FINAL REPORT

RESULTS OF CHEMICAL, PHYSICAL AND BIOASSAY TESTING OF SEDIMENTS FROM THE LOWER WALNUT CREEK FLOOD CONTROL CHANNEL

ENGEO
INCORPORATED

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GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS

In Reply
Please Refer to:
3459-W1

April 20, 1994

Mr. Robert D. Agnew
Contra Costa County Flood Control
and Water Conservation District
255 Glacier Drive
Martinez, CA 94553-4897

Subject: Lower Walnut Creek Flood Control Channel
Contra Costa County, California

ADDENDUM TO FINAL REPORT ON CHEMICAL, PHYSICAL AND BIOASSAY TESTING OF SEDIMENTS

Dear Mr. Agnew:

In response to your letter dated March 25, 1994, we have enclosed an expanded Executive Summary for your review. In addition, our responses to your numbered comments are listed below with the corresponding numbers.

1. The discussion of the source of the pollutants is described on Page 32 and 33 of the report. We do not believe a more detailed treatment of this topic is warranted for two reasons: (1) pollutants were not encountered above limits that require special treatment, and (2) our scope did not intend to cover these topics in detail.

2. All of the data contained on Figures 1 through 3 is in reference to Mean Sea Level which is equivalent to the 1929 sea level datum. The elevations presented in Table 1 on Pages 9 and 10 of the report are also relative to Mean Sea Level and not MLLW as indicated. The Water Depth/Elevation column refers to the elevation of the top of the core. The Core Depth column refers to the basal elevation of the core.

3. Definitions of the abbreviations used in the report are defined below:

   LC50 Lethal Concentration (LC) of a substance or material that is required to kill 50% of the test organisms over the timed testing period. Usually defined statistically using a range of test concentrations (100%, 50%, 10%, 1%).

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IC50 Inhibiting Concentration (IC) of a substance or material that is required to generate a negative response (mortality, growth, abnormal development) to 50% of the test organisms over the timed test period.

EC50 Effective Concentration (EC) of a substance or material causing a positive or negative response to 50% of the test organisms over the timed test period. Usually associated with non-lethal endpoints such as growth, development or cell numbers.

LPC Limiting Permissible Concentration (LPC) is the amount of toxic material permitted in a body of water that will not cause a significant toxicity. It is a computer modeled function incorporating disposal site characteristics, disposal volume, grain-size distribution and results of the toxicity testing and includes a 100% safety factor.

TRPH Total recoverable petroleum hydrocarbons. A chemical analysis which determines the concentration of petroleum derived materials in sediments.

STLC Soluble Threshold Lethal Concentration. An analysis designed to determine the potential leachability of contaminants in sediments when placed in upland disposal sites. It is based upon California Administrative Manual Title 22 analysis for hazardous waste disposal.

4. The reference list was revised to reflect the comments and revisions requested by the District. A revised Page 38 is included for insertion to your reports.

5. The raw data in the appendices were not clearly identified as in the draft report. The raw datasheets should be identified as below:

931119-1A	Site 1
931119-1B	Site 1 duplicate
931119-2	Site 2
931119-3	Site 3
931119-4	Site 4
931119-5	Site 5
931119-6	Site 6
931119-7	Site 7
931119-8	Site 8
931119-9	Carquinez Reference
931124-1	Control
STND	In-house reference sediment for QA/QC
STNE	In-house reference sediment for QA/QC

We have noted that the Table of Contents has some misnumbered pages. A new Table of Contents is included for inclusion to your reports.

If you have any questions regarding this letter, we will be glad to discuss them with you.

Very truly yours,

ENGEO INCORPORATED

Paul C. Guerin

Paul C. Guerin

cc: 1 - Advanced Biological Testing, Dr. Kurt Kline
1 - Sycamore Associates, Ms. Marylee Guinon
1 - Michael H. Cheney

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INCORPORATED

GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS

In Reply
Please Refer to:
3459-W1

March 9, 1994

Mr. Robert D. Agnew
Contra Costa County Flood Control & Water Conservation District
255 Glacier Drive
Martinez, CA 94553-4897

Subject: Lower Walnut Creek Flood Control Channel
Contra Costa County, California

FINAL REPORT ON CHEMICAL, PHYSICAL AND BIOASSAY TESTING OF SEDIMENTS

Dear Mr. Agnew:

Under contract to the District, we have completed testing of the sediments within the Lower Walnut Creek Flood Control Channel. This report describes the sample collection efforts, testing methods, test results, and significance of the results.

ENGEO Incorporated was assisted in this study by Advanced Biological Testing, Quality Assurance Laboratory, Sycamore Associates, and Michael H. Cheney.

We appreciate the opportunity of serving you on this interesting project, and look forward to working with you as your plans to dredge the channel progress. If you have any questions regarding the report, we will be glad to discuss them with you.

Very truly yours,

ENGEO INCORPORATED

Paul C. Guerin

Paul C. Guerin

cc: 1 - Advanced Biological Testing, Dr. Kurt Kline
1 - Sycamore Associates, Ms. Marylee Guinon
1 - Michael H. Cheney

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FINAL REPORT

RESULTS OF CHEMICAL, PHYSICAL AND BIOASSAY TESTING OF SEDIMENTS FROM THE LOWER WALNUT CREEK FLOOD CONTROL CHANNEL

Prepared for:

Contra Costa County Flood Control and Water Conservation District
255 Glacier Drive
Martinez, CA 94553-4897

Prepared by:

Advanced Biological Testing
98 Main Street, Suite 419
Tiburon, CA 94920

February 9,1994

Ref: 9306-1

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Executive Summary

To evaluate sediment material for disposal into the waters of the United States, the material must undergo testing defined by the U.S. Army Corps of Engineers and the Environmental Protection Agency. In the San Francisco Bay area, sediment testing for in-bay disposal is defined in Public Notice 93-2 (ACOE/EPA/RWQCB-SF/BCDC, 1993). Public Notice 93-2 reviews the existing data for in-bay disposal and establishes a minimum set of test requirements for testing of bay sediments destined for maintenance dredging and disposal at one of the three designated sites in the Bay Area. Any individual or agency desiring to dredge and dispose of material from the bay must test the sediments prior to receiving a permit to dredge from the Corps. Maintenance dredging is defined as the removal of sediment that has accumulated in a previously dredged area back to the depth originally permitted or designed.

There are two other disposal options available to dispose of the dredge material. One is to remove the material and barge it to the ocean disposal site, currently proposed for a location approximately 45 miles west of the Golden Gate. If this option is selected, the testing program required by the EPA and the Corps comes under the Ocean Disposal Program and falls under the requirements of the Green Book (EPA/ACOE 1992). This program evaluates the potential to degrade the ocean disposal site using six sediment toxicity tests, two bioaccumulation tests, as well as physical and chemical analyses. It is extremely expensive and is primarily reserved for new dredging projects.

The second option is for upland disposal, placing the sediments either at a designated waste disposal site or at an alternative location. The placement of sediments at land fills has been carried out in the Bay particularly for sediments that failed the testing for in-Bay disposal. The primary test program, usually carried out simultaneously with the in-bay testing is to characterize the potential for the leaching of chemicals from the sediments after disposal and placement. The testing is carried out using the WET test (waste extraction test) to define the STLC (soluble threshold limit concentration) or by testing the sediments using TCLP test (toxic characterization leachate potential). Either of these tests are used to assess the potential for soluble chemical

products from the deposited sediments to enter the ground water or influence the beneficial uses of the ground or surface water.

The Contra Costa County Flood Control District has proposed to conduct maintenance dredging of sediments from the lower reaches of the Walnut Creek Flood Control Channel. The basic project area is from the confluence of the creek with Suisun Bay, upstream almost to the Highway 4 Bridge (from Station 0+00 to 187+50). The dredging is proposed to remove accumulated sediments and to maintain adequate depth in the lower reaches of the creek for flood control. Currently, the depth of accumulated sediment in the channel ranges from 0 feet to +8 feet relative to the original depths. The District estimated the volume of sediment material to be approximately 800,000 cubic yards. It was proposed for the basis of this project that the dredge material tested according to PN 93-2 rules and the material would be disposed of at the Carquinez disposal site located south of Vallejo, California. The sediments were also tested for upland disposal. This testing was not defined within the scope of the project, but was based upon the professional judgement of the consulting team as a necessary element. The District was not charged for this element of the testing.

This Executive Summary summarizes the methods used in the testing program, the results, and the evaluation of the material in light of the two disposal options. The full report presents all of the data collected in the testing program and presents the results of the sediment chemical analysis, physical analysis and bioassays conducted on the dredge material at the sites according to the methods described in PN 93-2. This main document is intended to potentially support the District's application for various regulatory permits including a Department of the Army permit to conduct this maintenance dredging for flood control capacity and dispose of the dredged material in the designated dump site.

SEDIMENT COLLECTION

All test sediments were collected on November 18, 1993. The eight proposed dredge areas were divided into thirty-two sampling stations and the sampling locations established from designated survey points on shore. Samples in the water were collected by a push corer deployed from a

small boat; all of the cores taken on land were taken with a stainless rotary hand sampler. All samples were placed in plastic bags, stored in coolers with ice and transported back to the laboratory. All sediments were in cold storage by the evening of November 18th.

THE TESTING PROGRAM

The testing program required under PN 93-2 includes the chemical and physical analyses of sediments; liquid/suspended phase bioassays and solid phase bioassays. The chemical analyses are carried out on a composite sediment sample from each of the eight sites chosen for this test. The analyses included heavy metals, pesticides, PCBs, phthalates, polyaromatic hydrocarbons (PAHs), and petroleum hydrocarbons. The physical analyses include a detailed grain-size analysis as well the as the determination of percent solids and total organic carbon (TOC).

The Liquid/Suspended-Particulate Phase Bioassay is based upon a preparation of a sediment elutriate. The test solution used in the liquid/suspended-particulate phase bioassays was prepared using laboratory seawater from Bodega Bay and dredge site sediments. Laboratory seawater (30 ppt salinity) and sediment were mixed to obtain a volumetric sediment-to-water ratio of 1:4. The mixture was allowed to settle for one hour, and the supernatant then used to create 1, 10, 50, and 100% test concentrations for the bioassays.

The bivalve larval bioassay method is from ASTM (1993a). Bay mussels, *Mytilus edulis*, were induced to spawn by heat shocking. The gametes were placed in individual containers of filtered seawater and examined for viability. Eggs and sperm were mixed and allowed to fertilize for up to two hours. The developing embryos were added to each replicate to an initial density of 15-30 embryos per ml. Testing was conducted at 16° $\pm$ 2°C under a 14 hour light and 10 hour dark photoperiod. At the end of the exposure period (48 hrs), a sample was taken from each test replicate and preserved with buffered formalin. These samples were counted and the total number of normal and abnormal larvae were counted. Based upon these counts and interpretations, the lethal concentration of the elutriate could be determined as well as the concentration which caused abnormal development.

The Solid-Phase bioassays were conducted with the whole sediment using a small species of amphipod (shrimp-like animal) which burrows directly into the sediments. The procedures for the bioassay are found in ASTM (1993b). *Eohaustorius estuarius* were used as the test species. This species is currently acceptable as a suitable test organism under PN 93-2 rules, and survival is compared against the results of testing in the reference sediments. The mixed and composited sediments are sieved through a 1.0mm stainless steel mesh to remove large materials and extraneous organisms. Sediments from the control, reference and test sites were placed in five replicate chambers to which is added approximately 850 ml of seawater. The chambers were placed in a water bath at 20°C under continuous light. The water in each chamber was gently aerated using small bore pipettes. Daily water quality measurements were taken and the number of dead and surfaced animals was noted for each replicate. Passing criterion is $\geq 90\%$ survival in the control on Day 10. Significance in the test is determined by a statistically significant difference in survival between the reference site (Carquinez) and the test sites; and a difference in survival of 20 animals.

THE RESULTS OF THE TESTING

Chemical analyses

The analyses of the eight test site composites demonstrated no significant amounts of pesticides, PCBs or PAHs. No detectable levels of organic tin were noted. For those constituents found above detection limits (most of the heavy metals, TRPH and sulfides) there appears to be a gradient from Site 1 (at Suisun Bay) to Site 8 (near Highway 4), with high levels in lower reaches and lower levels in Sites 7 and 8. Since there are no definitive guidelines for comparing reference and test sediment values, the calculation of comparative differentials (reference value/test value) is useful for subjectively evaluating the potential for contamination at the reference site. The levels of most of the metals were higher in the test sites than in the Carquinez reference material with maximum differential ranging from 1.3 (nickel) to 9.8 (cadmium). Six of the metals had differential levels less than 3.0 (zinc, selenium, arsenic, chromium, lead and nickel).

Low levels of PAHs were found at the reference site. Phthalates were noted at all of the test sites, the reference site and the control site. Bis (2-ethylhezyl) phthalate was found at all of the sites while di-n-butyl phthalate was found only at Sites 3 to 7. Both of these compounds are common laboratory contaminants. It is likely that these constituents are generated during the sediment collection, compositing, and analytical testing procedures.

Grain-size analysis

Grain-size distribution at the sties was typical for low gradient stream channels with coarser sediments being deposited in the upper sites and the finer components, clays and silts, being deposited in the lower sites where tidal effects would cause this type of depositional pattern.

Solubility analyses for upland disposal

In the analysis of the solubility potential from these sediments, no results exceeded or were even close to the threshold levels defined in CAM Title 22.

Results of the Bivalve larvae bioassay

The results of the L/SP bioassays appear to indicate a potential for toxicity from the disposal of this material at the SF-9 site. However, the LPC values are not exceeded by any of the test sites under PN 93-2 rules.

Results of the solid phase bioassay

In the 10 day solid phase bioassay, control survival was 100% indicating that test conditions were acceptable. Survival in the reference sediment from the Carquinez disposal site was also 100%. Both of these sediments were sand and were an excellent substrate for *Eohaustorius*.

Survival in the test sediments ranged from 59% in Site 1 to 94% in Site 6. There was a general increase in survival as the stations went upstream. The percentage of sand also increased from

Site 1 to Site 8 from 11% at Site 1 to 32% at Site 8. Based upon the grain-size analysis it appeared that at 20% sand, survival increased. In a statistical comparison to the reference site, all of the sites were significantly different from the reference. Only Sites 1 and 2 exceeded the 20% rule in PN 93-2 and would have the potential to exceed the solid phase LPC. Site 5 had 80% survival and could be considered to be marginally significant. Therefore, under current guidelines, dredged materials from Sites 1 and 2 and perhaps Site 5 would not be suitable for in-Bay disposal and would require upland disposal.

SUMMARY

- Chemical analyses of the test sediments revealed elevated levels of metals compared to the reference site.
- Metal levels generally decreased at the upstream sites.
- No significant pesticide, PCB or PAH contamination was identified.
- The grain-size analyses revealed gradients from upstream to downstream.
- The test site sediments were analyzed using the STLC analysis. None of these sites revealed significant solubilization of metals when compared to the threshold values from Title 22. In light of these results, the deposition of this material on land should have no significant impact on surface or ground water from leachates from this material.
- Toxicity was observed in the bivalve larvae bioassay, but no site exceeded the LPC. Similar toxicity was observed in 1992 at sites around the Bay which may have been the result of a naturally occurring toxin.
- In the solid phase bioassay, Sites 1 and 2 exceeded the LPC; site 5 was exactly 20% different from the reference. All of the other sites were acceptable.

1.0
INTRODUCTION

1.1 OVERVIEW

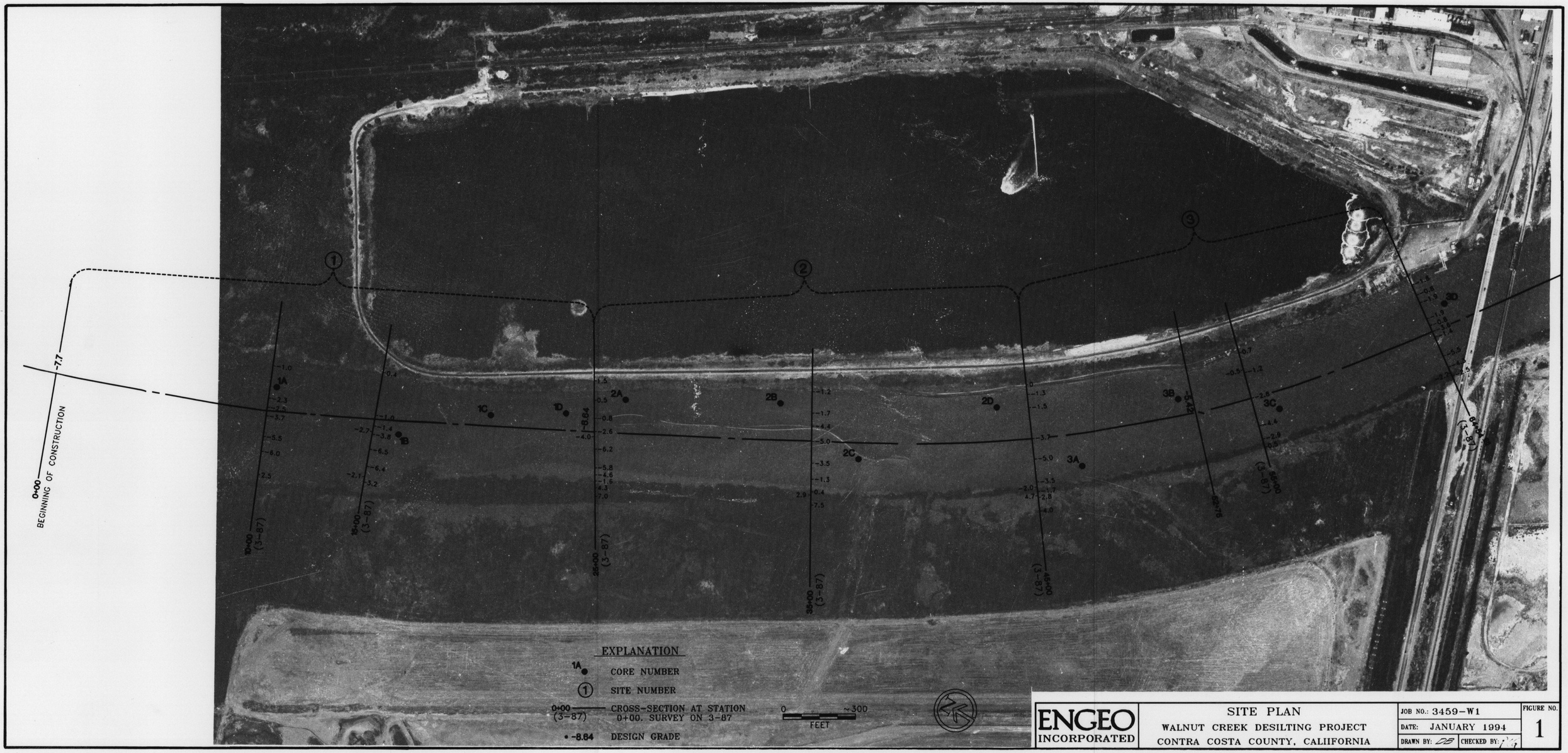
The Contra Costa County Flood Control District is proposing to conduct maintenance dredging in the lower reaches of Walnut Creek from Station 0 + 00 to 187 + 50 (Figures 1 to 3). The dredging is being performed to maintain adequate depth for flood control. Currently, the depth of accumulated sediment in the channel ranges from 0 feet to 8 feet relative to the original dredge depths. Dredging will be carried out to maintain the original dredge elevations which rise from -7.7 feet at Station 0 + 00 to +3.60 feet at Station 185 + 22 (mean sea level datum of 1929). The estimated volume of sediment material to be disposed is 800,000 cubic yards. It is proposed for the basis of this project that the dredge material will be disposed of at the Carquinez disposal site located south of Vallejo, California (Figure 4).

This report presents the results of the sediment chemical analysis, physical analysis and bioassays conducted on the dredge material at the site. This document is intended to support the client's application for various regulatory permits including a Department of the Army permit to conduct this maintenance dredging for flood control capacity and dispose of the dredged material in the designated dump site.

1.2 ORGANIZATION

This report follows guidelines provided in the Testing Manual for the Evaluation of Dredged Material Proposed for Ocean Disposal (U.S.EPA/ACOE, 1991) and the testing guidelines established by the ACOE, Regional Water Quality Control Board (San Francisco), BCDC and the U.S.EPA in PN 93-2 (1993). The report is organized as follows:

- Introduction - Section 1.0
- Sediment Collection-Section 2.0
- Methods - Section 3.0
- Results - Section 4.0
- Discussion - Section 5.0
- References - Section 6.0



ENGEO INCORPORATED	SITE PLAN WALNUT CREEK DESILTING PROJECT CONTRA COSTA COUNTY, CALIIFORNIA	JOB NO.: 3459-W1 DATE: JANUARY 1994 DRAWN BY: CB CHECKED BY:	FIGURE NO. 1

ENGEO INCORPORATED

SITE PLAN
WALNUT CREEK DESILTING PROJECT
CONTRA COSTA COUNTY, CALIIFORNIA

JOB NO.: 3459-W1		FIGURE NO. 2
DATE: JANUARY 1994		
DRAWN BY:	CHECKED BY:	

ENGEO INCORPORATED

SITE PLAN

WALNUT CREEK DESILTING PROJECT
CONTRA COSTA COUNTY, CALIIFORNIA

JOB NO.: 3459-W1
DATE: JANUARY 1994
DRAWN BY: CS CHECKED BY: RCJ

FIGURE NO. 3

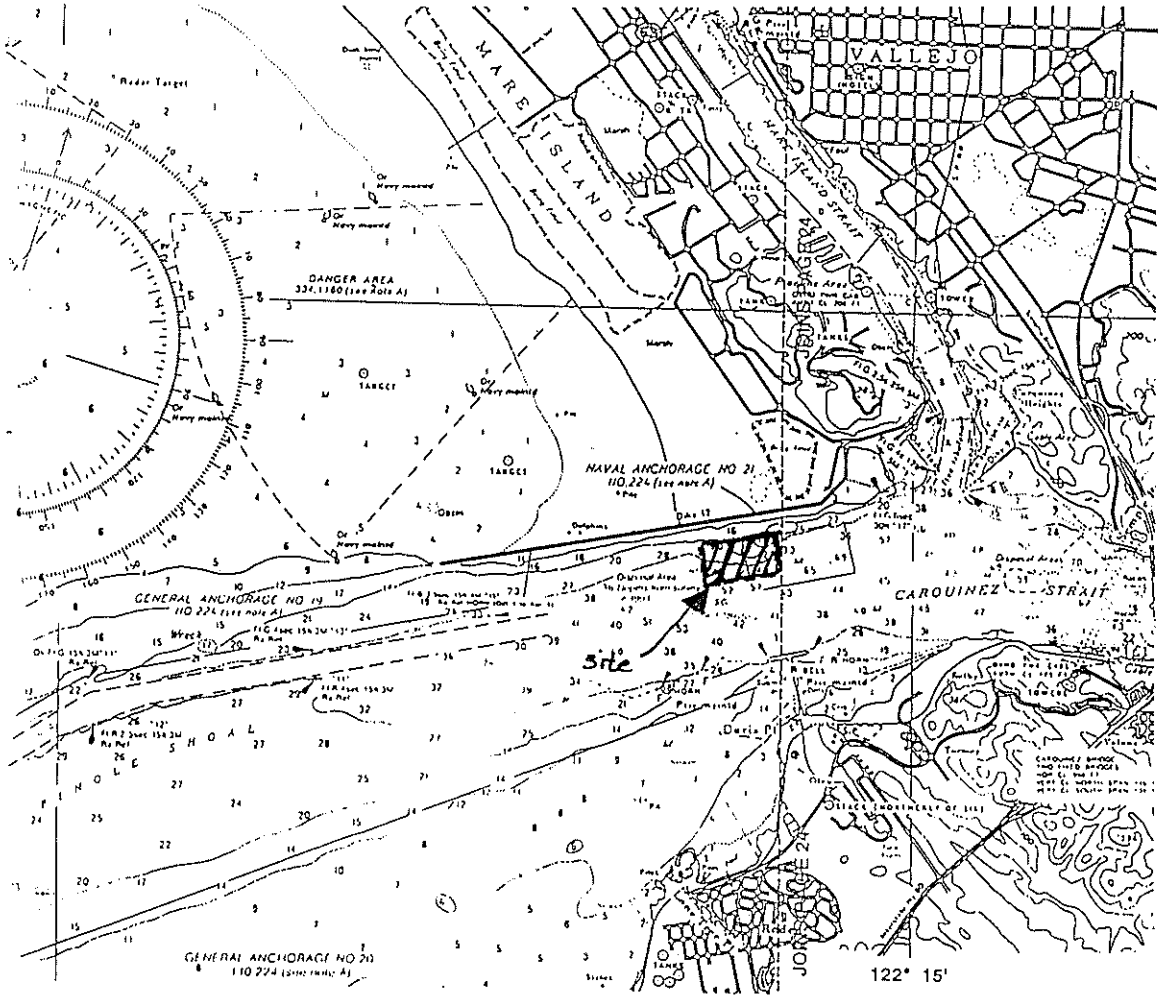


FIGURE 4

CARQUINEZ DISPOSAL SITE

2.0
STUDY AREAS AND SAMPLING PROGRAM

2.1. SEDIMENT COLLECTION

The dredge material testing program required the sampling of sediments from eight test sites in the lower reaches of Walnut Creek, the Carquinez Strait reference site, and a control sediment location in Yaquina Bay, Oregon. All test sediments were collected on November 18, 1993, the Carquinez sediments on November 17, 1993 and control sediments on November 23, 1993.

