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February 24, 2003

Dr. Stephen Storms
Maryland Port Administration
Maritime Center II
2310 Broening Highway
Baltimore, MD 21224

REF: MPA Contract No. 500912, PIN No. 600105P, MES Contract 02-07-16
Environmental, Planning, and Technical Services

SUBJ: Final Dredging and Site Engineering Reconnaissance Study of James Island as a Potential Beneficial Use and Habitat Restoration Project

Dear Dr. Storms:

Enclosed please find one hard copy and one CD-ROM copy of the Final Dredging and Site Engineering Reconnaissance Study for James Island submitted by Gahagan & Bryant Associates, Inc. MES is submitting this report for your records.

Please do not hesitate to contact me at 410-974-7261 if you have any questions or comments regarding this report.

Sincerely,

Rebecca Halloran

Rebecca Halloran, Natural Resource Planner
Environmental Dredging

Enclosures

FINAL

JAMES ISLAND HABITAT RESTORATION PROJECT
DREDGING AND SITE ENGINEERING
RECONNAISSANCE STUDY

MPA Contract # 500912 PIN 600105P
MES Contract# 02-07-16

Prepared for:

Maryland Port Administration
2310 Broening Highway
Baltimore, MD 21224

Under Contract to:

Maryland Environmental Service
2011 Commerce Park Drive
Annapolis, MD 21401

Prepared by:

Gahagan & Bryant Associates, Inc.

Baltimore, MD

February 2003

EXECUTIVE SUMMARY

The purpose of this reconnaissance report is to summarize the dredging and site engineering aspects of restoring & developing habitat at James Island using dredged material. This study presents five dike alignments that could provide additional tidal wetland and upland habitats at James Island. The habitat restoration project would be constructed through the beneficial use of dredged materials removed from the Bay approach channels to the Port of Baltimore. The five alignments are analogous to the five alignments presented as part of the James Island Modification Conceptual Study, which was prepared for the Maryland Port Administration (MPA) under contract to the Maryland Environmental Services (MES) in 2001. Gahagan & Bryant Associates, Inc. (GBA) has been retained by MES to conduct a reconnaissance study of the dredging and site engineering aspects of this project.

This report presents the five alignments, including: the dike design, the construction and operation, and the associated costs needed to assist decision makers in selecting the site layout to be carried to final design. The five alignments and dike cross-sections were developed based on consideration of coastal, environmental, geotechnical, dredging and site engineering aspects and data. The general location of the James Island site is shown on Figure ES-1.

For each of the five alignments, upland dike elevations of 10 ft MLLW and 20 ft MLLW were analyzed with wetland dike elevation of 10 ft MLLW. Each alignment includes a 50% wetland and 50% upland components. A summary of the site design characteristics is presented in Table ES-1. A description of the site design characteristics for each alignment is presented below:

- ***Site Surface Areas:*** Site surface areas were selected to minimize potential environmental impact and to not lie in deep waters (depths greater than –12 ft MLLW). The total site area of each alignment ranges between 979 and 2,202 acres. For the purposes of this study, the total surface areas are equally divided between wetland and upland habitat.
- ***Total Baseline Perimeter:*** The total baseline perimeter ranges between 32,102 linear feet and 48,963 linear feet for the five alignments. The total baseline is the same for both the 10 ft upland dike elevation and 20 ft upland dike elevation alternatives. This is due to the fact that the baseline is measured from the roadway on the dike crest and does not change for each alternative.
- ***Neat Dike Fill Volumes:*** The neat dike fill volumes for the 10 ft and 20 ft dike elevation alternatives range between 2,733,000 cy and 5,844,000 cy for the five alignments. The neat fill volumes include allowances for backfill of excavated unsuitable materials.
- ***Rock Protection & Quantities:*** Rock protection for the dikes was designed to yield sufficient protection against the adverse effects of high water and wave run-up resulting from a 35-year return period storm (M&N, 2002). Total rock quantities for the five alignments range between 455,000 tons and 872,000 tons. These quantities include toe armor, quarry run, slope armor, and slope underlayer stone.
- ***Potential Borrow Sources & Volumes:*** There are four potential sand borrow sites within the vicinity of the James Island project. Two of the sites are located north and west of James

Island and two are located southeast and southwest of the Island. The northern location has a total volume of 14.2 mcy, the western location has a total volume of 1.1 mcy, the southeast location has a total volume of 1.0 mcy, and the southwest location has a total volume of 0.3 mcy. These are total volumes. Estimated available sand volumes are presented in Figures B-7 through B-11 in Appendix B.

- ***Site Capacity & Operational Life:*** For the 10 ft. upland dike elevation alternative, the site capacity for the five alignments ranges between 23 and 52 mcy. For the 20 ft upland dike elevation alternative, the site capacity for the five alignments ranges between and 35 and 79 mcy. The site operational life is estimated to range between 13 and 15 years for the five alignments with respect to the 10 ft. dike elevation. The site operational life is estimated to range between 20 and 23 years for the five alignments with respect to the 20 ft. dike elevation.

For the purpose of this report it is assumed that the hydraulic stockpile and truck haul method of dike fill construction (the method previously used at Poplar Island) will be used. It is assumed that a small hydraulic dredge will complete excavation and backfill of the unsuitable foundation material. It is assumed that rock will be transported by barge to the site and then be handled by a crane at or near the dike section. A summary of the estimated completion time for dike construction is presented in Table ES-2. These completion times are based on the following assumptions:

- The total completion time was based on the time required for the longest construction element (rock placement for the 10 ft dike elevation and hydraulic fill for the 20 ft dike elevation) plus an additional six months to allow for mobilization, demobilization and overlap of the construction elements,
- 30 working days per month at 12 hour days,
- 15,000 cubic yards of dike material are dredged and stockpiled per day,
- 5,000 cubic yards of dike material are placed per day,
- Rock placement includes toe dike, slope stone and road stone, and
- 50 linear feet of stone will be placed per day.

As part of development of the Island site, 50% of the island restoration area will be habitat creation, including, intertidal wetland, high marsh, low marsh, bird islands, mud flats and circulation channels.

This report assumes that, once the maintenance dredged material placed at the site approaches the elevation of the bay water level, crust management is implemented in order to maximize the operational life of the site. Also, dried crust resulting from such operations could be a valuable source for building berms and for future dike raising.

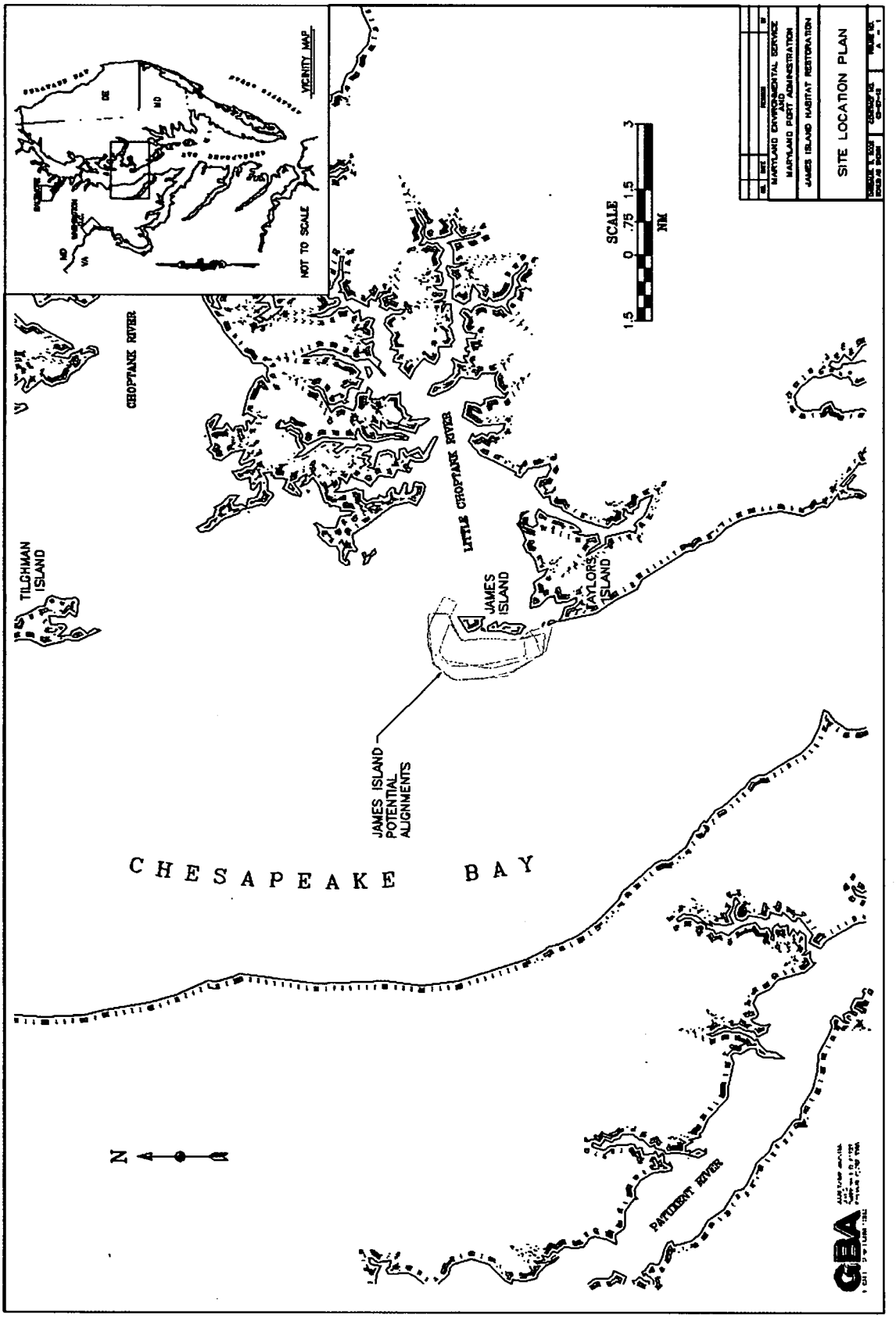

Figure ES-1, Site Location Map

Table ES-1. Site Design Characteristics and Quantities

Alignment	Total Surface Area (Acres)	Dike Perimeter Length (Lin. Ft.)	Neat Dike Fill Volume (CY)		Dike Rock Placement (Tons)	Site Capacity (Mcy)		Total Site Life (Years)	
			Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW		Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW	Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW
1	979	32,102	2,733,000	4,505,000	455,000	23	35	13	20
2	2,127	48,812	3,149,000	5,437,000	872,000	52	78	15	22
3	1,586	44,497	3,578,000	5,694,000	694,000	37	57	13	20
4	2,202	48,963	3,086,000	5,493,000	860,000	51	79	15	23
5	2,072	45,587	2,994,000	5,844,000	819,000	49	75	14	21

Table ES-2 Estimated Construction Completion Times

Alignment	Stockpile Completion Time (Days)		Dike Fill Completion Time (Days)		Dike Rock Placement (Tons)	Rock Placement Time (Days)	Total Completion Time (Years)	
	Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW	Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW			Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW
1	182	300	547	901	455,000	642	2.3	3.0
2	210	362	630	1,087	872,000	976	3.2	3.5
3	239	380	716	1,139	694,000	890	3.0	3.7
4	206	366	617	1,099	860,000	979	3.2	3.6
5	200	390	599	1,169	819,000	912	3.0	3.7

The total project costs, in constant 2002 dollars, for the operational life of the facility were generated as the sum of the initial construction costs, habitat development costs, site development costs, and the dredging, transport and placement costs. Table ES-3 presents the costs related to the 10 ft. upland dike elevation alternative, and the costs related to the 20 ft upland dike elevation alternative. The total project costs are the summation of all the above referenced costs. These costs, along with the cost per cubic yard of capacity for the site, are presented to compare the five island alignments. Dredging, Transport and Placement (DTP)

Costs: This includes costs for mobilization and demobilization, dredging the navigation channels, transport to the placement site, and unloading of the dredged material at the placement site for the operational life of the site. The DTP costs are the most significant of the four major items at about 60% of the total site costs and are further broken down and appropriated as follows:

DTP Costs Apportioned to Navigation Channels: DTP costs charged to a designated USACE navigation channel must be apportioned to that project consistent with the disposal plan identified as the Federal Standard or National Economic Development (NED) disposal plan for that project. For the purposes of this analysis we are using $3.80/cy as the estimate for the DTP costs apportioned to the USACE navigation channels. It should be noted that this NED apportionment is subject to revision and that the ongoing Dredge Material Management Plan being developed by the USACE had the potential to alter this estimate significantly.

DTP Costs Apportioned to The James Island Project: The DTP incremental costs, over and above the federal share of the NED disposal plan for that project are apportioned to the James Island Project.

Table ES-3 Summary of Site Costs

Alignment	Total Site Capacity (Mcy)	Total Site Life (Yrs.)	Project Costs ($ Millions)			Cost per CY Capacity ($/CY)
			Apportioned to		Total Project Costs	
			James Island	Channel Projects		
10 Ft. MLLW Dike Elevation:						
1	23	13	308	99	406	18
2	52	15	531	227	759	15
3	37	13	430	164	594	16
4	51	15	526	225	751	15
5	49	14	494	214	709	14
20 Ft. MLLW Dike Elevation:						
1	35	20	439	152	591	17
2	78	22	759	342	1,101	14
3	57	20	611	250	861	15
4	79	23	762	344	1,106	14
5	75	21	724	326	1,050	14

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1.0 INTRODUCTION

1.1 PROJECT OBJECTIVE

The objective of this study was to conduct a Dredging Engineering Reconnaissance Study for the construction of a habitat restoration project at James Island, Maryland. This study presents various alignments for the restoration of this site to rebuild James Island to its 1847 historic footprint, utilizing dredged material to accomplish the restoration. Gahagan & Bryant Associates, Inc. (GBA) tasks include:

Task 1 – Review Existing Data – Conduct a review of the existing information on site characteristics and information related to a potential beneficial use habitat restoration site at James Island.

Task 2 – Base Mapping – Develop base mapping with digital bathymetric information using NOAA charts, including all pertinent information available from the Maryland Department of the Environment (MDE), Maryland Department of Natural Resources (MDNR), Maryland Geological Survey (MGS), Maryland Environmental Service (MES), U.S. Army Corps of Engineers (USACE) and Maryland Port Administration (MPA).

Task 3 – Preliminary Site Layout and Design – Prepare preliminary site configurations and dike alignments consistent with available subsurface geological data obtained from the Geotechnical Reconnaissance Study for James Island (E2CR, 2002). The site configuration and dike alignments shall be consistent with the historic mid-1800s island footprint and where available shall maximize existing shallow areas. The beneficial use and habitat restoration project at James Island should be similar in general concept to the Poplar Island Environmental Restoration Project (PIERP) with a wetland to upland ratio suitable for the project and filling capacity for 40 to 80 million cubic yards of dredged sediment.

Based on the preliminary site layout and conceptual design, GBA shall provide analyses of site filling capacity, dredged material transportation feasibility, and borrow source identification. As part of this task, GBA shall prepare plan sheets showing site layout(s) and typical construction details and conceptual design elements including but not limited to dike geometry and fill volumes, site volumes and capacities, spillways and site facilities, and site construction methods (including site access).

Task 4 – Reconnaissance Cost Estimates – Based on the preliminary site layout and conceptual design, GBA will prepare a comprehensive site use cost estimate with supporting details on assumptions used for the cost estimate. The cost estimate shall include:

- Study costs
- Initial construction costs
- Construction management costs
- Operation and maintenance costs (annual and total)
- Unloading costs

- Monitoring costs
- Dredging and transportation costs
- Design costs
- Site Finish costs
- Total costs
- Unit costs

1.2 PROJECT HISTORY AND DESCRIPTION

The U.S. Army Corps of Engineers, Baltimore District (CENAB) maintains more than 125 miles of federal navigation channels providing access to the Port of Baltimore. Placement of the material removed during maintenance dredging of these channels requires substantial planning and commitment of resources. Beneficial use of dredged material is an important option, providing opportunities for environmental enhancement while also providing for the necessary ongoing activity of port maintenance.

James Island is a privately owned island located in Dorchester County, MD on the eastern shore of the Chesapeake Bay at the mouth of the Little Choptank River. James Island is located 15 nautical miles south of the PIERP. James Island was approximately 974 acres in 1847; by 1994 approximately 92 acres remained. Since 1847 an estimated 78% of James Island has been lost to erosion with most of the erosion occurring on the west side of the island at a rate of 6 acres per year (E2CR, 2002).

1.3 PROJECT SCOPE & ORGANIZATION

The scope of this project was to conduct a reconnaissance study of the James Island site for the Port of Baltimore. In order to conduct the reconnaissance study, the Maryland Environmental Service (MES) retained four consultants to study the following aspects:

EA Engineering, Science & Tech., Inc. (EA)	Environmental Investigations
Engineering, Consultation, Construction, Remediation (E2CR)	Geotechnical Investigations
Gahagan & Bryant Associates, Inc. (GBA)	Dredging & Site Engineering Investigation
Moffatt & Nichol Engineers (M&N)	Coastal Engineering Investigation

MES managed inter-organization as well as technical and advisory support for the reconnaissance study at the request of MPA. Technical support was provided by Maryland Department of the Environment (MDE) and the Maryland Geological Survey (MGS).

The results of the study were to be summarized as follows: (i) individual technical report by each of the consultants, (ii) a consolidated report summarizing the key aspects of the four study reports. This report outlines the results of the dredging & site engineering investigation conducted by GBA.

2.0 BASE MAPPING

2.1 GENERAL

James Island is a privately owned island located in Dorchester County, MD on the eastern shore of the Chesapeake Bay at the mouth of the Little Choptank River. James Island is 47 miles southeast of Baltimore Washington International Airport (Figure A-1, (Appendix A)).

2.2 GEOTECHNICAL RECONNAISSANCE MAP

Geotechnical Reconnaissance Maps have been generated for the five alignments and are presented in Figures B-1 through B-5 in Appendix B. The bathymetric data used to generate the maps was obtained from National Oceanic and Atmospheric Administration (NOAA) charts 12266 and 12264. Boring locations, vane shear locations, and electronic cone penetrometer test locations are presented on the maps. The location and data results were provided by E2CR (E2CR, 2002).

The locations of the legal Natural Oyster Bars (NOB) are also presented on the geotechnical reconnaissance maps. Each alignment is sited to avoid impacts to the NOB areas. The data used to identify the NOB areas was digitized from base maps prepared by the Coast and Geodetic Survey for the Maryland Department of Natural Resources (State of Maryland, 1961).

2.3 SAND BORROW AREA MAPS

The general location of the potential sand borrow areas are presented in Figure B-6 of Appendix B. Based on the preliminary geotechnical results there is adequate sand to construct the project at either the 10 or 20 ft MLLW upland dike height. There are four potential sand borrow sites within the vicinity of the James Island Habitat Restoration project. Two of the sites are located north and west of James Island and two are located southeast and southwest of the Island. Figures B-7 through B-11 present the location and quantities of available sand (less the footprint) for each alignment. The data used to generate the Sand Borrow Area maps was referenced from the Geotechnical Reconnaissance Study for James Island (E2CR 2002).

3.0 SITE LAYOUT

3.1 SITE LAYOUT ALIGNMENT 1

The Alignment 1 site layout, depicted in Figure 3-1, is the smallest layout with a boundary of James Island to the east. The upland portion is on the western side and the wetland portion is on the eastern side of James Island Habitat Restoration Project. Details of the Alignment 1 layout can be obtained from Figure C-1 in Appendix C. The total site is approximately 979 acres.

3.2 SITE LAYOUT ALIGNMENT 2

The Alignment 2 site layout, depicted in Figure 3-1, has a boundary of James Island to the east, deep water to the west, NOB to the north and a local navigation channel to the south. The upland portion is on the western side and the wetland portion is on the eastern side of James Island Habitat Restoration Project. Details of the Alignment 2 layout can be obtained from Figure C-2 in Appendix C. The total site is approximately 2,127 acres

3.3 SITE LAYOUT ALIGNMENT 3

The Alignment 3 site layout, depicted in Figure 3-1, is a variation to alignment 2 that has a boundary of James Island to the east, NOB to the north and Taylors Island to the south. The upland portion is on the western side and the wetland portion is on the eastern side of James Island Habitat Restoration Project. Details of the Alignment 3 layout can be obtained from Figure C-3 in Appendix C. The total site is approximately 1,586 acres.

3.4 SITE LAYOUT ALIGNMENT 4

The Alignment 4 site layout, depicted in Figure 3-1, is the largest layout and a variation to alignment 2 that has a boundary of James Island to the east, deep water to the west, NOB to the north and connects to Taylors Island to the south. The upland portion is on the western side and the wetland portion is on the eastern side of James Island Habitat Restoration Project. Details of the Alignment 4 layout can be obtained from Figure C-4 in Appendix C. The total site is approximately 2,202 acres.

3.5 SITE LAYOUT ALIGNMENT 5

The Alignment 5 site layout, depicted in Figure 3-1, is a variation to alignment 4 that has a boundary of James Island to the east, deep water to the west, NOB to the north and a local navigation channel to the south. The upland portion is on the western side and the wetland portion is on the eastern side of James Island Habitat Restoration Project. Details of the Alignment 5 layout can be obtained from Figure C-5 in Appendix C. The total site is approximately 2,072 acres.

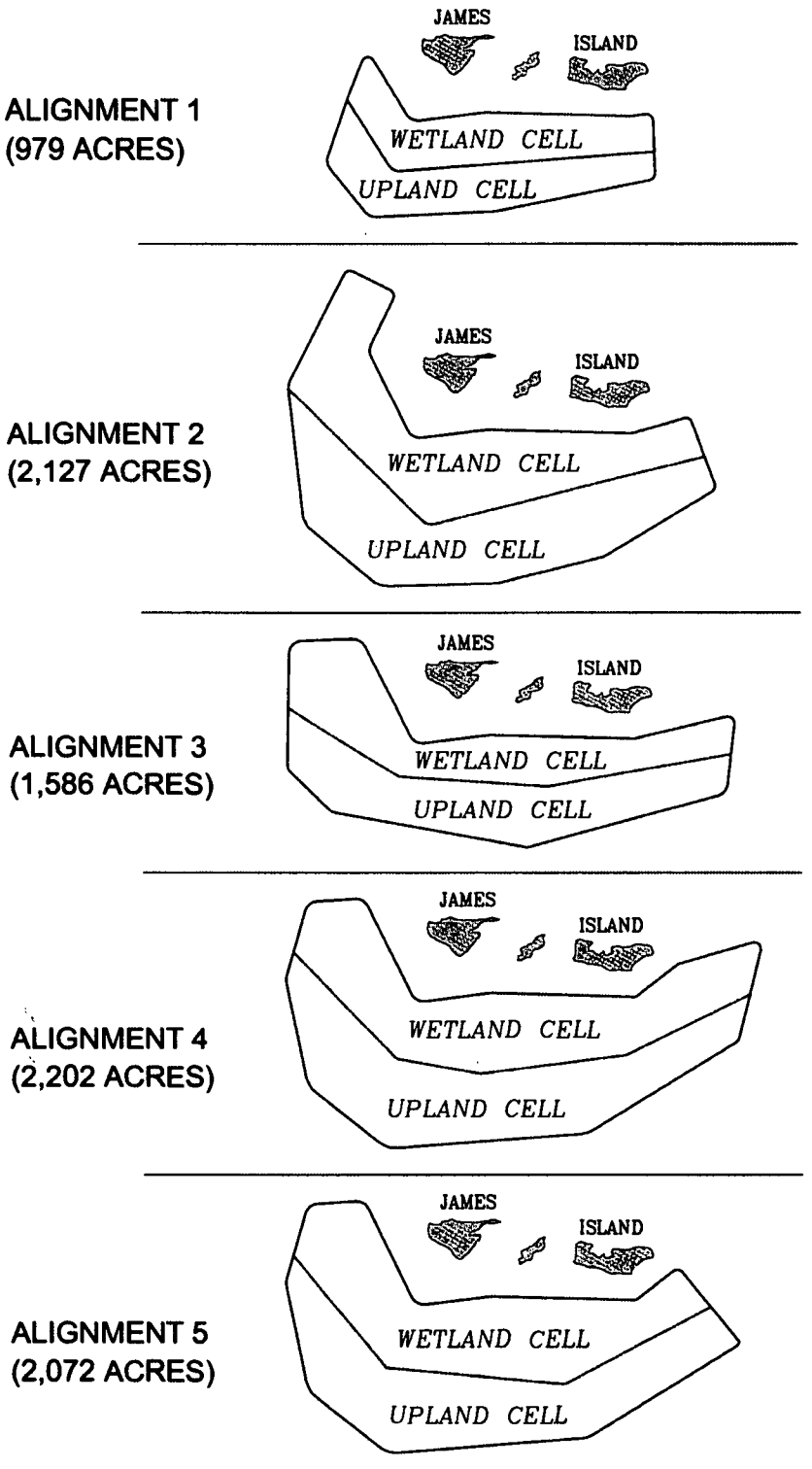


Figure 3-1 Alignment Layouts

4.0 SITE DESIGNS

4.1 GENERAL

Site design for the various alignments involved consideration of the following factors:

- ***Site Surface Areas:*** Site surface areas were selected to minimize environmental impact and not to lie in deep waters (i.e. waters greater than 12 ft MLLW). The total area of the five alignments range between 979 and 2,202 acres. Details of the surface areas are presented in Tables D-1 through D-5 in Appendix D.

- ***Dike Sections and Fill Volumes:*** Upland dike elevations of +10 ft MLLW and +20 ft MLLW were analyzed for this study. Typical dike sections are presented in Drawings C-6 through C-12 (Appendix C). The neat dike fill volumes for the +10 ft MLLW and +20 ft MLLW dike elevation alternatives are presented in Table 4-1. The neat dike fills shown include allowances for backfill of excavated unsuitable material. Details of the neat dike fill volumes are presented in Tables D-1 through D-5 in Appendix D.

- ***Rock Protection & Quantities:*** Rock protection for the dikes was designed to provide sufficient protection against the adverse effects of high water and waves resulting from a 35-year return period storm (M&N 2002). In order to provide a high degree of protection, the armor layer was designed to a height greater than the maximum level of wave runup during storm surges. In general, the rock sections consist of a toe protection structure, geotextile filter fabric, underlayer stones, and armor stones (see Figures C-6 through C-12 in Appendix C). Where a berm was included in the dike section due to geotechnical requirements, the berm was to be used to limit wave runup and to reduce the armor size. Details of the coastal protection design can be obtained from the coastal engineering investigation reconnaissance study for James Island performed by Moffatt & Nichol. The required volumes of rock armor, underlayer stones, geotextile fabric, and quarry run are presented in Table 4-1. Details of the armoring quantities are presented in Tables D-1 through D-5 in Appendix D.

