RESULTS OF CHEMICAL, PHYSICAL, AND BIOASSAY ANALYSIS ON SEDIMENTS FROM MAINTENANCE DREDGING TREASURE ISLAND

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1.0
INTRODUCTION

At the request of the U.S. Navy, Western Division Naval Facilities Engineering Command, Tetra Tech conducted a series of chemical, physical and bioassay tests on sediments from Treasure Island (TI), California, to determine if the sediments are suitable for aquatic disposal. Water depths at Treasure Island are currently inadequate to serve the loading and unloading needs of the Navy, and maintenance dredging is required to return the area to a maintained depth of -10 to -35 feet (with 2 feet of overdredging) Mean Lower Low Water (MLLW). The sediments were analyzed using Tier II methods as described in Public Notice 87-1 prepared by the U.S. Army Corps of Engineers, the Environmental Protection Agency, and the Regional Water Quality Control Board. This report presents the results of those analyses.

The sediments and water samples were collected by Sea Surveyor Inc. and Tetra Tech. The chemical analyses were performed by Quality Assurance Laboratory, and the bioassays and grain size distribution and total organic carbon analyses were performed by MEC Analytical Systems. This report of the sampling and analysis program was prepared by MEC Analytical Systems and Tetra Tech.

2.0
METHODS/ RESULTS

2.1 SAMPLE COLLECTION

Sampling was conducted on January 29 and 31, and February 1, 1990 by Sea Surveyor Inc. The sky was clear, and surface water conditions were calm in the mornings. Gentle breezes occurred in the afternoons.

Dredging Site

A total of 20 sediment sample cores were collected from the dreding site and composited into five samples for analysis. The sample locations were selected by Marc McGovern of the San Franciso District of the U.S. Army Corps of Engineers. The sample locations are shown in Figure 1.

The survey boat was positioned using an *E.S.P.* laser range/azimuth positioning system which has an accuracy of ± 1 ft. Multiple prisms arranged in a 360° configuration were mounted on the survey vessel and an onshore laser operator tracked the prisms using a combined laser rangefinder and electronic bearing unit. The onshore laser operator pre-set the *E.S.P.* laser system to the proposed coordinates for each coring station, and then verbally directed the vessel skipper to maneuver the survey vessel to the required location. For each sampling station, the onshore laser operator noted the range/azimuth data and then calculated the actual coordinates where the sediment sample was collected.

A Raytheon survey-grade fathometer (Model DE719B) was used to define the water column depth to within 0.1 ft. The water depth based upon MLLW datum was deterimed by correcting the depth registered on the ship's fathometer by the tidal height above MLLW for a given sampling time (based on a commercially available tidal height computer program for various sites around San Francisco Bay).

On January 31, eight sediment cores were collected at stations A1 to A4 and C1 to C4, near Treasure Island. On the following day, sediment cores were collected at the remaining twelve stations B1-B4, D1-D4 and E1 to E4. The cores were collected using the 70 ft vessel *White Lightning*, and the Sea Surveyor's BH-4 mini-vibracorer. The afternoon

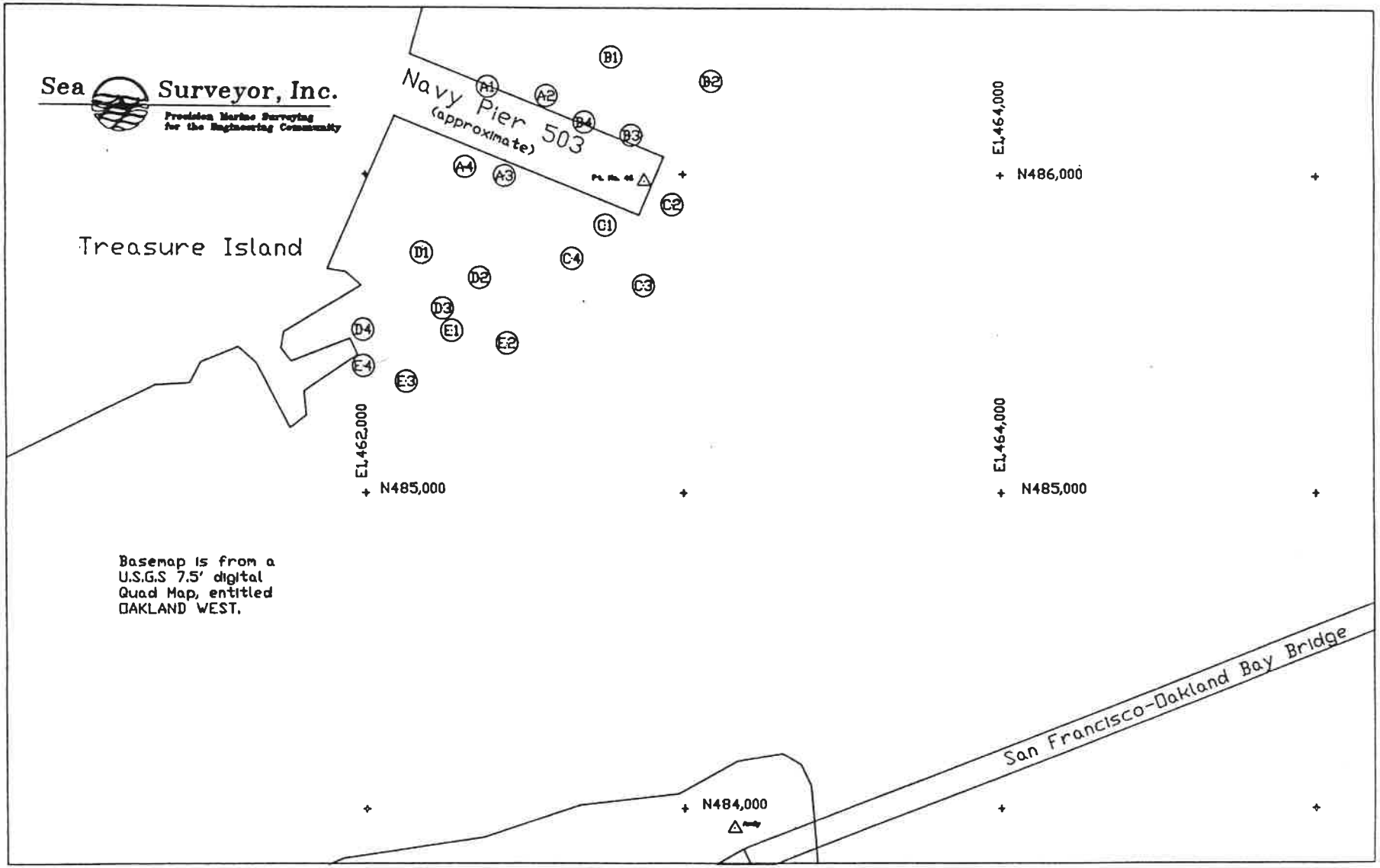

Figure 1. TI sediment sampling locations.

breezes and water currents were sufficiently strong to prevent effective anchoring of the *White Lightning* to maintain station. In all cases, it was necessary to tie off to a fixed point (i.e. a navy vessel, a dock piling, or a ship mooring buoy).

The mini-vibracorer collected sediment samples in a 2.5 in diameter cellulose acetate buterate (CAB) liner. The CAB liners were steam cleaned in advance of use. The core cutter and stainless steel retainer fingers were thoroughly rinsed with seawater prior to reassembly of the corer for each sample collection. Although the mini-vibracorer consistently penetrated to 14 to 15 ft below the seafloor at each station, only the surface 7.3 to 11.5 ft of sediments were sampled by the corer. The length of core retained was determined on the basis of the MLLW depth at each station, and the corresponding additional depth needed to achieve the project depth plus 2 ft of overdepth.

Sediment samples from the four "A" stations were composited in a plastic tray into one "A" sample. The "B", "C", "D", and "E" samples were composited similarly to yield a total of five dreding site sediment composites for analysis. The composited samples were placed into appropriately labeled FDA food-grade plastic bags which were then sealed and placed into coolers with non-toxic ice packs for transport to the MEC Analytical Systems laboratory in Tiburon.

The station coordinates, MLLW water depth, length of core needed to reach the project depth plus 2 ft at that location, and the length of the core collected at each site are listed in the following table for each sediment core location.

Station	Coordinates Easting	Coordinates Northing	Depth (MLLW) (ft)	Core Length Req. (ft)	Core Length Coll. (ft)	Core Length Retain. (ft)	Diff. (ft)
TI-A1	1,462,385	486,278	25.3	11.7	7.7	7.7	-4.0
TI-A2	1,462,570	486,250	29.4	7.6	9.0	7.6	0.0
TI-A3	1,462,438	485,996	27.5	9.5	8.9	8.9	-0.6
TI-A4	1,462,314	486,023	27.5	9.5	7.3	7.3	-2.2
TI-B1	1,462,775	486,370	34.6	2.4	10.3	2.4	0.0
TI-B2	1,463,090	486,295	36.5	0.5	7.3	0.5	0.0
TI-B3	1,462,837	486,125	33.0	4.0	9.7	4.0	0.0
TI-B4	1,462,689	486,166	29.7	7.3	9.1	7.3	0.0
TI-C1	1,462,755	485,840	29.6	7.4	11.5	7.4	0.0
TI-C2	1,462,966	485,905	34.6	2.4	7.3	2.4	0.0
TI-C3	1,462,875	485,650	30.5	6.5	8.5	6.5	0.0
TI-C4	1,462,650	485,735	24.7	12.3	9.3	9.3	-3.0
TI-D1	1,462,177	485,753	15.8	8.2	9.5	8.2	0.0
TI-D2	1,462,359	485,674	13.5	10.5	8.5	8.5	-2.0
TI-D3	1,462,242	485,578	10.8	9.2	9.2	9.2	0.0
TI-D4	1,461,991	485,512	10.9	9.1	9.1	9.1	0.0
TI-E1	1,462,271	485,509	9.2	10.8	11.1	10.8	0.0
TI-E2	1,462,445	485,470	8.9	3.1	8.0	3.1	0.0
TI-E3	1,462,127	485,350	10.1	1.9	7.7	1.9	0.0
TI-E4	1,461,992	485,399	12.1	7.9	8.4	7.9	0.0

As indicated by the difference column, project depth (+ 2 ft over depth) was not always attained. This was due in part to the narrow diameter and hence relatively high frictional resistance of the deeper, more dense material moving upward in the tube. Additionally, the softness of the top layer of sediments may have prevented the sediments from entering the corer tube for the first 6 ft or so, due to the closed retainer fingers. This problem was corrected after the first few cores, by removing the retainer fingers from the core tube.

Alcatraz Dredged Material Disposal Site

Sediment and water samples were collected at the Alcatraz dredged material disposal site (Figure 2) by the 26-foot sampling vessel Betty Jo on Janaury 29, 1990. The sampling vessel was equipped with a 12-foot A-frame and winch, and a gravity corer with 200 pounds of weight. Weather conditions at Alcatraz included cloudy skies, light seas and no wind. The horizontal control point for the *E.S.P* laser range/azimuth positioning system was Muni-7 (Easting 1,444,395.1 ft/Northing 482,968.2 ft). After locating the sampling vessel at the center of the Alcatraz disposal site, a subsurface water sample was collected at 0852 using a JABSCO 12-volt water pump and garden hose with the inlet weighted with a concrete block. A mid-depth water sample was taken while raising the inlet from a depth of 25 ft to a depth of 12 ft. After flushing the hose for three minutes, the water stream was directed into clear plastic bags supported by a large bucket. When full, the bags were sealed and placed into a cooler for transport to the analytical laboratory.

Surface sediment samples were collected from each of the four quadrants of the Alcatraz disposal site with a gravity core. The initial deployment of the gravity core resulted in a very small sample. To correct this problem, the catcher fingers were wrapped with a plastic material to enhance holding of the sediment at the core head during retrieval through the water column. Sample retainment was not a problem during the remaining deployments at the Alcatraz site. The sediment samples from all four cores at the Alcatraz site were composited into one sample for analysis.

