Mayport Naval Station Section 103 Sediment Characterization

Prepared for

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Contents

Executive Summary **1**

1 Introduction **1**

2 Materials and Methods **2**
2.1 Physical Parameters, Chemicals of Interest and Toxicity Testing 2
2.2 Field Methods and Procedures 4
2.3 Physical and Chemical Laboratory Methods and Detection Limits 6
2.4 Biological Testing 6

3 Locations of Sampling Areas **8**

4 Description of Testing Approach **18**

5 Final Results **19**
5.1 Field Measurement Data and Sediment Descriptions 19
5.2 Sediment Physical and Organic Carbon Data 19
5.3 Sediment Chemical Data 20
5.4 Background Water and Elutriate Chemical Data 22
5.5 Bioassay Results 23
5.6 Bioaccumulation Procedures and Results 30
5.7 Bioaccumulation Chemical Test Results 33
5.8 ADDAMS (STFATE) Modeling Summary 34
5.9 Tissue Statistical Comparison 35

6 Quality Assurance and Control **36**
6.1 Chemical Laboratory Quality Assurance and Control 36

7 Conclusions **39**

8 References **40**

Figures

Figure 1 Mayport Naval Station 2006 Offshore Reference-Sample Locations 16
Figure 2 Mayport Naval Station 2006 Sub-Zone Sampling Locations 17

Contents

Tables

1 Sampling Coordinates and Sampling Techniques for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

2 Mayport Naval Station 2006 Sediment, Elutriate and Tissue Method Numbers and Detection Limits

Sediment Tables

3 Physical and Total Organic Carbon Data for Mayport Naval Station (Jacksonville, Florida) Sediment Samples Collected November 2006

4 Sediment Oil & Grease, Total Organic Carbon, Cyanide and Ammonia Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

5 Sediment Metals Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

6 Sediment Pesticide Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

7 Sediment PCB Congener Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

8 Sediment PAH Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected Mayport Naval Station 2006

9 Sediment Organotin Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Elutriate Tables

10 Background Water and Elutriate Oil and Grease, Total Organic Carbon, Total Sulfide, Cyanide and Ammonia Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

11 Background Water and Elutriate Metals Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

12 Background Water and Elutriate Pesticide Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

13 Background Water and Elutriate PCB Congener Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

14 Background Water and Elutriate PAH Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

15 Background Water and Elutriate Organotin Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Contents

Tissue Tables (Please see Addendum 1 for Tables 16 through 25)

16 Total Lipids in Tissues for Mayport Naval Station Samples Collected November 2006

17 Metals in Tissue Concentrations for Mayport Naval Station Samples Collected November 2006 - Reference Sample, E-MP06-6,7,8 and E-MP06-9/9 Dupe

18 Metals in Tissue Concentrations for Mayport Naval Station Samples Collected November 2006 – E-MP06-Control and E-MP06-Pretest

19 PAHs in Tissue Concentrations for Mayport Naval Station Samples Collected November 2006

20 Organotins in Tissue Concentrations for Mayport Naval Station Samples Collected November 2006

21 Tissue Data Comparison for Mayport Naval Station Samples Collected November 2006

22 Average Tissue Concentrations of Metals in *M. nasuta* Exposed to Site and Reference Sediments

23 Average Tissue Concentrations of Metals in *M. nasuta* Exposed to Site Sediments Compared with FDA Action Limits

24 Average Tissue Concentrations of Metals in *N. virens* Exposed to Site and Reference Sediments.

25 Average Tissue Concentrations of Metals in *N. virens* Exposed to Site Sediments Compared with FDA Action Limits

Bioassay Tables

26 96-Hour *Americamysis bahia* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Naval Station, November 2006

27 Summary of Two-Sample T-Test Assuming Equal Variances of Control Water (0 percent Elutriate) and Test Sediment (100 percent Elutriate) on *Americamysis bahia* Survival for Mayport Naval Station, November 2006

28 96-Hour *Menidia beryllina* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Naval Station, November 2006

29 Summary of Wilcoxon's Rank Sum Test with Bonferroni Adjustment Test of Control Water (0 percent Elutriate) or Control Sediment (100 percent Elutriate) and Test Sediment (100 percent Elutriate) on *Menidia beryllina* Survival for Mayport Naval Station, November 2006

30 Sea Urchin, *Arbacia punctulata*, Fertilization Test Counts and Percentages in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Naval Station, November 2006

31 Summary of ANOVA and Dunnett's Tests of Control Seawater (0% Elutriate) or Control Sediment (100% Elutriate) and Test Sediment (100% Elutriate on A. punctulata Fertilization, Mayport Naval Station, November 2006

Contents

32 LC_{50} or EC_{50} (*Americamysis bahia*, *Menidia beryllina* and *A. punctulata*) Values[a] for Mayport Naval Station, November 2006, Percent Concentrations Elutriate Bioassay

33 10-Day Sediment *Americamysis bahia* Survival, Mayport Naval Station Sediments, November 2006

34 Summary of Two-Sample T-Test Assuming Equal Variances of Reference Sediment and Test Sediment Survival on *Americamysis bahia* Survival for Mayport Naval Station, November 2006

35 10-Day Sediment *Leptochirus plumulosus* Survival, Mayport Naval Station Sediments, November 2006

36 Summary of Two-Sample T-Test Assuming Equal Variances of Reference and Test Sediment on *Leptochirus plumulosus* Survival for Mayport Naval Station, November 2006

37 Survivorship of *Macoma nasuta* and *Nereis virens* During 28-Day Bioaccumulation Bioassays with Sediments from Mayport Naval Station, November 2006

38 Summary of Two-Sample T-Test Assuming Equal Variances of Reference and Test Sediment on *Macoma nasuta* Survival for Mayport Naval Station, November 2006

39 Summary of Wilcoxon's Rank Sum Test with Bonferroni Adjustment Test of Control Sediment and Test Sediment on *Nereis Virens* Survival for Mayport Naval Station, November 2006

40 Summary of STFATE Results

41 STFATE Input Parameters, Jacksonville ODMDS

Appendices

A Mayport Naval Station 103 Evaluation – 2006 Sampling Plan and Protocol ..... on CD
B Chain-of-Custodies ..... on CD
C Field Sampling Sheets, In-situ Data Collection and Field Operations ..... on CD
D Toxicity Report ..... on CD
E Physical Testing Data ..... hard copy and on CD
F Sediment, Elutriate and Tissue Laboratory Data Reports ..... on CD
F-1 Background Water Laboratory Data
F-2 Sediment Laboratory Data
F-3 Elutriate Laboratory Data
F-4 Tissue Laboratory Data (see Amendment 1)
G ADDAMS – STFATE Modeling Outputs ..... on CD
H Tissue Chemistry Statistical Outputs ..... Amendment 1 on CD

Acronyms

ADDAMS	Automated Dredging and Disposal Alternatives Management System
AEL	Advanced Environmental Laboratories, Inc.
ANOVA	analysis of variance
ASTM	American Society for Testing and Materials
$CdCl_2$	cadmium chloride
CAS	Columbia Analytical Services, Inc. (Kelso, Washington)
CCV	continuing calibration verification
CECW	Corps of Engineers Directorate of Civil Works
$CuSO_4$	copper sulfate
COC	chain of custody
CSA	Continental Shelf Associates
DGPS	differentially corrected global positioning system
DM	dredged material
DQO	data quality objective
EC_{50}	50% effect concentration
EPA	Environmental Protection Agency (Region IV)
g	gram
LC_{50}	50% lethal concentration
LCS	laboratory control standard
L	liters
MACTEC	MACTEC Engineering and Consultants, Inc.
MPRSA	Marine Protection, Resource, and Sanctuaries Act
mg/L	milligram per liter (ppm)
µg/L	microgram per liter (ppb)
MS	matrix spike
MSD	matrix spike duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NIST	National Institute of Standards & Technology
NOEC	no observed effect concentration
NTU	nephelometric turbidity unit
ODMDS	Ocean Dredged Material Disposal Site (Jacksonville)
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl (congeners)
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand

Acronyms

QA/QC	quality assurance/quality control
RPD	relative percent difference
Ag/S_2	silver sulfide
SDS	sodium dodecyl sulfate
SOP	standard operating procedure
SOW	scope of work (Mayport Naval Station - 2006 Sampling Plan and Protocol)
SRM	standard reference material
STFATE	Short Term Fate module
TEL	threshold effect level
TOC	total organic carbon
USACE	United States Army Corps of Engineers (Jacksonville District)
W&AR	Water & Air Research, Inc.
WAAS	wide area augmentation system
WES	USACE Waterways Experiment Station
WQC	water quality criterion

Executive Summary

This report is an evaluation of the toxicity of the sediments found in Mayport Naval Station (Jacksonville, Florida). The evaluation is part of the EPA's 103 concurrence process for the disposal of dredge material at the Jacksonville Ocean Dredged Material Disposal Site (ODMDS). The evaluation considers sediment from maintenance dredging located in the turning basin, destroyer slip, emergency boat basin, and entrance channel. Before ocean disposal of dredged sediments can occur, Naval Station and channel sediments needed to be tested and compared to reference sediments to determine if they contained elevated concentrations of potentially toxic chemicals and/or displayed unacceptable levels of toxicity as measured by bioassays and bioaccumulation of chemicals.

This report presents field data and test results from sediment collection activities that occurred in November 2006. The purpose of this sampling effort was to provide information required by decision makers for the evaluation of sediment disposal options, including placement in the Jacksonville ODMDS.

The sampling and laboratory test procedures used followed those specified in the USACE Mayport Naval Station 103 Evaluation – Sampling Plan and Protocol (Appendix A). Six problems were notable:

Arbacia punctulata was substituted, with permission, for the test organism, *Crassostrea virginica* (requested in the Mayport Naval Station 103 Evaluation – 2006 Sampling Plan and Protocol).

DO, pH, and salinity were maintained at acceptable levels throughout the testing period for *M. beryllina* with the exception of test solution temperature in Replicate A of the control sediment 10% concentration, E-MP06-6 10% and 50% concentrations, and E-MH06-8 10% and 50% concentrations on November 29, 2006 (temperature in these vessels ranged from 21.5 to 21.9 °C).

M. nasuta survivorship was lower than the Region IV (EPA, 1993) test acceptability criteria (≥ 90 percent survival) in the control treatment, which had 78 percent survival. Fungal growth was an issue in many of the *M. nasuta* exposures, and might account for the low survival across the board (site and reference exposures).

Temperature was exceeded in test solutions of some replicates of the bioaccumulation test conducted with *M. nasuta* on November 25, November 29, and December 2, 2006. Temperatures in these vessels ranged from 12 to 16.4 °C, either approximately 1°C lower, or 1 to 2 °C higher than the Region IV (EPA, 1993) test acceptability criteria.

Temperature was exceeded in test solutions of some replicates of the bioaccumulation test conducted with *N. virens* on November 21, November 22, and November 24, 2006. Temperatures in these vessels ranged from 17.7 to 22.1 °C, either approximately 1°C lower or 1 to 2 °C higher than the Region IV (EPA, 1993) test acceptability criteria.

Temperature was not recorded on November 24, 2006, due to technician error (*M. nasuta* and *N. virens*).

Sediment Chemistry Comparison

The concentrations of all metals of concern in Zone E-MP06-1 were less than the offshore reference sample metals concentrations.

The concentration of metals in Zone E-MP06-9 and 9 Dupe were similar to the metals concentrations found in the reference sample.

Zone composite samples E-MP06-2 through E-MP06-8 tended to have a greater concentration of metals than the offshore reference composite sample, ranging from two to six times higher than the reference sample's concentrations.

The control sediment sample yielded metals concentrations lower than the reference sample.

Trace amounts of silver was detected in composite E-MP06-3. The concentration was 0.001 ppm above the SOW's target detection limit. All other sediment composites did not yield detectable concentrations of silver.

Low concentrations of mercury were detected in composite samples E-MP06-3 through E-MP06-8, ranging from 0.054 ppm to 0.066 ppm (dry weight). All other samples did not yield detectable amounts of mercury.

Zone composite samples E-MP06-2 through E-MP06-8 had cadmium concentrations approximately two times the SOW's target detection limit, ranging from 0.166 ppm to 0.205 ppm (dry weight).

Aluminum and iron were detected in all zone composite samples, including the reference composite sample and the control sample, with the zone samples ranging from 3,860 ppm to 25,100 ppm (dry weight).

Arsenic, copper and lead were detected in all zone, reference and control samples. The concentrations of these elements ranged from 2.14 ppm to 28.5 ppm (dry weight) in the zone composite samples.

Chromium and zinc were found in all samples. The concentrations ranged from 9.56 ppm to 70.6 ppm (dry weight) in the zone composite samples.

There were no pesticides detected above the SOW's target detection limits.

There were no PCB congeners found above the SOW's target detection limits, except for PCB 206. PCB 206 was detected in the offshore reference sample at 0.0013 ppm and in zone composite samples E-MP06-2 through E-MP06-8. The zone sample concentrations ranged from 0.0010 ppm to 0.0026 ppm (dry weight), with zone E-MP06-3 having the greatest concentration.

PAH compounds were not found in zones E-MP06-1 and E-MP06-9 including the offshore reference sample and the control sample.

PAH compounds were detected in zone composite samples E-MP06-2 through E-MP06-8.

Phenanthrene was detected in zone E-MP06-6 at a concentration of 0.027 ppm (dry wt).

Benzo(a)anthracene and benzo(k)fluoranthene were detected in zone composites E-MP06-3, E-MP06-6 and E-MP06-7, ranging from 0.024 ppm to 0.030 ppm (dry weight).

Zone composite samples E-MP06-3 and E-MP06-7 yielded benzo(a)pyrene at a concentration on 0.020 ppm (dry weight). The SOW target detection limit for this compound was 0.020 ppm.

Benzo(b)fluoranthene was found in zone composite samples E-MP06-3, E-MP06-6, E-MP06-7 and E-MP06-8, ranging from 0.024 ppm to 0.033 ppm (dry weight).

Elevated levels of fluoranthene and pyrene were found in zones E-MP06-2 through E-MP06-8, ranging from 0.028 ppm to 0.079 ppm (dry weight).

Chrysene was detected in zones E-MP06-2, E-MP06-3, E-MP06-5, E-MP06-6, E-MP06-7 and E-MP06-8. The values ranged from 0.020 ppm to 0.081 ppm (dry weight), with zone 3 yielding the greatest concentration.

Butyltin and di-butyltin were not detected above the SOW's target detection limits in the zone composite samples, reference sample or the control sample. However, tri-butyltin was detected in zone composite sample E-MP06-7. The concentration was 0.039 ppm (dry weight).

Tables 3 through 9 present the sediment data.

Elutriation Chemistry Comparison

Cadmium, chromium, lead, mercury, nickel and silver were not detected at or above the SOW's target detection limits. All other metals of interest were detected in the elutriate samples, however zinc concentrations were less than the Class III Marine WQS.

Arsenic in the elutriate samples ranged from 12.6 ppb to 58.8 ppb. Sample E-MP06-6 had the greatest concentration of arsenic at 58.8 ppb. Zone elutriate samples E-MP06-4 and E-MP06-6 yielded concentrations greater than the Class III Water Quality Criteria. The reference sample and the control sample concentrations of arsenic were 1.83 μg/L and 1.78 μg/L, respectively.

Copper results ranged from 1.0 ppb to 3.79 ppb in the zone elutriate samples, with E-MP06-4 having the greatest concentration.

Pesticides, PCB congeners and PAHs were not detected at or above the SOW's target detection limits in the background water sample, reference sample or the zone elutriate samples.

Trace amounts of di-butyltin was detected in elutriate samples E-MP06-8, E-MP06-9 & 9 Dupe, the control sample and the reference sample. These values, ranging from 0.011 ppb to 0.016 ppb, were slightly above the SOW's target detection limit of 0.010 ppb. These results were flagged with a "J" qualifier which denotes the results are an estimated concentration that are less than the method reporting limit but greater than or equal to the laboratory's method detection limit.

Tables 10 through 15 present the elutriate data.

Elutriate Bioassay Survivorship

Americamysis bahia

A. bahia survivorship was 100 percent in the laboratory control seawater. Survivorship in the laboratory control sediment elutriate was 96 percent (10% concentration), 94 percent (50% concentration), and 96 percent (100% concentration). Survivorship in site sediment exposures ranged from 88 percent (10% exposure for sample E-MP06-7, 100% exposure for sample E-MP06-9, and 10% exposure for sample E-MP06-9 Dupe) to 98 percent (10% exposures for sample E-MP06-6 and 100% exposure for sample E-MP06-7). *A. bahia* survivorship among replicates was uniform.

Replicate results for survival of *A. bahia* exhibited normal distributions in all samples. All samples also exhibited normal distribution by Shapiro-Wilk's test and homogeneous variances, by Bartlett's test. Therefore the two-sample t-test assuming equal variances was used to determine if there was a significant reduction in fertilization for any site samples (100% elutriate) when compared to control seawater and elutriate from the control sediment. Sample E-MP06-9 had significantly less survival than the elutriate from the control sediment. The LC_{50} was >100% for sample E-MP06-9.

Table 26 presents the *A. bahia* survival rates.

Menidia beryllina

M. beryllina survivorship was 96 percent in laboratory control seawater. Survivorship for laboratory control sediment was 94 percent (10% concentration), 98 percent (50% concentration), and 96 percent (100% concentration). Sample survivorship ranged from 0 percent (50% exposure in samples E-MP06-7 and E-MP06-8, and 100% exposure in samples E-MP06-6, E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe) to 70 percent (10% exposure in samples E-MP06-6 and E-MP06-9 Dupe). *M. beryllina* survivorship among replicates was generally uniform.

The distribution of replicate results for *M. beryllina* survival for several site samples was not statistically normal. Consequently the Analysis of Variance was performed using the Wilcoxon's Rank Sum test. Samples E-MP06-6, E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe had significantly less survival than either the control seawater or the elutriate from the control sediment. The LC_{50} was 31.44% for sample E-MP06-6, <10% for samples E-MP06-7 and E-MP06-8, 12.23% for sample E-MP06-9, and 20.91% for sample E-MP06-9 Dupe.

The survival rates can be referenced in Table 28.

Arbacia punctulata

Fertilization data from the elutriate bioassays of control seawater, control sediment, sample stations are presented in Table 30. Fertilization of *A. punctulata* gametes was 75 percent in the control water (0% concentration). Fertilization for laboratory control sediment was 77 percent (10% concentration), 76 percent (50% concentration), and 77 percent (100% concentration). Fertilization of *A. punctulata* gametes in the site samples ranged from 63 percent (100% elutriate for sample E-MP06-8) to 77 percent (50% elutriate for sample E-MP06-6 and 10% elutriate for sample E-MP06-9).

Replicate results for fertilization of *A. punctulata* gametes exhibited normal distributions

in all samples. All samples also exhibited normal distribution by Shapiro-Wilk's test and homogeneous variances, by Bartlett's test. Therefore the parametric ANOVA test with the Dunnett's post-hoc test was used to determine if there was a significant reduction in fertilization for any site samples (100% elutriate) when compared to control seawater and elutriate from the control sediment. Samples E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe exhibited significantly lower survival from the control sediment.

Sediment Bioassay Survivorship

Americamysis bahia

A. bahia survivorship was 98 percent in the laboratory control sediment and 94 percent in the reference sediment, RS-MP06. Survivorship of *A. bahia* in the site sediments ranged from 82 percent in sample E-MP06-9, to 98 percent in sample E-MP06-8 (Table 33).

Replicate results for *A. bahia* survival were normally distributed for all samples. Therefore the two-sample t-test assuming equal variances was used to determine if there was a significant difference. Results are provided in Table 34. No sample had significantly less survival than the reference sediment.

Leptochirus plumulosus

L. plumulosus survivorship was 98 percent in the laboratory control sediment and 33 percent in the reference sediment, RS-MP06. Survivorship of *L. plumulosus* in the site sediments ranged from 41 percent in site samples E-MP06-8 and E-MP06-9, to 52 percent in sample E-MP06-7 (Table 35). *L. plumulosus* survivorship among replicates was relatively uniform.

The distribution of replicate results for *L. plumulosus* survival for bulk sediment samples was normally statistically distributed. Therefore the two-sample t-test assuming equal variances was used to determine if there was a significant difference. Results are presented in Table 36. No test sediments had significantly lower survival when compared with the reference sediment.

Bioaccumulation Survivorship

Macoma nasuta

M. nasuta survivorship was 78 percent in the laboratory control sediment and 71 percent in the reference sediment, RS-MP06. Survivorship of *M. nasuta* in the site sediments ranged from 71 percent in sample E-MP06-8 to 76 percent in sample E-MP06-9 Dupe (Table 37). *M. nasuta* survivorship among replicates was relatively uniform. The reference sample had significantly different survival from the control, no other samples had significantly different survival from the control.

Nereis virens

N. virens survivorship was 99 percent in the laboratory control sediment and 97 percent in the reference sediment, RS-MP06. Survivorship of *N. virens* in the site sediments ranged from 93 percent in sample E-MP06-9 Dupe, to 100 percent in sample E-MP06-8 (Table 37). *N. virens* survivorship among replicates was relatively uniform. No sample had significantly different survival from the control.

Bioaccumulated Chemicals in Tissues

Please see Addendum 1.

Tissue Chemistry Statistical Comparison Summary

Please see Addendum 1.

STFATE Modeling

For each sediment sample, iron was the contaminant of concern based on bulk sediment analyses. For the initial Tier II screening application of the STFATE model (Tier II, Determine Need for Further Testing), under the assumption that all iron in the bulk sediment is released to the water column, the water quality criterion (WQC) was not exceeded in any sample. Therefore, there would be sufficient dilution to reduce the concentration of iron below the WQC at the edge of the ODMDS.

A Tier II, Compare Water Quality model was completed for each of the samples and their contaminants of concern based on elutriate analyses (see Table 40). The results for each sample indicated that open water disposal of these sediments would not result in violation of any WQCs. For example, for sample E-MP06-2, arsenic was the contaminant of concern in the elutriate. According to the model, there would be sufficient dilution to reduce the concentration of arsenic below the WQC at the edge of the ODMDS.

Toxicity testing was performed on samples E-MP06-6, E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe, and a Tier III evaluation was completed for these samples. Toxicity test results indicated that, for each sample, the toxicity criterion was violated outside of the disposal site during the first four hours (see Table 40).

1 Introduction

This report, in support of a new permit application, presents information regarding sediment proposed for dredging from Mayport Naval Station under the oversight of the US Army Corps of Engineers, Jacksonville District. The area was evaluated for 103 certification in accordance with the 1991 ("Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual", i.e., "The Green Book"), with guidance from the South Eastern Regional Testing Manual. This evaluation included chemical analysis of sediments, waters, and elutriates; water column and sediment bioassays; and bioaccumulation studies.

Mayport Naval Station is located on the east coast of Florida at the mouth of the St. Johns River. The basin is located south of the river with an entrance channel that enters the river immediately west of the south jetty.

Mayport is a major Navy homeport and the port area is heavily developed. The aircraft carrier John F. Kennedy and its supporting battle group are the major users of the facility. Other warships occasionally visit Mayport but are not a significant factor. Commercial ships are not supported by Mayport facilities. Facilities within the port area include an airfield, vehicle and marine repair facilities and warehousing. Storage of hazardous and toxic materials is primarily confined to petroleum products including #6 and #2 fuel oil, diesel fuel, gasoline, and lubricants. All of the major storage facilities have confinement areas sufficient to contain any spills. The only permitted discharge into the basin, other than storm water, is a sewage outfall located east of Foxtrot Pier. The previous permit and concurrence for Mayport Navel Station expires in this year (2007).

The project area is periodically maintenance dredged. In the past material from maintenance cycles was placed in two upland sites located on Mayport Naval Station, however these sites are full and no longer available. In 1999 65,000 cubic yards of dredged material from the Mayport entrance channel was placed in the Jacksonville ODMDS, 837,300 yards of material from the entrance channel and turning basin was placed in the ODMDS in 2000. Mayport Naval Station has been dredged approximately every two years with the last disposal event a regular maintenance dredging event in 2006. 800,000 cubic yards of material was placed in the ODMDS during this event. Dredged depth in the entrance channel and basin is 42 feet + 2 feet allowable.

Figure 1 shows the Jacksonville ODMDS sampling locations, and figure 2 shows the Naval Station sampling locations for the proposed dredging.

2 Materials and Methods

Before sampling procedures could be developed, a list of chemical constituents and physical parameters of interest was developed. A Tier I investigation was performed by the USACE to identify site-specific chemicals of interest.

2.1 Physical Parameters, Chemicals of Interest and Toxicity Testing

The following physical parameters, chemical constituents, and analytical groups were identified as important for this project. Analytical methods used, along with target and achieved detection limits are listed in Table 2.

PHYSICAL PARAMETERS

Grain Size Analysis
Total Solids/ Water Content
Specific Gravity
Atterberg Limits
Settling Rates

CHEMICAL CONSTITUENTS

Metals

Aluminum (sediments only)	Iron (sediments only)
Arsenic	Mercury
Cadmium	Nickel
Chromium	Silver
Copper	Zinc
Lead	

Chlorinated Hydrocarbon Pesticides

Aldrin	Endosulfan Sulfate
Chlordane	Endrin
4, 4'-DDD	Endrin Aldehyde
4, 4'-DDE	Heptachlor
4, 4'-DDT	Heptachlor Epoxide
Dieldrin	Lindane & derivatives
Endosulfan I	Methoxychlor
Endosulfan II	Toxaphene

Polychlorinated Biphenyls Congeners

PCB 8	PCB 18	PCB 28	PCB 44	PCB 49
PCB 52	PCB 66	PCB 77	PCB 87	PCB 101
PCB 105	PCB 118	PCB 126	PCB 128	PCB 138
PCB 153	PCB 156	PCB 169	PCB 170	PCB 180
PCB 183	PCB 184	PCB 187	PCB 195	PCB 206
PCB 209				

CHEMICAL CONSTITUENTS (continued)

Polynuclear Aromatic Hydrocarbons (PAHs)

Acenaphthene	Chrysene
Acenaphthylene	Dibenzo (a,h) Anthracene
Anthracene	Fluoranthene
Benzo (a) Anthracene	Fluorene
Benzo (a) Pyrene	Indeno (1,2,3-cd) Pyrene
Benzo (b) Fluoranthene	1 & 2-Methylnaphthalene
Benzo (k) Fluoranthene	Phenanthrene
Benzo (g,h,i) perylene	Pyrene

In addition to the chemical and physical testing, toxicity testing was also performed as described in the "Green Book." Composited samples from Zones 1 through 5 were subjected to chemical testing only. Composited samples from Zones 6 through 9 were subjected to full chemical, bioassay and bioaccumulation testing.

A complete description of the bioassay and bioaccumulation procedures, associated quality assurance and control information, and statistical methods is provided in Appendix D.

Because of the unavailability of *Crassostrea virginica*, *Arbacia punctulata* was used in the elutriate bioassays. Brief toxicity testing summaries follow:

TOXICITY TESTING

Organism	Test
Water Column/Elutriate Bioassays	
*Americamysis bahia**	96 hours, static, non-renewal
Menidia beryllina	96 hours, static, non-renewal
Arbacia punctulata	48 hours, static, non-renewal
Benthic Bioassays	
*Americamysis bahia**	10-day, static renewal (twice/day)
Leptochirus plumulosus	10-day, static renewal (twice/day)
Bioaccumulation	
Nereis virens	28 days, static renewal (three/week)
Macoma nasuta	28 days, static renewal (three/week)

* = formerly *Mysidopsis bahia*

After elutriate and sediment test results had been reported, it was determined by the USACE Jacksonville District that metals, PAHs, organotins and lipids were the chemicals of interest to be analyzed in the bioaccumulated tissue samples. This data can be referenced in Addendum 1 (Tables 16 through 25).

2.2 Field Methods and Procedures

The following text summarizes the methods and procedures used to collect the sediment samples, background water sample and site water.

2.2.1 Field Equipment

CSA transported their field equipment to the Mayport Naval Station area, in preparation for the field effort, was placed in containers that protected the items from damage due to rough handling and wet weather conditions. To the extent practical, critical items were duplicated so that failure of any one item would not stop the field effort. Similarly, spare parts and replacement items were included as appropriate to prevent avoidable down time. When practical, sampling equipment was pre-cleaned before transporting to the field if it was ensured that integrity of such equipment would not be compromised during transport and storage. All sample containers were supplied by the W&AR team, and the integrity of all containers was maintained during shipment to and from the Jacksonville area, and while in storage awaiting use.

2.2.2 Decontamination and Clean Area Procedures

All equipment surfaces with the potential to contact sample material were decontaminated, e.g., stainless steel spoons and bowls. Such equipment was cleaned using a water/Liqui-nox® solution, followed by a tap water rinse, de-ionized water rinse, isopropanol rinse, and air-dried. If not immediately used after cleaning, decontaminated equipment was wrapped in food-grade aluminum foil with the shiny side facing/contacting the equipment. Field personnel wore Nitrile gloves that were non-powdered, talc- and phthalate-free, and were changed between sampling stations, when cleaning equipment, and when they became ripped or torn.

The deck area where sampling was to occur was scrubbed with Liqui-nox® solution or other appropriate non-contaminating cleaner to remove petroleum residues, loose debris, and any other materials that might contaminate collected sediment.

Care was taken to prevent wash water that potentially contained oil or petroleum compounds from entering the surface water. Sediment debris was removed from the sample collection area before departing each station.

Hydraulic and petroleum-fueled equipment were maintained in an area away from the vibracoring area and any drips or leaks of hydraulic fluids, fuels, or lubricants were cleaned up immediately. Gasoline- and diesel-fueled equipment was positioned downwind to minimize the potential for sample contamination.

2.2.3 Sediment Sample Collection and Handling

All samples were collected using appropriately cleaned, non-contaminating equipment (e.g., constructed of stainless steel or coated with Teflon®) as required for the analyses of interest. The vibracore tubing used was constructed of a ridged transparent acetyl butyrate plastic, with a stainless-steel cutting nose.

A vibracore and/or grab sampler was used to collect sediment samples. Table 1 presents the sub-zone sampling locations and the sampling method.

After collecting sediment in the transparent vibracore tube or grab sampler, the sample was withdrawn from the sediment and placed on deck where the contents were visually inspected. After inspecting and describing the sediment, the contents were released into a stainless steel Teflon® coated mixing vat and the excess water was decanted. The sediment was placed into pre-cleaned and pre-labeled one-gallon glass jars using stainless steel spoons.

Reference sediment samples, RS-MP06-A and RS-MP06-B, were collected using a stainless steel box corer. Collected sediments were placed into a stainless steel vessel with a protective coating of Teflon®. Excess water was decanted before transferring the sample into the laboratory supplied pre-cleaned and pre-labeled one-gallon glass containers.

After containerizing, all sediment and water samples were placed on ice in ice chests within fifteen minutes.

CSA personal relinquished samples to W&AR personnel as documented on the chain of custodies. The samples were delivered to W&AR's Gainesville, Florida facility, in ice chests, which were chilled with wet ice and maintained at approximately four degrees Celsius at all times. The sample transport vehicle remained locked at all times.

No sample breakage occurred during shipment.

Control sediment was provided by MACTEC in sufficient quantity for all specified physical, chemical, and biological tests. Information regarding the location from which this sediment was collected can be found in Section 2.4.

2.2.4 Background Water Collection and Handling

The background water sample (E-MP06-Background Water) was collected nearby the offshore reference sampling location (RS-MP06-A).

The background water sample for organic analytes was collected directly into pre-cleaned, 1-liter amber glass containers with Teflon® lid-liners. Background water for metals was collected in a similar manner using HDPE containers. Sample containers were inverted and submerged at least 0.5 feet below the water surface before they were turned upright and allowed to fill. Water sample fractions were preserved with the appropriate acids and then placed in ice chests with ice, and transported to W&AR in a manner similar to the sediment samples. The background water sample was then sent to CAS-Kelso, WA for testing, via an overnight shipping service. The background water sample was received at CAS in good condition and on wet ice.

2.2.5 Site Water Collection and Handling

The site water used to generate the elutriate samples was collected in the center of the Naval Station (see Figure 2).

One gallon pre-cleaned amber glass bottles were inverted and submerged approximately one foot below the water surface, turned upright and allowed to fill. The bottles were immediately capped, placed in ice chests and thoroughly iced. The coolers were then transported to W&AR and stored in a walk-in cold room until use.

2.2.6 Sediment Sample Compositing

Sub-zone samples were composited and homogenized to form a single composite sample (i.e. E-MP06-6-A through E-MP06-6-C were composited together to form E-MP06-6). The compositing took place at W&AR's Gainesville, Florida facility.

The mixing equipment was initially decontaminated by thoroughly scrubbing the stainless steel vessel, stainless steel mixing bit and stainless steel spoons with a clean sponge, Liquinox and tap water. The vessel and equipment were then rinsed well with de-ionized water and wiped dry with Kimwipe paper towels. The vessel and equipment were then wiped down with pesticide grade isopropanol and air dried. The equipment was finally triple rinsed with de-ionized water to assure complete removal of alcohol. Decontamination of equipment was done between each sample, including the field duplicate and offshore reference sample.

The composited samples were re-containerized after homogenization, and submitted to the analytical and biological laboratories for testing.

2.2.7 Hydrographic Measurements

Collection of sediment and water from Mayport Naval Station and reference stations A and B included the following general ancillary observations and hydrographic measurements made within the water column from just below the water surface, mid-depth, and near the bottom:

Sea State	Water Temperature	Dissolved Oxygen
Tidal Cycle	Water Depth	Turbidity
pH	Conductivity	Weather Conditions
Salinity		

2.3 Physical and Chemical Laboratory Methods and Detection Limits

Analytical procedures followed those prescribed in the Mayport Naval Station Scope of Work. Table 2 lists the analytical methods used for the physical and chemical testing and the target detection limit for each parameter or analyte, and achieved detection limits.

2.4 Biological Testing

Biological testing included elutriate bioassays with *Americamysis bahia* (formerly *Mysidopsis bahia*), *Arbacia punctulata*, and *Menidia beryllina*; benthic bioassays using *Americamysis bahia* and *Leptochirus plumulosus*; and bioaccumulation by exposing *Nereis virens* and *Macoma nasuta*. *Arbacia punctulata* was substituted for *Crassostrea virginica* because the latter was unavailable when needed. Complete descriptions of the biological testing procedures appear in Appendix D.

The suppliers of these test organisms were:

Aquatic Research Organisms
P.O. Box 1271
One Lafayette Road
Hampton, NH 03842
Phone (603) 926-1650

MBL Aquaculture
4569 Samuel St
Sarasota, Florida 34233
(800) 889-0384

Water used during toxicity testing was provided by MACTEC and comes from their routine source, i.e., the University of Florida's Whitney Center saltwater storage tank. The Whitney Center is located along US A1A and is north of and adjacent to Marineland, Florida. Water from this source has proven to be reliably free of contaminants with regard to success of past control groups for test organisms.

Control sediment was collected from the Matanzas River approximately 100 meters north of the Whitney Center and west of US A1A. This location is approximately at N 29.6719° and W -081.2148° (NAD 83).

3 Locations of Sampling Areas

The proposed disposal site is the Jacksonville ODMDS. The site is one nautical square mile with water depths that average 44 feet. The approximate corners of the ODMDS are located at:

30°21'30"N., 81°18'34"W
30°21'30"N., 81°17'26"W
30°20'30"N., 81°17'26"W
30°20'30"N., 81°18'34"W

In selecting sample stations, consideration was given to the location of shoals, the types of sediment, and areas that are likely to be contaminated, such as areas near point source discharges, or areas likely to be affected by non-point source discharge. Also considered was the influence of currents, geographical influences on different areas of the project.

Twenty-seven (27) sub-zone sample stations in nine zones were sampled in the entrance channel, turning basin, destroyer slip and emergency boat basin as shown on Figure 2. Each of the nine zones contains between 50,000 and 200,000 cubic yards of potential dredged material.

Three sub-zone stations were located in the entrance channel. Entrance channel sub-zone stations were identified as E-MP06-1A through C and was composited into a single sample labeled E-MP06-1.

Three sub-zone stations were located in the area along the northern edge of the basin (carrier dock). Carrier dock sub-zone stations were numbered E-MP06-2A through C, and were composited into a single sample identified as E-MP06-2.

Three sub-zone stations were located in the area along the Western edge of the basin (west dock). West dock sub-zone stations were numbered E-MP06-3A through C, and were composited into a single sample identified as E-MP06-3.

Three sub-zone stations were located in the area including the center and part of the southern end of the basin (center). Center sub-zone stations were numbered E-MP06-4A through C, and were composited into a single sample identified as E-MP06-4.

Three sub-zone stations were located at the southeast corner of the basin between the destroyer slip and the entrance channel (Foxtrot pier). Foxtrot pier sub-zone stations were numbered E-MP06-5A through C, and were composited into a single sample labeled E-MP06-5.

Three sub-zone stations were located in the north end of the destroyer slip and the southeast corner of the basin. The northern destroyer slip sub-zone stations were numbered E-MP06-6A through C, and were composited into a single sample labeled E-MP06-6.

Three sub-zone stations were located along the east side of the destroyer slip. The eastern destroyer slip sub-zone stations were numbered E-MP06-7A through C, and were composited into a single sample labeled E-MP06-7.

Three sub-zone stations were located along the west side of the destroyer slip. The western destroyer slip sub-zone stations were numbered E-MP06-8A through C, and were composited into a single sample labeled E-MP06-8.

Three sub-zone stations were located in the emergency boat basin located northeast of the destroyer slip adjacent to the entrance channel. The emergency boat basin sub-zone samples were numbered E-MP06-9A through C, and were composited into a single sample labeled E-MP06-9.

Two reference stations were sampled from water 44 and 45 feet deep, approximately one nautical mile north and one nautical mile south, respectively, of the northern and southern edges of the ODMDS. The locations sampled appear on Figure 1.

Positioning of the sampling equipment at the predetermined sampling stations was accomplished using a Leica Model 420 DGPS receiver. Differential corrections were acquired using the Coast Guard beacon from Cape Canaveral, Fl from which real-time GPS differential corrections are broadcast at 289 kHz. This system has a proven accuracy of ±5 m (1 m to 3 m is typical).

Copies of completed field sheets developed for this sampling effort appear in Appendix C.

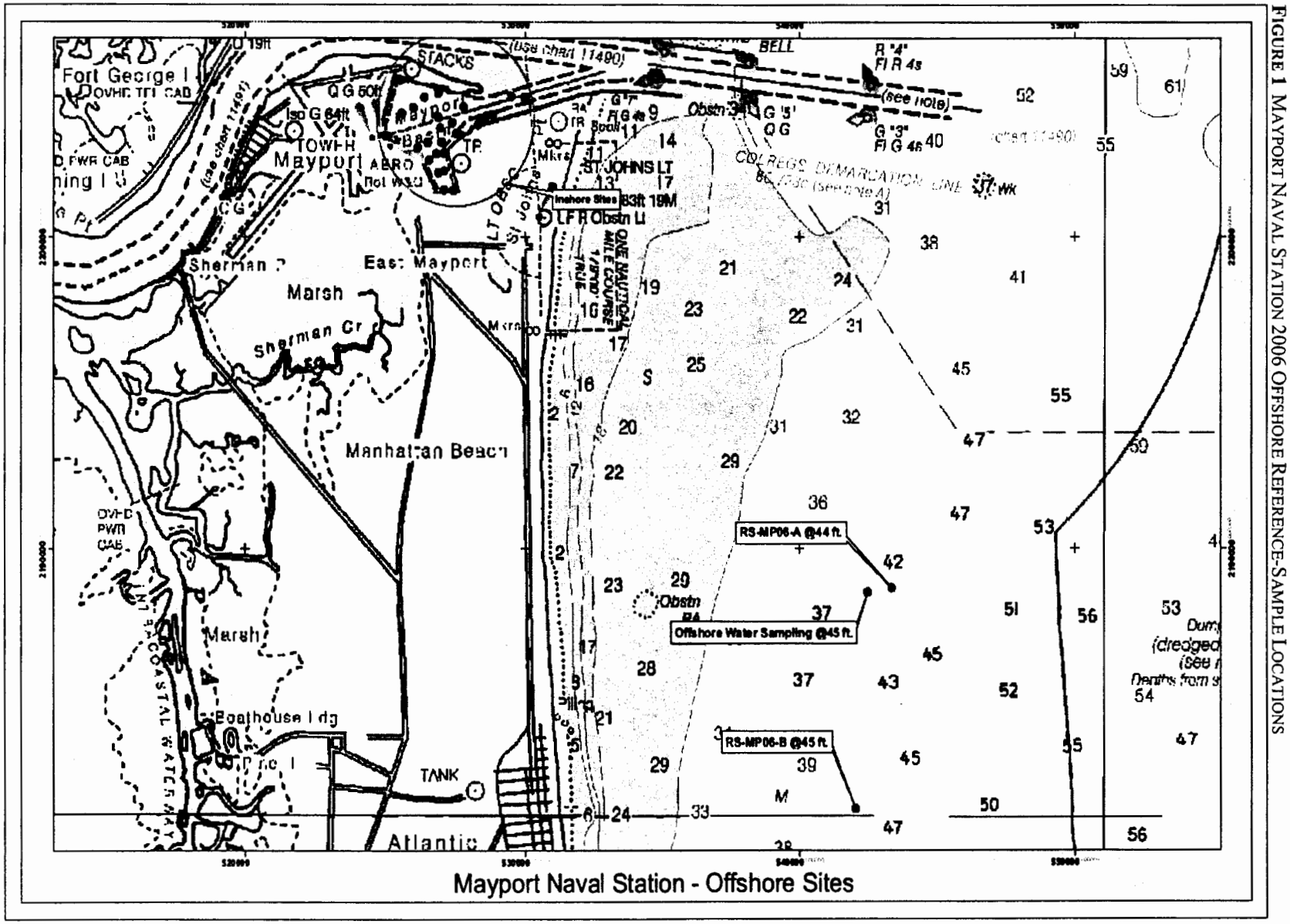
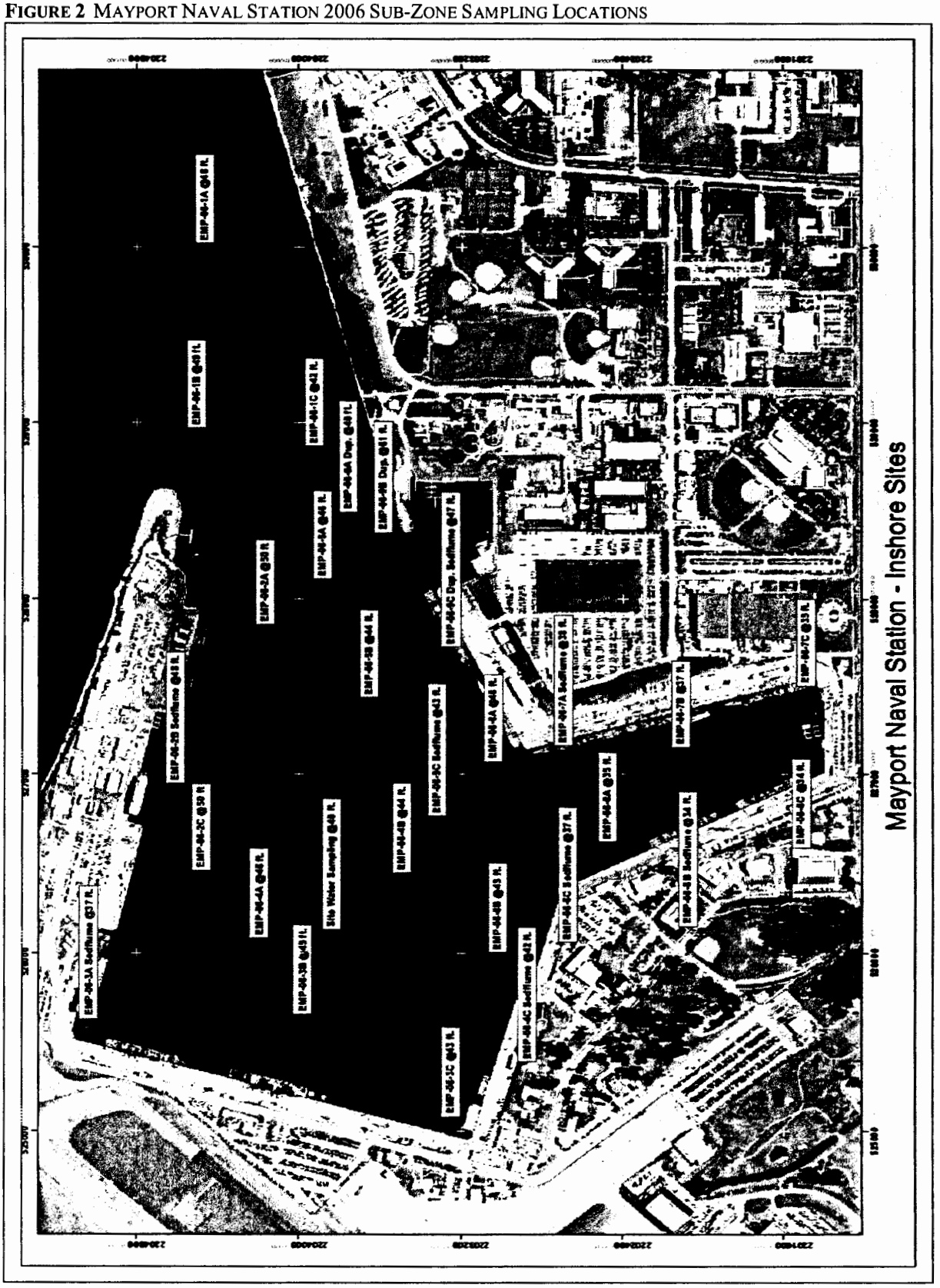


FIGURE 1 MAYPORT NAVAL STATION 2006 OFFSHORE REFERENCE-SAMPLE LOCATIONS

FIGURE 2 MAYPORT NAVAL STATION 2006 SUB-ZONE SAMPLING LOCATIONS



4 Description of Testing Approach

Selecting three sub-zone sampling locations throughout each zone was believed adequate to provide a representative set of samples. Collected sediments from each sub-zone were composited and homogenized in W&AR's Gainesville facility. Aliquots of composited sediment were submitted to Columbia Analytical (Kelso, WA) for metals and organics analyses, Advanced Environmental Laboratories for inorganic chemistry, MACTEC (Gainesville, Florida) for toxicity testing and MACTEC (Jacksonville, Florida) for physical testing.

Two reference station locations (A and B) were selected for generating a composite sample by combining equal proportions from each station.

The nine composited Naval Station samples, the duplicate sample, the reference station composite and the control sample were tested for metals, pesticides, PCB congeners, PAHs, organotins, oil and grease, total sulfide, ammonia, cyanide, specific gravity, bulk density, Atterberg limits, TOC, grain size and percent moisture.