- ***Potential Borrow Sources & Volumes:*** There are four potential sand borrow sites within the vicinity of the James Island project. Figure B-6 in Appendix B shows the general location of the four borrow areas. Two of the sites are located north and west of James Island and two are located southeast and southwest of the southern end of the project site. The northern location has a total volume of 14.2 mcy, the western location has a total volume of 1.1 mcy, the southeast location has a total volume of 1.0 mcy, and the southwest location has a total available volume of 0.3 mcy. These are total volumes referenced from the Geotechnical Reconnaissance Study for James Island (E2CR 2002). Portions of these borrow sites are not accessible, as they are under the footprint of dikes. Estimated available sand volumes are presented in Figures B-7 through B-11 in Appendix B.

- ***Site Capacity & Operational Life:*** The calculation of site capacity and operational life involves three primary considerations: (i) volume occupied by dredged material (accounts for material bulking during dredging, and consolidation and desiccation of dredged material

following placement at the site), (ii) placement rates and lift thickness, and (iii) site area and site capacity-dike elevation relationship. For the analysis in this report, a volume occupied (VO) ratio of 0.65 was assumed above water (material placed above 0 ft MLLW) and a value of 0.75 was assumed below water (material placed below 0 ft MLLW). The calculation of the site life was determined by dividing the site capacity by the annual channel cut volume. To account for ponding and freeboard in the site capacity computations, a freeboard of 2.0 ft was provided for the upland cells. Wetland cell capacity is based on a final average elevation of +1.5. Total site capacity and operational life values for the 10 ft MLLW and 20 ft MLLW alternatives are presented in Table 4-2 at the end of this section.

Table 4-1. Estimated Material Pay Quantities

Alignment	Perimeter Length (LF)	Neat Dike Fill (CY)		Quarry Run (Tons)	Under Layer (Tons)	Armor Stone (Tons)	Toe Armor (Tons)	Roadway Stone (S.Y.)	Geotextile Fabric (S.Y.)
		Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW						
1	32,102	2,733,000	4,505,000	43,000	99,000	217,000	96,000	50,000	582,000
2	48,812	3,149,000	5,437,000	106,000	173,000	393,000	200,000	74,000	882,000
3	44,497	3,578,000	5,694,000	89,000	137,000	322,000	146,000	68,000	807,000
4	48,963	3,086,000	5,493,000	110,000	170,000	382,000	198,000	75,000	888,000
5	45,587	2,994,000	5,844,000	101,000	164,000	367,000	187,000	71,000	828,000

Note: Neat dike fill includes backfill of excavated unsuitable material.

4.2 SITE DESIGN ALIGNMENTS

Five design alignments have been analyzed for the restoration of James Island. Upland dike elevations of 10 ft and 20 ft have been analyzed for this study. Site areas varied from 979 to 2,202 acres. Table 4-2 presents a summary of the planning estimates, site capacity, operational life, and neat dike fill for each alignment.

The total site capacities shown are based on a volume occupied ratio of 0.65 above water and 0.75 below water. Wetland cell capacities are based on a final average elevation of +1.5 ft MLLW. A freeboard height of 2 ft has been included for the upland cells.

Table 4-2 Site Design Alignments - Planning Estimates

Alignment	Upland Baseline Area (Acres)	Wetland Baseline Area (Acres)	Total Baseline Area (Acres)	Average Water Depth (Ft. MLLW)	Total Site Capacity (mcy)	Total Site Life (Yrs)	Neat Dike Fill (mcy)
10 Ft. MLLW Dike Elevation:							
1	489	489	979	6	23	13	2.7
2	1,063	1,063	2,127	6.5	52	15	3.1
3	793	793	1,586	6	38	13	3.6
4	1,101	1,101	2,202	6	51	15	3.1
5	1,036	1,036	2,072	6	49	14	3.0
20 Ft. MLLW Dike Elevation:							
1	489	489	979	6	35	20	4.5
2	1,063	1,063	2,127	6.5	78	22	5.4
3	793	793	1,586	6	57	20	5.7
4	1,101	1,101	2,202	6	79	23	5.5
5	1,036	1,036	2,072	6	75	21	5.8

5.0 SITE CONSTRUCTION & OPERATION

5.1 GENERAL

The significant element of construction is the containment dike system, which includes the perimeter and interior dikes. The perimeter dike consists of the dike core (mostly sand), a stone toe dike, slope stone and a stone roadway. The interior dikes consist of the dike core and a stone roadway.

The major construction elements are listed below in their order of work:

1. Borrow areas excavation
2. Placement of temporary sand stockpile
3. Excavation/Backfill of unsuitable foundation materials
4. Exterior toe dike (quarry run and armor stone)
5. Geotextile fabric placement
6. Dike (sand and silty sand, hauled from stockpile)
7. Dike armor stone (2 layers armor and under-layer)
8. Stone roadway
9. Ancillary items (spillways, a service pier, and habitat vegetation)

5.2 GENERAL SITE CONSTRUCTION

All five alignments are generally located along the west side of James Island, with portions to the north and south of the island. Fill material is assumed to be excavated from all the borrow areas, as shown on Figures B-6 through B-11 in Appendix B.

5.3 CONSTRUCTION TECHNIQUES

Dredged material containment sites may be constructed using several techniques. Construction possibilities for the fill material include direct placement using pipelines from hydraulic dredges, pump-out from hydraulic unloaders, and hydraulic stockpile trucked to the dike section. For the purpose of this report it is assumed that the hydraulic stockpile and truck haul method of dike fill construction (the method previously used at Poplar Island) will be used. It is assumed that a small hydraulic dredge will complete excavation and backfill of the unsuitable foundation material. It is assumed that rock will be transported by barge to the site and then be handled by a crane at or near the dike section.

5.4 MATERIAL PLACEMENT OPERATIONS

For dredged material placement operations, it is assumed that future maintenance materials are dredged/transported by clamshell/barge and placed within the island site by hydraulic unloader. Annual dredging volumes from Baltimore Harbor Outer Channels and the Chesapeake & Delaware Approach Channel, requiring placement at this Island site is assumed to be on average 3.5 mcy (GBA 2002). The dredging volumes include material from the following channels: (i) C&D Canal Approach, (ii) Tolchester Channel, (iii) Swan Point Channel, (iv) Brewerton

Channel Extension, (v) Craighill Upper Range Channel (including Craighill Angle, Craighill Upper Range, and Cutoff Angle Channels). Weighted average one-way transport distances were computed from these channels to the Island site based on estimated dredging quantities and the shortest distance from the centroid of the dredging locations to the site, giving due consideration of the draft requirements for the barges.

5.5 SITE OPERATIONS

As part of development of the project site, 50% of the James Island area will be restoration and creation of wetland, including intertidal wetland, high marsh, low marsh, bird islands, mud flats and circulation channels. The wetland dike height will range from 8 to 10 ft MLLW. The remaining 50% will be upland habitat.

This report assumes that, once the maintenance dredged material placed at the site approaches the elevation of the bay water level, crust management is implemented in order to maximize the operational life of the site. Also, dried dredged material resulting from such operations could be a valuable source for building berms and for future dike raising.

The progress and effectiveness of site construction and operation should be evaluated using site surveys and monitoring procedures. These typically include pre-construction environmental monitoring (contaminants, benthos, biota, etc), pre-construction surveys, quality assurance surveys, post-construction surveys, annual surveys, and post-construction environmental monitoring (ground water, TSS, effluent/runoff quality). A detailed monitoring and surveying plan (number, location, and spacing of stations and/or samples) should be developed based on site-specific factors.

General site geometries and construction quantities for the five alignments are presented in Table 5-1 for the 10 ft and 20 ft dike elevation alternatives. Table 5-1 also presents the estimated completion times for construction of the site. These completion times are based on the following assumptions:

- The total completion time was based on the time required for the longest construction element (rock placement for the 10 ft dike elevation and hydraulic fill for the 20 ft dike elevation) plus an additional six months to allow for mobilization, demobilization and overlap of the construction elements,
- 30 working days per month at 12 hour days,
- 15,000 cubic yards of dike material are dredged and stockpiled per day,
- 5,000 cubic yards of dike material are placed per day,
- Rock placement includes toe dike, slope stone and road stone, and
- 50 linear feet of stone will be placed per day.

Details for the costs related to construction, site development, habitat development and operation for the five alignments are discussed in Section 6 and are presented in Appendix E.

Table 5-1 Estimated Construction Completion Times

Alignment	Neat Dike Fill Volume (CY)		Stockpile Completion Time (Days)		Dike Fill Completion Time (Days)		Dike Perimeter Length (Lin. Ft.)	Dike Rock Placement (Tons)	Rock Placement Time (Days)	Total Completion Time (Years)	
	Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW	Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW	Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW				Dike Elev. 10 ft MLLW	Dike Elev. 20 ft MLLW
1	2,733,000	4,505,000	182	300	547	901	32,102	455,000	642	2.3	3.0
2	3,149,000	5,437,000	210	362	630	1,087	48,812	872,000	976	3.2	3.5
3	3,578,000	5,694,000	239	380	716	1,139	44,497	694,000	890	3.0	3.7
4	3,086,000	5,493,000	206	366	617	1,099	48,963	860,000	979	3.2	3.6
5	2,994,000	5,844,000	200	390	599	1,169	45,587	819,000	912	3.0	3.7

6.0 SITE COSTS

The total site costs for the various alignments consist of the following four major items:

- ***Initial Construction Costs:*** This includes construction of the dikes to the desired initial elevation, dike stabilization costs (armor, underlayer, and toe protection), installation of spillways/outlet structures, and site infrastructure. Also included in the initial construction costs are the study costs. The study costs consist of the conceptual study, reconnaissance study, and feasibility study costs.

- ***Habitat Development Costs:*** These are fixed and annual costs for planning, design, and implementation of wetland and upland habitat, including: circulation channels, planting and seeding, operation and maintenance (O&M), and habitat monitoring for the life of the site.

- ***Site Development Costs:*** This includes annual dredged material management, site maintenance, and site monitoring/reporting for the operational life of the site.

- ***Dredging, Transport and Placement (DTP) Costs:*** This includes costs for mobilization and demobilization, dredging the navigation channels, transport to the placement site, and unloading of the dredged material at the placement site for the operational life of the site. The DTP costs are the most significant of the four major items at about 60% of the total site costs and are further broken down and appropriated as follows:

    - ***DTP Costs Apportioned to Navigation Channels:*** DTP costs charged to a designated USACE navigation channel must be apportioned to that project consistent with the disposal plan identified as the Federal Standard or National Economic Development (NED) disposal plan for that project. For the purposes of this analysis we are using $3.80/cy as the estimate for the DTP costs apportioned to the USACE navigation channels. It should be noted that this NED apportionment is subject to revision and that the ongoing Dredge Material Management Plan being developed by the USACE had the potential to alter this estimate significantly.

    - ***DTP Costs Apportioned to The James Island Project***: The DTP incremental costs, over and above the federal share of the NED disposal plan for that project are apportioned to the James Island Project.

Based on the above factors, the total project costs for the operational life of the site equal the sum of the initial construction, habitat development costs, site development costs, and all apportioned dredging, transport and placement costs. The total project cost, along with the cost per cubic yard of capacity, were generated to compare the various island alignments.

The cost estimates for the initial construction are developed by averaging previous bid and construction costs from the Poplar Island projects and escalating them to 2002 costs (See Table E-16 in Appendix E). The basis for the habitat and site development costs and the dredging , transport and placement costs are shown in Tables E-6 through E-15 in Appendix E. A 15%

contingency is added to the totals of the cost estimates. It is felt that this will provide a good approximation of current day costs, suitable for reconnaissance cost estimates and for comparing the various design alignments presented herein.

6.1 TOTAL SITE COSTS

The total project costs in constant 2002 dollars for the five alignments is presented in Table 6-1 for the 10 ft MLLW dike elevation and in Table 6-2 for the 20 ft MLLW dike elevation. The cost tables for the individual alignments are presented in Tables E-1 through E-15 (Appendix-E).

Table 6-1 Total Project Cost for 10 ft Upland Dike Elevation

	Alignment				
	1	2	3	4	5
Net Capacity (Million Cubic Yards)	23	52	37	51	49
Life (Years)	13	15	13	15	14
A. Initial Construction ($Million)	66	83	85	81	78
B. Site Development ($Million)	49	84	66	84	74
C. Habitat Development ($Million)	24	34	28	34	32
D. Dredging, Transport and Placement ($Million)	214	459	337	454	432
Subtotal ($Million)	353	660	517	653	616
Contingency @ 15% ($Million)	53	99	77	98	92
Total Project Cost ($Million)	**406**	**759**	**594**	**751**	**709**
Cost per Cubic Yard Capacity ($Million)	**18**	**15**	**16**	**15**	**14**
Dredging, Transport and Placement ($Million)	86	198	143	195	186
Contingency @ 15% ($Million)	13	30	21	29	28
Total Channel Apportioned Cost ($Million)	**99**	**227**	**164**	**225**	**214**
Total Project Cost ($Million)	406	759	594	751	709
Less Apportioned Costs to Channels ($Million)	(99)	(227)	(164)	(225)	(214)
Total James Isl. Apportioned Cost ($Million)	**308**	**531**	**430**	**526**	**494**

Note: Numbers may not add up due to rounding.

Table 6-2 Total Project Cost for 20 ft Upland Dike Elevation

	Alignment				
	1	2	3	4	5
Net Capacity (Million Cubic Yards)	35	78	57	79	75
Life (Years)	20	22	20	23	21
A. Initial Construction ($Million)	82	101	102	100	101
B. Site Development ($Million)	73	123	97	125	113
C. Habitat Development ($Million)	31	41	35	42	40
D. Dredging, Transport and Placement ($Million)	328	692	514	695	660
Subtotal ($Million)	514	957	748	962	913
Contingency @ 15% ($Million)	77	144	112	144	137
Total Project Cost ($Million)	**591**	**1,101**	**861**	**1,106**	**1,050**
Cost per Cubic Yard Capacity ($Million)	**17**	**14**	**15**	**14**	**14**
Dredging, Transport and Placement ($Million)	132	298	217	299	284
Contingency @ 15% ($Million)	20	45	33	45	43
Total Channel Apportioned Cost ($Million)	152	342	250	344	326
Total Project Cost ($Million)	591	1,101	861	1,106	1,050
Less Apportioned Costs to Channels ($Million)	(152)	(342)	(250)	(344)	(326)
Total James Isl. Apportioned Cost ($Million)	**439**	**759**	**611**	**762**	**724**

Note: Numbers may not add up due to rounding.

7.0 SUMMARY OF ALIGNMENT COSTS & CHARACTERISTICS

7.1 COST-BASED ALIGNMENT COMPARISON

For a cost-based analysis of each alignment, total costs and unit costs for each alignment were considered, which included the following:

- Initial construction costs
- Habitat development costs
- Site development costs
- Dredging/transport and placement costs, and
- Contingency costs

The baseline perimeter length, total surface area, and total site capacity are important factors in estimating the costs to construct and operate the site. Unit costs are determined by dividing the total cost by the site capacity. Table 7-1 presents the site design data and associated project costs and unit cost for each of the five alignments with respect to the 10 ft. MLLW and the 20 ft. MLLW dike elevations. It should also be noted that alignments 1 and 3 for both the 10 ft. dike and 20 ft. dike have net annual placements less than the 3.5 mcy average requirement described in Section 5.4. In the case of Alignment 1 the net annual disposal is 1.7 mcy and is 2.8 mcy for Alignment 3. All other alignments have a net annual disposal, which meets the need. This explains why significant differences in project scale do not appear to cause significant changes in project life.

Table 7-1 Site Design Summary

Alignment	Baseline Perimeter Length (Ft.)	Total Surface Area (Acres)	Total Site Capacity (Mcy)	Total Site Life (Yrs.)	Project Costs ($ Millions)			Cost per CY Capacity ($/CY)
					Apportioned to		Total Project Costs	
					James Island	Channel Projects		
10 Ft. MLLW Dike Elevation:								
1	32,102	979	23	13	308	99	406	18
2	48,812	2,127	52	15	531	227	759	15
3	44,497	1,586	37	13	430	164	594	16
4	48,963	2,202	51	15	526	225	751	15
5	45,587	2,072	49	14	494	214	709	14
20 Ft. MLLW Dike Elevation:								
1	32,102	979	35	20	439	152	591	17
2	48,812	2,127	78	22	759	342	1,101	14
3	44,497	1,586	57	20	611	250	861	15
4	48,963	2,202	79	23	762	344	1,106	14
5	45,587	2,072	75	21	724	326	1,050	14

7.2 COMPARISON OF ALTERNATIVES

7.2.1 10 ft MLLW Dike Elevation

Figure 7-1 presents the total project cost versus the total surface area for each alignment with respect to the 10 ft MLLW dike elevation design alternatives. Alignment 1 has the smallest total surface area (979 acres) and results in the lowest total cost ($406 million). Inversely, Alignment 2 has one of the largest surface areas (2,127 acres) and has a total cost of ($759 million). Alignments 2, 4 and 5 have similar surface areas, which result in similar total costs.

Figure 7-2 presents the unit cost per cubic yard of capacity versus the total surface area for each alignment with respect to the 10 ft MLLW dike elevation design alternative. Alignments 2, 4 and 5 have the smallest unit cost at $14/cy and $15/cy and Alignment 1 has the largest unit cost at $18/cy. This suggests that the unit cost is sensitive to the total site surface area and a larger surface area provides for lower total unit costs.

7.2.2 20 ft MLLW Dike Elevation

Figure 7-3 presents the total project cost versus the total surface area for each alignment with respect to the 20 ft dike elevation design alternative. Alignment 1 has the smallest total surface area (979 acres) and results in the lowest total cost ($591 million). Inversely, Alignment 4 has the greatest surface area (2,202 acres) and has a total cost of ($1,106 million). Alignments 2, 4 and 5 have similar surface areas, which result in similar total costs. It should be noted that the total surface area does not change as a result of an increase in dike elevation. This is due to the fact that the surface area is calculated with respect to the design baseline, which does not change.

Figure 7-4 presents the unit cost per cubic yard of capacity versus the total surface area for each alignment with respect to the 20 ft MLLW dike elevation design alternative. Alignments 2, 4 and 5 have the smallest unit cost at $14/cy and Alignment 1 has the largest unit cost at $17/cy. It is again shown from Figure 7-4 that the unit cost is sensitive to the total site capacity resulting from the site design.

Figure 7-1 Total Project Cost vs. Surface Area
(at 10 ft MLLW Dike Elevation)

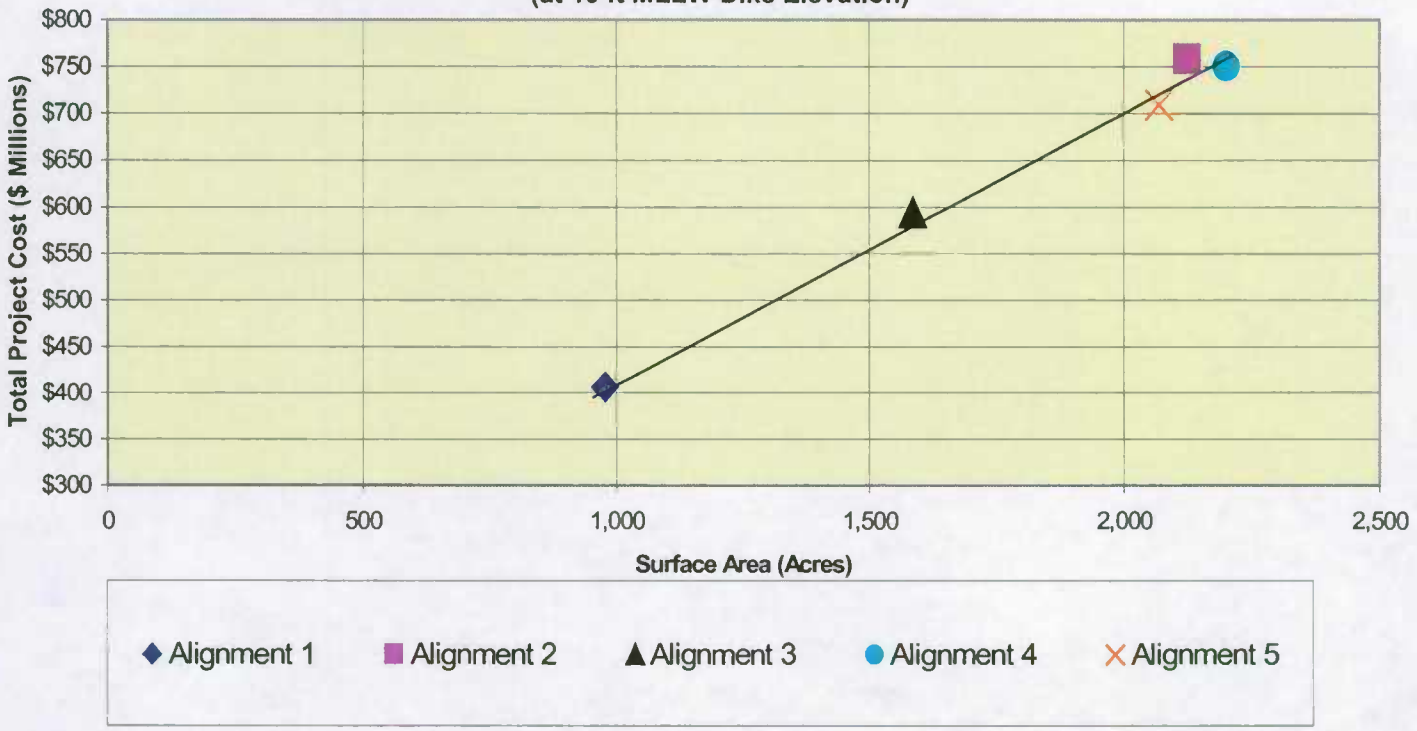


Figure 7-2 Unit Cost per CY at Capacity vs. Surface Area
(at 10 ft. MLLW Dike Elevation)

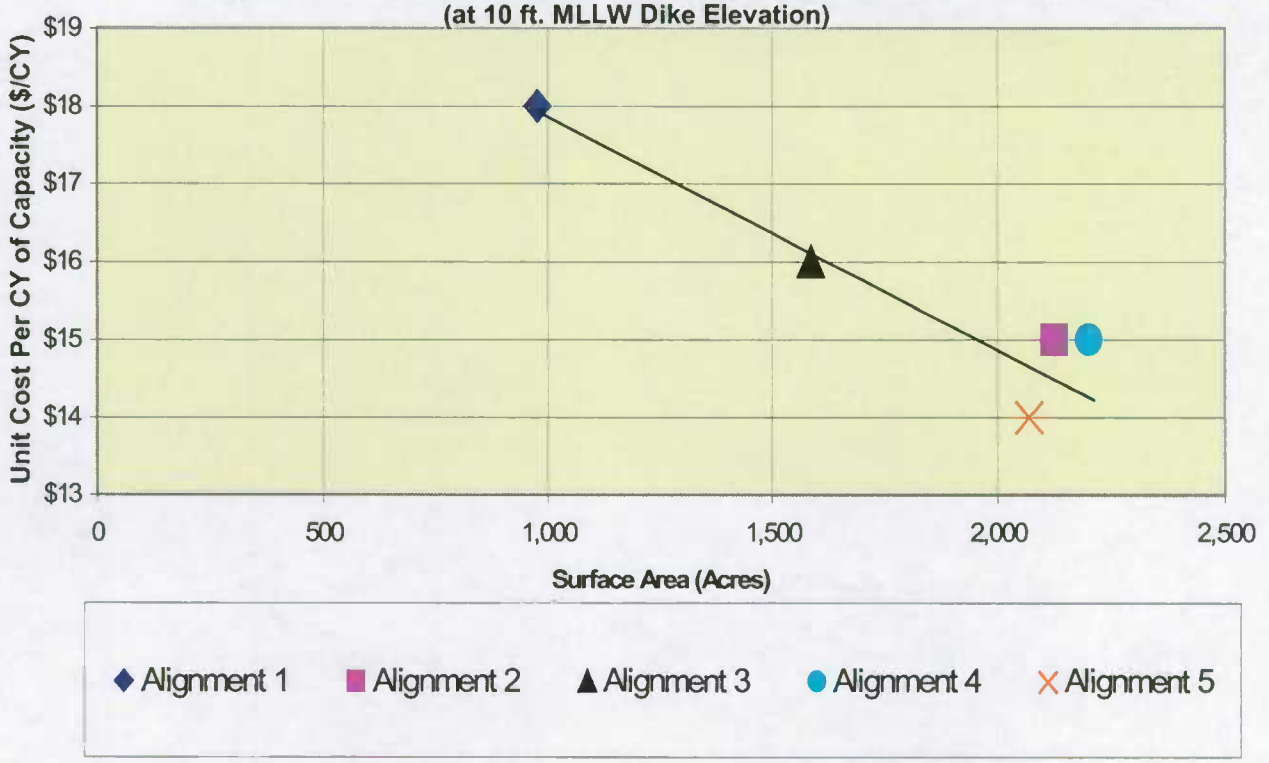


Figure 7-3 Total Project Cost vs. Surface Area
(at 20 ft MLLW Dike Elevation)

