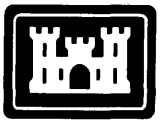


US Army Corps
of Engineers
Baltimore District

Maryland Port
Administration

Baltimore Harbor Anchorages and Channels, Maryland

Integrated Feasibility Report and Environmental Impact Statement

Technical Appendices

APPENDIX G - DESIGN

March 1997

APPENDIX G

DESIGN

BALTIMORE HARBOR ANCHORAGES AND CHANNELS, MARYLAND FEASIBILITY STUDY

1.1 INTRODUCTION

The purpose of this appendix is to present the results of engineering evaluations of the anchorages, branch channels and turning basin in Baltimore Harbor, Maryland. These improvements are a necessary adjunct to the Baltimore Harbor & Channels 50-Foot Project and would provide temporary mooring areas, safer and more efficient branch channels and safer and more efficient turning areas for deep draft vessels calling on the Port of Baltimore.

The following information is presented in this appendix:

Field Investigations
Site Conditions
Design Criteria
Anchorage Requirements
Alternatives Considered
Evaluation and Selection of a Recommended Alternative

The overall intent of this project is to assess the need for additional deep draft anchorages and improved channels in the Baltimore Harbor area and to recommend the optimum means for providing these improvements.

2.1 FIELD INVESTIGATIONS

2.1.1 Hydrographic Surveys

Hydrographic surveys were conducted in the anchorage and branch channel areas recommended for improvement in the reconnaissance study. The surveys were conducted by the Baltimore District's survey vessel LINTHICUM during August 1993 using a Sercel global positioning system. Surveys were conducted perpendicular to the channel centerline every 100 feet and sounding data was collected every 2 seconds along the cross sections. Condition surveys of the Ft. McHenry Channel and Ft. McHenry Anchorage conducted by the LINTHICUM during April 1995 were used for the turning basin. These surveys were used to determine the location and to compute dredging quantities for the proposed anchorages, branch

channels and turning basin improvements. The surveys are shown on Plates 1 through 4 of this appendix.

2.1.2 Sidescan Sonar Surveys

In addition to the hydrographic surveys, sidescan sonar and magnetometer surveys were conducted in the anchorage and branch channel areas to locate possible obstructions and archeologically significant artifacts. Six targets were identified just north of Anchorage No. 3 and just east of Anchorage No. 2, in the area proposed for expansion of Anchorage No. 3. The targets were determined to be of no archaeological significance, but were identified as possibly being barrels. U.S. Army divers stationed at Ft. Eustis, Virginia investigated the area to determine the nature of the targets. The divers identified and removed a barrel top, 5-gallon bucket, a guard rail and a metal box. No additional obstructions were identified.

2.1.3 Geotechnical Investigations

Extensive soil investigations were made in the proposed anchorages and branch channels to determine foundation conditions for any proposed structures and the character of material to be dredged. The geotechnical data and analyses are presented in Appendix E, Geotechnical Engineering. There are no soils problems anticipated with respect to dredging the anchorages, branch channels or turning basin.

2.1.4 Utility Investigations

There are no utilities or other structures in the proposed anchorage or branch channel areas. The Baltimore Harbor Tunnel, Route I-895, crosses the harbor at the northwestern end of the Ft. McHenry Channel and the Ft. McHenry Anchorage in the vicinity of the proposed turning basin. The location of the proposed turning basin will be further evaluated during Preconstruction, Engineering and Design studies to optimize the location of the turning basin and ensure there are no conflicts with the Baltimore Harbor Tunnel. If necessary the turning basin will be shifted to the southeast to avoid impacting the tunnel.

2.1.5 Regulations and Restrictions

The Code of Federal Regulations, 33 CFR was reviewed for restrictions and regulations in Baltimore Harbor. The first proposed anchorage would be located in a portion of Anchorage No. 3 necessitating revision of 33 CFR to reduce the size of the existing anchorage No. 3. The second proposed anchorage and widening of the Dundalk West channel would replace and eliminate the existing Anchorage No.4. The proposed turning basin would considerably shorten Anchorage No. 1. Since Anchorage No. 1 is rarely used because of its narrow width, and since additional anchorage areas are being provided, Anchorage No. 1 would be recommended for deauthorization.

