FINAL REPORT FOR

MAYPORT NAVAL STATION 103 EVALUATION - 2002

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SUBMITTED TO:

U.S. Army Corps of Engineers
Jacksonville District Office
400 West Bay Street
Jacksonville, FL 32202

SUBMITTED BY:

ANAMAR Environmental Chemistry, Inc.
6821 S.W. Archer Road
Gainesville, Florida 32608

ANAMAR Environmental Chemistry, Inc.

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Executive Summary

During the period of April 22 through April 26, 2002, six stations, a duplicate, and a reference station were sampled in Mayport Naval Station, Jacksonville, Florida, as part of the 103 Evaluation of Dredge Material for Ocean Disposal. This evaluation considered potential dredge material from maintenance dredging of the Naval Station in 2002.

Water column measurements and physical testing of sediments for all sample stations yielded values which are consistent with earlier studies of Mayport Naval Station.

In sediments, levels of aluminum, arsenic, chromium, copper, iron, lead, nickel, and zinc were higher than the numbers obtained at the reference station. Cadmium, lead, mercury, and nickel were either undetectable or present at very low levels. No pesticides and PCBs were detected and only low levels of PAHs and organo tin were detected in some of the sediments.

Chemical testing of elutriates prepared from sediment samples showed low levels of arsenic and cadmium in some of the stations. No pesticides, PCBs, or PAHs were detected and only low levels of organo tin were detected in some of the elutriates.

The elutriate test results indicated that after 96 hours of exposure to elutriates from the Mayport area, there were no significant differences in the survivorship of *Mysidopsis bahia* and *Menidia beryllina* between the control water (0% elutriate) or the control sediment (100% elutriate) and survival in any of the Mayport samples. Fertilization of *Lytechinus variegatus* gametes was not statistically different (P=0.05) for the control water (0% elutriate) or the control sediment (100% elutriate) compared to fertilization of the Mayport samples.

The sediment test results indicated that after 10 days of exposure to sediments from the Mayport area, there was not a significant difference (P=0.05) in the survival of *Mysidopsis bahia* between the control sediment from all the sample stations except E-MP02-04 and E-MP02-05. Survival of *M. bahia* in E-MP02-05 was also significantly different from the reference sediment.

After 10 days of exposure to sediments from the Mayport area, there were significant differences (P=0.05) in the survival of *L. plumulosus* between the laboratory control sediment and sample station E-MP02-05. Survival of *L. plumulosus* in the reference sediment was not statistically different from any site samples.

Finally, at the termination of the 28-day bioaccumulation tests, M. nasuta survivorship in the laboratory control sediment was 73% . Survival of M. nasuta in the site sediments ranged from 54% to 68%. Survival was somewhat lower than observed in prior tests, and may have been due to the modest increase in loading. Some additional mortality (but less than 10% incremental) was

anticipated at the higher loading rate based upon past data (80% control survival). The increased loading was chosen as a cost effective approach to obtaining the additional tissue required for this investigation. Adequate mass of *Macoma nasuta* and *Nereis virens* tissues were available for use in chemical analyses.

Results of metal analyses on tissue samples show low level hits for arsenic, cadmium, chromium, copper, lead, nickel, tin, zinc, and mercury present in most of the *Macoma nasuta* and *Nereis virens* replicates. No PAHs were detected in either species.

Simulations of the STFATE module component of the ADDAMS model for Tier II elutriate chemistry and Tier III toxicity showed that regardless of dredge equipment, the water quality criteria and the toxicity criteria were not violated.

Statistical analyses of bioaccumulation data were run for all *Macoma nasuta* and *Nereis virens* replicates and a detail discussion of the findings has been included in Section 3 of this report.

1 Introduction

This report presents the results of the physical, chemical, and biological analysis of sediment and water samples from Mayport Naval Station, Jacksonville, Florida as part of the 2002 maintenance dredging 103 Evaluation of Dredged Materials for Ocean Disposal.

Sediment samples were collected by ANAMAR Environmental Chemistry, Inc. (ANAMAR) under contract to the Jacksonville District U.S. Army Corps of Engineers (DACW-17-02-C-0019) during the period of April 22 through 26 at six sample stations. A reference sample was collected on April 24, 2002 and was used concurrently with the Mayport bioassay tests.

ANAMAR coordinated and directed all operations for this project and worked closely with its subcontractors to organize security issues, schedule, sample, prepare, deliver, analyze, review and produce the final report. Sediments, water, and water quality data were collected at various harbor points and offshore station by an ANAMAR team and one of its subcontractors. A surveying boat with a captain and one technician from Continental Shelf Associates, Inc. (CSA) were hired to assist during sampling collection and navigation.

Sediment and water samples were properly labeled, iced, and then transported to Gainesville, Florida by ANAMAR. The samples were thoroughly homogenized and divided for physical, chemical, biological analysis, and elutriate preparation according to the 1991 "Green Book" procedures by ANAMAR personnel. Sample portions were delivered/shipped to PPB Environmental Laboratories, Inc. (PPB) for inorganic analysis, Harding ESE for bioassay testing, LAW Engineering, Inc. for physical testing and to Harbor Branch Environmental Laboratory for analysis of organic parameters. All testing was performed in accordance with published procedures.

Tier II evaluation of chemical, toxicological and physical characteristics of the sediments was performed by the various laboratories and the data was reviewed by ANAMAR. After preliminary review of the data, the contract was modified to include tissue analysis as part of the evaluation. Data to provide information for contaminant fate modeling was gathered. Statistical analyses were performed and the ADDAMS model was run by ANAMAR and Harding ESE. The final report was prepared by ANAMAR.

2 Methods and Materials

2.1 Sample Collection Techniques

Eighteen (18) pre-established sub-sample stations (A, B, C) in six zones were collected as grab samples. Each sub-sample station was composited into a single sample. One duplicate station and a reference station were also collected. Details are as follows:

Station/Zone	Sediment Collection Technique
E-MP02-01 / Entrance Channel	Van Veen Grabs
E-MP02-02 / Carrier Dock	Van Veen Grabs
E-MP02-03 / West Dock	Van Veen Grabs
E-MP02-04 / Center Basin	Van Veen Grabs
E-MP02-05 / Destroyer Slip	Van Veen Grabs
E-MP02-06 / Foxtrot Pier	Van Veen Grabs
E-MP02-03 DUP / West Dock	Van Veen Grabs
RS-MP02 / Offshore Reference Station	Van Veen Grabs

Whenever a Navy vessel obstructed sampling at a pre-determined location, the closest safe location with similar projected depth was chosen and appropriate comments were made in the field sheets.

Sufficient sediment (18 gallons per zone, 6 gallons per sub-station) and water samples were collected to run sediment and water chemistry as well as bioassays for five species and bioaccumulation for two species, and to run a re-test of the reference station if required. Fifty-eight gallons of water for elutriate preparation were collected from a point in the approximate center of the Mayport basin.

The stainless steel sampling equipment was cleaned and rinsed before sampling of each zone by hosing down with salt water, brushing with clean soapy water, rinsing with fresh water, and then performing a final rinse with isopropyl alcohol.

A Van Venn sediment-sampling device was lowered and raised by a winch connected to joisting equipment on the side of a 25-foot Parker 2520 surveying vessel. A captain maintained the boat in position while one technician operated the winch and another one guided the sampling equipment.

Sediment samples were transferred from the Van Veen into certified pre-cleaned one-gallon glass containers using stainless steel spoons and new disposable laboratory gloves. All containers were properly labeled and sampling information was recorded on individual project specific field sheets. Information documented on the field sheets included date and time, water depth, weather, sea state, station, tidal cycle, coordinates, field team members, number of containers, sample physical description, and comments. This information has been summarized in Table 3 and copies of the field sheets have been included in Appendix A-1. Water for elutriate preparation was collected directly into certified pre-cleaned one-gallon amber jars. Water for chemical analyses was collected

in properly pre-cleaned and preserved containers. All samples were placed in coolers right after collection and were immediately iced. Samples were kept chilled with ice at all times, and then transported to Gainesville, Florida via surface transportation. Over 2,000 pounds (lbs) of ice were used during the sampling event.

Sample collection, transportation, and preparation are shown in the enclosed photographs (See Figure 1).

Station locations were established using DGPS and are shown in the enclosed site maps (see Figure 2). The vessel's DGPS was a Leica Mx 400GPS system connected to Haypack Max Software, its measurements were confirmed with a WAAS Garmin GPS Mat 76 unit. The depth finder used was a Si-Tex Cys 105 MK system.

2.2 *In Situ* Field Measurements

Hydrographic measurements for water temperature, pH, water depth, turbidity, dissolved oxygen, turbidity, salinity, and conductivity were made at each sub-station using a Hydrolab Multi Probe Datasonde. Two units (working unit and back-up unit) were calibrated according to the manufacturer's specifications. Copies of the calibration have been included in Appendix A-2. *In Situ* field measurements were recorded in project-specific field sheets, copies of the field sheets have been included in Appendix A-1. Hydrographic measurements have been summarized in Table 4.

2.3 Sediment Analyses

The samples were thoroughly homogenized and divided for physical, chemical, biological analysis, and elutriate preparation. Homogenization of all sub-samples for each individual station was performed in a clean environment using properly decontaminated stainless steel mixing equipment. Sample portions were placed in certified, method-specific, pre-cleaned, and pre-labeled containers and delivered/shipped to PPB Environmental Laboratories, Inc. (PPB) for inorganic analysis, Harding ESE for bioassay testing, LAW Engineering, Inc. for physical testing and to Harbor Branch Environmental Laboratory for analysis of organic parameters. All testing was performed in accordance with published procedures. Specific analytical methods for sediment analyses are listed in Table 1.

2.4 Elutriate Analysis

Waters and elutriates were prepared and analyzed in accordance with the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers standard testing manual, Evaluation of Dredged Material Proposed for Ocean Disposal – Testing manual (USEPA-503/8-91/001, February 1991), commonly referred to as the "Green Book." Specific water and elutriate analyses and analytical methods are listed in Table 2.

2.5 Tissue Analysis

The tissue samples (*Macoma nasuta* and *Nereis virens*) were sent from Harding ESE to Harbor Branch Environmental Laboratory for homogenization, sample distribution, and analyses. Once received at Harbor Branch. Homogenization of all replicate samples for each individual station was performed in a clean environment using properly decontaminated stainless steel mixing equipment. Sample portions were placed in certified, method-specific, pre-cleaned, and pre-labeled containers

for % lipids, metals, and PAH analysis. Fractions of samples for % lipids analysis were shipped to Microbac Laboratories, fractions for metals and PAH analysis remained at Harbor Branch. All testing was performed in accordance with published procedures. Specific analytical methods for tissue analyses are listed in Table 1.

2.6 Bioassays

2.6.1 General Procedures

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, *Mysidopsis bahia* (a crustacean), and gametes of the sea urchin, *Lytechinus variegatus*.

Sediment bioassays were conducted to determine the effects of the site contaminants on the infaunal amphipod, *Leptocheirus plumulosus* and the mysid shrimp, *Mysidopsis bahia*. Sediment bioaccumulation tests were also conducted with the polychaete, *Nereis virens* and the bivalve, *Macoma nasuta*.

All bioassays were conducted in accordance with the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers Standard Testing Manual entitled: *Evaluation of Dredged Material for Proposed Ocean Disposal - Testing Manual* (USEPA-503/8-91/001, February 1991).

The test samples (six site sediments and one duplicate sediment) were collected between April 24 through April 26, 2002, and were received at the Harding ESE Toxicology Laboratory on April 29 and 30, 2002. Samples received at the Harding ESE Toxicology Laboratory were identified as E-MP02-01, E-MP02-02, E-MP02-03, E-MP02-04, E-MP02-05, E-MP02-06, and E-MP02-03 DUPLICATE. Additionally, approximately 25 gallons of site water, labeled as Basin Water, was collected on April 26, 2002. A reference sediment (RS-MP02) was also collected on April 24, 2002 and was tested concurrently with the Mayport Naval Station site sediments. Control sediment (approximately 15 gallons) was collected by Harding ESE personnel from the Atlantic Ocean near Marineland, Florida, on April 30, 2002 for use in the control exposures of the bioassay tests. The same control sediment was used for all the bioassay tests. All samples were stored in a refrigerator at 4 ± 2°C until used, and unused portions of test samples were stored similarly during the testing period. Sample chain-of-custody and other traffic information is provided in Appendix D-1.

Test sediments were received at the Harding ESE lab in quantities of approximately 11 gallons each. 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 concentrations were measured for each of 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 (100 milliliters [mLs]) for the ammonia analyses. Ammonia porewater concentrations were confirmed to be <50 ppm (Appendix D-1).

2.6.2 Elutriate Bioassay Procedures

Two of the test species used for the elutriate bioassays, *M. beryllina* and *M. bahia*, were received from Aquatic Indicators, St. Augustine, Florida. *M. beryllina* were 12 days and *M. bahia* were 2 days old at test initiation. Gravid adult sea urchins, *L. variegatus*, were received from Gulf Specimen Company, Panacea, Florida.

The elutriate bioassays were conducted at the Harding ESE Toxicology Laboratory from May 9 through May 13, 2002 for *M. bahia* and *M. beryllina*, and on May 23, 2002 for *L. variegatus* with laboratory control sediment and sediments from the six sample stations, plus the duplicate site sample.

Natural filtered seawater collected from the Atlantic Ocean, near Marineland, Florida, was used as dilution and laboratory control water. The seawater was adjusted to a salinity of 20 parts per thousand (ppt) prior to use in preparing the three different elutriate concentrations for the *M. beryllina* and *M. bahia* tests. The salinity for the sea urchin test was maintained at 30 ± 1 ppt. Five replicates each of the three elutriate concentrations (10 percent, 50 percent, and 100 percent) of the six site sediments, the duplicate site sediment, and laboratory control sediment were tested. The laboratory control water was also tested as zero percent elutriate. Elutriates were not prepared from the field reference sample. The *M. beryllina* tests were conducted in 600-mL beakers containing 300 mL of elutriate or control solution and the *M. 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. *M. bahia* was fed three drops per replicate of brine shrimp nauplii (*Artemia* sp.) twice daily to prevent cannibalism. Twenty-milliliter (20 mL) glass scintillation vials were used as test vessels for the sea urchin tests. All tests were performed at a temperature of 20 ± 1°C and under ambient laboratory illumination (~740 lux).

Elutriates were prepared by mixing one part of sediment to four parts of site water (Basin Water) to achieve a sediment-to-water ratio of 1:4 by volume. The mixtures were mechanically stirred for 30 minutes at room temperature on a magnetic stirrer, with additional mixing by hand every 10 minutes. The mixtures were allowed to settle for at least 1 hour and then the supernatant was siphoned off as the 100 percent elutriate. Dilutions of the 100 percent elutriate were made to obtain the 50 percent and 10 percent elutriates on a volume-to-volume basis.

Water quality parameters measured daily during the 96-hour *M. bahia* and *M. beryllina* tests and at test initiation of the sea urchin tests, were D.O., pH, temperature, and salinity. Dissolved oxygen 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 daily before use. Survival counts were performed daily and at test conclusion for the *M. beryllina* and *M. bahia* elutriate tests.

L. variegatus eggs and sperm were obtained from adults by injecting approximately 1.0 mL of 0.5-M KCl 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. Approximately five million 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 two mL 10 percent buffered formalin. 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 sea urchin egg. For each test replicate, a total of 100 eggs were counted and any damaged eggs were not included in the counts.

ANOVAs (or nonparametric equivalent for data which did not meet the assumptions for the parametric test) were used to compare mean survivorship or fertilization in the control sediment (100 percent elutriate) or the control elutriate (0 percent elutriate) versus the 100 percent elutriate from each of the Mayport site sediments. Data were first checked for normality and homogeneity of variance. If either of these assumptions was not met, the data were transformed in an attempt to

normalization prior to analysis by Dunnett's procedure. When data could not be normalized by transformation, the data were analyzed by the equivalent nonparametric test. Median lethal concentration (LC_{50}) values for survival of *M. bahia* and *M. beryllina* and exposure concentration (EC_{50}) values for egg fertilization for *L. variegatus* 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 percent 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 less than 50 percent mortality (or fertilization) were estimated as greater than 100 percent in accordance with EPA guidelines (EPA/503/8-91/001).

2.6.3 Sediment Bioassay Procedures

Two test species were used for the sediment bioassays, *Leptocheirus plumulosus* and *M. bahia*. Juvenile *L. plumulosus* (two to four mm in length, with no mature males) were obtained from Aquatic Research Organisms, Hampton, Hew Hampshire, and *M. bahia* (three days old at test initiation) were obtained from Aquatic Indicators, Inc. (St. Augustine, FL).

The 10-day sediment tests with *L. plumulosus* and *M. bahia* were conducted from May 10 through May 20, 2002, with a daily photoperiod of 16-hour light and 8-hour dark cycle under fluorescent lighting conditions (~840 lux) for the duration of the tests.

The sediment tests were conducted at the Harding ESE Toxicology Laboratory using five replicates each for the: (1) laboratory control sediment, (2) one duplicate site sediment, (3) six site sediments, and (4) one reference sediment from the Mayport Naval Station area. Test chambers were 1.5-liter glass jars for the *L. plumulosus* test and 1.6-liter glass Carolina bowls for the *M. bahia* test. Twenty *M. bahia* or *L. plumulosus* were loaded in each of the five replicate test chambers at test initiation. All test chambers were aerated at approximately 60-80 bubbles per minute. Aeration was supplied to the test chambers using an oil-free laboratory air compressor (Aquatic Eco Systems, Inc., Clearwater, Florida) through flexible Tygon® tubing fitted with glass pipette tips. During testing, *M. bahia* was fed three drops per replicate of brine shrimp nauplii (*Artemia* sp.) twice 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 *M. bahia* and *L. plumulosus* sediment tests were D.O., pH, temperature, ammonia, and salinity. Dissolved oxygen 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 was measured with a SA 290A meter equipped with an Orion 95-12 ammonia probe and light intensity was measured with a lux meter. All instruments were calibrated daily before use. Survival counts were performed at test termination for all *L. plumulosus* and *M. bahia* sediment tests.

Prior to test initiation (Day-1), natural seawater (salinity of 25 ppt for *M. bahia* and 28 ppt for *L. plumulosus*) and sediments were introduced to each test chamber at a ratio of 1 part sediment to 4 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. Water quality parameters were measured immediately prior to adding the test organisms. Water renewals were performed at 48-hour intervals immediately after taking water quality measurements. Water was siphoned from the test chambers and placed in a glass beaker to determine that inadvertent removal of test organisms had not occurred. Any test organisms siphoned out were immediately returned to their test chambers. Clean seawater was added back into the test chambers, taking care not to resuspend the sediment. Dead brine shrimp were removed from the *M. bahia* test chambers on a daily basis.

Sediment bioassay data were evaluated by a statistical comparison of mean survivorship in the sample station sediment relative to the field reference or laboratory control average survivorship using Dunnett's procedure (EPA/600/4-89/001). Data were first checked for normality and homogeneity of variance. If either of these assumptions was not met, the data were transformed in an attempt to normalization prior to analysis by Dunnett's procedure. When data could not be normalized by transformation, the data were analyzed by the equivalent nonparametric test.

2.7 Bioaccumulation Procedures

The polychaete, *N. virens*, and the bivalve, *M. nasuta* used in the bioaccumulation study were obtained from Aquatic Research Organisms, Hampton, New Hampshire.

The bioaccumulation tests were performed for 28 days (from May 3 through May 31, 2002). To produce sufficient tissue mass for analytical requirements, five test aquaria were used for the *N. virens* tests with each aquaria representing an exposure replicate for a total of five replicates for each sample. *M. nasuta* tests were conducted using two aquaria to represent each exposure replicate to produce five tissue sample replicates per site sample. Each site sediment sample was tested including the reference sediment and the laboratory control without dilution. Each replicate test chamber was a 10-gallon aquarium to which at least two centimeters of sediment were added. Each of the exposure aquaria was filled with approximately eight gallons natural seawater with a salinity of 25 ± 2 ppt. Twenty *N. virens* and 25 *M. nasuta* were then added to each test chamber (the two species were tested in separate tanks). Test organisms were not fed at any time during the testing period.