2.2 TEST SITE SEDIMENTS

All test sediments at sites 1, 2, 3, 4 and 5a, and 5b were collected on November 18, 1993 utilizing the R/V Winner and a hand corer with a 2 inch diameter barrel. The balance of the test stations were collected on the same day on foot using a hand auger with a 2 inch diameter barrel. The eight dredge areas were divided originally into thirty-two sampling stations (Figures 1 to 3). The sampling locations were established from designated survey points on shore.

Positioning at the sites was by visual triangulation. The station positions are plotted in Figures 1 to 3 and are listed in Table 1. Each station core sample was measured and then placed in a cooler with ice and transported to the laboratory in Tiburon, California. Each station was kept individually until site compositing was carried out at the laboratory.

2.2.1 Reference Sediments

The Carquinez reference sediments were collected on November 17, 1993 (Figure 4). The sediments were collected by pipe dredge. A total of 5 gallons of sediment were collected from two different locations at the site.

2.2.2 Control Sediments

Sediments from Yaquina Bay, Oregon were used to provide the standard sediment control for the amphipod bioassays. The sediments were collected on November 23, 1993 along with the *Eohaustorius*.

2.3 SEDIMENT HANDLING

Each core was placed in a cleaned and rinsed FDA food grade plastic bag, labeled and placed in coolers and returned to the laboratory. The test sediments from each station were thoroughly composited at the laboratory in stainless steel bowls until their color and texture were consistent. A small aliquot of sediments from each station was archived for future analytical testing if needed. Each station sample was then mixed with the other stations from the sampling site and the composite was thoroughly mixed to a consistent color and texture. The control and reference sediments were treated as single samples and composited separately. All sediments were then placed in cold storage and maintained at 4°C prior to testing.

3.0
METHODS

3.1 INTRODUCTION

The testing program described in this report involves several elements: chemical analysis of sediments; physical analysis of the sediments; liquid/suspended phase bioassays and solid phase bioassays. Chemical analyses of sediments were conducted by Quality Assurance Laboratory in San Diego, California. Grain-size analyses of sediments were conducted by MEC Analytical Systems, Inc. in Carlsbad, California. The bivalve larvae bioassay was conducted by MEC's bioassay laboratory in Tiburon, California, and the amphipod bioassay was conducted by ABT. The short-term liquid/suspended-particulate phase and the 10 day solid phase studies were conducted using two species of marine organisms.

All methods and procedures outlined in this section follow specifications in PN 93-2 (EPA/ACOE/RWQCB 1993).

3.2 TEST ORGANISM PROCUREMENT AND HOLDING

The liquid/suspended-particulate phase (L/SP) tests was the bivalve larvae bioassay using the mussel, *Mytilus edulis*. The ten-day solid phase testing was carried out with the amphipod *Eohaustorius estuarius*.

Eohaustorius were supplied by Northwestern Aquatic, Newport Oregon. The amphipods were collected and delivered in sediment in small plastic trays. The amphipods were held and acclimated at the bioassay facility for at least 72 hours prior to testing.

Mytilus were spawned from stock provided by A.K. Siewers, in Santa Cruz, California and were tested immediately. All holding/quarantine areas, as well as the test rooms, were environmentally controlled. Following filtration and sterilization, seawater was adjusted to a temperature of 16°± 2°C (the temperature required for acclimation). Air temperature of the rooms was maintained at 18 ± 2°C.

TABLE 1

CORING LOG

LOWER WALNUT CREEK DESILTING PROJECT

Site	Station	Water Depth/Elevation	Core Depth	Sediment Description
1	1-A	-2.5'	-8.0'	unconsolidated clays & silts
	1-B	-3.5'	-8.0'	unconsolidated clays & silts
	1-C	-3.5'	-8.0'	unconsolidated clays & silts
	1-D	-3.5'	-8.0'	unconsolidated clays & silts
2	2-A	-3.0	-8.0'	unconsolidated clays & silts w/sand
	2-B	-0.5'	-7.0'	unconsolidated clays & silts w/sand
	2-C	-3.0'	-8.0'	unconsolidated clays & silts w/sand
	2-D	-2.0'	-8.0'	unconsolidated clays & silts
3	3-A	-2.0	-8.0'	clays & sand
	3-B	-3.0'	-7.0'	clays & sand
	3-C	-4.0'	-8.0'	unconsolidated clays & silts w/sand
	3-D	-4.2'	-8.0'	unconsolidated clays & silts w/sand
4	4-A	-3.0	-7.0'	unconsolidated clays & silts w/sand
	4-B	-4.0'	-8.0'	unconsolidated clays & silts
	4-C	-6.0'	-8.0'	unconsolidated clays & silts
	4-D	-4.0'	-8.0'	unconsolidated clays & silts
5	5-A	-3.0	-6.0'	unconsolidated clays & silts
	5-B	-1.0'	-6.0'	unconsolidated clays & silts
	5-C	+1.0'	-8.0'	soft silts & clays
	5-D	+0.5'	-8.0'	soft silts & clays

Water depth or elevation and core depths are measured in feet adjusted to MLLW.

TABLE 1 (Cont'd)

CORING LOG
LOWER WALNUT CREEK DESILTING PROJECT

Site	Station	Water Depth/Elevation	Core Depth	Sediment Description
6	6-A	+1.0'	-8.0'	unconsolidated clays & silts
	6-B	+1.5'	-8.0'	unconsolidated clays & silts
	6-C	-1.0'	-8.0'	unconsolidated silts
	6-D	-2.0'	-8.0'	unconsolidated clays & silts
7	7-A	-2.0'	-8.0'	unconsolidated clays & silts
	7-B	+2.0'	-6.0'	unconsolidated clays & silts
	7-C	+1.0'	-7.0'	unconsolidated clays & silts
	7-D	-1.0'	-8.0'	unconsolidated clays & silts w/sand
8	8-A	+0.5'	-7.5'	soft silty clays
	8-B	+0.5'	-7.5'	soft silty clays
	8-C	+2.0'	-6.0'	soft silty clays
	8-D	+0.5'	-7.5'	soft silty clays w/sand

Water depth or elevation and core depths are measured in feet adjusted to MLLW.

3.3 CHEMICAL ANALYSIS OF SEDIMENTS

A subsample of the sediment composite from the individual cores taken at the test sites was removed for chemical and total organic carbon analysis, and sent under chilled conditions to Quality Assurance Laboratory (QAL) in San Diego, California. QAL analyzed all samples for a suite of heavy metals and organic compounds. Subsamples for grain-size analysis were collected and shipped to MEC Analytical Systems, Inc. in Carlsbad, California.

Sediment chemical analysis was conducted according to PN 93-2 and accepted practices of the Army Corps of Engineers. Detection limits are specified in PN 93-2. All analyses were carried out to those limits within the limitations of the test media and the analytical methods.

3.3.1 Bulk Chemistry Analysis

The composite sediment samples submitted to QAL were analyzed for heavy metals (EPA Method 6000, as well as 7000 for specific metals), pesticides and PCBs (EPA Method 8080), polynuclear aromatic hydrocarbons (PAHs) (EPA Method 8270), phthalates (EPA Method 8270), total sulfides (modified method AOAC-1.013 and Standard Method 4500-SD), dissolved sulfides (Standard method 4500-SD), Total Recoverable Petroleum Hydrocarbons (EPA Method 418.1), and organic tin using the GCFPD method. The analysis of total organic carbon was performed using a persulfate wet oxidation (Menzel and Vaccaro, 1964). The laboratory data reports and the QA/QC documentation are presented in Appendix A.

3.3.2 Sediment Grain-Size

The method for grain-size analysis follows Plumb (1981). This method combines the dry sieve and the pipette methods to analyze the smaller particle sizes. The full distribution analyses are presented in Appendix A.

3.4 BIOASSAY GENERAL METHODS

The procedures used for the bioassays are detailed in ASTM (1992a, b), and PN 93-2. The methods are summarized below for elutriate preparation, the liquid/suspended phase (L/SP) bioassays; and the solid phase bioassays.

3.4.1 Bioassay Water Quality

Water quality is monitored daily as appropriate for each test form, and data are entered on data sheets. Dissolved oxygen was measured using an oxygen meter and probe; pH was measured using a digital pH meter. Salinity and temperature were measured with a conductivity/salinity meter. Ammonia was analyzed by colorimetric method.

All instruments are routinely calibrated daily and the calibration results are logged in the Calibration Log as described in laboratory SOPs.

3.4.2 Liquid/Suspended-Particulate Phase Bioassay

3.4.2.1 Elutriate Preparation

The test solution used in the liquid/suspended-particulate phase bioassays was prepared using laboratory seawater from Bodega Bay and dredge site sediments. Laboratory seawater (30 ppt salinity) and sediment were mixed to obtain a volumetric sediment-to-water ratio of 1:4 in 4-L glass chambers at 20°C. Mechanical mixing was supplied to agitate the mixture vigorously for 30 minutes. The mixture was allowed to settle for one hour, and the supernatant then used to create 1, 10, 50, and 100% test concentrations for the bioassays.

3.4.2.2 Bivalve Larvae Bioassay

The bivalve larval bioassay method is from ASTM (1992a). Bay mussels, *Mytilus edulis*, were obtained from A.K. Siewers, Santa Cruz, California. Adults were induced to spawn by heat shocking. Released gametes were placed in individual containers of filtered seawater and examined for viability. Gametes were mixed and allowed to fertilize for up to two hours, under gentle aeration. Fertilized eggs were then separated from sperm and debris by filtering the suspension at 20 µm. Egg stock density was estimated by counting an aliquot of dilute stock concentrate. Equal volumes of concentrate were added to each replicate to an initial density of 15-30 embryos per mL. Initial density was confirmed by counting a 5 mL aliquot from at least three control replicates. Testing was conducted at 16° ± 2°C under a 14 hour light and 10 hour dark photoperiod. Temperature, pH, dissolved oxygen, and salinity were taken at 0 and 48 hours; temperature was also recorded at 24 hours. Total ammonia was measured in 100% elutriate at 0 and 48 hours. At the end of the exposure period, a 5 mL sub-sample was taken from each test

replicate and preserved with buffered formalin. Sub-samples were counted in a Sedgwick-Rafter cell, and the total number of normal and abnormal larvae were counted.

3.4.3 Solid-Phase Bioassays

The procedures for the infaunal amphipod bioassay are found in ASTM (1992b). *Eohaustorius estuarius* were used as the test species. This species is currently acceptable as a suitable test organism under PN 93-2 rules, and is compared against the results of testing the Environs reference.

Thoroughly mixed and composited sediments were sieved through a 1.0 mm stainless steel mesh to remove large materials and organisms. Sediments from the control, reference and test sites were placed in five replicate 1000 mL chambers to a thickness of 2 cm, to which was added approximately 850 mL of 25 ± 2 ppt seawater. The chambers were placed in a water bath at 20 ± 2°C under continuous light. The water in each chamber was gently aerated using small bore pipettes. After 24 hours, water quality, including temperature, dissolved oxygen, pH, salinity and total ammonia, was recorded for each replicate and 20 animals were placed in each chamber. Animals remaining in the water column and/or exhibiting abnormal behavior after one hour were replaced. The water level was brought slowly to 950 mL. The chambers were then covered with watch glasses to minimize evaporation. Daily water quality measurements were taken and the number of dead and surfaced animals was noted for each replicate. Passing criterion is ≥90% survival in the control on Day 10.

3.5 QUALITY ASSURANCE PROCEDURES

3.5.1 Chemical Analysis

For trace analysis, procedures included documentation of the following criteria for each sample matrix type: analytical reproducibility, analytical detection limits, recovery of *in situ* metals and organics, and sample chain-of-custody documentation.

Instrument Calibration: Instrument calibration follows EPA protocols for AA spectrophotometry (7000), ICP (EPA protocol 6000), EPA protocols 8080 for pesticides/PCBs and 8270 for GC/MS. Daily logs of instrument usage were maintained to document all parameters related to instrument performance.

Control Samples: Laboratory control sample analysis results were performed at a rate of 10%. Laboratory control samples are standards or standard reference materials carried through all sample preparation and analysis procedures to demonstrate method performance. Results were reported in percent recovery with acceptable ranges provided.

Matrix and Duplicate Samples: Environmental sample matrix spike and duplicate analysis was performed at a rate of 10%. For a matrix spike a known concentration of analyte of interest is added to a sediment sample prior to sample preparation and analysis. The percent recovery is reported for matrix spikes. Spike data can provide an indication of matrix bias or interference on analyte recovery. Duplicate samples of a single sediment sample were taken through the extraction procedures and analyzed to determine the relative percent difference Duplicate data can provide an indication of laboratory precision.

Records: All Quality Assurance/Quality Control records for the various testing programs are kept on file for review by regulatory agency personnel.

3.5.2 Bioassay Analyses

The quality assurance objectives for toxicity testing conducted by ABT are those described in U.S.EPA (1988) and U.S.EPA/ACOE (1991). Objectives for accuracy and precision include: (1) water and sediment sampling and handling; (2) source and condition of test organisms including Chain of Custody documentation; (3) condition of equipment; (4) test conditions; (5) instrument calibration; (6) use of reference toxicants; (7) record keeping; and (8) data evaluation.

The methods employed in these toxicity testing programs are detailed in ASTM (1992a, b) and in laboratory Standard Operating Procedures (SOPs). These SOPs have been approved by the laboratory manager and placed in the laboratory files. All data collected and produced as a result of this analysis were recorded on approved data sheets which become the permanent data record for that program. The quality control officer checked all the raw data and study records to ensure that required test conditions were within specifications cited in the SOPs and the ASTM guides. Any unforeseen circumstances that might have affected the integrity of the study were reported with the test results.

SOPs for each analytical instrument used in toxicity testing are maintained in the Maintenance and Calibration Log and instruments were calibrated daily. All daily calibration data are logged

and initialed by the technician carrying out the calibration. Procedures used to monitor equipment are included in the Maintenance and Calibration Log.

Reference toxicant tests are used as an internal quality check of the sensitivity in the bivalve larvae toxicity test and the amphipod bioassay. The results of each species test were compared with laboratory data for the specific reference toxicant used to determine if the results are within acceptable limits (2 standard deviations as the warning limits, >3 standard deviations are considered critical and the tests are rerun). Water quality measurements were monitored to ensure they fall within prescribed limits, and corrective actions taken if necessary. The precision of the LC50 determinations were shown by calculating the 95 percent confidence intervals.

Chain of Custody forms were prepared in the field during sediment collection by ABT personnel. The field personnel maintained custody of the samples until they are returned to the laboratory. As the sediments are composited, a new chain of custody is prepared for the transfer of sediments to the chemistry laboratory and to MEC Analytical Systems in Carlsbad for grain size analysis.

3.6 STATISTICAL METHODS

At the conclusion of all tests, test species data were evaluated statistically to estimate the LC50 and IC50 values for the elutriate tests and to compare the percent survival in the test sediments to the reference site for the solid phase toxicity tests. The LC50 and IC50 values were estimated using the Probit or the Linear Interpolation (Bootstrap) Method. Percent survival was calculated as described in PN 93-2, with percent survival equal to percent normal larvae per mL.

A significant effect in the amphipod bioassay is defined as a statistically significant difference ($P \geq 0.05$, one-tailed t-test) between the reference and test survival and an absolute difference between the test and the reference of 20 (twenty) animals. The lowest value of the LC50 or EC50 is then used in determining if the LPC value has been exceeded; and significance is defined as a factored LC50 or EC50 less than the calculated LPC.

3.7 CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

The LPC is estimated using methods generally described in the EPA/ACOE Manual (1991).

4.0
RESULTS

Summaries of the results of the chemical analysis and bioassay tests are provided in Tables 2 through 6. Complete chemistry analytical data are in Appendix A. The bioassay data are included in Appendix B and the quality control documentation is in Appendix C.

4.1 SEDIMENT CHEMICAL CHARACTERISTICS

4.1.1 Test Sites

The results of the sediment chemical analyses and physical characterization of the eight sites, the reference and the control sites are presented in Table 2.

4.1.1.1 Site 1

The analysis of the composite sediments from this area revealed moderate levels of total and low levels of dissolved sulfides. TRPH was moderate at 146 mg/kg. TOC was 1.43%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were detected. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate was noted at 204 µg/kg and is probably an introduced laboratory contaminant.

4.1.1.2 Site 2

The analysis of the composite sediments from this area revealed moderate levels of total and low levels of dissolved sulfides. TRPH was low at 72.7 mg/kg. TOC was 0.97%. Tributyltin, dibutyltin and monobutyltin were detected at <1.0 µg/kg each. All of the listed metals were detected except selenium and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate was noted at 49.9 µg/kg.

4.1.1.3 Site 3

The analysis of the composite sediments from this area revealed moderate levels of total and low levels of dissolved sulfides. TRPH was low at 100 mg/kg. TOC was 1.32%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were

detected except selenium and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate and Di-n-butyl phthalate were noted at 120 and 169 µg/kg, respectively.

4.1.1.4 Site 4

The analysis of the composite sediments from this area revealed moderate levels of total and low levels of dissolved sulfides. TRPH was low at 102 mg/kg. TOC was 3.08%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were detected except selenium and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate and Di-n-butyl phthalate were noted at 124 and 182 µg/kg, respectively.

4.1.1.5 Site 5

The analysis of the composite sediments from this area revealed moderate levels of total and low levels of dissolved sulfides. TRPH was low at 83.8 mg/kg. TOC was 1.51%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were detected except selenium and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate and Di-n-butyl phthalate were noted at 187 and 180 µg/kg, respectively.

4.1.1.6 Site 6

The analysis of the composite sediments from this area revealed moderate levels of total and dissolved sulfides. TRPH was low at 99.3 mg/kg. TOC was 1.73%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were detected except selenium and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate and Di-n-butyl phthalate were noted at 228 and 165 µg/kg, respectively.

4.1.1.7 Site 7

The analysis of the composite sediments from this area revealed moderate levels of total and low levels of dissolved sulfides. TRPH was low at 72.4 mg/kg. TOC was 1.15%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were

detected except selenium and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate and Di-n-butyl phthalate were noted at 299 and 178 µg/kg, respectively.

4.1.1.8 Site 8

The results of the Site 8 chemical analysis are presented in Table 2. The analysis of the composite sediments from this area revealed low levels of total and dissolved sulfides. TRPH was low at 24.2 mg/kg. TOC was 0.96%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were detected except selenium and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate was noted at 59.9 µg/kg.

4.1.2 Reference Site

The analysis of the composite sediments from this area revealed moderate levels of total and dissolved sulfides. TRPH was low at 14.0 mg/kg. TOC was 0.22%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were detected except selenium and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate was noted at 45.9 µg/kg.

4.1.3 Control Site

The results of the Control Site chemical analysis are presented in Table 2. The analysis of the composite sediments from this area revealed very low levels of total and dissolved sulfides. TRPH was low at 11.5 mg/kg. TOC was 0.04%. Tributyltin, dibutyltin and monobutyltin were non-detected at <1.0 µg/kg each. All of the listed metals were detected except selenium, mercury and silver. No pesticides, PCBs or PAHs were noted above the method reporting limits. Bis (2-ethylhexyl) phthalate was noted at 191 µg/kg.

4.2 SEDIMENT PHYSICAL CHARACTERISTICS-GRAIN-SIZE ANALYSIS

The grain size analysis of the sediments was carried out by MEC Analytical Systems and is shown in Table 2. The test sites have significantly finer grained sediments (based upon the sum of the silt/clay fraction) than the Carquinez reference sediments or the control site.

4.3 RESULTS OF THE STLC ANALYSES

All of the test site composites were analyzed for STLC according to CAM Title 22 guidelines. This analysis assesses the potential of solubilization of chemicals from sediments placed at terrestrial disposal sites. The results of the analyses are presented in Table 3. All of the data are compared to existing threshold limits specified in Title 22.

No STLC values for any analyte at any of the eight sites exceeded the threshold limits.

4.4 RESULTS OF THE BIOASSAY ANALYSES

4.4.1 Liquid/Suspended-Particulate Phase Bioassays

Bivalve Larvae Bioassay

The composite value (Total normal-Abnormal) for control survival was 77.4% meeting the passing criterion of >70%. Abnormal development in the control was low at 2.2%. Water quality parameters were within the appropriate limits. A summary of the test parameters is presented in Table 4. The results of the tests are presented in Table 5 and the full data set for the study in Appendix B.

The LC50 of the test sediment elutriate was calculated using the combined data as described in the Testing Guidelines (PN 93-2). The LC50 for Site 1 was 23.7%; at Site 2, 22.7%; Site 3, 28.2%; Site 4, 17.2%; Site 5, 25.1%; Site 6, 29.0%; Site 7, 70.0% and Site 8, 23.6%. The IC50s were slightly higher than the LC50 and are shown in Table 5. The Carquinez reference sediments were tested and yielded an LC50 and IC50 of >100%.

The reference toxicant was copper sulfate, with nominal concentrations of 0.18, 0.56, 3.2, 10 and 32 µg/L as Cu^{2+}. It had statistically significant effects on mortality at 32 µg/L. The LC50 was 21.0 µg/L. The current laboratory mean LC50 of copper for the bivalve larvae toxicity test is 16.1 µg/L. The reference toxicant also had a significant effect on development at 32 µg/L. The IC50 was 21.0 µg/L. The current laboratory mean IC50 of copper for the bivalve larvae toxicity test is 10.4 µg/L. This test data indicates that the group of embryos used in this test was normally sensitive (within two standard deviations of the mean).

4.4.2 Solid-Phase Amphipod Bioassays

In the 10-day *Eohaustorius estuarius*. bioassay, water quality was monitored daily for all of the replicates and was acceptable for this protocol. Control survival was 100%, which met the protocol criterion of less than 10% mortality. Survival in the reference sediments was also 100%. Survival at the test sites was 59% for Site 1, 75% for Site 2, 87% for Site 3, 84% for Site 4, 80% for Site 5, 94% for Site 6, 91% for Site 7 and 89% for Site 8. Due to no variability between replicates in the reference sediments, all of the test sites had statistically significant mortality when compared to the reference site. Only Sites 1 and 2 however, had greater than a 20% differential from the reference, with Site 1 being 31% and Site 2 at 25%. Site 5 had exactly a 20% differential. All of the other sites were between 6% and 16% differential. A summary of the test parameters are presented in Table 6. A summary of the results of this study are presented in Table 7, and the full data set of water quality are presented in Appendix B.

A four day reference toxicant bioassay was conducted concurrently with the sediment bioassay. The reference toxicant was sodium dodecyl sulfonate (SDS), a standard toxicant for amphipods. The LC50 for SDS with this group of test organisms was 21.29 mg/L with 95% confidence limits of 18.12 to 25.01 mg/L. An insufficient number of tests have been completed by ABT using this toxicant and species to estimate general sensitivity, however the confidence limits are relatively narrow. The data for the reference toxicant analysis is presented in Appendix B.