3.1 SITE CONDITIONS

Site conditions in the study area have been condensed from existing data as presented in previous Corps of Engineers' reports, NOAA Tide and Current Tables, the United State Coast Pilot No 3, and other available sources. These conditions will be used in evaluating potential anchorage locations on a general scale, based on the criteria discussed below, as well as for specific sites as presented in Section 5.0 of this report.

3.1.1 TIDES

The mean tidal range in Baltimore Harbor is 1.1 feet at Ft. McHenry. Mean High Water is 1.35 feet above mean lower low water and mean tide level is 0.8 feet above mean lower low water. Hurricanes and storms periodically strike the Baltimore area causing extreme high and low tides. Prolonged winds from the northwest will move water out of the harbor and Chesapeake Bay lowering water levels, while prolonged southeast winds will move water into the Chesapeake Bay and harbor area increasing water levels. Water levels at Ft. McHenry have been recorded as low as 4.9 feet below mean lower low water and as high as 7.9 feet above mean lower low water.

3.1.2 CURRENT CONDITIONS

Current affecting the study area are generally caused by tidal currents, fresh water runoff, and storm induced surges. Normal flood and ebb currents in the harbor are typically weak and variable in nature. In general, currents in the anchorage areas are aligned with the channels, reversing nearly 180 degrees during flood and ebb tide cycles. in the study area range between 0.5 and 1.7 knots. Storm-induced surges or heavy runoff would cause stronger currents throughout the area.

3.1. 3 WAVE CONDITIONS

Wave conditions within Baltimore Harbor are caused by waves propagating through the mouth of the Patapsco River from the Chesapeake Bay and by locally generated wind waves. As a result of the limited exposure of the Baltimore Harbor area, average annual wave heights should be less than two feet.

4 DESIGN CRITERIA

The design criteria presented here for the deep water anchorages for Baltimore Harbor were established after a review of existing published data. These criteria were used for the preliminary development and evaluation of alternative anchorage and branch channel concepts. They are not intended to be used in developing final designs or operating criteria for the anchorage facilities.

For this study, design criteria were required both for the development of the number of anchorages required (queuing analysis) as well as for the type and siting of the anchorages. The following criteria were evaluated:

4.1 Vessel Characteristics

A review of the existing fleet using the anchorages in Baltimore and Annapolis, indicates that a 95 percent of the vessels had a length of 875 feet or less. A bulk carrier, 875 feet long, drawing 38 feet in a ballasted condition was selected as the design vessel for the anchorages.

The design vessel for the branch channels was a Panamax container vessel 965 feet long, with a 106-foot beam since vessels of this size frequently call on the port. It should be noted that Post-Panamax container vessels (with beams ranging from 135 to 145 feet) are in operation today and several container lines have numerous ships either under construction or planned for construction in the next several years. The Seagirt Marine Terminal was designed for these larger container vessels and already has the container cranes in place to handle the vessels.

A 150,000 - 175,000 Dead Weight Tonnage bulk carrier with a 1,000-foot length and 150 to 175-foot beam was selected as the design vessel for the turning basin since vessels this size already call at the coal facilities.

4.2 Anchorage Alternatives Considered

The location and type of anchorage alternatives must be considered in evaluating potential anchorages in Baltimore Harbor. These factors are interrelated since the type of anchorage, vis a vis, swing, fixed structure, spread mooring, etc., will dictate spatial requirements. The area required bears a direct impact on location, particularly in congested areas. Conversely, available sites can also have an impact on selection of the type of anchorage recommended. The evaluation requires concurrent consideration of both sets of alternatives, including such factors as the number of anchorages required, cost, operational considerations, foundation conditions, etc.

4.3 Alternative Anchorage Sites

Siting of anchorages within a harbor directly impacts the operational efficiency of the port and the cost of the anchorages. The following factors affect the location of anchorage areas.

4.3.1 Proximity to Channel and Port Facilities - From an operational standpoint, anchorages should be located as close as possible to the channels, berthing areas and facilities being served. The anchorages should provide easy access to the berthing areas but should not hinder ship operations in channels and turning basins.

4.3.2 Level of Protection - Anchorage areas should be located in protected areas. The greater

the level of protection afforded, the greater the utility of the anchorages particularly during adverse weather conditions.

