

**Long-Range Dredged Material Management Plan  
for the Intracoastal Waterway in  
Volusia County, Florida**

Final Report  
September, 1993

**Long-Range Dredged Material Management Plan  
for The Intracoastal Waterway in  
Volusia County, Florida**

Prepared for:

**FLORIDA INLAND NAVIGATION DISTRICT**

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## EXECUTIVE SUMMARY

The identification and permitting of suitable dredged material management areas for the Intracoastal Waterway in Florida have become increasingly difficult. This has resulted from the nature of dredging, the requirements of handling and storing dredged material, and the environmentally sensitive and rapidly developing areas in which these operations are performed. In response to this situation, the Florida Inland Navigation District (FIND) initiated, in 1986, a program of long-range dredged material management. When fully implemented this program will provide a permanent infrastructure of management facilities for all maintenance material dredged from the 374 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 Volusia County. Similar plan documents have been completed and approved for the Waterway in Nassau, Duval, St. Johns, Brevard, and Palm Beach Counties. In addition, comparable plan documents are nearing completion for the Waterway in Flagler and Martin Counties. 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 Volusia County are based on those used in the development of previous plan documents for the Waterway in Nassau, Duval, St. Johns, Brevard, and Palm Beach Counties. The major tasks performed as part of the present effort were as follows: (1) establishment of the 50-year material storage requirement within the

Volusia 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 analyzed to develop estimates for the 50-year maintenance dredging and material storage requirements of the 52 miles of channel within the study area. The analysis showed a projected total storage requirement of 9,145,000 cubic yards of bulked material distributed over six channel reaches. Preliminary assessment was then made of the 27 tracts totalling over 5,165 acres the FIND either owns (one 16.52-acre tract) or holds under perpetual easement (26 tracts, totalling 5150.77 acres). This assessment revealed that only eight tracts met the most basic site evaluation criteria and thereby showed potential for development and use as dredged material management areas. These eight tracts were retained as candidate sites for further evaluation.

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

- (1) In the vicinity of Ponce DeLeon Inlet, material dredged from the Waterway channels will be managed through the use of beach disposal combined with a back-up upland storage capability.
- (2) In all other segments of the Waterway, to the greatest extent possible as determined by site availability, dredged material will be placed in diked upland management facilities having existing or developable road access.
- (3) Centralized upland sites will be established in a minimum number of locations per operating reach of the Waterway.

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

Within this framework a total of 36 alternative candidate sites were identified. Each existing and alternative site was then field inspected and evaluated under a standard set of criteria addressing engineering, operational, environmental, and land-use considerations. By this process, 11 sites were selected to form a site bank of nine primary (first-choice) options and eight secondary alternatives. Six primary sites have also been identified as secondary alternatives under different management approaches. Three sites within the site bank are contained in four existing easements. The remaining eight sites were identified as part of the present project and thus are 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 Natural Resources (DNR), the Florida Department of Environmental Regulation (FDER)<sup>1</sup>, 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, review technical decisions, and establish project policy for the execution of future tasks. These meetings were supplemented with continuing dialogue with key agency personnel. In addition, representatives of the Halifax River Task Force, appointed by the Volusia County Council, served as a Citizens Advisory Committee for the project, and 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 Volusia County Council and twice to the general public at Public Information Workshops, held in Daytona Beach and Edgewater. At the workshops, comment was actively solicited from representatives of local government, civic groups, and interested citizens. Input and guidance received from all those who participated in the committee meetings and workshops proved invaluable to the successful completion of the project.

Experience gained from the earlier long-range dredged material management studies completed for the Waterway in Nassau, Duval, St. Johns, Brevard, and Palm Beach Counties has demonstrated the importance of

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<sup>1</sup>On July 1, 1993, the Florida Department of Environmental Regulation and the Florida Department of Natural Resources were consolidated into the Florida Department of Environmental Protection. Most of the work on this project was performed before the date of consolidation. Therefore, reference to the two antecedent agencies is retained throughout the remainder of this report.

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 Volusia County and documents all work performed under this contract. A companion set of 57 photobase engineering plans summarize pertinent channel and site information. Phase II of this project will develop all of the detailed engineering, environmental, and survey information necessary to design, permit, and construct permanent dredged material management facilities on each of the primary sites selected. Phase II will also address cost considerations associated with these actions and will develop detailed site operation and management plans. A detailed scope of work for Phase II of the project is presented in Section 5.0 of this report.

## **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 Volusia 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 the construction and continuing operation and maintenance of these sites as permanent dredged material management facilities.

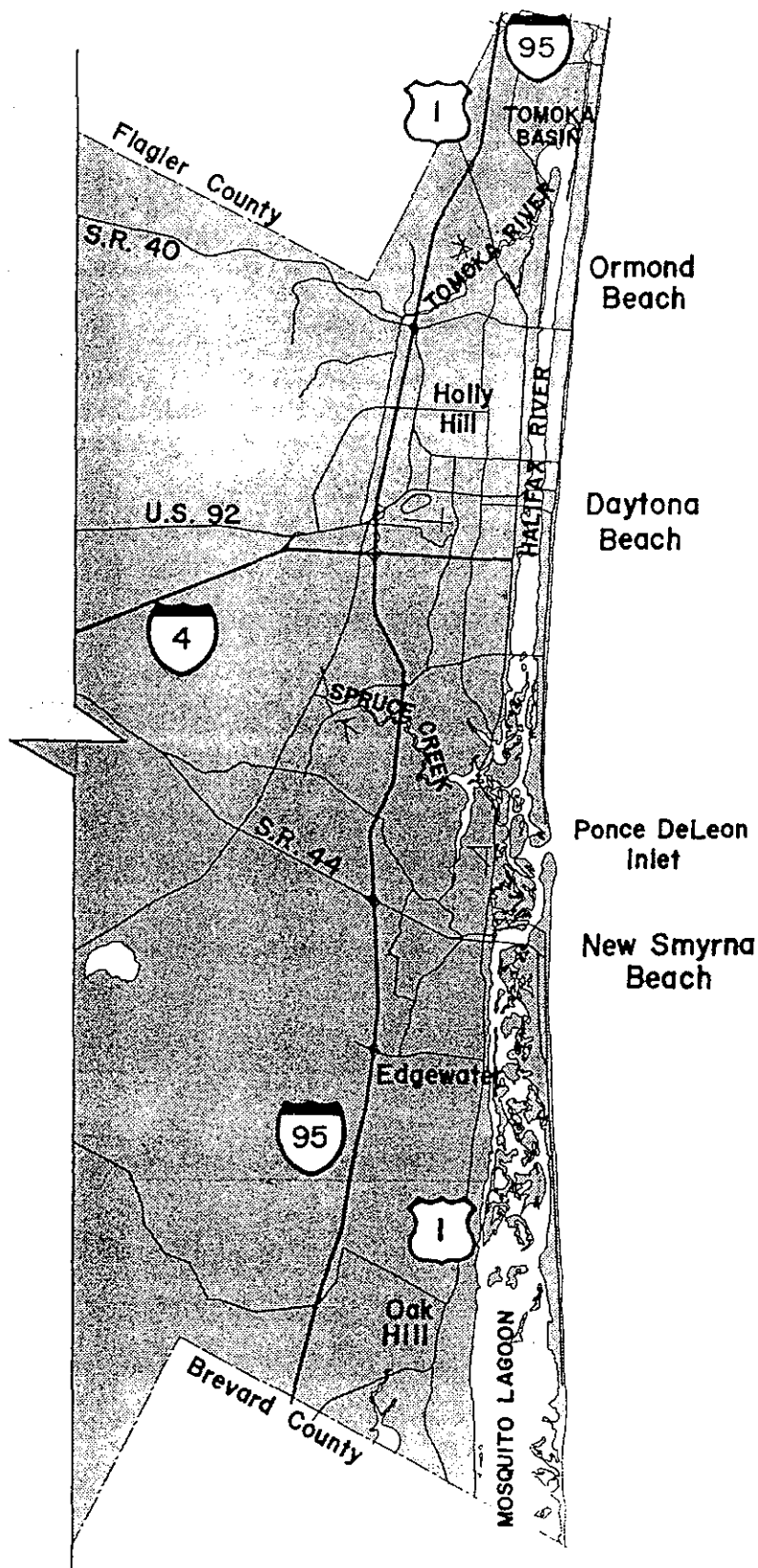
The methods used in the performance of the work reported herein are based on a study (Taylor and McPetridge, 1986) which addressed similar needs of the ICWW within Nassau and Duval Counties, Florida. This earlier effort, performed under the sponsorship of the Florida Inland Navigation District (FIND), 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 near completion. 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, Brevard, and Palm Beach Counties. Phase II is also nearing completion in 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 Volusia 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



# VOLUSIA COUNTY



Figure 1-1  
Project Area, Long-Range  
Dredged Material Management Plan  
Intracoastal Waterway  
Volusia County, Florida



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PROJECT
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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. 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<sup>2</sup>. In addition, local county and municipal governments typically address dredge-and-fill issues in local comprehensive planning documents within guidelines established by state regulation. The long-range implications of these constraints have become more apparent in the ensuing years as existing sites reach capacity and 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

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<sup>2</sup>On July 1, 1993, the Florida Department of Environmental Regulation and the Florida Department of Natural Resources were consolidated into the Florida Department of Environmental Protection. Most of the work on this project was performed before the date of consolidation. Therefore, reference to the two antecedent agencies is retained throughout the remainder of this report.

site acquisition to provide a means for accommodating all maintenance material dredged from the Waterway during the next 50 years and beyond. The first program element addressed the needs of the Waterway within Nassau and Duval counties, as discussed in Section 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 three counties — Flagler, Volusia, and Martin — as the third 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 Volusia County.

## **1.2 Project Overview**

Phase I development of the long-range dredged material management plan for the ICWW in Volusia 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 was being 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 Regulation, the Florida Department of Natural Resources, and the Florida Department of Community Affairs; (2) representatives of the Halifax River Task Force, serving as a Citizens' Advisory Committee for the present project, and comprising community representatives appointed by the Volusia County Council; (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, review technical decisions, and establish project policy for the execution of future tasks. The first meeting of the Technical Advisory Committee was held August 13, 1992, at the offices of Taylor Engineering. 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 with some potential for continued use and newly identified alternative sites. The second meeting of the Technical Advisory Committee was held October 7, 1992, at the offices of the DNR 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 last two meetings of the committee were held March 18, 1993, at Taylor Engineering, and on April 16, 1993, at the DER offices in Tallahassee. In these meetings the committee reviewed the results of the site evaluation process and the selection of the site bank of primary and secondary alternatives. 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 representatives of the Halifax River Task Force, serving as a Citizens' Advisory Committee. 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 Halifax River Task Force 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 Volusia 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 Volusia County Council on July 16, 1992, to introduce the FIND program of long-range dredged material management for the Intracoastal Waterway and to inform the Council that a planning effort for the Waterway in Volusia County was being initiated.

To inform the citizens of Volusia County and to receive additional input, two Public Information Workshops were held. These two workshops, held at the Daytona Beach City Hall on November 12, 1992,

and at the Edgewater Community Center on April 29, 1993, presented the work accomplished to date and set forth the direction of the plan at that time. Input received from both the Technical Advisory and Citizens' Advisory Committees was incorporated in the information presented and discussed at the public workshops.

Finally, progress made in the development of the Long-Range Dredged Material Management Plan for the Intracoastal Waterway in Volusia County was discussed at the regularly scheduled public workshops and 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 Volusia County project, progress reports and updates were presented and discussed by the FIND Board at seven public meetings and workshops. These included the FIND public workshops held in Fernandina Beach (Nassau County) on October 24, 1992, in Stuart (Martin County) on February 20, 1993, and in Ft. Pierce (St. Lucie County) on April 24, 1993, as well as the FIND Board meetings held in Miami (Dade County) on September 17-18, 1992, in Palm Coast (Flagler County) on January 22, 1993, in Jacksonville (Duval County) on July 23-24, 1993, and finally in Ft. Lauderdale (Broward County) on September 9-10, 1993, at which time the plan was formally adopted by the Board.

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 Volusia County.

### **1.3 Plan Document**

The entire planning process is documented in the remaining sections of this report. Section 2.0 describes the establishment of 50-year material management requirements for various reaches of the Waterway. This was accomplished by the use of historic data, and the comparison of projected dredging locations and material storage requirements with the capacities of existing disposal easements. Section 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. Section 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, Section 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 Volusia County segment of the Waterway were projected from historic shoaling rates in the Waterway channel. Baseline shoaling rates, in turn, were determined from a detailed analysis of Jacksonville District COE archival records, engineering plans, and survey data related to channel maintenance. These records represent the only available information on patterns of sedimentation within the project area.

Baseline shoaling rates for the various segments of the Waterway in Volusia County were derived from two estimated 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 which has occurred since the last maintenance operation or which has occurred in areas not covered by later channel maintenance.

The first quantity, the volume of historic maintenance dredging, is derived from COE records, as previously stated. The estimated quantity is based on the analysis of all plans and supporting documents for channel maintenance performed in the Volusia County segment of the ICWW since the channel was deepened to its present project depth of 12 feet below Mean Low Water (MLW). Within the Volusia County project area, the deepening of the channel was performed in two phases — from S.R. 100 in Flagler County southward to Oak Hill in 1952 and from Oak Hill southward to Haulover Canal in Brevard County in early 1953.

The volume of material dredged in previous channel maintenance operations is expressed in two forms in the archival records. 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 amount the dredging contractor is paid for the work. It is based on the comparison of detailed pre- and post-dredging

examination surveys, and therefore closely corresponds to the actual volume of material removed from the channel. Because of past contracting and recording procedures, pay volumes do not always link dredging quantities to specific dredging locations. In those maintenance operations for which the pay volume is unavailable, the pay volume was estimated by multiplying the design volume by a correction factor. The correction factor represents the ratio of pay volume to design volume in those channel maintenance operations for which both quantities are known. The correction factor applied to the Volusia County dredging data is 1.1153.

In addition, a second quantity, the estimated volume of recent shoaling, was derived to provide a more complete indication of the patterns of sedimentation. 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. In addition to shoaling rates, other unrelated factors 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 will be discussed, the lack of suitable sites has prevented channel maintenance in much of the Volusia County segment of the Waterway since 1960 despite the documented presence of extensive shoals. Only in the Ponce DeLeon Inlet area have existing easements provided adequate material storage capacity for channel maintenance operations up to the present time. Therefore, the calculation of future dredging and material storage requirements includes estimates of current shoaling volumes based on the most recent COE channel centerline survey. Performed in October, 1987, this survey reflects shoaling which has occurred since the last maintenance dredging operation in each channel segment. Thus, the period of record on which the historic rates of shoaling are based is late 1952 to late 1987, or 35 years.

The development of plan elements which address the needs of the ICWW in Nassau, Duval, St. Johns, Brevard, 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 the original navigation project record document which accompanied the establishment of the 12-foot MLW project depth in 1952-53 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). This system, presented in Table 2-1, was used throughout the remainder of the study. Inspection of Table 2-1 shows that the ICWW within the Volusia County project area comprises 46 straight line segments, or dredging cuts, totalling 52.48 miles. This distance includes 2.59 miles of Cut V-46 which extend within Mosquito Lagoon from Volusia County into Brevard County north of Haulover Canal. Haulover Canal forms a natural break between the Mosquito Lagoon and the Indian River segments of the Waterway. Material dredged in the Mosquito Lagoon cannot be efficiently transported through Haulover Canal to available sites on the western shore of the Indian River in Brevard County. Therefore, the segment of Cut V-46 within Brevard County was not included in the previous Brevard County planning effort.

Within this framework, a comprehensive analysis was then conducted of all maintenance dredging occurring in the ICWW in Volusia County since 1952. All available sources of dredging information within the Jacksonville District COE were consulted to ensure accuracy, consistency, and completeness. Preliminary sources included the annual Office of the Chief of Engineers (OCE) Reports, previous COE summaries of maintenance dredging within the project area, and interviews with COE personnel. The primary sources of information, however, were archival maintenance plan documents and examination surveys.

The compilation and reduction of historic dredging information from the various preliminary sources was a difficult task. No single source had complete information, and the resolution of inconsistencies among sources was necessary prior to locating dredging plans. This task accomplished, the records then had to be physically located under several filing systems within the district office archives and missing plans recalled from inter-division loan or from alternate storage at the Jacksonville District Dredge Depot. All relevant dredging information was verified by reference to the original plan sheets or microfiche versions of the original engineering drawings. Additional information contained in the dredging plans included shoaling areas and limits of planned dredging (referenced to the existing longitudinal stationing), the estimated dredging volume for each shoal and, in many cases, the location of material placement. Through this procedure, it was determined that maintenance within the study area since the establishment of the present 12-foot MLW project depth consisted of 13 separate events. The results of this analysis are summarized in Table 2-2.

Table 2-1 Intracoastal Waterway  
Volusia County, Florida<sup>1</sup>

	End Station (ft)	Length (mi)	MILEAGE		
			0.0 @ Cut V-1 Sta 0+00	ICWW Mileage 0.0 @ DU-1	0.0 @ FHP <sup>2</sup> AIWW Cut 34
Cut F-32	50 + 12.0			73.85	96.23
Cut V-1	47 + 12.0	0.89	0.89	74.74	97.12
V-2	33 + 71.1	0.64	1.53	75.38	97.76
V-3	18 + 63.9	0.35	1.88	75.73	98.11
V-4	37 + 47.9	0.71	2.59	76.44	98.82
V-5	68 + 11.3	1.29	3.88	77.73	100.11
V-6	96 + 77.0	1.83	5.72	79.57	101.95
V-7	27 + 61.4	0.52	6.24	80.09	102.47
V-8	196 + 11.9	3.71	9.95	83.80	106.18
V-9	22 + 00.0	0.42	10.37	84.22	106.60
V-10	224 + 64.8	4.25	14.63	88.48	110.86
V-10A	11 + 79.1	0.22	14.85	88.70	111.08
V-11A	20 + 98.0	0.40	15.25	89.10	111.48
V-12	24 + 95.92	0.47	15.72	89.57	111.95
V-13	63 + 56.9	1.20	16.92	90.77	113.15
V-16	35 + 00.4	0.66	17.59	91.44	113.82
V-17	47 + 38.6	0.90	18.48	92.33	114.71
V-18	65 + 73.6	1.25	19.73	93.58	115.96
- V-19	107 + 24.8	2.03	21.76	95.61	117.99
V-20	50 + 48.8	0.96	22.72	96.57	118.95
V-21	44 + 40.0	0.84	23.56	97.41	119.79
V-22	67 + 69.6	1.28	24.84	98.69	121.07
V-23	28 + 15.0	0.53	25.37	99.22	121.60
V-24	109 + 33.4	2.07	27.44	101.29	123.67
V-25	6 + 43.9	0.12	27.56	101.41	123.79
V-26	31 + 26.9	0.59	28.16	102.01	124.39
V-27	35 + 47.2	0.67	28.83	102.68	125.06
V-28	19 + 17.6	0.36	29.19	103.04	125.42
V-29	24 + 51.6	0.46	29.66	103.51	125.89
V-30	15 + 15.1	0.29	29.94	103.79	126.17
V-31	34 + 00.0	0.64	30.59	104.44	126.82
V-32	10 + 20.6	0.19	30.78	104.63	127.01
V-33	22 + 44.6	0.43	31.21	105.06	127.44
V-34	13 + 47.8	0.26 <sup>1</sup>	31.46	105.31	127.69
V-35	6 + 74.96	0.13	31.59	105.44	127.82
- V-36	29 + 24.48	0.55	32.14	105.99	128.37
V-37	19 + 31.69	0.37	32.51	106.36	128.74
V-38	111 + 09.3	2.10	34.61	108.46	130.84
V-39	124 + 46.7	2.36	36.97	110.82	133.20
V-40	31 + 87.9	0.60	37.57	111.42	133.80
V-41	42 + 00.6	0.80	38.37	112.22	134.60
V-42	115 + 50.1	2.19	40.56	114.41	136.79
V-43	96 + 85.2	1.83	42.39	116.24	138.62
V-44	111 + 22.8	2.11	44.50	118.35	140.73
V-45	152 + 61.5	2.89	47.39	121.24	143.62
V-46	268 + 97.4	5.09	52.48	126.33	148.71
<b>TOTAL</b>	<b>277,103.35 ft</b>		<b>52.48 mi</b>		

<sup>1</sup>Based on data contained in "Control Data, Intracoastal Waterway, Jacksonville to Miami, St. Johns River to Melbourne, 12 ft Project" D.O. File No. 8A-30,014, Jacksonville District, U.S. Army Corps of Engineers (undated).

<sup>2</sup>Fernandina Harbor Project, Fernandina Beach, Florida

Table 2-2 Summary of Historic Maintenance Dredging/Recent Shoaling  
Intracoastal Waterway, Volusia County  
1952-1987  
(page 1 of 2)

ICWW	Mileage		Channel Cut/Sta		Length	Year	Design Vol. (cy)	Pay Vol. (cy)	Disposal Area
	From	To	From	To					
77.16	77.84		V-5/38+00	V-6/61+00	0.68	1960	35,000		MSA 428, MSA V-1
77.62	77.72		V-5/62+50	V-5/67+50	0.09	1987*	2,326		---
78.10	78.16		V-6/19+50	V-6/22+50	0.06	1987*	4,167		---
78.53	80.42		V-6/42+00	V-8/17+00	1.89	1987*	147,280		---
80.79	81.07		V-8/37+00	V-8/52+00	0.28	1987*	18,287		---
82.60	83.21		V-8/132+50	V-8/164+50	0.61	1987*	44,656		---
85.74	85.93		V-10/80+50	V-10/90+50	0.19	1987*	12,153		---
88.67	88.73		V-10A/10+00	V-10A/13+00	0.06	1987*	3,194		---
90.14	90.69		V-13/30+00	V-13/59+00	0.55	1960	30,000		---
91.46	92.48		V-17/1+00	V-18/8+00	1.03	1987*	55,089		---
95.10	95.16		V-19/80+50	V-19/83+50	0.06	1987*	4,444		---
95.72	95.95		V-20/6+00	V-20/18+00	0.23	1962	12,000		MSA 434A
95.81	95.95		V-20/10+50	V-20/18+00	0.14	1987*	10,532		---
95.83	95.95		V-20/11+40	V-20/18+00	0.13	1972	11,000		MSA 434A
97.41	98.75		V-22/0+00	V-23/3+00	0.34	1970	14,500	9,302	---
98.45	99.45		V-22/55+00	V-24/12+00	1.00	1979	213,000		MSA 434A/434B
98.48	99.25		V-22/56+50	V-24/1+50	0.77	1968	46,800	43,080	MSA 434A/B/C
98.51	99.13		V-22/58+00	V-23/23+00	0.62	1960	22,000	26,646	MSA 434A/B/C
98.67	98.92		V-23/66+50	V-23/23+00	0.25	1958	13,854	15,451	---
98.67	98.92		V-22/66+50	V-23/12+00	0.25	1962	10,000	10,048	MSA 434A/B/C
98.67	98.92		V-23/66+50	V-23/12+00	0.25	1963	5,606	6,252	---
98.75	98.90		V-23/3+00	V-23/11+00	0.15	1987*	11,690		---
99.13	99.17		V-23/23+00	V-23/25+50	0.04	1987*	2,778		---
99.81	100.06		V-24/31+00	V-24/44+50	0.26	1958	28,735	32,048	---
99.81	100.06		V-24/31+00	V-24/44+50	0.26	1968	42,400	56,124	MSA 434A/B/C
100.12	102.13		V-24/47+50	V-27/6+50	2.01	1968	92,400	111,043	MSA 434A/B/C
100.85	101.83		V-24/86+00	V-26/22+00	0.98	1986	162,000		MSA 434/434C
100.88	102.74		V-24/87+50	V-28/3+00	1.86	1979	405,000		MSA 434/434C
101.06	101.53		V-24/97+00	V-26/6+50	0.47	1964	65,000	80,739	MSA 434/434C
101.18	101.69		V-24/103+50	V-26/15+00	0.51	1960	59,000	76,504	MSA 434/434C
101.19	101.63		V-24/104+18	V-26/11+50	0.44	1966	29,000	65,877	MSA 434/434C
101.19	101.66		V-24/104+18	V-26/13+00	0.47	1962	36,000	52,133	MSA 434/434C
101.19	101.73		V-24/104+18	V-26/16+00	0.54	1970	83,700	62,716	MSA 434/434C
101.21	101.43		V-24/105+00	V-26/1+00	0.22	1967	37,400	33,033	MSA 434/434C
101.52	101.75		V-26/21+00	V-27/18+00	0.23	1958	83,982	93,666	---
101.52	101.75		V-26/21+00	V-27/18+00	0.23	1963	13,000	27,404	MSA 434/434E
101.81	102.29		V-26/21+00	V-27/15+00	0.48	1962	19,000	13,948	MSA 434/434C
102.12	102.29		V-27/6+00	V-27/15+00	0.17	1963	2,700	4,123	MSA 434/434E
102.22	102.78		V-27/11+00	V-27/5+30	0.56	1967	38,500	44,559	MSA 434/434C
102.35	102.78		V-27/18+00	V-27/30+00	0.23	1958	6,811	7,596	---
102.35	102.58		V-27/18+00	V-27/30+00	0.23	1960	11,000	16,367	---
102.55	102.75		V-27/28+50	V-28/3+50	0.20	1968	8,200	14,710	MSA 434AR
102.56	102.65		V-27/29+00	V-27/34+00	0.09	1962	2,000	12,250	MSA 434/434C
102.56	102.76		V-27/29+00	V-28/4+00	0.20	1970	9,700	7,268	---
102.60	102.65		V-27/31+00	V-27/33+50	0.05	1987*	2,778		---
102.83	103.38		V-28/8+00	V-29/18+00	0.55	1967	29,200	32,575	MSA 434/434C
102.91	103.05		V-28/12+00	V-28/19+50	0.14	1987*	9,028		---
103.04	104.90		V-29/0+00	V-33/14+50	1.86	1973	119,000	98,423	D/A 6B
103.41	104.13		V-29/19+36	V-31/18+00	0.72	1970	51,000	38,214	D/A 6B
104.16	104.54		V-31/19+60	V-32/5+20	0.38	1970	17,000	20,893	D/A 6B
104.58	105.09		V-32/7+25	V-34/1+50	0.51	1968	26,000	28,490	MSA V-9
104.63	105.54		V-33/0+00	V-36/5+20	0.91	1986	64,000		MSA V-9
105.59	105.64		V-36/8+00	V-36/10+50	0.05	1968	1,600		MSA V-9
105.76	105.87		V-36/17+00	V-36/22+50	0.10	1987*	9,167		---
106.47	106.78		V-38/6+00	V-38/22+00	0.30	1979	47,000		MSA 436
106.51	106.89		V-38/8+00	V-38/28+00	0.38	1960	22,000		MSA 434AR
106.55	106.85		V-38/10+00	V-38/26+00	0.30	1962	11,000		MSA V-10

Table 2-2 Summary of Historic Maintenance Dredging/Recent Shoaling  
Intracoastal Waterway, Volusia County  
1952-1987  
(page 2 of 2)

ICWW From	Mileage To	Channel Cut/Sta		Length	Year	Design Vol. (cy)	Pay Vol. (cy)	Disposal Area
		From	To					
106.60	106.85	38/12+50	V-38/26+00	0.26	1970	19,700		----
106.63	106.72	V-38/14+50	V-38/19+50	0.09	1987*	8,912		----
107.93	108.40	V-38/83+00	V-38/107+50	0.46	1972	17,600		MSA 436, D/A - E
108.05	108.44	V-38/89+00	V-38/110+00	0.39	1960	8,000		MSA V-10, MSA 436
108.28	108.42	V-38/101+50	V-38/109+00	0.14	1987*	7,813		----
109.21	109.41	V-39/39+50	V-39/50+00	0.20	1972	10,000		D/A - F
109.22	109.33	V-39/40+00	V-39/46+00	0.11	1987*	7,500		----
109.99	110.04	V-39/81+00	V-39/83+50	0.05	1987*	3,125		----
110.75	111.02	V-39/121+00	V-40/10+50	0.27	1987*	19,691		----
111.42	111.30	V-40/20+00	V-40/25+50	0.10	1987*	7,512		----
111.42	111.57	V-41/0+00	V-41/8+00	0.15	1987*	10,864		----
112.22	112.50	V-42/0+00	V-42/15+00	0.28	1972	10,300		D/A - H
112.60	112.75	V-42/20+00	V-42/28+00	0.15	1987*	8,272		----
113.36	113.56	V-42/60+00	V-42/70+50	0.20	1987*	12,031		----
115.75	115.82	V-43/71+00	V-46/74+50	0.07	1987*	3,565		----
123.24	123.96	V-46/105+50	V-46/143+50	0.72	1987*	51,019		----
124.11	124.35	V-46/151+50	V-46/164+00	0.24	1987*	12,037		----
125.07	126.24	V-46/202+00	V-46/264+00	1.17	1987*	76,926		----
TOTAL							2,669,524	
(Est.) Pay Volume							(x 1.1153)	
Dredging Volume/yr							2,977,320	
50-yr Dredging Requirement							(÷ 35)	
50-yr Storage Requirement							85,066	
							(x 50)	
							4,253,295	
							(x 2.15)	
							9,144,584	

\* Estimated shoal volumes based on centerline survey "Reconnaissance Survey, 10 and 12-foot Project, St. Johns River to Key West" D.O. File No. 8-35, 044, Jacksonville District, U.S. Army Corps of Engineers, July, 1987.



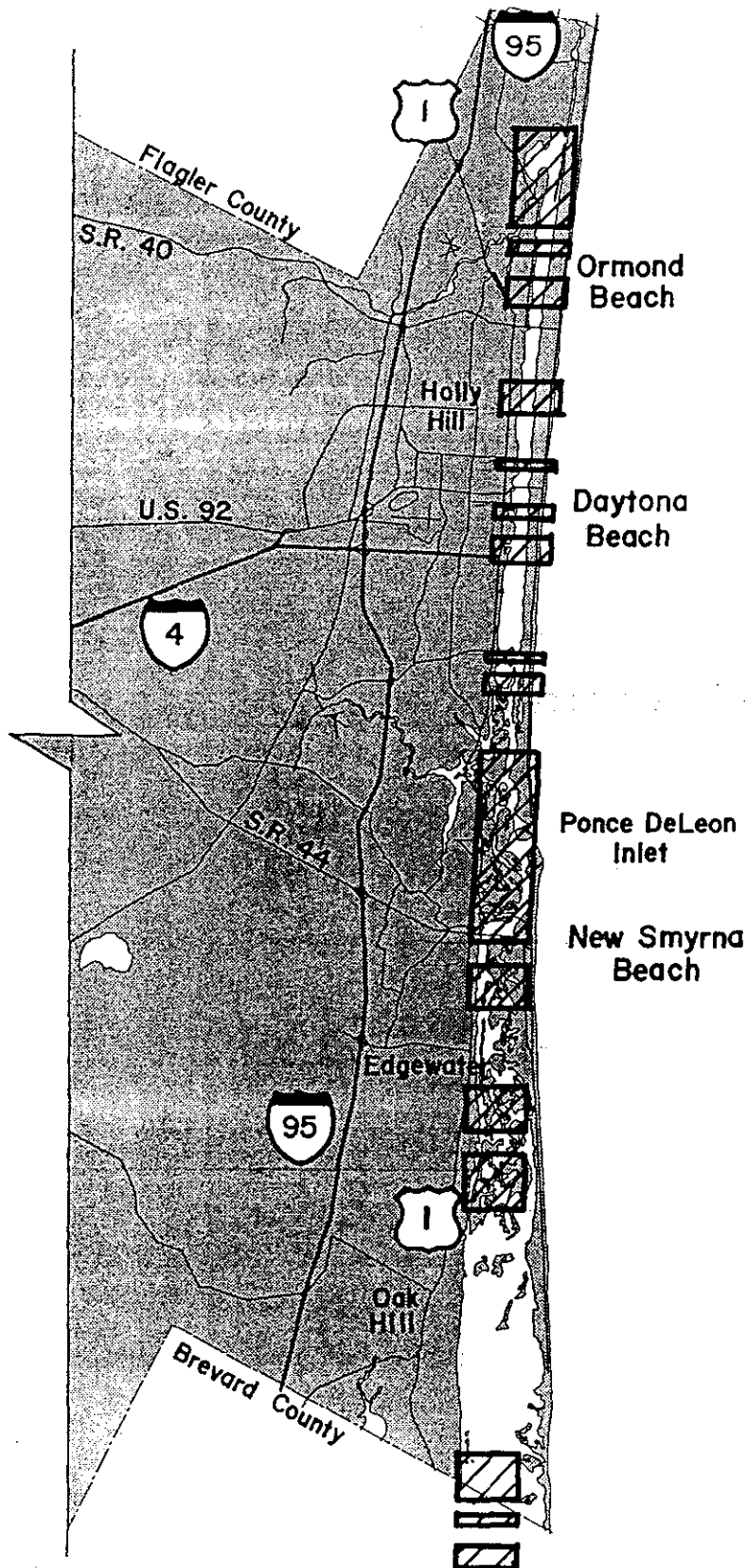
Table 2-2 also includes the locations and estimated volumes of shoaling which have not been removed by later channel maintenance. In segments of the Waterway which have required maintenance dredging, these estimates represent shoaling which has occurred since the last dredging operation. In areas which have never been dredged since the channel was deepened to the present 12 feet, these estimates represent shoaling which has occurred over the 35-year history of the 12-foot project. The locations and estimated volumes of shoaling are based on the results of the most recent (October, 1987) channel centerline survey as described earlier. For consistency, corresponding pay volumes for each area of shoaling are projected from the same design volume to pay volume ratio used in the analysis of historic dredging. The estimated shoaling volumes were then combined with historic dredging volumes to determine projected dredging and material storage requirements. Segments of the ICWW within Volusia County which have historically required maintenance or which have experienced shoaling are identified in Figure 2-1.

### **2.1.2 Material Quantities and Locations**

Examination of Table 2-2 leads to three primary conclusions concerning the characteristic pattern of shoaling within the Volusia County segment of the ICWW. First, a significant volume of shoaling has occurred since the present 12-foot MLW project depth was established in 1951-1952. Indeed, the total volume of shoaling documented for the Volusia County project area, 2,977,307 cubic yards (cy), is the largest of the eight counties addressed thus far in the FIND's 15-year program, slightly exceeding the volume of shoaling reported for the St. Johns County channel segment (2,929,917 cubic yards). Of the total volume of documented shoaling in the Volusia County channel segment, 79 percent (2,345,115 cy) represents material dredged in previous channel maintenance operations, while the remaining 21 percent (632,192 cy) represents existing shoals.

Second, by far the greater portion of shoaling within the Volusia County project area has occurred near Ponce DeLeon Inlet. Of the total volume of shoaling since the channel was deepened to its present 12-foot depth (2,977,307 cy), over 72 percent (2,156,238 cy) has been reported within the 11-mile segment adjacent to the inlet. Moreover, 61 percent (1,812,057 cy) of the total volume of shoaling within the county has occurred within the 5.24-mile Ponce DeLeon Inlet Cut-off channel. This is characteristic of those areas of the Waterway near tidal inlets, as inlets typically introduce littoral sediments to interior navigation channels. Indeed, experience indicates tidal inlets are the primary source of ICWW channel sediment. However, shoaling in the Waterway near Ponce DeLeon Inlet is more rapid than almost all other inlet areas examined thus far in the FIND's dredged material management program. In terms of the relative rate of

# VOLUSIA COUNTY



## LEGEND



AREAS OF PREVIOUS  
DREDGING/RECENT  
SHOALING



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

Figure 2-1  
Areas of Historic  
Maintenance Dredging / Recent Shoaling  
Intracoastal Waterway  
Volusia County, Florida

PROJECT
REVISION
SHEET
DATE

shoaling, expressed as cubic yards per year per channel mile, only the vicinity of Matanzas Inlet in southern St. Johns County experiences more rapid shoaling (8,079 cy/yr/mi) than does the Ponce DeLeon Inlet area (5,611 cy/yr/mi). As a result, maintaining the authorized channel depth at Ponce DeLeon Inlet has required 13 separate maintenance dredging operations, with a total dredging volume of 2,110,233 cy, since the present 12-foot project depth was established. This corresponds to a mean dredging frequency of one event every 2.69 years, and a mean dredging volume of approximately 162,000 cy per event. Shoaling in this area continues at a relatively rapid rate, with an additional 46,000 cy of shoaling having occurred between the completion of the most recent channel maintenance operation in late 1986 and the most recent channel centerline survey in October, 1987. This segment of the Waterway is scheduled for maintenance in Fiscal Year (FY) 1994.

The third characteristic of the shoaling pattern within the Volusia County segment of the ICWW is that shoaling outside the immediate area of the inlet is well distributed throughout the remainder of the project area. Notably, most of these shoals have never been dredged. Of the 821,069 cy of shoaling which has occurred outside the vicinity of the Inlet since the present project depth was established, 586,187 cy, or almost 93 percent, remains in the channel. Most segments of the Waterway in the Volusia County project area away from the influence of the inlet have received no maintenance since 1960. As will be seen, the reason for the failure to maintain the authorized depth is the lack of suitable dredged material management sites.

The most extensive existing shoals are found at the northern end of the county — specifically, within the 4.68 channel miles extending southward from the vicinity of the Tomoka Basin (Cut V-6, ICWW mile 78.53) to a point approximately 0.8 mile north of the Granada Boulevard (S.R. 40) Bridge in Ormond Beach (Cut V-8, ICWW mile 83.21). Three separate shoals, with a total volume of 234,461 cy, have been documented in this area. North of the Granada Bridge the Waterway has been maintained only once, in 1960, when approximately 39,000 cy of material were dredged from the channel. This operation took place immediately north of the area of existing shoaling described above. Thus, of the 280,739 cy of shoaling which has occurred within Volusia County north of the Granada Bridge since the present 12-foot project depth was established, 241,739 cy, or 86 percent, remains in the channel.

Southward from the Granada Bridge the rate and extent of shoaling is reduced. Within the 10.68-mile segment of the channel extending southward to the Port Orange Bridge, only one minor shoal has been dredged. This operation, performed in 1960, removed approximately 33,500 cy of material from the

channel immediately south of the Orange Avenue Bridge. Three additional shoals — totalling 78,558 cy — were documented in the 1987 centerline survey. The largest of the three (61,441 cy) is located approximately 1.5 miles south of the Orange Avenue Bridge, opposite the eastern end of Beville Road (S.R. 400). A second shoal (13,554 cy) is approximately 1.8 miles south of the Granada Bridge. The third and smallest shoal (3,562 cy) is located approximately 0.2 mile south of the Seabreeze Boulevard Bridge. No maintenance dredging has ever been performed in this channel segment.

South of the Port Orange Bridge to the South (S.R. 44) Bridge in New Smyrna Beach, shoaling in the ICWW channel is dominated by the influence of Ponce DeLeon Inlet, as discussed previously. Continuing southward from New Smyrna Beach, the volume of shoaling — reduced compared to the intensive shoaling at the inlet — remains roughly equal to that which has occurred at the northern end of the county north of the Granada Bridge. However, unlike the situation in the north county where no maintenance dredging has taken place since 1960, the 10-mile channel segment south of the S.R. 44 Bridge has been dredged five times over the history of the 12-foot project. A total of 162,387 cy of material was removed in the five maintenance operations, the most recent being performed in 1979. Since 1979 shoaling in this area has continued, with the 1987 survey documenting a total of 109,804 cy of material in 11 separate shoals distributed throughout the 10-mile channel segment (Cut V-36, ICWW mile 105.67 to Cut V-43, ICWW mile 115.82).

From the point the ICWW enters the broad open expanse of the southern portion of the Mosquito Lagoon (Cut V-44, ICWW mile 115.82) to the southern end of the Volusia County project area (Cut BV-1, ICWW mile 126.33), no maintenance dredging has been performed over the history of the present 12-foot project depth. However, the 1987 survey identified three shoals within the southernmost three miles of the project area. The total estimated volume of these three shoals (156,122 cy) represents 25 percent of the total volume of documented shoals within the Volusia County project area.

Combining the maintenance dredging quantities and existing shoal volumes for the various segments of the ICWW within the county yields a total county-wide volume of 2,977,320 cy for the 35-year period of record (1952-1987). To project the corresponding 50-year maintenance requirement, this figure was then apportioned upward by linear extrapolation (i.e., multiplied by a factor of 50/35, or 1.429). The resulting 50-year projected dredging volume of 2,977,307 cy corresponds to the *in situ* or unbulked volume of anticipated shoaling throughout the county.

To translate the projected 50-year *in situ* volume of shoaling into an equivalent volume required to store 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, the dredged material will begin to consolidate under its own weight. Given appropriate conditions and sufficient time, the material may approach its original pre-dredging volume. The degree to which the material expands (bulks) depends on the physical characteristics of the sediment, as well as its relative consolidation prior to dredging. For this study a factor of 2.0 was used to account for the increase in volume of the *in situ* shoal material as it is dredged. An additional allowance of 15 percent of the original *in situ* volume accounts for anticipated non-pay volume or unauthorized overdredging. The selection of these conservative values is based upon Jacksonville District, U.S. Army Corps of Engineers experience and recommendation. Multiplying the projected 50-year volume of shoaling by the effective bulking factor of 2.15 yields a projected 50-year material storage requirement of 9,144,584 cy for the Volusia County project area.

### **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, both the chemical and physical properties of the dredged material determine its potential for reuse and, therefore, the effective site lifetime. In a procedure similar to that used to establish historic dredging volumes, all available historic physical and chemical sediment data were reviewed. To augment the limited historic data on Volusia County sediments, a program of sediment sampling and analysis was performed specifically for the present planning effort. Both the historic and the more recent sediment data are discussed in the following paragraphs.

#### **2.1.3.1 Physical Characteristics**

The primary source of historic physical data by which to characterize ICWW channel sediment within the Volusia County project area is a series of grab samples and core borings taken by the Jacksonville District COE prior to scheduled maintenance activity. Only since the early 1970's have sediment data been systematically included in maintenance dredging plans prepared by the Jacksonville District. Thus, data of

this type are available only for segments of recently dredged channel. This limits the data coverage to the area of Ponce DeLeon Inlet.

Within the Volusia County project area, the earliest data are based on a series of grab samples taken in the Ponce DeLeon cutoff channel southward to New Smyrna Beach in May and December, 1970. Fifteen samples were taken within Cuts V-22 through V-27, seven within Cuts V-30 through V-32, and three samples within Cut V-38. The samples were consistently described as fine sand, light brown to gray in color, with small fractions of silt and shell.

In addition, two sets of core boring data are available. First, before the 1979 maintenance operation, core borings were taken and analyzed in December, 1978, at twelve locations in Cuts V-24 through V-27 and two locations in Cut V-38. To prepare for the 1986 operation, a second set of data were obtained in September, 1985, at seven locations in Cuts V-24 through V-26 and four locations in Cut V-33. In each case, individual core boring logs present qualitative characterizations of sediment at elevations referenced to MLW. In addition, gradation or sieve analysis results and suspended sediment-time curves are also contained in the data for a very limited number of core boring locations. The total depth of each boring is typically -17 to -20.5 feet MLW, or 3 to 6.5 feet below the maximum depth of dredging. Sediment which enters the channel to form shoals may be qualitatively different than the native material underlying the channel. Therefore, only data which correspond to the material above the depth to which the channel was originally constructed (i.e., -14 feet MLW, or 12 feet, plus 2 feet over-dredging) are considered.

The core boring logs uniformly characterize the sediments from all boring locations as fine sand, light gray to yellow to brown in color, with varying minor fractions of silt and shell. Laboratory analysis of the samples taken in 1985 indicates that, under the Unified Soils Classification System (USCS), the silt component of the samples (i.e., grain diameter  $< 0.074$  mm, or passing a #200 sieve) ranges from 2.6 percent to 6.3 percent. This characterization is qualitatively supported by inspection of the areas adjacent to this reach previously used as dredged material sites (i.e., MSA 434A, MSA 434/434C, MSA V-9). The surface of these areas is generally composed of clean, fine sand, light gray to light tan to white in color.

To augment the limited historic sediment data and provide a more complete picture of sediment quality within the Waterway, the FIND contracted Taylor Engineering to conduct a preliminary quality assessment of ICWW channel sediments in Flagler, Volusia, and Martin Counties. This effort, which addressed both the physical and chemical characteristics of channel sediments, was completed in April, 1993.

The methods used in the performance of this assessment and its findings, including sediment sampling, analytical results, and interpretation, are documented in a separate report (Schropp and Taylor, 1993). Data from this study which pertain to the physical characteristics of channel sediments within the Volusia County project area are briefly summarized below.

In January, 1993, surface samples were taken from six locations throughout the project area, each location centered in the ICWW channel (Figure 2-2). In an effort to sample worst case conditions, each station was located near a potential source of fine sediments such as wastewater treatment plants, major canals and stormwater outfalls, or residential developments. In the area of Ponce DeLeon Inlet — that is, the segment of the Waterway which lies between Port Orange and New Smyrna Beach — the sampling site was located distant from the inlet to increase the likelihood of finding fine sediments. The sampling locations are as follows: (1) Station V-1, 4,000 feet north of the Granada Bridge, near the Ormond Beach WWTP outfall; (2) Station V-2, 5,100 feet north of the Seabreeze Bridge, opposite the mouth of the 11th St. Canal; (3) Station V-3, 5,000 feet south of the Orange Ave. Bridge, near the Bethune Point WWTP outfall; (4) Station V-4, 2,200 feet south of the Port Orange Bridge; (5) Station V-5, Edgewater, 3.3 miles south of the S.R. 44 Bridge, 600 feet north of Waterway Marker DBN-55; and, (6) Station V-6, Oak Hill, 150 feet east of Waterway Marker Buoy-10. Notably, with the exception of Station V-6, all stations are in or near areas of active shoaling and thus represent sediments to be dredged.

To obtain a physical characterization of the sediment samples, an analysis of grain size distribution was performed. The resulting grain size distribution curves indicate the mean grain sizes of the six samples range from 0.209 mm to 0.025 mm. The sediments contained in the samples taken north of Ponce DeLeon Inlet are significantly finer than the sediments taken to the south. The finest sediment (mean grain diameter — 0.025 mm) was found at Station V-3, located near the Bethune Point (Daytona Beach) WWTP. To the north, the sediments from Station V-1 (Ormond Beach) and Station V-2 (Holly Hill) are only slightly more coarse (mean grain diameters of 0.039 mm and 0.036 mm, respectively). Based on mean grain size, the sediments from all three northern sampling locations are classified as silt under the Wentworth Classification system. To the south, the sediment from Station V-4, located south of the Port Orange Bridge, has a mean grain diameter of 0.069 mm. The Wentworth system classifies sediment of this size as very fine sand. The two southern sampling locations, Station V-5 (Edgewater) and V-6 (Oak Hill), produced sediment with mean grain diameters of 0.209 mm and 0.139 mm, respectively. Based on mean grain diameter, both samples are classified as fine sand under the Wentworth system. Under the Unified Soils Classification (USC) system, used by the COE and thereby more common in dredging applications, the classification of all

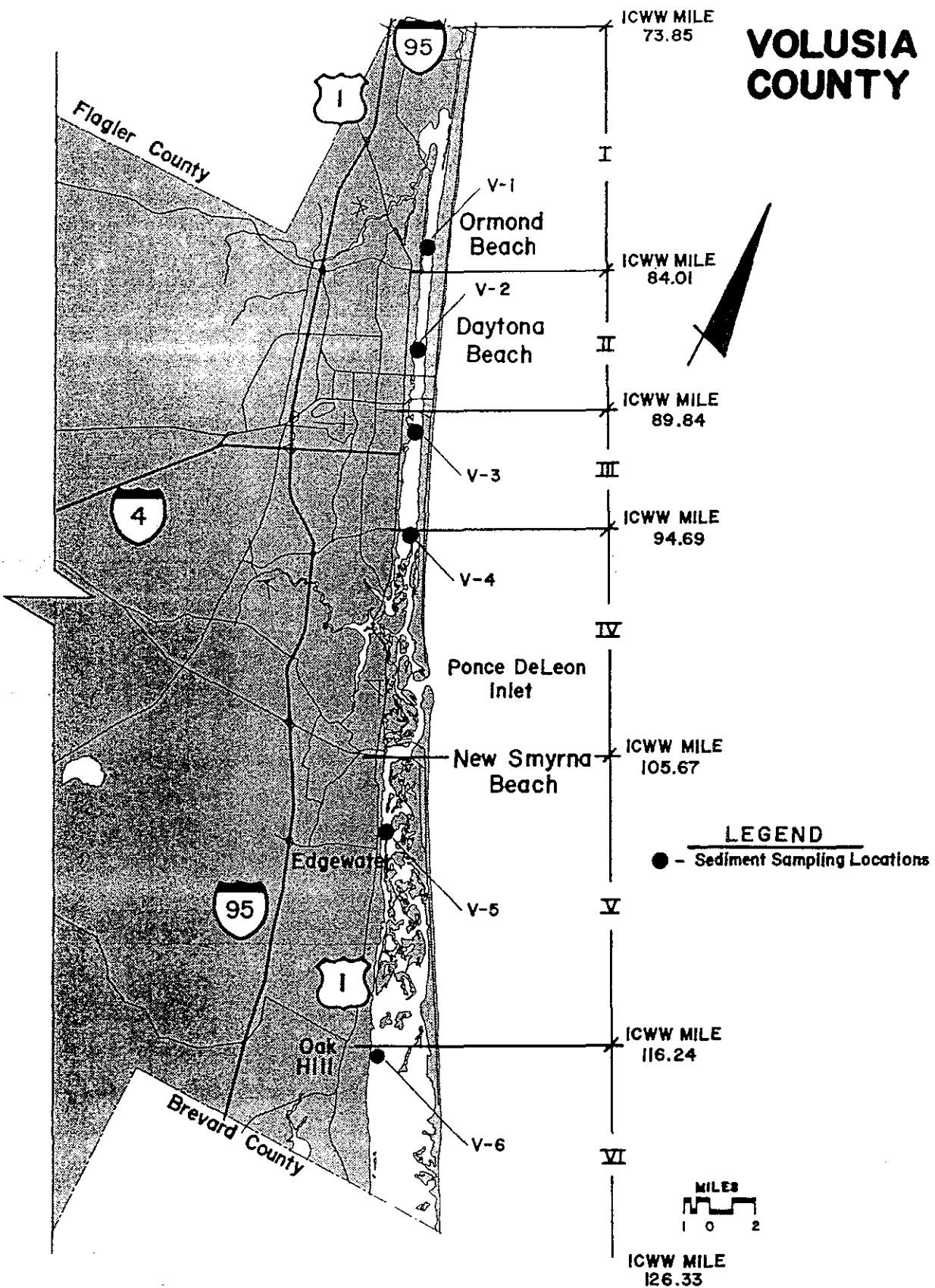


Figure 2-2  
Sediment Sampling Locations  
Dredged Material Management Plan  
Intracoastal Waterway  
Volusia County, Florida

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samples remains unchanged from the Wentworth system, with the exception of Station V-4. Under the USC system the material from Station V-4 is classified as silt.

In addition, the percentage of each sample classified within the silt-sized fraction under the USC system (i.e., less than 0.074 mm or passing on a #200 sieve) is consistent with the pattern established by the mean grain size of each sampling location. The station reporting the finest mean grain size, Station V-3, also reports the highest percentage of the total sediment sample within the silt-sized fraction, with 96 percent of the sample consisting of particles less than 0.074 mm in diameter. Once dredged, material containing such a high fraction of silt may require specialized dewatering techniques to achieve rapid drying while also maintaining the quality of the return water within state standards. The remaining stations north of the inlet also report relatively high percentages of silt-size particles, with the samples from Stations V-1, V-2, and V-4 containing silt fractions of 64 percent, 78 percent, and 38 percent, respectively. Conversely, the stations south of the inlet report relatively small silt-sized fractions, with samples from Stations V-5 and V-6 containing only 2.5 percent and 6.0 percent silt-sized particles, respectively.

These results indicate that ICWW channel sediment in Volusia County is marked by two different regimes. From Ponce DeLeon Inlet southward, channel sediment is composed largely of sand, with only minor components of silts and clays. This is especially true near the inlet where strong tidal currents flush fine sediment from the channel. North of the inlet, channel sediment contains a more significant component of fine-grained material. This condition is most likely a result of increased urban runoff and reduced tidal circulation, as well as the possible contribution of the Tomoka River north of Ormond Beach.

#### 2.1.3.2 Sediment Chemistry

Since the Jacksonville District COE was not required to analyze sediment chemistry to obtain the needed permits for its earlier channel maintenance operations, no historic sediment chemistry data are available from the Corps. As a result, historic sediment chemistry data for the ICWW channel within Volusia County are limited to the results of a Florida Department of Environmental Regulation (FDER) sediment sampling program. In 1984, the FDER sampled sediments within the ICWW or adjacent waters at 20 locations within the project area. The samples were then analyzed for the presence of a number of potential contaminants, primarily heavy metals. The measured concentrations were then compared to those which would be anticipated under natural conditions. The procedures used and the results obtained from that study are discussed below.

The stations were chosen to characterize "worst case" conditions — that is, at locations where contaminants, if present in the system, would most likely be encountered. Many contaminants, most notably heavy metals, have a strong affinity for fine-grained sediment. Therefore, the stations were located in areas where fine-grained sediments may accumulate. These included locations both within the authorized ICWW channel — such as near wastewater treatment plant (WWTP) outfalls — and locations well outside the channel — such as the entrances of tidal creeks or major canals, or inside boat basins. Of the 20 stations sampled by the FDER within the Halifax River or the Mosquito Lagoon, 14 were located inside or near the ICWW channel. These are identified in Table 2-3. The remaining six stations were well outside the authorized channel. Because channel sediments may differ significantly from those nearer shore or within sheltered embayments, only the results from the 14 stations located inside or near the ICWW channel are discussed here.

The most significant conclusion to be drawn from the FDER data is that Waterway channel sediments are not significantly contaminated. However, a number of stations do give evidence of metals concentrations which are somewhat elevated above their expected natural ranges. Because of the affinity of heavy metals for fine particles, the presence of elevated metals concentrations closely corresponds to the distribution of fine-grained sediments. Conversely, elevated concentrations of metals are not typically encountered where sediments are primarily of a coarser nature. As discussed in the previous section, channel sediment from the area of Ponce DeLeon Inlet southward is composed largely of sand with only minor components of fine-grained sediment. As expected, all FDER sampling stations south of the inlet reported metals concentrations within natural ranges.

North of the inlet, where channel sediment contains larger fractions of fine-grained material, a number of the sampling stations reported slightly elevated concentrations of one or more metals compared to natural levels. However, at no location were levels such that the sediment could be considered significantly contaminated. Copper, cadmium, and lead were the metals most commonly present at higher than expected concentrations. Copper slightly exceeded natural concentrations at five stations — HXR-0003 opposite the entrance to Bulow Creek, HXR-0005 near the Ormond Beach WWTP outfall, HXR-0008 north of the Seabreeze Bridge, HXR-12 near the Bethune Point (Daytona Beach) WWTP outfall, and HXR-0013 approximately one mile farther south. Elevated levels of cadmium were found at HXR-0003, HXR-0009

**Table 2-3 Department of Environmental Regulation**  
**Sediment Sampling Locations, Intracoastal Waterway Channel, (1985)**  
**Volusia County**

Sampling Location	Channel Cut/Station	Description
HXR-0002	V-1/23+00	4500 ft N of High Bridge
HXR-0003	V-2/32+50	700 ft S of High Bridge, opposite mouth of Bulow Creek
HXR-0005	V-8/170+00	3800 ft N of Granada Bridge, at Ormond Beach STP outfall
HXR-0006	V-10/0+00	1200 ft S of Granada Bridge
HXR-0007	V-10/158+00	at 11th St. Canal (Holly Hill STP outfall)
HXR-0008	V-10/188+00	3200 ft N of Seabreeze Bridge
HXR-0009	V-10A/2+00	1400 ft S of Seabreeze Bridge
HXR-0010	V-11A/18+50	800 ft S of Main St. Bridge
HXR-0011	V-12/8+50	100 ft N of Orange Ave. Bridge
HXR-0012	V-16/2+50	5200 ft S of Orange Ave. Bridge, at Bethune Point STP outfall
HXR-0013	V-17/24+00	10,800 ft S of Orange Ave. Bridge
HXR-0015	V-19/20+00	3800 ft N of Port Orange Bridge
HXR-0018	V-27/8+50	4000 ft S of Rockhouse Creek
MQL-0002	BV-1/0+00	8500 ft N of Haulover Canal

between the Seabreeze and Main Street Bridges, and HXR-0011 immediately north of the Orange Avenue Bridge. Lead was present at slightly elevated levels at HXR-0007 opposite the 11th St. Canal, HXR-0008, and HXR-0012. The only station producing elevated levels of zinc was Station HXR-0012 (near the Daytona Beach WWTP outfall). Indeed, Station HXR-0012 demonstrated elevated levels of copper, lead, and zinc when sampled in 1984. However, in 1990 the FDER again sampled the same location and reported only lead present at slightly elevated concentrations with copper and zinc within their natural ranges. Again, at no location were heavy metals found at concentrations which demonstrate significant contamination. The findings could, however, prompt the FDER to request elutriate testing or additional sediment sampling during its evaluation of dredge and fill permit applications for proposed operations at or near the areas of reported metals enrichment. The elutriate test is intended to ensure maintenance of water quality standards during dredging or discharge of ponded water.

More recent and comprehensive channel sediment chemistry data is provided by Schropp and Taylor (1993). In addition to determining grain size distribution, the 1993 study also analyzed surface samples from the same locations described in Section 2.1.3.1 for the presence of potential contaminants. Notably, three of the six stations in the 1993 study were near locations sampled by the FDER in 1984 as follows: Station V-1, near the Ormond Beach WWTP outfall, also near FDER station HXR-0005; Station V-2, opposite the mouth of the 11th Street Canal, also near FDER station HXR-0007; and Station V-3, near the Bethune Point WWTP, also near FDER station HXR-0012.

The samples were analyzed to measure a suite of potential pollutants including metals (i.e., arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), nutrients, polynuclear aromatic hydrocarbons (PAH), chlorinated pesticides, and polychlorinated biphenyls (PCB). Samples were analyzed using U.S. Environmental Protection Agency or American Public Health Association standard methods. The suite of sediment constituents examined in this report is more extensive than that usually required by the Florida Department of Environmental Regulation (FDER) in support of dredge and fill permit applications. The broader suite of constituents was examined, however, to provide a thorough sediment characterization and to identify potential sediment contaminant problems.

