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 D - WORK PLAN FOR ENVIRONMENTAL AND GEOTECHNICAL INVESTIGATIONS

March 1997

U.S ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
P.O. Box 1715
Baltimore, Maryland
21203

Work Plan for Environmental and Geotechnical Investigation
Baltimore Anchorages and Channels Feasibility Study
Baltimore, Maryland

MARCH 1994

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1.0 WORK MANAGEMENT PLAN

1.1 INTRODUCTION

Since 1824, the Baltimore District of the US Army Corps of Engineers has been actively involved in constructing and maintaining a system of channels to allow large, deep draft shipping vessels to call on the Port of Baltimore. Until recently, these channels were adequate in size and depth to accommodate the vessels. However, recently shipping companies have been constructing larger vessels that require more draft. Due to these changes, the Port of Baltimore decided to increase the width and depth of the existing anchorages and channels, by dredging, in order to stay competitive in the international shipping industry. In support of that decision, on 23 June 1988, the United States Congress, via *House Documents Number 94-181, 94th Congress, 1st Session, and Number 86, 85th Congress, 1st Session*, authorized the Army Corps of Engineers to perform study to determine if improvements to the existing anchorages and channels was necessary. In response to the Congressional mandate, the US Army Corps of Engineers, Baltimore District performed a reconnaissance study. In April 1992 the Baltimore District published a report titled, *Baltimore Harbor Anchorages and Channels, Maryland, Reconnaissance Report, April 1992*. The report recommended that a feasibility study be performed to, in part, "to evaluate the specific engineering, environmental and economic effects of alternative improvements.".

1.2 SAMPLING OBJECTIVES

There are two sampling objectives for this investigation. First, environmental sampling of sediments that will be dredged will be performed. Chemical analysis of these sediments will be used to determine the dredged material disposal requirements. Second, geotechnical sampling of sediments that will be dredged will be performed. Standard Penetration Test data and soil test results of geotechnical samples will be used to confirm the results of a previous geophysical investigation for characterizing dredging conditions.

1.3 SAMPLING LOCATIONS

The project site has been divided into five work areas. These work areas are defined as South Locust Point (SL1), Anchorage Areas 2 & 3 (AA2 and AA3), Anchorage Area 4 (AA4), the Terminal Channels (TC5 and TC6) and Curtis Creek (CC7). Both environmental and geotechnical sampling will be performed in the first four work areas. Additional sampling will be performed in the Curtis Creek work area only if time and funding are available. Figure 1 in Appendix B shows the project site. Figures 2 and 3 in Appendix B show the boundaries of the first four work areas.

Environmental sampling locations were selected by dividing each work area in equal areas and then selecting an unbiased boring location that is representative of each area. Geotechnical sampling locations were selected to confirm the results of a previous geophysical investigation by sampling calibration points and anomalous conditions. Additional geotechnical sampling locations were added to provide evenly spaced coverage of all work areas.

1.3.a South Locust Point

The work area near South Locust Point (SL1) is located towards the western end of the Ferry Bar Channel as shown in Figure 2. The investigation area measures approximately 1600 feet long and 600 feet wide. The investigation area is an old remnant channel that will be deepened and widened to permit one way ship traffic in and out of the SL1 marine terminal. A total of four environmental borings and four geotechnical borings will be completed in the SL1 work area. All borings will be sampled to a depth of 45.0 feet below Mean Lower Low Water (MLLW). Average water depth is expected to be 29 feet and average coring

length is expected to be 16 feet. Detailed information on each boring location is included in Appendix B.

1.3.b. Anchorage Areas 2 & 3:

The work area in Anchorage Areas 2 & 3 (AA2 and AA3) is located along the northeast side of the Fort McHenry Channel between Ferry Bar and Curtis Bay Channels and northwest of the West Dundalk Branch Channel as shown in Figure 3. The investigation area measures approximately 4400 feet long and 2100 feet wide. The investigation area is an existing anchorage basin that will be deepened to accommodate larger ships. A total of eight environmental borings and eight geotechnical borings will be completed in the AA2 and AA3 work area. There is one additional geotechnical boring in the AA2 and AA3 work area that may be completed if time permits. All borings will be sampled to a depth of 45.0 feet below MLLW. Average water depth is expected to be 34 feet and average coring length is expected to be 11 feet. Detailed information on each boring location is included in Appendix B.

1.3.c. Anchorage Area 4

The work area in Anchorage Area 4 (AA4) is located approximately 1000 feet southeast of the AA2 and AA3 work area as shown in Figure 3. The investigation area measures approximately 1500 feet long and 1500 feet wide. The investigation area is an existing anchorage basin that will be deepened to accommodate larger ships. A total of four environmental borings and six geotechnical borings will be completed in the AA4 work area. All borings will be sampled to a depth of 45.0 feet below MLLW. Average water depth is expected to be 33 feet and average coring length is expected to be 12 feet. Detailed information on each boring location is included in Appendix B.

1.3.d. Terminal Channels

The work area at the Terminal Channels (TC5 and TC6) consist of two branch channels to the Dundalk marine terminal and the connecting channel between Dundalk and Seagirt marine terminals as shown in Figure 3. The investigation area is limited to within 150 feet of both sides of the existing channels except for two proposed cutoff angles; one that extends north towards Colgate Creek from the connecting channel and the other at the intersection of West Dundalk Branch and Fort McHenry Channels. The terminal channels will be widened to accommodate larger ships. A total of ten environmental borings and seven geotechnical borings will be completed in the TC5 and TC6 work area. There are three additional geotechnical borings in the TC5 and TC6 work area that may be completed if time permits. All borings will be sampled to a depth of 45.0 feet below MLLW. Average water depth is expected to be 27 feet and average coring length is expected to be 18 feet. Detailed information on each boring location is included in Appendix B.

1.3.d. Curtis Creek

The optional work area in Curtis Creek (CC7) is located southwest of the western edge of the Curtis Bay Channel as shown in Figure 1. The investigation area measures approximately 600 feet wide by 3000 feet long. The investigation area is an existing channel that is being considered for both widening and deepening. A total of four environmental and four geotechnical borings will be completed in the CC7 work area is time and funding permits. All borings will be sampled to a depth of 45.0 feet below MLLW. Average water depth is expected to be 35 feet and the average coring length is expected to be 10 feet. Detailed information on each boring location is included in Appendix B.

1.4 PROJECT ORGANIZATION

The project management organization for the Baltimore Anchorages and Channel Feasibility Study is below. The responsibilities of each person are provided. The Contractor will provide tug boat and barge support. Quality Assurance testing will be performed by New England Division Environmental Laboratory.

Planning Division Project Manager: The Planning Division Project Manager is responsible for establishing and executing project administration project controls, project-related policy matters, and project levels of authority, responsibility, and communication with outside agencies. Mr. Wesley Matheu (CENAB-PL-PC) will serve as the Planning Division Project Manager. His phone number is (410) 962 4399.

Technical Support Team: The Technical Support Team is responsible for preparing the Project Work Plan. The team is comprised of personnel from HTRW Branch (CENAB-EN-HT), Geotechnical Branch (CENAB-EN-GG), Planning Division (CENAB-PL-EC), and Operations Division (CENAB-OP-B). Key personnel from the team include:

Operations Coordinator: Mr. Brian Walls (CENAB-OP-B) provides support regarding water and sediment quality sampling and testing. His phone number is (410) 962-5677.

Geotechnical Coordinator: Mr. Christopher Evans (CENAB-EN-GG) provides support regarding geotechnical sampling and testing. He is also responsible for coordination with the tug and barge Contractor. His phone number is (410) 962-4431.

HTRW Coordinator: Mr. Russell Marsh (CENAB-EN-HT) provides support regarding environmental sampling and testing. He will serve as the Engineering Division Technical Lead for the project. His phone number is (410) 962-2227.

Project Chemist: Mr. Robert Miller (CENAB-EN-HT) provides support regarding environmental sampling and testing. He will also serve as the Quality Assurance Officer. His phone number is (410) 962-6744.

Industrial Hygienist: The Industrial Hygienist will be responsible for providing safety guidelines and procedures. The Industrial Hygienist will approve all Health and Safety Plans. Ms. Charmayne Kirkland (CENAB-EN-HT) will be the Industrial Hygienist. Her phone number is (410) 962-2771.

Site Safety Officer: The Site Safety and Health Officer ensures compliance with site-specific Health and Safety Plan during site activities. Instructs site personnel in site-specific Health and Safety procedures through daily meetings. Mr. James Moore (CENAB-EN-HT) will be the Site Safety Officer. His phone number is (410) 962-6742 (office) or (410) 591-7681 (mobile/field).

Site Supervisor: The Site Supervisor will be responsible for coordination all field activities to ensure that safety and security requirements are met. This position will provide oversight for site mobilization and demobilization, coordination for testing and sampling. Mr. Jim Carpenter (CENAB-EN-GGE) will be the Site Supervisor.

Sampling Personnel: Sampling Personnel will conduct sampling of various media for

chemical and/or physical analysis. The Sampling Personnel will comply with all requirements of the Work Plan. Mr. James Moore will be the primary sampler, however, personnel from the Technical Support Team may assist in the sampling activities.

Contractor: J. Willis Smith and Brother, Inc. will provide tug boat and barge support for the duration of the field project. The Contractor will comply with all applicable requirements of his contract. The point of contact for the Contractor will be Mr. Paul Stradley. His phone number is (410) 355-7626.

1.5 IDENTIFICATION OF APPLICABLE RELEVANT AND APPROPRIATE REQUIREMENTS

Listed below are the applicable relevant and appropriate requirements which will govern the work efforts at the site.

• 29 CFR 1904	Recording and Reporting Occupational Injuries and Illnesses
• 29 CFR 1910	Occupational Safety and Health Standards
• 29 CFR 1910.120	OSHA - Hazardous Waste Operations
• 29 CFR 1926	Safety and Health Regulations for Construction
• 40 CFR 122	National Pollution Discharge Elimination System
• 40 CFR 130	Water Quality Planning and Management
• 40 CFR 260-280	Resource Conservation and Recovery Act
• 40 CFR 300	National Contingency Plan
• 40 CFR 1500-8	National Environmental Policy Act (NEPA)

1.6 SITE GEOLOGY

The Chesapeake Bay is located in the Atlantic Coastal Plain physiographic province and is characterized by sequences of sands, silts, and clays overlying crystalline bedrock. The geologically unconsolidated marine sediments date from the Cretaceous, Tertiary, Pleistocene, and Recent periods and dip in a southeasterly direction towards the Atlantic Ocean. The general geologic setting of the Baltimore Harbor is comprised of a series of wedge shaped Cretaceous and Tertiary sediments dipping and thickening seaward. The older and generally harder Cretaceous materials appear farthest to the north and west within Baltimore Harbor, while the younger and less compact Tertiary sediments are typically in the southern and eastern portions.

Geologic information in Baltimore Harbor was studied extensively during the planning stages for the construction of the Francis Scott Key Bridge, Fort McHenry (Interstate 95) Tunnel, and 50 Foot Dredging Project of the Fort McHenry Channel. Materials identified in the analysis were of Recent, Pleistocene, and Cretaceous age. A thick stratum of organic silty clays to organic sandy silts exist at the harbor bottom and the consistency of this material ranges from soft to stiff. The upper few feet of sediment are typically in a semi-liquid state. The bottom deposits also contain areas of decomposing organics and petroleum residue. Underlying these materials is a stratum of compact to very compact silty sand to gravelly sand existing below an elevation of -60.0 feet Mean Lower Low Water.

The presence of very competent materials near the bottom surface was detected during these past studies. In the area of the Fort McHenry Tunnel, soft muds were found to overlie a very stiff clay, thought to belong to the Cretaceous Raritan Formation. Also, iron-cemented Pleistocene sands were encountered in numerous locations in the Fort McHenry Tunnel area. In the vicinity of the Key Bridge, compact soils consisting of stiff, variegated silty clays of the Patapsco Formation and compacted sands and gravels were detected at the harbor bottom.

The recent geophysical survey completed as part of this feasibility study indicates that most of the proposed drilling locations are dominated by a high density material. This material may consist of highly competent clay or silty clay with scattered zones of loose, compacted, or possibly cemented sands. Within large areas of the study, the primary sediment layer is overlain by a low density fluid mud which may reach thicknesses up to 4.0 feet.

2.0 QUALITY ASSURANCE PROJECT PLAN

2.1 Quality Assurance Objectives

2.1.a. Purpose

The purpose of this QAPjP is to specify sampling analytical quality control procedures that will allow the data collected for Baltimore Anchorages and Channels Project to be of sufficient quality in making sound project decisions. The specific quality assurances objectives that are required for the data are developed and identified, through the Data Quality Objectives (DQOs). DQOs take into consideration the intended use of the data, the procedures available for lab analysis and the resources available. Once the DQOs for each data collection activity have been established, analytical methods are selected. Specific quality assurance objectives for the analytical methods are then determined.

2.1.b. Data Requirements

The purpose of this sampling program is to examine the proposed dredging site for hazardous material contamination and comply with Federal (EPA and USACE) and State regulations regarding characterization of dredged material. A review of the Baltimore Anchorage and Channels contamination conditions was performed by CH2M HILL, Inc. (Herndon, VA) under contract DACA31-89-D-0056 with USACE. The January 1994 report indicates that concentrations of metals in the proposed dredge areas are greater than those of their counterparts in the Chesapeake Bay. Semivolatiles, and pesticides were also found in the harbor area. The extent of semivolatiles, pesticides and heavy metals contamination in the soil/sediments is required for the proper disposal of the dredged material and to predict the quality of the effluent during the dredging operations. Volatiles will not be examined because the previous studies did not identify volatiles as pollutants contained in the Baltimore Harbor sediments. It should also be noted that composite samples can not accurately be analyzed for volatiles.

2.1.c. Data Quality Objectives and Quality Assurance Objectives

The DQOs need to be supported by a certain level of quality which is based on the intended use of the data. Since the primary objective is for the proper disposal of the dredged material, the level of the generated data must be of a sufficent quality to identify the levels of contaminants present in the dredged material. If the levels of contaminants are more than twenty times Resource Conservation and Recovery

Act (RCRA) Hazardous Waste Regulatory Levels, the Toxicity Characteristic Leachate Procedure (TCLP, EPA SW 846-Method 1311) will be used to determine the leaching characteristics of the material. The modified elutriate test will predict the quality of effluent discharged from confined dredged material during dredging operations. Level III analysis will be performed on the soil/sediment and the elutriate liquid by the laboratory to identify the extent of the contamination, if necessary, followed by the TCLP procedures to determine the leaching characteristics. The laboratory is validated by the Corps of Engineers.

2.1.d QA Objectives for Measurements

Data assessments and review will be accomplished by the project QA/QC Officer. Problems arising during sample collection, packing, shipping, or analysis will be taken into consideration in the data assessment.

The following procedures will be used to evaluate data precision, accuracy, and analytical completeness for the analyses conducted.

2.1.d.1 Accuracy

Accuracy is the degree of agreement between a measurement and the true value or expected value and is expressed as percent recovery as follows:

$$\text{Percent Recovery (\%R)} = X \div T \times 100$$

where X = the observed value of measurement
T = "true" value

These recoveries will be compared with the control limits and the outlier will be assessed in conformance with other QC data. The surrogate recoveries will also be calculated as above and compared against the limits set for the methody. If the surrogate percent recovery limits are exceeded, the data will be assessed as specified hereafter.

In addition, the matrix spike and matrix spike duplicate sample results will be used to calculate the percent recovery.

$$\text{Percent Recovery (\%R)} = X \div [S + T] \times 100$$

where X = observed value after spike
S = sample value
T = amount spiked

The matrix spike and matrix spike duplicate percent recoveries will be compared against procedure published limits. Surrogate recoveries will be compared against the method approved limits.

2.1.d.2 Precision is an estimate of variability and is expressed as relative percent difference (RPD) for duplicate environmental samples and for duplicate control samples, as follows:

$$\text{RPD (\%)} = [S-D] \div [(S+D) \div 2]$$

where S = first sample value (original)
D = second sample value (duplicate)

2.1.d.3 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to accuracy and precision as these quantities are measures of data reliability. Data are comparable if collection techniques, and measurement procedures, methods, and reporting are equivalent for the samples within a sample set.

2.1.d.4 Completeness and Usability

Following evaluation of the data packages, assessment of the data with respect to fulfillment of quality assurance objectives and usability will be accomplished by the joint efforts of the project chemistry staff. This assessment will include sample collection, sample handling, field data, consideration of blank values and field duplicate values and additional flagging of qualifying data for use at each site.

The analytical completeness will be the ratio of the amount valid results to the total number of analytical results expected on sample submitted for analysis. The % completeness will be calculated by multiplying the above ratio by 100.

$$\% \text{ Completeness} = \frac{\text{Amount of valid data obtained (samples)}}{\text{Amount of valid data expected (samples)}} \times 100$$

The percent completeness will be compared against the overall program goal for this project. The overall analytical completeness goal for the Baltimore Anchorage and Channel project is 80%. If the goal is not met, the project chemist will decide if the data are sufficient for characterization.

2.1.e Required Level of Analysis and Review

a. EPA Test Methods for Evaluating Solid Waste SW-846 7000 Series methods 6010 and 7470 will be used to analyze soil/sediment, rinsate blanks and leachate samples and the EPA Water/Wastewater 200 Series methods 200.7 and 245 will be used to analyze background water and elutriate samples for selected inorganics [As, Ba, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Ag, and Zn]. The sample preparation/extraction and analysis methods for each procedure are summarized in Table 2-1. EPA SW-846 method 8270 will be used for testing semi-volatiles (SVOC) and method 8080 for tesing PCB's and pesticides in soil/sediment samples, rinsate blanks, and the toxicity characteristic leaching procedure samples(TCLP). EPA 600 Series Water/Wastewater method 625 will be used for testing semivolatiles (SVOC) and method 608 for testing PCB's and pesticides in background water samples and elutriate samples. The analytical support Level III [Data Quality Objectives for Remedial Response Activties EPA/540/G-87/003, March 1987] data evaluation and data documentation requirements will be used. The sample bottle, preservation and hold time requirements are summarized in Table 2-2.

b. Internal quality control samples and procedures utilized by the laboratory for analysis are specified in the Laboratory Quality Assurance Manual.

c. Level III data documentation will be obtained from the laboratory and will be retained within the

project files for a minimum of 50 years from the time of receipt from the laboratory.

d. Data review as defined in Section six will be performed on all data produced for this project.

2.1.f QA/QC Checks

Field duplicates, rinsate blanks, split samples,and matrix spikes will be collected and submitted to the analytical laboratory to provide a means to assess the quality of the data resulting from the field sampling program. Field duplicate samples will be analyzed to check for sampling and laboratory reproducibility. Rinsate blanks will be used as a measure of contamination of samples from the sampling equipment. Matrix spike and laboratory control samples will be analyzed to assess if recoveries falling outside acceptance window are attributable to sample matrix interferences and not to laboratory analytical errors, as well as to measure the accuracy of the analysis. Laboratory duplicates for inorganic analysis and matrix spike duplicates for organic analytes will be analyzed to evaluate laboratory reproducibility or precision.

2.1.f.1 Field Duplicate

A field duplicate (QC) is an environmental sample which is divided into two separate aliquots. The aliquots are processed separately and the results compared to evaluate the effects of the matrix on the precision of the analysis. Results are expressed as relative percent difference (RPD) between the duplicate aliquot analyzed. The % RPD should be less than 50% for soil samples. Duplicate field samples will be obtained at a rate of 1 per 10 environmental samples or one per batch of samples (which ever is greater) and submitted blind to the contract lab.

2.1.f.2 Matrix Spike

A matrix spike (MS) is an environmental sample to which known concentrations of analytes have been added. The matrix spike is taken through the entire analytical procedure and the recovery of the analytes calculated. Results are expressed as percent recovery of the known amount spiked. The matrix spike is used to evaluate the effect of the sample matrix on the accuracy of the analysis. Matrix spike analysis will be conducted at a rate of one per matrix per batch of 20 samples, and will be designated on the chain-of-custody by field sampling personnel. Extra sample volume will be collected for matrix spike samples. A determination will be made in the field concerning representative matrices.

2.1.f.3 Rinsate Blanks

A rinsate blank is prepared in the field by pouring "clean" deionized, distilled or High Performance Liquid Chromatograph (HPLC) grade water over or through a sample collection device or equipment. A rinsate blank is sometimes referred to as an equipment blank or wash blank. One rinsate blank will prepared and analyzed for the analytes being sampled for by the sampling equipment.

2.1.f.4 Split Sample

QA split samples will be prepared by the primary laboratory by dividing each of the area composite samples in two portions. One portion from each area composite will be forwarded to the USACE Lab (New England Division Environmental Laboratory Project No. **E0208**) and the other portion will be analyzed by the primary laboratory. The QA samples will be obained at a ratio of 1 per 10 environmental samples.

2.2 Laboratory Qualifications

Contract Laboratory: GP Environmental Services, Inc. is the analytical laboratory for this project and is located in Gaithersburg, MD. GP facilities are capable of providing complete environmental analytical services consistent with USEPA protocols and is validated by USACE. GP's point of contact is:

Ms. Amy Friedlander
GP Environmental Services, Inc.
202 Perry Parkway
Gaithersburg, MD 20877
Telephone (301) 926-6802
Fax (301) 840-1209

Quality Assurance Lab: The Corps of Engineers New England Division Environmental Laboratory will serve as the Quality Assurance lab for this project. QA samples (splits/duplicates rinsate blanks) will be shipped by overnight or express mail delivery. The QA lab point of contact is:

Mr. Brian J. Condike
U.S. Army Corps of Engineers
Environmental Laboratory
Hubbardston, MA 01452
Telephone (508) 928-4238
Fax (508) 928-5494

Include the NED Project No. **E0208** with all samples (**must be included on chain of custody**) and correspondence relating to this project.

2.3 SAMPLING PROCEDURES

Sampling and analysis planned is based upon potential contaminants at the project area. Sample will be analyzed by the methods listed in Table 2-1 for the corresponding parameters.

2.3.a Soil/Sediment Sampling

2.3.a.1 General

Four or six soil/sediment sample boring locations have been selected to be representative of each of the areas being investigated. The locations of the soil borings are shown in the Field Sampling Plan. See Table 2-3 for a complete listing of sample numbers. The representative samples will be composite samples from each core. These four or six core composites will subsequently be combined at lab by mixing proportional amounts from each core within an area. This will be determined by measuring the depth of the soil in each core and calculating the percentage of each core respective to the total. These percentages will be relative to the amount of soil to be dredged at that specific locations.

2.3.b Surface water/ sediment sampling

2.3.b.1 General Procedures

Water samples shall be obtained by collecting grab samples at each sampling area. Six water samples will be taken from the boring area concurrent with four (or six) soil/sediment samples (one from each boring) for elutriate testing. The water samples shall be tested by the modified elutriate procedure for metals, semivolatiles, pesticides, and PCB's. TCLP analysis will target the compounds specified by the COE chemist after reviewing the results of the general SW-846 analysis for semi-volatiles, pesticides, herbicides, and metals.

