USACE CONTRACT NO. DACW33-94-D-0002
TASK ORDER NO. 024
TOTAL ENVIRONMENTAL RESTORATION CONTRACT

FINAL
AFTER ACTION REPORT
FOR
NORTH LOBE DREDGING

NEW BEDFORD HARBOR SUPERFUND SITE
OPERABLE UNIT NO. 1
NEW BEDFORD, MASSACHUSETTS

May 2005

Prepared by

Tetra Tech FW, Inc.
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

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Prepared for

U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

Prepared by

Tetra Tech FW, Inc.
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

Revision	Date	Prepared by	Approved by	Pages Affected
2	05/17/05	D. Beck, P.E.	G. Willant	All

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ABBREVIATIONS AND ACRONYMS

BCE	Bourne Consulting Engineering
CDF	Confined Disposal Facility
CY	cubic yards
DDA	Debris Disposal Area
EPA	U.S. Environmental Protection Agency
ENSR	ENSR Corporation
FCN	Field Change Notice
FSP	Field Sampling Plan
GPS	Global Positioning System
iscy	in situ cubic yards
Kevric	Kevric Company, Inc.
Maxymillian	Maxymillian Technologies, Inc.
MLLW	Mean Lower Low Water
NBH	New Bedford Harbor
NOAA	National Oceanographic and Atmospheric Administration
NTU	nephelometric turbidity unit
Packer	R. M. Packer Company, Inc.
PCB	polychlorinated biphenyls
PPE	personal protection equipment
ppm	parts per million
QAPP	Quality Assurance Project Plan
QC	quality control
RFP	Request for Proposal
ROD	Record of Decision
RTK	Real Time Kinematics
sf	square feet
SOW	Statement of Work
SSHP	Site Safety and Health Plan
TERC	Total Environmental Restoration Contract
TSCA	Toxic Substances Control Act
TtFW	Tetra Tech FW, Inc.
TTSP	Transportation and Temporary Storage Plan
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

Tetra Tech FW, Inc. (TtFW), formerly Foster Wheeler Environmental Corporation, has prepared this After Action Report for the North Lobe Dredging Remediation pursuant to Request for Proposal No. 92 from the U.S. Army Corps of Engineers (USACE). This remedial action was conducted under Task Order No. 24 of the Total Environmental Restoration Contract (TERC) No. DACW33-94-D-0002. This After Action Report is based on the remediation work performed from August 2003 through November 2003 at the North Lobe area located on the west shoreline of the New Bedford Lower Harbor. The work was performed in accordance with the *North Lobe Dredging Work Plan* submitted to the USACE on July 23, 2003.

This After Action Report is a compilation of data and information gathered during the performance of this work. This report generally follows the suggested contents for a Remedial Action Report as defined in the U.S. Environmental Protection Agency (EPA) *Close Out Procedures for National Priorities List Sites* (EPA 540-R98-016) dated January 2002 and as modified by EPA e-mail dated November 12, 2003.

The North Lobe Dredging involved the removal of about 4,100 cubic yards (CY) of contaminated sediments having polychlorinated biphenyl (PCB) concentrations greater than 50 parts per million (ppm). Prior to remediation, PCB concentrations in the sediments ranged from non-detect to a high reading of about 300 ppm. Dredging work was performed from September 2003 to November 2003 with final demobilization of equipment from the Debris Disposal Area (DDA) in January 2004. Final grading of the DDA was completed in April 2004.

The dredged sediments were transported in small scows from the dredge barge at the North Lobe to the existing Sawyer Street Facilities, which was about one mile north of the North Lobe. At Sawyer Street, the material was screened and then slurry pumped into Cell No. 1 for interim storage. The materials stored in Cell No. 1 will be desanded, dewatered, and transported to an off-site disposal facility at a later date under a separate USACE contract.

TtFW provided construction management, procurement services, engineering support, and subcontracts for excavation, transport, processing, and air sampling.

1.1 Operable Unit No. 1 Background

1.1.1 Site Description

The New Bedford Harbor Superfund Site (the Site), located in Bristol County, Massachusetts, extends from the shallow northern reaches of the Acushnet River estuary south through the commercial harbor of New Bedford and into adjacent areas of Buzzards Bay. Industrial and urban development surrounding the harbor has resulted in sediments becoming contaminated with many pollutants, notably PCBs and heavy metals, with PCB contaminant gradients generally decreasing from north to south. From the 1940s into the 1970s, two electrical capacitor manufacturing facilities, one located near the northern boundary of the site and one located just south of the New Bedford Harbor hurricane barrier, discharged PCB-wastes either directly into the harbor or indirectly via discharges to the city’s sewerage system.

Refer to the 1998 Record of Decision (ROD) for a detail description the Site background issues.

1.1.2 Response Action Summary

The major components of the 1998 remedy include the following:

- Approximately 880,000 CY of sediment contaminated with PCBs will be removed. In the upper harbor north of Coggeshall Street, sediments above 10 ppm PCBs will be removed, while in the lower harbor and in salt marshes, sediments above 50 ppm will be removed.
- In certain shoreline areas prone to beach combing, sediments between the high and low tide levels will be removed if above 25 ppm PCBs. In areas where homes directly abut the harbor and where contact with sediment is expected, sediments between the high and low tide levels will be removed if above 1 ppm PCBs.
- Institutional controls, including seafood advisories, no-fishing signs, and educational campaigns will be implemented to minimize ingestion of the local PCB-contaminated seafood until PCBs in seafood reach safe levels. State fishing restriction will also be in effect until such time as the Commonwealth deems it appropriate to amend them.

The EPA directed the removal of contaminated sediments having PCB concentrations above 50 ppm at the North Lobe in areas where the new bulkhead and navigational channel are to be constructed by R. M. Packer Company, Inc. (Packer).

1.2 North Lobe Dredging

The New Bedford Harbor (NBH) Superfund project includes the dredging of approximately 880,000 CY of PCB-contaminated sediments from the harbor and adjacent wetlands to commence in August 2004. The removed materials will be mechanically dewatered and transported off-site for disposal. The sediment dewatering and water treatment facility is being constructed at the South Lobe, Area D, located at the intersection of Herman Melville Boulevard and Hervey Tichon Avenue.

As part of the Area D site preparation, the Packer lease facilities (bulkhead and dock loading area) will be relocated to the North Lobe property off Herman Melville Boulevard. Refer to Figure 1-2 for aerial photo showing prior conditions at both the North and South Lobes as of 2002, and to Figure 1-3 for North Lobe Existing Site Conditions as of August 2003. The Boatyard at the North Lobe shown in Figure 1-2 was removed by USACE/FWENC in 2002 as part of the overall remedial action for the harbor. See Boatyard Demolition Remedial Action Completion Report for a description of this activity. Packer is constructing a new bulkhead with associated extension of the existing navigation channel to the new North Lobe location as shown on USACE Drawing C-1 in Appendix A. The EPA directed removal of contaminated sediments having PCB concentrations above 50 ppm at the North Lobe in areas where the new bulkhead and navigational channel are to be constructed.

The dredged materials were transported in scows from the North Lobe area to the existing facilities at Sawyer Street. Refer to Figure 1-4 for layout of the Sawyer Street Facilities. The dredged material was offloaded from the scows and transported to the DDA. The debris was separated from the dredged sediments and placed in the DDA. The dredged sediments were pumped into Cell No. 1 for future processing and disposal.

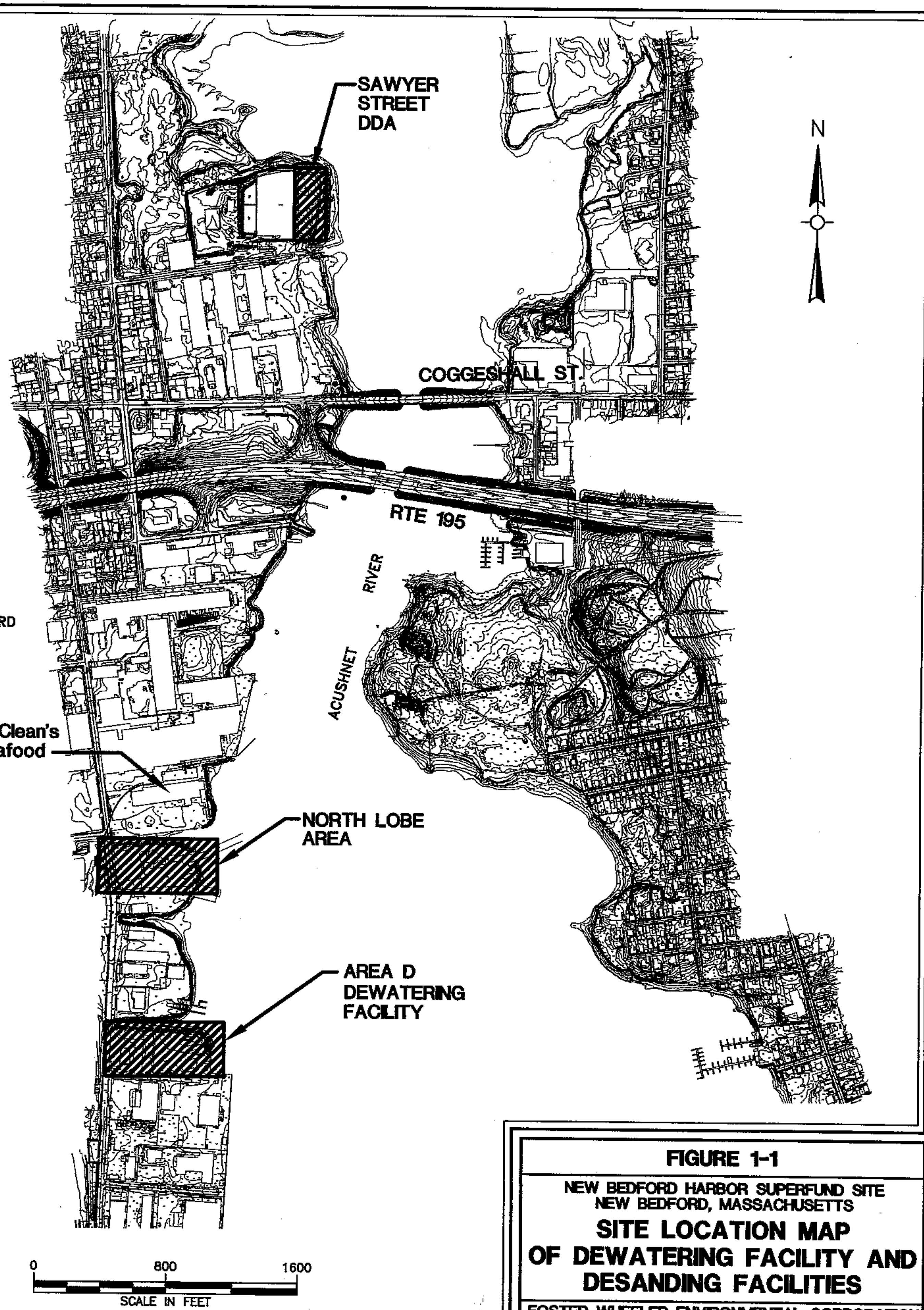

FIGURE 1-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SITE LOCATION MAP OF DEWATERING FACILITY AND DESANDING FACILITIES

