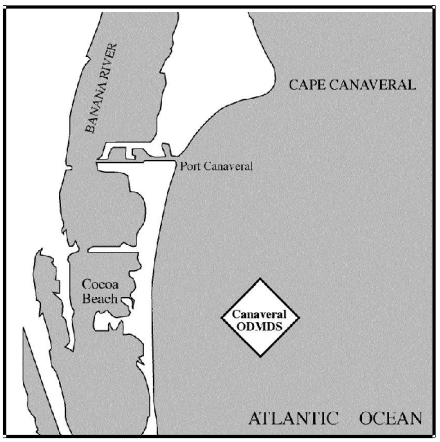
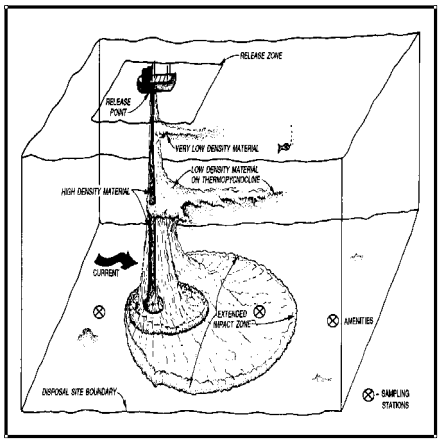
October 2001

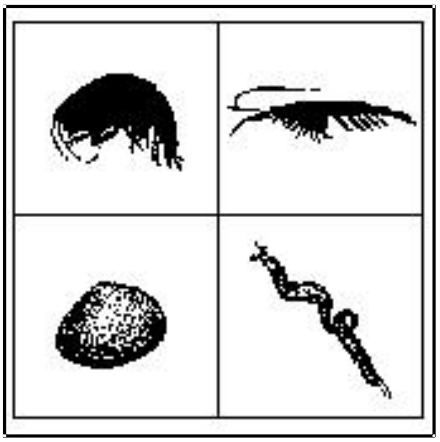
U.S. Army Corps of Engineers

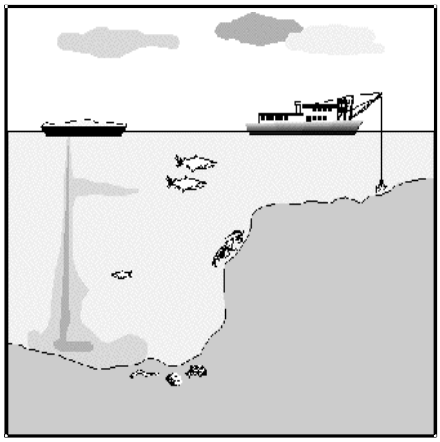
CANAVERAL OCEAN DREDGED MATERIAL DISPOSAL SITE

SITE MANAGEMENT AND MONITORING PLAN









The following Site Management and Monitoring Plan for the Canaveral ODMDS has been developed and agreed to pursuant to the Water Resources Development Act Amendments of 1992 (WRDA 92) to the Marine Protection, Research, and Sanctuaries Act of 1972 for the management and monitoring of ocean disposal activities, as resources allow, by the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers.

	23 AUG 02		OCT 17 2001
James G. May, Colonel District Engineer Jacksonville District U.S. Army Corps of Engineers P.O. Box 4970 Jacksonville, Florida	Date	Beverly Banister, Director Water Management Division U.S. Environmental Protection Agency Region 4 Atlanta, Georgia	Date

This plan is effective from the date of signature for a period not to exceed 10 years. The plan shall be reviewed and revised more frequently if site use and conditions at site indicate a need for revision.

CANAVERAL OCEAN DREDGED MATERIAL DISPOSAL SITE (ODMDS) SITE MANAGEMENT AND MONITORING PLAN

TABLE OF CONTENTS

Section — Page

INTRODUCTION 1
- Site Management and Monitoring Plan Team 1

SITE MANAGEMENT 2
- Disposal Site Characteristics 2
- Management Objectives 3
- Material Volumes 4
- Material Suitability 8
- Time of Disposal 9
- Disposal Technique 9
- Disposal Location 9
- Permit and Contract Conditions 10
- Permit Process 10
- Information Management of Dredged Material Placement Activities 11

SITE MONITORING 13
- Baseline Monitoring 13
- Disposal Monitoring 19
- Post Discharge Monitoring 19
- Material Tracking and Disposal Effects Monitoring 20
  - Summary of Results of Past Monitoring Surveys 20
  - Future Monitoring Surveys 21
- Reporting and Data Formatting 24

MODIFICATION OF THE CANAVERAL ODMDS SMMP 24

REFERENCES 25

LIST OF FIGURES

Figure No.	Title	Page
Figure 1.	Canaveral ODMDS Location Map	3
Figure 2.	Volume of Dredged Material Placed in the Canaveral ODMDS	4
Figure 3.	Sources of Dredged Material Disposed at the Canaveral ODMDS	6
Figure 4.	Projected Disposal Volumes at the Canaveral ODMDS	8
Figure 5.	Permit Application / Evaluation Procedure	12

LIST OF TABLES

Table No.	Title	Page
Table 1.	Volume of Dredged Material Placed in the Canaveral ODMDS	5-6
Table 2.	Projected Volume of Dredged Material Disposed in the Canaveral ODMDS	7
Table 3.	Summary of Permit and Contract Conditions	10
Table 4.	Surveys Conducted at the Canaveral ODMDS	14-18
Table 5.	Canaveral ODMDS Monitoring Strategies and Thresholds for Action	22-23

APPENDICES

Appendix A: Harbor Wide Testing Strategy

Appendix B: Water Column Evaluations: Numerical Model (STFATE) Input Parameters

Appendix C: Interim Disposal Zones

Appendix D: Template for MPRSA 103 Standard Permit Conditions

Appendix E: Template for Ocean Disposal Contract Specifications

Appendix F: Long Term Monitoring Strategy

Appendix G: Essential Fish Habitat Assessment

Canaveral ODMDS

Site Management and Monitoring Plan

INTRODUCTION. It is the responsibility of the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (COE) under the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 to manage and monitor each of the Ocean Dredged Material Disposal Sites (ODMDSs) designated by the EPA pursuant to Section 102 of MPRSA. As part of this responsibility, a Site Management and Monitoring Plan (SMMP) was originally developed as part of the designation process and was published in August 1990 as part of, "Final EIS Canaveral Harbor, Florida Ocean Dredged Material Disposal Site Designation" to specifically address the disposal of dredged material into the Canaveral ODMDS. It incorporates subsequent monitoring results and provisions of the 1992 Water Resources Development Act and a Memorandum of Agreement between EPA and COE. Upon finalization of this revised SMMP, these SMMP provisions shall be requirements for all dredged material disposal activities at the site. All Section 103 (MPRSA) ocean disposal permits or evaluations shall be conditioned as necessary to assure consistency with the SMMP.

Site Management and Monitoring Plan Team. An interagency SMMP team has been established to assist EPA and the Corps of Engineers in developing this SMMP. The team consists of the following agencies and their respective representatives:

Jacksonville District Corps of Engineers	Canaveral Port Authority
State of Florida	NOAA
EPA Region 4	U.S. Coast Guard
U.S. Navy	

Other agencies such as the National Marine Fisheries Service (NMFS) and the Fish and Wildlife Service (FWS) will be asked to participate where appropriate. The SMMP team will assist EPA and the Corps of Engineers in evaluating existing monitoring data, the type of disposal (i.e., O&M vs. construction), the type of material (i.e., sand vs. mud), location of placement within the ODMDS and quantity of material. The team will assist EPA and COE on deciding on appropriate monitoring techniques, the level of monitoring, the significance of results and potential management options.

Specific responsibilities of EPA and the Jacksonville District Corps of Engineers are:

> EPA: EPA is responsible for designating/dedesignating MPRSA Section 102 ODMDSs, for evaluating environmental effects of disposal of dredged material at these sites and for reviewing and concurring on dredged material suitability determinations.
>
> COE: The COE is responsible for evaluating dredged material suitability, issuing MPRSA Section 103 permits, regulating site use and developing and implementing disposal monitoring programs.

SITE MANAGEMENT

Section 228.3 of the Ocean Dumping Regulations (40 CFR 220 - 229) states: "Management of a site consists of regulating times, rates, and methods of disposal and quantities and types of materials disposed of; developing and maintaining effective ambient monitoring programs for the site; conducting disposal site evaluation studies; and recommending modifications in site use and/or designation." The plan may be modified if it is determined that such changes are warranted as a result of information obtained during the monitoring process.

Disposal Site Characteristics. The Canaveral ODMDS is a 2 nautical mile (nmi) by 2 nmi square centered at the geographic coordinates 28°18'44"N latitude and 30°31'00"W longitude (NAD 27) or state plane coordinates 1446468 N and 655198 E (NAD 27). The corner coordinates are as follows:

Geographic		State Plane (Florida East 0901 U.S. Ft)	
28°20'15"N	80°31'11"W	1455654 N	654499 E
28°18'51"N	80°29'15"W	1447214 N	664901 E
28°17'13"N	80°30'53"W	1437281 N	656182 E
28°18'36"N	80°32'45"W	1445624 N	646137 E

The site (see Figure 1) lies in the Canaveral Bight on the shallow continental shelf, centered 4.5 nmi offshore Cocoa Beach, Florida, has a depth range of 14 meters (47 feet) to 17 meters (55 feet) and an area of 4 nmi^2. Physical and biological conditions at the ODMDS are described in, "Final Environmental Impact Statement Canaveral Harbor, Florida Ocean Dredged Material Disposal Site Designation."

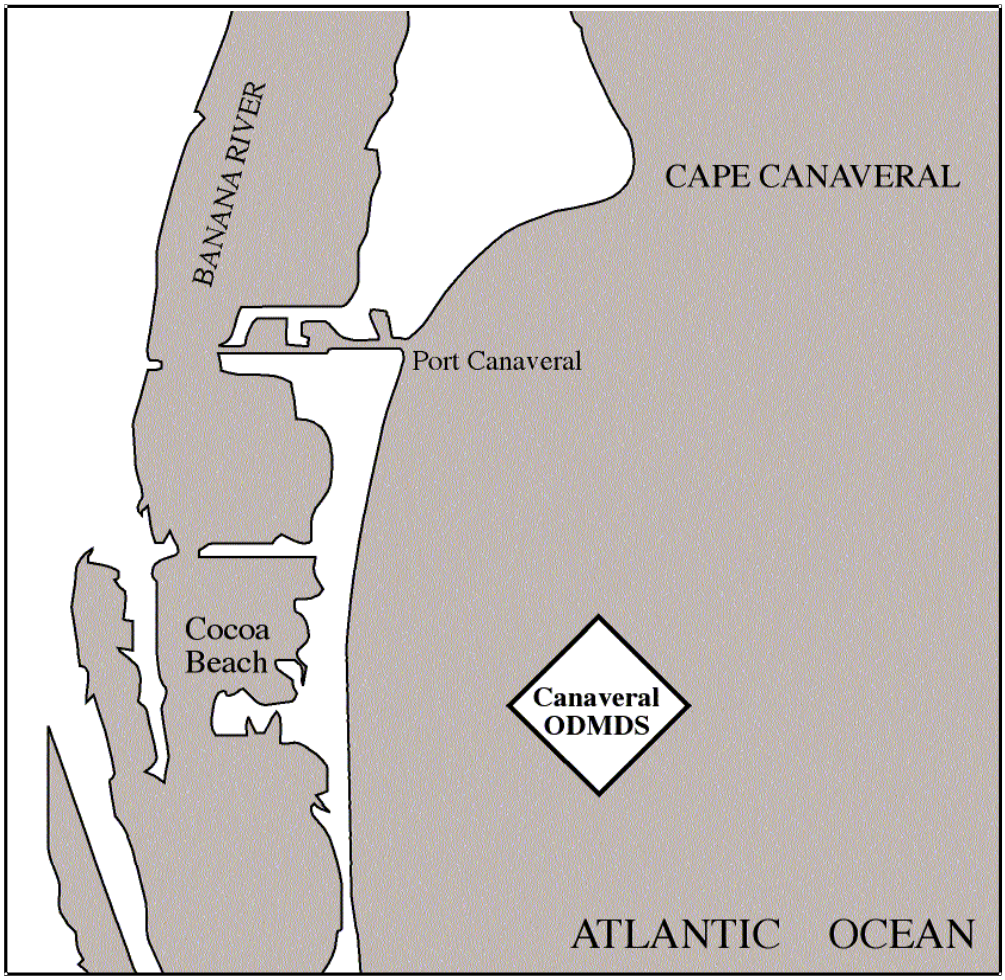


Figure 1: Canaveral ODMDS Location Map

Management Objectives. There are three primary objectives in the management of each ODMDS. These are:

- Protection of the marine environment;
- Beneficial use of dredged material whenever practical; and
- Documentation of disposal activities at the ODMDS.

The following sections provide the framework for meeting these objectives to the extent possible.

Dredged Material Volumes It is intended that the Canaveral ODMDS will be used for dredged material from the greater Canaveral, Florida vicinity. The three primary users of the Canaveral ODMDS are:

- U.S. Army Corps of Engineers for Civil Works (West and Middle Turning Basins, Entrance Channel (Cut 1), Inner Channel (Cuts 2 and 3), and the Barge Canal)
- U.S. Navy (Trident Access Channel and Turning Basin, Cut 1A, Entrance Channel Widener)
- Canaveral Port Authority (West and Middle Turning Basins and Berthing Areas)

Since 1974, approximately 22.6 million cubic yards of dredged materials have been disposed in the Canaveral ODMDS (Table 1). Since 1990 (the date of site designation), approximately 9.1 million cubic yards of dredged materials have been disposed in the Canaveral ODMDS. Between 1974 and 1990, the average volume of dredged material disposed in the ocean was about 943,000 cubic yards and between 1990 and 2000 the average annual disposal volume was about 847,000 cubic yards. Figure 2 shows the yearly record of ocean dredged material disposal in the Canaveral ODMDS for the period 1974 through 2000. The percentage of each source of dredged material disposed within the ODMDS is shown in Figure 3.