The station coordinates, MLLW water depth and length of core collected at each station are as follows for the Alcatraz disposal site:

Station	Easting	Northing	Depth (MLLW) (ft)	Core Length (ft)
North	1,444,572	487,046	34.1	2.5
East	1,444,776	486,877	31.2	2.5
South	1,444,578	486,659	37.1	2.5
West	1,444,370	486,837	31.3	2.5

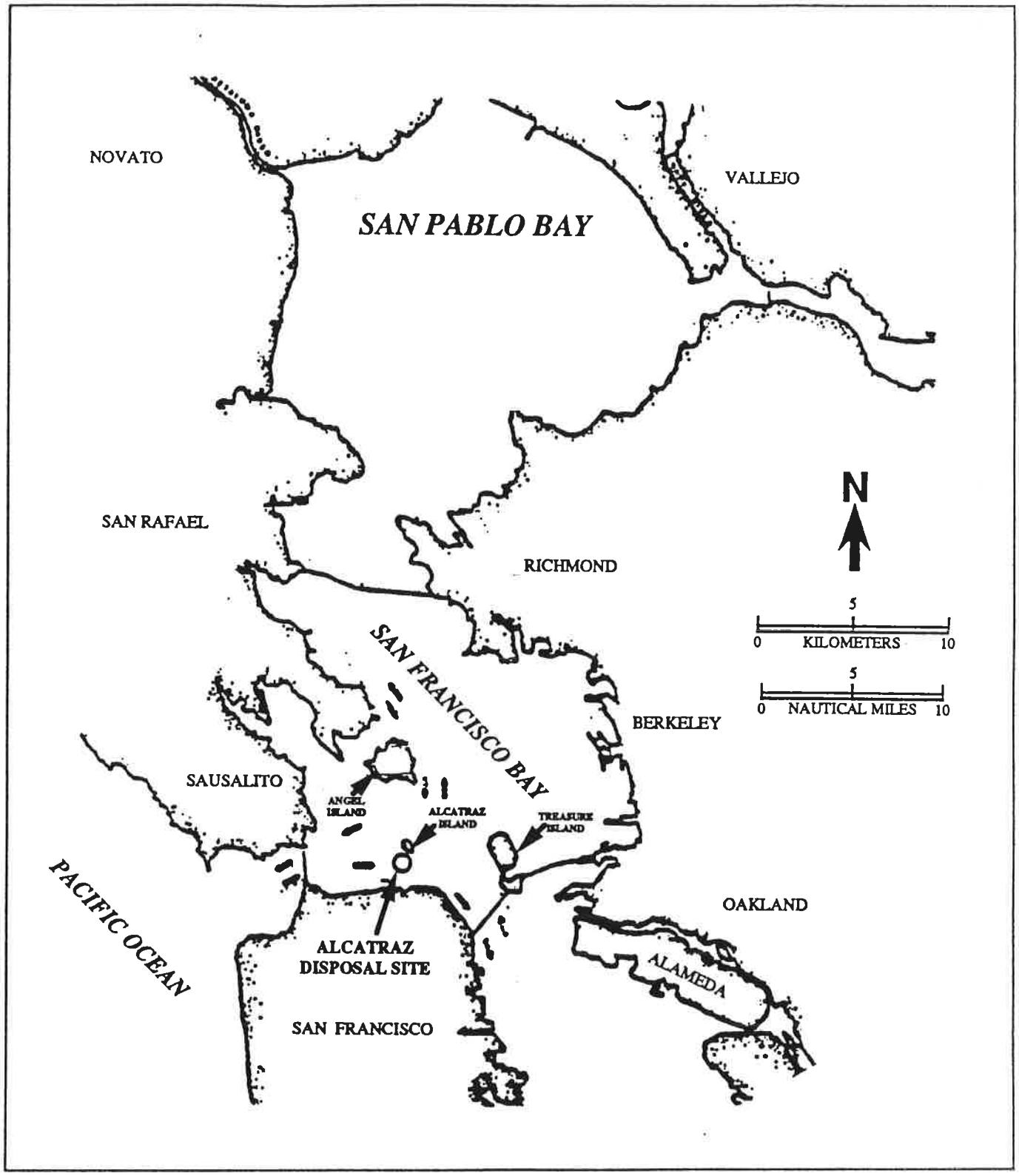

Figure 2. Alcatraz disposal site.

2.2 PHYSICAL ANALYSIS

The sediment samples were analyzed for grain size distribution and total organic carbon by MEC Analytical Systems Laboratory in Carlsbad. 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 analysis of total organic carbon was performed using a persulfate wet oxidation (Menzel and Vaccaro, 1964)

2.3 BULK CHEMISTRY ANALYSIS

The sediment samples submitted to Quality Assurance Laboratory were analyzed for heavy metals, pesticides, polynuclear aromatic hydrocarbons (PAHs), PCBs, phenols, total and dissolved sulfides, and organic tin. Chemical constituents were analyzed according to the EPA methods listed in Table 1. The full laboratory data report and QA/QC report are presented in Appendix A. Quality assurance tests included continuing calibration curve verifications for all analytes, spike and duplicate analyses, and surrogate recoveries.

2.4 BIOASSAY TESTING

The bivalve larvae bioassay was performed using Alcatraz Disposal Site water (DSW) as the diluent. The sediment composites were tested using a four to one elutriate prepared by mixing 250 ml sediment with 1000 ml DSW, aerating for 30 minutes, settling for 1 hour and decanting off the supernatants. The supernatant was tested as the elutriate at 10, 50, and 100% concentrations. The elutriate of Alcatraz Disposal Site sediments were also run at concentrations of 10, 50, and 100%. A treatment of Alcatraz disposal site water was also tested to be used as a reference. Three replicates were tested of each treatment.

A reference toxicant (cadmium chloride) is tested as an internal laboratory standard using laboratory seawater as the diluent. The laboratory seawater also acted as the control for determining the adequacy of the test according to ASTM standards. Reference toxicant concentrations were set at 10, 20, 40, 80, and 160 µg/L of cadmium chloride. Three replicates per concentration were tested.

A summary of the bioassay methods and test organisms is presented in Table 2. Mussels were induced to spawn by heat shocking the adults at 20-22°C. The gametes were then placed in individual crystallizing dishes and examined for viability. Gametes were mixed

TABLE 1

SUMMARY OF TIER II SEDIMENT CHARACTERIZATION

	Treasure Island					Alcatraz	Detection	Limit
	Composite A	Composite B	Composite C	Composite D	Composite E	Sediment	Achieved	PN 87-1
Grain size (%)								
Gravel	0.0	0.0	0.0	0.0	0.0	1.2		
Sand	9.6	14.4	11.0	4.0	6.2	13.2		
Silt	38.3	38.8	41.6	46.0	44.2	36.5		
Clay	52.1	46.8	47.4	50.1	49.5	49.0		
Solids (%) (Dry Wt.)	50.00	50.00	50.00	46.93	45.11	55.90		
Total Organic Carbon (%)	1.444	1.297	1.390	1.043	1.539	1.141		0.1
Sulfides (mg/kg)								
Total	554	668	518	784	958	265		0.5
Water Soluble	0.02	< 0.02	0.12	0.13	< 0.02	0.05	0.02	1.0
Organotins (mg/kg)								
Monobutyltin	< 2	< 2	< 2	< 2	< 2	< 2	1.0	1.0
Dibutyltin	< 2	< 2	< 2	< 2	< 2	< 2	1.0	1.0
Tributyltin	< 2	< 2	< 2	< 2	< 2	< 2	1.0	1.0
Others (mg/kg)								
Cyanide	46.96	11.30	30.24	52.10	51.10	7.91		
Grease & Oil (/duplicate)	< 20.0	32.6	< 20.0	< 21.3	< 22.2/< 22.2	44.4		
TRPH (/duplicate)	43.8/43.8	61.2	21.4	46.7	< 22.2/< 22.2	39.2		
Metals (mg/kg)								
Arsenic (As)	11.18	10.10	10.12	13.13	10.95	10.89		0.1
Cadmium (Cd)	0.322	0.334	0.274	0.526	0.372	0.313		0.1
Chromium (Cr)	139.0	97.4	166.0	157.7	123.5	107.2		0.1
Copper (Cu)	53.6	42.6	42.0	51.8	53.2	53.0		0.1
Lead (Pb)	38.8	40.6	37.8	52.2	42.3	34.9		0.1
Mercury (Hg)	0.34	0.30	0.26	0.30	0.29	0.32		0.02
Nickel (Ni)	71.6	58.2	58.0	63.5	63.4	66.5		0.1
Selenium (Se)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.1	0.1
Silver (Ag)	2.22	1.622	1.806	2.43	1.804	2.06		0.1
Zinc (Zn)	111.8	108.8	98.4	119.1	113.3	99.5		2.0

(1) All chemical analyses are given as dry weight basis.

(2) PN 87-1 detection limits and achieved detection limits are given as wet weight basis.

TABLE 1 (Cont'd)

SUMMARY OF TIER II SEDIMENT CHARACTERIZATION

	Treasure Island Composite A	Treasure Island Composite B	Treasure Island Composite C	Treasure Island Composite D	Treasure Island Composite E	Alcatraz Sediment	Detection Limit Achieved	PN 87-1
Pesticides and PCBs (mg/kg)								
4,4' - DDD	ND	ND	ND	ND	ND	ND	2	0.5
4,4' - DDE	ND	ND	ND	ND	ND	ND	2	0.5-1.0
4,4' - DDT	ND	ND	ND	ND	ND	ND	2	0.5-1.0
Aldrin	ND	ND	ND	ND	ND	ND	2	0.5-1.0
Alpha-BHC	ND	ND	ND	ND	ND	ND	2	0.5-1.0
Beta BHC	ND	ND	ND	ND	ND	ND	2	5.0
Chlorodane	ND	ND	ND	ND	ND	ND	25	1.0
Delta BHC	ND	ND	ND	ND	ND	ND	2	0.5
Dieldrin	ND	ND	ND	ND	ND	ND	2	1.0
Endosulfan I	ND	ND	ND	ND	ND	ND	10	0.5
Endosulfan II	ND	ND	ND	ND	ND	ND	2	2.0
Endosulfan Sulfate	ND	ND	ND	ND	ND	ND	25	0.5
Endrin	ND	ND	ND	ND	ND	ND	2	10.0
Endrin Aldehyde	ND	ND	ND	ND	ND	ND	10	0.5
Heptachlor	ND	ND	ND	ND	ND	ND	2	
Heptachlor Epoxide	ND	ND	ND	ND	ND	ND	10	
Gamma-BHC	ND	ND	ND	ND	ND	ND	2	
Toxaphene	ND	ND	ND	ND	ND	ND	25	30.0
PCB 1016	ND	ND	ND	ND	ND	ND	50	20.0
PCB 1221	ND	ND	ND	ND	ND	ND	50	20.0
PCB 1232	ND	ND	ND	ND	ND	ND	50	20.0
PCB 1242	ND	ND	ND	ND	ND	ND	50	20.0
PCB 1248	ND	ND	ND	ND	ND	ND	50	20.0
PCB 1254	ND	ND	ND	ND	ND	ND	50	20.0
PCB 1260	ND	ND	ND	ND	ND	ND	50	20.0
Phenols (mg/kg)								
4-Chloro-3-Methyphenol	ND	ND	ND	ND	ND	ND	10	20.0
2-Chlorophenol	ND	ND	ND	ND	ND	ND	10	
2, 4-Dichlorophenol	ND	ND	ND	ND	ND	ND	10	
2, 4-Dimethylphenol	ND	ND	ND	ND	ND	ND	10	100.0
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND	50	20.0
2-Methyl-4,6-Dinitrophenol	ND	ND	ND	ND	ND	ND	50	100.0
2-Nitrophenol	ND	ND	ND	ND	ND	ND	10	
4-Nitrophenol	ND	ND	ND	ND	ND	ND	50	
Pentachlorophenol	ND	ND	ND	ND	ND	ND	100	
Phenol	ND	ND	ND	ND	ND	ND	10	20.0
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	10	

TABLE 1 (Cont'd)