FOSTER WHEELER ENVIRONMENTAL CORPORATION
TERC PROGRAM

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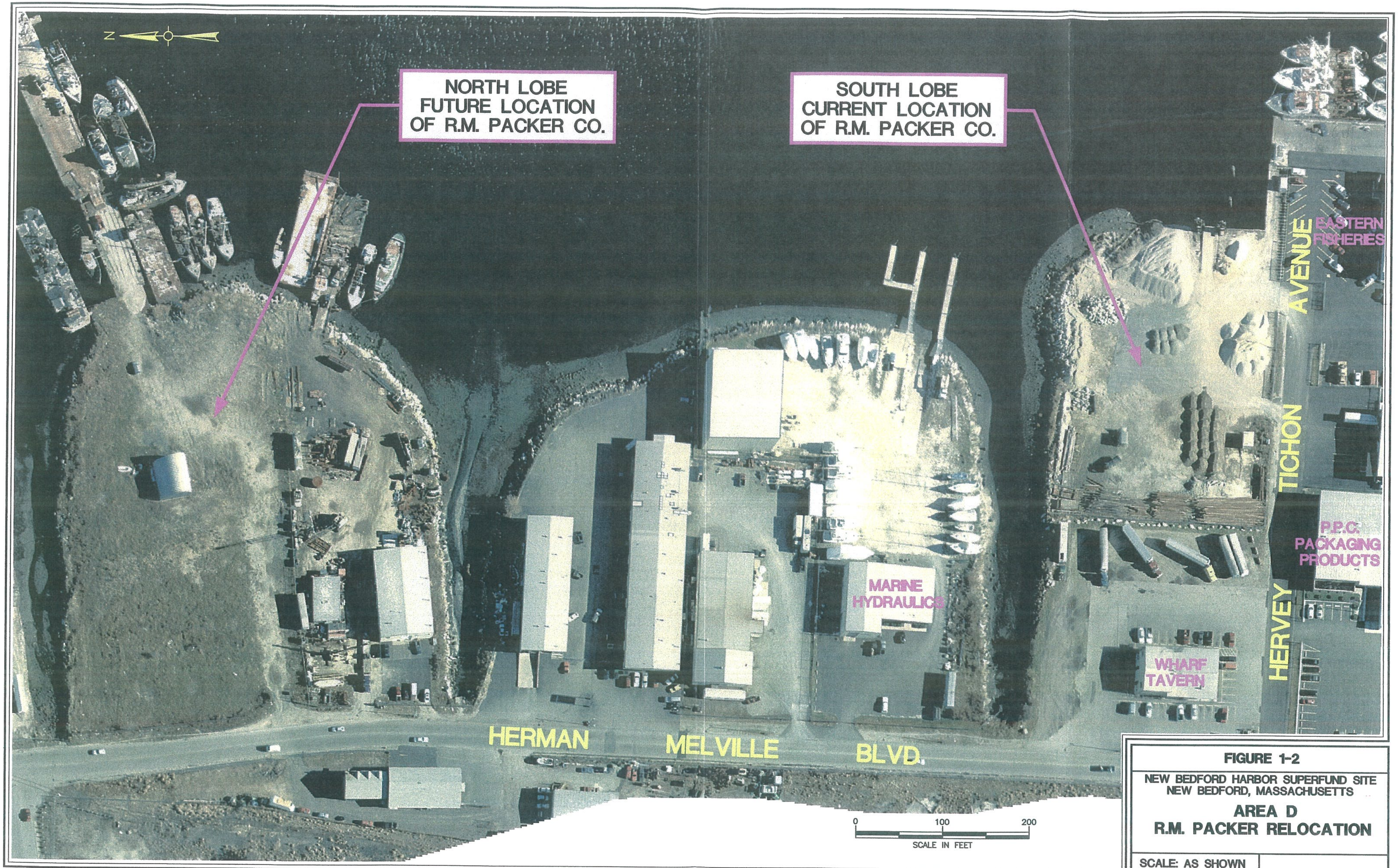

FIGURE 1-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

AREA D
R.M. PACKER RELOCATION

SCALE: AS SHOWN

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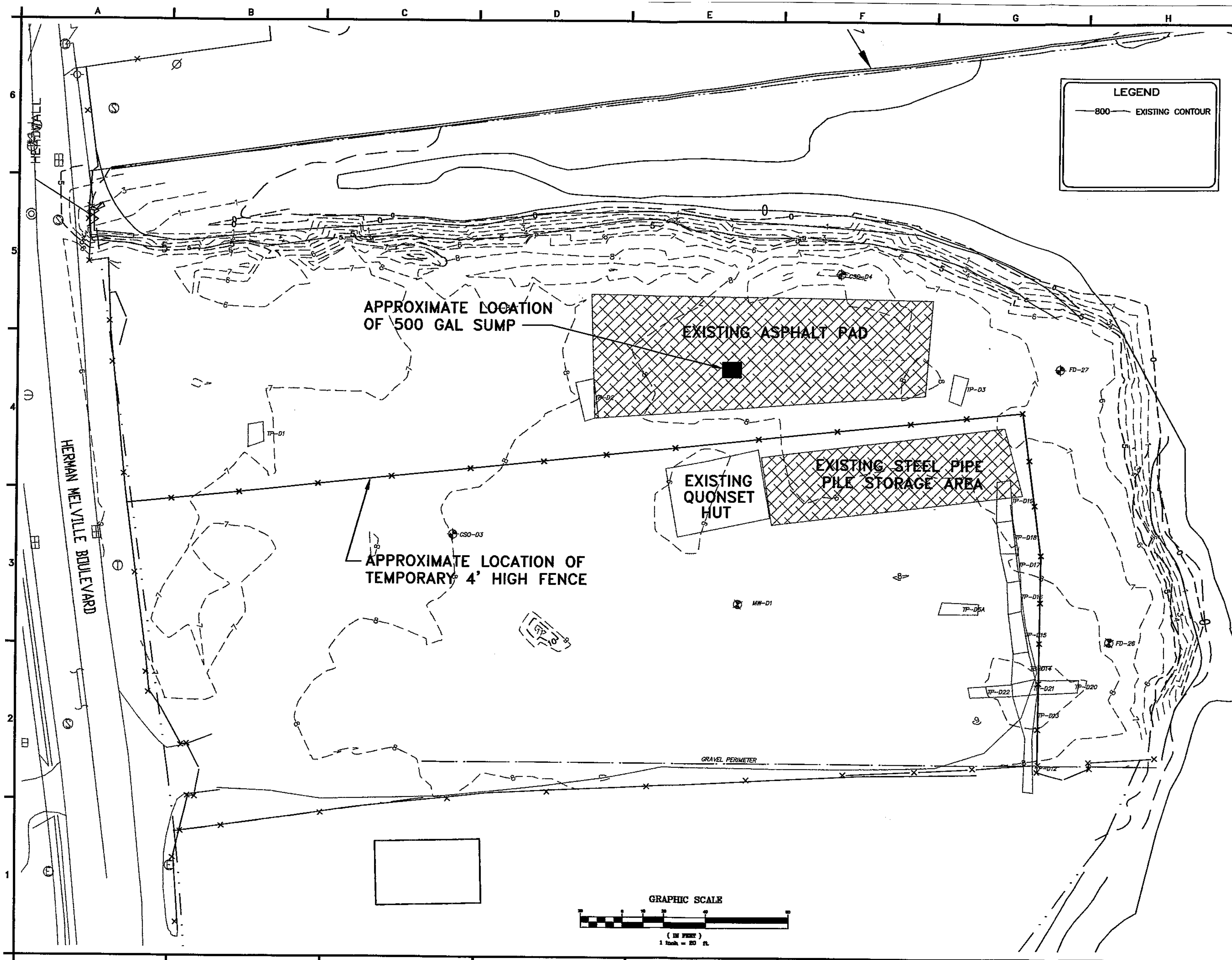


US Army Corps of Engineers New England District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

FOSTER WHEELER ENVIRONMENTAL CORP.
133 FEDERAL STREET
BOSTON, MASSACHUSETTS

Date: MAY 2003

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

NORTH LOBE
EXISTING SITE CONDITIONS

Reference number:
FIGURE 1-3

FIGURE 1-4

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SAWYER STREET FACILITIES

SCALE: AS SHOWN

CAD FILE: 0290_A_VISUAL_14a.DWG

1.3 North Lobe Dredging Design

The characterization sampling for PCBs was performed from August 2001 through May 2003, refer to Phase III Sediment Sampling Report dated December 2002 (Transmittal No. 17.11.02-17-002) and Phase IV A Sediment Sample Results dated August 2003 (Transmittal No. GM.02.09-03-001). Based on the results of those samples, the USACE prepared dredging plans to remove materials with PCB concentrations greater than 50 ppm. This included the area where Packer was to construct its new bulkhead with navigational channel and the area to the east of the MacLean property. Figure 1-5 shows the sample locations in the area of the North Lobe and MacLean's Seafood. Figure 1-6 shows the highest PCB concentrations for each of the sample locations.

The USACE issued the initial dredging design in May 2003, which is contained in Appendix A. The dredge areas were labeled as Dredge Areas A, B, C, D, F2, F3, F4, and F6. The areas as defined in the May 2003 design drawings are summarized in Table 1-1. This is the scope of work upon which the Work Plan and the Dredging Subcontract was awarded.