TABLE 2

SUMMARY OF SEDIMENT CHARACTERIZATION
Walnut Creek Desilting Project

Site (1)	1	2	3	4	5	6	7	8	Reference	Control	Detection Limit Achieved (2)	Detection Limit Reqd (3)
Grain size (%)												
Gravel	0.0/0.3	0.3	0.1	0.6	0.5	0.1	6.3	2.5	1.4	0.0		
Sand	12.2/11.3	11.4	18.8	22.8	18.5	23.7	25.7	32.0	94.6	98.4		
Silt	47.6/48.2	51.1	44.4	37.4	37.9	42.9	30.5	34.2	1.4	0.7		
Clay	40.1/40.2	37.3	36.7	39.3	43.1	33.3	37.6	31.3	2.6	0.9		
Solids (%) (Dry Wt.)	47.0	88.2	53.1	53.9	51.1	57.8	59.1	64.8	77.4	79.9		0.1
Total Organic Carbon (%)	1.43	0.97	1.32	3.08	1.51	1.73	1.15	0.96	0.22	0.04		0.1
Sulfides (mg/kg)												
Total	349	188	286	306	323	261	274	121	1.25	0.31		0.5
Water Soluble	0.4	0.2	0.4	0.4	0.8	0.5	0.3	<0.2	<0.1	<0.1		0.1
Organotins (µg/kg)												
Tributyltin	<2.1	<1.1	<1.9	<1.9	<2.0	<1.7	<1.7	<1.5	<1.3	<1.3	1.0	1.0
Dibutyltin	<2.1	<1.1	<1.9	<1.9	<2.0	<1.7	<1.7	<1.5	<1.3	<1.3	1.0	1.0
Monobutyltin	<2.1	<1.1	<1.9	<1.9	<2.0	<1.7	<1.7	<1.5	<1.3	<1.3	1.0	1.0
TRPH (mg/kg)	146	72.7	100	102	83.8	99.3	72.4	24.2	14.0	11.5		0.1
Metals (mg/kg)												
Zinc (Zn)	114	65.6	97.9	86.6	95.7	87.4	77.3	64.0	53.1	12.9		0.1
Mercury (Hg)	6.2	3.00	4.71	4.64	4.7	4.0	2.79	1.31	0.840	<0.626		0.2
Selenium (Se)	<0.213	<0.113	<0.186	<0.182	<0.196	<0.170	<0.166	<0.154	<0.129	<0.123	0.1	0.1
Arsenic (As)	9.11	4.64	6.93	8.01	7.36	5.55	6.21	4.92	5.41	3.63		0.1
Cadmium (Cd)	0.521	0.325	0.435	0.469	0.521	0.481	0.284	0.321	0.053	<0.025	0.02	0.1
Chromium (Cr)	71.5	45.6	60.8	54.7	56.9	47.6	45.0	34.6	40.7	10.5		0.1
Copper (Cu)	54.9	29.7	44.8	43.0	43.6	36.0	31.1	20.8	10.7	2.09		0.1
Lead (Pb)	29.6	26.5	34.5	31.4	34.8	36.0	24.2	15.9	12.3	2.75		0.1
Nickel (Ni)	66.8	37.8	58.0	53.4	55.2	49.7	43.8	40.1	51.9	6.70		0.1
Silver (Ag)	<0.170	<0.090	<0.151	<0.147	<0.157	<0.137	0.655	<0.122	<0.102	<0.099	0.08	0.1
Pesticides and PCBs (µg/kg)												
4,4' - DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
4,4' - DDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
4,4' - DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
alpha-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
beta BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
Chlorodane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25	25
delta BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
Endosulfan I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	10
Endosulfan II	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
Endosulfan Sulfate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25	25
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
Endrin Aldehyde	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	10
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
Heptachlor Epoxide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	10
Lindane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25	25
PCB 1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
PCB 1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
PCB 1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
PCB 1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
PCB 1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
PCB 1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
PCB 1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20

(1) All chemical analyses are given as dry weight basis unless noted.
(2) Detection limits are given as wet weight basis since the dry weight values are arithmeticaly derived.
(3) Detection limits required by ACOE.

TABLE 2 (Cont'd)

SUMMARY OF SEDIMENT CHARACTERIZATION
Walnut Creek Desilting Project

Site (1)	1	2	3	4	5	6	7	8	Reference	Control	Detection Limit	
											Achieved (2)	Required (3)
PAHs (µg/kg)												
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Benzo (A) Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	67.8	ND	20	20
Benzo(A)Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Benzo(B)Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Benzo(GHI)Perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Benzo(K)Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	
Chrysene	ND	ND	ND	ND	ND	ND	ND	ND	165	ND	20	20
Dibenzo(A,H)Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	428	ND	20	20
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Ideno (1,2,3-CD) Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	280	ND	20	20
1-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Total	0	0	0	0	0	0	0	0	940.8	0		
Phthalate Esters (µg/kg)												
Bis (2-ethylhexyl) Phthalate	204	49.9	120	124	187	228	299	59.9	45.9	191	20	20
Butylbenzyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Di-n-butyl Phthalate	ND	ND	169	182	180	165	178	ND	ND	ND	20	20
Diethyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Dimethyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Di-n-octyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	20
Total	204	49.9	289	306	367	393	477	59.9	45.9	191		

(1) All chemical analyses are given as dry weight basis unless noted.
(2) Detection limits are given as wet weight basis since the dry weight values are arithmeticaly derived.
(3) Detection limits required by ACOE.

TABLE 3

SUMMARY OF STLC SEDIMENT CHARACTERIZATION
Lower Walnut Creek Desilting Project

Site	1	2	3	4	5	6	7	8	Threshold Limits
Metals (mg/kg)									
Antimony	<0.525	<0.525	<0.525	<0.525	<0.525	<0.525	<0.525	<0.525	15
Arsenic	<0.053	0.054	0.081	<0.053	0.084	0.078	0.127	0.139	5
Barium	1.81	3.01	3.55	2.71	3.06	4.26	0.302	4.54	100
Beryllium	0.021	0.021	0.022	0.013	0.013	0.021	0.022	<0.011	0.75
Cadmium	<0.084	<0.084	<0.084	<0.084	<0.084	<0.084	<0.084	<0.084	1.0
Chromium	0.741	1.04	0.545	0.626	0.359	0.374	0.317	0.115	5 (VI)
Cobalt	0.249	0.274	0.305	0.197	0.199	0.202	0.176	0.181	80
Copper	<0.063	<0.063	<0.063	<0.063	<0.063	<0.063	<0.063	<0.063	25
Lead	<0.263	0.375	0.311	<0.263	<0.263	<0.363	0.351	<0.263	5
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.2
Molybdenum	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	350
Nickel	0.415	0.524	0.721	0.524	0.669	0.655	0.560	0.546	20
Selenium	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	1
Silver	0.073	<0.042	<0.042	<0.042	<0.042	0.074	<0.042	0.709	5
Thallium	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	7
Vanadium	1.43	2.19	1.32	1.23	1.00	1.09	1.01	0.667	24
Zinc	1.14	1.13	1.39	0.850	1.30	1.46	1.10	0.839	250

Threshold limits are in mg/kg as wet weight, under CAM Title 22.
(VI) indicates level for chromium VI.

TABLE 4

Bioassay Procedure And Organism Data
For The 48 Hour Liquid/Suspended Phase Bioassay
Using Larvae of *Mytilus edulis* (ASTM 1992a)

Parameter	Data
Sample Identification	
Sample ID(s)	931119-1 to 931119-9
Date Sampled	11/19/93
Date Received	11/19/93
Volume Received	3 - 5 gallons each site
Sample Storage Conditions	4°C in the dark
Test Species	*Mytilus edulis*
Supplier	Kim Siewers, Santa Cruz, CA
Collection location	Santa Cruz, California
Date Acquired	11/24/93
Acclimation Time	Used immediately
Acclimation Water	Damp towels
Acclimation Temperature	4°C- 10°C
Age group	Fertilized embryos, 2 hours
Test Procedures	
Type; Duration	Acute/static; 48 hours
Test Dates	11/24 - 11/26/93
Control Water	Bodega Bay seawater, 0.45 µm filtered and µv-sterilized
Test Temperature	16 ± 2°C
Test Photoperiod	14 L : 10 D
Salinity	30 ± 2 ppt
Test Chamber	4 L glass containers
Animals/Replicate	15-30 embryos per mL
Exposure Volume	100 mL of L/SP concentration and diluent
Replicates/Treatment	3

TABLE 5

Mytilus edulis
SUMMARY OF RESULTS FOR THE ELUTRIATE TESTS

Concentration (%)	Mean Total Normal Larvae/mL	% Treatment Mortality	LC50 (%)	% Abnormal	IC50 (%)
Control	40.3	NA		2.2	
Reference Site					
1	39.9	1.0	>100	1.8	>100
10	35.4	12.2		0.2	
50	38.6	4.2		1.8	
100	35.1	12.9		2.1	
Site 1					
1	28.6*	29.0	23.7 (20.5-27.0)	3.7	29.9 (29.5-30.3)
10	32.5	19.4		2.5	
50	0.1*	99.8		99.6*	
100	0.0*	100.0		100.0*	
Site 2					
1	37.2	7.7	22.7 (17.9-26.5)	1.7	30.0 (29.9-30.0)
10	29.5*	26.8		1.1	
50	0.0*	100.0		100.0*	
100	0.1*	99.8		99.9*	
Site 3					
1	40.2	0.2	28.2 (25.0-30.0)	1.8	30.0 (29.7-30.0)
10	36.9	8.4		2.2	
50	0.0*	100.0		100.0*	
100	0.0*	100.0		100.0*	
Site 4					
1	29.1*	27.8	17.2 (8.5-22.6)	1.9	29.9 (29.5-30.0)
10	24.5*	39.2		2.7	
50	0.0*	100.0		100.0*	
100	0.0*	100.0		100.0*	

* Statistically significant.
LC/IC50: Lethal/Inhibition Concentration for 50% of the organisms.
( ): 95% Confidence limits.

TABLE 5 (Cont'd)

Mytilus edulis
SUMMARY OF RESULTS FOR THE ELUTRIATE TESTS

Concentration (%)	Mean Total Normal Larvae/mL	% Treatment Mortality	LC50 (%)	% Abnormal	IC50 (%)
Site 5					
1	32.9*	18.4	25.1 (23.0-27.0)	0.9	30.0 (29.9-30.0)
10	32.4*	19.6		1.0	
50	0.0*	100.0		100.0*	
100	0.0*	100.0		100.0*	
Site 6					
1	38.5	4.5	29.0 (27.2-30.3)	2.5	30.3 (30.1-30.5)
10	37.9	6.0		0.9	
50	0.5*	98.8		98.4*	
100	0.1*	99.8		99.8*	
Site 7					
1	28.5*	29.3	70.0 (68.1-72.2)	4.2	74.8 (74.1-75.5)
10	36.4*	9.7		2.5	
50	35.4*	12.2		3.8	
100	0.2*	99.6		99.2*	
Site 8					
1	37.4	7.2	23.6 (21.4-25.4)	1.0	30.1 (29.9-30.3)
10	30.3*	24.9		3.4	
50	0.5*	98.8		97.8*	
100	0.1*	99.8		99.5*	

* Statistically significant.
LC/IC50: Lethal/Inhibition Concentration for 50% of the organisms.
( ): 95% Confidence limits.

TABLE 5 (Cont'd)

Mytilus edulis
SUMMARY OF RESULTS
FOR THE REFERENCE TOXICANT (COPPER) TEST

Copper Concentration (µg/L)	Mean Total Normal Larvae/mL	% Treatment Mortality	LC50 (µg/L)	% Abnormal	IC50 (µg/L)
Control	40.3	NA	21.0 (20.0-21.0)	2.2	21.0 (20.8-21.0)
0.18	42.0	0.0		1.3	
0.56	41.3	0.0		1.6	
3.2	40.6	0.0		2.9	
10	42.3	0.0		1.1	
32	0.0*	100.0		100.0*	

* Statistically significant.
LC/IC50: Lethal/Inhibition Concentration for 50% of the organisms.
( ): 95% Confidence limits.

TABLE 6

Bioassay Procedure And Organism Data
For The 10-Day Solid Phase Bioassay
Using *Eohaustorius estuarius* (ASTM 1992b)

Parameter	Data
Sample Identification	
Sample ID(s)	931119-1 to 931119-9
Date Sampled	11/18/93
Date Received at ABT	11/18/93
Volume Received	3 - 5 gallons each site
Sample Storage Conditions	4°C in the dark
Test Species	*Eohaustorius estuarius*
Supplier	Northwest Aquatics, Newport, OR
Collection location	Yaquina Bay
Date Acquired	11/24/93
Acclimation Time	Three days in control sediments
Acclimation Water	30 ppt seawater
Acclimation Temperature	20 ± 1°C
Age group	Juveniles
Test Procedures	
Type; Duration	Acute/static; 10 days
Test Dates	11/28/93 - 12/8/93 and 12/6/93 - 12/10/93
Control Water	Bodega Bay seawater, 0.45 µm filtered and µv-sterilized
Test Temperature	20 ± 3°C (Time-weighted: 20 ± 1°C)
Test Photoperiod	Continuous light
Salinity	25 ± 2 ppt
Test Chamber	1000 mL Ball jars/800 mL seawater
Animals/Replicate	20
Exposure Volume	2.0 cm of sediment
Replicates/Treatment	5
Feeding	None
Deviations from procedures	None

TABLE 7

SUMMARY OF THE AMPHIPOD BIOASSAY
LOWER WALNUT CREEK

Sample	Rep	Initial	Final	Percent Survival	Total Reburying	Percent Reburial
Control	1	20	20	100%	20	100%
	2	20	20	100%	20	100%
	3	20	20	100%	20	100%
	4	20	20	100%	20	100%
	5	20	20	100%	20	100%
		Mean Survival		100%	Mean Reburial	100%
Reference	1	20	20	100%	20	100%
	2	20	20	100%	20	100%
	3	20	20	100%	20	100%
	4	20	20	100%	20	100%
	5	20	20	100%	20	100%
		Mean Survival		100%	Mean Reburial	100%
Site 1	1	20	7	35%	7	100%
	2	20	15	75%	15	100%
	3	20	17	85%	17	100%
	4	20	10	50%	10	100%
	5	20	10	50%	10	100%
		Mean Survival		59%*	Mean Reburial	100%
Site 2	1	20	16	80%	16	100%
	2	20	17	85%	17	100%
	3	20	17	85%	17	100%
	4	20	13	65%	13	100%
	5	20	12	60%	12	100%
		Mean Survival		75%*	Mean Reburial	100%

* Significantly different from the Carquinez Reference (Level of significance = 0.05, one-tailed test)

TABLE 7 (Cont'd)

SUMMARY OF THE AMPHIPOD BIOASSAY
LOWER WALNUT CREEK

Sample	Rep	Initial	Final	Percent Survival	Total Reburying	Percent Reburial
Site 3	1	20	18	90%	18	100%
	2	20	17	85%	17	100%
	3	20	18	90%	18	100%
	4	20	16	80%	16	100%
	5	20	18	90%	16	88.9%
		Mean Survival		87%*	Mean Reburial	97.8%
Site 4	1	20	16	80%	16	100%
	2	20	19	95%	19	100%
	3	20	18	90%	18	100%
	4	20	15	75%	15	100%
	5	20	16	80%	16	100%
		Mean Survival		84%*	Mean Reburial	100%
Site 5	1	20	15	75%	15	100%
	2	20	20	100%	20	100%
	3	20	17	85%	17	100%
	4	20	14	70%	14	100%
	5	20	14	70%	14	100%
		Mean Survival		80%*	Mean Reburial	100%
Site 6	1	20	19	95%	19	100%
	2	20	18	90%	18	100%
	3	20	20	100%	20	100%
	4	20	18	90%	18	100%
	5	20	19	95%	19	100%
		Mean Survival		94%*	Mean Reburial	100%

* Significantly different from the Carquinez Reference (Level of significance = 0.05, one-tailed test)

TABLE 7 (Cont'd)

SUMMARY OF THE AMPHIPOD BIOASSAY
LOWER WALNUT CREEK

Sample	Rep	Initial	Final	Percent Survival	Total Reburying	Percent Reburial
Site 7	1	20	18	90%	18	100%
	2	20	18	90%	18	100%
	3	20	20	100%	20	100%
	4	20	18	90%	18	100%
	5	20	17	85%	17	100%
		Mean Survival		91%*	Mean Reburial	100%
Site 8	1	20	18	90%	18	100%
	2	20	17	85%	17	100%
	3	20	17	85%	17	100%
	4	20	19	95%	19	100%
	5	20	18	90%	18	100%
		Mean Survival		89%*	Mean Reburial	100%

* Significantly different from the Carquinez Reference (Level of significance = 0.05, one-tailed test)

5.0
DISCUSSION

5.1 CHEMISTRY AND PHYSICAL RESULTS

The analyses of the eight test site composites demonstrated no significant pesticides, PCBs or PAHs. No detectable levels of organic tin were noted. For those constituents found above detection limits (most of the heavy metals, TRPH and sulfides) there appears to be a gradient from Site 1 (at Suisun Bay) to Site 8 (near Highway 4), with high levels in lower reaches and lower levels in Sites 7 and 8. The levels of most of the metals were higher in the test sites than in the Carquinez reference material with maximum differential ranging from 1.3 (nickel) to 9.8 (cadmium). Six of the metals had differential levels less than 3.0 (zinc, selenium, arsenic, chromium, lead and nickel).

Low levels of PAHs were found at the reference site. Phthalates were noted at all of the test sites, the reference site and the control site. Bis (2-ethylhexyl) phthalate was found at all of the sites while di-n-Butyl phthalate was found only at Sites 3 to 7. Both of these compounds are common laboratory contaminants. It is likely that these constituents are generated during the sediment collection, compositing, and analytical testing procedures.

Grain-size distribution at the sites was typical for low gradient stream channels with coarser sediments being deposited in the upper sites and the finer components, clays and silts, being deposited in the lower sites where tidal effects would cause this type of depositional pattern.

In the analysis of the solubility potential from these sediments, no results exceeded or were even close to the threshold levels defined in CAM Title 22. In light of these results, the deposition of this material on land should have no significant impact on surface or ground water from leachates from this material.

Potential Fate and Effects of Chemical Constituents

Much of the data concerning metal transport and accumulation in sediments in aquatic environments indicates that significantly higher metal concentrations occur in the finer grain-size fraction. This trend is predominantly attributed to sorption, coprecipitation and complexing of metals on particulate surfaces and coatings. Smaller particles have larger surface area/volume ratios, and therefore smaller size fractions contain higher concentrations of metals.

Because metals in the finer grain sediment fraction are generally absorbed or coprecipitated on the particulate surface, trends in concentrations of metals in fine fractions may also document anthropogenic inputs (Moore *et al.*, 1989, Campbell *et al.*, 1988).

In cities and major urban areas metals frequently originate from industrial operations, however the automobile is the major source of many of the heavy metals observed in sediments in runoff areas.

The Lower Walnut Creek Flood Control Channel acts as a sink for particulates and heavy metals. The wetland areas as well as the braided channels act to reduce velocities and result in particulate settlement. The coarser grain sediments are deposited in the upper reaches of the zone; while finer grained particulates move further down stream until they reach the effect of tidal action.

The analysis of the sediment composites from the lower Walnut Creek Flood Control Channel revealed levels of heavy metals that would be generally expected in non-point source deposition areas such as a flood control channel receiving surface runoff from streets, residential areas, industrial zones, and commercial development.

In general, sorbed and particulate heavy metals in sedimentary material do not become soluble under disposal conditions. The results of the STLC analysis also indicated a very low potential for heavy metals to become soluble in upland disposal conditions. Based upon these results, there is a low potential for these sediments to create toxic conditions upon disposal or to increase the potential for bioaccumulation in benthic organisms.

5.2 BIOASSAY RESULTS

5.2.1 Bivalve Larvae Bioassay

The results of the L/SP bioassays appear to indicate a potential for toxicity from the disposal of this material at the SF-9 Site. However on close evaluation of the data, the mortality is really the result of abnormal development, particularly at the 50% and 100% elutriate concentrations. The embryos did not reach the D-hinge stage and appeared to be in a stasis at the blastula stage. This type of response was observed in the winter of 1992-93 and may be attributed to a natural toxin on the sediments. This phenomenon is currently being examined in a research project at ABT.

The LPC values are not exceeded by any of the test sites (Table 8) under PN 93-2 rules.

5.2.2 Amphipod Solid-Phase Bioassays

In the 10 day solid phase bioassay control survival was 100% indicating that test conditions were acceptable. Survival in the reference sediment from the Carquinez disposal site was also 100%. Both of these sediments were sand and were an excellent substrate for *Eohaustorius*.

Survival in the test sediments ranged from 59% in Site 1 to 94% in Site 6. There was a general increase in survival as the stations went upstream. The percentage of sand also increased from Site 1 to Site 8 from 11% at Site 1 to 32% at Site 8. Based upon the grain-size analysis it appeared that at 20% sand, survival increased.

In a statistical comparison to the reference site all of the sites were significantly different from the reference. Due to the 100% survival in the reference, all of the statistical analyses were run using non-parametric tests, since the variances were not homogeneous.

Only sites 1 and 2 exceeded the 20% rule in PN 93-2 and would have the potential to exceed the solid phase LPC. Site 5 had 80% survival and could be considered to be marginally significant.

5.3 SUMMARY

- Chemical analysis of the test sediments revealed elevated levels of metals compared to the reference site.
- Metal levels were generally decreased at the upstream sites in the coarser grained sediments.
- No significant pesticide, PCB or PAH contamination was identified.
- The grain-size analysis revealed gradients from upstream to downstream.
- The test site sediments were analyzed using the STLC analysis. None of these sites revealed significant solubilization of metals when compared to the threshold values from Title 22.
- Toxicity was observed in the bivalve larvae bioassay, but no site exceeded the LPC. Similar toxicity was observed in 1992 at sites around the Bay which may have been the result of a naturally occurring toxin.

- In the solid phase bioassay, Sites 1 and 2 exceeded the LPC; Site 5 was exactly 20% different from the reference. All of the other sites were within the 20% rule and were acceptable.

TABLE 8

CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

Project Site: Walnut Creek Flood Control Channel

Species: *Mytilus edulis* **Disposal Site:** Carquinez

Mixing Zone Estimation	Site 1	Site 2	Site 3	Site 4
Depth of disposal site (m)=	10	10	10	10
Pi=	3.14159	3.14159	3.14159	3.14159
Width of vessel (m)=	8	8	8	8
Length of vessel(m)=	30	30	30	30
Speed of vessel (m/sec)=	0.5	0.5	0.5	0.5
Time of discharge (sec)=	30	30	30	30
Depth of vessel (m)=	5	5	5	5
Mixing Zone Volume(cu.m)=	423759	423759	423759	423759
Volume of Liquid Phase				
Bulk density (constant) =	1.3	1.3	1.3	1.3
Particle density (constant) =	2.6	2.6	2.6	2.6
Density of liquid phase (constant) =	1	1	1	1
Vol of disposal vessel (cu.m)=	1200	1200	1200	1200
Liquid phase volume (cu.m)=	975	975	975	975
Concentration of suspended phase				
Percent Silt=	47.6	51.1	44.4	37.4
Percent Clay=	40.1	37.3	36.7	39.3
Volume of Suspended Phase (cu.m)=	197	199	182	173
Projected Concentration (percent SP) =	0.0466	0.0469	0.0431	0.0407
Lowest LC50 or EC50 from bioassay=	23.7	22.7	28.2	17.2
Factor LC50 or EC 50 X 0.01=	0.237	0.227	0.282	0.172

The factored LC50 or EC50 is higher than the projected concentration; therefore the Limiting Permissible Concentration is not exceeded for this dredge material for the site specified.

Site 1	**TRUE**
Site 2	**TRUE**
Site 3	**TRUE**
Site 4	**TRUE**

TABLE 8 (Cont'd)

CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

Project Site: Walnut Creek Flood Control Channel

Species: *Mytilus edulis* **Disposal Site:** Carquinez

Mixing Zone Estimation	Site 5	Site 6	Site 7	Site 8
Depth of disposal site (m)=	10	10	10	10
Pi=	3.14159	3.14159	3.14159	3.14159
Width of vessel (m)=	8	8	8	8
Length of vessel(m)=	30	30	30	30
Speed of vessel (m/sec)=	0.5	0.5	0.5	0.5
Time of discharge (sec)=	30	30	30	30
Depth of vessel (m)=	5	5	5	5
Mixing Zone Volume(cu.m)=	423759	423759	423759	423759
Volume of Liquid Phase				
Bulk density (constant) =	1.3	1.3	1.3	1.3
Particle density (constant) =	2.6	2.6	2.6	2.6
Density of liquid phase (constant) =	1	1	1	1
Vol of disposal vessel (cu.m)=	1200	1200	1200	1200
Liquid phase volume (cu.m)=	975	975	975	975
Concentration of suspended phase				
Percent Silt=	37.9	42.9	30.5	34.2
Percent Clay=	43.1	33.3	37.6	31.3
Volume of Suspended Phase (cu.m)=	182	171	153	147
Projected Concentration (percent SP) =	0.0430	0.0405	0.0362	0.0348
Lowest LC50 or EC50 from bioassay=	25.1	29.0	70.0	23.6
Factor LC50 or EC 50 X 0.01=	0.251	0.29	0.7	0.236

The factored LC50 or EC50 is higher than the projected concentration; therefore the Limiting Permissible Concentration is not exceeded for this dredge material for the site specified.

Site 5	**TRUE**
Site 6	**TRUE**
Site 7	**TRUE**
Site 8	**TRUE**

Army Corps of Engineers, San Francisco District, Environmental Protection Agency, Region 9, California Regional Water Quality Board, San Francisco Bay Region; and the Bay Conservation Development Commission. 1992. Testing Procedures for Evaluating Dredged Material Suitability for Disposal in San Francisco Bay (Implementation of Requirements under Section 404 of the Clean Water Act). Public Notice 93-2. (Tier 2)

ASTM. 1992a. Annual Book of Standards. Vol. 11.04. Standard guide for conducting static acute toxicity tests starting with embryos of four species of saltwater bivalve molluscs. E724-89.

ASTM. 1992b. Annual Book of Standards. Vol. 11.04. Guide for conducting 10-day static sediment toxicity tests with marine and estuarine amphipods. E-1367-90.

Campbell, J.A., J.V. Towner and R. Vallurupalli. 1988. Distribution of heavy metals in sewage sludge: the effect of particle size, Chemical and Biological Characterization of Sludges, Sediments, Dredge Spoils, and Drilling Muds. ASTM STP 976, J.J. Lichtenberg, J.A. Winter, C.I. Weber, and L. Fradkin, Eds., American Society for Testing and Materials, Philadelphia, 1988, pp. 93-101.

Menzel, D.W., and R.F. Vaccarro. 1964. The measurement of dissolved organic and particulate carbon in seawater. Limnology and Oceanography, Vol. 9, pp. 138-142.

Moore, J.N., E.J., Brook, and C. Johns. Grain size partitioning of metals in contaminated, coarse-grained river floodplain sediment: Clark Fork River, Montana, U.S.A. Environ Geol Water Sci Vol. 14, No. 2, 107-115.