SUMMARY OF TIER II SEDIMENT CHARACTERIZATION

	Treasure Island Composite A	Treasure Island Composite B	Treasure Island Composite C	Treasure Island Composite D	Treasure Island Composite E	Alcatraz Sediment	Detection Limit Achieved	PN 87-1
PAHs (mg/kg)								
Acenaphthene	39.0	42.4	30.8	21.05	ND	144.4	20	20.0
Acenaphthylene	30.4	28.6	28.0	25.1	ND	438	20	20.0
Anthracene	122.8	69.2	101.6	147.7	146.1	1150	20	20.0
Benzo (A) Anthracene	210	174.8	ND	228	203.5	1283	20	20.0
Benzo (A) Pyrene	ND	ND	ND	ND	ND	ND	20	20.0
Benzo (B)Flouranthene	ND	ND	ND	ND	ND	ND	20	20.0
Benzo (G,H,I) Perylene	ND	ND	ND	ND	ND	ND	20	20.0
Benzo (K) Flouranthene	ND	ND	ND	ND	ND	ND	20	20.0
Chrysene	262	159.8	226	307	315	1553	20	20.0
Dibenzo (A,H) Anthracene	ND	ND	ND	ND	ND	ND	20	20.0
Fluoranthene	586	492	516	518	306	2826	20	20.0
Fluorene	34.6	27.0	22.4	ND	18.98	279	20	20.0
Ideno (1,2,3-CD) Pyrene	ND	ND	ND	ND	ND	ND	20	20.0
Naphthalene	ND	31.0	ND	ND	ND	174.2	20	20.0
Phenanthrene	320	274	284	237	150.3	2844	20	20.0
Pyrene	506	278	376	526	244	3649	20	20.0
Phthalate Esters (mg/kg)	2110.8	1576.8	1584.8	2009.85	1383.88	14,390.6		
Bis(2-Ethylhexyl)Phthalate	ND	ND	ND	ND	ND	ND	50	20.0
Butyl Benzyl Phthalate	ND	ND	ND	ND	ND	ND	8.5	20.0
Di-N-Butyl Phthalate	ND	ND	ND	ND	ND	ND	9	20.0
Diethyl Phthalate	ND	ND	ND	ND	ND	ND	12	20.0
Dimethyl Phthalate	ND	ND	ND	ND	ND	ND	7.3	20.0
Di--N-Octyl Phthalate	ND	ND	ND	ND	ND	ND	75	20.0

(1) All chemical analyses are given as dry weight basis.
(2) Tier II detection limits and achieved detection limits are given as wet weight basis.
ND = None Detected

TABLE 2

BIOASSAY PROCEDURE AND ORGANISM DATA

THE 48-HOUR EMBRYO-LARVAL BIOASSAY
FOR *Mytilus edulis*

Parameter	Data
Test Type	Acute/Static
Duration	2 days (48 hours)
Test Photoperiod	14 hour light : 10 hour dark
Start Date	2/2/90
Completion Date	2/4/90
Control Water	0.45 µm-filtered, uv-sterilized San Francisco Bay seawater
Test Temperature	18 ± 2°C
Organisms per Container	1665 (estimated)
Test Container/Exposure Volume	125 ml flask/50 ml
No. of Test Containers	3 for each concentration and controls
Sample Storage Conditions	4°C
Treatment Problems	None
Organism	
Test Species	*Mytilus edulis*
Source	Cove Mussel Co., Marshall, CA
Date acquired	2/1/90
Acclimation period	48 hours
Acclimation water	Stored in damp towels
Acclimation temperature	12°C
Number spawned	3 females and 1 male
Spawning temperature	20°C
Time to spawn; time to fertilize	2 hours; 2 hours

placed in individual crystallizing dishes and examined for viability. Gametes were mixed and allowed to fertilize for two hours, while being gently aerated. Fertilized eggs were separated from sperm and debris. Density was estimated by counting a diluted aliquot of the stock concentrate. Equal volumes of embryos were added to each chamber at 15-30 embryos per ml. Initial density was confirmed by counting a 5 ml aliquot from each control replicate.

Testing was conducted at 18 ± 2°C with a photoperiod of 14 hours light and 10 hours dark. Temperature, pH, dissolved oxygen, and salinity were measured at 0 and 48 hours, and temperature was measured at the 24 hour interval as well. At the end of the 48 hour exposure period, a 5 ml aliquot was removed from each chamber, preserved with buffered formalin and allowed to settle. The bottom 1 ml of the subsample was removed and counted in a Sedgewick-Rafter Cell. The average number of total and abnormal larvae is determined. The test is considered to be within ASTM guidelines if 70% of the embryos survived compared to initial densities and less than 10% of the surviving embryos are abnormal in the laboratory control. Abnormality is defined as any embryo not exhibiting the normal prodissiconch D-hinge configuration.

2.5 Bioassay Quality Assurance Procedures

The quality assurance objectives for toxicity testing conducted by MEC Analytical Systems Bioassay Division are identical to those described in U.S. EPA (1985a, 1985b). These objectives for accuracy and precision involve all aspects of the testing process including: (1) water sampling and handling; (2) source and condition of test organisms; (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 every phase of this toxicity testing program are detailed in ASTM (1980) and in laboratory protocols and procedures. These SOPs have been approved and placed in the laboratory files. All data collected and produced as a result of this analysis have been recorded on approved data sheets which have become the permanent data record for the program. The MECBL quality control manager checked the raw data and study records to ensure that required test conditions are within specifications cited in the standard operating procedures.

Instruments were calibrated daily according to Laboratory Standard Operating Procedures (SOP's). All calibration data were logged and initialed. The SOP's for the analytical instruments used in toxicity testing were maintained in the Maintenance and Calibration Log. The SOPs contain applicable calibration and maintenance intervals, listings of standards to be used, environmental conditions requiring recalibration, units for reporting data, accuracy and expected precision. All equipment identification and calibration information was recorded in the Maintenance and Calibration Log maintained at the Laboratory.

A reference toxicant test, utilizing cadmium chloride was used as an internal quality check of the sensitivity of each batch of test organisms. Water quality measurements were monitored to ensure that they fell within prescribed limits. All limits established for this program met or exceeded those recommended by EPA and ASTM (1980). The results of each test were compared with laboratory data for this reference toxicant performed on the species, to determine if the results were within acceptable limits.

The performance of key analytical equipment was routinely monitored. Procedures used to monitor equipment were included in the Maintenance and Calibration Log.

Stock standard solutions were stored in at least two separate containers, so that a fresh standard solution was always available in case the stock standard currently in use became contaminated. Working standards which are in frequent contact with electrodes, pipets, etc. are kept in separate working bottles to reduce chances of contamination of stock standards.

The precision of the LC_{50} determinations was shown by calculating the 95 percent confidence intervals. Accuracy cannot be determined as a true value but rather must be determined relative to a reference value of the pollutant being measured.

Finally, the precision of all the analytical instruments (D.O. meter, pH meter, balances, etc.) was assumed to be that stipulated by the manufacturer. The accuracy of the measurements was assessed through calibration each time the instruments were used.

2.6 DATA ANALYSIS

At the conclusion of the test a statistical evaluation of embryo survival and development is performed using Dunnett's test (ANOVA) with Bonferroni's adjustment. The null hypothesis (H_O) was that there is no difference in mean survival (or percent abnormality) in the Alcatraz seawater reference compared to the dredging site composite. Significant values of the test statistic led to a rejection of the null hypothesis and the conclusion that the dredging site composite affects the mean survival or development of the test organisms.

Percent survival is based upon the total number of larvae surviving in each test, reference or control compared to the initial counts. Treatment mortality for the sediment data is the result of the comparison of the mean total number of larvae in each test concentration to the survival in the reference (Alcatraz) treatment. Reference toxicant data is compared to the laboratory control. Percent abnormality is the relationship between the number of abnormal larvae in each replicate and the total surviving embryos in that replicate. The LC_{50} value is based upon the analysis of the treatment mortality as a dose response; and the EC_{50} is based upon the percentage of abnormally developing embryos.

2.7 CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

According to the EPA/ACOE (1977) procedures, the bioassay results are interpreted in light of the initial mixing expected to occur at the disposal site. Initial mixing is defined to be that dispersion or diffusion of liquid, suspended particulate and solid phases of a material that occurs within 4 hours after disposal. The Limiting Permissible Concentration (LPC) is estimated using methods described in the EPA/ACOE Manual (1977). One variation from the Manual is the use of a bulk density constant of 1.3 instead of 1.5 (per SF/ACOE recommendations). The analysis is carried out for three different barge configurations.

3.0 RESULTS

3.1 PHYSICAL ANALYSES

A summary of the grain size analysis is presented in Table 1 and the full data package is provided in Appendix A. Composite A had 9.6% sand, 38.3% silt, and 52.1% clay, Composite B had 14.4% sand, 38.8% silt, and 46.8% clay. Composite C had 11.0% sand, 41.6% silt, and 47.4% clay. Composite D had 4.0% sand, 46.0% silt, and 50.1% clay, Composite E had 6.2% sand, 44.2% silt, and 49.5% clay. The composite sediments collected at the Alcatraz disposal site consisted of 13.2% sand, 36.5% silt, and 49.0% clay.

3.2 BULK CHEMICAL ANALYSIS

The results of the bulk chemical analysis of the composites and Alcatraz sediments are presented in Table 1. The achieved detection limits are based upon the method, chemical constituent, and levels of interference, and are the actual detection levels achieved for each test element where a less than sign (<) is used on the data.

Based upon a comparison of the composite samples to the Alcatraz sediments, there appears to be little difference between the sediments with two exceptions. The levels of cyanide in all the Treasure Island composites were higher than the Alcatraz composite, and elevated levels of PAHs were detected in the Alcatraz sediments. No significant amounts of pesticides, PCBs, phthalates, phenols or PAHs were found in the Treasure Island sediment composites.

3.3 BIOASSAY TESTS

The summary of results of the bioassays are presented in Table 3. The laboratory controls had 87.7% mean survival and 7.2% mean abnormality, meeting the required 70% and 10% levels allowable in ASTM (1980). The Alcatraz seawater reference had 76.5% mean survival and 5.2% mean abnormality. The 100% concentration using Alcatraz sediments yielded 35.6% mean treatment mortality and 7.7% mean abnormality compared to the Alcatraz seawater reference. The NOEC was 10%.

TABLE 3

Mytilus edulis
SUMMARY OF BIOASSAY RESULTS FOR NAVAL SUPPLY CENTER

Treatment and Concentration (%)	Mean # of Larvae Surviving/ml	Treatment Mortality (Mean %)	LC50	Mean # of Abnormal Larvae/ml	Abnormality (Mean %)	EC50	NOEC	LOEC	MATC
Initial Counts	33.3	NA			NA				
Alcatraz Control	25.5	NA		1.3	5.2				
Reference Sediment (Alcatraz)			> 100%			> 100%	10%	50%	22.4%
10	22.1	13.4		1.6	7.3				
50	17.9*	29.8		1.4	7.8				
100	16.4*	35.6		1.3	7.7				
Composite A			> 100%			> 100%	< 10%	10%	< 10%
10	22.3	12.3		2.5	11.0*				
50	26.1	0.0		4.8	18.4*				
100	15.9*	37.7		3.7	23.5*				
Composite B			> 100%			> 100%	< 10%	10%	< 10%
10	20.0	21.5		2.4	12.0*				
50	22.5	11.5		3.9	17.2*				
100	23.4	8.1		5.3	22.8*				
Composite C			> 100%			> 100%	10%	50%	22.4%
10	21.9	13.9		2	9.1				
50	22.5	11.5		3.1	13.9*				
100	17.0*	33.2		4.7	27.5*				
Composite D			> 100%			> 100%	< 10%	10%	< 10%
10	23.1	9.4		2	8.7*				
50	21.3	16.2		2.7	12.5*				
100	17.4*	31.7		4.2	24.1*				
Composite E			> 100%			> 100%	< 10%	10%	< 10%
10	23.4	8.1		2.1	8.8*				
50	21.1	17.3		2.2	10.4*				
100	15.7*	38.5		3.8	24.3*				
Lab Control	29.2	NA		2.1	7.2				
Cadmium chloride (µg/L)			> 160 µg/L			> 160 µg/L	10 µg/L	20 µg/L	14.1 µg/L
10	22.9	21.7		1.8	7.9				
20	18.7*	36.1		2.1	11.1				
40	21.4*	26.7		3.3	15.3*				
80	22.3	23.7		3.8	17.1*				
160	20.0*	31.5		3.4	17.0*				

* Demonstrating a statistically significant difference (alpha = 0.05) compared to the Alcatraz reference for the TI composite treatments, and compared to the Laboratory Control for the reference toxicant.