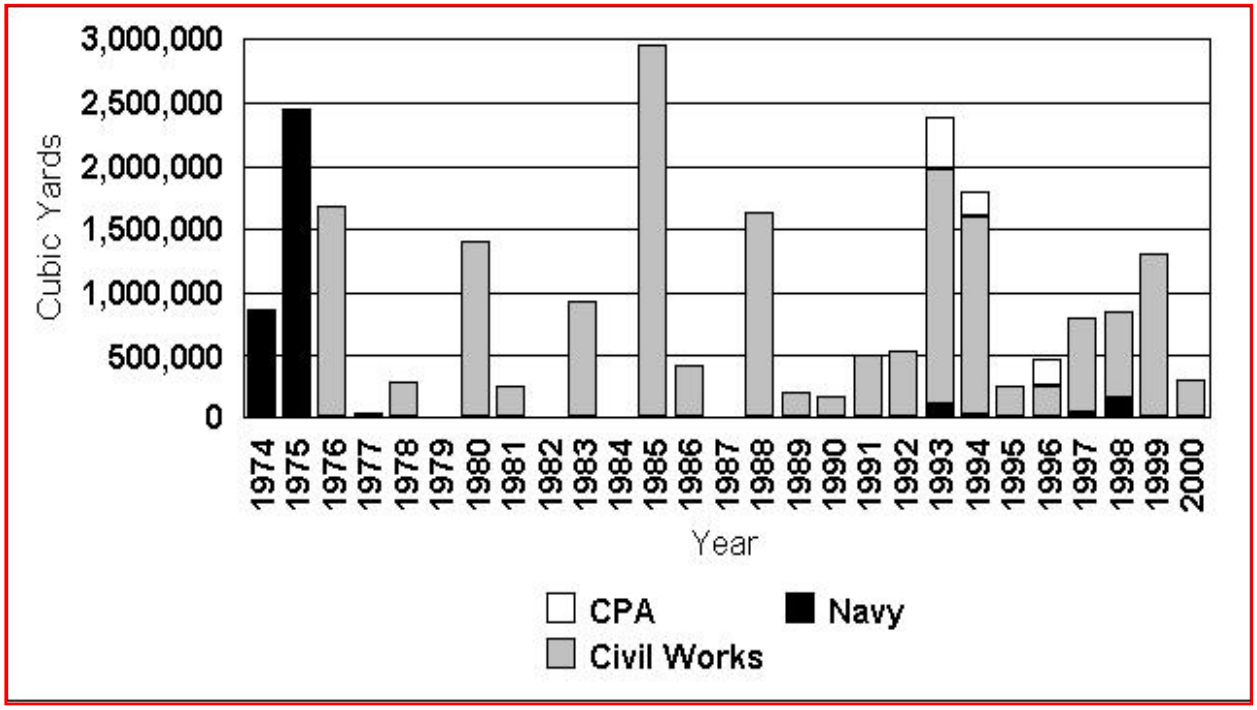


Figure 2: Volume of Dredged Material Placed in the Canaveral ODMDS, 1976-2000

Table 1. Volume of Dredged Material Placed in the Canaveral ODMDS

Year	Type of Action	Source	Volume (yd^3)	Sponsor	Composition
1974	NW	Entrance Channel & Trident Basin	645,198	Navy	Sandy Silt
1974	MD	Entrance Channel & Trident Basin	223,986	Navy	Sandy Silt
1975	NW	Entrance Channel & Trident Basin	2,196,470	Navy	Sandy Silt
1975	MD	Entrance Channel & Trident Basin	187,212	Navy	Silty Sand
1975	MD	Trident Basin	63,077	Navy	Sandy Silt
1976	NW	Entrance Channel	1,343,121	Civil Works	Sandy Silt
1976	MD	Entrance Channel	341,888	Civil Works	Sandy Silt
1977	MD	Entrance Channel	48,017	Civil Works	Sandy Silt
1978	MD	Entrance Channel	282,517	Civil Works	Sandy Silt
1980	MD	Entrance Channel	1,402,547	Civil Works	Sandy Silt
1981	MD	Entrance Channel	257,326	Civil Works	Sandy Silt
1983	MD	Entrance Channel	929,555	Civil Works	Sandy Silt
1985	MD	Entrance Channel	2,958,827	Civil Works	Silty Sand
1986	NW	Entrance Channel	63,370	Civil Works	Silty Sand
1986	MD	Entrance Channel	351,535	Civil Works	Silty Sand
1988	MD	Entrance Channel	442,750	Civil Works	Silty Sand
1988	MD	Entrance Channel	1,200,188	Civil Works	Silt
1989	MD	Entrance Channel	203,000	Civil Works	Silt
1990	MD	Entrance Channel	173,772	Civil Works	Silt
1991	MD	Middle Turning Basin	497,380	Civil Works	Silt
1992	MD	Entrance Channel	342,000	Civil Works	Silt
1992	MD	Middle Turning Basin	208,000	Civil Works	Silt
1993	MD	Entrance Channel	1,878,460	Civil Works	Silt
1993	MD	Trident Access Channel	108,410	Navy	Silty Sand
1993	NW	W. Turning Basin SE Corner Cutoff	400,000	CPA	Clay

Year	Type of Action	Source	Volume (yd^3)	Sponsor	Composition
1994	NW	Entrance Channel	454,000	Civil Works	Silty Sand
1994	NW	Middle Turning Basin	1,039,000	Civil Works	Silty Sand
1994	MD	Entrance Channel	98,820	Civil Works	Silt
1994	MD	Trident Access Channel	17,510	Navy	Sandy Silt
1994	MD	W. Turning Basin CT5	24,000	CPA	Sandy Clay
1994	NW	W. Turning Basin CT10	86,000	CPA	Silty Sand
1995	MD	Entrance Channel	243,180	Civil Works	Silt
1995	MD	Trident Access Channel & Turning Basin	12,090	Navy	Silt
1996	MD	Entrance Channel	245,274	Civil?	Sandy Silt
1996	NW	W. Turning Basin CT8	212,000	CPA	Silty Sand
1997	MD	Entrance Channel	773,999	Civil Works	Sandy Silt
1997	MD	Trident Turning Basin	36,965	Navy	Silts & Clays
1998	MD	Entrance Channel	688,839	Civil Works	Sandy Silt
1998	MD	Entrance Channel, TTB, & Poseidon Wharf	160,044	Navy	Sandy Silts & Clays
1998	MD	W. Turning Basin CT5	5,600	CPA	Sandy Clay
1999	MD	Entrance Channel	1,312,703	Navy	Sandy Silt
2000	MD	Entrance Channel	300,320	Civil Works	Silt

NW: New Work MD: Maintenance Dredging CPA: Canaveral Port Authority

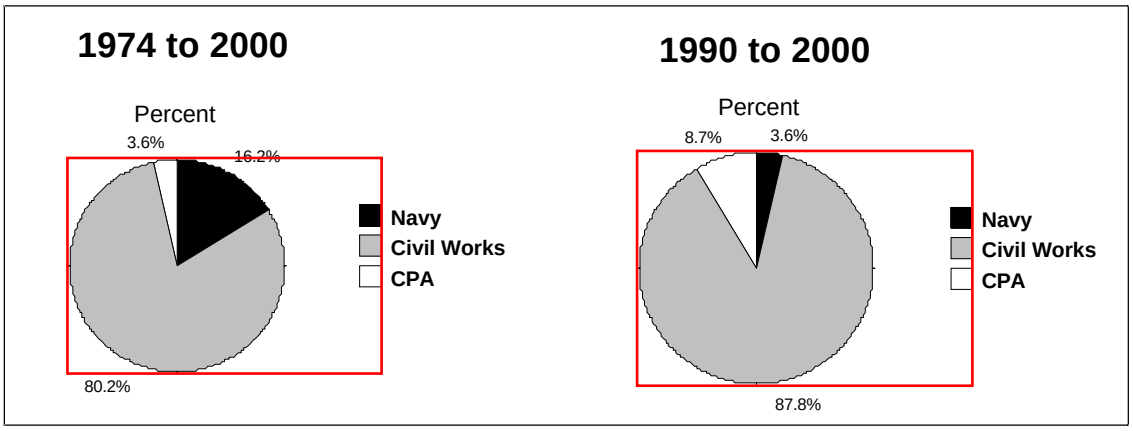


Figure 3: Sources of Dredged Material Disposed at the Canaveral ODMDS

Future volumes and rates of disposal, from both Federal and non-federal applicants, are expected to range around 1 million cubic yards per year. Short term (5 year) projected disposal volumes are shown in Table 2 and Figure 4. Civil works maintenance projects for Canaveral Harbor are anticipated to account for approximately 75% of the total volume of material to be disposed at the ODMDS.

Table 2. Projected Volume of Dredged Material Disposed in the Canaveral ODMDS (5 year)

Year	Type of Action	Source	Volume (yd^3)	Sponsor	Composition
2001-2005	MD	Entrance Channel, West and Middle Turning Basins, Inner Channel and Barge Canal	500,000 per year	Civil Works	Silt and Fine Sand
2001-2005	MD	Entrance Channel Widener, Cut 1A & Trident Access Channel and Turning Basin	100,000 per year	Navy	Silt and Fine Sand
2002-2003	NW	West Turning Basin Deepening	900,000	CPA	Silts and Clays
2004-2005	MD	West Turning Basin Maintenance	250,000 per year	CPA	Silt and Fine Sand
2002-2004	NW	Cruise Terminal 6&7	76,000	CPA	Fine Sand
2002-2004	NW	West Basin Corner Cut-Off	750,000	CPA	Silt & Fine Sand
2002-2004	NW	Canaveral ADA	1,000,000	CPA	Silt and Clay

NW: New Work
MD: Maintenance Dredging
CPA: Canaveral Port Authority

The Canaveral ODMDS has been determined to be a dispersive site. However, the dispersiveness of the site and consequently the capacity of the ODMDS has yet to be determined. Future monitoring will attempt to address this issue. Until the capacity of the ODMDS has been determined, use of the ODMDS will be restricted to 3 million cubic yards of dredged material per year. This volume is based on the historical maximum volume disposed in any single year. Average annual disposal volumes are not expected to approach this volume.

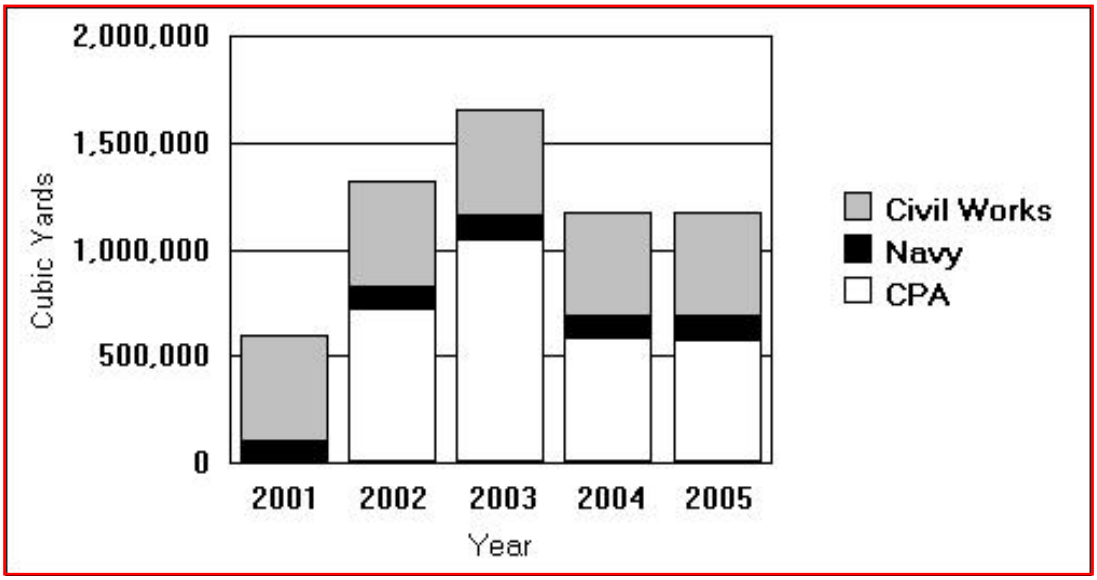


Figure 4: Project Disposal Volumes at the Canaveral ODMDS

Material Suitability. Two basic sources of material are expected to be placed at the site, new work dredged material and maintenance material. These materials will consist of mixtures of silt, clay and sand in varying percentages.

The disposition of any significant quantities of beach compatible sand from future projects will be determined on a project by project basis. It is expected that the State of Florida will exercise its authority and responsibility, regarding beach nourishment, to the full extent possible. Utilization of any significant quantities of beach compatible dredged material for beach nourishment is strongly encouraged and supported by EPA. Disposition of non-beach quality sand should be planned to allow the material to be placed so that it will be within or accessible to the sand-sharing system, to the maximum extent practical, and following the provisions of the Clean Water Act. Disposal of coarser material, such as rubble, should be coordinated with the State of Florida and EPA to avoid unintended impacts in the ODMDS and to promote possible beneficial uses of the material.

The suitability of dredged material for ocean disposal must be verified by the COE and agreed to (concurred) by EPA prior to disposal. Verification will be valid for three years from the time last verified. Verification will involve: 1) a case-specific evaluation against the exclusion criteria (40 CFR 227.13(b)), 2) a determination of the necessity for testing including bioassay (toxicity and bioaccumulation) testing for non-excluded material based on the potential for contamination of the sediment since last tested, and 3) carrying out the testing (where needed) and determining that the non-excluded, tested material is suitable for ocean disposal.

Documentation of verification will be completed prior to use of the site. Documentation will be in the form of a MPRSA Section 103 Evaluation. The Evaluation and any testing will follow the

procedures outlined in the 1991 EPA/COE Dredged Material Testing Manual and 1993 Regional Implementation Manual (RIM) and the guidance provided in Appendix A. This includes how dredging projects will be subdivided into project segments for sampling and analysis. The MPRSA Section 103 Evaluation will be in the form outlined in Appendix B of the RIM. Water Quality Compliance determinations will be made using the STFATE (ADDAMS) model and the input parameters provided in Appendix B. Only material determined to be suitable through the verification process by the COE and EPA will be placed at the Canaveral ODMDS.

Time of Disposal. At present no restrictions have been determined to be necessary for disposal related to seasonal variations in ocean current or biotic activity. As monitoring results are compiled, should any such restrictions appear necessary, disposal activities will be scheduled so as to avoid adverse impacts. Between December 1 and March 31 monitoring and precautions necessary to protect whales, as described in the next paragraph, are required. Additionally, if new information indicates that endangered or threatened species are being adversely impacted, restrictions may be incurred.

Disposal Technique. No specific disposal technique is required for this site. However, in order to protect whales, NMFS requires monitoring by endangered species observers with at-sea large whale identification experience to conduct daytime observations for whales between December 1 and March 31. During daylight hours, the dredge operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the vessel must slow down to 5 knots or less when traversing between areas if whales have been spotted within 15nm of the vessel's path within the previous 24 hours. In addition, the dredge operator will maintain a 500 yard buffer zone between the vessel and any whale.

Additionally, standard surveillance and evasive measures to protect sea turtles and marine mammals shall be employed during all disposal operations at the ODMDS.

Disposal Location. Disposal shall occur no less than 330 feet (100 meters) inside the site boundaries to comply with 40 CFR §227.28. Placement methods which prevent mounding of dredged materials from becoming an unacceptable navigation hazard will be used. Dredged material shall be placed so that at no point will depths less than -40 feet Mean Lower Low Water (MLLW) occur (i.e., a clearance of 40 feet above the bottom will be maintained). To maximize ODMDS capacity and minimize mounding of material, the dumps shall be scattered throughout specified disposal zones and not placed repeatedly at one location. When necessary, the Jacksonville District COE in consultation with EPA Region 4 will specify zones within the ODMDS for dredged material from each specific ocean dumping activity. An interim disposal plan is presented in Appendix C. Depths at the time of disposal will be monitored to detect if adjustments of disposal methods is needed to prevent unacceptable mounding. While control of placement to minimize mounding is preferred, the physical removal or leveling of material above -30 feet MLLW is a management alternative should mounds greater than those elevations occur.

Permit and Contract Conditions. The disposal monitoring and post-disposal monitoring requirements described under Site Monitoring will be included as permit conditions on all MPRSA Section 103 permits and will be incorporated in the contract language for all federal projects. A summary of the management and monitoring requirements to be included are listed in Table 3. Appendix D contains a template for standard permit conditions for MPRSA 103 permits for the Canaveral ODMDS and Appendix E contains a template for standard contract conditions for civil works project use of the ODMDS.

Table 3. Summary of Permit and Contract Conditions

Condition	Reference
Dredged Material Suitability and Term of Verification	Canaveral ODMDS SMMP page 8, Appendix A Regional Implementation Manual
Disposal within Appropriate Zones	Canaveral ODMDS SMMP page 9, Appendix C
Northern Right Whale Avoidance	Canaveral ODMDS SMMP page 9
Post Bathymetric Surveys within 30 days of Project Completion	Canaveral ODMDS SMMP page 19 and 20
Disposal Monitoring and Recording of Disposal Locations	Canaveral ODMDS SMMP page 19
Reporting Requirements: Daily & Monthly Operations Reports and Disposal Summary Reports within 90 Days of Project Completion	Canaveral ODMDS SMMP page 24

Permit Process. The permit process is outlined in Figure 5 and consists of 10 main steps:

- **Preapplication Consultation**: Includes discussion of alternatives and the qualitative and quantitative information required by the District Engineer for use in evaluating the proposed dredged material.
- **Evaluation of Dredged Material Proposed for Ocean Disposal**: Includes development, approval and implementation of sampling and analysis plan (see Section on Material Suitability). This step should include close coordination between EPA Region 4, the Jacksonville District Corps of Engineers and the applicant.
- **Permit Application**: According to 33 CFR 325.1, a permit application must include the following:
  - A complete description of the proposed activity, including necessary drawings, sketches, or plans.
  - The location, purpose, and need for the proposed activity; scheduling of the activity; names and addresses of adjoining property owners; location and dimension of adjacent structures
  - A list of authorizations required by other Federal, interstate, State, or local agencies for the work, including all approvals received or denials already made
  - The source of the material; the purpose of the disposal and a description of the type, composition, and quantity of the material (this includes information necessary to determine if the material is in compliance with the criteria); the method of transportation and disposal of the material; and the location of the disposal site.

- **Review of Application for Completeness**: Additional information is requested if the application is incomplete.
- **Public Notice**: Per 33 CFR 325.3, Public Notices issued by the USACE for dredged material disposal must include all of the information in 40 CFR 225.2(a) (see RIM). A supplemental, revised or corrected Public Notice will be issued if the District Engineer believes that the new information affects the review of the proposal.
- **EPA MPRSA Review**: Independent review of the information to determine whether the disposal activity complies with the criteria found in 40 CFR 227 and 228.
- **District Engineer Completes Evaluation**: The District Engineer addresses comments and holds public meeting if needed.
- **USACE Public Interest Review**: The USACE must consider all comments, suggestions, and concerns provided by all commenters and incorporate their comments into the administrative record of the application.
- **Permit Issued**: A decision to issue or deny a permit is discussed in either a Statement of Findings or Record of Decision.
- **Permit Public Notice**: A list of permit decisions is published and distributed to all interested parties each month.

