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Water Quality Monitoring Summary Reports 2004

New Bedford Harbor Superfund Site - New Bedford, Massachusetts

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Contract:
DACW33-00-D-0003
Task Order 0012
ENSR Document No.
09000-350-750

2004 Water Quality

U.S. Army Corps of Engineers
New England District

U.S. Environmental Protection Agency

Water Quality Monitoring Summary Reports 2004 New Bedford Harbor Superfund Site

Prepared by:

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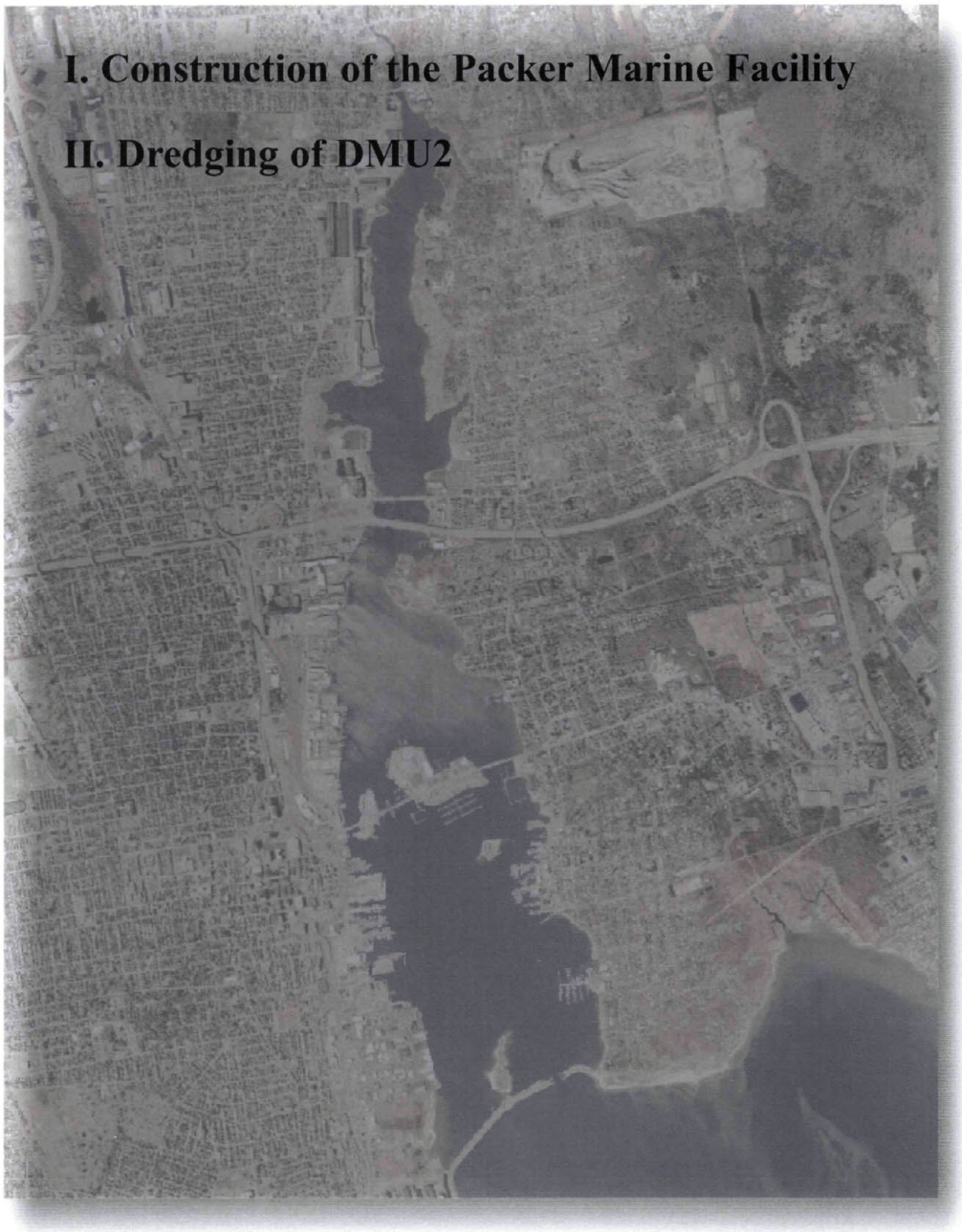
Water Quality Monitoring Summary Reports 2004

New Bedford Harbor Superfund Site - New Bedford, Massachusetts



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I. PACKER MARINE

US Army Corps of Engineers®
New England District

U.S. Environmental Protection Agency

Water Quality Monitoring Summary Report

Construction and Dredging of the Packer Marine Facility

New Bedford Harbor Superfund Site – New Bedford Massachusetts

Prepared by:

ENSR INTERNATIONAL

CR ENVIRONMENTAL, INC. WBE

Contract DACW33-00-D-0003-Task Order 12

Document No. 0-9000-350-320

Final December 2005

REVISION NOTES

Packer Marine Facility Water Quality Monitoring Report

A draft of this report was first prepared in March 2005.
Based on comments, outlined in the Response to Comments (RTC) – Appendix C, the draft report was revised to produce this final report dated December 2005.Those portions of the original document that did not require revision retain the original draft report date of March 2005.

A summary of the revisions are as follows:

1. *Cover page – Edited date, changed Draft to Final.*
2. *TOC – Added a list of appendices section, Added Appendix E to list, Page numbers adjusted based on required edits and reformatting. File path and footer date changed.*
3. *Text – An entire body of text (dated December 2005) has been provided to supersede the draft version. Page numbers adjusted based on required edits and reformatting. File path and footer date changed.*
4. *Tables – no RTC requirements to tables however a typo was corrected in Table 1; a modified table is provided.*
5. *Figures - no RTC requirements thus no changes made*
6. *Appendices – Edited existing and/or created new cover pages for each existing appendix Added cover page for Appendix E, added content of RTC to Appendix E.*

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EXECUTIVE SUMMARY

As part of the overall remediation effort for the New Bedford Harbor Superfund Site, a new barge docking facility was constructed at the former Herman Melville Marine Boatyard for the relocation of Tisbury Towing and Transportation Company, Inc. (referred to as the Packer Marine Facility). In-water work required to build the facility included construction of a bulkhead and finger pier, as well as dredging approximately 10,000 cubic yards of sediment for an approach channel. The area of construction and dredging contained some sediments with elevated concentrations of PCBs and metals. As a result, a full-depth silt curtain and oil boom were required for the in-water work as well as the performance of water quality monitoring.

The water quality monitoring program was developed by the USACE and the USEPA to ensure construction and dredging activities were carried out in a manner that did not result in acute impacts to organisms within the water column adjacent to the activities or in significant transport of contaminated sediments outside the work zone. The monitoring focused on real-time measurement of water column turbidity around and down-current of the construction/dredging activities and set a project-specific turbidity criterion of 50 nephelometric turbidity units (NTUs) above background at a point 300 feet down-current form the project activity. The program also included sampling for toxicity testing and chemical analyses contingent on exceedence of the turbidity criterion.

Construction was initiated in May 2004 and was completed in January 2005. Water quality monitoring revealed that the turbidity control measures worked well with limited elevation of suspended solids outside the immediate construction and dredging area. There were no exceedences of the 50 NTU above background turbidity criterion 300 feet down-current of the construction and dredging. Similar to previous monitoring of work within New Bedford Harbor, highest measured turbidity levels were associated with vessel and equipment movement. Toxicity testing performed on water samples collected from within an area of elevated turbidity in the work zone confirmed the ecological protectiveness of the +50 NTU criterion.

1.0 INTRODUCTION

1.1 Site Background

New Bedford Harbor is located approximately 50 miles south of Boston on the waters of Buzzards Bay in Bristol County, Massachusetts. The sediments in many areas of the Harbor are contaminated with polychlorinated biphenyl's (PCB's) and metals, primarily from the manufacture of electrical components which occurred in the area between 1940 and the mid-1970's. Based on human health concerns and ecological risk assessments, the U.S. Environmental Protection Agency (USEPA) added New Bedford Harbor to the National Priorities List in 1982 as a designated Superfund Site, and stipulated that remedial measures were required to remove PCB-contaminated sediments from the Harbor. Through an Interagency Agreement between the USEPA and the U.S. Army Corps of Engineers, New England District (USACE), the USACE is responsible for carrying out the design and implementation of the remedial measures.

The New Bedford Harbor Superfund Site extends from the shallow northern reaches of the Acushnet River estuary, south through the commercial harbor of New Bedford and out beyond the City's hurricane barrier into 17,000 adjacent acres of Buzzards Bay. The Superfund Site is divided into three areas: the Upper, Lower and Outer Harbors defined by geographical features of the Harbor and gradients of sediment contamination (Figure 1). The industrial discharge of PCB contaminated waste, either directly into the Harbor or indirectly through the City's sewer system, was most significant in the Upper Harbor. The location of the associated PCB discharge and the hydrodynamics of the Harbor contributed to the deposition of significant levels of PCB contamination in the Upper Harbor. The highest PCB concentrations or "hot-spots", which contained PCB concentrations in excess of 100,000 ppm, resided in the sediments located in the immediate area of the discharge. These "hot-spot" sediments were removed between 1994 and 1995 as part of the USEPA's first cleanup phase (USEPA, 1997). The remaining sediments in the Upper Harbor, an area of approximately 190 acres, are still heavily contaminated, with PCB concentrations in the thousands of ppm in some sections.

As part of the progression of the overall New Bedford Harbor Superfund Site remediation effort construction of a Sediment Dewatering, Material Transfer & Receiving Facility began in 2002 at the southern lobe of the former CDF-D facility in the Lower Harbor, now referred to as Area D (Figure 1). The dewatering facility was designed to receive dredged material from remediation areas of the Harbor for processing. As part of the construction of the dewatering facility, Packer Marine, originally located at Area-D, was relocated to the north at an area referred to as the North Lobe, approximately one-half mile south of the I-195 Bridge along the western shore of Lower New Bedford Harbor (Figure 1). The relocation of Packer Marine required site and shoreline development of the North Lobe area which included construction of a shoreline bulkhead and dredging of an approach channel.

1.2 Overview of Packer Marine Facility Construction

The Packer Marine relocation project involved the construction of a barge docking facility consisting of a bulkhead and attached finger pier, dredged approach channel, and a truck access ramp (Figures 2 and 3). Both the bulkhead and finger pier were built of filled cellular sheet-pile cofferdams and were designed to contain material dredged from the access channel. The truck ramp was constructed on the south side of the bulkhead to provide truck access to barges. The entire structure extends approximately 320 feet into the harbor from the existing shoreline. The bulkhead, 160 by 100 foot, was formed with 6 individual cells varying between 35 and 45 feet in diameter and connected by sub-arcs. The attached finger pier, 200 feet long and 50 feet wide, was constructed of four 45 foot diameter cells and extends into the harbor to provide barge dockage capability and vehicle access. The circular cells served a dual purpose as the structural center of the finger-pier as well as sediment containment for the material removed during dredging of the access channel for the facility.

Construction of the facility was initiated in May 2004 and completed in January 2005. The work was performed by Reed & Reed (Woolwich, ME) under contract to Tisbury Towing & Transportation, as a Business Relocation funded by the Government. The work included shore-based components as well as in-water construction and dredging. Because previous investigations had identified elevated levels of sediment contamination in the construction/dredging area, the work was performed with a full-depth silt curtain and oil boom around the in-water perimeter of the site to contain suspended sediments and floating debris/surface sheens. In addition to these measures, a water quality monitoring program was developed for the in-water work as described below.

1.3 Water Quality Monitoring Program

Previous sampling and analysis of sediments in the North Lobe area detected elevated levels of PCBs and metals, most notably copper (USACE unpublished data). A follow-up sediment characterization investigation was performed on the sediments in this area and confirmed the elevated metals concentrations and revealed the potential for acute suspended phase toxicity (ENSR 2003). As a result, the USEPA and USACE identified areas in the vicinity of the planned construction where special handling of sediments was required because of the contamination levels. Consistent with previous remediation work at New Bedford Harbor, the USEPA and USACE also developed a water quality monitoring program to ensure that the construction operation was carried out in a manner to meet the following goals:

- The disturbance of the contaminated sediments does not result in any acute impact to organisms within the water column outside the construction area.

- There is not significant transport and deposition of sediments and their associated contaminants outside the construction zone to uncontaminated areas or areas that have already been remediated.

The monitoring focused on real-time measurement of turbidity down-current of dredging/construction with conditional sampling for toxicity testing and chemical analyses. A project-specific turbidity criterion was set at 50 NTUs above background at 600 feet down-current of the work zone (Figure 3). The criterion was developed by the USEPA and the USACE based on a review of previous dredging and monitoring activities at the New Bedford Harbor Superfund Site (ENSR 2003), harbor sediment contamination levels, and current patterns in the vicinity of the construction and dredging area. The monitoring was performed throughout dredging and construction, more intensively at the start of each phase with the greatest potential for water-related impacts and periodically throughout the rest of project. As described in Section 2, the monitoring program contained provisions for additional sampling and analyses and for corrective action for the construction operation to ensure that the project environmental goals were met. The water quality monitoring was performed by ENSR and CR Environmental under USACE contract DACW33-00-D-0003.

2.0 METHODS

2.1 Program Overview

The water quality monitoring program for the Packer Marine Facility construction and dredging included field verification of water quality controls, field monitoring of water quality parameters, and contingency sampling and laboratory analyses. The field monitoring focused on real-time measurement of water column turbidity and followed the protocol developed for previous water quality monitoring at New Bedford (Figure 4). Initial monitoring was performed in the immediate vicinity of the construction/dredging operation as well as at an up current reference location. If turbidity was elevated outside of the silt curtain or immediate work zone, additional monitoring was performed along transects located 300 and 600 feet down-current of the operation. In the event the project turbidity criterion (50 NTU above background) was exceeded at the 300 foot down-current transect additional monitoring, collection of water samples for analysis, and notification of the resident project engineer for implementation of corrective action would be carried out. If the criterion at the 600 foot down-current transect was exceeded additional sampling and immediate shut down of project operations would occur (Figure 4). A tiered set of laboratory analyses was implemented if elevated turbidity triggered collection of samples, similar to the protocol used in previous monitoring at New Bedford Harbor (Figure 5). Biological (toxicity) testing formed the initial level of tests with chemical testing (PCBs, metals) contingent on poor survivorship in the toxicity test.

The monitoring was conducted at varying levels of intensity, depending on the potential level of impact for a given construction or dredging operation. Specifics of the monitoring program are presented below. Additional details can be found in the Scope of Work (SOW) for the Water Quality Monitoring during Construction and Dredging Activities at Packer Marine, New Bedford Harbor Superfund Site (Appendix A) and the Quality Assurance Project Plan Addendum (ENSR 2004a).

2.2 Field Monitoring and Sampling

The monitoring program consisted of shore- and boat-based components. Periodic shore-based observations were performed to assess the position of water quality controls (booms/curtains), to provide observations of potential shoreline turbidity and sheens, and to coordinate the boat-based monitoring with the construction schedule. The boat-based monitoring and sampling operations were conducted at varying levels of intensity depending on the nature of the dredging operation.

The timing of this monitoring coincided with the project construction and dredging activities deemed to have the greatest potential to affect water quality, including:

- Removal and handling of material left behind during the demolition relic vessel removal activities of 2003;
- Pile driving into possible contaminated sediments; and
- General in-water construction and dredging activities.

Monitoring and sampling activities were conducted using a Jon-boat operated by CR Environmental. Geographic information for field data collection and sample collection were documented using a Garmin hand-held GPS. Distance measurement between dredge activity and survey vessel was determined by using a laser range finder. During the initial phase of the project, debris removal and pile driving, monitoring was performed using an optical backscatter (OBS) nephelometer, during the later dredging phase Yellow Springs Instruments (YSI) multiparameter meters were used. Grab water samples were collected using a 12-volt Teflon diaphragm pump and the appropriate length of C-FLEX Teflon composite tubing. Details on the use and maintenance of the OBS Sensor and the YSI are found in the Standard Operating Procedures attached to Field Sampling Plan (ENSR 2004b).

On each monitoring day, turbidity measurements were performed periodically along the two down-current stations (based on tidal stage) of the established 300 and 600 foot mixing zones around the construction/dredging operation. Monitoring was performed throughout the water column at one to two ft intervals depending on the overall water depth. In addition to the down-current monitoring stations, background (i.e., reference station) measurements were performed outside the influence of project operations, approximately 1000 feet up-current (based on tidal stage) of operations (Figure 3). Background measurements were obtained outside the influence of any localized turbidity sources such as CSO discharges or storm water drains, but were performed in an area representative of the water flowing through the deeper channel areas up-current of the demolition area. The real-time nature of these measurements allowed for direct correlation between construction and dredging activities and water column impacts. A field log sheet was completed each monitoring day and documented the date, time, position, sample location, sample ID, meteorological observations, water depth, turbidity, temperature, dissolved oxygen and other pertinent observations that would impact the sample (Field Log Sheets are attached in Appendix B).

2.3 Laboratory Analyses

Water samples that were collected for analysis part of the monitoring were containerized, labeled, and submitted to the designated laboratories as specified in Field Sampling Plan in (ENSR 2004b). Biological testing included acute toxicity tests using the sea urchin sperm fertilization test (*Arbacia* sp.) and the *Mysid* shrimp (*Mysidopsis* sp.) test. Toxicity results were available from 24 hours to 1 week after sampling depending upon the specific test/analysis requirements and relevance to ongoing construction activities. Parameters analyzed included total suspended solids (TSS) and turbidity with potential analysis of dissolved copper, total copper and lead, dissolved PCBs, total petroleum hydrocarbons (TPH), oil and grease. Additional details are available in the QAPP.

3.0 RESULTS

3.1 Construction Summary

Construction of Packer Marine began in May 2004, and initial activities included pile driving, concrete pouring for abutments, and assembly of steel frameworks. Prior to larger scale in-water activities a full-depth silt curtain with oil boom was installed around the work area to contain any sediment, oils or floatables released during dredging activities. Piles were driven around the work area to secure the silt curtain. During construction and dredging activities a work boat was responsible for maintaining the silt curtain/boom, and monitoring for any oil slicks or floating debris. Debris removal began in June 2004 and was accomplished by scooping debris from the harbor bottom using two barge-mounted cranes and outfitted with open buckets. A small tugboat was used to reposition the barges. After debris was cleared from the cell footprint, construction was initiated by driving sheet-piles to form cell walls. Dredging the channel continued through November and was halted in December when excavation inside cells took place. Dredging the approach channel resumed in early January and was completed by mid January 2005.

3.2 Monitoring Summary

A total of 15 days of boat-based water quality monitoring was performed during construction and dredging activities as well as periodic shore-based observations. A summary of the boat-based monitoring is provided in Table 1. Shore-based observations began in May 2004, during initial construction and framework assembly, the silt curtain was installed and debris on the harbor bottom was detected in the construction areas. Initial in-water construction activities produced little disturbance to bottom sediments and no visible sediment plumes were observed. Water quality monitoring began in June 2004, during the early phases of Packer construction which included pile driving and debris removal. During this initial activity little turbidity was observed outside the silt curtains and monitoring was suspended until dredging began in October 2004. The water quality monitoring program resumed in mid October 2004 and was conducted 2 to 3 days per week for the initial phase of dredging. After the initial dredging phase, impacts to water quality were determined to be minimal, and monitoring decreased to one day per week. Dredging activities declined in December, and monitoring was suspended until dredging resumed again in January. Dredging and monitoring resumed in early January 2005, and the project was completed in mid January 2005.

3.3 Turbidity Measurements

On each monitoring day, turbidity measurements were conducted periodically at a background reference location along the down-current edge (based on tidal stage) of the established 300 foot mixing zone, and around the immediate construction/dredging operation. During the duration of the project, background turbidity values obtained at reference stations were less than 10 NTUs. Turbidity 300 feet down-current of the project activity was, on average, less than 20 NTU above background except during barge movement. The highest turbidity noted at the 300 foot down-current location was approximately 35 NTU above background, noted on three occasions during monitoring when barges were repositioned. Turbidity at the 300 foot down-current mixing zone was often at or near background levels. Turbidity immediately down-current of the silt curtain was, on average, less than 30 NTU above background except on occasions when dredge barges were repositioned using tugboats and sediment dropped from buckets outside the silt curtain.

The highest turbidity level measured (approximately 76 NTU above background) occurred on 01 November 2004, approximately 25 feet down-current of the silt curtain (100 ft down-current of activity) during repositioning of a dredge barge inside the silt curtain. As the project tugboat pushed the barge forward its propwash re-suspended bottom sediments. A visible turbidity plume was observed flowing south with the ebb tide. Although turbidity levels dropped significantly at 300 foot down-current station (14 NTU) no turbidity exceedences occurred samples were collected 25 feet down-current of the silt curtain within the plume to verify the protectiveness of the +50 NTU criterion. In addition to repositioning barges, other activities that resulted in elevated turbidity included release of dredged material back into the dredge area (when a bucket was brought up with limited material or was hindered with debris), and/or the loss of material as the crane swung the bucket back to the cells.

3.4 Biological and Chemical Testing

Samples collected on 01 November 2004, during the 76 NTU occurrence within the 300 foot mixing zone of the project, were submitted for biological testing to verify the protectiveness of the project turbidity criterion. Acute toxicity testing was performed using the sea urchin sperm fertilization test (*Arbacia* sp.) and the *Mysid* shrimp (*Mysidopsis* sp.) survival test. As presented in Table 2, there were good fertilization rates for the *Arbacia* test during the toxicity analysis and good survivorship of test organisms in the *Mysid* test. Given the favorable results of the toxicity testing, the chemistry samples that were collected and archived were only analyzed for TSS, with a resulting value of 15 mg/L for TSS and a laboratory measured turbidity of 92 NTU. Biological and Analytical laboratory results are provided in Appendix C. Since the project turbidity criterion (50 NTU above background 300 feet down-current of the construction/dredging) was not exceeded, no compliance samples were submitted for testing. A summary of the toxicity results are provided in Table 2.

4.0 DISCUSSION AND CONCLUSION

The construction of the Packer Marine Facility involved a significant component of in-water work, including removal of debris imbedded in bottom sediments, driving of sheet-pile to create cells for a bulkhead and pier, dredging of an approach channel, and placement of dredged material within the sheet-piled cells. As sediments in the area were known to contain elevated levels of PCBs and metals, the in-water work was performed within a full-depth silt curtain and oil boom. The water quality monitoring revealed that the site controls were successful; there was limited transport of suspended solids outside of the curtained area for most facets of the construction, and there were no exceedences of the project-specific turbidity criterion of 50 NTU above background 300 feet down-current of the construction/dredging activity.

As in the water quality monitoring of previous projects that have been part of the remediation effort, the movement of vessels and equipment caused the greatest level of sediment resuspension. The highest turbidity levels recorded during the monitoring occurred during tugboat/barge relocation within the curtained area. Turbidity levels reached approximately 30 NTU above background at the 300 foot down-current boundary during this event, but were more than 70 NTU above background closer to the silt curtain. Toxicity testing was performed on water samples collected in the area of maximum turbidity. The testing demonstrated that turbidity levels over 70 NTU above background created no adverse impacts to survivorship or fertilization rates of test organisms, providing confirmation that the +50 NTU criterion was ecologically protective for work in this area of the Harbor.

Components of the monitoring that helped to create an effective overall program were the reliance on real-time field measurements and an adaptive monitoring schedule. The measurement of turbidity allowed for real-time feedback on the potential impacts of a given construction activity and evaluated the placement and effectiveness of the silt curtain. The turbidity monitoring was also effective as a surrogate for more traditional sampling and laboratory analysis. The monitoring program was also designed to allow adaptation to the varied construction schedule and to the results of the monitoring itself. Relatively intensive monitoring was scheduled at the outset of a new construction/dredging activity, but the monitoring schedule was reduced if the monitoring revealed limited impacts to water quality.

5.0 REFERENCES

ENSR. 2003. Water Quality Monitoring Summary Report – Construction of the Commonwealth Electric Cable Crossing, New Bedford Harbor Superfund Site. August 2003.

ENSR. 2004a. Quality Assurance Project Plan for Packer Marine Site, New Bedford, Massachusetts. 2004.

ENSR. 2004b. Field Sampling Plan, New Bedford, Massachusetts. 2004.

Foster-Wheeler Environmental Corp. (FWENC). 2001. Pre-Design Field Test Dredge Technology Evaluation Report. New Bedford Harbor Superfund Site. August 2001.

USEPA. 1997. Report on the Effects of the Hot Spot Dredging Operations – New Bedford Harbor Superfund Site, New Bedford, Massachusetts. October 1997.

TABLES

Table 1. Water Quality Monitoring Summary

Date	Day	Dredging Activity	Tidal Stage(s)	Background Turbidity (NTU)	Turbidity Range near Dredging Activities (NTU)	Turbidity Exceedence	Sampling for Laboratory Analysis	Notes:
3- June-04	Thu	Sheet & pile driving	Ebb and Flood	5	5	No		
17-June-04	Thu	Debris removal	Flood	4-5	5-6	No		Clearing 2 cell areas of debris in preparation for sheet driving.
18-Oct-04	Mon	Dredging	Ebb	2	20-25	No		Dredging west near shore. Turb.
21-Oct-04	Thu	Dredging	Ebb and Flood	4	4-27	No		Dredging east, ebb tide am, flood pm.
25-Oct-04	Mon	Dredging	LWS	1	2-10	No		Dredging east. Low slack tide.
28-Oct-04	Thu	Dredging 2	Ebb	2	2-23	No		2 dredged operating, repositioned one barge in am. Tugboat creates turbidity plume as it moves barge north of cells.
1-Nov-04	Mon	Dredging 2	Ebb	5	2-81	No	1 sample	2 dredges operating. Turb. outside curtain <15 NTUs, elevated to 81 NTUs when tugboat moved barge south of cells. Plume observed south of curtain.
2-Nov-04	Tue	Dredging - 2	Ebb	1	7-46	No		2 dredges operating. Dregde east of cell, dropping sediment outside of curtain.
4-Nov-04	Thu	Dredging 2	Ebb	5	5-21	No		2 dredges operating, moving sand to cells.
9-Nov-04	Tue	No Dredging	Flood					No dredging activity.
11-Nov-04	Thu	No Dredging	Flood					No dredging activity.

Table 1 (Continued). Water Quality Monitoring Summary

Date	Day	Dredging Activity	Tidal Stage(s)	Background Turbidity (NTU)	Turbidity Range near Dredging Activities (NTU)	Turbidity Exceedence	Sampling for Laboratory Analysis	Notes:
18-Nov-04	Thu	No Dredging	Flood					No dredging activity.
23-Nov-04	Tue	Dredging 2	Ebb and Flood	2	6-37	No		2 dredges operating.
3-Jan-05	Mon	Dredging 1	Flood	1	10-35	No		1 dredge operating. Tugboat moved barges from inside curtain to north of cells (outside curtain). During barge movement turb. levels elevated to 10-35 NTUs.
11-Jan-05	Tue	Dredging 1	Ebb	2	1-7	No		1 dredge operating south of cell, dismantling curtain and removing piles eastern of pier created small oil sheen visible on water surface.

Table 2 Results of Toxicity Testing

Date	Location	*Americamysis bahia* 48hr Survival Assay[1] (Survival after 2 days)	*Arbacia punctulata* Chronic Fertilization Assay[1] (% Fertilized)	Turbidity During Sample Collection (NTU)
1 November 2004	Laboratory Control	100 %	98.9 %	NA
	25 ft down-current of curtain (100 ft down-current of activity)	100 %	98.4 %	81

[1]*Complete sample results located in Appendix C*
NA - Not applicable

FIGURES

US Army Corps of Engineers
New England District

U.S. Army Corps of Engineers
New Bedford Harbor Superfund Site

Figure 1 Harbor Overview Showing Packer Marine

ENSR

Sources:MassGIS 2-m orthophotos
NAD 83 Mass State Plane m
Date: 20 November 2003
ME scale 1:35000

0 0.25 0.5 1 Miles

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US Army Corps of Engineers
New England District

U.S. Army Corps of Engineers
New Bedford Harbor Superfund Site

Figure 2 Location of Packer Marine

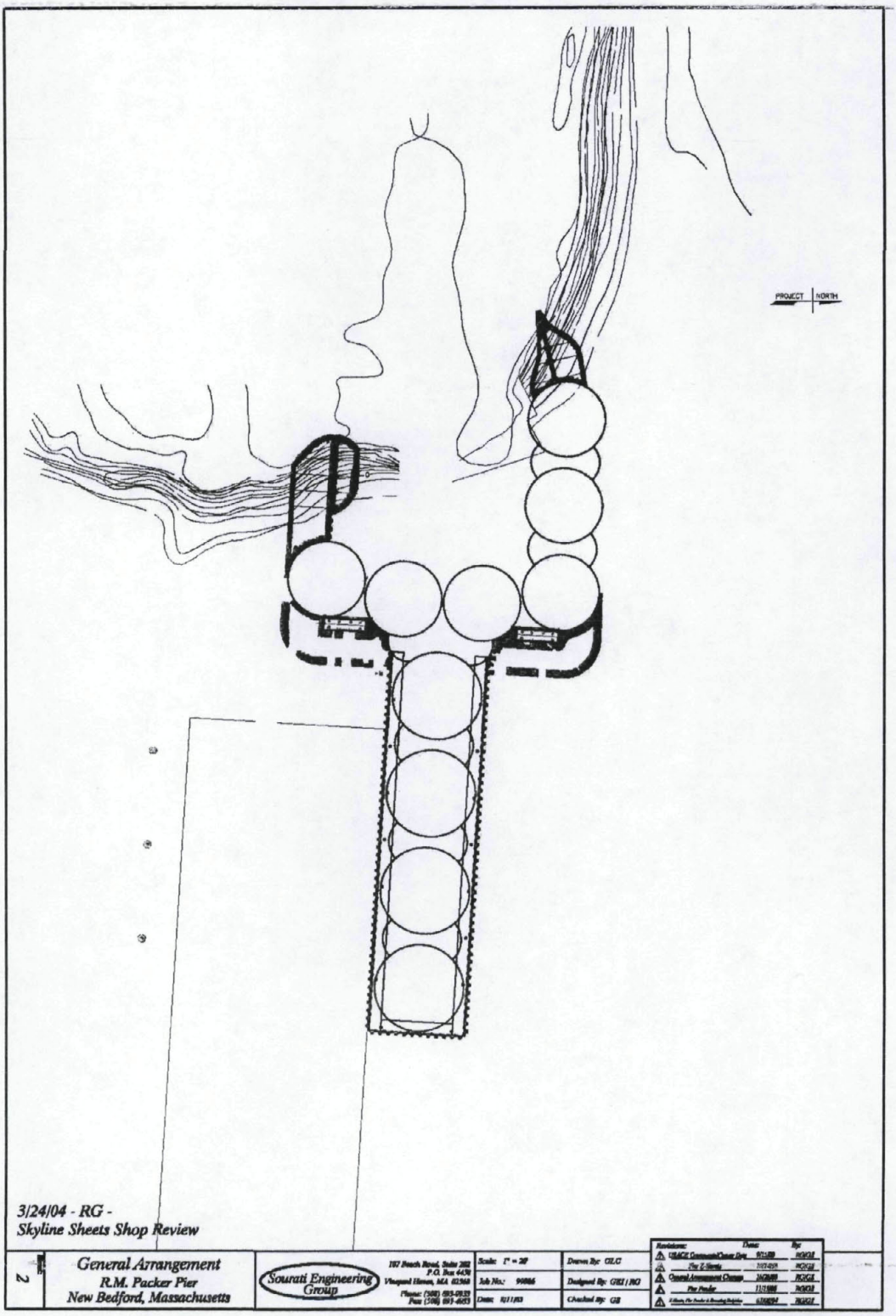
ENSR

Sources: MassGIS 1/2-m color orthophotos
NAD 83 Mass State Plane m
Date: 1 February 2005
ME Scale 1:8000

0 250 500 1,000 Feet

J:\Water\ProjectFiles\P90\9000NBH\GIS\PACKER\Fig_2_Packer_relocation

Figure 3 Packer Marine Site Plan



US Army Corps of Engineers
New England District

U.S. Army Corps of Engineers
New Bedford Harbor Superfund Site

Figure 4 Location of Packer Marine with Environmental Compliance Boundaries

ENSR

Sources: MassGIS 1/2-m color orthophotos
NAD 83 Mass State Plane m
Date: 1 February 2005
ME Scale 1:500

0 250 500 Feet

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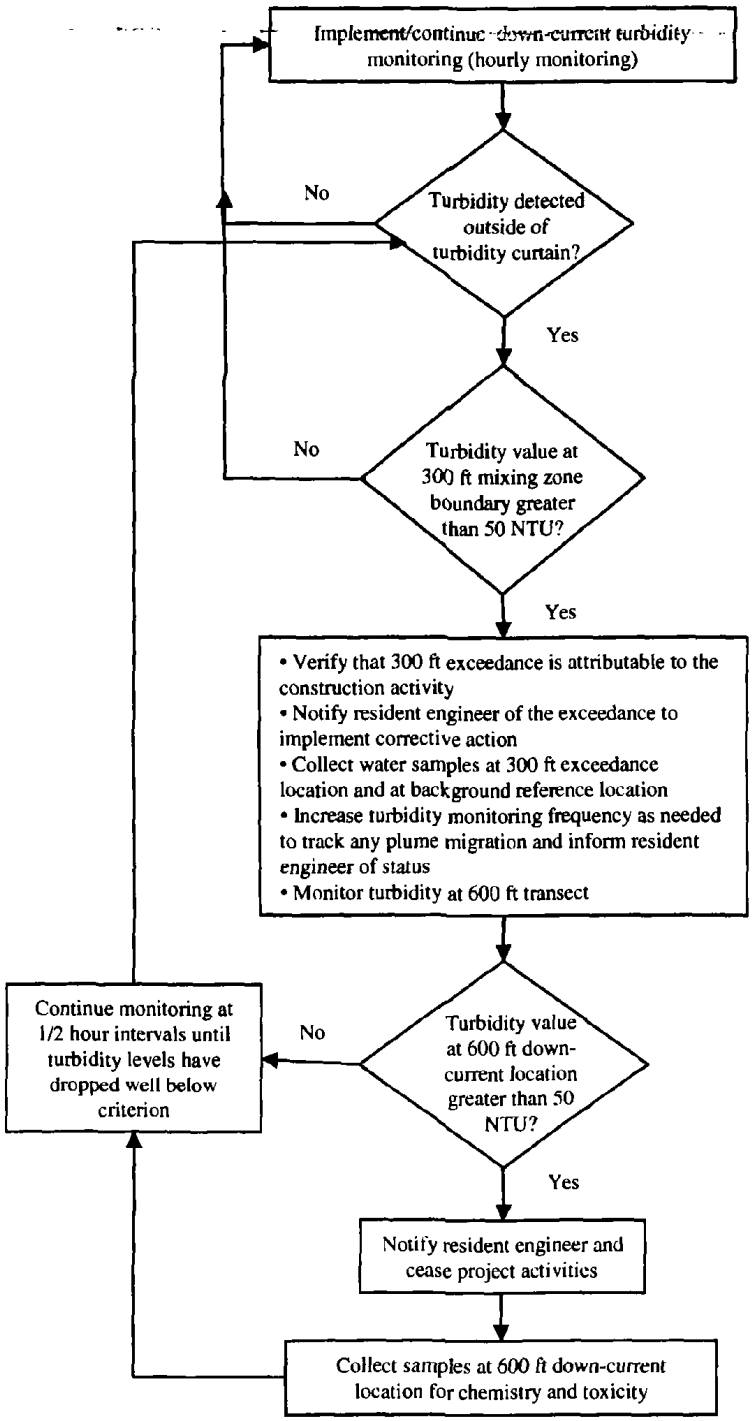
Figure 5 Water Quality Monitoring Decision Sequence

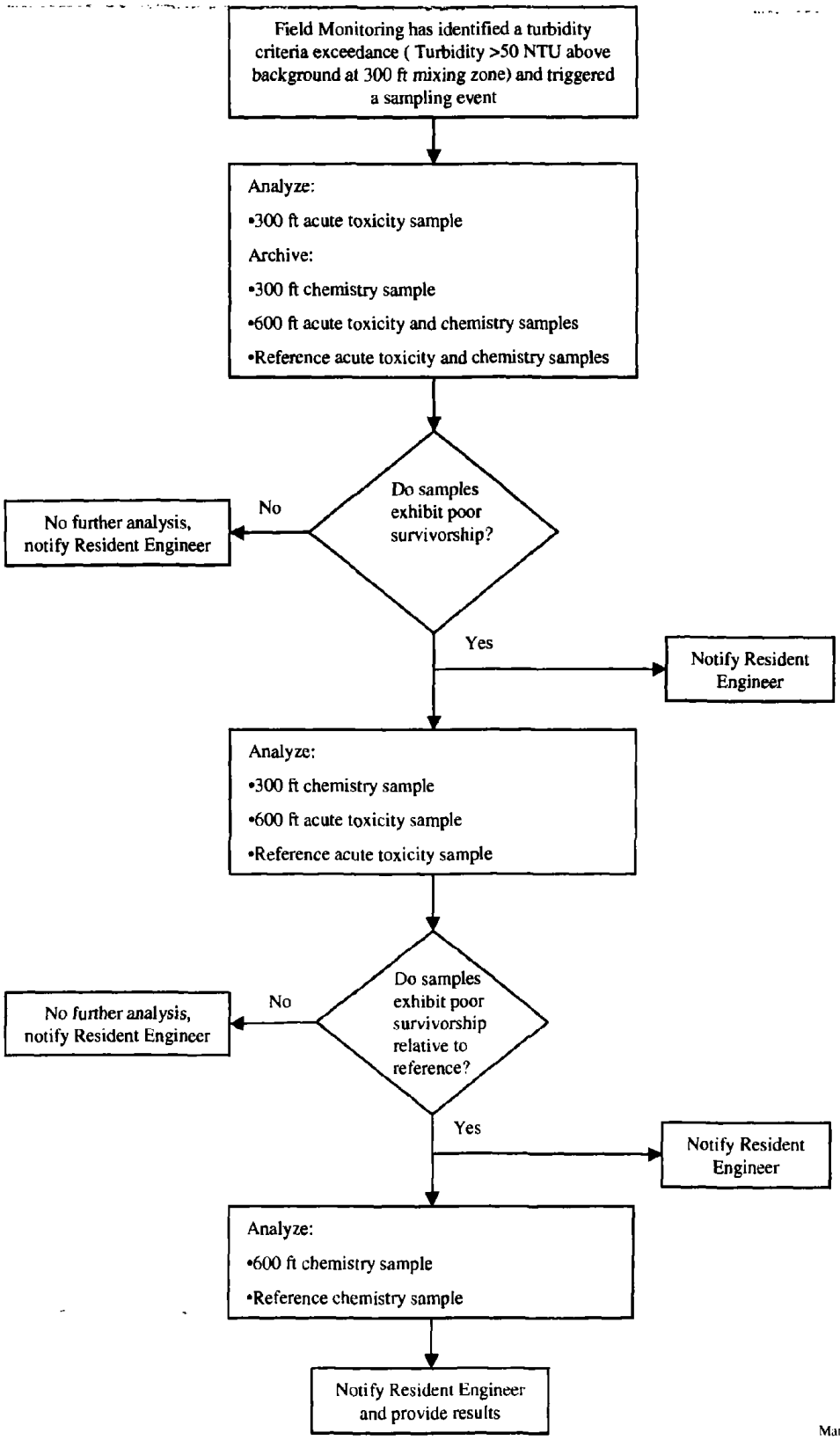


Notes

1: 50 NTU value was defined as 50 NTU above the background turbidity level

2: The presence and extent of any visible oil sheen emanating from project area, even though project turbidity limits have not been exceeded were brought to the attention of resident engineer, and a surface grab sample was collected for potential analysis.

Figure 6 Analytical Protocol Decision Sequence



APPENDIX

APPENDIX A

STATEMENT OF WORK FOR WATER QUALITY MONITORING

Water Quality Monitoring during Navigation Dredging at the New Packer Marine Facility (former Herman Melville Marine Boatyard) New Bedford Harbor Superfund Site 28 March 2004

Background

The sediments within many areas of the New Bedford Harbor Superfund Site are contaminated with high concentrations of many pollutants, including polychlorinated biphenyl's (PCB's) and heavy metals, from industrial and urban development surrounding the harbor. One of the required steps in preparing for the full-scale remedial dredging of the Harbor is the relocation/construction of the Packer Marine Terminal located at the former Herman Melville Marine Boatyard. The site is located along the western shore of New Bedford Harbor, approximately one-half mile south of the I-195 Bridge. The sediments in this area contain elevated levels of PCBs, organic compounds, and metals; most notably Cu from previous industrial activities in the area. Release of these sediments to the water column in an uncontrolled manner has the potential to cause significant environmental impacts. For this reason, the navigation dredging for the new facility will required the use of a full-depth turbidity curtain/oil-boom around the entire in-water perimeter of the site.

The following monitoring program shall be conducted by the Environmental Contractor on behalf of the USACE-NED during the duration of the Project as discussed below. The navigational dredging protion of the project is expected to intermittently over a period of 3 months.

I. Monitoring Approach

A. Water Quality Monitoring

Boat-based monitoring shall be performed during in-water operations that have the potential to disturb significant quantities of sediment. The purpose of this monitoring is to ensure that acute impacts to the water column do not extend beyond the designated mixing zone established for the project and that contaminants are not transported away from the operations area at unacceptable levels to other portions of the harbor.

A tiered monitoring approach will include field turbidity measurements, with additional "conditional" laboratory-based acute toxicity testing and water column chemistry during any portion of the dredging effort that may result in unacceptable environmental impact to the water column.

The overall approach of the water quality monitoring program will consist of boat-based measurements of water column turbidity along transects within the vicinity of the project site. The real-time nature of these measurements allows for direct correlation between project activities and water column impacts. The turbidity monitoring will be conducted periodically during project operations along the downstream edge of established mixing zones and compared to an upper-level decision criterion. The timing of this monitoring will coincide with those project activities deemed to have the greatest potential to affect water quality.

Turbidity monitoring will be supplemented with water samples to undergo physical/chemical and biological (biotoxicity) testing to assess the extent and degree of ecological impact to the surrounding harbor waters. These "conditional samples" will be collected when turbidity criteria

have either been approached or exceeded. Biological testing will involve acute toxicity tests using the sea urchin sperm fertilization test (*Arbacia* sp.) and the Mysid shrimp (*Mysidopsis* sp.) with the physical/chemical analysis contingent upon the results of the toxicity testing. Samples, which do not exhibit toxicity, will not require further analysis. However, poor survivorship in either toxicity test will require further analytical testing to identify the cause of toxicity. This analysis will include total suspended solids (TSS), total petroleum hydrocarbons (TPH), oil and grease, total PCB's and heavy metals including Copper (Cu) and Lead (Pb).

B. Environmental Oversight during Dredging Activities

The Environmental Contractor shall maintain a regular site presence to monitor environmental conditions during dredging activities to ensure that operations are conducted in accordance with the environmental requirements as outlined in this scope of work. This effort involves coordinating boat-based monitoring activities, results notification to appropriate personnel, and tracking and assessing any oil sheen or other conditions that could potentially affect water quality within New Bedford Harbor.

II. Monitoring Measurements

Equipment - Turbidity monitoring shall be performed using an optical backscatter (OBS) nephelometer with an underwater sensor and direct surface readout or other instrumentation having similar capabilities. The OBS sensor unit shall be sensitive over an approximate operating range of 0-500 NTU, and shall be calibrated on a regular basis using analytical standards.