Table 2-1

Parameters and Method numbers

Parameter	Method Number
RCRA Metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag) & Other Metals (Cu, Fe, Ni, Zn)	EPA SW-846 7000 Series (sediment) Methods 6010 & 7470 (elutriate) EPA Water/Wastewater 200 Series Methods 200.7 & 245 (elutriate)
Nitrogen, Total Kjeldahl (TKN)	EPA 351 (sediment & elutriate)
Phosphorus, Total	EPA 365.2 (sediment & elutriate)
Hydrogen Ion (pH)	EPA 9045 (sediment & elutriate)
Oil and Grease	EPA 9070 (sediment & elutriate)
Organic Carbon, Total (TOC)	EPA 9060 (sediment & elutriate)
Semi-volatile organics	SW-846 Method 8270 (sediment) Water/Wastewater 600 Series Method 625 (elutriate)
Modified Elutriate Preparation	Environmental Effects of Dredging Technical Notes EEDP-04-2, June 1985
TCLP Extraction	SW-846 Method 1311 (sediment)
PCB's and Chlorinated Pesticides	SW-846 Method 8080 (sediment) Waste/Wastewater 600 Series Method 608 (elutriate)

Table 2-2
SUMMARY OF LABORATORY TEST
BALTIMORE ANCHORAGE AND CHANNELS WATER/SOIL SAMPLING MATRIX

Media/Location	SW-846 Semivolatiles 8270 Pesticides and PCB's Metals SW-846	TCLP EPA 1311 SW-846 Semivolatiles 8270, Pesticides, and PCB's Metals SW-846	Modified Elutriate EPA 600 Series Semivolatiles, Pesticides, and PCB's Metals EPA 200 Series	pH Nitrogen, (TKN) Phosphorus Oil & Grease Total Organic Carbon (TOC)
South Locust Point 1 SL1	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite
Anchorage Area 2 AA2	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite
Anchorage Area 3 AA3	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite
Anchorage Area 4 AA4	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite
Terminal Channel 5 TC5	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite
Terminal Channel 6 TC6	6 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite
Curtis Creek Channel 7 CC7	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite
Liquid Mud*	1	NA	NA	1
Splits/Duplicates QC (Field Split, GPES Lab)	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings/ 1 Composite	4 Borings 1 Composite
QA (COE Lab)	1 Composite From GPES	NA	NA	1 Composite From GPES
Rinsates	1	NA	NA	1
Matrix Spike/Duplicate MS/MSD (GPES Lab)	1/1	1/1	1/1	1/1
Total Samples	**10**	**8**	**8**	**10**

* If present, one liquid mud sample will be obtained from a core containing a sufficient quantity of sample and the specific boring location will be recorded in the field.

2.4 SAMPLE HANDLING AND FIELD DOCUMENTATION

The following equipment will be used to complete the specified field activities:

2.4.a Sampling Equipment and Supplies - See the Field Sampling Plan for a complete listing of the sampling equipment and supplies.

2.4.b Decontamination Equipment and Supplies: See the Field Sampling Plan for a complete listing of the decontamination equipment and supplies.

2.4.c Sample Containers:

The quantity and types of sample containers required for the various sample matrices and respective analytical parameters are listed in Table 2-3. All containers must be pre-cleaned, have Teflon-lined seals and will be supplied by the laboratory. When both organic and inorganic substances are to be analyzed separate samples will be taken.

2.4.d Sample Preservation

After collection of each sample, the sample will be preserved with the appropriate preservative(s) for the sample matrix and parameter to be analyzed. Table 2-3 listed below, contains a listing of preservatives to use, and maximum holding times for each type of sample collected for this project.

2.4.e Safety Equipment:

Safety equipment is specified in the Site Specific Health and Safety Plan (SSHSP).

2.4.f Field Documentation See the Field Sampling Plan for a complete listing of the field documentation requirements.

2.4.g Sample Designation/Identification

All samples, including QC duplicates, collected during the field investigation will be identified and labeled with a site specific sample identification code. The site specific sample code will be based on the following system:

xxx - Number refers to dredging area (SL1, AA2, AA3, AA4, TC5, TC6, CC7)
EB - Letter refers to environmental boring
XX - Numbers refer to boring number (01 to 28)
SX - Sample number

Note: For the QC split samples collected, label the sample using the identification code system as outlined above. However, make a notation in the field logbook as to which samples were collected as the QC splits.

This site specific sample ID code shall be recorded in indelible ink on the sample label and the chain of custody form accompanying each sample submitted to the laboratory for analysis.

TABLE 2-3
PARAMETERS FOR TOTAL ANALYSIS* OF THE SAMPLES, CONTAINERS, PRESERVATION, and HOLDING TIMES

Laboratory Analysis	Matrix	Analytical Method Reference	Container	Sample Preservation	Holding Time
Semi-volatiles voiatiies	Elutriate/Water	EPA 600 Series Method 625	3 - 1/2 gal. amber glass bottles	Cool, 4° C	7 days to Ext. 40 days after Ext.
	Rinsate	SW-846 Method 8270	1 - 1 L amber glass jar	Cool, 4° C	7 days to Ext. 40 days after Ext.
	Soil & TCLP	SW-846 Method 8270	1 - 8 oz glass jar	Cool, 4° C	7 days til Ext. 40 days after Ext.
PCB's and Pesticides	Elutriate/Water	600 Series Method 608	3 - 1/2 gal. amber glass bottles	Cool, 4° C	7 days til Ext. 40 days after Ext.
	Rinsate	SW-846 Method 8080	1 - 1 L amber glass jar	Cool, 4° C	7 days til Ext. 40 days after
	Soil & TCLP	SW-846 Method 8080	1 - 8 oz wide mouth, glass jar with teflon lined cap	Cool, 4° C	14 days
Metals	Elutriate & Water	EPA 200 Series, Methods 200.7 & 245	1 - 1 L Polyethylene bottle with teflon lined cap	Cool, 4° C HNO_3 to pH < 2	6 months Hg 28 days
	Rinsate	SW-846 7000 Series, Methods 6010 & 7470	1 - 1 L Polyethylene boattle with teflon lined cap	Cool, 4° C HNO_3 to pH < 2	6 months Hg 28 days
	Soil & TCLP	SW-846 7000 Series, Methods 6010 & 7470	1 - 8 oz wide mouth glass jar with teflon lined cap	Cool, 4° C	6 months Hg 28 days
Nitrogen, Total (TKN)	Elutriate & Water	EPA 600 Method 351.2	1 - 1 L High density Plastic	Cool, 4° C H_2SO_4 pH < 2	28 days
	Rinsate	EPA 600 Method 351.2	1 - 1 L High density Plastic	Cool, 4° C	28 daus
	Soil	EPA 600 Method 351.2	1 - 4 oz. wide mouth glass jar with teflon lined cap	Cool, 4° C	28 days

TABLE 2-3 (continued)
PARAMETERS FOR TOTAL ANALYSIS* OF THE SAMPLES, CONTAINERS, PRESERVATION, and HOLDING TIMES

Laboratory Analysis	Matrix	Analytical Method Reference	Container	Sample Preservation	Holding Time
Phosphorus, Total	Elutriate & Water	EPA 600 Method 365.2	1 - 1 L High Density Plastic	Cool, 4° C H_2SO_4 pH < 2	28 days
	Rinsate	EPA 600 Method 365.2	1 - 1 L High Density Plastic	Cool, 4° C H_2SO_4 pH < 2	28 days
	Soil	EPA 600 Method 365.2	1 - 8 oz. wide mouth glass jar with Teflon lined cap	Cool, 4° C H_2SO_4 pH < 2	28 days
Oil & Grease	Elutriate & Water	EPA 600 Method 413.1	2 - 1 L Amber glass jar	Cool, 4° C H_2SO_4 pH < 2	28 days
	Rinsate	EPA 600 Method 413.1	2 - 1 L amber glass jar	Cool, 4° C H_2SO_4 pH < 2	28 days
	Soil	SW-846 Method 9071	1 - 8 oz. Clear wide mouth jar	Cool, 4° C	28 days
TOC, Total Organic Carbon	Elutriate & Water	EPA 600 Method 415	1 - 500 ml Amber glass with no head space	Cool, 4° C H_2SO_4 pH < 2	28 days
	Rinsate	SW-846 Method 9060	1 - 500 ml Amber glass with no head space	Cool, 4°C H_2SO_4	28 days
	Soil	SW-846 Method 9060	1 - 4 oz. Clear wide mouth jar	Cool, 4° C	28 days

* Holding times start from the date of sample collection in the field.

2.4.h Quality Control Summary Report (QCSR)

For this confirmation study, upon completion of field activities at the site, a separate QCSR will be completed, dated and signed by the site safety officer to be included in the final report. A copy of this QCSR will be sent to the HTRW Branch project chemist for review. These reports shall include at least the following information:

a. Samples collected, including the dates collected.
b. Weather conditions encountered at time of sampling.
c. Any deviations from the QAPjP, problems identified, corrective actions taken, observations made.

These reports may be generated from information recorded in the field logbook by the Site Supervisor. Evidence of the sample traceability from collection, to shipment, to laboratory receipt, and laboratory custody until proper disposal must be documented. A sample is considered to be in a person's custody if the sample is:

a. In a person's actual possession
b. In view after being in a person's possession
c. Locked up so that no one can tamper with it after having been in physical custody
d. In a secured area, restricted to authorized personnel

2.4.i Chain of Custody

The chain of custody procedures are initiated in the field following sample collection. The procedures consist of:

a. preparing and attaching a unique sample label to each sample collected
b. completing the chain of custody form
c. preparing and packaging the samples for shipment

2.4.i.1 Sample Labels

Field personnel are responsible for uniquely identifying and labeling all samples collected during a field investigation. All labeling will be completed in indelible ink and be securely affixed to the sample container. All sample bottles shall be labeled containing the following information:

a. Project number and site name
b. Unique sample identification number
c. Sample description
d. Parameters to be analyzed for
e. Sampling date and time
f. Initials of sampling technician
g. Method of sample preservation/conditioning

2.4.i.2 Chain of Custody Form

Documentation will be accomplished through a chain of custody form that records each sample and the individuals responsible for sample collection, transfer, shipment, and receipt by the laboratory. This form must also contain pertinent information about sampling location, date, and times, signature of sampling technician, types and numbers of samples collected and shipped for analysis in each lot, parameters to be analyzed per sample, unique sample identification numbers assigned to the sample(s), and the project name and number.

Samples shall be accompanied by an approved and completed chain of custody form during each step of custody, transfer, and shipment. When physical possession of samples is transferred, both the individual relinquishing the samples and the individual receiving them shall sign, date, and record the time on the chain of custody form.

2.4.i.3 Sample Packing and Transportation

Samples will be placed in individual containers compatible with the intended analysis, properly preserved, and sealed with a Teflon-lined screw cap prior to shipment to the laboratory. Sample labels, field notebook information, and chain of custody forms are checked to be sure there is no errors in sample identification and to verify that all the required information has been supplied. The samples are then packaged to prevent breakage and/or leakage.

As soon as field personnel are ready to transport samples from the field to the contract laboratory, the laboratory point of contact (POC) shall be notified by telephone of the shipment along with the estimated time of arrival.

No chemical analytical samples shall be held on site for more than 24 hours. All samples will be shipped to the designated laboratory in sealed coolers via overnight carrier or delivered in person.

2.4.i.4 Sample Packing Instructions

In order to maintain chain of custody protocol as well as to prevent breakage of the sample containers, the packaging procedures shall be as follows:

a. Secure the lids of properly labelled samples with strapping tape.

b. Place approximately a 3-inch layer of inert cushioning material (e.g. vermiculite) in the bottom of a waterproof metal or equivalent strength plastic ice chest or cooler.

c. Enclose the bottles in clear plastic bags, through which labels are visible, and seal the bag. Place the bottles upright in the cooler so they do not touch and will not touch during shipment.

d. Put in additional packing material to partially cover sample bottles (more than halfway), to ensure that they do not shift during transport.

e. Place sealed plastic bags of ice (double bagged) in ziplocs around and on top of the samples bottles. If chemical ice is used (i.e. blue ice), it should be placed in a plastic bag. **NOTE:** Use sufficient quantity of ice in order to maintain samples cool during shipment at a temperature of 4°C.

f. Seal the appropriate chain of custody form(s) in a ziploc plastic bag, and tape it securely to the inside lid of the cooler.

g. Tape the drain shut.

h. Close and lock/latch the cooler. Secure the lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.

i. Attach completed shipping label to top of the cooler.

j. Put "This Side Up" labels on top of the cooler and "Fragile" labels on at least two sides.

k. Affix numbered and signed custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

While packing each cooler for shipment, remember not to exceed the weight limit set by the

shipper.

2.5 Laboratory Analytical Procedures

2.5.a Analytical Methods

All environmental samples collected for analysis will be sent to the designated laboratory for this project. The designated laboratory to perform analytical sample analyses for this project is GP Environmental Services, Inc. (a USACE validated laboratory). The laboratory will prepare area (i.e., SL1, AA2, AA3, etc.) environmental samples by homogenizing proportional amounts of each boring composite into one sample per each boring area. The area composite environmental samples will be analyzed by GPES using EPA approved methods. The area composite is prepared by weighting proportional amounts from each vibro-core composite (wet weight) from an area, into a clean stainless steel container. The amount of sediment from each vibro-core composite is directly proportional to the length of sediment in the vibro-core that that sample came from, in relation to the total length of sediment in all vibro-cores from that area.

The mixing time will be kept at a minimum to avoid sample degradation and both the mixing time will be annotated. The composite is then divided among sample containers, labeled, and properly preserved.

Label the composite sample containers with the following identification code:
xxx - Number refers to dredging area (SL1, AA2, AA3, AA4, TC5, TC6, or CC7)
Cxx - Number refers to composite number (C01, etc.)

2.5.a.1 SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs) ANALYSIS

2.5.a.1.1 Soil Samples

SW-846 method 8270 will provide data on the semivolatile constituents in the soil samples, TCLP samples, and rinsate blank samples. The extraction procedures that cover most of the analytes are 3540, 3550, and 3580.It will test for a total of 233 diferent organic compounds. The TCLP extraction procedure which will be used is solid waste method 1311. The QC acceptance criteria are from SW-846 method 8270A. The estimated quantitation limits (EQL) are illustrated in Table 2.4 for water and soil samples with low levels of analytes.

2.5.a.1.2 Water Samples (Elutriate)

The EPA 600 Series method 625 will be used for analyzing the semivolatiles in water samples obtained from the modified elutriate procedure EEDP-04-2 Environmental Effects of Dredging Technical Notes. The EQL for method 8270 of water is approximately the same as the method detection limits listed for method 625 which is used for analyzing the semivolatiles in wastewaters. Method 625 tests for a total of 81 compounds in the water samples. The extraction procedures that cover most of the analytes are 3510 and 3520.

TABLE 2-4
PRACTICAL QUANTITATION LIMITS

Chemical Name	SW-846 Method 8270 Water (EQL) ug/L	SW-846 Method 8270 Soil-Low (EQL) ug/kg	Series 600 Method 625 (MDL) ug/L	Series 600 Method 608 (MDL) µg/l	SW 846 Method 8080A (MDL) µg/l
Acenaphthene	10	660	1.9	-	-
Acenaphthylene	10	660	3.5	-	-
Acetophenone	10	ND	-	-	-
1-Acetyl-2-thiourea	1000	ND	-	-	-
2-Acetaminofluorene	10	ND	-	-	-
Aldrin	-	-	1.9	0.004	0.004
2-Aminoazobenzene	10	ND	-	-	-
Anilazine	100	ND	-	-	-
Aniline	100	ND	-	-	-
o-Anisidine	10	ND	-	-	-
Anthracene	10	660	1.9	-	-
Aramite	20	ND	-	-	-
Aroclor-1016	-	-	-	-	-
Aroclor-1221	-	-	30.0	-	-
Aroclor-1232	-	-	-	-	-
Aroclor-1242	-	-	-	-	-
Aroclor-1248	-	-	-	-	-
Aroclor-1254	-	-	36.0	-	-
Aroclor-1260	-	-	-	-	-
Azinphos methyl	100	ND	-	-	-
Burban	200	ND	-	-	-
Benzidine	-	-	44.0	-	-
Benzoic acid	50	330	-	-	-
p-Benzoquinone	10	ND	-	-	-
Benzoanthracne	10	660	7.8	-	-
Benzopyrene	10	660	2.5	-	-

Benzofluoranthene	10	660	2.5	-	-
Benzoperylene	10	660	4.1	-	-
Benzofluoranthene	10	660	2.5	-	-
Benzyl alcohol	20	3300	-	-	-
α-BHC	-	-	-	0.003	0.003
ß-BHC			4.2	0.006	0.006
γ-BHC	-	-	-	0.004	0.004
δ-BHC	-	-	-	0.009	0.009
4-Bromophenphenyl-phenylether	10	660	1.9	-	-
Bromoxynil	10	ND	-	-	-
Butylbenzylphthalate	10	660	2.5	-	-
Captafol	20	ND	-	-	-
Captan	50	ND	1.9	-	-
Carbaryl	10	ND	-	-	-
Carbofuran	10	ND	-	-	-
Carbophenothion	10	ND		-	-
Chlorfenvinphos	20	ND	-	-	-
4-Chloro-3-methlyphenol			3.0		-
4-Chloroaniline	20	1300	-	-	-
Chlorobenzilate	40	ND		-	-
Chlorodane	-	-	-	0.014	0.014
bis(2-Chloroethoxy)methane	10	660	5.3	-	-
bis(2-Chloroethyl)ether	10	660	5.7	-	-
bis(2-Chloroisopropyl) ether	10	660	5.7	-	-
3-(Chloromethyl) pyridine hydro-chloride	100	ND		-	-
2-Chloronaphthalene	10	660	1.9	-	-
2-Chlorophenol	10	660	3.3	-	-
4-Chlorophenyl-phenylether	10	660	4.2	-	-
Chrysene	10	660	2.5	-	-

Coumaphos	40	ND		-	-
p-Cresidine	10	ND	-	-	-
Crotoxyphos	20	ND		-	-
2-Cyclohexyl-4,6-dinitrophenol	100	ND	-	-	
4,4'-DDD			2.8	0.011	0.011
4,4'-DDE			5.6	0.004	0.004
4.4"-DDT			4.7	0.012	0.012
Demeton-o	10	ND	-	-	-
Demeton-s	10	ND	-	-	-
Diallate	10	ND		-	-
2,4-Diaminotoluene	10	ND		-	-
Dibenzofuran	10	660		-	-
Dibenzopyrene	10	ND		-	-
Dibenzanthracene	10	660	2.5	-	-
Dibenzacridine	10	ND		-	-
Dichlone	10	ND		-	-
1.2-Dichlorobenzene	10	660	1.9	-	-
1.3-Dichlorobenzene	10	660	1.9	-	-
1.4-Dichlorobenzene	10	660	4.4	-	-
2.4-Dichlorophenol	10	660	2.7	-	-
2,6-Dichlorophenol	10	ND		-	-
Dichlorovos	10	ND		-	-
Dicrotophos	10	ND		-	-
Dieldrin			2.5	0.002	0.002
Diethyl sulfate	100	ND		-	-
Diethylphthalate	10	660	1.9	-	-

Diethylstilbesterol	20	ND	2.8	-	-
Demethoate	20	ND	5.6	-	-
3,3'-Dimethoxy-benzidine	100	ND			-
-p-Dimethylamino-azobenzene	10	ND	-	-	-
3,3'-Dimethylbenzidine	10	ND	-	-	-
7,12-Dimethyl-benzanthracene	10	ND		-	-
2,4-Dimethylphenol	10	660	2.7	-	-
Dimethylphthalate	10	660	1.6	-	-
α,α-Dimethylphen-ethylamine	ND	ND		-	-
Di-n-butylphathalate	10	660	2.5	-	-
4,6-Dinitro-2-methylphenol	50	3300			-
1,3-Dinitrobenzene	20	ND		-	-
1,4-Dinitrobenzene	40	ND		-	-
1,2-Dinitrobenzene	40	ND		-	-
2,4-Dinitrophenol	50	3300	2.7	-	-
2,4-Dinitrotoluene	10	660	5.7	-	-
2,6-Dinitrotoluene	10	660		-	-
Donocap	100	ND		-	-
Di-n-octylphthalate	10	660	2.5	-	-
Dinoseb	20	ND		-	-
5,5-Diphenylhydantoin	20	ND		-	-
Disulfoton	10	ND		-	-
Endosulfan I		-	-	0.014	0.014
Endosulfan II	-	-	-	0.004	0.004
Endosulfan sulfate			5.6	0.066	0.066
Endrin	-	-	-	0.006	0.006
Endrin aldehyde	-	-	-	0.023	0.023
bis(2-Ethylhexyl)phthalate	10	660	2.5	-	-
Famphur	20	ND		-	-
Fensulfothion	40	ND	-	-	-

Fenthion	10	ND	-	-	-
Fluchloralin	20	ND		-	-
Fluoranthene	10	660	2.2	-	-
Fluorene	10	660	1.9	-	-
Heptachlor			1.9	0.003	0.003
Heptachlor epoxide	-	-	2.2	0.083	0.083
Hexachlorobenzene	10	660	1.9	-	-
Hexachlorocyclopentadiene	10	660		-	-
Hexachloroethane	10	660	1.6	-	-
Hexachlorophene	50	ND		-	-
Hexachloropropene	10	ND		-	-
Hexamethyl phosphoramide	20	ND	5.7	-	-
Indeno(1,2,3-cd)pyrene	10	660	3.7	-	-
Isophorone	10	660	2.2	-	-
Isosafrole	10	ND		-	-
Keponeb	20	ND		-	-
Leptophos	10	ND		-	-
Malathion	50	ND	-	-	
Mevinphos	10	ND		-	-
Mestranol	20	ND		-	-
Methapyrilene	100	ND		-	-
Methoxychlor	10	ND		-	0.176
Methyl parathion	10	ND	-	-	-
3-Methylchoanthrene	10	ND		-	-
Methyl-methanesulfonate	10	ND		-	-
2-Methylnaphthalene	10	660		-	-
2-Methylphenol	10	660		-	-
3-Methylphenol	10	ND	-	--	-
4-Methylphenol	10	ND	-	-	-
Mexacarbate	20	ND		-	-
Mirex	10	ND		-	-
Monocrotophos	40	ND		-	-

Naled	20	ND		-	-
Naphthalene	10	660	1.6	-	-
1,4-Naphthoquinone	10	660		-	-
2-Naphthylamine	10	ND	-	-	-
1-Naphtylamine	10	ND		-	-
Nicotine	20	ND		-	-
5-Nitroacenaphthene	10	ND		-	-
2-Nitroaniline	50	3300	-	-	-
3-Nitroaniline	50	3300		-	-
4-Nitroaniline	20	ND		-	-
Nitrobenzene	10	660	1.9	-	-
4-Nitrobiphenyl	10	ND	--	-	-
Nitrofen	20	ND	-	-	-
5-Nitro-o-toluidine	10	ND		-	-
2-Nitrophenol	10	660	3.6	-	-
4-Nitrophenol	50	3300	2.4	-	-
Nitroquinoline-1-oxide	40	ND		-	-
N-Nitrosodibutaylamine	10	ND	-	-	-
N-Nitrosodiethylamine	20	ND	-	-	-
N-Nitroso-di-n-propylamine	10	660		-	-
N-Nitrosodiphenylamine	10	660	1.9	--	-
N-Nitrosodimethylamine	20	ND		-	-
N-Nitrosopiperidine	20	ND		-	-
N-Nitrosopyrrolidine	40	ND		-	-
4,4'-Oxydianiline	20	ND		-	-
Parathion	10	ND		-	-
Pentachlorobenzene	10	ND		-	-
Pentachloronitro-benzene	20	ND		-	-
Pentachlorophenol	50	330	3.6	-	-
Phenacetin	20	ND	-	-	-
Phenanthrene	10	660	5.4	-	-
Phenobarbitol	10	ND		-	-

Phenol	10	660	1.5	-	-
1,4-Phenylenediamine	10	ND	-	-	-
Phorate	10	ND	-	-	-
Phosaline	100	ND		-	-
Phosmet	40	ND		-	-
APhosphamidon	100	ND		-	-
Phthalic anhydride	100	ND		-	-
2-Picoline	100	ND	-	-	
Piperonyl sulfoxide	100	ND	-	-	-
Pronamide	10	ND		-	-
Propylthiouracil	100	ND		-	-
Pyrene	10	660	1.9	-	
Resorcinol	100	ND		-	
Safrole	10	ND		-	
Strychinine	200	ND		-	
Sulfallaate	10	ND		-	-
Terbufos	20	ND		-	-
1,2,4,5-Tetrachlorobenzene	10	ND		-	-
2,3,4,6-Tetrachlorophenol	10	ND	-	-	-
Tetrachlorvinphos	20	ND	-	-	-
Tetraethyl Pyrophosphate	40	ND	-	-	-
Thionazine	20	ND		-	-
Thiophenol	20	ND		-	-
Toluene diisocyanate	100	ND	-	-	-
o-Toluidine	10	ND	-	-	-
Toxaphene	-	-	-	0.24	-
1,2,4-Trichlorobenzene	10	660	1.9	-	-
2,4,5-Trichlorobiphenyl	10	660		-	–
2,4,5-Trichlorophenol	10	660		-	-
2,4,6-Trichlorphenol	10	660	2.7	-	-
Trifluralin	10	ND	-	-	-
Trimethyl phosphate	10	ND	-	-	-

2,4,5-Trimethylaniline	10	ND		-	-
1,3,5-Trinitrobenzene	10	ND		-	-
Tri-p-tolyl phosphate	10	ND		-	-
Tris(2,3-dibromopropyl) phophate	20	ND		-	-

NOTE: Practical Quantitation Limits (PQL) listed for soil/sediment are based on wet weight. Normally data is reported on a dry weight basis; therefore, PQLs will be higher, based on the percent moisture in each sample compared to water PQL's or method detection limits.

