently fallow citrus groves occur. These areas are classified as citrus groves/urban land in transition without positive indicators of activity (221/193). They contain old citrus trees (*Citrus* sp.) and an abundance of weedy opportunistic vegetation such as Brazilian pepper (*Schinus terebinthifolius*) and primrose willow (*Ludwigia peruviana*). An abandoned package sewage treatment plant lies near one of the northern areas categorized as urban areas in transition (193). It is possible that sewage effluent was applied to some of the disturbed areas.

Several on-site dirt roads and ditches occur within pure stands of Australian pine (*Casuarina equisetifolia*; 437). A large ditch traverses the site from the vicinity of the southwestern corner to the vicinity of the northeastern corner; a branch of this ditch continues due east. The southern section of the large ditch contains standing water, in contrast to the relatively dry northern section. The ditch branch, possibly 8 ft deep, contains standing water and some emergent wetland vegetation.

A cabbage palm/tropical hardwood (625/426) wetland occurs in the center of the site. The previous citrus operation has disturbed the edge of the area which contains some exotic species. The vegetation primarily consists of cabbage palm (*Sabal palmetto*) and an understory of wild coffee (*Psychotria nervosa*) and marlberry (*Ardisia escallonioides*).

The eastern half of the site contains most of the site's relatively undisturbed, natural portions. The northern area of the eastern half of the site consists of thick pine flatwoods (411) that have not been burned recently. Dominant vegetation includes slash pine (*Pinus elliottii*), saw palmetto (*Serenoa repens*), and some live oak (*Quercus virginiana*).

A cabbage palm/temperate hardwoods (428/425) community bisected by the large ditch and a dirt road occurs south of the pine flatwoods. Dominant vegetation includes live oak, cabbage palm, and saw palmetto.



-- LEGEND --

422	Brazilian Pepper	32.1 Ac
437/422	Australian Pine/Brazilian Pepper	25.8 Ac
612	Mangrove Swamps	3.5 Ac
	Total Acreage	61.4 Ac
	Area Boundary	

N

Scale in Feet

0 300 600

SOURCE: W&AR Graphic 1996.

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Figure A-11
Land Use and Vegetation of
Secondary Site MSA IR-FO-6B
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE MSA FO-IR-6B

A. LOCATION

County:	**Indian River**	Municipality:	**IR Shores, Vero Bch**
ICWW Mile:	**209.35**	East/West of ICWW:	**West**
Section/Township/Range:	**S30/T32S/R40E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-3** Reach Length (mi): **6.85**

ICWW Mileage: **209.38** to **217.66**

Geographic: **Vero Beach to Indian River/St. Lucie County line**

50-yr Requirements

Dredging (cy): **75,655**

Storage (cy): **162,658**

C. SITE PARAMETERS entire island (easements only, *based Cochrane and Taylor, 1992*)

Mapped Area (ac):	**61.4 (13.4)**
Containment Area (ac):	**26.3 (5.3)**
Total Area Impacted (ac):	**28.7 (7.1)**
Total Buffer Area (ac):	**16.7 (3.6)**
Buffer Outside Mapped Area (ac):	**0 (0)**

Buffer Width (ft)	
North:	**100 (<50)**
South:	**<50 (<50)**
East:	**<50 (<50)**
West:	**<50 (<50)**

Preliminary Total Site Area (ac): **45.3 (13.4)** *(Area Impacted + Buffer)*

Storage Capacity (cy):	**338,438 (38,748)**
Dike Height (ft):	**12.0 (8.0)**
Excavation Depth (ft):	**4.30 (5.35)**
Estimated Site Elevation (ft +NGVD):	**4.0**
Maximum Pumping Distance (mi):	**8.05**

D. SITE CHARACTERISTICS

Public Road to Site: **island**

Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **N/A**

Comprehensive Plan Designation: **RESI (Residential-Environmentally Sensitive Island Dist.)**

Adjacent Land Use: **open water**

Predominant Land Use Impacted: **Brazilian pepper, Australian pine**

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**3.5**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

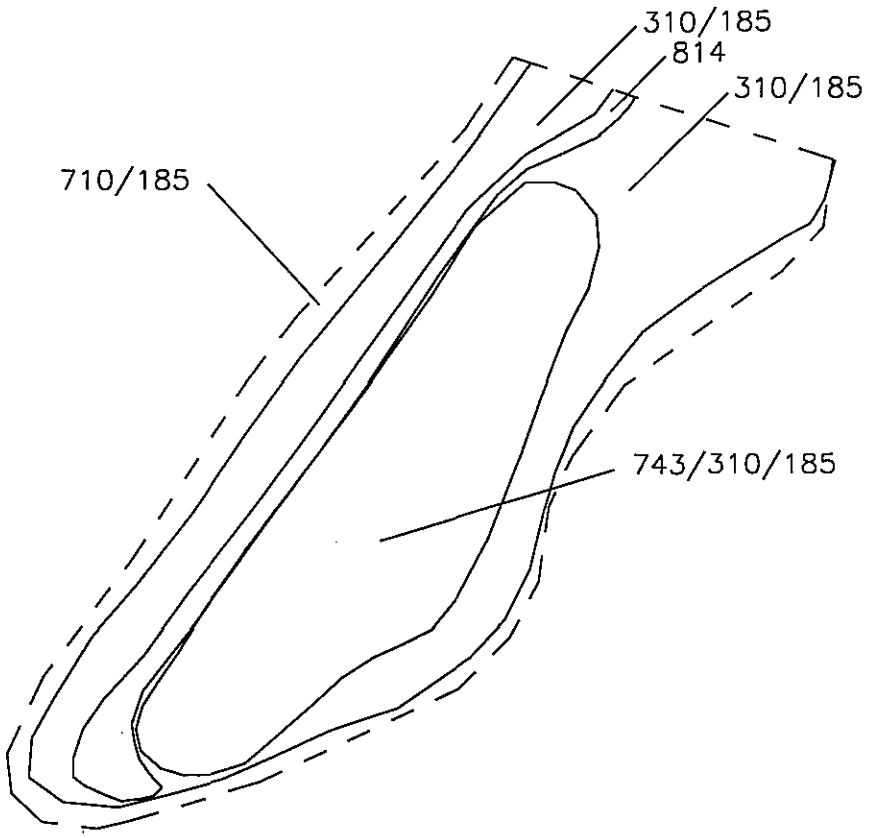
The Brazilian pepper (422) and Australian pine (437) communities dominate the 61-acre MSA-FO-IR-6B site, an island on the eastern shore of the ICWW. The island interior is covered by the Brazilian pepper (422) community with three small patches where Brazilian pepper mixes with Australian pine (437/422). The large interior Brazilian pepper (422) area is nearly surrounded by this band of mixed community. In some areas the mixed community extends to the island's bank. In other locations, a thin band of mangrove fringe occurs between the Australian pine/Brazilian pepper (437/422) community and the Indian River.

Vegetation diversity within the exotic dominated communities is characteristically low; however, some locations contained clusters of other species. Vines were observed growing both on the ground and into the canopy. They include peppervine (*Ampelopsis arborea*), muscadine (*Vitis rotundifolia*), *Mikania scandens*, and greenbrier (*Smilax* sp.). Shrubs observed include wild coffee (*Psychotria* sp.), saltbush (*Baccharis halimifolia*), Florida privet (*Forestiera segregata*), and beautybush (*Callicarpa americana*). Other trees observed in these communities include rare occurrences of live oak (*Quercus virginiana*) and gumbo-limbo (*Bursera simaruba*).

In the mangrove (612) community, young red, black, and white mangroves (*Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*) mix with Brazilian pepper (*Schinus terebinthifolius*) along the western shoreline. The sediments in this location are pockmarked with the burrows of the great land crab (*Cardisoma guanhumi*).

APPENDIX B

Other Candidate Sites



-- LEGEND --

310/185	Herbaceous/Parks and Zoos	2.8 Ac
710/185	Beaches other than Swimming Beaches/Parks and Zoos	1.0 Ac
743/310/185	Spoil Areas/Herbaceous /Parks and Zoos	2.6 Ac
814	Roads and Highways	0.5 Ac
	Total Acreage	6.9 Ac
	Area Boundary	

N

Scale in Feet

0 100 200

SOURCE:
W&AR Graphic 1996.

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9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-1
Land Use and Vegetation of
Candidate Site IR-Inlet
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE INLET

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**195.12**	East/West of ICWW:	**East**
Section/Township/Range:	**S29/T30S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-1**	Reach Length (mi):	**8.09**
ICWW Mileage:	**194.34** to **202.43**		
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**		

50-yr Requirements

Dredging (cy):	**199,006**
Storage (cy):	**427,862**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**6.9**		
Containment Area (ac):	**3.6**	North:	**<50**
Total Area Impacted (ac):	**4.5**	South:	**<50**
Total Buffer Area (ac):	**2.4**	East:	**<50**
Buffer Outside Mapped Area (ac):	**.0**	West:	**<50**
Preliminary Total Site Area (ac):	**6.9**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**6,632**		
Dike Height (ft):	**4.0**		
Excavation Depth (ft):	**3.98**		
Estimated Site Elevation (ft +NGVD):	**2.0**		
Maximum Pumping Distance (mi):	**7.32**		

D. SITE CHARACTERISTICS

Public Road to Site:	**N/A**	Additional Road Easement (ft):	**<4000**
		Pipeline Easement (ft):	**N/A**
Comprehensive Plan Designation:	**Conservation/Recreation**		
Adjacent Land Use:	**Sebastian Inlet State Park**		
Predominant Land Use Impacted:	**existing DMMA**		

Wetlands (ac)

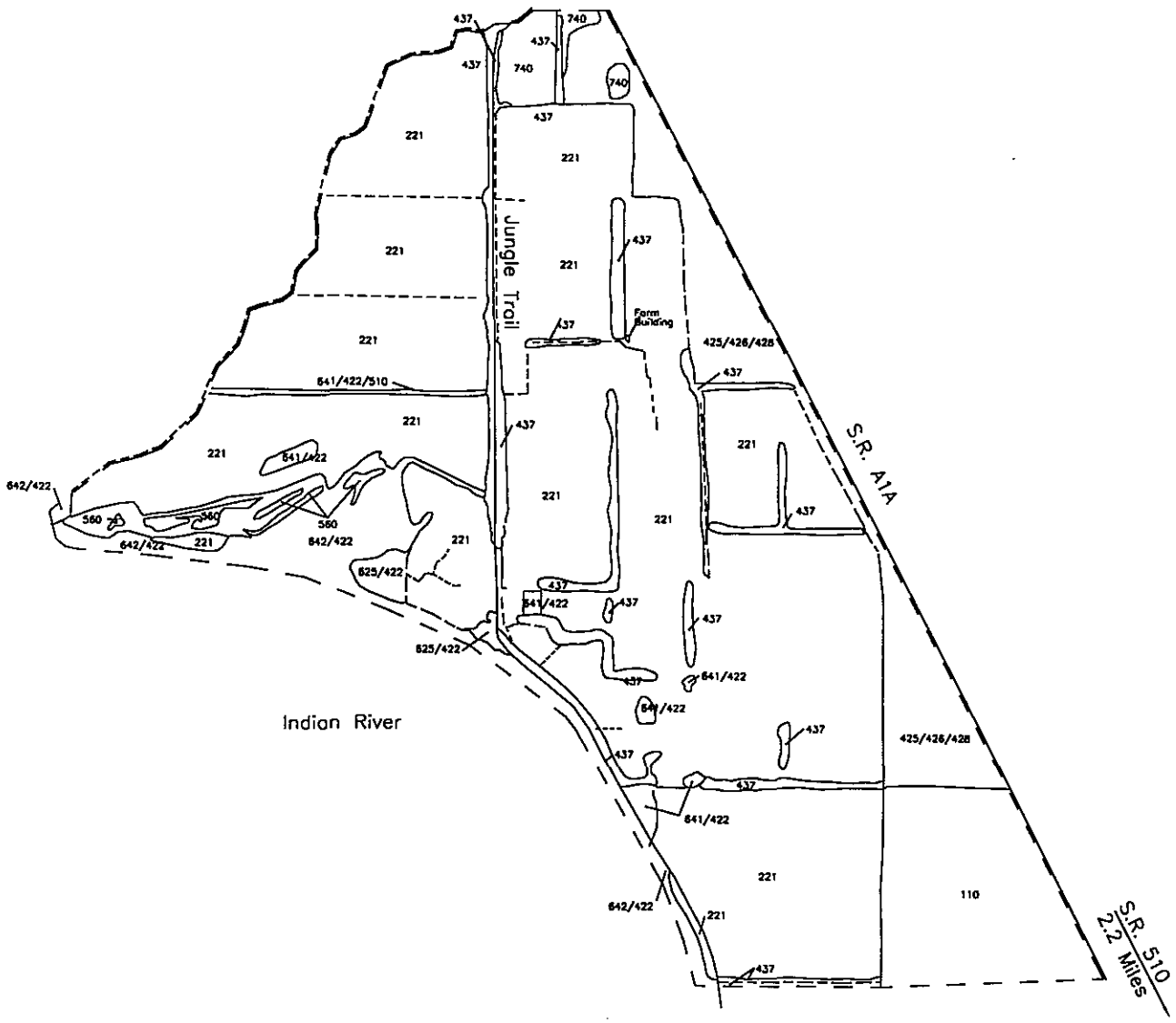
On-Site		Impacted	
Contiguous:	**0.0**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

The IR-Inlet site, a small spoil disposal peninsula in the St. Lucie park system, is located adjacent to the St. Lucie Inlet. Shoreline erosion has created steep side slopes along the peninsula from its eastern border to its southern tip; its western border gradually slopes to the water. Used mainly for recreational fishing, the peninsula is designated as parks and zoos (185).

Beaches designated for uses other than for swimming (710) surround the historic spoil island. The narrow beaches contain clayey sands. At elevations beyond the high water line, the community is designated as spoil areas/herbaceous/parks and recreation (743/310/185). The vegetation cover in this community is mostly broomsedge (*Andropogon* sp.), beggar ticks (*Bidens pilosa*), torpedo grass (*Panicum repens*), *Carex* sp., rail-road vine (*Ipomoea pes-caprae*) and some young cabbage palm (*Sabal palmetto*). Various other salt-tolerant herbs characteristic of disturbed areas also occur.

A dirt road (814) along the peninsula's western side allows access for fishermen and sightseers. A small dirt parking facility is located at the end of the peninsula.



-- LEGEND --

110	Residential, Low Density	35.9 Ac
221	Citrus Groves	330.1 Ac
425/426/428	Temperate Hardwoods/Tropical Hardwoods/Cabbage Palm	42.8 Ac
437	Australian Pine	24.9 Ac
560	Slough Waters	2.6 Ac
625/422	Cabbage Palm/Brazilian Pepper	3.0 Ac
641/422	Freshwater Marshes/Brazilian Pepper	3.4 Ac
641/422/510	Freshwater Marshes/Brazilian Pepper/Streams and Waterways	1.5 Ac
642/422	Saltwater Marshes/Brazilian Pepper	31.2 Ac
740	Disturbed Lands	7.1 Ac
	Total Acreage	482.5 Ac
— — — —	Area Boundary	
--------	Ditches	——— Road

N

Scale in Feet

0 600 1200

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-2
Land Use and Vegetation of
Candidate Site IR-1A
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-1A

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**198.11**	East/West of ICWW:	**East**
Section/Township/Range:	**S4/T31S/R39E, S9/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-1**	Reach Length (mi):	**8.09**
ICWW Mileage:	**194.34** to **202.43**		
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**		

50-yr Requirements

Dredging (cy):	**199,006**
Storage (cy):	**427,862**

C. SITE PARAMETERS

Mapped Area (ac):	**482.5 (w/IR-1B)**	Buffer Width (ft)	
Containment Area (ac):	**41.8**	North:	**<200**
Total Area Impacted (ac):	**49.5**	South:	**300**
Total Buffer Area (ac):	**56.0**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**<150**
Preliminary Total Site Area (ac):	**105.5**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**660,243**		
Dike Height (ft):	**14.0**		
Excavation Depth (ft):	**4.36**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**5.41**		

D. SITE CHARACTERISTICS

Public Road to Site:	**Jungle Trail**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**N/A**
Comprehensive Plan Designation:	**L-1 Low Density Residential (Single Family)**		
Adjacent Land Use:	**citrus groves, open land (wetland)**		
Predominant Land Use Impacted:	**citrus groves**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**42.8**	State:	**0.0**
Isolated:	**3.4**	COE/WMD:	**0.0**

III Site Description

Site IR-1A, located south of the Brevard/Indian River County line, is primarily citrus grove (221) bordered on the west by the Indian River and on the east by Jungle Trail Road, an Indian River County designated scenic dirt road.

Throughout the site occur small grassy swales and large flowing ditches, some associated with Australian pine communities (*Casuarina equisetifolia*; 437). Four small freshwater marsh/Brazilian pepper communities (*Schinus terebinthifolius*; 641/422) occur in the southwestern area of the site, and a tidally influenced saltwater marsh/Brazilian pepper (642/422) community occurs along the extreme southwestern boundary. Temperate hardwood/tropical hardwood/cabbage palm mixed communities (425/426/428) occur in the northeastern and southeastern areas of the site along SR A1A. Dominant vegetation in this community includes live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), saw palmetto (*Serenoa repens*), wild coffee (*Psychotria nervosa*), and marlberry (*Ardisia escallonioides*). Also, in the southeastern area of the site, low-density single-family residences (110) exist. The disturbed (740) northern area is possibly an old citrus grove regrown with weedy herbs and grasses. This area may be located within land designated as a national wildlife preserve.

The state-listed threatened species golden polypody fern (*Phlebodium aureum*) and shoestring fern (*Vittaria lineata*), occasional to locally common, grow near the tops of cabbage palms in the temperate hardwood/tropical hardwood/cabbage palm (425/426/428) community.

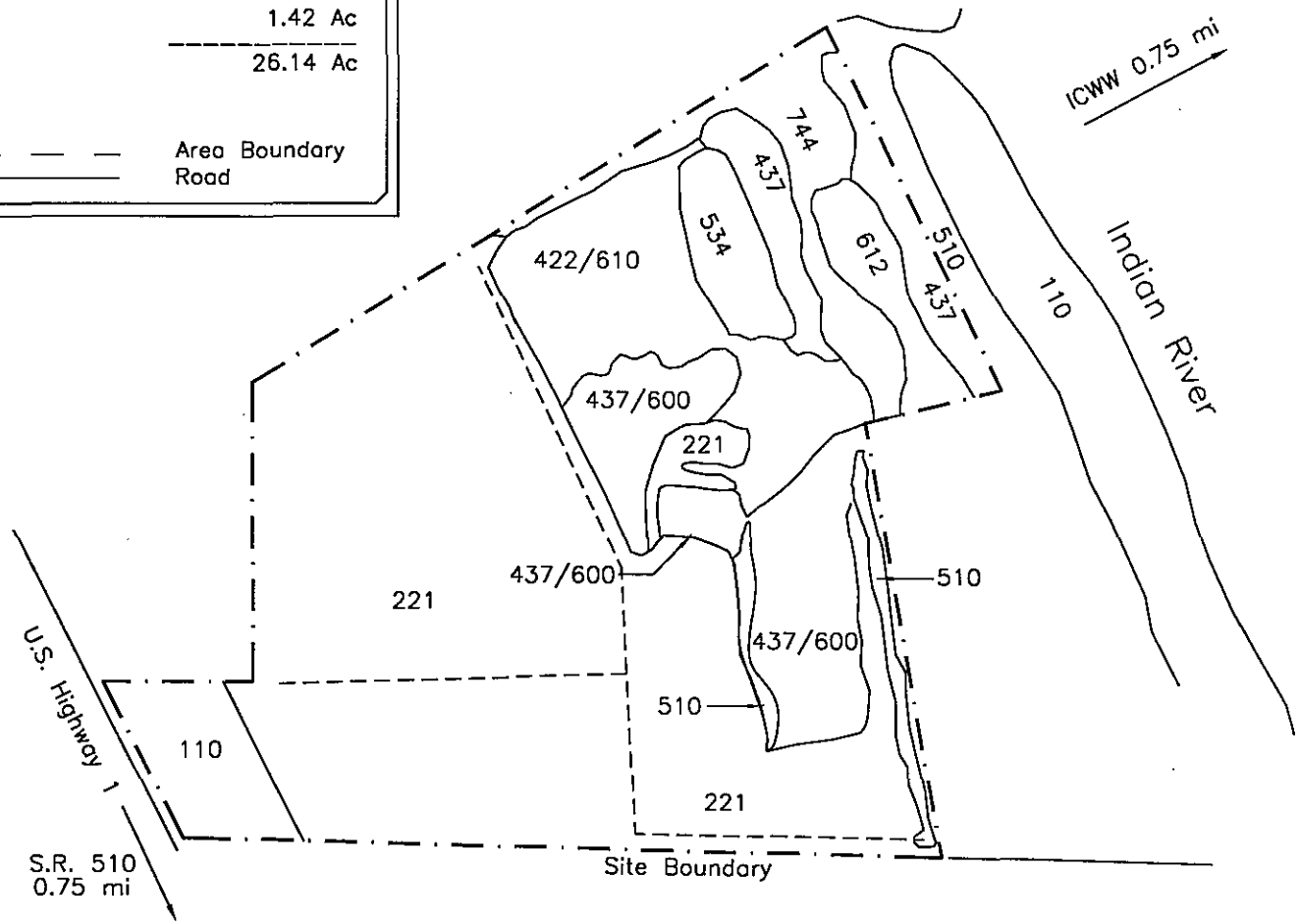
-- LEGEND --

110	Low Density Residential	1.09 Ac
221	Citrus Grove	14.49 Ac
422/610	Brazilian Pepper/Wetland Hardwood Forest	2.90 Ac
437	Australian Pine	1.32 Ac
437/600	Australian Pine/Wetland	2.99 Ac
510	Streams & Waterways (Ditch)	0.46 Ac
534	Reservoir	0.75 Ac
612	Mangrove Swamp	0.72 Ac
744	Fill Areas	1.42 Ac
	Total Acreage	26.14 Ac

----- Ditch

— — — Area Boundary

——— Road



N

Scale in Feet

0 150 300

SOURCE: W&AR Graphic 1996.

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JACKSONVILLE, FLORIDA 32256

Figure B-3
Land Use and Vegetation of
Candidate Site IR-3
Indian River County, Florida

PROJECT C-9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-3 (aka Bates-Begley)

A. LOCATION

County:	Indian River	Municipality:	County
ICWW Mile:	202.18	East/West of ICWW:	West
Section/Township/Range:	S21/T3/R39E, S28/T31S/R39E		
Receiving Waterbody:	Indian River		
FDEP classification:	36		

B. REACH INFORMATION

Reach Designation:	IR-1	Reach Length (mi):	8.09
ICWW Mileage:	194.34 to 202.43		
Geographic:	Sebastian Inlet to Wabasso (S.R. 510) Bridge		

50-yr Requirements

Dredging (cy):	199,006
Storage (cy):	427,862

C. SITE PARAMETERS

Mapped Area (ac):	26.1	Buffer Width (ft)	
Containment Area (ac):	7.0	North:	<100
Total Area Impacted (ac):	8.3	South:	<100
Total Buffer Area (ac):	6.2	East:	300.0
Buffer Outside Mapped Area (ac):	.0	West:	<100
Preliminary Total Site Area (ac):	14.5	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	60,600	*(based on Taylor and Cochrane, 1995)*	
Dike Height (ft):	9.0		
Excavation Depth (ft):	4.8		
Estimated Site Elevation (ft +NGVD):	5.0		
Maximum Pumping Distance (mi):	7.85		

D. SITE CHARACTERISTICS

Public Road to Site:	U.S. Hwy 1	Additional Road Easement (ft):	N/A
		Pipeline Easement (ft):	<500
Comprehensive Plan Designation:	L-2 Medium Density Residential (Single Family)		
Adjacent Land Use:	residential, citrus groves,open land (wetlands)		
Predominant Land Use Impacted:	citrus groves		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	7.8	Contiguous:	0.0
Isolated:	0.0	Isolated:	0.0

III Site Description

Site IR-3, aka the Bates Groves-Begley properties, is located 0.7 miles north of Wabasso Beach Road (County Road 510) approximately 200 ft west of the Indian River's western shoreline.

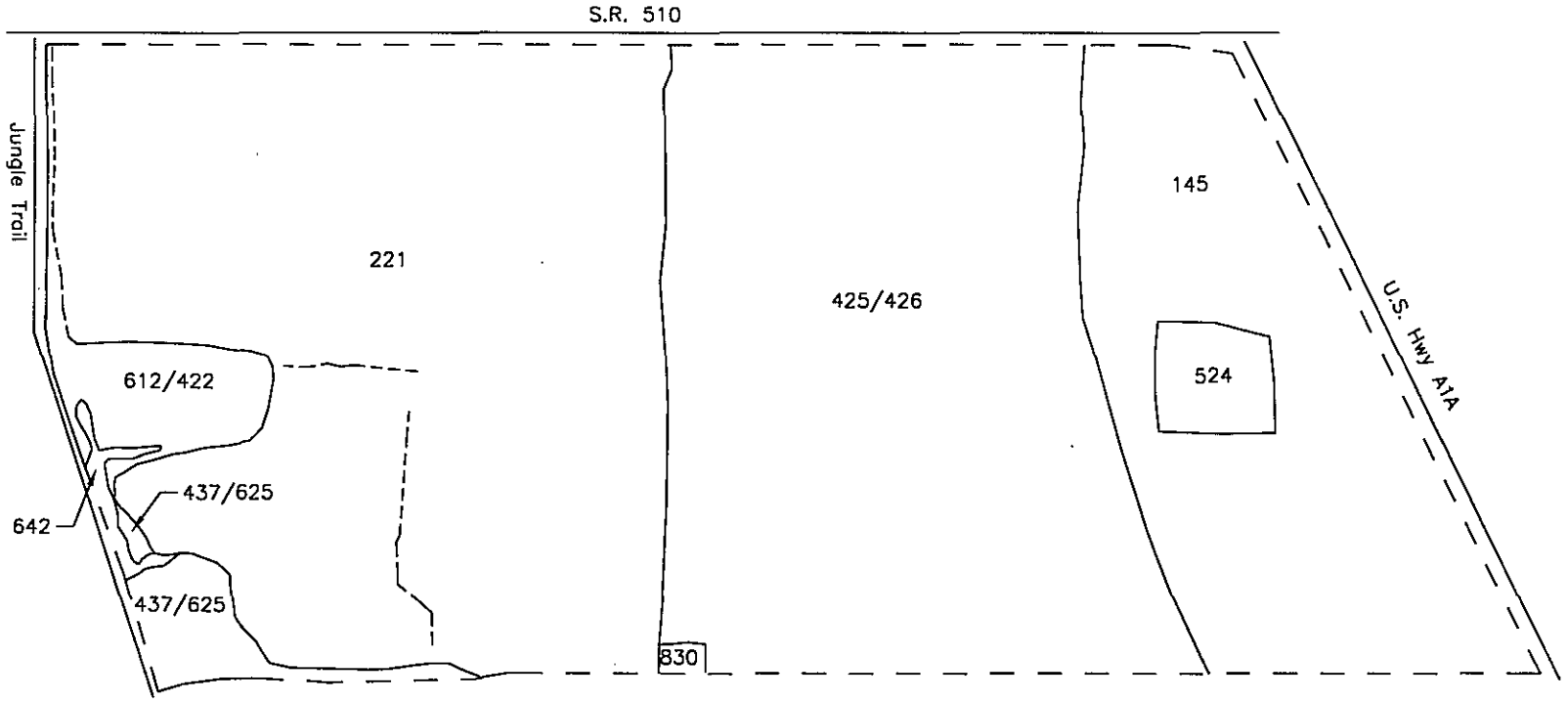
Approximately one half of the property is currently under citrus cultivation (221). Grove vegetation includes mature grapefruit trees, a variety of grasses, and low-growing herbs. Species include bahia grass (*Paspalum notatum*), matchhead (*Lippia nodiflora*), false dandelion (*Pyrrhopappus carolinianus*), knotroot foxtail (*Setaria geniculata*), and fleabane (*Erigeron* sp.).

The southeastern corner of the site contains bedded groves and marginal wetland species including dock (*Rumex* sp.), creeping oxeye (*Wedelia trilobata*), and canna (*Canna* sp.). Two large ditches provide grove drainage. The ground between these ditches is low and contains a stand of Australian pine (*Casuarina equisetiflora*, 437/600). The area is practically devoid of ground cover due to a thick mat of pine duff.

The northeastern portion of the site, consisting mainly of disturbed wetlands, is bordered on the east by a large canal. The canal connects to the Indian River at the northeast property corner and separates the property from a narrow peninsula containing single-family homes. On-site vegetation along the canal bank includes stands of Australian pine and black mangrove (*Avicennia germaneness*). A water-filled barrow pit (534) lies near the northeastern property corner. The steep shoreline of the pit contains no emergent vegetation. A Brazilian pepper/wetland hardwood forest (422/610) dominates this area. The forest contains Brazilian pepper (*Schinus terebinthifolius*), wax myrtle (*Myrica cerifera*), red maple (*Acer rubrum*), red mulberry (*Morus rubra*), cabbage palm (*Sabal palmetto*), and Carolina willow (*Salix caroliniana*). Groundcover in the forest includes poison ivy (*Toxicodendron radicans*), and jack-in-the-pulpit (*Arisaema triphyllum*). A fill area (744) in the extreme northeastern corner of the property is vegetated by bahia grass, guinea grass (*Panicum maximum*), ragweed (*Ambrosia artimisfolia*), caesar-weed (*Urena lobata*), and blackberry (*Rubus* sp.).

Two species of plants listed as threatened by the State of Florida were found on the property. Giant leather fern (*Acrostichum danaefolium*) grows in the Brazilian pepper/wetland hardwood and Australian pine/wetland communities. Hairy maiden fern (*Thelypteris hispidula*) grows in several locations within the grove ditch system and in the Brazilian pepper/wetland hardwood community.

During the site visit a variety of wildlife was observed including several types of passerine birds, a raccoon, ground skinks, cattle egrets, and great land crabs. No protected wildlife species were observed on the property during the site inspection. However, portions of the Bates Groves property would provide suitable wading habitat for snowy egrets, little blue heron, and white ibis, all listed by the State of Florida as species of special concern.



