Table 4-1. Vertebrates Observed at the Pablo Creek Alternative 2 Dredged Material Management Area (Extended Southerly), St. John's County, Florida (Page 1 of 2)

Scientific Name	Common Name	Vegetation Community
AMPHIBIANS		
Hyla cinerea	Green treefrog	615
Rana utricularia	Southern leopard frog	615
REPTILES		
Coluber constrictor	Southern black racer	411
Gopherus polyphemus	Gopher tortoise	411, 441
Opheodrys aestivs	Rough green snake	615
Scincella lateralis	Ground skink	411, 441
BIRDS		
Ardea herodias	Great blue heron	642
Buteo jamaicensis	Red-tailed hawk	212
Buteo lineatus	Red-shouldered hawk	411
Casmerodius albus	Great egret	642
Cyanocitta eristata	Bluejay	441
Corvus brachyrhynchos	American crow	615
Dendroica coronata	Yellow-rumped warbler	411, 641
Dryocopus pileatus	Pileated woodpecker	615
Dumetella carolinensis	Gray catbird	611, 615
Egretta tricolor	Tricolored heron	642
Eudocimus albus	White ibis	642
Melanerpes erythrocephalus	Red-bellied woodpecker	411
Mimus polyglottos	Northern mockingbird	411, 615
Mycteria americana	Wood stork	441
Pandion haliaetus	Osprey	642
Pipilo erythrophthalmus	Rufous-sided towhee	321, 411, 611

Table 4-1. Vertebrates Observed at the Pablo Creek Alternative 2 Dredged Material Management Area (Extended Southerly), St. John's County, Florida (Page 2 of 2)

Scientific Name	Common Name	Vegetation Community
Thryothorus ludovicianus	Carolina wren	411, 615
Toxostoma rufum	Brown thrasher	411
Zenaida macroura	Mourning Dove	211, 212
MAMMALS		
Dasypus novemcinctus	Nine-banded armadillo	411, 615, 641
Geomys pinetis	Pocket gopher	411
Odocoileus virginanus	White tailed deer	411, 615
Sciurus carolinensis	Eastern grey squirrel	615
Sciurus niger shermanii	Sherman's fox squirrel	411
Sus scrofa	Wild boar	615

Notes:

212 = Unimproved Pasture, 321 = Palmetto Prairie, 411 = Pine Flatwoods, 441 = Coniferous Plantation, 611 = Bay Swamps, 615 = Stream and Lake Swamps, 641 = Freshwater Marsh, 642 = Saltwater Marsh

Source: WAR 1992.

The freshwater marsh, wet prairies, and other isolated wetlands provide breeding habitat for amphibians. Such wetlands are used for breeding by the southern toad, pinewoods treefrog, squirrel treefrog, oak toad, Florida chorus frog, narrow-mouthed toad, and southern leopard frog. Salamanders found in these habitats include tiger, southern dusky, and flatwoods salamanders. When isolated ponds contain water and are used by amphibians for breeding, various wading birds and mammals frequently forage in these areas.

The open water environment of the ICWW and nearby saltmarsh provide a rich and productive habitat for aquatic wading birds, gulls, terns, and osprey. Along Pablo Creek, not far from the site, numerous osprey nests are perched in trees in and adjacent to the marsh. Some birds such as rails and marsh wrens are common inhabitants of the smooth cordgrass and needlegrass marshes. Mammals found in the marsh include rice rats, otter, mink, marsh rabbits, and raccoons.

4.2 ENDANGERED AND THREATENED ANIMALS

Table 4-2 lists protected species that are found or may be found at the Pablo Creek Alternative 2 dredged material management area (extended southerly), along the pipeline access route, or in ICWW. A number of protected species probably exist on or adjacent to the Pablo Creek Alternative 2 dredged material management area (extended southerly). The gopher tortoise was observed occasionally in the planted pine and flatwoods. It is possible that some protected gopher burrow associates, such as the Florida gopher frog, occur on site. Because pocket gopher sign was observed, it is also possible that the Florida pine snake is found on site.

Although the southeastern kestrel was not observed on site, its use of the site for foraging is considered probable. No sign of red-cockaded woodpecker nest trees was observed although some longleaf pine trees on site are near maturity. Identified red-cockaded woodpecker nest sites occur within a few miles of the Pablo Creek Alternative 2 dredged material management area (extended southerly) in southwest Duval County. Because of the proximity

Table 4-2. Designated Status of State or Federally Listed Animal Species That May Occur at the Pablo Creek Dredged Material Management Area (Extended Southerly), the Pipeline Route or Adjacent Waters, St. Johns County, Florida (Page 1 of 3)

Species	Designated Status		
	FGFWFC	USFWS	CITES
AMPHIBIANS AND REPTILES			
Alligator mississippiensis American Alligator	SSC	T(S/A)	II
Ambystoma annulatum Flatwoods Salamander			C2
Caretta caretta caretta Atlantic Loggerhead	T	T	I
Chelonia mydas mydas Atlantic Green Turtle	E	E	I
Dermochelys coriacea coriacea Atlantic Leatherback	E	E	I
Drymarchon corais couperi Eastern Indigo Snake	T	T	
Gopherus polyphemus* Gopher Tortoise	SSC	C2	
Lepidochelys kempi Atlantic Ridley	E	E	I
Pituophis melanoleucus mugitus Florida Pine Snake	SSC	C2	
Rana aerolata aesopus Florida Gopher Frog	SSC	C2	
BIRDS			
Aimophila aestivalis Bachman's sparrow		C2	
Aramus guarauna Limpkin	SSC		

Table 4-2. Designated Status of State or Federally Listed Animal Species That May Occur at the Pablo Creek Dredged Material Management Area (Extended Southerly), the Pipeline Route or Adjacent Waters, St. Johns County, Florida (Page 2 of 3)

Species	Designated Status		
	FGFWFC	USFWS	CITES
Egretta caerulea Little Blue Heron	SSC		
Egretta thula Snowy Egret	SSC		
Egretta tricolor* Tricolored Heron	SSC		
Falco columbarius Merlin			II
Falco peregrinus Peregrine Falcon	E	T	I
Falco sparverius Southeastern American Kestrel	T	C2	II
Falco sparverius sparverius Eastern American Kestrel			II
Haliaeetus leucocephalus Bald Eagle	T	E	I
Mycteria americana* Wood Stork	E	E	
Pandion haliaetus* Osprey			II
Pelecanus occidentalis Brown Pelican	SSC		
Picoides borealis Red-cockaded Woodpecker	T	E	
Sterna antillarum Least Tern	T		

Table 4-2. Designated Status of State or Federally Listed Animal Species That May Occur at the Pablo Creek Dredged Material Management Area (Extended Southerly), the Pipeline Route or Adjacent Waters, St. Johns County, Florida (Page 3 of 3)

Species	Designated Status FGFWFC	USFWS	CITES
MAMMALS			
Lutra canadensis River Otter			II
Mustela vision lutensis Florida Mink		C2	
Podomys floridanus Florida Mouse	SSC	C2	
Sciurus niger shermanii* Sherman's Fox Squirrel	SSC	C2	
Trichechus manatus West Indian Manatee	E	E	I
Ursus americanus floridanus Florida Black Bear	T	C2	

*Presence confirmed on site.

Notes:

E=Endangered, T=Threatened, SSC=Species of Special Concern, C2=Candidate for listing with some evidence of vulnerability, but for which not enough data exist to support listing. I=Appendix I Species, II=Appendix II Species.

FGFWFC = Florida Game and Fresh Water Fish Commission, 1991 List (39-27.003-005 F.A.C.).
USFWS = U.S. Fish and Wildlife Service (50 CFR 17.11-12).
CITES = Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Source: WAR 1992.

of other colonies and suitable on-site habitat, a survey should be conducted for the presence of this species. The extensive thick swamps in the region may harbor the Florida black bear. No bear sign was observed on site.

Sherman's fox squirrel is an inhabitant of the pine forests on site. Stands of longleaf pine in the flatwoods and ecotonal areas between flatwoods and adjacent swamps provide good habitat.

A number of protected wading birds were observed feeding or perched along the margins of the saltmarsh adjacent to the ICWW. A wood stork rookery occurs approximately 1 mile west of the site, so wood storks are occasionally observed flying over this site.

A number of protected species may utilize the saltmarshes, Pablo Creek, or the nearby ICWW. Wading birds are commonly observed on the creek shorelines. Terns, osprey, and pelicans forage over open waters for fish. A number of osprey nests were observed in snags within and adjacent to the emergent marsh along Pablo Creek. Sea turtles and the West Indian manatee may also forage occasionally along the creek and the ICWW.

5.0 PIPELINE ROUTE

5.0 PIPELINE ROUTE

The pipeline route will enter the site on its eastern border along the east-west oriented road that currently exists on the site. The pipeline will follow the route of the existing road east, and cross two forested hardwood wetland bands. It will depart from the existing road close to the ICWW and pass through a section of mixed pine/oak woodlands before crossing a thin band of cordgrass-dominated saltmarsh fringing the ICWW.

6.0 JURISDICTIONAL WETLANDS

6.0 JURISDICTIONAL WETLANDS

On December 9, 1988, and August 3, 1992, representatives from the Florida Department of Environmental Regulation (DER) and St. John's River Water Management District (SJRWMD) made an informal, nonbinding assessment of areas subject to permitting authority. During this visit, all previously identified wetlands occurring within the footprint of the dredged material management area were visited. Currently, all isolated wetland systems larger than 0.5 acre will require permits from the SJRWMD if impacted by the construction of the dredged material containment area. There are two cypress wetlands in the northeastern corner and one bay swamp in the northeastern corner likely to be affected by construction. Mitigation for adverse impacts to these forested wetlands may be required by the SJRWMD. All DER jurisdictional areas appear to be located within the buffer area surrounding the containment basin and, therefore, will not be impacted by site development. The pipeline access will temporarily impact a band of saltmarsh vegetation adjacent to the ICWW.

7.0 REFERENCES

7.0 REFERENCES

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APPENDIX II

ENGINEERING NARRATIVE AND PERMIT DRAWINGS

Engineering Narrative
Pablo Creek Alternative 2 Southern Extension
Dredged Material Management Area

This narrative summarizes the documents comprising the dredge and fill permit application package for the Pablo Creek Alternative 2 Southern Extension (Pablo Creek) dredged material management area. The Pablo Creek site will be a permanent facility to service material removed from Reach VII of the Intracoastal Waterway (ICWW) in Northeast Florida during maintenance dredging operations. This reach of the Waterway extends 4.98 miles from Beach Boulevard (ICWW mile 7.52) in Duval County southward to the vicinity of Palm Valley (ICWW mile 12.50) in St. Johns County.

The submission of this application package represents an intermediate step towards the completion of the second phase of a two-phased program element addressing the maintenance requirements of the Intracoastal Waterway in Nassau and Duval Counties, Florida. This element is part of a 15-year program sponsored by the Florida Inland Navigation District (FIND) to develop a long-term dredged material management plan for the Intracoastal Waterway along the entire east coast of Florida. The two phases are described as follows.