2.5.a.1.2 Method Specific Data Quality Objectives

Method 8270 is a Gas Chromatographic/Mass Spectroscopy GC/MS. Prior to using this method, the samples should be prepared for chromatography using the appropriate sample preparation and cleanup methods. This method describes chromatographic conditions that allow for the separation of the compounds in the extract and the system will be calibrated using a five-point calibration with standards specific to the compounds of interest.

2.5.a.2 ORGANOCHLORINE PESTICIDES AND PCBs

Soil samples will be analyzed by the SW-846 method 8080 for a total of 26 analytes. The elutriate samples will be analyzed by the EPA 600 Series method 608 for a total of 25 analytes. The method detection limits for the two methods are the same and are incorporated into the semivolatile table. The only diference is the analyte Methoxychlor with a MDL of 0.176 ug/L. The QC acceptance criteria are also the for method 8080 are the same as method 608. The extraction procedures are the same as the semivolatile extraction procedures 3510, 3520, 3540, 3550, and 3580.

2.5.a.3 INORGANIC ANALYSIS (METALS)

2.5.a.3.1 Soil and water Samples

Methods 7000 Series/6010 or 200 Series/200.7 may be used for the analysis of the RCRA metals and Cu, Fe, NI, & Zn (SW-846, 3rd Edition update). It should be noted that the detection limits for the target analytes for SW-846 Methods 7000 Series/6010, EPA Method 200 Series/200.7, and Standard Methods method 3120 are equivalent. Arsenic, selenium, and lead shall be analyzed by the respective graphite furnace methods 3050/7060, 3050/7740, and 3050/7421 when they are not present at sufficient concentration to be detected by ICP (3005/6010)or EPA/4-79-017. Sufficient concentration will be defined as being greater than three times the instrument detection limit (IDL) for ICP. Mercury will be analyzed using method 7470, which is a cold-vapor atomic absorption (CVAA) procedure.

TABLE 2-5
TARGET ANALYTE LIST AND ESTIMATED DETECTION LIMITS

Analyte	Estimated Detection Limit (ug/L)
Arsenic[1]	1
Barium	2
Cadmium	4
Chromium	7
Copper	6
Iron	7
Lead[1]	1
Mercury[2]	0.2
Nickel[1]	1
Selenium[1]	2
Silver	7
Zinc	2

NOTE: The estimated detection limits are obtained from clean aqueous samples. The actual method detection limits are sample dependent and will vary per sample matrix.

Detection Limits are for ICP Atomic Emission Spectroscopy unless indicated otherwise.
(1) Graphite furnace technique
(2) Cold vapor technique SW-846 method 7470/7471 & EPA Series Methods 245.1/245.5.

2.5.a.3.2 Method Specific Data Quality Objectives

Analyses for metals using the methods indicated in section 6 will be completed to within an accuracy range of 75-125% recovery, with a precision of 20% RPD for both soil and water samples.

Soil shall be calculated and reported on a dry weight basis. Detection limits must meet or exceed the low levels parameters established by EPA as specified in SW-846 methods.

2.5.a.4 Total Kjeldahl Nitrogen, Total Phosphorus, Oil and Grease, and Total Organic Carbon

Total Kjeldahl Nitrogen (EPA 351), Total Phosphorus (EPA 365.2), Oil and Grease (EPA 9070), and Total Organic Carbon (EPA 9060) are from: Methods for Chemical Analysis of Water and Wastewater, EPA-600/4-79-020. The reporting limits for Total Phosphorus is 0.1 mg/L and Oil and Grease is 1%. The practical quantitation limit for Total Kjeldahl Nitrogen is 200 µg/L and for Total Organic Carbon is 1 mg/L. The measurement of these parameters will be used to characterize the overall composition of the dredged material.

2.5.b Laboratory QC Checks

Two types of quality assurance checks will be used to assess the production of analytical data of known and documented quality. These include program quality assurance, and analytical method quality control.

The stated objectives of the laboratory QA/QC Program are to:

a. Verify that all procedures are documented, including any changes in administrative and/or technical procedures.

b. Document that all analytical procedures comply with sound scientific principles and have been validated.

c. Monitor the performance of the laboratory by a systematic inspection program and provide for corrective action as necessary.

d. Verify that all data are properly recorded and archived.

All laboratory procedures are documented in writing as either Standard Operating Procedures (SOPs) or Method Procedures (MPs), which are edited and controlled. Internal quality control procedures for analytical services will comply with the QAPjP's and SOPs. These specifications include the types of QC samples required (sample spikes, method spikes, reference samples, controls, blanks), the frequency of each QC sample, the compounds to be used for sample spikes, and the quality control acceptance criteria for these audits.

In each data package provided, the laboratory will document that analytical QC functions have been met. Any samples analyzed that are not in conformance with the QC criteria will be reanalyzed by the laboratory if the laboratory procedures were not in control as assessed by laboratory control procedures, and, if sufficient sample volume is available for reanalyses. QC check samples (method blanks, MS/MSD, duplicates etc.) will be analyzed concurrently with the sample batch to which they are assigned. Any deviations or modification from the published EPA procedures or SOP must be documented and clearly noted in the case narrative.

2.5.b.1 Method Blank

A method blank consists of analyte-free deionized water. The method blank is carried through each step of the analytical method. Method blanks will be analyzed at a rate of one per 20 environmental samples or analytical batch whichever is greater.

2.5.b.2 Laboratory Control Sample (LCS) or Duplicate Control Sample (DCS)

An LCS or DCS is a standard reference material of identical matrix to the environmental samples being prepared and analyzed for metals in a batch. It used both to validate the preparation method and to control instrument precision and accuracy. These samples are analyzed at a rate of 1 per 20 or 1 per analytical batch, whichever is greater. When the recovery for any analyte in the LCS is outside acceptance limits, samples associated with that LCS will be redigested and reanalyzed.

2.5.c PROJECT QC GOALS

2.5.c.1 Accuracy Limits

Accuracy (%R) limits for Laboratory Control Samples, surrogate spike and matrix spikes are specified in Tables. The limits specified in these tables will be utilized during QC review of data validation.

2.5.c.2 Precision Limits

Precision is monitored through the analysis of matrix spike duplicates, Laboratory duplicates and Field duplicate samples. Precision limits tables will be utilized during the QC review of data. See item 3.6.1 (Field Duplicate).

2.6 DATA REDUCTION, EVALUATION, AND DOCUMENTATION

2.6.a Data evaluation serves three main purposes:

a. It qualifies data for further use to ensure data is not inappropriately used.

b. It serves as a check on a laboratory to ensure they are meeting contractual deliverables and regulatory requirements.

c. It reduces corporate liability by establishing due diligence and allows errors to be addressed sooner in a program where the impact will be less if caught later.

2.6.b The data evaluation process for this project will consist of data generation, reduction, and two levels of review, the first by the analytical laboratory and the second through an independent data review. The analytical data generated by the laboratory will be reviewed by USACE for accuracy, precision, completeness, representativeness, and comparability and additional parameters outlined below. Upon the conclusion of analysis the USACE QA lab generates QA/QC report at which the contract lab data are compared against the QA lab data. The percentage of agreement or disagreement will indicate which tests should be accepted and which data should be disqualified.

2.6.c Analytical Laboratory Data Review and Reporting

The first level of review, which may contain multiple sub levels, will be conducted by the analytical laboratory data reviewer who has the initial responsibility for the correctness and completeness of the data. All data are generated and reduced in accordance with protocols specified in the analytical methodology. The laboratory data reviewer will evaluate the quality of the work based on an established set of laboratory guidelines (see GPES Quality Assurance Manual and this QAPjP. This person will review the data package to ensure that:

a. Sample preparation information is correct and complete
b. Analysis information is correct and complete
c. Appropriate methods have been followed
d. Analytical results are correct and complete
e. QC samples are within appropriate QC limits
f. Special sample preparation and analytical requirements have been met

g. Documentation is complete (all anomalies in the preparation and analysis have been documented, and holding times are documented).

The laboratory will perform the in-house analytical data reduction and QA review under the direction of the laboratory Data Review Supervisor. The laboratory Program Administrator (PA) is responsible for assessing data quality and advising the Project Chemist of any data which were rated "preliminary" or "unacceptable", or other notations which would caution the data user of possible unreliability. Data reduction, QA review, and reporting by the laboratory will be conducted as follows:

a. Raw data produced by the analyst is processed and reviewed for attainment of quality control criteria as outlined in this QAPjP and/or established EPA methods and for overall reasonableness.
b. The data reviewer will need to decide if further sample analysis of any sample is required.
c. Upon acceptance of the preliminary reports by the data reviewer, final reports will be generated.
d. The data reduction and the QC review steps will be documented, signed, and dated by the analyst.

Laboratory data reduction procedures will be those specified in EPA SW-846, 3rd Edition, and revisions thereto, and those described in the laboratory SOPs.

The laboratory will prepare and retain full analytical and QC documentation. This shall include raw data system printouts (or legible photocopies) identifying date of reported analysis, analyst, parameters analyzed, calibration curves, calibration verifications, method blanks, any reported sample dilutions, sample duplicates, spikes, and control samples; sample spiking levels, preparation/extraction logs, and run logs. For SW-846 and other analytical methods the following reporting requirements outlined below shall be met:

The laboratory will report the data as a group of 20 samples or less, along with QC supporting data:

a. Chains of custody
b. Cover sheet listing the samples included in the report and narrative comments describing problems encountered in analysis.
c. Tabulated results of inorganic and organic compounds identified and quantified with appropriate qualifiers.
d. Tabulation of reporting limits related to the sample analytes.
e. Data Summary Tables of all samples by matrix and analysis type, i.e., 8270 SVOC, etc.
f. Analytical results for QC MS/MSD, Splits/ duplicates, blanks, standard procedural blanks, and laboratory control samples, surrogate spike and surrogate spike duplicates.
g. BFB/DFTPP tuning instrument performance check summary.
h. Initial calibration data summary.
i. Continuing calibration data summary.
j. Internal standard area summary.
k. Sample and standard chromatogram (with compound retention time, organic only).

Furthermore, the laboratory must keep on file all the raw data to substantiate the results reported on the data summary forms.

Laboratory qualifiers will include:

a. Concentration below required reporting limit

b. Estimated concentration due to poor spike recovery
c. Concentration of chemical also found in laboratory blank

The narrative accompanying the data package will include cautions on quantitative use and usability of results from out-of-control QC method modification deviations.

2.6.d Independent Data Review Process

All laboratory analytical data packages will receive a second level of review by a project chemistry staff member whose function is to provide an independent review of the data package. Laboratory results will be reviewed and data qualified, if required. Sample data may be qualified as "J" estimated), "UJ" (not detected - estimated), or may be rejected "R". The qualifier "U" is normally used for analytes not detected by the laboratory. Rejected data are not usable for any purpose.

A summary of the elements to be checked in the evaluation and review process is discussed hereafter:

2.6.d.1 Review of Metals Analyses

Analytical data for metal samples will undergo a data review of the following requirements, in accordance with SW-846 Chapter (USEPA 1986) Third Edition, November 1990, and the appropriate method. This review will consist of:

a. Data package completeness check
b. Holding times
c. Blanks - field, rinsate, lab (method and instrument)
d. Laboratory control sample (LCS)
e. Duplicate sample analysis
f. Matrix spike sample analysis
g. Field and lab duplicates,
h. Overall assessment of data for a case

2.6.d.2 Review of Semi-volatiles, Pesticides, and PCBs Analyses

Semi-volatile organic, pesticide, and PCBs analytical data for all samples will undergo review of the following requirements, in accordance with SW-846 Chapter 1 (USEPA, 1986) and the appropriate method requirements. The data review will include the following:

a. Data package complete
b. Holding times
c. Blanks
d. Surrogate recovery
e. Matrix spikes/matrix spike duplicates
f. Laboratory control sample
g. Compound quantitation and reported quantitation limits
h. Tentatively identified compounds (TICs)
i. Field duplicates
j. Overall assessment of data

2.6.d.3 Review of Total Kjeldahl Nitrogen (TKN), Total Phosphorus, Oil and Grease, and Total Organic Carbon (TOC) Analyses

TKN, Total Phosphorus, Oil and Grease, and TOC analytical data for all samples will undergo review of the following requirements, in accordance with SW-846 Chapter 1 (USEPA, 1986) and appropriate method requirements. The data review will include the following:

a. Data package Complete
b. Holding times
c. Blanks
d. Field duplicates
e. Over assessment of data

2.6.e PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits may be conducted to verify documentation on implementation of the QA program, assess the effectiveness of the QAPJP, identify any nonconformances, and verify correction of identified deficiencies. The QA/QC coordinator will be responsible for initiating audits, selecting the audit team, and overseeing audit implementation. Laboratories participating in the Baltimore Harbor Anchorages and Channels project will undergo a validation procedure by the U.S. Army Corps of Engineers, which includes performance evaluation sample analysis and inspection. This validation by the Corps is part of the USACE QA program.

2.6.e.1 Performance Audits

The QA/QC Officer will evaluate the need for a performance audit. Performance audits are utilized to quantitatively assess the accuracy of laboratory measurement data through the use of performance evaluation (or blind check) samples. A performance audit may be conducted by the QA/QC Coordinator or his or her designee if required by USACE or requested by the project chemist.

2.6.e.2 Technical Systems Audits

A systems audit will be performed of field operations to review the total data generation process, which includes on-site review of the field operational system, physical facilities for sampling, and equipment calibrations. At least one technical systems audit of field operations must take place during this project

2.6.e.3 Field

A minimum of one technical systems audit of fieldwork performance will be conducted by the QA/QC Coordinator during the sampling events. The Field Sampler is responsible for supervising and checking that samples are collected and handled in accordance with the approved project plans and that documentation of work is adequate and complete. The project chemist is responsible for overseeing that the project performance satisfies the QA objectives as set forth in this QAPjP. Reports and technical correspondence will be peer reviewed by qualified individuals, otherwise external to the project, before being finalized.

2.6.e.4 Laboratory

A system audit of the laboratory will be performed annually and when required by specific projects. The USACE has performed a system audit of GPES on July 1992. Results of this audit will be provided to the EPA as requested.

2.6.e.5 System Audit Procedure

This procedure provides requirements and guidance for performing internal and external audits to verify compliance with the elements of the QAPjP.

2.6.e.6 Audit Notification

The Program Manager, Project Manager, and, if appropriate, other audited entity (e.g., Field Sampler, Laboratory Supervisor) will be notified by the QA/QC Officer of an audit at a reasonable time before the audit is performed. This notification will be in writing and will include information such as the general scope and schedule of the audit and the name of the audit team leader.

2.6.e.7 Preaudit Conference

A preaudit conference shall be conducted at the audit site with the appropriate manager or designated representative (e.g., Field Sampler, Laboratory Supervisor). The purpose of the conference will be to confirm the audit scope, present the audit plan, discuss the audit sequence, and plan for the post audit conference.

2.6.e.8 Audit

The audit is then implemented by the audit team and consist of the following:

a. Checklists prepared by the audit team and approved by the QA/QC Coordinator will be sufficiently detailed to document major audit components.

b. Selected elements of the QAPjP will be audited to the depth necessary to evaluate the effectiveness of implementation.

c. Conditions requiring immediate corrective action shall be reported immediately to the QA/QC Officer.

2.6.e.9 Postaudit Conference

At the conclusion of the audit, a post audit conference will be held with the Field Team Leader or Laboratory Supervisor, or their designated representatives, to present audit findings and clarify any misunderstandings. Audit findings will be concisely stated by the audit team leader on a list of findings. The findings will be acknowledged by signature of the Project Manager or designated representative upon completion of the post audit conferences.

2.6.e.10 Audit Report

An audit report will be prepared by the audit team leader and signed by the QA/QC Coordinator.

The report will include the following:

a. Description of the audit scope.
b. Identification of the audit team.
c. Persons contacted during pre audit, audit, and post audit activities.
d. A summary of audit results, including an evaluation statement regarding the effectiveness of the QAPjP elements which were audited.
e. Details of findings and program deficiencies.
f. Recommendations for correcting the findings to the QA/QC Officer.

2.6.e.11 Audit Response

The Project Chemist or designated representative will respond to the audit report within 2 working days of receipt. The response will clearly state the corrective action for each finding, including action to prevent recurrence and the date the corrective action will be completed.

2.6.e.12 Follow-Up Action

Follow-up action shall be performed by the QA/QC Officer or designated representative to:

a. Evaluate the adequacy of the Project Manager's response.
b. Assess that corrective action is identified and scheduled for each finding.
c. Confirm that corrective action is accomplished as scheduled.

Follow-up action may be accomplished through written communications, re audit, or other appropriate means. When all corrective actions have been verified, a memo shall be sent to the Project Chemist signifying the satisfactory close-out of the audit, with copies to the Program Chemist and others as appropriate.

2.6.e.13 Audit Records

Original records generated for all audits shall be retained within the central project files. Records shall include audit reports, written replies, the record of completion of corrective actions, and documents associated with the conduct of audits which support audit findings and corrective actions as appropriate.

2.7 SUMMARY

Within this QAPjP, quantitative limits are defined for quantitation, detection, reporting limits, accuracy, precision, and analytical completeness. Quantitation and detection limits are those specified by the USEPA SW-846, while reporting limits are set by the analytical laboratory based on historical data and comparison to USEPA limits for SW-846 and other methods. Accuracy is defined as the degree of agreement of a measurement to an accepted reference or true value. Accuracy will be measured as the percent recovery (%R) of an analyte in a reference standard or spiked sample. The procedure for calculating percent recovery is specified in Section 2.1.d.1. Precision is defined as the agreement between a set of replicate measurements without assumption or knowledge of the true value. The procedures for calculating precision are specified in Section 2.1.d.2. Analytical completeness is defined as the percentage of valid analytical results requested. The procedure for calculating analytical completeness is specified in Section 2.1.d.4.

2.7.a Incoming Samples/Cooler Receipt Form

Upon sample receipt, the laboratory representative responsible for accepting incoming sample shipments must compare the samples received against the list on the chain of custody form. All samples will be examined and information will be recorded on a "Cooler Receipt Form" or equivalent verify the condition of the samples upon receipt, and verify that sample holding times have not been exceeded. Laboratory personnel shall measure the surface temperature of the samples to determine if the proper temperature was maintained during shipment. If any samples are observed as improperly preserved or damaged during transit, the USACE project chemist shall be notified immediately to decide if resampling will be required.

2.7.b Instrument Preventive Maintenance, Calibration and Frequency

The analytical instrumentation to be used for sample analysis shall have preventive maintenance performed and calibrations done at a frequency which is specified and in accordance with the procedures documented in the Laboratory's QA Manual. These shall be consistent with the requirements of the analytical method.

2.7.c Data Reduction, Evaluation and Documentation

Data evaluation shall be performed in accordance with the procedures of the Laboratory's QA manual and shall adhere to the protocols described in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, Third Edition, U.S. EPA, November 1990.

For purposes of this investigation, the primary laboratory shall perform a Level III data type evaluation on all generated analytical data. The Level III type data evaluation will be performed consistent with EPA/540/G-87/003, Data Quality Objectives for Remedial Response Activities. Methods used for level III have built-in quality control requirements including calibration standard runs, blanks, spikes, and duplilcates. Documentation obtained is anlysis dependent. Minimally, laboratory notebooks, instrument logs, standard documentation and instrument reports are provided with additional documentation.

2.7.d Chemical Data Quality Management Deliverables

During the project, the following reports and chemical data shall be submitted:

2.7.d.1 Quality Control Summary Report (QCSR)

During the field sampling/investigation activities, the primary sampler shall provide a QCSR to the project chemist. These reports shall be compiled upon completion of sampling activities at the site. The QCSR shall summarize daily sampling activities which occurred at the site. The QCSRs shall include, but not be limited to, the minimum information described and listed here.

2.7.d.2 Departure From Approved Plans

These reports shall include problems identified, corrective actions, and verbal/written instructions from USACE personnel for sampling or re-analysis. Written reports of all significant problems shall be sent to the USACE project manager within 48 hours of the occurrence.

2.7.d 3 Analytical Data Report/Package to the USACE

The contractor's data must be submitted as a pre-draft final report to the USACE Project Chemist for comparison and evaluation between the data generated from the contractor's internal QC and results obtained from the field duplicate/split samples. This review also encompasses an assessment of the internal quality control and method requirements, enabling a validation of the data generated during the project to be performed. This package of data shall be submitted as soon as it becomes available. The data set shall also be reviewed for completeness and verification that the DQOs were met.

This deliverable shall contain at a minimum all of the items listed below to allow the USACE chemist to perform an adequate evaluation (data shall be presented in tabular format whenever possible):

a. Sample Identification

Prepare a tabular presentation which matches the contract laboratory sample identifications to the field sample identification numbers assigned to each sample. This table shall identify all field splits/duplicates as such and shall match with their corresponding field samples where applicable.

b. Cooler Receipt Forms
Provide copies from all sample shipments received at the contract laboratory.

c. Chain of Custody Record Forms
Provide copies from all sample shipments to the contract laboratory.

2.8 References

Department of the Army, US Army Corps of Engineers, *ER 1110-1-263, Chemical Data Quality Management for Hazardous Waste Remedial Activities*, Washington D.C., 1 October 1990.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, Third Edition*, Washington D.C., November 1990.

U.S. Environmental Protection Agency, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, *EPA/540/G-87/003, Data Quality Objectives for Remedial Response Activities*, Washington D.C., March 1987.

U.S. Army Corps of Engineers, Waterways Experiment Station, *EEDP -04-2, Environmental Effects of Dredging Technical Notes*, Vicksburg, MS, June 1985.

U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, *Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020*, Cincinnati, OH, March 1983.

U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, *Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600/4-82-057*, Cincinnati, OH, July 1982.

TAB A - FIELD SAMPLING PLAN

Work Plan for Environmental and Geotechnical Investigation
Baltimore Anchorages and Channels Feasibility Study
Baltimore, Maryland

FIELD SAMPLING PLAN

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APPENDIX A: Sampling Check Lists

APPENDIX B: Borehole Locations

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Work Plan for Environmental and Geotechnical Investigation
Baltimore Anchorages and Channels Feasibility Study
Baltimore, Maryland

FIELD SAMPLING PLAN

1.0 SAMPLING OBJECTIVES:

There are two sampling objectives for this investigation. First, environmental sampling of sediments that will be dredged will be performed. Chemical analysis of these sediments will be used to determine the dredged material disposal requirements. Second, geotechnical sampling of sediments that will be dredged will be performed. Standard Penetration Test data and soil test results of geotechnical samples will be used to confirm the results of a previous geophysical investigation for characterizing dredging conditions.

2.0 SAMPLING LOCATIONS:

The project site has been divided into five work areas. These work areas are defined as South Locust Point (SL1), Anchorage Areas 2 & 3 (AA2 and AA3), Anchorage Area 4 (AA4), the Terminal Channels (TC5 and TC6) and Curtis Creek (CC7). Both environmental and geotechnical sampling will be performed in the first four work areas. Additional sampling will be performed in the Curtis Creek work area only if time and funding are available. Figure 1 in Appendix B shows the project site. Figures 2 and 3 in Appendix B show the boundaries of the first four work areas.