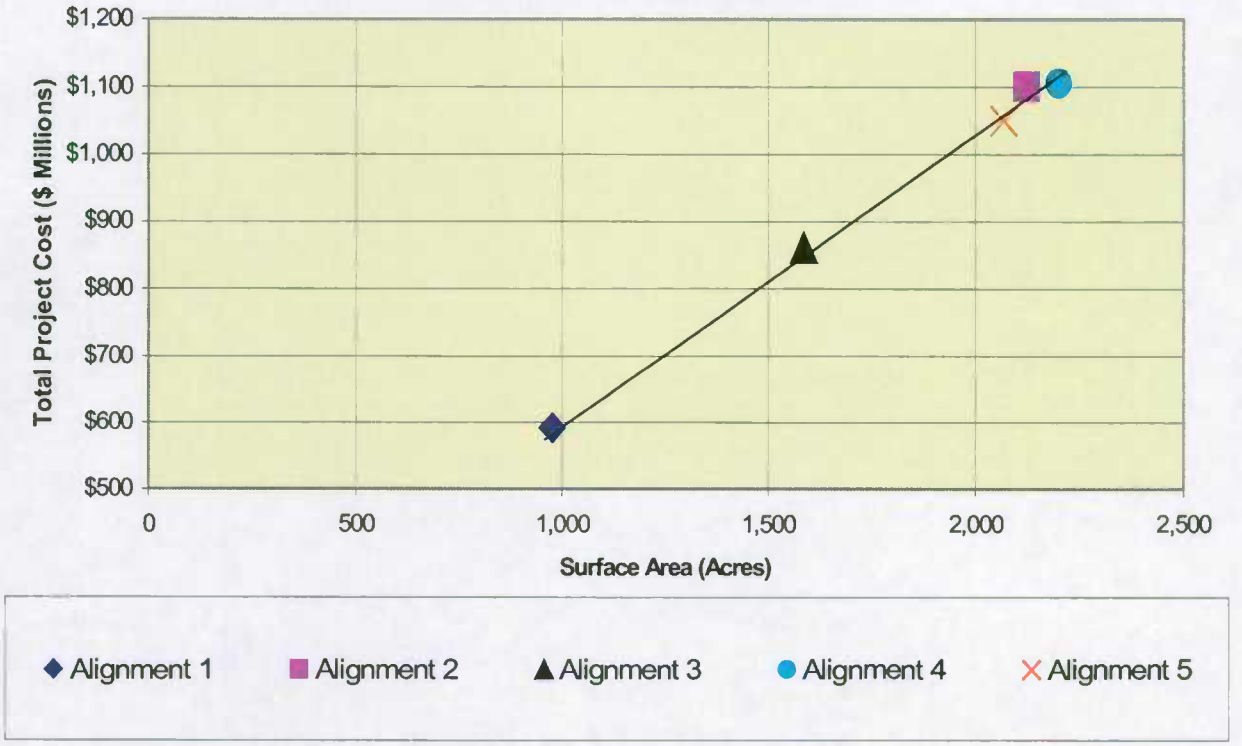
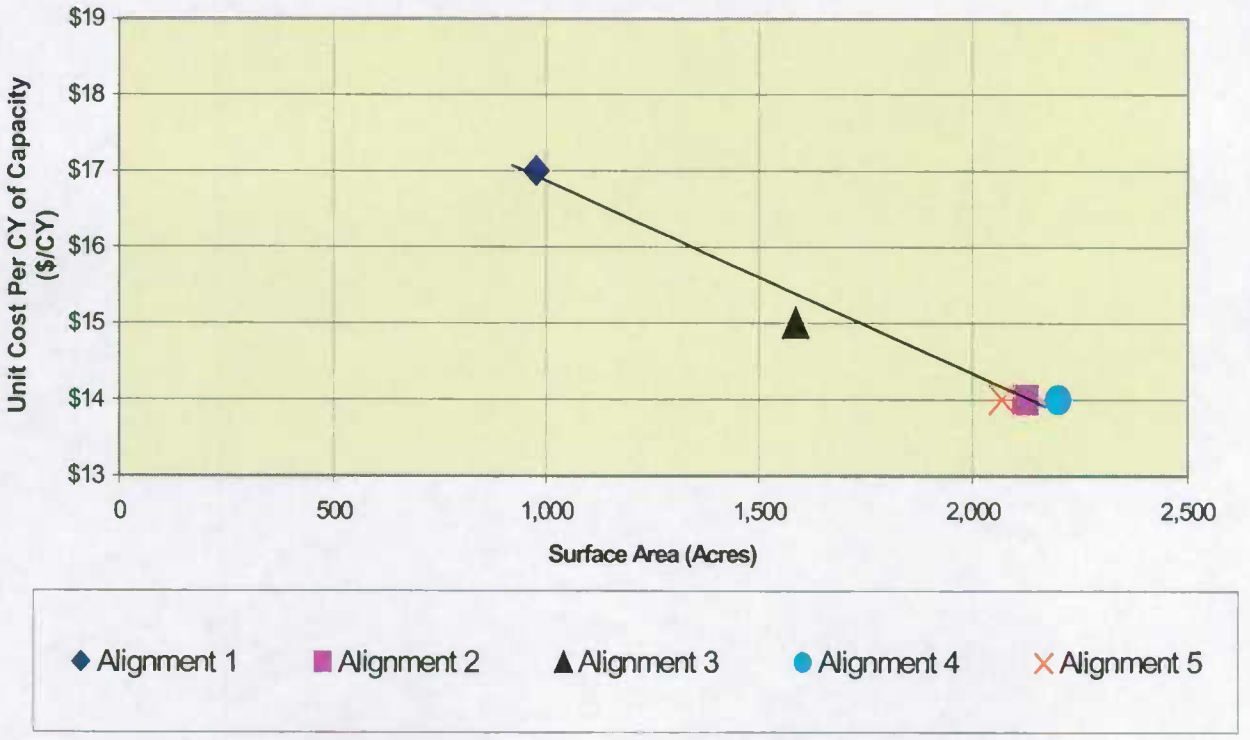


Figure 7-4 Unit Cost per CY at Capacity vs. Surface Area
(at 20 ft MLLW Dike Elevation)



8.0 REFERENCE

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APPENDIX A

SITE LOCATION PLAN

N

CHESAPEAKE BAY

TILGHMAN ISLAND

CHOPTANK RIVER

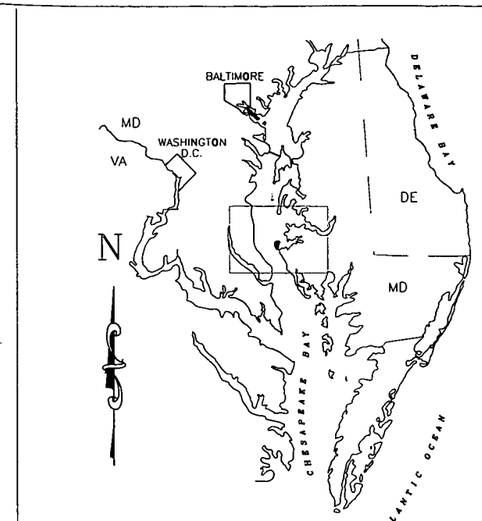
JAMES ISLAND POTENTIAL ALIGNMENTS

JAMES ISLAND

LITTLE CHOPTANK RIVER

TAYLORS ISLAND

PATUXENT RIVER



NOT TO SCALE

VICINITY MAP

SCALE
1 0 .5 1 2
NM

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE AND MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

SITE LOCATION PLAN

SURVEYED BY: _____
DESIGNED BY: W.J.D.
DRAWN BY: T. B. BURWELL
TRACED BY: _____
CHECKED BY: D. C. URSO

DATE: FEB 2003
SCALE: 1"= 2'

CONTRACT NO. 02-07-30

FIGURE NO. A - 1

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APPENDIX B

GEOTECHNICAL RECONNAISSANCE MAPS & SAND BORROW AREA MAPS

NOB 15-2

NOB 15-1

NOB 14-6

NOB 14-5

TAYLORS ISLAND

JAMES ISLAND

WETLAND CELL

UPLAND CELL

CHESAPEAKE BAY

JB1 JB2 JB3 JB4 JB5 JB6 JB7 JB8 JB9 JB10 JB11 JB12 JB13 JB14 JB15 JB16 JB17 JB18 JB19 JB20 JB21 JB22

CP1 CP2 CP3 CP4

-6 -12 -18

LEGEND

- EXISTING SHORELINE
- POTENTIAL ALIGNMENT
- N.O.B. BOUNDARY
- -6- NOAA CONTOUR
- JBxx SPT BORING
- CPx CPT BORING

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1000 0 1000 2000
SCALE : 1" = 2000'

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GEOTECHNICAL BORING LOCATION PLAN ALIGNMENT 1

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DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

DATE: FEB 2003
SCALE: 1"=2000'

CONTRACT NO. 02-07-16

FIGURE NO. B - 1

NOB 15-2

NOB 15-1

NOB 14-6

NOB 14-5

TAYLORS ISLAND

JAMES ISLAND

WETLAND CELL

UPLAND CELL

CHESAPEAKE BAY

JB1 JB2 JB3 JB4 JB5 JB6 JB7 JB8 JB9 JB10 JB11 JB12 JB13 JB14 JB15 JB16 JB17 JB18 JB19 JB20 JB22 JP21

CP1 CP2 CP3 CP4

-6 -12 -18

1000 0 1000 2000
SCALE : 1" = 2000'

LEGEND

- EXISTING SHORELINE
- POTENTIAL ALIGNMENT
- N.O.B. BOUNDARY
- -6- NOAA CONTOUR
- JBxx SPT BORING
- CPx CPT BORING

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GEOTECHNICAL BORING LOCATION PLAN ALIGNMENT 2

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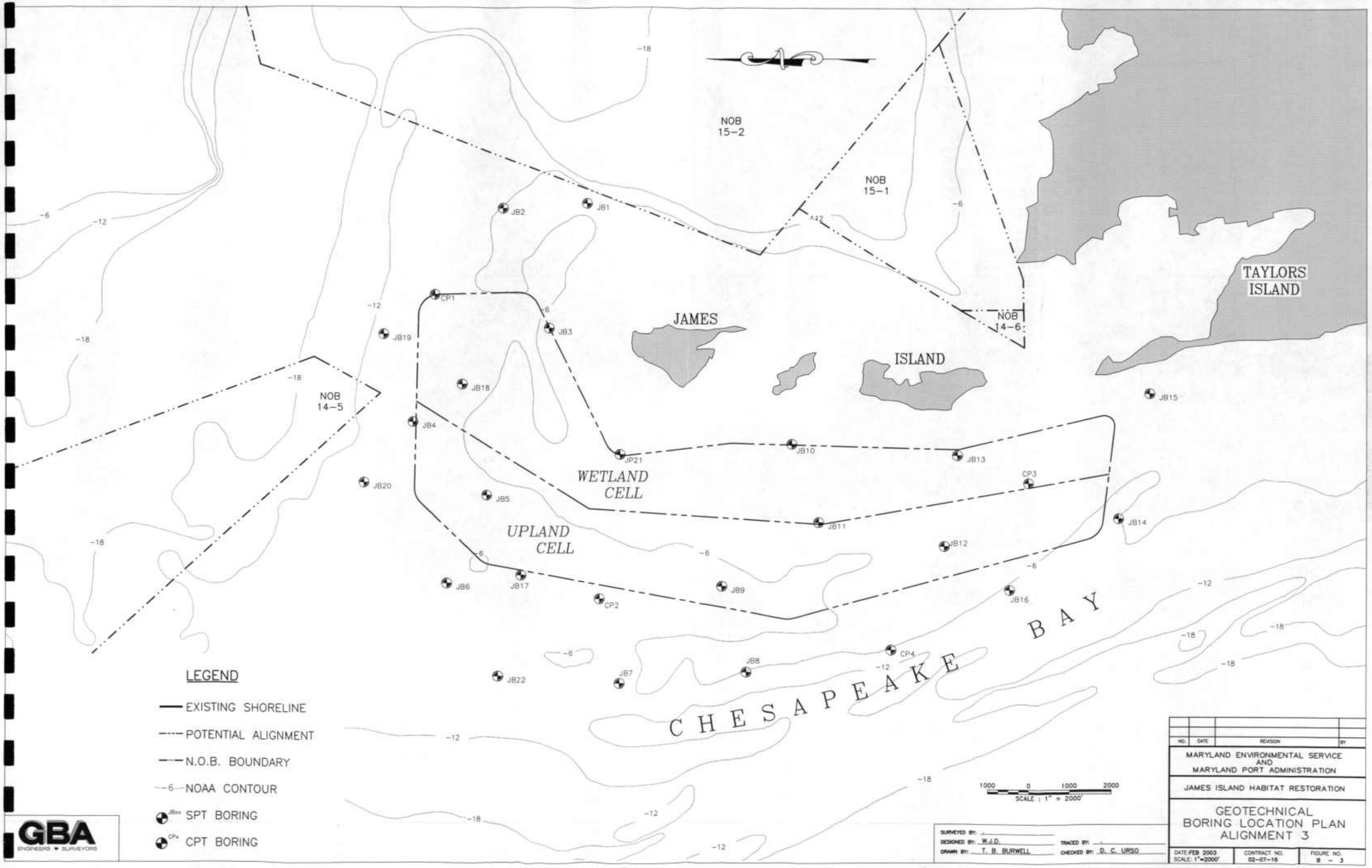
CHECKED BY: D. C. URSO

DATE: FEB 2003
SCALE: 1"=2000'
CONTRACT NO. 02-07-16
FIGURE NO. 9 - 2


NOB 15-2
NOB 15-1
NOB 14-6
NOB 14-5
JAMES ISLAND
TAYLORS ISLAND
WETLAND CELL
UPLAND CELL
CHESAPEAKE BAY
JB1
JB2
JB3
JB4
JB5
JB6
JB7
JB8
JB9
JB10
JB11
JB12
JB13
JB14
JB15
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JB19
JB20
JB22
JP21
CP1
CP2
CP3
CP4
-6
-12
-18
LEGEND
EXISTING SHORELINE
POTENTIAL ALIGNMENT
N.O.B. BOUNDARY
-6- NOAA CONTOUR
JBxx SPT BORING
CPx CPT BORING
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SCALE : 1" = 2000'
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JAMES ISLAND HABITAT RESTORATION
GEOTECHNICAL BORING LOCATION PLAN ALIGNMENT 3
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CHECKED BY: D. C. URSO
DATE: FEB 2003
SCALE: 1"=2000'
CONTRACT NO. 02-07-16
FIGURE NO. B - 3

NOB 15-2

NOB 15-1

NOB 14-6

NOB 14-5

TAYLORS ISLAND

JAMES ISLAND

WETLAND CELL

UPLAND CELL

CHESAPEAKE BAY

JB1 JB2 JB3 JB4 JB5 JB6 JB7 JB8 JB9 JB10 JB11 JB12 JB13 JB14 JB15 JB16 JB17 JB18 JB19 JB20 JB22 JP21

CP1 CP2 CP3 CP4

-6 -12 -18

LEGEND

- EXISTING SHORELINE
- POTENTIAL ALIGNMENT
- N.O.B. BOUNDARY
- -6- NOAA CONTOUR
- JBxx SPT BORING
- CPx CPT BORING

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1000 0 1000 2000
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GEOTECHNICAL BORING LOCATION PLAN ALIGNMENT 4

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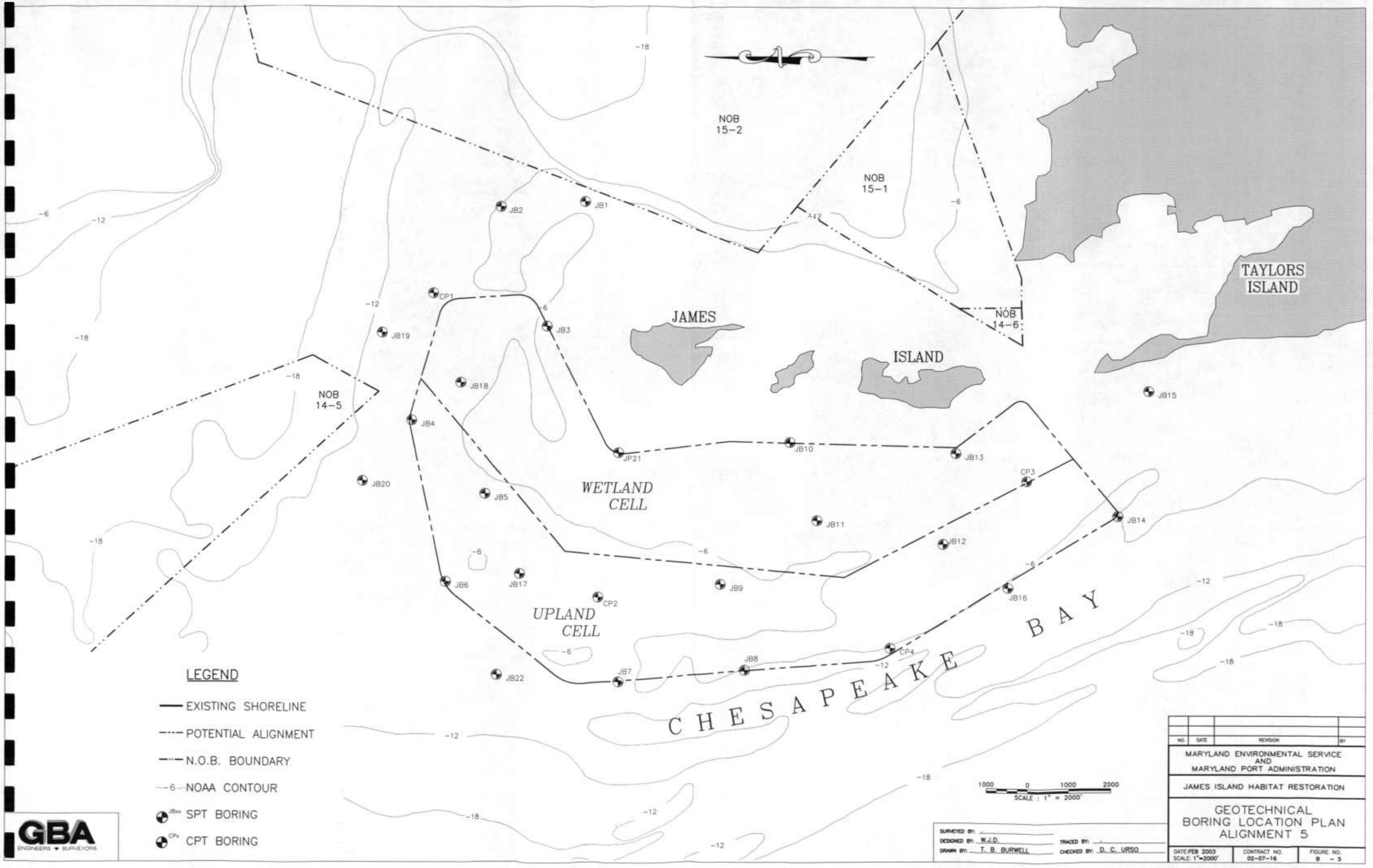
DATE: FEB 2003	CONTRACT NO.	FIGURE NO.
SCALE: 1"=2000'	02-07-16	B - 4



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GEOTECHNICAL BORING LOCATION PLAN ALIGNMENT 5

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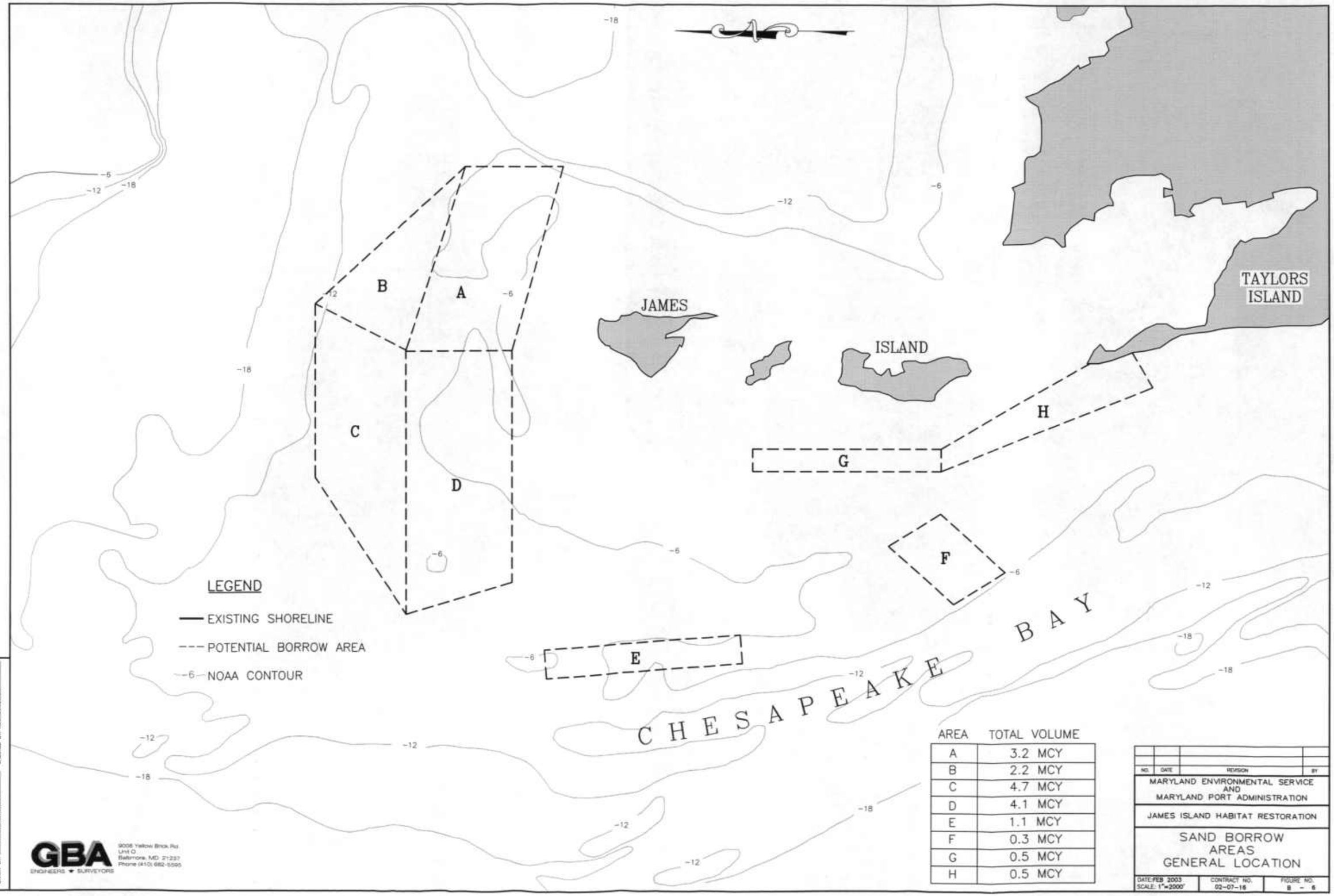
DATE: FEB 2003 SCALE: 1"=2000'	CONTRACT NO. 02-07-16	FIGURE NO. 8 - 5



AREA	TOTAL VOLUME
A	3.2 MCY
B	2.2 MCY
C	4.7 MCY
D	4.1 MCY
E	1.1 MCY
F	0.3 MCY
G	0.5 MCY
H	0.5 MCY

SURVEYED BY: _____ TRACED BY: _____
DESIGNED BY: W.J.D. CHECKED BY: D. C. URSO
DRAWN BY: T. B. BURWELL

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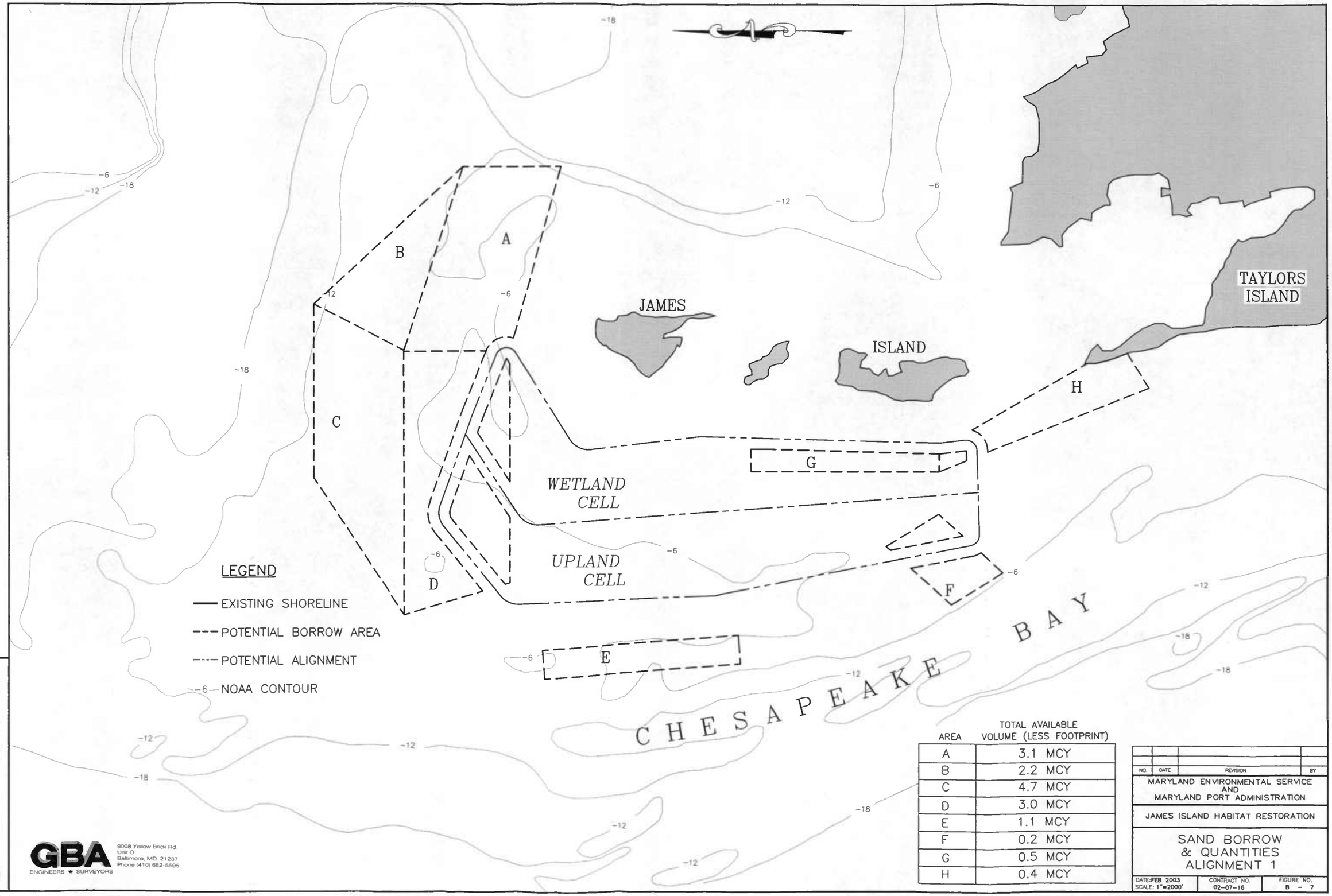
SAND BORROW AREAS GENERAL LOCATION