The tests were performed in a temperature-controlled room adjusted to maintain a constant test temperature of 18 ± 2°C, and under laboratory illumination (~1,050 lux). Aeration was provided to all the test chambers at approximately 100-120 bubbles per minute with the aid of an oil-free laboratory air compressor (Aquatic Eco Systems, Inc., Clearwater, Florida).

Water quality parameters measured daily during the 28-day sediment bioaccumulation tests were D.O., pH, temperature, and salinity. Dissolved oxygen 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 daily before use. Observations were made daily for organism behavior and mortality. Survival counts were performed at test termination for all of the bioaccumulation tests.

Renewals of the overlying water in the aquaria were performed three times per week. Water was siphoned from the aquaria through 11/16-inch (outside diameter) Tygon® tubing and the aquaria were refilled with seawater pumped from a holding tank through similar tubing. The Tygon® tubing, equipped with plastic pinch clamps and tipped with plastic T-joints, was connected to PVC pipes fitted with control valves to adjust the flow of water. Care was taken to ensure that the sediment in each tank was not disturbed during renewals.

After 28 days of exposure, 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 deionized water, placed into Ziploc® bags, and stored in a freezer at -10 ± 2°C. Frozen *N. virens* and *M. nasuta* tissues were archived for shipment to an analytical laboratory, if required.

3 Results and Discussion

3.1 Field Data

In Situ field measurements were taken at each sub-station at surface level (one foot), mid-depth, and three feet above bottom. Sampling occurred from April 22 through April 26, 2002 when water temperatures ranged from 22.1 to 24.6°C. Dissolved oxygen ranged from 6.11 to 7.80 ppm, while the range for pH was 7.42 to 7.74. Turbidity ranged from 0.3 to 39.2 NTUs. Salinity and conductivity ranged from 33.2 to 37.2 ppt and from 50.9 to 57.5 mmhos/cm, respectively. Weather conditions varied from sunny and 5 mph winds to partly cloudy and 20 mph winds. Sea state varied from calm to three to five foot waves. Results of water column measurements, field observations, and tidal information are presented in Tables 3 and 4. Copies of field sheets and instrument calibrations are included in Appendix A.

3.2 Physical Testing Data

Results of physical testing for specific gravity, percent solids, grain size analysis, Atterberg limits, and settling rates are presented in Tables 5-7, Chart 1, and Appendix B. Specific gravity ranged from 2.527 to 2.671. The plasticity index varied from non plastic to 72 and the percent solids varied from 10.5 to 53.3. Particle size analysis indicated that all the samples contained mostly sand and silt/clay. The Reference station contained the highest percent of sand and station E-MP02-5 contained the highest percent of silt/clay.

3.3 Chemistry Data

3.3.1 Sediment Chemistry Data

Analytical results for sediments are presented in Tables 8-12. Results of metal analyses show that aluminum, arsenic, chromium, copper, iron, and zinc were detected in all samples. Low levels of cadmium, lead, mercury, and nickel were present in some of the samples. Levels of aluminum, arsenic, chromium, copper, iron, lead, nickel, and zinc were higher than the reference station. Silver and cyanide were not detected in any of the samples. Ammonia levels ranged from 33.1 to 233 μg/g (reference station: 65.4 μg/g). Percent TOC ranged from 1.7 to 4.1 (reference station: 0.24%). Oil and Grease results varied from 21U (below detection limit) for the reference station to 140 mg/Kg for sample E-MP02-4. No pesticides and PCBs were detected and only low levels of PAHs and organo tin were detected in some of the sediments, Tables 10 and 12.

Laboratory blanks were below reporting detection limits for metals, organics and water quality parameters. Laboratory control samples and duplicates were within laboratory precision and accuracy limits for metals, organics and water quality parameters. Matrix spike/matrix spike Duplicate recoveries were within laboratory precision and accuracy limits and/or Sample Duplicate analysis data demonstrated acceptable reproducibility of laboratory processes for metals, organics and water quality parameters.

Precision between the laboratory control and laboratory control duplicate samples for method SW-846 8270 (PAH) as well as between the matrix spike duplicate samples did not meet established quality control criteria for naphthalene. Accuracy was acceptable in all QC samples for this analyte.

Due to matrix effects, one of four surrogates in samples E-MP02-4 Sed and E-MP02-5 Sed, and three of four in sample E-MP02-6 Sed did not meet established limits. Method performance was evaluated on the remaining surrogates and surrounding quality control parameters.

The laboratory control sample and laboratory control duplicate sample associated with the PCB Congener analyses of all sediment samples produced recoveries for 2,2',3,3',4,4',5,5',6-Nonalchlorobiphenyl that were higher than the laboratory's acceptance range. This analyte was not detected in any of the associated production samples.

All other quality criteria were met.

All laboratory data pertaining sediment chemistry analyses has been included in Appendices C1-2.

3.3.2 Elutriate Chemistry Data

Analytical results for elutriates and water chemistry are presented in Tables 13 - 17. Results of metal analyses show that arsenic and cadmium were present in some of the samples. Arsenic levels were elevated in comparison with the National Recommended Water Quality Criteria for Priority Toxic Pollutants. Ammonia levels ranged from 0.060 mg/L for the reference site water to 21.0 mg/L for sample E-MP02-5. TOC ranged from 2.0U (below detection limit) for the reference site water to 22.2 mg/L for sample E-MP02-5. No pesticides, PCBs, or PAHs were detected in the water or elutriates. Low levels of organo tin were detected in some of the elutriate samples, Table 17.

Laboratory blanks were below reporting detection limits for metals, organics and water quality parameters. Laboratory control samples and duplicates were within laboratory precision and accuracy limits for metals, organics and water quality parameters. Matrix spike/matrix spike Duplicate recoveries were within laboratory precision and accuracy limits and/or Sample Duplicate analysis data demonstrated acceptable reproducibility of laboratory processes for metals, organics and water quality parameters.

Due to matrix effects, the matrix spike and matrix spike duplicate did not meet acceptable accuracy criteria for phenanthrene. The precision was acceptable and the laboratory control and laboratory control duplicate samples were found to be acceptable for that compound, method SW-846 8270 (PAH).

The recovery of endrin aldehyde (SE-846 8081) in the matrix spike, matrix spike duplicate, laboratory control, and laboratory control duplicate samples was above acceptable limits. This compound was not detected in the samples and therefore the possibility of a false positive result has been eliminated.

Due to matrix effects, one of two surrogates in all elutriate and water samples did not meet established quality control criteria for SW-846 Method 8081, 8082 (arochlors and congeners). QC limits for congeners were not generated due to limited samples processed. Data were evaluated per method criteria.

Due to a laboratory error in the extraction process for organo tin analysis, the method quality control blank was inadvertently spiked with the standard containing the analytes used for the laboratory control.

All other quality criteria were met.

All laboratory data pertaining water and elutriate chemistry analyses has been included in Appendices C3-4.

3.3.3 Tissue Chemistry Data

Analytical results for tissue chemistry (*Macoma nasuta* and *Nereis virens*) are presented in Tables 18-21. Results of metal analyses show low level hits for arsenic, cadmium, chromium, copper, lead, nickel, tin, zinc, and mercury present in most of the replicates. No PAHs were detected in either species.

Although QC parameters for nickel do not show any problems with the analysis, we suspect that the nickel results for the *Nereis virens* control sample, replicate C, are artificially elevated. There was insufficient sample available for re-analysis. The result for this sample was regarded as an outlier data point during the tissue statistical analysis.

All the tissue analysis results have been reported in dry weight basis. It should be taken into account that low percent solids in samples, dramatically elevate the detection limits. The extractions department at HBEL did concentrate the SW-846 Method 8270 extracts down to a volume lower than its normal final volume, in an effort to keep the dry weight adjusted detection limits as close to the target levels as possible. Should the samples have been made up of a more solid nature, or be reported as wet weight basis, then the laboratory MDLs would have met the scope of work.

Laboratory blanks were below reporting detection limits for metals and PAHs. Laboratory control samples and duplicates were within laboratory precision and accuracy limits for metals and PAHs. Matrix spike/matrix spike Duplicate recoveries were within laboratory precision and accuracy limits and/or Sample Duplicate analysis data demonstrated acceptable reproducibility of laboratory processes for metals and PAHs

Due to insufficient sample volume, the analytical batches for the SW-846 8270 analyses of all tissue samples did not contain matrix spikes. Batch precision and accuracy was based on the analyses of a laboratory control sample and laboratory control sample duplicate.

Due to matrix interferences, several samples were found to have surrogate recoveries outside of the laboratory's acceptance limits. Method performance for these analyses was based on the remaining surrogates, as well as surrounding quality control parameters.

Due to suspected matrix effects in the native sample chosen to spike, the matrix spike samples produced recoveries for chromium, copper, nickel, tin, mercury, and zinc that were outside of the laboratory's acceptance limits. Precision between the matrix spikes also fell outside of the laboratory's acceptance limits for zinc, copper, and chromium. Acceptable accuracy was demonstrated with the laboratory control sample.

All other quality criteria were met.

All laboratory data pertaining tissue chemistry analyses has been included in Appendices C5-6

3.4 Bioassay Data

3.4.1 Elutriate Bioassay Data

Test conditions for the elutriate bioassay tests, including temperature, DO, salinities and pH levels, were maintained at acceptable levels throughout the testing period. Complete copies of the

laboratory raw data are provided in Appendices D-2, D-3, and D-4 for *M. bahia*, *M. beryllina* and *L. variegatus*, respectively.

Mysidopsis bahia

Survivorship data from elutriate bioassays of control water (0 percent elutriate), control sediment elutriate, and the six sample stations plus duplicate are presented in Table 22. Survival of *M. bahia* was 94 percent in the control water (0 percent elutriate) and 90 percent in the elutriate control sediment (100 percent control elutriate). Test station sample survivorship ranged from 78 percent (50 percent exposure for E-MP02-05) to 96 percent (10 percent exposure for Sample E-MP02-02) (Table 22).

Based on the results of the survival counts, there were no significant differences (P=0.05) in the survivorship of *M. bahia* between the control water (0 percent elutriate) or control sediment and sample stations E-MP02-01, E-MP02-02, E-MP02-03, E-MP02-04, E-MP02-05, E-MP02-06 and E-MP02-03DUP for the 100 percent elutriate concentrations prepared from the site sediments (Table 23).

Menidia beryllina

Survivorship data from elutriate bioassays of control water (0 percent elutriate), control sediment elutriate, six sample stations and one duplicate station are presented in Table 24. Survivorship of *M. beryllina* was 98 percent in both the control water (0 percent elutriate) and the control sediment (100 percent elutriate). Test station sample survivorship ranged from 88 percent (E-MP02-04) to 100 percent (E-MP02-01, E-MP02-04 50 percent exposures, E-MP02-06 10 and 50 percent exposures, and E-MP02-03 DUP, 10, 50, and 100 percent elutriate exposures) (Table 24).

Based on the results of the survival counts, there were no significant differences (P=0.05) between the survivorship of *M. beryllina* in the control water (0 percent elutriate) or control sediment (100 percent elutriate) and survivorship in the 100 percent elutriate concentration prepared from the site sediment for E-MP02-01, E-MP02-02, E-MP02-03, E-MP02-04, E-MP02-05, E-MP02-06, and E-MP02-03DUP (Table 25).

Lytechinus variegates

Fertilization data from the elutriate bioassays of control sediment, six sample stations and one duplicate station are presented in Table 26. Fertilization of *L. variegatus* gametes was 64 percent in the control water (0 percent elutriate) and 67 percent in the 100 percent elutriate control sediment. Fertilization of *L. variegatus* gametes in the site samples ranged from 59 percent (50 percent elutriate from sample station E-MP02-02) to 72 percent (10 percent elutriate from sample station E-MP02-03) (Table 26).

There were no significant differences (P=0.05) in the fertilization of *L. variegatus* between the control water (0 percent elutriate) and control sediment (100 percent elutriate) when compared to the Mayport sample stations (Table 27).

Median Lethal Concentration

Exposure of *M. bahia* to elutriates prepared from sediments from the Mayport Naval Station sample stations and one duplicate station resulted in less than 50 percent mortality for all of the sample stations. Consequently, the LC_{50} values for the *M. bahia* tests were estimated to be greater than 100 percent, for all the sample stations including the duplicate station, as determined in accordance with EPA/503/8-91/001 (Table 28).

Exposure of *M. beryllina* to elutriates prepared from sediments from all the sample stations resulted in less than 50 percent mortality for all sample stations (Table 28). Consequently, the LC_{50} values for

the *M. beryllina* tests were estimated to be greater than 100 percent, for all the sample stations including the duplicate station, as determined in accordance with EPA/503/8-91/001 (Table 28).

Additionally, exposure of *L. variegatus* gametes to elutriates prepared from sediments from the sample stations and one duplicate station resulted in greater than 50 percent fertilization rates in all of the elutriates tested. Consequently, the EC_{50} values for the *L. variegatus* tests were all estimated to be greater than 100 percent, in accordance with EPA/503/8-91/001 for all the stations.

Reference Toxicant Tests

Concurrent reference toxicant tests were conducted to determine the general health of each test species. The reference toxicant for the *M. bahia* and *M. beryllina* tests was sodium dodecyl sulfate (SDS) with a test duration of 48 hours. The reference toxicant for the sea urchin tests was copper sulfate ($CuSO_4$) with a duration of 80 minutes and was performed concurrently with the fertilization tests. The 48-hour LC_{50} results for *M. bahia* was 11.36 mg SDS/L (95 percent confidence limits of 9.00 to 14.33 mg SDS/L) and that for *M. beryllina* was 3.54 mg SDS/L (95 percent confidence limits were reported as not reliable). Finally, the reference toxicant LC_{50} for the sea urchin was 107.33 μg $CuSO_4$/L (95 percent confidence limits of 101.12 to 113.92 μg $CuSO_4$/L). The current LC_{50} values were within the upper and lower control limits (±2S) of the Harding ESE control charts running average LC_{50} , and indicated that the test organisms were within their normal sensitivity ranges (USEPA, 1994). The reference toxicant data sheets and the LC_{50} calculations for the elutriate tests are presented in Appendix D-5.

3.4.2 Sediment Bioassay Data

Sediment bioassay test conditions, including temperature, DO, and pH were maintained at acceptable levels throughout the testing period. Salinity variations for the sediment tests slightly exceeded the recommended test range; however, the test organisms did not appear to be affected by the salinity variation. A combination of frequent overlying water renewals were used to bring the salinity to acceptable levels. Ammonia was detected in the various samples in varying concentrations ranging from non-detect (<0.1 mg/L as nitrogen), to a maximum concentration of 3.7 mg/L as nitrogen in sample E-MP02-03 DUP. The relevant laboratory raw data pertaining to the sediment tests are provided in Appendices D-6 and D-7 for *M. bahia* and *L. plumulosus*, respectively.

Mysidopsis bahia

M. bahia survivorship was 97 percent in the laboratory control sediment and 85 percent in the reference sediment, RS-MP02 (Table 29). Survivorship of *M. bahia* in site sediments ranged from 23 percent (Station E-MP02-05) to 86 percent (Station E-MP02-01). Surviving *M. bahia* appeared healthy at test termination. *M. bahia* survivorship between replicates was relatively uniform (Appendix D-6).

Statistical analysis indicated that the survival of *M. bahia* in the laboratory control sediment was not significantly different (P=0.05) from survival in any samples except E-MP02-04 and E-MP02-05 (Table 30). Survival of *M. bahia* in the reference sediment was only significantly different (p=0.05) from survival in samples E-MP02-05 (Table 30).

Leptocheirus plumulosus

L. plumulosus survivorship was 97 percent in the laboratory control sediment and 88 percent in the reference sediment (Table 31). Survivorship of *L. plumulosus* in the site sediments ranged from 86 percent (station E-MP02-05) to 94 percent (station E-MP02-03). Surviving *L. plumulosus* appeared healthy at the termination of the tests.

Statistical analysis using Dunnett's T-test indicated that the survival of *L. plumulosus* in the laboratory control sediment was significantly different (P=0.05) from survival in one Mayport sample, E-MP02-05 (Table 32). Survival of *L. plumulosus* in the reference sediment was not statistically different from any site samples (Table 32).

Reference Toxicant Tests

Reference toxicant tests were conducted on each species tested in the sediment tests. The reference toxicant used for *M. 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 duration of 96 hours. The 48-hour LC_{50} results for *M. bahia* was 11.36 mg SDS/L (95 percent confidence limits of 9.00 to 14.33 mg SDS/L) and the 96-hour LC_{50} results for *L. plumulosus* was 1.00 mg Cd/L (95 percent confidence limits of 0.78 to 1.29 mg Cd/L). The current LC_{50} values were within the upper and lower control limits (±2S) of the Harding ESE control charts running average LC_{50} , and indicated that the test organisms were within their normal sensitivity ranges (USEPA, 1994). The reference toxicant data sheets and LC_{50} calculations for the sediment tests are presented in Appendix D-8.

3.5 Bioaccumulation Data

The bioaccumulation test conditions, including temperature, DO, pH, and salinity were maintained at acceptable levels throughout the 28-day testing period. Salinity variations for the sediment tests slightly exceeded the recommended test range; however, the test organisms did not appear to be affected by the salinity variation. The laboratory raw data are provided in Appendices D-9 and D-10.

Macoma nasuta

Data for the survival of M. nasuta in the bioaccumulation tests are presented in Table 33. M. nasuta survivorship in the laboratory control sediment was 73% . Survival of M. nasuta in the site sediments ranged from 54% (sample station E-MP02-05) to 68% (sample station RS-MP02) (Table 33). Survival was somewhat lower than observed in prior tests, and may have been due to the modest increase in loading. Control survival at recommended loading are typically greater than 80%., and generally range from 85-90+%. Control survival is highly dependent upon the status of the organisms when received from the field. Some additional mortality (but less than 10% incremental) was anticipated at the higher loading rate based upon past data (80% control survival) and recommendations from the supplier. Based upon these factors, the increased loading was chosen as a cost effective approach to obtaining the additional tissue required for this investigation. Adequate mass of M. nasuta tissue was available for chemical analyses, if required.

Nereis virens

Data for the survival of *N. virens* in the bioaccumulation tests are also presented in Table 33. *N. virens* survivorship in the laboratory control sediment was 97 percent. Survival of *N. virens* in the site sediments ranged from 62 percent (sample station E-MP02-03) to 95 percent (sample station RS-MP02) (Table 33). It was noted upon takedown of the tests that survival in Replicate C of Sample E-MP02-03 was limited to one organism. However, survival in the other replicates for the same sample was 17, 14, 15, and 15. It is anticipated that an error was made during the organism loading step of the test initiation. If tissue analyses are required, it is recommended that the tissues for all replicates be combined and random aliquots be collected as outlined in the test guidance (USEPA-503/8-91/001, February 1991). Adequate mass of *N. virens* tissue was available for chemical analyses in the remaining samples, if required.

3.6 ADDAMS Model

Simulations of the STFATE module component of the ADDAMS model were run for sample E-MP02-4 from the Mayport Naval Station in Jacksonville, Florida. This sample evidenced toxicity and elevated arsenic levels in comparison with the National Recommended Water Quality Criteria for Priority Toxic Pollutants. The analyses were performed following the "Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual" prepared by USEPA and USACE, and otherwise called the 1991 "Green Book".

Four separate applications of the model were made. These were:

1. Section 103 Regulatory Analysis for Ocean Waters, Tier II, applied to arsenic for elutriate chemistry using a Multiple Bin Hopper (File name MP024HE1).
2. Section 103 Regulatory Analysis for Ocean Waters, Tier II, applied to arsenic for elutriate chemistry using a Barge (File name MP024BE1).
3. Section 103 Regulatory Analysis for Ocean Waters, Tier III, Toxicity, using a Multiple Bin Hopper (File name MP024HT1).
4. Section 103 Regulatory Analysis for Ocean Waters, Tier III, Toxicity, using a Barge (File name MP024BT1).

