SAN RAFAEL CHANNEL
CONFIRMATORY CHEMISTRY
SAMPLING AND ANALYSIS REPORT (SAR)

June 2011

U.S. Army Corps of Engineers
San Francisco District
Engineering and Technical Services Division
Planning Branch
Environmental Section A

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1 INTRODUCTION

As part of the Operations and Maintenance Program, the United States Army Corps of Engineers, San Francisco District (USACE) is planning to dredge accumulated sediment from within the San Rafael Creek Channel to restore navigation depths. The USACE, San Francisco District performed pre-dredge sampling and analysis in 2010 to support a determination of suitability for placement of dredged sediments from Stations 0+00 to 175+00 at the SF-11 (Alcatraz) in-bay site. This sampling and analysis was conducted according to the procedures and requirements in the *San Rafael Channel, FY 2011 Maintenance Dredging, Confirmatory Chemistry Sampling and Analysis Plan (SAP)*. This data report has been prepared to provide the evaluation of these sediments.

1.1 Project Description

The City of San Rafael is located approximately 17 miles north of San Francisco in Marin County. The Inner Canal portion of the San Rafael Creek Channel is located along the entire length of San Rafael Creek and the Across the Flats (ATF) portion of the channel extends out into the San Francisco Bay from the mouth of the San Rafael Creek, see Figure 1-1. The channel is mainly used for light commercial and recreational navigation. This channel has been dredged by the USACE since 1928. The Inner Canal portion of the channel is authorized as a channel 60 feet wide; approximately 1.6 miles long from the mouth of the creek to Grand Street in San Rafael, with a depth of -6 feet mean lower low water (MLLW). This portion of the channel also has a turning basin 100 feet wide, 200 feet long and -6 ft MLLW at the San Rafael Yacht Club. The ATF portion of the channel is authorized as a channel 100 feet wide, approximately 2.4 miles long from the mouth of the creek out into the Bay, with a depth of -8 feet MLLW.

In addition to the project depth, this project has an allowable over-depth of -2 feet. The following volume of shoaling in the channel was estimated based on surveys performed in February of 2011. The Inner Canal portion of the channel has an estimated volume of 72,185 cubic yards (CY) above the project depth of -6 feet MLLW. The ATF portion of the channel has an estimated volume of 246,822 CY above the project depth of -8 feet MLLW, see Table 1-1.

Figure 1-1 Location Map: San Rafael Channel, San Rafael, CA

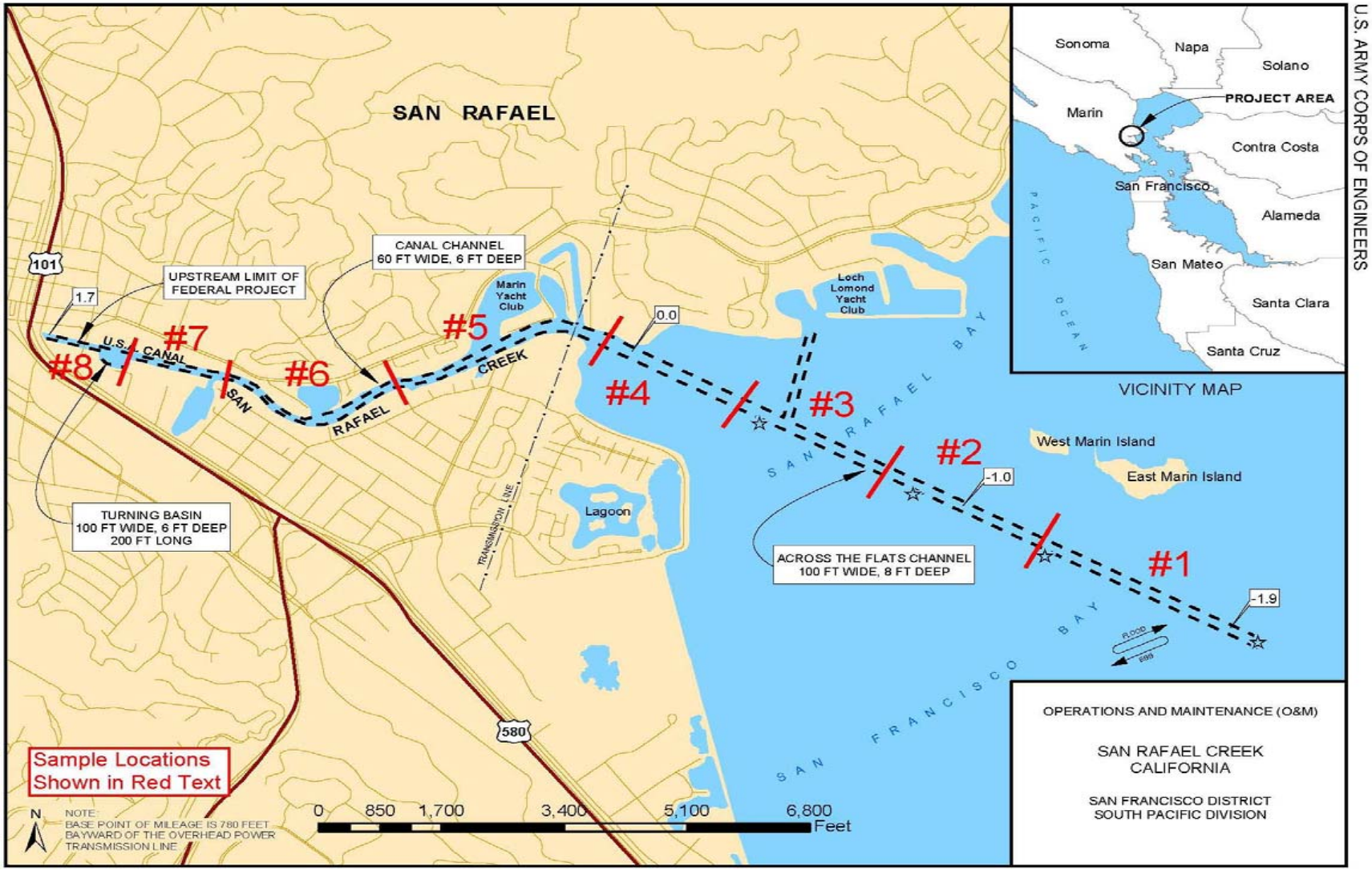

Table 1-1: San Rafael Channel Navigation Channels

Stations	Navigation Channel	Depth[1] (ft MLLW)	Width (feet)	Length	Allowable Over-depth (feet)
0+00-116+00	Across the Flats	-8	100	2.4 miles	-2
116+00-200+87	Inner Canal	-6	60	1.6 miles	-2
	Turning Basin	-6	100	200 feet	-2

[1] Depth is measured in feet below Mean Lowest Low Water (MLLW), defined as the average level of the lower of the two daily low tides.

1.2 Purpose of the Sampling Effort

The purpose of this sampling and analysis effort is to support the determination of suitability of material to be dredged from the San Rafael Channel. In 2010, analytical results revealed that pesticide and PCBs were present in the channel at concentrations which led to a Non-suitable for Unconfined Aquatic Disposal (NUAD) determination for the material present from Station 175+00 to Station 200+87. The concentrations of these constituents decreased to an almost non-detect level at Station 175+00, which further led to a determination that the material from Station 0+00 to Station 175+00 was Suitable for Unconfined Aquatic Disposal (SUAD). This sampling event is to confirm whether the previous statement still holds true or if the impacted sediments has migrated downstream (east) of Station 175+00.

1.3 Organization of this Document

Sample collection and handling procedures are discussed in Sections 2 and 3. Analytical/testing methods are described in Section 4. Chemical analyses results are provided in Section 5. A Quality Control (QC) summary is provided in Section 6. Section 7 presents the conclusions regarding possible contaminated material migrations east of Station 175+00. References are provided in Section 8. Appendices A and B contain supporting documentation for this study.

2 FIELD SEDIMENT SAMPLE COLLECTION

2.1 Collection of San Rafael Channel Sediment Cores

This sampling was conducted as a joint effort between the USACE San Francisco District (SPN) and the Sacramento District (SPK). Sediment sampling was performed May 19th, 2011, by USACE personnel Mr. Edward Keller (SPN), Mr. Justin Kosta (SPN) and Mr. Yuen Chan (SPK). USACE, San Francisco District provided the sampling vessel and on-board positioning system as well as the lexan tubes for sediment sampling. USACE, Sacramento District provided decontamination and disposal equipment. Calscience Environmental Laboratories, Inc., located in Garden Grove, California provided sampling jars and coolers for sample transport.

Sediment cores were collected from seven designated sites (Table 2-1, Figure 2-1). Final site positions were determined with a differential global positioning system (DGPS) and are accurate to ± 10 feet. Table 2-1 lists station identifiers, DGPS coordinates for all core locations, core lengths and sample depths. There were no deviations from the SAP with regards to sampling locations. Field logs are presented in Appendix A.

2.1.1 Field Equipment Decontamination Procedure

All sampling equipment used to collect the cores (lexan tubes) was clean and in their original packaging. These tubes were also disposable and did not require decontamination. All sampling equipment used for homogenizing and packaging the collected sediments was decontaminated between samples using the following procedures:

- Rinse with distilled water and wash with scrub brush until free of sediment;
- Wash with phosphate-free biodegradable soap solution; and
- Second rinse with distilled water.

Any sampling equipment that could not be properly cleaned was not used for subsequent sampling activities.

2.1.2 Sample Processing and Labeling

Using lexan tubes a core was collected from each of the seven sampling locations. The tubes were hand pushed into the sediments until the desired depth was achieved and then it was recovered, again by hand. Excess tube was cut off beyond the sample material and then the tube was capped for transport. While onboard and in-between sampling locations, each lexan tube that contained a sediment core was placed into a clean substrate lined with a food-grade

polyethylene bag. Once core collection was completed and all personnel were landside, sediment cores were removed from the lexan tubes one at a time, placed in polyethylene bags and their physical and olfactory characteristics were noted. Each sediment sample was assigned a unique alphanumeric identifier as described in the SAP. While aboard the vessel and during transportation to the Calscience Environmental Laboratories, Inc., samples were stored on ice within insulated coolers.

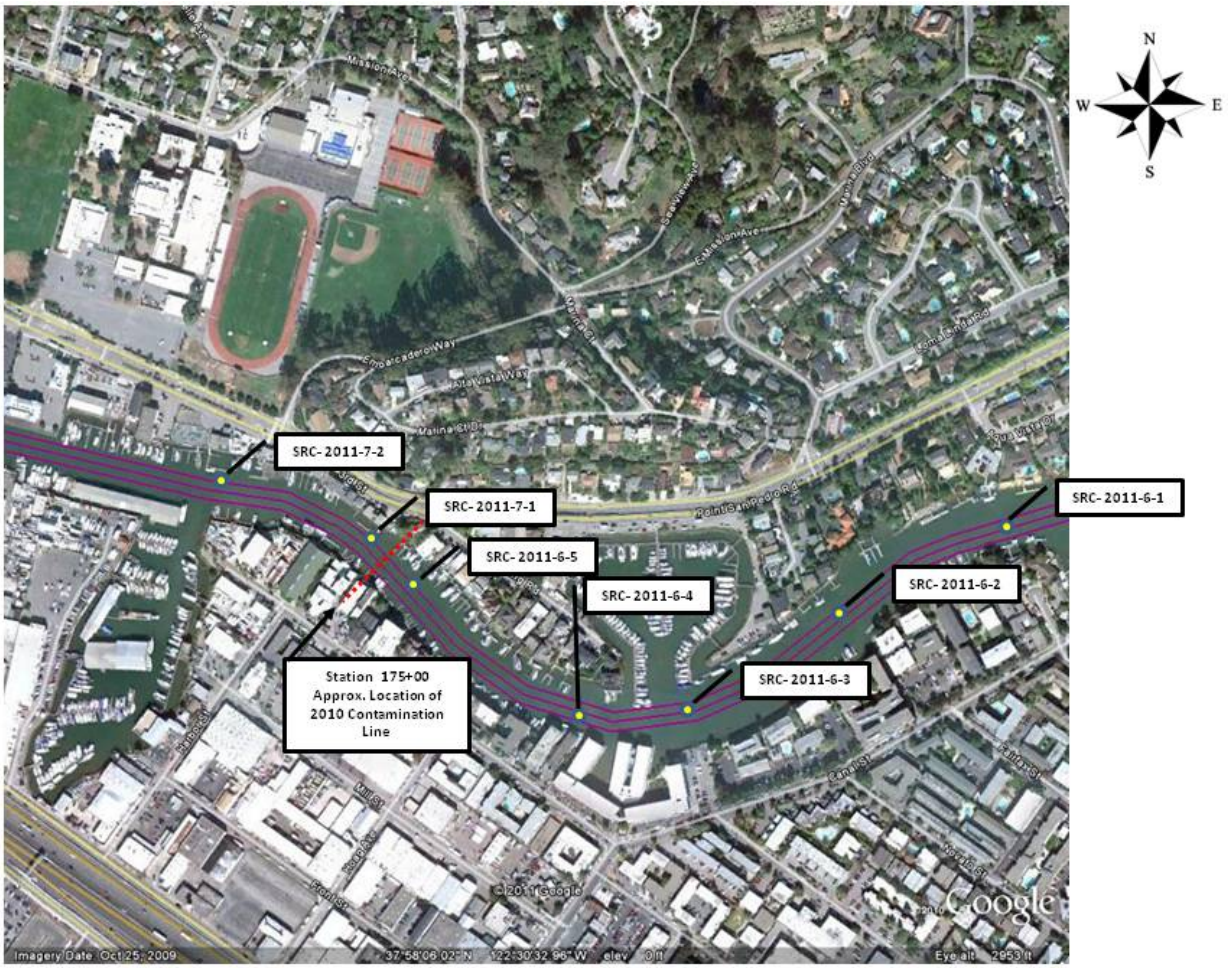

Figure 2-1 2011 Sampling Locations

Table 2-1. Locations of Sediment Samples for Stations 153+00 to 183+00

Sample ID	Latitude	Longitude	Approximate Depth to Bottom of Sample (ft. MLLW)	Approximate Core Length (ft MLLW)	Station
SRC-2011-6-1	37.96792496750	-122.50412927600	-4.8	1.0-2.0	153+00
SRC-2011-6-2	37.96721578900	-122.50580331500	-5.5	2.0-3.0	159+00
SRC-2011-6-3	37.96635703300	-122.50746362300	-5.3	1.0-2.0	164+00
SRC-2011-6-4	37.96631956680	-122.50861957400	-5.5	3.0-4.0	168+00
SRC-2011-6-5	37.96721206020	-122.51031541900	-4.7	1.0-2.0	174+00
SRC-2011-7-1	37.96795943700	-122.51127066400	-5.5	2.0-3.0	178+00
SRC-2011-7-1	37.96832762180	-122.51314421200	-5.4	1.0-2.0	183+00

3 SAMPLE PROCESSING

3.1 Homogenization and Compositing of Sediments

Homogenization of individual sediment cores was performed landside in Loch Lomond Marina located in San Rafael, CA. Each sediment core was individually homogenized in a stainless-steel bowl or high-density polyethylene (HDPE) container. For each core, two 500-mL sub-samples of the homogenized sediment were submitted to the analytical laboratory for chemical analysis as per the SAP. The remaining sediments from each of the individual cores were placed in a 55 gallon drum for disposal.

Sample labels were filled out with an indelible-ink pen and affixed to the sample containers. Each label contained the project name, sample identification number, preservation technique, requested analyses, date and time of collection and preparation, and initials of the person preparing the sample. To protect the information on the sample labels, clear tape was placed around the labeled sample containers. The sample containers were then placed into a cooler with ice and stored at $\leq$4°C.

All sediment was processed following procedures outlined in the SAP, without deviation.

3.2 Sample Shipping

Prior to shipping to the analytical laboratory, sample containers were securely packed inside a cooler with ice packs or crushed ice. A temperature blank was included in the cooler. The original signed chain-of-custody (COC) forms were placed in a sealed plastic bag and taped to the inside lid of the cooler.
Sediment samples were delivered in person by USACE, Sacramento District personnel Mr. Yuen Chan to the analytical laboratory on the same day as sampling occurred.

3.2.1 Chain-of-Custody (COC) Protocol

COC procedures were followed for all samples throughout the collection, handling, and analyses activities. The Sampling and Analysis Project Manager, or a designee, was responsible for all sample tracking and COC procedures. This person was responsible for final sample inventory, maintenance of sample custody documentation, and completion of COC forms prior to transferring samples to the analytical laboratory. A COC form accompanied each cooler of samples to the respective analytical laboratories. Each custodian of the samples signed the COC form; copies of the COC forms are retained in the project file.

4 ANALYTICAL AND TESTING METHODS

All analyses were conducted as per the SAP and in accordance with USACE/EPA guidelines (USACE/EPA 1998).

4.1 Sediment Analytical Chemistry Procedures

The analytical methods and targeted method reporting limits (MRL) for chemical analyses of bulk sediment are provided in Table 4-1. All sediment analytical results are presented on a dry weight basis (e.g., µg/kg, dry wt). Analyses of matrix spikes and sample duplicates were performed on the site samples. All samples were maintained according to the appropriate holding times and temperatures for each analysis as per the SAP.

Table 4-1: List of standard analytes, methods, and targeted reporting limits

Analyte	Method Used	SAP Targeted MRL
Pesticides		
Aldrin	EPA 8081A	2 µg/kg
Alpha-BHC	EPA 8081A	2 µg/kg
Beta-BHC	EPA 8081A	2 µg/kg
Delta-BHC	EPA 8081A	2 µg/kg
Gamma-BHC	EPA 8081A	2 µg/kg
Chlordane	EPA 8081A	20 µg/kg
Dieldrin	EPA 8081A	2 µg/kg
Trans-nonachlor	EPA 8081A	2 µg/kg
2,4'-DDD	EPA 8081A	2 µg/kg
2,4'-DDE	EPA 8081A	2 µg/kg
2,4'-DDT	EPA 8081A	2 µg/kg
4,4'-DDD	EPA 8081A	2 µg/kg
4,4'-DDE	EPA 8081A	2 µg/kg
4,4'-DDT	EPA 8081A	2 µg/kg
Endosulfan I	EPA 8081A	2 µg/kg
Endosulfan II	EPA 8081A	2 µg/kg
Endosulfan sulfate	EPA 8081A	2 µg/kg
Endrin	EPA 8081A	2 µg/kg
Endrin aldehyde	EPA 8081A	2 µg/kg
Endrin Ketone	EPA 8081A	2 µg/kg
Heptachlor	EPA 8081A	2 µg/kg
Heptachlor Epoxide	EPA 8081A	2 µg/kg
Methoxychlor	EPA 8081A	2 µg/kg
Toxaphene	EPA 8081A	20 µg/kg
Alpha Chlordane	EPA 8081A	2 µg/kg
Gamma Chlordane	EPA 8081A	2 µg/kg
Cis-nonachlor	EPA 8081A	2 µg/kg

Table 4-1 Continued: List of standard analytes, methods, and targeted reporting limits

Analyte	Method Used	SAP Targeted MRL

Total PCBs Congeners (RMP 40)		
PCB008	EPA 8082	0.5 µg/kg
PCB018	EPA 8082	0.5 µg/kg
PCB028	EPA 8082	0.5 µg/kg
PCB052	EPA 8082	0.5 µg/kg
PCB049	EPA 8082	0.5 µg/kg
PCB044	EPA 8082	0.5 µg/kg
PCB074	EPA 8082	0.5 µg/kg
PCB070	EPA 8082	0.5 µg/kg
PCB066	EPA 8082	0.5 µg/kg
PCB101	EPA 8082	0.5 µg/kg
PCB099	EPA 8082	0.5 µg/kg
PCB087	EPA 8082	0.5 µg/kg
PCB110	EPA 8082	0.5 µg/kg
PCB151	EPA 8082	0.5 µg/kg
PCB149	EPA 8082	0.5 µg/kg
PCB118	EPA 8082	0.5 µg/kg
PCB153	EPA 8082	0.5 µg/kg
PCB105	EPA 8082	0.5 µg/kg
PCB138/158	EPA 8082	0.5 µg/kg
PCB187	EPA 8082	0.5 µg/kg
PCB183	EPA 8082	0.5 µg/kg
PCB128	EPA 8082	0.5 µg/kg
PCB177	EPA 8082	0.5 µg/kg
PCB156	EPA 8082	0.5 µg/kg
PCB180	EPA 8082	0.5 µg/kg
PCB170	EPA 8082	0.5 µg/kg
PCB201	EPA 8082	0.5 µg/kg
PCB195	EPA 8082	0.5 µg/kg
PCB194	EPA 8082	0.5 µg/kg
PCB031	EPA 8082	0.5 µg/kg
PCB033	EPA 8082	0.5 µg/kg
PCB056	EPA 8082	0.5 µg/kg
PCB060	EPA 8082	0.5 µg/kg
PCB095	EPA 8082	0.5 µg/kg
PCB097	EPA 8082	0.5 µg/kg
PCB132	EPA 8082	0.5 µg/kg
PCB141	EPA 8082	0.5 µg/kg
PCB174	EPA 8082	0.5 µg/kg
PCB203	EPA 8082	0.5 µg/kg

4.2 Data Analysis and Interpretation

Data were analyzed and are presented clearly to determine if impacted material from the 2010 sampling event had migrated east of Station 175+00. All analytical data were reviewed for accuracy. The chemical characteristics of sediment samples were screened to bay ambient levels (SFRWQCB 1998).

5 RESULTS OF LABORATORY ANALYSES

Chemical analysis was performed on each of the seven individual San Rafael Channel sediment samples. Sediment samples were analyzed for pesticides and PCBs as specified in the SAP.

The results of the chemical analyses for the seven San Rafael Channel samples were compared to bay ambient sediment concentrations. At sample locations 7-1 and 7-2 the total DDTs, chlordane and total PCBs exceeded the bay ambient levels. At sample locations 6-1 through 6-5 all analytes were below the bay ambient levels with the exception of PCBs at location 6-4. Full analytical laboratory data reports for these sediments are provided in Table 5-1 below.