Zone composites E-MP06-6 through E-MP06-9, the duplicate sample, the reference composite and the control sample were subjected to elutriate bioassays, sediment bioassays and bioaccumulation.

Elutriate samples were generated from the Naval Station composite samples, the duplicate composite sample, the reference composite sample and the control sample. The elutriate samples were tested for the same parameters as the sediment samples, excluding aluminum and iron.

The background water sample was collected nearby the reference sampling location A and was tested for the same parameters as the elutriate samples.

A list of chemicals was developed, based on the sediment results for the bioaccumulation tissue testing. It was decided that the tissues be tested for metals, PAHs, organotins and lipids.

5 Final Results

Prior to the initiation of field work, pre-printed field sheets were designed specifically for this project. Completed field documentation appears in Appendix C. All laboratory reports of analyses for the Mayport Naval Station sediments, background water, elutriates, and tissues appear in Appendix F.

5.1 Field Measurement Data and Sediment Descriptions

The weather during the field effort varied between clear conditions to raining, with wind speeds ranging from 5-20 knots. Appendix C presents the water quality data measured at near surface, mid-depth and near bottom for each Naval Station and the offshore reference station.

Composited sediments from Zones 1 and 9, were composed mostly of sand, fine quartz, with little silt-clay, trace medium to fine sand sized shell fragments and a coloration of dark gray. Composite sediments from Zones 2, 3, 5, 6, 7 and 8 were composed mostly of a silt mixture with some fine sand and a coloration of dark gray. Zone 4 composite was composed mostly of a clay mixture, little fine sand, with trace medium to fine sand sized shell fragments and was dark gray in color.

The offshore reference composite sample (RS-MP06) was composed largely of sand, with fine quartz and some silt, trace medium to fine sand sized shell fragments. The coloration was dark gray.

The control sediment sample (E-MP06-Control Sediment) consisted mostly of sand, with few medium to mostly fine quartz and trace fine sand sized shell fragments. The coloration was light brown.

All Naval Station and offshore sampling locations were accessible and provided enough sediment for project needs.

5.2 Sediment Physical and Organic Carbon Data

The composited zone samples, including the reference sample and control sample were sieved to determine grain size distribution, and tested to determine the content of organic carbon and moisture. The samples were tested for specific gravity and Atterberg limits. Physical and organic carbon data can be referenced in Table 3. The sediment testing report and the particle size distribution report can be referenced in Appendix E.

For all Naval Station zone samples, gravel was found to be 1.9 percent or less. The control sample was composed of 2.3 percent gravel, and the reference sample had no gravel present.

Sand content in the zone samples ranged from 1.2 to 82.0 percent, with zone E-MP06-6 having the lowest sand content of 1.2 percent and E-MP06-1 having the greatest sand content of 82.0 percent. The reference composite and the control sample were composed mostly of sand, 67.4 percent and 96.4 percent, respectively.

The silt-clay content ranged from 18.0 to 98.8 percent in the zone composite samples, with zone E-MP06-6 having the greatest silt-clay content. The reference composite had a

silt-clay content of 32.6 percent and the control sample had a silt-clay content of 1.3 percent.

The zone composite samples had a moisture content ranging from 34.3 to 78.3 percent.

The reference composite sample had a similar sand content when compared to zone samples E-MP06-1 and E-MP06-9. Zones E-MP06-2 through E-MP06-8 tended to have significantly higher silt/clay content than the reference composite sample and control sample.

Control sediment used for toxicity testing was significantly coarser than the majority of the zone composite samples, specifically zones E-MP06-2 through E-MP06-8. The sand content in the control sediment was 96.4 percent and the gravel content was 2.3 percent. The silt-clay content was 1.3 percent. Moisture content in the control sediment was 16.8 percent and TOC content was 1.08 percent.

Total organic carbon ranged from 0.77 to 4.24 percent in the zone composite samples. The reference sediment total organic carbon content was 1.01 percent, while the control sediment contained 1.08 percent.

5.3 Sediment Chemical Data

The zone composite samples, reference composite and control sediment were analyzed for metals, pesticides, PCB congeners, PAHs, organotins, oil and grease, ammonia, sulfide and cyanide. The Naval Station composite E-MP06-9 was sampled and tested in duplicate to provide precision information using the actual sample matrix. All chemical laboratory reports, complete with chain of custody forms and laboratory quality assurance narratives, appear in Appendix F.

5.3.1 Sediment Metals

The concentrations of all metals of concern in Zone E-MP06-1 were less than the offshore reference sample metals concentrations.

The concentration of metals in Zone E-MP06-9 and 9 Dupe were similar to the metals concentrations found in the reference sample.

Zone composite samples E-MP06-2 through E-MP06-8 tended to have a greater concentration of metals than the offshore reference composite sample, ranging from two to six times higher than the reference sample's concentrations.

The control sediment sample yielded metals concentrations lower than the reference sample.

Trace amounts of silver was detected in composite E-MP06-3. The concentration was 0.001 ppm above the SOW's target detection limit. All other sediment composites did not yield detectable concentrations of silver.

Low concentrations of mercury were detected in composite samples E-MP06-3 through E-MP06-8, ranging from 0.054 ppm to 0.066 ppm (dry weight). All other samples did not yield detectable amounts of mercury.

Zone composite samples E-MP06-2 through E-MP06-8 had cadmium concentrations approximately two times the SOW's target detection limit, ranging from 0.166 ppm to 0.205 ppm (dry weight).

Aluminum and iron were detected in all zone composite samples, including the reference composite sample and the control sample, with the zone samples ranging from 3,860 ppm to 25,100 ppm (dry weight).

Arsenic, copper and lead were detected in all zone, reference and control samples. The concentrations of these elements ranged from 2.14 ppm to 28.5 ppm (dry weight) in the zone composite samples.

Chromium and zinc were found in all samples. The concentrations ranged from 9.56 ppm to 70.6 ppm (dry weight) in the zone composite samples.

Table 5 presents the sediment metals data. The detection limits achieved by the laboratory can be referenced in Table 2, and the analytical report can be found in Appendix F-2.

5.3.2 Sediment Pesticides and PCB Congeners

There were no pesticides detected above the SOW's target detection limits.

There were no PCB congeners found above the SOW's target detection limits, except for PCB 206. PCB 206 was detected in the offshore reference sample at 0.0013 ppm and in zone composite samples E-MP06-2 through E-MP06-8. The zone sample concentrations ranged from 0.0010 ppm to 0.0026 ppm (dry weight), with zone E-MP06-3 having the greatest concentration.

Tables 6 and 7 present the pesticide and PCB congener data for the composite zone samples, reference composite sample and control sediment sample.

5.3.3 Sediment PAHs

PAH compounds were not found in zones E-MP06-1 and E-MP06-9 including the offshore reference sample and the control sample.

PAH compounds were detected in zone composite samples E-MP06-2 through E-MP06-8.

Phenanthrene was detected in zone E-MP06-6 at a concentration of 0.027 ppm (dry weight).

Benzo(a)anthracene and benzo(k)fluoranthene were detected in zone composites E-MP06-3, E-MP06-6 and E-MP06-7, ranging from 0.024 ppm to 0.030 ppm (dry weight).

Zone composite samples E-MP06-3 and E-MP06-7 yielded benzo(a)pyrene at a concentration on 0.020 ppm (dry weight). The SOW target detection limit for this compound was 0.020 ppm.

Concentrations of benzo(b)fluoranthene was found in zone composite samples E-MP06-3, E-MP06-6, E-MP06-7 and E-MP06-8, ranging from 0.024 ppm to 0.033 ppm (dry weight).

Elevated levels of fluoranthene and pyrene were found in zones E-MP06-2 through E-MP06-8, ranging from 0.028 ppm to 0.079 ppm (dry weight).

Chrysene was detected in zones E-MP06-2, E-MP06-3, E-MP06-5, E-MP06-6, E-MP06-7 and E-MP06-8. The values ranged from 0.020 ppm to 0.081 ppm (dry weight), with zone 3 yielding the greatest concentration.

Table 8 presents the PAH data.

5.3.4 Sediment Organotins

Butyltin and di-butyltin were not detected above the SOW's target detection limits in the zone composite samples, reference sample or the control sample. However, tri-butyltin was detected in zone composite sample E-MP06-7. The concentration was 0.039 ppm (dry weight).

The organotin data can be referenced in Table 9.

5.4 Background Water and Elutriate Chemical Data

Background water and elutriates were tested for metals, pesticides, PCB congeners, PAHs, ammonia, cyanide, oil and grease, total organic carbon, sulfides, and organotins. All chemical laboratory reports, complete with chain of custody forms and laboratory quality assurance narratives, appear in Appendix F-1.

5.4.1 Aqueous Metals

Cadmium, chromium, lead, mercury, nickel and silver were not detected at or above the SOW's target detection limits. All other metals of interest were detected in the elutriate samples, however zinc concentrations were less than the Class III Marine WQS.

Arsenic in the elutriate samples ranged from 12.6 ppb to 58.8 ppb. Sample E-MP06-6 had the greatest concentration of arsenic at 58.8 ppb. Zone elutriate samples E-MP06-4 and E-MP06-6 yielded concentrations greater than the Class III Water Quality Criteria. The reference sample and the control sample concentrations of arsenic were 1.83 µg/L and 1.78 µg/L, respectively.

Copper results ranged from 1.0 ppb to 3.79 ppb in the zone elutriate samples, with E-MP06-4 having the greatest concentration.

Table 11 presents the metals data for the elutriate samples, reference elutriate sample, control elutriate sample and the background water.

5.4.2 Aqueous Pesticides, PCB Congeners and PAHs

Pesticides, PCB congeners and PAHs were not detected at or above the SOW's target detection limits in the background water sample, reference sample or the zone elutriate samples. Tables 12 through 14 present the aqueous pesticides, PCB congeners and PAHs data.

5.4.3 Aqueous Organotins

Trace amounts of di-butyltin were detected in elutriate samples E-MP06-8, E-MP06-9 & 9 Dupe, the control sample and the reference sample. These values, ranging from 0.011 ppb to 0.016 ppb, were slightly above the SOW's target detection limit of 0.010 ppb. These results were flagged with a "J" qualifier which denotes the results are an estimated concentration that are less than the method reporting limit but greater than or equal to the laboratory's method detection limit.

5.5 Bioassay Results

A suite of bioassays were conducted in accordance with the USEPA and USACE guidance. Elutriate bioassays were conducted on sediments collected from the Mayport Naval Station area to determine the potential impact of dissolved and suspended contaminants on organisms exposed to the elutriate after conducting an initial mixing period. The test organisms used for the elutriate tests included the inland silverside, *Menidia beryllina*, the mysid shrimp, *Americamysis bahia* (formerly *Mysidopsis bahia*), and gametes of the sea urchin, *Arbacia punctulata*. *Arbacia punctulata* was used in place of the American oyster, *Crassostrea virginica,* due to a lack of available spawning organisms. The complete toxicity testing report appears in Appendix D.

The test samples were collected from November 4 through 9, 2006. Samples E-MP06-6, E-MP06-7, and E-MP06-8 were collected on November 4, 2006. Samples E-MP06-9 and E-MP06-9 Dupe were collected on November 6, 2006. RS-MP06 was collected on November 9, 2006. All samples were received at the MACTEC Engineering and Consulting, Inc. (MACTEC) Toxicology Laboratory on November 15, 2006. Additionally, approximately 21 gallons of site water, collected on November 8, 2006, was received at the MACTEC Toxicology Laboratory November 15, 2006. Control sediment (E-MP06-Control) was collected by MACTEC personnel from the Atlantic Ocean near Marineland, Florida, on October 28, 2006 for use in the control exposures of the bioassay tests. The same source for control sediment was used for all the bioassay tests. After receipt at MACTEC, test samples were stored in at $4 \pm 2^{o}C$ prior to test initiation, and unused portions of test samples were stored similarly during the testing period. Sample chain-of-custody and other traffic information are provided in Appendix D.

Prior to use in testing, sediments were thoroughly homogenized in their original containers and sifted or hand-sorted to remove any organic debris, small rocks, and indigenous organisms. Prior to initiating sediment tests, pore water ammonia and sulfide concentrations were measured for the site samples, the reference sample, and the control sediment. The sediment samples were centrifuged and the pore water decanted off to obtain sufficient volume for the ammonia and sulfide analyses. Ammonia and sulfide pore water concentration data are included with the whole sediment bioassay data (see Appendix D).

5.5.1 Elutriate Bioassay Test Procedures

The test species used for the elutriate bioassays, *A. bahia* and *M. beryllina*, were received on December 1 and November 28, 2006 respectively from MBL Aquaculture, Sarasota,

Florida. At test initiation, *A. bahia* were 4 days old and *M. beryllina* were 13 days old. Gravid adult sea urchins, *Arbacia punctulata*, were received on November 9, 2006 from Aquatic Research Organisms, Hampton, New Hampshire.

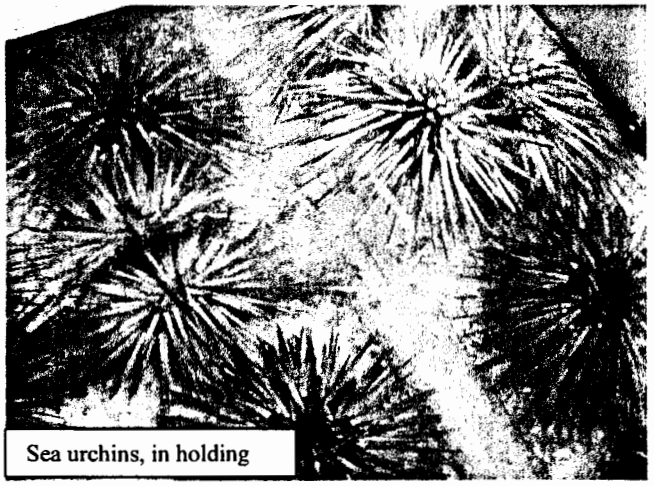
Laboratory control sediment and sediment from the sample stations were used to conduct elutriate bioassays at the MACTEC Toxicology Laboratory from December 1 through 5, 2006 for *A. bahia* and from November 29 through December 3, 2006 for *M. beryllina*. Testing for *A. punctulata* took place on November 16, 2006.

Elutriates were prepared by mixing one (1) part of sediment to four (4) parts of site water to achieve a sediment-to-water ratio of 1:4 by volume. Mayport Naval Station site water was received at varying salinity levels: 31 parts per thousand (ppt) to 34 ppt. Well water was added to bring the salinity to test condition salinity; 25 ppt for *A. bahia,* 20 ppt for *M. beryllina* elutriate tests and 28 ppt for the *A. punctulata*. The mixtures were stirred by hand for 30 minutes at room temperature. The mixtures were allowed to settle for at least one hour and the supernatant was siphoned off as the 100% elutriate concentration. Dilutions of the 100% elutriate concentration were made to obtain the 50% and 10% elutriate concentrations on a volume-to-volume basis.

Natural filtered seawater collected from the Atlantic Ocean, near Marineland, Florida, was used as dilution and laboratory control water. The seawater was adjusted to test salinity prior to use in preparing the three different elutriate concentrations for the *M. beryllina, A. bahia* and *A. punctulata* tests. Five replicates each (three replicates each for *A. punctulata*) of the three elutriate concentrations (10%, 50%, and 100%) of the five site sediments (E-MP06-6, E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe) and laboratory control sediment were tested. The laboratory control water was tested as 0% elutriate. The *M. beryllina* tests were conducted in 600-ml beakers containing 250 milliliters (mL) of elutriate or control solution and the *A. bahia* tests were conducted in 340-mL crystallizing dishes containing 200 mL of elutriate or control solution. Ten organisms were placed in each of the five replicate test chambers for *A. bahia* and *M. beryllina. A. bahia* and *M. beryllina* were fed brine shrimp nauplii (*Artemia* sp.) during the test period, *A. bahia* were fed daily and *M. beryllina* were fed every 48 hours. Test vessels containing *A. bahia* and *M. beryllina* were aerated during the test. The *A. punctulata* gamete elutriate test was conducted in twenty-milliliter glass scintillation vials. The *A. punctulata* tests were conducted in 20 mL scintillation vials containing 5 mL of elutriate or control solution. All tests were performed at a temperature of 20 ± 1°C and under ambient laboratory illumination (~740 lux/70 foot-candles).

Water quality parameters were measured daily during the 96-hour *A. bahia* and *M. beryllina* tests, and at test initiation of the *A. punctulata* test. Water quality parameters include dissolved oxygen (DO), pH, temperature, and salinity. DO was measured with a YSI Model 55 DO meter, temperature was measured with a VWR thermocouple, pH was measured with an Orion Model SA 290A pH meter, and salinity was measured with an Aquatic Eco-systems CL893 refractometer. All instruments were calibrated/verified daily before use, and verified at the end of each day. Survival counts were performed daily and at test conclusion for the *M. beryllina* and *A. bahia* elutriate tests.

A. punctulata eggs and sperm were obtained from adults by injecting approximately 1.0 ml of 0.5-M potassium chloride solution into the mouth region. Sperm were collected neat, and the eggs were collected in dilution water. The eggs were washed three times with seawater, allowing eggs to settle for 30 minutes between rinses. Sufficient sperm cells were added to 5 ml of elutriate and incubated for 60 minutes at 20°C. Approximately 2,000 eggs were then added to each vial, allowing fertilization to take place. Development was halted after 20 minutes by the addition of 2 ml 10% buffered formalin, per test vial. Fertilization was then quantified by the presence or absence of a fertilization membrane using a Sedgwick-Rafter counting chamber and a compound microscope. The fertilization membrane appeared as a "halo" around the *A. punctulata* egg. For each test replicate, a total of 100 eggs were counted and any damaged eggs were not included in the counts.


Sea urchins, in holding

ANOVA (Analysis of Variance) (or nonparametric equivalent for data which did not meet the assumptions for the parametric test) or a two-sample t-test assuming equal variance (Excel®) was used to compare mean survivorship or fertilization in the control sediment (100% elutriate) or the control elutriate (0% elutriate) versus the 100% elutriate from each of the Mayport Naval Station site sediments. Data were first checked for normality and homogeneity of variance. If either of these assumptions was not met, the nonparametric Kruskal Wallis test or Wilcoxin's Rank sum test was used. Median lethal concentration (LC_{50}) values for survival of *A. bahia* and *M. beryllina* and exposure concentration (EC_{50}) values for larval development for *A. punctulata* were calculated, if necessary. The LC_{50} and EC_{50} are defined as the concentration of elutriate or reference toxicant that kills or inhibits 50% of the exposed test organisms under the specified conditions of exposure. The LC_{50} and EC_{50} values for all of the sediment elutriates with greater than 50% survival (or development) were estimated as greater than 100% in accordance with USEPA guidelines (EPA/600/R-94/025).

5.5.2 Elutriate Bioassay Data

Elutriate bioassay test conditions, including temperature, DO, pH, and salinity were maintained at acceptable levels throughout the testing period for *A. bahia.* Elutriate bioassay test conditions, including temperature, DO, pH, and salinity were maintained at acceptable levels throughout the testing period for *M. beryllina* with the exception of test solution temperature in Replicate A of the control sediment 10% concentration, E-MP06-6 10% and 50% concentrations, and E-MH06-8 10% and 50% concentrations on November 29, 2006 (temperature in these vessels ranged from 21.5 to 21.9 °C). Water quality parameters for *A. punctulata* were measured on Day 0. The relevant laboratory raw data pertaining to the elutriate tests are provided in Appendix D for *A. bahia, M. beryllina*, and *A. punctulata.*

Elutriate Bioassays with *Americamysis bahia*

A. bahia survivorship was 100 percent in the laboratory control seawater. Survivorship in the laboratory control sediment elutriate (Table 26) was 96 percent (10% concentration), 94 percent (50% concentration), and 96 percent (100% concentration). Survivorship in site sediment exposures ranged from 88 percent (10% exposure for sample E-MP06-7, 100% exposure for sample E-MP06-9, and 10% exposure for sample E-MP06-9 Dupe) to 98 percent (10% exposures for sample E-MP06-6 and 100% exposure for sample E-MP06-7). *A. bahia* survivorship among replicates was uniform (Appendix D).

Replicate results for survival of *A. bahia* exhibited normal distributions in all samples. All samples also exhibited normal distribution by Shapiro-Wilk's test and homogeneous variances, by Bartlett's test. Therefore the two-sample t-test assuming equal variances was used to determine if there was a significant reduction in fertilization for any site samples (100% elutriate) when compared to control seawater and elutriate from the control sediment. Sample E-MP06-9 had significantly less survival than the elutriate from the control sediment. The LC_{50} was >100% for sample E-MP06-9. Statistical output data can be found in Appendix D.

Elutriate Bioassays with *Menidia beryllina*

M. beryllina survivorship was 96 percent in laboratory control seawater. Survivorship for laboratory control sediment (Table 28) was 94 percent (10% concentration), 98 percent (50% concentration), and 96 percent (100% concentration). Sample survivorship ranged from 0 percent (50% exposure in samples E-MP06-7 and E-MP06-8, and 100% exposure in samples E-MP06-6, E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe) to 70 percent (10% exposure in samples E-MP06-6 and E-MP06-9 Dupe) (Table 28). *M. beryllina* survivorship among replicates was generally uniform (Appendix D).

The distribution of replicate results for *M. beryllina* survival for several site samples was not statistically normal. Consequently the Analysis of Variance was performed using the Wilcoxon's Rank Sum test (see Table 29). Samples E-MP06-6, E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe had significantly less survival than either the control seawater or the elutriate from the control sediment. The LC_{50} was 31.44% for sample E-MP06-6, <10% for samples E-MP06-7 and E-MP06-8, 12.23% for sample E-MP06-9, and 20.91% for sample E-MP06-9 Dupe. Statistical output data can be found in Appendix D.

Elutriate Bioassays with *Arbacia punctulata*

Fertilization data from the elutriate bioassays of control seawater, control sediment, sample stations are presented in Table 30. Fertilization of *A. punctulata* gametes was 75 percent in the control water (0% concentration). Fertilization for laboratory control sediment (Table 30) was 77 percent (10% concentration), 76 percent (50% concentration), and 77 percent (100% concentration). Fertilization of *A. punctulata* gametes in the site samples ranged from 63 percent (100% elutriate for sample E-MP06-8) to 77 percent (50% elutriate for sample E-MP06-6 and 10% elutriate for sample E-MP06-9) (Table 30).

Replicate results for fertilization of *A. punctulata* gametes exhibited normal distributions in all samples. All samples also exhibited normal distribution by Shapiro-Wilk's test and

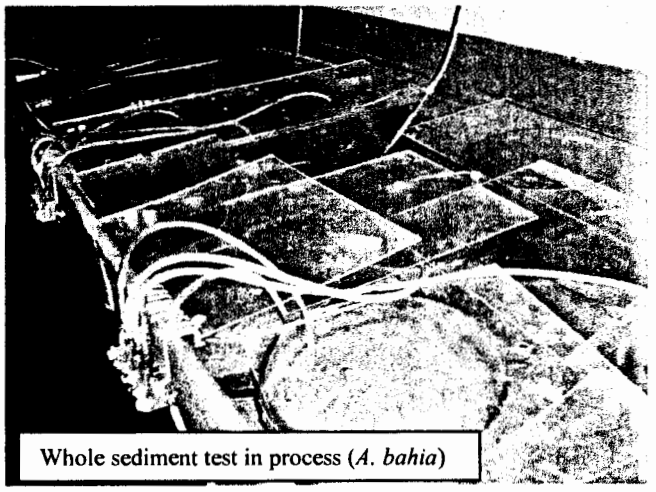
homogeneous variances, by Bartlett's test. Therefore the parametric ANOVA test with the Dunnett's post-hoc test was used to determine if there was a significant reduction in fertilization for any site samples (100% elutriate) when compared to control seawater and elutriate from the control sediment. Samples E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe exhibited significantly lower survival from the control sediment (Table 31). Statistical output data can be found in Appendix D.

Elutriate Reference Toxicant Test

Concurrent reference toxicant tests were conducted to determine the general health of each test species. The reference toxicant used for the *A. bahia* and *M. beryllina* tests was sodium dodecyl sulfate (SDS) with a test duration of 48 hours. The reference toxicant for the *A. punctulata* test was copper sulfate ($CuSO_4$), and was performed concurrently (duration of 80 minutes) with the fertilization test. The 48-hour LC_{50} result for *A. bahia* was 20.00 mg SDS/L (95% confidence limits of 15.55 to 25.73 mg SDS/L) and for *M. beryllina* was 7.41 mg SDS/L (95% confidence limits of 4.02 to 13.67 mg SDS/L). The reference toxicant EC_{50} for the sea urchin was 79.94 µg $CuSO_4$/L (95% confidence limits of 75.90 to 84.19 µg $CuSO_4$/L). The current LC_{50} or EC_{50} values were within the upper and lower control limits of organisms tested at MACTEC, and indicated the test organisms were within their normal sensitivity ranges. The reference toxicant data sheets and the LC_{50} and EC_{50} calculations for the elutriate tests are presented in Appendix D.

5.5.3 Sediment Bioassay Test Procedures

Two test species were used for the sediment bioassays, *Leptochirus plumulosus* and *Americamysis bahia*. Juvenile *L. plumulosus* (3-5 mm in length) were obtained from Aquatic Research Organisms, Hampton, New Hampshire, and received on November 28, 2006. *A. bahia* (4 days old at test initiation) were received from MBL Aquaculture, Sarasota, Florida, on December 2, 2006.



Whole sediment test in process (*A. bahia*)

Test vessels containing *A. bahia* were exposed to a daily photoperiod cycle of 16-hour light and 8-hour dark, and the *L. plumulosus* were under continuous light throughout the test. Both tests were conducted under fluorescent lighting conditions (~720 lux/67 foot-candles).

The sediment tests were conducted at the MACTEC Toxicology Laboratory using five replicates for *A. bahia* and five replicates for *L. plumulosus* for the laboratory control sediment and the 6 site sediments (E-MP06-6, E-MP06-7, E-MP06-8, E-MP06-9, E-MP06-9 Dupe, and RS-MP06). Test chambers were 1.8-liter jars for the *L. plumulosus* test, and 1.6-liter glass Carolina bowls for the *A. bahia* test. Twenty *A. bahia* and twenty *L. plumulosus* were loaded in each of the replicate test chambers at test initiation. All test chambers were aerated at approximately 60-80

bubbles per minute. During testing, *A. bahia* were fed 0.2 ml per replicate of brine shrimp nauplii (*Artemia* sp.) daily to prevent cannibalism, and *L. plumulosus* were not fed for the duration of the 10-day exposure period.

Water quality parameters measured daily during the 10-day *A. bahia* and *L. plumulosus* sediment tests included DO, pH, temperature, and salinity. DO was measured with a YSI Model 55 DO meter, temperature was measured with a VWR thermocouple, pH was measured with an Orion Model SA 290A pH meter, and salinity was measured with an Aquatic Eco Systems CL893 refractometer. Total ammonia in pore water and overlying water samples was determined utilizing an Orion Model SA290A+ meter with an Orion 95-12 ammonia probe. For the determination of ammonia, pore water samples were collected prior to test initiation and overlying water samples were collected on Day 0 and Day 9 for *A. bahia* and *L. plumulosus* from control, reference, and site sediments. Sulfide concentrations in pore water and overlying water samples were determined utilizing an Orion Model SA290A meter with an Orion 96-16 Ag/S_2 (silver sulfide) probe. For the determination of sulfide, pore water samples were collected prior to test initiation and overlying water samples were collected on Day 0 and Day 9 for *A. bahia* and *L. plumulosus* from control, reference, and site sediments. Test water was renewed every other day, beginning on Day 0 for *L. plumulosus* and *A. bahia.* All instruments were calibrated/verified daily before use, and verified at the end of each day. Survival counts for *L. plumulosus* and *A. bahia* were performed at termination of the sediment tests, when organisms could be readily observed.

Technician counting whole sediment organisms, at test

Prior to test initiation (Day 0), natural filtered seawater (salinity of 25 ppt for *A. bahia* and 28 ppt for *L. plumulosus*) and sediments were introduced to each test chamber at a ratio of one part sediment to four parts seawater and allowed to settle overnight. The overlying water was siphoned from each of the replicate test chambers after 24 hours and new overlying water was added. The overlying water was aerated vigorously prior to test initiation on Day 0. Water quality parameters were measured prior to adding the test organisms on Day 0. During the test period, water was renewed every other day. During the renewal, water was siphoned from each test chamber and viewed in a glass beaker to ensure no removal of test organisms had occurred. Any test organisms inadvertently siphoned out were immediately returned to the appropriate test chamber, using a pipet. To complete the renewal process, fresh seawater was added to the test chambers, taking care not to re-suspend the sediment. Dead brine shrimp were removed from the *A. bahia* test chambers, as needed.

ANOVA (Analysis of Variance) (or nonparametric equivalent for data which did not meet the assumptions for the parametric test) or a two-sample t-test assuming equal variance was used to compare mean survivorship in the sediment bioassay data from each

of the Mayport Naval Station site sediments. Data were first checked for normality and homogeneity of variance. If either of these assumptions was not met, the nonparametric Kruskal Wallis or Wilcoxin's Rank sum test was used.

5.5.4 Sediment Bioassay Data

Sediment bioassay test conditions, including temperature, DO, pH, and salinity were maintained at acceptable levels throughout the testing period for both *A. bahia* and *L. plumulosus*. Ammonia in the overlying water was determined for each sample and recorded at the beginning and the end of the test. Ammonia levels in the overlying water ranged from 0.01 to 0.36 parts per million (ppm) at the beginning of the test, and from 0.00 to 0.09 ppm at the conclusion of the test. The relevant laboratory raw data pertaining to the sediment tests are provided in Appendix C for *A. bahia* and *L. plumulosus*.

Sediment Bioassays with *Americamysis bahia*

A. bahia survivorship was 98 percent in the laboratory control sediment and 94 percent in the reference sediment, RS-MP06 (Table 33). Survivorship of *A. bahia* in the site sediments ranged from 82 percent in sample E-MP06-9, to 98 percent in sample E-MP06-8 (Table 33).

Replicate results for *A. bahia* survival were normally distributed for all samples. Therefore the two-sample t-test assuming equal variances was used to determine if there was a significant difference. Results are provided in Table 34. No sample had significantly less survival than the reference sediment. Statistical output data can be found in Appendix D.

Sediment Bioassays with *Leptochirus plumulosus*

L. plumulosus survivorship was 98 percent in the laboratory control sediment and 33 percent in the reference sediment, RS-MP06 (Table 35). Survivorship of *L. plumulosus* in the site sediments ranged from 41 percent in site samples E-MP06-8 and E-MP06-9, to 52 percent in sample E-MP06-7 (Table 35). *L. plumulosus* survivorship among replicates was relatively uniform (Appendix D).

The distribution of replicate results for *L. plumulosus* survival for bulk sediment samples was normally statistically distributed. Therefore the two-sample t-test assuming equal variances was used to determine if there was a significant difference. Results are presented in Table 36. No test sediments had significantly lower survival when compared with the reference sediment. Statistical output data can be found in Appendix D.

Sediment Reference Toxicant Test

Reference toxicant tests were conducted on each species tested in the sediment tests. The reference toxicant used for *A. bahia* was SDS and the duration of the test was 48 hours. The reference toxicant used for *L. plumulosus* was cadmium chloride ($CdCl_2$), measured as Cd, for a test duration of 96 hours. The 48-hour LC_{50} result for *A. bahia* was 14.98 mg SDS/L (95% confidence limits of 9.26 to 24.24 mg SDS/L). The LC_{50} value for *A. bahia* was within the current control limits at MACTEC control charts and indicated the test organisms were within their expected sensitivity ranges. The 96-hour LC_{50} result for *L.*

plumulosus was 0.95 µg $CdCl_2$ (cadmium chloride) measured as Cd (95% confidence limits of 0.69 to 1.33 µg $CdCl_2$/L). The LC_{50} value was within the current control limits at MACTEC and indicated the test organisms were within their expected sensitivity ranges. The reference toxicant data sheets and LC_{50} calculations for the sediment tests are presented in Appendix C.

5.5.5 Deviations From Test Protocol

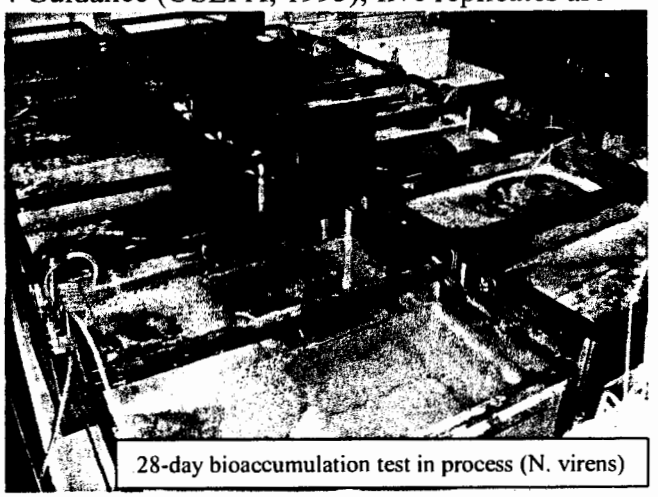
Temperature was exceeded in test solutions of some replicates of the elutriate test conducted with *M. beryllina* (Replicate A of the control sediment 10% concentration, E-MP06-6 10% and 50% concentrations, and E-MH06-8 10% and 50% concentrations) on November 29, 2006). Temperature ranged from 21.5 to 21.9 °C, approximately 1 °C higher than the required test temperature.

Arbacia punctulata was substituted, with permission, for the test organism, Crassostrea virginica (requested in the Mayport Naval Station 103 Evaluation – 2006 Sampling Plan and Protocol).

5.6 Bioaccumulation Procedures and Results

The polychaete, *Nereis virens*, and the bivalve, *Macoma nasuta* used in the bioaccumulation study were obtained from Aquatic Research Organisms, Hampton, New Hampshire, and received on November 21, 2006.

The bioaccumulation tests were conducted for 28 days. Ten-gallon test aquaria were used for the *N. virens* and *M. nasuta* tests with each aquaria representing an exposure replicate for a total of 5 replicates (*N. virens* and a total of 10 replicates (*M. nasuta*) for each test sample. According to Region 4 Guidance (USEPA, 1993), five replicates are required for *M. nasuta* 28-day bioaccumulation testing, and five replicates were used for statistical analysis. However, to ensure adequate tissue was available for tissue analysis, ten replicates of *M. nasuta* were exposed to test sediment, allowed to depurate at the conclusion of the test, frozen, and held for tissue analysis. The laboratory control sediment sample, site sediment samples, and one reference sediment sample were tested without dilution. Approximately 5 centimeters (depth) of sediment were added to each replicate test chamber, and the aquaria were filled with at least 20 liters of natural seawater with a salinity of 25 ppt ± 10%. Prior to test initiation, *M. nasuta* were held for one day in natural filtered seawater, and fed Shellfish Diet: Algal Spat formula (Reed Mariculture, Inc) as needed. At test initiation, 20 *N. virens* and 20 *M. nasuta* were placed in each test chamber (the two species were tested in separate tanks). Test organisms were fed twice weekly (Tetramin® or Shellfish Diet: Algal Spat formula®) during the testing period.



28-day bioaccumulation test in process (N. virens)

The tests were performed in temperature-controlled rooms. Ambient laboratory illumination was set on a timer, 12 hours light and 12 hours dark. Aeration was provided to all the test chambers at approximately 75 to 100 bubbles per minute.

Water quality parameters measured daily during the 28-day sediment bioaccumulation tests included DO, pH, temperature, and salinity. DO was measured with a YSI Model 55 DO meter, temperature was measured with a VWR thermocouple, pH was measured with an Orion Model SA 290 pH meter, and salinity was measured with an Aquatic Eco Systems CL893 refractometer. All instruments were calibrated/verified daily before use, and verified at the end of each day. Observations were made daily for organism behavior and mortality. Dead organisms were removed when observed. Survival counts were performed at test termination for all of the bioaccumulation tests.

After 28 days of exposure, survival and mortality of test organisms was determined and recorded. At the conclusion of the test, test organisms from each replicate were removed from the aquaria and allowed to depurate in clean seawater for 24 hours. After depuration, organisms from each replicate were rinsed in de-ionized water, drained, placed into Ziploc® freezer bags, and stored in a freezer at -10 ± 2°C. Frozen *N. virens* and *M. nasuta* tissues were archived for shipment to CAS.

5.6.1 Bioaccumulation Data

An adequate number of *Macoma nasuta* and *Nereis virens* were exposed to the offshore reference sample, control sediment and the zone sediment composites to provide sufficient quantities of tissue for subsequent chemical testing.

Bioaccumulation using *Macoma nasuta*

The bioaccumulation test conditions, including DO, pH, and salinity were maintained at acceptable levels throughout the 28-day testing period for *M. nasuta,* with the exception of slight temperature deviations on a few days during the test conducted with *M. nasuta.* The bioaccumulation test with *M. nasuta* was conducted with a goal temperature of 14 ± 1°C. On a few days during the test (November 25, November 29, and December 2, 2006) temperatures in a few of the test vessels ranged from 12 to 16.4 °C. This slight deviation did not appear to have an effect of survival. Temperature was not recorded on November 24, 2006, due to technician error.. The technician was counseled to review laboratory data forms daily to ensure daily data is entered on the form. Adequate mass of *M. nasuta* tissue was available for chemical analyses.

Fungal growth was observed in multiple replicates of each sample exposure beginning on December 5, 2006. The affected replicates were treated with an anti-fungal treatment, Maroxy® fungal solution (Mardel Laboratories), for up to, but not exceeding, five days (as recommended by product directions). Fungi in the treated aquaria typically disappeared within three days of the first treatment, and were treated for one additional day beyond our ability to observe the fungus, although treatment did not exceed five days in any aquaria. Anti-fungal treatment of affected aquaria ended on December 19, 2006.

M. nasuta survivorship was 78 percent in the laboratory control sediment and 71 percent in the reference sediment, RS-MP06 (Table 37). Survivorship of *M. nasuta* in the site sediments ranged from 71 percent in sample E-MP06-8 to 76 percent in sample E-MP06-

9 Dupe (Table 37). *M. nasuta* survivorship among replicates was relatively uniform (Appendix D). The reference sample had significantly different survival from the control, no other samples had significantly different survival from the control.

Bioaccumulation using *Nereis virens*

The bioaccumulation test conditions, including temperature, DO, pH, and salinity were maintained within range for all samples throughout the testing period for *N. virens* with the exception of slight temperature deviations on a few days during the test conducted with *N. virens*. The bioaccumulation test with *N. virens* was conducted with a goal temperature of 20 ± 1°C. On a few days during the test (November 21, November 22, and November 24, 2006) temperature in one of the test vessels ranged from 17.7 to 22.1 °C. This slight deviation did not appear to have an effect of survival. Temperature was not recorded on November 24, 2006, due to technician error. The technician was counseled to review laboratory data forms daily to ensure daily data is entered on the form. Adequate mass of *N. virens* tissue was available for chemical analyses.

N. virens survivorship was 99 percent in the laboratory control sediment and 97 percent in the reference sediment, RS-MP06 (Table 37). Survivorship of *N. virens* in the site sediments ranged from 93 percent in sample E-MP06-9 Dupe, to 100 percent in sample E-MP06-8 (Table 37). *N. virens* survivorship among replicates was relatively uniform (Appendix D). No sample had significantly different survival from the control.

Sediment Reference Toxicant Test

Concurrent reference toxicant tests were conducted to determine the general health of each test species. The reference toxicant used for testing the *M. nasuta* and *N. virens* tests was copper sulfate ($CuSO_4$). Test duration was 96 hours. The 96-hour LC_{50} result for *M. nasuta* was 3433.04 mg $CuSO_4$/L (95% confidence limits of 2378.77 to 4954.57 mg $CuSO_4$/L). The 96-hour LC_{50} result for *N. virens* was 823.37 g $CuSO_4$/L (95% confidence limits of 721.91 to 939.10 mg $CuSO_4$/L). These results are within the current control limits at the laboratory and indicated the test organisms were within their expected sensitivity range.

The reference toxicant data sheets and LC_{50} calculations for the sediment tests are presented in Appendix D.

5.6.2 Deviations From Protocol

Temperature was exceeded in test solutions of some replicates of the bioaccumulation test conducted with M. nasuta on November 25, November 29, and December 2, 2006. Temperatures in these vessels ranged from 12 to 16.4 °C, either approximately 1°C lower, or 1 to 2 °C higher than the Region IV (EPA, 1993) test acceptability criteria.

M. nasuta survivorship was lower than the Region IV (EPA, 1993) test acceptability criteria (≥ 90 percent survival) in the control treatment, which had 78 percent survival. Fungal growth was an issue in many of the M. nasuta exposures (see section 3.3), and might account for the low survival across the board (site and reference exposures).

Temperature was exceeded in test solutions of some replicates of the bioaccumulation test conducted with N. virens on November 21, November 22, and November 24, 2006. Temperatures in these vessels ranged from 17.7 to 22.1 °C, either approximately 1°C

lower or 1 to 2 °C higher than the Region IV (EPA, 1993) test acceptability criteria.

Temperature was not recorded on November 24, 2006, due to technician error (*M. nasuta* and *N. virens*).

5.7 Bioaccumulation Chemical Test Results

After review of the chemical testing results for the sediment samples, it was decided by the USACE that the bioaccumulated tissue samples (*Macoma nasuta* and *Nereis virens*), which were exposed to the zone sediments, reference sediment and control sediment, would be analyzed for metals, PAHs, organotins and lipids.

	Percent Lipids	Percent Moisture	Ag	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Organotins
RS-MP06	X	X	X	X	X	X	X	X	X	X	X
E-MP06-6,7,8	X	X	X	X	X	X	X	X	X	X	X
E-MP06-9/9 Dupe	X	X	X	X	X	X	X	X	X	X	X
E-MP06-Control	X	X	X	X	X	X	X	X	X	X	X
E-MP06-Pretest	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X
Total	49	49	49	49	49	49	49	49	49	49	49

Note:

- Each **X** represents 10 tissue samples (5 *Macoma* replicates + 5 *Nereis* replicates).
- Each X* represents 9 tissue samples (4 *Macoma* replicates + 5 *Nereis* replicates). (Replicate sample E-MP06-*macoma*-A-pretest was accidentally dropped by the laboratory technician.)

5.7.1 Metals in Tissues

***Macoma nasuta* (wet weight)**

Please see Addendum 1. Tables 17 and 18 present the metals in *Macoma* tissue data. Table 21 summarizes the tissue data by comparing the sample values with the reference values.

***Nereis virens* (wet weight)**

Please see Addendum 1. Tables 17 and 18 present the metals in *Nereis* tissue data. Table 21 summarizes the tissue data by comparing the sample values with the reference values.

5.7.2 PAHs in Tissues

Please see Addendum 1. Table 19 presents the PAHs in tissue data.

5.7.3 Butyltins in Tissues

Please see Addendum 1. Table 20 presents the organotins in tissue data.

5.8 ADDAMS (STFATE) Modeling Summary

A Section 103 Water Column Evaluation was performed in accordance with United States Environmental Protection Agency and United States Army Corps of Engineers *Evaluation of Dredged Material Proposed for Ocean Disposal*, EPA 503/8-91/001, dated 1991, using the Short Term Fate (STFATE) module of the Automated Dredging and Disposal Alternatives Management System (ADDAMS) supported by the USACE Waterways Experiment Station (WES). The most current version of the model was downloaded from the Dredging Operations Technical Support Center website. Model applications were performed in accordance with STFATE's associated guidance manual (USEPA and USACE, 1995; *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual, Appendix C*).

The first step in this evaluation was to identify the contaminants of concern by identifying the chemical detected in each sediment sample that required the greatest dilution to achieve its water quality criterion (WQC). The applicable WQC is the Class III predominantly marine waters surface water quality criteria, as found in Chapter 62-302.530, Florida Administrative Code, and entitled *Criteria for Surface Water Quality Classifications*. no

The screening process described in USEPA and USACE (1995) Section 10.1.1 was performed. Chemicals that require the greatest dilution in the bulk sediment and elutriate, by sample, and their concentrations as provided by Water and Air Research are summarized in Table 40.

STFATE was run using the "Section 103 Regulatory Analysis for Ocean Waters" option, followed by selecting the Tier II screening menu option. Default inputs were used for all parameters with the following site-specific exceptions developed using results presented in the *Jacksonville Ocean Dredged Material Disposal Site (ODMDS) Site Management and Monitoring Plan* (1997), the *Jacksonville ODMDS Benthic Surveys: 1995 and 1998* report (1998), both accessed on the USEPA Region IV website, information obtained from Mr. Chris McArthur at USEPA Region IV, and sample concentration data provided by Water and Air Research, as presented in Table 40:

- The Jacksonville ODMDS was defined as a one square nautical mile area, one nautical mile on each side.
- The dredged material disposal equipment was assumed to be a split-hull barge.
- The water depth was 46 feet.
- Currents were estimated to be 19.4 centimeters per second to the north northeast, which is represented in STFATE by north and east vector components of 0.24 feet per second (ft/sec) to the east, and 0.59 ft/sec to the north.

- Physical characteristics of sediments used in the modeling were taken from data provided in soil testing reports completed by MACTEC in December 2006, provided by Water and Air Research.
- LC_{50} values used were those observed from *Menidia beryllina* results presented in *Final Report, Aquatic Toxicity Testing, Mayport Naval Station, Florida*, dated February 12, 2007, completed by MACTEC.

For each sediment sample, iron was the contaminant of concern based on bulk sediment analyses. For the initial Tier II screening application of the STFATE model (Tier II, Determine Need for Further Testing), under the assumption that all iron in the bulk sediment is released to the water column, the WQC was not exceeded in any sample. Therefore, there would be sufficient dilution to reduce the concentration of iron below the WQC at the edge of the ODMDS.

A Tier II, Compare Water Quality model was completed for each of the samples and their contaminants of concern based on elutriate analyses (see Table 40). The results for each sample indicated that open water disposal of these sediments would not result in violation of any WQCs. For example, for sample E-MP06-2, arsenic was the contaminant of concern in the elutriate. According to the model, there would be sufficient dilution to reduce the concentration of arsenic below the WQC at the edge of the ODMDS.

Toxicity testing was performed on samples E-MP06-6, E-MP06-7, E-MP06-8, E-MP06-9, and E-MP06-9 Dupe, and a Tier III evaluation was completed for these samples. Toxicity test results indicated that, for each sample, the toxicity criterion was violated outside of the disposal site during the first four hours (see Table 40).

Model outputs documenting these evaluations are provided in Appendix G.

5.9 Tissue Statistical Comparison

Please see Addendum 1.

6 Quality Assurance and Control

Chemical data quality was monitored and assured by Columbia Analytical Services and Water & Air Research, Inc.

Review of the field data and sample collection process, and laboratory data and quality assurance reports show that all data are usable for project purposes of this Section 103 pre-dredging sediment evaluation.