Documented in a report included as Attachment 1 to this permit application, Phase I of the Northeast Florida program element developed basic plan concepts for the continuing management of maintenance material dredged from the Intracoastal Waterway in Northeast Florida. It also defined short and long-term program needs based on a comprehensive examination of historic dredging records for the project area. Additionally, it identified suitable centralized sites which satisfy these needs based on preliminary environmental, engineering, and operational criteria.

Phase II consists of the gathering of detailed, site specific information required for the preparation and submission of permit applications for the primary dredged material management areas identified in Phase I. In addition, Phase II also addresses the acquisition of these sites (where appropriate), through negotiated purchase or condemnation, by the Florida Inland Navigation District; the design of the containment facilities; and the construction and continuing operation and maintenance of these sites as permanent dredged material management areas.

This narrative makes no attempt to recount, in detail, the information contained in the documents accompanying the permit application. Rather, this narrative—while emphasizing engineering considerations and design specifications—is designed to help the reviewer organize this information. In addition to the application document, the permit application package includes the following: (1) the Phase I report, as previously discussed; (2) permit drawings, providing site design specifications (Attachment 2); (3) site boundary and pipeline easement surveys, providing completeness, as well as the legal description necessary for acquisition (Attachment 3); (4) a topographic survey documenting pre-construction topography and drainage patterns and providing information necessary for site design, volumetric calculations, and grade analysis (Attachment 4); (5) a sub-surface and soils report identifying site foundation conditions and in-situ construction material suitability, as well as locating the water table on-site (Attachment 5); (6) an environmental report documenting on-site vegetation communities and wildlife habitats that guide the configuration of the containment area within the site so as to avoid, to the greatest extent possible, the most sensitive environmental areas (Attachment 6); and (7) a site-specific management plan ensuring the dredged material management area will continue to operate in an efficient manner as a permanent facility without undue conflicts with adjacent off-site land use (Attachment 7).

The Pablo Creek dredged material management area, a 179.99 acre site, is located 0.45 miles west of the ICWW and 0.5 miles south of Pablo Creek. Though it is intended to serve a portion of the ICWW in Duval County, the site property lies in St. Johns County. Undeveloped lands of the Danov Corporation bound the property on all sides. The site is vegetated by pastures, pine flatwoods, planted pine, and various types of wetlands. A review of the Florida Master Site File revealed no record of historical or archaeological activities of record within the site boundaries.

The environmental report (Attachment 6) documents the habitats, land use, and species found on the Pablo Creek site. Site vegetation is dominated by a combination of pine flatwoods and planted slash pine (*Pinus elliottii*). Ground cover in these areas includes wiregrass (*Aristida stricta*), gallberry (*Ilex glabra*), saw palmetto (*Serenoa repens*), and bracken fern (*Pteridium aquilinium*). A band of old pasture lies across the center of the site. It contains a variety of annuals, grasses, and young pine trees. On-site soils consist predominantly of poorly drained Myakka and Zolfo fine sands; however, some areas of very poorly drained Wesconnett fine sand are also present (Readle, 1983).

A variety of wetlands are present on-site including bay swamps, stream and lake swamp systems, cypress heads, freshwater marshes, and wet prairies. All wetlands likely to fall under the permit review authority of the Florida Department of Environmental Protection (DEP) are located within the buffer area surrounding the containment basin and will not be impacted by site development (Attachment 2, Sheet 4 of 5).

A comprehensive evaluation of dredging records and shoaling patterns indicates that maintenance of the ICWW channel over the next 50 years will produce an estimated 1,875,300 cy of material in Reach VII (Attachment 1). This capacity represents the projected 50-year in-situ volume of shoaling in the reach multiplied by a bulking plus over-dredging factor of 2.15. Maintenance dredging of this reach was not performed on a regular basis in the recent past, due mainly to the unavailability of adequate containment facilities. However, this will likely change with the implementation of the long-term dredged material management program. Future maintenance dredging within this reach is expected to occur at five- to 10- year intervals. Depending on the interval between successive dredging operations, each maintenance event will produce 185,700 cy to 371,500 cy of material.

The construction of a 96.01-acre containment basin within the central portion of the site (Attachment 2, Sheet 2 of 5) will provide the required material storage capacity for Reach VII of the ICWW in Northeast Florida. The excavation of a perimeter ditch and the construction of access roads surrounding the containment area will impact an additional 6.80 acres. Thus, the development of the containment area will impact 102.81 acres of the 179.99-acre site, leaving 77.81 acres of the existing natural vegetation within the site buffer area.

As configured within the property boundaries of the dredged material management site, the Pablo Creek dike footprint will leave a buffer completely surrounding the containment area. The buffer will range in width from 300 to 430 ft. Much of this area will remain as undisturbed natural vegetation (Attachment 2, Sheet 2 of 5). As previously stated, the buffer area will preserve all of the on-site wetlands which fall under the jurisdiction of the DEP.

To obtain the required material storage capacity within the 96.01-acre containment area, dikes must be constructed to a crest elevation of 16.5 ft (+31.37 ft NGVD) above the existing mean site elevation of +14.87 ft NGVD (Attachment 2, Sheet 3 of 5). A conservative dike cross-sectional design, including side slopes of 1V:3H and a dike crest width of 12 ft, will require 349,877 cy of material for construction. Ramps to provide equipment access to the interior of the containment basin for material dewatering and transfer will require an additional 3,428 cy of material. Excavating the basin interior to a mean elevation of +11.72 ft NGVD (3.15 ft below existing average site grade) will provide material for dike and ramp construction. Excavation will be set back 20 ft from the inside toe of the dikes and will maintain the 1V:3H side slope of the dikes.

When the containment basin has been filled to capacity (1,877,073 cy), the surface of the deposition layer will be a minimum 4.0 ft below the dike crest. This will allow 2.0 ft of ponding depth and an additional 2.0 ft of freeboard.

A system of perimeter ditches will be constructed at a 20-ft setback from the outside toe of the dikes. These ditches will control stormwater runoff from the outside slope of the dike and limited portions of the buffer area. Additionally, they will intercept possible seepage of impounded water from the containment basin. Approximately 7,670 cy of material will be obtained from construction of the ditches. This material will be used to augment the material taken from the basin interior for dike construction.

Dredged material will be pumped as a slurry to the containment area via a pipeline. Each dredging operation will require the placement and retrieval of both supply and return pipelines. Attachment 2, Sheets 1,2 and 5 of 5 show the pipeline routes. The pipelines will lie within a 60-ft wide easement approximately 2,470 ft in length. This easement extends from the ICWW to a point near the middle of the eastern site boundary where it adjoins the site property 1,370 ft south of the northeastern site corner. Once inside the site, the dredge discharge pipeline will be routed along the eastern and southern sides of the dike to the southwest corner of the containment basin. There it will enter the basin by passing over the dike crest.

A parallel arrangement of four corrugated metal half-pipes will decant the clarified ponded water from which sediment has settled. The half-pipes will be located in the northeast corner of the containment area, diagonally opposite the slurry inlet (Attachment 2, Sheet 2 of 5). Each half-pipe will release effluent over a sharp-crested weir section of minimum length of nine feet, for a total length of 36 ft. Weir height will be adjustable over a range of 18.22 ft, from the mean excavated grade at the weirs to a maximum elevation of +26.90 ft NGVD. Removable flash boards fitted tongue and groove will minimize leakage. The minimum elevation of the weir crest will allow the removal of stormwater runoff prior to the initial use of the site. The maximum elevation of the weir crest will provide 2.0 ft of freeboard below the dike crest at maximum site capacity. A manifold, with a single outlet pipe passing under the dike, will connect the four weirs. The return pipeline will connect to the weir-manifold system near the northeast corner of the containment dike. It will then be routed parallel to the exterior toe of the eastern side of the containment dike to the pipeline easement and then continue to the MHW shoreline of the ICWW within the easement described above. Within both the easement and the site, the pipelines will be placed to minimize impacts on wetlands and existing vegetation.

As stated, the minimum length of the weir crest for the Pablo Creek site is 36 ft. This specification, based on the Selective Withdrawal Model developed by the U.S. Army Corps of Engineers' Waterways Experiment Station (WES), represents the weir crest length required to maintain the depth of withdrawal less than the minimum ponding depth of 2.0 feet. Project planning guidelines used by the Jacksonville District Corps of Engineers indicate that an 18-inch O.D. dredge will likely be used for future channel maintenance in Reach VII. However, to ensure a conservative containment basin design, determination of weir crest length was based on the use of a 24-inch O.D. dredge (discharge velocity of 16 ft/sec, a volumetric discharge of 6,430 cy/hr, and a 20/80 solids/liquid slurry mix). The use of an 18-inch O.D. dredge would produce a withdrawal depth substantially less than that produced by a 24-inch O.D. dredge for a given weir crest length. Analysis of weir performance based on nomograms (Walski and Schroeder, 1978) developed at WES under the Dredged Material Research Program (DMRP) indicates that these design parameters may be expected to produce an effluent suspended solids concentration of 0.63 g/l. Translation of suspended solids concentration to a measure of turbidity (the property on which Florida water quality standards are based) is highly dependent on the suspended material characteristics. However, WES guidelines (Palermo, 1978) indicate that this effluent quality should be adequate.

Finally, an analysis of containment area efficiency was performed to determine the minimum operational ponding depth required for adequate solids retention performance and acceptable effluent quality. The projected performance of the basin is highly dependent on the physical characteristics of the sediment to be dredged. Therefore, an analysis of containment area efficiency was performed to determine the minimum operational ponding depth required for adequate solids retention performance and acceptable effluent quality. The analysis used data obtained from a series of core borings taken in 1985 within Reach VII of the ICWW channel. Material from these borings contained silt contents ranging from 4.3 to 62.2 percent. In order to ensure a conservative containment basin design, it was assumed that a maximum silt content would be encountered during dredging operations. Therefore, the boring logs, grain size distribution curves, and suspended sediment-time curves of boring CB-IW85-3D, containing 62.2 percent silt, were used in the analysis.

Retention time is directly related to the depth of ponded water maintained within the basin. The preliminary design of the containment area and dikes provides a minimum 2.0 foot ponding depth. That is, at capacity the containment dike will keep 2.0 ft of ponding plus 2.0 ft of freeboard above the maximum deposition surface. Analysis of the hydraulic characteristics of the proposed containment basin indicates that under ideal conditions -- i.e., flow over the weir balances the liquid discharge of the dredge -- a 2.0 ft ponding depth provides a maximum retention time of 45.4 hours. In comparison, the time required for the suspended sediment to settle out of the withdrawal depth of 2.0 ft is 3.41 hours, based on the zone settling velocity of CB-IW85M-3D sediment. Research by WES (Shields et al., 1987) under the Dredged Material Research Program (DMRP) indicates that to account for field conditions requires multiplying the necessary settling time of the dredged material by 2.25. This yields an adjusted settling time of 7.67 hours. Thus, the Pablo Creek containment basin provides a retention time which exceeds the adjusted settling time required to maintain adequate sedimentation and effluent quality by a factor of 5.9. However, ponding depths should be maintained above the 2.0 ft minimum whenever possible. The recommended operational ponding depth for the Pablo Creek site is 4.0 ft, with a maximum of 5.0 ft. The use of a 4.0-ft operational ponding depth results in a basin retention time of 90.8 hours. This time increase will provide an additional margin of safety. It will also ensure the proposed containment basin provides adequate retention time to maintain the required effluent quality.