Table 5-1 San Rafael Channel-Inner Canal Analytical Results

May-11

Analyte	SF-11*	Bay Background (RWQBC 1998)	SRC-2011-6-1	SRC-2011-6-2	SRC-2011-6-3	SRC-2011-6-4	SRC-2011-6-5	SRC-2011-7-1	SRC-2011-7-2
Pesticides (uq/Kg)									
Aldrin	<0.057	1.1	<0.79	<0.80	<0.83	<0.74	<0.86	<0.73	<0.80
Alpha-BHC	<0.072	-	<0.75	<0.76	<0.79	<0.70	<0.82	<0.70	<0.76
Beta-BHC	<0.23	-	<0.65	<0.66	<0.68	<0.61	<0.71	<0.60	<0.66
Delta-BHC	<0.087	-	<0.81	<0.83	<0.85	<0.76	<0.89	<0.75	<0.82
Gamma-BHC	<0.063	-	<0.58	<0.59	<0.61	<0.55	<0.64	<0.54	2
Chlordane	<13.0	1.1	<10.0	<10.0	<11.0	<9.6	<11.0	**12**	**22**
Dieldrin	<0.063	0.44	<0.58	<0.59	<0.61	<0.54	<0.63	<0.54	<0.59
Trans-nonachlor	-	-	<1.4	<1.4	<1.5	<1.3	<1.5	<1.3	<1.4
2,4'-DDD	<0.075	-	<0.51	<0.52	<0.54	<0.48	<0.56	**1.6**	<0.52
2,4'-DDE	<0.077	-	**0.79**	<0.46	<0.48	<0.43	<0.50	**0.78**	**1.6**
2,4'-DDT	<0.055	-	<0.36	<0.36	<0.38	<0.33	<0.39	<0.33	<0.36
4,4'-DDD	<0.13	-	**1.5**	**0.73**	**0.99**	**0.74**	**1.1**	**5.2**	**7.8**
4,4'-DDE	<0.059	-	**1.7**	**0.86**	**0.89**	**0.79**	**1.0**	**3.3**	**4.9**
4,4'-DDT	<0.071	-	<0.84	<0.85	<0.88	<0.78	<2.8	<0.78	<0.85
∑ detected DDTs	<0.13	7.0	**3.99**	**1.59**	**1.88**	**1.53**	**2.1**	**10.1**	**12.7**
Endosulfan I	<0.070	-	<0.91	<0.93	<0.95	<0.85	<0.99	<0.84	<0.92
Endosulfan II	<0.111	-	<0.45	<0.46	<0.47	<0.42	<0.49	<0.41	<0.45
Endosulfan sulfate	<0.063	-	<0.67	<0.68	<0.71	<0.63	<0.73	<0.62	<0.68
Endrin	<0.071	0.78	**0.74**	<0.52	<0.54	<0.48	<0.56	<0.48	<0.52
Endrin aldehyde	<0.060	-	<0.50	<0.51	<0.52	<0.47	<0.54	<0.46	<0.51
Endrin Ketone	-	-	<0.77	<0.78	<0.81	<0.72	<0.84	<0.71	<0.78
Heptachlor	<0.057	-	<0.57	<0.58	<0.60	<0.53	<0.62	<0.53	<0.58
Heptachlor Epoxide	<0.060	-	<0.47	<0.48	<0.49	<0.44	<0.51	<0.43	<0.48
Methoxychlor	-	-	<0.43	<0.43	<0.45	<0.40	<0.47	<0.40	<0.43
Toxaphene	<3.0	-	<22.0	<22.0	<23.0	<20.0	<24.0	<20.0	<22.0
Alpha Chlordane	<0.078	-	**0.66**	<0.67	<0.69	<0.62	<0.72	**1.1**	**2.2**
Gamma Chlordane	<0.070	-	<0.66	<0.67	<0.69	<0.62	<0.72	**1.1**	**1.4**
Cis-nonachlor	-	-	<1.4	<1.4	<1.4	<1.3	<1.5	<1.3	<1.4
PCBs (uq/Kg)									
PCB008	-	-	<0.67	<0.68	<0.70	<0.63	<0.73	<0.62	**3.4**
PCB018	-	-	<0.69	<0.70	<0.72	<0.65	<0.75	**1.5**	**16**
PCB028	-	-	<0.64	<0.65	<0.68	<0.60	<0.70	**1.3**	**12**
PCB052	-	-	<0.74	**1.3**	**1.2**	**1.8**	**1.3**	**3.2**	**18**
PCB049	-	-	<0.87	<0.88	<0.91	**1.2**	<0.95	**1.7**	**10**
PCB044	-	-	<0.77	<0.78	<0.81	**1.3**	<0.84	**2.6**	**10**
PCB074	-	-	<0.72	<0.73	<0.75	<0.67	<0.78	**1.4**	**5**
PCB070	-	-	<0.71	<0.72	<0.75	**1.2**	<0.77	**2.5**	**12**
PCB066	-	-	<0.66	<0.67	<0.69	**1.5**	<0.72	**2.7**	**11**
PCB101	-	-	**0.96**	**1.4**	**1.3**	**2.3**	**1.4**	**3.6**	**11**
PCB099	-	-	<0.70	<0.71	<0.74	**1.1**	<0.76	**1.6**	**4.7**
PCB087	-	-	<0.71	<0/72	<0.74	<0.66	<0.77	**1**	**3.3**
PCB110	-	-	**0.9**	**1.2**	**1.2**	**2**	**1.4**	**3.4**	**10**
PCB151	-	-	<0.67	<0.68	<0.71	<0.63	<0.73	**1.2**	**2**
PCB149	-	-	**0.97**	**1.3**	**1.2**	**2.3**	**1.2**	**2.7**	**6.6**
PCB118	-	-	<0.71	**1**	**1.1**	**1.8**	**1.3**	**3**	**8.5**
PCB153	-	-	**1.8**	**2.2**	**2.2**	**3.4**	**2.4**	**4.5**	**11**
PCB105	-	-	<0.75	<0.76	<0.79	**1.4**	<0.82	**1.6**	**4.6**
PCB138/158	-	-	**1.8**	**2.5**	**2.1**	**3.1**	**2.2**	**4.3**	**10**
PCB187	-	-	<0.75	<0.76	0.99	**1.3**	<0.82	**1.5**	**3.2**
PCB183	-	-	<0.73	<0.74	<0.76	<0.68	<0.79	<0.67	**1.5**
PCB128	-	-	<0.86	<0.87	<0.90	<0.80	<0.93	<0.79	**2.1**
PCB177	-	-	<0.72	<0.73	<0.76	<0.68	<0.79	<0.67	**1.2**
PCB156	-	-	<0.71	<0.73	<0.75	<0.67	<0.78	<0.66	**1.2**
PCB180	-	-	**1**	**1.3**	**1.3**	**2.1**	**1.5**	**2.5**	**5.7**
PCB170	-	-	<0.67	<0.68	<0.70	**1.1**	<0.73	**1.3**	**2.8**
PCB201	-	-	<0.76	<0.77	<0.80	<0.71	<0.83	0.86	**1.6**
PCB195	-	-	<0.70	<0.71	<0.73	<0.65	<0.76	<0.65	<0.71
PCB194	-	-	<0.68	<0.69	<0.71	<0.63	<0.74	<0.63	<0.69
PCB031	-	-	<0.91	<0.92	<0.95	<0.85	<0.99	**1.4**	**13**
PCB033	-	-	<0.84	<0.85	<0.88	<0.78	<0.91	**0.99**	**5.1**
PCB056	-	-	<0.73	<0.74	<0.77	<0.68	<0.80	**1.1**	**4.3**
PCB060	-	-	<0.81	<0.82	<0.85	<0.76	<0.88	**0.9**	**2.1**
PCB095	-	-	<0.86	<0.88	<0.91	**1.5**	<0.94	**2.6**	**7.8**
PCB097	-	-	<0.79	<0.80	<0.83	**1.2**	<0.86	**1.6**	**5.1**
PCB132	-	-	<0.80	<0.81	<0.84	<0.75	<0.87	<0.74	<0.81
PCB141	-	-	<0.88	<0.90	<0.93	<0.83	<0.96	**1.1**	**2.3**
PCB174	-	-	<0.87	<0.88	<0.91	0.93	<0.94	**1.3**	**2.8**
PCB203	-	-	<0.84	<0.86	<0.89	<0.79	<0.92	<0.78	**1.4**
∑ detected PCBs	16	-	**7.43**	**12.2**	**11.6**	**31.6**	**12.7**	**60.09**	**232.3**

* Reference Criteria for PCBs derived from new EFH Consultation Bioaccumulation Testing Trigger Levels (LTMH EFH Draft, June 2011, Page 9, Table 1)

Bold Font and Bold Outline	**Exceeds SF-11**
Bold Font, Outline and Shading	**Exceeds Bay Background and SF-11**
Bold Font	**Above Detection Limits**

6 LABORATORY QUALITY CONTROL/QUALITY ASSURANCE

Provided below is a narrative of our analytical effort, including any unique features or anomalies encountered as part of the analysis of the sediment samples.

6.1 Sample Condition on Receipt

Seven sediment samples (housed in 8-oz glass containers, two per sample) were received for this project on May 20, 2011. The samples were transferred to the laboratory in an ice-chest with wet ice, following strict COC procedures. The temperature of the samples upon receipt at the laboratory was 2.4°C. All samples were given laboratory identification numbers, logged into the Laboratory Information Management System (LIMS) and then stored under refrigeration pending sediment chemistry testing.

No sample receiving anomalies were noted.

6.2 Tests Performed

- Chlorinated Pesticides by EPA 8081A
- PCB Congeners by EPA 8270C SIM

6.3 Data Summary

All sample results and reporting limits were dry weight corrected.

6.4 Holding times

All holding times were met.

6.5 Calibration

Frequency and control criteria for initial and continuing calibration verifications were met.

6.6 Reporting Limits

All Method Detection Limits were met. The results were evaluated to the MDL and any concentrations found that were greater than or equal to the MDL, but less than RL, are qualified with a "J" flag.

6.7 Method Blanks

Concentrations of target analytes in the method blank were found to be below reporting limits for all testing.

6.8 Laboratory Control Samples

A Laboratory Control Sample (LCS) analysis was performed at the required frequencies, and unless otherwise noted, all parameters were within the established control limits.

6.9 Matrix Spikes

Matrix spike analyses were performed for each applicable analysis on project sample SRC-2011-6-4. All parameters were within the established control limits with the following exceptions.
The MS/MSD recoveries and/or RPDs for Aldrin, Alpha-BHC and Endrin Aldehyde (by EPA 8081A) exceeded the control limits due to matrix interference. Yet, since the associated LCS, LCSD and RPDs were within the control limits, the results were released with no further qualification.

The MS and/or MSD recoveries for four PCB Congeners (by EPA 8270C SIM) fell outside their established control limits due to matrix interference. However, the results have been flagged with the appropriate qualifiers and released with no further action since the associated LCS/LCSD recoveries were in control.

6.10 Surrogates

Surrogate recoveries for all applicable tests were within the established control limits for all samples.

6.11 Acronyms

- LCS/LCSD- Laboratory Control Sample/Laboratory Control Sample Duplicate
- PDS/PDSD- Post Digestion Spike/Post Digestion Spike Duplicate
- MS/MSD- Matrix Spike/Matrix Spike Duplicate
- ME-Marginal Exceedance
- RPD- Relative Percent Difference

7 SUMMARY

The San Rafael Channel sediments were analyzed to ascertain whether impacted material from the 2010 sampling event had migrated east of Station 175+00. Please refer to Table 7-1 below.

7.1 Pesticides

When 2010 and 2011 analytical data are compared for ∑ detected DDTs, the trend shows that 2011 total DDT concentrations have diminished by approximately half from 2010 concentrations in Sampling Area 6 (i.e. 4.41 µg/kg in 2010 to 2.218 µg/kg in 2011). At these low levels though this is not thought to be a significant difference.

The comparison of data shows that within Sampling Area 7 (i.e. *SRC-2010-7-1/SRC-2011-7-1 and SRC-2010-7-2/SRC-2011-7-2*), total DDT concentrations have increased slightly from 6.19 µg/kg in 2010 to 10.1 µg/kg in 2011 and from 8.7 µg/kg in 2010 to 12.7 µg/kg in 2011, respectively.

Chlordane levels within Sampling Area 6 had no significant change from 9.1 µg/kg in 2010 to non-detect levels (9.6 µg/kg - < 11.0 µg/kg) in 2011. Chlordane levels within Sampling Area 7 have stayed relatively stable or have increased slightly over 2010 concentrations (i.e. 12- 18 µg/kg in 2010 to 12-22 µg/kg in 2011).

7.2 PCBs

In 2010, the PCB analysis for San Rafael Channel consisted of the Aroclor suite while the 2011 PCB analysis was the list of 40 PCB Congeners. In order to compare both data sets, the 2011 ∑ detected PCBs results were averaged and compared against the 2010 ∑ detected PCBs.

The data shows that total PCB concentrations have decreased in Sampling Area 6 from 18 µg/kg in 2010 to 15.106 µg/kg in 2011. Total PCB concentrations in Sampling Area 7 have significantly increased from 23.2 µg/kg in 2010 to 60.09 µg/kg in 2011 at the area that corresponds to SRC-2010-7-1/SRC-2011-7-1, and from 75 µg/kg in 2010 to 232.3 in 2011 µg/kg at the area that corresponds to SRC-2010-7-2/SRC-2011-7-2.

7.3 Conclusion

Based on the evaluation of the 2011 analytical results when compared to those from 2010, it is believed that the impacted material has not migrated east, past Station 175+00 since the 2010 sampling event was completed.

Table 7-1 San Rafael Channel-Inner Canal Analytical Results								
2010 vs 2011 Comparison								
Analyte	SF-11*	Bay Background (RWQBC 1998)	SRC-2010-6	SRC-2011-6**	SRC-2010-7-1	SRC-2011-7-1	SRC-2010-7-2	SRC-2011-7-2
Pesticides (ug/Kg)								
Aldrin	<0.057	1.1	<0.20	<(0.74-0.86)	<0.21	<0.73	<0.20	<0.80
Alpha-BHC	<0.072	-	<0.14	<(0.70-0.82)	<0.12	<0.70	<0.14	<0.76
Beta-BHC	<0.23	-	<0.22	<(0.60-0.71)	<0.24	<0.60	<0.22	<0.66
Delta-BHC	<0.087	-	<0.091	<(0.75-0.89)	<0.095	<0.75	<0.089	<0.82
Gamma-BHC	<0.063	-	<0.098	<(0.55-0.64)	<0.12	<0.54	<0.096	2
Chlordane	<13.0	1.1	**9.1**	<(9.6-11.0)	**12**	**12**	**18**	**22**
Dieldrin	<0.063	0.44	<0.18	<(0.54-0.63)	<0.18	<0.54	<1.2	<0.59
Trans-nonachlor	-	-	-	<(1.3-1.5)	-	<1.3	-	<1.4
2,4'-DDD	<0.075	-	**0.51**	-	**0.69**	**1.6**	**1**	<0.52
2,4'-DDE	<0.077	-	<1.3	-	<1.3	0.78	<1.2	1.6
2,4'-DDT	<0.055	-	**0.7**	-	<1.3	<0.33	**1.7**	<0.36
4,4'-DDD	<0.13	-	**1.2**	-	**1.5**	**5.2**	**2.4**	**7.8**
4,4'-DDE	<0.059	-	**2**	-	**2.4**	**3.3**	**3.6**	**4.9**
4,4'-DDT	<0.071	-	<1.3	-	**1.6**	<0.78	<2.0	<0.85
∑ detected DDTs	<0.13	7.0	**4.41**	**2.218**	**6.19**	**10.1**	**8.7**	**12.7**
Endosulfan I	<0.070	-	<0.18	<(0.85-0.99)	<0.14	<0.84	0.34	<0.92
Endosulfan II	<0.111	-	<0.080	<(0.42-0.49)	<0.18	<0.41	<0.17	<0.45
Endosulfan sulfate	<0.063	-	<0.14	<(0.63-0.73)	<0.15	<0.62	<0.14	<0.68
Endrin	<0.071	0.78	<0.12	**0.358**	<0.13	<0.48	<0.20	<0.52
Endrin aldehyde	<0.060	-	<0.15	<(0.47-0.54)	<0.16	<0.46	<0.15	<0.51
Endrin Ketone	-	-	-	<(0.72-0.84)	-	<0.71	-	<0.78
Heptachlor	<0.057	-	<0.15	<(0.53-0.62)	<0.16	<0.53	<0.15	<0.58
Heptachlor Epoxide	<0.060	-	<0.24	<(0.44-0.51)	<0.18	<0.43	<0.53	<0.48
Methoxychlor	-	-	-	<(0.40-0.47)	-	<0.40	-	<0.43
Toxaphene	<3.0	-	<15	<(22.0-24.0)	<21	<20.0	<49	<22.0
Alpha Chlordane	<0.078	-	**0.53**	**0.402**	**1.1**	**1.1**	**0.95**	**2.2**
Gamma Chlordane	<0.070	-	**1.1**	<(0.62-0.72)	**1.3**	**1.1**	**2.3**	**1.4**
Cis-nonachlor	-	-	-	<(1.3-1.5)	-	<1.3	-	<1.4

Table 7-1 San Rafael Channel-Inner Canal Analytical Results

2010 vs 2011 Comparison

Analyte	SF-11*	Bay Background (RWQBC 1998)	SRC-2010-6	SRC-2011-6**	SRC-2010-7-1	SRC-2011-7-1	SRC-2010-7-2	SRC-2011-7-2
PCBs (ug/Kg)								
PCB008	-	-	-	-	-	<0.62	-	**3.4**
PCB018	-	-	-	-	-	**1.5**	-	**16**
PCB028	-	-	-	-	-	**1.3**	-	**12**
PCB052	-	-	-	-	-	**3.2**	-	**18**
PCB049	-	-	-	-	-	**1.7**	-	**10**
PCB044	-	-	-	-	-	**2.6**	-	**10**
PCB074	-	-	-	-	-	**1.4**	-	**5**
PCB070	-	-	-	-	-	**2.5**	-	**12**
PCB066	-	-	-	-	-	**2.7**	-	**11**
PCB101	-	-	-	-	-	**3.6**	-	**11**
PCB099	-	-	-	-	-	**1.6**	-	**4.7**
PCB087	-	-	-	-	-	**1**	-	**3.3**
PCB110	-	-	-	-	-	**3.4**	-	**10**
PCB151	-	-	-	-	-	**1.2**	-	**2**
PCB149	-	-	-	-	-	**2.7**	-	**6.6**
PCB118	-	-	-	-	-	**3**	-	**8.5**
PCB153	-	-	-	-	-	**4.5**	-	**11**
PCB105	-	-	-	-	-	**1.6**	-	**4.6**
PCB138/158	-	-	-	-	-	**4.3**	-	**10**
PCB187	-	-	-	-	-	**1.5**	-	**3.2**
PCB183	-	-	-	-	-	<0.67	-	**1.5**
PCB128	-	-	-	-	-	<0.79	-	**2.1**
PCB177	-	-	-	-	-	<0.67	-	**1.2**
PCB156	-	-	-	-	-	<0.66	-	**1.2**
PCB180	-	-	-	-	-	**2.5**	-	**5.7**
PCB170	-	-	-	-	-	**1.3**	-	**2.8**
PCB201	-	-	-	-	-	0.86	-	**1.6**
PCB195	-	-	-	-	-	<0.65	-	<0.71
PCB194	-	-	-	-	-	<0.63	-	<0.69
PCB031	-	-	-	-	-	**1.4**	-	**13**
PCB033	-	-	-	-	-	**0.99**	-	**5.1**
PCB056	-	-	-	-	-	**1.1**	-	**4.3**
PCB060	-	-	-	-	-	**0.9**	-	**2.1**
PCB095	-	-	-	-	-	**2.6**	-	**7.8**
PCB097	-	-	-	-	-	**1.6**	-	**5.1**
PCB132	-	-	-	-	-	<0.74	-	<0.81
PCB141	-	-	-	-	-	**1.1**	-	**2.3**
PCB174	-	-	-	-	-	**1.3**	-	**2.8**
PCB203	-	-	-	-	-	<0.78	-	**1.4**
Aroclor 1016	<1.7	-	<2.6	-	<2.7	-	<2.6	-
Aroclor 1221	<1.7	-	<2.6	-	<2.7	-	<2.6	-
Aroclor 1232	<1.7	-	<2.6	-	<2.7	-	<2.6	-
Aroclor 1242	<1.7	-	<2.6	-	**9.2**	-	<2.6	-
Aroclor 1248	<1.7	-	<2.6	-	<2.7	-	<2.6	-
Aroclor 1254	<1.7	-	**13**	-	<2.7	-	**42**	-
Aroclor 1260	<1.7	-	**5**	-	**14**	-	**33**	-
∑ detected PCBs	16	22.7	**18**	**15.106**	**23.2**	**60.09**	**75**	**232.3**

* Reference Criteria for PCBs derived from new EFH Consultation Bioaccumulation Testing Trigger Levels (LTMH EFH Draft, June 2011, Page 9, Table 1)

** Numerical Composite Sample for Comparison Purposes with 2010 Data, Refer to the Table Above for Individual Analyte Results

Bold Font and Bold Outline	**Exceeds SF-11**
Bold Font, Outline and Shading	**Exceeds Bay Background and SF-11**
Bold Font	**Above Detection Limits**

8 REFERENCES

SFRWQCB (1998) Ambient concentrations of toxic chemicals in San Francisco Bay Sediments: Draft Staff Report. San Francisco Regional Water Quality Lab Control Board, Oakland, CA.

USACE/USEPA (1998) Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual (Inland Testing Manual). U.S. Environmental Protection Agency/U.S. Army Corps of Engineers. EPA/823/B-94/002. Office of Water. Washington, DC 20460.

USACE (2004) Master Sampling and Analysis Plan USACE SF-District O&M Dredging. U.S. Army Corps of Engineers San Francisco District, Engineering and Technical Services Division Planning Branch, Environmental Sciences Section, Material Management Unit.

USACE (2011) San Rafael Channel FY 2011 Maintenance Dredging Confirmatory Chemistry Sampling and Analysis Plan May 2011. U.S. Army Corps of Engineers San Francisco District, Engineering and Technical Services Division Planning Branch, Environmental Section A.

