

**Cruise Report**  
**1998 Regional Monitoring Program**  
**Sediment Sampling Cruise #18**  
**July 30-31, August 3-5, 1998**

1. INTRODUCTION

This report describes activities associated with the 1998 dry-season sediment sampling cruise of the Regional Monitoring Program (RMP) for Trace Substances in the San Francisco Estuary. Sediment sampling is one component of this program that is designed to provide long-term data on concentrations of trace metals and organic compounds, as well as toxicity, throughout the estuary.

Sediment samples were collected and distributed to five laboratories for analysis under RMP protocols. A sample distribution list is shown in Table 1. Intercalibration and Blind sample identification is shown in Table 2. A list of all samples collected is shown in Table 4.

2. CRUISE REPORT

2.1 Objectives

The objectives of this cruise were:

1. Collect sediment samples at 26 stations for the analysis of:
  - Trace metals and trace organics by Bay Area Dischargers Authority (BADA)
  - As, Hg, Se by Brooks-Rand (BRL)
  - Grain size, TOC and total nitrogen by University of California, Santa Cruz (UCSC)
  - Pore water pH and ammonia by Applied Marine Sciences (AMS)
  - Pore water sulfides by Marine Pollution Studies Lab (MPSL)
  - Foraminifera by US Geological Survey (USGS)
  - CTD profiles by AMS
2. Collect sediment samples at 14 stations for the analysis of:
  - Toxicity by MPSL
3. Collect sediment samples at nine stations for the analysis of:
  - Benthic infauna by City and County of Santa Cruz (CCSF)
4. Collect sediment splits at three stations for the intercalibration analysis of:
  - Trace elements by UCSC
  - Trace organics by GERG
  - As, Hg, Se by BADA

5. Collect sediment splits at one “blind” station for the intercalibration analysis of:
- Trace elements by UCSC
  - Trace organics by GERG

## 2.2 Personnel

The personnel and work assignments for this cruise were as follows:

Name	Affiliation	Duties
Samir Arora (7/30, 8/3)	SFEI	Sample collection
David Bell	AMS	Cruise manager, sample collection, sediment chemistry, pore water, watershed sampling and CTD
Ted Daum (7/31)	SFEI	Sample collection
Sherry Fung (8/3-5)	AMS	Sample collection, sediment chemistry, and pore water
Michael Kellogg	CCSF	Benthic samples
Allison Luengen (8/4-5)	SFEI	Sample collection
Paul Salop	AMS	Sample collection, sediment chemistry, pore water, watershed sampling and CTD
Gordon Smith	UCSC	Vessel skipper
Laura Taggart (7/31, 8/3-4)	CCSF	Benthic samples
Christina Wong (8/3)	SFEI	Sample collection

## 2.3 Activities

Date	Time	Activity
Day 1 July 30, 1998	0630- 0730	Mobilized gear aboard R/V David Johnston, conducted safety briefing at Martinez Marina. Departed for Grizzly Bay (BF21).
	0815- 0900	Sampled Grizzly Bay, departed for Honker Bay (BF40).
	0945- 1030	Sampled Honker Bay, departed for Sacramento River (BG20).
	1130- 1200	Sampled Sacramento River, departed for San Joaquin River (BG30).

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	1235- 1310	Sampled San Joaquin River, departed for Pacheco Creek (BF10).
	1440- 1520	Sampled Pacheco Creek, departed for Martinez Marina.
	1550- 1630	Arrived at Martinez Marina. Benthic infauna sampling gear is loaded onto vessel.
Day 2 July 31, 1998	0700- 0720	Mobilized gear aboard R/V David Johnston, conducted safety briefing at Martinez Marina. Departed for Napa River site (BD50).
	0815- 0840	Sampled Napa River, departed for Davis Point site (BD41).
	0915- 1015	Sampled Davis Point, departed for Pinole Point site (BD30).
	1040- 1110	Sampled Pinole Point, departed for San Pablo Bay site (BD20).
	1130- 1205	Sampled San Pablo Bay, departed for Petaluma River site (BD15).
	1240- 1315	Sampled Petaluma River, departed for Red Rock site (BC60).
	1450- 1600	Sampled Red Rock, departed for Emeryville Marina.
	1645- 1730	Arrived at Emeryville Marina, demobilized vessel. All samples for trace elements, organic compounds and intercalibration were transferred to a BADA lab representative. All other chemistry and toxicity samples were kept aboard the vessel on dry ice and wet ice, respectively.
Day 3 August 3, 1998	0800- 0830	Mobilized gear aboard R/V David Johnston, conducted safety briefing at Emeryville Marina. Departed for Yerba Buena Island site (BC11).
	0850- 0940	Sampled Yerba Buena Island, departed Alameda site (BB70).