Plumb, R.H., Jr. 1981. Procedure for handling and chemical analysis of sediment and water samples. Technical Report EPA/CE-81-1, Vicksburg, MS: U.S. Environmental Protection Agency/U.S. Army Corps of Engineers Technical Committee on criteria for dredged and fill material, U.S. Army Waterways Experimental Station. 471 pages.

U.W. EPA. 1988. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. Weber, C.I., *et al.*, eds, Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH, EPA/600/4-87/028.

U.S. EPA/ACOE. 1991. Evaluation of Dredged Material Proposed for Ocean Disposal-Testing Manual. Office of Water. Washington, DC. EPA-503/8-91/001. February 1991.

APPENDIX A

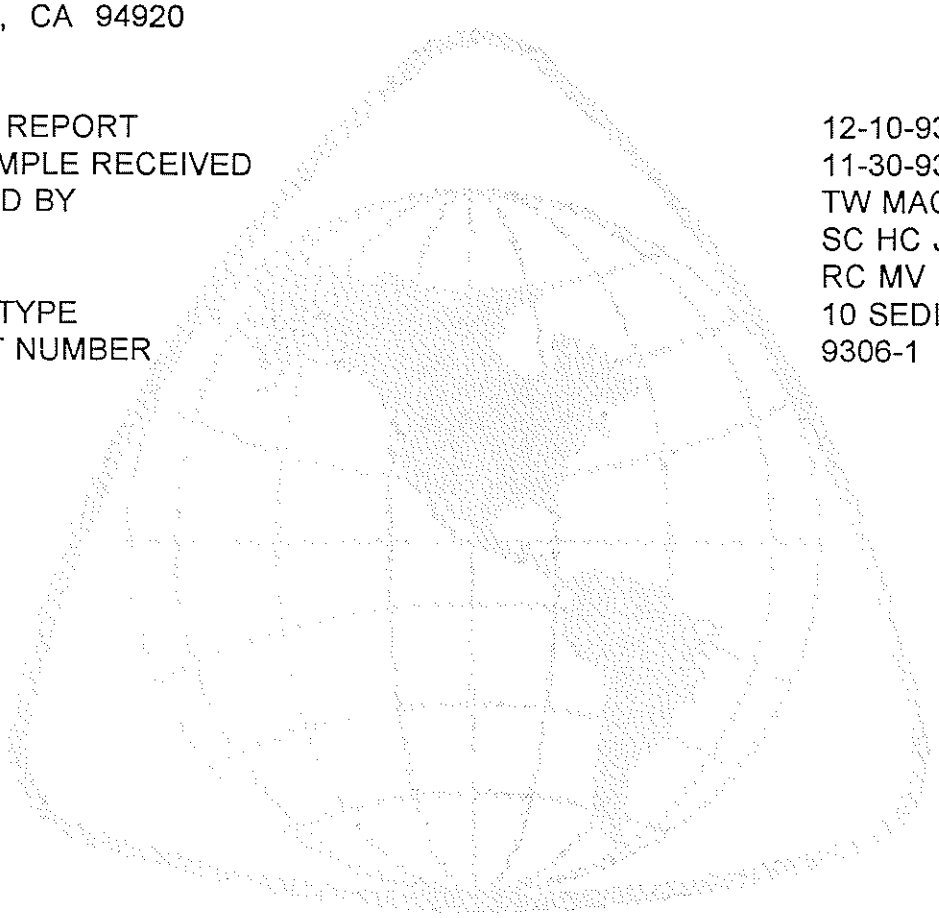
PHYSICAL ANALYSES AND BULK CHEMICAL TESTING

SEDIMENT CHEMISTRY

Quality Assurance Laboratory
6605 NANCY RIDGE DRIVE
SAN DIEGO, CALIFORNIA 92121
(619) 552-3636

ADVANCED BIOLOGICAL TESTING
ATTN: KURT KLINE
98 MAIN ST, STE 419
TIBURON, CA 94920

DATE OF REPORT	12-10-93
DATE SAMPLE RECEIVED	11-30-93
ANALYZED BY	TW MAC MV DL SC HC JM FM EA RC MV
SAMPLE TYPE	10 SEDIMENT
PROJECT NUMBER	9306-1



QUALITY ASSURANCE
LABORATORY

12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19307-9311
SAMPLE ID: 931119-1
SITE WC-1

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			47.0
ZINC	3050/6010	MG/KG	1	53.4	114
MERCURY	7471	MG/KG	2	2.9	6.2
SELENIUM	3050/7740	MG/KG	1	< 0.100	< 0.213
ARSENIC	3050/7060	MG/KG	10	4.28	9.11
CADMIUM	3050/7131	MG/KG	5	0.245	0.521
CHROMIUM	3050/6010	MG/KG	1	33.6	71.5
COPPER	3050/6010	MG/KG	1	25.8	54.9
LEAD	3050/6010	MG/KG	1	13.9	29.6
NICKEL	3050/6010	MG/KG	1	31.4	66.8
SILVER	3050/6010	MG/KG	1	< 0.080	< 0.170
TOTAL SULFIDE	*	MG/KG	1	164	349
DISSOLVED SULFIDE	**	MG/KG	1	0.2	0.4
TOC	EPA 415.1	MG/KG	1	6700	14300
TRPH	3550/EPA 418.1	MG/KG	1	68.7	146
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 2.1
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 2.1
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 2.1

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - TOTAL SULFIDE, DISSOLVED SULFIDE
12-7-93 - TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
LABORATORY DIRECTOR

PS/cap

QUALITY ASSURANCE
LABORATORY

12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19308-9311
SAMPLE ID: 931119-2
SITE WC-2

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			88.2
ZINC	3050/6010	MG/KG	1	57.9	65.6
MERCURY	7471	MG/KG	1	2.65	3.00
SELENIUM	3050/7740	MG/KG	1	< 0.100	< 0.113
ARSENIC	3050/7060	MG/KG	10	4.09	4.64
CADMIUM	3050/7131	MG/KG	5	0.287	0.325
CHROMIUM	3050/6010	MG/KG	1	40.2	45.6
COPPER	3050/6010	MG/KG	1	26.2	29.7
LEAD	3050/6010	MG/KG	1	23.4	26.5
NICKEL	3050/6010	MG/KG	1	33.3	37.8
SILVER	3050/6010	MG/KG	1	< 0.079	< 0.090
TOTAL SULFIDE	*	MG/KG	1	166	188
DISSOLVED SULFIDE	**	MG/KG	1	0.2	0.2
TOC	EPA 415.1	MG/KG	1	8580	9730
TRPH	3550/EPA 418.1	MG/KG	1	64.1	72.7
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.1
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.1
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.1

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - TOTAL SULFIDE, DISSOLVED SULFIDE
12-7-93 - TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
LABORATORY DIRECTOR

PS/cap

QUALITY ASSURANCE
LABORATORY

12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19309-9311
SAMPLE ID: 931119-3
SITE WC-3

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			53.1
ZINC	3050/6010	MG/KG	1	52.0	97.9
MERCURY	7471	MG/KG	1	2.50	4.71
SELENIUM	3050/7740	MG/KG	1	< 0.099	< 0.186
ARSENIC	3050/7060	MG/KG	10	3.68	6.93
CADMIUM	3050/7131	MG/KG	5	0.231	0.435
CHROMIUM	3050/6010	MG/KG	1	32.3	60.8
COPPER	3050/6010	MG/KG	1	23.8	44.8
LEAD	3050/6010	MG/KG	1	18.3	34.5
NICKEL	3050/6010	MG/KG	1	30.8	58.0
SILVER	3050/6010	MG/KG	1	< 0.080	< 0.151
TOTAL SULFIDE	*	MG/KG	1	152	286
DISSOLVED SULFIDE	**	MG/KG	1	0.2	0.4
TOC	EPA 415.1	MG/KG	1	6990	13200
TRPH	3550/EPA 418.1	MG/KG	1	53.1	100
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.9
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.9
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.9

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - TOTAL SULFIDE, DISSOLVED SULFIDE
12-7-93 - TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
LABORATORY DIRECTOR

PS/cap

QUALITY ASSURANCE
LABORATORY

12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19310-9311
SAMPLE ID: 931119-4
SITE WC-4

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			53.9
ZINC	3050/6010	MG/KG	1	46.7	86.6
MERCURY	7471	MG/KG	1	2.50	4.64
SELENIUM	3050/7740	MG/KG	1	< 0.098	< 0.182
ARSENIC	3050/7060	MG/KG	10	4.32	8.01
CADMIUM	3050/7131	MG/KG	5	0.253	0.469
CHROMIUM	3050/6010	MG/KG	1	29.5	54.7
COPPER	3050/6010	MG/KG	1	23.2	43.0
LEAD	3050/6010	MG/KG	1	16.9	31.4
NICKEL	3050/6010	MG/KG	1	28.8	53.4
SILVER	3050/6010	MG/KG	1	< 0.079	< 0.147
TOTAL SULFIDE	*	MG/KG	1	165	306
DISSOLVED SULFIDE	**	MG/KG	1	0.2	0.4
TOC	EPA 415.1	MG/KG	1	16600	30800
TRPH	3550/EPA 418.1	MG/KG	1	55.2	102
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.9
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.9
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.9

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - TOTAL SULFIDE, DISSOLVED SULFIDE
12-7-93 - TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
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12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19311-9311
SAMPLE ID: 931119-5
SITE WC-5

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			51.1
ZINC	3050/6010	MG/KG	1	48.9	95.7
MERCURY	7471	MG/KG	1	2.4	4.7
SELENIUM	3050/7740	MG/KG	1	< 0.100	< 0.196
ARSENIC	3050/7060	MG/KG	10	3.76	7.36
CADMIUM	3050/7131	MG/KG	5	0.266	0.521
CHROMIUM	3050/6010	MG/KG	1	29.1	56.9
COPPER	3050/6010	MG/KG	1	22.3	43.6
LEAD	3050/6010	MG/KG	1	17.8	34.8
NICKEL	3050/6010	MG/KG	1	28.2	55.2
SILVER	3050/6010	MG/KG	1	< 0.080	< 0.157
TOTAL SULFIDE	*	MG/KG	1	165	323
DISSOLVED SULFIDE	**	MG/KG	1	0.4	0.8
TOC	EPA 415.1	MG/KG	1	7730	15100
TRPH	3550/EPA 418.1	MG/KG	1	42.8	83.8
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 2.0
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 2.0
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 2.0

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - DISSOLVED SULFIDE
12-7-93 - TOTAL SULFIDE, TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

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12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19312-9311
SAMPLE ID: 931119-6
SITE WC-6

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			57.8
ZINC	3050/6010	MG/KG	1	50.5	87.4
MERCURY	7471	MG/KG	1	2.3	4.0
SELENIUM	3050/7740	MG/KG	1	< 0.098	< 0.170
ARSENIC	3050/7060	MG/KG	10	3.21	5.55
CADMIUM	3050/7131	MG/KG	5	0.278	0.481
CHROMIUM	3050/6010	MG/KG	1	27.5	47.6
COPPER	3050/6010	MG/KG	1	20.8	36.0
LEAD	3050/6010	MG/KG	1	20.8	36.0
NICKEL	3050/6010	MG/KG	1	28.7	49.7
SILVER	3050/6010	MG/KG	1	< 0.079	< 0.137
TOTAL SULFIDE	*	MG/KG	1	151	261
DISSOLVED SULFIDE	**	MG/KG	1	0.3	0.5
TOC	EPA 415.1	MG/KG	1	9970	17300
TRPH	3550/EPA 418.1	MG/KG	1	57.4	99.3
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.7
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.7
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.7

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - DISSOLVED SULFIDE
12-7-93 - TOTAL SULFIDE, TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
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12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19313-9311
SAMPLE ID: 931119-7
SITE WC-7

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			59.1
ZINC	3050/6010	MG/KG	1	45.7	77.3
MERCURY	7471	MG/KG	1	1.65	2.79
SELENIUM	3050/7740	MG/KG	1	< 0.098	< 0.166
ARSENIC	3050/7060	MG/KG	10	3.67	6.21
CADMIUM	3050/7131	MG/KG	2	0.168	0.284
CHROMIUM	3050/6010	MG/KG	1	26.6	45.0
COPPER	3050/6010	MG/KG	1	18.4	31.1
LEAD	3050/6010	MG/KG	1	14.3	24.2
NICKEL	3050/6010	MG/KG	1	25.9	43.8
SILVER	3050/6010	MG/KG	1	0.387	0.655
TOTAL SULFIDE	*	MG/KG	1	162	274
DISSOLVED SULFIDE	**	MG/KG	1	0.2	0.3
TOC	EPA 415.1	MG/KG	1	6810	11500
TRPH	3550/EPA 418.1	MG/KG	1	42.8	72.4
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.7
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.7
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.7

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - DISSOLVED SULFIDE
12-7-93 - TOTAL SULFIDE, TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
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LABORATORY

12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19314-9311
SAMPLE ID: 931119-8
SITE WC-8

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			64.8
ZINC	3050/6010	MG/KG	1	41.5	64.0
MERCURY	7471	MG/KG	1	0.850	1.31
SELENIUM	3050/7740	MG/KG	1	< 0.100	< 0.154
ARSENIC	3050/7060	MG/KG	10	3.19	4.92
CADMIUM	3050/7131	MG/KG	2	0.208	0.321
CHROMIUM	3050/6010	MG/KG	1	22.4	34.6
COPPER	3050/6010	MG/KG	1	13.5	20.8
LEAD	3050/6010	MG/KG	1	10.3	15.9
NICKEL	3050/6010	MG/KG	1	26.0	40.1
SILVER	3050/6010	MG/KG	1	< 0.079	< 0.122
TOTAL SULFIDE	*	MG/KG	1	78.4	121
DISSOLVED SULFIDE	**	MG/KG	1	< 0.1	< 0.2
TOC	EPA 415.1	MG/KG	1	6200	9570
TRPH	3550/EPA 418.1	MG/KG	1	15.7	24.2
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.5
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.5
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.5

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - DISSOLVED SULFIDE
12-7-93 - TOTAL SULFIDE, TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
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12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19315-9311
SAMPLE ID: 931119-9
REF SITE

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			77.4
ZINC	3050/6010	MG/KG	1	41.1	53.1
MERCURY	7471	MG/KG	1	0.650	0.840
SELENIUM	3050/7740	MG/KG	1	< 0.100	< 0.129
ARSENIC	3050/7060	MG/KG	10	4.19	5.41
CADMIUM	3050/7131	MG/KG	1	0.041	0.053
CHROMIUM	3050/6010	MG/KG	1	31.5	40.7
COPPER	3050/6010	MG/KG	1	8.25	10.7
LEAD	3050/6010	MG/KG	1	9.50	12.3
NICKEL	3050/6010	MG/KG	1	40.2	51.9
SILVER	3050/6010	MG/KG	1	< 0.079	< 0.102
TOTAL SULFIDE	*	MG/KG	1	0.97	1.25
DISSOLVED SULFIDE	**	MG/KG	1	< 0.1	< 0.1
TOC	EPA 415.1	MG/KG	1	1710	2210
TRPH	3550/EPA 418.1	MG/KG	1	10.8	14.0
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.3
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.3
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.3

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - DISSOLVED SULFIDE
12-7-93 - TOTAL SULFIDE, TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
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12/13/93

ADVANCED BIOLOGICAL TESTING
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19316-9311
SAMPLE ID: 931124-1
CONTROL SITE

ANALYSIS	PREP/ANALYSIS METHOD	UNITS	DF	WET WEIGHT	DRY WEIGHT
% SOLID	STD 2540-G	%			79.9
ZINC	3050/6010	MG/KG	1	10.3	12.9
MERCURY	7471	MG/KG	1	< 0.500	< 0.626
SELENIUM	3050/7740	MG/KG	1	< 0.098	< 0.123
ARSENIC	3050/7060	MG/KG	10	2.90	3.63
CADMIUM	3050/7131	MG/KG	1	< 0.020	< 0.025
CHROMIUM	3050/6010	MG/KG	1	8.39	10.5
COPPER	3050/6010	MG/KG	1	1.67	2.09
LEAD	3050/6010	MG/KG	1	2.20	2.75
NICKEL	3050/6010	MG/KG	1	5.35	6.70
SILVER	3050/6010	MG/KG	1	< 0.079	< 0.099
TOTAL SULFIDE	*	MG/KG	1	0.25	0.31
DISSOLVED SULFIDE	**	MG/KG	1	< 0.1	< 0.1
TOC	EPA 415.1	MG/KG	1	346	433
TRPH	3550/EPA 418.1	MG/KG	1	9.2	11.5
TRIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.3
DIBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.3
MONOBUTYLTIN	GCFPD	UG/KG	1	< 1.0	< 1.3

* MOD AOAC 1.013/STD 4500-D
** 1:1 EXTRACT ZINC ACETATE/STD 4500-D
TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATE EXTRACTED:
12-1-93 - ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-6-93 - TRPH
12-9-93 - MERCURY

DATE ANALYZED:
11-30-93 - % TOTAL SOLIDS
12-1-93 - TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
12-3-93 - ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
12-6-93 - DISSOLVED SULFIDE
12-7-93 - TOTAL SULFIDE, TOC, ARSENIC
12-8-93 - TRPH
12-9-93 - MERCURY

DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

PETER T.L. SHEN
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12/13/93

ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19307-9311
SAMPLE ID: 931119-1
SITE WC-1

ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			47.0
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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12/13/93

ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19308-9311	
	SAMPLE ID:	931119-2	
		SITE WC-2	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			88.2
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19309-9311
SAMPLE ID: 931119-3
SITE WC-3

ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			53.1
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19310-9311	
	SAMPLE ID:	931119-4	
		SITE WC-4	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			53.9
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19311-9311	
	SAMPLE ID:	931119-5	
		SITE WC-5	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			51.1
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19312-9311	
	SAMPLE ID:	931119-6	
		SITE WC-6	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			57.8
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19313-9311
SAMPLE ID: 931119-7
SITE WC-7

ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			59.1
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19314-9311
SAMPLE ID: 931119-8
SITE WC-8

ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			64.8
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19315-9311	
	SAMPLE ID:	931119-9	
		REF SITE	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			77.4
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550/3620
ANALYSIS METHOD: EPA METHOD 8080
DATE EXTRACTED: 12-5-93
DATE ANALYZED: 12-8-93
ORGANOCHLORINE PESTICIDES AND PCB
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19316-9311	
	SAMPLE ID:	931124-1	
		CONTROL SITE	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			79.9
4,4' - DDD	2	ND	ND
4,4' - DDE	2	ND	ND
4,4' - DDT	2	ND	ND
ALDRIN	2	ND	ND
ALPHA-BHC	2	ND	ND
BETA-BHC	2	ND	ND
CHLORDANE	25	ND	ND
DELTA-BHC	2	ND	ND
DIELDRIN	2	ND	ND
ENDOSULFAN I	10	ND	ND
ENDOSULFAN II	2	ND	ND
ENDOSULFAN SULFATE	25	ND	ND
ENDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
LINDANE	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	20	ND	ND
PCB-1221	20	ND	ND
PCB-1232	20	ND	ND
PCB-1242	20	ND	ND
PCB-1248	20	ND	ND
PCB-1254	20	ND	ND
PCB-1260	20	ND	ND
TOTAL ORGANOCHLORINE PESTICIDES		ND	ND
TOTAL PCB'S		ND	ND

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19307-9311	
	SAMPLE ID:	931119-1	
		SITE WC-1	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			47.0
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19308-9311	
	SAMPLE ID:	931119-2	
		SITE WC-2	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			88.2
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19309-9311	
	SAMPLE ID:	931119-3	
		SITE WC-3	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			53.1
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19310-9311
SAMPLE ID: 931119-4
SITE WC-4

ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			53.9
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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12/13/93

ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19311-9311	
	SAMPLE ID:	931119-5	
		SITE WC-5	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			51.1
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19312-9311
SAMPLE ID: 931119-6
SITE WC-6

ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			57.8
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19313-9311	
	SAMPLE ID:	931119-7	
		SITE WC-7	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			59.1
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19314-9311	
	SAMPLE ID:	931119-8	
		SITE WC-8	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			64.8
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19315-9311	
	SAMPLE ID:	931119-9 REF SITE	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			77.4
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	52.5	67.8
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	128	165
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	331	428
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	217	280
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		729	941

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8100 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
POLYNUCLEAR AROMATIC HYDROCARBONS
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19316-9311	
	SAMPLE ID:	931124-1	
		CONTROL SITE	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			79.9
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	ND	ND
BENZO(A)ANTHRACENE	20	ND	ND
BENZO(A)PYRENE	20	ND	ND
BENZO(B)FLUORANTHENE	20	ND	ND
BENZO(GHI)PERYLENE	20	ND	ND
BENZO(K)FLUORANTHENE	20	ND	ND
CHRYSENE	20	ND	ND
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	ND	ND
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	ND	ND
PYRENE	20	ND	ND
1-METHYLPHENANTHRENE	20	ND	ND
2-METHYLPHENANTHRENE	20	ND	ND
TOTAL PAHs		ND	ND

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19307-9311	
	SAMPLE ID:	931119-1	
		SITE WC-1	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			47.0
BIS(2-ETHYLHEXYL)PHTHALATE	20	96.0	204
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	ND	ND
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		96.0	204

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

		LOG NUMBER:	19308-9311
		SAMPLE ID:	931119-2
			SITE WC-2
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			88.2
BIS(2-ETHYLHEXYL)PHTHALATE	20	44.0	49.9
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	ND	ND
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		44.0	49.9

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19309-9311	
	SAMPLE ID:	931119-3	
		SITE WC-3	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			53.1
BIS(2-ETHYLHEXYL)PHTHALATE	20	63.8	120
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	89.8	169
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		154	289

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19310-9311	
	SAMPLE ID:	931119-4	
		SITE WC-4	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			53.9
BIS(2-ETHYLHEXYL)PHTHALATE	20	66.8	124
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	98.3	182
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		165	306

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19311-9311	
	SAMPLE ID:	931119-5	
		SITE WC-5	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			51.1
BIS(2-ETHYLHEXYL)PHTHALATE	20	95.8	187
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	91.8	180
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		188	367

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19312-9311	
	SAMPLE ID:	931119-6	
		SITE WC-6	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			57.8
BIS(2-ETHYLHEXYL)PHTHALATE	20	132	228
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	95.3	165
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		227	393

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19313-9311	
	SAMPLE ID:	931119-7	
		SITE WC-7	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			59.1
BIS(2-ETHYLHEXYL)PHTHALATE	20	177	299
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	105	178
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		282	477

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19314-9311	
	SAMPLE ID:	931119-8	
		SITE WC-8	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			64.8
BIS(2-ETHYLHEXYL)PHTHALATE	20	38.8	59.9
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	ND	ND
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		38.8	59.9

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

	LOG NUMBER:	19315-9311	
	SAMPLE ID:	931119-9	
		REF SITE	
ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			77.4
BIS(2-ETHYLHEXYL)PHTHALATE	20	35.5	45.9
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	ND	ND
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		35.5	45.9

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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ADVANCED BIOLOGICAL TESTING
EXTRACTION METHOD: EPA METHOD 3550
ANALYSIS METHOD: EPA METHOD 8060 BY EPA 8270
EXTRACTION DATE: 12-6-93
ANALYSIS DATE: 12-9-93
PHTHALATE ESTER
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 19316-9311
SAMPLE ID: 931124-1
CONTROL SITE

ANALYSIS	DETECTION LIMIT UG/KG	WET WEIGHT UG/KG	DRY WEIGHT UG/KG
% SOLID			79.9
BIS(2-ETHYLHEXYL)PHTHALATE	20	153	191
BUTYL BENZYL PHTHALATE	20	ND	ND
DI-N-BUTYL PHTHALATE	20	ND	ND
DIETHYL PHTHALATE	20	ND	ND
DIMETHYL PHTHALATE	20	ND	ND
DI-N-OCTYL PHTHALATE	20	ND	ND
TOTAL PHTHALATE ESTERs		153	191

ND = NONE DETECTED

% SOLIDS METHOD: STD 2540-G
% SOLIDS UNITS: %
% SOLIDS DATE ANALYZED: 11-30-93

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STLC CHEMISTRY

12-13-93

ADVANCED BIOLOGICAL TESTING
TITLE 22 - METALS STLC
SAMPLE TYPE - SEDIMENT

ANALYSES RESULTS

ANALYSIS	PREP/ANALYSIS METHOD	LOG NUMBER: 19307-9311 SAMPLE ID: 931119-1 SITE WC-1 UNITS: MG/L	19308-9311 931119-2 SITE WC-2 MG/L
ANTIMONY	3020/6010	<0.525	<0.525
ARSENIC	3020/7060	<0.053	0.054
BARIUM	3020/6010	1.81	3.01
BERYLLIUM	3020/6010	0.021	0.021
CADMIUM	3020/6010	<0.084	<0.084
CHROMIUM	3020/6010	0.741	1.04
COBALT	3020/6010	0.249	0.274
COPPER	3020/6010	<0.063	<0.063
LEAD	3020/6010	<0.263	0.375
MERCURY	7470	<0.010	<0.010
MOLYBDENUM	3020/6010	<0.053	<0.053
NICKEL	3020/6010	0.415	0.524
SELENIUM	3020/7740	<0.053	<0.053
SILVER	3020/6010	0.073	<0.042
THALLIUM	3020/7841	<0.053	<0.053
VANADIUM	3020/6010	1.43	2.19
ZINC	3020/6010	1.14	1.13