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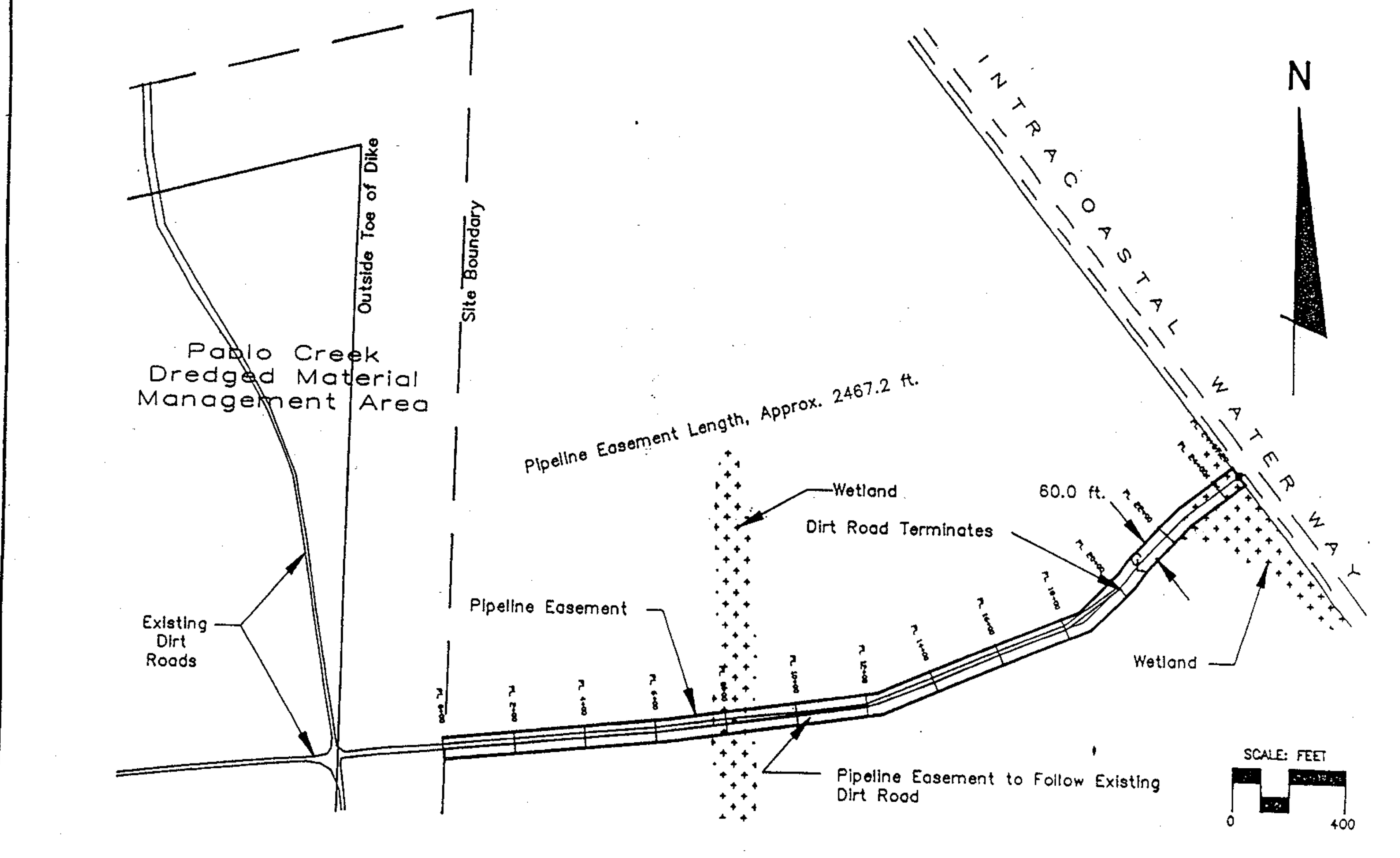

TAYLOR ENGINEERING INC 9086 CYPRESS GREEN DRIVE JACKSONVILLE, FLORIDA 32256	Pipeline Easement Location, Pablo Creek Dredged Material Management Area St. Johns County, Florida	PROJECT C8610 REVISION SHEET 5 of 5 DATE Nov. 1993

APPENDIX III

SITE MANAGEMENT PLAN

Management Plan
Pablo Creek Alternative 2
(Southern Extension)
Dredged Material Management Area

November, 1993

Management Plan
Pablo Creek Alternative 2
(Southern Extension)
Dredged Material Management Area

Prepared For:

FLORIDA INLAND NAVIGATION DISTRICT

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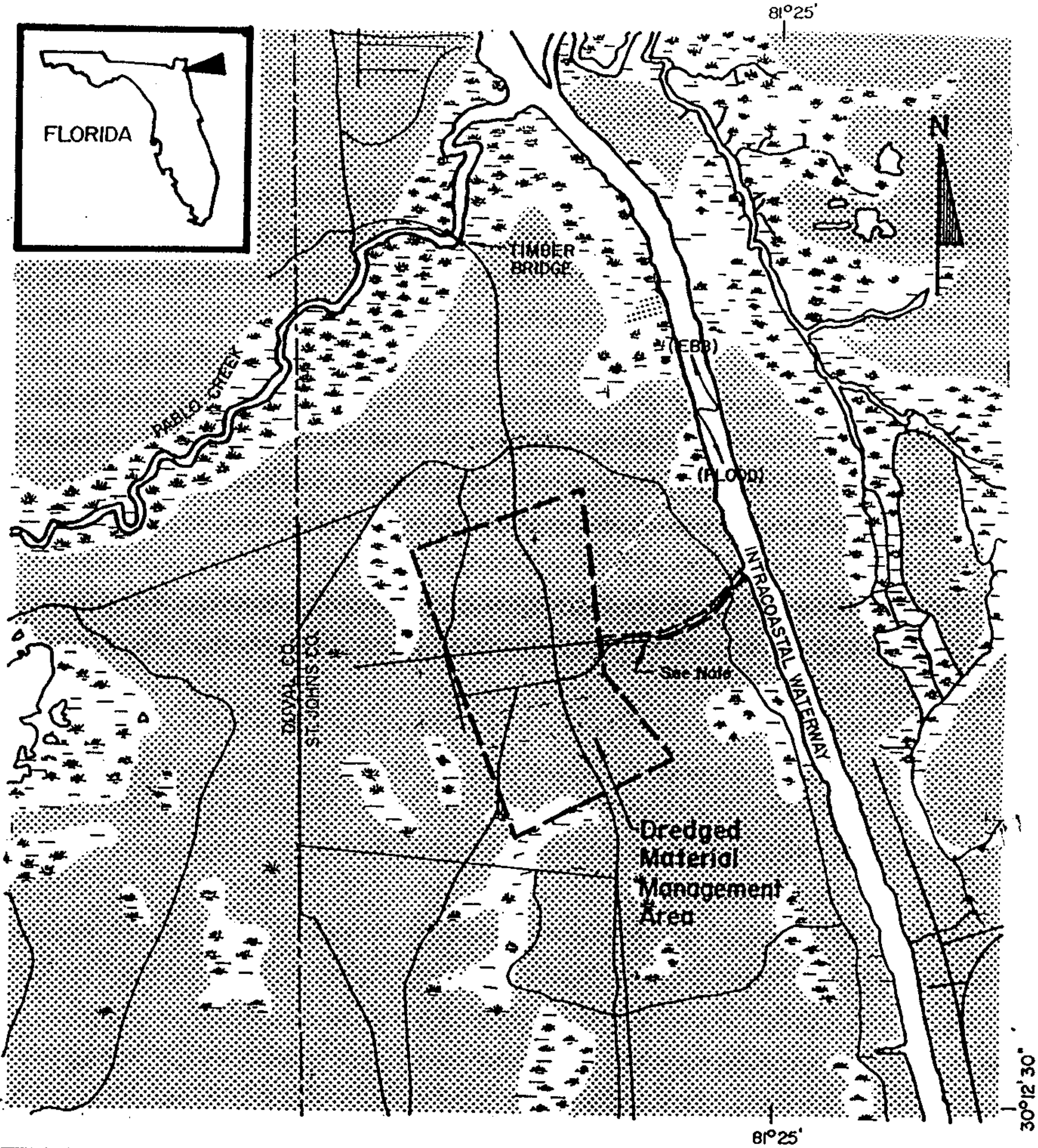
1.0 INTRODUCTION

A key element in the long-term utilization of any dredged material management area is the development and implementation of a site-specific management plan. The management plan for the Pablo Creek Alternative 2 Southern Extension (Pablo Creek) is outlined in this report. It is intended to provide guidance for the development and operation of the material management area so that optimum efficiency is achieved in both effluent quality and containment facility service life while minimizing the impact of the site on the environment and on adjacent property.

This plan document addresses those facets of site design and operation which directly influence site efficiency or reduce off-site conflicts. These include elements of site preparation prior to initial dredging, techniques of decanting and dewatering the dredged material during and immediately following a maintenance event, and criteria for post-dredging site operation and maintenance. Throughout, the goal of each phase of site management is to ensure that the site not only achieves its minimum design 50-year service life, but that it also fulfills its potential as a permanent operating facility for the intermediate storage and rehandling of maintenance material dredged from the Intracoastal Waterway (ICWW).

The Pablo Creek site (Figure 1-1) is one of nine selected for development as a dredged material management facility to provide long-term capacity for the management of sediments dredged from the ICWW in Nassau and Duval Counties in Northeast Florida (Taylor and McFetridge, 1986). Specifically, the Pablo Creek site is intended to serve that portion of the ICWW defined as Reach VII. This reach extends 4.98 miles from Beach Boulevard (ICWW mile 7.52) southward to Palm Valley (ICWW mile 12.50) in St. Johns County.

A comprehensive evaluation of dredging records for this portion of the ICWW indicates that maintenance dredging has occurred eight times since the establishment of the 12-ft project depth in 1951 (Taylor and McFetridge, 1986). Based on these findings, the projected 50-year storage requirement for Reach VII is approximately 1,857,300 cubic yards (cy). This represents the projected 50-year in-situ volume of shoaling multiplied by a bulking plus over-dredging factor of 2.15. Maintenance dredging occurred at two-year intervals between 1956 and 1964. However, since that time maintenance dredging has occurred at irregular intervals ranging from one to 16 years. Future dredging operations within this reach will probably be performed once every five to 10 years, based on operational considerations of scheduling and contract procedures, as well as historical patterns of shoaling. Thus, each maintenance event is expected to produce between 185,700 cy and 371,500 cy of material, depending on the interval between successive dredging operations.