Environmental sampling locations were selected by dividing each work area in equal areas and then selecting an unbiased boring location that is representative of each area. Geotechnical sampling locations were selected to confirm the results of a previous geophysical investigation by sampling calibration points and anomalous conditions. Additional geotechnical sampling locations were added to provide evenly spaced coverage of all work areas.

2.1 South Locust Point:

The work area near South Locust Point (SL1) is located towards the western end of the Ferry Bar Channel as shown in Figure 2. The investigation area measures approximately 1600 feet long and 600 feet wide. The investigation area is an old remnant channel that will be deepened and widened to permit one way ship traffic in and out of the SL1 marine terminal. A total of four environmental borings and four geotechnical borings will be completed in the SL1 work area. All borings will be sampled to a depth of 45.0 feet below Mean Lower Low Water (MLLW). Average water depth is expected to be 29 feet and average coring length is expected to be 16 feet. Detailed information on each boring location is included in Appendix B.

2.2 Anchorage Areas 2 & 3:

The work area in Anchorage Areas 2 & 3 (AA2 and AA3) is located along the northeast side of the Fort McHenry Channel between Ferry Bar and Curtis Bay Channels and northwest of the West Dundalk Branch Channel as shown in Figure 3. The investigation area measures approximately 4400 feet long and 2100 feet

wide. The investigation area is an existing anchorage basin that will be deepened to accommodate larger ships. A total of eight environmental borings and eight geotechnical borings will be completed in the AA2 and AA3 work area. There is one additional geotechnical boring in the AA2 and AA3 work area that may be completed if time permits. All borings will be sampled to a depth of 45.0 feet below MLLW. Average water depth is expected to be 34 feet and average coring length is expected to be 11 feet. Detailed information on each boring location is included in Appendix B.

2.3 Anchorage Area 4:

The work area in Anchorage Area 4 (AA4) is located approximately 1000 feet southeast of the AA2 and AA3 work area as shown in Figure 3. The investigation area measures approximately 1500 feet long and 1500 feet wide. The investigation area is an existing anchorage basin that will be deepened to accommodate larger ships. A total of four environmental borings and six geotechnical borings will be completed in the AA4 work area. All borings will be sampled to a depth of 45.0 feet below MLLW. Average water depth is expected to be 33 feet and average coring length is expected to be 12 feet. Detailed information on each boring location is included in Appendix B.

2.4 Terminal Channels:

The work area at the Terminal Channels (TC5 and TC6) consist of two branch channels to the Dundalk marine terminal and the connecting channel between Dundalk and Seagirt marine terminals as shown in Figure 3. The investigation area is limited to within 150 feet of both sides of the existing channels except for two proposed cutoff angles; one that extends north towards Colgate Creek from the connecting channel and the other at the intersection of West Dundalk Branch and Fort McHenry Channels. The terminal channels will be widened to accommodate larger ships. A total of ten environmental borings and seven geotechnical borings will be completed in the TC5 and TC6 work area. There are three additional geotechnical borings in the TC5 and TC6 work area that may be completed if time permits. All borings will be sampled to a depth of 45.0 feet below MLLW. Average water depth is expected to be 27 feet and average coring length is expected to be 18 feet. Detailed information on each boring location is included in Appendix B.

2.5 Curtis Creek:

The optional work area in Curtis Creek (CC7) is located southwest of the western edge of the Curtis Bay Channel as shown in Figure 1. The investigation area measures approximately 600 feet wide by 3000 feet long. The investigation area is an existing channel that is being considered for both widening and deepening. A total of four environmental and four geotechnical borings will be completed in the CC7 work area is time and funding permits. All borings will be sampled to a depth of 45.0 feet below MLLW. Average water depth is expected to be 35 feet and the average coring length is expected to be 10 feet. Detailed information on each boring location is included in Appendix B.

3.0 DRILLING:

Drilling will be accomplished by two distinct methods. All environmental borings will be completed by the Vibrocore Method. All geotechnical borings will be completed by continuous sampling using the Standard Penetration Test method.

3.1 Sequence of Drilling:

Work will be performed in the sequence specified below. The drilling sequence shall not be modified without the approval of all three of the Geotechnical, HTRW, and Operations Division Project Coordinators. The three Division Coordinators will also decide how many, if any, of the optional environmental and geotechnical borings will be completed.

1) SL1 Environmental Borings (any order)
2) AA2 Environmental Borings (any order)
3) AA3 Environmental Borings (any order)
4) AA4 Environmental Borings (any order)
5) TC5 Environmental Borings (any order)
6) TC6 Environmental Borings (any order)
7) AA2, AA3, AA4, TC5, & TC6 Geotechnical Borings (any order)
8) SL1 Geotechnical Borings (any order)
9) CC7 Environmental and Geotechnical Borings (any order)
10) Remaining optional Geotechnical Borings (any order)

3.2 Work Platform and Surveying Support:

3.2.1 All drilling will be performed from a barge provided by a private contractor, J. Willis Smith and Brother, Inc. The contractor's dock area is located at 6211 Pennington Avenue and all drilling and sampling personnel will leave and arrive from that point daily. The contractor's point of contract is Phil Stradley at 355-7626.

The contractor will also provide a tug boat, captain, and deck hand to position and anchor the barge; and a crane and operator to lower and raise the vibrocore rig. The contractor will be responsible for providing additional support services such as loading and unloading of government equipment, overnight docking, radio communications, and other supporting services as described in the scope of work included as Appendix C.

3.2.2 Survey support for this investigation will be provided by the Baltimore District Operation Division, Hydrographic Survey Section. Boring locations may be marked in advance will a small buoy. A GPS system with operator will be positioned on the barge/tug to provide accurate survey data for each hole location. Tide readings will also be provided to determine the depths of the boring at each location referenced to Mean Lower Low Water (MLLW).

3.3 Field Equipment and Supplies:

Truck Mounter Drill Rig with drill rods, casing, and hammer
Vibrocore Rig with air compressor and drill tubes
Potable Water Tank, filled daily (confirm contractor supply)
Min. of three, 1-3/8 inch ID SPT split spoon samplers
Min. of 30, 20-foot long, cellulose buterate vibrocore liners
End Caps for vibrocore liners
Heavily Weighted 100-foot tape measure
Decontamination steam cleaning unit
Small pump with strainer element

Stainless steel spoons, mixing bowls, etc.
Vibrocore liner cutting and splitting equipment
Porta-Potty (unless contractor supply confirmed)
Mobile Phone
Camera and film
Safety Equipment specified in safety and health plan
Field Book, Boring Log Forms, ink pens, and permanent markers
Cooler and Chemical Sample Containers
Geotechnical Samples Jars and Boxes
Ice, zip-lock bags, and packing material
Chain of custody forms and custody seals
Federal Express Forms
Decon Detergent, basins, buckets, brushes, etc. for PPE decon
Aluminum foil, trash bags, and paper towels
Polyethylene sheet and Nalgene squirt bottles
Deionized Water
Isopropyl Alcohol
1% Nitric Acid Solution
Drums to collect sample collection equipment decon fluids

3.4 Equipment Decontamination:

3.4.1 The steam cleaning of all drilling equipment to include rigs, water tanks (inside and out), augers, drill casings, rods, samplers, tools, etc., shall be done prior to mobilization with potable water. Vibrocore tubes will be precleaned and sealed prior to mobilization. Lubricants shall not be used on any downhole tools and sampling equipment at environmental boring locations.

3.4.2 All downhole tools will be cleaned between holes by steam cleaning with harbor or potable water. All sampling collection equipment (hacksaw, spoons, bowls, etc.) for the environmental borings will be cleaned between sampling episodes following the decontamination procedures presented below:

1) Dislodge gross contamination with sampling utensils.
2) Steam clean the equipment thoroughly. Use a brush to remove any particulate matter or surface film.
3) Potable Water rinse.
4) Rinse with 1% Nitric Acid solution.
5) Potable Water rinse.
6) Isopropyl alcohol rinse.
7) Total air dry.
8) Distilled/deionized water rinse.

3.4.3 During storage and/or transport to another field sampling location, wrap the sample collection equipment completely with aluminum foil to prevent contamination.

3.5 Management of Investigation Derived Waste:

All activities will be performed in such a manner to minimize the generation of investigation derived waste. All soil cuttings generated during drilling and not placed in sample containers will be returned to the harbor

bottom in the same work area where sampled. Steam cleaning water will be collected, allowed to cool, and then returned to the harbor. Fluids generated from the decontamination of sample collection equipment (nitric acid rinse, potable water rinse, isopropyl alcohol rinse, and deionized water rinse) and personnel protective equipment (detergent water) will be collected and drummed for on land disposal to the sanitary sewer. Used vibrocore liners will be steam cleaned and disposed of on land in a trash dumpster.

4.0 SAMPLING COLLECTION AND ANALYSIS:

Geotechnical sample collection will be the responsibility of the field geologist or site supervisor. Environmental sample collection will be the responsibility of the environmental technician.

4.1 Field Records:

4.1.1 The field geologist or site supervisor will be required to keep a field logbook to document all field activities. The logbook will be a bound notebook with water resistant pages.

4.1.2 The following guidelines will be followed when entering information into the logbook:

1) All entries will be made in waterproof ink.
2) All time will be reported as military time.
3) All pages will be numbered consecutively.
4) No blank pages or sections of pages will be allowed. If a page is not completely filled in, a line will be drawn through the blank portion and initialed by the field geologist or site supervisor.
5) Errors will be corrected by drawing a single line through the error and initialing the change.
6) Each page will be signed and dated.

4.1.3 The field notebook will contain the following:

1) Date, weather conditions, personnel, and equipment calibration information will be recorded at the beginning of each day.
2) A description of the sampling method.
3) Documentation of sample collection to include sample identification number, type of sample, sample location, time of collection, sampling depths, results of field screening, sample description, and type of analysis requested.
4) Level of protection and changes in levels of protection shall be noted.
5) Any deviation from the field sampling plan shall be noted and explained.

4.2 Boring Logs:

A complete and accurate field log for each boring will be completed. Each log must include the project name, project location, hole identification, type of drill rig, driller's name, sampling method, soil classification according to USCS, actual water depth and tide reading, depth and identification for each sample, time the sample was collected, sample testing parameters, and field screening results.

4.3 Sample Identification:

4.3.1 Geotechnical samples will be labeled and logged in accordance with standard operating

procedures for geotechnical borings. Samples will be collected continuously and each sample jar will represent each eighteen inches of penetration for the full depth of the boring.

4.3.2 Environmental samples will be labeled and logged in accordance with the sampling check lists contained in Appendix A.

4.4 Geotechnical Sediment Sampling:

4.4.1 Geotechnical borings will be completed by continuous sampling using the Standard Penetration Test (SPT) method. Once the drilling position is secured, a heavily weighted tape will be used to determine the water depth. Using the surveyed tide reading, the actual boring depth will be calculated and referenced to a MLLW elevation. The drill steel will be positioned and the GPS system will be used to determine the actual boring location.

4.4.2 Retrieve geotechnical samples for each eighteen inches of penetration. Record blow counts for each six inches of penetration to include depth of penetration by weight of rods (WR) or weight of hammer (WH) for softer sediments.

4.4.3 Record the strata changes within each spoon sample. Record the length of sample recovered and make note of coloration, and if gravel or shells are present. Note any zones of soil cementation.

4.4.4 Once initial penetration of the fluid mud is accomplished it may become necessary to set a casing to keep the hole open and act as a guide for the split spoon sampler. For more competent sediment, it may be necessary to perform delicate flushing inside the casing before advancing the next spoon.

4.5 Environmental Sediment Sampling:

4.5.1 Environmental borings will be completed by continuous sampling using the Vibrocore method. Once the drilling position is secured, a heavily weighted tape should used to determine the water depth on the sampling location side of the barge. Using the surveyed tide reading, the actual boring depth will be calculated and referenced to a MLLW elevation. The vibrocore rig will be positioned on the bottom of the harbor and the GPS system will be used to calculate the actual boring location.

4.5.2 Retrieve a full column of sediment for the entire depth of the boring or until vibrocore refusal, whichever comes first. Record the time for each foot of penetration if possible. Upon retrieval of the vibrocore tube, remove the vibrocore liner and seal both ends with end caps to prevent loss of material until sampling can begin.

4.5.3 Sampling of the vibrocore sediment will be made by first cutting off empty ends of the tube. Next, the tube containing the sediment will be opened along its entire length to reveal the entire column of the sediment.

4.5.4 Record the strata changes within the vibrocore tube liner. Record the length of sample recovered and make note of coloration, and if gravel or shells are present. Note any zones of soil cementation.

4.5.5 Collect a composite sample along the entire length of the sediment column and place into a mixing bowl. Insure that the composite sample results in equal representation of material from all portions

of the sediment column. The composite sample should be homogenized in the mixing bowl prior to filling the sample containers. Sample collection equipment will be decontaminated between each boring.

4.5.6 Quality Control (QC) duplicate samples will be collected at the same location and time as the original sample and will be sent along with the original sample to the contract laboratory for the same analysis.

4.6 Sample Handling Procedure:

4.6.1 The project chemist shall arrange for delivery of all coolers, labels, and sampling jars for chemical analysis to Fort McHenry prior to mobilization.

4.6.2 Each environmental sample jar will be labeled to indicate the sample number, location, date, time, sampler, and analysis required.

4.6.3 Each environmental sample jar will be placed in the cooler immediately after being filled and cooled to 4° Celsius. The temperature of 4° Celsius shall be maintained until such time as the samples have been turned over to the laboratory.

4.6.4 Each environmental sample number and associated information will be entered on the lab provided chain of custody form.

4.6.5 Environmental samples will either shipped overnight express or be hand delivered to the specified laboratory every day. A copy of the chain of custody form showing proper turnover to the lab will be returned to the quality assurance officer at the completion of the project.

4.6.6 Environmental samples collected on Friday and going to the contract laboratory will be marked on the shipping label for Saturday delivery and sent by overnight express. The environmental technician will contact the laboratory to expect a Saturday delivery.

4.6.7 Environmental samples collected on Friday and going to the quality assurance laboratory will be maintained at the proper temperature throughout the weekend and shipped overnight express on Monday.

4.6.8 The field geologist or site supervisor will deliver all geotechnical samples to the Fort McHenry Soils Laboratory upon completion of the work. The soils laboratory will be instructed not to begin testing the samples until the environmental test results are available.

4.7 Shipping Addresses:

Analytical Laboratory:

Ms. Amy Friedlander
GP Environmental Services, Inc.
202 Perry Parkway
Gaithersburg, MD 20877
Telephone (301) 926-6802
Fax (301) 840-1209

Include the NED Project No. E0208 with all samples (must be included on chain of custody) and correspondence relating to this project.

APPENDIX A:

SAMPLING CHECK LISTS

Baltimore Harbor Anchorages and Channels
Feasibility Study
Sampling Check List

Boring Number	Boring Depth	Sample Number	Approx. Sample Interval	Container	Analysis	Lab	QA/QC	Initials
SOUTH LOCUST POINT (SL1)								
EB-1-94	45'	SL1-EB01-S1	30.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		SL1-EB01-S2	30.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		SL1-EB01-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-2-94	45'	SL1-EB02-S1	32.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		SL1-EB02-S2	32.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		SL1-EB02-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-3-94	45'	SL1-EB03-S1	21.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		SL1-EB03-S2	21.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		SL1-EB03-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-4-94	45'	SL1-EB04-S1	30.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		SL1-EB04-S2	30.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		SL1-EB04-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		

Boring Number	Boring Depth	Sample Number	Approx. Sample Interval	Container	Analysis	Lab	QA/QC	Initials
ANCHORAGE AREAS 2 & 3 (AA2)								
EB-5-94	45'	AA2-EB05-S1	37.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA2-EB05-S2	37.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA2-EB05-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-6-94	45'	AA2-EB06-S1	27.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA2-EB06-S2	27.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA2-EB06-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-7-94	45'	AA2-EB07-S1	41.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA2-EB07-S2	41.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA2-EB07-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-8-94	45'	AA2-EB08-S1	28.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA2-EB08-S2	28.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA2-EB08-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		

Boring Number	Boring Depth	Sample Number	Approx. Sample Interval	Container	Analysis	Lab	QA/QC	Initials
ANCHORAGE AREAS 2 & 3 (AA3)								
EB-9-94	45'	AA3-EB09-S1	41.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA3-EB09-S2	41.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA3-EB09-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
		AA3-EB09-S4	41.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES	QC	
		AA3-EB09-S5	41.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES	QC	
		AA3-EB09-S6	Bay Water	1 - 1 gal amber glass	Elutriate	GPES	QC	
EB-10-94	45'	AA3-EB10-S1	29.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA3-EB10-S2	29.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA3-EB10-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
		AA3-EB10-S4	29.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES	QC	
		AA3-EB10-S5	29.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES	QC	
		AA3-EB10-S6	Bay Water	1 - 1 gal amber glass	Elutriate	GPES	QC	

Boring Number	Boring Depth	Sample Number	Approx. Sample Interval	Container	Analysis	Lab	QA/QC	Initials
ANCHORAGE AREAS 2 & 3 (AA3)								
EB-11-94	45'	AA3-EB11-S1	40.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA3-EB11-S2	40.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA3-EB11-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
		AA3-EB11-S4	40.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES	QC	
		AA3-EB11-S5	40.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES	QC	
		AA3-EB11-S6	Bay Water	1 - 1 gal amber glass	Elutriate	GPES	QC	
EB-12-94	45'	AA3-EB12-S1	28.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA3-EB12-S2	28.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA3-EB12-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
		AA3-EB12-S4	28.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES	QC	
		AA3-EB12-S5	28.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES	QC	
		AA3-EB12-S6	Bay Water	1 - 1 gal amber glass	Elutriate	GPES	QC	
		AA3-EB12-S7	Fluid Mud*	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES	QC	

* Fluid Mud Sample can be obtained from the top of any one boring where present. Change sample number to match actual hole sampled.

Boring Number	Boring Depth	Sample Number	Approx. Sample Interval	Container	Analysis	Lab	QA/QC	Initials
ANCHORAGE AREA 4 (AA4)								
EB-13-94	45'	AA4-EB13-S1	37.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA4-EB13-S2	37.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA4-EB13-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
		AA4-EB13-S4	Rinsate	3 - 1 L amber glass	TCL, Oil and Grease	GPES	Rinsate	
		AA4-EB13-S5	Rinsate	1 - 500 ml amber glass	TOC	GPES	Rinsate	
		AA4-EB13-S6	Rinsate	2 - 1L plastic bottle	TAL, TKN, Total Phos	GPES	Rinsate	
EB-14-94	45'	AA4-EB14-S1	36.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA4-EB14-S2	36.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA4-EB14-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
		AA4-EB14-S4	Rinsate	3 - 1 L amber glass	TCL, Oil and Grease	GPES	Rinsate	
		AA4-EB14-S5	Rinsate	1 - 500 ml amber glass	TOC	GPES	Rinsate	
		AA4-EB14-S6	Rinsate	2 - 1L plastic bottle	TAL, TKN, Total Phos	GPES	Rinsate	
EB-15-94	45'	AA4-EB15-S1	32.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA4-EB15-S2	32.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA4-EB15-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
		AA4-EB15-S4	Rinsate	3 - 1 L amber glass	TCL, Oil and Grease	GPES	Rinsate	
		AA4-EB15-S5	Rinsate	1 - 500 ml amber glass	TOC	GPES	Rinsate	
		AA4-EB15-S6	Rinsate	2 - 1L plastic bottle	TAL, TKN, Total Phos	GPES	Rinsate	
EB-16-94	45'	AA4-EB16-S1	30.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		AA4-EB16-S2	30.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		AA4-EB16-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
		AA4-EB16-S4	Rinsate	3 - 1 L amber glass	TCL, Oil and Grease	GPES	Rinsate	
		AA4-EB16-S5	Rinsate	1 - 500 ml amber glass	TOC	GPES	Rinsate	
		AA4-EB16-S6	Rinsate	2 - 1L plastic bottle	TAL, TKN, Total Phos	GPES	Rinsate	

Boring Number	Boring Depth	Sample Number	Approx. Sample Interval	Container	Analysis	Lab	QA/QC	Initials
TERMINAL CHANNELS (TC5)								
EB-17-94	45'	TC5-EB17-S1	29.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC5-EB17-S2	29.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC5-EB17-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-18-94	45'	TC5-EB18-S1	27.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC5-EB18-S2	27.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC5-EB18-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-19-94	45'	TC5-EB19-S1	35.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC5-EB19-S2	35.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC5-EB19-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-20-94	45'	TC5-EB20-S1	30.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC5-EB20-S2	30.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC5-EB20-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		

Boring Number	Boring Depth	Sample Number	Approx. Sample Interval	Container	Analysis	Lab	QA/QC	Initials
TERMINAL CHANNELS (TC6)								
EB-21-94	45'	TC6-EB21-S1	37.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC6-EB21-S2	37.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC6-EB21-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-22-94	45'	TC6-EB22-S1	32.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC6-EB22-S2	32.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC6-EB22-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-23-94	45'	TC6-EB-23-S1	37.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC6-EB23-S2	37.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC6-EB23-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-24-94	45'	TC6-EB24-S1	35.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC6-EB24-S2	35.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC6-EB24-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-25-94	45'	TC6-EB25-S1	21.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC6-EB25-S2	21.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC6-EB25-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-26-94	45'	TC6-EB26-S1	20.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		TC6-EB26-S2	20.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		TC6-EB26-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		

Boring Number	Boring Depth	Sample Number	Approx. Sample Interval	Container	Analysis	Lab	QA/QC	Initials
CURTIS CREEK (CC7)			"Optional Work Area"					
EB-27-94	45'	CC7-EB27-S1	36.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		CC7-EB27-S2	36.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		CC7-EB27-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-28-94	45'	CC7-EB28-S1	38.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		CC7-EB28-S2	38.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		CC7-EB28-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-29-94	45'	CC7-EB29-S1	34.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		CC7-EB29-S2	34.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		CC7-EB29-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		
EB-30-94	45'	CC7-EB30-S1	31.0 - 45.0	1 - 16 oz glass jar	TCL: svoc, pest, PCB TAL: Metals TKN, Total Phos, pH TOC, Oil and Grease	GPES		
		CC7-EB30-S2	31.0 - 45.0	1 - 8 oz glass jar	TCLP	GPES		
		CC7-EB30-S3	Bay Water	1 - 1 gal amber glass	Elutriate	GPES		

APPENDIX B:

BOREHOLE LOCATIONS

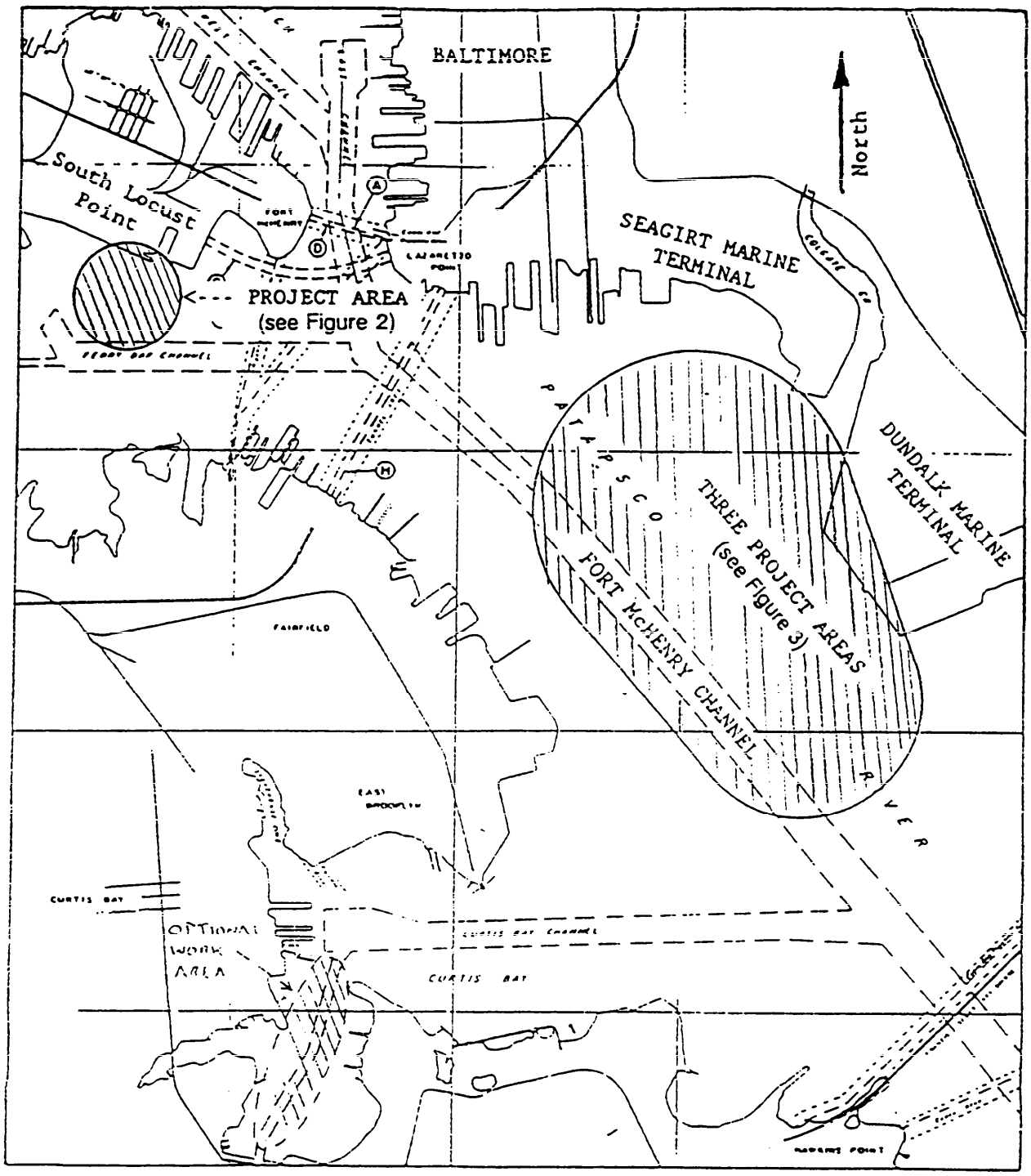


Figure 1. Site map of Baltimore Harbor indicating the project area locations

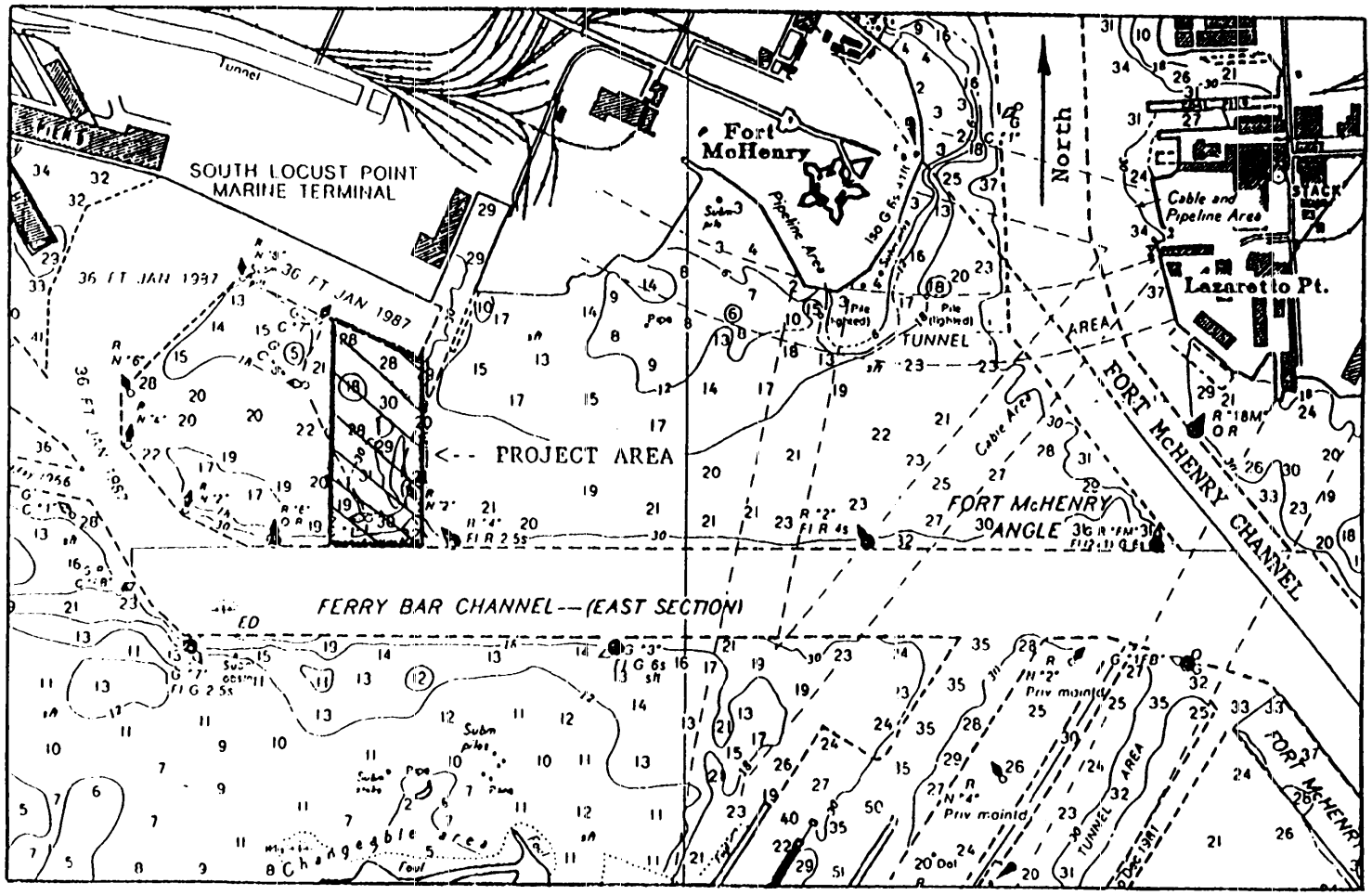


Figure 2. Location of project area near South Locust Point

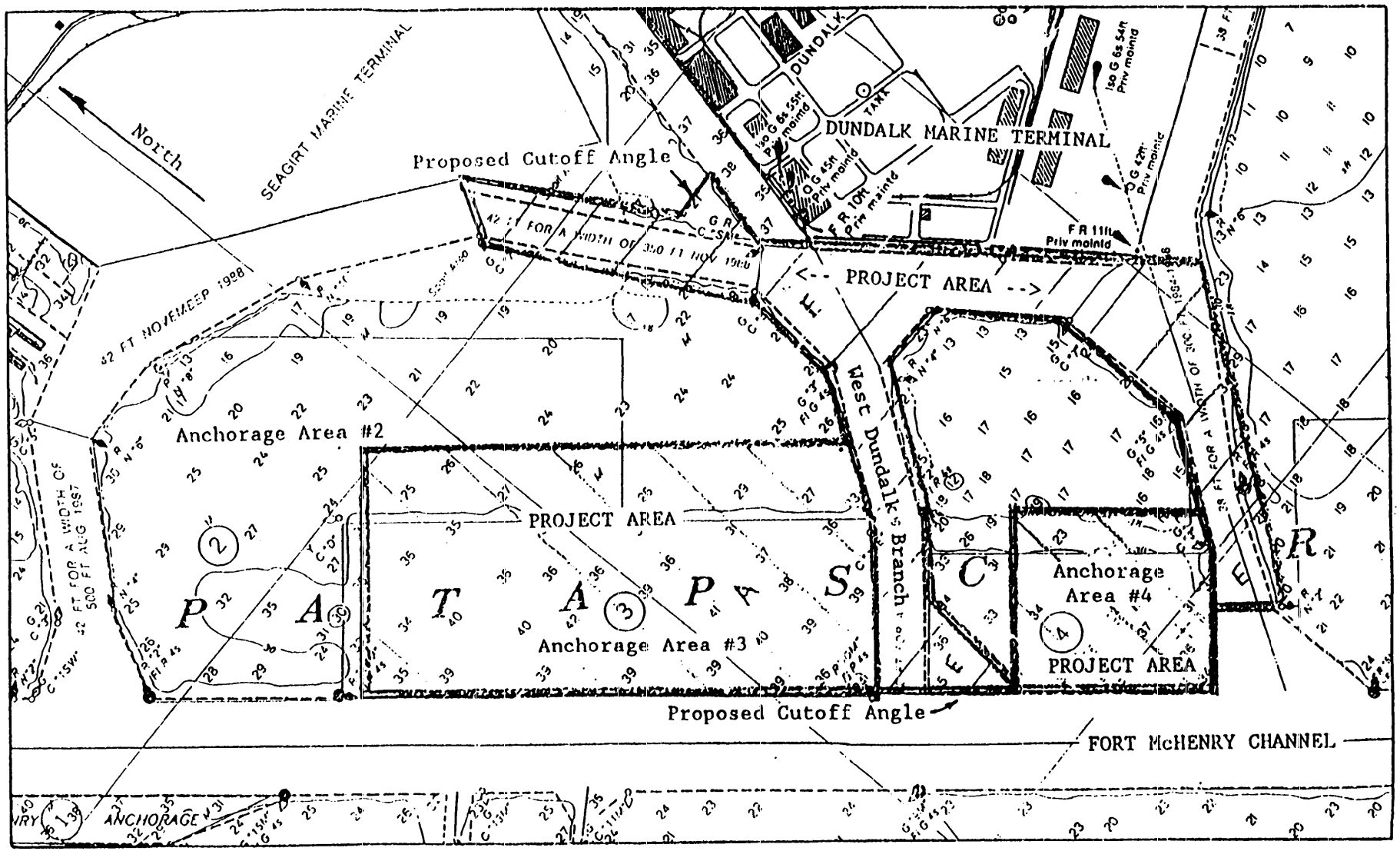


Figure 3. Location of project areas near the Dundalk and Seagirt Marine Terminals

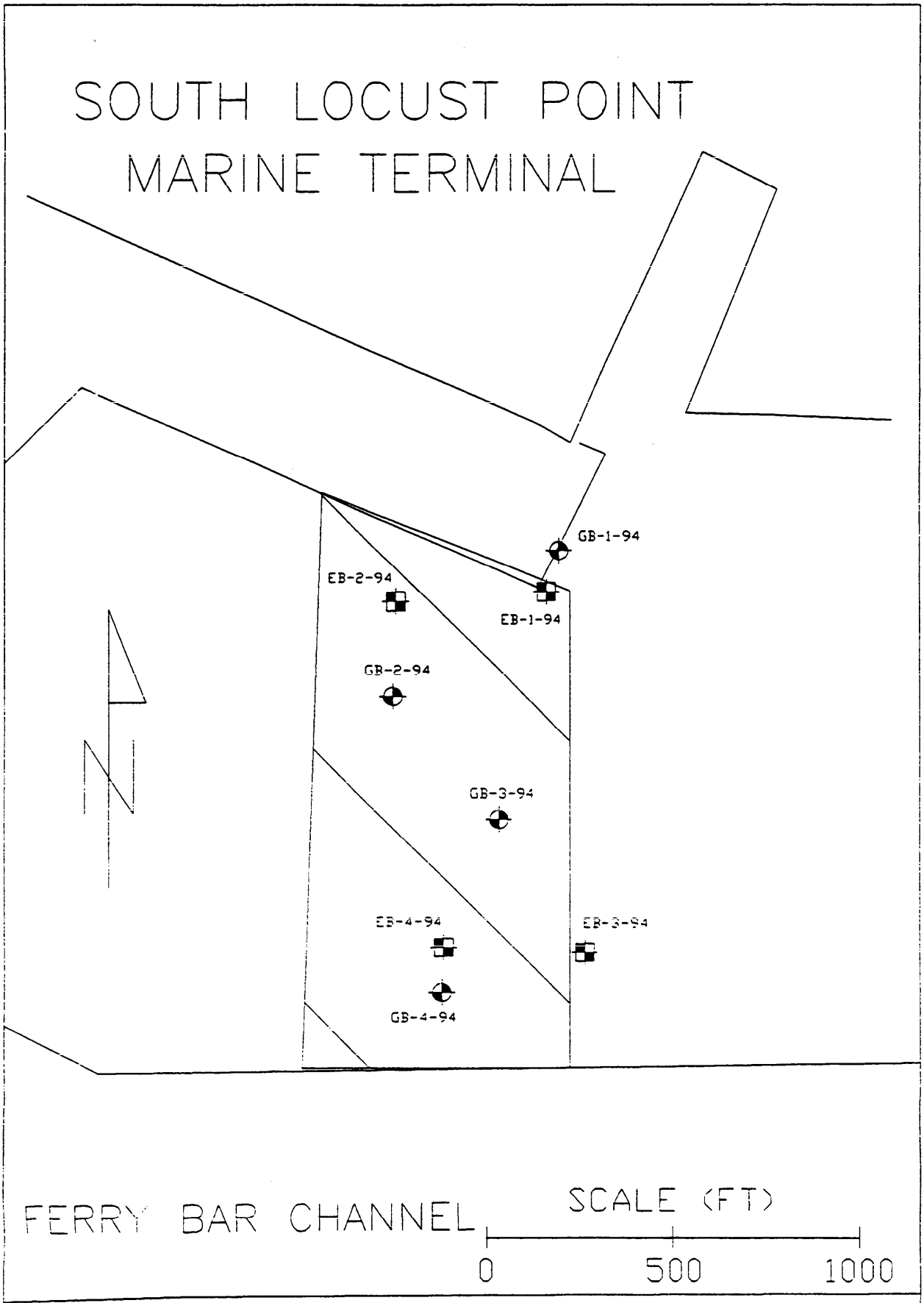
BALTIMORE HARBOR ANCHORAGES AND CHANNELS
FEASIBILITY STUDY
ENVIRONMENTAL BORING LOCATIONS

		NA 1983 Datum		Drilling Plan				
DH#	Area	Easting	Northing	Water	BOH	Core	Samples	Jars
EB-1-94	SL1	1428438	580496	30	45	15	3	3
EB-2-94	SL1	1428036	580470	32	45	13	3	3
EB-3-94	SL1	1428544	579526	21	45	24	3	3
EB-4-94	SL1	1428162	579540	30	45	15	3	3
EB-5-94	AA2	1438350	575640	37	45	8	3	3
EB-6-94	AA2	1439148	576315	27	45	18	3	3
EB-7-94	AA2	1439010	574873	41	45	4	3	3
EB-8-94	AA2	1439826	575520	28	45	17	3	3
EB-9-94	AA3	1439700	574050	41	45	4	6	6
EB-10-94	AA3	1440495	574695	29	45	16	6	6
EB-11-94	AA3	1440354	573202	40	45	5	6	6
EB-12-94	AA3	1441172	573909	28	45	17	7	7
EB-13-94	AA4	1441596	571470	37	45	8	6	9
EB-14-94	AA4	1442181	570924	36	45	9	6	9
EB-15-94	AA4	1442115	571995	32	45	13	6	9
EB-16-94	AA4	1442660	571392	30	45	15	6	9
EB-17-94	TC5	1443474	570840	29	45	16	3	3
EB-18-94	TC5	1443450	571455	27	45	18	3	3
EB-19-94	TC5	1443930	571450	35	45	10	3	3
EB-20-94	TC5	1443786	572490	30	45	15	3	3
EB-21-94	TC6	1441170	572517	37	45	8	3	3
EB-22-94	TC6	1441812	573795	32	45	13	3	3
EB-23-94	TC6	1441953	576010	37	45	8	3	3
EB-24-94	TC6	1441516	576798	35	45	10	3	3
EB-25-94	TC6	1442517	575976	21	45	24	3	3
EB-26-94	TC6	1442460	576285	20	45	25	3	3
Optional Borings:								
EB-27-94	CC7	1432835	565660	36	45	9	3	3
EB-28-94	CC7	1432645	564885	38	45	7	3	3
EB-29-94	CC7	1432290	564160	34	45	11	3	3
EB-30-94	CC7	1432060	563320	31	45	14	3	3

LEGEND:

1. DH# = Drill Hole Number; EB = Environmental Boring and GB = Geotechnical Boring
2. Area = Work Area; 7 work areas as described in Field Sampling Plan.
3. Water = Estimated depth of water in feet
4. BOH = Bottom of Hole in feet referenced to Mean Lower Low Water (MLLW)
5. Core = Estimated length of core to be drilled in feet

			BALTIMORE HARBOR ANCHORAGES AND CHANNELS						
			FEASIBILITY STUDY						
			GEOTECHNICAL BORING LOCATIONS						
			NA 1983	Datum		Drilling Plan		Geo.	Ref.
DH#	Area		Easting	Northing		Water	BOH	Core	SL#	File#
GB-1-94	SL1		1428469	580605		34.0	45.0	11.0	BP01	020
GB-2-94	SL1		1428030	580212		30.0	45.0	15.0	BP04	023
GB-3-94	SL1		1428310	579883		28.0	45.0	17.0	BP02	020
GB-4-94	SL1		1428155	579418		29.0	45.0	16.0	BP03	003
GB-5-94	AA2		1439288	576607		24.0	45.0	21.0	BP07	061
GB-6-94	AA2		1438844	575861		35.0	45.0	10.0	BP10	010
GB-7-94	AA2		1437908	576012		33.0	45.0	12.0	BP12	000
GB-8-94	AA2		1438726	574523		40.0	45.0	5.0	BP13	043
GB-9-94	AA3		1440112	574741		37.0	45.0	8.0	BP09	030
GB-10-94	AA3		1440781	574895		27.0	45.0	18.0	BP07	023
GB-11-94	AA3		1441131	573508		35.0	45.0	10.0	BP09	003
GB-12-94	AA3		1440036	572962		39.0	45.0	6.0	BP13	010
GB-13-94	AA4		1440917	571863		37.0	45.0	8.0	BP22	003
GB-14-94	AA4		1441929	572160		32.0	45.0	13.0	BP17	030
GB-15-94	AA4		1442646	571909		20.0	45.0	25.0	BP15	020
GB-16-94	AA4		1441963	571504		37.0	45.0	8.0	BP19	022
GB-17-94	AA4		1441801	571049		36.0	45.0	9.0	BP21	020
GB-18-94	AA4		1442596	571013		32.0	45.0	13.0	BP18	030
GB-19-94	TC5		1443267	571287		25.0	45.0	20.0	BP30	030
GB-20-94	TC5		1444010	571392		28.0	45.0	17.0	BP33	040
GB-21-94	TC6		1441872	573122		26.0	45.0	19.0	BP27	023
GB-22-94	TC6		1442172	574501		25.0	45.0	20.0	BP25	040
GB-23-94	TC6		1442692	575987		24.0	45.0	21.0	BP37	030
GB-24-94	TC6		1442647	576377		20.0	45.0	25.0	BP38	003
GB-25-94	TC6		1441436	576573		20.0	45.0	25.0	BP24	011
Optional Borings:										
GB-26-94	AA3		1440221	575041		29.0	45.0	16.0	BP08	030
GB-27-94	CC7		1432835	565660		36.0	45.0	9.0	NA	NA
GB-28-94	CC7		1432645	564885		38.0	45.0	7.0	NA	NA
GB-29-94	CC7		1432290	564160		34.0	45.0	11.0	NA	NA
GB-30-94	CC7		1432060	563320		31.0	45.0	14.0	NA	NA
GB-31-94	TC6		1441709	576075		21.0	45.0	24.0	BP24	020
GB-32-94	TC5		1443049	569881		32.0	45.0	13.0	BP32	064
GB-33-94	TC6		1442917	577289		18.0	45.0	27.0	BP38	020
LEGEND:										
1. DH# = Drill Hole Number; EB = Environmental Boring and GB = Geotechnical Boring										
2. Area = Work Area; 7 work areas as described in Field Sampling Plan.										
3. Water = Estimated depth of water in feet										
4. BOH = Bottom of Hole in feet referenced to Mean Lower Low Water (MLLW)										
5. Core = Estimated length of core to be drilled in feet										
6. Geo. Ref. = Geophysical Reference Point; SL# = Scan Line Number and File# = File Number										

