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Long-Range Dredged Material Management Plan for the Intracoastal Waterway in St. Lucie County, Florida

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Long-Range Dredged Material Management Plan for The Intracoastal Waterway in St. Lucie 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 where 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 St. Lucie 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 Indian River 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 St. Lucie County are based on those used in the development of previous plan documents for the Waterway in the counties cited above. The major tasks performed as part of the present effort are as follows: (1) establishment of the 50-year material storage requirement within the St. Lucie 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 FIND's 1996 ICWW channel survey were analyzed to develop estimates for the 50-year maintenance dredging and material storage requirements of the 21.71 miles of channel within the study area. The analysis showed a projected total storage requirement of 155,240 cubic yards of bulked material distributed over three channel reaches. Preliminary assessment was then made of the six tracts totaling over 3,711 acres the FIND holds under perpetual easement. This assessment revealed that only one site contained within two existing easements met the most basic criteria of reasonable upland acreage and thereby showed potential for continued use as a dredged material management area. This island site, despite lacking road access, was retained as a candidate site for further evaluation.

With the maintenance characteristics and the projected 50-year material storage requirement of the Waterway within the St. Lucie 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 St. Lucie County are as follows:

- 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 25 alternative candidate sites were identified. Each of the 25 alternative sites as well as the one existing site was then field inspected and evaluated under a standard set of criteria addressing engineering, operational, environmental, and land-use considerations. By this process, five sites were selected to form a site bank of three primary (first-choice) options and three secondary alternatives. One of the primary sites also serves as a secondary option under a different management strategy. All of the area contained in the primary sites and secondary alternatives represents newly identified properties neither owned nor currently held under easement 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 St. Lucie 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. At the workshops, held in the St. Lucie County Commission chambers in Ft. Pierce, 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 the counties cited above 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 St. Lucie County and documents all work performed under this contract. A companion set of 13 photobased 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.

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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 St. Lucie 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 St. Lucie 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.



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 state-established guidelines. 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 to accommodate 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 — St. Lucie and Indian River — 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 St. Lucie County.

1.2 Project Overview

Phase I development of the long-range dredged material management plan for the ICWW in St. Lucie 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 St. Lucie 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 St. Lucie 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 Citizens' Advisory Committee. Appointees to this committee included the following county staff: Richard Bouchard (Engineering), Brad Keen (Leisure Services), David Kelly (Community Development), Morris Adger (Director, Port of Ft. Pierce), and Jim David (Mosquito Control). Also serving on the committee was St. Lucie County Commissioner Cliff Barnes. A total of four meetings of this committee were held to review project work: October 16, 1995; March 4, 1996; March 13, 1997, and July 23, 1997. Each meeting of this committee was held in the St. Lucie County Administration Building in Ft. Pierce. 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 St. Lucie 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 St. Lucie County Commission on September 13, 1995, to introduce the FIND's long-range dredged material management program for the Intracoastal Waterway, to inform the Commission that they had initiated a planning effort for the Waterway in St. Lucie County, and to request the appointment of a Citizens' Advisory Committee.

To inform the citizens of St. Lucie 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 *Ft. Pierce Tribune* newspaper. Additionally, an FIND-initiated mailing list that included government representatives in St. Lucie County and other interested parties was used to distribute meeting notices and status reports (Appendix F). Held at the St. Lucie County Administration Building in Ft. Pierce on October 19, 1995, and at the chambers of the St. Lucie County Board of Commissioners on March 4, 1996, March 13, 1997 and July 23, 1997, these workshops presented the work accomplished to date and set forth the direction of the plan. 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 St. Lucie 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 St. Lucie 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 St. Lucie 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 dredging records and recent survey 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 St. Lucie 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 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 a detailed analysis of Jacksonville District COE archival records — specifically, analysis of all engineering plans and supporting documents for channel maintenance performed in the St. Lucie County segment of the ICWW since the channel was deepened to its presently authorized project depth. Within St. Lucie County, two segments corresponding to two authorized project depths comprise the Waterway. From the Ft. Pierce Harbor Project northward to Fernandina Beach, the authorized depth of the Intracoastal Waterway is 12 ft below Mean Low Water (-12 ft MLW). From the Ft. Pierce Harbor Project southward to Biscayne Bay in Miami, the authorized channel depth is -10 ft MLW. Accordingly, the deepening of the channel within St. Lucie County was performed in two phases — from Wabasso in Indian River County southward to Ft. Pierce (Cut SL-3S, sta 0+00; ICWW mile 225.52) between early 1959 and late 1960, and from Ft. Pierce southward to St. Lucie Inlet in Martin County between early 1961 and early 1962.

To estimate the volume of historic dredging activity, a comprehensive analysis was then conducted of all maintenance dredging occurring in the ICWW in St. Lucie County since 1960. 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 COE 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. With 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 quantities to specific dredging locations. In those maintenance operations for which 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 only one maintenance dredging operation was performed in the St. Lucie County segment of the Waterway since the establishment of the present project depths. This 1972 operation removed a minimal shoal (design volume — 2,000 cubic yards [cy]) immediately south of the Ft. Pierce Harbor Project and north of the Seaway Bridge (Cut SL-3N, sta 9+50 to Sta 11+50, ICWW mile 225.43 to mile 225.47). The records also indicate that the material (pay volume — 2,381 cy, based on the derived ratio of pay volume to design volume discussed above) was placed on a small spoil island partially contained within each of two existing disposal easements adjacent to the dredging site. Existing disposal easements and their remaining storage capacity is discussed in Sections 2.2 and 2.3.

A single minimal maintenance dredging operation lacks sufficient data by which to characterize and quantify patterns of shoaling and thereby to project future dredging and material storage requirements for the entire Waterway channel within St. Lucie County. Over an adequate period of record during which channel maintenance is performed regularly or on an "as needed" basis, historic dredging volumes provide a reasonable and reliable indication of sedimentation patterns. However, 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, St. Lucie County has suffered from a lack of placement sites appropriate to receive dredged material under today's regulatory criteria.

More recent survey data support the contention that the lack of channel maintenance in St. Lucie County is attributable more to the lack of appropriate placement sites rather than the absence of shoaling. The most recent survey data available from the Jacksonville District COE by which to characterize shoaling within St. Lucie County was contained in the results of the COE's October 1987 channel centerline survey. This survey identified a number of shoals throughout the St. Lucie 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 establish clear patterns of shoaling on which to base a reasonable projection of future dredging and material storage requirements.

To augment and update existing data on shoaling within the St. Lucie 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 1996 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 where the surveyed depths were less than the established project depth for that segment of the Waterway. Shoal volumes were then calculated

based on an additional one 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- and 10-ft MLW project depths in St. Lucie County between 1960 and 1961 and modifications to that document which appeared in succeeding maintenance plans. 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 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 St. Lucie County comprises seven straight line segments, or cuts, totalling 21.71 miles. This total includes five cuts — designated Cuts SL-1 through SL-5 — entirely within St. Lucie County. It also includes the St. Lucie County portions of two additional cuts

which extend across county lines — 2,434 ft of Cut IR-35 to the north of Cut SL-1 and 37,340 ft of Cut SL-6 to the south of Cut M-25. The first, Cut IR-35, begins in Indian River County but extends across the county line into St. Lucie County. The portion of Cut IR-35 which lies north of St. Lucie County will be addressed in the development of a dredged material management plan for Indian River County. The second, Cut SL-6, begins in St. Lucie County but continues southward an additional 3,950 feet into Martin County. The Martin County portion of Cut SL-6 was previously covered in FIND's dredged material management plan for Martin County.

	Mileage									
Cut	End Station (ft)	Length (mi)	0.0 @ Cut IR-1 Sta 0+00	ICWW Mileage 0.0 @ DU-1	0.0 @ FHP AIWW Cut 34					
IR-35	55 + 84.10	1.06	0.46	218.92	241.23					
SL-1	278 + 20.55	5.27	5.73	224.19	246.50					
SL-2	55 + 77.30	1.06	6.79	225.24	247.55					
SL-3N	14 + 11.81	0.27	7.05	225.51	247.82					
SL-3S	10 + 60.87	0.20	7.25	225.71	248.02					
SL-4	4 + 53.87	0.09	7.34	225.80	248.11					
SL-5	385 + 99.31	7.31	14.65	233.11	255.42					
SL-6	412 + 90.26	7.82	22.47	240.93	263.24					

Table 2.1 Intracoastal Waterway, St. Lucie County

Note: Indian River/St. Lucie County line located at Cut IR-35/Station 31+ 50, ICWW mile 218.46 St. Lucie/Martin County line located at Cut SL-6/Station 373+40, ICWW mile 240.18

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 St. Lucie County segment of the Waterway channel, as well as the location and estimated volume of shoal material removed in the single maintenance operation performed in St. Lucie County since the establishment of the present project depths. 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.

As shown in Table 2.2, the total volume of shoaling throughout the county since the channel was deepened to its presently authorized depths is estimated to be only 53,202 cy. Of this, 50,821 cy, or approximately 95 percent of the total shoal volume, represents material documented by the 1996 channel

					141-	Design	Pav	
ICWW	Mileage	Cut/S	Station	Length		Volume	Volume	
From	То	From	То	(ft)	Year	(cy)	(cy)	Disposal Area
220.01	220.05	SL-1 / 57+55	SL-1 / 59+59	206	1996*	1,109	1,320	
220.13	220.14	SL-1 / 63+74	SL-1 / 64+21	48	1996*	194	230	
222.27	222.27	SL-1 / 176+99	SL-1 / 176+99		1996*	39	46	
222.67	223.03	SL-1 / 197+82	SL-1 / 216+85	1,901	1996*	1,463	1,742	
223.14	223.29	SL-1 / 222+78	SL-1 / 230+87	808	1996*	585	696	
223.35	223.37	SL-1 / 234+04	SL-1 / 234+85	79	1996*	92	109	
223.42	223.43	SL-1 / 237+81	SL-1 / 238+14	32	1996*	76	91	
223.91	3.91 223.91 SL-1 / 263+32 SL-1 / 263+32				1996*	54	64	
224.42	4.42 224.50 SL-2 / 12+19 SL-2 / 16+21			401	1996*	1,468	1,747	
224.68	224.78	SL-2 / 25+77	SL-2 / 31+07	533	1996*	1,271	1,513	
224.87	225.19	SL-2 / 35+64	SL-2 / 52+87	1,721	1996*	9,970	11,869	
225.42	225.44	SL-3N / 9+19	SL-3N / 9+89	71	1996*	1,087	1,294	
225.43	225.47	SL-3N / 9+50	SL-3N / 11+50	211	1972	2,000	2,381	MSA SL-2/MSA SL-7
225.57	225.57	SL-3S / 2+28	SL-3S / 2+75		1996*	39	46	
225.67	225.67	SL-3S / 8+01	SL-3S / 8+01		1996*	69	82	
225.75	225.77	SL-4 / 1+38	SL-4 / 2+66	127	1996*	493	587	
225.82	225.82	SL-5 / 1+01	SL-5 / 1+01		1996*	21	25	
226.22	226.25	SL-5 / 22+36	SL-5 / 23+80	143	1996*	149	177	
226.38	227.00	SL-5 / 30+50	SL-5 / 63+19	3,268	1996*	8,704	10,362	
227.09	227.09	SL-5 / 67+84	SL-5 / 67+84		1996*	56	67	
227.18	227.18	SL-5 / 72+69	SL-5 / 72+69		1996*	77	92	
229.96	229.97	SL-5 / 219+50	SL-5 / 220+04	53	1996*	128	152	
231.20	231.20	SL-5 / 285+09	SL-5 / 285+09		1996*	72	86	
231.84	231.89	SL-5 / 318+87	SL-5 / 321+66	280	1996*	481	573	
231.93	231.96	SL-5 / 324+19	SL-5 / 325+04	116	1996*	31	37	
233.95	233.95	SL-6 / 44+49	SL-6 / 44+89		1996*	63	75	
236.17	236.17	SL-6 / 161+61	SL-6 / 161+61		1996*	47	56	
236.77	236.77	SL-6 / 193+12	SL-6 / 193+12		1996*	60	71	
237.05	237.08	SL-6 / 208+21	SL-6 / 209+79	158	1996*	254	302	
237.60	237.62	SL-6 / 237+03	SL-6 / 238+34	132	1996*	258	307	
238.70	238.82	SL-6 / 295+17	SL-6 / 301+63	649	1996*	674	802	
238.91	239.75	SL-6 / 306+15	SL-6 / 350+80	4,467	1996*	11,264	13,410	
239.88	240.12	SL-6 / 357+28	SL-6 / 370+31	1,299	1996*	2,300	2,738	
240.18	240.18	SL-6 / 373+26	SL-6 / 373+40		1996*	44	52	
			То	tal Design	Volume:	44,690		
				Total Pay	Volume:	53,203		
			D	redging Vo	olume/yr:	1,444	су	
			50-yr Dre	dging Requ	irement:	72,204	су	
			irement:	155,240	су			

Table 2.2 Summary of Historic Maintenance Dredging/Recent Shoaling Intracoastal Waterway, St. Lucie County, 1959** - 1996

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.

** : 12-ft project depth established 1959 to Ft. Pierce (Cut SL-3S/Sta 0+00, ICWW mile 225.52), 1961 from

Ft. Pierce southward to Stuart.



survey and thus presently remains within the channel. Moreover, the relatively small volume of shoaling that has occurred has been largely restricted to three separate areas. Approximately 35 percent (18,804 cy) of the total shoal volume for the county occurs within the 1.1 miles north of the Seaway (S.R. A1A) Bridge, immediately north and south of the Ft. Pierce Harbor turning basin (Cut SL-2, sta 12+19 to Cut SL-3N, sta 11+10; ICWW mile 224.42 to mile 225.47). This area encompasses the single maintenance dredging operation recorded for the St. Lucie County segment of the Waterway (1972, pay volume - 2,381 cy). An additional 11,279 cy, representing 21 percent of the total volume of shoaling within the county, is located within 1.5 miles south of the Seaway Bridge (Cut SL-3S, sta 2+28 to Cut SL-5, sta 63+19; ICWW mile 225.57 to mile 227.00). The third area of shoaling is located within the 1.3 channel miles at the extreme south end of the county, immediately north of the St. Lucie/Martin County line (Cut SL-6, sta 306+15 to sta 373+40; ICWW mile 238.91 to mile 240.18), and represents 16,200 cy, or 31 percent of the county total. The remaining 13 percent (6.919 cy) of documented shoaling is in minimal shoals scattered throughout the remaining 17.8 channel miles within St. Lucie County, with the majority of the remainder (3,758 cy) in two shoals located near the north end of the county. The first, accounting for 1,320 cy, is located between ICWW mile 220.03 and mile 220.08 (Cut SL-1, sta 57+55 to 59+59). The second, accounting for an additional 2,438 cy, is located between ICWW mile 222.67 and mile 223.29 (Cut SL-1, sta 197+82 to 230+87).

Combining the maintenance dredging quantities and existing shoal volumes for the various segments of the ICWW within the county yields a total county-wide shoaling volume of 53,202 cy. Because the channel within St. Lucie County was deepened to its presently authorized depth in two stages, this total volume of shoaling reflects two periods of record — 38 years (1959–1996, inclusive) for the segment from Ft. Pierce northward (specifically, from Cut SL-3S, sta 0+00, ICWW mile 225.52 northward) and 36 years (1961–1996, 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 72,204 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 a 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 nonpay 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 155,240 cy.

Significantly, the projected 50-year material storage requirement for St. Lucie County of 155,240 cy represents by far the lowest projected storage requirement among the 10 counties addressed thus far in the FIND's long-ranged dredged material management program. 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, or a volume over 15 times that required by St. Lucie 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 St. Lucie County. Again, as revised by the results of the 1996 channel survey, Volusia County is projected to require a material storage capacity of St. Lucie 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 St. Lucie 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 St. Lucie 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 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 sediment characteristics. In this section, historical sediment quality information and additional sediment data recently collected for this Phase I study are evaluated. The section includes discussion of the distribution of fine *muck* sediments since accumulations of muck sediment have been identified in the ICWW channel in St. Lucie County and since contaminants have an affinity for the fine-grained sediments.

Historical Sediment Information

The Jacksonville District COE does not have any sediment quality information for the ICWW in St. Lucie 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 St. Lucie County (Seal et al., 1994), but none of the FDEP sampling stations are in the ICWW. Information about muck sediment distribution, as well as some limited contaminant information, 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* 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) took samples in the ICWW and adjacent areas near Ft. Pierce. Muck sediment was not present in any of the samples. In subsequent sampling spanning the entire length of the ICWW in St. Lucie County, Trefry et al. (1990) did not find any muck deposits north of Herman Bay Point. A one-half mile long deposit of thin (0.2–5.0 cm) muck was present at Herman Bay Point. A thick (> 30 cm), six-tenths

mile long muck deposit was present midway between Herman Bay Pt. and Nettles Island. Two thick muck deposits, each about one-half mile long, were present near Nettles Island.

Sediment Contaminants

As noted, neither the Corps of Engineers nor the FDEP have historical sediment contaminant data for the ICWW in St. Lucie County. Trefry et al. (1987) reported copper, lead, and mercury concentrations from six sediment samples taken from three stations in the ICWW south of Ft. Pierce. Normalizing the reported metal concentrations to aluminum as described by Schropp and Windom (1988), all of the metals were within predicted natural ranges, except for lead in one sample west of Middle Pt. The lead enrichment ratio in that sample was 1.18, indicating slight lead enrichment.

Recently Collected Data

Due to the lack of information about sediments in St. Lucie County, in 1995 Taylor Engineering collected and analyzed a limited number of sediment samples (9) 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 sediment. In 1997, in response to public concern about potential contaminants being carried into the ICWW from Taylor Creek, two additional samples were collected from shoals in the ICWW channel a short distance north and south of Taylor Creek. This section describes the results obtained from the sediment samples.

Sampling Methods and Analyses

Nine sediment samples were collected on October 11, 1995 from the designated ICWW channel throughout St. Lucie 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. 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. Two additional samples



Station	Date	Reach	ICWW Channel Mile	Analyses ^a	Latitude/ Longitude	Location ^b
SL-1-1	10/11/95	1	220.49	GS	27°31.650' N 80°20.418' W	R"150"
SL-1-2	10/11/95	1	223.23	GS	27°29.399' N 80°19.832' W	G"179"
SL-1-3	10/11/95	1	224.22	C, GS	27°28.532' N 80°19.587' W	R"182"
SL-2-1	10/11/95	2	225.84	C, GS	27°27.223' N 80°18.982' W	500 ft north of R"188"
SL-2-2	10/11/95	2	228.41	GS	27°25.038' N 80°18.067' W	G"193"
SL-2-3	10/11/95	2	232.05	GS	27°22.149' N 80°16.824' W	R"200"
SL-3-1	10/11/95	3	234.10	GS	27°20.518' N 80°16.040' W	R"206"
SL-3-2	10/11/95	3	236.22	GS	27°18.880' N 80°15.140' W	R"210"
SL-3-3	10/11/95	3	238.29	C, GS	27°17.244' N 80°14.230' W	R"214"
ICWW-TC-1	10/10/97	1	224.74	С	27°28.119' N 80°19.389' W	100 ft south of R"184A"
ICWW-TC-2	10/10/97	1	225.07	C	27°27.851' N 80°19.276' W	400 ft north of R"184"

Table 2.3 ICWW Sediment Sampling Locations in St. Lucie County

^aC = Chemistry, GS = Grain size

^bSamples were taken in the ICWW channel near the indicated channel marker.

were collected on October 10, 1997 from shoals in the ICWW a short distance north and south of Taylor Creek. These samples were analyzed for the same chemical constituents noted above and, additionally, organophosphorus pesticides. Locations of the latter two samples are shown in Figure 2.2 and listed in Table 2.3

Sediment was collected using a stainless steel petite Ponar grab sampler and transferred to precleaned 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. Environmental Protection Agency methods. Metals were analyzed by inductively-coupled plasma spectroscopy 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, organiccarbon 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, Trefry et al. (1990) and Trefry et al. (1987) reported that muck sediment was present in parts of the ICWW in southern St. Lucie County.

Mean grain size, silt and clay content, and water content of the St. Lucie County sediments are listed in Table 2.4. All of the samples are classified as fine or medium sand, with the exception of SL-3-2 and SL-3-3 in Reach 3, which are silts. Mean grain size was largest in Reach 1, with increasing amounts of finegrained material in the southern part of the county. Grain size was not measured in the 1997 samples (ICWW-TC-1, ICWW-TC-2). However, field observation indicated that the sediment consisted of fine sand and shell hash.

Stations SL-3-1, SL-3-2, and SL-3-3 were located in areas identified by Trefry et al. (1990) as containing muck deposits. Using Trefry et al.'s (1990) definition of muck (>65 percent silts and clays, >14 percent organic matter, and >60 percent water), none of these stations contained muck sediment during the recent sampling. Stations SL-3-2 and SL-3-3 did, however, contain higher concentrations of fine-grained material than other stations in St. Lucie County.

-	Mean Grain Size		USC ^a Size	Silt + clay	Water ^b	Organic Matter ^c
Station	(phi)	(mm)		(%)	(%)	(%)
SL-1-1	1.47	0.361	Fine Sand	1.5	NA ^d	NA
SL-1-2	1.33	0.397	Fine Sand	1.3	NA	NA
SL-1-3	0.29	0.819	Medium Sand	3.6	38	0.95
SL-2-1	2.04	0.242	Fine Sand	5.7	37	0.98
SL-2-2	2.93	0.131	Fine Sand	18.9	NA	NA
SL-2-3	2.62	0.163	Fine Sand	17.2	NA	NA
SL-3-1	1.52	0.350	Fine Sand	8.3	NA	NA
SL-3-2	4.10	0.058	Silt	50.5	NA	NA
SL-3-3	4.60	0.041	Silt	44.3	48	7.0
ICWW-TC-1			Fine sand ^d		28	0.4
ICWW-TC-2			Fine sand ^d		34	1.45

Table 2.4 Physical Characteristics of St. Lucie County ICWW Sediment

^aUSC = Unified Soil Classification

^bWater content = 100 - solids(%)

^cOrganic Matter = Total organic carbon * 2.5 (Trefry et al., 1990)

^dEstimated classification based on field observation

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 St. Lucie 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 St. Lucie County ICWW sediments are listed in Table 2.5. Most of the metal enrichment ratios in the tested samples were less than one, indicating that metals in these sediments are within natural ranges. Copper, lead, and zinc at Station SL-1-3, were, however somewhat enriched, with enrichment ratios ranging from 1.2 to 1.8.

Station	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercur y
SL-1-3	0.26	<0.56	0.58	1.78	1.26	< 0.80	1.21	<0.07
SL-2-1	0.12	< 0.39	0.26	<0.31	0.75	< 0.48	0.29	< 0.07
SL-3-3	0.05	< 0.30	0.38	0.25	0.60	< 0.30	0.40	0.16
ICWW- TC-1	0.23	<2.73	0.33	<0.56	0.94	<0.10	<0.44	<0.10
ICWW- TC-2	0.13	<1.52	0.22	<0.19	0.44	<0.10	0.27	<0.10

Table 2.5 Metal Enrichment Ratios

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, including those that slightly exceed natural ranges, are below the TEL, indicating that they are unlikely to cause adverse biological effects. Thus, metal contaminants do not appear to be a problem in the tested sediments.

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 - 4.4	<0.14 - <0.76	5.0 - 34	<3.5 - 11.0	2.3 - 15	<5.5 - <7.7	<2.8 - 25	<0.014 - 0.033

Table 2.6 TEL, PEL, and Measured Values (µg g⁻¹) for Metals

Organochlorine pesticides, PAH, PCB, and organophosphorus pesticide concentrations were below the practical quantitation limit (reporting limit) in all samples. The specific compounds analyzed and their reporting limits are listed in Appendix E¹. In the 1997 samples, the laboratory noted that the results for six PAH—benzo(a)anthracene, chrysene, fluoranthene, indeno(1,2,3-cde)pyrene, phenanthrene, and pyrene fell between the reporting limit and the lower method detection limit. These results, tagged with a "J" code in Appendix E, indicate that the compounds may be present in the sediment at concentrations too low to be reliably quantified.

• 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 St. Lucie County 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. Stations SL-1-3 and SL-2-1 contained carbon and nitrogen concentrations typical of those in natural Florida sediments. Station SL-3-3, located in an area of fine sediments in Reach 3, appeared enriched in nitrogen relative to carbon. The two stations near Taylor Creek — ICWW-TC-1 and ICWW-TC-2 — also contained carbon and nitrogen in typical ranges.

¹The laboratory data sheets in Appendix E contain the results of two separate analyses using two separate methods (8100 and 8310) for PAH in the 1997 samples. Lower detection limits were achieved using method 8310. The results discussed above are from the method 8310 analyses reported on 05 NOV 97.


Figure 2.3 Organic Carbon and Nitrogen in St. Lucie County ICWW Sediment

Oil and grease in sediments have natural as well as pollutant origins. Oil and grease values in the St. Lucie County ICWW sediments ranged from than 18 to 23 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 St. Lucie 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. Total petroleum hydrocarbons, a measurement similar to oil and grease, was measured in the 1997 samples. The low values, 19 mg kg⁻¹ and 17 mg kg⁻¹ in ICWW-TC-1 and ICWW-TC-2 respectively, indicate that these sediments are not contaminated with hydrocarbons.

• Summary

ICWW sediments in St. Lucie County have variable physical texture. Recent samples and previous work indicate that some fine-grained sediment has accumulated in the ICWW channel in Reach 3. Although none of the samples collected for this project can be classified as muck, two of those in Reach 3 do fall within the silt size range typical of muck.

The sediment samples taken for this project were collected from areas considered most likely to be contaminated due to the presence of fine sediments and proximity to urban areas. These samples, and limited historical information, suggest that sediment in the St. Lucie County part of the ICWW do not contain substantial quantities of contaminants. Metal concentrations were within predicted natural ranges except at station SL-3-1 in the northern part of Reach 1 where copper, lead, and zinc slightly exceeded predicted natural limits. The measured metal concentrations were, however, well below values considered to pose a threat to aquatic organisms. No organic contaminants were detected above the laboratory reporting limit in any of the sediments tested. Oil and grease concentrations, or the similar total petroleum hydrocarbon concentrations, were low. Nutrient concentrations were generally low and within typical estuarine ranges, although nitrogen was enriched relative to carbon at station SL-3-3. Thus, these limited data indicate that ICWW sediments in St. Lucie County, including those near Taylor Creek, do not contain substantial quantities of contaminants.

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 St. Lucie 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 0.041 mm to 0.819 mm. Seven of the nine samples were classified as fine to medium sand under the Unified Soils Classification (USC) system (i.e., possessing a mean grain diameter greater than 0.074 mm). These include the three samples taken north of the North Beach Causeway (Samples SL-1-1, SL-1-2, and SL-1-3), as well as the first four samples taken south of the Seaway (S.R. A1A) Bridge (Samples SL-2-1, SL-2-2, SL-2-3, and SL-3-1). The remaining two samples (SL-3-2 and SL-3-3) located toward the south end of the county, and the two most distant from Ft. Pierce Inlet, 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 SL-1-3, located immediately north of the North Beach Causeway. The coarsest sediments in terms of possessing the smallest component of silt-size particles were found further to the north at Stations SL-1-1 and SL-1-2. However, all three of the samples taken north of the North Beach Causeway contained less than four percent silt-sized particles. In addition, all three of these samples contained a significant component of shell, ranging from 29 to 55 percent of the

sample by weight. In contrast, the two samples — SL-3-2 and SL-3-3 — classified as silt by their mean grain diameter under the UC system, contained 50 and 44 percent silt-sized particles, respectively. Both of these samples contained negligible shell fractions (less than two percent). The remaining four samples from the central portion of the county were intermediate between the extreme values, possessing from 5.7 to 18.9 percent silt, and 7 to 50 percent shell.

Of the nine sampling locations, only Station SL-2-1, one of the stations that produced relatively coarse material, and Station SL-3-3, the station that produced the finest sediment of the nine samples analyzed, are 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 as part of preparing the bid specification package before contracting procedures begin. Sediment chemistry typically is not analyzed unless such data is required to obtain the necessary Water Quality Certificate from the Florida FDEP.

2.2 Existing Sites

Review of Jacksonville District COE Real Estate Maps (Drawing No. RE-C 12,214) and 1994 FIND aerial basemaps (1" = 200 ft) of the project area reveals that the FIND controls six tracts designated for the placement of dredged material. These are identified in Table 2.7 and shown in Figure 2.4. All are publicly owned parcels, totalling 3,711 acres, under perpetual easement. Except in the immediate vicinity of Ft. Pierce Inlet, all of these tracts are 1,250 ft wide, adjoining and parallel to the 500-ft right-of-way that encompasses the Waterway channel, and consist primarily of open water. Those north of the inlet also contain a number of relic spoil islands, typically less than five acres in size. These islands, dating from the early history of the Waterway, resulted from the unconfined placement of dredged material immediately adjacent to the dredging site. Two of the easements adjacent to Ft. Pierce Inlet — MSA SL-6 and MSA SL-7 — are more irregular in shape and, in addition to small relic spoil islands, also contain mangrove or salt marsh areas (Coon Island), as well as portions of the North Beach Causeway. The two easements south of the inlet — MSA SL-3 and MSA SL-4 — extend from just south of the Seaway Bridge southward over 14 miles to the St. Lucie/Martin County line. Except for intermittently exposed sand bars that likely resulted from historic unconfined placement of dredged material, these easements are entirely open water.