REFERENCES

USGS PALM VALLEY QUADRANGLE 1964, REVISED 1981

NOTE:

Approx. Location of Pipeline Route. Which Follows Dirt Road to R/W I.C.W.W.

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Figure 1-1
Location Map, Pablo Creek Dredged Material Management Area St. Johns County, Florida

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The total area of the Pablo Creek site is 179.99 acres. Constructing a 96.01 acre containment basin within the central portion of the site will provide the required storage capacity, i.e., 1,877,073 cy. The site, therefore, can contain the projected 50-year disposal requirement for Reach VII.

As stated above, beyond satisfying a minimum capacity requirement, the management objective for the Pablo Creek dredged material management area is to process (i.e. decant and dewater) the dredged material efficiently and to operate the facility so as to extend its usefulness beyond the design site service life. The potential long-term efficiency of the material management area is established by the design and construction of the facility, while the degree to which this potential is realized is largely determined by operating procedures. Specific elements of site design and operation during and following dredging activities will be discussed in turn as they relate to site efficiency and local impacts. However, design features and construction practices, beginning with site preparation, provide the physical and figurative foundation for the project. These features and practices, then, reflect the level of effort that has gone into the selection of the Pablo Creek site.

The management plan begins in Section 2.0 with a discussion of site preparation and design. Site operational considerations during dredging are discussed in Section 3.0. Post-dredging site management is addressed in Section 4.0.

2.0 PRE-DREDGING SITE PREPARATION AND DESIGN FEATURES

2.1 Site Design

No attempt will be made here to address, in detail, all elements of site design. These are described elsewhere in the permit documentation. Rather, the present discussion will be limited to those aspects of site design which directly influence site construction and operation.

2.1.1 Containment Basin Configuration

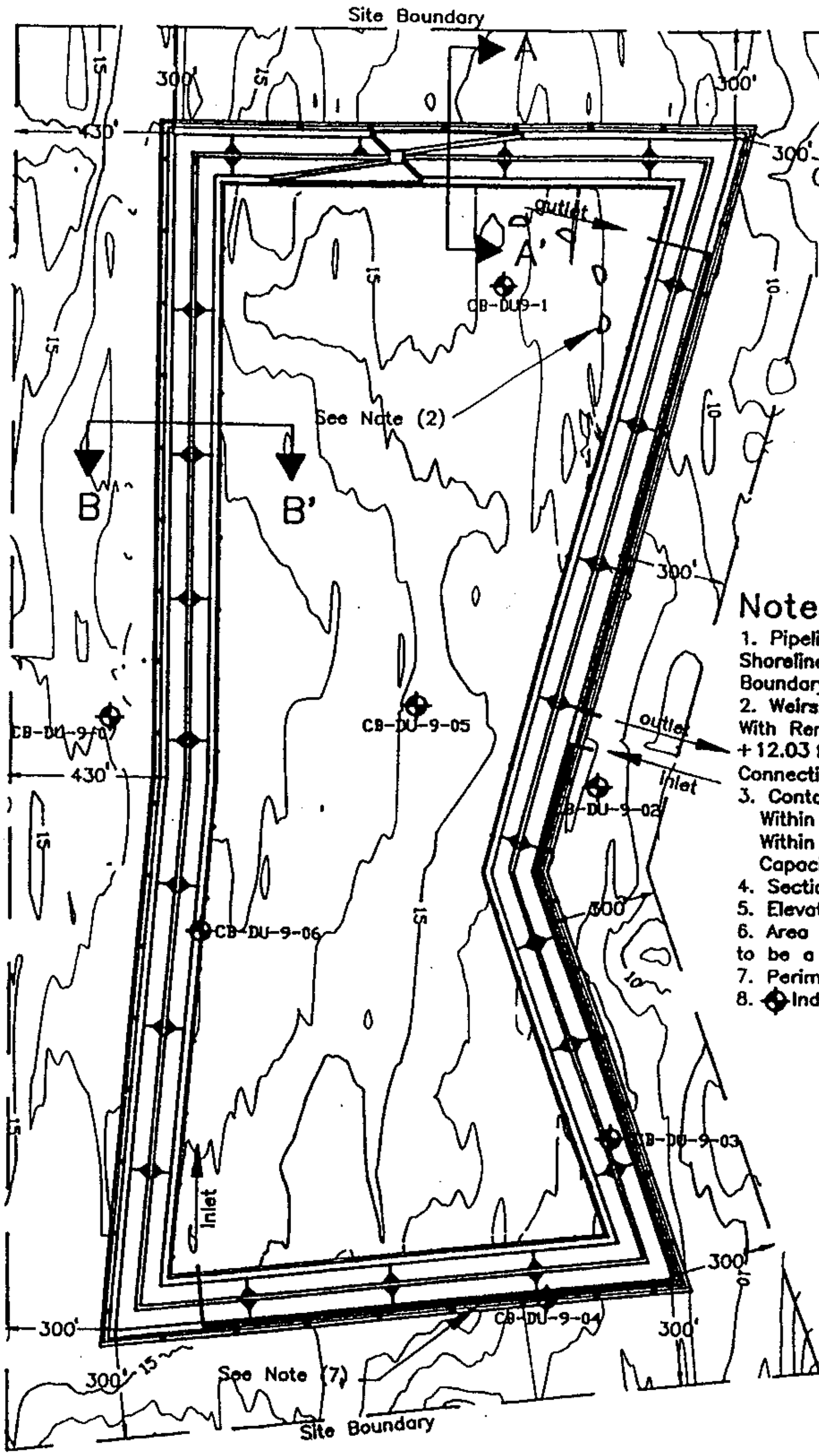
The configuration of the Pablo Creek containment basin must provide adequate capacity for the projected 50-year material storage requirements of Reach VII without unnecessarily impacting environmentally sensitive wetland areas and upland habitats on-site. As discussed in Section 1.0, the storage requirement for Reach VII is approximately 1,857,300 cy. The basin configuration presented in Figures 2-1 and 2-2 and discussed in the following paragraphs provides a capacity of 1,877,073 cy.

The Pablo Creek containment basin also minimizes the impacts of site development on environmentally sensitive areas. As stated, the total acreage of the Pablo Creek site is 179.99 acres. Adequate storage capacity requires a containment basin area of 96.01 acres. The excavation of a perimeter ditch and the construction of access roads surrounding the containment area will impact an additional 6.80 acres. Thus, the fully developed containment facility will impact a total of 102.81 acres.

As shown in Figure 2-2, the resulting configuration of the containment facility provides a buffer area completely surrounding the containment dike. The buffer varies in width from 300 ft to 430 ft of which approximately 270 ft to 400 ft remain as undisturbed natural vegetation. This area will encompass all on-site Department of Environmental Protection (DEP) jurisdictional wetlands. Management of natural resources within the buffer area is discussed in more detail in Section 4.5.

2.1.2 Site Capacity

As stated, the Pablo Creek site will meet the capacity requirement of approximately 1,857,300 cy (Taylor and McFetridge, 1986). Obtaining this capacity within a containment area of 96.01 acres will require the construction of a containment dike to a crest elevation of 16.50 ft (+31.37 ft NGVD) above the existing mean



Notes:

1. Pipeline Easement to Run From M.H.W. Shoreline of the I.C.W.W. to the Site Boundary.
2. Weirs: Four 9ft. Diameter CM Half-Pipes With Removable Flash Boards Adjustable From +12.03 ft. Above Grade to Below Grade (With Connecting Manifold.)
3. Containment Area:
   Within Outside Toe of Dike: 96.0 Acres
   Within Inside Toe of Dike: 72.3 Acres
   Capacity: 1,877,073 Cubic Yards
4. Sections A-A', B-B', See Sheet 3 of 5.
5. Elevation Datum: NGVD of 1929.
6. Area Outside Dike Within Site Boundary to be a Buffer of Existing Vegetation.
7. Perimeter Ditch, See Sheet 3 of 5.
8. ⯐ Indicates Core Boring Location.

TAYLOR ENGINEERING INC 9086 CYPRESS GREEN DRIVE JACKSONVILLE, FLORIDA 32256	Figure 2-1 Site Plan, Pablo Creek Dredged Material Management Area St. Johns County, Florida	PROJECT 08610 REVISION SHEET DATE Nov., 1993

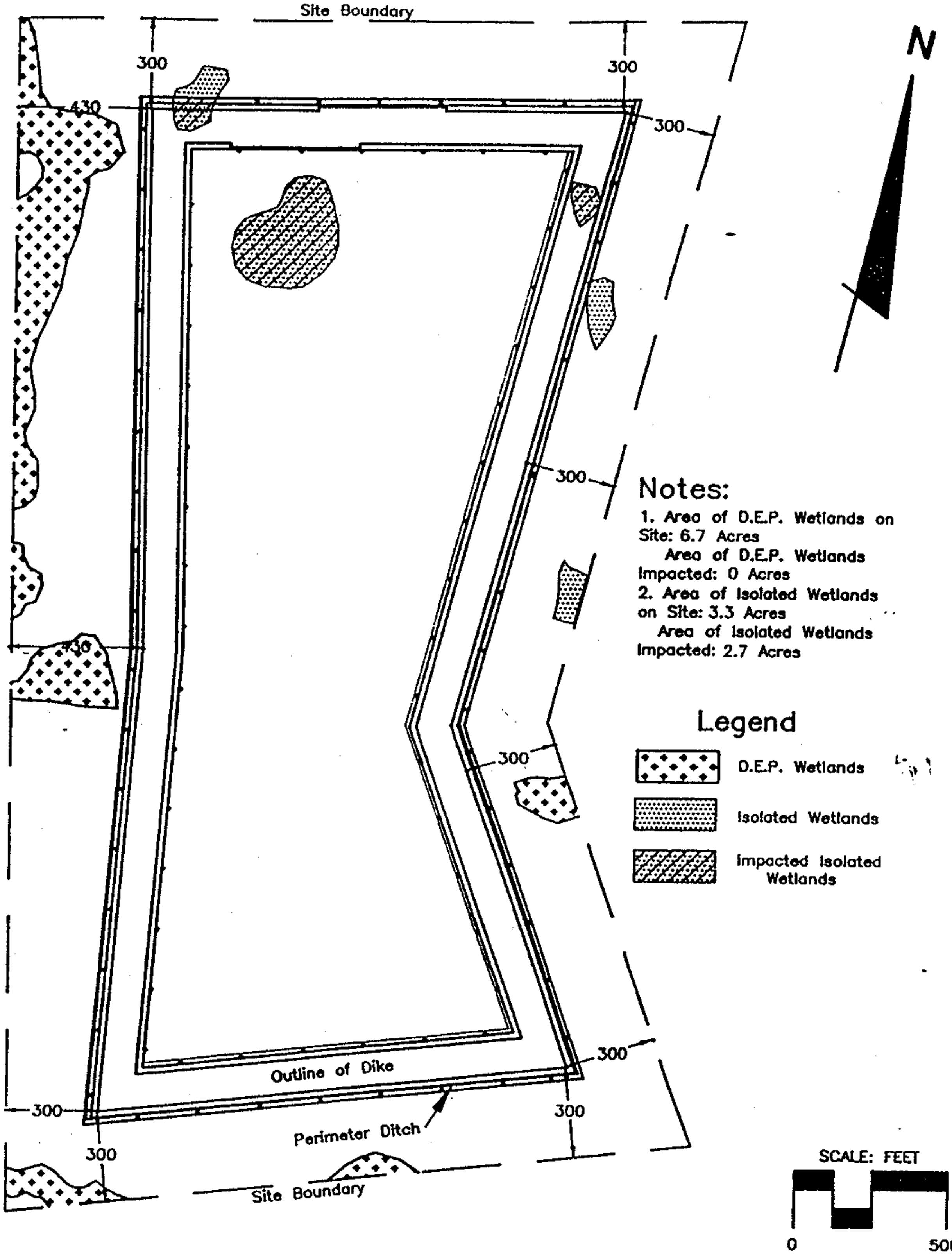


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Figure 2–2
Wetlands Map, Pablo Creek
Dredged Material Management Area
St. Johns County, Florida