Appendix A

Sampling Field Logs and Data Sheets

DRILLING LOG For use of this form, see ER 1110-1-1901; the proponent agency is CECW-EG	DIVISION	INSTALLATION 9:15 am	SHEET 1 OF 7 SHEETS

1. PROJECT SAN RAFAEL CHANNEL CONFIRMATORY SAMPLING		10. SIZE AND TYPE OF BIT LEXAN TUBE	
2. LOCATION *(Coordinates or Station)* 37.96792496750 -122.50412927600		11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* N/A	
		12. MANUFACTURERS DESIGNATION OF DRILL N/A	
3. DRILLING AGENCY USACE, SAN FRANCISCO DISTRICT		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED N/A / UNDISTURBED N/A
4. HOLE NO. *(as shown on drawing title and title number)* SRC-2011-6-1		14. TOTAL NUMBER CORE BOXES	N/A
5. NAME OF DRILLER JUSTIN KOSTA		15. ELEVATION GROUND WATER	N/A
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED DEG. FROM VERT.		16. DATE HOLE *(YYYYMMDD)*	STARTED 20110519 / COMPLETED 20110519
		17. ELEVATION TOP OF HOLE	N/A
7. THICKNESS OF OVERBURDEN N/A		18. TOTAL CORE RECOVERY FOR BORING %	N/A
8. DEPTH DRILLED INTO ROCK		19. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE 1.0-2.0 FEET MLLW			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS *(Description)* d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling Time, water loss, depth of weathering, etc., if significant)* g
			VERY FINE GRAINED BAY MUD	%		DARK GREY, HIGH WATER CONTENT, FINE GRAINED, SLIGHT ORGANIC SMELL, NO SIGNS OF IMPACTION
				%		
				%		
				%		
				%		
				%		
				%		

DRILLING LOG For use of this form, see ER 1110-1-1901; the proponent agency is CECW-EG	DIVISION	INSTALLATION 9:20 am	SHEET 2 OF 7 SHEETS

1. PROJECT SAN RAFAEL CHANNEL CONFIRMATORY SAMPLING		10. SIZE AND TYPE OF BIT LEXAN TUBE	
2. LOCATION *(Coordinates or Station)* 37.96721578900 -122.50580331500		11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* N/A	
		12. MANUFACTURERS DESIGNATION OF DRILL N/A	
3. DRILLING AGENCY USACE, SAN FRANCISCO DISTRICT		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED N/A / UNDISTURBED N/A
4. HOLE NO. *(as shown on drawing title and title number)* SRC-2011-6-2		14. TOTAL NUMBER CORE BOXES	N/A
		15. ELEVATION GROUND WATER	N/A
5. NAME OF DRILLER JUSTIN KOSTA		16. DATE HOLE *(YYYYMMDD)*	STARTED 20110519 / COMPLETED 20110519
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED DEG. FROM VERT.		17. ELEVATION TOP OF HOLE	N/A
7. THICKNESS OF OVERBURDEN N/A		18. TOTAL CORE RECOVERY FOR BORING %	N/A
8. DEPTH DRILLED INTO ROCK		19. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE 2.0-3.0 FEET MLLW			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS *(Description)* d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling Time, water loss, depth of weathering, etc., if significant)* g
			VERY FINE GRAINED BAY MUD	%		DARK GREY, HIGH WATER CONTENT, FINE GRAINED, SLIGHT ORGANIC SMELL, NO SIGNS OF IMPACTION
				%		
				%		
				%		
				%		
				%		
				%		

DRILLING LOG For use of this form, see ER 1110-1-1901; the proponent agency is CECW-EG	DIVISION	INSTALLATION 9:35 am	SHEET 3 OF 7 SHEETS

1. PROJECT SAN RAFAEL CHANNEL CONFIRMATORY SAMPLING		10. SIZE AND TYPE OF BIT LEXAN TUBE	
2. LOCATION *(Coordinates or Station)* 37.96635703300 -122.50746362300		11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* N/A	
		12. MANUFACTURERS DESIGNATION OF DRILL N/A	
3. DRILLING AGENCY USACE, SAN FRANCISCO DISTRICT		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED N/A / UNDISTURBED N/A
4. HOLE NO. *(as shown on drawing title and title number)* SRC-2011-6-3		14. TOTAL NUMBER CORE BOXES	N/A
		15. ELEVATION GROUND WATER	N/A
5. NAME OF DRILLER JUSTIN KOSTA		16. DATE HOLE *(YYYYMMDD)*	STARTED 20110519 / COMPLETED 20110519
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED DEG. FROM VERT.		17. ELEVATION TOP OF HOLE	N/A
7. THICKNESS OF OVERBURDEN N/A		18. TOTAL CORE RECOVERY FOR BORING %	N/A
8. DEPTH DRILLED INTO ROCK		19. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE 1.0-2.0 FEET MLLW			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS *(Description)* d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling Time, water loss, depth of weathering, etc., if significant)* g
			VERY FINE GRAINED BAY MUD	%		DARK GREY, HIGH WATER CONTENT, FINE GRAINED, SLIGHT ORGANIC SMELL, NO SIGNS OF IMPACTION
				%		
				%		
				%		
				%		
				%		
				%		

DRILLING LOG For use of this form, see ER 1110-1-1901; the proponent agency is CECW-EG	DIVISION	INSTALLATION 9:50 am	SHEET 4 OF 7 SHEETS

1. PROJECT SAN RAFAEL CHANNEL CONFIRMATORY SAMPLING		10. SIZE AND TYPE OF BIT LEXAN TUBE	
2. LOCATION *(Coordinates or Station)* 37.96631956680 -122.50861957400		11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* N/A	
		12. MANUFACTURERS DESIGNATION OF DRILL N/A	
3. DRILLING AGENCY USACE, SAN FRANCISCO DISTRICT		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED N/A / UNDISTURBED N/A
4. HOLE NO. *(as shown on drawing title and title number)* SRC-2011-6-4		14. TOTAL NUMBER CORE BOXES	N/A
		15. ELEVATION GROUND WATER	N/A
5. NAME OF DRILLER JUSTIN KOSTA		16. DATE HOLE *(YYYYMMDD)*	STARTED 20110519 / COMPLETED 20110519
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED DEG. FROM VERT.		17. ELEVATION TOP OF HOLE	N/A
7. THICKNESS OF OVERBURDEN N/A		18. TOTAL CORE RECOVERY FOR BORING %	N/A
8. DEPTH DRILLED INTO ROCK		19. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE 3.0-4.0 FEET MLLW			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS *(Description)* d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling Time, water loss, depth of weathering, etc., if significant)* g
			VERY FINE GRAINED BAY MUD	%		DARK GREY, HIGH WATER CONTENT, FINE GRAINED, SLIGHT ORGANIC SMELL, NO SIGNS OF IMPACTION
				%		
				%		
				%		
				%		
				%		
				%		

DRILLING LOG For use of this form, see ER 1110-1-1901; the proponent agency is CECW-EG	DIVISION	INSTALLATION 10:00 am	SHEET 5 OF 7 SHEETS

1. PROJECT SAN RAFAEL CHANNEL CONFIRMATORY SAMPLING		10. SIZE AND TYPE OF BIT LEXAN TUBE	
		11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* N/A	
2. LOCATION *(Coordinates or Station)* 37.96721206020 -122.51031541900		12. MANUFACTURERS DESIGNATION OF DRILL N/A	
3. DRILLING AGENCY USACE, SAN FRANCISCO DISTRICT		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED N/A / UNDISTURBED N/A
4. HOLE NO. *(as shown on drawing title and title number)* SRC-2011-6-5		14. TOTAL NUMBER CORE BOXES	N/A
5. NAME OF DRILLER JUSTIN KOSTA		15. ELEVATION GROUND WATER	N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED DEG. FROM VERT.		16. DATE HOLE *(YYYYMMDD)*	STARTED 20110519 / COMPLETED 20110519
		17. ELEVATION TOP OF HOLE	N/A
7. THICKNESS OF OVERBURDEN N/A		18. TOTAL CORE RECOVERY FOR BORING %	N/A
8. DEPTH DRILLED INTO ROCK		19. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE 1.0-2.0 FEET MLLW			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS *(Description)* d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling Time, water loss, depth of weathering, etc., if significant)* g
			VERY FINE GRAINED BAY MUD	%		DARK GREY, HIGH WATER CONTENT, FINE GRAINED, SLIGHT ORGANIC SMELL, NO SIGNS OF IMPACTION
				%		
				%		
				%		
				%		
				%		
				%		

DRILLING LOG For use of this form, see ER 1110-1-1901; the proponent agency is CECW-EG	DIVISION	INSTALLATION 10:20 am	SHEET 6 OF 7 SHEETS

1. PROJECT SAN RAFAEL CHANNEL CONFIRMATORY SAMPLING		10. SIZE AND TYPE OF BIT LEXAN TUBE	
2. LOCATION *(Coordinates or Station)* 37.96795943700 -122.51127066400		11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* N/A	
		12. MANUFACTURERS DESIGNATION OF DRILL N/A	
3. DRILLING AGENCY USACE, SAN FRANCISCO DISTRICT		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED N/A / UNDISTURBED N/A
4. HOLE NO. *(as shown on drawing title and title number)* SRC-2011-7-1		14. TOTAL NUMBER CORE BOXES	N/A
		15. ELEVATION GROUND WATER	N/A
5. NAME OF DRILLER JUSTIN KOSTA		16. DATE HOLE *(YYYYMMDD)*	STARTED 20110519 / COMPLETED 20110519
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED DEG. FROM VERT.		17. ELEVATION TOP OF HOLE	N/A
7. THICKNESS OF OVERBURDEN N/A		18. TOTAL CORE RECOVERY FOR BORING %	N/A
8. DEPTH DRILLED INTO ROCK		19. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE 2.0-3.0 FEET MLLW			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS *(Description)* d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling Time, water loss, depth of weathering, etc., if significant)* g
			VERY FINE GRAINED BAY MUD	%		DARK GREY, HIGH WATER CONTENT, FINE GRAINED, SLIGHT ORGANIC SMELL, NO SIGNS OF IMPACTION
				%		
				%		
				%		
				%		
				%		
				%		

DRILLING LOG For use of this form, see ER 1110-1-1901; the proponent agency is CECW-EG	DIVISION	INSTALLATION 10:35 am	SHEET 7 OF 7 SHEETS

1. PROJECT SAN RAFAEL CHANNEL CONFIRMATORY SAMPLING		10. SIZE AND TYPE OF BIT LEXAN TUBE	
2. LOCATION *(Coordinates or Station)* 37.96832762180 -122.51314421200		11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* N/A	
		12. MANUFACTURERS DESIGNATION OF DRILL N/A	
3. DRILLING AGENCY USACE, SAN FRANCISCO DISTRICT		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED N/A / UNDISTURBED N/A
4. HOLE NO. *(as shown on drawing title and title number)* SRC-2011-7-2		14. TOTAL NUMBER CORE BOXES	N/A
5. NAME OF DRILLER JUSTIN KOSTA		15. ELEVATION GROUND WATER	N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED DEG. FROM VERT.		16. DATE HOLE *(YYYYMMDD)*	STARTED 20110519 / COMPLETED 20110519
		17. ELEVATION TOP OF HOLE	N/A
7. THICKNESS OF OVERBURDEN N/A		18. TOTAL CORE RECOVERY FOR BORING %	N/A
8. DEPTH DRILLED INTO ROCK		19. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE 1.0-2.0 FEET MLLW			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS *(Description)* d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling Time, water loss, depth of weathering, etc., if significant)* g
			VERY FINE GRAINED BAY MUD	%		DARK GREY, HIGH WATER CONTENT, FINE GRAINED, SLIGHT ORGANIC SMELL, NO SIGNS OF IMPACTION
				%		
				%		
				%		
				%		
				%		
				%		

Appendix B

Laboratory Analytical Report

Calscience
Environmental
Laboratories, Inc.

Supplemental Report 1

June 09, 2011

Tommy L. Waldrup
US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Subject: **Calscience Work Order No.: 11-05-1314**
Client Reference: San Rafael Creek 2011

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 5/20/2011 and analyzed in accordance with the attached chain-of-custody.

Calscience Environmental Laboratories certifies that the test results provided in this report meet all NELAC requirements for parameters for which accreditation is required or available. Any exceptions to NELAC requirements are noted in the case narrative. The original report of subcontracted analysis, if any, is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Danielle Gonsman
Project Manager

Calscience Environmental Laboratories, Inc.

CASE NARRATIVE

Calscience Work Order No.: 11-05-1314
Project Name: San Rafael Creek 2011

Provided below is a narrative of our analytical effort, including any unique features or anomalies encountered as part of the analysis of the sediment samples.

Sample Condition on Receipt

Seven sediment samples (housed in 8-oz glass containers) were received for this project on May 20, 2011. The samples were transferred to the laboratory in an ice-chest with wet ice, following strict chain-of-custody (COC) procedures. The temperature of the samples upon receipt at the laboratory was 2.4°C. All samples were given laboratory identification numbers, logged into the Laboratory Information Management System (LIMS) and then stored under refrigeration pending sediment chemistry testing.

No sample receiving anomalies were noted.

Tests Performed

Chlorinated Pesticides by EPA 8081A
PCB Congeners by EPA 8270C SIM
Total Solids by SM 2540B

Data Summary

All sample results and reporting limits were dry weight corrected.

Holding times

All holding times were met.

Calibration

Frequency and control criteria for initial and continuing calibration verifications were met.

Reporting Limits

All Method Detection Limits were met. The results were evaluated to the MDL and any concentrations found that were greater than or equal to the MDL, but less than RL, are qualified with a "J" flag.

Method Blanks

Concentrations of target analytes in the method blank were found to be below reporting limits for all testing.

Laboratory Control Samples

A Laboratory Control Sample (LCS) analysis was performed at the required frequencies, and unless otherwise noted, all parameters were within the established control limits.

Matrix Spikes

Matrix spike analyses were performed for each applicable analysis on project sample SRC-2011-6-4. All parameters were within the established control limits with the following exceptions.

The MS/MSD recoveries and/or RPDs for Aldrin, Alpha-BHC and Endrin Aldehyde (by EPA 8081A) exceeded the control limits due to matrix interference. Yet, since the associated LCS, LCSD and RPDs were within the control limits, the results are released with no further qualification.

The MS and/or MSD recoveries for four PCB Congeners (by EPA 8270C SIM) fell outside their established control limits due to matrix interference. However, the results have been flagged with the appropriate qualifiers and released with no further action since the associated LCS/LCSD recoveries were in control.

Surrogates

Surrogate recoveries for all applicable tests were within the established control limits for all samples.

Acronyms

LCS/LCSD- Laboratory Control Sample/Laboratory Control Sample Duplicate
PDS/PDSD- Post Digestion Spike/Post Digestion Spike Duplicate
MS/MSD- Matrix Spike/Matrix Spike Duplicate
ME-Marginal Exceedance
RPD- Relative Percent Difference

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	N/A
	Method:	SM 2540 B

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-1	**11-05-1314-1-A**	**05/19/11 09:15**	**Solid**	**N/A**	**05/24/11**	**05/24/11 18:00**	**B0524TSB1**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Units
Solids, Total	39.1	0.100	0.100	1		%

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-2	**11-05-1314-2-A**	**05/19/11 09:20**	**Solid**	**N/A**	**05/24/11**	**05/24/11 18:00**	**B0524TSB1**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Units
Solids, Total	38.5	0.100	0.100	1		%

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-3	**11-05-1314-3-A**	**05/19/11 09:35**	**Solid**	**N/A**	**05/24/11**	**05/24/11 18:00**	**B0524TSB1**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Units
Solids, Total	37.3	0.100	0.100	1		%

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-4	**11-05-1314-4-A**	**05/19/11 09:50**	**Solid**	**N/A**	**05/24/11**	**05/24/11 18:00**	**B0524TSB1**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Units
Solids, Total	41.8	0.100	0.100	1		%

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-5	**11-05-1314-5-A**	**05/19/11 10:00**	**Solid**	**N/A**	**05/24/11**	**05/24/11 18:00**	**B0524TSB1**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Units
Solids, Total	35.9	0.100	0.100	1		%

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-7-1	**11-05-1314-6-A**	**05/19/11 10:20**	**Solid**	**N/A**	**05/24/11**	**05/24/11 18:00**	**B0524TSB1**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Units
Solids, Total	42.3	0.100	0.100	1		%

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District		Date Received:	05/20/11
1325 J Street		Work Order No:	11-05-1314
Sacramento, CA 95814-2922		Preparation:	N/A
		Method:	SM 2540 B

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-7-2	**11-05-1314-7-A**	**05/19/11 10:35**	**Solid**	**N/A**	**05/24/11**	**05/24/11 18:00**	**B0524TSB1**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Units
Solids, Total	38.6	0.100	0.100	1		%

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-05-019-1,658**	**N/A**	**Solid**	**N/A**	**05/24/11**	**05/24/11 18:00**	**B0524TSB1**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Units
Solids, Total	ND	0.100	0.100	1		%

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8081A
Units: ug/kg

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-1	**11-05-1314-1-A**	**05/19/11 09:15**	**Solid**	**GC 51**	**05/24/11**	**05/27/11 01:41**	**110524L12**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.
-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
Aldrin	ND	2.6	0.79	1		Endosulfan I	ND	2.6	0.91	1	
Alpha-BHC	ND	2.6	0.75	1		Endosulfan II	ND	2.6	0.45	1	
Beta-BHC	ND	2.6	0.65	1		Endosulfan Sulfate	ND	2.6	0.67	1	
Delta-BHC	ND	2.6	0.81	1		Endrin	0.74	2.6	0.52	1	J
Gamma-BHC	ND	2.6	0.58	1		Endrin Aldehyde	ND	2.6	0.50	1	
Chlordane	ND	26	10	1		Endrin Ketone	ND	2.6	0.77	1	
Dieldrin	ND	2.6	0.58	1		Heptachlor	ND	2.6	0.57	1	
Trans-nonachlor	ND	2.6	1.4	1		Heptachlor Epoxide	ND	2.6	0.47	1	
2,4'-DDD	ND	2.6	0.51	1		Methoxychlor	ND	2.6	0.43	1	
2,4'-DDE	0.79	2.6	0.45	1	J	Toxaphene	ND	51	22	1	
2,4'-DDT	ND	2.6	0.36	1		Alpha Chlordane	0.66	2.6	0.66	1	J
4,4'-DDD	1.5	2.6	0.66	1	J	Gamma Chlordane	ND	2.6	0.66	1	
4,4'-DDE	1.7	2.6	0.77	1	J	Cis-nonachlor	ND	2.6	1.4	1	
4,4'-DDT	ND	2.6	0.84	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2,4,5,6-Tetrachloro-m-Xylene	73	50-130		Decachlorobiphenyl	61	50-130	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8081A
Units: ug/kg

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-2	**11-05-1314-2-A**	**05/19/11 09:20**	**Solid**	**GC 51**	**05/24/11**	**05/27/11 01:56**	**110524L12**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.
-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
Aldrin	ND	2.6	0.80	1		Endosulfan I	ND	2.6	0.93	1	
Alpha-BHC	ND	2.6	0.76	1		Endosulfan II	ND	2.6	0.46	1	
Beta-BHC	ND	2.6	0.66	1		Endosulfan Sulfate	ND	2.6	0.68	1	
Delta-BHC	ND	2.6	0.83	1		Endrin	ND	2.6	0.52	1	
Gamma-BHC	ND	2.6	0.59	1		Endrin Aldehyde	ND	2.6	0.51	1	
Chlordane	ND	26	10	1		Endrin Ketone	ND	2.6	0.78	1	
Dieldrin	ND	2.6	0.59	1		Heptachlor	ND	2.6	0.58	1	
Trans-nonachlor	ND	2.6	1.4	1		Heptachlor Epoxide	ND	2.6	0.48	1	
2,4'-DDD	ND	2.6	0.52	1		Methoxychlor	ND	2.6	0.43	1	
2,4'-DDE	ND	2.6	0.46	1		Toxaphene	ND	52	22	1	
2,4'-DDT	ND	2.6	0.36	1		Alpha Chlordane	ND	2.6	0.67	1	
4,4'-DDD	0.73	2.6	0.67	1	J	Gamma Chlordane	ND	2.6	0.67	1	
4,4'-DDE	0.86	2.6	0.78	1	J	Cis-nonachlor	ND	2.6	1.4	1	
4,4'-DDT	ND	2.6	0.85	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2,4,5,6-Tetrachloro-m-Xylene	64	50-130		Decachlorobiphenyl	58	50-130	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8081A
	Units:	ug/kg
Project: San Rafael Creek 2011		Page 3 of 7

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-3	**11-05-1314-3-A**	**05/19/11 09:35**	**Solid**	**GC 51**	**05/24/11**	**05/27/11 02:10**	**110524L12**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
Aldrin	ND	2.7	0.83	1		Endosulfan I	ND	2.7	0.95	1	
Alpha-BHC	ND	2.7	0.79	1		Endosulfan II	ND	2.7	0.47	1	
Beta-BHC	ND	2.7	0.68	1		Endosulfan Sulfate	ND	2.7	0.71	1	
Delta-BHC	ND	2.7	0.85	1		Endrin	ND	2.7	0.54	1	
Gamma-BHC	ND	2.7	0.61	1		Endrin Aldehyde	ND	2.7	0.52	1	
Chlordane	ND	27	11	1		Endrin Ketone	ND	2.7	0.81	1	
Dieldrin	ND	2.7	0.61	1		Heptachlor	ND	2.7	0.60	1	
Trans-nonachlor	ND	2.7	1.5	1		Heptachlor Epoxide	ND	2.7	0.49	1	
2,4'-DDD	ND	2.7	0.54	1		Methoxychlor	ND	2.7	0.45	1	
2,4'-DDE	ND	2.7	0.48	1		Toxaphene	ND	54	23	1	
2,4'-DDT	ND	2.7	0.38	1		Alpha Chlordane	ND	2.7	0.69	1	
4,4'-DDD	0.99	2.7	0.69	1	J	Gamma Chlordane	ND	2.7	0.69	1	
4,4'-DDE	0.89	2.7	0.81	1	J	Cis-nonachlor	ND	2.7	1.4	1	
4,4'-DDT	ND	2.7	0.88	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2,4,5,6-Tetrachloro-m-Xylene	79	50-130		Decachlorobiphenyl	62	50-130	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8081A
Units: ug/kg

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-4	**11-05-1314-4-A**	**05/19/11 09:50**	**Solid**	**GC 51**	**05/24/11**	**05/27/11 02:25**	**110524L12**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.
-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
Aldrin	ND	2.4	0.74	1		Endosulfan I	ND	2.4	0.85	1	
Alpha-BHC	ND	2.4	0.70	1		Endosulfan II	ND	2.4	0.42	1	
Beta-BHC	ND	2.4	0.61	1		Endosulfan Sulfate	ND	2.4	0.63	1	
Delta-BHC	ND	2.4	0.76	1		Endrin	ND	2.4	0.48	1	
Gamma-BHC	ND	2.4	0.55	1		Endrin Aldehyde	ND	2.4	0.47	1	
Chlordane	ND	24	9.6	1		Endrin Ketone	ND	2.4	0.72	1	
Dieldrin	ND	2.4	0.54	1		Heptachlor	ND	2.4	0.53	1	
Trans-nonachlor	ND	2.4	1.3	1		Heptachlor Epoxide	ND	2.4	0.44	1	
2,4'-DDD	ND	2.4	0.48	1		Methoxychlor	ND	2.4	0.40	1	
2,4'-DDE	ND	2.4	0.43	1		Toxaphene	ND	48	20	1	
2,4'-DDT	ND	2.4	0.33	1		Alpha Chlordane	ND	2.4	0.62	1	
4,4'-DDD	0.74	2.4	0.62	1	J	Gamma Chlordane	ND	2.4	0.62	1	
4,4'-DDE	0.79	2.4	0.72	1	J	Cis-nonachlor	ND	2.4	1.3	1	
4,4'-DDT	ND	2.4	0.78	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2,4,5,6-Tetrachloro-m-Xylene	71	50-130		Decachlorobiphenyl	68	50-130	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8081A
Units: ug/kg

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-5	**11-05-1314-5-A**	**05/19/11 10:00**	**Solid**	**GC 51**	**05/24/11**	**05/27/11 02:39**	**110524L12**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.
-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
Aldrin	ND	2.8	0.86	1		Endosulfan I	ND	2.8	0.99	1	
Alpha-BHC	ND	2.8	0.82	1		Endosulfan II	ND	2.8	0.49	1	
Beta-BHC	ND	2.8	0.71	1		Endosulfan Sulfate	ND	2.8	0.73	1	
Delta-BHC	ND	2.8	0.89	1		Endrin	ND	2.8	0.56	1	
Gamma-BHC	ND	2.8	0.64	1		Endrin Aldehyde	ND	2.8	0.54	1	
Chlordane	ND	28	11	1		Endrin Ketone	ND	2.8	0.84	1	
Dieldrin	ND	2.8	0.63	1		Heptachlor	ND	2.8	0.62	1	
Trans-nonachlor	ND	2.8	1.5	1		Heptachlor Epoxide	ND	2.8	0.51	1	
2,4'-DDD	ND	2.8	0.56	1		Methoxychlor	ND	2.8	0.47	1	
2,4'-DDE	ND	2.8	0.50	1		Toxaphene	ND	56	24	1	
2,4'-DDT	ND	2.8	0.39	1		Alpha Chlordane	ND	2.8	0.72	1	
4,4'-DDD	1.1	2.8	0.72	1	J	Gamma Chlordane	ND	2.8	0.72	1	
4,4'-DDE	1.0	2.8	0.84	1	J	Cis-nonachlor	ND	2.8	1.5	1	
4,4'-DDT	ND	2.8	0.91	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2,4,5,6-Tetrachloro-m-Xylene	83	50-130		Decachlorobiphenyl	71	50-130	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8081A
Units: ug/kg

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-7-1	**11-05-1314-6-A**	**05/19/11 10:20**	**Solid**	**GC 51**	**05/24/11**	**05/27/11 02:54**	**110524L12**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.
-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
Aldrin	ND	2.4	0.73	1		Endosulfan I	ND	2.4	0.84	1	
Alpha-BHC	ND	2.4	0.70	1		Endosulfan II	ND	2.4	0.41	1	
Beta-BHC	ND	2.4	0.60	1		Endosulfan Sulfate	ND	2.4	0.62	1	
Delta-BHC	ND	2.4	0.75	1		Endrin	ND	2.4	0.48	1	
Gamma-BHC	ND	2.4	0.54	1		Endrin Aldehyde	ND	2.4	0.46	1	
Chlordane	12	24	9.5	1	J	Endrin Ketone	ND	2.4	0.71	1	
Dieldrin	ND	2.4	0.54	1		Heptachlor	ND	2.4	0.53	1	
Trans-nonachlor	ND	2.4	1.3	1		Heptachlor Epoxide	ND	2.4	0.43	1	
2,4'-DDD	1.6	2.4	0.47	1	J	Methoxychlor	ND	2.4	0.40	1	
2,4'-DDE	0.78	2.4	0.42	1	J	Toxaphene	ND	47	20	1	
2,4'-DDT	ND	2.4	0.33	1		Alpha Chlordane	1.1	2.4	0.61	1	J
4,4'-DDD	5.2	2.4	0.61	1		Gamma Chlordane	1.1	2.4	0.61	1	J
4,4'-DDE	3.3	2.4	0.71	1		Cis-nonachlor	ND	2.4	1.3	1	
4,4'-DDT	ND	2.4	0.78	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2,4,5,6-Tetrachloro-m-Xylene	83	50-130		Decachlorobiphenyl	69	50-130	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8081A
	Units:	ug/kg
Project: San Rafael Creek 2011		Page 7 of 7