NOEC = (No Observed Effect Concentration) highest exposure at which no adverse effects on survival or development were observed.

LOEC = (Lowest Observed Effect Concentration) lowest exposure at which statistically significant effects either on survival or abnormality were observed in the test species.

MATC = (Maximum Allowable Toxic Concentration) geometric mean of the NOEC and LOEC and is considered the toxic threshold concentration.

LC50 = Concentration which is lethal to 50 percent of the test organisms.

EC50 = Concentration which produced sublethal effects in 50 percent of the test organisms.

Composites A, D, and E showed statistically significant mortality at the 100% concentration and abnormality at all concentrations compared to the Alcatraz seawater reference, with NOECs of less than 10%. Composite B had no significant mortality, but statistically significant abnormality at all concentrations, with an NOEC of less than 10%. Composite C had a statistically significant mortality at 100% and significant abnormality at 50% and 100%, with an NOEC of 10%. The LC_{50} and EC_{50} values were greater then 100% for all composites.

The $CdCl_2$ reference toxicant had an LC_{50} of greater then 160 µg/L, an EC_{50} of less than 160 µg/L, and an MATC of 14.1 µg/L. Our mean laboratory values are 71.2 µg/L for the LC_{50} and 19.2 µg/L for the MATC. The results of the reference toxicant (MATC) are within one standard deviation of our laboratory mean and indicate no unusual sensitivity of the larvae

3.4 Limiting Permissible Concentration Analysis

Based upon the results of the Limiting Permissible Concentration analyses (Table 4) the LPC will not be exceeded during the disposal of these dredged materials at the Alcatraz dredged material disposal site.

3.5 Test Deviations

No test deviations were encountered with the exception of Laboratory control (replicate 3), which was apparently subsampled incorrectly and no data were generated. The consistency of the other data is adequate for all calculations.

TABLE 4

CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

Site: Treasure Island Composite A

Mixing Zone estimation	BARGE SIZE		
	4000 yd	3000 yd	3000 yd Hop
Depth of disposal site (m)=	14	14	14
Pi=	3.14159	3.14159	3.14159
Width of vessel (m)=	11	10	10
Length of vessel(m)=	58	50	54
Speed of vessel (m/sec)=	0.5	0.5	0.5
Time of discharge (sec)=	30	30	30
Depth of vessel (m)=	5	4.5	4
Mixing Zone Volume(cu.m)=	686265	658923	670683
Volume of liquid phase			
Bulk density (constant) =	1.3	1.3	1.3
Particle density (constant) =	2.6	2.6	2.6
Density of liquid phase (constant) =	1	1	1
Vol of disposal vessel (cu.m)=	3190	2250	2160
Liquid phase volume (cu.m)=	2591.875	1828.125	1755
Concentration of suspended phase			
Percent Silt=	38.3	38.3	38.3
Percent Clay=	52.1	52.1	52.1
Volume of Suspended phase (cu.m)=	541	381	366
Projected Concentration (percent SP) =	0.0788	0.0579	0.0546
Lowest LC50 or EC50 from bioassay=	100	100	100
Factor LC50 or EC 50 X 0.01=	1	1	1

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 barge size specified.

4000 yd	TRUE
3000 yd	TRUE
3000 yd Hop	TRUE

TABLE 4 (Cont'd)

CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

Site: Treasure Island Composite B

Mixing Zone estimation	BARGE SIZE		
	4000 yd	3000 yd	3000 yd Hop
Depth of disposal site (m)=	14	14	14
Pi=	3.14159	3.14159	3.14159
Width of vessel (m)=	11	10	10
Length of vessel(m)=	58	50	54
Speed of vessel (m/sec)=	0.5	0.5	0.5
Time of discharge (sec)=	30	30	30
Depth of vessel (m)=	5	4.5	4
Mixing Zone Volume(cu.m)=	686265	658923	670683
Volume of liquid phase			
Bulk density (constant) =	1.3	1.3	1.3
Particle density (constant) =	2.6	2.6	2.6
Density of liquid phase (constant) =	1	1	1
Vol of disposal vessel (cu.m)=	3190	2250	2160
Liquid phase volume (cu.m)=	2591.875	1828.125	1755
Concentration of suspended phase			
Percent Silt=	38.8	38.8	38.8
Percent Clay=	46.8	46.8	46.8
Volume of Suspended phase (cu.m)=	512	361	347
Projected Concentration (percent SP) =	0.0746	0.0548	0.0517
Lowest LC50 or EC50 from bioassay=	100	100	100
Factor LC50 or EC 50 X 0.01=	1	1	1

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 barge size specified.

4000 yd	TRUE
3000 yd	TRUE
3000 yd Hop	TRUE

TABLE 4 (Cont'd)

CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

Site: Treasure Island Composite C

Mixing Zone estimation	BARGE SIZE		
	4000 yd	3000 yd	3000 yd Hop
Depth of disposal site (m)=	14	14	14
Pi=	3.14159	3.14159	3.14159
Width of vessel (m)=	11	10	10
Length of vessel(m)=	58	50	54
Speed of vessel (m/sec)=	0.5	0.5	0.5
Time of discharge (sec)=	30	30	30
Depth of vessel (m)=	5	4.5	4
Mixing Zone Volume(cu.m)=	686265	658923	670683
Volume of liquid phase			
Bulk density (constant) =	1.3	1.3	1.3
Particle density (constant) =	2.6	2.6	2.6
Density of liquid phase (constant) =	1	1	1
Vol of disposal vessel (cu.m)=	3190	2250	2160
Liquid phase volume (cu.m)=	2592	1828	1755
Concentration of suspended phase			
Percent Silt=	41.6	41.6	41.6
Percent Clay=	47.4	47.4	47.4
Volume of Suspended phase (cu.m)=	532	376	360
Projected Concentration (percent SP) =	0.0776	0.0570	0.0537
Lowest LC50 or EC50 from bioassay=	100	100	100
Factor LC50 or EC 50 X 0.01=	1	1	1

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 barge size specified.

4000 yd	TRUE
3000 yd	TRUE
3000 yd Hop	TRUE

TABLE 4 (Cont'd)

CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

Site: Treasure Island Composite D

Mixing Zone estimation	BARGE SIZE		
	4000 yd	3000 yd	3000 yd Hop
Depth of disposal site (m)=	14	14	14
Pi=	3.14159	3.14159	3.14159
Width of vessel (m)=	11	10	10
Length of vessel(m)=	58	50	54
Speed of vessel (m/sec)=	0.5	0.5	0.5
Time of discharge (sec)=	30	30	30
Depth of vessel (m)=	5	4.5	4
Mixing Zone Volume(cu.m)=	686265	658923	670683
Volume of liquid phase			
Bulk density (constant) =	1.3	1.3	1.3
Particle density (constant) =	2.6	2.6	2.6
Density of liquid phase (constant) =	1	1	1
Vol of disposal vessel (cu.m)=	3190	2250	2160
Liquid phase volume (cu.m)=	2591.875	1828.125	1755
Concentration of suspended phase			
Percent Silt=	46.0	46.0	46.0
Percent Clay=	50.1	50.1	50.1
Volume of Suspended phase (cu.m)=	575	405	389
Projected Concentration (percent SP) =	0.0838	0.0615	0.0580
Lowest LC50 or EC50 from bioassay=	100	100	100
Factor LC50 or EC 50 X 0.01=	1	1	1

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 barge size specified.

4000 yd	TRUE
3000 yd	TRUE
3000 yd Hop	TRUE

TABLE 4 (Cont'd)

CALCULATION OF THE LIMITING PERMISSIBLE CONCENTRATION

Site: Treasure Island Composite E

Mixing Zone estimation	BARGE SIZE		
	4000 yd	3000 yd	3000 yd Hop
Depth of disposal site (m)=	14	14	14
Pi=	3.14159	3.14159	3.14159
Width of vessel (m)=	11	10	10
Length of vessel(m)=	58	50	54
Speed of vessel (m/sec)=	0.5	0.5	0.5
Time of discharge (sec)=	30	30	30
Depth of vessel (m)=	5	4.5	4
Mixing Zone Volume(cu.m)=	686265	658923	670683
Volume of liquid phase			
Bulk density (constant) =	1.3	1.3	1.3
Particle density (constant) =	2.6	2.6	2.6
Density of liquid phase (constant) =	1	1	1
Vol of disposal vessel (cu.m)=	3190	2250	2160
Liquid phase volume (cu.m)=	2591.875	1828.125	1755
Concentration of suspended phase			
Percent Silt=	44.2	44.2	44.2
Percent Clay=	49.5	49.5	49.5
Volume of Suspended phase (cu.m)=	560	395	379
Projected Concentration (percent SP) =	0.0817	0.0600	0.0566
Lowest LC50 or EC50 from bioassay=	100	100	100
Factor LC50 or EC 50 X 0.01=	1	1	1

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 barge size specified.

4000 yd	TRUE
3000 yd	TRUE
3000 yd Hop	TRUE

4.0
DISCUSSION

Based upon the results of the chemical analysis, grain size analysis, bioassay, and the calculation of the LPC for a variety of disposal options, these sediments appear to meet current criteria for suitability for disposal at the Alcatraz dredged material disposal site.

5.0
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APPENDIX A

ANALYTICAL DATA

APPENDIX TABLE 1

Mytilus edulis
WATER QUALITY DATA FOR TREASURE ISLAND
CONTROLS, REFERENCE SEDIMENT, AND REFERENCE TOXICANT

Treatment and Concentration (%)	Rep.	Day 0 °C	D.O.	pH	Sal	Day 1 °C	Day 2 °C	D.O.	pH	Sal
Laboratory Control										
	1	19.6	7.7	7.83	30	19.3	18.8	7.5	8.13	28
	2					19.3	18.8			
	3					19.2	18.8			
Alcatraz Reference										
	1	18.2	6.8	7.68	32	18.9	19.0	7.8	8.15	30
	2					18.9	18.9			
	3					19.0	18.9			
Reference Sediment (Alcatraz)										
10	1	18.7	6.7	7.72	30	19.1	19.1	7.9	8.13	30
	2					19.1	19.0			
	3					19.1	19.0			
50	1	18.2	6.7	7.79	30	19.1	19.1	7.9	8.16	30
	2					19.1	19.1			
	3					19.2	19.0			
100	1	18.0	6.7	7.84	30	19.2	19.2	7.9	8.25	30
	2					19.2	19.1			
	3					19.2	19.0			
Cadmium chloride (µg/L)										
10	1	18.3	8.5	7.91	30	19.2	18.9	7.4	8.08	28
	2					19.2	18.9			
	3					19.2	18.9			
20	1	19.3	8.5	7.91	30	19.2	18.9	7.4	8.09	28
	2					19.2	18.9			
	3					19.2	18.9			
40	1	19.0	8.6	7.92	29	19.1	18.9	7.4	8.09	28
	2					19.0	18.9			
	3					19.0	19.0			
80	1	19.2	8.6	7.92	28	19.1	18.9	7.4	8.09	28
	2					19.0	18.8			
	3					19.0	18.8			
160	1	19.5	8.6	7.93	28	19.0	18.8	7.4	8.09	28
	2					19.0	18.8			
	3					19.0	18.8			

APPENDIX TABLE 1 (Cont'd)