DATE: FEB 2003 SCALE: 1"=2000'	CONTRACT NO. 02-07-16	FIGURE NO. 8 - 6



AREA	TOTAL AVAILABLE VOLUME (LESS FOOTPRINT)
A	3.1 MCY
B	2.2 MCY
C	4.7 MCY
D	3.0 MCY
E	1.1 MCY
F	0.2 MCY
G	0.5 MCY
H	0.4 MCY

SURVEYED BY: ---
DESIGNED BY: W.J.D. TRACED BY: ---
DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

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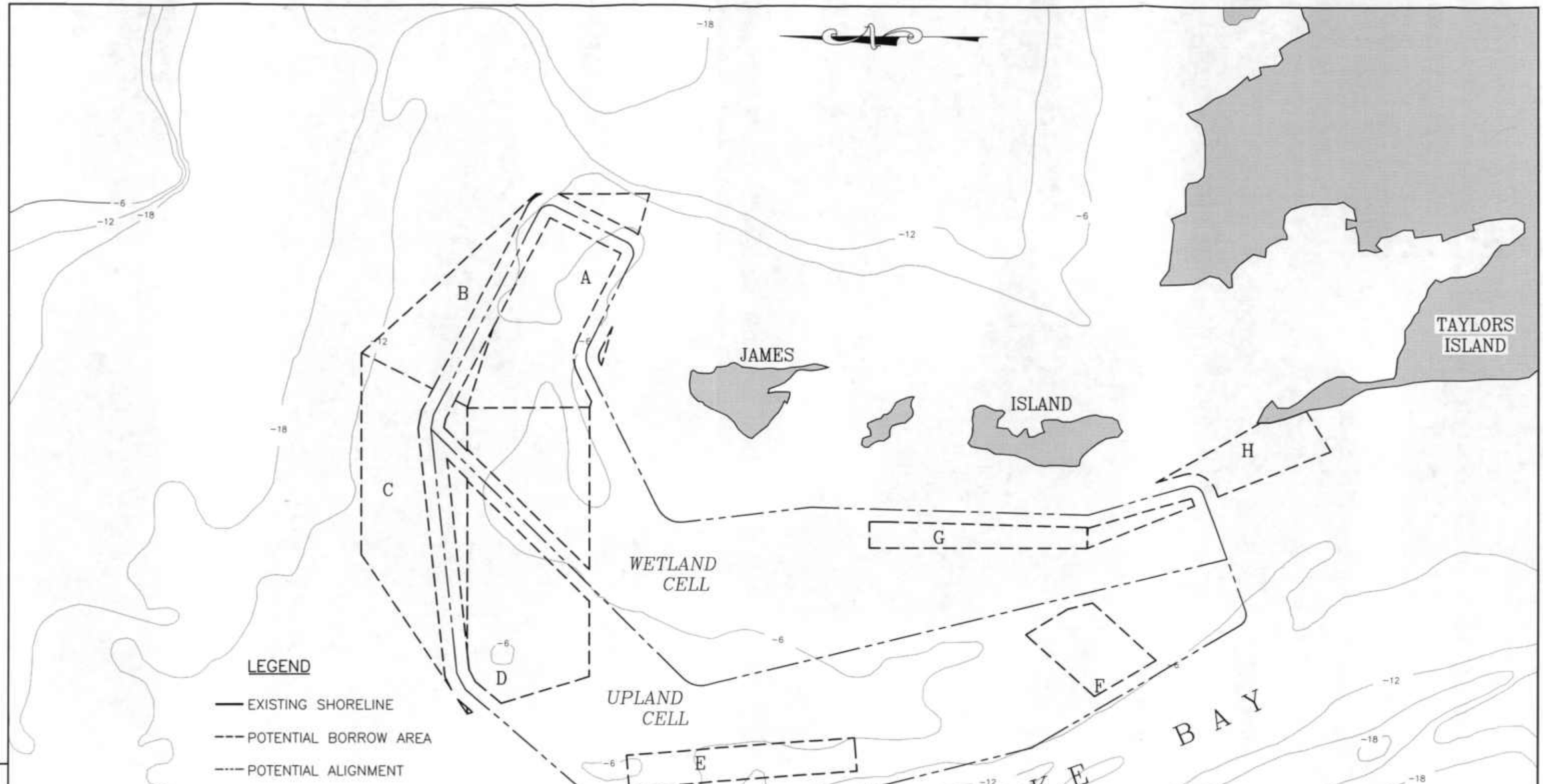
SAND BORROW & QUANTITIES ALIGNMENT 1

DATE: FEB 2003
SCALE: 1"=2000'

CONTRACT NO. 02-07-16

FIGURE NO. B - 7



AREA	TOTAL AVAILABLE VOLUME (LESS FOOTPRINT)
A	2.3 MCY
B	1.5 MCY
C	3.3 MCY
D	3.6 MCY
E	1.1 MCY
F	0.2 MCY
G	0.5 MCY
H	0.4 MCY

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JAMES ISLAND HABITAT RESTORATION

SAND BORROW & QUANTITIES ALIGNMENT 2

DATE: FEB 2003 | SCALE: 1"=2000' | CONTRACT NO. 02-07-16 | FIGURE NO. 8 - 8

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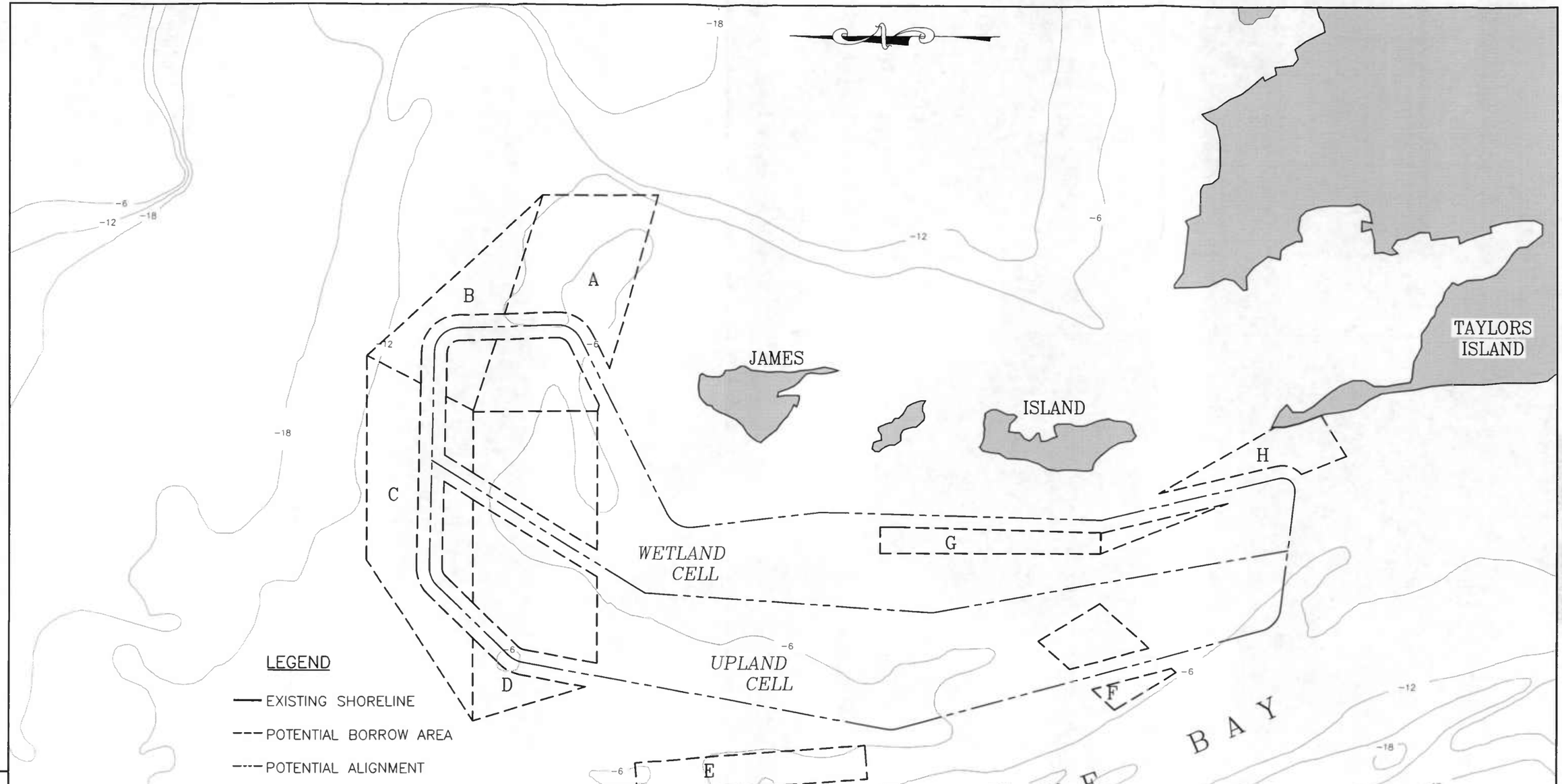
Phone (410) 682-5595



LEGEND

- EXISTING SHORELINE
- POTENTIAL BORROW AREA
- POTENTIAL ALIGNMENT
- -6- NOAA CONTOUR

AREA	TOTAL AVAILABLE VOLUME (LESS FOOTPRINT)
A	2.7 MCY
B	1.7 MCY
C	3.5 MCY
D	3.3 MCY
E	1.1 MCY
F	0.2 MCY
G	0.5 MCY
H	0.3 MCY

SURVEYED BY: ____ TRACED BY: ____
DESIGNED BY: W.J.D. CHECKED BY: D. C. URSO
DRAWN BY: T. B. BURWELL

GBA
ENGINEERS ★ SURVEYORS
9008 Yellow Brick Rd.
Unit O
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NO.	DATE	REVISION	BY

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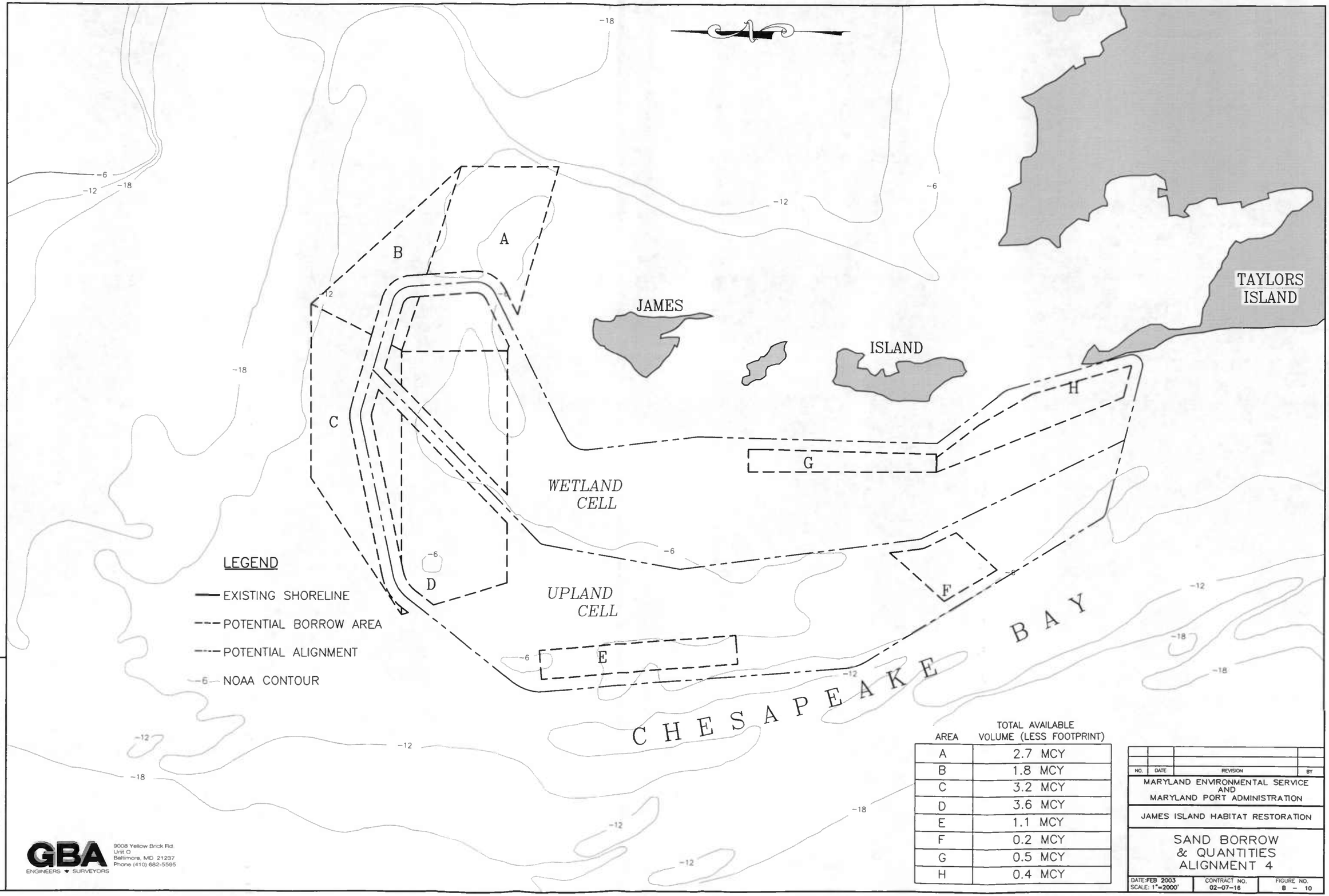
AND
MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

SAND BORROW & QUANTITIES ALIGNMENT 3

DATE: FEB 2003 SCALE: 1"=2000'	CONTRACT NO. 02-07-16	FIGURE NO. B - 9



AREA	TOTAL AVAILABLE VOLUME (LESS FOOTPRINT)
A	2.7 MCY
B	1.8 MCY
C	3.2 MCY
D	3.6 MCY
E	1.1 MCY
F	0.2 MCY
G	0.5 MCY
H	0.4 MCY

SURVEYED BY: ...
DESIGNED BY: W.J.D. TRACED BY: ...
DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

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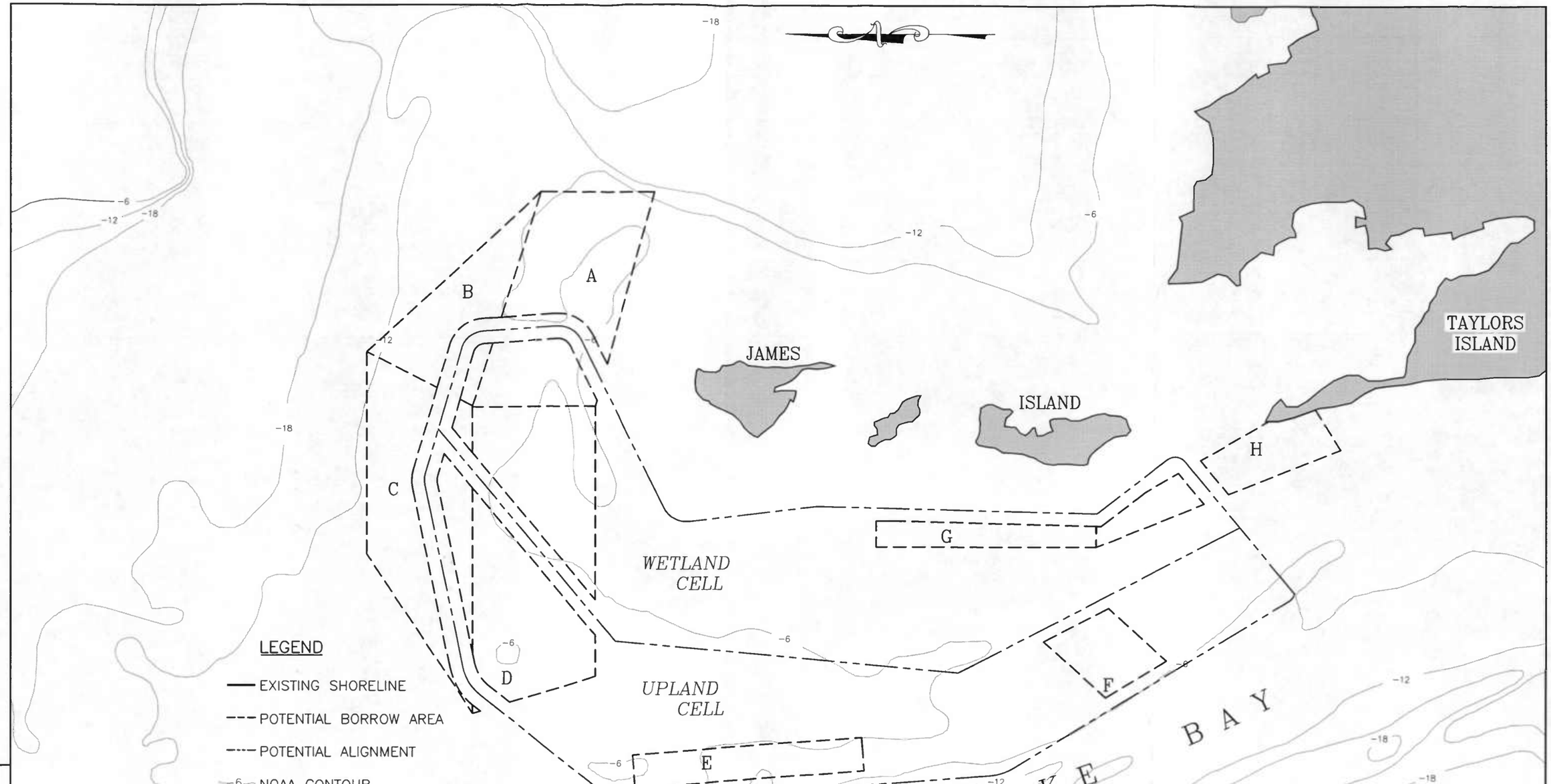
SAND BORROW & QUANTITIES ALIGNMENT 4

DATE: FEB 2003
SCALE: 1"=2000'

CONTRACT NO. 02-07-16

FIGURE NO. 8 - 10



LEGEND

- EXISTING SHORELINE
- POTENTIAL BORROW AREA
- POTENTIAL ALIGNMENT
- -6 NOAA CONTOUR

AREA	TOTAL AVAILABLE VOLUME (LESS FOOTPRINT)
A	2.7 MCY
B	1.8 MCY
C	3.2 MCY
D	3.5 MCY
E	1.1 MCY
F	0.2 MCY
G	0.5 MCY
H	0.4 MCY

SURVEYED BY: ...
DESIGNED BY: W.J.D. TRACED BY: ...
DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

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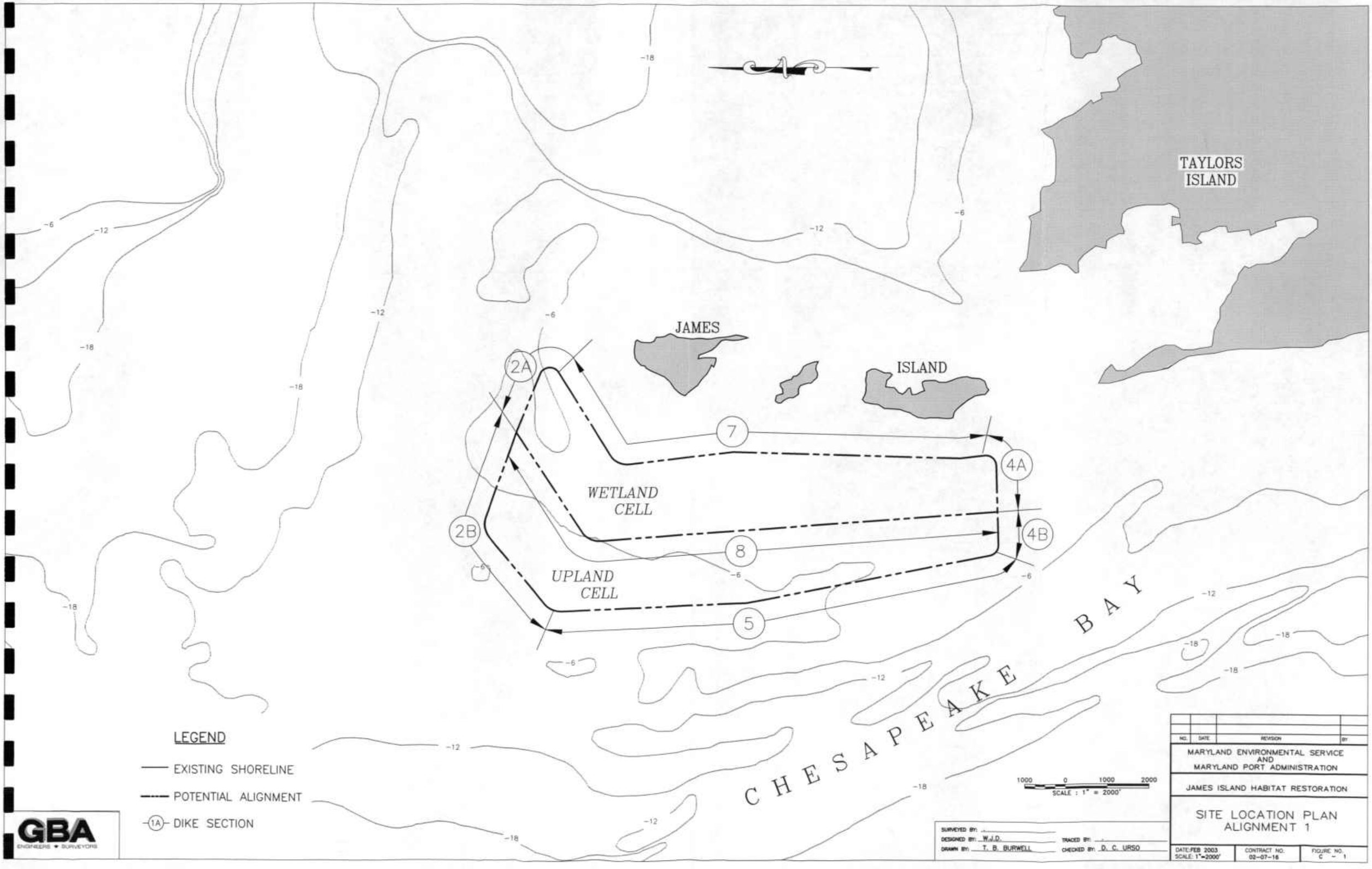
SAND BORROW & QUANTITIES ALIGNMENT 5

DATE: FEB 2003
SCALE: 1"=2000'
CONTRACT NO. 02-07-15
FIGURE NO. B - 11

APPENDIX C

SITE LOCATION PLANS & CROSS-SECTIONS



LEGEND

EXISTING SHORELINE

POTENTIAL ALIGNMENT

(1A) DIKE SECTION

GBA
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1000 0 1000 2000
SCALE : 1" = 2000'

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE
AND
MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

SITE LOCATION PLAN
ALIGNMENT 1

SURVEYED BY: -
DESIGNED BY: W.J.D.
DRAWN BY: T. B. BURWELL
TRACED BY: -
CHECKED BY: D. C. URSO

DATE: FEB 2003 SCALE: 1"=2000'	CONTRACT NO. 02-07-16	FIGURE NO. C - 1

TAYLORS ISLAND

JAMES ISLAND

WETLAND CELL

UPLAND CELL

CHESAPEAKE BAY

-18 -12 -6

1A 1B 2A 2B 4 6 7 8

LEGEND

EXISTING SHORELINE

POTENTIAL ALIGNMENT

(1A) DIKE SECTION

GBA ENGINEERS ▼ SURVEYORS

1000 0 1000 2000

SCALE : 1" = 2000'

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE AND MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

SITE LOCATION PLAN ALIGNMENT 2

SURVEYED BY: ---

DESIGNED BY: W.J.D. TRACED BY: ---

DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

DATE: FEB 2003 SCALE: 1"=2000' | CONTRACT NO. 02-07-16 | FIGURE NO. C - 2

TAYLORS ISLAND

JAMES ISLAND

WETLAND CELL

UPLAND CELL

CHESAPEAKE BAY

1A 1B 2A 2B 5 6 7 8

-6 -12 -18

LEGEND

EXISTING SHORELINE

POTENTIAL ALIGNMENT

(1A) DIKE SECTION

GBA ENGINEERS ♥ SURVEYORS

1000 0 1000 2000
SCALE : 1" = 2000'

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE AND MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