Information Management of Dredged Material Placement Activities. As discussed in the following sections, a substantial amount of diverse data regarding use of the Canaveral ODMDS and effects of disposal is required from many sources (EPA, COE, Navy, Canaveral Port Authority). If this information is readily available and in a useable format it can be used to answer many questions typically asked about a disposal site:

- What is being dredged?
- How much is being dredged?
- Where did the dredged material come from?
- Where was the dredged material placed?
- Was dredged material dredged correctly? placed correctly?
- What will happen to the environment at the disposal site?

As part of site management, EPA and the COE will investigate alternatives for appropriate data management. A GIS data management system, the Dredged Material Spatial Management Analysis and Record Tool (DMSMART) is currently in development by the Corps of Engineers DOER program at the Waterways Experiment Station. This tool will include guidance to Districts for development of a database of dredging project history and the dredging and disposal site monitoring data. Once available, the District, with assistance from EPA Region 4, will evaluate the best approach to implementing a data management system. This will enable the COE and EPA to better manage the Canaveral ODMDS and account for the multiple users of the site.

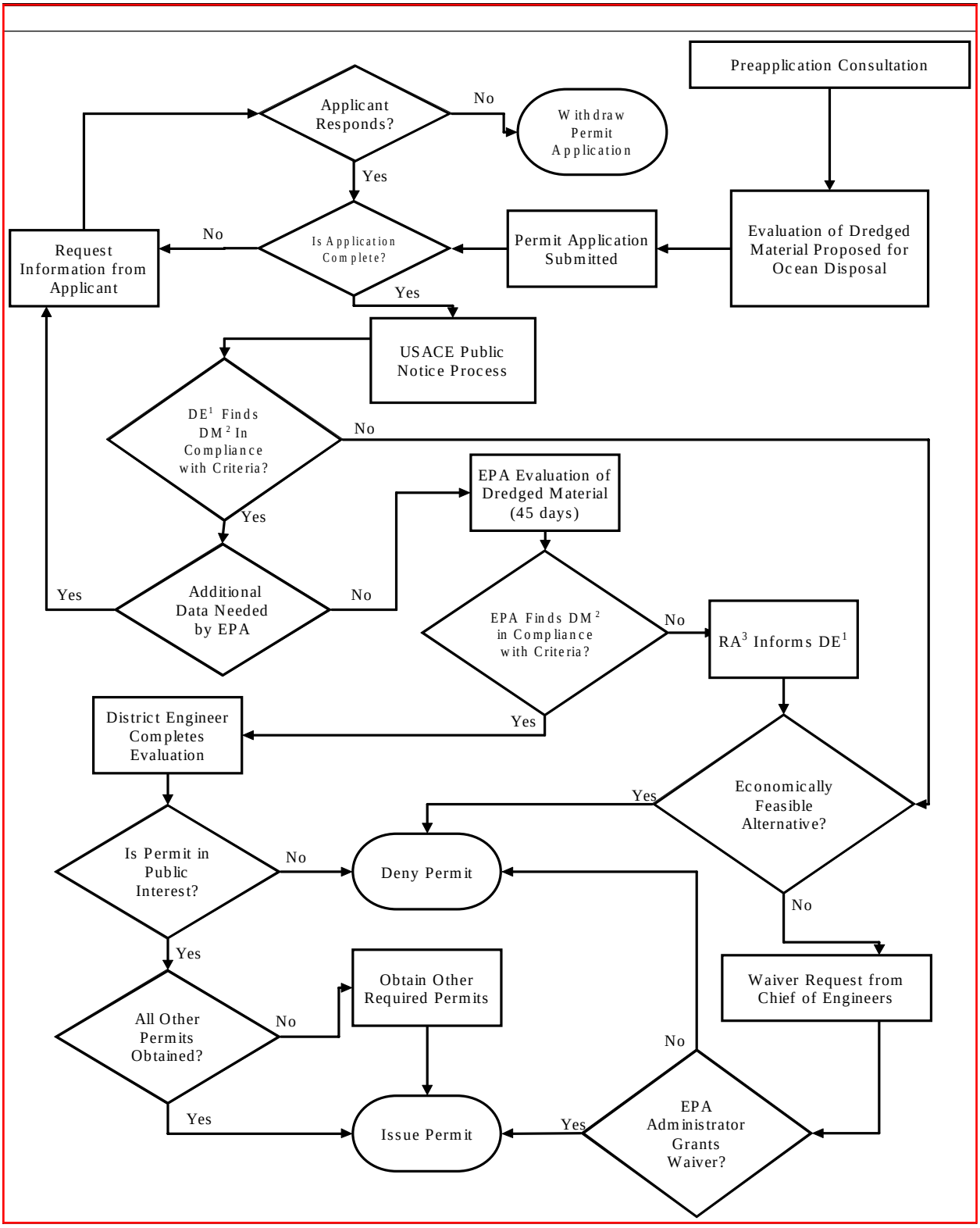


Figure 5: Permit Application/Evaluation Procedure
[1]District Engineer; [2]Dredged Material; [3]Regional Administrator

SITE MONITORING

The MPRSA establishes the need for including a monitoring program as part of the Site Management Plan. Site monitoring is conducted to ensure the environmental integrity of a disposal site and the areas surrounding the site and to verify compliance with the site designation criteria, any special management conditions, and with permit requirements. Monitoring programs should be flexible, cost effective, and based on scientifically sound procedures and methods to meet site-specific monitoring needs. A monitoring program should have the ability to detect environmental change as a result of disposal activities and assist in determining regulatory and permit compliance. The intent of the program is to provide the following:

(1) Information indicating whether the disposal activities are occurring in compliance with the permit and site restrictions; and/or

(2) Information concerning the short-term and long-term environmental impacts of the disposal; and/or

(3) Information indicating the short-term and long-term fate of materials disposed of in the marine environment.

The main purpose of a disposal site monitoring program is to determine whether dredged material site management practices, including disposal operations, at the site need to be changed to avoid significant adverse impacts.

Baseline Monitoring. Disposal has occurred at the present site since 1974 and predates any data gathering at the site. Therefore, no true baseline information has or can be collected. The results of investigations presented in the designation EIS (See FEIS Appendices A, B, C, D, F, and G) and subsequent surveys listed in Table 4 will serve as the main body of data for the monitoring of the impacts associated with the use of the Canaveral ODMDS.

Table 4. Surveys and Studies Conducted at the Canaveral ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Interpretative Analysis of Surficial Sediments as an Aid in Transport Studies of Dredged Materials in Cape Canaveral, FL	U.S. COE Waterways Experiment Station	1984	Determine the direction and amount of sediment transport from a dredged material disposal site.	-No trends in sediment distribution -Sand waves indicate recent current activity capable of transporting sediment. -Detailed site-specific data are necessary in order to make conclusive statements about sediment transport off the disposal site.
Field Survey of the Canaveral Harbor ODMDS	Continental Shelf Associates for COE	1986	Video, Bathymetry, Hydrography, Water Quality, Sediment Benthic Survey, Tissue Analysis	-Baseline Survey -All data collected except could not obtain video due to poor clarity.
Sediment Mapping at Charleston, SC and Canaveral, FL	UGA Center for Applied Isotopes for EPA	1988	Characterization of bottom sediments using gamma spectrometery	-Showed possible presence of dredged material west of the site (low gamma activity). -Showed a mound of dredged material in the center of the site (low gamma activity).
Sidescan Sonar	EPA	July 1988	Clear candidate site with respect to obstructions and outcrops (live bottom)	-Areas of differing sediment character identified coincidental with low gamma activity.

Table 4. Surveys and Studies Conducted at the Canaveral ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Video & Still Photography	EPA	July 1988	Visually observe the nature of the sediment exhibiting unique gamma isotope signatures as well as differing sonar returns.	-Could not obtain video due to poor clarity. -Photo's verified that the areas identified in sediment mapping and sidescan sonar surveys contained dredged material. -The dredged material identified to the west of the site appears to be from direct disposal and not transport.
Sediment Mapping & Rapid Surveillance of Fernandina Beach & Canaveral, FL ODMDSs	UGA Center for Applied Isotopes for EPA	April 1989	Examine areas identified in previous survey and areas to the northwest of the site boundaries	-Area of low gamma activity extends beyond the site boundaries to the northwest
REMOTS (Remote Ecological Monitoring of the Seafloor)	Science Applications International Corp. for EPA	1990	Delineate the areal extent of dredged material at the Canaveral ODMDS, assess the biological status of the area, & compare the mapped results of the gamma sled with those of REMOTS.	-Verified sediment mapping results. -Concluded site is dispersive for fines. Fines are eroded from the surface of the deposited material. -Dredged material may extend well beyond designated site boundaries. -Recommend precision bathymetric and sidescan survey and current meters and wave gauges.

Table 4. Surveys and Studies Conducted at the Canaveral ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Canaveral Harbor, FL ODMDS Benthic Communities Study	Battelle Ocean Sciences/Barry Vittor & Associates for EPA	1990	Benthic community characterization	-Sampled 15 sites based on REMOTS data. -Species abundance very high and individual abundance moderately high.
Bathymetric Survey	COE - Jacksonville District	December 1991	Monitor bathymetry changes	-Minimum depth of 39.6 feet northwest of center of ODMDS -Depth at souther corner of ODMDS = 52.4 feet
Bathymetric Survey	COE - Jacksonville District	January 1993	Monitor bathymetry changes	-Minimum depth of 40.2 feet northwest of center of ODMDS -Depth at souther corner of ODMDS = 52.7 feet
Bathymetric Survey	COE - Jacksonville District	March 1994	Monitor bathymetry changes	-Minimum depth of 40.0 feet northwest of center of ODMDS -Depth at souther corner of ODMDS = 51.0 feet
Disposal Monitoring	Lyman Burk	October 1994	-Compliance	-Disposal occurred throughout site. -No disposal occurred outside of site.

Table 4. Surveys and Studies Conducted at the Canaveral ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Post Disposal Sediment Mapping at the Canaveral, FL ODMDS	UGA Center for Applied Isotopes for EPA	March 1995	Document changes in seafloor environment since 1989.	-Mound in center of site is still present. -Western & northwestern extensions of dredged material still present. -New deposit of dredged material detected just inside the eastern corner of the ODMDS. -Possible presence of dredged material still exists to west of site. This material does not match material in site or surrounding ambient material.
Thesis: A Study of Dredged Material Dispersion on the Inner Continental Shelf, Cape Canaveral, FL	Julie Ellen Vann: Florida Institute of Technology	August 1995	Estimate potential for burial of the inner shelf sediments and benthic communities by disposed dredged material	-Dispersion of plume phase of disposal the significant factor in overall dispersion. -Erosion of bulk or solid phase is less significant. More current data is necessary to assess this phase. -Dredged material has dispersed to cover a 596 km^2 area.
Disposal Monitoring	Gahagan & Bryant Assoc.	August 1995		-Disposal occurred mostly at the center of the site. -No disposal occurred outside of site.
Bathymetric Survey	COE - Jacksonville District	July 1996	Monitor bathymetry changes	-Minimum depth of 42.2 feet north corner of ODMDS -Depth at souther corner of ODMDS = 52.9 feet

Table 4. Surveys and Studies Conducted at the Canaveral ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Disposal Monitoring	CPA	August 1996	Compliance for CT#8 (permit #199101718)	-Disposal occurred mostly at the center of the site. -No disposal occurred outside of site.
Bathymetric Survey	COE - Jacksonville District	January 2000	Monitor bathymetry changes	-Minimum depth of 33.2 feet northwest of center of ODMDS -Depth at souther corner of ODMDS = 50.5 feet -Significant shoaling occurring
Preliminary Acoustic Plume Tracking	EPA/NOAA	August 2000	Estimate Dispersion Coefficient	- Analysis in Progress
Erosion Rate Study	EPA / Sandia National Laboratories	October 2000	Determine Erodibility of Dredged Material as function of bulk density and shear stress for use in long term fate models.	- Disposed dredged material reaches full consolidation within 2 months. - Disposed dredged material is susceptible to erosion until full consolidation. - Parameters for LTFATE model calculated
Bathymetric Survey	COE - Jacksonville District	November 2000	Monitor bathymetry changes	-Minimum depth of 30.5 feet northwest of center of ODMDS -Depth at souther corner of ODMDS = 52.0 feet -Significant shoaling occurring

Disposal Monitoring. For all disposal activities, the dredging contractor will be required to prepare and operate under an approved electronic verification plan for all disposal operations. As part of this plan, the contractor will provide an automated system that will continuously track (1 to 5 minute intervals) the horizontal location and draft condition (vertical) of the disposal vessel from the point of dredging to the disposal area, and return to the point of dredging. Required digital data are as follows:

(a) Date;

(b) Time;

(c) Vessel Name;

(d) Dump Number;

(e) Map Number on which dump is plotted (if appropriate);

(f) Beginning and ending coordinates of the dredging area for each load (source of dredged material);

(g) Actual location (in degrees and minutes of longitude and latitude) at points of initiation and completion of disposal event;

(h) Brief description of material disposed;

(I) Volume of material disposed; and

(j) Disposal technique used.

The user will be required to prepare and submit to the COE daily reports of operations and a monthly report of operations for each month or partial month's work. The user is also required to notify the COE and the EPA if a violation of the permit and/or contract conditions occur during disposal operations. In the case of large new work projects (>1 million cubic yards) where the material is expected to consist of stiff clays, it is recommended that mid project bathymetric surveys be conducted of the disposal area to insure that mounding limits are not being exceeded.

Post Discharge Monitoring. The COE or other site user will conduct a bathymetric survey within 30 days after disposal project completion. Surveys will not be required for projects less than 50,000 cubic yards. Surveys will conform to Class 2 specifications as described in the COE Engineering Manual, EM1110-2-1003, "Hydrographic Surveying" dated 31 October 1994 and EC1130-2-210, "Hydrographic Surveying" dated 1 October 1998 to the extent practicable. The number and length of transects required will be sufficient to encompass the ODMDS and a 500

foot wide area around the site. The survey area may be reduced on a case by case basis if disposal zones are specified and adhered to. The surveys will be taken along lines spaced at 500-foot intervals or less with a depth recording density of 20 to 70 feet. Depth precision of the surveys will be ±/- 0.1 feet. Horizontal location of the survey lines and depth sounding points will be determined by an automated positioning system utilizing either a microwave line of sight system or differential global positioning system. The vertical datum will be referenced to prescribed NOAA Mean Lower Low Water (MLLW) datum, 1960-1978 epoch, as shown on the Tidal Benchmark sheet for Port Canaveral Entrance (872 1608). MLLW is 1.8 feet below NGVD 1929. The horizontal datum will be Florida State Plane (zone 0901 FL East) or Geographic (NAD 1983 or NAD 1927). Bathymetric surveys will be used to monitor the disposal mound to insure a navigation hazard is not produced, to assist in verification of material placement, to monitor bathymetric changes and trends, to aid in environmental effects monitoring and to insure that the site capacity is not exceeded, ie., the mound does not exceed the site boundaries. Copies of these surveys shall be provided to EPA Region 4 when completed.

Material Tracking and Disposal Effects Monitoring. Surveys can be used to address possible changes in bathymetric, sedimentological, chemical, and biological aspects of the ODMDS and surrounding area as a result of the disposal of dredged material at the site.

Summary of Results of Past Monitoring Surveys

Table 4 lists the past surveys at the Canaveral ODMDS. In general, the surface of the site is covered by rippled very fine sand below which fine grained mud exists. The surface sands probably represents *in-situ* washing of the sediment with removal of fines from the upper surface. However, it is difficult to determine if the observed sand-over-mud stratigraphy is: 1) uniquely related to surficial washing of muddy dredged materials, 2) a natural phenomenon reflecting existing sedimentation of fines derived from coastal erosion or riverine input, 3) a result of reworking of ancient muddy sediments, or 4) a reflection of all of the above sources.