The results of sediment chemistry analyses are often difficult to interpret. No sediment quality standards exist comparable to the water quality standards adopted by the Florida Department of Environmental Regulation. The FDER has supported, however, the development of guidance documents to simplify the interpretation of sediment chemistry data. Two procedures detailed in these documents were

used to evaluate the ICWW sediment data. The first procedure compares measured chemical concentrations to natural background concentrations. A chemical within its natural range is considered to pose no environmental threat. This procedure is essentially the same as used by the FDER to interpret the results of their 1984 sampling effort. The second procedure compares measured chemical concentrations to concentrations determined to represent hazards to aquatic life.

Application of both methods indicate that the ICWW sediments examined during this project are not significantly contaminated and pose no environmental threat. Sediment metal concentrations are all found to fall within natural ranges with three exceptions. Concentrations of mercury exceeded the expected values at Stations V-2 and V-3. Both locations are near WWTP outfalls. In addition, zinc was found at higher than natural concentrations at Station V-4. However, in all three cases the reported concentrations were below those deemed to represent a significant hazard to aquatic life. Furthermore, the levels of zinc found at Station V-4, although above the natural range, are below the level which produces observable effects on aquatic organisms.

Notably, the 1993 study does not support the earlier FDER results which identified slightly elevated metals concentrations at several stations, specifically, copper near Station V-1 (FDER station HXR-0005), lead near Station V-2 (FDER station HXR-0007), and copper, lead, and zinc near Station V-3 (FDER station HXR-0012). As noted earlier, a second sample taken by the FDER at station HXR-0012 in 1990 indicated only minimally elevated levels of lead, with both copper and zinc within their natural ranges. However, the 1993 findings of elevated levels of mercury at two locations could prompt the FDER to request elutriate testing or additional sediment sampling during its evaluation of dredge and fill permit applications for proposed operations at or near these locations.

PAHs, PCBs, and pesticides were all below detectable limits. Further evaluation of the chemical concentrations using biological effects-based sediment quality guidelines indicate that the tested ICWW sediments pose no threat to aquatic life. In addition, levels of nutrients and oil and grease are typical of normal estuarine sediments and do not indicate any significant contamination.

No sediment quality data are presently available to characterize recently 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 prior to the initiation of contracting

procedures. Sediment chemistry typically is not analyzed unless required to obtain the necessary Water Quality Certificate from the Florida DER.

## 2.2 Existing Sites

From a review of Jacksonville District COE Real Estate Maps (Drawing No. RE-C 12,214) and FIND real estate aerial basemaps (1986) of the project area, the FIND controls 27 tracts available for dredged material management. These are identified in Table 2-4 and shown in Figure 2-3. The FIND holds one of these tracts (MSA 410, 16.52 acres) under fee simple ownership, while it holds the remaining 26 privately or publicly owned parcels, totalling 5150.77 acres, under perpetual disposal easement.

A preliminary evaluation of each existing easement and FIND-owned tract was then performed. In addition to the COE Real Estate Maps and FIND aerial basemaps already mentioned, four other resources were used to perform the evaluation. These include: (1) black and white aerial photography of nominal 1" = 800' scale, flown January-December, 1985, for the Jacksonville District COE; (2) 1:24,000 scale (1" = 2,000') color-infrared aerial photography, flown March, 1983, and March, 1984, from the National High Altitude Photography Program of the U.S. Geological Survey (USGS); (3) 1:24,000 scale (1" = 2,000') USGS Topographic Quadrangle Maps, 7.5-minute series; and (4) 1:24,000 scale (1" = 2,000') 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 eight of these tracts from further consideration. 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 for the efficient construction of earthen dikes to dewater and store the dredged material. Examination of Table 2-4 confirms that most of the tracts were eliminated because they contained insufficient contiguous upland area, either as a result of minimal overall acreage (e.g., less than five acres) or because the tract consisted primarily of either open water with small spoil islands or salt marsh. The eight remaining tracts, all held under perpetual easement by the FIND, therefore exhibit at least some potential for development and use as dredged material management areas.

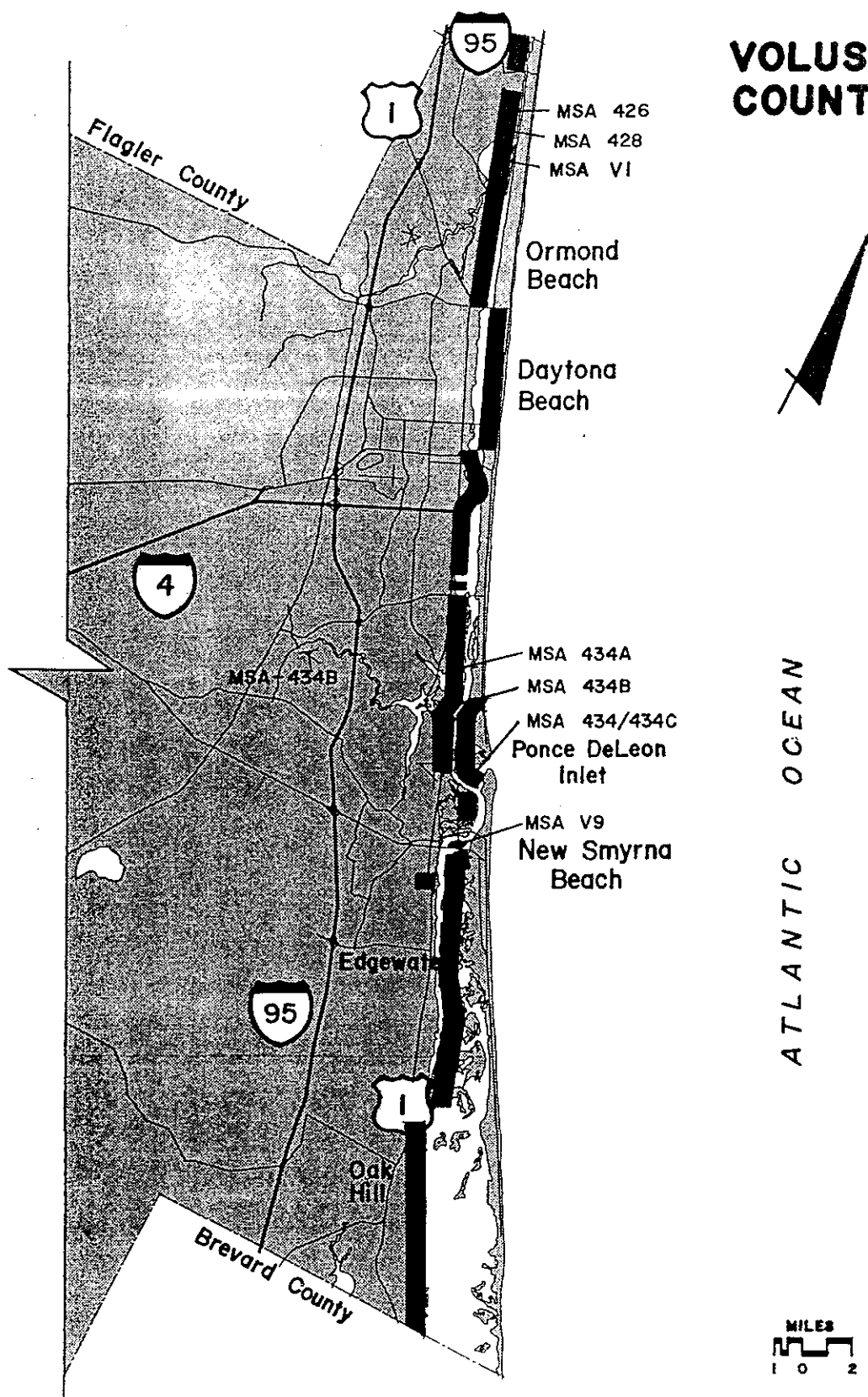
**Table 2-4 Inventory of Existing Disposal Easements**  
**Intracoastal Waterway, Volusia County, Florida**  
 (page 1 of 2)

F.I.N.D. Designation	C.O.E. Tract No.	ICWW Mile	Total Acreage	Useable Upland Acreage	Containment Capacity (c.y.)	Comments
MSA 401	269	73.85	10.83	---	---	Marsh with small spoil island, adjacent to 3114A (Flagler Co.)
MSA 403	272	74.07	30.30	---	---	Marsh with small spoil island
MSA 405B	278	74.48	30.30	---	---	Marsh with small spoil island
MSA 409	280	74.74	28.00	---	---	Marsh, no usable upland
MSA-FO-410	281	74.91	N/A	---	---	Marsh and open water, no usable upland.
MSA 412	286	75.29	36.70	7.27	52,533	Consists mainly of marsh, usable upland limited to one spoil island
MSA 426	298	75.06	108.00	---	251,181	Three contiguous esmts. containing series of six spoil islands linked by dirt road, forming eastern side of Tomoka Marsh Mosquito Impoundment
MSA 428	305	76.14	63.59	77.40		
MSA V-1	306	77.44-80.09	253.90	---	---	Primarily open water with isolated spoil islands
MSA V-2	307	80.09-84.02	285.10	---	---	Open water, no usable upland
MSA V-3	309	84.02-88.48	307.80	---	---	Open water, no usable upland
MSA V-4	310	88.48-89.16	71.60	---	---	Open water, no usable upland
MSA V-5	311	89.16-89.64	39.90	---	---	Open water, no usable upland
MSA V-6	312	89.66-93.42	266.50	---	---	Open water, no usable upland
MSA V-7	313	93.69-95.25	68.15	---	---	Open water, Port Orange Causeway located within this easement
MSA 434A	314	94.41-98.86	865.00	22.45	382,164	Primarily tidal marsh, but also contains spoil islands ranging from 1/2 to 25 acres, no road access
MSA 434	316	98.86-102.60	378.80	90.27	1,890,251	Two existing disposal areas located on two islands adjacent to Rockhouse Creek, no road access
MSA 434B	317	98.86-100.76	207.00	9.3	66,365	Marsh with spoil islands of up to 20 acres, no road access
MSA 434C	D400E	101.14-101.88	46.90	---	---	Adjacent to MSA 434, contains portions of spoil islands at to Rockhouse Creek
MSA V-8	319E	102.53-104.16	190.70	---	---	Marsh with spoil islands
MSA V-9	323	104.44-105.63	84.30	6.84	40,090	Consists mainly of open water, Chicken Island located within this easement, no road access
MSA V-10	325	105.64-106.93	145.40	---	---	Open water, marsh, contains small spoil islands with no road access

Table 2-4 Inventory of Existing Disposal Easements  
Intracoastal Waterway, Volusia County, Florida  
(page 2 of 2)

F.I.N.D. Designation	C.O.E. Tract No.	ICWW Mile	Total Acreage	Useable Upland Acreage	Containment Capacity (c.y.)	Comments
MSA 434AR	324	106.05	14.98	---	---	Residential development located within this easement
MSA 436	327	106.93-116.75	941.12	---	---	Open water, marsh with numerous spoil islands ranging in size from 1/2 to 42 acres, located east of ICWW, no road access
MSA V-11	347	116.75-118.39	159.80	---	---	Open water with numerous small spoil islands
MSA V-12	349	118.06-123.38	516.10	---	---	Open water with numerous small spoil islands of less than 2 acres each
TOTAL				2,682,584		

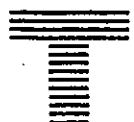




# VOLUSIA COUNTY



ATLANTIC OCEAN



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Figure 2-3  
Existing FIND Easements  
Dredged Material Management Plan  
Intracoastal Waterway  
Volusia County, Florida

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As identified in Figure 2-3, the eight remaining tracts are located within two discrete segments of the Volusia County project area — at the northern end of the county, north of the Tomoka Basin, and in the Waterway segment centered on Ponce DeLeon Inlet. Thus, the segments of the Waterway which have demonstrated the greatest amount of shoaling also contain easements which possess some potential for continued dredged material management. In the remainder of this section, the eight tracts retained for more detailed evaluation, as well as the 19 tracts eliminated from further consideration, are discussed.

Southward from the Flagler-Volusia County line (ICWW mile 73.83) to the north end of the Tomoka Basin (ICWW mile 77.50), a series of eight existing easements are located in a broken band along the western shore of the Halifax River (ICWW). North of High Bridge (ICWW mile 75.12), these easements contain primarily salt marsh, tidal creeks, and mosquito ditches. A series of small (less than five acres) isolated spoil islands provide the only upland. The size of the islands, combined with their isolation from adjacent uplands, eliminates any potential for their development and use as dredged material management areas.

Southward from High Bridge, the easements contain a series of relatively larger spoil islands. These islands generally possess over 10 acres of upland. The easement immediately south of High Bridge, MSA 412, contains 7.27 acres of an 11-acre island. It is not apparent whether this island was formed naturally or resulted from the placement of dredged material from the earliest days of the Waterway. However, because this island is isolated from adjacent uplands by tidal creeks and ditches, and because only a portion of the island is held under easement, this area fails to merit further evaluation.

Continuing southward, two easements, MSA 426 and MSA 428, as well as the extreme northern end of a third easement, MSA V-1, encompass a series of interconnecting spoil islands which extend southward along the Halifax River to the north end of the Tomoka Basin. These islands form the eastern side of a mosquito impoundment encompassing approximately 1,000 acres of salt marsh extending from Bulow Creek on the north to the Tomoka Basin on the south. The southern, western, and northern sides of the impoundment are formed by dikes constructed from material dredged from a network of mosquito ditches in the interior of the impoundment. The spoil islands within the easements are connected to the uplands approximately 1.5 miles to the west by Pumphouse Road, an unimproved public dirt road/causeway. The uplands contained in easements MSA 426/428/V-1 are formed by a chain of narrow islands broken by several tidal creeks or ditches. Therefore, these areas cannot readily be consolidated into an efficient configuration for the construction of a diked containment basin without impacting some portions of the

adjacent salt marsh. Nevertheless, the interconnecting upland areas of MSA 426, MSA 428, and MSA V-1 represent almost 80 acres. Their size, combined with the upland road access provided by Pumphouse Road, merit a more detailed evaluation.

Easement MSA V-1 continues southward approximately 2.6 miles from the north end of the Tomoka Basin. In an 800-foot wide band, it runs immediately west and parallel to the ICWW channel right-of-way. It then connects to a second easement, MSA V-2, 600 feet in width, which continues southward to the Granada (S.R. 40) Bridge in Ormond Beach. With the exception of numerous small spoil island located within the northern three miles, MSA V-1 and MSA V-2 are entirely open water. The islands are typically less than five acres in size and therefore afford no realistic opportunity for continued use. From the Granada Bridge, a series of four 600-foot wide easements parallel the channel for the next 10 miles, alternating between the east and west sides of the channel, to a point approximately one mile north of the Port Orange Bridge (ICWW mile 93.78). These easements, designated MSA V-3, MSA V-4, MSA V-5, and MSA V-6, total over 685 acres, almost all of which is open water. An additional easement, MSA V-7, extends discontinuously north and south of the Port Orange Bridge and encompasses over 68 acres of open water east of the spoil islands adjacent to the bridge, as well as a portion of the bridge causeway east of the trailer park (Bird Island).

Immediately south of the Port Orange Bridge (ICWW mile 94.69) begins a series of extensive easements which continue southward to the point at which the Ponce DeLeon Cutoff channel of the ICWW intersects with the south inlet channel of the Halifax River. These easements, totalling almost 1,500 acres, consist primarily of open water, mud flats, and salt marsh. However, also contained within these easements are numerous spoil islands. These islands, varying in size from less than one acre to more than 25 acres, have resulted from channel construction and maintenance activities since the 1920's. The smaller islands, relics from the earliest days of the ICWW, resulted from the unconfined placement of dredged material within areas of open water or salt marsh immediately beside the area of dredging. The larger islands most likely began in the same manner but have grown to their present size as regulation and dredging practice have required consolidated placement to minimize the destruction of wetland habitat. Regulation has also mandated that dredged material be placed within containment dikes so that the excess water returned to the ICWW can meet established standards. The accumulation of material has allowed the more recent construction of rudimentary containment dikes on the larger islands.

The first and largest of these easements, MSA 434A, begins immediately south of the Port Orange Bridge and west of MSA V-7 described above. It continues over four miles southward along the western edge of the ICWW channel right-of-way to Lost Creek opposite the intersection of the ICWW and the north inlet channel of the Halifax River (ICWW mile 98.86). MSA 434A, extending in places over 2000 feet west of the ICWW channel, takes in much of Mike's Bay in the north, as well as broad expanses of open water, salt marsh, and isolated spoil islands. The largest of the islands (approximately 25.8 acres) is located at the extreme south end of the easement, immediately north of the blocked entrance to Lost Creek. The useable upland area of this island (22.45 acres) merits its continued use if its capacity were increased by redeveloping the site and reconstructing the dike. However, several additional considerations limit its potential for long-term use. The primary drawback is its isolation from adjacent upland areas. Thus, the island affords no road access for construction or long-term site operation. Moreover, no possibility for site expansion exists. Indeed, providing even a minimal buffer between the redesigned containment dikes and the adjacent marsh would result in a significant reduction of storage area. Finally, the projected site capacity, addressed in the following section, represents only a portion of the total projected material storage requirements for the adjacent segment of the ICWW channel. These and other site evaluation criteria are discussed in more detail in Section 4.0.

MSA 434B, a second easement with a uniform width of 800 feet, continues along the western edge of the ICWW channel right-of-way southward to the north side of the New Smyrna Beach power generating station north of Rockhouse Creek (ICWW mile 100.76). This easement also encompasses numerous spoil islands generally less than five acres in size. Only the largest island within this easement contains sufficient upland acreage (greater than 10 acres) to be considered for continued use as a dredged material management area.

A third easement, MSA 434, begins opposite the northern end of MSA 434B opposite Lost Creek and continues southward along the eastern edge of the ICWW inlet cutoff channel right-of-way, ending over 3.6 miles to the south at the intersection of the ICWW and the north inlet channel of the Halifax River (ICWW mile 102.52). This easement also contains a number of small spoil islands. However, also contained within this easement are portions of two large spoil islands located immediately north and south of Rockhouse Creek. The uniform 800-foot easement width provided by MSA 434 was, in 1950, expanded both north and south of Rockhouse Creek by the addition of a fourth easement, MSA 434C. The combined easements MSA 434/434C now include almost all of the upland area — totalling over 90 acres — of the two spoil islands. These two areas have received most of the material dredged from the ICWW inlet cutoff

channel over the history of the 12-foot project depth. The southern island was used more recently, having received over 180,000 cy of material from a 1986 channel maintenance operation performed in Cuts V-24 through V-26. Both the north and south islands now meet or exceed the elevations established by the existing dikes, with the maximum elevation of the south island being above +30 feet NGVD. However, by removing much of the dredged material and redeveloping the sites, both islands demonstrate the potential for continued use.

South of the intersection of the ICWW inlet cutoff channel and the north inlet channel of the Halifax River a 190-acre easement, designated MSA V-8, extends along the western edge of the ICWW right-of-way southward to the North (Coronado Beach) Bridge in New Smyrna Beach (ICWW mile 104.17). This easement contains primarily open water and salt marsh but also includes several small spoil islands (less than 10 acres), as well as approximately eight acres of a larger, 20-acre island. Notably, this easement also contains approximately three acres of a dredge-and-fill residential subdivision. Because of the small size of these islands and their isolation from adjacent uplands, none show sufficient potential for development and use as dredged material management areas.

Beginning 1,500 feet south of the Coronado Beach Bridge, MSA V-9 extends along the eastern and southern edge of the ICWW channel right-of-way southward to the South (S.R. 44) Bridge (ICWW mile 105.67). The easement includes all open water areas between the channel right-of-way and the shoreline of Bouchelle Island. Its boundaries include Chicken Island, located between Sheephead Cut and the ICWW. This island, with a total area of almost 25 acres, has been used several times to receive material dredged from the Waterway. Most recently, over 70,000 cy of material was placed on the island in a 1986 operation that filled the containment dikes (with elevations of +11.0 feet NGVD) to capacity.

South of the S.R. Bridge, MSA V-10, containing 145 acres, extends east of the ICWW channel for approximately 1.3 miles. This easement encompasses open water and salt marsh, with only a few small spoil islands, the largest less than three acres. MSA 436AR, a 15-acre conditional use easement, is located on the opposite side of the Waterway. This area, last used in 1968, is now a built-out waterfront residential development. Its present status with the FIND has not been determined.

Extending southward from the south end of MSA V-10 is the largest easement in Volusia County. This 950-acre easement, designated MSA 436, extends along the eastern edge of the ICWW channel right-of-way almost 10 miles (ICWW mile 106.93 to mile 116.75) with a uniform width of 800 feet. Similar to

almost all the easements within Volusia County, MSA 436 contains primarily open water, tidal creeks, and salt marsh. However, it also contains a large number of spoil islands, ranging in size from less than one acre to more than 42 acres. The largest of these was used as recently as 1979, when it received as much as 52,000 cy of material. The minimal dikes constructed at that time are now at capacity.

Two additional easements, 800 feet wide, parallel the Waterway southward to the Volusia-Brevard County line. The first, MSA V-11, begins at the southern end of MSA 436 (ICWW mile 116.75) and continues over 1.6 miles along the eastern edge of the channel right-of-way. The second, MSA V-12, begins on the western side of the ICWW channel right-of-way, 1,750 feet north of the southern end of MSA V-11 (ICWW mile 118.06) and continues southward over five miles to the county line. A similar easement, MSA B-1, continues from the county line southward to Haulover Canal. Each of these easements contain primarily open water, with numerous small spoil islands, all less than three acres in size. As discussed in Section 2.1.2, this segment of the Waterway has not been dredged since it was last deepened to its present authorized depth of 12 feet. Therefore, no material has been placed on these islands since 1952.

### **2.3 Existing Storage Capacity**

As discussed above, only eight of the 27 easements held by the FIND were determined to have some potential for development and continued used as dredged material management areas. As shown in Figure 2-3, these are MSA 426, MSA 428, and MSA V-1 at the northern end of the county immediately north of Tomoka Basin, and MSA 434, MSA 434A, MSA 434B, MSA 434C, and MSA V-9 in the area of Ponce DeLeon Inlet southward to New Smyrna Beach.

To further evaluate these eight easements, an analysis was performed to determine the maximum potential material storage capacity of each. The useable upland area within each contiguous easement tract was determined from tracings made of the 1" = 800' black and white aerials, guided by color-infrared photography, and USFWS wetland inventory maps. 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 to all sites. Selected parameter values are within the range of standard practice for similar sites used for previous maintenance events. These included a 15-foot crest elevation above grade, a 1V:3H side slope, a 12-foot crest width, a 20-foot setback of the interior excavation from the inside toe of the dike, and a minimum freeboard plus ponding allowance of four feet. Calculations were based on a realistic dike configuration (i.e., a three- to five-sided polygon), specific to each site, which utilizes the maximum available upland area as delineated by photo-interpretation. The mean grade elevation for each site was estimated from survey transects, if available, or from USGS Quadrangle maps. In some cases, small upland acreage or low mean grade elevation prevented designing a 15-foot dike without requiring the excavation of the basin interior to an unreasonable depth. Typically, excavation was limited to a very rough estimate of the elevation of the water table on-site or on the order of +2 to +4 feet NGVD. In such cases, the dike height was limited by the available material. The results of the preliminary capacity analysis are presented in Table 2-3.

Comparison of the total estimated capacity of the existing easements in Volusia County (2,682,584 cy) with the projected 50-year capacity requirement for the Volusia County segment of the ICWW (9,144,584 cy, Table 2-2) shows that the existing capacity falls far short of the long-term requirement. As previously noted, the potential capacity contained in the existing easements falls within the reaches of the Waterway with the greatest storage requirement. However, even in these limited Waterway reaches, the existing capacity does not meet the project's long-term need. Moreover, the continued use of the existing easements may not be the most cost-effective and operationally efficient plan to meet the long-term needs of the ICWW. In the next section, the characteristics of the most appropriate plan — i.e., the "Management Concept," for the Waterway in Volusia County — are discussed.

### **3.0 DREDGED MATERIAL MANAGEMENT ALTERNATIVES**

#### **3.1 Management Concept**

Inherent in every maintenance dredging operation is a set of guiding principles that reflect 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 Volusia 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 salt marsh-estuarine system of the Intracoastal Waterway in northeast Florida, this concept often led to the unconfined placement of dredged material within the marsh. 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 salt marsh areas, are now recognized as among the most biologically productive ecosystems and resources that must be conserved. However, preservation of marsh 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. 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 Volusia County**

The central issue guiding the development of a management concept for the ICWW in Volusia 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 Disposal
- o Centralized Upland Storage

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

Ocean disposal of material dredged from the ICWW is not a realistic option for the Volusia 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 Volusia County, this operational requirement poses a very costly and difficult task for the following reasons. First, the material must be loaded into barges capable of transiting the relatively shallow depths of the ICWW. These barges must then proceed to the Ponce DeLeon Inlet for passage to sea. Material from the northern or southern ends of the Volusia County project area must be transported as far as 26 miles to reach the inlet. Once reaching the inlet the material must then be transferred to deep draft seagoing barges for transport to the authorized disposal area. Collectively, these requirements render this method of material disposition impractical and prohibitively expensive.

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 with it unacceptable environmental impacts in terms of loss and degradation of wetlands and associated impacts. In addition, the intent of the FIND 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 Volusia County.

The third material management alternative considered for Volusia County is beach disposal. Beach disposal — i.e., placing on the beach dredged material compatible with the native beach sands — is an approach to dredged material management that the State of Florida encourages. The FIND also includes this approach as an essential part of dredged material management for channel reaches which, based on

historic data, are likely to contain beach quality sediments. These conditions are most typically encountered in the immediate area of tidal inlets where Waterway shoals are formed primarily by sand driven through the inlet by waves and tides. Such conditions are present within the Waterway channel in the vicinity of Ponce DeLeon Inlet. As discussed in Section 2.1.3, analysis of grab samples and core borings obtained from documented shoals within this reach over the last 23 years indicate that the shoal material is predominantly clean, fine sand, light gray to brown in color, with only traces of silt and shell. The degree to which the channel sediment is compatible with the physical characteristics of the native beach material has not been determined. However, because both channel sediment and beach sands are littoral material, a high degree of compatibility is anticipated.

With the specific exception of the use of beach disposal in the immediate area of Ponce DeLeon Inlet, centralized upland storage remains the preferred method of dredged material management in all other areas of the Volusia County segment of the Waterway. Upland storage, as used here, is the use of a diked containment area with appropriate outlet flow control structures. The dredged material is pumped in a sediment-water slurry to one end of the containment area, which thus serves as a settling basin within which the dredged sediment settles out of the transporting water. The residual water is then returned to the Waterway via the basin outlet structure and return pipeline.

Upland storage offers a number of significant advantages over the other available methods: (1) upland storage provides an efficient means of dredged material management without the excessive costs of transportation and material re-handling 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 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 implies that ways be explored 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.

In the area of Ponce DeLeon Inlet, upland storage must also provide a needed complement to the preferred method of beach disposal. An upland storage capability must be an integral part of beach disposal for several reasons. First, the ability to place dredged material on the beach is subject to delays produced by regulatory review. It is also highly dependent on the quality of the material. As discussed in Section 2.1.3.1, grab samples and core borings taken in the ICWW channel near the inlet have demonstrated that channel sediments in this area are predominantly sand. This is consistent with this sediment being littoral material introduced through the inlet. However, it is possible that isolated shoals will be encountered which contain sufficient fine-grained sediment to render the material inappropriate for beach placement. The occurrence of such shoals becomes more likely with increasing distance from the inlet. In addition to the above mentioned constraints, the feasibility of beach disposal is influenced by other considerations. These include the compliance of upland property owners, the need for additional material on the beach, and most importantly, restrictions tied to sea turtle nesting. For these reasons it becomes necessary to include an upland storage capability as part of the beach disposal management concept.

### **3.1.2 Management Concept for Volusia County**

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

- (1) In the vicinity of Ponce DeLeon Inlet, material dredged from the Waterway channels will be managed through the use of beach disposal combined with a back-up upland storage capability.
- (2) In all other segments of the Waterway, to the greatest extent possible as determined by site availability, dredged material will be placed in diked upland management facilities having existing or developable road access.
- (3) Centralized upland sites will be established in a minimum number of locations per operating reach of the Waterway.
- (4) 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.

### **3.2 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 historical 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.

Six reaches, ranging from 4.85 miles to 10.98 miles in length, were defined within the Volusia County project area. The resulting delineation is summarized in Table 3-1 and presented in Figure 3-1. Table 3-2 organizes the previous summary of historic dredging/recent shoaling as presented in Table 2-2 by channel reach. Also presented in Table 3-2 are the total dredging or shoaling volumes and 50-year material storage requirements for each reach. As an indication of the relative shoaling rate within each reach, the mean volume of maintenance dredging required annually per channel mile is also included.

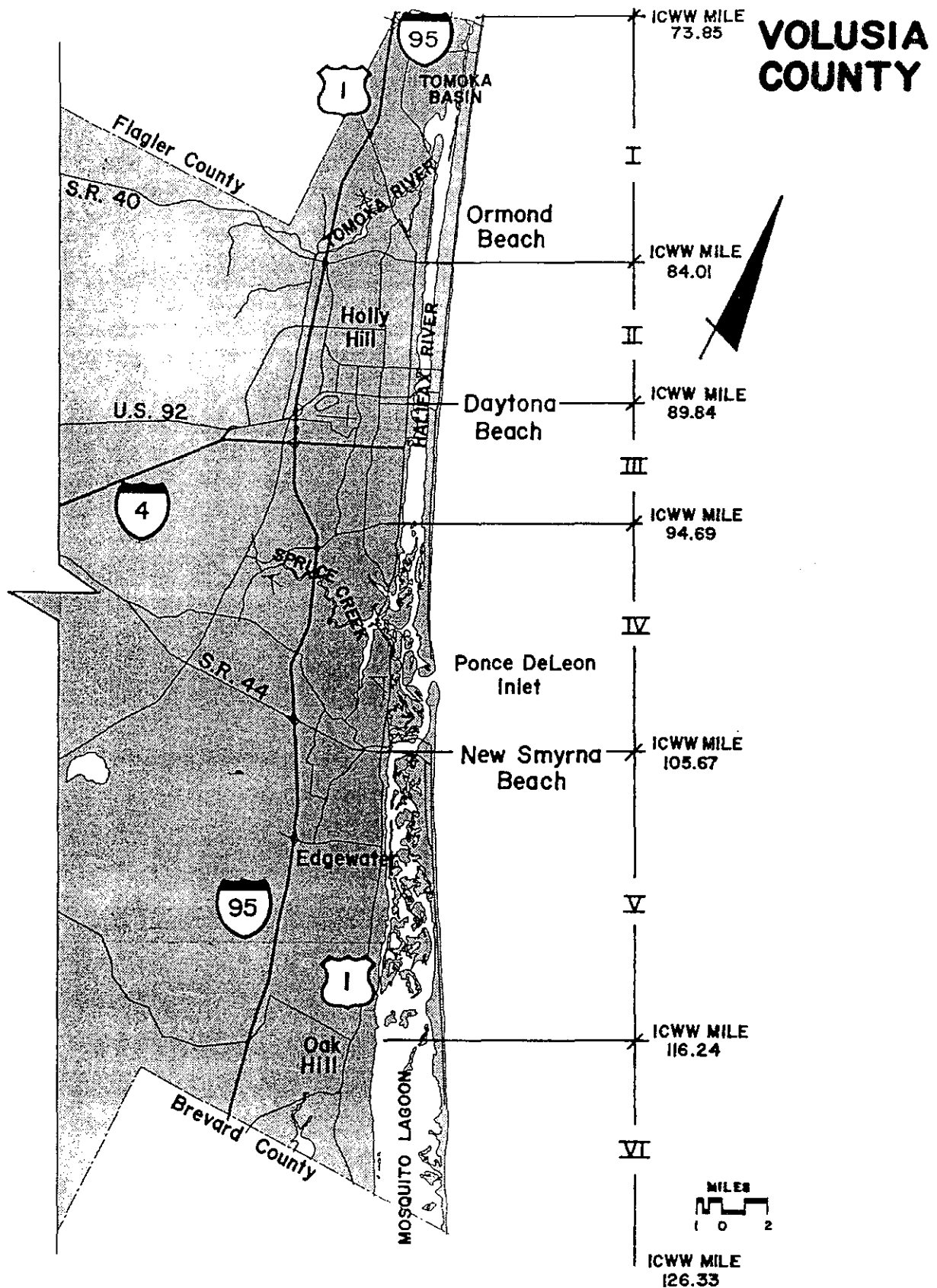
The northernmost reach, Reach I, extends from the Flagler-Volusia County line (Cut V-1, sta 0+00, ICWW mile 73.85) southward 10.16 miles to the Granada (S.R. 40) Bridge in Ormond Beach (Cut V-9, sta 11+00, ICWW mile 84.01). This reach covers the broad area of documented shoaling which extends southward from the Tomoka Basin (Figure 3-2). The southern end of Reach I corresponds to a discontinuity in the shoaling pattern, as well as an obvious and logical geographic feature. The projected 50-year material storage requirement for this reach is 862,000 cy. Since the channel in this area was last deepened to its present 12-foot authorized project depth in 1952, this reach has been dredged only once, primarily because of the lack of a suitable means of material disposition. The 1960 maintenance operation removed over 39,000 cy of material (*in situ* volume) from the channel. Thus, over 85 percent of the projected 50-year storage requirement results from the estimated volume of existing shoals documented in the 1987 channel centerline survey (241,703 cy *in situ* volume).

Reach II continues southward from the Granada Bridge to the Orange Avenue Bridge in Daytona Beach (Cut V-13, sta 14+00, ICWW mile 89.84), a distance of 5.83 miles. Reach II is shorter in length than Reach I because of urbanization in the Ormond Beach-Holly Hill-Daytona Beach area which requires increased flexibility in the identification of candidate sites. By reducing the reach length, increased distances to a dredged material management facility west of the Waterway can be accommodated without exceeding maximum pumping distance limitations. The projected 50-year material storage requirement for Reach II is only 53,000 cy, by far the smallest requirement of the six reaches designated for the Volusia County project area. No maintenance dredging has been performed in this reach since the establishment of the 12-foot project depth in 1952. The projected 50-year storage requirement is therefore based on the estimated *in situ* volume of existing shoals (17,117 cy), based on the 1987 channel survey.

Reach III extends southward from the Orange Avenue Bridge to the Port Orange Bridge (Cut V-19, sta 58+50). This reach is also relatively short — 4.85 miles — based on the same considerations of

**Table 3-1 Dredged Material Management Channel Reaches,  
Intracoastal Waterway, Volusia County, Florida**

<b>Reach</b>	<b>From</b>	<b>To</b>	<b>Length (mi)</b>
1	Flagler/Volusia Co. Line ICWW Mile 73.85 Cut V1/sta 0+00	Granada (SR 40) Bridge ICWW Mile 84.01 Cut V9/sta 11+00	10.16
2	Granada (SR 40) Bridge ICWW Mile 84.01 Cut V9/sta 11+00	Orange Ave. Bridge ICWW Mile 89.84 Cut V13/sta 14+00	5.83
3	Orange Ave. Bridge ICWW Mile 89.84 Cut V13/sta 14+00	Port Orange Bridge ICWW Mile 94.69 Cut V19/sta 58+50	4.85
4	Port Orange Bridge ICWW Mile 94.69 Cut V19/sta 58+50	South (SR 44) Bridge ICWW Mile 105.67 Cut V36/sta 12+00	10.98
5	South (SR 44) Bridge ICWW Mile 105.67 Cut V36/sta 12+00	Vicinity of Eldora ICWW Mile 116.24 Cut V44/sta 0+00	10.57
6	Vicinity of Eldora ICWW Mile 116.24 Cut V44/sta 0+00	Vicinity of Haulover Canal ICWW Mile 126.33 Cut BV-1/sta 0+00	10.09
<b>TOTAL</b>			<b>52.48</b>



**TAYLOR ENGINEERING INC**

9086 CYPRESS GREEN DRIVE  
JACKSONVILLE, FLORIDA 32256

**Figure 3-1**  
**Dredged Material Management**  
**Channel Reaches**  
**Intracoastal Waterway**  
**Volusia County, Florida**

PROJECT

REVISION

SHEET

DATE

**Table 3-2 Summary of Historical Maintenance Dredging/Recent Shoaling by Channel Reach**  
**Intracoastal Waterway, Volusia County (page 1 of 4)**  
**1952-1987**

Previous Maintenance/Recent Shoaling								Reach Summary				
Reach	To From ICWW Mileage	From Cut/Sta	To Cut/Sta	Length (mi)	Year	Design Vol (cy)	Pay Vol** (cy)	Total Vol (cy)	Vol/Yr (cy)	Vol/Yr/Mi (cy)	50-yr Unbulk'd Vol (cy)	50-yr Storage Req't (cy)
I: Flagler/Vol. Co. Line to Granada (SR40) Br. ICWW Mile 73.85 to 84.01	77.16 - 77.84	V-5/38+00	V-6/61+00	0.68	1960	35,000	(39,036)	280,739	8,021	789	401,056	862,270
	77.62 - 77.72	V-5/62+50	V-5/67+50	0.09	1987*	2,326	(2,594)					
	78.10 - 78.16	V-6/19+50	V-6/22+50	0.06	1987*	4,167	(4,594)					
	78.53 - 80.42	V-6/42+00	V-8/17+00	1.89	1987*	147,280	(164,261)					
	80.79 - 81.07	V-8/37+00	V-8/52+00	0.28	1987*	18,287	(20,395)					
	82.60 - 83.21	V-8/132+50	V-8/164+00	0.61	1987*	44,656	(49,805)					
II: Granada (SR40) Br. to Orange Ave. Br. ICWW Mile 84.01 to 89.84	85.74 - 85.93	V-10/80+50	V-10/90+50	0.19	1987*	12,153	(13,554)	17,117	489	84	24,452	52,572
	88.67 - 88.73	V-10A/10+00	V-10A/13+00	0.06	1987*	3,194	(3,562)					
III: Orange Ave. Br. to Port Orange Bridge ICWW Mile 89.84 to 94.69	90.14 - 90.69	V-13/30+00	V-13/59+00	0.55	1960	30,000	(33,459)	94,900	2,711	559	135,571	291,478
	91.46 - 92.48	V-17/ 1+00	V-18/ 8+00	1.03	1987*	55,089	(61,441)					

\* Estimated shoal volumes based on centerline survey "Reconnaissance Survey, 10 and 12-foot Project, St. Johns River to Key West" D.O. File No. 8-35, 044, Jacksonville District, U.S. Army Corps of Engineers, July, 1987.

\*\* ( ) Estimate based on Pay Vol = 1.1153 (Design Vol); Section 2.1



Table 3-2 Summary of Historical Maintenance Dredging/Recent Shoaling by Channel Reach  
Intracoastal Waterway, Volusia County (page 2 of 4)  
1952-1987

Previous Maintenance/Recent Shoaling								Reach Summary				
Reach	To From ICWW Mileage	From Cut/Sta	To Cut/Sta	Length (mi)	Year	Design Vol (cy)	Pay Vol** (cy)	Total Vol (cy)	Vol/Yr (cy)	Vol/Yr/Mi (cy)	50-yr Unbulked Vol (cy)	50-yr Storage Req't (cy)
IV: Port Orange Bridge to SR 44 Br., NSB ICWW Mile 94.69 to 105.67	95.10 - 95.16	V-19/80+50	V-19/83+50	0.06	1987*	4,444	(4,956)					
	95.72 - 95.95	V-20/ 6+00	V-20/18+00	0.23	1962	12,000	(13,384)					
	95.81 - 95.95	V-20/10+50	V-20/18+00	0.14	1987*	10,532	(11,746)					
	95.83 - 95.95	V-20/11+40	V-20/18+00	0.13	1972	11,000	(12,268)					
	97.41 - 98.75	V-22/ 0+00	V-23/ 3+00	0.34	1970	14,500	9,302					
	98.45 - 99.45	V-22/55+00	V-24/12+00	1.00	1979	213,000	(237,559)					
	98.48 - 99.25	V-22/56+50	V-24/ 1+50	0.77	1968	46,800	43,080					
	98.51 - 99.13	V-22/58+00	V-23/23+00	0.62	1960	22,000	26,646					
	98.67 - 98.92	V-23/66+50	V-23/23+00	0.25	1958	13,854	15,451					
	98.67 - 98.92	V-22/66+50	V-23/12+00	0.25	1962	10,000	10,048					
	98.67 - 98.92	V-23/66+50	V-23/12+00	0.25	1963	5,606	6,252					
	98.75 - 98.90	V-23/ 3+00	V-23/11+00	0.15	1987*	11,690	(13,038)					
	99.13 - 99.17	V-23/23+00	V-23/25+50	0.04	1987*	2,778	(3,098)					
	99.81 - 100.06	V-24/31+00	V-24/44+50	0.26	1958	28,735	32,048					
	99.81 - 100.06	V-24/31+00	V-24/44+50	0.26	1968	42,400	56,124					
	100.12 - 102.13	V-24/47+50	V-27/ 6+50	2.01	1968	92,400	111,043					
	100.85 - 101.83	V-24/86+00	V-26/22+00	0.98	1986	162,000	(180,679)					
	100.88 - 102.74	V-24/87+50	V-28/ 3+00	1.86	1979	405,000	(451,697)					
	101.06 - 101.53	V-24/97+00	V-26/ 6+50	0.47	1964	65,000	80,739					
	101.18 - 101.69	V-24/103+50	V-26/15+00	0.51	1960	59,000	76,504					
	101.19 - 101.63	V-24/104+18	V-26/11+50	0.44	1966	29,000	65,877					
	101.19 - 101.66	V-24/104+18	V-26/13+00	0.47	1962	36,000	52,133					

\* Estimated shoal volumes based on centerline survey "Reconnaissance Survey, 10 and 12-foot Project, St. Johns River to Key West" D.O. File No. 8-35, 044, Jacksonville District, U.S. Army Corps of Engineers, July, 1987.

\*\* ( ) Estimate based on Pay Vol = 1.1153 (Design Vol); Section 2.1

Table 3-2 Summary of Historical Maintenance Dredging/Recent Shoaling by Channel Reach  
Intracoastal Waterway, Volusia County (page 3 of 4)  
1952-1987

Previous Maintenance/Recent Shoaling								Reach Summary				
Reach	To From ICWW Mileage	From Cut/Sta	To Cut/Sta	Length (mi)	Year	Design Vol (cy)	Pay Vol** (cy)	Total Vol (cy)	Vol/Yr (cy)	Vol/Yr/Mi (cy)	50-yr Unbulked Vol (cy)	50-yr Storage Req't (cy)
IV: Port Orange Bridge to South (SR44) Br. ICWW Mile 94.69 to 105.67 (continued)	101.19 - 101.73	V-24/104+18	V-26/16+00	0.54	1970	83,700	62,716					
	101.21 - 101.43	V-24/105+00	V-26/ 1+00	0.22	1967	37,400	33,033					
	101.52 - 101.75	V-26/21+00	V-27/18+00	0.23	1958	83,982	93,666					
	101.52 - 101.75	V-26/21+00	V-27/18+00	0.23	1963	13,000	27,404					
	101.81 - 102.29	V-26/21+00	V-27/15+00	0.48	1962	19,000	13,948					
	102.12 - 102.29	V-27/ 6+00	V-27/15+00	0.17	1963	2,700	4,123					
	102.22 - 102.78	V-27/11+00	V-27/ 5+30	0.56	1967	38,500	44,559					
	102.35 - 102.78	V-27/18+00	V-27/30+00	0.23	1958	6,811	7,596					
	102.35 - 102.58	V-27/18+00	V-27/30+00	0.23	1960	11,000	16,367					
	102.55 - 102.75	V-27/28+50	V-28/ 3+50	0.20	1968	8,200	14,710					
	102.56 - 102.65	V-27/29+00	V-27/34+00	0.09	1962	2,000	12,250					
	102.56 - 102.76	V-27/29+00	V-28/ 4+00	0.20	1970	9,700	7,268					
	102.60 - 102.65	V-27/31+00	V-27/33+50	0.05	1987*	2,778	(3,098)					
	102.83 - 103.38	V-28/ 8+00	V-29/18+00	0.55	1967	29,200	32,575					
	102.91 - 103.05	V-28/12+00	V-28/19+50	0.14	1987*	9,028	(10,069)					
	103.04 - 104.90	V-28/ 0+00	V-33/14+50	1.86	1973	119,000	98,423					
	103.41 - 104.13	V-29/19+36	V-31/18+00	0.72	1970	51,000	38,214					
	104.16 - 104.54	V-31/19+60	V-32/ 5+20	0.38	1970	17,000	20,893					
	104.58 - 105.09	V-32/ 7+25	V-34/ 1+50	0.51	1968	26,000	28,490					
	104.63 - 105.54	V-33/ 0+00	V-36/ 5+20	0.91	1986	64,000	(71,379)					
	105.59 - 105.64	V-36/ 8+00	V-36/10+50	0.05	1968	1,600	(1,784)	2,156,238	61,607	5,611	3,080,340	6,622,730

\* Estimated shoal volumes based on centerline survey "Reconnaissance Survey, 10 and 12-foot Project, St. Johns River to Key West" D.O. File No. 8-35, 044, Jacksonville District, U.S. Army Corps of Engineers, July, 1987.

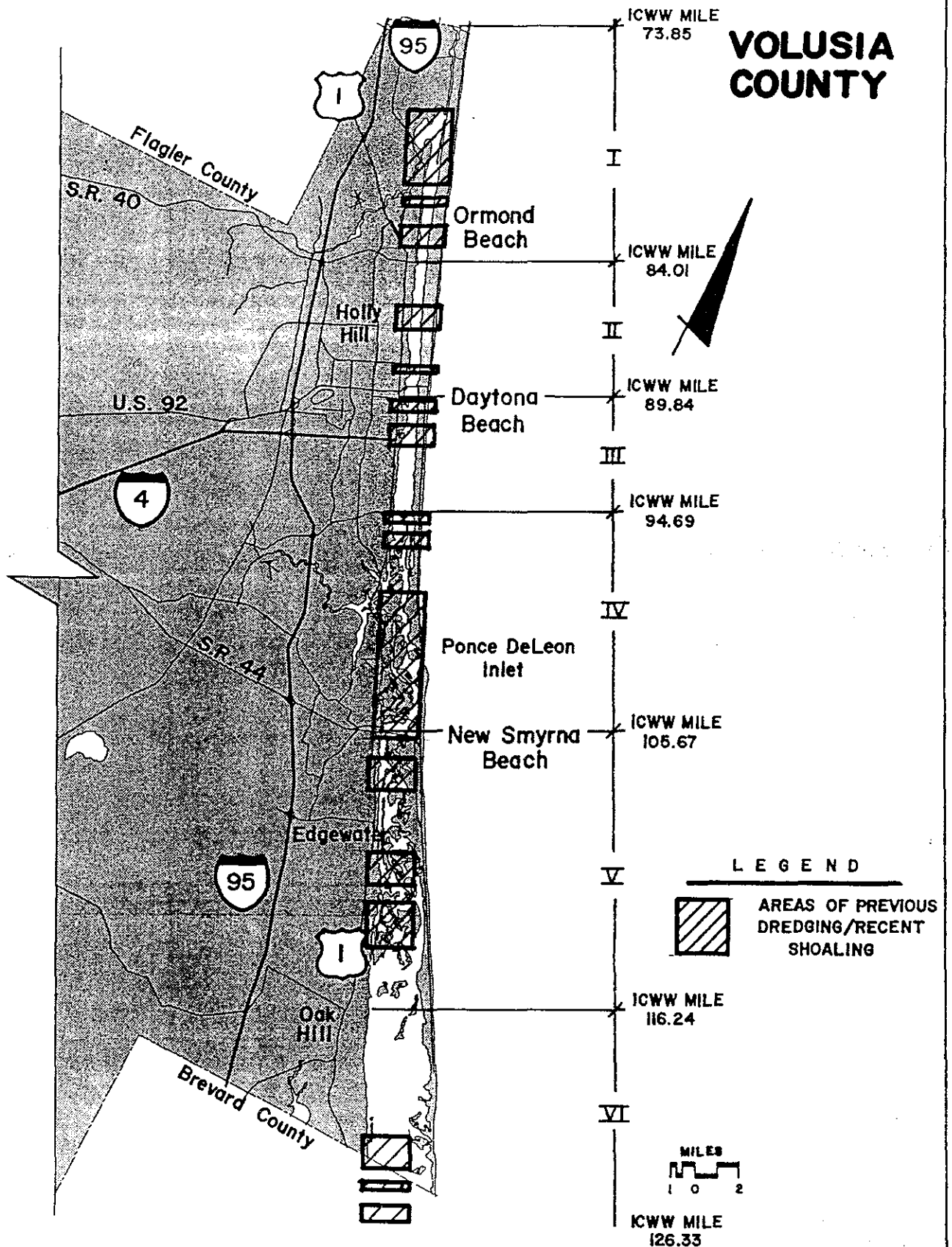
\*\* ( ) Estimate based on Pay Vol = 1.1153 (Design Vol); Section 2.1

Table 3-2 Summary of Historical Maintenance Dredging/Recent Shoaling by Channel Reach  
Intracoastal Waterway, Volusia County (page 4 of 4)  
1952-1987

Previous Maintenance/Recent Shoaling								Reach Summary				
Reach	To From ICWW Mileage	From Cut/Sta	To Cut/Sta	Length (mi)	Year	Design Vol (cy)	Pay Vol** (cy)	Total Vol (cy)	Vol/Yr (cy)	Vol/Yr/Mi (cy)	50-yr Unbulk'd Vol (cy)	50-yr Storage Req't (cy)
V: South (SR44) Br. to Vicinity of Eldora ICWW Mile 105.67 to 116.24	105.76 - 105.87	V-36/17+00	V-36/22+50	0.10	1987*	9,167	(10,224)					
	106.47 - 106.78	V-38/ 6+00	V-38/22+00	0.30	1979	47,000	(52,419)					
	106.51 - 106.89	V-38/ 8+00	V-38/28+00	0.38	1960	22,000	(24,537)					
	106.55 - 106.85	V-38/10+00	V-38/26+00	0.30	1962	11,000	(12,268)					
	106.60 - 106.85	V-38/12+50	V-38/26+00	0.26	1970	19,700	(21,971)					
	106.63 - 106.72	V-38/14+50	V-38/19+50	0.09	1987*	8,912	(9,940)					
	107.93 - 108.40	V-38/83+00	V-38/107+50	0.46	1972	17,600	(19,629)					
	108.05 - 108.44	V-38/89+00	V-38/110+00	0.39	1960	8,000	(8,922)					
	108.28 - 108.42	V-38/101+50	V-38/109+00	0.14	1987*	7,813	(8,714)					
	109.21 - 109.41	V-39/39+50	V-39/50+00	0.20	1972	10,000	(11,153)					
	109.22 - 109.33	V-39/40+00	V-39/46+00	0.11	1987*	7,500	(8,365)					
	109.99 - 110.04	V-39/81+00	V-39/83+50	0.05	1987*	3,125	(3,485)					
	110.75 - 111.02	V-39/121+00	V-40/10+50	0.27	1987*	19,691	(21,961)					
	111.42 - 111.30	V-40/20+00	V-40/25+50	0.10	1987*	7,512	(8,378)					
	111.42 - 111.57	V-41/ 0+00	V-41/ 8+00	0.15	1987*	10,864	(12,117)					
	112.22 - 112.50	V-42/ 0+00	V-42/15+00	0.28	1972	10,300	(11,488)					
	112.60 - 112.75	V-42/20+00	V-42/28+00	0.15	1987*	8,272	(9,226)					
	113.36 - 113.56	V-42/60+00	V-42/70+50	0.20	1987*	12,031	(13,418)					
115.75 - 115.82	V-43/71+00	V-43/74+50	0.07	1987*	3,565	(3,976)	272,191	7,777	736	388,844	836,016	
VI: Vicinity of Eldora to Vicinity of Haul- over Canal ICWW Mile 116.24 to 126.33	123.24 - 123.96	V-46/105+50	V-46/143+50	0.72	1987*	51,019	(56,901)					
	124.11 - 124.35	V-46/151+50	V-46/164+00	0.24	1987*	12,037	(13,425)					
	125.07 - 126.24	V-46/202+00	V-46/264+00	1.17	1987*	76,926	(85,796)	156,122	4,461	442	223,031	479,518

\* Estimated shoal volumes based on centerline survey "Reconnaissance Survey, 10 and 12-foot Project, St. Johns River to Key West" D.O. File No. 8-35, 044, Jacksonville District, U.S. Army Corps of Engineers, July, 1987.

\*\* ( ) Estimate based on Pay Vol = 1.1153 (Design Vol); Section 2.1



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**Figure 3-2**  
**Areas of Historic**  
**Maintenance Dredging / Recent Shoaling**  
**By Reach, Intracoastal Waterway**  
**Volusia County, Florida**

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pumping distance and site availability encountered in Reach II. However, the projected 50-year storage requirement for this reach — 291,000 cy — is significantly higher. This projection is based on a single maintenance operation performed in 1960 which removed over 33,000 cy of material, as well as a single shoal identified in the 1987 survey (61,441 cy *in situ* volume).

Reach IV encompasses the vicinity of Ponce DeLeon Inlet, extending 10.98 miles from the Port Orange Bridge to the South (S.R. 44) Bridge in New Smyrna Beach. As discussed in Section 2.1.2, this reach experiences the most rapid and persistent shoaling in the Volusia County project area because of the influence of the inlet. Maintaining the authorized channel depth at Ponce DeLeon Inlet over the period 1952-1987 has required 13 separate dredging operations to remove an *in situ* shoal volume of 2,110,233 cy. This corresponds to a mean dredging frequency of one event every 2.69 years and a mean material storage requirement (i.e., bulked volume) of 349,000 cy per event. Combining the volume of historic dredging with the additional 46,000 cy of shoaling which occurred between the completion of the most recent channel maintenance operation in late 1986 and the most recent channel centerline survey in October, 1987, results in a projected 50-year material storage requirement for Reach IV of 6,623,000 cy. This represents 72 percent of the projected storage requirement for the entire Volusia County project area. Portions of this reach are scheduled for maintenance in FY 1994 in connection with an emergency beach disposal operation.

Reach V continues southward from the South Bridge in New Smyrna Beach to the vicinity of Eldora, north of Oak Hill (Cut V-44, ICWW mile 116.24), a distance of 10.57 miles. Although Reach V experiences less shoaling than Reach IV to the north, the volume of shoaling remains relatively high. A total *in situ* volume of 272,191 cy of shoaling has occurred in this reach over the history of the 12-foot project depth. This volume is roughly equal to that reported in Reach I over the same period. Over the history of the 12-foot project depth, the channel in this reach has received five maintenance operations, the last occurring in 1979. From 1979 to 1987, an additional 110,000 cy of shoaling (*in situ* volume) has been documented. Combining the previous dredging volume with the volume of more recent shoaling yields a projected 50-year material storage requirement of 836,000 cy.

The southernmost reach, Reach VI, extends from the vicinity of Eldora southward to a point in Mosquito Lagoon 1.45 miles north of Haulover Canal (Cut BV-1, sta 0+00), a distance of 10.09 miles. As discussed in Section 2.1.1, this reach includes 2.59 miles of Cut V-46 in Brevard County. Since this reach was deepened to its authorized project depth of 12 feet in 1953, no additional maintenance dredging has been performed. Shoaling, however, has continued. The 1987 centerline survey identified shoals with

an estimated *in situ* volume of 156,122 cy, all located within the southern 3.1 miles of Reach VI. This results in a projected 50-year material storage requirement of 480,000 cy.

### **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 Volusia County. As discussed in Section 2.3, the storage capacity of the existing sites (2,683,000 cy) falls far short of the projected 50-year requirement (9,145,000). Review of existing sites with respect to the established channel reaches shows that all existing easements which show potential for continued use are located in Reach I and Reach IV, the two reaches with the highest projected material storage requirement. However, the projected requirements for these reaches exceed the capacities of their existing easements.

Within Reach I, the combined capacities of the existing uplands contained within MSA 426, MSA 428, and MSA V-1 (251,181 cy) represents less than 30 percent of the long-term reach requirement. Moreover, this total capacity can only be achieved within the existing upland through the construction, operation, and maintenance of five separate containment areas. Within Reach IV, four existing easements — MSA 434, MSA 434A, MSA 434B, MSA 434C, and MSA V-9 — possess a total storage capacity of 2,379,000 cy. This volume represents almost 90 percent of the existing capacity for the entire Volusia County project area. Nevertheless, this capacity, achievable only by the construction of five separate island-based containment areas, still accounts for only 36 percent of the long-term storage requirement of Reach IV. However, when the existing easements are evaluated in terms of providing the needed upland staging area required to complement beach disposal, their continued use becomes more realistic. Still, the use of one or more of the existing island-based easements, all of which are presently at or near capacity, will require the removal of material to achieve the desired storage capacity. This may not be the most efficient plan to address the needs of this high maintenance reach. Therefore, to meet established program criteria, as well as to provide flexibility in the development of a plan most appropriate to the specific needs of all six reaches within the Volusia County project area, 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

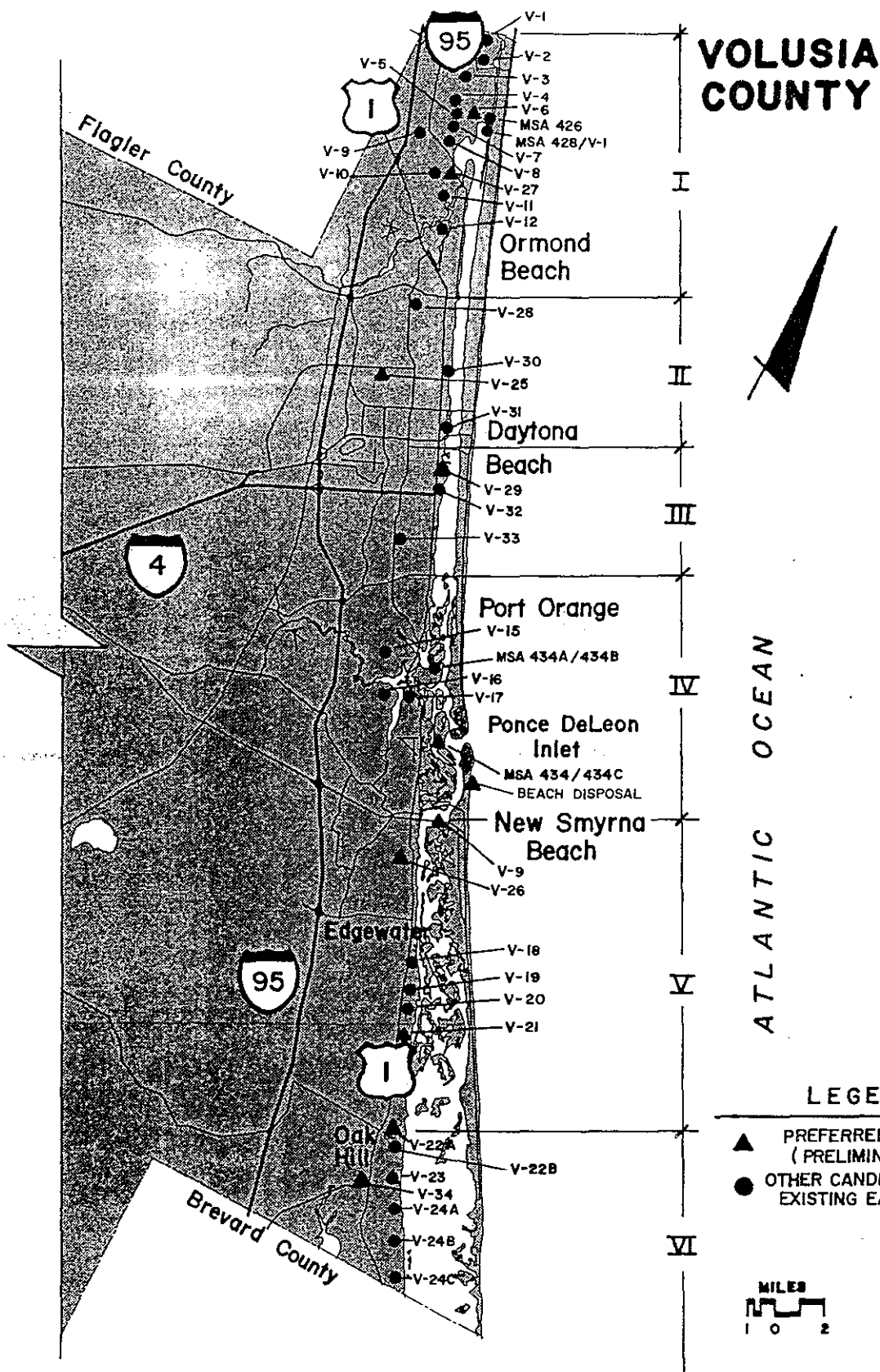
degree to which the area had been previously disturbed by land clearing, logging, agriculture, or mining. Additional environmental considerations, such as the quality of existing habitat or the diversity of vegetation, were not included in the initial site identification. However, these factors were 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 the black and white aerial photographs (1" = 800' nominal scale), color infrared photography, and USFWS Wetlands Inventory maps described in Section 2.2. A total of 36 alternative candidate sites — or from 3 to 13 sites within each reach — were selected. Of these, 28 resulted from the first round of site identification. The remaining eight alternative candidate sites were identified during the site inspection process, the Technical Advisory meetings, or the Citizens' Advisory Committee meetings. All 36 alternative candidate sites, as well as the eight existing easements having potential for continued use, are shown in Figure 3-3.