Table 1-1
Dredge Area Data – May 2003 Design

Areas of Dredging	Dredge Volumes (iscy)		Cut Dept (feet)		Areal Extent (sf)	Existing Water Depths (feet below MLLW)		High PCB Readings (ppm)
	Base	Total	Min	Max		Minimum	Maximum	
Area A	420	470	4	4	3,200	1	2	90
Area B	130	190	1	1	3,500	5	5	79
Area C	310	400	1	4	5,200	4	8	130
Area D	2,200	2,500	2	5	18,000	0	10	300
Area F-2	150	180	3	3	1,400	3	3	90
Area F-3	160	200	1.5	1.5	2,900	4	8	54
Area F-4	340	390	3	3	3,100	4	5	100
Area F-6	150	180	2	2	2,000	3	3	77
Totals	3,860	4,510			39,300	+4	10	

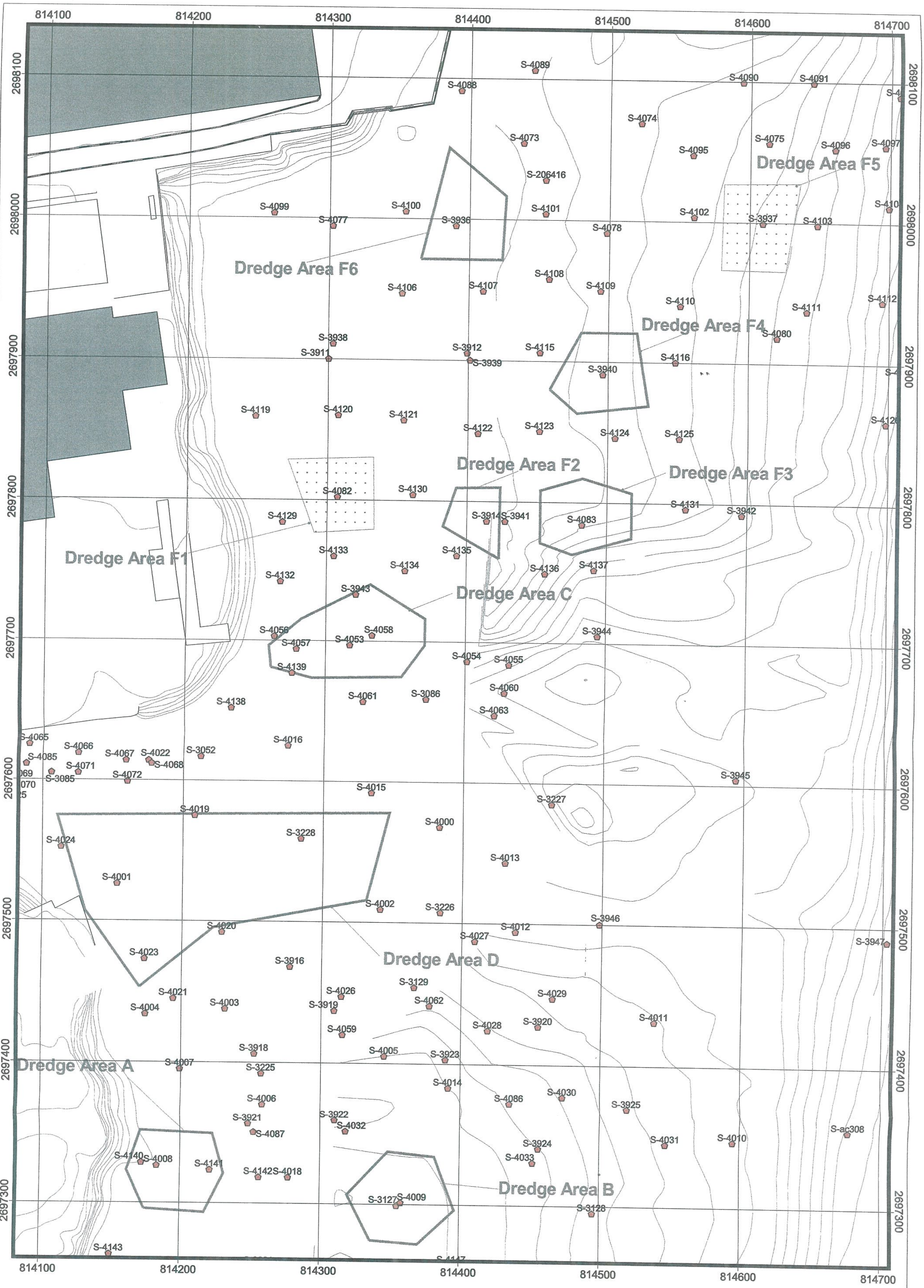
Note: Area E was optional area that was deleted by the USACE prior to the May issued drawings.

The total May 2003 design dredge volume of 4,510 CY is the base volume and includes a 6-inch over dredge allowance.

In August 2003, the USACE deleted the dredging for Areas F2, F3, F4, and F6 east of MacLean Seafood's property due to the results of the ENSR North Lobe Dredging Area Characterization Report, dated August 7, 2003, that showed high levels of heavy metals, and limited capacity of Cell No. 1 at the Sawyer Street Facilities for the temporary storage of the dredged sediments. Also, the configuration of Dredge Areas A, B, C, and D were revised in USACE revised dredge drawings that are contained in Appendix B. The data for the dredge area based on these revised drawings is presented in Table 1-2.

Table 1-2
Dredge Area Data – August 2003 Design

Areas of Dredging	Dredge Volumes (iscy)		Cut Dept (feet)		Areal Extent (sf)	Existing Water Depths (feet below MLLW)		High PCB Readings (ppm)
	Base	Total	Min	Max		Minimum	Maximum	
Area A	250	280	4	4	3,200	1	2	90
Area B	120	180	1	1	3,500	5	5	79
Area C	900	1,130	1	4	5,200	4	8	130
Area D	2,200	2,500	2	5	18,000	0	10	300
Totals	3,470	4,090			29,900	+0	10	



- Pre and Post ROD Actual Sediment Sample Locations
- Topographic and Bathymetric Contours
- North Lobe Dredge Areas
- North Lobe Dredge Areas (deleted)
- Buildings

N

0 50 100 Feet

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NEW BEDFORD HARBOR SUPERFUND SITE
BRISTOL COUNTY, MASSACHUSETTS

North Lobe Dredging
Sample Locations and
Proposed Dredge Areas

FIGURE 1-5

DRAFT: MAY 28, 2003

MA STATE PLANE
NAD 83 FEET
NGVD 29
1 FOOT CONTOUR INTERVAL

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North Lobe Layout 4

Pre and Post ROD Actual Sediment Sample Locations
Topographic and Bathymetric Contours
North Lobe Dredge Areas
North Lobe Dredge Areas (deleted)
Buildings

N

0 50 100 Feet

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FOSTER WHEELER ENVIRONMENTAL CORPORATION
133 FEDERAL STREET, BOSTON, MASSACHUSETTS 02110

NEW BEDFORD HARBOR SUPERFUND SITE
BRISTOL COUNTY, MASSACHUSETTS

North Lobe Dredging
Sample Locations/Highest PCB Concentration (ppm)
and Proposed Dredge Areas

FIGURE 1-6

DRAFT: MAY 28, 2003

MA STATE PLANE
NAD 83 FEET
NGVD 29
1 FOOT CONTOUR INTERVAL

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North Lobe Layout 5

The final dredge areas are described as follows:

- Dredge Areas A and B are the two areas south of the proposed Packer navigational channel. Dredge Area A is the area closer to the shore (more westerly).
- Dredge Area C is the area just north of the Packer-MacLean property line, within the footprint of the proposed MacLean-Revere bulkhead.
- Dredge Area D is the area necessary for construction of the Packer bulkhead, including a buffer of approximately 20 feet north of the north side of the Packer bulkhead to facilitate construction.
- Dredge Area F was made up of the six small areas of contamination east of the MacLean's Seafood facility and north of Dredge Area C. Due to limitations of capacity in Cell No. 1 at the Sawyer Street Facilities, the dredging of the Area F locations, F-2, F-3, F-4, and F-6, were deleted from the scope of work by the USACE in August 2003.

The Dredging Subcontract was modified in August 2003 to accommodate the revised design. The Dredging Subcontractor, under the direction of TtFW, was responsible for dredging approximately 4,090 CY from this area of proposed North Lobe construction (Dredge Area A, B, and D) and one area to the north near the MacLean property (Dredge Area C). The water depths ranged from shoreline to approximately 10 feet below Mean Lower Low Water (MLLW). Dredge cut depth ranged from approximately 1.5 feet to 5.5 feet below the mud line as indicated on the USACE dredge plans.

Dredged sediments were transported in small scows from the North Lobe Dredging operations to the existing Sawyer Street Facilities. Refer to Figure 1-4 for an aerial photo of the Sawyer Street Facilities.

1.4 Confirmatory Sampling

Details of the confirmation sampling are presented in the North Lobe Dredging Confirmatory Sample Results report dated January 16, 2004 (Transmittal No. N1.02.06.01) as contained in Appendix L.

The clean-up goal was to remove material having an average PCB concentration greater than 50 ppm from the dredge area designated on the USACE drawings. Final results of the confirmation sampling for each dredge area are summarized in Table 1-3. The contract volumes for each of the areas was supplied by the USACE based on the USACE August 2003 issued drawings. The revised August 2003 drawings deleted areas F-2, F-3, F-4 and F-6, and revised the scope of dredging required for Area A, Area B, and Area C. The contract volumes in Table 1-2 are based on the August 2003 drawings. The volumes of sediments removed were obtained from the BCE as-built surveys, which are included in Appendix C.

TtFW personnel collected the sample using a boat and sampling equipment supplied by CR Environmental. The collected samples were sent to Severn Trent Laboratories for analysis. All confirmatory sampling results are shown in Appendix L.

1.5 Air Sampling

One air sampling station was set up at the North Lobe. In addition, three existing air-sampling stations at the Sawyer Street Facilities were used to document PCB air concentrations during the handling of the material at the DDA and Cell No. 1.

Results of the air sampling are summarized in Appendix D. There were no readings that exceeded acceptable limits.

Table 1-3
Summary of Compliance Demonstration Areas and Confirmation Sampling Results for North Lobe Dredging

Dredge Area	Contract Volumes (CY) Net	Contract Volumes (CY) Gross	Volume of Sediments Removed (CY)	No. of Sample Locations	Surface (0 to 6") Average PCB Conc. (ppm)	Comments
Area A	250	280	331	5	3.2	
Area B	120	180	173	6	20	
Area C	900	1,130	1,307	11	10	The volume of sediments removed includes 255 CY of additional dredging due to results of confirmation sampling.
Area D	2,200	2,500	2,134	9	35	
Total	3,470	4,090	3,952	31	-	

1.6 Key Subcontractors

TtFW provided construction management for the work.

Maxymillian Technologies, Inc. (Maxymillian) performed the following work as a subcontractor to TtFW:

- Dredging of contaminated materials;
- Transportation of dredged materials to the DDA at Sawyer Street; and
- Processing of materials at DDA and placement in Cell No. 1 for future desanding, dewatering, and off-site disposal.

Bourne Consulting Engineering (BCE) performed the bathymetric surveys as a subcontractor to Maxymillian.

Kevric Company, Inc. (Kevric) performed air sampling as a subcontractor to TtFW. Kevric subcontracted the analysis of the collected samples to Axys Analytical Ltd.

TtFW collected the confirmation samples. Severn Trent Laboratories performed laboratory testing of the sediment samples.

2.0 CHRONOLOGY OF EVENTS

Table 2-1 provides a chronology of events related to the North Lobe Environmental Dredging Project. This Table 2-1 provides a summary of key events. A detailed Project Schedule is presented in Appendix G.