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-7-2	**11-05-1314-7-A**	**05/19/11 10:35**	**Solid**	**GC 51**	**05/24/11**	**05/27/11 03:08**	**110524L12**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
Aldrin	ND	2.6	0.80	1		Endosulfan I	ND	2.6	0.92	1	
Alpha-BHC	ND	2.6	0.76	1		Endosulfan II	ND	2.6	0.45	1	
Beta-BHC	ND	2.6	0.66	1		Endosulfan Sulfate	ND	2.6	0.68	1	
Delta-BHC	ND	2.6	0.82	1		Endrin	ND	2.6	0.52	1	
Gamma-BHC	2.0	2.6	0.59	1	J	Endrin Aldehyde	ND	2.6	0.51	1	
Chlordane	22	26	10	1	J	Endrin Ketone	ND	2.6	0.78	1	
Dieldrin	ND	2.6	0.59	1		Heptachlor	ND	2.6	0.58	1	
Trans-nonachlor	ND	2.6	1.4	1		Heptachlor Epoxide	ND	2.6	0.48	1	
2,4'-DDD	ND	2.6	0.52	1		Methoxychlor	ND	2.6	0.43	1	
2,4'-DDE	1.6	2.6	0.46	1	J	Toxaphene	ND	52	22	1	
2,4'-DDT	ND	2.6	0.36	1		Alpha Chlordane	2.2	2.6	0.67	1	J
4,4'-DDD	7.8	2.6	0.67	1		Gamma Chlordane	1.4	2.6	0.67	1	J
4,4'-DDE	4.9	2.6	0.78	1		Cis-nonachlor	ND	2.6	1.4	1	
4,4'-DDT	ND	2.6	0.85	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2,4,5,6-Tetrachloro-m-Xylene	74	50-130		Decachlorobiphenyl	63	50-130	

Method Blank	099-12-858-93	N/A	Solid	GC 51	05/24/11	05/26/11 22:34	110524L12

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
Aldrin	ND	1.0	0.31	1		Endosulfan I	ND	1.0	0.36	1	
Alpha-BHC	ND	1.0	0.29	1		Endosulfan II	ND	1.0	0.18	1	
Beta-BHC	ND	1.0	0.25	1		Endosulfan Sulfate	ND	1.0	0.26	1	
Delta-BHC	ND	1.0	0.32	1		Endrin	ND	1.0	0.20	1	
Gamma-BHC	ND	1.0	0.23	1		Endrin Aldehyde	ND	1.0	0.20	1	
Chlordane	ND	10	4.0	1		Endrin Ketone	ND	1.0	0.30	1	
Dieldrin	ND	1.0	0.23	1		Heptachlor	ND	1.0	0.22	1	
Trans-nonachlor	ND	1.0	0.55	1		Heptachlor Epoxide	ND	1.0	0.18	1	
2,4'-DDD	ND	1.0	0.20	1		Methoxychlor	ND	1.0	0.17	1	
2,4'-DDE	ND	1.0	0.18	1		Toxaphene	ND	20	8.5	1	
2,4'-DDT	ND	1.0	0.14	1		Alpha Chlordane	ND	1.0	0.26	1	
4,4'-DDD	ND	1.0	0.26	1		Gamma Chlordane	ND	1.0	0.26	1	
4,4'-DDE	ND	1.0	0.30	1		Cis-nonachlor	ND	1.0	0.54	1	
4,4'-DDT	ND	1.0	0.33	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2,4,5,6-Tetrachloro-m-Xylene	96	50-130		Decachlorobiphenyl	86	50-130	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8270C SIM PCB Congeners
	Units:	ug/kg
Project: San Rafael Creek 2011		Page 1 of 8

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-1	**11-05-1314-1-A**	**05/19/11 09:15**	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11 21:29**	**110525L02**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
PCB008	ND	2.6	0.67	1		PCB183	ND	2.6	0.73	1	
PCB018	ND	2.6	0.69	1		PCB128	ND	2.6	0.86	1	
PCB028	ND	2.6	0.64	1		PCB177	ND	2.6	0.72	1	
PCB052	ND	2.6	0.74	1		PCB156	ND	2.6	0.71	1	
PCB049	ND	2.6	0.87	1		PCB180	1.0	2.6	0.74	1	J
PCB044	ND	2.6	0.77	1		PCB170	ND	2.6	0.67	1	
PCB074	ND	2.6	0.72	1		PCB201	ND	2.6	0.76	1	
PCB070	ND	2.6	0.71	1		PCB195	ND	2.6	0.70	1	
PCB066	ND	2.6	0.66	1		PCB194	ND	2.6	0.68	1	
PCB101	0.96	2.6	0.70	1	J	PCB031	ND	2.6	0.91	1	
PCB099	ND	2.6	0.70	1		PCB033	ND	2.6	0.84	1	
PCB087	ND	2.6	0.71	1		PCB056	ND	2.6	0.73	1	
PCB110	0.90	2.6	0.68	1	J	PCB060	ND	2.6	0.81	1	
PCB151	ND	2.6	0.67	1		PCB095	ND	2.6	0.86	1	
PCB149	0.97	2.6	0.74	1	J	PCB097	ND	2.6	0.79	1	
PCB118	ND	2.6	0.71	1		PCB132	ND	2.6	0.80	1	
PCB153	1.8	2.6	0.76	1	J	PCB141	ND	2.6	0.88	1	
PCB105	ND	2.6	0.75	1		PCB174	ND	2.6	0.87	1	
PCB138/158	1.8	5.1	1.5	1	J	PCB203	ND	2.6	0.84	1	
PCB187	ND	2.6	0.75	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2-Fluorobiphenyl	90	50-125		p-Terphenyl-d14	99	50-125	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8270C SIM PCB Congeners
	Units:	ug/kg
Project: San Rafael Creek 2011		Page 2 of 8

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-2	**11-05-1314-2-A**	**05/19/11 09:20**	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11 21:56**	**110525L02**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
PCB008	ND	2.6	0.68	1		PCB183	ND	2.6	0.74	1	
PCB018	ND	2.6	0.70	1		PCB128	ND	2.6	0.87	1	
PCB028	ND	2.6	0.65	1		PCB177	ND	2.6	0.73	1	
PCB052	1.3	2.6	0.75	1	J	PCB156	ND	2.6	0.73	1	
PCB049	ND	2.6	0.88	1		PCB180	1.3	2.6	0.76	1	J
PCB044	ND	2.6	0.78	1		PCB170	ND	2.6	0.68	1	
PCB074	ND	2.6	0.73	1		PCB201	ND	2.6	0.77	1	
PCB070	ND	2.6	0.72	1		PCB195	ND	2.6	0.71	1	
PCB066	ND	2.6	0.67	1		PCB194	ND	2.6	0.69	1	
PCB101	1.4	2.6	0.71	1	J	PCB031	ND	2.6	0.92	1	
PCB099	ND	2.6	0.71	1		PCB033	ND	2.6	0.85	1	
PCB087	ND	2.6	0.72	1		PCB056	ND	2.6	0.74	1	
PCB110	1.2	2.6	0.69	1	J	PCB060	ND	2.6	0.82	1	
PCB151	ND	2.6	0.68	1		PCB095	ND	2.6	0.88	1	
PCB149	1.3	2.6	0.75	1	J	PCB097	ND	2.6	0.80	1	
PCB118	1.0	2.6	0.72	1	J	PCB132	ND	2.6	0.81	1	
PCB153	2.2	2.6	0.78	1	J	PCB141	ND	2.6	0.90	1	
PCB105	ND	2.6	0.76	1		PCB174	ND	2.6	0.88	1	
PCB138/158	2.5	5.2	1.5	1	J	PCB203	ND	2.6	0.86	1	
PCB187	ND	2.6	0.76	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2-Fluorobiphenyl	85	50-125		p-Terphenyl-d14	94	50-125	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-3	**11-05-1314-3-A**	**05/19/11 09:35**	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11 22:23**	**110525L02**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.
-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
PCB008	ND	2.7	0.70	1		PCB183	ND	2.7	0.76	1	
PCB018	ND	2.7	0.72	1		PCB128	ND	2.7	0.90	1	
PCB028	ND	2.7	0.68	1		PCB177	ND	2.7	0.76	1	
PCB052	1.2	2.7	0.77	1	J	PCB156	ND	2.7	0.75	1	
PCB049	ND	2.7	0.91	1		PCB180	1.3	2.7	0.78	1	J
PCB044	ND	2.7	0.81	1		PCB170	ND	2.7	0.70	1	
PCB074	ND	2.7	0.75	1		PCB201	ND	2.7	0.80	1	
PCB070	ND	2.7	0.75	1		PCB195	ND	2.7	0.73	1	
PCB066	ND	2.7	0.69	1		PCB194	ND	2.7	0.71	1	
PCB101	1.3	2.7	0.73	1	J	PCB031	ND	2.7	0.95	1	
PCB099	ND	2.7	0.74	1		PCB033	ND	2.7	0.88	1	
PCB087	ND	2.7	0.74	1		PCB056	ND	2.7	0.77	1	
PCB110	1.2	2.7	0.71	1	J	PCB060	ND	2.7	0.85	1	
PCB151	ND	2.7	0.71	1		PCB095	ND	2.7	0.91	1	
PCB149	1.2	2.7	0.77	1	J	PCB097	ND	2.7	0.83	1	
PCB118	1.1	2.7	0.74	1	J	PCB132	ND	2.7	0.84	1	
PCB153	2.2	2.7	0.80	1	J	PCB141	ND	2.7	0.93	1	
PCB105	ND	2.7	0.79	1		PCB174	ND	2.7	0.91	1	
PCB138/158	2.1	5.4	1.6	1	J	PCB203	ND	2.7	0.89	1	
PCB187	0.99	2.7	0.79	1	J						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2-Fluorobiphenyl	84	50-125		p-Terphenyl-d14	88	50-125	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8270C SIM PCB Congeners
Units: ug/kg

Project: San Rafael Creek 2011

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-4	**11-05-1314-4-A**	**05/19/11 09:50**	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11 22:51**	**110525L02**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.
-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
PCB008	ND	2.4	0.63	1		PCB183	ND	2.4	0.68	1	
PCB018	ND	2.4	0.65	1		PCB128	ND	2.4	0.80	1	
PCB028	ND	2.4	0.60	1		PCB177	ND	2.4	0.68	1	
PCB052	1.8	2.4	0.69	1	J	PCB156	ND	2.4	0.67	1	
PCB049	1.2	2.4	0.81	1	J	PCB180	2.1	2.4	0.70	1	J
PCB044	1.3	2.4	0.72	1	J	PCB170	1.1	2.4	0.63	1	J
PCB074	ND	2.4	0.67	1		PCB201	ND	2.4	0.71	1	
PCB070	1.2	2.4	0.67	1	J	PCB195	ND	2.4	0.65	1	
PCB066	1.5	2.4	0.62	1	J	PCB194	ND	2.4	0.63	1	
PCB101	2.3	2.4	0.65	1	J	PCB031	ND	2.4	0.85	1	
PCB099	1.1	2.4	0.66	1	J	PCB033	ND	2.4	0.78	1	
PCB087	ND	2.4	0.66	1		PCB056	ND	2.4	0.68	1	
PCB110	2.0	2.4	0.63	1	J	PCB060	ND	2.4	0.76	1	
PCB151	ND	2.4	0.63	1		PCB095	1.5	2.4	0.81	1	J
PCB149	2.3	2.4	0.69	1	J	PCB097	1.2	2.4	0.74	1	J
PCB118	1.8	2.4	0.66	1	J	PCB132	ND	2.4	0.75	1	
PCB153	3.4	2.4	0.72	1		PCB141	ND	2.4	0.83	1	
PCB105	1.4	2.4	0.70	1	J	PCB174	0.93	2.4	0.81	1	J
PCB138/158	3.1	4.8	1.4	1	J	PCB203	ND	2.4	0.79	1	
PCB187	1.3	2.4	0.70	1	J						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2-Fluorobiphenyl	92	50-125		p-Terphenyl-d14	104	50-125	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8270C SIM PCB Congeners
	Units:	ug/kg
Project: San Rafael Creek 2011		Page 5 of 8

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-6-5	**11-05-1314-5-A**	**05/19/11 10:00**	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11 23:18**	**110525L02**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
PCB008	ND	2.8	0.73	1		PCB183	ND	2.8	0.79	1	
PCB018	ND	2.8	0.75	1		PCB128	ND	2.8	0.93	1	
PCB028	ND	2.8	0.70	1		PCB177	ND	2.8	0.79	1	
PCB052	1.3	2.8	0.80	1	J	PCB156	ND	2.8	0.78	1	
PCB049	ND	2.8	0.95	1		PCB180	1.5	2.8	0.81	1	J
PCB044	ND	2.8	0.84	1		PCB170	ND	2.8	0.73	1	
PCB074	ND	2.8	0.78	1		PCB201	ND	2.8	0.83	1	
PCB070	ND	2.8	0.77	1		PCB195	ND	2.8	0.76	1	
PCB066	ND	2.8	0.72	1		PCB194	ND	2.8	0.74	1	
PCB101	1.4	2.8	0.76	1	J	PCB031	ND	2.8	0.99	1	
PCB099	ND	2.8	0.76	1		PCB033	ND	2.8	0.91	1	
PCB087	ND	2.8	0.77	1		PCB056	ND	2.8	0.80	1	
PCB110	1.4	2.8	0.74	1	J	PCB060	ND	2.8	0.88	1	
PCB151	ND	2.8	0.73	1		PCB095	ND	2.8	0.94	1	
PCB149	1.2	2.8	0.80	1	J	PCB097	ND	2.8	0.86	1	
PCB118	1.3	2.8	0.77	1	J	PCB132	ND	2.8	0.87	1	
PCB153	2.4	2.8	0.83	1	J	PCB141	ND	2.8	0.96	1	
PCB105	ND	2.8	0.82	1		PCB174	ND	2.8	0.94	1	
PCB138/158	2.2	5.6	1.6	1	J	PCB203	ND	2.8	0.92	1	
PCB187	ND	2.8	0.82	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2-Fluorobiphenyl	82	50-125		p-Terphenyl-d14	92	50-125	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8270C SIM PCB Congeners
	Units:	ug/kg
Project: San Rafael Creek 2011		Page 6 of 8

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-7-1	**11-05-1314-6-A**	**05/19/11 10:20**	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11 23:45**	**110525L02**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
PCB008	ND	2.4	0.62	1		PCB183	ND	2.4	0.67	1	
PCB018	1.5	2.4	0.64	1	J	PCB128	ND	2.4	0.79	1	
PCB028	1.3	2.4	0.60	1	J	PCB177	ND	2.4	0.67	1	
PCB052	3.2	2.4	0.68	1		PCB156	ND	2.4	0.66	1	
PCB049	1.7	2.4	0.80	1	J	PCB180	2.5	2.4	0.69	1	
PCB044	2.6	2.4	0.71	1		PCB170	1.3	2.4	0.62	1	J
PCB074	1.4	2.4	0.67	1	J	PCB201	0.86	2.4	0.70	1	J
PCB070	2.5	2.4	0.66	1		PCB195	ND	2.4	0.65	1	
PCB066	2.7	2.4	0.61	1		PCB194	ND	2.4	0.63	1	
PCB101	3.6	2.4	0.65	1		PCB031	1.4	2.4	0.84	1	J
PCB099	1.6	2.4	0.65	1	J	PCB033	0.99	2.4	0.77	1	J
PCB087	1.0	2.4	0.65	1	J	PCB056	1.1	2.4	0.68	1	J
PCB110	3.4	2.4	0.63	1		PCB060	0.90	2.4	0.75	1	J
PCB151	1.2	2.4	0.62	1	J	PCB095	2.6	2.4	0.80	1	
PCB149	2.7	2.4	0.68	1		PCB097	1.6	2.4	0.73	1	J
PCB118	3.0	2.4	0.65	1		PCB132	ND	2.4	0.74	1	
PCB153	4.5	2.4	0.71	1		PCB141	1.1	2.4	0.82	1	J
PCB105	1.6	2.4	0.69	1	J	PCB174	1.3	2.4	0.80	1	J
PCB138/158	4.3	4.7	1.4	1	J	PCB203	ND	2.4	0.78	1	
PCB187	1.5	2.4	0.70	1	J						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2-Fluorobiphenyl	109	50-125		p-Terphenyl-d14	99	50-125	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8270C SIM PCB Congeners
	Units:	ug/kg
Project: San Rafael Creek 2011		Page 7 of 8

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
SRC-2011-7-2	**11-05-1314-7-A**	**05/19/11 10:35**	**Solid**	**GC/MS HHH**	**05/25/11**	**05/28/11 00:11**	**110525L02**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

-Results are reported on a dry weight basis.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
PCB008	3.4	2.6	0.68	1		PCB183	1.5	2.6	0.74	1	J
PCB018	16	2.6	0.70	1		PCB128	2.1	2.6	0.87	1	J
PCB028	12	2.6	0.65	1		PCB177	1.2	2.6	0.73	1	J
PCB052	18	2.6	0.75	1		PCB156	1.2	2.6	0.72	1	J
PCB049	10	2.6	0.88	1		PCB180	5.7	2.6	0.75	1	
PCB044	10	2.6	0.78	1		PCB170	2.8	2.6	0.68	1	
PCB074	5.0	2.6	0.73	1		PCB201	1.6	2.6	0.77	1	J
PCB070	12	2.6	0.72	1		PCB195	ND	2.6	0.71	1	
PCB066	11	2.6	0.67	1		PCB194	ND	2.6	0.69	1	
PCB101	11	2.6	0.71	1		PCB031	13	2.6	0.92	1	
PCB099	4.7	2.6	0.71	1		PCB033	5.1	2.6	0.85	1	
PCB087	3.3	2.6	0.71	1		PCB056	4.3	2.6	0.74	1	
PCB110	10	2.6	0.69	1		PCB060	2.1	2.6	0.82	1	J
PCB151	2.0	2.6	0.68	1	J	PCB095	7.8	2.6	0.88	1	
PCB149	6.6	2.6	0.75	1		PCB097	5.1	2.6	0.80	1	
PCB118	8.5	2.6	0.71	1		PCB132	ND	2.6	0.81	1	
PCB153	11	2.6	0.77	1		PCB141	2.3	2.6	0.89	1	J
PCB105	4.6	2.6	0.76	1		PCB174	2.8	2.6	0.88	1	
PCB138/158	10	5.2	1.5	1		PCB203	1.4	2.6	0.86	1	J
PCB187	3.2	2.6	0.76	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2-Fluorobiphenyl	94	50-125		p-Terphenyl-d14	100	50-125	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8270C SIM PCB Congeners
	Units:	ug/kg
Project: San Rafael Creek 2011		Page 8 of 8

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-14-341-4**	**N/A**	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11 17:00**	**110525L02**

Comment(s): -Results were evaluated to the MDL, concentrations >= to the MDL but < RL, if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qual	Parameter	Result	RL	MDL	DF	Qual
PCB008	ND	1.0	0.26	1		PCB183	ND	1.0	0.28	1	
PCB018	ND	1.0	0.27	1		PCB128	ND	1.0	0.34	1	
PCB028	ND	1.0	0.25	1		PCB177	ND	1.0	0.28	1	
PCB052	ND	1.0	0.29	1		PCB156	ND	1.0	0.28	1	
PCB049	ND	1.0	0.34	1		PCB180	ND	1.0	0.29	1	
PCB044	ND	1.0	0.30	1		PCB170	ND	1.0	0.26	1	
PCB074	ND	1.0	0.28	1		PCB201	ND	1.0	0.30	1	
PCB070	ND	1.0	0.28	1		PCB195	ND	1.0	0.27	1	
PCB066	ND	1.0	0.26	1		PCB194	ND	1.0	0.27	1	
PCB101	ND	1.0	0.27	1		PCB031	ND	1.0	0.35	1	
PCB099	ND	1.0	0.27	1		PCB033	ND	1.0	0.33	1	
PCB087	ND	1.0	0.28	1		PCB056	ND	1.0	0.29	1	
PCB110	ND	1.0	0.26	1		PCB060	ND	1.0	0.32	1	
PCB151	ND	1.0	0.26	1		PCB095	ND	1.0	0.34	1	
PCB149	ND	1.0	0.29	1		PCB097	ND	1.0	0.31	1	
PCB118	ND	1.0	0.28	1		PCB132	ND	1.0	0.31	1	
PCB153	ND	1.0	0.30	1		PCB141	ND	1.0	0.35	1	
PCB105	ND	1.0	0.29	1		PCB174	ND	1.0	0.34	1	
PCB138/158	ND	2.0	0.59	1		PCB203	ND	1.0	0.33	1	
PCB187	ND	1.0	0.29	1							

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
2-Fluorobiphenyl	92	50-125		p-Terphenyl-d14	104	50-125	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Duplicate

ACCREDITED IN ACCORDANCE WITH nelac

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	N/A
	Method:	SM 2540 B

Project: San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
SRC-2011-6-4	**Solid**	**N/A**	**05/24/11**	**05/24/11**	**B0524TSD1**

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Solids, Total	41.8	42.0	0	0-10	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8081A

Project San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
SRC-2011-6-4	**Solid**	**GC 51**	**05/24/11**	**05/26/11**	**110524S12**

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Aldrin	99	70	50-135	34	0-25	4
Alpha-BHC	103	77	50-135	29	0-25	4
Beta-BHC	108	87	50-135	21	0-25	
Delta-BHC	72	70	50-135	3	0-25	
Gamma-BHC	74	72	50-135	3	0-25	
Dieldrin	71	66	50-135	7	0-25	
4,4'-DDD	79	72	50-135	8	0-25	
4,4'-DDE	70	65	50-135	7	0-25	
4,4'-DDT	78	73	50-135	7	0-25	
Endosulfan I	70	65	50-135	7	0-25	
Endosulfan II	79	73	50-135	8	0-25	
Endosulfan Sulfate	74	69	50-135	6	0-25	
Endrin	80	75	50-135	7	0-25	
Endrin Aldehyde	13	18	50-135	35	0-25	3,4
Endrin Ketone	87	81	50-135	8	0-25	
Heptachlor	67	66	50-135	2	0-25	
Heptachlor Epoxide	69	66	50-135	4	0-25	
Methoxychlor	73	67	50-135	7	0-25	
Alpha Chlordane	68	64	50-135	6	0-25	
Gamma Chlordane	69	65	50-135	6	0-25	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Spike/Spike Duplicate - Surrogate

US Army Corps of Engineers, Sacramento District	Date Received:	05/20/11
1325 J Street	Work Order No:	11-05-1314
Sacramento, CA 95814-2922	Preparation:	EPA 3545
	Method:	EPA 8081A

Project San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
11-05-1314-4	**Solid**	**GC 51**	**05/24/11**	**5/26/2011**	**110524S12**

Parameter	MS REC (%)	MSD REC (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	83	80	50-130	
Decachlorobiphenyl	74	70	50-130	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8270C SIM PCB Congeners

Project San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
SRC-2011-6-4	**Solid**	**GC/MS HHH**	**05/25/11**	**05/28/11**	**110525S02**

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
PCB008	99	108	50-125	8	0-30	
PCB018	105	114	50-125	8	0-30	
PCB028	108	118	50-125	9	0-30	
PCB052	104	113	50-125	8	0-30	
PCB044	110	119	50-125	8	0-30	
PCB066	111	122	50-125	9	0-30	
PCB101	114	124	50-125	8	0-30	
PCB077	97	117	50-125	19	0-30	
PCB118	118	131	50-125	10	0-30	3
PCB153	114	124	50-125	8	0-30	
PCB105	113	125	50-125	10	0-30	
PCB187	117	129	50-125	9	0-30	3
PCB126	94	115	50-125	20	0-30	
PCB128	112	124	50-125	10	0-30	
PCB180	124	135	50-125	9	0-30	3
PCB170	101	111	50-125	9	0-30	
PCB195	112	121	50-125	8	0-30	
PCB206	121	130	50-125	8	0-30	3
PCB209	112	120	50-125	7	0-30	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Spike/Spike Duplicate - Surrogate