-- LEGEND --

145	Tourist Services	16.21 Ac
221	Citrus Groves	33.85 Ac
425/426	Temperate Hardwoods/Tropical Hardwoods	29.12 Ac
625/437	Cabbage Palm/Australian Pine	1.69 Ac
524	Lakes Less than 10 Acres	1.30 Ac
612/422	Mangrove Swamps/Brazilian Pepper	2.52 Ac
642	Saltwater Marshes	0.35 Ac
830	Utilities	0.14 Ac
	Total Acreage	85.18 Ac

--------- Ditch — — — Area Boundary

———— Road

N

Scale in Feet

0 200 400

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-4
Land Use and Vegetation of
Candidate Site IR-5
Indian River County, Florida

PROJECT C-9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-5

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**202.21**	East/West of ICWW:	**East**
Section/Township/Range:	**S23/T31S/R39E, S26/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

(Note: Information in parentheses refers to Reach 2)

Reach Designation:	**IR-1, IR-2**		Reach Length (mi):	**8.09**	**6.95**
ICWW Mileage:	**194.34**	to	**202.43**	**(202.43 to 209.38)**	
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**				
	(Wabasso (S.R. 510) Bridge to Vero Beach)				
50-yr Requirements					
Dredging (cy):	**199,006**	-	**5,591**		
Storage (cy):	**427,862**	-	**12,021**		

C. SITE PARAMETERS

Mapped Area (ac):	**85.2**	Buffer Width (ft)	
Containment Area (ac):	**18.2**	North:	**300**
Total Area Impacted (ac):	**22.8**	South:	**300**
Total Buffer Area (ac):	**37.4**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**60.3**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**233,655**		
Dike Height (ft):	**12.0**		
Excavation Depth (ft):	**5.0**		
Estimated Site Elevation (ft +NGVD):	**7.0**		
Maximum Pumping Distance (mi):	**8.84**	**(8.68)**	

D. SITE CHARACTERISTICS

Public Road to Site:	**S.R. 510, U.S. Hwy 1**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**400**
Comprehensive Plan Designation:	**L-2 Medium Density Residential (Single Family)**		
Adjacent Land Use:	**residential, resort (Disney), open land (wetlands)**		
Predominant Land Use Impacted:	**citrus grove, hardwood forest**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**2.9**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

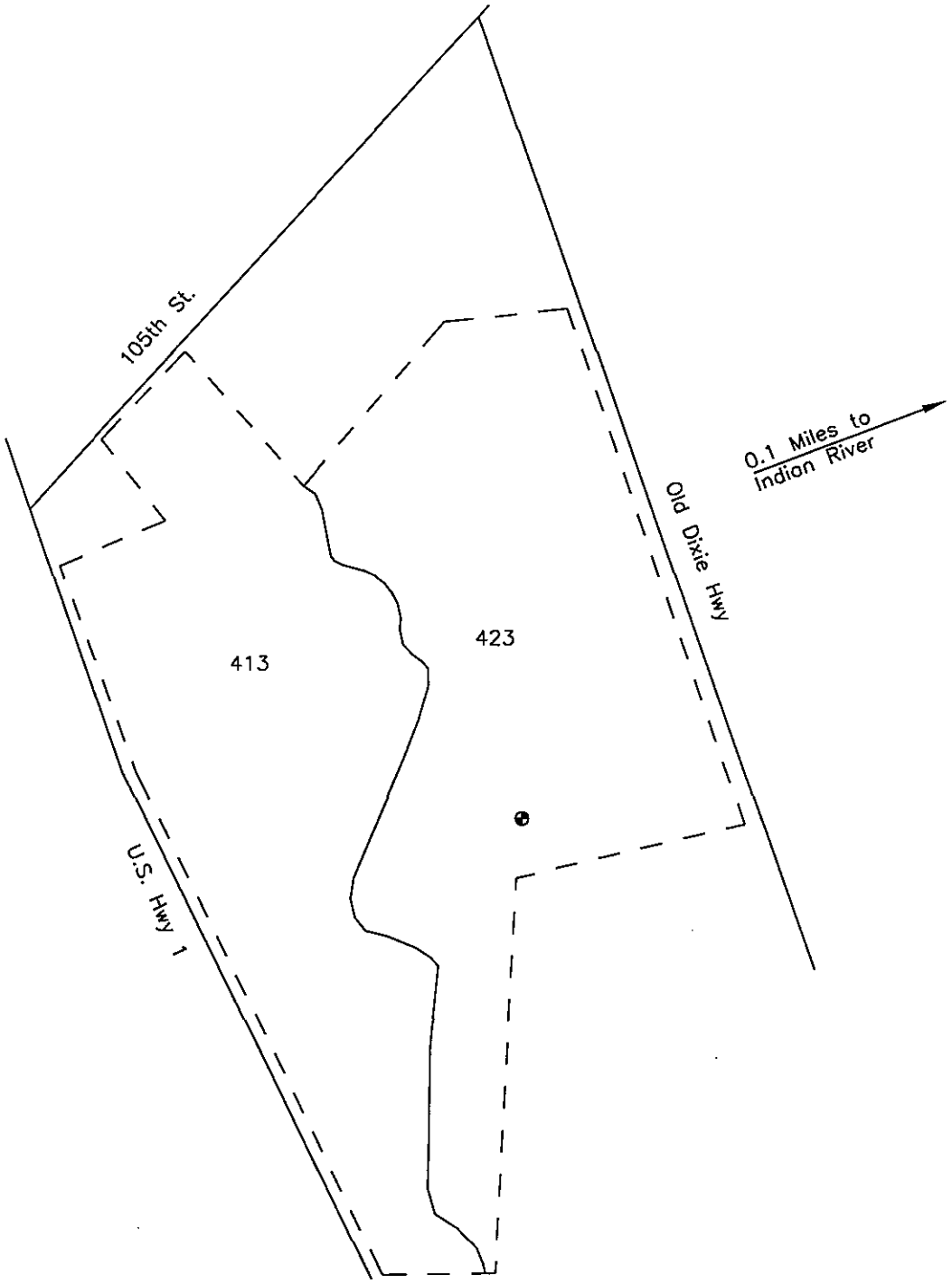
Site IR-5 is a rectangular site bordered by Jungle Trail Road (an Indian River County designated scenic road) and a ditch on the west, S.R. 510 on the north, and S.R. A1A on the east. Developed and undeveloped land lies to the south.

Mostly grapefruit citrus groves (221) occupy the western site area; however, several wetlands occur in the southwestern site area. A tidal influenced mangrove swamp/Brazilian pepper community (612/422) lies adjacent to and flows under (via a culvert) Jungle Trail Road. White mangrove (*Laguncularia racemosa*), Brazilian pepper (*Schinus terebinthifolius*), and the state-listed threatened giant leather fern (*Acrostichum danaeifolium*) dominant this area.

Adjacent to the mangrove/Brazilian pepper (612/422) community is a small area of saltwater marsh (642) and Australian pine/cabbage palm wetlands (437/625). The saltwater marsh is primarily open water. The Australian pine/cabbage palm (437/625) wetland community is almost exclusively Australian pine (*Casuarina equisetifolia*), Brazilian pepper, giant leather fern, and cabbage palm (*Sabal palmetto*). Both of these communities appear to connect to the mangrove/Brazilian pepper (612/422) community only during periods of unusually high water.

The eastern one-fourth of Site IR-5 has been recently cleared for development. Construction of roads, stormwater retention ponds, and buildings are associated with the expansion of the nearby Disney Resort.

West of the developed area and east of the citrus grove is a relatively undisturbed area of temperate and tropical hardwood hammock (425/426) dominated by live oak (*Quercus virginiana*), red bay (*Persea borbonia*), and cabbage palm. Dominant understory shrubs include myrsine (*Rapanea punctata*), white stopper (*Eugenia axillaris*), saw palmetto (*Serenoa repens*), and wild coffee (*Psychotria nervosa*). The relatively dry eastern area of the hammock has a slight lower canopy. Although most of the area is characterized as mesic hammock, some small areas almost exclusively vegetated with cabbage palm may be considered hydric hammock in the western area. A small cleared area used for utilities (830) occurs in the southern site area between the citrus grove and the hammock.



-- LEGEND --

413	Sand Pine	20.82 Ac
423	Oak-Pine-Hickory	22.50 Ac
	Total Acreage	43.42 Ac
	Artesian Well	Area Boundary
		Road

N

Scale in Feet

0 200 400

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-5
Land Use and Vegetation of
Candidate Site IR-18
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-18

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**195.72**	East/West of ICWW:	**West**
Section/Township/Range:	**S25/T30S/R38E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-1** Reach Length (mi): **8.09**

ICWW Mileage: **194.34** to **202.43**

Geographic: **Sebastian Inlet to Wabasso (S.R. 510) Bridge**

50-yr Requirements

Dredging (cy): **199,006**

Storage (cy): **427,862**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**43.4**		
Containment Area (ac):	**5.4**	North:	**300**
Total Area Impacted (ac):	**7.9**	South:	**300**
Total Buffer Area (ac):	**24.6**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**32.5**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**31,263**		
Dike Height (ft):	**7.0**		
Excavation Depth (ft):	**4.26**		
Estimated Site Elevation (ft +NGVD):	**25.0**		
Maximum Pumping Distance (mi):	**7.84**		

D. SITE CHARACTERISTICS

Public Road to Site: **U.S. Hwy 1, 105th St.** Additional Road Easement (ft): **N/A**

Old Dixie Hwy. Pipeline Easement (ft): **>600**

Comprehensive Plan Designation: **M-1 Medium Density Residential (Multi Family)**

Adjacent Land Use: **residential, commercial**

Predominant Land Use Impacted: **sand pine, oak-pine-hickory**

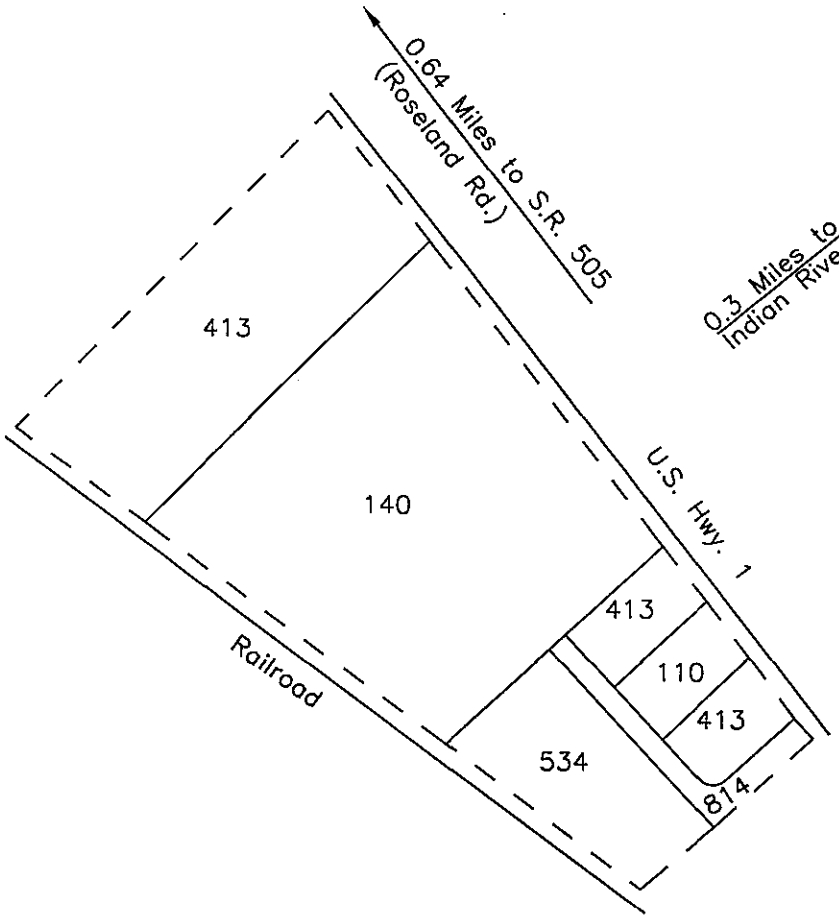
Wetlands (ac)

On-Site		Impacted	
Contiguous:	**0.0**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

Site IR-18 is an irregularly shaped 43-acre site vegetated with a sand pine (413) community on the west and mixed oak-pine-hickory (423) community on the east. The sand pine (*Pinus clausa*) area occurs along a higher sandy ridge bordering U.S. Highway 1. Scattered, mature sand pine occurs in the community with occasional dense patches of young sand pine. In the absence of young sand pine, smaller oaks (*Quercus geminata* and *Q. myrtifolia*) are scattered as understory or shrub species. Barren, white sand patches occur throughout this community and deer moss (*Cladonia* sp.) dominates the ground surface in some spots. Other common shrubs and groundcover species include rosemary (*Ceratiola ericoides*), saw palmetto (*Serenoa repens*), prickly pear (*Opuntia stricta*), yellow button (*Balduina angustifolia*), and *Helianthemum nashii*.

The oak-pine-hickory (423) community contains live oak (*Quercus virginiana*), sand pine, and hickory (*Carya floridana*) as canopy dominants. In some locations, cypress-pine (*Callitris columellaris*), native to Australia, has invaded and dominates small areas within this community which appears to be in transition from sand pine scrub community to a xeric hammock community. Shrubs and understory trees observed occasionally include wild coffee (*Psychotria nervosa*), myrtle oak (*Q. myrtifolia*), tallowwood (*Ximenia americana*), marlberry (*Ardisia escallonioides*), and wild olive (*Osmanthus americana*). Groundcover species include prickly pear (*Opuntia stricta*), *Palafoxia feayi*, winged blue-eyed grass (*Sisyrinchium angustifolium*), and silk grass (*Pityopsis graminifolia*).



-- LEGEND --		
110	Residential, Low Density	1.50 Ac
140	Commercial	22.64 Ac
413	Sand Pine	14.98 Ac
534	Reservoirs Less than 10 Acres	4.89 Ac
814	Roads and Highways	1.46 Ac
	Total Acreage	45.47 Ac
	Area Boundary	
	Road	

1980731

N

Scale in Feet

0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-6
Land Use and Vegetation of
Candidate Site IR-19
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-19

A. LOCATION

County:	**Indian River**	Municipality:	**Sebastian**
ICWW Mile:	**196.43**	East/West of ICWW:	**West**
Section/Township/Range:	**Fleming Grant**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-1** Reach Length (mi): **8.09**

ICWW Mileage: **194.34** to **202.43**

Geographic: **Sebastian Inlet to Wabasso (S.R. 510) Bridge**

50-yr Requirements

Dredging (cy): **199,006**

Storage (cy): **427,862**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	45.5		
Containment Area (ac):	N/A	North:	N/A
Total Area Impacted (ac):	N/A	South:	N/A
Total Buffer Area (ac):	N/A	East:	N/A
Buffer Outside Mapped Area (ac):	N/A	West:	N/A

Preliminary Total Site Area (ac): N/A *(Area Impacted + Buffer)*

Storage Capacity (cy): **insufficient undeveloped area**

Dike Height (ft): N/A

Excavation Depth (ft): N/A

Estimated Site Elevation (ft +NGVD): **23.0**

Maximum Pumping Distance (mi): 6.64

D. SITE CHARACTERISTICS

Public Road to Site: **U.S. Hwy 1**

Additional Road Easement (ft): N/A

Pipeline Easement (ft): N/A

Comprehensive Plan Designation: **CG (General Commercial), Conservation**

Adjacent Land Use: **commercial, railroad**

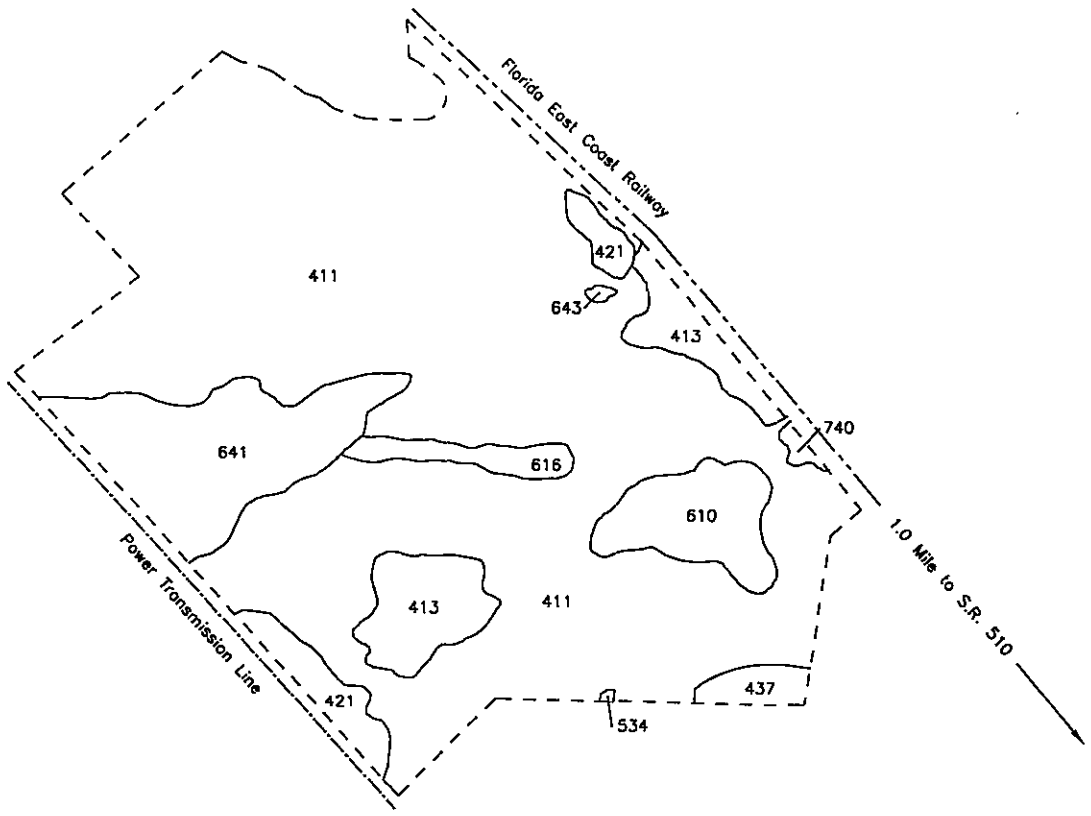
Predominant Land Use Impacted: N/A

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**0.0**	Contiguous:	N/A
Isolated:	**4.9**	Isolated:	N/A

III Site Description

The 45-acre IR-19 site has been developed since March 1994 for mostly commercial uses based on the aerial photographs. A Wal-Mart Superstore (140), a retention pond (534), and an access road (814) currently occupy the majority of the site. The remaining natural area consists of sand pine scrub (413) which occupies the north portion of the site. It also occupies two small areas on both sides of a residence (110) in the site's southeastern corner. Dominant species include sand pine (*Pinus clausa*), sand live oak (*Quercus geminata*), saw palmetto (*Serenoa repens*), scrub hickory (*Carya floridana*), and rosemary (*Ceratiola ericoides*).



TOWN OF SEBASTIAN

-- LEGEND --		
411	Pine Flatwoods	112.6 Ac
413	Sand Pine	8.1 Ac
421	Xeric Oak	3.9 Ac
437	Australian Pine	1.5 Ac
534	Reservoirs Less than 10 Acres	0.1 Ac
610	Wetland Hardwood Forests	5.9 Ac
616	Inland Ponds and Sloughs	2.2 Ac
641	Freshwater Marshes	12.8 Ac
643	Wet Prairies	0.1 Ac
740	Disturbed Land	0.4 Ac
	Total Acreage	147.6 Ac
- - - - - - -	Area Boundary	
—·—·—·—	Railway	

N

Scale in Feet

0 400 800

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-7
Land Use and Vegetation of
Candidate Site IR-20
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-20N

A. LOCATION

County:	**Indian River**	Municipality:	**Sebastian (partial)**
ICWW Mile:	**196.95**	East/West of ICWW:	**West**
Section/Township/Range:	**Fleming Grant, S6/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-1**	Reach Length (mi):	**8.09**
ICWW Mileage:	**194.34** to **202.43**		
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**		

50-yr Requirements

Dredging (cy):	**199,006**
Storage (cy):	**427,862**

C. SITE PARAMETERS

Mapped Area (ac):	**147.6**	Buffer Width (ft)	
Containment Area (ac):	**33.0**	North:	**300**
Total Area Impacted (ac):	**39.3**	South:	**300**
Total Buffer Area (ac):	**47.8**	East:	**200**
Buffer Outside Mapped Area (ac):	**7.8**	West:	**300**
Preliminary Total Site Area (ac):	**87.1**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**520,164**		
Dike Height (ft):	**14.0**		
Excavation Depth (ft):	**4.54**		
Estimated Site Elevation (ft +NGVD):	**22.0**		
Maximum Pumping Distance (mi):	**6.09**		

D. SITE CHARACTERISTICS

Public Road to Site:	**Main St. to Louisiana Av**	Additional Road Easement (ft):	**<1000**
		Pipeline Easement (ft):	**>1500**
Comprehensive Plan Designation:	**Industrial, Mixed Rresidential**		
Adjacent Land Use:	**open land (wetlands), residential, railroad**		
Predominant Land Use Impacted:	**pine flatwoods**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**15.0**	Contiguous:	**0.0**
Isolated:	**0.1**	Isolated:	**0.1**

SITE DATA SUMMARY SHEET SITE IR-20S

A. LOCATION

County:	**Indian River**	Municipality:	**Sebastian (partial)**
ICWW Mile:	**196.95**	East/West of ICWW:	**West**
Section/Township/Range:	**Fleming Grant, S6/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-1** Reach Length (mi): **8.09**

ICWW Mileage: **194.34** to **202.43**

Geographic: **Sebastian Inlet to Wabasso (S.R. 510) Bridge**

50-yr Requirements

Dredging (cy): **199,006**

Storage (cy): **427,862**

C. SITE PARAMETERS

Mapped Area (ac):	**147.6**	Buffer Width (ft)	
Containment Area (ac):	**13.8**	North:	**300**
Total Area Impacted (ac):	**18.1**	South:	**300**
Total Buffer Area (ac):	**35.3**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**53.4**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**138,203**		
Dike Height (ft):	**10.0**		
Excavation Depth (ft):	**4.82**		
Estimated Site Elevation (ft +NGVD):	**22.0**		
Maximum Pumping Distance (mi):	**6.09**		

D. SITE CHARACTERISTICS

Public Road to Site: **Main St. to Louisiana Av** Additional Road Easement (ft): **<200**

Pipeline Easement (ft): **<1200**

Comprehensive Plan Designation: **Industrial, Mixed residential**

Adjacent Land Use: **open land (wetlands), residential, railroad**

Predominant Land Use Impacted: **pine flatwoods, sand pine**

Wetlands (ac)

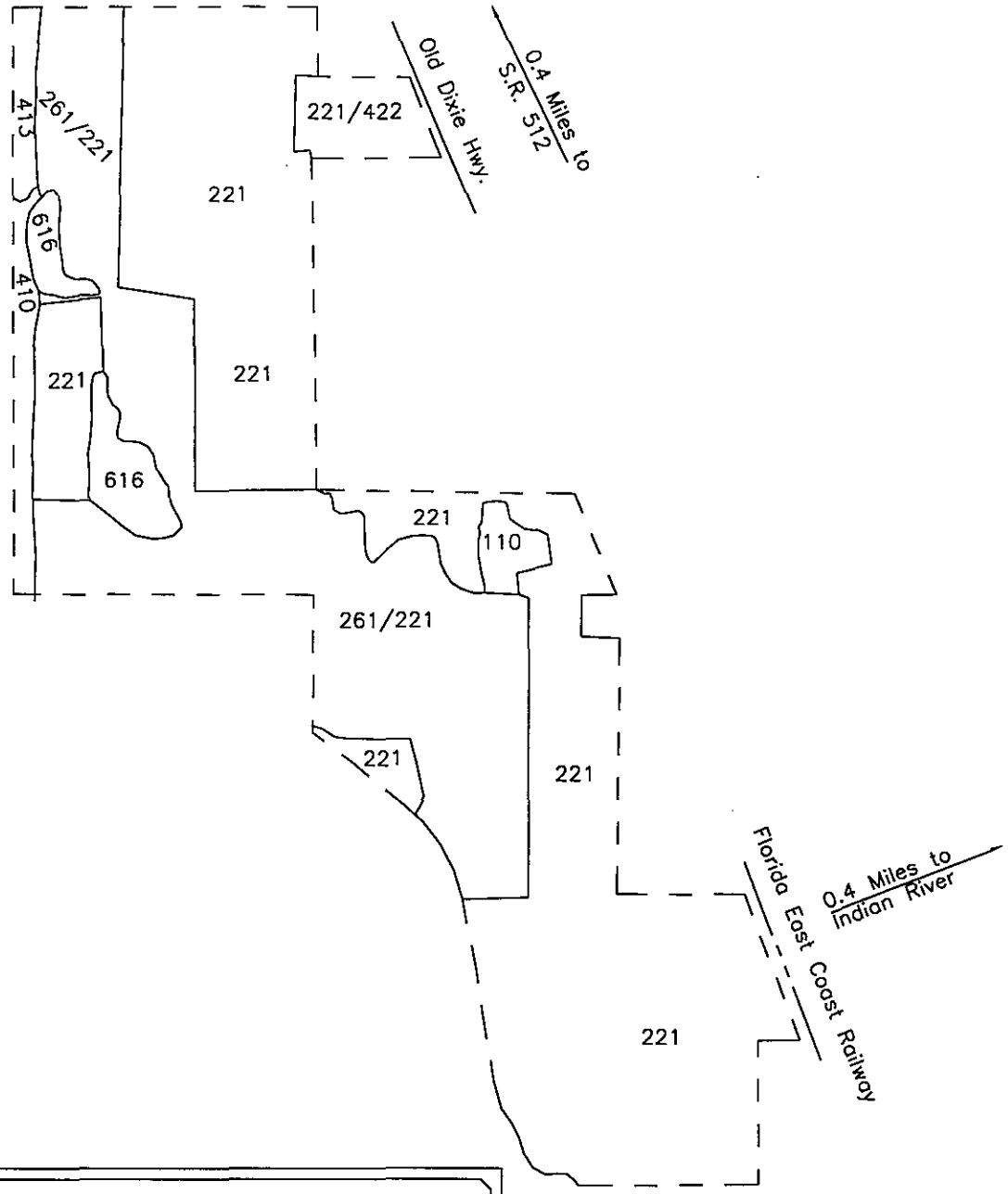
	On-Site		Impacted
Contiguous:	**15.0**	Contiguous:	**0.0**
Isolated:	**0.1**	Isolated:	**0.0**

III Site Description

Site IR-20 is a large, diverse site consisting mostly of pine flatwoods (411), sand pine (413), and xeric oak (421) uplands. The scrubby flatwoods contain widely spaced slash pine (*Pinus elliottii*) and sand pine (*Pinus clausa*) with low-growing sand live oak (*Quercus geminata*) and myrtle oak (*Q. myrtifolia*) interspersed with saw palmeto (*Serenoa repens*) and fetterbush (*Lyonia lucida*). Groundcover species includes wiregrass (*Aristida* sp.), deer tongue (*Carphephorus* sp.), gopher apple (*Licania michauxii*), and blazing star (*Liatris* sp.). A dense canopy of sand pine 5–8 in. in diameter with an shrub layer of rosemary (*Ceratiola ericoides*), saw palmetto, and sand live oak dominate the sand pine (413) community. Two small xeric oak (421) scrub communities border the east and west of the site. Sand live oak, myrtle oak, and saw palmetto dominate the community..

Wildlife likely occurs in moderate abundance on-site because of the quality and diversity of the habitats that border other large, undeveloped properties. The scrubby flatwoods may harbor a number of protected species including Florida scrub jays, gopher tortoises, southeastern kestrel, gopher frog, and eastern indigo.

A variety of wetlands interspersed on the site include a portion of a large freshwater marsh (641) on the western boundary, a wetland hardwood forest (610) area in the southeastern area, and a wetland slough (616) that drains into the marsh near the center of the site. Torpedo grass (*Panicum repens*) and *Sagittaria lancifolia* vegetate the freshwater marsh (641) which contains standing water. Other less common species observed include pennywort (*Hydrocotyle* sp.), bladderwort (*Utricularia* sp.), and horsetail (*Equisetum hyemale*). Sandweed (*Hypericum fasiculatum*) is common along the margins of the marsh. A low, pine slough (616) drains into the marsh and contains slash pine, swamp bay (*Persea palustris*), and dahoon holly (*Ilex cassine*).



-- LEGEND --

110	Residential, Low Density	2.02 Ac
221	Citrus Groves	97.86 Ac
221/422	Citrus Groves/Brazilian Pepper	4.88 Ac
261/221	Fallow Cropland/Citrus Groves	55.42 Ac
410	Upland Coniferous Forest	3.96 Ac
413	Sand Pine	2.11 Ac
616	Inland Ponds and Sloughs	3.73 Ac
	Total Acreage	169.98 Ac
	Area Boundary	
	Road	
	Railway	

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-8
Land Use and Vegetation of
Candidate Site IR-21
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-21N

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**198.61**	East/West of ICWW:	**West**
Section/Township/Range:	**S7/T31S/R39E, S17/T31S/R39E, S18/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-1**		Reach Length (mi):	**8.09**
ICWW Mileage:	**194.34**	to **202.43**		
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**			

50-yr Requirements

Dredging (cy):	**199,006**
Storage (cy):	**427,862**

C. SITE PARAMETERS

Mapped Area (ac):	**170.0**	Buffer Width (ft)	
Containment Area (ac):	**21.7**	North:	**300**
Total Area Impacted (ac):	**27.5**	South:	**300**
Total Buffer Area (ac):	**45.1**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**72.7**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**210,437**		
Dike Height (ft):	**10.0**		
Excavation Depth (ft):	**4.21**		
Estimated Site Elevation (ft +NGVD):	**30.0**		
Maximum Pumping Distance (mi):	**5.71**		

D. SITE CHARACTERISTICS

Public Road to Site:	**Old Dixie Hwy to Viking**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**>1500**

Comprehensive Plan Designation:

Adjacent Land Use: **open land (part wetlands), residential, railroad**

Predominant Land Use Impacted: **citrus grove, fallow croplands**

Wetlands (ac)

On-Site		Impacted	
Contiguous:	**0.0**	Contiguous:	**0.0**
Isolated:	**3.7**	Isolated:	**0.0**

SITE DATA SUMMARY SHEET SITE IR-21S

A. LOCATION

County:	Indian River	Municipality:	County
ICWW Mile:	198.61	East/West of ICWW:	West
Section/Township/Range:	S7/T31S/R39E, S17/T31S/R39E, S18/T31S/R39E		
Receiving Waterbody:	Indian River		
FDEP classification:	III, OFW		

B. REACH INFORMATION

Reach Designation:	IR-1		Reach Length (mi):	8.09
ICWW Mileage:	194.34	to	202.43	
Geographic:	Sebastian Inlet to Wabasso (S.R. 510) Bridge			

50-yr Requirements

Dredging (cy):	199,006
Storage (cy):	427,862

C. SITE PARAMETERS

Mapped Area (ac):	170.0	Buffer Width (ft)	
Containment Area (ac):	31.7	North:	300
Total Area Impacted (ac):	37.9	South:	300
Total Buffer Area (ac):	47.2	East:	300
Buffer Outside Mapped Area (ac):	9.8	West:	300
Preliminary Total Site Area (ac):	85.1	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	499,276		
Dike Height (ft):	14.0		
Excavation Depth (ft):	4.72		
Estimated Site Elevation (ft +NGVD):	30.0		
Maximum Pumping Distance (mi):	5.71		

D. SITE CHARACTERISTICS

Public Road to Site:	Old Dixie Hwy	Additional Road Easement (ft):	N/A
		Pipeline Easement (ft):	>1700
Comprehensive Plan Designation:			
Adjacent Land Use:	open land (part wetlands), residential, railroad		
Predominant Land Use Impacted:	citrus grove, fallow croplands		

Wetlands (ac)

On-Site		Impacted	
Contiguous:	0.0	Contiguous:	0.0
Isolated:	3.7	Isolated:	0.0

III Site Description

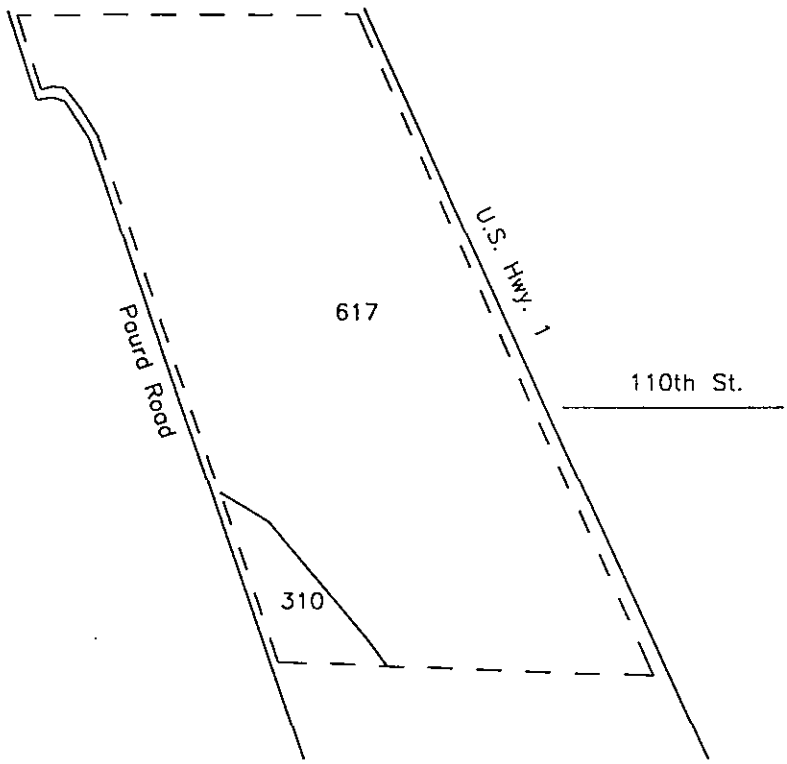
Site IR-21 is a 170-acre site consisting of citrus grove (221), former citrus grove (261/221), and citrus areas invaded by Brazilian pepper (221/422). Some small areas of remnant upland forests occur along the west boundary. Two wetland areas classified as inland ponds and sloughs (616) occur in the site's northern area.