4.3.3 Existing/Natural Depths - In order to minimize dredging requirements, anchorages should be located in areas with sufficient, naturally deep water. Where practical, this approach will minimize both initial dredging and subsequent maintenance dredging requirements. Where sufficient natural depths are not available, anchorage should be located in areas which minimize dredging to achieve the necessary depths and to minimize future maintenance dredging.

4.3.4 Currents - Anchorage locations should be free of strong or highly variable currents. Strong currents will generally tend to increase the required holding power developed by anchors in swing moorings, mooring loads, and structure forces in fixed moorings. In addition, strong and/or highly variable currents tend to complicate vessel handling in an anchorage.

4.3.5 Foundation Conditions - It is preferable to locate anchorages in areas where the bottom is relatively soft avoiding areas of rock, hard gravel, coral, etc. Deep muds and silts are also undesirable, however, due in part to their adverse impacts on anchor handling/holding power. In the case of fixed moorings, consideration should be given to the engineering characteristics of the foundations in terms of their ability to support fixed structures.

4.3.6 Bottom Obstructions - The bottom and anchorage areas should be free of obstructions, such as ship wrecks, bridges, tunnels, pipelines, cable crossings, etc.

4.3.7 Site Selection - Sites were only considered inside Baltimore Harbor to provide the maximum level of protection, nearest proximity to facilities, minimal currents, and the greatest operational efficiency. There are currently seven anchorages in Baltimore Harbor. Since these anchorages were identified initially because of the factors discussed above, site selection was keyed to these areas.

Water depths were determined from the August 1993 surveys in the areas of Anchorage Nos 2, 3 and 4. National Oceanic and Atmospheric Administration, National Ocean Survey navigation chart 12281 was used to evaluate depths in other areas of the harbor. The deepest waters within Baltimore Harbor are located in the vicinity of Anchorages No 2, 3 and 4 primarily due to the fact that Anchorages No. 3 and 4 are maintained to depths of 35 and 30 feet, respectively. Anchorage No. 2 has natural depths of 20 to 25 feet.

4.4 Branch Channel Siting

Branch channels are siting using same siting conditions for anchorages. With the exception of the proposed South Locust Point Channel, the branch channels targeted for improvements in this study already serve the Seagirt and Dundalk Marine Terminals and have range lights

marking the channel location. Improvements to the existing branch channels were therefore designed to maintain the current channel centerlines. The proposed new South Locust Point Channel was located to take advantage of natural water depths and provide efficient maneuvering from the existing South Locust Point Channel to the Ferry Bar Channel.

5. DESIGN ANALYSES

5.1 Anchorage Design Analysis

Based on construction, operations and maintenance costs and other operational considerations free-swinging anchorages were determined to provide the safest and most cost-effective solution for providing anchorage areas. The results of vessel queuing analyses indicate that two 42-foot deep anchorages are recommended, one 2,200 feet x 2,200 feet and the other 1,800 feet x 1,800 feet.

Given the existing depths in the harbor and location of current anchorages in the proximity of the land side facilities, the best locations for the proposed anchorages in terms of both available depths and proximity to facilities served are Anchorages No. 3 and 4. The 2,200 x 2,200 x 42-foot anchorage would be located at the southeast east end of Anchorage No. 3. This would take advantage of the deeper depths in Anchorage No.3, while keeping a little more than half of the existing Anchorage no. 3 and all of Anchorage No. 2 for other shallower draft vessels. The 1,800 x 1,800 x 42-foot anchorage would be located at the southeast end of Anchorage No. 4. This would take advantage of the deeper depths in Anchorage No. 4 (although not as deep as Anchorage No. 3) and would allow use of the remaining portion of Anchorage No. 4 for widening the entrance to the West Dundalk Marine Channel. The two revised Baltimore Harbor Anchorages recommended for improvement are shown on Plate 2. The U.S. Coast Guard will be required to implement new rules and make necessary revisions to 33 CFR.

5.2 Branch Channel Design Analyses

Design of the branch channels is based upon one way traffic for container vessels. Ships frequently use tugs to assist in maneuvering through the channels, but more maneuverable vessels with bow and stern thrusters may depart berths under their own power. Channel depths would remain commensurate with existing channel depths since it is uncertain whether the existing berthing areas could be deepened without adversely impacting the structural integrity of the marine terminals.