The surveys/studies listed in table 4 have indicated that the ODMDS is a dispersive site for fine grained material and as a result dredged material may extend beyond the designated site boundaries. Indicators of dredged material (from the sediment mapping, REMOTS, sidescan sonar and bathymetric surveys) appear within the ODMDS and to the northwest. Dredged material to the northwest of the site is likely either a result of offsite transport or short dumping. Erosion of fine-grained material from the bottom appears to be taking place within the center of the disposal site and is apparently related to the presence of dredged material deposits of over consolidated clays. The COE bathymetric surveys have shown very little change in bathymetry until recently. A bathymetric survey conducted in January 2000 has indicated that significant mounding is beginning to occur within the site. A mound with a relief of approximately 10 feet has developed just northwest of the center of the site. Sediment transport studies conducted in the region indicate that net movement is alongshore with a southward near bottom countercurrent. However, it is expected that dispersal is not due to average currents and waves, but extreme events. Erosion rate analysis has indicated that disposed dredged material is most

susceptible to erosion within 60 days following disposal. Multiple study authors have recommended placement of near bottom current meters and wave gauges and the collection of other site specific information in order to make inferences about sediment resuspension and bedload transport.

The 1991 benthic report indicated that the coarsest bottom sediments were outside the site and that silty sand habitats are prevalent within the majority of the ODMDS. This report also indicated that within and near the site the species abundance is very high with individual abundance moderately high. Results of this survey compared favorably with a 1985 study, although fewer silty sand stations were sampled in 1985.

Future Monitoring Surveys

Based on the type and volume of material disposed and impacts of concern, various monitoring surveys can be used to examine if and the direction the disposed dredged material is moving, and what environmental effect the material is having on the site and adjacent areas.

At the current time, no nearby biological resources have been identified that are of concern for potential impact. The Canaveral ODMDS is at least one nautical miles from all known fish havens, artificial reefs, and fishing areas. The site has been designated as a dispersive site. This means that it is expected that material will be moved outside the site boundaries. It is also expected that this material will not move in distinct mounds, but instead will blend with the surrounding environment causing a progressive transition to sediments containing a higher percentage of silt and clay. Changes in sediment composition will likely alter the benthic community structure. However, based on previous benthic studies, it is unlikely that permanent or long-term adverse impacts will result due to changes in sediment composition.

Concern has been raised regarding the potential for disposed dredged material impacting offshore sand sources and the magnitude and extent of disposed dredged material dispersal outside of the ODMDS boundaries. Additionally, recent mounding at the site has raised capacity concerns. Future surveys as outlined in Table 5 and Appendix F will focus on determining the rate and direction of disposed dredged material dispersal and the capacity of the ODMDS. Should future disposal at the Canaveral ODMDS result in unacceptable adverse impacts, further studies may be required to determine the persistence of these impacts, the extent of the impacts within the marine system, and/or possible means of mitigation. In addition, the management plan presented may require revision based on the outcome of any monitoring program.

Table 5. Canaveral ODMDS Monitoring Strategies and Thresholds for Action

Goal	Technique	Sponsor	Rationale	Frequency	Threshold for Action	Management Options	
						Threshold Not Exceeded	Threshold Exceeded
Monitor Bathymetric Trends	Bathymetry	Site User	Determine the extent of the disposal mound and major bathymetric changes	Post disposal	Disposal mound occurs outside ODMDS boundaries	Continue Monitoring	-Modify disposal method/placement -Restrict disposal volumes -Enlarge site
Benthic Effects Monitoring	Sediment Mapping (Gamma/CS^3)	EPA	Determine areal influence of dredged material	Completed	Communities under the influence of dredged material outside the site have significant differences in diversity/ richness/biomass from those not under dredged material influence after one year recovery period.	Discontinue monitoring unless disposal quantities, type of material or frequency of use significantly changes	-Limit quantity of dredged material to prevent impacts outside boundaries -Create berms to retard dredged material movement -Cease site use
	Benthic Survey	EPA	Determine impact of dredged material on benthic community	Completed			
Long Term Fate	Modelling	EPA/ COE	Determine dispersiveness of site and areal extent of impact	As resources allow	Areal extent of impact reaches resources of concern and/or increases over time.	Continue to use site without restrictions	-Restrict disposal volumes -Create berms to retard dredged material transport -Cease site use / Designate new site
	Current Meter & Wave Gauge	EPA/ COE/ Site Users					
	Erosional Analysis	EPA					
	Precision Bathymetry and Sidescan	COE/ EPA					
	Regional Grain Size Analysis	COE /Site Users					

Table 5 (Continued). Canaveral ODMDS Monitoring Strategies and Thresholds for Action

Goal	Technique	Sponsor	Rationale	Frequency	Threshold for Action	Management Options	
						Threshold Not Exceeded	Threshold Exceeded
Site Capacity	Information from Long Term Fate	EPA/ COE/ Site Users	Determine dispersiveness of site and long and short term capacity	-As resources allow -Prior to any project in excess of 3 million cubic yards	New work volumes exceed estimated capacity	Continue to use site without restrictions	-Enlarge site or designate additional site for new work
					Maintenance volumes exceed estimated capacity	Continue to use site without restrictions	-Enlarge site or designate additional site for new work
Insure Safe Navigation Depth	Bathymetry	Site User	Determine height of mound and any excessive mounding	Post disposal	Mound height > -40 feet mean lower low water (MLLW)	Continue Monitoring	-Modify disposal method/placement -Restrict disposal volumes
					Mound height > -30 feet MLLW	Continue Monitoring	- Physically level material
Compliance	Disposal Site Use Records	Site User	-Insure management requirements are being met -To assist in site monitoring	Daily during the project	Disposal records required by SMMP are not submitted or are incomplete	Continue Monitoring	-Restrict site use until requirements are met
					Review of records indicates a dump occurred outside ODMDS boundary	Continue Monitoring	-Notify EPA Region 4/COE, and investigate why egregious dump(s) occurred. Take appropriate enforcement action.
					Review of records indicates a dump occurred in the ODMDS but not in target area	Continue Monitoring	-Direct placement to occur as specified.

Reporting and Data Formatting. The user will be required to prepare daily reports of operations and submit to the COE a monthly report of operations for each month or partial month's work. Disposal monitoring data shall be delivered to the COE on a weekly basis. The user is also required to notify the COE and the EPA within 24 hours if a violation of the permit and/or contract conditions related to MPRSA Section 103 or SMMP requirements occur during disposal operations.

Disposal summary reports shall be provided by the COE to EPA within 90 days after project completion. These should consist of dates of disposal, volume of disposal, approximate location of disposal and disposal bathymetric survey results in both hard and electronic formats. Other disposal monitoring data shall be made available upon request. In addition, EPA should be notified by the Corps of Engineers or project permittee 15 days prior to the beginning of a dredging cycle or project disposal.

Material tracking, disposal effects monitoring and any other data collected shall be coordinated with and be provided to SMMP team members and federal and state agencies as appropriate. Data will be provided to other interested parties requesting such data to the extent possible. Data will be provided for all surveys in a report generated by the action agency. The report should indicate how the survey relates to the SMMP and previous surveys at the Canaveral ODMDS and should provide data interpretations, conclusions, and recommendations, and should project the next phase of the SMMP.

MODIFICATION OF THE CANAVERAL ODMDS SMMP

Should the results of the monitoring surveys or valid reports from other sources indicate that continued use of the ODMDS would lead to unacceptable effects, then the ODMDS SMMP will be modified to mitigate the adverse impacts. The SMMP will be reviewed and revised if appropriate at a minimum of every ten years. The SMMP will be reviewed and updated as necessary if site use changes significantly. For example, the SMMP will be reviewed if the quantity or type of dredged material placed at the site changes significantly or if conditions at the site indicate a need for revision. Modification will be preceded by contact of all participating team members regarding issues and proposed changes. If any member requests a meeting, a meeting or conference call will be held to discuss issues and proposed changes. Significant changes to the SMMP will be noticed in a local paper for public comment.

REFERENCES

Continental Shelf Associates, Inc. 1986. *Final Report for Field Survey of the Canaveral Harbor Candidate Ocean Dredged Material Disposal Site.* A report for U.S. Department of the Army, Corps of Engineers, Jacksonville District.

Fredette, Thomas J., Nelson, David A., Clausner, James E., and Anders, Fred J. 1990. *Guidelines for Physical and Biological Monitoring of Aquatic Dredged Material Disposal Sites*, Technical Report D-90-12, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

National Oceanic and Atmospheric Administration. 1994. *Fort Pierce, Florida Dredge Material Discharge Study,* A report to the U.S. Army Corps of Engineers, November, 1994.

Pequegnat, Willis E., Gallaway, Benny J., and Wright, Thomas D., 1990. *Revised Procedural Guide for Designation Surveys of Ocean Dredged Material Disposal Sites*, Technical Report D-90-8, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Sandia National Laboratories. 2001 May. *Canaveral ODMDS Dredged Material Erosion Rate Analysis*. Carlsbad, NM..

U.S. Army Corps of Engineers (COE). 1994. *Hydrographic Surveying*. Engineering Manual 1110-2-1003, Department of the Army, Washington D.C.

U.S. Environmental Protection Agency (EPA). 1990. *Environmental Impact Statement (EIS) for Canaveral Harbor, Florida Ocean Dredged Material Disposal Site Designation A Supplement to the Jacksonville Harbor Dredged Material Disposal Final Environmental Impact Statement*, August 1990.

U.S. Environmental Protection Agency (EPA). 1991. *Canaveral Harbor, Florida, ODMDS Benthic Communities*, May 27, 1991. Prepared by Barry A. Vittor & Associates, Inc. under contract to Battelle Ocean Sciences for U.S. EPA, Office of Marine and Estuarine Protection.

U.S. Environmental Protection Agency (EPA). 1996. *Postdisposal Areal Mapping of Sediment Chemistry at the Canaveral, Florida ODMDS*, April 8, 1996. Prepared by Center for Applied Isotope Studies under contract to Battelle Ocean Sciences for U.S. EPA, Office of Wetlands, Oceans and Watersheds.

U.S. Environmental Protection Agency (EPA). 1989. *Sediment Mapping and Rapid Surveillance of Fernandina and Canaveral, Florida ODMDS, Florida ODMDS*, September 8, 1989. Prepared by Center for Applied Isotope Studies under contract to Battelle Ocean Sciences for U.S. EPA, Office of Wetlands, Oceans and Watersheds.

U.S. Environmental Protection Agency (EPA). 1990. *Canaveral Harbor Dredged Material Disposal Site REMOTS Survey*, August 24, 1990. Prepared by Science Applications International Corporation for U.S. EPA, Office of Research and Development.

U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, 1991. *Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual)*, February 1991. Prepared by Environmental Protection Agency Office of Marine and Estuarine Protection and Department of Army United States Army Corps of Engineers under EPA Contract No. 68-C8-0105.

U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, 1996. *Guidance Document for Development of Site Management Plans for Ocean Dredged Material Disposal Sites*, February 1996. Prepared by Environmental Protection Agency Office of Water and Department of Army United States Army Corps of Engineers.

U.S. Environmental Protection Agency Region 4 and U.S. Army Corps of Engineers South Atlantic Division, 1993. *Regional Implementation Manual Requirements and Procedures for Evaluation of the Ocean Disposal of Dredged Material in Southeastern Atlantic and Gulf Coastal Waters*, May 1993.

Vann, Julie E. *A Study of Dredged Material Dispersion on the Inner Continental Shelf, Cape Canaveral, Florida* [thesis]. Melbourne, FL: Florida Institute of Technology; 1995.

APPENDIX A

CANAVERAL HARBOR SAMPLING AND ANALYSIS STATEGY

Canaveral Harbor Dredged Material Sampling and Analysis Strategy

Introduction

This appendix provides supplementary guidance for the sampling and analysis of proposed dredged material from Canaveral Harbor, Florida with regards to the following:

- Harbor wide contaminants of concern
- Sample station selection
- Frequency of testing

It's intent is to supplement, not replace, guidance currently available in the EPA/COE testing manual, *Evaluation of Dredged Material Proposed for Ocean Disposal* (Green Book) and the COE South Atlantic Division / EPA Region 4 *Regional Implementation Manual*. These manuals provide specifics on the tiered testing approach and specific test protocols. This guidance is also intended to apply mainly to maintenance dredging projects.

Contaminants of Concern

The EPA/COE testing manual, *Evaluation of Dredged Material Proposed for Ocean Disposal* (Green Book) provides guidance on the identification of contaminants of concern (CoC). Eight previous sampling events from Canaveral Harbor from 1991 through 1999 were reviewed in order to refine the standard Contaminant of Concern (CoC) list for Canaveral Harbor. Most metals have been detected during most sampling events. Pesticides, PCBs, Phenols and Phthalate Esters have not been detected in the harbor. Selected PAH's were detected in sediments from the West Basin in 1993, however, they have not been consistently tested for in past analysis for the remaining portions of the harbor. A query of EPA databases on water discharges, superfund sites, hazardous waste generators and toxic releases was made for Canaveral Harbor. The results are shown in Figure 1 and Table 1. Based on this review, the CoCs listed in Table 2 are considered applicable to maintenance material proposed for ocean disposal from Canaveral Harbor. If data collected shows that certain CoCs are not present in a project vicinity, these chemicals need not be included in any further testing. Additionally, chemicals can be added to the list when those chemicals which can be linked to specific new sources or activities within the Canaveral Harbor have been identified.

Table 1: Water discharges, superfund sites, hazardous wastes generators and toxic releases at Canaveral Harbor

Facility	Location	Comments
Discharges to Water		
Fleet Marine Scallop	WTB	Discharge of Surfactant: Methylene Blue
Cruise Terminal #10	WTB	No records of permitted discharges
Cape Marine Services Inc.	WTB	No records of permitted discharges
Commercial Carrier Corp.	MTB	No records of permitted discharges
Bay Scallop Inc.	WTB	Conduit Discharge
Morton Salt	MTB	Wet Scrubber/Wash/Storm Water: Chloride, Oil & Grease, Magnesium, Sulfate, Cadmium, Lead
Toxic Releases		
Coastal Fuels Marketing Inc.	MTB	No surface water discharges; air and other land disposal of the following: 1,2,4 Trimethyl benzene; Benzene; Cumene; Ethylbenzene; Methyl Tert-Butyl Ether; N-Hexane; Tert-Butyl Alcohol; Toluene; Xylene
Hazardous Waste Generators		
Manutech	WTB	Small Quantity Generator
Excell Coatings Inc.	WTB	Small Quantity Generator
Cape Marina	WTB	Small Quantity Generator
Royal Caribbean Cruises Ltd.	MTB	Large Quantity Generator
Disney Cruise Line	MTB	Small Quantity Generator
USAF	MTB	Conditional Exempt Small Quantity Generator
Ambassador Services	MTB	Small Quantity Generator
US Coast Guard	WTB	

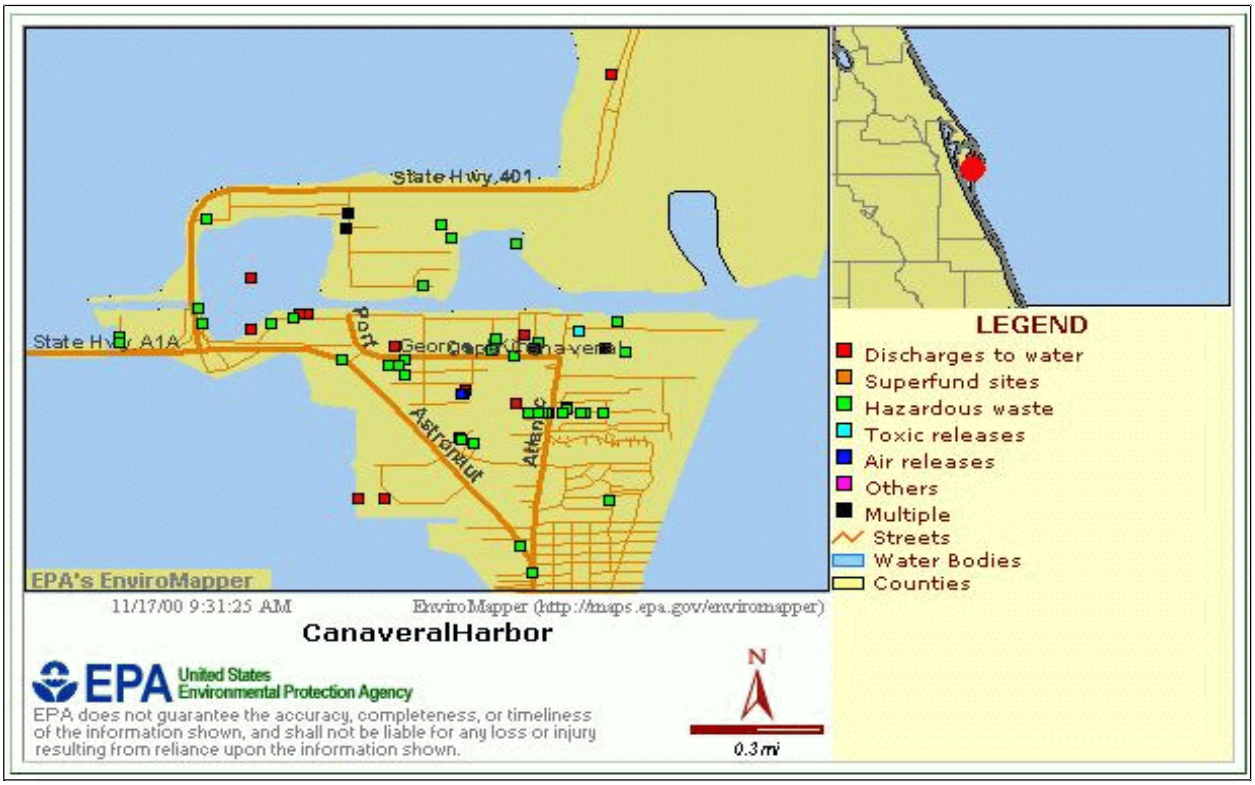


Figure 1: Water discharges, superfund sites, hazardous waste generators and toxic releases in Canaveral Harbor