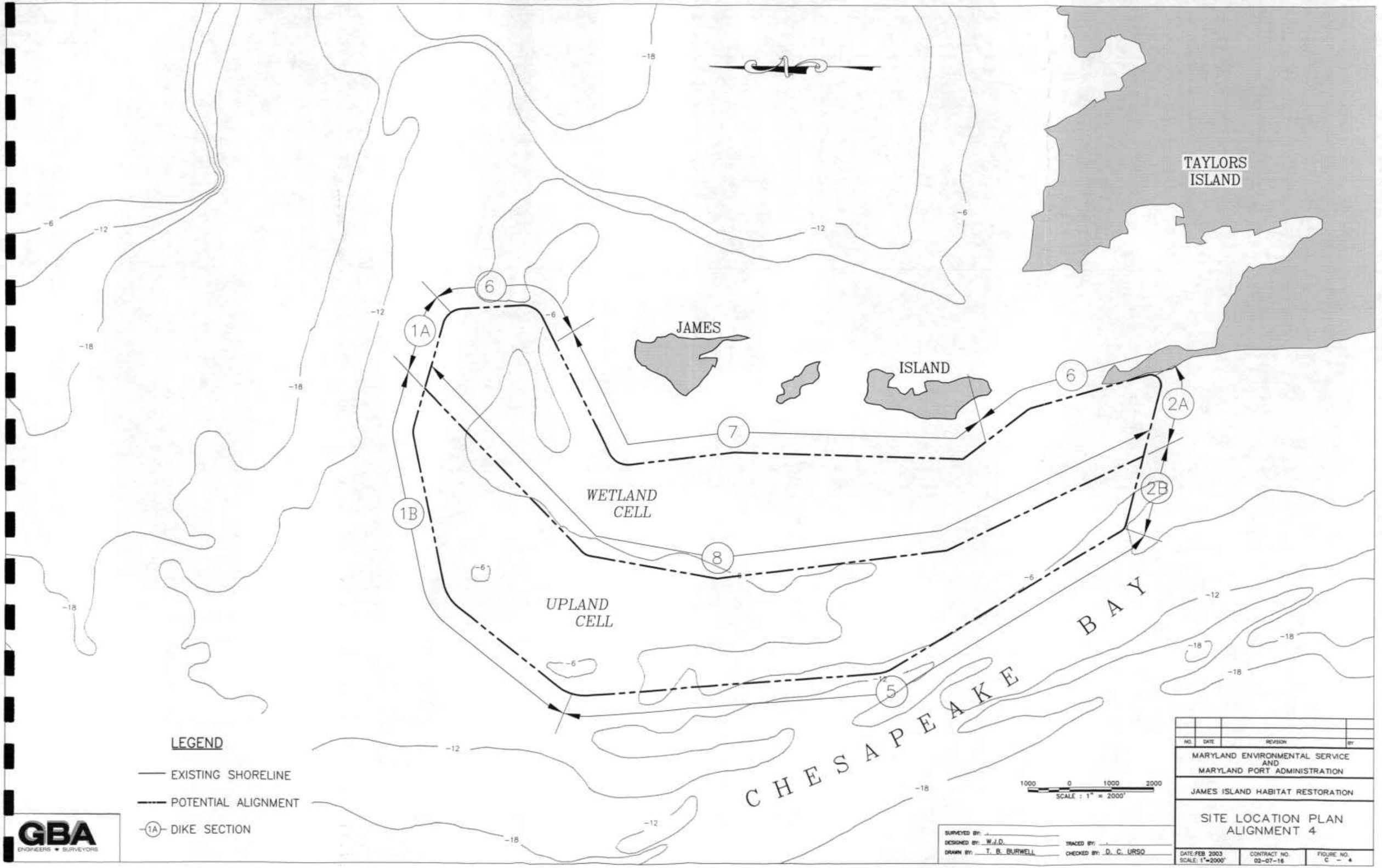
SITE LOCATION PLAN ALIGNMENT 3

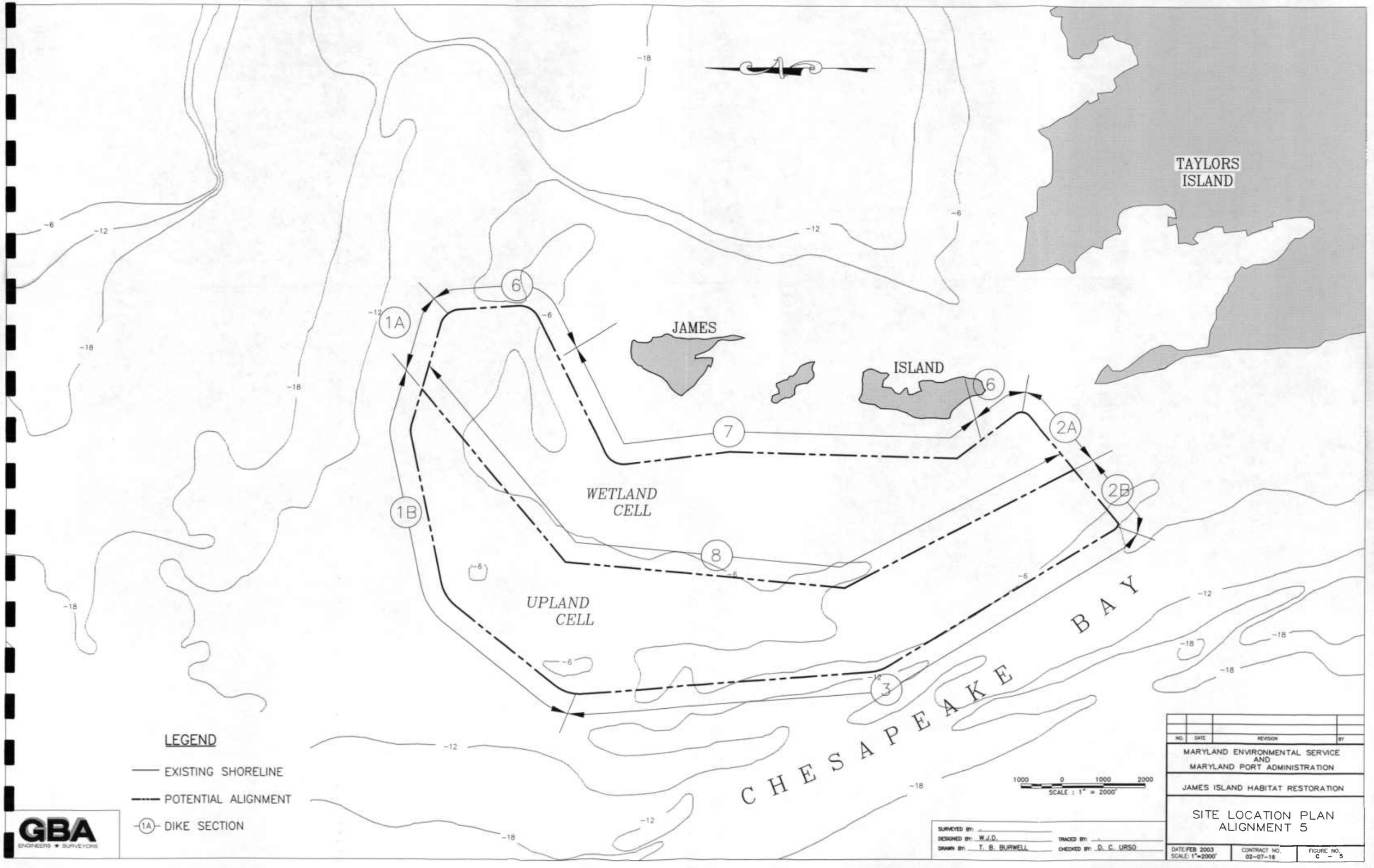
SURVEYED BY: ---
DESIGNED BY: W.J.D. TRACED BY: ---
DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

DATE: FEB 2003
SCALE: 1"=2000'

CONTRACT NO. 02-07-16

FIGURE NO. C - 3


TAYLORS
ISLAND
JAMES
ISLAND
WETLAND
CELL
UPLAND
CELL
CHESAPEAKE BAY
1A
1B
2A
2B
5
6
7
8
-6
-12
-18
LEGEND
EXISTING SHORELINE
POTENTIAL ALIGNMENT
1A DIKE SECTION
1000 0 1000 2000
SCALE : 1" = 2000'
GBA
ENGINEERS ▼ SURVEYORS
NO. DATE REVISION BY
MARYLAND ENVIRONMENTAL SERVICE
AND
MARYLAND PORT ADMINISTRATION
JAMES ISLAND HABITAT RESTORATION
SITE LOCATION PLAN
ALIGNMENT 4
SURVEYED BY:
DESIGNED BY: W.J.D.
DRAWN BY: T. B. BURWELL
TRACED BY:
CHECKED BY: D. C. URSO
DATE: FEB 2003
SCALE: 1"=2000'
CONTRACT NO.
02-07-16
FIGURE NO.
C - 4



LEGEND

EXISTING SHORELINE

POTENTIAL ALIGNMENT

(1A) DIKE SECTION

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1000 0 1000 2000
SCALE : 1" = 2000'

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE
AND
MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

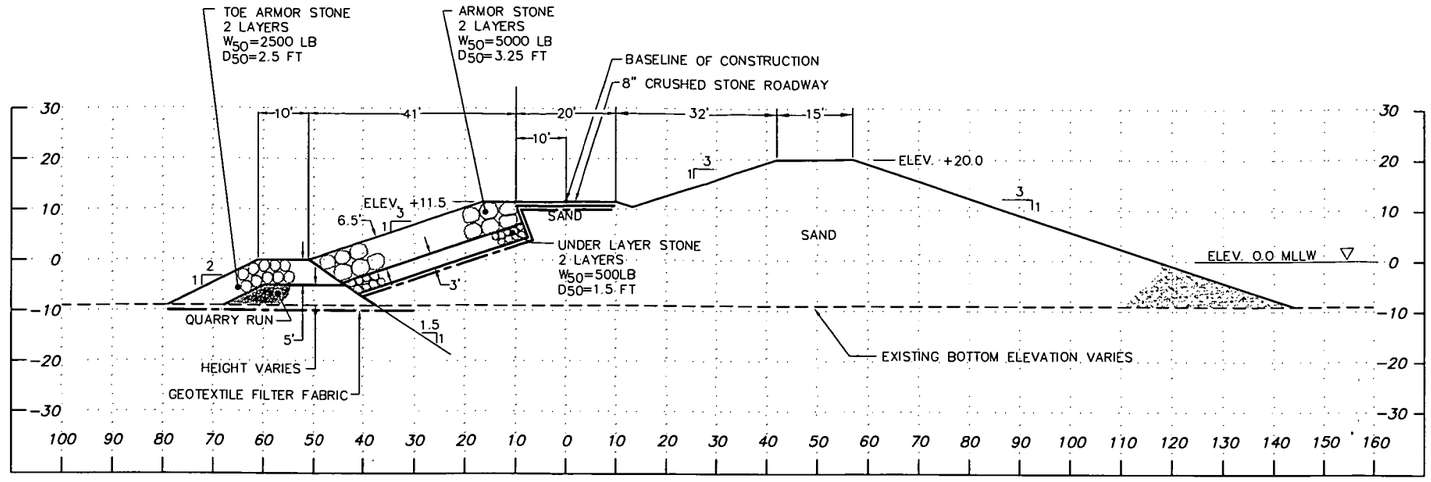
SITE LOCATION PLAN
ALIGNMENT 5

SURVEYED BY: -
DESIGNED BY: W.J.D.
DRAWN BY: T. B. BURWELL
TRACED BY: -
CHECKED BY: D. C. URSO

DATE: FEB 2003
SCALE: 1"=2000'

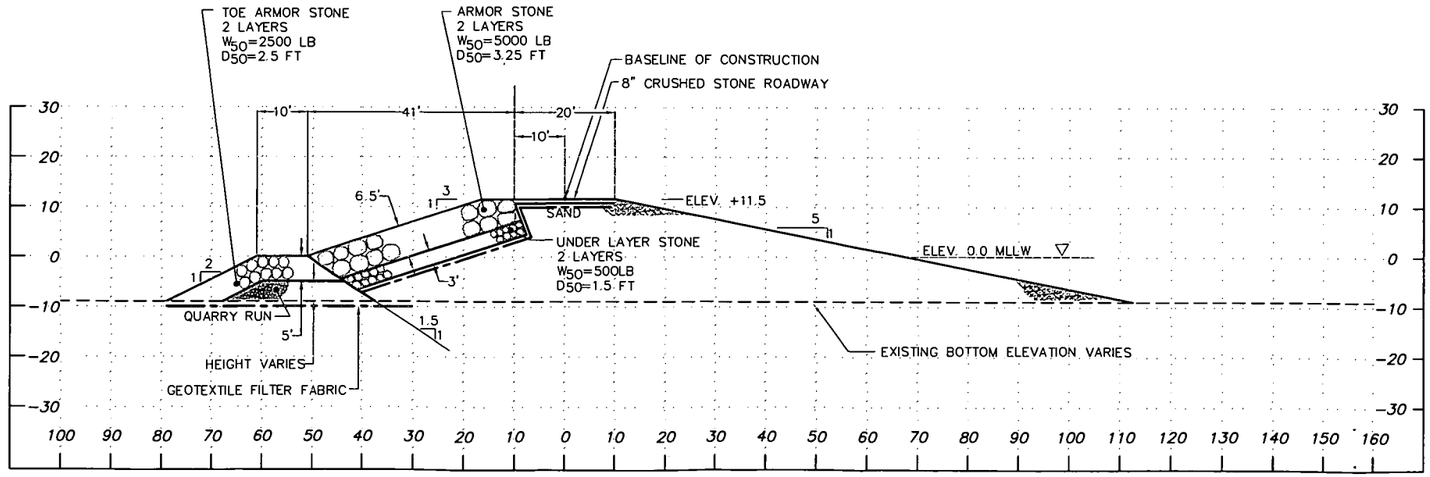
CONTRACT NO.
02-07-16

FIGURE NO.
C - 5



TYPICAL DIKE SECTION NO. 1 TO 20 FEET

NOTE: This is the typical dike section for 1B corresponding to the 20 ft. dike elevation alternatives for Options 1 through 5.



TYPICAL DIKE SECTION NO. 1 TO 11.5 FEET

LEGEND

- EXISTING GROUND
- PROPOSED DIKE
- GEOTEXTILE

NOTE: This is the typical dike section for 1A and 1B corresponding to the 10 ft. dike elevation alternatives for Options 1 through 5.
This is the typical dike section for 1A corresponding to the 20 ft. dike elevation alternatives for Options 1 through 5.

SCALE
15 0 7.5 15 30
FEET

GBA
ENGINEERS ★ SURVEYORS

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE
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JAMES ISLAND HABITAT RESTORATION

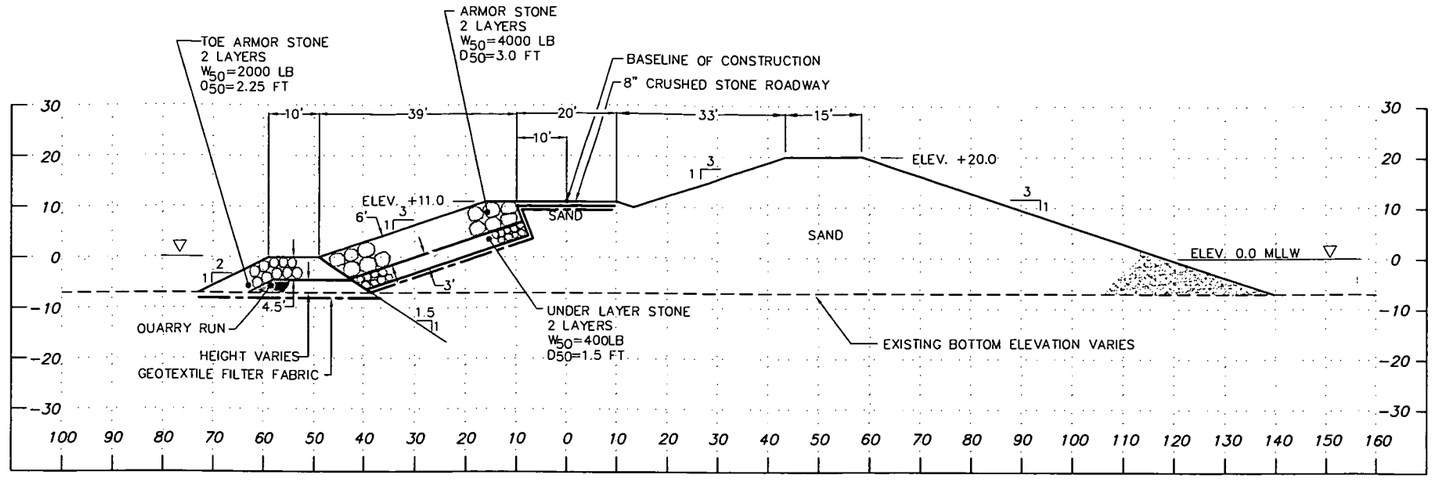
TYPICAL DIKE SECTION
NO. 1

SURVEYED BY:
DESIGNED BY: W.J.D. TRACED BY:
DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

DATE: FEB 2003
SCALE: 1"=30'

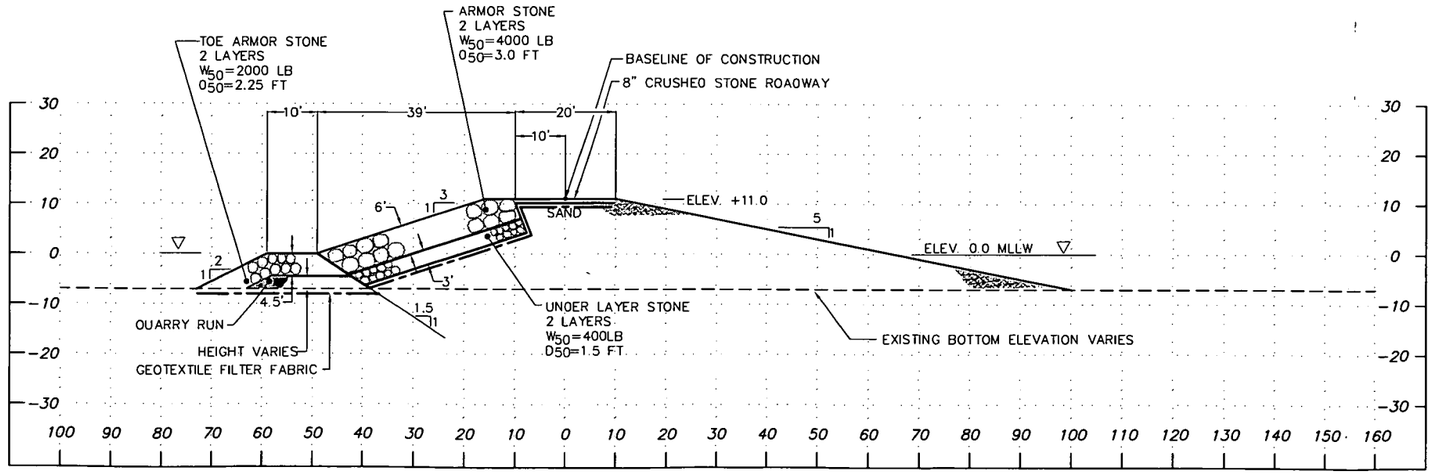
CONTRACT NO.
02-07-16

FIGURE NO.
C - 6



TYPICAL DIKE SECTION NO. 2 TO 20 FEET

NOTE: This is the typical dike section for 2B corresponding to the 20 ft. dike elevation alternatives for Options 1 through 5.



TYPICAL DIKE SECTION NO. 2 TO 11 FEET

LEGEND

- EXISTING GROUND
- PROPOSED DIKE
- GEOTEXTILE

NOTE: This is the typical dike section for 2A and 2B corresponding to the 10 ft. dike elevation alternatives for Options 1 through 5.
This is the typical dike section for 2A corresponding to the 20 ft. dike elevation alternatives for Options 1 through 5.

SCALE
15 0 7.5 15 30
FEET

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE
AND
MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

TYPICAL DIKE SECTION
NO. 2

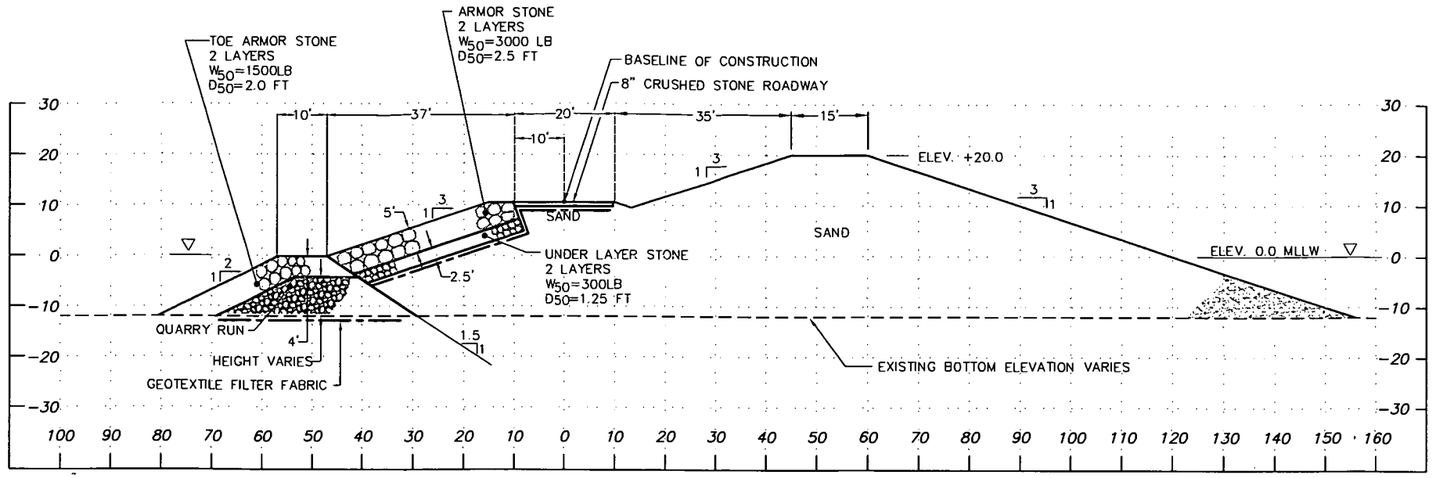
GBA
ENGINEERS ★ SURVEYORS

SURVEYED BY: _____
DESIGNED BY: W.J.D. TRACED BY: _____
DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

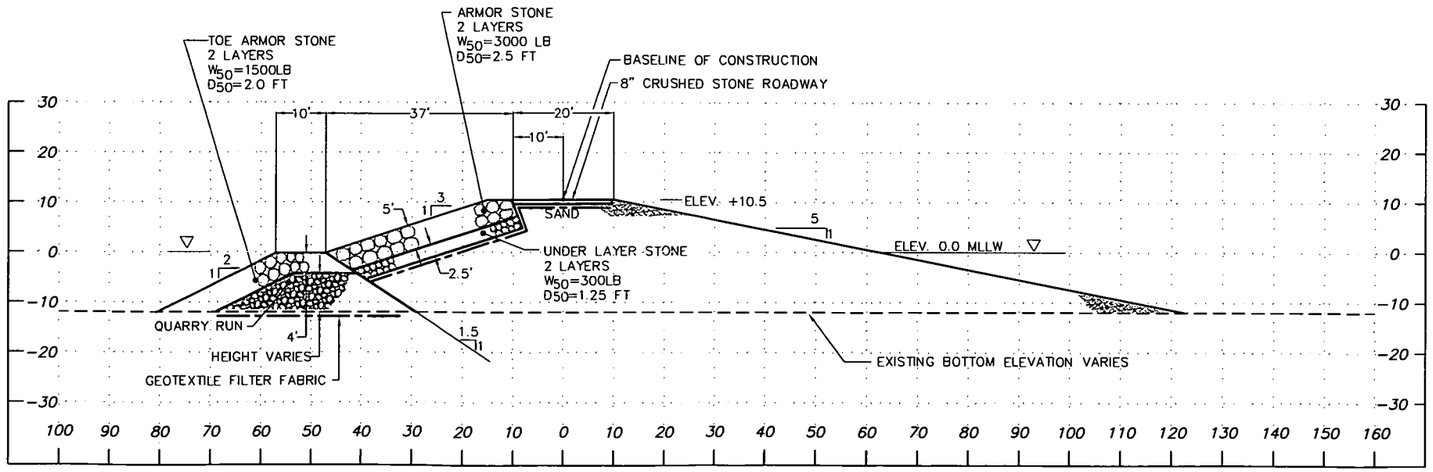
DATE: FEB 2003
SCALE: 1"=30'

CONTRACT NO.
02-07-16

FIGURE NO.
C - 7



TYPICAL DIKE SECTION NO. 3 to 20 FEET



TYPICAL DIKE SECTION NO. 3 to 10.5 FEET

LEGEND

- EXISTING GROUND
- PROPOSED DIKE
- GEOTEXTILE

SCALE
15 0 7.5 15 30
FEET

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE
AND
MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

TYPICAL DIKE SECTION NO. 3

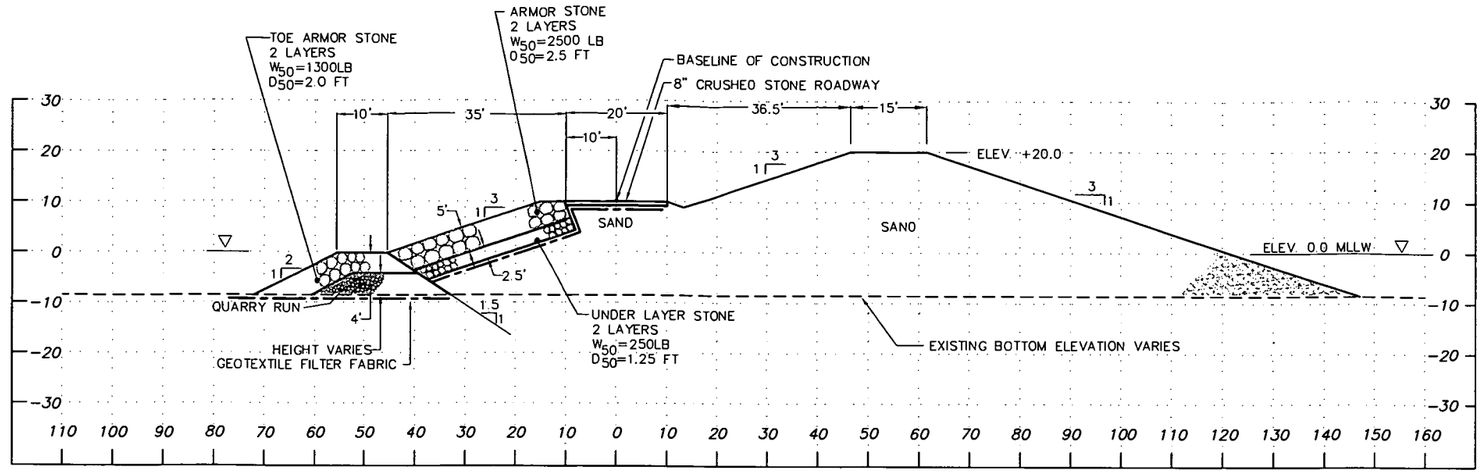
GBA
ENGINEERS ★ SURVEYORS

SURVEYED BY:
DESIGNED BY: W.J.D.
DRAWN BY: T. B. BURWELL
TRACED BY:
CHECKED BY: D. C. URSO

DATE: FEB 2003
SCALE: 1"=30'

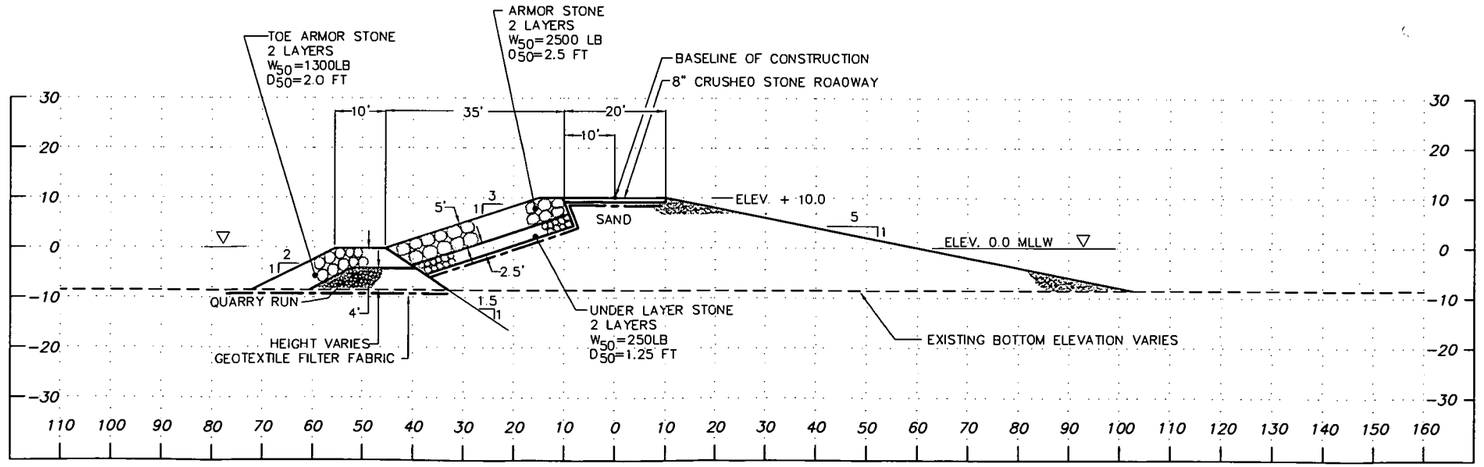
CONTRACT NO.
02-07-16

FIGURE NO.
C – 8



TYPICAL DIKE SECTION NO. 4 TO 20 FEET

NOTE: This is the typical dike section for 4B corresponding to the 20 ft. dike elevation alternatives for Options 1 through 5.