Tracings were made from the 1" = 800' black and white aerials of the initial delineation of useable upland area of each site. An initial determination of the maximum disposal 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 inspections of the eight existing easements with potential for future use were performed during July, 1992. Inspections of the 28 alternative candidate sites initially identified were performed during September - October, 1992. Inspection of the remaining eight sites, identified later in the site evaluation process, was completed in January, 1993. The basic objectives of each field inspection, conducted by a biologist and an engineer, were to document and evaluate the environmental characteristics and the existing



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**Figure 3-3**  
Candidate Sites, Long-Range  
Dredged Material Management Plan  
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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 photographic aerial interpretation and ground-truthing as necessary to identify and map vegetation communities. Aerial coverage included the same resource material discussed in Section 2.2, specifically, 1985 1" = 800' black and white photography, 1984 1" = 2,000' color infrared photography, and in some cases, 1986 blueline aerials at a scale of 1" = 400'. In addition to pedestrian surveys, ground-truthing was carried out using 4-wheel-drive vehicles accessing adjacent roads or on-site dirt roads and trails. Dominant or significant photographic signatures were identified on aerials and visited by truck or on foot. Maps were prepared in the field by drawing on acetate overlays on the 1" = 800' black and white aerial photographs, or in some cases, by mapping directly on the 1" = 400' 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. This 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 those areas exhibiting salt marsh characteristics or wetland-transitional areas contiguous with the ICWW or its tributaries. Because of this latter consideration which establishes the jurisdiction of DER permitting, all drainage features were examined for evidence of this contiguity. Isolated wetlands or drainage features still within the permitting jurisdiction of the COE and the St. Johns River Water Management District (SJRWMD) were excluded where feasible. However, if the exclusion of a minimal isolated wetland made an otherwise viable site unusable, some wetland impacts may be unavoidable.

A second analysis of maximum potential storage capacity was then performed for each site based on its field-verified configuration. Results of this analysis are presented in Table 3-3. Again, the combined

Table 3-3 Candidate Sites, Long-Range Dredged Material Management Plan, Intracoastal Waterway, Volusia County (page 1 of 4)

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 North County Line to Granada Bridge  ICWW Mile 73.85 to 84.01	V-1	73.91	121.15	55.02	119.28	953,900	9.86	Rural	RA	Rural estate residential
	V-2	74.91	108.93	49.84	98.74	864,500	9.63	Conservation/ Env. Corridor	Con. <sup>1</sup>	within Bulow Creek State Park
	MSA 426	75.06	36.70	19.48	26.65	81,000	8.95	Environmental System Corridor	Con. <sup>1</sup>	contains two spoil mounds with connecting road, totals given
	V-3	75.11	198.20	55.23	128.92	948,700	9.46	Conservation/ Env. Corridor	Con. <sup>1</sup>	within Bulow Creek State Park
	MSA 428/V-1	76.14	317.49	15.89	23.11	58,000	8.63	Environmental System Corridor	Con. <sup>1</sup>	contains 4 spoil mounds with connecting road, totals given
	V-4	76.50	119.49	41.52	95.79	534,700	7.57	Conservation	Con. <sup>1</sup>	within Bulow Creek State Park
	V-5	76.67	100.95	31.92	76.13	410,800	8.44	Conservation	RC	within Bulow Creek State Park
	V-6	76.90	122.89	50-60	50-60	862,000	7.60	Conservation	RC	Mosquito impoundment, Tomoka Marsh Aquatic Preserve
	V-7	77.67	345.00	49.84	98.74	864,500	7.97	Conservation	C/RC	Publicly held conservation lands, possible C.A.R.L. tract
	V-8	78.70	N:103.5 S:110.0	N:48.54 S:50.00	98.33 100.81	840,900 866,400	7.01	N: Conservation S: Planned Comm.	RA	Publicly held conservation lands, possible C.A.R.L. tract
	V-9	78.11	378.40	37.66	84.04	649,500	8.74	Planned Comm./ Rural	PUD, R3 & R4	Presently undeveloped, privately owned, possible C.A.R.L. tract
	V-10	79.83	138.80	50.00	100.81	866,400	7.68	Planned Comm./ Low Intens. Urban	Con. <sup>1</sup> R2	Public/Private ownership, possible C.A.R.L. tract

Table 3-3 Candidate Sites, Long-Range Dredged Material Management Plan, Intracoastal Waterway, Volusia County (page 2 of 4, continued)

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  Continued	V-27	79.51	102.8	28.82	69.27	495,400	6.68	Low Intensity Urban	Trans./ Agri. <sup>4</sup>	Cleared subdivision parcel, apparently abandoned during early phases of construction; contains infrastructure, but no houses
	V-11	80.36	217.6	50.00	100.81	866,400	7.80	Conservation	Con. <sup>1</sup>	Publicly held conservation lands, possible C.A.R.L. site, may also contain significant historical site
	V-12	81.78	388.5	50.00	100.81	866,400	9.92	Rural Estate/ Conservation	R4C, R3C	aka 'John's Island,' public (O.B.)/ private ownership, possible C.A.R.L. tract
II  Granada Bridge to Orange Ave. Bridge  ICWW Mile 84.01 to 89.84	V-28	84.89	206.0	33.10	33.10	53,400 cy/ft depth	5.48	Open Space/ Conservation	Park/Rec.	Active shell mine operated by Vol. Co., located within Ormond Beach Central Park
	V-30	86.84	8.91	4.22	6.12	7,300	3.12	Conservation/ Public Rec.	Park/Rec.	City of Holly Hill, Sunrise Park
	V-25	86.98	277.3	21.1	59.35	359,400	10.00	General Industry	M2 & M4	Site undeveloped, some disturbance, within LPGA\Indigo DRI, can serve both Reaches 2 & 3
	V-31	89.08	7.58	4.73	7.58	13,900	5.22	Downtown Re- Dev. Area/Park	Park/Rec.	City of Daytona Beach Manatee Island Park
III  Orange Ave. Bridge to Port Orange Bridge  ICWW Mile 89.84 to 94.69	V-29	90.71	18.22	9.84	18.22	70,000	4.58	Wastewater Treatment Plant	N/A	Outparcel for Daytona Beach Bethune Point WWTP, requires relocation of access & utilities
	V-32	91.43	42.60	5.60	8.00	24,100	3.62	Conservation	Con. <sup>1</sup>	Spoil island located in larger area of high salt marsh
	V-33	94.16	37.90	15.62	37.90	112,400	6.02	Residential	Res.	Remnant pasture within residential area, slated for single/multi. family development, parcel for sale

Table 3-3 Candidate Sites, Long-Range Dredged Material Management Plan, Volusia County (page 3 of 4, continued)

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
IV  Port Orange Bridge to SR 44 Bridge  ICWW Mile 94.69 to 105.67	MSA 434A	94.69 - 98.86	865	22.45	25.40	382,200	6.81	Conservation	Con. <sup>1</sup>	Large esmt., mainly open water or marsh, contains islands from 1/2 to 25 acres, north of Lost Creek
	V-15	98.08	281.0	62.05	117.84	1,077,900	8.34	Conservation, Commercial	Con. <sup>1</sup>	County owned, addition to Spruce Creek State Preserve, CARL tract
	V-17	99.60	292.0	27.55	67.49	472,700	7.55	Environmental System Corridor	Con. <sup>1</sup> / Res. <sup>3</sup>	Scattered residential, southern half of site is currently for sale
	V-16	99.84	256.3	63.37	125.56	1,098,400	8.42	Conservation	Con. <sup>1</sup>	Possible CARL tract
	MSA 434/434C	N: 101.09 S: 101.47	378.0	N: 44.22 S: 46.05	N: 57.88 S: 59.97	N: 761,400 S: 1,128,900	N: 5.87 S: 6.25	Open Space and Recreation	Con. <sup>1</sup>	Esmts. containing two existing spoil islands/disposal areas located north and south of Rockhouse Creek
	MSA 434B	98.86 - 100.76	207.0	9.30	12.80	66,400	6.25	Open space and recreation	Con. <sup>1</sup>	Large esmt., primarily open water/marsh with islands of up to 20 acres, south of Lost Creek
	MSA V-9	104.74	84.30	7.52	11.94	33,000	5.49	Conservation/ Recreation	Con. <sup>1</sup>	Esmt. consists mainly of open water, existing spoil island/disposal area, aka "Chicken Island"
	Beach Disposal	-----	-----	-----	-----	-----	-----	-----	---	Location and size of fill section will be specific to each dredging event, details to be addressed in Phase II
V  SR 44 Bridge to Vicinity of Eldora  ICWW Mile 105.67 to 116.24	V-26	106.98	128.6	50.24	89.31	870,800	9.94	Industrial	Ind. <sup>2</sup>	Adjacent to existing industrial development, FEC Railroad, wetland separates from DBCC(NSB) campus
	V-18	110.43	252.0	N/A	N/A	N/A	4.76	Medium Density Residential	Res. <sup>3</sup>	Site now manufactured home community "Edgewater Landing"
	V-19	112.63	187.5	45.12	95.40	780,100	7.16	Low Density Urban, Commcl.	Res. <sup>3</sup>	Site in process of being developed as addition to "Hacienda Del Rio"

Table 3-3 Candidate Sites, Long-Range Dredged Material Management Plan Intracoastal Waterway, Volusia County (page 4 of 4, continued)

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
V Continued	V-20	113.38	88.20	48.50	85.69	837,800	7.71	Urban, Medium Density	R4, R6 B4 & B5	Site bisected by major N/S drainage canal which may limit its use, adjacent to industrial site
	V-21	115.59	138.9	48.52	96.28	841,600	9.87	Urban, Medium Den., Unspec. Residential	R3W, R3W & MH5W	Presently undeveloped, extensive coastal scrub may limit, but not preclude, use of site
VI  Vicinity of Eldora to Haulover Canal  ICWW Mile 116.24 to 126.33	V-22A	118.26	203.0	39.88	86.04	513,600	8.69	Agriculture/ Unspecified Residential	A3	Portion of site citrus, general agriculture, portion undeveloped, scattered residences on perimeter
	V-22B	118.76	53.30	36.50	80.70	524,500	7.82	Conservation	N/A	Canaveral National Seashore
	V-23	119.32	772.1	40.0	89.28	515,200	7.67	Conservation	N/A	Canaveral National Seashore
	V-34	120.19	141.9	30.76	71.36	529,800	8.84	Rural	N/A	Active sand mine, citrus, site contains eagle nest within active mine, nest inactive but not yet declared abandoned (USFWS)
	V-24A	120.95	298.4	40.0	85.04	515,150	5.78	Conservation	N/A	Merritt Island National Wildlife Refuge, under NASA ownership
	V-24B	122.18	217.6	40.0	84.71	515,150	6.20	Conservation	N/A	Merritt Island NWR/NASA
	V-24C	122.88	277.2	40.0	88.55	515,150	6.73	Conservation	N/A	Merritt Island NWR/NASA

<sup>1</sup> Conservation

<sup>2</sup> Industrial (various intensities)

<sup>3</sup> Residential (various densities)

<sup>4</sup> Transitional/Agriculture

potential capacity of the remaining easements and the FIND-owned tracts and the newly identified candidate sites exceeds the material storage requirement for each reach. During the final site evaluation, described in the following section, the site acreages are reduced such that their capacities match the reach requirements.



## 4.0 ESTABLISHMENT OF SITE BANK

The final evaluation of the eight existing easements and the 36 newly identified alternative candidate sites was accomplished by assessing the ability of each site to satisfy a standard set of evaluation criteria. Through this process a group of 11 sites was selected to form a site bank serving the six reaches of the Intracoastal Waterway channel within the Volusia County project area. The site bank consists of nine primary (first-choice) sites and eight secondary (second-choice) alternatives for the long-term management of dredged material removed from ICWW channels. As discussed later in this section, six primary sites also serve as secondary alternatives under different management approaches.

### 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 very 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 Section 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 Volusia 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, a single site was selected as the primary site to serve both Reaches II and III. In addition, two primary sites were selected to serve Reach V, with one of the two also serving as the secondary site for the entire reach.

Adequate Dike Material — Closely related to site capacity is the availability of adequate dike material on-site 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-foot 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 the suitability of a site. 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 salt marsh or other wetlands (discussed in Section 4.3.2), 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.

#### **4.1.2 Environmental Considerations**

The environmental criteria used for site evaluation are intended to minimize adverse impacts to sensitive estuarine and upland areas, within the constraint of providing suitable sites to serve the needs of the Waterway. The resulting criteria may be organized under two categories reflecting the desire to restrict the placement and storage of dredged material to upland sites only: (1) criteria for the avoidance of wetland areas to the greatest extent possible and (2) criteria for minimizing unavoidable impacts to upland areas.

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. 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.

Salt marsh and all wetland areas exhibiting salt water characteristics, particularly those judged to be contiguous with state waters, are recognized by all state and federal agencies to be an extremely valuable resource. Therefore, the degree to which a site succeeds in eliminating the impacts to the salt marsh is obviously a crucial criterion in site selection. Closely related to this is the sometimes unavoidable impact

caused by pipeline access to the site. If no other avenue is available (e.g., floating the pipeline in a tidal creek), crossing the marsh itself 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 DER permitting criteria. However, such wetlands are under the jurisdiction of the COE and the St. Johns River Water Management District (SJRWMD). The presence of these isolated wetlands was considered in the evaluation of a particular site, and their disruption was avoided wherever possible. Experience gained in previous plan development efforts suggests that the sacrifice of small, isolated areas possessing wetland vegetation may be acceptable if required to provide an adequate containment area. However, mitigation may be required to offset such impacts, if incurred. Somewhat independent of the extent of an interior wetland is the quality of the habitat 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 can 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 has been forwarded to the Division of Historical Resources, Florida Department of State, to identify potential conflicts. This search has not yet been completed. 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 Volusia County are not significantly contaminated and do not pose an environmental threat. In addition, the sediment to be dredged will undergo further analysis, including elutriate testing, before each future dredging operation. Should elevated levels of contaminants be identified, permitting procedures will require taking appropriate measures to ensure these contaminants remain sequestered with the dredged material. Therefore, contamination of local groundwater by materials contained in channel sediments is not anticipated.

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

evaluation. As such, this criterion is closely related to adjacent land use, an issue addressed in the following section.

#### **4.1.3 Socioeconomic or Cultural Considerations**

Land Use — The third major category of site evaluation criteria considers the socioeconomic issues of on-site or adjacent land use, current comprehensive plan and zoning designations, local governmental jurisdictions, and site ownership. Every effort was made during the initial identification of new candidate sites to select areas of suitable existing on-site land use. For obvious reasons, areas of minimal development were preferred. Moreover, areas previously disturbed by clearing, excavation, timber harvesting, or draining 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 11 sites were selected to form the site bank to serve the six reaches of the Intracoastal Waterway channel within the Volusia County project area. These sites are identified in Figure 4-1. Of these, nine sites represent primary or first-choice options. Two sites — Site V-25 in Reach II and Site V-29 in Reach III — were selected to serve as joint primary sites for Reaches II and III. In Reach IV, three sites — beach disposal, MSA 434/434C (North) and MSA 434/434C (South) — make up the primary option. And in Reach V, two sites — Site V-21 and Site V-26 — jointly serve as the primary sites. Eight sites provide secondary dredged material management alternatives should use of one or more of the primary sites prove not to be feasible. As discussed later in this section, six of the primary sites also serve as secondary alternatives under different management approaches.

Each of the six channel reaches within the Volusia County project area has been assigned at least one primary and one secondary site. As their names imply, these 11 sites represent the nine best and eight 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. Finally, narratives accompanying each site summarize pertinent characteristics including general

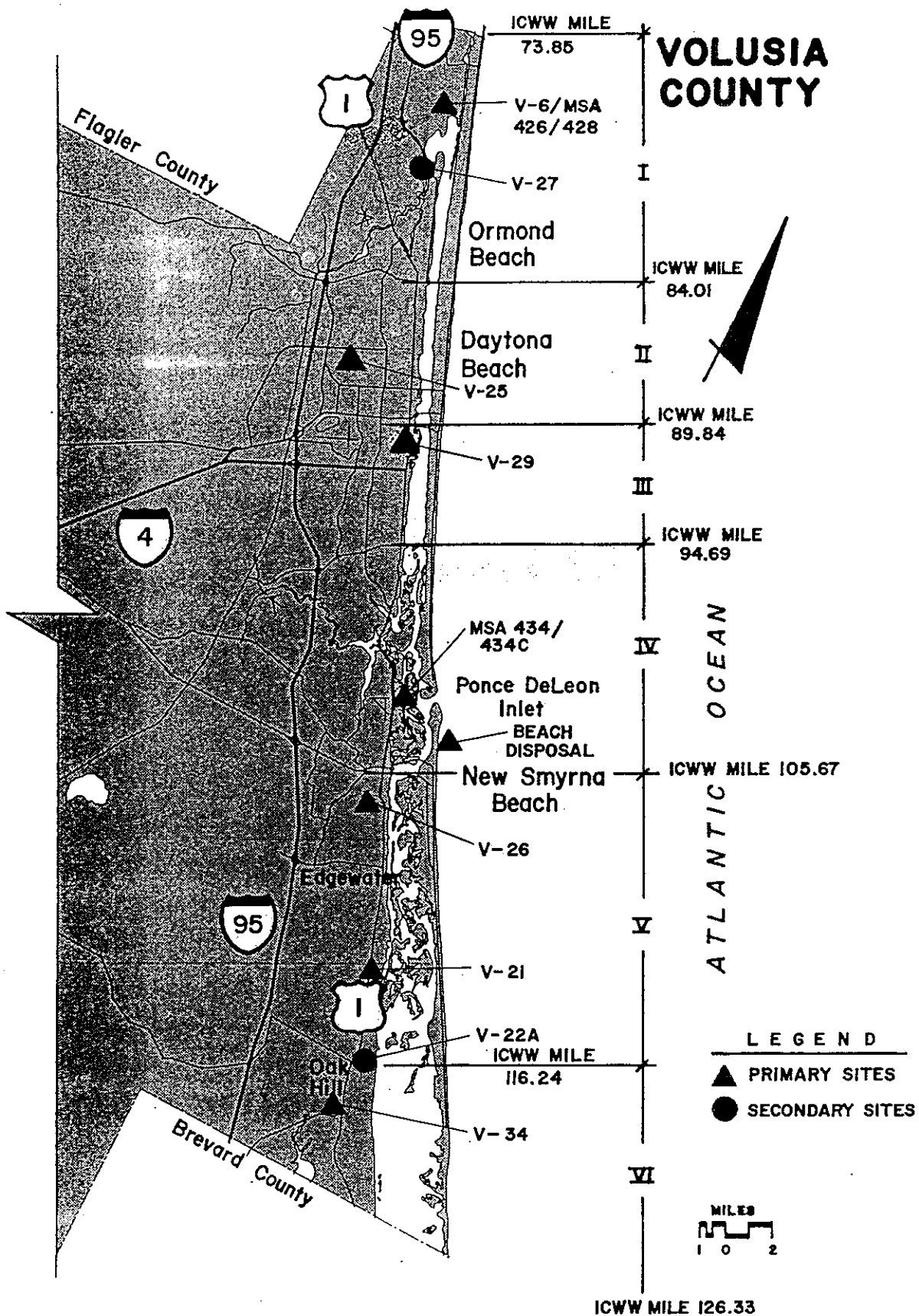


Figure 4-1  
Site Bank, Long-Range  
Dredged Material Management Plan  
Intracoastal Waterway  
Volusia County, Florida

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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.

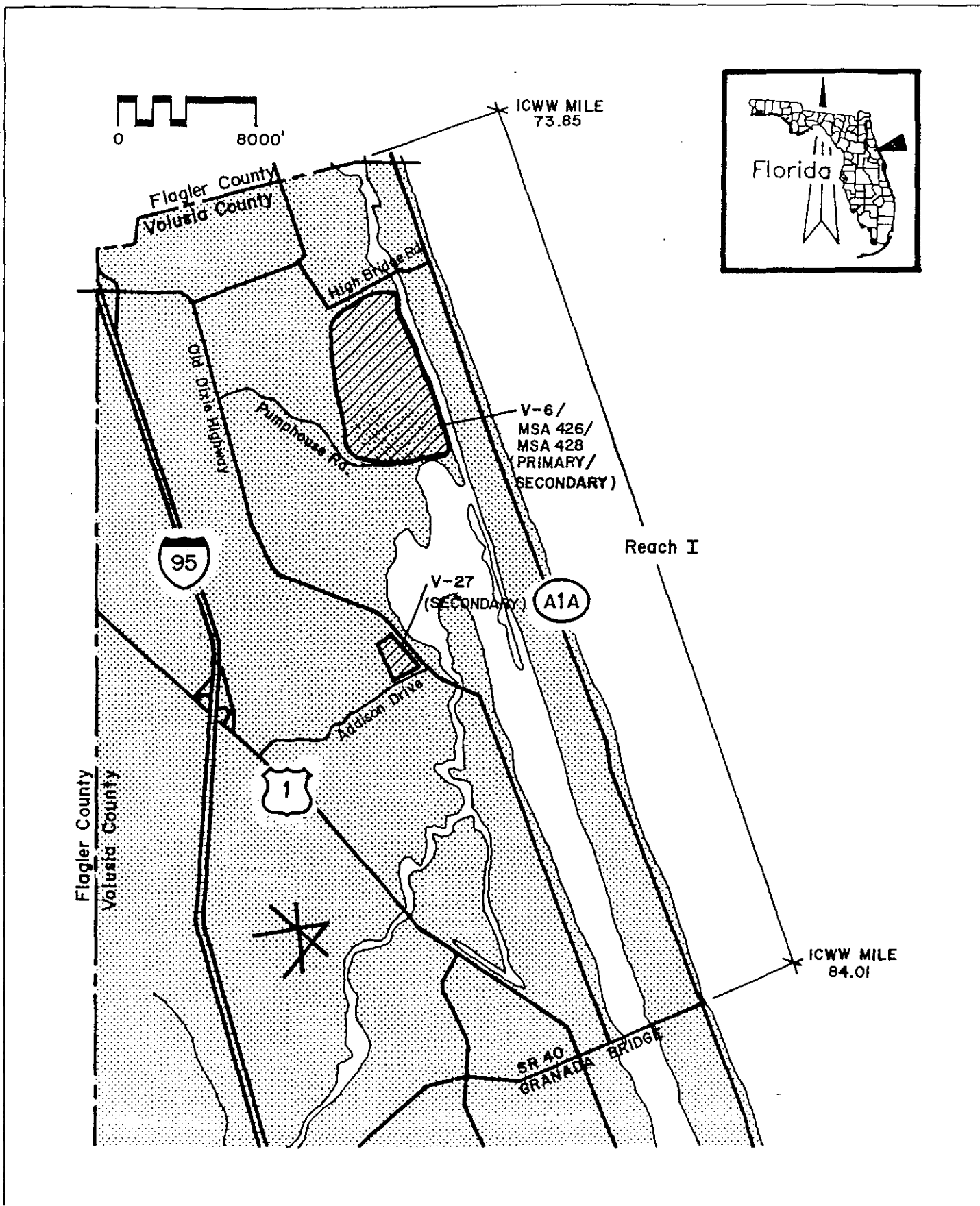
In the remainder of this section, the key factors which led to the selection of the individual sites comprising the site bank are discussed, as well as the considerations which influenced the designation of the selected sites as either primary or secondary alternatives.

Within Reach I, Site V-6/MSA 426/428 has been designated the primary site, while Site V-27 has been designated the secondary site. Site locations are shown in Figure 4-2. Reach I presented one of the most difficult situations yet encountered in FIND's 15-year program to develop a long-range dredged material management plan for the ICWW in Florida. No alternatives within Reach I satisfy all program criteria. Most of the undeveloped upland within this reach is located within Tomoka State Park or Bulow Creek State Park, or is otherwise under public ownership, having been purchased via bond issue as dedicated conservation areas. Property not so encumbered either possesses insufficient acreage, involves an unacceptably difficult pipeline access, or contains wetlands which would be impacted by site construction. As a result, several issues involving wetland impacts remain to be resolved before a final recommendation can be made.

The designated primary site for Reach I, located within a 1000-acre mosquito impoundment north of the Tomoka Basin, therefore represents a range of possible alternative site configurations. Each of the alternative configurations involve portions of the easements MSA 426 and MSA 428 and/or portions of the adjacent mosquito impoundment. Each alternative requires between 50 and 60 acres for construction of the containment basin, resulting in the filling of 18 or more acres of salt marsh. The evaluation of the various alternatives for Reach I, addressed in a separate report to the FIND (Taylor, 1993), recommended that because of the difficult choices involved in the selection of the most appropriate site to serve Reach I of the Waterway, the FIND should solicit additional comment from agency and community representatives before finalizing its decision.

Site V-6/MSA 426/428 was selected as the Reach I primary site for several reasons. First, depending on the site configuration finally selected, this site can meet the reach requirement within existing easements, thereby reducing the amount of additional property the FIND must acquire. Second, all of the alternative site configurations being considered lie within an existing mosquito impoundment. The quality of the marsh





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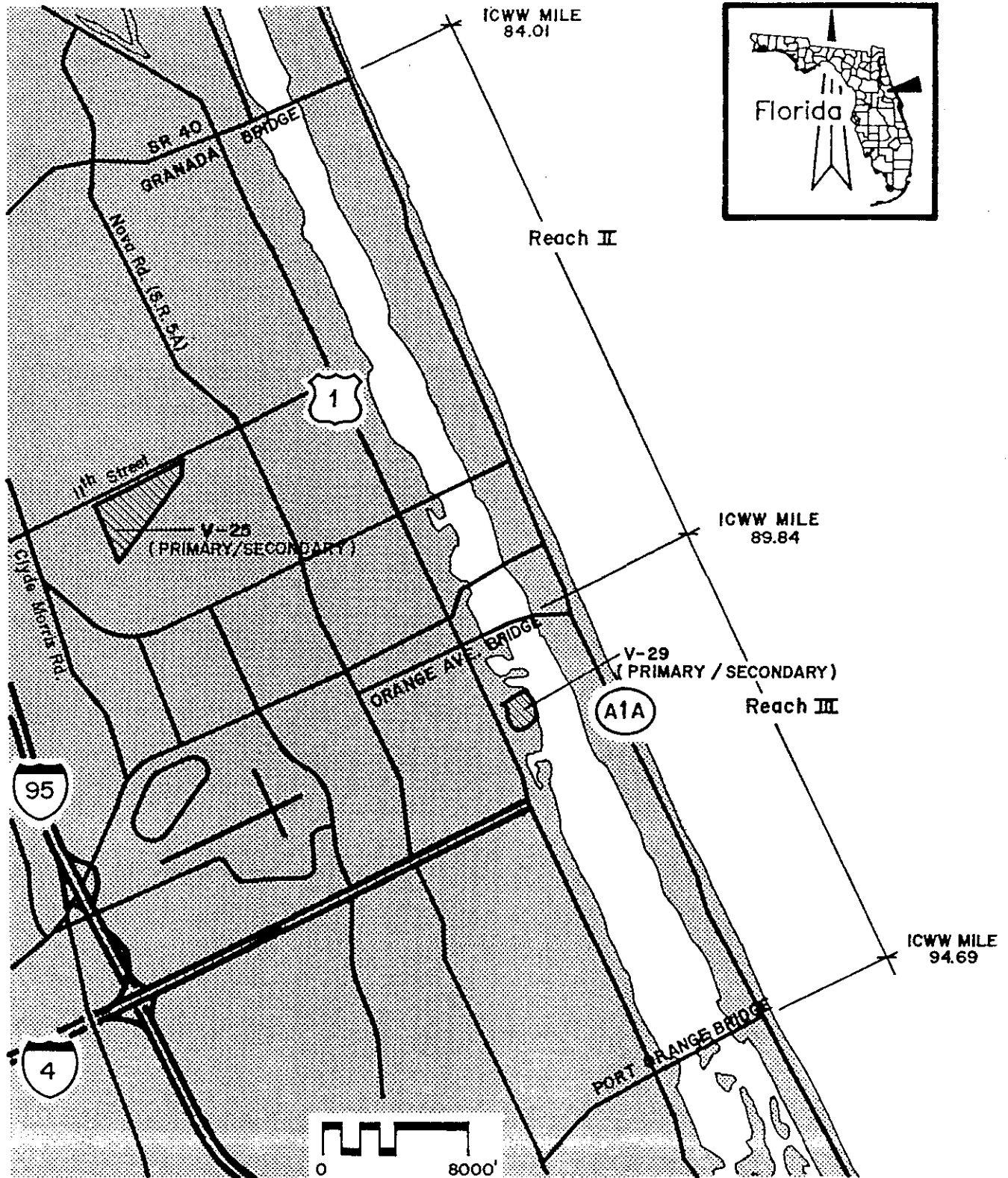
Figure 4-2  
Location Map  
Primary and Secondary Sites,  
Reach I  
Volusia County, Florida

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within this impoundment has been reduced by the construction of dikes and the excavation of ditches. Development of a site within the impoundment presents the opportunity to improve tidal circulation within the impounded marsh as part of required mitigation. The possibility of environmental enhancement in this area originally led local interests to offer and support this alternative. Third, although isolated by extensive wetlands, each of the alternative site configurations also offers upland road access via Pumphouse Road. Finally, Site V-6/MSA 426/428, located directly on the Waterway, affords excellent pipeline access to the site with no additional easement required.

The secondary site for Reach I, Site V-27, provides a realistic alternative when used in combination with a reduced configuration of Site V-6/MSA 426/428. The development of Site V-27 would involve significantly less wetland impacts than would the development of any of the primary alternatives. Moreover, Site V-27, previously cleared for a residential subdivision, would also involve minimal impacts to upland habitat. However, Site V-27 is less desirable than the primary site for several reasons. First, Site V-27 can provide only 57 percent of the full 50-year required storage capacity for Reach I. Wetlands on the north, west, and south of the site, as well as a county road on the east, prevent site expansion without introducing additional wetland impacts. Second, because Site V-27 incorporates no existing disposal easements, its acquisition would require the negotiated purchase or condemnation of additional acreage not presently controlled by the FIND. Third, Site V-27, located farther from the Waterway than the primary site, will require a more difficult pipeline access. To reach Site V-27, the pipeline must cross the very shallow Tomoka Basin, as well as Old Dixie Highway, and will require the acquisition of additional pipeline easements. Finally, Site V-27 is located near adjacent low density residential development on the east side of Old Dixie Highway.

Two primary sites, Site V-25 and Site V-29, have been designated to jointly serve Reaches II and III (Figure 4-3). As discussed below, the secondary option includes the alternative use of Site V-25 and/or Site V-29 in a revised strategy to serve both reaches. Several reasons led to the selection of these two sites to serve both Reaches II and III. First, with respect to the selection of Site V-25, Reaches II and III encompass the urban corridor formed by Ormond Beach, Holly Hill, and Daytona Beach. As a result, Site V-25 offers one of the few large tracts of undeveloped land in the area. Second, although Site V-25 is located west of urban development and 2.65 miles inland from the Waterway, special circumstances make accessing the site via pipeline difficult but workable. Most sites located this far from the Waterway could not be considered because of the difficulty of providing pipeline access through an urban area. However, the presence of the 11th Street Canal can provide an acceptable route to within one mile of the site. Plans



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Figure 4-3  
Location Map  
Primary and Secondary Sites,  
Reaches II and III  
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to improve 11th Street from Nova Road (S.R. 5A) west to Interstate 95 provide the opportunity to install permanent below grade conduits within the road right-of-way to carry the pipelines the remaining distance to the site. Third, the site is located in an area previously disturbed by logging, partial clearing, and site drainage. Therefore, site development will involve only minimal impacts to upland habitats. Fourth, the site is presently classified under a variety of industrial and commercial zoning and future land use designations. Finally, although the site is located in the eastern corner of a proposed Development of Regional Impact (DRI) which encompasses over 4000 acres, the present land use of adjacent properties does not offer significant conflicts to its intended use for dredged material management.

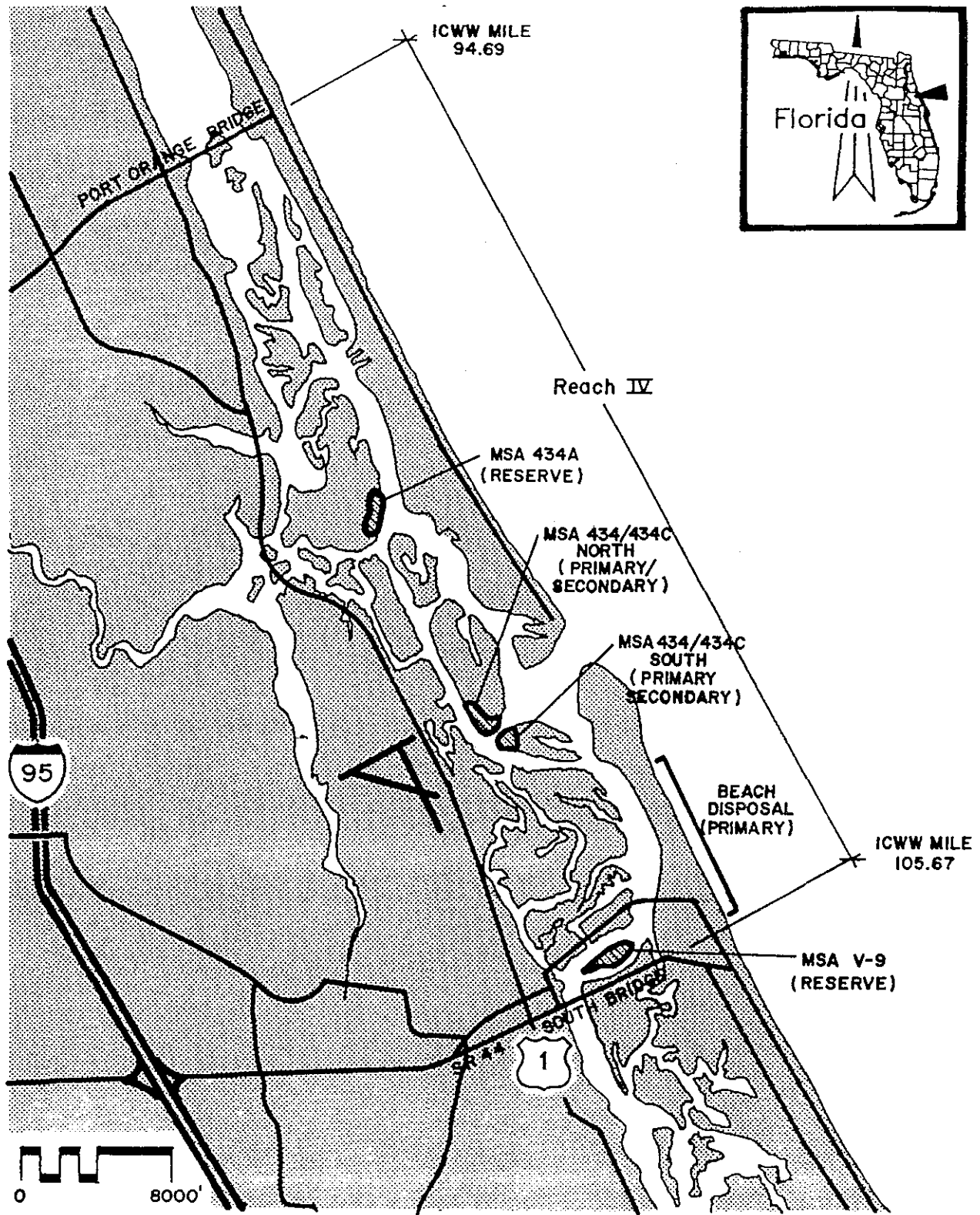
As discussed above, the use of Site V-25 involves a difficult and lengthy pipeline access. However, in preliminary discussions with representatives of the Jacksonville District COE, the plan to pump dredged material directly to Site V-25 was accepted in principle, given the lack of a suitable alternative site with sufficient capacity to serve Reaches II and III. Additional discussion with the Volusia County Departments of Engineering and Public Works have supported the feasibility of incorporating in the scheduled 11th Street/Nova Road improvement projects a permanent below grade conduit or sleeve for the temporary dredge pipelines. Nevertheless, the uncertainties inherent in accessing Site V-25 via pipeline suggest that an alternative strategy must be a component of a comprehensive dredged material management plan for Reaches II and III.

This alternative is provided by Site V-29, an unused outparcel for the Bethune Point Wastewater Treatment Plant owned by the City of Daytona Beach. Highly disturbed, this site has been used to store surplus materials associated with the operation of the WWTP. As a result, development of the site for dredged material management will involve a minimum of environmental impacts. Moreover, the location of the property adjacent to the WWTP suggests that potential conflicts with adjoining multi-family residential developments may not be significant. Because the site's southeast corner fronts directly on the Waterway, pipeline access to the site is excellent. However, the site suffers from insufficient acreage to provide the projected 50-year storage capacity for Reaches II and III. Efficient use of the site's 18.22 acres will provide 70,000 cy of capacity, or approximately 20 percent of the projected 50-year requirement. Thus, Site V-25 is still required to provide the needed long-term storage capacity for Reaches II and III. Therefore, the most appropriate use of Site V-29 may be as a dewatering, temporary storage, and material transfer facility. Between each use of the facility, the dewatered material must be reused, or trucked to a long-term storage area such as Site V-25. The specific manner in which Sites V-25 and V-29 are to be used, either

individually or in combination, will be determined by the specific requirements of each maintenance dredging operation.

Within Reach IV, the reach encompassing Ponce DeLeon Inlet, the primary means of dredged material management will be the use of beach disposal, combined with an upland storage capability to be provided by MSA 434/434C (North) and MSA 434/434C (South) (Figure 4-4). As discussed in Section 3.1, beach disposal is the preferred method of material management for this reach of the Waterway because of the large quantities of beach-quality sediment driven through the inlet and deposited in the ICWW channel. In this respect, returning channel sediments to the beach south of the inlet may mitigate inlet-related erosion of downdrift beaches. Specific design considerations (e.g., location, length of fill section, design profile, etc.) will be addressed in Phase II of the project. However, as also discussed in Section 3.1, the feasibility of placing material dredged from Waterway channels on the beach is determined by other factors which may place restrictions on the timing of beach disposal operations. Moreover, unforeseen events may produce isolated shoals containing material incompatible with native beach sands. Therefore, to provide for the continued maintenance of the Waterway under all conditions, the plan for Reach IV incorporates a conventional confined upland placement capability. The redevelopment and continued use of the two existing spoil islands, located both north and south of Rockhouse Creek in the easements MSA 434 and MSA 434C, will provide this contingency. Much of the material now stored on these islands may eventually be transferred to the beach, thereby regaining site capacity. If for unforeseen reasons beach disposal proves not to be feasible, MSA 434/434C (North) and MSA 434/434C (South) will serve as the secondary alternative for this reach. In addition, two additional easements, MSA 434A (north of Lost Creek) and MSA V-9 (Chicken Island), will provide a reserve capacity (Figure 4-4). These easements, located in the northern and southern portions of Reach IV, respectively, will contribute an additional capability to sequester material which may be unsuited for beach placement.

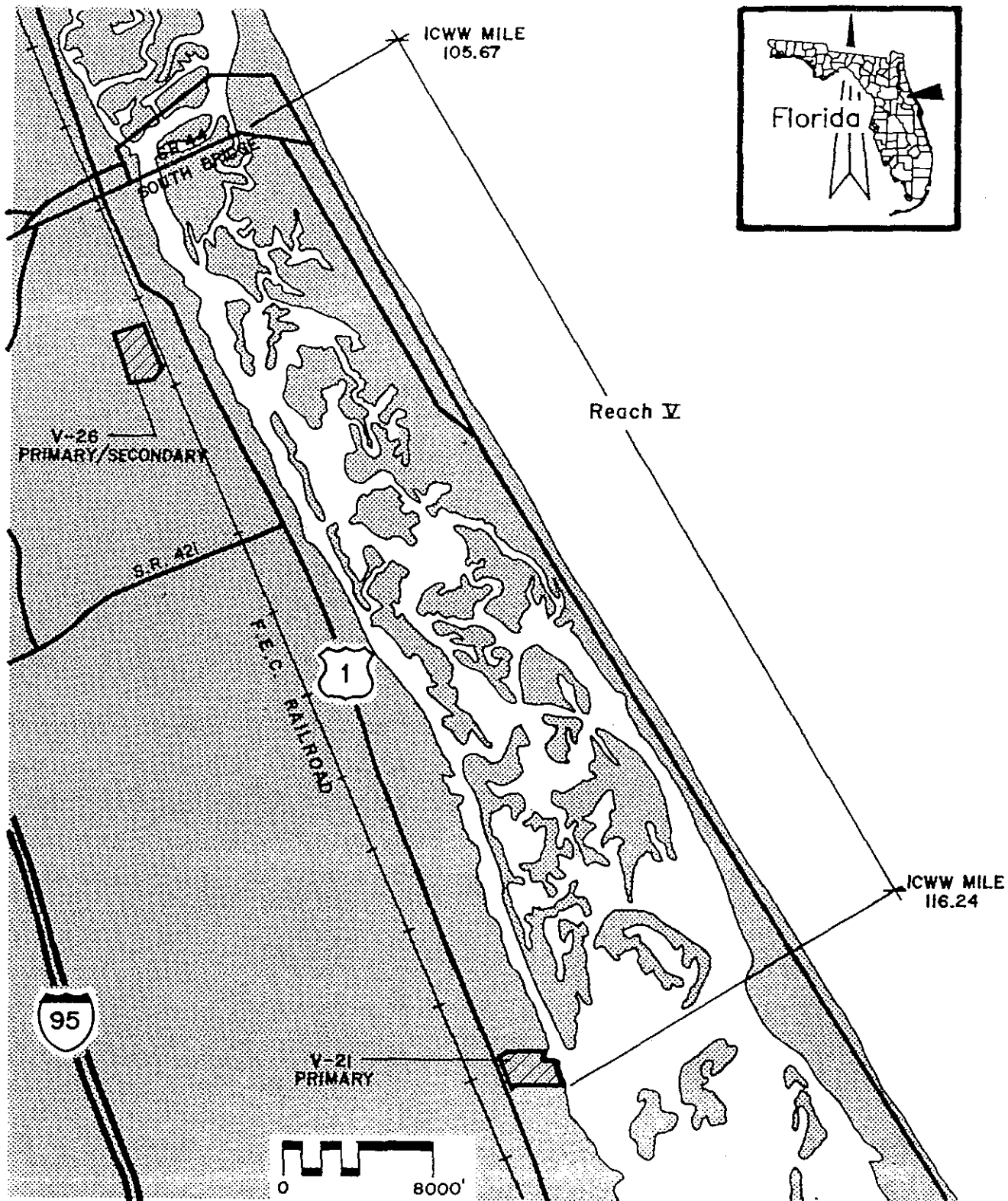
Two sites, Site V-21 and Site V-26, are designated as the primary sites to serve Reach V. The locations of these sites are shown in Figure 4-5. No single site of sufficient capacity to serve the entire reach could be identified in the central portion of Reach V. Therefore, to reduce the maximum pumping distance, the decision was made to designate two sites, located at opposite ends of the reach, to serve jointly as primary sites. Site V-26 will then serve the northern one-half of Reach V, and Site V-21 will serve the southern one-half of the reach. By using two primary sites in this manner, the maximum pumping distance required to maintain the entire reach is reduced to 4.66 miles. In the event that the use of Site V-21 proves to be not feasible, Site V-26 is designated as the secondary site for all of Reach V. For Site V-26 to serve



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Figure 4-4  
Location Map  
Primary, Secondary, and Reserve Sites  
Reach IV  
Volusia County, Florida

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Figure 4-5  
Location Map  
Primary and Secondary Sites,  
Reach V  
Volusia County, Florida

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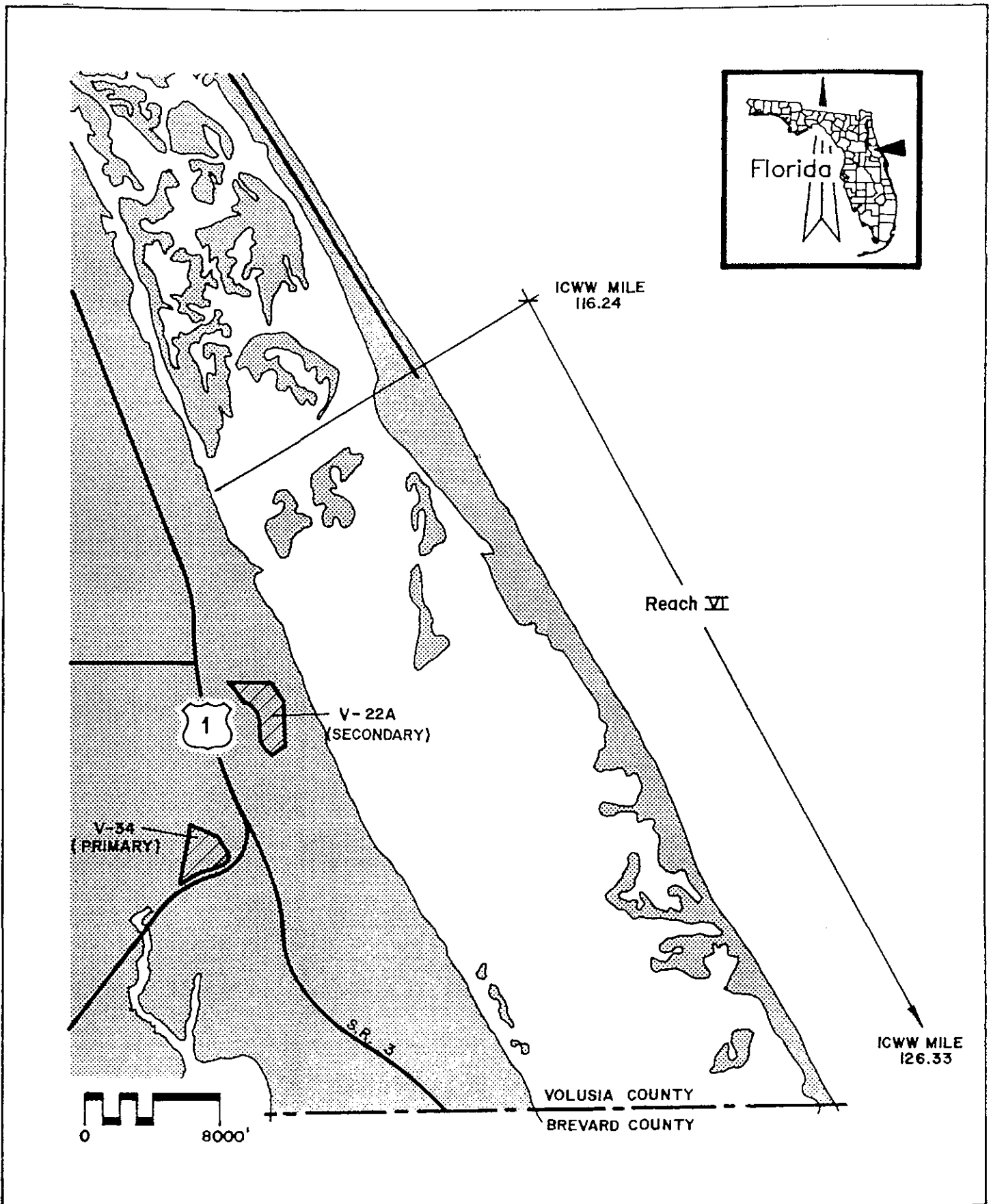
the southern end of Reach V requires a pumping distance of up to 9.94 miles. Although pumping material this distance will significantly reduce the efficiency of the operation, the maximum distance does not exceed the operational limit of 10 miles established by the COE (Section 4.1.1).

Both Site V-26 and Site V-21 are well suited to meet the requirements of Reach V. Site V-26 is within an area designated for industrial use under both current zoning and future land use comprehensive planning designations. Adjacent industrial development is also compatible with the intended use of the site, with the Florida East Coast Railroad forming the eastern boundary of the site, and a heavy industrial operation located at the site's southeastern corner. In addition, Site V-26 is isolated from the New Smyrna Beach campus of the Daytona Beach Community College to the west by a large wetland system. The development of Site V-26 will not impact this system. The site is also afforded good pipeline access by a major east-west canal which forms the northern site boundary and connects to the Mosquito Lagoon. Providing a storage capacity equal to one-half the reach requirement allows the greatest flexibility in the use of the site. However, in the event that Site V-21 cannot be used and Site V-26 is required to serve the entire reach, Site V-26 provides adequate area for the required containment basin plus a 350-foot buffer to the north, west, and south of the basin. A 100-foot buffer is provided along the FEC railroad right-of-way to the east of the site.

Site V-21 is also an appropriate choice to serve as the primary site for the southern one-half of Reach V. Indeed, Site V-21 possesses sufficient acreage to serve the entire reach. However, several considerations limit the realistic capacity of the site to one-half the reach requirement. First, Site V-21 is bounded on the north and south by residential development, and the site itself is zoned for a variety of residential densities. Second, the majority of the site is classified as coastal scrub. Although no scrub jays were noted at the time of the site inspection, scrub jays and the preservation of scrub habitat will likely be an issue in site development. Limiting site capacity to one-half of the reach requirement will allow flexibility in locating the containment basin within the site, thereby avoiding much of the scrub habitat and further isolating the operations of the site from adjacent residential development.

Within Reach VI, Site V-34 was selected as the primary site, while Site V-22A was designated as the secondary site. Site locations are shown in Figure 4-6. The selection of Site V-34 as primary is based on several factors. First, Site V-34 is a highly disturbed site, having been previously cleared and planted in citrus. More recently, the site has served as a sand/shell mine, and active mining operations continue. Use of the site for dredged material management would therefore carry little or no environmental impact.





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Figure 4-6  
Location Map  
Primary and Secondary Sites,  
Reach VI  
Volusia County, Florida

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Although presently zoned as rural, the recent approval of the construction of a temporary asphalt plant immediately east of the site further characterizes the area as industrial. At present, the site is isolated from residential development.

The secondary site for Reach VI, Site V-22A, is a realistic management alternative should the use of Site V-34 prove not to be feasible. However, Site V-22A is less desirable than the primary site for several reasons. First, Site V-22A is bounded on the northwest, north, and northeast by low density residential development. Second, although the northern portion of the site is presently fallow cropland, the southern portion is undisturbed coastal scrub adjoining the Canaveral National Seashore further to the south. Thus, the development of Site V-22A would carry greater environmental impacts than would the development of the primary site for this reach.

Preliminary acreage requirements, storage capacities, and operational factors for each site in the site bank are summarized in Table 4-1. The final determination of these parameter values will be made during Phase II of the project. However, the preliminary estimates presented here are felt to be both realistic and conservative. In each case, material storage capacities of the primary sites are sufficient to meet the projected 50-year requirements of the reach to be served. However, in Reach III, limitations of the secondary site require the acceptance of a reduced capacity, and therefore a reduced interval during which the dredged material must be removed for reuse or transfer to a permanent storage facility.

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. The total required area corresponds to the required containment area, plus an appropriate buffer surrounding the diked containment basin. A 350-foot wide buffer surrounding the containment area is provided with five exceptions. The first is Site V-6/MSA 426/428. All of the alternative site configurations being considered are adequately isolated within the Tomoka Marsh mosquito impoundment. Therefore, no allowance for additional buffer acreage was felt to be necessary. The second exception is Site V-27, the secondary site designated for Reach I. As discussed above, the useable upland acreage of this site is limited. Efficient use of the available upland requires that the width of the buffer area provided along Old Dixie Highway be reduced to 200 feet. For Site V-29, the secondary site for Reach III, acreage within the city-owned parcel adjacent to the Bethune Point Wastewater Treatment Plant is even more limited. As a result, achieving a realistic capacity requires reduction of the buffer to 50 feet. Fourth, Site V-26, one of two primary sites for Reach V, provides a reduced 100-foot

Table 4-1 Site Bank, Long-Range Dredged Material Management Plan, Intracoastal Waterway, Volusia County (page 1 of 2)

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 North County Line to Granada Bridge	V-6/ MSA 426/428 Primary (Secondary)	76.90	1000±	60± (30±)	60± (30±)	862,000 (366,000)	7.60	Conservation	RC	Mosquito impoundment, Tomoka Marsh Aquatic Preserve, privately owned
ICWW Mile 73.85 to 84.01	V-27 Secondary	79.51	102.8	28.82	73.53	495,400	6.68	Low Intensity Urban	Trans./ Agri. <sup>4</sup>	Site consists of a subdivision apparently abandoned during early phases of construction; contains infrastructure, but no houses
II Granada Bridge to Orange Ave. Bridge	V-25 Primary/ Secondary Reaches II/III	86.98	277.3	20.28	61.45	346,100	10.00	General Industry	M2, M4	Site undeveloped, some disturbance, within LPGA\Indigo DRI, can serve Reaches 2 & 3
ICWW Mile 84.01 to 89.84										
III Orange Ave. Br. to Port Orange Bridge	V-29 Primary/ Secondary Reaches II/III	90.71	18.22	9.84	18.22	70,000	4.58	Wastewater Treatment Plant	N/A	Site is outparcel for Daytona Beach Bethune Point WWTP, not required for WWTP expansion, requires re- location of access & utilities
ICWW Mile 89.84 to 94.69										

Table 4-1 Site Bank, Long-Range Dredged Material Management Plan, Intracoastal Waterway, Volusia County (page 2 of 2, continued)

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
IV Port Orange Bridge to SR 44 Bridge  ICWW Mile 94.69 to 105.67	MSA434/434C (North) Primary/Secondary	101.09	378.0	44.22	57.88	761,400	5.87	Open Space and Recreation	Con. <sup>1</sup>	Esmts. containing two existing spoil islands/disposal areas located north and south of Rockhouse Creek
	MSA 434/434C (South) Primary/Secondary	101.47	378.0	46.05	59.97	1,128,900	6.25	Open Space and Recreation	Con. <sup>1</sup>	Esmts. containing two existing spoil islands/disposal areas located north and south of Rockhouse Creek
	Beach Disposal Primary	----	----	----	----	----	----	----	---	Location and size of fill section will be specific to each dredging event, details to be addressed in Phase II
V SR 44 Bridge to Vicinity of Eldora  ICWW Mile 105.67 to 116.24	V-26 Primary: N 1/2 (Secondary: all)	106.98	128.6	30.13 (50.24)	78.39 (94.32)	431,400 (870,800)	4.66 (9.94)	Industrial	Ind. <sup>2</sup>	Adjacent to existing industrial development, F.E.C. Railroad, wetland separates from DBCC(NSB)
	V-21 Primary (S 1/2)	115.59	138.9	26.91	76.32	425,600	4.59	Urban, Medium Den., Unspec. Residential	R3W, R3W & MHSW	Presently undeveloped, extensive coastal scrub may limit, but not preclude, use of site
VI Vicinity of Eldora to Haulover Canal  ICWW Mile 116.24 to 126.33	V-22A Secondary	118.26	203.0	36.31	108.99	520,700	8.69	Agriculture/ Unspecified Residential	A3	Portion of site citrus, general agriculture, portion undeveloped, scattered residences on perimeter
	V-34 Primary	120.19	141.9	30.76	71.36	529,800	8.84	Rural	N/A	Active sand mine, citrus, site contains eagle nest within active mine, nest inactive but not yet declared abandoned (USFWS)

<sup>1</sup> Conservation<sup>2</sup> Industrial (various intensities)<sup>3</sup> Residential (various densities)<sup>4</sup> Transitional/Agriculture

buffer along the FEC railroad right-of-way which borders the site to the east. And fifth, because of the natural isolation of two large spoil islands contained in MSA 434/434C within Reach IV, only a minimal buffer was considered in calculating the specified storage capacity.

The total required primary site acreage for the 52.48 miles of Waterway channel within the Volusia County project area is approximately 487 acres. This includes 268 acres of active containment area and 219 acres of buffer. Not included in this total is the acreage required for beach disposal. Of the total required area of 487 acres, up to 178 acres are contained in four existing easements. In the corresponding total secondary site requirement of 508 acres, 266 acres are containment area and 242 acres are buffer. Of the secondary management alternatives, 148 acres are contained in four existing easements.