Table 2: Contaminant of Concern List for Canaveral Harbor

Metals	
Aluminum	Lead
Antimony	Mercury
Arsenic	Nickel
Cadmium	Silver
Chromium	Zinc
Copper	Mono, Di, and Tributyltin
Iron	

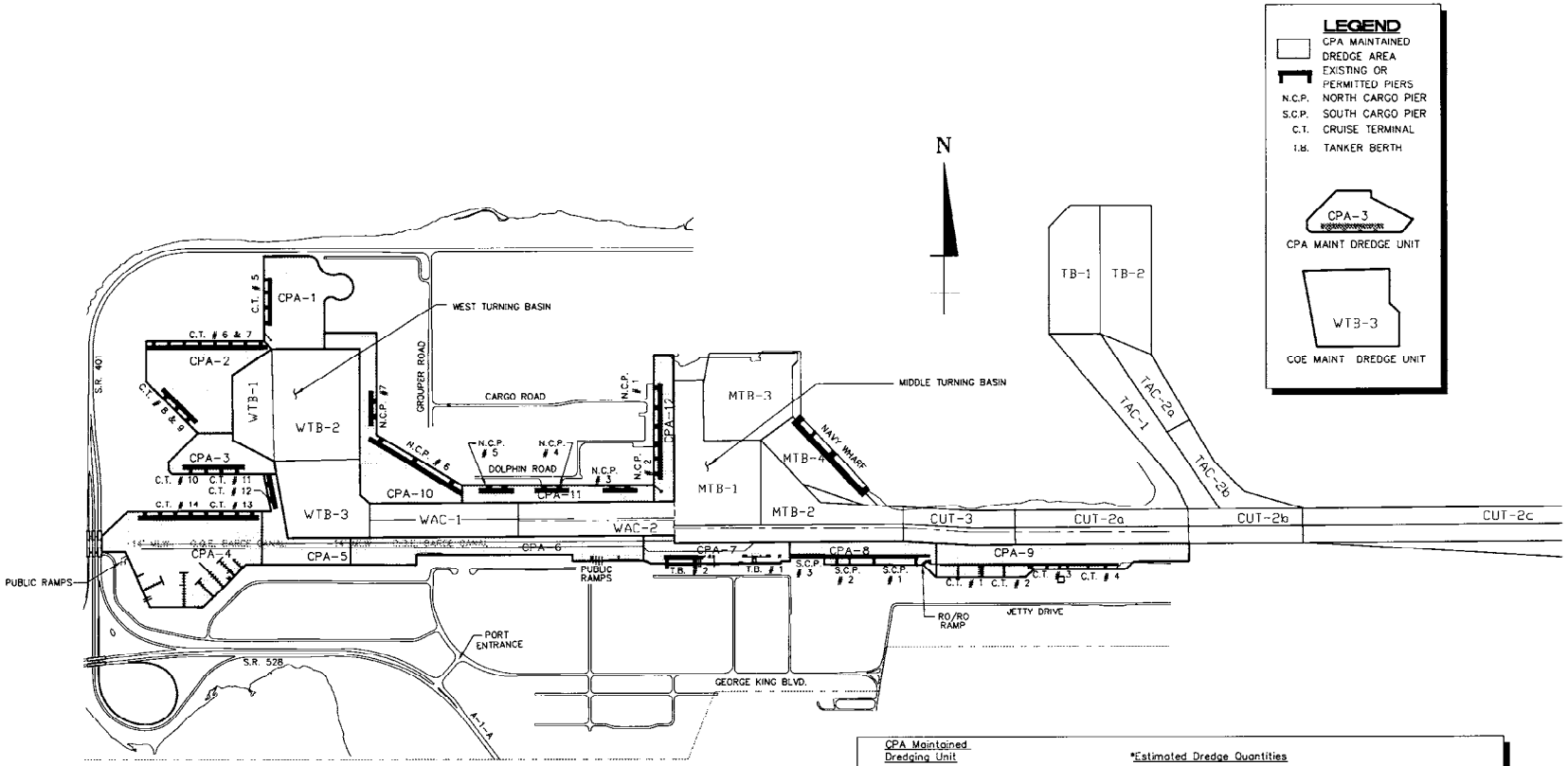
Table 2 Continued: Contaminant of Concern List for Canaveral Harbor

Polycyclic Aromatic Hydrocarbons (PAHs)	
Acenapthene	Flouranthene
Acenaphthylene	Fluorene
Anthracene	Indeno(1,2,3-cd)Pyrene
Benzo (a) Anthracene	Napthalene
Benzo (a)Pyrene	Phenanthrene
Benzo (b)Flouranthene	Pyrene
Benzo (k)Flouranthene	2-Methylnaphthalene
Chrysene	1-Methylnaphthalene
Dibenzo(a,h) Anthracene	

Dredged Material Management Units

In determining the number of samples and analyses required to fully characterize project sediments, the concept of "dredged material management units" (DMMU) is used. A DMMU can represent the total volume of sediment to be dredged for a small project or can be a sub-unit of the total volume of a larger project. Typically, a DMMU represents a unit of sediments similar in nature that can be characterized by a single sediment analysis. Thus, a separate decision can be made for a management unit that can be characterized and dredged separately from other sediment in the project. The acceptability of dredged material for ocean disposal is determined for individual DMMUs independently of other management units within the project, and is based on the results of the analysis representing that DMMU.

Project sponsors (Port of Canaveral, Corps of Engineers, U.S. Navy) have identified DMMU's for Canaveral Harbor and are shown in Figure 2 (referred to as Maintenance Dredge Units). DMMUs have been assigned one of four possible ranks: exclusionary, low, moderate, or high. In that order, these ranks represent a scale of increasing potential for significant concentrations of chemicals-of-concern and/or adverse biological effects. Table 3 identifies the parameters that better define these rankings.



MAINTENANCE DREDGE UNITS

CPA Maintained Dredging Unit	*Estimated Dredge Quantities
CPA-1	100,000 c.y.
CPA-2	110,000 c.y.
CPA-3	50,000 c.y.
CPA-4	150,000 c.y.
CPA-5	50,000 c.y.
CPA-6	100,000 c.y.
CPA-7	50,000 c.y.
CPA-8	50,000 c.y.
CPA-9	100,000 c.y.
CPA-10	110,000 c.y.
CPA-11	50,000 c.y.
CPA-12	50,000 c.y.

*BASED ON 1 FOOT MAINTENANCE DREDGE DEPTH

REV.	DESCRIPTION	APPR.	DATE
rev 3	Remove Bangor Basin	DM	3/8/01
Rev 2	update unit dimensions per EPA	DM	3/8/01
REV 1	Dredge Unit Delineations		

PLT. DATE: 3-8-2001
PLT. SCALE: 1" = 600.0
DESIGN: JG
DWG CHK: EDO
DRAWN: TLJ
DWG CHK: KM
APPROVED: DM
DATE: 1-18-01

SEAL

MAINTENANCE DREDGE UNITS

CANAVERAL PORT AUTHORITY

PORT CANAVERAL, BREVARD CO. FL.

REDUCED DRAWING - DO NOT SCALE

GEE & JENSON
Engineers • Architects • Planners, Inc.
One Harvard Circle
West Palm Beach, Florida 33409

JOB NUMBER 99000.14

CAD FILE DREDGE SITES A24X36

SHEET NUMBER

SHEET OF

\\GRI\99000.14\Coastal\21000.42\dredge units\DREDGE SITES A24X36.dwg Last Update: 3/8/2001 Plotted: 3/8/2001 9:41 am By: Gazzpaire Plot Scale: 1=600.0 Xref Dwg's:

Table 3: DMMU Ranking Definitions

Ranking	Parameters
Exclusionary	Material which has been shown to meet the exclusionary criteria in 40 CFR §227.13(b) summarized below: 1) the material is predominately sand (at least 90% sand retained on No. 230 sieve) and material is found in areas of high current or wave energy. or 2) the material is substantially the same as the substrate at the Canaveral ODMDS and the dredging site is far removed from known existing and historical sources of pollution.
Low	Available data indicate low concentrations of CoCs and/or no significant response in biological tests. Locations with higher percentages of finer-grained sediments and organic material but few sources of potential contamination. Typical locations include adjacent entrance channels, rural marinas, navigable side sloughs, and small community berthing facilities.
Moderate	Available data indicate moderate concentrations of CoCs in sediments in a range known to cause adverse response in biological tests. Locations where sediments are subject to several sources of contamination, or where existing or historical use of the site has the potential to cause sediment contamination. Typical locations include urban marinas, fueling and ship berthing facilities; areas downstream of major sewer or stormwater outfalls; and medium-sized urban areas with limited shoreline industrial development.
High	Available data indicates high concentrations of CoCs in sediments and/or significant adverse responses in at least one of the last two cycles of biological tests. Locations where sediments are subject to numerous sources of sediment contamination, including industrial runoff and outfalls, or where existing or historical use of the site has the potential to cause sediment contamination. Typical locations include large urban areas and shoreline areas with major industrial development.

The ranking system is based on two major factors:

- The availability of historic information on the physical, chemical, and/or biological-response characteristics of the sediments from a reach or site

- The number, kinds, and proximity of chemical sources (existing and historical) known to occur in or near a particular reach or site.

Initial rankings for the identified DMMUs are contained within Table 4. These rankings represent

existing information at the time of initial ranking. DMMUs can be re-ranked based upon the results of new sediment testing. Failure of any of the biological tests will result in a "High" ranking.

Table 4: Initial DMMU Rankings

Basin Area	DMMU	Sponsor	Volume (1000 cy)	Exclusionary	Low	Moderate	High
Entrance Channel	Cut-1	COE	300	x			
	Cut-1B	COE	200	x			
	Cut-1A	Navy	225	x			
Access Channel	Cut-2a	COE	100		x		
	Cut-2b	COE	100			x	
	Cut-2c	COE	250		x		
	Cut-3	COE	50		x		
	CPA-9	CPA	50			x	
Trident Basin	TAC-1	Navy	40			x	
	TAC-2a	Navy	10				x
	TAC-2b	Navy	50				x
	TB-1	Navy	20				x
	TB-2	Navy	20				x
Middle Turning Basin	MTB-1	COE	100		x		
	MTB-2	COE	50		x		
	MTB-3	COE	100		x		
	MTB-4	COE	75			x	
	CPA-7	CPA	50			x	
	CPA-8	CPA	50			x	
	CPA-12	CPA	100			x	

Basin Area	DMMU	Sponsor	Volume (1000 cy)	Exclusionary	Low	Moderate	High
Western Access Channel	WAC-1	COE	50		x		
	WAC-2	COE	50		x		
	CPA-6	CPA	100		x		
	CPA-11	CPA	50			x	
West Turning Basin	CPA-1	CPA	100			x	
	CPA-2	CPA	110			x	
	CPA-3	CPA	50			x	
	CPA-4	CPA	150			x	
	CPA-5	CPA	50			x	
	WTB-1	COE	50		x		
	WTB-2	COE	100		x		
	WTB-3	COE	100		x		

Determination of Sampling Requirements

The following guidelines specify the recommended volume of dredged material that can be represented by a single analysis.

Table 5 presents the recommended volume of sediment in a DMMU that can be characterized by a single analysis based on area ranking. The presence of heterogenous or discreet layers in the dredge cut may warrant further sub-sampling or assignment of a smaller DMMU. Dredging proponents have the option to propose smaller DMMUs. For example, if 25% of the sample volume is visually different from the rest of the sediment profile, and can be sampled and dredged separately, then an additional DMMU may be warranted. Furthermore, DMMUs can be combined to create larger DMMU following the guidelines in Table 5. For example, based on the volume estimates and initial rankings provided in Table 4, the following DMMU could be combined: Cut-2a and Cut-3; MTB-1,2,3; CPA-7,8; WAC-1,2 and CPA-6; CPA-3,4; and WTB-1,2,3.

The number of samples required of a proposed project, or that can be composited or combined for a single analysis, will be determined on a DMMU by DMMU basis. The number of samples and the compositing scheme varies depending on such factors as 1) a reason to believe that

contamination may exist at the surface or in subsurface sediments, 2) the heterogeneity of the sediments, 3) the DMMU rank, 4) the aerial extent of a DMMU, and 5) the proposed depth of dredging. In general, sampling intensity increases with suspected contamination, higher ranking, greater aerial extent, increasing depth, or the occurrence of stratification. In homogenous sediments, a minimum of two samples, and in heterogenous sediments a minimum of three samples composited for one analysis will be required to characterize a single DMMU.

Table 5: Recommended Volumes for Dredged Material Management Units

Ranking	**Volume** (cubic yards)
Exclusionary	300,000
Low	200,000
Moderate	100,000
High	50,000

Frequency of Testing

This strategy provides guidelines for maintenance material. It is assumed that most maintenance material will be dredged on a frequent basis, such as every year or, at most, every two or three years. Such dredging commonly reflects a situation of routine and rapid buildup of shoals with relatively homogeneous sediments. In such situations, it is expected that the quality of the sediment at the dredging site will tend to stay the same for successive years, barring any significant changed condition at or upstream of the site.

Projects are required to be evaluated prior to issuance of an ocean disposal permit (MPRSA 103 permit). Testing should be conducted as part of the evaluation every three years. However, if it can be demonstrated that the quality of the dredged material remains relatively consistent, the frequency of testing may be extended. In order to be considered for an extension, a project requires characterization of sediments for two successive permit cycles (or concurrence cycles for federal civil works projects) to document consistency in the quality of the specific dredged material. The length of the extension is then based on the relative risk (potential for adverse biological effects) based on the rankings described earlier. The recommended intervals between testing once the consistency has been documented is given in table 6. These intervals do not apply when a known “changed” condition has occurred since the most recent sampling effort, such as an accidental spill or the siting of a new discharge outfall. In such a case, testing must be conducted prior to disposal. Areas or projects ranked under Exclusionary should be tested every ten years to insure the exclusionary criteria remain in effect.

Table 6: Testing Frequency Guidelines for Dredged Material Shown to be Consistent in Quality from Dredge Cycle to Dredge Cycle

Ranking	**Frequency**
Low	9 Years
Moderate	6 Years

Physical, chemical and biological testing is recommended every three years or at the frequency shown in table 6 if applicable and is also valid for the same duration (ie. high ranked material must be dredged within three years of testing or new testing will be required). All maintenance material within the Canaveral Harbor has undergone biological testing, most recently in 1999. Except for High ranked material, confirmatory physical and chemical (whole sediment and ellutriate if necessary to show compliance with WQC) testing may be conducted in lieu of biological testing (toxicity and bioaccumulation) if it is shown that the material remains substantially the same as when the biological testing was conducted. Material will be considered substantially the same when the mean grain size, percent fines, and chemical compounds detected are not statistically different (greater for chemical compounds) based on 95% confidence limits. Use of prior biological test results in confirmatory analysis will be limited to results obtained within 9 years.