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	1020- 1100	Sampled Alameda, departed for Horseshoe Bay site (BC21).
	1210- 1255	Sampled Horseshoe Bay, departed for Richardson Bay site (BC32).
	1315- 1355	Sampled Richardson Bay, departed for Point Isabel site (BC41).
	1450- 1530	Sampled Point Isabel, departed for Emeryville Marina.
	1615- 1645	Arrived at Emeryville Marina. Demobilized vessel.
Day 4 August 4, 1998	0700- 0730	Mobilized gear aboard R/V David Johnston, conducted safety briefing at Emeryville Marina. Departed for Oyster Point site (BB30).
	0830- 0940	Sampled Oyster Point, departed for San Bruno Shoal site (BB15).
	1015- 1050	Sampled San Bruno Shoal, departed for Redwood Creek site (BA41).
	1130- 1212	Sampled Redwood Creek, departed for Dumbarton Bridge site (BA30).
	1300- 1345	Sampled Dumbarton Bridge, departed for South Bay site (BD20).
	1405- 1445	Sampled South Bay, departed Coyote Creek site (BA10).
	1505- 1550	Sampled Coyote Creek, departed for Redwood City USGS dock.
	1640- 1720	Arrived Redwood City USGS dock, demobilized vessel. Benthic infauna samples removed by CCSF. All other samples stored on ice on the vessel.
Day 5 August 5, 1998	0700- 0720	Mobilized gear aboard R/V David Johnston, conducted safety briefing at Redwood City. Departed for San Jose site (C-3-0).

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0935-1020	Sampled San Jose, departed for Sunnyvale site (C-1-3).
1140-1230	Sampled Sunnyvale, departed for Emeryville Marina.
1445-1530	Arrived Emeryville Marina, demobilized vessel. All remaining samples for trace elements, organic compounds and intercalibration were transferred to a BADA lab representative. Toxicity and pore water samples were picked up by MPSTL on the same day. Foraminifera samples were held on ice and picked up by USGS on 8/7. Samples for As, Hg, Se were shipped to BRL on 8/10/98.

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## 2.4 Discussion

### *Sample Collection and Handling Procedures*

Prior to sampling, all equipment was thoroughly cleaned. The cleaning process began with thorough washing with Alconox<sup>®</sup> detergent. The scoops and stirrers were soaked in detergent for two days before washing. Following the detergent wash, the grab and compositing bucket were rinsed with tap water, followed by three rinses with de-ionized water, a rinse with 10% HCl, and a rinse with petroleum ether. The utensils were rinsed three times with de-ionized water, soaked three days with 10% HCl, and rinsed with petroleum ether. Cleaned utensils were sealed in Ziploc<sup>®</sup> bags until used in the field.

Sampling procedures ensured that samples are collected from a localized area at each site to reduce uncontrolled temporal and spatial variation. In the field, the vessel was anchored at the coordinates listed in Table 3. The coordinates were checked throughout sampling to ensure that the anchor had not dragged. Coordinates were recorded for two grabs from each site.

The first sampling operation at each site was the collection of the benthic samples with the Ponar grab. After the required benthic samples were collected, the Ponar grab was replaced with the Van Veen grab for collection of chemistry samples. After being sieved, benthic samples were preserved in buffered 10% formalin/seawater according to the standard operating procedures used by the City of San Francisco.

When the Van Veen grab was brought on deck, sediment was carefully removed for compositing. After any overlying water was drained off, a single scoop was taken from each grab for foraminifera sampling and six, 5-cm deep cores were removed for measurement of pH, ammonia, and total sulfides in pore water. The remaining top 5-cm of sediment was scooped from each of two replicate grabs and mixed in the bucket to provide a single composite sample for each site for analysis of

chemistry, TOC, grain size, and toxicity. Portions of the composited sample were placed into the containers provided by each laboratory. Chemistry samples for intercalibration were also collected from the composite. Cores collected for analysis of pore water were centrifuged onboard the vessel, with some of the supernatant being preserved for analysis of sulfides in the Marine Pollution Studies Laboratory at Granite Canyon and the remainder being analyzed for ammonia onboard the vessel.

The quality of grab samples was ensured by requiring each sample to satisfy a set of criteria concerning the depth of penetration and disturbance of the sediment within the grab. Each sample normally contained the top 5-cm of sediment within the area of the grab jaws. Samples were rejected for the following conditions:

- There was a rock or shell fragment wedged between the jaws of the grab allowing the sample to wash out.
- The surface of the sample was significantly disturbed.
- The sample was uneven from side to side, indicating that the grab was tilted when it penetrated the sediment.
- The surface of the sample was in contact with the top doors of the grab, indicating over-penetration of the grab and possible loss of material around the doors.

Samples were collected from each site, composited in the bucket and placed into containers as indicated in Table 3.