## 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 sub-tasks 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. Tasks A, B, C, and D below are not applicable to the beach disposal area designated to serve Reach IV. Specific requirements of this site are addressed in Sub-task II-E.

- A. Boundary Survey — Provide boundary survey of each primary site. Provide boundary surveys for additional pipeline and road access easements as required. Document results of each survey in sufficient detail to support legal and engineering actions required for acquisition of the site, as well as acquisition of additional easements under consideration by the FIND, and for site development for the purposes of dredged material management. Provide final boundary survey drawings, written legal descriptions, and other supporting documents to the FIND for each site. Reference boundary information for each site and additional easement to the Florida State Plane Coordinate System.
- B. Engineering Topographic Survey — Provide site topographic information necessary for site planning, permitting, and design purposes. Reference horizontal and vertical control of data to established bench marks and reference all elevations to NGVD.
- C. Subsurface and Soils Survey — This task will be performed by the Jacksonville District, U.S. Army Corps of Engineers.
1. Soils Survey — By means of core borings and analysis, document site soil characteristics including boring logs, grain size distributions, specific gravity, organic content, Atterberg limits (where appropriate), shear strength, compaction, and consolidation.
  2. Groundwater — Obtain groundwater table elevations at a sufficient number of locations to provide estimates of on-site water table potential surface elevations referenced to NGVD.
- D. Environmental Survey — Perform field survey and data collection efforts to provide the following:
1. Detailed documentation of site vegetation communities, including species frequencies of occurrence, and the delineation of wetlands and transitional areas using state approved methods.
  2. Detailed documentation of on-site animal species, including endangered or threatened species, and pertinent habitat information.

3. Documentation of existing vegetation communities and species habitats along proposed pipeline access and return drainage routes.
  4. Documentation for a Phase I Site Environmental Assessment for concerns related to hazardous waste.
- E. Beach Disposal Area (Reach IV) — Obtain necessary engineering and environmental site information required for preliminary engineering design and permitting. No boundary survey will be provided for the project area. Work elements within this task will include the following:
1. Analyze existing beach profile data obtained from Jacksonville District, Corps of Engineers and Florida DNR, Division of Beaches and Shores to evaluate historic beach profile geometry and background erosion rates.
  2. Define beach disposal project area.
  3. Perform preliminary material compatibility analysis using newly acquired samples of native beach material and existing data on historic shoal material in Reach IV Waterway channels.
  4. Locate and characterize all existing public access points, bulkheads, revetments, and stormwater outfalls within the project area.
  5. Perform field survey and data collection to provide documentation of environmental conditions (species present, frequency of occurrence, pertinent habitat information, endangered or threatened species) within project area, adjacent nearshore regions, and along proposed pipeline routes.
  6. Review existing information to determine possible impact of project on sea turtle nesting.

### **Task III: Preliminary Design and Analysis**

With data obtained from Task II, develop site documentation and complete preliminary design necessary to prepare permit drawings. Tasks III-A and III-B below are not applicable to the beach disposal area designated to serve Reach IV. Specific requirements of this site are addressed in Sub-task III-C.



- A. Environmental — With information obtained from Task II-D, prepare the following:
1. Detailed site maps showing vegetation communities, species locations and habitats, revised usable boundaries, and wetland areas.
  2. Detailed written text supporting (1) above.
  3. Specific mitigation measures as required.
  4. Archeological site locations as recorded in published records available from the Division of Historical Resources, Florida Department of State.
  5. Recommended pipeline access and return water routes.
- B. Engineering - With information obtained in Task II, prepare the following:
1. Site Capacity Analysis — Recalculate estimated site capacity and dike material requirements
  2. Site Topographic Map
  3. Engineering Report on Subsurface and Soils Conditions — Prepared by Jacksonville District, U. S. Army Corps of Engineers
  4. Preliminary design calculations and permit drawings of:
    - o Location/Reach Map
    - o Site Plan
    - o Pipeline Access and Return Routes
    - o Inlet Works
    - o Outlet Works
    - o Dike Section
    - o Internal Structures
    - o Equipment Ingress and Egress Features
    - o Vegetation and Buffer Area Plan
    - o Site Drainage Plans
  5. Detailed written text supporting (1) - (4) above
  6. Phase I Site Environmental Assessment Report.

C. Beach Disposal Area (Reach IV)

1. Engineering — With information obtained in Sub-task II-E, prepare the following:
  - a. Preliminary design calculations and permit drawings of:
    - o Location Map
    - o Site Plan
    - o Typical Section(s)
    - o Pipeline Access Routes
    - o Locations of Public Access, Bulkheads, Revetments, Outfalls
  - b. Compatibility analysis of fill with native beach material
  - c. Projected performance of beach fill
  - d. Detailed written support of (a) - (c) above.
2. Environmental — With information obtained in Sub-task II-D, prepare the following:
  - a. Evaluation of environmental conditions within beach disposal project area, adjacent nearshore areas, and along proposed pipeline routes
  - b. Evaluation of project impacts on beach and nearshore habitats, with special emphasis on sea turtle nesting
  - c. Detailed maps of project area, adjacent nearshore regions, and proposed pipeline routes showing species and habitat location, vegetation communities, rock outcroppings, documented turtle nesting sites and other pertinent habitat information
  - d. Detailed written text in support of (a) - (c) 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. Tasks A, B, and C below are not applicable to the beach disposal area designated to serve Reach IV. Specific requirements of this site are addressed in Sub-task IV-D. 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
- D. Beach Disposal Area (Reach IV) — The site management plan for the beach disposal area will address the long-range implications of the site — specifically, the assessment of project performance — and the continuing modifications in project design and operational criteria in response to project performance.

### **Task V: Cost Considerations**

For all primary sites, evaluate the following cost considerations:

- A. Site Improvement Costs
- B. Site Operation Costs
- C. Site Maintenance Costs

### **Task VI: Documents and Deliverables**

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

- A. Boundary survey with legal description, with additional boundary surveys of pipeline and road access easements as required. A boundary survey is not to be performed for the beach disposal area designated to serve Reach IV.
- 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 (not applicable to beach disposal area, Reach IV).
- E. Environmental Report.
- F. Phase I Site Environmental Assessment Report.
- G. Site Management Plan.
- H. Cost Report.

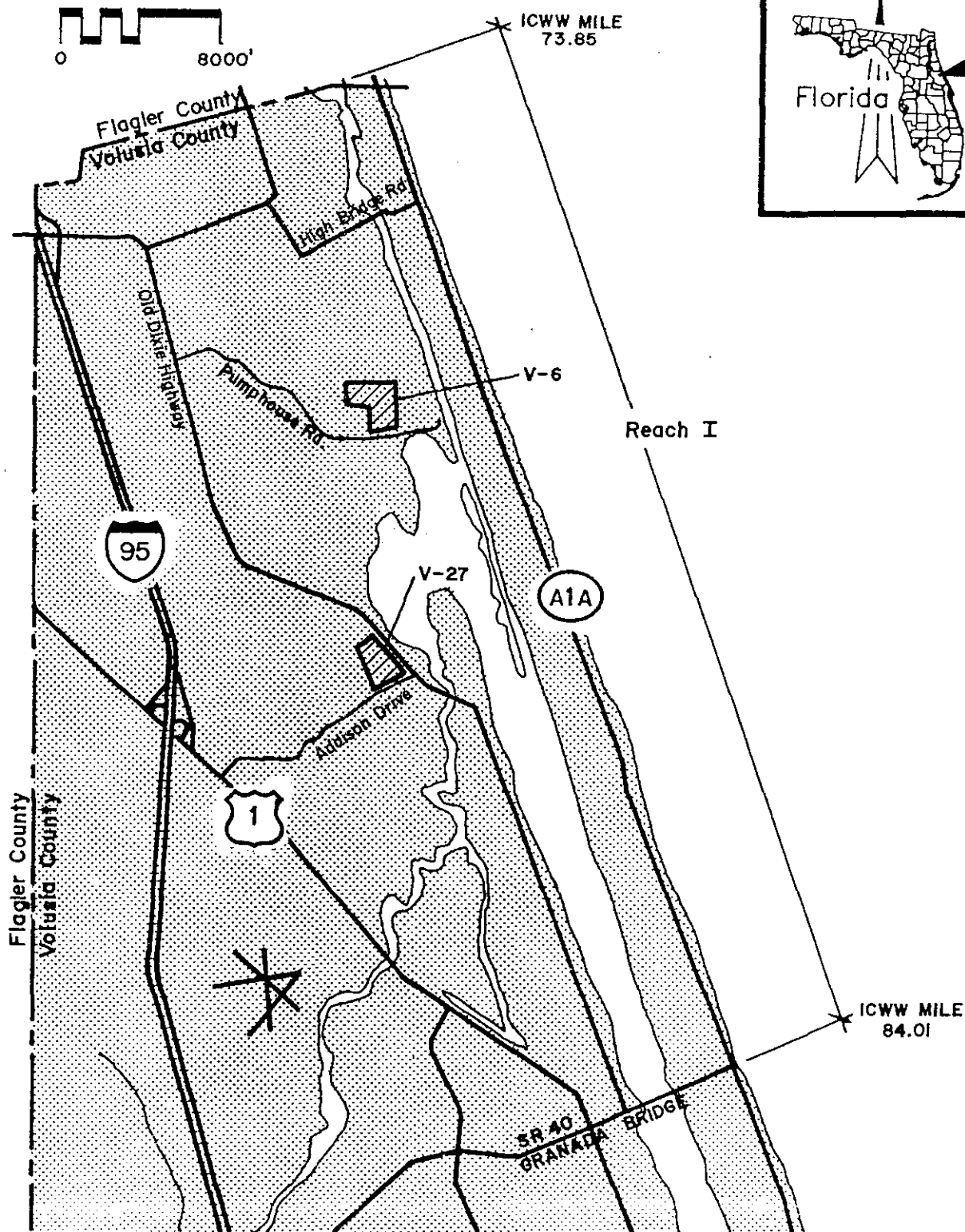
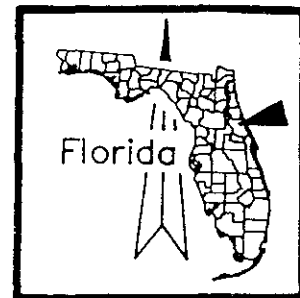
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**APPENDIX A**

**Site Bank**

**(Primary and Secondary Sites)**



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**Figure A-1**  
**Location Map**  
**Primary and Secondary Sites,**  
**Reach I**  
**Volusia County, Florida**

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**SITE V-6 DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax Creek/Tomoka Basin</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>17/13S/32E</u>	<u>862,000 cy</u>	<u>2,600 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>76.90</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>122.9 ac</u>	<u>50-60 ac</u>	<u>50-60 ac</u>	<u>N/A</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>862,000 cy</u>	<u>&gt; 2600 ft</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>7.60 mi</u>	<u>15 ft</u>	<u>Not Determined</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Pumphouse Rd.</u>	<u>0</u>	<u>Open water, Saltmarsh, Mangrove Swamps</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>



**SITE MSA 426 DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax River (ICWW)</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>8/13S/32E</u>	<u>862,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req't</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>75.06</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>36.70</u>	<u>50.1</u>	<u>50.1</u>	<u>Minimal (50 ft±)</u>
<b>Initial Esmt. Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+5.0 ft NGVD</u>	<u>882,122 cy</u>	<u>N/A</u>	<u>Conservation/Environ. System Corridor</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>8.95 mi</u>	<u>13 ft</u>	<u>Not Determined</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Old Dixie Hwy. to Pumphouse Road</u>	<u>3.76 ft</u>	<u>Cabbage Palm, Saltwater Marsh</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

**SITE MSA 428 DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax River (ICWW)</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>17/13S/32E</u>	<u>862,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>76.14</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>317.49 ac</u>	<u>28.9 ac</u>	<u>28.9 ac</u>	<u>Minimal (50 ft±)</u>
<b>Initial Esmt. Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+5.0 ft NGVD</u>	<u>371,844 cy</u>	<u>N/A</u>	<u>Conservation/Environ. System Corridor</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>7.91 mi</u>	<u>12 ft</u>	<u>Not Determined</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Old Dixie Hwy. to Pumphouse Road</u>	<u>3.16 ft</u>	<u>Cabbage Palm, Saltwater Marsh</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-6 is located in the Tomoka Marsh Aquatic Preserve. The site encompasses approximately 1,000 acres and consists mainly of old mosquito impoundments. The site is bounded on the south by Pumphouse road and on the east by the ICWW. Many of the impoundment dikes have been breached to allow tidal exchange with surrounding waters. Though most of the site is submerged, several upland areas are present. Uplands exist in the site's interior and also along the shore of the ICWW. The shore-side uplands are contained within two existing FIND easements, MSA 426 and MSA 428.

The interior uplands consist of a group of three islands surrounded by saltmarsh. Only the largest of these was visited during the site inspection on September 21, 1992, however all of the islands appear to have much the same types of vegetation cover. The islands are predominantly vegetated by temperate hardwoods communities (425). Species include cabbage palm (*Sabal palmetto*), live oak (*Quercus virginiana*), southern red cedar (*Juniperus silicicola*) and pignut hickory (*Carya glabra*). Portions of the largest island have been cleared. In some places only the understory has been removed while in other places the canopy was removed as well. Ground cover in the cleared areas consists of bahia grass (*Paspalum secundum*), beautybush (*Callicarpa americana*), and buckthorn (*Bumelia* sp.). The islands are surrounded by open water (500) and saltmarsh (642) containing black rush (*Juncus roemarianus*), sea oxeye (*Borrchia frutescens*) and marsh elder (*Iva frutescens*).

**Table A-1 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-6, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
329/612	Other Shrubs and Brush/Mangrove Swamps	1.3
425	Temperate Hardwood	21.0
500	Water	35.1
642	Saltwater Marsh	65.5
Total		122.9

Source: WAR, 1993

The uplands along the shore of the ICWW consists of a series of islands separated by saltmarsh and tidal creeks. These islands were formed by the deposition of material dredged from the ICWW channel during construction and subsequent maintenance events. They lie within two contiguous FIND easements;

MSA 426 and MSA 428. Each island contains a high central portion of exposed sand ringed by a fringe of vegetation. Typically, these fringe areas contain southern red cedar (*Juniperus silicicola*), cabbage palm (*Sabal palmetto*), Brazilian pepper (*Schinus terebinthifolius*), and scattered stands of yaupon holly (*Ilex vomitoria*). In addition, live oaks (*Quercus virginiana*) and sugarberry (*Celtis laevigata*) exist in some areas. Prickly-pear cactus (*Opuntia sp.*, listed by the state as threatened) and various grass species inhabit the exposed areas. One of the larger islands has a broad expanse of exposed sand vegetated by scattered prickly-pear cactus. Active burrows on one of the larger islands indicates the presence of a population of gopher tortoises.

**Table A-2 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found within MSA 426 and MSA 428, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
425	Temperate Hardwoods	39.5
625	Cabbage Palm	16.6
642	Saltwater Marshes	6.5
651	Tidal Flats	1.8
743	Spoil Areas	21.3
Total		85.7

Source: WAR, 1993

# LEGEND

- 329/612 Other Shrubs and Brush/Mangrove Swamps
- 425 Temperate Hardwoods
- 500 Water
- 642 Saltwater Marsh
- ==== Road
- Ditch
- Berms
- - - - Dike

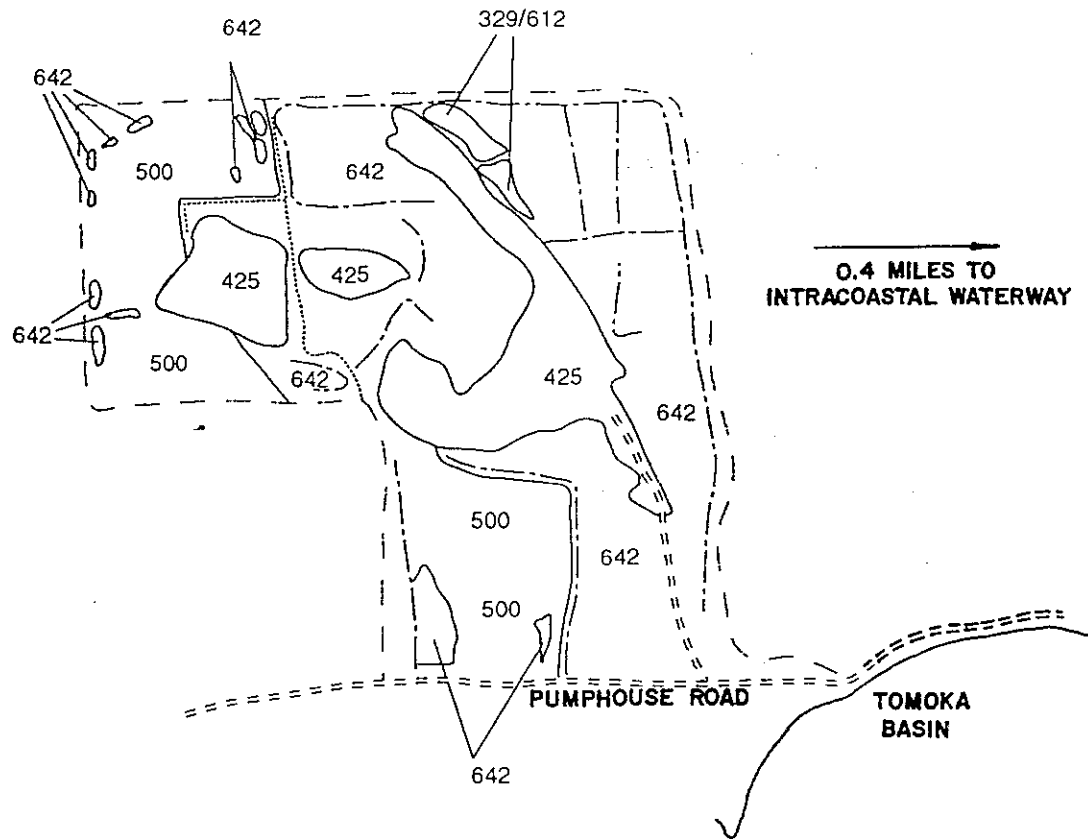
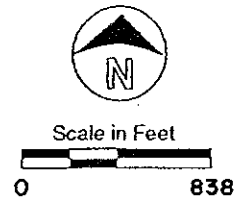
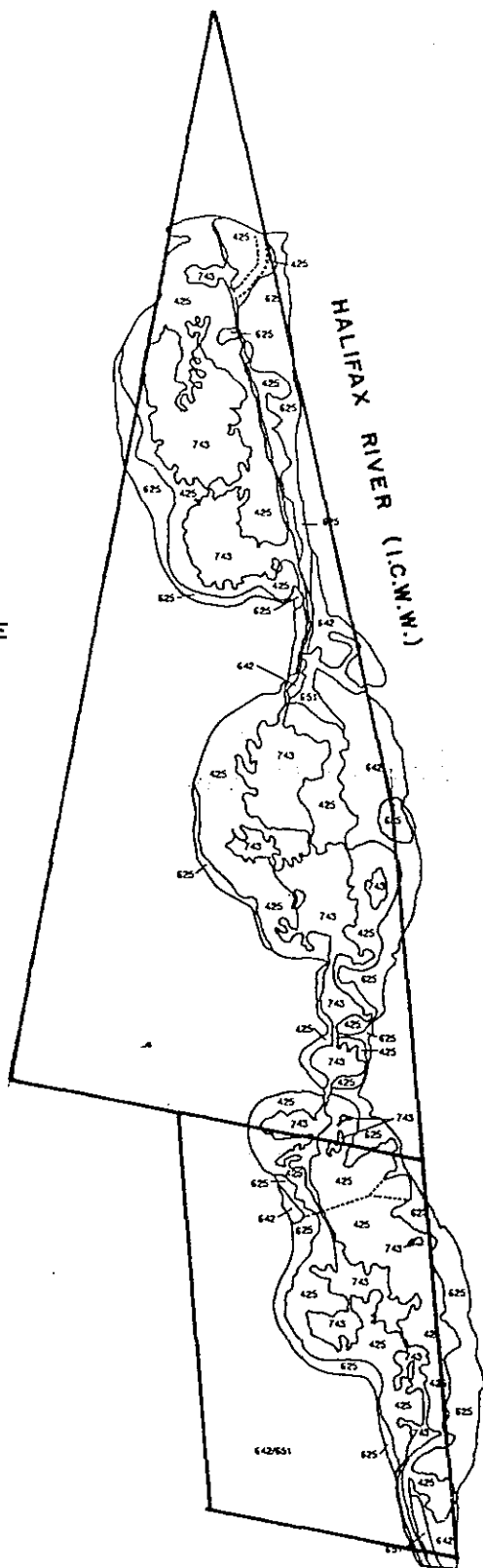


Figure A-2  
Vegetation and Land Use of  
Site V-6 Interior Uplands  
Volusia County, Florida



**TOMOKA MARSH  
AQUATIC PRESERVE**

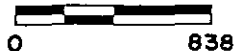


**LEGEND**

- 425 Temperate Hardwood
- 625 Cabbage Palm
- 642 Saltwater Marshes
- 651 Tidal Flats
- 743 Spoil Areas
- Streams and Waterways (510)



Scale in Feet



**Figure A-3**  
**Vegetation and Land Use of**  
**Site V-6 Within Portions of**  
**MSA 426/428 (North)**  
**Volusia County, Florida**



SITE       V-27       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax River (Tomoka Basin)</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>40/13S/32E</u>	<u>862,000 cy</u>	<u>6,700 ft to ICWW; 500 ft to Tomoka Basin</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. Line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>79.51</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>102.8 ac</u>	<u>28.82 ac</u>	<u>73.53 ac</u>	<u>350 ft West/200 on Old Dixie Highway</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt;5.0 ft NGVD</u>	<u>495,400 cy</u>	<u>500 ft</u>	<u>Low Impact Urban</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>6.68 mi</u>	<u>15 ft</u>	<u>None</u>	<u>Conservation/Low Impact Urban</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Old Dixie Highway</u>	<u>5.21 ft</u>	<u>Cabbage Palm, Freshwater Marsh, Saltwater Marsh</u>	<u>Reservoir</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-27 lies approximately 1.3 miles west of the Halifax River, northwest of the intersection of Old Dixie Highway and Addison Drive. The site encompasses a partially constructed residential development (192). Though paved streets and other infrastructure is presently in place, no structures have been built. Bahiagrass (*Paspalum notatum*) and other weedy herbs and grasses make up the ground cover in this area.

A large storm water retention pond (530) lies in the eastern portion of this development. Though it does not appear to be tidally connected, it is connected by culvert to a cabbage palm wetland (625) to the northwest. This freshwater reservoir contains cattail (*Typha* sp.). A thin band of live oak (427) lies between the cleared area and Old Dixie Highway to the east. A small powerline runs along the northern edge of the development, separating it from the adjacent hardwood-conifer mix community (434).

A second pond (530) lies near the northwest corner of the site. It is connected to the Tomoka River via a tidal creek and a canal which passes under Old Dixie Highway. It is surrounded by saltwater marsh (642) which contains sand cordgrass (*Spartina bakeri*), perennial glasswort (*Salicornia virginica*), and sea-oxeye (*Borrchia frutescens*). Adjacent to the saltmarsh fringe is a cabbage palm wetland (625) containing cabbage palm (*Sabal palmetto*), yaupon holly (*Ilex vomitoria*), wax myrtle (*Myrica cerifera*), and southern red cedar (*Juniperus silicicola*). Golden polypody fern (*Phlebodium aureum*), a species listed by the state as threatened by the state, grows on the cabbage palm. There is little ground cover in this area, possibly due to the high water table. The many shallow depressions scattered throughout the community were inundated during the field visit on January 27, 1993. An unusually high tide occurred at this time due to persistent northeast winds. Adjacent to the cabbage palm community to the east is a freshwater marsh (641) which contains soft rush (*Juncus effusus*), sand cordgrass (*Spartina bakeri*), and maidencane (*Panicum hemitomom*).

An unburned pine flatwoods community (411) is centrally located in the site's northern half. It contains slash pine (*Pinus elliotii*), saw palmetto (*Serenoa repens*), wax myrtle, rusty lyonia (*Lyonia ferruginea*), and deer moss (*Cladonia* sp.). Live oak (*Quercus virginiana*) and laurel oak (*Quercus laurifolia*) have taken hold in the flatwoods, possibly due to the lack of recent burning. A hardwood-conifer mix community (434) lies east of the pine flatwoods and adjacent to the freshwater marsh. This upland area contains live oaks, slash pine, saw palmetto, and cabbage palm.



A third pond (530), located in the southwestern portion of the site, is similar to the northwestern pond in that it is tidally connected and surrounded by saltwater marsh. A freshwater marsh connects with the saltwater marsh east of the pond. The saltwater marsh contains sand cordgrass, an abundance of sawgrass (*Cladium jamaicense*), and sea oxeye. The freshwater marsh contains mostly soft rush with some sand cordgrass. These communities are adjacent to a cabbage palm wetland which contained standing water at the time of the field visit. Three hardwood-conifer mix communities occur in the southern portion of the site. They are vegetated by slash pine, live oak, saw palmetto, and an understory of shiny blueberry and highbush blueberry (*Vaccinium myrsinites*, and *V. corymbosum*), fetterbush (*Lyonia lucida*), and rusty lyonia. Portions of these communities are disturbed and contain water-filled depressions that appear to have been made by heavy machinery. Communities along the site's northern, western, and southern boundaries contain wetlands.

Though V-27 is a viable candidate site, it is considered the secondary choice for Reach I for three reasons. First, it can provide only half of the storage capacity needed to meet the entire 50 year reach requirement. Second, it lies a considerable distance from the ICWW, thus pipeline access to the site would be more complicated than to the primary site. Finally, the site's location close to residential development could create a conflict in local land use plans.

**Table A-3 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-27, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
192	Inactive Land with Street Pattern but without Structures	31.9
411	Pine Flatwoods	6.4
434	Hardwood - Conifer Mixed	20.4
530	Reservoirs	16.3
625	Cabbage Palm	15.6
641	Freshwater Marshes	3.4
642	Saltwater Marshes	8.8
<b>Total</b>		<b>102.8</b>

Source: WAR, 1993

# LEGEND

- 192 Inactive Land with Street Pattern but without Structures
- 411 Pine Flatwoods
- 434 Hardwood - Conifer Mixed
- 530 Reservoirs
- 625 Cabbage Palm
- 641 Freshwater Marshes
- 642 Saltwater Marshes
- Powerline
- County Road

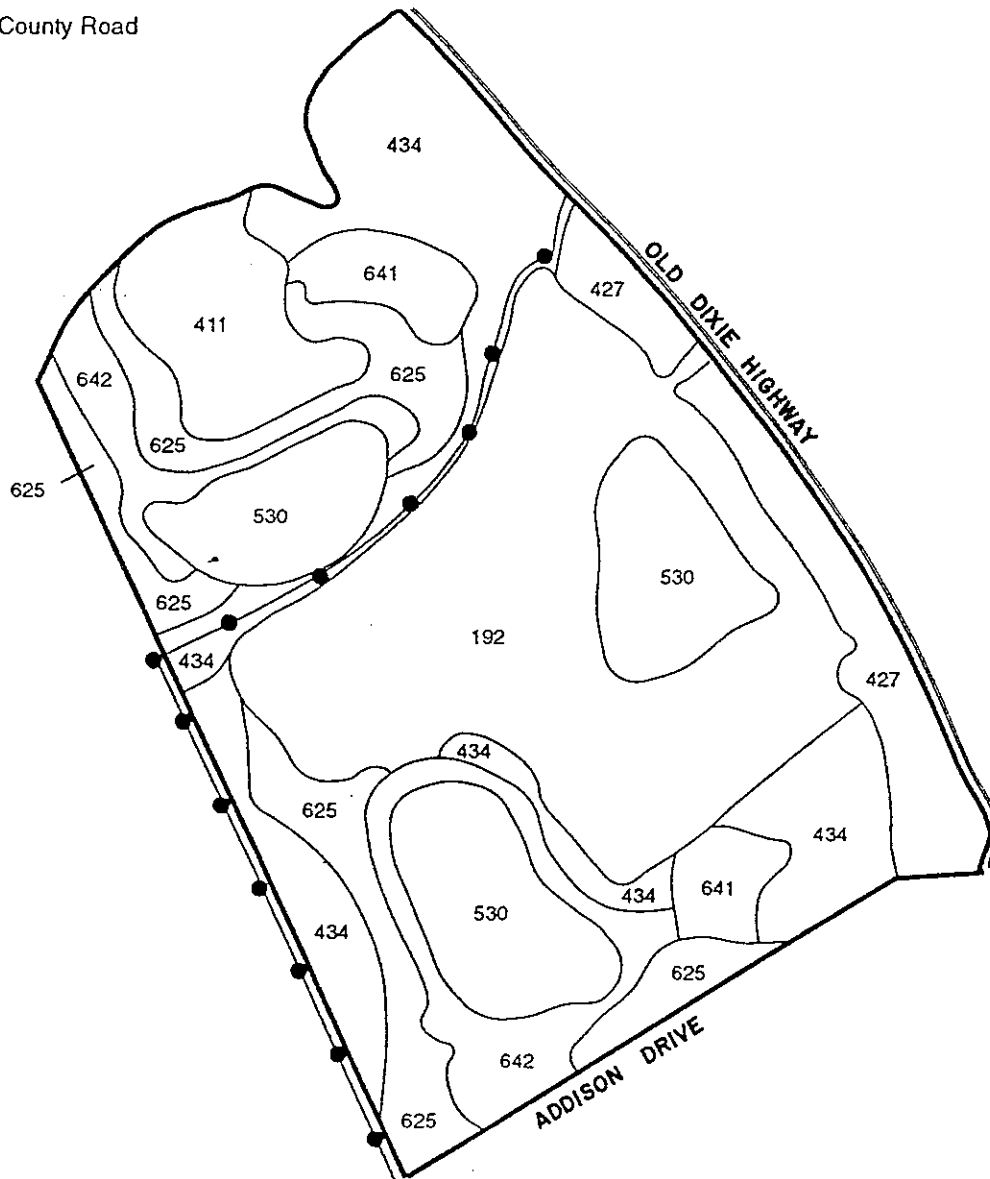
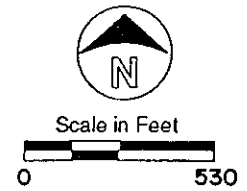
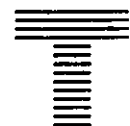
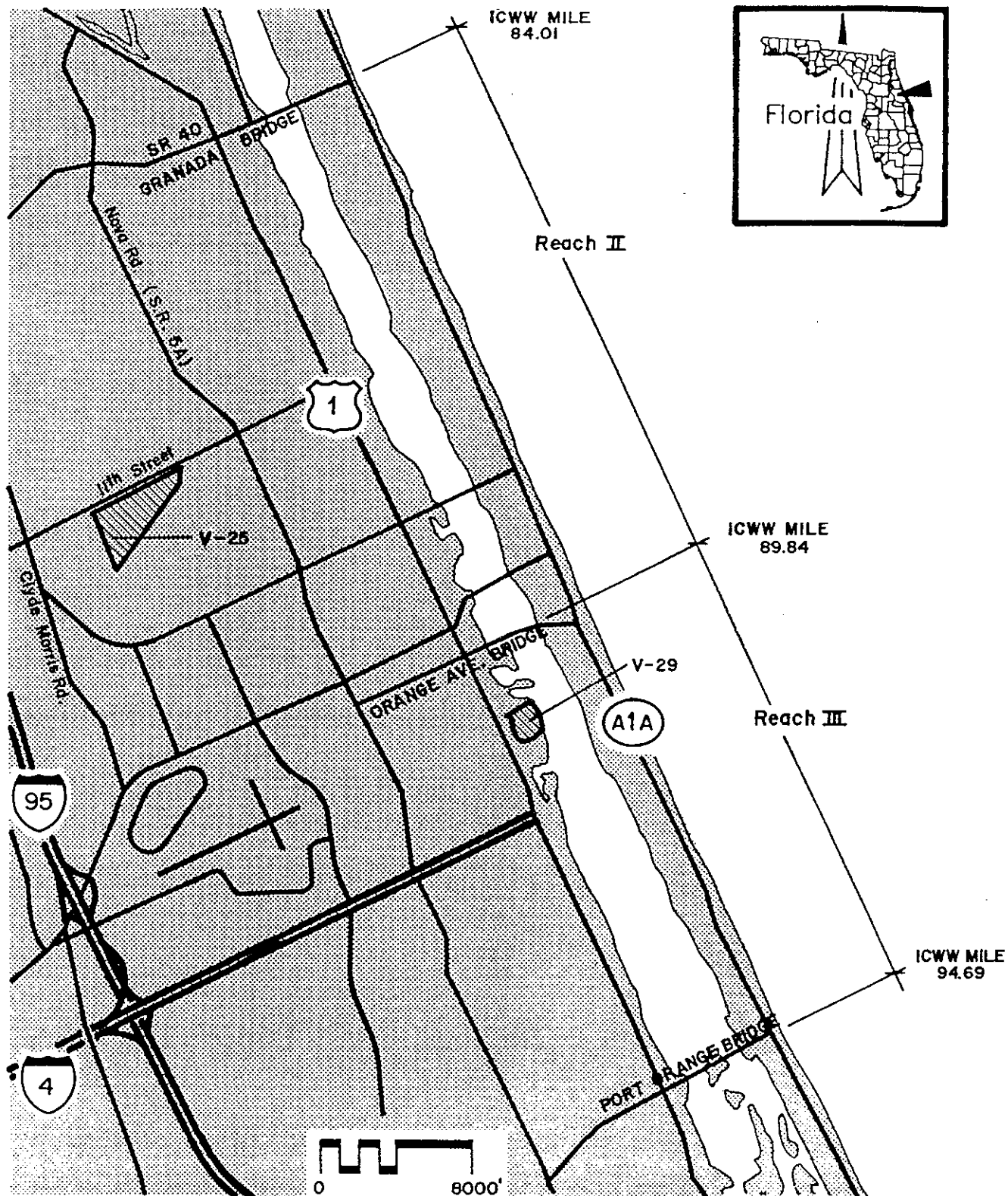


Figure A-4  
Vegetation and Land Use of  
Site V-27  
Volusia County, Florida





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

**Figure A-5**  
**Location Map**  
**Primary and Secondary Sites,**  
**Reaches II and III**  
**Volusia County, Florida**

PROJECT
REVISION
SHEET
DATE

**SITE V-25 DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>II (II &amp; III)</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>2,10,11/15S/32E</u>	<u>53,000 cy (344,000 cy)</u>	<u>12,400 ft (to ICWW)</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>Daytona Beach</u>	<u>5.83 mi (+4.35 mi)</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Granada Bridge (mi 84.01) to Orange Ave. Bridge (mi 89.84)</u>		<u>86.98</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>277.3 ac</u>	<u>6.0 ac (21.09 ac)</u>	<u>31.64 ac (59.35 ac)</u>	<u>Varies</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&gt; +25.0 ft NGVD</u>	<u>60,571 cy (359,403 cy)</u>	<u>12,400 ft</u>	<u>General Industry</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>5.24 mi (10.0 mi)</u>	<u>10 ft (15 ft)</u>	<u>None Required</u>	<u>Primarily undeveloped, mixed resident, school, church</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>11th St/Jimmy Ann Dr</u>	<u>8.58 ft (8.55 ft)</u>	<u>Mixed Forested Wetlands</u>	<u>Bay Swamp, Wetland Coniferous Forest</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-25 is located approximately 2.3 miles west of the Halifax River, near the intersection of 11th Street and Jimmy Ann Drive. A large north-south drainage ditch bisects the site. A small creek feeds into this major drainage ditch from the eastern portion of the property. A powerline traverses the northeastern end of the property and another powerline runs along the southern site boundary.

The eastern half of the site contains a mixture of sand pine (413), forested wetlands (611 and 630), and pine flatwoods (411). A variety of species inhabit the sand pine community including sand pine (*Pinus elliottii*), sand live oak (*Quercus geminata*), saw palmetto (*Serenoa repens*), Chapman's oak (*Quercus chapmanii*), and deer moss (*Cladonia* sp.). Stands of loblolly bay (*Gordonia lasianthus*) are also present there, occupying linear depressions. No standing water was evident in these depressions at the time of the site visit, but wetland species including fetterbush (*Lyonia lucida*) and ferns (*Thelpteris* sp.) grow there. Portions of the sand pine community have been cleared and areas of bare sand are common there.

A mixed wetland forest (630) lies just east of the drainage canal. Vegetation in this community includes Florida elm (*Ulmus floridana*), red maple (*Acer rubrum*), cabbage palm (*Sabal palmetto*), cypress (*Taxodium* sp.), and swamp bay (*Persea palustris*).

Vegetation communities in the western half of the site include pine flatwoods (411), palmetto prairie (321), and forested wetlands (620 and 630). The pine flatwoods contain slash pine (*Pinus elliottii*), saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), and fetterbush. The forested wetlands are vegetated by a variety of species including slash pine, cypress, swamp bay and cabbage palm.

**Table A-4 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-25, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
321	Palmetto Prairie	26.6
411	Pine Flatwoods	143.8
413	Sand Pine	62.5
611	Bay Swamp	6.4
620	Wetland Coniferous Forest	0.3
630	Wetland Forested Mixed	37.7
Total		277.3

Source: WAR, 1993

# LEGEND

- 321 Palmetto Prairie
- 411 Pine Flatwoods
- 413 Sand Pine
- 611 Bay Swamp
- 620 Wetland Coniferous Forest
- 630 Wetland Forested Mixed
- Creek
- Ditch
- - - Road
- Powerline



Scale in Feet  
0 865

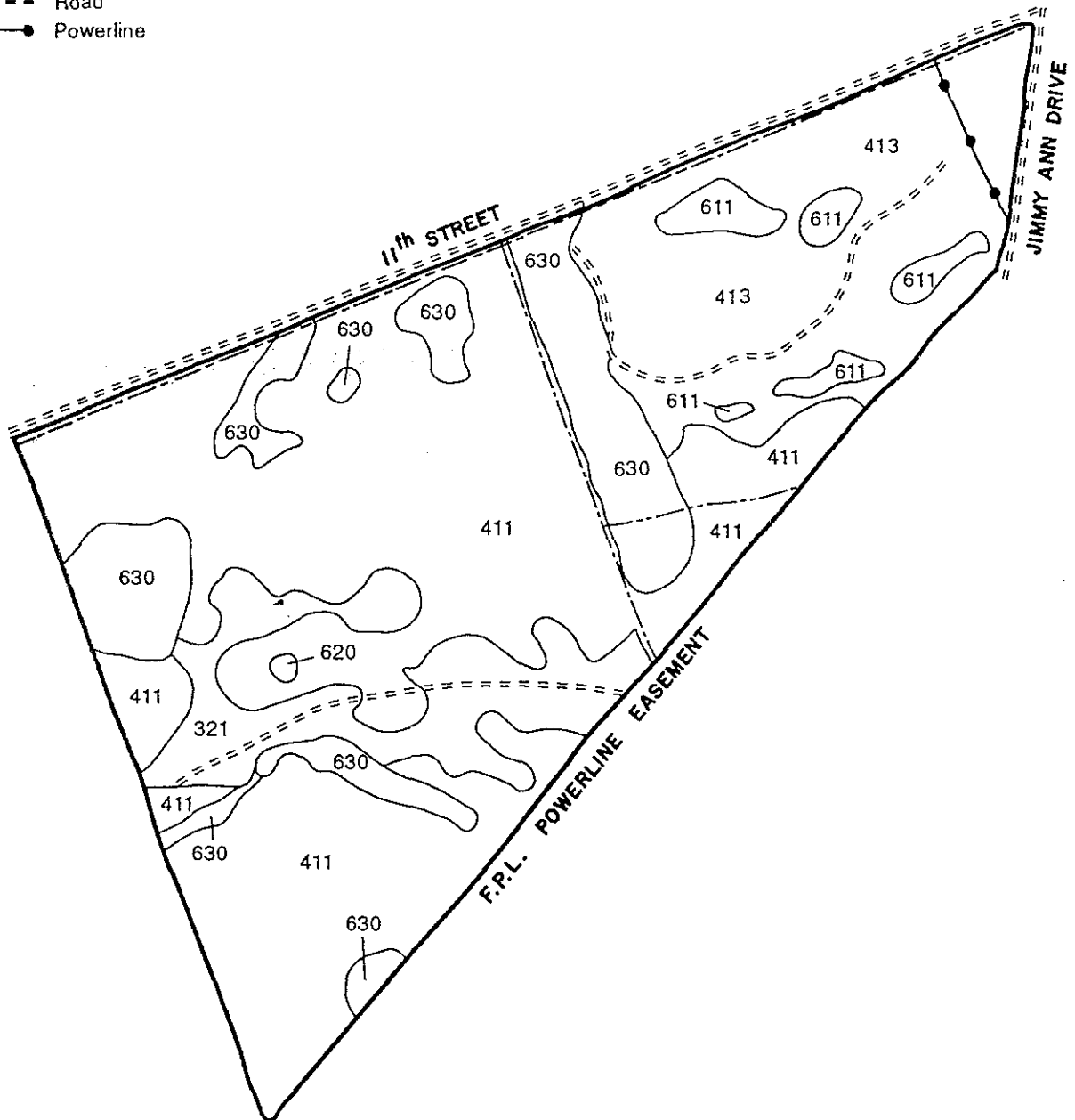


Figure A-6  
Vegetation and Land Use of  
Site V-25  
Volusia County, Florida



**SITE       V-29       DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>III</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>16/15S/32E</u>	<u>291,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>Daytona Beach</u>	<u>4.85 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Orange Ave. Bridge (mi 89.84) to Port Orange Bridge (mi 94.69)</u>		<u>90.71</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>18.22 ac</u>	<u>9.84 ac</u>	<u>18.22 ac</u>	<u>50/ &gt; 50/50/50 ft</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&gt; +5.0 ft NGVD</u>	<u>69,993 cy</u>	<u>900 ft±</u>	<u>Sewage Treatment Plant (STP)</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>4.58 mi</u>	<u>8 ft</u>	<u>None</u>	<u>Single/Mult. - Family Residential Bethune Pt. STP</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>S. Beach St. to Shady Place</u>	<u>3.32 ft</u>	<u>None</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-29 is located on the western shore of the Halifax River adjacent to the Bethune Point Sewage Treatment Plant (834). It encompasses a portion of Bethune Point Park and adjacent lands owned by the City of Daytona Beach. The park contains baseball/softball fields and parking lots (186). The southwestern quarter of the site, which shows evidence of past disturbance, consists of open fields (740/744) and a mixed hardwood forest (193/438) with cabbage palm (*Sabal palmetto*). Shady Place, the street which provides access to the sewage treatment plant runs east-west through this area. A large, roadside drainage ditch lies along the southern edge of this street. This ditch extends eastward through an open field (191) and is tidally connected to the Halifax River.

The disturbed communities (193/438) contain a variety of mixed hardwoods including laurel oak (*Quercus laurifolia*), southern red cedar (*Juniperus silicicola*), Brazilian pepper (*Schinus terebinthifolius*), and cabbage palm (*Sabal palmetto*). Ground cover is weedy and contains among other species begger ticks (*Bidens pilosa*).

**Table A-5 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-29, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
186	Community Recreational Facilities	28.5
191	Undeveloped Land within Urban Areas	4.5
193/438	Urban Land in Transition without Positive Indicators of Intended Activity/Mixed Hardwoods	8.7
740/744	Disturbed Lands/Fill Area	4.7
834	Sewage Treatment Plant	15.8
Total		62.2

Source: WAR, 1993



# LEGEND

186	Community Recreational Facilities
191	Undeveloped Land within Urban Areas
193/438	Urban Land in Transition without Positive Indicators of Intended Activity/Mixed Hardwoods
740/744	Disturbed Lands/Fill Area
834	Sewage Treatment Plant
---	Canal
==	Paved Road

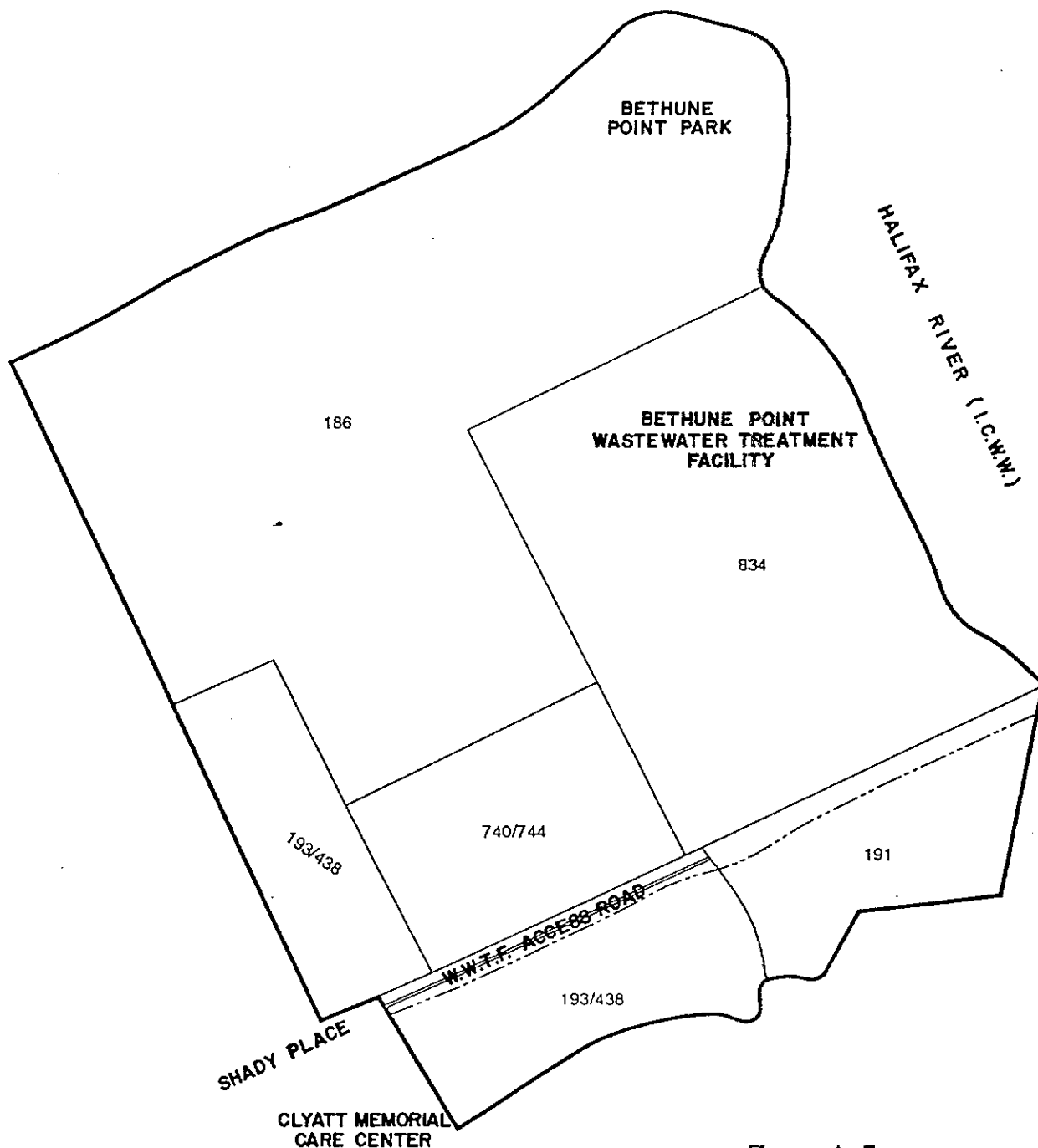
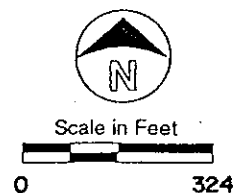
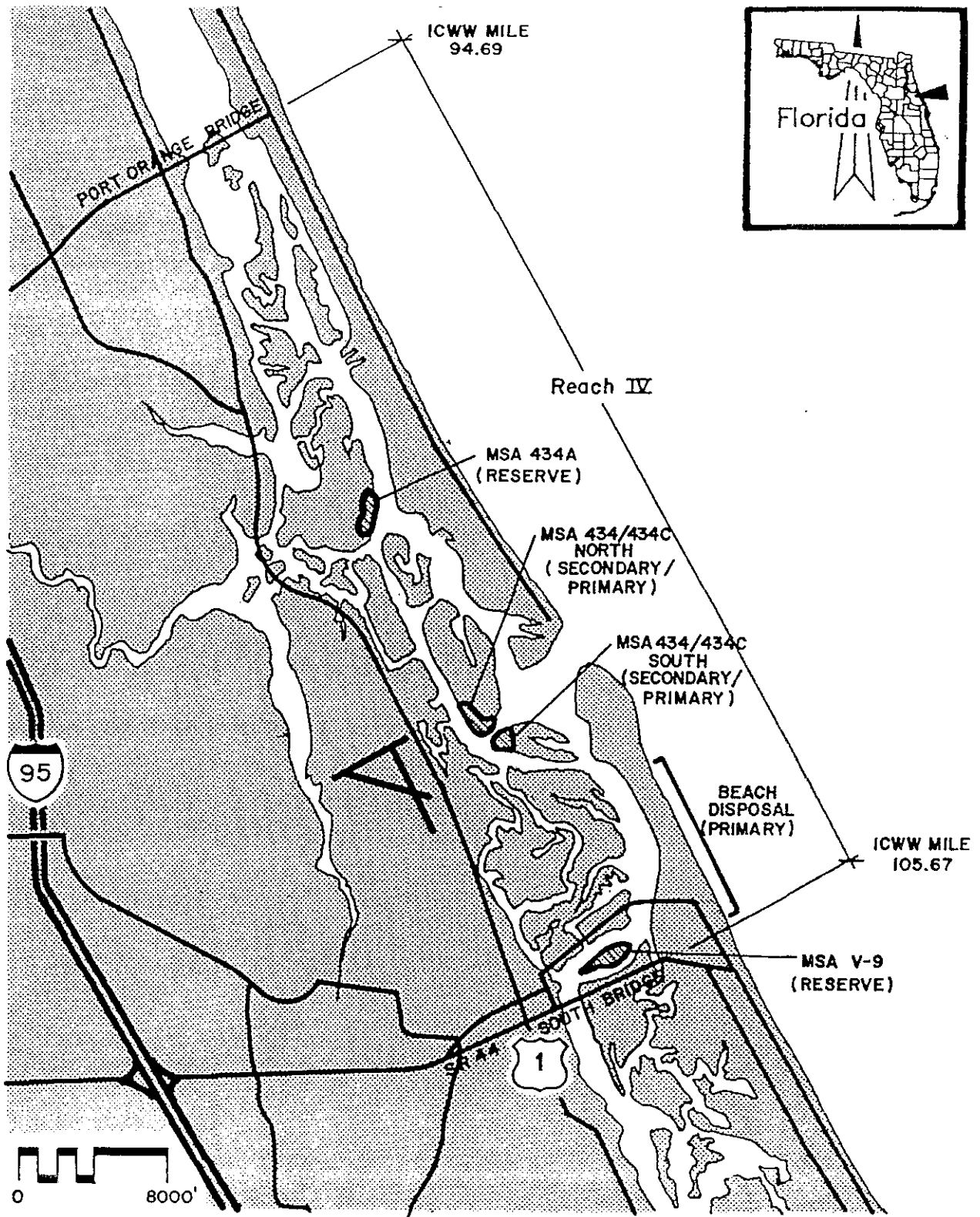


Figure A-7  
Vegetation and Land Use of  
Site V-29  
Volusia County, Florida





TAYLOR ENGINEERING INC  
9086 CYPRESS GREEN DRIVE  
JACKSONVILLE, FLORIDA 32256

Figure A-8  
Location Map  
Primary, Secondary, and Reserve Sites  
Reach IV  
Volusia County, Florida

PROJECT  
REVISION  
SHEET  
DATE

**SITE MSA 434A DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>IV</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>?/16S/33E</u>	<u>6,623,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>Ponce Inlet</u>	<u>10.98 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Port Orange Bridge (mi 94.69) to S.R. 44 Bridge (mi 105.67)</u>		<u>94.69 - 98.86</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>865.0 ac</u>	<u>22.45 ac</u>	<u>25.40 ac</u>	<u>Minimal Upland Buffer</u>
<b>Total Area of Esmt.</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+16.0 ft NGVD</u>	<u>382,164 cy</u>	<u>None Required</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>6.81 mi</u>	<u>15 ft</u>	<u>No Upland Access</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>No Upland Access</u>	<u>8.85 ft</u>	<u>None</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### **III Narrative Description**

FIND easement MSA 434A encompasses the western shore of the Halifax River from the Port Orange Bridge to the northern end of Ponce DeLeon Cut. However, only a single island within this easement, located adjacent to the north end of Ponce DeLeon Cut is considered suitable as a site for dredged material storage. This island was created by the placement of dredged material taken from the ICWW channel during past maintenance events. It presently contains a diked area that is nearly filled to capacity. Future use of the site would include reconfiguration of the existing dikes and possibly the removal of excess material. This site will serve as a backup staging and holding area for beach disposal operations within Reach IV.

Vegetation types shown in Figure A-6 are typical of those found in areas where dredged material has been placed in a saltwater marsh environment. Vegetation community types and sizes were determined through the evaluation of aerial photography of the site. However, these determinations have not been field varified.

- LEGEND**
- 310 Herbaceous
  - 429 Wax Myrtle-Willow
  - 642 Saltwater Marsh
  - 743 Spoil Areas

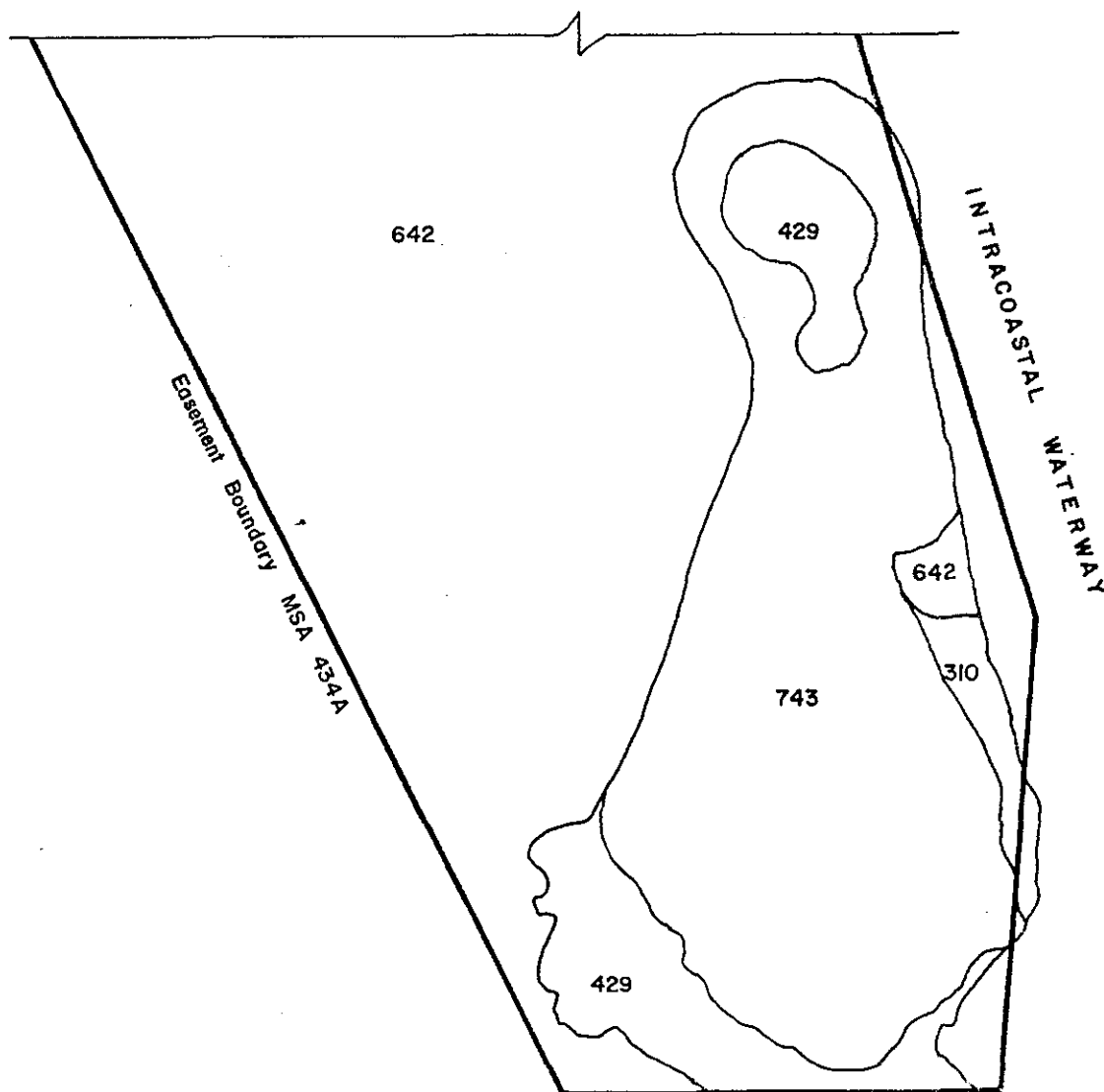
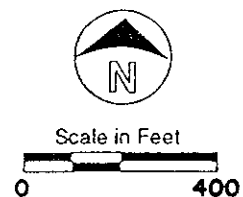


Figure A-9  
Vegetation and Land Use of  
MSA 434A  
Volusia County, Florida



**SITE MSA 434/434C DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>IV</u>	<u>ICWW/Rockhouse Creek</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>??/17S/34E</u>	<u>6,623,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>New Smyrna Beach</u>	<u>10.98 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Port Orange Bridge (mi 94.69) to SR 44 Bridge (mi 105.67)</u>		<u>N: 101.09 S: 101.47</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>378.0 ac</u>	<u>N: 44.22 S: 46.05</u>	<u>N: 57.88 S: 59.97</u>	<u>Minimal Upland Buffer ( &lt; 100 ft)</u>
<b>Total Area of Esmts.</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&gt; +20.0 ft NGVD</u>	<u>N: 761,361 cy S: 1,128,890 cy</u>	<u>None Required</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>6.06 mi</u>	<u>N: 15 ft S: 20 ft</u>	<u>No Upland Access</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>No Upland Access</u>	<u>N: 5.10 ft S: 5.73 ft</u>	<u>Saltwater Marsh</u>	<u>Freshwater Marsh</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

FIND easement MSA 434/434C lies along the eastern shore of Ponce DeLeon Cut. Two islands located within this area, one north and one south of Rockhouse Creek are suitable for dredged material management sites. Both of these islands were created by the deposition of material from past ICWW channel maintenance dredging.