Table 2-1
Chronology of Events

Date	Event
May 2002	Boatyard Demolition Completed
May 2, 2003	USACE issues RFP 92 to TtFW for North Lobe Dredging
May 16, 2003	USACE revised scope of dredging by deleting 6,000 CY of optional dredging
May 27, 2003	USACE issues dredge drawings for Dredging at Areas A, B, C, D and F Areas and revised scope of dredging work from 4,200 CY to 4,500 CY
May 29, 2003	Draft Work Plan for the North Lobe Dredging transmitted to the USACE
July 23, 2002	TtFW Submitted Final Negotiated North Lobe Dredging Work Plan and Cost Estimate
July 24, 2003	Subcontract Awarded to Maxymillian for the North Lobe Dredging
August 7, 2003	North Lobe Dredging Area Characterization Report issued by ENSR
August 12, 2003	USACE deleted F areas from scope of work
August 12, 2003	Pre-dredge Bathymetric Surveys for Areas B, C and D were performed
August 18/27, 2003	Project Mobilization: Dredge equipment to the North Lobe and setting up equipment at the DDA
August 25, 2003	Install Air Monitoring Station at North Lobe
August 26, 2003/ September 30, 2003	Install material processing equipment at the DDA
September 2/4, 2003	Dredge Area B (173 CY)
September 4, 2003/ October 1, 2003	Dredge Area D (2,134 CY)
September 8, 2003	Post-Dredge Bathymetric Survey Area B
September 18, 2003	Confirmation Sampling at Area B, 5 samples taken
October 1/14, 2003	Dredge Area C (1,052 CY)
October 2, 2003	Post Dredge Bathymetric Survey at Area D, and Pre-dredge Bathymetric Survey for Area A
October 8/14, 2003	Dredge Area A (331 CY)
October 7, 2003	Sampling at Area D, Samples collected at 9 Locations, 6 at required depth
October 16, 2003	Post Dredge Bathymetric Surveys at Areas C and A
October 17, 2003	Confirmation Sampling at Area D. Last 3 samples at required depth
October 20/21, 2003	Confirmation Sampling at Area C (9 sample locations) and Area A (5 sample locations)
November 3, 2003	Additional Dredging at Area C (255 CY)
November 3/4, 2003	Process additional dredged sediments at the DDA
November 5, 2003	Shut down processing of materials at the DDA
November 11, 2003	Demobilize Dredge Barge from the Site
November 18, 2003	Final Bathymetric Survey of Area C to verify remedial dredging
November 23, 2003	Demobilize Transport Scows from the Site
November 25, 2003	Final Confirmation Sampling at Area C (2 sample locations)
January, 2004	Decontamination and demobilization of DDA material processing equipment
February, 2004	Cutting of steel debris for placement into DDA
April 21, 2004	Final grading of DDA

3.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

3.1 Surveying Control

BCE performed the pre-dredge bathymetric surveys with sonar sounding survey equipment. Maxymillian used its Real Time Kinematics (RTK) Global Positioning System (GPS) survey equipment mounted onto the dredge bucket to control excavation. BCE performed the post-dredge bathymetric surveys with sonar sounding survey equipment.

Final as-built survey data for each of the four dredged areas is presented in Appendix C. These surveys verified that dredging had been completed to depths as indicated on the USACE August 2003 Dredging Plans.

3.2 Health and Safety

Health and Safety activities were completed in accordance with the contract specifications and the Site Safety and Health Plan (SSHP). All site personnel were given a site orientation and were required to acknowledge by signature that they read and understood the SSHP before beginning work. Personnel completed the required pre-screening requirements for the entrance and exit physicals. All work was performed in Level D Personal Protection Equipment (PPE).

This work was performed without any reportable safety incidences.

3.3 Confirmation Sampling Quality Control

Quality control of the off-site laboratory testing of confirmation samples was performed in accordance with the TtFW Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). Refer to the North Lobe Confirmatory Sampling Report in Appendix L for full report on the laboratory testing of the confirmatory samples.

3.4 Environmental Controls

The Work Plan called for the dredging operations to be enclosed within a turbidity curtain. However, due to favorable water quality monitoring results, the silt curtain and oil boom were not deployed.

3.5 Standards for Water Quality Criteria

During the dredging work activities, downstream turbidity measurements (within 300 feet of the work area) were not to exceed 50 nephelometric turbidity units (NTUs) above background levels. Per the ENSR Water Quality Monitoring Summary Report contained in Appendix E, this limit on turbidity was never exceeded during the dredging operations.

3.6 Cleanup Goals

The performance standards for the cleanup goals were to remove all sediments with PCB concentrations greater than 50 ppm. This goal was obtained. Refer to the North Lobe Dredging Confirmatory Sample Results report in Appendix L.

4.0 CONSTRUCTION ACTIVITIES

4.1 General Sequence of Work

The general sequence of work for dredging the four designated Dredge Areas at the North Lobe was as follows:

1. Perform pre-dredge hydrographic surveys of the areas to be dredged.
2. Mobilize dredge equipment to the North Lobe site.
3. Establish air-sampling stations.
4. Dredge Area B.
5. Dredge Area D.
6. Dredge Area C.
7. Dredge Area A.
8. Dredge Sediment Transportation in the harbor to the DDA.
9. Perform post-dredge hydrographic surveys.
10. Perform confirmatory sampling once it had been confirmed that the excavation depths within a dredge area had been obtained as required by the USACE Dredge Plans.
11. Re-dredge Area C based on confirmatory sample results.
12. Demobilize the dredging equipment from the North Lobe.
13. Dredge sediment processing and placement in DDA.
14. Debris management at the DDA.
15. Demobilization of processing equipment from the DDA.
16. Cut and spread debris at the DDA.
17. Cap and grade DDA.

4.2 Mobilization and Site Setup

Upon Notice to Proceed had been issued, Maxymillian began pre-mobilization and mobilization activities, including:

- Providing the submittals specified in the technical specifications and Statement of Work (SOW);
- Furnish all labor, supervision, materials, and equipment for mobilization and site work activities;
- Install all temporary facilities (sanitation and fencing) and lay down areas at the North Lobe property (302 Herman Melville Boulevard);
- Establish a barge platform along the shoreline of the DDA to dock Maxymillian's mini sediment scow barges and support boats;
- Prepare Dredge Plan in accordance with contract requirements;
- Coordinate with U.S. Coast Guard in accordance with Specification 02325 to issue a "Notice to Mariners" at least two weeks prior to commencing dredging operations;
- Establish employee sign-in/out sheet and submit with Subcontractor Daily Quality Control (QC) Report;
- Mobilize dredge barge and scows along with support boats to the site; and
- Setup screening units, pumps and other equipment at the DDA for the processing of the dredged materials.

4.3 Environmental Protection

As part of mobilization, and prior to any intrusive work within the waterway, Maxymillian procured and delivered environmental controls to the site. Approximately 650 linear feet of 10 to 15 foot deep floating turbidity curtains and oil absorbent booms were delivered to the North Lobe for possible installation around the dredging activities.

The USACE monitored water quality in the harbor while Maxymillian performed dredging. The USACE's monitoring determined that it was not necessary to install the environmental controls, turbidity curtain and oil absorbent booms, around the dredging operations. See Appendix E for ENSR's Water Quality Monitoring Summary Report.

Maxymillian did supply a boat with crew and oil absorbent materials in accordance with the Debris Management Plan to collect and remove any floating debris or oil sheens resulting from dredging activities.

4.4 Hydrographic Survey

Prior to dredging operations, BCE performed a hydrographic survey of the areas to be dredged.

Maxymillian conducted and monitored the work using GPS real-time survey equipment linked to specialized dredging software. Using the initial BCE hydrographic survey, Maxymillian created a surface model of the existing and desired dredge elevations based on the USACE dredge design drawings. These two surfaces were loaded into specialized dredge software. The dredge operator used this information displayed on a screen in the operator's cab to accurately dredge each area to the required depths.

The excavator-mounted GPS method provided three precise coordinate locations of the bucket (x, y, z). Maxymillian integrated the Trimble GPS system with Dredgepack software. This allowed the operator to display color-coded depth information in plan and sectional views to show the "As Surveyed" and the "As Dredged" depths for individual 3.5-feet x 4.5-feet cells. The electronic field data, including the XY coordinates and Z elevation in ASCII format, was submitted on a daily basis with the daily QC reports.

Upon completion of the dredging, BCE performed post-dredge hydrographic surveys to verify that the dredge depths as indicated on the USACE Dredge plans had been obtained. The results of the hydrographic surveys are presented in Appendix C.

4.5 Excavation Work

The dredging was performed with a 100,000-pound hydraulic excavator mounted on barge. Wooden mats were placed on the barge deck to support the excavator. The barge had hoppers for the temporary storage of the dredged materials. A 3-CY environmental clamshell bucket was used to excavate the material in a controlled manner. The bucket was designed with smooth cutting edges and a near horizontal closure to provide clean, level cuts of the harbor bottom. Refer to the photos in Appendix K for photos showing the dredge barge in operation.

A GPS antenna was mounted directly above the center of the environmental bucket to allow for precise positioning. The operator worked from a graphical depiction of the dredge cut lines displayed on a computer screen in the operator's cab. This system allowed for precision dredging with minimum over-excavation.

To maximize reliability and productivity, the various phases of dredging, screening, and sediment transfer were conducted as distinct work activities. The dredged material was placed into hoppers on the dredge barge and then transferred to the scows for transport to the DDA for processing. Refer to the photos in Appendix K for pictures of these operations. The material was unloaded from the scows and then stockpiled in the DDA to allow for batch processing of the dredged sediments. This separation of activities eliminated problems due to different production rates for different operations, and enhanced reliability for each operation.

The dredge barge was secured in location with two steel pipe spuds. The dredged materials were loaded directly into hoppers on the dredge barge. The hoppers were partitioned into two areas: one for sediments, and the other for large debris. Large debris, such as poles or timbers, were picked out and placed directly into the debris pile. Periodically during dredging, sediments and debris from the dredge barge hoppers were segregated and loaded into separate small 30-CY sediment scows for transport to the DDA.

The majority of the areas to be dredged were at the site of the former Herman Melville Shipyard. Numerous abandoned boats and barges were demolished and removed during the summer of 2002. During dredging operations, the Subcontractor did encounter debris, including pieces of wood, metal, and broken concrete. All removed debris was barged to the Sawyer Street Facilities. At the DDA, the debris was removed from the sediments prior to processing the sediments through the screening unit, and were then placed into the DDA.

Once the excavation in a dredge area was completed, BCE performed post-dredging hydrographic surveys to ensure that target elevations had been attained. Then TtFW collected and tested confirmatory samples to ensure that the clean-up goals for PCB contamination had been obtained. In an attempt to minimize standby time, Maxymillian did commence dredging in the next dredge area before receiving the results from TtFW's confirmatory sampling. This was done for all the areas except the final dredging which was the re-dredging of Area C.