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: 05/20/11
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8270C SIM PCB Congeners

Project San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
11-05-1314-4	**Solid**	**GC/MS HHH**	**05/25/11**	**5/28/2011**	**110525S02**

Parameter	MS REC (%)	MSD REC (%)	Control Limits	Qualifiers
p-Terphenyl-d14	46	70	50-125	2
2-Fluorobiphenyl	76	79	50-125	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: N/A
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8081A

Project: San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-858-93	**Solid**	**GC 51**	**05/24/11**	**05/26/11**	**110524L12**

Parameter	LCS %REC	LCSD %REC	%REC CL	ME_CL	RPD	RPD CL	Qualifiers
Aldrin	77	77	50-135	36-149	0	0-25	
Alpha-BHC	77	77	50-135	36-149	0	0-25	
Beta-BHC	72	72	50-135	36-149	1	0-25	
Delta-BHC	74	73	50-135	36-149	1	0-25	
Gamma-BHC	78	77	50-135	36-149	1	0-25	
Dieldrin	74	74	50-135	36-149	1	0-25	
4,4'-DDD	78	79	50-135	36-149	1	0-25	
4,4'-DDE	79	79	50-135	36-149	1	0-25	
4,4'-DDT	80	78	50-135	36-149	2	0-25	
Endosulfan I	75	76	50-135	36-149	1	0-25	
Endosulfan II	79	81	50-135	36-149	2	0-25	
Endosulfan Sulfate	78	77	50-135	36-149	1	0-25	
Endrin	79	80	50-135	36-149	0	0-25	
Endrin Aldehyde	66	67	50-135	36-149	1	0-25	
Endrin Ketone	85	86	50-135	36-149	1	0-25	
Heptachlor	79	79	50-135	36-149	0	0-25	
Heptachlor Epoxide	67	67	50-135	36-149	0	0-25	
Methoxychlor	77	75	50-135	36-149	2	0-25	
Alpha Chlordane	74	74	50-135	36-149	0	0-25	
Gamma Chlordane	75	75	50-135	36-149	0	0-25	

Total number of LCS compounds : 20
Total number of ME compounds : 0
Total number of ME compounds allowed : 1
LCS ME CL validation result : Pass

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

LCS/LCS Duplicate - Surrogate

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: N/A
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8081A

Project: San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-858-93	**Solid**	**GC 51**	**05/24/11**	**05/26/11**	**110524L12**

Parameter	LCS REC (%)	LCSD REC (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	90	89	50-130	
Decachlorobiphenyl	80	80	50-130	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: N/A
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8270C SIM PCB Congeners

Project: San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-14-341-4	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11**	**110525L02**

Parameter	LCS %REC	LCSD %REC	%REC CL	ME_CL	RPD	RPD CL	Qualifiers
PCB008	108	109	50-125	38-138	2	0-30	
PCB018	108	110	50-125	38-138	2	0-30	
PCB028	108	110	50-125	38-138	2	0-30	
PCB052	102	102	50-125	38-138	0	0-30	
PCB044	108	110	50-125	38-138	2	0-30	
PCB066	109	110	50-125	38-138	1	0-30	
PCB101	107	108	50-125	38-138	2	0-30	
PCB077	107	109	50-125	38-138	2	0-30	
PCB118	107	109	50-125	38-138	2	0-30	
PCB153	101	103	50-125	38-138	2	0-30	
PCB105	102	104	50-125	38-138	2	0-30	
PCB187	99	101	50-125	38-138	2	0-30	
PCB126	97	99	50-125	38-138	3	0-30	
PCB128	99	101	50-125	38-138	2	0-30	
PCB180	102	104	50-125	38-138	3	0-30	
PCB170	97	100	50-125	38-138	3	0-30	
PCB195	105	107	50-125	38-138	2	0-30	
PCB206	110	113	50-125	38-138	3	0-30	
PCB209	104	106	50-125	38-138	2	0-30	

Total number of LCS compounds : 19
Total number of ME compounds : 0
Total number of ME compounds allowed : 1
LCS ME CL validation result : Pass

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

LCS/LCS Duplicate - Surrogate

US Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Date Received: N/A
Work Order No: 11-05-1314
Preparation: EPA 3545
Method: EPA 8270C SIM PCB Congeners

Project: San Rafael Creek 2011

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-14-341-4	**Solid**	**GC/MS HHH**	**05/25/11**	**05/27/11**	**110525L02**

Parameter	LCS REC (%)	LCSD REC (%)	Control Limits	Qualifiers
p-Terphenyl-d14	95	95	50-125	
2-Fluorobiphenyl	84	86	50-125	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order Number: 11-05-1314

Qualifier	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution, therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
4	The MS/MSD RPD was out of control due to matrix interference. The LCS/LCSD RPD was in control and, therefore, the sample data was reported without further clarification.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to a matrix interference effect. The associated batch LCS/LCSD was in control and, hence, the associated sample data was reported without further clarification.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
ME	LCS Recovery Percentage is within LCS ME Control Limit range.
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.

Calscience Environmental Laboratories, Inc.

☐ SoCal Laboratory
7440 Lincoln Way
Garden Grove, CA 92841-1427
(714) 895-5494

☒ NorCal Service Center
5063 Commercial Circle, Suite H
Concord, CA 94520-8577
(925) 689-9022

CHAIN OF CUSTODY RECORD

Date 5/19/11

Page 1 of 1

LABORATORY CLIENT: TOMMY WALDRUP US ARMY CORPS OF ENG

ADDRESS: 1325 J STREET

CITY: SACRAMENTO STATE: CA ZIP: 95814

TEL: 916-557-7673 E-MAIL: TOMMY.L.WALDRUP@USACE.ARMY.MIL

CLIENT PROJECT NAME / NUMBER: SAN RAFAEL CREEK 2011

P.O. NO.:

PROJECT CONTACT: TOMMY WALDRUP

LAB USE ONLY: 05-1314

SAMPLER(S): (PRINT) ED KELLER

COELT LOG CODE:

COOLER RECEIPT TEMP= °C

TURNAROUND TIME: ☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ STANDARD

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING FORMS ☐ COELT EDF ☐ _____

SPECIAL INSTRUCTIONS:
COPY OF ELECTRONIC DELIVERABLE TO
EDWARD.P.KELLER@USACE.ARMY.MIL
JUSTIN.M.KOSTA@USACE.ARMY.MIL
PCB CONGENER RMP40

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	FIELD POINT NAME (FOR COELT EDF)	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (g)	TPH (d) or (C6-C36) or (C6-C44)	TPH ( )	BTEX / MTBE (8260B) or ( )	VOCs (8260B)	Oxygenates (8260B)	Encore Prep (5035)	SVOCs (8270C)	Pesticides (8081A)	PCBs (8082) (ECD) Congener 40	PNAs (8310) or (8270C)	T22 Metals (6010B/747X)	Cr(VI) [7196A or 7199 or 218.6]	VOCs (TO-14A) or (TO-15)	TPH (g) [TO-3]+			Remark
1	SRC-2011-6-1		5/19/11	0915	S	2	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—			
2	SRC-2011-6-2		5/19/11	0920	S	2	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—			
3	SRC-2011-6-3		5/19/11	0935	S	2	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—			
4	SRC-2011-6-4		5/19/11	0950	S	2	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—			MS/MSD
5	SRC-2011-6-5		5/19/11	1000	S	2	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—			
6	SRC-2011-7-1		5/19/11	1020	S	2	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—			
7	SRC-2011-7-2		5/19/11	1035	S	2	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—			
	TEMP BLANK																							

Relinquished by: (Signature) Edward Keller	5/19/2011 1540	Received by: (Signature/Affiliation) Tom O'Malley CEL	Date: 5/19/11 Time: 1540
Relinquished by: (Signature) Tom O'Malley TO 050	5/19/11 1730	Received by: (Signature/Affiliation)	Date: Time:
Relinquished by: (Signature)		Received by: (Signature/Affiliation)	Date: 5/20/11 Time: 1030

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05/01/07 Revision

1314

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SAMPLE RECEIVING
CEL
7440 LINCOLN WAY
GARDEN GROVE, CA 92841

COD:
$0.00

Reference:
U S ARMY CORPS OF ENGINEERS

Delivery Instructions:

Signature Type:
SIGNATURE REQUIRED

Tracking #: 516613434

NPS

ORC **D**

GARDEN GROVE

D92843A

91254864

Print Date : 05/19/11 16:00 PM

Package 1 of 1

Send Label To Printer ☑ Print All Edit Shipment Finish

LABEL INSTRUCTIONS:

Do not copy or reprint this label for additional shipments - each package must have a unique barcode.

STEP 1 - Use the "Send Label to Printer" button on this page to print the shipping label on a laser or inkjet printer.

STEP 2 - Fold this page in half.

STEP 3 - Securely attach this label to your package, do not cover the barcode.

STEP 4 - Request an on-call pickup for your package, if you do not have scheduled daily pickup service or Drop-off your package at the nearest GSO drop box. Locate nearest GSO dropbox locations using this link.

ADDITIONAL OPTIONS:

Send Label Via Email Create Return Label

TERMS AND CONDITIONS:

By giving us your shipment to deliver, you agree to all the service terms and conditions described in this section.
Our liability for loss or damage to any package is limited to your actual damages or $100 whichever is less, unless you pay for and declare a higher authorized value. If you declare a higher value and pay the additional charge, our liability will be the lesser of your declared value or the actual value of your loss or damage. In any event, we will not be liable for any damage, whether direct, incidental, special or consequential, in excess of the declared value of a shipment whether or not we had knowledge that such damage might be incurred including but not limited to loss of income or profit. We will not be liable for your acts or omissions, including but not limited to improper or insufficient packaging, securing, marking or addressing. Also, we will not be liable if you or the recipient violates any of the terms of our agreement. We will not be liable for loss, damage or delay caused by events we cannot control, including but not limited to acts of God, perils of the air, weather conditions, act of public enemies, war, strikes, or civil commotion. The highest declared value for our GSO Priority Letter or GSO Priority Package is $500. For other shipments the highest declared value is $10,000 unless your package contains items of "extraordinary value", in which case the highest declared value we allow is $500. Items of "extraordinary value" include, but or not limited to, artwork, jewelry, furs, precious metals, tickets, negotiable instruments and other items with intrinsic value.

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 11-05-1314

SAMPLE RECEIPT FORM

Cooler 1 of 1

CLIENT: Tomy Waldrop DATE: 05/20/11

TEMPERATURE: Thermometer ID: SC1 (Criteria: 0.0 °C – 6.0 °C, not frozen)

Temperature 1.9 °C + 0.5 °C (CF) = 2.4 °C ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____).

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling.

☐ **Received at ambient temperature, placed on ice for transport by Courier.**

Ambient Temperature: ☐ Air ☐ Filter Initial: _____

CUSTODY SEALS INTACT:

☑ Cooler ☐_____ ☐ No (Not Intact) ☐ Not Present ☐ N/A Initial: _____

☐ Sample ☐_____ ☐ No (Not Intact) ☑ Not Present Initial: TN

SAMPLE CONDITION:	Yes	No	N/A
Chain-Of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Collection date/time, matrix, and/or # of containers logged in based on sample labels.			
☐ No analysis requested. ☐ Not relinquished. ☐ No date/time relinquished.			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and good condition	☑	☐	☐
Proper containers and sufficient volume for analyses requested	☑	☐	☐
Analyses received within holding time	☑	☐	☐
pH / Res. Chlorine / Diss. Sulfide / Diss. Oxygen received within 24 hours	☐	☐	☑
Proper preservation noted on COC or sample container	☐	☐	☑
☐ Unpreserved vials received for Volatiles analysis			
Volatile analysis container(s) free of headspace	☐	☐	☑
Tedlar bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE:

Solid: ☐4ozCGJ ☑8ozCGJ ☐16ozCGJ ☐Sleeve (_____) ☐EnCores® ☐TerraCores® ☐_____

Water: ☐VOA ☐VOA**h** ☐VOA**na$_2$** ☐125AGB ☐125AGB**h** ☐125AGB**p** ☐1AGB ☐1AGB**na$_2$** ☐1AGB**s** ☐500AGB ☐500AGJ ☐500AGJ**s** ☐250AGB ☐250CGB ☐250CGB**s** ☐1PB ☐500PB ☐500PB**na** ☐250PB ☐250PB**n** ☐125PB ☐125PB**znna** ☐100PJ ☐100PJ**na$_2$** ☐_____ ☐_____ ☐_____

Air: ☐Tedlar® ☐Summa® **Other:** ☐_____ **Trip Blank Lot#:**_____ **Labeled/Checked by:** TN

Container: **C:** Clear **A:** Amber **P:** Plastic **G:** Glass **J:** Jar **B:** Bottle **Z:** Ziploc/Resealable Bag **E:** Envelope **Reviewed by:** YL

Preservative: **h:** HCL **n:** HNO_3 **na$_2$:**$Na_2S_2O_3$ **na:** NaOH **p:** H_3PO_4 **s:** H_2SO_4 **znna:** $ZnAc_2$+NaOH **f:** Field-filtered **Scanned by:** YL

APPENDIX C

1999 & 2002 SAMPLING ANALYTICAL RESULTS

San Rafael Creek - Historical Chemistry Data

	Feb-99				Aug-02					
Analyte	SR1 TOP	SR1 BOTTOM	SR2	SR3	SRC 1	SRC 2	SRC 3	SRC 4	SRC 5	REF.
Grain Size (%)										
Gravel	9.409	0.709	2.612	0.641	0.93	0	0	0	0	0.455
Sand	68.896	33.331	21.279	13.145	39.5	3.72	0.25	0.34	0.44	79.316
Silt	11.929	35.709	36.779	40.905	30.2	37.4	32.5	37.8	44.2	1.409
Clay	9.767	30.251	39.33	45.308	29.4	58.9	67.2	61.8	55.4	0.821
Total Organic Carbon (%)	2.132	4.304	3.383	2.839	4.89	2.3	1.46	1.38	1.34	0.101
Total Solids (%)	59.5	50.4	42.6	42	44.7	38.6	41.1	42.6	43.9	84.2
Dissolved Sulfides (mg/Kg)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3	<0.2	<0.2	<0.2	<0.1
Total Sulfides (mg/Kg)	304	226	216	379	828	674	251	275	556	62
Oil & Grease (mg/Kg)	516	169	188	85.7						<5.9
Volatile Solids (%)	7.7	10.8	12.4	9.3						0.9
TRPH (mg/Kg)	336	133	153	73.8						<5.9
Metals (mg/Kg)										
Antimony	<0.3	<0.4	<0.5	<0.5						<0.2
Arsenic	3.5	8.3	7.3	8	9.1	12.4	13.6	12.7	13.7	2.1
Barium	73.6	90.3	84	83.3						8.1
Beryllium	<1.7	<2.0	<2.3	<2.4						<1.2
Cadmium	0.4	0.9	0.4	0.4	0.7	0.3	<0.2	<0.2	<0.2	<0.1
Chromium	28.1	55.7	45.9	60.5	63.3	86.2	92.9	79	87.8	9
Cobalt	10.3	14.5	15.5	16.9						6
Copper	36.8	88.9	80.4	96.2	57.3	70.6	58.9	43.4	46.4	2.7
Lead	64.3	139	82.8	75.2	130	67.7	40.7	36.5	35.4	3.7
Mercury	0.34	0.57	0.61	0.59	0.52	0.42	0.44	0.39	0.43	0.03
Molybdenum	<1.7	<2.0	<2.3	<2.4						<1.2
Nickel	40.2	70	58.8	73.2	66.2	76.7	81	68.1	75.5	13.3
Selenium	0.2	0.5	0.4	0.5	0.5	<0.6	<0.5	<0.5	<0.5	<0.1
Silver	<0.2	0.6	0.3	0.3	0.3	0.4	0.4	0.4	0.4	<0.1
Thallium	<0.2	<0.2	<1.2	<0.2						<0.1
Zinc	164	305	219	213	275	215	159	145	137	13.6
Organotoxins (µg/Kg)										
Tetrabutylin					<2.2	<2.6	<2.4	<2.3	<2.3	
Tributyltin	<1.7	<2.0	<2.3	<2.4	<2.2	<2.6	<2.4	<2.3	<2.3	<1.2
Dibutyltin	<1.7	<2.0	<2.3	<2.4	<4.5	<5.2	<4.9	<4.7	<4.6	<1.2
Monobutyltin	<1.7	<2.0	<2.3	<2.4	<4.5	<5.2	<4.9	<4.7	<4.6	<1.2

San Rafael Creek - Historical Chemistry Data

	Feb-99				Aug-02					
Analyte	SR1 TOP	SR1 BOTTOM	SR2	SR3	SRC 1	SRC 2	SRC 3	SRC 4	SRC 5	REF.
Pesticides and PCBs (µg/Kg)										
Aldrin	<3.4	<4.0	<4.7	<4.8	<1.2	<1.2	<1.3	<1.2	<1.2	<2.4
Alpha-BHC	<3.4	<4.0	<4.7	<4.8	<2.2	<2.2	<2.4	<2.4	<2.3	<2.4
Beta-BHC	<3.4	<4.0	<4.7	<4.8	<1.4	<1.4	<1.3	<1.4	<1.4	<2.4
Gamma-BHC	<3.4	<4.0	<4.7	<4.8	<1.4	<1.4	<1.5	<1.5	<1.4	<2.4
Delta-BHC	<3.4	<4.0	<4.7	<4.8	<1.4	<1.4	<1.6	<1.5	<1.5	<2.4
Chlordane	<3.4	<4.0	<4.7	<4.8	271.6	41.7	8.5	<5.6	<5.4	<2.4
2,4-DDD					<1.4	<1.4	<1.3	<1.4	<1.4	
4,4-DDD	<3.4	<4.0	<4.7	<4.8	63.5	5.1	<1.3	1.8	<1.4	<2.4
2,4-DDE					<1.2	<1.2	<1.1	<1.3	<1.2	
4,4-DDE	<3.4	<4.0	<4.7	<4.8	35.6	6.5	2.5	3	<1.2	<2.4
2,4-DDT					<2.2	<2.2	<2.4	<2.4	<2.3	
4,4-DDT	<3.4	<4.0	<4.7	<4.8	38.5	<2.2	<2.4	<2.6	<2.3	<2.4
Dieldrin	<3.4	<4.0	<4.7	<4.8	6.3	<1.5	<1.6	<1.5	<1.5	<2.4
Endosulfan I	<3.4	<4.0	<4.7	<4.8	<1.8	<1.8	<1.7	<1.9	<1.9	<2.4
Endosulfan II	<3.4	<4.0	<4.7	<4.8	<1.9	<1.9	<2.1	<2.0	<1.9	<2.4
Endosulfan Sulfate	<3.4	<4.0	<4.7	<4.8	<1.6	<1.6	<1.8	<1.7	<1.6	<2.4
Endrin	<3.4	<4.0	<4.7	<4.8	<1.7	<1.7	<1.8	<1.7	<1.7	<2.4
Endrin Aldehyde	<3.4	<4.0	<4.7	<4.8	<1.8	<1.8	<2.0	<1.9	<1.9	<2.4
Heptachlor	<3.4	<4.0	<4.7	<4.8	<1.8	<1.8	<1.7	<2.0	<1.9	<2.4
Heptachlor Epoxide	<3.4	<4.0	<4.7	<4.8	<1.9	<1.9	<2.0	<2.0	<1.9	<2.4
Methoxychlor	<34.0	<40.0	<47	<48.0						<24.0
Toxaphene	<42.0	<50.0	<59.0	<59.0	<9.8	<9.8	<10.7	<10.3	<10.0	<30.0
Arochlor-1016	<17.0	<20.0	<23.0	<24.0	<5.1	<5.1	<5.6	<5.4	<5.3	<12.0
Arochlor-1221	<17.0	<20.0	<23.0	<24.0	<5.1	<5.1	<5.6	<5.4	<5.3	<12.0
Arochlor-1232	<17.0	<20.0	<23.0	<24.0	<5.1	<5.1	<5.6	<5.4	<5.3	<12.0
Arochlor-1242	<17.0	<20.0	<23.0	<24.0	<5.1	<5.1	<5.6	<5.4	<5.3	<12.0
Arochlor-1248	<17.0	<20.0	<23.0	<24.0	<5.1	<5.1	<5.6	<5.4	<5.3	<12.0
Arochlor-1254	<17.0	<20.0	<23.0	<24.0	<5.1	<5.1	<5.6	<5.4	<5.3	<12.0
Arochlor-1260	55	111	157	50	<5.1	<5.1	<5.6	<5.4	<5.3	<12.0

San Rafael Creek - Historical Chemistry Data

	Feb-99				Aug-02					
Analyte	SR1 TOP	SR1 BOTTOM	SR2	SR3	SRC 1	SRC 2	SRC 3	SRC 4	SRC 5	REF.
PAHs (µg/Kg)										
Acenaphthalene	<17.0	34	<23.0	<24.0	11.6	<9.3	<8.8	<10.8	<8.2	<12.0
Acenaphthylene	<17.0	22	<23.0	<24.0	<10.5	<12.2	<11.4	<11.0	<10.7	<12.0
Anthracene	40	77	61	38	17.9	<16.3	<15.3	<13.6	<14.4	<12.0
Benzo(b)Fluoranthene	180	429	371	288	181.5	30.5	<21.7	<20.9	25.1	<12.0
Benzo(k)Fluoranthene	118	413	258	152	48.2	<17.6	<16.5	<16.0	<15.5	<12.0
Benzo(a)Anthracene	145	361	261	169	106.2	26.5	<16.3	16.5	24.6	<12.0
Benzo(a)Pyrene	155	484	369	226	150.4	24.1	<18.0	<17.4	21	<12.0
Benzo(ghi)Perylene	148	427	380	240	140.3	26.2	<23.6	<22.8	<22.1	<12.0
Chrysene	215	560	369	274	130.8	13	<9.5	<9.2	12.8	<12.0
Dibenzo(a,h)Anthracene	<17.0	30	<23.0	<24.0	22	<23.8	<22.4	<21.6	<21.0	<12.0
Fluoranthrene	358	823	622	402	280.6	30.5	<14.1	<13.6	29.6	<12.0
Fluorene	34	44	26	<24.0	15.1	<11.9	<11.2	<10.8	<10.5	<12.0
Indeno(1,2,3-cd)Pyrene	116	425	373	240	99.7	<25.9	<24.3	<23.5	<22.8	<12.0
Naphthalene	<17.0	20	<23.0	<24.0	<4.3	<4.9	<4.6	<4.5	5.7	<12.0
Phenanthrene	151	304	185	126	82.1	<10.9	<10.2	<9.9	10.6	<12.0
Pyrene	597	1670	116	848	342.9	49	15	17.2	36.4	<12.0
Total PAHs	2257	6123	4435	3003	1626.2	332.6	242.9	239.3	301.5	0