Most of the citrus observed on the property appeared to be grapefruit. Some of the groves were maintained (mowed), others seriously invaded by Brazilian pepper (*Schinus terebinthifolius*). Other plants observed growing within the groves included saltbush (*Baccharis halimifolia*), broomsedge (*Andropogon virginicus*), Spanish needles (*Bidens bipinnata*), ironweed (*Sida rhombdifolia*), and lantana (*Lantana camera*). A citrus grove surrounds a residence (110) located adjacent to Old Dixie Highway.

The former citrus grove area (261/221) is a fallow field with low scattered trees and shrubs and a groundcover of guineagrass (*Panicum maximum*), white milkpea (*Galactia elliottii*), greenbrier (*Smilax auriculata*), redtops (*Rhynchelytrum repens*), and sneezeweed (*Heterotheca subaxillaris*). Young trees and shrubs observed include live oak (*Quercus virginiana*), citrus (*Citrus* sp.), cabbage palm (*Sabal palmetto*), and scrub hickory (*Carya floridana*). Other scrub species observed in this area include large flowered rosemary (*Conradina grandiflora*), sand spikemoss (*Selaginella arenicola*), and *Palafoxia feayi*.

Two depressional wetlands (616) located in the site's northwest area are vegetated with wax myrtle (*Myrica cerifera*) and primrose willow (*Ludwigia peruviana*). Other species observed in the wetlands include maidencane (*Panicum hemitomom*), swamp fern (*Blechnum serrulatum*), and blackberry (*Rubus* sp.).

Remnant pine stands appear along the site's western boundary. The northernmost consists of sand pine (*Pinus clausa*) and an understory of live oak and saw palmetto (*Serenoa repens*). Slash pine (*Pinus elliottii*) and saw palmetto dominate the south stand.



-- LEGEND --

310	Herbaceous	0.61 Ac
617	Mixed Wetland Hardwoods	11.65 Ac
	Total Acreage	12.26 Ac
	Area Boundary	
	Road	

N

Scale in Feet

0 150 300

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-9
Land Use and Vegetation of
Candidate Site IR-22
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-22

A. LOCATION

County:	Indian River	Municipality:	Sebastian/County
ICWW Mile:	199.25	East/West of ICWW:	West
Section/Township/Range:	S8/T31S/R39E		
Receiving Waterbody:	Indian River		
FDEP classification:	III, OFW		

B. REACH INFORMATION

Reach Designation: IR-1 Reach Length (mi): 8.09

ICWW Mileage: 194.34 to 202.43

Geographic: Sebastian Inlet to Wabasso (S.R. 510) Bridge

50-yr Requirements

Dredging (cy):	199,006
Storage (cy):	427,862

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	12.3		
Containment Area (ac):	N/A	North:	N/A
Total Area Impacted (ac):	N/A	South:	N/A
Total Buffer Area (ac):	N/A	East:	N/A
Buffer Outside Mapped Area (ac):	N/A	West:	N/A
Preliminary Total Site Area (ac):	N/A	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	minimal upland area		
Dike Height (ft):	N/A		
Excavation Depth (ft):	N/A		
Estimated Site Elevation (ft +NGVD):	12.0		
Maximum Pumping Distance (mi):	5.28		

D. SITE CHARACTERISTICS

Public Road to Site: U.S. Hwy 1

Additional Road Easement (ft): N/A

Pipeline Easement (ft): N/A

Comprehensive Plan Designation: Commercial/Industrial

Adjacent Land Use: commercial, railroad, highway, residential

Predominant Land Use Impacted: N/A

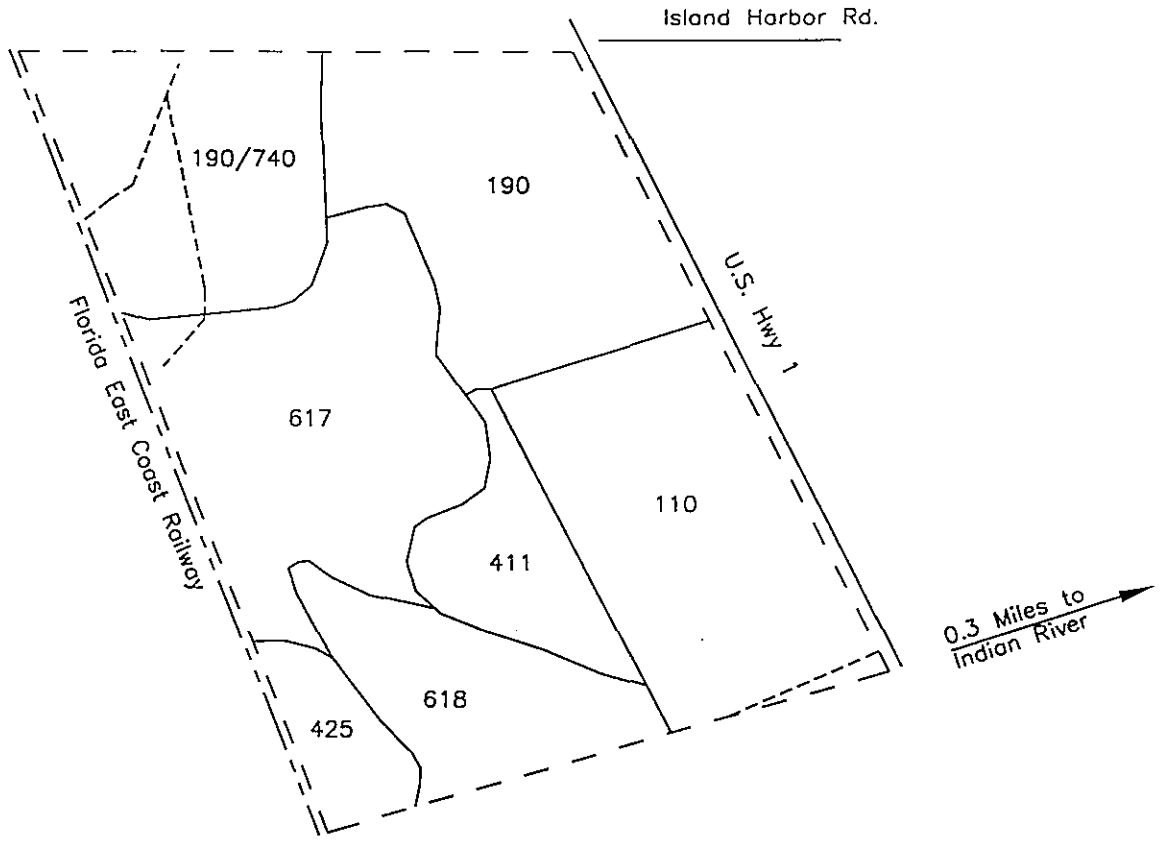
Wetlands (ac)

	On-Site		Impacted
Contiguous:	11.7	Contiguous:	N/A
Isolated:	0.0	Isolated:	N/A

III Site Description

Site IR-22 is a small, narrow site composed almost completely of wetland cover.. The site consists of a disturbed, mixed wetland hardwood (617) community. Tree and shrub species include slash pine (*Pinus elliottii*), swamp bay (*Persea palustris*), Carolina willow (*Salix caroliniana*), Brazilian pepper (*Schinus terebinthifolius*), and wax myrtle (*Myrica cerifera*). Trees in the sparse canopy vary in size from large remnant specimens to saplings. In the northern site area, muscadine vines (*Vitis rotundifolia*) provide a thick ground surface. Other species observed in the wetland include elderberry (*Sambucus simpsonii*), swamp fern (*Blechnum serrulatum*), and royal fern (*Osmunda regalis*).

The upland area in the southwestern corner consists of a mowed grass upland similar to the adjacent road right-of-way. Dominant species include bahiagrass (*Paspalum notatum*), sandspur (*Cenchrus* sp.), and hairy indigo (*Indigofera hirsuta*). A lower mowed area adjacent to the wetland also contains several species of sedge (*Cyperus* sp.) and a few clumps of rush (*Juncus* sp.).



-- LEGEND --		
110	Residential, Low Density	4.74 Ac
190	Open Land	4.64 Ac
190/740	Open Land/Disturbed Land	3.60 Ac
411	Pine Flatwoods	1.54 Ac
425	Temperate Hardwoods	0.91 Ac
617	Mixed Wetland Hardwoods	4.95 Ac
618	Shrub Marsh	2.30 Ac
	Total Acreage	22.68 Ac

------ Ditch
——— Road
– – – – Area Boundary
——— – – ——— Railway

N

Scale in Feet
0 150 300

SOURCE: W&AR Graphic 1996.

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Figure B-10
Land Use and Vegetation of
Candidate Site IR-23
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-23

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**200.03**	East/West of ICWW:	**West**
Section/Township/Range:	**S17/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-1** Reach Length (mi): **8.09**

ICWW Mileage: **194.34** to **202.43**

Geographic: **Sebastian Inlet to Wabasso (S.R. 510) Bridge**

50-yr Requirements

Dredging (cy): 199,006

Storage (cy): **427,862**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	22.7		
Containment Area (ac):	N/A	North:	N/A
Total Area Impacted (ac):	N/A	South:	N/A
Total Buffer Area (ac):	N/A	East:	N/A
Buffer Outside Mapped Area (ac):	N/A	West:	N/A

Preliminary Total Site Area (ac): N/A *(Area Impacted + Buffer)*

Storage Capacity (cy): **minimal upland area**

Dike Height (ft): N/A

Excavation Depth (ft): N/A

Estimated Site Elevation (ft +NGVD): **10.0**

Maximum Pumping Distance (mi): **6.02**

D. SITE CHARACTERISTICS

Public Road to Site: **U.S. Hwy 1** Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **N/A**

Comprehensive Plan Designation: **Commercial/Industrial**

Adjacent Land Use: **commercial, railroad, highway, residential**

Predominant Land Use Impacted: N/A

Wetlands (ac)

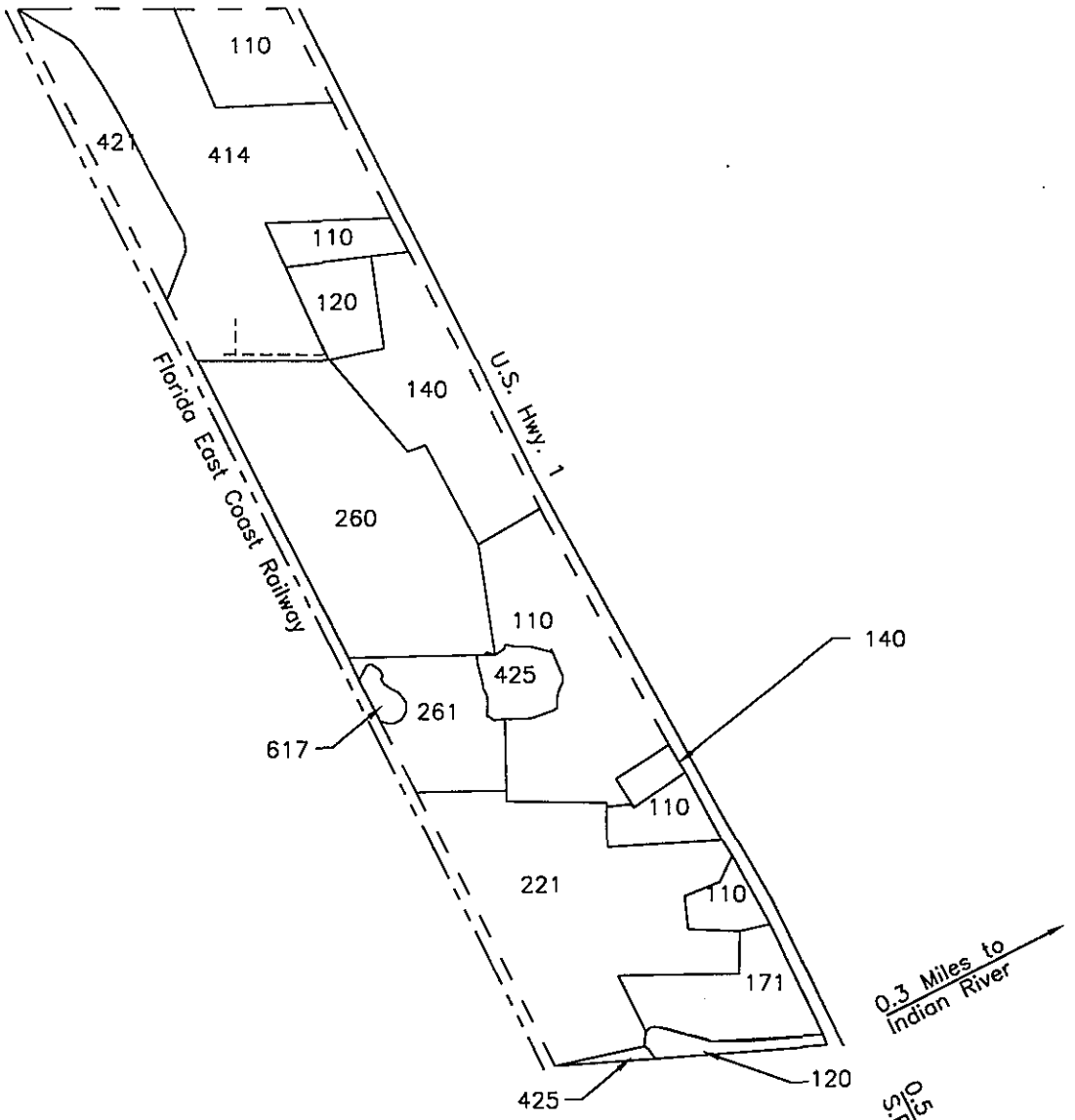
	On-Site		Impacted
Contiguous:	**0.0**	Contiguous:	N/A
Isolated:	**6.3**	Isolated:	N/A

III Site Description

Site IR-23 is a 23-acre site with a variety of vegetation communities and land use types. The site's open land (190) northeast portion consists of a mowed area of grasses and herbs with scattered large slash pine (*Pinus elliottii*). Other species observed include muscadine (*Vitis rotundifolia*), fingergrass (*Eustachys petraea*), broomsedge (*Andropogon virginicus*), and some escaped ornamental plants (*Philodendron* sp.). The site's northwestern area recently had been cleared and surveyed. Remnant plants include cabbage palm (*Sabal palmetto*) and red maple (*Acer rubrum*). Several ditches traverse this area. Common vegetation growth in these ditches are primrose willow (*Ludwigia peruviana*), cattail (*Typha* sp.), and Carolina willow (*Salix caroliniana*).

Several residences (110) with mowed yards occur in the site's southeastern corner. A small area of upland pine forest (411) is located immediately west of these residences.

A large area of wetland cover occupies the site's center and extends to the site's southern area. Mixed wetland hardwoods (617) occur in the center of the wetland area; prevalent species include red maple, sweetbay (*Magnolia virginiana*), and Brazilian pepper (*Schinus terebinthifolius*). Primrose willow and wax myrtle (*Myrica cerifera*) cover a dense shrub marsh (618) on the southern end of the site. A small area of upland forest (425) occurs along the railroad tracks west of the shrub marsh. A live oak (*Quercus virginiana*) canopy dominates this area.



-- LEGEND --

110	Residential, Low Density	22.58 Ac
120	Residential, Medium Density	4.02 Ac
140	Commercial and Services	10.48 Ac
171	Educational	5.30 Ac
221	Citrus Groves	19.91 Ac
260	Other Open Lands	20.45 Ac
261	Fallow Cropland	5.74 Ac
414	Pine - Mesic Oak	22.08 Ac
421	Xeric Oak	4.63 Ac
425	Temperate Hardwoods	2.38 Ac
617	Mixed Wetland Hardwoods	0.62 Ac
	Total Acreage	118.19 Ac

Area Boundary — Road

Railway — Ditch

SOURCE: W&AR Graphic 1996.

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JACKSONVILLE, FLORIDA 32256

Figure B-11
Land Use and Vegetation of
Candidate Site IR-24
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-24

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**201.75**	East/West of ICWW:	**West**
Section/Township/Range:	**S20/T31S/R39E, S21/T31S/R39E, S28/T31S/R39E, S29/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

(Note: Information in parentheses refers to Reach 2)

Reach Designation:	**IR-1, IR-2**	Reach Length (mi):	**8.09** **(6.95)**
ICWW Mileage:	**194.34** to **202.43** **(202.43 to 210.96)**		
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**		
	(Wabasso (S.R. 510) Bridge to Vero Beach)		

50-yr Requirements

Dredging (cy):	199,006	(5,591)
Storage (cy):	427,862	(12,021)

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**118.2**		
Containment Area (ac):	**N/A**	North:	**N/A**
Total Area Impacted (ac):	**N/A**	South:	**N/A**
Total Buffer Area (ac):	**N/A**	East:	**N/A**
Buffer Outside Mapped Area (ac):	**N/A**	West:	**N/A**
Preliminary Total Site Area (ac):	**N/A**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**Inadequate undeveloped area**		
Dike Height (ft):	**N/A**		
Excavation Depth (ft):	**N/A**		
Estimated Site Elevation (ft +NGVD):	**10.0**		
Maximum Pumping Distance (mi):	**8.44** **(10.08)**		

D. SITE CHARACTERISTICS

Public Road to Site:	**U.S. Hwy 1**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**N/A**
Comprehensive Plan Designation:	**Commercial/Industrial**		
Adjacent Land Use:	**residential, railroad, highway, commercial**		
Predominant Land Use Impacted:	**N/A**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**0.0**	Contiguous:	**N/A**
Isolated:	**0.6**	Isolated:	**N/A**

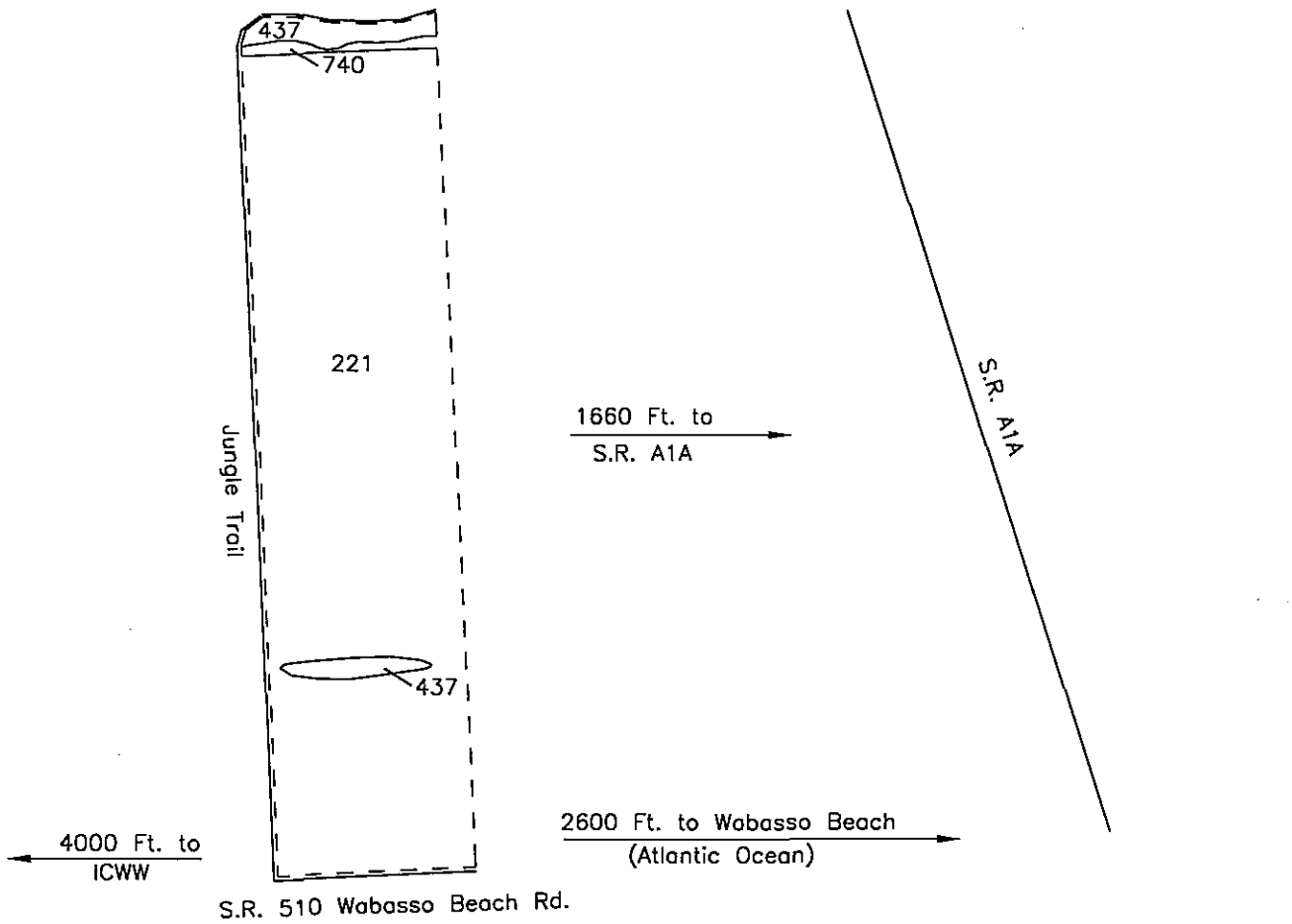
III Site Description

Site IR-24 is a 118-acre, narrow site located between the railroad and U.S. Highway 1. The property consists of a variety of developed, agricultural, and wooded uplands land uses. Nearly all of the highway frontage contains some type of development, including low and medium density residential (110, 120), commercial (140), and educational (171) land uses.

The agricultural land uses consist of active young citrus grove (221), fallow (261), and open lands (260). The open land may have been used for citrus production or another agricultural activity, but its current use is unclear. Small live oaks (*Quercus virginiana*) and cabbage palm (*Sabal palmetto*) occur within the regularly mowed grassy area. Other observed species include winged sumac (*Rhus copallina*) and giant foxtail (*Setaria maxima*).

Slash pine (*Pinus elliottii*), live oak, wax myrtle (*Myrica cerifera*), and cabbage palm vegetate a large forested area of pine-mesic oak (414) in the site's northern area. A small area of oak scrub (421) occurs immediately east of the railroad. Dominant tree cover includes sand live oak (*Quercus geminata*), myrtle oak (*Q. myrtifolia*), scrub hickory (*Carya floridana*), and Chapman's oak (*Q. chapmanii*).

One small wetland occurs along the railroad. Red maple (*Acer rubrum*), Carolina willow (*Salix caroliniana*), cabbage palm, and wax myrtle vegetate the mixed wetland hardwood area (617).



-- LEGEND --

221	Citrus Groves	36.2 Ac
437	Australian Pine	1.5 Ac
740	Disturbed Land	0.4 Ac
	Total Acreage	38.1 Ac

Area Boundary — Road

N

Scale in Feet

0 300 600

SOURCE: W&AR Graphic 1996.

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JACKSONVILLE, FLORIDA 32256

Figure B-12
Land Use and Vegetation of
Candidate Site IR-25
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-25

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**201.33**	East/West of ICWW:	**East**
Section/Township/Range:	**S23/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-1** Reach Length (mi): **8.09**

ICWW Mileage: **194.34** to **202.43**

Geographic: **Sebastian Inlet to Wabasso (S.R. 510) Bridge**

50-yr Requirements

Dredging (cy): **199,006**

Storage (cy): **427,862**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**38.1**		
Containment Area (ac):	**N/A**	North:	**N/A**
Total Area Impacted (ac):	**N/A**	South:	**N/A**
Total Buffer Area (ac):	**N/A**	East:	**N/A**
Buffer Outside Mapped Area (ac):	**N/A**	West:	**N/A**

Preliminary Total Site Area (ac): **N/A** *(Area Impacted + Buffer)*

Storage Capacity (cy): **too narrow for adequate buffers**

Dike Height (ft): **N/A**

Excavation Depth (ft): **N/A**

Estimated Site Elevation (ft +NGVD): **6.0**

Maximum Pumping Distance (mi): **8.66**

D. SITE CHARACTERISTICS

Public Road to Site: **Wabasso Beach Rd. (S.R. 510), Jungle Trail**

Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **N/A**

Comprehensive Plan Designation: **L-2 Medium Density Residential (Single Family)**

Adjacent Land Use: **residential, golf course**

Predominant Land Use Impacted: **N/A**

Wetlands (ac)

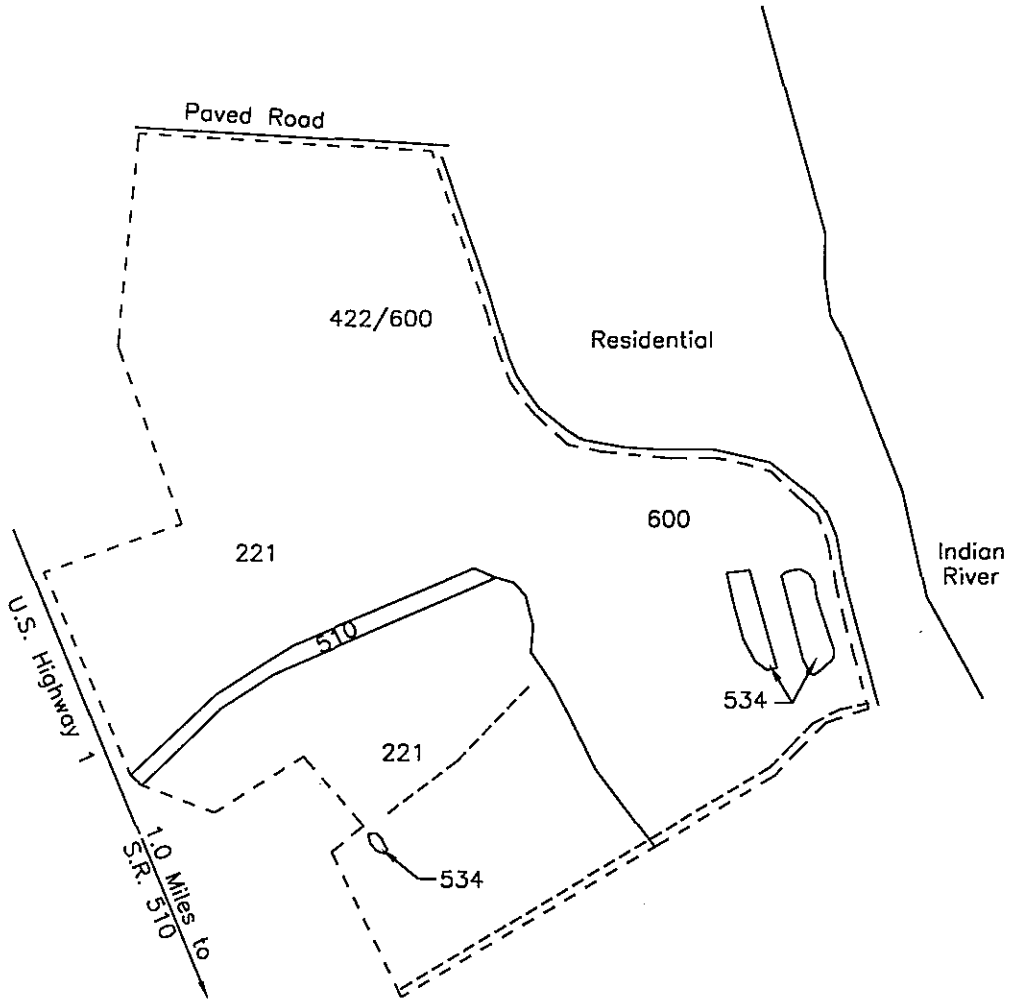
	On-Site		Impacted
Contiguous:	**0.0**	Contiguous:	**N/A**
Isolated:	**0.0**	Isolated:	**N/A**

III Site Description

Site IR-25, a rectangular site oriented north to south, consists of grapefruit citrus groves (221) with two small areas of Australian pine (437).

The Australian pine (437) communities are located in the site's south-central area and along the northern boundary of the citrus grove (221). The northernmost community contains an abundance of Australian pine (*Casuarina equisetifolia*), some lantana (*Lantana camera*), live oak (*Quercus virginiana*), Brazilian pepper (*Schinus terebinthifolius*), and cabbage palm (*Sabal palmetto*). The south Australian pine community is predominantly Australian pine.

A small area of disturbed lands (740) occurs along the northern site area. A dirt road forms the western boundary.



-- LEGEND --

221	Citrus Groves	21.20 Ac
422/600	Brazilian Pepper/Wetland	10.74 Ac
510	Streams and Waterways	0.66 Ac
534	Reservoirs Less than 10 Acres	0.54 Ac
600	Wetlands	5.65 Ac
	Total Acreage	38.79 Ac

– — — – Area Boundary
---------- Ditch
———— Road

1689597

N

Scale in Feet
0 200 400

SOURCE: W&AR Graphic 1996.

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9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-13
Land Use and Vegetation of
Candidate Site IR-26
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-26

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**201.80**	East/West of ICWW:	**West**
Section/Township/Range:	**S21/T3/R39E, S28/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-1**			Reach Length (mi):	**8.09**
ICWW Mileage:	**194.34**	to	**202.43**		
Geographic:	**Sebastian Inlet to Wabasso (S.R. 510) Bridge**				

50-yr Requirements

Dredging (cy):	**199,006**
Storage (cy):	**427,862**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**38.8**		
Containment Area (ac):	**N/A**	North:	**N/A**
Total Area Impacted (ac):	**N/A**	South:	**N/A**
Total Buffer Area (ac):	**N/A**	East:	**N/A**
Buffer Outside Mapped Area (ac):	**N/A**	West:	**N/A**
Preliminary Total Site Area (ac):	**N/A**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**inadequate upland area**		
Dike Height (ft):	**N/A**		
Excavation Depth (ft):	**N/A**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**7.66**		

D. SITE CHARACTERISTICS

Public Road to Site:	**U.S. Hwy 1**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**N/A**
Comprehensive Plan Designation:	**L-2 Meidum Density Residential (Single Family)**		
Adjacent Land Use:	**residential, open land (wetlands)**		
Predominant Land Use Impacted:	**N/A**		

Wetlands (ac)

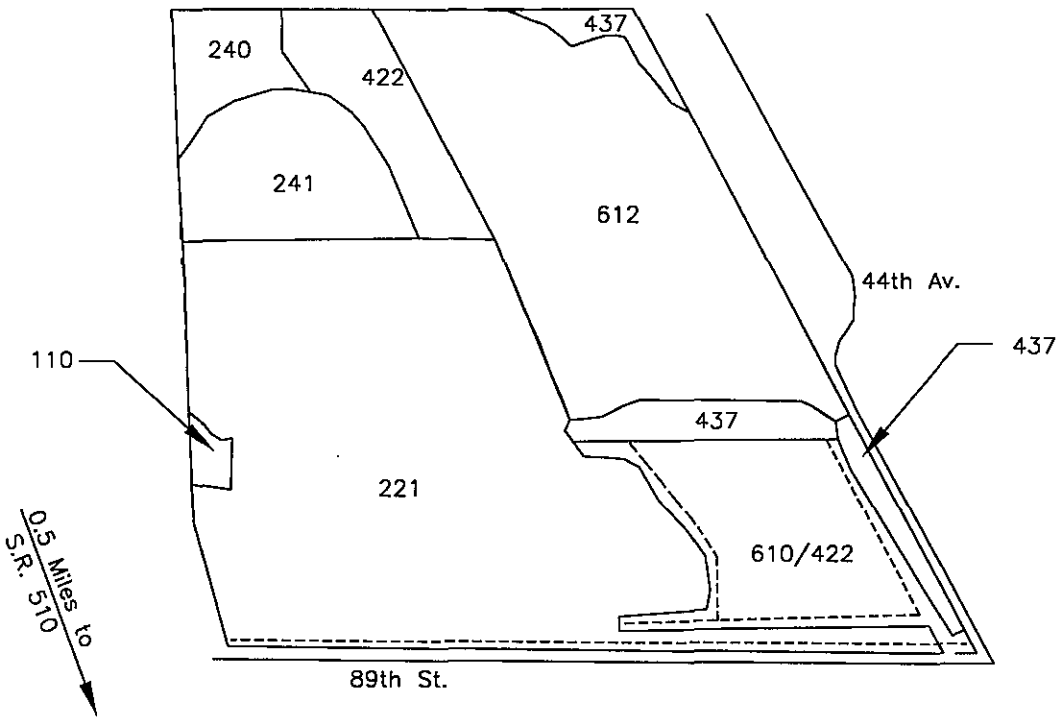
	On-Site		Impacted
Contiguous:	**17.6**	Contiguous:	**N/A**
Isolated:	**0.0**	Isolated:	**N/A**

III Site Description

Site IR-26 is a 38-acre, irregularly-shaped site located between U.S. Highway 1 and some residential lots located along Indian River. The western side of the site is mostly an active grapefruit grove (221). The eastern side of the site consists of wetlands (600) and some constructed ponds (534).