Parameters describing the disposal site and equipment specifications were gathered from the Contractual Scope of Work and from the 1982 EIS report. Whenever information was not available, the program's default values were utilized and guidance parameters that appear within the program menus were followed. Calculations were performed using both the Multiple Bin Hopper and the Barge. For current flows and estimation of initial mixings it was assumed that dredging would occur in the Fall/Winter months. Parameters utilized were:

1. Size of disposal area: 1 nautical mile or 6,076 feet.
2. Water depth: 52 feet (1% slope considered insignificant for model calculations)
3. Current speed: 0.8 feet/sec at the surface and 0.2 feet/sec at the bottom.
4. Current direction: SW in fall and winter.
5. Temperature and salinity profile: obtained from in-situ measurements at reference station; refer to Table 4.
6. Sediment physical characteristics: obtained from physical analysis testing, Tables 5 and 6.
7. Length of disposal vessel: 22 x 91.5 meters.
8. Speed of disposal vessel: 2.68 meters per second.
9. Vessel volume and time to dump: 1,700 cubic meters and 300 seconds.
10. National Recommended Water Quality Criteria for Priority Toxic Pollutants for Arsenic CCC in Saltwater: 36 μg/L, background concentration: 2 μg/L.

Results:

Regardless of dredge equipment, the water quality criteria and the toxicity criteria were not violated during the Tier II bulk sediment chemistry, Tier II elutriate chemistry and Tier III toxicity simulations while the vessel was positioned in the middle of the disposal site.

Copies of the outputs have been provided in electronic format. The files can be viewed using either the ADDAMS model software or independently as a text file. When viewing as a text file using Word, open the EMP024XX.DUO file.

3.7 Statistical Analysis of Bioaccumulation Data

Problem:

Are concentrations of chemicals detected in *Macoma* (clams) or *Nereis* (worms) significantly greater at sites in the project area (Mayport Naval Station) than at the Reference site?

Hypothesis

Null Hypothesis:

All sites, including the Reference site, are drawn from the same population.

Method of Analysis:

Tissue metals data were evaluated by a statistical comparison of mean tissue concentration of a metal from the sample stations relative to the field reference mean tissue concentration using ANOVA and Dunnett's multiple comparisons procedure. Bonferroni's comparison was substituted following ANOVA in cases where sample sizes were not equal. Values reported as below detection limit were entered as one half the reported detection limit. Data were first checked for normality and homogeneity of variance. If either of these assumptions was not met, the data were transformed in an attempt to normalization prior to analysis by ANOVA and Dunnett's or Bonferroni's procedure. Because the objective of this analysis is to determine whether or not organisms exposed to the dredge materials have a greater bioaccumulation of metals than organisms exposed to the reference sediments, it is appropriate to use a "one-sided" test distribution. In other words, the analysis is testing for significant differences among sample means only for tissue concentrations greater than, not less than, the reference tissue concentration.

Results:

Macoma

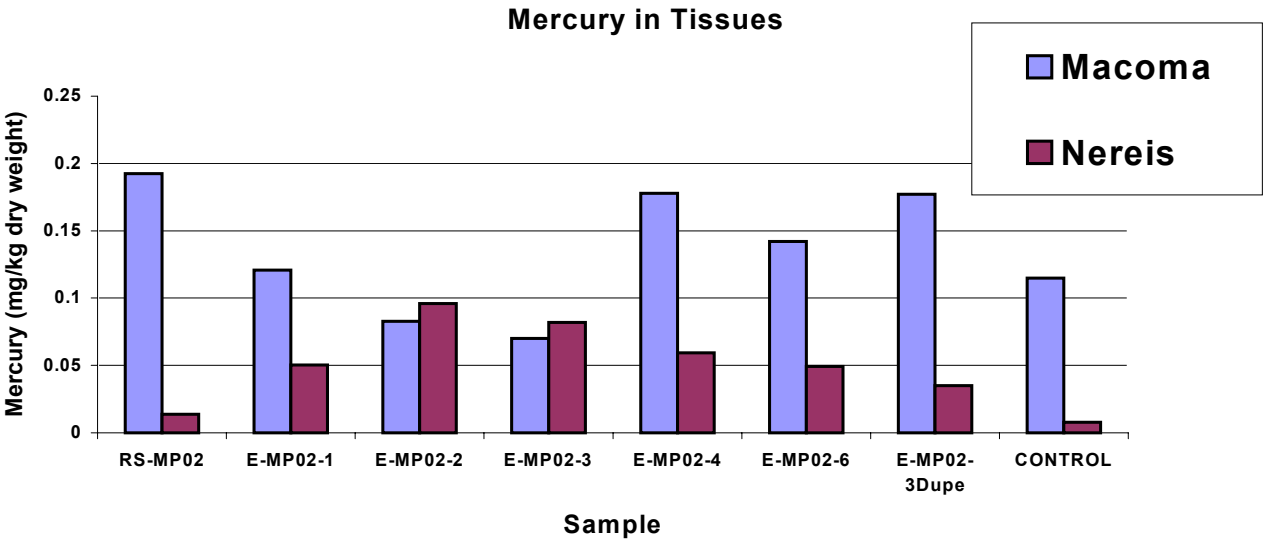
Datasets for all metals except mercury passed statistical tests for normality and homogeneity of variance without transformation. Most samples had measureable metal concentrations, although cadmium and tin were frequently below detection limits. Mercury tissue concentrations passed upon log transformation. All samples had five replicates, and ANOVA with Dunnett's comparisons were used throughout (Appendix E). Few differences among means were observed for any of the

nine metals tested. Only tin and mercury had significant ANOVA findings. Site sample E-MP02-1 had significantly more tin in *Macoma* tissue than RS-MP02. For mercury, no Dunnett's comparisons were significant because site tissue samples were actually slightly lower in mercury concentration than the reference concentration. Although the ANOVA was not significant, Dunnett's comparison showed a statistically significant difference in arsenic concentration for tissue from E-MP02-1 compared to the reference site. Similarly, cadmium was significantly elevated in *Macoma* tissue from E-MP02-3Duplicate compared to the reference site. The result from E-MP02-3Duplicate does not agree with cadmium tissue concentrations observed from E-MP02-3. In this sample, mean cadmium tissue concentration is actually less than the reference site.

Nereis

Nereis tissue concentrations were analyzed with the Bonferroni comparison because only four replicate tissue samples were available for E-MP02-3. Nickel and tin were infrequently detected in tissues. Mercury was not detected in control samples, and was detected in only one reference site sample. One control tissue value for nickel was determined to be an outlier and was removed for the purposes of this analysis. Datasets for all metals, except mercury and nickel, passed statistical tests for normality and homogeneity of variance without transformation. The nickel and mercury datasets were normal and had homogeneity of variance upon log transformation. Few differences among means were observed for any of the nine metals tested (Appendix E). Only lead, tin, and mercury had significant ANOVA findings. For lead, tin, and all other metals except mercury, no site tissue samples were found to be statistically greater than the reference station tissue concentrations. For mercury, all site tissue samples for *Nereis* were found to be significantly greater than the reference tissue concentration. These results are inconsistent with the results from the *Macoma* tissue comparisons (see figure below). It is possible that the difference in results reflects the difference in feeding mode of the two organisms and a possible difference between sediment and water born bioavailability. For *Macoma,* all reference tissue samples had detectable mercury concentrations, whereas only one detection was noted for *Nereis*;, the treatment of nondetect values may also have contributed to the observed results.

Copies of the statistical data outputs have been provided in Appendix E.



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Figures

- Reference and Sample Station Maps
- Sample Collection, Transportation, and Preparation Photographs

1. Team Organization (From left to right)

Sampling Crew: Anthony Segretto (Technician-CSA), Nadia Lombardero (QA/QC-ANAMAR), John Busseno (Field Leader-ANAMAR), Tim Shaw (Captain-CSA)

Sample Handling Crew: John Busseno (Field Leader-ANAMAR), Bryan Cotter (Chemist-PPB), Michael Welker and Henry Busseno (Technicians-ANAMAR)

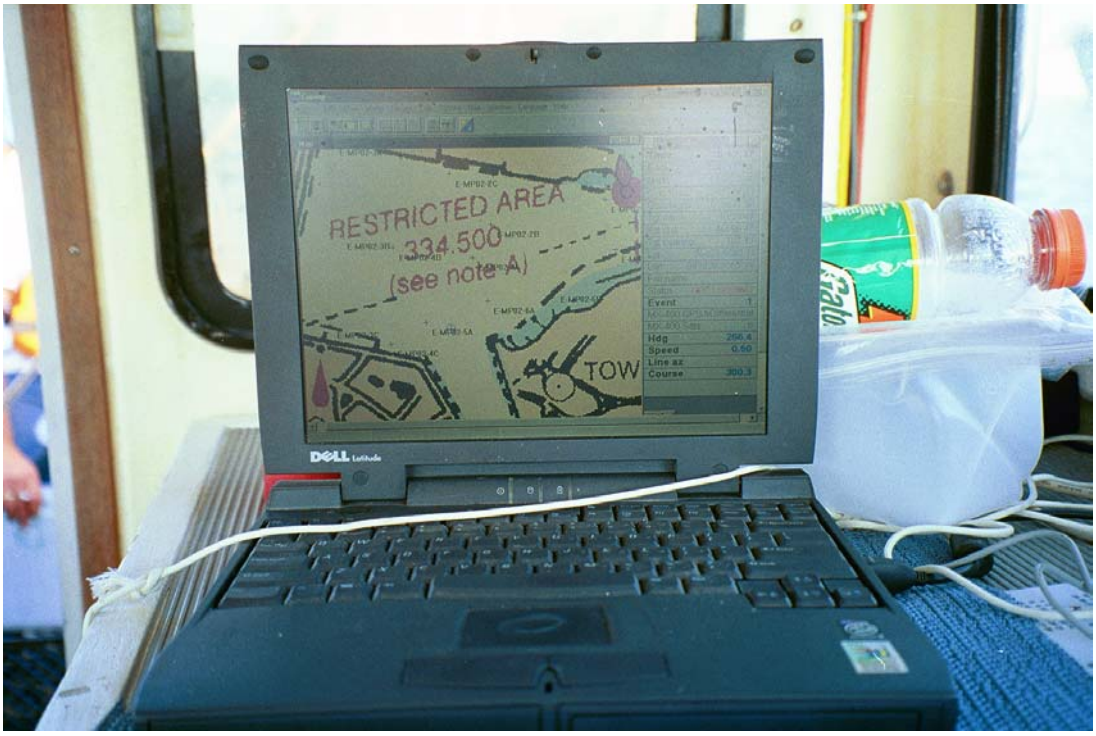
2. Mobilization / Transport

3. Sampling and Mixing Equipment Cleaning

4.Instrument Calibration

5. Data Documentation

6. Station Location and Positioning



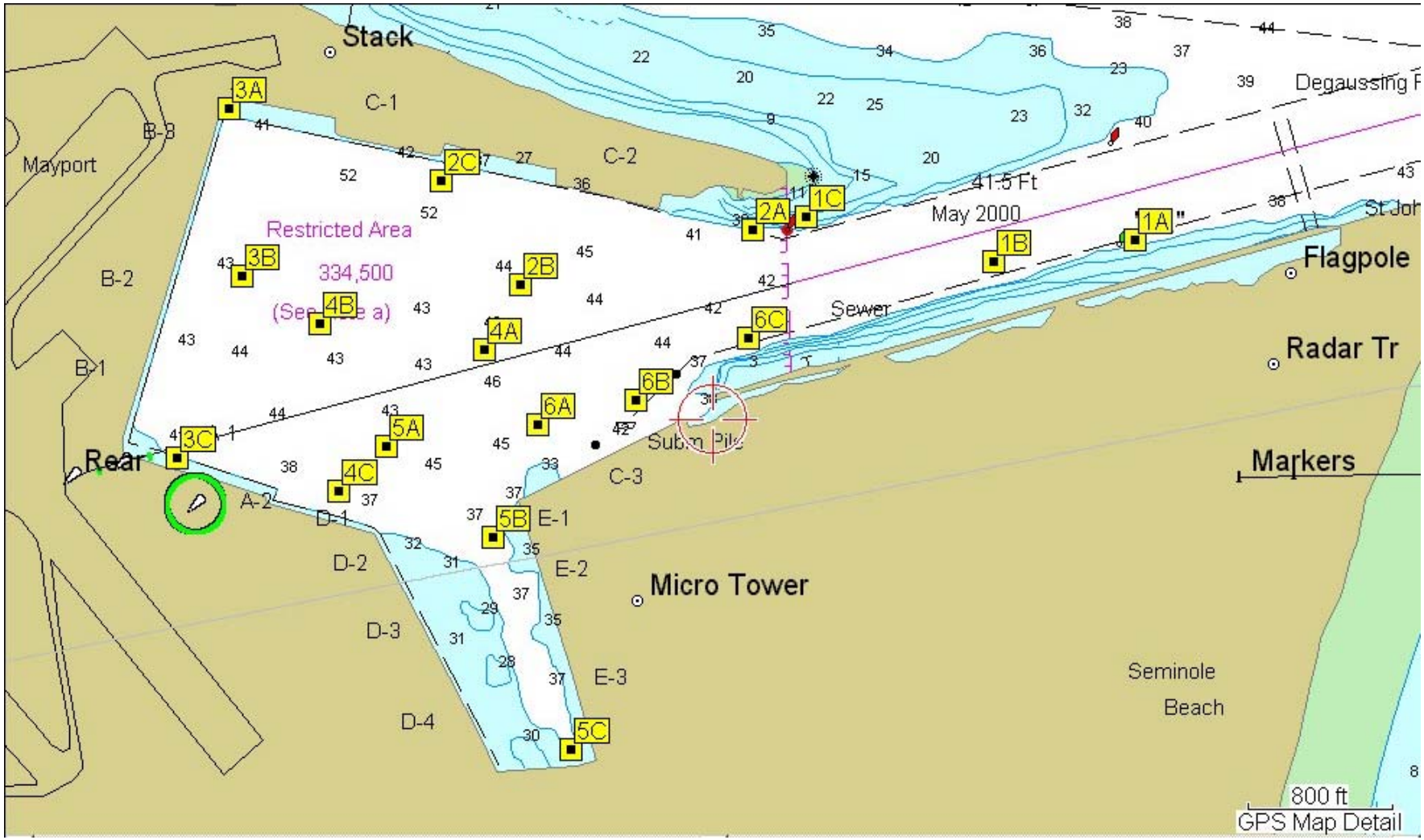
7. Sample Collection Procedure

8. Sample Handling

9. Sample Transport and storage

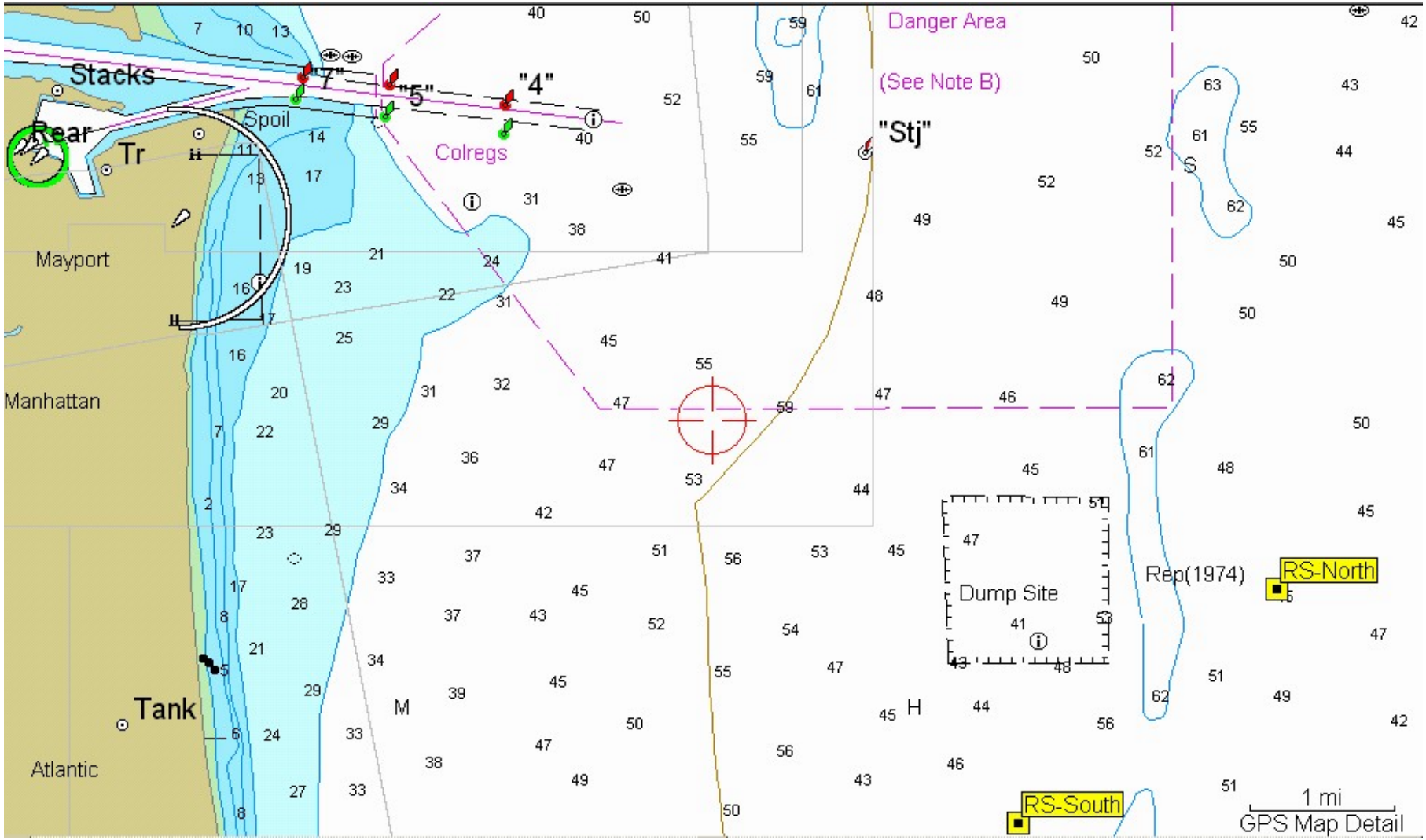
10. Field Measurement

Figure 2-A. Sediment Sampling Locations for Mayport Naval Station, Jacksonville, Florida - 2002



Map ID	1A, 1B, 1C	2A, 2B, 2C	3A, 3B, 3C	4A, 4B, 4C	5A, 5B, 5C	6A, 5B, 5C	RS-North	RS-South
Sample ID	E-MP02-1 (A, B, C)	E-MP02-2 (A, B,C)	E-MP02-3 (A, B,C)	E-MP02-4 (A, B,C)	E-MP02-5 (A, B,C)	E-MP02-6 (A, B, C)	RS-MP02	RS-MP02

Figure 2-B. Sediment Sampling Locations for Reference Station (Mayport Naval Station, Jacksonville, Florida) - 2002