Location – Turbidity monitoring shall occur along the down-current edge of a pre-determined "Mixing Zone." The term "Mixing Zone" has been established approximately 300 feet outside the boundary of the turbidity curtain. The down-current edge is defined in relation to tidal direction (ebb/flood tide) from standard tide tables for New Bedford, as well as observations on site. A second "compliance zone" has been established at a range of 600 feet outside the boundary of the turbidity curtain. This outer boundary will be monitored and/or sampled in the event a project criteria exceedence is recorded at the 300-foot mixing zone to determine the potential range of water column effects.

Turbidity shall be measured around the perimeter of the 300-foot boundary at a point roughly mid-depth in the water column. When water depths are greater than 10 feet, additional vertical profiles shall be made between the surface and 3 feet above the bottom to detect sub-surface plume migration. In addition to the turbidity monitoring along the boundary of the mixing zone, background (i.e., reference) measurements will be collected approximately 1000 feet up-current of dredging operations. This location shall be outside the influence of any localized turbidity sources (ex. CSO discharges or storm water drains), but still representative of the water flowing through the deeper channel areas up-current of the dredge area.

Frequency – For the purposes of this scope of work, the Environmental Oversight Contractor should conduct environmental monitoring activities according to the schedule shown below. The table outlines the number of days each week, for each monitoring activity, that the Contractor will be responsible for conducting during the course of the expected 3-month project.

Project Month Number	Boat-Based Turbidity Monitoring (Days/Month)	Boat-Based Sampling for Biological and Chemical Testing (Days/Month)	Shore-Based Coordination (Days/Month)
1	8	3	10
2	4	Conditional	5
3	4	Conditional	5
TOTAL	16	4	20

Description – The Environmental Oversight Contractor shall coordinate with the USACE Resident Engineer prior to and during the course of the project to review planned operations and to identify specific activities that require monitoring.

Site Mobilization and Project Work Month-1 – Much of the mobilization and site preparation work will be performed on land during this initial period and will not require boat-based monitoring. Prior to commencement of in-water activities, the Environmental Oversight Contractor shall perform one day of boat-based monitoring and sample collection to determine typical values of background turbidity and dissolved Cu in the area. As mobilization proceeds to in-water activities (pile driving and installation of the turbidity curtain/oil-boom and dredging), the Environmental Oversight Contractor shall perform boat-based monitoring approximately 2 days per week depending on specific construction activities. During this first month of the dredging, sampling shall be performed when project activities appear to be causing the maximum disturbance to the water area enclosed by the turbidity curtain and when tidal conditions result in maximum drainage of water from the enclosed area to the surrounding waters. Water samples shall be collected 1) in the initial mixing zone immediately adjacent to a seam or equilibration flap where water is draining through the turbidity curtain, 2) along the down-current boundary of the mixing zone at 300 feet from the turbidity curtain, 3) along a transect approximately 600 feet down-current of the turbidity curtain, and 4) at an appropriate up-current background location. The water sample from the initial mixing zone shall be submitted for biotoxicity testing. All other samples shall be archived, with additional biotoxicity and/or chemical testing contingent on the results of biotoxicity testing of the initial mixing zone sample. Poor survivorship in either toxicity test will require the chemical analysis of samples collected at the respective station and the performance of toxicity testing on samples collected at the station immediately down-current.

Project Work – Months 2-3 – Assuming that no major water quality issues are identified during the initial month of monitoring described above, the frequency of boat-based turbidity monitoring shall be scaled back during the remainder of the in-water work. Sampling for biotoxicity and chemical testing at the boundary of the 300-foot mixing zone and background location would be conditional on the observance of turbidity values in excess of the project specific criterion.

Data Recording – A written summary record of field turbidity measurements and a list of samples collected will be provided to the USACE Resident Engineer on a daily basis after each monitoring event.

Lab Schedule - A laboratory turn-around time of 24-hours is required. It is anticipated that the requirement to analyze water column chemistry samples will be reduced or curtailed as operations continue.

III. Project Specific Criterion

The upper level turbidity criterion, defined as a "reportable event", will be 50 Nephelometric Turbidity Units (NTUs) above background as measured at the edge of the 300-foot mixing zone. Additional monitoring and the sampling required by a criterion exceedence event are defined herein.

IV. Criterion Exceedence

When the monitoring reveals that the upper-level criterion has been exceeded at the edge of the mixing zone, additional background and near field measurements shall be performed as needed to determine if the elevated turbidity is attributed to project activities. Also, an additional transect shall be run 600 feet downstream of the project activity to assess far-field impact. If the turbidity appears to be project-based, the Environmental Oversight Contractor will immediately notify the USACE Resident Engineer or his representative so that corrective actions can be employed to alleviate the condition. If exceedences are noted at both downstream transects (300- and 600-foot), project activities will cease until conditions have abated to acceptable levels at the 300 ft transect. If the criterion has been exceeded at only the downstream edge of the 300-foot mixing zone, corrective actions will be employed as deemed appropriate by the USCAE Resident Engineer. Actions may include either altering or slowing the rate of construction or ceasing project activities until turbidity levels have fallen within an acceptable range.

In addition, when a criterion is exceeded, the Environmental Oversight Contractor shall collect "conditional" water samples along the edge of either one or both of the downstream monitoring transect(s). Biological and chemical testing shall be performed on a composite water sample collected along the downstream edge of the mixing zone(s) within the boundaries of an observable plume. Toxicity testing shall be initiated immediately upon sample collection and delivery to the testing facility. Monitoring of turbidity shall proceed continuously to track the return to background conditions. Upon the resumption of project activities, monitoring will continue at an increased frequency (30-minute cycle) to track turbidity changes and monitor for further exceedences.

The Environmental Oversight Contractor shall also note the presence and extent of any visible oil sheen that may emanate from the activity area, even though other criteria limits have not been exceeded, and contact the USACE Resident Engineer or his representative. A surface grab sample shall be collected for potential analysis. The approximate area of sheen coverage will be sketched onto the data sheet as provided in the Reporting task below.

V. Reporting

The Environmental Oversight Contractor shall develop an oversight report sheet for this project. This daily submittal for each day of boat-based monitoring shall provide the following information:

(1) Date, time, location, and type of construction activity as well as the names of sampling team members and team leader.

(2) A plan-view of the harbor and construction site that allows for the recording of visual events such as plumes or oil sheens. This map will be included with the daily oversight

report sheet and will graphically present turbidity values recorded during each monitoring event.

(4) A summary of weather conditions, and the timing of the tides.

(5) A comments section to allow field personnel to record visual observations or relevant field activities which may assist in data interpretation.

Data sheets shall be delivered either electronically or in hard copy to the USACE or their representative at the end of each day of monitoring. A hard copy shall be hand delivered to the on-site office of the USACE Resident Engineer. If the established turbidity criterion is exceeded, the USACE shall be immediately notified and "conditional" monitoring/sampling activities initiated. A secure project-based web site will be established to post monitoring data sheets along with toxicity and analytical data. The site will be accessible only to individuals identified by the USACE.

VI. Project Meetings

Based on the USACE requirement that the project shall be completed within 120 days of awarding a contract to complete the site work, the Environmental Oversight Contractor should assume the following meetings would be required:

- One Pre-Construction Meeting at the onset of the project to define roles and responsibilities, discuss project logistics and health and safety issues
- Biweekly Construction Coordination Meetings for the duration of the project.
- Monthly Project Status Meetings for the duration of the project.

VII. Deliverables

The Environmental Oversight Contractor shall provide the USACE a field summary report of the Packer Dredging Project, including field observations and analytical data upon completion of the monitoring program. The deliverable shall include three hard copies and three CD's with all data.

- **Cost Proposal**

The Contractor shall submit their cost estimate breaking out "Base Costs" for the work outlined in this scope of work and also for the following Options to be exercised at the discretion of the Government:

- Option A – Individual Toxicity Testing
- Option B – Chemical Analysis (TPH, Oil/Grease, PCB dissolved, Total Metals (including Cu and Pb), TSS, Turbidity
- Option C – Daily rate for boat based monitoring which includes turbidity monitoring and conditional collection of water samples
- Option D – Daily rate for land based oversight

APPENDIX B

FIELD DATA LOGS

ENSR U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Packer Marine Facility Construction

EPA

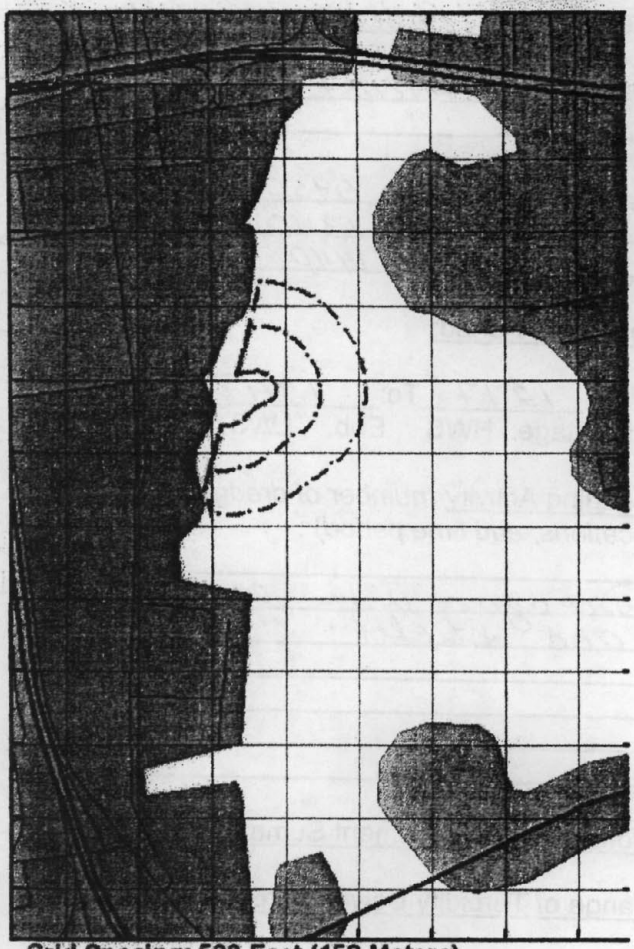
Date: 6/17/04

Monitoring Period: Arrival: 0900
Departure: 1330

Construction Activities Observed:
Clearing & CAD Cell areas of debris in preparation for sheet driving.

Tidal Direction: Flood Ebb
Tidal Period: 0813 to 1320

Weather Observations: 80° F
Partly Cloudy



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station
Water Depth: 12 ft
Turbidity: 4-5 NTU
Depth of Sensor: 9 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	10 ft	7 ft	5-6 NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU

Samples Collected:

☑ None ☐ TSS ☐ Turbidity ☐ Metals ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
Raking or clearing harbor bottom was accomplished using a bucket and crane to pick up and move debris.

Scientific Crew: Julie Stearns
Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 21 October, 2004

Weather: Overcast 55°F

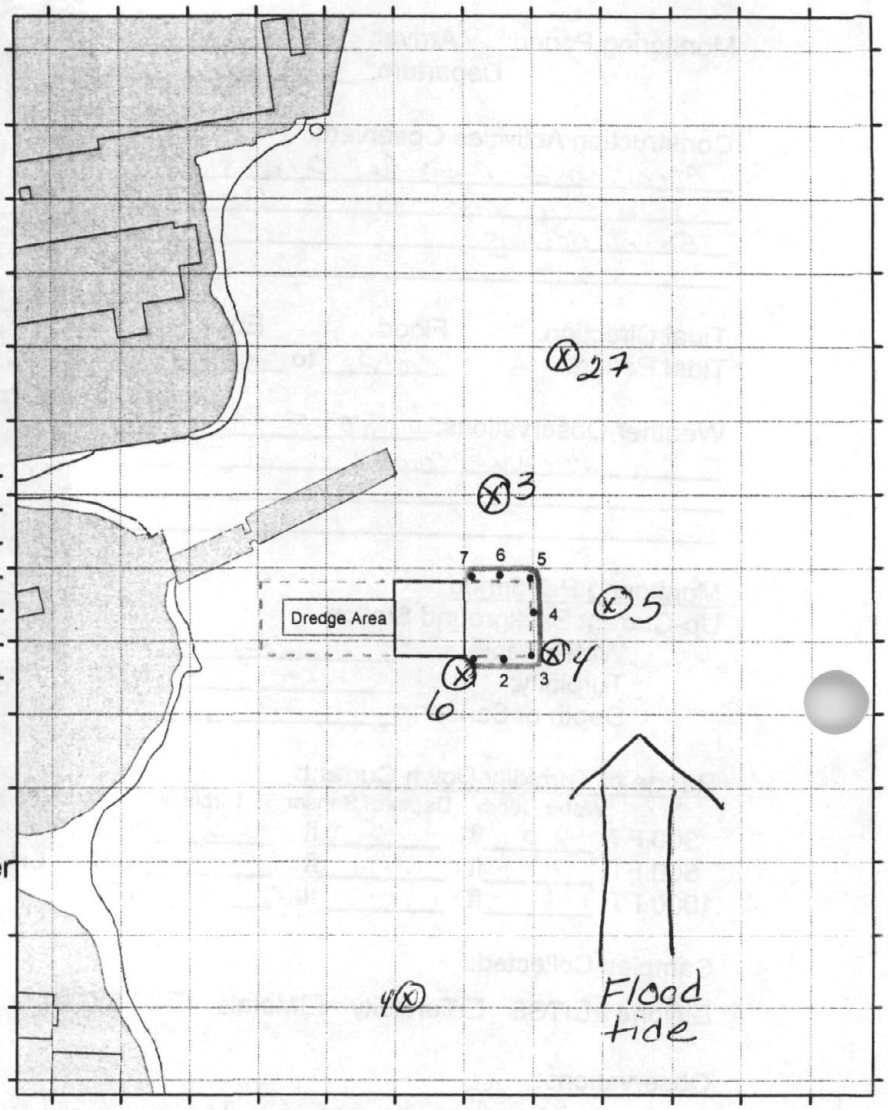
Tides:
LWS @ 0950
Flood @ 1340
HWS @ 1440

Monitoring Period:

From: 1217 To: 1248
Tidal Stage: HWS Ebb LWS (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

Dredging with crane and bucket.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
0-10ft North of Curtain	4-6	5/6
100ft North of Curtain	3	9/10
300ft North of Curtain	27	15/16

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Dredging with clamshell bucket and crane with periodic stops.
Bucket and crane moves sediment material to cell located just North East of Dredge area.

Scientific Crew: J. Stearns, R. McCarthy, J. Drake
Completed By: J. Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 21 October, 2004

Weather: Overcast, 55°F

Tides:

LWS	@	0950
Flood	@	1340
HWS	@	1440

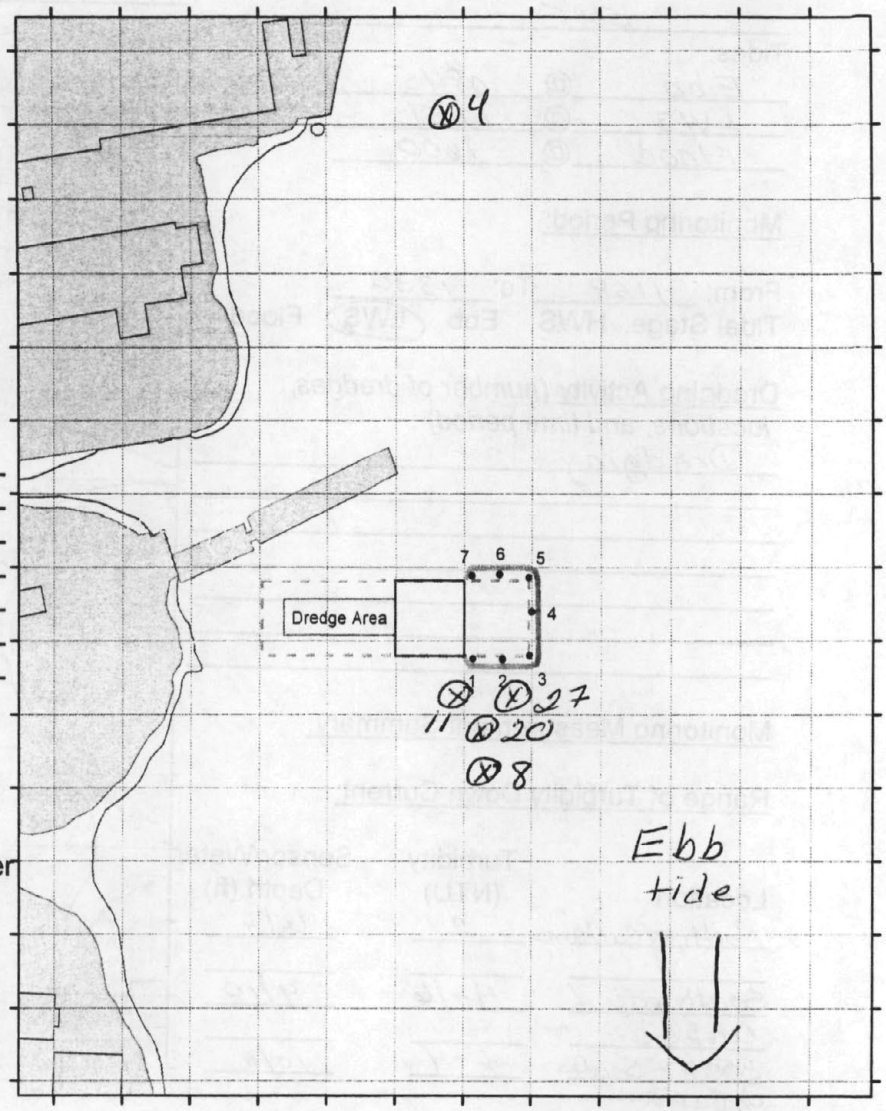
Monitoring Period:

From: 1515 To: 1600

Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :

Dredging - one crane and bucket.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
0-20 Ft South of Curtain	11-27	15/16
20-100 Ft South of Curtain	2-20	15/16
200 Ft South of Curtain	8	19/20

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Dredging continuously throughout monitoring period. Turbidity levels not above 27 NTU outside curtain. Inside curtain turbidity levels reached 102 NTU.

Scientific Crew: J. Stearns, R. McCarthy, J. Drake

Completed By: J. Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 25, October, 2004

Weather: Breezy and misty 50°F

Tides:

Ebb	@	0845
LWS	@	1251
Flood	@	1600

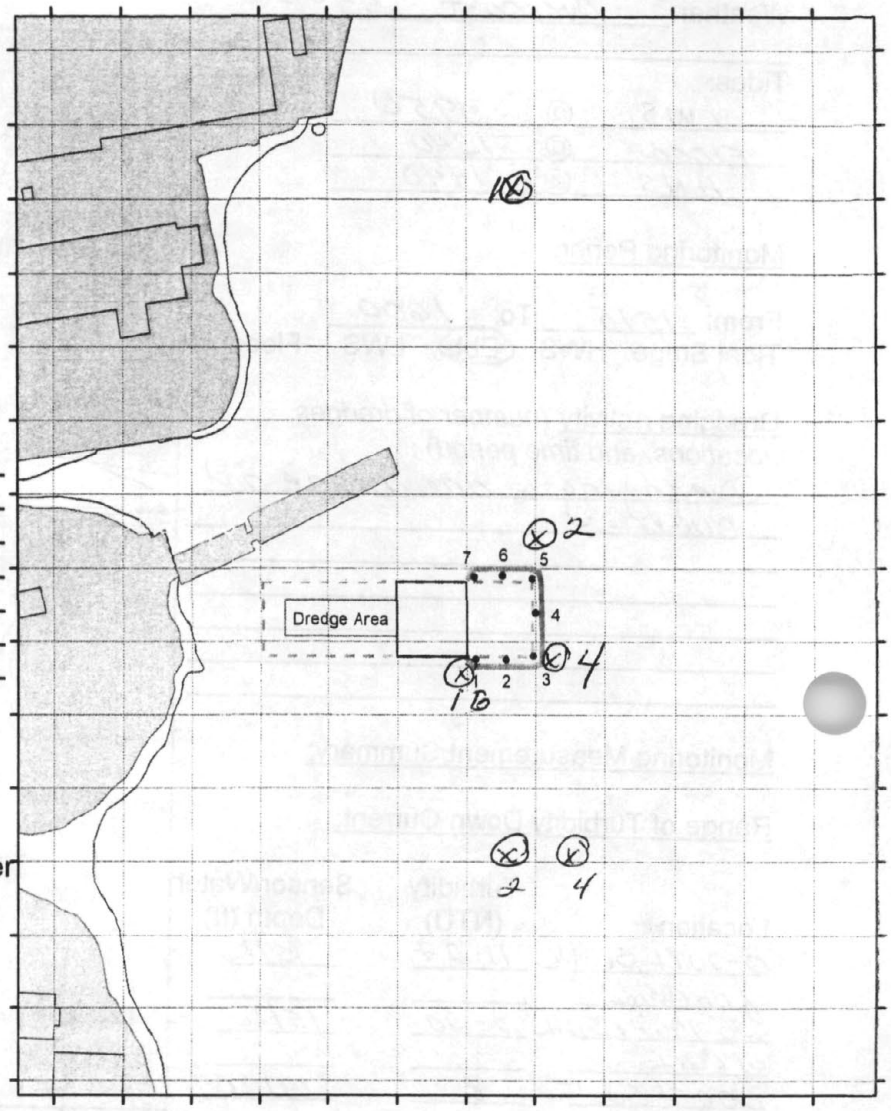
Monitoring Period:

From: 1158 To: 1330

Tidal Stage: HWS Ebb (LWS) Flood

Dredging Activity *(number of dredges, locations, and time period)* :

Dredging



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
North of Curtain	2	6/7
South edge of Curtain	14-16	9/10
300 Ft South of Curtain	2-4	10/11

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Dredging, moving material into cell.

Turbidity outside curtain not above 16 NTUs

Inside curtain - highest reading 49 NTUs.

Scientific Crew: R. McCarthy, T. Delaney

Completed By: J. Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 28 October, 2004

Weather: Sunny 50°F

Tides:

HWS	@	831
Ebb	@	1100
LWS	@	1443

Monitoring Period:

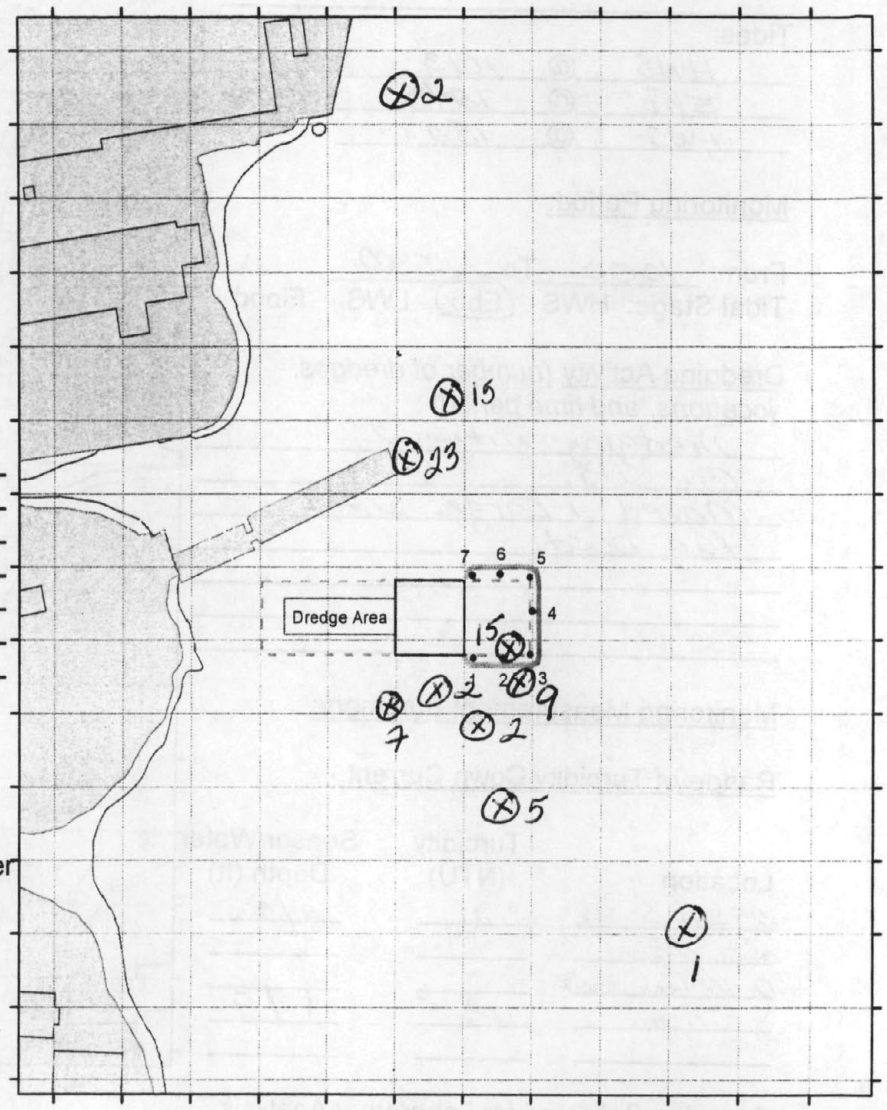
From: 1030 To: 1628

Tidal Stage: HWS (Ebb) (LWS) Flood

Dredging Activity *(number of dredges, locations, and time period)* :

2 Dredge buckets in use in morning

Moving bardge with tug boat



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
South of Curtain	1-9	2-9
100-200 feet North of Cells	15-23	5-12

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Dredging - 2 buckets in use in the morning
Moved barge at 1543 caused turbidity to rise north of cells and dredging area

Scientific Crew: Julie Stearns, Melissa Cannon, Terry Delaney

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 1 November 2004

Weather: Sunny

Tides:

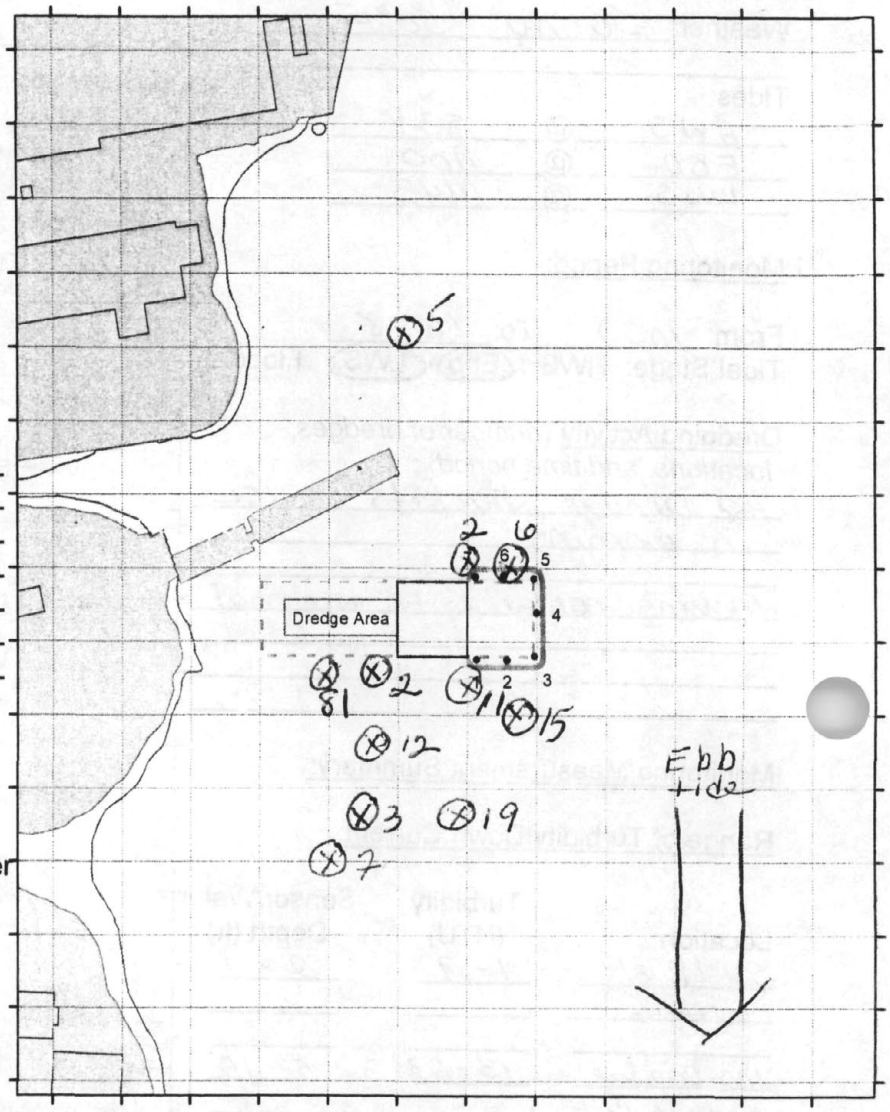
HWS @ 1013
Ebb @ 1245
LWS @ 1528

Monitoring Period:

From: 1000 To: 1530
Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :

Dredging with 2 Buckets.
Moved 1 barge with tug boat.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
25 feet South of curtain	81	8/3
50-100 feet South of curtain	11-15	1/9

Samples Collected for Laboratory Analysis

☐ None ☑ TSS & turbidity ☑ Toxicity ☑ PCBs & Metals

Grid spacing: 100 feet

Observations

Dredging with 2 buckets, turbidity levels outside curtain stay below 75 NTU. NTU levels elevated to 81 when tug boat pushed barge into place.

Scientific Crew: J. Stearns, J. Lund, T. Delaney
Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 2 November 2004

Weather: Cloudy 50°F

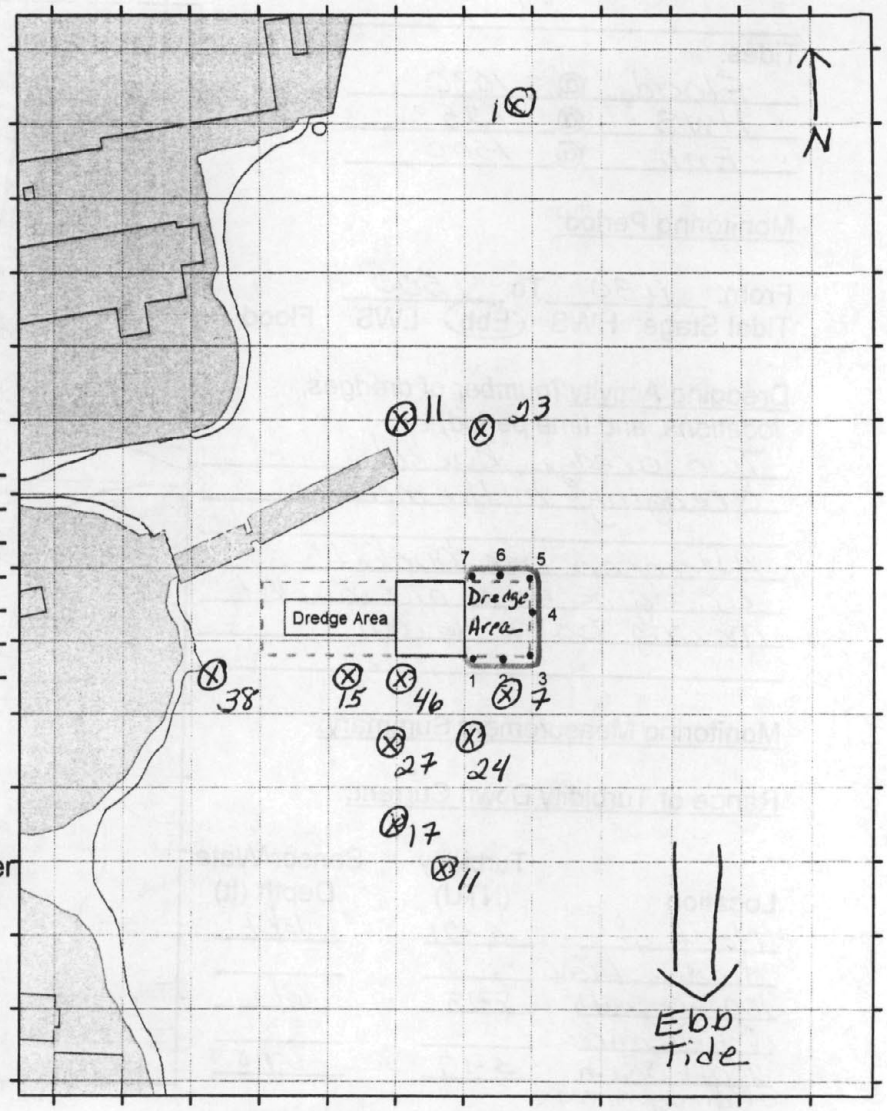
Tides:

HWS @ 1100
Ebb @ 1315
LWS @ 1606

Monitoring Period:

From: 1000 To: 1300
Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)*:
2 dredge buckets in use.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
50-100 ft South of Dredging	7-46	7/9
100 ft South Dredging	24-27	7/13
200-900 ft South of Dredging	11-17	9/11

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

While dredge bucket, located furthest from shore, moves sediment material from dredge area to cell - sediment drops out of bucket outside of curtain - Turbidity levels in this area ranges from 11 to 23 NTUs

Turbidity levels south of dredge areas below 46 NTUs.

Scientific Crew: Julie Stearns, Ryan McCarthy, Terry Delaney

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 4 November, 2004

Weather: Sunny 45°F

Tides:

Flood @ 1030
HWS @ 1253
Ebb @ 1500

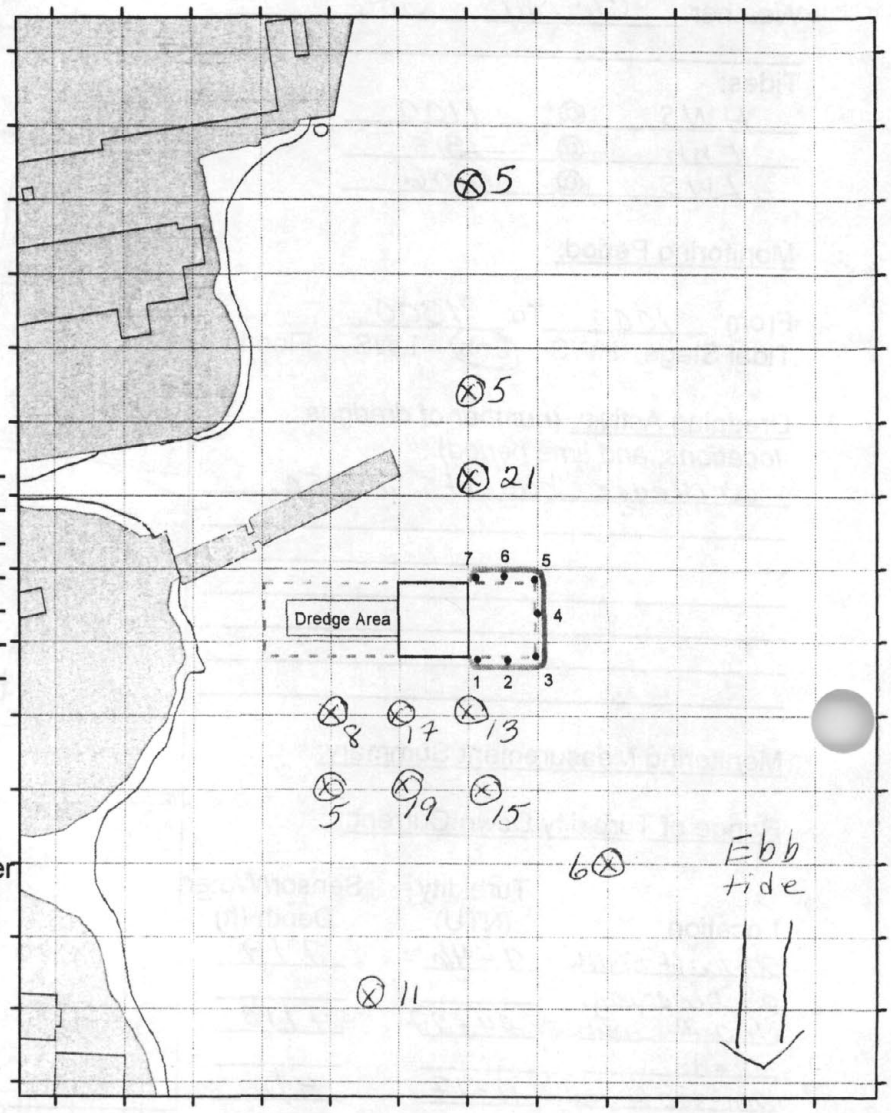
Monitoring Period:

From: 1130 To: 1500
Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :

Two dredge buckets dredging in the morning.

Afternoon one bucket dredging and one bucket moving sand to cell.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
North of dredge Area	5-21	6/7
100 feet South of dredge Area	8-13	6/8
200 ft South of dredge area	5-19	6/8

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Dredging with two buckets in morning, one bucket in the afternoon.

Turbidity levels below 19 NTUs south of dredge areas.

Scientific Crew: Julie Stearns, Jamie Lund, Terry Delaney
Completed By: Julie Stearns.

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 23 November 2004

Weather: Sunny 50°F

Tides:

Ebb	@	715
LWS	@	1140
Flood	@	1500

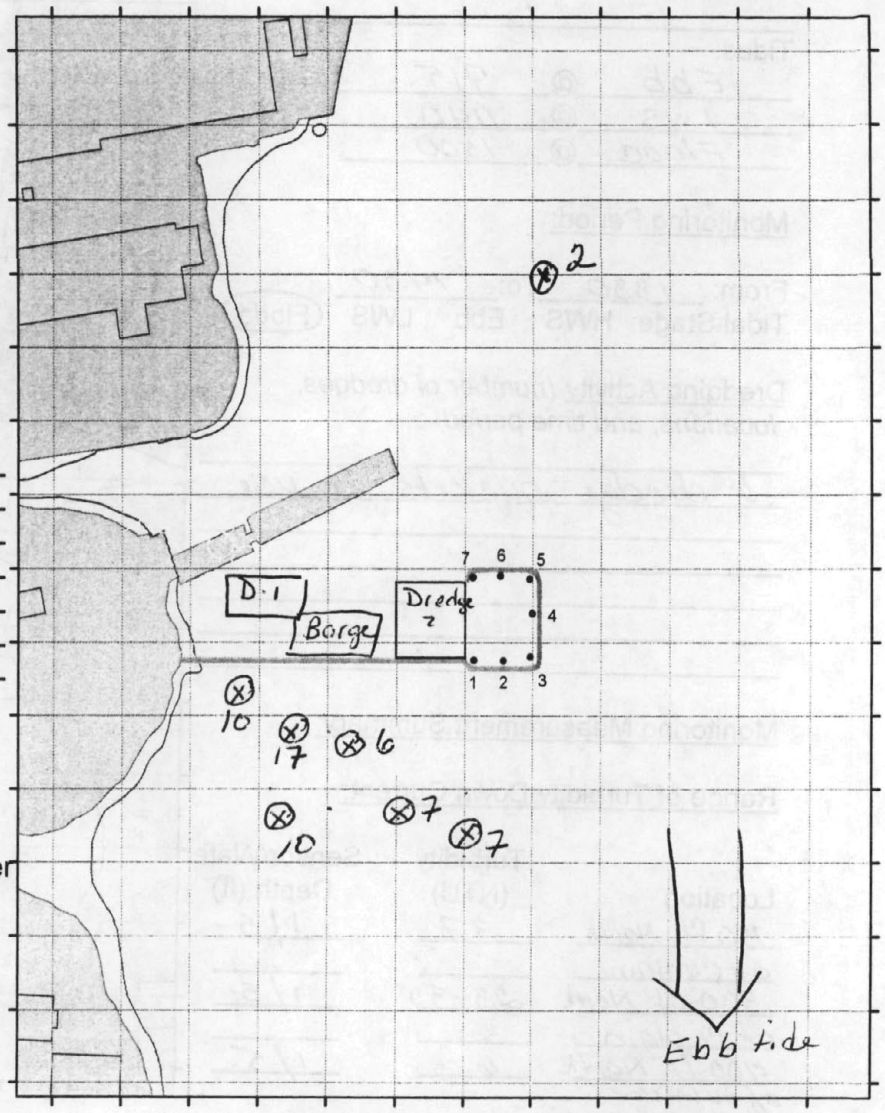
Monitoring Period:

From: 1000 To: 1320

Tidal Stage: HWS (Ebb) (LWS) (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

2 dredging buckets in use.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
100ft south of curtain	10-17	1/7
200ft south of curtain	7-10	1/7

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Both buckets in use most of the day.
Periodicly moving sediment from barge to cells.

Scientific Crew: Julie Stearns, Jamie Lund, Terry Delaney

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 23 November 2004

Weather: Sunny 50°F

Tides:

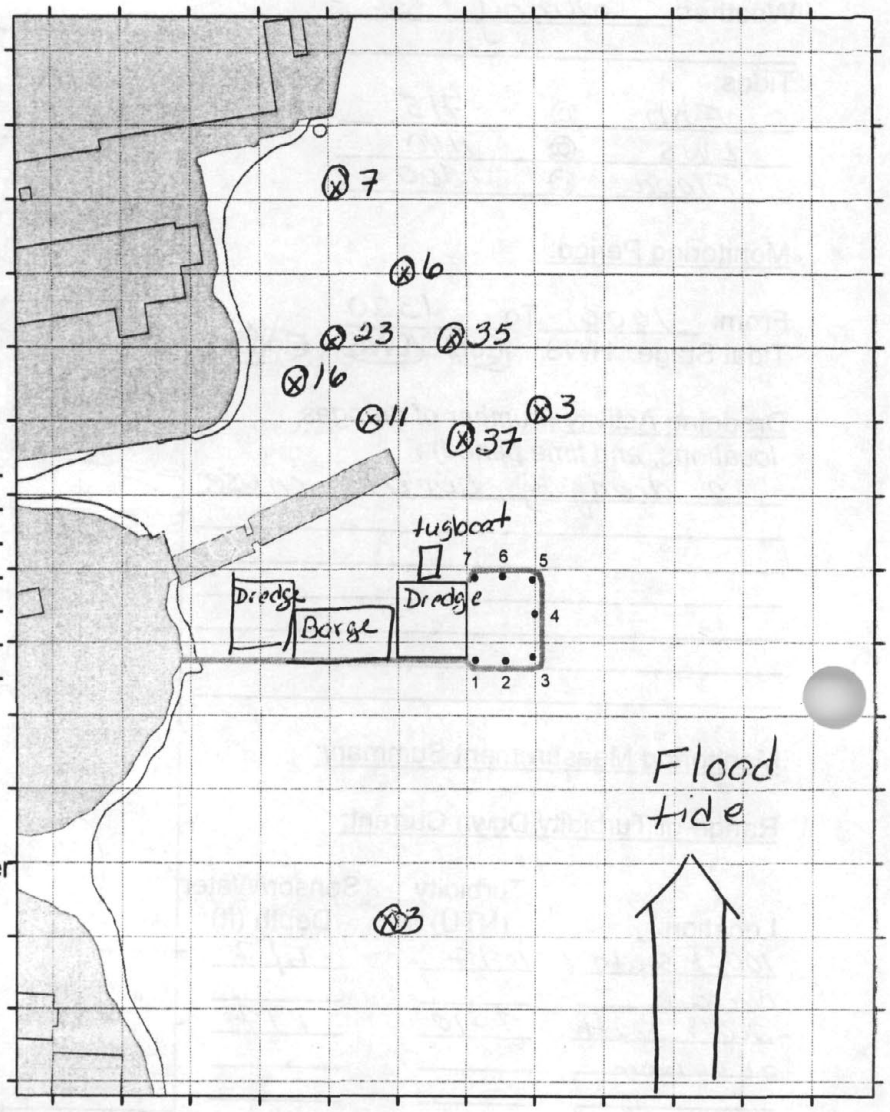
Ebb @ 715
LWS @ 1140
Flood @ 1500

Monitoring Period:

From: 1330 To: 1430
Tidal Stage: HWS Ebb LWS (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

2 dredge buckets in use.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
150 ft North of Curtain	37	1/5
300 ft North of Curtain	23-35	1/5
400 ft North of Curtain	6	1/5

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Both buckets in use.
Turbidity levels north of curtain are elevated - possibly due to 2 factors 1. the silt curtain is open at piles 5,6, and 7 and the tugboat is operating north of dredge activities.