F.I.N.D. Designation	C.O.E. Tract No.	ICWW Mile	Total Acreage	Useable Upland Acreage	Containment Capacity (cy)	Comments
MSA SL-1	410	218.48-219.46	157.82	0	0	Open water
MSA SL-2	411	218.48-225.22	852.33	5.8	14,921	Useable upland on island partly in MSA SL-7
MSA SL-3	413	225.87-227.99	213.07	0	0	Open water
MSA SL-4	414	227.99-240.18	1,836.55	0	0	Open water
MSA SL-6	8801E	224.36	475.63	0	0	Major portion revoked, remaining area open water
MSA SL-7	8800E	225.49	175.60			See MSA SL-2

Table 2.7 Inventory of Disposal Easements, Intracoastal Waterway, St. Lucie County, Florida

A preliminary evaluation of the six disposal easements 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 one site, consisting of a single spoil island partially contained within each of two adjacent easements — MSA SL-2 and MSA SL-7. The full range of site evaluation criteria are presented in detail in Section 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 four of the six tracts were eliminated because they consist almost entirely of open water. The minimal spoil islands they do contain possess insufficient contiguous upland area (e.g., less than five acres) to allow their development and use as permanent dredged material management facilities.



As identified in Figure 2.4, only a single spoil island partially contained within each of two adjacent easements — MSA SL-2 and MSA SL-7 — was considered as possessing some potential for future use and therefore meriting further evaluation. This results less from the site's conforming to the appropriate management concept for this segment of the Waterway (discussed in Chapter 3.0) than from the site's having received the material from the single (1972) maintenance dredging operation performed in St. Lucie County since the present project depths were established. In the remainder of this section, the methodology and results of the additional evaluation of this single site are discussed in more detail.

2.3 Existing Storage Capacity

To further evaluate the single spoil island determined to possess some potential for future use, an analysis was performed to determine its maximum potential material storage capacity. The useable upland area of the island was first estimated by inspection of the 1994 FIND aerial basemaps (1'' = 200 ft), guided by color-infrared photography, and USFWS wetland inventory maps. As discussed in Section 3.4, this initial estimate of useable upland area was later refined by on-site inspection. 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-ft 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 4 ft. 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 single spoil island contained within easements MSA SL-2/SL-7, small upland acreage (5.8 acres) and low mean grade elevation (estimated to be +3.0 ft NGVD) restricted the available dike material, and thereby limited the height of the dike crest to 6 ft above the existing grade. The result of the preliminary capacity analysis, presented in Table 2.7, indicates that the maximum capacity achievable within Site MSA SL-2/SL-7 is 14,921 cy.

Comparison of the estimated capacity of the single site within existing easements (14,921 cy) with the 50-year projected capacity requirement for the St. Lucie County segment of the ICWW (155,240 cy, Table 2.2) shows that the existing capacity falls far short of the long-term requirement. The single site representing the total capacity within existing easements — MSA SL-2/SL-7 — is located within one of the three channel segments within St. Lucie County in which shoaling has been concentrated (Section 2.2), i.e., the segment of the channel adjacent to Ft. Pierce Harbor immediately north of the Seaway (S.R. A1A) Bridge. However, even in this limited area, the existing capacity does not meet the project's long-term need. Moreover, the continued use of this site may not be the most cost-effective and operationally efficient means of meeting the long-term needs of the ICWW in St. Lucie County.

The lack of sufficient 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 St. Lucie County, in turn, dictate the criteria by which these sites are identified and evaluated. The characteristics of this plan — the *Management Concept* — 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 St. Lucie 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. As has become apparent, 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 St. Lucie County

The central issue guiding the development of a management concept for the ICWW in St. Lucie 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 St. Lucie County.

Ocean disposal of material dredged from the ICWW is not a realistic option for the St. Lucie 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 St. Lucie 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, particularly in the segment of the Waterway south of the inlet with an authorized depth of -10 ft MLW. Regulatory restrictions on hopper overflow during filling further limit hopper capacity. These barges must then proceed to Ft. Pierce Inlet for passage to sea. Once reaching the inlet the material must then be transferred to deep draft seagoing barges for transport to the authorized 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 Ft. 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.

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 St. Lucie County.

The third material management alternative considered for St. Lucie County is beach placement. Beach placement — 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. However, at Ft. Pierce Inlet the greater depths within the Ft. Pierce Harbor turning basin likely act as a sediment trap and limit the deposition of sand introduced though the inlet in the adjacent ICWW channel. The two causeways immediately north and south of the inlet further limit the spread of littoral material. As discussed in Section 2.1.3, no sediment samples were taken from the Waterway channel immediately adjacent to the turning basin. Samples taken north of the North Beach Causeway and immediately south of the Seaway Bridge suggest that at least some of the sediment within the ICWW channel may potentially be suitable for beach placement. However, because of the inlet's restricted impact as a source of ICWW shoal material, most shoal material that enters the ICWW channel is likely derived from upland sources or the redistribution of sediment already within the Indian River estuary. As a result, the future compatibility of material dredged from the Waterway within St. Lucie County with native beach sands is uncertain. Prudence dictates that within St. Lucie 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 St. Lucie County segment of the Waterway, 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.

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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 St. Lucie County

The preceding discussion leads to the following definition of the dredged material management concept for the Intracoastal Waterway in St. Lucie County:

- 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 as the following narrative illustrates. Local interests in St. Lucie

County have suggested the use of material from the ICWW channel to fill submerged borrow areas south of Causeway Island in order to restore its natural (pre-dredging) bathymetry and recreate shallow water habitat suitable for sea grasses or other submerged aquatic vegetation. As discussed above, such beneficial use provides only for a single channel maintenance operation or a limited number of operations until the desired depths are restored. Future channel maintenance would then depend on securing additional long-term storage capacity at a time when the options will likely be even more limited. Moreover, the dredged material could not be transported directly from the dredging site to the open water placement area without elaborate measures to contain the turbidity produced by the dredged slurry discharge. A more reasonable alternative would be to transfer dewatered dredged material from a containment basin to the placement site. The turbidity produced by open water placement of the dredged material could then be more effectively controlled by turbidity screens. Thus, the beneficial use of the dredged material cannot eliminate the need to secure a permanent containment facility.

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 6.22 miles to 8.44 miles in length, were defined within the St. Lucie 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 organize the previous summary of historic dredging events and recent shoaling as presented in Table 2.2 by channel reach. Also presented in Table 3.2 are estimates of the historic and 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.



Reach	From	To	Length (mi)
Ι	Indian River/St. Lucie Co. Line ICWW Mile 218.46 Cut IR-35/Station 31+50	Seaway (S.R. A1A) Bridge ICWW Mile 225.52 Cut SL-3S/Station 0+00	7.05
п	Seaway (S.R. A1A) Bridge ICWW Mile 225.52 Cut SL-3S/Station 0+00	Hutchinson Island Nuclear Power Plant ICWW Mile 233.96 Cut SL-6/Station 45+00	8.44
ш	Hutchinson Island Nuclear Power Plant ICWW Mile 233.96 Cut SL-6/Station 45+00	St. Lucie/Martin Co. Line ICWW Mile 240.18 Cut SL-6/Station 373+40	6.22
		TOTAL	21.71

Table 3.1 Delineation of Operational Channel Reaches, Intracoastal Waterway, St. Lucie County



		Fight I	Prev	ious Maintenance/Rec	ent Shoaling**	8					Reach Sumr	пагу	
												50-yr	
							a a 1510					Unbulked	50-yr Storage
	ICWW	Mileage	Cut	Station	Length		Design Vol.	Pay Vol.	Total Vol.	Vol/Yr	Vol/Yr/Mi	Vol.	Requirement
Reach	From	То	From	То	(ft)	Year	(cy)	(cy)	(cy)	(cy)	(cy)	(cy)	(cy)
I: Indian River/St. Lucie County	220.01	220.05	SL-1 / 57+55	SL-1 / 59+59	206	1996*	1,109	1,320					
Line to Seaway (S.R. A1A) Bridge	220.13	220.14	SL-1 / 63+74	SL-1 / 64+21	48	1996*	194	230					
ICWW Mile 218 46 to 225 52	222.27	222.27	SL-1 / 176+99	SL-1 / 176+99		1996*	39	46					
	222.67	223.03	SL-1 / 197+82	SL-1 / 216+85	1,901	1996*	1,463	1,742					
	223.14	223.29	SL-1 / 222+78	SL-1 / 230+87	808	1996*	585	696					
	223.35	223.37	SL-1 / 234+04	SL-1 / 234+85	79	1996*	92	109					
	223.42	223.43	SL-1 / 237+81	SL-1 / 238+14	32	1996*	76	91					
	223.91	223.91	SL-1 / 263+32	SL-1 / 263+32		1996*	54	64					
	224.42	224.50	SL-2 / 12+19	SL-2 / 16+21	401	1996*	1,468	1,747					
	224.68	224.78	SL-2 / 25+77	SL-2 / 31+07	533	1996*	1,271	1,513					
	224.87	225.19	SL-2 / 35+64	SL-2 / 52+87	1,721	1996*	9,970	11,869					
	225.42	225.44	SL-3N 9+19	SL-3N 9+89	71	1996*	1,087	1,294					
	225.43	225.47	SL-3N / 9+50	SL-3N / 11+50	211	1972	2,000	2,381	23,103	608	86	30,399	65,358
II: Seaway (S.R. A1A) Bridge to	225.57	225.57	SL-3S / 2+28	SL-3S / 2+75		1996*	39	46					
Hutchinson Island Nuclear Power	225.67	225.67	SL-3S / 8+01	SL-3S / 8+01		1996*	69	82					
Plant ICWW Mile 225 52 to	225.75	225.77	SL-4 / 1+38	SL-4 / 2+66	127	1996*	493	587					
233.06	225.82	225.82	SL-5 / 1+01	SL-5 / 1+01		1996*	21	25					
255.90.	226.22	226.25	SL-5 / 22+36	SL-5 / 23+80	143	1996*	149	177					
	226.38	227.00	SL-5 / 30+50	SL-5 / 63+19	3,268	1996*	8,704	10,362					
	227.09	227.09	SL-5 / 67+84	SL-5 / 67+84		1996*	56	67					
	227.18	227.18	SL-5 / 72+69	SL-5 / 72+69		1996*	77	92					
	229.96	229.97	SL-5 / 219+50	SL-5 / 220+04	53	1996*	128	152					
	231.20	231.20	SL-5 / 285+09	SL-5 / 285+09		1996*	72	86					
	231.84	231.89	SL-5 / 318+87	SL-5 / 321+66	280	1996*	481	573	1				
	231.93	231.96	SL-5 324+19	SL-5 325+04	116	1996*	31	37					
	233.95	233.95	SL-6 / 44+49	SL-6 / 44+89		1996*	63	75	12,362	343	41	17,170	36,916
III: Hutchinson Island Nuclear	236.17	236.17	SL-6 / 161+61	SL-6 / 161+61		1996*	47	56					
Power Plant to St. Lucie/Martin	236.77	236.77	SL-6 / 193+12	SL-6 / 193+12		1996*	60	71					
County Line ICWW Mile 222.06	237.05	237.08	SL-6 / 208+21	SL-6 / 209+79	158	1996*	254	302					
to 240 18	237.60	237.62	SL-6 / 237+03	SL-6 / 238+34	132	1996*	258	307					
10 240.18.	238.70	238.82	SL-6 / 295+17	SL-6 / 301+63	649	1996*	674	802					
	238.91	239.75	SL-6 / 306+15	SL-6 / 350+80	4,467	1996*	11,264	13,410					
	239.88	240.12	SL-6 / 357+28	SL-6 / 370+31	1,299	1996*	2,300	2,738					
	240.18	240.18	SL-6 / 373+26	SL-6 / 373+40		1996*	44	52	17,737	493	79	24,635	52,966

Table 3.2 Summary of Historical Maintenance Dredging/Recent Shoaling by Channel Reach, Intracoastal Waterway, St. Lucie County, 1959 - 1996

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.

** : 12-ft project depth established 1959 to Ft. Pierce (Cut SL-3S/Sta 0+00, ICWW mile 225.52), 1961 from Ft. Pierce southward to Stuart.

The northernmost reach, Reach I, extends from the Indian River/St. Lucie County line (Cut IR-35, sta 31+50, ICWW mile 218.46) southward 7.05 miles to the Seaway (S.R. A1A) Bridge (Cut SL-3S, sta 0+00, ICWW mile 225.52). In addition to the northern portion of the project area, Reach I also includes the channel segment adjacent to Ft. Pierce Inlet and the Ft. Pierce Harbor Project and turning basin. The single maintenance dredging operation performed in the St. Lucie segment of the ICWW since the present project depths were established took place at the extreme south end of this reach. As noted in Section 2.2, additional shoals, with a total volume of 20,722 cy were identified by the 1996 channel survey channel. Almost 80 percent (16,423 cy) of this material is located within the 1.1 miles north of the Seaway (S.R. A1A) Bridge, immediately north and south of the Ft. Pierce Harbor turning basin (Cut SL-2, sta 12+19 to Cut SL-3N, sta 11+10; ICWW mile 224.42 to mile 225.47). The one site within existing easements that was determined to have any potential for continued use and therefore merited additional evaluation - MSA SL-2/SL-7 — is located in this same area. As discussed in Section 2.3, this site was evaluated as a candidate site primarily because it received the dredged material from the 1972 maintenance operation, not because it conformed to long-term program objectives. Combining the volume of material removed in the 1972 maintenance operation with the volume of shoals documented by the 1996 channel survey yields a total in situ shoaling volume for Reach I of 23,103 cy. By the methodology described in Section 2.1, this in situ volume translates to a projected 50-year material storage requirement for this reach of 65,358. The maximum capacity of Site MSA SL-2/SL-7 (14,921 cy) represents less than 23 percent of this long-term reach requirement.

Reach II, the middle channel reach, extends southward 8.44 miles from the Seaway Bridge in Ft. Pierce to a point opposite the southern edge of the Hutchinson Island Nuclear Power Plant (Cut SL-6, sta 45+00; ICWW mile 233.96). The 1996 channel survey documented a total in situ shoal volume of 12,362 cy, yielding a projected 50-year material storage requirement of 36,916 cy. Over 90 percent (11,279 cy) of the in situ volume of shoaling for the reach is located within 1.5 miles south of the Seaway Bridge (Cut SL-3S, sta 2+28 to Cut SL-5, sta 63+19; ICWW mile 225.57 to mile 227.00). Existing easements within this reach consist almost entirely of open water and, as a result, were determined to have no existing storage capacity and no potential for development as permanent dredged material management areas.

Reach III, the southernmost reach, extends from the Hutchinson Island Nuclear Power Plant southward 6.22 miles to the St. Lucie /Martin County line (Cut SL-6, sta 373+40; ICWW mile 240.18). The projected 50-year material storage requirement for this reach is 52,966 cy, based on a total shoal volume of

17,737 cy documented by the 1996 channel survey. Over 90 percent (16,200 cy) of the total in situ volume of shoaling for the reach is contained within its southernmost 1.3 miles channel miles, immediately north of the St. Lucie/Martin County line (Cut SL-6, sta 306+15 to sta 373+40; ICWW mile 238.91 to mile 240.18). As in Reach II, all of the existing easements within Reach III consist entirely of open water and demonstrate no potential for future use.

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 St. Lucie County. As discussed in Section 2.3, the storage capacity of the single realistic site within the existing easements (14,921 cy) falls far short of the projected 50-year requirement for St. Lucie County (155,240 cy), as well as the projected 50-year storage requirement of the reach in which the single existing site lies (Reach I – 65,358 cy). Therefore, to meet established program criteria and provide for the long-term maintenance of the St. Lucie 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 St. Lucie County and the City of Ft. Pierce were also used to guide site identification. By these resources a total of 25 alternative candidate sites — or from three to 12 sites within each reach — were selected. Of these, 21 resulted from the first round of site identification. The remaining four alternative candidate sites were identified during the site inspection process, the Technical Advisory meetings, the Citizens' Advisory Committee meetings, or other collateral contacts. All 25 alternative candidate sites, as well as the one site within existing easements with potential for continued use, 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 22 candidate sites initially identified, including the one site within existing easements that was initially considered for further evaluation, was performed during November 1995. Inspection of the remaining four sites, identified later in the site evaluation process, was completed in March 1996. 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 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 photogrammetry and groundtruthing 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 (and in some cases, 1992) St. Lucie 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-wheeldrive 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 South Florida Water Management District (SFWMD) 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. Because the projected material storage requirements for each of the three reaches is relatively low, each site need only provide a containment basin of 10 acres — determined to be the minimum size for efficient site construction and operation — to meet or exceed the required capacity. As discussed in Section 4.1, additional acreage is typically required surrounding the containment basin to separate the basin from adjacent properties. However, at this preliminary stage the maximum site acreage was retained to provide the greatest

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Reach	Site	Location (ICWW Mile)	Mapped Area (ac)	Containment Area (ac)	Capacity (cy)	Max. Pumping Distance (mi)	Comp. Plan Designation	Predominant Habitat	Limiting Factors
	SL-1	218.48	74.3	29.3	418,817	7.36	RU/RC	Citrus	Pumping Distance
	SL-2	218.75	161	75.2	1,309,466	7.36	RU/RC	Citrus	Pumping Distance
	SL-3	219.52	53.1	15.9	158,943	6.70	Mixed	Citrus	
	SL-4	218.84	410.8	120.5	2,101,772	5.94	RU/C _{Pub}	Tropical Hardwoods, Mangroves	Adjacent Land-Use
	SL-5	220.89	73.1	N/A	N/A	6.72	RH	Mangroves/Mixed Wetlands	Inadequate Upland
I	SL-6	220.55	46.9	N/A	N/A	5.36	RU/RC	Pine Flatwoods/Forested Wetlands	Inadequate Upland
Indian River/St. Lucie Co. Line to Seaway (S.R. A1A) Bridge	SL-7	222.14	61.3	18.6	239,140	4.42	Com./Mixed	Golf Course, Upland Forest	Commercial Development
ICWW Mile 218.46 to 225.52	SL-8	224.91	72.7	19.5	250,034	6.7	Utl./Ind./Com.	Disturbed Land	Commercial/Port Development
	SL-20	219.56	64.9	13.2	95,298	7.18	Mixed/Com.	Disturbed Land	Harbor Branch Expansion
	SL-21	221.43	51.9	10.3	59,679	4.55	Mixed/Com.	Disturbed, Herbaceous	Pipeline Access
	SL-22	220.55	28.3	N/A	N/A	5.12	Mixed	Mangroves	Mosquito Impoundment
	SL-23	220.88	40.7	N/A	N/A	5.05	Mixed	Mangroves	Mosquito Impoundment
	SL-23A	221.02	51.1	25.7	441,815	5.23	Mixed	Brazilian Pepper/Disturbed Wetlands, Pine Flatwoods	Low Site Elevation with Some Wetland Char.
	MSA SL-2/7	224.97	5.8	3.3	14,921	6.72	·	Non-Native Vegetation	Inadequate Area

Table 3.3 Candidate Sites, Long-Range Dredged Material Management Plan, St. Lucie County (page 1 of 2)

Reach	Site	Location (ICWW Mile)	Mapped Area (ac)	Containment Area (ac)	Capacity (cy)	Max. Pumping Distance (mi)	Comp. Plan Designation	Predominant Habitat	Limiting Factors
	SL-9	225.19	114.1	51.5	892,468	8.78	Mixed/Com.	Disturbed, Non-Native Veg.	
	SL-11	227.95	53.9	N/A	N/A	6.04	RS	Disturbed/Forested Upland	Inadequate Upland
	SL-12	228.71	32.4	N/A	N/A	5.09	RS	Residential/Forested Upland	Inadequate Area
П	SL-13	231.19	337.1	61.7	765,476	5.50	C _{Pub}	Herbaceous/Forested Upland	Public Acquisition
Seaway (S.R. A1A) Bridge to Hutchinson Is. Nuclear Power Plant	SL-24	233.53	78.3 (w/SL-25)	N/A	N/A	6.59	RC	Mangroves	Mosquito Impoundment
ICWW Mile 225.52 to 233.96	SL-25	233.96	78.3 (w/SL-24)	N/A	N/A	6.33	RC	Mangroves	Mosquito Impoundment
	SL-26	233.96	70.8	20.4	290,500	9.66	Trans./Util.	Disturbed upland, spoil area	FPL/Hutchinson Island Nuclear Power Plant
	SL-27	229.10	42.8	N/A	N/A	5.09	RU	Mangroves	Inadequate Upland
	SL-28	227.47	103.9	35.9	224,126	5.93	C _{Pub}	Mangroves	Mosquito Impoundment
ш	SL-17	237.46	23.7	N/A	N/A	4.48	RS	Upland Hardwoods	Inadequate Area
Hutchinson Is. Nuclear Power Plant to St. Lucie/Martin County	SL-19	239.09	11	N/A	N/A	6	RS	Residential/Open Land	Inadequate Area
ICWW Mile 233.96 to 240.18	M-8	236.31	53.9	14.9	191390	4.26	RS	Herbaceous/Forested Upland	

Table 3.3 Candidate Sites, Long-Range Dredged Material Management Plan, St. Lucie County (page 2 of 2, continued)

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 26 candidate sites, including the 25 newly identified sites and the one site within existing easements, was accomplished by assessing the ability of each site to satisfy a standard set of evaluation criteria. Through this process a group of five sites was selected to form a site bank serving the three reaches of the Intracoastal Waterway channel within the St. Lucie County project area. The site bank consists of three primary (first-choice) sites and three secondary (second-choice) alternatives for the long-term management of dredged material removed from ICWW channels. One primary site — Site SL-26 in Reach II — also serves as a secondary alternative for Reach III under a different management approach.

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 St. Lucie 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, Site SL-26 — designated the primary site for Reach II — also serves as the secondary site for both Reaches II and III. In the secondary role, the capacity of Site SL-26 is expanded to meet the combined material storage requirements of the two reaches.

- 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 marsh 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 South Florida Water Management District (SFWMD). 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, all existing data indicates that the Waterway channel sediments in St. Lucie 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

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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 five sites were selected to form the site bank to serve the three reaches of the Intracoastal Waterway channel within the St. Lucie 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 three sites provide secondary dredged material management alternatives should use of one or more of the primary sites prove infeasible. One primary site



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 Indian River/St. Lucie County Line to Seaway (SR A1A)Bridge	SL-2 Primary	218.74	161.0	10.0	42.5	70,793	7.36	RU/RC	RS-2 R/C	Citrus Groves
ICWW Mile 218.46 to 225.52	SL-23A Secondary	221.02	51.1	10.0	42.5	70,768	5.23	Mixed	Ш	Disturbed Uplands/Wetlands, possible joint use site (FIND and Port of Ft. Pierce)
II Seaway (SR A1A) Bridge to Hutchinson Is. NPP	SL-26 Primary	233.95	70.8	10.0	13.3	40,653	9.66	Trans./Util	Util.	Hutchinson Island Nuclear Power Plant, proposed joint use site (FIND and FPL)
ICWW Mile 225.52 to 233.96	SL-9 Secondary	225.62	114.1	10.0	30.4	40,392	8.78	Mixed/Com.	RMHI/CG	Causeway Island
III Hutchinson Is. NPP to St. Lucie/Martin Co. Line	M-8 Primary	236.30	53.9	10.0	32.1	56,453	4.26	RS	RE-2	Containment facility can be restricted to southern half of property (Parcel A) already controlled by FIND
ICWW Mile 233.96 to 240.16	SL-26 (expanded) Secondary	233.95	70.8	10.0	13.3	100,138	8.78	Trans./Util.	Util.	Capacity increased to serve both Reaches II & III, increased capacity gained by added dike height

Table 4.1 Site Bank, Long-Range Dredged Material Management Plan, Intracoastal Waterway, St. Lucie County

- Site SL-26 in Reach II - also serves as a secondary alternative for Reach III under a different management approach.

Each of the three channel reaches within the St. Lucie County project area has been assigned one primary and one secondary site. As their names imply, these five sites represent the three best and three second-best alternatives after consideration of all engineering, operational, environmental, and socioeconomic factors influencing site selection. In each case, both the primary and secondary sites are well-suited to serve the requirements of their designated channel reach.

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 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 SL-2 has been designated the primary site, while Site SL-23A has been designated the secondary site. Site locations are shown in Figure 4.2. Site SL-2, located at the northern end of Reach I, contains both active citrus groves and former grove areas. Because of the previous agricultural


disturbance, development of Site SL-2 as a permanent dredged material management area would carry minimal environmental constraints. The site lies between Old Dixie Highway and the Florida East Coast (FEC) Railway to the west and impounded wetlands bordering the Indian River to the east and thus is likely to remain relatively isolated from future development. Moreover, Site SL-2 contains sufficient disturbed upland to allow the required 10-acre containment basin to be positioned nearer the eastern edge of the grove area and thereby further isolate the site. The site can also 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 SL-3, a second citrus grove located just south of Site SL-2, shares many characteristics with Site SL-2 and would appear to be preferable to SL-2 based on its slightly more central location. However, preliminary discussions with the Harbor Branch Foundation, owner of Site SL-3, indicate that this property figures prominantly in the future expansion of the Harbor Branch Oceanographic Institute, and the foundation would strongly oppose FIND's acquisition of this property. In contrast, the owner of Site SL-2 has indicated a willingness to work with the FIND in the negotiated purchase of an appropriate portion of the property. As a result, Site SL-2 is retained as the primary site to serve Reach I, while Site SL-3 is removed from further consideration.

Site SL-23A will serve as the secondary site for Reach I. Compared to Site SL-2, Site SL-23A carries the advantage of being more centrally located within the reach, thus reducing the pumping distance required to transport dredged material from Reach I's southern end. This is a key factor considering, as discussed in Section 3.2, that 90 percent of the shoaling documented within Reach I has occurred in the reach's southernmost 1.1 miles. Moreover, some members of the St. Lucie County staff support FIND's development of Site SL-23A to be used jointly with the Port of Ft. Pierce. However, preliminary environmental surveys of the property have indicated that a portion, perhaps a significant portion, of the site consists of wetlands. Because of the level of previous disturbance, a formal agency wetland delineation would be required to determine the extent of on-site wetlands, and the wetland impacts and mitigation requirements resulting from site development. Prudence dictates that, because of its permitting uncertainties, Site SL-23A should be retained as the secondary alternative for Reach I despite its more central location within the reach compared to primary Site SL-2. All other, more centrally-located candidate sites within Reach I would involve excessive wetland impacts or carry other environmental constraints, or suffer from conflicting adjacent land uses. Notably, the one candidate site contained within existing easements - Site MSA SL-2/SL-7 — is located adjacent to the area of documented shoaling within Reach I's southernmost 1.1 miles. However, as discussed in Section 2.3, its capacity represents less than 23 percent of projected 50year storage requirement for Reach I. Moreover, off-loading material from the island site to allow its

continued use presents operational difficulties akin to the original dredging. Thus, continued use of Site MSA SL-2/SL-7 is not consistent with the FIND's objective of providing long-term dredged material management capability.

Site SL-26 has been designated as the primary site within Reach II, while Site SL-9 will serve as the secondary option. Located at the extreme southern end of Reach II (Figure 4.3), Site SL-26 lies within an undeveloped portion of Florida Power and Light Company's Hutchinson Island Nuclear Power Plant property. FPL has acknowledged a need to maintain a channel from the ICWW through Big Mud Creek to its nuclear facility and will require an expanded dredged material containment facility to support a maintenance dredging operation. The FIND sees this need as an opportunity to enlist FPL's participation in the development of a containment facility on the Hutchinson Island property that could serve both FPL's requirements and the long-term requirements of Reach II of the Waterway. Development of Site SL-26 in this manner will require a joint use agreement negotiated between FPL and the FIND. The proposed 10-acre containment facility would most likely be placed in the same area in which FPL had previously constructed a rudimentary containment basin used to receive material dredged from the power plant's cooling water discharge canals. Therefore, redevelopment of a permanent containment facility in this same area to the standards set by the FIND and the Jacksonville District Corps of Engineers should carry few environmental constraints. Site SL-9, the designated secondary option to serve Reach II, is located in the southwest corner of Causeway Island at the extreme northern end of the reach. Similar to Site SL-26, the proposed location of the Site SL-9 containment basin is centered on an area of previous unconfined dredged material placement and thus carries minimal environmental liabilities. Moreover, its location on the Indian River shoreline provides excellent pipeline access. Use of Site SL-9 has initially been opposed by the City of Ft. Pierce as being inconsistent with its plan for downtown redevelopment. This opposition comes in spite of the apparent need of the city to maintain its municipal marina, located on the opposite side of Causeway Island, and FIND's initial offer for possible joint use of the SL-9 facility with the city. However, the Port of Ft. Pierce has more recently expressed an informal interest in a possible joint use arrangement should FIND proceed with Site SL-9. Notably, because both Site SL-26 and Site SL-9 are located at the opposite ends of Reach II, use of either site would involve less than optimal pumping distances to transport material to either site from the reach's opposite end. Development of any of the other candidate sites more centrally located within Reach II would carry unacceptable environmental impacts. Use of both Site SL-26 and Site SL-9 to jointly serve Reach II would significantly reduce this distance. However, either site is individually capable of meeting the requirements of the reach.