San Rafael Creek - Historical Chemistry Data

	June-02 High Resolution						Aug-02 High Resolution										
Analyte	SRC 1-1	SRC 1-2	SRC 2-1	SRC 2-2	SRC 3-1	SRC 3-2	SRC-A	SRC-B	SRC-C	SRC-D	SRC-E	SRC-F	SRC-G	SRC-H	SRC-I	SRC-J	REF.
Pesticides (µg/Kg)																	
Aldrin	<0.99	<1.16	<1.28	<1.32	<1.22	<1.24	<2.9	<3.3	<5.2	<1.1	<1.7	<1.4	<1.3	<1.2	<5.2	<0.56	<2.4
Alpha-BHC	<1.90	<2.23	<2.46	<2.54	<2.34	<2.38	<1.3	<1.5	<2.3	<0.45	<0.45	<0.53	<0.55	<1.3	<0.23	<0.25	<2.4
Beta-BHC	<1.16	<1.36	<1.50	<1.55	<1.43	<1.45	<1.8	<2.1	<3.3	<0.65	<0.65	<0.76	<0.79	<0.71	<0.33	<0.35	<2.4
Gamma-BHC	<1.20	<1.40	<1.55	<1.60	<1.47	<1.50	<3.0	<3.5	<5.4	<1.1	<1.1	<1.3	<1.3	<1.2	<0.54	<0.58	<2.4
Delta-BHC	<1.23	<1.44	<1.59	<1.64	<1.51	<1.54	<4.5	<5.3	<8.2	<1.7	<1.7	<2.0	<2.0	<1.8	<0.82	<0.88	<2.4
Chlordane	438	459	84.4	14.2	<5.55	<5.64	130	200	260	160	140	140	66	100	58	6.4	<2.4
2,4-DDD	<1.16	<1.36	<1.50	<1.55	<1.43	<1.45	11	24	12	8.4	6	4.2	8.2	<4.8	4.3	1.3	
4,4-DDD	19.4	12.6	4.61	<1.55	<1.43	<1.45	25	34	35	24	30	19	6.1	13	3.5	1.5	<2.4
2,4-DDE	<1.03	<1.20	<1.33	<1.37	<1.26	<1.28	<1.6	<15	<1.1	<4.4	<4.4	<5.2	0.68	<0.94	<0.22	<0.12	
4,4-DDE	30.2	30	8.7	2.21	1.75	1.67	12	34	38	19	23	13	8.1	15	4.1	2.1	<2.4
2,4-DDT	<1.90	<2.23	<2.45	<2.54	<2.34	<2.38	4.3	7.4	4.7	3.2	5.3	3.7	4.9	8.1	2.5	0.79	
4,4-DDT	<1.90	<2.23	<2.45	<2.54	<2.34	<2.38	11	19	38	8.0	16	5.4	6.3	9.9	1.9	1.4	<2.4
Dieldrin	<1.23	<1.44	<1.59	<1.64	<1.51	<1.54	<3.8	<4.4	6.8	<1.4	4.2	<1.6	<2.1	<4.8	<1.4	<0.73	<2.4
Endosulfan I	<1.56	<1.82	<2.01	<2.08	<1.91	<1.95	<2.2	<15	<21	<5.2	<4.9	<9.4	<3.1	<3.2	<0.31	<0.30	<2.4
Endosulfan II	<1.61	<1.88	<2.08	<2.15	<1.98	<2.01	<2.7	<3.1	<4.9	<2.1	<1.4	<1.2	<2.4	<1.1	<0.49	<0.52	<2.4
Endosulfan Sulfate	<1.37	<1.60	<1.77	<1.83	<1.68	<1.71	<2.0	<2.3	<3.6	<1.7	<0.70	<0.83	<0.86	<0.77	<0.36	<0.38	<2.4
Endrin	<1.44	<1.68	<1.86	<1.92	<1.77	<1.80	<1.7	<1.9	<3.0	<0.62	<1.4	<0.95	<0.71	<0.86	<0.46	2.1	<2.4
Endrin Aldehyde	<1.54	<1.80	<1.99	<2.06	<1.89	<1.92	<4.3	<5.0	<7.8	<1.6	<1.6	<1.9	<1.9	<1.7	<0.79	<0.84	<2.4
Heptachlor	<1.59	<1.87	<2.06	<2.13	<1.96	<1.99	<1.7	<2.0	<3.0	<0.59	<0.59	<0.70	<0.72	<0.65	<0.30	<0.32	<2.4
Heptachlor Epoxide	<1.58	<1.85	<2.04	<2.11	<1.94	<1.97	<2.2	<2.0	<4.9	<4.1	<6.5	<4.1	<3.0	<5.2	<2.3	<0.33	<2.4
Methoxychlor																	<24.0
Toxaphene	<16.7	<19.6	<21.6	<22.3	<20.6	<20.9	<69	<130	<150	<84	<120	<98	<83	<330	<93	<120	<30.0

San Rafael Creek Channel - Benthic Toxicity Data

	Feb-99						Aug-02					
	SR1-Top	SR1-Bottom	SR2	SR3	Reference	Control	SRC-1	SRC-2	SRC-3	SRC-4	SRC-5	Control
Amphipod (*Rhepoxynius abrontius*) Survival (%)	98 ± 2.7	72 ± 13.04	71 ± 21.33	77 ± 10.37	99 ± 2.24	99 ± 2.24						
Amphipod (*Ampelisca abdita*) Survival (%)	90 ± 3.54	82 ± 8.37	84 ± 10.84	91 ± 4.18	57 ± 16.05	99 ± 2.24	68 ± 17.7	71 ± 12.4	70 ± 13.7	64 ± 9.6	70 ± 20.0	91 ± 5.5
Neanthes arenaceodentata Survival (%)	94 ± 8.94	84 ± 16.73	84 ± 11.40	88 ± 13.04	94 ± 8.94	98 ± 4.47						
Nephthys caecoides Survival (%)							98 ± 4.5	94 ± 8.9	94 ± 8.9	94 ± 8.9	92 ± 8.4	96 ± 5.5

San Rafael Creek Channel - Water Column Toxicity Data

	Feb-99				Aug-02				
	SR1-Top	SR1-Bottom	SR2	SR3	SRC-1	SRC-2	SRC-3	SRC-4	SRC-5
Bivalve Larvae (*Crassostrea gigas*) Survival, LC50	25.1	73.7	73.3	>100					
Bivalve Larvae (*Crassostrea gigas*) Development IC50	33.0	74.9	75.0	>100					
Bivalve Larvae (Mytilus edulis) survival, LC50 (%)					31.9	30.7	30.5	30.8	30.4
Bivalve Larvae (Mytilus edulis) development , EC50 (%)					31.8	30.7	30.5	30.7	30.4

APPENDIX D

2010 SAMPLING ANALYTICAL RESULTS

Table 1- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Areas 1-6 Maintenance Depth Core Section Composites.

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-1	SRC-2010-2	SRC-2010-3	SRC-2010-4	SRC-2010-5	SRC-2010-6
Grain Size											
Gravel (>2.00 mm)	%, dry wt	14.4	2.34	<100% fines	NA	18.60	16.80	0.64	23.20	10.50	4.04
Sand (0.0625 mm to 2.00 mm)	%, dry wt	66.9	92.10			17.22	36.4	35.5	31.9	35.8	31.2
Silt (0.0039 mm to 0.0625 mm)	%, dry wt	11.4	0.67			31.50	19.50	30.80	19.30	25.60	24.50
Clay (< 0.0039 mm)	%, dry wt	10.8	1.39			36.1	18.50	30.00	21.80	26.90	41.80
Percent fines (Silt+Clay)	%, dry wt	22.2	2.06			67.6	38.0	60.8	41.1	52.5	66.3
% Solids	%	67.1	80.9	-	-	44.6	46.7	48.3	47.2	44.2	40.9
TOC	%	0.87	0.27	-	-	1.38	1.28	1.15	1.29	1.45	1.56
Metals											
Arsenic	mg/kg, dry wt	8.02	4.12	15.3	15.3	10.4	9.95	9.73	9.97	10.5	11
Cadmium	mg/kg, dry wt	0.145	0.035	0.33	0.7	0.221	0.189	0.184	0.182	0.203	0.236
Chromium	mg/kg, dry wt	42.2	21.4	112	112	76.6	74.7	71.9	75	81.1	84.8
Copper	mg/kg, dry wt	24.3	4.13	68.1	68.1	53	49.7	46.6	51.3	60	**76.4**
Lead	mg/kg, dry wt	14.1	6.84	43.2	43.2	23.1	22.1	21.8	24.7	27.9	39.1
Mercury	mg/kg, dry wt	0.138	0.033	0.43	0.43	0.311	0.287	0.306	0.309	0.395	0.356
Nickel	mg/kg, dry wt	59.9	27.4	112	112	87.3	85.1	79.7	83.9	89.9	93.5
Selenium	mg/kg, dry wt	0.04 J	0.03	0.64	0.64	0.27	0.35	0.27	0.36	0.39	0.30
Silver	mg/kg, dry wt	0.106	0.018 J	0.58	0.58	0.243	0.246	0.246	0.263	0.285	0.338
Zinc	mg/kg, dry wt	67.3	23.6	158	158	123	112	122	142	158	**185**
Butyltins											
Tetra-n-butyltin	µg/kg, dry wt	<0.64	<0.54	-	-	<0.98	<0.94	<0.89	<0.92	<1.0	<1.1
Tri-n-butyltin Cation	µg/kg, dry wt	<0.62	<0.53	-	-	<0.96	<0.92	1.3 J	<0.90	1.7 J	3.8
Di-n-butyltin Cation	µg/kg, dry wt	0.63 J	<0.24	-	-	2.1 J	1.5 J	2.3	1.6 J	5.0	14
n-Butyltin Cation	µg/kg, dry wt	0.93 J	<0.32	-	-	2.5	2.0 J	2.5	2.5	5.6	12
∑ detected Butylins	**µg/kg, dry wt**	**1.56 J**	**<0.54**	-	-	**4.6**	**3.5 J**	**6.1**	**4.1**	**12.3**	**29.8**
PCBs											
Aroclor 1016	µg/kg, dry wt	<2.0	<1.7	-	-	<2.4	<2.3	<2.2	<2.3	<2.4	<2.6
Aroclor 1221	µg/kg, dry wt	<2.0	<1.7	-	-	<2.4	<2.3	<2.2	<2.3	<2.4	<2.6
Aroclor 1232	µg/kg, dry wt	<2.0	<1.7	-	-	<2.4	<2.3	<2.2	<2.3	<2.4	<2.6
Aroclor 1242	µg/kg, dry wt	<2.0	<1.7	-	-	<2.4	<2.3	<2.2	<2.3	<2.4	<8.9
Aroclor 1248	µg/kg, dry wt	<2.0	<1.7	-	-	<2.4	<2.3	<2.2	<2.3	<2.4	<2.6
Aroclor 1254	µg/kg, dry wt	<2.0	<1.7	-	-	10 J	<4.2	3.8 J	<4.4	8.8 J	13 J
Aroclor 1260	µg/kg, dry wt	2.9 J	<1.7	-	-	9.6 J	<5.5	5.5 J	<2.3	8.7 J	5.0 J
∑ detected PCBs	**µg/kg, dry wt**	**2.9 J**	**<1.7**	**22.7**	**22.7**	**19.6 J**	**<5.5**	**9.3 J**	**<4.4**	**17.5 J**	**18.0 J**

Table 2- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Areas 1-6 Maintenance Depth Core Section Composites

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-1	SRC-2010-2	SRC-2010-3	SRC-2010-4	SRC-2010-5	SRC-2010-6
Organochlorine Pesticides											
Aldrin	µg/kg, dry wt	<0.069	<0.057	1.1	-	<0.18	<0.18	<0.17	<0.17	<0.19	<0.20
alpha-BHC	µg/kg, dry wt	<0.087	<0.072	-	-	<0.13	<0.12	<0.12	<0.12	<0.13	<0.14
beta-BHC	µg/kg, dry wt	<0.27	<0.23	-	-	<0.21	<0.20	<0.19	<0.20	<0.21	<0.22
delta-BHC	µg/kg, dry wt	<0.11	<0.087	-	-	0.10 J	<0.080	<0.077	<0.079	<0.084	<0.091
gamma-BHC (lindane)	µg/kg, dry wt	<0.076	<0.063	-	-	<0.090	<0.086	<0.083	<0.085	<1.2	<0.098
alpha-Chlordane	µg/kg, dry wt	<0.094	<0.078	-	-	<0.12	<0.11	<0.11	<0.11	0.26 J	0.53 J
gamma-Chlordane	µg/kg, dry wt	0.16 J	<0.070	-	-	0.29 J	0.12 J	<0.094	0.24 J	0.43 J	1.1 J
Chlordane	µg/kg, dry wt	<15	<13	1.1	1.1	<3.4	<2.7	<2.5	<2.1	3.5 J	9.1 J
4,4'-DDD	µg/kg, dry wt	0.44	<0.13	-	-	1.1 J	0.90 J	0.51 J	0.60 J	0.86 J	1.2 J
4,4'-DDE	µg/kg, dry wt	0.87	<0.059	-	-	2.0	1.4	1.0 J	0.96 J	1.3	2
4,4'-DDT	µg/kg, dry wt	<0.30	<0.071	-	-	<0.65	<0.46	<0.25	<0.20	<1.2	<1.3
2,4'-DDD	µg/kg, dry wt	0.17 J	<0.075	-	-	0.51 J	0.55 J	0.35 J	0.17 J	0.25 J	0.51 J
2,4'-DDE	µg/kg, dry wt	<0.093	<0.077	-	-	<0.18	<0.18	<0.17	<0.17	<0.19	<1.3
2,4'-DDT	µg/kg, dry wt	0.21 J	<0.055	-	-	0.44 J	0.24 J	0.21 J	0.22 J	0.40 J	0.70 J
∑ detected DDTs	**µg/kg, dry wt**	**1.69**	**<0.13**	**7.0**	**7.0**	**4.05 J**	**3.09 J**	**2.07 J**	**1.95 J**	**2.81 J**	**4.41 J**
Dieldrin	µg/kg, dry wt	<0.076	<0.063	0.44	0.72	<0.16	<0.15	<0.15	<0.18	<0.16	<0.18
Endosulfan I	µg/kg, dry wt	<0.084	<0.070	-	-	<0.071	<0.068	<0.066	<0.070	<0.072	<0.080
Endosulfan II	µg/kg, dry wt	<0.13	<0.111	-	-	<0.16	<0.15	<0.15	<0.15	<0.16	<0.18
Endosulfan sulfate	µg/kg, dry wt	<0.076	<0.063	-	-	<0.13	<0.12	<0.12	<0.12	<0.13	<0.14
Endrin	µg/kg, dry wt	<0.085	<0.071	0.78	-	<0.11	<0.11	<0.098	<0.10	<0.11	<0.12
Endrin aldehyde	µg/kg, dry wt	<0.072	<0.060	-	6.4	<0.14	<0.13	<0.13	<0.13	<0.14	<0.15
Heptachlor	µg/kg, dry wt	<0.069	<0.057	-	0.3	<0.14	<0.13	<0.15	<0.13	<0.14	<0.15
Heptachlor epoxide	µg/kg, dry wt	<0.072	<0.060	-	0.3	<0.095	<0.097	<0.087	<0.089	<0.095	<0.24
Toxaphene	µg/kg, dry wt	<3.6	<3.0	-	-	<13	<7.3	<9.9	<9.4	<18	<15
PAHs											
Naphthalene	µg/kg, dry wt	5.2	7.9	55.8	-	12	11	15	11	12	14
Acenaphthylene	µg/kg, dry wt	1.8 J	0.94 J	31.7	-	4.2 J	4.9 J	9.1	4.2 J	7.5	4.0 J
Acenaphthene	µg/kg, dry wt	1.4 J	<0.76	26.6	-	3.1 J	3.8 J	6.1	2.7 J	3.6 J	3.2 J
Fluorene	µg/kg, dry wt	3.1	1.7 J	25.3	-	5.1 J	4.8 J	7.9	4.0 J	6.8	5.0 J
Phenanthrene	µg/kg, dry wt	27	13	237	-	38	40	80	32	72	31
Anthracene	µg/kg, dry wt	16	4.0	88	-	10	13	30	9.9	23	9.3
Fluoranthene	µg/kg, dry wt	47	14	514	-	91	110	190	88	260	100
Pyrene	µg/kg, dry wt	57	15	665	-	150	190	300	150	360	200

Table 3- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Areas 1-6 Maintenance Depth Core Section Composites

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-1	SRC-2010-2	SRC-2010-3	SRC-2010-4	SRC-2010-5	SRC-2010-6
PAHs											
Benzo(a)anthracene	µg/kg, dry wt	23	7.6	244	-	46	56	100	48	140	54
Chrysene	µg/kg, dry wt	26	7.1	289	-	54	79	120	62	180	78
Benzo(b)fluoranthene	µg/kg, dry wt	35	8.2	371	-	86	110	160	93	240	120
Benzo(k)fluoranthene	µg/kg, dry wt	13	2.9	258	-	27	32	51	31	74	37
Benzo(a)pyrene	µg/kg, dry wt	37	7.3	412	-	90	110	180	92	210	100
Indeno(1,2,3-cd)pyrene	µg/kg, dry wt	32	5.4	382	-	81	90	150	84	200	110
Dibenzo(a,h)anthracene	µg/kg, dry wt	3.9	1.5 J	32.7	-	9.2	10	16	8.9	24	13
Benzo(g,h,i)perylene	µg/kg, dry wt	39	6.6	310	-	99	110	170	100	210	140
∑ detected PAHs	**µg/kg, dry wt**	**367**	**103**	**3390**	**3390**	**806**	**975**	**1585**	**821**	**2023**	**1019**
Hamilton Metals											
Barium	mg/kg, dry wt	38.4	8.5	-	190	52.2	46.6	47.3	49.6	48.1	51.5
Beryllium	mg/kg, dry wt	0.352	0.14	-	1.03	0.566	0.535	0.503	0.543	0.626	0.643
Boron	mg/kg, dry wt	0.3	2.0 J	-	36.9	24	22	24	25	25	28
Cobalt	mg/kg, dry wt	13.7	7.09	-	27.6	17.9	17	16.1	16.3	17.8	17.6
Manganese	mg/kg, dry wt	434	303	-	943	733	654	619	659	598	506
Vanadium	mg/kg, dry wt	52.3	18.6	-	118	69.9	64.1	66.7	71	68.8	73.2
Hamilton Organics											
Phenol	µg/kg, dry wt	29 J	3.0 J	-	130	5.4 J	4.0 J	3.7 J	19 J	4.6 J	3.7 J
Pentachlorophenol	µg/kg, dry wt	<20	<20	-	17	<23	<22	<21	<22	<23	<24
TPH Diesel / motor oil	mg/kg, dry wt	42.8 J	20.9 J	-	144000	145	156	161	223	188	355
TPH Gasoline / JP-4	mg/kg, dry wt	<2.3	<1.7	-	12000	<3.8	<3.6	<3.4	<3.5	<3.7	<4.1
Methoxyclor	mg/kg, dry wt	<0.23	<0.19	-	90	<0.22	<0.21	<0.20	<0.21	<0.22	<0.24
Dioxins (TCDD)	ng/kg, dry wt	0.210	0.00392	-	20	0.479	0.128	0.0288	0.281	0.330	2.40

Notes:

[1] San Francisco Regional Water Quality Control Board (1998) Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments. May 1998.

[2] Hamilton Wetlands Biological Opinion (USFWS 2005).

J – Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate; as a result, J-flagged values are not identified as exceeding screening criteria.

Bold Font and Bold Outline = Reported Value > Bay Background.

Bold Font and Grey Shading = Value > HWRP Acceptance Criteria and Bay Background.

Table 4- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Area 7 Maintenance Depth and Z-Layer Core Section Composites and Individual Core Maintenance Depth Sections.

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-7	SRC-2010-7-Z	SRC-2010-7-1	SRC-2010-7-2	SRC-2010-7-3	SRC-2010-7-4	SRC-2010-7-5
Grain Size												
Gravel (>2.00 mm)	%, dry wt	14.4	2.34	<100% fines	NA	9.18	7.71	5.68	42.1	23.6	5.36	10
Sand (0.0625 mm to 2.00 mm)	%, dry wt	66.9	92.10			28.7	43.0	19.0	11.0	16.8	28.6	39.7
Silt (0.0039 mm to 0.0625 mm)	%, dry wt	11.4	0.67			10.40	21.40	34.10	22.1	29.9	35.9	27.7
Clay (< 0.0039 mm)	%, dry wt	10.8	1.39			41.90	26.00	44.80	26.6	30.7	29.3	22.2
Percent fines (Silt+Clay)	%, dry wt	22.2	2.06			52.3	47.4	78.90	48.70	60.60	65.20	49.90
% Solids	%	67.1	80.9	-	-	42.0	47.5	39.0	41.7	41.3	39.8	43.8
TOC	%	0.87	0.27	-	-	2.84	0.558	1.77	1.61	1.96	3.83	4.91
Metals												
Arsenic	mg/kg, dry wt	8.02	4.12	15.3	15.3	10.9	11.9	9.14	11.5	10.5	11.6	11.5
Cadmium	mg/kg, dry wt	0.145	0.035	0.33	0.7	**0.441**	**0.505**	0.191	0.278	0.295	**0.517**	**0.726**
Chromium	mg/kg, dry wt	42.2	21.4	112	112	91.1	101	80.6	89.9	86.3	97	101
Copper	mg/kg, dry wt	24.3	4.13	68.1	68.1	**104**	**109**	**88.2**	**88.3**	**101**	**129**	**95.7**
Lead	mg/kg, dry wt	14.1	6.84	43.2	43.2	**78.3**	**138**	33.3	**57.7**	**49.6**	**91.3**	**162**
Mercury	mg/kg, dry wt	0.138	0.033	0.43	0.43	**0.461**	**0.728**	0.359	**0.534**	0.412	**0.438**	**0.541**
Nickel	mg/kg, dry wt	59.9	27.4	112	112	101	110	88.6	98.7	95.8	109	**119**
Selenium	mg/kg, dry wt	0.04 J	0.03	0.64	0.64	0.45	0.22	0.40	0.33	0.24	0.18	0.31
Silver	mg/kg, dry wt	0.106	0.018 J	0.58	0.58	0.358	0.49	0.268	0.392	0.346	0.332	0.419
Zinc	mg/kg, dry wt	67.3	23.6	158	158	**248**	**227**	**207**	**210**	**227**	**272**	**298**
Butyltins												
Tetra-n-butyltin	µg/kg, dry wt	<0.64	<0.54	-	-	<1.1	<0.90	<1.2	<1.1	<1.1	<1.1	<1.1
Tri-n-butyltin Cation	µg/kg, dry wt	<0.62	<0.53	-	-	9.6	21	3.9	12	6.7	14	17
Di-n-butyltin Cation	µg/kg, dry wt	0.63 J	<0.24	-	-	33	50	15	68	30	51	63
n-Butyltin Cation	µg/kg, dry wt	0.93 J	<0.32	-	-	20	21	10	29	20	29.0	27
∑ detected Butylins	**µg/kg, dry wt**	**1.56 J**	**<0.54**	-	-	**62.6**	**92**	**28.9**	**109**	**56.7**	**94**	**107**
PCBs												
Aroclor 1016	µg/kg, dry wt	<2.0	<1.7	-	-	<2.5	<2.3	<2.7	<2.6	<2.6	<2.7	<2.4
Aroclor 1221	µg/kg, dry wt	<2.0	<1.7	-	-	<2.5	<2.3	<2.7	<2.6	<2.6	<2.7	<2.4
Aroclor 1232	µg/kg, dry wt	<2.0	<1.7	-	-	<2.5	<2.3	<2.7	<2.6	<2.6	<2.7	<2.4
Aroclor 1242	µg/kg, dry wt	<2.0	<1.7	-	-	34	91	9.2 J	<2.6	27	55	<2.4
Aroclor 1248	µg/kg, dry wt	<2.0	<1.7	-	-	<2.5	<2.3	<2.7	<2.6	<2.6	<2.7	180
Aroclor 1254	µg/kg, dry wt	<2.0	<1.7	-	-	47	100	<2.7	42	42	97	230
Aroclor 1260	µg/kg, dry wt	2.9 J	<1.7	-	-	45	64	14	33	37	66	170
∑ detected PCBs	**µg/kg, dry wt**	**2.9 J**	**<1.7**	**22.7**	**22.7**	**126**	**255**	**23.2**	**75**	**106**	**218**	**580**

Table 5- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Area 7 Maintenance Depth and Z-Layer Core Section Composites and Individual Core Maintenance Depth Sections