Dredged material was deposited relatively recently on the island north of Rockhouse Creek. The existing mound presently rises approximately 35-40 feet above sea level. Sea oats (*Uniola paniculata*) and beach morning glory (*Ipomoea stolonifera*) are scattered throughout this area. The mound is surrounded by herbaceous vegetation, wax myrtle/willow communities, and saltwater marsh communities. Dominant vegetation species of the adjacent communities are cabbage palm (*Sabal palmetto*), southern red cedar (*Juniperus silicicola*), wax myrtle (*Myrica cerifera*), groundsel bush (*Baccharis halimifolia*), and prickly-pear cactus (*Opuntia sp.*). Oyster beds are present on the northern edge of the adjacent saltmarsh. This site was checked in May 1992 for nesting least terns, during another study; no evidence of their presence was found.

**Table A-6 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site MSA 434/434C (North), Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
422	Braxialian Pepper	25.9
429	Wax Myrtle-Willow	1.5
642	Saltwater Marsh	10.8
720	Sand Other than Beaches	7.9
720/429	Sand Other than Beaches/Wax Myrtle-Willow	23.8
Total		69.9

Source: WAR, 1993

The island south of Rockhouse Creek is dredged material disposal island is very similar to the north island. The center of the island contains large areas of exposed sand. Cabbage palm (*Sabal palmetto*), southern red cedar (*Juniperus silicicola*), wax myrtle (*Myrica cerifera*), Brazilian pepper (*Schinus terebinthifolius*), and Hercules club (*Zanthoxylum clava-herculis*) are scattered across the island. Several large slash pine (*Pinus elliottii*) occur in the wooded area on the east side of the island (422). Ground cover consists mainly of prickly-pear cactus (*Opuntia sp.*), and sea oats (*Uniola paniculata*).

This island is surrounded by salt marsh on the north, west, and east (off-site). A very thin band of saltmarsh, fringing the island's west and southern shores, consists of a thin beach community. No wetlands are present within the upland areas of the island. During the site visit an active gopher tortoise burrow was found. More borrows are likely to be scattered across the island.

**Table A-7 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site MSA 434/434C (South), Volusia County, Florida**

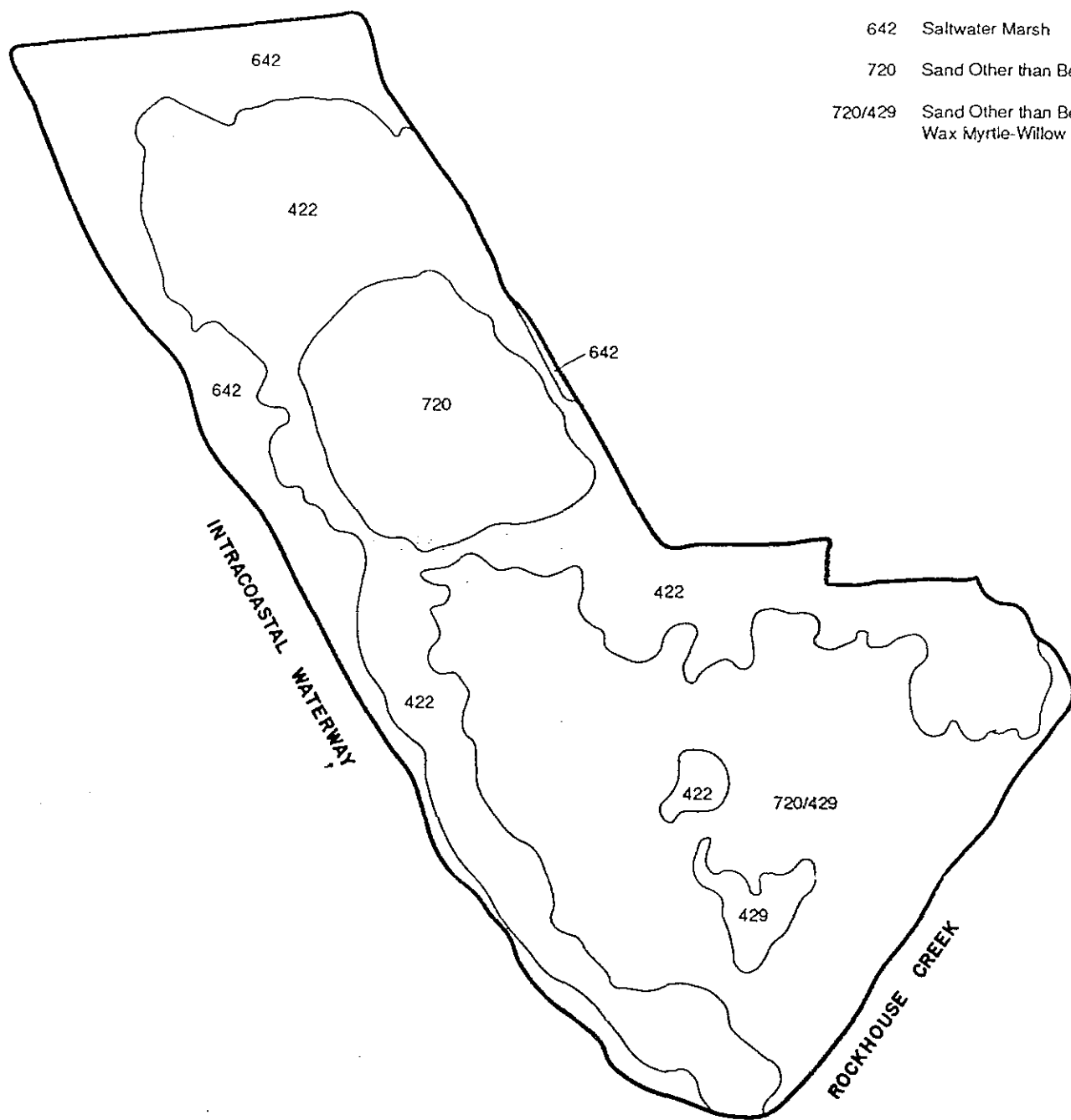
Map ID No.	Name	Approximate Acreage
310	Herbaceous	7.8
429	Wax Myrtle-Willow	12.2
641	Freshwater Marsh	0.3
642	Saltwater Marsh	1.8
743	Spoil Areas	31.6
720/429	Spoil Area/Herbaceous	2.5
<b>Total</b>		<b>56.2</b>

Source: WAR, 1993



LEGEND

- 422 Brazilian Pepper
- 429 Wax Myrtle-Willow
- 642 Saltwater Marsh
- 720 Sand Other than Beaches
- 720/429 Sand Other than Beaches/  
Wax Myrtle-Willow



Scale in Feet  
0 405

Figure A-10  
Vegetation and Land Use of  
MSA 434/434C (North)  
Volusia County, Florida



LEGEND

- 310 Herbaceous
- 429 Wax Myrtle-Willow
- 641 Freshwater Marsh
- 642 Saltwater Marsh
- 743 Spoil Areas
- 743/310 Spoil Area/Herbaceous

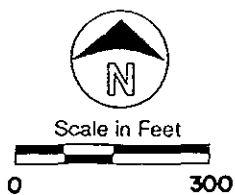
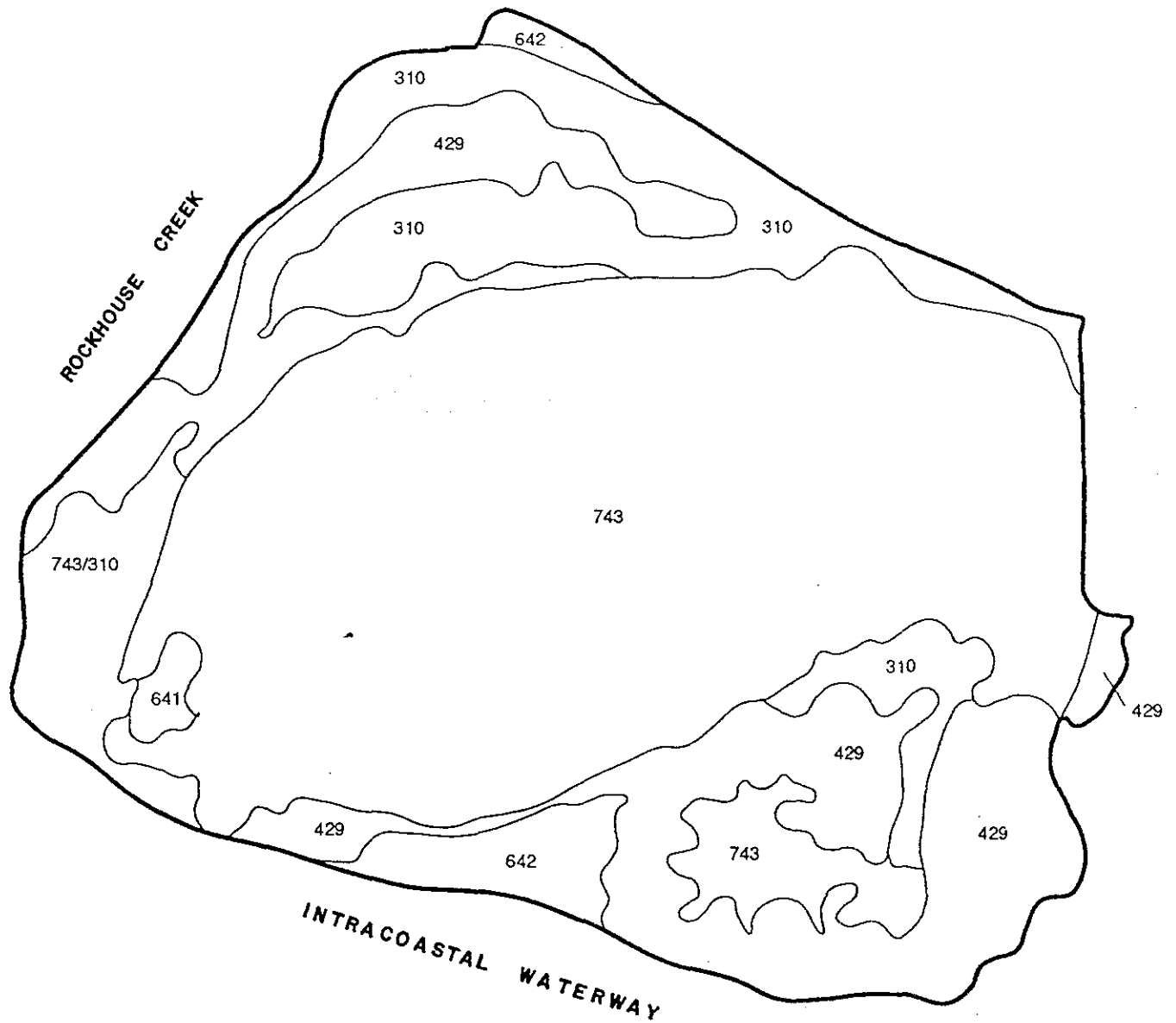


Figure A-11  
Vegetation and Land Use of  
MSA 434/434C (South)  
Volusia County, Florida



**SITE MSA V-9 DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>IV</u>	<u>Indian River North (ICWW)</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>??/17S/34E</u>	<u>6,623,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>New Smyrna Beach</u>	<u>10.98 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Port Orange Bridge (mi 94.69) to SR 44 Bridge (mi 105.67)</u>		<u>104.74</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>84.3 ac</u>	<u>7.52 ac</u>	<u>11.94 mi</u>	<u>Minimal Upland Buffer</u>
<b>Total Area of Esmt.</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+8.0 ft NGVD±</u>	<u>33,044 cy</u>	<u>None Required</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>5.49 mi</u>	<u>6 ft</u>	<u>No Upland Access</u>	<u>Mixed Residential/Marina /Public Land Use</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>No Upland Access</u>	<u>3.47 ft</u>	<u>Saltwater Marsh</u>	
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Find easement MSA V-9 contains three adjacent islands separated by saltwater marsh. The largest of these, Chicken Island, is the only one suitable for a dredged material storage site. MSA V-9 will serve as a backup staging and holding site for beach disposal operations in Reach IV.

Vegetation covers most of the islands as dredge material has not been deposited on them for at least 50 years; however, each island has small areas of exposed sand (743). The dominant tree canopy species are cabbage palms (*Sabal palmetto*), Washington palms (*Washingtonia* sp.), and some southern red cedar (*Juniperus silicicola*). The understory and ground cover species are predominantly wax myrtle (*Myrica cerifera*), groundsel bush (*Baccharis halimifolia*), sandspurs (*Cenchrus* sp.), and other weeds associated with disturbed coastal areas.

The saltwater marshes (642) which surround and separate the islands contain black mangroves (*Avicennia germinans*), tidal marsh grasses, and oyster bars. A large snake, probably an Eastern indigo snake (listed as threatened by state and federal agencies) was sighted on Chicken Island during the site inspection.

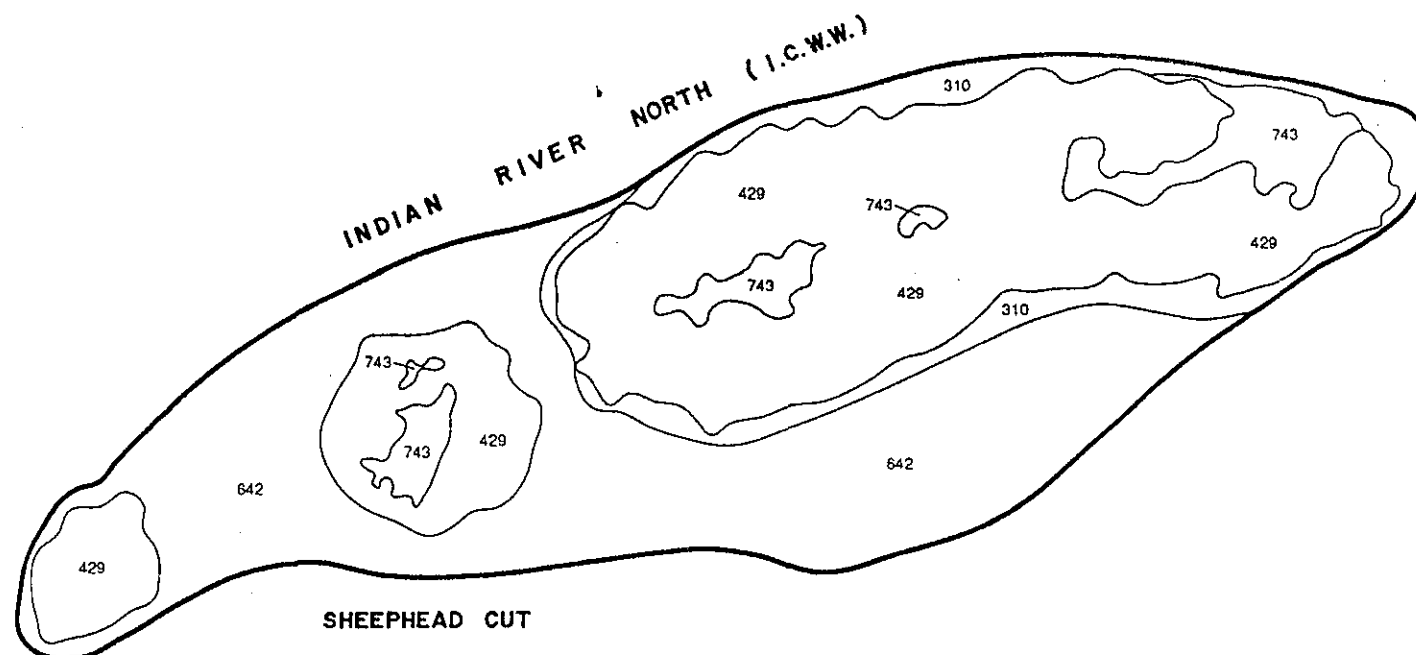
**Table A-8 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site MSA V-9, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
310	Herbaceous	2.7
429	Wax Myrtle-Willow	10.9
642	Saltwater Marsh	9.5
743	Spoil Areas	1.5
Total		24.6

Source: WAR, 1993

# LEGEND

- 310 Herbaceous
- 429 Wax Myrtle - Willow
- 642 Saltwater Marsh
- 743 Spoil Areas



Scale in Feet

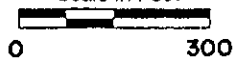
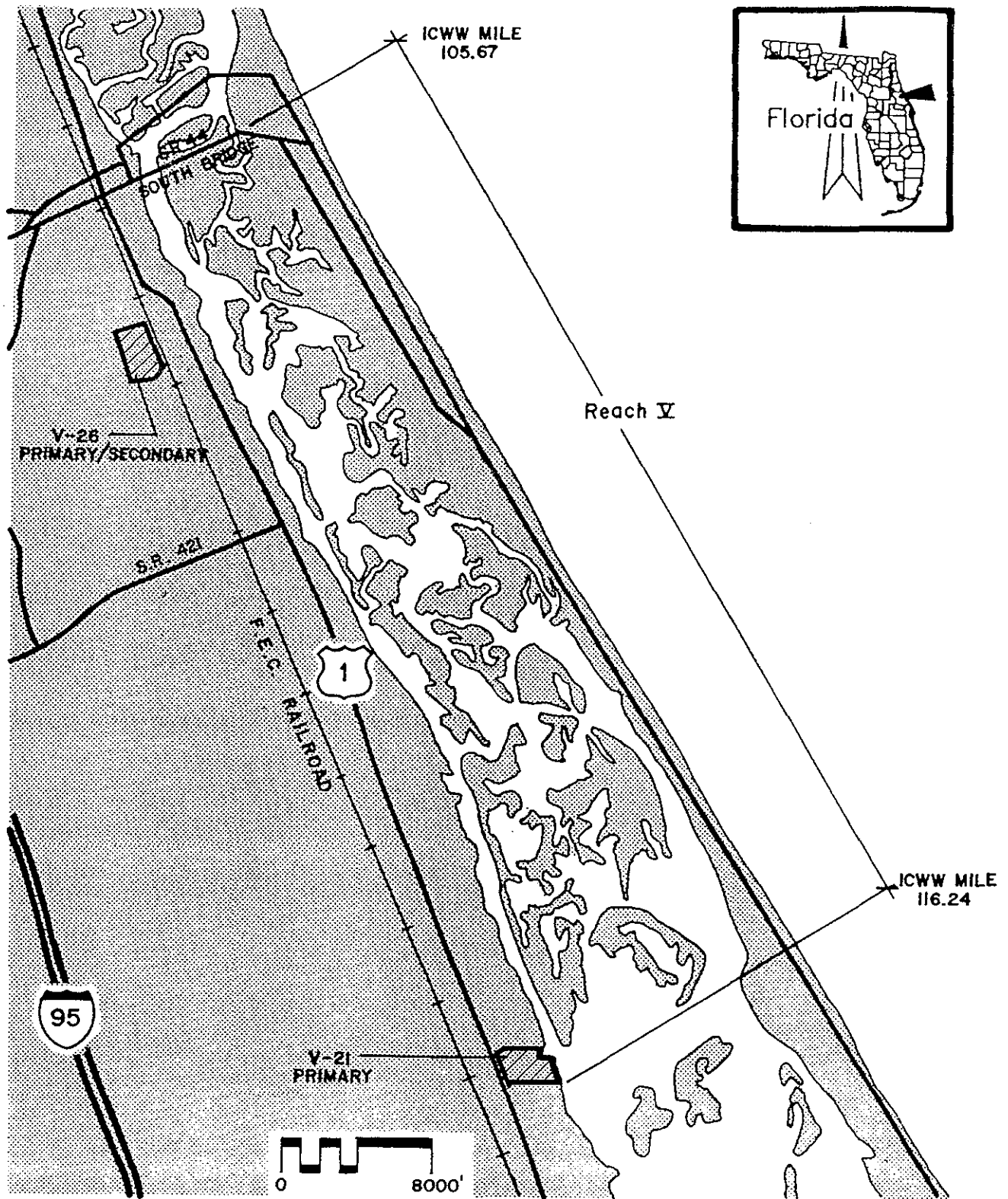


Figure A-12  
Vegetation and Land Use of  
MSA V-9  
Volusia County, Florida





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

**Figure A-13**  
**Location Map**  
**Primary and Secondary Sites,**  
**Reach V**  
**Volusia County, Florida**

PROJECT
REVISION
SHEET
DATE

SITE     V-26     DATA SUMMARY SHEET

I General Location

<u>Volusia</u>	<u>V</u>	<u>Indian River North</u>
County	Reach #	Waterbody Name
<u>29,50/17S/34E</u>	<u>836,000 cy</u>	<u>3,000 ft</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>Edgewater</u>	<u>10.57 mi</u>	<u>III</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>SR 44 Bridge (mi 105.67) to Eldora (mi 116.24)</u>		<u>106.98</u>
Reach Start/End		ICWW Mile of Site

II Site Characteristics

<u>128.6 ac</u>	<u>30.13 ac (50.24 ac)</u>	<u>78.39 ac (94.32 ac)</u>	<u>350 ft on N, S, W, 100 ft on E</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>+5.0 ft NGVD±</u>	<u>431,330 cy (870,770 cy)</u>	<u>3,000 ft</u>	<u>Industrial</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>4.66 mi (9.94 mi)</u>	<u>15 ft</u>	<u>None Required</u>	<u>Industrial, FEC RR, Undeveloped</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>10th Street</u>	<u>3.39 ft</u>	<u>Wetland Hardwood Forest</u>	<u>None</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

Site V-26, the primary site for Reach V, is located approximately 0.6 miles west of the Indian River. It is bounded on the east by the Florida East Coast Railroad right-of-way and on the north by 10th Street and the Gaborty Canal. Vegetation in the western half of the site consists mainly of a coniferous plantation (441) and includes slash pine (*Pinus elliottii*) and saw palmetto (*Serenoa repens*). A small wetland hardwood forest encroaches into the pine plantation along the western boundary of the site. This area is separated from the eastern half of the site by a large drainage canal which flows north into the Gaborty Canal.

The eastern part of the site contains a live oak (*Quercus virginiana*) community (427). This community contains cabbage palmetto (*Sabal palmetto*), saw palmetto, and some laurel oak (*Quercus laurifolia*). A portion of this community appears to have been impacted by the construction of a powerline easement and a road. Neither the powerline nor the road are presently in use and are overgrown by prickly pear cactus (*Opuntia* sp., listed by the state as threatened), blazing star, (*Liatris* sp.), laurel oak, muscadine grape (*Vitis rotundifolia*), live oak, and vegetation.

**Table A-9 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-26, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
427	Live Oak	73.7
434/741	Hardwood-Conifer Mixed/Rural Land in Transition Without Positive Indications of Intended Activity	11.3
441	Coniferous Plantations	41.7
610	Wetland Hardwood Forests	1.1
741	Rural Land in Transition Without Positive Indications of Intended Activity	0.8
Total		128.6

Source: WAR, 1993



# LEGEND

- 427 Live Oaks
- 434/741 Hardwood-Conifer Mixed/Rural Land in Transition Without Positive Indications of Intended Activity
- 441 Coniferous Plantations
- 610 Wetland Hardwood Forests
- 741 Rural Land in Transition Without Positive Indications of Intended Activity
- Canal
- ⊗ Archeological Site VOI13 (GV)  
State of Florida, Division of  
Historical Resources



Scale in Feet  
0 862

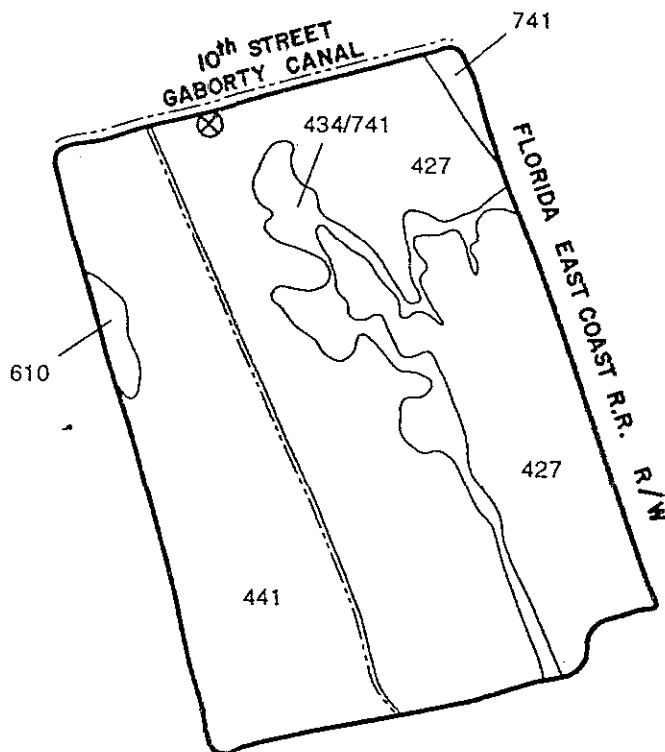


Figure A-14  
Vegetation and Land Use of  
Site V-26  
Volusia County, Florida



SITE     V-21     DATA SUMMARY SHEET

I General Location

<u>Volusia</u>	<u>V</u>	<u>Indian River North</u>
County	Reach #	Waterbody Name
<u>30,31,32/18S/35E</u>	<u>836,000 cy</u>	<u>1100 ft</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>N: Oak Hill S: Volusia Co.</u>	<u>10.57 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classification
<u>S.R. 44 Bridge (mi 105.67) to Eldora (mi 116.24)</u>		<u>115.59</u>
Reach Start/End		ICWW Mile of Site

II Site Characteristics

<u>138.9 ac</u>	<u>26.91 ac</u>	<u>76.32 ac</u>	<u>350 ft</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>8.0 ft± NGVD</u>	<u>424,488 cy</u>	<u>800 ft±</u>	<u>N: Unspec. Residential S: Urban Med. Intensity</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>9.87 mi</u>	<u>14 ft</u>	<u>None</u>	<u>Manufactured Home/Campground, Scattered Residential</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>U.S. 1</u>	<u>4.0 ft</u>	<u>None</u>	<u>Freshwater Marsh</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

Site V-21 lies on the western shore of the Indian River. It is bounded on the west by U.S. Highway 1. Much of the west and central portions of the site are vegetated by coastal scrub (322) species and the eastern portion is dominated by temperate hardwoods (425).

The coastal scrub community is very dense, having not been burned for a number of years. Vegetation there averages about 15 ft in height and includes sand live oak (*Quercus geminata*), myrtle oak (*Quercus myrtifolia*), Chapman's oak (*Quercus chapmani*), rusty lyonia (*Lyonia ferruginea*), saw palmetto (*Serenoa repens*), and slash pine (*Pinus elliottii*). The remnants of a building site remain in the northwestern corner of this area.

The temperate hardwood community is vegetated with cabbage palm (*Sabal palmetto*), live oak (*Quercus virginiana*), red bay (*Persea borbonia*), and red cedar (*Juniperus silicicola*).

An isolated freshwater marsh (641) lies near the center of the site on the division line between the scrub and temperate hardwood communities. Its center is vegetated by herbaceous species including sand cordgrass (*Spartina bakerii*) and cattail (*Typha* sp.). A margin of wax myrtle (*Myrica cerifera*), cabbage palm (*Sabal palm*), and swamp dogwood (*Cornus foemina*) surrounds the herbaceous vegetation.

Several mounds of dredged material (740) are located within the site along the shore of the ICWW. These areas host a vegetation cover of broomsedge (*Andropogon* sp.), horse mint (*Monarda punctata*), spanish needles (*Bidens pilosa*) and sneezeweed (*Heterotheca subaxillaris*). A fringe of cabbage palm and red cedar surround the mounds.

**Table A-10 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-21, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
190	Open Land	3.6
322	Coastal Scrub	91.6
425	Temperate Hardwoods	34.8
641	Freshwater Marsh	0.5
740	Disturbed Land	8.4
Total		138.9

Source: WAR, 1993

# LEGEND

- 190 Open Land
- 322 Coastal Scrub
- 425 Temperate Hardwoods
- 641 Freshwater Marsh
- 740 Disturbed Land
- == Road
- Ditch/Creek



Scale in Feet  
0 846

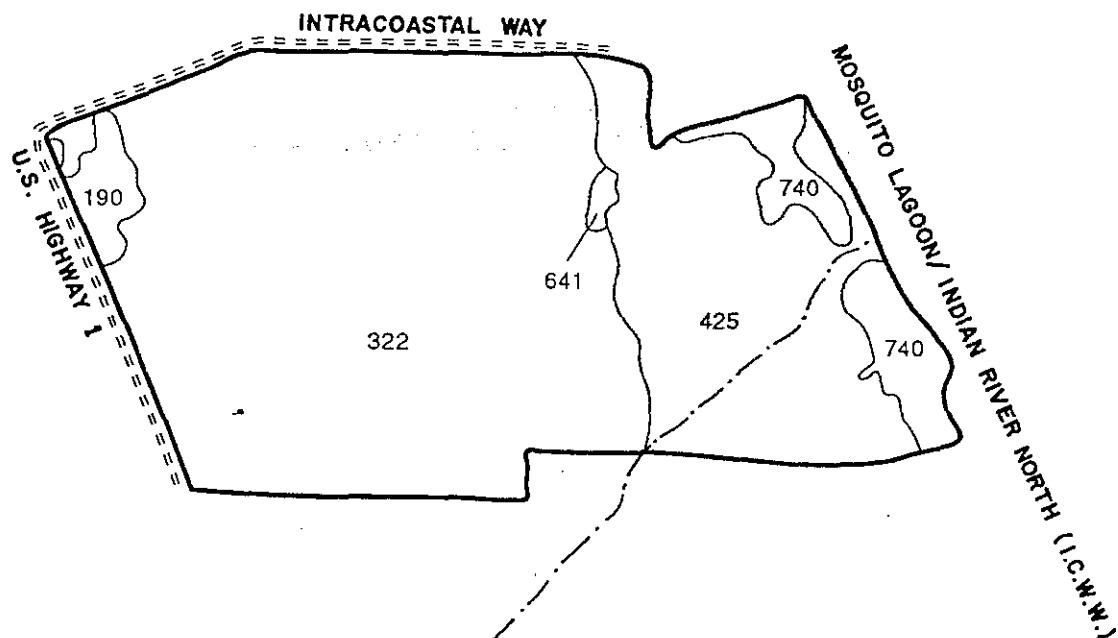
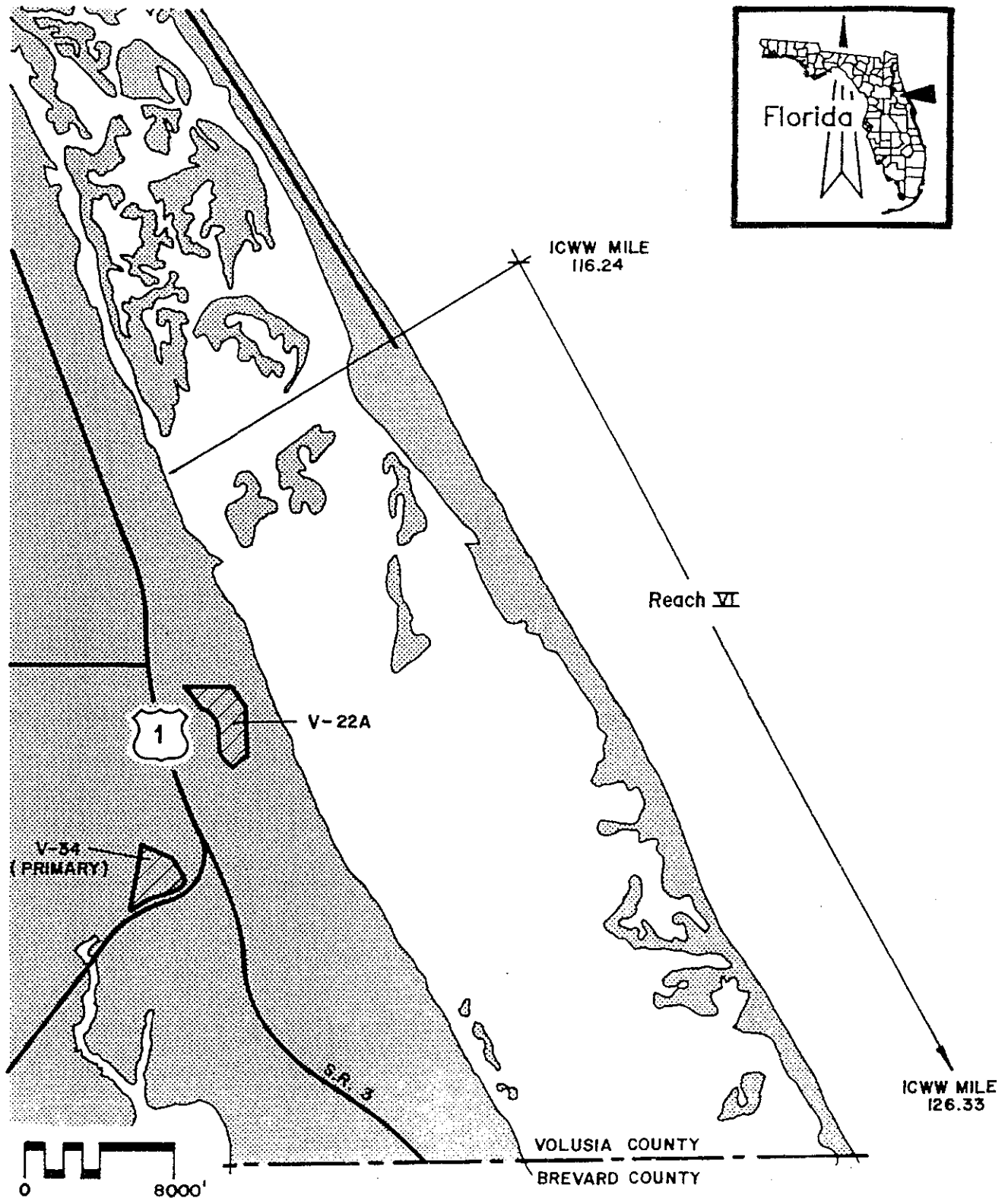


Figure A-15  
Vegetation and Land Use of  
Site V-21  
Volusia County, Florida





TAYLOR ENGINEERING INC  
9086 CYPRESS GREEN DRIVE  
JACKSONVILLE, FLORIDA 32256

Figure A-16  
Location Map  
Primary and Secondary Sites,  
Reach VI  
Volusia County, Florida

PROJECT
REVISION
SHEET
DATE

SITE V-22A DATA SUMMARY SHEET

I General Location

<u>Volusia</u>	<u>VI</u>	<u>Mosquito Lagoon/Indian River N.</u>
County	Reach #	Waterbody Name
<u>8/19S/35E</u>	<u>480,000 cy</u>	<u>2000 ft to Mosquito Lagoon</u> <u>3800 ft to ICWW</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>Oak Hill</u>	<u>10.09 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>Eldora (mi 116.24) to Haulover Canal (mi 126.33)</u>		<u>118.26</u>
Reach Start/End		ICWW Mile of Site

II Site Characteristics

<u>203.0 ac</u>	<u>36.31 ac</u>	<u>108.99 ac</u>	<u>350 ft</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>+ 15.0 ft NGVD</u>	<u>520,686 cy</u>	<u>1100 ft</u>	<u>AG/Unspec. Residential</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>8.69 mi</u>	<u>13 ft</u>	<u>None Req'd</u>	<u>AG./Unspecified</u> <u>Residential/Conservation</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>Unknown roads East off U.S. 1</u>	<u>3.52 ft</u>	<u>None</u>	<u>None</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

Site V-22A is located in the City of Oak Hill approximately 0.7 miles west of the ICWW. Site vegetation consists of a variety of cover types including coastal scrub (322) located in the south central and southwestern portions of the property, a former citrus grove site (261) in the northeastern site corner, pine flatwoods (411) along the northwestern boundary, and temperate hardwoods (425) along the eastern boundary. A small residential area (110) is located near the northwestern site corner.

The former citrus grove has been cleared. The coastal scrub community contains a dense cover of oaks (*Quercus geminata*, *Q. myrtifolia*, and *Q. chapmanii*). Scrub jays were sighted in this area during the site inspection. The scrub jay is listed by state and federal agencies as threatened. The temperate hardwoods canopy includes live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), and pignut hickory (*Carya glabra*).

**Table A-11 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-22A Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
110	Low Density Residential	5.6
261	Fallow Cropland	42.6
322	Coastal Scrub	111.2
411	Pine Flatwoods	16.9
425	Temperate Hardwoods	26.7
Total		203.0

Source: WAR, 1993

# LEGEND

- 110 Low Density Residential
- 261 Fallow Cropland
- 322 Coastal Scrub
- 411 Pine Flatwoods
- 425 Temperate Hardwoods

== Road

--- Ditch

--- Boundary, Canaveral National Seashore



Scale in Feet

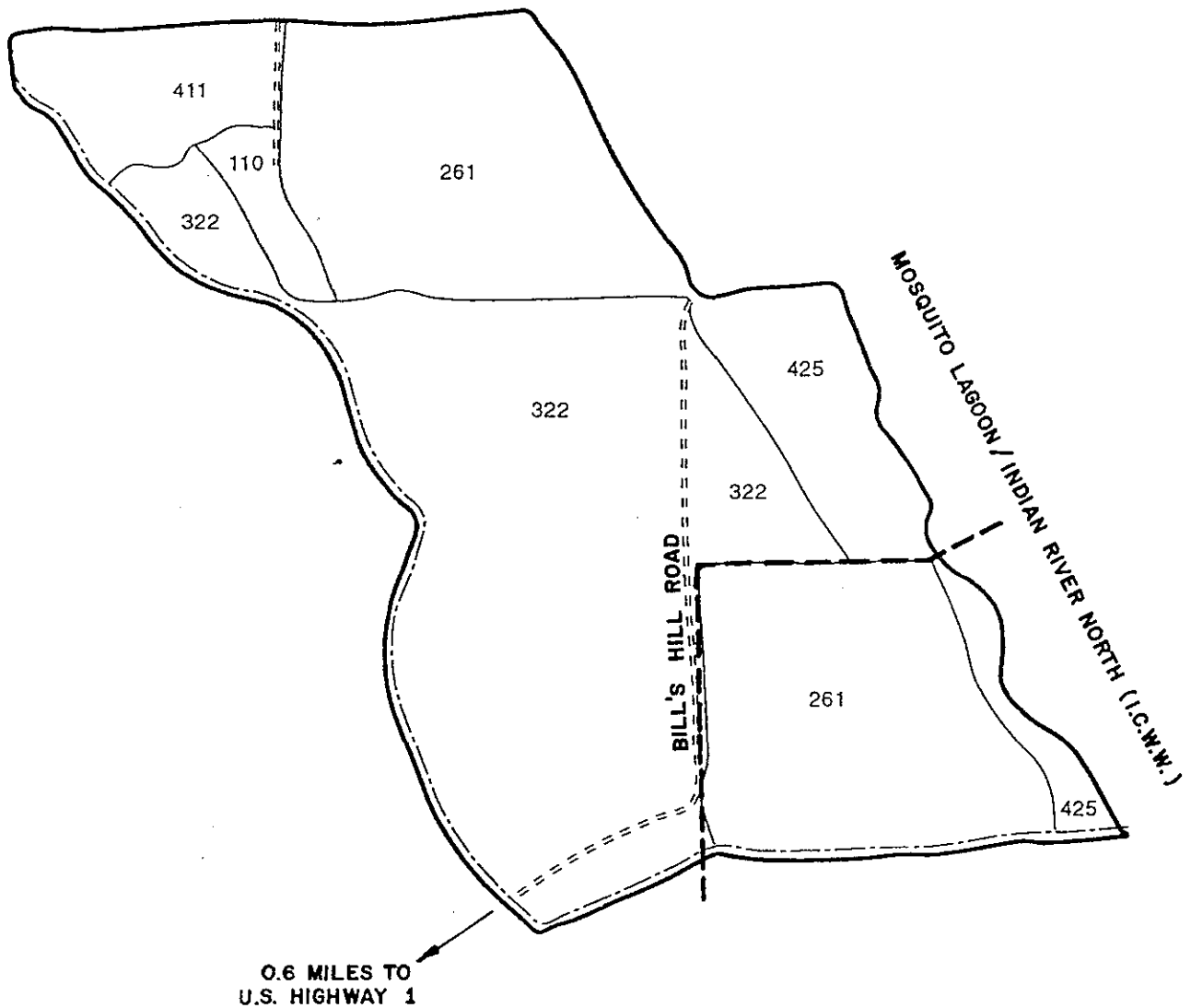


Figure A-17  
Vegetation and Land Use of  
Site V-22A  
Volusia County, Florida





SITE     V-34     DATA SUMMARY SHEET

I General Location

<u>Volusia</u>	<u>VI</u>	<u>Mosquito Lagoon/Indian River N.</u>
County	Reach #	Waterbody Name
<u>Pablo Rosette Grant/19S/35E</u>	<u>480,000 cy</u>	<u>1.61 mi</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>N/A</u>	<u>10.09 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>Eldora (mi 116.24) to Haulover Canal (mi 126.33)</u>		<u>120.19</u>
Reach Start/End		ICWW Mile of Site

II Site Characteristics

<u>141.9 ac</u>	<u>30.76 ac</u>	<u>71.36 ac</u>	<u>&gt; 375 ft/350 ft/350 ft/ &gt; 670 ft</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>Contains pits of unknown depth</u>	<u>529,760 cy</u>	<u>2.26 mi</u>	<u>Rural</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>8.84 mi</u>	<u>15 ft</u>	<u>N/A</u>	<u>Agriculture Resource, Conservation, Environ- mental System Cooridor</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>U.S. 1</u>	<u>4.68 ft</u>	<u>Stream and Lake Swamps (Bottomland)</u>	<u>Inland Ponds and Sloughs</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

Site V-34 is located approximately 1.6 miles west of the Indian River. It is bounded on the south by U.S. Highway 1, on the west by the Florida East Coast Railroad right-of-way, and on the north and east by Fullerton Grove Road. An active sand mine (162) occupies much of the site, although a maintained orange grove (221) exists in the southwestern site corner. A large, wet, stream swamp (615), or "bottomland" community lies between the railroad right-of-way and the sand mine. There are several canals and large ditches within the community, which at the time of the site visit (January 27, 1993), were filled with water. Much of wetland was also inundated at that time. The runoff from the adjacent mine apparently flows into the bottomland and is carried offsite by the canals. The bottomland is connected to a large wetland west of the railroad right-of-way by ditches and canals. Tree species in the wetland community include red maple (*Acer rubrum*), Florida elm (*Ulmus floridana*), sugarberry (*Celtis laevigata*), cabbage palm (*Sabal palmetto*), and laurel oak (*Quercus laurifolia*). Dominant ground cover species include dragons tongue (*Arisaema dracontium*), wild coffee (*Psychotria nervosa*), and poison ivy (*Toxicodendron radicans*). Golden polypody fern (*Phlebodium aureum*, listed by the state as threatened) and shoestring fern (*Vittaria lineata*) grow on many of the cabbage palms.

Pine flatwoods (411) and hardwood-conifer mix (434) communities are located in the northern portion of the site. The flatwoods contain mostly slash pine (*Pinus elliottii*) and saw palmetto, while the hardwood-conifer mix consists of laurel oak, saw palmetto, groundsel bush (*Baccharis halimifolia*), and muscadine grape (*Vitis rotundifolia*). The presence of orange trees within the hardwood-conifer mix community indicates that this area may have once hosted orange groves. An osprey nest is located in the southeastern portion of the site. An old eagle nest, located in the southeastern central portion of the active sand mine area, appears to be abandoned.

**Table A-12 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-34, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
162	Sand and Gravel Pits	77.9
166	Holding Pond	7.0
221	Citrus Groves	7.1
411	Pine Flatwoods	9.2
434	Hardwood - Conifer Mix	13.0
615	Stream, Lake, and Swamps	27.6
616	Inland Ponds and Sloughs	0.1
<b>Total</b>		<b>141.9</b>

Source: WAR, 1993

# LEGEND

162 Sand and Gravel Pits	616 Inland Ponds and Sloughs
166 Holding Pond	+++++ Railroad
221 Citrus Groves	..... County Dirt Road
411 Pine Flatwoods	==== Highway (U.S. 1)
434 Hardwood - Conifer Mix	---- Canals
615 Stream and Lake Swamps (Bottomland)	* Old Eagles Nest

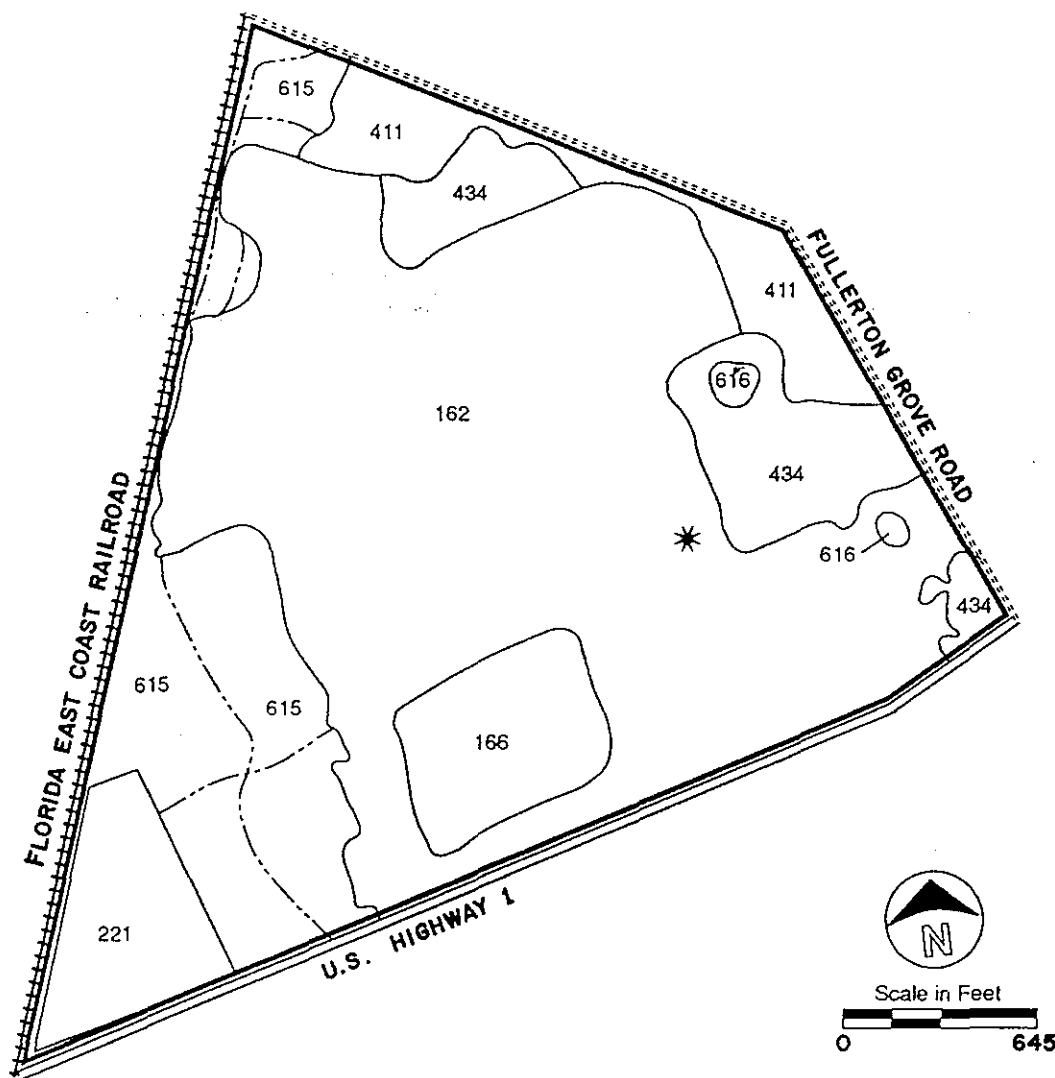
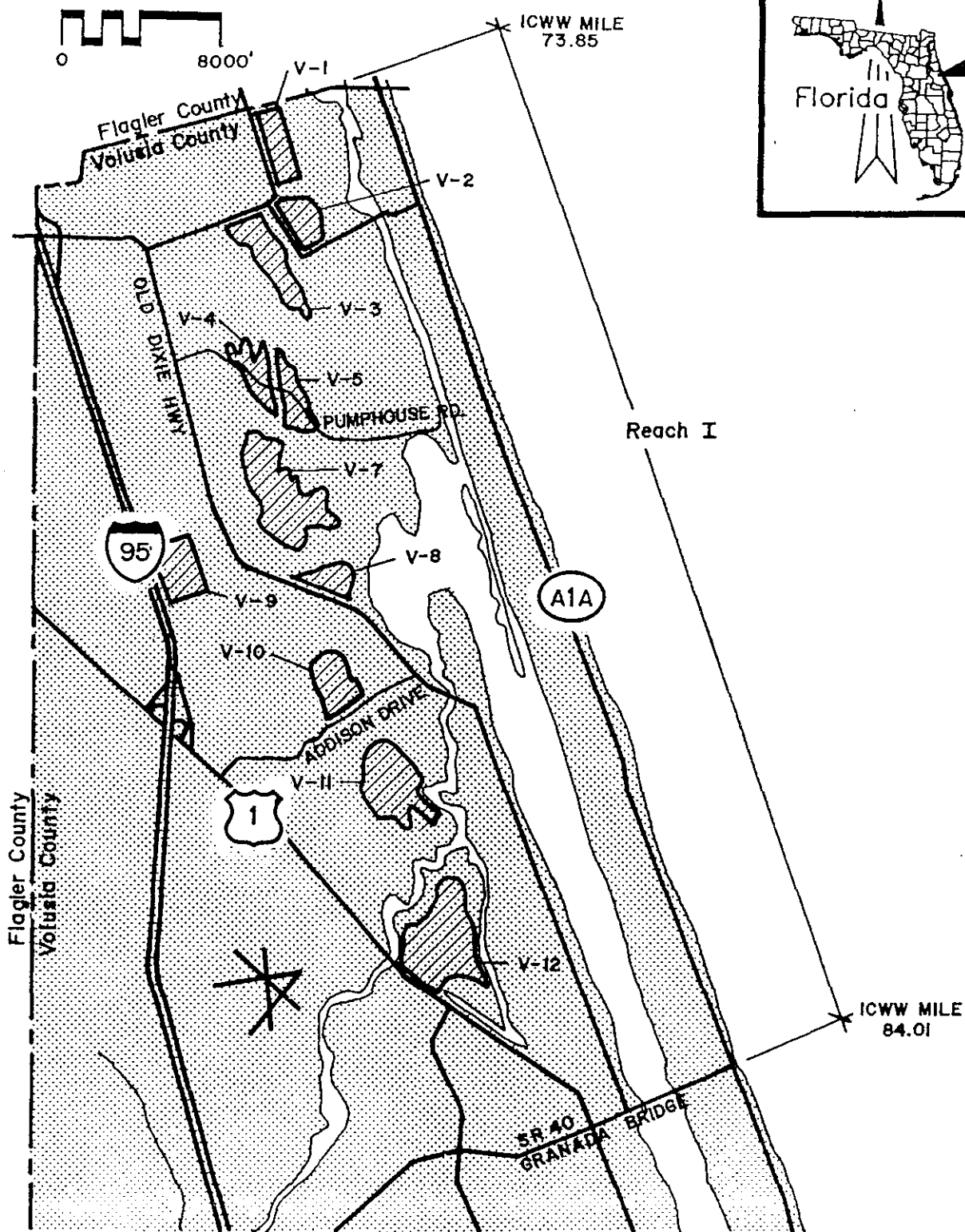


Figure A-18  
Vegetation and Land Use of  
Site V-34  
Volusia County, Florida



**APPENDIX B**  
**Other Candidate Sites**



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

**Figure B-1**  
**Location Map**  
**Candidate Sites**  
**Reach I**  
**Volusia County, Florida**

PROJECT
REVISION
SHEET
DATE

SITE     V-1     DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Smith Creek</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>37,38/12S/32E</u>	<u>862,000 cy</u>	<u>3,300 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>73.91</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>122.15 ac</u>	<u>55.02 ac</u>	<u>119.28 mi</u>	<u>300 ft</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+8 - 10 ft NGVD</u>	<u>953,940 cy</u>	<u>Extensive Marsh Crossing</u>	<u>Rural</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>9.86 mi</u>	<u>15 ft</u>	<u>None Req'd</u>	<u>Low Density Residential</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>John Anderson Hwy.</u>	<u>3.37 ft</u>	<u>Saltmarsh (3.3 ac)</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-1 is bounded on the west by John Anderson Highway and on the north by the Volusia/Flagler County line. It contains low density, single family housing on large lots. Because of this development, the site has been dropped from further consideration as a candidate site.

Two areas within the site contain live oak hammocks (110/427). The rest of the site has been mostly cleared of native vegetation (110). Vegetation in the live oak hammocks includes southern magnolia (*Magnolia grandiflora*), saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), cabbage palm (*Sabal palmetto*), rusty lyonia (*Lyonia ferruginea*), and water oak (*Quercus nigra*). Florida coontie (*Zamia umbrosa*), a species listed as threatened by the state, is abundant in the hammock areas.

Cleared residential areas (110) contain scattered live oak (*Quercus virginiana*), red cedar (*Juniperus silicicola*), and pignut hickory (*Carya glabra*) trees. Ground cover includes Bahia grass (*Paspalum notatum*), various landscaping species, prickly pear cactus (*Opuntia* sp., a threatened species), and Florida coontie. Gopher tortoise (*Gopherus polyphemus*) borrows are located in the cleared areas. The state lists the Gopher tortoise as a species of special concern. A small strip of saltmarsh lies along the eastern site boundary.

**Table B-1 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-1, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
110	Residential, Low Density	65.2
110/427	Residential, Low Density/Live Oak	52.7
642	Saltwater Marsh	3.3
Total		121.2

Source: WAR, 1993



# LEGEND

- 110 Residential, Low Density
- 110/427 Residential, Low Density/Live Oak
- 642 Saltwater Marsh



Scale in Feet



Volusia / Flagler County Line

John Anderson Hwy.

110

110/427

110

110/427

642

0.6 Miles to  
I.C.W.W.

Figure B-2  
Vegetation and Land Use of  
Site V-1  
Volusia County, Florida



SITE     V-2     DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Smith Creek/Bulow Creek</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>6,44/13S/32E</u>	<u>862,000 cy</u>	<u>4,000 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>74.91</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>108.93 ac</u>	<u>49.84 ac</u>	<u>98.74 mi</u>	<u>&gt; 200 ft</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+ 10 ft NGVD</u>	<u>864,482 cy</u>	<u>3800 ft</u>	<u>Conservation/Env. System Corridor</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>9.63 mi</u>	<u>15 ft</u>	<u>N/A</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Highbridge Rd.</u>	<u>3.21 ft</u>	<u>Streams, Waterways, Saltmarsh</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-2 lies on the easter shore of Bulow Creek. Much of the site is occupied by an old orange grove (221/741). It is heavily overgrown with greenbriar (*Smilax* sp.), muscadine grage (*Vitis rotundifolia*), goldenrod (*Solidago* sp.), sandspurs (*Cenchrus* sp.), and prickly pear cactus (*Opuntia* sp., listed in Florida as threatened). Many gopher tortoise (*Gopherus polyphemus*) burrows were seen in this area during the site visit. The Gopher tortoise is a species of special concern in Florida.

Bands of temperate hardwoods (425) and salt marsh (642) lis along the eastern site boundary. Some of the more common plants in the temperate hardwoods are yaupon holly (*Ilex vomitoria*), southern magnolia (*Magnolia grandiflora*), and the listed species Florida coontie (*Zamia umbrosa*). Giant leather fern (*Acrostichum danaeifolium*, listed as threatened by the state) are sparsely scattered throughtout the saltmarsh community.

A narrow bank of red cedar (*Juniperus silicicola*, 451) and a tidally connected body of water (510) lie along the southern site boundary. An historic residential site (the family home of baseball great Ty Cobb) is located in the southwestern corner and another old homesite (110/741) is located in the center of the western boundary. the only structures on-site are dilapidated sheds.

**Table B-2 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-2, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
110/741	Residential, Low Density/Rural Land in Transition Without Positive Indicators of Intended Activity	2.2
221/741	Citrus Groves/Rural Land in Transition Without Positive Indicators of intended Activity	86.4
425	Temperate Hardwoods	11.0
451	Red Cedar	2.7
510	Streams and Waterways	0.8
645	Saltwater Marshes	5.8
Total		108.9

Source: WAR, 1993

# LEGEND

- 110/741 Residential, Low Density/Rural Land in Transition Without Positive Indicators of Intended Activity
- 221/741 Citrus Groves/Rural Land in Transition Without Positive Indicators of Intended Activity
- 425 Temperate Hardwoods
- 451 Red Cedar
- 510 Streams and Waterways
- 642 Saltwater Marshes



Scale in Feet  
0 858

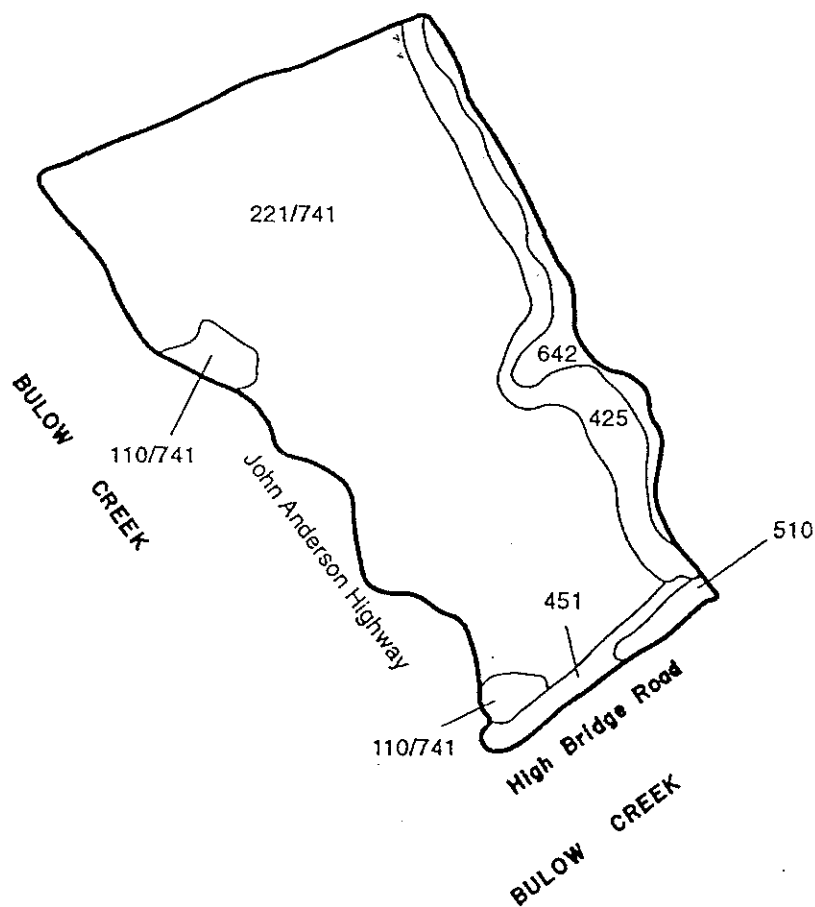


Figure B-3  
Vegetation and Land Use of  
Site V-2  
Volusia County, Florida



SITE     V-3     DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax Creek</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>6,7,45/13S/32E</u>	<u>862,000 cy</u>	<u>6,000 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>75.11</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>198.2 ac</u>	<u>55.23 ac</u>	<u>128.92 ac</u>	<u>200 ft/700 ft/200-400 ft</u>
<b>Initial Site Area</b>	<b>Containment Acreage</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+ 50 ft NGVD</u>	<u>948,700 cy</u>	<u>&gt; 6000 ft (Marsh)</u>	<u>Conservation/Env. System Corridor</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>9.46 mi</u>	<u>15 ft</u>	<u>None Req'd</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>(No direct access) Walter Boardman</u>	<u>6.35 ft</u>	<u>Vegetated Non-Forested Wetlands, Saltmarsh</u>	<u>Wetland Hardwood Forest</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-3 lies west of Bulow Creek within Bulow Creek State Park. It is bordered on the north by Walter Boardman Road. The northern portion of the site is occupied by a pine plantation (441) containing 8 to 11 inches dbh (diameter at breast height) slash pine (*Pinus elliotii*). Cabbage palm (*Sabal palmetto*) and a variety of hardwoods are also present there. Clearings within the plantation contain a shrubby vegetation cover (320) consisting of cabbage palm, saw palmetto (*Serenoa repens*), and a variety of grasses. A band of temperate hardwoods (425) lies along the eastern site boundary.