Within Reach III, Site M-8 will serve as the primary dredged material management alternative (Figure 4.4). The secondary option is to increase the capacity of Site SL-26 to meet the combined storage requirements of Reaches II and III. Site M-8 was previously investigated as part of the development of a dredged material management plan for the Waterway in Martin County. Recognizing the extremely limited site options in this portion of St. Lucie County, the FIND has already acquired the southern 32.1 areas of Site M-8 (designated Parcel A) and holds a purchase option on the remaining 21.8 acres. As shown in Table 3.3, the present plan development process failed to identify any other viable candidate sites within Reach III of St. Lucie County. Preliminary evaluation has shown that site development can be restricted to Parcel A and still provide the capacity necessary to meet the requirements of Reach III as well as adequate if not optimal buffers to surround the containment basin. Community interests, seeking to enlist FIND's cooperation in developing a park to provide public access to the Indian River, may lead the FIND to acquire Parcel B for its containment facility and dedicate much of Parcel A for public use. Either alternative can provide the needed dredged material storage capability but will involve impacts to a mix of native vegetation communities including temperate hardwoods, herbaceous rangeland, and sand live oak. Gopher tortoises, typical inhabitants of herbaceous rangeland, were noted on site and will likely become an issue in site development. However, neither consideration should prevent FIND's intended use of the site.

As noted above, no other viable candidate sites were identified within Reach III. Therefore, Site SL-26, located immediately north of the northern limit of Reach III, will serve as the secondary option for this reach should the use of Site M-8, for unforeseen reasons, prove infeasible. In this secondary management strategy, the capacity of Site SL-26 is expanded by increasing the dike height within the same basin footprint proposed to serve Reach II alone.

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 (e.g., the impounded wetlands separating Site SL-3 from the Indian River) not presently included in the initial site area or the site maps. Notably, the total required area listed in Table 4.1 for Site SL-26 — the Hutchinson Island Nuclear Power Plant site — only considers a minimal 50-ft buffer surrounding the proposed 10-acre containment area. The actual buffer to be included within the final site configuration will be specified as part of the negotiations between Florida Power and Light Company and the FIND leading to the joint use agreement governing FIND's use of the site.

The total required primary site acreage for the 21.71 miles of Waterway channel within the St. Lucie County project area is approximately 88 acres. This includes 30 acres of active containment area and 58 acres of buffer. In the corresponding total secondary site requirement of 86 acres, 30 acres are containment area and 56 acres are buffer. All of the area contained in the primary sites and secondary alternatives represents newly identified properties not presently controlled 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.
 - 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.
 - 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:
 - Detailed documentation of site vegetation communities, including species frequencies of occurrence, and the delineation of wetlands and transitional areas using state approved methods.
 - Detailed documentation of on-site animal species, including endangered or threatened species, and pertinent habitat information.
 - Documentation of existing vegetation communities and species habitats along proposed pipeline access and return drainage routes.

 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:
 - 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:
 - Site Capacity Analysis Recalculate estimated site capacity and dike material requirements.
 - 2. Site Topographic Map.
 - 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: Groundwater Monitoring Well Installation and Testing at Site M-8 and Site M-12

The objective of this task is to install permanent groundwater monitoring wells at Site M-8 and Site M-12 and to obtain initial information regarding groundwater flow direction and quality with respect to salinity in the surficial aquifer. The budgeted cost of this task allows for no more than 8 wells on Site M-12 and 7 wells on Site M-8. However, the precise number, depth, and location of wells will be determined following review of site conditions. Fewer wells may be installed if dictated by site conditions. Following well installation, groundwater levels will be determined and samples analyzed for the components in the Florida secondary drinking water standards list. These include chloride and total dissolved solids. The water level data will be analyzed to determine groundwater flow patterns on both sites. Results of this task will be documented in written reports. The wells will remain in place for future monitoring to determine whether dredged material management operations have any effect on groundwater quality.

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)





A. LOCATION

County: ICWW Mile: Section/Township/Range: Receiving Waterbody: FDEP classification:	St. Lucie 218.74 S5/T34S/R40 Indian River II, OFW	DE, S6/7	Г34S/R40I	Mur East/West o E	nicipality: f ICWW:	County West
B. REACH INFORMATIO	N					
Reach Designation:	SL-1		Reach	Length (mi):	7.06	
ICWW Mileage:	218.46	to	225.52			
Geographic:	Indian River.	/St. Luc	cie Co. Lin	e to Seaway (S.R. A1A)	Bridge
50-yr Requirements Dredging (cy): Storage (cy):	30,399 65,358					
C. SITE PARAMETERS	oped Area (ac)	•	161.0		Buffer V	Width (ft)
Contain	nent Area (ac)	•20 •25	10.0	-	North:	300
Total Area	Impacted (ac)		13.3		South:	300
Total Bu	iffer Area (ac)		29.2		East:	300
Buffer Outside Map	oped Area (ac)		.0		West:	300
Preliminary Total	Site Area (ac)		42.5	(Area Impacted	t + Buffer)	
Storage (Capacity (cy):		70,793			
Dil	ke Height (ft):		8.0			
Excavati	on Depth (ft):		2.99			
Estimated Site Elevation	(ft +NGVD):		4.0			
Maximum Pumping I	Distance (mi):		7.36			
D. SITE CHARACTERIST	TICS					

Public Road to Site: Old Dixie Hwy	(SR 605) A	dditional Road Easement (ft):	<2200
		Pipeline Easement (ft):	>1000
Comprehensive Plan Designation: Adjacent Land Use:	RU/RC/Mixed (Re citrus groves, open	esUrban/ResConservation/ 1 land (wetlands)	Mixed)
Predominant Land Use Impacted:	citrus grove		

		Wetlands (ac)	
	On-Site		Impacted
Contiguous:	0.0	Contiguous:	0.0
Isolated:	0.0	Isolated:	0.0

Site SL-2 is located 0.25 miles south of the Indian River/St. Lucie County line, and approximately 0.2 miles west of the Indian River's western shoreline. The Florida East Coast Railroad and Old Dixie Highway adjoin the site's western boundary.

The predominant on-site land use is an active citrus grove (221) on the western side of the site. The eastern side consists of fallow crop land/citrus grove (221/261), apparently old and unmaintained. A thin strip of disturbed land (741) adjoins the railroad along the entire western site boundary.

The site also contains two unpaved roads, one oriented east to west and the second north to south, that provide access to an on-site farm building. The eastern one-third of the site interior also contains several small ditches oriented east to west. These ditches appear to be little more than grass-filled swales. A larger, perimeter ditch runs along the site's north, east, and south borders, and may contain some emergent wetland vegetation.



A-5

A. LOCATION						
County:	St. Lucie		Mun	icipality:	County	
ICWW Mile:	221.01		East/West of	ICWW:	West	
Section/Township/Range:	S16,17/T34S/R4	40E				
Receiving Waterbody:	Indian River					
FDEP classification:	II, OFW					
B. REACH INFORMATIO	N	2-2 S				
Reach Designation:	SL-1	Reach	Length (mi):	7.06		
ICWW Mileage:	218.46 to	225.52				
Geographic:	Indian River/St.	. Lucie Co. Lir	e to Seaway (S	.R. A1A)	Bridge	
50 D						
50-yr Requirements	20.200					
Dreaging (cy):	30,399					
Storage (cy):	00,008					
C SITE PARAMETERS						
C. SITE TIMUNIETENS Mai	oped Area (ac).	51.1		Buffer V	Vidth (ft)	
Contain	ment Area (ac):	10.0	-	North:	300.0	
Total Area	Impacted (ac):	13.3		South:	300.0	
Total Bu	iffer Area (ac):	29.2		East:	300.0	
Buffer Outside May	oped Area (ac):	.0		West:	300.0	
■Contractions						
Preliminary Total	Site Area (ac):	42.5	(Area Impacted	+ Buffer)		
Storage (Capacity (cy):	70,768				
Dil	ke Height (ft):	8.0				
Excavati	on Depth (ft):	3.0				
Estimated Site Elevation	(ft +NGVD):	<5.0				
Maximum Pumping I	Distance (mi):	5.23				
D. SITE CHARACTERIST	ICS					
Public Road to Site:	Michigan St.,		Additional	Road Ease	ement (ft):	N/A
	(unnamed ext.)	and and the	Pip	eline Ease	ement (ft):	600.0
Comprehensive Plan	Designation:	Mixed				
Adjac	ent Land Use:	open land, co	mmercial			
D 1 T 1T	T T . I	D				
Predominant Land	Use Impacted:	Brazilian pep	per, disturbed	uplands/v	wetlands	
		Watlanda (ca)				
	On-Site	wenanus (ac)	1	mnacted		
Contiguous	40.0		Contiguous:	N/A		
Icolated:	0.0		Isolated:	N/A		
isoittou.				* 17 * *		

III Site Description

The 51-acre SL-23A site (also known as the Trreasure Coast Industrial Park site) is located west of Site SL-23. Brazilian pepper wetland (422/640), the dominant community, is a located in the eastern two-thirds of the site adjacent to the open water, constructed lagoon (500). This community contains a patchy to dense cover of Brazilian pepper (*Schinus terebinthifolius*). The major groundcover is chestnut sedge (*Fimbristylis castanea*) with less coverage from *Mikania scandens*, *Cyperus* sp., and sawgrass (*Cladium jamaicense*). In some locations, the ground surface contains small hummocks of soil with standing water in the furrows. The soil contains organic matter mixed with shell fragments.

A large, open-water lagoon to the west drains to the Indian River via small ditches from the site's northern end. The lagoon features very steep sides and contains dark brown water. Vegetation along the lagoon banks include seashore paspalum (*Paspalum vaginatum*), sand cordgrass (*Spartina bakerii*), and sea oxeye (*Borrichia frutescens*). Scattered white mangrove (*Avicennia germinans*) grows along the western shore. Thick Brazilian pepper occurs along the eastern shore. Alligators and needlefish were observed in the lagoon.

The northwestern area of the site is fenced commercial land use (140). This area also contains an area of inland pond and slough (616). At the time of the site visit, the pond contained standing open water, and cattail (*Typha* sp.) vegetated the pond fringe. The flatwoods area to the south was not visited, but scattered slash pine (*Pinus elliottii*) was observed south of the pond.

St. Lucie County staff, interested in the possible joint use of this site by the FIND and the Port of Ft. Pierce, conducted a second, informal biological survey of the property. In his brief report, the staff biologist that conducted the survey classified the Brazilian pepper area within Site SL-23A (mapped as Brazilian pepper/non-forested wetland, 422/640) as predominantly upland with only a few small patches of wetland. Notably, the highly disturbed character of this community makes definitive wetland delineation problematic. A formal wetland delineation of this site by regulatory agency representatives would be necessary to clearly establish the extent of wetlands on site and the mitigation that site development would likely require.

A-7





A. LOCATION

A. LOCATION			5.5 (2)			
County:	St. Lucie		Munio	cipality:	Ft. Pierce	
ICWW Mile:	225.18		East/West of	ICWW:	East	
Section/Township/Range:	S2/T35S/R40E					
Receiving Waterbody:	Indian River					
FDEP classification:	III, OFW					
B. REACH INFORMATIO	N					
Reach Designation:	SL-2	Reach	Length (mi):	8.44		
ICWW Mileage:	225.52 to	233.96				
Geographic:	Seaway (S.R. A	1A) Bridge to	Hutchinson Isla	and Nucl	ear Power	Plant
	• 、	, 0				
50-yr Requirements						
Dredging (cv):	17,224					
Storage (cv):	37,031					
8-(-)).						
C. SITE PARAMETERS						
Mar	oped Area (ac):	114.1		Buffer V	Width (ft)	
Contain	nent Area (ac):	10.0	_	North:	300	
Total Area	Impacted (ac):	13.3		South:	50	
Total Bi	iffer Area (ac):	17.1		East:	300	
Buffer Outside Mar	and Area (ac):	17.1		West:	50	
Buller Outside Mar	iped Alea (ac).	.0		west.	50	
Preliminary Total	Site Area (ac):	30.4	(Auga Impacted)	- Duffan)		
Tremmary Total	Site Area (ac).	50.4	(Area Impaciea	+ Dujjer)		
Storage (apacity (cy).	10 307				
Dil	-apacity (cy).	40,572				
	Dentl (ft).	0.0				
Excavation	on Depth (It):	1./				
Estimated Site Elevation	$(\pi + NGVD)$:	<5.0				
Maximum Pumping I	Distance (m1):	8.78				
D. SITE CHARACTERIST	ICS					
Public Road to Site:	Seaway Dr. (S.F	R. A1A)	Additional R	oad Ease	ement (ft):	1100.0
			Pipe	line Ease	ement (ft):	N/A
Comprehensive Plan	Designation:	RMHI-CG "	Mixed Use Res	ort"		
Adjace	ent Land Use:	residential, c	ommercial, ma	rine con	imercial	
Predominant Land U	Ise Impacted:	disturbed lan	ids, non-native	vegetati	on	
-		Wetlands (ac)				
	On-Site		I	mpacted	2	
Contiguous:	3.2		Contiguous:	0.0	3	
Isolated:	3.2		Isolated:	2.9		

Stisites.xls, Sheet SL-9

Site SL-9 is located adjacent to S.R. A1A on the east bank of the ICWW, just east of the A1A Bridge and just south of Seaway Drive. This location places Site SL-9 adjacent to the intersection of Reach I & II in the ICWW.

Site SL-9 appears to be a large fill area covered with a variety of vegetation communities indicative of disturbance. Most of the community are dominated by invasive and exotic plants including Brazilian pepper (*Schinus terebinthifolius*) and Australian pine (*Casuarina equisetifolia*). The eastern area of the site is covered with a Brazilian pepper (422) community. Other common plants in this area are broomsedge (*Andropogon virginicus*), wax myrtle (*Myrica cerifera*), bracken fern (*Pteridium aquilinum*), and occasional Australian pine. An unidentified upland forest (400) was observed on the aerial photograph but was not visited; therefore, dominant species were not identified.

Adjacent to S.R. A1A and north of Site SL-9 is an enlarged road right-of-way maintained as lawn with scattered trees (814). This right-of-way borders a forested area of mixed Australian pine and Brazilian pepper (437/422). Other plants observed in this forested area include Woman's tongue tree (*Albizia lebbeck*), cabbage palm (*Sabal palmetto*), broomsedge (*Andropogon virginicus*), and smutgrass (*Sporobolus indicus*).

More recently disturbed areas (740/310) appear along the west side of the site, including road-like clearings and a large, white sand area with sparse vegetation. The dominant groundcover is smutgrass, redtops (*Rhynchelytrum repens*), crowfootgrass (*Dactyloctenium aegyptium*), *Crotalaria* sp. and beach sunflower (*Helianthus debilis*).

The western site area contains several herbaceous grass areas (310) and another grassy area infused with Brazilian pepper (310/422). Bahiagrass (*Paspalum notatum*), Spanish needles (*Bidens bipinnata*), and red lovegrass (*Eragrostis secundiflora*) dominate these areas. The site visit found low dikes, cracked ground surface, and evidence that the site had been used to settle and dry sediments.

Two interior wetlands were found on site. One small wet prairie (643) was found in a depression along a disturbed herbaceous path (740/310). Species common in this area include cattail (*Typha* sp.), maidencane (*Panicum hemitomon*), and matchhead (*Lippia nodiflora*). A marsh, just less than three acres,

A-11

was found near the center of the site. Water from this marsh likely drains into the Indian River when flood conditions occur. A low dike lies along the western side of the site. Common marsh species including smooth cordgrass (*Spartina alterniflora*) and seashore paspalum (*Paspalum distichum*) were found.

Within the site's southern portion adjacent to the Indian River lies a narrow border of saltwater marsh/mangrove swamp (642/612). Common species include white mangrove (*Laguncularia racemosa*), smooth cordgrass (*Spartina alterniflora*), and seashore paspalum (*Paspalum distichum*).



LOCUTION .

A. LOCATION						
County:	St. Lucie		Munic	pality:	County	
ICWW Mile:	233.95		East/West of	ICWW:	East	
Section/Township/Range:	S16/T36S/R41E	3				
Receiving Waterbody:	Indian River					
FDEP classification:	II, OFW					
	8					
B. REACH INFORMATIO	N					
Reach Designation:	SL-2 (SL-3)	Reach I	ength (mi):	8.44	6.22	
ICWW Mileage:	225.52 to	233.96	(233.96 t	o 240.18)		
Geographic	Seaway (S.R. A	1A) Bridge to F	Jutchinson Isla	and Nucle	ear Power H	Plant
Geographie.	(Hutchison Is	VPP to St. Luci	Martin Coun	ty line)		
50 pr Requirements	(IIIIICIIISON IS. I	III to St. Euch	contactin coun	ty mic)		
Dredging (ov):	17 170 (24 635)					
Diedging (cy).	2(01((52.0(6)					
Storage (cy):	36,916 (52,966)					
C. SITE PARAMETERS		= 0		D (C 11	1.1.1 (0)	
Map	oped Area (ac):	70.8		Buffer W	/idth (ft)	
Containn	nent Area (ac):	10.0		North:	.0	
Total Area	Impacted (ac):	13.3		South:	.0	
Total Bu	iffer Area (ac):	.0		East:	.0	
Buffer Outside Map	oped Area (ac):	.0		West:	.0	
Preliminary Total	Site Area (ac):	13.3	(Area Impacted ·	+ Buffer)		
Storage (Capacity (cy):	40,653 (100,13	38)			
Dik	te Height (ft):	6.0 (10.0)				
Excavati	on Depth (ft):	1.78 (5.15)				
Estimated Site Elevation	(ft +NGVD):	5.0				
Maximum Pumping I	Distance (mi):	9.66				
· · · · · · · · · · · · · · · · · · ·	().					
D. SITE CHARACTERIST	ICS					
Public Road to Site:	No public road		Additional R	oad Ease	ment (ft).	N/A
Tublic Road to Site.	SR A1A Cate	G	Pine	line Ease	ment (ft):	N/A
Comprehensive Plan	Designation:	Transportatio	n/Iltilities	mie Lasei	ment (1t).	11/11
Comprehensive i lan	Designation.	Hutchinson L	aland Nuclear	Dowon DI	ant mosau	ito imn
Aujace	sint Land Use.	futchinson is	sianu Nuclear	rowerri	ant, mosqu	no mp.
Due de mineret I au d I	In Transitada	EDI			in al Calar	
Predominant Land C	Jse Impacted:	FPL: spon ar	ea, nerdaceous	, recreat	ional, firing	g range
		Wether I. ()				
	0- 5'	wetlands (ac)	Ť			
0 <i>t</i>	<u>Un-Site</u>			mpacted		
Contiguous:	0.0		Contiguous:	0.0		
Isolated:	0.0		Isolated:	0.0		

5/15/97

The 71-acre SL-26 site is located on the Hutchinson Island Nuclear Power Plant property. The site consists mostly of open herbaceous rangeland and some recreational land uses. The herbaceous rangeland (310) and herbaceous/electrical power transmission facilities (310/832) include open grassland with dominant species of redtops (*Rhynchelytrum repens*), unidentified grass, fingergrass (*Eustachys petrea*), and Spanish needles (*Bidens bipinnata*). High voltage electrical lines from the power plant cross this area. A small wet prairie (643) was found in the herbaceous area.

Located in the center of the site, recreational facilities include a shooting range—a grassed-berm, fenced facility that includes an adjacent, landscaped, unpaved parking lot. A road runs along the north and east sides of the site. Adjacent to this road is a paved parking area used in conjunction with a picnic and play areas north of the road. A retention basin (534) is located next to the parking lot. A boat ramp (184) provides access to Big Mud Creek.

A Brazilian pepper fringe (422 and 422/832) borders mangrove areas in two on-site locations. In addition to the dominant Brazilian pepper, saltbush (Baccharis halimifolia) and Australian pine (Casuarina equisetifolia) are locally common. A mangrove fringe (612) borders a small tidal ditch that enters Big Mud Creek.

A 9.5-acre diked spoil disposal area is located in the eastern area of the site. Low grassy dikes surround a vegetated basin which contains some areas of exposed sediment. The southwestern area of the basin contains some shallow standing water. Broomsedge (*Andropogon virginicus*) and two species of unidentified grass dominate this area.

A-15





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A. LOCATION

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County:	St. Lucie	Municipality: Port St. 1			Port St. Lu	icie
ICWW Mile:	236.30		East/West of	EICWW:	West	
Section/Township/Range:	S29/T36S/R41	E, S32/T36S/R4	41E			
Receiving Waterbody:	Indian River					
FDEP classification:	III, OFW					
B. REACH INFORMATIC	DN					
Reach Designation:	SL-3	Reach	Length (mi):	6.22		
ICWW Mileage:	233.96 1	to 240.18				
Geographic:	Hutchinson Isl	and Nuclear Po	wer Plant to St	. Lucie/M	lartin Co. Li	ine
50-yr Requirements						
Dredging (cy):	24,635					
Storage (cy):	52,966					
C. SITE PARAMETERS						
Ma	pped Area (ac):	53.9		Buffer V	Width (ft)	
Contain	ment Area (ac):	10.0	-	North:	300.0	
Total Area	Impacted (ac):	13.3		South:	300.0	
Total B	uffer Area (ac):	18.8		East:	>50	
Buffer Outside Mag	pped Area (ac):	.0		West:	.0	
Preliminary Total	Site Area (ac):	32,1	(Area Impacted	+ Buffer)		
Storage	Capacity (cy):	56,453				
Di	ke Height (ft):	7.0				
Excavati	ion Depth (ft):	2.7				
Estimated Site Elevation	(ft +NGVD):	30.0				
Maximum Pumping	Distance (mi):	4.26				
D. SITE CHARACTERIST	TICS					
Public Road to Site:	Indian River D)r. (SR 707)	Additional Pin	Road Eas	ement (ft):	N/A N/A
Comprehensive Plan	n Designation [.]	RL Residenti	۰. آها		uniunt (11).	1011
Adiac	ent Land Use:	residential lo	w density, cons	servation		
、						
Predominant Land	Use Impacted:	native vegetati	on			
		(hardwood-c	onifer mixed)			
		Wetlands (ac)	•		-	

		monanas (uo)	
	On-Site		Impacted
Contiguous:	0.0	Contiguous:	0,0
Isolated:	0.0	Isolated:	0.0

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III Site Description

Site M-8 is located along a relict dune ridge just west of the Indian River. The site contains two single-family residences adjacent to Indian River Drive. The site's eastern area is densely vegetated with a young temperate hammock containing live oak (*Quercus virginiana*), red bay (*Persea borbonia*), cabbage palm (*Sabal palmetto*), Carolina laurelcherry (*Prunus caroliniana*), and hickory (*Carya* sp.). This hammock grades into a sand live oak scrub (432) to the west. In the northern area of this community, guava (*Guava* sp.) and mother-in-law tongue (*Sanseveria* sp.) are locally common. Other species include sand live oak (*Quercus virginiana var. geminata*), myrtle oak (*Quercus myrtifolia*), and occasional sand pine (*Pinus clausa*). The dense low canopy keeps groundcover low , but saw palmetto (Serenoa repens) and greenbrier (Smilax auriculata) exist in this area.

The scrubby sand live oak community is interspersed with variable sized white sand patches with sparse vegetation. Species typical of this open scrub community include wiregrass (*Aristida* sp.), prickly-pear (*Opuntia* sp.), sandhill wireweed (*Polygonella fimbriata*), and bracken fern (*Pteridium aquilinum*). Gopher tortoise (*Gopherus polyphemus*) and Florida scrub lizard (*Sceleporus woodi*) were observed in several locations within this community.

The western boundary near the site's center includes a sand pine community. The large (24-in.-diameter at breast height) sand pines that dominate this community provide a seed source for the sand pine seedlings and saplings observed scattered throughout the rest of the site. Sand live oak and myrtle oak form the community's understory.

APPENDIX B

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Other Candidate Sites

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B-1

A. LOCATION County: ICWW Mile: Section/Township/Range: Receiving Waterbody: FDEP classification:	St. Lucie 218.47 S5/T34S/R40E Indian River 26	, S6/T34S/R40E	Munie East/West of	cipality: ICWW:	County West
B. REACH INFORMATIO Reach Designation: ICWW Mileage: Geographic:	N SL-1 218.46 to Indian River/S	Reach I 0 225.52 t. Lucie Co. Lin	Length (mi): ne to Seaway (S	7.06 S.R. A1A)) Bridge
50-yr Requirements Dredging (cy): Storage (cy):	30,399 65,358				
C. SITE PARAMETERS				— aa '-	
Map	pped Area (ac):	74.3		Butter \	Width (ft)
Containn	nent Area (ac):	29.3		North:	300
Total Area	Impacted (ac):	35.6		South:	300
Total Bu	iffer Area (ac):	47.7		East:	300
Buffer Outside Map	oped Area (ac):	7.2		West:	300
Preliminary Total	Site Area (ac):	83.3	(Area Impacted	+ Buffer)	
Storage C	Canacity (cv):	418.817			
Dik	e Height (ft):	13.0			
Excavatio	on Depth (ff):	4.76			
Estimated Site Elevation	(ft + NGVD):	4.0			
Maximum Pumping D	Distance (mi):	7.36			
D. SITE CHARACTERIST	ICS				
Public Road to Site:	Old Dixie Hwy	(SR 605)	Additional R Pipe	oad Ease line Ease	ement (ft): N/A ement (ft): >1000
Comprehensive Plan	Designation:	RU/RC (Resi	dential-Urban	Residen [®]	tial -Conservation)
Adjace	ent Land Use:	citrus groves	, open land (we	etlands)	
Predominant Land U	Jse Impacted:	citrus groves	, cabbage palm	L	
		Wetlands (ac)			
<u> </u>	On-Site		Τ	mpacted	-
Contiguous:	0.0		Contiguous:	0.0	-
Isolated:	0.0		Isolated	0.0	

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Site SL-1's northern boundary is located on the Indian River/St. Lucie County line. A ditch follows along the site's western boundary, positioned just east and parallel to the Florida East Coast Railway. A dirt road, oriented east-west, bisects the site.

The site's northwest quarter contains active citrus groves (221) and cabbage palm upland communities (428). The vegetation in the cabbage palm upland community (428), inaccessible at the time of the site survey, appears to be cabbage palm (*Sabal palmetto*), live oak (*Quercus virginiana*), and grape vines (*Vitis* sp.). The northeast quadrant, also inaccessible, may be wetland. A ditch comprises the west boundary of this community.



A. LOCATION

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County:	St. Lucie	Muni	icipality:	County
ICWW Mile:	218.83	East/West of	ICWW:	East
Section/Township/Range:	S3/T34S/R40E, S10	/T34S/R40E		
Receiving Waterbody:	Indian River			
FDEP classification:	II, OFW			
B. REACH INFORMATIO	N			
Reach Designation:	SL-1	Reach Length (mi):	7.06	
ICWW Mileage:	218.46 to	225.52		
Geographic:	Indian River/St. Lu	cie Co. Line to Seaway (S.R. A1 A)) Bridge
50-yr Requirements				
Dredging (cy):	30,399			
Storage (cy):	65,358			
C. SITE PARAMETERS				

Mapped Area (ac):	410.8	Buffer '	Width (ft)
Containment Area (ac):	120.5	North:	300
Total Area Impacted (ac):	133.8	South:	300
Total Buffer Area (ac):	89.2	East:	300
Buffer Outside Mapped Area (ac):	.0	West:	300
Preliminary Total Site Area (ac):	223.0	(Area Impacted + Buffer)	
Storage Capacity (cy):	2,101,772		
Dike Height (ft):	15.0		
Excavation Depth (ft):	2.43		
Estimated Site Elevation (ft +NGVD):	4.0		
Maximum Pumping Distance (mi):	5.94		
D. SITE CHARACTERISTICS			
Public Road to Site: S.R. A1A		Additional Road Ease Pipeline Ease	ement (ft): N/A ement (ft): <500
Comprehensive Plan Designation: Adjacent Land Use:	: RU/C(Pub) Residential-Urban/Conservation-Publi : open land (some wetlands), residential (high densit		servation-Public ial (high density)
Predominant Land Use Impacted:	tropical hard	woods/cabbage palm/E	Brazilian pepper

		Wetlands (ac)	
	On-Site		Impacted
Contiguous:	158.6	Contiguous	0.0
Isolated:	0.0	Isolated	0.0

The Indian River borders the relatively undisturbed SL-4 site along its western border. Two dirt roads form the site's northern and southern borders; North Ocean Drive forms the eastern border. Vegetation communities are forested. Ditches and subsequent infestations of Brazilian pepper (*Schinus terebinthifolius*) account for the only on-site disturbances.