Example 1: Moderate Ranked Project

Year	**Testing**	**Comments**
2000	Physical, Chemical, & Biological	Pass: DMMU receives moderate ranking
2003	Physical & Chemical Confirmatory Analysis	Consistency in dredged material quality documented: Additional testing not required for six years per table 6.
2006	Evaluation: no change in condition	No testing required per table 6
2009	Physical, Chemical, & Biological	Pass: Additional testing not required for six years per table 6.
2012	Evaluation: no change in condition	No testing required per table 6

Example 2: Moderate Ranked Project with Failure

Year	Testing	Comments
2000	Physical, Chemical, & Biological	Pass: DMMU receives moderate ranking
2003	Physical & Chemical Confirmatory Analysis	Consistency in dredged material quality documented: Additional testing not required for six years per table 6.
2006	Evaluation: no change in condition	No testing required per table 6
2009	Physical, Chemical, & Biological	Fail; Rank changed to High; material taken upland
2012	Physical, Chemical, & Biological	Pass
2015	Physical, Chemical, & Biological	Pass: DMMU receives moderate ranking. Additional testing not required for six years per table 6.
2018	Evaluation: no change in condition	No testing required per table 6
2021	Physical & Chemical Confirmatory Analysis	Chemistry documents change in dredged material quality, additional biological testing required.

Based on these guidelines and the initial rankings, all areas within the Canaveral Harbor will require confirmatory physical and chemical testing in 2003 with the exception of the Entrance Channel DMMUs which should undergo physical characterization to document compliance with the exclusionary criteria. Additionally, Trident Basin DMMUs ranked high will need biological testing prior to approval for ocean disposal.

F:\JACKSON\CANAVERA\MONITOR\SMMP\testing.wpd

APPENDIX B

WATER COLUMN EVALUATIONS
NUMERICAL MODEL (STFATE) INPUT PARAMETERS

Water Column Evaluations
Numerical Model (STFATE) Input Parameters
Canaveral ODMDS

SITE DESCRIPTION

Parameter	Value	Units
Number of Grid Points (left to right)	45	
Number of Grid Points (top to bottom)	45	
Spacing Between Grid Points (left to right)	350	ft
Spacing Between Grid Points (top to bottom)	350	ft
Constant Water Depth	45	ft
Roughness Height at Bottom of Disposal Site	.005[1]	ft
Slope of Bottom in X-Direction	0	Deg.
Slope of Bottom in Z-Direction	0	Deg.
Number of Points in Ambient Density Profile Point	2	
Ambient Density at Depth = 0 ft	1.0237	g/cc
Ambient Density at Depth = 45 ft	1.0240	g/cc

AMBIENT VELOCITY DATA

Parameter	Value	Units
Water Depth	45	ft
Profile	Logarithmic	
Vertically Averaged X-Direction Velocity	0.0	ft/sec
Vertically Averaged Z-Direction Velocity	0.33	ft/sec

DISPOSAL OPERATION DATA

Parameter	Value	Units
Location of Disposal Point from Top of Grid	7,875	ft
Location of Disposal Point from Left Edge of Grid	7,875	ft
Dumping Over Depression	0	

INPUT, EXCECUTION AND OUTPUT

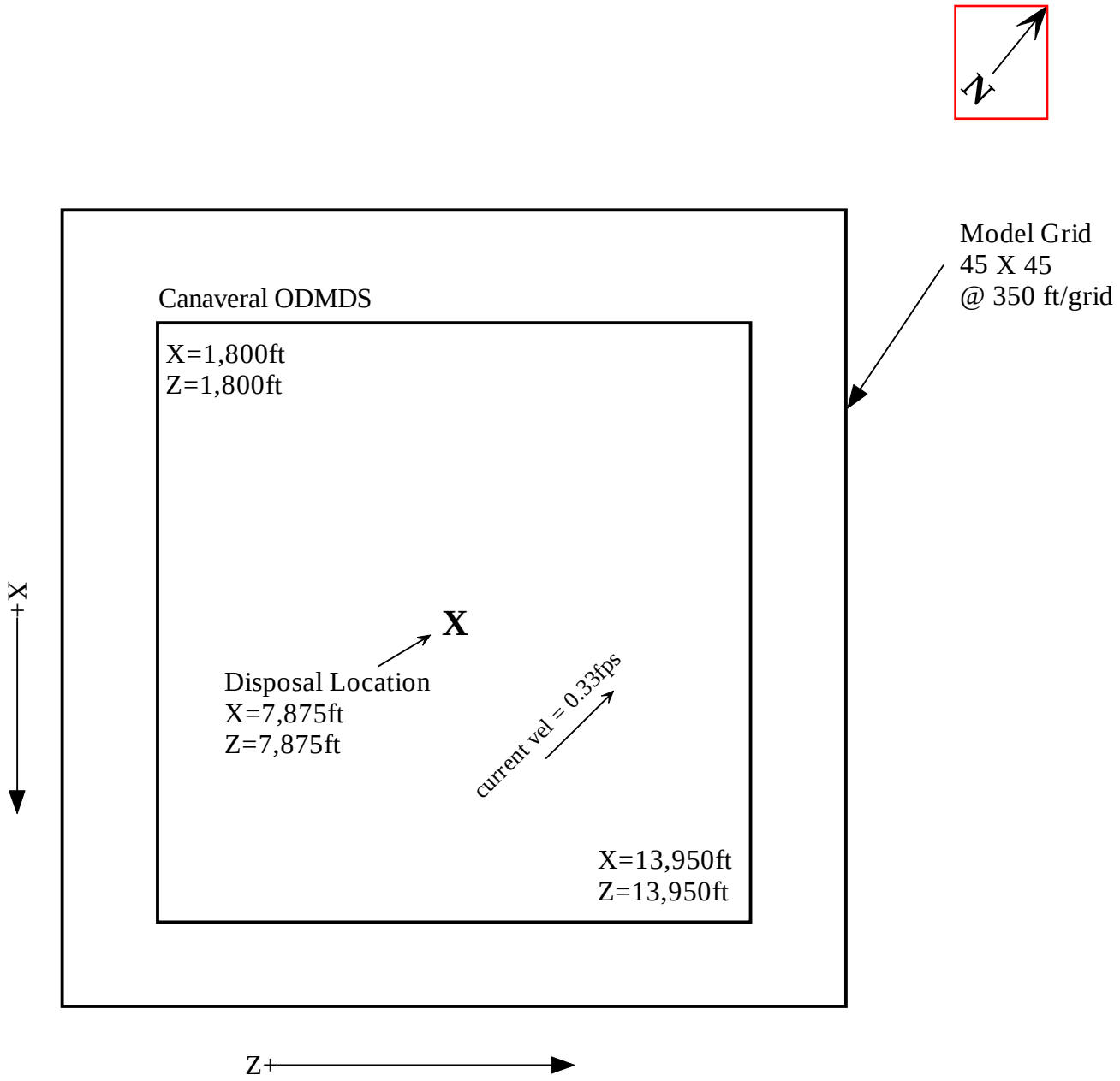
Parameter	Value	Units
Location of the Upper Left Corner of the Disposal Site - Distance from Top Edge	1,800	ft
Location of the Upper Left Corner of the Disposal Site - Distance from Left Edge	1,800	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Top Edge	13,950	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Left Edge	13,950	ft
Duration of Simulation	14,400	sec
Long Term Time Step	600	sec

COEFFICIENTS

Parameter	Keyword	Value
Settling Coefficient	BETA	0.000[1]
Apparant Mass Coefficient	CM	1.000[1]
Drag Coefficient	CD	0.500[1]
Form Drag for Collapsing Cloud	CDRAG	1.000[1]
Skin Friction for Collapsing Cloud	CFRIC	0.010[1]
Drag for an Ellipsoidal Wedge	CD3	0.100[1]
Drag for a Plate	CD4	1.000[1]
Friction Between Cloud and Bottom	FRICTN	0.010[1]
4/3 Law Horizontal Diffusion Dissipation Factor	ALAMDA	0.0225[2]
Unstratified Water Vertical Diffusion Coefficient	AKYO	Pritchard Expression
Cloud/Ambient Density Gradient Ratio	GAMA	0.250[1]
Turbulent Thermal Entrainment	ALPHAO	0.235[1]
Entrainment in Collapse	ALPHAC	0.100[1]
Stripping Factor	CSTRIP	0.003[1]

[1]Model Default Value
[2]Calculated from NOAA Field Work at Fort Pierce (1994)

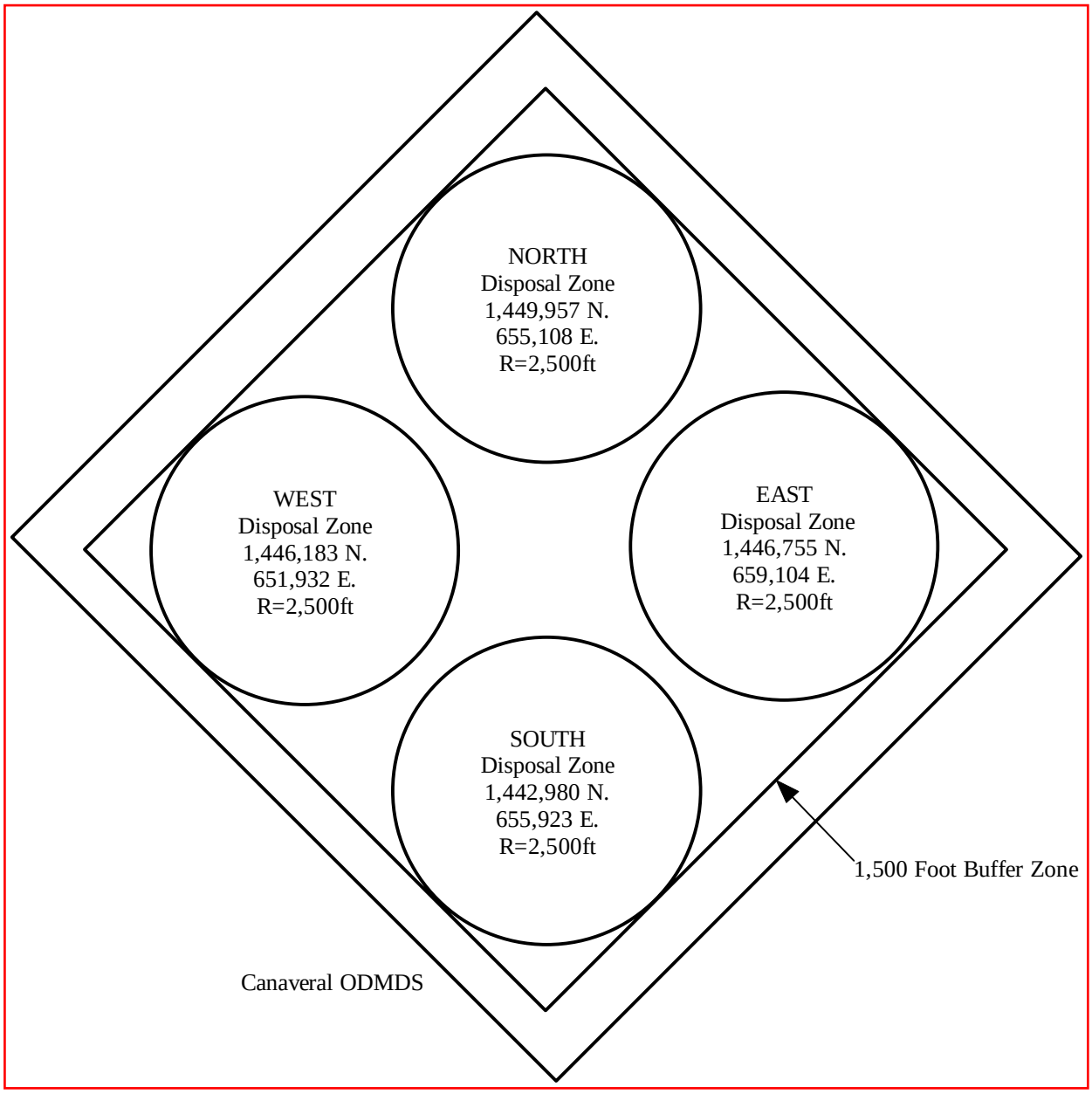
Canaveral ODMDS STFATE Input Parameters



APPENDIX C

INTERIM DISPOSAL ZONES

Canaveral ODMDS Disposal Zones



Disposal Zone	Anticipated Projects	State Plane Center Coordinates (Florida East 0901 U.S. Ft.)		Geographic Center Coordinates	
NORTH	Canaveral Port Authority ADA Upland Disposal Site	1,449,957 N.	655,108 E.	28°19'19" N	80°31'04" W
SOUTH	Canaveral Port Authority West Turning Basin Deepening/Expansion and Maintenance Material	1,442,980 N.	655,923 E.	28°18'08" N	80°30'58" W
EAST	Civil Works & Navy Maintenance Material	1,446,755 N.	659,104 E.	28°18'40" N	80°31'41" W
WEST	Civil Works & Navy Maintenance Material	1,446,183 N.	651,932 E.	28°18'46" N	80°30'19" W

APPENDIX D

TEMPLATE FOR MPRSA 103 STANDARD PERMIT CONDITIONS

TEMPLATE
GENERIC SPECIAL CONDITIONS
FOR MPRSA SECTION 103 PERMITS
CANAVERAL HARBOR, FL ODMDS

I. DISPOSAL OPERATIONS

A. For this permit, the term disposal operations shall mean: navigation of any vessel used in disposal of operations, transportation of dredged material from the dredging site to the Canaveral Harbor, FL ODMDS, proper disposal of dredged material at the disposal area within the Canaveral Harbor, FL ODMDS, and transportation of the hopper dredge or disposal barge or scow back to the dredging site.

B. The Canaveral Harbor, FL ODMDS is defined as the rectangle with center coordinates of 28º18’44" North latitude by 80º31’00" West longitude (NAD 27) or state plane coordinates 1446468 N and 655198 E (NAD 27) and corner coordinates of:

Geographic		State Plane (Florida East 0901 U.S. Ft)	
28°20'15"N	80°31'11"W	1455654 N	654499 E
28°18'51"N	80°29'15"W	1447214 N	664901 E
28°17'13"N	80°30'53"W	1437281 N	656182 E
28°18'36"N	80°32'45"W	1445624 N	646137 E

C. No more than [NUMBER] cubic yards of dredged material excavated at the location defined in [REFERENCE LOCATION IN PERMIT] are authorized for disposal at the Canaveral Harbor, FL ODMDS.

D. The permittee shall use an electronic positioning system to navigate to and from the Canaveral Harbor, FL ODMDS. For this section of the permit, the electronic positioning system is defined as: a differential global positioning system or a microwave line of site system. Use of LORAN-C alone is not an acceptable electronic positioning system for disposal operations at the Canaveral Harbor, FL ODMDS. If the electronic positioning system fails or navigation problems are detected, all disposal operations shall cease until the failure or navigation problems are corrected.

E. The permittee shall certify the accuracy of the electronic positioning system proposed for use during disposal operations at the Canaveral Harbor, FL ODMDS. The certification shall be accomplished by direct comparison of the electronic positioning system’s accuracy with a known fixed point.

F. The permittee shall not allow any water or dredged material placed in a hopper dredge or disposal barge or scow to flow over the sides or leak from such vessels during transportation to the Canaveral Harbor, FL ODMDS.

G. A disposal operations inspector and/or captain of any tug boat, hopper dredge or other vessel used to transport dredged material to the Canaveral Harbor, FL ODMDS shall insure compliance with disposal operation conditions defined in this permit.

1. If the disposal operations inspector or the captain detects a violation, he shall report the violation to the permittee immediately.

2. The permittee shall contact the U.S. Army Corps of Engineers, Jacksonville District's Regulatory Branch [TELEPHONE NUMBER] and EPA Region 4 at (404) 562-9391 to report the violation within twenty-four (24) hours after the violation occurs. A complete written explanation of any permit violation shall be included in the post-dredging report.

H. When dredged material is disposed, no portion of the hopper dredge or disposal barge or scow shall be outside of the boundaries of the Canaveral ODMDS as defined in Special Condition B. Additionally, disposal shall occur within the disposal zone defined as a 2,500 foot radius with center at:

[INSERT APPROPRIATE DISPOSAL ZONE CENTER
COORDINATES FROM APPENDIX C OF THE SMMP]

I. The permittee shall use an automated disposal verification system that will continuously track (1 to 5 minute intervals) the horizontal location and draft condition of the disposal vessel (hopper dredge or disposal barge or scow) to and from the Canaveral ODMDS. This information shall be available in electronic format to the Jacksonville District Corps of Engineers and EPA Region 4 upon request.