Scientific Crew: Julie Stearns, Jamie Lund, Terry Delaney
Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 3 Jan 2005

Weather: Cloudy

Tides:

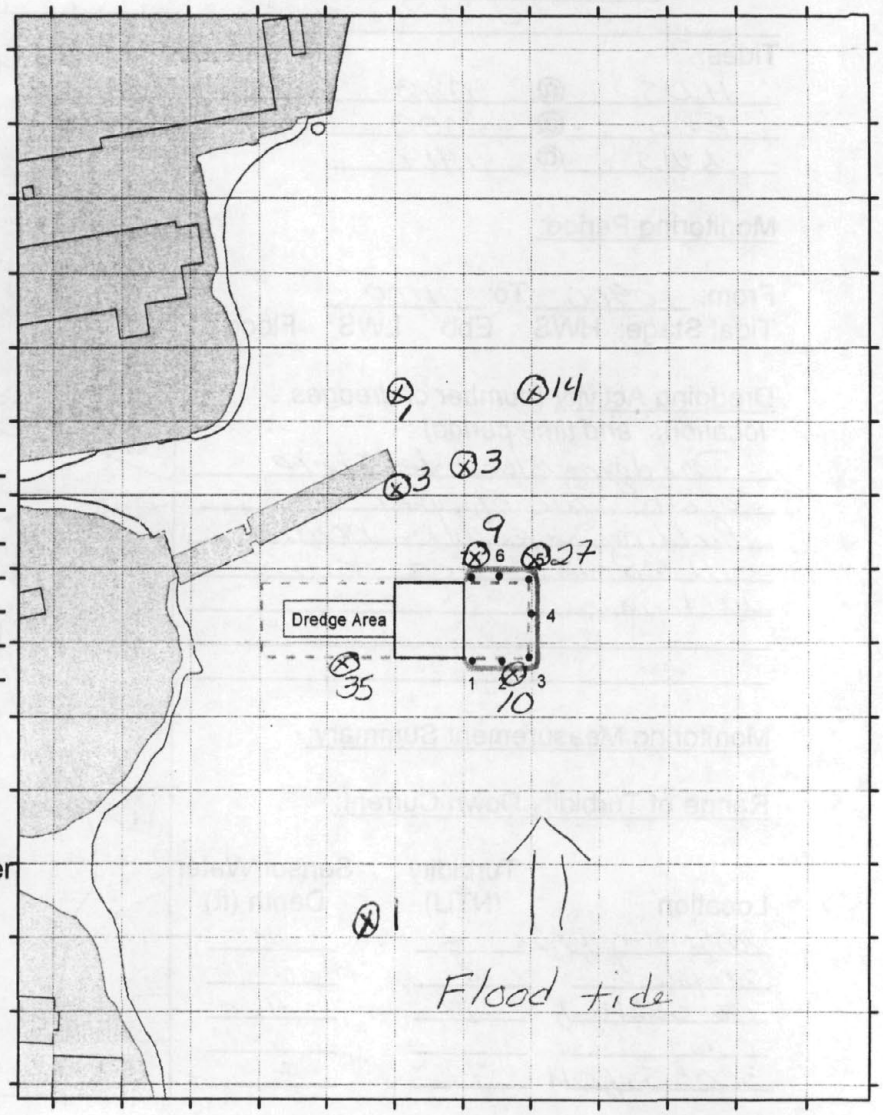
Flood @ 1015
HWS @ 1316
Ebb @ 1530

Monitoring Period:

From: 1000 To: 1100
Tidal Stage: HWS Ebb LWS (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

Dredging with bucket east of cell until 1010.
1015 – 1100 - moving 2 barges north of cell.
1100 – 1800 Bathymetry survey of dredge area.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
200' N of cell	1	7/9
100' N of cell	3	7/9
200' N of cell	14	9/10
200' E cell		
100' S of cell	35	7/8

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

One dredge in use in mornings. 2 barges moved from inside silt curtain to the northern side of cells to make way for bathymetry survey.
Moving barges increased turbidity to 35 NTUs

Scientific Crew: Julia Stearns Terry Delaney
Completed By: Julia Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at Packer

Date: 11 January 2005

Weather: Sunny 35°F

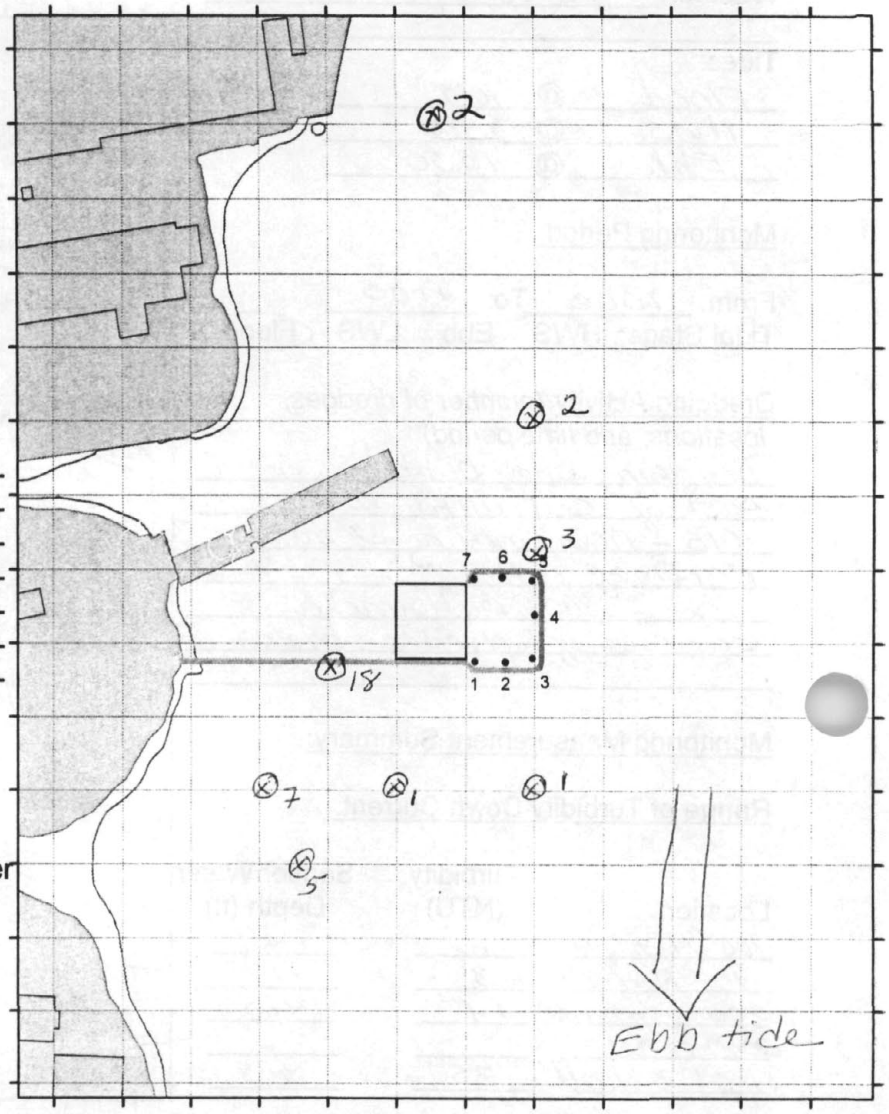
Tides:

HWS @ 0813
Ebb @ 1000
LWS @ 1419

Monitoring Period:

From: 0900 To: 1100
Tidal Stage: HWS Ebb LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :
Dredging close to shore, South side of pier. Pulling up piles holding silt curtain and silt curtain.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
200' North of pile 5	2	2'
at pile 5	3	6
100' South of cell	18	4
300' S of cell	7	7

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations
Pulling up piling east of cells created small amounts of oil, an oil sheen was observed 300' south of activity. NTUs not above 7.

Scientific Crew: Julie Stearns, Terry Delaney
Completed By: Julie Stearns

APPENDIX C

BIOLOGICAL AND ANALYTICAL LABORATORY ANALYSIS

Rec'd 1/25/05
AN292

collected 1/11/05

ANALYTICAL REPORT

Prepared for:
ENSR International
2 Westford Technology Park
Westford, MA 01886

Project:	New Bedford Harbor Task 3
ETR:	0411007
Report Date:	January 24, 2005

Certifications and Accreditations
Massachusetts MA030
Connecticut PH-0141
New Hampshire 220602
Rhode Island 64
New Jersey MA015
Maine MA030
New York 11627
Louisiana 03090
Army Corps of Engineers
Department of the Navy
Florida E87814

This report shall not be reproduced except in full, without written approval from the laboratory.

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whole@whgrp.com

Sample ID Cross Reference

Client: **ENSR International**
Project: **New Bedford Harbor Task 3**

Lab Code: **MA00030**
ETR: **0411007**

Lab Sample ID	Client Sample ID
0411007-01	WQ1E110104
0411007-02	WQ1E110104

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

CASE NARRATIVE

Woods Hole Group Environmental Laboratories

ETR: 0411007
Project: New Bedford Harbor Task 3

All analyses were performed according to Woods Hole Group Environmental Laboratories' quality assurance program and documented Standard Operating Procedures (SOPs). The analytical results contained in this report meet all applicable agency and/or NELAC standards, were performed within holding time, and with appropriate quality control measures, except where noted. Blank correction of results is not performed in the laboratory for any parameter. Soil/sediment samples are reported on a dry weight basis unless otherwise noted. Tissue and sediment samples are not certifiable under the NELAC accreditation.

Sample Receipt

Samples were received in good condition.

The enclosed results of analyses are representative of the samples as received by the laboratory. Woods Hole Group Environmental Laboratories makes no representations or certifications as to the method of sample collection, sample identification, or transporting/handling procedures used prior to the receipt of samples by Woods Hole Group Environmental Laboratories. To the best of my knowledge, the information contained in this report is accurate and complete.

Approved by: _____ Title: Project Manager Date: 1/24/05

Woods Hole Group Environmental Laboratories, 375 Paramount Drive, Suite 2, Raynham, MA 02767, 508-822-9300, whale@whgrp.com

WET CHEMISTRY

Form I
Inorganics

Client: **ENSR International**
Project: **New Bedford Harbor Task 3**
Case: **N/A** SDG: **N/A**
Client ID: **WQ1E110104**
Matrix: **Water**

Lab Code: **MA00030**
ETR: **0411007**
Lab ID: **0411007-01**
Date Collected: **11/01/04**
Date Received: **11/01/04**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Unit	Analytical Method	Analyst
TSS - Membrane	92		1.0	N/A	11/08/04	mg/L	2540D	NAR
Turbidity - 180.1	15		0.40	1	11/01/04	NTU	180.1	NAR

N/A - Not Applicable

Suite 2, Bourne, Massachusetts 02767 (508) 822-9300 Fax (508) 822-3288 whole@whgrp.com

Form III
Inorganics

Client: **ENSR International**
Project: **New Bedford Harbor Task 3**
Case: **N/A** SDG: **N/A**
Client ID: **Blank**
Matrix: **Water**

Lab Code: **MA00030**
ETR: **0411007**
Lab ID: **WW110904B35**
Date Collected: **N/A**
Date Received: **N/A**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Unit	Analytical Method	Analyst
TSS - Membrane	1.0	U	1.0	N/A	11/08/04	mg/L	2540D	NAR
Turbidity - 180.1	0.40	U	0.40	1	11/01/04	NTU	180.1	NAR

N/A - Not Applicable
U - The analyte was analyzed for but not detected at the sample specific level reported.

11/10/04 12:18

CHAIN OF CUSTODY RECORDS

Chain-of-Custody Record

Woods Hole Group

375 Paramount Drive
Raynham, MA 02767

TEL: (508) 822-9300
FAX: (508) 822-3288

0411007

COMPANY INFORMATION

Name: ENSR
Address: 2 Technology Park Dr
Westford MA 01886
Telephone: 978 589 3006
Facsimile:
Contact Name: Dion Lewis

COMPANY'S PROJECT INFORMATION

Regulatory Protocol:
For the State of:
Project Name: NBH Task 200
Project Number: ~~NBH Task 200~~
~~PO #~~ 09000350200
Sampler Name(s): Jamie Lund

SHIPPING INFORMATION

Carrier:
Airbill Number:
Date Shipped:
Quote #:

(TAT IS IN BUSINESS DAYS)
CIRCLE TAT: 10 Day 5 Day 3 Day 48 Hr 24 Hr Other (IF OTHER NOTE BELOW)

SAMPLE CONTAINERS (NOTE 4)					
PRESERVATIVE	ICe	ICe	HNO_3		
CONTAINER TYPE	A	P	P		
VOLUME	1Lt	1Lt	500ml		

WHG LAB #	SAMPLE ID (NOTE 1)	COLLECTION DATE	COLLECTION TIME	COMPOSITE OR GRAB	MATRIX	ANALYSIS/REMARKS (NOTES 2, 3)	SAMPLER(S) INITIALS	NUMBER OF CONTAINERS					
-1	WQ1E110104	11/1/04	1150	G	SW	8082 (Aqueous PCB (aq))	J.L	2					
	WQ "	"	"	"		160.2 (TSS) 180.1 (Turbidity)			1				
	"	"	"	"		6020 (Total metals)				1			

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Jamie Lund	11/1/04	1539	Jamie Lund
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
[illegible]	11/1/04	17:40	[illegible]
Relinqu[illegible] by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.; MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.; 40ml/glass/H_2SO_4

Notes to Lab: Shipping tape # 20361 / 20921

Sample Receipt Checklist

Client: ENSR		Receipt Date: 11/1/04	
Project: NBH Task 200 3 MR		Log-in Date: ~~TTT~~ 11/2/04 MR	
LTR #: 0411007		Inspection by: MFP	Login by: MR

ALL SECTIONS BELOW MUST BE COMPLETED

Comments / Notes

Were samples shipped? Yes, FedEx / UPS / Other:_____
No, WHG Courier pick-up / Hand delivered

Is bill of lading retained? Yes, Tracking #:_____
No, Unavailable / NA

Number of coolers received for this project delivery: 1

Indicate cooler temperature upon opening (if multiple coolers, record all temps):

Note: *If all coolers are 2-6°C, use one checklist, if NOT, use separate checklists and note all samples received above 6°C.*

Cooler 1:
Temperature(s) taken from: 6° IR Gun, _____ Temp. Blank, / NA

Were samples received on ice? Yes / No

Chain-of-Custody present? Yes / No
Complete? Yes / No

Custody seals present on Cooler? Yes / No
on Bottles? Yes / No
Intact? Yes / No / NA

Note: Affix custody seals to back of this page.

Were sample containers intact? Yes / No If No, list samples: →

Did VOA/VPH waters contain headspace (>5mm)? Yes / No / NA If Yes, list samples: →

Were 5035 VOA soils, or VPH soils, *covered* with MeOH? Yes / No / NA
If No, list samples: →

Was a sufficient amount of sample received for each test indicated on the COC?
Yes / No If No, list samples: →

If chemical preservation is appropriate -
Were samples field preserved? Yes / No / NA

☐ C=HCl ☐ M=MeOH ☐ S=H_2SO4
☐ H=NaOH ☒ N=HNO_3 ☐ Other:_____ ☐ U= Unknown

Preservation (pH) verified at lab for *EVERY* bottle? (Not: VOA / VPH / Sulfide)
YES: <2 or >12 (CN) or NO NA
If No, why?:

Were samples received within hold time? Yes / No If No, list samples: →

Discrepancy between samples rec'd & COC ? Yes / No If Yes, list samples: →

Was the Project Manager notified of any other problems? Yes / No / NA

Project Manager Acknowledgement: Date: MR

Sample storage refrigerator #: C3

Sample storage freezer #:_____

Cooler 2:_____ Cooler 3:_____
Cooler 4:_____ Cooler 5:_____
Cooler 6:_____ Cooler 7:_____

More:_____

COC - States project is NBH Task 200 per D. Lewis 11/3/04 Project is Task 3 MR

Chemical preservation OK for ALL samples?
Yes / No / N/A

If No, list samples below:

Please use back for any additional notes!

Certificate Program Summary

Method numbers assume the most recent EPA revisions. For a complete listing of analytes for the referenced methods please contact your Woods Hole Group Environmental Laboratories Project Manager or the Quality Assurance Manager.

Connecticut Department of Public Health Certificate No. : PH-0141 - *Wastewater* (General Chemistry: 120.1, 150.1, 160.1, 160.2, 180.1, 300.0, 310.1, 335.2, 365.2, 405.1, 413.1, COD HACH 8000; Metals: 200.7, 245.1; Organics: 608, 624, 625). *Solid Waste/Soil* (General Chemistry: 1010, 9010/9014, 9045, 9056, 9060; Metals: 6010, 6020, 7041, 7471; Organics: 8081, 8082, 8260, 8270, ETPH).

Florida Department of Health Certificate No. : E87814 - Secondary NELAP Accreditation for *Wastewater* (Gerneral Chemistry: 120.1/2510B, 150.1, 160.1/SM2540C, 160.2/SM2540D, 180.1, 300.0, SM2320B, 335.2, 365.2, 413.1, 420.1, SM2540G, COD HACH 8000; Metals: 200.7, 204.2, 206.2, 239.2, 245.1, 270.2, 279.2; Organics: 608, 624, 625). *Solid and Hazardous Waste* (General Chemistry: 9010/9014, 9045, 9050, 9056, 9060, 9065; Metals: 6010, 6020, 7041, 7060, 7421, 7470, 7471, 7740, 7841; Organics: 8081, 8082, 8260, 8270).

Louisiana Department of Environmental Quality Certificate No. : 03090 - Primary NELAP Accrediting Authority for *Wastewater* (General Chemistry: 120.1/2510B, 150.1, 160.1/SM2540C, 160.2/SM2540D, 180.1, 300.0, 310.1/SM2320B, 335.2, 365.2, 376.2, 405.1, 413.1, 420.1, SM2540G, COD HACH 8000; Metals: 200.7, 204.2, 206.2, 239.2, 245.1, 270.2, 279.2; Organics: 608, 624, 625). *Solid and Hazardous Waste* (General Chemistry:1010, 1311, 9010/9014, 9045, 9056, 9060; Metals: 6010, 6020, 7041, 7060, 7191, 7421, 7470, 7471, 7740, 7841; Organics: 8081, 8082, 8260, 8270).

Maine Department of Human Services Certificate No. : MA030 -*Wastewater* (General Chemistry: 120.1/2510B, 150.1, 160.1/SM2540C, 160.2/SM2540D, 180.1, 300.0, 310.1/SM2320B, 335.2, 365.2, 405.1, 413.1, 420.1, COD HACH 8000; Metals: 200.7, 239.2, 245.1, 270.2, 279.2; Organics: 608, 624).

Massachusetts Department of Environmental Protection Certificate No. : M-MA030 - *Wastewater* (General Chemistry: 120.1/2510B, 150.1, 160.1/SM2540C, 160.2/SM2540D, 180.1, 300.0, 310.1/SM2320B, 335.2, 365.2, 405.1, 413.1, 42 COD HACH 8000; Metals: 200.7, 239.2, 245.1, 270.2, 279.2; Organics: 608, 624).

New Hampshire Department of Environmental Services Certificate No. : 220604 - Secondary NELAP Accreditation for *Wastewater* (Gerneral Chemistry: 120.1/2510B, 150.1, 160.1/SM2540C, 160.2/SM2540D, 180.1, 300.0, 310.1/SM2320B, 335.2, 365.2, 376.2, 405.1, 413.1, 420.1, COD HACH 8000, SM2540G; Metals: 200.7, 204.2, 206.2, 239.2, 245.1, 270.2, 279.2; Organics: 608, 624, 625).

New Jersey Department of Environmental Protection Certificate No. : MA015 -*Solid and Hazardous Waste* (General Chemistry: 1010, 1311, 3060, 7196, 9010/9014, 9045, 9056, 9060; Metals: 3010, 3015, 3020, 3050, 3051, 6010, 6020, 7041, 7060, 7131, 7191, 7211, 7421, 7470, 7471, 7520, 7740, 7761, 7841; Organics: 3510, 3545, 5030, 5035, 3620, 3630, 3640, 3660, 8081, 8082, 8100, 8260, 8270).

New York Department of Health Certificate No. : 11627 - Secondary NELAP Accreditation for *Wastewater* (Metals: 200.7, 204.2, 206.2, 239.2, 245.1, 270.2, 279.2; Organics: 608, 624, 625). *Solid and Hazardous Waste* (Metals: 6010, 7041, 7060, 7470, 7471, 7740; Organics: 8081, 8082, 8260, 8270).

Rhode Island Department of Health Certificate No. : 00064 - Chemistry: *Organic and Inorganic in Surface Water, Wastewater/Sewage and Soil* (Method numbers not specified with certificate.)

U.S. Army Corps of Engineers - General Chemistry: 9010/9014, 9071/418.1, 9060; Organics: 8081, 8082, 8260, 8270, 8270-SIM; Metals: 6010, 6020, 7000.

Department of the Navy - General Chemistry: 9010/9014, 9060; Organics: 8081, 8082, 8015-mod, 8260, 8270, 8270-SIM, Metals: 6010, 6020.

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Arbacia punctulata Fertilization Data

STUDY: 12703
CLIENT: ENSR
PROJECT: New Bedford Harbor
SAMPLE DATE: 11/1/2004

TREATMENT	REPLICATE				UNFERTILIZED
	A	B	C	D	MEAN
LAB	1.8%	0.0%	2.8%	0.0%	1.1%
WQ1E110104	1.7%	1.8%	3.1%	0.0%	1.6%

TREATMENT	REPLICATE				FERTILIZED
	A	B	C	D	MEAN
LAB	98.2%	100.0%	97.2%	100.0%	98.9%
WQ1E110104	98.3%	98.2%	96.9%	100.0%	98.4%

STUDY: 12703
CLIENT: ENSR
PROJECT: New Bedford Harbor
SAMPLE DATE: 11/1/2004
TASK: Mysid Survival
ACCEPTABILITY: Mean Control Survival = 90%

SITE	Rep	Exposure Period / # Alive			
	Day	0	1	2	
Control	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
	E	5	5	5	
	F	5	5	5	
	G	5	5	5	
	H	5	5	5	
	Mean				100.0%
WQ1E110104	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
	E	5	5	5	
	F	5	5	5	
	G	5	5	5	
	H	5	5	5	
	Mean				100.0%

STUDY: 12703
CLIENT: ENSR
PROJECT: New Bedford Harbor
SAMPLE DATE: 11/1/2004
TASK: Mysid Survival
ACCEPTABILITY: Mean Control Survival = 80%

SITE	Rep	Exposure Period / # Alive								
		0	1	2	3	4	5	6	7	
Control	A	5	5	5	5	5	5	5	5	
	B	5	5	5	5	5	5	5	5	
	C	5	5	5	5	5	5	5	5	
	D	5	5	5	5	5	5	5	5	
	E	5	5	5	5	5	5	5	5	
	F	5	5	5	5	5	5	5	5	
	G	5	5	5	5	5	5	5	5	
	H	5	5	5	5	5	5	4	4	
	Mean									98%
WQ1E110104	A	5	5	5	5	5	5	5	5	
	B	5	5	5	5	5	5	5	5	
	C	5	5	5	5	5	5	5	5	
	D	5	5	5	5	5	5	5	5	
	E	5	5	5	5	5	5	5	5	
	F	5	5	5	5	5	5	5	5	
	G	5	5	5	5	5	5	5	5	
	H	5	5	5	5	5	5	5	5	
	Mean									100%

STUDY: 12703
CLIENT: ENSR
PROJECT: New Bedford Harbor
SAMPLE DATE: 11/1/2004
TASK: Mysid Dry Weights
ACCEPTABILITY Mean Dry Weight = 0.200 mg

Conc.	Rep	Tare (Grams)	Shrimp + Foil (Grams)	Net (mg)	# Shrimp Day 0	Mean Weight (mg)	# Shrimp Day 7	Mean Weight (mg)
Control	A	0.21225	0.21465	2.40	5	0.480	5	0.480
	B	0.21045	0.21284	2.39	5	0.478	5	0.478
	C	0.21104	0.21347	2.43	5	0.486	5	0.486
	D	0.21346	0.21641	2.95	5	0.590	5	0.590
	E	0.21191	0.21445	2.54	5	0.508	5	0.508
	F	0.21109	0.21348	2.39	5	0.478	5	0.478
	G	0.21112	0.21370	2.58	5	0.516	5	0.516
	H	0.21272	0.21500	2.28	5	0.456	4	0.570
	MEAN					0.499		0.513
WQ1E110104	A	0.20704	0.20931	2.27	5	0.454		
	B	0.20974	0.21216	2.42	5	0.484		
	C	0.20921	0.21173	2.52	5	0.504		
	D	0.21033	0.21283	2.50	5	0.500		
	E	0.21059	0.21290	2.31	5	0.462		
	F	0.21023	0.21232	2.09	5	0.418		
	G	0.21093	0.21331	2.38	5	0.476		
	H	0.21002	0.21288	2.86	5	0.572		
	MEAN					0.484		

STUDY: 12703
CLIENT: ENSR
PROJECT: New Bedford Harbor
SAMPLE DATE: 11/1/2004
TASK: Champia Acute Exposure - 48 Hr Survival

Site	Rep	# Branches	# impacted	% Survival
Lab Control	A	5	0	100%
	B	5	0	100%
	C	5	0	100%
	D	5	0	100%
WQ1E110104	A	5	0	100%
	B	5	0	100%
	C	5	0	100%
	D	5	0	100%

STUDY: 12703
CLIENT: ENSR
PROJECT: New Bedford Harbor
SAMPLE DATE: 11/1/2004
TASK: Champia Chronic Exposure - Cystocarp Production
ACCEPTABILITY: Mean Cystocarp production = 10

Site	Rep	Tip	Mean	Site Mean
Lab Control	A	1	2	2.0	1.0
		2	1		
		3	0		
		4	4		
		5	3		
	B	1	2	1.8	
		2	1		
		3	3		
		4	1		
		5	2		
	C	1	0	0.0	
		2	0		
		3	0		
		4	0		
		5	0		
	D	1	0	0.0	
		2	0		
		3	0		
		4	0		
		5	0		
WQ1E110104	A	1	1	0.4	0.3
		2	0		
		3	0		
		4	1		
		5	0		
	B	1	0	0.8	
		2	1		
		3	1		
		4	2		
		5	0		
	C	1	0	0.0	
		2	0		
		3	0		
		4	0		
		5	0		
	D	1	0	0.0	
		2	0		
		3	0		
		4	0		
		5	0		

APPENDIX D

PROJECT PHOTOGRAPHS

Pile driving for the southern abutment, June 2004

Debris removal, June 2004

Placing debris on shore, June 2004

Cofferdam cellular sheet-piles

Cellular cofferdam template

Dredge bucket

Filling eastern most cell of finger pier with sediment from access channel

Dredging eastern portion of the access channel

Tugboat and barge in foreground, excavation of pier cells

Completing the New Packer Marine pier

APPENDIX E

PACKER MARINE FACILITY WATER QUALITY MONITORING REPORT RESPONSE TO COMMENTS (RTC) – NOVEMBER 2005

U. S. ARMY ENGINEER DISTRICTS – NEW YORK & NEW ENGLAND

CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS

PROJECT New Bedford Harbor Superfund Project

☐ SITE DEV & GEO ☐ ENVIR PROT& UTIL ☐ ARCHITECTURAL ☐ STRUCTURAL

☐ MECHANICAL ☐ MFG TECHNOLOGY ☐ ELECTRICAL ☐ INST & CONTROLS

☐ SAFETY ☐ ADV TECH ☐ ESTIMATING ☐ SPECIFICATIONS

☐ SYSTEMS ENG ☐ VALUE ENG ■ OTHER

REVIEW Packer Marine Facility WQM Report

DATE 14 NOV 05

NAME

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		Comments from MADEP	
1	General	When finalized, could these reports be sent in an electronic form?	Reports will be available as .pdf documents when finalized.
2	Section I. Construction of the Packer Marine Facility - Page ii, 2nd paragraph, 2nd sentence	Define NTU.	Text will be modified to: "The monitoring focused on real-time measurement of water column turbidity around and down-current of the construction/dredging activities and set a project-specific turbidity criterion of 50 nephelometric turbidity units (NTUs) above background at 300 ft down-current form the project activity."
3	Section I. Construction of the Packer Marine Facility - Page 5, 2nd paragraph, 3rd sentence	Define YSI.	Text will be modified to: "During the initial phase of the project, debris removal and pile driving, monitoring was performed using an optical backscatter (OBS) nephelometer, during the later dredging phase an Yellow Springs Instruments (YSI) multiparameter meters were used."
		Comments from Jay Mackay	
4	Section I. Construction of the Packer Marine Facility - page 4, 5th sentence	It reads: "The exceedance of the project criterion at the 300 ft transect **triggered** additional monitoring.... and the next sentence reads the same with regard to the 600 ft transect as well as the notification. I interpret it as an exceedance actually occurred. Might want to take a look at it and reword to say "in the event of" or something.	Text will be modified to: "In the event the project turbidity criterion (50 NTU above background) was exceeded at the 300 ft down-current transect additional monitoring, collection of water samples for analysis, and notification of the resident project engineer for implementation of corrective action would be carried out." Text will be modified in a similar fashion for the 600-ft distance.
		Comments from Gary Morin	
5	Page 2, Section 1.2 2nd para., 2nd sentence	Please note that Reed & Reed was NOT under contract to Jacobs. Reed was under contract to Tisbury Towing & Transportation who was reimbursed by the Government as a Business Relocation. Please revise the report accordingly.	Text will be modified to: "The work was performed by Reed & Reed (Woolwich, ME) under contract to Tisbury Towing & Transportation, as a Business Relocation funded by the Government."

ACTION CODES
A - ACCEPTED/CONCUR
D - ACTION DEFERRED
W - WITHDRAWN
N - NON-CONCUR
VE - VE POTENTIAL/VEP ATTACHED

II. DMU #2

US Army Corps of Engineers®
New England District

U.S. Environmental Protection Agency

Water Quality Monitoring Summary Report

Remediation Dredging at DMU-2 Fall 2004

New Bedford Harbor Superfund Site – New Bedford Massachusetts

Prepared by:

ENSR INTERNATIONAL

CR ENVIRONMENTAL, INC. WBE

Contract
DACW33-00-D-0003
Task Order 12
Document No.
09000-350-310

Final December 2005

REVISION NOTES

Dredging of DMU-2 Water Quality Monitoring Report

A draft of this report was first prepared in May 2005.
Based on comments, outlined in the Response to Comments (RTC) – Appendix C, the draft report was revised to produce this final report dated December 2005. Those portions of the original document that did not require revision retain the original draft report date of May 2005.

A summary of the revisions are as follows:

1. *Cover page – Edited date, changed Draft to Final.*
2. *TOC - Added a list of appendices section, Added Appendix E to list, Page numbers adjusted based on required edits and reformatting. File path and footer date changed.*
3. *Text – An entire body of text (dated December 2005) has been provided to supersede the draft version. Page numbers adjusted based on required edits and reformatting. File path and footer date changed.*
4. *Tables - no RTC requirements to tables however a typo was corrected in Table 1; a modified table is provided.*
5. *Figures – Based on the RTC, a modified Figure 7 and 14 is provided.*
6. *Appendices - Edited existing and/or created new cover pages for each existing appendix Added cover page for Appendix E, added content of RTC to Appendix E.*

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EXECUTIVE SUMMARY

Remediation dredging was performed within Dredge Management Unit #2 of the New Bedford Harbor Superfund Site from September through early November 2004. Approximately 12,500 cubic yards of contaminated sediments were removed during the period using auger-equipped hydraulic dredges. Dredged material was pumped to nearby shore-side facilities for desanding and dewatering. Because of elevated PCB concentrations in the dredged sediments (>1000 ppm), special material handling and a silt curtain and oil boom were required for the work as well as the performance of water quality monitoring.

The water quality monitoring program was developed by the USEPA and the USACE to ensure that the dredging and support activities were carried out in a manner that did not result in acute impacts to organisms within the water column outside of the dredge area, in significant transport of contaminated sediments outside of the work zone to clean or previously remediated area, or in blockage of the waterway to anadromous fish passage. The monitoring focused on real-time measurement of water column turbidity around and down current of the dredging. Similar to previous in-water work with the New Bedford Harbor Superfund Site, a turbidity criterion of 50 nephelometric turbidity units (NTUs) above background at 300 feet down current of the dredging was set for the project. The program also included sampling for toxicity testing and chemical analyses contingent on exceedence of the turbidity criterion.

Boat-based monitoring did not identify any exceedences of the 50 NTU above background criterion 300 feet down current of the dredging. Toxicity testing performed on water samples collected from within areas of elevated turbidity in close proximity to the dredging confirmed the ecological protectiveness of the +50 NTU criterion. Data from recording turbidity meters deployed around the dredged area generally supported the boat-based measurements; the dredging and support operations generated plumes of suspended solids that were variable over time and location, but the plumes diminished in intensity quickly as they moved down current. The recording meters identified several instances of potential exceedence of the 50 NTU criterion at 300 feet down current. However, the recorded exceedences were very short in duration (minutes), and may have been due to biota (shrimp and crabs) interfering with the turbidity sensor's measurements or support vessel operations closer to the deployed meter. Even if these events were related to the dredging, they were not expected to cause significant impacts given their extremely short duration.

Sediment traps were deployed within and down current of the work area. Analysis of sediments collected in the traps indicated that deposition of sediment with elevated PCB levels was occurring within DMU-2 and beyond the curtained boundaries both during and following the dredging. Interpretation of these data is qualified because of the lack of baseline or reference samples for comparison, because of the elevated sediment PCB concentrations in the surrounding area, and because of the general uncertainty associated with sediment traps deployed in this type of setting.

However, given the intensity of the suspended solids plumes identified near the dredging (100 mg/L or more) and the fact that the plumes diminished significantly within several hundred feet down current, it is clear that some redeposition of suspended material was occurring within and immediately down current of the dredge area.

1.0 INTRODUCTION

This report summarizes the water quality monitoring performed in support of remediation dredging of the New Bedford Harbor Superfund Site at Dredge Management Unit #2 that took place in fall 2004. The objective of the monitoring was to ensure that the remediation was carried out in a manner that minimized associated impacts to the surrounding waters and transport of contaminated material away from the work area. The report is organized into five sections and four appendices. Background information is included in Section 1. Details of the methodology for field monitoring and laboratory analyses are presented in Section 2. The monitoring results are presented in Section 3 and discussed in Section 4. Cited references are included in Section 5. The appendices include the project scope of work, additional field and laboratory data records, and project photographs. The water quality monitoring was performed by ENSR and its subcontractor CR Environmental under USACE contract DACW33-00-D-0003.

1.1 Site Background

New Bedford Harbor is located approximately 50 miles south of Boston on the waters of Buzzards Bay in Bristol County, Massachusetts. The sediments in many areas of the Harbor are contaminated with polychlorinated biphenyls (PCBs) and metals, primarily from the manufacture of electrical components which occurred in the area between 1940 and the mid-1970s. Based on human health concerns and ecological risk assessments, the U.S. Environmental Protection Agency (USEPA) added New Bedford Harbor to the National Priorities List in 1982 as a designated Superfund Site, and stipulated that remedial measures were required to remove PCB-contaminated sediments from the Harbor. Through an Interagency Agreement between the USEPA and the U.S. Army Corps of Engineers, New England District (USACE), the USACE is responsible for carrying out the design and implementation of the remedial measures.

The New Bedford Harbor Superfund Site extends from the shallow northern reaches of the Acushnet River estuary, south through the commercial harbor of New Bedford and out beyond the City's hurricane barrier into 17,000 adjacent acres of Buzzards Bay. The Superfund Site is divided into three areas: the Upper, Lower, and Outer Harbors defined by geographical features of the Harbor and gradients of sediment contamination (Figure 1). The industrial discharge of PCB contaminated waste, either directly into the Harbor or indirectly through the City's sewer system, was most significant in the Upper Harbor. The location of the associated PCB discharge and the hydrodynamics of the Harbor contributed to the deposition of significant levels of PCB contamination in the Upper Harbor.

The highest PCB concentrations or "hot-spots", which contained PCB concentrations in excess of 100,000 ppm, resided in the sediments located in the immediate area of the discharge. These "hot-spot" sediments were removed between 1994 and 1995 as part of the USEPA's first cleanup phase

(USEPA, 1997). The remaining sediments in the Upper Harbor, an area of approximately 190 acres, are still heavily contaminated, with PCB concentrations in the thousands of ppm. Following completion of a sediment dewatering, water treatment, and material transfer facility, full-scale remediation dredging was performed in fall 2004 with additional intervals of full-scale dredging expected to occur in following years.

1.2 Overview of the Fall 2004 Dredging

Remediation of the Upper Harbor was divided into a series of dredge management units (DMUs) based on location and previously defined sediment PCB concentrations. The fall 2004 dredging effort focused on DMU-2 located in the northern portion of the Upper Harbor adjacent to the Aerovox Facility (Figure 2). Only a portion of DMU-2, approximately 225 feet by 500 feet, was designated for dredging to allow space for passage of the fall anadromous fish run. Based on previous investigations, total PCB concentrations were in excess of 1000 ppm for some sediments within this area with the depth of contamination ranging from less than 1 foot to nearly 5 feet (USEPA data base).

Preparatory work was initiated in late August 2004 and included the installation of individual sheet piles, traveling cable, and silt curtain along with limited debris removal within the area to be dredged. Dredging was performed from September through early November, using an auger equipped hydraulic dredge. Dredged material was pumped through a pipeline within the Upper Harbor waterway to a desanding unit located at the Sawyer Street Facility (Figure 1). Following desanding, the fine material was pumped through another pipeline in the waterway to the sediment dewatering, water treatment, and material transfer facility located in the Lower Harbor (Figure 1).

The dredging removed a total of approximately 12,500 cubic yards of material, with the depth of cut ranging from 1 foot to nearly 8 feet. The demobilization effort following completion of the dredging included removal of the dredges, pipeline, and silt curtain. The sheet piles were left in place. The remedial operation was performed by the Jacobs Engineering Group and subcontractor Sevenson Environmental Services as part of a Total Environmental Restoration Contract with the USACE. Complete details of the dredging operation can be found in the *After Action Report – 2004 New Bedford Harbor Remedial Action* (Jacobs 2005).

1.3 Water Quality Monitoring Program

The fall 2004 dredging was performed in an area with some of the highest PCB concentrations remaining in the Upper Harbor. The dredging approach and placement of silt curtains were employed to minimize resuspension and transport of sediments outside of the immediate dredging area. In addition, the USEPA and USACE developed a water quality monitoring program to ensure that dredging operations were carried out to meet the following overall goals for work within the Superfund Site:

- The disturbance of the contaminated sediments does not result in acute impact to organisms within the water column outside the dredging area.

- There is not significant transport and deposition of sediments and their associated contaminants outside the dredging area to uncontaminated areas or areas that have already been remediated.

An added monitoring goal was related to the timing and location of the fall 2004 DMU-2 work:

- A zone of safe passage for anadromous fish should be maintained around the dredging operation.

The monitoring focused on real-time measurement of turbidity down-current of dredging with conditional sampling for toxicity testing and chemical analyses. A project-specific turbidity criterion was set at 50 NTUs (Nephelometric Turbidity Unit) above background at 300 feet down-current of the work zone. The criterion was developed by the USEPA and the USACE based on a review of previous dredging and monitoring activities at the New Bedford Harbor Superfund Site (ENSR 2003), Harbor sediment contamination levels, and current patterns in the vicinity of the construction and dredging area. The monitoring was performed throughout dredging, more intensively at the start of operations and periodically throughout the rest of project. As described in Section 2, the monitoring program contained provisions for additional sampling and analyses and for corrective action for the dredging operation to ensure that the project environmental goals were met.

2.0 METHODS

2.1 Program Overview

The water quality monitoring program for DMU-2 included field verification of water quality controls, field measurement of turbidity (boat-based and deployed meters), collection of water samples for laboratory analyses, and assessment of potential dredging related deposition of suspended solids. More intensive boat-based monitoring was performed during the initial weeks of the dredging to verify the effectiveness of the dredging methodology and silt curtain at limiting suspended solids.

The monitoring focused on real-time measurement of water column turbidity and followed the protocol developed for previous water quality monitoring at New Bedford (Figure 3). Initial monitoring was performed in the immediate vicinity of the dredging operation (immediately outside of the silt curtain) as well as at an up current reference location. If turbidity was elevated immediately outside of the silt curtain, additional monitoring was performed along transects located further down-current of the operation.

In the event of an exceedence of the project turbidity criterion (50 NTUs (Nephelometric Turbidity Unit) above background) at the 300 foot down-current transect additional monitoring would be triggered, along with collection of water samples for analysis and notification of the resident project engineer for implementation of corrective action. In the event of an exceedence of the criterion at the 600 foot down-current transect additional sampling would be triggered along with immediate shut down of project operations (Figure 3). A tiered set of laboratory analyses was implemented if elevated turbidity triggered collection of samples, similar to the protocol used in previous monitoring at New Bedford Harbor (Figure 4). Biological (toxicity) testing formed the initial level of tests with chemical testing (PCBs, metals) contingent on poor survivorship in the toxicity test.

A summary of the monitoring program is presented below, and additional details can be found in the Scope of Work (SOW) for the Water Quality Monitoring during Remediation Dredging of Dredging Management Unit #2, New Bedford Harbor Superfund Site (Appendix A), the Quality Assurance Project Plan (Jacobs 2004), and the Field Sampling Plan (ENSR 2004).

2.2 Field Monitoring and Sampling

The monitoring program for DMU-2 consisted of four components, discrete boat-based water column monitoring, continuous water column monitoring with deployed meters, sediment transport assessment, and observations and assessments of water quality controls (booms/curtains). The boat-based monitoring and sampling operations were conducted at varying levels of intensity depending on the nature and intensity of dredge activity. The timing of this monitoring coincided with

the project dredging activities deemed to have the greatest potential to affect water quality, including removal of large debris prior to dredging.

2.2.1 Discrete Boat-based Water Column Monitoring

Monitoring and sampling activities were conducted using a Jon-boat operated by CR Environmental. Geographic information for field data collection and sample collection locations were documented using a Garmin hand-held GPS, and distance measurement between dredge activity and survey vessel was determined by using a laser range finder. Real-time water quality measurements were performed using Yellow Springs Instruments (YSI) multiparameter meters. Water sampling was performed using a 12-volt Teflon diaphragm pump and the appropriate length of C-FLEX Teflon composite tubing. Details on the use and maintenance of the YSI meter is found in the Standard Operating Procedures attached to Field Sampling Plan (ENSR 2004).

On each monitoring day, turbidity measurements were performed periodically down current of the dredging along the edge of the silt curtain. If elevated turbidity was recorded at the silt curtain, additional measurements were performed 300 feet down current of the dredging operation (Figure 5). During some time periods (such as when the dredge was operating in the northern portion of DMU-2 on an ebb or southerly tide), the closest approach distance at the edge of the silt curtain was greater than 300 feet. In addition to the down-current monitoring stations, background (i.e., reference station) measurements were performed approximately 1000 feet up-current (based on tidal stage) outside of the influence of operations and of any localized turbidity sources such as storm water discharges. Monitoring was performed throughout the water column at 0.5 to 1 foot intervals at all stations.

The real-time nature of these measurements allowed for direct correlation between dredging activities and water column impacts. A field log sheet was completed during each monitoring day including date, time, monitoring positions, sample collection identification and locations, meteorological observations, water depth, turbidity, temperature, dissolved oxygen, and other relevant observations. These daily field summary sheets are included in Appendix B.