5.2.1 Dundalk East Channel Design

Based upon the design guidance provided in Draft EM 1110-2-1613, Hydraulic Design of Deep Draft Navigation Projects, 8 January 1994, one way channels with variable cross sections, average aids to navigation, trench configurations, and maximum current velocities of

0.5 knots, should have a channel width of 3.5 times the beam of the design vessel. Based upon a Panamax design vessel 965 feet long and 106 feet wide, the channel would have a width of 371 feet. Due to the difficulties associated with maneuvering these long vessels in a confined channel with berthing and anchorage areas located immediately adjacent to the channel, the channel width was rounded up to 400 feet.

5.2.2 Seagirt-Connecting-Dundalk West Channel Design

Design of the Seagirt-Connecting-Dundalk West Channel was based upon a Panamax design vessel 965 feet long and 106 feet wide as discussed for the Dundalk East Channel. However consideration was given to designing the channel for a post-Panamax vessel to be consistent with the existing West Seagirt Marine Channel. Based upon a 140-foot beam vessel, the channel would have a width of 490 feet, which would be rounded up to 500 feet.

5.2.3 South Locust Point Channel Design

The South Locust Point Channel was designed with the same constraints and conditions as the Dundalk East Channel.

5.3 Turning Basin Analysis

As indicated in Draft EM 1110-2-1613, Hydraulic Design of Deep Draft Navigation Projects, 8 January 1994, turning basins are provided for safe and efficient navigation through channel systems and for sufficient maneuvering room for ships to turn around. Turning basins are usually located at the head of navigation, the upstream end of a group of docks or terminals, or at the entrance to a side channel with berthing facilities. Large bulk carriers ranging up to 150,000 - 175,000 Dead Weight Tonnage are calling on the Consolidation Coal Sales Company (CCSC) terminal at the head of the Ft. McHenry Channel. The bulk carriers range up to 1,000 feet long, 175 feet wide and currently load to drafts of up to 47.5 feet. These vessels do not have bow or stern thrusters and rely on two or more tugs to back the vessels out of CCSC's channel and turn them using the 50-foot deep CCSC access channel, the 700-foot wide Ft. McHenry Channel, and the 35-foot deep Ft. McHenry Anchorage. A turning basin is needed at the head of the Ft. McHenry Channels to provide a safe maneuvering area to turn these large vessels and to provide safer and more efficient movement for other vessels using the Ft. McHenry Channel and turning into other access channels in the vicinity.

The turning basin should provide a minimum turning diameter of 1.2 to 1.5 times the length of the design vessel depending on the currents and wind conditions in the area. The turning basin should have a minimum diameter of 1.2 times the vessel length where prevailing currents are 0.5 knots or less, and a minimum diameter of at least 1.5 times the vessel length if prevailing currents are 0.5 to 1.5 knots. The basin should be elongated further in areas with stronger currents.

The turning basin is best situated at the head of the Ft. McHenry Channel and Ft. McHenry Anchorage, see Plate 4. This location is the most convenient for vessels calling on CCSC and other facilities in the area, provides additional maneuvering room where two federal channels meet, and takes advantage of deeper water to minimize dredging costs.

Since currents in Baltimore Harbor are weak and variable (less than 0.5 knots), the proposed turning basin is located away from piers and other structures, and the vessels use tugs to turn, the turning basin was designed with a turning diameter 1,200 feet (1.2 times the vessel length). The turning basin will be dredged to a depth of 50, plus two feet of allowable overdepth commensurate with the 50-foot deep Ft. McHenry Channel. The turning basin will be located primarily within the existing Ft. McHenry Channel and Ft. McHenry Anchorage to take advantage of deeper water with minor widening on the north side. The southeastern end of the basin will be tapered at a 45 degree angle to transition with the Ft. McHenry Channel.. The turning basin may be shifted to the southeast during PED if it is determined that the basin will interfere with the existing Baltimore Harbor Tunnel, I-895, which crosses the harbor near the head of the Ft. McHenry Channel.