4.6 Water Quality Monitoring

Maxymillian implemented work practices to control water quality throughout the project. Controls were designed to minimize re-suspension, siltation, and turbidity.

USACE, through its subcontractor ENSR Corporation (ENSR), performed real-time water column turbidity monitoring down stream of the work area using a Nephlometer measuring device in accordance with Specification Section 01454. Turbidity measurements were taken on a daily basis for the first three weeks, and then only once a week after the initial period (pending turbidity values). In the event of an exceedance, Maxymillian was to stop work, evaluate work methods with USACE, and adjust the work methodology or install the turbidity curtains as required by USACE. However, there was no reported exceedance of the turbidity limits.

If the turbidity curtain had been required by USACE, Maxymillian would have installed a floating, full-height silt barrier consisting of a turbidity curtain, a floating boom at the top, and an anchoring system with posts, to maintain the curtain's horizontal location. The barrier would have prevented turbidity and sediments from migrating from the work area.

During the dredging work activities, downstream turbidity measurements (within 300 feet of the work area) rarely exceeded 5 or 6 nephelometric turbidity units (NTUs), which was well within the 10 NTU specified limit. See Appendix E for ENSR's Water Quality Monitoring Summary Report.

4.7 Dredged Sediment Transportation

Dredged sediments were transported from the dredge areas to the DDA located at Sawyer Street. Maxymillian handled this operation with two small scows transporting sediments up the river to the DDA.

The small scows were capable of transporting approximately 30 CY per trip. The 30-CY scow consisted of a proprietary design of three 10-CY floating sections. The sectional barge was designed for low water draft and low overhead clearance. This also allowed Maxymillian to load each section with different types of materials for more efficient processing/placement at the DDA.

Maxymillian performed a preliminary study of clearances under Coggeshall Bridge and Route 195 Bridge at high tide and the required draft at low tide, and found that the low profile design of the scows allowed for passage under the Coggeshall Bridge and Route 195 Bridge. The scows were cycled from the dredge barge where they were loaded and the Sawyer Street Facilities where the dredged materials were offloaded to the DDA. At the excavation area, Maxymillian loaded the scows with sediments from the excavation that have been previously placed in the hoppers on the dredge barge. The 30-CY scows had three individual 10-CY hoppers.

4.8 Debris Disposal Area (DDA) Operations

At the DDA, concurrent with dredging and transport operations, Maxymillian processed the sediments into a 2-inch minus slurry for placement in Cell No. 1. All oversized materials (2-inch plus) were stockpiled for further processing and placement into the DDA. Refer to photos in Appendix K for DDA operations.

An excavator tended the stockpile of sediment at the DDA and loaded the sediment into an Extec screening plant to process the sediment to a 2-inch minus material. Any obviously large pieces of debris were picked out and set aside for subsequent disposal in the DDA.

The sediments were loaded into the feed hopper and initially screened through the bar grizzly to eliminate debris larger than 6 inches. The remaining materials were run over a vibrating 2-inch screen with water jets to remove sediments from the material greater than 2-inches. The wetted 2-inch minus material was then transferred into the slurry tank where more water was added to create a slurry for hydraulically pumping the sediments into Cell No. 1. Required make-up water was pumped from Cell No. 2. All material greater than 2-inches including large pieces of debris was stockpiled for placement in the DDA at job completion.

Excess water from Cell No. 1 flowed into Cell No. 2. TtFW pumped, treated and discharged into the city sewer approximately one million gallons of wastewater. The wastewater treatment was done with a series of sand filters and carbon cells. Three water samples were taken to verify that the discharged water did meet the requirements of the discharge permit. The excess water from Cell No. 2 was treated and discharged to the city sewer system in two batch operations.

4.9 Sampling

Sampling was performed in accordance with the New Bedford Project Field Sampling Plan (FSP), Revision 6.1 dated August 2003 (Transmittal No. W1.01.03-01-002), and analysis of the sample was performed in accordance with the New Bedford Project Quality Assurance Project Plan (QAPP), Revision 3 dated January 2003 (Transmittal No. 17.01.03-03-005).

4.9.1 Air Sampling

Air sampling was conducted at one location at the North Lobe and at three locations around the Sawyer Street Confined Disposal Facility (CDF). See Figure 4-1 for the location of these sampling stations.

For the North Lobe area, one station was placed on the northern side of the North Lobe (#38). The location at the North Lobe was sampled during dredging and material handling activities. Sampling was also conducted around the Sawyer Street CDF at existing Sites 2, 3, and 6. See Appendix D for summary of the collected air sampling data.

The air sampling frequency for the North Lobe was conducted in accordance with the North Lobe Dredging Work Plan and the North Lobe modification to the FSP (Revision 6.1 dated August 2003).

4.9.2 Confirmatory Sampling

The 50-foot grid spacing was selected as suitable for meeting post-removal sampling purposes. A 50-foot reference grid was placed over Areas A , B, C and D to determine proposed sample collection locations. During field implementation, actual sample locations were altered slightly so that sample locations were not biased toward the perimeter of the removal area. See Figure 4-2 for the location of the final confirmatory samples.

The actual number of post-removal sampling locations in each dredge area are summarized in Table 4-1.

Table 4-1
Confirmatory Sampling

North Lobe Dredge Area	No. of Sample Locations
A	5
B	6
C	9 with 2 additional locations after additional dredging
D	18

A total of 32 sample locations were included in Dredge Areas A through D. Samples were collected and tested in accordance with the Project FSP (Revision 6.1 dated August 2003) (Transmittal No. N1.01.03-01-0002) and analyzed in accordance with the Project QAPP (Revision 3.0 dated January 2003) (Transmittal No. 17.01.03-03-0005). See Appendix L.1 for North Lobe Dredging Confirmatory Sample Results Report. See Appendix L.2 for a Graphical Depiction of Confirmatory Sampling Results.

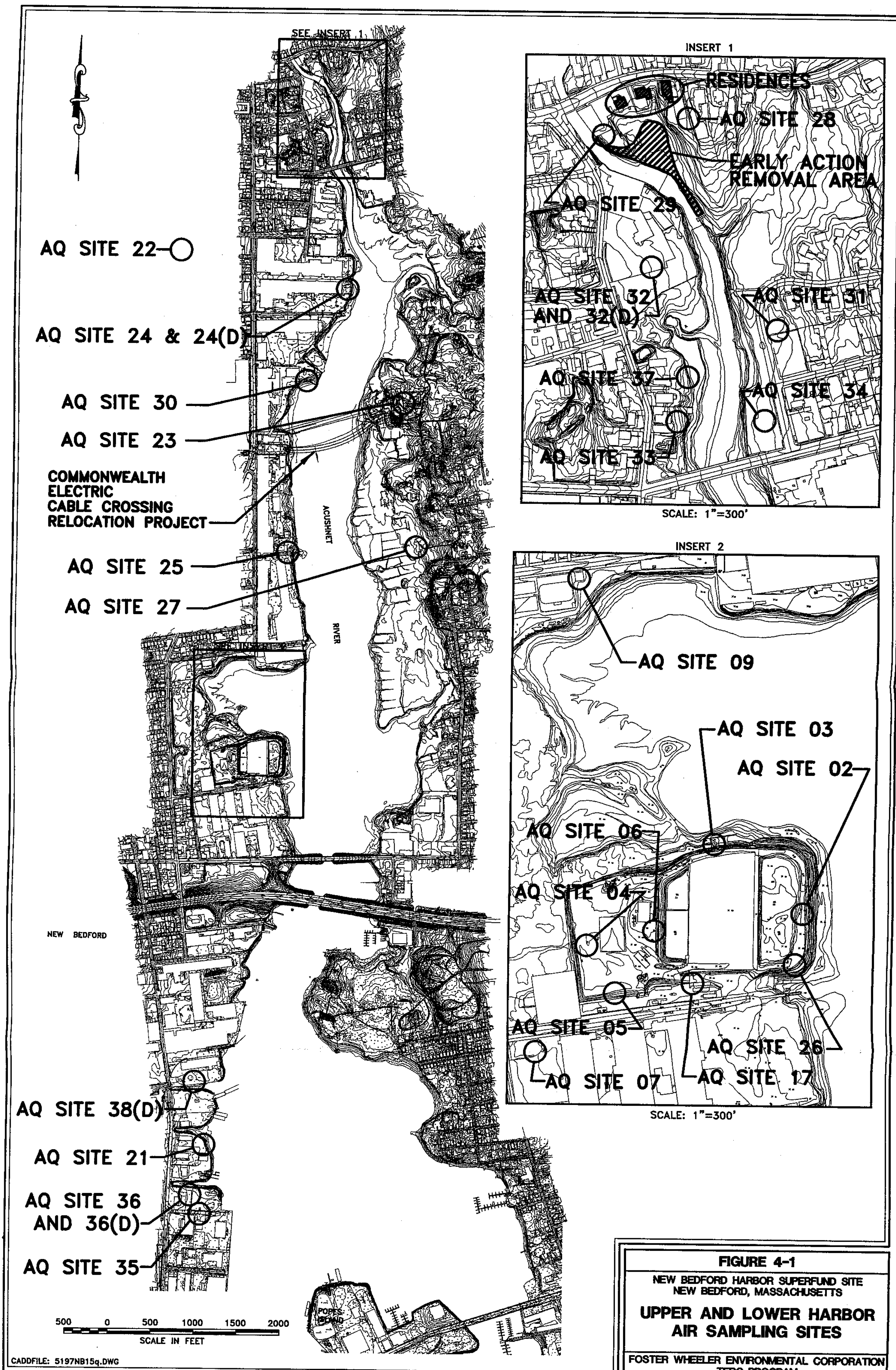

FIGURE 4-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

UPPER AND LOWER HARBOR AIR SAMPLING SITES

FOSTER WHEELER ENVIRONMENTAL CORPORATION
TERC PROGRAM

Confirmatory Sample Locations
Topographic and Bathymetric Contours
North Lobe Dredge Areas
Buildings

N

0 50 100 Feet

TETRA TECH FW, INC

NEW BEDFORD HARBOR SUPERFUND SITE
BRISTOL COUNTY, MASSACHUSETTS

Figure 4-2
North Lobe Dredging
Proposed Dredge Areas and
Actual Confirmatory Sampling Locations

DRAFT: DECEMBER 31, 2003

MA STATE PLANE
NAD 83 FEET
NGVD 29
1 FOOT CONTOUR INTERVAL

P:\Terc-5197\NBH\GIS\WORKDIR\03-n1220407-001.apr
North Lobe Sampling Layout

4.10 Demobilization

Dredge Area C was the last area to be dredged. Prior to completion of the dredging at Dredge Area C, the post-dredge bathymetric surveys for Dredge Areas A, B, and D verified that the material had been removed to depths as required on the Dredge Plans. Also the confirmation samples from those areas had been analyzed to verify that the remaining surface material within those areas had PCB concentrations less than the 50-ppm limit.