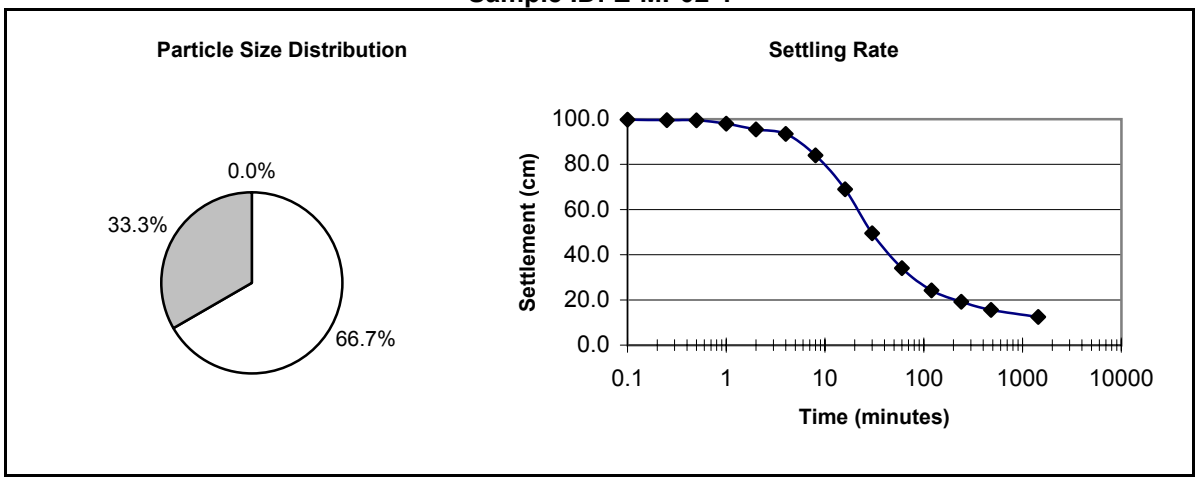


Charts

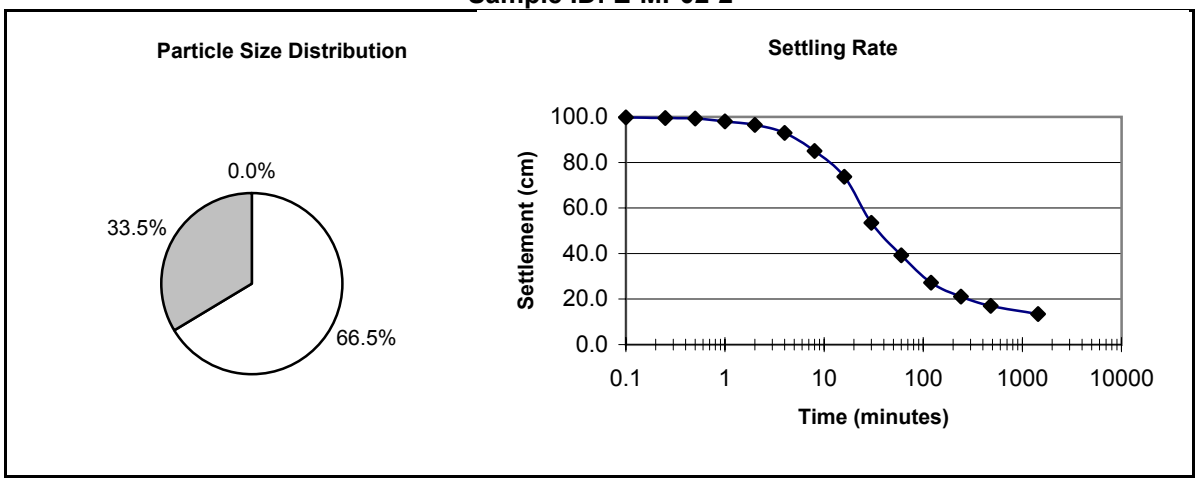
- Particle Size Distribution and settling rates

Chart 1
Particle Size Distribution and Settling Rate for Mayport-2002

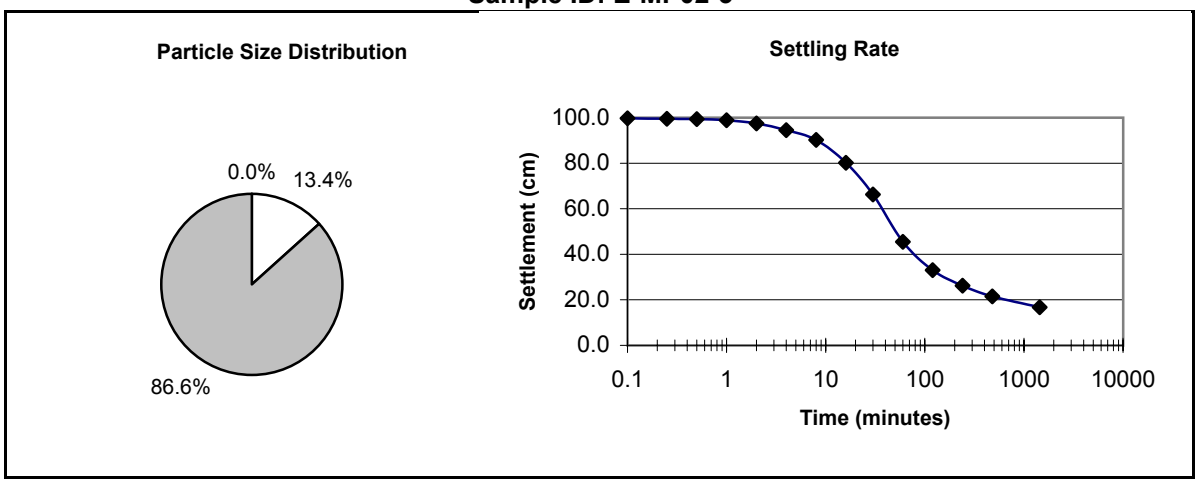
Sample ID: E-MP02-1



Sample ID: E-MP02-2



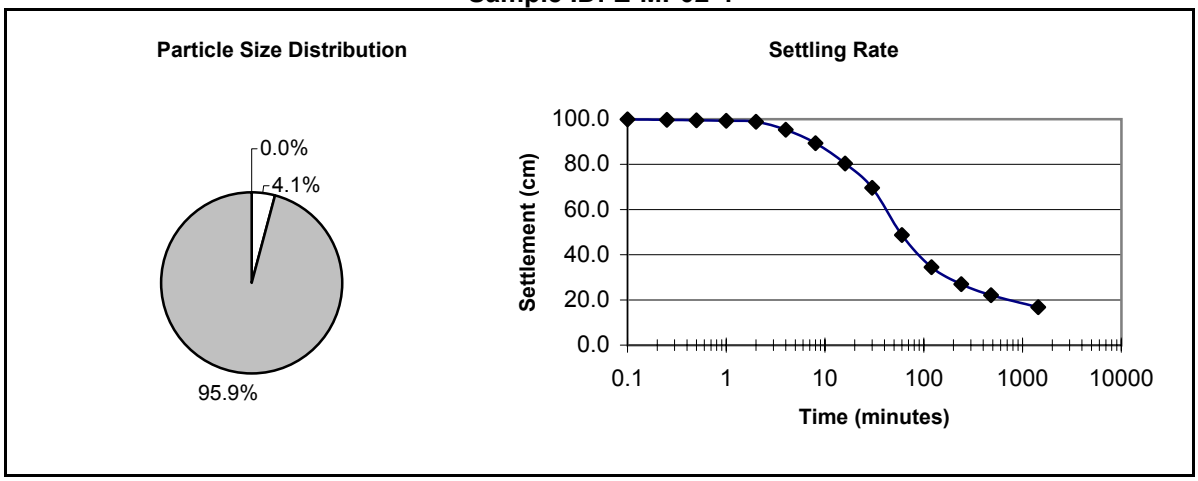
Sample ID: E-MP02-3



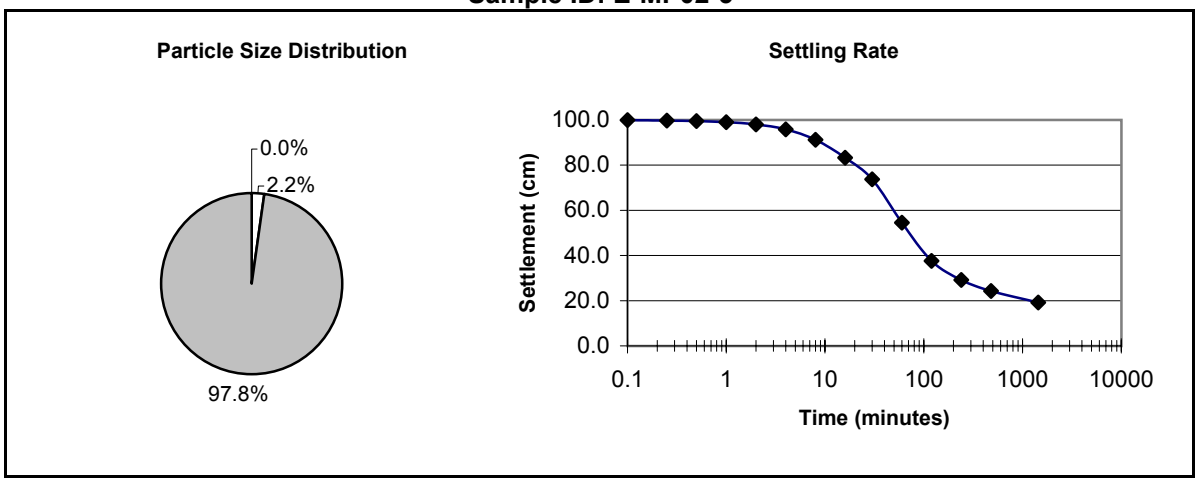
Gravel **Sand** **Silt/Clay**

Chart 1
Particle Size Distribution and Settling Rate for Mayport-2002

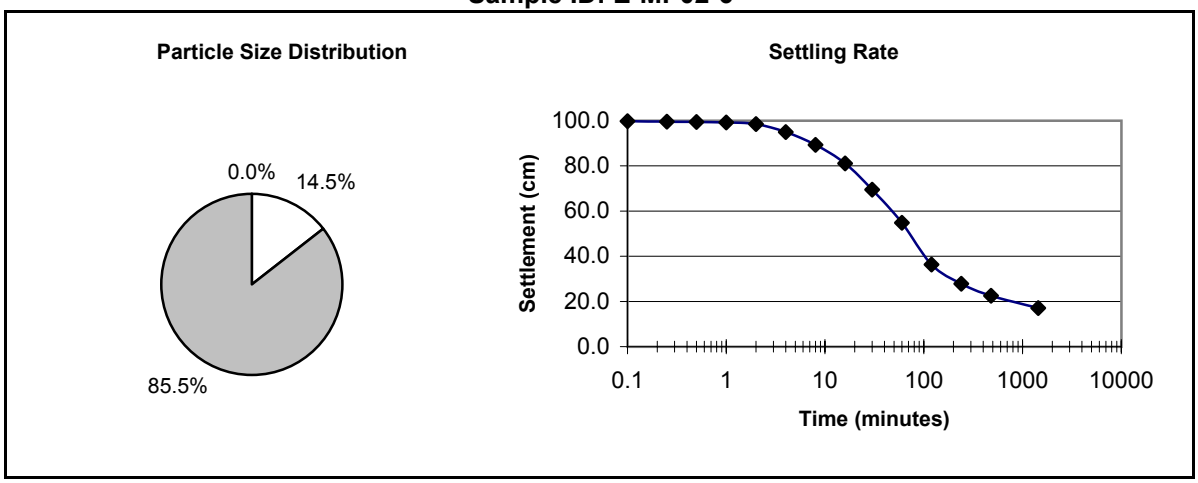
Sample ID: E-MP02-4



Sample ID: E-MP02-5



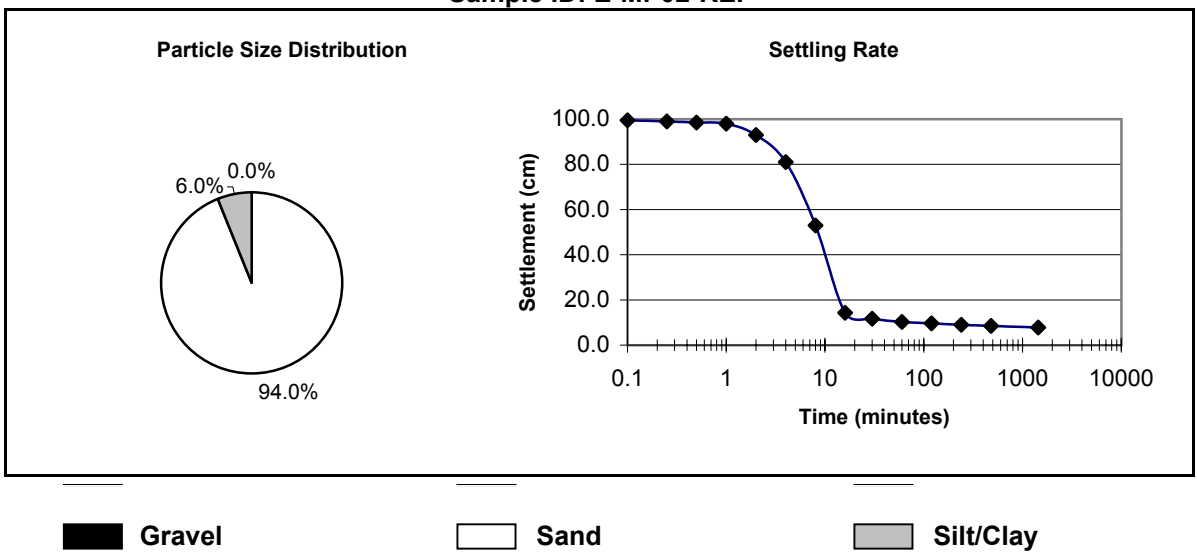
Sample ID: E-MP02-6



Gravel **Sand** **Silt/Clay**

Chart 1

Particle Size Distribution and Settling Rate for Mayport-2002



Tables

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- 15 Results of Pesticides and PCB Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002

- 16 Results of Polynuclear Aromatic Hydrocarbon Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002

- 17 Results of Organic Tin Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002

- 18 Results of Metals Analyses for Tissues (*Nereis virens*) From 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002

- 19 Results of Metals Analyses for Tissues (*Macoma nasuta*) From 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002

- 20 Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses For Tissues(*Nereis virens*) from 28-day Bioaccumalation Testing. Mayport Naval Station, Jacksonville, Florida April 22-26, 2002

- 21 Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses For Tissues(*Macoma nasuta*) from 28-day Bioaccumalation Testing. Mayport Naval Station, Jacksonville, Florida April 22-26, 2002

- 22 96-Hour *Mysidopsis bahia* Survival in Three Elutriate Concentrations Prepared from Sediments Collection From Mayport Harbor, May 2002

- 23 Summary of Steel's Many-One Rank Test of Control Water (0 percent Elutriate) or Control Sediment (100 percent Elutriate) and Test Sediment (100 percent Elutriate) *Mysidopsis bahia* Survival for Mayport, May 2002

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- 25 Summary of Steel's *Menidia*

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- 30 ANOVA *Mysidopsis*
- 31 10-Day Sediment *Leptocheirus*
- 32 Summary of Stat. Lepocheirus
- 33 Survivorship of *Macoma nasuta* and *Neireis virens* During 28-Day Bioaccumulation Bioassays with Sediments from ANAMAR, May 2002

TABLE 1
Sediment and Tissue Analytes with Analytical Methods

Analyte	Sediment Method Number	Tissue Method Number
Aluminum	EPA 6010	N/A
Arsenic	EPA 7060	EPA 6010
Cadmium	EPA 7131	EPA 6010
Chromium	EPA 6010	EPA 6010
Copper	EPA 6010	EPA 6010
Iron	EPA 6010	N/A
Lead	EPA 6010	EPA 6010
Mercury	EPA 7471	EPA 7471
Tin	N/A	EPA 6010
Nickel	EPA 6010	EPA 6010
Silver	EPA 7761	N/A
Zinc	EPA 6010	EPA 6010
Cyanide	EPA 335.2	N/A
Ammonia	EPA 350.1	N/A
Total Organic Carbon TOC)	USACOE	N/A
Oil and Grease	EPA SW-846 9071	N/A
Total Solids	EPA 160.3	SM 2540G
Pesticides/PCB's	EPA SW-846 8081 & 8082	N/A
Polynuclear Aromatic Hydrocarbons (PAHs)	EPA SW-846 8270	EPA SW-846 8270
Organic Tin	Uhler and Durrell, 1989	N/A
Grain Size	ASTM D422	N/A
Specific Gravity	ASTM D854	N/A
Atterburg Limits	ASTM D4318	N/A
Settling Rates	Corps SAD Lab Methods	N/A

N/A = Not Applicable

TABLE 2
Elutriate Analytes and Analytical Methods

Analyte	Method Number
Arsenic	EPA 206.2
Cadmium	EPA 213.2
Chromium	EPA 218.2
Copper	EPA 220.2
Lead	EPA 239.2
Mercury	EPA 245.1
Nickel	EPA 249.2
Silver	EPA 272.2
Zinc	EPA 200.7
Cyanide	EPA 335.2
Ammonia	EPA 350.1
Total Organic Carbon TOC)	EPA 415.1
Oil and Grease	EPA 413.1
Pesticides/PCBs	EPA SW-846 8081 & 8082
Polynuclear Aromatic Hydrocarbons (PAHs)	EPA SW-846 8270
Organic Tin	Uhler and Durrell, 1989

TABLE 3

Results of In Situ Hydrographic Measurements at Mayport Naval Station from April 22 to 26, 2002

Station ID	Coordinates	Date and Time	Depth (feet)	Sea State	Weather
E-MP02-1A	30°23.779' N 81°23.901' W	04/25/02 0845	40	Calm	Sunny to partly cloudy, wind from the west at 10 mph
E-MP02-1B	30°23.760' N 81°24.050' W	04/25/02 1000	41	Light chop	Sunny, wind from the west at 15 to 20 mph
E-MP02-1C	30°23.801' N 81°24.248' W	04/25/02 1100	42	Light chop	Sunny, wind from the west at 10 mph
E-MP02-2A	30°23.789' N 81°24.305' W	04/25/02 1130	40	Calm	Sunny, wind from the west at 10 to 15 mph
E-MP02-2B	30°23.739' N 81°24.549' W	04/25/02 1200	38	Calm	Sunny, wind from the northwest at 5 to 10 mph
E-MP02-2C	30°23.833' N 81°24.634' W	04/25/02 1230	38	Light chop	Sunny, wind from the west at 10 to 20 mph
E-MP02-3A	30°23.899' N 81°24.857' W	04/25/02 1445	35	Calm	Partly sunny, wind from the west-southwest at 10 to 15 mph
E-MP02-3B	30°23.747' N 81°24.844' W	04/25/02 1610	39	Calm	Sunny, winds from the south at 10 to 20 mph
E-MP02-3C	30°23.581' N 81°24.912' W	04/25/02 1710	39	Calm	Sunny to partly cloudy winds west-southwest at 10 to 15 mph
E-MP02-3A DUP	30°23.895' N 81°24.856' W	04/25/02 1530	35	Calm	Sunny to partly cloudy winds west-northwest at 10 to 15 mph
E-MP02-3B DUP	28°23.742' N 81°24.837' W	04/25/02 1640	39	Calm	Sunny to partly cloudy winds from the west-southwest at 10 to 15 mph
E-MP02-3C DUP	30°23.579' N 81°24.910' W	04/25/02 1800	40	Calm	Sunny winds from the west at 5 to 15 mph
E-MP02-4A	30°23.680' N 81°24.588' W	04/25/02 1110	40	Light chop	Sunny, winds out of northeast 5 to 10 mph
E-MP02-4B	30°23.703' N 81°24.762' W	04/25/02 1000	42	Choppy	Mostly cloudy, winds out of northwest 10 to 15 mph
E-MP02-4C	30°23.551' N 81°24.742' W	04/25/02 1045	41	Slight Chop	Mostly cloudy, winds out of northeast 10 to 15 mph
E-MP02-5A	30°23.591' N 81°24.692' W	04/24/02 1710	42	Slight chop	Sunny, wind out of east-southeast 5 to 15 mph

TABLE 3

Results of In Situ Hydrographic Measurements at Mayport Naval Station from April 22 to 26, 2002

Station ID	Coordinates	Date and Time	Depth (feet)	Sea State	Weather
E-MP02-5B	30°23.509' N 81°24.578' W	04/24/02 1625	38	Calm	Sunny, wind out of east at 5 to 15 mph
E-MP02-5C	30°23.315' N 81°24.497' W	04/24/02 1540	33	Calm	Sunny, wind out of east at 5 to 15 mph
E-MP02-6A	30°23.611' N 81°24.532' W	04/26/02 0920	42	Light Chop	Sunny, wind out of northeast at 15 to 20 mph
E-MP02-6B	30°23.633' N 81°24.428' W	04/26/02 1130	40	Light Chop	Sunny, wind out of northeast at +20 mph
E-MP02-6C	30°23.690' N 81°24.309' W	04/26/02 0830	39	Light Chop	Sunny, wind out of east-northeast at 10 to 15 mph
RS-MP02A	30°20.947' N 81°16.281' W	04/24/02 0845	54	3-5 Foot Waves	Sunny, wind out of northeast at 10 to 15 mph
RS-MP02B	30°19.541' N 81°18.082' W	04/24/02 1045	50	3-5 Foot Waves	Sunny, wind out of east-northeast at 10 to 15 mph

Source: ANAMAR Environmental Chemistry, Inc.