The citrus grove area lies at a low elevation, with more than half lying below the 5 ft NGVD contour line. Shallow swales between the rows of citrus contain standing water. These swales appear to drain into the larger canal, oriented east to west, that bisects the site. In addition to grapefruit (*Citrus paradisi*), other vegetation present in the citrus grove includes an occasional cabbage palm (*Sabal palmetto*) and a variety of herbaceous groundcover. Typical species include cranesbill (*Geranium carolinianum*), matchheads (*Phyla nodiflora*), dayflower (*Commelina* sp.), *Chamaesyce* sp., poorman's pepper (*Lepidium virginicum*), and wild balsam apple (*Momordica charantia*). The canal banks and ditches are vegetated with primrose willow (*Ludwigia peruviana*), giant foxtail (*Setaria magna*), water hemlock (*Cicuta mexicana*), and an unidentified grass.

The wetlands to the east were not visited due to a thick cover of Brazilian pepper (*Schinus terebinthifolius*); however, Brazilian pepper (*Schinus terebinthifolius*) was observed from the east side of the citrus grove. This wetland also contains mangrove and associated species.



-- LEGEND --		
110	Residential, Low Density	0.23 Ac
221	Citrus Groves	16.79 Ac
240	Nurseries and Vineyards	1.13 Ac
241	Tree Nurseries	2.77 Ac
422	Brazilian Pepper	1.91 Ac
437	Australian Pine	1.86 Ac
610/422	Wetland Hardwood Forests	4.24 Ac
612	Mangrove Swamp	9.91 Ac
	Total Acreage	38.84 Ac

- - - - - Area Boundary
---------- Ditch
———— Road

N

Scale in Feet
0 200 400

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
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JACKSONVILLE, FLORIDA 32256

Figure B-14
Land Use and Vegetation of
Candidate Site IR-4
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-4

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**202.69**	East/West of ICWW:	**West**
Section/Township/Range:	**S28/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-2**	Reach Length (mi):	**6.95**
ICWW Mileage:	**202.43** to **209.38**		
Geographic:	**Wabasso (S.R. 510) Bridge to Vero Beach**		

50-yr Requirements

Dredging (cy):	**5,591**
Storage (cy):	**12,021**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**38.8**		
Containment Area (ac):	**adequate upland area**	North:	**N/A**
Total Area Impacted (ac):	**N/A**	South:	**N/A**
Total Buffer Area (ac):	**N/A**	East:	**N/A**
Buffer Outside Mapped Area (ac):	**N/A**	West:	**N/A**
Preliminary Total Site Area (ac):	**N/A**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**N/A**		
Dike Height (ft):	**N/A**		
Excavation Depth (ft):	**N/A**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**9.75**		

D. SITE CHARACTERISTICS

Public Road to Site:	**89th St.**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**450**
Comprehensive Plan Designation:	**L-2 Medium Density Residential (Single Family)**		
Adjacent Land Use:	**residential, commercial, citrus, open land (wetlands)**		
Predominant Land Use Impacted:	**citrus grove**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**14.2**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

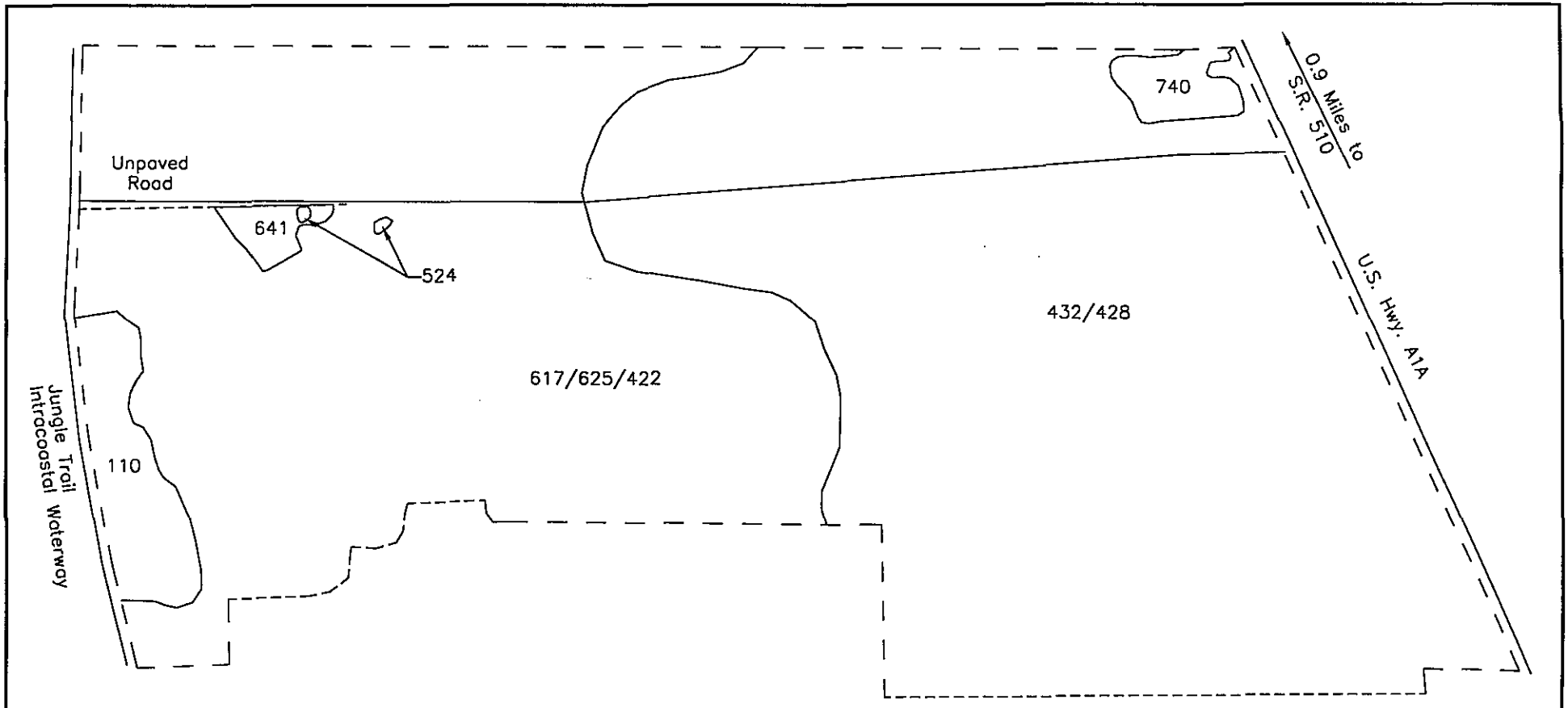
Site IR-4 is a 39-acre parcel consisting principally of agricultural land uses on the west side of the site. Wetlands were found on the eastern side of the site. Ditches are oriented from east to west along the northern and southern site boundaries. Other ditches occur within the wetlands. All on-site ditches discharge directly or indirectly into the Indian River.

An active yet somewhat overgrown grapefruit grove (221) can be found in the southwestern area of the site. Guineagrass (*Panicum maximum*) is the dominant groundcover. Smaller amounts of sandspur (*Cenchrus* sp.), globe amaranth (*Gomphrena serrata*), crowfootgrass (*Dactyloctenium aegyptium*), Spanish needles (*Bidens bipinnata*), and *Richardia scabra* also occur. A residential property (110) exists in the grove along the western boundary of the site.

A disturbed area in the site's northwest corner receives debris from the adjacent plant nursery. Slightly south of the plant nursery area (240) occurs a tree nursery (241) that cultivates ornamental palms. In addition to the small Washingtonia palms (*Washingtonia robusta*), the area contains a thick cover of broomsedge (*Andropogon* sp.), guineagrass, *Crotalaria* sp., and frostweed (*Verbinsina virginica*). A dense area of Brazilian pepper (*Schinus terebinthifolius*; 422) occurs east of the nursery area.

The northeastern site area, consisting primarily of mangrove swamp (612), is vegetated with giant leather fern (*Acrostichum danaeifolium*) and red, white, and black mangroves (*Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*). A small area dominated by Australian pine (*Casuarina equisetifolia*; 437) lies along a fill road in the northeastern site area.

In the southeastern site area, Australian pine cover (437) dominates small upland areas bordering ditches and roads. Brazilian pepper, Carolina willow (*Salix caroliniana*), wax myrtle (*Myrica cerifera*), and giant leather fern dominates this area of disturbed wetland.



-- LEGEND --

110	Residential, Low Density	3.02 Ac
432/428	Sand Oak/Cabbage Palm	58.67 Ac
524	Lakes Less than 10 Acres	0.06 Ac
617/625/422	Mixed Wetland Hardwoods/Cabbage Palm/Brazilian Pepper	45.95 Ac
641	Freshwater Marshes	0.63 Ac
740	Disturbed Lands	1.10 Ac
	Total Acreage	109.43 Ac

— — — Area Boundary - - - - - - - - Ditch ———— Road

N

Scale in Feet

0 200 400

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-15
Land Use and Vegetation of
Candidate Site IR-6
Indian River County, Florida

PROJECT C-9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-6

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**203.54**	East/West of ICWW:	**East**
Section/Township/Range:	**S25/T31S/R39E, S26/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-2** Reach Length (mi): **8.38**

ICWW Mileage: **202.43** to **210.81**

Geographic: **Wabasso (S.R. 510) Bridge to New Merrill P. Barber (S.R. 60) Bridge**

50-yr Requirements

Dredging (cy):	5,591
Storage (cy):	12,021

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**109.4**		
Containment Area (ac):	**13.8**	North:	**300**
Total Area Impacted (ac):	**17.8**	South:	**300**
Total Buffer Area (ac):	**33.6**	East:	**300**
Buffer Outside Mapped Area (ac):	**2.1**	West:	**300**
Preliminary Total Site Area (ac):	**51.4**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**137,342**		
Dike Height (ft):	**10.0**		
Excavation Depth (ft):	**4.12**		
Estimated Site Elevation (ft +NGVD):	**7.0**		
Maximum Pumping Distance (mi):	**7.31**		

D. SITE CHARACTERISTICS

Public Road to Site: **U.S. Hwy A1A** Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **<100**

Comprehensive Plan Designation: **L-2 Medium Density Residential (Single family)**

Adjacent Land Use: **residential, citrus groves**

Predominant Land Use Impacted: **sand oak, cabbage palm**

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**46.6**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

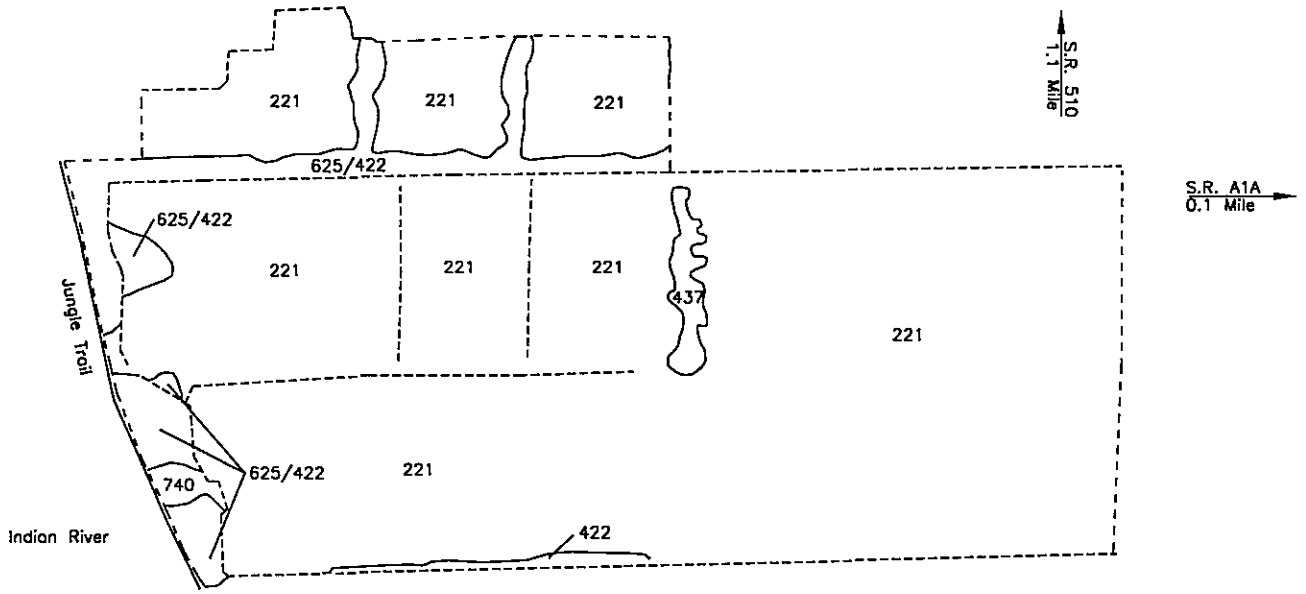
Site IR-6, a rectangular site oriented east to west, is bordered by the Intracoastal Waterway and Jungle Trail Road (an Indian River County designated scenic dirt road) on the west and by SR A1A on the east. The southern boundary consists of a large ditch that occurs intermittently. In the northern site area, an unimproved road oriented east to west serves as a jeep trail that traverses the northern one-third of the site from Jungle Trail Road to SR A1A. During the field survey, land surveyors on site indicated that Indian River County may acquire the area for preservation.

A small area in the site's western portion (bordering Jungle Trail Road) is designated low-density residential (110). Most of the area surrounding the residential area and half of the area east to SR A1A consist of mixed wetland hardwoods/cabbage palm/Brazilian pepper (*Sabal palmetto* and *Schinus terebinthifolius*; 617/625/422). This wetland community contains some large live oaks (*Quercus virginiana*) in the drier areas, cabbage palm, and an understory with an abundance of Brazilian pepper and occasional to locally common wild coffee (*Psychotria nervosa*), marlberry (*Ardisia escallonioides*), and giant leather leaf fern (*Acrostichum danaeifolium*), state-listed as threatened. This disturbed community contains many small water-filled ditches that contain some emergent vegetation, such as the golden canna (*Canna flacida*). These ditches tend to disappear as they traverse east.

The state-listed threatened species, golden polypody fern (*Phlebodium aureum*) and shoestring fern, (*Vittaria lineata*) are commonly associated with cabbage palms in the 617/625/422 community.

Adjacent to the jeep trail and within the mixed wetland hardwoods/cabbage palm/Brazilian pepper (617/625/422) community is a small open freshwater marsh (641) with some open water (reservoirs smaller than 10 acres; 524). The marsh consists predominantly of cattails (*Typha* sp.).

The site's east portion is predominantly a sand live oak/cabbage palm (*Quercus geminata*; 432/428) community. The vegetation component of this community is primarily sand live oak, saw palmetto (*Serenoa repens*), wild coffee, and marlberry. The state-listed threatened golden polypody fern, shoestring fern (which grows on cabbage palms), whisk fern (*Psilotum nudum*), and rein orchid, (*Habenaria* sp.) are occasional in the sand live oak/cabbage palm (432/428) community. A state-listed threatened epiphytic orchid, believed to be *Encyclia* sp., is rare to occasional in this community.



-- LEGEND --

221	Citrus Groves	92.4 Ac
422	Brazilian Pepper	0.4 Ac
437	Australian Pine	1.0 Ac
625/422	Cabbage Palm/Brazilian Pepper	7.6 Ac
740	Disturbed Land	0.5 Ac
540	Citrus Groves	
	Total Acreage	101.9 Ac

---------- Area Boundary
---------- Ditch
———— Road

N

Scale in Feet
0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-16
Land Use and Vegetation of
Candidate Site IR-7B
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-7B

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**203.81**	East/West of ICWW:	**East**
Section/Township/Range:	**S25/T31S/R39E, S26/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-2**		Reach Length (mi):	6.95
ICWW Mileage:	**202.43**	to **209.38**		
Geographic:	**Wabasso (S.R. 510) Bridge to Vero Beach**			

50-yr Requirements

Dredging (cy):	5,591
Storage (cy):	12,021

C. SITE PARAMETERS

Mapped Area (ac):	**101.9**	Buffer Width (ft)	
Containment Area (ac):	**29.0**	North:	**300**
Total Area Impacted (ac):	**36.0**	South:	**300**
Total Buffer Area (ac):	**51.9**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**<300**
Preliminary Total Site Area (ac):	**88.0**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**331,054**		
Dike Height (ft):	**11.0**		
Excavation Depth (ft):	**4.13**		
Estimated Site Elevation (ft +NGVD):	**7.0**		
Maximum Pumping Distance (mi):	**6.84**		

D. SITE CHARACTERISTICS

Public Road to Site:	**Jungle Trail**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**N/A**
Comprehensive Plan Designation:	**Indian River Shores/ L-1**		
Adjacent Land Use:	**residential, open land, citrus groves**		
Predominant Land Use Impacted:	**citrus groves**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**7.6**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

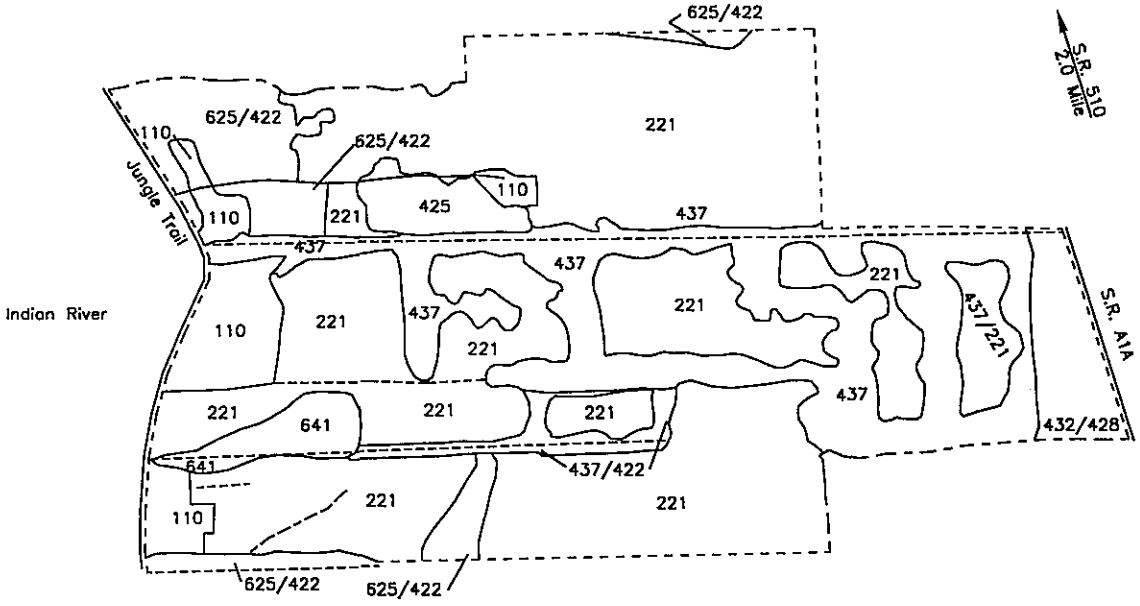
III Site Description

IR-7B is a rectangular-shaped site oriented east to west, with Jungle Trail Road (an Indian River County designated scenic dirt road) forming the west boundary. Many ditches oriented east to west and north to south traverse the site. Determined from aerial photographs, the ditches vary in depth from shallow grassy swales (primarily the north to south ditches in the interior of the site) to 4- to 5-ft deep ditches or canals (primarily the ditches along the south and north boundaries). The site predominantly consists of citrus grove (221).

The only on-site wetlands are located adjacent to or near the western boundary and adjacent to a large ditch in the site's northern portion. The cabbage palm/Brazilian pepper (*Sabal palmetto*, *Schinus terebinthifolius*; 625/422) community is predominantly cabbage palm and Brazilian pepper with an understory of giant leather leaf fern (*Acrostichum danaeifolium*; a Florida threatened species) and swamp fern (*Blechnum serrulatum*).

Citrus near the center of the site surrounds an area of Australian pine (*Casuarina equisetifolia*; 437). A small area of disturbed land (740) lies adjacent to the cabbage palm/Brazilian pepper (625/422) community in the site's southwest area.

A few of the state-listed threatened species—golden polypody fern (*Phlebodium aureum*) and shoestring fern—(*Vittaria lineata*) can be found in the cabbage palm/Brazilian pepper (625/422) community growing on cabbage palms.



-- LEGEND --

110	Residential, Low Density	4.7 Ac
221	Citrus Groves	50.1 Ac
425	Temperate Hardwoods	1.9 Ac
432/428	Sand Live Oak/Cabbage Palm	2.9 Ac
437	Australian Pine	16.0 Ac
437/221	Australian Pine/Citrus Groves	1.6 Ac
437/422	Australian Pine/Brazilian Pepper	1.6 Ac
625/422	Cabbage Palm?/Brazilian Pepper	6.2 Ac
641	Freshwater Marsh	1.8 Ac
	Total Acreage	86.8 Ac

---------- Area Boundary
---------- Ditch
———— Road

N

Scale in Feet
0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-17
Land Use and Vegetation of
Candidate Site IR-8
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-8

A. LOCATION

County:	**Indian River**	Municipality:	**IR Shores/County**
ICWW Mile:	**204.60**	East/West of ICWW:	**East**
Section/Township/Range:	**S36/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-2** Reach Length (mi): **6.95**

ICWW Mileage: **202.43** to **209.38**

Geographic: **Wabasso (S.R. 510) Bridge to Vero Beach**

50-yr Requirements

Dredging (cy):	**5,591**
Storage (cy):	**12,021**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**86.8**		
Containment Area (ac):	**36.2**	North:	**300**
Total Area Impacted (ac):	**42.4**	South:	**300**
Total Buffer Area (ac):	**46.7**	East:	**300**
Buffer Outside Mapped Area (ac):	**21.5**	West:	**300**
Preliminary Total Site Area (ac):	**82.9**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**624,922**		
Dike Height (ft):	**15.0**		
Excavation Depth (ft):	**4.24**		
Estimated Site Elevation (ft +NGVD):	**6.0**		
Maximum Pumping Distance (mi):	**6.13**		

D. SITE CHARACTERISTICS

Public Road to Site: **S.R. A1A, Jungle Trail** Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **>750**

Comprehensive Plan Designation: **R1A (Single-Family Residence District)/L-1**

Adjacent Land Use: **residential, citrus groves, open land**

Predominant Land Use Impacted: **citrus groves, Australian pine**

Wetlands (ac)

On-Site		Impacted	
Contiguous:	**8.0**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

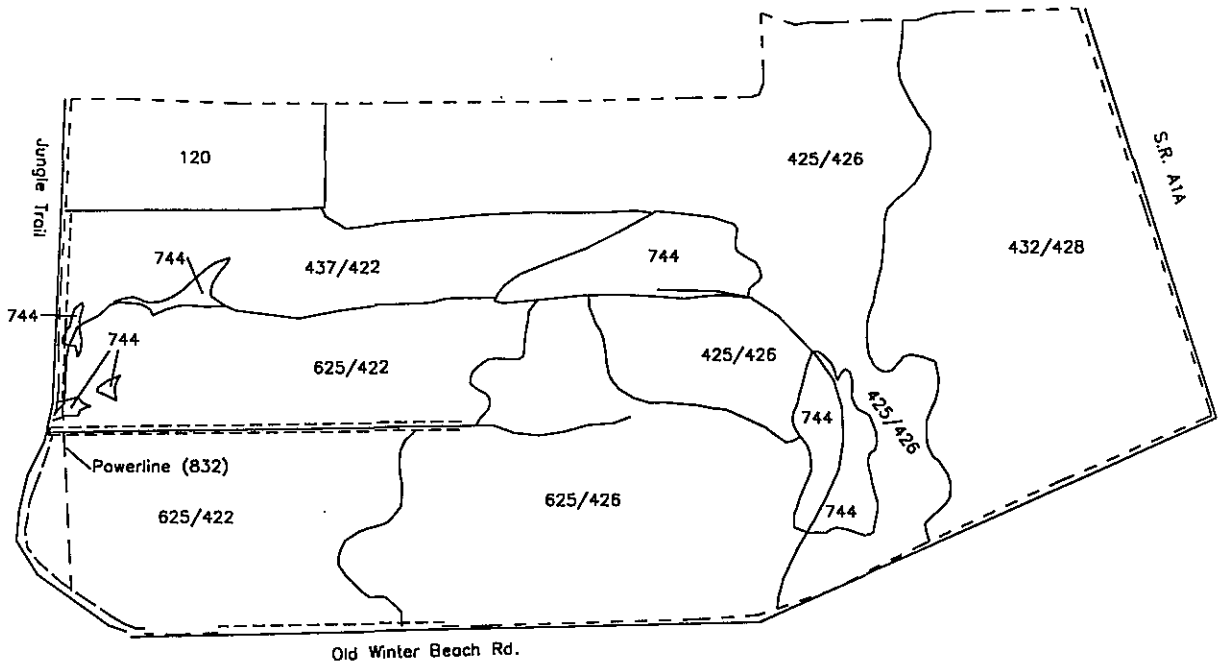
Site IR-8 is primarily citrus groves (221) separated by windrows of Australian pine (437) and Australian pine/Brazilian pepper (437/422). Many of the citrus groves (221) appear to be unmaintained. Several small ditches, oriented east to west, traverse nearly the entire site.

Three residential properties (110) are near the western boundary (Jungle Trail Road, designated an Indian River County scenic road). An unpaved road in the northern half of the site leads to another residential property (110) adjacent to a small area of temperate hardwoods (425).

Some of the citrus groves appear uncultivated given their abundance of Australian pine (*Casuarina equisetifolia*) and unhealthy citrus (*Citrus* sp.). These areas are categorized as Australian pine/citrus groves (437/221).

A cabbage palm/Brazilian pepper wetland (625/422) occurs in the northwestern site corner. The cabbage palm (*Sabal palmetto*) with an understory of Brazilian pepper (*Schinus terebinthifolius*) suggests a historically disturbed wetland. Small cabbage palm/Brazilian pepper (625/422) wetlands also occur at the site's southwestern and northeastern boundaries. Some tidal influence may occur at the southwestern wetland area given the presence of white mangroves (*Laguncularia racemosa*). A culvert under Jungle Trail Road appears to connect this wetland to the Indian River. A slightly disturbed freshwater marsh (641) is located between two of the residential properties in the site's southwestern area. This wetland contains cordgrass (*Spartina* sp.), camphorweed (*Pluchea odorata*), and Brazilian pepper. Standing water also exists in this area.

The eastern site area, a relatively undisturbed sand live oak/cabbage palm (432/428) community, contains sand live oak (*Quercus geminata*), cabbage palm (*Sabal palmetto*), saw palmetto (*Serenoa repens*), and rusty lyonia (*Lyonia ferruginea*). The state-listed threatened species shoestring fern (*Vittaria lineata*) and golden polypody fern (*Phlebodium aureum*) are occasional, growing on the cabbage palm.



-- LEGEND --

120	Residential, Medium Density	6.2 Ac
425/426	Temperate Hardwoods/Tropical Hardwoods	30.0 Ac
432/428	Sand Live Oak/Cabbage Palm	25.4 Ac
437/422	Australian Pine/Brazilian Pepper	10.0 Ac
625/422	Cabbage Palm/Brazilian Pepper	26.6 Ac
625/426	Cabbage Palm/Tropical Hardwoods	21.5 Ac
744	Fill Areas	6.4 Ac
	Total Acreage	126.1 Ac

- - - - - - - - Area Boundary
---------- Ditch
———— Road

N

Scale in Feet
0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-18
Land Use and Vegetation of
Candidate Site IR-9
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-9

A. LOCATION

County:	**Indian River**	Municipality:	**Indian River Shores**
ICWW Mile:	**204.87**	East/West of ICWW:	**East**
Section/Township/Range:	**S1/T32S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-2**	Reach Length (mi):	**6.95**
ICWW Mileage:	**202.43** to **209.38**		
Geographic:	**Wabasso (S.R. 510) Bridge to Vero Beach**		

50-yr Requirements

Dredging (cy):	5,591
Storage (cy):	12,021

C. SITE PARAMETERS

Mapped Area (ac):	126.1	Buffer Width (ft)	
Containment Area (ac):	30.9	North:	300
Total Area Impacted (ac):	36.9	South:	300
Total Buffer Area (ac):	45.7	East:	300
Buffer Outside Mapped Area (ac):	11.0	West:	300
Preliminary Total Site Area (ac):	82.6	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	486,840		
Dike Height (ft):	14.0		
Excavation Depth (ft):	4.57		
Estimated Site Elevation (ft +NGVD):	6.0		
Maximum Pumping Distance (mi):	5.81		

D. SITE CHARACTERISTICS

Public Road to Site:	**S.R. A1A, Jungle Trail, Old Winter Beach Rd.**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**>1200**
Comprehensive Plan Designation:	**R1A (Single-Family Residence District)**		
Adjacent Land Use:	**residential, citrus groves, open land**		
Predominant Land Use Impacted:	**temperate hardwoods, tropical hardwoods, cabbage palm, sand live oak**		

Wetlands (ac)

	On-Site		Impacted
Contiguous:	48.1	Contiguous:	0.0
Isolated:	0.0	Isolated:	0.0

III Site Description

Unpaved roads on the west and south and S.R. A1A on the east border Site IR-9; adjacent Site IR-8 forms the northern border. A mixture of natural, natural/disturbed, and disturbed communities comprise the site. Dirt roads, ditches, clearing, and filling account for the disturbance.