The wetland communities are mainly mangrove swamps/Brazilian pepper (612/422) and slough waters (560). Some of the slough waters may be remnants of old mosquito impoundment ditches. The sloughs occur interior to and surrounded by the mangrove swamps/Brazilian pepper wetlands. The dominant vegetation in the swamps is red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), black mangrove (*Avicennia germinans*), Brazilian pepper, and buttonwood (*Conocarpus erecta*). The slough waters were not visited; however, aerial photographs do not indicate an abundance of emergent vegetation.

Upland communities occur in the central and eastern areas of Site SL-4. Because of the impenetrable vegetation in the site's central area, the wetland/upland borders were difficult to distinguish and may vary somewhat. The predominant upland community is tropical hardwoods/cabbage palm/Brazilian pepper (426/428/422). The dominant vegetation is live oak (*Quercus virginiana*) with an occasional cabbage palm (*Sabal palmetto*), Brazilian pepper, myrsine (*Rapanea punctata*), wild coffee (*Psychotria nervosa*), saw palmetto (*Serenoa repens*), red bay (*Persea borbonia*), and stopper (*Eugenia sp.*).

Tropical hardwoods (426) without the disturbance of Brazilian pepper occur along North Ocean Drive in the site's northeast area. The dominant vegetation in this location is live oak, stopper, myrsine, and wild coffee.

The other dominant upland vegetation community on-site is cabbage palm/Brazilian pepper/tropical hardwoods (428/422/426). This community contains the same vegetation species as does the tropical hardwoods/cabbage palm/Brazilian pepper (426/428/422) community. The dominance of the vegetation species reflects the order of the vegetation assemblages that comprise this community. Here cabbage palm and Brazilian pepper are more prevalent than the vegetation species associated with the tropical hardwoods.

The most disturbed area on site is an Australian pine/Brazilian pepper community (437/422) adjacent to North Ocean Drive. This community consists almost exclusively of dead and dying Australian pine (*Casuarina equisetifolia*) and healthy Brazilian pepper.





TAYLOR ENGINEERING INC. 9086 CYPRESS GREEN DRIVE JACKSONVILLE, FLORIDA 32256 Figure B-3 Land Use and Vegetation of Candidate Site SL-5 St. Lucie County, Florida

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C95	09
REVISION	
SHEET	
May	1997

Α.	LOCATION
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A. LOCATION					
County:	St. Lucie		Muni	icipality:	County
ICWW Mile:	220.88		East/West of	ICWW:	East
Section/Township/Range:	S14/T34S/R401	E, S15/T34S/R4	0 E		
Receiving Waterbody:	Indian River				
FDEP classification:	II, OFW				
B. REACH INFORMATIC	DN				
Reach Designation:	SL-1	Reach I	Length (mi):	7.06	
ICWW Mileage:	218.46 to	o 225.52			
Geographic:	Indian River/S	t. Lucie Co. Lin	e to Seaway (S	S.R. A1A)	Bridge
50-yr Requirements	ł				
Dredging (cy):	30,399				
Storage (cy):	65,358				
C. SITE PARAMETERS					
Maj	pped Area (ac):	73.1		Buffer W	'idth (ft)
Contain	ment Area (ac):	N/A	_	North:	N/A
Total Area	Impacted (ac):	N/A		South:	N/A
Total B	uffer Area (ac):	N/A		East:	N/A
Buffer Outside Maj	pped Area (ac):	N/A		West:	N/A
Preliminary Total	Site Area (ac):	N/A	(Area Impacted	+ Buffer)	
Storage	Capacity (cy):	no upland			
Dil	ke Height (ft):	N/A			
Excavati	on Depth (ft):	N/A			
Estimated Site Elevation	(ft +NGVD):	3.0			
Maximum Pumping I	Distance (mi):	6.72			
D. SITE CHARACTERISI	TICS				
Public Road to Site:	N. Ocean Dr. (S	S.R. A1A)	Additional F Pine	Road Easen	nent (ft):
Comprehensive Plan	Designation:	RH Residenti	al-High Densi	tv	
Adjac	ent Land Use:	residential, oj	pen land (wetl	ands)	
Predominant Land U	Use Impacted:	N/A			
		Wetlands (ac)			
	On-Site			Impacted	
Contiguous:	61.5		Contiguous:	N/A	
Isolated:	0.0		Isolated:	N/A	

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N/A N/A

Site Description

Blue Hole Creek flows along Site SL-5's western boundary and a majority of its southern boundaries. S.R. A1A is located along the eastern boundary. A development exists just north of the site.

Site SL-5 has the following wetland communities: mangrove swamp (612), cabbage palm (625), and slough waters (560). The tidally influenced mangrove swamp (612) contains red mangrove (Rhizophora mangle), black mangrove (Avicennia germinans), buttonwood (Conocarpus erecta), Brazilian pepper (Schinus terebinthifolius), and the state-listed threatened giant leather fern (Acrostichum danaeifolium).

Interspersed among the mangrove swamps are areas of tidally influenced slough waters (560) and cabbage palm wetlands (625). The cabbage palm wetlands contain cabbage palm (Sabal palmetto), wild coffee (Psychotria nervosa), and the state-listed threatened golden polypody (Phlebodium aureum) and occasional shoestring ferns (Vittaria lineata) growing on the cabbage palm.

An upland cabbage palm/tropical hardwood (428/426) community is located between S.R. A1A and the wetland communities. Dominant vegetation is cabbage palm, saw palmetto (Serenoa repens), myrsine (Rapanea punctata), live oak (Quercus virginiana), stopper (Eugenia sp.), and red bay (Persea borbonia). The state-listed threatened golden polypody fern and shoestring fern are occasional on the cabbage palm.

Several large canals connect the slough water with Blue Hole Creek. Several smaller ditches also traverse some of the forested wetlands.



A. LOCATION

County:	St. Lucie	Municipality:	County
ICWW Mile:	220.54	East/West of ICWW:	West
Section/Township/Range:	S17/T34S/R40E		
Receiving Waterbody:	Indian River		
FDEP classification:	II, OFW		

B. REACH INFORMATION

Reach Designation:	SL-1		Reach Length (mi):	7.06
ICWW Mileage:	218.46	to	225.52	
Geographic:	Indian Rive	r/St.	Lucie Co. Line to Seaway ((S.R. A1A) Bridge

50-yr Requirements	
Dredging (cy):	30,399
Storage (cy):	65,358

C. SITE PARAMETERS

Mapped Area (ac):	46.9	Buffer W	idth (ft)
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

N/A

N/A N/A 4.0 5.36

Preliminary Total Site Area (ac):

Insufficient upland area

(Area Impacted + Buffer)

Residential-Urban/Residential-Conservation

open land (wetlands), highway

Additional Road Easement (ft):

Pipeline Easement (ft):

Storage Capacity (cy):
Dike Height (ft):
Excavation Depth (ft):
Estimated Site Elevation (ft +NGVD):
Maximum Pumping Distance (mi):

D. SITE CHARACTERISTICS

Public Road to Site: Wilcox Rd., Michigan St. Comprehensive Plan Designation: Adjacent Land Use:

N/A

Predominant Land Use Impacted:

 Wetlands (ac)

 On-Site
 Impacted

 Contiguous:
 34.1
 Contiguous:
 N/A

 Isolated:
 0.0
 Isolated:
 N/A

N/A

N/A

The 47-acre SL-6 site is predominantly wetland with a pine area located in the interior presumed to be upland flatwoods. Access to the site interior is difficult due to the dense, shrubby character of the surrounding wetlands. Due to the access difficulty, all comments regarding the pine flatwoods are based on aerial photo interpretation, mapped data, and data gathered by viewing from adjacent communities. The pine canopy appeared to be dense, mature slash pine (*Pinus elliottii*). The infrared aerial photo and wetland inventory map indicate an upland pine habitat. However, the soil survey indicates this area contains a hydric soil, Samsula variant-Myakka variant indicative of a wetland. Mapped as upland based on canopy conditions, the area may just as likely be hydric flatwoods.

A small area of temperate hardwood forest is located in the southern area of the site. This area appears to contain fill material and various other types of debris. Vegetation observed in this area includes live oak (*Quercus virginiana*) and Brazilian pepper (*Schinus terebinthifolius*).

The area shown as mixed wetland hardwood (617) appears to have been disturbed previously. A dense, thick cover of muscadine (*Vitis rotundifolia*) and blackberry (*Rubus* sp.) blankets the area. Patches of elephant ear (*Colocasia esculentum*) occasionally sprouted through the vines. Occasional trees and shrubs include wax myrtle (*Myrica cerifera*), chinaberry (*Melia aredarach*), Carolina willow (*Salix caroliniana*), Brazilian pepper, and sweetbay (*Magnolia virginiana*). The shrub swamp/wax myrtle–willow cover type (618/429) is similar to the previously described mixed wetland hardwoods but has a more consistent shrub character with fewer trees. Typical species in this area include the dominant wax myrtle, Carolina willow, Brazilian pepper, and strawberry guava (*Psidium littorale*).

Sweetbay dominates the swamp along the northern boundary. Other species common in this flooded area include cabbage palm (*Sabal palmetto*) and wax myrtle, along with a ground cover of fern and green arum (*Peltandra virginica*). A small area of freshwater marsh (641) occurs in the northwest corner.



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A. LOCATION

County:	St. Lucie		Muni	cinality	County
ICWW Mile:	222 13		East/West of	ICWW	West
Section/Township/Rappe:	\$20/T345/P4	OF \$21/T34\$/	PANE	10 11 11.	TT CSL
Pagaining Waterbody:	Indian Divor	010, 021/1040/	N40E		
EDED alagoification					
FDEP classification:	II, OF W				
B. REACH INFORMATIC	N				
Reach Designation:	SL-1	Rea	ch Length (mi):	7.06	
ICWW Mileage:	218.46	to 225.52	2		
Geographic:	Indian River/	St. Lucie Co.	Line to Seaway (S	S.R. A1A)) Bridge
50-yr Requirements					
Dredging (cy):	30,399				
Storage (cy):	65,358				
C. SITE PARAMETERS					
Maj	oped Area (ac):	61.3		Buffer V	Vidth (ft)
Containr	nent Area (ac):	18.6	-	North:	300
Total Area	Impacted (ac):	23.1		South:	300
Total Bu	offer Area (ac):	36.7		East:	300
Buffer Outside Map	oped Area (ac):	.0		West:	300
Preliminary Total	Site Area (ac):	59.8	(Area Impacted	+ Buffer)	

Storage Capacity (cy):	239,140
Dike Height (ft):	12.0
Excavation Depth (ft):	4.5
Estimated Site Elevation (ft +NGVD):	30.0
Maximum Pumping Distance (mi):	4.42

D. SITE CHARACTERISTICS

Isolated:

2.9

Public Road to Site: U.S. Hwy. 1	Additional Road Easement (ft): N/A
	Pipeline Easement (ft): <2000
Comprehensive Plan Designation:	Commercial/Mixed
Adjacent Land Use:	open land, highway
Predominant Land Use Impacted:	driving range (golf), coastal scrub, sand pine
	Wetlands (ac)
On-Site	Impacted
Contiguous: 0.0	Contiguous: 0.0

Isolated:

2.4

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The white sandy soils common to Site SL-7, a 61-acre site located on a relict dune, support a cover of sand pine (*Pinus clausa*) and coastal scrub vegetation. A former sand mine likely existed in the eastern/central portion of the site given the area's relatively low elevation and steep slopes which suggest previous excavations. The area now supports a golf driving range. Delineated as a wet prairie, a low spot in the driving area frequently collects water. White ibis, a state species of special concern, were observed feeding in this grassy pool.

Most of the site's western and southern area is sand pine community (413). Sand pine dominated the overstory, but myrtle oak (*Quercus myrtifolia*), Chapman's oak (*Q. chapmanii*), and sand live oak (*Quercus geminata*) are also prevalent. Other shrubs observed include rosemary (*Ceratiola ericoides*) and saw palmetto (*Serenoa repens*). The coastal scrub (322) has a similar species composition along the site's northern area but lacks the dominance of sand pine. Some slash pine (*Pinus elliottii*) and scrub hickory (*Carya floridana*) were also observed. One area of mostly barren sand (720) was observed along the eastern border of the site. Some disturbance, possibly the result of all-terrain vehicles, has disrupted the vegetation cover in this area.

Belcher Conal 437/422 Old Dixie Hwy. Indion River (ICNIN) 310 437 31 ڊ. ب 153 z 2nd 437. ទួ Roilwoy 422 422 HIHHHHHHHHHHHHHHHHHHHHH Coost 310 -- LEGEND --140 Commercial and Services 0.7 Ac 153 Mineral Processing 15.0 Ac 310 Herbaceous 28.5 Ac Scale in Feet 422 **Brazilian** Pepper 23.9 Ac 0 Australian Pine 1.3 Ac 437 300 600 437/422 Australian Pine/Brazilian Pepper 3.3 Ac SOURCE: W&AR Graphic 1996. 72.7 Ac Total Acreage Road Area Boundary _ _ Railroad ------C9509 Figure B-6 REVISIO Land Use and Vegetation of TAYLOR ENGINEERING INC. SHEET 9086 CYPRESS GREEN DRIVE JACKSONVILLE, FLORIDA 32256 Candidate Site SL-8 St. Lucie County, Florida DATE May, 1997

A LUCATION	A.	LOCATION
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i.

County: St. Lucie Municipality: Ft. Pierce LCWW Mile: 224.90 East/West of ICWW: West Section/Township/Range: S3/7355/R40E Receiving Waterbody: Indian River PDEP classification: III III B. REACH INFORMATION Reach Designation: SL-1 Reach Length (mi): 7.06 ICWW Mileage: 218.46 to 225.52 Geographic: Indian River/St. Lucie Co. Line to Seaway (S.R. A1A) Bridge 50-yr Requirements Dredging (cy): 30,399 Storage (cy): 65,358 C. SITE PARAMETERS Mapped Area (ac): 72.7 Buffer Width (ft) Containment Area (ac): 19.5 North: <200 Total Area Impacted (ac): 24.5 South: 300 Total Buffer Area (ac): .0 West: 300 Preliminary Total Site Area (ac): .0 West: 300 Preliminary Total Site Area (ac): .0 West: 300 Storage Capacity (cy): 250,034 Dike Height (ft): 12.0 Estimated Site Elevation (ft +NGVD): 5.0 Maximum Pumping Distance (mi): N/A Pipeline Casation Depth (ft): 4.12 Estimated Site Elevation (ft +NGVD):	A. LOCATION						
ICWW Mile:224.90East/West of ICWW:WestSection/Township/Range:S3/735S/R40ERacciving Waterbody:Indian RiverRacciving Waterbody:Indian RiverFDEP classification:IIIB. REACH INFORMATIONReach Designation:SL-1Reach Length (mi):7.06ICWW Mileage:218.46to225.52Geographic:Indian River/St. Lucie Co. Line to Seaway (S.R. A1A) Bridge 50 -yr RequirementsDredging (cy):30,399Storage (cy):65,358C. SITE PARAMETERSMapped Area (ac):72.7Buffer Width (ft)Containment Area (ac):19.5North: <200Total Area Impacted (ac):24.5South:Total Area Impacted (ac):.0West:Buffer Outside Mapped Area (ac):.0West:Storage Capacity (cy):250,034Dike Height (ft):Like Height (ft):12.0Excavation Depth (ft):Like Height (ft):12.0Excavation Depth (ft):Like Height (ft):12.0Storage Capacity (cy):Storage Capacity (cy):5.0Maximum Pumping Distance (mi):6.70Distre CHARACTERISTICSPublic Road to Site:Public Road to Site:N2 dSt.Additional Road Easement (ft):N/APripeline Easement (ft):N/APipeline Easement (ft):N/ADidact Land Use:Port Area - IndustrialPredominant Land Use Impacted:herbaccous vegetation, mineral processingWetlands (ac)ImpactedInsolated: <th>County:</th> <th>St. Lucie</th> <th></th> <th>Mun</th> <th>icipality:</th> <th>Ft. Pierce</th> <th></th>	County:	St. Lucie		Mun	icipality:	Ft. Pierce	
Section/Township/Range: S3/T35S/R40E Receiving Waterbody: Indian River FDEP classification: III B. REACH INFORMATION Reach Designation: SL-1 Reach Length (mi): 7.06 ICWW Mileage: 218.46 to 225.52 Geographic: Indian River/St. Lucie Co. Line to Seaway (S.R. A1A) Bridge $\frac{50 - yr}{Requirements}$ Dredging (cy): 30,399 Storage (cy): 65,358 C. SITE PARAMETERS Mapped Area (ac): 72.7 Buffer Width (ft) Containment Area (ac): 19.5 North: <200 Total Area Impacted (ae): 24.5 South: 300 Total Buffer Area (ac):	ICWW Mile:	224.90	N.	East/West of	f ICWW:	West	
Receiving Waterbody: Indian River FDEP classification: III B. REACH INFORMATION Reach Designation: SL-1 Reach Length (mi): 7.06 ICWW Mileage: 218.46 to 225.52 Geographic: Indian River/St. Lucie Co. Line to Seaway (S.R. A1A) Bridge 50-yr Requirements Dredging (cy): 30,399 Storage (cy): 65,358 C. SITE PARAMETERS Mapped Area (ac): 72.7 Buffer Width (ft) Containment Area (ac): 19.5 North: <200 Total Area Impacted (ac): 25.4 East: <200 Buffer Outside Mapped Area (ac): .0 West: 300 Preliminary Total Site Area (ac): 49.9 (Area Impacted + Buffer) Storage Capacity (cy): 250,034 Dike Height (ft): 12.0 Excavation Depth (ft): 4.12 Estimated Site Elevation (ft +NGVD): 5.0 Maximum Pumping Distance (mi): 6.70 D. SITE CHARACTERISTICS Public Road to Site: N 2nd St. Additional Road Easement (ft): N/A Pipeline Eas	Section/Township/Range:	S3/T35S/R40E					
FDEP classification: III B. REACH INFORMATION Reach Designation: SL-1 Reach Length (mi): 7.06 ICWW Mileage: 218.46 to 225.52 Geographic: Indian River/St. Lucie Co. Line to Seaway (S.R. A1A) Bridge 50-yr Requirements Dredging (cy): 30,399 Storage (cy): 65,358 C. SITE PARAMETERS Mapped Area (ac): 72.7 Buffer Width (ft) Containment Area (ac): 19.5 North: <200 Total Area Impacted (ac): 24.5 South: 300 Total Area Impacted (ac): .0 West: 300 Total Area Impacted (ac): .0 West: 300 Buffer Outside Mapped Area (ac): .0 West: 300 Preliminary Total Site Area (ac): .0 West: 300 Preliminary Total Site Area (ac): 49.9 (Area Impacted + Buffer) Excavation Opth (ft): 4.12 Estimated Site Elevation (ft +NGVD): 5.0 Maximum Pumping Distance (mi): 6.70 N/A Dise Height (ft): 12.0 Excavation It +NGVD): 5.0 Maximum Pumping Distance (mi): N/A Pipeli	Receiving Waterbody:	Indian River					
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Storage (cy): 65,358 C. SITE PARAMETERS Mapped Area (ac): 72.7 Buffer Width (ft) Containment Area (ac): 19.5 North: <200	Dredging (cv):	30.399					
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Maximum Fumping Distance (iii): 6.70 D. SITE CHARACTERISTICS Public Road to Site: N 2nd St. Public Road to Site: N 2nd St. Additional Road Easement (ft): N/A Comprehensive Plan Designation: Port Area - Industrial N/A Adjacent Land Use: Port facilites, open land, marina Predominant Land Use Impacted: herbaceous vegetation, mineral processing Wetlands (ac) Vetlands (ac) Isolated: 0.0 Isolated: 0.0	Asymptotic Elevation	(IL TING VD):	5.0				
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Comprehensive Plan Designation: Adjacent Land Use: Port Area - Industrial Port facilites, open land, marina Predominant Land Use Impacted: herbaceous vegetation, mineral processing Wetlands (ac) Wetlands (ac) Contiguous: 0.0 Isolated: 0.0				Pip	eline Ease	ement (ft):	N/A
Adjacent Land Use: Port facilites, open land, marina Predominant Land Use Impacted: herbaceous vegetation, mineral processing Wetlands (ac) Wetlands (ac) Contiguous: 0.0 Isolated: 0.0 Isolated: 0.0	Comprehensive Plan	Designation:	Port Area - 1	Industrial			
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Wetlands (ac)On-SiteImpactedContiguous:0.0Contiguous:0.0Isolated:0.0Isolated:0.0	Predominant Land U	Jse Impacted:	herbaceous v	vegetation, min	neral proc	cessing	
Wetlands (ac)On-SiteImpactedContiguous:0.0Contiguous:0.0Isolated:0.0Isolated:0.0				、 、			
Contiguous:0.0Contiguous:0.0Isolated:0.0Isolated:0.0		On-Site	wetlands (ac)	Impacted	-	
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	1501aleu.	V.V		isolateu:	0.0		

The 73-acre SL-8 site is located adjacent to the Indian River and Belcher Canal. The site cover is predominantly exotic vegetation and herbaceous vegetation. A mineral processing plant is also located on the site. Under management to the St. Lucie Port Authority, the site was once likely used for spoil disposal based on observed soil characteristics and the disturbed vegetation communities.

Grass dominates the herbaceous vegetation community (310), but it also contains a few herbs and scattered shrubs. Common species observed include fingergrass (*Eustachys petraea*), broomsedge (*Andropogon virginicus*), redtops (*Rhynchelytrum repens*), and guineagrass (*Panicum maximum*). Grass cover is moderate to sparse in areas of coarse shelly soils. Shrubs observed include Brazilian pepper (*Schinus terebinthifolius*) and young mastic (*Mastichodendron foetidissimum*).

The exotic vegetation communities of Brazilian pepper (422) and Australian pine (437) or combinations of both occur along the eastern and northern shorelines. These combinations also exist in some sections along the site's western portion. These areas contain the dominant Brazilian pepper, Australian pine (*Casuarina equisetifolia*), cabbage palm (*Sabal palmetto*), coin-vine (*Dalbergia ecastophyllum*), lantana (*Lantana camara*), ragweed (*Ambrosia artemisiifolia*), and wedelia (*Wedelia trilobata*).

Nearly void of vegetation, the mineral processing area (153) actively processes aragonite and contains a variety of machinery, conveyance apparatuses, an office, and open mineral storage areas. An earthen berm separates this area from other areas on the site.



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A. LOCATION

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A. LOCATION						
County:	St. Lucie		Mun	icipality:	County	
ICWW Mile:	219.55		East/West of	FICWW:	West	
Section/Township/Range:	S7/T34S/R40E,	S8/T34S/R40E				
Receiving Waterbody:	Indian River					
FDEP classification:	II, OFW					
B. REACH INFORMATIC	N					
Reach Designation:	SL-1	Reach L	ength (mi):	7.06		
ICWW Mileage:	218.46 to	225.52	0 ()			
Geographic:	Indian River/St	. Lucie Co. Lin	e to Seaway (S.R. A1A) Bridge	
			•		, 0	
50-yr Requirements						
Dredging (cy):	30,399					
Storage (cy):	65,358					
•						
C. SITE PARAMETERS						
Maj	oped Area (ac):	64.9	_	Buffer V	Vidth (ft)	
Containr	nent Area (ac):	13.2	_	North:	300	_
Total Area	Impacted (ac):	18.1		South:	300	
Total Bu	iffer Area (ac):	39.2		East:	300	
Buffer Outside Map	oped Area (ac):	.0		West:	300	
Preliminary Total	Site Area (ac):	57.3	(Area Impactea	l + Buffer)		
Storage (Capacity (cy):	95,298				
Dil	ke Height (ft):	8.0				
Excavati	on Depth (ft):	4.54				
Estimated Site Elevation	(ft +NGVD):	30.0				
Maximum Pumping I	Distance (mi):	7.18				
D. SITE CHARACTERIST	ICS					
Public Road to Site:	U.S. Hwy. 1		Additional 1	Road Ease	ment (ft):	N/A
	Old Dixie Hwy.		Pip	eline Ease	ment (ft):	>2600
Comprehensive Plan	Designation:	Mixed/Comm	ercial		()	
Adjaco	ent Land Use:	open land, res	idential, Har	bor Bran	ch O. I.	
Drodominant Lond I	Ico Impostadi	-	a have cand	D		
Fredominant Land C	se impacted:	nerdaceous ve	g., bare sano	, brazina	n pepper	
		Wetlands (ac)				
	On-Site			Impacted		
Contiguous:	0.0		Contiguous:	0.0		
Isolated:	1.4		Isolated:	0.0		

The 65-acre SL-20 site is located north of the Harbor Branch Institute. Most of the site is highly disturbed as a result of previous mining activities, presumably for sand. Most of the excavated area is now vegetated with a moderate cover of grasses, low-growing herbs (310), or clumps of Brazilian pepper (422). A ridge of natural habitat occurs along the western area of the site and consists mostly of sand live oak scrub (432). Large areas of white barren sand (720) can be found around the scrub oak areas. Two developed areas exist on site. The first, in the southwestern corner, contains apartments (133) associated with Harbor Branch. The second contains a utility area with a berm and adjacent fence (743 and 830). This area does not seem to be currently in use. A band of Australian pine (437) is located along the northern border of the site.

The herbaceous cover type is vegetated with redtops (*Rhynchelytrum repens*), broomsedge (*Andropogon virginicus*), spanish needles (*Bidens bipinnata*), and matchhead (*Phyla nodiflora*). Some Brazilian pepper (*Schinus terebinthifolius*) are scattered throughout the area. Separate maps (422) indicate areas in which it occurs in dense clusters. The Brazilian pepper clusters sometimes surround depressions; closer investigation may indicate they form a wetland in the center. One large cluster in the eastern central area of the site (616/422) contained primrose willow (*Ludwigia peruviana*), Carolina willow (*Salix caroliniana*), and wax myrtle (*Myrica cerifera*).

Two other small wetlands occur in the northeastern area of the site. One is a herbaceous extension of the adjacent Brazilian pepper wetland. Hurricanegrass (*Fimbristylis spathacea*) and matchhead vegetate this area. Wax myrtle, primrose willow, and maidencane (*Panicum hemitomom*) vegetate another small ponded area (616). A small dredged lake (534) occurs in the southeastern corner of the site. Active dredging occurred during the site visit. Species observed on the perimeter of the lake include cattail (*Typha* sp.) and wax myrtle.

Sand live oak (*Quercus geminata*), myrtle oak (*Q. myrtifolia*), and scrub hickory (*Carya floridana*) dominate the sand live oak uplands. Groundcover in the open areas include redtops, Palafoxia feayi, wireweed (*Polygonella* sp.), and prickly pear cactus (*Opuntia* sp.), a state-listed species.



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A. LOCATION					
County:	St. Lucie		Muni	cipality:	County
ICWW Mile:	221.42		East/West of	ICWW:	West
Section/Township/Range:	S17/T34S/R40H	E, S20/T34S/R4	0E		
Receiving Waterbody:	Indian River				
FDEP classification:	II, OFW				
B. REACH INFORMATIO	N				
Reach Designation:	SL-1	Reach	Length (mi):	7.06	
ICWW Mileage:	218.46 to	o 225.52			
Geographic:	Indian River/St	t. Lucie Co. Lii	ne to Seaway (S	S.R. A1A)	Bridge
50-yr Requirements					
Dredging (cy):	30,399				
Storage (cy):	65,358				
C. SITE PARAMETERS					
Map	ped Area (ac):	51.9	_	Buffer V	Vidth (ft)
Containn	nent Area (ac):	10.3		North:	300
Total Area	Impacted (ac):	14.5		South:	300
Total Bu	iffer Area (ac):	34.8		East:	300
Buffer Outside Map	ped Area (ac):	7.2		West:	300
Preliminary Total	Site Area (ac):	49.2	(Area Impacted	+ Buffer)	
		F0 (F0			
Storage (Capacity (cy):	59,679			
Dik	e Height (ff):	7.0			
Excavatio	on Depth (ft):	3.84			
Estimated Site Elevation	(ff +NGVD):	35.0			
Maximum Pumping I	Distance (mi):	4.55			
D CHER CHIADA CERDICI	100				
D. SITE CHARACTERIST			A 1114 1 Y		((0)
Public Road to Site:	U.S. Hwy I		Additional F	Coad Ease	ment (ff):
	Destant	M:	Pipe	eline Ease	ment (ff):
Comprehensive Plan	Designation:	Mixed/Com	nercial	• •	
Adjace	ent Land Use:	open land (w	etlands), comr	nercial	
	T T	h h .			T .
Predominant Land U	se impacted:	nerdaceous v	eg., bare sand	, sand nve	e oak
		Wotlands (sa)			
	On Sita	wenands (ac)	/	Imposted	
Contiguous	2 1		Contiguous		
Configuous.	L		Contiguous.	0.0	

Isolated:

0.0

N/A

>2400

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Isolated:

0.0

The 52-acre SL-21 site has been disturbed by all-terrain vehicles and probably by some sand extraction. Some depressed sand areas with steep side slopes reflect previous shallow mining; however, no distinct pits are present as they are elsewhere in the county. A cover of sand live oak occurs in patches along the western site area and reflects the former dominant cover type. Three ponds or freshwater marshes located on the site's western portion are part of a large wetland system located just west of Site SL-21. Several areas of barren, white sand (720) located throughout the site indicate a disturbance on sterile relict dune sands where revegetation occurs slowly. A retail antique store (140) is located in the southeastern corner of the site.