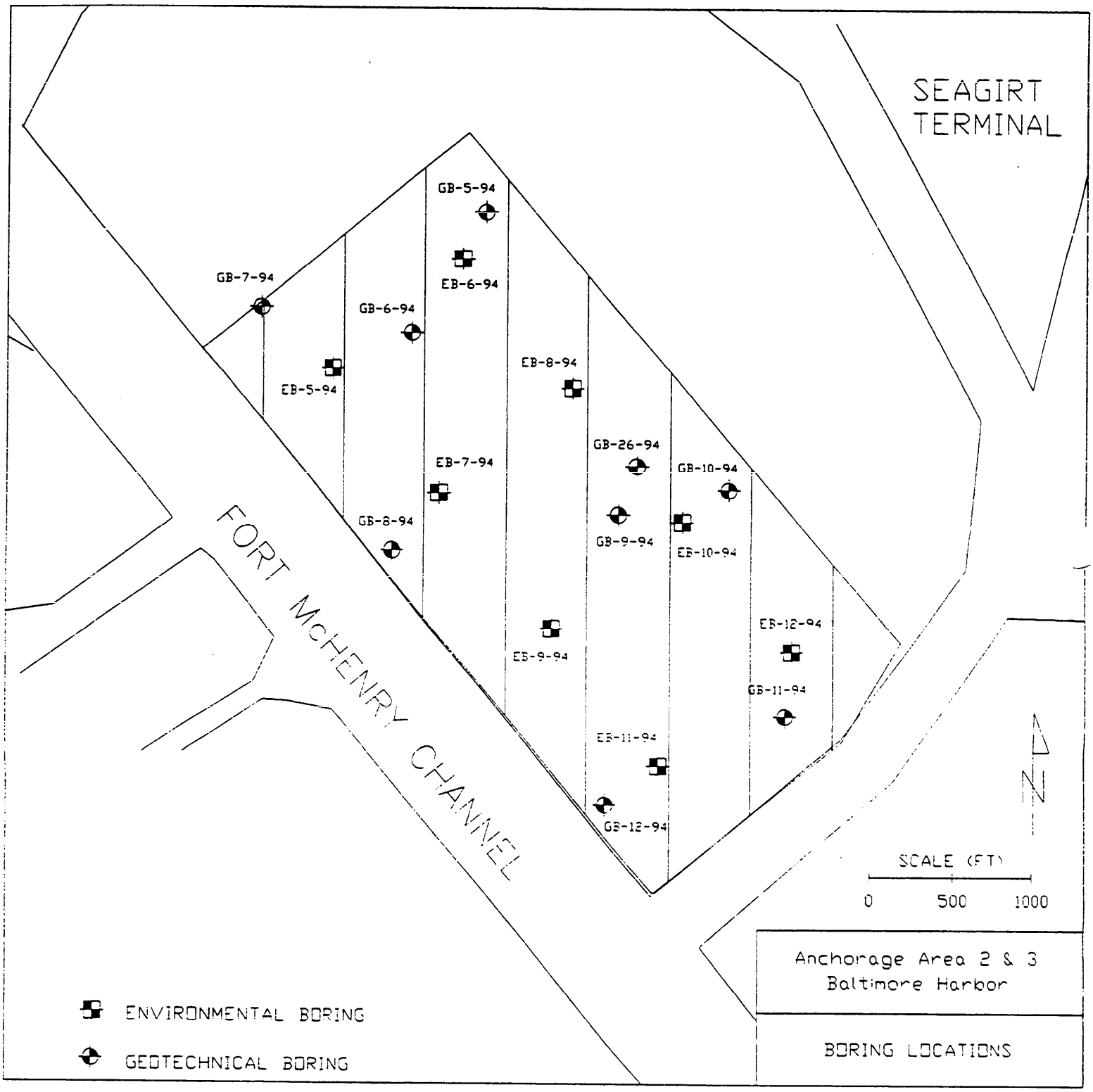


ENVIRONMENTAL BORING

GEOTECHNICAL BORING

South Locust Point Area
Baltimore Harbor

BORING LOCATIONS


SEAGIRT TERMINAL
FORT McHENRY CHANNEL
GB-5-94
EB-6-94
GB-7-94
GB-6-94
EB-5-94
EB-8-94
GB-26-94
EB-7-94
GB-10-94
GB-8-94
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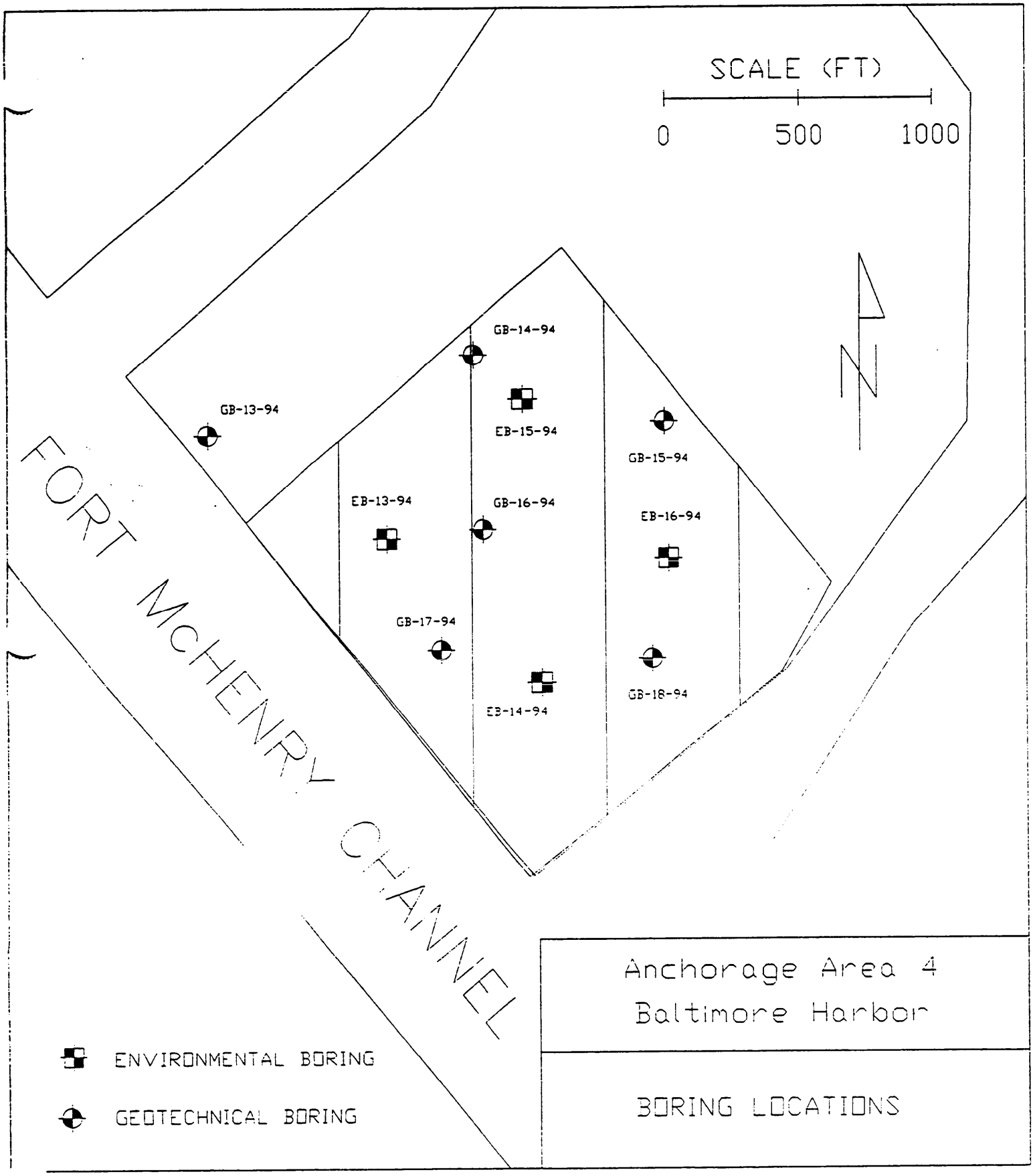
EB-10-94
EB-12-94
EB-9-94
GB-11-94
EB-11-94
GB-12-94
N
SCALE (FT)
0
500
1000
Anchorage Area 2 & 3
Baltimore Harbor
BORING LOCATIONS
ENVIRONMENTAL BORING
GEOTECHNICAL BORING


SCALE (FT)
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GB-13-94
EB-15-94
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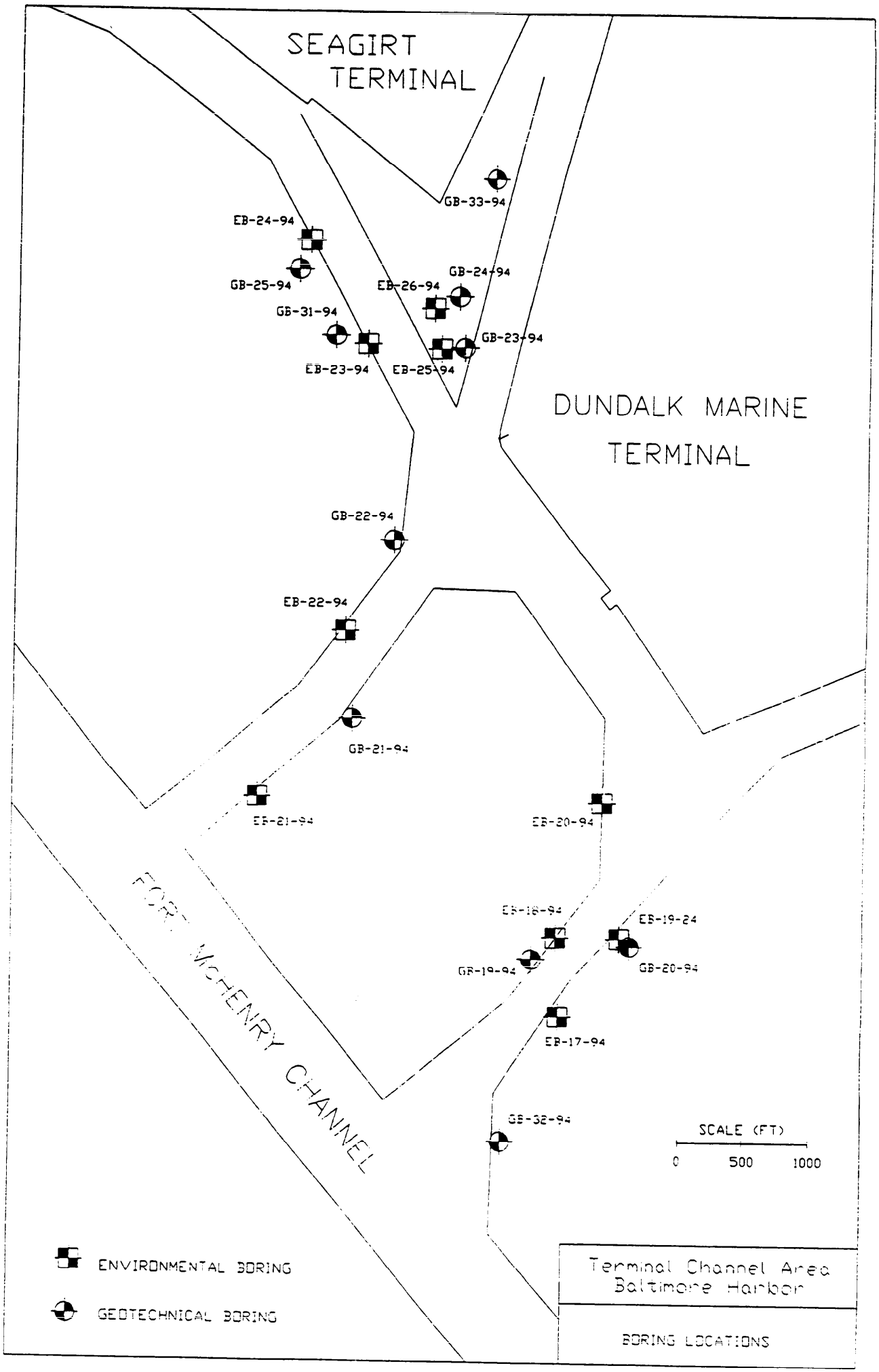
EB-13-94
GB-16-94
EB-16-94
GB-17-94
GB-18-94
EB-14-94
FORT MCHENRY CHANNEL
ENVIRONMENTAL BORING
GEOTECHNICAL BORING
Anchorage Area 4
Baltimore Harbor
BORING LOCATIONS


SEAGIRT TERMINAL
DUNDALK MARINE TERMINAL
FORT MCHENRY CHANNEL
GB-33-94
EB-24-94
GB-25-94
EB-26-94
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GB-31-94
GB-23-94
EB-23-94
EB-25-94
GB-22-94
EB-22-94
GB-21-94
EB-21-94
EB-20-94
EB-18-94
EB-19-24
GB-19-94
GB-20-94
EB-17-94
GB-32-94
SCALE (FT)
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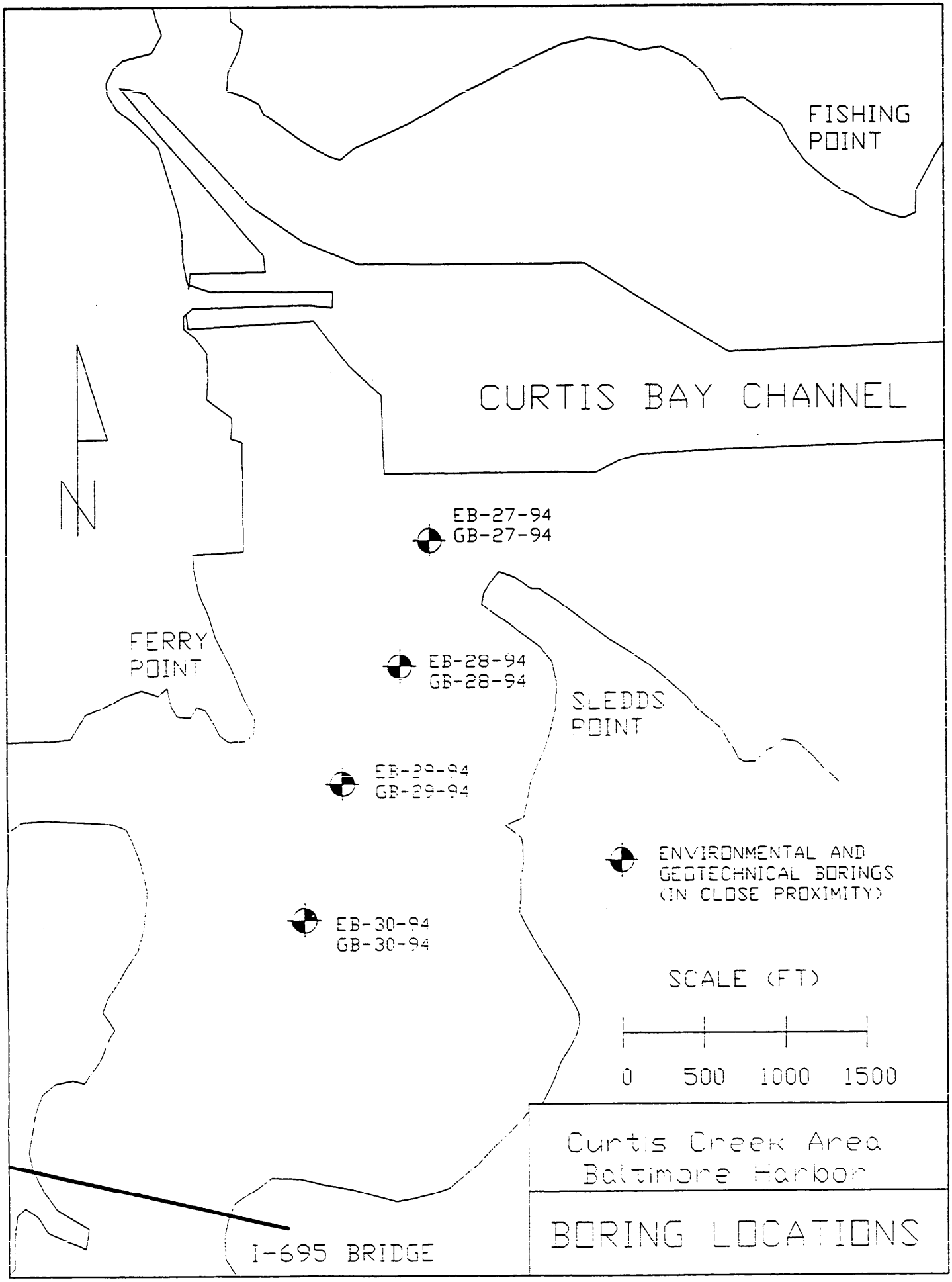
500
1000
ENVIRONMENTAL BORING
GEOTECHNICAL BORING
Terminal Channel Area
Baltimore Harbor
BORING LOCATIONS



Curtis Creek Area
Baltimore Harbor

BORING LOCATIONS

APPENDIX C:

BARGE AND TUG CONTRACT

SECTION C

DESCRIPTION/SPECS./WORK STATEMENT

C.1 Scope: A barge, tug boat, crane , ancillary equipment and personnel are required to support a geotechnical investigation (i.e drilling and sampling of sub bottom materials) to be performed in the vicinity of the Dundalk, Seagrit and South Locust Point Marine Terminals in Baltimore Maryland. A Government owned drill rig (truck mounted: 30,000 pounds GVW) vibrocore rig (2,500 pounds) fully loaded 10-ton stake body supply truck , air compressor (3,000 pounds) and other equipment and supplies will be placed on the Contractor owned barge. Operation of the Government owned equipment will be by the government personnel. Operation of the Contractor provided tug boat and crane will be by Contractor provided personnel. Geotechnical investigation support services will be required for a continuous three week period during the 29 March 1994 to 30 April 1994 time frame.

C.2 TECHNICAL REQUIREMENTS:

C.2.1 CLIN Item 0001- Mobilization and Demobilization: Mobilization shall consist of the delivery of all personnel, equipment, material, and supplies to be furnished by the contractor and complete assembly of all items in satisfactory working order. Demobilization shall consist of all tasks necessary to return all personnel, equipment, material and supplies after the completion of work.

C.2.1.1. The Contractor is required to provide the personnel, equipment and services necessary to load and unload the Government equipment onto the barge.

C.2.1.2 The Contractor shall provide all necessary loading, equipment, and supplies including but not limited to the appropriate hoisting equipment, hooks, shackles, rings, wire rope, slings spread bars, etc. to safely hoist government equipment on and off the barge. The Contractor shall be responsible for performing all rigging of Government owned equipment, prevent damage to Government equipment during loading and unloading, provide and operate hoisting equipment, and assist Government personnel in securing all Government equipment to the barge.

C.2.1.3 The Contractor shall inspect all rigging and lifting equipment prior to use to insure that it is in a safe condition. Defective rigging and lifting equipment shall not be used.

C.2.2. CLIN 0002 Barge Rental: The Government supplied barge shall have a minimum nominal size of 40 feet by 110 feet and is required to be: supplied in a safe operating condition, seaworthy, clean of debris, in good state of repair, and suitable for use as an off shore drilling platform.

C.2.2.1 The Contractor shall be advised that the Government shall inspect the barge proposed for use. The Government reserves the right to reject the

barge if not deemed acceptable in accordance with the provisions stated above.

C.2.2.2. The barge shall be maintained in a safe condition during completion of the work. Any costs related to maintaining the barge shall be included in the contract price. Any time lost during maintenance will not be charged to the Government. Failure to maintain the barge through completion of the work in accordance with all of the provisions stated above is grounds for termination of this contract.

C.2.2.3. The barge shall have fenders to prevent sparking. Guardrails, bulwarks, or taut cable guidelines shall be provided along the working end of the barge. They shall be 42 inches high and have an intermediate rail.

C.2.2.4 Holdbacks or rings shall be provided on the barge to secure Government equipment.

C.2.2.2.5 A twelve inch minimum diameter "spud" hole or "well" hole shall be provided near one end of the barge to allow drilling and sampling to be performed through the opening.

C.2.2.6. The Contractor shall provide all required anchors, cables, buoys, anchor winches, spuds, and ancillary equipment.

C.2.2.7 The barge shall meet all required regulations of the United States Coast Guard (USCG). If requested by the Government, the contractor shall certify in writing that all appropriate USCG regulations have been satisfied.

C.2.3. CLIN 0003 Tug Boat Rental: The Contractor shall supply a full-time tug boat and operating personnel to support the scope of work. The tug boat shall be supplied in a safe operating condition, seaworthy, in good state of repair, and of sufficient size to tow and position the fully loaded barge.

C.2.3.1 The Contractor shall be advised that the Government shall inspect the tug boat proposed for use. The Government reserves the right to reject the tug boat if not deemed acceptable in accordance with the provisions stated above.

C.2.3.2. The tug boat shall be maintained in a safe condition during completion of the work. Any costs related to maintaining the tug boat shall be included in the contract price. Any time lost during maintenance will not be charged to the Government. Failure to maintain the tug boat through completion of the work in accordance with all of the provisions stated above is grounds for termination of this contract.

C.2.3.3. The tug boat shall be supplied with an operator and at least one deck hand. The tug boat operator shall have a current valid USCG license. The deck hand shall be capable of operating winches to drop and take-up anchors or spuds in such a way to insure that the barge remains properly positioned during drilling and sampling.

C.2.3.4 The tug boat shall have appropriate radio communications system on board to communicate with any channel traffic. The radio telephone equipment shall operate on a single channel very high frequency (VHF), FM, on a frequency of 156.65 MHz per second, with low power output having a communication range of approximately ten (10) miles. The frequency has been approved by the Federal Communication Commission.

C.2.3.5 The tug boat shall meet all required regulations of the United States Coast Guard (USCG). If requested by the Government, the Contractor shall certify in writing that all appropriate USCG regulations have been satisfied.

C.2.4 CLIN 0004 Crane Rental: The Contractor shall supply a crane and crane operator on the barge to raise and lower the vibrocore rig from the bottom of the harbor. The crane shall be supplied in a safe operating condition and in good state of repair. The crane shall have a minimum hoisting capacity of 15 tons, minimum boom length of 50 feet, and minimum cable length of 225 feet.

C.2.4.1 The Contractor shall be advised that the Government shall inspect the crane proposed for use. The Government reserves the right to reject the crane if not deemed acceptable in accordance with the provisions stated above.

C.2.4.2 The crane shall be maintained in a safe condition during completion of the work. Any costs related to maintaining the crane shall be included in the contract price. Any time lost during maintenance will not be charged to the Government. Failure to maintain the crane through completion of the work in accordance with all of the provisions stated above is grounds for termination of this contract.

C.2.4.3. The Contractor provided crane operator shall be fully qualified and experienced to operate the crane.

C.2.4.4 The Contractor shall provide all necessary crane equipment and supplies including but not limited to the appropriate hooks, shackles, rings, wire rope, slings, spread bars, etc. to safely hoist the Government virbrocore rig on and off the barge. The Contractor shall be responsible for performing all rigging of Government owned equipment and prevent damage

to Government equipment during hoisting.

C.3. General Requirements

C.3.1. Positioning: Positioning of the barge shall be by towing and/or pushing with the tug boat to achieve general position and then by maneuvering of the barge using anchor winches or spuds to achieve the final position. The required positions shall be marked with survey buoys by Government personnel. All anchors or spuds shall be set firmly to prevent drifting of the barge off the established positions.

C.3.2. Overnight Docking of Barge: The Contractor shall be required to provide for overnight docking of the barge at a location convenient to the work sites in the channel. The intent of this requirement is to prevent unreasonable travel times between docking facilities and work sites.

C.3.2.1. Open-water mooring of the barge may be used if all appropriate regulations pertaining to open water mooring are satisfied. The Contractor shall display signal lights as required by law.

C.3.2.2. The Contractor assumes full and total responsibility for overnight docking of the barge.

C.3.2.3 The Government reserves the right of approval or disapproval of an overnight docking location.

C.3.3 Work Areas: All work will be conducted in the Baltimore Harbor and Anchorage Areas north of the Key Bridge and normally in the vicinity of the South Locust Point, Seagrit, and Dundalk Marine Terminals.

C.3.4. Schedule: All work will be completed in a continuous manner for a three week period during the time frame of 29 March 1994 to 30 April 1994. The Government will notify the Contractor three weeks in advance of the planned mobilization date. No work will be performed on Saturdays or Sundays. The typical work day will be eleven hours in duration starting each day at 7:00 AM and including a one hour break for lunch on the water.

C.3.5 Safety: The Contractor is advised that he shall comply with all OSHA standards as well as the appropriate health and safety requirements of EM 385-1-1, the U.S. Army Corps of Engineers Safety and Health Manual. A copy of the EM can be provided upon request.

C.3.6 Inclement Weather: The Government shall not perform or shall suspend drilling operations during periods of inclement weather. Inclement weather shall be defined as periods of precipitation, high winds, or high waves determined by the Government to pose a safety hazard to Government personnel.

The Government shall notify the contractor in person or by telephone when drilling operations are to be suspended. The Contractor shall designate a point of contact to notify under such conditions. A designated calling time shall be agreed to by the Government and Contractor during periods of extended inclement weather.

C.3.7 Channel Traffic: Channel traffic is defined as large commercial vessels, tugs, commercial fishing boats, barges, oil barges, and recreational vessels to include both power and sail.

C.3.8. Obstruction of Channel: The Government will not undertake to keep the work areas free from channel traffic during this scope of work. The contractor will be required to conduct his operations in a manner to obstruct channel traffic as little as possible. In the case where the Contractor's floating plant so obstructs the channel as to make difficult or endanger the passage of channel traffic, said plant shall be moved promptly in approach of any channel traffic to such an extent as may be necessary to afford a practicable passage.

C.3.9 Misplaced Materials: Should the Contractor, during the progress of this work, lose, dump, throw overboard, sink or misplace any material, plant, equipment, machine, or appliance, which in the opinion of the Government may be dangerous to or obstruct channel traffic, the Contractor shall recover and remove the same with utmost dispatch. The Contractor shall give immediate notice, with the description and location of such obstructions to appropriate authorities. The Contractor shall mark or buoy such materials until they are removed.

C.3.10 Navigation Aids: The contractor shall not relocate or move any aids to navigation that have been established by the USCG.

C.3.11 Notification of the U.S. Coast Guard: Prior to the commencement of work on the site, the Contractor will be required to notify the Commander, Fifth Coast Guard District in writing with a copy furnished to the Contracting Officer, of his intended operations and request that it be published in the Local Notice to Mariners. This notification must be given in sufficient time so that it appears in the Notice to Mariners at least two weeks prior to the commencement of this work.

C.3.12 Signal Lights: The Contractor shall display lights and conduct his operations in accordance with the General Regulations of the Department of the Army and U.S. Coast Guard governing lights and day signals to be displayed by towing vessels with tows on which no signals can be displayed, and day signals to be displayed by vessels of more than 65-feet in length moored or anchored in a fairway or channel, and the passing by other vessels of floating plant working in navigable channels, as set forth in Commandant

U.S. Coast Guard Instruction M16672.2A, Navigation Rules: International-Inland (Comdtinst M16672.2a), or 33 CFR 81 Appendix A (International) and 33 CFR 84 through 33 CFR 89 (Inland) as applicable.

C.4. Option For increased or Decreased Quantity :

C.4.1. If the quantity of a unit priced item in this contract is an estimated quantity and the actual quantity of the unit-priced item varies more that 50 percent above or below the estimated quantity, an equitable adjustment in the contract price shall be made upon demand by either party. The equitable adjustment shall be based upon any increase or decrease in costs due soley to the variation above 150 percent or below 50 percent of the estimated quantity. If the quantity variation is such as to requirean extension of the contract period, the Government may require continued performance of the contract by written notice from the Contracting Officer to the COntractor no later than three (3) working days before the end of the contract period. The Contracting Officer may extend the contract more than one time but the total extension of performance shall not exceed 5 working days.

C.5. Measurement and Payment: The contract unit price for each item shall constitute full compensation for furnishing all plant, labor, supervision, equipment, materials, tools, transportation, supplies and ancillary items necessary for performing all operations required for completion of the scope of work.