2.2.2 Continuous Turbidity Monitoring

Continuous turbidity monitoring was incorporated into the monitoring program to better evaluate short term fluctuations in turbidity levels that might have not been captured by the discrete boat-based measurements. YSI meters were deployed both inside and outside the silt-curtained dredge area during the later phase of the dredging from 25 October through 14 November 2004. Meters were deployed at four locations, two to the north of the dredging and two to the south (Figure 6). The meters were attached directly to the sheet piles installed around the dredge area, and positioned approximately 6 to 12 inches above the bottom. The meters were inspected every two to five days to download data and confirm that the sensors were operational.

2.2.3 Sediment Deposition Monitoring

In an effort to characterize sediment transport and deposition within and near DMU-2, a series of sediment traps were deployed during the later portion of the dredging and demobilization operations. Traps were deployed at three locations within the main axis of channel: approximately 400 feet north of the silt curtain bounding DMU-2, within the curtained zone just west of the dredge area, and approximately 500 feet south of the silt curtain (Figure 7). The traps consisted of a weighted plastic wash bin outfitted with a bridle and marker float (Figure 7). Once deployed, the traps sat on the bottom with the side walls rising approximately 5 inches above the surrounding sediments. The traps were recovered by pulling them up slowly through the water column to avoid washing the collected sediment out of the bin. Once recovered, the overlying water was decanted, and the sediment slurry in the bottom of the trap was poured into 1-liter sample bottles.

2.3 Analyses

Water and sediment samples collected to support the monitoring program were containerized, labeled, and submitted to the designated laboratories as specified in Field Sampling Plan (ENSR 2004). Water quality samples were submitted to Enviro-Systems Incorporated (ESI) of Hampton Falls, NH for the following toxicity bioassay tests:

- Sea urchin (*Arbacia punctalata*) 1-hr sperm cell fertilization;
- Red alga (*Champia parvula*) 48-hr exposure viability and 7-day reproduction bioassay; and
- Mysid (*Americamysis bahia*) 48-hr survival and 7-day growth and survival.

Toxicity test controls were prepared using surface water from the Hampton Estuary. Toxicity tests were conducted in accordance with relevant U.S. EPA Environmental Research Laboratory, Atlantic Ecology Division Narragansett, RI protocols and the project QAPP (Jacobs 2004). Water quality and sediment samples collected for chemical analysis were submitted to Woods Hole Group (WHG) of Raynham, MA. Water samples were analyzed for total suspended solids and dissolved and particulate PCBs (18 NOAA congeners). Sediment samples were also submitted to WHG for analysis of PCBs (18 NOAA congeners). Gravimetric TSS measurements were made using membrane filters, with careful rinsing of any retained salt to avoid bias. Wholewater samples collected for PCB analysis were filtered at the laboratory to obtain dissolved and particulate sample fractions. Standard EPA methods (SW-846) methods were used to analyze the water and sediment samples for PCBs. Specific analytical methods and procedures are presented in the project QAPP (Jacobs 2004).

3.0 RESULTS

3.1 Dredging Summary

Dredging in DMU-2 was performed from September through early November, primarily using an auger equipped Mudcat hydraulic dredge. Dredging was generally limited to a single unit with only occasional periods of a second dredge operating in tandem. Dredged material was pumped through a pipeline within the Upper Harbor waterway to a desanding unit located at the Sawyer Street Facility (Figure 1). Following desanding, the fine material was pumped through another pipeline in the waterway to the sediment dewatering, water treatment, and material transfer facility located in the Lower Harbor (Figure 1).

A grid system was laid out over the area of DMU-2 designated for dredging for use in planning and tracking (Figure 8). A target depth of cut and final post-dredge elevation (defined as z*) was assigned to each grid cell based on previous sediment sampling. Dredging was performed in west-to-east oriented cuts, with the dredge using a series of cables for advancement and alignment along a given cut. The depth of cut was approximately 1 foot for each production pass. Larger debris (e.g. bricks, rope, and pipe) were encountered and had to be periodically cleared from the cutterhead and pipeline. Floating oil and gas bubbles were often observed in the water above the cutterhead. Based on the continued presence of released oil when dredging had reached its target depth, a decision was made to dredge deeper than z* in portions of rows 12-15 (Figure 8). In total, the dredging within DMU-2 removed approximately 12,500 cubic yards of material, with the depth of cut ranging from 1 foot to nearly 8 feet (Jacobs 2005). The post-dredge bathymetry clearly showed the overall area dredged as well as the portion with a deeper total cut (Figure 9).

A number of barges and support vessels supported the dredging operation. The barges were used as excavator and crane platforms, for storage and transport of the larger debris, and for staging operations within and outside the silt-curtained area. Support vessels were used for crew transport, to move the barges, in adjusting the silt curtain and dredge positioning cable systems, and in relocating the discharge pipeline. Representative photos of the various dredging and support operations are provided in Appendix D. A chronology of the DMU-2 dredging operations performed in 2004 and additional detail are provided below:

> June-August – In-water mobilization work was performed. The dredge pipeline was installed with one section between DMU-2 and the Sawyer Street Facility and a second section connecting the Sawyer Street Facility and the Dewatering Facility in the Lower Harbor. A series of sheet piles were driven around the perimeter of the dredge area, and cable was connected for placement of the silt curtain and positioning of the dredge. The piles were numbered for reference (Figure 8). The perimeter of the dredge area was enclosed with a

floating boom and weighted silt control skirt. The skirt length varied from 2 feet in the shallower areas to 4 feet in the deeper areas.

31 August – 7 September – Removal of debris from portions of the DMU-2 footprint using a barge-mounted excavator.

8 September – Dredging operations were initiated in DMU-2 but soon after suspended because of hydrogen sulfide buildup at the desanding unit.

22 September – Dredging operations resumed in DMU-2 with hydrogen sulfide controls in place.

10 November – Dredging operations completed in DMU-2.

11-18 November – In-water demobilization included removal of silt curtain and dredges, relocation of pipelines to the waters adjacent to the Sawyer Street Facility. The sheet piles were left in place.

The remedial operation was performed by the Jacobs Engineering Group and subcontractor Sevenson Environmental Services as part of a Total Environmental Restoration Contract with the USACE. Complete details of the dredging operation can be found in the *After Action Report – 2004 New Bedford Harbor Remedial Action* (Jacobs 2005).

3.2 Field Monitoring Summary

A total of 26 days of water quality monitoring were performed during 2004 DMU-2 work including general observations of remedial operations and environmental controls, discrete boat-based water quality measurements and sampling, and deployment and retrieval of recording turbidity meters and sediment traps. The monitoring program began in early August with reconnaissance and baseline surveys of DMU-2 and surrounding areas. As the piles and silt curtain were installed, monitoring of the fish passage zone located at the east boundary of DMU-2 was performed at different tidal stages.

More focused water quality monitoring was initiated in early September during debris removal and in late September with the start of more continuous dredging. The boat-based monitoring revealed limited impacts to water quality (no exceedences of the +50 NTU (Nephelometric Turbidity Unit) criterion at 300 feet down current), but the dredging schedule was variable given constraints of tidal stage, debris, and material processing at the desanding and dewatering facilities. Given this schedule, the monitoring program was modified to include the use of recording turbidity meters and sediment traps to better evaluate short duration or cumulative water column impacts. Monitoring continued throughout the remainder of the dredging and completion of in-water demobilization

activities in mid November. A chronology of the overall water quality monitoring effort is provided in Table 1.

3.3 Boat-Based Monitoring and Sampling

3.3.1 Turbidity Measurements

On each monitoring day, turbidity measurements were conducted periodically at the closest down current approach point to the dredging adjacent to the silt curtain, further down current at the edge of the 300 foot mixing zone, and at an up current reference location. During the duration of the project, reference turbidity values generally ranged from 3 to 7 NTU with a maximum of 12 NTU. There were no exceedences of the +50 NTU above background criterion at the 300 foot down current location recorded during the boat-based monitoring. Turbidity levels at this location were often at or near reference levels.

Turbidity measured at the down current edge of the silt curtain was often elevated above background but was generally less than 30 NTU above background. Higher excursions of turbidity at this location were linked to debris removal activity at the dredge or support vessel maneuvering in shallow waters, and a summary of some of these events is provided below:

> 7 October – As the dredge intake was cleared of debris, a visible turbidity plume observed moving north on the flood tide beneath the silt curtain, approximately 200 feet down current of the dredge. Turbidity levels as high as 47 NTUs above background were measured just outside the curtain. Turbidity levels dropped significantly at the 300 foot down current location, with a maximum of approximately 15 NTUs above background.
>
> 9 November – During a response to small hydraulic oil release (description in 3.3.3), a support vessel was maneuvered into shallow water to place an absorbent boom. This created a visible plume that was transported to the south with the ebb tide. Turbidity as high as 74 NTU above background was measured directly within the plume approximately 100 feet down current of the vessel. Turbidity levels decreased within 300 feet down current of the vessel, and the plume diminished quickly following completion of the vessel activity (less than one hour in extent).

Additional limited monitoring was performed directly within the silt-curtained area during dredging operations. Turbidity levels varied considerably within this area depending on dredge and support vessel operations.

3.3.2 Sample Collection and Analyses

Water samples were collected periodically throughout the monitoring program for analysis of total suspended solids (TSS) as a check on the performance of the field meter. Although there were no exceedences of the +50 NTU turbidity criterion that triggered compliance sampling during the boat-based monitoring, samples were collected on five occasions to evaluate potential water column impacts as described below:

1 September – Samples were collected approximately 300 feet down current (south – ebb tide) of debris removal operations. Turbidity values up to approximately 8 NTU above background were measured during the monitoring of this area.

24 September – Samples were collected approximately 300 feet down current (north – flood tide) of the dredge near the start of continued full production dredging. Turbidity values up to approximately 25 NTU above background were measured during the monitoring of this area.

7 October – Samples were collected at approximately 200 feet down current (north – flood tide) of the dredging operation following the identification of a visible turbidity plume as debris was cleared from the dredge intake. Turbidity values up to 47 NTU above background were measured during the monitoring of this area. Additional samples were collected approximately 400 feet down current of the dredge where turbidity levels had dropped to approximately 10 NTU above background and at 600 feet down current where turbidity returned to background levels.

13 October – Samples were collected directly within the silt-curtained area approximately 100 feet from the dredging operation to evaluate worst-case conditions and verify the protectiveness of the project turbidity criterion. Turbidity values up to 60 NTU above background were measured during the monitoring of this area.

15 October – Samples were collected directly within the silt-curtained area approximately 30 feet from the dredging operation to evaluate worst-case conditions and verify the protectiveness of the project turbidity criterion. Turbidity values up to 60 NTU above background were measured during the monitoring of this area.

Total Suspended Solids

A total of 44 samples were analyzed for TSS, and the results are presented in Table 2. Measured values ranged from 3 to 230 mg/L with a mean of 45 mg/L. The 230 mg/L sample was collected within the wash from a support vessel to the south of the dredged and curtained area. The maximum value associated with the dredge was 180 mg/L for a sample collected from within the silt curtain approximately 100 feet from the dredge.

Biological Testing

Samples collected on each of the five dates noted above were submitted for biological testing. As these were investigative samples (rather than compliance resulting from a turbidity exceedence), reference samples were archived pending the results of the initial *Arbacia* fertilization test. The *Arbacia* fertilization results did not identify any significant impacts, and the biological test results were compared against laboratory control results. Results of the biological testing are presented in Table 3 and summarized below. Additional test data are presented in Appendix C.

Sea urchin (*Arbacia punctalata*) 1-hr sperm cell fertilization – All but one of the test results were within 5% of the laboratory control. For the sample collected on 1 September, the New Bedford sample results were approximately 12% lower than the laboratory control, but the overall fertilization rate (79%) was still good.

Mysid (*Americamysis bahia*) 48-hr survival – All test results were within 5% of the laboratory controls, and the overall survival rate was excellent.

Mysid (*Americamysis bahia*) 7-day survival – All test results were within 8% of the laboratory controls, and the overall survival rate was excellent.

Mysid (*Americamysis bahia*) 7-day growth – Growth rates for the test samples were similar to or exceeded the laboratory controls, and the overall growth rate was good.

Red alga (*Champia parvula*) 48-hr exposure viability – There was 100% survival for all test samples and laboratory controls.

Red alga (*Champia parvula*) 7-day reproduction – Reproduction rates of the test samples were similar to or exceeded the laboratory controls for most samples. For the sample collected on 24 September, the test sample displayed good reproduction, but the laboratory control failed, potentially attributed to a lighting issue. For the samples collected on 7 October, the sample collected in close proximity to the dredge had a reproduction rate comparable to the laboratory control, but the sample collected further down current had a reduced reproduction rate.

Chemical Analyses

Samples collected on 7, 13, and 15 October were also submitted for analysis of dissolved and particulate PCBs. Summary results are presented in Table 4, and individual congener data are presented in Appendix C. Dissolved PCB concentrations ranged from 0.6 to 3.8 ug/L, and particulate PCB concentrations ranged from 0.6 to 34 ug/L (PCB concentrations presented as the sum of the 18 NOAA congeners).

The sample set collected on 7 October provided a good illustration of potential dissolved and particulate phase release during the dredging and reduction in concentration with down current transport. PCB concentration at the reference station was measured at 0.6 ug/L. Sample WQ1 was collected approximately 200 feet down current from the dredging operation at the edge of the silt curtain and had the highest dissolved phase concentration measured for the monitoring, 3.8 ug/L,

and a particulate phase concentration of 7.0 ug/L. Concentrations were reduced in the samples collected approximately 400 feet down current (sample WQ2 in Table 4 – dissolved PCB at 1.4 ug/L and particulate PCB at 2.7 ug/L) and were at or near background approximately 600 feet down current (sample WQ3 in Table 4 – dissolved PCB at 1.0 ug/L and particulate PCB at 0.6 ug/L). The highest particulate phase concentration (34 ug/L) was found in the sample collected within the silt curtained area approximately 100 feet from the dredge.

3.3.3 Additional Observations

In addition to the turbidity measurements and sampling, the boat-based monitoring team periodically inspected the perimeter of the silt curtain and work area. The curtain remained in place for the duration of the project, and space remained to the east of the curtained dredge area to allow for fish passage. No abnormal fish schooling behavior was observed within and around the curtained area, and no fish kills were recorded.

On 9 November, a small amount of hydraulic oil was released from the dredge due to a hose leak. Most of the floating oil was contained within the dredged area, but some passed beneath the boom and curtain on the ebb tide. Support vessels positioned additional absorbent booms and completed collection the oil outside of DMU-2 within an hour.

3.4 Recording Turbidity Meter Measurements

Recording turbidity meters were deployed at four locations around the dredge area during the latter portion of the fall 2004 dredging (Figure 6). Turbidity measurements were recorded at one-minute intervals during the deployment period. The data retrieved from the meters were plotted and inspected for anomalous values. Potential anomalies include very low (zero) values or high values of turbidity or unchanging values that could signal meter malfunction. Intermittent high turbidity values could also signal something physically interfering with the backscatter light path of the turbidity sensor. Inspection of the data record indicated that the meters were working properly, but a series of anomalously high values were identified that were attributed to physical interference at the sensor. Upon checking and retrieval of the meters, small crabs and shrimp were occasionally noted within the sensor package that could have caused the interference. Debris or algae moving within the lower portion of the water column also could have caused the interference. As a result, short-term spikes of turbidity greater than 150 NTU were removed from the data set during processing.

Data from deployment at each of the four locations are presented in Figures 10-13. In addition to the plot of turbidity, each figure includes a record of predicted tidal stage and dredge operating period. A line at 50 NTU has been drawn in for reference. It should be noted that turbidity values above this line do not necessarily indicate an exceedence of the project turbidity criterion (>50 NTU above background at 300 feet down current) as the 50 NTU line did not include background levels

and the distance between the dredge and meter was often less than 300 feet. A review of the data presented in each of the figures is provided below. Refer to Figure 6 for the deployment locations.

Station CM S1 (Figure 10) – This station was located to the south of DMU-2 just outside of the silt curtain and was down current of DMU-2 during the ebb tide period. A 2-day record of turbidity is presented in Figure 10. On 25 October the dredge was working approximately 200 feet from the monitoring location. During the last of the ebb tide between 1100 and 1300 on 25 October, turbidity was elevated throughout much of the period with some spikes approaching 100 NTU. As the tide began to flood, the station was out of the influence of the dredging, and turbidity returned to background levels. The series of turbidity spikes early in the morning of 26 October (0530-0700) may have been due to sensor interference. The elevation of turbidity levels later in the morning during ebb tide conditions coincided with the dredge working approximately 500 feet up current from the monitoring location. Consistently higher turbidity was recorded at the time of startup with several spikes above 50 NTU over the course of the day.

Station CM N2 (Figure 11) – This station was located to the north of DMU-2 just outside of the silt curtain and was down current of DMU-2 during the flood tide period. A 2-day record of turbidity is presented in Figure 11. On 25 October the dredge was working approximately 450 feet from the monitoring location, and turbidity was elevated during the initial portion of the flood tide with a single spike above 50 NTU. A similar pattern was apparent on 26 October, but the turbidity levels were much higher as the dredge was working approximately 100 feet from the monitoring location. Turbidity levels were moderately elevated during the overnight hours of 26-27 October in the absence of dredging.

Station CM 3 (Figure 12) – This station was located to the north of DMU-2 just inside of the silt curtain and was down current of DMU-2 during the flood tide period. A 3-day record of turbidity is presented in Figure 12. On 27 October the dredge was working approximately 300 feet from the monitoring location, and elevated turbidity was apparent at the monitoring location during much of the flood tide. A similar pattern was recorded on 28 October with the dredge working approximately 350 feet away. On 29 October the dredge had moved within 50 feet of the monitoring location, and much higher turbidity was recorded. Turbidity was also somewhat elevated around low tide during non-dredging periods.

Station CM 25 (Figure 13) – This station was located to the southwest of DMU-2 within the silt curtain and was down current of some portions of DMU-2 during the ebb tide period. A 6-day record of turbidity is presented in Figure 13. The periods of sustained turbidity elevations correlate well with dredging work over the recording period. On 28 October the dredge was working approximately 100 to 200 feet from the monitoring location. During the morning hours of 29 October the dredge was working from 50 to 200 feet from the monitoring location but moved to approximately 400 feet away in the afternoon. During the remainder of the recording

period, the dredge ranged from approximately 100 to 300 feet away from the monitoring location.

3.5 Sediment Deposition Monitoring

Sediment traps were deployed at three locations within the main axis of channel to gage the potential cumulative effect of suspended solids transport and redeposition. The traps were deployed approximately 400 feet north of the silt curtain bounding DMU-2, within the curtained zone just west of the dredge area, and approximately 500 feet south of the silt curtain (Figure 7). Not all of the deployments resulted in sample collection as some samples were lost during retrieval of the trap or because of a disturbance imparted by the dredge pipeline. A total of six samples were retrieved from the traps over the course of the monitoring. The results of PCB analysis for these samples is presented in Table 5 and described below.

North of DMU-2 – The sample collected from Station ST1 was retrieved after a 15-day deployment, 10 days of which involved dredging and had a total PCB concentration of 1132 mg/kg. A sample collected from Station ST2 was retrieved after only a 2-day deployment, both of which involved dredging. Although there was much less material in the trap compared to the ST1 sample, the concentration was comparable, at 955 mg/kg. A follow up sample was collected from Station ST2 after a 19-day deployment which included demobilization activities, but not dredging. The total PCB concentration in this sample was 322 mg/kg.

South of DMU-2 – No samples were successfully retrieved from this location during dredging. One sample was retrieved from Station ST3 following a 19-day deployment during demobilization activities. The total PCB concentration in this sample was 325 mg/kg.

Adjacent to DMU-2 – Two samples were retrieved from Station ST25, located approximately 100 feet west of the dredged area of DMU-2. The first was retrieved after an 8-day deployment, 4 days of which involved dredging in nearby portions of DMU-2. This trap had accumulated a large amount of sediment over the period and had a total PCB concentration of 2375 mg/kg. A second sample was retrieved after a 19 day deployment including the demobilization period, but no dredging. The total PCB concentration in this sample was 862 mg/kg.

3.6 Data QC and Database Entry

Upon data receipt from the laboratory, ENSR provided a cursory review for completeness and loaded the data into a temporary database for use in draft data reporting. ENSR also performed a quick check of the QC sample results from the temporary database to evaluate overall data quality before transmitting the data to the program database. Furthermore, electronic files of the hardcopy

laboratory reports were generated and provided to Battelle Ocean Sciences for subsequent data validation efforts and uploading into the Project database

4.0 DISCUSSION AND RECOMMENDATIONS

The fall 2004 dredging at DMU-2 was performed in an area with some of the highest sediment PCB concentrations remaining in the Upper Harbor. The dredging approach and placement of silt curtains were employed to minimize resuspension and transport of sediments outside of the immediate dredging area. The water quality monitoring program developed by the USEPA and USACE was designed to evaluate potential water column impacts around the work zone and potential transport of suspended solids as well as to ensure that an adequate unobstructed zone was maintained for anadromous fish passage.

The overall layout of the silt curtain and dredging operation did not appear to cause a hindrance to fish in the area. Numerous small fish were observed in the area during the early portion of the work in September, but no abnormal schooling behavior was observed, and there were no observations of fish kills.

As in previous phases of New Bedford Harbor Superfund Site work, a project-specific turbidity criterion of 50 NTUs above background 300 feet down current of dredging operations was set as a trigger for sample collection and assessment of operating methods. No exceedence of this criterion was identified during the boat-based monitoring. Also as identified in previous New Bedford Harbor monitoring, the operation of support vessels in shallow water had a capacity equal to or greater than that of the dredge at resuspending sediments. On three occasions, water samples were collected closer to dredging operations in areas where the turbidity was 50 NTU or greater above background. Toxicity testing performed on the samples revealed that these turbidity levels created no adverse impacts to survivorship or fertilization rates, providing confirmation that the +50 NTU criterion was ecologically protective for work in this area.

Data from deployed recording turbidity meters generally supported the boat-based measurements; the dredging and support operations generated plumes of suspended solids that were variable over time and location, but the plumes diminished in intensity quickly as they moved down current. The recording meters identified several instances of potential exceedence of the 50 NTU criterion at 300 feet down current. However, the recorded exceedences were very short in duration (minutes), and may have been due to biota (shrimp and crabs) interfering with the sensor's measurements or support vessel operations closer to the deployed meter. Even if these events were related to the dredging, they were not expected to cause significant impacts given their extremely short duration.

The data from the recording meters also revealed some temporal variation in turbidity levels during non-dredging periods. Although there is no baseline data for comparison, some variation is expected in a shallow tidal system such as New Bedford Harbor. However, the regularity and level of the variation, particularly at the station located near the northern edge of DMU-2 (CM 3 in Figures 6 and 12) could be an indication of the silt curtain disturbing the bottom during a particular stage of

the tide (the curtain used at DMU-2 was not full depth – 2 and 4 foot lengths were used depending on the area).

The sediment trap data indicated that deposition of sediment with elevated PCB levels was occurring within DMU-2 and beyond the curtained boundaries both during and following the dredging. Interpretation of these data is qualified because of the lack of baseline or reference samples for comparison and the general uncertainty associated with sediment traps deployed in this type of setting. In addition, background sediment concentrations in the vicinity of the trap deployments were already quite elevated (Figure 14), and the deposition in the traps may have been influenced by normal resuspension of these sediments. However, given the intensity of the suspended solids plumes identified near the dredging (100 mg/L or more) and the fact that the plumes diminished significantly within several hundred feet down current, it is clear that some redeposition of the suspended material was occurring within this area.

Components of the monitoring that helped to create a more effective overall program were the reliance on real-time field measurements and an adaptive approach for modification of the program. This allowed for a shift in program focus from boat-based measurements once it was confirmed that the dredging did not have unacceptable water column impacts to incorporation of recording meters and sediment traps to better gage transport and redeposition. It is recommended that monitoring of future dredging activities include deployment of recording meters and sediment traps prior to the start of in-water work to provide baseline conditions for comparison and assessment during the remediation effort.

5.0 REFERENCES

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TABLES

Table 1. Water Quality Monitoring Summary During Fall 2004 Dredging at DMU-2

Date	Day	Dredging Activity	Tidal Stage(s)	Background Turbidity (NTU)	Turbidity Range near Dredging Activities (NTU)	Turbidity Exceedence	Sampling for Laboratory Analysis						Notes:
							Toxicity		TSS/Turb.		PCBs		
							Analyze	Archive	Analyze	Archive	Analyze	Archive	
10-Aug-04	Tue	None	LWS/ FL										Reconnaissance survey of the DMU-2 area.
23-Aug-04	Mon	None											Reconnaissance survey of the DMU-2 area.
27-Aug-03	Fri	None	LWS	5	5 - 12								Recon. survey of fish passage with existing dredging configuration
1-Sep-04	Wed	Debris removal	Ebb	6	6 - 14	No	1	2	5				Debris removal with excavator. Samples collected at 300 ft down-current.
2-Sep-04	Thu	None/ maint.	FL/ HWS	6	6 - 14	No			4				Background data collection
24-Sep-04	Fri	Dredging- part-time	LWS/ FL	4	3 - 29	No	1	2	7				Samples collected at 300 ft. down-current.
27-Sep-04	Mon	Dredging -part-time	Ebb/ LWS	4	12 - 36	No			6				
30-Sep-04	Thu	Dredging- part-time	Ebb	7	7 - 23	No			5				
4-Oct-04	Mon	Dredging- part-time	Flood	3	19-36	No			5				
7-Oct-04	Thu	Dredging	Flood	3	7 - 50	No	2	2	5		4		Visible turbidity plume originating from debris removal at dredge moved north on flood tide with elevated turbidity at the silt curtain.
13-Oct-04	Wed	Dredging	Ebb	12	7 – 63 (inside curtain)	No	1	1	3		2		Two dredge in use. Samples collected at curtain and further down-current.
14-Oct-04	Thu	Dredging	Ebb	9	5 - 9	No							One dredge in use.
15-Oct-04	Fri	Dredging	Ebb	7	9 - 65 inside curtain	No	1				1		Samples collected in elevated turbidity within silt curtain.

Table 1 (Continued). Water Quality Monitoring Summary during Fall 2004 Dredging at DMU-2

Date	Day	Dredging Activity	Tidal Stage(s)	Background Turbidity (NTU)	Turbidity Range near Dredging Activities (NTU)	Turbidity Exceedance	Sampling for Laboratory Analysis						Notes:
							Toxicity		TSS/Turb.		PCBs		
							Analyze	Archive	Analyze	Archive	Analyze	Archive	
18-Oct-04	Mon	Dredging	Ebb	7	11 - 45	No							One dredge in use.
21-Oct-04	Thu	Dredging – part-time	Flood	3	7 – 6	No							One dredge in use.
26-Oct-04	Tue	Dredging	Ebb	4	5 – 7	No							One dredge in use.
28-Oct-04	Thu	Dredging	Ebb	6	6 – 23	No							One dredge in use.
1-Nov-04	Mon	Dredging	Ebb	3	7 – 12	No							One dredge in use.
2-Nov-04	Tue	Dredging	HWS	2	5 – 9	No							One dredge in use.
4-Nov-04	Thu	Dredging	Flood	4	8	No							One dredge in use.
9-Nov-04	Tue	Dredging	LWS	4	10-50	No							Elevated hydraulic oil spill at 0800. Absorbent booms used. Turbidity levels observed south of DMU#2 from support vessel, limited in duration.
11-Nov-04	Thu	Demobilization	LWS										Removal of silt curtain, piping, floats and dredges.
18-Nov-04	Thu	Demobilization	Flood										Monitoring sediment traps and deployed meters.
30-Nov-04	Tue	None	Ebb										Collected and sampled sediment traps.

Table 2 Results of TSS Analyses for Water Samples Collected during Fall 2004 Dredging at DMU-2

Sample Date	Sample ID	TSS (mg/L)
9/01/2004	WQTSS01090104	39
	WQTSS02090104	23
	WQR1090104	45
	WQE1090104	45
	WQE2090104	43
9/02/2004	WQTSS001090204	25
	WQTSS002090204	29
	WQTSS003090204	33
	WQTSS004090204	27
9/24/2004	WQ1F092404	41
	WQ2F092404	3
	WQ3F092404	26
	WQTSS001092404	38
	WQTSS002092404	65
	WQTSS003092404	72
	WQTSS004092404	27
9/27/2004	WQTSS001092704	91
	WQTSS002092704	71
	WQTSS003092704	48
	WQTSS004092704	74
	WQTSS005092704	100
	WQTSS006092704	45
9/30/2004	WQTSS001093004	23
	WQTSS002093004	26
	WQTSS003093004	13
	WQTSS004093004	9.0
	WQTSS005093004	9.0
10/04/2004	WQTSS001100404	21
	WQTSS002100404	20
	WQTSS003100404	13
	WQTSS004100404	11
	WQTSS005100404	51
10/07/2004	WQTSS00100704	54
	WQTSS003100704	28
	WQTSS002100704	21
	WQTSS004100704	60
	WQTSS005100704	25
	WQ1F100704	52
	WQ2F100704	34
	WQ3F100704	21
	WQRF100704	28
10/13/2004	WQTSS1E101304	230
	WQ1F101304	180
	WQRF101304	24

Table 3 Results of Biological Testing for Water Samples Collected during Fall 2004 Dredging at DMU-2

Sampling Date	Sample ID	Toxicity Testing Results					
		Arbacia fertilization (%)	Mysid 48 hour survival (%)	Mysid 7 day survival (%)	Mysid 7 day growth (mg/mysid)	*Champia* 48 hour survival (%)	*Champia* 7 day reproduction (cystocarp/tip)
9/1/2004	Lab Control	90.9	100	100	0.4	100	17
	WQE2090104	79.2	100	97.5	0.5	100	28
9/24/2004	Lab Control	90.3	97.5	97.5	0.6	100	0
	WQ1F092404	86.4	97.5	97.5	0.6	100	22
10/7/2004	Lab Control	95.8	100	100	0.5	100	18
	WQ1F100704	90.3	95	92.5	0.6	100	18
	WQ2F100704	91.3	100	97.5	0.7	100	6
10/13/2004	Lab Control	96.1	95	95	0.5	100	15
	WQ1F101304	93.0	95	95	0.5	100	14
10/15/2004	Lab Control	95.8	97.5	97.5	0.4	100	17
	WQ1E101504	92.0	100	100	0.6	100	17

Table 4 Results of PCB Analyses for Water Samples Collected during Fall 2004 Dredging at DMU-2

Sample Date	Sample ID	Sample Results	
		PCB (ug/L) Fraction	
		Dissolved	Particulate
10/07/2004	WQ1F100704	3.8	7.0
	WQ2F100704	1.4	2.7
	WQ3F100704	1.0	0.6
	WQRF100704	0.6	0.7
10/13/2004	WQ1F101304	2.0	34
	WQRF101304	1.3	3.9
10/15/2004	WQ1E101504	1.6	5.8

Table 5 Total PCB Concentrations for Sediment Trap Samples Collected during Fall 2004

Location ID	Date Trap Deployed	Date Collected	Sediment Accumulation Period (Days)	Number of Dredge Days	Total PCB* (mg/kg)
North of Wood Street to North of DMU-2					
ST1	10/21/2004	11/04/2004	15	10	1132
ST2	11/02/2004	11/04/2004	2	2	955
ST2	11/11/2004	11/30/2004	19	0	322
South of DMU-2					
ST3	11/11/2004	11/30/2004	19	0	325
Adjacent to DMU-2					
ST25	11/04/2004	11/11/2004	8	4	2375
ST25	11/11/2004	11/30/2004	19	0	862

*Congeners summed x 2.6 multiplier.

FIGURES

US Army Corps

U.S. Army Corps of Engineers
New Bedford Harbor Superfund Site

Figure 1 New Bedfrod Harbor Overview

ENSR

Sources:MassGIS 2-m orthophotos
NAD 83 Mass State Plane m
Date: 01 April 2005
ME scale 1:35000

Miles
0 0.25 0.5 1

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US Army Corps of Engineers

U.S. Army Corps of Engineers
New Bedford Harbor Superfund Site

Figure 2 Dredge Management Unit 2 in Upper New Bedford Harbor

ENSR

Sources: MassGIS 2-m orthophotos
NAD 83 Mass State Plane m
Date: 04.01.05
ME scale 1:7200

0 250 500 1,000 Feet

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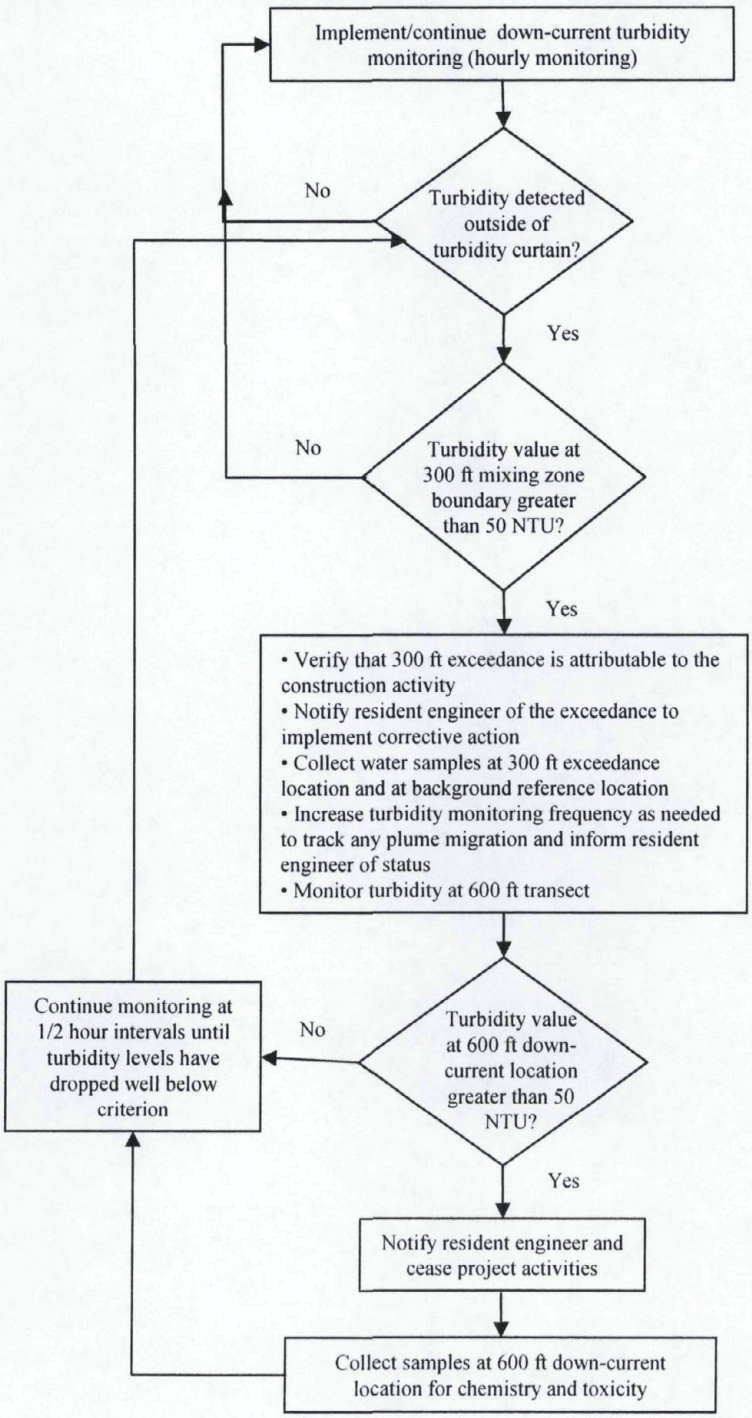
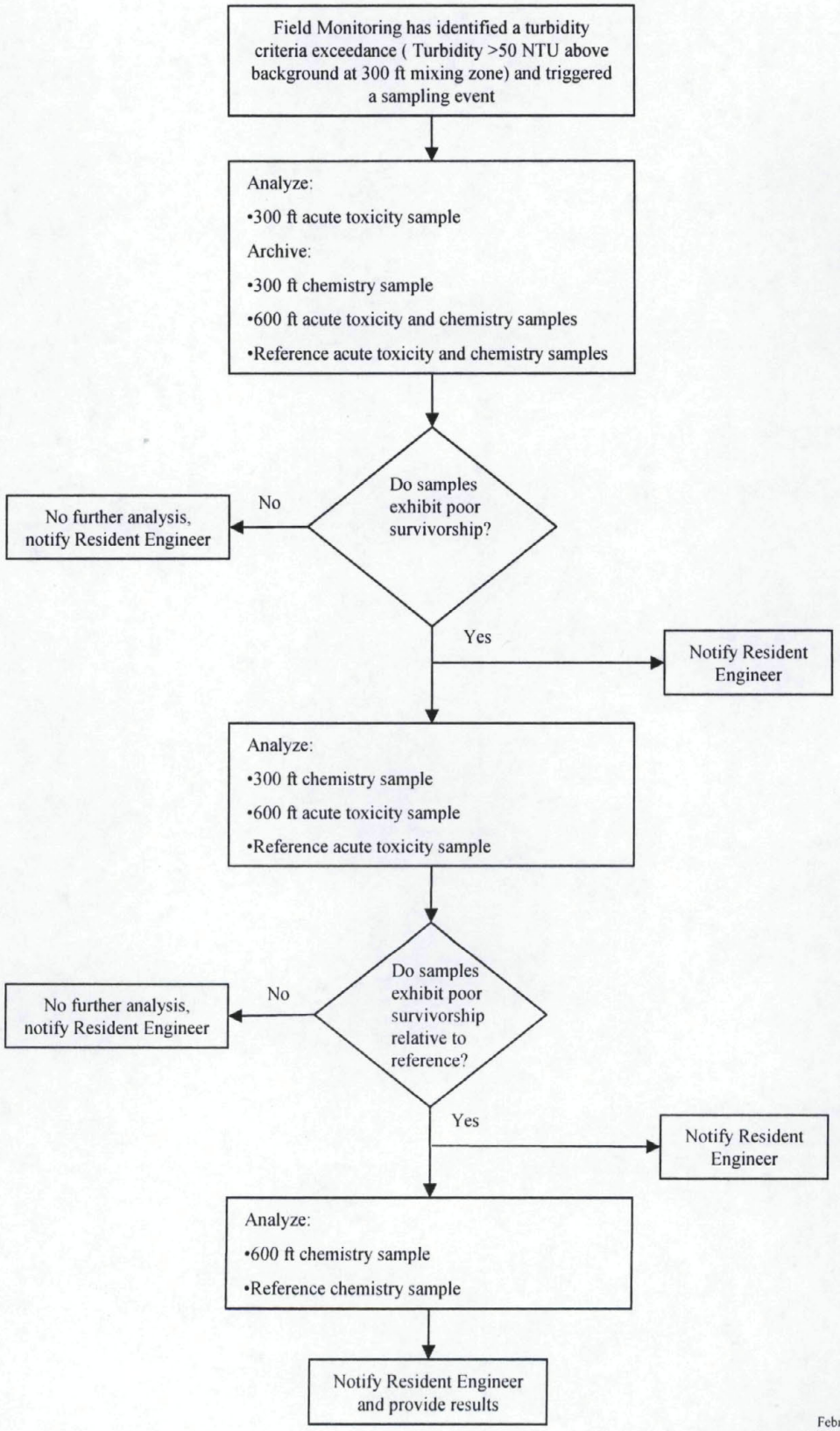
Figure 3 Water Quality Monitoring Decision Sequence



Notes

1: 50 NTU value was defined as 50 NTU above background turbidity level

Figure 4 Analytical Protocol Decision Sequence



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New England District

U.S. Army Corps of Engineers
New Bedford Harbor Superfund Site

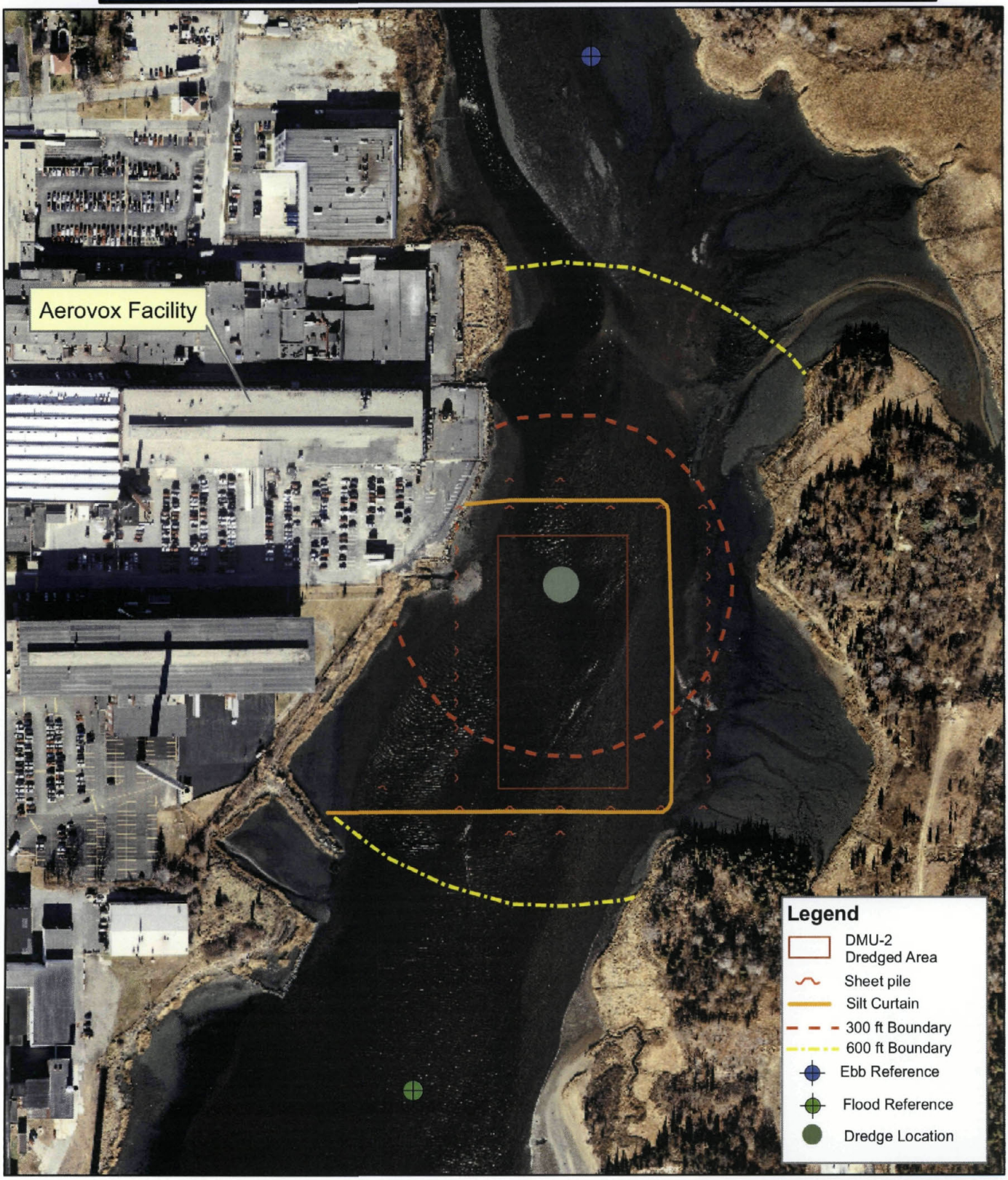

Figure 5 Location of Dredge Management Unit 2 with Environmental Compliance Boundaries