6.1 Chemical Laboratory Quality Assurance and Control

Columbia Analytical's quality assurance narrative reports appear in Appendix F with the laboratory data reports that they describe. All routine problems encountered during analyses were successfully addressed. Field duplicate results for the sediment and elutriate samples compared well except for total sulfide in elutriates (see Section 6.1.2).

6.1.1 Sediment Data Quality Assurance and Control

Samples were received at CAS Kelso, WA on 11/17/06 and at AEL Gainesville, FL on 11/16/06 in good condition and consistent with accompanying chain of custody forms. The samples were stored in refrigerators at 4°C upon receipt at the laboratories.

All analyses were performed consistent with the quality assurance programs of CAS and AEL.

Cyanide
The fourteen day holding time for cyanide was exceeded by three days due to an analyst error.

Ammonia
AEL is not NELAC certified for ammonia.

Metals
The relative percent difference (RPD) for the replicate analysis of copper in sample E-MP06-3 was outside the normal CAS control limits. The variability in the results is attributed to the heterogeneous character of the sample. Standard mixing techniques were used, but were not sufficient for complete homogenization of this sample.

Pesticides
The reporting limit is elevated for at least one analyte in some samples. The chromatogram indicated the presence of non-target background components. The matrix interference prevented adequate resolution of the target compounds at the reporting limit. The results are flagged to indicate the matrix interferences.

Organotin Compounds
The lower control criterion was exceeded for the tri-n-propyltin surrogate in method blank KWG0620208-6 and sample E-MP06-1. Since the problem indicates a potential negative bias in the method blank, all associated field samples contained target analytes were re-extracted and reanalyzed 22 days past the recommended hold time. The method blank met control criteria for the reanalysis. Note the results for the field samples were comparable for both determinations except sample E-MP06-1, which indicates the

problem with the initial analysis was restricted to the method blank.
The control criteria for matrix spike recoveries of tri-n-butyltin, di-n-butyltin and/ or n-butyltin for sample E-MP06-7 are not applicable. The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

6.1.2 Background Water and Elutriate Data Quality Assurance and Control

Samples were received at CAS Kelso, WA on 12/05/06 and at AEL Gainesville, FL on 12/4/06 in good condition and consistent with accompanying chain of custody forms. The samples were stored in refrigerators at 4°C upon receipt at the laboratory.

All analyses were performed consistent with the quality assurance programs of CAS and AEL.

Total Sulfide
Total sulfide concentrations in sample E-MP06-9 and in the field duplicate (E-MP06-9 Dupe) were significantly different.

Total sulfide was analyzed out of holding time on sample E-MP06-Background Water.

Cyanide
The fourteen day holding time for cyanide in sample E-MP06-Background Water was exceeded by seven days.

PCB Congeners
The matrix spike recovery of PCB 183 for samples E-MP06-1 elutriate and E-MP06-9 elutriate, and the relative percent difference, was outside control criteria because of matrix interferences. The chromatogram indicated the presence of non-target background components that prevented adequate resolution of the target analytes. As a result, accurate quantitation was not possible. No further corrective action was required.

The upper control criterion was exceeded for PCB 183 in LCS KWG0620848-4. The analyte in question was not detected in the associated field samples. The error associated with the elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.

Pesticides
The primary evaluation criterion was exceeded for several analytes in CCV 1222F020, CCV 1222F039, and CCV 122F053. In accordance with CAS standard operating procedures, the alternative evaluation specified in the EPA method was performed using the average percent recovery of all analytes

The recovery of chlordane in sample E-MP06-9 Dupe was outside the control limits listed in the results summary. The limits are default values temporarily in use until sufficient data points are generated to calculate statistical control limits. Based on the method and historic data, the recoveries observed are in range expected for this procedure. No further corrective action was taken.

The relative percent difference for the following analytes in the replicate matrix spike

analyses of sample name was outside control criteria: heptachlor and Aldrin. This indicates a potential bias in the matrix spike/ matrix spike duplicate. All spike recoveries in the MS, MSD and associated laboratory control sample were within acceptance limits, indicating the analytical batch was in control. No further corrective action was appropriate.

6.1.3 Bioaccumulated Tissue Data Quality Assurance and Control

Metals

Please see Addendum 1.

PAHs

Please see Addendum 1.

Organotin Compounds

Please see Addendum 1.

Total Lipids

Please see Addendum 1.

7 Conclusions

Sediment sampling in Mayport Naval Station occurred in November 2006. All data were collected as planned for the chemical, physical, and toxicological characterization of sediment from Mayport Naval Station along with similar data from an offshore reference site for comparison. Appropriate methods and procedures were employed to collect and deliver sediment samples to the analytical laboratory in a condition that was representative of the zones at the time of collection. All analytical holding times were met, except for cyanide in sediments and background water, and sulfide in background water. Some of the Mayport Naval Station Scope of Work target detection limits were not attainable. All data are judged to be of acceptable quality for project needs.

8 References

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Table 1. Sampling Coordinates and Sampling Techniques for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sub-zone Sampling Location	Sampling Technique	Depth	Easting (feet)	Northing (feet)	Latitude	Longitude
Site Water	Grab	1 foot below surface	526906.34	2203836.55	30° 23.7034' N	81° 24.5994' W
Background Water Sample (offshore)	Grab	1 foot below surface	542488.70	2188602.20	30° 21.1989' N	81° 21.6248' W
RS-MP06-A	Grab	44 ft.	543355.30	2188742.00	30° 21.2224' N	81° 21.4600' W
RS-MP06-B	Grab	45 ft.	542043.70	2181636.00	30° 20.0494' N	81° 21.7052' W
E-MP06-1A	Grab	48 ft.	529982.58	2204468.08	30° 23.8094' N	81° 24.0144' W
E-MP06-1B	Grab	49 ft.	529508.22	2204504.92	30° 23.8152' N	81° 24.1047' W
E-MP06-1C	Grab	42 ft.	528839.32	2203918.10	30° 23.7180' N	81° 24.2316' W
E-MP06-2A	Grab	50 ft	527819.22	2204167.25	30° 23.7585' N	81° 24.4259' W
E-MP06-2B	Grab	48 ft.	526910.70	2204606.97	30° 23.8305' N	81° 24.5991' W
E-MP06-2C	Grab	50 ft	526419.47	2204482.06	30° 23.8096' N	81° 24.6925' W
E-MP06-3A	Vibracore	37 ft.	525581.28	2205036.73	30° 23.9006' N	81° 24.8524' W
E-MP06-3B	Vibracore	45 ft.	525612.58	2203967.34	30° 23.7242' N	81° 24.8457' W
E-MP06-3C	Vibracore	43 ft.	525050.29	2203243.22	30° 23.6044' N	81° 24.9522' W
E-MP06-4A	Vibracore	46 ft.	526024.16	2204148.90	30° 23.7544' N	81° 24.7675' W
E-MP06-4B	Vibracore	44 ft.	526980.76	2203491.98	30° 23.6466' N	81° 24.5850' W
E-MP06-4C	Vibracore	42 ft.	526171.88	2202868.75	30° 23.5433' N	81° 24.7385' W
E-MP06-5A	Vibracore	46 ft.	528641.10	2203884.87	30° 23.7124' N	81° 24.2693' W
E-MP06-5B	Vibracore	44 ft.	527410.68	2203658.33	30° 23.6743' N	81° 24.5033' W
E-MP06-5C	Grab	43 ft.	527554.46	2203311.70	30° 23.6172' N	81° 24.4757' W
E-MP06-6A	Grab	46 ft.	527036.92	2203037.76	30° 23.5717' N	81° 24.5740' W
E-MP06-6B	Grab	45 ft.	526534.50	2203020.79	30° 23.5686' N	81° 24.6696' W
E-MP06-6C	Grab	37 ft.	526850.09	2202670.50	30° 23.5110' N	81° 24.6093' W
E-MP06-7A	Grab	38 ft.	527112.40	2202693.79	30° 23.5150' N	81° 24.5594' W
E-MP06-7B	Grab	37 ft.	527129.23	2202115.45	30° 23.4196' N	81° 24.5558' W
E-MP06-7C	Grab	35 ft.	527450.68	2201491.16	30° 23.3168' N	81° 24.4942' W
E-MP06-8A	Grab	35 ft.	526595.04	2202473.81	30° 23.4784' N	81° 24.6577' W
E-MP06-8B	Grab	34 ft.	526929.38	2202071.32	30° 23.4122' N	81° 24.5938' W
E-MP06-8C	Grab	34 ft.	527120.76	2201517.20	30° 23.3209' N	81° 24.5570' W
E-MP06-9A Dupe	Grab	40 ft.	528452.06	2203776.43	30° 23.6944' N	81° 24.3052' W
E-MP06-9B Dupe	Grab	61 ft.	528337.37	2203589.54	30° 23.6635' N	81° 24.3269' W
E-MP06-9C Dupe	Grab	47 ft.	527700.37	2203265.10	30° 23.6096' N	81° 24.4479' W
Coordinates:	U.S. State Plane 1983		Florida East	Zone NAD-83	Units: Feet	

Table 9. Sediment Organotin Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sample ID	Percent Solids (%)	n-Butyltin mg/Kg (ppm)				Di-n-butyltin mg/Kg (ppm)				Tri-n-butyltin mg/Kg (ppm)			
		Reported Value **(Dry)**	Result Notes	Reported Value **(Wet)**	Result Notes	Reported Value **(Dry)**	Result Notes	Reported Value **(Wet)**	Result Notes	Reported Value **(Dry)**	Result Notes	Reported Value **(Wet)**	Result Notes
E-MP06-Control Sed	82.3%	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U
RS-MP06	56.9%	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U
E-MP06-1	60.2%	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U
E-MP06-2	26.3%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-3	28.2%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-4	28.6%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-5	27.9%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-6	23.1%	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U
										0.039	*	**0.0085**	*
E-MP06-7	21.7%	0.010	U	0.002	U	0.010	U	0.002	U	**0.058** ‡	--	**0.0125** ‡	--
E-MP06-8	25.5%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-9	47.4%	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U
E-MP06-9 Dupe	46.3%	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U

Notes:

U = The compound was analyzed for, but was not detected ("Non-detect") at or above the requested Sampling Plan and Protocol Method Reporting Limit

‡ = Re-analysis result

* = The result is an outlier. See case narrative

-- = No qualifier needed

Table 10. Background Water and Elutriate Oil and Grease, Total Organic Carbon, Total Sulfide, Cyanide and Ammonia Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

	Oil and Grease, Total mg/L (ppm)		Total Organic Carbon mg/L (ppm)		Total Sulfide mg/L (ppm)	
Sample ID	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	1.1	U	2.04	I	2.00	I Q
E-MP06-Control	1.1	U	1.24	I	2.40	I
E-MP06-Reference	1.1	U	2.52	I	4.00	I
E-MP06-1	1.1	U	6.37	--	4.80	--
E-MP06-2	1.1	U	9.10	--	8.60	--
E-MP06-3	1.1	U	7.71	--	32.4	--
E-MP06-4	1.1	U	13.8	--	6.40	--
E-MP06-5	1.1	U	10.4	--	38.4	--
E-MP06-6	1.1	U	7.74	--	13.6	--
E-MP06-7	1.1	U	6.71	--	11.2	--
E-MP06-8	1.1	U	8.30	--	4.80	--
E-MP06-9	1.1	U	5.39	--	39.2	--
E-MP06-9 Dupe	1.1	U	5.82	--	1.60	I
Surface Class III WQS	5.0		not listed		not listed	

	Cyanide mg/L (ppm)		Ammonia mg/L (ppm)	
Sample ID	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	0.002	U Q	0.032	I
E-MP06-Control	0.002	I	0.208	--
E-MP06-Reference	0.002	U	1.35	--
E-MP06-1	0.002	U	14.2	--
E-MP06-2	0.002	U	11.8	--
E-MP06-3	0.002	U	22.3	--
E-MP06-4	0.014	--	32.4	--
E-MP06-5	0.002	U	32.1	--
E-MP06-6	0.002	U	11.9	--
E-MP06-7	0.002	U	10.0	--
E-MP06-8	0.002	U	10.2	--
E-MP06-9	0.002	I	9.18	--
E-MP06-9 Dupe	0.004	I	12.2	--
Surface Class III WQS	0.001		not listed	

Notes:

U = The compound was analyzed for, but was not detected at or above the requested Sampling Plan and Protocol Method Reporting Limit

I = Result between detection limit and practical quantitation limit

Q = Sample analyzed out of holding time

-- = No qualifier needed

Table 11. Background Water and Elutriate Metals Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

	Arsenic µg/L (ppb)		Cadmium µg/L (ppb)		Chromium µg/L (ppb)		Copper µg/L (ppb)		Lead µg/L (ppb)	
Sample ID	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	1.83	N	0.5	U	0.5	U	1.00	U	1.0	U
E-MP06-Control	1.78	--	0.5	U	0.5	U	1.66	--	1.0	U
E-MP06-Reference	6.01	--	0.5	U	0.5	U	1.00	U	1.0	U
E-MP06-1	12.6	--	0.5	U	0.5	U	2.28	--	1.0	U
E-MP06-2	36.7	--	0.5	U	0.5	U	1.91	--	1.0	U
E-MP06-3	21.1	--	0.5	U	0.5	U	1.14	--	1.0	U
E-MP06-4	**55.3**	--	0.5	U	0.5	U	**3.79**	--	1.0	U
E-MP06-5	46.9	--	0.5	U	0.5	U	3.38	--	1.0	U
E-MP06-6	**58.8**	--	0.5	U	0.5	U	1.54	--	1.0	U
E-MP06-7	12.6	--	0.5	U	0.5	U	2.79	--	1.0	U
E-MP06-8	32.7	--	0.5	U	0.5	U	3.00	--	1.0	U
E-MP06-9	15.4	--	0.5	U	0.5	U	1.36	--	1.0	U
E-MP06-9 Dupe	17.5	--	0.5	U	0.5	U	1.00	U	1.0	U
Surface Class III WQS	50		8.8		50		3.7		8.5	

	Mercury µg/L (ppb)		Nickel µg/L (ppb)		Silver µg/L (ppb)		Zinc µg/L (ppb)	
Sample ID	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	0.20	U	1.0	U	1.0	U	1.5	--
E-MP06-Control	0.20	U	1.0	U	1.0	U	3.4	--
E-MP06-Reference	0.20	U	1.0	U	1.0	U	2.9	--
E-MP06-1	0.20	U	1.0	U	1.0	U	11.2	--
E-MP06-2	0.20	U	1.0	U	1.0	U	3.1	--
E-MP06-3	0.20	U	1.0	U	1.0	U	4.4	--
E-MP06-4	0.20	U	1.0	U	1.0	U	3.9	--
E-MP06-5	0.20	U	1.0	U	1.0	U	20.2	--
E-MP06-6	0.20	U	1.0	U	1.0	U	14.4	--
E-MP06-7	0.20	U	1.0	U	1.0	U	4.1	--
E-MP06-8	0.20	U	1.0	U	1.0	U	6.5	--
E-MP06-9	0.20	U	1.0	U	1.0	U	13.1	--
E-MP06-9 Dupe	0.20	U	1.0	U	1.0	U	6.1	--
Surface Class III WQS	0.025		8.3		2.3		86	

Notes:

U = The compound was analyzed for, but was not detected at or above the requested Sampling Plan and Protocol Method Reporting Limit

-- = No qualifier needed

N = The matrix spike sample recovery is not within control limits. See laboratory case narrative.

Table 15. Background Water and Elutriate Organotin Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sample ID	n-Butyltin µg/L (ppb)		Di-n-butyltin µg/L (ppb)		Tri-n-butyltin µg/L (ppb)	
	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	0.010	U	0.010	U	0.010	U
E-MP06-Control	0.010	U	**0.013**	J	0.010	U
E-MP06-Reference	0.010	U	**0.012**	J	0.010	U
E-MP06-1	0.010	U	0.010	U	0.010	U
E-MP06-2	0.010	U	0.010	U	0.010	U
E-MP06-3	0.010	U	0.010	U	0.010	U
E-MP06-4	0.010	U	0.010	U	0.010	U
E-MP06-5	0.010	U	0.010	U	0.010	U
E-MP06-6	0.010	U	0.010	U	0.010	U
E-MP06-7	0.010	U	0.010	U	0.010	U
E-MP06-8	0.010	U	**0.011**	J	0.010	U
E-MP06-9	0.010	U	**0.013**	J	0.010	U
E-MP06-9 Dupe	0.010	U	**0.016**	J	0.010	U
Surface Class III WQS	not listed		not listed		not listed	

Notes:

U = The compound was analyzed for, but was not detected at or above the requested Sampling Plan and Protocol Method Reporting Limit.

J = The result is an estimated concentration that is less than the MRL but greater than or equal to the laboratory's MDL

Table 26. 96-Hour *Americamysis bahia* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Harbor, November 2006 (Page 1 of 2)

Sample	Replicate	Number of Survivors[a]
Control Seawater	A	10
	B	10
	C	10
	D	10
	E	10
	Total	50
	Percent	100%

Sample	Replicate	Elutriate Concentration		
		10%	50%	100%
Control Sediment	A	9	10	10
	B	10	10	9
	C	9	10	10
	D	10	8	9
	E	10	9	10
	Total	48	47	48
	Percent	96%	94%	96%
E-MP06-6	A	10	9	10
	B	10	8	10
	C	10	9	9
	D	10	10	9
	E	9	10	9
	Total	49	46	47
	Percent	98%	92%	94%
E- MP06-7	A	10	9	10
	B	10	10	10
	C	7	10	10
	D	8	9	9
	E	9	10	10
	Total	44	48	49
	Percent	88%	96%	98%

Table 26. 96-Hour *Americamysis bahia* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Harbor, November 2006 (Page 2 of 2)

Sample	Replicate	Elutriate Concentration		
		10%	50%	100%
E- MP06-8	A	9	10	9
	B	9	9	10
	C	10	10	9
	D	8	10	9
	E	10	9	9
	Total	46	48	46
	Percent	92%	96%	92%
E- MP06-9	A	10	10	8
	B	8	9	9
	C	10	8	9
	D	9	10	9
	E	10	9	9
	Total	47	46	44
	Percent	94%	92%	88%
E- MP06-9 Dupe	A	8	10	9
	B	9	10	10
	C	9	8	9
	D	9	7	9
	E	9	10	10
	Total	44	45	47
	Percent	88%	90%	94%

a - Based upon 50 organisms exposed.

Source: MACTEC, 2006.

Table 27. Summary of Two-Sample T-Test Assuming Equal Variances of Control Water (0 percent Elutriate) and Test Sediment (100 percent Elutriate) on *Americamysis bahia* Survival for Mayport Naval Station, November 2006 (Page 1 of 2)

Two-Sample T-Test Assuming Equal Variances

Sample ID	Transformed Mean	Significance
Control Water (0 percent Elutriate)	1.5708	
E-MP06-6 (100 percent)	1.378	*
E-MP06-7 (100 percent)	1.506	
E-MP06-8 (100 percent)	1.313	*
E-MP06-9 (100 percent)	1.221	*
E-MP06-9 Dupe (100 percent)	1.378	*

Critical Values alpha = 0.05
* indicates significant difference from control

Source: MACTEC, 2007.

Table 27. Summary of Two-Sample T-Test Assuming Equal Variances of Control Sediment (100 percent Elutriate) and Test Sediment (100 percent Elutriate) on *Americamysis bahia* Survival for Mayport Naval Station, November 2006 (Page 2 of 2)

Two-Sample T-Test Assuming Equal Variances

Sample ID	Transformed Mean	Significance
Control Sediment (0 percent Elutriate)	1.442	
E-MP06-6 (100 percent)	1.378	
E-MP06-7 (100 percent)	1.378	
E-MP06-8 (100 percent)	1.313	
E-MP06-9 (100 percent)	1.221	*
E-MP06-9 Dupe (100 percent)	1.378	

Critical Values alpha = 0.05
* indicates significant difference from control

Source: MACTEC, 2007.

Table 28. 96-Hour *Menidia beryllina* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Naval Station, November 2006 (Page 1 of 2)

Sample	Replicate	Number of Survivors[a]
Control Seawater	A	10
	B	9
	C	9
	D	10
	E	10
	Total	48
	Percent	96%

Sample	Replicate	Elutriate Concentration Number of Survivors		
		10%	50%	100%
Control Sediment	A	9	10	9
	B	9	10	10
	C	10	10	10
	D	10	10	10
	E	9	9	9
	Total	47	49	48
	Percent	94%	98%	96%
E-MP06-6	A	(b)	0	0
	B	7	2	0
	C	7	7	0
	D	7	7	0
	E	7	5	0
	Total	28	21	0
	Percent	70%	42%	0%
E- MP06-7	A	3	0	0
	B	1	0	0
	C	4	0	0
	D	1	0	0
	E	1	0	0
	Total	10	0	0
	Percent	20%	0%	0%

Table 28. 96-Hour *Menidia beryllina* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Naval Station, November 2006 (Page 2 of 2)

Sample	Replicate	Elutriate Concentrations Number of Survivors		
		10%	50%	100%
E- MP06-8	A	3	0	0
	B	1	0	0
	C	5	0	0
	D	1	0	0
	E	0	0	0
	Total	10	0	0
	Percent	20%	0%	0%
E- MP06-9	A	4	1	0
	B	7	5	0
	C	7	5	0
	D	3	3	0
	E	4	3	0
	Total	25	17	0
	Percent	50%	34%	0%
E- MP06-9 Dupe	A	(b)	0	0
	B	7	3	0
	C	8	0	0
	D	7	5	0
	E	6	3	0
	Total	28	11	0
	Percent	70%	22%	0%

(a) Survival based on 50 organisms exposed per concentration

(b) Replicate lost due to breakage; survival based on 40 organisms instead of 50 organisms.

Source: MACTEC, 2006.

Table 29. Summary of Wilcoxon's Rank Sum Test with Bonferroni Adjustment Test of Control Water (0 percent Elutriate) or Control Sediment (100 percent Elutriate) and Test Sediment (100 percent Elutriate) on *Menidia beryllina* Survival for Mayport Naval Station, November 2006 (Page 1 of 2)

Wilcoxon's Rank Sum Test with Bonferroni adjustment

Sample ID	Transformed Mean	Rank Sum	Significance
Control Water (0 percent Elutriate)	0.960		
E-MP06-6 (100 percent)	0.000	15.0	*
E-MP06-7 (100 percent)	0.000	15.0	*
E-MP06-8 (100 percent)	0.000	15.0	*
E-MP06-9 (100 percent)	0.000	15.0	*
E-MP06-9 Dupe (100 percent)	0.000	15.0	*

Critical Values use k=6, are 1 tailed, and alpha = 0.05
* indicates significant difference from control

Source: MACTEC, 2007.

Table 29. Summary of Wilcoxon's Rank Sum Test with Bonferroni Adjustment Test of Control Water (0 percent Elutriate) or Control Sediment (100 percent Elutriate) and Test Sediment (100 percent Elutriate) on *Menidia beryllina* Survival for Mayport Naval Station, November 2006 (Page 2 of 2)

Wilcoxon's Rank Sum Test with Bonferroni adjustment

Sample ID	Transformed Mean	Rank Sum	Significance
Control Sediment (100 percent Elutriate)	0.960		
E-MP06-6 (100 percent)	0.000	15.0	*
E-MP06-7 (100 percent)	0.000	15.0	*
E-MP06-8 (100 percent)	0.000	15.0	*
E-MP06-9 (100 percent)	0.000	15.0	*
E-MP06-9 Dupe (100 percent)	0.000	15.0	*

Critical Values use k=9, are 1 tailed, and alpha = 0.05
* indicates significant difference from control

Source: MACTEC, 2007.

Table 30. Sea Urchin, *Arbacia punctulata*, Fertilization Test Counts and Percentages in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Naval Station, November 2006 (Page 1 of 2)

Sample	Replicate [a]	Number Fertilized
Control [b]	A	73
	B	81
	C	70
	Total	224
	Percent	75%

Sample	Replicate [a]	Concentrations [c], and Number Fertilized		
		10%	50%	100%
Control Sediment	A	69	76	88
	B	83	80	68
	C	80	72	74
	Total	232	228	230
	Percent	77%	76%	77%
E-MP06-6	A	70	81	67
	B	65	76	72
	C	77	75	73
	Total	212	232	212
	Percent	71%	77%	71%
E- MP06-7	A	70	68	65
	B	66	63	70
	C	68	71	63
	Total	204	202	198
	Percent	68%	67%	66%
E-MP06-8	A	77	66	60
	B	69	70	63
	C	72	71	65
	Total	218	207	188
	Percent	73%	69%	63%

Table 30. Sea Urchin, *Arbacia punctulata*, Fertilization Test Counts and Percentages in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Naval Station, November 2006 (Page 2 of 2)

Sample	Replicate [(a)]	Concentrations [(c)], and Number Fertilized		
		10%	50%	100%
E-MP06-9	A	82	68	70
	B	74	71	63
	C	75	66	64
	Total	231	205	197
	Percent	77%	68%	66%
E-MP06-9 Dupe	A	72	68	61
	B	69	71	70
	C	73	77	63
	Total	214	216	194
	Percent	71%	72%	65%

[a]One hundred eggs counted per replicate
[b]Control: filtered natural seawater
[c]Percent concentrations of elutriate

SOURCE: MACTEC, 2006

Table 31. Summary of ANOVA and Dunnett's Tests of Control Seawater (0% Elutriate) or Control Sediment (100% Elutriate) and Test Sediment (100% Elutriate on *A. punctulata* Fertilization, Mayport Naval Station, November 2006 (Page 1 of 2)

A. punctulata 100% Elutriates vs. Control Seawater

ANOVA for Differences Between Means

Source of Variation	df	Sum of Squares	Mean Square	F
Between Means	6	0.052	0.009	2.953
Within Means	14	0.041	0.003	
Total	20	0.092		

Since F is > Critical F; reject H_o: all groups are equal; with $\alpha = 0.05$, and 6,14 df.

Dunnett's Post Hoc Test

Sample ID	Transformed Mean	Significance
Control Seawater	0.747	
E-MP06-6	0.707	
E-MP06-7	0.660	
E-MP06-8	0.627	*
E-MP06-9	0.657	
E-MP06-9 Dupe	0.647	

* Indicates the sample station had significantly less fertilization than the control seawater

Source: MACTEC, 2007.

Table 31. Summary of ANOVA and Dunnett's Tests of Control Seawater (0% Elutriate) or Control Sediment (100% Elutriate) and Test Sediment (100% Elutriate on *A. punctulata* Fertilization, Mayport Naval Station, November 2006 (Page 2 of 2)

A. punctulata 100% Elutriates vs. Control Sediment (100% elutriate)

ANOVA for Differences Between Means

Source of Variation	df	Sum of Squares	Mean Square	F
Between Means	5	0.060	0.012	5.515
Within Means	12	0.026	0.002	
Total	17	0.086		

Since F is > Critical F (= 3.11) reject H_o: all groups are equal; with $\alpha = 0.05$, and 5, 12

Dunnett's Post Hoc Test

Sample ID	Transformed Mean	Significance
Control Sediment (100%)	0.800	
E-MP06-6	0.707	
E-MP06-7	0.660	*
E-MP06-8	0.627	*
E-MP06-9	0.657	*
E-MP06-9 Dupe	0.647	*

* Indicates the sample station had significantly less fertilization than the control seawater

Source: MACTEC, 2007.

Table 32. LC_{50} or EC_{50} (*Americamysis bahia*, *Menidia beryllina* and *A. punctulata*) Values[a] for Mayport Naval Station, November 2006, Percent Concentrations Elutriate Bioassay.

Sample ID	*Americamysis bahia* LC_{50}	*Menidia beryllina* LC_{50}	*Arbacia punctulata* EC_{50}
Control Seawater	>100	>100	>100
Control Sediment	>100	>100	>100
E-MP06-6	>100	31.4	>100
E-MP06-7	>100	<10	>100
E-MP06-8	>100	<10	>100
E-MP06-9	>100	12.2	>100
E- MP06-9 Dupe	>100	20.9	>100

[a] LC_{50} values recorded as greater than 100% had greater than 50 percent survivorship. In the case of sea urchin (*A. punctulata*), an EC_{50} value recorded as greater than 100% had fertilization greater than 50 percent.

Source: MACTEC, 2006.

Table 33. 10-Day Sediment *Americamysis bahia* Survival, Mayport Naval Station Sediments, November 2006. (Page 1 of 2)

Sample	Replicate	Number of Survivors[a]
Control Sediment	A	20
	B	19
	C	20
	D	20
	E	19
	Total	98
	Percent	98%
E-MP06-6	A	18
	B	17
	C	20
	D	19
	E	15
	Total	89
	Percent	89%
E-MP06-7	A	20
	B	18
	C	19
	D	18
	E	19
	Total	94
	Percent	94%
E-MP06-8	A	20
	B	20
	C	20
	D	20
	E	18
	Total	98
	Percent	98%

Table 33. 10-Day Sediment *Americamysis bahia* Survival, Mayport Naval Station Sediments, November 2006. (Page 2 of 2)

Sample	Replicate	Number of Survivors[a]
E-MP06-9	A	16
	B	20
	C	16
	D	15
	E	15
	Total	82
	Percent	82%
E-MP06-9 Dupe	A	19
	B	19
	C	19
	D	18
	E	19
	Total	94
	Percent	94%
RS-MP06	A	19
	B	19
	C	19
	D	17
	E	20
	Total	94
	Percent	94%

a - Based upon 100 organisms exposed.

Source: MACTEC, 2006.

Table 34. Summary of Two-Sample T-Test Assuming Equal Variances of Reference Sediment and Test Sediment Survival on *Americamysis bahia* Survival for Mayport Naval Station, November 2006 (Page 1 of 1).

A.bahia Reference Sediment vs. Other Samples

Two-Sample T-Test Assuming Equal Variances

Sample ID	Transformed Mean	Significance
Reference	1.356	
E-MP06-6	1.277	
E-MP06-7	1.352	
E-MP06-8	1.506	
E-MP06-9	1.176	
E-MP06-9 Dupe	1.326	

Critical Values alpha = 0.05
* indicates significant difference from reference

Source: MACTEC, 2007.

Table 35. 10-Day Sediment *Leptochirus plumulosus* Survival, Mayport Naval Station Sediments, November 2006, (Page 1 of 2)

Sample	Replicate	Number of Survivors[a]
Control Sediment	A	20
	B	20
	C	19
	D	19
	E	20
	Total	98
	Percent	98%
E-MP06-6	A	10
	B	10
	C	7
	D	15
	E	9
	Total	51
	Percent	51%
E-MP06-7	A	10
	B	9
	C	7
	D	14
	E	12
	Total	52
	Percent	52%
E-MP06-8	A	9
	B	9
	C	10
	D	5
	E	8
	Total	41
	Percent	41%

Table 35. 10-Day Sediment *Leptochirus plumulosus* Survival, Mayport Naval Station Sediments, November 2006, (Page 2 of 2)

Sample	Replicate	Number of Survivors[a]
E-MP06-9	A	6
	B	9
	C	8
	D	5
	E	13
	Total	41
	Percent	41%
E-MP06-9 Dupe	A	5
	B	9
	C	7
	D	15
	E	9
	Total	45
	Percent	45%
RS-MP06	A	5
	B	7
	C	7
	D	7
	E	7
	Total	33
	Percent	33%

a - Based upon 100 organisms exposed.

Source: MACTEC, 2006.

Table 2. Mayport Naval Station 2006 Sediment, Elutriate and Tissue Method Numbers and Detection Limits

Analyte	Sediment Method Number	Laboratory SOPs	Units	Requested Sediment Detection Limit (dry wt)	SE RIM MDL (dry wt)	Achieved Sediment Detection Limit (dry wt)	Elutriate Method Number	Laboratory SOPs	Units	Requested Elutriate Detection Limit	SE RIM MDL	Achieved Elutriate Detection Limit	Tissue Method Number	Laboratory SOPs	Units	Requested Tissue Detection Limit (wet wt)	SE RIM MDL (wet wt)	Achieved Tissue Detection Limit (wet wt)
Acenaphthene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00016 - 0.00074	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0031	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Acenaphthylene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00022 - 0.0011	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0023	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Anthracene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00022 - 0.0011	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0039	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Benzo (a) anthracene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00016 - 0.00074	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0039	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Benzo (a) pyrene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00022 - 0.0011	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0043	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Benzo (b) fluoranthene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00048 - 0.0023	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0046	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Benzo (k) fluoranthene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00033 - 0.0016	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0051	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Benzo (g,h,i) perylene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00023 - 0.0011	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0041	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Chrysene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00041 - 0.0019	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0053	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Dibenzo (a,h) anthracene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00026 - 0.0012	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0036	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Fluoranthene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00034 - 0.0016	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0047	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Fluorene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00019 - 0.00088	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0036	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Indeno (1,2,3-c,d) pyrene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00024 - 0.0012	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0033	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Naphthalene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00042 - 0.0016	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0065	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Phenanthrene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00033 - 0.0016	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0032	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
Pyrene	EPA 3541 / 8270C SIM	CAS SOC-8270P	mg/kg	0.020	0.03	0.00036 - 0.0017	EPA 3520C / 8270C SIM	CAS SOC-8270P	µg/L	5	--	0.0047	EPA 8270C SIM	CAS SOC-8270P	mg/kg	0.02	0.03	see Addendum 1
n-butyltin	Krone	SOC-BUTYL	mg/kg	0.01	0.01	0.000037 - 0.00014	EPA 3520C Krone	SOC-BUTYL	µg/L	0.01	--	0.0017 - 0.0025	GC-FPD	SOC-BUTYL	µg/kg	10	10	see Addendum 1
di-n-butyltin	Krone	SOC-BUTYL	mg/kg	0.01	0.01	0.000035 - 0.00013	EPA 3520C Krone	SOC-BUTYL	µg/L	0.01	--	0.00055	GC-FPD	SOC-BUTYL	µg/kg	10	10	see Addendum 1
tri-n-butyltin	Krone	SOC-BUTYL	mg/kg	0.01	0.01	0.000069 - 0.00026	EPA 3520C Krone	SOC-BUTYL	µg/L	0.01	--	0.00060	GC-FPD	SOC-BUTYL	µg/kg	10	10	see Addendum 1
Ammonia	EPA 350.1	AEL AN0015	mg/kg	0.10	0.10	0.009 (mg/L)	EPA 350.1	AEL AN0015	mg/L	0.01	--	0.009	--	--	--	--	--	--
Cyanide	EPA 335.2	AEL AN0011	mg/kg	1.0	1.0	0.002 (mg/L)	EPA 335.2	AEL AN0011	mg/L	0.001	--	0.002	--	--	--	--	--	--
Oil and Grease	EPA 1664	CAS 1664	mg/kg	1.0	--	70	EPA 1664	CAS 1664	mg/L	1.0	--	1.1	--	--	--	--	--	--
Total Organic Carbon	EPA 9060M	CAS GEN-ASTM	%	0.1	0.1	0.02	EPA 415.1	AEL AN0004	mg/L	0.1	--	1.0	--	--	--	--	--	--
Total Sulfides	EPA 9030M	CAS GEN-AVS	mg/kg	--	0.20	--	EPA 376.1	AEL AN0032	mg/L	0.20	--	1.0	--	--	--	--	--	--
Percent Solids (wet wt)	EPA 160.3M	CAS GEN-160.3	%	1.0	1.0	1.0	--	--	--	--	--	--	EPA 160.3M	CAS GEN-160.3	%	0.1	0.1	see Addendum 1
Percent Lipids	--	--	--	--	--	--	--	--	--	--	--	--	NOAA	CAS SOC-LIPID	%	0.1	0.1	see Addendum 1
Grain Size	ASTM D422	ASTM D422	%	1.0	1.0	1	--	--	--	--	--	--	--	--	--	--	--	--
Specific Gravity	ASTM D854	ASTM D854	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atterburg Limits	ASTM D4318	ASTM D4318	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Settling Rates	Corps SAD Lab Methods	Corps SAD	g/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Note:
Sediment Requested Detection Limits are based on the USACE Mayport Naval Station 103 Evaluation - 2006 Sampling Plan and Protocol
-- = not listed
* = dry weight basis

Table 2. Mayport Naval Station 2006 Sediment, Elutriate and Tissue Method Numbers and Detection Limits

Analyte	Sediment Method Number	Laboratory SOPs	Units	Requested Sediment Detection Limit (dry wt)	SE RIM MDL (dry wt)	Achieved Sediment Detection Limit (dry wt)	Elutriate Method Number	Laboratory SOPs	Units	Requested Elutriate Detection Limit	SE RIM MDL	Achieved Elutriate Detection Limit	Tissue Method Number	Laboratory SOPs	Units	Requested Tissue Detection Limit (wet wt)	SE RIM MDL (wet wt)	Achieved Tissue Detection Limit (wet wt)
Aluminum	EPA 6010B	CAS MET 6010 B	mg/kg	0.5	--	4.4 - 7.7	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	EPA 6021	CAS MET 6021	mg/kg	0.5	0.50	0.06 - 0.09	EPA 200.8	CAS MET-ICP.MS	µg/L	1.0	--	0.04 - 0.05	EPA 200.8	CAS MET-ICP.MS	mg/kg	0.2	0.10	see Addendum 1
Cadmium	EPA 6022	CAS MET 6022	mg/kg	0.1	0.10	0.003 - 0.005	EPA 200.8	CAS MET-ICP.MS	µg/L	0.5	--	0.01	EPA 200.8	CAS MET-ICP.MS	mg/kg	0.1	0.10	see Addendum 1
Chromium	EPA 6010B	CAS MET 6010 B	mg/kg	0.1	0.10	0.04 - 0.06	EPA 200.8	CAS MET-ICP.MS	µg/L	0.5	--	0.1	EPA 6010B	CAS MET 6010 B	mg/kg	0.1	0.10	see Addendum 1
Copper	EPA 6020	CAS MET-6020	mg/kg	0.1	0.10	0.06 - 0.09	EPA 200.8	CAS MET-ICP.MS	µg/L	1.0	--	0.02	EPA 200.8	CAS MET-ICP.MS	mg/kg	0.1	0.10	see Addendum 1
Iron	EPA 6010B	CAS MET 6010 B	mg/kg	0.5	--	0.5 - 0.9	--	--	--	--	--	--	--	--	--	--	--	--
Lead	EPA 6020	CAS MET-6020	mg/kg	0.3	0.10	0.02 - 0.03	EPA 200.8	CAS MET-ICP.MS	µg/L	1.0	--	0.004 - 0.005	EPA 200.8	CAS MET-ICP.MS	mg/kg	0.1	0.10	see Addendum 1
Mercury	EPA 7471A	CAS MET 7471A	mg/kg	0.05	0.05	0.004	EPA 7470A	CAS MET 7470A	µg/L	0.2	--	0.02	EPA 7471A	CAS MET 7471A	mg/kg	0.02	0.05	see Addendum 1
Nickel	EPA 6020	CAS MET-6020	mg/kg	0.4	0.10	0.05 - 0.08	EPA 200.8	CAS MET-ICP.MS	µg/L	1.0	--	0.04 - 0.05	EPA 200.8	CAS MET-ICP.MS	mg/kg	0.1	0.10	see Addendum 1
Silver	EPA 6020	CAS MET-6020	mg/kg	0.1	0.10	0.006 - 0.009	EPA 200.8	CAS MET-ICP.MS	µg/L	1.0	--	0.01	EPA 200.8	CAS MET-ICP.MS	mg/kg	0.1	0.10	see Addendum 1
Zinc	EPA 6020	CAS MET-6020	mg/kg	0.2	0.01	0.3 - 0.5	EPA 200.8	CAS MET-ICP.MS	µg/L	1.0	--	0.1	EPA 200.8	CAS MET-ICP.MS	mg/kg	0.2	0.10	see Addendum 1
Aldrin	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00019 - 0.00070	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00040 - 0.0016	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.03	see Addendum 1
Chlordane	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.0042 - 0.016	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.015 - 0.050	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.03	see Addendum 1
4,4 DDT	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.000078 - 0.00030	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00058 - 0.0030	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.03	see Addendum 1
4,4 DDE	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00013 - 0.00047	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00036 - 0.0030	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.03	see Addendum 1
4,4 DDD	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00015 - 0.00056	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.0015 - 0.0023	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.03	see Addendum 1
Dieldrin	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00036 - 0.0014	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00035 - 0.0034	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.03	see Addendum 1
Endosulfan I	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.02	0.00021 - 0.00079	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00044 - 0.0014	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.02	see Addendum 1
Endosulfan II	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.02	0.00024 - 0.00088	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00040 - 0.0012	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.02	see Addendum 1
Endosulfan sulfate	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.02	0.000096 - 0.00037	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00047 - 0.0012	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.02	see Addendum 1
Endrin	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00025 - 0.00093	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00068 - 0.0020	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.01	see Addendum 1
Endrin Aldehyde	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.000065 - 0.00025	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00046 - 0.0017	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.01	see Addendum 1
Heptachlor	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.02	0.00098 - 0.0037	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00036 - 0.0014	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.02	see Addendum 1
Heptachlor Epoxide	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.02	0.00016 - 0.00060	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00032 - 0.0048	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.02	see Addendum 1
Alpha-BHC	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00032 - 0.0012	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00033 - 0.0035	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.01	see Addendum 1
Beta-BHC	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00037 - 0.0014	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00083 - 0.0029	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.01	see Addendum 1
Gamma-BHC (Lindane)	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00019 - 0.0007	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00044 - 0.00069	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.01	see Addendum 1
Delta-BHC	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.010	0.01	0.00028 - 0.00011	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00057 - 0.00080	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.01	see Addendum 1
Methoxychlor	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.047	0.02	0.00013 - 0.00060	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.00093 - 0.0018	EPA 8081A	CAS SOC-8081	mg/kg	0.005	0.02	see Addendum 1
Toxaphene	EPA 3540C / 8081A	CAS SOC-8081	mg/kg	0.020	0.01	0.011 - 0.042	EPA 8081A	CAS SOC-8081	µg/L	0.03	--	0.028 - 0.082	EPA 8081A	CAS SOC-8081	mg/kg	0.047	0.01	see Addendum 1
PCB 8	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00024 - 0.00088	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.92 - 8.0	EPA 8081	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 18	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00030 - 0.0012	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	1.3	EPA 8082	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 28	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00014 - 0.0039	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.48 - 4.9	EPA 8083	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 44	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00012 - 0.00046	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	1.1 - 2.8	EPA 8084	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 49	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00035 - 0.0013	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.50 - 4.9	EPA 8085	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 52	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00011 - 0.00041	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.95	EPA 8086	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 66	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.000086 - 0.00033	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.70	EPA 8087	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 77	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00020 - 0.00074	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.47	EPA 8088	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 87	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00019 - 0.00070	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.42	EPA 8089	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 101	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00011 - 0.00042	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.74 - 5.8	EPA 8090	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 105	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00016 - 0.00060	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.42 - 0.43	EPA 8091	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 118	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00016 - 0.00060	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.53	EPA 8092	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 126	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00043 - 0.0017	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.45	EPA 8093	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 128	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00018 - 0.00065	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.37	EPA 8094	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 138	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00012 - 0.00043	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.65 - 0.87	EPA 8095	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 153	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00022 - 0.00083	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.43 - 4.9	EPA 8096	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 156	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.000094 - 0.00036	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.52	EPA 8097	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 169	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00019 - 0.00070	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.57	EPA 8098	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 170	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00020 - 0.00074	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.33	EPA 8099	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 180	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.000093 - 0.00036	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.64	EPA 8100	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 183	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.000095 - 0.00036	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.56 - 4.9	EPA 8101	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 184	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.000081 - 0.00031	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.73	EPA 8102	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 187	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00033 - 0.0013	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.90	EPA 8103	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 195	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00022 - 0.00083	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.44	EPA 8104	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 206	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00012 - 0.00044	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.65	EPA 8105	CAS SOC-8082C	mg/kg	0.001	--	--
PCB 209	EPA 3540C / 8082	CAS SOC-8082C	mg/kg	0.001	--	0.00015 - 0.00056	EPA 3520C / 8082	CAS SOC-8082C	ng/L	10	--	0.64	EPA 8106	CAS SOC-8082C	mg/kg	0.001	--	--

Table 6. Sediment Pesticide Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sample ID	Percent Solids (%)	Aldrin mg/Kg (ppm)				Chlordane mg/Kg (ppm)				4,4 DDT mg/Kg (ppm)				4,4 DDD mg/Kg (ppm)				4,4 DDE mg/Kg (ppm)				Dieldrin mg/Kg (ppm)				Endosulfan I mg/Kg (ppm)				Endosulfan II mg/Kg (ppm)				Endosulfan sulfate mg/Kg (ppm)				Endrin mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U
RS-MP06	56.9%	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U
E-MP06-1	60.2%	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U
E-MP06-2	26.3%	0.010	U	0.003	U	0.013	U ^	0.003	U ^	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-3	28.2%	0.010	U	0.003	U	0.013	U ^	0.004	U ^	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-4	28.6%	0.010	U	0.003	U	0.012	U ^	0.003	U ^	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-5	27.9%	0.010	U	0.003	U	0.013	U ^	0.004	U ^	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-6	23.1%	0.010	U	0.002	U	0.015	U ^	0.003	U ^	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U
E-MP06-7	21.7%	0.010	U	0.002	U	0.016	U ^	0.003	U ^	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U
E-MP06-8	25.5%	0.010	U	0.003	U	0.014	U ^	0.004	U ^	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U
E-MP06-9	47.4%	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U
E-MP06-9 Dupe	46.3%	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U

Sample ID	Percent Solids (%)	Endrin Aldehyde mg/Kg (ppm)				Heptachlor mg/Kg (ppm)				Heptachlor Epoxide mg/Kg (ppm)				Alpha-BHC mg/Kg (ppm)				Beta-BHC mg/Kg (ppm)				Gamma-BHC (Lindane) mg/Kg (ppm)				Delta-BHC mg/Kg (ppm)				Methoxychlor mg/Kg (ppm)				Toxaphene mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.010	U	0.008	U	0.020	U	0.016	U	0.047	U	0.039	U
RS-MP06	56.9%	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.020	U	0.011	U	0.047	U	0.027	U
E-MP06-1	60.2%	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.010	U	0.006	U	0.020	U	0.012	U	0.047	U	0.028	U
E-MP06-2	26.3%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.020	U	0.005	U	0.047	U	0.012	U
E-MP06-3	28.2%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.020	U	0.006	U	0.047	U	0.013	U
E-MP06-4	28.6%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.020	U	0.006	U	0.047	U	0.013	U
E-MP06-5	27.9%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.020	U	0.006	U	0.047	U	0.013	U
E-MP06-6	23.1%	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.020	U	0.005	U	0.047	U	0.011	U
E-MP06-7	21.7%	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.010	U	0.002	U	0.020	U	0.004	U	0.047	U	0.010	U
E-MP06-8	25.5%	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.010	U	0.003	U	0.020	U	0.005	U	0.047	U	0.012	U
E-MP06-9	47.4%	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.020	U	0.009	U	0.047	U	0.022	U
E-MP06-9 Dupe	46.3%	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.010	U	0.005	U	0.020	U	0.009	U	0.047	U	0.022	U