TABLE 3

Results of In Situ Hydrographic Measurements at Mayport Naval Station from April 22 to 26, 2002

Below are the tides, sunrise, sunset and moon phases times for St. John's River Entrance, Florida Current

Date	Time	Speed	Description
2000-04-23	2:28 AM EDT	0.00 knots	Slack, Ebb Begins
2000-04-23	5:09 AM EDT	-2.10 knots	Max Ebb
2000-04-23	6:49 AM EDT	Sunrise	
2000-04-23	10:05 AM EDT	0.00 knots	Slack, Flood Begins
2000-04-23	12:03 PM EDT	1.35 knots	Max Flood
2000-04-23	2:29 PM EDT	0.00 knots	Slack, Ebb Begins
2000-04-23	5:15 PM EDT	-2.03 knots	Max Ebb
2000-04-23	7:58 PM EDT	Sunset	
2000-04-23	9:51 PM EDT	0.00 knots	Slack, Flood Begins
2000-04-24	12:25 AM EDT	1.82 knots	Max Flood
2000-04-24	3:13 AM EDT	0.00 knots	Slack, Ebb Begins
2000-04-24	5:53 AM EDT	-1.98 knots	Max Ebb
2000-04-24	6:48 AM EDT	Sunrise	
2000-04-24	10:58 AM EDT	0.00 knots	Slack, Flood Begins
2000-04-24	12:53 PM EDT	1.22 knots	Max Flood
2000-04-24	3:16 PM EDT	0.00 knots	Slack, Ebb Begins
2000-04-24	6:01 PM EDT	-1.90 knots	Max Ebb
2000-04-24	7:59 PM EDT	Sunset	
2000-04-24	10:45 PM EDT	0.00 knots	Slack, Flood Begins
2000-04-25	1:16 AM EDT	1.67 knots	Max Flood
2000-04-25	4:02 AM EDT	0.00 knots	Slack, Ebb Begins

TABLE 3

Results of In Situ Hydrographic Measurements at Mayport Naval Station from April 22 to 26, 2002

Below are the tides, sunrise, sunset and moon phases times for St. John's River Entrance, Florida Current

Date	Time	Speed	Description
2000-04-25	6:41 AM EDT	-1.87 knots	Max Ebb
2000-04-25	6:47 AM EDT	Sunrise	
2000-04-25	11:54 AM EDT	0.00 knots	Slack, Flood Begins
2000-04-25	1:45 PM EDT	1.13 knots	Max Flood
2000-04-25	4:09 PM EDT	0.00 knots	Slack, Ebb Begins
2000-04-25	6:53 PM EDT	-1.78 knots	Max Ebb
2000-04-25	7:59 PM EDT	Sunset	
2000-04-25	11:46 PM EDT	0.00 knots	Slack, Flood Begins
2000-04-26	2:09 AM EDT	1.56 knots	Max Flood
2000-04-26	4:54 AM EDT	0.00 knots	Slack, Ebb Begins
2000-04-26	6:46 AM EDT	Sunrise	
2000-04-26	7:34 AM EDT	-1.79 knots	Max Ebb
2000-04-26	12:48 PM EDT	0.00 knots	Slack, Flood Begins
2000-04-26	2:39 PM EDT	1.13 knots	Max Flood
2000-04-26	3:32 PM EDT	Last Quarter	
2000-04-26	5:07 PM EDT	0.00 knots	Slack, Ebb Begins
2000-04-26	7:48 PM EDT	-1.71 knots	Max Ebb
2000-04-26	8:00 PM EDT	Sunset	

TABLE 4
Depth Profile In Situ Data from Mayport Naval Station from April 22 to 26, 2002

Station ID	Sampling Depth (feet)	Temp (°C)	pH (Units)	Dissolved O2 (ppm)	Salinity (ppt)	Conductivity (mmhos/cm)	Turbidity (NTU)
E-MP02-1A	1	23.47	7.63	6.87	35.0	52.2	3.7
	20	22.95	7.61	6.93	36.6	55.3	9.9
	37	22.96	7.63	6.96	36.7	55.3	25.2
E-MP02-1B	1	23.53	7.65	7.01	35.0	52.3	0.3
	20.5	23.04	7.65	7.07	36.5	54.9	13.6
	38	22.99	7.63	6.94	36.5	55.0	11.0
E-MP02-1C	1	23.66	7.64	7.03	34.9	52.5	3.1
	21	23.01	7.63	6.76	36.3	54.6	5.9
	39	22.99	7.63	6.80	36.4	55.1	10.6
E-MP02-2A	1	23.76	7.63	6.95	34.6	52.1	4.9
	20	23.04	7.62	6.76	36.2	54.6	5.3
	37	23.01	7.53	6.89	36.4	54.9	8.5
E-MP02-2B	1	23.92	7.60	7.01	35.0	52.6	5.3
	19	23.05	7.58	6.72	36.1	54.5	5.6
	35	22.95	7.42	6.81	36.6	55.1	10.5
E-MP02-2C	1	24.10	7.61	6.96	34.7	53.1	5.3
	19	22.98	7.60	6.43	36.3	54.7	7.9
	35	22.96	7.51	6.59	36.6	54.6	9.1
E-MP02-3A	1	24.65	7.64	7.30	34.8	52.2	3.8
	17.5	23.09	7.64	6.71	36.1	54.5	5.5
	32	23.01	7.59	6.48	36.4	55.0	39.2
E-MP02-3B	1	24.31	7.63	6.87	34.1	57.5	7.0
	19.5	23.92	7.63	7.07	35.3	53.5	6.8
	36	23.06	7.59	6.65	36.3	54.7	6.4
E-MP02-3C	1	24.52	7.62	6.90	33.3	57.3	6.7
	19.5	24.22	7.62	7.03	34.6	52.6	9.0
	39	23.04	7.61	6.50	36.5	55.2	14.6
E-MP02-3A DUP	1	24.26	7.66	7.28	35.1	53.0	5.4
	17.5	23.79	7.65	7.06	35.5	53.6	5.4
	32	23.30	7.60	6.80	35.7	54.0	7.2

TABLE 4
Depth Profile In Situ Data from Mayport Naval Station from April 22 to 26, 2002

Station ID	Sampling Depth (feet)	Temp (°C)	pH (Units)	Dissolved O2 (ppm)	Salinity (ppt)	Conductivity (mmhos/cm)	Turbidity (NTU)
E-MP02-3B DUP	1	24.44	7.63	6.89	33.5	50.9	8.5
	19.5	24.00	7.63	7.20	35.2	53.3	5.3
	36	23.00	7.61	6.55	36.5	54.9	8.2
E-MP02-3C DUP	1	24.54	7.60	6.92	33.2	51.1	6.0
	20	24.31	7.60	6.80	34.2	51.8	6.7
	37	23.10	7.59	6.39	36.4	54.8	14.2
E-MP02-4A	1	23.82	7.56	6.45	35.0	52.9	6.8
	20	23.10	7.56	6.19	36.2	54.6	12.5
	37	22.80	7.51	6.19	36.8	55.4	17.9
E-MP02-4B	1	23.87	7.56	6.52	34.4	52.1	5.2
	21	22.96	7.56	6.19	36.4	54.8	9.4
	39	22.66	7.54	6.15	36.9	55.7	14.4
E-MP02-4C	1	24.04	7.56	6.51	34.4	52.3	8.0
	20.5	22.97	7.57	6.18	36.5	54.9	9.9
	38	22.65	7.55	6.05	37.2	55.7	21.9
E-MP02-5A	1	24.03	7.66	7.46	34.1	51.7	4.7
	21	23.33	7.66	6.87	34.7	52.5	6.8
	39	22.46	7.66	6.49	36.3	54.5	7.3
E-MP02-5B	1	24.24	7.69	7.80	34.0	51.8	6.3
	19	23.38	7.68	7.14	35.0	52.9	6.9
	35	22.49	7.69	6.37	36.1	54.5	5.9
E-MP02-5C	1	24.33	7.71	7.61	34.3	52.0	5.8
	16.5	23.69	7.72	7.56	34.6	52.4	5.3
	30	22.39	7.74	6.11	36.2	54.6	6.6
E-MP02-6A	1	23.80	7.57	6.42	34.1	51.8	5.2
	21	23.04	7.56	6.25	36.2	54.5	10.5
	39	22.71	7.56	6.20	37.0	55.6	24.4
E-MP02-6B	1	24.69	7.56	6.92	34.5	52.3	5.3
	20	23.11	7.56	6.21	36.4	54.9	7.1
	37	22.75	7.51	5.96	36.9	55.5	16.0

TABLE 4
Depth Profile In Situ Data from Mayport Naval Station from April 22 to 26, 2002

Station ID	Sampling Depth (feet)	Temp (°C)	pH (Units)	Dissolved O2 (ppm)	Salinity (ppt)	Conductivity (mmhos/cm)	Turbidity (NTU)
E-MP02-6C	1	23.80	7.55	6.42	34.0	51.6	5.3
	19.5	23.51	7.55	6.45	35.1	53.2	7.1
	36	22.70	7.55	6.28	36.8	55.7	27.4
RS-MP02A	1	23.16	7.69	7.06	37.0	55.2	1.5
	27	22.99	7.68	7.09	37.2	55.8	1.3
	51	21.78	7.69	6.71	37.1	55.8	4.2
RS-MP02B	1	23.00	7.69	7.09	37.1	55.8	1.5
	25	22.93	7.69	7.03	37.1	55.7	1.8
	47	22.06	7.69	6.52	37.2	55.9	8.0

Source: ANAMAR Environmental Chemistry, Inc.

TABLE 5
Results of Physical Analysis (Specific Gravity, Atterberg Limits, and Percent Solids) from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002

Sample Number	Specific Gravity	Atterberg Limits			Percent Solids
		Liquid Limit (Percent)	Plastic Limit (Percent)	Plasticity Index	
E-MP02-1	2.600	72	36	36	23.1
E-MP02-2	2.658	94	37	57	16.8
E-MP02-3	2.527	208	72	136	11.0
E-MP02-4	2.633	220	68	152	9.8
E-MP02-5	2.539	220	64	156	10.5
E-MP02-6	2.630	197	64	133	11.1
RS-MP02	2.671	NP	NP	NP	53.3

NP=Non Plastic

Source: LAW Engineering and Environmental Services, Inc.

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 6
Results of Physical Analysis (Grain Size) from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002

Sample ID	Gravel (Percent)	Sand (Percent)	Silt/Clay (Percent)
E-MP02-1	0.0	66.7	33.3
E-MP02-2	0.0	66.5	33.5
E-MP02-3	0.0	13.4	86.6
E-MP02-4	0.0	4.1	95.9
E-MP02-5	0,0	2.2	97.8
E-MP02-6	0.0	14.5	85.5
RS-MP02	0.0	94.0	6.0
Statistical Values			
Maximum	0.0	94.0	97.8
Minimum	0.0	2.2	6.0
Average	0.0	37.3	62.7
90 Percent Exceed	0.0	3.3	22.4
50 Percent Exceed	0.0	14.5	85.5
10 Percent Exceed	0.0	77.6	96.7

Source: LAW Engineering and Environmental Services, Inc.

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 7
Results of Physical Analysis (Settling Rate) from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002

Time	E-MP02-1	E-MP02-2	E-MP02-3	E-MP02-4	E-MP02-5	E-MP02-6	RS-MP02
0.1	99.8	99.8	99.7	99.9	99.9	99.8	99.5
0.25	99.6	99.5	99.5	99.7	99.7	99.6	99.0
0.5	99.5	99.3	99.4	99.5	99.5	99.4	98.5
1	98.0	98.0	98.9	99.3	99.0	99.2	98.0
2	95.5	96.5	97.5	98.9	98.0	98.5	93.0
4	93.5	93.0	94.5	95.3	95.8	95.0	81.0
8	84.0	85.0	90.2	89.4	91.2	89.3	53.0
16	69.0	73.7	80.2	80.4	83.3	81.1	14.3
30	49.5	53.5	66.3	69.6	73.7	69.5	11.7
60	34.1	39.2	45.5	48.7	54.5	54.8	10.3
120	24.2	27.2	33.0	34.5	37.6	36.3	9.6
240	19.2	21.1	26.2	27.0	29.2	27.8	9.0
480	15.6	17.0	21.5	22.1	24.3	22.5	8.5
1440	12.5	13.4	16.7	16.8	19.2	17.1	7.8

*Sample Concentration: 100g/L, Time (minutes), Sample Settlement (cm)

Source: LAW Engineering and Environmental Services, Inc.

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 8
Results of TOC, Cyanide, Ammonia, and Oil and Grease Analyses for Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station ID	TOC (Percent)	Cyanide	Ammonia	O & G (mg/Kg)
RS-MP02	0.24	1.0 U	65.4	21 U
E-MP02-1	1.7	1.0 U	33.1	35 U
E-MP02-2	2.0	1.0 U	81.4	39 U
E-MP02-3	3.7	1.0 U	140	71
E-MP02-3 DUP	3.3	1.0 U	178	72
E-MP02-4	4.0	1.0 U	233	140
E-MP02-5	4.1	1.0 U	13.5	110
E-MP02-6	3.5	1.0 U	196	84
E-MP02-Control	0.19	1.0 U	5.08	24

All data reported in μg/g – Dry weight.

U=Result below detection limit

Source: PPB Environmental Laboratories, Inc. and Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

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TABLE 9
Results of Metals Analyses for Composited Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station ID	Aluminum	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Nickel	Silver	Zinc
RS-MP02	8930	1.66	0.240	8.0	3.2	2730	4.8 U	0.05 U	2.8 U	0.1 U	7.2
E-MP02-Control	28400	2.22	0.100 U	24.8	9.8	12200	12.0 U	0.05 U	14.0	0.1 U	18.9
E-MP02-1	24700	4.73	0.106	25.0	7.4	11700	13.7 U	0.05 U	8.0 U	0.1 U	25.0
E-MP02-2	30000	5.60	0.193	29.1	9.4	13600	11.9U	0.05	6.9 U	0.1 U	29.8
E-MP02-3	49600	10.2	0.127	56.1	24.4	25800	12.6	0.06 U	15.7	0.1 U	68.0
E-MP02-3 DUP	52100	11.0	0.134	56.5	26.7	29100	14.7	0.05 U	14.1	0.1 U	74.8
E-MP02-4	61500	12.9	0.134	69.7	18.8	31900	24.5	0.05 U	15.2	0.1 U	75.9
E-MP02-5	56300	12.0	0.175	63.2	25.2	29300	15.5	0.08	14.9	0.1 U	79.6
E-MP02-6	48000	11.8	0.144	51.3	14.9	24300	14.2	0.05 U	13.3	0.1 U	56.8

*All data reported in mg/Kg.-Dry weight

U=Result below detection limit

Source: PPB Environmental Laboratories, Inc.

Compiled by: ANAMAR Environmental Chemistry, Inc.

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TABLE 10
Results of Pesticides and PCB Analyses for Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D. / Parameter	E-MP02-1	E-MP02-2	E-MP02-3	E-MP02-3D	E-MP02-4	E-MP02-5	E-MP02-6	RS-MP02	E-MP02-Control
4,4'-DDD	2.7U	3.0U	4.6U	4.7U	5.3U	5.4U	4.9U	1.6U	1.6U
4,4'-DDE	3.5U	3.9U	6.0U	6.1U	7.0U	7.1U	6.4U	2.1U	2.1U
4,4'-DDT	3.7U	4.1U	6.4U	6.5U	7.4U	7.5U	6.8U	2.2U	2.2U
Aldrin	3.7U	4.1U	6.4U	6.5U	7.4U	7.5U	6.8U	2.2U	2.2U
alpha-BHC	2.5U	2.7U	4.2U	4.3U	4.9U	5.0U	4.5U	1.5U	1.5U
beta-BHC	4.2U	4.6U	7.1U	7.2U	8.2U	8.3U	7.5U	2.5U	2.5U
Chlordane	3.1U	3.4U	5.3U	5.4U	6.2U	6.2U	5.6U	1.9U	1.9U
delta-BHC	2.7U	3.0U	4.6U	4.7U	5.3U	5.4U	4.9U	1.6U	1.6U
Dieldrin	2.5U	2.7U	4.2U	4.3U	4.9U	5.0U	4.5U	1.5U	1.5U
Endosulfan I	2.5U	2.7U	4.2U	4.3U	4.9U	5.0U	4.5U	1.5U	1.5U
Endosulfan II	2.9U	3.2U	4.9U	5.1U	5.7U	5.8U	5.3U	1.7U	1.7U
Endosulfan sulfate	4.4U	4.8U	7.4U	7.6U	8.6U	8.8U	7.9U	2.6U	2.6U
Endrin	2.7U	3.0U	4.6U	4.7U	5.3U	5.4U	4.9U	1.6U	1.6U
Endrin aldehyde	2.3U	2.5U	3.9U	4.0U	4.5U	4.6U	4.1U	1.4U	1.4U
gamma-BHC (Lindane)	2.5U	2.7U	4.2U	4.3U	4.9U	5.0U	4.5U	1.5U	1.5U
Heptachlor	2.7U	3.0U	4.6U	4.7U	5.3U	5.4U	4.9U	1.6U	1.6U
Heptachlor epoxide	2.3U	2.5U	3.9U	4.0U	4.5U	4.6U	4.1U	1.4U	1.4U
Methoxychlor	17U	18U	28U	29U	33U	33U	30U	9.9U	9.9U
Toxaphene	46U	50U	78U	79U	90U	92U	83U	27U	27U
2,2',3,3',4,4',5,5',6-NonaCB	0.82U	0.90U	1.4U	1.4U	1.6U	1.6U	1.5U	0.49U	0.49U
2,2',3,3',4,4',5-HeptaCB	0.73U	0.80U	1.2U	1.3U	1.4U	1.5U	1.3U	0.44U	0.43U
2,2',3,3',4,4'-HexaCB	9.1U	10U	15U	16U	18U	18U	16U	5.4U	5.4U
2,2',3,4,4',5'-HexaCB	0.81U	0.89U	1.4U	1.4U	1.6U	1.6U	1.5U	0.49U	0.48U
2,2',3,4',5-PentaCB	1.4U	1.5U	2.4U	2.4U	2.8U	2.8U	2.5U	0.84U	0.84U
2,2',3,5'-TetraCB	1.1U	1.3U	1.9U	2.0U	2.2U	2.3U	2.1U	0.68U	0.68U
2,2',4,4',5,5'-HexaCB	2.7U	3.0U	4.6U	4.7U	5.4U	5.5U	4.9U	1.6U	1.6U
2,2',4,5,5'-PentaCB	1.6U	1.7U	2.7U	2.7U	3.1U	3.2U	2.9U	0.94U	0.94U
2,2',4,5'-TetraCB	2.3U	2.5U	3.8U	3.9U	4.5U	4.5U	4.1U	1.4U	1.4U
2,2',5,5'-TetraCB	0.99U	1.1U	1.7U	1.7U	2.0U	2.0U	1.8U	0.59U	0.59U
2,2',5-TriCB	0.94U	1.0U	1.6U	1.6U	1.8U	1.9U	1.7U	0.56U	0.56U
2,3,3',4,4'-PentaCB	2.4U	2.6U	4.0U	4.1U	4.7U	4.8U	4.3U	1.4U	1.4U
2,3,4,4',5-PentaCB	0.88U	0.96U	1.5U	1.5U	1.7U	1.8U	1.6U	0.52U	0.52U
2,3,4,4'-TetraCB	0.62U	0.68U	1.1U	1.1U	1.2U	1.2U	1.1U	0.37U	0.37U
2,4,4'-TriCB	20U	22U	34U	34U	39U	40U	36U	12U	12U
2,4'-DiCB	1.8U	2.0U	3.1U	3.2U	3.6U	3.6U	3.3U	1.1U	1.1U

TABLE 10
Results of Pesticides and PCB Analyses for Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D. / Parameter	E-MP02-1	E-MP02-2	E-MP02-3	E-MP02-3D	E-MP02-4	E-MP02-5	E-MP02-6	RS-MP02	E-MP02-Control
Aroclor-1016	12U	13U	20U	20U	23U	23U	21U	7.0U	6.9U
Aroclor-1221	8.7U	9.6U	15U	15U	17U	18U	16U	5.2U	5.2U
Aroclor-1232	25U	27U	42U	43U	49U	50U	45U	15U	15U
Aroclor-1242	20U	22U	34U	35U	39U	40U	36U	12U	12U
Aroclor-1248	7.1U	7.8U	12U	12U	14U	14U	13U	4.2U	4.2U
Aroclor-1254	25U	27U	42U	43U	49U	50U	45U	15U	15U
Aroclor-1260	50U	55U	85U	87U	98U	100U	90U	30U	30U

All data reported in μg/kg. – Dry weight

U = Result below detection limit.