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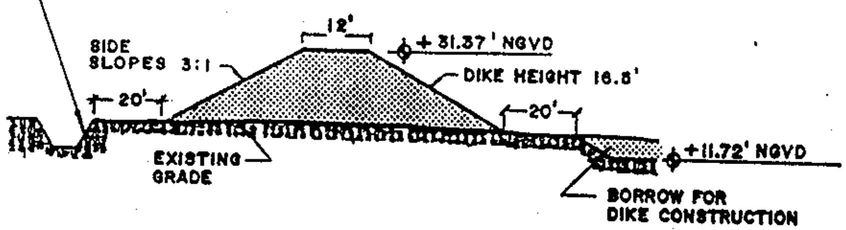
site elevation of +14.87 ft NGVD (Figure 2-3). Material used to construct the dikes will be obtained by excavating the basin interior to an elevation of +11.72 ft NGVD, or 3.15 ft below the existing site grade. Based on a conservative dike cross-sectional design including side slopes of 1V:3H and a crest width of 12 ft, 349,877 cy of material will be required to construct the dikes. An additional 3,428 cy will be required for ramps to provide equipment access to the interior of the containment basin. When the containment basin is filled to capacity, the surface of the deposition layer will be a minimum of 4.0 ft below the dike crest, comprising a minimum 2.0 ft of freeboard and 2.0 ft of ponding depth above the maximum deposition surface. The resulting capacity of the containment basin will be 1,877,073 cy.

2.2 Site Preparation

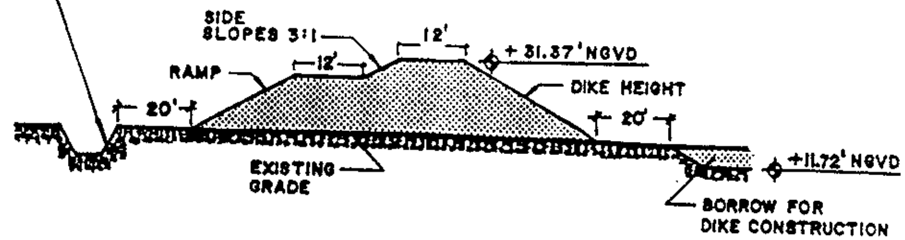
Site preparation required for the Pablo Creek dredged material management area will consist of two phases. The first phase will include the clearing and grubbing of vegetation in the containment basin area and the fence line, and the installation of security fencing. As soon as practical, this phase will be completed following site acquisition. The second phase of site preparation will consist of the construction of the containment basin and related earthmoving operations and the installation of outlet structures and other design features. This phase of site preparation is subject to the scheduling and budget priorities of the Jacksonville District Corps of Engineers and therefore may not immediately follow completion of the first phase. However, a fence and in-place security procedures will secure the site before excavation, grading, and dike construction begins. In the remainder of this section, each element of site preparation is discussed in more detail.

2.2.1 Clearing and Grubbing

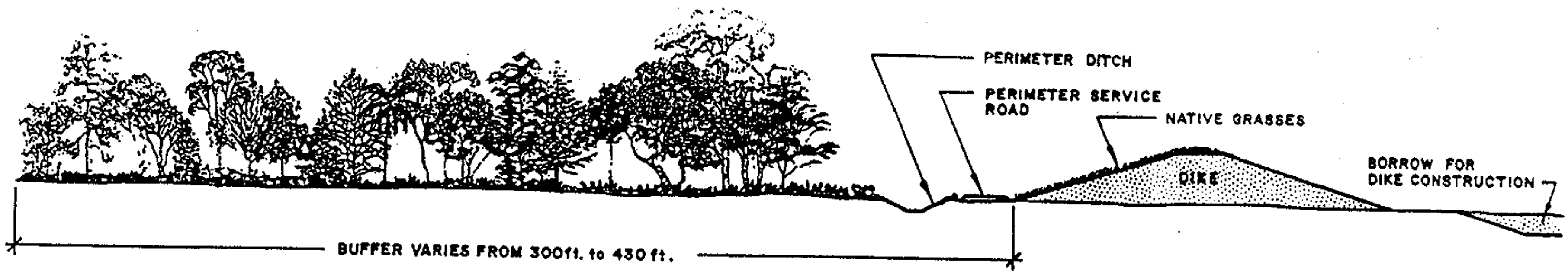
The first phase of site preparation begins with the required clearing and grubbing of vegetation. Historically, containment area construction has often been accomplished without any interior site preparation for several reasons. First, clearing vegetation from the site interior adds significantly to the initial construction cost of the containment area. Second, Haliburton (1978) and Gallagher (1978) have established that a limited growth of herbaceous vegetation or native grasses can improve sedimentation by filtration. However, clearing the site interior is warranted in the present situation because the woody vegetation (i.e. trees and brush) which characterizes much of the Pablo Creek site can constrict or channelize the flow through the containment basin. This would result in short-circuiting, reduced retention times, resuspension of sediment through increased flow velocities, and the deterioration of effluent quality. Moreover, a failure to clear existing vegetation will make



SECTION A-A'
N.T.S.



SECTION B-B'
N.T.S.



DISPOSAL AREA - VEGETATION PLAN
N.T.S

Note:
PERIMETER DITCH,
SIDE SLOPE: 1:1
BOTTOM WIDTH: 3ft.
MEAN INVERT ELEV.: 11.57' NGVD
BOTTOM SLOPE AS REQUIRED
FOR DRAINAGE

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Figure 2-3
Typical Dike and Ramp Sections, Vegetation Plan
Pablo Creek, Dredged Material Management Area
St. Johns County, Florida

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the periodic removal of the dewatered dredged material much more difficult. Therefore, the containment area should be cleared and grubbed prior to construction.

2.2.2 Excavation and Grading

The second phase of site preparation includes all earthmoving operations required to construct the containment dike and basin to the design geometry. Preliminary site design (Figures 2-1, 2-3) specifies that most of the 353,305 cy of material for initial dike construction will be obtained from excavation of the containment basin. An additional 7,670 cy will be produced from excavation of the perimeter ditch (Section 2.3.6). Preliminary subsurface surveys show that material obtained from either source is equally suitable for dike construction. Providing the required volume of material from the basin interior will necessitate excavating 3.15 ft below the existing grade to an average elevation of +11.72 ft NGVD. This will allow a 20-ft excavation setback from the interior toe of the dike.

Qualitative information describing general soil and groundwater conditions indicate that the predominant soil type on site is poorly drained Myakka fine sand (Readle et al., 1983). The water table for this type of soil is located at a depth of 3.25 ft below the surface under dry conditions. However, under high rainfall conditions, the water table may be located less than a foot below the surface. A subsurface survey conducted in December, 1992, located the on-site water table at an elevation of +12.19 ft NGVD, or approximately 2.68 ft below the mean grade of the site. Thus, the proximity of excavation to the water table will likely require the use of a sump and/or pumping of groundwater seepage during construction.

The interior of the containment basin must also be graded following excavation. Construction efficiency may dictate initially taking dike material from a perimeter trench inside the containment dike. However, this trench must be eliminated and the site interior regraded before initiating dredging operations to avoid flow channelization and unacceptable effluent quality. Irregular basin topography will produce non-uniform flow patterns and deposition geometry which, in turn, will result in the ponding of surface water. Ponding will inhibit drying of the deposition layer and make initial attempts at surface trenching more difficult. For these reasons, a uniform grade with an adequate slope (about 0.17 percent) must be provided from inlet to weir as part of the initial construction of the facility. Differential settling of varying grain size fractions (i.e., rapid precipitation of the coarser fractions nearer the inlet with increasingly finer sediments deposited nearer the outlet) will quickly establish a deposition surface sloping downward from inlet to weir once dredging operations begin.

2.3 Additional Design Features

2.3.1 Inlet

The number and location of the dredge slurry outfalls, or pipeline inlets, are the primary factors which govern the pattern of deposition within the containment basin. The disadvantage of a single, fixed inlet is a characteristic mounding of coarse material in the vicinity of the inlet which, if not mechanically redistributed, will result in a reduced retention area. However, the anticipated infrequent requirement for maintenance dredging in this portion of the ICWW (once every five to 10 years) cannot justify the cost of a fixed, multiple inlet manifold system for the Pablo Creek containment basin. More appropriate is the use of a moveable single inlet with the flexibility to be repositioned between successive dredging operations or within a single dredging event. The single inlet should also be fitted with a flow-splitter or a spoon to break the momentum of the jet and to distribute the slurry. However, regrading the de-watered sediment prior to each succeeding dredging operation may still be necessary. Moreover, the efficient use of the containment area and maximum solids retention performance will also require that the initial uniform slope (about 0.17 percent) from inlet to weir be reestablished between each dredging operation.

Preliminary analysis of the dredged material settling behavior within the Pablo Creek dredged material management area (Section 2.3.3) indicates that the maximum available distance between inlet and weir is adequate to meet solids retention requirements. Movement of the inlet to achieve a more even distribution should not be allowed to result in a significant reduction in the separation distance between inlet and outlet without the implementation of additional precautions to ensure water quality standards are met. These may include increasing the ponding depth or the use of floating baffles or turbidity screens surrounding the weirs.

