

Contaminant Concentrations In Central Bay Margins Sediment



CRUISE REPORT Regional Monitoring Program 2015



**Prepared for the
San Francisco Estuary Institute**

**by
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Introduction

This report contains information on the summer field sampling efforts conducted by Coastal Conservation & Research (CC&R) in support of the Regional Monitoring Program's (RMP) Bay Margins Sediment study. The work was contracted through the San Francisco Estuary Institute (SFEI). Sampling was conducted in coordination with EPA's National Coastal Condition Assessment (NCCA) and the San Francisco RWQCB Pacific Dry Dock study since the Bay Margins sampling had to be conducted at or near high tide.

This report includes sample collections over a two month period (July 27th through September 14th) encompassing four trips. The initial sampling trip targeted the Marin sites with subsequent trips focusing on the remaining Centray Bay sites. A total of 40 sites were sampled, two of which included collecting duplicate samples. At each site, field measurements were recorded for sediment pH, ORP (Oxygen Reduction Potential; Eh), color, composition/description (e.g., sand, mud), and anoxic transition depth. The field pH meter was calibrated daily prior to sampling while the ORP meter was checked by SFEI on July 7, 2015 and did not require daily calibration. Sediment was collected using a modified VanVeen grab (0.1 m² area). Analytical jars were filled directly by scraping the jar in the grab or by scooping the top 5 cm of the grab with a polyethylene scoop. A 6-liter polycarbonate sediment tub (trace-cleaned) was also filled, placed on wet ice, and brought back to the lab for processing and aliquoting into additional analytical jars. Ten sites were pre-selected by SFEI to collect a microplastics sample. All samples were frozen after collection and stored in a -20°C freezer except for grain size, which was refrigerated and stored at 4-6°C. Antibiotic-resistant bacteria samples were picked up by Ben Greenfield or Charles Moritz during or after sampling trips. The remaining samples were kept at Moss Landing Marine Labs until all collections were completed. These samples were shipped to analytical labs on September 23, 2015 via FedEx arriving the next day. Detailed protocols can be found in the 2015 Bay Margins Sediment Study Cruise Plan prepared by SFEI.

This report details weekly synopses of sampling efforts and provides figures for sampling locations (see Figures 1-5). Target and actual latitude and longitude coordinates are listed in Appendix A.

Trip 1 - Sampling Dates: July 27-29, 2015

Sampling Crew: Rusty Fairey, Marco Sigala, George Radojevic

The main objective of this cruise was to target Marin sites and northern Central Bay sites. Don Yee (SFEI) accompanied the field crew the first day to observe sampling and answer any questions. Eleven sites were successfully sampled.

Monday, July 27th

The sampling crew started the week by launching the vessel out of Sausalito at 1045. Sites CB19, CB39, and CB23 in Richardson Bay were sampled with Don Yee on the boat. Site CB23 was located near storm drains along a rockwall and road. The crew pulled the boat out of the water and drove to Loch Lomond marina to launch the boat again. The field crew sampled site CB34, located just south of the marina. All sites had mud bottoms. All samples were collected including a microplastics jar at site CB39 and placed on wet or dry ice. The crew ended the day at 1630 hours.

Tuesday, July 28th

The sampling crew started the day launching the vessel out of Loch Lomond and sampled for NCCA. The crew arrived at site CB45 near Castro Point at 1438 hours and collected all samples in breezy conditions. The sediment was a fine sand/mud mixture. The crew then travelled to site CB10 in the Richmond Inner Harbor. The site was located near a rockwall with homes located along the shoreline. Winds were strong with 1.5 foot waves. A lot of amphipod tubes were present on the mud surface. All samples were collected at both sites including a microplastics jar at CB10 and then placed on wet or dry ice.

Wednesday, July 29th

The sampling crew launched out of Loch Lomond and sampled an NCCA site before heading to site CB26 near the base of the Chevron Pier in Richmond. Weather conditions were calm and the sediment was a gray mud. The crew then transited south to site CB38 on the outside edge of the Richmond breakwall. Weather conditions had deteriorated to strong winds with 2 foot waves. The crew set anchor in rough conditions and deployed the grab. It was full of shell hash and eelgrass. The crew pulled anchor and travelled to the inside of the breakwall where a fine sand mud bottom was found within the allowable distance (50 m) for sampling a site from the target location. When sampling was completed, the crew travelled across the bay to site CB25, located south of San Quentin. Samples were collected and the crew then moved to sites CB29 (near Paradise Cay) and CB22 (near San Quentin) for collections. Site CB29 had a lot of amphipod tubes on the sediment surface. Site CB22 was located in the ferry channel in deeper, dredged water so the crew moved to the edge of the channel in shallower water. The sediment bottom consisted of brown mud with many amphipod tubes on the surface. All samples were collected and placed on wet or dry ice.