Mytilus edulis
WATER QUALITY DATA FOR TREASURE ISLAND TESTS

Treatment and Concentration (%)	Rep.	Day 0 °C	D.O.	pH	Sal	Day 1 °C	Day 2 °C	D.O.	pH	Sal
Composite A										
10	1	18.1	6.0	7.72	30	19.1	18.9	7.6	8.16	30
	2					19.1	18.9			
	3					19.1	18.9			
50	1	17.9	6.4	7.81	30	19.1	18.9	7.6	8.19	30
	2					19.1	18.9			
	3					19.0	18.9			
100	1	17.5	6.8	7.91	30	19.1	18.9	7.5	8.28	30
	2					19.1	18.9			
	3					19.0	18.9			
Composite B										
10	1	17.7	6.6	7.73	30	19.1	19.0	7.6	8.19	30
	2					19.0	19.0			
	3					19.0	19.0			
50	1	17.5	6.6	7.79	30	19.0	18.9	7.6	8.16	30
	2					19.0	18.9			
	3					19.0	18.9			
100	1	17.3	7.1	7.84	30	19.0	18.9	7.5	8.21	30
	2					19.0	18.9			
	3					19.0	18.9			
Composite C										
10	1	17.9	6.5	7.73	30	19.1	18.9	7.4	8.14	30
	2					19.0	18.9			
	3					19.0	18.8			
50	1	17.5	6.5	7.80	30	19.1	18.8	7.4	8.20	30
	2					19.0	18.8			
	3					19.0	18.8			
100	1	17.3	6.2	7.85	30	19.0	18.8	7.4	8.31	30
	2					19.0	18.8			
	3					18.9	18.8			

APPENDIX TABLE 1 (Cont'd)

Mytilus edulis
WATER QUALITY DATA FOR TREASURE ISLAND TESTS

Treatment and Concentration (%)	Rep.	Day 0 °C	D.O.	pH	Sal	Day 1 °C	Day 2 °C	D.O.	pH	Sal
Composite D										
10	1	17.8	6.1	7.71	30	19.0	18.8	7.5	8.23	30
	2					19.0	18.8			
	3					19.0	18.8			
50	1	17.5	5.9	7.84	30	19.0	18.8	7.4	8.17	30
	2					19.0	18.8			
	3					19.0	18.8			
100	1	17.3	5.4	7.89	30	19.0	18.8	7.4	8.25	30
	2					19.0	18.7			
	3					19.0	18.8			
Composite E										
10	1	17.8	6.0	7.73	30	19.0	18.8	7.4	8.15	30
	2					19.0	18.9			
	3					19.0	18.9			
50	1	17.8	5.9	7.83	30	19.0	18.9	7.4	8.21	30
	2					19.0	18.9			
	3					19.0	18.9			
100	1	17.6	5.2	7.89	30	19.0	18.9	7.4	8.37	30
	2					19.0	18.8			
	3					19.0	18.8			

APPENDIX TABLE 2

Mytilus edulis
MORTALITY AND ABNORMALITY DATA FOR TREASURE ISLAND TESTS
TEST SITES

Treatment and Concentration (%)	Rep	Total embryos per ml	No. Abnormal per ml	% Survival	% Abnormal	% Mortality Compared to Alcatraz Reference
Initial Counts		33.3				
Alcatraz Reference	1	24.6	1.6			
	2	23.0	1.2			
	3	28.8	1.2			
	Mean	25.5	1.3	76.5	5.2	NA
Reference Sediment (Alcatraz)						
10	1	21.2	1.6			
	2	20.4	1.4			
	3	24.6	1.8			
	Mean	22.1	1.6	66.3	7.3	13.4
50	1	17.6	1.0			
	2	16.4	1.4			
	3	19.6	1.8			
	Mean	17.9	1.4	53.7	7.8	29.8
100	1	14.0	0.6			
	2	17.6	1.2			
	3	17.6	2.0			
	Mean	16.4	1.3	49.2	7.7	35.6
Composite A						
10	1	20.4	2.0			
	2	19.4	1.8			
	3	27.2	3.6			
	Mean	22.3	2.5	67.1	11.0	12.3
50	1	26.2	4.2			
	2	27.8	4.8			
	3	24.2	5.4			
	Mean	26.1	4.8	78.3	18.4	0.0
100	1	15.2	3.6			
	2	14.6	3.4			
	3	17.8	4.2			
	Mean	15.9	3.7	47.6	23.5	37.7

APPENDIX TABLE 2 (Cont'd)

Mytilus edulis
MORTALITY AND ABNORMALITY DATA FOR TREASURE ISLAND TESTS
TEST SITES

Treatment and Concentration (%)	Rep	Total embryos per ml	No. Abnormal per ml	% Survival	% Abnormal	% Mortality Compared to Alcatraz Reference
Composite B						
10	1	15.0	1.2			
	2	23.2	2.8			
	3	21.8	3.2			
	Mean	20.0	2.4	60.1	12.0	21.5
50	1	24.8	4.4			
	2	22.2	3.4			
	3	20.6	3.8			
	Mean	22.5	3.9	67.7	17.2	11.5
100	1	23.2	4.4			
	2	23.8	5.6			
	3	23.2	6.0			
	Mean	23.4	5.3	70.3	22.8	8.1
Composite C						
10	1	18.8	1.6			
	2	23.2	3.0			
	3	23.8	1.4			
	Mean	21.9	2.0	65.9	9.1	13.9
50	1	22.0	3.4			
	2	23.8	3.8			
	3	21.8	2.2			
	Mean	22.5	3.1	67.7	13.9	11.5
100	1	21.6	6.2			
	2	13.8	3.8			
	3	15.6	4.0			
	Mean	17.0	4.7	51.1	27.5	33.2
Composite D						
10	1	25.2	1.8			
	2	21.8	2.2			
	3	22.2	2.0			
	Mean	23.1	2.0	69.3	8.7	9.4
50	1	20.8	2.6			
	2	24.6	2.8			
	3	18.6	2.6			
	Mean	21.3	2.7	64.1	12.5	16.2
100	1	14.0	3.8			
	2	20.6	4.6			
	3	17.6	4.2			
	Mean	17.4	4.2	52.3	24.1	31.7

APPENDIX TABLE 2 (Cont'd)

Mytilus edulis
MORTALITY AND ABNORMALITY DATA FOR TREASURE ISLAND TESTS
TEST SITES

Treatment and Concentration (%)	Rep	Total embryos per ml	No. Abnormal per ml	% Survival	% Abnormal	% Mortality Compared to Alcatraz Reference
Composite E						
10	1	24.0	2.4			
	2	26.4	1.8			
	3	19.8	2.0			
	Mean	23.4	2.1	70.3	8.8	8.1
50	1	21.4	2.2			
	2	20.8	2.4			
	3	21.0	2.0			
	Mean	21.1	2.2	63.3	10.4	17.3
100	1	19.0	4.4			
	2	11.8	2.8			
	3	16.2	4.2			
	Mean	15.7	3.8	47.0	24.3	38.5

APPENDIX TABLE 2 (Cont'd)

Mytilus edulis
MORTALITY AND ABNORMALITY DATA
CONTROLS AND REFERENCE TOXICANTS

Treatment and Concentration (%)	Rep	Total embryos per ml	No. Abnormal per ml	% Survival	% Abnormal	% Mortality Compared to Laboratory Control
Initial Count		33.3				
Laboratory Control						
	1	30.6	1.8			
	2	27.8	2.4			
	3	-	-			
	Mean	29.2	2.1	87.7	7.2	NA
Cadmium chloride (µg/L)						
10	1	25.0	2.0			
	2	22.2	1.8			
	3	21.4	1.6			
	Mean	22.9	1.8	68.7	7.9	21.7
20	1	13.8	1.6			
	2	17.2	2.2			
	3	25.0	2.4			
	Mean	18.7	2.1	56.1	11.1	36.1
40	1	21.2	3.0			
	2	22.4	3.0			
	3	20.6	3.8			
	Mean	21.4	3.3	64.3	15.3	26.7
80	1	22.4	3.4			
	2	22.4	3.2			
	3	22.0	4.8			
	Mean	22.3	3.8	66.9	17.1	23.7
160	1	17.6	3.0			
	2	18.8	2.6			
	3	23.6	4.6			
	Mean	20.0	3.4	60.1	17.0	31.5

QUALITY ASSURANCE LABORATORY
6555 NANCY RIDGE DR., SUITE 300
SAN DIEGO, CALIFORNIA 92121
(619) 566-1060

1B

MEC ANALYTICAL SYSTEMS
ATTN: KURT KLINE
3150 PARADISE DRIVE.,BLDG 36
TIBURON, CA 94920

DATE OF REPORT	FEBRUARY 21, 1990
DATE RECEIVED	FEBRUARY 6, 1990
DATE COMPLETED	FEBRUARY 19, 1990
ANALYZED BY	JM NZ MC VJ EA MS MG
SAMPLE TYPE	9 SEDIMENT
PROJECT NUMBER	90005-1A,1B

FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2006-90
SAMPLE ID: 900202-7 TI-A

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
TOTAL SULFIDE	AOAC 1.013	MG/KG	277	554
DISSOLVED SULFIDE	STD 4500	MG/KG	0.01	0.02
GREASE & OIL	EPA 413.2	MG/KG	< 10.0	< 20.0
CYANIDE	SW846-9010	MG/KG	23.48	46.96
TRPH	EPA 418.1	MG/KG	21.9	43.8
TRPH	DUPLICATE	MG/KG	21.9	43.8
TRIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
DIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
MONOBUTYLTIN	GCFPD	UG/KG	< 1	< 2
%SOLID	METTLER 4000	%		50.00

TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

PETER SHEN
ABORATORY DIRECTOR

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2007-90
SAMPLE ID: 900202-8 TI-B

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
TOTAL SULFIDE	AOAC 1.013	MG/KG	334	668
DISSOLVED SULFIDE	STD 4500	MG/KG	< 0.01	< 0.02
GREASE & OIL	EPA 413.2	MG/KG	16.3	32.6
CYANIDE	SW846-9010	MG/KG	5.65	11.30
TRPH	EPA 418.1	MG/KG	30.6	61.2
TRIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
DIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
MONOBUTYLTIN	GCFPD	UG/KG	< 1	< 2
%SOLID	METTLER 4000	%		50.00

TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBON

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MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2008-90
SAMPLE ID: 900202-9 TI-C

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
TOTAL SULFIDE	AOAC 1.013	MG/KG	259	518
DISSOLVED SULFIDE	STD 4500	MG/KG	0.06	0.12
GREASE & OIL	EPA 413.2	MG/KG	< 10.0	< 20.0
CYANIDE	SW846-9010	MG/KG	15.12	30.24
TRPH	EPA 418.1	MG/KG	10.7	21.4
TRIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
DIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
MONOBUTYLTIN	GCFPD	UG/KG	< 1	< 2
%SOLID	METTLER 4000	%		50.00

TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBON

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MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2009-90
SAMPLE ID: 900202-10 TI-D

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
TOTAL SULFIDE	AOAC 1.013	MG/KG	368	784
DISSOLVED SULFIDE	STD 4500	MG/KG	0.06	0.13
GREASE & OIL	EPA 413.2	MG/KG	< 10.0	< 21.3
CYANIDE	SW846-9010	MG/KG	24.45	52.10
TRPH	EPA 418.1	MG/KG	21.9	46.7
TRIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
DIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
MONOBUTYLTIN	GCFPD	UG/KG	< 1	< 2
%SOLID	METTLER 4000	%		46.93

TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBON

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2010-90
SAMPLE ID: 900202-11 TI-E

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
TOTAL SULFIDE	AOAC 1.013	MG/KG	432	958
DISSOLVED SULFIDE	STD 4500	MG/KG	< 0.01	< 0.02
GREASE & OIL	EPA 413.2	MG/KG	< 10.0	< 22.2
GREASE & OIL	DUPLICATE	MG/KG	< 10.0	< 22.2
CYANIDE	SW846-9010	MG/KG	23.05	51.10
TRPH	EPA 418.1	MG/KG	< 10.0	< 22.2
TRPH	DUPLICATE	MG/KG	< 10.0	< 22.2
TRIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
DIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
MONOBUTYLTIN	GCFPD	UG/KG	< 1	< 2
%SOLID	METTLER 4000	%		45.11

TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Peter Shen

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LABORATORY DIRECTOR

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2002-90
SAMPLE ID: 900129-2 (Alcatraz)

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
TOTAL SULFIDE	AOAC 1.013	MG/KG	148	265
DISSOLVED SULFIDE	STD 4500	MG/KG	0.03	0.05
GREASE & OIL	EPA 413.2	MG/KG	24.8	44.4
CYANIDE	SW846-9010	MG/KG	4.42	7.91
TRPH	EPA 418.1	MG/KG	21.9	39.2
TRIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
DIBUTYLTIN	GCFPD	UG/KG	< 1	< 2
MONOBUTYLTIN	GCFPD	UG/KG	< 1	< 2
%SOLID	METTLER 4000	%		55.90

TRPH - TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

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MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2006-90
SAMPLE ID: 900202-7 TI-A

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
ARSENIC	7060	MG/KG	5.59	11.18
CADMIUM	7131	MG/KG	0.161	0.322
CHROMIUM	7191	MG/KG	69.5	139.0
COPPER	6010	MG/KG	26.8	53.6
LEAD	7421	MG/KG	19.4	38.8
MERCURY	7471	MG/KG	0.17	0.34
NICKEL	6010	MG/KG	35.8	71.6
SELENIUM	7740	MG/KG	< 0.1	< 0.2
SILVER	6010	MG/KG	1.11	2.22
ZINC	6010	MG/KG	55.9	111.8
% SOLID	METTLER 4000	%		50.00

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MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2007-90
SAMPLE ID: 900202-8 TI-B

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
ARSENIC	7060	MG/KG	5.05	10.10
CADMIUM	7131	MG/KG	0.167	0.334
CHROMIUM	7191	MG/KG	48.7	97.4
COPPER	6010	MG/KG	21.3	42.6
LEAD	7421	MG/KG	20.3	40.6
MERCURY	7471	MG/KG	0.15	0.30
NICKEL	6010	MG/KG	29.1	58.2
SELENIUM	7740	MG/KG	< 0.1	< 0.2
SILVER	6010	MG/KG	0.811	1.622
ZINC	6010	MG/KG	54.4	108.8
% SOLID	METTLER 4000	%		50.00

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MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2008-90
SAMPLE ID: 900202-9 TI-C

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
ARSENIC	7060	MG/KG	5.06	10.12
CADMIUM	7131	MG/KG	0.137	0.274
CHROMIUM	7191	MG/KG	83.0	166.0
COPPER	6010	MG/KG	21.0	42.0
LEAD	7421	MG/KG	18.9	37.8
MERCURY	7471	MG/KG	0.13	0.26
NICKEL	6010	MG/KG	29.0	58.0
SELENIUM	7740	MG/KG	< 0.1	< 0.2
SILVER	6010	MG/KG	0.903	1.806
ZINC	6010	MG/KG	49.2	98.4
% SOLID	METTLER 4000	%		50.00

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MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2009-90
SAMPLE ID: 900202-10 TI-D

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
ARSENIC	7060	MG/KG	6.16	13.13
CADMIUM	7131	MG/KG	0.247	0.526
CHROMIUM	7191	MG/KG	74.0	157.7
COPPER	6010	MG/KG	24.3	51.8
LEAD	7421	MG/KG	24.5	52.2
MERCURY	7471	MG/KG	0.14	0.30
NICKEL	6010	MG/KG	29.8	63.5
SELENIUM	7740	MG/KG	< 0.1	< 0.2
SILVER	6010	MG/KG	1.14	2.43
ZINC	6010	MG/KG	55.9	119.1
% SOLID	METTLER 4000	%		46.93

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MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2010-90
SAMPLE ID: 900202-11 TI-E

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
ARSENIC	7060	MG/KG	4.94	10.95
CADMIUM	7131	MG/KG	0.168	0.372
CHROMIUM	7191	MG/KG	55.7	123.5
COPPER	6010	MG/KG	24.0	53.2
LEAD	7421	MG/KG	19.1	42.3
MERCURY	7471	MG/KG	0.13	0.29
NICKEL	6010	MG/KG	28.6	63.4
SELENIUM	7740	MG/KG	< 0.1	< 0.2
SILVER	6010	MG/KG	0.814	1.804
ZINC	6010	MG/KG	51.1	113.3
% SOLID	METTLER 4000	%		45.11

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MEC ANALYTICAL SYSTEMS
ANALYSES RESULTS
SAMPLE TYPE - SEDIMENT

LOG NUMBER: 2002-90
SAMPLE ID: 900129-2 Alcatraz

ANALYSES	METHOD	UNITS	WET WEIGHT	DRY WEIGHT
ARSENIC	7060	MG/KG	6.09	10.89
CADMIUM	7131	MG/KG	0.175	0.313
CHROMIUM	7191	MG/KG	59.9	107.2
COPPER	6010	MG/KG	29.6	53.0
LEAD	7421	MG/KG	19.5	34.9
MERCURY	7471	MG/KG	0.18	0.32
NICKEL	6010	MG/KG	37.2	66.5
SELENIUM	7740	MG/KG	< 0.1	< 0.2
SILVER	6010	MG/KG	1.15	2.06
ZINC	6010	MG/KG	55.6	99.5
% SOLID	METTLER 4000	%		55.90

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8080
ORGANOCHLORINE PESTICIDES
AND PCB'S

LOG NUMBER: 2006-90
SAMPLE ID: 900202-7
TYPE: SEDIMENT TI-A

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
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
GAMMA-BHC	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	50	ND	ND
PCB-1221	50	ND	ND
PCB-1232	50	ND	ND
PCB-1242	50	ND	ND
PCB-1248	50	ND	ND
PCB-1254	50	ND	ND
PCB-1260	50	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8080
ORGANOCHLORINE PESTICIDES
AND PCB'S

LOG NUMBER: 2007-90
SAMPLE ID: 900202-8
TYPE: SEDIMENT TI-B

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
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
GAMMA-BHC	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	50	ND	ND
PCB-1221	50	ND	ND
PCB-1232	50	ND	ND
PCB-1242	50	ND	ND
PCB-1248	50	ND	ND
PCB-1254	50	ND	ND
PCB-1260	50	ND	ND

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8080
ORGANOCHLORINE PESTICIDES
AND PCB'S

LOG NUMBER: 2008-90
SAMPLE ID: 900202-9
TYPE: SEDIMENT TI-C

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
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
NDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
GAMMA-BHC	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	50	ND	ND
PCB-1221	50	ND	ND
PCB-1232	50	ND	ND
PCB-1242	50	ND	ND
PCB-1248	50	ND	ND
PCB-1254	50	ND	ND
PCB-1260	50	ND	ND

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8080
ORGANOCHLORINE PESTICIDES
AND PCB'S

LOG NUMBER: 2009-90
SAMPLE ID: DUPLICATE
TYPE: SEDIMENT TI-D

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			46.93
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
GAMMA-BHC	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	50	ND	ND
PCB-1221	50	ND	ND
PCB-1232	50	ND	ND
PCB-1242	50	ND	ND
PCB-1248	50	ND	ND
PCB-1254	50	ND	ND
PCB-1260	50	ND	ND

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8080
ORGANOCHLORINE PESTICIDES
AND PCB'S

LOG NUMBER: 2010-90
SAMPLE ID: 900202-11
TYPE: SEDIMENT TIE

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			45.11
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
GAMMA-BHC	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	50	ND	ND
PCB-1221	50	ND	ND
PCB-1232	50	ND	ND
PCB-1242	50	ND	ND
PCB-1248	50	ND	ND
PCB-1254	50	ND	ND
PCB-1260	50	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8080
ORGANOCHLORINE PESTICIDES
AND PCB'S

LOG NUMBER: 2002-90
SAMPLE ID: 900129-2
TYPE: SEDIMENT Alcatraz

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			55.90
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
NDRIN	2	ND	ND
ENDRIN ALDEHYDE	10	ND	ND
HEPTACHLOR	2	ND	ND
HEPTACHLOR EPOXIDE	10	ND	ND
GAMMA-BHC	2	ND	ND
TOXAPHENE	25	ND	ND
PCB-1016	50	ND	ND
PCB-1221	50	ND	ND
PCB-1232	50	ND	ND
PCB-1242	50	ND	ND
PCB-1248	50	ND	ND
PCB-1254	50	ND	ND
PCB-1260	50	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

EC ANALYTICAL SYSTEMS
EPA METHOD 8040
PHENOLS

LOG NUMBER: 2006-90
SAMPLE ID: 900202-7
TYPE: SEDIMENT TI-A

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
4-CHLORO-3-METHYLPHENOL	10	ND	ND
2-CHLOROPHENOL	10	ND	ND
2,4-DICHLOROPHENOL	10	ND	ND
2,4-DIMETHYLPHENOL	10	ND	ND
2,4-DINITROPHENOL	50	ND	ND
2-METHYL-4,6-DINITROPHENOL	50	ND	ND
2-NITROPHENOL	10	ND	ND
4-NITROPHENOL	50	ND	ND
PENTACHLOROPHENOL	100	ND	ND
PHENOL	10	ND	ND
2,4,6-TRICHLOROPHENOL	10	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

EC ANALYTICAL SYSTEMS
EPA METHOD 8040
PHENOLS

LOG NUMBER: 2007-90
SAMPLE ID: 900202-8
TYPE: SEDIMENT TI-13

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
4-CHLORO-3-METHYLPHENOL	10	ND	ND
2-CHLOROPHENOL	10	ND	ND
2,4-DICHLOROPHENOL	10	ND	ND
2,4-DIMETHYLPHENOL	10	ND	ND
2,4-DINITROPHENOL	50	ND	ND
2-METHYL-4,6-DINITROPHENOL	50	ND	ND
2-NITROPHENOL	10	ND	ND
4-NITROPHENOL	50	ND	ND
PENTACHLOROPHENOL	100	ND	ND
PHENOL	10	ND	ND
2,4,6-TRICHLOROPHENOL	10	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

EC ANALYTICAL SYSTEMS
EPA METHOD 8040
PHENOLS

LOG NUMBER: 2008-90
SAMPLE ID: 900202-9
TYPE: SEDIMENT TI-C

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
4-CHLORO-3-METHYLPHENOL	10	ND	ND
2-CHLOROPHENOL	10	ND	ND
2,4-DICHLOROPHENOL	10	ND	ND
2,4-DIMETHYLPHENOL	10	ND	ND
2,4-DINITROPHENOL	50	ND	ND
2-METHYL-4,6-DINITROPHENOL	50	ND	ND
2-NITROPHENOL	10	ND	ND
4-NITROPHENOL	50	ND	ND
PENTACHLOROPHENOL	100	ND	ND
PHENOL	10	ND	ND
2,4,6-TRICHLOROPHENOL	10	ND	ND

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8040
PHENOLS

LOG NUMBER: 2009-90
SAMPLE ID: 900202-10
TYPE: SEDIMENT TI-1)

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			46.93
4-CHLORO-3-METHYLPHENOL	10	ND	ND
2-CHLOROPHENOL	10	ND	ND
2,4-DICHLOROPHENOL	10	ND	ND
2,4-DIMETHYLPHENOL	10	ND	ND
2,4-DINITROPHENOL	50	ND	ND
2-METHYL-4,6-DINITROPHENOL	50	ND	ND
2-NITROPHENOL	10	ND	ND
4-NITROPHENOL	50	ND	ND
PENTACHLOROPHENOL	100	ND	ND
PHENOL	10	ND	ND
2,4,6-TRICHLOROPHENOL	10	ND	ND

'D = NONE DETECTED

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8040
PHENOLS

LOG NUMBER: 2010-90
SAMPLE ID: 900202-11
TYPE: SEDIMENT TI-E

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			45.11
4-CHLORO-3-METHYLPHENOL	10	ND	ND
2-CHLOROPHENOL	10	ND	ND
2,4-DICHLOROPHENOL	10	ND	ND
2,4-DIMETHYLPHENOL	10	ND	ND
2,4-DINITROPHENOL	50	ND	ND
2-METHYL-4,6-DINITROPHENOL	50	ND	ND
2-NITROPHENOL	10	ND	ND
4-NITROPHENOL	50	ND	ND
PENTACHLOROPHENOL	100	ND	ND
PHENOL	10	ND	ND
2,4,6-TRICHLOROPHENOL	10	ND	ND