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 11
Results of Polynuclear Aromatic Hydrocarbon Analyses for Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-1	E-MP02-2	E-MP02-3	E-MP02-3D	E-MP02-4	E-MP02-5	E-MP02-6	RS-MP02	E-MP02-Control
Acenaphthene	1.7U	2.0U	3.0U	3.1U	3.5U	3.5U	3.2U	1.1U	1.0U
Acenaphthylene	1.7U	2.0U	3.0U	3.1U	3.5U	3.5U	3.2U	1.1U	1.0U
Anthracene	1.7U	8.8	11	3.1U	3.5U	3.5U	3.2U	1.1U	1.0U
Benzo(a)anthracene	8.4	22	25	23	19	20	9.3	7.5	1.0U
Benzo(a)pyrene	5.2	11	19	3.1U	12	17	3.2U	7.1	1.0U
Benzo(b)fluoranthene	8.0	18	29	23	18	25	3.2U	9.3	1.0U
Benzo(g,h,i)perylene	1.7U	6.1	3.0U	3.1U	3.5U	11	3.2U	4.3	1.0U
Benzo(k)fluoranthene	1.7U	7.2	13	8.4	3.5U	9.7	3.2U	2.6	1.0U
Chrysene	7.2	29	29	21	20	21	3.2U	6.2	1.0U
Dibenz(a,h)anthracene	1.7U	2.0U	3.0U	8.7	3.5U	3.5U	3.2U	1.1U	1.0U
Fluoranthene	9.3	23	23	16	20	24	3.2U	7.8	1.0U
Fluorene	1.7U	2.0U	3.0U	3.1U	3.5U	3.5U	3.2U	1.1U	1.0U
Indeno(1,2,3-cd)pyrene	1.7U	2.0U	10	7.7	3.5U	3.5U	3.2U	1.1U	1.0U
Naphthalene	1.7U	2.0U	3.0U	3.1U	3.5U	3.5U	3.2U	1.1U	1.0U
Phenanthrene	1.7U	9.8	11	3.1U	3.5U	3.5U	3.2U	2.9	1.0U
Pyrene	9.6	22	28	26	20	25	3.2U	8.9	1.0U

*All data reported in μg/kg. – Dry weight

U = Result below detection limit.

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

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TABLE 12
Results of Organic Tin Analyses for Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Sample Number	Monobutyl Tin	Dibutyl Tin	Tributyl Tin
E-MP02-1	3.7U	6.6U	4.9U
E-MP02-2	4.1U	7.2U	18
E-MP02-3	6.4U	11U	13
E-MP02-3 DUP	6.5U	11U	8.6U
E-MP02-4	7.4U	13U	9.8U
E-MP02-5	7.1U	13U	12
E-MP02-6	8.3	12U	8.9U
RS-MP02	2.9	4.0U	3.9
E-MP02-Control	2.2U	3.9U	2.9U

*All data reported in μg/Kg. Dry weight

U = Result below detection limit.

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 13
Results of TOC, Cyanide, Ammonia, and Oil and Grease Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station ID	TOC	Cyanide	Ammonia	O & G
RS-MP02 WATER	2.00 U	0.004 U	0.060	5.0 U
RS-MP02 ELUTRIATE	7.81	0.004 U	0.860	5.0 U
E-MP02-Control ELUTRIATE	6.89	0.004 U	1.08	5.0 U
E-MP02-1	10.4	0.004 U	6.62	5.0 U
E-MP02-2	15.0	0.004 U	11.3	5.0 U
E-MP02-3	18.6	0.004 U	18.2	5.0 U
E-MP02-3 DUP	17.4	0.004 U	19.5	5.0 U
E-MP02-4	22.2	0.004 U	17.1	5.0 U
E-MP02-5	21.3	0.004 U	21.0	5.0 U
E-MP02-6	18.7	0.004 U	14.9	5.0 U

All data reported in mg/L.

U=Result below detection limit

Source: PPB Environmental Laboratories, Inc. and Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 14
Results of Metals Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station ID	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc
RS-MP02 WATER	8.0 U	0.50 U	0.5 U	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	80 U
RS-MP02 ELUTRIATE	2.0 U	0.50 U	0.5 U	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	32 U
E-MP02-Control ELUTRIATE	2.0 U	0.50 U	0.5 U	3.2 I	2.5 U	0.20 U	2.0 U	1.0 U	32 U
E-MP02-1	18.8	0.58	0.5 U	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	32 U
E-MP02-2	78.1	0.52	0.5 U	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	32 U
E-MP02-3	102	0.57	0.5 U	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	32 U
E-MP02-3 DUP	80.9	0.50U	0.5 U	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	32 U
E-MP02-4	103	0.66	0.5 U	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	32 U
E-MP02-5	75.2	0.50U	0.6 I	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	32 U
E-MP02-6	97.4	0.50U	0.5 U	2.5 U	2.5 U	0.20 U	2.0 U	1.0 U	32 U

All data reported in μg/L.

U=Result below detection limit
I=Result between detection limit and practical quantitation limit

Source: PPB Environmental Laboratories, Inc.

Compiled by: ANAMAR Environmental Chemistry, Inc.

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TABLE 15
Results of Pesticide and PCB Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-1	E-MP02-2	E-MP02-3	E-MP02-3Dup	E-MP02-4	E-MP02-5	E-MP02-6	RS-MP02-Elut.	RS-MP02-Water	E-MP02-Control Elut.
4,4'-DDD	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
4,4'-DDE	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
4,4'-DDT	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Aldrin	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
alpha-BHC	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Chlordane	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Dieldrin	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Endosulfan I	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Endosulfan sulfate	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Endrin	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Endrin aldehyde	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
gamma-BHC (Lindane)	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Heptachlor	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Heptachlor epoxide	0.049 U	0.049 U	0.049 U	0.050 U	0.052 U	0.050 U	0.051 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.20 U	0.20 U	0.20 U	0.20 U	0.21 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toxaphene	0.99 U	0.98 U	0.98 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2',3,3',4,4',5,5',6-NonaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',3,3',4,4',5-HeptaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',3,3',4,4'-HexaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',3,4,4',5'-HexaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',3,4',5-PentaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',3,5'-TetraCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',4,4',5,5'-HexaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U

TABLE 15
Results of Pesticide and PCB Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-1	E-MP02-2	E-MP02-3	E-MP02-3Dup	E-MP02-4	E-MP02-5	E-MP02-6	RS-MP02-Elut.	RS-MP02-Water	E-MP02-Control Elut.
2,2',4,5,5'-PentaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',4,5'-TetraCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',5,5'-TetraCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,2',5-TriCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,3,3',4,4'-PentaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,3,4,4',5-PentaCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,3,4,4'-TetraCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,4,4'-TriCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
2,4'-DiCB	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
Aroclor-1016	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U
Aroclor-1260	0.49 U	0.49 U	0.49 U	0.50 U	0.52 U	0.50 U	0.51 U	0.50 U	0.50 U	0.50 U

*All data reported in μg/L.

U = Result below detection limit.

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 16
Results of Polynuclear Aromatic Hydrocarbon Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-1	E-MP02-2	E-MP02-3	E-MP02-3Dup	E-MP02-4	E-MP02-5	E-MP02-6	RS-MP02-Elut.	RS-MP02-Water	E-MP02-Control Elut.
1-Methylnaphthalene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
2-Methylnaphthalene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Acenaphthene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Acenaphthylene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Anthracene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Benzo(a)anthracene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Benzo(a)pyrene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Benzo(b)fluoranthene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Benzo(g,h,i)perylene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Benzo(k)fluoranthene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Chrysene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Dibenz(a,h)anthracene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Fluoranthene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Fluorene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Indeno(1,2,3-cd)pyrene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Naphthalene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Phenanthrene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U
Pyrene	4.9 U	4.9 U	4.9 U	5.0 U	5.1 U	5.0 U	4.9 U	5.0 U	5.1 U	5.0 U

All data reported in μg/L.

U = Results below detection limit.

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

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TABLE 17
Results of Organic Tin Analyses for Reference Water and Elutriates Prepared from Sediments Collected at Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Sample Number	Monobutyl Tin	Dibutyl Tin	Tributyl Tin
E-MP02-1	0.14	0.050	0.13
E-MP02-2	0.12	0.049U	0.15
E-MP02-3	0.049U	0.054	0.061
E-MP02-3 DUP	0.059	0.065	0.050U
E-MP02-4	0.22	0.26	0.098
E-MP02-5	0.23	0.29	0.16
E-MP02-6	0.18	0.063	0.11
RS-MP02 Elutriate	0.094	0.099	0.099
E-MP02-Control Elutriate	0.050U	0.050U	0.074
RS-MP02 Water	0.066	0.050U	0.050U

*All data reported in μg/L.

U = Result below detection limit.

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 18
Results of Metals Analyses for Tissues (*Nereis virens*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station ID	Replicate	Percent Solids	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Tin	Zinc	Mercury
E-MP02-1	A	13.3	17	0.32	0.44	7.4	0.88	0.26	2.9	160	0.039
E-MP02-1	B	12.0	18	0.32	0.82	7.1	1.8	0.60U	6.0U	410	0.095
E-MP02-1	C	12.9	16	0.38	1.0	7.0	1.9	0.36	3.4U	170	0.042
E-MP02-1	D	12.7	16	0.36	0.59	8.6	1.2	0.30	3.4	120	0.018
E-MP02-1	E	12.9	15	0.37	0.93	10	1.6	0.78U	7.8U	84	0.058
E-MP02-2	A	12.3	13	0.35	1.5	8.8	2.4	1.7	5.2U	240	0.017
E-MP02-2	B	13.5	17	0.37U	0.94U	8.2	1.6	1.0U	10U	81	0.054
E-MP02-2	C	13.8	13	0.36	0.73	7.8	2.2	0.42U	4.4	250	0.18
E-MP02-2	D	13.0	15	0.41	0.72	9.3	3.1	0.53U	5.3U	82	0.14
E-MP02-2	E	10.8	15	0.64	1.2	11	2.7	0.42U	4.2U	370	0.089
E-MP02-3	A	13.1	16	0.33	0.69	8.4	1.7	0.47U	4.7U	280	0.11
E-MP02-3	B	13.1	14	0.61	0.86	10	1.9	0.44U	4.4U	340	0.073
E-MP02-3	C^	-	-	-	-	-	-	-	-	-	-
E-MP02-3	D	13.2	12	0.23	0.65	9.5	1.1	0.44U	4.4U	65	0.078
E-MP02-3	E	12.2	16	0.51	0.64	9.2	1.2	0.81	3.1U	270	0.067
E-MP02-4	A	14.1	6.6	0.18	0.27	3.6	0.74	0.54	2.1U	36	0.030
E-MP02-4	B	13.8	14	0.37	0.46	7.4	1.7	0.42	3.5	200	0.095
E-MP02-4	C	12.2	15	0.39	0.36U	6.5	1.6	0.40U	4.0U	210	0.082
E-MP02-4	D	12.0	17	0.39	0.71	9.0	1.6	0.50	3.2	260	0.043
E-MP02-4	E	12.7	17	0.39	0.37	6.7	0.93	0.39	3.9U	210	0.047
E-MP02-6	A	12.7	14	0.28	0.42	7.3	3.1	0.44U	4.4	170	0.073
E-MP02-6	B	13.2	13	0.26	0.48	5.6	2.3	0.46	3.4U	56	0.044
E-MP02-6	C	12.0	18	0.42	0.68	10	2.5	0.72	4.6U	270	0.060
E-MP02-6	D	13.6	15	0.45	1.2	7.8	1.7	0.56	3.6	220	0.047

E-MP02-6	E	13.2	14	0.36	0.74	7.1	1.4	0.86	2.9U	120	0.022
E-MP02-3 DUPE	A	12.2	16	0.30	0.53	7.9	1.6	0.44	4.8	210	0.044
E-MP02-3 DUPE	B	12.5	14	0.33	0.64	8.7	2.0	0.54	4.1U	190	0.047
E-MP02-3 DUPE	C	13.0	17	0.60	0.48	8.6	2.1	0.39U	4.6	230	0.024
E-MP02-3 DUPE	D	12.0	14	0.40	0.54	9.2	2.5	0.32U	5.0	230	0.033
E-MP02-3 DUPE	E	12.0	16	0.32	0.94	9.0	2.6	0.75	5.5	180	0.027
E-MP02-CONTROL	A	13.4	17	0.43	0.46	12	1.1	0.30	2.5	100	0.012U
E-MP02-CONTROL	B	12.7	17	0.43	0.71	9.2	1.5	0.59	3.4	230	0.022U
E-MP02-CONTROL	C	12.6	20	0.33	0.59	7.3	0.84	30	2.8U	240	0.014U
E-MP02-CONTROL	D	11.9	16	0.33	0.64	8.2	1.3	0.81	3.5	210	0.018U
E-MP02-CONTROL	E	12.9	16	0.40	0.52	6.6	0.80	0.47	3.5	290	0.013U
RS-MP02	A	15.8	15	0.37	0.61	8.9	1.8	0.44	3.9	250	0.015U
RS-MP02	B	13.1	20	0.33	0.74	9.2	1.6	0.44	3.3	260	0.012U
RS-MP02	C	13.3	17	0.42	0.52	9.6	1.7	0.50	4.7	140	0.015U
RS-MP02	D	12.7	19	0.34	0.62	8.4	1.4	0.46	5.3	220	0.016U
RS-MP02	E	13.1	21	0.28	0.66	9.0	3.0	0.49U	8.0	75	0.040
PRETEST TISSUE	N/A	16.4	20	0.36	1.2	15	3.2	1.3	3.2	250	0.015U

*All data reported in mg/Kg-Dry weight

^Replicate not analyzed, insufficient tissue

U=Result below detection limit

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 19
Results of Metals Analyses for Tissues (*Macoma nasuta*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station ID	Replicate	Percent Solids	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Tin	Zinc	Mercury
E-MP02-1	A	6.97	23	0.32	7.7	33	5.5	6.0	5.9	190	0.12
E-MP02-1	B	8.94	29	0.33U	12	34	9.6	6.6	12	190	0.13
E-MP02-1	C	8.46	22	0.20U	4.9	23	4.6	4.5	7.0	150	0.084
E-MP02-1	D	7.16	25	0.47	2.9	25	3.9	3.7	12	380	0.14
E-MP02-1	E	6.67	24	0.29U	14	43	8.1	6.1	9.5	280	0.13
E-MP02-2	A	13.7	10	0.13U	2.6	12	2.1	2.6	4.4	110	0.054
E-MP02-2	B	10.4	18	0.44	3.6	13	2.7	4.4	4.4	140	0.090
E-MP02-2	C	6.96	26	0.27	7.1	22	5.3	6.5	5.8	190	0.092
E-MP02-2	D	8.46	26	0.20U	6.0	16	3.5	6.2	5.3	210	0.077
E-MP02-2	E	9.09	19	0.25	2.4	12	2.2	3.6	4.0	350	0.10
E-MP02-3	A	9.68	14	0.13U	1.5	8.5	1.5	2.0	4.3	100	0.10
E-MP02-3	B	9.46	17	0.13U	2.1	20	2.2	2.7	4.9	110	0.035
E-MP02-3	C	10.1	13	0.21U	1.3	11	1.6	2.1	7.8	150	0.073
E-MP02-3	D	10.1	19	0.18U	3.9	17	2.7	3.7	1.8U	120	0.053
E-MP02-3	E	11.9	17	0.28U	7.3	39	6.3	5.5	2.8U	210	0.089
E-MP02-4	A	8.13	18	0.17U	5.3	28	4.3	4.0	1.6U	170	0.28
E-MP02-4	B	5.71	31	0.61	12	41	10	8.9	3.6	450	0.22
E-MP02-4	C	8.44	15	0.14U	3.0	16	2.6	2.9	2.7	180	0.15
E-MP02-4	D	14.1	10	0.19U	0.62	21	0.93	1.9	2.0	77	0.14
E-MP02-4	E	9.29	26	0.34	6.6	28	4.4	5.6	2.2	170	0.10
E-MP02-6	A	15.0	12	0.30	1.3	12	1.3	3.8	1.8U	97	0.10
E-MP02-6	B	13.6	20	0.18	3.4	15	2.3	3.9	1.4	120	0.10
E-MP02-6	C	7.80	25	0.28U	4.1	37	2.9	5.2	2.8U	160	0.14
E-MP02-6	D	8.01	26	0.28U	6.6	22	4.5	5.0	2.8U	210	0.20

E-MP02-6	E	8.39	21	0.27	1.8	38	2.9	3.1	1.9	360	0.17
E-MP02-3 DUPE	A	9.33	16	0.46	2.9	17	3.4	3.7	4.0U	180	0.13U
E-MP02-3 DUPE	B	10.7	22	0.41	4.6	38	5.4	8.3	3.1U	120	0.14
E-MP02-3 DUPE	C	4.87	31	0.41	11	65	11	8.5	4.1U	340	0.41
E-MP02-3 DUPE	D	9.28	17	0.33U	3.5	20	3.1	4.2	4.9	200	0.15
E-MP02-3 DUPE	E	9.54	21	0.22U	6.6	34	5.4	5.4	3.2	270	0.12
E-MP02-CONTROL	A	13.7	16	0.12U	6.7	22	4.8	9.0	3.9	170	0.096
E-MP02-CONTROL	B	10.5	21	0.25	5.6	46	5.1	6.7	3.9	180	0.13
E-MP02-CONTROL	C	11.8	17	0.21	4.0	14	2.4	6.4	2.1U	110	0.078
E-MP02-CONTROL	D	10.4	20	0.38	1.2	11	1.4	3.5	4.8	140	0.14
E-MP02-CONTROL	E	11.4	14	0.16	3.7	29	4.0	3.4	4.1	150	0.13
RS-MP02	A	19.3	10	0.094	4.8	18	3.0	2.9	2.0	70	0.052
RS-MP02	B	17.2	11	0.088U	3.4	12	2.2	2.0	3.4	180	0.14
RS-MP02	C	10.7	18	0.16U	7.4	25	4.4	4.2	5.4	160	0.18
RS-MP02	D	11.6	18	0.12U	7.6	22	3.7	4.3	3.5U	130	0.15
RS-MP02	E	9.28	20	0.20	5.2	21	3.4	4.0	5.2U	220	0.44
PRETEST TISSUE	N/A	14.6	13	0.24	0.97	23	1.5	2.8	2.2U	100	0.21

*All data reported in mg/kg-Dry weight

U=Result below detection limit

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 20
Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses for Tissues (*Nereis virens*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-1					E-MP02-2				
Compound	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**
Acenaphthene	100U	100U	110U	96U	110U	94U	110U	98U	93U	110U
Acenaphthylene	110U	110U	120U	100U	120U	100U	120U	110U	100U	120U
Anthracene	78U	77U	83U	74U	85U	72U	83U	75U	72U	83U
Benzo(a)anthracene	90U	89U	96U	86U	99U	84U	97U	87U	83U	96U
Benzo(a)pyrene	83U	81U	88U	78U	90U	77U	88U	80U	76U	88U
Benzo(b)fluoranthene	78U	77U	83U	74U	85U	72U	83U	75U	72U	83U
Benzo(g,h,i)perylene	150U	150U	160U	140U	170U	140U	160U	150U	140U	160U
Benzo(k)fluoranthene	130U	130U	140U	120U	140U	120U	140U	120U	120U	140U
Chrysene	48U	47U	51U	46U	53U	45U	52U	47U	44U	51U
Dibenz(a,h)anthracene	170U	170U	180U	160U	190U	160U	180U	170U	160U	180U
Fluoranthene	69U	67U	73U	65U	75U	64U	73U	66U	63U	73U
Fluorene	70U	69U	75U	66U	76U	65U	75U	68U	65U	75U
Indeno(1,2,3-cd)pyrene	140U	140U	150U	130U	150U	130U	150U	140U	130U	150U
Naphthalene	110U	110U	110U	100U	120U	100U	120U	100U	99U	110U
Phenanthrene	47U	46U	50U	44U	51U	43U	50U	45U	43U	50U
Pyrene	30U	29U	31U	28U	32U	27U	32U	29U	27U	32U

*All data reported in μg/kg.