Notes:

U = The compound was analyzed for, but was not detected ("Non-detect") at or above the requested Sampling Plan and Protocol Method Reporting Limit

^ = The method detection limit was greater than the requested Sampling Plan and Protocol method detection limit

-- = No qualifier needed

Table 7. Sediment PCB Congener Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sample ID	Percent Solids (%)	PCB 08 mg/Kg (ppm)				PCB 18 mg/Kg (ppm)				PCB 28 mg/Kg (ppm)				PCB 44 mg/Kg (ppm)				PCB 52 mg/Kg (ppm)				PCB 66 mg/Kg (ppm)				PCB 77 mg/Kg (ppm)				PCB 87 mg/Kg (ppm)				PCB 49 mg/Kg (ppm)				PCB 101 mg/Kg (ppm)				PCB 105 mg/Kg (ppm)				PCB 118 mg/Kg (ppm)				PCB 126 mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U
RS-MP06	56.9%	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U
E-MP06-1	60.2%	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U
E-MP06-2	26.3%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0011	U^	0.0003	U^	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0014	U^	0.0004	U^
E-MP06-3	28.2%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0013	U^	0.0004	U^
E-MP06-4	28.6%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0013	U^	0.0004	U^
E-MP06-5	27.9%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0011	U^	0.0003	U^	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0013	U^	0.0004	U^
E-MP06-6	23.1%	0.0010	U	0.0002	U	0.0011	U^	0.0003	U^	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0013	U^	0.0003	U^	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0016	U^	0.0004	U^
E-MP06-7	21.7%	0.0010	U	0.0002	U	0.0012	U^	0.0003	U^	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0013	U^	0.0003	U^	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0017	U^	0.0004	U^
E-MP06-8	25.5%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0011	U^	0.0003	U^	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0014	U^	0.0004	U^
E-MP06-9	47.4%	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U
E-MP06-9 Dupe	46.3%	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U

Sample ID	Percent Solids (%)	PCB 128 mg/Kg (ppm)				PCB 138 mg/Kg (ppm)				PCB 153 mg/Kg (ppm)				PCB 156 mg/Kg (ppm)				PCB 169 mg/Kg (ppm)				PCB 170 mg/Kg (ppm)				PCB 180 mg/Kg (ppm)				PCB 183 mg/Kg (ppm)				PCB 184 mg/Kg (ppm)				PCB 187 mg/Kg (ppm)				PCB 195 mg/Kg (ppm)				PCB 206 mg/Kg (ppm)				PCB 209 mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U	0.0010	U	0.0008	U
RS-MP06	56.9%	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	**0.0013**	–	**0.0007**	–	0.0010	U	0.0006	U
E-MP06-1	60.2%	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U	0.0010	U	0.0006	U
E-MP06-2	26.3%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0011	U^	0.0003	U^	0.0010	U	0.0003	U	**0.0012**	–	**0.0003**	–	0.0010	U	0.0003	U
E-MP06-3	28.2%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	**0.0026**	–	**0.0007**	–	0.0010	U	0.0003	U
E-MP06-4	28.6%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	**0.0015**	–	**0.0004**	–	0.0010	U	0.0003	U
E-MP06-5	27.9%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	**0.0024**	–	**0.0007**	–	0.0010	U	0.0003	U
E-MP06-6	23.1%	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0012	U^	0.0003	U^	0.0010	U	0.0002	U	0.0010	U	0.0002	U	**0.0010**	–	**0.0002**	–	0.0010	U	0.0002	U
E-MP06-7	21.7%	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0010	U	0.0002	U	0.0013	U^	0.0003	U^	0.0010	U	0.0002	U	0.0010	U	0.0002	U	**0.0019**	–	**0.0004**	–	0.0010	U	0.0002	U
E-MP06-8	25.5%	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0010	U	0.0003	U	0.0011	U^	0.0003	U^	0.0010	U	0.0003	U	0.0010	U	0.0003	U	**0.0018**	–	**0.0005**	–	0.0010	U	0.0003	U
E-MP06-9	47.4%	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U
E-MP06-9 Dupe	46.3%	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U	0.0010	U	0.0005	U

Notes:

U = The compound was analyzed for, but was not detected ("Non-detect") at or above the requested Sampling Plan and Protocol Method Reporting Limit

^ = The method detection limit was greater than the requested Sampling Plan and Protocol method detection limit

-- = No qualifier needed

Table 8. Sediment PAH Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected Mayport Naval Station 2006

Sample ID	Percent Solids (%)	Acenaphthene mg/Kg (ppm)				Acenaphthylene mg/Kg (ppm)				Anthracene mg/Kg (ppm)				Benzo (a) anthracene mg/Kg (ppm)				Benzo (a) pyrene mg/Kg (ppm)				Benzo (g,h,i) perylene mg/Kg (ppm)				Benzo (k) fluoranthene mg/Kg (ppm)				Benzo (b) fluoranthene mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U
RS-MP06	56.9%	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U
E-MP06-1	60.2%	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U
E-MP06-2	26.3%	0.020	U	0.0053	U	0.020	U	0.0053	U	0.020	U	0.0053	U	0.020	U	0.0053	U	0.020	U	0.0053	U	0.020	U	0.0053	U	0.020	U	0.0053	U	0.020	U	0.0053	U
E-MP06-3	28.2%	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	**0.028**	--	**0.0078**	--	**0.020**	--	**0.0056**	--	0.020	U	0.0056	U	**0.028**	--	**0.0079**	--	**0.024**	--	**0.0068**	--
E-MP06-4	28.6%	0.020	U	0.0057	U	0.020	U	0.0057	U	0.020	U	0.0057	U	0.020	U	0.0057	U	0.020	U	0.0057	U	0.020	U	0.0057	U	0.020	U	0.0057	U	0.020	U	0.0057	U
E-MP06-5	27.9%	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U
E-MP06-6	23.1%	0.020	U	0.0046	U	0.020	U	0.0046	U	0.020	U	0.0046	U	**0.027**	--	**0.0062**	--	0.020	U	0.0046	U	0.020	U	0.0046	U	**0.024**	--	**0.0055**	--	**0.025**	--	**0.0058**	--
E-MP06-7	21.7%	0.020	U	0.0043	U	0.020	U	0.0043	U	0.020	U	0.0043	U	**0.026**	--	**0.0056**	--	**0.020**	--	**0.0043**	--	0.020	U	0.0043	U	**0.030**	--	**0.0065**	--	**0.033**	--	**0.0072**	--
E-MP06-8	25.5%	0.020	U	0.0051	U	0.020	U	0.0051	U	0.020	U	0.0051	U	0.020	U	0.0051	U	0.020	U	0.0051	U	0.020	U	0.0051	U	0.020	U	0.0051	U	**0.027**	--	**0.0069**	--
E-MP06-9	47.4%	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U
E-MP06-9 Dupe	46.3%	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U

Sample ID	Percent Solids (%)	Chrysene mg/Kg (ppm)				Dibenzo (a,h) anthracene mg/Kg (ppm)				Fluoranthene mg/Kg (ppm)				Fluorene mg/Kg (ppm)				Indeno (1,2,3-cd) pyrene mg/Kg (ppm)				Naphthalene mg/Kg (ppm)				Phenanthrene mg/Kg (ppm)				Pyrene mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U	0.020	U	0.0165	U
RS-MP06	56.9%	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U	0.020	U	0.0114	U
E-MP06-1	60.2%	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U	0.020	U	0.0120	U
E-MP06-2	26.3%	**0.025**	--	**0.0066**	--	0.020	U	0.0053	U	**0.040**	--	**0.0105**	--	0.020	U	0.0053	U	0.020	U	0.0053	U	0.020	U	0.0053	U	0.020	U	0.0053	U	**0.031**	--	**0.0082**	--
E-MP06-3	28.2%	**0.081**	--	**0.0228**	--	0.020	U	0.0056	U	**0.073**	--	**0.0206**	--	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	**0.062**	--	**0.0175**	--
E-MP06-4	28.6%	0.020	U	0.0057	U	0.020	U	0.0057	U	**0.034**	--	**0.0097**	--	0.020	U	0.0057	U	0.020	U	0.0057	U	0.020	U	0.0057	U	0.020	U	0.0057	U	**0.028**	--	**0.0080**	--
E-MP06-5	27.9%	**0.020**	--	**0.0056**	--	0.020	U	0.0056	U	**0.039**	--	**0.0109**	--	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	0.020	U	0.0056	U	**0.031**	--	**0.0086**	--
E-MP06-6	23.1%	**0.038**	--	**0.0068**	--	0.020	U	0.0046	U	**0.079**	--	**0.0182**	--	0.020	U	0.0046	U	0.020	U	0.0046	U	0.020	U	0.0046	U	**0.027**	--	**0.0062**	--	**0.062**	--	**0.0143**	--
E-MP06-7	21.7%	**0.043**	--	**0.0093**	--	0.020	U	0.0043	U	**0.056**	--	**0.0122**	--	0.020	U	0.0043	U	0.020	U	0.0043	U	0.020	U	0.0043	U	0.020	U	0.0043	U	**0.048**	--	**0.0104**	--
E-MP06-8	25.5%	**0.025**	--	**0.0064**	--	0.020	U	0.0051	U	**0.051**	--	**0.0130**	--	0.020	U	0.0051	U	0.020	U	0.0051	U	0.020	U	0.0051	U	0.020	U	0.0051	U	**0.049**	--	**0.0125**	--
E-MP06-9	47.4%	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U	0.020	U	0.0095	U
E-MP06-9 Dupe	46.3%	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U	0.020	U	0.0093	U

Notes:

U = The compound was analyzed for, but was not detected ("Non-detect") at or above the requested Sampling Plan and Protocol Method Reporting Limit

-- = No qualifier needed

Table 14. Background Water and Elutriate PAH Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sample ID	Acenaphthene µg/L (ppb)		Acenaphthylene µg/L (ppb)		Anthracene µg/L (ppb)		Benzo (a) anthracene µg/L (ppb)		Benzo (a) pyrene µg/L (ppb)		Benzo (g,h,i) perylene µg/L (ppb)		Benzo (k) fluoranthene µg/L (ppb)		Benzo (b) fluoranthene µg/L (ppb)	
	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-Control	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-Reference	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-1	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-2	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-3	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-4	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-5	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-6	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-7	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-8	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-9	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-9 Dupe	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Surface Class III WQS	2.7 mg/L		0.031 mg/L		110 mg/L		0.031 mg/L		0.031 mg/L		0.031 mg/L		0.031 mg/L		0.031 mg/L	

Sample ID	Chrysene µg/L (ppb)		Dibenzo (a,h) anthracene µg/L (ppb)		Fluoranthene µg/L (ppb)		Fluorene µg/L (ppb)		Indeno (1,2,3-cd) pyrene µg/L (ppb)		Naphthalene µg/L (ppb)		Phenanthrene µg/L (ppb)		Pyrene µg/L (ppb)	
	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-Control	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-Reference	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-1	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-2	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-3	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-4	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-5	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-6	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-7	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-8	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-9	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
E-MP06-9 Dupe	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Surface Class III WQS	0.031 mg/L		0.031 mg/L		0.370 mg/L		14 mg/L		0.031 mg/L		0.031 mg/L		0.031 mg/L		11 mg/L	

Notes:

U = The compound was analyzed for, but was not detected at or above the requested Sampling Plan and Protocol Method Reporting Limit.

-- = No qualifier needed

ter and Elutriate PCB Congener Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

PCB 08 µg/L (ppb)		PCB 18 µg/L (ppb)		PCB 28 µg/L (ppb)		PCB 44 µg/L (ppb)		PCB 52 µg/L (ppb)		PCB 66 µg/L (ppb)		PCB 77 µg/L (ppb)		PCB 87 µg/L (ppb)		PCB 49 µg/L (ppb)		PCB 101 µg/L (ppb)		PCB 105 µg/L (ppb)		PCB 118 µg/L (ppb)		PCB 126 µg/L (ppb)	
Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L	

PCB 128 µg/L (ppb)		PCB 138 µg/L (ppb)		PCB 153 µg/L (ppb)		PCB 156 µg/L (ppb)		PCB 169 µg/L (ppb)		PCB 170 µg/L (ppb)		PCB 180 µg/L (ppb)		PCB 183 µg/L (ppb)		PCB 184 µg/L (ppb)		PCB 187 µg/L (ppb)		PCB 195 µg/L (ppb)		PCB 206 µg/L (ppb)		PCB 209 µg/L (ppb)	
Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L		0.03 µg/L	

/zed for, but was not detected at or above the requested Sampling Plan and Protocol Method Reporting Limit.

Table 12. Background Water and Elutriate Pesticide Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sample ID	Aldrin µg/L (ppb)		Chlordane µg/L (ppb)		4,4 DDT µg/L (ppb)		4,4 DDE µg/L (ppb)		4,4 DDE µg/L (ppb)		Dieldrin µg/L (ppb)		Endosulfan I µg/L (ppb)		Endosulfan II µg/L (ppb)		Endosulfan sulfate µg/L (ppb)		Endrin µg/L (ppb)	
	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-Control	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-Reference	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-1	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-2	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-3	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-4	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-5	0.030	U	0.050	U ^	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-6	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-7	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-8	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-9	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
E-MP06-9 Dupe	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U
Surface Class III WQS	1.3 µg/L		0.004 µg/L		0.001 µg/L		0.001 µg/L		0.001 µg/L		0.0019 µg/L		0.0087 µg/L		0.0087 µg/L		0.0087 µg/L		0.0023 µg/L	

Sample ID	Endrin Aldehyde µg/L (ppb)		Heptachlor µg/L (ppb)		Heptachlor Epoxide µg/L (ppb)		Alpha-BHC µg/L (ppb)		Beta-BHC µg/L (ppb)		Gamma-BHC (Lindane) µg/L (ppb)		Delta-BHC µg/L (ppb)		Methoxychlor µg/L (ppb)		Toxaphene µg/L (ppb)	
	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes	Reported Value	Result Notes
E-MP06-Background Water	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.050	U ^
E-MP06-Control	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.031	U ^
E-MP06-Reference	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.034	U ^
E-MP06-1	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.052	U ^
E-MP06-2	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.041	U ^
E-MP06-3	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.082	U ^
E-MP06-4	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.062	U ^
E-MP06-5	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.068	U ^
E-MP06-6	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.043	U ^
E-MP06-7	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.040	U ^
E-MP06-8	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.028	U ^
E-MP06-9	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.040	U ^
E-MP06-9 Dupe	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.030	U	0.036	U ^
Surface Class III WQS	0.0023 µg/L		0.0036 µg/L		0.0036 µg/L		0.16 µg/L		0.16 µg/L		0.16 µg/L		0.16 µg/L		0.03 µg/L		0.0002 µg/L	

Notes:

U = The compound was analyzed for, but was not detected at or above the requested Sampling Plan and Protocol Method Reporting Limit.
^ = The method detection limit was greater than the requested Sampling Plan and Protocol method detection limit

Table 36. Summary of Two-Sample T-Test Assuming Equal Variances of Reference and Test Sediment on *Leptochirus plumulosus* Survival for Mayport Naval Station, November 2006 (Page 1 of 1)

L. plumulosus Reference Sediment vs. Other Samples

Sample ID	Transformed Mean	Significance
Reference	0.611	
E-MP06-6	0.797	
E-MP06-7	0.806	
E-MP06-8	0.693	
E-MP06-9	0.692	
E-MP06-9 Dupe	0.735	

Critical Values alpha = 0.05
* indicates significant difference from Reference

Source: MACTEC, 2007.

Table 37. Survivorship of *Macoma nasuta* and *Nereis virens* During 28-Day Bioaccumulation Bioassays with Sediments from Mayport Naval Station, November 2006 (Page 1 of 3)

Sample ID	Replicate	*Macoma nasuta*	*Nereis virens*
E-MP06-Control	A	15	19
	B	17	20
	C	16	20
	D	14	20
	E	16	20
	Total	78	99
	Percent	78%	99%
E-MP06-6	A	18	20
	B	13	20
	C	15	20
	D	13	19
	E	13	19
	Total	72	98
	Percent	72%	98%
E-MP06-7	A	16	20
	B	13	19
	C	13	18
	D	17	19
	E	16	20
	Total	75	96
	Percent	75%	96%

Table 37. Survivorship of *Macoma nasuta* and *Nereis virens* During 28-Day Bioaccumulation Bioassays with Sediments from Mayport Naval Station, November 2006 (Page 2 of 3)

Sample ID	Replicate	*Macoma nasuta*[a]	*Nereis virens*
E-MP06-8	A	12	20
	B	15	20
	C	12	20
	D	16	20
	E	16	20
	Total	71	100
	Percent	71%	100%
E-MP06-9	A	15	20
	B	13	20
	C	16	19
	D	14	17
	E	15	20
	Total	73	96
	Percent	73%	96%
E-MP06-Dupe	A	15	19
	B	16	19
	C	15	19
	D	14	17
	E	16	19
	Total	76	93
	Percent	76%	93%

Table 37. Survivorship of *Macoma nasuta* and *Nereis virens* During 28-Day Bioaccumulation Bioassays with Sediments from Mayport Naval Station. November 2006 (Page 3 of 3)

Sample ID	Replicate	*Macoma nasuta*[a]	*Nereis virens*
RS-MP06	A	15	18
	B	14	19
	C	15	20
	D	14	20
	E	13	20
	Total	71	97
	Percent	71%	97%

Source: MACTEC, 2006

Table 38. Summary of Two-Sample T-Test Assuming Equal Variances of Reference and Test Sediment on *Macoma nasuta* Survival for Mayport Naval Station, November 2006 (Page 1 of 1)

M. nasuta Control Sediment vs. Other Samples

Sample ID	Transformed Mean	Significance
E-MP06-Control	1.0851	
E-MP06-6	1.0219	
E-MP06-7	1.0526	
E-MP06-8	1.0067	
E-MP06-9	1.0261	
E-MP06-9 Dupe	1.0600	
Reference	1.0029	*

Critical Values alpha = 0.05
* indicates significant difference from control

Source: MACTEC, 2007.

Table 39. Summary of Wilcoxon's Rank Sum Test with Bonferroni Adjustment Test of Control Sediment and Test Sediment on *Nereis Virens* Survival for Mayport Naval Station, November 2006 (Page 1 of 1)

Wilcoxon's Rank Sum Test with Bonferroni adjustment

Sample ID	Transformed Mean	Rank Sum	Significance
Control	1.436	-	
E-MP06-6	1.413	25.0	
E-MP06-7	1.371	22.0	
E-MP06-8	1.459	30.0	
E-MP06-9	1.379	24.5	
E-MP06-9 Dupe	1.311	17.0	
Reference	1.394	24.5	

Critical Values use k=6, are 1 tailed, and alpha = 0.05
* indicates significant difference from control

Source: MACTEC, 2007.

Table 40. Summary of STFATE Results (page 1 of 1)

	Tier II – Determine Need for Further Testing			Tier II – Compare Water Quality			Tier III – Compare Toxicity Results	
Sample ID	Sediment COC	Concentration in Sample (mg/kg)	Pass/Fail STFATE	Elutriate COC	Concentration in Sample (µg/L)	Pass/Fail STFATE	LC50 *	Pass/Fail STFATE
E-MP06-1	Iron	4,440	Pass	Copper	2.28	Pass	N/A	N/A
E-MP06-2	Iron	18,600	Pass	Arsenic	36.7	Pass	N/A	N/A
E-MP06-3	Iron	22,300	Pass	Arsenic	21.1	Pass	N/A	N/A
E-MP06-4	Iron	20,300	Pass	Cyanide	0.014	Pass	N/A	N/A
E-MP06-5	Iron	19,800	Pass	Copper	3.38	Pass	N/A	N/A
E-MP06-6	Iron	21,500	Pass	Arsenic	58.8	Pass	31.4	**Fail**
E-MP06-7	Iron	24,500	Pass	Copper	2.79	Pass	<10	**Fail**
E-MP06-8	Iron	20,100	Pass	Copper	3.00	Pass	<10	**Fail**
E-MP06-9	Iron	7,130	Pass	Cyanide	2	Pass	12.2	**Fail**
E-MP06-9 DUPE	Iron	7,930	Pass	Cyanide	2	Pass	20.9	**Fail**

Notes:

* LC50 values from *Menidia beryllina* LC50 results presented in *Final Report, Aquatic Toxicity Testing, Mayport Harbor, Florida*, dated February 12, 2007, completed by MACTEC Engineering & Consulting, Inc.

mg/kg - milligrams per kilogram

µg/L - micrograms per liter

N/A - Not Applicable; toxicity testing was not completed for these samples. See *Final Report, Aquatic Toxicity Testing, Mayport Harbor, Florida*, dated February 12, 2007, completed by MACTEC Engineering & Consulting, Inc.

Table 41. STFATE Input Parameters, Jacksonville ODMDS (page 1 of 3)

SITE DESCRIPTION

Parameter	Value	Units
Number of Grid Points (left to right)	45	
Number of Grid Points (top to bottom)	45	
Spacing Between Grid Points (left to right)	750	ft
Spacing Between Grid Points (top to bottom)	750	ft
Constant Water Depth	46	ft
Roughness Height at Bottom of Disposal Site	0.005[1]	ft
Slope of Bottom in X-Direction	0	Deg.
Slope of Bottom in Z-Direction	0	Deg.
Number of Points in Ambient Density Profile Point	2	
Ambient Density at Depth = 0 ft	1.0211	g/cc
Ambient Density at Depth = 70 ft	1.0212	g/cc

AMBIENT VELOCITY DATA

Parameter	Value	Units
Water Depth	46	ft
Profile	Vertically averaged	
X-Direction Velocity at Depth = 46 ft	-0.59	ft/sec
Z-Direction Velocity at Depth = 46 ft	0.24	ft/sec

DISPOSAL OPERATION DATA

Parameter	Value	Units
Location of Disposal Point from Top of Grid	21,040	ft
Location of Disposal Point from Left Edge of Grid	21,040	ft
Dumping Over Depression	0	

Table 41. STFATE Input Parameters, Jacksonville ODMDS (page 2 of 3)

INPUT, EXECUTION AND OUTPUT

Parameter	Value	Units
Location of the Upper Left Corner of the Disposal Site - Distance from Top Edge	18,000	ft
Location of the Upper Left Corner of the Disposal Site - Distance from Left Edge	18,000	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Top Edge	24,000	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Left Edge	24,000	ft
Duration of Simulation	14,400	sec
Long Term Time Step	900	sec

COEFFICIENTS

Parameter	Keyword	Value
Settling Coefficient	BETA	0.000[1]
Apparent Mass Coefficient	CM	1.000[1]
Drag Coefficient	CD	0.500[1]
Form Drag for Collapsing Cloud	CDRAG	1.000[1]
Skin Friction for Collapsing Cloud	CFRIC	0.010[1]
Drag for an Ellipsoidal Wedge	CD3	0.100[1]
Drag for a Plate	CD4	1.000[1]
Friction Between Cloud and Bottom	FRICTN	0.010[1]
4/3 Law Horizontal Diffusion Dissipation Factor	ALAMDA	0.0010[1]
Unstratified Water Vertical Diffusion Coefficient	AKYO	0.0250[1]
Cloud/Ambient Density Gradient Ratio	GAMA	0.250[1]
Turbulent Thermal Entrainment	ALPHAO	0.235[1]
Entrainment in Collapse	ALPHAC	0.100[1]
Stripping Factor	CSTRIP	0.003[1]

[1]Model Default Value

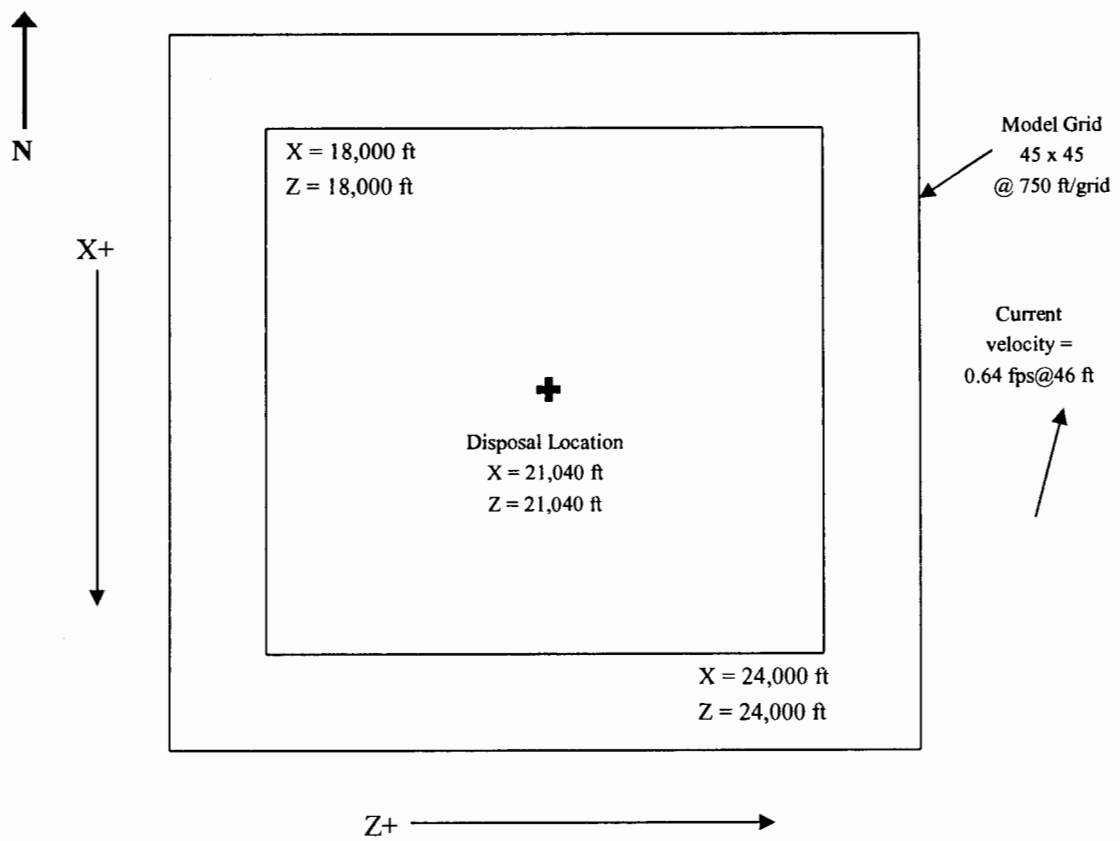
Table 41. STFATE Input Parameters, Jacksonville ODMDS (page 3 of 3)

TYPICAL DILUTION RATES

Model Run #[2]	Dilution at 4 hours	Minimum Dilution outside of ODMDS at all times
E-MP06-1	24,307:1	657:1
E-MP06-2	11,155:1	303:1
E-MP06-3	11,530:1	312:1
E-MP06-4	11,290:1	308:1
E-MP06-5	8,346:1	247:1
E-MP06-6	10,500:1	287:1
E-MP06-7	10,410:1	284:1
E-MP06-8	18,587:1	505:1
E-MP06-9	16,529:1	444:1

[2] Dilution rates given for Tier II, Compare Water Quality models only. Dilution rates obtained for other models (Tier I and Tier III) were comparable to those depicted here.

STFATE Model Grid, Jacksonville ODMDS



MACTEC

REPORT OF SOIL TESTING

Project: COE-Mayport

Project Number: 6063-06-0090-06

Client: Water and Air Research

Date: December 5, 2006

As requested by Mr. Bryan Cotter of Water and Air Research, MACTEC Engineering & Consulting Inc. has completed particle size analysis (ASTM D-422 without hydrometer), moisture content (ASTM D-2216), specific gravity (ASTM D-854), Atterberg limits (ASTM D-4318), and settling rate (USACOE method) of eleven samples delivered to our Jacksonville office on November 20, 2006. The results are outlined below and on the attached sheets.

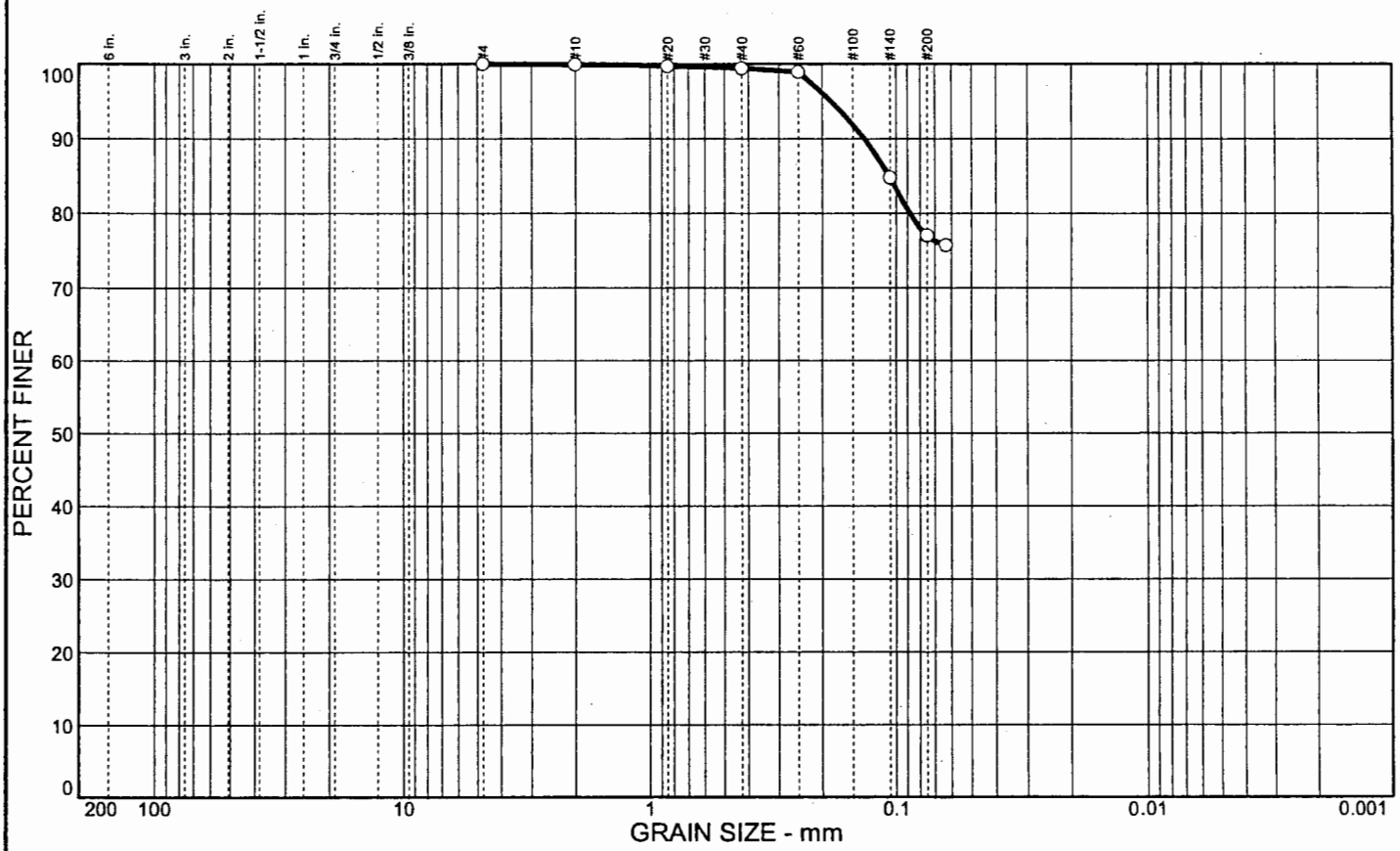
Station	Percent Solids (%)	Moisture Content (% Wet Weight)	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity
E-MP06-1	65.7	34.3	34	27	7	2.608
E-MP06-2	26.7	73.3	149	60	89	2.509
E-MP06-3	29.0	71.0	205	77	127	2.524
E-MP06-4	27.9	72.1	189	63	126	2.537
E-MP06-5	28.0	72.0	174	65	108	2.531
E-MP06-6	22.4	77.6	205	83	122	2.510
E-MP06-7	21.7	78.3	215	81	134	2.522
E-MP06-8	26.7	73.3	171	70	101	2.528
E-MP06-9	49.8	50.2	69	30	40	2.596
RS-MP06	59.9	40.1	43	31	12	2.647
E-MP06-Control	83.2	16.8	NP	NP	NP	2.680

RESPECTFULLY SUBMITTED,

Balaji Balachandran, E.I.

MACTEC Engineering and Consulting Inc.
3901 Carmichael Avenue
Jacksonville, FL 32207
(904)396-5173

Grain Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			23.0	77.0		MH	A-7-5	60	149

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#10	99.9		
#20	99.7		
#40	99.4		
#60	98.9		
#140	84.8		
#200	77.0		
#230	75.7		

SOIL DESCRIPTION

○ SILT, some fine sand, dark gray

REMARKS:

○

○ Source: E-MP06-2

Sample No.: 1

MACTEC ENGINEERING. AND CONSULTING, INC.

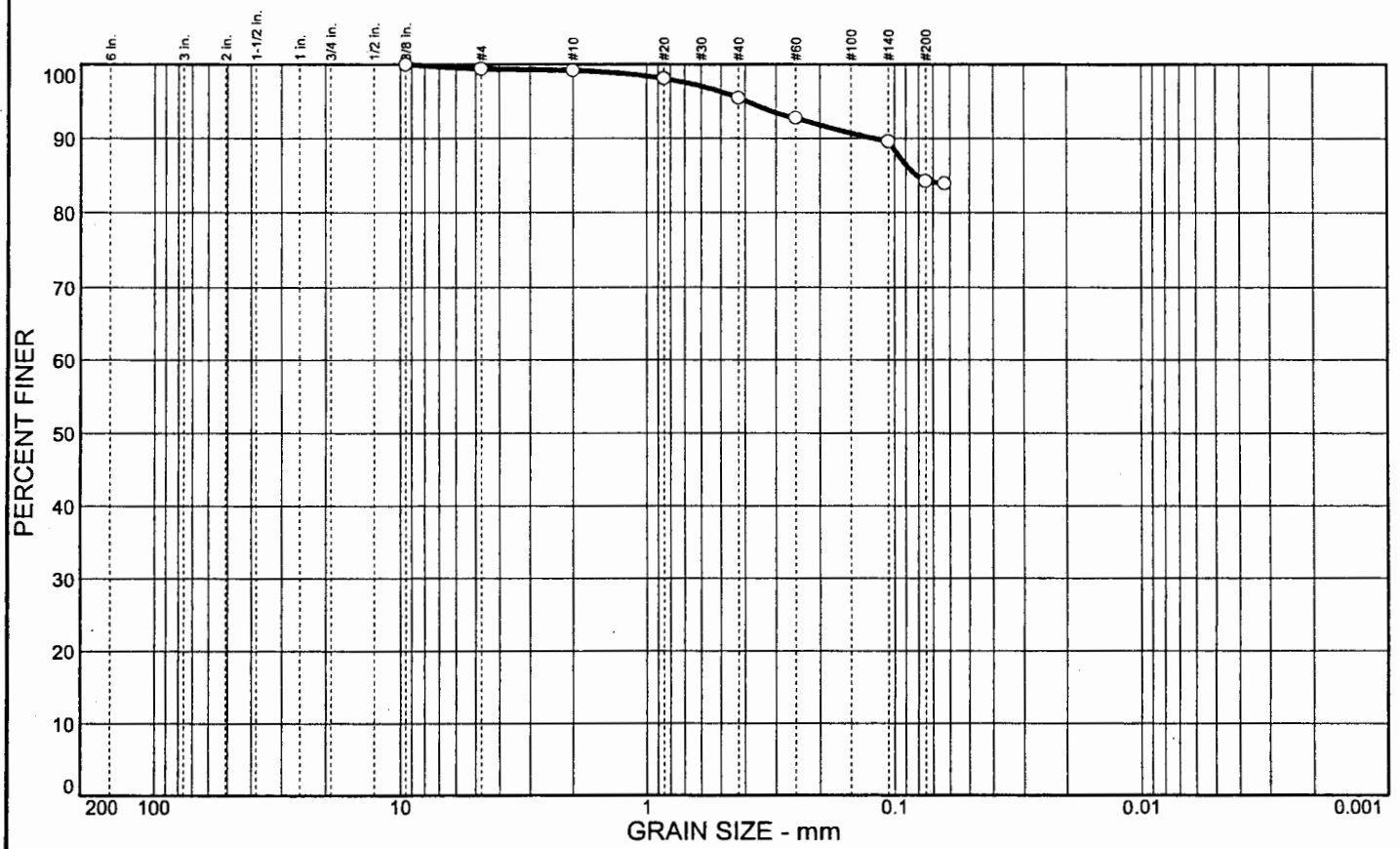
Client: Water and Air Research

Project: Mayport Naval Station

Project No.: 6063-06-0090-06

Reviewed By B.B

Grain Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		0.6	15.1	84.3		CH	A-7-5	63	189

SIEVE inches size	PERCENT FINER ○		
.375	100.0		
	GRAIN SIZE		
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○		
#4	99.4		
#10	99.2		
#20	98.1		
#40	95.5		
#60	92.8		
#140	89.6		
#200	84.3		
#230	84.0		

SOIL DESCRIPTION

○ CLAY, little fine sand, trace mediun to fine sand sized shell fragments, dark gray

REMARKS:

○

○ Source: E-MP06-4

Sample No.: 1

MACTEC ENGINEERING. AND CONSULTING, INC.

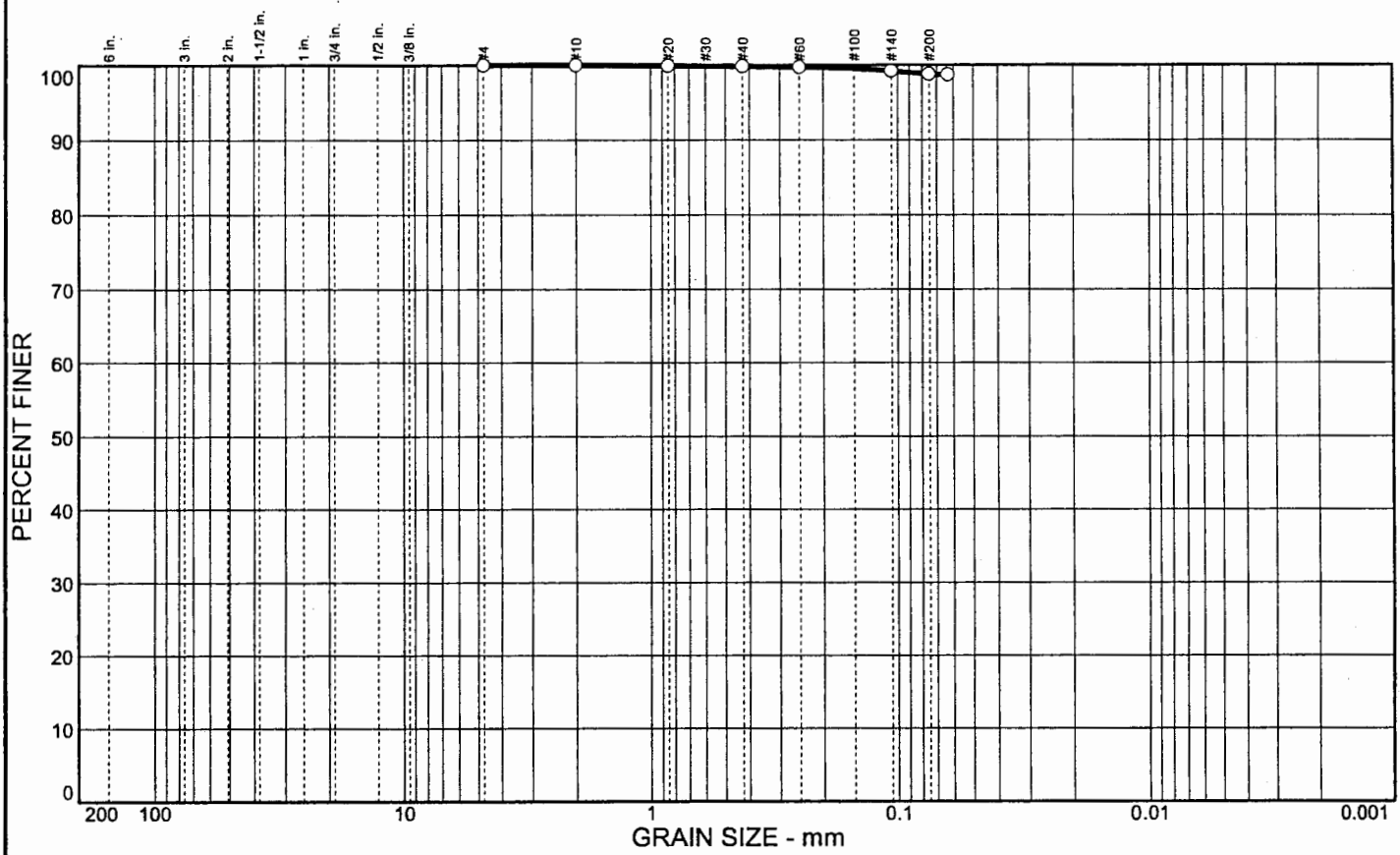
Client: Water and Air Research

Project: Mayport Naval Station

Project No.: 6063-06-0090-06

Reviewed By B.B

Grain Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			1.2	98.8		MH	A-7-5	83	205

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.7		
#140	99.2		
#200	98.8		
#230	98.7		

SOIL DESCRIPTION

○ SILT, trace fine sand, dark gray

REMARKS:

○

○ Source: E-MP06-6

Sample No.: 1

MACTEC ENGINEERING. AND CONSULTING, INC.

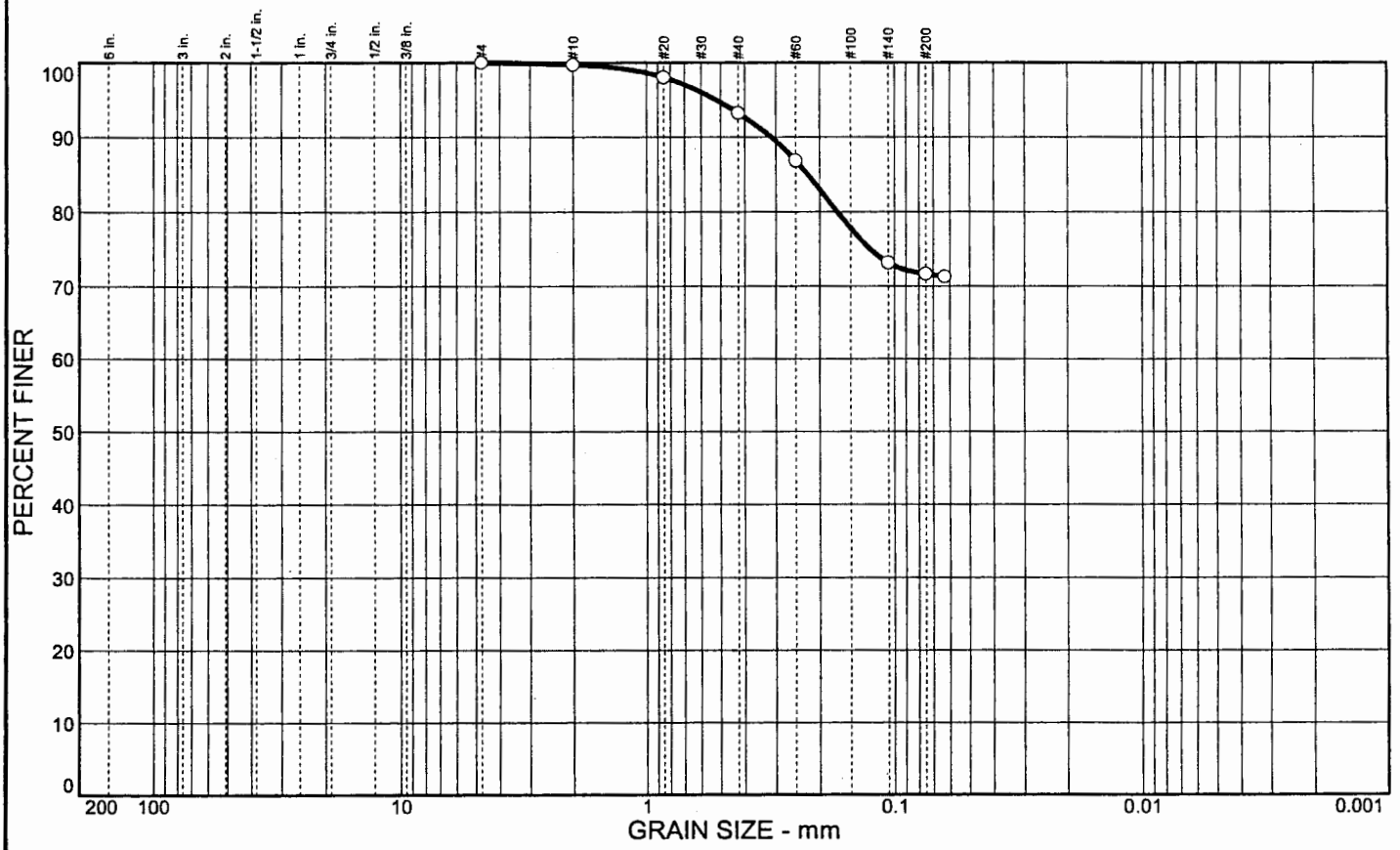
Client: Water and Air Research

Project: Mayport Naval Station

Project No.: 6063-06-0090-06

Reviewed By B.B

Grain Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
O			28.3	71.7		MH	A-7-5	70	171

SIEVE inches size	PERCENT FINER O		
	GRAIN SIZE		
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER O		
#4	100.0		
#10	99.7		
#20	98.0		
#40	93.2		
#60	86.9		
#140	73.2		
#200	71.7		
#230	71.3		

SOIL DESCRIPTION

O SILT, little fine sand, dark gray

REMARKS:

O

O Source: E_MP06-8

Sample No.: 1

MACTEC ENGINEERING. AND CONSULTING, INC.