ENSR

Sources:MassGIS 1/2-m color orthophoto
NAD 83 Mass State Plane ft
Date: 04.01.05

0 150 300 600 Feet

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New England District

U.S. Army Corps of Engineers
New Bedford Harbor Superfund Site

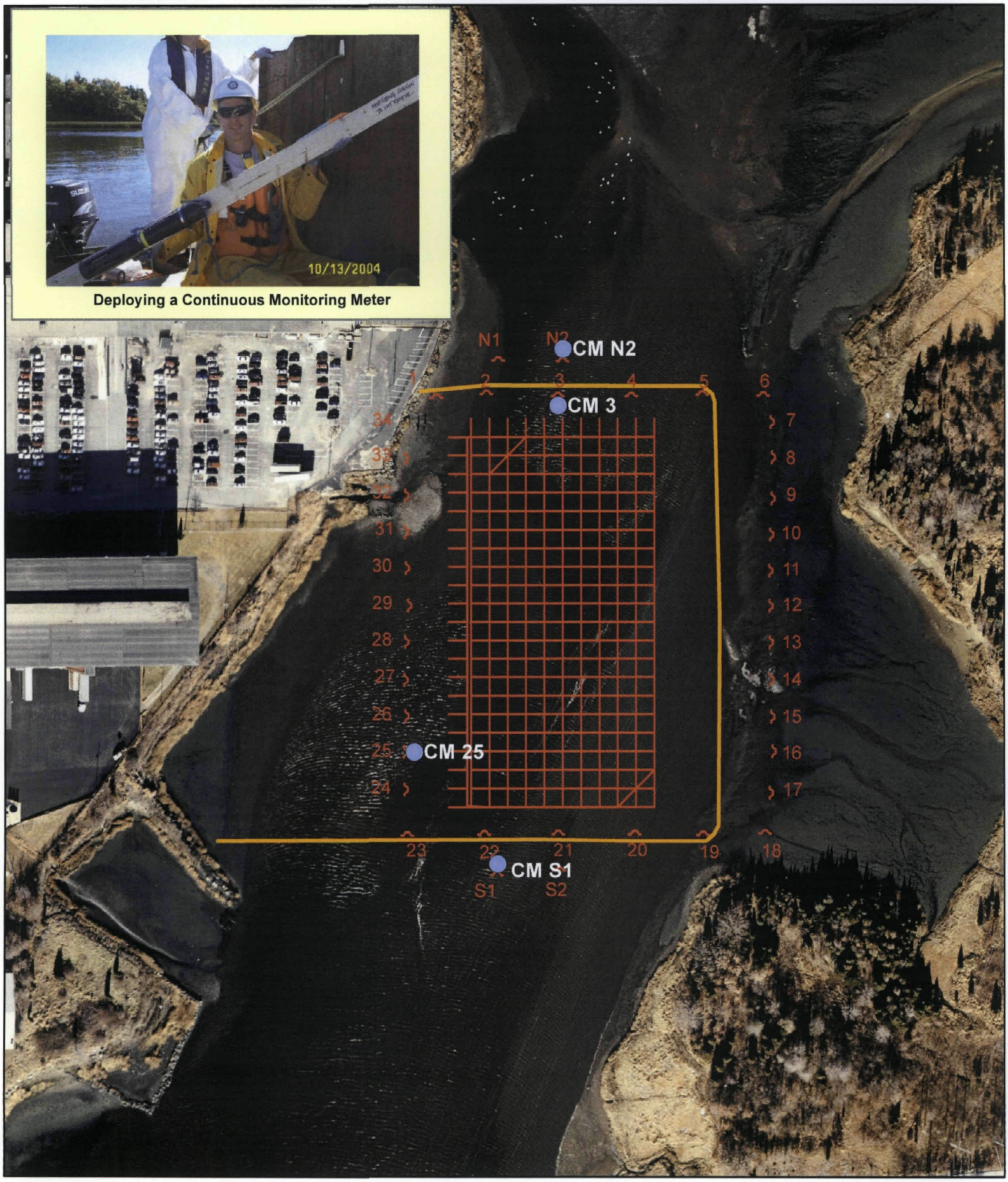

Figure 6 Locations of Continuous Recording Water Quality Meters at DMU-2

Sources: MassGIS 1/2-m color orthophoto
NAD 83 Mass State Plane ft
Date: 04.01.05

ENSR

Legend

- Continuous Recording Meters (CM)
- Silt Curtain
- Sheet Piles
- DMU-2 Dredge Area

0 100 200 400 Feet

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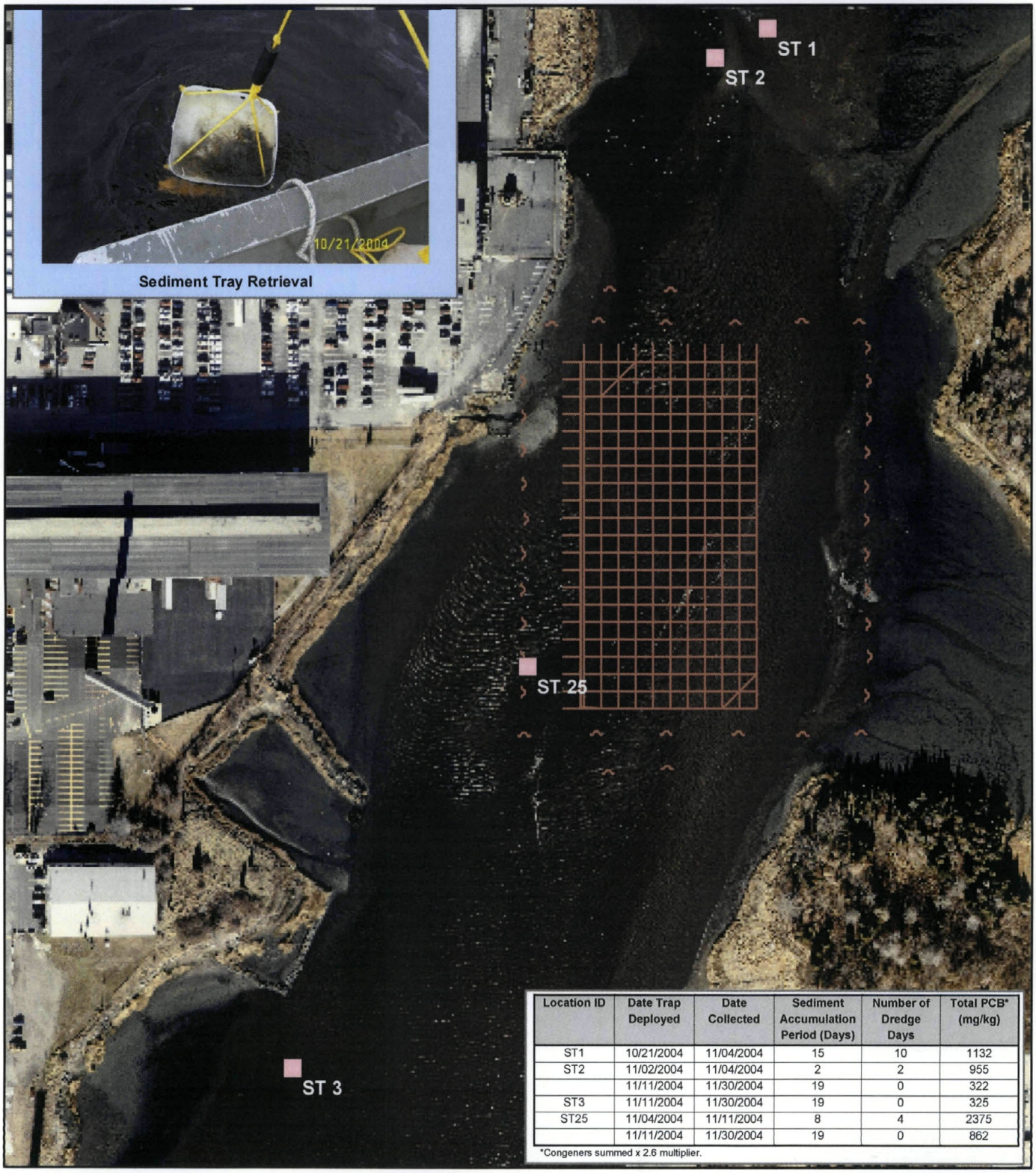

Location ID	Date Trap Deployed	Date Collected	Sediment Accumulation Period (Days)	Number of Dredge Days	Total PCB* (mg/kg)
ST1	10/21/2004	11/04/2004	15	10	1132
ST2	11/02/2004	11/04/2004	2	2	955
	11/11/2004	11/30/2004	19	0	322
ST3	11/11/2004	11/30/2004	19	0	325
ST25	11/04/2004	11/11/2004	8	4	2375
	11/11/2004	11/30/2004	19	0	862

*Congeners summed x 2.6 multiplier.

Figure 7 Sediment Trap Deployment Locations and PCB Concentrations

Sources:
NAD 83 Mass State Plane ft
Date: 12.20.05

ENSR

Legend

Sediment Trap
DMU #2 Dredge Area

0 100 200 400 Feet

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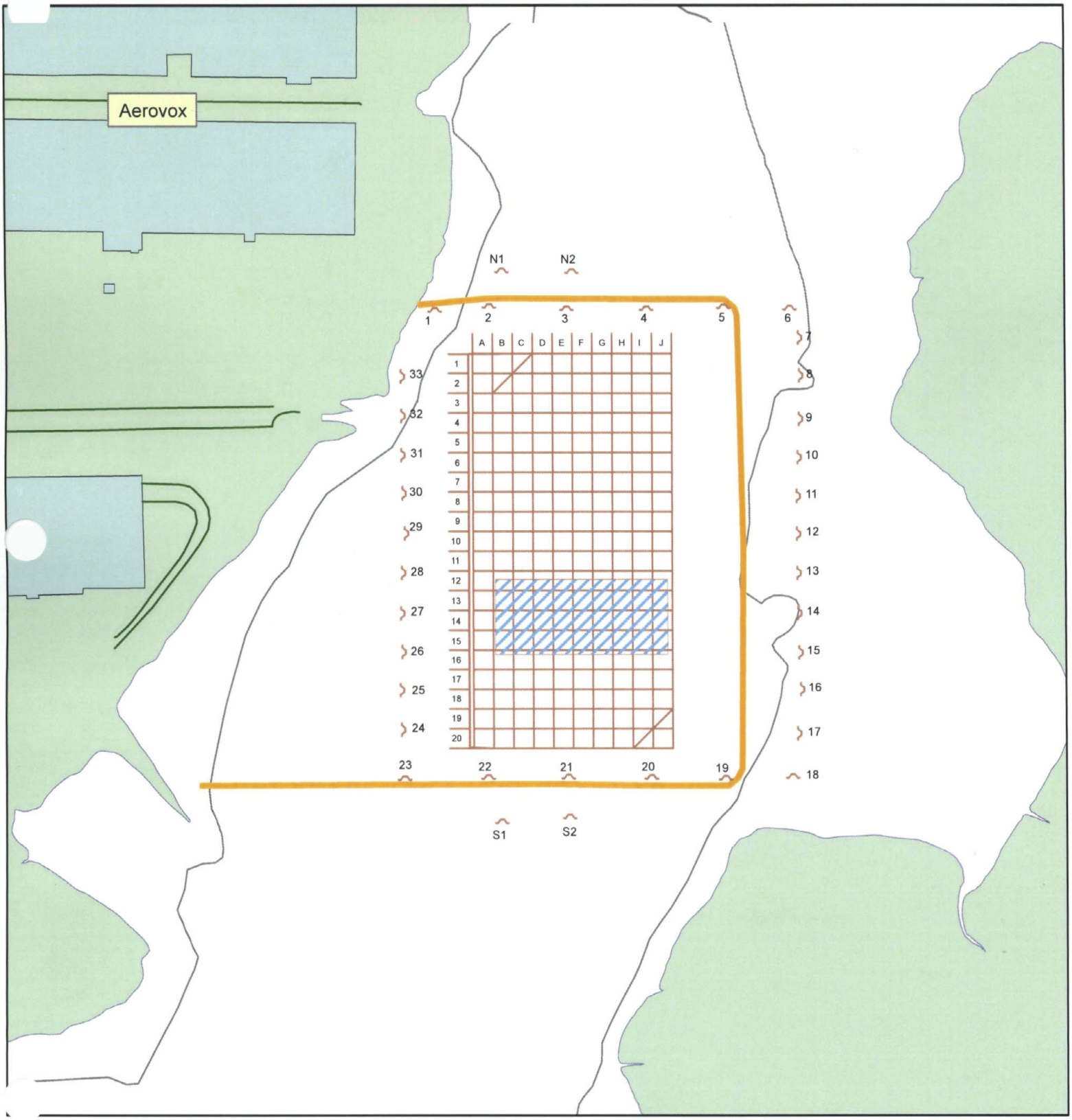

Figure 8 DMU-2 Showing Grid and Focused Dredge Area

Sources:
NAD 83 Mass State Plane ft
Date: 05.09.05

ENSR

Planned Final Cut Area
DMU 2004 Boundary
Silt Curtain

0 100 200 400 Feet

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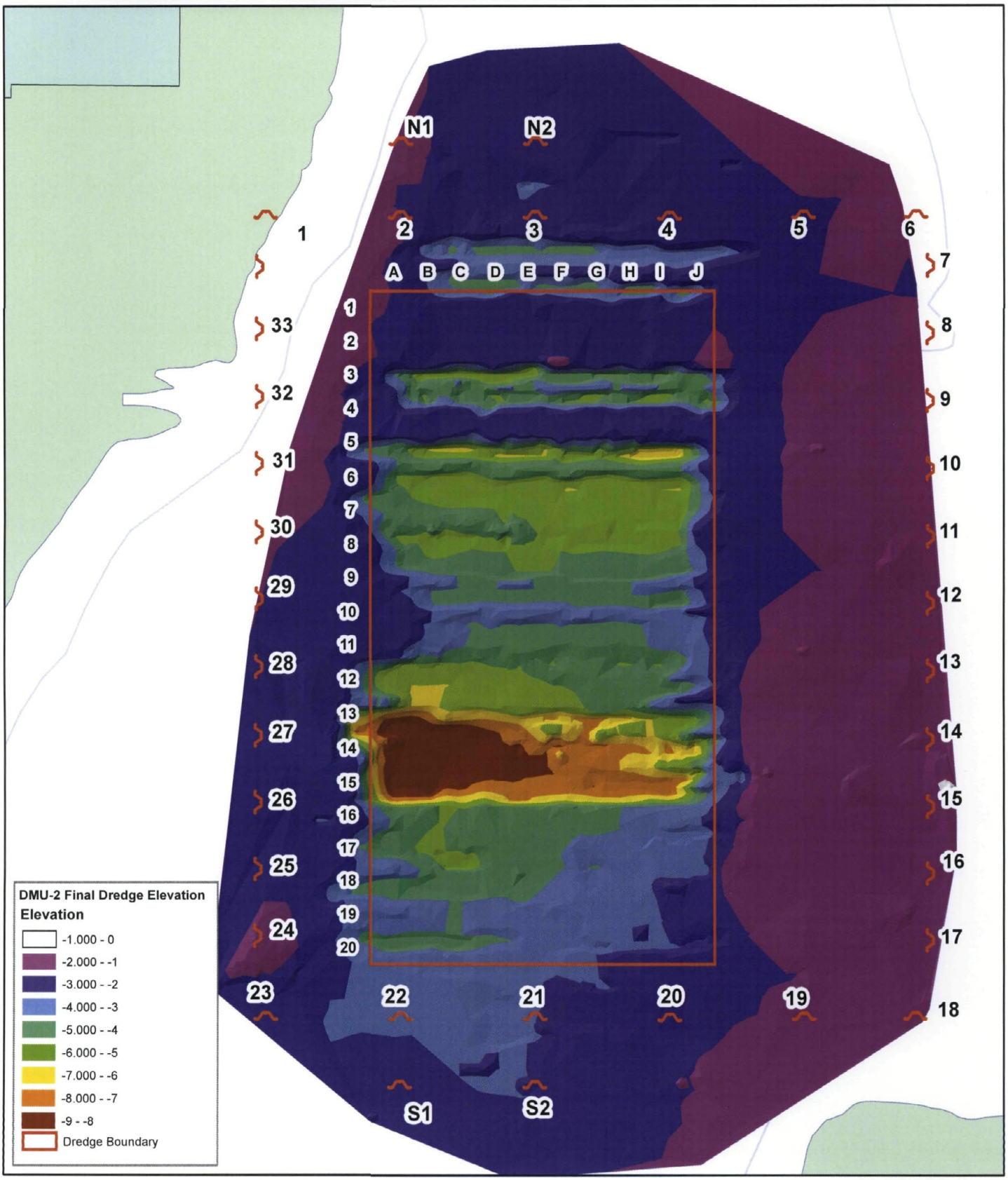

Figure 9 Post-Dredge Bathymetry over DMU-2

ENSR
CR ENVIRONMENTAL, INC. WBE

Sources: MassGIS
NAD 83 Mass State Plane ft
Survey Date: 01/2005
Depth Recorded in feet at MLLW
Date: 05.10.05

0 50 100 200 Feet

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Figure 10
Turbidity Monitoring at Station CM S1 for the Period
25 - 26 October 2004

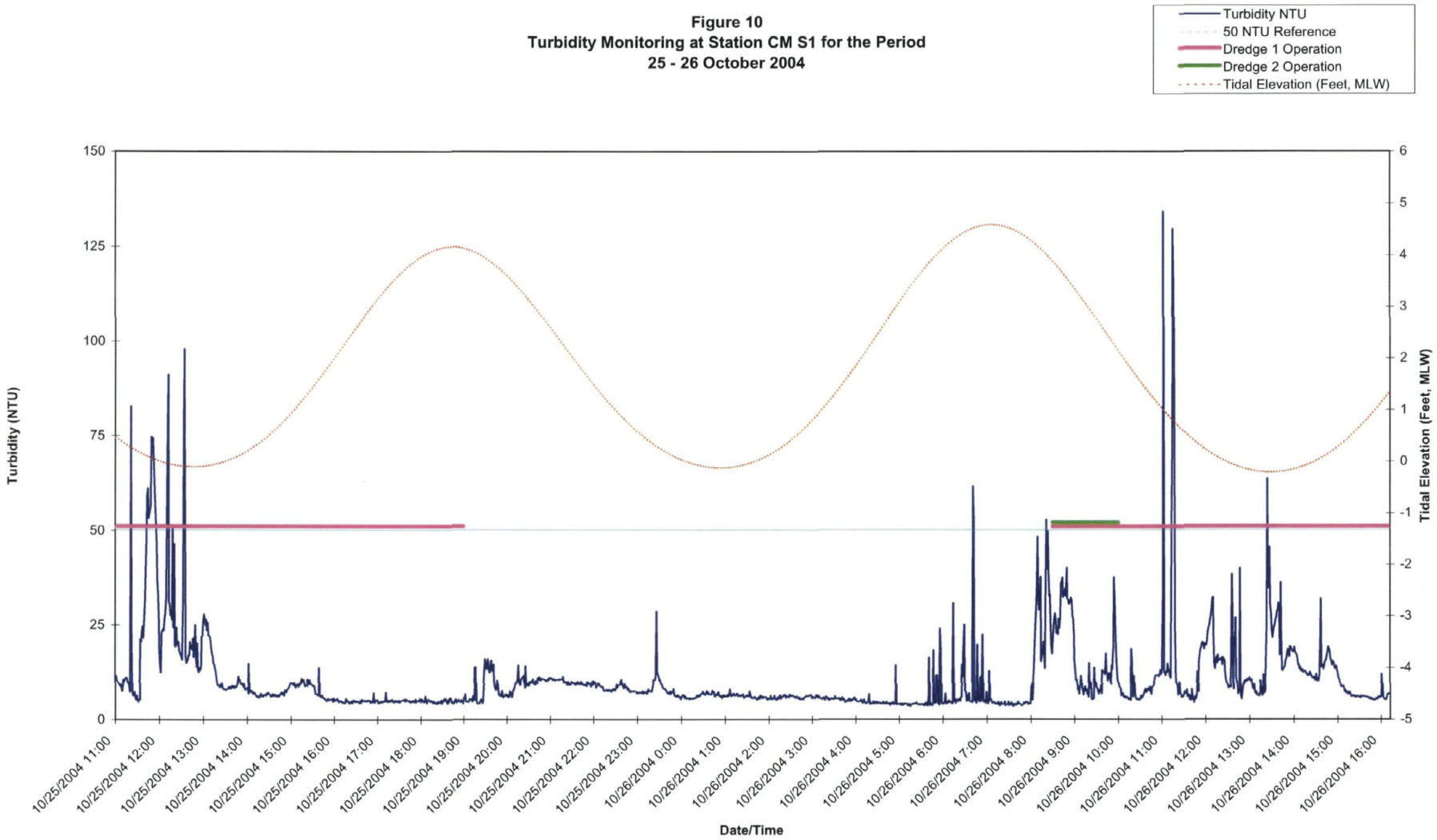


Figure 11
Turbidity Monitoring at Station CM N2 for the Period
25 - 27 October 2004

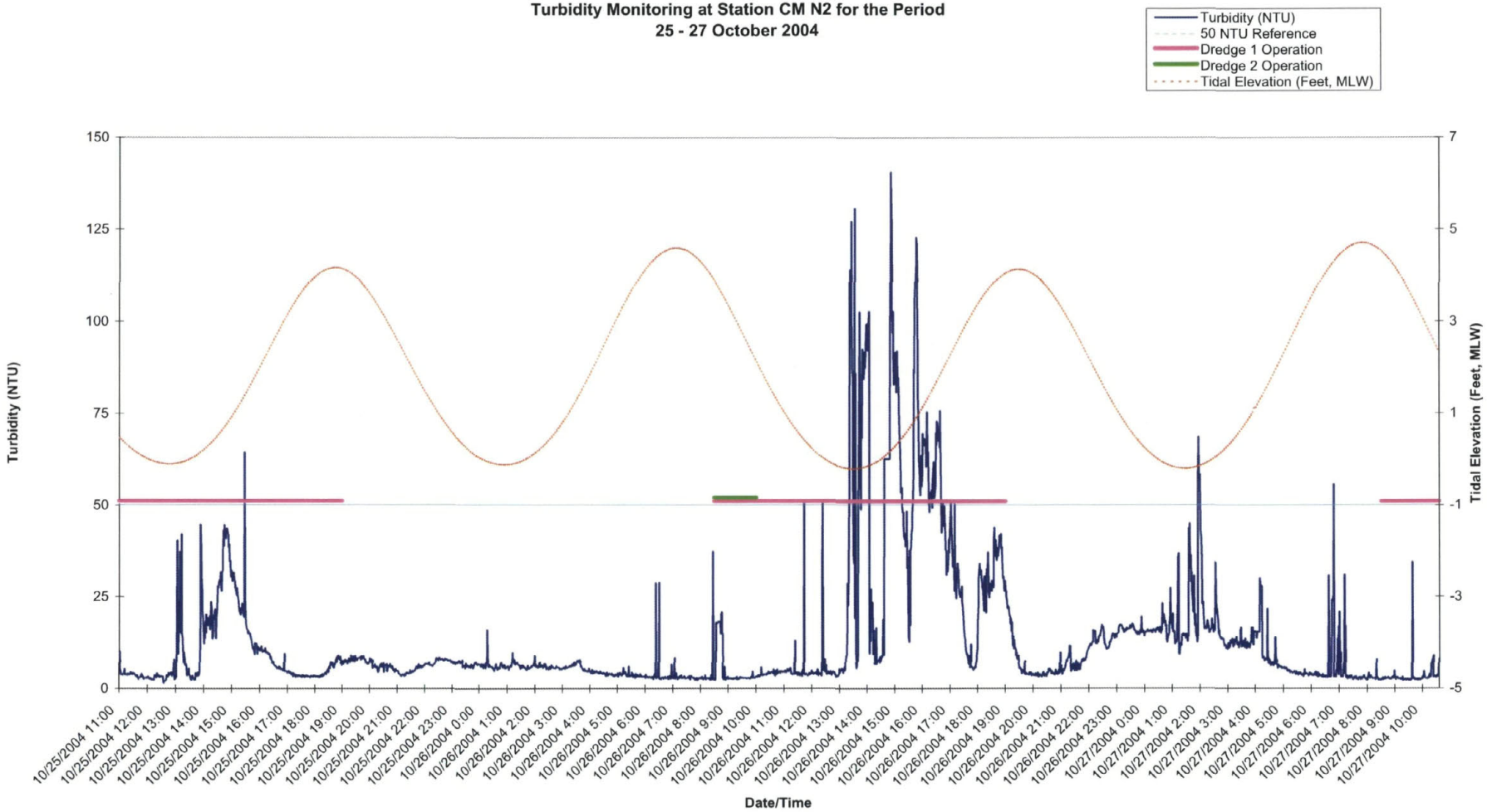


Figure 12
Turbidity Monitoring at Station CM 3 for the Period
27 - 30 October 2004

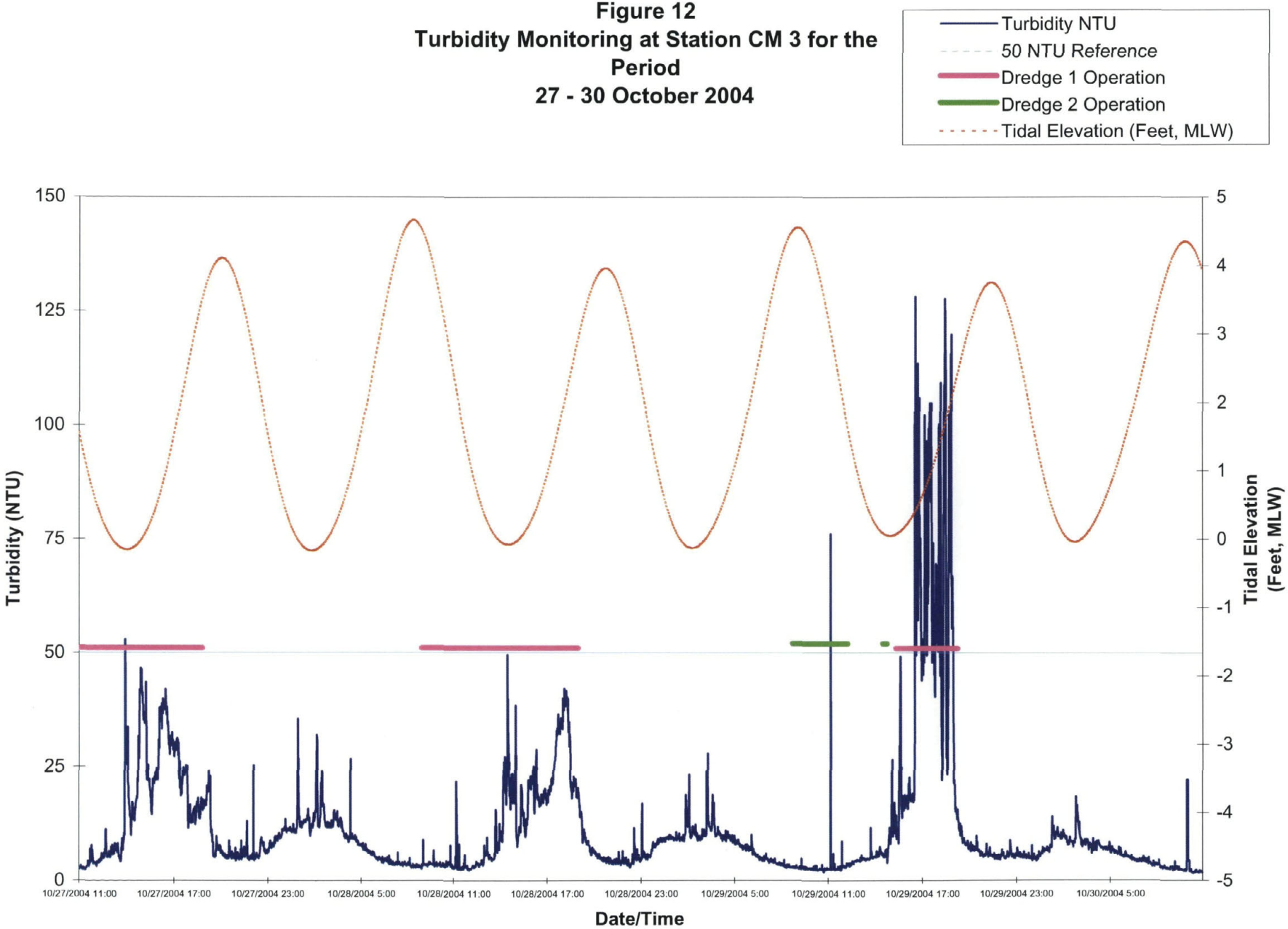
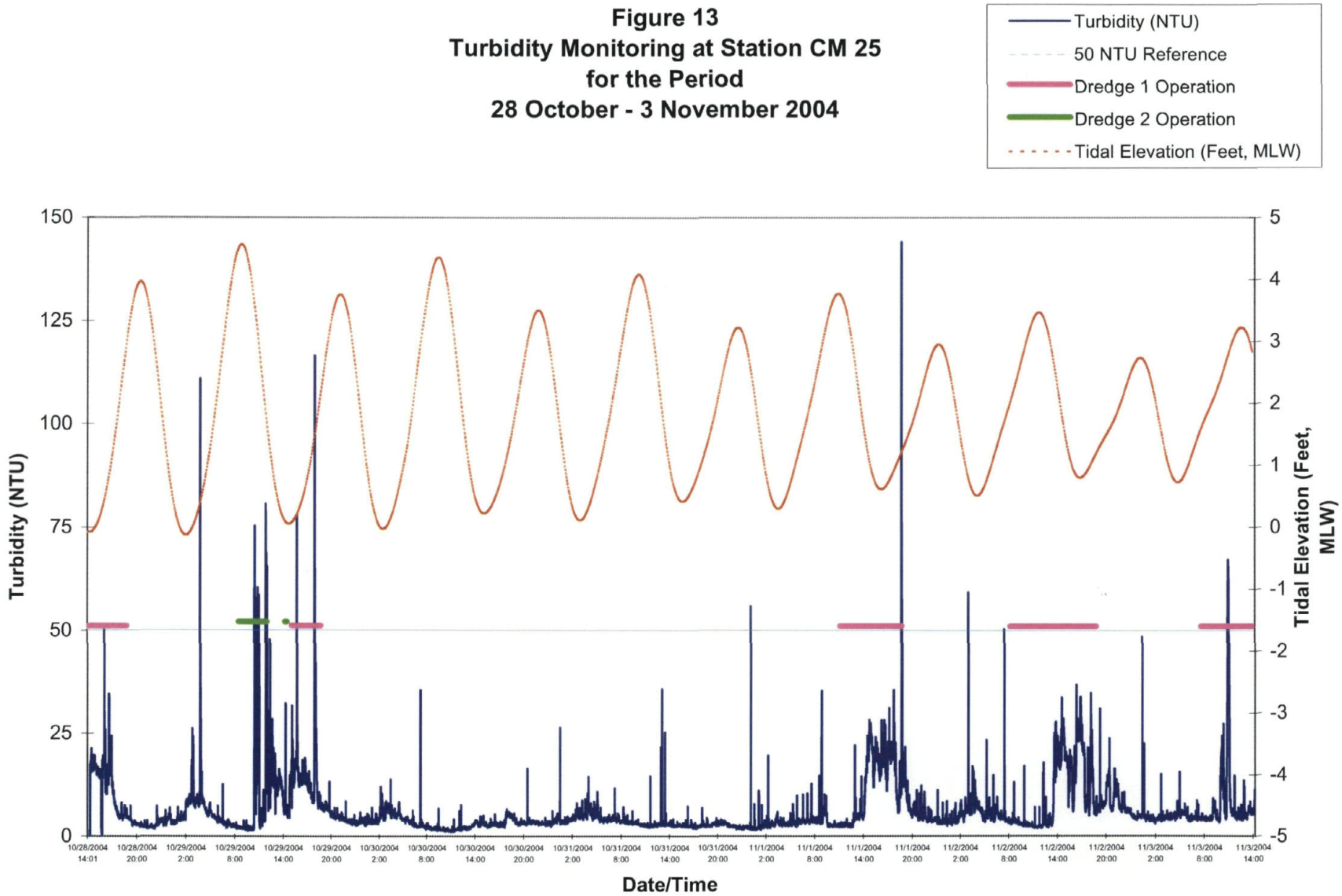


Figure 13
Turbidity Monitoring at Station CM 25
for the Period
28 October - 3 November 2004



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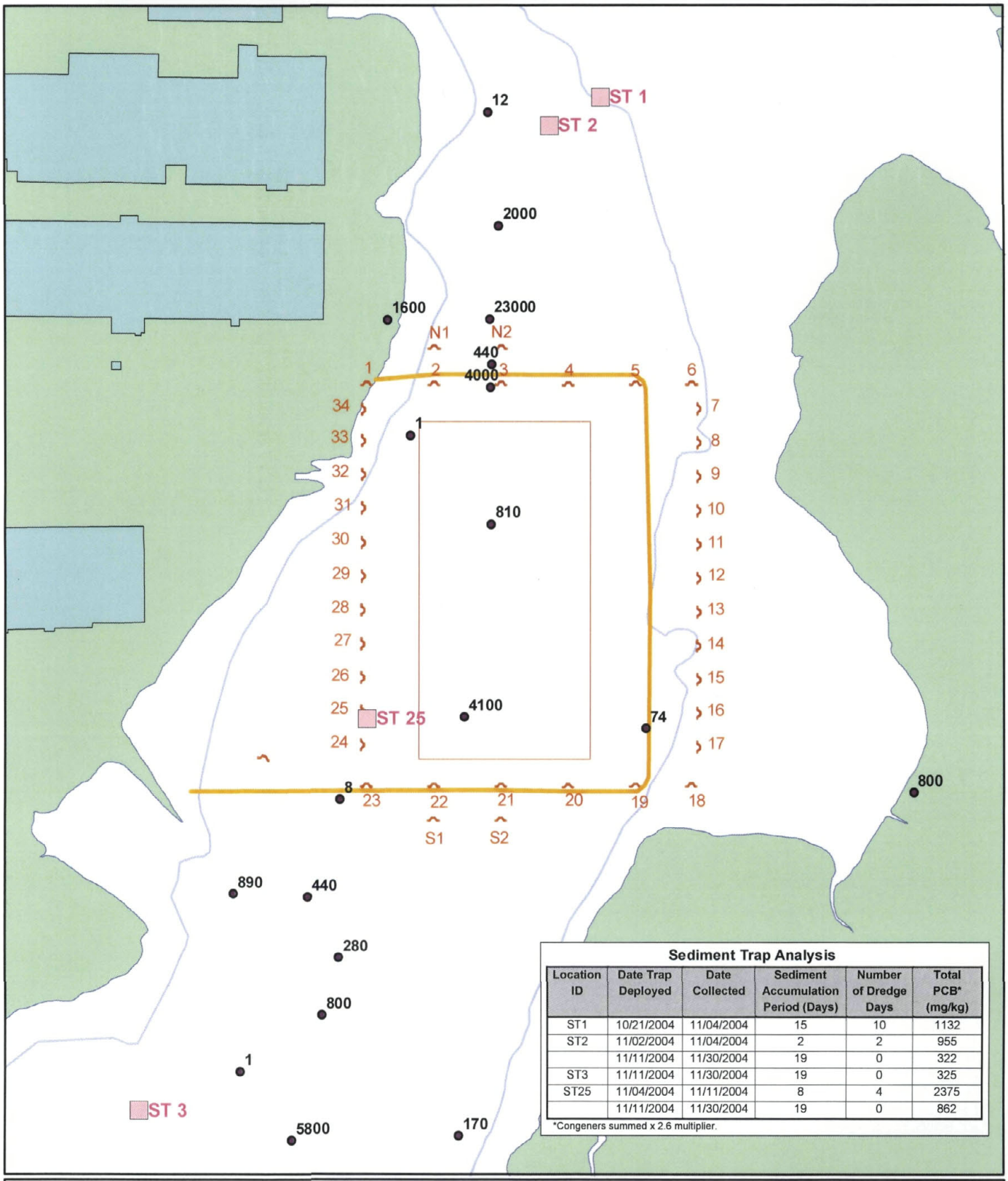


Sediment Trap Analysis

Location ID	Date Trap Deployed	Date Collected	Sediment Accumulation Period (Days)	Number of Dredge Days	Total PCB* (mg/kg)
ST1	10/21/2004	11/04/2004	15	10	1132
ST2	11/02/2004	11/04/2004	2	2	955
	11/11/2004	11/30/2004	19	0	322
ST3	11/11/2004	11/30/2004	19	0	325
ST25	11/04/2004	11/11/2004	8	4	2375
	11/11/2004	11/30/2004	19	0	862

*Congeners summed x 2.6 multiplier.

Figure 14 Total PCB Concentrations in Sediment - 2001 Pre-Dredge Data and 2004 Sediment Trap Data

Sources: MassGIS
NAD 83 Mass State Plane ft
Date: 12.20.05

2001 Sediment Sample (ppm)
Depth -.5 - -1.0 ft
Sediment Trap Location
Dredge Boundary
Silt Curtain

0 100 200 400 Feet

ENSR

NOTE:
Concentrations shown on figure represent historical data for PCB sediment concentrations found in the vicinity of the locations used for sediment trap deployment.

J:\Water\ProjectFiles\P90\9000NBH\Task_300_DMU2_WQ\DMU2_WQ_Report\Figures\DMU2_Fig_14_PCB_05.pdf

APPENDIX

APPENDIX A

STATEMENT OF WORK FOR WATER QUALITY MONITORING

Water Quality Monitoring during Remediation Dredging of Dredge Management Unit #2
New Bedford Harbor Superfund Site
2 March 2004

I. General

The purpose of this scope of work (SOW) is to present a general monitoring and sediment testing approach to assess both ecological impact to the water column and recontamination of previously dredged areas during the dredging process.

Water quality monitoring to be conducted during the dredging of the first dredge management unit will be carried out over a 2-month period starting in September 2004. During this timeframe dredging will take place within the first dredge management unit (DMU #2) where approximately 30,000 cubic yards of fined grained material will be removed from this area using a hydraulic dredge system and pumped via pipeline to a sand separation facility and then ultimately to the dewatering facility at Area D. The material to be removed will have an average total PCB concentration of approximately 500 ppm. As with all previous construction and dredging related operations conducted as part of this Superfund remedy, a water quality monitoring program will be implemented designed to limit environmental impacts to the water column and to assess transport and settlement of contaminated material away from the dredging operation.

Due to the proximity of DMU#2 relative to the Coggeshall Street Bridge, in conjunction with water quality monitoring data collected during the "hot spot" remediation activities, it has been determined that there will be a shift in the emphasis in the upcoming full-scale dredge monitoring away from a total flux measurement approach (as performed during the "hot spot" dredging) to one that will focus on near-field water column impacts (environmental) as well as identify the extent of recontamination of previously dredged areas (operational) as a result of the dredging process. The data collected as part of this effort will be used to guide project operations as necessary in order to minimize environmental impacts and limit recontamination of previously dredged areas for this and future DMU' s. For the purpose of this SOW the Tasks will be addressed as two distinct efforts referred to as the environmental component (water quality monitoring) and the operational component (recontamination assessment). Although separate efforts, the Contractor shall identify opportunities for efficiencies in carrying out both field programs.

A <u>Water Quality Monitoring</u>:

As with previous monitoring efforts, a tiered approach will be employed using varying levels of monitoring intensity to assess and gauge project related water quality impacts. More intensive monitoring will occur during the initial weeks of dredging to establish and verify the protectiveness of project specific monitoring criteria and track plume dispersion, suspended sediment and contaminant transport down-field of the dredge. The monitoring effort will incorporate plume tracking, transect monitoring, water column sampling/analysis and toxicity testing to gauge impacts. During the course of the dredging operation in DMU#2, it is anticipated that environmental conditions within the water column will stabilize and a protective criteria will

have been established. At this point, monitoring intensity and duration will be scaled back with a reliance on acoustic profiling and real-time turbidity monitoring as the primary methods to gauge impact. Flexibility in the monitoring program will be necessary throughout the dredging process to respond to changing field conditions and data flow. The Contractor shall review the elements of this SOW and consult with the USEPA Region I, USEPA Atlantic Ecology Division and the USACE to finalize the goals, methods and approaches of the program.

B. Recontamination Assessment:

In order to assess the potential for recontamination of previously dredged areas, it will be necessary for the Contractor to devise and implement a sediment sampling and testing program to identify to what extent, if any, previously dredge areas are being recontaminated during the dredging process. The Contractor shall review the general assessment approach outlined in this SOW and consult with the USEPA Region I, USEPA Atlantic Ecology Division and USACE to finalize goals, methods and approaches to the program.

The following monitoring approach shall be used as a basis for further program development. The Contractor shall assume that monitoring will occur over a 10-week period.

II. Monitoring Approach

A. Water Quality Monitoring

Boat-based monitoring shall be performed during in-water operations that have the potential to disturb significant quantities of sediment. The purpose of this monitoring is to ensure that acute impacts to the water column do not extend beyond the designated mixing zone established for the project and that contaminants are not transported away from the operations area at unacceptable levels to other portions of the harbor or to adjacent areas that have been previously dredged.

A tiered monitoring approach will be implemented incorporating field measurements of acoustic backscatter, turbidity, and water quality parameters as well as sampling for toxicity testing and laboratory analysis. The overall approach of the water quality monitoring program will consist of boat-based measurements of water column turbidity along transects within the vicinity of the project site. Monitoring along transects will take place immediately adjacent of the dredging operation, and at 300 and 600 feet distance(s) down-current, with additional tracking of any identified suspended solids plumes. Monitoring shall also be performed at an appropriate up current reference location. Three general levels of the intensity of the monitoring are defined as follows:

- Level I – Includes sampling/testing at all stations over multiple tidal cycles
- Level II – Includes sampling/testing at the station immediately adjacent to the dredging operation
- Level III – Boat-based monitoring using acoustic backscatter and OBS sensor with water sample collection and analysis contingent upon on any exceedance of the project-based criterion or as may be determined based on detection of sheens or plumes emanating from the project area.

During project initiation, Level I monitoring will be implemented to ensure that project environmental goals are being met and to verify the protectiveness of the project-based turbidity criterion. It is expected that the level of monitoring will be scaled back as the project progresses, but is assumed to return to Level I at various points throughout the project as different dredging conditions are encountered. An assumed monitoring schedule is presented in Attachment 1.

A(1) Equipment – The Contractor shall incorporate the following equipment for use in the implmentation of the monitoring program:

- Optical back-scatter (OBS) nephelometer with an underwater sensor and direct surface readout or capable of submerged deployment. Up to three units may be required over the course of the project with the potential for evaluation of the effectiveness of a deployed meter array.
- Acoustic Doppler Current Profiler (ADCP) capable of performing in the relatively shallow waters of the Upper Harbor.
- Water quality instrumentation capable of providing in-situ measurements of temperature, salinity, and dissolved oxygen.
- Sampling equipment (pumps, tubing etc.) suitable for the collection of water samples requiring low detection limit analyses.

A(2) Location – The boat-based monitoring shall focus on the following areas:

- Station 1 – defined as immediately adjacent to an down current of the dredging operation (as close as practice and safety allows)
- Station 2 – defined as along the down-current edge of pre-determined mixing zone set 300 feet from the dredging operation
- Station 3 – defined as along a second zone set 600 feet down-current of the dredging operation
- Reference Station – background (i.e., reference) measurements shall be collected approximately 1000 feet up-current of the dredging operations prior to each day of dredging for each monitoring day. This location shall be outside the influence of any localized turbidity sources (ex. CSO discharges or storm water drains), but still representative of the water flowing through the deeper channel areas up-current of the dredge area.
- Additional sampling locations may be defined as the monitoring is performed

A(3). Frequency – For the purposes of this SOW, the Contractor shall assume the frequency of environmental monitoring activities as presented in Table 1 attached.

A(4). Sample Collection and Analyses – Sample collection shall be assumed as follows over the course of each monitoring day:

- Level I – 4 stations x 2 tidal stages = 8 sample sets/day
- Level II – 1 station (#1) x 1 tidal stage = 1 sample set/day (with 2 additional sets archived)
- Level III – sampling conditional on results of turbidity monitoring

Total number of samples assumed during the effort and specific testing and analytical requirements are found in the attached table.