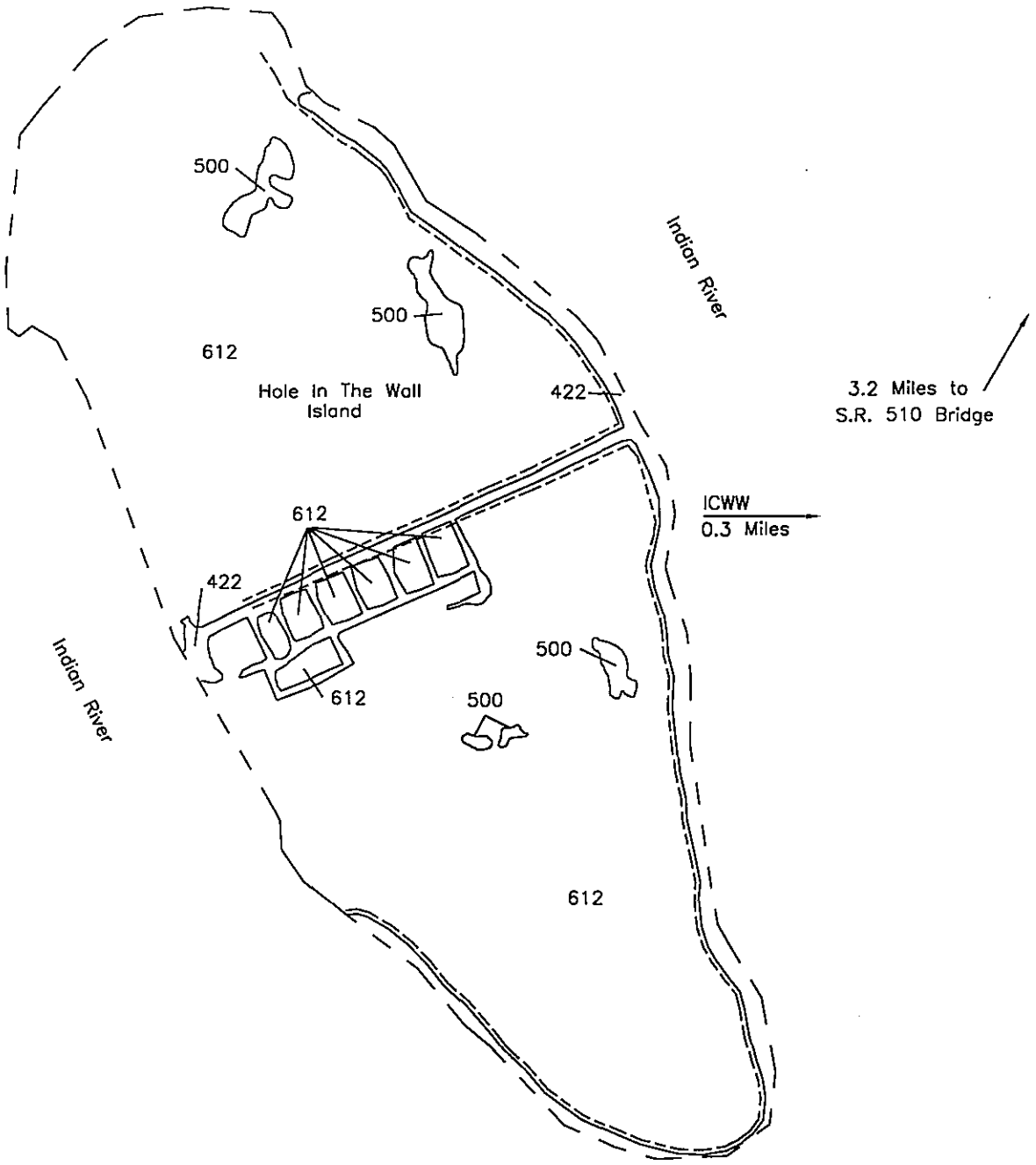
A residential area (120) in the northwestern site corner contains eight or nine houses. Immediately to their south occur the following disturbed communities: Australian pine/Brazilian pepper (437/422), Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*), disturbed land (744), a slightly disturbed cabbage palm/Brazilian pepper (625/422) wetland consisting mostly of cabbage palm (*Sabal palmetto*), and Brazilian pepper. A dirt road oriented east to west traverses the wetlands to slightly beyond the center of the site. Two ditches containing standing water border the road on the north and south. Small disturbed areas are the result of previous clearing and filling and may be associated with an underground water pipeline and a deteriorating powerline currently out of use.

Cabbage palm/tropical hardwoods (625/426) east of disturbed wetland contain areas of mucky soils and standing water. The water table appears to be less than 1-ft below ground. Dominant vegetation include cabbage palm and tropical species such as wild coffee (*Psychotria nervosa*) and marlberry (*Ardisia escallonioides*). The state-listed threatened species, shoestring fern (*Vittaria lineata*) and golden polypody fern (*Phlebodium aureum*) grow on the cabbage palm. A few of the wetter areas contain the state-listed threatened giant leather fern (*Acrostichum danaeifolium*).

East of the wetland are areas of clearing and filling (disturbed lands; 744). Some of the wetland areas (cabbage palm/tropical hardwoods; 625/426) and upland areas (temperate hardwoods/tropical hardwoods; 425/426) appear with construction rubble: some large mounds occur along the eastern edge of the disturbed lands (744). A road traverses the disturbed areas.

Although it shows some evidence of historical soil disturbance, the temperate hardwoods/tropical hardwoods (425/426) community east of the disturbed lands (744) is primarily natural. Live oak (*Quercus virginiana*), marlberry, rouge plant (*Rivinia humilis*), and the wild coffees (*P. nervosa* and *P. sulzneri*) comprise the dominant vegetation. The state-listed threatened rein orchid (*Habenaria* sp.) found in this community is rare to occasional.

The easternmost community is a relatively undisturbed upland sand live oak/cabbage palm community (432/428). Dominant vegetation includes sand live oak (*Quercus geminata*), cabbage palm, saw palmetto (*Serenoa repens*), winged sumac (*Rhus copallina*), rusty lyonia (*Lyonia ferruginea*), white stopper (*Eugenia axillaris*), and some Brazilian pepper.



-- LEGEND --

422	Brazilian Pepper	11.2 Ac
500	Water	2.2 Ac
612	Mangrove Swamps	124.0 Ac
	Total Acreage	137.4 Ac

------ Ditch — — — Area Boundary

N

Scale in Feet

0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-19
Land Use and Vegetation of
Candidate Site IR-10
Indian River County, florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-10

A. LOCATION

County:	**Indian River**	Municipality:	**Indian River Shores**
ICWW Mile:	**205.23**	East/West of ICWW:	**West**
Section/Township/Range:	**S2/T32S/R39E, S11/T32S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-2**	Reach Length (mi):	**6.95**
ICWW Mileage:	**202.43** to **209.38**		
Geographic:	**Wabasso (S.R. 510) Bridge to Vero Beach**		

50-yr Requirements

Dredging (cy):	**5,591**
Storage (cy):	**12,021**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**137.4**		
Containment Area (ac):	**N/A**	North:	**N/A**
Total Area Impacted (ac):	**N/A**	South:	**N/A**
Total Buffer Area (ac):	**N/A**	East:	**N/A**
Buffer Outside Mapped Area (ac):	**N/A**	West:	**N/A**
Preliminary Total Site Area (ac):	**N/A**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**Inadequate upland area**		
Dike Height (ft):	**N/A**		
Excavation Depth (ft):	**N/A**		
Estimated Site Elevation (ft +NGVD):	**3.0**		
Maximum Pumping Distance (mi):	**5.47**		

D. SITE CHARACTERISTICS

Public Road to Site:	**Island**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**N/A**
Comprehensive Plan Designation:	**RESI (Residential-Environmentally Sensitive Island Dist.)**		
Adjacent Land Use:	**N/A**		
Predominant Land Use Impacted:	**N/A**		

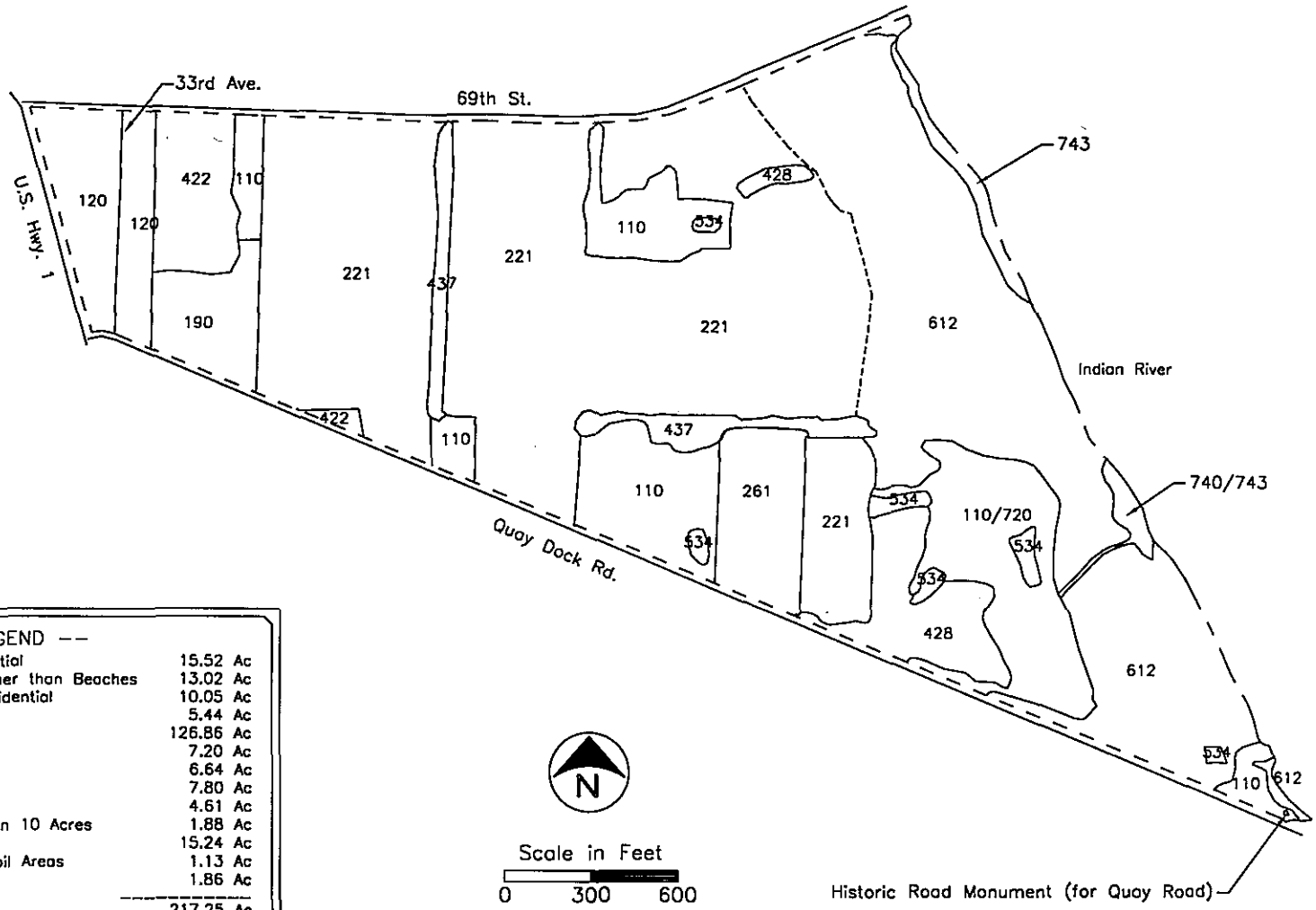
Wetlands (ac)

	On-Site		Impacted
Contiguous:	**126.2**	Contiguous:	**N/A**
Isolated:	**0.0**	Isolated:	**N/A**

III Site Description

Site IR-10 is an Indian River island almost completely covered by red, white, and black mangrove (*Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*; 612) and open water (500). Other species observed in the mangrove area include giant leather fern (*Acrostichum danaeifolium*) and sea oxeye (*Borrichia frutescens*). Aerial photographs indicate areas of open water where wading and aquatic birds are plentiful. A bird rookery likely exists north of an old, unpaved road covered by Brazilian pepper (*Schinus terebinthifolius*). The road bisects the island which has drainage ditches around its perimeter along its east and south sides. A berm vegetated with Brazilian pepper (422) occurs adjacent to these ditches. Other species observed along the berms and the road include cabbage palm (*Sabal palmetto*), prickly pear (*Opuntia stricta*), and white stopper (*Eugenia axillaris*). A series of constructed berms south of the road create small mangrove cells. The purpose of these berms, vegetated with Brazilian pepper, are unknown.

A concrete pumphouse occurs on the western side of the island at the end of the road. Powerlines also cross the island along the road.



SOURCE: W&AR Graphic 1996.

-- LEGEND --

110	Low Density Residential	15.52 Ac
110/720	Residential/Sand other than Beaches	13.02 Ac
120	Medium Density Residential	10.05 Ac
190	Open Land	5.44 Ac
221	Citrus Groves	126.86 Ac
261	Fallow Crop Land	7.20 Ac
422	Brazilian Pepper	6.64 Ac
428	Cabbage Palm	7.80 Ac
437	Australian Pine	4.61 Ac
534	Reservoirs, Less than 10 Acres	1.88 Ac
612	Mangrove Swamps	15.24 Ac
740/743	Disturbed Lands/Spoil Areas	1.13 Ac
743	Spoil Areas	1.86 Ac
	Total Acreage	217.25 Ac

— — — — Area Boundary ———— Road

---------- Ditch

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-20
Land Use and Vegetation of
Candidate Site IR-11
Indian River County, Florida

PROJECT C-9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-11

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**205.83**	East/West of ICWW:	**West**
Section/Township/Range:	**S2/T32S/R39E, S3/T32S/R39E, S10/T32S/R39E, S11/T32S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-2**	Reach Length (mi):	**6.95**
ICWW Mileage:	**202.43** to **209.38**		
Geographic:	**Wabasso (S.R. 510) Bridge to Vero Beach**		

50-yr Requirements

Dredging (cy):	**5,591**
Storage (cy):	**12,021**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**217.3**		
Containment Area (ac):	**11.8**	North:	**300**
Total Area Impacted (ac):	**15.4**	South:	**300**
Total Buffer Area (ac):	**30.9**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**46.2**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**117,940**		
Dike Height (ft):	**10.0**		
Excavation Depth (ft):	**4.17**		
Estimated Site Elevation (ft +NGVD):	**5.0**		
Maximum Pumping Distance (mi):	**4.78**		

D. SITE CHARACTERISTICS

Public Road to Site:	**Quay Dock Rd.**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**1,800**
Comprehensive Plan Designation:	**L-1 Low Density residential (SF), Com., Ind.**		
Adjacent Land Use:	**low density residential, citrus**		
Predominant Land Use Impacted:	**citrus grove**		

Wetlands (ac)

On-Site		Impacted	
Contiguous:	**15.2**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

Site IR-11 is predominantly a mixture of active citrus groves (221), residential areas of medium and low density residences (120-110), and mangroves (612). Windrows of Australian pine (437) separate many of the citrus groves.

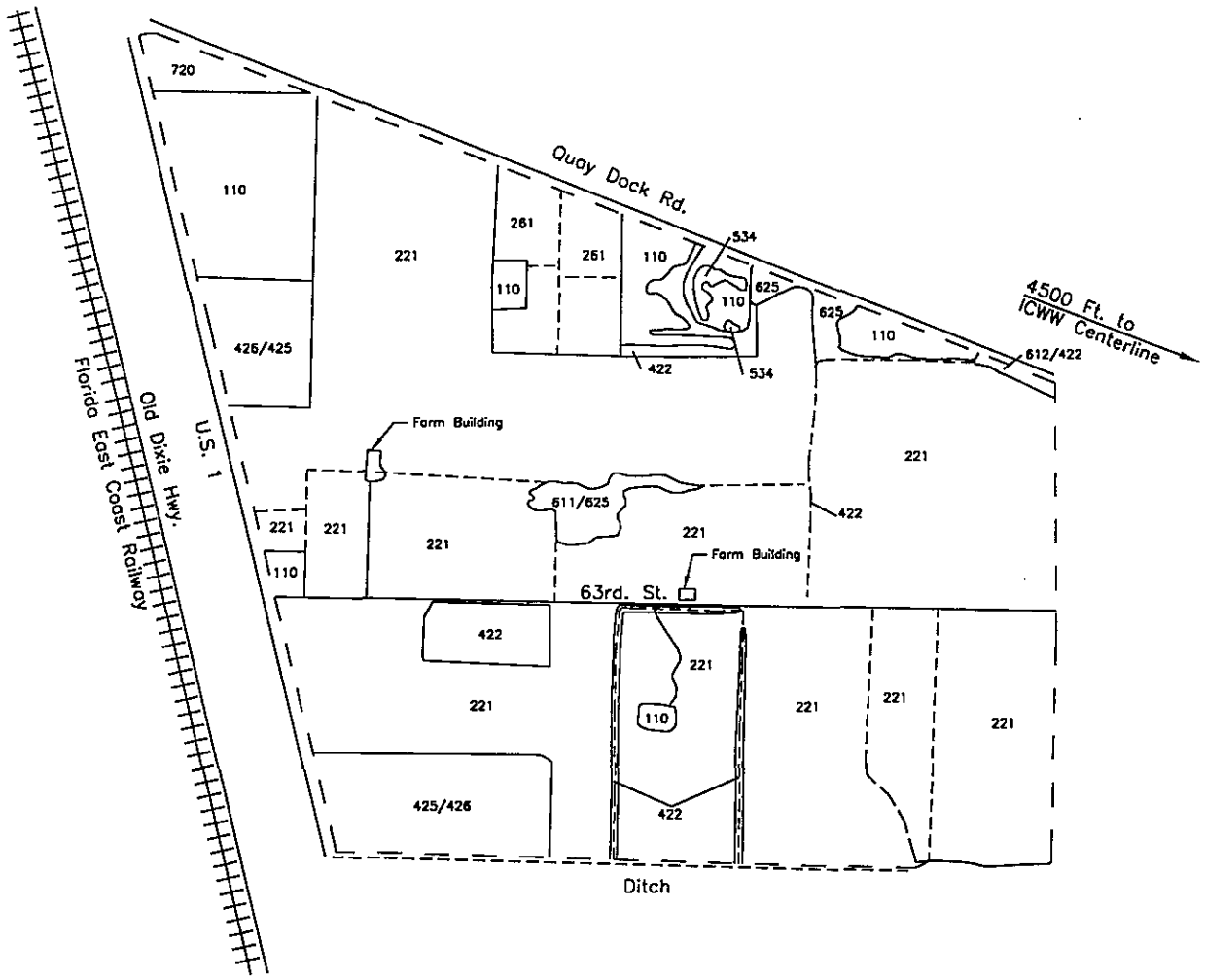
The medium density residential neighborhood (120) occur on the site's western boundary, and the low-density single-family residences (110) occur primarily along the site's southern boundary along Quay Dock Road (an Indian River County designated historic road). Several of the residences include areas dug to create open water (534). A large residence currently under construction contains large areas of exposed sand (110/720).

Other disturbed communities in the western area of the site contain Brazilian pepper (*Schinus terebinthifolius)* (422) and open land (190). The open land mostly contains beggar ticks (*Bidens pilosa*), *Richardia* sp., and other herbs typically found in areas with disturbed soils.

Other communities along and adjacent to Quay Dock Road include fallow fields (261) that once were citrus groves and a disturbed cabbage palm (428) community composed almost entirely of cabbage palm (*Sabal palmetto*) and bahia grass (*Paspalum notatum*).

Mangrove swamps (612) that comprise the eastern boundary also contain areas of disturbance (740/743) and fill (743) along the site's border with the ICWW. The mangrove communities (612) primarily consist of white mangrove (*Laguncularia racemosa*) and black mangrove (*Avicennia germinans*). Brazilian pepper, live oak (*Quercus virginiana*), white stopper (*Eugenia axillaris*), and Spanish stopper (*Eugenia foetida*) vegetate the fill areas. Sea grape (*Coccoloba uvifera*) and wild coffee (*Psychotria nervosa*) occur occasionally. Also, the state-listed threatened giant leather fern (*Acrostichum danaeifolium*) occurs occasionally at the edges of the mangrove swamps (612).

Another single family residence (110) and a historic monument for Quay Dock Road exist at the site's very southeast tip.



-- LEGEND --		
110	Residential, Low Density	32.3 Ac
221	Citrus Groves	251.0 Ac
261	Fallow Cropland	12.4 Ac
422	Brazilian Pepper	12.0 Ac
425/426	Temperate Hardwoods/Tropical Hardwoods	22.6 Ac
534	Reservoirs Less than 10 Acres	0.8 Ac
611/625	Bay Swamps/Cabbage Palm	3.4 Ac
612/422	Mangrove Swamps/Brazilian Pepper	0.7 Ac
625	Cabbage Palm	1.9 Ac
	Total Acreage	337.1 Ac
- - - -	Area Boundary	Road
----------	Ditch	Railway

N

Scale in Feet

0 500 1000

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-21
Land Use and Vegetation of
Candidate Site IR-12A
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-12A

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**206.41**	East/West of ICWW:	**West**
Section/Township/Range:	**S10/T32S/R39E, S11/T32S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation:	**IR-2**			Reach Length (mi):	**6.95**
ICWW Mileage:	**202.43**	to	**209.38**		
Geographic:	**Wabasso (S.R. 510) Bridge to Vero Beach**				

50-yr Requirements

Dredging (cy):	**5,591**
Storage (cy):	**12,021**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**337.1**		
Containment Area (ac):	**61.0**	North:	**300**
Total Area Impacted (ac):	**69.1**	South:	**300**
Total Buffer Area (ac):	**58.1**	East:	**300**
Buffer Outside Mapped Area (ac):	**28.7**	West:	**300**
Preliminary Total Site Area (ac):	**127.2**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**1,059,929**		
Dike Height (ft):	**15.0**		
Excavation Depth (ft):	**3.0**		
Estimated Site Elevation (ft +NGVD):	**5.0**		
Maximum Pumping Distance (mi):	**4.78**		

D. SITE CHARACTERISTICS

Public Road to Site:	**U.S. Hwy. 1, Quay Dock Rd.**	Additional Road Easement (ft):	**N/A**
		Pipeline Easement (ft):	**>700**
Comprehensive Plan Designation:	**L-2 Medium Density Residential (Single Family)**		
Adjacent Land Use:	**citrus groves, residential, open land**		
Predominant Land Use Impacted:	**citrus groves**		

Wetlands (ac)

On-Site		Impacted	
Contiguous:	**0.0**	Contiguous:	**0.0**
Isolated:	**6.8**	Isolated:	**0.0**

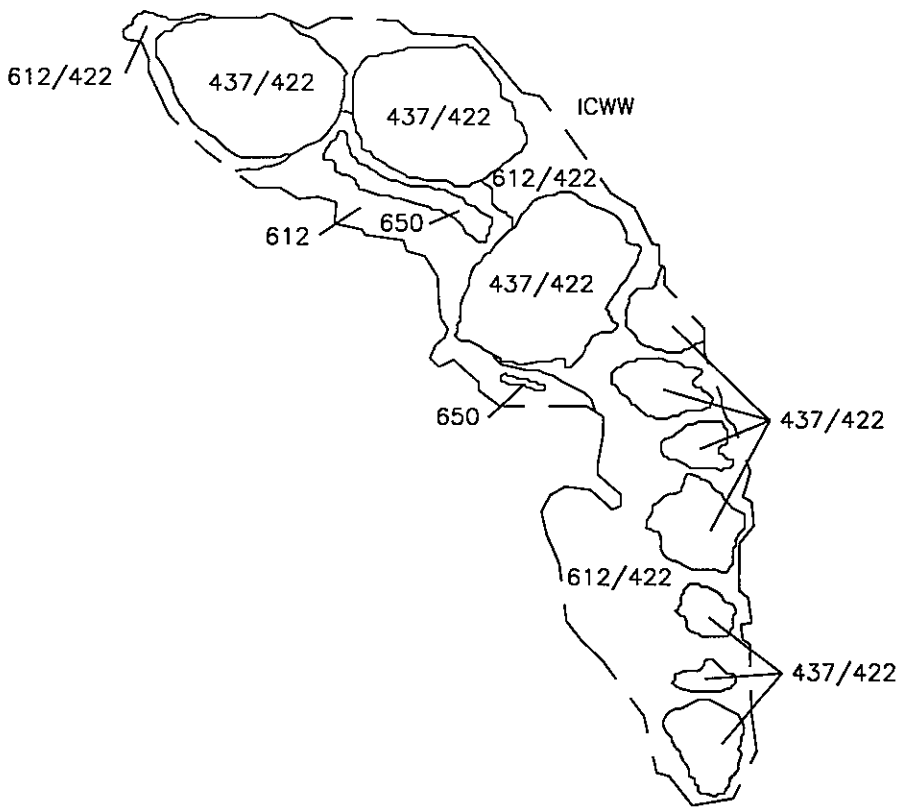
III Site Description

Site IR-12A is predominantly active citrus grove (221) and inactive citrus grove (fallow cropland; 261). Low-density residential (110) and various upland and small wetland communities intermingle with the citrus. The isolated residential areas are located in the south-central, northeast, northern-central, and northwest site areas.

Quay Dock Road (an Indian River County designated historic road) forms Site IR-12A's north boundary, U.S. Highway 1 the site's west boundary, and a large and deep ditch the south boundary. Ditches and swales (mostly grass) occur in most of the citrus areas. Brazilian pepper (*Schinus terebinthifolius*) vegetate some of the larger ditches. A dirt road (63rd street) oriented east to west traverses the center of the site.

Two areas of temperate hardwoods/tropical hardwoods (425/426) occur in the extreme southwest corner and west-central site areas. Typical vegetation in these areas include live oak (*Quercus virginiana*), laurel oak (*Q. laurifolia*), wild coffee (*Psychotria sulzneri* and *P. nervosa*), and cabbage palm (*Sabal palmetto*). State-listed threatened species occasionally found in this community include shoestring fern (*Vittaria lineata*) growing on cabbage palm and rein orchid (*Habenaria* sp.).

Wetlands (other than ditches and canals) designated as bay swamps/cabbage palm (611/625) occur in the center of the site. Cabbage palm (625) and mangrove swamps/Brazilian pepper (612/422) occur in the northeast site area, designated as reservoirs less than 10 acres (534). The reservoirs (534) are associated with a house located in the north central portion of the site along Quay Dock Road.



-- LEGEND --		
437/422	Australlian Pine/Brazilian Pepper	19.0 Ac
612/422	Mangrove Swamps/Brazilian Pepper	14.3 Ac
612	Mangrove Swamps	4.3 Ac
650	Non-Vegetated	0.9 Ac
	Total Acreage	38.5 Ac
	Area Boundary	

N

Scale in Feet

0 100 200

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-22
Land Use and Vegetation of
Candidate Site MSA IR-3
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE MSA IR-3

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**203.13**	East/West of ICWW:	**West**
Section/Township/Range:	**S26/T31S/R39E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**II, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-2** Reach Length (mi): **8.28**

ICWW Mileage: **202.43** to **209.38**

Geographic: **Wabasso (S.R. 510) Bridge to Vero Beach**

50-yr Requirements

Dredging (cy): **5,591**

Storage (cy): **12,021**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**38.5**		
Containment Area (ac):	**N/A**	North:	**N/A**
Total Area Impacted (ac):	**N/A**	South:	**N/A**
Total Buffer Area (ac):	**N/A**	East:	**N/A**
Buffer Outside Mapped Area (ac):	**N/A**	West:	**N/A**
Preliminary Total Site Area (ac):	**N/A**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**insufficient contiguous upland**		
Dike Height (ft):	**N/A**		
Excavation Depth (ft):	**N/A**		
Estimated Site Elevation (ft +NGVD):	**5.0**		
Maximum Pumping Distance (mi):	**7.52**		

D. SITE CHARACTERISTICS

Public Road to Site: **N/A**

Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **N/A**

Comprehensive Plan Designation: **Conservation**

Adjacent Land Use: **open water**

Predominant Land Use Impacted: **N/A**

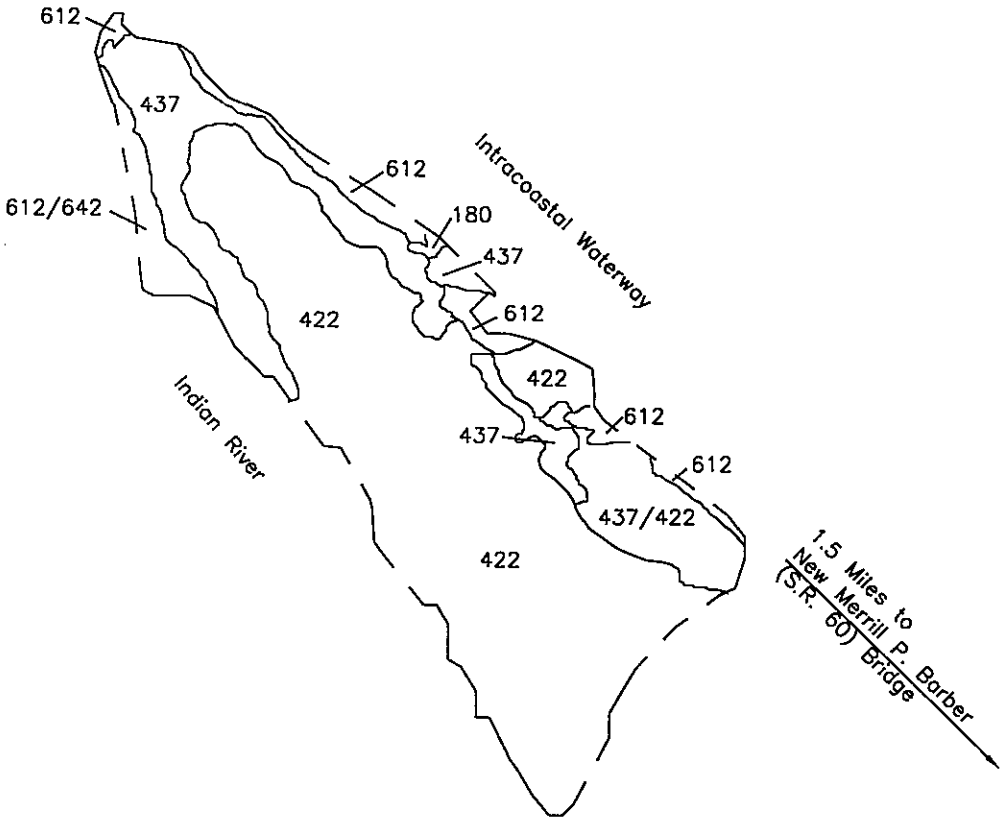
Wetlands (ac)

	On-Site		Impacted
Contiguous:	**19.5**	Contiguous:	**N/A**
Isolated:	**0.0**	Isolated:	**N/A**

III Site Description

Site MSA IR-3 is a 39-acre island located on the west side of the ICWW. The site consists of 10 upland spoil mounds surrounded by mangrove swamp (612). The upland mounds, characterized as Brazilian pepper/Australian pine (437/422), are dominated by Brazilian pepper (*Schinus terebinthifolius*) and Australian pine (*Casuarina equisetifolia*). A number of Australian pines appear dead, presumably from freezes, but resprouting from the tree base is common. In some locations fallen dead trees litter the ground surface. Other trees and shrubs observed in the upland areas include gumbo limbo (*Bursera simaruba*), Florida privet (*Forestiera segregata*), gray nicker (*Caesalpinia bonduc*), and snowberry (*Chiococca alba*). The sparse groundcover contains observed species prickly pear (*Opuntia* sp.), rouge plant (*Rivinia humilis*), and night jessamine (*Cestrum nocturum*).

The mangrove (612) areas surround the spoil mounds and border the Indian River. The red mangrove (*Rhizophora mangle*) occurs along the shoreline. Black mangrove (*Avicennia germinans*) occurs closer to the uplands areas. Occasional white mangrove (*Laguncularia reacemosa*) occurs mixed with the other species. An area of barren sand (not visited) located on the site's western side is presumed to be a salt barren. This same area is typically unvegetated or sparsely vegetated with halophytic species.