6 QUANTITY CALCULATIONS

6.1 Anchorages

Dredging quantities for the anchorages were calculated from the August 1993 surveys. Based upon the design vessel, quantities for the new anchorage in Anchorage No. 3 included deepening an area 2,200 x 2,200 feet to a depth of 42 feet, plus two feet of allowable overdepth, with side slopes of 3 horizontal to 1 vertical (3H:1V). Quantities do not include existing maintenance dredging quantities within the limits of Anchorage No. 3 to a depth of 35 feet plus two feet of allowable overdepth. The maintenance dredging material would be removed under the same contract as the deepening work, but would be apportioned to the Operation & Maintenance, General Appropriation. Similarly, quantities to dredge a new anchorage in Anchorage No. 4 include deepening an area 2,200 x 2,200 feet to a depth of 42 feet, plus two feet of allowable overdepth, with 3H:1V side slopes. Quantities do not include existing maintenance dredging quantities within the limits of Anchorage No. 4 to a depth of 30 feet plus two feet of allowable overdepth. This maintenance material would also be removed under the same contract as the deepening work, but would be apportioned to the Operation & Maintenance, General Appropriation.

6.2 Branch Channels

Dredging quantities for all the branch channels were calculated from the August 1993 surveys and include two feet of allowable overdepth dredging and 3H:1V side slopes. Quantities do not include any material within the Seagirt, Dundalk or South Locust Point berthing areas located within 125 feet of the marine terminals, and do not include any required maintenance dredging within the existing 500-foot wide, 42-foot deep Seagirt Channel or the 400-foot wide,

36-foot deep South Locust Point Channel areas for which there are no proposed improvements. Any necessary maintenance dredging would be performed under the same contract as the deepening work, but would be apportioned to the State of Maryland.

6.2.1 Dundalk East Channel

Dredging quantities for the Dundalk East Channel include widening the channel from 300 feet wide and 38 feet deep to 400 feet wide and 38 feet deep. Quantities do not include maintenance dredging quantities within the existing 300-foot wide channel limits. Any required maintenance dredging within the existing channel limits would be removed under the same contract as the deepening work, but would be apportioned to the State of Maryland.

6.2.2 Seagirt-Connecting-West Dundalk Channel

Dredging quantities for the Seagirt-Connecting-West Dundalk Channel include widening the channel from 350 feet wide and 42 feet deep, to 500 feet wide and 42 feet deep. Quantities include a widener at the intersection of the channel with the Ft. McHenry Channel to provide necessary maneuvering room, but do not include maintenance dredging quantities within the existing 350-foot wide channel limits. Any required maintenance dredging within the existing channel limits would be removed under the same contract as the deepening work, but would be apportioned to the State of Maryland.

6.2.3 South Locust Point Channel

Dredging quantities for the new South Locust Point Channel include dredging a new channel 400 feet wide and 36 feet deep.

NOTE:

1. SOUNDINGS SHOWN INDICATE ALL CHANGES OF CRITICAL POINTS IN THE CHANNEL.
2. STATIONS ARE AT 1000' INTERVALS.
3. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
4. VERTICAL DATUM MLLW(M), FOR THE '83 TO '93 TIDAL EPOCH.
5. HORIZONTAL DATUM NORTH AMERICAN 1983 DATUM, MARYLAND STATE PLANE COORDINATE SYSTEM.
6. SURVEYED BY THE LANTHORN USING A SERIES GLOBAL POSITIONING SYSTEM.
7. THE BOTTOM WAS DEFINED BY AN INTERFACE AND DEPTH SOUNDER, AN INTERFACE VARYDENSITOMETER, AND A 3.5 DEGREE-200 KHZ TRANSDUCER.
8. SURVEYED 04-27 AUG. 1993.
9. SHORELINE TAKEN FROM MDP AERIAL DATA, DATED JULY 1990.

SEAGIRT MARINE TERMINAL

DUNDALK MARINE TERMINAL

BERTHING AREA

BERTHING AREA

ANCHORAGE 2

ANCHORAGE 3

ANCHORAGE 4

FORT MCHENRY CHANNEL

LEGEND
EXISTING CHANNEL
PROPOSED CHANNEL

NO.	REVISIONS DESCRIPTION	DATE	BY

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

PROPOSED
SEAGIRT/DUNDALK
BRANCH CHANNELS

BALTIMORE HARBOR — MARYLAND

SCALE	PROJECTION NO.	FILE NO.	PLATE
1" =		FILE: 17 MAP: 4828	1
SCALE: AS SHOWN		DATE: JULY 1995	SHEET 1 OF 4

DESIGN FILE: C1A33294.DGN

NOTE:

1. SOUNDINGS SHOWN INDICATE ALL CHANGES OF CRITICAL DEPTH IN THE CHANNEL.
2. STATIONS ARE AT 1000' INTERVALS.
3. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND SHALL ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
4. VERTICAL DATUM: M.L.L.W. FOR THE ES TU TE TIDAL EPOCH
5. HORIZONTAL DATUM: NORTH AMERICAN 1983 DATUM MARYLAND STATE PLANE COORDINATE SYSTEM
6. SURVEYED BY THE LANTHORN USING A SERIES GLOBAL POSITIONING SYSTEM.
7. THE BOTTOM WAS DEFINED BY AN INTERFACE AND DEPTH SOUNDER, AN INTERFACE AMPLIFIER, AND A 3.5 DEGREE-CCD KHZ TRANSDUCER.
8. SURVEYED DATE: AUG. 1995

SEAGIRT MARINE TERMINAL

DUNDALK MARINE TERMINAL

BERTHING AREA

BERTHING AREA

ANCHORAGE 3

PROPOSED ANCHORAGE

ANCHORAGE 4

(PROPOSED) ANCHORAGE

FORT MCHENRY CHANNEL

LEGEND

EXISTING CHANNEL

PROPOSED CHANNEL

SCALE

REVISIONS			
NO.	DESCRIPTION	DATE	BY

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

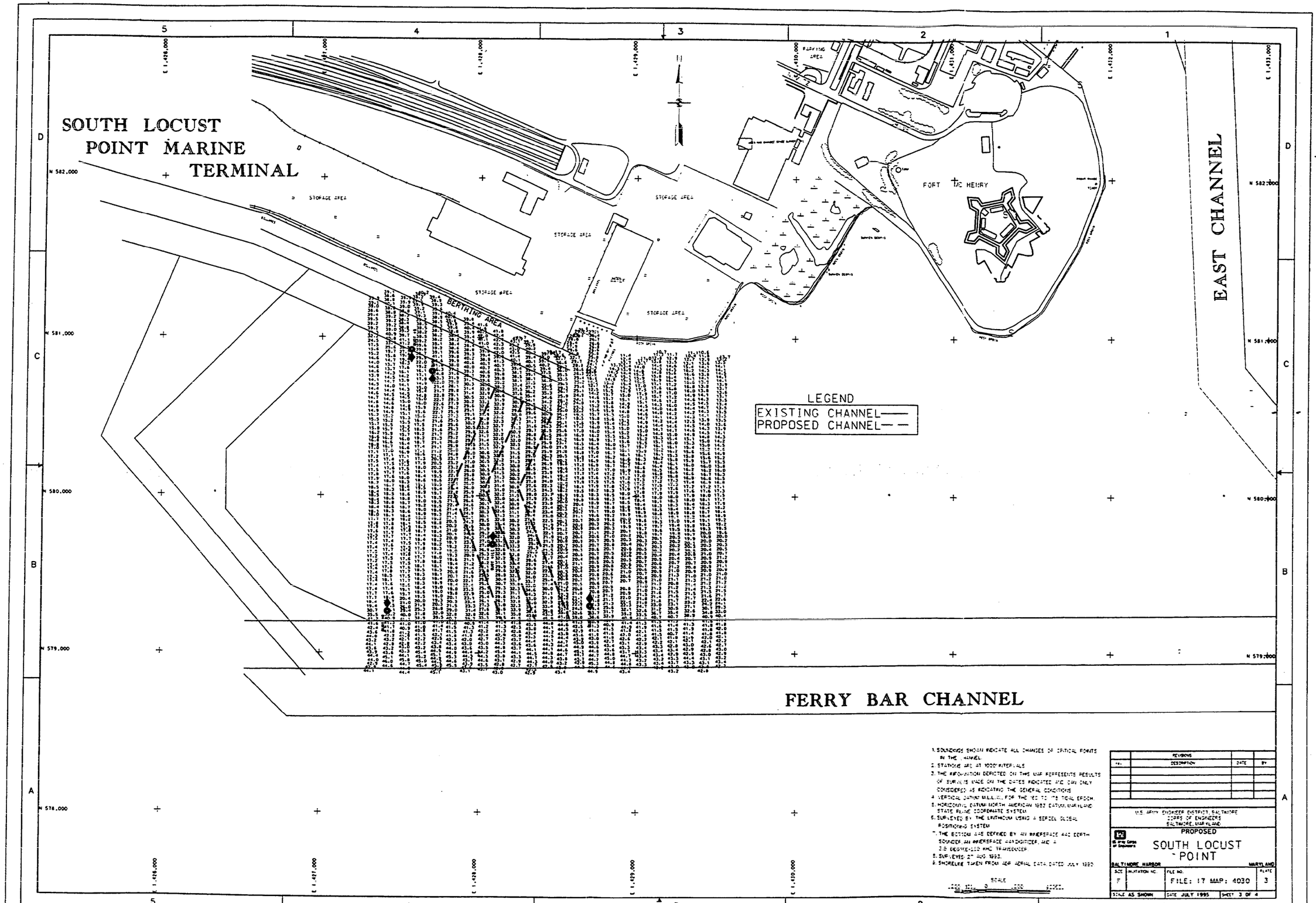
PROPOSED

RIVERVIEW ANCHORAGE 3 & 4

BALTIMORE HARBOR — MARYLAND

SIZE	ELEVATION NO.	FILE NO.	PLATE
F		FILE: 17 MAP: 4029	2
SCALE AS SHOWN		DATE JULY 1995	SHEET 2 OF 4

DESIGN FILE: C1A032398.DGN



1. SOUNDINGS SHOWN INDICATE ALL CHANGES OF CRITICAL POINTS IN THE CHANNEL.
2. STATIONS ARE AT 1000 FEET INTERVALS.
3. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS.
4. VERTICAL DATUM MEAN LOW WATER. FOR THE USC TO MLW TIDAL EPOCH.
5. HORIZONTAL DATUM NORTH AMERICAN 1983 DATUM, MARYLAND STATE PLANE COORDINATE SYSTEM.
6. SURVEYED BY THE LANTHORN USING A DIFFERENTIAL GLOBAL POSITIONING SYSTEM.