DATE EXTRACTED: 12-6-93 - ANTIMONY, ARSENIC, BARIUM, BERYLLIUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MOLYBDENUM, NICKEL, SELENIUM, SILVER, THALLIUM, VANADIUM, ZINC
12-7-93 - MERCURY

DATE ANALYZED: 12-6-93 - ARSENIC
12-8-93 - ANTIMONY, BARIUM, BERYLLIUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MERCURY, MOLYBDENUM, NICKEL, SELENIUM, SILVER, THALLIUM, VANADIUM, ZINC

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12-13-93

ADVANCED BIOLOGICAL TESTING
TITLE 22 - METALS STLC
SAMPLE TYPE - SEDIMENT

ANALYSES RESULTS

ANALYSIS	PREP/ANALYSIS METHOD	LOG NUMBER: 19309-9311 SAMPLE ID: 931119-3 SITE WC-3 UNITS: MG/L	19310-9311 931119-4 SITE WC-4 MG/L
ANTIMONY	3020/6010	<0.525	<0.525
ARSENIC	3020/7060	0.081	<0.053
BARIUM	3020/6010	3.55	2.71
BERYLLIUM	3020/6010	0.022	0.013
CADMIUM	3020/6010	<0.084	<0.084
CHROMIUM	3020/6010	0.545	0.626
COBALT	3020/6010	0.305	0.197
COPPER	3020/6010	<0.063	<0.063
LEAD	3020/6010	0.311	<0.263
MERCURY	7470	<0.010	<0.010
MOLYBDENUM	3020/6010	<0.053	<0.053
NICKEL	3020/6010	0.721	0.524
SELENIUM	3020/7740	<0.053	<0.053
SILVER	3020/6010	<0.042	<0.042
THALLIUM	3020/7841	<0.053	<0.053
VANADIUM	3020/6010	1.32	1.23
ZINC	3020/6010	1.39	0.850

DATE EXTRACTED: 12-6-93 - ANTIMONY, ARSENIC, BARIUM, BERYLLIUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MOLYBDENUM, NICKEL, SELENIUM, SILVER, THALLIUM, VANADIUM, ZINC
12-7-93 - MERCURY

DATE ANALYZED: 12-6-93 - ARSENIC
12-8-93 - ANTIMONY, BARIUM, BERYLLIUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MERCURY, MOLYBDENUM, NICKEL, SELENIUM, SILVER, THALLIUM, VANADIUM, ZINC

PETER T.L. SHEN
LABORATORY DIRECTOR

PS/cap

QUALITY ASSURANCE
LABORATORY

12-13-93

ADVANCED BIOLOGICAL TESTING
TITLE 22 - METALS STLC
SAMPLE TYPE - SEDIMENT

ANALYSES RESULTS

ANALYSIS	PREP/ANALYSIS METHOD	LOG NUMBER: 19311-9311 SAMPLE ID: 931119-5 SITE WC-5 UNITS: MG/L	19312-9311 931119-6 SITE WC-6 MG/L
ANTIMONY	3020/6010	<0.525	<0.525
ARSENIC	3020/7060	0.084	0.078
BARIUM	3020/6010	3.06	4.26
BERYLLIUM	3020/6010	0.013	0.021
CADMIUM	3020/6010	<0.084	<0.084
CHROMIUM	3020/6010	0.359	0.374
COBALT	3020/6010	0.199	0.202
COPPER	3020/6010	<0.063	<0.063
LEAD	3020/6010	<0.263	0.363
MERCURY	7470	<0.010	<0.010
MOLYBDENUM	3020/6010	<0.053	<0.053
NICKEL	3020/6010	0.669	0.655
SELENIUM	3020/7740	<0.053	<0.053
SILVER	3020/6010	<0.042	0.074
THALLIUM	3020/7841	<0.053	<0.053
VANADIUM	3020/6010	1.00	1.09
ZINC	3020/6010	1.30	1.46

DATE EXTRACTED: 12-6-93 - ANTIMONY, ARSENIC, BARIUM, BERYLLIUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MOLYBDENUM, NICKEL, SELENIUM, SILVER, THALLIUM, VANADIUM, ZINC
12-7-93 - MERCURY

DATE ANALYZED: 12-6-93 - ARSENIC
12-8-93 - ANTIMONY, BARIUM, BERYLLIUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MERCURY, MOLYBDENUM, NICKEL, SELENIUM, SILVER, THALLIUM, VANADIUM, ZINC

PETER T.L. SHEN
LABORATORY DIRECTOR

PS/cap

QUALITY ASSURANCE
LABORATORY

12-13-93

ADVANCED BIOLOGICAL TESTING
TITLE 22 - METALS STLC
SAMPLE TYPE - SEDIMENT

ANALYSES RESULTS

		LOG NUMBER:	19313-9311	19314-9311
	PREP/ANALYSIS	SAMPLE ID:	931119-7	931119-8
			SITE WC-7	SITE WC-8
ANALYSIS	METHOD	UNITS:	MG/L	MG/L
ANTIMONY	3020/6010		<0.525	<0.525
ARSENIC	3020/7060		0.127	0.139
BARIUM	3020/6010		3.02	4.54
BERYLLIUM	3020/6010		0.022	<0.011
CADMIUM	3020/6010		<0.084	<0.084
CHROMIUM	3020/6010		0.317	0.115
COBALT	3020/6010		0.176	0.181
COPPER	3020/6010		<0.063	<0.063
LEAD	3020/6010		0.351	<0.263
MERCURY	7470		<0.010	<0.010
MOLYBDENUM	3020/6010		<0.053	<0.053
NICKEL	3020/6010		0.560	0.546
SELENIUM	3020/7740		<0.053	<0.053
SILVER	3020/6010		<0.042	0.709
THALLIUM	3020/7841		<0.053	<0.053
VANADIUM	3020/6010		1.01	0.667
ZINC	3020/6010		1.10	0.839

DATE EXTRACTED:
12-6-93 - ANTIMONY, ARSENIC, BARIUM, BERYLLIUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MOLYBDENUM, NICKEL, SELENIUM, SILVER, THALLIUM, VANADIUM, ZINC
12-7-93 - MERCURY

DATE ANALYZED:
12-6-93 - ARSENIC
12-8-93 - ANTIMONY, BARIUM, BERYLLIUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MERCURY, MOLYBDENUM, NICKEL, SELENIUM, SILVER, THALLIUM, VANADIUM, ZINC

PETER T.L. SHEN
LABORATORY DIRECTOR

PS/cap

QUALITY ASSURANCE
LABORATORY

GRAIN-SIZE

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-1 A
Total sample weight: 18.310 grams

Size (Microns)	Size (Phi)	Weight (grams)	Percent	Cumulative Percent
2000.000	-1.0	0.001	0.005	0.005
1414.214	-0.5	0.011	0.060	0.066
1000.000	0.0	0.019	0.104	0.169
707.107	0.5	0.049	0.268	0.437
500.000	1.0	0.052	0.284	0.721
353.553	1.5	0.065	0.355	1.076
250.000	2.0	0.120	0.655	1.731
176.777	2.5	0.189	1.032	2.764
125.000	3.0	0.384	2.097	4.861
88.388	3.5	0.610	3.332	8.192
62.500	4.0	0.738	4.031	12.223
31.250	5.0	1.907	10.414	22.637
15.625	6.0	2.434	13.295	35.932
7.812	7.0	2.353	12.851	48.783
3.906	8.0	2.028	11.079	59.862
1.953	9.0	1.136	6.204	66.066
< 1.953	> 9.0	6.213	33.934	100.000

% < 4 phi = 87.777
% > 1 phi = 0.437
% gravel = 0.005
% sand = 12.218
% silt = 47.639
% clay = 40.138

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
7.110	7.24	7.736	4.69	3.374	0.186

5th percentile = 3.021
16th percentile = 4.363
50th percentile = 7.110
84th percentile = 11.110
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-1 B
Total sample weight: 18.602 grams

Size (Microns)	Size (Phi)	Weight grams	Percent	Cumulative Percent
2000.000	-1.0	0.058	0.312	0.312
1414.214	-0.5	0.010	0.054	0.366
1000.000	0.0	0.012	0.065	0.430
707.107	0.5	0.041	0.220	0.650
500.000	1.0	0.035	0.188	0.839
353.553	1.5	0.101	0.543	1.382
250.000	2.0	0.055	0.296	1.677
176.777	2.5	0.144	0.774	2.451
125.000	3.0	0.333	1.790	4.242
88.388	3.5	0.693	3.725	7.967
62.500	4.0	0.683	3.672	11.639
31.250	5.0	1.907	10.251	21.889
15.625	6.0	2.840	15.267	37.156
7.812	7.0	2.069	11.123	48.279
3.906	8.0	2.150	11.559	59.838
1.953	9.0	1.217	6.543	66.381
< 1.953	> 9.0	6.254	33.619	100.000

% < 4 phi = 88.361
% > 1 phi = 0.650
% gravel = 0.312
% sand = 11.327
% silt = 48.200
% clay = 40.162

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
7.149	7.05	7.708	4.78	3.283	0.170

5th percentile = 3.102
16th percentile = 4.425
50th percentile = 7.149
84th percentile = 10.991
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-2
Total sample weight: 20.898 grams

Size		Weight		Cumulative
Microns	Phi	grams	Percent	Percent
2000.000	-1.0	0.056	0.268	0.268
1414.214	-0.5	0.016	0.077	0.345
1000.000	0.0	0.024	0.115	0.459
707.107	0.5	0.040	0.191	0.651
500.000	1.0	0.037	0.177	0.828
353.553	1.5	0.043	0.206	1.034
250.000	2.0	0.084	0.402	1.436
176.777	2.5	0.130	0.622	2.058
125.000	3.0	0.424	2.029	4.086
88.388	3.5	0.684	3.273	7.359
62.500	4.0	0.895	4.283	11.642
31.250	5.0	2.150	10.289	21.931
15.625	6.0	3.489	16.695	38.626
7.812	7.0	2.678	12.813	51.439
3.906	8.0	2.353	11.260	62.699
1.953	9.0	1.136	5.436	68.134
< 1.953	> 9.0	6.659	31.866	100.000

% < 4 phi = 88.358
% > 1 phi = 0.651
% gravel = 0.268
% sand = 11.374
% silt = 51.056
% clay = 37.301

Sample Statistics

Median		Mean		Dispersion	Skewness
phi	microns	phi	microns		
6.888	8.44	7.636	5.03	3.212	0.233

5th percentile = 3.140
16th percentile = 4.424
50th percentile = 6.888
84th percentile = 10.848
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-3
Total sample weight: 20.368 grams

Size (Microns)	Size (Phi)	Weight grams	Percent	Cumulative Percent
2000.000	-1.0	0.023	0.113	0.113
1414.214	-0.5	0.021	0.103	0.216
1000.000	0.0	0.007	0.034	0.250
707.107	0.5	0.042	0.206	0.457
500.000	1.0	0.079	0.388	0.844
353.553	1.5	0.263	1.291	2.136
250.000	2.0	0.125	0.614	2.749
176.777	2.5	0.339	1.664	4.414
125.000	3.0	0.740	3.633	8.047
88.388	3.5	1.108	5.440	13.487
62.500	4.0	1.103	5.415	18.902
31.250	5.0	2.029	9.959	28.862
15.625	6.0	2.475	12.150	41.012
7.812	7.0	2.150	10.557	51.569
3.906	8.0	2.394	11.752	63.321
1.953	9.0	1.258	6.175	69.496
< 1.953	> 9.0	6.213	30.504	100.000

% < 4 phi = 81.098
% > 1 phi = 0.457
% gravel = 0.113
% sand = 18.789
% silt = 44.418
% clay = 36.679

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
6.851	8.66	7.165	6.97	3.433	0.091

5th percentile = 2.581
16th percentile = 3.732
50th percentile = 6.851
84th percentile = 10.599
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-4
Total sample weight: 21.175 grams

Size (Microns)	Size (Phi)	Weight grams	Percent	Cumulative Percent
2000.000	-1.0	0.119	0.562	0.562
1414.214	-0.5	0.028	0.132	0.694
1000.000	0.0	0.057	0.269	0.963
707.107	0.5	0.089	0.420	1.384
500.000	1.0	0.242	1.143	2.527
353.553	1.5	0.668	3.155	5.681
250.000	2.0	0.955	4.510	10.191
176.777	2.5	0.576	2.720	12.912
125.000	3.0	0.684	3.230	16.142
88.388	3.5	0.675	3.188	19.329
62.500	4.0	0.848	4.005	23.334
31.250	5.0	1.623	7.664	30.998
15.625	6.0	1.947	9.197	40.195
7.812	7.0	2.394	11.304	51.499
3.906	8.0	1.947	9.197	60.695
1.953	9.0	1.379	6.514	67.209
< 1.953	> 9.0	6.943	32.791	100.000

% < 4 phi = 76.666
% > 1 phi = 1.384
% gravel = 0.562
% sand = 22.772
% silt = 37.361
% clay = 39.305

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
6.867	8.56	7.029	7.66	4.051	0.040

5th percentile = 1.392
16th percentile = 2.978
50th percentile = 6.867
84th percentile = 11.081
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-5
Total sample weight: 18.725 grams

Size (Microns)	Size (Phi)	Weight (grams)	Percent	Cumulative Percent
2000.000	-1.0	0.085	0.454	0.454
1414.214	-0.5	0.028	0.150	0.603
1000.000	0.0	0.057	0.304	0.908
707.107	0.5	0.098	0.523	1.431
500.000	1.0	0.144	0.769	2.200
353.553	1.5	0.527	2.814	5.015
250.000	2.0	0.281	1.501	6.515
176.777	2.5	0.339	1.810	8.326
125.000	3.0	0.504	2.692	11.017
88.388	3.5	0.760	4.059	15.076
62.500	4.0	0.723	3.861	18.937
31.250	5.0	1.379	7.366	26.304
15.625	6.0	1.461	7.800	34.103
7.812	7.0	2.312	12.350	46.453
3.906	8.0	1.947	10.400	56.853
1.953	9.0	1.379	7.366	64.219
< 1.953	> 9.0	6.700	35.781	100.000

% < 4 phi = 81.063
% > 1 phi = 1.431
% gravel = 0.454
% sand = 18.483
% silt = 37.916
% clay = 43.147

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
7.341	6.17	7.464	5.66	3.844	0.032

5th percentile = 1.497
16th percentile = 3.620
50th percentile = 7.341
84th percentile = 11.308
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-6
Total sample weight: 21.102 grams

Size (Microns)	Size (Phi)	Weight (grams)	Percent	Cumulative Percent
2000.000	-1.0	0.029	0.137	0.137
1414.214	-0.5	0.050	0.237	0.374
1000.000	0.0	0.043	0.204	0.578
707.107	0.5	0.097	0.460	1.038
500.000	1.0	0.126	0.597	1.635
353.553	1.5	0.222	1.052	2.687
250.000	2.0	0.107	0.507	3.194
176.777	2.5	0.245	1.161	4.355
125.000	3.0	0.470	2.227	6.582
88.388	3.5	1.383	6.554	13.136
62.500	4.0	2.258	10.701	23.837
31.250	5.0	2.759	13.074	36.911
15.625	6.0	2.799	13.266	50.177
7.812	7.0	1.826	8.652	58.828
3.906	8.0	1.663	7.883	66.711
1.953	9.0	1.298	6.152	72.863
< 1.953	> 9.0	5.726	27.137	100.000

% < 4 phi = 76.163
% > 1 phi = 1.038
% gravel = 0.137
% sand = 23.700
% silt = 42.874
% clay = 33.289

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
5.987	15.77	7.051	7.54	3.417	0.311

5th percentile = 2.645
16th percentile = 3.634
50th percentile = 5.987
84th percentile = 10.468
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-7
Total sample weight: 21.716 grams

Size (Microns)	Size (Phi)	Weight grams	Percent	Cumulative Percent
2000.000	-1.0	1.358	6.253	6.253
1414.214	-0.5	0.214	0.985	7.239
1000.000	0.0	0.181	0.833	8.072
707.107	0.5	0.145	0.668	8.740
500.000	1.0	0.207	0.953	9.693
353.553	1.5	0.224	1.031	10.725
250.000	2.0	0.535	2.464	13.188
176.777	2.5	0.627	2.887	16.075
125.000	3.0	1.104	5.084	21.159
88.388	3.5	1.177	5.420	26.579
62.500	4.0	1.171	5.392	31.971
31.250	5.0	1.177	5.418	37.389
15.625	6.0	1.501	6.912	44.301
7.812	7.0	2.272	10.462	54.763
3.906	8.0	1.663	7.660	62.422
1.953	9.0	1.623	7.473	69.895
< 1.953	> 9.0	6.538	30.105	100.000

% < 4 phi = 68.029
% > 1 phi = 8.740
% gravel = 6.253
% sand = 25.718
% silt = 30.451
% clay = 37.578

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
6.545	10.71	6.614	10.21	4.127	0.017

5th percentile = .
16th percentile = 2.487
50th percentile = 6.545
84th percentile = 10.741
95th percentile = .
*** 5th percentile not obtainable ***
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-8
Total sample weight: 23.861 grams

Size (Microns)	Size (Phi)	Weight grams	Percent	Cumulative Percent
2000.000	-1.0	0.592	2.481	2.481
1414.214	-0.5	0.352	1.475	3.956
1000.000	0.0	0.253	1.060	5.016
707.107	0.5	0.491	2.058	7.074
500.000	1.0	0.553	2.318	9.392
353.553	1.5	0.996	4.174	13.566
250.000	2.0	0.444	1.861	15.427
176.777	2.5	0.801	3.357	18.784
125.000	3.0	1.189	4.983	23.766
88.388	3.5	1.417	5.938	29.705
62.500	4.0	1.148	4.811	34.516
31.250	5.0	1.582	6.631	41.147
15.625	6.0	2.678	11.222	52.369
7.812	7.0	2.069	8.671	61.040
3.906	8.0	1.826	7.651	68.691
1.953	9.0	1.136	4.761	73.452
< 1.953	> 9.0	6.335	26.548	100.000

% < 4 phi = 65.484
% > 1 phi = 7.074
% gravel = 2.481
% sand = 32.035
% silt = 34.175
% clay = 31.309

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
5.789	18.09	6.265	13.00	4.179	0.114

5th percentile = -0.008
16th percentile = 2.085
50th percentile = 5.789
84th percentile = 10.444
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931119-9
Total sample weight: 31.287 grams

Size (Microns)	Size (Phi)	Weight (grams)	Percent	Cumulative Percent
2000.000	-1.0	0.439	1.403	1.403
1414.214	-0.5	0.041	0.131	1.534
1000.000	0.0	0.073	0.233	1.768
707.107	0.5	0.073	0.233	2.001
500.000	1.0	0.137	0.438	2.439
353.553	1.5	0.283	0.905	3.343
250.000	2.0	2.500	7.991	11.334
176.777	2.5	15.857	50.683	62.017
125.000	3.0	9.502	30.371	92.388
88.388	3.5	0.975	3.116	95.504
62.500	4.0	0.143	0.457	95.961
31.250	5.0	0.203	0.648	96.610
15.625	6.0	0.162	0.519	97.128
7.812	7.0	0.041	0.130	97.258
3.906	8.0	0.041	0.130	97.388
1.953	9.0	0.041	0.130	97.517
< 1.953	> 9.0	0.777	2.483	100.000

% < 4 phi = 4.039
% > 1 phi = 2.001
% gravel = 1.403
% sand = 94.558
% silt = 1.426
% clay = 2.612

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
2.381	191.92	2.454	182.51	0.408	0.178

5th percentile = 1.604
16th percentile = 2.046
50th percentile = 2.381
84th percentile = 2.862
95th percentile = 3.419

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: 931124-1
Total sample weight: 32.523 grams

Size (Microns)	Size (Phi)	Weight grams	Percent	Cumulative Percent
2000.000	-1.0	0.000	0.000	0.000
1414.214	-0.5	0.000	0.000	0.000
1000.000	0.0	0.000	0.000	0.000
707.107	0.5	0.000	0.000	0.000
500.000	1.0	0.002	0.006	0.006
353.553	1.5	0.148	0.455	0.461
250.000	2.0	1.226	3.770	4.231
176.777	2.5	16.483	50.681	54.911
125.000	3.0	13.185	40.540	95.452
88.388	3.5	0.901	2.770	98.222
62.500	4.0	0.045	0.138	98.360
31.250	5.0	0.122	0.374	98.734
15.625	6.0	0.041	0.125	98.859
7.812	7.0	0.041	0.125	98.984
3.906	8.0	0.041	0.125	99.109
1.953	9.0	0.041	0.125	99.233
< 1.953	> 9.0	0.249	0.767	100.000

% < 4 phi = 1.640
% > 1 phi = 0.000
% gravel = 0.000
% sand = 98.360
% silt = 0.748
% clay = 0.891

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
2.452	182.81	2.487	178.32	0.371	0.097

5th percentile = 2.008
16th percentile = 2.116
50th percentile = 2.452
84th percentile = 2.859
95th percentile = 2.994

MEC Analytical Systems, Inc.
2433 Impala Dr.
Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: STN D
Total sample weight: 28.645 grams

Size		Weight		Cumulative
Microns	Phi	grams	Percent	Percent
2000.000	-1.0	0.001	0.003	0.003
1414.214	-0.5	0.008	0.028	0.031
1000.000	0.0	0.007	0.024	0.056
707.107	0.5	0.017	0.059	0.115
500.000	1.0	0.050	0.175	0.290
353.553	1.5	0.089	0.311	0.600
250.000	2.0	0.298	1.040	1.641
176.777	2.5	0.845	2.950	4.591
125.000	3.0	4.875	17.019	21.609
88.388	3.5	10.618	37.067	58.676
62.500	4.0	7.896	27.565	86.241
31.250	5.0	2.394	8.356	94.597
15.625	6.0	0.487	1.700	96.297
7.812	7.0	0.041	0.142	96.439
3.906	8.0	0.081	0.283	96.722
1.953	9.0	0.041	0.142	96.864
< 1.953	> 9.0	0.898	3.136	100.000

% < 4 phi = 13.759
% > 1 phi = 0.115
% gravel = 0.003
% sand = 86.238
% silt = 10.481
% clay = 3.278

Sample Statistics

Median		Mean		Dispersion	Skewness
phi	microns	phi	microns		
3.383	95.86	3.397	94.91	0.562	0.025

5th percentile = 2.512
16th percentile = 2.835
50th percentile = 3.383
84th percentile = 3.959
95th percentile = 5.237

MEC Analytical Systems, Inc.
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Carlsbad, CA 92008

GRAIN SIZE ANALYSIS

Contract: 9306-1
Contact person: Dr. Kurt Kline
Date of analysis: 30Nov93
Date of report: 13Dec93
Analysis method: Sieve/pipette (Plumb, 1981)
Sample Identification: STN E
Total sample weight: 28.505 grams

Size (Microns)	Size (Phi)	Weight grams	Percent	Cumulative Percent
2000.000	-1.0	0.004	0.014	0.014
1414.214	-0.5	0.008	0.028	0.042
1000.000	0.0	0.013	0.046	0.088
707.107	0.5	0.027	0.095	0.182
500.000	1.0	0.043	0.151	0.333
353.553	1.5	0.216	0.758	1.091
250.000	2.0	0.249	0.874	1.965
176.777	2.5	1.117	3.919	5.883
125.000	3.0	4.197	14.723	20.607
88.388	3.5	11.623	40.775	61.381
62.500	4.0	7.473	26.216	87.597
31.250	5.0	2.191	7.685	95.283
15.625	6.0	0.203	0.712	95.994
7.812	7.0	0.162	0.569	96.564
3.906	8.0	0.122	0.427	96.990
1.953	9.0	0.284	0.996	97.987
< 1.953	> 9.0	0.574	2.013	100.000

% < 4 phi = 12.403
% > 1 phi = 0.182
% gravel = 0.014
% sand = 87.583
% silt = 9.393
% clay = 3.010

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
3.360	97.37	3.387	95.56	0.544	0.050

5th percentile = 2.387
16th percentile = 2.844
50th percentile = 3.360
84th percentile = 3.931
95th percentile = 4.963

MEC Analytical Systems, Inc.
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Carlsbad, CA 92008

APPENDIX B

BIOASSAY DATA

APPENDIX TABLE 1

SAMPLE ELUTRIATE QUALITY

Date Prepared	Date Used	Sample	pH (units)	DO (mg/L)	Total NH3 (mg/L)	Initial Salinity (ppt)
11/24/93	11/24/93	Reference Site	7.60	7.5	0.13	29
		Site 1	7.84	2.5	18.7	27
		Site 2	7.15	3.0	20.1	27
		Site 3	7.16	4.1	21.1	27
		Site 4	7.31	4.1	18.1	27
		Site 5	7.47	2.8	3.45	28
		Site 6	7.51	5.9	0.45	29
		Site 7	7.64	5.2	1.14	29
		Site 8	7.54	3.1	1.60	28

APPENDIX TABLE 2

Mytilus edulis
SUMMARY OF WATER QUALITY FOR ELUTRIATE TESTS
Test Dates: 11/24-11/26/93