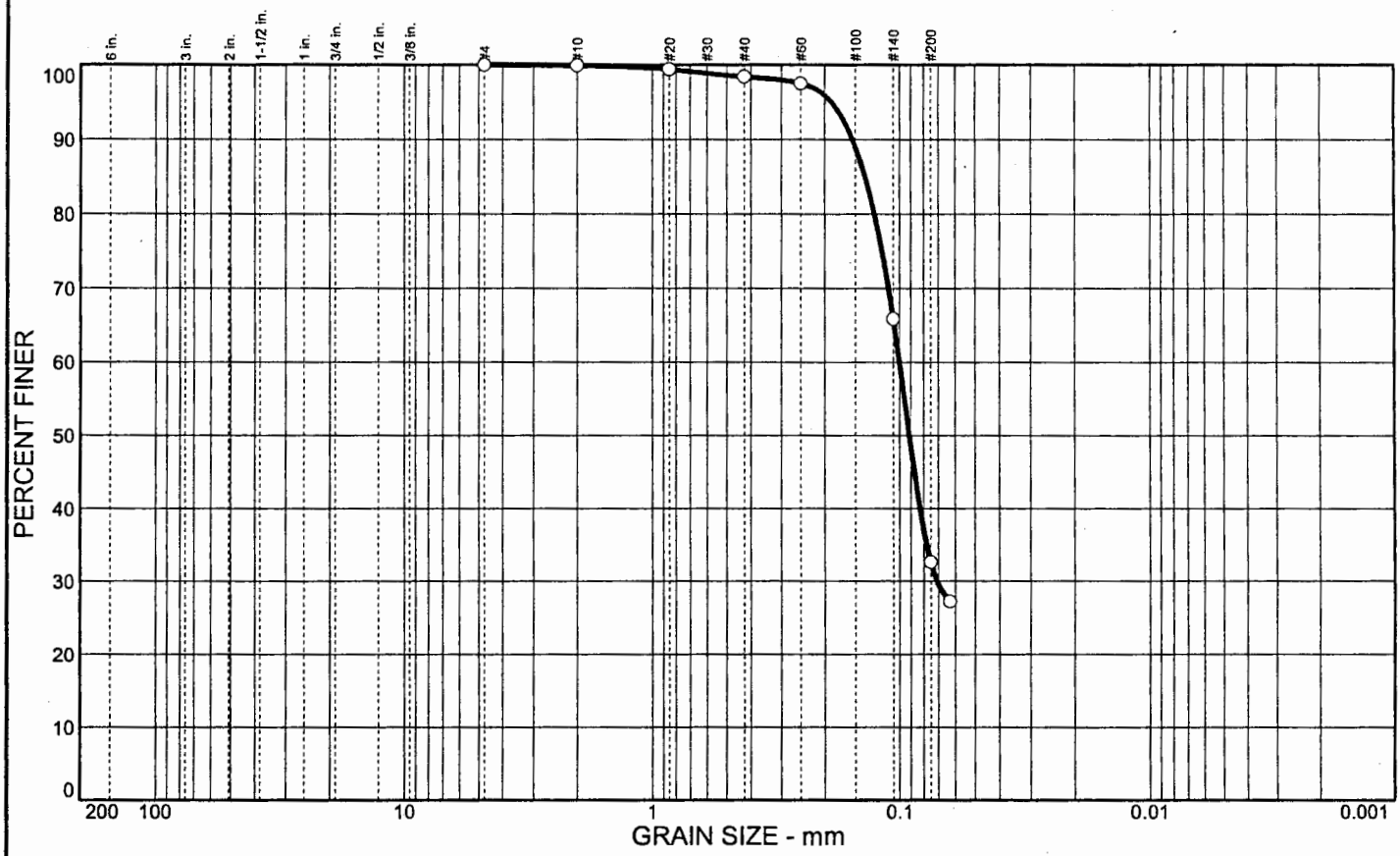
Client: Water and Air Research

Project: Mayport Naval Station

Project No.: 6063-06-0090-06

Reviewed By B·B

Grain Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			67.4	32.6		SM	A-2-7	31	43

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.100		
D_{30}	0.0708		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#10	99.9		
#20	99.4		
#40	98.4		
#60	97.5		
#140	65.9		
#200	32.6		
#230	27.2		

SOIL DESCRIPTION

○ SAND, fine quartz, some silt, trace medium to fine sand sized shell fragments, dark gray

REMARKS:

○

○ Source: RS-MP06

Sample No.: 1

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Water and Air Research

Project: Mayport Naval Station

Project No.: 6063-06-0090-06

Reviewed By B.B

MACTEC

REPORT OF SETTLING RATE TESTING

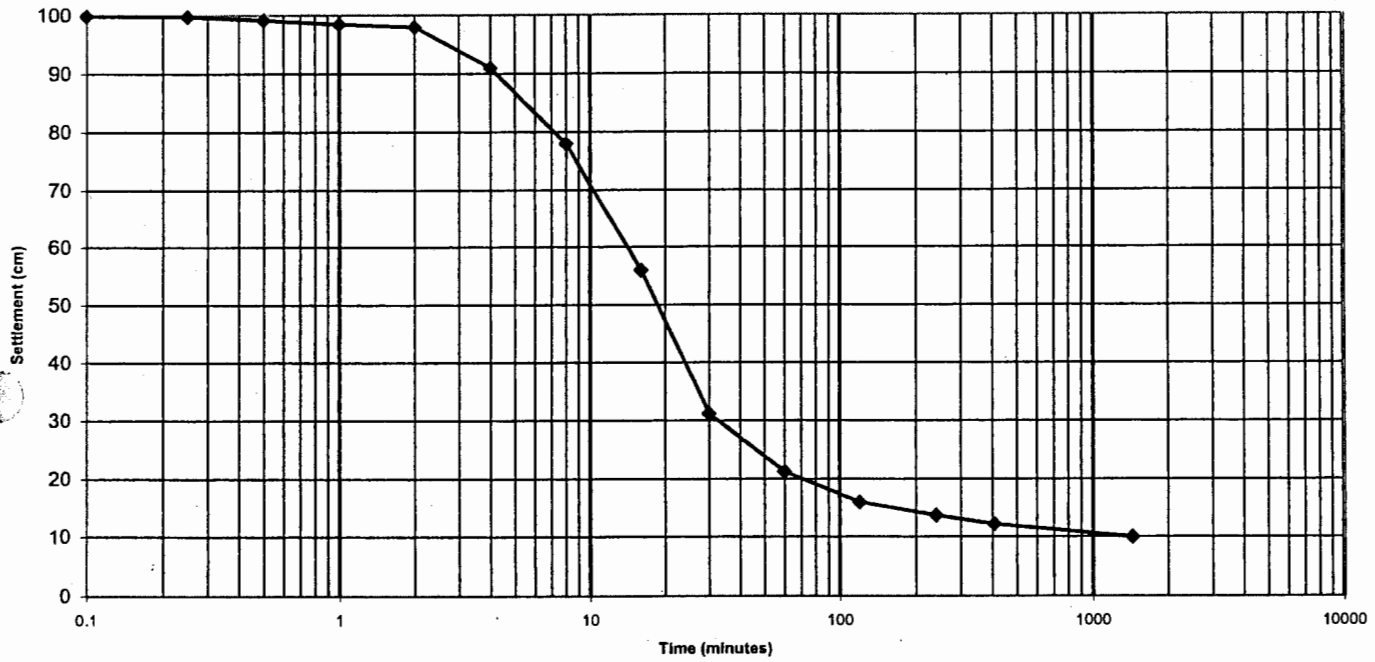
MACTEC PROJECT NO: 6063-06-0090-06

PROJECT: Mayport Naval Station

CLIENT: Water and Air Research, Inc.

SAMPLE NO: E-MP06-1

CONCENTRATION: 100 g/L



TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	99.9	16	56
0.25	99.8	30	31.2
0.5	99.2	60	21.3
1	98.5	120	16
2	98.0	240	13.7
4	91.0	408	12.2
8	78.0	1440	10

Final Concentration: 1000 g/L

Reviewed By

Balaji Balachandran, E.I.

MACTEC

REPORT OF SETTLING RATE TESTING

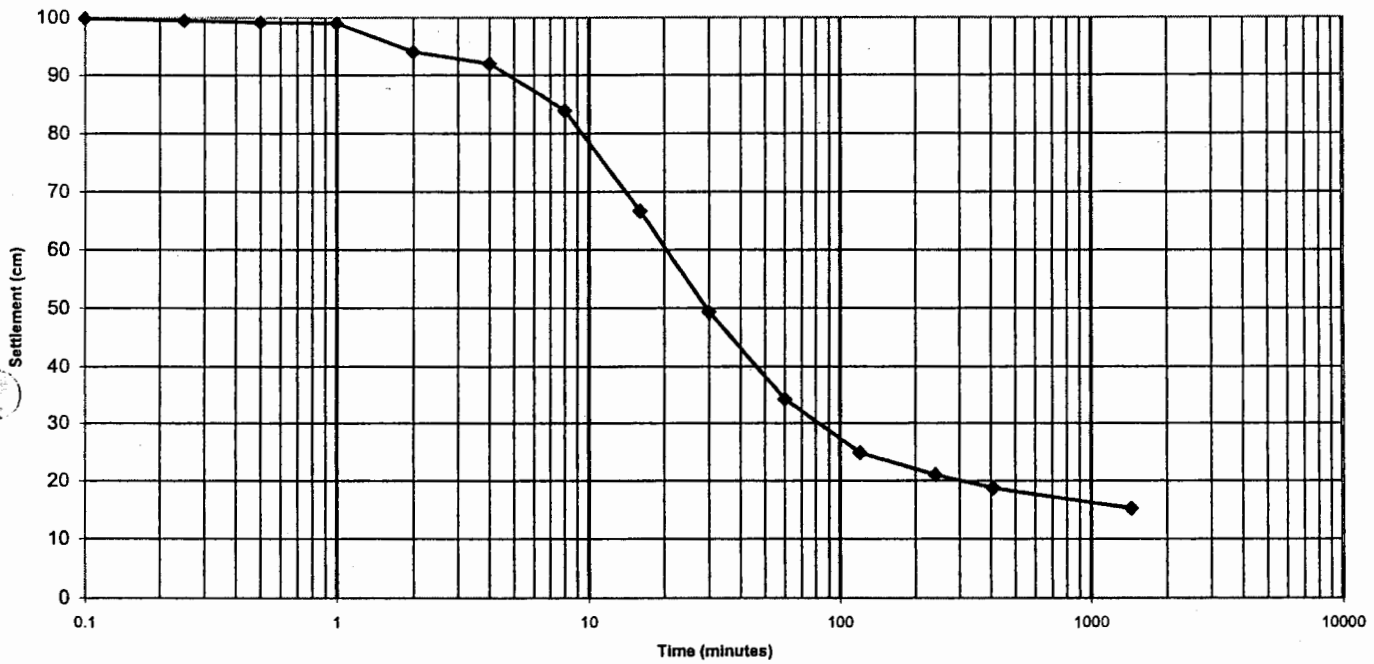
MACTEC PROJECT NO: 6063-06-0090-06

PROJECT: Mayport Naval Station

CLIENT: Water and Air Research, Inc.

SAMPLE NO: E-MP06-3

CONCENTRATION: 100 g/L



TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	99.9	16	66.7
0.25	99.5	30	49.4
0.5	99.2	60	34.3
1	99.0	120	24.9
2	94.0	240	21.1
4	92.0	408	18.8
8	84.0	1440	15.3

Final Concentration: 653.59 g/L

Reviewed By

Balaji Balachandran, E.I.

MACTEC

REPORT OF SETTLING RATE TESTING

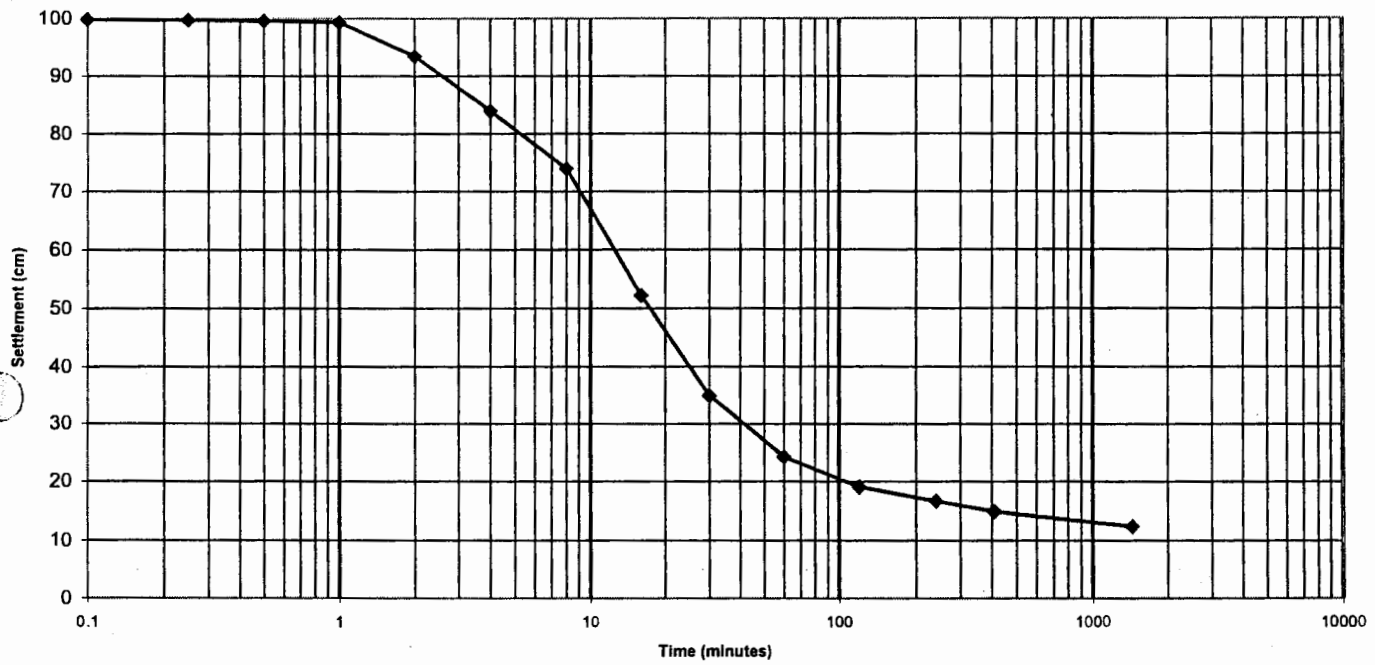
MACTEC PROJECT NO: 6063-06-0090-06

PROJECT: Mayport Naval Station

CLIENT: Water and Air Research, Inc.

SAMPLE NO: E-MP06-5

CONCENTRATION: 100 g/L



TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	99.9	16	52.3
0.25	99.8	30	35.0
0.5	99.6	60	24.3
1	99.4	120	19.1
2	93.5	240	16.7
4	84.0	408	15.0
8	74.0	1440	12.5

Final Concentration: 800 g/L

Reviewed By

Balaji Balachandran, E.I.

MACTEC

REPORT OF SETTLING RATE TESTING

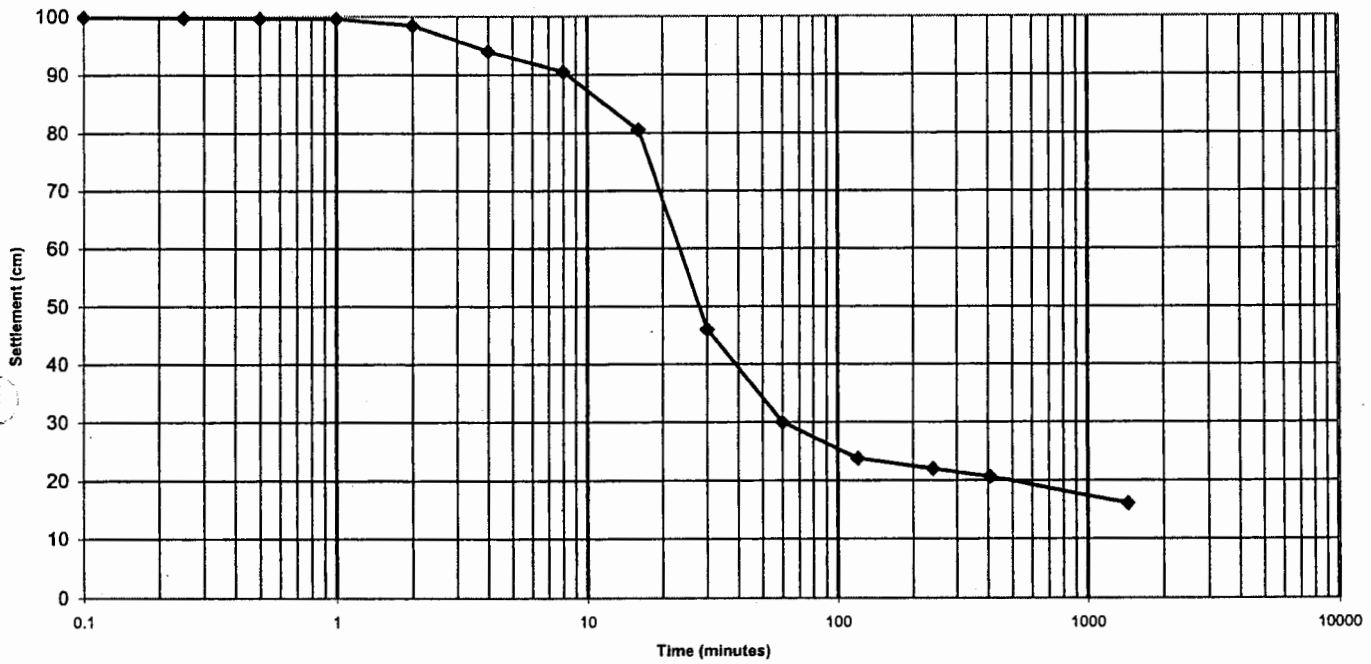
MACTEC PROJECT NO: 6063-06-0090-06

PROJECT: Mayport Naval Station

CLIENT: Water and Air Research, Inc.

SAMPLE NO: E-MP06-7

CONCENTRATION: 100 g/L



TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	99.9	16	80.6
0.25	99.8	30	46.0
0.5	99.7	60	30.0
1	99.6	120	23.8
2	98.5	240	22.0
4	94.0	408	20.7
8	90.5	1440	16.1

Final Concentration: 621.12 g/L

Reviewed By

Balaji Balachandran, E.I.

MACTEC

REPORT OF SETTLING RATE TESTING

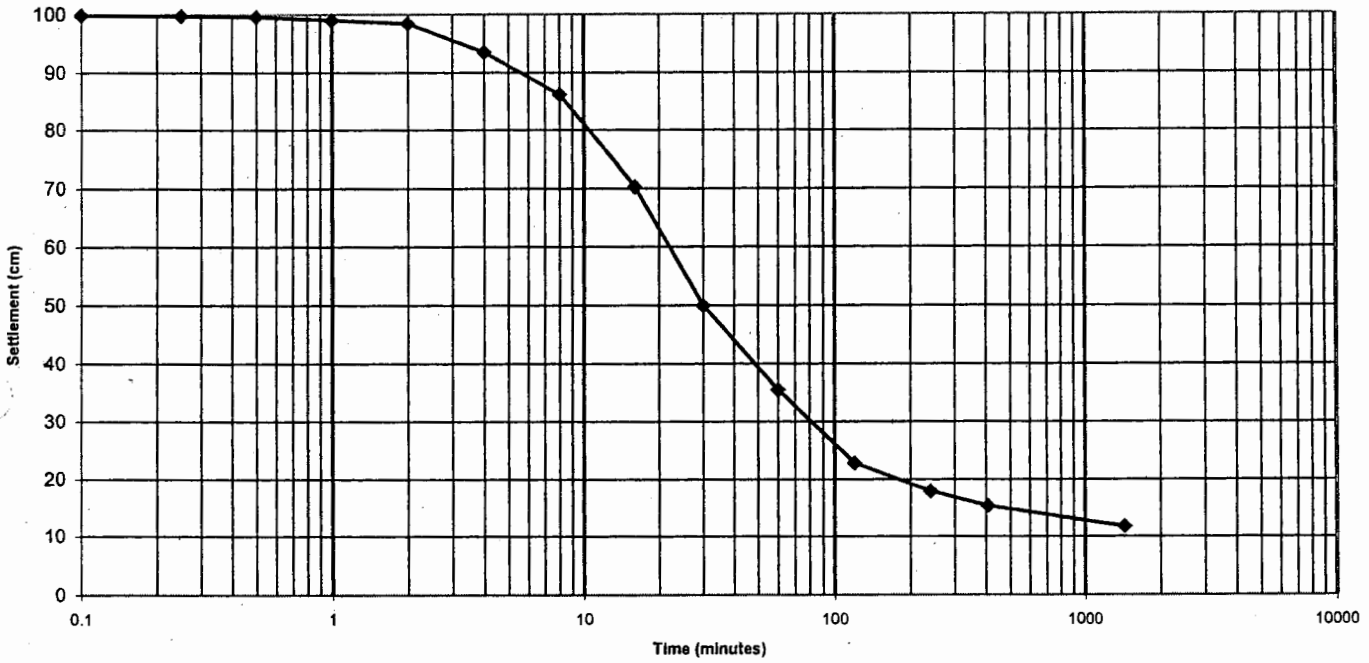
MACTEC PROJECT NO: 6063-06-0090-06

PROJECT: Mayport Naval Station

CLIENT: Water and Air Research, Inc.

SAMPLE NO: E-MP06-9

CONCENTRATION: 100 g/L



TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	99.9	16	70.3
0.25	99.8	30	50.0
0.5	99.6	60	35.5
1	99.0	120	22.9
2	98.5	240	18.0
4	93.5	408	15.4
8	86.3	1440	11.8

Final Concentration: 847.46 g/L

Reviewed By

Balaji Balachandran, E.I.

MACTEC

REPORT OF SETTLING RATE TESTING

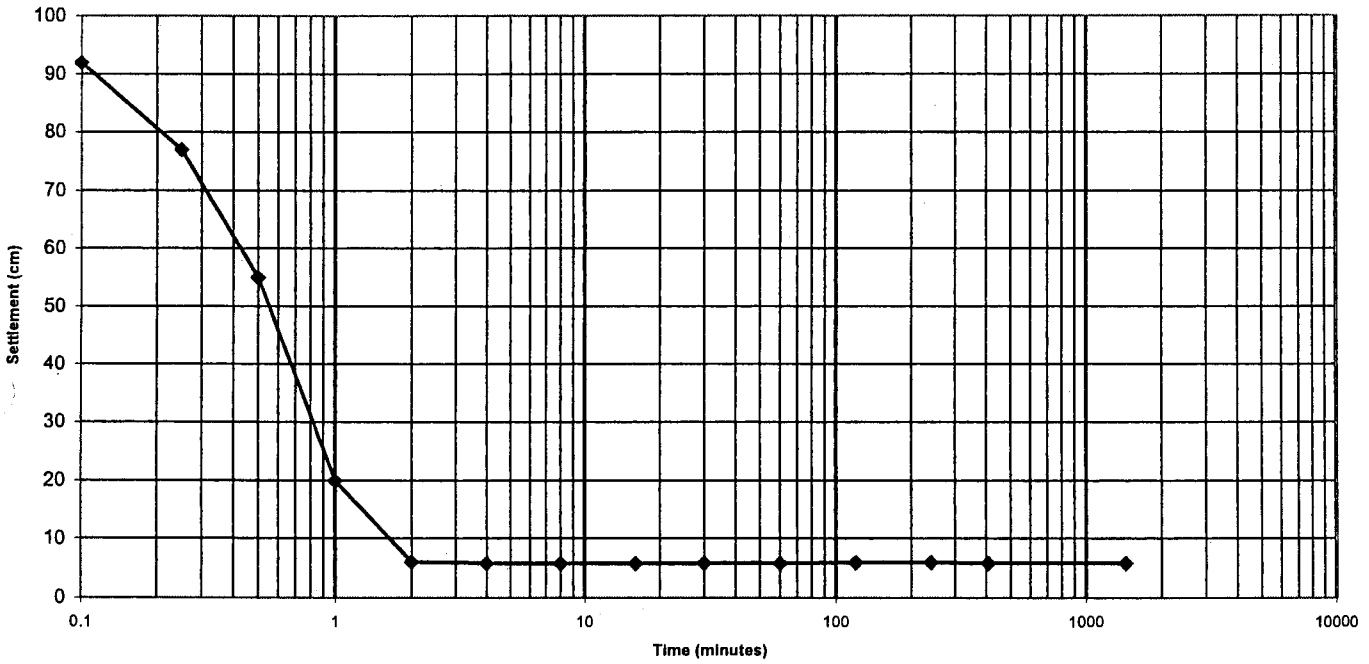
MACTEC PROJECT NO: 6063-06-0090-06

PROJECT: Mayport Naval Station

CLIENT: Water and Air Research, Inc.

SAMPLE NO: MP06-Control

CONCENTRATION: 100 g/L



TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	92.0	16	5.7
0.25	77.0	30	5.8
0.5	55.0	60	5.8
1	20.0	120	5.9
2	6.0	240	5.9
4	5.8	408	5.8
8	5.7	1440	5.8

Final Concentration: 1724.1 g/L

Reviewed By

Balaji Balachandran, E.I.

Table 3. Physical and Total Organic Carbon Data for Mayport Naval Station (Jacksonville, Florida) Sediment Samples Collected November 2006

Sample ID	Grain Size Distribution (percent)				TOC (dry weight) percent	Percent Solids*	Percent Moisture
	Gravel >2.00 mm	Sand 2.00 - 0.0625 mm	Silt 0.0625 - 0.0039 mm	Clay <0.0039 mm			
E-MP06-Control Sed	2.3	96.4	1.3		1.08%	83.2	16.8
RS-MP06	--	67.4	32.6		1.01%	59.9	40.1
E-MP06-1	--	82.0	18.0		0.77%	65.7	34.3
E-MP06-2	--	23.0	77.0		3.33%	26.7	73.3
E-MP06-3	--	11.3	88.7		3.90%	29.0	71.0
E-MP06-4	0.6	15.1	84.3		3.45%	27.9	72.1
E-MP06-5	--	16.7	83.3		3.39%	28.0	72.0
E-MP06-6	--	1.2	98.8		3.84%	22.4	77.6
E-MP06-7	--	5.1	94.9		4.24%	21.7	78.3
E-MP06-8	--	28.3	71.7		3.35%	26.7	73.3
E-MP06-9	1.9	67.8	30.3		1.37%	49.8	50.2
E-MP06-9 Dupe	--	--	--		1.30%	--	--

Sample ID	Specific Gravity	Liquid Limit	Plastic Limit	Plasticity Index
E-MP06-Control Sed	2.680	NP	NP	NP
RS-MP06	2.647	43	31	12
E-MP06-1	2.608	34	27	7
E-MP06-2	2.509	149	60	89
E-MP06-3	2.524	205	77	127
E-MP06-4	2.537	189	63	126
E-MP06-5	2.531	174	65	108
E-MP06-6	2.510	205	83	122
E-MP06-7	2.522	215	81	134
E-MP06-8	2.528	171	70	101
E-MP06-9	2.596	69	30	40
E-MP06-9 Dupe	--	--	--	--

* Reported percent solids results were determined at MACTEC-Jacksonville (reported on this table only)

Table 4. Sediment Oil & Grease, Total Organic Carbon, Cyanide and Ammonia Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sample ID	Percent Solids (%)	Oil and Grease * mg/Kg (ppm)				Total Organic Carbon Percent (%)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	70	U	58	U	1.08%	--	0.89%	--
RS-MP06	56.9%	140	--	80	--	1.01%	--	0.57%	--
E-MP06-1	60.2%	70	U	42	U	0.77%	--	0.46%	--
E-MP06-2	26.3%	730	--	192	--	3.33%	--	0.88%	--
E-MP06-3	28.2%	170	--	48	--	3.90%	--	1.10%	--
E-MP06-4	28.6%	170	--	49	--	3.45%	--	0.99%	--
E-MP06-5	27.9%	260	--	73	--	3.39%	--	0.95%	--
E-MP06-6	23.1%	280	--	65	--	3.84%	--	0.89%	--
E-MP06-7	21.7%	340	--	74	--	4.24%	--	0.92%	--
E-MP06-8	25.5%	360	--	92	--	3.35%	--	0.85%	--
E-MP06-9	47.4%	150	--	71	--	1.37%	--	0.65%	--
E-MP06-9 Dupe	46.3%	200	--	93	--	1.30%	--	0.60%	--

Sample ID	Percent Solids (%)	Cyanide mg/Kg (ppm)				Ammonia ^ mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	0.417	U	0.34	U	40.4	I	33.2	I
RS-MP06	56.9%	0.493	U Q	0.28	U Q	46.6	I	26.5	I
E-MP06-1	60.2%	0.494	U Q	0.30	U Q	111	--	66.8	--
E-MP06-2	26.3%	1.69	U Q	0.44	U Q	348	I	91.5	I
E-MP06-3	28.2%	0.915	U Q	0.26	U Q	368	--	104	--
E-MP06-4	28.6%	0.751	U Q	0.21	U Q	395	--	113	--
E-MP06-5	27.9%	0.956	U Q	0.27	U Q	364	--	102	--
E-MP06-6	23.1%	1.91	U Q	0.44	U Q	363	I	83.9	I
E-MP06-7	21.7%	1.91	U Q	0.41	U Q	380	I	82.5	I
E-MP06-8	25.5%	1.50	U Q	0.38	U Q	407	I	103.8	I
E-MP06-9	47.4%	0.960	U Q	0.46	U Q	143	I	67.8	I
E-MP06-9 Dupe	46.3%	0.733	U Q	0.34	U Q	177	I	82.0	I

Notes:

U = The compound was analyzed for, but was not detected at or above the Method Reporting Limit

J = The result is an estimated concentration that is less than the MRL, but greater than or equal to the MDL

I = The analyte was not detected above the practical quantitation limit

Q = Sample analyzed out of holding time

-- = No qualifier needed

* = The method detection limit (MDL) was greater than the requested Sampling Plan and Protocol MDL

^ = Laboratory not NELAC Certified for this analysis

Table 5. Sediment Metals Concentrations for Mayport Naval Station (Jacksonville, Florida) Samples Collected November 2006

Sample ID	Percent Solids (%)	Aluminum mg/Kg (ppm)				Arsenic mg/Kg (ppm)				Cadmium mg/Kg (ppm)				Chromium mg/Kg (ppm)				Copper mg/Kg (ppm)				Iron mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	372	--	306	--	0.90	--	0.74	--	0.100	U	0.082	U	1.75	--	1.44	--	0.34	*	0.28	*	812	--	668	--
RS-MP06	56.9%	5300	--	3016	--	5.04	--	2.87	--	0.100	U	0.057	U	12.8	--	7.28	--	2.63	*	1.50	*	7940	--	4518	--
E-MP06-1	60.2%	3860	--	2324	--	2.98	--	1.79	--	0.100	U	0.060	U	9.56	--	5.76	--	2.14	*	1.29	*	4440	--	2673	--
E-MP06-2	26.3%	15600	--	4103	--	11.0	--	2.89	--	0.182	--	0.048	--	40.0	--	10.5	--	16.8	*	4.42	*	18600	--	4892	--
E-MP06-3	28.2%	20500	--	5781	--	12.9	--	3.64	--	0.166	--	0.047	--	43.7	--	12.3	--	16.3	*	4.60	*	22300	--	6289	--
E-MP06-4	28.6%	18100	--	5177	--	14.3	--	4.09	--	0.187	--	0.053	--	40.5	--	11.6	--	15.8	*	4.52	*	20300	--	5806	--
E-MP06-5	27.9%	13900	--	3878	--	14.4	--	4.02	--	0.182	--	0.051	--	48.6	--	13.6	--	14.5	*	4.05	*	19800	--	5524	--
E-MP06-6	23.1%	18400	--	4250	--	12.9	--	2.98	--	0.169	--	0.039	--	41.0	--	9.47	--	17.8	*	4.11	*	21500	--	4967	--
E-MP06-7	21.7%	25100	--	5447	--	13.8	--	2.99	--	0.205	--	0.044	--	36.4	--	7.90	--	28.5	*	6.18	*	24500	--	5317	--
E-MP06-8	25.5%	16700	--	4259	--	11.1	--	2.83	--	0.177	--	0.045	--	37.8	--	9.64	--	20.7	*	5.28	*	20100	--	5126	--
E-MP06-9	47.4%	6190	--	2934	--	4.43	--	2.10	--	0.100	U	0.047	U	13.8	--	6.54	--	5.10	*	2.42	*	7130	--	3380	--
E-MP06-9 Dupe	46.3%	7410	--	3431	--	4.96	--	2.30	--	0.100	U	0.046	U	15.8	--	7.32	--	5.70	*	2.64	*	7930	--	3672	--

Sample ID	Percent Solids (%)	Lead mg/Kg (ppm)				Mercury mg/Kg (ppm)				Nickel mg/Kg (ppm)				Silver mg/Kg (ppm)				Zinc mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
E-MP06-Control Sed	82.3%	1.86	--	1.53	--	0.050	U	0.041	U	0.68	--	0.56	--	0.100	U	0.082	U	2.7	--	2.22	--
RS-MP06	56.9%	5.62	--	3.20	--	0.050	U	0.028	U	3.46	--	1.97	--	0.100	U	0.057	U	15.8	--	8.99	--
E-MP06-1	60.2%	3.48	--	2.09	--	0.050	U	0.030	U	2.70	--	1.63	--	0.100	U	0.060	U	10.7	--	6.44	--
E-MP06-2	26.3%	15.9	--	4.18	--	0.050	U	0.013	U	11.2	--	2.95	--	0.100	U	0.026	U	49.3	--	13.0	--
E-MP06-3	28.2%	19.8	--	5.58	--	0.066	--	0.019	--	12.4	--	3.50	--	0.101	--	0.028	--	56.3	--	15.9	--
E-MP06-4	28.6%	19.4	--	5.55	--	0.057	--	0.016	--	11.4	--	3.26	--	0.100	U	0.029	U	70.6	--	20.2	--
E-MP06-5	27.9%	20.4	--	5.69	--	0.055	--	0.015	--	13.9	--	3.88	--	0.100	U	0.028	U	56.9	--	15.9	--
E-MP06-6	23.1%	18.4	--	4.25	--	0.054	--	0.012	--	11.4	--	2.63	--	0.100	U	0.023	U	60.5	--	14.0	--
E-MP06-7	21.7%	20.6	--	4.47	--	0.064	--	0.014	--	10.8	--	2.34	--	0.112	U	0.024	U	67.5	--	14.6	--
E-MP06-8	25.5%	18.0	--	4.59	--	0.057	--	0.015	--	10.9	--	2.78	--	0.129	U	0.033	U	57.2	--	14.6	--
E-MP06-9	47.4%	6.31	--	2.99	--	0.050	U	0.024	U	3.99	--	1.89	--	0.100	U	0.047	U	18.1	--	8.58	--
E-MP06-9 Dupe	46.3%	7.04	--	3.26	--	0.050	U	0.023	U	4.48	--	2.07	--	0.100	U	0.046	U	21.0	--	9.72	--

Notes:

U = The compound was analyzed for, but was not detected ("Non-detect") at or above the requested Sampling Plan and Protocol Method Reporting Limit

* - The duplicate analysis was not within control limits. See case narrative.

-- = No qualifier needed

FINAL REPORT

Jacksonville Harbor Section 103 Sediment Characterization

Prepared for

United States Army Corps of Engineers
Jacksonville District
701 San Marco Blvd
CESAJ-CT
Jacksonville, Florida 32207-8175

Prepared by

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October 2007
DACW17-03-D-0016

Task Orders No. 0031
Project Number 07-5956-02

Contents

Executive Summary **ES-1**

1 Introduction **1**

2 Materials and Methods **2**
2.1 Physical Parameters and Chemicals of Interest 2
2.2 Field Methods and Procedures 3
2.3 Physical and Chemical Laboratory Methods and Detection Limits 5

3 Locations of Sampling Areas **6**

4 Description of Testing Approach **7**

5 Final Results **8**
5.1 Field Measurement Data and Sediment Descriptions 8
5.2 Sediment Physical and Organic Carbon Data 8
5.3 Sediment Chemical Data 8

6 Quality Assurance and Control **10**
6.1 Chemical Laboratory Quality Assurance and Control 10

7 Conclusions **12**

8 References **13**

Figures

1 Jacksonville Harbor 2007 Sampling Locations Overview
2 Jacksonville Harbor 2007 Sampling Locations Relative to the Channel
3 Jacksonville Harbor 2007 Sampling Location for Sample Station E-JH07-1
4 Jacksonville Harbor 2007 Sampling Location for Sample Station E-JH07-2
5 Jacksonville Harbor 2007 Sampling Location for Sample Station E-JH07-3
6 Jacksonville Harbor 2007 Sampling Location for Sample Station RS-JH07-A
7 Jacksonville Harbor 2007 Sampling Location for Sample Station RS-JH07-B

Contents

Tables

1 Sampling Coordinates and Sampling Techniques for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

2 Jacksonville Harbor 2007 Sediment Method Numbers and Detection Limits

Sediment Tables

3 Physical and Total Organic Carbon Data for Jacksonville Harbor (Jacksonville, Florida) Sediment Samples Collected August 2007

4 Sediment Oil and Grease, Total Organic Carbon, Cyanide and Ammonia Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

5 Sediment Metals Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

6 Sediment Pesticide Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

7 Sediment PCB Congener Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

8 Sediment PAH Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected Jacksonville Harbor 2007

9 Sediment Organotin Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

10 Jacksonville Harbor 2004 / 2007 Data Comparison for E-JH07-1

11 Jacksonville Harbor 2004 / 2007 Data Comparison for E-JH07-2

12 Jacksonville Harbor 2004 / 2007 Data Comparison for E-JH07-2 Dup

13 Jacksonville Harbor 2004 / 2007 Data Comparison for E-JH07-3

Appendices

A Jacksonville Harbor 103 Evaluation – 2007 Sampling Plan and Protocol..... hard copy and on CD
B Chain-of-Custodies ..... hard copy and on CD
C Field Sampling Sheets, In-situ Data Collection and Field Operations..... hard copy and on CD
D Physical Testing Data ..... hard copy and on CD
E Sediment Laboratory Data Report ..... on CD

Acronyms

ASTM	American Society for Testing and Materials
CAS	Columbia Analytical Services, Inc. (Kelso, Washington)
CCV	continuing calibration verification
COC	chain of custody
CSA	Continental Shelf Associates
DGPS	differentially corrected global positioning system
DM	dredged material
DQO	data quality objective
EPA	Environmental Protection Agency (Region IV)
g	gram
LCS	laboratory control standard
L	liters
MACTEC	MACTEC Engineering and Consulting, Inc.
mg/L	milligram per liter (ppm)
µg/L	microgram per liter (ppb)
MS	matrix spike
MSD	matrix spike duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NIST	National Institute of Standards & Technology
NTU	nephelometric turbidity unit
ODMDS	Ocean Dredged Material Disposal Site (Jacksonville)
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl (congeners)
ppb	parts per billion
ppm	parts per million
QA/QC	quality assurance/quality control
RPD	relative percent difference
SOP	standard operating procedure
SOW	scope of work (Jacksonville Harbor - 2007 Sampling Plan and Protocol)
SRM	standard reference material
TOC	total organic carbon
USACE	United States Army Corps of Engineers (Jacksonville District)
W&A	Water & Air Research, Inc.
WAAS	wide area augmentation system
WQC	water quality criterion

Executive Summary

This evaluation considers potential dredged material from the Jacksonville Harbor entrance channel shoal located on the south side of the channel at Station 120 (Jacksonville, Florida). The evaluation is part of the EPA's 103 concurrence process for the disposal of dredge material at the Jacksonville Ocean Dredged Material Disposal Site (ODMDS). Before ocean disposal of dredged sediments can occur, potential pre-dredged sediments needed to be tested to determine if they contained elevated concentrations of potentially toxic chemicals.

This report presents field data and test results from sediment collection activities that occurred in August 2007. The purpose of this sampling effort was to provide information required by decision makers for the evaluation of sediment disposal options, including placement in the Jacksonville ODMDS.

The sampling and laboratory test procedures used followed those specified in the *USACE Jacksonville Harbor 103 Evaluation – 2007 Sampling Plan and Protocol* (SOW) (Appendix A).

Sediment Chemistry Comparison

Antimony, cadmium, mercury and silver were not detected at or above the SOW's target detection limits in the sediment samples.

Aluminum, arsenic, chromium, copper, iron, lead, nickel and zinc were detected in all samples. Sample E-JH07-2 Dup yielded the greatest concentration of metals.

Pesticides, PCBs and PAHs were not detected in the sediment samples at or above the SOW's target detection limits.

Butyltin, di-butyltin and tri-butyltin were not detected at or above the SOW's target detection limits in the sediment samples

Oil and Grease in the sediment samples ranged from 84 ppm to 160 ppm.

Tables 3 through 9 present the sediment data.

Tables 10 through 13 compares the August 2007 sediment samples to the sediment samples collected during the October 2004 sampling event.

1 Introduction

This report presents information regarding sediment proposed for dredging from Jacksonville Harbor under the oversight of the US Army Corps of Engineers, Jacksonville District. The area was evaluated for 103 certification in accordance with the *1991 ("Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual"*, i.e., *"The Green Book"*), with guidance from the South Eastern Regional Testing Manual. This evaluation included chemical and physical analysis of sediments.

Jacksonville Harbor is located in Duval County between the City of Jacksonville and the mouth of the St. Johns River where it empties into the Atlantic Ocean. The harbor project provides access to deep draft vessel traffic using terminal facilities located in the City of Jacksonville. These port facilities handle approximately 16 million tons of cargo a year based on recent statistics. This tonnage is sufficient to place the port among the top three cargo ports in the State of Florida. The City of Jacksonville is the largest urban and business complex in northeast Florida and southeast Georgia.

Figure 1 is an overview showing the Jacksonville Harbor and the ODMDS sampling locations. Figure 2 shows the sampling locations in relation to the channel. Figures 3 through 5 show the sampling locations in detail. Details of the offshore reference sample locations are presented on Figures 6 and 7.

2 Materials and Methods

Before sampling procedures could be developed, a list of chemical constituents and physical parameters of interest was developed. A Tier I investigation was performed by the USACE to identify site-specific chemicals of interest.

2.1 Physical Parameters and Chemicals of Interest

The following physical parameters, chemical constituents, and analytical groups were identified as important for this project. Analytical methods used, along with target and achieved detection limits are listed in Table 2.

PHYSICAL PARAMETERS

Grain Size Analysis
Total Solids/ Water Content
Specific Gravity
Atterberg Limits
Settling Rates

CHEMICAL CONSTITUENTS

Metals

Aluminum (sediments only)	Lead
Antimony	Iron
Arsenic	Mercury
Cadmium	Nickel
Chromium	Silver
Copper	Zinc

Chlorinated Hydrocarbon Pesticides

Aldrin	Endosulfan Sulfate
Chlordane	Endrin
4, 4'-DDD	Endrin Aldehyde
4, 4'-DDE	Heptachlor
4, 4'-DDT	Heptachlor Epoxide
Dieldrin	Lindane & derivatives
Endosulfan I	Methoxychlor
Endosulfan II	Toxaphene

Polychlorinated Biphenyls Congeners

PCB 8	PCB 18	PCB 28	PCB 44	PCB 49
PCB 52	PCB 66	PCB 77	PCB 87	PCB 101
PCB 105	PCB 118	PCB 126	PCB 128	PCB 138
PCB 153	PCB 156	PCB 169	PCB 170	PCB 180
PCB 183	PCB 184	PCB 187	PCB 195	PCB 206
PCB 209				

CHEMICAL CONSTITUENTS (continued)

Polynuclear Aromatic Hydrocarbons (PAHs)

Acenaphthene	Chrysene
Acenaphthylene	Dibenzo (a,h) Anthracene
Anthracene	Fluoranthene
Benzo (a) Anthracene	Fluorene
Benzo (a) Pyrene	Indeno (1,2,3-cd) Pyrene
Benzo (b) Fluoranthene	1 & 2-Methylnaphthalene
Benzo (k) Fluoranthene	Phenanthrene
Benzo (g,h,i) perylene	Pyrene

Other

Total Ammonia
Cyanide
Oil and Grease
Total Organic Carbon
Total Sulfides
Total Organic Tin (mono, di and tri)

2.2 Field Methods and Procedures

The following text summarizes the methods and procedures used to collect the sediment samples and site water.

2.2.1 Field Equipment

CSA transported their field equipment to the Jacksonville Harbor area, in preparation for the field effort, was placed in containers that protected the items from damage due to rough handling and wet weather conditions. To the extent practical, critical items were duplicated so that failure of any one item would not stop the field effort. Similarly, spare parts and replacement items were included as appropriate to prevent avoidable down time. When practical, sampling equipment was pre-cleaned before transporting to the field if it was ensured that integrity of such equipment would not be compromised during transport and storage. All sample containers were supplied by Water & Air Research, Inc. (W&A), and the integrity of all containers was maintained during shipment to and from the Jacksonville area, and while in storage awaiting use.

2.2.2 Decontamination and Clean Area Procedures

All equipment surfaces with the potential to contact sample material were decontaminated, e.g., stainless steel spoons and bowls. Such equipment was cleaned using a water/Liqui-nox® solution, followed by a tap water rinse, de-ionized water rinse, isopropanol rinse, and air-dried. If not immediately used after cleaning, decontaminated equipment was wrapped in food-grade aluminum foil with the shiny side facing/contacting the equipment. Field personnel wore Nitrile gloves that were non-powdered, talc- and phthalate-free, and were changed between sampling stations, when cleaning equipment, and when they became ripped or torn.

The deck area where sampling occurred was scrubbed with Liqui-nox® solution to

remove petroleum residues, loose debris, and any other materials that might contaminate collected sediment.

Care was taken to prevent wash water that potentially contained oil or petroleum compounds from entering the surface water. Sediment debris was removed from the sample collection area before departing each station.

Hydraulic and petroleum-fueled equipment were maintained in an area away from the sampling area and any drips or leaks of hydraulic fluids, fuels, or lubricants were cleaned up immediately. Gasoline- and diesel-fueled equipment was positioned downwind to minimize the potential for sample contamination.

2.2.3 Sediment Sample Collection and Handling

All samples were collected using appropriately cleaned, non-contaminating equipment (e.g., constructed of stainless steel or coated with Teflon®) as required for the analyses of interest. The vibracore tubing was constructed of a ridged transparent acetyl butyrate plastic, with a stainless-steel cutting nose, however the vibracore sampler was not used on this sampling event due to unsafe sea and weather conditions.

A Van Veen grab sampler was used to collect the sediment samples. Table 1 presents the sampling locations and the method of sampling.

After collecting sediment with the grab sampler, the sampling device was placed in a stainless steel Teflon® coated mixing vat where the contents were visually inspected. After inspecting and describing the sediment, the contents were released into the mixing vat and the excess water was decanted. The sediment was thoroughly mixed and placed into pre-cleaned and pre-labeled one-gallon glass jars using stainless steel spoons.

Reference sediment samples, RS-JH07-A and RS-JH07-B, were collected using a stainless steel Van Veen grab sampler. Collected sediments were placed into a stainless steel vessel with a protective coating of Teflon®. Excess water was decanted before transferring the sample into the laboratory supplied pre-cleaned and pre-labeled one-gallon glass containers.

After containerizing, all sediment and water samples were placed in ice chests and covered with wet ice within fifteen minutes.

CSA personal relinquished samples to Fed Ex personnel as documented on the chain of custodies. The samples were delivered to W&A's Gainesville, Florida facility, in ice chests, which were chilled with wet ice and maintained at approximately four degrees Celsius at all times. Custody seals remained intact upon arrival.

No sample breakage occurred during shipment.