2.3.2 Weirs

The outlet control structures within the containment basin consist of a system of weirs whose primary function is to control the release of the ponded water. Adjustment of weir height controls ponding depth within the containment basin which in turn controls basin retention time. Several additional aspects of weir design control the flow of water inside the basin and thereby strongly influence the efficiency of solids retention and the quality of effluent released from the site. These include the type of weir employed, the length of the weir crest, and the location of the weirs within the containment area. Each of these design aspects and its effect on basin efficiency is discussed in the following paragraphs.

A rectangular, sharp-crested weir will be used in the Pablo Creek containment basin. This type of weir structure represents a compromise between considerations of performance, adjustability, maintenance, and economy. A rectangular weir is straight and passes flow over its crest normal to the weir crest axis. The term sharp-crested indicates that the thickness (T) of the weir crest is less than the depth of flow (h) over the weir; typically $h/T > 1.5$. The depth of withdrawal is the depth at which gravity forces on suspended sediment particles exceed the inertial forces associated with flow over the weir. It therefore represents the depth of the surface layer of ponded water which is drawn over the weir and released from the containment basin. Maintaining the depth of withdrawal to less than the ponding depth reduces the possibility of resuspending sediment which has settled out of the water column. Moreover, since the concentration of suspended sediment increases with depth, minimizing the depth of the withdrawal layer maximizes the retention of suspended solids. Specific expected performance characteristics of the weir system are discussed later in this section.

Weir crest length was determined using the Selective Withdrawal Model developed by the U.S. Army Corps of Engineers' Waterways Experiment Station (WES). Project planning guidelines used by the Jacksonville District Corps of Engineers indicate that an 18-inch O.D. dredge will likely be used for future channel maintenance in Reach VII. However, to ensure a conservative containment basin design, determination of weir crest length was based on the use of a 24-inch O.D. dredge. Results of the Selective Withdrawal Model indicate that a weir crest length of 36 ft is adequate to maintain a depth of withdrawal less than the minimum ponding depth of 2.0 ft when a 24-inch O.D. dredge is used. The use of an 18-inch O.D. dredge would produce a withdrawal depth substantially less than that produced by a 24-inch O.D. dredge for a given weir crest length. The 36-ft weir crest length will be provided by four corrugated metal half-pipes, each with a nine feet weir section. The four half-pipes will be connected by a common manifold which provides drainage from the containment basin via a single pipe under the dike.

The height of the weir crest is adjustable by means of removable flashboards. The adjustment ranges from the excavated grade elevation of at the weirs (+8.57 ft NGVD) to a maximum elevation of +26.90 ft NGVD (12.03 ft above the mean site elevation). The minimum elevation of the weirs allows for the removal of stormwater prior to the initial use of the site, while the maximum elevation provides 2.0 feet of freeboard above the maximum deposition surface. The flashboards are to be 4 x 4 stock, interlocking by tongue and groove to provide rigidity against hydrostatic pressure and to minimize between-board seepage. The milling of the interlocking tongue and groove joints will reduce the height of the flashboards to 3.0 inches. This provides a minimum adjustment increment which is less than the projected depth of flow over the weir crest (4.3 inches) at the point the weir discharge approximately equals the liquid inflow to the containment basin. This design provides adequate adjustment resolution to maximize weir performance and effluent quality throughout the dredging operation and the subsequent release of the ponded water.

The final weir design parameter considered is the location of the weirs within the containment area. The weirs will be located so that the distance between them and the dredge pipe inlet is maximized and the return distance to the receiving waters is minimized (Figure 2-1). The latter requirement is to promote the efficient transport of effluent from the containment area using gravity flow. However, the length of pipeline required to return the clarified water to the ICWW may necessitate auxiliary pumping. Positioning the weirs as shown in Figure 2-1 provides approximately 3,000 ft of separation between the inlet and the weirs.

Analysis of weir performance based on nomograms developed at the Waterways Experiment Station under the Dredged Material Research Program (Walski and Schroeder, 1978) indicates that these design parameters may be expected to produce an effluent suspended sediment concentration of 0.63 g/l. Translation of suspended solids concentration to a measure of turbidity on which Florida water quality standards are based is highly dependent on the suspended material characteristics. However, WES guidelines (Palermo, 1978) indicate that this effluent quality should be adequate.

2.3.3 Ponding Depth and Basin Performance

Ponding depth refers to the height of the water column (with its suspended sediment load) maintained above the depositional surface during dredging operations. It is regulated by the height of the weir crest and, to a lesser extent, by dredge plant output. More of an operational criterion than a design feature, ponding depth nevertheless impacts the design of the containment basin, the dikes, and the weirs.

Ponding should be maintained at the greatest possible depth during dredging operations. Increased ponding depths produce increased retention times and decreased flow velocities through the containment basin and therefore improve solids retention and effluent quality. The limiting consideration for increased ponding depth is the amount of hydrostatic pressure the dike can withstand without loss of structural integrity.

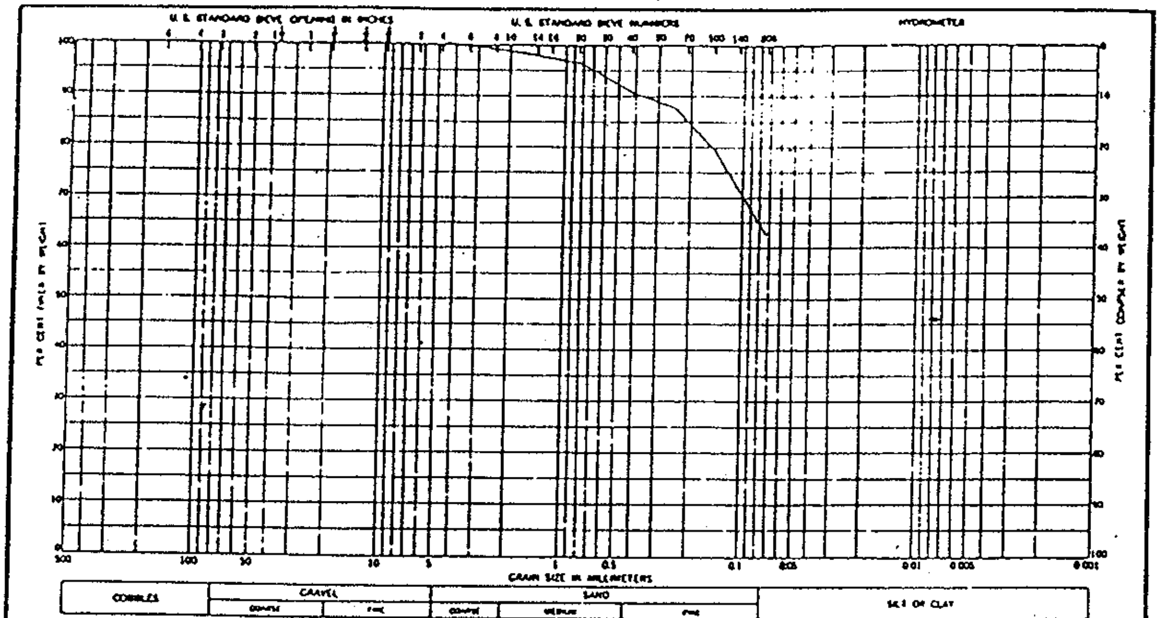
An analysis of containment basin efficiency was performed to determine the minimum operational ponding depth and basin retention time needed for adequate solids retention performance and acceptable effluent quality. The required retention time is, in turn, dependent on the physical characteristics of the sediment to be dredged. Since the fine-grained component of the sediment requires the longest period of time to settle out of the water column, the fine fraction of the dredged material determines the required basin retention time and, in turn, the required ponding depth.

Data characterizing channel sediments in Reach VII were obtained from core borings made in preparation for ICWW channel maintenance dredging near the mouth of Pablo Creek in 1986. Of the core borings taken at this location, CB-IW85M-3D contained the greatest content of fine-grained sediment. Grain size distribution analysis of the CB-IW85M-3D sample (Figure 2-4) indicated that 62 percent of the material was "fines" – that is, sediments having a grain size diameter less than a 0.074 mm.

Based on design criteria, an associated zone settling velocity was then determined from an empirical relationship between silt content and settling behavior. This relationship was developed from COE sediment data characterizing the silt content of a variety of ICWW channel sediments and the corresponding settling behavior of slurry concentrations similar to those typically encountered in dredging operations (Figure 2-5; Taylor and McFetridge, 1989). The resulting zone settling velocity for the sediment to be placed in the Pablo Creek site was determined to be 0.30 cm/min. This settling velocity was then used to determine the retention time needed to provide adequate sedimentation within the containment basin.

The preliminary design of the containment basin provides a minimum 2.0- ft ponding depth above the deposition surface. Analysis of the hydraulic characteristics of the proposed containment basin indicates that this depth will provide a maximum retention time of 45.4 hours during which the flow over the weirs balances the liquid discharge of the dredge. In comparison, the time required for the sediment to settle out of the withdrawal layer of 2.0 ft is 3.41 hours based on the zone settling velocity of the CB-IW85M-3D material. However, research (Shields, Thackston and Schroeder, 1987) by the Army Corps of Engineers Waterways Experiment Station (WES) under the Dredged Material Research Program (DMRP) indicates that the predicted settling time of the dredged material should be multiplied by a correction factor of 2.25 to account for field conditions. This yields an adjusted required settling time of 7.67 hours. Thus, the Pablo Creek containment basin provides a retention time which exceeds the adjusted settling time required to maintain adequate sedimentation and effluent quality by a factor of 5.9.