U = Result below detection limit.

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 20
Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses for Tissues (*Nereis virens*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-3					E-MP02-3 DUPLICATE				
Compound	**Replicate A**	**Replicate B**	**Replicate C^**	**Replicate D**	**Replicate E**	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**
Acenaphthene	110U	110U	-	110U	100U	110U	97U	89U	110U	100U
Acenaphthylene	110U	120U	-	120U	110U	120U	100U	95U	120U	110U
Anthracene	82U	83U	-	86U	80U	86U	74U	68U	86U	78U
Benzo(a)anthracene	95U	97U	-	99U	92U	100U	86U	79U	100U	90U
Benzo(a)pyrene	86U	88U	-	91U	85U	92U	79U	72U	92U	83U
Benzo(b)fluoranthene	82U	83U	-	86U	80U	86U	74U	68U	86U	78U
Benzo(g,h,i)perylene	160U	160U	-	170U	160U	170U	150U	130U	170U	150U
Benzo(k)fluoranthene	130U	140U	-	140U	130U	140U	120U	110U	140U	130U
Chrysene	51U	52U	-	53U	49U	54U	46U	42U	54U	48U
Dibenz(a,h)anthracene	180U	180U	-	190U	180U	190U	160U	150U	190U	170U
Fluoranthene	72U	73U	-	75U	70U	76U	65U	60U	76U	69U
Fluorene	73U	75U	-	77U	72U	78U	67U	61U	78U	70U
Indeno(1,2,3-cd)pyrene	150U	150U	-	150U	140U	160U	130U	120U	160U	140U
Naphthalene	110U	120U	-	120U	110U	120U	100U	94U	120U	110U
Phenanthrene	49U	50U	-	51U	48U	52U	45U	41U	52U	47U
Pyrene	31U	32U	-	33U	30U	33U	28U	26U	33U	30U

*All data reported in μg/kg.

^ Insufficient tissue for analysis.

U = Result below detection limit.

Data provided by: Harbor Branch Environmental Laboratory.

TABLE 20
Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses for Tissues (*Nereis virens*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-4					E-MP02-6				
Compound	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**
Acenaphthene	83U	88U	100U	100U	97U	92U	110U	110U	94U	94U
Acenaphthylene	89U	94U	110U	110U	100U	99U	120U	120U	100U	100U
Anthracene	64U	67U	81U	79U	75U	71U	87U	86U	72U	72U
Benzo(a)anthracene	74U	78U	94U	92U	86U	82U	100U	100U	84U	84U
Benzo(a)pyrene	68U	71U	86U	84U	79U	75U	93U	91U	77U	77U
Benzo(b)fluoranthene	64U	67U	81U	79U	75U	71U	87U	86U	72U	72U
Benzo(g,h,i)perylene	130U	130U	160U	160U	150U	140U	170U	170U	140U	140U
Benzo(k)fluoranthene	100U	110U	130U	130U	120U	120U	140U	140U	120U	120U
Chrysene	40U	42U	50U	49U	46U	44U	54U	53U	45U	45U
Dibenz(a,h)anthracene	140U	150U	180U	170U	160U	160U	190U	190U	160U	160U
Fluoranthene	56U	59U	71U	70U	66U	62U	77U	76U	64U	64U
Fluorene	57U	61U	73U	71U	67U	64U	79U	77U	65U	65U
Indeno(1,2,3-cd)pyrene	110U	120U	150U	140U	130U	130U	160U	150U	130U	130U
Naphthalene	88U	93U	110U	110U	100U	98U	120U	120U	100U	100U
Phenanthrene	38U	40U	48U	48U	45U	42U	52U	52U	43U	43U
Pyrene	24U	26U	31U	30U	28U	27U	33U	33U	27U	27U

*All data reported in μg/kg.

U = Result below detection limit.

Data provided by: Harbor Branch Environmental Laboratory.

TABLE 20
Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses for Tissues (*Nereis virens*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-CONTROL					RS-MP02					PRETEST TISSUE
Compound	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	
Acenaphthene	90U	100U	110U	110U	96U	76U	89U	89U	93U	92U	73U
Acenaphthylene	97U	110U	110U	120U	100U	81U	95U	96U	100U	99U	78U
Anthracene	69U	77U	81U	83U	74U	58U	68U	69U	72U	71U	56U
Benzo(a)anthracene	80U	89U	94U	96U	85U	67U	79U	80U	83U	82U	65U
Benzo(a)pyrene	74U	81U	86U	88U	78U	62U	72U	73U	76U	75U	59U
Benzo(b)fluoranthene	69U	77U	81U	83U	74U	58U	68U	69U	72U	71U	56U
Benzo(g,h,i)perylene	140U	150U	160U	160U	140U	110U	130U	130U	140U	140U	110U
Benzo(k)fluoranthene	110U	130U	130U	140U	120U	95U	110U	110U	120U	120U	92U
Chrysene	43U	47U	50U	51U	46U	36U	42U	43U	44U	44U	35U
Dibenz(a,h)anthracene	150U	170U	180U	180U	160U	130U	150U	150U	160U	160U	120U
Fluoranthene	61U	67U	72U	73U	65U	51U	60U	60U	63U	62U	49U
Fluorene	62U	69U	73U	75U	66U	52U	61U	62U	64U	64U	50U
Indeno(1,2,3-cd)pyrene	120U	140U	150U	150U	130U	100U	120U	120U	130U	130U	100U
Naphthalene	96U	110U	110U	110U	100U	80U	94U	95U	99U	98U	77U
Phenanthrene	42U	46U	49U	50U	44U	35U	41U	41U	43U	43U	34U
Pyrene	26U	29U	31U	32U	28U	22U	26U	26U	27U	27U	21U

*All data reported in μg/kg.

U = Result below detection limit.

Data provided by: Harbor Branch Environmental Laboratory.

TABLE 21
Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses for Tissues (*Macoma nasuta*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-1					E-MP02-2				
Compound	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**
Acenaphthene	320U	240U	250U	300U	320U	160U	210U	310U	490U	230U
Acenaphthylene	350U	260U	270U	320U	340U	180U	230U	330U	530U	240U
Anthracene	250U	180U	200U	230U	250U	130U	160U	240U	380U	170U
Benzo(a)anthracene	290U	210U	230U	260U	280U	150U	190U	270U	440U	200U
Benzo(a)pyrene	260U	200U	210U	240U	260U	130U	170U	250U	400U	180U
Benzo(b)fluoranthene	250U	180U	200U	230U	250U	130U	160U	240U	380U	170U
Benzo(g,h,i)perylene	490U	360U	380U	440U	480U	250U	320U	460U	740U	340U
Benzo(k)fluoranthene	410U	300U	320U	370U	400U	210U	270U	390U	620U	290U
Chrysene	150U	110U	120U	140U	150U	78U	100U	150U	230U	110U
Dibenz(a,h)anthracene	550U	410U	430U	500U	540U	280U	360U	520U	830U	380U
Fluoranthene	220U	160U	170U	200U	220U	110U	140U	210U	330U	150U
Fluorene	220U	170U	180U	200U	220U	110U	150U	210U	340U	160U
Indeno(1,2,3-cd)pyrene	450U	330U	350U	410U	440U	230U	300U	430U	680U	310U
Naphthalene	340U	260U	270U	310U	340U	170U	230U	330U	520U	240U
Phenanthrene	150U	110U	120U	140U	150U	76U	99U	140U	230U	100U
Pyrene	94U	70U	74U	86U	93U	48U	63U	90U	140U	66U

*All data reported in μg/kg.

U = Result below detection limit.

Source: Harbor Branch Environmental Laboratory

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 21
Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses for Tissues (*Macoma nasuta*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-3					E-MP02-3 DUPLICATE				
Compound	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**
Acenaphthene	210U	240U	210U	220U	300U	230U	320U	470U	410U	290U
Acenaphthylene	230U	260U	220U	240U	320U	250U	340U	510U	440U	310U
Anthracene	170U	190U	160U	170U	230U	180U	240U	360U	310U	220U
Benzo(a)anthracene	190U	210U	180U	200U	270U	210U	280U	420U	360U	260U
Benzo(a)pyrene	180U	200U	170U	180U	240U	190U	260U	390U	330U	240U
Benzo(b)fluoranthene	170U	190U	160U	170U	230U	180U	240U	360U	310U	220U
Benzo(g,h,i)perylene	320U	360U	310U	330U	450U	350U	480U	710U	610U	440U
Benzo(k)fluoranthene	270U	300U	260U	280U	380U	300U	400U	600U	510U	370U
Chrysene	100U	110U	98U	100U	140U	110U	150U	230U	190U	140U
Dibenz(a,h)anthracene	360U	410U	350U	370U	510U	400U	540U	800U	690U	490U
Fluoranthene	150U	160U	140U	150U	200U	160U	210U	320U	280U	200U
Fluorene	150U	170U	140U	150U	210U	160U	220U	330U	280U	200U
Indeno(1,2,3-cd)pyrene	300U	330U	290U	300U	420U	320U	440U	660U	560U	400U
Naphthalene	230U	260U	220U	230U	320U	250U	340U	500U	430U	310U
Phenanthrene	99U	110U	95U	100U	140U	110U	150U	220U	190U	130U
Pyrene	63U	70U	60U	64U	88U	69U	92U	140U	120U	85U

*All data reported in μg/kg.

U = Result below detection limit.

Data provided by: Harbor Branch Environmental Laboratory.

TABLE 21
Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses for Tissues (*Macoma nasuta*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-4					E-MP02-6				
Compound	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**
Acenaphthene	260U	370U	260U	200U	220U	140U	150U	280U	250U	270U
Acenaphthylene	280U	400U	280U	210U	240U	150U	170U	300U	270U	300U
Anthracene	200U	280U	200U	150U	170U	110U	120U	220U	200U	210U
Benzo(a)anthracene	230U	330U	230U	180U	200U	130U	140U	250U	230U	240U
Benzo(a)pyrene	210U	300U	210U	160U	180U	120U	130U	230U	210U	220U
Benzo(b)fluoranthene	200U	280U	200U	150U	170U	110U	120U	220U	200U	210U
Benzo(g,h,i)perylene	390U	560U	390U	300U	340U	220U	230U	420U	380U	410U
Benzo(k)fluoranthene	330U	470U	320U	250U	280U	180U	190U	350U	320U	350U
Chrysene	120U	180U	120U	94U	110U	68U	74U	130U	120U	130U
Dibenz(a,h)anthracene	440U	630U	430U	330U	380U	240U	260U	470U	430U	460U
Fluoranthene	180U	250U	170U	130U	150U	97U	100U	190U	170U	190U
Fluorene	180U	260U	180U	140U	150U	99U	110U	190U	180U	190U
Indeno(1,2,3-cd)pyrene	360U	510U	350U	270U	310U	200U	210U	390U	350U	380U
Naphthalene	270U	390U	270U	210U	240U	150U	160U	300U	270U	290U
Phenanthrene	120U	170U	120U	91U	100U	66U	71U	130U	120U	130U
Pyrene	76U	110U	75U	58U	65U	42U	45U	82U	74U	80U

*All data reported in μg/kg.

U = Result below detection limit.

Data provided by: Harbor Branch Environmental Laboratory.

TABLE 21
Results of Polynuclear Aromatic Hydrocarbon (PAH) Analyses for Tissues (*Macoma nasuta*) from 28-day Bioaccumulation Testing. Mayport Naval Station, Jacksonville, Florida, April 22-26, 2002*

Station I.D.	E-MP02-CONTROL					RS-MP02					PRETEST TISSUE
Compound	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate D**	**Replicate E**	
Acenaphthene	150U	200U	180U	200U	190U	120U	130U	210U	180U	230U	140U
Acenaphthylene	160U	220U	190U	220U	200U	130U	140U	230U	200U	250U	150U
Anthracene	120U	160U	140U	150U	150U	91U	98U	160U	140U	180U	110U
Benzo(a)anthracene	130U	180U	160U	180U	170U	110U	110U	190U	160U	200U	120U
Benzo(a)pyrene	120U	160U	140U	160U	160U	97U	100U	170U	150U	190U	110U
Benzo(b)fluoranthene	120U	160U	140U	150U	150U	91U	98U	160U	140U	180U	110U
Benzo(g,h,i)perylene	230U	310U	270U	300U	290U	180U	190U	320U	280U	340U	210U
Benzo(k)fluoranthene	190U	260U	220U	250U	240U	150U	160U	260U	230U	290U	180U
Chrysene	72U	96U	84U	96U	91U	57U	61U	100U	87U	110U	66U
Dibenz(a,h)anthracene	250U	340U	300U	340U	320U	200U	220U	350U	310U	390U	240U
Fluoranthene	100U	140U	120U	140U	130U	80U	86U	140U	120U	150U	94U
Fluorene	100U	140U	120U	140U	130U	82U	88U	150U	130U	160U	96U
Indeno(1,2,3-cd)pyrene	210U	280U	240U	280U	260U	160U	180U	290U	250U	320U	190U
Naphthalene	160U	210U	190U	210U	200U	130U	140U	220U	190U	240U	150U
Phenanthrene	69U	93U	81U	92U	88U	55U	59U	97U	85U	110U	64U
Pyrene	44U	59U	52U	59U	56U	35U	37U	61U	53U	67U	41U

*All data reported in μg/kg.

U = Result below detection limit.

Data provided by: Harbor Branch Environmental Laboratory.

TABLE 22
96-Hour *Mysidopsis bahia* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Harbor, May 2002

Sample	Replicate	Number of Survivors[a]
CONTROL	A	10
	B	10
	C	8
	D	10
	E	9
	Total	47
	Percent	94 percent

Sample	Replicate	Elutriate Concentration		
		10 percent	50 percent	100 percent
CONTROL SEDIMENT	A	9	10	10
	B	9	9	9
	C	9	10	9
	D	10	10	9
	E	10	9	8
	Total	47	48	45
	Percent	94 percent	96 percent	90 percent
E-MP02-01	A	10	10	10
	B	10	9	9
	C	8	9	9
	D	10	9	8
	E	9	9	9
	Total	47	46	45
	Percent	94 percent	92 percent	90 percent
E-MP02-02	A	10	9	7
	B	10	10	10
	C	10	10	9
	D	9	9	9
	E	9	9	9
	Total	48	47	44
	Percent	92 percent	92 percent	80 percent

TABLE 22
96-Hour *Mysidopsis bahia* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Harbor, May 2002

Sample	Replicate	Elutriate Concentration		
		10 percent	50 percent	100 percent
E-MP02-03	A	9	9	8
	B	10	9	8
	C	9	8	8
	D	9	8	9
	E	9	9	9
	Total	46	43	42
	Percent	92 percent	86 percent	84 percent
E-MP02-04	A	9	9	10
	B	9	8	9
	C	10	8	8
	D	9	9	9
	E	9	10	9
	Total	46	44	45
	Percent	92 percent	88 percent	90 percent
E-MP02-05	A	8	8	10
	B	8	8	8
	C	9	8	7
	D	9	7	10
	E	10	8	8
	Total	44	39	43
	Percent	88 percent	78 percent	86 percent
E-MP02-06	A	9	10	8
	B	10	9	8
	C	9	9	8
	D	9	9	8
	E	9	9	8
	Total	46	46	40
	Percent	92 percent	92 percent	80 percent

TABLE 22
96-Hour *Mysidopsis bahia* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Harbor, May 2002

Sample	Replicate	Elutriate Concentration		
		10 percent	50 percent	100 percent
E-MP02-03DUP	A	9	8	8
	B	9	10	9
	C	9	9	9
	D	9	8	8
	E	8	7	8
	Total	44	42	42
	Percent	88 percent	84 percent	84 percent

[a] - Based upon 50 organisms exposed.

Source: Harding ESE
Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 23
Summary of Steel's Many-One Rank Test of Control Water (0 percent Elutriate) or Control Sediment (100 percent Elutriate) and Test Sediment (100 percent Elutriate) *Mysidopsis bahia* Survival for Mayport, May 2002

Mysidopsis bahia Control Water (0 percent Elutriate) vs. Other Sample

Sample ID	a = 0.05	Mean Natural Log Transform	Rank Sum	Critical Value
Control Water (O percent Elutriate)	=	2.24	--	--
E-MP02-01 (100 percent)	=	2.19	23.5	16.0
E-MP02-02 (100 percent)	=	2.17	23.0	16.0
E-MP02-03 (100 percent)	=	2.13	19.5	16.0
E-MP02-04 (100 percent)	=	2.19	23.5	16.0
E-MP02-05 (100 percent)	=	2.14	23.0	16.0
E-MP02-06 (100 percent)	=	2.08	18.0	16.0
E-MP02-03DUP (100 percent)	=	2.13	19.5	16.0
Control Sediment (100 percent)	=	2.19	23.5	16.0

= Indicates no significant difference between the sample station and the control water
* Indicates a significant difference exists between the sample station and the control water
+ Critical values are 1 tailed (k = 8)
Degree of Freedom = 5

Mysidopsis bahia Control Sediment (100 percent Elutriate) vs. Other Sample

Sample ID	a = 0.05	Mean Natural Log Transform	Rank Sum	Critical Value
Control Sediment (100 percent)	=	2.19	--	--
E-MP02-01 (100 percent)	=	2.19	27.5	16.0
E-MP02-02 (100 percent)	=	2.17	27.0	16.0
E-MP02-03 (100 percent)	=	2.13	21.5	16.0
E-MP02-04 (100 percent)	=	2.19	27.5	16.0
E-MP02-05 (100 percent)	=	2.14	25.0	16.0
E-MP02-06 (100 percent)	=	2.08	18.0	16.0
E-MP02-03DUP (100 percent)	=	2.13	21.5	16.0

= Indicates no significant difference between the sample station and the control water
* Indicates a significant difference exists between the sample station and the control water
+ Critical values are 1 tailed (k = 8)
Degree of Freedom = 5

Source: Harding ESE, Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 24
96-Hour *Menidia beryllina* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Harbor, May 2002

Sample	Replicate	Number of Survivors[a]
CONTROL	A	10
	B	9
	C	10
	D	10
	E	10
	Total	49
	Percent	98 percent

Sample	Replicate	Elutriate Concentration		
		10 percent	50 percent	100 percent
CONTROL SEDIMENT	A	10	10	10
	B	10	10	10
	C	10	10	10
	D	8	10	10
	E	10	10	9
	Total	48	50	49
	Percent	96 percent	100 percent	98 percent
E-MP02-01	A	10	10	10
	B	10	10	10
	C	10	10	9
	D	9	10	10
	E	10	10	10
	Total	49	50	49
	Percent	98 percent	100 percent	98 percent
E-MP02-02	A	10	9	10
	B	9	10	10
	C	9	10	10
	D	10	10	9
	E	10	10	10
	Total	48	49	49
	Percent	96 percent	98 percent	98 percent

TABLE 24
96-Hour *Menidia beryllina* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Harbor, May 2002

Sample	Replicate	Elutriate Concentration		
		10 percent	50 percent	100 percent
E-MP02-03	A	10	10	10
	B	9	9	10
	C	10	10	10
	D	10	10	10
	E	10	9	10
	Total	49	48	50
	Percent	98 percent	96 percent	100 percent
E-MP02-04	A	10	10	10
	B	10	10	8
	C	9	10	9
	D	10	10	8
	E	10	10	9
	Total	49	50	44
	Percent	98 percent	100 percent	88 percent
E-MP02-05	A	10	10	9
	B	10	9	9
	C	10	10	8
	D	8	9	10
	E	9	9	9
	Total	47	47	45
	Percent	94 percent	94 percent	90 percent
E-MP02-06	A	10	10	10
	B	10	10	9
	C	10	10	9
	D	10	10	9
	E	10	10	9
	Total	50	50	46
	Percent	100 percent	100 percent	92 percent

TABLE 24
96-Hour *Menidia beryllina* Survival in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport Harbor, May 2002

Sample	Replicate	Elutriate Concentration		
E-MP02-03DUP	A	10	10	10
	B	10	10	10
	C	10	10	10
	D	10	10	10
	E	10	10	10
	Total	50	50	50
	Percent	100 percent	100 percent	100 percent

[a] - Based upon 50 organisms exposed.