1. Required digitally recorded data are: date, time, vessel name, captain of vessel, beginning and ending coordinates of the dredging area for each load, location at points of initiation and completion of disposal, description of material disposed (sand, clay or silt), volume of load, and disposal technique. This information will be available to the Jacksonville District Corps of Engineers on a daily basis.

2. The permittee shall use Florida State Plane or latitude and longitude coordinates (North American Datum 1983 or 1927). State Plane coordinates shall be reported to the nearest 0.10 foot and latitude and longitude coordinates shall be reported as degrees and decimal minutes to the nearest 0.01 minutes.

J. The permittee shall conduct a bathymetric survey of the Canaveral ODMDS within 30 days following project completion.

1. The number and length of the survey transects shall be sufficient to encompass the Canaveral ODMDS and a 500 foot wide area around the site. The transects shall be spaced at 500-foot intervals or less with a depth recording density of 20 to 70 feet..

2. Vertical accuracy of the survey shall be ±0.1 feet. Horizontal location of the survey lines and depth sounding points will be determined by an automated positioning system utilizing either microwave line of site system or differential global positioning system. The vertical datum will be referenced to prescribed NOAA Mean Lower Low Water (MLLW) datum, 1960-1978 epoch, as shown on the Tidal Benchmark sheet for Port Canaveral Entrance (872 1608). MLLW is 1.8 feet below NGVD 1929. The horizontal datum will be Florida State Plane (zone 0901 FL East) or Geographic (NAD 1983 or NAD 1927). State Plane coordinates shall be reported to the nearest 0.10 foot and latitude and longitude coordinates shall be reported as degrees and decimal minutes to the nearest 0.01 minutes.

K. The permittee has read and agrees to assure that they are in compliance with the requirements of the Canaveral ODMDS Site Management and Monitoring Plan.

II. REPORTING REQUIREMENTS

A. The permittee shall send the U.S. Army Corps of Engineers, Jacksonville District's Regulatory Branch and EPA Region 4' s Wetlands, Coastal and Water Quality Branch (61 Forsyth Street, Atlanta, GA 30303) a notification of commencement of work at least fifteen (15) days before initiation of any dredging operations authorized by this permit.

B. The permittee shall submit to the U.S. Army Corps of Engineers weekly disposal monitoring reports. These reports shall contain the information described in Special Condition I.I.

C. The permittee shall send one (1) copy of the disposal summary report to the Jacksonville District's Regulatory Branch and one (1) copy of the disposal summary report to EPA Region 4 documenting compliance with all general and special conditions defined in this permit. The disposal summary report shall be sent within 90 days after completion of the disposal operations authorized by this permit. The disposal summary report shall include the following information:

1. The report shall indicate whether all general and special permit conditions were met. Any violations of the permit shall be explained in detail.

2. The disposal summary report shall include the following information: Corps permit number, actual start date and completion date of dredging and disposal operations, total cubic yards disposed at the Canaveral Harbor, FL ODMDS, locations of disposal events, and post disposal bathymetric survey results (in hard and electronic formats).

III. PERMIT LIABILITY

A. The permittee shall be responsible for ensuring compliance with all conditions of this permit.

B. The permittee and all contractors or other third parties who perform an activity authorized by this permit on behalf of the permittee shall be separately liable for a civil penalty of up to $50,000 for each violation of any term of this permit thy commit alone or in concert with the permittee or other parties. This liability shall be individual, rather than joint and several, and shall not be reduced in any fashion to reflect the liability assigned to and civil penalty assessed against the permittee or any other third party as defined in 33 U.S.C. Section 1415(a).

C. If the permittee or any contractor or other third party knowingly violates any term of this permit (either alone or in concert), the permittee, contractor or other party shall be individually liable for the criminal penalties set forth in 33 U.S.C. Section 1415(b).

Appendix E

Jacksonville District Corps of Engineers
Contract Specification Language

Jacksonville District Corps of Engineers Contract Specification Language

3.3.17 Electronic Tracking System (ETS) for Ocean Disposal Vessels

The Contractor shall furnish an ETS for surveillance of the movement and disposition of dredged material during [excavation and ocean disposal] [excavation and disposal (nearshore and ocean)]. This ETS shall be established, operated and maintained by the Contractor to continuously track in real-time the horizontal location and draft condition of the disposal vessel for the entire dredging cycle, including dredging area and disposal area. The ETS shall be capable of displaying and recording in real-time the disposal vessel's draft and location.

3.3.17.1 ETS Standards

The Contractor shall provide automated (computer) system and components to perform in accordance with EM 1110-1-2909. A copy of the EM can be downloaded from the following website: http://www.usace.army.mil/inet/usace-docs'eng-manuals/em.htm. Horizontal location shall have an accuracy equal to or better than a standard DGPS system, equal to or better than plus/minus 10 feet (horizontal repeatability). Vertical (draft) data shall have an accuracy of plus/minus 0.5 foot. Horizontal location and vertical data shall be collected in sets and each data set shall be referenced in real-time to date and local time (to nearest minute), and shall be referenced to the same state plane coordinate system used for the survey(s) shown in the contract plans. The ETS shall be calibrated, as required, in the presence of the COR at the work location before disposal operations have started, and at 30-day intervals while work is in progress. The COR shall have access to the ETS in order to observe its operation. Disposal operations will not commence until the ETS to be used by the Contractor is certified by the COR to be operational and within acceptable accuracy. It is the Contractor's responsibility to select a system that will operate properly at the work location. The complete system shall be subject to the COR's approval.

3.3.17.2 ETS Data Requirements and Submissions

a. The ETS for each disposal vessel shall be in operation for all dredging and disposal activities and shall record the full round trip for each loading and disposal cycle. [Note: A dredging and disposal cycle constitutes the time from commencement of dredging to complete discharge of the material.] The COR shall be notified immediately in the event of ETS failure and all dredging operations for the vessel shall cease until the ETS is fully operational. Any delays resulting from ETS failure shall be at the contractor’s expense.

b. All data shall be collected and stored on 3 1/2 inch disk or CD-ROM(s) in ASCII format using IBM compatible MS-DOS 5.0 or later version. Each dredging and disposal cycle will be a separate and distinct ASCII file, labeled by the trip number. More than one file may be stored on the disk(s) or CD-ROM(s).

c. Data shall be collected, during the dredging and disposal cycle, every 500 feet (at least) during travel to the disposal area, and every minute or every 200 feet, whichever is smaller, while approaching within 1,000 feet and within the disposal area.

d. The required digital data to be collected for each dredging and disposal cycle includes the following:

(1) Trip Number
(2) Date
(3) Time
(4) Vessel ID
(5) Vessel Captain
(6) State Plane X Coordinate - in accordance with c. above
(7) State Plane Y Coordinate - in accordance with c. above
(8) Vessel Draft
(9) Type of Disposal Vessel
(10) Exact State Plane X & Y coordinate at start of dump
(11) Volume of Material Disposed

e. Plot Reporting (2 types):

(1) Tracking Plot - For each disposal event, data collected while the disposal vessel is in the vicinity of the disposal area shall be plotted in chart form, in 200-foot intervals, to show the track and draft of the disposal vessel approaching and traversing the disposal area. Each plot will be attached to the corresponding ascii data table when submitted. [A sample tracking plot diagram has been provided as an Appendix to this Section.]

(2) Scatter Plot - Following completion of all disposal events, a single and separate plot will be prepared to show the exact disposal locations of all dumps. Every plotted location shall coincide with the beginning of the respective dump. Each dump will be labeled with the corresponding Trip Number and shall be at a small but readable scale. To accompany the Scatter Plot, a single and separate table will be prepared of the corresponding ETS data for every dump location. The volume of material disposed for each trip will be included in this table. [A sample scatter plot diagram and table have been provided as an Appendix to this Section.]

f. All digital ETS data shall be furnished to the COR within 24 hours of collection. The digital plot files should be in an easily readable format such as Adobe Acrobat PDF file, Microstation DGN file, JPEG, BMP, TIFF, or similar. The hardcopy of the ETS data and tracking plots shall be both maintained onboard the vessel and submitted to the COR on a weekly basis.

APPENDIX F

LONG TERM MONITORING STRATEGY

Canaveral ODMDS Long-Term Monitoring Strategy

Introduction

This appendix outlines a long-term (approximately 10 years) strategy for monitoring of the Canaveral Ocean Dredged Material Disposal Site (ODMDS). This strategy describes the monitoring program purpose and objectives, but does not address specific study designs. Specific study designs will be developed by the sponsoring agency with review by EPA and the Corps of Engineers (COE).

Background

The Canaveral ODMDS is the most heavily used ocean disposal site managed by EPA and the COE off the coast of Florida. Annual disposal volumes average one million cubic yards with a maximum annual volume of close to three million cubic yards. This volume far exceeds that at other disposal sites along the Florida east coast. The Canaveral ODMDS was classified as a dispersive site at the time of designation. This was based on a study conducted by the COE Waterways Experiment Station, "Interpretive Analysis of Surficial Sediments as an Aid in Transport Studies of Dredged Materials Cape Canaveral, Florida" that concluded that based on bathymetric changes and the presence of sand waves on the shelf surface, material is being removed from the site. However, the report indicated that in order to make conclusive statements about sediment transport off the disposal site, detailed site-specific data are necessary. (Ferland, 1984) Subsequent to site designation, studies have been conducted at the site to attempt to identify transport direction and magnitude from the site. These studies, summarized in the Canaveral ODMDS SMMP, though not conclusive, appear to support the COE's conclusion that the site is dispersive.

Objectives

As part of the development of a revised Site Management and Monitoring Plan, an interagency meeting was held. Consensus was reached that the major focus of site monitoring should address two issues:

1. Site capacity.

2. Areal extent of physical impact of disposal.

Site capacity is typically defined by physical parameters, ie. how much material can be disposed in a site and at what rate before a navigation hazard is created or before a measurable mound is created exceeding the site boundaries. However, a more appropriate definition is the disposal rate or amount that does not interfere with other uses of the ocean. Other uses of the ocean as defined by the 40 CFR 227.21 include: commercial and recreational fishing; recreational use of shorelines and beaches; commercial and recreational navigation; actual or anticipated exploitation of living marine resources; actual or anticipated exploitation of non-living resources, including without limitation, sand and gravel places and other mineral deposits, oil and gas exploration and

development and offshore marine terminal or other structure development; and scientific research and study.

Therefore, in determining the capacity of the site, both localized effects (mounding) and effects beyond the site boundaries (chemical, physical and biological changes in the benthos) must be examined. For the purpose of this strategy, the term "Near-field Capacity" will be used to define capacity controlled by localized effects (e.g. mounding) and the term "Far-field Capacity" will be used to define capacity controlled by effects beyond the site boundaries.

The areal extent of physical impact (changes in grain size distribution) well beyond the boundary of the ODMDS was identified as a concern. It was recommended that the ODMDS be managed such that the areal extent of impact does not increase over time. The areal extent must be therefore identified, monitored for change and modeled to determine a disposal amount / rate that prevents an increase in areal extent, ie. "Far-field" capacity.

Priority is given to an examination of the nearfield capacity over far-field effects. Much of the information collected as part of the nearfield studies will be useful in examining far-field effects.

Nearfield Fate & Capacity

Historical bathymetric monitoring of the disposal site has shown little mounding of dredged material within the site until surveys following the 1999 disposal events. Recent bathymetry surveys conducted by the COE (January 2000) and EPA (August 2000) have shown that a significant mound reaching a depth of 35 feet has been created. This appears to be the result of precise navigation, disposal at the center of the ODMDS and the cohesive nature of recently disposed materials. Mounding above 40 feet is not desirable due the potential for vessel grounding.

The interagency meeting resulted in the following objectives of a study of nearfield processes:

1. Determine maximum annual disposal volumes that would not cause significant mounding above -40 feet and would maintain the measurable mound apron within the disposal site boundaries.

2. Determine the most appropriate disposal strategy (disposal locations) to maximize near-field site capacity as defined above.

The overall approach to addressing the near-field fate of disposed dredged material is based on methodologies developed by the U.S. Army Corps of Engineers DOER/ DOTS programs at the Waterways Experiment Station. Site specific field data will be collected to provide input for Corps of Engineers developed models for the prediction of short-term fate and long-term fate of disposed dredged material in the near-field. Most of the field data collected will be useful for both near and far-field analysis efforts. Results of the studies will provide: 1) estimates of quantities of material transported outside of the site boundaries during disposal activities; 2) estimates of quantities of material transported outside of the site boundaries after disposal activities have

ceased; and 3) an estimation of the short (maximum annual amount) and long term (total volume) capacity of the disposal site. Multiple disposal strategies can also be examined to determine a strategy to maximize site near-field capacity.

Disposal plume transport of disposed dredged material beyond the ODMDS boundaries can be simulated by the Short Term Fate of Dredged Material Model (STFATE) under varying scenarios. This can provide an estimate of the amount of material transported offsite during disposal and the depositional pattern of this material.

Mound creation can be simulated by the Multiple Dump Fate of Dredged Material (MDFATE) model. The MDFATE simulations will assist in site management by determining likely placement patterns required to build mounds of specific dimensions. The mounds designed using MDFATE will then be simulated by the Long Term Fate of Dredged Material Model (LTFATE) to determine their long-term stability (i.e., will the mounds erode and if so, which direction and in what magnitude will the eroded material move). The erosion rate of fine-grained sediments are very sensitive to a number of site specific characteristics, such as bulk density, mineralogy, prior loading history, cohesivity, salinity, etc. Dredged material of similar geophysical properties can have erosion rates that vary by over two orders of magnitude. At present, the only way to make an accurate estimate of fine-grained sediment erosion rate is to collect samples from the site and perform laboratory tests.

For both the short and long-term modeling efforts site specific data is needed. Current velocities and general dredged material physical properties are needed for both efforts. Wave conditions and site specific information relating erosion to bottom shear stress is needed for input in the new cohesive sediment transport submodel for LTFATE.

Costs and time frame for planned activities to address the long-term capacity and nearfield fate of disposed dredged material are listed in Table 1.

Additionally, field calibration/verification of the model results can be conducted. This could include acoustical plume tracking to determine quantities of material lost during disposal and dispersion coefficients; and sidescan sonar surveys and precision bathymetric surveys for disposal mound delineation.

Far-field Fate & Capacity

As mentioned previously, the Canaveral ODMDS has been classified as a dispersive site. Numerous attempts have been made to determine the magnitude, extent and direction of transport of disposed dredged material from the Canaveral ODMDS. A summary of the monitoring efforts and their conclusions are given in the Canaveral ODMDS SMMP. One study conducted by Julie Vann at the Florida Institute of Technology concluded, based on physical analysis of 105 sediment samples, that disposed dredged material has dispersed to cover a 596 square kilometer area. If this is the case, then it could have an adverse impact on potential offshore mineral resources (beach quality sand) and greatly expand the recognized area of influence of the disposal site for potential benthic environmental impact.

The interagency meeting resulted in the following objectives of a study of far-field fate:

1. Verify extent of physical impact as determined by changes in grain size distribution.

2. Monitor area of physical extent for growth or reduction.

3. Estimate maximum disposal volume to limit growth of areal extent of impact (Farfield Capacity).

To verify and monitor the extent of physical impact due to disposal would require an intense sampling and analysis of grain size distributions. Alternative methods such as radiometric mapping could also be explored. It is suggested that the areal extent of impact be monitored at a frequency of 5 to 10 years. Correlations between disposal volume rates and areal extent of impact could be made utilizing larger spacial scale models than those discussed for the near-field capacity analysis above. However, much of the data collected as part of the near-field capacity analysis (wave, current, sediment properties) would be useful for such modeling. Table 1 list the estimated costs and timetable for such investigations.

Benthic Community Impact Trend Assessment (Near & Far-field)

40 CFR §228.9(a)(1) requires, "trend assessment surveys conducted at intervals frequent enough to assess the extent and trends of environmental impact." Once the areal extent of physical impact is established, a benthic impact trend assessment survey should be conducted utilizing this information. This study would examine benthic macro infaunal and/or meiofaunal species diversity and abundance from areas within and outside the influence of disposed dredged material. Additionally, surveys of the areas within the influence of disposed dredged material should be conducted to document any low relief live bottom communities. These surveys would consist of sidescan sonar surveys with diver assisted ground-truthing. Cost for such surveys are presented in Table 1.