Once the base subcontract scope of dredging was complete at Dredge Area C, Maxymillian was placed on standby until confirmation samples were collected and analyzed. Due to two confirmation samples having PCB concentrations above the 50-ppm limit, Maxymillian was directed to perform additional dredging at Dredge Area C. Maxymillian was on standby from the time the subcontract dredging scope was completed until direction was given to perform additional dredging at Dredge Area C. This was a period of about two weeks.

Once the additional dredging at Area C was completed as directed, the dredge barge and associated equipment were demobilized from the North Lobe.

Prior to demobilization of the equipment from the Site, the Subcontractor decontaminated equipment that had contact with harbor sediment during dredging and sediment transfer activities per Toxic Substances Control Act (TSCA) requirements. The equipment that was decontaminated included the hoppers on the barges, dredge bucket, pumps, and water storage tanks. The decontamination fluids generated were collected in a scow and barged to the Sawyer Street Facilities where the decontamination water was pumped into Cell No. 1. All spent solvents and solvent-soaked pads used in the double wash/rinse decontamination procedure were disposed off-site by TtFW.

Refer to Appendix I for a list of equipment that was used on the project and copies of decontamination certificates that all equipment was decontaminated.

Once all material had been processed at the DDA, that equipment was decontaminated and demobilized from the Sawyer Street Site.

5.0 FINAL GOVERNMENT ACCEPTANCE INSPECTION

During the performance of the work, both USACE and TtFW representatives conducted inspection of the work. They jointly reviewed the post dredge bathymetric surveys to verify that sediments had been removed from the area to the depths as indicated on the Dredge Plans for Dredge Areas A, B, C, and D and that the additional dredging at Dredge Area C had been performed as directed. Refer to the final survey data of the dredged areas provided in Appendix C.

Results of the post-dredge confirmation samples are presented in the North Lobe Dredging Confirmatory Sample Results that was transmitted to the USACE in January 2004 (Transmittal No. N1.02.06-01).

See Appendix J for Pre-Final and Final Government Acceptance Inspection dated December 17, 2003.

6.0 OPERATION AND MAINTENANCE PLAN

No operation and maintenance plan was required for the remediation work performed at the North Lobe.

7.0 SUMMARY OF PROJECT COSTS AND SCHEDULE

7.1 Summary of Project Costs

Appendix F contains the North Lobe Dredging Cost Report dated June 3, 2005 (Final Updated Cost Report). The project costs are summarized in the following table.

Job Code	Job Description	Budget Cost	Actual Cost	Cost Variance
N1	TtFW Support Services	$522,380	$491,935	$27,453
N2	Dredging Subcontractor	$1,132,772	$1,482,575	($349,803)
	Total Project	$1,655,152	$1,974,510	($322,350)

These costs do not include the design, water quality monitoring, and site inspections performed by the USACE; nor are the costs of TtFW management that were included in the Task Order No. 24 GM account. Actual dredged volume was 3,952 CY, therefore, the average cost per cubic yard of material excavated was $524/CY.

Summary of variances by job and subtask level follow.

7.2 Job N1 – FWENC H. O. Support – North Lobe Dredging

Job N1 had a cost underrun of $27,453 (5.26%).

7.2.1 Task N1.01 – Mobilization and Preparatory Work

<u>Subtask N1.01.03 – Submittals/Implementation Plans</u>

A number of project plans and documents required amendments to cover the type of activities to take place under this scope of work. These amendments, as well as the Work Plan, are described below.

<u>Activity N1.01.03.01 – Field Sampling Plan (FSP)</u>

The efforts to prepare an amendment to the Project FSP were included under this activity. This document did include procedures for the collection of air and sediment samples. The plan did briefly discuss the objectives for sampling, the analyses required, and relevant decision levels for evaluating results. Summaries of the frequency of sampling and associated QA/QC samples were also discussed. This effort had a cost underrun of $1,080 (16.6%).

<u>Activity N1.01.03.08 – Site Safety and Health Plan (SSHP)</u>

TtFW worked with the Dredging Subcontractor to update the existing SSHP to address this work. No direct charges were made to this account, hence a cost underrun of $1,117.

<u>Activity N1.01.03.13 – Work Plan</u>

This activity included the preparation of both the draft Work Plan modification, including meetings, conference calls, information gathering, negotiations, and the final Work Plan modification. The purpose of the Work Plan was to define the work activities and tasks in sufficient detail to aid the negotiation process and properly define the work to be conducted.

The Work Plan served as the basis for the referenced Cost Estimate and Project Schedule. Additional efforts for internal review and comments were included. This had a cost overrun of $3,451 (7.6%).

Activity N1.01.03.15 – Transportation and Temporary Storage Plan (TTSP)

The existing site TTSP did not require amendment. Hence this activity had a cost underrun of $2,243.

7.2.2 Task N1.02 – Monitoring, Sampling, Testing, and Analysis

Subtask N1.02.03 – Ambient Air Sampling and Analysis

Activity N1.02.03.02 – Non-real Time

This account includes the costs for Kevric to perform the sampling, evaluation, and reporting of air samples. Due to EPA reduction of air sampling requirements, this activity had a cost underrun of $7,465 (18.30%).

Subtask N1.02.06 – Sampling Soil and Sediment

Activity N1.02.06.03 – Sediment/Sludge

This account was for TtFW labor and CR Environmental to provide a boat with sample collection equipment for obtaining the confirmation samples. This activity had a cost underrun of $21,701 (51.08%) due to the elimination of the F Areas by the USACE in August 2003.

Subtask N1.02.09 – Laboratory Chemical Analysis

Activity N1.02.09.07 – Sediment Analysis

This activity had a cost underrun of $6,893 (21.62%).

Subtask N1.13.90 – North Lobe Water Treatment/Testing

This subtask was for the treatment and testing of wastewater that was discharged into the city sewer. There was a $10,897 (47.05%) underrun on this subtask.

7.2.3 Task N1.21 – Demobilization

Subtask N1.21.06 – Submittals

Activity N1.21.06.91 –After Action Report

This account contains the costs for the preparation of this report. This activity had a $28,930 (135.08%) cost overrun from what was originally estimated due to the report being more detailed in terms of sediment sampling mapping and data presentation than originally anticipated in the original cost estimate and due to additional review cycles because of missing or incomplete data in original drafts.

7.2.4 Task N1.22 – General Requirements (Optional Breakout)

Subtask N1.22.03 – Warehousing, Materials Handling, and Purchasing

Activity N1.22.03.02 – Purchasing Agent

The “Procurement Activities” included Acquisition Planning, Pre-qualification, Request for Proposal (RFP), Proposal Evaluation, Request for Consent, Award and Subcontract Management. The major procurement presently was for the Dredging Subcontractor. Costs were included for other procurements such as laboratory services and other required services.

Acquisition planning established objectives and tactics that obtain the best value for a specific procurement to accomplish the USACE’s needs. Acquisition planning focused on combining the purchase process with the objectives of project design and schedule while addressing all specific contract requirements.

This activity included the mailing and reproduction costs associated with procurement services.

This account had a $1,922 (6.06%) underrun.

Subtask N1.22.04 – Engineering, Surveying, and Quality Control

Activity N1.22.04.07 – Sciences

Included under this activity were the efforts to manage the technical components of work that pertain to sampling, analysis, data review and validation, and data evaluation. These included air sampling and analysis, confirmatory sediment sampling and analysis, wastewater treatment plant analyses, and material disposal sampling and analysis. Specific tasks included input/preparation of appropriate subcontractor SOWs, technical evaluation of bidder’s proposal, management of sampling and laboratory subcontracts, data review, evaluation, and reporting. This activity had a cost underrun of $5,712 (15.52%), due to expanded number of confirmatory sampling that was required by USACE and EPA.

Activity N1.22.04.11 – Home Office Engineers

This activity also includes costs for preparing the SOW for the Dredging Subcontract and review of subcontractor submittals. This activity had a cost overrun of $1,291 (4.69%).

Activity N1.22.04.14 – Estimate Preparation

This activity included the time and expenses for a cost estimator to prepare the Cost Estimate. This activity also included costs for internal peer review of the Cost Estimate. This activity had a cost overrun of $3,484 (14.39%).

Activity N1.22.04.24 – Quality Control Engineer

This activity included the cost of a TtFW construction engineer to supervisor the work and to monitor the quality control of all subcontractors and the costs of a vehicle. This activity had a cost overrun of $2,327 (3.27%).

Subtask N1.22.04 had a net cost underrun of $1,192 (0.75%)

Subtask N1.22.07 – Health and Safety

This Subtask has a net cost underrun of $14,070 (98.92%) since the TtFW-dedicated Safety and Health Office was not required for this work.

Subtask N1.22.11 – Miscellaneous Project Expenses

This subtask had an estimated cost of $1,000 for miscellaneous project costs. No charges were made to this account; hence this subtask had a cost underrun of $1,000.

7.2.5 Task N1.98 – Indirect Rate Adjustment – Est.

Subtask N1.98.01 – Indirect Rate Adjustment – Estimate

There is a forecast cost of $1,989 government approved DCAA for a potential indirect rate adjustment to the FY05 indirect rates.

7.2.6 Task N1.99 – Fee

This is the TtFW fixed fee for the work as required by USACE RFP 95, including all direct costs in Jobs N1 and N2.

7.3 Job N2 – North Lobe Dredging Subcontractor

Estimated costs are based on the Cost Estimate submitted with the North Lobe Dredging Work Plan while the actual costs are obtained from the Dredging Subcontract pricing form.

This job had net cost overrun of $349,803 (30.88%), which was due mostly to subcontractor bid prices being higher than estimated. This also takes into consideration that the subcontract bid prices were based on the 4,510 CY of material as defined in Table 1-1 and that the subcontract was adjusted after subcontract award to reflect the 4,090 CY as defined in Table 1-2.

7.3.1 Task N2.01 – Mobilization

This task included the costs for the Dredging Subcontractor to mobilize all of its equipment and personnel to the site. This included setting up of temporary facilities at the North Lobe and DDA, and the preparation of submittals.

This task had a cost overrun of $381,518 (289.26%). Part of the reason for this increase in cost was due to the difference in the way the work was estimated and how it was actually performed. The Cost Estimate was based on the materials being trucked from the North Lobe to the DDA, while the actual work was performed with small scows. The water transportation method had a higher setup cost than the trucking option.

7.3.2 Task N2.02 – Supply of Turbidity Curtain

Subtask 10 – Supply of Turbidity Curtain

This is the cost for the Dredging Subcontractor to supply and delivery turbidity curtain and oil boom to the North Lobe Site.

This subtask had a cost overrun of $6,762 (20.98%), which was due to actual cost being higher than the estimated costs.