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-7	SRC-2010-7-Z	SRC-2010-7-1	SRC-2010-7-2	SRC-2010-7-3	SRC-2010-7-4	SRC-2010-7-5
Organochlorine Pesticides												
Aldrin	µg/kg, dry wt	<0.069	<0.057	1.1	-	<0.24	<0.17	<0.21	<0.20	<0.20	<0.67	<1.7
alpha-BHC	µg/kg, dry wt	<0.087	<0.072	-	-	<0.45	<0.12	<0.15	<0.14	<0.14	<0.14	<0.13
beta-BHC	µg/kg, dry wt	<0.27	<0.23	-	-	<0.50	<0.19	<0.24	<0.22	<0.22	<0.23	<0.21
delta-BHC	µg/kg, dry wt	<0.11	<0.087	-	-	<0.089	<0.083	<0.095	<0.089	<0.090	<0.13	<0.55
gamma-BHC (lindane)	µg/kg, dry wt	<0.076	<0.063	-	-	<0.096	<1.1	<0.12	<0.096	<0.097	<0.26	0.82 J
alpha-Chlordane	µg/kg, dry wt	<0.094	<0.078	-	-	5.2	3.6	1.1 J	0.95 J	2.4	8.7	30
gamma-Chlordane	µg/kg, dry wt	0.16 J	<0.070	-	-	<7.3	6.7	1.3	2.3	3.7	11	43
Chlordane	µg/kg, dry wt	<15	<13	1.1	1.1	**64**	**48**	**12 J**	**18**	**32**	**96**	**380**
4,4'-DDD	µg/kg, dry wt	0.44	<0.13	-	-	7.5	13	1.5	2.4	2.8	16	66
4,4'-DDE	µg/kg, dry wt	0.87	<0.059	-	-	6.8	11	2.4	3.6	4.4	13	33
4,4'-DDT	µg/kg, dry wt	<0.30	<0.071	-	-	<1.2	4.5	1.6	<2.0	<2.2	<1.9	<9.7
2,4'-DDD	µg/kg, dry wt	0.17 J	<0.075	-	-	2.7	4.2	0.69 J	1.0 J	<1.1	4.5	18
2,4'-DDE	µg/kg, dry wt	<0.093	<0.077	-	-	<1.2	<2.1	<1.3	<1.2	<1.3	<1.3	<5.2
2,4'-DDT	µg/kg, dry wt	0.21 J	<0.055	-	-	1.9	3.5	<1.3	1.7	1.8	3.6	7.3
∑ detected DDTs	**µg/kg, dry wt**	**1.69**	**<0.13**	**7.0**	**7.0**	**18.9**	**36.2**	**6.19**	**8.7**	**9.0**	**37.1**	**124.3**
Dieldrin	µg/kg, dry wt	<0.076	<0.063	0.44	0.72	**0.46 J**	<1.1	<0.18	<1.2	<0.33	**1.2 J**	**2.8**
Endosulfan I	µg/kg, dry wt	<0.084	<0.070	-	-	<1.2	1.1 J	<0.14	0.34 J	<1.3	<1.3	<3.8
Endosulfan II	µg/kg, dry wt	<0.13	<0.111	-	-	<0.70	<0.15	<0.18	<0.17	<0.21	<1.1	<1.2
Endosulfan sulfate	µg/kg, dry wt	<0.076	<0.063	-	-	<0.69	<0.12	<0.15	<0.14	<0.14	<1.3	<1.2
Endrin	µg/kg, dry wt	<0.085	<0.071	0.78	-	<0.12	<0.099	<0.13	<0.20	<0.17	<0.53	<1.2
Endrin aldehyde	µg/kg, dry wt	<0.072	<0.060	-	6.4	0.31 J	<1.1	<0.16	<0.15	0.19 J	<0.27	<1.2
Heptachlor	µg/kg, dry wt	<0.069	<0.057	-	0.3	<0.15	<0.13	<0.16	<0.15	<0.15	<0.16	<1.2
Heptachlor epoxide	µg/kg, dry wt	<0.072	<0.060	-	0.3	<0.74	<1.1	<0.18	<0.53	<0.54	<0.11	<0.096
Toxaphene	µg/kg, dry wt	<3.6	<3.0	-	-	<44	<39	<21	<49	<42	<89	<210
PAHs												
Naphthalene	µg/kg, dry wt	5.2	7.9	55.8	-	16	11	11	13	12	13	25
Acenaphthylene	µg/kg, dry wt	1.8 J	0.94 J	31.7	-	9.4	3.4 J	5.5 J	5.8 J	7.5	6.6	11
Acenaphthene	µg/kg, dry wt	1.4 J	<0.76	26.6	-	12	4.6 J	2.7 J	2.6 J	3.5 J	4.5 J	33
Fluorene	µg/kg, dry wt	3.1	1.7 J	25.3	-	16	5.4	4.3 J	4.3 J	5.2 J	5.5 J	42
Phenanthrene	µg/kg, dry wt	27	13	237	-	170	28	44	44	65	69	230
Anthracene	µg/kg, dry wt	16	4.0	88	-	47	8.5	15	11	18	20	59
Fluoranthene	µg/kg, dry wt	47	14	514	-	490	100	130	140	200	250	750
Pyrene	µg/kg, dry wt	57	15	665	-	780	200	180	230	340	450	1000

Table 6- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Area 7 Maintenance Depth and Z-Layer Core Section Composites and Individual Core Maintenance Depth Sections

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-7	SRC-2010-7-Z	SRC-2010-7-1	SRC-2010-7-2	SRC-2010-7-3	SRC-2010-7-4	SRC-2010-7-5
PAHs												
Benzo(a)anthracene	µg/kg, dry wt	23	7.6	244	-	270	48	59	56	91	110	310
Chrysene	µg/kg, dry wt	26	7.1	289	-	380	73	92	86	140	110	360
Benzo(b)fluoranthene	µg/kg, dry wt	35	8.2	371	-	510	110	130	150	220	260	500
Benzo(k)fluoranthene	µg/kg, dry wt	13	2.9	258	-	170	35	38	46	64	72	150
Benzo(a)pyrene	µg/kg, dry wt	37	7.3	412	-	450	100	110	140	180	210	430
Indeno(1,2,3-cd)pyrene	µg/kg, dry wt	32	5.4	382	-	420	100	130	170	200	220	430
Dibenzo(a,h)anthracene	µg/kg, dry wt	3.9	1.5 J	32.7	-	56	9.9	20	23	24	27	53
Benzo(g,h,i)perylene	µg/kg, dry wt	39	6.6	310	-	460	130	130	180	220	250	490
∑ detected PAHs	**µg/kg, dry wt**	**367**	**103**	**3390**	**3390**	**4256**	**967**	**1102**	**1302**	**1790**	**2078**	**4873**
Hamilton Metals												
Barium	mg/kg, dry wt	38.4	8.5	-	190	65.4	64.7	48.8	54.1	56.3	62.5	80.4
Beryllium	mg/kg, dry wt	0.352	0.14	-	1.03	0.653	0.704	0.638	0.739	0.651	0.767	0.741
Boron	mg/kg, dry wt	0.3	2.0 J	-	36.9	33	27	33	28.0	30.0	38	47
Cobalt	mg/kg, dry wt	13.7	7.09	-	27.6	17	17.7	16.5	17.7	16.6	17.8	17.2
Manganese	mg/kg, dry wt	434	303	-	943	392	382	444	496	463	364	347
Vanadium	mg/kg, dry wt	52.3	18.6	-	118	64	66.2	70.7	74.5	71.5	64.4	58.1
Hamilton Organics												
Phenol	µg/kg, dry wt	29 J	3.0 J	-	130	150 J	<11	4.4 J	4.2 J	5.0 J	7.4 J	6.7 J
Pentachlorophenol	µg/kg, dry wt	<20	<20	-	17	<240	<110	<26	<24	<24	<26	<23
TPH Diesel / motor oil	mg/kg, dry wt	42.8 J	20.9 J	-	144000	1240	880	376	530	620	1590	2950
TPH Gasoline / JP-4	mg/kg, dry wt	<2.3	<1.7	-	12000	5.0 J	7.1 J	<4.3	<3.9	<4.1	<4.3	6.4 J
Methoxyclor	mg/kg, dry wt	<0.23	<0.19	-	90	<1.2	<0.20	<0.29	<0.23	<0.64	<1.3	1.70
Dioxins (TCDD)	ng/kg, dry wt	0.210	0.00392	-	20	5.00	5.12	-	-	-	-	-

Notes:

[1] San Francisco Regional Water Quality Control Board (1998) Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments. May 1998.

[2] HWRP Biological Opinion (USFWS 2005).

J – Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate; as a result, J-flagged values are not identified as exceeding screening criteria.

Bold Font and Bold Outline = Value > Bay Background.

Bold Font and Grey Shading = Value > HWRP Acceptance Criteria and Bay Background.

Table 7- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Area 8 Maintenance Depth and Z-Layer Core Section Composites and Individual Core Maintenance Depth Sections.

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-8	SRC-2010-8-Z	SRC-2010-8-1	SRC-2010-8-2	SRC-2010-8-3	SRC-2010-8-4
Grain Size											
Gravel (>2.00 mm)	%, dry wt	14.4	2.34	<100% fines	NA	8.91	7.25	5.56	16.9	10.8	3.89
Sand (0.0625 mm to 2.00 mm)	%, dry wt	66.9	92.10			67.0	61.6	35.8	66.6	65.7	36.3
Silt (0.0039 mm to 0.0625 mm)	%, dry wt	11.4	0.67			14.4	18.10	34.5	8.84	19.3	41.7
Clay (< 0.0039 mm)	%, dry wt	10.8	1.39			8.5	15.60	31.2	6.97	9.84	18.1
Percent fines (Silt+Clay)	%, dry wt	22.2	2.06			22.9	33.7	65.7	15.8	29.1	59.8
% Solids	%	67.1	80.9	-	-	54.4	47.5	42.7	59.8	38.1	45.4
TOC	%	0.87	0.27	-	-	4.26	4.75	2.70	9.50	7.60	3.80
Metals											
Arsenic	mg/kg, dry wt	8.02	4.12	15.3	15.3	5.58	12.1	**17.1**	8.59	10.5	5.88
Cadmium	mg/kg, dry wt	0.145	0.035	0.33	0.7	**0.363**	**0.845**	**1.11**	**1.03**	**1.13**	0.577
Chromium	mg/kg, dry wt	42.2	21.4	112	112	47.8	106	111	70.7	82.5	47.8
Copper	mg/kg, dry wt	24.3	4.13	68.1	68.1	52.7	**107**	**75.0**	**79.2**	**115**	39.5
Lead	mg/kg, dry wt	14.1	6.84	43.2	43.2	**60.3**	**200**	**126**	**86.5**	**227**	**131**
Mercury	mg/kg, dry wt	0.138	0.033	0.43	0.43	0.279	**0.503**	**1.54**	0.293	0.332	0.262
Nickel	mg/kg, dry wt	59.9	27.4	112	112	61.4	**127**	**130**	85.8	94.9	56.5
Selenium	mg/kg, dry wt	0.04 J	0.03	0.64	0.64	0.12	0.29	0.603	0.528	0.462	0.217
Silver	mg/kg, dry wt	0.106	0.018 J	0.58	0.58	0.152	0.425	**0.763**	0.316	0.499	0.165
Zinc	mg/kg, dry wt	67.3	23.6	158	158	**184**	**323**	**237**	**358**	**392**	**201**
Butyltins											
Tetra-n-butyltin	µg/kg, dry wt	<0.64	<0.54	-	-	<0.81	1.3 J	<0.75	<0.84	<0.82	<0.59
Tri-n-butyltin Cation	µg/kg, dry wt	<0.62	<0.53	-	-	5.9	11	<0.71	7.2	23	18
Di-n-butyltin Cation	µg/kg, dry wt	0.63 J	<0.24	-	-	12	25	6.1	16	67	32
n-Butyltin Cation	µg/kg, dry wt	0.93 J	<0.32	-	-	12	27	<2.1	<2.3	<2.2	<1.6
∑ detected Butylins	**µg/kg, dry wt**	**1.56 J**	**<0.54**	-	-	**29.9**	**64.3**	**6.1**	**23.2**	**90**	**50**
PCBs											
Aroclor 1016	µg/kg, dry wt	<2.0	<1.7	-	-	<23	<50	<4.3	<4.7	<4.6	<3.3
Aroclor 1221	µg/kg, dry wt	<2.0	<1.7	-	-	<6.4	<23	<4.2	<4.7	<4.6	<3.3
Aroclor 1232	µg/kg, dry wt	<2.0	<1.7	-	-	<29	<110	<4.2	<4.7	<4.6	<3.3
Aroclor 1242	µg/kg, dry wt	<2.0	<1.7	-	-	<39	<29	<4.2	<4.7	<4.6	<3.3
Aroclor 1248	µg/kg, dry wt	<2.0	<1.7	-	-	<38	<61	<4.2	<4.7	<4.6	<3.3
Aroclor 1254	µg/kg, dry wt	<2.0	<1.7	-	-	<57	<58	<4.2	<4.7	<4.6	<3.3
Aroclor 1260	µg/kg, dry wt	2.9 J	<1.7	-	-	60	76	<4.7	<5.2	<5.1	<3.7
∑ detected PCBs	**µg/kg, dry wt**	**2.9 J**	**<1.7**	**22.7**	**22.7**	**60**	**76**	**<4.7**	**<5.2**	**<5.1**	**<3.7**

Table 8- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Area 8 Maintenance Depth and Z-Layer Core Section Composites and Individual Core Maintenance Depth Sections

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-8	SRC-2010-8-Z	SRC-2010-8-1	SRC-2010-8-2	SRC-2010-8-3	SRC-2010-8-4
Organochlorine Pesticides											
Aldrin	µg/kg, dry wt	<0.069	<0.057	1.1	-	0.55 J	0.83 J	<0.65	<0.73	<0.70	<0.51
alpha-BHC	µg/kg, dry wt	<0.087	<0.072	-	-	<0.43	<0.64	<0.62	<0.69	<0.67	<0.49
beta-BHC	µg/kg, dry wt	<0.27	<0.23	-	-	<0.18	<0.21	<0.54	<0.60	<0.58	<0.42
delta-BHC	µg/kg, dry wt	<0.11	<0.087	-	-	<0.074	<0.38	<0.67	<0.75	<0.72	<0.53
gamma-BHC (lindane)	µg/kg, dry wt	<0.076	<0.063	-	-	<0.22	<1.3	<0.48	<0.54	<0.52	<0.38
alpha-Chlordane	µg/kg, dry wt	<0.094	<0.078	-	-	12	15	1.2 J	10	18	16
gamma-Chlordane	µg/kg, dry wt	0.16 J	<0.070	-	-	18	23	2.8	11	36	23
Chlordane	µg/kg, dry wt	<15	<13	1.1	1.1	**130**	**170**	<8.5	**170**	**250**	**190**
4,4'-DDD	µg/kg, dry wt	0.44	<0.13	-	-	22	43	76	15	29	29
4,4'-DDE	µg/kg, dry wt	0.87	<0.059	-	-	13	18	16	13	21	14
4,4'-DDT	µg/kg, dry wt	<0.30	<0.071	-	-	<4.3	<2.7	44	<0.77	7.1	<0.54
2,4'-DDD	µg/kg, dry wt	0.17 J	<0.075	-	-	4	7.1	<0.42	<0.47	<0.46	<0.33
2,4'-DDE	µg/kg, dry wt	<0.093	<0.077	-	-	<1.5	<2.0	<0.38	<0.42	<0.41	<0.29
2,4'-DDT	µg/kg, dry wt	0.21 J	<0.055	-	-	3.3	4.2	0.45	<0.33	<0.32	<0.23
∑ detected DDTs	**µg/kg, dry wt**	**1.69**	**<0.13**	**7.0**	**7.0**	**42.3**	**72.3**	**136**	**28**	**57.1**	**43**
Dieldrin	µg/kg, dry wt	<0.076	<0.063	0.44	0.72	**3.1**	**4.0**	**1.8**	<0.53	**5.1**	**4.2**
Endosulfan I	µg/kg, dry wt	<0.084	<0.070	-	-	3.9	5.3	<0.75	<0.84	<0.81	<0.59
Endosulfan II	µg/kg, dry wt	<0.13	<0.11	-	-	<0.92	<0.16	<0.37	<0.41	<0.40	<0.29
Endosulfan sulfate	µg/kg, dry wt	<0.076	<0.063	-	-	<0.92	<1.2	**1.2 J**	<0.62	<0.60	<0.44
Endrin	µg/kg, dry wt	<0.085	<0.071	0.78	-	<0.92	0.18 J	<0.43	<0.47	<0.46	<0.33
Endrin aldehyde	µg/kg, dry wt	<0.072	<0.060	-	6.4	<0.92	<0.14	<0.41	<0.46	<0.45	<0.32
Heptachlor	µg/kg, dry wt	<0.069	<0.057	-	0.3	<0.12	<0.14	<0.47	<0.52	<0.51	<0.37
Heptachlor epoxide	µg/kg, dry wt	<0.072	<0.060	-	0.3	<0.92	<1.2	**2.5**	<0.43	<0.42	<0.30
Toxaphene	µg/kg, dry wt	<3.6	<3.0	-	-	<90	<130	<18	<20	<19	<14
PAHs											
Naphthalene	µg/kg, dry wt	5.2	7.9	55.8	-	10	37	30	36	22 J	19
Acenaphthylene	µg/kg, dry wt	1.8 J	0.94 J	31.7	-	5.6	21	15 J	65	13 J	9.6 J
Acenaphthene	µg/kg, dry wt	1.4 J	<0.76	26.6	-	93	21	13 J	69	18 J	29
Fluorene	µg/kg, dry wt	3.1	1.7 J	25.3	-	85	20	17 J	130	42	32
Phenanthrene	µg/kg, dry wt	27	13	237	-	1400	230	41	130	150	410
Anthracene	µg/kg, dry wt	16	4.0	88	-	300	54	16 J	39	45	74
Fluoranthene	µg/kg, dry wt	47	14	514	-	2100	990	150	290	370	570
Pyrene	µg/kg, dry wt	57	15	665	-	2200	1600	320	560	400	820

Table 9- San Rafael Channel 2010 Sediment Chemistries – Composite Sample Area 8 Maintenance Depth and Z-Layer Core Section Composites and Individual Core Maintenance Depth Sections

Analyte	Units	SF-10	SF-11	Bay Background (RWQCB 1998)[1]	HWRP Acceptance Criteria[2]	SRC-2010-8	SRC-2010-8-Z	SRC-2010-8-1	SRC-2010-8-2	SRC-2010-8-3	SRC-2010-8-4
PAHs											
Benzo(a)anthracene	µg/kg, dry wt	23	7.6	244	-	1000	300	41	110	140	290
Chrysene	µg/kg, dry wt	26	7.1	289	-	900	400	80	170	210	350
Benzo(b)fluoranthene	µg/kg, dry wt	35	8.2	371	-	790	670	84	150	190	210
Benzo(k)fluoranthene	µg/kg, dry wt	13	2.9	258	-	280	170	67	130	170	210
Benzo(a)pyrene	µg/kg, dry wt	37	7.3	412	-	680	710	110	160	190	290
Indeno(1,2,3-cd)pyrene	µg/kg, dry wt	32	5.4	382	-	450	850	86	100	120	140
Dibenzo(a,h)anthracene	µg/kg, dry wt	3.9	1.5 J	32.7	-	97	61	13 J	28	26	30
Benzo(g,h,i)perylene	µg/kg, dry wt	39	6.6	310	-	480	970	140	170	190	210
∑ detected PAHs	**µg/kg, dry wt**	**367**	**103**	**3390**	**3390**	**10871**	**7104**	**1223**	**2337**	**2296**	**3694**
Hamilton Metals											
Barium	mg/kg, dry wt	38.4	8.5	-	190	58.7	98.9	70.4	58.3	78.1	85.5
Beryllium	mg/kg, dry wt	0.352	0.14	-	1.03	0.276	0.721	0.611	0.519	0.496	0.570
Boron	mg/kg, dry wt	0.3	2.0 J	-	36.9	25.1	40	38.5	21.0	55.0	37.9
Cobalt	mg/kg, dry wt	13.7	7.09	-	27.6	11.0	17.6	14.8	12.4	11.1	15.2
Manganese	mg/kg, dry wt	434	303	-	943	241	372	337	299	254	326
Vanadium	mg/kg, dry wt	52.3	18.6	-	118	32.9	63.6	60.5	32.0	39.0	53.2
Hamilton Organics											
Phenol	µg/kg, dry wt	29 J	3.0 J	-	130	<0.83	<23	<24	29 J	<590	<22
Pentachlorophenol	µg/kg, dry wt	<20	<20	-	17	<25	<230	<240	<200	<270	<220
TPH Diesel / motor oil	mg/kg, dry wt	42.8 J	20.9 J	-	144000	262	2620	2060	1500	3440	3510
TPH Gasoline / JP-4	mg/kg, dry wt	<2.3	<1.7	-	12000	15	4.9 J	<4.0	<2.6	<4.4	7.2 J
Methoxyclor	mg/kg, dry wt	<0.23	<0.19	-	90	<2.0	<2.8	<0.35	<0.39	<0.38	<0.28
Dioxins (TCDD)	ng/kg, dry wt	0.210	0.00392	-	20	6.15	10.2	-	-	-	-

Notes:

[1] San Francisco Regional Water Quality Control Board (1998) Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments. May 1998.

[2] HWRP Biological Opinion (USFWS 2005)

J – Analyte detected below the method reporting limit (MRL) and the reported value is therefore an estimate; as a result, J-flagged values are not identified as exceeding screening criteria.

Bold Font and Bold Outline = Value > Bay Background

Bold Font and Grey Shading = Value > HWRP Acceptance Criteria and Bay Background

Table 10- Modified Elutriate Test Chemistry Results.

Analytes	SRC-2010-1	SRC-2010-2	SRC-2010-3	SRC-2010-4	SRC-2010-5	SRC-2010-6	SRC-2010-7	SRC-2010-8	Water Quality Objective[A]
TSS	56	382	169	42.7	25.5	48	172	28.0	-
Total Metals (µg/L)									
Arsenic	4.86	11.9	7.09	5.11	14.9	18.6	9.23	3.19	NA
Cadmium	0.034	0.035	0.010J	0.027J	0.017J	0.028J	0.061	0.010J	NA
Chromium	2.00	3.10	0.27	2.73	1.33	2.96	4.35	0.21J	NA
Copper	3.430	5.640	0.569	3.910	2.250	6.830	12.1	0.602	NA
Lead	1.620	2.840	0.178	2.120	1.100	3.510	8.590	0.640	NA
Mercury	**0.0392**	0.0036	0.0035	**0.0263**	0.0059	**0.0725**	**0.0843**	0.0019	0.025
Nickel	5.99	7.28	1.89	7.44	3.25	5.93	9.75	2.53	NA
Selenium	0.3J	0.3J	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	5.0
Zinc	6.30	10.8	2.30	7.32	4.24	9.39	21.0	1.31	NA
Dissolved Metals (µg/L)									
Arsenic	2.83	7.24	3.99	3.22	13.4	15.3	8.77	2.07	36
Cadmium	0.014J	0.018J	0.016J	0.014J	0.011J	0.010J	0.029J	0.011J	9.3
Chromium	0.04J	0.07J	0.06J	0.07J	0.09J	0.08J	0.09J	0.05J	50
Copper	1.070	1.790	1.790	1.450	1.040	1.400	2.880	0.562	6.0[B]
Lead	0.014J	0.016J	0.023J	0.019J	0.018U	0.081	0.068	0.036	8.1
Mercury	0.0014	0.0014	0.0010	0.0008	0.0009	0.0015	0.0006	0.0007	0.025
Nickel	2.10	2.51	2.29	2.38	1.45	1.14	1.86	2.10	8.2
Selenium	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NA
Zinc	0.62	1.53	1.09	0.64J	0.58J	0.56J	3.94	1.31	81.0

A – Chronic criteria (four-day average) from the SF Bay Basin Plan (RWQCB, 2007) unless otherwise noted.
B – New chronic criteria set by USEPA and promulgated by the RWQCB in the January Executive Officer's Report (RWQCB, 2009).
NA – Not applicable.