2.2.4 Site Water Collection and Handling

The site water used for settling rates was collected at each sediment sampling location (see Figures 3 through 7).

Pre-labeled half-gallon plastic jugs were inverted and submerged approximately one foot below the water surface, turned upright and allowed to fill.

2.2.5 Sediment Sample Compositing

Sediment samples were thoroughly homogenized and aliquots were placed into pre-cleaned, pre-labeled sample jars.

The mixing equipment was initially decontaminated by thoroughly scrubbing the stainless steel vessel, stainless steel mixing bit and stainless steel spoons with a clean sponge, Liquinox and tap water. The vessel and equipment were then rinsed well with de-ionized water and wiped dry with Kimwipes® paper towels. The vessel and equipment were then wiped down with pesticide grade isopropanol and air dried. The equipment was finally triple rinsed with de-ionized water to assure complete removal of alcohol. Decontamination of equipment was done between each sample, including the field duplicate and offshore reference sample (the offshore sample was archived).

The homogenized samples were re-containerized after homogenization, and submitted to the analytical and physical testing laboratories for testing. The homogenization took place at W&A's Gainesville, Florida facility.

2.2.6 Hydrographic Measurements

Collection of sediment and water from Jacksonville Harbor and reference stations A and B included the following general ancillary observations and hydrographic measurements made within the water column from just below the water surface, mid-depth, and near the bottom:

Sea State	Water Temperature	Dissolved Oxygen
Tidal Cycle	Water Depth	Turbidity
pH	Conductivity	Weather Conditions
Salinity		

2.3 Physical and Chemical Laboratory Methods and Detection Limits

Analytical procedures followed those prescribed in the *Jacksonville Harbor Scope of Work*. Table 2 lists the analytical methods used for the physical and chemical testing and the target detection limit for each parameter or analyte, and achieved detection limits.

3 Locations of Sampling Areas

The proposed disposal site is the Jacksonville ODMDS. The site is one nautical square mile with water depths that average 44 feet. The approximate corners of the ODMDS are located at:

30°21'30"N., 81°18'34"W
30°21'30"N., 81°17'26"W
30°20'30"N., 81°17'26"W
30°20'30"N., 81°18'34"W

In selecting sample stations, consideration was given to the location of shoals, the types of sediment, and areas that are likely to be contaminated, such as areas near point source discharges, or areas likely to be affected by non-point source discharge. Also considered was the influence of currents, geographical influences on different areas of the project.

Three samples were collected within the entrance channel as shown on Figures 2 through 5.

Two reference stations were sampled from water 43 and 44 feet deep, approximately one nautical mile north and one nautical mile south, respectively, of the northern and southern edges of the ODMDS. The locations sampled appear on Figures 6 and 7.

Positioning of the sampling equipment at the predetermined sampling stations was accomplished using a Leica Model 420 DGPS receiver. Differential corrections were acquired using the Coast Guard beacon from Cape Canaveral, FL from which real-time GPS differential corrections are broadcast at 289 kHz. This system has a proven accuracy of ±5 m (1 m to 3 m is typical).

Copies of completed field sheets developed for this sampling effort appear in Appendix C.

4 Description of Testing Approach

Selecting three locations throughout the channel was believed adequate to provide a representative set of samples. Collected sediments from each location were homogenized in W&A's Gainesville facility. Aliquots of homogenized sediment were submitted to Columbia Analytical (Kelso, WA) for organic and inorganic analyses and MACTEC (Jacksonville, Florida) for physical testing.

Two reference station locations (A and B) were selected for generating a composite sample by combining equal proportions from each station. The reference station composite was archived.

The three sediment samples and the duplicate sample were tested for metals, pesticides, PCB congeners, PAHs, organotins, oil and grease, total sulfide, ammonia, cyanide, specific gravity, bulk density, Atterberg limits, TOC, grain size and percent moisture.

5 Final Results

Prior to the initiation of field work, pre-printed field sheets were designed specifically for this project. Completed field documentation appears in Appendix C. All laboratory reports of analyses for the Jacksonville Harbor sediments appear in Appendix E.

5.1 Field Measurement Data and Sediment Descriptions

The weather during the field effort was sunny, with wind speeds ranging from 5-10 knots. Appendix C presents the water quality data measured at near surface, mid-depth and near bottom for each Naval Station and the offshore reference station.

Sample E-JH07-1 was described as a thick black mud. Sample E-JH07-2 consisted of a thick sandy mud with a sulfur odor. Sample E-JH07-3 was described as a thick black mud with a sulfur odor.

Offshore reference sample RS-JH07-A consisted of a thick mud with sand grains. Sample RS-JH07-B was described as thick mud with worms present.

All sampling locations were accessible and provided enough sediment for project needs.

5.2 Sediment Physical and Organic Carbon Data

The samples were sieved to determine grain size distribution, and tested to determine the content of organic carbon and moisture. The samples were tested for specific gravity and Atterberg limits. Physical and organic carbon data can be referenced in Table 3. The sediment testing report and the particle size distribution report can be referenced in Appendix D.

For all samples, gravel was found to be 0.1 percent or less.

Sand content in the samples ranged from 84.9 to 97.6 percent, with sample E-JH07-3 having the lowest sand content of 84.9 percent and E-JH07-1 having the greatest sand content of 97.6 percent.

The silt-clay content ranged from 2.3 to 15.1 percent in the samples, with sample E-JH07-3 having the greatest silt-clay content.

The samples had a moisture content ranging from 25.7 to 40.5 percent.

Total organic carbon ranged from 0.09 to 0.88 percent in the sediment samples.

5.3 Sediment Chemical Data

The sediment samples were analyzed for metals, pesticides, PCB congeners, PAHs, organotins, oil and grease, ammonia, sulfide, total organic carbon and cyanide. Sample E-JH07-2 was sampled and tested in duplicate to provide precision information using the actual sample matrix. All chemical laboratory reports, complete with chain of custody forms and laboratory quality assurance narratives, appear in Appendix E.

5.3.1 Sediment Metals

Antimony, cadmium, mercury and silver were not detected at or above the SOW's target detection limits.

Aluminum, arsenic, chromium, copper, iron, lead, nickel and zinc were detected in all samples.

Arsenic and copper ranged from 0.4 ppm to 2.6 ppm (dry weight). Sample E-JH07-2 Dup yielded the greatest concentration of both metals.

Lead and nickel ranged from 0.84 ppm to 4.96 ppm (dry weight), with sample E-JH07-2 Dup having the greatest concentration of both metals.

Chromium and zinc ranged from 2.46 ppm to 13.8 ppm (dry weight). The highest concentration of both of these metals was found in sample E-JH07-2 Dup.

Aluminum and iron ranged from 563 ppm to 5880 ppm (dry weight). Sample E-JH07-2 Dup yielded the greatest concentration of both metals.

Table 5 presents the sediment metals data. The detection limits achieved by the laboratory can be referenced in Table 2, and the analytical report can be found in Appendix E.

5.3.2 Sediment Pesticides and PCB Congeners

Pesticides were not detected at or above the SOW's target detection limits.

PCB congeners were not detected at or above the SOW's target detection limits.

Tables 6 and 7 present the pesticide and PCB congener data for the sediment samples.

5.3.3 Sediment PAHs

PAH compounds were not detected at or above the SOW's target detection limits.

Table 8 presents the PAH data.

5.3.4 Sediment Organotins

Butyltin, di-butyltin and tri-butyltin were not detected at or above the SOW's target detection limits in the samples.

The organotin data can be referenced in Table 9.

5.3.5 Sediment Oil and Grease

Oil and grease was detected in all samples ranging from 84 ppm to 160 ppm. Sample E-JH07-2 yielded the greatest concentration of oil and grease.

5.3.6 Sediment Cyanide

Cyanide was not detected at or above the SOW requested detection limits in the sediment samples.

5.3.7 Sediment Ammonia and Sulfide

Ammonia levels ranged from 1.78 ppm to 7.47 ppm. Sulfide ranged from 39.4 ppm to 208 ppm.

6 Quality Assurance and Control

Chemical data quality was monitored and assured by Columbia Analytical Services and Water & Air Research, Inc.

Review of the field data and sample collection process, and laboratory data and quality assurance reports show that all data are usable for project purposes of this Section 103 pre-dredging sediment evaluation.

6.1 Chemical Laboratory Quality Assurance and Control

Columbia Analytical's quality assurance narrative reports appear in Appendix E with the laboratory data reports that they describe. All routine problems encountered during analyses were successfully addressed.

6.1.1 Sediment Data Quality Assurance and Control

Samples were received at CAS Kelso, WA on 08/16/07 in good condition and consistent with accompanying chain of custody forms. The samples were stored in refrigerators at 4°C upon receipt at the laboratory. The offshore reference sample (RS-JH07) was archived and frozen at -20°C.

All analyses were performed consistent with the quality assurance program of CAS.

Cyanide

No anomalies associated with the analysis of these samples were observed.

Ammonia

No anomalies associated with the analysis of these samples were observed.

Oil and Grease

No anomalies associated with the analysis of these samples were observed.

Metals

The control criteria for matrix spike recoveries of iron for sample E-JH07-1 are not applicable. The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

Pesticides

No anomalies associated with the analysis of these samples were observed.

PCB Congeners

The primary evaluation criterion was exceeded for PCB 209 in CCV 0913F010. In accordance with CAS standard operating procedures, the alternative evaluation specified in the EPA method was performed using the average percent recovery of all analytes in the verification standard. The standard meets the alternative evaluation criteria.

The recovery of PCB 187 in the matrix spike analysis of sample E-JH07-1 was outside the control limits listed in the results summary. The limits are default values temporarily in use until sufficient data points are generated to calculate statistical control limits.

Based on the method and historic data, the recoveries observed are in the range expected for this procedure. No further corrective action was taken.

The recovery of PCB 187 in LCS KWG0709077-3 was outside the control limits listed in the results summary. The limits are default values temporarily in use until sufficient data points are generated to calculate statistical control limits. Based on the method and historic data, the recoveries observed are in the range expected for this procedure. No further corrective action was taken.

The confirmation comparison criterion of 40% difference for PCB 170 and PCB 156 was exceeded in SRM 1944. The higher of the two values was reported when both peaks were within the expected retention time window for this analysis and Gaussian in shape or the lower of the two values was reported when there was an apparent interference on the alternate column that produced the higher value.

The reporting limits are elevated for PCB 8 in samples E-JH07-2 Dup and E-JH07-3. The chromatogram indicated the presence of non-target background components. The matrix interference prevented adequate resolution of the target compounds at the reporting limits. The results are flagged to indicate the matrix interference.

Organotin Compounds

No anomalies associated with the analysis of these samples were observed.

PAHs

The advisory criterion was exceeded for Benzo(k)fluoranthene in standard reference material KWG0709248-6. As per the CAS/Kelso standard operating procedure for this method, these compounds are not included in the subset of analytes used to control the analysis. The recovery information reported for these analytes is for advisory purposes only (i.e. to provide additional detail related to the performance of each individual compound). The discrepancy in recovery is likely due to a different analytical technique used in determination of the analytes during the initial characterization which differentiated between other isomers which co-elute. No further correction action was appropriate.

7 Conclusions

Sediment sampling in Jacksonville Harbor occurred in August 2007. All data were collected as planned for the chemical and physical characterization of sediment from Jacksonville Harbor. Appropriate methods and procedures were employed to collect and deliver sediment samples to the analytical laboratory in a condition that was representative of the sampling locations at the time of collection. All analytical holding times were met. Some target detection limits requested in the SOW were not attained. All data are judged to be of acceptable quality for project needs.

8 References

The following references were cited in this report or were consulted for technical guidance during the planning and implementation of this project.

Environmental Protection Agency. 1996. "Test Methods for Evaluating Solid Waste Physical/Chemical Methods." SW-846, Third Edition.

Environmental Protection Agency (EPA) and Department of the Army. 1995. "QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations - Chemical Evaluations." EPA 823-B-95-001. EPA - Office of Water, Washington, D.C. and Department of the Army, Washington, D.C.

Environmental Protection Agency (EPA) and Department of the Army. 1994. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. (Testing Manual - Draft). June. EPA-823-B-94-002.

Environmental Protection Agency (EPA IV) and U.S. Army Corps of Engineers. 1993. Requirements and Procedures for Evaluation of the Ocean Disposal of Dredged Material in Southeastern Atlantic and Gulf Coastal Waters.

Environmental Protection Agency (EPA). 1986. Test Methods for Evaluating Solid Wastes, EPA SW-846, Third Edition.

Environmental Protection Agency (EPA). 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.

Evaluation of Dredged Material Proposed for Ocean Dumping (Green Book). EPA-503/8-91/001. February 1991.

Plumb, R.H., Jr. 1981. "Procedure for Handling and Chemical Analysis of Sediment and Water Samples." Technical Report EPA/CE-81-1.

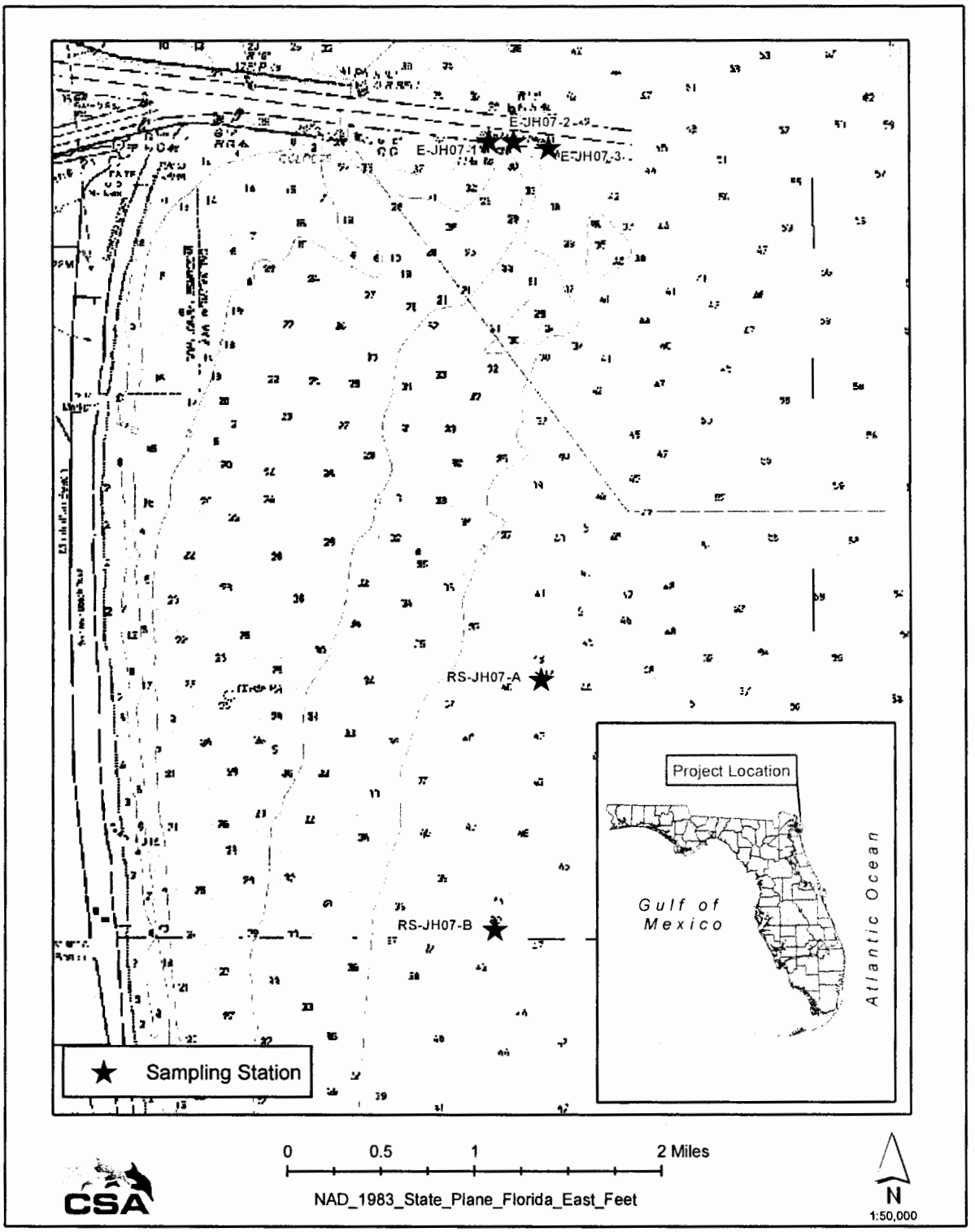


Figure 1. Sampling Station locations.

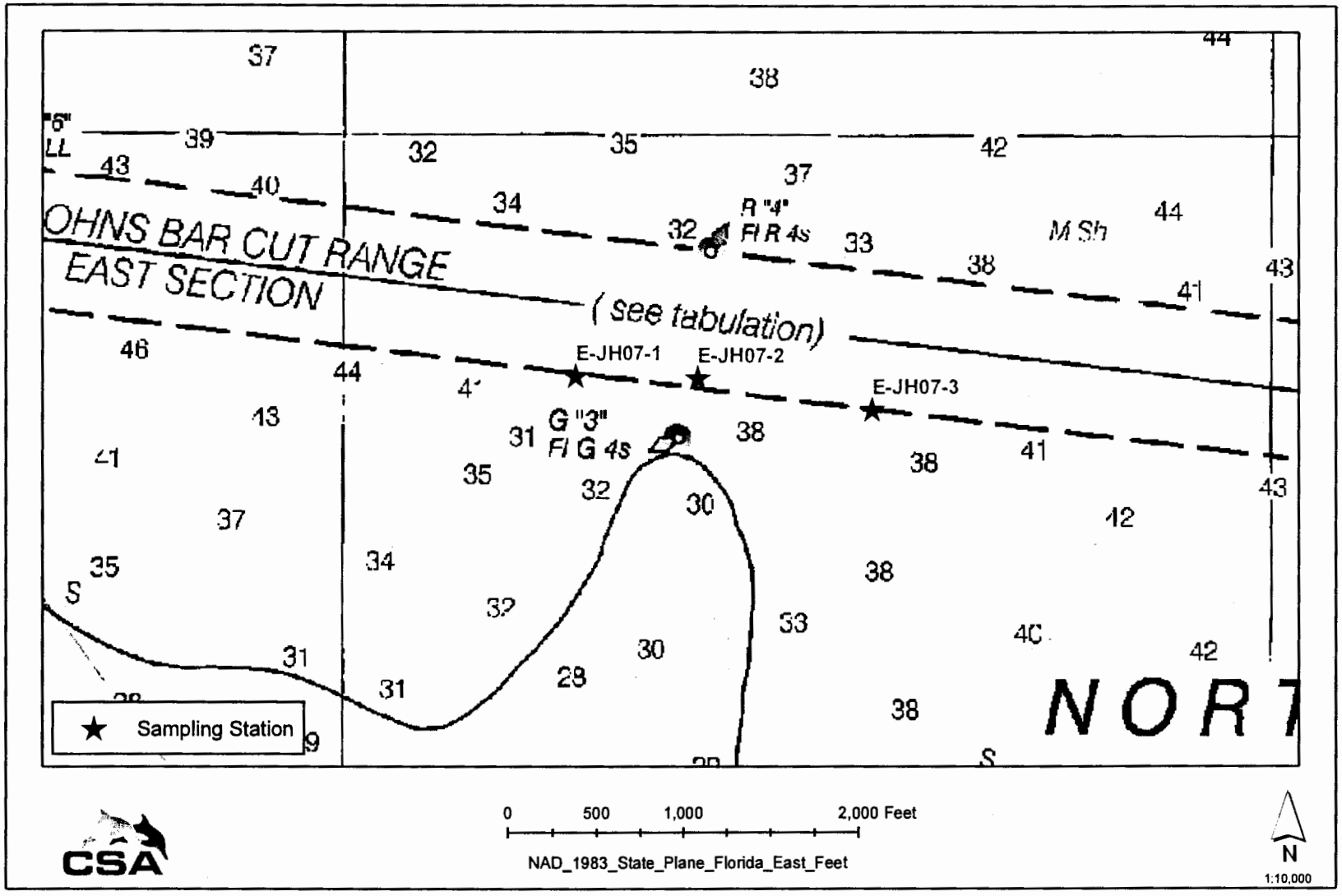


Figure 2. Sampling Stations relative to channel.

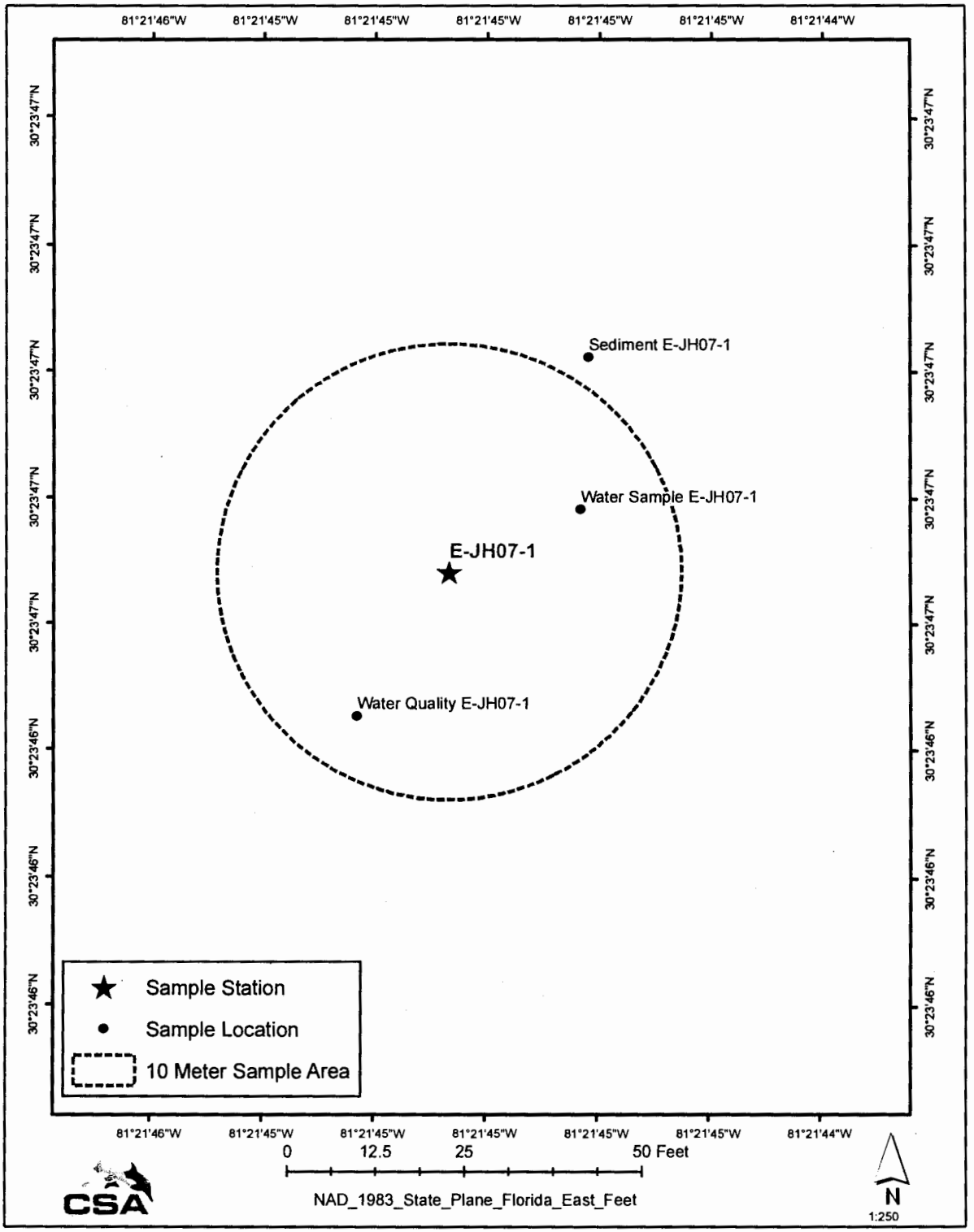


Figure 3. Sample locations for Sample Station EJH07-1.

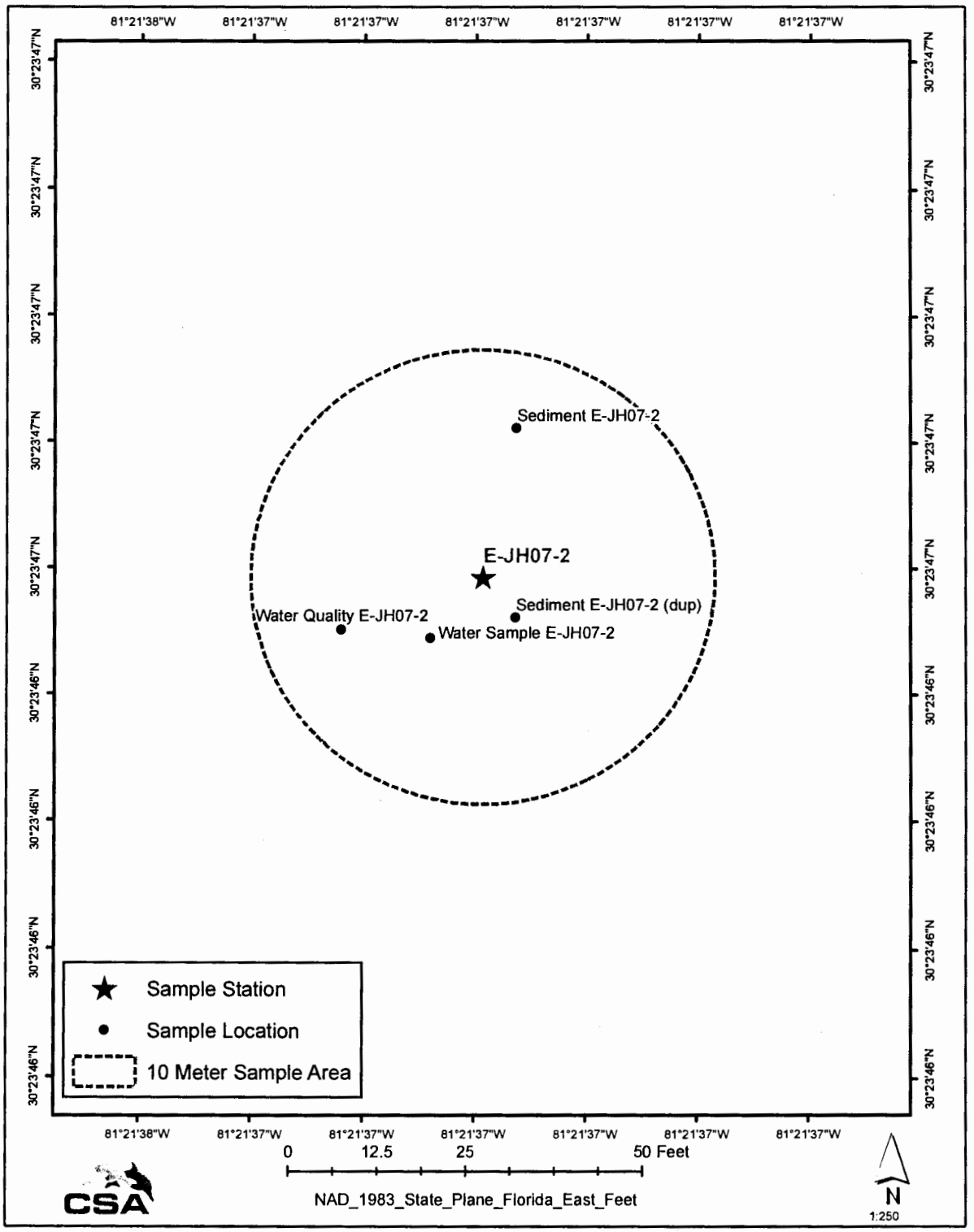


Figure 4. Sample locations for Sample Station EJH07-2.

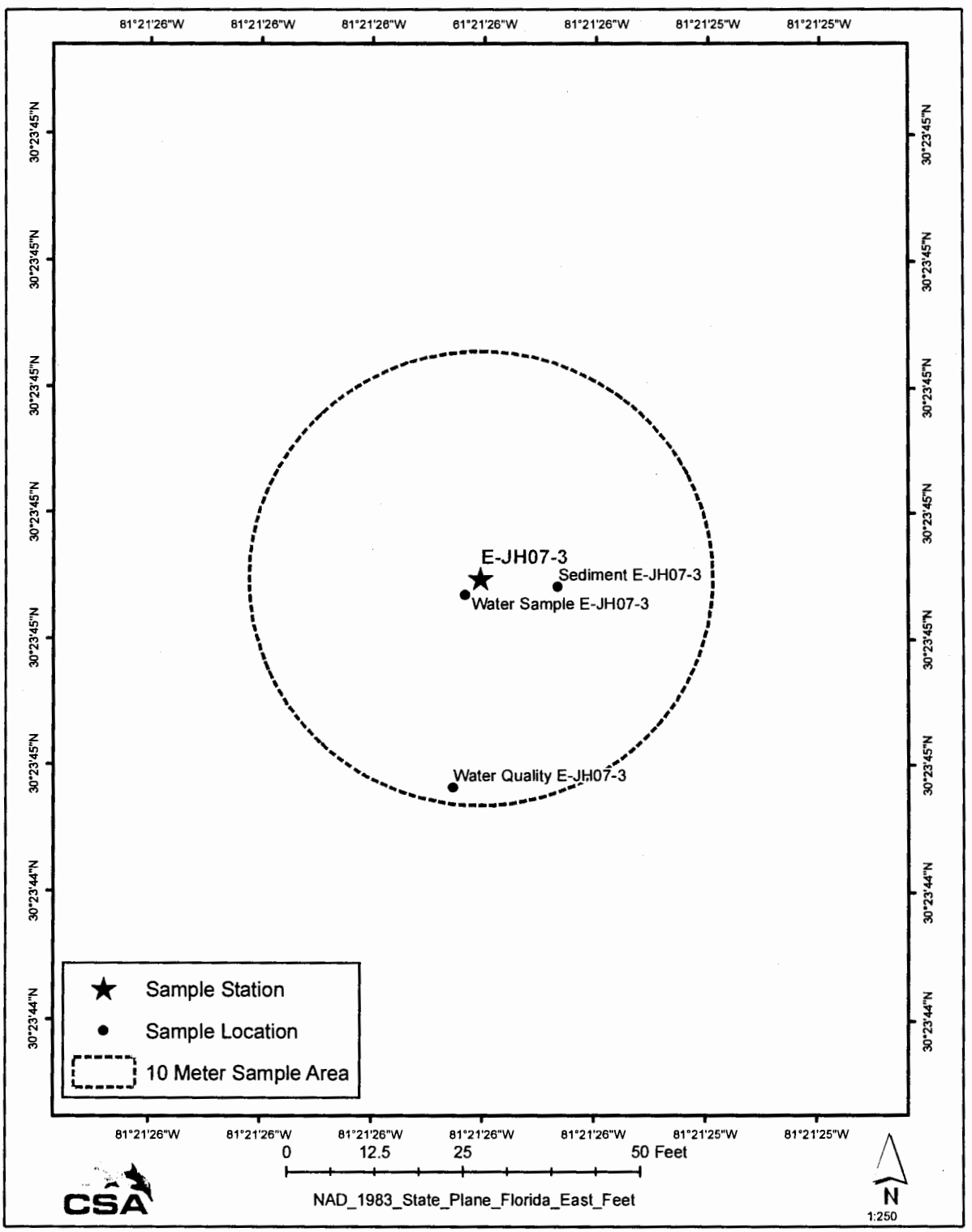


Figure 5. Sample locations for Sample Station EJH07-3.

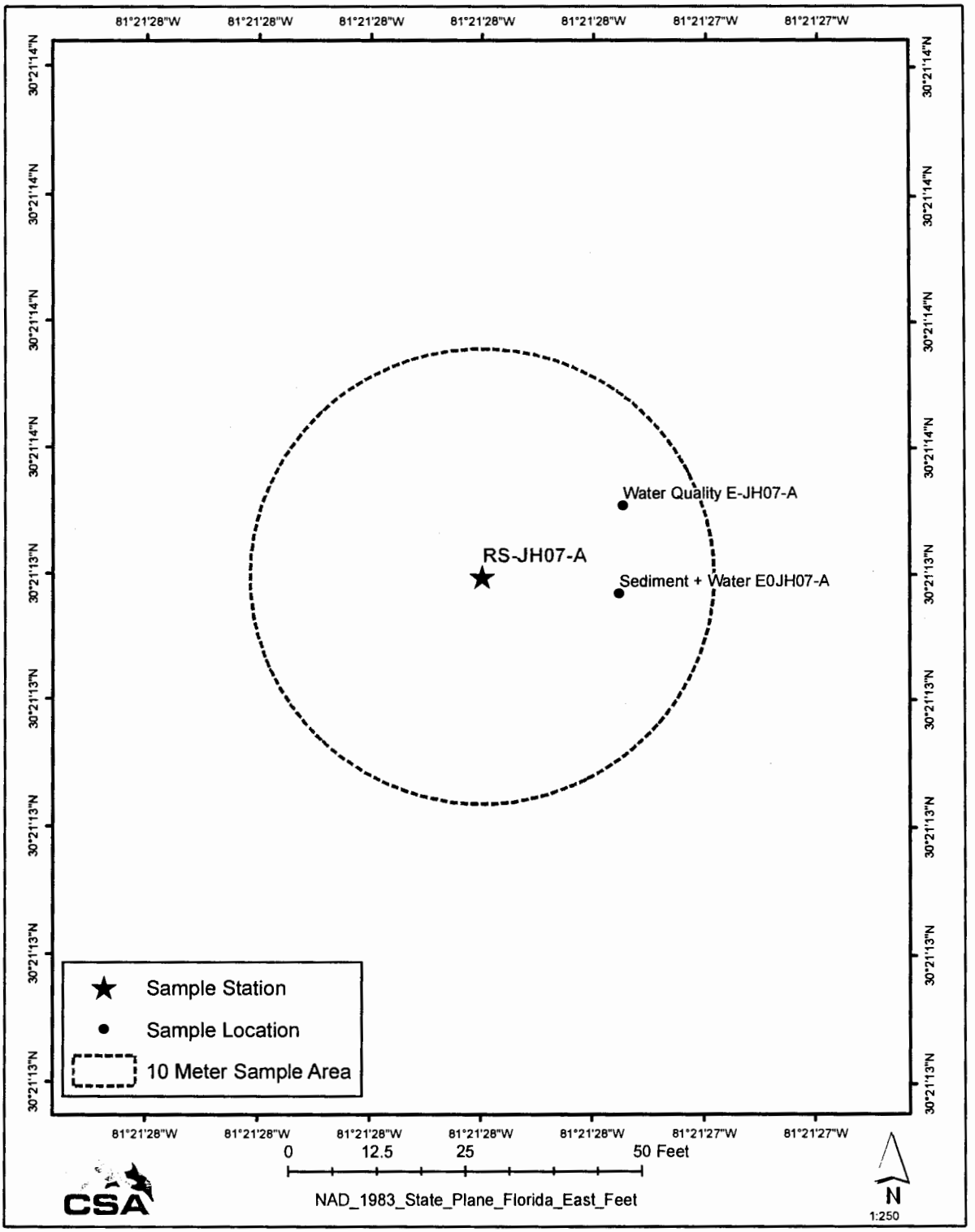


Figure 6. Sample locations for Sample Station RS-JH07-A.

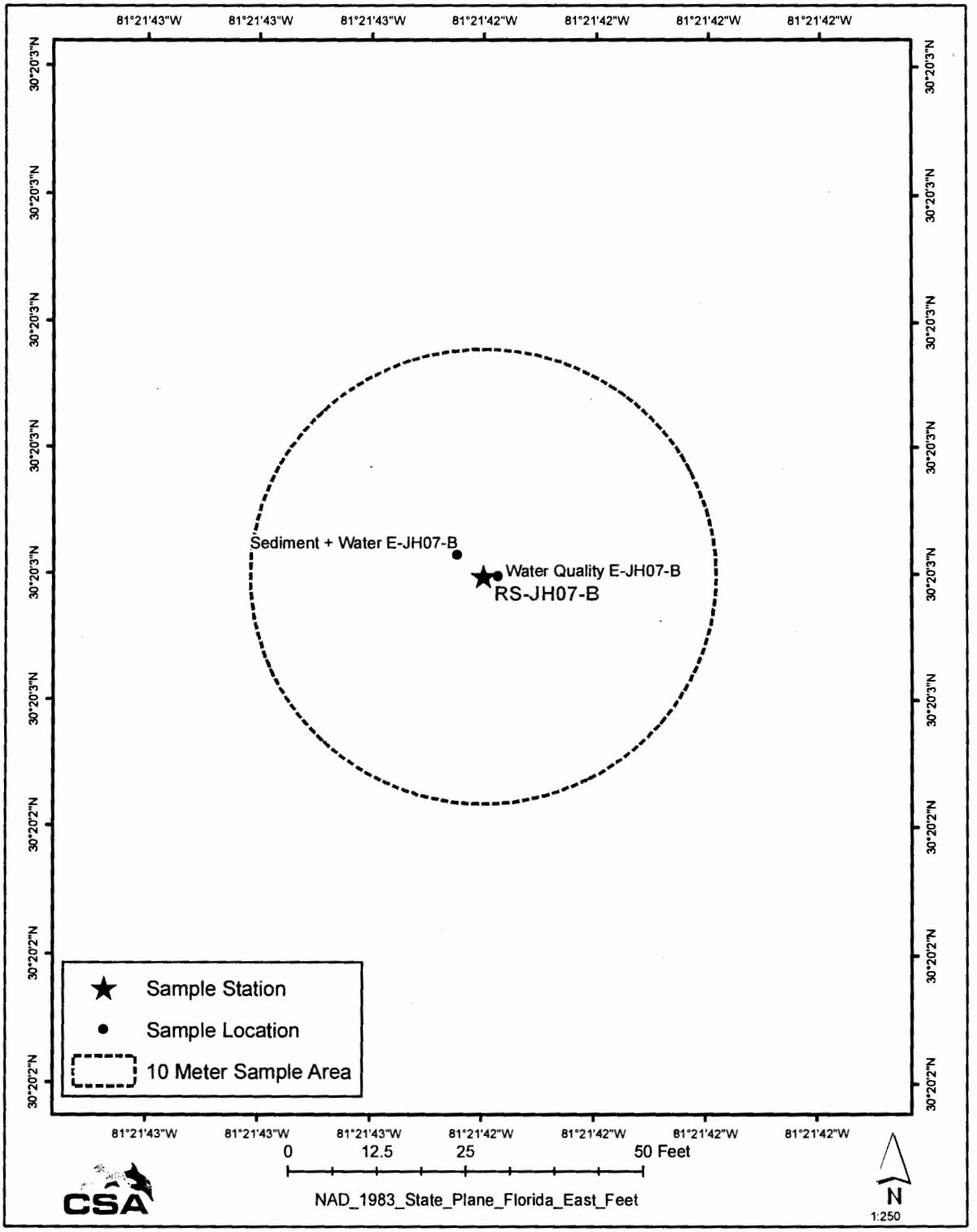


Figure 7. Sample locations for Sample Station RS-JH07-B.

Table 1. Sampling Coordinates and Sampling Techniques for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

STATION	DATE	TIME	Technique	X (ft)	Y (ft)	LAT	LON	DEPTH (ft)
Sediment E-JH07-1	8/13/2007	17:06	Grab *	541894.64	2204257.63	30° 23.7806' N	81° 21.7475' W	40
Sediment E-JH07-2	8/13/2007	17:28	Grab *	542579.78	2204237.26	30° 23.7776' N	81° 21.6171' W	40
Sediment E-JH07-3	8/13/2007	18:02	Grab *	543577.01	2204039.52	30° 23.7455' N	81° 21.4272' W	41
Sediment E-JH07-2 Dup	8/13/2007	17:44	Grab *	542579.69	2204209.98	30° 23.7731' N	81° 21.6171' W	40
Sediment RS-JH07-A	8/14/2007	11:00	Grab	543364.23	2188736.52	30° 21.2208' N	81° 21.4585' W	45
Sediment RS-JH07-B	8/14/2007	10:43	Grab	542025.19	2181617.84	30° 20.0457' N	81° 21.7089' W	46
Water Quality E-JH07-1	8/13/2007	16:51	in-situ	541862.07	2204205.94	30° 23.7721' N	81° 21.7537' W	41
Water Quality E-JH07-2	8/13/2007	16:34	in-situ	542554.99	2204208.24	30° 23.7728' N	81° 21.6218' W	39
Water Quality E-JH07-3	8/13/2007	16:28	in-situ	543562.20	2204010.47	30° 23.7407' N	81° 21.4300' W	41
Water Quality RS-JH07-A	8/14/2007	10:05	in-situ	543364.80	2188749.25	30° 21.2229' N	81° 21.4584' W	44
Water Quality RS-JH07-B	8/14/2007	10:26	in-situ	542030.97	2181614.79	30° 20.0452' N	81° 21.7078' W	46
Site Water E-JH07-1	8/13/2007	17:22	Direct Grab	541893.52	2204235.81	30° 23.7770' N	81° 21.7477' W	41
Site Water E-JH07-2	8/13/2007	17:52	Direct Grab	542567.59	2204206.99	30° 23.7726' N	81° 21.6194' W	39
Site Water E-JH07-3	8/13/2007	18:11	Direct Grab	543563.87	2204038.35	30° 23.7453' N	81° 21.4297' W	40
Site Water RS-JH07-A	8/14/2007	11:00	Direct Grab	543364.23	2188736.52	30° 21.2208' N	81° 21.4585' W	45
C00RDINATES: U.S. STATE PLANE 1983 - FLORIDA EAST ZONE NAD 83 - FEET								

* = See field sheets

Site water for physical testing was collected directly into the laboratory provided containers

Table 2. Jacksonville Harbor Sediment Method Numbers and Detection Limits

Analyte	Sediment Method Numbers	Units	SOW Requested Sediment Detection Limits (dry wt)	SE RIM MDLs (dry wt; Draft April 2005)	Achieved Sediment Detection Limits (dry wt)
Metals					
Aluminum	EPA 6010B	mg/kg	0.5	--	4.7 - 5.6
Antimony	EPA 6020	mg/kg	0.3		0.02
Arsenic	EPA 6020	mg/kg	0.5	1	0.05 - 0.06
Cadmium	EPA 6020	mg/kg	0.1	0.1	0.006 - 0.007
Chromium	EPA 6020	mg/kg	0.2	1	0.04
Copper	EPA 6020	mg/kg	0.1	1	0.1
Iron	EPA 6010B	mg/kg	1.5	--	0.4
Lead	EPA 6020	mg/kg	0.1	0.5	0.02
Mercury	EPA 7471A	mg/kg	0.05	0.05	0.005 - 0.006
Nickel	EPA 6020	mg/kg	0.2	1	0.05 - 0.06
Silver	EPA 6020	mg/kg	0.1	0.2	0.02
Zinc	EPA 6020	mg/kg	0.2	1	0.2
Pesticides					
Aldrin	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00021 - 0.00026
Chlordane	EPA 3540C / 8081A	mg/kg	0.025	0.01	0.0046 - 0.0058
4,4' DDT	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.000087 - 0.00011
4,4' DDE	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00014 - 0.00017
4,4' DDD	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00017 - 0.00021
Dieldrin	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00040 - 0.00049
Endosulfan I	EPA 3540C / 8081A	mg/kg	0.025	0.01	0.00023 - 0.00029
Endosulfan II	EPA 3540C / 8081A	mg/kg	0.025	0.01	0.00026 - 0.00032
Endosulfan sulfate	EPA 3540C / 8081A	mg/kg	0.025	0.01	0.00011 - 0.00014
Endrin	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00027 - 0.00034
Endrin Aldehyde	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.000072 - 0.000090
Heptachlor	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00011 - 0.00014
Heptachlor Epoxide	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00018 - 0.00022
Alpha-BHC	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00035 - 0.00044
Beta-BHC	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00041 - 0.00051
Gamma-BHC (Lindane)	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00021 - 0.00026
Delta-BHC	EPA 3540C / 8081A	mg/kg	0.020	0.01	0.00015 - 0.00017
Methoxychlor	EPA 3540C / 8081A	mg/kg	0.047	0.01	0.00014 - 0.00017
Toxaphene	EPA 3540C / 8081A	mg/kg	0.030	0.05	0.013 - 0.016
PCB Congeners					
PCB 8	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00026 - 0.002
PCB 18	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00033 - 0.00041
PCB 28	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00012 - 0.00028
PCB 44	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00014 - 0.00017
PCB 49	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00038 - 0.00048
PCB 52	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00012 - 0.00015
PCB 66	EPA 3540C / 8082	mg/kg	0.001	0.001	0.000095 - 0.00012
PCB 77	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00022 - 0.00027
PCB 87	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00021 - 0.00026
PCB 101	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00013 - 0.00016
PCB 105	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00018 - 0.00022
PCB 118	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00018 - 0.00022
PCB 126	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00048 - 0.00059
PCB 128	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00019 - 0.00024
PCB 138	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00013 - 0.00016
PCB 153	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00025 - 0.00031
PCB 156	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00011 - 0.00013
PCB 169	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00021 - 0.00026
PCB 170	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00022 - 0.00027
PCB 180	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00011 - 0.00013
PCB 183	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00011 - 0.00014
PCB 184	EPA 3540C / 8082	mg/kg	0.001	0.001	0.000089 - 0.00012
PCB 187	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00037 - 0.00046
PCB 195	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00025 - 0.00031
PCB 206	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00013 - 0.00016
PCB 209	EPA 3540C / 8082	mg/kg	0.001	0.001	0.00017 - 0.00021

Table 2. Jacksonville Harbor Sediment Method Numbers and Detection Limits

Analyte	Sediment Method Numbers	Units	SOW Requested Sediment Detection Limits (dry wt)	SE RIM MDLs (dry wt; Draft April 2005)	Achieved Sediment Detection Limits (dry wt)
Polynuclear Aromatic Hydrocarbons					
Acenaphthene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00031 - 0.00039
Acenaphthylene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00033 - 0.00041
Anthracene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00064 - 0.00079
Benzo (a) anthracene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00065 - 0.00081
Benzo (a) pyrene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00019 - 0.00024
Benzo (b) fluoranthene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00034 - 0.00043
Benzo (k) fluoranthene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00021 - 0.00026
Benzo (g,h,i) perylene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00087 - 0.0011
Chrysene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00034 - 0.00043
1-Methylnapthalene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00042 - 0.00053
2-Methylnapthalene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00053 - 0.00066
Dibenzo (a,h) anthracene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00038 - 0.00048
Fluoranthene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00083 - 0.0011
Fluorene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00068 - 0.00085
Indeno (1,2,3-c,d) pyrene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00022 - 0.00027
Naphthalene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00050 - 0.00063
Phenanthrene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.0011 - 0.0013
Pyrene	EPA 3541 / 8270C SIM	mg/kg	0.020	0.02	0.00050 - 0.00063
Total Organic Tins					
n-butyltin	Krone	mg/kg	0.01	0.01	0.000041 - 0.000051
di-n-butyltin	Krone	mg/kg	0.01	0.01	0.000038 - 0.000048
tri-n-butyltin	Krone	mg/kg	0.01	0.01	0.000076 - 0.000095
Other Parameters					
Ammonia	EPA 350.1	mg/kg	0.10	--	0.005
Cyanide	EPA 335.2	mg/kg	1.0	--	0.063
Oil and Grease	EPA 9071A / EPA 1664	mg/kg	1.0 *	--	70
Total Organic Carbon	EPA 9060M	%	0.1	--	0.02
Total Sulfides	EPA 9030M	mg/kg	0.20	--	1.7
Physical Parameters					
Percent Solids (wet wt)	EPA 160.3M	%	1.0	--	1.0
Grain Size	ASTM D422	%	1.0	--	1
Specific Gravity	ASTM D854	mg/L	--	--	--
Atterburg Limits	ASTM D4318	--	--	--	--
Settling Rates	Corps SAD Lab Methods	g/L	--	--	--