7. THE BOTTOM WAS DEFINED BY AN INVERSONIC AND DEPTH SOUNDER, AN INVERSONIC HYDROTRACER, AND A SIDE SCANNED SONAR TOWFISH.
8. SURVEYED 27 AUG 1993.
9. SHORELINE TAKEN FROM NOS AERIAL DATA DATED JULY 1990.

SCALE
400 200 0 400 800 FEET

REVISIONS			
NO.	DESCRIPTION	DATE	BY

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

PROPOSED

SOUTH LOCUST POINT

BALTIMORE HARBOR — MARYLAND

SIZE	INVITATION NO.	FILE NO.	PLATE
F		FILE: 17 MAP: 4030	3
SCALE AS SHOWN		DATE JULY 1995	SHEET 3 OF 4

DESIGN FILE: C1A33230C.DGN

EAST CHANNEL

FERRY BAR CHANNEL

FORT MCHENRY CHANNEL

1200

1300

STATION 113+000

STATION 112+000

STATION 111+000

STATION 110+000

STATION 109+000

STATION 108+000

STATION 107+000

STATION 106+000

LEGEND

EXISTING CHANNEL ——

PROPOSED CHANNEL - - -

NOTE:

1. STATIONS ARE AT 1000' INTERVALS.
2. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
3. VERTICAL DATUM: M.L.L.W. FOR THE USE TO ITS TIDAL EPOCH.
4. HORIZONTAL DATUM: NORTH AMERICAN 1983 DATUM, MARYLAND STATE PLANE COORDINATE SYSTEM.
5. SURVEYED BY: THE UNITHOUSH USING A SERCEL GLOBAL POSITIONING SYSTEM
6. THE BOTTOM WAS DEFINED BY AN ENGINEERS 440 DEPTH SOUNDER AN ENGINEERS 440 SOUNDER, AND A 200 DEGREE-200 KHC TRANSDUCER
7. PROJECT DEPTH 50 FEET.
8. CHANNEL WIDTH IS 700 FEET
9. SURVEYED 10,26 APRIL 1995
10. TICE ROAD AT FORT MCHENRY.

SCALE

200 100 0 200 400FT

REVISIONS			
NO.	DESCRIPTION	DATE	BY

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

PROPOSED

TURNING BASIN

BALTIMORE HARBOR MARYLAND

SIZE	AUTHORITY NO.	FILE NO.	PLATE
F		FILE: 17 MAP: 4031	4
SCALE AS SHOWN		DATE JULY 1995	SHEET 4 OF 4

DESIGN FILE: C:\A332390.DGN