A(5). Lab Schedule – For a Level 1, II and III activities, a laboratory turn-around time of 24-hours shall be required for the chemical analysis. Toxicity test analysis shall report results verbally as soon as practical with full reports due within 1 week of test completion.

A(6). Project Specific Criterion - The upper level turbidity criterion, defined as a "reportable event" will be initially set at 50 Nephelometric Turbidity Units (NTUs) above background as measured at the edge of the 300-foot mixing zone. This criterion may be adjusted based on the results of the monitoring during the program.

B. Monitoring Potential Sediment Recontamination

Monitoring will also be performed to assess the potential recontamination of bottom sediments where remedial dredging has already been performed. This monitoring shall be conducted in conjunction with the water quality monitoring and will include the taking of periodic bottom grab samples and/or push cores for visual inspection of the surface sediments at the sediment-water interface and collection of samples for PCB analysis. The Contractor shall develop the detailed scope of this monitoring after review of the specifics of the dredging operation and consultation with representatives of the USEPA and USACE. The Contractor shall assume that 30 sediment samples shall undergo PCB analysis for cost-estimation purposes.

III. Reporting

A. Daily Reporting - The Contractor shall develop a daily field report sheet for each monitoring event. This daily submittal shall provide the following information:

(1) Date, time, location, and type of construction activity as well as the names of sampling team members and team leader.
(2) A plan-view of the harbor and construction site that allows for the recording of visual events such as plumes or oil sheens. This map will be included with the daily field-reporting sheet and will graphically present turbidity values recorded during each monitoring event.
(4) A summary of weather conditions, and the timing of the tides.
(5) A comments section to allow field personnel to record visual observations or relevant field activities that may assist in data interpretation.

Data sheets shall be delivered either electronically or in hard copy to the USACE or their representative at the end of each day of monitoring. A hard copy shall be hand delivered to the on-site office of the USACE Resident Engineer. If the established turbidity criterion is exceeded, the USACE shall be immediately notified and "conditional" monitoring/sampling activities initiated.

B. Weekly Update – A weekly update report shall be prepared summarizing the monitoring performed during the week and the results of testing and analyses. This report shall be distributed via email.

C. Project Website - A secure, project-based web site will be established to post monitoring data sheets, toxicity and analytical data, and update reports. The site will be accessible only to individuals identified by the USACE.

IV. Deliverables

A. Summary Report - The Contractor shall provide the USACE a summary report of the monitoring results within 2 months of completion of the dredging of DMU#2. The report shall include monitoring methods, field observations during construction, photos of the monitoring process and toxicity and analytical data. The report shall also contain a "Summary" and "Conclusions" section based on all monitoring data with discussion relative to overall impact of the dredging process on water quality. The discussion shall also address dredging impacts relative to recontamination and present recommendations to minimize these effects if warranted. The deliverable shall include 10 hard copies as well as 10 CDs.

APPENDIX B

FIELD DATA LOGS

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 27 August 2004

Weather: Sunny 75°F

Tides:

HWS	@	605
Ebb	@	845
LWS	@	1152

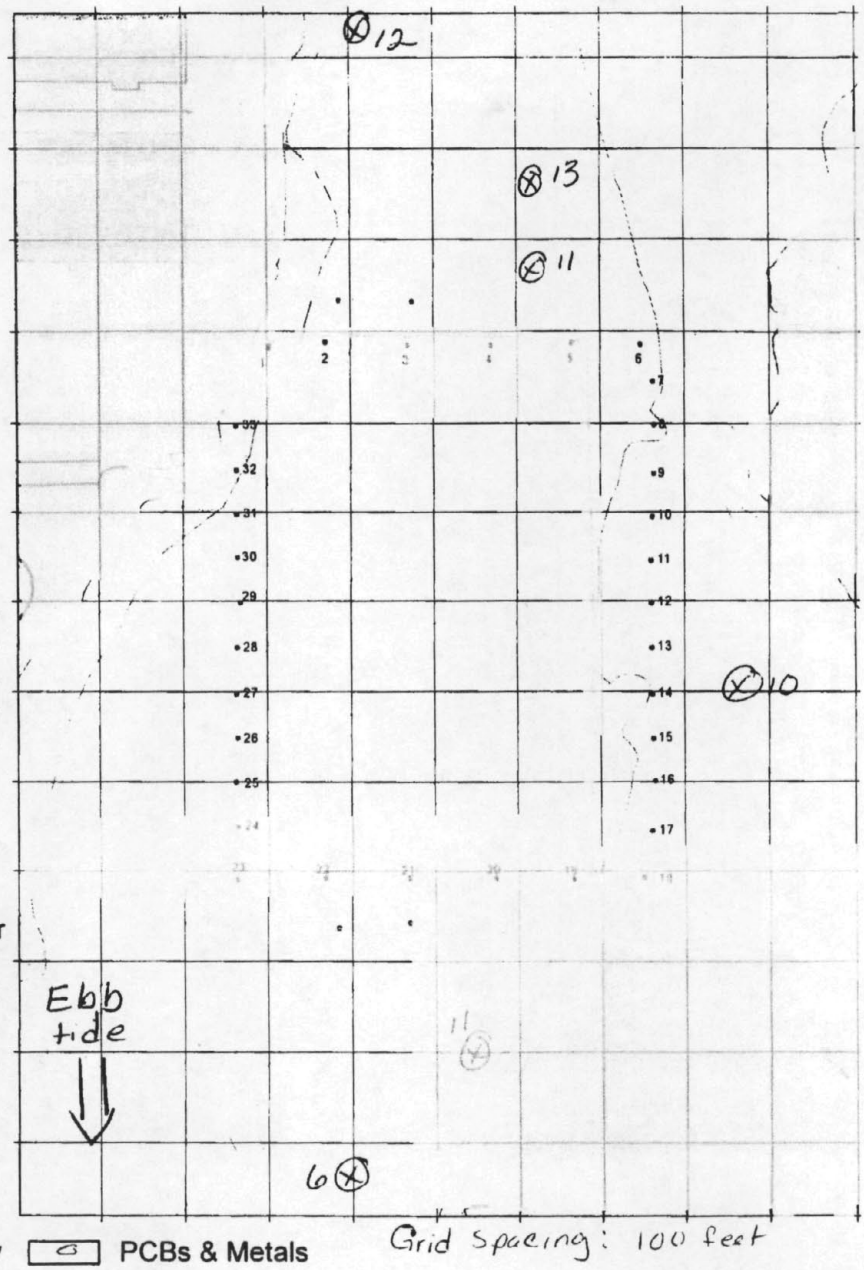
Monitoring Period:

From: 1040 To: 1410

Tidal Stage: HWS (Ebb) (LWS) Flood

Dredging Activity *(number of dredges, locations, and time period)* :

No dredging or debris removal.



Monitoring Measurement Summary.

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
North of DMU#2	11-13	2/4
East of DMU#2	10	1/2
South of DMU#2	6-11	2/3

Samples Collected for Laboratory Analysis

☐ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Observations

No activity, turbidity levels 6-13 NTUs

Scientific Crew: Ken Hickey, Julie Stearns, Norm Farris, Chip Ryther

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 1 September 2004

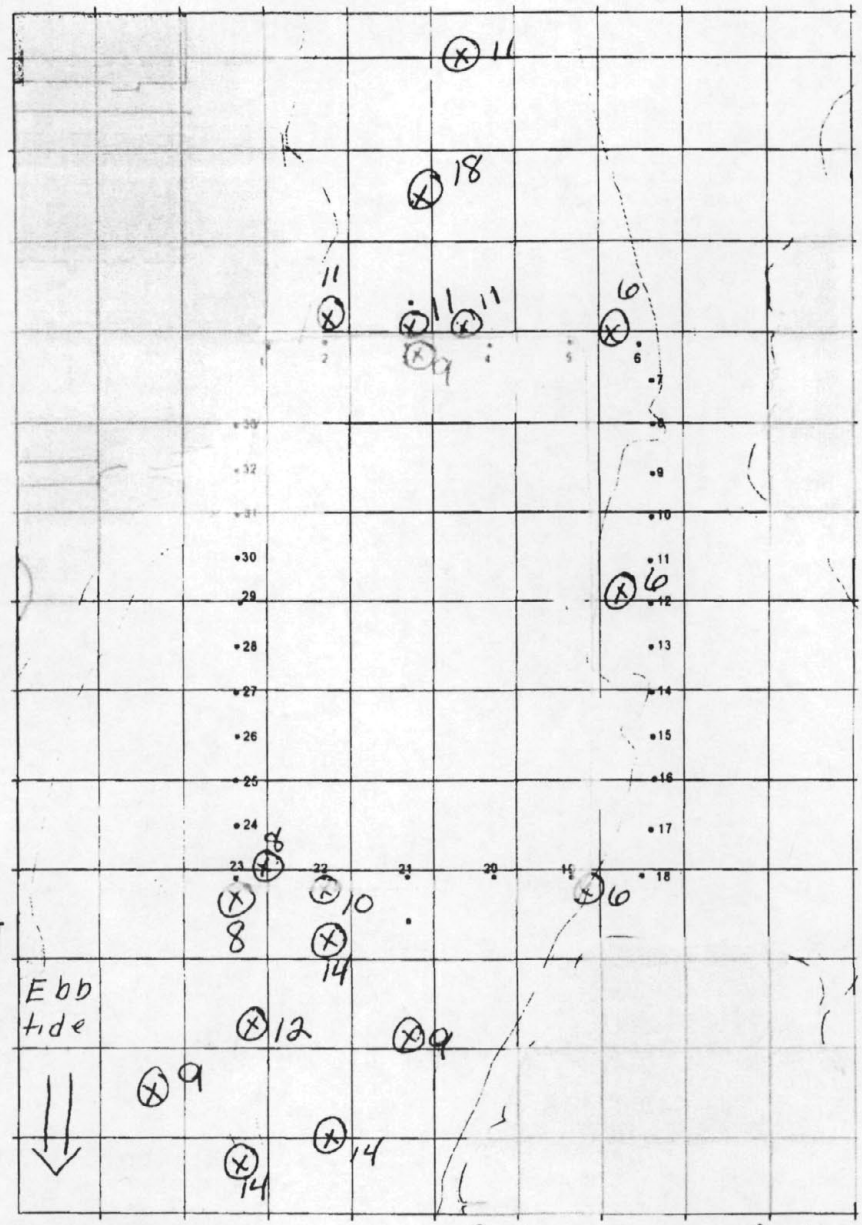
Weather: Sunny 75°F

Tides:
HWS @ 1008
Ebb @ 1215
LWS @ 1606

Monitoring Period:

From: 1028 To: 1430
Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :
Debris removal



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
150ft N. of Curt	18	3/4
N Curtain boundry	11	2/5
Fish passage	6	3/4
S. Curtain Bndr	8-10	1/2
200-300 ft Sth Curtain	9-14	1/2

Samples Collected for Laboratory Analysis

☐ None ☐ 6 TSS & turbidity ☐ 1 Toxicity ☐ 1 PCBs & Metals

Observations

NTU levels not above 18 NTU.
Debris removal with periodic stops.

Scientific Crew: Ray Shields, Ken Hickey, Julie Stearns

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 2 September 2004

Weather: Sunny 70°F

Tides:

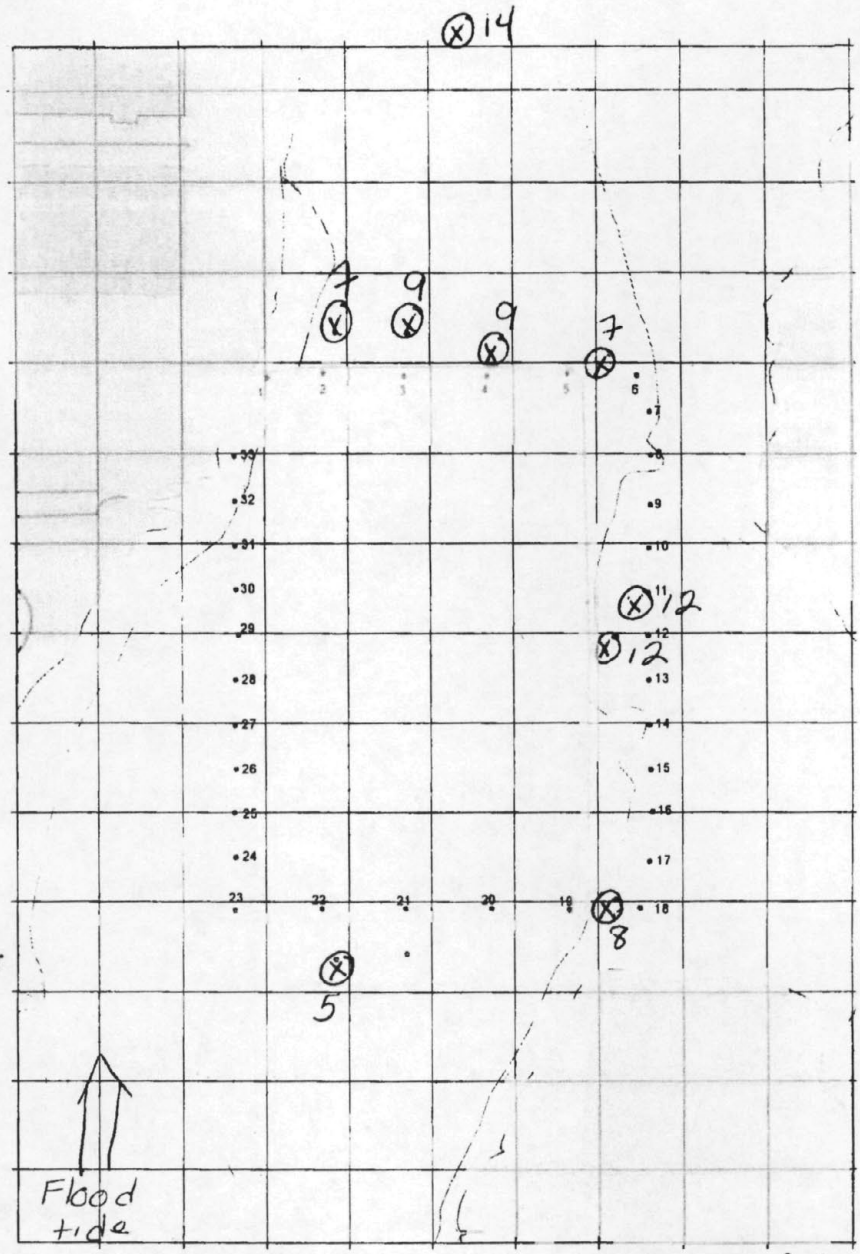
Flood @ 830
HWS @ 1053
Ebb @ 1315

Monitoring Period:

From: 752 To: 940
Tidal Stage: (HWS) Ebb LWS (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

No Debris removal or dredging



Grid spacing: 100 feet

Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
N. Curtain	7-9	2/3
350' N of Curtain	14	2/3
Fish Passage	12	2/3
S. Curtain	5 8	2/3

Samples Collected for Laboratory Analysis

☐ None ☒ 4 TSS & turbidity ☐ 0 Toxicity ☐ 0 PCBs & Metals

Observations

No turbidity levels above 12 NTU

Observed north of Wood Street area Turbidity 10-15 NTU
Dissolved Oxygen 2-7 mg/L.

Scientific Crew: Ken Hickey, Julie Stearns, Bob Lane, Don Boye

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 24 September 2004

Weather: Sunny 75°F

Tides:

Ebb @ 715

LWS @ 1047

Flood @ 1443

Monitoring Period:

From: 915 To: 1458

Tidal Stage: HWS Ebb (LWS) (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

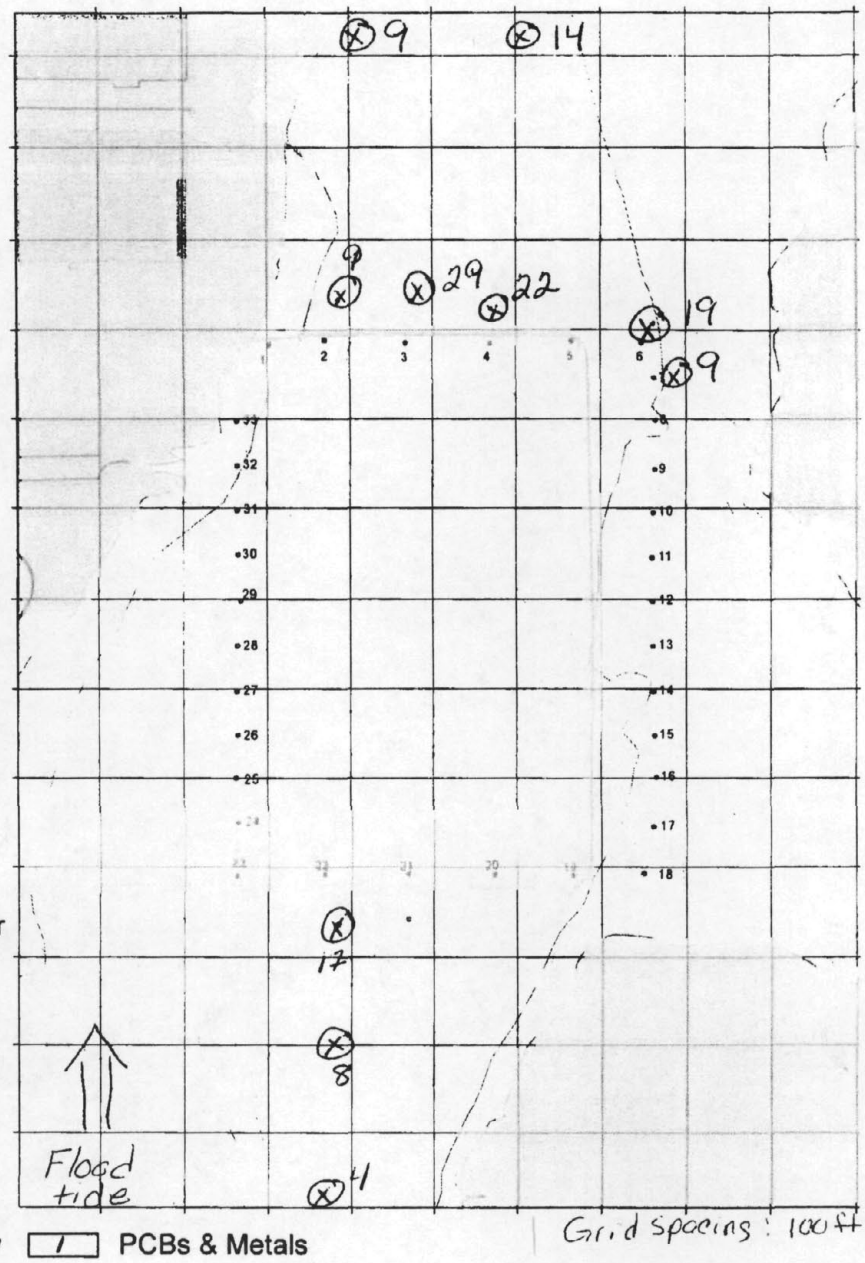
One dredge focused on doing some cuts to see impacts to H_2S gas descending area, and trying a new location of dredging

Periodic starts and stops

Monitoring Measurement Summary.

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
North Curtain	9-29	2/3
South Curtain	17	2/3
200ft S of Curtain	4-8	1.5/2



Samples Collected for Laboratory Analysis

☐ None ☐ 9 TSS & turbidity ☐ 1 Toxicity ☐ 1 PCBs & Metals

Observations

No turbidity levels above 29 NTU.

Periodic starts and stops of dredge, mostly inactive

Observed Swenson support boat creating plumes in shallow water.

Scientific Crew: Ken Hickey, Julia Stearns, Terry Delaney

Completed By: Julia Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 27 September 2004

Weather: Partly Sunny 75°F

Tides:

HWS @ 725
Ebb @ 1630
LWS @ 1342

Monitoring Period:

From: 1100 To: 1438
Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity (*number of dredges, locations, and time period*) :

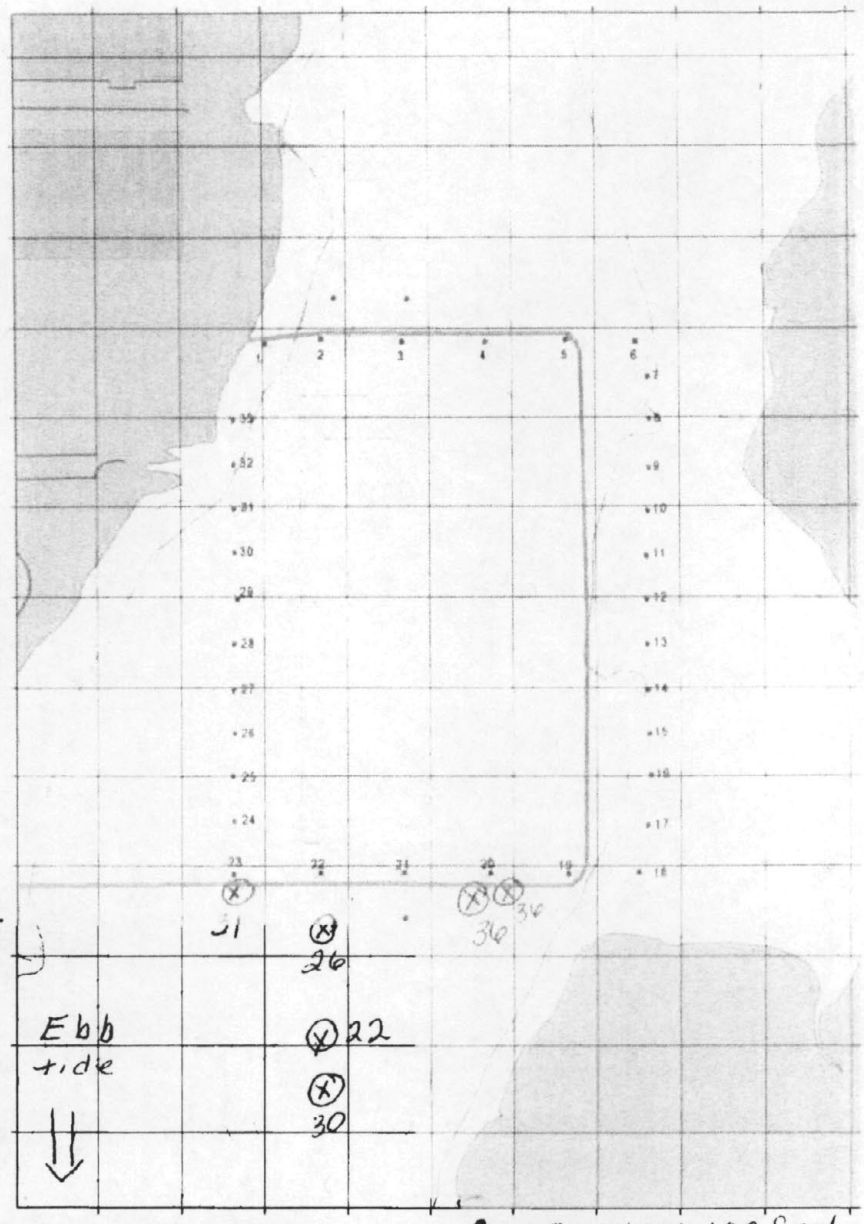
One dredge operating

Periodic stoppages to clear material from dredge intake.

Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
South border of Curtain	30-36	1/2
200ft South of curtain	20-30	1/2



Grid Spacing: 100 feet

Samples Collected for Laboratory Analysis

☐ None ☑ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Observations

No turbidity levels above 36 NTU.
Observed fish passage over water depth at southern opening 12".
Monitoring during Ebb tide, very shallow water and we had to be cautious of not over disturbing sediment.

Scientific Crew: Ken Haley, Julia Stearns, Terry Delaney

Completed By: Julia Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 30 September 2004

Weather: Sunny 70°F

Tides:

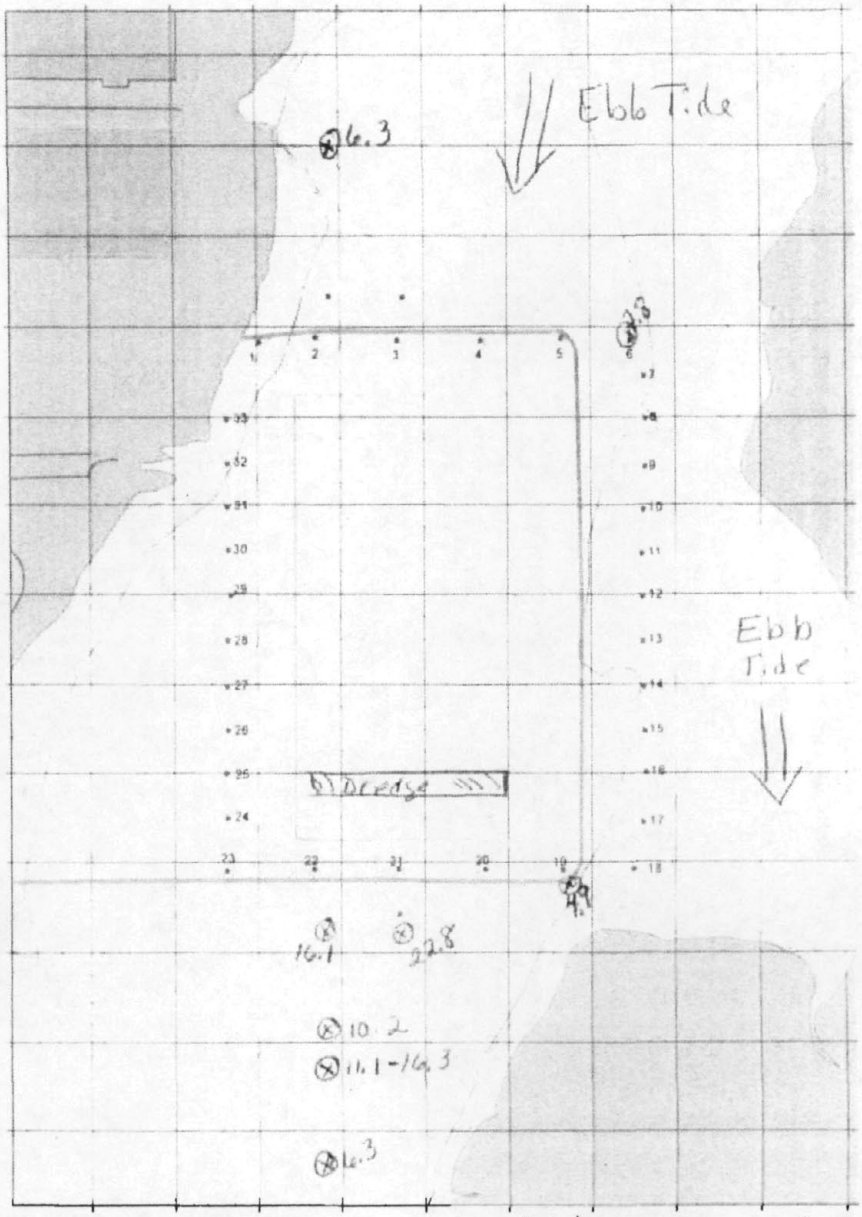
Flood @ 0934
Ebb @ 1528
@

Monitoring Period:

From: 930 To: 1330
Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :

One dredge working
workers moved platform
to Survey St. and back
to DMU #2



Grid spacing: 100 ft

Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
- 200' North of Curtain	2.4 - 6.3	3/4
- At Site #6	5.8 - 7.8	3/4
- 500ft South of Curtain	16 - 23	3/4
- 200ft S. of Curtain	10-16	3/4

Samples Collected for Laboratory Analysis

☐ None ☒ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Observations

No turbidity levels above 25 NTU.

Silt curtain is open to the south as "debris" barge is moved southward.

Scientific Crew: Kim Bakey, Julie Stearns, Ryan McCarthy, Terry Delaney

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 04 October 2004

Weather: Sunny 70°F

Tides:

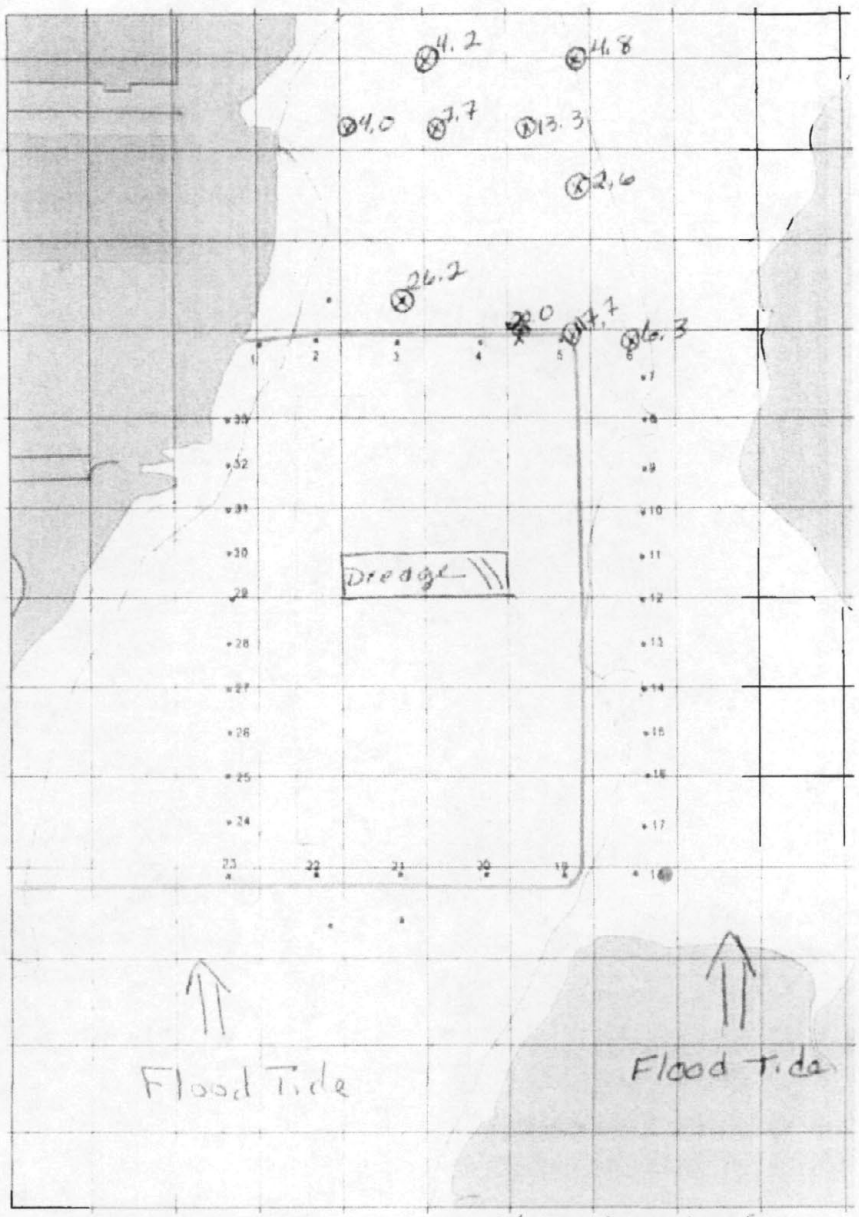
Ebb @ 0456
Flood @ 1234
Ebb @ 1738

Monitoring Period:

From: 1000 To: 1205
Tidal Stage: HWS Ebb LWS (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

1 Dredge used, periodic stops to clear debris from dredge.



Grid spacing: 100 ft

Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
North Curtain	16 - 26	2/3
200 ft North of Curtain	26 - 13	2/3
300 ft N of Curtain	4 - 4.8	2/3

Samples Collected for Laboratory Analysis

☐ None ☑ TSS & turbidity ☐ Toxicity ☑ PCBs & Metals

Observations

No turbidity exceedances were noted.

Turbidity appeared to elevate at curtains edge especially during times of debris removal from dredge.

Scientific Crew: J. Stearns / B. McCarthy / T. Delaney

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 7 OCTOBER 2004

Weather: SUNNY 70°F

Tides:

0724	@	LWS
1330	@	FLOOD
1532	@	HWS

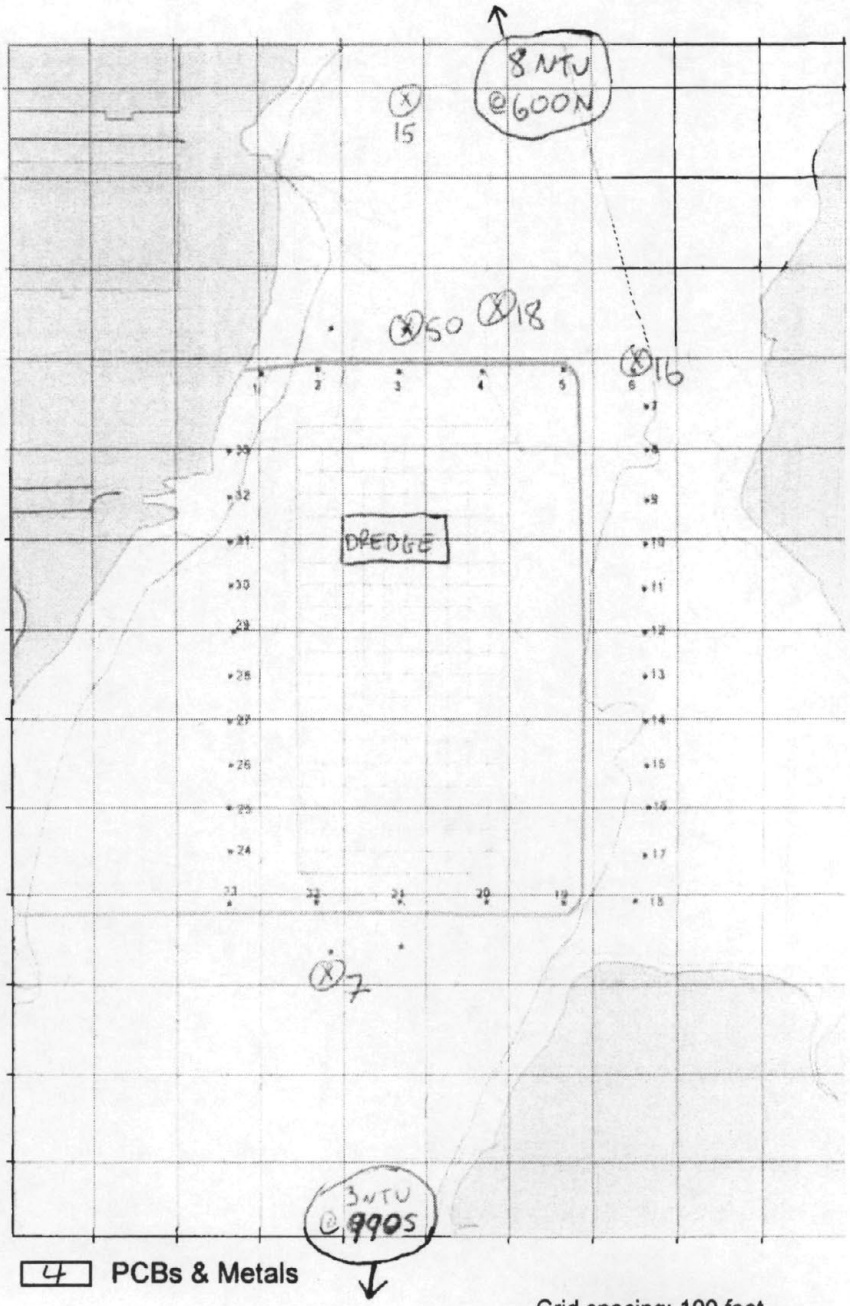
Monitoring Period:

From: 1030 To: 1400

Tidal Stage: HWS Ebb LWS (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

ONE DREDGE IN USE



Grid spacing: 100 feet

Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
SOUTH OF DMU #2	7-3	2/3
NORTH OF CURTAIN	16-50	1/2
100 200 FT N. OF CURTAIN	8-15	1/2
300 FT N. OF CURTAIN	8-9	1/2

Samples Collected for Laboratory Analysis

☐ None ☐ 9 TSS & turbidity ☐ 4 Toxicity ☐ 4 PCBs & Metals

Observations

ONE DREDGE IN USE, PERIODIC STOPS TO CLEAR DREDGE

VISIBLE PLUME MOVING NORTHWARD BEYOND NORTHERN CURTAIN BOUNDARY

Scientific Crew: JULIE STEARNS, RYAN McCARTHY, TERRY DELANEY

Completed By: RYAN McCARTHY

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 13, October 2004

Weather: Sunny 70°F

Tides:

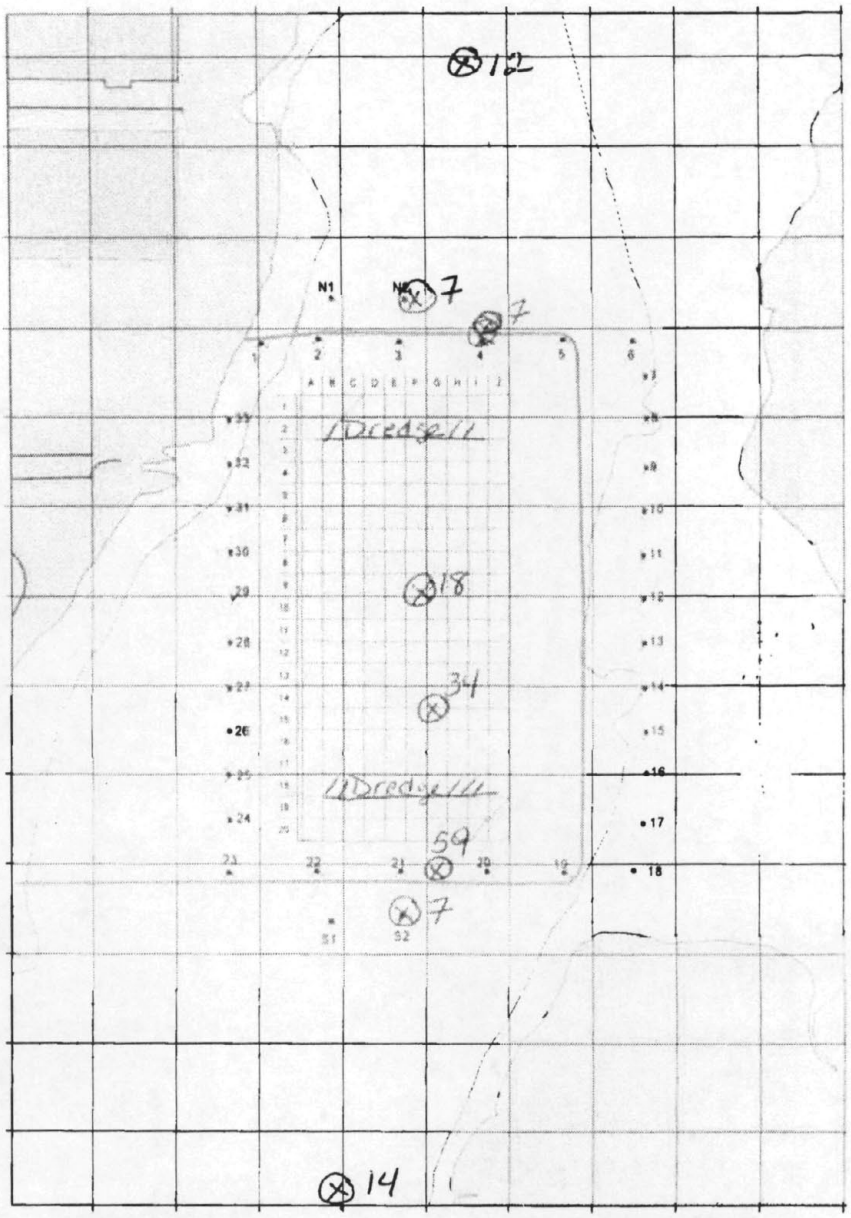
HWS @ 750
Ebb @ 1000
LWS @ 1330

Monitoring Period:

From: 1000 To: 1440
Tidal Stage: HWS Ebb LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :

Northern deedge operating in the morning, Southern dredge operating in the afternoon



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
300 ft North of Silt Curtain	12	1
Within Silt C.	18 - 34	1
No dredging		
during Dredging	60	1
300 ft South of Curtain	14	1

Samples Collected for Laboratory Analysis

☐ None ☑ TSS & turbidity ☑ Toxicity ☑ PCBs & Metals

Grid spacing: 100 feet

Observations

Approximately 1 mt of water with in fish passage, 10-20 Seagulls where feeding on small fish in the morning.

Northern dredge stopped at 1100 due to problems with pipeing. Southern dredge started dredging between 1300 1330.

Scientific Crew: Julie Stearns, Ryan McCarthy, Don Boye, Terry Delonay

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 14 October 2004

Weather: Cloudy / Rainy
65°F

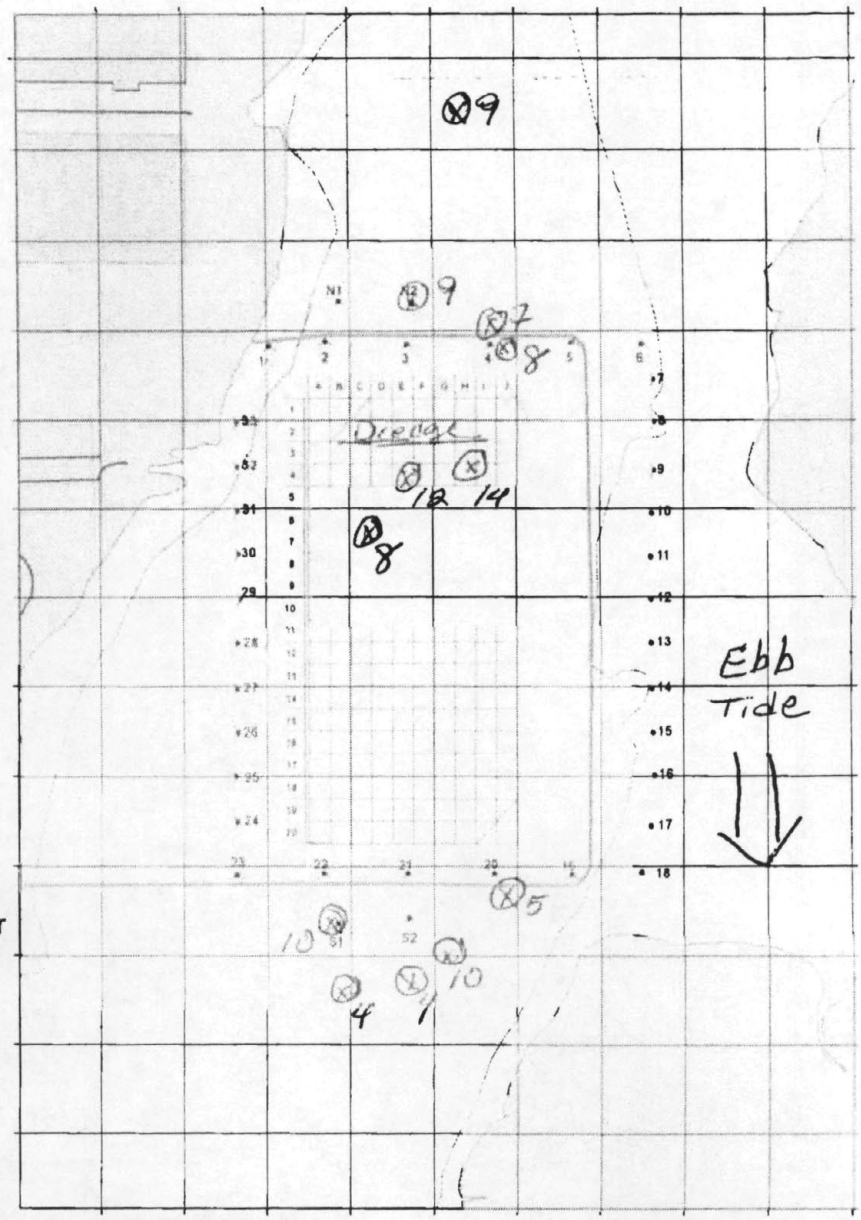
Tides:

HWS	@	833
Ebb	@	1030
LWS	@	1400

Monitoring Period:

From: 1030 To: 1300
Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :
One dredge in use - part-time



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
100-300 ft North of Curtain	7-9	2/3
With in Curtain (No dredging)	8-14	2/3
50-100 ft South of Curtain	5-10	2/3

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations
One dredge in use, stopped dredging at 1150.