C.5.2. CLIN 0001 Mobilization and Demobilization: Payment shall be made at the lump sum contract price. Payment shall be made only after all Government owned equipment has been removed from the barge at the completion of work.

C.5.2 CLIN 0002 Barge Rental: Payment shall be made on the basis of the actual number of work days at the contract unit price that Government owned equipment is located on the barge. Work days are defined as Monday through Friday to include any inclement weather days. Measurement shall begin with the first day that Government owned equipment is loaded on the barge and end with the last day when Government owned equipment is removed. No additional payments will be made for overnight docking facilities or for Saturday and Sundays.

C.5.3. CLIN 0003 Tug Boat Rental: Payment shall be made on the basis of the actual number of hours at the contract unit price that the tug boat is used to transport government personnel and tow or position the loaded barge. Measurement shall start when the tug boat leaves the docking facilities each morning and end when the tug boat arrives at the docking facilities each evening.

C.5.4. CLIN 0004 Crane Rental: Payment shall be made on the basis of the actual number of hours at the contract unit price that the crane and crane operator are required to be on the barge. Measurement shall start when the crane operator leaves the docking facilities each morning and end when the crane operator arrives at the docking facilities each evening.

END OF SECTION C

TAB B SITE SPECIFIC SAFETY AND HEALTH PLAN

SITE SPECIFIC SAFETY AND HEALTH PLAN
Baltimore Anchorages & Harbor Dredging Investigation
Baltimore, MD

February 1994

prepared by

U.S. Army Corps of Engineers, Baltimore District
Hazardous, Toxic, and Radioactive Waste Branch

SITE SPECIFIC SAFETY AND HEALTH PLAN
Baltimore Anchorages & Harbor Dredging Investigation
Baltimore, MD

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SITE SPECIFIC SAFETY AND HEALTH PLAN
Baltimore Anchorages & Harbor Dredging Investigation
Baltimore, MD

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SITE SPECIFIC SAFETY AND HEALTH PLAN
Baltimore Anchorages & Harbor Dredging Investigation
Baltimore, MD

A. SITE DESCRIPTION

1. Background

The Corps of Engineers has undertaken a study to widen and deepen the channels and anchorages at the South Locust Point and Dundalk Marine Terminals. During past studies the sediments have been shown to be contaminated with heavy metals, (Cd-3 ppm, Cr-560 ppm, Cu-270 ppm, Pb-186 ppm, Mn-1161 ppm, Hg-0.8 ppm, Ni-75 ppm, Zn-570 ppm) polycyclic aromatic hydrocarbon, polychlorinated biphenyls, and pesticides in the part per billion range.

2. Location

The boreholes will be located adjacent to South Locust Point, Seagirt, and Dundalk Marine Terminals which are located just downstream of the Baltimore Inner Harbor of the Patapsco River. See Exhibit 1.

3. Surrounding Population

There is no surrounding population.

4. Weather Conditions

This will depend on the time of year the drilling is performed. If work is completed on time in April 1994, the weather should be mild with possible heavy spring storms.

5. Site Conditions

The boreholes will be advanced in the shipping channels and anchorages of the heavy industrial freight liners. The work will be performed off the side of a 110 ft X 40 ft commercial work barge. The drill rig will be supported by a crane parked on the barge.

B. ENTRY OBJECTIVES

To drill approximately 50 boreholes from 5 to 25 feet deep in the sediments of the Patapsco River. Sediment samples will be obtained for geotechnical and chemical contamination analysis.

Exhibit 1. Location of Investigation Areas

BALTIMORE
PARKVILLE
OVERLEA
Fullerton
Hamilton
Govans
Mount Washington
U. of Balto.
Melvale
Northwood
Guilford
Waverly
Woodberry
Hampden
Lauraville
Gardenville
Kenwood
Golden Ring
Rosedale
Walbrook
Highlandtown
Canton
Eastpoint
Charlesmont
Dundalk
Mount Winans
Cherry Hill
LANSDOWNE
Baltimore Highlands
BROOKLYN
Fairfield
Curtis Bay
PUMPHREY
LINTHICUM
Shipley
FERNDALE
Furnace Branch
Foremans Corner
Sparrows Point
BALTIMORE-WASHINGTON INTERNATIONAL AIRPORT
GLEN BURNIE
Margate
Solley
Orchard Beach
RIVIERA BEACH
Altoona Beach
Fairview Beach
Sanders Park
Pine Haven
Silver Sands
HARUNDALE
Venice on the B
Hillendale
Forge
Elkridge
Belvedere
Northern
Harford
Ridge Road
KENNEDY
Holt
Hazelwood
Frankford
Belair
Pulaski
Erdman
Amtrak
Windlass
Eastern
Patapsco
German Hill Road
Holabird
Dundalk
Merritt
Wise
Keith Ave.
Fort McHenry
Boston St.
Francis Scott Key Med. Ctr.
Eastpoint Mall
Johns Hopkins Hosp.
Mount Clare Mansion
Westport
Hammonds
Andover Road
Furnace
Hammonds Ferry Road
Burnie
Stewart
Thelma Ave
Aquaint
Queenstown
Dorsey
Friendship
Marley Neck
Chestnut Hill Road
Nabus Creek
Stony
North Shore Dr.
Frankfurst Ave.
Pennington Ave.
Curtis Creek
Coast Guard Yard
Gen'l Ser. Admin.
Motor Veh. Adm.
Md. Port Admin.
Md. Sch. for Blind
Northern Hosp.
Sinai Hosp.
Loyola Col.
Notre Dame Col.
Morgan State U.
Montebello Cen. Hosp.
Union Mem. Hosp.
Charles Gen. Hosp.
Penn Station
Walbrook Lutheran Hosp.
Bon Secours Hosp.
St. Agnes Hosp.
Church Hosp.
Harbor Hosp.
St. Joseph's
Holy Rosary
Mercy Hosp.
Baltimore Co. Gen'l Hosp.
Dundalk Comm. Col.
Franklin Sq. Hosp.
Rossville Blvd.
Stemmers Run
Golden Ring Mall
Mace Ave
Wilkens Ave
Caton Ave
Athol Ave
Druid Hill Ave
Pennsylvania Expwy.
Sparrows Point Blvd.
Dundalk Ave
Merritt Blvd.
Wise Ave
Holabird Ave
Boston St.
Eastern Ave
Pulaski Hwy
Belair Rd
Harford Rd
Frankford Ave
Erdman Ave
Windlass Ave
Amtrak
Patapsco Ave
Hammonds Ferry Road
Furnace Ave
Andover Road
Shipley Road
Dept. of Trans.
S.H.A.
Stewart Ave
Thelma Ave
Aquaint Road
Queenstown
Dorsey
Friendship
Marley Neck
Chestnut Hill Road
Nabus Creek
Stony
North Shore Dr.
Silver Sands
Pine Haven
Altoona Beach
Fairview Beach
Sanders Park
Venice on the B
Orchard Beach
Solley
Margate
Foremans Corner
Furnace Branch
Curtis Bay
Fairfield
Highlandtown
Canton
Eastpoint
Charlesmont
Dundalk
Mount Winans
Cherry Hill
LANSDOWNE
Baltimore Highlands
BROOKLYN
PUMPHREY
LINTHICUM
FERNDALE
GLEN BURNIE
HARUNDALE
RIVIERA BEACH
Sparrows Point
Hillendale
Forge
Elkridge
Belvedere
Northern
Harford
Ridge Road
KENNEDY
Holt
Hazelwood
Frankford
Belair
Pulaski
Erdman
Amtrak
Windlass
Eastern
Patapsco
German Hill Road
Holabird
Dundalk
Merritt
Wise
Keith Ave.
Fort McHenry
Boston St.
Francis Scott Key Med. Ctr.
Eastpoint Mall
Johns Hopkins Hosp.
Mount Clare Mansion
Westport
Hammonds
Andover Road
Furnace
Hammonds Ferry Road
Burnie
Stewart
Thelma Ave
Aquaint
Queenstown
Dorsey
Friendship
Marley Neck
Chestnut Hill Road
Nabus Creek
Stony
North Shore Dr.
Silver Sands
Pine Haven
Altoona Beach
Fairview Beach
Sanders Park
Venice on the B
Orchard Beach
Solley
Margate
Foremans Corner
Furnace Branch
Curtis Bay
Fairfield
Highlandtown
Canton
Eastpoint
Charlesmont
Dundalk
Mount Winans
Cherry Hill
LANSDOWNE
Baltimore Highlands
BROOKLYN
PUMPHREY
LINTHICUM
FERNDALE
GLEN BURNIE
HARUNDALE
RIVIERA BEACH
Sparrows Point

C. ORGANIZATION

1. Project Personnel

The following personnel are designated to carry out the stated job functions.

PROJECT MANAGER

CENAB-EN-HT	Russel Marsh	410/962-2227
CENAB-EN-GG	Chris Evans	410/962-4431

CHIEF, FIELD EXPLORATION UNIT

CENAB-EN-GG	Bill Kriner	410/962-4044

HEALTH & SAFETY OFFICER

CENAB-EN-HT	Charmayne Kirkland	410/962-2771
CENAB-SO	Cheryl Mazzella	410/962-4100

SITE SAFETY OFFICER/RECORDKEEPER

CENAB-EN-HT	Jim Moore	410/962-6742

Alternates

CENAB-EN-HT	Clint Kneten	410/962-6743

FIELD TEAM LEADER (driller)

CESAM-EN	Sam Bowden
CENAB-EN-GG	Dan Bowden
	Albert McNamara

FIELD TEAM MEMBERS (helpers)

CENAB-EN-HT	Bill Baumgartener

FIELD GEOLOGIST

CENAB-EN-GG	To be determined

SURVEY CREW

CENAB-OP	Tom Conway, Boat Captain

CONTRACTORS

Tugboat Captain	To be Determined
Deck Hand	To be determined

All persons arriving or departing the site should log in and out with the recordkeeper. All activities on site must be cleared through the Site Safety Officer.

2. Responsibilities

a. Health and Safety Officer:

-prepares and coordinates approvals of the health and safety plans.

-supplies input for specific health and safety problems which may arise in the course of operations.

b. Project Managers:
- In Baltimore District, coordinates sampling and analysis.

c. Chief, Field Exploration Unit:
-selects qualified personnel for all positions,

d. Site Health and Safety Officer:
-enforces the safety and health plans,
-ensures all required safety equipment is on-site, clean and operable,
-revises equipment requirements or procedures based on new information gathered,
-determines and posts the locations of medical facilities, telephone numbers of emergency personnel, and arranges emergency transportation to medical facilities as required,
-monitors personnel exposures and signs and symptoms of exposure or stress,
-conducts preliminary site survey to detect the presence of any obvious hazards,
-conducts on-site air monitoring,
-notifies appropriate emergency personnel in the event of an accident, fire or explosion.
-has the authority to cease any operations not in compliance with the safety plan, or which threaten the health or safety of on-site personnel or the general public, or may cause significant adverse impact to the environment,
-reviews results of field monitoring and recommends additional monitoring or changes in personal protective equipment.
-establishes and marks site boundaries,
-ensures no unauthorized person enters the site boundaries.
-coordinates access and security on site,
-maintains field log containing weather conditions, instrumentation calibration documentation, air monitoring readings and all events on site.

e. Field Team Leader (driller)
-selects the type of drilling equipment and practices to be used.
-operates drill rig

f. Field Team Members (helpers)
-performs the necessary duties to carry out the assigned tasks.

g. Geologist
-obtains samples
-logs geotechnical observations

h. Survey Crew
-surveys borehole locations

i. Contractors
-operates tugboat and anchors

All personnel are responsible for complying with this plan and reporting any unsafe conditions.

D. TRAINING

All employees working on this project who will come in contact with contaminated sediments have received the 40 hour Hazardous Waste Worker training in accordance with 29 CFR 1910.120. The Site Safety Officer has received the additional 8 hour supervisor course for hazardous waste workers and 24 hours on the job training. Documentation is maintained in the Corps of Engineers, Baltimore District Human Resources Office.

E. MEDICAL SURVEILLANCE

All employees working on this site who will be in contact with contaminated sediments have received proper medical clearance for respirator use and medical surveillance in accordance with 29 CFR 1910.120. Documentation is maintained in Baltimore District Human Resources Office.

F. SAFETY MEETINGS

A safety meeting will be held at the start of the HTRW drilling and subsequently at the start of each work shift. The first meeting will cover the contents and format of the site health and safety plan. The daily meetings in the morning and, if necessary after work, with the Site Safety Officer will include any new information obtained, such as changes to the safety plan, work procedures or personal protective equipment. Additional safety meetings will be held after any significant unplanned or unusual events which modify safety procedures.

G. SITE CONTROL AND SECURITY

The worksite is zoned to reduce the spread of hazardous substances to clean areas. An exclusion zone will be established everywhere on the barge except in and around the van and inside the tugboat. No unauthorized person will be allowed within the exclusion zone, nor will any authorized person remain unnecessarily in this zone. The contamination reduction zone will be located outside the exclusion zone beside the van or on shore. The exact layout will depend on the site conditions.

The on-site support zone will be located in the van or on the survey boat.

Site access will be denied to the general public by virtue of its

location. Boreholes will not be left open when unattended. The barge will be moored along shore, out of the shipping lanes after hours. It will be equipped with adequate lighting and markings to avoid collisions in the dark.

H. HAZARD EVALUATION

The known chemical hazards consist of low concentrations of metals and semi-volatile organics in the sediment.

The physical hazards at this site include drowning and heavy equipment accidents.

Overall Hazard Evaluation

[ ] High [ ] Medium [x] Low [ ] Unknown

Activities/tasks of Greatest Concern: Working off of a barge around heavy freighter traffic. A secondary hazard is dermal contact with contaminated sediment.

I. HAZARD CONTROL

Work shall comply with all Federal, State, and local health and safety requirements including; OSHA 29 CFR 1910 and 1926, EPA 40 CFR 260-270, USACE EM 385-1-1, and all safety directives and policies.

All drilling sites will be inspected for Health and Safety hazards by the Site Safety Officer (SSO) prior to entering the site with drilling equipment. The SSO will then take all corrective measures necessary to safely work at the site. This inspection and all corrective measures will be documented and communicated to all site workers as the initial safety meeting. All drilling will be performed in accordance with the procedures outlined in the Drilling Activity Hazard Analysis in Appendix A. Contractors shall not work with potentially contaminated material from subsurface sampling. The project manager will contact the Maryland Port Authority prior to operations to inform them of the dates, times and locations of the barge.

1. Noise-Hearing protection will be worn by all field personnel in work areas where noise levels are above 85 dBA. These areas include: within ten feet of the rig motor when operating, within ten feet of the rear of the rig when the cat head is turning and the hammer is pounding, and with in ten feet of the rig when the auger is turning. The wearing of hearing devices is a condition of employment.

2. Thermal Stress-All personnel will be assigned a "buddy" who will observe the employee for signs of thermal stress, although

all personnel should be alert for temperature related injuries. The signs and symptoms of thermal stress are included in Appendix B. In addition, work/rest regimes in accordance with the ACGIH guidelines will be established by the SSO when necessary. Water will be available on site above 70 ^{0} F.

3. Electrical-All underground and overhead power lines will be located and marked. Operating procedures will be in accordance with EM 385-1-1 Section 15e.

4. Fire - No heaters or open flames will be allowed on the barge. Flammable liquids will be stored in appropriate containers.

5. Standard Operating Procedures-No eating, drinking, or smoking is permitted within the flagged work areas. No beards or facial hair is allowed on site that may interfere with the seal of a negative pressure respirator. No contact lenses will be worn on site. To limit any safety problems that may result from after hours visitors to the barge, all equipment and tools will be secured at the end of the day.

6. Drowning - All personnel shall wear U.S. Coast Guard approved Type III or V Personal Flotation Devices while on the barge IAW Section 05.I of the Safety Manual.

7. Fog - The barge shall be equipped with adequate lighting for maneuvering in fog.

Contamination avoidance shall be practiced such as: not walking through puddles or mud unnecessarily, avoid kneeling on ground or leaning on equipment whenever possible, and keeping track of weather conditions that may escalate potential site hazards such as lightning, rain or extreme temperatures.

J. PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE will be used and/or worn as required by this plan. No downward changes to the level of protection is allowed without the approval of the Site Safety Officer as outlined in the plan. Description of these levels are outlined in Appendix C.

Description of Task #1 DRILLING
[x] intrusive [ ] non-intrusive

Level of Protection
[ ] A [ ] B [ ] C [x] D [x] modified
Contingency to upgrade to level C based on real time air monitoring.

Description of Task #2 STEAM CLEANING

[ ] intrusive [X] non-intrusive

Level of Protection

[ ] A [ ] B [ ] C [x] D [x] modified

The person steam cleaning will wear a dust mask and face shield for splashes and aerosols.

In addition, a portable eyewash, first aid kit, 20lb ABC fire extinguisher, stretcher, and portable emergency shower will be available on site.

K. MONITORING

Monitoring for ionizable volatile organics shall be conducted in the breathing zone with photoionization detector (PID) while samplers are being retrieved from the drill rig and when the samplers are being opened. The breathing zone will also be monitored while the auger is being retrieved from the hole when appropriate.

At any time when concentrations measured with the PID in the breathing zone exceed 5 ppm above background levels, work activities will cease, and all employees will move to an area upwind where normal levels are indicated. A single spike above this level should not stop work, but a sustained reading (longer than 10 seconds) or repetitive spikes (5 within 10 minutes) shall stop work until appropriate PPE can be donned. Onset of symptoms of overexposure as described in the hazard analysis shall also stop work. (See emergency procedures for further instruction) Drilling shall resume after adequate upgrade of PPE is accomplished and the soils producing the readings are removed from the immediate work area.

Levels of PPE shall remain donned until work is finished in that particular site.

All results of monitoring will be recorded in the logbook. Notations of momentary spikes, high readings, and actions taken will also be recorded in the logbook.

If monitoring equipment malfunctions, work in the exclusion zone shall cease until the instrument is repaired or replaced. The instruments will be calibrated daily according to the manufacturer's instructions and recorded in the logbook.

L. COMMUNICATION PROCEDURES

Personnel will be informed of all known site hazards during the initial safety meeting and will also promptly be kept informed of all hazards discovered during the site investigation.

Personnel in the exclusion zone should remain in constant communication or within site of the support zone personnel. Any failure of communication requires an evaluation of whether personnel should leave the exclusion zone.

The following standard hand signals will be used in case of failure of the radio communications or for emergency communication on site.

hand gripping throat.....out of air, can't breathe
grip partner's wrist or
both hands around waist.....leave area immediately
hands on top of head.....need assistance
thumbs down.....No, negative
thumbs up.....OK, I'm alright

Telephone communication will be supplied by a mobile phone and marine radio in the survey boat and tugboat.

M. DECONTAMINATION PROCEDURES

Personnel and equipment leaving the exclusion zone shall be thoroughly decontaminated according to procedures in Appendix E. At a minimum, hands and face shall be washed whenever leaving the exclusion zone for any reason, i.e. changing respirator cartridges or gloves. Drill rig and equipment will be steam cleaned when the rig is moved off the barge. Employees will shower as soon as possible after leaving the worksite.

Each decontamination station will be separated by at least 3 feet. Decontamination will be accomplished by starting with the most grossly contaminated items at the first station and progressing to the last station and the least contaminated item, the inner clothing a outlined in Appendix D.

~~Decontamination fluids will be left on site. The contaminated PPE will be bagged for disposal as ordinary waste~~

N. EMERGENCY PROCEDURES

1. Emergency Medical Care

The SSO and Survey crew are currently certified in first aid and CPR.
By land from South Locust Point Terminals:
The nearest medical facility with full emergency room is Harbor Hospital (formerly South Baltimore General Hospital). It is located on the western shore of the middle branch of the Patapsco River directly across from Locust Point. There is a boat ramp adjacent to the hospital proper. By land directions to this facility are:

Dock at the terminals, Exit the terminals via McComas Street, turn left (west) and follow to Rt 2 (Hanover Street), turn left (south) and follow to the Hospital. See Exhibit 2.

Harbor Hospital Center (formerly South Baltimore General)
3001 South Hanover Street
Baltimore, MD 21225
410/347-3200
See Exhibit 3.

By land from Dundalk or Seagirt Terminals:
The nearest medical facility with full emergency room is Francis Scott Key Medical Center. directions to this facility:

Dock at the terminals, exit terminals at Dunhill Road, turn left (north) onto Dundalk Ave, follow to Eastern Ave and the hospital complex on north side of street. If in the northern portion, exit the Seagirt Terminals to Broening Highway, turn left (north) and follow to Hollabird Ave, turn right (east) and follow to Dundalk Ave, turn left (north), and follow to the hospital complex.