Nevertheless, ponding depths should be maintained above the 2.0-ft minimum whenever possible. Indeed, field conditions may require increasing the ponding depth above the minimum to meet effluent turbidity standards. The recommended operational ponding depth for the Pablo Creek site is 4.0 ft, with a maximum ponding depth limited to 5.0 ft. The use of a 4.0-ft operational ponding depth results in a basin retention time of 90.8 hours,



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
2	2.0-4.0	SANDY ORGANIC CLAY (OH)	326	177.0	69.8	107.2

Project INTRACOASTAL WATERWAY DREDGING PROJECT "I" TO "M" Job No. F85004
Area U.S.ARMY CORPS ENGINEERS
Boring No. CB-IW85-3D
Date 8/29/85

GRADATION CURVES

SIEVE NUMBER	SIEVE DIA.(MM)	CUMMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
4	4.75	0	0	100
10	2	.3	1.5	98.5
20	.85	.8	4	96
40	.425	2	10.1	89.9
60	.25	2.6	13.1	86.9
100	.15	4.2	21.2	78.8
200	.075	7.5	37.8	62.2

GRAVEL OR SHELL, PASSING 3IN. AND RETAINED ON NO.4 SIEVE------------------0%

SAND, PASSING NO.4 SIEVE AND RETAINED ON NO.200 SIEVE---------------------37.8%
--COARSE SAND, PASSING NO.4 SIEVE AND RETAINED ON NO.10 SIEVE------1.5%
--MEDIUM SAND, PASSING NO.10 SIEVE AND RETAINED ON NO.40 SIEVE-----8.6%
--FINE SAND, PASSING NO.40 SIEVE AND RETAINED ON NO.200 SIEVE------27.7%

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Figure 2 - 4
Grain Size Distribution for Core Boring CB-IW85M-3D

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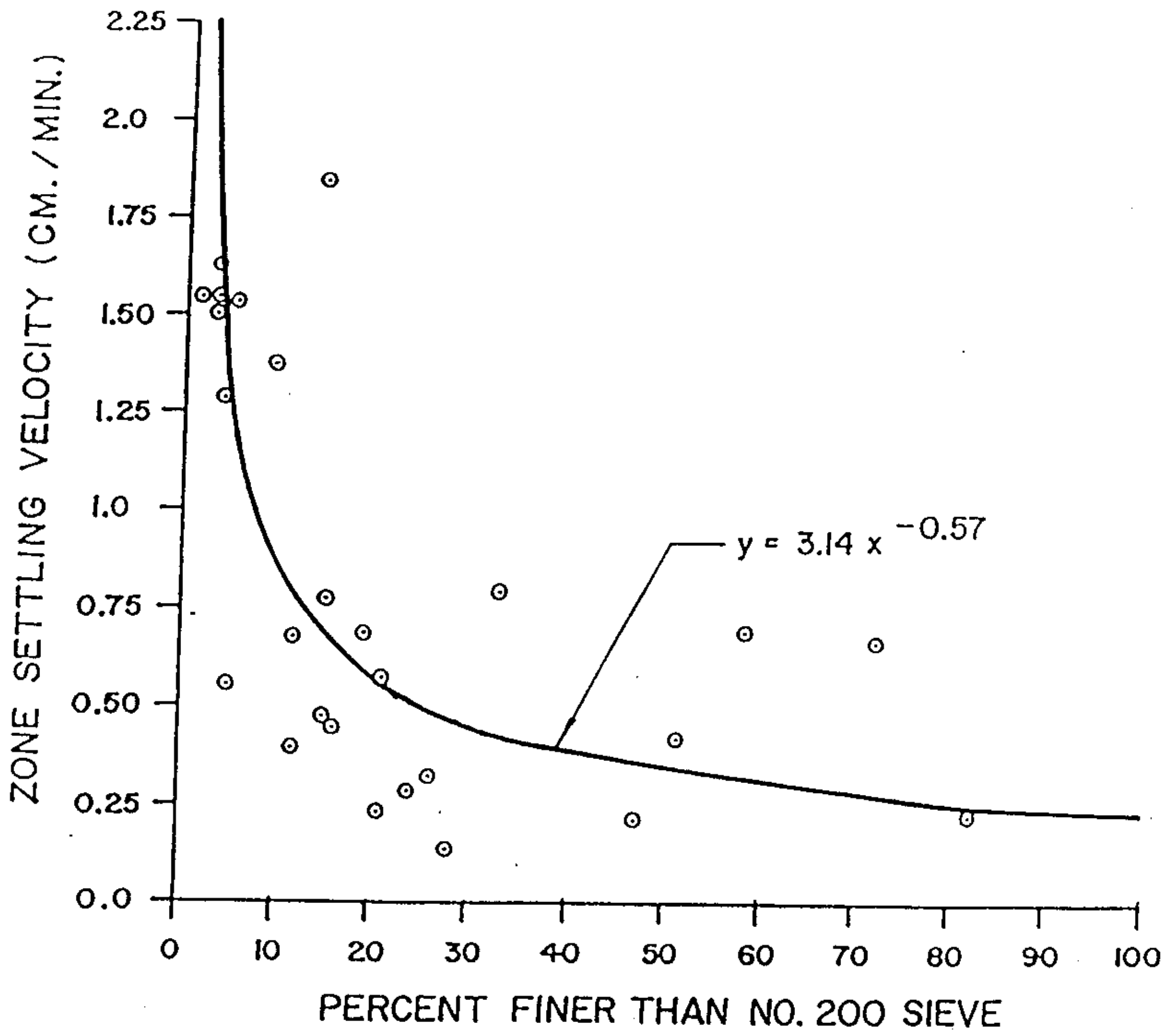

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Figure 2-5
Zone Settling Velocity of Intracoastal Waterway Channel Sediments
(Taylor and McFetridge, 1989)

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thereby providing an additional margin of safety and a basin retention time adequate to maintain the required effluent quality. Care must be taken not to increase ponding depth above the minimum too quickly. This may lead to dike saturation, piping, slumping, and other conditions of dike instability. Operational experience has demonstrated that if ponding depth is increased at a sufficiently slow rate, the permeability of the dike is reduced as fine sediments are filtered and trapped by percolation, thereby limiting dike saturation and instability. Restricting initial ponding depth to 4.0 ft should minimize the occurrence of unstable dike conditions and provide a sufficient safety factor to ensure efficient solids removal.

In addition to the recommendation of a ponding depth which exceeds that required for adequate basin performance, several additional considerations emphasize the conservative design of the Pablo Creek containment basin. DMRP research indicates that under field conditions the actual depth of withdrawal may be significantly less than that predicted by the WES Selective Withdrawal Model referenced above. Therefore, the use of the WES Selective Withdrawal Model provides a conservative containment basin design. Also, a withdrawal depth of 2.0 ft is not expected to result in the resuspension of sediment because the negative slope of the deposition layer from inlet to weir produces ponding depths at the weir greater than the minimum 2.0 ft-average over the entire basin. Moreover, providing the recommended operational ponding depth of 4.0 ft should further eliminate the possibility of resuspension, as well as doubling the retention time provided by a 2.0-ft ponding depth. Such measures should ensure that the turbidity of the effluent released from the Pablo Creek site complies with state water quality standards.

Additionally, the design dredge discharge rate of 6,430 cy/hr is based on a minimum distance from the dredge plant to the material management site. Increasing pumping distance results in increased line losses in the dredge pipe, thereby reducing output. This, in turn, produces an increase in containment basin retention time. The maximum pumping distance for the Pablo Creek site to serve all of Reach VII is 4.87 miles. Thus, actual dredging operations may lead to significant increases in basin retention time and a further decrease in the turbidity of the effluent released from the site. However, because the design of the Pablo Creek site is based on the maximum dredge plant pumping rate, the site does not require reduced dredge output for compliance with state water quality standards.

2.3.4 Interior Earthworks

Compartmentalizing the Pablo Creek containment basin with parallel containment basins or spur dikes is neither required nor desirable. Analysis of historic dredging records indicates that the projected frequency of dredging (at intervals of five to 10 years) does not warrant the use of parallel containment basins. Similarly, several considerations conspire against modifying the basin with spur dikes. First, the increased retention times which may result from their use do not offset the loss of capacity within the containment basin. Second, although they are intended to improve the efficiency of fine particle retention, spur dikes are often counter-productive because they constrict flow, leading to increased velocities and the possibility of sediment resuspension. For this site, the increased irregularity of the containment basin geometry would result in more dead zones, a reduced effective retention area, and less uniform deposition. Finally, a preliminary analysis of the efficiency of the Pablo Creek containment basin indicates that retention times adequate to allow precipitation of the finest category of sediment likely to be encountered are achievable without recourse to spur dikes.

2.3.5 Ramps

An important goal of the Long-Range Dredged Material Management Program for Florida's ICWW is to manage each dredged material management site as a permanent operating facility. Therefore, ramps to provide heavy equipment access to the containment basin interior have been integrated into the design of the containment dike (Figure 2-3). This was done to provide the capability of efficiently removing the dewatered dredged material as prevailing restrictions and market conditions dictate. Thus, the site is designed to function more as a material processing and rehandling station than as a permanent storage facility. Although the Pablo Creek containment basin is designed for the projected 50-year disposal requirement for Reach VII, its capacity can be effectively expanded by removing suitable material off-site for use in construction or agriculture. In this manner, the useful service life of the site may be extended indefinitely. In addition to providing for material removal, the ramps also allow easy entry for equipment to be utilized in the dewatering process. This latter process is discussed in Section 4.1.

The ramps will be positioned on the northern side of the containment dike (Figure 2-1). They will be accessible from San Pablo Road via the site's road easement. The ramps will obliquely traverse the containment dike and will maintain the same 1V:3H side slope as the dike. The road surface of the ramps will be 12 ft wide with an ascending/descending grade of five percent.

2.3.6 Perimeter Ditches

Migration of saltwater from the interior of the containment basin into the on-site shallow aquifer is not expected to be a significant problem because of the relatively infrequent periods of short duration in which saltwater will be present on-site and because of additional precautions incorporated in the facility design and operation. As discussed elsewhere in this report, ponded saltwater will be present within the containment area only during actual dredging operations and for a short period immediately following dredging to allow the clarified effluent to be released back to the ICWW. Such periods are expected to last approximately 10 to 12 weeks, at a frequency of approximately once every five to 10 years. A system of ditches will be constructed around the outer perimeter of the dike as a precaution to ensure that the horizontal migration of saltwater on-site is contained at or near the diked area. These ditches will completely surround the containment area, thereby inhibiting the horizontal migration of water.

The perimeter ditches are to be constructed at a 20-ft setback from the outside toe of the containment dike. To effectively intercept saltwater migration during the initial dredging operation, the ditch invert must be at or below the excavated interior grade of the containment basin. Therefore, the elevation of the ditch bottom will coincide with that of the basin interior. The ditches are to have a 1V:1H sideslope and a bottom width of 3.0 ft.

The ditches will also serve to control the flow of stormwater runoff from portions of the site outside of the containment basin. Preliminary analysis indicates that an average depth of 1.75 ft will provide adequate conveyance for the 25-year storm runoff from the exterior face of the containment dike, the perimeter road, and limited portions of the buffer area adjacent to the ditches. Control and conveyance of stormwater runoff from within the containment basin will be discussed in Section 4.2.1.

2.3.7 Dike Erosion and Vegetation

The stability of the containment dike must also be ensured against erosion from rainfall runoff and wind. This will be accomplished by vegetating the exterior dike slopes and crest immediately following dike construction (Figure 2-3). Native grasses will be used which quickly form soil binding mats while not rooting so deeply so as to structurally weaken the dike. An acceptable turf cover may be planted by approved techniques of sprigging, sodding, or seeding (broadcast or hydroseeding), or a combination of these methods, as determined by the contractor. Contract responsibilities shall include the maintenance of the vegetation until adequately established, as certified by the COE. An additional benefit of vegetating the dike in this manner is the site's aesthetic character.

2.3.8 Site Security

Site security will be provided for the project area to restrict access, prevent vandalism and damage to site facilities, and to ensure public safety. As stated (Section 2.2), during the initial phase of site construction, permanent security fencing will be erected around the site perimeter. Locked gates will control site access. FIND will hold the gate keys and distribute them on an as-needed basis to agents of the COE, dredging contractors, and other authorized parties.