The herbaceous areas, recovering from a previous disturbance, have a moderate to sparse cover of grasses and herbs with widely scattered shrubs. Grass and herb species observed include fingergrass (*Eustachys petraea*), broomsedge (*Andropogon virginicus*), redtops (*Rhynchelytrum repens*), wireweed (*Polygonella* sp.), gopher apple (*Licania michauxii*), and greenbrier (*Smilax auriculata*). Occasional shrubs include saw palmetto (*Serenoa repens*), Brazilian pepper (*Schinus terebinthifolius*), and sand live oak (*Quercus geminata*).

Sand live oak, myrtle oak (Quercus myrtifolia), and scrub hickory (Carya floridana) dominate the sand live oak scrub areas. Wild pine (Tillandsia sp.) provide a dense cover for the oak canopy in some locations. Tallowwood (Ximenia americana) is also a common component of this community. In the sandy areas the dominant groundcover is wireweed and silk grass (Pityopsis graminifolia). Areas of bare sand are common on the site.

Two areas depicted as other pines (419) exist in the northern and central portions of the site. These areas have a cover of young slash pine (*Pinus elliottii*) with a moderate groundcover of species common to the herbaceous community already discussed. A concentration of large, active gopher tortoise burrows occur near the other pine area in the northern portion of the site.

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A. LOCATION					
County:	St. Lucie		Muni	cipality:	County
ICWW Mile:	220.54		East/West of	ICWW:	West
Section/Township/Range:	S16/T34S/R40E	C, S17/T34S/R40)E		
Receiving Waterbody:	Indian River				
FDEP classification:	II, OFW				
B. REACH INFORMATIC	N				
Reach Designation:	SL-1	Reach L	ength (mi):	7.06	•
ICWW Mileage:	218.46 to	225.52	0 . /		
Geographic:	Indian River/St	. Lucie Co. Lin	e to Seaway (S	5.R. A1A)	Bridge
				,	8
50-yr Requirements					
Dredging (cv):	30.399				
Storage (cv):	65,358				
	,				
C. SITE PARAMETERS					
Mat	oped Area (ac):	28.3		Buffer W	/idth (ft)
Containr	nent Area (ac):	N/A	_	North:	N/A
Total Area	Impacted (ac):	N/A		South:	N/A
Total Bi	Iffer Area (ac):	N/A		East	N/A
Buffer Outside Mar	oned Area (ac):	N/A		West	N/A
Durier Guiside Huif		1 With		W 031.	11/28
Preliminary Total	Site Area (ac):	N/A	(Area Impacted	+ Buffer)	
Otomo e e	7				
Storage		no upiana			
	the Height (π) :	N/A			
Excavati	on Depth (ft):	N/A			
Estimated Site Elevation	(ff +NGVD):	2.0			
Maximum Pumping I	Distance (mi):	5.12			
D. SITE CHARACTERIST	ICS				
Public Road to Site:	Michigan St.,		Additional R	oad Easer	nent (ft):
	Wilcox Rd.		Pipe	line Easer	nent (ft):
Comprehensive Plan	Designation:	Mixed			
Adjace	ent Land Use:	open land			
Predominant Land U	Jse Impacted:	N/A			
		Wetlands (oc)			
	On-Site	wenanus (ac)	γ	mnacted	
Continuoue			Contiguous:	N/A	
Contiguous. Teolatede	20.3 0 0		Tealatad	N/A	
Isolated.	0.0		ISUIALEU.	13/23	

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N/A N/A

The 28-acre SL-22 site is an impounded or partially impounded mangrove swamp/freshwater marsh (612/422) adjacent to the Indian River and separated from it by a low berm vegetated with Brazilian pepper (Schinus terebinthifolius), red mangrove (Rhizophora mangle), and white mangrove (Laguncularia racemosa). In most locations, mangroves occur on the waterward side of the berm, but on occasional spots mangrove and Brazilian pepper intermix. Other species occasionally observed along the densely vegetated berm include white vine (Sarcostema clausen), coin-vine (Dalbergia ecastophyllum), sea grape (Coccoloba uvifera), Mikania scandens, and wedelia (Wedelia trilobata). Giant land crab (Carcinus huami) burrows were observed along the berm.

The impounded wetland contained scattered red and white mangrove (Laguncularia racemosa) as well as the threatened giant leather fern (Acrostichum danaeifolium). Carolina willow (Salix caroliniana), Ludwigia sp., wax myrtle (Myrica cerifera), and Brazilian pepper are also common species within the impounded area. Duckweed (Lemna sp.) covers the surface water.



A. LOCATION						
County:	St. Lucie		Mun	icipality:	County	
ICWW Mile:	220.87		East/West of	ICWW:	West	
Section/Township/Range:	S16/T34S/R40E	2				
Receiving Waterbody:	Indian River					
FDEP classification:	11, UF W					
B. REACH INFORMATIO	N					
Reach Designation:	SL-1	Reach	Length (mi):	7.06		
ICWW Mileage:	218.46 to	225.52				
Geographic:	Indian River/St	. Lucie Co. Lii	ne to Seaway (S.R. A1A)) Bridge	
50-yr Requirements						
Dredging (cy):	30,399					
Storage (cy):	65,358					
C. SITE PARAMETERS						
Ma	oped Area (ac):	· 40.7		Buffer V	Width (ft)	
Containr	nent Area (ac):	N/A	-	North:	N/A	
Total Area	Impacted (ac):	N/A		South:	N/A	
Total Bu	uffer Area (ac):	N/A		East:	N/A	
Buffer Outside Map	oped Area (ac):	N/A		West:	N/A	
Preliminary Total	Site Area (ac):	N/A	(Area Impacted	+ Buffer)		
Storage (Capacity (cy):	marginal up	and only			
Dil	ke Height (ft):	N/A	-			
Excavati	on Depth (ft):	N/A				
Estimated Site Elevation	(ft +NGVD):	3.0				
Maximum Pumping I	Distance (mi):	5.05				
D. SITE CHARACTERIST	ICS					
Public Road to Site:	Michigan St.		Additional I	Road Ease	ment (ft):	N/A
Comprohensive Plan	Designation	Mirod	Pip	eline Ease	ment (ft):	N/A
	ant Land Lice:	open land or	mmoraial			
Aujao	ent Land Ose.	open land, et	figurer ciai			
Predominant Land U	Jse Impacted:	N/A				
		Wetlands (ac))		_	
	On-Site			Impacted		
Contiguous:	40.7		Contiguous:	N/A		
Isolated:	0.0		Isolated:	N/A		

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The 41-acre SL-23 site is also an impounded wetland (612/422/616) that borders the Indian River. Located south and adjacent to SL-22, SL-23 shares characteristics with the northern site; only a narrow grass road (Michigan Avenue) separates the two. The low berm which separates SL-23 from the river is vegetated with Brazilian pepper (*Schinus terebinthifolius*), red mangrove (*Rhizophora mangle*), and white mangrove (*Laguncularia racemosa*). In most locations, the mangroves occur on the berm's waterward side and, occasionally, the mangrove and Brazilian pepper intermix. Other species observed occasionally along the densely vegetated berm include white vine (*Sarcostema clausen*), coin-vine (*Dalbergia ecastophyllum*), sea grape (*Coccoloba uvifera*), Mikania scandens, and wedelia (*Wedelia trilobata*). Giant land crab (*Carcinus huami*) burrows were observed along the berm. Brazilian pepper that occurs in the impoundment area is more prevalent than it is on Site SL-22. Mangrove (*Rhizophora mangle* and *Laguncularia racemosa*) is scattered in the impounded area along with Ludwigia sp., cattail (*Typha* sp.), and giant leather fern (*Acrostichum danaeifolium*).

A large constructed lagoon (part of Site SL-23A) borders SL-23 on the west; conveyance ditches connect the lagoon to the Indian River. A series of internal ditches associated with the site's impoundment area may also connect directly with the Indian River.

Indian River/ St. Lucie Co. 1.0 Mile Line Farm Building FIOTIDO Indian River 0.2 Mile 221 221 221 Coast Railway -- LEGEND --Citrus Groves 221 53.1 Ac Scale in Feet 53.1 Ac Total Acreage 200 0 400 Area Boundary Ditch Railroad ┿╋ ┽╍╂╍┠╶┤ SOURCE: W&AR Graphic 1996. T C9509 Figure B-11 Land Use and Vegetation of REVISION TAYLOR ENGINEERING INC. Candidate Site SL-3 St. Lucie County, Florida SHEET 9086 CYPRESS GREEN DRIVE JACKSONVILLE, FLORIDA 32256 DATE May, 1997

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A. LOCATION County: ICWW Mile: Section/Township/Range: Receiving Waterbody: FDEP classification:	St. Lucie 219.51 S8/T34S/R40E Indian River II, OFW		Municipali East/West of ICW	ity: County W: West	
B. REACH INFORMATIC	DN				
Reach Designation:	SL-1	Reach I	Length (mi): 7.0)6	
ICWW Mileage:	218.4 6 t	o 225.52			
Geographic:	Indian River/S	t. Lucie Co. Lin	e to Seaway (S.R. A	.1A) Bridge	
50-yr Requirements					
Dredging (cy):	30,399				
Storage (cy):	65,358				
C. SITE PARAMETERS					
Ma	nned Area (ac):	53.1	Buf	fer Width (ft)	
Contain	ment Area (ac):	10.0	Nor	th: 300	_
Total Area	Impacted (ac):	13.3	Sou	th: 300	
Total B	uffer Area (ac):	29.2	Ea	ist: 300	
Buffer Outside Map	pped Area (ac):	.0	We	est: 300	
Preliminary Total	Site Area (ac):	42.5	(Area Impacted + Buff	fer)	
Storage	Capacity (cy):	70,783			
Di	ke Height (ft):	8.0			
Excavati	ion Depth (ft):	2.99			
Estimated Site Elevation	(ft +NGVD):	4.0			
Maximum Pumping	Distance (mi):	6.70			
D. SITE CHARACTERIST	TICS				
Public Road to Site:	Old Dixie Hwy	(SR 605)	Additional Road Pipeline	Easement (ft): Easement (ft):	N/A >700
Comprehensive Plan	1 Designation:	Mixed	A		
Adjac	ent Land Use:	open land (we	etlands)		
Predominant Land	Use Impacted:	citrus grove			
		Wetlands (ac)			
	On-Site		Impac	ted	
Contiguous:	0.0		Contiguous: 0.0	0	
Isolated:	0.0		Isolated: 0.0	D	

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Site SL-3—an active and maintained citrus grove (221)—is located approximately one mile south of the Indian River/St. Lucie County line, and 750 ft south of the southern border of Site SL-2. The Indian River (ICWW) lies to the east of the site, and S.R. 605 (Old Dixie Highway) and the Florida East Coast Railway lies to the west.

Within its perimeter, the site contains two ditches—roughly oriented north to south—that divide the site into thirds. The ditches appear to be little more than grass-filled swales. Three ditches also occur along the north, south, and east boundaries. These ditches are relatively large compared to the interior ditches. A building in the center of the site appears to be associated with the citrus operation. None of the on-site roads, all dirt, could be detected from the aerial photographs.

North (S.R. A1A) 0.5 Mile Beach Causeway 437/422 ICWW 0.1 Mile 642 612 -- LEGEND --437/422 Australian Pine/Brazilian Pepper 5.4 Ac Mangrove Swamps Saltwater Marshes 0.3 Ac. 612 642 0.2 Ac Scale in Feet Total Acreage 5.8 Ac 0 100 200 Area Boundary SOURCE: W&AR Graphic 1996. ROJECT C9509 Figure B-12 Land Use and Vegetation of Candidate Site MSA SL-2/7 REVISION TAYLOR ENGINEERING INC. SHEET 9086 CYPRESS GREEN DRIVE JACKSONVILLE, FLORIDA 32256 St. Lucie County, Florida DATE May, 1997

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A. LOCATION						
County:	St. Lucie		Mun	icipality:	Ft. Pierce	
ICWW Mile:	224.96	02/00250/00 40E	East/West o	f ICWW:	East	
Section/ I ownship/Range:	S2/T35S/R40E,	S3/T35S/R40E				
EDEP aloosification:	Indian River					
PDEF Classification.	111					
B. REACH INFORMATIO	N					
Reach Designation:	SL-1	Reach L	ength (mi):	7.06		
ICWW Mileage:	218.46 to	225.52				
Geographic:	Indian River/St	t. Lucie Co. Line	e to Seaway ((S.R. A1A)) Bridge	
50-vr Requirements						
Dredging (cv):	30,399					
Storage (cy):	65,358					
C SITE PARAMETERS						
C. SITE I ARAMETERS	oned Area (ac):	5.8		Buffer V	Width (ft)	
Containn	nent Area (ac):	3.3		North:	<50	
Total Area	Impacted (ac):	4.0		South:	<50	
Total Bu	iffer Area (ac):	1.8		East:	<50	
Buffer Outside Map	oped Area (ac):	.0		West:	<50	
Preliminary Total	Site Area (ac):	5.8	(Area Impacted	d + Buffer)		
Storage (Capacity (cy):	14,921				
Dik	e Height (ft):	6.0				
Excavatio	on Depth (ft):	4.02				
Estimated Site Elevation	(ft +NGVD):	3.0				
Maximum Pumping I	Distance (mi):	6.72				
D. SITE CHARACTERIST	ICS					
Public Road to Site:	island		Additional	Road Ease	ment (ft):	N/A
			Pip	eline Ease	ment (ft):	N/A
Comprehensive Plan	Designation:	Conservation ·	- Environme	ntally Sen	sitive Island	District
Adjace	ent Land Use:	open water				
Predominant Land U	Ise Impacted:	Australian pin	e/Brazilian	pepper		
	<u>.</u>	Wetlands (ac)				
	On-Site			Impacted	•	
Contiguous:	0.5	(Contiguous:	0.0		
Isolated:	0.0		Isolated:	0.0		

Site MSA SL 2/7 is a six-acre island located in the Intracoastal Waterway. The site contains upland areas dominated by exotic vegetation (437/422). This area, in turn, is dominated by an overstory of Australian pine (*Casuarina equisetifolia*) and an understory of Brazilian pepper (*Schinus terebinthifolius*). Other species observed within this community include dog fennel (*Eupatorium capillifolium*), rouge plant (*Rivinia humilis*), and lantana (*Lantana camara*). The low dikes that crisscross the island create several small, impounded, water-filled, and unvegetated areas. These impounded areas were not mapped separately.

An elevated, eroding bluff occurs along the island's northern and northwestern shoreline. Mangroves vegetate an area of low elevation on the southeast shoreline. Species observed in the mangrove community include black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and sea oxeye (*Borrichia frutescens*). A sand pit located in the eastern area of the island is vegetated with high marsh species. These species include seashore paspalum (*Paspalum virginatum*), sea lavender (*Limonium carolinianum*), and sea purslane (*Sesuvium portulacastrum*).



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A. LOCATION

County:	St. Lucie	Municipality:	Ft. Pierce
ICWW Mile:	227.94	East/West of ICWW:	West
Section/Township/Range:	S22/T35S/R40E, S23/T35S/R40)E	
Receiving Waterbody:	Indian River		
FDEP classification:	III, OFW		

B. REACH INFORMATION

Reach Designation:	SL-2		Reach Length (mi):	8.44	
ICWW Mileage:	225.52	to	233.96		
Geographic:	Seaway (S.R.	A1A)	Bridge to Hutchinson Is	land Nuclear Power	r Plant

50-yr Requirements	
Dredging (cy):	17,224
Storage (cy):	37,031

C. SITE PARAMETERS

53.9	Buffer Width (ft)	
N/A	North:	N/A
N/A	South:	N/A
N/A	East:	
N/A	West:	
	53.9 N/A N/A N/A N/A	53.9Buffer WN/ANorth:N/ASouth:N/AEast:N/AWest:

Preliminary Total Site Area (ac):

(Area Impacted + Buffer)

Storage Capacity (cy):	insufficient area	
Dike Height (ft):	N/A	
Excavation Depth (ft):	N/A	
Estimated Site Elevation (ft +NGVD):	30.0	
Maximum Pumping Distance (mi):	6.04	

D. SITE CHARACTERISTICS

Public Road to Site: Savannah Rd.	· Additional Road Easement (ft):	N/A
	Pipeline Easement (ft):	N/A
Comprehensive Plan Designation: Adjacent Land Use:	General Open Space/FEC Railroad Property residential, industrial, railroad	
Predominant Land Use Impacted:	N/A	

Wetlands (ac) On-Site Impacted Contiguous: Contiguous: 0.0 N/A Isolated: 20.8 Isolated: N/A
Site SL-11 consists of two separate sites. The larger, northwestern parcel is a water-filled sand and gravel pit (162) surrounded by disturbed lands (740) with some weedy vegetation. The government apparently owns this portion of SL-11 and keeps it heavily fenced.

Southeast of the sand and gravel pit, the upland portion of Site SL-11 consists of disturbed areas of sand live oak/sand pine (432/413), sand other than beaches (720), and sand live oak (432). The sand live oak/sand pine community (432/413) is predominantly sand live oak (*Quercus geminata*), sand pine (*Pinus clausa*), wiregrass (*Aristida* sp.), camphorweed (*Heterotheca subaxillaris*), hogplum (*Ximenia americana*), prickly pear cactus (*Opuntia* sp.), and wild pine (*Tillandsia* sp.).

Large areas of sand other than beaches (720) occur interspersed with the upland forested communities. Sparse vegetation occupies the sandy areas where blazing star (*Liatris* sp.) and cottonweed (*Froelichia floridana*) occur occasionally.

The sand live oak (432) areas are mostly sand live oak, wild pine, rosemary (*Ceratiola ericoides*), and scrub hickory (*Carya floridana*).

Active gopher tortoise burrows occur throughout the upland communities in the southeast portion of the SL-11 site. Gopher tortoise is a state-listed species of special concern.



A. LOCATION

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A. LUCATION						
County:	St. Lucie		Mun	icipality:	Ft. Pierce	
ICWW Mile:	228.70		East/West of	ICWW:	West	
Section/Township/Range:	S23/T35S/R402	E, S26/T35S/R4	10E			
Receiving Waterbody:	Indian River					
FDEP classification:	III, OFW					
B. REACH INFORMATIO	N					
Reach Designation:	SL-2	Reach	Length (mi):	8.44		
ICWW Mileage:	225.52 t	o 233.96				
Geographic:	Seaway (S.R. A	A1A) Bridge to	Hutchinson Is	and Nucl	lear Power	Plant
50-yr Requirements						
Dredging (cy):	17,224					
Storage (cy):	37,031					
	,					
C. SITE PARAMETERS	aned Area (ac).	37 /		Buffer V	Width (ft)	
Containr	peu Area (ac).	54.4 N/A	-	North		
Total Area	Imposted (ac):	N/A		South	N/A	
Total D	Inipacted (ac).	N/A		East	N/A	
Duffer Outside Mor	mel Area (ac).	IN/A		West	NI/A	
Butter Outside Mar	speu Area (ac):	IVA		west:	IN/A	
Preliminary Total	Site Area (ac):	N/A	(Area Impacted	+ Buffer)		
Storage (Capacity (cy):	insufficient a	area			
Dik	e Height (ft):	N/A				
Excavati	on Depth (ft):	N/A				
Estimated Site Elevation	(ft +NGVD):	35.0				
Maximum Pumping I	Distance (mi):	5.09				
N GIME OF LUL OFFENIOR	YOG					
D. SITE CHARACTERIST	ICS		A .]	T		BT/A
Public Road to Site:	Indian River D	or (SR /0/)	Additional I Pip	coad Ease	ement (ft):	N/A N/A
Comprehensive Plan	Designation:	Low Density	Residential			
Adjace	ent Land Use:	residential, r	ailroad			
5						
Predominant Land U	Jse Impacted:	N/A				
		Wetlands (ac))			
·	On-Site		<u> </u>	Impacted	-	
Contiguous	0.0		Contiguous:	N/A	-	
Isolated:	0.0		Isolated	N/A		
15014104.	V+V		15014104.	IVA		

Site SL-12 is predominantly low-density residential (110) mixed with old but inactive citrus groves (221), sand other than beaches (720), and coastal scrub (322). The large, rectangular residential lots extend east to west for the entire width of the site. The eastern portions of the lots are developed, whereas the western sections (near the Florida East Coast Railway) are generally undeveloped.

The slightly disturbed and undeveloped areas of coastal scrub (322) contain sand pine (*Pinus clausa*), southern red cedar (*Juniperus silicicola*), Brazilian pepper (*Schinus terebinthifolius*), sand live oak (*Quercus geminata*), and scrub hickory (*Carya floridana*). Groundcovers are wiregrass (*Aristida* sp.) and saw palmetto (*Serenoa repens*). Many small areas of exposed sand are present, but only the larger areas of exposed sand (720) appear on the maps. At least four active gopher tortoise burrows were observed in this community. The gopher tortoise is a state-listed species of special concern.

(S.R. 712) White City Rd. (S.R. 712) White City
LEGEND 162 Sand and Gravel Pits 35.8 Ac 162/641 Sand and Gravel Pits/Freshwater Marsh 1.6 Ac 310 Herbaceous 57.3 Ac 322 Coastal Scrub 42.4 Ac 410 Upland Coniferous Forests 1.1 Ac 428/422 Cobbage Polm/Brazilian Pepper 6.3 Ac 434/422 Hardwood Conifer Mixed//Brazilian Pepper 25.0 Ac N 740 Disturbed Lands/Herbaceous 0.2 Ac 740 Disturbed Lands 13.0 Ac Total Acreage 337.1 Ac Scale in Feet Area Boundary Road
HIMMANNAME Railroad SOURCE: W&AR Graphic 1996. Source: Figure B-15 Figure B-15 Figure B-15 Figure B-15 Image: Source: Figure B-15 Figure B-15 Figure B-15 Figure B-15 Image: Source: Source: Source: Source: Source: Source: Image: Source: Source: Source: Source: Source: Source: Source: Image: Source:

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B-43

LOCATION .

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A. LOCATION						
County:	St. Lucie		Muni	cipality:	County	
ICWW Mile:	231.18		East/West of	ICWW:	West	
Section/Township/Range:	S1/T36S/R40E,	S12/T36S/R40	E			
Receiving Waterbody:	Indian River					
FDEP classification:	III, OFW					
B. REACH INFORMATIO	N					
Reach Designation:	SL-2	Reach	Length (mi):	8.44		
ICWW Mileage:	225.52 to	233.96	0 ()			
Geographic:	Seaway (S.R. A	1A) Bridge to	Hutchinson Isl	and Nucl	ear Power	Plant
et eginpinet						
50-vr Requirements						
Dredging (cv):	17.224					
Storage (cy):	37.031					
Storage (Cy).	57,051					
C SITE DADAMETEDS						
C. SILE LARAMETERS	mad Area (ac)	227 1		Buffor V	Vidth (ft)	
Containr	peu Area (ac).	557.1	_	North:	300	
Containi. Total Area	International (ac).	UI./ 772 0		North.	200	
Iotal Area	Impacted (ac):	/5.0			500	
	inter Area (ac):	41.3		East:	50	
Buffer Outside Mar	oped Area (ac):	.0		West:	300	
	6	1160				
Preliminary Total	Site Area (ac):	116.3	(Area Impacted	+ Buffer)		
a .	-					
Storage	apacity (cy):	765,476				
Dik	te Height (ff):	12.0				
Excavati	on Depth (ft):	4.33				
Estimated Site Elevation	(ft +NGVD):	30.0				
Maximum Pumping I	Distance (mi):	5.50				
D. SITE CHARACTERIST	ICS					
Public Road to Site:	White City Rd.		Additional R	oad Ease	ment (ft):	N/A
	(C.R. 712)		Pipe	line Ease	ment (ft):	600
Comprehensive Plan Designation:		C(Pub) Publ	lic Conservatio	n		
Adjace	ent Land Use:	open land (Sa	avannas), railr	oad, resid	lential	
J.		· ·		•		
Predominant Land U	Jse Impacted:	native vegeta	tion			
	. .					
		Wetlands (ac)				
<u></u>	On-Site	(10)	<u>ן</u>	mpacted		
Contiguous:	0.0		Contiguous:	0.0		
Isolated:	35.8		Isolated:	0.0		

Isolated: 35.8

Stisites.xis, Sheet SL-13

Site SL-13 is a large, approximately rectangular site (oriented northwest to southeast) about 1.75 miles long and 1,000 to 1,200 ft wide. The Florida East Coast Railroad forms the eastern boundary and Savannas State Preserve forms the western boundary borders.

The northern one-fifth of the site contains a large water-filled borrow pit (162). Several hundred feet to the south is a much smaller borrow pit with vegetation (162/641) characteristic of marsh areas. A small herbaceous (310) community separates the two pits. A single family residence (110) is located on the shoreline north of the larger borrow pit.

The rest of the site is primarily an open herbaceous vegetation community (310) dominated by wiregrass (*Aristida* sp.) with open bare patches of sand. Interspersed with the herbaceous vegetation community is coastal scrub (322) and small cabbage palm (*Sabal palmetto*)/Brazilian pepper (*Schinus terebinthifolius*; 428/422) community. Along most of the western boundary (comprising the lower four-fifths of the site) is a hardwood-conifer mixed community with some Brazilian pepper (434/422).

A cactus (*Cereus* sp.), likely one of two protected species, occurs sporadically within portions of the herbaceous and coastal scrub communities. The cactus is either the state-listed endangered Simpson's prickly apple (*C. gracilis* var. *simpsonii*) or the state- and federally-listed endangered fragrant prickly apple (*C. eriophorus* var. *fragrans*). Gopher tortoise (*Gopherus polyphemus*), a state-listed species of special concern, probably inhabit the site; however, no density information could be ascertained during the site visit. Initial estimates based on the Phase I site visit indicate low densities.

Many dirt roads run throughout the site, mainly in the herbaceous vegetation community. The roads and/or trails are associated with the use of off-road vehicles and motorcycles. This motor vehicle activity has disturbed some portions of the site's predominant communities.



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A. LOCATION						
County:	St. Lucie		Muni	cipality:	County	
ICWW Mile:	233.52		East/West of	ICWW:	East	
Section/Township/Range:	S17/T36S/R41E	4				
Receiving Waterbody:	Indian River					
FDEP classification:	II, OFW					
B. REACH INFORMATIO	N ST S					
Reach Designation:	SL-2	Reach L	ength (m1):	8.44		
ICWW Mileage:	225.52 to	233.96				
Geographic:	Seaway (S.R. A	1A) Bridge to H	lutchinson Isl	and Nucl	lear Power I	Plant
50-vr Reauirements		-				
Dredging (cv):	17.224					
Storage (cy):	37,031					
Storage (05).	07,001					
C. SITE PARAMETERS						
Mar	oped Area (ac):	78.3 (w/SL-25) _	Buffer V	Width (ft)	
Containr	nent Area (ac):	N/A	_	North:	N/A	
Total Area	Impacted (ac):	N/A		South:	N/A	
Total Bı	uffer Area (ac):	N/A		East:	N/A	
Buffer Outside Mar	oped Area (ac):	N/A		West:	N/A	
Dullasian Tetal		N 7/A	// -			
Preliminary 10tal	Site Area (ac):	N/A	(Area Impacted	+ Buffer)		
Storage (Capacity (cy):	marginal upla	and only			
Dik	e Height (ft):	N/A	-			
Excavati	on Depth (ft):	N/A				
Estimated Site Elevation	(ft +NGVD):	3.0				
Maximum Pumping I	Distance (mi):	6.59				
D. SITE CHARACTERIST	ICS					
Public Road to Site:	No public road		Additional F	load Ease	ement (ft):	N/A
			Pipe	eline Ease	ement (ft):	N/A
Comprehensive Plan	Designation:	Residential-C	onservation			
Adjace	ent Land Use:	Hutchinson Is	land Nuclear	Power P	lant	
Predominant Land U	Jse Impacted:	N/A				
	L					
<u> </u>		Wetlands (ac)			-	
~ .	On-Site			mpacted	-	
Contiguous:	8.3 (w/SL-25)		Contiguous:	N/A		
Isolated:	0.0		Isolated:	N/A		

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A. LOCATION County: St. Lucie Municipality: County ICWW Mile: 233.95 East/West of ICWW: East Section/Township/Range: S16,17/T36S/R41E Receiving Waterbody: Indian River FDEP classification: II, OFW **B. REACH INFORMATION** Reach Designation: SL-2 Reach Length (mi): 8.44 ICWW Mileage: 225.52 233.96 to Geographic: Seaway (S.R. A1A) Bridge to Hutchinson Island Nuclear Power Plant 50-yr Requirements Dredging (cy): 17,224 Storage (cy): 37,031

C. SITE PARAMETERS

Mapped Area (ac):	78.3 (w/SL-24)		Buffer W	ridth (ft)	
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):	marginal upla	nd only			
Dike Height (ft):	N/A				
Excavation Depth (ft):	N/A				
Estimated Site Elevation (ft +NGVD):	3.0				
Maximum Pumping Distance (mi):	6.33				
D. SITE CHARACTERISTICS					
Public Road to Site: No public road		Additional F Pipe	Road Easen line Easen	nent (ft): nent (ft):	N/A N/A
Comprehensive Plan Designation:	Transportatio	n/Utilities			
Adjacent Land Use:	Hutchinson Is	land Nuclear	Power Pla	ant	
Predominant Land Use Impacted:	N/A				
	Wetlands (ac)				
On-Site]	Impacted		
Contiguous: 8.3 (w/SL-24)		Contiguous:	N/A		
Isolated: 0.0		Isolated:	N/A		

The 78-acre SL-24/25 site is a semi-impounded mangrove swamp (612) located on the Hutchinson Island Nuclear Power Plant. The site appears to have three diked impoundments (one impoundment within Site SL-24 and two impoundments within Site SL-25). A perimeter grassed road completely encircles SL-24 and partially encircles SL-25. The road borders SL-25 on the south, east, and west sides and serves as a fitness trail in conjunction with some of the other recreational facilities at the nuclear power plant.