The sediment tubs from this trip were processed in the lab on July 31, 2015. Homogenized sediment for each site was aliquoted into the remaining analytical jars and then placed in a refrigerator or in a -20°C freezer.

Trip 2 - Sampling Dates: August 20-21, 2015

Sampling Crew: Rusty Fairey, Marco Sigala, Cassandra Lamerdin

The main objective of this cruise was to begin sampling the Oyster Point and San Francisco areas of central San Francisco Bay. The crew began the week sampling the north coast portions of the NCCA study (Humboldt, Tomales, Bodega Bays) and finished the week sampling for this study on their southern return. Five sites were sampled.

Thursday, August 20th

The sampling crew travelled from Humboldt Bay arriving at the Oyster Point launch ramp late in the afternoon (1700 hours). Site CB05 was sampled first. The target location was located in a small channel in deeper water so the crew moved 100 feet closer to shore into shallower water. The ORP value was incorrectly written with a pH value so an ORP value will be recorded as Not Recorded in the database. The crew moved to site CB33 just north of Sierra Point located near a rockwall and highway 101. Duplicate samples were collected at this site as well as a field blank for the antibiotic-resistant bacteria analysis. All samples were collected and then placed on wet or dry ice. The crew ended the day at 1930 hours.

Friday, August 21st

The sampling crew started the day launching the vessel out of Oyster Point at 0630. Site CB17 was sampled first. Some shell debris was found in the brown mud. There was no clear anoxic transition zone in the ORP core. The crew then transited to site CB01 near Hunters Point where a lot of construction was occurring along the shoreline. Duplicate samples and a field blank for Antibiotic-resistant bacteria were collected. When sampling was completed, the crew pulled anchor and headed north to China Basin and McCovey Cove near AT&T Park where site CB49 was located. The sediment was composed of a brown mud with an anoxic transition depth of 2 cm. All samples were collected and then placed on wet or dry ice. The crew returned to Oyster Point and headed south to Moss Landing.

The sediment tubs from this trip were processed in the lab on August 24, 2015. Homogenized sediment for each site was aliquoted into the remaining analytical jars and then placed in a refrigerator or in a -20°C freezer.

Trip 3 - Sampling Dates: August 31 – September 2, 2015

Sampling Crew: Rusty Fairey, Marco Sigala, Sean Mundell

The main objective of this cruise was to complete sampling in the Oyster Point/San Francisco area and begin sampling in the Oakland and San Leandro areas of the central bay. Seventeen sites were successfully sampled.

Monday, August 31st

The crew started the week departing from Moss Landing at 0600 and driving to Oyster Point to launch the boat. The crew sampled NCCA sites in the morning and then sampled site CB37 beginning at 1300 hours. CB37 was located in a back area of shallow water that looked like it used to be an active work area with pilings but is now not used. Site CB21 was located outside of site CB37 in shallow open water. CB21 had a brown mud bottom with surficial algae. An anoxic transition zone was seen in the ORP core at 2 cm. The crew pulled anchor and transited to site CB53 located in Seaplane Harbor near the San Francisco International Airport. The target location was in an airport restricted zone so access was required and obtained from Nixon Lam. The crew contacted the airport prior to and when sampling was completed. All samples were collected and placed on wet or dry ice. The crew ended the day at 1830 hours.

Tuesday, September 1st

The crew launched out of Oyster Point and transited to the Central Bay area north of Treasure Island to sample a NCCA site. The crew began sampling Margins sites mid-day starting with site CB27 near the Emeryville marina. When finished, the crew pulled anchor and travelled south to the shallow mud flat area north of the base to the Bay Bridge where sites CB43 and CB15 were sampled. Both sites had mud bottoms with site CB15 having small clams present in the grabs. Conditions were breezy but the crew was able to collect all samples including a microplastics jar at site CB15. The crew pulled anchor and travelled back to Oyster Point to pull the boat from the water.