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 25
Summary of Steel's Many-One Rank 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, May 2002

Menidia beryllina Control Water (0 percent Elutriate) vs. Other Sample

Sample ID	a = 0.05	Mean in Original Units	Rank Sum	Critical Value
Control Water (O percent Elutriate)	=	9.8		
E-MP02-01 (100 percent)	=	9.8	27.5	16.0
E-MP02-02 (100 percent)	=	9.8	27.5	16.0
E-MP02-03 (100 percent)	=	10.0	32.0	16.0
E-MP02-04 (100 percent)	=	8.8	19.0	16.0
E-MP02-05 (100 percent)	=	9.0	19.5	16.0
E-MP02-06 (100 percent)	=	9.2	20.0	16.0
E-MP02-03DUP (100 percent)	=	10.0	32.0	16.0
Control Sediment (100 percent)	=	9.8	27.5	16.0

= Indicates no significant difference between the sample station and the control water
* Indicates a significant difference exists between the sample station and the control water
+ Critical values are 1 tailed (k = 8)
Degree of Freedom = 5

Sample ID	a = 0.05	Mean transformed	Rank Sum	Critical Value
Control Water (O percent Elutriate)	=	0.311		
E-MP02-01 (100 percent)	=	0.311	27.5	16.0
E-MP02-02 (100 percent)	=	0.311	27.5	16.0
E-MP02-03 (100 percent)	=	0.309	23.0	16.0
E-MP02-04 (100 percent)	=	0.329	36.0	16.0
E-MP02-05 (100 percent)	=	0.325	35.5	16.0
E-MP02-06 (100 percent)	=	0.321	35.0	16.0
E-MP02-03DUP (100 percent)	=	0.309	23.0	16.0

= Indicates no significant difference between the sample station and the control water
* Indicates a significant difference exists between the sample station and the control water
+ Critical values are 1 tailed (k = 8)
Degree of Freedom = 5

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 26
Sea Urchin, *L. variegatus*, Fertilization Test Counts and Percentages in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport, May 2002

Sample	Replicate[a]	Number Fertilized
CONTROL[b]	A	65
	B	59
	C	69
	Total	193
	Percent	64 percent

Sample	Replicate[a]	Concentrations[c]		
		10 percent	50 percent	100 percent
CONTROL SEDIMENT	A	75	68	65
	B	62	58	71
	C	70	63	66
	Total	207	189	202
	Percent	69 percent	63 percent	67 percent
E-MP02-01	A	69	57	70
	B	78	70	61
	C	64	71	58
	Total	211	198	189
	Percent	70 percent	66 percent	63 percent
E-MP02-02	A	66	54	63
	B	56	62	60
	C	65	61	67
	Total	187	177	190
	Percent	62 percent	59 percent	63 percent
E-MP02-03	A	72	68	56
	B	68	76	67
	C	75	61	64
	Total	215	205	187
	Percent	72 percent	68 percent	62 percent

TABLE 26
Sea Urchin, *L. variegatus*, Fertilization Test Counts and Percentages in Three Elutriate Concentrations Prepared from Sediments Collected from Mayport, May 2002

Sample	Replicate[a]	Concentrations[c]		
		10 percent	**50 percent**	**100 percent**
E-MP02-04	A	60	73	59
	B	69	61	65
	C	71	63	62
	Total	200	197	186
	Percent	67 percent	66 percent	62 percent
E-MP02-05	A	70	68	62
	B	61	71	58
	C	76	59	67
	Total	207	198	187
	Percent	69 percent	66 percent	62 percent
E-MP02-06	A	56	61	63
	B	65	59	55
	C	66	68	64
	Total	187	188	182
	Percent	62 percent	63 percent	61 percent
E-MP02-03DUP	A	71	64	57
	B	58	55	67
	C	62	65	60
	Total	191	184	184
	Percent	64 percent	61 percent	61 percent

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

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 27
Summary of ANOVA and Dunnett's Test of Seawater Control (0 percent Elutriate) or Control Sediment (100 percent Elutriate) and Test Sediment (100 percent Elutriate) *L. variegatus* Fertilization for Mayport Harbor, May 2002

L. variegatus Control Seawater vs. Other Samples

ANOVA for Differences Between Means

Source of Variation	df	Sum of Squares	Mean Square	F
Between Means	8	92.30	11.54	0.521
Within Means	18	398.67	22.15	
Total	26	490.96		

Critical F = 2.51 (a = 0.05, df = 8, 18)
Since F < Critical F fail to reject H_o: all groups equal;
with a = 0.05, and 8, 18, df.

Dunnett's Test

Critical T = 2.58

Sample ID	a = 0.05	difference between means	T Stat
Seawater Control (0 percent Elutriate)	-	-	-
E-MP02-01 (100 percent)	=	1.3	0.35
E-MP02-02 (100 percent)	=	1.0	0.26
E-MP02-03 (100 percent)	=	2.0	0.52
E-MP02-04 (100 percent)	=	2.3	0.61
E-MP02-05 (100 percent)	=	2.0	0.52
E-MP02-06 (100 percent)	=	3.7	0.95
E-MP02-03DUP (100 percent)	=	3.0	0.78
Control Sediment (100 percent)	=	-3.0	-0.78

= Indicates no significant difference between the sample station and the control water

TABLE 27
Summary of ANOVA and Dunnett's Test of Seawater Control (0 percent Elutriate) or Control Sediment (100 percent Elutriate) and Test Sediment (100 percent Elutriate) *L. variegatus* Fertilization for Mayport Harbor, May 2002

L. variegatus Control Sediment vs. Other Samples

ANOVA for Differences Between Means

Source of Variation	df	Sum of Squares	Mean Square	F
Between Means	7	85.96	12.28	0.565
Within Means	16	348.00	21.75	
Total	23	433.96		

Critical F = 2.66 (a = 0.05, df = 7, 16)
Since F < Critical F fail to reject H_o: all groups equal;
with a = 0.05, and 7, 16, df.

Dunnett's Test

Critical T = 2.56

Sample ID	a = 0.05	difference between means	T Stat
Sediment Control (0 percent Elutriate)	-	-	-
E-MP02-01 (100 percent)	=	4.3	1.14
E-MP02-02 (100 percent)	=	4.0	1.05
E-MP02-03 (100 percent)	=	5.0	1.31
E-MP02-04 (100 percent)	=	5.3	1.40
E-MP02-05 (100 percent)	=	5.0	1.31
E-MP02-06 (100 percent)	=	6.7	1.75
E-MP02-03DUP (100 percent)	=	6.0	1.58

= Indicates no significant difference between the sample station and the control sediment

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 28
LC_{50} (*Mysidopsis bahia*, *Menidia beryllina)* and EC_{50} (*Lytechinus variegatus*) Values[a] for Elutriate Bioassays Conducted on Mayport Harbor Sediments, May 2002

Sample ID	*Mysidopsis bahia*	*Menidia beryllina*	*Lytechinus variegatus*
Control Sediment	>100 percent	>100 percent	>100 percent
Station E-MP02-01	>100 percent	>100 percent	>100 percent
Station E-MP02-02	>100 percent	>100 percent	>100 percent
Station E-MP02-03	>100 percent	>100 percent	>100 percent
Station E-MP02-04	>100 percent	>100 percent	>100 percent
Station E-MP02-05	>100 percent	>100 percent	>100 percent
Station E-MP02-06	>100 percent	>100 percent	>100 percent
Station E-MP02-03DUP	>100 percent	>100 percent	>100 percent

[a] LC_{50} and EC_{50} values recorded as greater than 100 percent had greater than 50 percent survivorship.

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 29
10-Day Sediment *Mysidopsis bahia* Survival, Mayport Sediments, May 2002

Sample	Replicate	Number of Survivors[a]
CONTROL SEDIMENT	A	19
	B	20
	C	19
	D	20
	E	19
	Total	97
	Percent	97 percent
E-MP02-01	A	15
	B	17
	C	16
	D	13
	E	17
	Total	78
	Percent	78 percent
E-MP02-02	A	14
	B	15
	C	18
	D	16
	E	18
	Total	81
	Percent	81 percent
E-MP02-03	A	13
	B	17
	C	15
	D	12
	E	15
	Total	72
	Percent	72 percent

TABLE 29
10-Day Sediment *Mysidopsis bahia* Survival, Mayport Sediments, May 2002

Sample	Replicate	Number of Survivors[a]
E-MP02-04	A	11
	B	12
	C	11
	D	14
	E	15
	Total	63
	Percent	63 percent
E-MP02-05	A	0
	B	3
	C	9
	D	5
	E	6
	Total	23
	Percent	23 percent
E-MP02-06	A	9
	B	15
	C	18
	D	17
	E	16
	Total	75
	Percent	75 percent
E-MP02-03DUP	A	12
	B	16
	C	13
	D	19
	E	18
	Total	78
	Percent	78 percent

TABLE 29
10-Day Sediment *Mysidopsis bahia* Survival, Mayport Sediments, May 2002

Sample	Replicate	Number of Survivors[a]
RS-MP02	A	13
	B	14
	C	16
	D	15
	E	17
	Total	75
	Percent	75 percent

[a] - Based upon 100 organisms exposed.

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 30
Summary of ANOVA and Dunnett's Tests of Control Sediment or Reference Sediment and Test Sediment Survival for Mayport Harbor Sediment Bioassays of *Mysidopsis bahia*, May 2002

Mysidopsis bahia Control Sediment vs. Other Samples

ANOVA for Differences Between Means

Source of Variation	df	Sum of Squares	Mean Square	F
Between Means	8	731.24	91.41	19.36
Within Means	36	170.00	4.72	
Total	44	901.24		

Critical F = 2.21 (a = 0.05, df = 8,36)
Since F is > Critical F reject H_o: all groups equal;
with a = 0.05, and 8, 36 df.

Dunnett's Test

Critical T = 2.50 Sample ID	a = 0.05	difference between means	T Stat
Control Sediment	–	–	–
E-MP02-01	=	2.2	1.60
E-MP02-02	=	2.6	1.89
E-MP02-03	=	2.4	1.75
E-MP02-04	*	3.6	2.62
E-MP02-05	*	14.8	10.77
E-MP02-06	=	2.4	1.75
E-MP02-03DUP	=	2.8	2.04
RS-MP02	=	2.4	1.75

= Indicates no significant difference between the sample station and the control sediment
* Indicates a significant difference exists between the sample station and the control sediment

TABLE 30
Summary of ANOVA and Dunnett's Tests of Control Sediment or Reference Sediment and Test Sediment Survival for Mayport Harbor Sediment Bioassays of *Mysidopsis bahia*, May 2002

Mysidopsis bahia Reference Sediment vs. Other Samples

ANOVA for Differences Between Means

Source of Variation	df	Sum of Squares	Mean Square	F
Between Means	7	654.70	93.53	17.73
Within Means	32	168.80	5.28	
Total	39	823.50		

Critical F = 2.31 (a = 0.05, df = 7,32)
Since F is > Critical F reject H_o: all groups equal;
with a = 0.05, and 7, 32 df.

Dunnett's Test

Critical T = 2.43

Sample ID	a = 0.05	difference between means	T Stat
RS-MP02	–	–	–
E-MP02-01	=	-0.20	-0.14
E-MP02-02	=	0.20	0.14
E-MP02-03	=	0.00	0.00
E-MP02-04	=	1.20	0.83
E-MP02-05	*	12.40	8.54
E-MP02-06	=	0.00	0.00
E-MP02-03DUP	=	0.40	0.28

= Indicates no significant difference between the sample station and the reference sediment
* Indicates a significant difference exists between the sample station and the reference sediment

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 31
10- Day Sediment *Leptocheirus plumulosus* Survival, Mayport Harbor Sediments, May 2002

Sample	Replicate	Number of Survivors[a]
CONTROL SEDIMENT	A	19
	B	20
	C	20
	D	18
	E	20
	Total	97
	Percent	97 percent
E-MP02-01	A	19
	B	18
	C	20
	D	17
	E	19
	Total	93
	Percent	93 percent
E-MP02-02	A	16
	B	20
	C	17
	D	17
	E	20
	Total	90
	Percent	90 percent
E-MP02-03	A	19
	B	20
	C	17
	D	20
	E	18
	Total	94
	Percent	94 percent

TABLE 31
10- Day Sediment *Leptocheirus plumulosus* Survival, Mayport Harbor Sediments, May 2002

Sample	Replicate	Number of Survivors[a]
E-MP02-04	A	19
	B	19
	C	18
	D	19
	E	15
	Total	90
	Percent	90 percent
E-MP02-05	A	16
	B	18
	C	18
	D	17
	E	17
	Total	86
	Percent	86 percent
E-MP02-06	A	18
	B	18
	C	18
	D	18
	E	20
	Total	92
	Percent	92 percent
E-MP02-03DUP	A	18
	B	17
	C	18
	D	20
	E	19
	Total	92
	Percent	92 percent

TABLE 31
10- Day Sediment *Leptocheirus plumulosus* Survival, Mayport Harbor Sediments, May 2002

Sample	Replicate	Number of Survivors[a]
RS-MP02	A	17
	B	17
	C	17
	D	18
	E	19
	Total	88
	Percent	88 percent

a - Based upon 100 organisms exposed.

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 32
Summary of Statistical Analyses of Control Sediment or Reference Sediment and Test Sediment Survival for Mayport Sediment Bioassays of *Leptocheirus plumulosus*, May 2002)

Leptocheirus plumulosus Control Sediment vs. Other Samples

ANOVA for Differences Between Means

Source of Variation	df	Sum of Squares	Mean Square	F
Between Means	8	17.20	2.15	1.39
Within Means	36	55.60	1.54	
Total	44	72.80		

Critical F = 2.20 (a = 0.05, df = 8, 36)
Since F is < Critical F fail to reject H_o: all groups equal;
with a = 0.05, and 8, 36 df.

Dunnett's Test

Critical T = 2.5

Sample ID	a = 0.05	difference between means	T Stat
Control Sediment	–	–	–
E-MP02-01	=	0.8	1.02
E-MP02-02	=	1.4	1.78
E-MP02-03	=	0.6	0.76
E-MP02-04	=	1.4	1.78
E-MP02-05	*	2.2	2.80
E-MP02-06	=	1.0	1.27
E-MP02-03 (DUP)	=	1.0	1.27
RS-MP02	=	1.8	2.29

= Indicates no significant difference between the sample station and the control sediment
* Indicates a significant difference exists between the sample station and the control sediment

TABLE 32
Summary of Statistical Analyses of Control Sediment or Reference Sediment and Test Sediment Survival for Mayport Sediment Bioassays of *Leptocheirus plumulosus*, May 2002

Leptocheirus plumulosus Reference Sediment vs. Other Samples

ANOVA for Differences Between Means

Source of Variation	df	Sum of Squares	Mean Square	F
Between Means	7	9.975	1.4250	0.8702
Within Means	32	52.400	1.6375	
Total	39	62.375		

Critical F = 2.31 (a = 0.05, df = 7, 32)
Since F is < Critical F fail to reject H_o: all groups equal;
with a = 0.05, and 7, 32 df.

Dunnett's Test

Critical T = 2.45

Sample ID	a = 0.05	difference between means	T Stat
RS-MP02	–	–	–
E-MP02-01	=	-1.0	-1.24
E-MP02-02	=	-0.4	-0.49
E-MP02-03	=	-1.2	-1.48
E-MP02-04	=	-0.4	-0.49
E-MP02-05	=	0.4	0.49
E-MP02-06	=	-0.8	-0.99
E-MP02-03 (DUP)	=	-0.8	-0.99

= Indicates no significant difference between the sample station and the reference sediment
* Indicates a significant difference exists between the sample station and the reference sediment

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.

TABLE 33
Survivorship of *Macoma nasuta* and *Nereis virens* During 28-Day Bioaccumulation Bioassays with Sediments from ANAMAR, May 2002

Sample ID	Replicate	*Macoma nasuta*[a]	*Nereis virens*[b]
Control Sediment	A	37	20
	B	39	20
	C	35	20
	D	36	18
	E	36	19
	Total	183	97
	Percent	73 percent	97 percent
Station E-MP02-1	A	32	20
	B	37	18
	C	33	19
	D	30	19
	E	32	17
	Total	164	93
	Percent	66 percent	93 percent
Station E-MP02-2	A	33	18
	B	27	19
	C	33	18
	D	24	20
	E	33	18
	Total	150	93
	Percent	60 percent	93 percent
Station E-MP02-3	A	25	17
	B	26	14
	C	28	1
	D	39	15
	E	30	15
	Total	148	62
	Percent	59 percent	62 percent

TABLE 33
Survivorship of *Macoma nasuta* and *Nereis virens* During 28-Day Bioaccumulation Bioassays with Sediments from ANAMAR, May 2002

Sample ID	Replicate	*Macoma nasuta*[a]	*Nereis virens*[b]
Station E-MP02-4	A	30	18
	B	30	20
	C	33	18
	D	33	19
	E	31	18
	Total	157	93
	Percent	63 percent	93 percent
Station E-MP02-5	A	27	17
	B	28	15
	C	24	20
	D	31	20
	E	26	19
	Total	136	91
	Percent	54 percent	91 percent
Station E-MP02-6	A	26	18
	B	41	15
	C	36	17
	D	34	20
	E	33	15
	Total	170	85
	Percent	68 percent	85 percent
Station E-MP02-3 DUP	A	28	18
	B	31	20
	C	31	15
	D	33	17
	E	30	18
	Total	153	88
	Percent	61 percent	88 percent

TABLE 33
Survivorship of *Macoma nasuta* and *Nereis virens* During 28-Day Bioaccumulation Bioassays with Sediments from ANAMAR, May 2002

Sample ID	Replicate	Macoma nasuta[a]	Nereis virens[b]
Station RS- MP02	A	35	18
	B	38	20
	C	37	19
	D	28	19
	E	33	19
	Total	171	95
	Percent	68 percent	95 percent

[a] Two hundred and fifty organisms exposed per sample.
[b] One hundred organisms exposed per sample.

Source: Harding ESE

Compiled by: ANAMAR Environmental Chemistry, Inc.