The southern part of the site is vegetated by temperate hardwood (425) species including live oak (*Quercus virginiana*), pignut hickory (*Carya glabra*), southern magnolia (*Magnolia grandiflora*), and cabbage palm. Saw palmetto, wax myrtle (*Myrica cerifera*), yaupon (*Ilex vomitoria*), and Florida Coontie (*Zamia umbrosa*) are also interspersed in this area. Butterfly orchids (*Encyclia tampensis*, listed as threatened by the state) are present here in live oak trees. Several Gopher tortoise burrows are located in the temperate hardwood community as well as in sandy clearings (740) within the hammock. The Gopher tortoise is listed as a species of special concern by the state.

**Table B-3 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-3, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
320	Shrub and Brushland	30.7
425	Temperate Hardwoods	108.3
441	Coniferous Plantations	55.1
610	Wetland Hardwood Forests	0.3
640	Vegetated Non-Forested Wetlands	3.2
740	Disturbed Land	0.6
Total		198.2

Source: WAR, 1993

# LEGEND

- 320 Shrub and Brushland
- 425 Temperate Hardwoods
- 441 Coniferous Plantations
- 610 Wetland Hardwood Forests
- 640 Vegetated Non-Forested Wetlands
- 642 Saltwater Marsh
- 740 Disturbed Land
- = = = Road



Scale in Feet

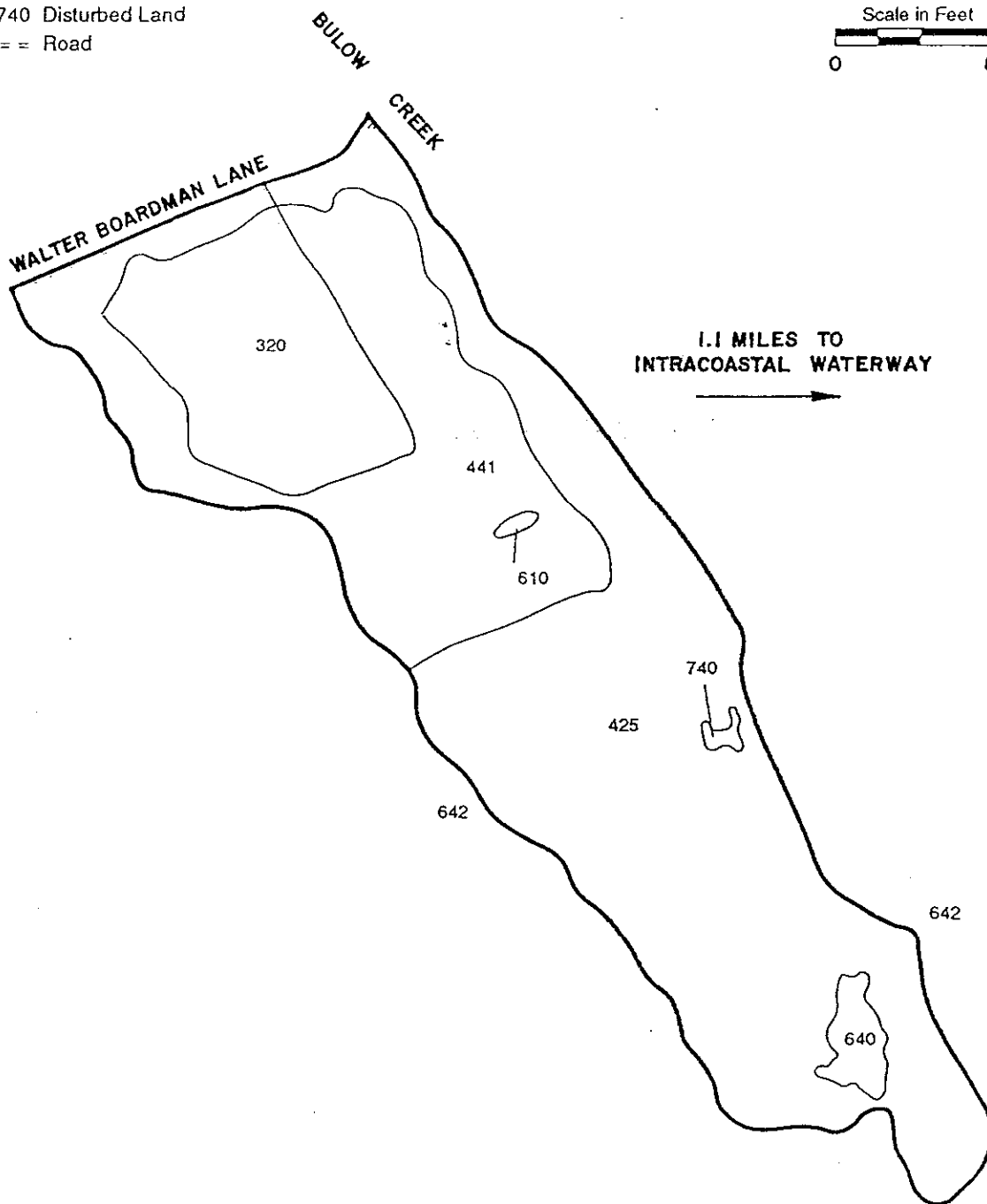
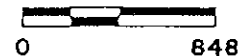


Figure B-4  
Vegetation and Land Use of  
Site V-3  
Volusia County, Florida



SITE V-4 DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax Creek</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>37/13S/32E</u>	<u>862,000 cy</u>	<u>7,300 ft</u>
<u>7,18,37,38/13S/32E</u>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<b>Sec/Twp/Rge</b>	<u>10.16 mi</u>	<u>III</u>
<u>N/A</u>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<b>Municipality</b>	<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>	<u>76.50</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>119.49 ac</u>	<u>41.52 ac</u>	<u>95.79 ac</u>	<u>&gt; 200 ft</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>534,723 cy</u>	<u>&gt; 8000 ft (Marsh)</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>7.57 mi</u>	<u>12 ft</u>	<u>None</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Pumphouse Rd.</u>	<u>3.24 ft</u>	<u>Mixed Forested Wetlands</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>



### III Narrative Description

Site V-4 is located in Bulow Creek State Park. A planted slash pine (*Pinus elliottii*) plantation (441) occupies most of the site. The trees are typically 8 to 10 inches dbh (diameter at breast height). Cabbage palm (*Sabal palmetto*) shrubs and trees cover much of the site between the pine. Other species include bracken fern (*Pteridium aquilinum*), saw palmetto (*Serenoa repens*), and muscadine (*Vitis rotundifolia*).

A band of forested wetland (630) fringes the northern site boundary. Species in this community include red maple (*Acer rubrum*), Florida elm (*Ulmus floridana*), cabbage palm, slash pine, southern red cedar (*Juniperus silicicola*), and live oak (*Quercus virginiana*). Temperate hardwoods (425) are also present within drier portions of the forested wetland. The site is bordered on the east and west by narrow wetland bands containing creeks or ditches. Areas adjacent to the northern and southern site boundaries contain tidal marsh (642).

**Table B-4 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-4, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
425	Temperate Hardwoods	4.1
441	Coniferous Plantations	94.1
630	Wetland Forested Mixed	21.3
642	Saltwater Marsh	
Total		119.5

Source: WAR, 1993

**SITE V-5 DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax Creek/Tomoka Basin</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>18/13S/32E</u>	<u>862,000 cy</u>	<u>7,000 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>76.67</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>100.95</u>	<u>31.92 ac</u>	<u>76.13 ac</u>	<u>&gt; 200 ft</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>410,812 cy</u>	<u>&gt; 7000 ft</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>8.44 mi</u>	<u>12 ft</u>	<u>None</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Pumphouse Rd.</u>	<u>3.24 ft</u>	<u>None</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

# LEGEND

- 425 Temperate Hardwood
- 441 Coniferous Plantation
- 630 Wetland Forested Mixed
- 642 Saltwater Marsh
- == = Road



Scale in Feet  
0 838

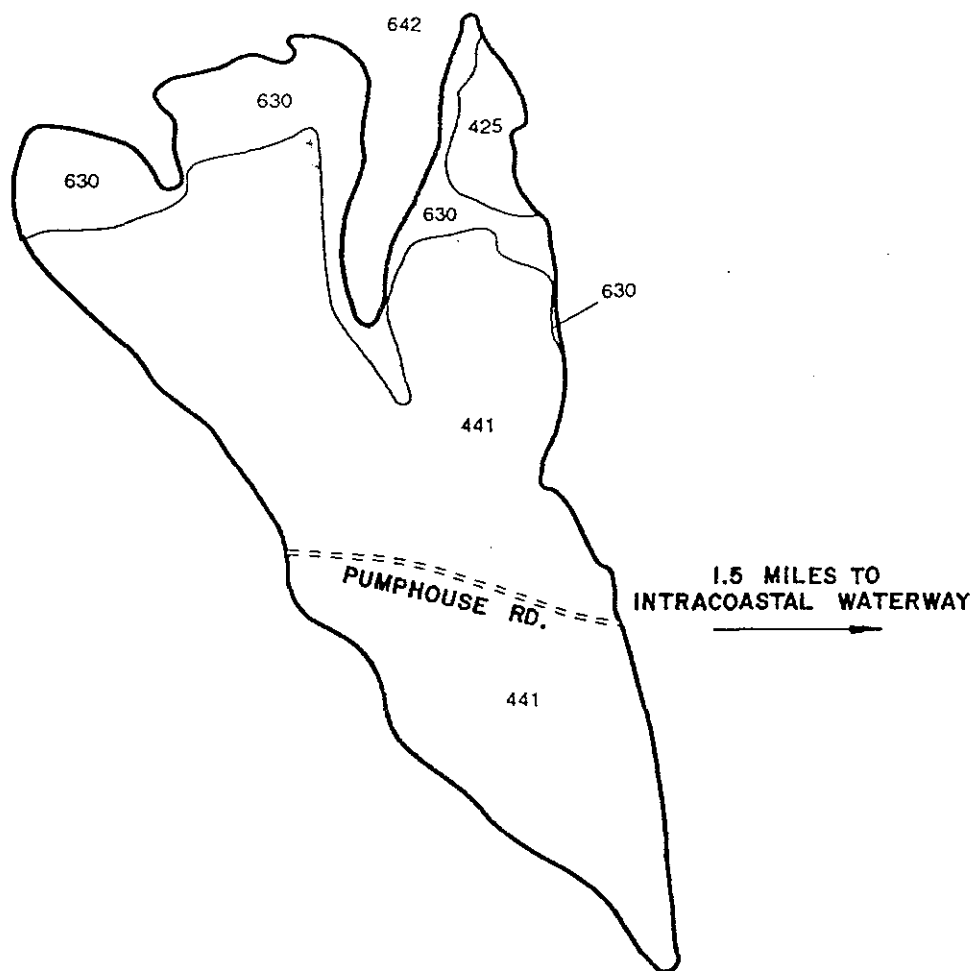


Figure B-5  
Vegetation and Land Use of  
Site V-4  
Volusia County, Florida



### III Narrative Description

Site V-5 is located on Pumphouse Road in Bulow Creek State Park. It consists of a triangular shaped parcel of land bounded by tidal marsh on the north, east, and south. A ditch south of Pumphouse Road connects to the marsh to the east.

Site vegetation consists of young temperate hardwood species (425) including live oak (*Quercus virginiana*), laurel oak (*Quercus laurifolia*), red bay (*Persea borbonia*), and southern magnolia (*Magnolia grandiflora*). Ground cover species include saw palmetto (*Serenoa repens*), coontie (*Zamia umbrosa*), and wax myrtle (*Myrica cerifera*).

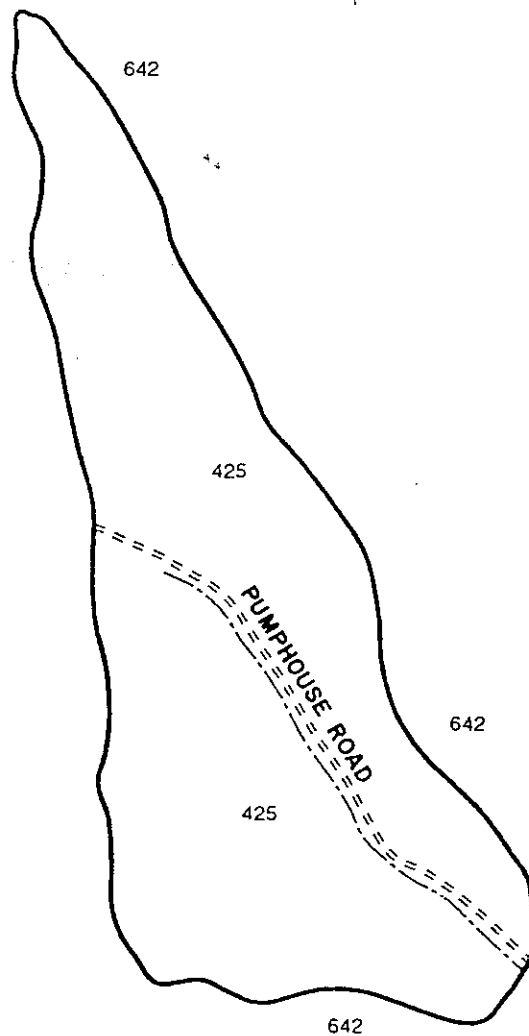
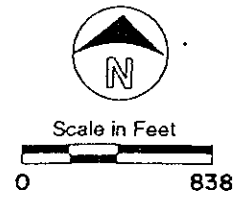
**Table B-5    Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-5, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
425	Temperate Hardwood	101.0
Total		101.0

Source: WAR, 1993

LEGEND

- 425 Temperate Hardwood
- 642 Saltwater Marsh
- Ditch
- === Road



1.2 MILES TO  
INTRACOASTAL WATERWAY



Figure B-6  
Vegetation and Land Use of  
Site V-5  
Volusia County, Florida



**SITE V-7 DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax Creek/Tomoka Basin</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>38,39/13S/32E</u>	<u>862,000 cy</u>	<u>8,600 ft (to ICWW)</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>77.67</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>345.0 ac</u>	<u>49.84 ac</u>	<u>98.74 ac</u>	<u>Irregular (100 to &gt;300ft)</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>864,482 cy</u>	<u>&gt; 2400 ft to Tomoka Basin</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>7.97 mi</u>	<u>15.0 ft</u>	<u>No upland access</u>	<u>Conservation</u>
<b>Max Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>(No direct access) Old Dixie Hwy.</u>	<u>3.21 ft</u>	<u>Mixed wetland forest veg. non-forested wetland</u>	<u>Same</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-7 is located in Bulow Creek State Park. Site vegetation communities include pine flatwoods (411), temperate hardwoods (425), and hardwood-conifer mixed (434). The site is surrounded by tidal marsh (642) on the north, east and south. A large tidal ditch along the western boundary separates the site from the mainland. The central portion of the site contains numerous herbaceous and forested wetlands. These wetlands may be connected to the tidal marsh east of the site.

Upland vegetation in the flatwoods includes slash pine (*Pinus elliottii*), saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*) and gallberry (*Ilex glabra*). A temperate hardwood area in the north and northeastern part of the site contains a canopy of live oak (*Quercus virginiana*), laurel oak (*Quercus laurifolia*), cabbage palm (*Sabal palmetto*), southern red cedar (*Juniperus silicicola*) and pignut hickory (*Carya glabra*). Ground cover includes saw palmetto and coontie (*Zamia umbrosa*, listed by the state as threatened). The hardwood-conifer mix in the north-central region of the site is thickly vegetated with slash pine, laurel oak, live oak and water oak (*Quercus nigra*). Thick stands of fetterbush (*Lyonia lucida*), gallberry, saw palmetto and wax myrtle also inhabit this area. Numerous Gopher tortoise burrows (state species of special concern) are located in the pine flatwoods and the hardwood conifer mixed communities.

**Table B-6    Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-7, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
321	Palmetto Prairie	40.1
411	Pine Flatwoods	172.1
425	Temperate Hardwood	71.1
434	Hardwood Conifer Mixed	52.7
630	Wetland Forested Mixed	5.8
640	Vegetated Non-Forested Wetland	3.2
Total		345.0

Source: WAR, 1993

# LEGEND

- 321 Palmetto Prairie
- 411 Pine Flatwoods
- 425 Temperate Hardwoods
- 434 Hardwood Conifer Mixed
- 630 Wetland Forested Mixed
- 640 Vegetated Non-Forested Wetland
- 642 Saltwater Marsh
- == Road
- Ditch



Scale in Feet  
0 860

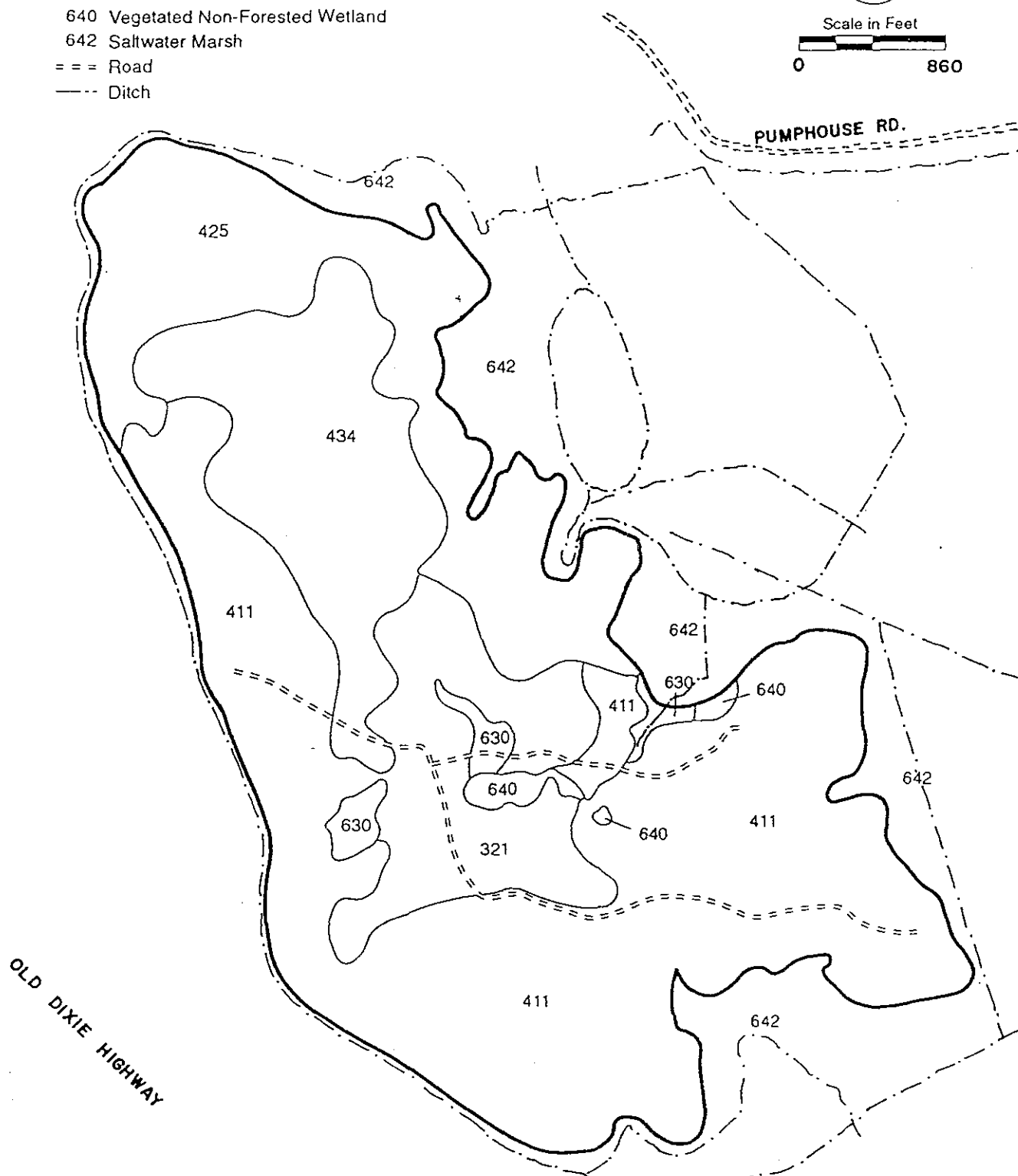


Figure B-7  
Vegetation and Land Use of  
Site V-7  
Volusia County, Florida





**SITE     V-8     DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>39/13S/32E</u>	<u>862,000 cy</u>	<u>2000 ft (to Tomoka Basin)</u> <u>9000 ft (to ICWW)</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>78.70</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>103.5</u>	<u>48.54</u>	<u>98.33 ac</u>	<u>Upland: 50 - 200 ft</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>840,930 cy</u>	<u>&gt; 2000 ft (to Tomoka Basin)</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>7.01 mi</u>	<u>15 ft</u>	<u>None Req'd</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Old Dixie Hwy.</u>	<u>3.46 ft</u>	<u>Saltmarsh, Mixed Wetland Hardwoods</u>	<u>Mixed Wetland Hardwoods (impacted)</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-8 lies approximately 1.7 miles west of the ICWW and is bordered on the south by Old Dixie Highway. Site vegetation consists primarily of pine-mesic oak community (414) species including slash pine (*Pinus elliottii*) and a variety of oaks (*Quercus* sp.).

A large mixed wetland hardwood community (617), containing American elm (*Ulmus americana*), blackgum tupelo (*Nyssa sylvatica* var. *biflora*), and Carolina ash (*Fraxinus caroliniana*) occupies the site's center. This community contains several varieties of ferns including cinnamon fern (*Osmunda cinnamomea*, a commercially exploited species), and two threatened varieties of epiphytic ferns, golden polypody fern (*Phlebodium aureum*) and shoestring fern (*Vittaria lineata*), which grow on cabbage palm (*Sabal palmetto*).

A sand live oak (432) community occupies the north-central portion of the site. Saltwater marsh (642) surrounds the site except along the southern boundary. Historic coquina ruins are located in the south-central portion of the site adjacent to Old Dixie Highway. Many of the vegetation communities are disturbed, possibly due past agricultural endeavors such as rice or sugar farming.

**Table B-7 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-8, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
414	Pine-Mesic Oak	72.5
432	Sand Live Oak	10.3
617	Mixed Wetland Hardwoods	6.5
642	Saltwater Marshes	14.2
Total		103.5

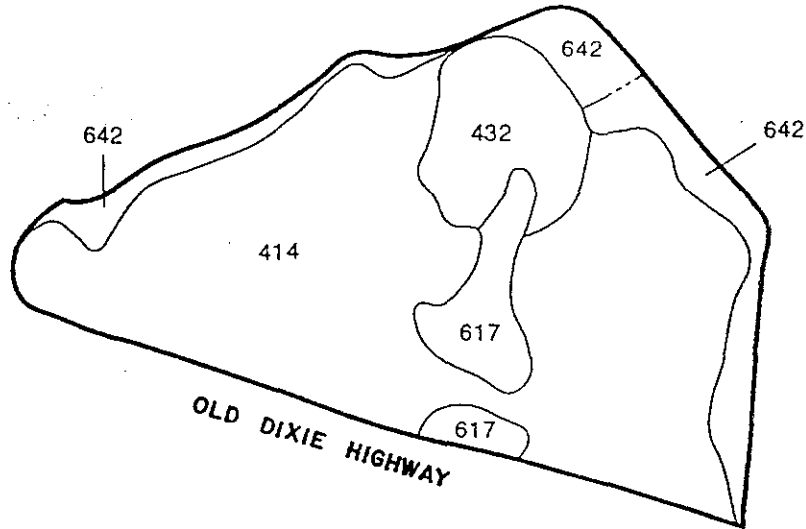
Source: WAR, 1993

LEGEND

- 414 Pine-Mesic Oak
- 432 Sand Live Oak
- 617 Mixed Wetland Hardwoods
- 642 Saltwater Marshes
- Canal



Scale in Feet  
0 848



1.7 MILES TO  
INTRACOASTAL WATERWAY

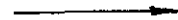


Figure B-8  
Vegetation and Land Use of  
Site V-8  
Volusia County, Florida



SITE       V-9       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>23,24/13S/31E</u>	<u>862,000 cy</u>	<u>15,000 ft (to ICWW)</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>78.11</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>378.4 ac</u>	<u>37.66 ac</u>	<u>84.04 ac</u>	<u>300 ft minimum</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&gt; +30 ft NGVD</u>	<u>2,209,800 cy</u>	<u>&gt; 9500 ft (to Tomoka Basin)</u>	<u>Planned Com./Rural</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>8.74 mi</u>	<u>15 ft</u>	<u>&lt; 2000 ft</u>	<u>Rural/Urban Low Intensity</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Old Dixie Hwy.</u>	<u>4.49 ft</u>	<u>Extensive</u>	<u>Mixed Forested Wetland, Freshwater Marsh</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-9 is located approximately 2.8 miles west of the ICWW. It is bounded on the west by the Interstate 95 right-of-way and on the east by Old Dixie Highway. Site vegetation consists mainly of pine plantation (441) species including slash pine (*Pinus elliottii*), saw palmetto (*Serenoa repens*), fetterbush (*Lyonia lucida*), and shiny blueberry (*Vaccinium myrsinites*).

Cypress wetlands (621), forested wetlands (630), and freshwater marshes (641) are scattered throughout the site. The wetland forest mix communities (630) contain mostly planted slash pine with an understory of various wetland herbs. A small bay swamp community (611) lies in the northeastern corner of the site bordering a large canal. This community contains sweet bay (*Magnolia virginiana*), swamp bay (*Persea palustris*), and Virginia chain fern (*Woodwardia virginiana*).

A group of wetlands located in the center of the site appear to be interconnected and may drain into the large canal which lies along the northern site boundary. A large borrow pit (530) is located in the southwestern corner of the site.

**Table B-8 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-9, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
441	Coniferous Plantations	291.5
530	Reservoir	16.3
611	Bay Swamps	2.4
621	Cypress	33.8
630	Wetland Forested Mixed	33.3
641	Freshwater Marsh	1.3
Total		378.4

Source: WAR, 1993

# LEGEND

- 441 Coniferous Plantations
- 530 Reservoir
- 611 Bay Swamps
- 621 Cypress
- 630 Wetland Forested Mixed
- 641 Freshwater Marsh
- Canal

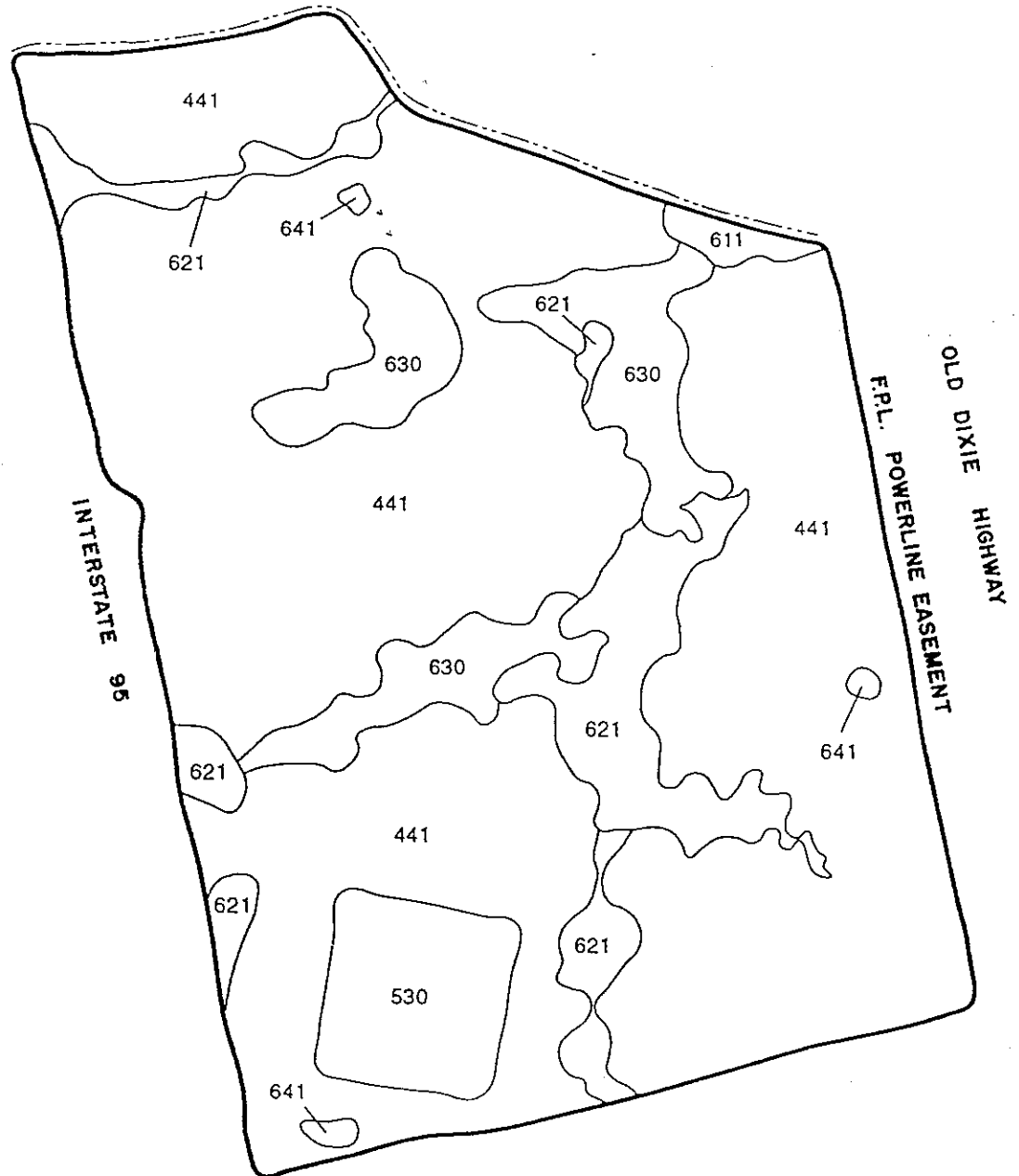
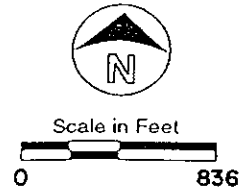


Figure B-9  
Vegetation and Land Use of  
Site V-9  
Volusia County, Florida



SITE       V-10       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>40/13S/32E</u>	<u>862,000 cy</u>	<u>9,000 ft (to ICWW)</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.16 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>79.83</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>138.8 ac</u>	<u>50.0 ac</u>	<u>100.81 ac</u>	<u>300 ft minimum</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>866,444 cy</u>	<u>4000 ft (to Tomoka Basin)</u>	<u>Conservation/Planned Community/Urban Low Intensity</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>7.68 mi</u>	<u>15 ft</u>	<u>None Req'd</u>	<u>Conservation/Rural/Urban Low Intensity</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Addison Drive</u>	<u>3.44 ft</u>	<u>Mixed Forested Wetland, Saltmarsh</u>	<u>Freshwater Marsh</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-10 lies adjacent to Addison Drive, approximately 1.7 miles west of the ICWW. Site vegetation consists primarily of pine flatwoods (411) species including slash pine (*Pinus elliottii*), live oak (*Quercus virginiana*), and red maple (*Acer rubrum*). Saw palmetto (*Saw palmetto*), gallberry (*Ilex glabra*), and fetterbush (*Lyonia lucida*) form much of the site's ground cover. A palmetto prairie (321) lies in the south-central portion of the site.

Two isolated herbaceous wetlands (641) are located in the northern portion of the site. They are vegetated by sand cordgrass (*Spartina bakerii*), saw grass (*Cladium jamaicense*), and Virginia chain fern (*Woodwardia virginica*).

**Table B-9 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-10, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
321	Palmetto Prairie	5.3
411	Pine Flatwoods	131.4
641	Freshwater Marsh	2.1
Total		138.8

Source: WAR, 1993



# LEGEND

- 321 Palmetto Prairie
- 411 Pine Flatwoods
- 630 Wetland Forested Mixed
- 641 Freshwater Marsh
- 642 Saltwater Marsh
- == Road



Scale in Feet  
0 845

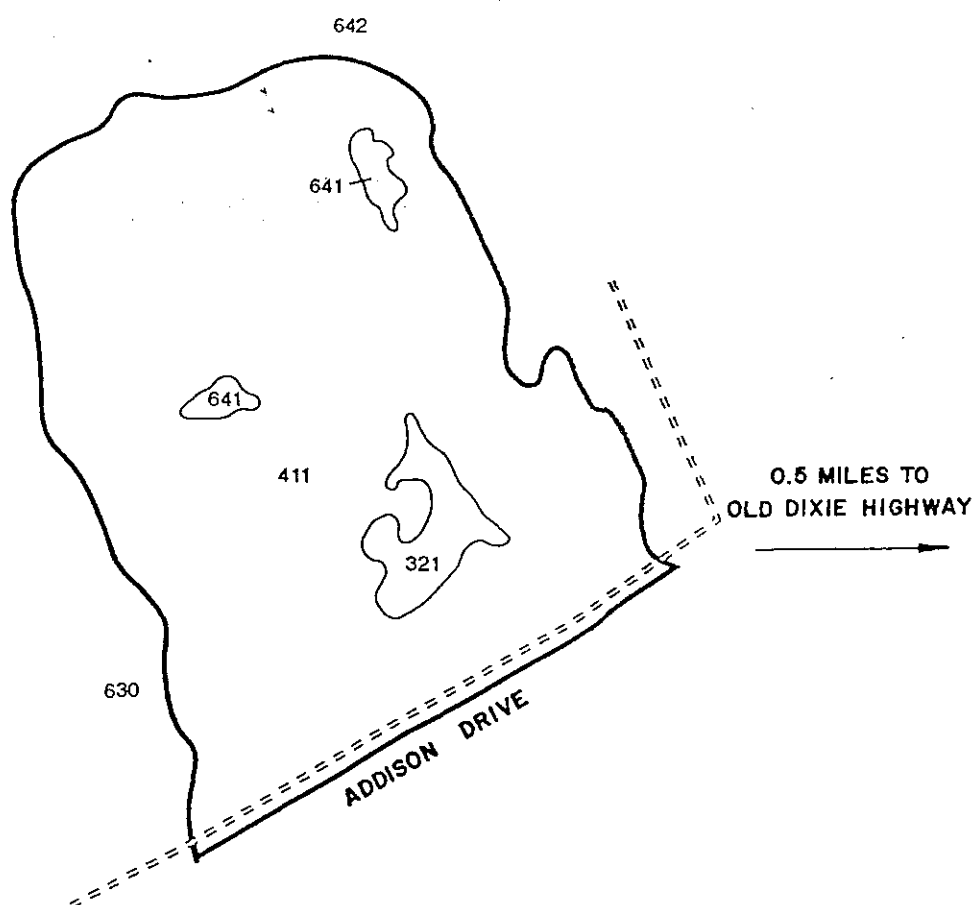
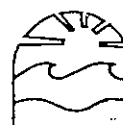


Figure B-10  
Vegetation and Land Use of  
Site V-10  
Volusia County, Florida



SITE       V-11       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax River</u>
<u>County</u>	<u>Reach #</u>	<u>Waterbody Name</u>
<u>40/13S/32E</u>	<u>862,000 cy</u>	<u>6,800 ft (to ICWW)</u>
<u>Sec/Twp/Rge</u>	<u>50 yr Reach Req'mt</u>	<u>Distance from Waterbody to Site</u>
<u>Ormond Beach (portion)</u>	<u>10.16 mi</u>	<u>III</u>
<u>Municipality</u>	<u>Reach Length</u>	<u>DER Receiving Water</u>
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>80.36</u>
<u>Reach Start/End</u>		<u>ICWW Mile of Site</u>

**II Site Characteristics**

<u>217.6 ac</u>	<u>50.0 ac</u>	<u>100.81 mi</u>	<u>300 ft minimum</u>
<u>Initial Site Area</u>	<u>Containment Area</u>	<u>Total Area Required</u>	<u>Buffer Width N,S,E,&amp; W</u>
<u>&lt; +5.0 ft NGVD</u>	<u>866,444 cy</u>	<u>&gt; 5600 ft (to Tomoka Basin)</u>	<u>Vol. Co.: Conservation</u>
<u>Avg. Site Elev.</u>	<u>Containment Capacity</u>	<u>Pipeline Easement</u>	<u>O.B.: L.D. Res.</u>
<u>7.80 mi</u>	<u>15 ft</u>	<u>&gt; 4500 ft</u>	<u>Comp. Plan Designation</u>
<u>Max. Pumping Distance</u>	<u>Dike Height</u>	<u>Road Easement</u>	<u>Conservation/L.D. Res.</u>
<u>Trail S. from Addison Drive</u>	<u>3.44 ft</u>	<u>Saltmarsh (off-site)</u>	<u>Surrounding Land Use</u>
<u>Road to Site</u>	<u>Excavation Depth</u>	<u>DER Juris. Wetlands</u>	<u>Freshwater Marsh (411)</u>
			<u>Isolated Wetlands</u>

### III Narrative Description

Site V-11 is located west of the Tomoka River. The ruins of Addison's Blockhouse, a significant historical resource, lie near the center of the site. Site vegetation consists primarily of temperate hardwoods (425), however a large pine flatwoods community (411) is located along western side of the site. Saltwater marsh (642) associated with the Tomoka River borders the east and south sides of the site.

Temperate hardwood species include live oak (*Quercu virginiana*), cabbage palm (*Sabal palmetto*), southern magnolia (*Magnolia grandiflora*), and slash pine (*Pinus elliottii*). Saw palmetto (*Serenoa repens*), yaupon (*Ilex vomitoria*), and wax myrtle (*Myrica cerifera*) form much of the ground cover in the hardwood areas. Green fly orchids (*Epidendrum conopseum*) are present within the oak canopy. The green fly orchid is listed by the state as a threatened species. Several small, low areas are present within the temperate hardwoods. Vegetation within these areas is dominated by cabbage palm and sweetgum (*Liquidambar styraciflua*). The shoestring fern (*Vittaria vittata*), a threatened species, grows on cabbage palms within these areas. The pine flatwoods vegetation is dominated by slash pine and a thick understory of gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), saw palmetto, and wax myrtle. Hardwoods including live oak, sweetgum (*Liquidambar styraciflua*), and water oak (*Quercus nigra*) have invaded the flatwoods in some areas due to lack of regular burning. A freshwater marsh (641) vegetated by saw grass (*Cladium jamaicense*) and sand cordgrass (*Spartina bakerii*) lies near the center of the site. The existence of Gopher tortoise (listed by the state as species of special concern) within in the flatwoods community is evidenced by the presence of their burrows.

**Table B-10 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-11, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
411	Pine Flatwoods	25.8
425	Temperate Hardwoods	190.9
641	Freshwater Marsh	0.9
Total		217.6

Source: WAR, 1993

- LEGEND
- 411 Pine Flatwoods
  - 425 Temperate Hardwoods
  - 641 Freshwater Marsh
  - 642 Saltwater Marsh

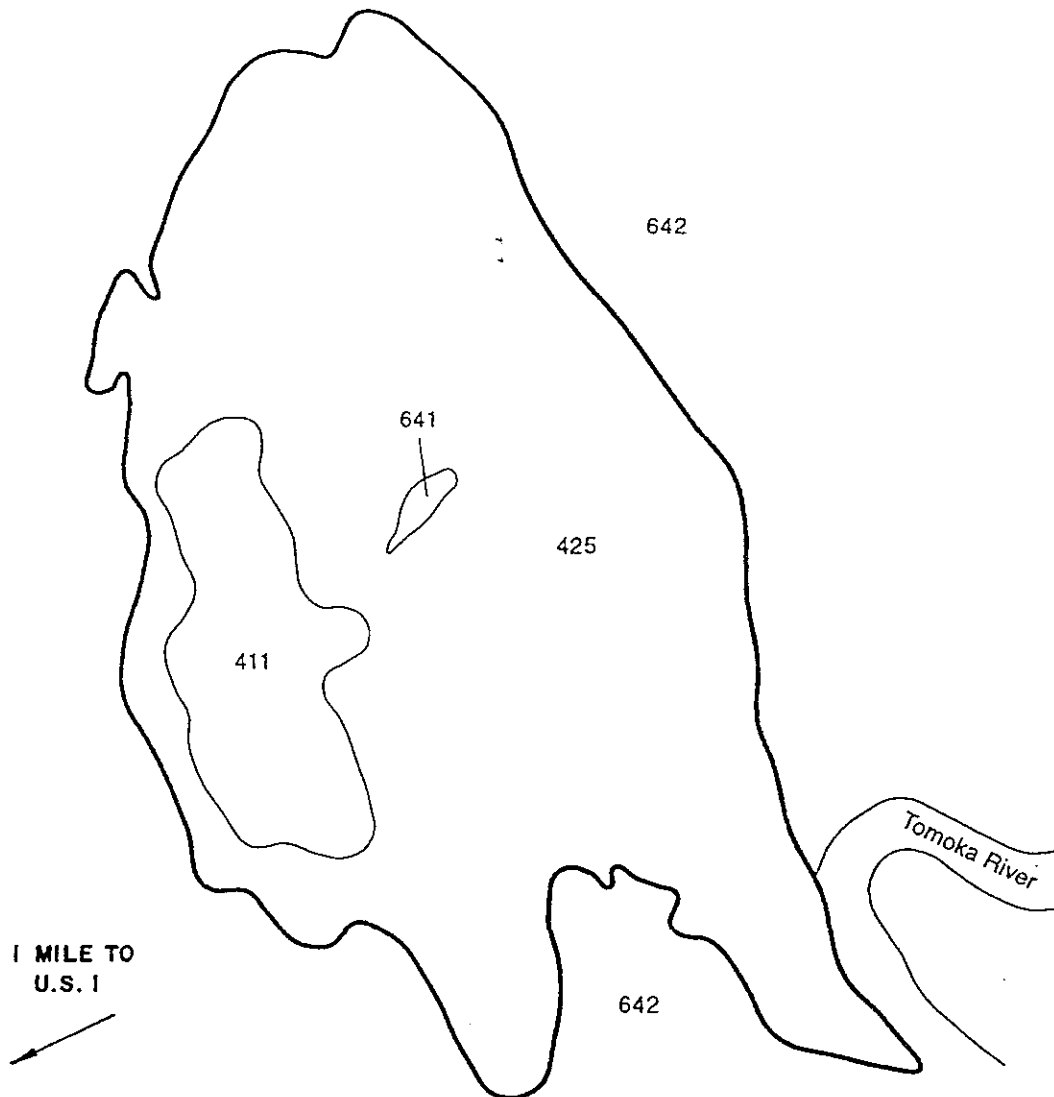
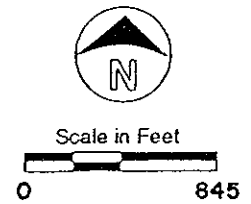


Figure B-11  
Vegetation and Land Use of  
Site V-11  
Volusia County, Florida



SITE       V-12       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>I</u>	<u>Halifax River</u>
County	Reach #	Waterbody Name
<u>39/14S/32E</u>	<u>862,000 cy</u>	<u>6,300 ft (to ICWW)</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>Ormond Beach (portion)</u>	<u>10.16 mi</u>	<u>III</u>
Municipality	Reach Length	DER Receiving Water
<u>Flagler/Volusia Co. line (mi 73.85) to Granada Bridge (mi 84.01)</u>		<u>81.78</u>
Reach Start/End		ICWW Mile of Site

**II Site Characteristics**

<u>388.5</u>	<u>50.0 ac</u>	<u>100.81 ac</u>	<u>300 ft minimum</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>&lt; +5.0 ft NGVD</u>	<u>866,444 cy</u>	<u>&gt; 2000 ft (to Tomoka River)</u>	<u>N: Rural Estate</u> <u>S: Conservation</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>9.92 mi</u>	<u>15 ft</u>	<u>&gt; 4500 ft to U.S. 1</u>	<u>Conservation/Sub L.D.</u> <u>Res./General Comm.</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>Trail E. from U.S. 1</u>	<u>3.44 ft</u>	<u>Mixed Forested Wetland/Veg. Non-Forested Wetland</u>	<u>Reservoir/Borrow Area</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

Site V-12 lies southeast of the Tomoka River. It is bordered on the east by Strickland Creek and associated marsh, and on the southwest by U.S. Highway 1. The site contains a variety of upland communities including pine flatwoods (411), xeric oak (421), hardwood-conifer mixed (434), and temperate hardwoods (425). The central and southwestern part of the site contains both herbaceous (640) and forested wetlands (630) as well as a large water-filled borrow pit (530).

Temperate hardwood communities exist in both the northeastern and southeastern portions of the site. These areas are vegetated with live oak (*Quercus virginiana*), southern magnolia (*Magnolia grandiflora*), and pignut hickory (*Carya glabra*). Ground cover includes saw palmetto (*Serenoa repens*), bracken fern (*Pteridium aquilinum*), and coontie (*Zamia umbrosa*). There are occasional patches of thick shrubs especially on the southern end of the site.

The xeric oak scrub consists of a low, dense cover of live oak, myrtle oak (*Quercus myrtifolia*), Chapman's oak (*Quercus chapmanii*), and saw palmetto. A portion of the site that was formerly cleared now hosts an emerging hardwood conifer mixed community. Vegetation there includes a dense cover of young live oak, slash pine (*Pinus elliottii*), southern red cedar (*Juniperus silicicola*), and cabbage palm (*Sabal palmetto*). The existence of Gopher tortoise in open areas of this community is evidenced by the presence of their burrows.

Much of the central portion of the site is vegetated by a pine flatwoods community. Vegetation there is dominated by slash pine, saw palmetto, and gallberry (*Ilex glabra*).

The southwestern portion of the site contains significant areas of forested wetlands (630) and herbaceous marshes (640). Two borrow pits (530) are located on the site. The southernmost was visited during the site inspection. It consists of an area of open water fringed by cattail (*Typha* sp.), arrowhead (*Sagittaria lancifolia*), and Carolina willow (*Salix caroliniana*).

**Table B-11 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-12, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
411	Pine Flatwoods	137.2
421	Xeric Oak	32.0
425	Temperate Hardwoods	65.2
434	Hardwood Conifer Mixed	33.4
530	Reservoir	18.6
630	Wetland Forested Mixed	54.2
640	Vegetated Non-Forested Wetland	47.9
<b>Total</b>		<b>388.5</b>

Source: WAR, 1993

# LEGEND

- 411 Pine Flatwoods
- 421 Xeric Oak
- 425 Temperate Hardwood
- 434 Hardwood Conifer Mixed
- 530 Reservoir
- 630 Wetland Forested Mixed
- 640 Vegetated Non-Forested Wetland
- 642 Saltwater Marsh
- = = = Road



Scale in Feet  
0 840

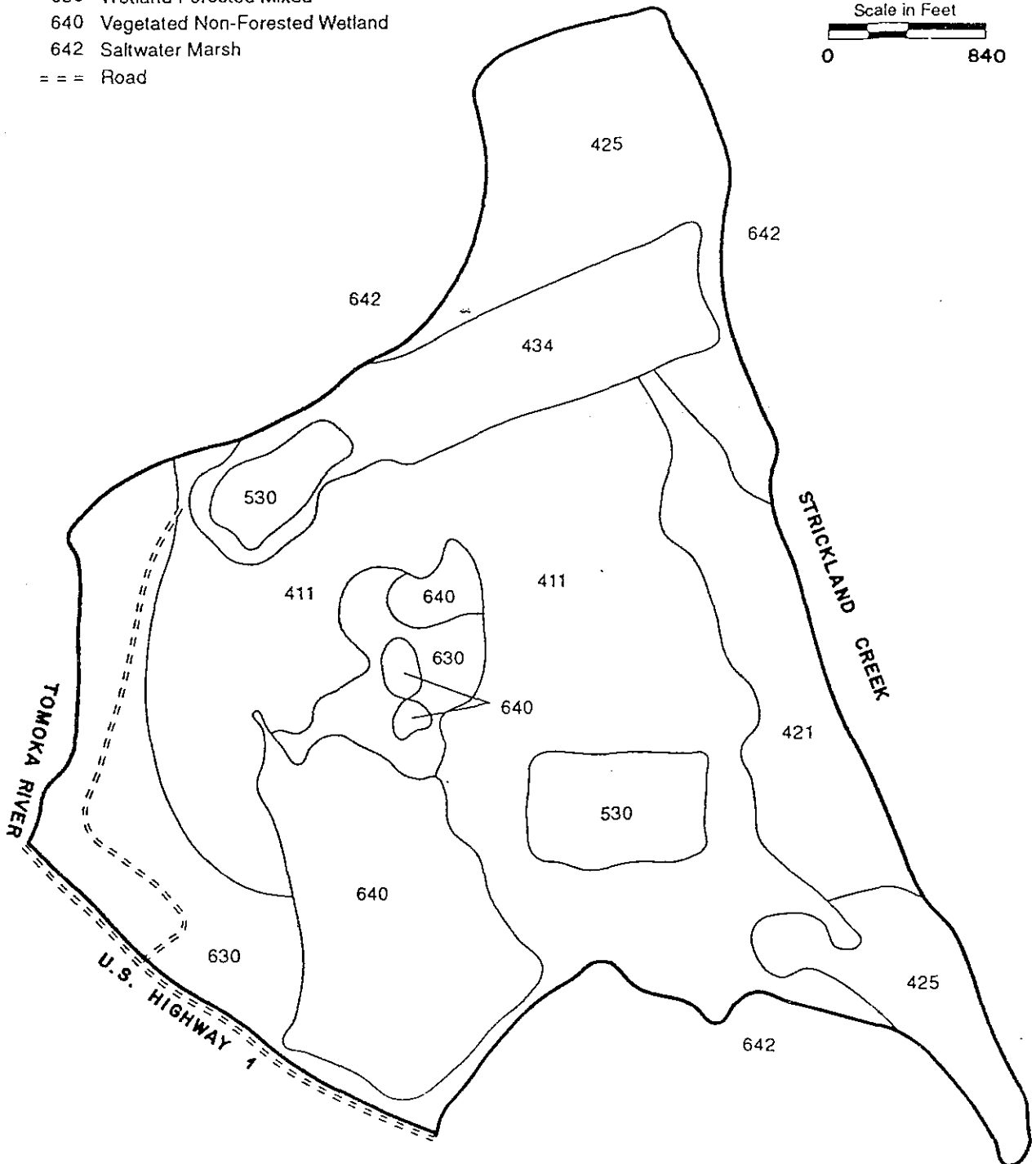
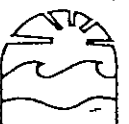
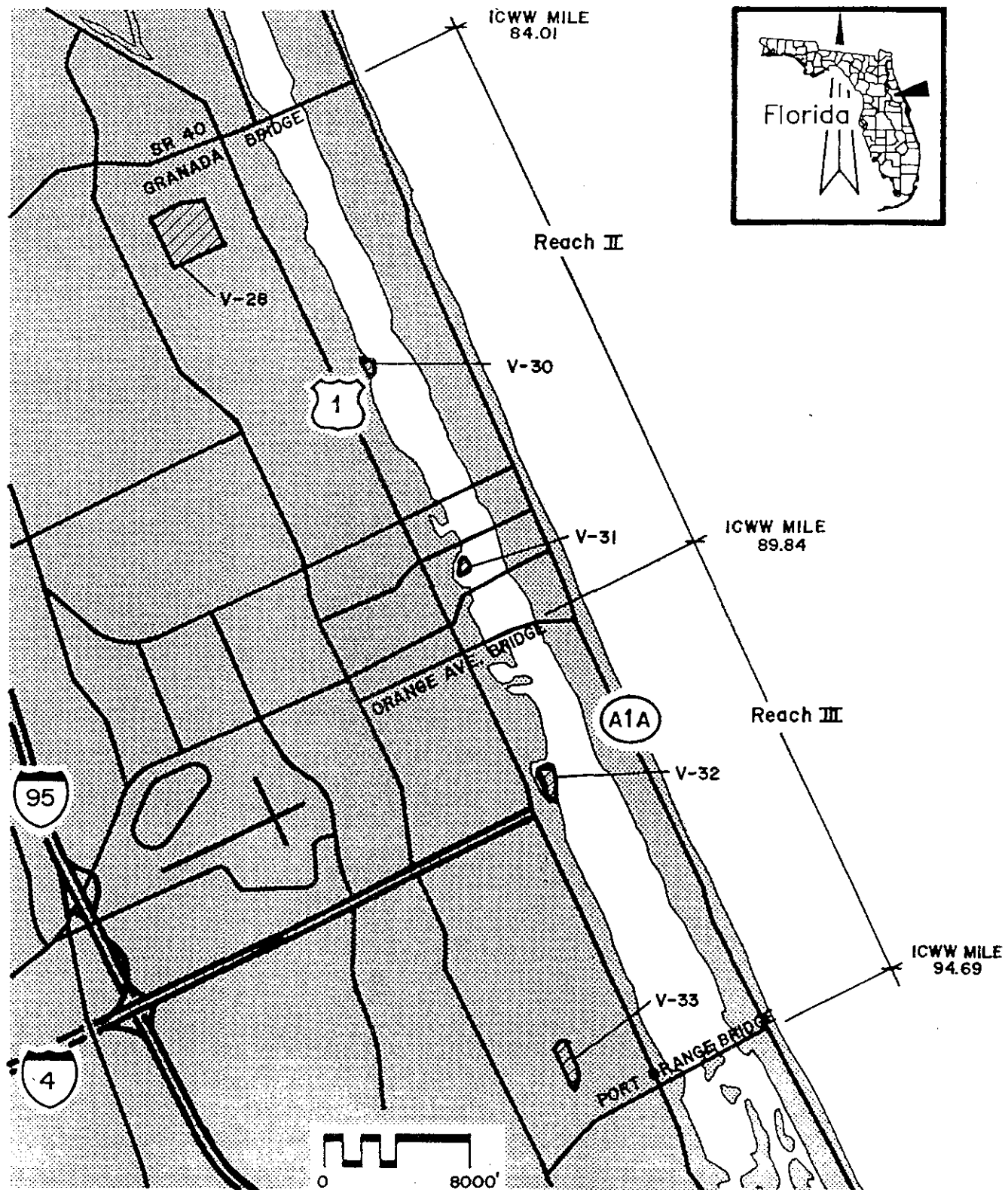


Figure B-12  
Vegetation and Land Use of  
Site V-12  
Volusia County, Florida







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

**Figure B-13**  
**Location Map**  
**Candidate Sites**  
**Reaches II and III**  
**Volusia County, Florida**

PROJECT	
REVISION	
SHEET	
DATE	

**SITE       V-28       DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>II</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>41/14S/32E</u>	<u>53,000 cy</u>	<u>5,200 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>Ormond Beach</u>	<u>5.83 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Granada Bridge (mi 84.01) to Orange Ave. (mi 89.84)</u>		<u>84.89</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>206.0 ac</u>	<u>33.10 ac pond</u>	<u>29.36 ac</u>	<u>N/A</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
	<u>53,401 cy/ft</u>	<u>5,200 ft</u>	<u>Open Space/Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>5.48 mi</u>	<u>N/A</u>	<u>None Required</u>	<u>Community Park/Single-Family Residential</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Hand Ave/Hammock Lane/Nova Rd.</u>	<u>N/A</u>	<u>N/A</u>	<u>Reservoir</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-28 is located in the City of Ormond Beach immediately north of Hand Avenue. Two reservoirs (530), separated by Ormond Beach Central Park (186), occupy a large portion of the northern half of the site. A mixed hardwood wetland (617) lies west of the reservoirs and an active sand mine (162) lies to the south. Residential areas (110, 120 and 130) are present to the north, southwest and east. Cattails (*Typha sp.*), red maple (*Acer rubrum*), wax myrtle (*Myrica cerifera*), and other wetland species line the edges of the reservoirs. Several osprey were circling the area at the time of the site inspection.

A second active sand mine (162) is located in the center of the southern half of the site. It is surrounded by a mixed wetland hardwood community (617). Low-lying areas of this community were inundated during the site inspection. Two large residential areas and an area of disturbed open land (193) are also present in the site's southern half. A small inland pond and slough community (616) lies adjacent to the unpaved road at the northern entrance to the southern sand mine. Carolina willow (*Salix caroliniana*) is abundant in this wetland.

The mixed wetland hardwood community in the southwestern portion of the site contains a small, clear water stream which flows into a roadside ditch. This community contains many large trees including sweetgum (*Liquidambar styraciflua*), sugarberry (*Celtis laevigata*), red maple (*Acer rubrum*), red buckeye (*Aesculus pavia*), cabbage palm (*Sabal palmetto*), and southern magnolia (*Magnolia grandiflora*). Poison ivy (*Toxicodendron radicans*), dragons tongue (*Arisaema dracontium*), boston fern (*Nephrolepis sp.*), thelypteris fern (*Thelypteris sp.*), and wild coffee (*Psychotria nervosa*) form a ground cover beneath these trees. Two species listed by the state as commercially exploited, cinnamon fern (*Osmunda cinnamomea*) and Florida coontie (*Zamia umbrosa*) are present in this community. A species listed by the state as threatened, golden polypody fern (*Phlebodium aureum*), grows on the cabbage palms.