Note:
Sediment Requested Detection Limits are based on the USACE Jacksonville Harbor 103 Evaluation - 2007 Sampling Plan and Protocol
-- = not listed
* = wet weight basis

Table 3. Physical and Total Organic Carbon Data for Jacksonville Harbor (Jacksonville, Florida) Sediment Samples Collected August 2007

Sample ID	Grain Size Distribution (mm)								TOC (dry weight) percent	Percent Solids*	Percent Moisture
	% Cobbles	% Gravel		% Sand			% Fines				
		CRS.	Fine	CRS.	Medium	Fine	Silt	Clay			
RS-JH07	archived	archived	archived	archived	archived	archived	archived		archived	archived	archived
E-JH07-1	0.0	0.0	0.1	0.3	0.5	96.8	2.3		0.09%	74.3	25.7
E-JH07-2	0.0	0.0	0	0.2	0.4	91.0	8.4		0.30%	68.4	31.6
E-JH07-2 Dup	nr	nr	nr	nr	nr	nr	nr		0.88%	59.5	40.5
E-JH07-3	0.0	0.0	0	0.1	0.3	84.5	15.1		0.60%	64.8	35.2

Sample ID	Specific Gravity	Liquid Limit	Plastic Limit	Plasticity Index
RS-JH07	archived	archived	archived	archived
E-JH07-1	2.673	NP	NP	NP
E-JH07-2	2.653	NP	NP	NP
E-JH07-2 Dup	nr	nr	nr	nr
E-JH07-3	2.653	32	24	8

* Reported percent solids results were determined at Columbia Analytical Services, Inc - Kelso, WA

nr = Analysis not required

Archived = Samples are archived until further notice

Table 4. Sediment Oil and Grease, Total Organic Carbon, Cyanide and Ammonia Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

Sample ID	Percent Solids (%)	Oil and Grease mg/Kg (ppm)				Total Organic Carbon Percent (%)				Total Sulfide mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived			
E-JH07-1	74.3%	84	J	62	J	0.09%	--	0.07%	--	39.4	--	29.3	--
E-JH07-2	68.4%	160	--	109	--	0.30%	--	0.21%	--	146	--	100	--
E-JH07-2 Dup	59.5%	140	--	83	--	0.88%	--	0.52%	--	202	--	120	--
E-JH07-3	64.8%	130	--	84	--	0.60%	--	0.39%	--	208	--	135	--

Sample ID	Percent Solids (%)	Total Cyanide mg/Kg (ppm)				Total Ammonia mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived			
E-JH07-1	74.3%	1.0	U	0.74	U	1.78	--	1.32	--
E-JH07-2	68.4%	1.0	U	0.68	U	5.24	--	3.58	--
E-JH07-2 Dup	59.5%	1.0	U	0.60	U	7.47	--	4.44	--
E-JH07-3	64.8%	1.0	U	0.65	U	4.22	--	2.73	--

Notes:

U = The compound was analyzed for, but was not detected at or above the Method Detection Limit requested in the Jacksonville Harbor Sampling Plan and Protocol

J = The result is an estimated concentration that is less than the MRL, but greater than or equal to the MDL

-- = No qualifier needed

Table 5. Sediment Metals Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

Sample ID	Percent Solids (%)	Aluminum mg/Kg (ppm)				Antimony mg/Kg (ppm)				Arsenic mg/Kg (ppm)				Cadmium mg/Kg (ppm)				Chromium mg/Kg (ppm)				Copper mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived				archived				archived				archived			
E-JH07-1	74.3%	563	--	418	--	0.30	U	0.22	U	0.57	--	0.42	--	0.100	U	0.074	U	2.46	--	1.83	--	0.4	--	0.30	--
E-JH07-2	68.4%	1940	--	1327	--	0.30	U	0.21	U	1.22	--	0.83	--	0.100	U	0.068	U	5.27	--	3.60	--	1.1	--	0.75	--
E-JH07-2 Dup	59.5%	5040	--	2999	--	0.30	U	0.18	U	2.60	--	1.55	--	0.100	U	0.060	U	11.4	--	6.78	--	2.5	--	1.49	--
E-JH07-3	64.8%	2780	--	1801	--	0.30	U	0.19	U	1.97	--	1.28	--	0.100	U	0.065	U	7.26	--	4.70	--	1.8	--	1.17	--

Sample ID	Percent Solids (%)	Iron mg/Kg (ppm)				Lead mg/Kg (ppm)				Mercury mg/Kg (ppm)				Nickel mg/Kg (ppm)				Silver mg/Kg (ppm)				Zinc mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived				archived				archived				archived			
E-JH07-1	74.3%	920	--	684	--	1.07	--	0.80	--	0.050	U	0.037	U	0.84	--	0.624	--	0.10	U	0.07	U	4.3	--	3.19	--
E-JH07-2	68.4%	2430	--	1662	--	2.40	--	1.64	--	0.050	U	0.034	U	1.70	--	1.16	--	0.10	U	0.07	U	6.2	--	4.24	--
E-JH07-2 Dup	59.5%	5880	--	3499	--	4.96	--	2.95	--	0.050	U	0.030	U	3.70	--	2.20	--	0.10	U	0.06	U	13.8	--	8.21	--
E-JH07-3	64.8%	4080	--	2644	--	3.50	--	2.27	--	0.050	U	0.032	U	2.40	--	1.56	--	0.10	U	0.06	U	9.9	--	6.42	--

Notes:

U = The compound was analyzed for, but was not detected at or above the Method Detection Limit requested in the Jacksonville Harbor Sampling Plan and Protocol

B = The result is an estimated concentration that is less than the laboratory's MRL, but greater than or equal to the laboratory's MDL

-- = No qualifier needed

Table 6. Sediment Pesticide Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

Sample ID	Percent Solids (%)	Aldrin mg/Kg (ppm)				Chlordane mg/Kg (ppm)				4,4 DDT mg/Kg (ppm)				4,4 DDD mg/Kg (ppm)				4,4 DDE mg/Kg (ppm)				Dieldrin mg/Kg (ppm)				Endosulfan I mg/Kg (ppm)				Endosulfan II mg/Kg (ppm)				Endosulfan sulfate mg/Kg (ppm)				Endrin mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived				archived				archived				archived				archived				archived				archived				archived			
E-JH07-1	74.3%	0.020	U	0.015	U	0.025	U	0.019	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.025	U	0.019	U	0.025	U	0.019	U	0.025	U	0.019	U	0.020	U	0.015	U
E-JH07-2	68.4%	0.020	U	0.014	U	0.025	U	0.017	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.025	U	0.017	U	0.025	U	0.017	U	0.025	U	0.017	U	0.020	U	0.014	U
E-JH07-2 Dup	59.5%	0.020	U	0.012	U	0.025	U	0.015	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.025	U	0.015	U	0.025	U	0.015	U	0.025	U	0.015	U	0.020	U	0.012	U
E-JH07-3	64.8%	0.020	U	0.013	U	0.025	U	0.016	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.025	U	0.016	U	0.025	U	0.016	U	0.025	U	0.016	U	0.020	U	0.013	U

Sample ID	Percent Solids (%)	Endrin Aldehyde mg/Kg (ppm)				Heptachlor mg/Kg (ppm)				Heptachlor Epoxide mg/Kg (ppm)				Alpha-BHC mg/Kg (ppm)				Beta-BHC mg/Kg (ppm)				Gamma-BHC (Lindane) mg/Kg (ppm)				Delta-BHC mg/Kg (ppm)				Methoxychlor mg/Kg (ppm)				Toxaphene mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived				archived				archived				archived				archived				archived				archived			
E-JH07-1	74.3%	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.030	U		
E-JH07-2	68.4%	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.030	U		
E-JH07-2 Dup	59.5%	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.030	U		
E-JH07-3	64.8%	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.030	U		

Notes:

U = The compound was analyzed for, but was not detected at or above the Method Detection Limit requested in the Jacksonville Harbor Sampling Plan and Protocol

-- = No qualifier needed

Table 7. Sediment PCB Congener Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

Sample ID	Percent Solids (%)	PCB 08 mg/Kg (ppm)				PCB 18 mg/Kg (ppm)				PCB 28 mg/Kg (ppm)				PCB 44 mg/Kg (ppm)				PCB 52 mg/Kg (ppm)				PCB 66 mg/Kg (ppm)				PCB 77 mg/Kg (ppm)				PCB 87 mg/Kg (ppm)				PCB 49 mg/Kg (ppm)				PCB 101 mg/Kg (ppm)				PCB 105 mg/Kg (ppm)				PCB 118 mg/Kg (ppm)				PCB 126 mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived				archived				archived				archived				archived				archived				archived				archived				archived				archived				archived			
E-JH07-1	74.3%	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U
E-JH07-2	68.4%	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U
E-JH07-2 Dup	59.5%	0.002	U ^	0.0012	U ^	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U
E-JH07-3	64.8%	0.001	U	0.0008	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U

Sample ID	Percent Solids (%)	PCB 128 mg/Kg (ppm)				PCB 138 mg/Kg (ppm)				PCB 153 mg/Kg (ppm)				PCB 156 mg/Kg (ppm)				PCB 169 mg/Kg (ppm)				PCB 170 mg/Kg (ppm)				PCB 180 mg/Kg (ppm)				PCB 183 mg/Kg (ppm)				PCB 184 mg/Kg (ppm)				PCB 187 mg/Kg (ppm)				PCB 195 mg/Kg (ppm)				PCB 206 mg/Kg (ppm)				PCB 209 mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived				archived				archived				archived				archived				archived				archived				archived				archived				archived				archived			
E-JH07-1	74.3%	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U
E-JH07-2	68.4%	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U	0.001	U	0.0007	U
E-JH07-2 Dup	59.5%	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U
E-JH07-3	64.8%	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U	0.001	U	0.0006	U

Notes:

U = The compound was analyzed for, but was not detected at or above the Method Detection Limit requested in the Jacksonville Harbor Sampling Plan and Protocol

^ = The method detection limit was greater than the requested Sampling Plan and Protocol method detection limit

-- = No qualifier needed

Table 8. Sediment PAH Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

Sample ID	Percent Solids (%)	Acenaphthene mg/Kg (ppm)				Acenaphthylene mg/Kg (ppm)				Anthracene mg/Kg (ppm)				Benzo (a) anthracene mg/Kg (ppm)				Benzo (a) pyrene mg/Kg (ppm)				Benzo (g,h,i) perylene mg/Kg (ppm)				Benzo (k) fluoranthene mg/Kg (ppm)				Benzo (b) fluoranthene mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived				archived				archived				archived				archived				archived			
E-JH07-1	74.3%	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U
E-JH07-2	68.4%	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U
E-JH07-2 Dup	59.5%	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U
E-JH07-3	64.8%	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U

Sample ID	Percent Solids (%)	Chrysene mg/Kg (ppm)				Dibenzo (a,h) anthracene mg/Kg (ppm)				Fluoranthene mg/Kg (ppm)				Fluorene mg/Kg (ppm)				Indeno (1,2,3-cd) pyrene mg/Kg (ppm)				Naphthalene mg/Kg (ppm)				Phenanthrene mg/Kg (ppm)				Pyrene mg/Kg (ppm)			
		Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes	Reported Value (Dry)	Result Notes	Reported Value (Wet)	Result Notes
RS-JH07	archived	archived				archived				archived				archived				archived				archived				archived				archived			
E-JH07-1	74.3%	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U	0.020	U	0.015	U
E-JH07-2	68.4%	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U	0.020	U	0.014	U
E-JH07-2 Dup	59.5%	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U	0.020	U	0.012	U
E-JH07-3	64.8%	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U	0.020	U	0.013	U

Notes:

U = The compound was analyzed for, but was not detected at or above the Method Detection Limit requested in the Jacksonville Harbor Sampling Plan and Protocol

-- = No qualifier needed

Table 9. Sediment Organotin Concentrations for Jacksonville Harbor (Jacksonville, Florida) Samples Collected August 2007

Sample ID	Percent Solids (%)	n-Butyltin mg/Kg (ppm)				Di-n-butyltin mg/Kg (ppm)				Tri-n-butyltin mg/Kg (ppm)			
		Reported Value **(Dry)**	Result Notes	Reported Value **(Wet)**	Result Notes	Reported Value **(Dry)**	Result Notes	Reported Value **(Wet)**	Result Notes	Reported Value **(Dry)**	Result Notes	Reported Value **(Wet)**	Result Notes
RS-JH07	archived	archived				archived				archived			
E-JH07-1	74.3%	10	U	7.4	U	10	U	7.4	U	10	U	7.4	U
E-JH07-2	68.4%	10	U	6.8	U	10	U	6.8	U	10	U	6.8	U
E-JH07-2 Dup	59.5%	10	U	6.0	U	10	U	6.0	U	10	U	6.0	U
E-JH07-3	64.8%	10	U	6.5	U	10	U	6.5	U	10	U	6.5	U

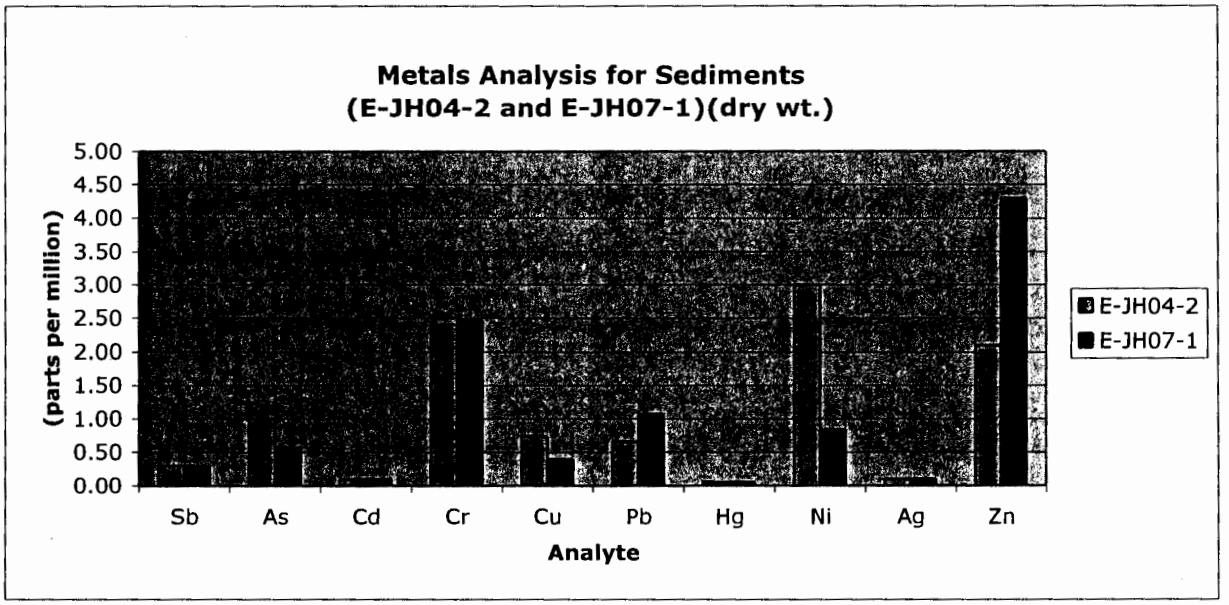
Notes:

U = The compound was analyzed for, but was not detected at or above the Method Detection Limit requested in the Jacksonville Harbor Sampling Plan and Protocol

Table 10. Jacksonville Harbor 2004 / 2007 Data Comparison for E-JH07-1

Sample ID	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
E-JH04-2	0.30	1.0	0.10	2.4	0.74	0.66	0.050	3.0	0.10	2.1
E-JH07-1	0.30	0.57	0.10	2.5	0.40	1.1	0.050	0.84	0.10	4.3

Sample ID	Al	Fe
E-JH04-2	327	709
E-JH07-1	563	920



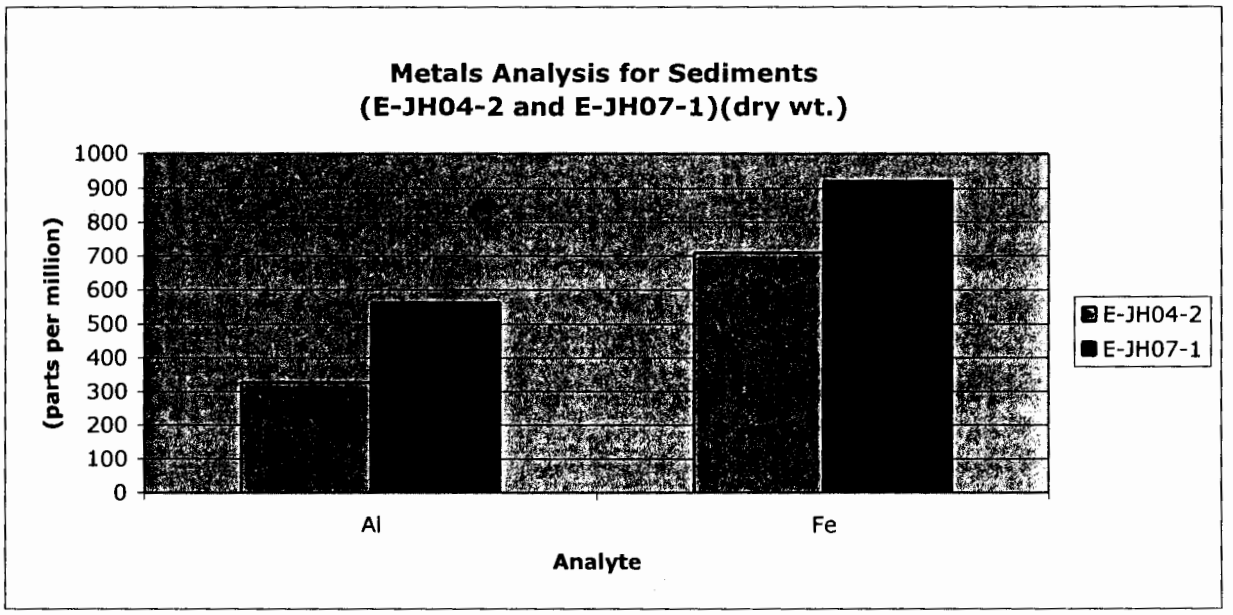
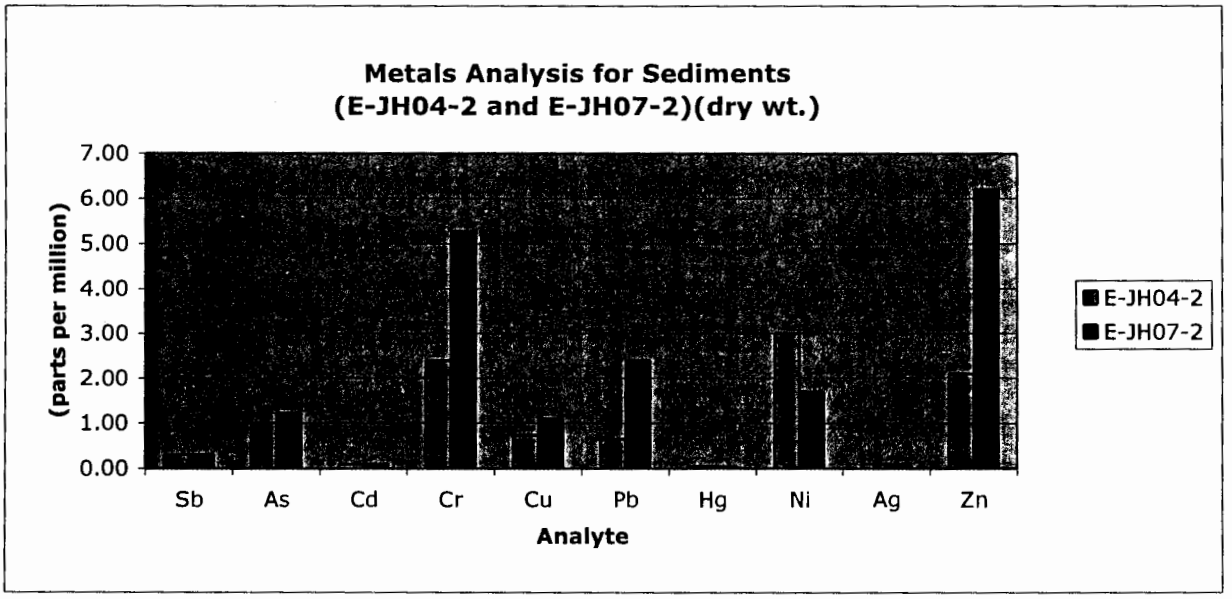


Table 11. Jacksonville Harbor 2004 / 2007 Data Comparison for E-JH07-2

Sample ID	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
E-JH04-2	0.30	1.0	0.10	2.4	0.74	0.66	0.050	3.0	0.10	2.1
E-JH07-2	0.30	1.2	0.10	5.3	1.1	2.4	0.050	1.7	0.10	6.2

Sample ID	Al	Fe
E-JH04-2	327	709
E-JH07-2	1940	2430



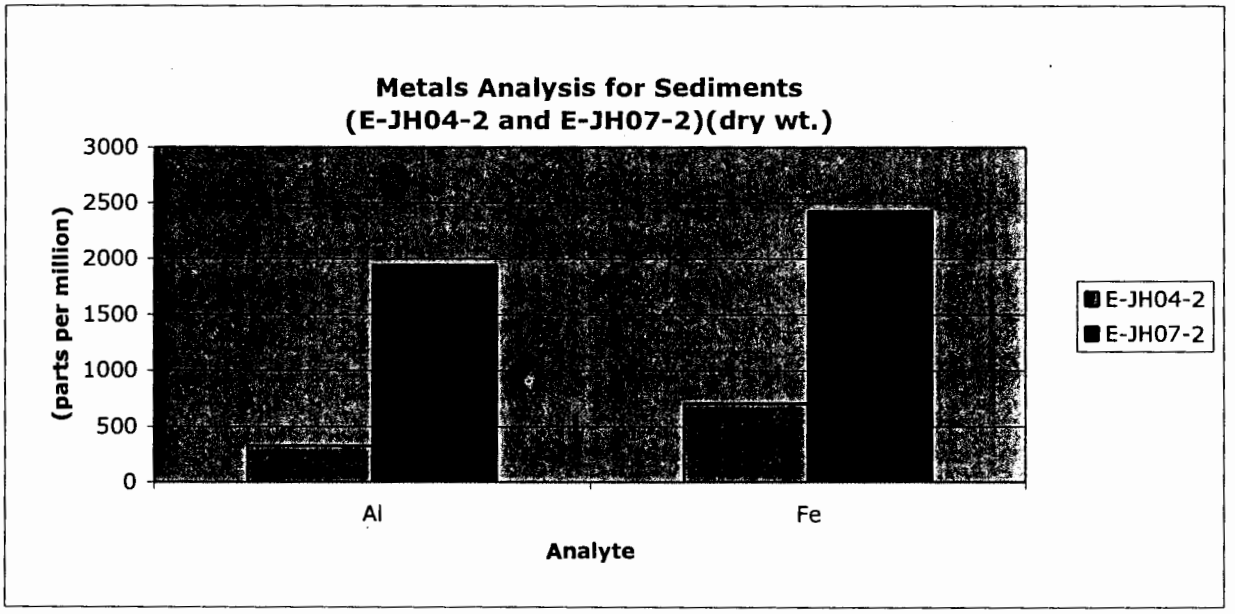
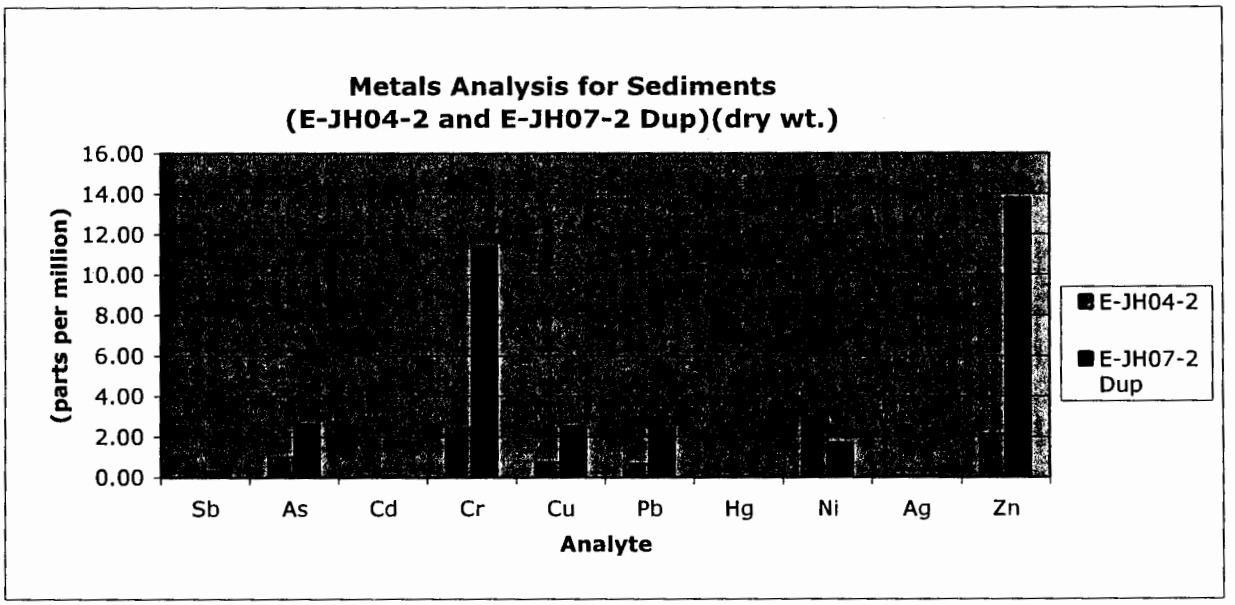


Table 12. Jacksonville Harbor 2004 / 2007 Data Comparison for E-JH07-2 Dup

Sample ID	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
E-JH04-2	0.30	1.0	0.10	2.4	0.74	0.66	0.050	3.0	0.10	2.1
E-JH07-2 Dup	0.30	2.6	0.10	11.4	2.5	2.4	0.050	1.7	0.10	13.8

Sample ID	Al	Fe
E-JH04-2	327	709
E-JH07-2 Dup	5040	5880



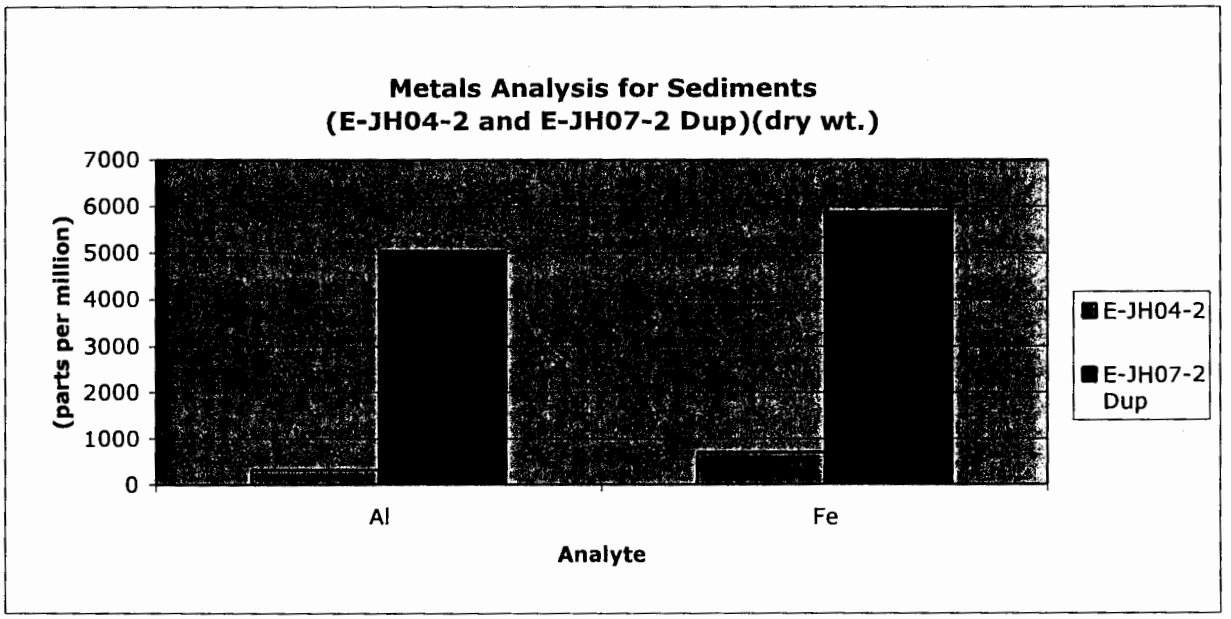
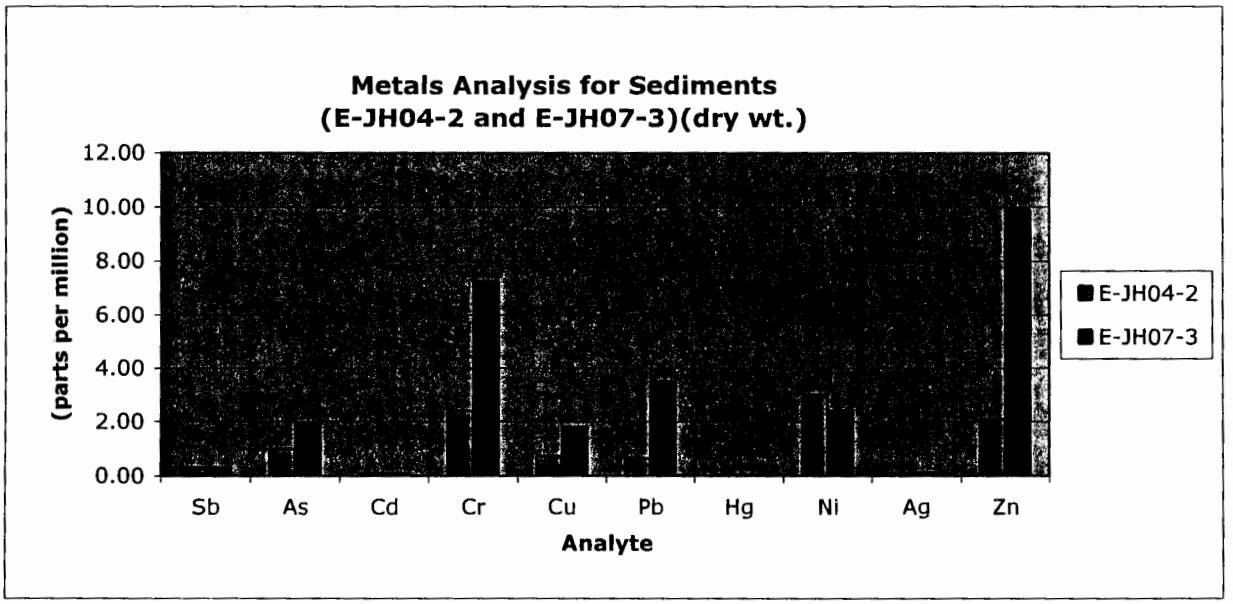
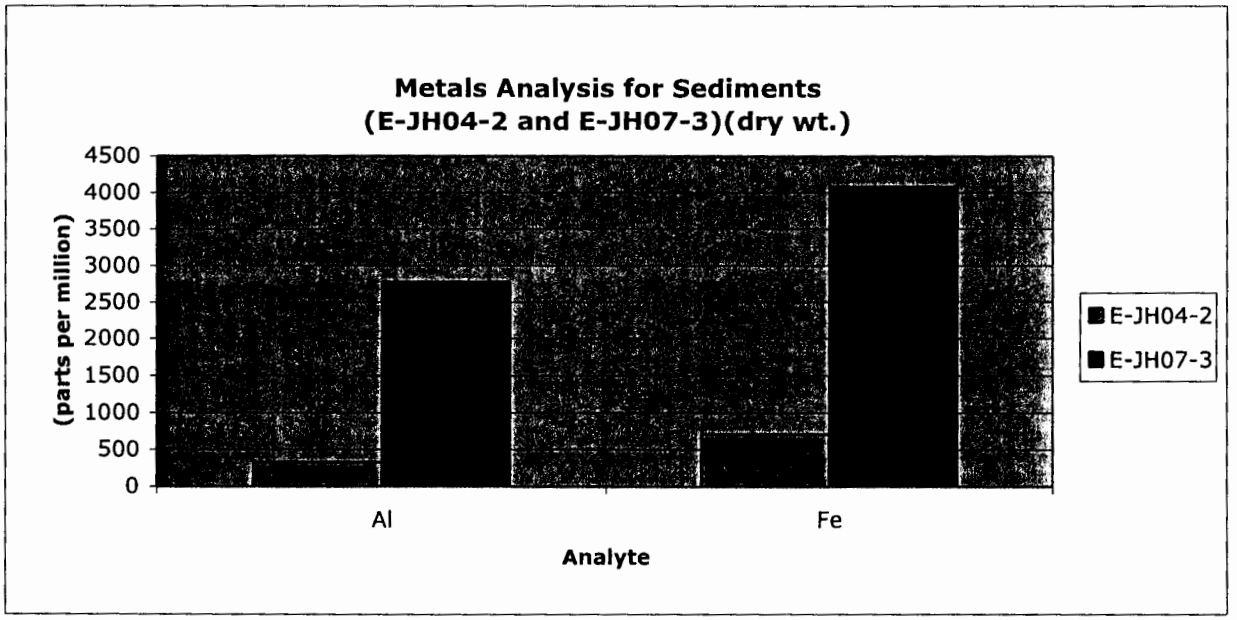


Table 13. Jacksonville Harbor 2004 / 2007 Data Comparison for E-JH07-3

Sample ID	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
E-JH04-2	0.30	1.0	0.10	2.4	0.74	0.66	0.050	3.0	0.10	2.1
E-JH07-3	0.30	2.0	0.10	7.3	1.8	3.5	0.050	2.4	0.10	9.9

Sample ID	Al	Fe
E-JH04-2	327	709
E-JH07-3	2780	4080





JACKSONVILLE HARBOR 103 EVALUATION - 2007
SAMPLING PLAN AND PROTOCOL ENTRANCE CHANNEL SHOAL LOCATED ON THE SOUTH SIDE OF THE CHANNEL AT STA. 120

Introduction

The 103 evaluation of the Jacksonville Harbor maintenance dredging and new work project considers potential dredged material (DM) from Bar Cut-3 of the Jacksonville Harbor Entrance Channel that are proposed for disposal in the Jacksonville Ocean Dredged Material Disposal Sites (ODMDS).

Project Description

Evaluation of the Jacksonville Harbor dredge material (DM) for ocean disposal considers maintenance dredging project for Jacksonville Harbor, located at the City of Jacksonville, Duval County, Florida. Examination Survey with sample locations provided at enclosures 1.

Jacksonville Harbor is located in Duval County between the City of Jacksonville and the mouth of the St. Johns River where it empties into the Atlantic Ocean. The harbor project provides access to deep draft vessel traffic using terminal facilities located in the City of Jacksonville. These port facilities handle approximately 16 million tons of cargo a year based on recent statistics. This tonnage is sufficient to place the port among the top three cargo ports in the State of Florida. The City is the largest urban and business complex in northeast Florida and southeast Georgia.

The existing project is authorized for a depth of 42 feet plus 2 feet of over depth (see Examination Survey at enclosure 1). The total amount to be dredged to maintain the existing channel is estimated at 100,000 cubic yards per year. However volume varies considerably from year to year. The next projected dredging event is scheduled for summer 2007 and will include 96,000 cubic yards of material. Dredged Material from this project consists of sand, gravel, silts and clays. All DM from this project is subject to disposal in the Jacksonville Ocean Dredged Material Disposal Site (ODMDS).

Previous dredging and disposal of Jacksonville Harbor sediments including both maintenance and new work;

Year	volume (cy)	D/A
2006	100,000	Upland
2005	100,000	Upland
2004	264,000	Upland
2003	180,000	Beach
2002	193,666	Beach
2002	1,041,734	Beneficial Use (reef)
2002	1,708,470	Upland
2001	3,745,223	Beach
2001	1,199,000	Upland
2000	1,131,660	Upland
1998	603,097	Beach
1998	223,588	Upland
1997	1,480,720	Upland
1996	716,151	Beach
1996	325,730	Upland
1994	1,900,890	Beach
1993	1,066,710	Upland

The project has been proposed for deepening to 42 feet for the entire channel.

From the Atlantic Ocean inland to about Blount Island, there are tidal saltwater marshes on either side of the St. Johns River. The north bank is low lying and has little area for development. Most of the development north of

the river is residential. The south bank in this reach is higher than the north bank and supports trees and large shrubs as well as commercial and residential development along most of the shoreline. The marsh behind the developments on both banks receives tidal flows through the various creeks with openings into the St. Johns River. The primary development on the south side in this reach is Mayport Naval Station at the mouth of the river. West of Mayport is a large expanse of marsh along the river west to the St. Johns Bluff area. Here the shoreline rises steeply on the south bank and residential development begins along the shore in the City of Jacksonville.

Evaluation Needed

This sampling plan and protocol defines the work necessary to obtain an EPA concurrence for disposal of dredged material from Jacksonville Harbor. The testing shall be done in accordance with the 1991 "Green Book"

A brief review of the steps leading to this decision is provided.

Tier I - Review of the available information for these projects indicates that chemical and bio-toxicity data for the harbor were collected in 2004 and considered adequate. It is proposed to collect samples in the sta. 120 shoal for chemical analysis for comparison to the 2004 data.

Tier II Evaluation - The proposed contaminants of concern for this project are listed below. The list includes the minimum requirements according to the regulations as well as other common contaminants.

Metals

Aluminum	Iron
Antimony	Lead
Arsenic	Mercury
Cadmium	Nickel
Chromium	Silver
Copper	Zinc

Selenium and thallium are not considered contaminates of interest. These metals have not been found in Florida marine sediments in significant quantities. In addition there are no industrial activities in the Jacksonville Harbor area that would be likely sources of these metals.

Beryllium is not considered a contaminate of interest. Beryllium is used in highly specialized nuclear and aerospace manufacturing processes, none of which have been, or currently are located within the watershed of Jacksonville Harbor.

Organic Chemicals

Chlorinated Hydrocarbon Pesticides

Aldrin	4,4'-DDE	Heptachlor
Chlordane	Dieldrin	Heptachlor Epoxide
2,4'-DDT	Endosulfan I	Methoxychlor
2,4'-DDD	Endosulfan II	Lindane & derivatives
2,4'-DDE	Endosulfan Sulfate	Toxaphene
4,4'-DDT	Endrin	
4,4'-DDD	Endrin Aldehyde	

Polychlorinated Biphenyls (PCBs)

PCB Congeners (Summation and Highest Priority list of congeners per Table 9.3 of the Green Book)

Polycyclic Aromatic Hydrocarbons (PAHs)

Acenapthene	Benzo (k) Fluoranthene
Indeno (1,2,3-cd)	Pyrene
Acenaphthylene	Benzo (b) Fluoranthene
1-Methylnaphthalene	Anthracene
Chrysene	2-Methylnaphthalene
Benzo (a) Anthracene	Dibenzo (a,h) Anthracene
Naphthalene	Benzo (a) Pyrene
Fluoranthene	Phenanthrene
Benzo (g,h,i) Perylene	Fluorene
Pyrene	

Other

Total Ammonia
Cyanide
Oil and Grease
Total Organic Carbon (T.O.C.)
Total Organic Tin
Total Sulfides

Dioxin is not considered to be a contaminant of concern. Although in the past there were paper mills located along this area of the river the only remaining mill is a recycling plant that does not produce any significant dioxin discharge. The strong current in the river combined with regular maintenance dredging makes it highly unlikely there would be any remaining dioxin in these sediments. Therefore dioxin has not been included.

Testing for the Jacksonville Harbor project shall be provided by Water & Air Research, Inc. of Gainesville, Florida and their subcontractors under a current contract with the Jacksonville District Corps of Engineers.

A plan for sampling and testing of representative sediment samples is detailed below.

Sample Plan Design

Sample Station Selection. In selecting sample stations, consideration is given to the location of shoals, the types of sediment, and areas that are likely to be contaminated, such as areas near point source discharges, or areas likely to be affected by non-point source discharge. Also considered are the influences of currents, geographical influences on different areas of the project and so forth. These points have been considered in this review.
Three (3) sample stations have been selected as shown on the encl 1. These zones shall be numbered E-JH07-1 through 3. Zones are located near the same locations sampled in Jacksonville Harbor in 2004.

The area to be sampled lies on the south side of Bar Cut-3 between stations 95 and station 125.

Sample station 1 is located at station 120 approximately 50 feet north of the southern toe of the channel.

Sample station 2 is located adjacent to channel marker Green 3 approximately 100 feet north of the toe of the channel.

Sample station 3 is located at station 104 approximately 75 feet north of the toe of the channel.

Reference Station. An area reference shall be collected and archived but not tested at this time. Sufficient material will be collected to run sediment chemistry and physical parameters. The reference sample shall be composited from two sub samples that will be taken at the following locations;

1) $30^0$21.222'N – $81^0$21.462'W
2) $30^0$20.046'N – $81^0$21.708'W

The reference sub-stations will be numbered RS-JH07A and B. The sub-samples will be homogenized and archived for future use.

The locations of stations shall be established using DGPS.

Vibracore samples shall be taken from the benthic surface to the project allowable dredge depth (-44 ft.) or refusal. Where the depth of sediment to be sampled is insufficient to allow efficient use of the Vibracore, or where the water is too deep to allow the use of the Vibracore, the samples shall be taken with a box core, gravity core or other appropriate sampling method. Reference sub-samples shall be taken by grab. The field collection contractor may change the sampling method as required by conditions in the field. Sufficient sediment shall be taken during fieldwork to rerun sediment and physical testing if required.

QA/QC. One sample station shall be sampled in duplicate for all sediment chemistry and physical tests. The station to be duplicated shall be selected at random by the field collection contractor. The contractor shall run spiked samples on request or provide splits of samples under a separate delivery order.

Hydrographic Measurements. Collection of sediment and water samples shall include the following information on station conditions and in situ hydrographic measurements at surface, mid-water column and bottom:

Water temp.	Salinity	DO
pH	Turbidity (NTU's)	Conductivity
Water depth	Tidal Cycle	Sea State
	Weather	

Field notes shall be provided to the District upon the completion of fieldwork.

Test Parameter	Test Method	Detection Limit
1. Grain Size Analysis	Plumb 1981	1.0 % (phi and mm
2. Total Solids/ Water Content	Plumb 1981	1.0% solids
3. Specific gravity	ASTM D854	
4. Atterburg limits	ASTM D4318	
5. Settling rates	Corps SAD Lab Method	

Sediment chemical analysis. Bulk sediment tests for samples from each station shall be performed for the following constituents using the methods and detection limits specified:

Test Parameter	Method to be Used	Detection Limit

(dry wgt basis)

1. Metals

a. Aluminum	ICP,	0.5 ppm
b. Antimony	6010	0.3 ppm
c. Arsenic	7061	0.5 ppm
d. Cadmium	ICP or 7131	0.1 ppm
e. Chromium	ICP or 7191	0.2 ppm
f. Copper	ICP	0.1 ppm
g. Iron	ICP	1.5 ppm
h. Lead	ICP or 7421	0.1 ppm
i. Mercury	7471	0.05 ppm
j. Nickel	ICP or 7191	0.2 ppm
k. Silver	ICP or 7761	0.1 ppm
l. Zinc	ICP	0.2 ppm

Note: Methods ending in 0 are flame atomic absorption (AA). Methods ending in 1 are Graphite furnace AA or cold vapor for mercury. 200.7 indicate inductively coupled plasma (ICP). For this work, flame AA is the least sensitive method, ICP next and furnace AA the most Testing sensitive.

2. Organics

a. Pesticides and PCB's

1) Aldrin	8080	0.020 ppm
2) Chlordane	8080	0.025 ppm
3) 4,4'-DDT	8080	0.020 ppm
4) 4,4'-DDD	8080	0.020 ppm
5) 4,4'-DDE	8080	0.020 ppm
6) Dieldrin	8080	0.020 ppm
7) Endosulfan I	8080	0.025 ppm
8) Endosulfan II	8080	0.025 ppm
9) Endosulfan Sulfate	8080	0.025 ppm
10) Endrin	8080	0.020 ppm
11) Endrin Aldehyde	8080	0.020 ppm
12) Heptachlor	8080	0.020 ppm
13) Heptachlor Epoxide	8080	0.020 ppm
14) Lindane & deriv	8080	0.020 ppm
15) Toxaphene	8080	0.030 ppm

16) PCB Congeners (Summation and Highest Priority lists of congeners per Table 9.3 of the Green Book)

b. Polynuclear Aromatic Hydrocarbons (PAHs) - all by 8100 at 0.020 ppm

1) Acenaphthene
2) Acenaphthylene
3) Anthracene
4) Benzo (a) Anthracene
5) Benzo (a) Pyrene
6) Benzo (b) Fluoranthene
7) Benzo (k) Fluoranthene
10) Dibenzo (a,h) Anthracene
11) Fluoranthene
12) Fluorene
13) Indeno(1,2,3-cd) Pyrene
14) 1-Methylnapthalene
15) 2-Methylnapthalene
16) Naphthalene

8) Benzo (g,h,i) perylene 9) Chrysene	17) Phenanthrene 18) Pyrene	
c. Total Ammonia	Plumb 1981	0.10 mg/kg
d. Cyanide	9010/9012	1.0 mg/kg
e. Oil and Grease	413.2	1.0 ppm (wet wt.)
f. Total Organic Carbon (TOC)	9060	0.1 %
g. Total Sulfides	9030, Plumb 1981	0.20 ppm

3. Total Organic Tin: Mono, di and tribuytal tin by Stephensen and Smith, 1988 or Uhler and Durrel, 1989 at a method detection limit of 0.01 mg/kg.

Chemical data shall be obtained and transmitted to the Jacksonville District as quickly as possible to allow for review.