Subtask 20 – Install Turbidity Curtain

Due to favorable results from the water quality monitoring of the dredging activities, the Subcontractor did not have to install the turbidity curtain and oil boom around the dredging work areas.

7.3.3 Task N2.03 – Dredging/Transportation/Processing

The Subtasks under Task N2.03 included the cost for dredging, transporting the dredged materials from the North Lobe to the DDA, processing materials at the DDA, and bathymetric surveys.

Subtask - N2.03.10 – Dredging/Transportation/Processing Area A

This subtask had a cost underrun of $23,328 (34.63%). This area was estimated to have 470 iscy excavated, but due to the USACE August 2003 revision, this volume was reduced to 280 iscy. This cost underrun was due to the reduced volume being lower than the estimated.

Subtask - N2.03.20 – Dredging/Transportation/Processing Area B

This subtask had a cost overrun of $1,002 (3.55%), which was due to variation of subcontract price from estimated cost. August 2003 volume was 180 CY, while estimated volume was 190 CY. This minor change in estimated volume did not effect the cost of the work.

Subtask - N2.03.30 – Dredging/Transportation/Processing Area C

This subtask had a cost overrun of $130,643 (217.64%), which was mostly due to the estimated volume of 400 iscy revised by the USACE to 1,330 iscy.

Subtask - N2.03.40 – Dredging/Transportation/Processing Area D

This subtask had a cost overrun of $70,864 (21.04%), which was due to the subcontract price being higher than the estimated cost.

Subtask - N2.03.50 – Dredging/Transportation/Processing Area F-1

Dredging of Area F-1 was deleted by the USACE, hence an underrun of $27,505.

Subtask - N2.03.60 – Dredging/Transportation/Processing Area F-3

Dredging of Area F-3 was deleted by the USACE hence an underrun of $28,856.

Subtask - N2.03.70 – Dredging/Transportation/Processing Area F-4

Dredging of Area F-4 was deleted by the USACE, hence an underrun of $60,705.

Subtask - N2.03.80 – Dredging/Transportation/Processing Area F-6

Dredging of Area F-6 was deleted by the USACE, hence an underrun of $27,505.

7.3.4 Task N2.04 – Grading of the DDA

This was the cost for the final grading of the DDA after all the dredged materials were processed. This work was transferred from the North of Wood Street cost budget and was not included the North Lobe Dredging cost estimate, hence the cost overrun of $9,649 (71.02%).

7.3.5 Task N2.05 – Demobilization

This task had a cost underrun of $89,806 (57.83%), which was due to the difference of the subcontract bid price from the Cost Estimate.

7.3.6 Task N2.06 – Survey Quantities

This is the cost for performing the bathymetric survey of the additional dredging performed at Area C that was not in the Cost Estimate, hence the cost overrun of $2,200.

7.3.7 Task N2.07 – Additional Dredging/Post Survey

This task included the dredging, transporting and processing of an additional 255 CY of sediments from Area C. This additional dredging was due to the results of confirmation sampling in Area C. Total cost of this work was $38,476 that was not in the Cost Estimate.

7.3.8 Task N2.08 – Steel Debris (Cutting)

This was an additional cost of $22,971 for cutting of steel debris into smaller pieces for placement into the DDA.

7.3.9 Task N2.09 – Standby Rate

This was an additional cost of $97,845 for equipment and labor standby from the Subcontractor completing the base scope of excavation work unit it was given direction to perform additional dredging at Dredge Area C. This included standby of dredge equipment and personnel at the North Lobe, scows and support boats, and equipment and personnel at the DDA.

7.3.10 Task N2.10 – Survey Quantity Calculations

This was an additional cost of $3,476 for having BCE perform volume calculations of actually excavated from the four dredge areas.

7.3.11 Task N2.12 – Screen Material From Area D

This was an additional cost of $2,500 for screening and placing contaminated materials from Area D into the DDA.

7.3.12 Task N2.14 – Gravel Fill in DDA

This was an additional cost of $2,370 for placing gravel fill in the DDA.

7.4 Field Change Notifications

A log of Field Change Notifications (FCNs) for this work is presented in Appendix H.

7.4.1 FCNs for Job N1 – TtFW Support

The following FCNs pertained to Job N1 for changes to the scope of TtFW support services.

<u>FCN 24-071 N1 Procurements</u>

This FCN was for the authorization to commence pre-dredge survey prior to the USACE issuing the Modification for this work. Cost of this FCN was included in the Job N2 costs for performing the work.

<u>FCN 24-092 NL Water Treatment/Testing</u>

This FCN was for the treatment and testing of water that TtFW pumped from Cell No. 2 and discharged to the city sanitary sewer. The costs for this FCN were not included in the cost report, but were funded under Modification 2418.

<u>FCN 24-101 Additional Analysis</u>

This FCN was for the additional testing of 46 confirmation samples for National Oceanographic and Atmospheric Administration (NOAA) PCB congeners, due to sloughing of sediments into the dredged areas. The costs for this FCN were not included in the cost report, but were funded under Modification 2418.

<u>FCN 24-120 Compressed Gas Cylinders</u>

There was an additional cost of $750 for handling and disposing of five compressed air cylinders, which were found in the scows at the DD during off loading operations.

7.4.2 FCNs for Job N2 – Dredging Subcontractor

The following FCNs pertained directly to the Dredging Subcontract.

<u>FCN 24-085 North Lobe Quantity Changes and Area F Deletion</u>

This FCN was only issued to document the changes due to the USACE revised drawings issued in August 2003. These changes have been addressed in the comments to the subtasks under Task N2.02 of the cost report.

<u>FCN 24-102 Additional Dredging/Confirmation Sampling</u>

This FCN was for the additional dredging and sampling that was performed in Area C due to the results of the first confirmation samples in that area. The costs for the additional dredging are included as Task N2.06 in the cost report. Costs of the additional sampling are included in Job N1 costs in the cost report.

FCN 24-109 Standby Time

The additional cost of $97,845 for this FCN was included in the cost report under Task N2.09. This cost was for the standby of dredging subcontractor's equipment and personnel from the time that the subcontract scope of dredging work was completed unit USACE determined that additional dredging was required at Dredge Area C.

FCN 24-114 Steel Debris Removal

This FCN is for the cutting of large steel debris removed from the North Lobe Dredge Areas for placement into the DDA. The additional cost of $22,971 for this FCN was included in the cost report under Task N2.08. During the preparation of the North Lobe Dredging Work Plan and Cost Estimate it was not anticipated that steel debris removed from the North Lobe Dredge Area would require down sizing for placement into the DDA.

FCN 24-116 Quantity Calculations

The USACE requested that Maxymillian's Hydrographic Survey Subcontractor perform volume calculations of the material excavated from the North Lobe Dredge Areas. Per the contract specifications this was work that was to be performed by the USACE. The cost of $5,676 was included in the cost report under Task N2.07.

8.0 OBSERVATIONS AND LESSONS LEARNED

8.1 Water Transport of Dredged Materials

The original Work Plan was based on the dredged sediment being offloaded onto the North Lobe and then trucked on city streets from the North Lobe Site to the Sawyer Street Facilities. The selected subcontractor proposed the alternate method of barging the materials from the dredge at the North Lobe to the DDA at the Sawyer Street Facilities.

The Subcontractor's use of small scows to transport dredged materials from the North Lobe to the DDA at Sawyer Street proved beneficial. The small scows were able to travel under the low clearance of the Coggeshall Street Bridge and maneuver in the shallow water at the DDA. Keeping the materials on the water eliminated the need for manifesting the material from the North Lobe to the Sawyer Street Facilities since the water is considered part of the Superfund Site. This eliminated the handling of materials at the North Lobe Site and the trucking of materials on the busy city streets. The on water transport of the dredged materials proved to be a safe and cost-effective method of transporting contaminated materials.

The lessons learned are that it is beneficial to utilize water transport whenever possible and limit the trucking of materials on city streets.

8.2 Verification of Dredged Depths Prior to Confirmation Sampling

The Dredging Subcontract was written for the Dredging Subcontractor to remove sediments to depths as indicated on the USACE design drawings. The Dredging Subcontractor was to perform pre-dredge bathymetric surveys prior to commencing the dredging work to determine the existing mud line elevations. Based on the pre-dredge elevations, the Dredging Subcontractor would then determine excavation elevations by subtracting the specified dredge depths from the pre-dredge elevations. Once the dredging in an area was completed, the Dredging Subcontractor was to perform a post-dredge bathymetric survey to verify that the material had been removed to the required depths. Verification that dredging was performed to the required depths was to be done prior to collecting the confirmation samples.

Since Maxymillian was using a GPS kinematic positioning system to control and record the excavation depths of the dredge bucket, the USACE decided to use this information as verification that the required dredge depth had been met. Based on review of the data indicating the locations and depths where dredge bucket had excavated, the USACE directed that the confirmation samples be taken once dredging within a dredge area had been completed. Hence, the post-dredge bathymetric survey was actually performed after the confirmation samples had been collected.

Upon the review of the post-dredge bathymetric surveys, it was discovered that there was sloughing along the sides of the dredge areas. It was determined that some of the samples had been obtained in areas where the post bathymetric survey showed that the material had not been dredged to the depths shown on the design drawings. The data from the dredge bucket positioning system recorded where the bucket excavated while the post-dredge bathymetric surveys show the actual post-dredge bottom conditions.

The confirmation sampling results from Dredge Areas A and B clearly indicated that the goal of removing sediments with PCB concentration above 50 ppm had been met. However, the confirmation results for Dredge Area D taken on October 7, 2003 had to be supplemented with additional samples taken ten days later on October 17, 2003. Dredge Area D required careful review of the post-dredge bathymetric surveys showing sloughing with the details of the confirmation sample results for the USACE to declare that the dredging objective for Dredge Area D had been met.

In the future, post-dredge bathymetric surveys should be used to verify that the design excavation depths have been obtained prior to performing confirmation sampling. The Dredging Subcontractor is contractually responsible for the dredging designated areas to specified depths. The only method of verifying that the Dredging Subcontractor has meet its contractual obligation is post dredging bathymetric surveys. Based on confirmation sample results, requirements for removal of additional materials can then be determined. It is also important that the same survey equipment and methods are used for both the pre- and post-dredge surveys.

8.3 Cross-Sections to Document Dredging

The specifications did not provide clear instruction on what was required for the as-built drawings to verify that the dredging had been performed. There were several iterations before the final format of cross-sections, as shown on the as-built drawings in Appendix C, was agreed upon. It was these cross-sections, which eventually showed sloughing of the side slopes, and areas where material had not been removed to the required depth.

The dredging contract documents should clearly define that the bathymetric surveys be verified by cross-sections showing the existing bottom, designed depths with over dredge limits and final excavated depths. If additional dredging is required due to the results of the confirmation sampling, then that additional dredging should also be shown on the cross-sections. The spacing of the cross-sections should not be greater than 20-foot spacing. For small areas, the bathymetric surveys should be performed in two directions.