4940 Eastern Ave.
Baltimore, MD 21224
Emergency 410/550-0350

U.S. Coast Guard by marine radio channel 13 or 16
Ambulance service 911
Police Dept. 911
Fire Dept. 911
CHEMTREC 1-800-424-9300
Balto. Safety Office 410/962-4100

Exhibit 2. Route to Harbor Hospital Center

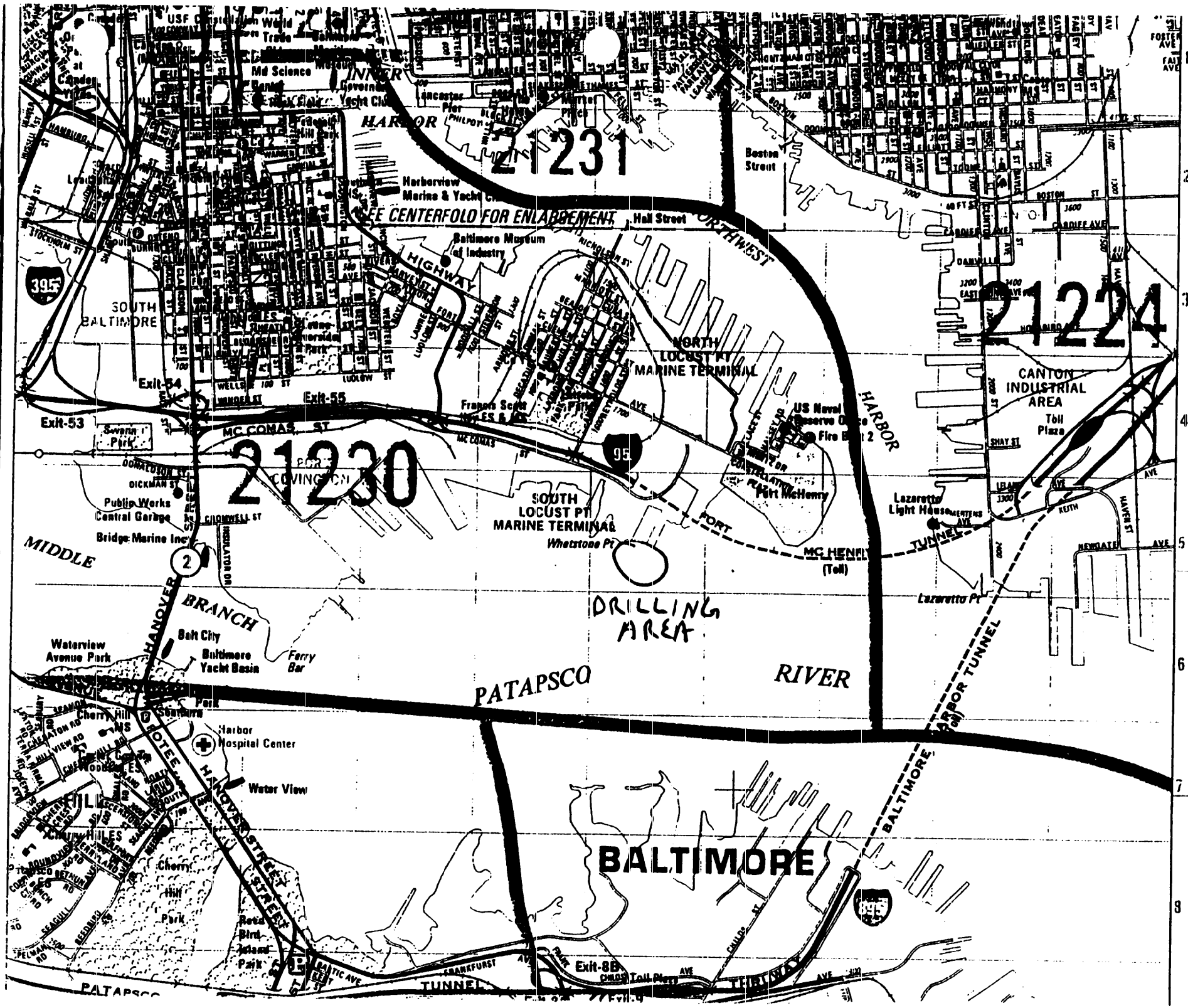
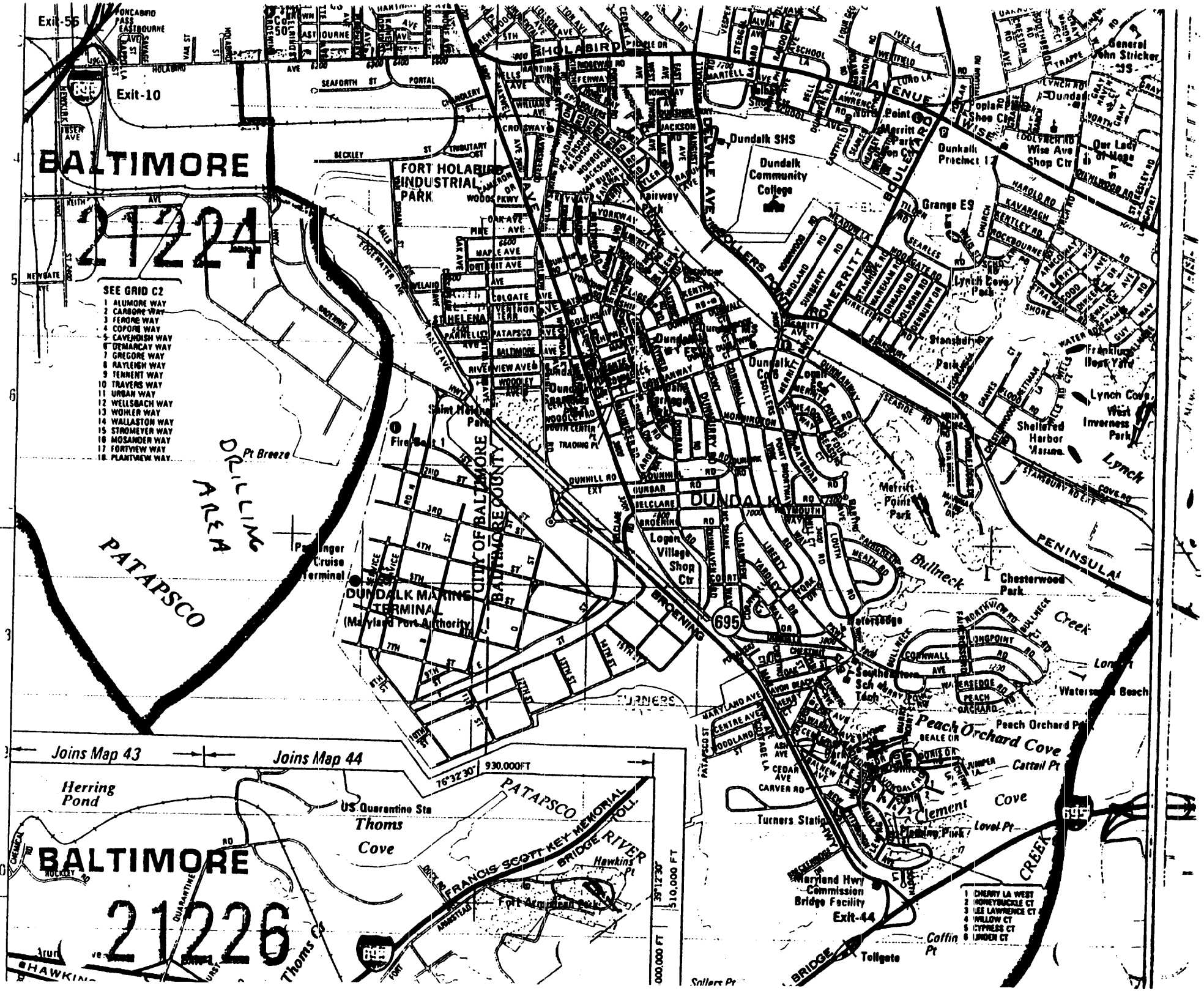

21231
21224
21230
SEE CENTERFOLD FOR ENLARGEMENT
INNER HARBOR
Md Science Center
Governor's Yacht Club
Lancaster Pier
Harborview Marine & Yacht Club
Hall Street
Baltimore Museum of Industry
Boston Street
SOUTH BALTIMORE
Exit-84
Exit-55
Exit-53
Swann Park
MC COMAS ST
PORT COVINGTON
Public Works Central Garage
Bridge Marine Inc
MIDDLE BRANCH
Waterview Avenue Park
Bolt City
Baltimore Yacht Basin
Ferry Bar
Harbor Hospital Center
Water View
Cherry Hill MS
Cherry Hill Park
Reed Bird Island Park
HANOVER STREET
HIGHWAY
NORTHWEST HARBOR TUNNEL
NORTH LOCUST PT MARINE TERMINAL
SOUTH LOCUST PT MARINE TERMINAL
Whetstone Pt
Fort McHenry
US Naval Reserve Office
Fire Engine 2
MC HENRY TUNNEL (Toll)
DRILLING AREA
PATAPSCO RIVER
CANTON INDUSTRIAL AREA
Toll Plaza
Lazaretto Light House
Lazaretto Pt
BALTIMORE HARBOR TUNNEL
BALTIMORE
Exit-8B
Toll Plaza
FRANKFURST TUNNEL
Joins Map 44

Exhibit 3. Route to Francis Scott Key Medical Center


BALTIMORE
21224
SEE GRID C2
1 ALUMORE WAY
2 CARBORE WAY
3 FERORE WAY
4 COPORE WAY
5 CAVENDISH WAY
6 DEMARCAY WAY
7 GREGORE WAY
8 RAYLEIGH WAY
9 TENNENT WAY
10 TRAVERS WAY
11 URBAN WAY
12 WELLSBACH WAY
13 WOHLER WAY
14 WALLASTON WAY
15 STROMEYER WAY
16 MOSANDER WAY
17 FORTVIEW WAY
18 PLANTVIEW WAY
Exit-56
Exit-10
FORT HOLABIRD INDUSTRIAL PARK
Dundalk SHS
Dundalk Community College
Dundalk Precinct 11
Wise Ave Shop Ctr
Our Lady of Hope
Grange ES
Lynch Cove Park
Stansbury Park
Franklin Boat Yard
Lynch Cove
West Inverness Park
Sheltered Harbor Marina
Metrite Point Park
Chesterwood Park
Bullneck Creek
Waterseage
Peach Orchard Cove
Peach Orchard Pt
Cattail Pt
Clement Cove
Level Pt
Turners Station
Planning Park
Maryland Hwy Commission Bridge Facility
Exit-44
Tollgate
Coffin Pt
Sellers Pt
PATAPSCO
Pt Breeze
DRILLING AREA
Passenger Cruise Terminal
DUNDALK MARINE TERMINAL (Maryland Port Authority)
Fire Boat 1
Saint Helena Park
Logan Village Shop Ctr
DUNDALK
CITY OF BALTIMORE
BALTIMORE COUNTY
Joins Map 43
Joins Map 44
Herring Pond
US Quarantine Sta
Thoms Cove
Hawkins Pt
Fort Armistead Park
FRANCIS SCOTT KEY MEMORIAL BRIDGE
RIVER
TOLL
BRIDGE
CREEK
520,000 FT
510,000 FT
930,000 FT
39°15'00"
39°12'30"
76°32'30"
695
21226

2. Emergency Procedures

Personnel Injury in the Exclusion Zone:
Upon notification of an injury in the exclusion zone, personnel shall assemble at the decontamination zone. A rescue team shall enter the exclusion zone (if required) to remove the injured person to the hotline. The SSO shall evaluate the nature of the injury, and the affected person should be decontaminated to the extent possible prior to movement to the support zone. The employees certified in first aid and CPR shall initiate the appropriate first aid, and someone shall call the Coast Guard (if necessary). No person shall reenter the exclusion zone until the cause of the injury is determined and the hazard removed.

In case of chemical contact with the skin or eyes, any contaminated clothing should be removed and the area flushed for 15 minutes with clear water from the portable shower. An ambulance shall be called on 911 to meet the boat or call the Coast Guard.

Personnel Injury in the Support Zone:
Upon notification of an injury in the support zone, the SSO will assess the nature of the injury. If the cause does not affect the performance of site personnel, operations may continue with appropriate first aid administered and necessary follow up actions taken. If the injury increases the risk to others, activities will stop until the added risk is removed or minimized.

Fire/Explosion:
Upon notification of a fire or explosion on site the SSO shall assemble personnel at the decontamination or other designated area. The fire department shall be alerted. If the fire is small, the on-site fire extinguisher should be used.

Personal Protective Equipment Failure:
If any site worker experiences a failure or alteration of protective equipment, that person and their buddy (if necessary) shall stop work and exit the exclusion zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

Other Equipment Failure:
If any other equipment on site fails to operate properly, the SSO and Project Manager shall be notified to make a determination of the effect this failure will have on operations.

In all situations, when an on-site emergency results in evacuation of the exclusion zone, personnel shall not reenter until:

a. the condition resulting in the emergency has been corrected,
b. the hazards have been reassessed,
c. the safety plan has been revised, and approved by all concurring offices,
d. site personnel have been briefed on any changes in the safety plan.

3. Emergency Reporting

The Baltimore District Health and Safety Office shall be notified of any incident, and the SSO shall submit the necessary forms in accordance with EM 385-1-1, Section 2.

SITE SPECIFIC SAFETY AND HEALTH PLAN
Baltimore Anchorages & Harbor Dredging Investigation
Baltimore, MD

O. PLAN APPROVAL

Baltimore District Safety and Occupational Health Officer:

Clinton S. Anuszewski Date: 1 April 1994
for Anita Pustelnik, CIH

P. STATEMENT OF UNDERSTANDING

All site personnel have read the above plan and are familiar with its provisions. My signature below certifies that I have read, understood, and will comply with the guidelines set forth.

name	signature	date
Site Safety Officer		

Other Site Personnel

Appendix A

29 June 1990

ACTIVITY HAZARD ANALYSES
EXPLORATION AND SUPPORT SECTION
SAFETY PROGRAM

Requirements of EM-385-1-1, The Safety Program and The Safety and Accident Prevention Plan apply.

MAJOR ACTIVITY HAZARD **CONTROLS**

NOTE: The hazards under General Drilling apply to all other major activities.

1. **General Drilling**

a. Training:

Untrained personnel are not allowed to operate the equipment. Operators must understand the drill rig Instruction Manual. Operators must know the equipment controls and how the equipment works. Operators must know hand signals and have had first aid, CPR, and fire safety (extinguisher) training. Operators must review this Activity Hazard Analysis and any site specific safety plan.

b. Clothing:

Clothing should be appropriate to the weather conditions and be close fitting without constraint. Rings and other jewelry should not be worn. Always wear appropriate personal protective equipment.

c. PPE:

The following personal protective equipment (PPE) is required:

- Hard hat
- Safety shoes
- Gloves
- Hearing protection
- Safety glasses

Other personal protective equipment may be required by customer or site safety plan. Always wear PPE in the proper manner.

d. Traveling:

Operators should know the dimensions and capacities of the rig or supply truck. Moving the drill rig with the mast up is strictly prohibited. Do not move the drill rig with the derrick upright. Always use a spotter when backing, moving on rough terrain

or under anything (low bridges or wires). Always survey terrain prior to travel and move equipment parallel to slope whenever possible. All operators must have a valid state and government driver's license. Vehicles are inspected daily by operators, and at least once a year by an inspector or foreman. Drive defensively.

e. Equipment:
Use equipment only for the purpose for which it is intended and designed. Know and do not exceed capabilities of equipment. Inspect rig daily for signs of wear, damage, or signs of faulty operation. Maintain equipment in accordance with manufacturer's instructions. Perform pre-operation check of clearances, gauges, warning and safety devices, operation of controls, belts, hoses, bolts, etc. Equipment is also inspected yearly by an inspector or foreman. Always check site for utilities (underground and overhead). Site should be cleared by all possible utility companies. Penetrate the surface and drill the first 6 ft. carefully. Always level machinery prior to operation.

f. Grouting:
Always wear goggles and dust respirator when mixing grout.

g. Split Spooning Hammer:
Handle hammer to avoid pinching a finger. Lift hammer properly.

h. Cathead:
Keep the cathead clean and free of rust, oil, and grease. Check the cathead for rope wear grooves. Replace the cathead if a groove forms deeper than 1/8". Always use a clean dry rope. If the rope grabs or becomes tangled in the cathead drum, release the rope and sound an alarm. All personnel should immediately and rapidly back away and stay clear. The rope will hoist the tools to the sheaves at the top of the mast, and usually break and release the tool. Always maintain a minimum of 18" of clearance between the operating hand and the cathead drum. Do not use rope that is any longer than necessary.

i. Spoon:
Always wear goggles or safety glasses (especially if the spoon is taped) while opening and closing the spoon.

j. Auguring:
Always use a low RPM. Stay clear of rotating augers. When starting, use an auger guide on hard surfaces.

Apply adequate down pressure to penetrate ground surface prior to starting auger. Start auger slowly and watch to ensure a controlled penetration into the ground. If auger head slides out of alignment, stop and repeat process. Never reach behind or around a rotating auger. Use a long handle shovel to move auger cuttings away from the auger, never use your hands or feet. Never remove earth from a rotating auger. Clean augers only whenthe drill rig is in neutral and the auger is stopped from rotating.

k. Tripping:

Keep rig and work area clean. Remove oil, grease and ice. Store tools in the proper tool box.

l. Tools:

Only use tools for the purpose for which they are intended and designed. Keep wrenches clean and maintained. Replace hook and jaws as necessary. Wear safety glasses or goggles when using any hammer. When breaking tool joints, position your hands so that your fingers will not be smashed should the wrench slip or the joint suddenly release.

m. Drill Rods:

Make every effort to keep the work area dry and clear of loose materials and tripping hazards. Watch your footing when removing or adding rods. Watch your fingers when setting rod on horses. Never add, remove or hold rods in the hole, by hand. Always lower drill rods slowly and point hoisting plug vent away from personnel to prevent mud squirting out of hoisting plug vent. Rods should be wiped clean for safe handling by a rod wiper, as they are hoisted from the hole. Never wipe the rods with your hands.

n. Fire:

Fire extinguishers are provided for all equipment. Use only approved safety cans for flammable liquids.

o. Lifting:

Keep load close to your body, bend knees, use leg muscles and keep your back straight. Get help for heavy loads.

p. Hoisting:

Use hoist only for the purpose for which it is intended and designed. Use proper slings and chains.

2. **Core Drilling**

a. Core barrel:

When breaking the bit from the barrel, position your hands so that your fingers will not be smashed should the wrench slip or the joint suddenly release. When removing core from the barrel the barrel should be inclined slowly and only enough to remove the core. (The core should slide, not fall.) A block or other device should be used to protect your hand if the core has to slide or fall more than 6". Extreme care should be used if the core must be hydraulically removed from the barrel. Wear safety glasses or goggles when using any hammer to break the core to fit in a box.

b. Pressure test:

Handle compressed air cylinders as required in EM-385-1-1 and EN-FD's Safety and Accident Prevention Plan.

3. **Air Drilling**

a. Dust:

An appropriate foam wetting agent shall be used to minimize airborne cuttings and dust. Appropriate personal protective equipment shall be worn as required.

b. Connections:

Quick makeup connections must be secured with safety lashings.

NOTE: The following major activity (Installation) includes Piezometer, Inclinometer, and Monitoring or Water Well Installation.

4. **Installation**

a. Floating:

Pipe will float due to the density difference between the inside of the pipe (air or water) and the outside of the pipe (usually mud). Settling cuttings can increase this difference. In extreme situations it can cause an almost explosive release of the pipe from the hole. Always thoroughly clean cuttings out of the hole & fill the pipe with an appropriate fluid while setting to minimize this difference.

b. Developing:

Always choose an appropriate place for discharging development water to prevent unnecessary contamination of the work area. When using airquick makeup, connections must be secured with safety lashings.

Appendix B

COLD STRESS

For exposed skin, continuous exposure shall not be permitted when air speed and temperature results in an equivalent chill temperature of -15°F. The ACGIH wind chill chart is presented below.

Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-28	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind Speeds >40 mph have little additional effect.)	*LITTLE DANGER* In <1 hour with dry skin. Maximum danger of false sense of security.				*INCREASING DANGER* Danger from freezing of exposed flesh within one minute.				*GREAT DANGER* Flesh may freeze within 30 seconds			
	Trenchfoot and immersion foot may occur at any point on this chart.											

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

At air temperatures of 35°F or less,it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing, and be treated for hypothermia. At temperatures below windchill equivalents of -15°F the following work warm up schedule shall be implemented.

Threshold Limit Values Work/Warm-up Schedule for Four Hour Shift*

Air Temperature-Sunny Sky		No Noticeable wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max Work Period	No. of Breaks
-26 to -28	-15 to -19	(Normal breaks) 1		(Normal Breaks) 1		75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	(Normal Breaks) 1		75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work shall cease.	
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work shall cease.			
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work shall cease.					
-40 to -42	-40 to -44	30 min	5	Non-emergency work shall cease							
-43 & below	-45 & below	Non-emergency work shall cease									

Notes:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten(10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example at -30°F with no noticeable wind (step 4), a worker at a job with little physical movement should have a maximum of work period of 40 minutes with 4 breaks in a 4-hour period (step 5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5mph-light flag moves; 10 mph-light flag fully extended; 15 mph-raises newspaper sheet; 20 mph-blowing and drifting snow.

COLD STRESS (continued)

Cold stress of hypothermia occurs when the body's core temperature fall below 36°C (96.8°F). Pain in the extremities is the first sign of overexposure. Maximum severe shivering develops when the body temperature fall to 95°F. This sign of danger and exposure to cold should immediately be terminated. The symptoms of hypothermia are presented below:

Progressive Clinical Presentations of Hypothermia

Core Temperature		Clinical Signs
°C	°F	
37.6	99.6	"Normal" rectal temperature
37	98.6	"Normal" oral temperature
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	93.2	Victim conscious and responsive, with normal blood pressure.
33	91.4	Severe hypothermia below this temperature
32 31	89.6 87.8	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated but react to light; shivering ceases.
30 29	86.0 84.2	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases.
28	82.4	Ventricular fibrillation possible with myocardial irritability.
27	80.6	Voluntary motion ceases; pupils nonreactive to light; deep tendon and superficial reflexes absent.
26	78	Victim seldom conscious.
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema.
22 21	71.6 69.8	Maximum risk of ventricular fibrillation.
20	68	Cardiac standstill.
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electrocephalogram.
9	48.2	Lowest artificially cooled hypothermia patient to recover.

Appendix B Continued
Thermal Stress

Heat stress injuries can easily occur when clothing (especially protective clothing) impairs the body's cooling capacity, the internal body temperature rises, and the normal thirst mechanism is not adequate to bring about fluid replacement that is lost through sweat.

When body temperatures taken at the beginning of a rest period indicate temperatures exceeding 99.6 degrees F (37.6 degrees C), the next work cycle should be shortened by 1/3. Another indication of rising internal temperatures is the heart rate. Heart rates can be obtained by counting the radial pulse during a 30 second period (and double it) as early as possible in a work period. If the heart rate exceeds 110 beats per minute shorten the following work cycle by 1/3.
The symptoms of heat stress in order of increasing severity include:

Heat Cramps (inadequate fluid replacement)

1. muscle spasms
2. pain in hands and feet

Heat Exhaustion (inadequate blood circulation)

1. pale, cool, moist skin
2. heavy sweating
3. dizziness
4. nausea
5. fainting

Heat Stroke

1. red, hot, usually dry skin
2. lack of or reduced sweating
3. nausea
4. dizziness and confusion
5. strong, rapid pulse
6. coma

Heat stress first aid includes:

Replace fluids (water)

Heat Exhaustion

1. Move person to cool place
2. Rest with feet elevated
3. Give water in small amounts
4. Recovery is usually rapid, if not emergency medical treatment is necessary.

Heat Stroke

1. Cool body immediately with cool water or cold compresses
2. Call ambulance immediately
3. Continue cooling until ambulance arrives

Heat stress prevention includes;

1. adjusting work hours during the coolest hours,
2. schedule rest periods,
3. maintain body fluids at normal levels by consuming small drinks of moderate temperature every 15 to 20 minutes.

For work in ordinary clothes, the WBGT will be monitored and the ACGIH Guidelines will be followed. The APG Planning and Operations Section can be contacted for WBGT temperature readings at 3-5225 on Post phones. These WBGT temperature can be related directly to the WBGT temperatures in the ACGIH table. On weekends when the post is not working, the airfield on post can be contacted for weather conditions.

Since the ACGIH TLV work/rest schedule is designed for use with ordinary work clothes and not impermeable PPE, the following modified schedule can be used to accommodate impermeable coveralls;

On a cloudy day: Continuous work below 70oF, above this temperatures heat stress can be controlled by monitoring internal body temperature, monitoring heart rate, or following the work/rest guidelines below:

75% work 25% rest each hour at air temperatures 70-79oF
50% work 50% rest each hour at air temperature 79-85oF
25% work 75% rest each hour at air temperature above 85oF

At temperatures above 85oF and in the absence of a personal heat stress monitor, everyone under a heavy work load and solar load should have their heart rate measurements taken at 15 minute intervals stop work in PPE when heart rate reaches 120 beats per minute. This schedule is conservative. If one is under a light work load the work periods can be extended. If under a heavy work load or a sunny day the rest periods can be extended.

WORK SHALL CEASE IN IMPERMEABLE COVERALLS AT 98oF.

Each employee should be aware of their own heart rate. If between work periods one feels their heart rate (pulse) may be greater that 120 beats per minute, STOP WORK, notify SSO, go to a shaded area, take heart rate, and if necessary rest.

Appendix C
Levels of Protection

Level D modified

hard hat
steel toed and shank boots
chemical resistant outer boots
(the two above boots may be combined)
waterproof outer gloves
chemical resistant inner gloves
plastic coated disposable coverall (i.e. Saranex, Tyvek QC)
safety glasses, or if appropriate, splash goggles or face shield
hearing protection, as required
dust mask, as required
personal flotation device

Level C

hard hat
steel toed boots
chemical resistant outer boots
chemical resistent inner and outer gloves
plastic coated disposable coverall
air purifying respirator with organic vapor cartridges
hearing protection, as required
personal flotation device

optional: splash gear

APPENDIX D

DECONTAMINATION PROCEDURES

Due to the nature of the contamination, level D decontamination will include all the procedures outlined below for level C except for the respirator steps. Detergents will be used for decon fluids on the barge, all coveralls will be disposable not washed. Equipment will be steam cleaned at demobilization.

Decontamination procedures will ensure that material which workers may have contacted in the exclusion zone (EZ) does not result in personal exposure and is not spread to clean areas of the site. This sequence describes the general decontamination procedure. The specific stages will vary depending on the site, the task and the protection level.

1. Go to end of EZ
2. Wash outer boots and gloves in detergent/river water solution
3. Rinse outer boots and gloves in water
4. Remove outer boots
5. Remove outer gloves
6. Cross into contamination reduction zone (CRZ)
7. Remove Saranex/Tyvek suit and discard
8. Remove and wash respirator with detergent potable water solution and hang to dry
9. Remove inner gloves
10. Wash hands and face with potable water.

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed through decontamination, don clean clothing, and immediately be taken for first aid.

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck, and face.

A separate area will be delineated for equipment decontamination by steam cleaning or high pressure wash. Wastestreams will be allowed to drain into the soil or river. Persons performing equipment decon shall wear proper PPE.