In addition, on-site operators should be present at all times during active dredging operations and decanting procedures following a dredging event, as well as at any time when significant ponded water remains within the containment basin. This is to ensure proper operation, adjustment, and maintenance of the weirs and to prevent premature release of effluent through unauthorized weir operation. Active on-site operations are discussed in more detail in Section 3.0.

2.4 Groundwater Monitoring

As discussed in Section 2.2.2, construction of the containment basin requires excavation to an elevation below the seasonal high water table in soil conditions that are conducive to groundwater flow. Moreover, material dredged from the ICWW will be discharged into the Pablo Creek containment basin as a slurry consisting of approximately 20 percent marine sediments and 80 percent saline water. During periods in which saline water is ponded within the containment basin, hydrostatic forces acting on the impounded mixture could potentially cause the infiltration of saline water from the basin into the groundwater. However, two factors limit the off-site movement of saline water. First, a system of perimeter ditches (discussed in Section 2.3.6) surrounding the containment basin will interdict outward movement of water from the basin. Second, ponded saline water will be present in the basin for relatively short periods time (on the order of 10 to 12 weeks) no more than once every five to ten years. Thus, the risk of saline water infiltration to off-site groundwater is considered minimal. Nevertheless, an on-site groundwater monitoring program will be implemented to provide a means of early detection of any changes in local groundwater chemistry due to site operations. The program will commence before construction of site facilities and remain in place throughout the life of the site. The establishment of the groundwater monitoring and monitoring activities to be initiated prior to site construction are discussed below.

The implementation of the groundwater monitoring program requires the installation of shallow test wells prior to construction of site facilities. The wells will be placed within the buffer area at a reasonable distance from the perimeter ditches. Initially, four wells will be sunk, one on each side of the containment basin. More wells may be sunk if it is determined that increased monitoring capability is required.

Existing on-site groundwater conditions will be documented following the installation of the test wells. The primary purpose of this effort is to document pre-construction groundwater chloride concentrations. Expansion of the monitoring program to include additional groundwater components will be contingent upon future permitting requirements. This information will be used to establish a baseline characterization of groundwater conditions prior to development of the site. Monitoring activities to be implemented during dredging operations and between dredging events are discussed in Sections 3.5 and 4.6.

Though little change in groundwater conditions is anticipated prior to the first dredging event, groundwater monitoring should continue on a regular schedule. It is recommended that samples be taken monthly for the first year after the wells are installed and quarterly thereafter until the first use of the site as a containment facility.

In addition to documenting site preconstruction baseline conditions, results of the preconstruction monitoring activities will be used to identify changes in groundwater elevation due to either site development or changes in off-site groundwater demand.

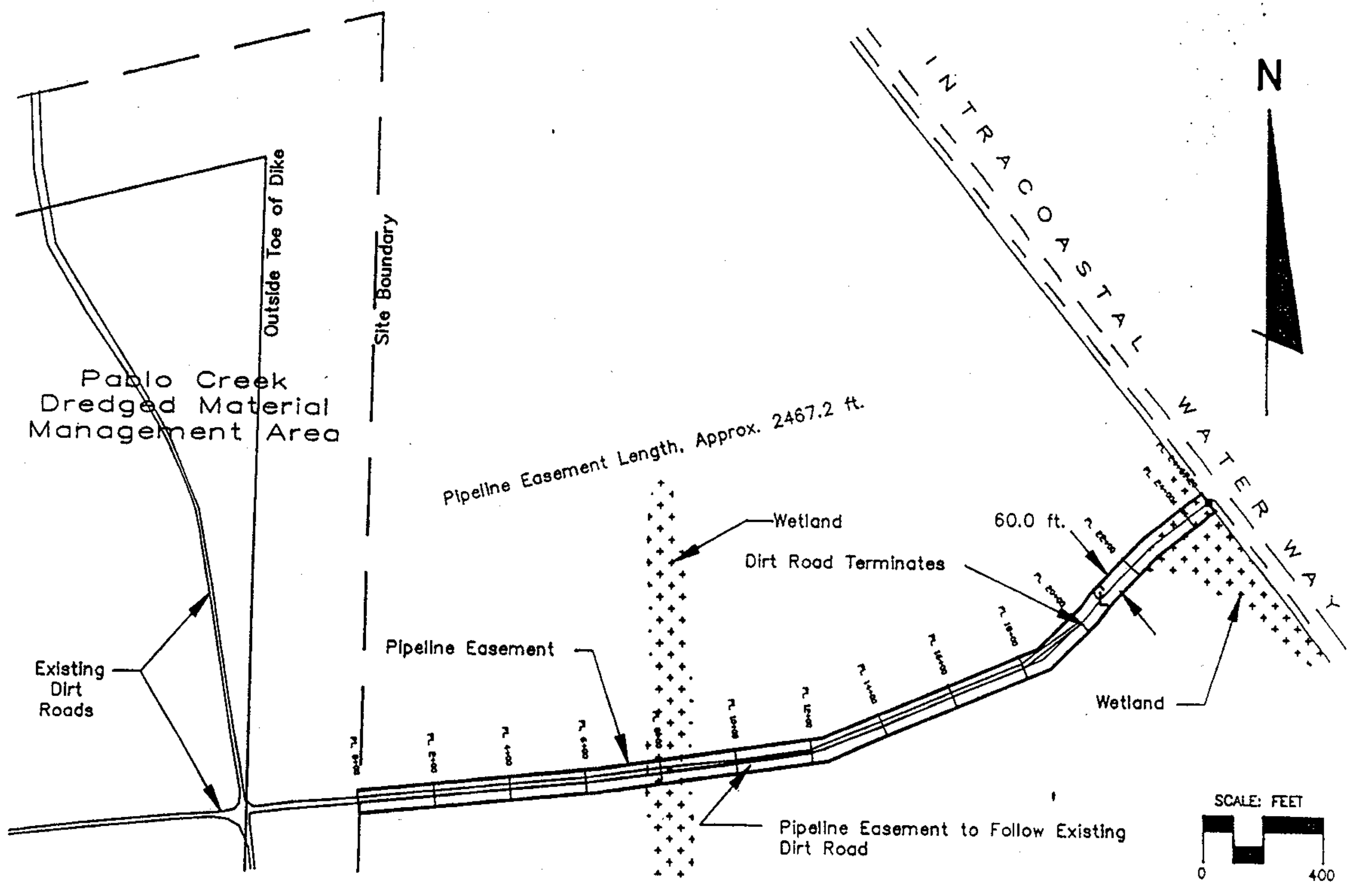
3.0 OPERATIONAL CONSIDERATIONS DURING DREDGING

The primary objectives of site management during dredging operations are (1) to maintain acceptable effluent quality during the decanting process, (2) to maximize the dewatering rate of the deposited material by controlling the pattern of deposition, and (3) to minimize the impact of site operations on adjacent areas. To this end, four elements of site management are discussed. The first addresses placement and handling of pipelines to and from the containment basin. The second examines the operation and monitoring of the dredged slurry inlets to the containment basin. Site operational guidelines and procedures included here are intended to promote the efficient use of the containment basin and to help meet effluent water quality standards. The third site management consideration addressed, and the one most critical for determining the quality of effluent released from the site, is weir operation. Last, a monitoring program is presented to ensure that the operation of the containment area does not degrade the shallow aquifer groundwater in the immediate vicinity of the dredged material management site.

3.1 Placement of Pipelines

Each dredging operation over the design life of the Pablo Creek site will require placing and retrieving both supply and return pipelines. The route to be used for this purpose is shown in Figure 3-1. The pipelines will lie within a 60 ft wide, 2,400± ft long easement. This easement extends from the ICWW to the eastern site boundary, where it adjoins the site property 2,043 ft south of the northeast site corner. Within the site boundary, the dredge discharge pipeline will lie between the ditch and the perimeter road and parallel the eastern and southern sides of the containment dike. At the southwest corner of the containment dike, the supply pipeline will pass over the dike crest and enter the basin. The return pipeline will connect to the weir-manifold system near the northeast corner of the containment dike, follow the eastern side of the containment dike, and then continue to the shoreline of the ICWW by the same route described above. Within both the easement and the site, the pipelines will be placed so as to minimize their impact on wetlands and existing vegetation.

The pipelines will be placed immediately before dredging begins and will remain in place until dredging and dewatering operations are complete. The time required to complete the dredging phase of operations will depend on the quantity and distribution of the dredged material. The average bulked volume of material produced in a single maintenance dredging operation, based on a 10-year maintenance interval (371,459 cy), corresponds to an in-situ volume of 172,771 cy. Project planning guidelines used by the Jacksonville District Corps of Engineers indicate that an 18-inch dredge will most likely be used for future channel maintenance. An 18-inch



TAYLOR ENGINEERING INC
9086 CYPRESS GREEN DRIVE
JACKSONVILLE, FLORIDA 32256

Figure 3–1
Pipeline Easement Location, Pablo Creek
Dredged Material Management Area
St. Johns County, Florida

PROJECT	C8610
REVISION	
SHEET	
DATE	Nov. 1993

dredge produces a discharge velocity of 16 ft/sec and a volummetric discharge rate of 3,560 cy/hr when pumping a 20/80 solids/liquid slurry mix. Applying these values to the in-situ capacity volume of 172,771 cy yields an effective dredging period of approximately 243 hours of continuous operation. However, because of typical delays associated with dredging projects, four to five weeks is a more realistic estimate.

Immediately upon completion, the dredge discharge pipeline will be removed. However, the return water pipeline will remain in place to decant all ponded water and any water released by initial trenching procedures (if required). After completion of this four- to five-week procedure, the return water pipeline would also be removed. Ponded rainwater expected to collect in the containment area will be subsequently removed via the weir system so that any suspended sediment will be retained in the containment basin. However, unlike the clarified effluent removed during dredging operations, the rainwater will be routed to an appropriate discharge point via a culvert/ditch system. The removal of run-off is discussed further in Section 4.2.1.

3.2 Inlet Operation

The operation of the inlet pipe will be primarily determined by the quality of the sediment to be dredged. As discussed in Section 2.3.3, available data indicates that the shoal sediments to be dredged in Reach VII may contain a component of fine-grained material as great as 62 percent. However, more specific data characterizing the material will be obtained prior to future dredging operations. These data will include, at a minimum, core boring logs and a qualitative categorization of each strata of sediment; laboratory data, including sediment size distribution curves and/or Atterberg limits; and suspended sediment-settling time curves from each boring location.

Subject to this event-specific information which characterizes the sediment to be dredged, the following strategy of inlet operation is recommended. As discussed, it is based on the characteristics of materials common to this region, which include fine sand with significant components of silt, clay, and organic materials. This strategy makes no attempt to segregate material grain size fractions by manipulation of the inlet. Some segregation will occur naturally as a result of differential settling behavior. The coarsest fraction of the material will settle out of suspension very rapidly and form a mound near the inlet. Successively finer fractions, characterized by lower settling velocities, will be deposited closer to the outlet weirs. The deposition of the finest fraction nearest the weirs is not expected to require intensive dewatering procedures because of the thin lift approach employed.