Site	Concentration (%)	Rep.	Day 0 °C	Day 0 DO	Day 0 pH	Day 0 Sal	Day 1 °C	Day 2 °C	Day 2 DO	Day 2 pH	Day 2 Sal	NH3
Control		1	15.1	8.0	7.85	30	15.0	16.2	7.7	8.02	30	
		2					15.7	16.2	7.6	8.05	30	
		3					15.7	16.3	7.7	8.05	30	
Reference Site	**1**	1	16.2	7.9	7.87	30	15.3	16.2	7.6	8.05	30	
		2					15.6	16.4	7.6	8.02	30	
		3					15.6	16.4	7.7	8.02	30	
	10	1	16.2	8.1	7.87	30	15.7	16.2	7.8	8.02	30	
		2					15.7	16.3	7.8	8.01	30	
		3					15.7	16.2	7.9	8.02	30	
	50	1	15.5	8.1	7.85	30	15.9	16.2	7.9	8.03	30	
		2					15.9	16.2	7.9	8.03	30	
		3					15.8	16.2	7.9	8.03	30	
	100	1	15.2	8.0	7.82	30	15.9	16.2	7.9	8.01	30	NT
		2					16.0	16.2	7.9	8.02	30	
		3					15.9	16.2	7.9	8.02	30	
Site 1	**1**	1	15.0	7.5	7.85	29	14.7	15.2	7.7	8.07	29	
		2					14.8	15.6	7.7	8.06	29	
		3					14.8	15.2	7.7	8.05	29	
	10	1	15.0	7.5	7.86	29	14.7	15.4	7.8	8.05	29	
		2					14.8	15.4	7.8	8.06	29	
		3					14.8	15.2	7.8	8.07	29	
	50	1	15.0	7.5	7.87	28	14.8	15.3	7.8	8.12	28	
		2					14.7	15.4	7.9	8.13	28	
		3					14.7	15.2	7.8	8.13	28	
	100	1	14.9	7.7	7.87	27	14.8	15.3	7.9	8.15	27	20.6
		2					14.8	15.2	7.9	8.14	27	
		3					14.8	15.3	7.9	8.14	27	
		Min	14.9	7.5	7.82	27	14.7	15.2	7.6	8.01	27	
		Max	16.2	8.1	7.87	30	16.0	16.4	7.9	8.15	30	

Note: NT=Not taken

APPENDIX TABLE 2 (Cont'd)

Mytilus edulis
SUMMARY OF WATER QUALITY FOR ELUTRIATE TESTS
Test Dates: 11/24-11/26/93

Site	Concentration (%)	Rep.	Day 0 °C	Day 0 DO	Day 0 pH	Day 0 Sal	Day 1 °C	Day 2 °C	Day 2 DO	Day 2 pH	Day 2 Sal	NH3
Site 2	1	1	15.8	7.7	7.81	29	14.9	15.1	7.7	8.08	29	
		2					14.8	15.1	7.6	8.07	29	
		3					14.8	15.1	7.8	8.07	29	
	10	1	16.2	7.7	7.80	29	14.8	15.4	7.8	8.08	29	
		2					14.8	15.2	7.7	8.08	29	
		3					14.8	15.2	7.7	8.08	29	
	50	1	16.7	7.8	7.70	28	14.9	15.5	7.7	8.06	28	
		2					14.9	15.4	7.6	8.02	28	
		3					14.8	15.2	7.7	8.05	28	
	100	1	16.8	7.7	7.50	27	14.9	15.5	7.8	8.04	27	26.4
		2					14.8	15.5	7.8	8.04	27	
		3					14.8	15.5	7.7	8.04	27	
Site 3	1	1	16.5	7.7	7.86	29	14.8	15.3	7.6	8.08	29	
		2					14.8	15.5	7.7	8.09	29	
		3					14.9	15.5	7.7	8.08	30	
	10	1	16.9	7.7	7.89	29	14.9	15.4	7.6	8.09	29	
		2					14.8	15.3	7.7	8.08	29	
		3					14.8	15.3	7.7	8.08	29	
	50	1	16.5	7.7	7.92	28	14.8	15.2	7.8	8.13	28	
		2					14.7	15.2	7.9	8.14	28	
		3					14.7	15.4	7.9	8.14	28	
	100	1	16.9	7.5	7.93	27	14.8	15.4	7.7	8.07	27	23.1
		2					14.8	15.4	7.8	8.07	27	
		3					14.8	15.3	7.8	8.07	27	
		Min	15.8	7.5	7.50	27	14.7	15.1	7.6	8.02	27	
		Max	16.9	7.8	7.93	29	14.9	15.5	7.9	8.14	30	

APPENDIX TABLE 2 (Cont'd)

Mytilus edulis
SUMMARY OF WATER QUALITY FOR ELUTRIATE TESTS
Test Dates: 11/24-11/26/93

Site	Concentration (%)	Rep.	Day 0 °C	Day 0 DO	Day 0 pH	Day 0 Sal	Day 1 °C	Day 2 °C	Day 2 DO	Day 2 pH	Day 2 Sal	NH3
Site 4	**1**	1	16.9	7.6	7.89	30	14.5	15.4	7.7	8.05	30	
		2					14.5	15.3	7.9	8.06	30	
		3					14.3	15.2	7.9	8.06	30	
	10	1	16.9	7.7	7.89	30	14.4	15.3	7.8	8.07	30	
		2					14.6	15.3	7.8	8.06	30	
		3					14.5	15.3	7.8	8.06	30	
	50	1	17.0	7.7	7.88	29	14.7	15.3	7.7	8.10	29	
		2					14.7	15.3	7.7	8.11	29	
		3					14.5	15.2	7.6	8.11	29	
	100	1	17.0	7.6	7.84	27	14.4	15.2	7.7	8.10	27	23.1
		2					14.6	15.2	7.7	8.10	27	
		3					14.5	15.3	7.7	8.09	27	
Site 5	**1**	1	14.9	7.9	7.87	30	14.5	15.3	7.8	8.07	30	
		2					14.7	15.2	7.8	8.06	30	
		3					14.7	15.2	7.7	8.08	30	
	10	1	14.8	8.0	7.87	30	14.5	15.2	7.9	8.06	30	
		2					14.7	15.2	7.9	8.06	30	
		3					14.8	15.2	7.9	8.06	30	
	50	1	14.8	8.0	7.87	29	14.8	15.2	7.8	8.07	29	
		2					14.8	15.2	7.8	8.08	29	
		3					14.9	15.2	7.9	8.09	29	
	100	1	14.8	7.9	7.86	28	14.6	15.2	7.7	8.08	28	4.78
		2					14.8	15.2	7.7	8.08	28	
		3					14.7	15.2	7.8	8.09	28	
		Min	14.8	7.6	7.84	27	14.3	15.2	7.6	8.05	27	
		Max	17.0	8.0	7.89	30	14.9	15.4	7.9	8.11	30	

APPENDIX TABLE 2 (Cont'd)

Mytilus edulis
SUMMARY OF WATER QUALITY FOR ELUTRIATE TESTS
Test Dates: 11/24-11/26/93

Site	Concentration (%)	Rep.	Day 0 °C	Day 0 DO	Day 0 pH	Day 0 Sal	Day 1 °C	Day 2 °C	Day 2 DO	Day 2 pH	Day 2 Sal	NH3
Site 6	1	1	14.9	7.9	7.86	30	14.9	15.5	7.7	8.02	30	
		2					15.0	15.6	7.8	8.03	30	
		3					15.0	15.6	7.6	8.03	30	
	10	1	15.0	7.9	7.87	30	15.0	15.6	7.6	8.02	30	
		2					15.0	15.5	7.7	8.02	30	
		3					15.0	15.4	7.7	8.02	30	
	50	1	14.9	8.1	7.87	30	15.0	15.5	7.8	8.02	29	
		2					15.0	15.5	7.9	8.03	29	
		3					15.0	15.4	7.9	8.03	29	
	100	1	14.7	8.0	7.86	29	15.0	15.5	7.8	8.03	29	0.51
		2					14.9	15.5	7.7	8.03	29	
		3					14.8	15.4	7.8	8.03	29	
Site 7	1	1	14.9	8.1	7.87	30	15.0	15.4	7.8	8.02	30	
		2					15.0	15.5	7.8	8.01	30	
		3					15.0	15.5	7.7	8.02	30	
	10	1	14.7	8.1	7.87	30	15.0	15.5	7.7	8.02	30	
		2					15.0	15.5	7.6	8.02	30	
		3					15.0	15.5	7.8	8.02	30	
	50	1	14.7	8.0	7.87	30	15.0	15.5	7.8	8.03	30	
		2					15.0	15.5	7.9	8.03	30	
		3					15.0	15.5	7.9	8.03	30	
	100	1	14.9	7.8	7.86	29	15.0	15.6	7.8	8.04	29	1.71
		2					15.0	15.7	7.8	8.05	30	
		3					15.0	15.8	7.8	8.05	29	
		Min	14.7	7.8	7.86	29	14.8	15.4	7.6	8.01	29	
		Max	15.0	8.1	7.87	30	15.0	15.8	7.9	8.05	30	

APPENDIX TABLE 2 (Cont'd)

Mytilus edulis
SUMMARY OF WATER QUALITY FOR ELUTRIATE TESTS
Test Dates: 11/24-11/26/93

Site	Concentration (%)	Rep.	Day 0 °C	Day 0 DO	Day 0 pH	Day 0 Sal	Day 1 °C	Day 2 °C	Day 2 DO	Day 2 pH	Day 2 Sal	NH3
Site 8	**1**	1	15.0	7.9	7.80	30	14.8	15.5	8.0	8.04	30	
		2					15.0	15.5	7.9	8.04	30	
		3					14.9	15.7	7.9	8.04	30	
	10	1	15.0	7.9	7.81	30	14.9	15.5	7.7	8.04	30	
		2					15.0	15.2	7.7	8.05	30	
		3					15.0	15.2	7.6	8.05	30	
	50	1	15.8	8.1	7.84	29	14.9	15.3	7.8	8.09	29	
		2					14.9	15.3	7.7	8.10	29	
		3					14.8	15.3	7.8	8.11	29	
	100	1	16.4	8.0	7.87	28	14.9	15.4	7.8	8.15	28	2.24
		2					14.9	15.3	7.8	8.15	28	
		3					15.0	15.3	7.8	8.15	28	
		Min	15.0	7.9	7.80	28	14.8	15.2	7.6	8.04	28	
		Max	16.4	8.1	7.87	30	15.0	15.7	8.0	8.15	30	

APPENDIX TABLE 3

Mytilus edulis
SUMMARY OF RESULTS FOR BIVALVE LARVAE BIOASSAY
Test Dates: 11/24/93-11/26/93

Concentration (%)	Rep	Total Normal	Total Abnormal	Total Normal/mL	% Survival	Total Abnormal /mL	% Abnormal	Treatment Mortality (%)
Initial Counts	1	261		52.2				
	2	253		50.6				
	3	267		53.4				
	Mean			52.1				
Final Control	1	203	2	40.6		0.4	1.0	
	2	214	8	42.8		1.6	3.6	
	3	187	4	37.4		0.8	2.1	
	Mean			40.3	77.4	0.9	2.2	NA
Reference Site								
1	1	183	4	36.6		0.8	2.1	
	2	211	3	42.2		0.6	1.4	
	3	205	4	41.0		0.8	1.9	
	Mean			39.9	76.6	0.7	1.8	1.0
10	1	178	1	35.6		0.2	0.6	
	2	189	0	37.8		0.0	0.0	
	3	164	0	32.8		0.0	0.0	
	Mean			35.4	67.9	0.1	0.2	12.2
50	1	199	2	39.8		0.4	1.0	
	2	198	7	39.6		1.4	3.4	
	3	182	2	36.4		0.4	1.1	
	Mean			38.6	74.1	0.7	1.8	4.2
100	1	193	8	38.6		1.6	4.0	
	2	165	4	33.0		0.8	2.4	
	3	169	0	33.8		0.0	0.0	
	Mean			35.1	67.4	0.8	2.1	12.9
Site 1								
1	1	176	11	35.2		2.2	5.9	
	2	130	5	26.0		1.0	3.7	
	3	123	2	24.6		0.4	1.6	
	Mean			28.6	54.9	1.2	3.7	29.0
10	1	156	3	31.2		0.6	1.9	
	2	140	5	28.0		1.0	3.4	
	3	191	4	38.2		0.8	2.1	
	Mean			32.5	62.4	0.8	2.5	19.4
50	1	2	158	0.4		31.6	98.8	
	2	0	163	0.0		32.6	100.0	
	3	0	151	0.0		30.2	100.0	
	Mean			0.1	0.2	31.5	99.6	99.8
100	1	0	130	0.0		26.0	100.0	
	2	0	135	0.0		27.0	100.0	
	3	0	157	0.0		31.4	100.0	
	Mean			0.0	0.0	28.1	100.0	100.0

APPENDIX TABLE 3 (Cont'd)

Mytilus edulis
SUMMARY OF RESULTS FOR BIVALVE LARVAE BIOASSAY
Test Dates: 11/24/93-11/26/93

Concentration (%)	Rep	Total Normal	Total Abnormal	Total Normal/mL	% Survival	Total Abnormal /mL	% Abnormal	Treatment Mortality (%)
Site 2								
1	1	162	2	32.4		0.4	1.2	
	2	186	4	37.2		0.8	2.1	
	3	210	4	42.0		0.8	1.9	
	Mean			37.2	71.4	0.7	1.7	7.7
10	1	161	0	32.2		0.0	0.0	
	2	170	1	34.0		0.2	0.6	
	3	111	3	22.2		0.6	2.6	
	Mean			29.5	56.6	0.3	1.1	26.8
50	1	0	133	0.0		26.6	100.0	
	2	0	143	0.0		28.6	100.0	
	3	0	151	0.0		30.2	100.0	
	Mean			0.0	0.0	28.5	100.0	100.0
100	1	1	235	0.2		47.0	99.6	
	2	0	192	0.0		38.4	100.0	
	3	0	177	0.0		35.4	100.0	
	Mean			0.1	0.2	40.3	99.9	99.8
Site 3								
1	1	213	6	42.6		1.2	2.7	
	2	194	2	38.8		0.4	1.0	
	3	196	3	39.2		0.6	1.5	
	Mean			40.2	77.2	0.7	1.7	0.2
10	1	177	4	35.4		0.8	2.2	
	2	211	2	42.2		0.4	0.9	
	3	165	6	33.0		1.2	3.5	
	Mean			36.9	70.8	0.8	2.2	8.4
50	1	0	194	0.0		38.8	100.0	
	2	0	205	0.0		41.0	100.0	
	3	0	186	0.0		37.2	100.0	
	Mean			0.0	0.0	39.0	100.0	100.0
100	1	0	170	0.0		34.0	100.0	
	2	0	163	0.0		32.6	100.0	
	3	0	172	0.0		34.4	100.0	
	Mean			0.0	0.0	33.7	100.0	100.0

APPENDIX TABLE 3 (Cont'd)

Mytilus edulis
SUMMARY OF RESULTS FOR BIVALVE LARVAE BIOASSAY
Test Dates: 11/24/93-11/26/93

Concentration (%)	Rep	Total Normal	Total Abnormal	Total Normal/mL	% Survival	Total Abnormal /mL	% Abnormal	Treatment Mortality (%)
Site 4								
1	1	136	2	27.2		0.4	1.4	
	2	129	4	25.8		0.8	3.0	
	3	171	2	34.2		0.4	1.2	
	Mean			29.1	55.9	0.5	1.9	1.4
10	1	134	7	26.8		1.4	5.0	
	2	90	1	18.0		0.2	1.1	
	3	144	3	28.8		0.6	2.0	
	Mean			24.5	47.0	0.7	2.7	39.2
50	1	0	142	0.0		28.4	100.0	
	2	0	134	0.0		26.8	100.0	
	3	0	141	0.0		28.2	100.0	
	Mean			0.0	0.0	27.8	100.0	100.0
100	1	0	130	0.0		26.0	100.0	
	2	0	72	0.0		14.4	100.0	
	3	0	148	0.0		29.6	100.0	
	Mean			0.0	0.0	23.3	100.0	100.0
Site 5								
1	1	170	3	34.0		0.6	1.7	
	2	172	2	34.4		0.4	1.1	
	3	151	0	30.2		0.0	0.0	
	Mean			32.9	63.1	0.3	0.9	18.4
10	1	151	1	30.2		0.2	0.7	
	2	173	3	34.6		0.6	1.7	
	3	162	1	32.4		0.2	0.6	
	Mean			32.4	62.2	0.3	1.0	19.6
50	1	0	125	0.0		25.0	100.0	
	2	0	95	0.0		19.0	100.0	
	3*	145	8					
	Mean			0.0	0.0	22.0	100.0	100.0
100	1	0	109	0.0		21.8	100.0	
	2	0	101	0.0		20.2	100.0	
	3	0	137	0.0		27.4	100.0	
	Mean			0.0	0.0	23.1	100.0	100.0

* Replicate determined to be an outlier (Dixon's test) and not evaluated statistically.

APPENDIX TABLE 3 (Cont'd)

Mytilus edulis
SUMMARY OF RESULTS FOR BIVALVE LARVAE BIOASSAY
Test Dates: 11/24/93-11/26/93

Concentration (%)	Rep	Total Normal	Total Abnormal	Total Normal/mL	% Survival	Total Abnormal /mL	% Abnormal	Treatment Mortality (%)
Site 6								
1	1	180	5	36.0		1.0	2.7	
	2	186	4	37.2		0.8	2.1	
	3	211	6	42.2		1.2	2.8	
	Mean			38.5	73.9	1.0	2.5	4.5
10	1	177	0	35.4		0.0	0.0	
	2	209	2	41.8		0.4	0.9	
	3	182	3	36.4		0.6	1.6	
	Mean			37.9	72.7	0.3	0.8	6.0
50	1	1	151	0.2		30.2	99.3	
	2	3	149	0.6		29.8	98.0	
	3	3	136	0.6		27.2	97.8	
	Mean			0.5	1.0	29.1	98.4	98.8
100	1	1	162	0.2		32.4	99.4	
	2	0	180	0.0		36.0	100.0	
	3	0	162	0.0		32.4	100.0	
	Mean			0.1	0.2	33.6	99.8	99.8
Site 7								
1	1	142	11	28.4		2.2	7.2	
	2	133	5	26.6		1.0	3.6	
	3	152	3	30.4		0.6	1.9	
	Mean			28.5	54.7	1.3	4.2	29.3
10	1	184	4	36.8		0.8	2.1	
	2	185	4	37.0		0.8	2.1	
	3	177	6	35.4		1.2	3.3	
	Mean			36.4	69.9	0.9	2.5	9.7
50	1	187	2	37.4		0.4	1.1	
	2	169	9	33.8		1.8	5.1	
	3	175	10	35.0		2.0	5.4	
	Mean			35.4	67.9	1.4	3.9	12.2
100	1	3	117	0.6		23.4	97.5	
	2	0	110	0.0		22.0	100.0	
	3	0	123	0.0		24.6	100.0	
	Mean			0.2	0.4	23.3	99.2	99.5

APPENDIX TABLE 3 (Cont'd)

Mytilus edulis
SUMMARY OF RESULTS FOR BIVALVE LARVAE BIOASSAY
Test Dates: 11/24/93-11/26/93

Concentration (%)	Rep	Total Normal	Total Abnormal	Total Normal/mL	% Survival	Total Abnormal /mL	% Abnormal	Treatment Mortality (%)
Site 8								
1	1	180	1	36.0		0.2	0.6	
	2	192	3	38.4		0.6	1.5	
	3	189	2	37.8		0.4	1.0	
	Mean			37.4	71.8	0.4	1.0	7.2
10	1	151	6	30.2		1.2	3.8	
	2	144	6	28.8		1.2	4.0	
	3	159	4	31.8		0.8	2.5	
	Mean			30.3	58.2	1.1	3.4	24.8
50	1	4	121	0.8		24.2	96.8	
	2	1	121	0.2		24.2	99.2	
	3	3	118	0.6		23.6	97.5	
	Mean			0.5	1.0	24.0	97.8	98.8
100	1	0	137	0.0		27.4	100.0	
	2	2	125	0.4		25.0	98.4	
	3	0	128	0.0		25.6	100.0	
	Mean			0.1	0.2	26.0	99.5	99.8

APPENDIX TABLE 4

Mytilus edulis
SUMMARY OF WATER QUALITY
FOR THE REFERENCE TOXICANT (COPPER) TEST
Test Dates: 11/24/93-11/26/93

Concentration		Day 0				Day 1	Day 3			
(µg/L)	Rep	°C	DO	pH	Sal	°C	°C	DO	pH	Sal
0.18	1	15.1	8.0	7.86	30	15.6	16.2	7.6	8.04	30
	2					15.4	16.2	7.6	8.03	30
	3					15.5	16.2	7.7	8.03	30
0.56	1	15.3	8.0	7.86	30	15.7	16.1	7.7	8.04	30
	2					15.2	16.2	7.8	8.05	30
	3					15.3	16.2	7.8	8.05	30
3.2	1	16.0	8.0	7.86	30	15.2	15.9	7.8	8.05	30
	2					15.3	16.0	7.8	8.05	30
	3					15.7	16.2	7.9	8.05	30
10	1	16.0	8.1	7.87	30	15.3	15.9	7.7	8.03	30
	2					15.3	15.9	7.6	8.03	30
	3					15.6	16.0	7.6	8.04	30
32	1	16.0	8.2	7.87	30	15.4	15.9	7.6	8.07	29
	2					15.2	16.0	7.7	8.08	29
	3					15.4	16.2	7.7	8.08	29
	Min	15.1	8.0	7.86	30	15.2	15.9	7.6	8.03	29
	Max	16.0	8.2	7.87	30	15.7	16.2	7.9	8.08	30

APPENDIX TABLE 5

Mytilus edulis
SUMMARY OF RESULTS FOR
THE REFERENCE TOXICANT (COPPER) BIOASSAY
Test Dates: 11/24/93-11/26/93

Concentration (µg/L)	Rep	Total Normal	Total Abnormal	Total Normal/mL	% Survival	Total Abnormal /mL	% Abnormal	Treatment Mortality (%)
0.18	1	218	4	43.6		0.8	1.8	
	2	187	3	37.4		0.6	1.6	
	3	225	1	45.0		0.2	0.4	
	Mean			42.0	80.6	0.5	1.3	0.0
0.56	1	239	4	47.8		0.8	1.6	
	2	198	4	39.6		0.8	2.0	
	3	182	2	36.4		0.4	1.1	
	Mean			41.3	79.3	0.7	1.6	0.0
3.2	1	182	7	36.4		1.4	3.7	
	2	224	3	44.8		0.6	1.3	
	3	203	8	40.6		1.6	3.8	
	Mean			40.6	77.9	1.2	2.9	0.0
10	1	228	1	45.6		0.2	0.4	
	2	204	0	40.8		0.0	0.0	
	3	202	6	40.4		1.2	2.9	
	Mean			42.3	81.2	0.5	1.1	0.0
32	1	0	97	0.0		19.4	100.0	
	2	0	105	0.0		21.0	100.0	
	3	0	122	0.0		24.4	100.0	
	Mean			0.0	0.0	21.6	100.0	100.0