### *General Comments*

All cruise objectives were achieved and the cruise was completed on schedule. The toxicity sample for San Jose (C-3-0) was not collected as scheduled on 8/4/98 due to an error in reading the sample log. The site was re-sampled for toxicity only on 8/18/98 and samples were sent to MPSTL the following day.

**Table 1. Sample Distribution List for Sediment Cruise 18, 1998.**

Laboratory	Sample Type	# of Sites Sampled
AMS	Pore water sulfides, pH	26
BRL	As, Hg, Se	26
BADA	Trace elements	26
BADA	Organic compounds	26
BADA	Archive	26
BADA	Blind intercalibration sample for trace elements and organic compounds (unmarked container)	1
CCSF	Benthic infauna	9
GERG	Intercalibration of organic compounds (unmarked container)	3
MPSL	Toxicity	14
MPSL	Pore water sulfides	26
USGS	Foraminifera	26
UCSC	Intercalibration of trace elements (unmarked container)	3
UCSC	TOC and grain size	26

**Table 2. Identification of Intercalibration and Blind Samples.**

Site Name/Code	Container Identification
Honker Bay/BF40	Intercalibration 1
Petaluma River/BD15	Intercalibration 2
Oyster Point/BB30	Intercalibration 3
Redwood Creek/BA41	Blind Station

**Table 3. Coordinates of Regional Monitoring Program Sediment Sampling Sites.**

Site Name/Code	Latitude	Longitude	Depth (m)	Sediment Description from 2/94
Standish Dam/BW10	37° 27.20'	121° 55.45'	shore	silty sand
Guadalupe River/BW15	-	-	shore	silty sand
San Jose/ C-3-0	37° 27.72'	121° 58.53'	3	approximately 5 cm of coarse sand with shell debris over mud
Sunnyvale/C-1-3	37° 26.13'	122° 00.67'	2.5	soft to semi-soft light brown sediment with some plant debris
South Bay/BA20	37° 29.64'	122° 05.25'	5.5	top 8–10 cm of sediment very soft light brown with Potamocorbula
Coyote Creek/BA10	37° 28.20'	122° 03.80'	5	Shell debris and sandy silt over gray clay

Dumbarton Bridge/BA30	37° 30.87'	122° 08.08'	7	soft brown sediment with shell debris and numerous polychaete tubes near surface over dark gray clayey sediment
Redwood Creek/BA41	37° 33.67'	122° 12.62'	2.5	shell debris near the surface with numerous polychaete tubes over dark gray clayey sediment
San Bruno Shoal/BB15	37° 37.00'	122° 17.00'	12	sandy mud with shell debris over gray clay
Oyster Point/BB30	37° 40.21'	122° 19.77'	9	soft brown sediment with shell debris and numerous polychaete tubes near the surface over very firm dark gray clay
Alameda/BB70	37° 44.84'	122° 19.40'	10	soft brown sediment with numerous polychaete tubes near the surface over gray clay
Yerba Buena Island/BC11	37° 49.44'	122° 20.93'	6	mixed soft sediment with shell debris over clay
Horseshoe Bay/BC21	37° 49.98'	122° 28.43'	12	very soft light brown sediment with sulfide pockets, over gray clay
Richardson Bay/BC32	37° 51.82'	122° 28.72'	1	soft light brown surficial sediment over firm dark clay
Point Isabel/BC41	37° 53.34'	122° 20.55'	1.5	soft dark brown surficial sediment with dense polychaete tubes over firm, dark clay
Red Rock/BC60	37° 55.00'	122° 25.97'	11	heavy shell debris and coarse sand
Petaluma River/BD15	38° 06.66'	122° 29.00'	4	soft light brown surficial sediment over dark gray mud/clay
San Pablo Bay/BD22	38° 02.86'	122° 25.24'	3	soft light brown surficial sediment over dark gray mud/clay
Pinole Point/BD30	38° 01.49'	122° 21.71'	6.5	soft light brown surficial sediment over dark gray clay
Davis Point/BD41	38° 03.11'	122° 16.65'	6.5	sandy silt with shell debris
Napa River/BD50	38° 05.79'	122° 15.61'	4	soft light brown silty mud with high density of Potamocorbula
Pacheco Creek/BF10	38° 02.85'	122° 05.66'	4	sandy sediments with layers of soft fine material, with occasional oil droplets
Grizzly Bay/BF21	38° 06.97'	122° 02.35'	3	very soft light brown sediment
Honker Bay/BF40	38° 04.00'	121° 56.00'	3	very soft light brown sediment
Sacramento River/BG20	38° 03.36'	121° 48.63'	8	soft light brown silty sand with high densities of Potamocorbula, over sandier sediments
San Joaquin River/BG30	38° 01.36'	121° 48.44'	5	sandy sediments with plant debris and Corbicula