-- LEGEND --		
180	Recreational	0.1 Ac
422	Brazilian Pepper	26.6 Ac
437	Australian Pine	7.1 Ac
437/422	Australian Pine/Brazilian Pepper	3.3 Ac
612	Mangrove Swamps	1.9 Ac
612/642	Mangrove Swamps/Saltwater Marshes	1.4 Ac
	Total Acreage	40.4 Ac
	Area Boundary	

N

Scale in Feet

0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-23
Land Use and Vegetation of
Candidate Site MSA IR-FO-6A/6D
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE MSA FO-IR-6A&6D

A. LOCATION

County: **Indian River** Municipality: **IR Shores, Vero Bch**
ICWW Mile: **208.88** East/West of ICWW: **West**
Section/Township/Range: **S25/T32S/R39E, S30/T32S/R40E**
Receiving Waterbody: **Indian River**
FDEP classification: **III, OFW**

B. REACH INFORMATION

Reach Designation: **IR-2** Reach Length (mi): **6.95**
ICWW Mileage: **202.43** to **209.38**
Geographic: **Wabasso (S.R. 510) Bridge to Vero Beach**

50-yr Requirements
Dredging (cy): **5,591**
Storage (cy): **12,021**

C. SITE PARAMETERS entire island (easements only, *based Cochrane and Taylor, 1992*)

		Buffer Width (ft)	
Mapped Area (ac):	40.4 (27.1)		
Containment Area (ac):	20.0 (12.1)	North:	600 (200)
Total Area Impacted (ac):	22.2 (14.3)	South:	<50 (<50)
Total Buffer Area (ac):	18.2 (12.8)	East:	<50 (<50)
Buffer Outside Mapped Area (ac):	0 (0)	West:	<50 (<50)

Preliminary Total Site Area (ac): **40.4 (27.1)** *(Area Impacted + Buffer)*

Storage Capacity (cy): **200,405 (104,297)**
Dike Height (ft): **10.0 (9.0)**
Excavation Depth (ft): **4.25 (5.50)**
Estimated Site Elevation (ft +NGVD): **4.0**
Maximum Pumping Distance (mi): **6.81**

D. SITE CHARACTERISTICS

Public Road to Site: **island** Additional Road Easement (ft): **N/A**
Pipeline Easement (ft): **N/A**
Comprehensive Plan Designation: **RESI (Residential-Environmentally Sensitive Island Dist.)**
Adjacent Land Use: **open water**

Predominant Land Use Impacted: **Brazilian pepper**

Wetlands (ac)

On-Site		Impacted	
Contiguous:	3.3 (8.7)	Contiguous:	0.0
Isolated:	0.0	Isolated:	0.0

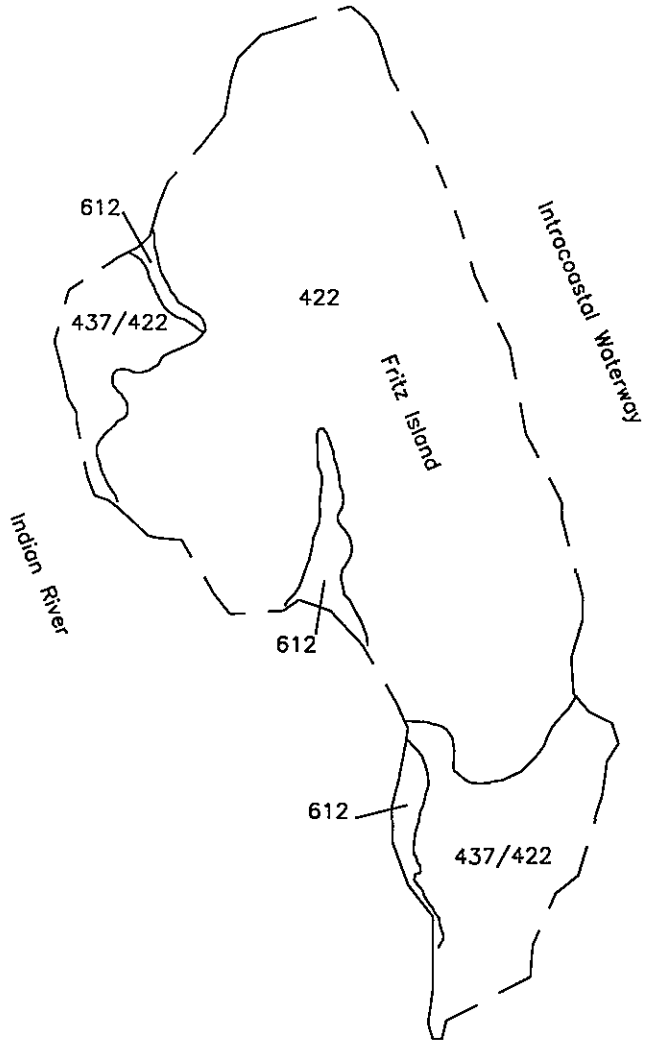
III Site Description

Site MSA-FO-6A&D is a 40-acre island site located in the ICWW. The exotic vegetation communities of Australian pine (437) and/or Brazilian pepper (422) or combinations of both dominate the island. In some cases these typically upland communities occur up to the water's edge. A thin band of mangrove (612) which borders the Indian River occurs along the island's northern and eastern edges.

In some locations of the Australian pine community, only Australian pine (*Casuarina equisetifolia*) occurs with a thick layer of pine duff on the ground. In other areas, trees and shrubs have colonized these areas. Some of the plants observed include strangler fig (*Ficus aureum*), papaya (*Carica papaya*), cabbage palm (*Sabal palmetto*), lantana (*Lantana camara*), beautybush (*Callicarpa americana*), and wild lime (*Zanthoxylum fagara*).

A cover of Brazilian pepper (*Schinus terebinthifolius*) dominates the island interior. Occasional mounds of dirt rise 3—4 ft grade above the surrounding landscape. Commonly found vines found throughout the area include pepper vine (*Ampelopsis arborea*),*Mikania scandens*, Virginia creeper (*Parthenocissus quinquefolia*), and muscadine (*Vitis rotundifolia*). Other species commonly occurring include bracken fern (*Pteridium aquilinium*) and Florida privet (*Forestiera segregata*). A rare area of whisk fern (*Psilotum nudum*) was observed in several locations.

Species observed in the fringing mangrove area include red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), and black mangrove (*Avicennia germinans*). In some protected locations a thin band of smooth cordgrass (*Spartina alterniflora*) occurs waterward of the mangroves. Other species observed in clusters within the mangrove community include sea oxeye (*Borrichia frutescens*), saltwort (*Batis maritima*), and marsh elder (*Iva frutescens*).



New Merrill P. Barber (S.R. 60) Bridge

-- LEGEND --

422	Brazilian Pepper	45.4 Ac
437/422	Australian Pine/Brazilian Pepper	11.4 Ac
612	Mangrove Swamps	2.4 Ac
	Total Acreage	59.2 Ac
	Area Boundary	

N

Scale in Feet

0 300 600

SOURCE: W&AR Graphic 1996.

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9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-24
Land Use and Vegetation of
Candidate Site MSA IR-FO-6C
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE MSA FO-IR-6C

A. LOCATION

County:	**Indian River**	Municipality:	**IR Shores/Vero Bch**
ICWW Mile:	**210.07**	East/West of ICWW:	**West**
Section/Township/Range:	**S31/T32S/R40E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III**		

B. REACH INFORMATION

Reach Designation: **IR-2** Reach Length (mi): **6.95**

ICWW Mileage: **202.43** to **209.38**

Geographic: **Wabasso (S.R. 510) Bridge to Vero Beach**

50-yr Requirements

Dredging (cy): **5,591**

Storage (cy): **12,021**

C. SITE PARAMETERS *(based on Alt 3, ltr to D. K. Roach, 27 Feb 96)*

		Buffer Width (ft)	
Mapped Area (ac):	**59.2**		
Containment Area (ac):	**16.4**	North:	**<50**
Total Area Impacted (ac):	**17.9**	South:	**100**
Total Buffer Area (ac):	**6.8**	East:	**<50**
Buffer Outside Mapped Area (ac):	**.0**	West:	**<50**

Preliminary Total Site Area (ac): *(Area Impacted + Buffer)*

Storage Capacity (cy):	**210,426**
Dike Height (ft):	**12.0**
Excavation Depth (ft):	**4.5**
Estimated Site Elevation (ft +NGVD):	**3.0**
Maximum Pumping Distance (mi):	**7.75**

D. SITE CHARACTERISTICS

Public Road to Site: **island**

Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **N/A**

Comprehensive Plan Designation: **RESI (Residential-Environmentally Sensitive Island Dist.)**

Adjacent Land Use: **open water**

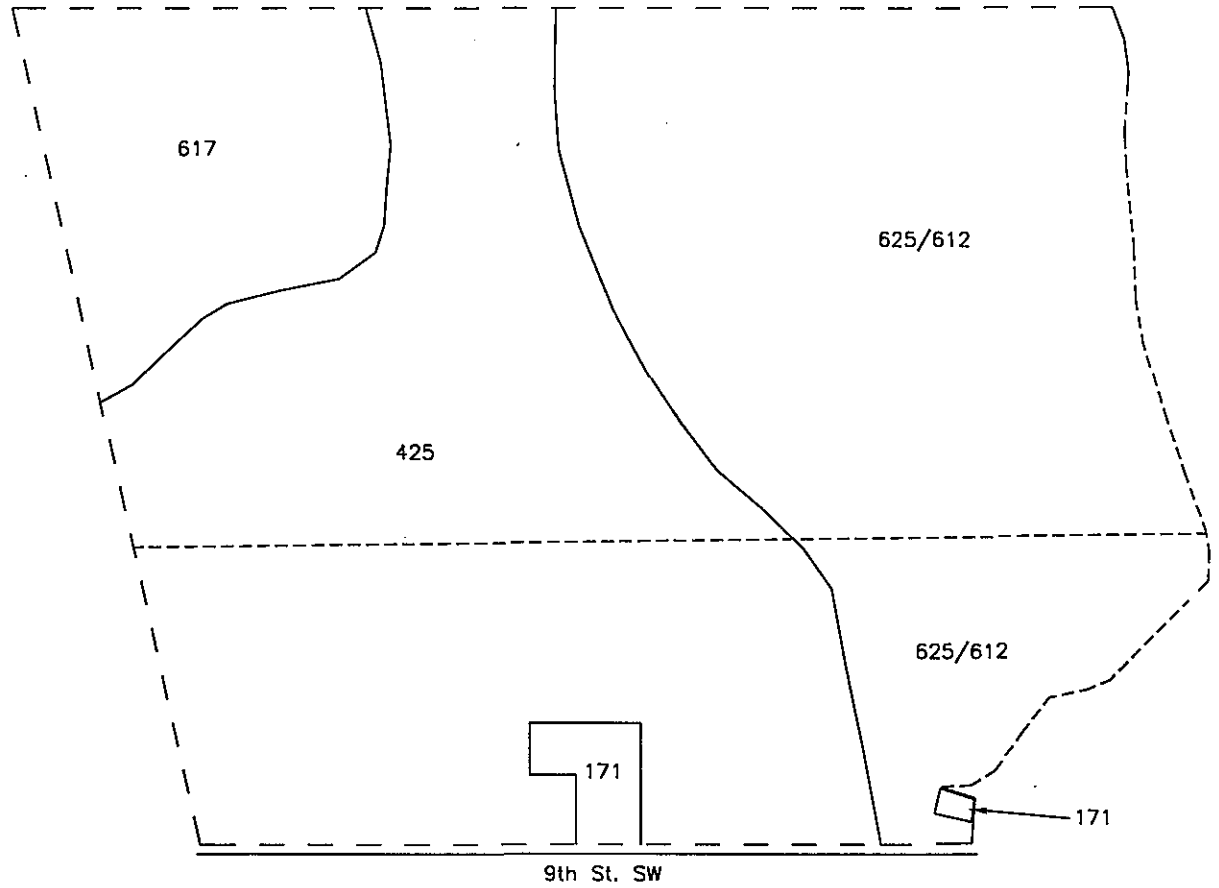
Predominant Land Use Impacted: **Brazilian pepper**

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**2.4**	Contiguous:	**0.1**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

Site MSA-FO-IR-6C (Fritz Island) is the southernmost of the four large, upland islands that lie just north of the Royal Palm Boulevard Bridge in the Intracoastal Waterway. Exotic vegetation communities such as Brazilian pepper (422) and a mixture of Australian pine and Brazilian pepper (437/422) dominate the island. Other species found in these areas include wild lime (*Zanthoxylum fagara*), strangler fir (*Ficus aureum*), Florida privet (*Forestiera segregata*), cabbage palm (*Sabal palmetto*), wild coffee (*Psychotria* sp.), and seagrape (*Coccoloba uvifera*). Some groundcover species include rouge plane (*Rivinia humilis*), wild balsam apple (*Momordica charantia*), *Mikania scandens*, periwinkle (*Vinca madagascarensis*), prickly pear (*Opuntia* sp.), and morning glory (*Ipomoea triloba*).



-- LEGEND --

171	Educational Facilities	1.10 Ac
425	Temperate Hardwoods	37.99 Ac
617	Mixed Wetland Hardwoods	10.19 Ac
625/612	Cabbage Palm/Mangrove Swamps	34.40 Ac
	Total Acreage	83.68 Ac

— — — Area Boundary
--------- Ditch
——— Road

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-25
Land Use and Vegetation of
Candidate Site IR-15
Indian River County, Florida

PROJECT C-9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-15

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**215.26**	East/West of ICWW:	**West**
Section/Township/Range:	**S19/T33S/R40E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-3** Reach Length (mi): **8.28**

ICWW Mileage: **209.38** to **217.66**

Geographic: **Vero Beach to Indian River/St. Lucie County line**

50-yr Requirements

Dredging (cy): **75,655**

Storage (cy): **162,658**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**83.7**		
Containment Area (ac):	**8.2**	North:	**300**
Total Area Impacted (ac):	**11.3**	South:	**300**
Total Buffer Area (ac):	**28.3**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**39.6**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**58,963**		
Dike Height (ft):	**8.0**		
Excavation Depth (ft):	**3.96**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**5.53**		

D. SITE CHARACTERISTICS

Public Road to Site: **9th St. SW** Additional Road Easement (ft): **<250**

Pipeline Easement (ft): **<700**

Comprehensive Plan Designation: **M-2 High Density Residential (Multi Family)**

Adjacent Land Use: **rresidential, commercial, open land (wetlands)**

Predominant Land Use Impacted: **temperate hardwoods**

Wetlands (ac)

	On-Site		Impacted
Contiguous:	**44.6**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

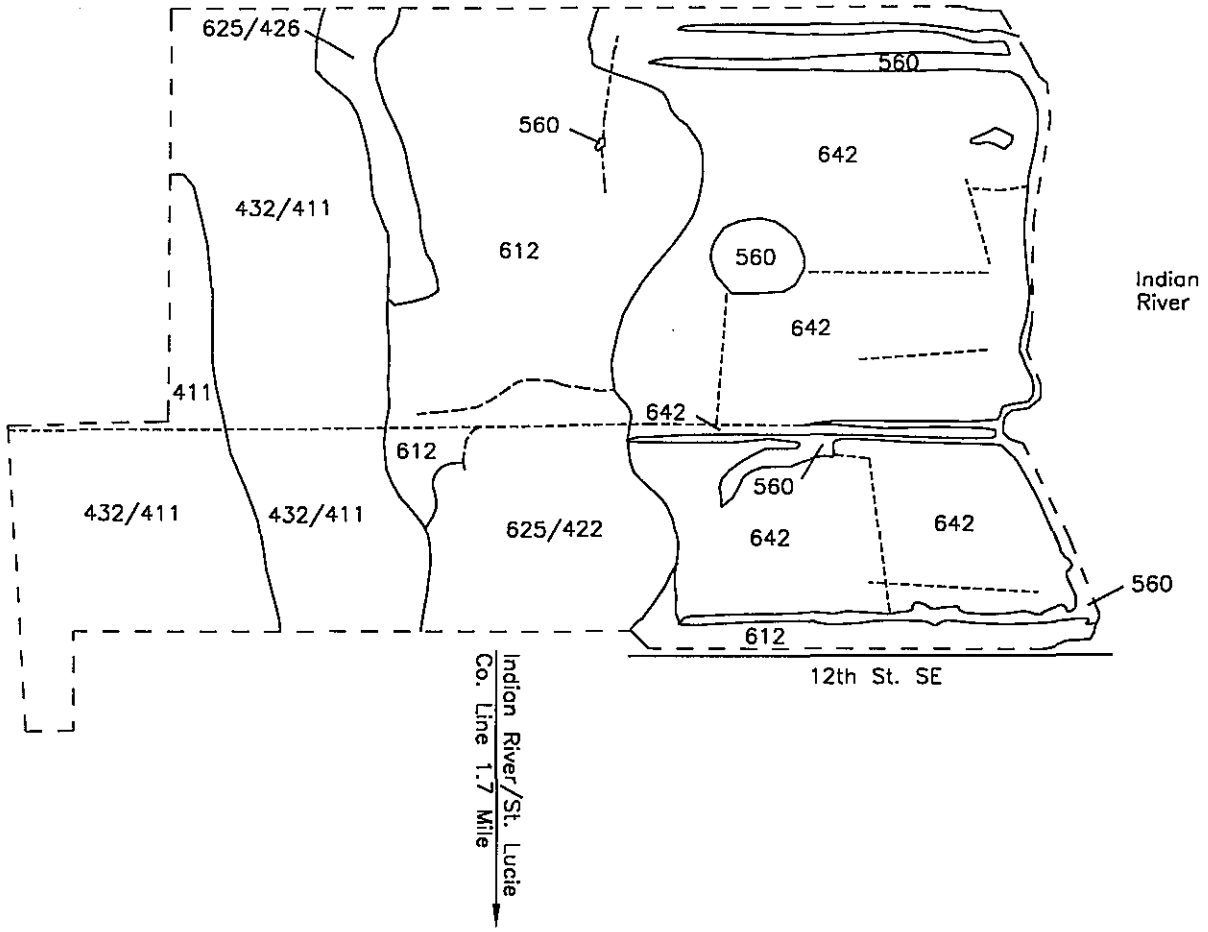
III Site Description

Site IR-15 is a relatively undisturbed site composed of mixed wetland hardwoods (617), temperate hardwoods (425), and cabbage palm/mangrove swamp wetlands (625/612). The site is the location of a University of Florida entomology laboratory (171). A large central ditch traverses the entire site from east to west. Standing water was present in the ditch during the site visit.

The mixed wetland hardwoods community (617) located in the northwestern corner of the site receives some stormwater runoff from an adjacent commercial center. This appears to have caused some erosion and hydrologic changes, such as connected pools of standing water. Dominant vegetation includes red maple (*Acer rubrum*), Brazilian pepper (*Schinus terebinthifolius*), and an occasional slash pine (*Pinus elliottii*). The state-listed threatened giant leather fern (*Acrostichum danaeifolium*) also occurs occasionally.

A majority of the central portion of the site, including the areas near the laboratory, consists of temperate hardwoods (425). Dominant vegetation includes live oak (*Quercus virginiana*), saw palmetto (*Serenoa repens*), red bay (*Persea borbonia*), wild coffee (*Psychotria nervosa*), wax myrtle (*Myrica cerifera*), and the exotic (and abundant) Boston fern (*Nephrolepis* sp.). This community comprises a network of trails and areas containing various entomological experiments (e.g., insect traps).

The entire eastern site area contains cabbage palm/mangrove swamp wetlands (625/612). This very wet area could not be field-truthed; however, an abundance of cabbage palm (*Sabal palmetto)* and mangrove species were discernable from the edge of the community. The state-listed threatened giant leather fern is also abundant in this ecosystem.



-- LEGEND --

411	Pine Flatwoods	2.5 Ac
432/411	Sand Live Oak/Pine Flatwoods	35.1 Ac
560	Slough Waters	6.9 Ac
612	Mangrove Swamps	26.8 Ac
625/422	Cabbage Palm/Brazilian Pepper	10.0 Ac
625/426	Cabbage Palm/Tropical Hardwoods	3.0 Ac
642	Saltwater Marshes	46.8 Ac
	Total Acreage	131.0 Ac

- - - - - - Area Boundary
---------- Ditch
———— Road

N

Scale in Feet
0 300 600

SOURCE: W&AR Graphic 1996.

TAYLOR ENGINEERING INC.
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure B-26
Land Use and Vegetation of
Candidate Site IR-16
Indian River County, Florida

PROJECT C9508
REVISION
SHEET
DATE May, 1997

SITE DATA SUMMARY SHEET SITE IR-16

A. LOCATION

County:	**Indian River**	Municipality:	**County**
ICWW Mile:	**215.60**	East/West of ICWW:	**West**
Section/Township/Range:	**S29/T33S/R40E**		
Receiving Waterbody:	**Indian River**		
FDEP classification:	**III, OFW**		

B. REACH INFORMATION

Reach Designation: **IR-3** Reach Length (mi): **8.28**

ICWW Mileage: **209.38** to **217.66**

Geographic: **Vero Beach to Indian River/St. Lucie County line**

50-yr Requirements

Dredging (cy): **75,655**

Storage (cy): **162,658**

C. SITE PARAMETERS

		Buffer Width (ft)	
Mapped Area (ac):	**131.0**		
Containment Area (ac):	**5.5**	North:	**300**
Total Area Impacted (ac):	**9.0**	South:	**300**
Total Buffer Area (ac):	**30.3**	East:	**300**
Buffer Outside Mapped Area (ac):	**.0**	West:	**300**
Preliminary Total Site Area (ac):	**39.3**	*(Area Impacted + Buffer)*	
Storage Capacity (cy):	**18,264**		
Dike Height (ft):	**5.0**		
Excavation Depth (ft):	**5.89**		
Estimated Site Elevation (ft +NGVD):	**4.0**		
Maximum Pumping Distance (mi):	**5.45**		

D. SITE CHARACTERISTICS

Public Road to Site: **12th St. SE** Additional Road Easement (ft): **N/A**

Pipeline Easement (ft): **<2200**

Comprehensive Plan Designation: **L-2 Medium Density Residential (Single family)**

Adjacent Land Use: **residential, commercial**

Predominant Land Use Impacted: **sand live oak, pine flatwoods**

Wetlands (ac)

On-Site		Impacted	
Contiguous:	**93.5**	Contiguous:	**0.0**
Isolated:	**0.0**	Isolated:	**0.0**

III Site Description

Site IR-16 consists primarily of various disturbed and semi-disturbed wetlands. The wetlands that occur in the eastern site area, consist of mangrove swamps (612), saltwater marshes (642), slough waters (560) and cabbage palm/Brazilian pepper (625/422) wetlands. Ditches and large mosquito control canals disturb these communities. Most of the disturbance occurs in the wetlands in the eastern site. A large ditch traverses the eastern uplands to the Indian River.

Given the restriction imposed by the wet area north of SE 12th Street, the mangrove swamps (612) comprise a small portion of the wetlands. The largest wetland community—tidal influenced saltwater marsh (642)—was field-truthed from the road due to access difficulties. The dominant vegetation (as observed in the aerial photographs) appears to be mainly emergent marsh species. Interspersed within the community are areas of open slough waters (560) that connect to the Indian River. The slough water areas and the smaller ditches in the area are associated with the mosquito control impoundments.

Cabbage palm/Brazilian pepper (625/422) wetlands and cabbage palm/tropical hardwoods (625/426) wetlands occur east of the tidal influenced wetlands. These forested wetlands contain standing water and consist primarily of cabbage palm (*Sabal palmetto*). The disturbed cabbage palm/Brazilian pepper (625/422) wetland also contains an abundance of Brazilian pepper (*Schinus terebinthifolius*) and, occasionally, the state-listed threatened giant leather fern (*Acrostichum danaeifolium*). The cabbage palm/tropical hardwoods community (625/426) also contains live oak (*Quercus virginiana*), wax myrtle (*Myrica cerifera*), myrsine (*Rapanea punctata*), swamp fern (*Blechnum serrulatum*), and saw palmetto (*Serenoa repens*) at the edge of the area.

The dry western site area (sand live oak/pine flatwoods; 432/411) contains sand live oak (*Quercus geminata*), Chapman's oak (*Q. chapmanii*), slash pine (*Pinus elliottii*), and tarflower (*Befaria racemosa*). The following scrub species were occasional to common: rusty lyonia (*Lyonia ferruginea*), large-flowered rosemary (*Conradina grandiflora*), and partridge-pea (*Cassia chamaecrista*). The sand live oak/pine flatwood community is fairly open with patches of bare ground. The community's eastern area is thicker and more mesic.

APPENDIX C

Dike Requirements and Site Capacity

Width of Dike at Grade, B_G

$$B_G = 2HS + T \quad (1)$$

Width of Dike at Excavated Grade, B_g

$$B_g = 2HS + T + (G - g)\,S \quad (2)$$

Width of Dike at Depth of Freeboard and Ponding, B_F

$$B_F = 2FS + T \quad (3)$$

Volume of Dike Material Required, V_{MR}

$$V_{MR} = \tfrac{1}{2}H\,(T + B_G)\,P \quad (4)$$

Volume of Dike Material Available on Site, V_{MA}

$$V_{MA} = (G - g)[A - \tfrac{1}{2}P_I\,(B_g - B_G)] \quad (5)$$

Volume of Disposal Capacity, V_D

$$V_D = V_{MA} + (H - F)\left\{A + \tfrac{1}{2}P_I[B_G - (H - F)\,S - B_F]\right\} \quad (6)$$

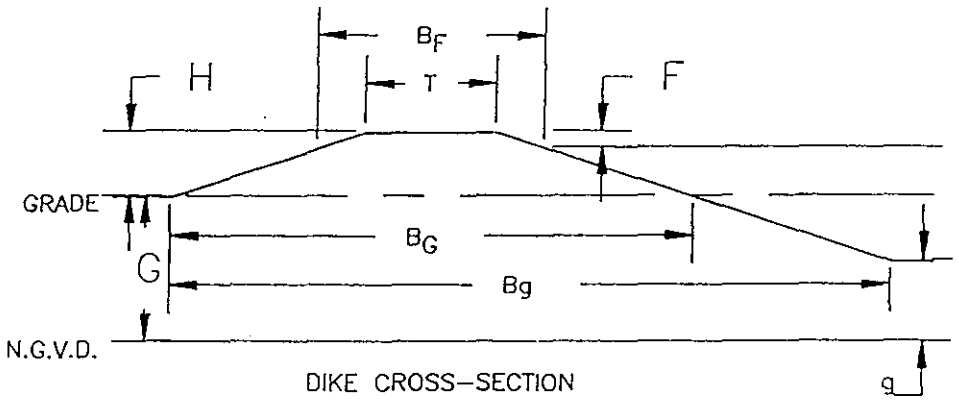
Depth of Excavation, $(G - g)$

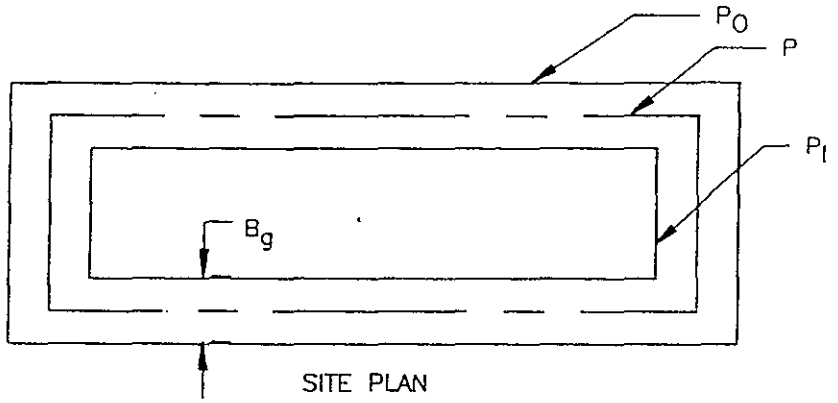
$$(G - g) = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (7)$$

where: $a = \tfrac{1}{2}P_I S$

$b = P_I HS + \tfrac{1}{2}P_I T - A - \tfrac{1}{2}P_I B_G$

$c = \tfrac{1}{2}H\,(T + B_G)\,P$





P_o	OUTER PERIMETER OF DIKE FOOTPRINT	SITE SPECIFIC
P	DIKE PERIMETER @ CENTERLINE OF DIKE CREST	SITE SPECIFIC
P_I	PERIMETER OF DIKE AT INTERIOR DIKE TOE	SITE SPECIFIC
A	REQUIRED DISPOSAL AREA, BOUNDED BY P_o	SITE SPECIFIC
A_I	AREA WITHIN P_I	SITE SPECIFIC
G	SITE GRADE (+ NGVD)	SITE SPECIFIC
g	EXCAVATED GRADE (+ NGVD)	SITE SPECIFIC
H	DIKE HEIGHT ABOVE GRADE	15 ft.
S	DIKE SIDE SLOPE	3 (1V:3H)
T	DIKE CREST WIDTH	12 ft.
F	FREEBOARD AND PONDING	4 ft.