**Table B-12 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-28, Volusia County, Florida**

<b>Map ID No.</b>	<b>Name</b>	<b>Approximate Acreage</b>
110	Residential - Low Density	1.2
120	Residential - Medium Density	27.1
130	Residential - High Density	20.1
162	Sand and Gravel Pits	32.8
185	Parks and Zoos	12.8
193	Urban Land in Transition without Positive Indicators of Intended Activity	5.0
530	Reservoirs	33.1
616	Inland Ponds and Sloughs	2.1
617	Mixed Wetland Hardwoods	71.8
<b>Total</b>		<b>206.0</b>

Source: WAR, 1993

# LEGEND

- 110 Residential - Low Density
- 120 Residential - Medium Density
- 130 Residential - High Density
- 162 Sand and Gravel Pits
- 185 Parks and Zoos
- 193 Urban Land in Tranition without Positive Indicators of Intended Activity
- 530 Reservoirs
- 616 Inland Ponds and Sloughs
- 617 Mixed Wetland Hardwoods
- Canals
- ..... Stream
- \*\*\*\*\* Dirt Roads
- ===== Paved Roads



Scale in Feet  
0 635

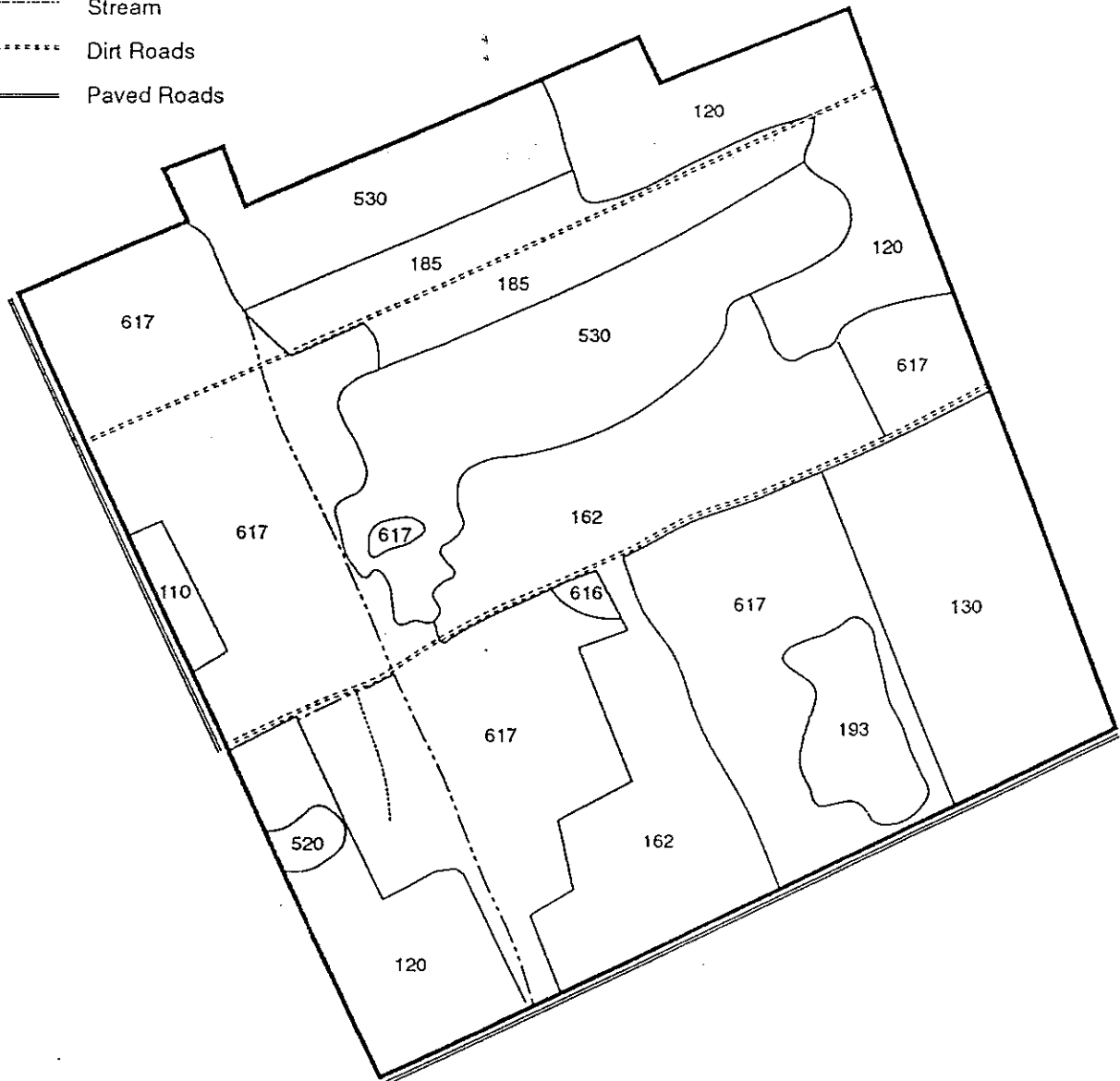


Figure B-14  
Vegetation and Land Use of  
Site V-28  
Volusia County, Florida



**SITE       V-30       DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>II</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>34,43/15S/32E</u>	<u>53,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>Holly Hill</u>	<u>5.83 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Granada Br. (mi 84.01) to Orange Ave. Br. (mi 89.84)</u>		<u>86.84</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>8.91 ac</u>	<u>4.22 ac</u>	<u>6.12 ac</u>	<u>50 ft on W, Minimal on N, E, &amp; S</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>5.0 ft</u>	<u>7,321 cy</u>	<u>None Required</u>	<u>Conservation/Public Recreation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>3.12 mi</u>	<u>4 ft</u>	<u>None Required</u>	<u>Single Fam. Residential, Mixed Commercial</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>S. Beach St.</u>	<u>2.75 ft</u>	<u>None</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-30 lies on the western shore of the Halifax River in the town of Holly Hill. The site is presently occupied by Holly Hill Sunrise Park and consists of a triangular peninsula projecting from the mainland into the river. The center of the site is planted with St. Augustine grass (*Stenotaphrum secundatum*) and serves as a playground (186). The southern portion of the site, also planted with grass, is separated from the central portion by a finger of water. Approximately half of the site's shoreline is protected by a concrete seawall. The remainder of the shoreline is vegetated with smooth cordgrass (*Spartina alternifolia*), southern red cedar (*Juniperus silicicola*), Brazilian pepper (*Schinus terebinthifolius*), cabbage palm (*Sabal palmetto*), and wax myrtle (*Myrica cerifera*).

**Table B-13 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-30, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
186	Community Recreational Facilities	8.9
Total		8.9

Source: WAR, 1993

LEGEND

- 186 Community Recreational Facilities  
(CITY of HOLLY HILL SUNRISE PARK)

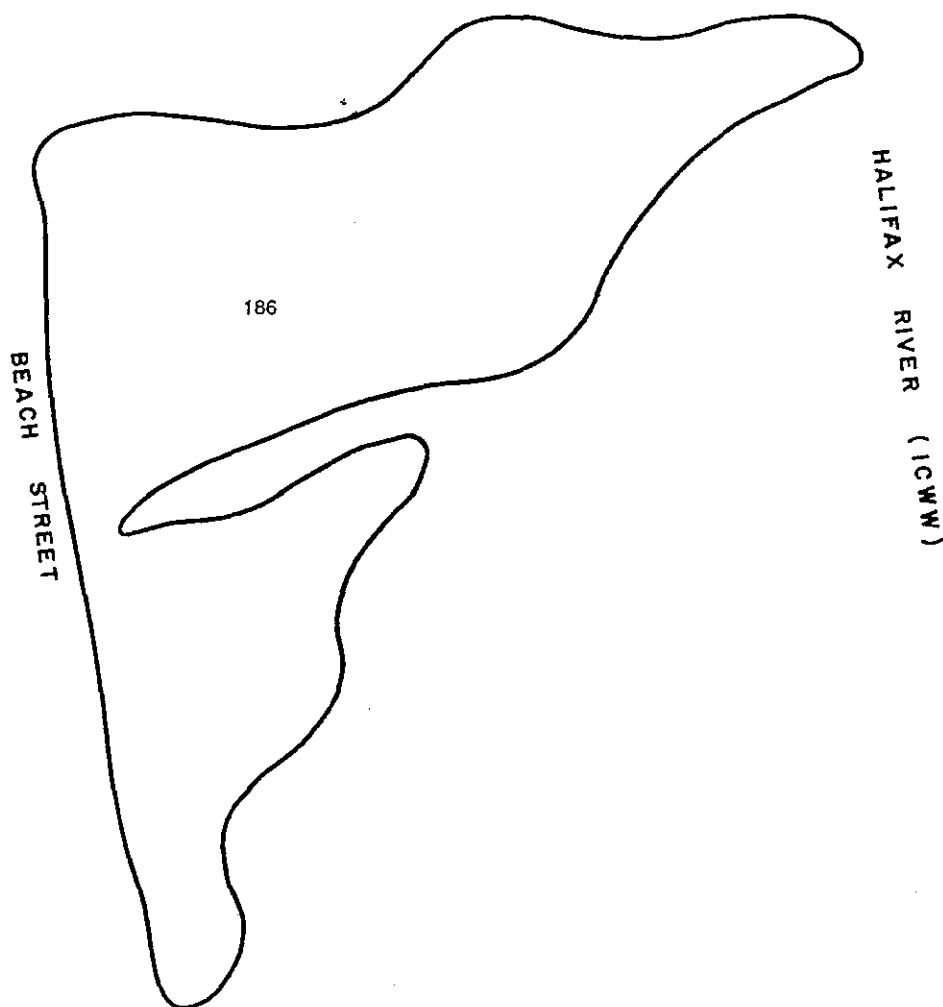
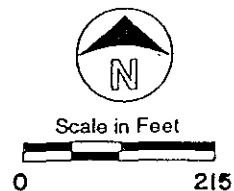


Figure B-15  
Vegetation and Land Use of  
Site V-30  
Volusia County, Florida





**SITE       V-31       DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>II</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>38/15S/33E</u>	<u>53,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>Daytona Beach</u>	<u>5.83 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Granada Br. (mi 84.01) to Orange Ave. Br. (mi 89.84)</u>		<u>89.08</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>7.58 ac</u>	<u>4.73 ac</u>	<u>7.58 ac</u>	<u>Minimum Upland</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+5.0 ft</u>	<u>13,945 cy</u>	<u>None Required</u>	<u>Conservation/Public Park</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>5.22 mi</u>	<u>5 ft</u>	<u>400 ft (Existing Bridge Inadequate)</u>	<u>Commercial/Downtown Redevelopment Area</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>S. Beach St.</u>	<u>2.73 ft</u>	<u>Saltwater Marsh</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-31 is an island located 400 ft. from the western shore of the ICWW between the Main Street bridge and Highway 92 bridge. The entire island has been developed as Manatee Island Park (185/428), with nature trails, boardwalks, and other facilities. Though much of the site is bare ground, cabbage palm (*Sabal palmetto*), southern red cedar (*Juniperus silicicola*), groundsel bush (*Baccharis halimifolia*), and Brazilian pepper (*Schinus terebinthifolius*) are present. A small saltwater marsh (642) is located at the island's northern tip.

**Table B-14 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-31, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
185/428	Parks and Zoos/Cabbage Palm	7.5
642	Saltwater Marshes	0.1
Total		7.6

Source: WAR, 1993

# LEGEND

185/428 Parks and Zoos/Cabbage Palm

642 Saltwater Marshes

--- Wooden Walkway/Bridge



Scale in Feet

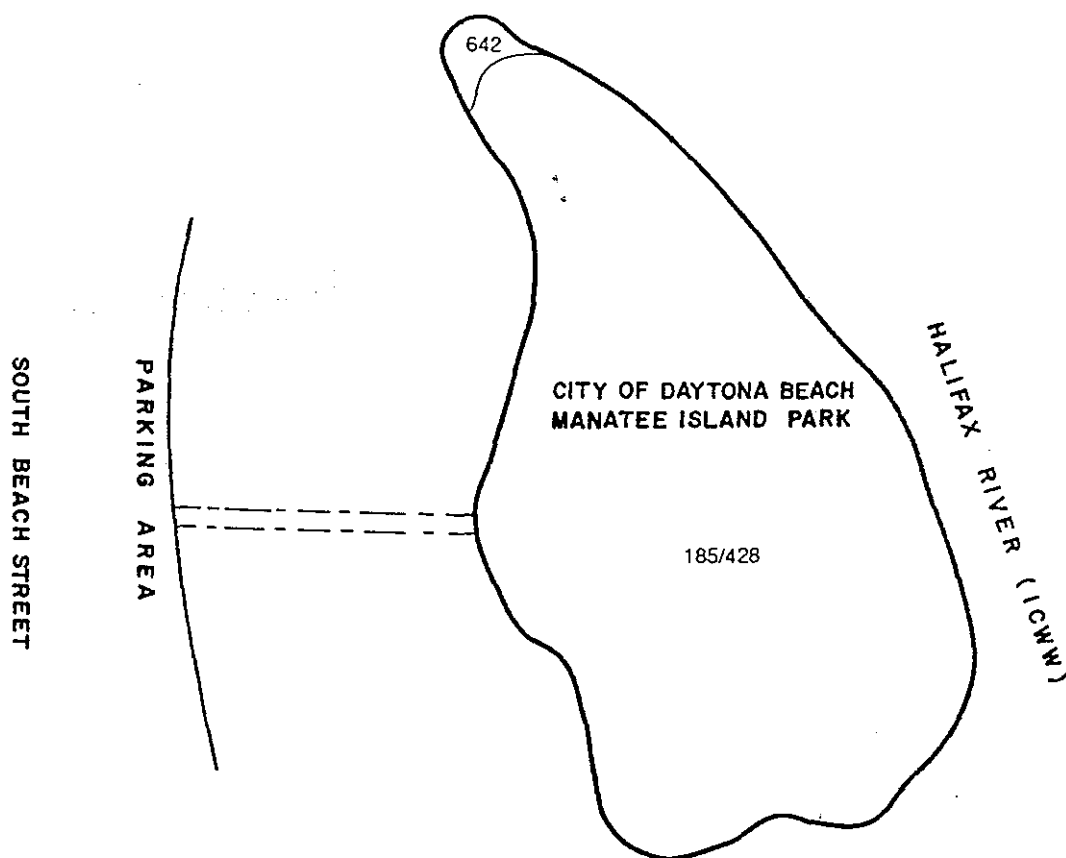
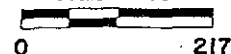
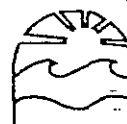


Figure B-16  
Vegetation and Land Use of  
Site V-31  
Volusia County, Florida



SITE       V-32       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>III</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>21/15S/32E</u>	<u>291,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>Daytona Beach</u>	<u>4.85 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Orange Ave. Bridge (mi 89.84) to Port Orange Bridge (mi 94.69)</u>		<u>91.43</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>42.6 ac</u>	<u>5.6 ac</u>	<u>8.0 ac</u>	<u>50 ft/980 ft/50 ft/730 ft</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+3.0 ft± NGVD</u>	<u>24,109 cy</u>	<u>N/A</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>3.62 mi</u>	<u>6 ft</u>	<u>2100 ft</u>	<u>Single/Multi. Family Residential</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>S. Palemtto to utility service road</u>	<u>2.96 ft</u>	<u>36 ac ±</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-32 is located at the eastern terminus of Beville Road, on the western shore of the Halifax River. Much of the site consists of saltwater marsh (642), however an old dredged material area is located in the site's northeastern corner (743 and 451). Saltwater marsh species on site include perennial glasswort (*Salicornia virginica*), sea-oxeye (*Borrchia frutescens*), saltmarsh cordgrass (*Spartina alterniflora*), and torpedo grass (*Paspalum repens*). Numerous white mangrove (*Laguncularia racemosa*) sprouts are scattered throughout the saltwater marsh. Red mangrove (*Rhizophora mangle*) sprouts are also present but in lesser numbers than the white mangrove sprouts.

The site interior was not accessible due to the unusually high tides during the site visit on January 27, 1993. However, southern red cedar (*Juniperus silicicola*), live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), and wax myrtle (*Myrica cerifera*) were visible within the dredged material area. It is likely that prickly-pear cactus (*Opuntia sp.*, listed by the state as threatened) also occurs in this area.

**Table B-15 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-32, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
451	Red Cedar	5.9
642	Saltwater Marshes	34.2
743	Spoil Areas	2.1
822	Communication Facilities	0.4
Total		42.6

Source: WAR, 1993

# LEGEND

- 451 Red Cedar
- 642 Saltwater Marshes
- 743 Spoil Areas
- 822 Communication Facilities

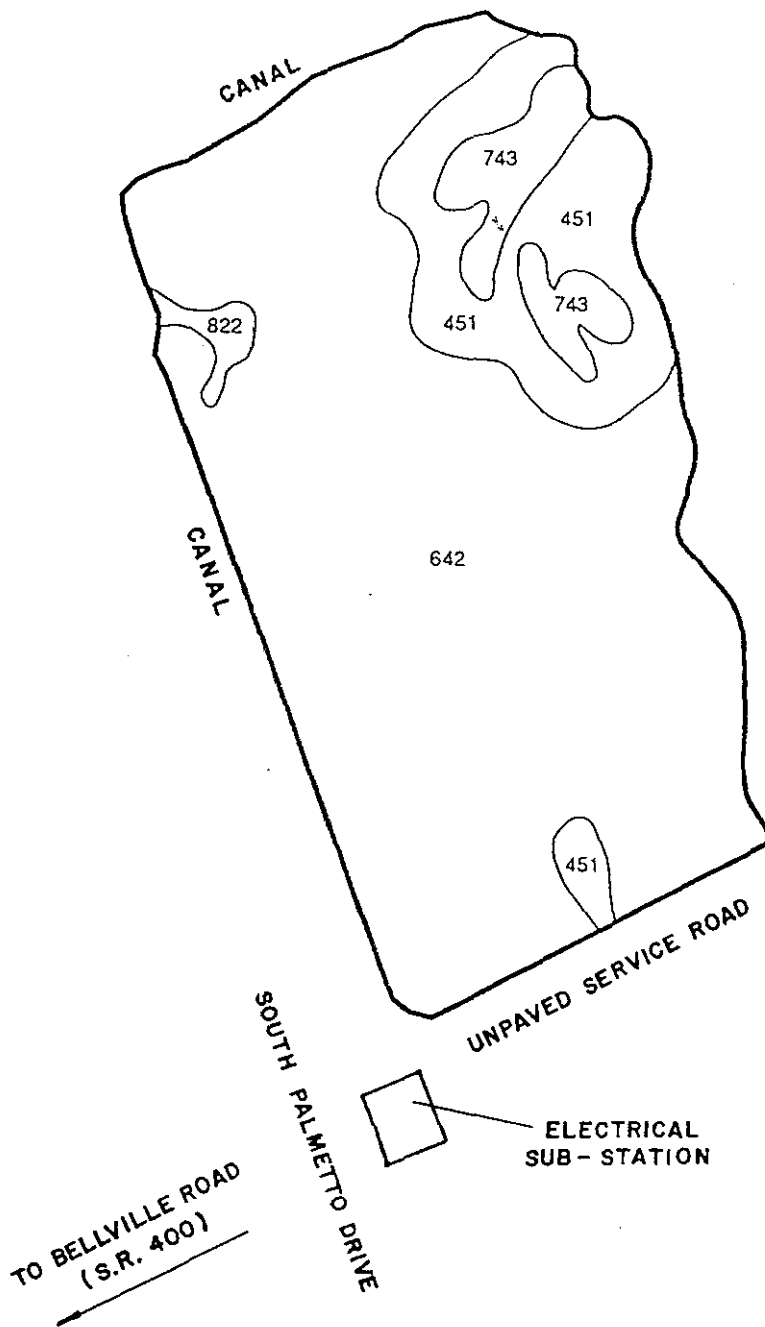
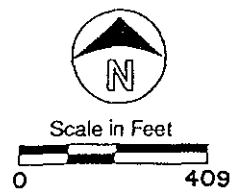


Figure B-17  
Vegetation and Land Use of  
Site V-32  
Volusia County, Florida



**SITE       V-33       DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>III</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>43/15S/33E 37/16S/33E</u>	<u>291,000 cy</u>	<u>4300 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>South Daytona</u>	<u>4.85 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Orange Ave. Bridge (mi 89.84) to Port Orange Bridge (mi 94.69)</u>		<u>94.16</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>37.9 ac</u>	<u>15.62 ac</u>	<u>37.9 ac</u>	<u>200 ft/200 ft/200 ft/100 ft</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>+7.0 ft NGVD±</u>	<u>112,432 cy</u>	<u>7000 ft</u>	<u>Residential Density 1</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>6.02 mi</u>	<u>8 ft</u>	<u>None Required</u>	<u>Residential</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Reed Canal, Madeline, Sauls Rd.</u>	<u>4.21 ft</u>	<u>None</u>	<u>Wet Prairie</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-33 is located approximately 0.8 miles west of the ICWW. It is bounded on the west by Saul Road. Vegetation consists mainly of improved pasture (211). A small live oak community (427) lies along the southern site boundary. A wet prairie (643) is also located in the southern portion. At the time of the field visit (January 27, 1993) water was flowing from this wetland into a large ditch located along Saul Road. An abundance of southern red cedar (*Juniperus silicicola*) and sugarberry (*Celtis laevigata*) grow along the fenceline surrounding the site. Small cabbage palms (*Sabal palmetto*), scattered throughout the pasture areas, show evidence of cattle grazing. A small patch of prickly-pear cactus (*Opuntia sp.*) occurs at the fenceline at the site's northwestern end. The prickly-pear cactus is listed by the state as threatened.

**Table B-16 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-33, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
211	Improved Pasture	37.9
427	Live Oak	1.4
643	Wet Prairies	0.9
Total		40.2

Source: WAR, 1993



LEGEND

211 Improved Pasture

427 Live Oak

643 Wet Prairies

— Paved Road

----- Seasonal Sream



Scale in Feet

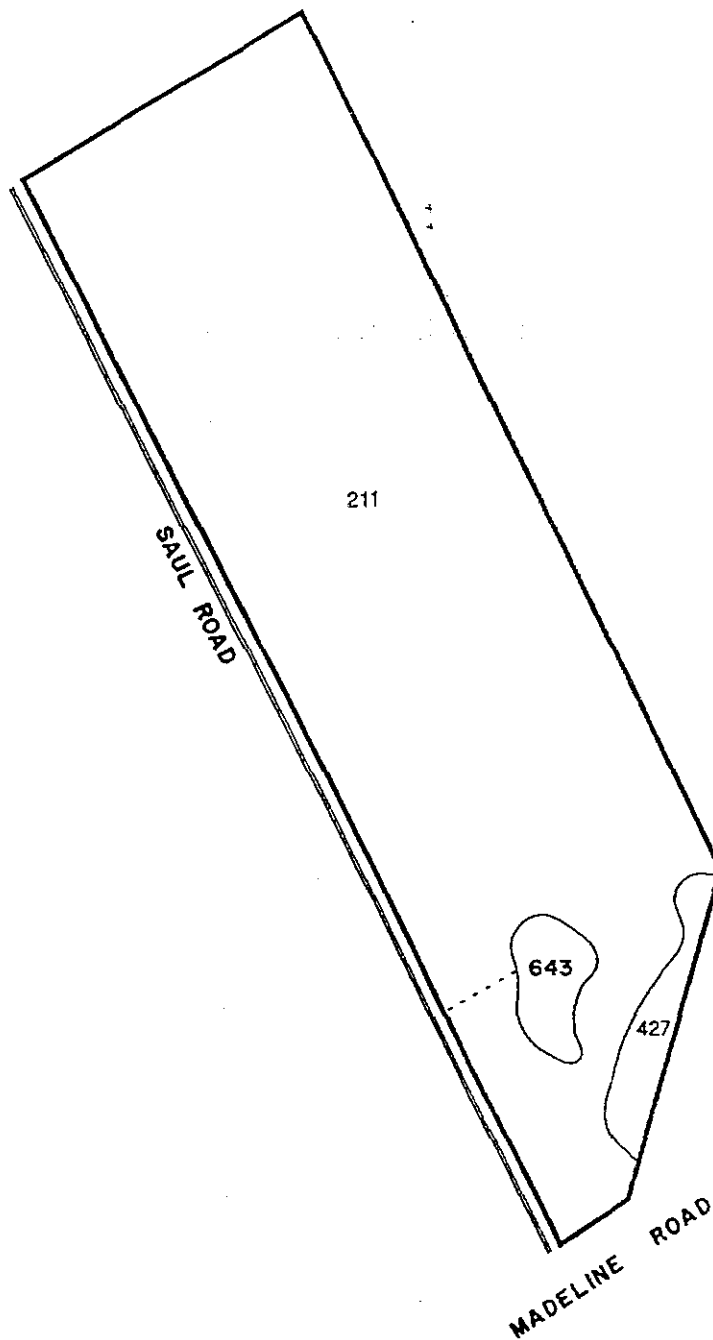
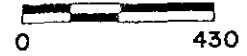
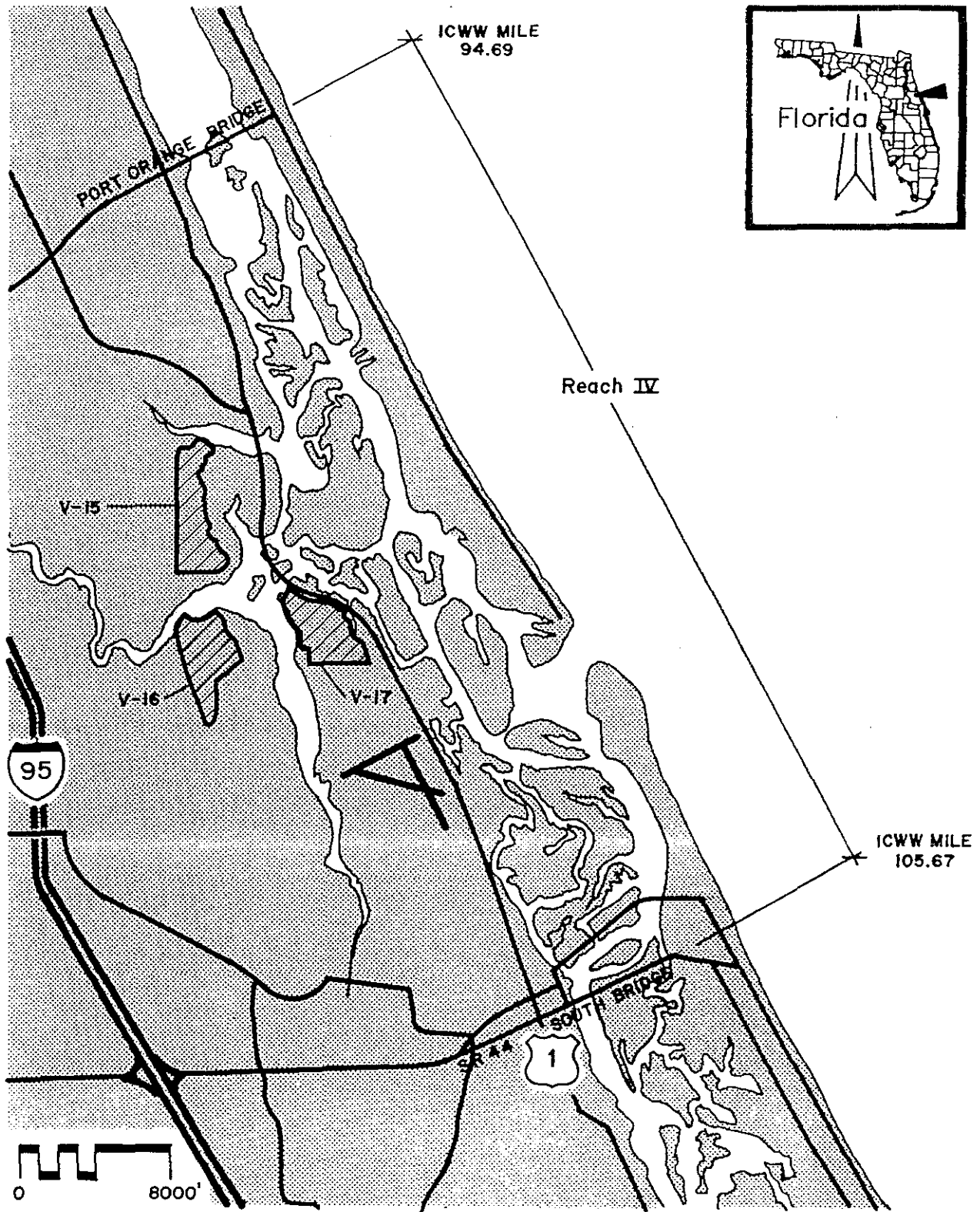


Figure B-18  
Vegetation and Land Use of  
Site V-33  
Volusia County, Florida





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

**Figure B-19**  
**Location Map**  
**Candidate Sites**  
**Reach IV**  
**Volusia County, Florida**

PROJECT
REVISION
SHEET
DATE

**SITE       V-15       DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>IV</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>22,27/16S/33E</u>	<u>6,623,000 cy</u>	<u>9500 ft (to ICWW)</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.98 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Port Orange Bridge (mi 94.69) to S.R. 44 Bridge (mi 105.67)</u>		<u>98.08</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>281.0 ac</u>	<u>62.05 ac</u>	<u>117.84 ac</u>	<u>300ft/300ft/Min/200 @ RR</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>1,077,900 cy</u>	<u>None: Access via Spruce Creek/Strickland Bay</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>8.34 mi</u>	<u>15 ft</u>	<u>1500ft (across FEC RR)</u>	<u>Conservation/Suburban and Rural Residential</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>No direct road access</u>	<u>2.9 ft</u>	<u>Wetland Harwood Forest F/W Marsh, Salt Water Marsh</u>	<u>Fresh Water Marsh</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-15 is located approximately 1.8 miles west of the ICWW on the southern shore of Rose Bay. It is bounded on the west by a Florida East Coast Railroad right-of-way and on the east by saltwater marsh (642) associated with the Halifax River. A finger of the marsh extends northward across the southern boundary into the site. A coniferous plantation (441) containing slash pine (*Pinus elliottii*) and saw palmetto (*Serenoa repens*) covers most of the site.

A band of wetland hardwood forest (610) containing red maple (*Acer rubrum*), American elm (*Ulmus americana*), and blackgum tupelo (*Nyssa sylvatica* var. *biflora*) lies along the western site boundary. Cinnamon fern (*Osmunda cinnomomea*), a species listed by the state as commercially exploited, also occurs in this community.

A freshwater marsh (641), vegetated by saw grass (*Cladium jamaicense*), Virginia chain fern (*Woodwardia virginiana*), and rush (*Juncus* sp.), lies in the north-central portion of the site. Golden polypody fern (*Phlebodium aureum*, a species listed as threatened by the state), and shoestring fern (*Vittaria lineata*) grow epiphytically on cabbage palms (*Sabal palmetto*) within this wetland.

**Table B-17 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-15, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
441	Coniferous Plantations	228.6
610	Wetland Hardwood Forests	45.7
641	Freshwater Marsh	4.6
642	Saltwater Marsh	2.1
Total		281.0

Source: WAR, 1993

# LEGEND

- 441 Coniferous Plantations
- 610 Wetland Hardwood Forests
- 641 Freshwater Marsh
- 642 Saltwater Marsh

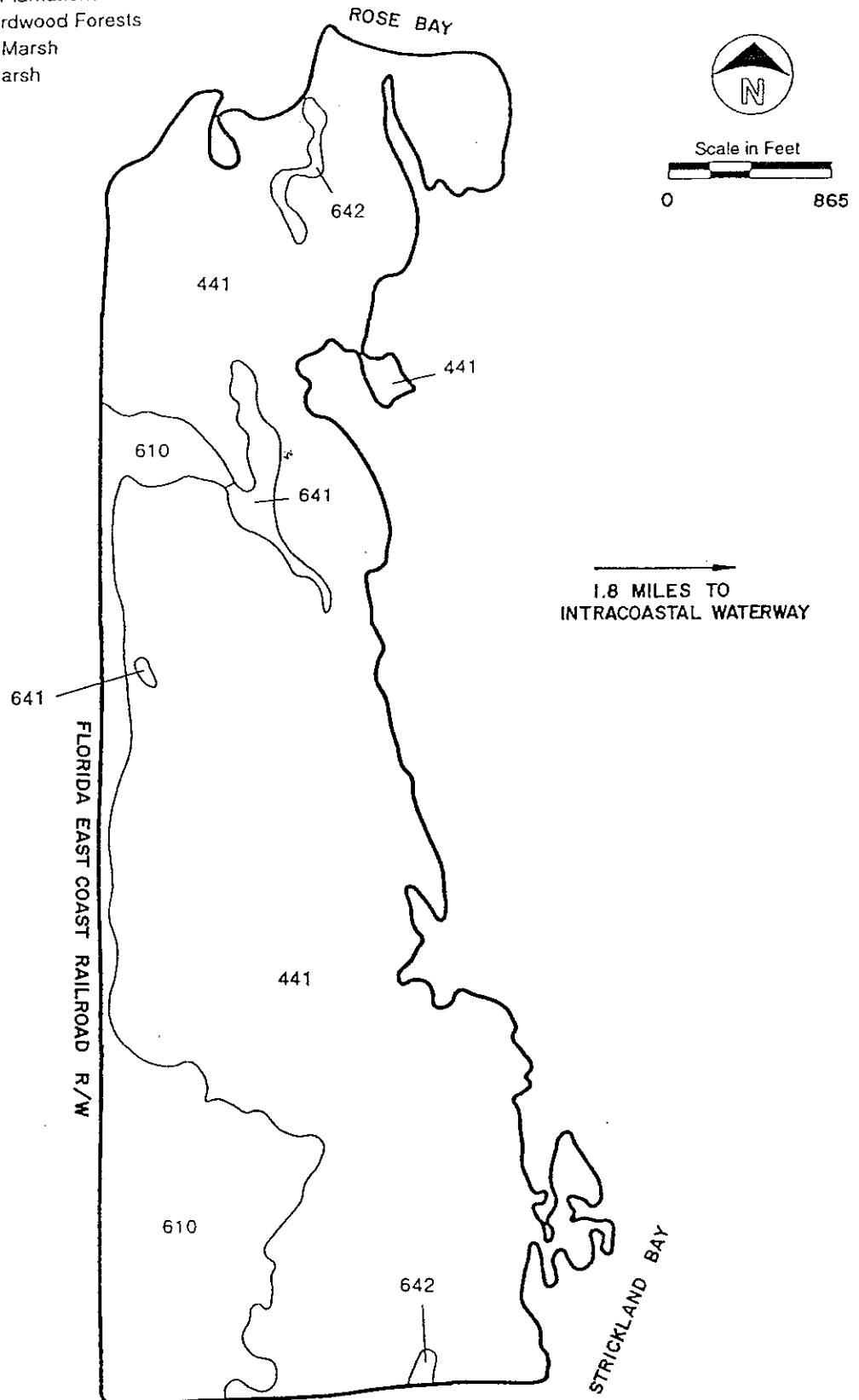


Figure B-20  
Vegetation and Land Use of  
Site V-15  
Volusia County, Florida



SITE       V-16       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>IV</u>	<u>Ponce DeLeon Cut</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>38/16S/33E</u>	<u>6,623,000 cy</u>	<u>10,000 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.98 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Port Orange Bridge (mi 94.69) to S.R. 44 Bridge (mi 105.67)</u>		<u>99.84</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>256.3 ac</u>	<u>63.37 ac</u>	<u>125.56 ac</u>	<u>300 ft Available</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>1,098,400 cy</u>	<u>None: Access via Spruce Creek/Strickland Bay</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>8.42 mi</u>	<u>15 ft</u>	<u>&gt; 1000ft (Wetland Crossing)</u>	<u>Conservation/Med. Density Residential</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>No direct road access</u>	<u>3.5 ft</u>	<u>Wetland Hardwood Forest</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-16, located approximately 2.5 miles west of the ICWW, is bounded on the west by a Florida East Coast Railroad right-of-way, on the east by Turnbull Bay, and on the north by Strickland Bay. The site is bisected north to south by a large wetland hardwood forest (610) containing red maple (*Acer rubrum*), swamp dogwood (*Cornus foemina*), and assorted wetland herbs such as camphor weed (*Pluchea* sp.).

The western half of the site contains a coniferous plantation (441) vegetated by slash pine (*Pinus elliottii*), saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*). This half of the site also contains a hardwood-conifer mix community (434) vegetated by slash pine and various upland oak species (*Quercus* sp.). A large ditch, lying along the western site boundary, contains string-lily (*Crinum americanum*) and common wetland herbs.

The eastern portion of the site consists of hardwood-conifer mix interspersed with areas of planted slash pine. A finger of saltwater marsh (642) extends south across the northern boundary approximately 500 ft into the site.

**Table B-18 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-16, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
434	Hardwood-Conifer Mix	116.5
441	Coniferous Plantations	81.3
610	Wetland Hardwood Forests	54.4
642	Saltwater Marsh	4.1
Total		256.3

Source: WAR, 1993

# LEGEND

- 434 Hardwood-Conifer Mix
- 441 Coniferous Plantations
- 610 Wetland Hardwood Forests
- 642 Saltwater Marsh
- Ditch



Scale in Feet  
0 866

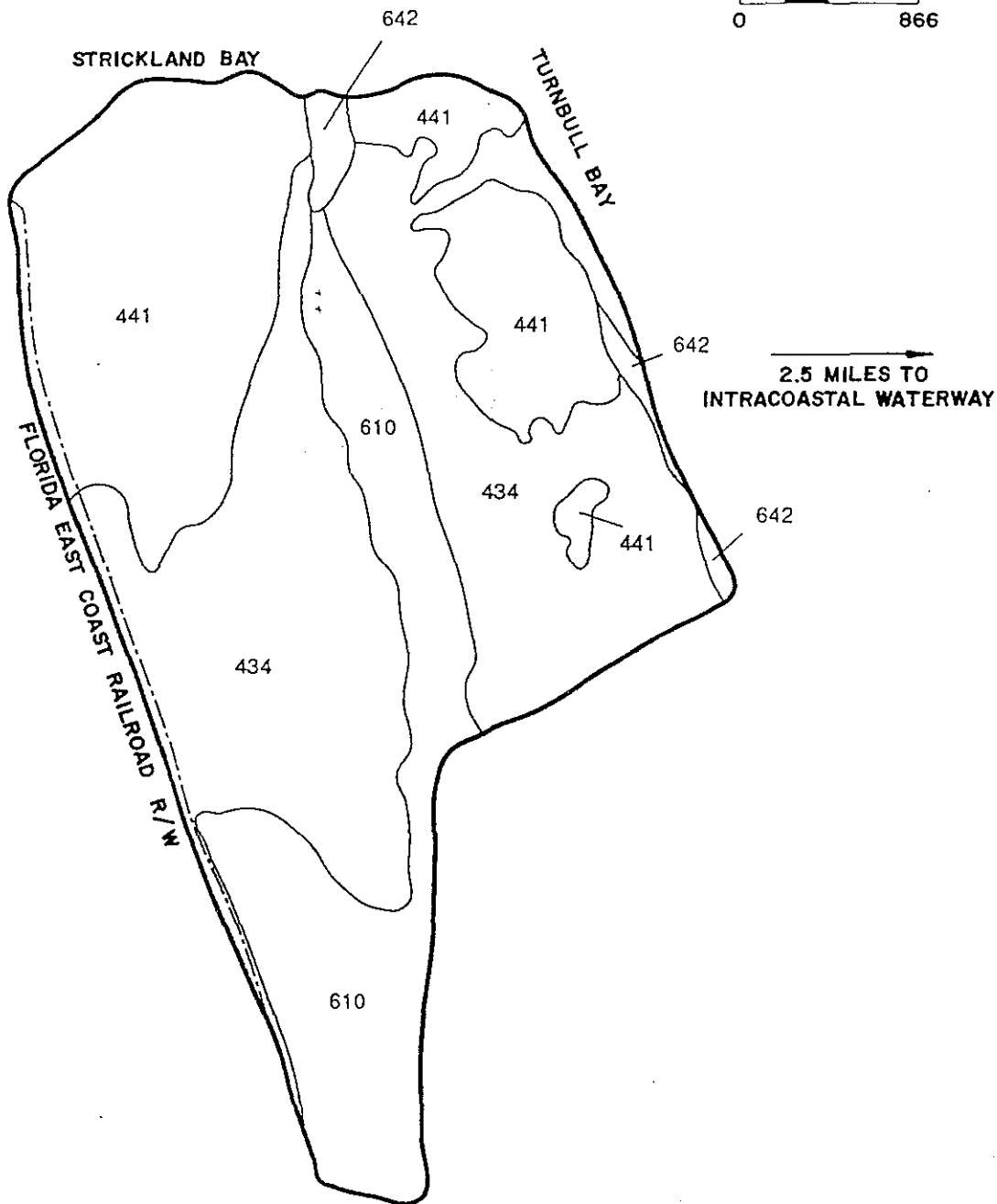


Figure B-21  
Vegetation and Land Use of  
Site V-16  
Volusia County, Florida





SITE     V-17     DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>IV</u>	<u>Ponce DeLeon Cut</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>26,35,38/16S/33E</u>	<u>6,623,000 cy</u>	<u>4300 ft</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N: N/A S: N.S.B.</u>	<u>10.98 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Port Orange Bridge (mi 94.69) to S.R. 44 Bridge (mi 105.67)</u>		<u>99.60</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>292.0 ac</u>	<u>27.55 ac</u>	<u>67.49 ac</u>	<u>Minimum 300 ft all sides</u>
<b>Initial Site Area</b>	<b>Containment Acea</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>472,735 cy</u>	<u>None: Access via Spruce Creek</u>	<u>Vol Co.: Env. Sys. Cor./ Low Impact Urban N.S.B.: Med Density Res</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>7.55 mi</u>	<u>15 ft</u>	<u>&lt; 500 ft</u>	<u>Same as above</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>U.S. 1</u>	<u>5.5 ft</u>	<u>Tidal Flats</u>	<u>Mixed Wetland Hardwoods, Inland Ponds and Sloughs</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-17 is located on the eastern shore of Turnbull Bay, immediately south of Spruce Creek. The site is bounded on the east by U.S. Highway 1.

Vegetation in the northern portion of the site is predominated by cabbage palm (428). Florida coontie (*Zamia umbrosa*, a species listed by the state as commercially exploited) is scattered throughout this area. Golden polypody fern (*Phlebodium aureum*, a species the state lists as threatened) and shoestring fern (*Vittaria lineata*) grow epiphytically on the palm trees.

A large mixed hardwood wetland (617) lies in the northeastern section of the site. This community contains swamp fern (*Blechnum serrulatum*), red mulberry (*Morus rubra*), Carolina willow (*Salix caroliniana*), and aspidium fern (*Thelypteris* sp.), a species the state lists as threatened. A small inland pond (616) located near the northwestern site corner contains Carolina willow, duckweed (*Lemna* sp.), and aspidium fern.

A large, tidally connected borrow pit (651) lies in the center of the site. It consists of an open water area fringed by salt-tolerant marsh grasses. Much of the open water contains oyster bars. A ditch, extending northeast from the pit's northeastern corner, connects to Murray Creek, the main connection to tidally influenced waters. However, several smaller ditches run northwesterly from the pit's southwestern corner and connect to Turnbull Bay.

A sand live oak community (432) vegetates the southeastern portion of the site. Sand live oak (*Quercus geminata*), rusty lyonia (*Lyonia ferruginea*), and devilwood (*Osmanthus americana*) are the dominant species in this area. The southwestern portion of the site contains a mixture of cabbage palm and sand live oak communities. A low-density residential area (110) is located along the site's southern boundary.

**Table B-19 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-17, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
110	Residential, Low Density	10.6
428	Cabbage Palm	116.6
432	Sand Live Oak	108.9
616	Inland Ponds and Sloughs	0.2
617	Mixed Wetland Hardwoods	6.6
651	Tidal Flats	49.1
<b>Total</b>		<b>292.0</b>

Source: WAR, 1993

# LEGEND

- 110 Residential, Low Density
- 428 Cabbage Palm
- 432 Sand Live Oak
- 616 Inland Ponds and Sloughs
- 617 Mixed Wetland Hardwoods
- 651 Tidal Flats
- Tidally Connected Ditch
- === Road



Scale in Feet  
0 852

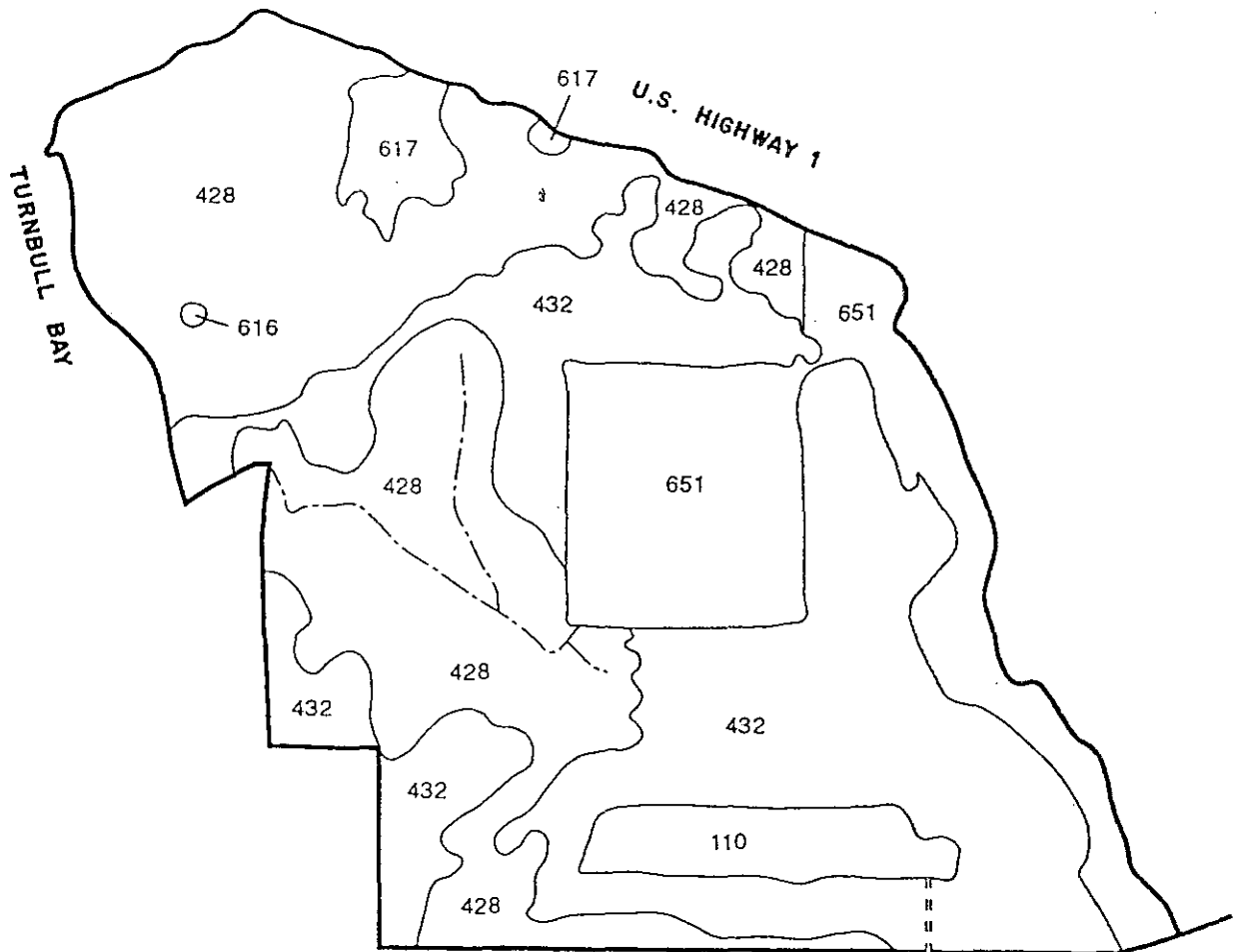


Figure 8-22  
Vegetation and Land Use of  
Site V-17  
Volusia County, Florida



SITE MSA 434B DATA SUMMARY SHEET

**I General Location**

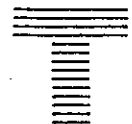
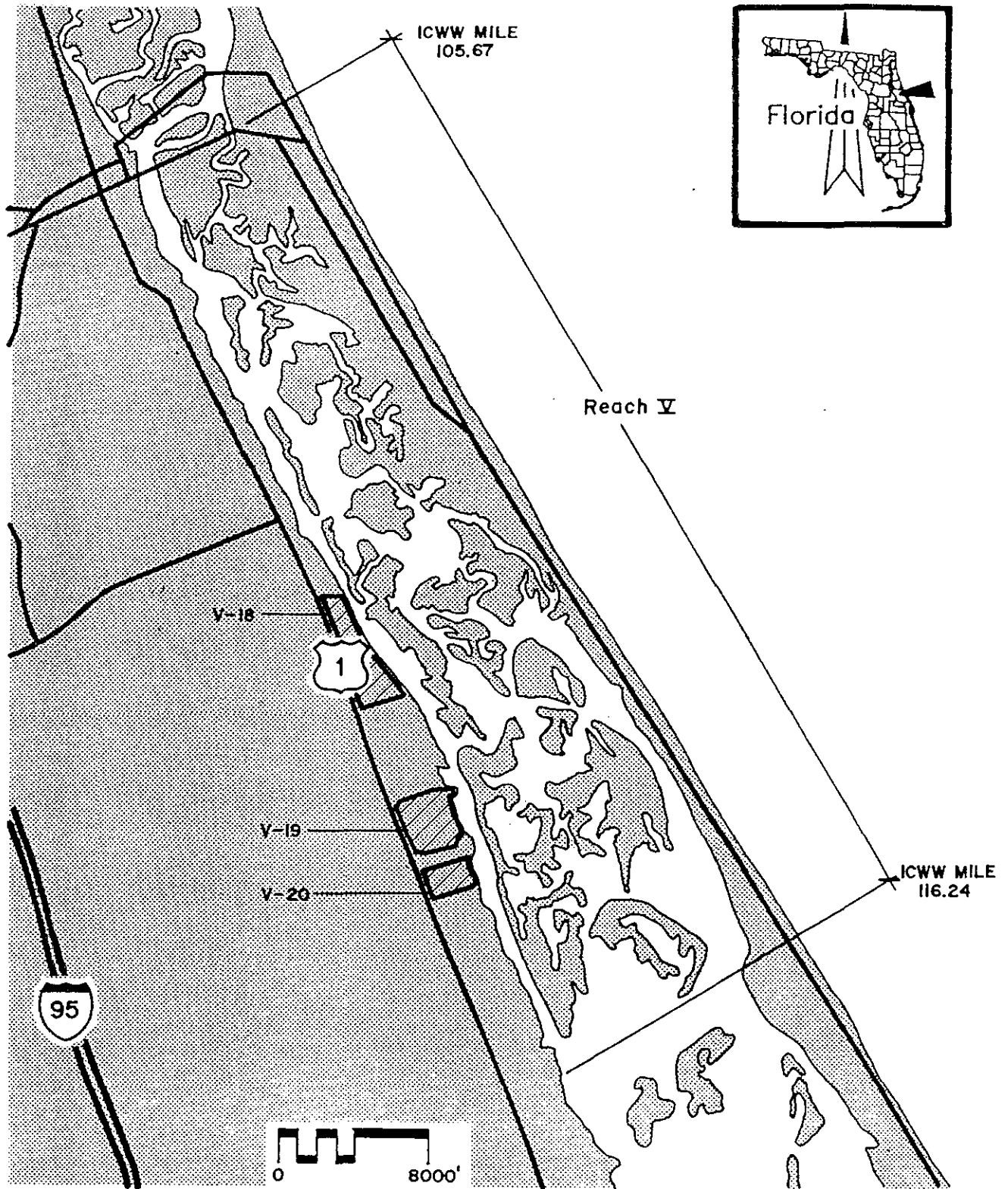
<u>Volusia</u>	<u>IV</u>	<u>Halifax River</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>?/16S/33E</u>	<u>6,623,000 cy</u>	<u>0</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>Ponce Inlet</u>	<u>10.98 mi</u>	<u>III</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Port Orange Bridge (mi 94.69) to S.R. 44 Bridge (mi 105.67)</u>		<u>98.86 - 100.76</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>207.0 ac</u>	<u>9.30 ac</u>	<u>12.80 ac</u>	<u>Minimal Upland Buffer</u>
<b>Initial Esmt. Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>?</u>	<u>66,365 cy</u>	<u>None Required</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>6.25 mi</u>	<u>8 ft</u>	<u>No Upland Access</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>No Upland Access</u>	<u>3.0 ft</u>	<u>None</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### **III Narrative Description**

MSA 434B occupies approximately 2 miles of the western shore of the ICWW. The only area suitable for use as a dredged material storage site is contained in a small island located at the extreme north end of the easement. Because of the small size of the available area, this site was dropped from further consideration as a candidate site and was not mapped.



**TAYLOR ENGINEERING INC**

9086 CYPRESS GREEN DRIVE  
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**Figure B-23**  
**Location Map**  
**Candidate Sites**  
**Reach V**  
**Volusia County, Florida**

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REVISION
SHEET
DATE

**SITE V-18 DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>V</u>	<u>Indian River North</u>
County	Reach #	Waterbody Name
<u>1,12/18S/34E</u>	<u>836,000 cy</u>	<u>Fronts on ICWW</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>Edgewater</u>	<u>10.57 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>S.R. 44 Bridge (mi 105.67) to Eldora (mi 116.24)</u>		<u>110.43</u>
Reach Start/End		ICWW Mile of Site

**II Site Characteristics**

<u>252.0 ac</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Initial Site Acreage	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>+10.0 ft NGVD</u>	<u>Developed</u>	<u>None Required</u>	<u>Med. Density Residential</u>
Initial Site Area	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>4.76 mi</u>	<u>N/A</u>	<u>None Required</u>	<u>Urban Low Intensity/ Commercial</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>U.S. 1</u>	<u>N/A</u>	<u>None</u>	<u>None</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands



### III Narrative Description

Site V-18 is located in the town of Edgewater, east of U.S. Highway 1. The entire site is presently included in the Edgewater Landing development. Some natural vegetation remains in the northern portion of the site; however, the intensely developed areas contain mainly landscaping plants. This site has been dropped from further consideration.

**Table B-20 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-18, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
110	Residential, Low Density	70.3
130	Residential, High Density	172.4
741	Rural Land in Transition Without Positive Indicators of Intended Activity	9.3
Total		252.0

Source: WAR, 1993

# LEGEND

- 110 Residential, Low Density
- 130 Residential, High Density
- 741 Rural Land in Transition Without Positive Indicators of Intended Activity
- = = = Road

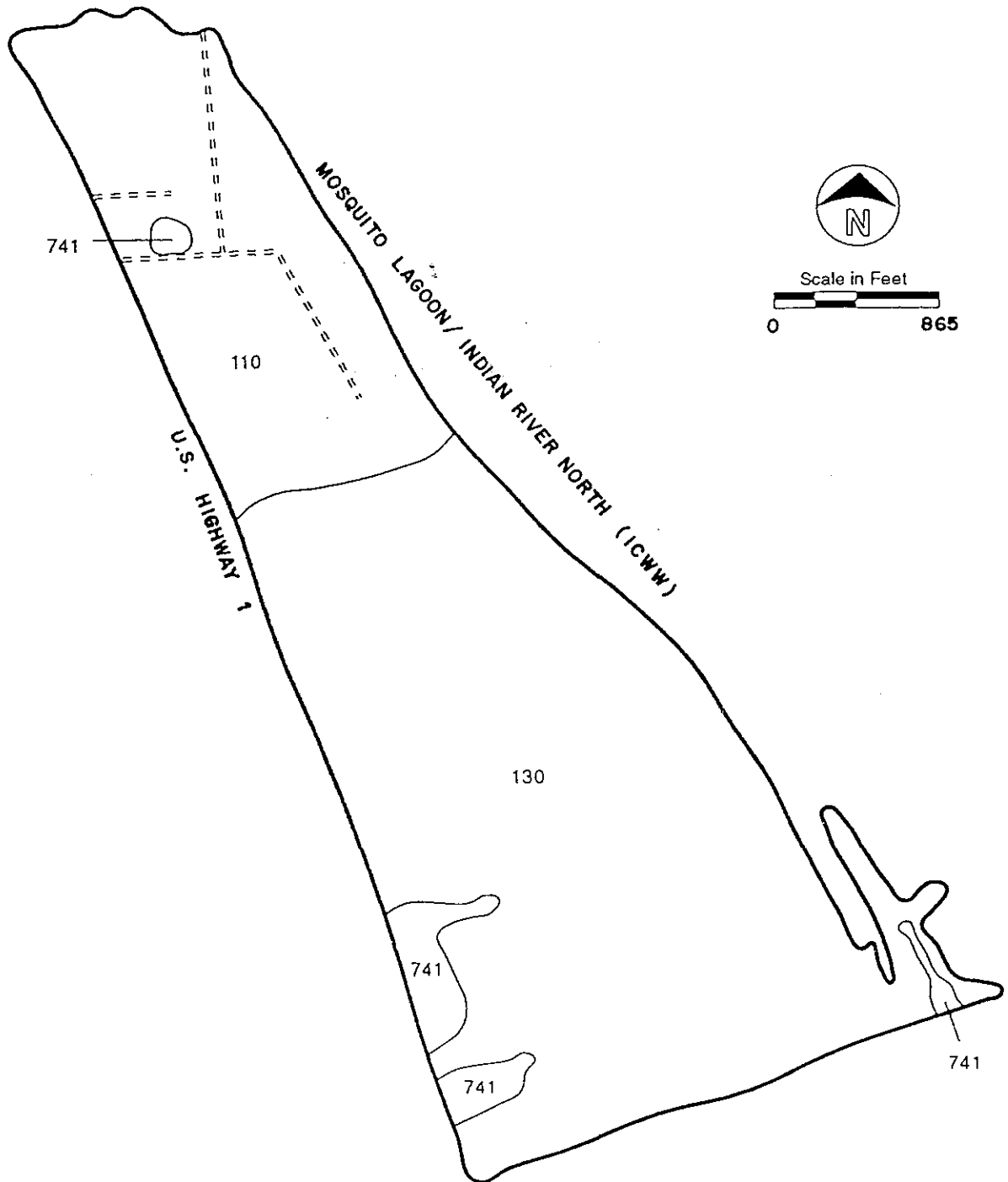


Figure B-24  
Vegetation and Land Use of  
Site V-18  
Volusia County, Florida



SITE     V-19     DATA SUMMARY SHEET

I General Location

<u>Volusia</u>	<u>V</u>	<u>Indian River North</u>
County	Reach #	Waterbody Name
<u>CE McHardy Grant/18S/35E</u>	<u>836,000 cy</u>	<u>Fronts on ICWW</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>N/A</u>	<u>10.57 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>S.R. 44 Bridge (mi 105.67) to Eldora (mi 116.24)</u>		<u>112.63</u>
Reach Start/End		ICWW Mile of Site

II Site Characteristics

<u>187.5 ac</u>	<u>45.12 ac</u>	<u>95.40 ac</u>	<u>300 ft</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>+ 10.0 ft NGVD</u>	<u>780,100 cy</u>	<u>None Required</u>	<u>Urban Med. Intensity</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>7.16 mi</u>	<u>15 ft</u>	<u>None Required</u>	<u>Urban Low Density/ Commercial</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>U.S. 1</u>	<u>3.89 ft</u>	<u>None</u>	<u>None</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

SITE       V-20       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>V</u>	<u>Indian River North</u>
County	Reach #	Waterbody Name
<u>CE McHardy Grant/18S/35E</u>	<u>836,000 cy</u>	<u>Fronts on ICWW</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>N/A</u>	<u>10.57 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>S.R. 44 Bridge (mi 105.67) to Eldora (mi 116.24)</u>		<u>113.38</u>
Reach Start/End		ICWW Mile of Site

**II Site Characteristics**

<u>88.2 ac</u>	<u>48.50 ac</u>	<u>85.69 ac</u>	<u>100 ft/300/300/&gt; 200</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>+ 10.0 ft ±</u>	<u>837,800 cy</u>	<u>None Required</u>	<u>Urban Med. Intensity</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>7.71 mi</u>	<u>15 ft</u>	<u>None Required</u>	<u>N: Industrial</u> <u>S: Residential</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>U.S. 1</u>	<u>4.12 ft</u>	<u>Mixed Wetland</u> <u>Hardwoods</u>	<u>None</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

#### V-19

Site V-19 is located south Edgewater, east of U.S. 1. It is presently being developed as an addition to "Hacienda Del Rio", a manufactured home community (130). Therefore, it has been dropped from further consideration.