Scientific Crew: Julia Stearns, Ryan McCarthy, Terry Delaney

Completed By: Julia Stearns

15 OCT 04
-NO EXCEEDENCE

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 15 OCTOBER 2004

Weather: OVERCAST / BREEZE
55 °F

Tides:

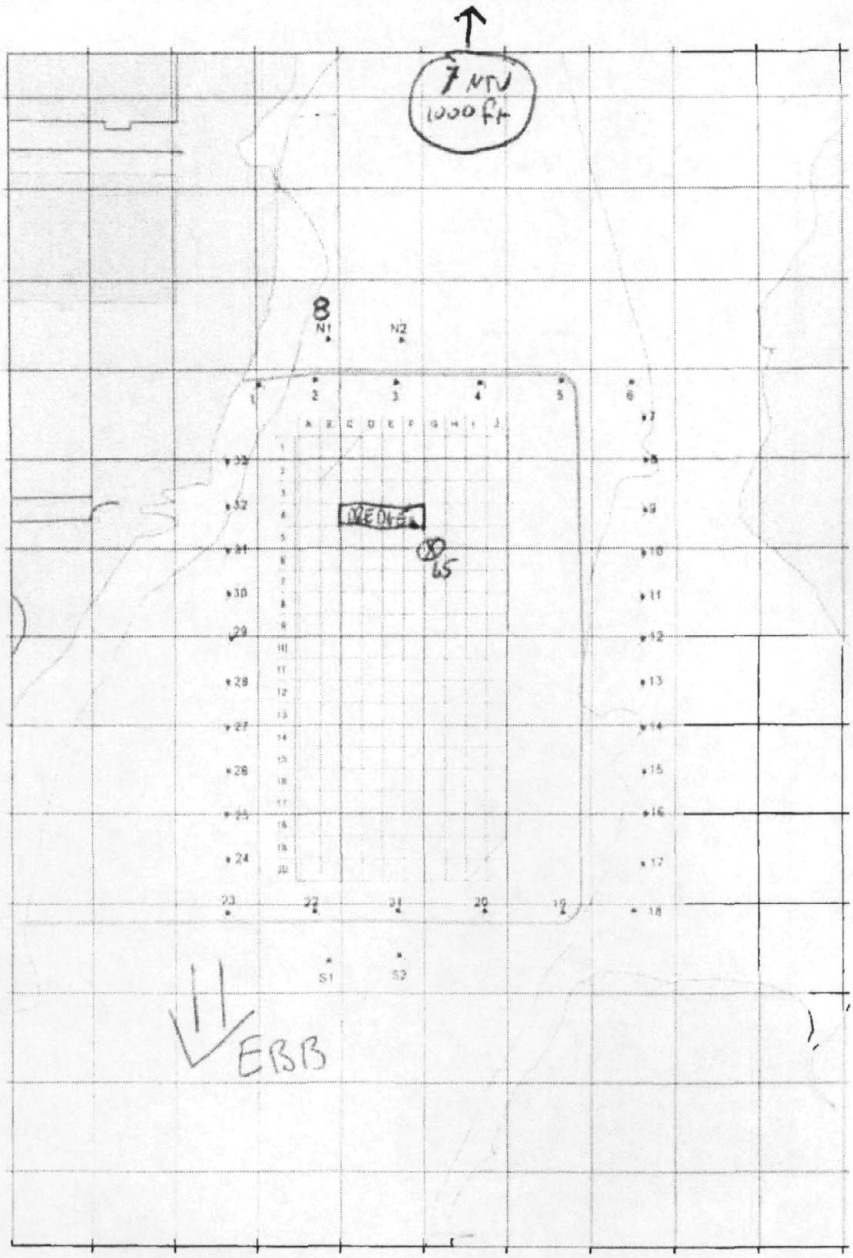
HWS	@	9:17
Ebb	@	1130
LWS	@	1500

Monitoring Period:

From: 1100 To: 1400

Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)*:
ONE DREDGE IN USE



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
1000 ft North of Curtain	7.0	1' / 1.5'
At N1	12	1' / 1.5'
10 yd from dredge path	63	6" / 1.5'

Samples Collected for Laboratory Analysis

☐ None ☐ TSS & turbidity ☑ Toxicity ☐ PCBs & Metals

1 sample submitted for testing

Grid spacing: 100 feet

Observations

- ONE DREDGE IN USE, LOTS OF STARTING AND STOPPING
- SAMPLE COLLECTED ~30' FROM DREDGE
- YSI UNITS DEPLOYED AT N2 & S1

Scientific Crew: RYAN MCCARTHY, TERRY DELANEY, JAMIE LUND DON BOTE

Completed By: RYAN MCCARTHY / STEVE WOLF

18OCT04
— No Exceedence

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 18, October 2004

Weather: Partly cloudy 60°F

Tides:

HWS	@	1130
LOW	@	1430
LWS	@	1725

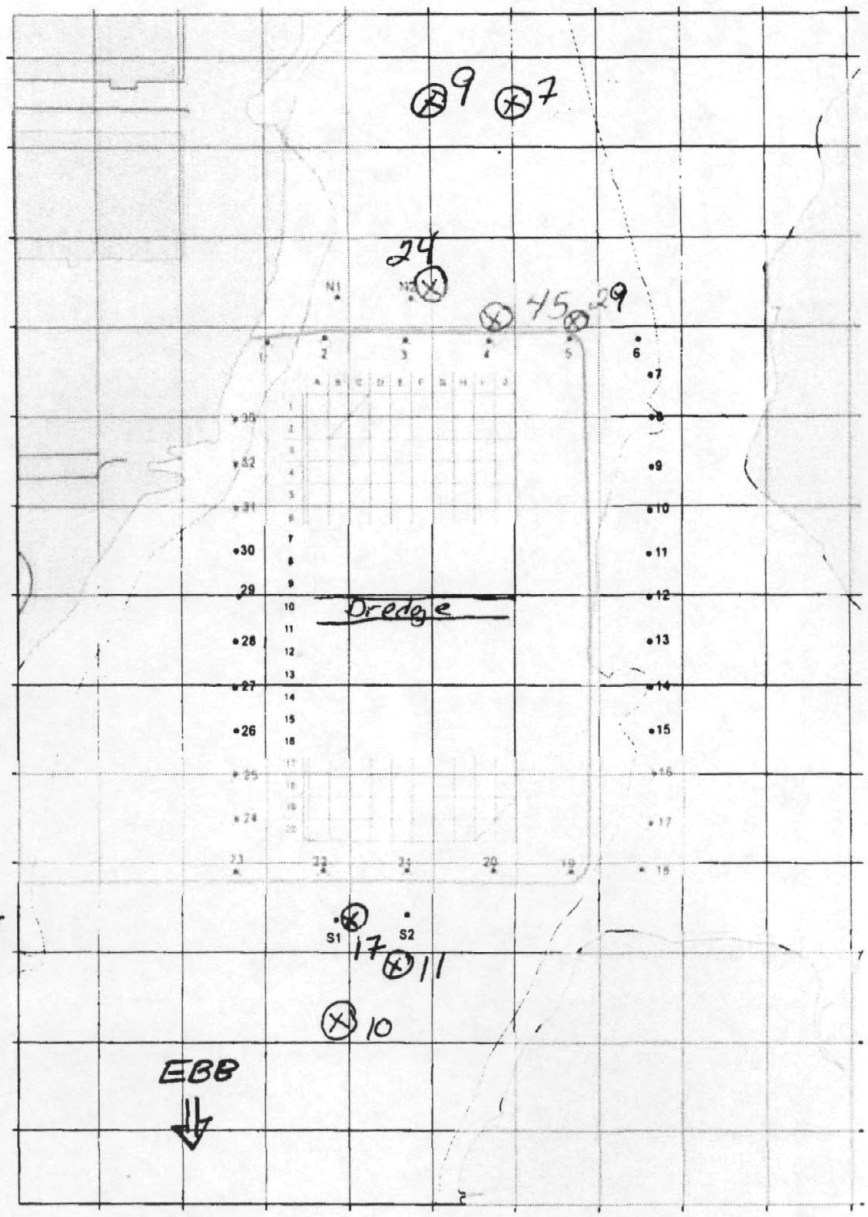
Monitoring Period:

From: 1000 To: 1510

Tidal Stage: (HWS) (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :

One dredging operating



Grid spacing: 100 feet

Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
550 ft North of Dredge	7-9	2/4
North Curtain	24-45	2/4
350 ft South of Dredge	10-17	3/4

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Observations

One dredge in use.

Turbidity levels below 50 NTUs

Retrieved both VSTs at piles N2 and S1.

Scientific Crew: J. Stearns, Ryan McCarthy, Bob Lane

Completed By: Julia Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 10/21/04

Weather: Overcast 55°F

Tides:

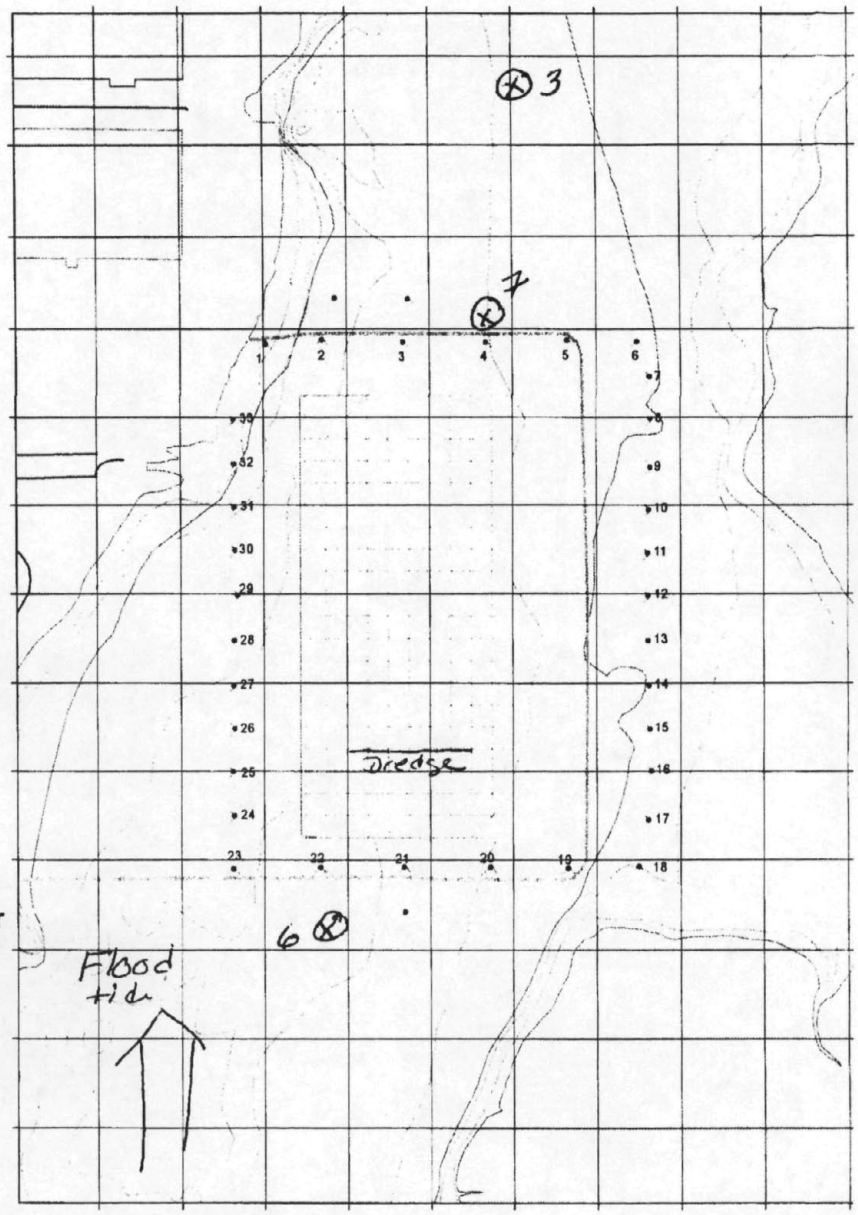
LWS @ 950
Flood @ 1340
HWS @ 1440

Monitoring Period:

From: 1100 To: 1200
Tidal Stage: HWS Ebb LWS (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

Dredge not in use



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
South of Curtain	6	1/3
At Pile #4	7	2/3
280 feet North of Curtain	3	1/2

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Observations

Dredge was not operating during monitoring period.
1 VST was deployed at pile S1.
2 Sediment traps were deployed approximately 300 feet North of Curtain and 600 feet South of Curtain.

Scientific Crew: J. Stearns, R. McCarthy, J. Drake

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 26 October, 2004

Weather: Sunny

Tides:
- HWS @ 750
- Ebb @ 1015
- LWS @ 1410

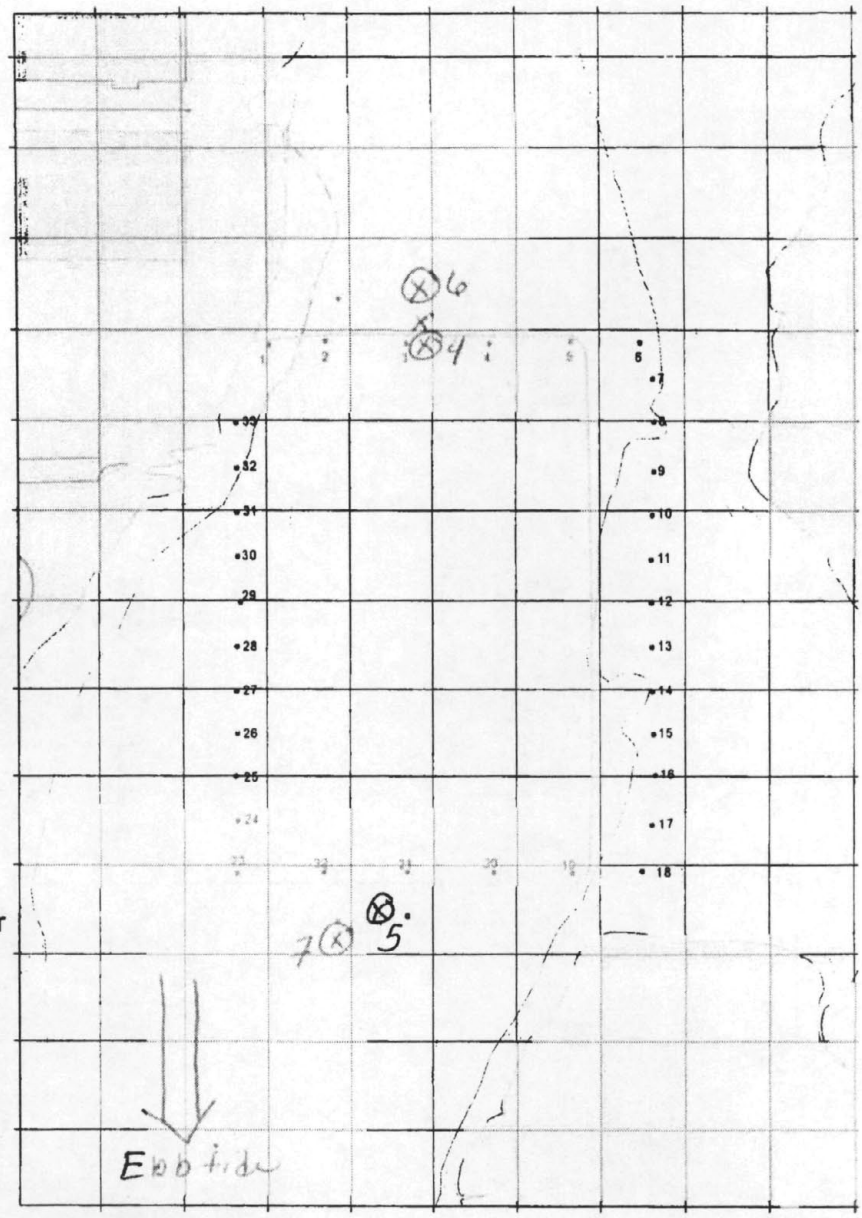
Monitoring Period:

From: 1000 To: 1130

Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :

Dredging



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
Norther curtain boundary	4-6	2/3
South Curtain Boundary	5-7	1/2

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Observations

Downloaded YSI meters and redeployed meters one at pile 3 inside curtain and one at pile 51 (outside curtain)
Turbidity levels not above 7.

Scientific Crew: Julie Stearns, Ryan McCarthy, Terry Delaney

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 28 October, 2004

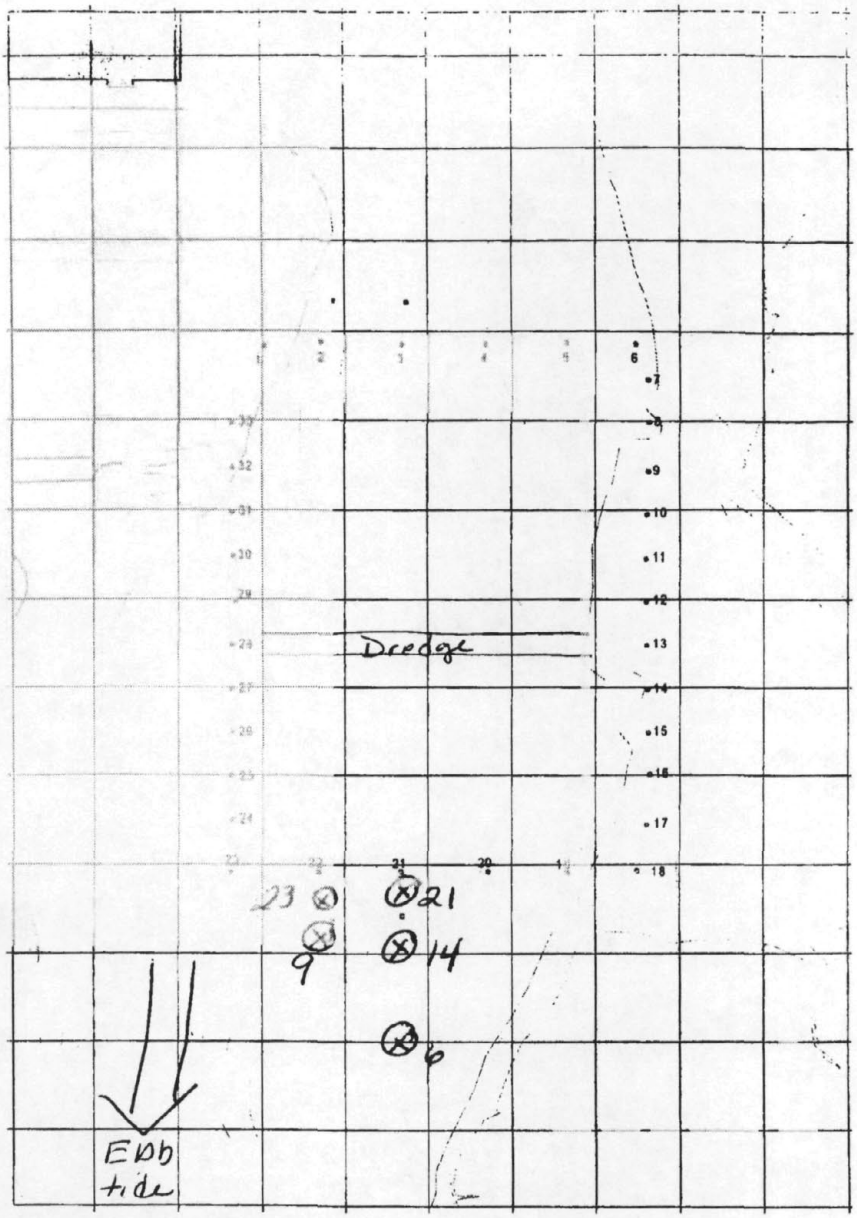
Weather: Sunny 60°F

Tides:
HWS @ 824
Ebb @ 1030
LWS @ 1431

Monitoring Period:

From: 1430 To: 1510
Tidal Stage: HWS (Ebb) (LWS) Flood

Dredging Activity *(number of dredges, locations, and time period)* :
Dredging (1 Dredges)



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
South Curtain Boundary	21-23	1/2
50-100 feet South of Curtain	9-14	1/2
200 feet S. of Curtain	6	1/2

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Observations

One dredge in use

No turbidity levels above 23.

Scientific Crew: Julie Stearns, Melissa Cannon, Terry Delaney

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 2 November 2004

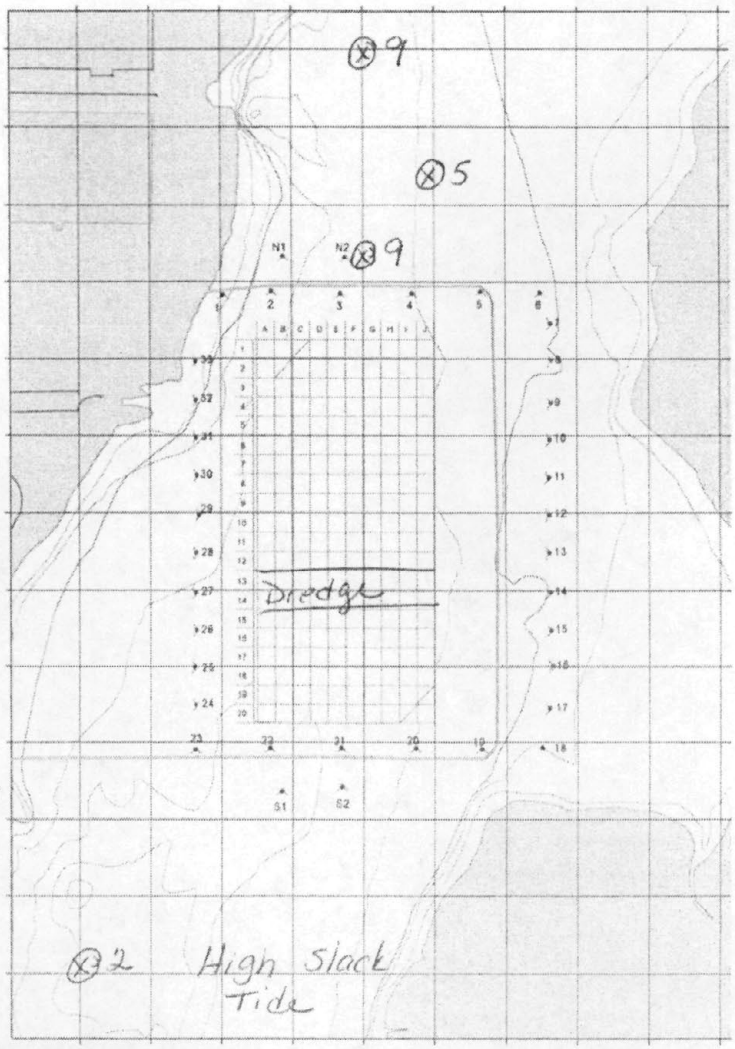
Weather: Cloudy 50°F

Tides:
HWS @ 1100
Ebb @ 1315
LWS @ 1606

Monitoring Period:

From: 1100 To: 1200
Tidal Stage: (HWS) Ebb LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :
One dredge in use.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
50 feet North of North Curtain	9	2/4.
150 feet North of Curtain	5	2/4
300 feet North of Curtain	9	2/4

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations
One dredge in use.
Turbidity levels below 10.

Deployed two sediment trays, one north of DMU #2 (adjacent to previous deployed tray) and second tray deployed approximately 300 feet southwest of DMU #2.

Scientific Crew: Julie Stearns, Ryan McCarthy, Terry Delaney

Completed By: Julie Stearns

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 1 November 2004

Weather: Sunny

Tides:
HWS @ 1013
Ebb @ 1245
LWS @ 1528

Monitoring Period:

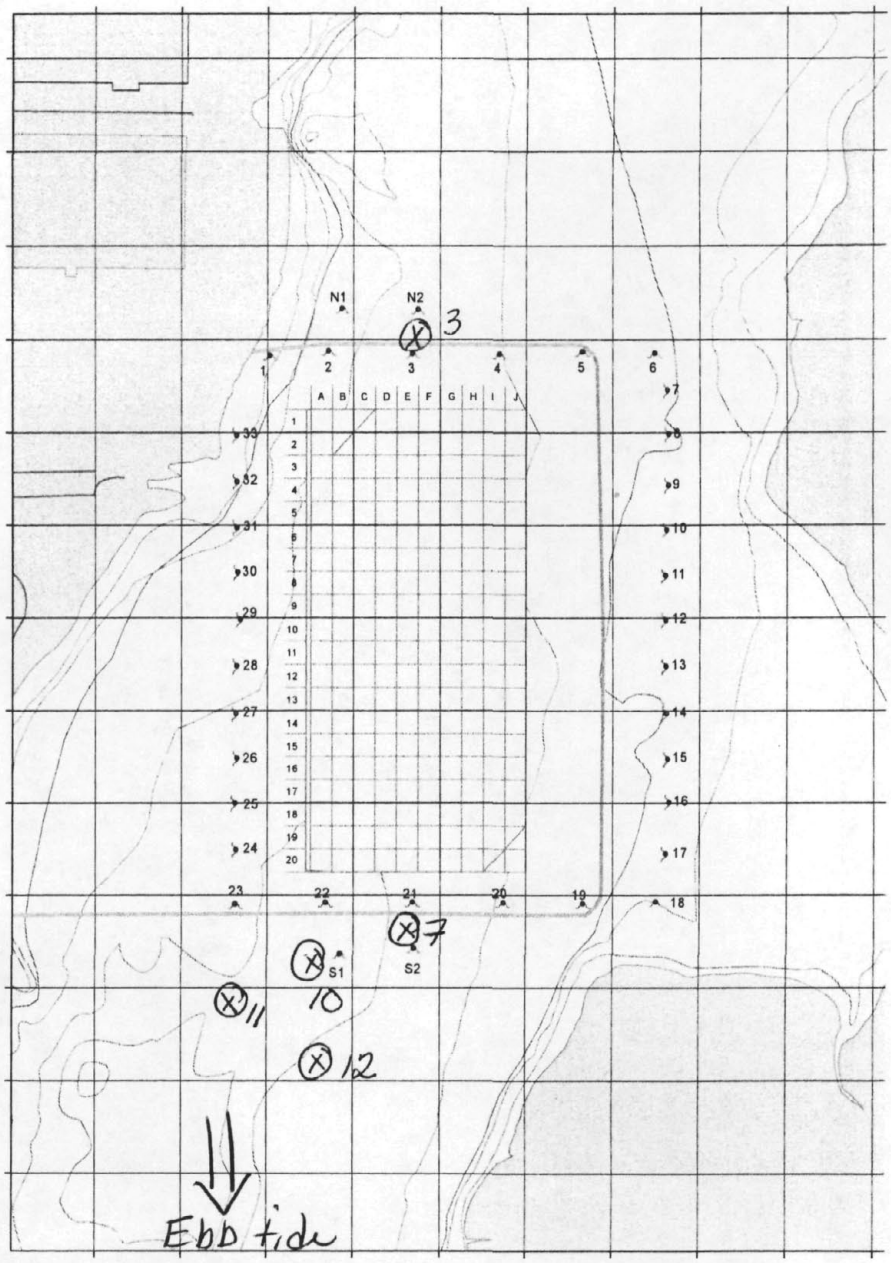
From: 1330 To: 1430
Tidal Stage: HWS (Ebb) LWS Flood

Dredging Activity *(number of dredges, locations, and time period)* :

Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)



Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Scientific Crew:

Completed By:

ENSR INTERNATIONAL

Daily Field Summary for Water Quality Monitoring at DMU #2

Date: 4 November, 2004

Weather: Sunny 45°F

Tides:

Flood	@	1030
HWS	@	1253
Ebb	@	1500

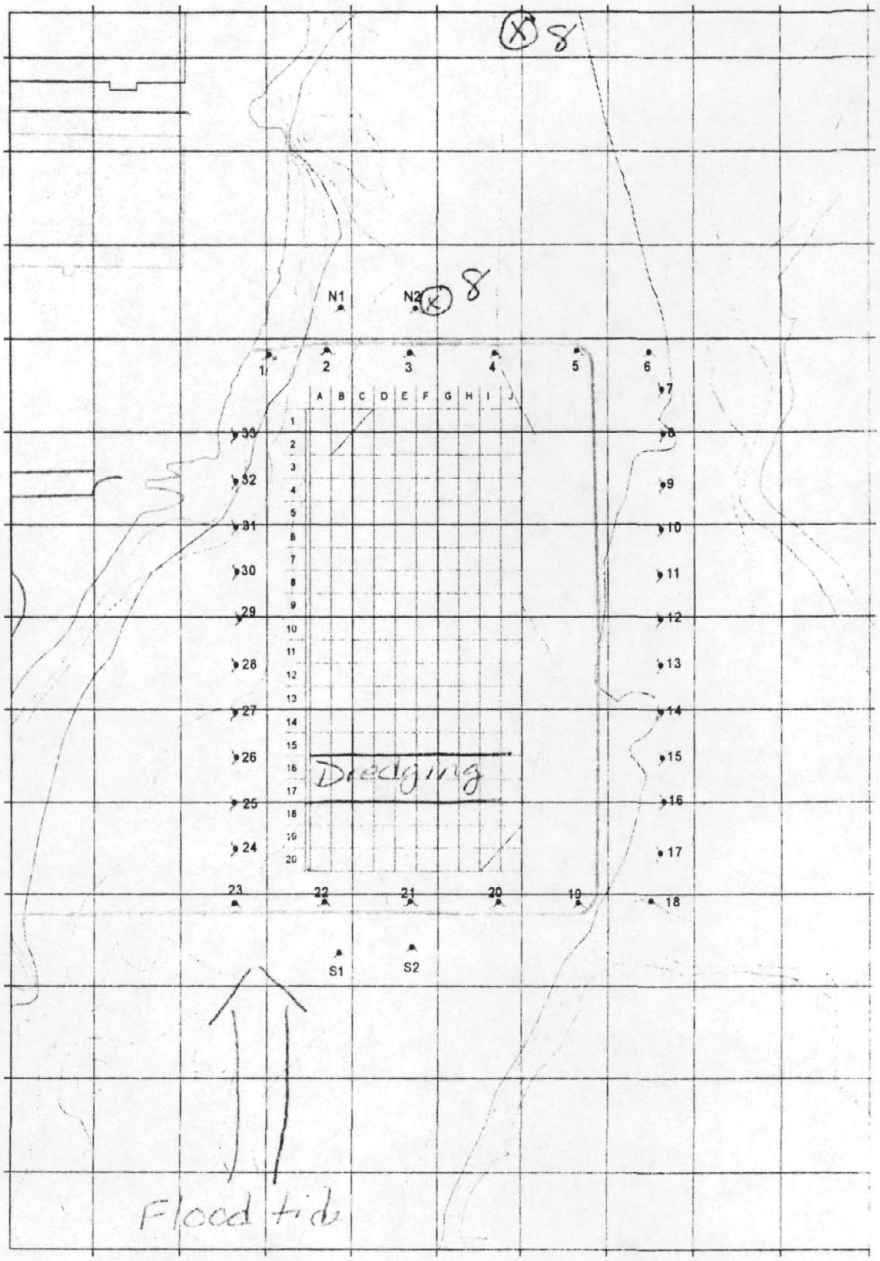
Monitoring Period:

From: 1030 To: 1130

Tidal Stage: HWS Ebb LWS (Flood)

Dredging Activity *(number of dredges, locations, and time period)* :

Dredging between piles 15 and 26.



Monitoring Measurement Summary:

Range of Turbidity Down Current:

Location	Turbidity (NTU)	Sensor/Water Depth (ft)
350 feet North of curtain	8	3/4
at pile N2 (50 ft North of curtains)	8	3/4

Samples Collected for Laboratory Analysis

☑ None ☐ TSS & turbidity ☐ Toxicity ☐ PCBs & Metals

Grid spacing: 100 feet

Observations

Dredging - between piles 15 and 26.

Collected sediment samples from sediment trays located north of DMU #2. Core sampling behind dredge. Turbidity levels at 8 NTU.

Scientific Crew: Julie Stearns, James Lund, Terry Delaney

Completed By: Julie Stearns

APPENDIX C

BIOLOGICAL AND ANALYTICAL LABORATORY ANALYSIS

New Bedford Harbor Water Quality Monitoring at DMU #2
Toxicological Analysis Results
1 September and 24 September 2004

Sample collected during debris removal activities at DMU#2

Sample	Sample Date	Location	Tide Stage
WQE2090104	9/1/2004	103 yards south of pile # 22	LWS

Analysis											
Arbacia		Mysid 48 hr survival		Mysid 7 day survival		Mysid 7 day growth		Champia 48 hr survival		Champia 7 day reproducation	
Lab	E2	Lab	E2	Lab	E2	Lab	E2	Lab	E2	Lab	E2
90.9% fertilized	79.2	100%	100%	100%	98%	0.404 mg/organism	mg/organism	100%	98%	17.2 tips/ replicate	27.9 tips/ replicate

Sample collected during single dredge, part-time activities at DMU#2

Sample	Sample Date	Location	Tide Stage
WQ1F092404	9/24/2004	at pile # N1	LWS

Analysis											
Arbacia		Mysid 48 hr survival		Mysid 7 day survival		Mysid 7 day growth		Champia 48 hr survival		Champia 7 day reproducation	
Lab	1F	Lab	1F	Lab	1F	Lab	1F	Lab	1F	Lab	1F
90.3% fertilized	86.40%	97.5%	97.5%	98%	98%	0.594 mg/ organism	0.566 mg/ organism			0 cystocarps/tip	22.2 cystocarps/tip

Toxicology Results

Sample	Sample Date	Location	Tide Stage
WQE2090104	9/1/2004	103 yards south of pile # 22	LWS

Analysis											
Arbacia		Mysid 48 hr survival		Mysid 7 day survival		Mysid 7 day growth		Champia 48 hr survival		Champia 7 day reproducation	
Lab	E2	Lab	E2	Lab	E2	Lab	E2	Lab	E2	Lab	E2
90.9% fertilized	79.2	100%	100%	100%	98%	0.404 mg/organism	mg/organism	100%	98%	17.2 tips/ replicate	27.9 tips/ replicate

Sample	Sample Date	Location	Tide Stage
WQ1F092404	9/24/2004	at pile # N1	LWS

Analysis											
Arbacia		Mysid 48 hr survival		Mysid 7 day survival		Mysid 7 day growth		Champia 48 hr survival		Champia 7 day reproducation	
Lab	1F	Lab	1F	Lab	1F	Lab	1F	Lab	1F	Lab	1F
90.3% fertilized	86.40%	97.5%	97.5%	98%	98%	0.594 mg/ organism	0.566 mg/ organism			0 cystocarps/tip	22.2 cystocarps/tip

5:1

Stage	Area	Inc Volume	Cum Volume		
42	136				
43	934	535	535	535	
40	305				
41	1421	863	863	863	
42	2726	2074	2074	2937	**3472**

4:1

Stage	Area	Inc Volume	Cum Volume		
41	4				
42	291	148	148	148	
43	934	612	612	760	
39	77				
40	721	399	399	399	
41	1669	1195	1195	1594	
42	2726	2197	2197	3791	**4551**

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL	UNIT
1104041	SA	TOTAL	1000	37680-73-2	BZ 101	25500	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	32598-14-4	BZ 105	856	UD	UG/KG_DRYWT
1104041	SA	TOTAL	1000	31508-00-6	BZ 118	16900	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	38380-07-3	BZ 128	856	UD	UG/KG_DRYWT
1104041	SA	TOTAL	1000	35065-28-2	BZ 138	4630	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	35065-27-1	BZ 153	19400	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	35065-30-6	BZ 170	1590	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	37680-65-2	BZ 18	46200	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	35065-29-3	BZ 180	2330	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	52663-68-0	BZ 187	3590	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	52663-78-2	BZ 195	856	UD	UG/KG_DRYWT
1104041	SA	TOTAL	1000	40186-72-9	BZ 206	856	UD	UG/KG_DRYWT
1104041	SA	TOTAL	1000	C-2051-24-3	BZ 209	856	UD	UG/KG_DRYWT
1104041	SA	TOTAL	1000	7012-37-5	BZ 28	64800	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	41464-39-5	BZ 44	32400	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	35693-99-3	BZ 52	81800	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	32598-10-0	BZ 66	36500	D	UG/KG_DRYWT
1104041	SA	TOTAL	1000	34883-43-7	BZ 8	29700	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	32598-14-4	BZ 105	2430	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	31508-00-6	BZ 118	22900	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	38380-07-3	BZ 128	956	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	35065-28-2	BZ 138	5850	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	35065-27-1	BZ 153	22600	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	35065-30-6	BZ 170	2110	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	37680-65-2	BZ 18	53200	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	35065-29-3	BZ 180	3050	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	52663-68-0	BZ 187	4070	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	52663-78-2	BZ 195	730	UD	UG/KG_DRYWT
1104042	SA	TOTAL	1000	40186-72-9	BZ 206	730	UD	UG/KG_DRYWT
1104042	SA	TOTAL	1000	C-2051-24-3	BZ 209	730	UD	UG/KG_DRYWT
1104042	SA	TOTAL	1000	7012-37-5	BZ 28	77600	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	41464-39-5	BZ 44	38000	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	35693-99-3	BZ 52	84100	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	32598-10-0	BZ 66	46600	D	UG/KG_DRYWT
1104042	SA	TOTAL	1000	34883-43-7	BZ 8	40200	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	37680-73-2	BZ 101	61300	LD	UG/KG_DRYWT
1111043	SA	TOTAL	2000	32598-14-4	BZ 105	1610	LD	UG/KG_DRYWT
1111043	SA	TOTAL	2000	31508-00-6	BZ 118	44600	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	38380-07-3	BZ 128	1720	LD	UG/KG_DRYWT
1111043	SA	TOTAL	2000	35065-28-2	BZ 138	9960	LD	UG/KG_DRYWT
1111043	SA	TOTAL	2000	35065-27-1	BZ 153	39500	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	35065-30-6	BZ 170	3410	D	UG/KG_DRYWT

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
1111043	SA	TOTAL	2000	37680-65-2	BZ 18	143000	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	35065-29-3	BZ 180	5060	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	52663-68-0	BZ 187	5710	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	52663-78-2	BZ 195	1380	UD	UG/KG_DRYWT
1111043	SA	TOTAL	2000	40186-72-9	BZ 206	1380	UD	UG/KG_DRYWT
1111043	SA	TOTAL	2000	C-2051-24-3	BZ 209	1380	UD	UG/KG_DRYWT
1111043	SA	TOTAL	2000	7012-37-5	BZ 28	167000	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	41464-39-5	BZ 44	67400	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	35693-99-3	BZ 52	157000	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	32598-10-0	BZ 66	91000	D	UG/KG_DRYWT
1111043	SA	TOTAL	2000	34883-43-7	BZ 8	113000	D	UG/KG_DRYWT
25	SA	TOTAL	500	37680-73-2	BZ 101	20000	D	UG/KG_DRYWT
25	SA	TOTAL	500	32598-14-4	BZ 105	2210	D	UG/KG_DRYWT
25	SA	TOTAL	500	31508-00-6	BZ 118	14800	D	UG/KG_DRYWT
25	SA	TOTAL	500	38380-07-3	BZ 128	923	D	UG/KG_DRYWT
25	SA	TOTAL	500	35065-28-2	BZ 138	4710	D	UG/KG_DRYWT
25	SA	TOTAL	500	35065-27-1	BZ 153	12800	D	UG/KG_DRYWT
25	SA	TOTAL	500	35065-30-6	BZ 170	1420	D	UG/KG_DRYWT
25	SA	TOTAL	500	37680-65-2	BZ 18	51100	D	UG/KG_DRYWT
25	SA	TOTAL	500	35065-29-3	BZ 180	2030	D	UG/KG_DRYWT
25	SA	TOTAL	500	52663-68-0	BZ 187	2220	D	UG/KG_DRYWT
25	SA	TOTAL	500	52663-78-2	BZ 195	620	UD	UG/KG_DRYWT
25	SA	TOTAL	500	40186-72-9	BZ 206	620	UD	UG/KG_DRYWT
25	SA	TOTAL	500	C-2051-24-3	BZ 209	620	UD	UG/KG_DRYWT
25	SA	TOTAL	500	7012-37-5	BZ 28	64100	D	UG/KG_DRYWT
25	SA	TOTAL	500	41464-39-5	BZ 44	29300	D	UG/KG_DRYWT
25	SA	TOTAL	500	35693-99-3	BZ 52	59200	D	UG/KG_DRYWT
25	SA	TOTAL	500	32598-10-0	BZ 66	32400	D	UG/KG_DRYWT
25	SA	TOTAL	500	34883-43-7	BZ 8	33300	D	UG/KG_DRYWT
2N	SA	TOTAL	100	37680-73-2	BZ 101	8660	D	UG/KG_DRYWT
2N	SA	TOTAL	100	32598-14-4	BZ 105	916	D	UG/KG_DRYWT
2N	SA	TOTAL	100	31508-00-6	BZ 118	6270	D	UG/KG_DRYWT
2N	SA	TOTAL	100	38380-07-3	BZ 128	502	D	UG/KG_DRYWT
2N	SA	TOTAL	100	35065-28-2	BZ 138	2100	D	UG/KG_DRYWT
2N	SA	TOTAL	100	35065-27-1	BZ 153	7520	D	UG/KG_DRYWT
2N	SA	TOTAL	100	35065-30-6	BZ 170	671	D	UG/KG_DRYWT
2N	SA	TOTAL	100	37680-65-2	BZ 18	18700	D	UG/KG_DRYWT
2N	SA	TOTAL	100	35065-29-3	BZ 180	985	D	UG/KG_DRYWT
2N	SA	TOTAL	100	52663-68-0	BZ 187	1480	D	UG/KG_DRYWT
2N	SA	TOTAL	100	52663-78-2	BZ 195	314	UD	UG/KG_DRYWT
2N	SA	TOTAL	100	40186-72-9	BZ 206	314	UD	UG/KG_DRYWT
2N	SA	TOTAL	100	C-2051-24-3	BZ 209	314	UD	UG/KG_DRYWT
2N	SA	TOTAL	100	7012-37-5	BZ 28	20400	D	UG/KG_DRYWT
2N	SA	TOTAL	100	41464-39-5	BZ 44	10600	D	UG/KG_DRYWT