Funding

EPA has the lead role in designing and implementing site monitoring programs with the COE providing support throughout both phases. Additionally, when work conducted by permit applicants comprises a significant percentage of dredged material disposed, they are expected to participate. The EPA regulations, 40 CFR §228.9(c) state,

> *EPA will require the full participation of permittees, and encourages the full participation of other Federal and State and local agencies in the development and implementation of disposal site monitoring programs.*

The portion of monitoring studies carried out or sponsored by permittees should be commensurate with the volume of dredged material they dispose at the site. If it is determined that monitoring activities are unaffordable, ocean disposal is no longer a feasible option and other non-ocean disposal options (including the no action/no dredging option) must then be considered.

Table 1: Canaveral ODMDS Long-term Monitoring Strategy

Task #	Title	Timeframe	Cost
Capacity Analysis Primary Tasks			
1	Erosion Rate Analysis	2000-01	$38,000
2	Current Meter Study	2001-02	$55,000
3	STFATE, MDFATE, LTFATE modeling	2003-05	$110,000
Capacity Analysis Secondary Tasks for Verification and Calibration			
4	Acoustical Plume Tracking and Sampling	2000-04	$30,000
5	Sidescan Sonar and Precision Bathymetry	2000-04	$35,000
Areal Impact Analysis			
6	Verify Areal Extent of Physical Impact	2002-03	$50,000
7	Regional Dredged Material Transport Modeling	2005-08	$100,000
8	Monitor Areal Extent of Physical Impact	2008-10	$50,000
Benthic Impact & Trend Assessment			
9	Benthic Community Survey	2005	$50,000
10	Low Relief Live Bottom Surveys	2005-10	$50,000

Since site designation, approximately 9.1 million cubic yards of dredged material has been disposed at the site. Of this, approximately 13% of the material was disposed by permittees (9% coming from the Canaveral Port Authority and 4% from the U.S. Navy). Total monitoring costs projected for the next ten years are expected to amount to approximately $568,000 or $0.05 per cubic yard based on projected disposal volumes. The interagency meeting, including site users, recommended that monitoring cost allocation should be based on historical disposal volumes. Projected expenditures for site monitoring for the site users are given in Table 2. These values are intended as guidelines and not regulatory requirements. It is expected that site users will select to sponsor a specific task or tasks outlined in the previous tables that approach the dollar amounts presented in Table 2. Alternatively, EPA and the Corps could require monitoring as permit requirements tied to specific projects. Additionally, EPA will continue to sponsor monitoring activities as funding allows. For example, EPA has already funded task 1 and a portion of task 2 and expects to be able to provide in-kind support in the form of the Ocean Survey Vessel Peter W. Anderson for field activities.

Table 2:Allocated Estimated 10 Year Monitoring Expenses

Site User / Project Sponsor	Percent of Site Use	Allocated Dollar Amount
U.S. Army Corps of Engineers - Civil Works	87	$494,160
U.S. Navy	4	$22,720
Canaveral Port Authority	9	$51,120

APPENDIX G

ESSENTIAL FISH HABITAT ASSESSMENT

Canaveral ODMDS Site Management and Monitoring Plan
Essential Fish Habitat Assessment
December 2000

Project Description: The U.S. Environmental Protection Agency Region 4 and the U.S. Army Corps of Engineers Jacksonville District are developing a revised Site Management and Monitoring Plan (SMMP) for the Canaveral Ocean Dredged Material Disposal Site (ODMDS). It is the responsibility of the EPA and the Corps of Engineers to manage and monitor each of the Ocean Dredged Material Disposal Sites (ODMDSs) designated by the EPA and to develop management plans for each site. Management plan provisions shall be requirements for all dredged material disposal activities at the site and sites without management plans are prohibited from use. The objective of the SMMP is to provide guidelines in making management decisions necessary to fulfill mandated responsibilities to protect the marine environment. The SMMP must include but not be limited to: a program for monitoring the site; special management conditions or practices to be implemented at each site that are necessary for the protection of the environment; consideration of the anticipated use of the site over the long term; and a schedule for review and revision of the plan.

The Canaveral ODMDS is used for disposal of dredged material from the Canaveral Port Authority, the U.S. Navy and the U.S. Army Corps of Engineers. It is expected that on average, 1 million cubic yards of dredged material will be disposed at the ODMDS per year. The material will consist primarily of stiff clays and silts, with horizons of very fine silty sand, shell fragments, and organics.

The Canaveral ODMDS is located in the Canaveral Bight on the shallow continental shelf, centered 4.5 nautical miles offshore Cocoa Beach, Florida, has a depth range of 14 meters to 17 meters and an area of 4 nmi^2. The site has been classified as a dispersive site and is therefore assumed that material migrates off site.

EFH Designations: According to the Canaveral ODMDS Designation EIS, the habitat in the vicinity of the ODMDS is known for commercially important invertebrates and bottom fishes including penaeid shrimp, crab, croaker, flounder, sea trout, and drum. During a field survey of the site, silver seatrout and silver perch predominated the fish catch while shrimp were the most conspicuous among the crustaceans. A taxonomic listing of the trawl data can be found in Appendix D of the EIS.

Table 1 lists the 34 species which may occur in the vicinity of the Canaveral ODMDS and which are managed under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). Table 2 shows the categories of Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for managed species which were identified in the Fishery Management Plan Amendments of the South Atlantic Fishery Management Council and which may occur in marine waters of the southeastern states. These fish species and habitats require special consideration to promote their viability and sustainability.

Table 1: Essential Fish Habitat (EFH) Species for Marine Waters Managed by the South Atlantic Fishery Management Council.

Species	**Life Stage**	**Species**	**Life Stage**
Brown shrimp	E, L, A	Blackfin snapper	J, A
White shrimp	E, L, A	Silk snapper	J, A
Pink shrimp	E, L, A	White grunt	E, L, A
Rock shrimp	A	Greater amberjack	J, A
Royal red shrimp	A	Blueline tilefish	E, A
Red drum	E, L, A	Golden tilefish	A
Snowy grouper	E, L, A	King mackeral	J, A
Yellowedge grouper	E, L, A	Spanish mackeral	L, J, A
Warsaw grouper	E, A	Cobia	E, L, J, A
Scamp	A	Dolphin	L, J, A
Speckled hind	A	Golden crab	A
Jewfish	A	Spiny lobster	L, J, A
Wreckfish	A	Coral	
Red snapper	L, J, A	Calico scallops	A
Vermilion snapper	J, A	Bluefish	L, J, A
Gray snapper	L, A	Spiny dogfish	J, A
Mutton snapper	E, L, J, A	Summer flounder	L, J, A
Life Stages: E = Eggs	L = Larval	J = Juvenile	A = Adult

Source: Essential Fish Habitat: A Marine Fish Habitat Conservation Mandate for Federal Agencies, NMFS, St. Petersburg, FL, October 2000.

Table 2: Categories of Essential Fish Habitat and Habitat Areas of Concern in Southeastern States.

ESSENTIAL FISH HABITAT - MARINE AREAS
Artificial / Manmade Reefs
Coral & Coral Reefs
Live / Hard Bottoms
Sargassum
Water Column
GEOGRAPHICALLY DEFINED HABITAT AREAS OF PARTICULAR CONCERN
Area Wide
Council-designated Artificial Reef Special Management Zones
Hermatypic (reef-forming) Coral Habitat & Reefs
Hard Bottoms
Hoyt Hills
Sargassum habitat
State-designated areas of importance to managed species
Submerged aquatic vegetation
Florida
Blake Plateau (manganese outcroppings)
Biscayne Bay
Biscayne National Park
Card Sound
Florida Bay
Florida Keys National Marine Sanctuary
Jupiter Inlet Point
Mangrove Habitat
Marathon Hump
Oculina Bank
Phragmatopoma (worm) reefs
The Wall (Florida Keys)

Source: Essential Fish Habitat: A Marine Fish Habitat Conservation Mandate for Federal Agencies, NMFS, St. Petersburg, FL, October 2000.

Assessment: Many of the habitat categories presented in table 2 are not present in the vicinity of the Canaveral ODMDS. Those include:

- Hoyt Hills - located in the Blake Plateau in water 450-600 m deep
- Council-designated Artificial Reef Special Management Zones
- Blake Plateau (manganese outcroppings)
- Biscayne Bay - located in South Florida
- Biscayne National Park - located in South Florida
- Card Sound - located in South Florida
- Florida Bay - located in South Florida
- Florida Keys National Marine Sanctuary - located in South Florida
- Oculina Bank - located approximately 30 nautical miles east of the ODMDS
- Jupiter Inlet Point - located in South Florida
- Mangrove Habitat
- Marathon Hump - located in South Florida
- Phragmatopoma (worm) reefs
- The Wall (Florida Keys) - located in South Florida

Impacts on habitats potentially present are discussed in the following paragraphs.

Sargassum. Sargassum is pelagic brown algae, which occurs in large floating mats on the continental shelf, in the Sargasso Sea, and in the Gulf Stream. It is a major source of productivity in a nutrient-poor part of the ocean. Masses of Sargassum provide extremely valuable habitat for a diverse assemblage of animal life, including juvenile sea turtles, sea birds, and over 100 species of fish. While smaller clumps of this seaweed may float into the Canaveral ODMDS area, it typically occurs much further offshore. In any case, since it occurs in the upper few feet of the water column, it would not be adversely affected by ocean dredged material disposal activities.

Hermatypic (reef-forming) Coral Habitat & Reefs. Hermatypic, or reef-forming, corals contain symbiotic, unicellular zoaxanthallae in their endodermal tissue. They are always found in shallow (0 to 100 m), warm (15 to 35ºC), sun-lit waters. Coral reefs are defined as the hard bottoms, deepwater banks, patch reefs and outer bank reefs. Hermatypic coral habitat and reefs have not been identified in the vicinity of the Canaveral ODMDS. The benthos of the Canaveral ODMDS and vicinity consists of mud and sandy bottom. Sidescan sonar surveys of the ODMDS and review of the SEAMAP data did not reveal the presence of any hermatypic coral habitat and reefs and consequently no impact is expected. If present nearby, effects would be limited to those caused by material being transported off-site. These effects are not expected to be significant considering that sediment similar to the dredged materials occur naturally in those areas and the sediments are dynamic, affected by the same energy which would transport the dredged material.

Artificial Reefs. The Florida Bureau of Marine Fisheries Management reports 24 reefs that are located in the Atlantic Ocean off Brevard County. All these sites are in water about 54 to 125 feet deep and at least two nautical miles from the ODMDS. Use of the Canaveral ODMDS would not significantly affect the artificial reefs.

Live or Hardbottoms. Scattered irregularly over the shelf are zones of highly concentrated invertebrate and algal growth, usually in association with marked deviations in relief that support substantial fish assemblages. Commonly called "live bottom" areas, they are usually found near outcropping shelves of sedimentary rock in the zone from 15 to 35 fathoms. Live bottom is especially evident at the shelf break, a zone from about 35 to 100 fathoms where the Continental Shelf adjoins the deep ocean basin and is often characterized by steep cliffs and ledges.
The live bottom areas constitute essential habitat for warm-temperate and tropical species of snappers, groupers, and associated fishes. Hardbottoms do not occur within the limits of the existing Canaveral ODMDS and are not shown in the vicinity of the ODMDS in the SEAMAP study. If present nearby, effects would be limited to those caused by material being transported off-site. These effects are not expected to be significant considering that sediment similar to the dredged materials occur naturally in those areas and the sediments are dynamic, affected by the same energy which would transport the dredged material.

State–designated Areas Important for Managed Species. The Florida Department of Environmental Protection Office of Coastal and Aquatic Managed Areas (CAMA) manages coastal lands and waters that have been designated as Aquatic Preserves, State Buffer Preserves, National Estuarine Research Reserves and the Florida Keys National Marine Sanctuary. The Banana River and Indian River Aquatic Preserves are located in the vicinity of the ODMDS. Both preserves are estuarine and are therefore unlikely to be affected by use of the Canaveral ODMDS.

Marine Water Column Including the Surf Zone. Ocean disposal would create minor and short-term plumes of suspended materials. The ocean disposal of dredged materials at the Canaveral ODMDS is not expected to significantly degrade water quality within those sites or in adjacent waters. Increases in suspended particulate concentrations or soluble constituents are expected to be short term and minimal. These effects are localized, short-term effects dissipated by natural dispersion, mixing, and eventual sinking of particles. The water quality effects are not expected to effect the surf zones or beaches. The water quality effects are not expected to adversely effect marine organisms. Only dredged material evaluated and found acceptable in accordance with the joint USEPA/USACOE guidance (USAEPA/USACE, 1991 and USEPA/USACE, 1993) may disposed of in the ocean. The testing evaluates the potential for unacceptable effects in both the benthos and water column such as toxicity or bioaccumulation caused by dredged material contaminants.

Impact Summary for Essential Fish Habitat. Use of the Canaveral ODMDS is not expected to cause significant adverse impacts to Essential Fish Habitat of EFH species. The disposal site is clear of any coral, coral reef, live / hard bottom or artificial reef habitat. Direct burial of any unknown coral, coral reef or live / hard bottom habitat in the vicinity of the ODMDS would only occur if short or missed dumps occurred. The Site Management and Monitoring Plan mandates that all permits and Corps of Engineers contract specifications require that disposal occur within a specified zone and disposal locations be electronically recorded. Indirect impacts to these habitat types (if present nearby) might occur due to material being transported offsite. The long term monitoring strategy includes a study of the rate of transport of material offsite and modeling of subsequent transport beyond the site boundaries. Potential impact to the water column and

benthic communities will be minimized through periodic testing of the dredged material proposed for disposal in the Canaveral ODMDS. A summary of potential impacts to EFH and HAPC are summarized in Table 3.

Table 3: Summary of Potential Impacts to Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC).

Essential Fish Habitat	**Resource Present**	**Impact Assessment**
Artificial / Manmade Reefs	NP	NS
Coral & Coral Reefs	NP	NS
Live / Hard Bottoms	NP	NS
Sargassum	P	NS
Water Column	P	NS
HAPC: Area Wide	**Resource Present**	**Impact Assessment**
Council-designated Artificial Reef Special Management Zones	NP	NS
Hermatypic (reef-forming) Coral Habitat & Reefs	NP	NS
Hard Bottoms	NP	NS
Hoyt Hills	NP	NS
Sargassum habitat	NP	NS
State-designated areas of importance to managed species	NP	NS
Submerged aquatic vegetation	NP	NS
HAPC: Florida	**Resource Present**	**Impact Assessment**
Blake Plateau (manganese outcroppings)	NP	NS
Biscayne Bay	NP	NS
Biscayne National Park	NP	NS
Card Sound	NP	NS
Florida Bay	NP	NS
Florida Keys National Marine Sanctuary	NP	NS
Jupiter Inlet Point	NP	NS
Mangrove Habitat	NP	NS
Marathon Hump	NP	NS
Oculina Bank	NP	NS
Phragmatopoma (worm) reefs	NP	NS
The Wall (Florida Keys)	NP	NS

P = Present; NP = Not Present; PS = Potentially Significant Impact; S = Significant Impact;
NS = No Significant Impact

References

Florida Department of Environmental Protection. Coastal and Aquatic Managed Areas. <http://www.dep.state.fl.us/cama/> Accessed 2000 Nov. 29.

Florida Fish and Wildlife Commission. Brevard County Artificial Reefs. <http://www.state.fl.us./fwc/marine/ar/ar-brevard.htm> Accessed 2000 Nov. 29.

National Marine Fisheries Service. *Essential Fish Habitat: A Marine Fish Habitat Conservation Mandate for Federal Agencies.* St. Petersburg, FL; 2000 Oct.

Perkins et al. *Distribution of Hard-Bottom Habitats on the Continental Shelf off Northern and Central East Coast of Florida. Final Report submitted to the Southeast Area Monitoring and Assessment Program Bottom Mapping (SEAMAP) Workgroup and the National Marine Fisheries Service*. 1997.

South Atlantic Fishery Management Council. *Habitat Plan for the South Atlantic Region: Essential Fish Habitat Requirements for Fishery Management Plans of the South Atlantic Fishery Management Council*. 1998 Oct.

U.S. Environmental Protection Agency Region 4. *Final Environmental Impact Statement Canaveral Harbor, Florida Ocean Dredged Material Disposal Site Designation.* Atlanta, GA; 1990 Aug.

U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, 1991. *Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual)*, February 1991. Prepared by Environmental Protection Agency Office of Marine and Estuarine Protection and Department of Army United States Army Corps of Engineers under EPA Contract No. 68-C8-0105.

U.S. Environmental Protection Agency Region 4 and U.S. Army Corps of Engineers South Atlantic Division, 1993. *Regional Implementation Manual Requirements and Procedures for Evaluation of the Ocean Disposal of Dredged Material in Southeastern Atlantic and Gulf Coastal Waters*, May 1993.