ND = NONE DETECTED

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IEC ANALYTICAL SYSTEMS
EPA METHOD 8040
PHENOLS

LOG NUMBER: 2002-90
SAMPLE ID: 900129-2
TYPE: SEDIMENT Alcatraz

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			55.90
4-CHLORO-3-METHYLPHENOL	10	ND	ND
2-CHLOROPHENOL	10	ND	ND
2,4-DICHLOROPHENOL	10	ND	ND
2,4-DIMETHYLPHENOL	10	ND	ND
2,4-DINITROPHENOL	50	ND	ND
2-METHYL-4,6-DINITROPHENOL	50	ND	ND
2-NITROPHENOL	10	ND	ND
4-NITROPHENOL	50	ND	ND
PENTACHLOROPHENOL	100	ND	ND
PHENOL	10	ND	ND
2,4,6-TRICHLOROPHENOL	10	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8100
POLYNUCLEAR AROMATIC
HYDROCARBONS

LOG NUMBER: 2006-90
SAMPLE ID: 900202-7
TYPE: SEDIMENT TI-A

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
ACENAPHTHENE	20	19.5	39.0
ACENAPHTHYLENE	20	15.2	30.4
ANTHRACENE	20	61.4	122.8
BENZO(A)ANTHRACENE	20	105	210
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	131	262
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	293	586
FLUORENE	20	17.3	34.6
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	160	320
PYRENE	20	253	506

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8100
POLYNUCLEAR AROMATIC
HYDROCARBONS

LOG NUMBER: 2007-90
SAMPLE ID: 900202-8
TYPE: SEDIMENT TI-B

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
ACENAPHTHENE	20	21.2	42.4
ACENAPHTHYLENE	20	14.3	28.6
ANTHRACENE	20	34.6	69.2
BENZO(A)ANTHRACENE	20	87.4	174.8
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	79.9	159.8
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	246	492
FLUORENE	20	13.5	27.0
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	15.5	31.0
PHENANTHRENE	20	137	274
PYRENE	20	139	278

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8100
POLYNUCLEAR AROMATIC
HYDROCARBONS

LOG NUMBER: 2008-90
SAMPLE ID: 900202-9
TYPE: SEDIMENT TI-C

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
ACENAPHTHENE	20	15.4	30.8
ACENAPHTHYLENE	20	14.0	28.0
ANTHRACENE	20	50.8	101.6
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	113	226
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	258	516
FLUORENE	20	11.2	22.4
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	142	284
PYRENE	20	188	376

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8100
POLYNUCLEAR AROMATIC
HYDROCARBONS

LOG NUMBER: 2009-90
SAMPLE ID: 900202-10 TI-D
TYPE: SEDIMENT

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			46.93
ACENAPHTHENE	20	9.88	21.05
ACENAPHTHYLENE	20	11.8	25.1
ANTHRACENE	20	69.3	147.7
BENZO(A)ANTHRACENE	20	107	228
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	144	307
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	243	518
FLUORENE	20	ND	ND
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	111	237
PYRENE	20	247	526

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8100
POLYNUCLEAR AROMATIC
HYDROCARBONS

LOG NUMBER: 2010-90
SAMPLE ID: 900202-11 TI-E
TYPE: SEDIMENT

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			45.11
ACENAPHTHENE	20	ND	ND
ACENAPHTHYLENE	20	ND	ND
ANTHRACENE	20	65.9	146.1
BENZO(A)ANTHRACENE	20	91.8	203.5
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	142	315
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	138	306
FLUORENE	20	8.56	18.98
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	ND	ND
PHENANTHRENE	20	67.8	150.3
PYRENE	20	110	244

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8100
POLYNUCLEAR AROMATIC
HYDROCARBONS

LOG NUMBER: 2002-90
SAMPLE ID: 900129-2
TYPE: SEDIMENT Alcatraz

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			55.90
ACENAPHTHENE	20	80.7	144.4
ACENAPHTHYLENE	20	245	438
ANTHRACENE	20	643	1150
BENZO(A)ANTHRACENE	20	717	1283
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	868	1553
DIBENZO(A,H)ANTHRACENE	20	ND	ND
FLUORANTHENE	20	1580	2826
FLUORENE	20	156	279
INDENO(1,2,3-CD)PYRENE	20	ND	ND
NAPHTHALENE	20	97.4	174.2
PHENANTHRENE	20	1590	2844
PYRENE	20	2040	3649

ND = NONE DETECTED

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8060
PHTHALATE ESTER

LOG NUMBER: 2006-90
SAMPLE ID: 900202-7
TYPE: SEDIMENT TI-A

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
BIS(2-ETHYLHEXYL)PHTHALATE	50	ND	ND
BUTYL BENZYL PHTHALATE	8.5	ND	ND
DI-N-BUTYL PHTHALATE	9	ND	ND
DIETHYL PHTHALATE	12	ND	ND
DIMETHYL PHTHALATE	7.3	ND	ND
DI-N-OCTYL PHTHALATE	75	ND	ND

ND = NONE DETECTED

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EBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8060
PHTHALATE ESTER

LOG NUMBER: 2007-90
SAMPLE ID: 900202-8 TI-B
TYPE: SEDIMENT

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
BIS(2-ETHYLHEXYL)PHTHALATE	50	ND	ND
BUTYL BENZYL PHTHALATE	8.5	ND	ND
DI-N-BUTYL PHTHALATE	9	ND	ND
DIETHYL PHTHALATE	12	ND	ND
DIMETHYL PHTHALATE	7.3	ND	ND
DI-N-OCTYL PHTHALATE	75	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8060
PHTHALATE ESTER

LOG NUMBER: 2008-90
SAMPLE ID: 900202-9
TYPE: SEDIMENT II-C

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			50.00
BIS(2-ETHYLHEXYL)PHTHALATE	50	ND	ND
BUTYL BENZYL PHTHALATE	8.5	ND	ND
DI-N-BUTYL PHTHALATE	9	ND	ND
DIETHYL PHTHALATE	12	ND	ND
DIMETHYL PHTHALATE	7.3	ND	ND
DI-N-OCTYL PHTHALATE	75	ND	ND

ND = NONE DETECTED

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MEC ANALYTICAL SYSTEMS
EPA METHOD 8060
PHTHALATE ESTER

LOG NUMBER: 2009-90
SAMPLE ID: 900202-10
TYPE: SEDIMENT II-D

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			46.93
BIS(2-ETHYLHEXYL)PHTHALATE	50	ND	ND
BUTYL BENZYL PHTHALATE	8.5	ND	ND
DI-N-BUTYL PHTHALATE	9	ND	ND
DIETHYL PHTHALATE	12	ND	ND
DIMETHYL PHTHALATE	7.3	ND	ND
DI-N-OCTYL PHTHALATE	75	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8060
PHTHALATE ESTER

LOG NUMBER: 2010-90
SAMPLE ID: 900202-11
TYPE: SEDIMENT TI-E

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			45.11
BIS(2-ETHYLHEXYL)PHTHALATE	50	ND	ND
BUTYL BENZYL PHTHALATE	8.5	ND	ND
DI-N-BUTYL PHTHALATE	9	ND	ND
DIETHYL PHTHALATE	12	ND	ND
DIMETHYL PHTHALATE	7.3	ND	ND
DI-N-OCTYL PHTHALATE	75	ND	ND

ND = NONE DETECTED

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FEBRUARY 21, 1990

MEC ANALYTICAL SYSTEMS
EPA METHOD 8060
PHTHALATE ESTER

LOG NUMBER: 2002-90
SAMPLE ID: 900129-2
TYPE: SEDIMENT Alcatraz

ANALYSIS	DETECTION LIMIT ug/kg	WET WEIGHT ug/kg	DRY WEIGHT ug/kg
%SOLID			55.90
BIS(2-ETHYLHEXYL)PHTHALATE	50	ND	ND
BUTYL BENZYL PHTHALATE	8.5	ND	ND
DI-N-BUTYL PHTHALATE	9	ND	ND
DIETHYL PHTHALATE	12	ND	ND
DIMETHYL PHTHALATE	7.3	ND	ND
DI-N-OCTYL PHTHALATE	75	ND	ND

ND = NONE DETECTED

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Project 90005

GRAIN SIZE ANALYSIS

Client: Dr. Kurt Kline
Contact person: Dr. Kurt Kline

Date of analysis: 8Feb90
Date of report: 20Feb90
Analysis method: Sieve/pipette (Plumb, 1981)

Sample Identification: 900202-7 composite TI-A

Total sample weight: 20.874 grams

Size		Weight		Cumulative
Microns	Phi	grams	Percent	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	0.018	0.086	0.086
707.107	0.5	0.016	0.077	0.163
500.000	1.0	0.035	0.168	0.331
353.553	1.5	0.104	0.498	0.829
250.000	2.0	0.059	0.283	1.111
176.777	2.5	0.127	0.608	1.720
125.000	3.0	0.208	0.996	2.716
88.388	3.5	0.500	2.395	5.112
62.500	4.0	0.936	4.484	9.596
31.250	5.0	2.312	11.078	20.674
15.625	6.0	2.353	11.273	31.947
7.812	7.0	1.582	7.580	39.527
3.906	8.0	1.745	8.357	47.884
1.953	9.0	1.217	5.831	53.715
< 1.953	> 9.0	9.662	46.285	100.000

% < 4 phi = 90.404
% > 1 phi = 0.163
% gravel = 0.000
% sand = 9.596
% silt = 38.288
% clay = 52.116

Sample Statistics

Median		Mean		Dispersion	Skewness
phi	microns	phi	microns		
8.363	3.04	.	*	.	.

5th percentile = 3.477
16th percentile = 4.578
50th percentile = 8.363
84th percentile = .
95th percentile = .
*** 84th percentile not reached ***
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

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

Project 40003

GRAIN SIZE ANALYSIS

Client: Dr. Kurt Kline
Contact person: Dr. Kurt Kline

Date of analysis: 8Feb90
Date of report: 20Feb90
Analysis method: Sieve/pipette (Plumb, 1981)

Sample Identification: 900202-8 composite II-B

Total sample weight: 20.202 grams

Size		Weight		Cumulative
Microns	Phi	grams	Percent	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	0.022	0.109	0.109
707.107	0.5	0.023	0.114	0.223
500.000	1.0	0.052	0.257	0.480
353.553	1.5	0.081	0.401	0.881
250.000	2.0	0.154	0.762	1.643
176.777	2.5	0.194	0.960	2.604
125.000	3.0	0.430	2.129	4.732
88.388	3.5	0.706	3.495	8.227
62.500	4.0	1.251	6.193	14.420
31.250	5.0	2.556	12.652	27.071
15.625	6.0	2.312	11.447	38.518
7.812	7.0	1.582	7.832	46.351
3.906	8.0	1.379	6.828	53.179
1.953	9.0	1.745	8.635	61.814
< 1.953	> 9.0	7.714	38.186	100.000

% < 4 phi = 85.580
% > 1 phi = 0.223
% gravel = 0.000
% sand = 14.420
% silt = 38.759
% clay = 46.821

Sample Statistics

Median		Mean		Dispersion	Skewness
phi	microns	phi	microns		
7.534	5.39	7.939	4.08	3.814	0.106

5th percentile = 3.038
16th percentile = 4.125
50th percentile = 7.534
84th percentile = 11.752
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

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

GRAIN SIZE ANALYSIS

Client: Dr. Kurt Kline
Contact person: Dr. Kurt Kline

Date of analysis: 8Feb90
Date of report: 20Feb90
Analysis method: Sieve/pipette (Plumb, 1981)

Sample Identification: 900202-9 Composite II-C

Total sample weight: 19.020 grams

Size		Weight		Cumulative
Microns	Phi	grams	Percent	Percent
2000.000	-1.0	0.000	0.000	0.000
1414.214	-0.5	0.008	0.042	0.042
1000.000	0.0	0.006	0.032	0.074
707.107	0.5	0.018	0.095	0.168
500.000	1.0	0.033	0.174	0.342
353.553	1.5	0.046	0.242	0.584
250.000	2.0	0.064	0.336	0.920
176.777	2.5	0.088	0.463	1.383
125.000	3.0	0.281	1.477	2.860
88.388	3.5	0.589	3.097	5.957
62.500	4.0	0.963	5.063	11.020
31.250	5.0	2.434	12.798	23.819
15.625	6.0	1.745	9.172	32.991
7.812	7.0	1.866	9.812	42.803
3.906	8.0	1.866	9.812	52.615
1.953	9.0	0.974	5.119	57.734
< 1.953	> 9.0	8.039	42.266	100.000

% < 4 phi = 88.980
% > 1 phi = 0.168
% gravel = 0.000
% sand = 11.020
% silt = 41.595
% clay = 47.385

Sample Statistics

Median		Mean		Dispersion	Skewness
phi	microns	phi	microns		
7.733	4.70	.	*	.	.