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9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure C-1
Dike Requirements and Site Capacity

PROJECT
REVISION
SHEET
DATE

APPENDIX D

Property Ownership, Site Bank

Table D-1 Site Ownership[1], Primary and Secondary Sites, Indian River County (page 1 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value	Comprehensive Plan Designation	Zoning
	03-31-39-00000-0030-00002.0	Korangy, Amile A & Parvone S. 4632 Willow Grove Dr. Ellicott City, MD 21043	3.91	$132,940.	L-1	A-1
	03-31-39-00000-0030-00005.0	Earring Point Groves, Inc. P.O. Box 68 Wabasso, FL 32970-0068	15.00	510,000.	L-1	A-1
IR-1B	10-31-39-00000-0020-00001.0	Earring Point Groves, Inc. P.O. Box 68 Wabasso, FL 32970-0068	40	1,360,000.	L-1	A-1
	10-31-39-00000-0030-00001.0	Earring Point Groves, Inc. P.O. Box 68 Wabasso, FL 32970-0068	27.58	937,720.	L-1	A-1
	10-31-39-00000-0030-00002.0	Lier Groves, Inc. P.O. Box 7 Wabasso, FL 32970-0007	12.42	422,280.	L-1	A-1

[1] Based on 1995/96 tax roll/public record information, Indian River County, Florida

Table D-1 Site Ownership[1], Primary and Secondary Sites, Indian River County (page 2 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value	Comprehensive Plan Designation	Zoning
	20-31-39-00000-1000-00003.0	Vero Beach Development Assn. Ltd. 5865 34th Court Vero Beach, FL 32960	6.27	$79,940.	L-2	RM-6
	17-31-39-00000-0030-00001.0	Duck Point Groves, Inc. P.O. Box 780357 Sebastian, FL 32978-0357	46.64	1,783,980.	L-2	RM-6
	20-31-39-00000-1000-00002.0	Vickers, conald S. (TR) 13995 Indian River Dr. Sebastian, FL 32958	10.40	132,600.	L-2	RM-6
IR-2	21-31-39-00000-0010-00001.0	Vickers, conald S. (TR) 13995 Indian River Dr. Sebastian, FL 32958	20.70	316,710.	L-2	RM-6
	16-31-39-00000-5000-00001.0	Duck Point Groves, Inc. P.O. Box 780357 Sebastian, FL 32978-0357	15.00	38,250.	L-2	RM-6
	17-31-39-00000-0040-00001.0	Vickers, Jack & Ramona 1053 Silver Fox Rt 3 Mars Hill, NC 28754	1.31	35,350.	L-2	RM-6
	17-31-39-00000-0050-00001.0	Duck Point Groves, Inc. P.O. Box 780357 Sebastian, FL 32978-0357	49.11	1,878,460.	L-2	RM-6
	20-31-39-00000-1000-00001.0	Vickers, Jack K. 1053 Silver Fox Rt. 3 Mars Hill, NC 28754	29.74	315,770.	L-2	RM-6

[1] Based on 1995/96 tax roll/public record information, Indian River County, Florida

Table D-1 Site Ownership[1], Primary and Secondary Sites, Indian River County (page 3 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value	Comprehensive Plan Designation	Zoning
IR-7A	34-31-39-00000-0020-00003.0	Florida Inland Navigation District 1314 Marcinski Road Jupiter, FL 33477	42.95	792,280.	L-2/M-1	RS-1/ RM-6
IR-12B	14-32-39-00000-1000-00001.0	Ryall, N.B Jr., & Rachel H. P.O. Box 95 Wabasso, FL 32970-0095	193.00	2,107,490.	C_{PUB}	I
IR-13	25-32-39-00000-0010-00001.0	Gregory, Martin A. (Trs) & 2600 NE 14st. Causeway Pompano Beach, FL 33062	89.70	228,740.	M-1	RM-6/ RS-6
	25-32-39-00000-3000-00001.0	Russell, Virginia Walker (Tr) c/o Hugh Russell P.O. Box 1720 Vero Beach,FL 32961-1720	38.20	97,410.	M-1	RS-1
	25-32-39-00000-3000-00002.0	Chimayo, Inc. c/o Hugh Russell P.O. Box 1720 Vero Beach,FL 32961-1720	38.20	487,050.	M-1	RM-6/ RS-6
	25-32-39-00000-3000-00003.0	Bobo, Christine P.O. Box 742 Vero Beach, FL 32961-0742	17.30	176,460.	M-1	RM-6/ RS-6
	25-32-39-00000-3000-00005.0	Crazy Woman Properties, Inc. P.O. Box 1148 Vero Beach, FL 32961-1148	10.91	24,300.	M-1	RM-6/ RS-6
	25-32-39-00000-3000-00006.0	Tobin, Richard W. Jr., & Karen 6601 SW 118th St. Miami, FL 33156	39.71	295,650.	M-1	RS-1

[1] Based on 1995/96 tax roll/public record information, Indian River County, Florida

Table D-1 Site Ownership[1], Primary and Secondary Sites, Indian River County (page 4 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value	Comprehensive Plan Designation	Zoning
MSA IR-FO-6B	30-32-40-00000-3000-00001.0	Florida Inland Navigation District 1314 Marcinski Road Jupiter, FL 33477	13.48	$34,370.	Cons.	C_{PUB}
	01-32-39-00001-0160-00001.0	Lost Tree Village Corp. 1 John's Island Dr. Vero Beach,FL 32963	411.70	709,320.	Cons.	C_{PUB}
IR-14	07-33-40-00000-0050-00002.0	Postweiller, John G. 6 Ramsgate Dr. Palos Park, IL 60464	10.00	25,500.	M-2	RM-8/ RM-10
	07-33-40-00000-0060-00003.0	Postweiler, John G. 6 Ramsgate Dr. Palos Park, IL 60464	8.85	225,680.	M-2	RM-8/ RM-10
	07-33-40-00000-0070-00001.0	Moretti, Joseph G. Jr. 8200 NW 58th St. Miami, FL 33166	14.37	$205,790.	M-2	RM-8/ RM-10
	07-33-40-00000-0070-00002.0	Empire Group (The) 250 Dundas St., West Ste 301 Toronto, Ontario, Canada MST 221	8.84	225,420.	M-2	RM-8/ RM-10
	07-33-40-00000-0070-00003.0	Flinn, Robert A. & Richard M. 411 Live Oak Road Vero Beach, FL 32963	18.87	320,790.	M-2	RM-8/ RM-10
	07-33-40-00000-0080-00001.0	Korenvaes, Herman & Phyllis 8115 SW 17th Terr. Miami, FL 33155	10	87,350.	M-2	RM-8/ RM-10
	07-33-40-00000-0080-00002.0	Flinn, Robert A. & Richard M. 411 Live Oak Road Vero Beach, FL 32963	20	168,730.	M-2	RM-8/ RM-10

[1] Based on 1995/96 tax roll/public record information, Indian River County, Florida

Table D-1 Site Ownership[1], Primary and Secondary Sites, Indian River County (page 5 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value	Comprehensive Plan Designation	Zoning
IR-17	31-33-40-00000-1000-00001.0	FL Industries Investment Corp. 4802 Distribution Court Ste 7 Orlando, FL 32822	10	51,000.	L-2	RM-6/ RS-6
	30-33-40-00000-7000-00003.0	FL Industries Investment Corp. 4802 Distribution Court Ste 7 Orlando, FL 32822	37.64	163170	L-2	RM-6/ RS-6

[1] Based on 1995/96 tax roll/public record information, Indian River County, Florida

APPENDIX E

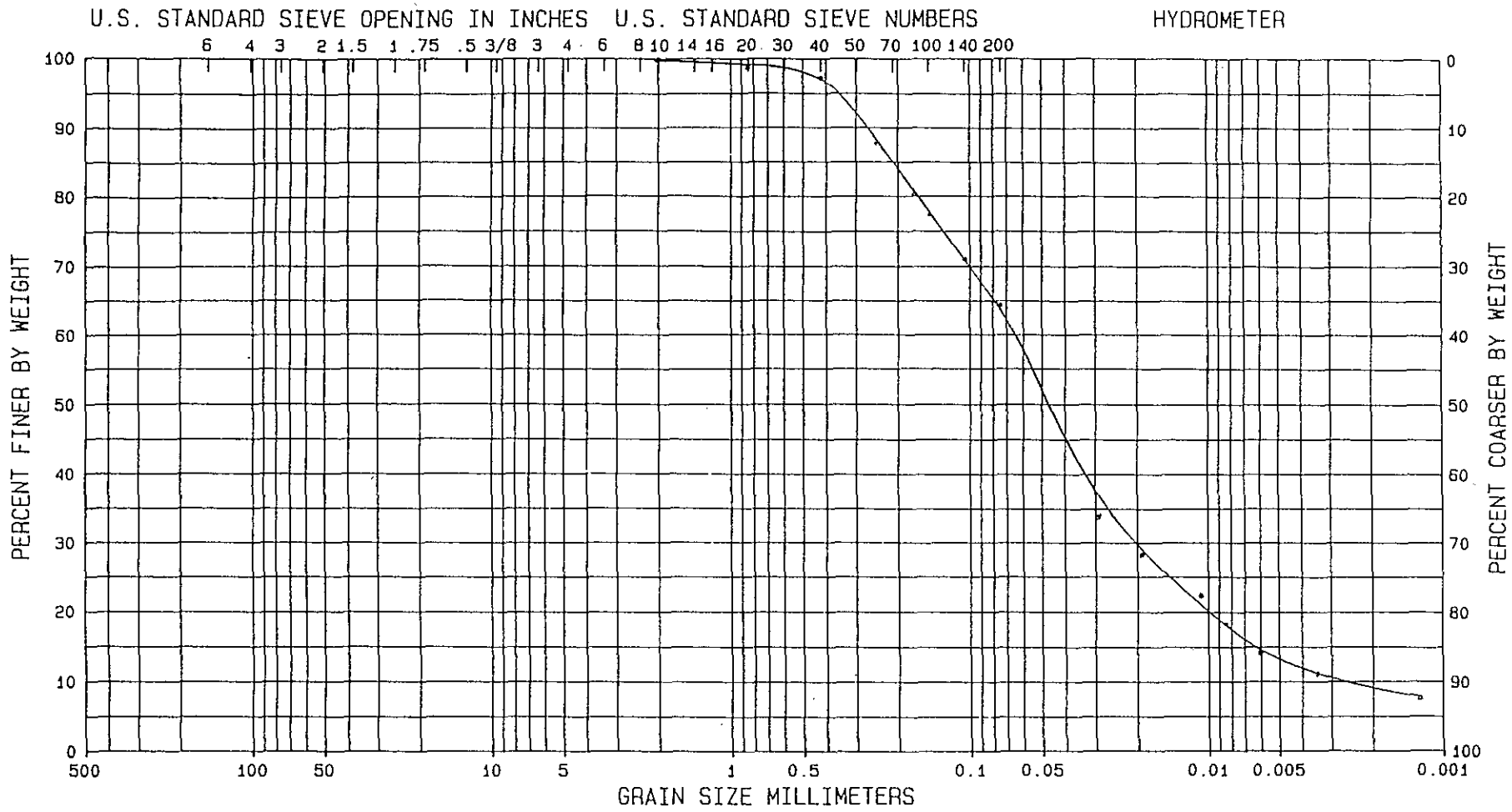
Sediment Data

SUMMARY OF GRADATION TEST RESULTS

PROJECT: Hydrometer and Grain Size Analyses
CLIENT: Taylor Engineering
PROJECT NO.: 95-1497

Boring/ Sample No.	Sample Depth (ft.)	GRADATION TEST % Passing No. 4	No. 10	No. 20	No. 40	No. 60	No. 80	No.100	No.140	No.200	Estimated Shell Content, %
SL-1-1		100.0	99.3	93.1	71.0	18.1	4.4	3.6	3.0	1.5	29-55
SL-1-2		100.0	95.2	87.0	68.8	21.0	3.9	2.6	1.9	1.3	31-55
SL-1-3		83.5	67.9	56.6	40.9	15.7	6.9	6.1	5.2	3.6	44-52
SL-2-1		99.3	95.6	90.7	78.8	59.7	35.8	28.1	12.5	5.7	21-31
SL-2-2		100.0	99.7	98.3	93.5	74.5	58.7	54.7	35.5	18.9	7-16
SL-2-3		100.0	96.6	90.8	83.9	71.5	57.0	51.2	27.2	17.2	16-22
SL-3-1		100.0	90.2	74.7	62.8	37.0	25.4	22.4	14.3	8.3	37-50
SL-3-2		100.0	100.0	99.6	98.3	95.4	92.0	89.9	71.1	50.5	1-2
SL-3-3		100.0	100.0	99.8	99.2	97.2	94.9	92.0	62.3	44.3	1-2
IR-1-1		100.0	100.0	99.3	97.2	88.4	80.3	77.2	70.8	64.9	1-3
IR-1-2		100.0	99.9	99.3	98.8	98.2	97.4	97.1	94.8	87.4	1-2
IR-1-3		100.0	97.5	95.2	93.2	90.5	80.3	70.9	33.9	19.1	7-8
IR-2-1		100.0	97.1	92.5	88.5	82.9	71.3	60.4	23.2	11.5	12-14
IR-2-2		100.0	98.5	96.5	95.1	93.7	85.9	72.9	16.7	4.4	5-6
IR-2-3		99.9	98.9	98.4	98.0	97.4	95.8	90.8	29.1	12.8	2-3
IR-3-1		100.0	99.7	99.5	99.1	98.2	95.7	89.5	30.7	18.5	1-2
IR-3-2		100.0	100.0	99.1	98.1	96.9	95.9	95.2	89.3	79.5	1-2
IR-3-3		100.0	98.7	98.5	98.3	97.6	94.8	87.8	33.7	13.6	1-2

ELLIS & ASSOCIATES, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

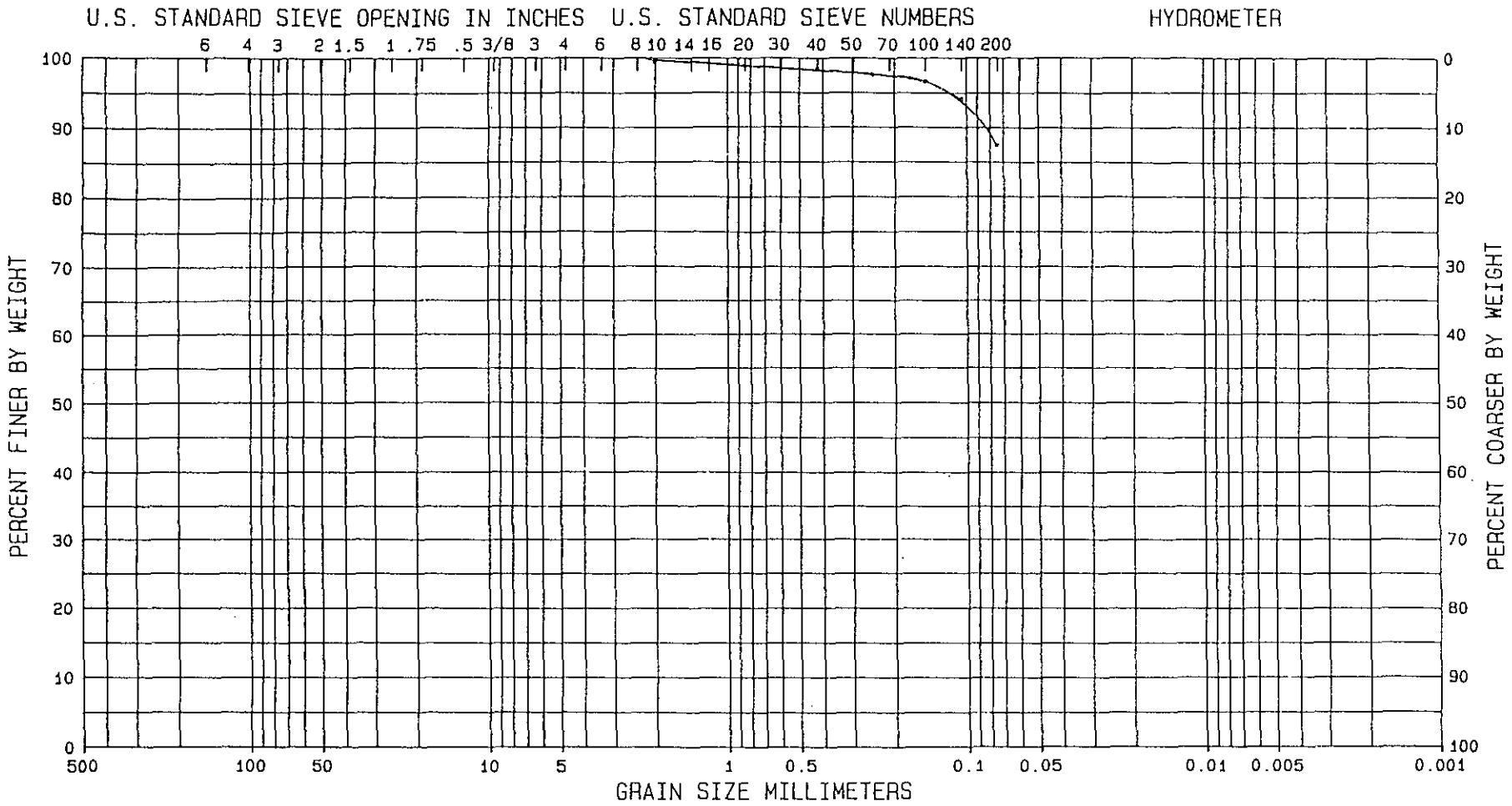
SAMPLE NO.		CLASSIFICATION	NAT W%	LL	PL	PI
IR-1-1						

GRADATION CURVES

Hydrometer and Grain Size Analyses

E&A Project No. 95-1497

ELLIS & ASSOCIATES, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

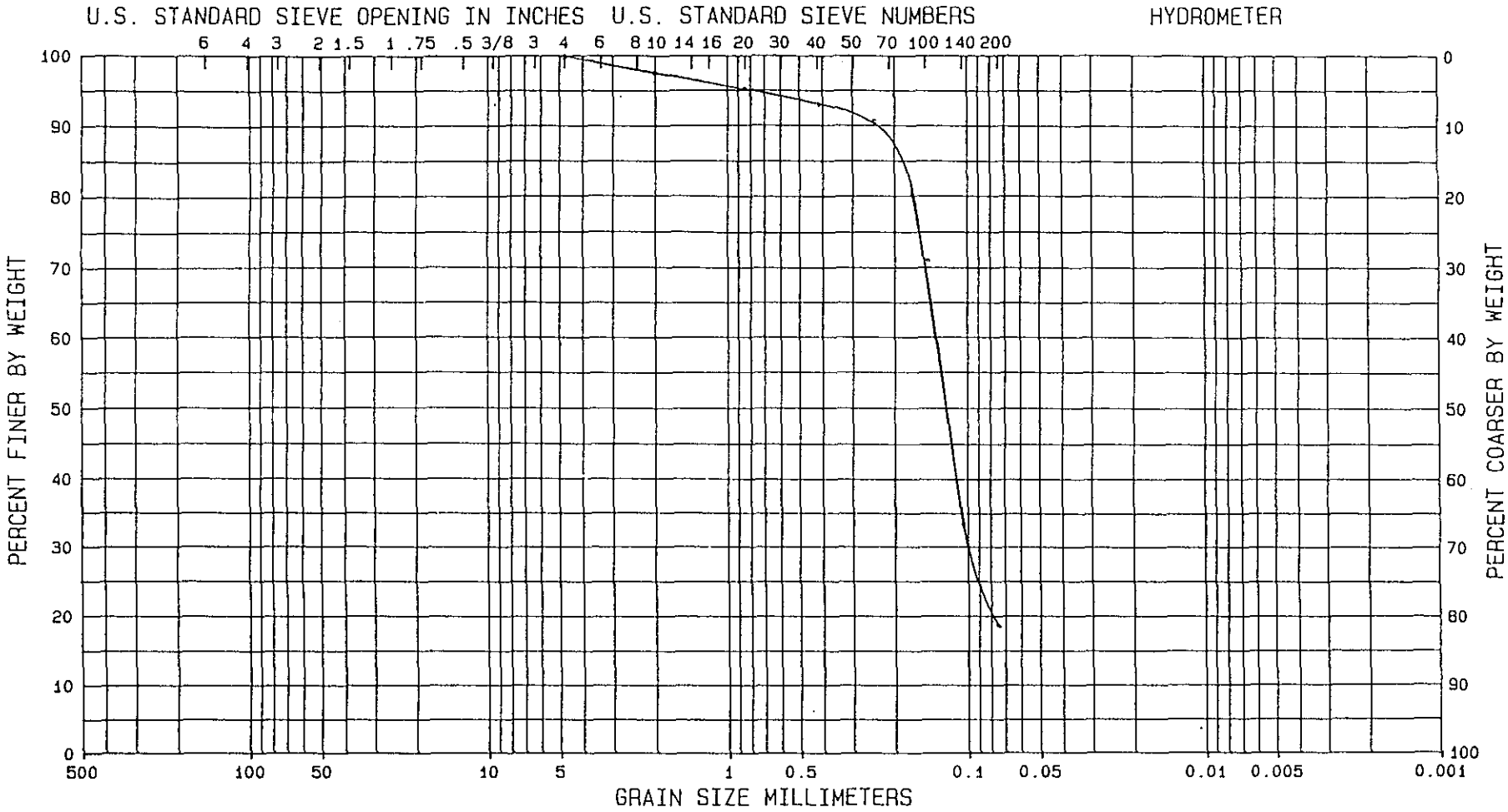
SAMPLE NO.		CLASSIFICATION	NAT w%	LL	PL	PI
IR-1-2						

GRADATION CURVES

Hydrometer and Grain Size Analyses

E&A Project No. 95-1497

ELLIS & ASSOCIATES, INC.



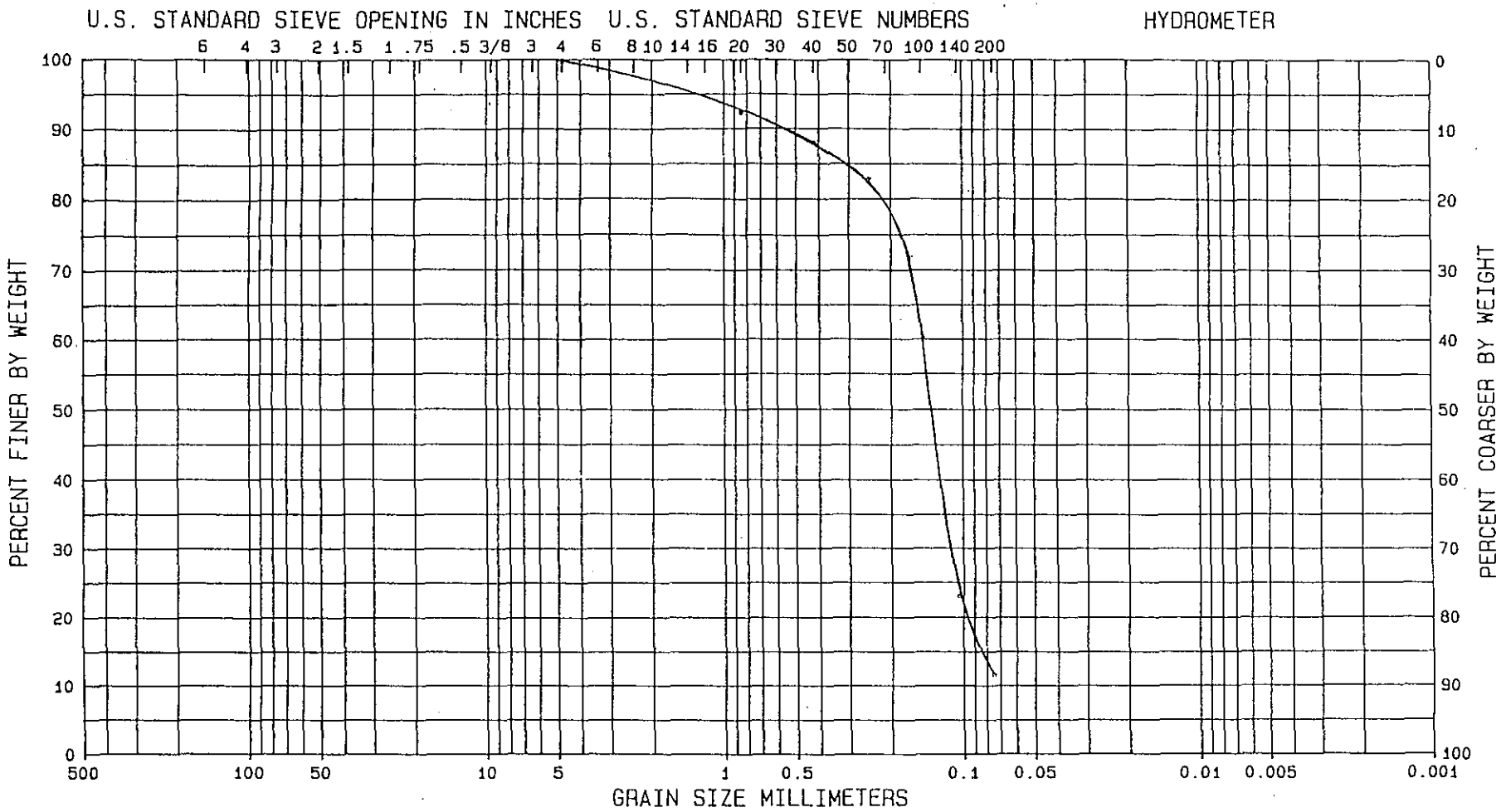
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.		CLASSIFICATION	NAT w%	LL	PL	PI
IR-1-3						

GRADATION CURVES

Hydrometer and Grain Size Analyses
E&A Project No. 95-1497

ELLIS & ASSOCIATES, INC.



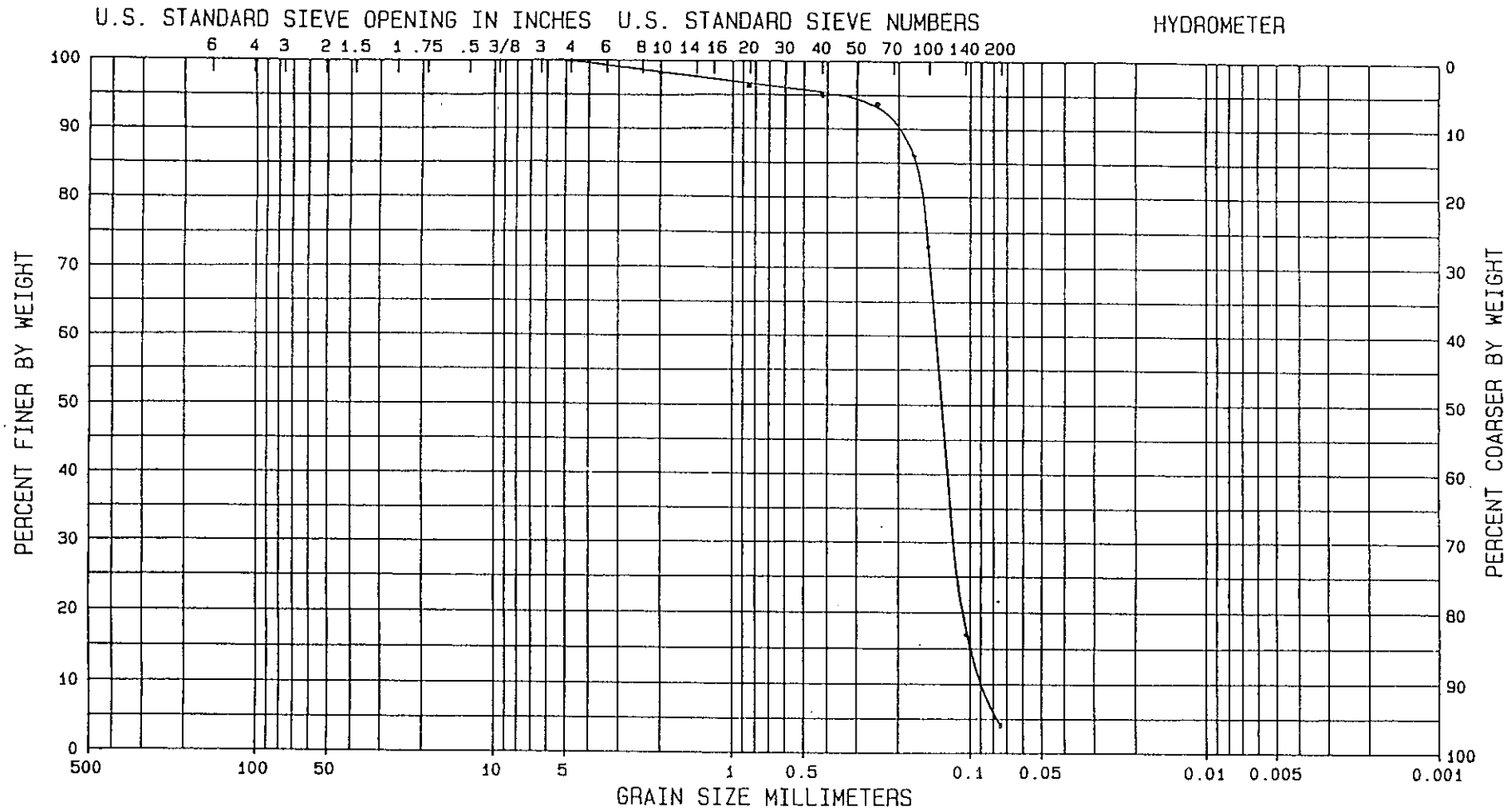
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.		CLASSIFICATION	NAT w%	LL	PL	PI
IR-2-1						

GRADATION CURVES

Hydrometer and Grain Size Analyses
E&A Project No. 95-1497

ELLIS & ASSOCIATES, INC.



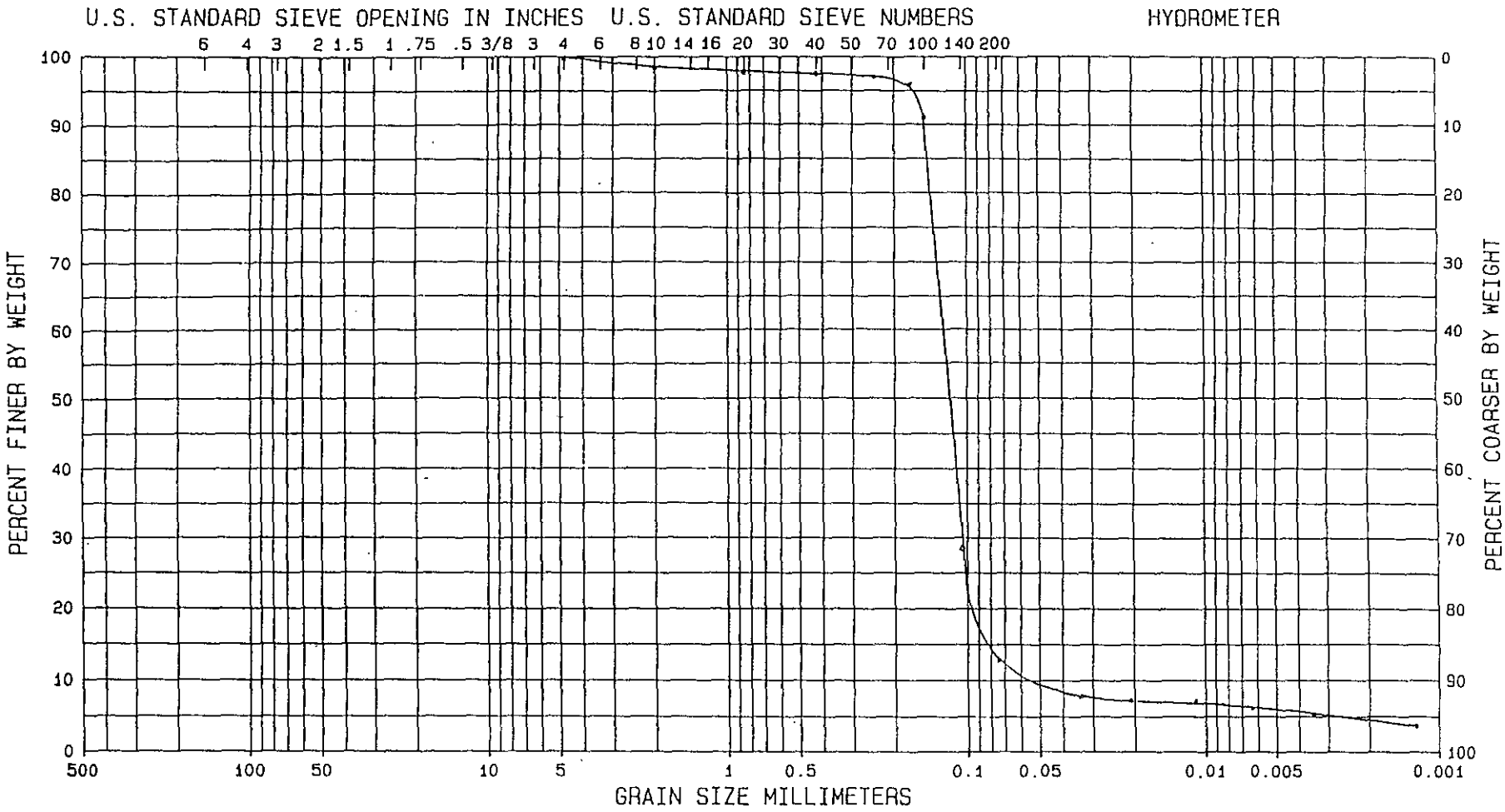
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.		CLASSIFICATION	NAT W%	LL	PL	PI
IR-2-2						

GRADATION CURVES

Hydrometer and Grain Size Analyses
E&A Project No. 95-1497

ELLIS & ASSOCIATES, INC.