TYPICAL DIKE SECTION NO. 4 TO 10 FEET

NOTE: This is the typicol dike section for 4A ond 4B corresponding to the 10 ft. dike elevotion alternotives for Options 1 through 5.
This is the typicol dike section for 4A corresponding to the 20 ft. dike elevotion alternotives for Options 1 through 5.

LEGEND

- EXISTING GROUND
- PROPOSED DIKE
- GEOTEXTILE

SCALE
15 0 7.5 15 30
FEET

GBA
ENGINEERS * SURVEYORS

NO.	DATE	REVISION	BY

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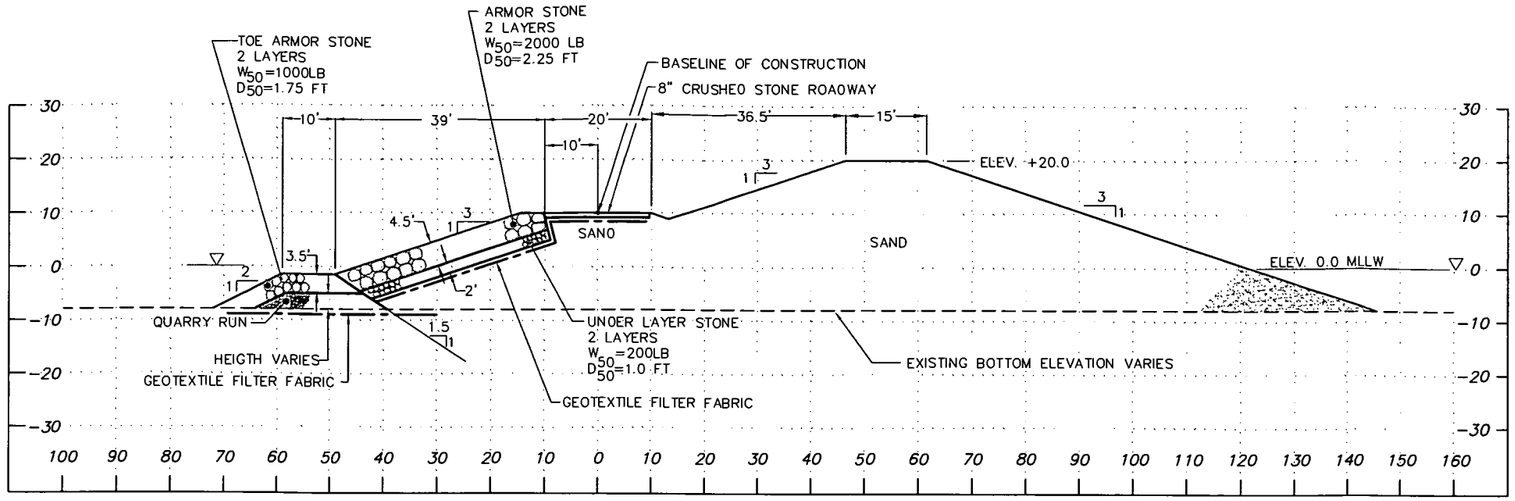
MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

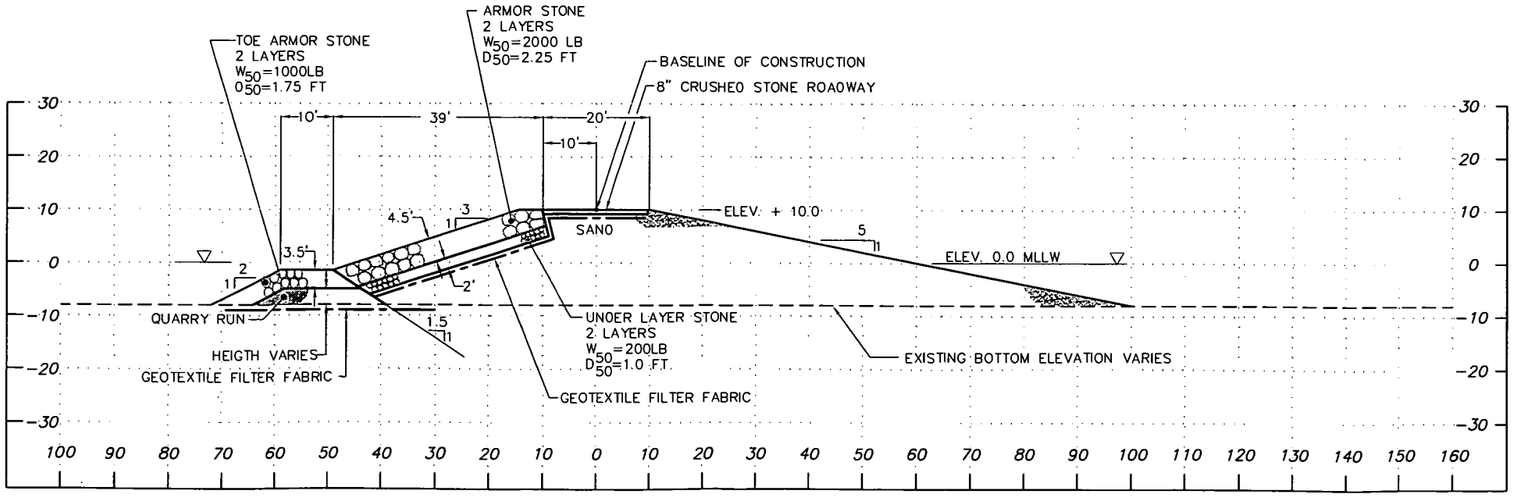
TYPICAL DIKE SECTION
NO. 4

SURVEYED BY: _____
DESIGNED BY: W.J.D. TRACED BY: _____
DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

DATE: FEB 2003 SCALE: 1"=30'	CONTRACT NO. 02-07-16	FIGURE NO. C - 9



TYPICAL DIKE SECTION NO. 5 TO 20 FEET



TYPICAL DIKE SECTION NO. 5 TO 10 FEET

LEGEND

- EXISTING GROUND
- PROPOSED DIKE
- GEOTEXTILE

SCALE
15 0 7.5 15 30
FEET

NO.	DATE	REVISION	BY

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MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

TYPICAL DIKE SECTION
NO. 5

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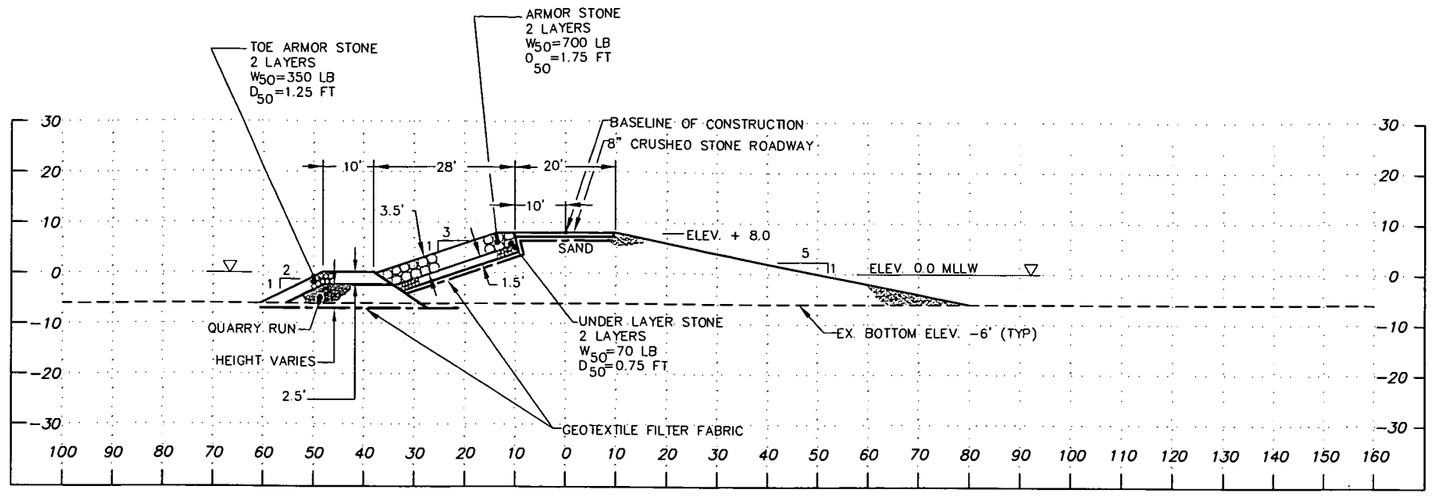
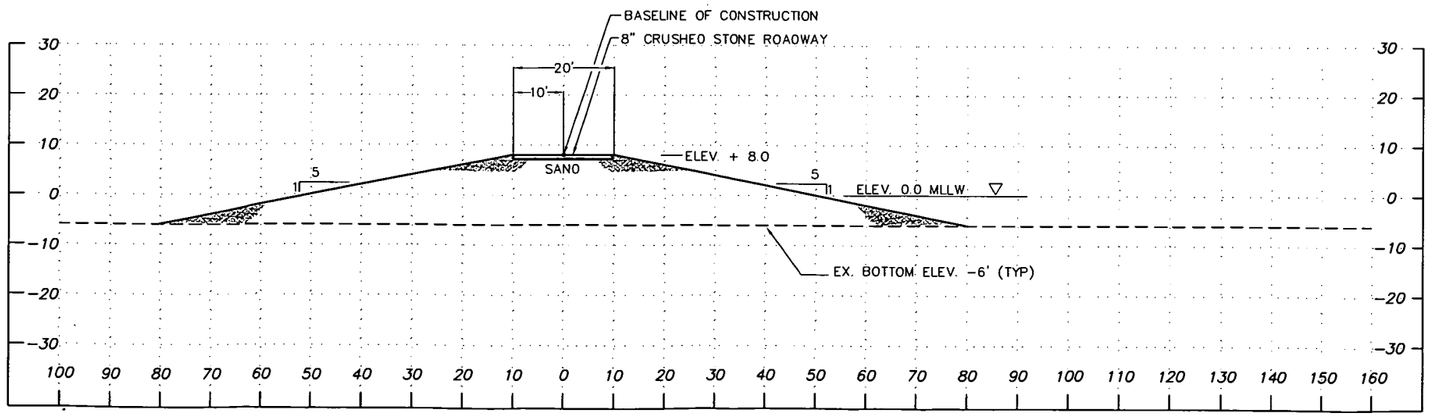
SURVEYED BY:
DESIGNED BY: W.J.D.
DRAWN BY: T. B. BURWELL
TRACED BY:
CHECKED BY: D. C. URSO

DATE: FEB 2003 SCALE: 1"=30'	CONTRACT NO. 02-07-16	FIGURE NO. C - 10



TYPICAL DIKE SECTION NO. 6 TO 8'



TYPICAL DIKE SECTION NO. 7 TO 8'

LEGEND

- EXISTING GROUND
- PROPOSED DIKE
- GEOTEXTILE

SCALE
15 0 7.5 15 30
FEET

GBA
ENGINEERS * SURVEYORS

NO.	DATE	REVISION	BY

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MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

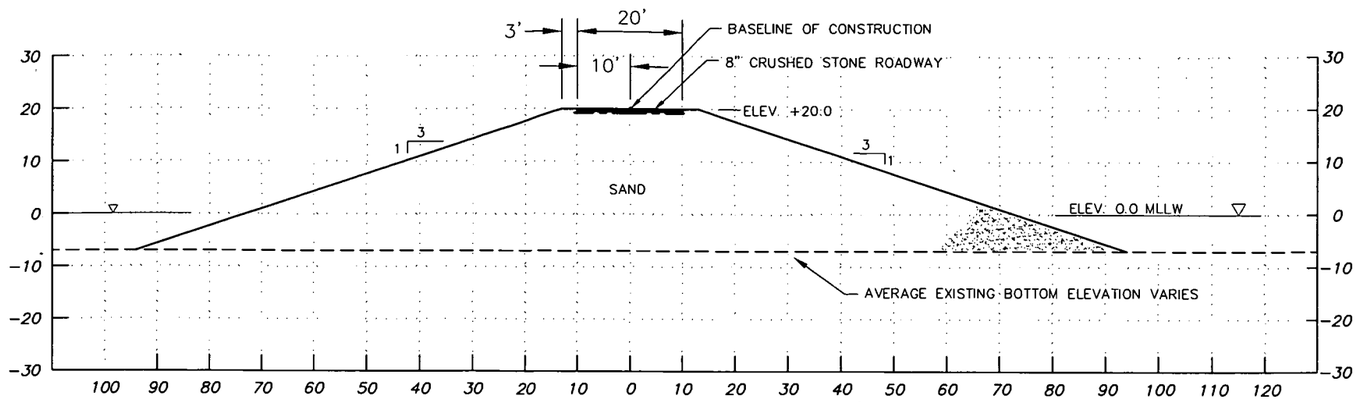
TYPICAL DIKE SECTION
NO. 6 & NO. 7

SURVEYED BY:
DESIGNED BY: W.J.D.
DRAWN BY: T. B. BURWELL
TRACED BY:
CHECKED BY: D. C. URSO

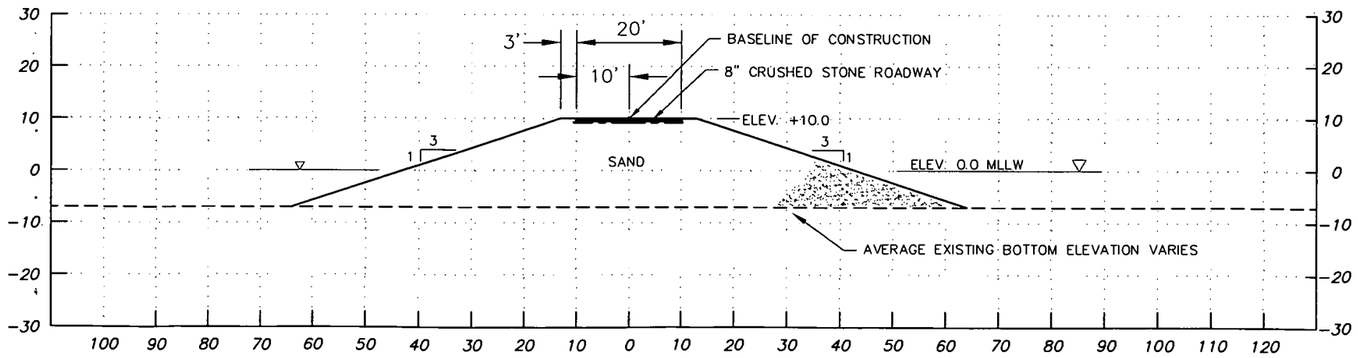
DATE: FEB 2003
SCALE: 1"=30'

CONTRACT NO.
02-07-16

FIGURE NO.
C - 11



TYPICAL DIKE SECTION NO. 8 TO 20'



TYPICAL DIKE SECTION NO. 8 TO 10'

LEGEND

- EXISTING GROUND
- PROPOSED DIKE
- GEOTEXTILE

SCALE

15 0 7.5 15 30

FEET

GBA
ENGINEERS ★ SURVEYORS

NO.	DATE	REVISION	BY

MARYLAND ENVIRONMENTAL SERVICE
AND
MARYLAND PORT ADMINISTRATION

JAMES ISLAND HABITAT RESTORATION

TYPICAL
DIKE SECTION NO. 8

SURVEYED BY: _____
DESIGNED BY: W.J.D. TRACED BY: _____
DRAWN BY: T. B. BURWELL CHECKED BY: D. C. URSO

DATE: FEB 2003
SCALE: 1"=30'

CONTRACT NO.
02-07-16

FIGURE NO.
C - 12

APPENDIX D

PRELIMINARY SITE CHARACTERISTICS & MATERIAL QUANTITIES

James Island Habitat Development

Teble D-1 - Preliminery Site Characteristics end Quentities Alignment No. 1

SITE CHARACTERISTICS	Alignment No. 1 (20 ft)		Alignment No. 1 (10 ft)	
Upland Baseline Area -	489.3	Acres	489.3	Acres
Upland Baseline Perimeter -	29,951	LF	29,951	LF
Upland Site Volume below sea level -	4.7	MCY	4.7	MCY
Upland Site Volume above sea level -	14.2	MCY	6.3	MCY
Uplend Site Volume -	18.9	MCY	11.1	MCY
Upland Site Capacity -	28.2	MCY	16.0	MCY
Wetland Baseline Aree -	489.4	Acres	489.4	Acres
Wetland Baseline Perimeter -	28,230	LF	28,230	LF
Wetland Site Volume below sea level -	3.6	MCY	3.6	MCY
Wetland Site Volume above sea level -	1.2	MCY	1.2	MCY
Wetland Site Volume -	4.7	MCY	4.7	MCY
Wetland Site Capacity -	6.6	MCY	6.6	MCY
Total Baseline Area -	978.6	Acres	978.6	Acres
Total Baseline Perimeter -	32,102	LF	32,102	LF
Total Interior Dike -	13,039	LF	13,039	LF
Total Volume -	23.7	MCY	15.8	MCY
Total Site Capacity -	34.7	MCY	22.6	MCY

QUANTITIES	Alignment No. 1 (20 ft)			Alignment No. 1 (10 ft)		
	LF	CY/LF	CY	LF	CY/LF	CY
Hydraulic Fill Material						
Unsuitable Backfill -			1,118,000			976,000
Wetland Perimeter Dike Section 2A to +11 -	2,098	42.0	88,000	2,098	42.0	88,000
Upland Perimeter Dike Section 2B to +11 -				5,085	48.6	247,000
Upland Perimeter Dike Section 2B to +20 -	5,085	100.8	512,000			
Wetland Perimeter Dike Section 4A to +10 -	1,622	27.0	44,000	1,622	27.0	44,000
Upland Perimeter Dike Section 4B to +10 -				817	33.2	27,000
Upland Perimeter Dike Section 4B to +20 -	817	85.7	70,000			
Upland Perimeter Dike Section 5 to +10 -				11,009	43.6	480,000
Upland Perimeter Dike Section 5 to +20 -	11,009	99.9	1,100,000			
Wetland Perimeter Dike Section 7 to +8 -	11,471	31.6	362,000	11,471	31.6	362,000
Longitudinal Dike Section 8 to +10 -				13,039	39.0	509,000
Longitudinal Dike Section 8 to +20 -	13,039	92.9	1,211,000			
Total -	**45,141**		**4,505,000**	**45,141**		**2,733,000**
	LF	Tons/LF	Tons	LF	Tons/LF	Tons
Perimeter Dike Stone Work						
Slope Armor Dike Section 2A & 2B -	7,183	12.4	89,000	7,183	12.4	89,000
Underlayer Dike Section 2A & 2B -	7,183	5.8	41,000	7,183	5.8	41,000
Toe Armor Dike Section 2A -	2,098	5.8	12,000	2,098	5.8	12,000
Quarry Run Dike Section 2A -	2,098	2.8	6,000	2,098	2.8	8,000
Toe Armor Dike Section 2B-	5,085	5.9	30,000	5,085	5.9	30,000
Quarry Run Dike Section 2B -	5,085	3.0	15,000	5,085	3.0	15,000
Slope Armor Dike Section 4A & 4B -	2,438	9.5	23,000	2,438	9.5	23,000
Underlayer Dike Section 4A & 4B -	2,438	4.4	11,000	2,438	4.4	11,000
Toe Armor Dike Section 4A -	1,622	4.9	8,000	1,622	4.9	8,000
Quarry Run Dike Section 4A -	1,622	1.6	3,000	1,622	1.6	3,000
Toe Armor Dike Section 4B -	817	4.9	4,000	817	4.9	4,000
Quarry Run Dike Section 4B -	817	1.6	1,000	817	1.6	1,000
Slope Armor Dike Section 5 -	11,009	9.5	105,000	11,009	9.5	105,000
Underlayer Dike Section 5 -	11,009	4.3	47,000	11,009	4.3	47,000
Toe Armor Dike Section 5 -	11,009	3.8	42,000	11,009	3.8	42,000
Quarry Run Dike Section 5 -	11,009	1.6	18,000	11,009	1.6	18,000
Total -	**20,631**		**455,000**	**20,631**		**455,000**
	LF	SY/LF	SY	LF	SY/LF	SY
Miscellaneous						
Road Stone -	45,141	1.1	50,000	45,141	1.1	50,000
Perimeter Geotextile -	32,102	14.5	465,000	32,102	14.5	465,000
Roadway Geotextile -	45,141	2.6	117,000	45,141	2.6	117,000

James Island Habitat Development

Table D-2 - Preliminary Site Cherecteristics and Quantities Alignment No. 2

SITE CHARACTERISTICS	Alignment No. 2 (20 ft)		Alignment No. 2 (10 ft)	
Upland Baseline Area -	1,063.3	Acres	1,063.3	Acres
Upland Baseline Perimeter -	41,816	LF	41,816	LF
Upland Site Volume below see level -	11.2	MCY	11.2	MCY
Upland Site Volume above see level -	30.9	MCY	13.7	MCY
Upland Site Volume -	42.0	MCY	24.9	MCY
Upland Site Capacity -	62.4	MCY	36.0	MCY
Wetland Baseline Area -	1,063.4	Acres	1,063.4	Acres
Wetland Baseline Perimeter -	43,313	LF	43,313	LF
Wetland Site Volume below sea level -	9.0	MCY	9.0	MCY
Wetland Site Volume ebove sea level -	2.6	MCY	2.6	MCY
Wetland Site Volume -	11.6	MCY	11.6	MCY
Wetlend Site Capacity -	16.0	MCY	16.0	MCY
Total Baseline Area -	2,126.8	Acres	2,126.8	Acres
Total Baseline Perimeter -	48,812	LF	48,812	LF
Total Interior Dike -	18,159	LF	18,159	LF
Total Volume -	53.6	MCY	36.5	MCY
Total Site Capacity -	78.3	MCY	52.0	MCY

QUANTITIES	Alignment No. 2 (20 ft)			Alignment No. 2 (10 ft)		
	LF	CY/LF	CY	LF	CY/LF	CY
Hydraulic Fill Material						
Unsuitable Backfill -			360,000			360,000
Wetland Perimeter Dike Section 1A to +11.5 -	5,037	51.1	257,000	5,037	51.1	257,000
Upland Perimeter Dike Section 1B to +11.5 -				8,773	53.2	467,000
Upland Perimeter Dike Section 1B to +20 -	8,773	103.1	904,000			
Wetland Perimeter Dike Section 2A to +11 -	1,668	32.1	53,000	1,668	32.1	53,000
Upland Perimeter Dike Section 2B to +11 -				1,263	36.4	46,000
Upland Perimeter Dike Section 2B to +20 -	1,263	84.7	107,000			
Upland Perimeter Dike Section 4 to +10 -				13,821	41.9	571,000
Upland Perimeter Dike Section 4 to +20 -	13,621	98.0	1,335,000			
Wetland Perimeter Dike Section 6A to +8 -	4,735	34.9	165,000	4,735	34.9	165,000
Wetland Perimeter Dike Section 6B to +8 -	1,865	18.0	33,000	1,865	18.0	33,000
Wetland Perimeter Dike Section 7 to +8 -	11,850	33.1	392,000	11,850	33.1	392,000
Longitudinal Dike Section 8 to +10 -				16,159	44.3	805,000
Longitudinal Dike Section 8 to +20 -	16,159	100.8	1,831,000			
Total -	**66,970**		**5,437,000**	**66,970**		**3,149,000**
	LF	Tons/LF	Tons	LF	Tons/LF	Tons
Perimeter Dike Stone Work						
Slope Armor Dike Section 1A & 1B -	13,810	14.0	194,000	13,810	14.0	194,000
Underlayer Dike Section 1A & 1B -	13,810	8.0	83,000	13,810	8.0	83,000
Toe Armor Dike Section 1A -	5,037	6.6	33,000	5,037	6.6	33,000
Quarry Run Dike Section 1A -	5,037	2.7	14,000	5,037	2.7	14,000
Toe Armor Dike Section 1B -	8,773	6.7	59,000	8,773	8.7	59,000
Quarry Run Dike Section 1B -	8,773	2.9	26,000	8,773	2.9	26,000
Slope Armor Dike Section 2A & 2B -	2,931	12.4	36,000	2,931	12.4	36,000
Underlayer Dike Section 2A & 2B -	2,931	5.8	17,000	2,931	5.8	17,000
Toe Armor Dike Section 2A -	1,668	5.8	10,000	1,668	5.8	10,000
Quarry Run Dike Section 2A -	1,668	2.8	5,000	1,668	2.8	5,000
Toe Armor Dike Section 2B -	1,263	5.9	7,000	1,263	5.9	7,000
Quarry Run Dike Section 2B -	1,263	3.0	4,000	1,263	3.0	4,000
Slope Armor Dike Section 4 -	13,621	9.5	129,000	13,621	9.5	129,000
Underlayer Dike Section 4 -	13,821	4.4	60,000	13,621	4.4	60,000
Toe Armor Dike Section 4 -	13,621	5.2	71,000	13,621	5.2	71,000
Querry Run Dike Section 4 -	13,621	2.1	29,000	13,621	2.1	29,000
Slope Armor Dike Section 6A -	4,735	5.2	25,000	4,735	5.2	25,000
Underlayer Dike Section 6A -	4,735	2.1	10,000	4,735	2.1	10,000
Toe Armor Dike Section 6A -	4,735	3.2	15,000	4,735	3.2	15,000
Querry Run Dike Section 6A -	4,735	5.2	25,000	4,735	5.2	25,000
Slope Armor Dike Section 6B -	1,865	5.0	9,000	1,865	5.0	9,000
Underlayer Dike Section 6B -	1,865	1.5	3,000	1,865	1.5	3,000
Toe Armor Dike Section 6B -	1,865	2.5	5,000	1,865	2.5	5,000
Querry Run Dike Section 6B -	1,865	1.7	3,000	1,865	1.7	3,000
Total -	**38,961**		**672,000**	**38,981**		**672,000**
	LF	SY/LF	SY	LF	SY/LF	SY
Miscellaneous						
Road Stone -	66,970	1.1	74,000	66,970	1.1	74,000
Perimeter Geotextile -	48,812	14.5	708,000	48,812	14.5	708,000
Roadwey Geotextile -	66,970	2.6	174,000	66,970	2.6	174,000