5th percentile = 3.345
16th percentile = 4.389
50th percentile = 7.733
84th percentile = .
95th percentile = .
*** 84th percentile not reached ***
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

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

Project 900203

GRAIN SIZE ANALYSIS

Client: Dr. Kurt Kline
Contact person: Dr. Kurt Kline

Date of analysis: 8F %b90
Date of report: 20F\ b90
Analysis method: Sie e/pipette (Plumb, 1981)

Sample Identification: 900202-10 Composite TI-D

Total sample weight: 16.948 grams

Size		Weight		Cumulative
Microns	Phi	grams	Percent	Percent
2000.000	-1.0	0.000	0.000	0.000
1414.214	-0.5	0.027	0.159	0.159
1000.000	0.0	0.012	0.071	0.230
707.107	0.5	0.005	0.030	0.260
500.000	1.0	0.029	0.171	0.431
353.553	1.5	0.039	0.230	0.661
250.000	2.0	0.015	0.089	0.749
176.777	2.5	0.031	0.183	0.932
125.000	3.0	0.045	0.266	1.198
88.388	3.5	0.112	0.661	1.859
62.500	4.0	0.359	2.118	3.977
31.250	5.0	1.988	11.729	15.706
15.625	6.0	2.272	13.405	29.111
7.812	7.0	2.069	12.208	41.319
3.906	8.0	1.461	8.617	49.936
1.953	9.0	1.542	9.096	59.032
< 1.953	> 9.0	6.943	40.968	100.000

% < 4 phi = 96.023
% > 1 phi = 0.260
% gravel = 0.000
% sand = 3.977
% silt = 45.960
% clay = 50.064

Sample Statistics

Median		Mean		Dispersion	Skewness
phi	microns	phi	microns		
8.007	3.89	8.383	2.99	3.361	0.112

5th percentile = 4.087
16th percentile = 5.022
50th percentile = 8.007
84th percentile = 11.745
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

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

GRAIN SIZE ANALYSIS

Client: Dr. Kurt Kline
Contact person: Dr. Kurt Kline

Date of analysis: 8Feb90
Date of report: 20Feb90
Analysis method: Sieve/pipette (Plumb, 1981)

Sample Identification: 90020I-11 Composite TI-E

Total sample weight: 18.613 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	0.007	0.038	0.038
707.107	0.5	0.019	0.102	0.140
500.000	1.0	0.019	0.102	0.242
353.553	1.5	0.041	0.220	0.462
250.000	2.0	0.105	0.564	1.026
176.777	2.5	0.131	0.704	1.730
125.000	3.0	0.149	0.801	2.530
88.388	3.5	0.188	1.010	3.541
62.500	4.0	0.503	2.702	6.243
31.250	5.0	1.866	10.026	16.269
15.625	6.0	2.596	13.950	30.219
7.812	7.0	2.069	11.116	41.335
3.906	8.0	1.704	9.155	50.490
1.953	9.0	1.785	9.590	60.081
< 1.953	> 9.0	7.430	39.919	100.000

% < 4 phi = 93.757
% > 1 phi = 0.140
% gravel = 0.000
% sand = 6.243
% silt = 44.247
% clay = 49.510

Sample Statistics

Median phi	Median microns	Mean phi	Mean microns	Dispersion	Skewness
7.946	4.05	8.236	3.32	3.263	0.089

5th percentile = 3.770
16th percentile = 4.973
50th percentile = 7.946
84th percentile = 11.500
95th percentile = .
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

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

GRAIN SIZE ANALYSIS Project 90005

Client: Dr. Kurt Kline
Contact person: Dr. Kurt Kline

Date of analysis: 8Feb90
Date of report: 20Feb90
Analysis method: Sieve/pipette (Plumb, 1981)

Sample Identification: 900129-2

Total sample weight: 23.009 grams Alcatraz sediment

Size		Weight		Cumulative
Microns	Phi	grams	Percent	Percent
2000.000	-1.0	0.283	1.230	1.230
1414.214	-0.5	0.042	0.183	1.412
1000.000	0.0	0.073	0.317	1.730
707.107	0.5	0.063	0.274	2.004
500.000	1.0	0.120	0.522	2.525
353.553	1.5	0.263	1.143	3.668
250.000	2.0	0.561	2.438	6.106
176.777	2.5	0.514	2.234	8.340
125.000	3.0	0.534	2.321	10.661
88.388	3.5	0.377	1.638	12.299
62.500	4.0	0.497	2.160	14.459
31.250	5.0	1.988	8.640	23.099
15.625	6.0	2.556	11.108	34.207
7.812	7.0	2.353	10.227	44.434
3.906	8.0	1.501	6.524	50.957
1.953	9.0	1.623	7.053	58.010
< 1.953	> 9.0	9.662	41.990	100.000

% < 4 phi = 85.541
% > 1 phi = 2.004
% gravel = 1.230
% sand = 13.229
% silt = 36.498
% clay = 49.043

Sample Statistics

Median		Mean		Dispersion	Skewness
phi	microns	phi	microns		
7.853	4.32	.	*	.	.

5th percentile = 1.773
16th percentile = 4.178
50th percentile = 7.853
84th percentile = .
95th percentile = .
*** 84th percentile not reached ***
*** 84th percentile extrapolated ***
*** 95th percentile not reached ***

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

QUALITY ASSURANCE LABORATORY

MEC ANALYTICAL SYSTEMS, INC.
ATTN: KURT KLINE
98 MAIN ST. #428
TIBURON, CA 94920

DATE OF QC REPORT	FEBRUARY 20, 1990
DATE RECEIVED	FEBRUARY 6, 1990
DATE OF SAMPLE	JANUARY 29, 1990
DATE COMPLETED	FEBRUARY 19, 1990
ANALYZED BY	JM MG EA MC MS JV
SAMPLE TYPE	9 SEDIMENTS
PROJECT NUMBER	90005-1A1B

QUALITY CONTROL DATA

FOR

LOG #2002-90 THROUGH #2010-90

Mailing Address:
P O. Box 22567
San Diego, CA 92122

San Diego
6555 Nancy Ridge Dr., Suite 300
San Diego, CA 92121
(619) 566-1060
Fax: (619) 458-9093

Arizona
(602) 468-0691
Orange County
(714) 261-7242

FEBRUARY 19, 1990
MEC ANALYTICAL SYSTEMS, INC.
QA/QC REPORT
LOG #2002-90 THROUGH #2010-90

METALS DATA

ANALYSES	METHOD	CCCV %RECOVERY	SPIKE %RECOVERY	DUPLICATE RPD
ARSENIC	7060	86%	83%	1%
CADMIUM	7131	93%	103%	4%
CHROMIUM	7191	109%	90%	1%
COPPER	6010	104%	90%	0%
LEAD	7421	92%	107%	2%
MERCURY	7471	81%	100%	0%
NICKEL	6010	84%	75%	3%
SELENIUM	7741	90%	103%	0%
SILVER	6010	89%	8% *	45% *
ZINC	6010	109%	92%	1%
CYANIDE	SW8469010	101%		

* LOW RECOVERY DUE TO SAMPLE MATRIX INTERFERENCE.

LISA MACCLELLAN
QA/QC DIRECTOR

FEBRUARY 20, 1990
MEC ANALYTICAL SYSTEMS, INC.
QA/QC REPORT
LOG #2002-90 THROUGH #2010-90

METHOD GCFPD
TRIBUTYLTIN ANALYSES

CONTINUING CALIBRATION CURVE VERIFICATION

CONC. (ppb)	TRIBUTYLTIN %RECOVERY	DIBUTYLTIN %RECOVERY	MONOBUTYLTIN %RECOVERY
200ppb	97%	107%	65%

SPIKE RECOVERY DATA
(log #2009 was spiked with 200ppb TBT standard)

CONC. (ppb)	TRIBUTYLTIN %RECOVERY	DIBUTYLTIN %RECOVERY	MONOBUTYLTIN %RECOVERY
200ppb	101%	141%	138%

DUPLICATE RELATIVE PERCENT DIFFERENCE
(log #2011 was analyzed in duplicate)

TRIBUTYLTIN RPD	DIBUTYLTIN RPD	MONOBUTYLTIN RPD
0%	0%	0%

LISA MACCLELLAN
QA/QC DIRECTOR

FEBRUARY 19, 1990

MEC ANALYTICAL SYSTEMS
QA/QC DATA
POLYNUCLEAR AROMATIC HYDROCARBONS
LOG #2002-90 THROUGH #2010-90

EPA METHOD 8100

Method Blanks showed no 8100 compounds.

CONTINUING CALIBRATION CURVE VERIFICATION

COMPOUND	% RECOVERY
Acenaphthene	104 %
1,4-Dichlorobenzene	104 %
N-Nitroso-di-n-propylamine	118 %
1,2,4-Trichlorobenzene	94 %
2,4-Dinitrotoluene	98 %
Di-n-butylphthalate	104 %
Fluoranthene	104 %
Phenol	111 %
2-Chlorophenol	110 %
4-Chloro-3-methylphenol	104 %

SURROGATE RECOVERY DATA

	% RECOVERY		
LOG#	NITROBENZENE-D5	2-FLUOROBIPHENYL	TERPHENYL-D14
2002	36%	45%	86%
2003	38%	42%	32%
2004	40%	44%	48%
2005	34%	38%	41%
2006	41%	48%	50%
2007	36%	40%	30%
2008	40%	44%	40%
2009	42%	42%	52%
2010	32%	40%	36%

LISA MACCLELLAN
QA/QC DIRECTOR

FEBRUARY 19, 1990
MEC ANALYTICAL SYSTEMS, INC.
QA/QC REPORT
LOG #2002-90 THROUGH 2010-90

EPA METHOD 8040 & 8060

CONTINUING CALIBRATION CURVE VERIFICATION.

A 100 ppb standard verification was run in the sample set up

COMPOUND	% RECOVERY
PHENOL	106%
1,4-DICHLOROBENZENE	104%
2-NITROPHENOL	97%
2,4-DICHLOROPHENOL	94%
HEXACHLOROBUTADIENE	99%
4-CHLORO-3-METHYLPHENOL	104%
2,4,6-TRICHLOROPHENOL	98%
ACENAPHTHENE	104%
N-NITROSODIPHENYLAMINE	102%
PENTACHLOROPHENOL	133%
FLUORANTHENE	104%
DI-N-OCTYL PHTHALATE	95%
BENZO(A)PYRENE	88%

SURROGATE RECOVERIES

LOG#	2-FLUOROPHENOL	PHENOL-D5	2,4,6-TRIBROMOPHENOL
2002	60%	72%	89%
2003	57%	69%	82%
2004	65%	79%	105%
2005	51%	67%	94%
2006	73%	80%	129%
2007	65%	78%	109%
2008	66%	82%	116%
2009	64%	81%	128%
2010	41%	59%	106%

LISA MACCLELLAN
QA/QC DIRECTOR