8.4 Dredge Cut Side Slopes

The as-built cross-sections in Appendix C show as-dredged side slopes ranging from 1 vertical to 5 or 6 horizontal. The dredge design drawings indicated side slopes of 1 vertical to 1 horizontal. This sloughing of the side slope would have increased the total volume of material to be removed had all the dredge areas had sediments removed as indicated on the design drawings. However, based on detailed review of the bathymetric survey results and the results from the confirmation sampling, the USACE representative determined that the material that had sloughed into the dredged areas had PCB concentrations above the target level of 50 ppm.

In future dredging design, the design side slopes of the dredging limits should be based on geotechnical data of the material to be dredged. Softer material will require greater design side slope than stiffer material. Variation in side slope angles will affect the quantity of materials to be removed. This is especially applicable when dredging small areas, as was the case in the North Lobe Dredging.

8.5 Standby Time

When the Dredging Subcontractor completed the contractual scope of dredging, the dredging equipment and DDA operations were put on standby while the final confirmation samples were collected and analyzed. The dredging equipment could not be demobilized from the site until the confirmation sample results were reviewed to determine if additional dredging would be required. The last of the contractual dredging was completed in Dredge Area C on October 14, 2003 and the post-dredge bathymetric survey was performed on October 16, 2003. Based on the results of the confirmation samples, on about November 2, 2003, direction was given to perform additional dredging in Dredge Area C. This was about two weeks of standby time.

The Dredging Subcontract did have a unit day rate for standby, but when the standby rate would be applied was not defined. This resulted in confusion of what standby cost the subcontractor was entitled to be reimbursed. This resulted in a negotiated change order taking into account standby cost for the dredging equipment and the processing equipment at the DDA.

Future dredging subcontracts should include a unit rate price for standby charges associated with each distinct operation and clear definition of when those rates are to be applied. Then the only issue to be resolved in the field would be the amount of standby time, and the requirement for a either a change order or claim would be avoided.

The following are suggested recommendations for future dredging contracts:

1. Define the completion of the dredging work as being after the post dredge bathymetric surveys have been completed and verify that the dredging has been performed to the depths and limits as shown on the contract drawings. The contractor had an obligation to remove all material to the minimum depths as indicated on the contract drawings.

2. Clearly define the time for confirmatory sampling and whether the period waiting for the confirmation sampling results is part of the overall dredge unit rate or standby costs.

3. Request pricing for various standby situations, such as standby costs for equipment and personnel on an hourly and daily basis; and standby cost for equipment only on a daily, weekly, monthly basis.

4. Clearly define under what circumstances standby charges will be allowed and more importantly will not be allowed. In general, with the exception of weather delays, standby charges should be allowable for anything that is not directly under the subcontractor's control, such as delays in sampling/analysis/evaluation of confirmatory sampling results. Conversely, it should not be allowable for having to stop dredging because the contractor is not taking the proper controls to minimize turbidity, which is work under its direct control.

These recommendations will help to achieve clearer definition of applicable standby charges in the dredging contract, but that is only one aspect of controlling standby cost during construction. The other aspect is to minimize the amount of standby time that is incurred from the time the dredging contractor has completed the contractual scope of work until the owner makes the final decision if additional dredging will be required based on confirmatory sample results. This requires up front planning and subsequent implementation of the final confirmation sampling, so that construction and supporting activities proceed in a manner that minimizes the amount of incurred standby time. Efforts should be taken to expedite the determination of the need for additional material removal.

8.6 Debris in Dredged Sediments

There was a large amount of debris from this dredging operation including wood, steel, and steel cylinders that were not fully realized when writing the Work Plan for this work. The debris not only had direct costs for handling and processing the debris, but the large amount of debris also had a negative effect on dredging production rates. In some cases, the debris would prevent the hydraulic bucket from closing, allowing sediments to flow out from the bucket possibly contributing to the sloughed material in the dredged area which was indicated on some of the post-dredge bathymetric surveys.

Future Work Plans should address how debris should be handled and disposed. Future contract documents should have provisions to pay the dredging contractor for handling and disposal of debris that could be encountered in the dredged sediments. In cases where large pieces of debris are known to exist, an effort should be made to remove those large pieces of debris prior to dredging the sediments. Ways to identify pieces of debris is to conduct side scan sonar and magnetic surveys in the areas to be dredged.

8.7 Hydraulic Transport of Dredged Materials

Consideration was given to pumping materials from the North Lobe to the DDA, thus eliminating the trucking or barging of the dredged sediments. The unit costs for the hydraulic transport of the dredged sediments are less than either trucking or barging of the materials. But the costs for setting up pumping operations, such as pumps, pipelines and transfer operations, were more costly than the setup costs required for either trucking or barging of the dredged sediments. Due to the small volume of materials involved in the North Lobe Dredging, the barging of the dredged sediments was more economical than pumping.

To hydraulically transport the dredged sediments, debris has to be removed prior to the material being pumped. In the case of the North Lobe material with the high amount of debris, this would have been a significant effort.

The lesson learned is that the cost-effective method of transporting and processing of materials is dependent on a number of factors, which include the following.

- Type of material to be dredged – silt, high organic content, sandy, etc.
- Method of dredging materials – mechanical or hydraulic.
- Volume of materials to be excavated – lower processing costs on large volumes can justify higher setup cost.
- Amount of debris expected – large volumes of debris could eliminate the possibility of hydraulic dredging and transport of materials.
- Distance that material are to be transported – cost of transport pipelines over long distances can eliminate the cost effectiveness of hydraulic transport of dredged sediments.
- Method of processing and disposal of materials.

8.8 Water Quality Monitoring

In navigational dredging contracts, it is common for the requirement of water quality monitoring to be performed by the dredging contractor. For the North Lobe Dredging, the USACE performed the water quality monitoring which worked well. This allowed the USACE to adjust the water quality monitoring efforts as the dredging work progressed.

For future environmental dredging efforts, it is recommended that the owner perform the water quality monitoring. In the case of the North Lobe Dredging the USACE was the owner. This allows for the dredging contractor to concentrate on performing the work rather than performing regulatory functions and allows the owner to have more control over the monitoring functions.

8.9 Over-Dredge Penalty

Due to limited capacity of Cell No. 1 to receive dredged materials, there was a penalty for over dredging. The payment for the dredging of the four areas was set up to be a lump sum for the dredging of each area. It was the Dredging Subcontractor’s responsibility to dredge to the required depths and the over-dredge penalty was added to ensure that the storage capacity of Cell No. 1 was not exceeded and the amount of excess sediments to be processed and disposed would be limited. This turned out not to be an issue for the North Lobe Dredging because dredging for the F areas was eliminated. However, this consideration should be given to future dredging and excavation contracts to protect increased cost of processing and disposal of excess dredged sediments.

8.10 Use of Lump Sum Payment

Since the scope of dredging work was defined to specific small areas, the payment for the dredging of each area was on a lump sum basis rather than a unit rate for measured volume of sediments removed. This allowed the Dredging Subcontractor to price out the work for each area and provided an incentive to not remove more material than was required. This also made the measurement and payment for the work more straightforward.

It is recommended that this approach of lump sum payment be utilized as much as possible on future dredging and excavation contracts.

8.11 Bathymetric Surveys Done by Dredging Contractor

In normal USACE dredging contracts, the owner is performing the pre and post bathymetric surveys to determine payment quantities. In the case of the North Lobe Dredging, the pre and post bathymetric surveys were only performed by the Dredging Subcontractor and were monitored by the USACE and TtFW field personnel. The Dredging Subcontractor was able to effectively schedule the bathymetric surveys with the ongoing dredging production work. This also eliminated possible delay claims of not having owner surveys supplied in a timely manner.

The specifications should clearly define the requirements for contractor surveys and when these surveys are to be performed. There should be methods to verify the contractor supplied survey information.

8.12 Confirmation Sample Elevations

The northing and easting coordinates were recorded for each confirmation sample taken; the surface elevation of the samples was not obtained. The elevation of the samples is important when evaluating the confirmation sampling results. Not having the sample elevations made it impossible to determine if the samples are taken from sloughed material or actual bottom of the dredged profile.

The elevation of the samples should be determined by use of lead lines and tide gauge readings when the samples are collected. The soundings should take into consideration the soft mud bottom. The other option is to obtain the sample elevation based on the most recent bathymetric survey of the area. It is realized that the elevation of the samples will not exactly match what is shown on a bathymetric survey for two reasons: One is the difference in survey methods, and the second is due to variations in bottom contours. The sample has high probability of being taken at a location that was not sounded, since the bathymetric surveys are performed on transects spaced 10 to 25 feet apart.

The surface elevation of the confirmation samples should be recorded along with the northing and easting grid coordinates. This is particularly important when confirmation samples are in areas that required additional dredging. The results of the confirmation samples should be shown on the final cross-sections of the dredged areas as verification that the final surface materials in a dredged area have been remediated to the specified cleanup goals.

9.0 CONTACT INFORMATION

U. S. Environmental Protection Agency

Jim Brown
Remedial Project Manager
USEPA Region I
One Congress Street, Suite 1100
Boston, MA 02114-2023
617.918.1308

Dave Dickerson
Remedial Project Manager
USEPA Region I
One Congress Street, Suite 1100
Boston, MA 02114-2023
617.918.1329

Massachusetts Department of Environmental Protection

Paul Craffey, State Coordinator
Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108
617.292.5591

United States Army Corp of Engineers

Maurice Beaudoin
USACE - New England District
USACE - New Bedford Resident Office
103 Sawyer Street
New Bedford, MA 02746
978.318.8223

Gary Morin
Project Manager
USACE - New England District
696 Virginia Road
Concord, MA 01742-2751
978.318.8232

Robert Simeone
Project Engineer
USACE - New England District
696 Virginia Road
Concord, MA 01742-2751
978.318.8713

Chris Turek, P.E.
USACE - New England District
USACE - New Bedford Resident Office
103 Sawyer Street
New Bedford, MA 02746
978.318.8234

Maxymillian Technologies, Inc.

Al Steinhoff
Remediation Manager
Maxymillian Technologies, Inc.
One McKinley Square
Boston, MA 02109
617.557.6077

Tony Pisanelli
Project Manager
Maxymillian Technologies, Inc.
One McKinley Square
Boston, MA 02109
617.557.6077

Tetra Tech FW, Inc.

David A. Beck, P.E.
Senior Construction Manager
Tetra Tech FW, Inc.
133 Federal Street, 6th Floor
Boston, MA 02110
617.457.8417

George Willant
Chief Project Manager
Tetra Tech FW, Inc.
133 Federal Street, 6th Floor
Boston, MA 02110
617.457.8259

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