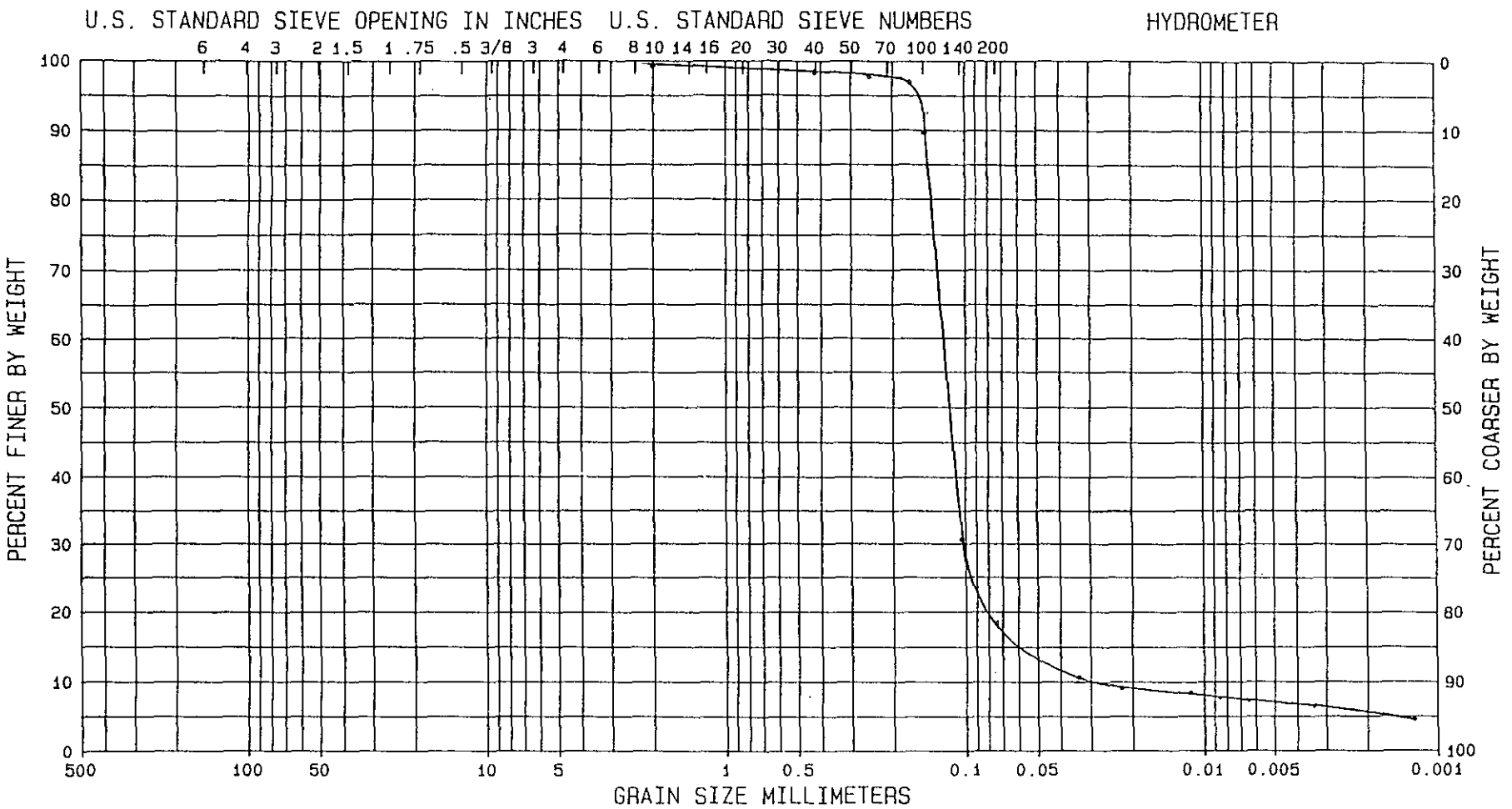
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.		CLASSIFICATION	NAT W%	LL	PL	PI
IR-2-3						

GRADATION CURVES

Hydrometer and Grain Size Analyses
E&A Project No. 95-1497

ELLIS & ASSOCIATES, INC.



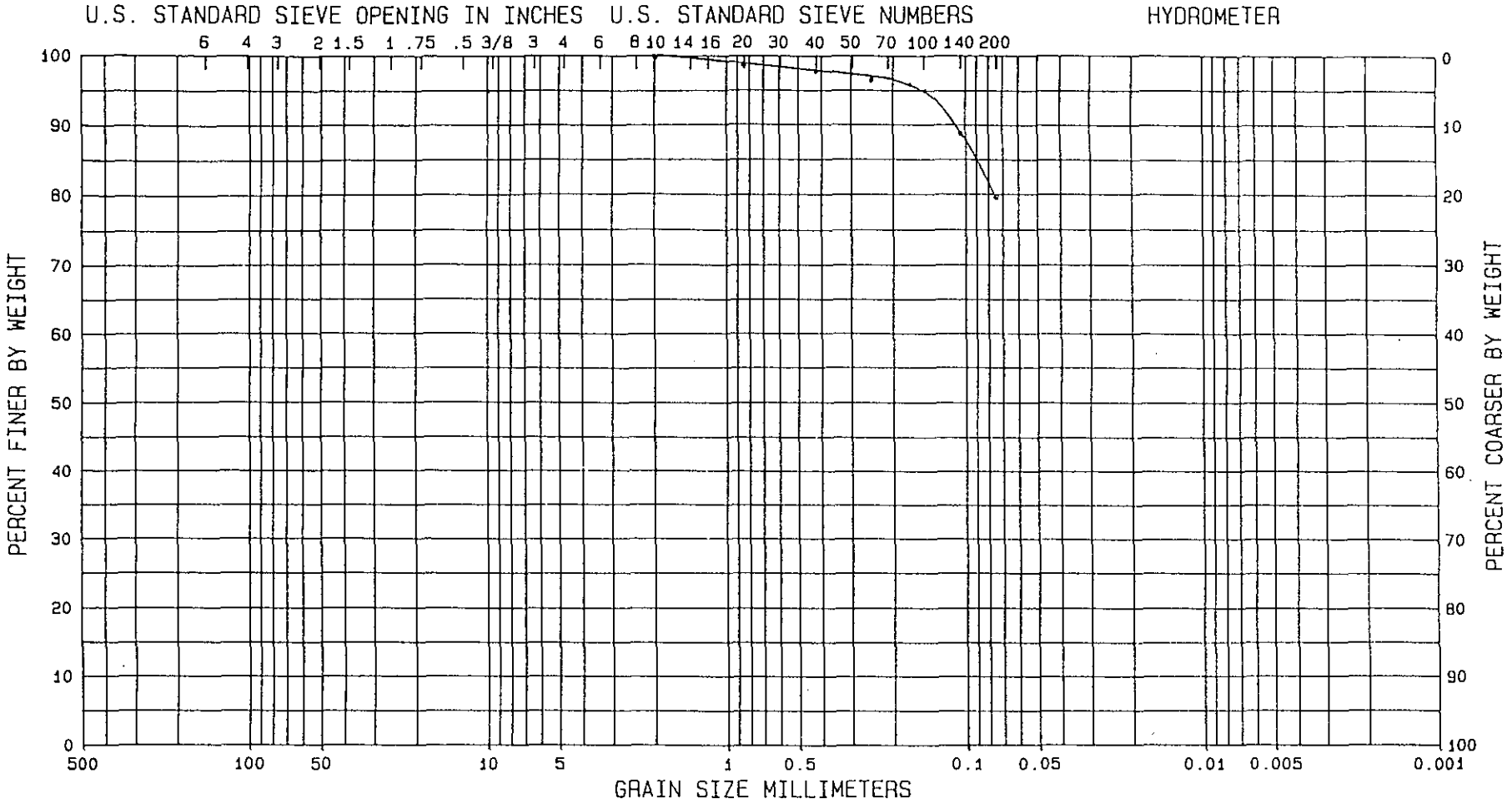
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.		CLASSIFICATION	NAT w%	LL	PL	PI
IR-3-1						

GRADATION CURVES

Hydrometer and Grain Size Analyses
E&A Project No. 95-1497

ELLIS & ASSOCIATES, INC.



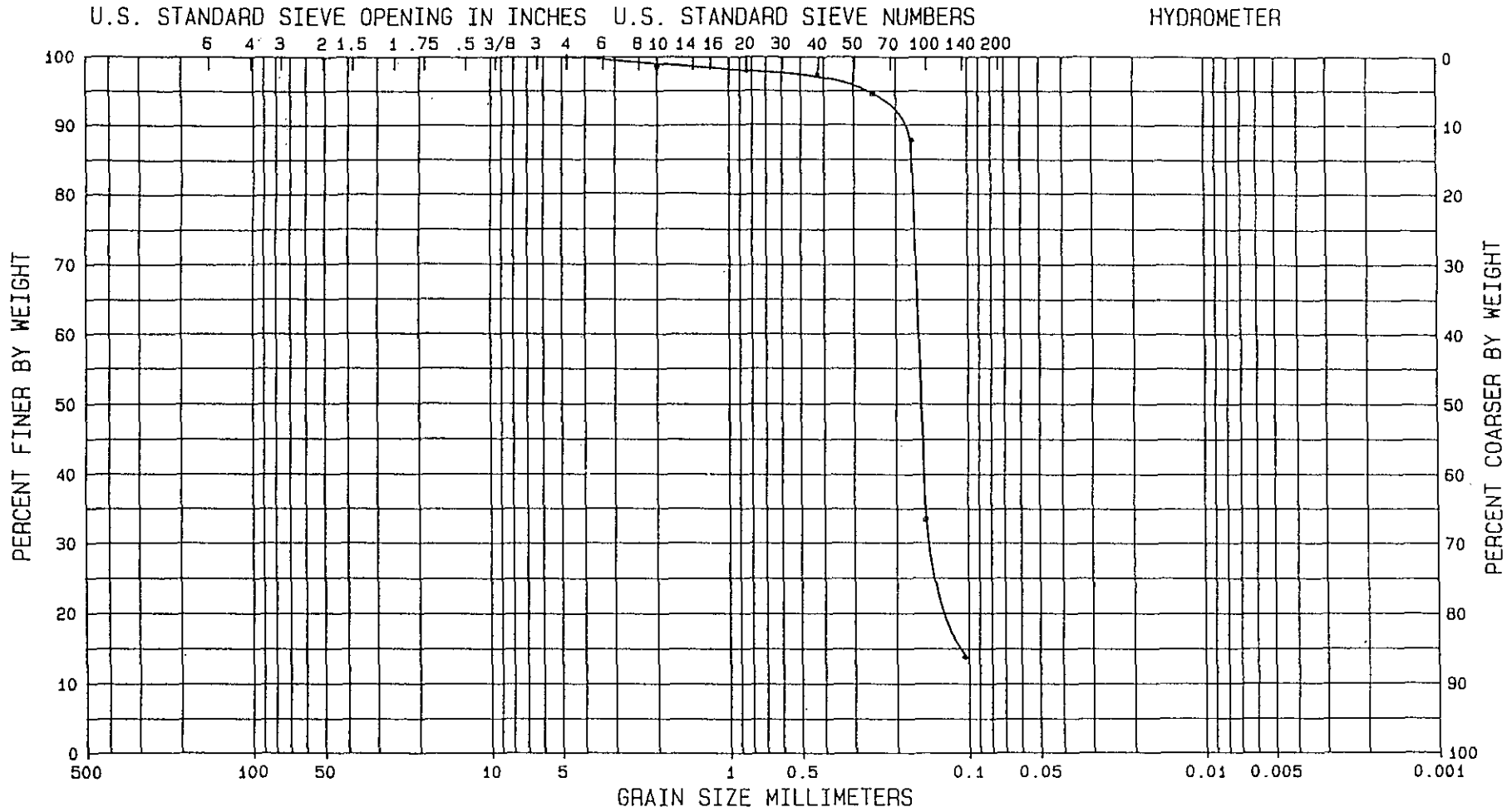
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.		CLASSIFICATION	NAT w%	LL	PL	PI
IR-3-2						

GRADATION CURVES

Hydrometer and Grain Size Analyses
E&A Project No. 95-1497

ELLIS & ASSOCIATES, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.		CLASSIFICATION	NAT W%	LL	PL	PI
IR-3-3						

GRADATION CURVES

Hydrometer and Grain Size Analyses
E&A Project No. 95-1497

SL *SAVANNAH LABORATORIES*
& ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: S5-55719

Received: 13 OCT 95
Reported: 03 NOV 95

Mr. Steve Schropp
Taylor Engineering, Inc.
9086 Cypress Green Drive
Jacksonville, FL 32256

Project: ICWW-IR & SL
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
55719-1	SL-3-3	10-11-95/1015
55719-2	SL-2-1	10-11-95/1210
55719-3	SL-1-3	10-11-95/1245
55719-4	IR-3-1	10-11-95/1010
55719-5	IR-1-1	10-12-95/1010

PARAMETER	55719-1	55719-2	55719-3	55719-4	55719-5
Aluminum (6010) , mg/kg dw	22000	3100	860	13000	23000
Arsenic (7060), mg/kg dw	2.9	1.9	1.9	1.9	3.2
Cadmium (7131), mg/kg dw	<0.19	<0.14	<0.14	<0.15	<0.25
Chromium (6010), mg/kg dw	34	7.8	8.7	15	36
Copper (6010), mg/kg dw	7.4	<3.5	11	9.2	9.8
Iron (6010), mg/kg dw	14000	2700	2000	6100	15000
Lead (7421), mg/kg dw	15	4.5	3.0	11	15
Nickel (6010), mg/kg dw	<7.7	<5.5	<5.6	<6.2	<10
Zinc (6010), mg/kg dw	25	4.4	7.5	18	33
Mercury (7471), mg/kg dw	0.033	<0.014	<0.014	0.021	0.040

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Received: 13 OCT 95
Reported: 03 NOV 95

Mr. Steve Schropp
Taylor Engineering, Inc.
9086 Cypress Green Drive
Jacksonville, FL 32256

Project: ICWW-IR & SL
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
55719-1	SL-3-3	10-11-95/1015
55719-2	SL-2-1	10-11-95/1210
55719-3	SL-1-3	10-11-95/1245
55719-4	IR-3-1	10-11-95/1010
55719-5	IR-1-1	10-12-95/1010

PARAMETER	55719-1	55719-2	55719-3	55719-4	55719-5
Cl-Pesticides/PCB (8080)					
Aldrin, ug/kg dw	<3.3	<2.3	<2.4	<2.6	<4.2
alpha-BHC, ug/kg dw	<3.3	<2.3	<2.4	<2.6	<4.2
beta-BHC, ug/kg dw	<3.3	<2.3	<2.4	<2.6	<4.2
gamma-BHC, ug/kg dw	<3.3	<2.3	<2.4	<2.6	<4.2
delta-BHC, ug/kg dw	<3.3	<2.3	<2.4	<2.6	<4.2
Chlordane, ug/kg dw	<33	<23	<24	<26	<42
4,4'-DDD, ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
4,4'-DDE, ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
4,4'-DDT, ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
Dieldrin, ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
Endosulfan I, ug/kg dw	<3.3	<2.3	<2.4	<2.6	<4.2
Endosulfan II, ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
Endosulfan sulfate, ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
Endrin, ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
Endrin aldehyde, ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
Heptachlor, ug/kg dw	<3.3	<2.3	<2.4	<2.6	<4.2
Heptachlor epoxide, ug/kg dw	<3.3	<2.3	<2.4	<2.6	<4.2
Methoxychlor, ug/kg dw	<33	<23	<24	<26	<42
Toxaphene, ug/kg dw	<330	<230	<240	<260	<420

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REPORT OF RESULTS

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55719-1	SL-3-3	10-11-95/1015
55719-2	SL-2-1	10-11-95/1210
55719-3	SL-1-3	10-11-95/1245
55719-4	IR-3-1	10-11-95/1010
55719-5	IR-1-1	10-12-95/1010

PARAMETER	55719-1	55719-2	55719-3	55719-4	55719-5
Aroclor-1016, ug/kg dw	<63	<45	<46	<51	<82
Aroclor-1221, ug/kg dw	<130	<92	<93	<100	<170
Aroclor-1232, ug/kg dw	<63	<45	<46	<51	<82
Aroclor-1242, ug/kg dw	<63	<45	<46	<51	<82
Aroclor-1248, ug/kg dw	<63	<45	<46	<51	<82
Aroclor-1254, ug/kg dw	<63	<45	<46	<51	<82
Aroclor-1260, ug/kg dw	<63	<45	<46	<51	<82
Date Extracted	10.17.95	10.17.95	10.17.95	10.17.95	10.17.95

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55719-2	SL-2-1	10-11-95/1210
55719-3	SL-1-3	10-11-95/1245
55719-4	IR-3-1	10-11-95/1010
55719-5	IR-1-1	10-12-95/1010

PARAMETER	55719-1	55719-2	55719-3	55719-4	55719-5
Polynuclear Aromatics (8310)					
Acenaphthene, ug/kg dw	<42	<29	<26	<35	<51
Acenaphthylene, ug/kg dw	<42	<29	<26	<35	<51
Anthracene, ug/kg dw	<8.3	<5.8	<5.3	<7.0	<10
Benzo(a)anthracene, ug/kg dw	<8.3	<5.8	<5.3	<7.0	<10
Benzo(a)pyrene, ug/kg dw	<8.3	<5.8	<5.3	10	<10
Benzo(b)fluoranthene, ug/kg dw	<8.3	<5.8	<5.3	14	<10
Benzo(g,h,i)perylene, ug/kg dw	<21	<14	<13	<18	<26
Benzo(k)fluoranthene, ug/kg dw	<21	<14	<13	<18	<26
Chrysene, ug/kg dw	<8.3	<5.8	<5.3	7.4	<10
Dibenzo(a,h)anthracene, ug/kg dw	<42	<29	<26	<35	<51
Fluoranthene, ug/kg dw	<21	<14	<13	<18	<26
Fluorene, ug/kg dw	<21	<14	<13	<18	<26
Indeno(1,2,3-cd)pyrene, ug/kg dw	<21	<14	<13	<18	<26
Naphthalene, ug/kg dw	<42	<29	<26	<35	<51
Phenanthrene, ug/kg dw	<8.3	<5.8	<5.3	<7.0	<10
Pyrene, ug/kg dw	<21	<14	<13	<18	<26
Date Extracted	10.19.95	10.19.95	10.19.95	10.19.95	10.19.95
Organic Carbon (Walkley-Black), mg/kg dw	28000	3900	3800	13000	57000
Oil & Grease (413.2), mg/kg dw	23	21	18	31	44
Carbonate, mg/kg dw	3000	32000	14000	6200	4600

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55719-2	SL-2-1	10-11-95/1210
55719-3	SL-1-3	10-11-95/1245
55719-4	IR-3-1	10-11-95/1010
55719-5	IR-1-1	10-12-95/1010

PARAMETER	55719-1	55719-2	55719-3	55719-4	55719-5
Total Kjeldahl Nitrogen-N, mg/kg dw	1500	300	560	730	4000
Percent Solids (160.3), %	52	73	72	65	40

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LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
55719-6	IR-2-3	10-12-95/1145

PARAMETER	55719-6				
Aluminum (6010) , mg/kg dw	17000				
Arsenic (7060), mg/kg dw	1.7				
Cadmium (7131), mg/kg dw	<0.16				
Chromium (6010), mg/kg dw	17				
Copper (6010), mg/kg dw	9.8				
Iron (6010), mg/kg dw	7200				
Lead (7421), mg/kg dw	11				
Nickel (6010), mg/kg dw	<6.2				
Zinc (6010), mg/kg dw	20				
Mercury (7471), mg/kg dw	0.017				

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
55719-6	IR-2-3	10-12-95/1145

PARAMETER	55719-6
Cl-Pesticides/PCB (8080)	
Aldrin, ug/kg dw	<2.6
alpha-BHC, ug/kg dw	<2.6
beta-BHC, ug/kg dw	<2.6
gamma-BHC, ug/kg dw	<2.6
delta-BHC, ug/kg dw	<2.6
Chlordane, ug/kg dw	<26
4,4'-DDD, ug/kg dw	<5.2
4,4'-DDE, ug/kg dw	<5.2
4,4'-DDT, ug/kg dw	<5.2
Dieldrin, ug/kg dw	<5.2
Endosulfan I, ug/kg dw	<2.6
Endosulfan II, ug/kg dw	<5.2
Endosulfan sulfate, ug/kg dw	<5.2
Endrin, ug/kg dw	<5.2
Endrin aldehyde, ug/kg dw	<5.2
Heptachlor, ug/kg dw	<2.6
Heptachlor epoxide, ug/kg dw	<2.6
Methoxychlor, ug/kg dw	<26
Toxaphene, ug/kg dw	<260
Aroclor-1016, ug/kg dw	<52
Aroclor-1221, ug/kg dw	<100
Aroclor-1232, ug/kg dw	<52
Aroclor-1242, ug/kg dw	<52
Aroclor-1248, ug/kg dw	<52
Aroclor-1254, ug/kg dw	<52
Aroclor-1260, ug/kg dw	<52
Date Extracted	10.17.95

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
55719-6	IR-2-3	10-12-95/1145

PARAMETER	55719-6		
Polynuclear Aromatics (8310)			
Acenaphthene, ug/kg dw	<30		
Acenaphthylene, ug/kg dw	<30		
Anthracene, ug/kg dw	<6.1		
Benzo(a)anthracene, ug/kg dw	<6.1		
Benzo(a)pyrene, ug/kg dw	6.2		
Benzo(b)fluoranthene, ug/kg dw	9.1		
Benzo(g,h,i)perylene, ug/kg dw	<15		
Benzo(k)fluoranthene, ug/kg dw	<15		
Chrysene, ug/kg dw	<6.1		
Dibenzo(a,h)anthracene, ug/kg dw	<30		
Fluoranthene, ug/kg dw	<15		
Fluorene, ug/kg dw	<15		
Indeno(1,2,3-cd)pyrene, ug/kg dw	<15		
Naphthalene, ug/kg dw	<30		
Phenanthrene, ug/kg dw	<6.1		
Pyrene, ug/kg dw	<15		
Date Extracted	10.19.95		
Organic Carbon (Walkley-Black), mg/kg dw	12000		
Oil & Grease (413.2), mg/kg dw	27		
Carbonate, mg/kg dw	13000		
Total Kjeldahl Nitrogen-N, mg/kg dw	510		
Percent Solids (160.3), %	64		

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID
55719-7	Method Blank
55719-8	Accuracy (Mean % Recovery)
55719-9	Precision (% RPD)
55719-10	Date Analyzed

PARAMETER	55719-7	55719-8	55719-9	55719-10
Aluminum (6010) , mg/kg dw	<20	108 %	0.93 %	10.31.95
Arsenic (7060), mg/kg dw	<1.0	100 %	2.0 %	11.01.95
Cadmium (7131), mg/kg dw	<0.10	100 %	1.0 %	11.02.95
Chromium (6010), mg/kg dw	<1.0	104 %	8.7 %	10.31.95
Copper (6010), mg/kg dw	<2.5	104 %	9.6 %	10.31.95
Iron (6010), mg/kg dw	<5.0	91 %	29 %	10.31.95
Lead (7421), mg/kg dw	<0.50	98 %	4.1 %	10.31.95
Nickel (6010), mg/kg dw	<4.0	104 %	9.6 %	10.31.95
Zinc (6010), mg/kg dw	<2.0	104 %	8.7 %	10.31.95
Mercury (7471), mg/kg dw	<0.010	98 %	1.0 %	10.19.95

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55719-7	Method Blank
55719-8	Accuracy (Mean % Recovery)
55719-9	Precision (% RPD)
55719-10	Date Analyzed

PARAMETER	55719-7	55719-8	55719-9	55719-10
Cl-Pesticides/PCB (8080)				
Aldrin, ug/kg dw	<1.7	87 %	7 %	10.26.95
alpha-BHC, ug/kg dw	<1.7	---	---	10.26.95
beta-BHC, ug/kg dw	<1.7	---	---	10.26.95
gamma-BHC, ug/kg dw	<1.7	84 %	10 %	10.26.95
delta-BHC, ug/kg dw	<1.7	---	---	10.26.95
Chlordane, ug/kg dw	<17	---	---	10.26.95
4,4'-DDD, ug/kg dw	<3.3	---	---	10.26.95
4,4'-DDE, ug/kg dw	<3.3	---	---	10.26.95
4,4'-DDT, ug/kg dw	<3.3	97 %	6 %	10.26.95
Dieldrin, ug/kg dw	<3.3	85 %	7 %	10.26.95
Endosulfan I, ug/kg dw	<1.7	---	---	10.26.95
Endosulfan II, ug/kg dw	<3.3	---	---	10.26.95
Endosulfan sulfate, ug/kg dw	<3.3	---	---	10.26.95
Endrin, ug/kg dw	<3.3	88 %	41 %	10.26.95
Endrin aldehyde, ug/kg dw	<3.3	---	---	10.26.95
Heptachlor, ug/kg dw	<1.7	91 %	11 %	10.26.95
Heptachlor epoxide, ug/kg dw	<1.7	---	---	10.26.95
Methoxychlor, ug/kg dw	<17	---	---	10.26.95
Toxaphene, ug/kg dw	<170	---	---	10.26.95
Aroclor-1016, ug/kg dw	<33	---	---	10.26.95

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LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID
55719-7	Method Blank
55719-8	Accuracy (Mean % Recovery)
55719-9	Precision (% RPD)
55719-10	Date Analyzed

PARAMETER	55719-7	55719-8	55719-9	55719-10
Aroclor-1221, ug/kg dw	<67	---	---	10.26.95
Aroclor-1232, ug/kg dw	<33	---	---	10.26.95
Aroclor-1242, ug/kg dw	<33	---	---	10.26.95
Aroclor-1248, ug/kg dw	<33	---	---	10.26.95
Aroclor-1254, ug/kg dw	<33	---	---	10.26.95
Aroclor-1260, ug/kg dw	<33	---	---	10.26.95
Date Extracted	10.17.95	---	---	---

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55719-7	Method Blank
55719-8	Accuracy (Mean % Recovery)
55719-9	Precision (% RPD)
55719-10	Date Analyzed

PARAMETER	55719-7	55719-8	55719-9	55719-10
Polynuclear Aromatics (8310)				
Acenaphthene, ug/kg dw	<20	60 %	5.0 %	10.23.95
Acenaphthylene, ug/kg dw	<20	---	---	10.23.95
Anthracene, ug/kg dw	<4.0	---	---	10.23.95
Benzo(a)anthracene, ug/kg dw	<4.0	---	---	10.23.95
Benzo(a)pyrene, ug/kg dw	<4.0	---	---	10.23.95
Benzo(b)fluoranthene, ug/kg dw	<4.0	---	---	10.23.95
Benzo(g,h,i)perylene, ug/kg dw	<10	---	---	10.23.95
Benzo(k)fluoranthene, ug/kg dw	<10	---	---	10.23.95
Chrysene, ug/kg dw	<4.0	85 %	2.4 %	10.23.95
Dibenzo(a,h)anthracene, ug/kg dw	<20	---	---	10.23.95
Fluoranthene, ug/kg dw	<10	---	---	10.23.95
Fluorene, ug/kg dw	<10	62 %	6.5 %	10.23.95
Indeno(1,2,3-cd)pyrene, ug/kg dw	<10	---	---	10.23.95
Naphthalene, ug/kg dw	<20	60 %	1.7 %	10.23.95
Phenanthrene, ug/kg dw	<4.0	---	---	10.23.95
Pyrene, ug/kg dw	<10	80 %	6.2 %	10.23.95
Date Extracted	10.19.95	---	---	---
Organic Carbon (Walkley-Black), mg/kg dw	<100	138 %	1.4 %	10.20.95
Oil & Grease (413.2), mg/kg dw	<10	88 %	4.5 %	11.07.95
Carbonate, mg/kg dw	---	---	---	11.02.95
Total Kjeldahl Nitrogen-N, mg/kg dw	<25	101 %	3.0	10.25.95

Methods: EPA SW-846, CE-81-1

Beverly A. Hughes, Project Manager

APPENDIX F

Indian River County Citizens Advisory Committee

Marine Advisory/Narrows Watershed Action Committee (MANWAC)

Tim Adams	John Amos	Steve Lau
Diane Barile	George Bunnell	Marvin Carter
Jerry Tillman	David Gunter	John E. Jackson
Peter O'Bryan	Karl Hedin	Bill Moody
George Phreaner	Dennis Hanisak	

Commissioner Richard H. Bird, Chairman

Indian River County Interested Party Mailing List

name	title	company	address	city	state	zip
Mr. George P. Bunnell	F.I.N.D. Commissioner		P.O. Box 8006	Vero Beach,	FL	32963
Mr. James Chandler	Indian River County Administrator		1840 25th Street	Vero Beach,	FL	32960
Mr. Kenneth R. Macht	Chairman	Indian River County Commission	1840 25th Street	Vero Beach,	FL	32960
Ms. Fran B. Adams	Vice-Chairman	Indian River County Commission	1840 25th Street	Vero Beach,	FL	32960
Mr. Richard N. Bird	Commissioner	Indian River County Commission	1840 25th Street	Vero Beach,	FL	32960
Ms. Carolyn K. Eggert	Commissioner	Indian River County Commission	1840 25th Street	Vero Beach,	FL	32960
Mr. John W. Tippin	Commissioner	Indian River County Commission	1840 25th Street	Vero Beach,	FL	32960
Mr. Jim Davis	Director	Indian River County Public Works Division	1840 25th Street	Vero Beach,	FL	32960
	Mayor	Town of Indian River Shores	6001 North A-1-A	Indian River Shores,	FL	32963
Mr. Derek Busby	Director	Indian River Lagoon NEP	1900 S. Harbor City Blvd., Suite 109	Melbourne,	FL	32901
Mr. Ray LeRoux	Executive Director	Sebastian Inlet District	114 Sixth Avenue	Indialantic,	FL	32903
	President	Marine Industries Assoc. of the Treasure Coast	P.O. Box 1639	Stuart,	FL	34995
	Director	Regional Planning Council - Treasure Coast	P.O. Box 1529	Palm City,	FL	34990
U.S. Fish & Wildlife Service		Jacksonville Field Office	3100 University Blvd., Suite 120	Jacksonville,	FL	32216
Mr. David Ferrell	Field Supervisor	U.S. Fish & Wildlife Service	P.O. Box 2676	Vero Beach,	FL	32961
Mr. Jerry McKinney	Marina Director	City of Vero Beach Marina	3611 Rio Vista Blvd.	Vero Beach,	FL	32963
Mr. Robert P. Burnett	Vice President Development	Lost Tree Village Corp.	#1 John's Island Drive	Vero Beach,	FL	32963
Press Journal			P.O. Box 1268	Vero Beach,	FL	32960
U.S. Army Corps of Engineers	CESAJ-RD-CT-S	Vero Beach Field Office	2001 9th Avenue	Vero Beach,	FL	32962
Mr. Mike Kiefer		Kimly Horn Associates, Inc.	601 21st Street, Suite 400	Vero Beach,	FL	32960
Mayor	City of Vero Beach		P.O. Box 1389	Vero Beach,	FL	32961-1389
Mayor	City of Fellsmere	Fellsmere Police Dept.	P.O. Box 39	Fellsmere,	FL	32948-0039
Mayor	Town of Orchid		10 Orchid Island Drive	Vero Beach,	FL	32963
Mayor	City of Sebastian		1225 Main Street	Sebastian,	FL	32958
Honorable Charles W. Sembler, II	Florida House Representative	District 80	P.O. Box 2380	Vero Beach,	FL	32961
Honorable William G. Myers	Florida State Senator	District 27	50 Kindred Street, Suite 301	Stuart,	FL	34994
Honorable Patsy Ann Kurth	Florida State Senator	District 15	2174 Harris Avenue, N.E., Suite1-B	Palm Bay,	FL	32905
Roland Deblois	Indian River County	Planning Department	1840 25th Street	Vero Beach,	FL	32960
Mr. Tom Nelson			P.O. Box 700338	Wabasso,	FL	32970
Mr. Bill Canty		Southeast Realty Advisors	4802 Distribution Court, Suite 7	Orlando,	FL	32822
	Vice President Development	Lost Tree Village Corp.	#1 John's Island Drive	Vero Beach,	FL	32963
Mr. Ray LeRoux	Executive Director	Sebastian Inlet District	114 Sixth Avenue	Indialantic,	FL	32903
Mr. Robert Cairns			1245 Spring Lake Drive	Orlando,	FL	32804
Mr. Richard W. Golden	Broker-Associate	Norris & Company Real Estate	3377 Ocean Drive	Vero Beach,	FL	32963