APPENDIX TABLE 6

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10-DAY WATER QUALITY MEASUREMENTS FOR THE SOLID PHASE BIOASSAY

		Day 0				Day 1				Day 2				Day 3					Day 4				Day 5			
Site	Rep	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	NH3	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal
Control	1	8.3	8.7	13.9	25	8.0	8.8	14.9	25	8.1	8.9	14.9	26	8.0	8.9	<0.10	15.1	26	8.0	8.9	15.0	26	8.0	10.2	14.9	26
	2	8.2	8.7	13.8	25	8.0	9.0	14.8	25	8.1	9.0	14.9	26	7.9	8.9		15.1	26	8.1	8.9	15.0	25	8.0	9.8	14.9	26
	3	8.2	8.5	13.8	25	8.1	8.7	14.8	25	8.1	8.6	14.8	26	7.9	8.8		15.1	26	8.0	9.1	15.0	25	8.0	9.8	14.8	26
	4	8.2	8.6	13.7	25	8.1	8.6	14.8	25	8.1	8.7	14.8	26	7.9	8.8		15.0	26	8.1	8.5	14.8	26	8.0	9.9	14.7	26
	5	8.2	9.0	13.8	25	8.1	8.7	14.9	25	8.1	8.7	14.8	26	8.0	8.4		15.0	26	8.0	8.7	15.0	25	8.0	10.1	14.7	26
Reference	1	8.3	9.1	13.8	25	8.1	8.8	14.8	25	8.1	8.9	14.9	26	8.0	9.0	<0.10	15.1	27	8.1	8.7	15.1	26	8.0	10.1	14.9	26
	2	8.2	9.0	13.8	25	8.1	8.9	14.8	25	8.1	8.8	14.9	26	7.9	8.7		15.1	27	8.1	9.2	15.0	26	8.0	10.2	14.9	26
	3	8.2	8.8	13.7	25	8.0	8.5	14.8	25	8.0	8.7	14.8	26	7.9	8.6		15.0	27	8.1	8.9	15.0	26	8.0	9.9	14.9	26
	4	8.2	8.8	13.8	25	8.0	8.6	14.8	26	7.9	8.8	14.9	26	8.0	8.6		15.0	27	8.0	8.9	15.0	27	8.0	9.8	14.8	26
	5	8.1	9.1	13.8	25	8.1	8.5	15.0	26	8.0	8.8	14.9	26	8.0	8.7		15.0	27	8.0	9.1	14.9	27	8.0	9.9	14.7	27
1	1	8.1	8.5	13.8	25	7.9	8.3	14.9	25	8.0	8.6	14.9	26	8.0	8.2	~4.0	15.1	27	8.0	9.1	15.1	25	8.0	10.1	14.9	26
	2	7.9	8.0	13.8	25	7.9	8.8	14.9	25	7.9	8.0	14.9	26	7.8	7.8		15.1	27	8.0	9.1	15.0	25	7.9	9.6	14.9	25
	3	8.0	8.1	13.8	25	7.9	9.0	14.9	25	8.0	8.3	14.9	26	7.8	7.9		15.1	27	7.9	9.1	15.1	25	7.9	9.6	14.9	26
	4	8.0	8.1	13.8	25	7.9	9.1	14.9	25	7.9	8.2	14.9	26	7.7	7.6		15.1	27	7.9	9.0	15.0	25	7.8	9.9	14.9	26
	5	8.1	8.4	13.8	25	8.0	8.9	15.0	25	7.9	9.3	15.0	26	7.8	8.0		15.1	27	7.9	9.0	15.0	25	8.0	10.1	14.8	26
2	1	8.0	8.5	13.8	25	8.0	8.5	14.9	25	7.9	8.8	14.9	26	7.7	7.7	>5.0	15.1	27	7.9	8.8	15.0	25	8.0	10.5	14.9	26
	2	8.0	8.1	13.7	25	7.9	8.2	15.0	25	7.8	8.4	14.9	26	7.7	8.1		15.1	27	7.9	8.8	14.9	26	7.9	10.4	14.8	26
	3	8.0	8.1	13.8	25	7.8	8.4	15.0	25	7.8	8.2	14.9	26	7.8	8.0		15.1	27	7.9	8.8	15.0	26	7.9	10.0	14.8	26
	4	7.9	8.0	13.9	25	7.9	8.3	15.1	25	7.9	8.3	15.0	26	7.8	8.1		15.1	27	7.9	8.7	15.0	26	7.9	10.1	14.8	26
	5	7.9	8.1	13.9	25	7.8	8.6	15.1	26	7.8	8.5	15.0	26	7.9	8.1		15.1	27	7.9	9.0	14.9	26	8.0	10.3	14.9	26
3	1	8.0	8.7	13.9	25	7.9	8.8	15.0	26	8.0	8.5	14.9	26	7.8	8.8	>5.0	15.0	27	8.0	9.0	15.1	25	7.9	10.4	14.9	25
	2	8.0	8.6	13.8	25	7.9	8.6	15.0	26	7.9	8.5	14.9	26	7.8	8.8		15.1	27	7.9	9.1	14.9	26	7.9	10.4	14.8	25
	3	8.0	8.4	13.8	25	7.9	8.5	15.1	26	7.9	8.4	15.0	26	7.8	8.4		15.0	27	7.9	9.0	15.0	26	7.9	10.5	14.8	25
	4	8.0	8.2	13.8	25	7.8	7.9	15.2	26	7.9	8.5	15.0	26	7.9	8.3		15.0	27	7.8	9.1	15.0	25	7.9	10.2	14.9	25
	5	7.9	7.9	14.0	25	7.8	7.9	15.4	26	7.9	8.4	15.0	26	7.9	8.2		15.2	27	7.9	8.8	15.0	26	7.9	10.1	14.9	25
4	1	8.0	8.7	13.8	25	7.9	9.0	15.1	26	7.9	8.9	15.1	26	7.9	8.9	>5.0	15.0	27	7.8	9.5	15.0	25	7.8	10.6	14.8	25
	2	8.1	8.6	13.8	25	7.9	8.5	15.0	26	8.0	8.6	15.0	26	8.0	9.1		15.1	27	8.0	9.0	15.1	25	7.9	9.8	14.9	26
	3	8.1	8.5	13.8	25	8.0	8.7	15.0	26	8.0	8.6	15.0	26	7.9	9.0		15.1	27	8.0	8.9	14.9	25	8.0	9.7	14.9	27
	4	8.1	8.5	13.8	25	7.9	8.4	15.1	26	8.0	8.5	14.9	26	7.8	9.0		15.1	27	7.8	8.0	15.0	26	7.9	9.9	14.9	27
	5	8.0	8.0	13.9	25	7.9	8.0	15.1	26	7.9	8.4	14.9	26	7.8	8.6		15.1	27	7.8	8.1	15.1	26	7.8	9.5	14.9	27
5	1	8.0	8.0	13.8	25	7.9	8.3	15.0	26	7.8	8.4	15.0	26	7.8	8.6	~2.0	15.1	26	7.8	8.5	15.0	25	7.9	9.7	14.9	25
	2	7.9	7.4	13.8	25	7.9	8.5	15.0	26	7.8	7.1	14.9	26	7.7	8.3		15.1	26	7.8	8.1	15.1	26	7.9	9.5	14.9	26
	3	7.9	7.8	13.8	25	7.9	8.5	15.0	26	7.8	7.8	14.9	26	7.7	8.2		15.1	26	7.8	8.3	15.1	26	7.8	9.5	14.8	27
	4	8.1	8.2	13.7	25	8.0	8.8	15.0	26	8.0	8.4	14.8	26	7.8	8.4		14.9	27	8.0	8.3	14.9	25	7.9	9.6	14.8	26
	5	8.1	8.3	13.7	25	7.9	8.6	15.0	26	8.0	8.5	14.7	26	7.9	8.4		14.9	27	7.9	8.4	14.8	26	8.0	9.8	14.7	27
Min		7.9	7.4	13.7	25	7.8	7.9	14.8	25	7.8	7.1	14.7	26	7.7	7.6	<0.10	14.9	26	7.8	8.0	14.8	25	7.8	9.5	14.7	25
Max		8.3	9.1	14.0	25	8.1	9.1	15.4	26	8.1	9.3	15.1	26	8.0	9.1	>5.0	15.2	27	8.1	9.5	15.1	27	8.0	10.6	14.9	27

APPENDIX TABLE 6 (Cont'd)

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10-DAY WATER QUALITY MEASUREMENTS FOR THE SOLID PHASE BIOASSAY

Site	Rep	Day 0				Day 1				Day 2				Day 3					Day 4				Day 5			
		pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	NH3	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal
6	1	8.2	8.7	13.8	25	8.0	8.7	15.0	26	7.9	8.8	15.0	26	7.9	8.2	~1.5	15.0	26	8.0	8.6	15.0	25	8.0	9.7	14.8	26
	2	8.2	8.6	13.9	25	8.0	8.9	15.0	26	7.9	8.5	14.9	26	7.9	8.3		14.9	26	8.0	8.4	14.8	26	7.9	9.5	14.8	26
	3	8.1	8.4	13.8	25	8.0	8.8	14.9	26	8.0	8.4	14.8	26	7.9	8.2		14.9	27	7.9	8.3	14.9	25	8.0	9.6	14.7	26
	4	8.0	8.2	13.8	25	8.0	8.5	15.0	26	8.0	8.3	14.8	26	7.9	8.2		14.9	27	8.0	8.6	14.8	26	8.0	9.8	14.7	27
	5	8.2	8.2	13.8	25	8.1	8.9	15.0	26	8.0	8.4	14.8	26	7.9	8.4		14.8	27	8.0	8.4	14.9	27	8.0	9.7	14.6	27
7	1	8.2	8.5	13.9	25	8.0	8.8	15.1	26	7.9	8.1	14.9	26	7.9	8.8	~1.5	14.8	26	7.9	8.5	14.9	25	8.0	9.8	14.7	26
	2	8.2	8.3	14.0	25	8.0	8.6	15.0	26	7.8	7.8	15.0	26	7.9	8.7		14.9	26	8.1	8.7	15.0	26	8.0	10.0	14.8	27
	3	8.1	8.0	13.9	25	8.0	8.9	15.0	26	7.9	7.8	14.9	26	8.0	8.5		14.9	26	8.0	8.7	15.1	26	8.0	10.1	14.8	27
	4	8.1	8.0	13.8	25	8.0	8.8	15.0	26	8.0	8.3	14.8	26	8.0	8.6		14.9	26	7.8	8.6	15.1	26	7.9	9.6	14.7	27
	5	8.2	9.1	13.8	25	8.0	8.6	15.0	26	8.0	8.4	14.8	26	8.0	9.1		14.8	27	8.0	8.9	14.8	26	8.0	9.8	14.7	27
8	1	8.1	8.1	14.1	25	8.0	8.6	15.0	26	8.0	8.8	15.0	26	8.0	8.7	~1.5	14.9	26	8.0	9.2	15.0	26	8.0	10.4	14.8	27
	2	8.1	7.2	14.1	25	7.9	8.2	15.0	26	8.0	8.2	15.1	26	7.9	8.3		14.8	26	8.1	8.7	14.9	25	8.0	9.8	14.8	27
	3	8.1	7.6	14.0	25	8.0	8.5	15.0	26	8.0	8.2	15.0	26	8.0	8.4		14.9	26	8.0	8.9	14.9	25	8.1	9.7	14.8	27
	4	8.1	8.5	14.1	25	8.0	8.7	15.0	26	8.0	8.3	15.0	26	8.0	8.4		15.0	26	8.0	9.0	15.0	26	8.1	9.8	14.8	27
	5	8.1	8.2	14.0	25	8.0	8.5	15.0	26	8.1	8.3	15.0	26	8.0	8.4		14.9	26	8.1	8.6	15.0	26	8.1	9.7	14.8	27
Min		8.0	7.2	13.8	25	7.9	8.2	14.9	26	7.8	7.8	14.8	26	7.9	8.2	~1.5	14.8	26	7.8	8.3	14.8	25	7.9	9.5	14.6	26
Max		8.2	9.1	14.1	25	8.1	8.9	15.1	26	8.1	8.8	15.1	26	8.0	9.1	~1.5	15.0	27	8.1	9.2	15.1	27	8.1	10.4	14.8	27

APPENDIX TABLE 6 (Cont'd)

Eohaustorius estuarius

10-DAY WATER QUALITY MEASUREMENTS FOR THE SOLID PHASE BIOASSAY

		Day 6				Day 7				Day 8					Day 9				Day 10			
Site	Rep	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	NH3	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal
Control	1	7.9	8.7	15.1	27	8.1	9.0	14.7	27	8.0	9.3	<0.10	15.9	25	8.0	8.6	15.2	25	7.9	8.7	15.5	25
	2	8.1	8.7	15.1	27	8.1	9.1	14.7	27	8.3	9.2		15.9	25	8.1	8.8	15.1	25	8.0	8.6	15.5	25
	3	8.0	8.8	15.1	27	8.1	8.7	14.8	27	8.4	8.1		15.8	25	8.1	8.9	15.3	25	8.0	8.3	15.8	26
	4	8.0	8.5	15.1	27	8.1	8.6	14.6	27	8.4	8.5		15.8	26	8.1	8.6	15.1	26	8.0	8.2	15.8	27
	5	8.0	8.1	15.1	27	8.1	8.5	14.6	27	8.4	8.6		15.4	26	8.1	8.3	15.3	26	8.0	8.1	16.4	27
Reference	1	8.0	8.3	15.1	27	8.1	8.7	14.8	27	8.3	8.7	<0.10	15.9	26	8.1	8.8	15.2	25	8.1	8.3	15.6	26
	2	8.0	8.6	15.1	27	8.1	9.1	14.9	27	8.3	8.8		16.0	26	8.2	8.8	15.1	25	8.1	8.4	15.4	27
	3	8.0	8.6	15.1	27	8.1	8.9	14.8	27	8.3	9.0		15.7	26	8.1	8.8	15.1	26	8.1	8.4	15.3	27
	4	8.0	8.3	15.1	27	8.0	8.5	14.8	27	8.3	9.0		15.9	26	8.1	8.8	15.1	26	8.1	8.4	15.3	27
	5	8.0	8.4	15.1	27	8.1	8.4	14.9	27	8.3	8.8		16.0	26	8.1	8.8	15.1	26	8.1	8.3	15.3	27
1	1	8.0	8.7	15.2	26	8.1	8.5	14.8	26	8.3	8.8	>5.0	15.9	25	8.0	8.8	15.1	25	8.1	8.2	15.7	25
	2	7.9	8.2	15.2	27	8.0	8.5	14.9	26	8.2	8.4		15.9	25	8.0	8.4	15.2	25	8.0	8.2	15.4	25
	3	7.9	8.2	15.1	27	7.9	8.2	14.8	27	8.2	8.6		15.7	25	8.0	8.4	15.1	25	7.9	8.2	15.4	25
	4	7.8	8.1	15.2	27	7.9	8.1	14.8	25	8.1	8.3		15.7	25	7.9	8.4	15.1	25	7.9	8.1	15.3	25
	5	7.9	8.6	15.1	27	8.0	8.5	14.9	27	8.1	8.7		15.9	25	7.9	8.5	15.1	25	8.0	8.1	15.4	25
2	1	7.9	9.0	15.2	27	8.0	9.0	14.9	26	8.2	8.9	>5.0	16.0	25	8.0	8.8	15.2	25	7.9	8.1	15.4	25
	2	7.8	8.6	15.1	27	7.9	8.9	14.8	27	8.1	8.6		15.9	25	7.9	8.5	15.1	25	7.8	8.1	15.3	25
	3	7.8	8.3	15.1	27	7.8	8.5	14.9	26	8.0	8.4		16.0	25	7.9	8.3	15.1	25	7.9	8.1	15.4	25
	4	7.8	8.3	15.1	27	7.9	8.5	14.9	27	8.0	8.4		16.0	25	7.9	8.3	15.2	25	7.9	8.0	15.6	25
	5	7.9	8.6	15.1	27	7.9	8.8	14.9	27	8.1	8.6		16.0	25	7.9	8.3	15.1	25	7.9	8.0	15.4	26
3	1	7.8	8.7	15.1	26	7.9	8.8	14.9	26	8.1	8.7	>5.0	15.8	25	8.0	8.4	15.4	25	8.0	8.0	16.1	25
	2	7.9	8.4	15.0	26	8.0	8.9	14.9	27	8.1	8.8		15.9	25	8.0	8.6	15.1	25	7.9	8.0	15.4	25
	3	7.9	8.7	15.0	27	7.9	8.7	14.9	27	8.1	8.7		16.1	25	8.0	8.9	15.1	25	8.0	8.1	16.1	25
	4	7.9	8.7	15.1	27	7.9	8.7	14.9	25	8.2	9.3		16.2	25	8.1	9.0	15.1	25	8.0	8.2	15.6	25
	5	7.9	8.5	15.3	27	7.9	8.6	15.0	26	8.3	9.2		16.1	25	8.1	9.0	15.1	25	8.1	8.3	15.6	25
4	1	7.9	9.2	15.1	26	7.9	8.9	15.0	26	8.2	9.4	>5.0	16.0	24	8.0	9.2	15.1	25	7.9	8.6	15.7	25
	2	7.9	8.5	15.2	26	8.0	8.8	15.0	27	8.1	9.0		16.0	25	8.0	8.6	15.1	25	8.0	8.3	15.6	25
	3	7.9	8.5	15.1	26	7.9	8.6	15.0	27	8.1	8.8		15.9	25	8.0	8.7	15.2	25	8.0	8.2	15.7	25
	4	7.9	8.5	15.2	27	7.9	8.6	14.9	26	8.1	8.8		15.8	25	7.9	8.9	15.2	25	8.0	8.1	15.7	26
	5	7.8	7.9	15.2	27	7.8	8.4	14.9	27	8.0	8.5		15.9	26	7.9	8.6	15.2	26	8.0	7.9	15.9	27
5	1	7.8	8.0	15.2	27	7.8	8.6	14.9	26	8.2	8.9	~3.0	15.9	24	8.0	8.4	15.2	24	7.9	7.9	15.6	25
	2	7.8	8.0	15.1	27	7.9	8.4	14.8	27	8.1	8.9		15.9	25	8.0	8.0	15.2	25	7.8	7.7	16.0	25
	3	7.7	8.0	15.1	27	7.8	8.2	14.8	27	8.0	8.9		15.9	25	7.9	8.0	15.2	25	7.8	7.4	16.0	26
	4	7.8	8.1	15.1	27	7.8	8.0	14.8	27	8.0	8.9		15.7	25	7.9	8.2	15.1	26	7.9	7.6	15.7	27
	5	7.8	7.9	15.0	27	7.9	8.1	14.8	27	8.0	8.5		15.8	26	7.9	8.2	15.1	27	8.0	7.8	15.7	27
Min		7.7	7.9	15.0	26	7.8	8.0	14.6	25	8.0	8.1	<0.10	15.4	24	7.9	8.0	15.1	24	7.8	7.4	15.3	25
Max		8.1	9.2	15.3	27	8.1	9.1	15.0	27	8.4	9.4	>5.0	16.2	26	8.2	9.2	15.4	27	8.1	8.7	16.4	27

APPENDIX TABLE 6 (Cont'd)

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10-DAY WATER QUALITY MEASUREMENTS FOR THE SOLID PHASE BIOASSAY

		Day 0				Day 1				Day 2				Day 3					Day 4				Day 5			
Site	Rep	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	NH3	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal
6	1	8.2	8.7	13.8	25	8.0	8.7	15.0	26	7.9	8.8	15.0	26	7.9	8.2	~1.5	15.0	26	8.0	8.6	15.0	25	8.0	9.7	14.8	26
	2	8.2	8.6	13.9	25	8.0	8.9	15.0	26	7.9	8.5	14.9	26	7.9	8.3		14.9	26	8.0	8.4	14.8	26	7.9	9.5	14.8	26
	3	8.1	8.4	13.8	25	8.0	8.8	14.9	26	8.0	8.4	14.8	26	7.9	8.2		14.9	27	7.9	8.3	14.9	25	8.0	9.6	14.7	26
	4	8.0	8.2	13.8	25	8.0	8.5	15.0	26	8.0	8.3	14.8	26	7.9	8.2		14.9	27	8.0	8.6	14.8	26	8.0	9.8	14.7	27
	5	8.2	8.2	13.8	25	8.1	8.9	15.0	26	8.0	8.4	14.8	26	7.9	8.4		14.8	27	8.0	8.4	14.9	27	8.0	9.7	14.6	27
7	1	8.2	8.5	13.9	25	8.0	8.8	15.1	26	7.9	8.1	14.9	26	7.9	8.8	~1.5	14.8	26	7.9	8.5	14.9	25	8.0	9.8	14.7	26
	2	8.2	8.3	14.0	25	8.0	8.6	15.0	26	7.8	7.8	15.0	26	7.9	8.7		14.9	26	8.1	8.7	15.0	26	8.0	10.0	14.8	27
	3	8.1	8.0	13.9	25	8.0	8.9	15.0	26	7.9	7.8	14.9	26	8.0	8.5		14.9	26	8.0	8.7	15.1	26	8.0	10.1	14.8	27
	4	8.1	8.0	13.8	25	8.0	8.8	15.0	26	8.0	8.3	14.8	26	8.0	8.6		14.9	26	7.8	8.6	15.1	26	7.9	9.6	14.7	27
	5	8.2	9.1	13.8	25	8.0	8.6	15.0	26	8.0	8.4	14.8	26	8.0	9.1		14.8	27	8.0	8.9	14.8	26	8.0	9.8	14.7	27
8	1	8.1	8.1	14.1	25	8.0	8.6	15.0	26	8.0	8.8	15.0	26	8.0	8.7	~1.5	14.9	26	8.0	9.2	15.0	26	8.0	10.4	14.8	27
	2	8.1	7.2	14.1	25	7.9	8.2	15.0	26	8.0	8.2	15.1	26	7.9	8.3		14.8	26	8.1	8.7	14.9	25	8.0	9.8	14.8	27
	3	8.1	7.6	14.0	25	8.0	8.5	15.0	26	8.0	8.2	15.0	26	8.0	8.4		14.9	26	8.0	8.9	14.9	25	8.1	9.7	14.8	27
	4	8.1	8.5	14.1	25	8.0	8.7	15.0	26	8.0	8.3	15.0	26	8.0	8.4		15.0	26	8.0	9.0	15.0	26	8.1	9.8	14.8	27
	5	8.1	8.2	14.0	25	8.0	8.5	15.0	26	8.1	8.3	15.0	26	8.0	8.4		14.9	26	8.1	8.6	15.0	26	8.1	9.7	14.8	27
Min		8.0	7.2	13.8	25	7.9	8.2	14.9	26	7.8	7.8	14.8	26	7.9	8.2	~1.5	14.8	26	7.8	8.3	14.8	25	7.9	9.5	14.6	26
Max		8.2	9.1	14.1	25	8.1	8.9	15.1	26	8.1	8.8	15.1	26	8.0	9.1	~1.5	15.0	27	8.1	9.2	15.1	27	8.1	10.4	14.8	27

APPENDIX TABLE 6 (Cont'd)

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10-DAY WATER QUALITY MEASUREMENTS FOR THE SOLID PHASE BIOASSAY

		Day 6				Day 7				Day 8					Day 9				Day 10			
Site	Rep	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	NH3	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal
Control	1	7.9	8.7	15.1	27	8.1	9.0	14.7	27	8.0	9.3	<0.10	15.9	25	8.0	8.6	15.2	25	7.9	8.7	15.5	25
	2	8.1	8.7	15.1	27	8.1	9.1	14.7	27	8.3	9.2		15.9	25	8.1	8.8	15.1	25	8.0	8.6	15.5	25
	3	8.0	8.8	15.1	27	8.1	8.7	14.8	27	8.4	8.1		15.8	25	8.1	8.9	15.3	25	8.0	8.3	15.8	26
	4	8.0	8.5	15.1	27	8.1	8.6	14.6	27	8.4	8.5		15.8	26	8.1	8.6	15.1	26	8.0	8.2	15.8	27
	5	8.0	8.1	15.1	27	8.1	8.5	14.6	27	8.4	8.6		15.4	26	8.1	8.3	15.3	26	8.0	8.1	16.4	27
Reference	1	8.0	8.3	15.1	27	8.1	8.7	14.8	27	8.3	8.7	<0.10	15.9	26	8.1	8.8	15.2	25	8.1	8.3	15.6	26
	2	8.0	8.6	15.1	27	8.1	9.1	14.9	27	8.3	8.8		16.0	26	8.2	8.8	15.1	25	8.1	8.4	15.4	27
	3	8.0	8.6	15.1	27	8.1	8.9	14.8	27	8.3	9.0		15.7	26	8.1	8.8	15.1	26	8.1	8.4	15.3	27
	4	8.0	8.3	15.1	27	8.0	8.5	14.8	27	8.3	9.0		15.9	26	8.1	8.8	15.1	26	8.1	8.4	15.3	27
	5	8.0	8.4	15.1	27	8.1	8.4	14.9	27	8.3	8.8		16.0	26	8.1	8.8	15.1	26	8.1	8.3	15.3	27
1	1	8.0	8.7	15.2	26	8.1	8.5	14.8	26	8.3	8.8	>5.0	15.9	25	8.0	8.8	15.1	25	8.1	8.2	15.7	25
	2	7.9	8.2	15.2	27	8.0	8.5	14.9	26	8.2	8.4		15.9	25	8.0	8.4	15.2	25	8.0	8.2	15.4	25
	3	7.9	8.2	15.1	27	7.9	8.2	14.8	27	8.2	8.6		15.7	25	8.0	8.4	15.1	25	7.9	8.2	15.4	25
	4	7.8	8.1	15.2	27	7.9	8.1	14.8	25	8.1	8.3		15.7	25	7.9	8.4	15.1	25	7.9	8.1	15.3	25
	5	7.9	8.6	15.1	27	8.0	8.5	14.9	27	8.1	8.7		15.9	25	7.9	8.5	15.1	25	8.0	8.1	15.4	25
2	1	7.9	9.0	15.2	27	8.0	9.0	14.9	26	8.2	8.9	>5.0	16.0	25	8.0	8.8	15.2	25	7.9	8.1	15.4	25
	2	7.8	8.6	15.1	27	7.9	8.9	14.8	27	8.1	8.6		15.9	25	7.9	8.5	15.1	25	7.8	8.1	15.3	25
	3	7.8	8.3	15.1	27	7.8	8.5	14.9	26	8.0	8.4		16.0	25	7.9	8.3	15.1	25	7.9	8.1	15.4	25
	4	7.8	8.3	15.1	27	7.9	8.5	14.9	27	8.0	8.4		16.0	25	7.9	8.3	15.2	25	7.9	8.0	15.6	25
	5	7.9	8.6	15.1	27	7.9	8.8	14.9	27	8.1	8.6		16.0	25	7.9	8.3	15.1	25	7.9	8.0	15.4	26
3	1	7.8	8.7	15.1	26	7.9	8.8	14.9	26	8.1	8.7	>5.0	15.8	25	8.0	8.4	15.4	25	8.0	8.0	16.1	25
	2	7.9	8.4	15.0	26	8.0	8.9	14.9	27	8.1	8.8		15.9	25	8.0	8.6	15.1	25	7.9	8.0	15.4	25
	3	7.9	8.7	15.0	27	7.9	8.7	14.9	27	8.1	8.7		16.1	25	8.0	8.9	15.1	25	8.0	8.1	16.1	25
	4	7.9	8.7	15.1	27	7.9	8.7	14.9	25	8.2	9.3		16.2	25	8.1	9.0	15.1	25	8.0	8.2	15.6	25
	5	7.9	8.5	15.3	27	7.9	8.6	15.0	26	8.3	9.2		16.1	25	8.1	9.0	15.1	25	8.1	8.3	15.6	25
4	1	7.9	9.2	15.1	26	7.9	8.9	15.0	26	8.2	9.4	>5.0	16.0	24	8.0	9.2	15.1	25	7.9	8.6	15.7	25
	2	7.9	8.5	15.2	26	8.0	8.8	15.0	27	8.1	9.0		16.0	25	8.0	8.6	15.1	25	8.0	8.3	15.6	25
	3	7.9	8.5	15.1	26	7.9	8.6	15.0	27	8.1	8.8		15.9	25	8.0	8.7	15.2	25	8.0	8.2	15.7	25
	4	7.9	8.5	15.2	27	7.9	8.6	14.9	26	8.1	8.8		15.8	25	7.9	8.9	15.2	25	8.0	8.1	15.7	26
	5	7.8	7.9	15.2	27	7.8	8.4	14.9	27	8.0	8.5		15.9	26	7.9	8.6	15.2	26	8.0	7.9	15.9	27
5	1	7.8	8.0	15.2	27	7.8	8.6	14.9	26	8.2	8.9	~3.0	15.9	24	8.0	8.4	15.2	24	7.9	7.9	15.6	25
	2	7.8	8.0	15.1	27	7.9	8.4	14.8	27	8.1	8.9		15.9	25	8.0	8.0	15.2	25	7.8	7.7	16.0	25
	3	7.7	8.0	15.1	27	7.8	8.2	14.8	27	8.0	8.9		15.9	25	7.9	8.0	15.2	25	7.8	7.4	16.0	26
	4	7.8	8.1	15.1	27	7.8	8.0	14.8	27	8.0	8.9		15.7	25	7.9	8.2	15.1	26	7.9	7.6	15.7	27
	5	7.8	7.9	15.0	27	7.9	8.1	14.8	27	8.0	8.5		15.8	26	7.9	8.2	15.1	27	8.0	7.8	15.7	27
Min		7.7	7.9	15.0	26	7.8	8.0	14.6	25	8.0	8.1	<0.10	15.4	24	7.9	8.0	15.1	24	7.8	7.4	15.3	25
Max		8.1	9.2	15.3	27	8.1	9.1	15.0	27	8.4	9.4	>5.0	16.2	26	8.2	9.2	15.4	27	8.1	8.7	16.4	27