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
2N	SA	TOTAL	100	32598-10-0	BZ 66	11900	D	UG/KG_DRYWT
2N	SA	TOTAL	100	34883-43-7	BZ 8	4890	D	UG/KG_DRYWT
S2	SA	TOTAL	200	37680-73-2	BZ 101	9180	D	UG/KG_DRYWT
S2	SA	TOTAL	200	32598-14-4	BZ 105	494	UD	UG/KG_DRYWT
S2	SA	TOTAL	200	31508-00-6	BZ 118	6240	D	UG/KG_DRYWT
S2	SA	TOTAL	200	38380-07-3	BZ 128	534	D	UG/KG_DRYWT
S2	SA	TOTAL	200	35065-28-2	BZ 138	2350	D	UG/KG_DRYWT
S2	SA	TOTAL	200	35065-27-1	BZ 153	7080	D	UG/KG_DRYWT
S2	SA	TOTAL	200	35065-30-6	BZ 170	756	D	UG/KG_DRYWT
S2	SA	TOTAL	200	37680-65-2	BZ 18	18200	D	UG/KG_DRYWT
S2	SA	TOTAL	200	35065-29-3	BZ 180	969	D	UG/KG_DRYWT
S2	SA	TOTAL	200	52663-68-0	BZ 187	1290	D	UG/KG_DRYWT
S2	SA	TOTAL	200	52663-78-2	BZ 195	494	UD	UG/KG_DRYWT
S2	SA	TOTAL	200	40186-72-9	BZ 206	494	UD	UG/KG_DRYWT
S2	SA	TOTAL	200	C-2051-24-3	BZ 209	494	UD	UG/KG_DRYWT
S2	SA	TOTAL	200	7012-37-5	BZ 28	24400	D	UG/KG_DRYWT
S2	SA	TOTAL	200	41464-39-5	BZ 44	10700	D	UG/KG_DRYWT
S2	SA	TOTAL	200	35693-99-3	BZ 52	26100	D	UG/KG_DRYWT
S2	SA	TOTAL	200	32598-10-0	BZ 66	11300	D	UG/KG_DRYWT
S2	SA	TOTAL	200	34883-43-7	BZ 8	4890	D	UG/KG_DRYWT
WQ1E101504	SADL1	PART	10	37680-73-2	BZ 101	0.424	LD	UG/L
S2	SA	TOTAL	200	52663-68-0	BZ 187	1290	D	UG/KG_DRYWT
WQ1E101504	SA	PART	1	37680-73-2	BZ 101	0.428	LE	UG/L
WQ1E101504	SA	DISS	5	37680-73-2	BZ 101	0.0144	LD	UG/L
WQ1E101504	SA	PART	1	32598-14-4	BZ 105	0.0185	L	UG/L
WQ1E101504	SADL1	PART	10	32598-14-4	BZ 105	0.0112	UD	UG/L
WQ1E101504	SA	DISS	5	32598-14-4	BZ 105	0.00562	UD	UG/L
WQ1E101504	SADL1	PART	10	31508-00-6	BZ 118	0.251	D	UG/L
WQ1E101504	SA	DISS	5	31508-00-6	BZ 118	0.00573	D	UG/L
WQ1E101504	SA	PART	1	31508-00-6	BZ 118	0.288	E	UG/L
WQ1E101504	SA	DISS	5	38380-07-3	BZ 128	0.00562	UD	UG/L
WQ1E101504	SA	PART	1	38380-07-3	BZ 128	0.0135	L	UG/L
WQ1E101504	SADL1	PART	10	38380-07-3	BZ 128	0.0133	LD	UG/L
WQ1E101504	SA	PART	1	35065-28-2	BZ 138	0.0712	L	UG/L
WQ1E101504	SA	DISS	5	35065-28-2	BZ 138	0.00562	UD	UG/L
WQ1E101504	SADL1	PART	10	35065-28-2	BZ 138	0.0711	LD	UG/L
WQ1E101504	SADL1	PART	10	35065-27-1	BZ 153	0.302	D	UG/L
WQ1E101504	SA	PART	1	35065-27-1	BZ 153	0.314	E	UG/L
WQ1E101504	SA	DISS	5	35065-27-1	BZ 153	0.00562	UD	UG/L
WQ1E101504	SA	DISS	5	35065-30-6	BZ 170	0.00562	UD	UG/L
WQ1E101504	SA	PART	1	35065-30-6	BZ 170	0.0227	L	UG/L
WQ1E101504	SADL1	PART	10	35065-30-6	BZ 170	0.0235	D	UG/L
WQ1E101504	SADL1	PART	10	37680-65-2	BZ 18	0.744	D	UG/L
WQ1E101504	SA	DISS	5	37680-65-2	BZ 18	0.517	D	UG/L

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
WQ1E101504	SA	DISS	5	35065-29-3	BZ 180	0.00562	UD	UG/L
WQ1E101504	SA	PART	1	35065-29-3	BZ 180	0.0369		UG/L
WQ1E101504	SADL1	PART	10	35065-29-3	BZ 180	0.0333	D	UG/L
WQ1E101504	SA	PART	1	52663-68-0	BZ 187	0.0551		UG/L
WQ1E101504	SADL1	PART	10	52663-68-0	BZ 187	0.0518	D	UG/L
WQ1E101504	SA	DISS	5	52663-68-0	BZ 187	0.00562	UD	UG/L
WQ1E101504	SA	PART	1	52663-78-2	BZ 195	0.00325	L	UG/L
WQ1E101504	SADL1	PART	10	52663-78-2	BZ 195	0.0112	UD	UG/L
WQ1E101504	SA	DISS	5	52663-78-2	BZ 195	0.00562	UD	UG/L
WQ1E101504	SADL1	PART	10	40186-72-9	BZ 206	0.0112	UD	UG/L
WQ1E101504	SA	PART	1	40186-72-9	BZ 206	0.00591		UG/L
WQ1E101504	SA	DISS	5	40186-72-9	BZ 206	0.00562	UD	UG/L
WQ1E101504	SA	PART	1	C-2051-24-3	BZ 209	0.00142	L	UG/L
WQ1E101504	SADL1	PART	10	C-2051-24-3	BZ 209	0.0112	UD	UG/L
WQ1E101504	SA	DISS	5	C-2051-24-3	BZ 209	0.00562	UD	UG/L
WQ1E101504	SA	DISS	5	7012-37-5	BZ 28	0.244	D	UG/L
WQ1E101504	SA	PART	1	7012-37-5	BZ 28	1.17	E	UG/L
WQ1E101504	SADL1	PART	10	7012-37-5	BZ 28	1.04	D	UG/L
WQ1E101504	SA	PART	1	41464-39-5	BZ 44	0.528	E	UG/L
WQ1E101504	SADL1	PART	10	41464-39-5	BZ 44	0.446	D	UG/L
WQ1E101504	SA	DISS	5	41464-39-5	BZ 44	0.0722	D	UG/L
WQ1E101504	SADL1	PART	10	35693-99-3	BZ 52	1.29	D	UG/L
WQ1E101504	SA	DISS	5	35693-99-3	BZ 52	0.202	D	UG/L
WQ1E101504	SA	PART	1	35693-99-3	BZ 52	1.44	E	UG/L
WQ1E101504	SADL1	PART	10	32598-10-0	BZ 66	0.59	D	UG/L
WQ1E101504	SA	DISS	5	32598-10-0	BZ 66	0.0359	D	UG/L
WQ1E101504	SA	PART	1	32598-10-0	BZ 66	0.621	E	UG/L
WQ1E101504	SA	PART	1	34883-43-7	BZ 8	0.472	E	UG/L
WQ1E101504	SADL1	PART	10	34883-43-7	BZ 8	0.463	D	UG/L
WQ1E101504	SA	DISS	5	34883-43-7	BZ 8	0.481	D	UG/L
WQ1F100704	SA	PART	1	37680-73-2	BZ 101	0.622	LE	UG/L
WQ1F100704	SA	DISS	10	37680-73-2	BZ 101	0.0398	LD	UG/L
WQ1F100704	SADL1	PART	20	37680-73-2	BZ 101	0.507	LD	UG/L
WQ1F100704	SADL1	PART	20	32598-14-4	BZ 105	0.0211	UD	UG/L
WQ1F100704	SA	DISS	10	32598-14-4	BZ 105	0.0105	UD	UG/L
WQ1F100704	SA	PART	1	32598-14-4	BZ 105	0.0252	L	UG/L
WQ1F100704	SA	DISS	10	31508-00-6	BZ 118	0.0174	D	UG/L
WQ1F100704	SA	PART	1	31508-00-6	BZ 118	0.385	LE	UG/L
WQ1F100704	SADL1	PART	20	31508-00-6	BZ 118	0.293	D	UG/L
WQ1F100704	SA	PART	1	38380-07-3	BZ 128	0.0147	L	UG/L
WQ1F100704	SADL1	PART	20	38380-07-3	BZ 128	0.0211	UD	UG/L
WQ1F100704	SA	DISS	10	38380-07-3	BZ 128	0.0105	UD	UG/L
WQ1F100704	SADL1	PART	20	35065-28-2	BZ 138	0.0764	LD	UG/L
WQ1F100704	SA	DISS	10	35065-28-2	BZ 138	0.0105	UD	UG/L

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
WQ1F100704	SA	PART	1	35065-28-2	BZ 138	0.0897	L	UG/L
WQ1F100704	SA	DISS	10	35065-27-1	BZ 153	0.0145	D	UG/L
WQ1F100704	SADL1	PART	20	35065-27-1	BZ 153	0.316	D	UG/L
WQ1F100704	SA	PART	1	35065-27-1	BZ 153	0.391	E	UG/L
WQ1F100704	SA	DISS	10	35065-30-6	BZ 170	0.0105	UD	UG/L
WQ1F100704	SA	PART	1	35065-30-6	BZ 170	0.0264	L	UG/L
WQ1F100704	SADL1	PART	20	35065-30-6	BZ 170	0.0238	D	UG/L
WQ1F100704	SA	PART	1	37680-65-2	BZ 18	2.32	E	UG/L
WQ1F100704	SA	DISS	10	37680-65-2	BZ 18	1.28	D	UG/L
WQ1F100704	SADL1	PART	20	37680-65-2	BZ 18	1.17	D	UG/L
WQ1F100704	SA	PART	1	35065-29-3	BZ 180	0.0435		UG/L
WQ1F100704	SA	DISS	10	35065-29-3	BZ 180	0.0105	UD	UG/L
WQ1F100704	SADL1	PART	20	35065-29-3	BZ 180	0.0354	D	UG/L
WQ1F100704	SA	DISS	10	52663-68-0	BZ 187	0.0105	UD	UG/L
WQ1F100704	SA	PART	1	52663-68-0	BZ 187	0.0609		UG/L
WQ1F100704	SADL1	PART	20	52663-68-0	BZ 187	0.0522	D	UG/L
WQ1F100704	SA	DISS	10	52663-78-2	BZ 195	0.0105	UD	UG/L
WQ1F100704	SADL1	PART	20	52663-78-2	BZ 195	0.0211	UD	UG/L
WQ1F100704	SA	PART	1	52663-78-2	BZ 195	0.00423	L	UG/L
WQ1F100704	SA	DISS	10	40186-72-9	BZ 206	0.0105	UD	UG/L
WQ1F100704	SADL1	PART	20	40186-72-9	BZ 206	0.0211	UD	UG/L
WQ1F100704	SA	PART	1	40186-72-9	BZ 206	0.00549	L	UG/L
WQ1F100704	SADL1	PART	20	C-2051-24-3	BZ 209	0.0211	UD	UG/L
WQ1F100704	SA	DISS	10	C-2051-24-3	BZ 209	0.0105	UD	UG/L
WQ1F100704	SA	PART	1	C-2051-24-3	BZ 209	0.00171	L	UG/L
WQ1F100704	SA	DISS	10	7012-37-5	BZ 28	0.491	D	UG/L
WQ1F100704	SA	PART	1	7012-37-5	BZ 28	2.45	E	UG/L
WQ1F100704	SADL1	PART	20	7012-37-5	BZ 28	1.21	D	UG/L
WQ1F100704	SA	DISS	10	41464-39-5	BZ 44	0.154	D	UG/L
WQ1F100704	SADL1	PART	20	41464-39-5	BZ 44	0.52	D	UG/L
WQ1F100704	SA	PART	1	41464-39-5	BZ 44	0.851	E	UG/L
WQ1F100704	SA	DISS	10	35693-99-3	BZ 52	0.393	D	UG/L
WQ1F100704	SADL1	PART	20	35693-99-3	BZ 52	1.4	D	UG/L
WQ1F100704	SA	PART	1	35693-99-3	BZ 52	2.41	E	UG/L
WQ1F100704	SA	DISS	10	32598-10-0	BZ 66	0.0874	D	UG/L
WQ1F100704	SADL1	PART	20	32598-10-0	BZ 66	0.674	D	UG/L
WQ1F100704	SA	PART	1	32598-10-0	BZ 66	0.92	LE	UG/L
WQ1F100704	SA	PART	1	34883-43-7	BZ 8	0.901	E	UG/L
WQ1F100704	SA	DISS	10	34883-43-7	BZ 8	1.27	D	UG/L
WQ1F100704	SADL1	PART	20	34883-43-7	BZ 8	0.676	D	UG/L
WQ1F101304	SADL1	PART	50	37680-73-2	BZ 101	2.03	LD	UG/L
WQ1F101304	SA	DISS	5	37680-73-2	BZ 101	0.0185	LD	UG/L
WQ1F101304	SA	PART	1	37680-73-2	BZ 101	2.67	E	UG/L
WQ1F101304	SADL1	PART	50	32598-14-4	BZ 105	0.0521	UD	UG/L

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
WQ1F101304	SA	DISS	5	32598-14-4	BZ 105	0.00521	UD	UG/L
WQ1F101304	SA	PART	1	32598-14-4	BZ 105	0.0639		UG/L
WQ1F101304	SADL1	PART	50	31508-00-6	BZ 118	1.22	D	UG/L
WQ1F101304	SA	DISS	5	31508-00-6	BZ 118	0.00703	D	UG/L
WQ1F101304	SA	PART	1	31508-00-6	BZ 118	1.24	E	UG/L
WQ1F101304	SA	DISS	5	38380-07-3	BZ 128	0.00521	UD	UG/L
WQ1F101304	SA	PART	1	38380-07-3	BZ 128	0.129		UG/L
WQ1F101304	SADL1	PART	50	38380-07-3	BZ 128	0.0802	LD	UG/L
WQ1F101304	SA	PART	1	35065-28-2	BZ 138	0.787	E	UG/L
WQ1F101304	SA	DISS	5	35065-28-2	BZ 138	0.00521	UD	UG/L
WQ1F101304	SADL1	PART	50	35065-28-2	BZ 138	0.401	LD	UG/L
WQ1F101304	SA	DISS	5	35065-27-1	BZ 153	0.0076	D	UG/L
WQ1F101304	SA	PART	1	35065-27-1	BZ 153	1.36	E	UG/L
WQ1F101304	SADL1	PART	50	35065-27-1	BZ 153	1.51	D	UG/L
WQ1F101304	SA	DISS	5	35065-30-6	BZ 170	0.00521	UD	UG/L
WQ1F101304	SA	PART	1	35065-30-6	BZ 170	0.139		UG/L
WQ1F101304	SADL1	PART	50	35065-30-6	BZ 170	0.147	D	UG/L
WQ1F101304	SADL1	PART	50	37680-65-2	BZ 18	5.29	LD	UG/L
WQ1F101304	SA	DISS	5	37680-65-2	BZ 18	0.599	D	UG/L
WQ1F101304	SA	PART	1	31508-00-6	BZ 118	1.24	E	UG/L
WQ1F101304	SA	DISS	5	38380-07-3	BZ 128	0.00521	UD	UG/L
WQ1F101304	SA	PART	1	38380-07-3	BZ 128	0.129		UG/L
WQ1F101304	SA	PART	1	37680-65-2	BZ 18	6.69	E	UG/L
WQ1F101304	SA	PART	1	35065-29-3	BZ 180	0.204		UG/L
WQ1F101304	SADL1	PART	50	35065-29-3	BZ 180	0.214	D	UG/L
WQ1F101304	SA	DISS	5	35065-29-3	BZ 180	0.00521	UD	UG/L
WQ1F101304	SA	PART	1	52663-68-0	BZ 187	0.233	E	UG/L
WQ1F101304	SADL1	PART	50	52663-68-0	BZ 187	0.289	D	UG/L
WQ1F101304	SA	DISS	5	52663-68-0	BZ 187	0.00521	UD	UG/L
WQ1F101304	SA	PART	1	52663-78-2	BZ 195	0.0221		UG/L
WQ1F101304	SADL1	PART	50	52663-78-2	BZ 195	0.0521	UD	UG/L
WQ1F101304	SA	DISS	5	52663-78-2	BZ 195	0.00521	UD	UG/L
WQ1F101304	SA	DISS	5	40186-72-9	BZ 206	0.00521	UD	UG/L
WQ1F101304	SADL1	PART	50	40186-72-9	BZ 206	0.0521	UD	UG/L
WQ1F101304	SA	PART	1	40186-72-9	BZ 206	0.0316		UG/L
WQ1F101304	SADL1	PART	50	C-2051-24-3	BZ 209	0.0521	UD	UG/L
WQ1F101304	SA	DISS	5	C-2051-24-3	BZ 209	0.00521	UD	UG/L
WQ1F101304	SA	PART	1	C-2051-24-3	BZ 209	0.00809		UG/L
WQ1F101304	SA	DISS	5	7012-37-5	BZ 28	0.285	D	UG/L
WQ1F101304	SADL1	PART	50	7012-37-5	BZ 28	6.82	D	UG/L
WQ1F101304	SA	PART	1	7012-37-5	BZ 28	7.47	E	UG/L
WQ1F101304	SADL1	PART	50	41464-39-5	BZ 44	2.15	LD	UG/L
WQ1F101304	SA	DISS	5	41464-39-5	BZ 44	0.081	D	UG/L
WQ1F101304	SA	PART	1	41464-39-5	BZ 44	2.17	E	UG/L

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
WQ1F101304	SA	DISS	5	35693-99-3	BZ 52	0.244	D	UG/L
WQ1F101304	SADL1	PART	50	35693-99-3	BZ 52	7.08	D	UG/L
WQ1F101304	SA	PART	1	35693-99-3	BZ 52	7.21	E	UG/L
WQ1F101304	SA	DISS	5	32598-10-0	BZ 66	0.0433	D	UG/L
WQ1F101304	SA	PART	1	32598-10-0	BZ 66	3.07	E	UG/L
WQ1F101304	SADL1	PART	50	32598-10-0	BZ 66	3.09	D	UG/L
WQ1F101304	SA	PART	1	34883-43-7	BZ 8	3.37	E	UG/L
WQ1F101304	SA	DISS	5	34883-43-7	BZ 8	0.684	D	UG/L
WQ1F101304	SADL1	PART	50	34883-43-7	BZ 8	3.52	D	UG/L
WQ2F100704	SADL1	PART	10	37680-73-2	BZ 101	0.146	LD	UG/L
WQ2F100704	SA	DISS	5	37680-73-2	BZ 101	0.0153	LD	UG/L
WQ2F100704	SA	PART	1	37680-73-2	BZ 101	0.12	L	UG/L
WQ2F100704	SA	DISS	5	32598-14-4	BZ 105	0.00532	UD	UG/L
WQ2F100704	SADL1	PART	10	32598-14-4	BZ 105	0.0106	UD	UG/L
WQ2F100704	SA	PART	1	32598-14-4	BZ 105	0.00379	L	UG/L
WQ2F100704	SADL1	PART	10	31508-00-6	BZ 118	0.0759	D	UG/L
WQ2F100704	SA	DISS	5	31508-00-6	BZ 118	0.00697	D	UG/L
WQ2F100704	SA	PART	1	31508-00-6	BZ 118	0.0654		UG/L
WQ2F100704	SA	PART	1	38380-07-3	BZ 128	0.00383	L	UG/L
WQ2F100704	SADL1	PART	10	38380-07-3	BZ 128	0.0106	UD	UG/L
WQ2F100704	SA	DISS	5	38380-07-3	BZ 128	0.00532	UD	UG/L
WQ2F100704	SADL1	PART	10	35065-28-2	BZ 138	0.0106	UD	UG/L
WQ2F100704	SA	PART	1	35065-28-2	BZ 138	0.0183	L	UG/L
WQ2F100704	SA	DISS	5	35065-28-2	BZ 138	0.00532	UD	UG/L
WQ2F100704	SA	DISS	5	35065-27-1	BZ 153	0.00622	D	UG/L
WQ2F100704	SA	PART	1	35065-27-1	BZ 153	0.0725		UG/L
WQ2F100704	SADL1	PART	10	35065-27-1	BZ 153	0.0855	D	UG/L
WQ2F100704	SA	PART	1	35065-30-6	BZ 170	0.00495		UG/L
WQ2F100704	SADL1	PART	10	35065-30-6	BZ 170	0.0106	UD	UG/L
WQ2F100704	SA	DISS	5	35065-30-6	BZ 170	0.00532	UD	UG/L
WQ2F100704	SA	DISS	5	37680-65-2	BZ 18	0.442	D	UG/L
WQ2F100704	SADL1	PART	10	37680-65-2	BZ 18	0.473	D	UG/L
WQ2F100704	SA	PART	1	37680-65-2	BZ 18	0.668	E	UG/L
WQ2F100704	SA	DISS	5	35065-29-3	BZ 180	0.00532	UD	UG/L
WQ2F100704	SADL1	PART	10	35065-29-3	BZ 180	0.0106	UD	UG/L
WQ2F100704	SA	PART	1	35065-29-3	BZ 180	0.00782		UG/L
WQ2F100704	SADL1	PART	10	52663-68-0	BZ 187	0.0131	D	UG/L
WQ2F100704	SA	PART	1	52663-68-0	BZ 187	0.0111		UG/L
WQ2F100704	SA	DISS	5	52663-68-0	BZ 187	0.00532	UD	UG/L
WQ2F100704	SA	PART	1	52663-78-2	BZ 195	0.00106	U	UG/L
WQ2F100704	SA	DISS	5	52663-78-2	BZ 195	0.00532	UD	UG/L
WQ2F100704	SADL1	PART	10	52663-78-2	BZ 195	0.0106	UD	UG/L
WQ2F100704	SADL1	PART	10	40186-72-9	BZ 206	0.0106	UD	UG/L
WQ2F100704	SA	PART	1	40186-72-9	BZ 206	0.00112		UG/L

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
WQ2F100704	SA	DISS	5	40186-72-9	BZ 206	0.00532	UD	UG/L
WQ2F100704	SADL1	PART	10	C-2051-24-3	BZ 209	0.0106	UD	UG/L
WQ2F100704	SA	DISS	5	C-2051-24-3	BZ 209	0.00532	UD	UG/L
WQ2F100704	SA	PART	1	C-2051-24-3	BZ 209	0.00106	U	UG/L
WQ2F100704	SADL1	PART	10	7012-37-5	BZ 28	0.558	D	UG/L
WQ2F100704	SA	DISS	5	7012-37-5	BZ 28	0.203	D	UG/L
WQ2F100704	SA	PART	1	7012-37-5	BZ 28	0.623	E	UG/L
WQ2F100704	SADL1	PART	10	41464-39-5	BZ 44	0.191	D	UG/L
WQ2F100704	SA	PART	1	41464-39-5	BZ 44	0.17		UG/L
WQ2F100704	SA	DISS	5	41464-39-5	BZ 44	0.061	D	UG/L
WQ2F100704	SA	PART	1	35693-99-3	BZ 52	0.567	E	UG/L
WQ2F100704	SADL1	PART	10	35693-99-3	BZ 52	0.595	D	UG/L
WQ2F100704	SA	DISS	5	35693-99-3	BZ 52	0.158	D	UG/L
WQ2F100704	SA	DISS	5	32598-10-0	BZ 66	0.0325	D	UG/L
WQ2F100704	SA	PART	1	32598-10-0	BZ 66	0.189		UG/L
WQ2F100704	SADL1	PART	10	32598-10-0	BZ 66	0.219	D	UG/L
WQ2F100704	SADL1	PART	10	34883-43-7	BZ 8	0.369	D	UG/L
WQ2F100704	SA	PART	1	34883-43-7	BZ 8	0.346	E	UG/L
WQ2F100704	SA	DISS	5	34883-43-7	BZ 8	0.449	D	UG/L
WQ3F100704	SA	PART	1	37680-73-2	BZ 101	0.0412	L	UG/L
WQ3F100704	SA	DISS	2	37680-73-2	BZ 101	0.0135	LD	UG/L
WQ3F100704	SA	PART	1	32598-14-4	BZ 105	0.00189	L	UG/L
WQ3F100704	SA	DISS	2	32598-14-4	BZ 105	0.00227	UD	UG/L
WQ3F100704	SA	PART	1	31508-00-6	BZ 118	0.0255		UG/L
WQ3F100704	SA	DISS	2	31508-00-6	BZ 118	0.00616	D	UG/L
WQ3F100704	SA	PART	1	38380-07-3	BZ 128	0.00192	L	UG/L
WQ3F100704	SA	DISS	2	38380-07-3	BZ 128	0.00227	UD	UG/L
WQ3F100704	SA	PART	1	35065-28-2	BZ 138	0.00844	L	UG/L
WQ3F100704	SA	DISS	2	35065-28-2	BZ 138	0.00227	UD	UG/L
WQ3F100704	SA	PART	1	35065-27-1	BZ 153	0.0299		UG/L
WQ3F100704	SA	DISS	2	35065-27-1	BZ 153	0.00545	D	UG/L
WQ3F100704	SA	PART	1	35065-30-6	BZ 170	0.0026		UG/L
WQ3F100704	SA	DISS	2	35065-30-6	BZ 170	0.00227	UD	UG/L
WQ3F100704	SA	DISS	2	37680-65-2	BZ 18	0.266	D	UG/L
WQ3F100704	SA	PART	1	37680-65-2	BZ 18	0.0807		UG/L
WQ3F100704	SA	PART	1	35065-29-3	BZ 180	0.00355		UG/L
WQ3F100704	SA	DISS	2	35065-29-3	BZ 180	0.00227	UD	UG/L
WQ3F100704	SA	DISS	2	52663-68-0	BZ 187	0.00227	UD	UG/L
WQ3F100704	SA	PART	1	52663-68-0	BZ 187	0.00511		UG/L
WQ3F100704	SA	DISS	2	52663-78-2	BZ 195	0.00227	UD	UG/L
WQ3F100704	SA	PART	1	52663-78-2	BZ 195	0.00114	U	UG/L
WQ3F100704	SA	PART	1	40186-72-9	BZ 206	0.00114	U	UG/L
WQ3F100704	SA	DISS	2	40186-72-9	BZ 206	0.00227	UD	UG/L
WQ3F100704	SA	PART	1	C-2051-24-3	BZ 209	0.00114	U	UG/L

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
WQ3F100704	SA	DISS	2	C-2051-24-3	BZ 209	0.00227	UD	UG/L
WQ3F100704	SA	PART	1	7012-37-5	BZ 28	0.125		UG/L
WQ3F100704	SA	DISS	2	7012-37-5	BZ 28	0.176	D	UG/L
WQ3F100704	SA	DISS	2	41464-39-5	BZ 44	0.0506	D	UG/L
WQ3F100704	SA	PART	1	41464-39-5	BZ 44	0.0469		UG/L
WQ3F100704	SA	DISS	2	35693-99-3	BZ 52	0.143	D	UG/L
WQ3F100704	SA	PART	1	35693-99-3	BZ 52	0.152		UG/L
WQ3F100704	SA	DISS	2	32598-10-0	BZ 66	0.0293	D	UG/L
WQ3F100704	SA	PART	1	32598-10-0	BZ 66	0.0572		UG/L
WQ3F100704	SA	PART	1	34883-43-7	BZ 8	0.0447		UG/L
WQ3F100704	SA	DISS	2	34883-43-7	BZ 8	0.266	D	UG/L
WQRF100704	SA	DISS	2	37680-73-2	BZ 101	0.00674	LD	UG/L
WQRF100704	SA	PART	1	37680-73-2	BZ 101	0.0387	L	UG/L
WQRF100704	SA	PART	1	32598-14-4	BZ 105	0.00217	L	UG/L
WQRF100704	SA	DISS	2	32598-14-4	BZ 105	0.00211	UD	UG/L
WQRF100704	SA	PART	1	31508-00-6	BZ 118	0.0229		UG/L
WQRF100704	SA	DISS	2	31508-00-6	BZ 118	0.00305	D	UG/L
WQRF100704	SA	PART	1	38380-07-3	BZ 128	0.00198	L	UG/L
WQRF100704	SA	DISS	2	38380-07-3	BZ 128	0.00211	UD	UG/L
WQRF100704	SA	PART	1	35065-28-2	BZ 138	0.00815	L	UG/L
WQRF100704	SA	DISS	2	35065-28-2	BZ 138	0.00211	UD	UG/L
WQRF100704	SA	DISS	2	35065-27-1	BZ 153	0.00267	D	UG/L
WQRF100704	SA	PART	1	35065-27-1	BZ 153	0.0257		UG/L
WQRF100704	SA	PART	1	35065-30-6	BZ 170	0.00219		UG/L
WQRF100704	SA	DISS	2	35065-30-6	BZ 170	0.00211	UD	UG/L
WQRF100704	SA	DISS	2	37680-65-2	BZ 18	0.193	D	UG/L
WQRF100704	SA	PART	1	37680-65-2	BZ 18	0.122		UG/L
WQRF100704	SA	DISS	2	35065-29-3	BZ 180	0.00211	UD	UG/L
WQRF100704	SA	PART	1	35065-29-3	BZ 180	0.00296		UG/L
WQRF100704	SA	PART	1	52663-68-0	BZ 187	0.00421		UG/L
WQRF100704	SA	DISS	2	52663-68-0	BZ 187	0.00211	UD	UG/L
WQRF100704	SA	PART	1	52663-78-2	BZ 195	0.00105	U	UG/L
WQRF100704	SA	DISS	2	52663-78-2	BZ 195	0.00211	UD	UG/L
WQRF100704	SA	PART	1	40186-72-9	BZ 206	0.00105	U	UG/L
WQRF100704	SA	DISS	2	40186-72-9	BZ 206	0.00211	UD	UG/L
WQRF100704	SA	PART	1	C-2051-24-3	BZ 209	0.00105	U	UG/L
WQRF100704	SA	DISS	2	C-2051-24-3	BZ 209	0.00211	UD	UG/L
WQRF100704	SA	PART	1	7012-37-5	BZ 28	0.126		UG/L
WQRF100704	SA	DISS	2	7012-37-5	BZ 28	0.108	D	UG/L
WQRF100704	SA	DISS	2	41464-39-5	BZ 44	0.0287	D	UG/L
WQRF100704	SA	PART	1	41464-39-5	BZ 44	0.0474		UG/L
WQRF100704	SA	PART	1	35693-99-3	BZ 52	0.146		UG/L
WQRF100704	SA	DISS	2	35693-99-3	BZ 52	0.0778	D	UG/L
WQRF100704	SA	PART	1	32598-10-0	BZ 66	0.0564		UG/L

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
WQRF100704	SA	DISS	2	32598-10-0	BZ 66	0.0143	D	UG/L
WQRF100704	SA	PART	1	34883-43-7	BZ 8	0.0505		UG/L
WQRF100704	SA	DISS	2	34883-43-7	BZ 8	0.185	D	UG/L
WQRF101304	SA	DISS	5	37680-73-2	BZ 101	0.0146	LD	UG/L
WQRF101304	SADL1	PART	10	37680-73-2	BZ 101	0.239	LD	UG/L
WQRF101304	SA	PART	1	37680-73-2	BZ 101	0.154	L	UG/L
WQRF101304	SA	PART	1	32598-14-4	BZ 105	0.00832	L	UG/L
WQRF101304	SA	DISS	5	32598-14-4	BZ 105	0.00521	UD	UG/L
WQRF101304	SADL1	PART	10	32598-14-4	BZ 105	0.0104	UD	UG/L
WQRF101304	SA	DISS	5	31508-00-6	BZ 118	0.00646	D	UG/L
WQRF101304	SA	PART	1	31508-00-6	BZ 118	0.1		UG/L
WQRF101304	SADL1	PART	10	31508-00-6	BZ 118	0.142	D	UG/L
WQRF101304	SADL1	PART	10	38380-07-3	BZ 128	0.0105	LD	UG/L
WQRF101304	SA	PART	1	38380-07-3	BZ 128	0.00743	L	UG/L
WQRF101304	SA	DISS	5	38380-07-3	BZ 128	0.00521	UD	UG/L
WQRF101304	SADL1	PART	10	35065-28-2	BZ 138	0.0495	LD	UG/L
WQRF101304	SA	PART	1	35065-28-2	BZ 138	0.0335	L	UG/L
WQRF101304	SA	DISS	5	35065-28-2	BZ 138	0.00521	UD	UG/L
WQRF101304	SA	DISS	5	35065-27-1	BZ 153	0.00563	D	UG/L
WQRF101304	SA	PART	1	35065-27-1	BZ 153	0.113		UG/L
WQRF101304	SADL1	PART	10	35065-27-1	BZ 153	0.166	D	UG/L
WQRF101304	SADL1	PART	10	35065-30-6	BZ 170	0.0133	D	UG/L
WQRF101304	SA	DISS	5	35065-30-6	BZ 170	0.00521	UD	UG/L
WQRF101304	SA	PART	1	35065-30-6	BZ 170	0.0102		UG/L
WQRF101304	SA	DISS	5	37680-65-2	BZ 18	0.391	D	UG/L
WQRF101304	SA	PART	1	37680-65-2	BZ 18	0.59	E	UG/L
WQRF101304	SADL1	PART	10	37680-65-2	BZ 18	0.759	D	UG/L
WQRF101304	SADL1	PART	10	35065-29-3	BZ 180	0.0202	D	UG/L
WQRF101304	SA	DISS	5	35065-29-3	BZ 180	0.00521	UD	UG/L
WQRF101304	SA	PART	1	35065-29-3	BZ 180	0.0155		UG/L
WQRF101304	SADL1	PART	10	52663-68-0	BZ 187	0.0267	D	UG/L
WQRF101304	SA	PART	1	52663-68-0	BZ 187	0.019		UG/L
WQRF101304	SA	DISS	5	52663-68-0	BZ 187	0.00521	UD	UG/L
WQRF101304	SADL1	PART	10	52663-78-2	BZ 195	0.0104	UD	UG/L
WQRF101304	SA	DISS	5	52663-78-2	BZ 195	0.00521	UD	UG/L
WQRF101304	SA	PART	1	52663-78-2	BZ 195	0.00159	L	UG/L
WQRF101304	SA	PART	1	40186-72-9	BZ 206	0.00256		UG/L
WQRF101304	SADL1	PART	10	40186-72-9	BZ 206	0.0104	UD	UG/L
WQRF101304	SA	DISS	5	40186-72-9	BZ 206	0.00521	UD	UG/L
WQRF101304	SA	DISS	5	C-2051-24-3	BZ 209	0.00521	UD	UG/L
WQRF101304	SADL1	PART	10	C-2051-24-3	BZ 209	0.0104	UD	UG/L
WQRF101304	SA	PART	1	C-2051-24-3	BZ 209	0.00104	U	UG/L
WQRF101304	SA	PART	1	7012-37-5	BZ 28	0.607	E	UG/L
WQRF101304	SADL1	PART	10	7012-37-5	BZ 28	0.812	D	UG/L

Analytical Laboratory Analysis Water Samples Collected during Fall 2004 Dredging at DMU-2

SAMP_ID	LAB_QC _CODE	FRACTION	DILUTION	CAS	ANALYTE	VALUE	LAB_ QUAL*	UNIT
WQRF101304	SA	DISS	5	7012-37-5	BZ 28	0.231	D	UG/L
WQRF101304	SA	PART	1	41464-39-5	BZ 44	0.195		UG/L
WQRF101304	SADL1	PART	10	41464-39-5	BZ 44	0.271	D	UG/L
WQRF101304	SA	DISS	5	41464-39-5	BZ 44	0.0602	D	UG/L
WQRF101304	SA	DISS	5	35693-99-3	BZ 52	0.183	D	UG/L
WQRF101304	SADL1	PART	10	35693-99-3	BZ 52	0.889	D	UG/L
WQRF101304	SA	PART	1	35693-99-3	BZ 52	0.659	E	UG/L
WQRF101304	SA	DISS	5	32598-10-0	BZ 66	0.0331	D	UG/L
WQRF101304	SA	PART	1	32598-10-0	BZ 66	0.242	E	UG/L
WQRF101304	SADL1	PART	10	32598-10-0	BZ 66	0.351	D	UG/L
WQRF101304	SADL1	PART	10	34883-43-7	BZ 8	0.396	D	UG/L
WQRF101304	SA	DISS	5	34883-43-7	BZ 8	0.379	D	UG/L
WQRF101304	SA	PART	1	34883-43-7	BZ 8	0.259	E	UG/L

*D - Result is reported at a secondary dilution factor. Spike and surrogate recoveries may have been diluted below quantifiable levels.

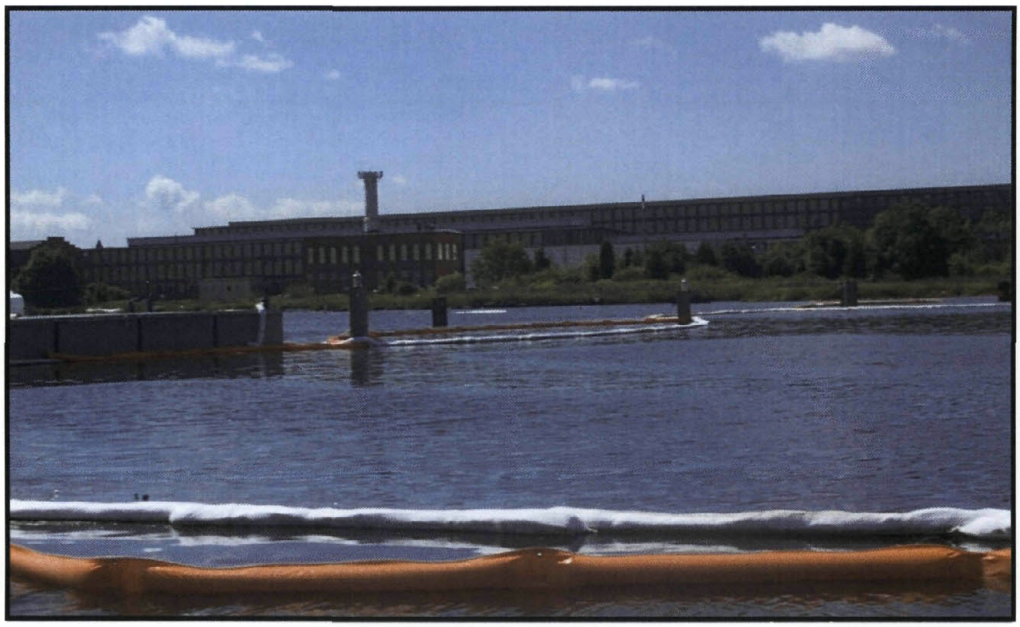
E - Concentration exceeds the range of the calibration curve for that particular analyte or compound.

L - More than 25 % diff. for detected target analyte conc. between the two columns. WHG only. Lower of two reported

U - Indicates the compound was analyzed for, but not detected above the reporting limit.

APPENDIX D

PROJECT PHOTOGRAPHS



Silt Curtain and Oil Boom at DMU-2, September 2004

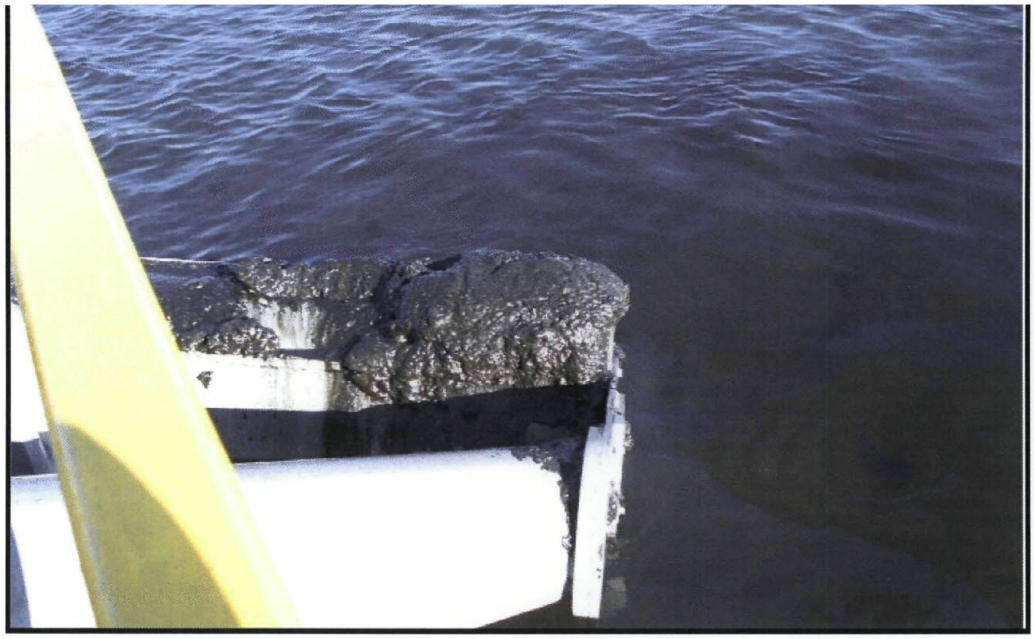
Dredge Traverse Cable at DMU-2, September 2004

Sheet Piles with Silt Curtain and Oil Booms, September 2004

Debris Removal at DMU-2, September 2004

Dredging, October 2004

Dredge (Cutter Head) and Traverse Cable, October 2004



Oily sediment On Top of Cutter Head at Z-Star Depth
11/02/04 (Jacobs Photo ID P110204 (6))

Gas Bubbles and Disturbed Silt at Cutter Cutter Head
11/02/04 (Jacobs Photo ID P110204 (3))

Support Vessel Crew and Dredge Pipeline
11/04/04 (Jacobs Photo ID P110404 (4))

Water Quality Monitoring, September 2004

APPENDIX E

DREDGING OF DMU-2 WATER QUALITY MONITORING REPORT RESPONSE TO COMMENTS (RTC) – NOVEMBER 2005

U. S. ARMY ENGINEER DISTRICTS – NEW YORK & NEW ENGLAND

CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS

PROJECT New Bedford Harbor Superfund Project

☐ SITE DEV & GEO ☐ MECHANICAL ☐ SAFETY ☐ SYSTEMS ENG
☐ ENVIR PROT& UTIL ☐ MFG TECHNOLOGY ☐ ADV TECH ☐ VALUE ENG
☐ ARCHITECTURAL ☐ ELECTRICAL ☐ ESTIMATING ■ OTHER
☐ STRUCTURAL ☐ INST & CONTROLS ☐ SPECIFICATIONS

REVIEW Dredging of DMU-2 WQM Report
DATE 14 NOV 05
NAME

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		Comments from Paul Craffey	
1	Figures 10 to 13 -	For future monitoring, the turbidity monitoring periods for each station should be the same.	Ideally, the monitoring periods would be the same. However, given the varied nature of the dredging and monitoring effort (some meters could only be retrieved at a specific tide height) the monitoring period will likely continue to be varied. We felt it more important to include the full record rather than truncating them just to the overlapping period.
2	Figure 14	This figure reports that the 2001 PCB Sediment Concentrations north of DMP 2 were 4,000 ppm, 440 ppm, 23,000 ppm, 72,000 ppm, 22,000 ppm, 45,000 ppm, and 100,000 ppm. These concentrations seemed to be much greater than the concentrations within the area that was dredged. It is suggested that the next dredging occur at this higher level PCB concentration area.	The following note will be added to the figure: "Concentrations shown on figure represent historical data for PCB sediment concentrations found in the vicinity of the locations used for sediment trap deployment". These concentrations were similar to those in the 2004 dredge area.
		Comments from Gary Morin	
3	Page 6, Section 2.2.3, 3rd sentence	The referenced sentence seems to imply that Figure 7 contains a drawing or picture of the sediment traps. However, there is no picture or figure of the traps shown on any of the figures. Either correct the sentence or add a picture/figure of the sediment traps.	Figure 7 will be revised by adding a photo of a typical sediment trap.
		Comments from Jim Brown	
4	Figure 14	Figure 14 is very misleading. The concentrations shown in Figure 14 imply that the sediment concentrations in DMU 1 are greater than DMUs 2, 3 and 4. This is not the case. If you look at the complete data set the average concentrations in the top foot are greater in DMUs 2, 3 and 4 (Volumes, Areas, and Properties of Sediments by Management Units, USACE, September 2003). If ENSR is attempting to correlate the Sediment Trap data with the surrounding contamination a truer representation of the contamination in the top foot should be presented.	See #2 above. The goal of the figure was to depict sediment concentrations in the immediate vicinity of the traps.

ACTION CODES
A - ACCEPTED/CONCUR
D - ACTION DEFERRED
W - WITHDRAWN
N - NON-CONCUR
VE - VE POTENTIAL/VEP ATTACHED