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Table D-3 - Preliminary Site Characteristics and Quantities Alignment No. 3

SITE CHARACTERISTICS	Alignment No. 3 (20 ft)		Alignment No. 3 (10 ft)	
Upland Baseline Area -	793	Acres	793	Acres
Upland Baseline Perimeter -	39,033	LF	39,033	LF
Upland Site Volume below sea level -	7.7	MCY	7.7	MCY
Upland Site Volume above sea level -	23.0	MCY	10.2	MCY
Upland Site Volume -	30.7	MCY	17.9	MCY
Upland Site Capacity -	45.7	MCY	26.0	MCY
Wetland Baseline Area -	793	Acres	793	Acres
Wetland Baseline Perimeter -	40,712	LF	40,712	LF
Wetland Site Volume below sea level -	6.4	MCY	6.4	MCY
Wetland Site Volume above sea level -	1.9	MCY	1.9	MCY
Wetland Site Volume -	8.3	MCY	8.3	MCY
Wetland Site Capacity -	11.5	MCY	11.5	MCY
Total Baseline Area -	1,586	Acres	1,586	Acres
Total Baseline Perimeter -	44,497	LF	44,497	LF
Total Interior Dike -	17,624	LF	17,624	LF
Total Volume -	39.0	MCY	26.2	MCY
Total Site Capacity -	57.2	MCY	37.5	MCY

QUANTITIES	Alignment No. 3 (20 ft)			Alignment No. 3 (10 ft)		
	LF	CY/LF	CY	LF	CY/LF	CY
Hydraulic Fill Material						
Unsuitable Backfill -			1,116,000			1,118,000
Wetland Perimeter Dike Section 1A to +11.5 -	2,705	56.5	153,000	2,705	56.5	153,000
Upland Perimeter Dike Section 1B to +11.5 -				4,857	53.2	248,000
Upland Perimeter Dike Section 1B to +20 -	4,657	103.1	480,000			
Wetland Perimeter Dike Section 2A to +11 -	1,416	32.1	45,000	1,416	32.1	45,000
Upland Perimeter Dike Section 2B to +11 -				1,476	38.7	57,000
Upland Perimeter Dike Section 2B to +20 -	1,478	67.8	130,000			
Upland Perimeter Dike Section 5 to +10 -				15,275	42.6	651,000
Upland Perimeter Dike Section 5 to +20 -	15,275	98.5	1,505,000			
Wetland Perimeter Dike Section 6A to +8 -	3,763	38.2	144,000	3,763	38.2	144,000
Wetland Perimeter Dike Section 6B to +6 -	3,670	21.3	78,000	3,670	21.3	76,000
Wetland Perimeter Dike Section 7 to +6 -	11,535	33.1	381,000	11,535	33.1	381,000
Interior Dike Section 6 to +10 -				17,624	39.9	703,000
Interior Dike Section 8 to +20 -	17,624	94.2	1,660,000			
Total -	**62,121**		**5,694,000**	**62,121**		**3,578,000**
	LF	Tons/LF	Tons	LF	Tons/LF	Tons
Perimeter Dike Stone Work						
Slope Armor Dike Section 1A & 1B -	7,361	14.0	103,000	7,381	14.0	103,000
Underlayer Dike Section 1A & 1B -	7,361	6.0	44,000	7,361	8.0	44,000
Toe Armor Dike Section 1A -	2,705	7.1	19,000	2,705	7.1	19,000
Quarry Run Dike Section 1A -	2,705	4.0	11,000	2,705	4.0	11,000
Toe Armor Dike Section 1B -	4,657	8.7	31,000	4,657	6.7	31,000
Quarry Run Dike Section 1B -	4,657	2.9	14,000	4,657	2.9	14,000
Slope Armor Dike Section 2A & 2B -	2,894	12.4	36,000	2,694	12.4	36,000
Underlayer Dike Section 2A & 2B -	2,894	5.6	17,000	2,894	5.6	17,000
Toe Armor Dike Section 2A -	1,418	5.8	6,000	1,416	5.6	6,000
Quarry Run Dike Section 2A -	1,418	2.8	4,000	1,416	2.8	4,000
Toe Armor Dike Section 2B -	1,416	5.9	6,000	1,416	5.9	6,000
Quarry Run Dike Section 2B -	1,416	3.0	4,000	1,416	3.0	4,000
Slope Armor Dike Section 5 -	15,275	9.5	145,000	15,275	9.5	145,000
Underlayer Dike Section 5 -	15,275	4.0	61,000	15,275	4.0	81,000
Toe Armor Dike Section 5 -	15,275	3.6	56,000	15,275	3.8	56,000
Quarry Run Dike Section 5 -	15,275	1.6	25,000	15,275	1.6	25,000
Slope Armor Dike Section 6A -	3,763	5.2	20,000	3,763	5.2	20,000
Underlayer Dike Section 6A -	3,763	2.1	6,000	3,763	2.1	8,000
Toe Armor Dike Section 6A -	3,763	3.4	13,000	3,763	3.4	13,000
Quarry Run Dike Section 6A -	3,763	6.6	25,000	3,763	6.8	25,000
Slope Armor Dike Section 6B -	3,670	5.0	16,000	3,670	5.0	18,000
Underlayer Dike Section 6B -	3,670	2.0	7,000	3,670	2.0	7,000
Toe Armor Dike Section 6B -	3,670	2.5	9,000	3,670	2.5	9,000
Quarry Run Dike Section 6B -	3,670	1.7	8,000	3,670	1.7	8,000
Total -	32,982		894,000	32,962		694,000
	LF	SY/LF	SY	LF	SY/LF	SY
Miscellaneous						
Road Stone -	62,121	1.1	66,000	62,121	1.1	68,000
Perimeter Geotextile -	44,497	14.5	645,000	44,497	14.5	645,000
Roadway Geotextile -	62,121	2.6	162,000	62,121	2.6	162,000

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Table D-4 - Preliminary Site Characteristics and Quantities Alignment No. 4

SITE CHARACTERISTICS	Alignment No. 4 (20 ft)		Alignment No. 4 (10 ft)	
Upland Baseline Area -	1,101	Acres	1,101	Acres
Upland Baseline Perimeter -	44,742	LF	44,742	LF
Upland Site Volume below sea level -	10.7	MCY	10.7	MCY
Upland Site Volume above sea level -	32.0	MCY	14.2	MCY
Upland Site Volume -	42.8	MCY	24.9	MCY
Upland Site Capacity -	63.4	MCY	36.1	MCY
Wetland Baseline Area -	1,101	Acres	1,101	Acres
Wetland Baseline Perimeter -	43,486	LF	43,486	LF
Wetland Site Volume below sea level -	8.4	MCY	8.4	MCY
Wetland Site Volume above sea level -	2.7	MCY	2.7	MCY
Wetland Site Volume -	11.1	MCY	11.1	MCY
Wetland Site Capacity -	15.3	MCY	15.3	MCY
Total Baseline Area -	2,202	Acres	2,202	Acres
Total Baseline Perimeter -	48,963	LF	48,963	LF
Total Interior Dike -	19,632	LF	19,632	LF
Total Volume -	53.7	MCY	36.0	MCY
Total Site Capacity -	78.7	MCY	51.4	MCY

QUANTITIES	Alignment No. 4 (20 ft)			Alignment No. 4 (10 ft)		
	LF	CY/LF	CY	LF	CY/LF	CY
Hydraulic Fill Material						
Unsuitable Backfill -			263,000			263,000
Wetland Perimeter Dike Section 1A to +11.5 -	1,975	59.2	117,000	1,975	59.2	117,000
Upland Perimeter Dike Section 1B to +11.5 -				9,004	54.9	494,000
Upland Perimeter Dike Section 1B to +20 -	9,004	105.0	946,000			
Wetland Perimeter Dike Section 2A to +11 -	2,083	36.4	78,000	2,083	36.4	78,000
Upland Perimeter Dike Section 2B to +11 -				1,825	41.1	75,000
Upland Perimeter Dike Section 2B to +20 -	1,825	91.0	166,000			
Upland Perimeter Dike Section 3 to +10.5 -				14,280	45.4	648,000
Upland Perimeter Dike Section 3 to +20 -	14,280	99.5	1,420,000			
Wetland Perimeter Dike Section 6A to +8 -	3,028	36.9	112,000	3,028	36.9	112,000
Wetland Perimeter Dike Section 6B to +8 -	4,450	21.3	95,000	4,450	21.3	95,000
Wetland Perimeter Dike Section 7 to +8 -	12,318	30.1	371,000	12,318	30.1	371,000
Interior Dike Section 8 to +10 -				19,632	42.5	835,000
Interior Dike Section 8 to +20 -	19,632	98.1	1,927,000			
Total -	**68,595**		**5,493,000**	**68,595**		**3,086,000**
	LF	Tons/LF	Tons	LF	Tons/LF	Tons
Perimeter Dike Stone Work						
Slope Armor Dike Section 1A & 1B -	10,979	14.0	154,000	10,979	14.0	154,000
Underlayer Dike Section 1A & 1B -	10,979	6.0	68,000	10,979	8.0	68,000
Toe Armor Dike Section 1A -	1,975	7.4	15,000	1,975	7.4	15,000
Quarry Run Dike Section 1A -	1,975	4.8	9,000	1,975	4.8	9,000
Toe Armor Dike Section 1B -	9,004	8.9	62,000	9,004	8.9	62,000
Quarry Run Dike Section 1B -	9,004	3.4	31,000	9,004	3.4	31,000
Slope Armor Dike Section 2A & 2B -	3,908	12.4	48,000	3,908	12.4	48,000
Underlayer Dike Section 2A & 2B -	3,908	5.8	23,000	3,908	5.8	23,000
Toe Armor Dike Section 2A -	2,083	5.8	12,000	2,083	5.8	12,000
Quarry Run Dike Section 2A -	2,083	2.8	8,000	2,083	2.8	8,000
Toe Armor Dike Section 2B -	1,825	5.9	11,000	1,825	5.9	11,000
Quarry Run Dike Section 2B -	1,825	3.0	5,000	1,825	3.0	5,000
Slope Armor Dike Section 3 -	14,280	9.9	141,000	14,280	9.9	141,000
Underlayer Dike Section 3 -	14,280	4.7	66,000	14,280	4.7	66,000
Toe Armor Dike Section 3 -	14,280	5.4	77,000	14,280	5.4	77,000
Quarry Run Dike Section 3 -	14,280	2.3	33,000	14,280	2.3	33,000
Slope Armor Dike Section 6A -	3,028	5.2	16,000	3,028	5.2	18,000
Underlayer Dike Section 6A -	3,028	2.1	6,000	3,028	2.1	6,000
Toe Armor Dike Section 6A -	3,028	3.3	10,000	3,028	3.3	10,000
Quarry Run Dike Section 6A -	3,028	8.1	18,000	3,028	8.1	18,000
Slope Armor Dike Section 6B -	4,450	5.2	23,000	4,450	5.2	23,000
Underlayer Dike Section 6B -	4,450	2.1	9,000	4,450	2.1	9,000
Toe Armor Dike Section 6B -	4,450	2.5	11,000	4,450	2.5	11,000
Quarry Run Dike Section 6B -	4,450	1.7	8,000	4,450	1.7	8,000
Total -	**36,645**		**860,000**	**36,645**		**860,000**
	LF	SY/LF	SY	LF	SY/LF	SY
Miscellaneous						
Road Stone -	68,595	1.1	75,000	68,595	1.1	75,000
Perimeter Geotextile -	48,963	14.5	710,000	48,963	14.5	710,000
Roadway Geotextile -	68,595	2.6	178,000	68,595	2.6	178,000

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Teble D-5 - Preliminery Site Cheracteristics end Quentities Alignment No. 5

SITE CHARACTERISTICS	Alignment No. 5 (20 ft)		Alignment No. 5 (10 ft)	
Upland Baseline Aree -	1,036	Acres	1,036	Acres
Upland Baseline Perimeter -	43,595	LF	43,595	LF
Upland Site Volume below sea level -	10.0	MCY	10.0	MCY
Uplend Site Volume ebove sea level -	30.1	MCY	13.4	MCY
Upland Site Volume -	40.1	MCY	23.4	MCY
Upland Site Capacity -	59.7	MCY	34.0	MCY
Wetland Baseline Area -	1,036	Acres	1,036	Acres
Wetland Baseline Perimeter -	39,053	LF	39,053	LF
Wetland Site Volume below sea level -	8.4	MCY	8.4	MCY
Wetland Site Volume ebove sea level -	2.5	MCY	2.5	MCY
Wetland Site Volume -	10.9	MCY	10.9	MCY
Wetland Site Capacity -	15.0	MCY	15.0	MCY
Total Baseline Area -	2,072	Acres	2,072	Acres
Total Baseline Perimeter -	45,587	LF	45,587	LF
Total Interior Dike -	18,530	LF	18,530	LF
Total Volume -	51.0	MCY	34.3	MCY
Total Site Capacity -	74.7	MCY	49.0	MCY

QUANTITIES	Alignment No. 5 (20 ft)			Alignment No. 5 (10 ft)		
	LF	CY/LF	CY	LF	CY/LF	CY
Hydraulic Fill Material						
Unsuitable Backfill -			263,000			263,000
Wetland Perimeter Dike Section 1A to +11.5 -	1,982	80.7	180,000	1,982	59.2	117,000
Upland Perimeter Dike Section 1B to +11.5 -				9,177	54.9	503,000
Upland Perimeter Dike Section 1B to +20 -	9,177	125.7	1,154,000			
Wetland Perimeter Dike Section 2A to +11 -	1,901	43.5	83,000	1,901	30.0	57,000
Upland Perimeter Dike Section 2B to +11 -				1,785	38.7	89,000
Upland Perimeter Dike Section 2B to +20 -	1,785	103.9	185,000			
Upland Perimeter Dike Section 3 to +10.5 -				14,102	44.4	626,000
Upland Perimeter Dike Section 3 to +20 -	14,102	113.3	1,597,000			
Wetland Perimeter Dike Section 6A to +8 -	3,464	36.1	125,000	3,464	36.1	125,000
Wetland Perimeter Dike Section 6B to +8 -	1,236	20.8	26,000	1,236	20.8	26,000
Wetland Perimeter Dike Section 7 to +8 -	11,939	33.1	395,000	11,939	33.1	395,000
Interior Dike Section 8 to +10 -				18,530	43.9	813,000
Interior Dike Section 8 to +20 -	18,530	100.1	1,856,000			
Total -	**64,117**		**5,844,000**	**64,117**		**2,994,000**
	LF	Tons/LF	Tons	LF	Tons/LF	Tons
Perimeter Dike Stone Work						
Slope Armor Dike Section 1A& 1B -	11,159	14.0	157,000	11,159	14.0	157,000
Underlayer Dike Section 1A & 1B -	11,159	8.0	67,000	11,159	6.0	87,000
Toe Armor Dike Section 1A -	1,982	7.4	15,000	1,982	7.4	15,000
Quarry Run Dike Section 1A -	1,982	4.8	9,000	1,982	4.8	9,000
Toe Armor Dike Section 1B -	9,177	8.9	63,000	9,177	8.9	63,000
Querry Run Dike Section 1B -	9,177	3.4	31,000	9,177	3.4	31,000
Slope Armor Dike Section 2A & 2B -	3,687	12.4	46,000	3,687	12.4	46,000
Underlayer Dike Section 2A & 2B -	3,687	5.8	21,000	3,687	5.8	21,000
Toe Armor Dike Section 2A -	1,901	5.8	11,000	1,901	5.8	11,000
Quarry Run Dike Section 2A -	1,901	2.8	5,000	1,901	2.8	5,000
Toe Armor Dike Section 2B -	1,785	5.9	10,000	1,785	5.9	10,000
Quarry Run Dike Section 2B -	1,785	3.0	5,000	1,785	3.0	5,000
Slope Armor Dike Section 3 -	14,102	9.9	140,000	14,102	9.9	140,000
Underlayer Dike Section 3 -	14,102	4.7	66,000	14,102	4.7	66,000
Toe Armor Dike Section 3 -	14,102	5.3	74,000	14,102	5.3	74,000
Quarry Run Dike Section 3 -	14,102	2.1	29,000	14,102	2.1	29,000
Slope Armor Dike Section 6A -	3,464	5.2	18,000	3,464	5.2	18,000
Underlayer Dike Section 6A -	3,464	2.1	7,000	3,464	2.1	7,000
Toe Armor Dike Section 6A -	3,464	3.2	11,000	3,464	3.2	11,000
Querry Run Dike Section 6A -	3,464	5.7	20,000	3,464	5.7	20,000
Slope Armor Dike Section 6B -	1,238	5.2	6,000	1,236	5.2	8,000
Underlayer Dike Section 6B -	1,236	2.1	3,000	1,236	2.1	3,000
Toe Armor Dike Section 6B -	1,236	2.5	3,000	1,236	2.5	3,000
Quarry Run Dike Section 6B -	1,236	1.7	2,000	1,238	1.7	2,000
Total -	**33,648**		**819,000**	**33,648**		**819,000**
	LF	SY/LF	SY	LF	SY/LF	SY
Miscelleneous						
Road Stone -	64,117	1.1	71,000	64,117	1.1	71,000
Perimeter Geotextile -	45,587	14.5	661,000	45,587	14.5	661,000
Roadwey Geotextile -	64,117	2.6	167,000	64,117	2.6	167,000

APPENDIX E

COST TABLES

James Island Habitat Development

Table E-1 - Preliminary Construction Costs Alignment No. 1
(Costs are Estimated in 2002 Dollars)

	Unit	Unit Rate $	Alignment No. 1 (20 FT)		Alignment No. 1 (10 FT)	
			Qty	Cost $	Qty	Cost $
Mobilization/Demobilization & Bonds	L.S.	4,800,000	Job	4,800,000	Job	4,800,000
Road Stone	S.Y.	12.00	50,000	600,000	50,000	600,000
Geotextile	S.Y.	4.00	582,000	2,328,000	582,000	2,328,000
Personnel Pier	L.S.	250,000	Job	250,000	Job	250,000
Unsuitable Foundation Excavation	C.Y.	12.00	1,118,000	13,416,000	976,000	11,712,000
Stone Work						
Slope Armor Dike Section	Ton	42.00	217,000	9,114,000	217,000	9,114,000
Underlayer Dike Section	Ton	41.00	99,000	4,059,000	99,000	4,059,000
Toe Armor Dike Section	Ton	53.00	96,000	5,088,000	96,000	5,088,000
Quarry Run Dike Section	Ton	40.00	43,000	1,720,000	43,000	1,720,000
Spillways	Each	250,000	6	1,500,000	6	1,500,000
Nursery Planting	L.S.	200,000	Job	200,000	Job	200,000
SUBTOTAL				43,075,000		41,371,000
Borrow Alternative 1 (offsite)						
Clam Shell Dredge from Craighill Channel	C.Y.	2.25	4,505,000	10,136,000	2,733,000	6,149,000
40 Miles One Way Barge Transport	C.Y.	4.00	4,505,000	18,020,000	2,733,000	10,932,000
Dike Fill Hydraulically from Barge	C.Y.	7.00	4,505,000	31,535,000	2,733,000	19,131,000
A1 GRAND TOTAL				**102,766,000**		**77,583,000**
$ per CY of Site Capacity				2.96		3.43
Borrow Alternative 2 (onsite)						
Dike Fill Hydraulically from Onsite	C.Y.	8.00	4,505,000	36,040,000	2,733,000	21,864,000
A2 GRAND TOTAL				**79,115,000**		**63,235,000**
$ per CY of Site Capacity				2.28		2.80

James Island Habitat Development

Table E-2 - Preliminary Construction Costs Alignment No. 2
(Costs are Estimated in 2002 Dollars)

	Unit	Unit Rate $	Alignment No. 2 (20 FT)		Alignment No. 2 (10 FT)	
			Qty	Cost $	Qty	Cost $
Mobilization/Demobilization & Bonds	L.S.	4,800,000	Job	4,800,000	Job	4,800,000
Road Stone	S.Y.	12.00	74,000	888,000	74,000	888,000
Geotextile	S.Y.	4.00	882,000	3,528,000	882,000	3,528,000
Personnel Pier	L.S.	250,000	Job	250,000	Job	250,000
Unsuitable Foundation Excavation	C.Y.	12.00	360,000	4,320,000	360,000	4,320,000
Stone Work						
Slope Armor Dike Section	Ton	42.00	393,000	16,506,000	393,000	16,506,000
Underlayer Dike Section	Ton	41.00	173,000	7,093,000	173,000	7,093,000
Toe Armor Dike Section	Ton	53.00	200,000	10,600,000	200,000	10,600,000
Quarry Run Dike Section	Ton	40.00	106,000	4,240,000	106,000	4,240,000
Spillways	Each	250,000	10	2,500,000	10	2,500,000
Nursery Planting	L.S.	200,000	Job	200,000	Job	200,000
SUBTOTAL				54,925,000		54,925,000
Borrow Alternative 1 (offsite)						
Clam Shell Dredge from Craighill Channel	C.Y.	2.25	5,437,000	12,233,000	3,149,000	7,085,000
40 Miles One Way Barge Transport	C.Y.	4.00	5,437,000	21,748,000	3,149,000	12,596,000
Dike Fill Hydraulically from Barge	C.Y.	7.00	5,437,000	38,059,000	3,149,000	22,043,000
A1 GRAND TOTAL				**126,965,000**		**96,649,000**
$ per CY of Site Capacity				1.62		1.86
Borrow Alternative 2 (onsite)						
Dike Fill Hydraulically from Onsite	C.Y.	8.00	5,437,000	43,496,000	3,149,000	25,192,000
A2 GRAND TOTAL				**98,421,000**		**80,117,000**
$ per CY of Site Capacity				1.26		1.54

James Island Habitat Development

Table E-3 - Preliminary Construction Costs Alignment No. 3
(Costs are Estimated in 2002 Dollars)

	Unit	Unit Rate $	Alignment No. 3 (20 FT)		Alignment No. 3 (10 FT)	
			Qty	Cost $	Qty	Cost $
Mobilization/Demobilization & Bonds	L.S.	4,800,000	Job	4,800,000	Job	4,800,000
Road Stone	S.Y.	12.00	68,000	816,000	68,000	816,000
Geotextile	S.Y.	4.00	807,000	3,228,000	807,000	3,228,000
Personnel Pier	L.S.	250,000	Job	250,000	Job	250,000
Unsuitable Foundation Excavation	C.Y.	12.00	1,118,000	13,416,000	1,118,000	13,416,000
Stone Work						
Slope Armor Dike Section 5	Ton	42.00	322,000	13,524,000	322,000	13,524,000
Underlayer Dike Section 5	Ton	41.00	137,000	5,617,000	137,000	5,617,000
Toe Armor Dike Section 5	Ton	40.00	146,000	5,840,000	146,000	5,840,000
Quarry Run Dike Section 5	Ton	40.00	89,000	3,560,000	89,000	3,560,000
Spillways	Each	250,000	10	2,500,000	10	2,500,000
Nursery Planting	L.S.	200,000	Job	200,000	Job	200,000
SUBTOTAL				53,751,000		53,751,000
Borrow Alternative 1 (offsite)						
Clam Shell Dredge from Craighill Channel	C.Y.	2.25	5,694,000	12,812,000	3,578,000	8,051,000
40 Miles One Way Barge Transport	C.Y.	4.00	5,694,000	22,776,000	3,578,000	14,312,000
Dike Fill Hydraulically from Barge	C.Y.	7.00	5,694,000	39,858,000	3,578,000	25,046,000
A1 GRAND TOTAL				**129,197,000**		**101,160,000**
$ per CY of Site Capacity				2.26		2.70
Borrow Alternative 2 (onsite)						
Dike Fill Hydraulically from Onsite	C.Y.	8.00	5,694,000	45,552,000	3,578,000	28,624,000
A2 GRAND TOTAL				**99,303,000**		**82,375,000**
$ per CY of Site Capacity				1.74		2.20

James Island Habitat Development

Table E-4 - Preliminary Construction Costs Alignment No. 4
(Costs are Estimated in 2002 Dollars)

	Unit	Unit Rate $	Alignment No. 4 (20 FT)		Alignment No. 4 (10 FT)	
			Qty	Cost $	Qty	Cost $
Mobilization/Demobilization & Bonds	L.S.	4,800,000	Job	4,800,000	Job	4,800,000
Road Stone	S.Y.	12.00	75,000	900,000	75,000	900,000
Geotextile	S.Y.	4.00	888,000	3,552,000	888,000	3,552,000
Personnel Pier	L.S.	250,000	Job	250,000	Job	250,000
Unsuitable Foundation Excavation	C.Y.	12.00	263,000	3,156,000	263,000	3,156,000
Stone Work						
Slope Armor Dike Section	Ton	42.00	382,000	16,044,000	382,000	16,044,000
Underlayer Dike Section	Ton	41.00	170,000	6,970,000	170,000	8,970,000
Toe Armor Dike Section	Ton	53.00	198,000	10,494,000	198,000	10,494,000
Quarry Run Dike Section	Ton	40.00	110,000	4,400,000	110,000	4,400,000
Spillways	Each	250,000	10	2,500,000	10	2,500,000
Nursery Planting	L.S.	200,000	Job	200,000	Job	200,000
SUBTOTAL				53,266,000		53,266,000
Borrow Alternative 1 (offsite)						
Clam Shell Dredge from Craighill Channel	C.Y.	2.25	5,493,000	12,359,000	3,086,000	8,944,000
40 Miles One Way Barge Transport	C.Y.	4.00	5,493,000	21,972,000	3,086,000	12,344,000
Dike Fill Hydraulically from Barge	C.Y.	7.00	5,493,000	38,451,000	3,086,000	21,602,000
A1 GRAND TOTAL				**126,048,000**		**94,156,000**
$ per CY of Site Capacity				1.60		1.83
Borrow Alternative 2 (onsite)						
Dike Fill Hydraulically from Onsite	C.Y.	8.00	5,493,000	43,944,000	3,086,000	24,688,000
A2 GRAND TOTAL				**97,210,000**		**77,954,000**
$ per CY of Site Capacity				1.23		1.52