ANALYTICAL METHODOLOGY

Laboratory analyses shall be conducted in accordance with the following:

a. Sediment Analysis.

(1) References.

(i) Procedures for Handling and Chemical Analysis of Sediment and Water Samples. USEPA/CE 81-1, May 1981, USAE Waterways Experiment Station, Vicksburg, Mississippi.

(ii) Standard Methods for the Examination of Water and Wastewater. 20th Edition, 1996, American Public Health Association (or latest edition).

(iii) Methods for Chemical Analysis of Water and Wastes (EPA 1983, and subsequent updated).

(iv) Test Methods for evaluating Solid Wastes (EPA 1986, and subsequent updates).

(v) Regional Implementation Manual – Requirements and Procedures for Evaluation of Ocean Disposal of Dredged Material in Southeastern Atlantic and Gulf Coastal Waters (EPA Region IV/COE South Atlantic Division 1993, and subsequent updates).

(vi) Evaluation of Dredged Material Proposed for Ocean Disposal (EPA/COE 1991, and subsequent updates).

(vii) Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual (EPA/COE 1998).

QUALITY CONTROL

a. The laboratory shall maintain accreditation under the National Environmental Laboratory Accreditation Conference/Program (NELAC/P)or have FDHR certification. Bioassays and tissue analysis however are not included in State approval process.

b. Contractors shall have an established quality control program which is based on Environmental Protection Agency's quality control program as outlined in Handbook for Analytical Quality Control in Water and Wastewater Laboratories, USEPA 600/4-79-019, March 1979, EPA Office of Research and Development, Cincinnati, Ohio and complies with the requirements of the Department of Defense Quality Systems Manual for Environmental Laboratories, October, 2000.

c. Upon completion of the analyses, the laboratory shall prepare a quality control report which includes the precision and accuracy of data generated on the analyzed samples.

d. As an absolute minimum, the following quality control measures shall be taken with each group of samples analyzed:

(1) Reagent blanks shall be run.

(2) Duplicate analyses shall be made on 10% of all samples, unless replicates are already required in the work order, and precision data shall be reported in the quality control report.

(3) At least one audit or reference sample (EPA, NBS or other EPA acceptable source) shall be run and reported in the quality control report. This audit sample (water or sediment) shall be within the same concentration range as the samples that are being analyzed.

(4) Spiked samples shall be run for all parameters in order to address analytical accuracy. At least 20 percent of the samples must be spiked with an appropriate standard in order to address accuracy. The concentration of the spike shall be large enough to increase the analyst's concentration by at least 50%, but not more than 200% above the original sample concentration. If the sample concentration is less than three times that of the analyte detection limit, then a spike of two to three times that detection limit is appropriate.

(5) Printouts from all AA and GC analyses shall be kept on file in the event that any problems with the data arise.

(e) A quality control plan (QCP) shall be submitted by the Contractor with their proposal to accomplish the work described in the scope of Work. The QCP should include:

(1) Listings of all analytical equipment and sampling devices to be used in the study, methods for calibrating in the field and lab, precision and accuracy standards, maintenance schedules, record keeping methods, and personnel responsible.

(2) Field survey procedures, including boat to be used, description of field notes to be taken, and sample collection, processing, and storage techniques. Particular attention should be given to field sampling and handling procedures to avoid contamination of water and sediment samples.

(3) Labeling system to be employed to ensure proper tracking of samples from collection through analysis to listing in final report.

(4) Laboratory analytical techniques and quality control procedures. Personnel responsible for accurately processing samples.

REPORT

The Contractor shall prepare a report as set forth below:

a. Report shall consist of a discussion of methods used to collect and analyze samples, sampling conditions (date and time of sample collection, tidal stage, weather conditions) and results of analyses. This report shall also contain the quality control report specified in paragraphs above.

b. Text material shall be typed on good quality 8½ by 11 inch bond paper with a 1½ binding margin on the left side, ½ inch on the right and 1 inch at the top and bottom.

c. Drawings or plates shall be no larger than 20 inches by 11 inches with sufficient margin for binding on the left side and shall include a geographical scale.

d. All Final Reports shall be typed, and one original plus three copies shall be furnished as specified below. In addition one electronic copy shall be provided in Microsoft Word format on a CDROM. One additional electronic copy shall be provided in Adobe Acrobat pdf format on a CDROM.

e. Verbal Brief. The Contractor shall prepare a verbal brief in the form of a progress review, to be submitted by phone to Corps of Engineers, Jacksonville District Office, area code 904-232-3691, after sampling and prior to completion of laboratory work.

f. Final Report. After completion of the laboratory analyses and data reduction and analysis, the Contractor shall prepare as set forth below, a final report for the project area. The final report and findings shall be objective and fully substantiated by documentation. Where full documentation is lacking, professional opinion shall be provided and qualified as such. The final report shall include the following as a minimum:

(1) Laboratory data. A scientific report of the laboratory analyses performed shall be furnished together with appropriate figures, tables, and lists of results as specified in reference 5.b.(1) above. Additional data may be requested during review by the Jacksonville District Office, U.S. Army Corps of Engineers.

(2) Data interpretation. Based on the laboratory analyses performed under this contract, the Contractor shall prepare an interpretive report addressing Study Objectives. Report format shall follow that required by reputable and scientific periodicals with introduction, methods, results, discussion, and summary sections.

SCHEDULE FOR WORK

ITEM	TIME FROM TASK ORDER INITIATION (DAYS)
Notice of Award	0
Submit QCP	5
Begin field sampling	10
Complete field sampling	20
Chemical analysis Complete	50
Prepare and submit report	60
Final Report submitted 15 days after government review complete.	

CSA SAMPLE CUSTODY SHEET

Continental Shelf Associates, Inc
759 Parkway Street
Jupiter, Florida 33477

JOB # 2121 CLIENT WATER & AIR RESEARCH DATE 8/14/07

	Sample I.D.	Date	Time	Collection Method	Container Type and Number	Sample Type/ Remarks/Preservative	Analysis
	E-JH07-1	8/13/07	1706	GRAB	1 GAL GLASS JAR x3	MARINE SEDIMENT	
	E-JH07-2	8/13/07	1734	GRAB	1 GAL GLASS JAR x3	MARINE SEDIMENT	
	E-JH07-3	8/13/07	1807	GRAB	1 GAL. GLASS JAR x3	MARINE SEDIMENT	
	E-JH07-A	8/14/07	1100	GRAB	1 GAL. GLASS JAR x2	MARINE SEDIMENT	
	E-JH07-B	8/14/07	1043	GRAB	1 GAL. GLASS JAR x2	MARINE SEDIMENT	
	E-JH07-1	8/13/07	1722	SURFACE	0.5 GAL PLASTIC x1	SEAWATER	
	E-JH07-2	8/13/07	1744	SURFACE	0.5 GAL. PLASTIC x1	SEAWATER	
	E-JH07-3	8/13/07	1811	SURFACE	0.5 GAL PLASTIC x1	SEAWATER	
~~DUPE~~	E-JH07-A	8/14/07	1100	SURFACE	0.5 GAL PLASTIC x1	SEAWATER	
DUPE	E-JH07-2	8/13/07	1743	GRAB	1 GAL GLASS JAR x3	MARINE SEDIMENT	
DUPE	E-JH07-2	8/13/07	1744	SURFACE	0.5 GAL PLASTIC x1	SEAWATER	

RELINQUISHED BY: B. PUDNEY DATE: 8/14/07 TIME: 1320 RECEIVED BY: [signature] cotter DATE: 8/15/07 TIME: 1100
RELINQUISHED BY: DATE: TIME: RECEIVED BY: DATE: TIME:
RELINQUISHED BY: DATE: TIME: RECEIVED BY: DATE: TIME:

CONTACT NAME / TELEPHONE NUMBER: BRUCE PUDNEY (561) 746-7946

Water and Air Research, Inc.
6821 S.W. Archer Road • (352) 372-1500
Gainesville, Florida 32608
info@waterandair.com

JH07 Soils

CHAIN-OF-CUSTODY-RECORD

Proj. No/Name: USACE: Jacksonville Harbor 2007

Site Name & Address: Jacksonville, FL

Samplers: (Signature) CJA

Identify Parameters Desired and No. of Containers

Sample Field ID. Number	Date	Time	Comp.	Grab	Station Location/Number	Sample Matrix	Number of Containers	Al, Sb, As, Cd, Cr	Cu, Fe, Pb, Hg, Ni	Ag, Zn	Pests, PCB, Congeners	PAHs, Organotins	Total Ammonia, CN	O&G, TOC, T. Sulfides	% Solids		Remarks or Observations
	9/13/07	1706		✓	E-JH07-1	Sed	3	✓	✓	✓	✓	✓	✓	✓	✓		
		1734		✓	-2												
		1743		✓	-2 Dup												
		1802		✓	-3												*
	9/14/07	1043	✓		RS-JH07*												Please archive ~~until~~ until further notice.
																	See attached SOW

Preservation

CF	Chilled-Filtered
SF	Sulfuric-Filtered
NF	Nitric-Filtered
C	Chilled
S	Sulfuric
N	Nitric
B	Basic/NaOH
Z	Zinc
T	Thiosulfate
H	HCL
OT	Other (see Remarks)

Precleaned Containers Relinquished by: *(Signature)*	Date/Time /	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time /	Received by: *(Signature)*
Relinquished by: *(Signature)* [signature] Cotter	Date/Time 9/15/07 1700	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time /	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date/Time /	Received for Laboratory by: *(Signature)*			

Matrix Types

S	Soil or Sediment	WW	Wastewater	T	Animal Tissues
SW	Surface Water	St.	Sludge or Solid Waste	MW	Marine Water
GW	Groundwater	DW	Drinking Water	P	Plant Tissue
OT	Other (see remarks)				

Distribution: Original Accompanies Shipment and is to be Returned to Project Manager, Yellow Copy - Field Team; Pink Copy - Lab; Gold Copy - File

Water and Air Research, Inc.
6821 S.W. Archer Road • (352) 372-1500
Gainesville, Florida 32608
Info@waterandair.com

JH07 - Original to MACTEC Jax

UPS

CHAIN-OF-CUSTODY-RECORD

Proj. No/Name: USACE: Jacksonville Harbor 2007

Site Name & Address: Jacksonville, FL

Samplers: (Signature) CSA

Sample Field ID. Number	Date	Time	Comp.	Grab	Station Location/Number	Sample Matrix	Number of Containers	Grain size	Specific Gravity	Atterberg Limits	Settling Rates						Remarks or Observations
	8/13/07	1706		✓	E-JH07-1	Sed	1	✓	✓	✓	✓						
	↓	1734		✓	-2	↓	1	✓	✓	✓	✓						
	↓	1802		✓	-3	↓	1	✓	✓	✓	✓						
	8/14/07	1043	✓		RS-JH07*	↓	1										*Please archive until further notice
	8/14/07	1722		✓	E-JH07-1	Water	1	site water for settling rates									
	↓	1749		✓	-2	↓	1										
	↓	1811		✓	-3	↓	1										
	8/14/07	1100		✓	RS-JH07*	↓	1 →	site water for settling rates; please archive									

Preservation

CF	Chilled-Filtered
SF	Sulfuric-Filtered
NF	Nitric-Filtered
C	Chilled
S	Sulfuric
N	Nitric
B	Basic/NaOH
Z	Zinc
T	Thiosulfate
H	HCL
OT	Other (see Remarks)

Precleaned Containers Relinquished by: *(Signature)*	Date/Time /	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time /	Received by: *(Signature)*
Relinquished by: *(Signature)* [signature]	Date/Time 8/16/07 1700	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time /	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date/Time /	Received for Laboratory by: *(Signature)*			

Matrix Types

S	Soil or Sediment	WW	Wastewater	T	Animal Tissues
SW	Surface Water	St.	Sludge or Solid Waste	MW	Marine Water
GW	Groundwater	DW	Drinking Water	P	Plant Tissue
OT	Other (see remarks)				

Distribution: Original Accompanies Shipment and is to be Returned to Project Manager, Yellow Copy - Field Team; Pink Copy - Lab; Gold Copy - File

COLUMBIA ANALYTICAL SERVICES, INC. (CAS)
Sample Bottle Preparation and Shipment Log
Phone: (360) 577-7222 FAX: (360) 636-1068

Name: Bryan Cotter		Lab Contact: Harvey Jacky	
Company: Water and Air Research		Project:	
Address: 6821 SW Archer Rd.			
City, State, Zip Code: Gainesville, Fl 32608		Phone:	
Carrier:	Order Arrival Date: 8/15		BP Initial/Date:
Client UPS/FEDX#			

BOTTLE TYPE/PRESERVATIVE	1 L	500 ml	250 ml	ANALYSIS - Check Box
Unpreserved Plastic White		NA	NA	☐ BOD ☐ BOD-DIS ☐ CBOD
				☐ TSS ☐ TDS ☐ Tannin/Lignin ☐ Settleable solids ☐ pH ☐ Cond ☐ Color ☐ NO2 ☐ NO3 ☐ Turb ☐ Ophos ☐ F ☐ Cl ☐ SO4 ☐ Cr6 ☐ TCLP Metals ☐ ALK ☐ HCO3 ☐ CO3 ☐ OH
Preserved Plastic Yellow (H2SO4)				☐ TOC ☐ COD ☐ NH3 ☐ TKN ☐ T-Phos ☐ NO3/NO2
Preserved Plastic Green (NaOH, ZN Acetate)				☐ Sulfide
Preserved Plastic Green (NaOH)				☐ Cyanide
Amber Glass Teflon Lid (H2SO4)				☐ Total Phenols ☐1653 ☐ TOX
Amber Glass Teflon Lid (Na2S2O3)				☐ 515
Amber Glass Teflon Lid (HNO3)				☐ AOX-1650A ☐ AOX-506
Plastic Test Vial: Coliform (100ml)				☐Total ☐Fecal ☐Enterococcus ☐Landfill ☐Colilert
Plastic Red/HNO3				☐ Total Metals ☐ Hardness ☐ Dissolved Metals (Field Filtered)
* NOTE: 2 L additional needed if QC required		NA	NA	☐ Reductive precipitation
Plastic Red (No HNO3)				☐ Lab Filter Diss. Metals
Fluoropoly (HCL) (Prepared by Metals Lab)	NA		NA	☐ Hg/1631 (total) ☐ Hg/1631 (field filtered)
Polycarbonate		NA	NA	☐ Organotin
Organic Amber Glass Teflon Lid (HCl)			NA	☐ Oil & Grease ☐ 8015M ☐ DRO ☐ EPH ☐ HCID
Organic Amber Glass Teflon Lid (NaOH)		NA	NA	☐ 8501 (RA/FA)
Organic Amber Glass Teflon Lid		NA	NA	☐ 8270/625 ☐ SIM
				☐ Chlorophyll A ☐ Dioxins ☐
			NA	☐ 8081-Pest ☐ 8141-OP Pest ☐ 608 ☐ 610
		NA	NA	☐ 8082-PCB ☐ 8151 ☐ 8310 ☐ 8330
40ml amber				☐ PCP/TCP
40ml VOA w/Teflon Septa (HCl)	Sets of 3☐ 2☐			☐ 524.2 ☐ Gas/BTEX ☐ BTEX ☐ GRO ☐ VPH ☐ 624 ☐ RSK 175 (no CO2) ☐ 8021 ☐ 8260 ☐ Trip Blank
40ml VOA w/Teflon Septa (Na2S2O3)	Sets of 3			☐ 504 ☐
40ml VOA w/Teflon Septa				☐ RSK 175 w/CO2 ☐ Methanol ☐ Glycols
1 oz. soil w/septa (MEOH)				☐ Mass.VPH ☐ AK 101 ☐ 8260
Soil - Glass:	☐ 2 oz.	☐4 oz	☐ 8 oz.	☒16 oz. X10 ☐32 oz.
5035 Kits	☐ 2 bisulfate, 1 MEOH, and 1-2oz soil jar			☐ 3 encores
Soil Sulfide kit with Zinc Acetate	☒2 oz X5			
Cubetainer	☐ 1 gallon	☐ 5 gallon	☐ with DI water ☐ empty	☐ Voa Free water in 1L amber
Additional Comments:	—			

Chain of Custody Forms: ☒ Regular ☐ Landfill ☐Tissue/Sediment ☐ Drinking Water ☐ Blank
Other: ☒ Blue Ice ☒ Custody Seals ☒ Temperature Blank

NOTE: All organics and hydrocarbons need extra bottles for QC. Two per test is ideal.

Precautions: Sample bottles containing preservatives should not be overflowed while filling. Under no circumstances should the inside of the bottles or lids be handled. If you have questions, please call your lab contact at (360) 577-7222. Please return this form with the samples.

☐ *Invoice Client for shipping. Shipping Cost $*

Jacksonville Harbor 2007
WAR/COE
SITE WATER AND SEDIMENT ASSESMENT

Date 08/ 13/2007
Time 1713
Water Depth (ft.) 39
Project Depth (ft.) 37 / 44
Weather breeze 5-10kts Sunny
Sea State 2-3ft chop

Station # E-JH-07-1
Tidal Cycle Outgoing
Coordinates: N
W See Nav Log
Field Team BP,EW,CL

Sampling Depth (ft)	Temp (C)	pH	Dissolved O_2 mg/l	Salinity (ppt)	Conductivity (mmhos/cm)	Turbidity (NTU/s)
[illegible]	30.4	[illegible]	6.0	33.5	56	2.5
30.6	30.1	8.1	6.2	35.7	59.6	3.7
31.2	29.8	8.1	6.0	36.3	60.1	5.3

Sample Collection

Sediment sample volume (gallons): 3
Sediment Description: Sandy / thick black mud / chunks

Water sample volume (gallons): 0.5

Comments: VanVeen Crab used instead of Vibracore due weather and seas conditions

Water Sampler Used: SEALED 12

Sensor Serial # : 5030

Jacksonville Harbor 2007
WAR/COE
SITE WATER AND SEDIMENT ASSESMENT

Date 08/ 13 /2007
Time 1728
Water Depth (ft.) [illegible]
Project Depth (ft.) 37 / 44
Weather 5-10kts Sunny clear
Sea State 2-3 ft Chop

Station # E-JH07-2
Tidal Cycle outgoing
Coordinates: N
W See nav log.
Field Team BP,EW,CL

Sampling Depth (ft)	Temp (C)	pH	Dissolved O_2 mg/l	Salinity (ppt)	Conductivity (mmhos/cm)	Turbidity (NTU/s)
[illegible]	30.3	8.0	[illegible]	34.2	[illegible]	[illegible]
[illegible]	30.2	[illegible]	[illegible]	34.4	[illegible]	[illegible]
[illegible]	29.7	8.1	[illegible]	36.[illegible]	60.1	[illegible]

Sample Collection

Sediment sample volume (gallons): 6 (Dupe)
Sediment Description: Thick sandy mud, sulphur smell

Water sample volume (gallons): ~~[illegible]~~ 1 gallon (Dupe)

Comments: Dupsite Van Veen Grab used instead of Vibrocore due to [illegible]

Water Sampler Used: [illegible]

Sensor Serial # : 5030

Jacksonville Harbor 2007
WAR/COE
SITE WATER AND SEDIMENT ASSESMENT

Date 08/ [illegible] /2007
Time 1802
Water Depth (ft.) [illegible]
Project Depth (ft.) 37 / 44
Weather 5-10kts sunny clear.
Sea State 2-3ft chop

Station # E-JH07-03
Tidal Cycle Outgoing
Coordinates: N
W See nav log
Field Team BP,EW,CL

Sampling Depth (ft)	Temp (C)	pH	Dissolved O_2 mg/l	Salinity (ppt)	Conductivity (mmhos/cm)	Turbidity (NTU/s)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21.1	30.7	8.1	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	30.1	8.1	[illegible]	[illegible]	[illegible]	[illegible]

Sample Collection

Sediment sample volume (gallons): 3
Sediment Description: thick black mud sulphur smell

Water sample volume (gallons): 0.5

Comments: Vouvcon Crab used instead of [illegible] due to weather and sea condition

Water Sampler Used: SEALIFE [illegible]

Sensor Serial # : [illegible]

Jacksonville Harbor 2007
WAR/COE
SITE WATER AND SEDIMENT ASSESMENT

Date 08/ 14 /2007
Time 1043
Water Depth (ft.) 44.5 ft
Project Depth (ft.) 37 / 44
Weather 3-5 kts clear
Sea State calm

Station # E-JH07-B
Tidal Cycle High.
Coordinates: N
W See new log
Field Team BP,EW,CL

Sampling Depth (ft)	Temp (C)	pH	Dissolved O_2 mg/l	Salinity (ppt)	Conductivity (mmhos/cm)	Turbidity (NTU/s)
4.7	30.1	8.2	6.7	36.2	[illegible]	[illegible]
23.5	[illegible]	8.1	5.7	36.3	[illegible]	1.7
[illegible]	[illegible]	8.1	5.4	36.3	[illegible]	3.1

Sample Collection

Sediment sample volume (gallons): 2
Sediment Description: Thick mud, worms present

Water sample volume (gallons):

Comments: Van Veen grab used unbeard of [illegible] due to location

Water Sampler Used: [illegible] 194

Sensor Serial # : [illegible]

Jacksonville Harbor 2007
WAR/COE
SITE WATER AND SEDIMENT ASSESMENT

Date 08/ 14 /2007
Time 1100
Water Depth (ft.) [illegible]
Project Depth (ft.) 37 / 44
Weather Calm 3-5kts
Sea State Calm

Station # E-JH07-A
Tidal Cycle High
Coordinates: N
W See nav Log

Field Team BP,EW,CL

Sampling Depth (ft)	Temp (C)	pH	Dissolved O_2 mg/l	Salinity (ppt)	Conductivity (mmhos/cm)	Turbidity (NTU/s)
4.0	30.0	8.1	[illegible]	35.9	59.7	0.9
22.5	29.8	8.1	[illegible]	35.1	58.1	1.3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Sample Collection

Sediment sample volume (gallons): 1/2
Sediment Description:

Water sample volume (gallons): 0.5

Comments: Rock mud / sand grains
Van Veen was used instead of Ponar due to location

Water Sampler Used: [illegible]

Sensor Serial # : [illegible]

JACKSONVILLE HARBOR
FIELD OPS LOG AUGUST 13-14, 2007

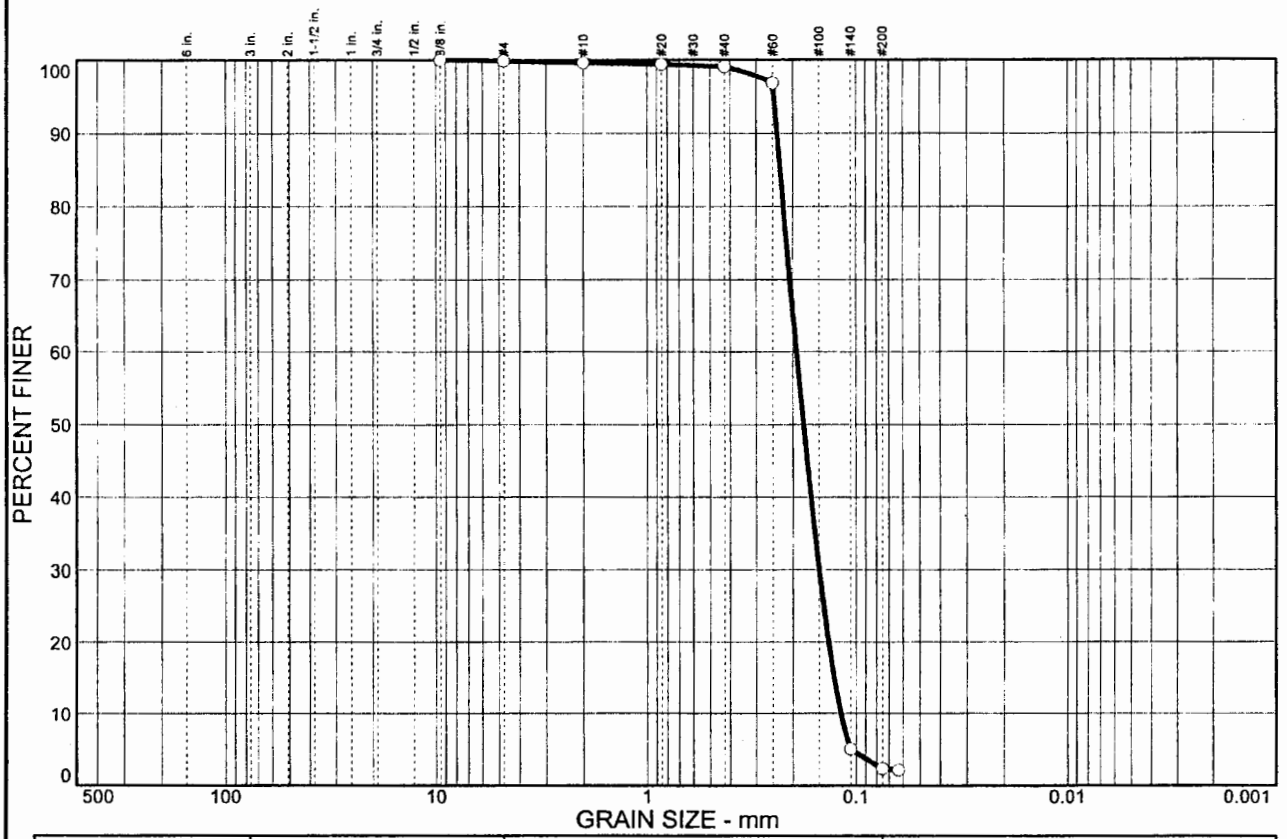
Monday 8/13/07 Weather: Clear, East Wind 5 Knots

0830 BP, EW, CL leave Jupiter with Parker
1100 Stop for fuel – 25 gal truck – 60 gal parker
1300 Stop to replace blown trailer tire
1445 Arrive at Mayport boat ramp
1500 Launch boat and begin MOB
1540 Depart dock for three inshore sites
1610 Call B. Cotter to verify site positions. Field team given OK to proceed with planned site positions.
1628 Begin water quality @ E-JH07-3
1631 Transit to E-JH07-2
1634 Begin water quality @ E-JH07-2
1639 Transit to E-JH07-1
1651 Begin water quality @ E-JH07-1
1706 Sediment grab @ E-JH07-1 (3 jars)
1722 Water sample @ E-JH07-1 (.5 gal)
1724 Transit to E-JH07-2
1728 Sediment grab @ E-JH07-2 (3 jars)
1744 Sediment grab @ E-JH07-2 (3 jars) DUP SITE
1752 Water sample @ E-JH07-2 (1 gal) DUP SITE
1757 Transit to E-JH07-3
1802 Sediment grab @ E-JH07-3 (3 jars)
1811 Water sample @ E-JH07-3 (.5 gal)
1815 Transit to ramp
1900 Depart ramp
1930 Arrive @ Hotel

Tuesday 8/14/07 Weather: Clear, Light Wind

0800 BP, EW, CL leave hotel to get ice and launch boat
0845 Arrive at ramp and begin MOB
0900 Depart ramp (parker will only go 10 knots suspect fuel flow problem)
1000 Arrive at E-JH07-A
1005 Begin water quality @ E-JH07-A
1012 Transit to E-JH07-B
1026 Begin water quality @ E-JH07-B
1043 Sediment grab + water sample @ E-JH07-B (3 jars)
1100 Sediment grab + water sample @ E-JH07-A (3 jars + .5 gal)
1200 Arrive @ ramp & demob boat for transit to Jupiter
1320 Drop coolers off at Fed Ex
1330 Transit to Jupiter
1815 Arrive @ CSA Jupiter

Grain Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.1	0.3	0.5	96.8	2.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.9		
#10	99.6		
#20	99.4		
#40	99.1		
#60	96.9		
#140	5.0		
#200	2.3		
#230	2.1		

* (no specification provided)

Soil Description

SAND, fine quartz, gray

Atterberg Limits (ASTM D 4318)

PL= NP LL= NP PI= NP

Classification

USCS= SP AASHTO= A-3

Coefficients

D_{85}= 0.230 D_{60}= 0.192 D_{50}= 0.178
D_{30}= 0.149 D_{15}= 0.127 D_{10}= 0.118
C_u= 1.63 C_c= 0.99

Date Tested: 8-17-2007 **Tested By:** FB

Remarks

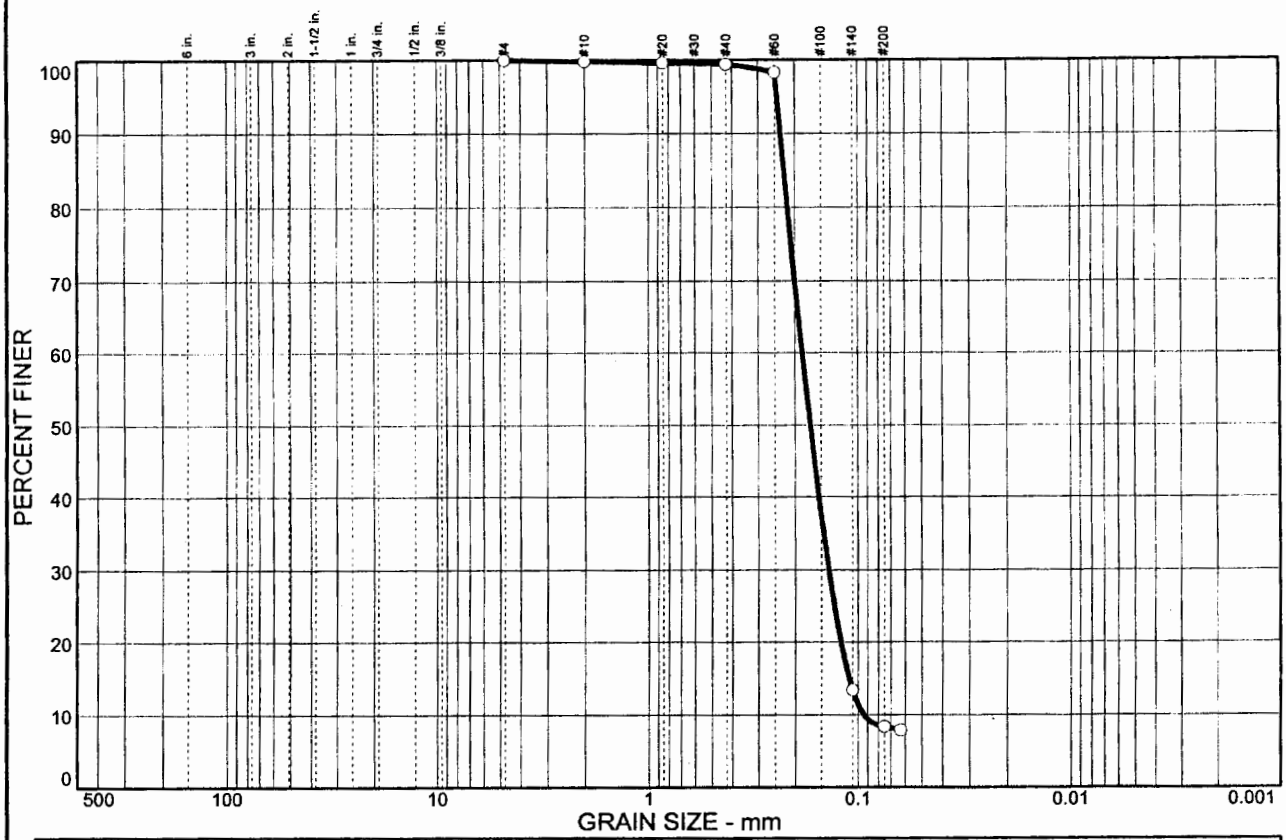
Specific Gravity: 2.673

Sample No.: 1 **Source of Sample:** E-JH07 **Date Sampled:** 8-13-2007
Location: **Elev./Depth:**
Checked By: **Title:**

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Water and Air Research, Inc.
Project: Jacksonville Harbor 2007
Project No: 6738-04-4564-06
Reviewed By 8-22-07

Grain Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.2	0.4	91.0	8.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.6		
#40	99.4		
#60	98.3		
#140	13.4		
#200	8.4		
#230	7.9		

* (no specification provided)

Soil Description

SAND, mostly fine quartz, few silt, dark gray

Atterberg Limits (ASTM D 4318)

PL= NP LL= NP PI= NP

Classification

USCS= SP-SM AASHTO= A-3

Coefficients

D_{85}= 0.225 D_{60}= 0.184 D_{50}= 0.169
D_{30}= 0.138 D_{15}= 0.110 D_{10}= 0.0935
C_u= 1.97 C_c= 1.10

Date Tested: 8-17-2007 **Tested By:** FB

Remarks

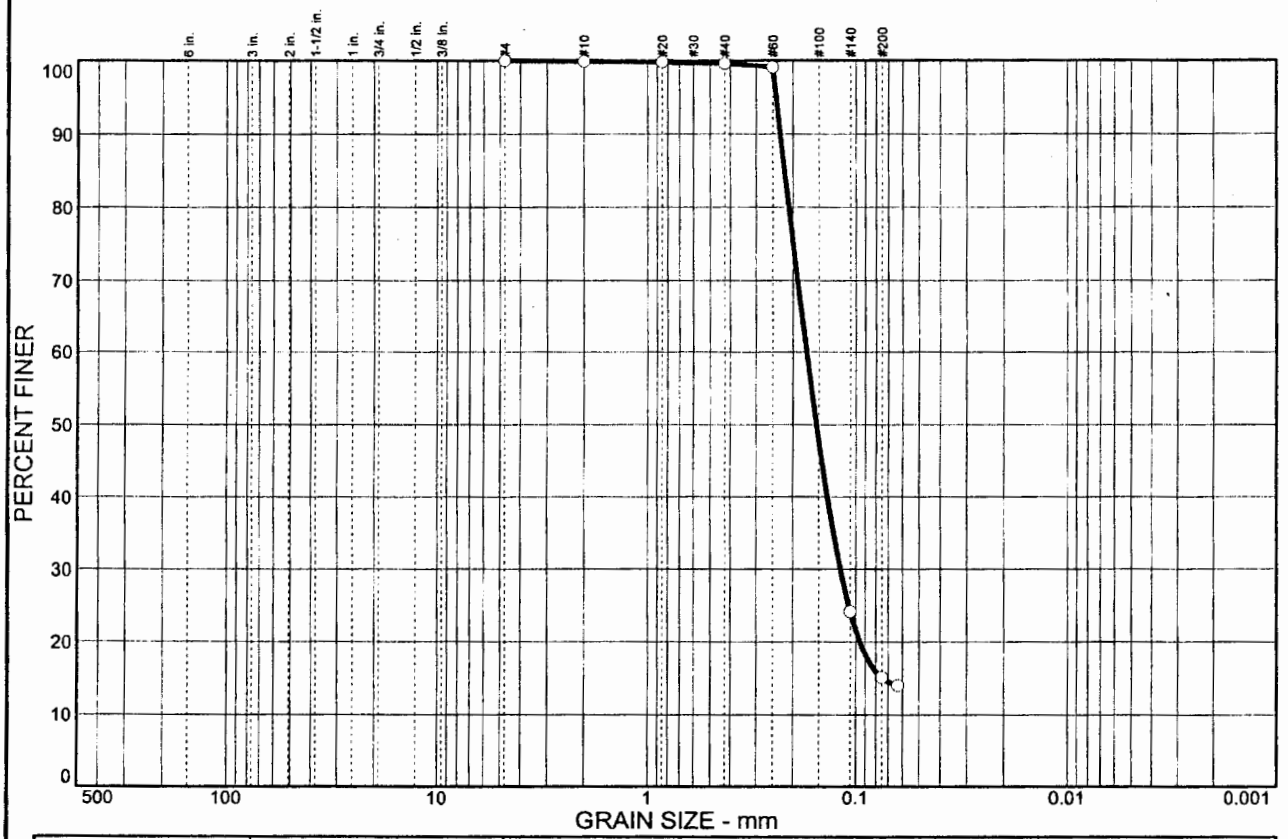
Specific Gravity: 2.653

Sample No.: 2 **Source of Sample:** E-JH07 **Date Sampled:** 8-13-2007
Location: **Elev./Depth:**
Checked By: **Title:**

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Water and Air Research, Inc.
Project: Jacksonville Harbor 2007
)
Project No: 6738-04-4564-06
Reviewed By 8-27-07

Grain Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	0.3	84.5	15.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.8		
#40	99.6		
#60	99.1		
#140	24.2		
#200	15.1		
#230	14.0		

* (no specification provided)

Soil Description

SAND, mostly fine quartz, little silt, dark gray

Atterberg Limits (ASTM D 4318)

PL= 24 LL= 32 PI= 8

Classification

USCS= SM AASHTO= A-2-4

Coefficients

D_{85}= 0.219 D_{60}= 0.171 D_{50}= 0.154
D_{30}= 0.118 D_{15}= 0.0742 D_{10}=
C_u= C_c=

Date Tested: 8-17-2007 **Tested By:** FB

Remarks

Specific Gravity: 2.653

Sample No.: 3 **Source of Sample:** E-JH07 **Date Sampled:** 8-13-2007
Location: **Elev./Depth:**
Checked By: **Title:**

MACTEC ENGINEERING. AND CONSULTING, INC.

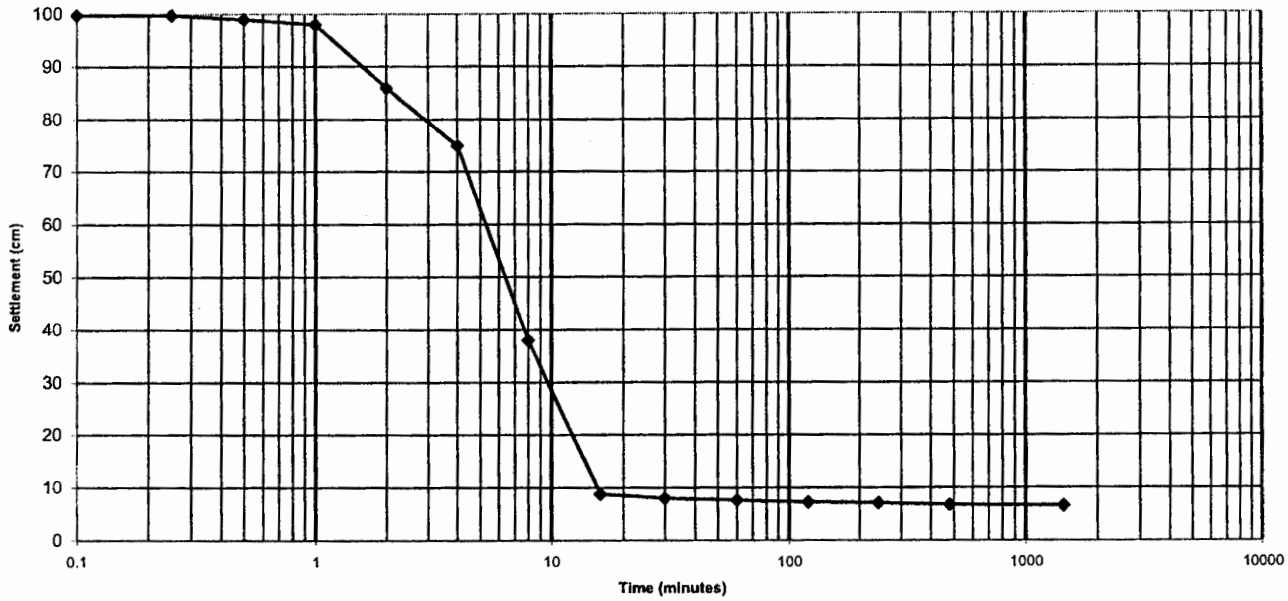
Client: Water and Air Research, Inc.
Project: Jacksonville Harbor 2007
)
Project No: 6738-04-4564-06
Reviewed By: Michael Hd 8-22-07

MACTEC

REPORT OF SETTLING RATE TESTING

MACTEC PROJECT NO: 6738-04-4564-06
PROJECT: Jacksonville Harbor 2007
CLIENT: Water and Air Research
COE Test Method

DATE: August 20, 2007
SAMPLE NO: E-JH07-1
CONCENTRATION: 100 g/L



Sedimentation Rate Test COE Method

TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	99.8	16	8.8
0.25	99.8	30	8.0
0.5	99.0	60	7.6
1	98.0	120	7.3
2	86.0	240	7.1
4	75.0	480	6.8
8	38.0	1440	6.6

Final Concentration: 1515.152 g/L

Reviewed By
Michael J Holm 8-22-07
Mike Holm, P.E.

MACTEC Engineering and Consulting, Inc.
3901 Carmichael Avenue
Jacksonville, Florida 32207
(904) 396-5173

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REPORT OF SETTLING RATE TESTING

MACTEC PROJECT NO: 6738-04-4564-06

PROJECT: Jacksonville Harbor 2007

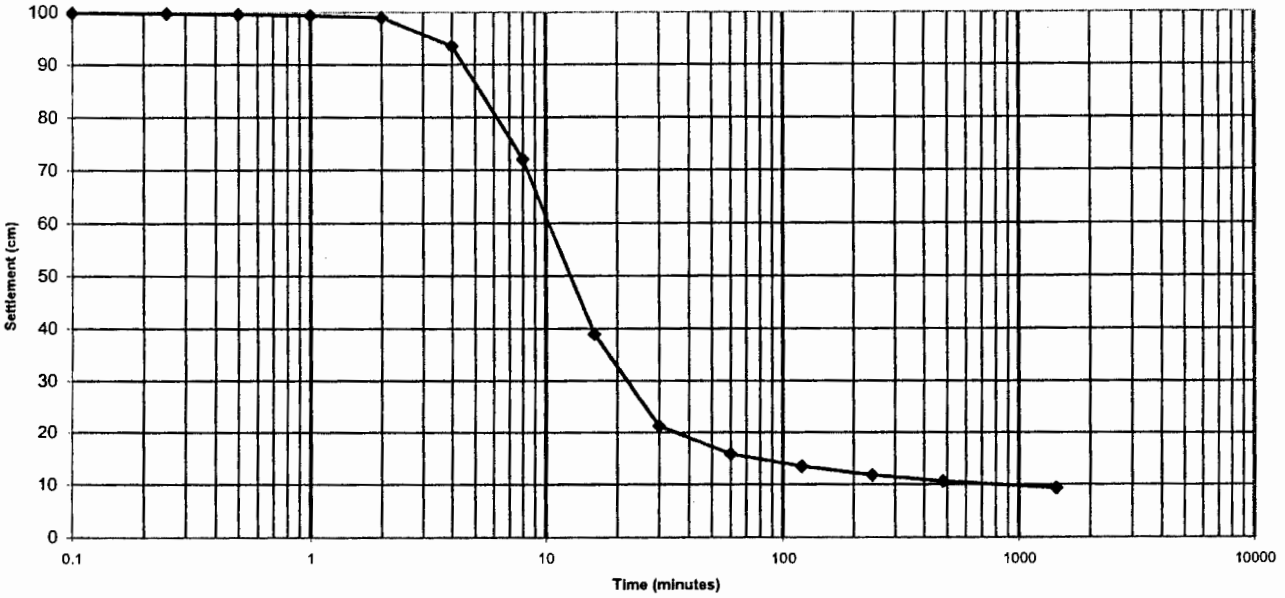
CLIENT: Water and Air Research

COE Test Method

DATE: August 20, 2007

SAMPLE NO: E-JH07-2

CONCENTRATION: 100 g/L



Sedimentation Rate Test COE Method

TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	99.9	16	39.0
0.25	99.8	30	21.3
0.5	99.6	60	15.9
1	99.4	120	13.5
2	99.0	240	11.8
4	93.5	480	10.6
8	72.0	1440	9.3

Final Concentration: 1075.269 g/L

Reviewed By

Michael J. Holm 8-22-07

Mike Holm, P.E.

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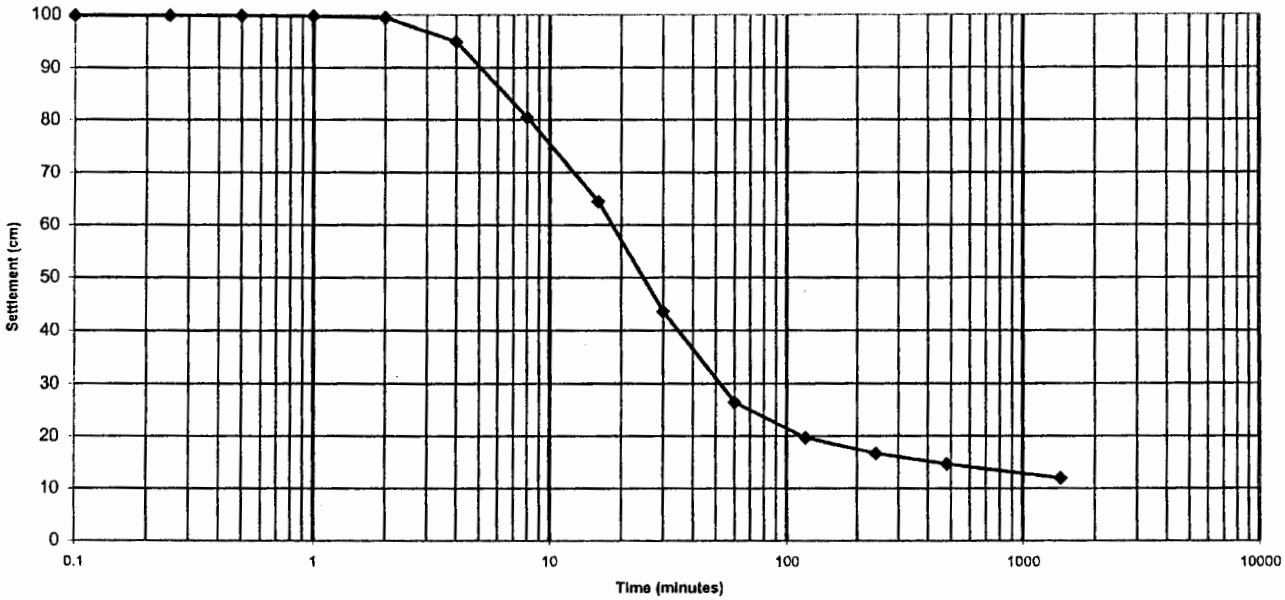
MACTEC

REPORT OF SETTLING RATE TESTING

MACTEC PROJECT NO: 6738-04-4564-06
DATE: August 20, 2007
PROJECT: Jacksonville Harbor 2007
SAMPLE NO: E-JH07-3
CLIENT: Water and Air Research
CONCENTRATION: 100 g/L
COE Test Method



Sedimentation Rate Test COE Method

TIME (min)	INTERFACE (cm)	TIME (min)	INTERFACE (cm)
0.1	99.9	16	64.5
0.25	99.9	30	43.7
0.5	99.9	60	26.5
1	99.8	120	19.7
2	99.5	240	16.7
4	95.0	480	14.7
8	80.5	1440	12.0

Final Concentration: 833.3333 g/L

Reviewed By

Mike Holm, P.E.

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