Site SL-24 contains large areas of dead red mangrove (*Rhizophora mangle*) with some dead black mangrove (*Avicennia germinans*) along the water line of the impoundment. Live red and black mangove with some white mangrove (*Laguncularia racemosa*) occur along the dikes. Other species observed growing along the roadway and dikes include Brazilian pepper (*Schinus terebinthifolius*), saltbush (*Baccharis halimifolia*), saltwort (*Batis maritima*), and gray nicker (*Caesalpinia bonduc*). Observed culverts in several locations allow adequate drainage between the impoundment and the Indian River. Species observed on the road included St. Augustine grass (*Stenopharum secundum*), spanish needles (*Bidens bipinnata*), and bermudagrass (*Cynodon dactylon*).

Similar to conditions described on Site SL-24, the northern impoundment area of SL-25 contains an area of extensive dead red and black mangroves covered with algae on their lower trunks and roots. Shallow standing water was present during the site visit at both impoundment sites. Some of the black mangroves are resprouting. Salt marsh bulrush (*Scirpus robustus*) exists in some areas. Other species observed include seaside heliotrope (*Heliotropium curassavicum*) and sea purslane (*Sesuvium maritimum*) which occur in an area separated from the south impoundment by a dike covered with Brazilian pepper. The culvert in the southernmost impoundment interconnects it with the Indian River, and culverts may connect the two impoundments.



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B-50

A. LOCATION County: ICWW Mile: Section/Township/Range: Receiving Waterbody: FDEP classification:	St. Lucie 229.09 S29,30/T36S/R Indian River III, OFW	41E	Mun East/West of	icipality: FICWW:	County East	
B. REACH INFORMATIO	N SL 2	Dee	h T an ath (mi).	9 44		
Keach Designation:	5L-2 225 52 +		ch Length (mi):	0.44		
Geographic:	Seaway (S.R. A	1A) Bridge	, to Hutchinson Isl	and Nucl	lear Power	Plant
Geographie.	Southay (Sint 1	, 21.04ge				
50-yr Requirements						
Dredging (cy):	17,224					
Storage (cy):	37,031					
C. SHE PARAMETERS	aned Area (ac):	12 8		Buffer V	Width (ff)	
Containn	nent Area (ac):	42.0 N/A	-	North	N/A	
Total Area	Impacted (ac):	N/A		South:	N/A	
Total Bi	iffer Area (ac):	N/A		East	N/A	
Buffer Outside Mar	pped Area (ac):	N/A		West:	N/A	
r	,					
Preliminary Total	Site Area (ac):	N/A	(Area Impacted	! + Buffer)		
Storage (Dik Excavati Estimated Site Elevation Maximum Pumping I	Capacity (cy): te Height (ft): on Depth (ft): (ft +NGVD): Distance (mi):	In adequa N/A N/A 0.0, site m 5.09	te upland area, e ostly flooded	xtensive :	mangroves	
D. STTE OHADA OTEDIST	TCS					
Public Road to Site:	S.R. A1A		Additional I Pin	Road Ease	ement (ft):	N/A 1700 0
Comprehensive Plan	Designation:	Residentia	l Urban		mont (11).	1700.0
Adjace	ent Land Use:	Nuclear P	ower Plant, man	grove/mo	squito imp	ound.
·						
Predominant Land U	Jse Impacted:	N/A				
·		Wetlands (ac)		_	
	On-Site		_	Impacted	_	
Contiguous:	29.7		Contiguous:	N/A		
Isolated:	0.0		Isolated:	N/A		

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The 43-acre SL-27 site consists of a beachside access park (185, Frederick Douglas Memorial Park), a sandy beach (181) bordering the Atlantic Ocean, and an adjacent mangrove swamp impoundment (612). Small areas of exotic plant communities occur along the park access road.

A thin band of Australian pine (*Casuarina equisetifolia*, 437) occurs south of the park road and along the beach. Other species observed in this area include the beach elder (*Iva imbricata*), cabbage palm (*Sabal* palmetto), beach sunflower (*Helianthus debilis*), Brazilian pepper (*Schinus terebinthifolius*), and sea grape (*Coccoloba uvifera*).

Red mangrove (*Rhizophora mangle*) and white mangrove (*Laguncularia racemosa*) vegetate the impoundment. Some sea oxeye (*Borrichia frutescens*) grows along the impoundment banks. A ditch lies along the south impoundment boundary.



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A. LOCATION						
County: ICWW Mile: Section/Township/Range: Receiving Waterbody: FDEP classification:	St. Lucie 227.46 S18/T35S/R41E Indian River III, OFW	;	Mun East/West of	icipality: TCWW:	County East	
B. REACH INFORMATIO	N					
Reach Designation:	SL-2	Reach	Length (mi):	8.44		
ICWW Mileage:	225.52 to	233.96				-
Geographic:	Seaway (S.R. A	1A) Bridge to	Hutchinson Is	land Nucl	lear Power	Plant
50-yr Requirements						
Dredging (cy):	17,224					
Storage (cy):	37,031					
C SITE DADAMETEDS						
C. SILE PARAMETERS	med Area (ac):	103.9		Buffer V	Vidth (ft)	
Containn	nent Area (ac):	35.9	-	North:	>150	
Total Area	Impacted (ac):	41.1		South:	N/A	
Total Bu	uffer Area (ac):	62.6		East:	>50	
Buffer Outside Map	oped Area (ac):	.0		West:	>350	
Preliminary Total	Site Area (ac):	N/A	(Area Impactea	+ Buffer)		
Storage (Dik	Capacity (cy): te Height (ft):	244,126 9.0				
Excavatio	on Depth (ft):	0.0, mat'l ob	tained off site			
Estimated Site Elevation	(ft +NGVD):	0.0, flooded	1			
Maximum Pumping I	Distance (mi):	5.93				
D SITE CHADA CTEDIST	TCS					
Public Road to Site	ICO Riua Haron Riv	đ	Additional	2 oad Fase	ment (ft)	N/A
	Dide Heron Div	u.	Pin	eline Ease	ment (ff):	>800
Comprehensive Plan	Designation:	Public Cons	ervation			
Adjace	ent Land Use:	public park,	mosquito imp	oundmen	t	
Predominant Land U	Jse Impacted:	mangroves,	mosquito impo	oundment	:	
		Wetlands (ac)		_	
	On-Site			Impacted	-	
Contiguous:	81.4		Contiguous:	35.9+		
Isolated:	0.0		Isolated:	0.0		

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The 104-acre SL-28 site contains an impounded mangrove swamp (612), beachfront (181), and a temperate hardwood forest invaded by Brazilian pepper (425/422). Other land use and vegetation communities on-site include a small commercial parcel (140) along the west boundary (S.R. A1A), a grassy area used for access to the beach (310), and a strand of Australian pine (437) between the beach and the mangrove impoundment.

A hardwood forest occurs just south of Blue Heron Boulevard on the site's northern end. Brazilian pepper (*Schinus terebinthifolius*), red bay (*Persea borbonia*), and cabbage palm (*Sabal palmetto*) dominate the hardwood forest. The community also includes some live oak (*Quercus virginiana*) canopy with understory shrubs of myrsine (*Rapanea punctata*) and wild coffee (*Psychotria nervosa*).

Red, white, and black mangrove (*Rhizophora mangle, Laguncularia racemosa, and Avicennia germinans*) vegetate the mangrove area. Also, several large areas of open water were visible on the aerial photographs. Ditches run generally east-west within the mangrove impoundment. A dike vegetated with Brazilian pepper is oriented north to south through the center of the mangrove area.



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A. LOCATION						
County:	St. Lucie		Mur	icipality:	County	
ICWW Mile:	237.45		East/West of	f ICWW:	West	
Section/Township/Range:	S32/T36S/R41	E				
Receiving Waterbody:	Indian River					
FDEP classification:	III, OFW					
B. REACH INFORMATIC)N					
Reach Designation:	SL-3	Reach	Length (mi):	6.22		
ICWW Mileage:	233.96 t	o 240.18				
Geographic:	Hutchinson Isl	and Nuclear Po	wer Plant to S	t. Lucie/M	Iartin Co. L	ine
50-yr Requirements						
Dredging (cy):	24,635					
Storage (cy):	52,966					
C. SITE PARAMETERS						
Ma	pped Area (ac):	23.7		Buffer V	Width (ft)	
Contain	ment Area (ac):	N/A	-	North:	N/A	
Total Area	Impacted (ac):	N/A		South:	N/A	
Total B	uffer Area (ac):	N/A		East:	N/A	
Buffer Outside Ma	pped Area (ac):	N/A		West:	N/A	
Preliminary Total	Site Area (ac):	N/A	(Area Impacted	+ Buffer)		
Storage	Capacity (cy):	inadequate a	rea			
Di	ke Height (ft):	N/A				
Excavati	ion Depth (ft):	N/A				
Estimated Site Elevation	(ft +NGVD):	35.0				
Maximum Pumping	Distance (mi):	4.48				
D. SITE CHARACTERIST	TICS					
Public Road to Site:	Walton Rd.		Additional	Road Eas	ement (ft):	N/A
	S. Indian River	Dr.	Pi	peline Eas	ement (ft):	N/A
Comprehensive Plan	n Designation:	RS (Resident	tial-Suburban)	-	. ,	
Adjac	ent Land Use:	residential hi	gh density, op	en land		
Predominant Land	Use Impacted:	N/A				
		Wetlands (ac))			
	On-Site			Impacted	_	
Contiguous:	0.0		Contiguous:	N/A		
Isolated	0.0		Isolated:	N/A		

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Site SL-17 is located adjacent to the Indian River on a relic dune ridge. The site contains the sterile white sands characteristic of dune areas. Vegetation communities include temperate hammock (425) in the northeastern corner, oak-pine-hickory (423) along the southern border, a small stand of sand pine (413) along the western side of the site, and a composite herbaceous/sand live oak community (310/432) comprising the majority of the site.

In the herbaceous/sand live oak community, open grassy areas are intermixed with small scrub oak, including sand live oak (*Quercus geminata*) and myrtle oak (*Q. myrtifolia*). The herbaceous areas contain a sparse cover of three awn grass (*Aristida gyrans*), wireweed (*Polygonella ciliata* and *P. robusta*), silk grass (*Pityopsis graminifolia*), greenbrier (*Smilax auriculata*), and sand spikemoss (*Selaginella arenicola*). Active gopher tortoise burrows were observed in several locations in this community. A dense overstory of sand pine (*Pinus clausa*) in the sand pine community has an understory of oaks similar to the sand live oak areas.

The hammock community contains a dense canopy of live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), and red bay (*Persea borbonia*). Some invasion of African bowstring hemp (*Sansevieria hyacinthoides*) has occurred in this community. The pine-oak-hickory community is similar to the hammock community. Live oak and sand live oak dominate, but it also contains a mixture of slash pine (*Pinus elliottii*) and scrub hickory (*Carya floridana*) that make this area distinctly different.



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A. LOCATION						
County: ICWW Mile: Section/Township/Range: Receiving Waterbody: FDEP classification:	St. Lucie 239.03 S9/T37S/R41E Indian River III, OFW		Mun East/West of	icipality: TCWW:	County West	
D DEACHINEODMATIO						
D. KEACH INFORMATIO	2T 2	Decoh	(anoth (mi))	6 12		
ICWW Mileage	233.96 t	740 18	cengui (iiii).	0.22		
Geographic:	Hutchinson Isla	and Nuclear Pov	ver Plant to St	. Lucie/M	lartin Co. Li	ne
50-yr Requirements						
Dredging (cy):	24,635					
Storage (cy):	52,966					
C. SITE PARAMETERS						
Maj	oped Area (ac):	11.0		Buffer V	Width (ft)	
Contain	nent Area (ac):	N/A	_	North:	N/A	
Total Area	Impacted (ac):	N/A		South:	N/A	
Total Bu	uffer 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 ur	developed are	a		
Dil	ke Height (ft):	N/A	-			
Excavati	on Depth (ft):	N/A				
Estimated Site Elevation	(ft +NGVD):	30.0				
Maximum Pumping I	Distance (mi):	6.00				
D. SITE CHARACTERIST	ICS					
Public Road to Site:	S. Indian River	Dr.	Additional Pir	Road Eas	ement (ft): ement (ft):	N/A N/A
Comprehensive Plan	Designation:	Rs Residentia	l-Suburban			
Adjace	ent Land Use:	residential lov	v density, cons	ervation		
Predominant Land U	Use Impacted:	N/A				
		Wetlands (ac)			_	
	On-Site			Impacted	-	
Contiguous:	0.0		Contiguous:	N/A		
Isolated:	0.0		Isolated:	N/A		

Site SL-19, an 11-acre developed site, contains a residence on its northern edge. Some clearing on the southern portion indicates that development may soon occur in this area as well. The dominant vegetation is live oak (*Quercus virginiana*) canopy with scattered cabbage palm (*Sabal palmetto*) and red bay (*Persea borbonia*). Brazilian pepper (*Schinus terebinthifolius*) has invaded the site and, where not maintained, prevails over much of the site.

The site's western area is an undeveloped land area (191) including some small clearings that contain a variety of herbs and vines, wireweed (*Polygonella* sp.), goldenrod (*Solidago* sp.), bracken fern (*Pteridium aquilinium*), partridge-pea (*Cassia chamaecrista*), and muscadine (*Vitis rotundifolia*).

APPENDIX C

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Dike Requirements and Site Capacity

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Width of Dike at Grade, B_G

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$$B_{G} = 2HS + T$$
(1)

Width of Dike at Excavated Grade, B_g

$$B_{g} = 2HS + T + (G - g) S$$
 (2)

(3)

Width of Dike at Depth of Freeboard and Ponding, ${\rm B}_{\rm F}^{}$ = 2FS + T

Volume of Dike Material Required,
$$V_{MR}$$

 $V_{MR} = \frac{1}{2}H (T + B_G) P$ (4)

Volume of Dike Material Available on Site, ${\rm V}_{\rm MA}$

$$V_{MA} = (G - g)[A - \frac{1}{2}P_{I}(B_{g} - B_{G})]$$
 (5)

Volume of Disposal Capacity, ${\rm V}^{}_{\rm D}$

$$V_{D} = V_{MA} + (H - F) \left\{ A + \frac{1}{2} P_{I} [B_{G} - (H - F) S - B_{F}] \right\}$$
(6)

Depth of Excavation, (G - g)

$$(G - g) = -b \pm \sqrt{b^2 - 4ac}$$
 (7)

where: $a = \frac{1}{2}P_{I}S$

 $b = P_I HS + \frac{1}{2} P_I T - A - \frac{1}{2} P_I B_G$ $c = \frac{1}{2} H (T + B_G) P$

TAYLOR ENGINEERING INC 9086 CYPRESS GREEN DRIVE JACKSONVILLE, FLORIDA 32256	Appendix C Dike Requirements and Site Capacity	PROJECT REVISION SHEET DATE
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APPENDIX D

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Property Ownership, Site Bank

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Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value	Comprehensive Plan Designation	Zoning
SL-2	1405-230-0000-000/3	Kennedy Groves, Inc. P.O. Box 189 Wabasso, FL 32970	158.28	\$912,910.	RU	RS-2
	1405-100-0000-000/3	Poteat, Guy E, Sr. 5945 20th Street Vero Beach, FL 32966	33.53	108,220.	R/C	R/C
SL-23A	1416-233-0002-000/0	Mc Inturf Enterprises, Inc. 6300 Stirling Road Hollywood, FL 33024-2153	82.46	221,460.	Mixed	IH
	1417-411-0000-000/5	Same as above	27.38	136,900.	Mixed	IH
SL-9	2402-133-0003-000/0	John D. & Catherine T. MacArthur Foundation 4400 PGA Blvd., Ste 900 Palm Beach Gardens, FL 33410	108.62	3,180,450.	Mixed	PMUD, MI
SL-26	3508-111-0002-000/3	Florida Power & Light Co. Attn: Property Tax Office P.O. Box 14000 Juno Beach, FL 33408	591.7	353,036,520.	T/U	U
	3529-701-0012-000/2	Florida Inland Navigation District	32.10		RU	RS-2
M-8	3529-701-0011-000/5	MacArthur (used full name/address above)	20.93	531,840.	RU	RS-2
	3529-701-0014-000/6	Kwapinski, Elke H. 11 Ocean Drive Jupiter Inlet Colony, FL 33469	0.81	97,350.	RU	RS-2

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 Table D-1
 Site Ownership¹, Primary and Secondary Sites, St. Lucie County

¹ Based on 1995 tax roll/public record documents, St. Lucie County, Florida

APPENDIX E

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Sediment Data

ELLIS & ASSOCIATES, INC.

SUMMARY OF GRADATION TEST RESULTS

PROJECT:	Hydrometer and Grain Size Analyses
CLIENT:	Taylor Engineering
PROJECT NO.:	95-1497

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					GRAI	ΙΤΑΟ	ON	TES	Т		Estimated
	Sample	% Passing									Shell
Boring/	Depth										- Content,
Sample No.	(ft.)	No. 4	No. 10	No. 20	No. 40	No. 60	No. 80	No.100	No.140	No.200	%
==========		333385	225222	======	======					======	
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
18-3-3		100 N	98.7	98.5	98 3	97.6	94.8	87.8	33 7	13.6	1-2



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SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: \$5-55719

Received: 13 OCT 95 Reported: 03 NOV 95

Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256

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Project:	I	CWW-	IR	&	SL
Sample	d	By:	C1	ie	ent

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION	, SOLID OF	SEMISOLID	SAMPLES	DATE/ TIME SAMPLE	D
55719-1	SL-3-3				10-11-95/10	15
55719-2	SL-2-1				10-11-95/12	10
55719-3	SL-1-3				10-11-95/12	45
55719-4	IR-3-1				10-11-95/10	10
5571 9- 5	IR-1-1				10-12-95/10	10
PARAMETER		55719-1	55719-2	55719-3	55719-4	55719-5
Aluminum (6010) , mg/kg dw	22000	3100	860	13000	23000
Arsenic (7	060), mg/kg dw	2.9	1.9	1.9	1.9	3.2
Cadmium (7	131), mg/kg dw	<0.19	<0.14	<0.14	<0.15	<0.25
Chromium (6010), mg/kg dw	34	7.8	8.7	1,5	36
Copper (60	10), 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 (60	10), 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 (7	471), mg/kg dw	0.033	<0.014	<0.014	0.021	0.040



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> Project: ICWW-IR & SL Sampled By: Client

		REPORT (OF RESULTS			Page 2
					DATE/	
LOG NO	SAMPLE DESCRIPTION	, SOLID OR	SEMISOLID	SAMPLES	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-Pesticid	es/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.	uq/kq 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, 1	ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
4,4'-DDE, 1	uq/kq dw	<6.3	<4.5	<4.6	<5.1	<8.2
4,4'-DDT, 1	ug/kg dw	<6.3	<4.5	<4.6	<5.1	<8.2
Dieldrin,	ug/kg đw	<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 đw	<6.3	<4.5	<4.6	<5.1	<8.2
Endrin ald	ehyde, 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
Methoxychlo	or, ug/kg dw	<33	<23	<24	<26	<42
Toxaphene,	ug/kg dw	<330	<230	<240	<260	<420
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> Project: ICWW-IR & SL Sampled By: Client

			REPORT	OF RESULTS			Page 3
						DATE/	
LOG NO	SAMPLE D	ESCRIPTION	, SOLID OR	SEMISOLID	SAMPLES	TIME SAMPLED)
55719-1	SL-3-3					10-11-95/101	.5
55719-2	SL-2-1					10-11-95/121	.0
55719-3	SL-1-3					10-11-95/124	5
55719-4	IR-3-1					10-11-95/101	.0
55719-5	IR-1-1					10-12-95/101	.0
PARAMETER			55719-1	55719-2	55719-3	55719-4	55719-5
Aroclor-10	16, ug/kg		<63	 <45	<46	<51	<82
Aroclor-12	21, ug/kg	dw	<130	<92	<93	<100	<170
Aroclor-12	32, ug/kg	đw	<63	<45	<46	<51	<82
Aroclor-12	42, ug/kg	dw	<63	<45	<46	<51	<82
Aroclor-12	48, ug/kg	dw	<63	<45	<46	<51	<82
Aroclor-12	54, ug/kg	dw	<63	<45	<46	<51	<82
Aroclor-12	60, ug/kg	đw	<63	<45	<46	<51	<82
Date Extra	cted		10.17.95	10.17.95	10.17.95	10.17.95	10.17.95
							



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> Project: ICWW-IR & SL Sampled By: Client

DATE/ DATE/ LOG NO SAMPLE DESCRIFTION , SOLID OR SEMISOLID SAMPLES TIME SAMPLED 55719-1 SL-3-3 10-11-95/1015 55719-2 SL-2-1 10-11-95/1216 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 Polynuclear Aromatics (8310) Acenaphthylene, ug/kg dw <42 <29 <26 <35 <51 Acenaphthylene, ug/kg dw <8.3 <5.8 <5.3 <7.0 <10 Benzo (a) anthracene, ug/kg dw <8.3 <5.8 <5.3 10 <10 Benzo (b) fluoranthene, ug/kg dw <8.3 <5.8 <5.3 10 <10 Benzo (a) pyrene, ug/kg dw <21 <14 <13 <18 <26 Benzo (b) fluoranthene, ug/kg dw <21 <14 <13 <18 <26 Chrysene, ug/kg dw <21 <14 <13 <18 <26			REPORT (OF RESULTS			Page 4
LOG NO SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES TIME SAMPLED 55719-1 SL-3-3 10-11-95/1015 55719-2 SL-2-1 10-11-95/1245 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 Polynuclear Aromatics (8310) 2 226 <35						DATE/	
55719-1 SL-3-3 10-11-95/1015 55719-2 SL-2-1 10-11-95/1245 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	LOG NO	SAMPLE DESCRIPTION ,	SOLID OR	SEMISOLID	SAMPLES	TIME SAMPLED	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	55719-1	SL-3-3				10-11-95/101	5
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	55719-2	SL-2-1				10-11-95/121	0
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	55719-3	SL-1-3				10-11-95/124	5
55719-5IR-1-110-12-95/1010PARAMETER55719-155719-255719-355719-455719-5Polynuclear Aromatics (8310)Acenaphthene, ug/kg dw<42	55719-4	IR-3-1				10-11-95/101	0
PARAMETER 55719-1 55719-2 55719-3 55719-4 55719-5 Polynuclear Aromatics (8310) Acenaphthene, ug/kg dw <42	55719-5	IR-1-1				10-12-95/101	0
Polynuclear Aromatics (8310) Acenaphthene, ug/kg dw <42	PARAMETER	······	55719-1	55719-2	55719-3	55719-4	55719-5
Polynuclear Aromatics (8310) Acenaphthene, ug/kg dw <42							
Acenaphthene, ug/kg dw <42	Polynuclear	Aromatics (8310)					
Acenaphthylene, ug/kg dw <42	Acenaphther	ie, ug/kg dw	<42	<29	<26	<35	<51
Anthracene, ug/kg dw <8.3	Acenaphthyl	ene, ug/kg dw	<42	. <29	<26	<35	<51
Benzo (a) anthracene, ug/kg dw <8.3	Anthracene,	ug/kg dw	<8.3	<5.8	<5.3	<7.0	<10
Benzo (a) pyrene, ug/kg dw<8.3<5.8<5.310<10Benzo (b) fluoranthene, ug/kg dw<8.3	Benzo (a) ant	hracene, ug/kg dw	<8.3	<5.8	<5.3	<7.0	<10
Benzo (b) fluoranthene, ug/kg dw <8.3	Benzo (a) pyr	rene, ug/kg dw	<8.3	<5.8	<5.3	10	<10
Benzo (g,h,i) perylene, ug/kg dw <21	Benzo(b)flu	oranthene, ug/kg dw	<8.3	<5.8	<5.3	14	<10
Benzo (k) fluoranthene, ug/kg dw<21<14<13<18<26Chrysene, ug/kg dw<8.3	Benzo(g,h,i)perylene, ug/kg dw	<21	<14	<13	<18	<26
Chrysene, ug/kg dw<8.3<5.8<5.37.4<10Dibenzo(a,h) anthracene, ug/kg dw<42	Benzo(k)flu	oranthene, ug/kg dw	<21	<14	<13	<18	<26
Dibenzo(a,h) anthracene, ug/kg dw<42<29<26<35<51Fluoranthene, ug/kg dw<21	Chrysene, ı	ug/kg dw	<8.3	<5.8	<5.3	7.4	<10
Fluoranthene, ug/kg dw<21<14<13<18<26Fluorene, ug/kg dw<21	Dibenzo(a,h	1)anthracene, ug/kg dw	r <42	<29	<26	<35	<51
Fluorene, ug/kg dw<21<14<13<18<26Indeno(1,2,3-cd)pyrene, ug/kg dw<21	Fluoranther	ne, ug/kg dw	<21	<14	<13	<18	<26
Indeno(1,2,3-cd)pyrene, ug/kg dw<21<14<13<18<26Naphthalene, ug/kg dw<42	Fluorene, ı	ıg/kg dw	<21	<14	<13	<18	· <26
Naphthalene, ug/kg dw <42	Indeno(1,2,	3-cd)pyrene, ug/kg dw	/ <21	<14	<13	<18	<26
Phenanthrene, ug/kg dw<8.3<5.8<5.3<7.0<10Pyrene, ug/kg dw<21	Naphthalene	e, ug/kg dw	<42	<29	<26	<35	<51
Pyrene, ug/kg dw<21<14<13<18<26Date Extracted10.19.9510.19.9510.19.9510.19.9510.19.9510.19.95Organic Carbon28000390038001300057000(Walkley-Black), mg/kg dw2321183144Oil & Grease (413.2), mg/kg dw3000320001400062004600	Phenanthrer	ie, ug/kg dw	<8.3	<5.8	<5.3	<7.0	<10
Date Extracted10.19.9510.19.9510.19.9510.19.9510.19.95Organic Carbon (Walkley-Black), mg/kg dw28000390038001300057000Oil & Grease (413.2), mg/kg dw2321183144Carbonate, mg/kg dw3000320001400062004600	Pyrene, ug/	'kg dw	<21	<14	<13	<18	<26
Organic Carbon 28000 3900 3800 13000 57000 (Walkley-Black), mg/kg dw 601 600	Date Extrac	ted 1	.0.19.95	10.19.95	10.19.95	10.19.95	10.19.95
(Walkley-Black), mg/kg dw Oil & Grease (413.2), mg/kg dw 23 21 18 31 44 Carbonate, mg/kg dw 3000 32000 14000 6200 4600	Organic Carb	oon	28000	3900	3800	13000	57000
Oil & Grease (413.2), mg/kg dw2321183144Carbonate, mg/kg dw3000320001400062004600	(Walkley-E	lack), mg/kg dw					
Carbonate, mg/kg dw 3000 32000 14000 6200 4600	Oil & Grease	e (413.2), mg/kg dw	23	21	18	31	44
	Carbonate, m	ıg/kg dw	3000	32000	14000	6200	4600

■ & ENVIRONMENTAL SERVICES, INC.