Table 11- *Ampelisca abdita* survival in the San Rafael Channel test sediments.

Sediment Site	% Survival in Test Replicates					**Overall Mean % Survival**
	Rep A	Rep B	Rep C	Rep D	Rep E	
Lab Control	80	90	80	85	90	**85**
SF-10 (San Pablo)	95	90	95	90	90	**92**
SF-11 (Alcatraz)	95	100	85	90	85	**91**
SRC-2010-1	90	95	95	85	100	**93**
SRC-2010-2	80	80	100	100	90	**90**
SRC-2010-3	100	95	95	90	90	**94**
SRC-2010-4	100	90	90	90	80	**90**
SRC-2010-5	100	80	90	100	100	**94**
SRC-2010-6	90	85	85	90	90	**88**
SRC-2010-7	100	100	90	100	90	**96**
SRC-2010-8	75	90	70	85	100	**84**

Table 12- Reference Toxicant Testing: effects of KCl on *Ampelisca abdita*.

KCl Treatment (g/L)	Mean% Survival
Lab Control	**95**
0.25	**95**
0.5	**90**
1	**65**
2	**0**
4	**0**
EC_{50} =	1.1 g/L KCl

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 13-Summary of Reference Toxicant Database for *Ampelisca abdita*.

Current LC_{50} Value	Typical Response Range (mean $\pm$ 2SD)
1.1 g/L KCl	0.52 – 1.8 g/L KCl

Table 14- ***Neanthes arenaceodentata survival in the San Rafael Channel Test Sediments***

Sediment Site	% Survival in Test Replicates					**Overall Mean % Survival**
	Rep A	Rep B	Rep C	Rep D	Rep E	
Lab Control	80	100	100	90	100	**94**
SF-10 (San Pablo)	90	100	90	90	100	**94**
SF-11 (Alcatraz)	90	90	90	90	90	**90**
SRC-2010-1	100	90	100	90	100	**96**
SRC-2010-2	90	100	90	90	100	**94**
SRC-2010-3	90	80	80	80	100	**86**
SRC-2010-4	90	90	90	80	100	**90**
SRC-2010-5	100	80	90	90	90	**90**
SRC-2010-6	100	100	100	80	100	**96**
SRC-2010-7	90	90	100	90	100	**94**
SRC-2010-8	100	90	100	80	90	**92**

Table 15- Reference toxicant testing: Effects of KCl on *Neanthes arenaceodentata*.

KCl Treatment (g/L)	Mean% Survival
Lab Control	100
0.25	100
0.5	100
1	100
2	**70***
4	**0***
EC_{50} =	2.3 g/L KCl

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 16- Summary of Reference Toxicant Database for *Neanthes arenaceodentata*..

Current LC_{50} Value	Typical Response Range (mean $\pm$ 2SD)
2.3 g/L KCl	0.83 – 2.7 g/L KCl

Table 17- Effects of San Rafael Channel SET sediment elutriates on *Mytilus galloprovincialis*.

Elutriate Treatment	Survival LC_{50}	Development EC_{50}	ESC Acceptable?
SF-10	50.3% elutriate	72.8% elutriate	YES
SF-11	>100% elutriate	>100% elutriate	YES
SRC-2010-1	48.8% elutriate	48.6% elutriate	YES
SRC-2010-2	35.4% elutriate	37.5% elutriate	YES
SRC-2010-3	39.2% elutriate	44.5% elutriate	YES
SRC-2010-4	35.0% elutriate	37.5% elutriate	YES
SRC-2010-5	35.1% elutriate	37.5% elutriate	YES
SRC-2010-6	34.8% elutriate	37.5% elutriate	YES
SRC-2010-7	35.2% elutriate	37.5% elutriate	YES
SRC-2010-8	32.5% elutriate	37.3% elutriate	YES

The test data and the summary of statistical analyses for these tests are presented in Appendix J. Elutriate suitability calculations are presented in Appendix K.

Table 18- Effects of SF-10 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	68.1	74.1
10%	77.5	98.0
50%	**60.3***	95.2
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	50.3% elutriate	72.8% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 19- Effects of SF-11 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	95.2	99.4
10%	89.1	98.2
50%	**74.9***	98.2
100%	**65.7***	98.6
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	>100% elutriate	>100% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 20- Effects of SRC-2010-1 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	84.5	98.3
10%	93.2	98.8
25%	90.5	99.0
50%	**42.9***	**45.6***
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	48.8% elutriate	48.6% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 21- Effects of SRC-2010-2 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	89.7	99.2
10%	98.6	99.3
25%	93.8	98.6
50%	**0.11***	**0.15***
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	35.4% elutriate	37.5% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 22- Effects of SRC-2010-3 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	90.9	99.2
10%	83.0	99.2
25%	89.0	98.1
50%	**30.0***	**35.3***
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	39.2% elutriate	44.5% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 23- Effects of SRC-2010-4 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	88.1	98.6
10%	89.7	98.4
25%	88.5	98.3
50%	**0***	**0***
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	35% elutriate	37.5% elutriate

*The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 24- Effects of SRC-2010-5 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	87.6	98.9
10%	88.5	97.8
25%	89.8	98.8
50%	**0***	**0***
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	35.1% elutriate	37.5% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 25- Effects of SRC-2010-6 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	90.8	98.3
10%	93.8	98.2
25%	90.1	98.5
50%	**0***	**0***
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	34.8% elutriate	37.5% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 26- Effects of SRC-2010-7 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	88.9	99.0
10%	93.0	98.3
25%	90.4	98.9
50%	**0***	**0***
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	35.2% elutriate	37.5% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 27- Effects of SRC-2010-8 sediment elutriate on *Mytilus galloprovincialis*.

Elutriate Treatment	Mean % Survival	Mean % Normal Development
Lab Control	90.7	97.5
1%	90.2	98.6
10%	92.1	98.6
25%	81.5	96.7
50%	**0***	**0***
100%	**0***	**0***
Site Water Control	88.1	99.2
Survival LC_{50} or Development EC_{50} =	32.5% elutriate	37.3% elutriate

* The survival response at this treatment was significantly less than the Lab Control at $p < 0.05$.

Table 28- Reference toxicant testing: Effects of KCl on *Mytilus galloprovincialis*.

KCl Treatment (g/L)	Mean % Normal Embryo Development
Lab Control	98.9
0.5	97.7
1	98.4
2	**92.6***
3	**0***
4	**0***
EC_{50} =	2.5 g/L KCl

* Significantly less than the Lab Control treatment response at $p < 0.05$.

Table 29- Summary of Reference Toxicant Database for *Mytilus galloprovincialis*.

Current EC_{50}	Typical Response Range (mean $\pm$ 2SD)
2.5 g/L KCl	1.7–2.9 g/L KCl

Table 30- Effects of San Rafael Channel MET elutriates on *Americamysis bahia*.

Test Treatment	% Survival in Test Replicates					Mean % Survival
	Rep A	Rep B	Rep C	Rep D	Rep E	
Lab Control 1	100	90	90	100	100	96
Site Water Control	90	100	100	100	90	96
SRC-2010-1	100	90	100	100	100	98
SRC-2010-2	100	90	100	90	100	96
SRC-2010-3	90	100	100	100	100	98
SRC-2010-4	100	90	100	100	100	98
Lab Control 2	90	100	100	100	100	98
SRC-2010-5	90	100	100	100	100	98
SRC-2010-6	100	100	100	100	100	100
SRC-2010-7	90	100	100	100	100	98
SRC-2010-8	90	100	100	100	90	96

Table 31- Reference toxicant testing: Effects of KCl on *Americamysis bahia*.

KCl Treatment (g/L)	Mean % Survival
Lab Control	95
0.125	90
0.25	100
0.5	**15***
1	**0***
2	**0***
LC_{50} =	0.39 g/L KCl

* Significantly less than the Lab Control treatment response at $p < 0.05$.

Table 32- Summary of Reference Toxicant Database for *Americamysis bahia*.

Current LC_{50}	Typical Response Range (mean $\pm$ 2SD)
0.39 g/L KCl	0.31–0.75 g/L KCl

APPENDIX E

PAST SAMPLING LOCATIONS

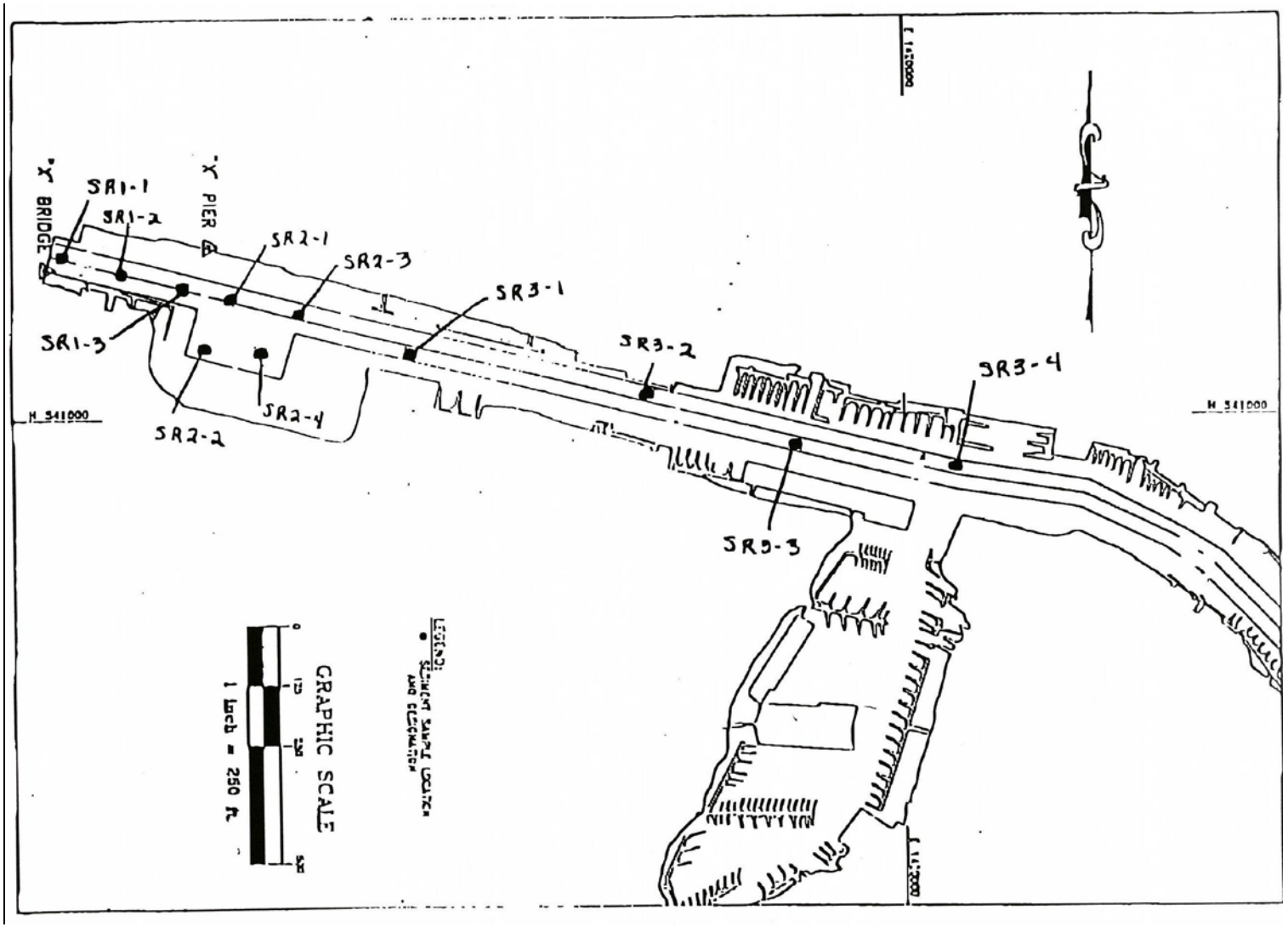


FIGURE 1- 1999 SAMPLING LOCATIONS

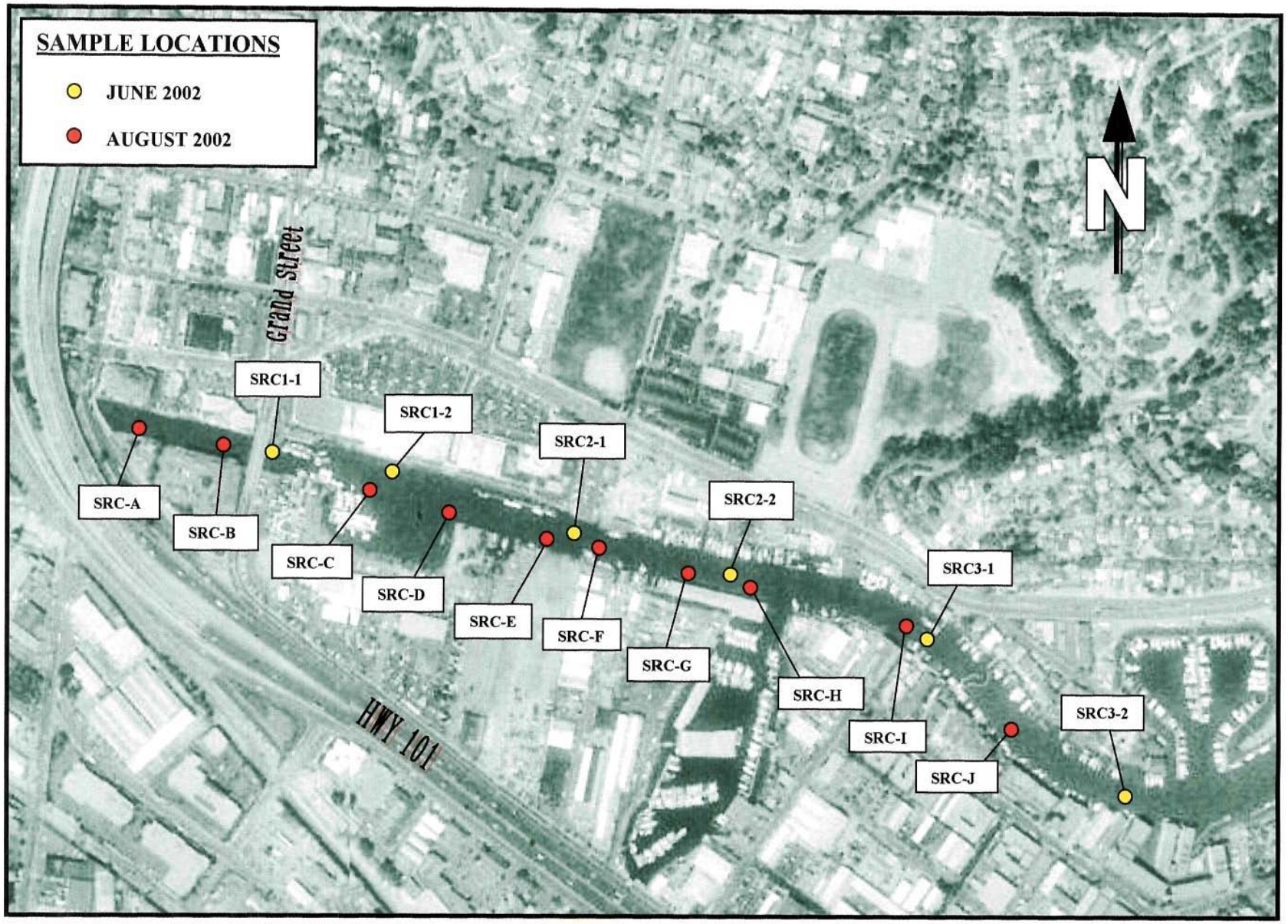


FIGURE 2- 2002 SAMPLING LOCATIONS

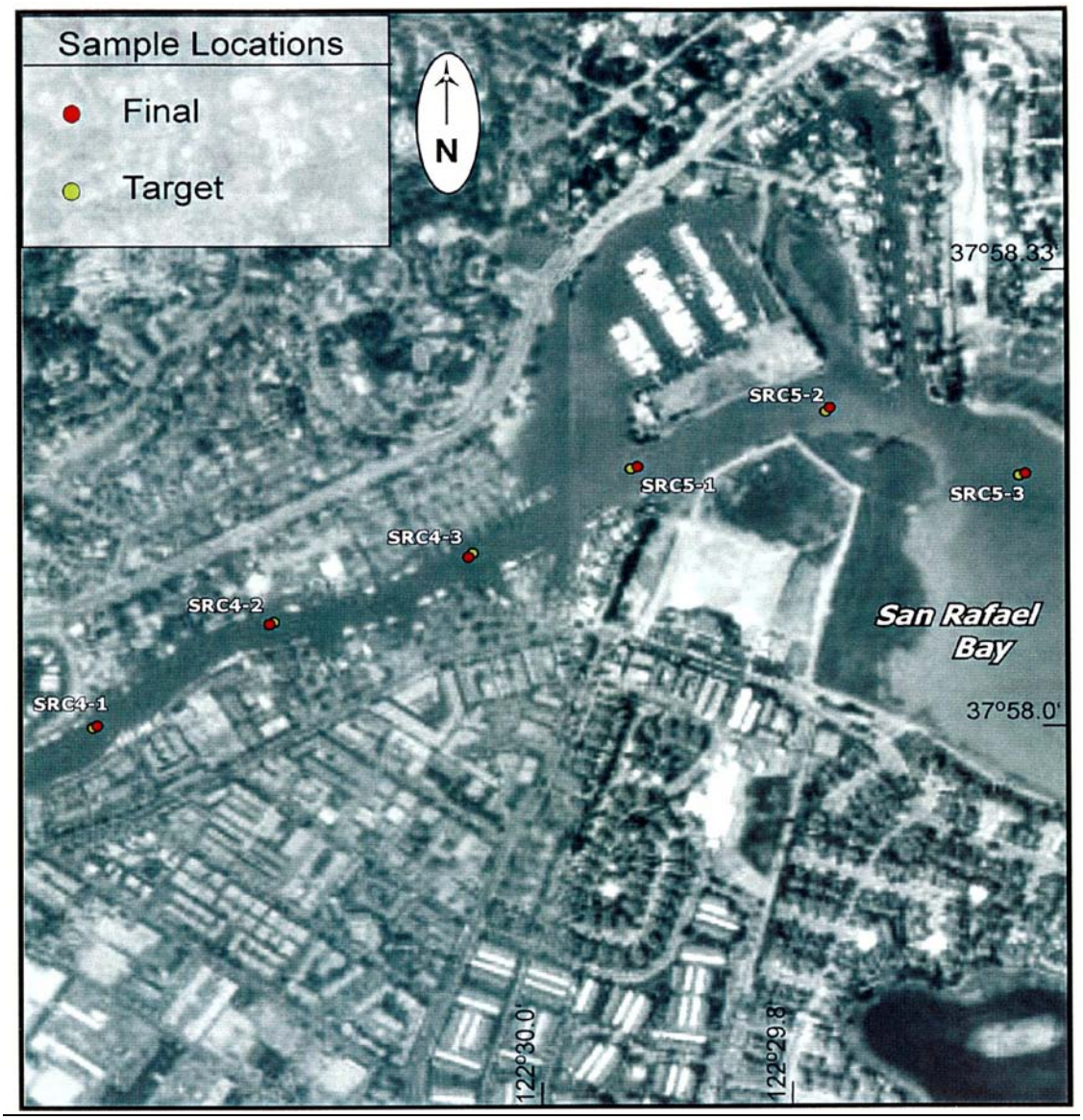
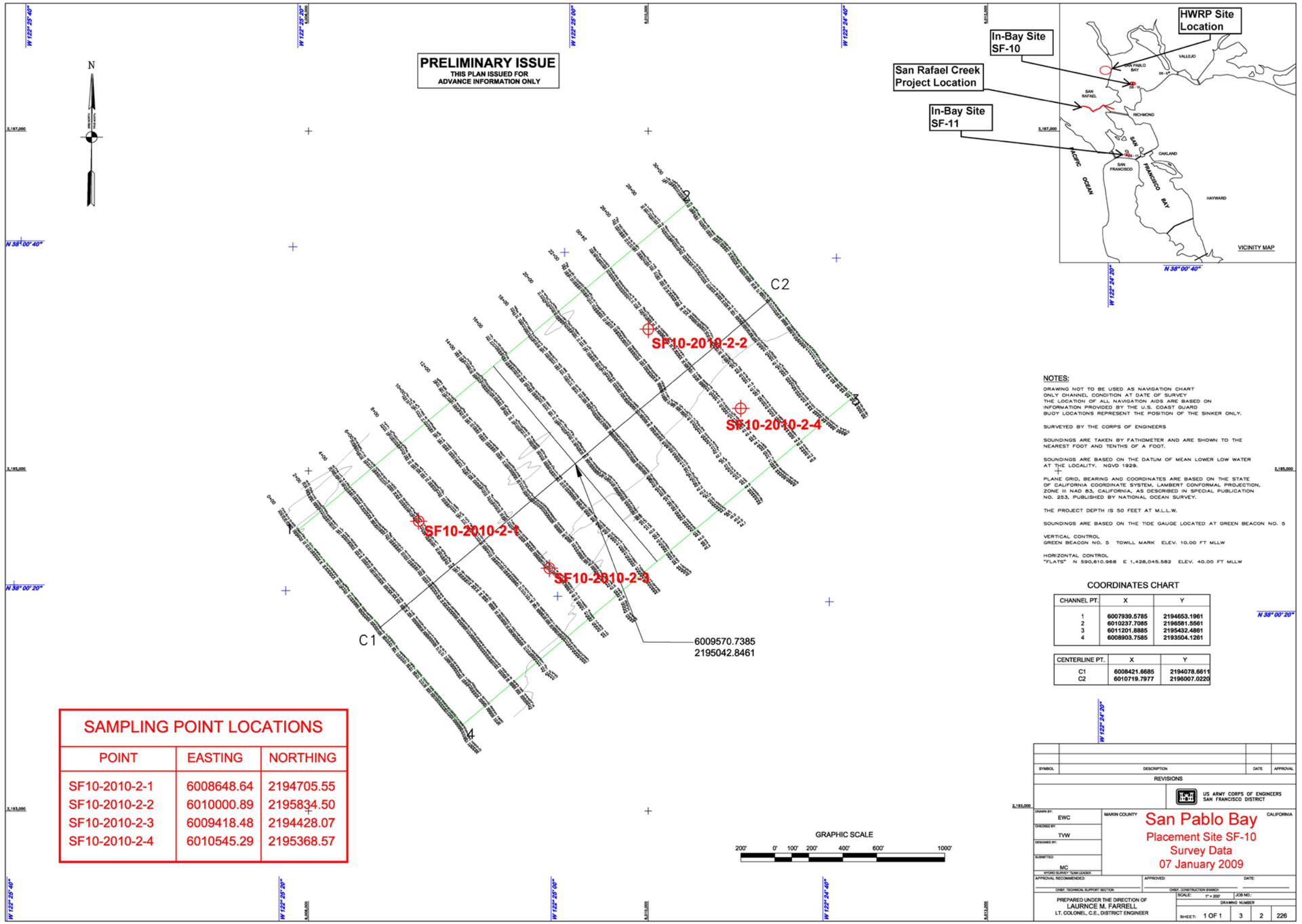


FIGURE 2- 2002 SAMPLING LOCATIONS (CONT.)



SAMPLING POINT LOCATIONS

POINT	EASTING	NORTHING
SF10-2010-2-1	6008648.64	2194705.55
SF10-2010-2-2	6010000.89	2195834.50
SF10-2010-2-3	6009418.48	2194428.07
SF10-2010-2-4	6010545.29	2195368.57

FIGURE 4- 2010 REFERENCE AREA (SF-10) SAMPLING LOCATIONS