### III Narrative Description

#### V-20

Site V-20 lies south of Site V-19, separated from it by two industrial sites. The site is bisected by a north-south canal (510) which appears to be part of the local drainage infrastructure. The canal contained standing water at the time of the site inspection. Narrow strips of mixed wetland hardwoods (617) lie along both banks of the canal. Vegetation in these strips include hackberry (*Celtis laevigata*), American elm (*Ulmus americana*), pig nut hickory (*Carya glabra*), and laurel oak.

The western half of the site is vegetated by a coniferous plantation (441). Vegetation primarily consists of slash pine (*Pinus elliottii*) and saw palmetto (*Serenoa repens*). Other notable species include tarflower (*Befaria racemosa*), and prickly pear cactus (*Opuntia species*, a species listed by the state as threatened). A small remnant canal lies in this area near the northern site boundary. The eastern half of the site contains a hardwood-conifer mix community vegetated by slash pine and assorted upland oaks such as laurel oak (*Quercus laurifolia*).

A low density, single-family development (110) lies along the southern site boundary. An east-west drainage canal, which separates this development from the site, drains into the north-south canal previously described.

**Table B-21 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-19 and V-20, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
110	Residential, Low Density	9.1
130	Residential, High Density	204.0
156	Other Heavy Industrial	74.1
434	Hardwood Conifer Mix	28.4
441	Coniferous Plantations	42.2
510	Streams and Waterways	0.6
617	Mixed Wetland and Hardwoods	4.4
743	Spoil Areas	5.8
Total		368.6

Source: WAR, 1993

# LEGEND

- 130 Residential, High Density
- 110 Residential, Low Density
- 155 Other Light Industrial
- 434 Hardwood Conifer Mixed
- 441 Coniferous Plantations
- 510 Streams and Waterways
- 617 Mixed Wetland Hardwoods
- 743 Spoil Areas



Scale in Feet  
0 848

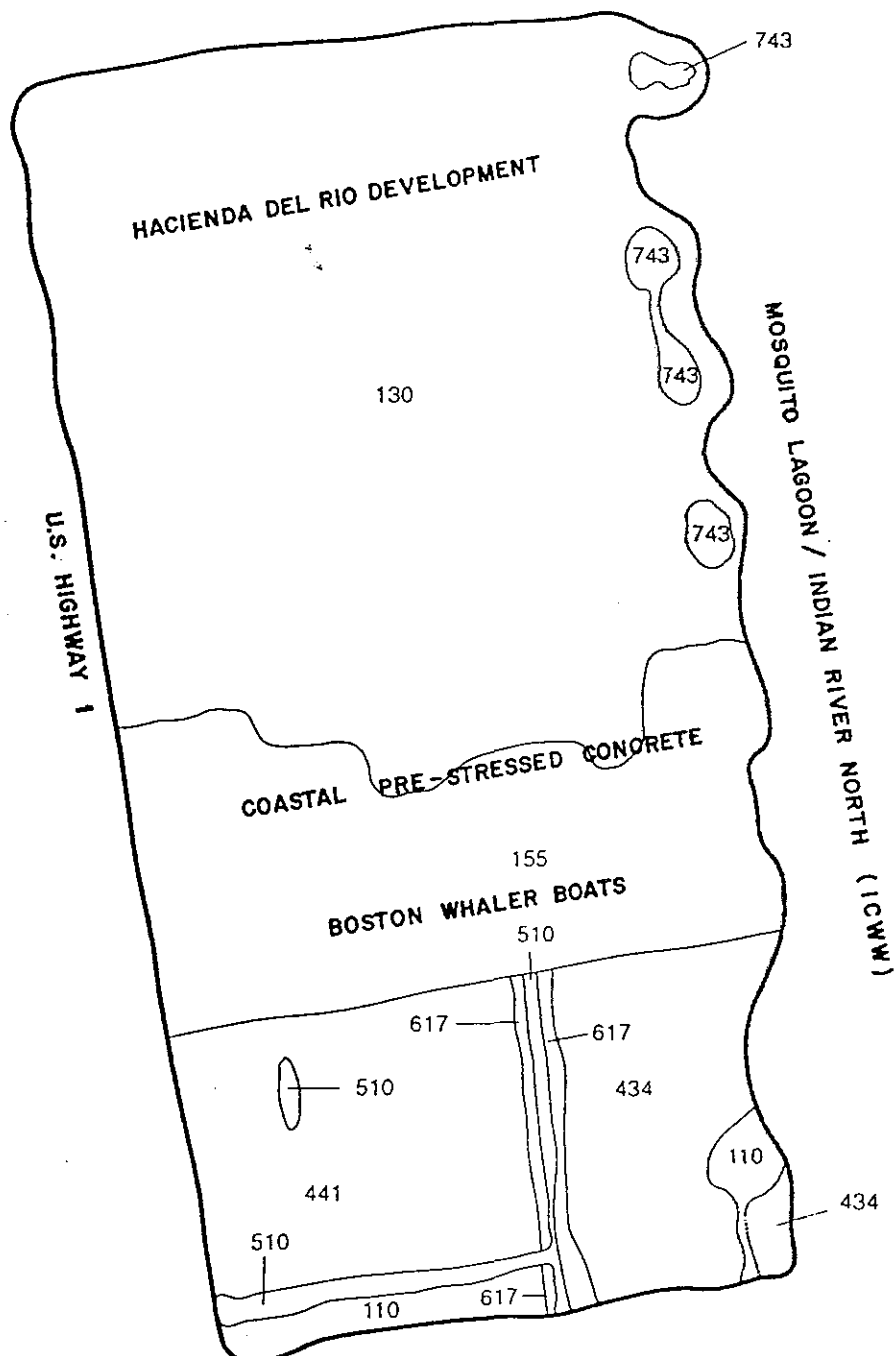
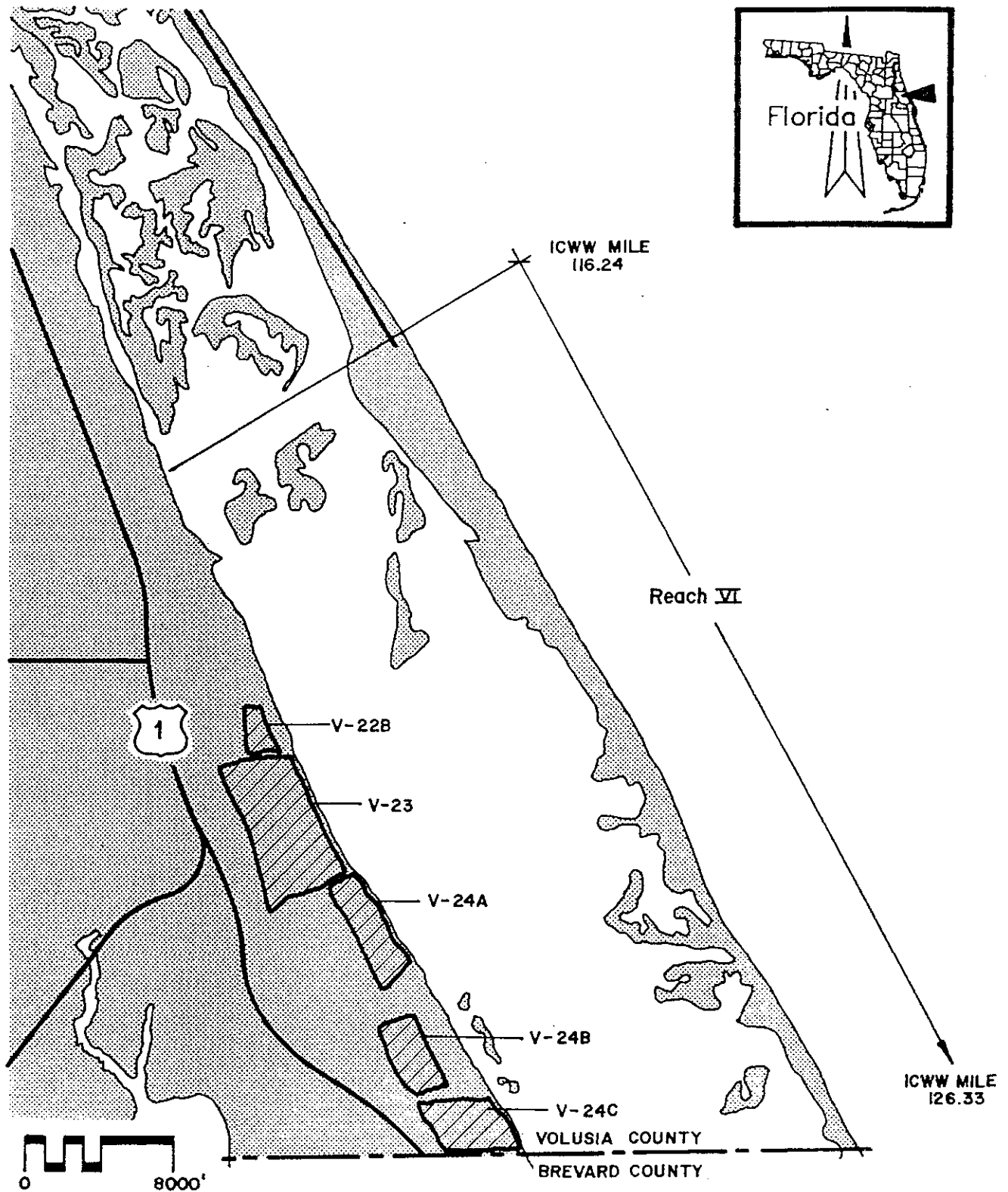


Figure B-25  
Vegetation and Land Use of  
Sites V-19 and V-20  
Volusia County, Florida





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Figure B-26  
Location Map  
Candidate Sites  
Reach VI  
Volusia County, Florida

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SITE     V-22B     DATA SUMMARY SHEET

I General Location

<u>Volusia</u>	<u>VI</u>	<u>Mosquito Lagoon/Indian River N.</u>
County	Reach #	Waterbody Name
<u>9/19S/35E</u>	<u>480,000 cy</u>	<u>930 ft to Mosquito Lagoon</u> <u>1830 ft to ICWW</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>N/A</u>	<u>10.09 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>Eldora (mi 116.24) to Haulover Canal (mi 126.33)</u>		<u>118.76</u>
Reach Start/End		ICWW Mile of Site

II Site Characteristics

<u>53.3 ac</u>	<u>36.5 ac</u>	<u>80.70 ac</u>	<u>300/300/ &lt; 900/300</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>&gt; +10.0 ft NGVD</u>	<u>524,450 cy</u>	<u>None Req'd</u>	<u>Conservation</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>7.82 mi</u>	<u>13 ft</u>	<u>None Req'd</u>	<u>Conservation</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>Bill's Hill Rd.</u>	<u>3.14 ft</u>	<u>None</u>	<u>None</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

Site V-22B lies within the Canaveral National Seashore on the western shore of the ICWW. Much of the site interior, formerly a citrus grove, has been cleared and remains fallow (261). This area is overgrown with a variety of shrubs, young trees, and grasses.

Coastal scrub vegetation (322) surrounds the grove area to the north, west and south. This community consists of a dense cover of oaks (*Quercus geminata*, *Q. myrtifolia*, and *Q. chapmanii*) and other scrub species. Scrub jays were seen in this area during the site inspection. The scrub jay is listed by both state and federal agencies as threatened.

A band of temperate hardwoods (425) lies along the shore of the ICWW, which forms the site's eastern boundary. This area is dominated by a canopy of live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), and pignut hickory (*Carya glabra*) trees.

**Table B-22 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-22B Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
261	Fallow Cropland	53.3
322	Coastal Scrub	16.8
425	Temperate Hardwoods	10.6
Total		80.7

Source: WAR, 1993

# LEGEND

- 110 Low Density Residential
- 261 Fallow Cropland
- 322 Coastal Scrub
- 411 Pine Flatwoods
- 425 Temperate Hardwoods
- === Road
- Ditch
- Boundary, Canaveral National Seashore



Scale in Feet  
0 848

0.6 MILES TO  
U.S. HIGHWAY 1

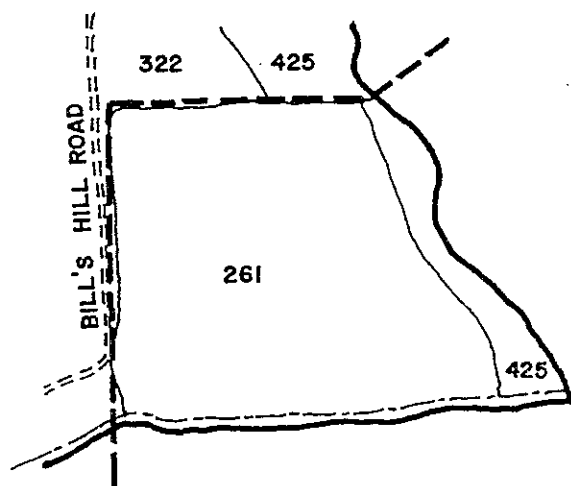
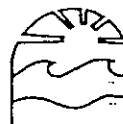


Figure B-27  
Vegetation and Land Use of  
Site V-22B  
Volusia County, Florida



SITE     V-23     DATA SUMMARY SHEET

I General Location

<u>Volusia</u>	<u>VI</u>	<u>Mosquito Lagoon/Indian River N.</u>
County	Reach #	Waterbody Name
<u>16,21/19S/35E</u>	<u>480,000 cy</u>	<u>Fronts on I.R.L.</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>N/A</u>	<u>10.09 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>Eldora (mi 116.24) to Haulover Canal (mi 126.33)</u>		<u>119.32</u>
Reach Start/End		ICWW Mile of Site

II Site Characteristics

<u>772.1 ac</u>	<u>40.0 ac</u>	<u>89.28 ac</u>	<u>300/300/1000/300</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>+ 8.0 ft ± NGVD</u>	<u>515,154 cy</u>	<u>None Required</u>	<u>Conservation</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>7.67 mi</u>	<u>12 ft</u>	<u>300 ft - 1500 ft</u>	<u>Conservation</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>Dirt Rd. off U.S. 1</u>	<u>2.87 ft</u>	<u>Mixed Forested Wetlands, Saltwater Marsh</u>	<u>Freshwater Marsh, Wet Prairie</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

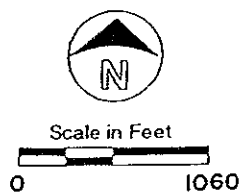
V-23 is located within the Canaveral National Seashore Park on the western shore of the ICWW. It is bordered on the south by Gomez Grantline Road. The site contains a variety of upland and wetland communities. Many of the wetlands have formed between old coastal dune ridges. Most are herbaceous wet prairies (641) or freshwater marshes (643). These areas are vegetated by sand cordgrass (*Spartina bakerii*), saw grass (*Cladium jamaicense*), and Virginia chain fern (*Woodwardia virginica*). Forested wetlands (630) are also present and are vegetated by red maple (*Acer rubrum*), cabbage palm (*Sabal palmetto*), sweetgum (*Liquidambar styraciflua*), and Florida elm (*Ulmus floridana*). Saltwater marsh (642) lines the eastern edge of the site.

Upland communities on site include coastal scrub (322), pine flatwoods (411), and temperate hardwoods (425). The coastal scrub community contains a dense cover of sand live oak (*Quercus geminata*), myrtle oak (*Quercus mytifolia*), fetterbush (*Lyonia lucida*), and Chapman's oak (*Quercus chapmanii*). Slash pine (*Pinus elliottii*) are interspersed throughout this community. Greater numbers of slash pine are present in the scrubby pine flatwoods. The flatwoods also contain saw palmetto (*Serenoa repens*), fetterbush, and a broken cover of scrubby oaks. The temperate hardwood community, located on the western edge of the site, has a canopy of live oak (*Quercus virginiana*), cabbage palm, red cedar (*Juniperus silicicola*), sweetgum (*Liquidambar styraciflua*), and Florida elm (*Ulmus floridana*). Some areas of predominately hydric hammock are present within this community.

**Table B-23 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-23, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
322	Coastal Scrub	364.8
411	Pine Flatwoods	142.6
425	Temperate Hardwoods	144.3
630	Wetland Forested Mixed	13.1
641	Freshwater Marsh	57.4
642	Saltwater Marsh	48.8
643	Wet Prairie	1.1
Total		772.1

Source: WAR, 1993



# LEGEND

- 322 Coastal Scrub
- 411 Pine Flatwoods
- 425 Temperate Hardwoods
- 630 Wetland Forested Mixed
- 641 Freshwater Marsh
- 642 Saltwater Marsh
- 643 Wet Prairie
- == Road

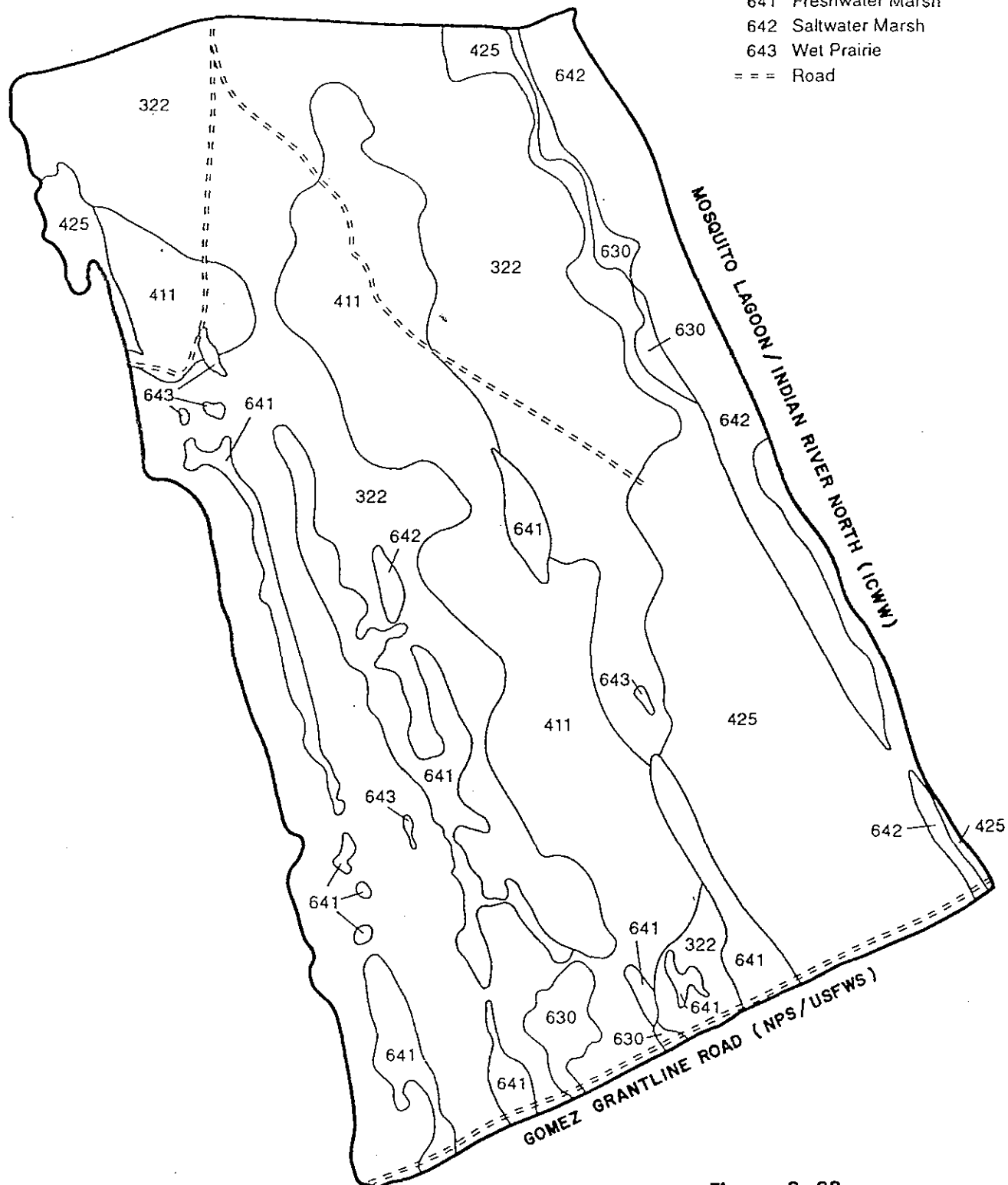


Figure B-28  
Vegetation and Land Use of  
Site V-23  
Volusia County, Florida



**SITE V-24A DATA SUMMARY SHEET**

**I General Location**

<u>Volusia</u>	<u>VI</u>	<u>Mosquito Lagoon/Indian Rvr N</u>
<b>County</b>	<b>Reach #</b>	<b>Waterbody Name</b>
<u>27/19S/35E</u>	<u>492,000 cy</u>	<u>Fronts on Indian River</u>
<b>Sec/Twp/Rge</b>	<b>50 yr Reach Req'mt</b>	<b>Distance from Waterbody to Site</b>
<u>N/A</u>	<u>10.09 mi</u>	<u>II</u>
<b>Municipality</b>	<b>Reach Length</b>	<b>DER Receiving Water</b>
<u>Eldora (mi 116.24) to Haulover Canal (mi 126.33)</u>		<u>120.95</u>
<b>Reach Start/End</b>		<b>ICWW Mile of Site</b>

**II Site Characteristics**

<u>298.4 ac</u>	<u>40.0 ac</u>	<u>85.04 ac</u>	<u>300' Minimum</u>
<b>Initial Site Area</b>	<b>Containment Area</b>	<b>Total Area Required</b>	<b>Buffer Width N,S,E,&amp; W</b>
<u>&lt; +5.0 ft NGVD</u>	<u>515,150 cy</u>	<u>None Required</u>	<u>Conservation</u>
<b>Avg. Site Elev.</b>	<b>Containment Capacity</b>	<b>Pipeline Easement</b>	<b>Comp. Plan Designation</b>
<u>5.78 mi</u>	<u>12 ft</u>	<u>&gt; 9500 ft from SR 3</u>	<u>Conservation</u>
<b>Max. Pumping Distance</b>	<b>Dike Height</b>	<b>Road Easement</b>	<b>Surrounding Land Use</b>
<u>Dirt Rd. off S.R. 3</u>	<u>2.42 ft</u>	<u>Wax Myrtle/Wet Prairie, Mixed Hardwood Wetlands</u>	<u>None</u>
<b>Road to Site</b>	<b>Excavation Depth</b>	<b>DER Juris. Wetlands</b>	<b>Isolated Wetlands</b>

### III Narrative Description

Site V-24A is located in the Merritt Island National Wildlife Refuge (USFWS) on the western shore of the ICWW. A sand live oak community (432) covers most of the site. It contains sand live oak (*Quercus geminata*), bracken fern (*Pteridium aquilinum*), and rusty lyonia (*Lyonia ferruginea*). The western edge of the site is vegetated by a mixed hardwood wetland (617) and wax myrtle/wet prairie communities (619/643). Two old orange groves (221/741) are located on the eastern site boundary, surrounded by the sand live oak community. A wax myrtle/wet prairie community lies north of the orange groves along the eastern site boundary. Sand live oak cover in the site interior is very thick; however, habitation by scrub jays may be possible there.

**Table B-24 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-24A, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
221/741	Citrus Groves/Rural Land in Transition Without Positive Indicators of Intended Activity	11.4
432	Sand Live Oak	213.2
617	Mixed Wetlands Hardwoods	12.2
619/643	Wax Myrtle/Wet Prairies	61.6
Total		298.4

Source: WAR, 1993



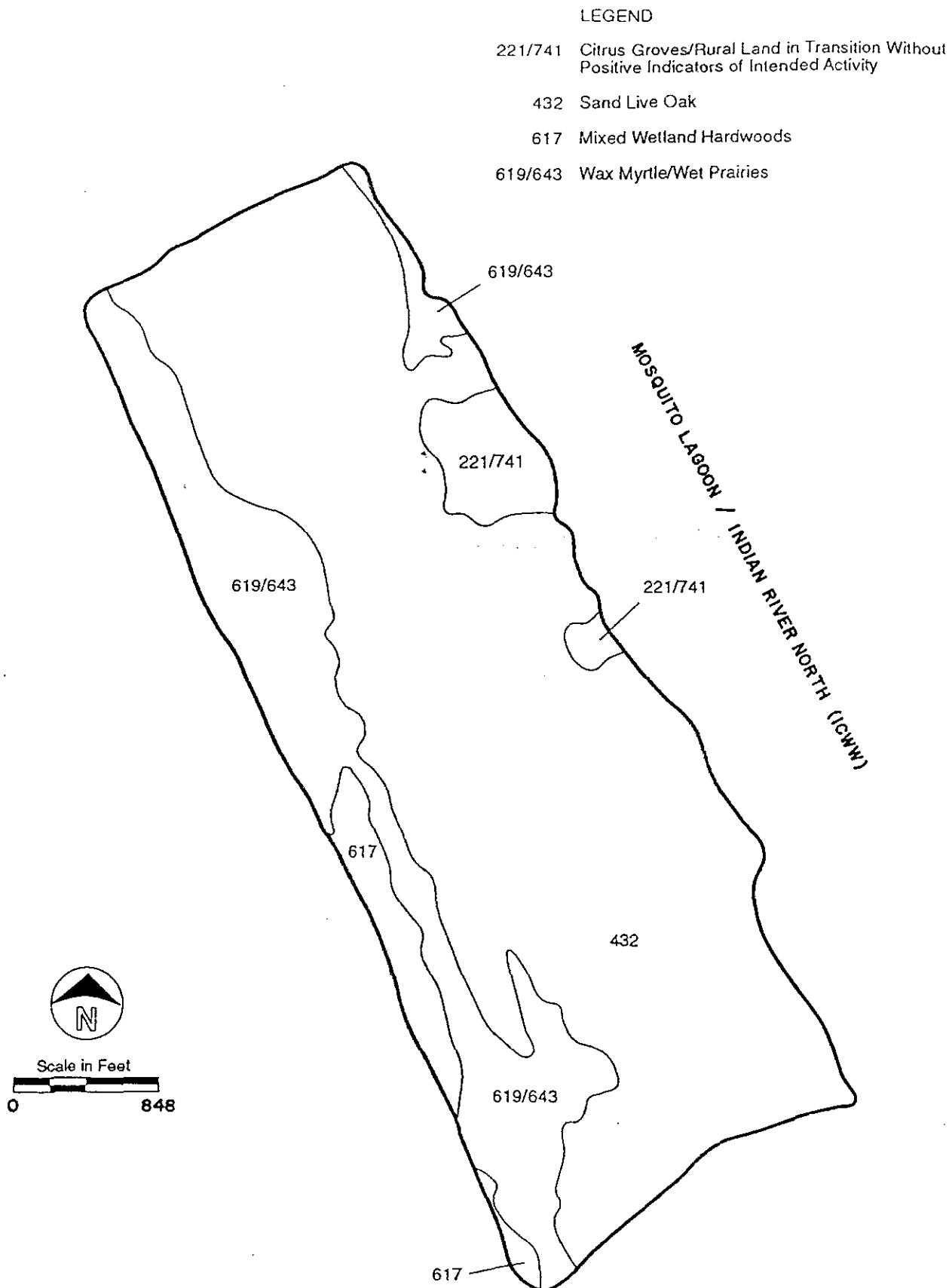
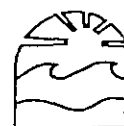


Figure B-29  
Vegetation and Land Use of  
Site V-24A  
Volusia County, Florida



SITE     V-24B     DATA SUMMARY SHEET

I General Location

<u>Volusia</u>	<u>VI</u>	<u>Mosquito Lagoon/Indian Rvr N</u>
County	Reach #	Waterbody Name
<u>27,34/19S/35E</u>	<u>480,000 cy</u>	<u>Fronts on Indian River</u>
Sec/Twp/Rge	50 yr Reach Req't	Distance from Waterbody to Site
<u>N/A</u>	<u>10.09 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>Eldora (mi 116.24) to Haulover Canal (mi 126.33)</u>		<u>122.18</u>
Reach Start/End		ICWW Mile of Site

II Site Characteristics

<u>217.6 ac</u>	<u>40.0 ac</u>	<u>84.71 ac</u>	<u>300' Minimum, all sides</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>+7.0 ft NGVD</u>	<u>515,150 cy</u>	<u>None Required</u>	<u>Conservation</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>6.20 mi</u>	<u>12 ft</u>	<u>&gt; 3600 ft from SR 3</u>	<u>Merritt Island National Wildlife Refuge</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>Dirt Rd. off S.R. 3</u>	<u>2.39 ft</u>	<u>Mixed Hardwood Wetlands, Freshwater Marsh</u>	<u>None</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

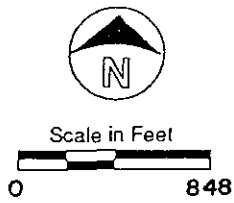
Site V-24B is located in the Merritt Island National Wildlife Refuge on the western shore of the ICWW. The site interior contains sand live oak (432) and hardwood conifer mix (434) communities. The sand live oak community contains sand live oak (*Quercus geminata*), slash pine (*Pinus elliottii*), and prickly pear cactus (*Opuntia* sp., listed by the state as threatened). The existence of Gopher tortoise (*Gopherus polyphemus*) in this community is evidenced by the presence of their burrows. Vegetation in the hardwood conifer mix community includes slash pine, sand live oak, wax myrtle (*Myrica cerifera*), and muscadine grape (*Vitis rotundifolia*). The hardwood conifer mix community lies in the center of the site. Prickly pear cactus and gopher tortoise burrows are also present in this area.

A band of mixed wetland hardwoods (617) partially encircle the site on the north and west. A fringe of freshwater marsh (641) lies along the eastern site boundary. Old citrus groves (221/741) are located in the southwestern site corner.

**Table B-25 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-24B, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
221/741	Citrus Groves/Rural Land in Transition Without Positive Indicators of Intended Activity	9.7
432	Sand Live Oak	132.2
434	Hardwood Conifer Mixed	36.0
617	Mixed Wetlands Hardwoods	29.2
641	Freshwater Marsh	10.5
Total		217.6

Source: WAR, 1993



LEGEND

- 221/741 Citrus Groves/Rural Land in Transition Without Positive Indicators of Intended Activity
- 432 Sand Live Oak
- 434 Hardwood Conifer Mixed
- 617 Mixed Wetland Hardwoods
- 641 Freshwater Marsh

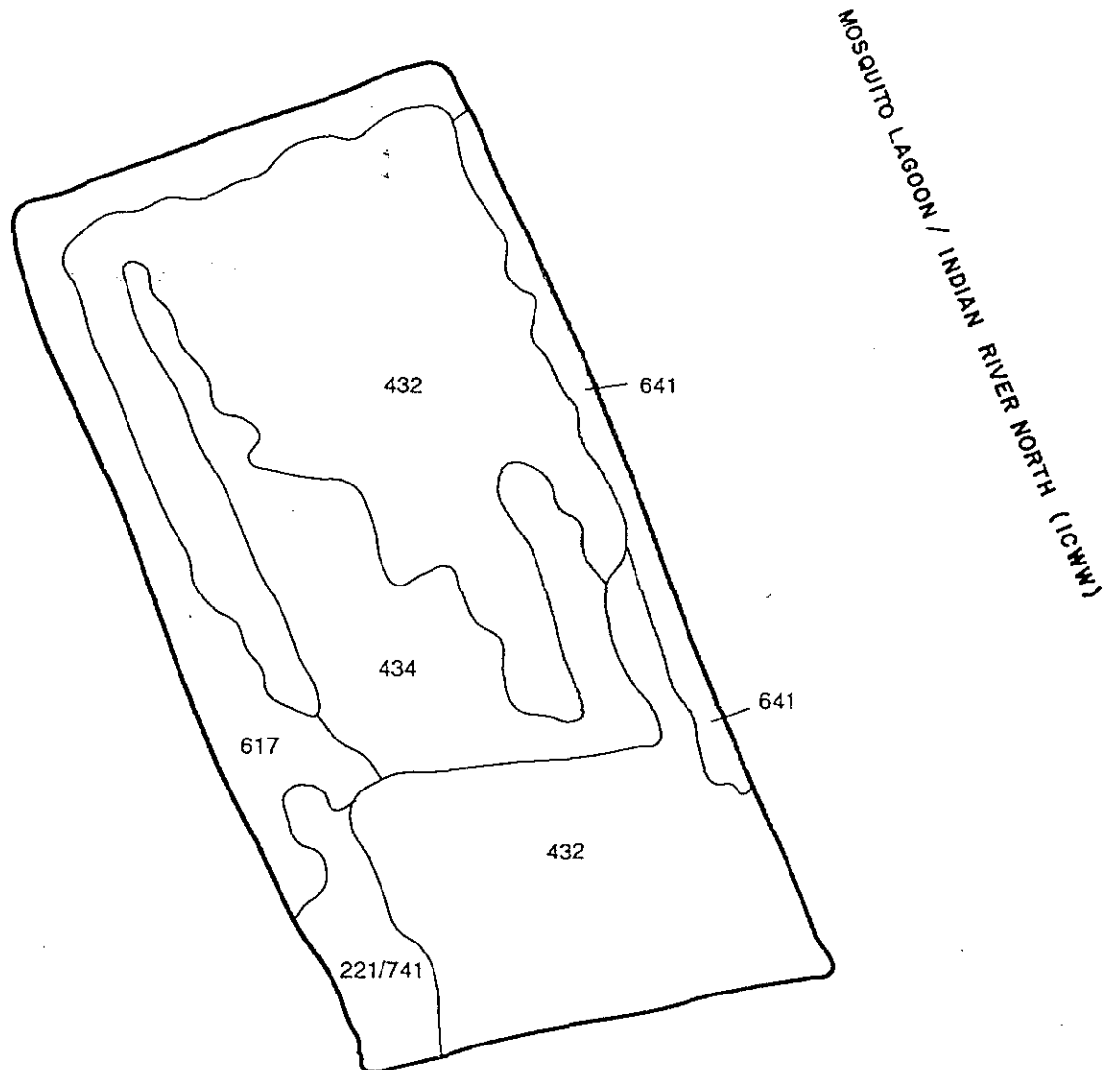


Figure B-30  
Vegetation and Land Use of  
Site V-24B  
Volusia County, Florida



SITE       V-24C       DATA SUMMARY SHEET

**I General Location**

<u>Volusia</u>	<u>VI</u>	<u>Mosquito Lagoon/Indian Rvr N</u>
County	Reach #	Waterbody Name
<u>35/19S/35E</u>	<u>480,000 cy</u>	<u>Fronts on Indian River</u>
Sec/Twp/Rge	50 yr Reach Req'mt	Distance from Waterbody to Site
<u>N/A</u>	<u>10.09 mi</u>	<u>II</u>
Municipality	Reach Length	DER Receiving Water Classificatio
<u>Eldora (mi 116.24) to Haulover Canal (mi 126.33)</u>		<u>122.88</u>
Reach Start/End		ICWW Mile of Site

**II Site Characteristics**

<u>277.2 ac</u>	<u>40.0 ac</u>	<u>88.55 ac</u>	<u>300' Minimum, all sides</u>
Initial Site Area	Containment Area	Total Area Required	Buffer Width N,S,E,& W
<u>+5.0 ft NGVD</u>	<u>515,150 cy</u>	<u>None Required</u>	<u>Conservation</u>
Avg. Site Elev.	Containment Capacity	Pipeline Easement	Comp. Plan Designation
<u>6.73 mi</u>	<u>12 ft</u>	<u>5200 ft from SR 3</u>	<u>Merritt Island National Wildlife Refuge</u>
Max. Pumping Distance	Dike Height	Road Easement	Surrounding Land Use
<u>Dirt Jeep Trail off S.R. 3</u>	<u>2.79 ft</u>	<u>Mixed Hardwood Wetlands</u>	<u>None</u>
Road to Site	Excavation Depth	DER Juris. Wetlands	Isolated Wetlands

### III Narrative Description

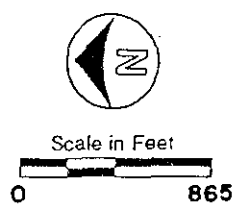
Site V-24C is located in the Merritt Island National Wildlife Refuge on the western shore of the ICWW. Much of the site is vegetated by pine-mesic oak (414) and xeric oak (421) communities. The pine mesic oak community contains slash pine (*Pinus elliottii*), live oak (*Quercus virginiana*), and saw palmetto (*Serenoa repens*).

Fingers of mixed wetland hardwoods (617) project south to north into the upland areas along the southern site boundary. These wetland communities contain wax myrtle (*Myrica cerifera*), red maple (*Acer rubrum*), and some dahoon holly (*Ilex cassine*). Wetland herbs such as saw grass (*Cladium jamaicense*) and duck potato (*Sagittaria lancifolia*) are also present. A large, water-filled canal lies along the southern site boundary.

**Table B-26 Approximate Acreage of the Florida Land Use, Cover, and Forms Classification System Found at Site V-24C, Volusia County, Florida**

Map ID No.	Name	Approximate Acreage
414	Pine-Mesic Oak	164.9
421	Xeric Oak	85.8
617	Mixed Wetlands Hardwoods	26.5
Total		277.2

Source: WAR, 1993



# LEGEND

- 414 Pine-Mesic Oak
- 421 Xeric Oak
- 617 Mixed Wetland Hardwoods
- Canal

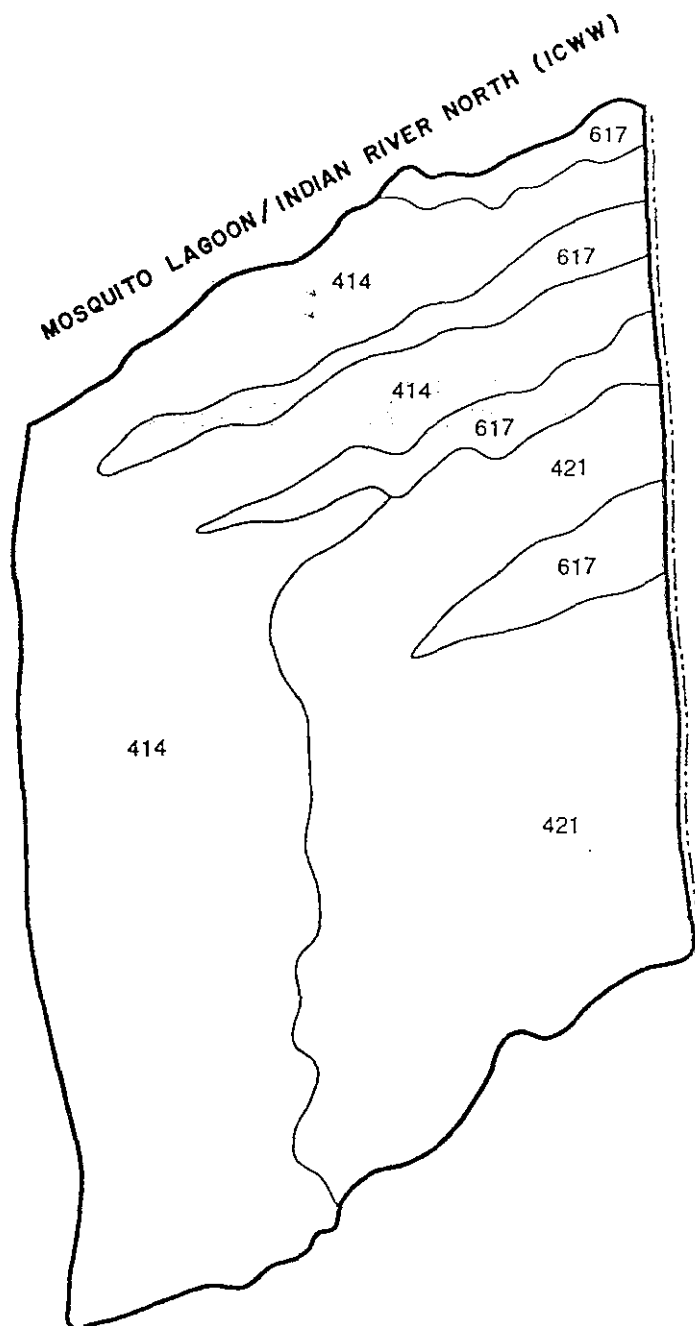


Figure B-31  
Vegetation and Land Use of  
Site V-24C  
Volusia County, Florida



## **APPENDIX C**



Width of Dike at Grade,  $B_G$

$$B_G = 2HS + T \quad (1)$$

Width of Dike at Excavated Grade,  $B_g$

$$B_g = 2HS + T + (G - g) S \quad (2)$$

Width of Dike at Depth of Freeboard and Ponding,  $B_F$

$$B_F = 2FS + T \quad (3)$$

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

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

Volume of Dike Material Available on Site,  $V_{MA}$

$$V_{MA} = (G - g)[A - \frac{1}{2}P_I (B_g - B_G)] \quad (5)$$

Volume of Disposal Capacity,  $V_D$

$$V_D = V_{MA} + (H - F) \left\{ A + \frac{1}{2}P_I [B_G - (H - F) S - B_F] \right\} \quad (6)$$

Depth of Excavation,  $(G - g)$

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

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

$$b = P_I HS + \frac{1}{2}P_I T - A - \frac{1}{2}P_I B_G$$

$$c = \frac{1}{2}H (T + B_G) P$$

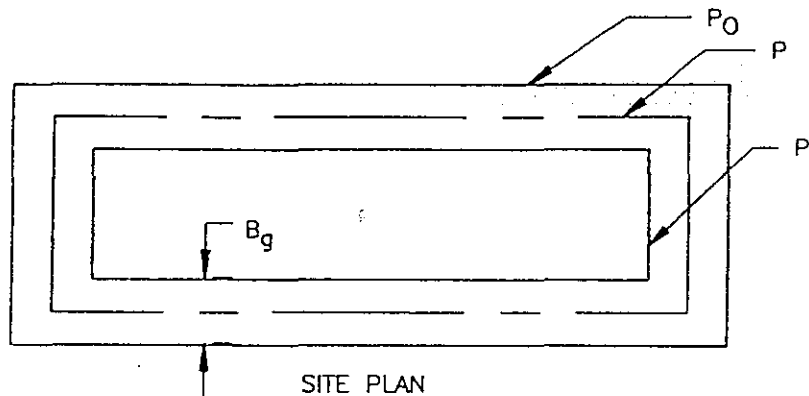
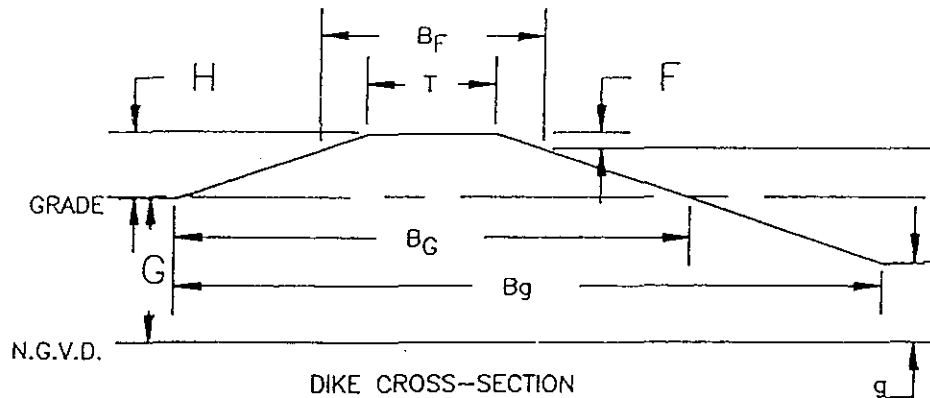


**TAYLOR ENGINEERING INC**  
9086 CYPRESS GREEN DRIVE  
JACKSONVILLE, FLORIDA 32256

# Appendix C

## Dike Requirements and Site Capacity

PROJECT
REVISION
SHEET
DATE



$P_O$	OUTER PERIMETER OF DIKE FOOTPRINT	SITE SPECIFIC
$P$	DIKE PERIMETER @ CENTERLINE OF DIKE CREST.	SITE SPECIFIC
$P_I$	PERIMETER OF DIKE AT INTERIOR DIKE TOE	SITE SPECIFIC
$A$	REQUIRED DISPOSAL AREA, BOUNDED BY $P_O$	SITE SPECIFIC
$A_I$	AREA WITHIN $P_I$	SITE SPECIFIC
$G$	SITE GRADE (+ NGVD)	SITE SPECIFIC
$g$	EXCAVATED GRADE (+ NGVD)	SITE SPECIFIC
$H$	DIKE HEIGHT ABOVE GRADE	15 ft.
$S$	DIKE SIDE SLOPE	3 (1V:3H)
$T$	DIKE CREST WIDTH	12 ft.
$F$	FREEBOARD AND PONDING	4 ft.



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

**Figure C-1**  
**Dike Requirements and Site Capacity**

PROJECT
REVISION
SHEET
DATE

## **APPENDIX D**

Table D-1 Site Ownership<sup>1</sup>, Primary and Secondary Sites, Volusia County (page 1 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value
V-6/MSA 426/428	3217-00-02-0030	Central Florida Council Boy Scouts of America, Inc. 1215 E. Nebraska St. Orlando, FL 32803-1916	121.00	\$ 12,100
	3217-00-04-0041	Cemetary No Address Given	0.02 (30 ft sq)	50
	3217-00-04-0042	Florida Power & Light Co. ATTN: Property Tax Department P.O. Box 14000 Juno Beach, FL 33408-0420	4.80	2,400
	3217-00-04-0043	Brinkley, Henry & Linda P.O. Box 1371 Bunnell, FL 32110-1371	5.00	5,000
	3217-00-04-0044	Hutcheson, Lillian 105 Mimus Drive Palatka, FL 32177-6422	109.20	19,310
	3208-00-01-0010	Ford, Frank A., Trustee Group 4 P.O. Box 457 DeLand, FL 32721-0457	160.00	48,000
	3208-00-03-0030	Central Florida Council Boy Scouts of America, Inc. 1215 E. Nebraska St. Orlando, FL 32803-1916	97.00	29,100
	3207-01-00-0010	Ford, Frank A., Trustee Group 4 P.O. Box 457 DeLand, FL 32721-0457	40.00	12,000
V-27	3217-00-00-0050	Volusia Land Trust, Inc. P.O. Box 191 Daytona Beach, FL 32115	2,395.00	838,390
	3240-04-00-0010	Collins, John 2990 S. Atlantic Ave. Daytona Bch Shores, FL 32118-6002	N/A	10,500
	3240-04-00-0020	Same as Above	N/A	10,500
	3240-04-00-0030	Same as Above	N/A	10,500

<sup>1</sup> Based on 1992 Tax Rolls, Volusia County

Table D-1 Site Ownership<sup>1</sup>, Primary and Secondary Sites, Volusia County (page 2 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value
V-27 Cont...	3240-04-00-0040	Collins, John 2990 S. Atlantic Ave. Daytona Bch Shores, FL 32118-6002	N/A	\$ 10,600
	3240-04-00-0050	Same as Above	N/A	10,300
	3240-04-00-0060	Same as Above	N/A	10,300
	3240-04-00-0070	Same as Above	N/A	10,800
	3240-04-00-0080	Same as Above	N/A	10,800
	3240-04-00-0090	Same as Above	N/A	10,800
	3240-04-00-0100	Same as Above	N/A	10,400
	3240-04-00-0110	Same as Above	N/A	10,000
	3240-04-00-0120	Same as Above	N/A	10,000
	3240-04-00-0130	Same as Above	N/A	10,900
	3240-04-00-0140	Same as Above	N/A	10,000
	3240-04-00-0150	Same as Above	N/A	10,000
	3240-04-00-0160	Same as Above	N/A	10,000
	3240-04-00-0170	Same as Above	N/A	11,025
	3240-04-00-0180	Same as Above	N/A	12,000
	3240-04-00-0190	Same as Above	N/A	12,000
	3240-04-00-0200	Same as Above	N/A	12,000
	3240-04-00-0210	Same as Above	N/A	12,000
	3240-04-00-0220	Same as Above	N/A	10,815
	3240-04-00-0230	Same as Above	N/A	12,600
	3240-04-00-0240	Same as Above	N/A	12,000
	3240-04-00-0250	Same as Above	N/A	12,240
	3240-04-00-0260	Same as Above	N/A	12,240
	3240-04-00-0270	Same as Above	N/A	10,815
	3240-04-00-0280	Same as Above	N/A	12,000
	3240-04-00-0290	Same as Above	N/A	12,240
	3240-04-00-0300	Same as Above	N/A	12,000
	3240-04-00-0310	Same as Above	N/A	12,000

<sup>1</sup> Based on 1992 Tax Rolls, Volusia County

Table D-1 Site Ownership<sup>1</sup>, Primary and Secondary Sites, Volusia County (page 3 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value
V-25	5202-00-00-0820	Lagoni, Patricia, Trustee P.O. Box 10809 Daytona Beach, FL 32120-0809	140.60	1,124,800
	5203-00-00-0040	Same as Above	323.00	969,000
V-29	5339-03-62-0011	City of Daytona Beach P.O. Box 551 Daytaon Beach, FL 32115-0551	16.23	243,450
	5339-03-61-0012	Same as Above	17.78	402,950
	5340-06-00-0010	Same as Above	7.78	194,500
V-26	7429-00-00-0010	Gran Central Corporation P.O. Drawer 1048 St. Augustine, FL 32085-1048	223.54	843,224
	7450-01-00-0131	Cook, Richard R., Jr. 528 Dora Street New Smyrna Beach, FL 32168-6747	5.30	95,400
	7450-01-00-0200	T.I.I.T.F. State of Florida Murphy Act Land c/o Dept. of Natural Resources Douglas Building Tallahassee, FL 32399	1.30	23,400
	7450-01-00-0243	Zeller, Oscar and Julian M. Greene P.O. Box 3335 Jacksonville, FL 32206-0335	5.00	72,000
	7451-04-01-0010	Zeller, Oscar and Julian M. Greene 1727 Bennett St. Jacksonville, FL 32206-5415	7.30	52,560
	7451-04-02-0020	Same as Above	1.20	8,640
	7451-04-02-0060	Same as Above	0.55	3,960
V-21	8530-00-00-0270	Burch, H.H., & Rose L., Trustees 296 Burch Rd. Oak Hill, FL 32759-9585	13.00	39,000
	8531-00-00-0010	Legg, Robert P., and James L. & Ann Legg 1800 N. Douglas Rd., Suite 100 Pembroke Pines, FL 33024-3200	60.00	390,000

<sup>1</sup> Based on 1992 Tax Rolls, Volusia County

Table D-1 Site Ownership<sup>1</sup>, Primary and Secondary Sites, Volusia County (page 4 of 5)

Site Name	Parcel Number	Owner	Parcel Acreage	Assessed Value
V-21 Cont...	8531-00-00-0080	Howell, John R. & Etta 637 Catalpa St. Seymour, TN 37865-5611	28.00	181,300
	8531-00-00-0081	Basista, Ellive Marie Rt. 5, Box 5308-A Blairsville, GA 30512-9244	28.20	182,595
	8532-00-00-0010	Abbott, Earl A., Trustee 4420 S. Washington Ave. Titusville, FL 32780-6646	220.00	275,000
V-22A	9508-00-00-0110	Payne, Carlton I. & Norma Jean 229 Osteen St. Oak Hill, FL 32759-9523	7.60	30,400
	9508-00-00-0111	Hall, Harold H. & Charlene P.O. Box 376 Oak Hill, FL 32759-0376	12.40	46,600
	9508-00-00-0112	Hall, David J. 200 N. Causeway New Smyrna Beach, FL 32169-5232	12.40	43,400
	9508-04-04-0010	Bell, John W. & Betty J. 1780 Hallum Ave. Titusville, FL 32796-1721	5.00	17,000
	9508-04-04-0020	Oak Hill Partnership 1901 Via Coronel Palos Verdes, CA 90279	35.00	70,000
	9508-04-03-0010	Ireland, Betty 241 Osteen St. Oak Hill, FL 32759-9523	1.40	16,681
	9508-04-03-0011	Goodrich, June B. P.O. Box 6 Oak Hill, FL 32759-0006	0.43	2,365
	9508-04-03-0021	Goodrich, Winston S. & June B. P.O. Box 6 Oak Hill, FL 32759-0006	6.37	25,480
	9508-04-03-0022	Crossley, R.J. & Idella N, Life E. 275 Osteen St. Oak Hill, FL 32759-9523	4.57	44,799

<sup>1</sup> Based on 1992 Tax Rolls, Volusia County

Table D-1 Site Ownership<sup>1</sup>, Primary and Secondary Sites, Volusia County (page 5 of 5)

	Parcel Number	Owner	Parcel Acreage	Assessed Value
V-22A Cont...	9508-04-03-0030	Payne, Carlton I. & Norma Jean 229 Osteen St. Oak Hill, FL 32759-9523	5.50	91,387
	9508-04-03-0040	Same as Above	2.00	45,543
	9508-04-03-0041	Same as Above	2.50	10,000
V-34	9507-02-00-1140	JBJ Industries (AKA Monarch Land Industries) 222 W. Comstock Ave., #206 Winter Park, FL 32789-4272	128.00	271,136
	9507-02-00-1200	Same as Above	20.00	50,000

<sup>1</sup> Based on 1992 Tax Rolls, Volusia County



Voting Order  
Councilman Hays  
Councilman Mitchum  
Mayor Hayman  
Councilman Jones  
Councilwoman Martin

AGENDA  
CITY COUNCIL OF EDGEWATER  
FEBRUARY 7, 1994  
7:00 p.m.  
COMMUNITY CENTER

1. Call to Order, Roll Call, Invocation, Pledge of Allegiance
2. Approval of Minutes
  - A. Regular Meeting of January 24, 1994
3. Citizen Comments
4. Council/Officers Reports
  - A. City Attorney
  - B. City Manager
  - C. City Council
5. Consent Agenda

Items on the consent agenda are defined as routine nature that do not warrant detailed discussion or individual action by the Council; therefore, all items remaining on the consent agenda shall be approved and adopted by a single motion, second and vote by the City Council. Items on the consent agenda are not subject to discussion. One of the most basic rules of a consent agenda is that any member of the City Council may remove any item from the consent agenda simply by verbal request at the City Council meeting. Removing an item from the consent agenda does not require a motion, second or a vote; it would simply be a unilateral request of an individual Councilmember.

(None)
6. New Business
  - A. Florida Inland Navigation District's proposal to locate spoil site in the Planned Industrial Development district
  - B. Jan & Lib's Hi-Tops Lounge Inc. request to extend hours to 3:00 a.m. during Bike Week and to put up tent to sell T-shirts - March 4th till March 13th
  - C. Ernst & Young's Presentation of Audit for Fiscal Year ending September 30, 1993 and Agreement for Future Auditing Services
  - D. Waters Risk Management's Proposal to Perform Risk Management Audit and Provide Insurance Remarketing Assistance
  - E. Sign Ordinance Report/Economic Development Board Comments
  - F. Perry Barrett re: concerns with sign ordinance
  - G. Steve Dennis re: Kiwanis Club Donation/Kiwanis House
  - H. Public Works Director's request to purchase one F700 Diesel Chassis 4 yd. dump truck for \$30,153 using State contract

City Council of Edgewater  
Agenda - February 7, 1994  
Page Two

6. New Business (Continued)
  - I. Appointment of one member to Building Trades Regulatory and Appeals Board due to expiration of term of Michael Nelson
  - J. Appointment of two members to Land Development and Regulatory Agency due to expiration of terms of Dominick Fazzzone and Robert Garthwaite
  - K. Amendment to Angie Brewer & Associates Contract re: CIP Grant/Loan Program
  - L. City Clerk's Request for Establishment of Equity Study Commission re: Chapter 11, Occupational License Taxes, Regulations and Classifications
  - M. Cancelling or rescheduling regular meeting of Monday, February 21, 1994, due to Presidents Day holiday
  - N. Discussion of tentative agenda and schedule of City programs, projects and work tasks
7. Ordinances, Public Hearings, and Resolutions  
First Reading:
  - A. Ord. 94-O-05 Reducing Grass and Weed Height from 18" to 12" and Establishing Enforcement Procedure  
Second Reading: (Public Hearing)
  - B. Ord. 94-O-01 Creating Reclaimed Water Reuse Program and Res. 94-R-02 Establishing Schedule of Fees and Charges for Reclaimed Water System
  - C. Ord. 94-O-02 Revising Section 19-27 and 19-27.1 on Cross-Connection Control policy re: Reclaimed Water
  - D. Ord. 94-O-03 Annexation Request of Wesley S. Harvey for .35± acre parcel at 191 Roberts Road
8. Unfinished Business  
(None)
9. Council/Officers Reports
  - A. City Attorney
  - B. City Manager
  - C. City Council
10. Questions from Press
11. Citizen Comments
12. Adjourn.

All items for inclusion on the next City Council agenda must be received by the City Manager's office no later than 4:30 p.m. seven (7) days prior to that meeting.

Pursuant to Chapter 286, F.S., if an individual decides to appeal any decision made with respect to any matter considered at a meeting or hearing, that individual will need a record of the proceedings and will need to insure that a verbatim record of the proceedings is made.