James Island Habitat Development

Table E-5 - Preliminary Construction Costs Alignment No. 5
(Costs are Estimated in 2002 Dollars)

	Unit	Unit Rate $	Alignment No. 5 (20 FT)		Alignment No. 5 (10 FT)	
			Qty	Cost $	Qty	Cost $
Mobilization/Demobilization & Bonds	L.S.	4,800,000	Job	4,800,000	Job	4,800,000
Road Stone	S.Y.	12.00	71,000	852,000	71,000	852,000
Geotextile	S.Y.	4.00	828,000	3,312,000	828,000	3,312,000
Personnel Pier	L.S.	250,000	Job	250,000	Job	250,000
Unsuitable Foundation Excavation	C.Y.	12.00	263,000	3,156,000	263,000	3,156,000
Stone Work						
Slope Armor Dike Section 3	Ton	42.00	367,000	15,414,000	367,000	15,414,000
Underlayer Dike Section 3	Ton	41.00	164,000	6,724,000	164,000	8,724,000
Toe Armor Dike Section 3	Ton	53.00	187,000	9,911,000	187,000	9,911,000
Quarry Run Dike Section 3	Ton	40.00	101,000	4,040,000	101,000	4,040,000
Spillways	Each	250,000	10	2,500,000	10	2,500,000
Nursery Planting	L.S.	200,000	Job	200,000	Job	200,000
SUBTOTAL				51,159,000		51,159,000
Borrow Alternative 1 (offsite)						
Clam Shell Dredge from Craighill Channel	C.Y.	2.25	5,844,000	13,149,000	2,994,000	6,737,000
40 Miles One Way Barge Transport	C.Y.	4.00	5,844,000	23,376,000	2,994,000	11,976,000
Dike Fill Hydraulically from Barge	C.Y.	7.00	5,844,000	40,908,000	2,994,000	20,958,000
A1 GRAND TOTAL				**128,592,000**		**90,830,000**
$ per CY of Site Capacity				1.72		1.86
Borrow Alternative 2 (onsite)						
Dike Fill Hydraulically from Onsite	C.Y.	8.00	5,844,000	46,752,000	2,994,000	23,952,000
A2 GRAND TOTAL				**97,911,000**		**75,111,000**
$ per CY of Site Capacity				1.31		1.53

James Island Habitat Development

Table E - 6 Project Cost Analysis for Dike Alignment No. 1 (10 ft)
(Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	22.6	978.6	Site Surface Area (Ac)
Site Operating Life (Years)	13.3	32,102	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	1.7	13,039	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	10	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				63,235,000	From Table E-1 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibility costs.
Total Initial Construction Costs			$	**66,235,000**	
B. Site Development Costs:					
Dredged Material Management	13.3	Year	1,104,000	14,683,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	15.3	Year	1,535,000	23,486,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	16.3	Year	675,000	11,003,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs			$	**49,172,000**	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	13.3	Year	500,000	6,650,000	
Implementation					
Channels	489	Acre	6,000	2,936,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	979	Acre	4,400	4,306,000	$4,400 per acre
Operation & Maintenance	13.3	Year	500,000	6,650,000	
Total Habitat Development Costs			$	**23,542,000**	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	14.0	Year	2,000,000	28,000,000	Mob & Demob for operating life of site
Dredging	22.6	Mcy	2.00	45,200,000	Clamshell Dredging
Transport	22.6	Mcy	4.00	90,400,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	22.6	Mcy	2.25	50,850,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs			$	**214,450,000**	
Subtotal Project Cost A+B+C+D			$	**353,399,000**	
Contingency @	15%			53,010,000	
Total Project Cost A+B+C+D			$	**406,409,000**	
Total Unit Cost per CY Capacity (Rounded)			$	**18.00**	per cubic yard
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	22.6	Mcy	3.80	85,880,000	
Contingency @	15%			12,882,000	
Total Apportioned Costs to Channel Projects			$	**98,762,000**	
Summary of Costs:					
Total Project Cost				406,409,000	
Less Apportioned Cost to Channel Projects				(98,762,000)	
Total Apportioned Cost to James Island Project			$	**307,647,000**	

James Island Habitat Development

Table E - 7 Project Cost Analysis for Dike Alignment No. 2 (10 ft)
(Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	52.0	2,126.8	Site Surface Area (Ac)
Site Operating Life (Years)	14.9	48,812	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	3.5	18,159	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	10	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				80,117,000	From Table E-2 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibility costs.
Total Initial Construction Costs				$ 83,117,000	
B. Site Development Costs:					
Dredged Material Management	14.9	Year	2,224,000	33,138,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	16.9	Year	2,287,000	38,650,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	17.9	Year	675,000	12,083,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs				$ 83,871,000	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	14.9	Year	500,000	7,450,000	
Implementation					
Channels	1,063	Acre	6,000	6,380,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	2,127	Acre	4,400	9,358,000	$4,400 per acre
Operation & Maintenance	14.9	Year	500,000	7,450,000	
Total Habitat Development Costs				$ 33,638,000	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	15.0	Year	2,000,000	30,000,000	Mob & Demob for operating life of site
Dredging	52.0	Mcy	2.00	104,000,000	Clamshell Dredging
Transport	52.0	Mcy	4.00	208,000,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	52.0	Mcy	2.25	117,000,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs				$ 459,000,000	
Subtotal Project Cost A+B+C+D				$ 659,626,000	
Contingency @	15%			98,944,000	
Total Project Cost A+B+C+D				$ 758,570,000	
Total Unit Cost per CY Capacity (Rounded)				$ 15.00	per cubic yard

Apportioned Costs to Channel Projects:				
Dredging, Transport & Placement	52.0	Mcy	3.80	197,600,000
Contingency @	15%			29,640,000
Total Apportioned Costs to Channel Projects				$ 227,240,000

Summary of Costs:	
Total Project Cost	758,570,000
Less Apportioned Cost to Channel Projects	(227,240,000)
Total Apportioned Cost to James Island Project	$ 531,330,000

James Island Habitat Development

Table E - 8 Project Cost Analysis for Dike Alignment No. 3 (10 ft) (Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	37.5	1,586.0	Site Surface Area (Ac)
Site Operating Life (Years)	13.4	44,497	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	2.8	17,624	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	10	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				82,375,000	From Table E-3 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibility costs.
Total Initial Construction Costs				$ **85,375,000**	
B. Site Development Costs:					
Dredged Material Management	13.4	Year	1,696,000	22,726,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	15.4	Year	2,092,000	32,217,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	16.4	Year	675,000	11,070,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs				$ **66,013,000**	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	13.4	Year	500,000	6,700,000	
Implementation					
Channels	793	Acre	6,000	4,758,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	1,586	Acre	4,400	6,978,000	$4,400 per acre
Operation & Maintenance	13.4	Year	500,000	6,700,000	
Total Habitat Development Costs				$ **28,136,000**	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	14.0	Year	2,000,000	28,000,000	Mob & Demob for operating life of site
Dredging	37.5	Mcy	2.00	75,000,000	Clamshell Dredging
Transport	37.5	Mcy	4.00	150,000,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	37.5	Mcy	2.25	84,375,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs				$ 337,375,000	
Subtotal Project Cost A+B+C+D				$ **516,899,000**	
Contingency @	15%			77,535,000	
Total Project Cost A+B+C+D				$ **594,434,000**	
Total Unit Cost per CY Capacity (Rounded)				$ **16.00**	per cubic yard
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	37.5	Mcy	3.80	142,500,000	
Contingency @	15%			21,375,000	
Total Apportioned Costs to Channel Projects				$ **163,875,000**	
Summary of Costs:					
Total Project Cost				594,434,000	
Less Apportioned Cost to Channel Projects				(163,875,000)	
Total Apportioned Cost to James Island Project				$ **430,559,000**	

James Island Habitat Development

Table E - 9 Project Cost Analysis for Dike Alignment No. 4 (10 ft) (Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	51.4	2,202.0	Site Surface Area (Ac)
Site Operating Life (Years)	14.7	48,963	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	3.5	19,632	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	10	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				77,954,000	From Table E-4 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibillty costs.
Total Initial Construction Costs			$	**80,954,000**	
B. Site Development Costs:					
Dredged Material Management	14.7	Year	2,297,000	33,766,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	16.7	Year	2,293,000	38,293,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	17.7	Year	675,000	11,948,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs			$	**84,007,000**	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	14.7	Year	500,000	7,350,000	
Implementation					
Channels	1,101	Acre	6,000	6,606,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	2,202	Acre	4,400	9,689,000	$4,400 per acre
Operation & Maintenance	14.7	Year	500,000	7,350,000	
Total Habitat Development Costs			$	**33,995,000**	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	15.0	Year	2,000,000	30,000,000	Mob & Demob for operating life of site
Dredging	51.4	Mcy	2.00	102,800,000	Clamshell Dredging
Transport	51.4	Mcy	4.00	205,600,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	51.4	Mcy	2.25	115,650,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs			$	**454,050,000**	
Subtotal Project Cost A+B+C+D			$	**653,006,000**	
Contingency @	15%			97,951,000	
Total Project Cost A+B+C+D			$	**750,957,000**	
Total Unit Cost per CY Capacity (Rounded)			$	**15.00**	**per cubic yard**
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	51.4	Mcy	3.80	195,320,000	
Contingency @	15%			29,298,000	
Total Apportioned Costs to Channel Projects			$	**224,618,000**	
Summary of Costs:					
Total Project Cost				750,957,000	
Less Apportioned Cost to Channel Projects				(224,618,000)	
Total Apportioned Cost to James Island Project			$	**526,339,000**	

James Island Habitat Development

Table E - 10 Project Cost Analysis for Dike Alignment No. 5 (10 ft)
(Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	49.0	2,072.0	Site Surface Area (Ac)
Site Operating Life (Years)	13.6	45,587	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	3.6	18,630	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	10	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				75,111,000	From Table E-5 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibility costs.
Total Initial Construction Costs			$	78,111,000	
B. Site Development Costs:					
Dredged Material Management	13.6	Year	2,170,000	29,512,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	15.6	Year	2,141,000	33,400,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	16.6	Year	675,000	11,205,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs			$	74,117,000	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	13.6	Year	500,000	6,800,000	
Implementation					
Channels	1,036	Acre	6,000	6,216,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	2,072	Acre	4,400	9,117,000	$4,400 per acre
Operation & Maintenance	13.6	Year	500,000	6,800,000	
Total Habitat Development Costs			$	31,933,000	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	14.0	Year	2,000,000	28,000,000	Mob & Demob for operating life of site
Dredging	49.0	Mcy	2.00	98,000,000	Clamshell Dredging
Transport	49.0	Mcy	4.00	196,000,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	49.0	Mcy	2.25	110,250,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs			$	432,250,000	
Subtotal Project Cost A+B+C+D			$	616,411,000	
Contingency @	15%			92,462,000	
Total Project Cost A+B+C+D			$	708,873,000	
Total Unit Cost per CY Capacity (Rounded)			$	14.00	per cubic yard
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	49.0	Mcy	3.80	186,200,000	
Contingency @	15%			27,930,000	
Total Apportioned Costs to Channel Projects			$	214,130,000	
Summary of Costs:					
Total Project Cost				708,873,000	
Less Apportioned Cost to Channel Projects				(214,130,000)	
Total Apportioned Cost to James Island Project			$	494,743,000	

James Island Habitat Development

Table E - 11 Project Cost Analysis for Dike Alignment No. 1 (20 ft) (Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	34.7	978.6	Site Surface Area (Ac)
Site Operating Life (Years)	20.4	32,102	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	1.7	13,039	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	20	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				79,115,000	From Table E-1 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibility costs.
Total Initial Construction Costs			$	**82,115,000**	
B. Site Development Costs:					
Dredged Material Management	20.4	Year	1,104,000	22,522,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	22.4	Year	1,535,000	34,384,000	Site Maintenance for operating life plus 2 yeers following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	23.4	Year	675,000	15,795,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs			$	**72,701,000**	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	20.4	Year	500,000	10,200,000	
Implementation					
Channels	489	Acre	6,000	2,936,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	979	Acre	4,400	4,306,000	$4,400 per acre
Operation & Maintenance	20.4	Year	500,000	10,200,000	
Total Habitat Development Costs			$	**30,642,000**	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	21.0	Year	2,000,000	42,000,000	Mob & Demob for operating life of site
Dredging	34.7	Mcy	2.00	69,400,000	Clamshell Dredging
Transport	34.7	Mcy	4.00	138,800,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	34.7	Mcy	2.25	78,075,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs			$	**328,275,000**	
Subtotal Project Cost A+B+C+D			$	**513,733,000**	
Contingency @	15%			77,060,000	
Total Project Cost A+B+C+D			$	**590,793,000**	
Total Unit Cost per CY Capacity (Rounded)			$	**17.00**	**per cubic yard**
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	34.7	Mcy	3.80	131,860,000	
Contingency @	15%			19,779,000	
Total Apportioned Costs to Channel Projects			$	**151,639,000**	
Summary of Costs:					
Total Project Cost				590,793,000	
Less Apportioned Cost to Channel Projects				(151,639,000)	
Total Apportioned Cost to James Island Project			$	**439,154,000**	

James Island Habitat Development

Table E - 12 Project Cost Analysis for Dike Alignment No. 2 (20 ft) (Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	78.3	2,126.8	Site Surface Area (Ac)
Site Operating Life (Years)	22.4	48,812	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	3.5	18,159	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	20	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				98,421,000	From Table E-2 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibillty costs.
Total Initial Construction Costs			$	**101,421,000**	
B. Site Development Costs:					
Dredged Material Management	22.4	Year	2,224,000	49,818,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	24.4	Year	2,287,000	55,803,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	25.4	Year	675,000	17,145,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs			$	**122,766,000**	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	22.4	Year	500,000	11,200,000	
Implementation					
Channels	1,063	Acre	6,000	6,380,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	2,127	Acre	4,400	9,358,000	$4,400 per acre
Operation & Maintenance	22.4	Year	500,000	11,200,000	
Total Habitat Development Costs			$	**41,138,000**	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	23.0	Year	2,000,000	46,000,000	Mob & Demob for operating life of site
Dredging	78.3	Mcy	2.00	156,600,000	Clamshell Dredging
Transport	78.3	Mcy	4.00	313,200,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	78.3	Mcy	2.25	176,175,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs			$	**691,975,000**	
Subtotal Project Cost A+B+C+D			$	**957,300,000**	
Contingency @	15%			143,595,000	
Total Project Cost A+B+C+D			$	**1,100,895,000**	
Total Unit Cost per CY Capacity (Rounded)			$	**14.00**	**per cubic yard**
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	78.3	Mcy	3.80	297,540,000	
Contingency @	15%			44,631,000	
Total Apportioned Costs to Channel Projects			$	**342,171,000**	
Summary of Costs:					
Total Project Cost				1,100,895,000	
Less Apportioned Cost to Channel Projects				(342,171,000)	
Total Apportioned Cost to James Island Project			$	**758,724,000**	

James Island Habitat Development

Table E - 13 Project Cost Analysis for Dike Alignment No. 3 (20 ft)
(Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	57.2	1,586.0	Site Surface Area (Ac)
Site Operating Life (Years)	20.4	44,497	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	2.8	17,624	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	20	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				99,303,000	From Table E-3 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibility costs.
Total Initial Construction Costs				$ 102,303,000	
B. Site Development Costs:					
Dredged Material Management	20.4	Year	1,696,000	34,598,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	22.4	Year	2,092,000	46,861,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	23.4	Year	675,000	15,795,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs				$ 97,254,000	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	20.4	Year	500,000	10,200,000	
Implementation					
Channels	793	Acre	6,000	4,758,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	1,586	Acre	4,400	6,978,000	$4,400 per acre
Operation & Maintenance	20.4	Year	500,000	10,200,000	
Total Habitat Development Costs				$ 35,136,000	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	21.0	Year	2,000,000	42,000,000	Mob & Demob for operating life of site
Dredging	57.2	Mcy	2.00	114,400,000	Clamshell Dredging
Transport	57.2	Mcy	4.00	228,800,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	57.2	Mcy	2.25	128,700,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs				$ 513,900,000	
Subtotal Project Cost A+B+C+D				$ 748,593,000	
Contingency @	15%			112,289,000	
Total Project Cost A+B+C+D				$ 860,882,000	
Total Unit Cost per CY Capacity (Rounded)				$ 15.00	per cubic yard
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	57.2	Mcy	3.80	217,360,000	
Contingency @	15%			32,604,000	
Total Apportioned Costs to Channel Projects				$ 249,964,000	
Summary of Costs:					
Total Project Cost				860,882,000	
Less Apportioned Cost to Channel Projects				(249,964,000)	
Total Apportioned Cost to James Island Project				$ 610,918,000	

James Island Habitat Development

Table E - 14 Project Cost Analysis for Dike Alignment No. 4 (20 ft)
(Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	78.7	2,202.0	Site Surface Area (Ac)
Site Operating Life (Years)	22.5	48,963	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	3.5	19,632	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	20	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				97,210,000	From Table E-4 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibility costs.
Total Initial Construction Costs			$	**100,210,000**	
B. Site Development Costs:					
Dredged Material Management	22.5	Year	2,297,000	51,683,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	24.5	Year	2,293,000	56,179,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	25.5	Year	675,000	17,213,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs			$	**125,075,000**	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	22.5	Year	500,000	11,250,000	
Implementation					
Channels	1,101	Acre	6,000	6,606,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	2,202	Acre	4,400	9,689,000	$4,400 per acre
Operation & Maintenance	22.5	Year	500,000	11,250,000	
Total Habitat Development Costs			$	**41,795,000**	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	23.0	Year	2,000,000	46,000,000	Mob & Demob for operating life of site
Dredging	78.7	Mcy	2.00	157,400,000	Clamshell Dredging
Transport	78.7	Mcy	4.00	314,800,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	78.7	Mcy	2.25	177,075,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs			$	**695,275,000**	
Subtotal Project Cost A+B+C+D			$	**962,355,000**	
Contingency @	15%			144,353,000	
Total Project Cost A+B+C+D			$	**1,106,708,000**	
Total Unit Cost per CY Capacity (Rounded)			$	**14.00**	per cubic yard
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	78.7	Mcy	3.80	299,060,000	
Contingency @	15%			44,859,000	
Total Apportioned Costs to Channel Projects			$	**343,919,000**	
Summary of Costs:					
Total Project Cost				1,106,708,000	
Less Apportioned Cost to Channel Projects				(343,919,000)	
Total Apportioned Cost to James Island Project			$	762,789,000	

James Island Habitat Development

Table E - 15 Project Cost Analysis for Dike Alignment No. 5 (20 ft) (Costs are Estimated in 2002 Dollars)

Basis For Estimate:

Site Capacity (Mcy)	74.7	2,072.0	Site Surface Area (Ac)
Site Operating Life (Years)	21.3	45,587	Site Perimeter Dike (Ft)
Annual Channel (Cut) Volume (Mcy)	3.5	18,530	Site Interior Dikes (Ft)
Average One-Way Haul Distance (NM)	40	20	Final Dike Elev. (Ft)

	Quantity	Unit	Unit Cost $	Item Cost $	Comments
A. Initial Construction Costs:					
Initial Construction Costs				97,911,000	From Table E-5 (onsite)
Study Costs				3,000,000	Conceptual, pre-feasibility and feasibility costs.
Total Initial Construction Costs				$ 100,911,000	
B. Site Development Costs:					
Dredged Material Management	21.3	Year	2,170,000	46,221,000	Placement, dewatering and crust management costs for the operating life. $150,000 + ($975 per acre)
Site Maintenance	23.3	Year	2,141,000	49,885,000	Site Maintenance for operating life plus 2 years following site placement. $90,000 + ($45 per Perimeter Ft.)
Site Monitoring and Reporting	24.3	Year	675,000	16,403,000	Environmental monitoring for operating life, plus 3 years following site placement.
Total Site Development Costs				$ 112,509,000	
C. Habitat Development Cost :					
Plan and Design	3.0	Year	1,000,000	3,000,000	
Monitoring	21.3	Year	500,000	10,650,000	
Implementation					
Channels	1,036	Acre	6,000	6,216,000	$8/cy x 3 cy/LF x 250 LF/acre
Planting / Seeding	2,072	Acre	4,400	9,117,000	$4,400 per acre
Operation & Maintenance	21.3	Year	500,000	10,650,000	
Total Habitat Development Costs				$ 39,633,000	
D. Dredging, Transportation & Placement Costs:					
Mob and Demob	22.0	Year	2,000,000	44,000,000	Mob & Demob for operating life of site
Dredging	74.7	Mcy	2.00	149,400,000	Clamshell Dredging
Transport	74.7	Mcy	4.00	298,800,000	$0.10 Per One-Way Haul in NM (40 NM)
Placement	74.7	Mcy	2.25	168,075,000	Hydraulic Unloader
Total Dredging, Transport & Placement Costs				$ 660,275,000	
Subtotal Project Cost A+B+C+D				$ 913,328,000	
Contingency @	15%			136,999,000	
Total Project Cost A+B+C+D				$ 1,050,327,000	
Total Unit Cost per CY Capacity (Rounded)				$ 14.00	per cubic yard
Apportioned Costs to Channel Projects:					
Dredging, Transport & Placement	74.7	Mcy	3.80	283,860,000	
Contingency @	15%			42,579,000	
Total Apportioned Costs to Channel Projects				$ 326,439,000	
Summary of Costs:					
Total Project Cost				1,050,327,000	
Less Apportioned Cost to Channel Projects				(326,439,000)	
Total Apportioned Cost to James Island Project				$ 723,888,000	

TABLE E-16 ESCALATION OF UNIT RATES FROM PREVIOUS POPLAR BIDS

(Based on 1998 Poplar Island Phase I and 2000 Poplar Island Phase II Bids - Escalated to 2002 @ 2.5% per annum)

Item No.	Description	Unit	Poplar Island Phase I - Bid Unit Rates From Five Lowest Bidders					Escalated @ 1.104	Poplar II Escal. 1.051	Combined Avg. Rounded	Use For James Isl.
			Low Bid	2nd Bid	3rd Bid	4th Bid	5th Bid				
01	Bonds	LS	400,000.00	300,000.00	225,000.00	500,000.00	356,250.00	393,233.34	188,000.00	291,000.00	300,000.00
02	Mob / Demob	LS	4,870,800.00	4,200,259.00	2,000,000.00	5,948,000.00	4,254,764.75	4,696,464.18	4,203,000.00	4,450,000.00	4,500,000.00
03	Geotechnical Borings	Lin Ft	50.00	75.00	55.00	50.00	57.50	63.47		63.00	63.00
04	Roadway Stone	Sq Yd	10.00	10.00	10.00	16.00	11.50	12.69	11.00	12.00	12.00
05	Geotextile	Sq Yd	3.00	3.50	3.00	4.00	3.38	3.73	4.00	4.00	4.00
06	Personnel Pier	LS	100,000.00	410,400.00	120,000.00	200,000.00	207,600.00	229,151.56		229,000.00	250,000.00
07	Unsuitable Fdn Excavation	CY	8.00	7.50	10.00	10.00	8.88	9.80	14.00	12.00	12.00
08	Hydraulic Fill Material	CY	5.50	5.00	4.00	5.94	5.11	5.64	8.00	7.00	8.00
09AA	2000 # Toe Armor Stone	Ton	36.00	55.00	45.00	48.00	46.00	50.78	53.00	52.00	54.00
09AB	1500 # Toe Armor Stone	Ton	36.00	50.00	45.00	48.00	44.75	49.40	53.00	51.00	53.00
09AC	3000 # Armor Stone	Ton	34.00	35.00	45.00	32.00	36.50	40.29	37.00	39.00	41.00
09AD	4000 # Armor Stone	Ton	34.00	34.00	45.00	32.00	36.25	40.01		40.00	42.00
09AE	Underlayer & 250 # Armor	Ton	32.00	36.00	45.00	37.00	37.50	41.39	37.00	39.00	41.00
09AF	Quarry Run Stone	Ton	26.00	20.00	24.00	25.00	23.75	26.22	49.00	38.00	40.00
09AG	No. 57 Stone	CY	30.00	40.00	60.00	45.00	43.75	48.29		48.00	50.00
10AA	Type A Spillway	Each	100,000.00	90,000.00	175,000.00	95,000.00	115,000.00	126,938.48	158,000.00	142,000.00	250,000.00
10AB	Type B Spillway	Each	200,000.00	200,000.00	360,000.00	175,000.00	233,750.00	258,016.26	315,000.00	287,000.00	250,000.00
10AC	Type C Spillway	Each	225,000.00	210,000.00	400,000.00	200,000.00	258,750.00	285,611.59		286,000.00	250,000.00
11	Nursery Planting	LS	150,000.00	155,000.00	200,000.00	100,000.00	151,250.00	166,951.70		167,000.00	200,000.00
12AA	Geotextile Tubes	LS	700,000.00	800,000.00	900,000.00	1,349,000.00	937,250.00	1,034,548.63		1,035,000.00	
12AB	Geotextile Tubes Dike Sect.	LS	600,000.00	1,300,000.00	1,000,000.00	1,025,000.00	981,250.00	1,083,116.40		1,083,000.00	
13	Geotextile Tubes Shoreline	LS	60,000.00	217,000.00	250,000.00	285,000.00	203,000.00	224,074.02		224,000.00	
14	Shell Clutch	LS	100,000.00	225,120.00	200,000.00	141,630.00	166,687.50	183,991.81	262,000.00	223,000.00	

Note: $2.00 added to James Island rock unit rates to account for longer haul distance.