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Page 5

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 SAMPLE	SD	_
55719-1 55719-2 55719-3 55719-4 55719-5	SL-3-3 SL-2-1 SL-1-3 IR-3-1 IR-1-1				10-11-95/10 10-11-95/12 10-11-95/12 10-11-95/10 10-12-95/10	015 210 245 010 010	_
PARAMETER		55719-1	55719-2	55719-3	55719-4	55719-5	-
Total Kjelda Percent Sol:	ahl Nitrogen-N, mg/ ids (160.3), %	kg dw 1500 52	300 73	560	730 65	4000 40	



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> Project: ICWW-IR & SL Sampled By: Client

Page 6

REPORT OF RESULTS

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	

5102 Lafi	loche Avenue • Savannah, GA 31	404 • (912) 354-7858 • Fax (912) 352-0	165	
			LOG NO:	S5-55719
	Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive		Received: Reported:	13 OCT 95 03 NOV 95
	Jacksonville, FL 32256		Project: IC Sampled 2	WW-IR & SI By: Client
- 06 NO		REPORT OF RESULTS	DATE/	Page 7
LOG NO	SAMPLE DESCRIPTION ,	SOLID OR SEMISOLID SAMPLES	TIME SAMPLED	
55719-6	IR-2-3		10-12-95/114	5
PARAMET	ER	55719-6		
Cl_Pest	icides/PCB (8080)			
Aldrin	ug/kg dw	-2 6		
alpha-	, ug/kg uw PHC yg/kg dw	<2.0		
hota P	BAC, $ug/kg uw$	<2.0		
Deca-b.	nc, ug/kg uw	<2.0		
ganuna	BHC, ug/kg dw	.<2.0		
delta-	BHC, ug/kg dw	<2.6		
	ane, ug/kg dw	<20		
4,4°°D	DD, ug/kg dw	<5.2		
4, 4 - D	DE, ug/kg dw	<5.2		
H,H -D. Dioldr	in ug/kg dw	<5.2		
Endoeu	lfan Tug/kg dw	<2.2		
Endosu	lfan II ug/kg dw	<5.2		
Endosu	lfan gulfate ug/kg dw	<5.2		
Endrin	ug/kg dw	<5.2		
Endrin	aldehvde ug/kg dw	<5.2		
Heptac	hlor, ug/kg dw	<2.6		
Heptac	hlor epoxide, ug/kg dw	<2.6		
Methox	vchlor, ug/kg dw	<26		
Toxaph	ene, ug/kg dw	<260		
Aroclo	r-1016, ug/kg dw	<52		
Aroclo	r-1221, ug/kg dw	<100		
Aroclo	r-1232, ug/kg dw	<52		
Aroclo	r-1242, ug/kg dw	<52		
Aroclo	r-1248, ug/kg dw	<52		
Aroclo	r-1254, ug/kg dw	<52		
Aroclo	r-1260, ug/kg dw	<52		

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SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC. 5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165 LOG NO: \$5-55719 Received: 13 OCT 95 Mr. Steve Schropp Reported: 03 NOV 95 Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256 Project: ICWW-IR & SL Sampled By: Client REPORT OF RESULTS Page 8 DATE/ LOG NO SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES TIME SAMPLED IR-2-3 55719-6 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 <15 Indeno(1,2,3-cd)pyrene, ug/kg dw 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

Laboratories in Savannah, GA • Tallahassee, FL • Tampa, FL • Deerfield Beach, FL • Mobile, AL • New Orleans, LA

Percent Solids (160.3), %

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SL	& ENVIRONMENTAL SERV	ICES, INC.				
5102 LaRoch	e Avenue • Savannah, GA	31404 • (912) 354-7858 • Fa	x (912) 35	2-01	165	
					LOG NO	: S5-55719
					Received	: 13 OCT 95
Mr Ta 90 Ja	. Steve Schropp ylor Engineering, Inc 86 Cypress Green Driv cksonville, FL 32256	z. ze			Reported	: 03 NOV 95
					Project: I Sampled	CWW-IR & SL By: Client
		REPORT OF RESULTS				Page 9
LOG NO	SAMPLE DESCRIPTION	, QC REPORT FOR SOLID/	SEMISOL	ID		
55719-7 55719-8 55719-9 55719-10	Method Blank Accuracy (Mean % Re Precision (% RPD) Date Analyzed	covery)				
PARAMETER		55719-7	55719	- 8	55719-9	55719-10
Aluminum (<20	108	 %	0.93 %	10.31.95
Arsenic (7	060), mg/kg dw	<1.0	100	e e	2.0 %	11.01.95
Cadmium (7	131), mg/kg dw	<0.10	100	જ	1.0 %	11.02.95
Chromium (6010), mg/kg dw	<1.0	104	÷	8.7 %	10.31.95
Copper (60)	10), mg/kg dw	<2.5	104	8	9.6 %	10.31.95
Iron (6010)), mg/kg dw	<5.0	91	Ŷ	29 %	10.31.95
Lead (7421)), mg/kg dw	<0.50	98	જ	4.1 %	10.31.95
Nickel (60	10), mg/kg dw	<4.0	104	ò	9.6 %	10.31.95
Zinc (6010)), mg/kg dw	<2.0	104	ofo	8.7 %	10.31.95
Mercury (7-	471), mg/kg dw	<0.010	98	웅	1.0 %	10.19.95

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5102 LaRoc	he Avenue • Savannah, GA 31404	• (912) 354-7858 • Fa	x (912) 352-0	165	
				LOG NO	: S5-55719
				Received	: 13 OCT 95
M: Ta 91 Ja	r. Steve Schropp aylor Engineering, Inc. 086 Cypress Green Drive acksonville, FL 32256			Reported	: 03 NOV 95
				Project: I Sampled	CWW-IR & SI By: Client
	R	EPORT OF RESULTS			Page 10
LOG NO	SAMPLE DESCRIPTION , QC	REPORT FOR SOLID	SEMISOLID		
55719-7	Method Blank				
55719-8	Accuracy (Mean % Recove:	ry)			
55719-9	Precision (% RPD)				
55719-10	Date Analyzed				
PARAMEIER			55719-6	55719-9	55719-10
Cl-Pestic:	ides/PCB (8080)				
Aldrin, u	ja/ka gw	<1.7	87 %	7 %	10.26.95
alpha-BH	C, ug/kg dw	<1.7			10.26.95
beta-BHC	, ug/kg dw	<1.7			10.26.95
gamma-BH(C, ug/kg dw	<1.7	84 %	10 %	10.26.95
delta-BH	C, 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
Endosulfa	an I, ug/kg dw	<1.7			10.26.95
Endosulfa	an II, ug/kg dw	<3.3			10.26.95
Endosulfa	an sulfate, ug/kg dw	<3.3			10.26.95
Endrin, u	ıg/kg dw	<3.3	88 %	41 %	10.26.95
Endrin al	ldehyde, ug/kg dw	<3.3			10.26.95
Heptachlo	or, ug/kg dw	<1.7	91 %	11 %	10.26.95
Heptachlo	or epoxide, ug/kg dw	<1.7	·		10.26.95
Methoxycl	nlor, ug/kg dw	<17			10.26.95
Toxaphene	e, ug/kg dw	<170			10.26.95
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OTOL LUTIO	he Avenue • Savannah, GA 31404 • (912) (354-7858 • Fa	x (912) 352-0	165	
				LOG NO	: S5-55719
M T 9 J	r. Steve Schropp aylor Engineering, Inc. 086 Cypress Green Drive acksonville, FL 32256			Received Reported	: 13 OCT 95 : 03 NOV 95
				Project: I Sampled	CWW-IR & SI By: Client
	REPORT C	F RESULTS			Page 12
LOG NO	SAMPLE DESCRIPTION , QC REPORT	FOR SOLID,	/SEMISOLID		
55719-7 55719-8 55719-9 55719-10	Method Blank Accuracy (Mean % Recovery) Precision (% RPD) Date Analyzed				
PARAMETER		55719-7	55719-8	55719-9	55719-10
Polymucles	ar Aromatics (8310)				
Acenapht	hene, ug/kg dw	<20	60 %	5.0 %	10.23.95
Acenapht	hylene, ug/kg dw	<20	- 	-	10.23.95
Anthrace	ne, 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
	a,h)anthracene, ug/kg dw	<20			10.23.95
Dibenzo(a	-	<10			10.23.95
Dibenzo(a Fluorant	hene, ug/kg dw				10 00 00
Dibenzo(a Fluorant) Fluorene	hene, ug/kg dw , ug/kg dw	<10	62 %	6.5 %	10.23.95
Dibenzo(a Fluorant Fluorene Indeno(1	hene, ug/kg dw , ug/kg dw ,2,3-cd)pyrene, ug/kg dw	<10 <10	62 %	6.5 %	10.23.95
Dibenzo(Fluorant Fluorene Indeno(1 Naphthal	hene, ug/kg dw , ug/kg dw ,2,3-cd)pyrene, ug/kg dw ene, ug/kg dw	<10 <10 <20	62 % 60 %	6.5 % 1.7 %	10.23.95
Dibenzo(Fluorant) Fluorene Indeno(1 Naphthal Phenanth:	hene, ug/kg dw , ug/kg dw ,2,3-cd)pyrene, ug/kg dw ene, ug/kg dw rene, ug/kg dw	<10 <10 <20 <4.0	62 % 60 %	6.5 * 1.7 * 	10.23.95 10.23.95 10.23.95 10.23.95
Dibenzo(Fluorant Fluorene Indeno(1 Naphthal Phenanth Pyrene, T	hene, ug/kg dw , ug/kg dw ,2,3-cd)pyrene, ug/kg dw ene, ug/kg dw rene, ug/kg dw ug/kg dw	<10 <10 <20 <4.0 <10	62 % 60 % 80 %	6.5 * 1.7 * 6.2 *	10.23.95 10.23.95 10.23.95 10.23.95 10.23.95
Dibenzo(a Fluorant) Fluorene Indeno(1 Naphthale Phenanth: Pyrene, T Date Ext:	hene, ug/kg dw , ug/kg dw ,2,3-cd)pyrene, ug/kg dw ene, ug/kg dw rene, ug/kg dw ug/kg dw racted arbon (Walkley-Plack) mg/kg dw	<10 <10 <20 <4.0 <10 10.19.95	62 & 60 & 80 & 	6.5 * 1.7 * 6.2 * 	10.23.95 10.23.95 10.23.95 10.23.95 10.23.95
Dibenzo(a Fluorant) Fluorene Indeno(1 Naphthala Phenanth: Pyrene, u Date Ext: Organic Ca	hene, ug/kg dw , ug/kg dw ,2,3-cd)pyrene, ug/kg dw ene, ug/kg dw rene, ug/kg dw ug/kg dw racted arbon (Walkley-Black), mg/kg dw	<10 <10 <20 <4.0 <10 10.19.95 <100	62 % 60 % 80 % 138 %	6.5 % 1.7 % 6.2 % 1.4 % 4 5 %	10.23.95 10.23.95 10.23.95 10.23.95 10.23.95 10.20.95
Dibenzo(a Fluorant) Fluorene Indeno(1 Naphthala Phenanth: Pyrene, u Date Ext: Organic Ca Oil & Grea	hene, ug/kg dw , ug/kg dw ,2,3-cd)pyrene, ug/kg dw ene, ug/kg dw rene, ug/kg dw ug/kg dw racted arbon (Walkley-Black), mg/kg dw ase (413.2), mg/kg dw	<10 <10 <20 <4.0 <10 10.19.95 <100 <10	62 % 60 % 80 % 138 % 88 %	6.5 * 1.7 * 6.2 * 1.4 * 4.5 *	10.23.95 10.23.95 10.23.95 10.23.95 10.23.95 10.23.95 10.20.95 11.07.95

Methods: EPA SW-846, CE-81-1

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N Beverly A. Høghes, Project Manager

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5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165			
			LOG NO: S7-75791 Received: 11 OCT 97 Reported: 29 OCT 97
Mr.	Steve Schropp		
Tay	lor Engineering, Inc.		
908	6 Cypress Green Drive		**
Jac	ksonville, FL 32256		
			Project: C9509-01 Sampled By: Client
			Code: 12367116
		REPORT OF RESULTS	Page 1
			DATE/
LOG NO	SAMPLE DESCRIPTION ,	SOLID OR SEMISOLID SAMPLES	TIME SAMPLED
75791-1	ICWW-TC-2		10-10-97/1015
75791-2	ICWW-TC-1		10-10-97/1030
PARAMETER		. 75791-1	75791-2
»]			
Aluminum (6		0050	205
Droparatio	BOID) , mg/kg dw	10 16 97	
Piepaiacio	ni Date	10.10.27	
Date Analy		10.22.97	10.22.97
Batah TD	actor	10163	10167
Arconia (70		TOTOX	TOIRY
Arsenic (70	(00) (060) mg/bg đư	A 4	1 7
Brenaratio	n Date	10 16 97	10 16 97
Dete Anely	and Date	10.23.97	10.23.97
Dilution f	actor	1 0	1 0
Batch TD		10168	10168
Cadmium (60	10)	10102	20202
Cadmium (6	(010), ma'ka dw	<0.76	<0.69
Preparatio	n Date	10.16.97	10.16.97
Date Analy	zed	10.22.97	10.22.97
Dilution f	actor	1.0	1.0
Batch ID		1016A	1016A
Chromium (6	010)		
Chromium (6010), mg/kg dw	12.8	5.0
Preparatic	on Date	10.16.97	10.16.97
Date Analy	zed	10.22.97	10.22.97
Dilution f	actor	1.0	1.0
Batch ID		1016A	1016A
		 	



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SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

LOG NO: S7-75791 Received: 11 OCT 97 Reported: 29 OCT 97 Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, PL 32256 REPORT OF RESULTS REPORT OF RESULTS Sampled By: Client Code: 12367116 REPORT OF RESULTS THME SAMPLED 75791-1 ICWN-TC-2 10-10-97/1015 75791-2 ICWN-TC-1 Copper (6010) Copper (6010) REPORT OF RESULTS REPORT OF RESULTS THME SAMPLED THE SAMPLED THE SAMPLED TO: 10-10-97/1015 THE Copper (6010) Copper (6010	5102 LaRoche Avenue • Savannah, GA 3	1404 • (912) 354-7858 • Fax (912) 352-0	165
Received: 11 OCT 97 Reported: 29 OCT 97 Reported: 29 OCT 97 Reported: 29 OCT 97 Reported: 29 OCT 97 Report Regimeering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256 Project: C9509-01 Sampled By: Client Code: 12367116 Page 2 DATE/ TIME SAMPLED DATE/ TIME SAMPLED TIME SAMPL			LOG NO: S7-75791
Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256 Project: C9509-01 Sampled By: Client Code: 12367116 REPORT OF RESULTS Page 2 DATE/ DATE/ LOG NO SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 TARAMETER 75791-1 75791-2 Copper (6010) Copper (6010), mg/kg dw <3.8			Received: 11 OCT 97
Mr. Steve Schropp Taylor Engineering, Inc. 9066 Cypress Green Drive Jacksonville, FL 32256 Project: C9509-01 Sampled By: Client Code: 12367116 REPORT OF RESULTS Page 2 DATE/ Page 2 LOG NO SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES DATE/ TIME SAMPLED TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) Copper (6010) 3.8 <3.5			Reported: 29 OCT 97
Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256 Project: C9509-01 Sampled By: Client Code: 12367116 REPORT OF RESULTS DATE/ TIME SAMPLED TS751-1 10-10-97/1015 TS751-1 TGW-TC-2 TS791-1 TGW-TC-1 TO 10-10-97/1015 TS791-1 TS791-1 TS791-1 TGW-TC-1 TO 10-10-97/1015 TS791-1 TGW-TC-1 TO 10.16.97 Date Analyzed DICQOPER DIO	Mr. Steve Schropp		
9086 Cypress Green Drive Jacksonville, FL 32256 Project: C9509-01 Sampled By: Client Code: 12367116 REPORT OF RESULTS Page 2 DATE/ LOG NO SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) Copper (6010), mg/kg dw <3.8 <3.5 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 106A Iron (6010), mg/kg dw 4620 1450 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Iron (6010), mg/kg dw 6.1 2.3 Preparation Date 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) Lead (7421), mg/kg dw 6.1 2.3 Preparation Date 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) Lead (7421) 10 16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010)	Taylor Engineering, Inc.	· · ·	
Jacksonville, FL 32256 Project: C9509-01 Sampled By: Client Code: 12367116 REPORT OF RESULTS Page 2 DATE/ DATE/ IOG NO SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) Copper (6010, mg/kg dw <3.8	9086 Cypress Green Drive	1	
Project: C9509-01 Sampled By: Client Code: 12367116 REPORT OF RESULTS Page 2 DATE/ DATE/ TIME SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) c3.8 <3.5	Jacksonville, FL 32256		
Sampled By: Client Code: 12367116 REPORT OF RESULTS Page 2 DATE/ DATE/ TIME SAMPLED 10-10-97/1015 75791-1 ICWW-TC-2 10-10-97/1030 PARAMETER 75791-1 10-10-97/1030 Copper (6010) 0.16.97 10.16.97 Copper (6010) 3.8 <3.5			Project: C9509-01
Code: 12367116 REPORT OF RESULTS DATE/ LOG NO SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791 75791-2 Copper (6010) Copper (6010) Copper (6010) Copper (6010) Copper (6010) Copper (6010) Copper (6010) Copper (6010) 10.16.97 10.16.97 Datte Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Iron (6010) Iron (6010) 10.22.97 Iron (6010) Iron (6010, mg/kg dw 4620 Preparation Date 10.16.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) mg/kg dw 6.1 2.3 Preparation Date 10.16.97 10.23.97 Dilution factor			Sampled By: Client
REPORT OF RESULTS Page 2 LOG NO SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) Copper (6010), mg/kg dw <3.8			Code: 12367116
DATE/ LOG NO SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) Copper (6010), mg/kg dw <3.8		REPORT OF RESULTS	Page 2
LOG NO SAMPLE DESCRIPTION, SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) Copper (6010) 75791-2 Copper (6010) rg/kg dw <3.8			DATE/
75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) Copper (6010), mg/kg dw <3.8	LOG NO SAMPLE DESCRIPTION ,	SOLID OR SEMISOLID SAMPLES	TIME SAMPLED
TS791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 Copper (6010) Copper (6010) 3.8 <3.5	75791-1 ICWW-TC-2		10-10-97/1015
PARAMETER 75791-1 75791-2 Copper (6010) (3.8 <3.5	75791-2 ICWW-TC-1		10-10-97/1030
PARAMETER 75791-1 75791-2 Copper (6010) <3.8			
Copper (6010) mg/kg dw <3.8	PARAMETER	75791-1	75791-2
Copper (6010) <3.8			
Copper (6010), mg/kg dw <3.8	Copper (6010)		
Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Iron (6010) 1000 1000 Iron (6010), mg/kg dw 4620 1450 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) 10.16.97 10.16.97 Lead (7421), mg/kg dw 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Copper (6010), mg/kg dw	<3.8	<3.5
Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Iron (6010) Iron (6010), mg/kg dw 4620 1450 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) 10.16.97 10.16.97 Lead (7421), mg/kg dw 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Preparation Date	10.16.97	10.16.97
Dilution factor 1.0 1.0 Batch ID 1016A 1016A Iron (6010) Iron (6010), mg/kg dw 4620 1450 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) 10.16.97 10.16.97 Date Analyzed 10.16.97 10.16.97 Lead (7421), mg/kg dw 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Date Analyzed	10.22.97	10.22.97
Batch 1D 1016A 1016A Iron (6010) Iron (6010), mg/kg dw 4620 1450 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) 10.16.97 10.16.97 Date Analyzed 6.1 2.3 Preparation Date 10.16.97 10.16.97 Lead (7421), mg/kg dw 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Dilution factor	1.0	1.0
Iron (6010), mg/kg dw 4620 1450 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.16.97 10.16.97 Lead (7421) 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Batter ID	1016A	IUIBA
Preparation Date 10.16.97 10.16.97 Date Analyzed 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.16.97 10.16.97 Lead (7421) 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	11011 (8010)	4620	1450
Date Analyzed 10.10.37 10.10.37 Dilution factor 10.22.97 10.22.97 Dilution factor 1.0 1.0 Batch ID 1016A 1016A Lead (7421) 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Propagation Date	10 16 97	10 16 97
Date Analyzed 10.22.97 Dilution factor 1.0 Batch ID 1016A Lead (7421) 6.1 Lead (7421), mg/kg dw 6.1 Preparation Date 10.16.97 Date Analyzed 10.23.97 Dilution factor 1.0 Batch ID 1016B Dilution factor 1.0 Batch ID 1016B Nickel (6010) 1016B	Date Maluzed	10.10.97	10 22 97
Batch ID 1016A 1016A Lead (7421) 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B	Bilution factor	1 0	1 0
Lead (7421) 6.1 2.3 Lead (7421), mg/kg dw 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 10 10	Batch TD	1016A	1016A
Lead (7421), mg/kg dw 6.1 2.3 Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 10 1.0	Lead (7421)		
Preparation Date 10.16.97 10.16.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Lead (7421) , mg/kg dw	6.1	2.3
Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Preparation Date	10.16.97	10.16.97
Dilution factor 1.0 1.0 Batch ID 1016B 1016B Nickel (6010) 1016B 1016B	Date Analyzed	10.23.97	10.23.97
Batch ID 1016B 1016B Nickel (6010)	Dilution factor	1.0	1.0
Nickel (6010)	Batch ID	1016B	1016B
	Nickel (6010)		
Nickel (6010), mg/kg dw <6.1 <5.6	Nickel (6010), mg/kg dw	<6.1	<5.6
Preparation Date 10.16.97 10.16.97	Preparation Date	10.16.97	10.16.97
Date Analyzed 10.22.97 10.22.97	Date Analyzed	10.22.97	10.22.97
Dilution factor 1.0 1.0	Dilution factor	1.0	1.0
Batch ID 1016A 1016A	Batch ID	1016A	1016A

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SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

E100 LoDooh	Averus - Severach CA 21	404 + (012) 254 7858 + For (010) 250 0	165
5102 Lahoon	e Avenue • Savannan, GA 31	404 ▼ (912) 354-7858 ● Fax (912) 352-0	corv
			LOG NO: S7-75791
			Received: 11 OCT 97
			Reported: 29 OCT 97
Mr	. Steve Schropp		
Tay	ylor Engineering, Inc.		
908	86 Cypress Green Drive		
Jac	cksonville, FL 32256		
			Project, Casoa ol
			Sampled By: Client
			Code: 12367116
		REPORT OF RESULTS	Page 3
			DATE/
LOG NO	SAMPLE DESCRIPTION ,	SOLID OR SEMISOLID SAMPLES	TIME SAMPLED
75791-1	ICWW-TC-2		10-10-97/1015
75791-2	ICWW-TC-1		10-10-97/1030
PARAMETER		75791-1	75791-2
Zipa (6010)			
Zinc (6010)), ma/ka dw	97	<2.8
Preparatio	on Date	10.16.97	10.16.97
Date Analy	/zed	10.22.97	10.22.97
Dilution f	Eactor	1.0	1.0
Batch ID		1016A	1016A
Mercury (74	171)		
Mercury (7	7471), mg/kg	<0.0200	<0.0200
Preparatio	on Date	10.16.97	10.16.97
Date Analy	zed	10.23.97	10.23.97
Dilution f	factor	1.0	1.0
Batch ID		1023R	1023R
		···· ··· ··· ··· ··· ··· ··· ··· ··· ·	

SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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5102 LaRoche Avenue • Savannah, GA 3	1404 • (912) 354-7858 • Fax (912) 352-0)165
Mr. Steve Schropp Taylor Engineering, Inc.		LOG NO: S7-75791 Received: 11 OCT 97 Reported: 29 OCT 97
9086 Cypress Green Drive Jacksonville, FL 32256		
	REPORT OF RESULTS	Project: C9509-01 Sampled By: Client Code: 12367116 Page 4
LOG NO SAMPLE DESCRIPTION ,	SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
75791-1 ICWW-TC-2 75791-2 ICWW-TC-1		10-10-97/1015 10-10-97/1030
PARAMETER	75791-1	75791-2
Cl-Destigides / DCB (2020)		
Aldrin, ug/kg dw	<13	<2.4
alpha-BHC, ug/kg dw	<13	<2.4
beta-BHC, ug/kg dw	<13	<2.4
gamma-BHC, ug/kg dw	<13	<2.4
delta-BHC, ug/kg dw	<13	<2.4
Chlordane, ug/kg dw	<130	<24
4,4'-DDD, ug/kg dw	<25	<4.6
4,4'-DDE, ug/kg dw	<25	<4.6
4,4'-DDT, ug/kg dw	<25	<4.6
Dieldrin, ug/kg dw	<25	<4.6
Endosulfan I, ug/kg dw	<13	<2.4
Endosulfan II, ug/kg dw	<25	<4.6
Endosulfan sulfate, ug/kg dw	<25	<4.6
Endrin, ug/kg dw	<25	<4.6
Endrin aldehyde, ug/kg dw	<25	<4.6
Heptachlor, ug/kg dw	<13	<2.4
Heptachlor epoxide, ug/kg dw	<13	<2.4
Methoxychlor, ug/kg dw	<130	<24
Toxaphene, ug/kg dw	<1300	<240
Aroclor-1016, ug/kg dw	<250	<46
Arocior-1221, ug/kg dw	<510	<93

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5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165				
	LOG NO:	S	7-75	791
	Received:	11	OCT	97
	Reported:	29	OCT	97
Mr. Steve Schropp				
Taylor Engineering, Inc.				
9086 Cypress Green Drive				
Jacksonville, FL 32256				

LOG NO	REPORT OF RESU SAMPLE DESCRIPTION , SOLID OR SEMISO	ULTS DLID SAMPLES	Project: Sampled E Code: DATE/ TIME SAMPLED	C9509-01 By: Client 12367116 Page 5
75791-1 75791-2	ICWW-TC-2 ICWW-TC-1		10-10-97/1015 10-10-97/1030	,
PARAMETER		75791-1	75791-2	
Aroclor-123 Aroclor-124 Aroclor-124 Aroclor-126 Surrogate Date Extrac Date Analyz Dilution fa Batch ID	32, ug/kg dw 42, ug/kg dw 48, ug/kg dw 54, ug/kg dw 50, ug/kg dw 51, ug/kg dw 52, ug/kg dw 54, ug/kg dw 54, ug/kg dw 55, 0, ug/kg dw 55, 0, ug/kg dw 56, ug/kg dw 56, ug/kg dw 56, ug/kg dw	<250 <250 <250 <250 <250 31 % 10.14.97 10.21.97 5.0 1014P	<46 <46 <46 <46 41 % 10.14.97 10.16.97 1.0 1014P	

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Merphos, ug/kg dw

Naled, ug/kg dw

Phorate, ug/kg dw

Mevinphos, ug/kg dw

Monochrotophos, ug/kg dw

Ethyl Parathion, ug/kg dw

Methyl Parathion, ug/kg dw

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			LOG NO:	S7-75791
			Received: 1	1 OCT 97
			Reported: 2	9 OCT 97
M:	r. Steve Schropp			
Ta	aylor Engineering, Inc.			
91	ose cypress Green Drive	1		
U	acksonville, FL 32256			
			Project: (C9509-01
			Sampled By	: Client
			Code:	12367116
		REPORT OF RESULTS		Page 6
			DATE/	
LOG NO	SAMPLE DESCRIPTION ,	SOLID OR SEMISOLID SAMPLES	TIME SAMPLED	
75791-1	ICWW-TC-2		10-10-97/1015	
75791-2	ICWW-TC-1		10-10-97/1030	
PARAMETER		75791-1	75791-2	
Organophos	sphorus Pesticides (814	1)		
Azinphos	methyl, ug/kg dw	<66	<66	
Bolstar	(Sulprofos), ug/kg dw	<33	<33	
Chlorpyri	ifos, ug/kg dw	<33	<33	
Coumaphos	s, ug/kg dw	<330	<330	
Demeton,	ug/kg dw	<83	<83	
Diazinon	, ug/kg dw	<33	<33	
Dichlorvo	os, ug/kg dw	<66	<66	
Dimethoat	te, ug/kg dw	<66	<66	
Disulfot	on, ug/kg dw	<66	<66	
EPN, ug/l	kg dw	<33	<33	
Ethoprop	, ug/kg dw	<17	<17	
Fensulfot	tnion, ug/kg dw	<330	<330	
Fenthion,	, ug/kg dw	<33	<33	
Malathior	n. ug/kg dw	<33	<33	

Laboratories in Savannah, GA • Tallahassee, FL • Tampa, FL • Deerfield Beach, FL • Mobile, AL

<33

<66

<330

<330

<33

<17

<33

<33

<66

<330

<330

<33

<17

<33



75791-1 75791-2

PARAMETER

Ronnel, ug/kg dw

Date Extracted

Date Analyzed Dilution factor

Batch ID

ICWW-TC-2

ICWW-TC-1

Tokuthion (Prothiofos), ug/kg dw

Surrogate - Triphenylphosphate

Trichloronate, ug/kg dw

Stirophos (Tetrachlorvinphos), ug/kg dw

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Tetraethyl dithiopyrophosphate (Sulfotepp), ug/kg dw

& ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165		
I	LOG NO: Received:	S7-75791 11 OCT 97
. 1	Reported:	29 OCT 97
Mr. Steve Schropp		
Taylor Engineering, Inc.		
9086 Cypress Green Drive		
Jacksonville, FL 32256		
	Project	C9509-01
	Sampled H	By: Client
	Code :	12367116

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES TIME SAMPLED

Page 7

DATE/

75791-1

<33

<17

<33

<33

<330

70 %

1.0

1014Q

10.14.97 10.14.97 10.21.97 10.21.97

10-10-97/1015

10-10-97/1030

75791-2

<33

<17

<33

<33

<330

78 %

1.0

1014Q

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			LOG NU:	\$7-75791
			Received:	11 OCT 97
			Reported:	29 OCT 97
Mr	. Steve Schropp			
Ta	ylor Engineering, Inc.			
90	86 Cypress Green Drive			
Ja	cksonville, FL 32256			
			D	
			Project:	C9509-01
			Sampled B	y: Client
			Code:	12437116
	REPOP	T OF RESULTS		Page 8
TOC NO		OR CENTROLIN COMPLER	DATE/	
TOG NO	SAMPLE DESCRIPTION , SOLID	OR SEMISOLID SAMPLES	IIME SAMPLED	
75791-1	ICWW-TC-2		10-10-97/1015	
75791-2	ICWW-TC-1		10-10-97/1030	
PARAMETER		75791-	1 75791-2	
Delementa				
Polynuciea	ene walka dw	-50	0 4400	
Acenaphth	vlene, ug/kg dw	<50	0 <460	
Rengo (a) n	yrene, ug/kg dw	<50	0 <460	
Benzo (a) p	i) porgulozo yg/kg dw	<50	0 <460	
Benzo (g, h)fluoranthene ug/kg dw	<50	0 <460	
Chrysene	+ Benzo (a) anthracene ug/kg d	×50	0 <460	
Fluoranth	ene ug/kg dw	~50	0 <460	
Fluorene	ua/ka dw	<50	0 <460	
Indeno (1	2 3-cd) pyrene+Dibenzo(a h) ant	hracene ug/kg dw <50	0 <460	
Nanhthale	ne ug/kg dw	-50	0 <460	
Phenanthr	ene + Anthracene, ug/kg dw	<50	0 <460	
Pyrene 11	a/ka dw	<50	0 <460	
1-Methyln	aphthalene ug/kg dw	<50	0 <460	
2-Methvln	aphthalene, ug/kg dw	<50	0 <460	
Surrogate	- 2-Fluorobiphenvl	40	\$ <u>38</u> \$	
Dilution	factor	10	0 1.0	
Date Extr	acted	 10-14-9	7 10.14.97	
Date Anal	vzed	10.15.9	7 10.15.97	
Batch ID	<i>x</i>	1014	U 1014U	

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5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: S7-75791 Received: 11 OCT 97 Reported: 29 OCT 97 Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256 Project: C9509-01 Sampled By: Client Code: 12367116 REPORT OF RESULTS Page 9 DATE/ LOG NO SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES TIME SAMPLED 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-2 75791-1 Organic Carbon (Walkley-Black) Organic Carbon (Walkley-Black), mg/kg dw 5800 1600 10.22.97 10.22.97 Preparation Date Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1022X 1022X Total Kjeldahl Nitrogen (351.2) Total Kjeldahl Nitrogen-N (351.2), mg/kg dw 710 110 Preparation Date 10.21.97 10.21.97 10.22.97 Date Analyzed 10.22.97 Dilution factor 1.0 1.0 Batch ID 1021A 1021A Total Phosphorous (365.4) Total Phosphorus (365.4), mg/kg dw 660 230 Preparation Date 10.21.97 10.21.97 Date Analyzed 10.23.97 10.23.97 Dilution factor 1.0 1.0 Batch ID 1021A 1021A Petroleum Hydrocarbons (9073) 19 Petroleum Hydrocarbons (9073), mg/kg dw 17 10.14.97 10.14.97 Preparation Date Date Analyzed 10.15.97 10.15.97 Dilution factor 1.0 1.0 1014G Batch ID 1014G

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5102 LaRoche Avenue	٠	Savannah,	GΑ	31404	۰	(912)	354-7858	٠	Fax	(91	2)	352-0165
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LOG NO: \$7-75791 Received: 11 OCT 97 Reported: 29 OCT 97 Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256 Project: C9509-01 Sampled By: Client Code: 12367116 REPORT OF RESULTS Page 10 DATE/ SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES TIME SAMPLED LOG NO 75791-1 ICWW-TC-2 10-10-97/1015 75791-2 ICWW-TC-1 10-10-97/1030 PARAMETER 75791-1 75791-2 72 Percent Solids (160.3), % 66

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INC

5102 LaRoc	che Avenue • Savannah, GA 31404 • (S	912) 354-7858 • Fax (912) 352-01	65
			LOG NO: S7-75791
			Received: 11 OCT 9
			Reported: 29 OCT 97
M	fr. Steve Schropp		
T	aylor Engineering, Inc.		
9	086 Cypress Green Drive		
J	acksonville, FL 32256		
			Project: C9509-03
			Sampled By: Client
			Code: 12367116
	REPO	RT OF RESULTS	Page 11
LOG NO	SAMPLE DESCRIPTION , QC RE	PORT FOR SOLID/SEMISOLID	
 75791.2	Mothod Plank		
75791-4	Lab Control Standard % Rec	overy	
PARAMETER			75791-4
			·····
Aluminum	(6010)		
Aluminum	1 (6010) , mg/kg dw	<20.0	121 %
Preparat	ion Date	10.16.97	
Date Ana	lyzed	10.22.97	
Dilution	factor	1.0	
Batch ID		1016A	
Arsenic (7060)		
Arsenic	(7060), mg/kg dw	<1.0	110 %
Preparat	ion Date	10.16.97	
Date Ana	Lyzed	10.23.97	
Dilution	factor	1.0	
Batch ID		1016B	
Caomium (0 50	o. /
Cadmium	(6010), mg/kg dw	<0.50	94 %
Preparat	lon Date	10.16.97	
Date Ana	Lyzed	10.22.97	
Dilution	factor	U.L	
Batch ID	((010)	1016A	
Chromium	(6010)	.1.0	0.7 B
Chromium	i (6010), mg/kg dw	<i.u< td=""><td>23 6</td></i.u<>	23 6
Preparat	Junod	10.10.97	
Date Ana	factor	10.22.97	
DITUCION	LACLUL	U.L 10167	
04424		LUTPA	



5102 LaRoo	che Avenue • Savannah, GA 31404 • (912) 35	54-7858 • Fax (912) 352-01	65
			LOG NO: S7-75791 Received: 11 OCT 97 Reported: 29 OCT 97
יי ר נ	aylor Engineering, Inc. 086 Cypress Green Drive acksonville, FL 32256		
			Project: C9509-01 Sampled By: Client Code: 12367116
	REPORT OF	RESULTS	Page 12
LOG NO	SAMPLE DESCRIPTION , QC REPORT	FOR SOLID/SEMISOLID	
75791-3 75791-4	Method Blank Lab Control Standard % Recovery		
PARAMETER		75791-3	75791-4
Conner (6	010)		
) reggos (6010), mg/kg dw	<2.5	91 %
Preparat	ion Date	10.16.97	
Date Ana	lyzed	10.22.97	
Dilution	factor	1.0	
Batch ID		1016A	
Iron (601	0)		
Iron (60	10), mg/kg dw	<5.0	103 %
Preparat	ion Date	10.16.97	
Date Ana	lyzed	10.22.97	
Dilution	tactor	1.0	
Baten ID	-	10164	
Leau (742	(1) mg/kg du	<0 E0	02 S
Deau (74	ion Date	10 16 97	
Date Ana	luzed	10 23 97	
Dilution	factor	1 0	
Batch ID		1016B	
Nickel (6	010)		
Nickel (6010), mg/kg dw	<4.0	94 %
Preparat	ion Date	10.16.97	
Date Ana	lyzed	10.22.97	
Dilution	factor	1.0	
Dotah ID		10163	



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5102 LaRoche Avenue	 Savannah. 	, GA 31404	• (912)	354-7858	• Fax (912)	352-0165	
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							Rece

OG NO: S7-75791 eived: 11 OCT 97 Reported: 29 OCT 97

Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256

	REPORT OF RESULTS		Project: C9509-01 Sampled By: Client Code: 12367116 Page 13
LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SE	MISOLID	
75791-3 75791-4	Method Blank Lab Control Standard % Recovery		
PARAMETER		75791-3	75791-4
Zinc (6010)		
Zinc (601	0), mg/kg dw	<2.0	97 %
Preparati	on Date 10	0.16.97	
Date Anal	yzed 10	0.22.97	
Dilution	factor	1.0	
Batch ID		1016A	
Mercury (7	2471)		
Mercury (7471), mg/kg	<0.0200	106 %
Preparati	on Date 10	0.16.97	
Date Anal	yzed 10	0.23.97	
Dilution	factor	1.0	
Batch ID		1023R	



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C100 LaBooha Avenue - Coursesh OA C	1404 - (010) 054 7050 - 5- (010) 050 0-	
5102 Lakoche Avenue • Savannah, GA 3	1404 • (912) 354-7858 • Fax (912) 352-01	691
		LOG NO: S7-75791
		Received: 11 OCT 97
		Reported: 29 OCT 97
Mr. Steve Schropp		
Taylor Engineering, Inc	•	
9086 Cypress Green Drive	e	
Jacksonville, FL 32256		
		Project: C9509-01
		Sampled By: Client
		Code: 12367116
	REPORT OF RESULTS	Page 14
	OC REPORT FOR SOLLD/SEMISOLLD	
75791-3 Method Blank		
75791-4 Lab Control Standard	1 % Recovery	
PARAMETER	75791-3	75791-4
Cl-Pesticides/PCB (8080)		
Aldrin, ug/kg dw	<1.7	60 %
alpha-BHC, ug/kg dw	<1.7	
beta-BHC, ug/kg dw	<1.7	
gamma-BHC, ug/kg dw	<1.7	· 64 %
delta-BHC, ug/kg dw	<1.7	
Chlordane, ug/kg dw	<17	
4,4'-DDD, ug/kg dw	0.65J	
4,4'-DDE, ug/kg dw	<3.3	
4,4'-DDT, ug/kg dw	<3.3	88 %
Dieldrin, ug/kg dw	<3.3	/6 8
Endosulfan I, ug/kg dw	<1./	
Endosulian II, ug/kg uw	<3.3	
Endosullan sullace, ug/kg dw	<3.3	76 %
Endrin aldebude ug/kg dw	(3.3 0 17.1	/0 °
Heptachlor ug/kg dw		63 8
Heptachlor epoxide ug/kg dw	<1 7	
Methoxychlor, ug/kg dw	<17	
Toxaphene, ug/kg dw	<170	
Aroclor-1016, ug/kg dw	<33	
Aroclor-1221, ug/kg dw	<67	

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 •	Fax (912) 352-016	\$5	
		LOG NO:	S7-7579 1
		Received:	L1 OCT 97
		Reported: 2	29 OCT 97
Mr. Steve Schropp		_	
Taylor Engineering, Inc.			
9086 Cypress Green Drive			
Jacksonville, FL 32256			
		Project	C9509-01
		Sampled By	z: Client
		Code:	12367116
REPORT OF RESULTS	5		Page 15
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI	D/SEMISOLID		
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank	D/SEMISOLID		
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard & Recovery	D/SEMISOLID		
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard % Recovery PARAMETER	D/SEMISOLID	75791-4 [.]	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard & Recovery PARAMETER Aroclor-1232, ug/kg dw	D/SEMISOLID 75791-3 <33	 75791-4 [.] 	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard % Recovery PARAMETER Aroclor-1232, ug/kg dw Aroclor-1242, ug/kg dw	D/SEMISOLID 75791-3 <33 <33	75791-4	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard % Recovery PARAMETER Aroclor-1232, ug/kg dw Aroclor-1242, ug/kg dw Aroclor-1248, ug/kg dw	D/SEMISOLID 75791-3 <33 <33 <33 <33	75791-4	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard & Recovery PARAMETER Aroclor-1232, ug/kg dw Aroclor-1242, ug/kg dw Aroclor-1248, ug/kg dw Aroclor-1254, ug/kg dw	D/SEMISOLID 75791-3 <33 <33 <33 <33 <33	75791-4	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard & Recovery PARAMETER Aroclor-1232, ug/kg dw Aroclor-1242, ug/kg dw Aroclor-1248, ug/kg dw Aroclor-1254, ug/kg dw Aroclor-1260, ug/kg dw	CD/SEMISOLID 75791-3 <33 <33 <33 <33 <33 <33 <33	75791-4	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard & Recovery PARAMETER Aroclor-1232, ug/kg dw Aroclor-1242, ug/kg dw Aroclor-1248, ug/kg dw Aroclor-1254, ug/kg dw Aroclor-1260, ug/kg dw Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	CD/SEMISOLID 75791-3 <33 <33 <33 <33 <33 <33 <33 <33 <33 <	75791-4 ⁻ 39 %	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard & Recovery PARAMETER Aroclor-1232, ug/kg dw Aroclor-1242, ug/kg dw Aroclor-1254, ug/kg dw Aroclor-1254, ug/kg dw Aroclor-1260, ug/kg dw Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX) Date Extracted	D/SEMISOLID 75791-3 <33 <33 <33 <33 <33 <33 <33 <33 51 % 10.14.97	75791-4	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard & Recovery PARAMETER Aroclor-1232, ug/kg dw Aroclor-1242, ug/kg dw Aroclor-1248, ug/kg dw Aroclor-1254, ug/kg dw Aroclor-1260, ug/kg dw Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX) Date Extracted Date Analyzed	D/SEMISOLID 75791-3 <33 <33 <33 <33 <33 <33 <33 <1 % 10.14.97 10.16.97	75791-4	
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLI 75791-3 Method Blank 75791-4 Lab Control Standard & Recovery PARAMETER Aroclor-1232, ug/kg dw Aroclor-1242, ug/kg dw Aroclor-1248, ug/kg dw Aroclor-1254, ug/kg dw Aroclor-1260, ug/kg dw Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX) Date Extracted Date Analyzed Dilution factor	D/SEMISOLID 75791-3 <33 <33 <33 <33 <33 <33 51 % 10.14.97 10.16.97 1.0	75791-4	

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SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

5102 LaRoche	Avenue • Savannah, GA 3140	04 • (912) 354-7858 • Fax (912) 352-0	165
			LOG NO: S7-75791
			Received: 11 OCT 97
		· · ·	Reported: 29 OCT 97
Mr.	Steve Schropp		
Tay	lor Engineering, Inc.		
908	6 Cypress Green Drive		
Jad	ksonville, FL 32256		
			Project: C9509-01
			Sampled By: Client
			Code: 12367116
		REPORT OF RESULTS	Page 16
LOG NO	SAMPLE DESCRIPTION . C	C REPORT FOR SOLID/SEMISOLID	
75791-3	Method Blank		
75791-4	Lab Control Standard %	Recovery	
PARAMETER		/5/91-3	75791-4
Organophosp	horus Pesticides (8141)		
Azinphos m	ethyl, ug/kg dw	<66	
Bolstar (S	ulprofos), ug/kg dw	<33	
Chlorpyrif	os, ug/kg đw	<33	
Coumaphos,	ug/kg dw	<330	
Demeton, u	g/kg dw	<83	
Diazinon,	ug/kg dw	<33	106 %
Dichlorvos	, ug/kg dw	<66	
Dimethoate	, ug/kg dw	<66	
Disulfoton	., ug/kg dw	<66	
EPN, ug/kg	dw	<33	
Ethoprop,	ug/kg dw	<17	
Fensulfoth	ion, ug/kg dw	<330	
Fenthion,	ug/kg dw	<33	
Malathion,	ug/kg dw	<33	
Merphos, u	g/kg aw	<33	
Mevinphos,	ug/kg dw	<00	
Malod ug/	bros, ug/kg uw	<330	
Ethyl Dara	thion ug/kg dw	~23	65 %
Methvl Par	athion, ug/kg dw	<17	100 %
Phorate. 11	a/ka dw	<33	
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SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.			
5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax	(912) 352-01	65	····
		LOG NO: Received: Reported:	S7-75791 11 OCT 97 29 OCT 97
Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256			
		Project Sampled 1	: C9509-01 By: Client
REPORT OF RESULTS		Code	Page 17
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/	SEMISOLID		
75791-3Method Blank75791-4Lab Control Standard % Recovery			
PARAMETER	75791-3	75791-4	
Poppol walka dw			
Tetraethyl dithiopyrophosphate (Sulfotepp), ug/kg dw	<17		
Stirophos (Tetrachlorvinphos), ug/kg dw	<33		
Tokuthion (Prothiofos), ug/kg dw	<33	•	
Trichloronate, ug/kg dw	<330		
Surrogate - Triphenylphosphate	138 %	123 %	
Date Extracted	10.14.97		
Date Analyzed	10.21.97		
Dilution factor	1.0		
Batch ID	1014Q		
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5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax	(912) 352-01	65	
Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256		LOG NO: Received: Reported:	S7-75791 11 OCT 97 29 OCT 97
REPORT OF RESULTS		Project: Sampled F Code:	C9509-01 By: Client 12437116 Page 18
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/	SEMISOLID		
75791-3 Method Blank			
75791-4 Lab Control Standard % Recovery			
PARAMETER	75791-3	75791-4	
Polymuclear Aromatics (8100)			
Acenaphthene, ug/kg	<330	76 %	
Acenaphthylene, ug/kg	<330		
Benzo(a)pyrene, ug/kg	<330	59 %	
Benzo(g,h,i)pervlene, ug/kg	<330		
Benzo (b, k) fluoranthene. ug/kg	<330		
Chrysene + Benzo(a)anthracene, ug/kg	<330		
Fluoranthene, ug/kg	<330		
Fluorene, ug/kg	<330	70 %	
Indeno(1,2,3-cd)pyrene+Dibenzo(a,h)anthracene, ug/kg	<330		
Naphthalene, ug/kg	<330	70 %	
Phenanthrene + Anthracene, ug/kg	<330		
Pyrene, ug/kg	<330	70 %	
1-Methylnaphthalene, ug/kg	<330		
2-Methylnaphthalene, ug/kg	<330		
Surrogate - 2-Fluorobiphenyl	54 %	70 %	
Dilution factor	1.0		
Date Extracted	10.14.97		
Date Analyzed	10.15.97		
Batch ID	1014U		

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5102 LaRoc	he Avenue • Savannah, GA 31404 • (912) 354-7858	3 • Fax (912) 352-010	65	
			LOG NO: \$7-757	91
			Received: 11 OCT	97
			Reported: 29 OCT	97
M	r. Steve Schropp			
Ta	aylor Engineering, Inc.			
9(086 Cypress Green Drive			
Ja	acksonville, FL 32256			
			Project: C9509-	01
			Sampled By: Clie	at
			Code: 123671	16
	REPORT OF RESU	LTS	Page 1	19
LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR S	OLID/SEMISOLID		
75791-3	Method Blank			
75791-4	Lab Control Standard % Recovery			
PARAMETER		75791-3	75791-4	
Organic Ca	arbon (Walkley-Black)			-
Organic (Carbon (Walkley-Black), mg/kg dw	<100	100 %	
Preparati	ion Date	10.22.97		
Date Anal	lyzed	10.23.97		
Dilution	factor	1.0		
Batch ID		1022X		
Total Kjel	ldahl Nitrogen (351.2)			
Total Kje	eldahl Nitrogen-N (351.2), mg/kg dw	<50	98 %	
Preparati	ion Date	10.21.97		
Date Anal	lyzed	10.22.97		
Dilution	factor	1.0		
Batch ID		1021A		
TOTAL PROS	sphorous (365.4)	- 25	110 9	
Proparati	on Date	10 21 97	TTP &	
Dete Maral	luzed	10.21.97		
Dilution	factor	1 0		
Batch ID		1021A		
Petroleum	Hydrocarbons (9073)			
Petroleum	n Hydrocarbons (9073), mg/kg dw	<10	92 %	
Preparati	ion Date	10.14.97		
Date Anal	Lyzed	10.15.97		
Dilution	factor	1.0		
Batch ID		1014G		
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& ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue •	Savannah,	GA 31404	• (912) 354-3	7858 • Fax	(912) 352-0165

LOG NO: S7-75791 Received: 11 OCT 97 Reported: 29 OCT 97

Mr. Steve Schropp Taylor Engineering, Inc. 9086 Cypress Green Drive Jacksonville, FL 32256

> Project: C9509-01 Sampled By: Client Code: 12367116 Page 20

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID 75791-3 Method Blank 75791-4 Lab Control Standard % Recovery PARAMETER 75791-3 75791-4

Methods: EPA SW-846

* Organochlorine Pesticides method 8080 and Organophosphorus Pesticides method 8141 were evaluated down to the laboratory's Method Detection Limit (MDL). No estimated values were detected for any of the target compounds. Experpts from Table 5 SL-QAP, June 1997, Rev. 2.0 have been provided to evaluate the appropriate MDLs.

ael J. Salum, eot Manager Mi

Final Page Of Report



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5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165						
			LOG NO: S7-75791A Received: 11 OCT 97 Reported: 05 NOV 97			
Mr Ta 90 Ja	r. Steve Schropp hylor Engineering, Inc. 86 Cypress Green Drive hcksonville, FL 32256					
		REPORT OF RESULTS	Project: C9509-01 Sampled By: Client Code: 17017115 Page 1			
LOG NO	SAMPLE DESCRIPTION ,	SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED			
75791A-1 75791A-2	ICWW-TC-2 ICWW-TC-1		10-10-97/1015 10-10-97/1030			
PARAMETER		75791A-1	75791A-2			
Polynuclea	r Aromatics (8310)					
Acenaphth	ene, ug/kg dw	<30	<28			
Acenaphth	ylene, ug/kg dw	<30	<28			
Anthracen	e, ug/kg dw	<6.0	<5.6			
Benzo(a)a	nthracene, ug/kg dw	1.6J	<5.6			
Benzo(a)p	yrene, ug/kg dw	<6.0	<5.6			
Benzo(b)f	Luoranthene, ug/kg dw	<6.0	<5.6			
Benzo(g, n	(,1)perylene, ug/kg dw	<15	<14			
Chargene ug/kg dw <			<14			
Chrysene, ug/kg dw 3.4J			< 3.0			
Fluorenthene ug/kg dw = 5.25			<14			
Fluorene.	ug/kg dw	<15	<14			
Indeno(1,2,3-cd) pyrene, ug/kg dw		2.7J	<14			
Naphthalene, ug/kg dw		<30	<28			
Phenanthrene, ug/kg dw		2.2J	<5.6			
Pyrene, ug/kg dw		З.8Ј	<14			
Surrogate - Terphenyl - d14		67 %	68 %			
Date Extracted		10.30.97	10.30.97			
Date Analyzed		11.05.97	11.05.97			
Dilution	factor	1.0	1.0			
Batch ID		1030K	1030K			
Percent Solids (160.3), % 70			77			


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SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354	-7858 • Fax (912) 352-0	165	
Mar Ottown Dobuona		LOG NO: S Received: 1 Reported: 0	7-75791A 1 OCT 97 5 NOV 97
Mr. Steve Schropp Tavlor Engineering, Inc			
9086 Cypress Green Drive			
Jacksonville, FL 32256			
		Project: (Sampled By	C9509-01 : Client
REPORT OF I	RESULTS		Page 2
LOG NO SAMPLE DESCRIPTION , QC REPORT FO	OR SOLID/SEMISOLID		
5791A-3 Method Blank			
5791A-4 Lab Control Standard % Recovery			
ARAMETER	75791A-3	75791A-4	
olymuclear Aromatics (8310)			
Acenaphthene, ug/kg dw	<20	33 %	
Acenaphthylene, ug/kg dw	<20		
Anthracene, ug/kg dw	<4.0		
Benzo(a)anthracene, ug/kg dw	<4.0	- 	
Benzo(a)pyrene, ug/kg dw	<4.0		
Benzo(b)fluoranthene, ug/kg dw	<4.0		
Benzo(g,h,i)perylene, ug/kg dw	<10		
Chargene wa/ka dw	<10	70 %	
Dibenzo(a h)anthracene ug/kg dw	<4.0	/0 శ	
Fluoranthene, ug/kg dw	<10		
Fluorene, ug/kg dw	<10	42 %	
Indeno(1,2,3-cd) pyrene, ug/kg dw	<10		
Naphthalene, ug/kg dw	<20	31 %	
Phenanthrene, ug/kg dw	<4.0		
Pyrene, ug/kg dw	<10	73 %	
Surrogate – Terphenyl – d14	72 %	76 %	
Date Extracted	10.30.97		
Date Analyzed	11.01.97		
Dilution factor Batch ID	1.0 1030K		
ichael 7. Salum, Project Manager Final Page	e Of Report		
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APPENDIX F

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Revised Interested Party List — 1997

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<u>Name</u>	<u>Title</u>	<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>
Mr. Havert Fenn	Former Commissioner	St. Lucie Co. Commission	2300 Virginia Ave	Et Pierce	FI	34982
Mr. Ken Sattler	Commissioner	St. Lucie Co. Commission	2300 Virginia Ave	Ft Pierce	FI	34982
Mr. Deany Green	Former Commissioner	St. Lucie Co. Commission	2300 Virginia Ave	Ft Pierce	FI	34082
Mr. Gary D. Charles	Commissioner	St. Lucie Co. Commission	2300 Virginia Ave	Ft Pierce	म	34982
DEP - Aquatic Perserve	Commissioner	Di Badio Co. Commission	1801 S.E. Hillmoor Dr. Suite C-204	Port St. Lucie	FI	34952
DEP		South East District Branch	1801 S.E. Hillmoor Dr., Suite C-204	Port St. Lucie	FI	34952
Mayor	City of Port St. Lucie	Bouth East District Dialion	121 SW Port St. Lucie Blvd	Port St. Lucie	FL	34984
Mayor	City of Fort Pierce		P O Box 1480	Ft Pierce	FL.	34954
	Director	Treasure Coast Regional			. ~	51751
	2.10000	Planning Council	P.O. Box 1529	Palm City	FL	34990
	President	Marine Industries Assoc. of				0.000
	-	the Treasure Coast	P.O. Box 1639	Stuart	FL	34995
The Honorable O.R. Minton, Jr.	FL House Representative	District 78	2300 Virginia Ave., Room 200	Ft. Pierce	FL	34982
The Honorable Tom Warner	FL House Representative	District 82	957 S. Federal Highway	Stuart	FL	34994-3702
The Honorable Ken Pruitt	FL House Representative	District 81	2400 SE Midport Rd., Suite 310	Port St. Lucie	FL	34952
The Honorable William G. Myers	Florida State Senator	District 27	50 Kindred St., Suite 301	Stuart	FL	34994
The Honorable Patsy Ann Kurth	Florida State Senator	District 15	2174 Harris Ave., N.E., Suite 1-B	Palm Bay	FL	32905
Ms. Sheryl Friend	Asst. Director	Port St. Lucie Plan. & Zoning	121 S.W. Port St. Lucie Blvd.	Port St. Lucie	FL	34984
	City Manager	Port St. Lucie	121 S.W. Port St. Lucie Blvd.	Port St. Lucie	FL	34984
Gary Bouska		FP&L	P.O. Box 1691	Jensen Beach	FL	34958
Mr. Steve Cohen	Counsel	MacArthur Foundation	4400 PGA Blvd., Suite 900	Palm Beach Gardens	FL	33410-9680
Bill Snow			P.O. Box 1344	Palm City	FL	34990
Carl Kennough		I.R. Drive Freeholders Assoc.	9895 S. Indian River Dr.	Ft. Pierce	FL	34982
Nell Kreis		Indian River Drive Freeholders	6789 S. Indian River Dr.	Ft. Pierce	FL	34982
Kenneth Kennedy	Vice-President	Kennedy Groves	P.O. Box 189	Wabasso	FL	32970
Guy E. Poteat, Sr.			5945 20 th Street	Vero Beach	FL	32966
Mr. Andrew M. Clark	Ph.D., P.E.	Harbor Branch Oceanographic				
		Institution, Inc.	5600 U.S. 1 North	Ft. Pierce	FL	34946
Kennedy Properties of Indian						
River, Inc.			P.O. Box 189	Wabasso	FL	32970

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St. Lucie County Interested Party Mailing List

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e, FL	34982-5652
e, FL	34982
icie, FL	34952
icie, FL	34952
icie, FL	34984
e, FL	34954
e, FL	34982
FL	34990
FL	34995
FL	34982
FL	34994-3702
icie, FL	34952
FL	34994
FL	32905
e, FL	34982
icie, FL	34984
icie, FL	34984
ach, FL	34958
h FL	33410-9680
FI	34000
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ក្រ ជា	3/082
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St. Lucie County Citizens Advisory Committee

Engineering - Richard Bouchard Leisure Services - Brad Keen Community Development - David Kelly Port Director - Morris Adger (Jack Karibo - 1997) Mosquito Control - Jim David Commissioner Cliff Barnes