APPENDIX TABLE 6 (Cont'd)

Eohaustorius estuarius

10-DAY WATER QUALITY MEASUREMENTS FOR THE SOLID PHASE BIOASSAY

		Day 6				Day 7				Day 8					Day 9				Day 10			
Site	Rep	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	NH3	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal
6	1	7.9	8.2	15.0	26	7.8	8.4	14.9	26	8.1	8.6	~0.5	15.9	25	8.0	8.3	15.0	25	8.0	7.7	15.7	25
	2	7.9	8.0	15.0	27	7.9	8.3	14.9	27	8.1	8.3		15.9	25	8.0	8.3	15.1	25	8.0	7.6	15.7	25
	3	7.9	8.3	15.1	27	7.9	8.2	14.8	27	8.0	8.4		15.8	25	7.9	8.1	15.1	25	7.9	7.7	15.8	26
	4	7.9	8.4	15.0	27	7.9	8.2	14.8	27	8.0	8.5		15.7	26	7.9	8.2	15.1	26	8.0	7.8	15.9	27
	5	7.8	8.4	14.9	27	7.9	8.2	14.7	27	8.0	8.3		15.8	27	7.9	8.2	15.0	27	8.0	7.8	15.7	27
7	1	7.9	8.8	14.9	26	7.9	8.5	14.9	27	8.2	8.6	0.25	15.9	25	8.0	8.6	15.0	25	8.1	7.9	15.6	25
	2	8.0	9.0	15.0	27	8.0	8.6	14.9	25	8.2	8.7		15.8	25	8.0	8.5	15.0	25	8.1	7.9	15.7	25
	3	7.9	8.5	15.0	27	8.0	8.8	14.9	27	8.1	8.7		15.8	25	8.0	8.4	15.1	25	8.0	7.8	16.2	26
	4	7.8	8.6	14.9	27	8.0	9.0	14.7	27	8.2	9.4		15.6	25	8.0	8.3	15.0	27	8.0	7.8	16.1	26
	5	8.0	8.6	15.0	27	7.9	8.9	14.8	27	8.2	9.3		15.7	25	8.0	8.6	15.0	26	8.0	7.9	15.8	27
8	1	8.0	8.6	15.1	26	8.0	8.7	15.0	26	8.2	8.8	0.25	16.1	25	8.0	8.7	15.0	25	8.0	8.0	15.7	25
	2	8.0	8.1	15.0	27	7.9	8.3	14.9	27	8.1	8.6		16.1	25	8.1	8.4	14.9	25	8.1	7.9	15.6	25
	3	8.0	8.1	15.2	27	8.1	8.2	15.0	27	8.2	8.5		15.9	25	8.1	8.1	15.2	25	8.0	7.8	16.2	25
	4	8.0	8.3	15.1	27	8.0	8.3	14.9	27	8.2	8.6		15.6	24	8.2	8.2	15.4	25	8.2	7.9	16.5	25
	5	8.0	8.3	15.0	27	8.0	8.2	14.9	27	8.1	8.6		15.7	25	8.2	8.2	15.1	25	8.2	8.1	15.7	25
Min		7.8	8.0	14.9	26	7.8	8.2	14.7	25	8.0	8.3	0.25	15.6	24	7.9	8.1	14.9	25	7.9	7.6	15.6	25
Max		8.0	9.0	15.2	27	8.1	9.0	15.0	27	8.2	9.4	~0.5	16.1	27	8.2	8.7	15.4	27	8.2	8.1	16.5	27

APPENDIX TABLE 7

Eohaustorius estuarius
10-DAY SURVIVAL AND REBURIAL IN SOLID PHASE BIOASSAY

Site	Rep	Initial Added	Total Number Surviving	% Survival	Total Number Reburying	% Reburial
Control	1	20	20	100.0	20	100.0
	2	20	20	100.0	20	100.0
	3	20	20	100.0	20	100.0
	4	20	20	100.0	20	100.0
	5	20	20	100.0	20	100.0
	Mean			100.0		100.0
Reference	1	20	20	100.0	20	100.0
	2	20	20	100.0	20	100.0
	3	20	20	100.0	20	100.0
	4	20	20	100.0	20	100.0
	5	20	20	100.0	20	100.0
	Mean			100.0		100.0
1	1	20	7	35.0	7	100.0
	2	20	15	75.0	15	100.0
	3	20	17	85.0	17	100.0
	4	20	10	50.0	10	100.0
	5	20	10	50.0	10	100.0
	Mean			59.0		100.0
2	1	20	16	80.0	16	100.0
	2	20	17	85.0	17	100.0
	3	20	17	85.0	17	100.0
	4	20	13	65.0	13	100.0
	5	20	12	60.0	12	100.0
	Mean			75.0		100.0
3	1	20	18	90.0	18	100.0
	2	20	17	85.0	17	100.0
	3	20	18	90.0	18	100.0
	4	20	16	80.0	16	100.0
	5	20	18	90.0	16	88.9
	Mean			87.0		97.8
4	1	20	16	80.0	16	100.0
	2	20	19	95.0	19	100.0
	3	20	18	90.0	18	100.0
	4	20	15	75.0	15	100.0
	5	20	16	80.0	16	100.0
	Mean			84.0		100.0
5	1	20	15	75.0	15	100.0
	2	20	20	100.0	20	100.0
	3	20	17	85.0	17	100.0
	4	20	14	70.0	14	100.0
	5	20	14	70.0	14	100.0
	Mean			80.0		100.0

APPENDIX TABLE 7 (Cont'd)

Eohaustorius estuarius
10-DAY SURVIVAL AND REBURIAL IN SOLID PHASE BIOASSAY

Site	Rep	Initial Added	Total Number Surviving	% Survival	Total Number Reburying	% Reburial
6	1	20	19	95.0	19	100.0
	2	20	18	90.0	18	100.0
	3	20	20	100.0	20	100.0
	4	20	18	90.0	18	100.0
	5	20	19	95.0	19	100.0
	Mean			94.0		100.0
7	1	20	18	90.0	18	100.0
	2	20	18	90.0	18	100.0
	3	20	20	100.0	20	100.0
	4	20	18	90.0	18	100.0
	5	20	17	85.0	17	100.0
	Mean			91.0		100.0
8	1	20	18	90.0	18	100.0
	2	20	17	85.0	17	100.0
	3	20	17	85.0	17	100.0
	4	20	19	95.0	19	100.0
	5	20	18	90.0	18	100.0
	Mean			89.0		100.0

APPENDIX TABLE 8

Eohaustorius estuarius
WATER QUALITY MEASUREMENTS FOR REFERENCE TOXICANT (S.D.S) TEST
Walnut Creek Flood Control Channel

Concentration		Day 0				Day 1				Day 2				Day 3				Day 4			
(mg/L)	Rep	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal	pH	DO	°C	Sal
Control	1	8.0	9.6	14.5	25	8.1	8.6	15.0	25	8.1	7.9	15.3	26	7.9	8.1	15.7	26	7.9	7.9	16.3	26
	2					8.1	8.3	14.9	25	8.2	7.7	15.4	26	8.0	8.1	15.4	26	8.0	7.7	16.3	27
	3					8.1	8.1	14.9	25	8.1	7.6	15.3	26	8.1	8.2	15.4	26	8.0	7.8	16.3	27
6.25	1	8.0	9.4	14.5	25	8.1	8.0	15.0	25	8.1	7.5	15.4	26	8.1	8.2	15.7	25	8.0	7.8	16.4	27
	2					8.1	7.8	15.0	25	8.0	7.2	15.4	26	8.0	7.9	15.5	26	8.0	7.2	16.3	27
	3					8.1	7.9	14.9	25	8.1	7.0	15.5	26	8.0	7.9	15.5	26	8.0	7.1	16.3	27
12.5	1	8.0	9.3	14.4	25	8.1	7.9	15.0	25	8.0	6.1	15.3	26	8.0	5.4	15.6	25	7.9	5.5	16.3	27
	2					8.1	7.7	15.0	25	7.9	5.7	15.2	26	7.9	5.3	15.5	26	7.8	5.1	16.3	27
	3					8.1	7.7	14.9	25	8.0	5.7	15.4	26	7.9	5.4	15.6	26	7.9	4.9	16.3	27
25	1	8.0	9.3	14.4	25	8.1	7.8	14.9	25	8.0	5.8	15.4	26	7.9	5.5	15.9	26	7.9	5.0	16.3	27
	2					8.1	7.3	14.9	25	7.9	5.2	15.4	26	7.8	4.9	15.9	26	7.8	4.5	16.3	27
	3					8.1	7.5	14.8	25	7.9	5.3	15.3	26	7.9	5.0	15.8	26	7.8	4.5	16.3	27
50	1	8.0	9.3	14.4	25	8.1	7.6	14.9	25	7.9	5.5	15.6	26	7.9	5.2	15.9	26	7.7	4.1	16.3	27
	2					8.1	7.3	15.0	25	7.8	4.9	15.6	26	7.8	4.6	15.6	26	—	—	—	—
	3					8.1	7.4	14.9	25	8.0	5.3	15.5	26	7.8	4.6	15.8	26	—	—	—	—
100	1	8.0	9.3	14.4	25	8.1	7.8	15.0	25	8.0	5.4	15.5	27	7.9	5.9	15.7	26	—	—	—	—
	2					8.1	7.9	15.0	25	7.9	5.4	15.5	26	7.8	6.1	15.6	26	—	—	—	—
	3					8.1	8.0	15.0	25	7.9	5.4	15.2	26	8.0	5.8	15.6	26	—	—	—	—
Min		8.0	9.3	14.4	25	8.1	7.3	14.8	25	7.8	4.9	15.2	26	7.8	4.6	15.4	25	7.7	4.1	16.3	26
Max		8.0	9.6	14.5	25	8.1	8.6	15.0	25	8.2	7.9	15.6	27	8.1	8.2	15.9	26	8.0	7.9	16.4	27

Note: — = All animals dead.

APPENDIX TABLE 9

Eohaustorius estuarius
SURVIVAL DATA FOR REFERENCE TOXICANT (S.D.S.) TEST
Walnut Creek Flood Control Channel

Concentration (ppm)	Rep	Initial Added	Day 1	Day 2	Day 3	Day 4	% Survival	Average % Survival
Control	1	10	10	10	10	10	100	
	2	10	10	10	10	10	100	
	3	10	10	10	10	10	100	100.0
6.25	1	10	10	10	10	10	100	
	2	10	10	10	10	10	100	
	3	10	10	10	9	9	90	96.7
12.5	1	10	10	10	10	9	90	
	2	10	10	10	10	9	90	
	3	10	10	10	10	9	90	90.0
25	1	10	10	9	3	2	20	
	2	10	10	8	6	4	40	
	3	10	10	10	9	7	70	43.3
50	1	10	10	3	1	0	0	
	2	10	10	4	0	—	0	
	3	10	10	6	0	—	0	0.0
100	1	10	9	1	0	—	0	
	2	10	6	1	0	—	0	
	3	10	6	5	0	—	0	0.0

QUALITY CONTROL DOCUMENTATION

APPENDIX C

QUALITY ASSURANCE LABORATORY

QUALITY CONTROL DATA REPORT

December 10, 1993
ADVANCED BIOLOGICAL TESTING
LOG #19307-9311 THROUGH 19316-9311

DATE EXTRACTED:

DECEMBER 1, 1993-	ZINC, SELENIUM, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER, TRIBUTYLTIN, DIBUTYLTIN, MONOBUTYLTIN
DECEMBER 6, 1993-	TRPH
DECEMBER 9, 1993-	MERCURY

DATE ANALYZED:

DECEMBER 1, 1993-	TRIBUTYLTIN, DIBUTYLTIN, MONMOBUTYLTIN
DECEMBER 3, 1993-	ZINC, SELENIUM, CADMIUM, CHROMIUM, COPPER, LEAD, NICKEL, SILVER
DECEMBER 6, 1993-	T.SULFIDE #1 (LOG NUMBERS 19307-9311 THROUGH 19310-9311), DISS. SULFIDE
DECEMBER 7, 1993-	T.SULFIDE #2 (LOG NUMBERS 19311-9311 THROUGH 19316-9311), TOC, ARSENIC
DECEMBER 8, 1993-	TRPH
DECEMBER 9, 1993-	MERCURY

ANALYSES	PREP/ANALYSIS METHOD	LCS % RECOVERY	SPIKE %RECOVERY	DUPLICATE RPD
ZINC	3050/6010	93%	74%	0%
MERCURY	7471	98%	100%	0%
SELENIUM	3050/7740	92%	91%	5%
T.SULFIDE #1	MOD AOAC 1.013/STD4500-D	90%	84%	2%
T.SULFIDE #2	MOD AOAC 1.013/STD4500-D	91%	92%	2%
DISS. SULFIDE	1:1 ZINC ACETATE/STD4500-D	90%	84%	2%
TOC	EPA 415.1	100%		6%
ARSENIC	3050/7060	102%	104%	5%
CADMIUM	3050/7131	96%	106%	1%
TOTAL CHROMIUM	3050/6010	93%	83%	1%
COPPER	3050/6010	95%	88%	0%
LEAD	3050/6010	93%	74%	0%
NICKEL	3050/6010	91%	82%	1%
SILVER	3050/6010	92%	81%	0%
TRPH	3550/418.1	80%		0%
TRIBUTYLTIN	GCFPD	97%	100%	1%
DIBUTYLTIN	GCFPD	90%	109%	5%
MONOBUTYLTIN	GCFPD	106%	101%	10%

Yvette Liebesman

YVETTE J. LIEBESMAN
QA/QC DIRECTOR

QUALITY CONTROL TERMINOLOGY

•LCS - LABORATORY CONTROL STANDARD. REPORTED AS % RECOVERY OF AN INDEPENDENT STANDARD CARRIED THROUGH ALL SAMPLE PREPARATION PROCEDURES TO VERIFY METHOD PERFORMANCE. ACCEPTABLE RANGE IS BASED ON HISTORICAL LABORATORY CONTROL DATA AND EPA REQUIREMENTS. ANY OUT-OF-CONTROL QC DATA IS CLEARLY INDICATED.

•SPIKE - ENVIRONMENTAL SAMPLE IS MATRIX SPIKED WITH METHOD COMPOUNDS AND % RECOVERY OF CONCENTRATION SPIKED INTO SAMPLE IS CALCULATED. REPORTED AS % RECOVERY. ACCEPTABLE RANGE FOR "NORMAL MATRIX SAMPLE" IS BASED ON HISTORCCAL LABORATORY CONTROL DATA. ANY OUT-OF-CONTROL QC DATA IS CLEARLY INDICATED.

•SURROGATES - COMPOUNDS REPRESENTATIVE OF A GROUP OF COMPOUNDS. SURROGATES ARE SPIKED INTO ENVIRONMENTAL SAMPLES AND % RECOVERY OF CONCENTRATION SPIKED IS CALCULATED AND REPORTED. ACCEPTABLE RANGE VARIES DEPENDING ON SAMPLE MATRIX AND ANALYSIS METHOD. ANY OUT-OF-CONTROL DATA IS CLEARLY INDICATED.

QUALITY CONTROL REPORT, CONTINUED
December 13, 1993
ADVANCED BIOLOGICAL TESTING
LOG #19307-9311 THROUGH 19316-9311

DATE EXTRACTED: DECEMBER 5, 1993
DATE ANALYZED: DECEMBER 8, 1993

EXTRACTION METHOD: 3550/3620
ANALYSIS METHOD: 8080
Concentrations were calculated against 4 point calibration curves of concentrations 25, 50, 100 and 200 ppb.

LABORATORY CONTROL SAMPLE
A 1.0 ppb Laboratory Control Sample was run in the sample setup.

COMPOUND	LCS % RECOVERY
gamma-BHC	96%
Heptachlor	98%
Aldrin	95%
Dieldrin	97%
Endrin	100%
4,4-DDT	102%

SPIKE DATA
QAL log number 19316-9311 was spiked in duplicate with 8080 standard.

COMPOUND	SPIKE % RECOVERY	DUPLICATE RPD
Spike Amount = 5.0 ppb:		
gamma-BHC	105%	5%
Heptachlor	120%	10%
Aldrin	116%	13%
Spike Amount = 12.5 ppb:		
Dieldrin	109%	13%
Endrin	122%	11%
4,4-DDT	109%	17%

Yvette Liebesman

YVETTE J. LIEBESMAN
QA/QC DIRECTOR

QUALITY CONTROL TERMINOLOGY

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•**SPIKE** - ENVIRONMENTAL SAMPLE IS MATRIX SPIKED WITH METHOD COMPOUNDS AND % RECOVERY OF CONCENTRATION SPIKED INTO SAMPLE IS CALCULATED. REPORTED AS % RECOVERY. ACCEPTABLE RANGE FOR "NORMAL MATRIX SAMPLE" IS BASED ON HISTORCCAL LABORATORY CONTROL DATA. ANY OUT-OF-CONTROL QC DATA IS CLEARLY INDICATED.
•**SURROGATES** - COMPOUNDS REPRESENTATIVE OF A GROUP OF COMPOUNDS. SURROGATES ARE SPIKED INTO ENVIRONMENTAL SAMPLES AND % RECOVERY OF CONCENTRATION SPIKED IS CALCULATED AND REPORTED. ACCEPTABLE RANGE VARIES DEPENDING ON SAMPLE MATRIX AND ANALYSIS METHOD. ANY OUT-OF-CONTROL DATA IS CLEARLY INDICATED.

QUALITY CONTROL REPORT, CONTINUED
December 13, 1993
ADVANCED BIOLOGICAL TESTING
LOG # 19307-9311 THROUGH 19316-9311
DATE EXTRACTED: DECEMBER 6, 1993
DATE ANALYZED: DECEMBER 9, 1993
EXTRACTION METHOD: 3550
ANALYSIS METHOD: 8270

METHOD BLANK:
BIS (2-ETHYLHEXYL) PHTHALATE (27.8 UG/KG) WAS DETECTED IN THE METHOD BLANK. SAMPLES WERE NOT BLANK CORRECTED.

LABORATORY CONTROL STANDARD:

COMPOUND	LCS % RECOVERY
1,4-DICHLOROBENZENE	99%
1,2,4-TRICHLOROBENZENE	99%
ACENAPHTHENE	113%
2,4-DINITROTOLUENE	81%
PHENOL	71%
2-CHLOROPHENOL	70%
4-CHLORO-3-METHYLPHENOL	82%
4-NITROPHENOL	100%
PENTACHLOROPHENOL	78%

SURROGATE RECOVERIES:

ACID EXTRACTABLE SURROGATE RECOVERIES

LOG#	2-FLUOROPHENOL	PHENOL-d5	2,4,6-TRIBROMOPHENOL
19307-9311	62%	70%	83%
19408-9311	57%	66%	81%
19309-9311	59%	68%	83%
19410-9311	53%	64%	83%
19311-9311	45%	55%	73%
19412-9311	52%	62%	86%
19313-9311	47%	57%	81%
19414-9311	54%	64%	87%
19315-9311	64%	76%	87%
19416-9311	66%	77%	87%
METHOD BLANK	66%	75%	81%
EPA LIMITS	25%-121%	24%-113%	19%-122%

BASE NEUTAL EXTRACTABLE SURROGATE RECOVERIES

LOG#	NITROBENZENE-d5	2-FLUOROBIPHENYL	p-TERPHENYL-d14
19307-9311	66%	72%	91%
19408-9311	65%	73%	96%
19309-9311	63%	69%	94%
19410-9311	60%	69%	94%
19311-9311	52%	61%	87%
19412-9311	52%	58%	90%
19313-9311	51%	56%	90%
19414-9311	63%	69%	99%
19315-9311	78%	80%	97%
19416-9311	76%	78%	96%
METHOD BLANK	75%	79%	99%
EPA LIMITS	23%-120%	30%-115%	18%-137%

Yvette Liebesman

YVETTE J. LIEBESMAN
QA/QC DIRECTOR

QUALITY CONTROL TERMINOLOGY

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•SPIKE - ENVIRONMENTAL SAMPLE IS MATRIX SPIKED WITH METHOD COMPOUNDS AND % RECOVERY OF CONCENTRATION SPIKED INTO SAMPLE IS CALCULATED. REPORTED AS % RECOVERY. ACCEPTABLE RANGE FOR "NORMAL MATRIX SAMPLE" IS BASED ON HISTORCCAL LABORATORY CONTROL DATA. ANY OUT-OF-CONTROL QC DATA IS CLEARLY INDICATED.
•SURROGATES - COMPOUNDS REPRESENTATIVE OF A GROUP OF COMPOUNDS. SURROGATES ARE SPIKED INTO ENVIRONMENTAL SAMPLES AND % RECOVERY OF CONCENTRATION SPIKED IS CALCULATED AND REPORTED. ACCEPTABLE RANGE VARIES DEPENDING ON SAMPLE MATRIX AND ANALYSIS METHOD. ANY OUT-OF-CONTROL DATA IS CLEARLY INDICATED.

2820

CHAIN OF CUSTODY

Project Name/Number: 9306-1

Send Results To:
Advanced Biological Testing
98 Main St. # 419
Tiburon, Ca. 94920
Form No. 1

Sampling Date	Sampling Time	ABT Log No.	No. of Containers	Sample Identification	Sample Type Comp	Sample Type Grab	Analyses Required	Remarks
11.19.93		931119-1	2	SITE WC-1	SED		See	SEE ATTACHED SHEET 19307-934
"		931119-2	"	" WC-2	"		attached	" 19308
"		931119-3	"	" WC-3	"		sheet	" 19309
"		931119-4	"	" WC-4	"			" 19310
"		931119-5	"	" WC-5	"			" 19311
"		931119-6	"	" WC-6	"			" 19312
"		931119-7	"	" WC-7	"			" 19313
"		931119-8	"	" WC-8	"			" 19314
"		931119-9	"	REF SITE	"			" 19315
11/24/93		931124-1	"	CONTROL SITE	"			" 19316

	Date/Time		Date/Time	Remarks:
Sampled by: Mark L. Grant	11/27/93	Relinquished by: Mark L. Grant	11/29/93 1500	Added T.22/STLC Zn
Received by: Airborne		Relinquished by: Airborne	11/30/93 13:15	Lab #'s 19307/19314-93
Received by: Tania Garrett/QA Lab	11/30/93 13:15	Relinquished by:		per K. Kline 11/30/93 @ 10:00
Received by:		Shipped via: UPS Bus Fed Ex (Air) Hand Other		

1 Cooler Return