The crew drove to Oakland Inner Harbor, launched the boat, and travelled to the San Leandro channel. Sites CB48, CB44, CB16, and CB32 were sampled at high tide in breezy conditions. The

sediment core at site CB48 had a thin black surface on top with all gray mud below it. There was a sulfide smell and filamentous algae was present on the surface in the grabs. Site CB44 also had a sulfide smell in the sediment along with dense algae and amphipods on the surface. The crew carefully removed algae before samples were collected. Site CB16 had dense surface algae in the first grab but the remaining two grabs were clear of algae. The green alga *Ulva* was present at site CB32. This site had pH in grabs 2 and 3 below 5.5 (5.23 and 4.75, respectively) and the ORP value was -231 mV. The core transitioned from a black mud at the surface to a gray mud 1 cm below the core surface. All samples were successfully collected including microplastic jars at sites CB48 and CB32. Samples were placed on wet or dry ice. The crew transited back to the Oakland Inner Harbor and finished the day at 1730 hours.

Wednesday, September 2nd

The crew launched out of Oakland Inner Harbor at 0700 hours and sampled for the Pacific Dry Dock study near Coast Guard island. The crew then transited to the San Leandro channel mid-day and collected the final seven sites in this area. Site CB36 was sampled first. The target location was on land so the crew moved the site to the nearest sampleable location. Small white clams were present in the sandy substrate in each grab. Sites CB52 and CB12 also had small white clams in each grab. The target location for site CB28 was located near a bridge with a cable crossing so the crew moved to the southwest to set anchor. When sampling was done, the crew transited to site CB04 located near Ballena Bay in a shallow mud flat near the shore and a park. The winds were strong with 2 foot wind waves. Sediment pH was acidic in the range of 5.01-5.83. There was a very light transition at 3 cm core depth. The crew pulled anchor and travelled back to Coast Guard island where sites CB24 and CB20 were sampled. Don Yee from SFEI observed from land while sampling was conducted at both sites. Site CB24 was located in the small Pacific Dry Dock basin. The target site was in deep water so the crew moved towards the back end of the basin in shallower water. A strong sulfide smell was present and the surface mud was black. Sediment pH in the three grabs were 3.15, 3.82, and 4.47. Site CB20 also had a strong sulfide smell and the sediment was black with a mud and fine sand composition. Sediment pH was also in the 3-5 range. All samples were collected including microplastic jars at sites CB04 and CB24 and then placed on wet or dry ice.

Sediment tubs from this trip were processed in the lab on September 4, 2015. Homogenized sediment for each site was aliquoted into the remaining analytical jars and then placed in a refrigerator or in a -20°C freezer.

Trip 4 - Sampling Date: September 14, 2015

Sampling Crew: Rusty Fairey, Marco Sigala, Billy Jakl

The objective of this week was to complete sampling focusing on the area between Richmond and Berkeley and within the Oakland Inner harbor. Seven sites were sampled.

Monday, September 14th

The crew started the week departing Moss Landing at 0600 and travelled to Oakland. The crew launched the boat and transited north towards Richmond to sample in breezy conditions. Site CB42 was sampled first at 1016 hours. Surface algae was present in the grabs. Site CB46 was located off Point Isabel near a large dog park. Each grab consisted of sand. No transition was seen in the sediment core but a transition zone was seen at 5 cm depth when scooping sediment for chemistry

analyses. The crew then transited to site CB14, which was located in an exposed area with rough, 2-foot wind waves. When done, the crew quickly pulled anchor and travelled around the point to a sheltered bay in Albany where site CB30 was located. Sampling was conducted without any problems. The sediment consisted of a mud/sand mixture. Site CB03 was sampled next. Each grab contained coarse sand with no transition zone seen in the core. The crew transited back to the Oakland Inner Harbor to sample the last two sites – CB31 and CB47. Site CB31 was located in 5 meters of water so the crew moved closer to shore in shallower water. The sediment consisted of sand with some shell hash present. A transition zone was seen at 5 cm core depth. The sediment at site CB47 also consisted of sand with some shell hash but a transition zone was not seen. All samples were collected including a microplastic jar at site CB30. Samples were placed on wet or dry ice.

The sediment tubs from this trip were processed in the lab on September 17, 2015. Homogenized sediment for each site was aliquoted into the remaining analytical jars and then placed in a refrigerator or in a -20°C freezer.

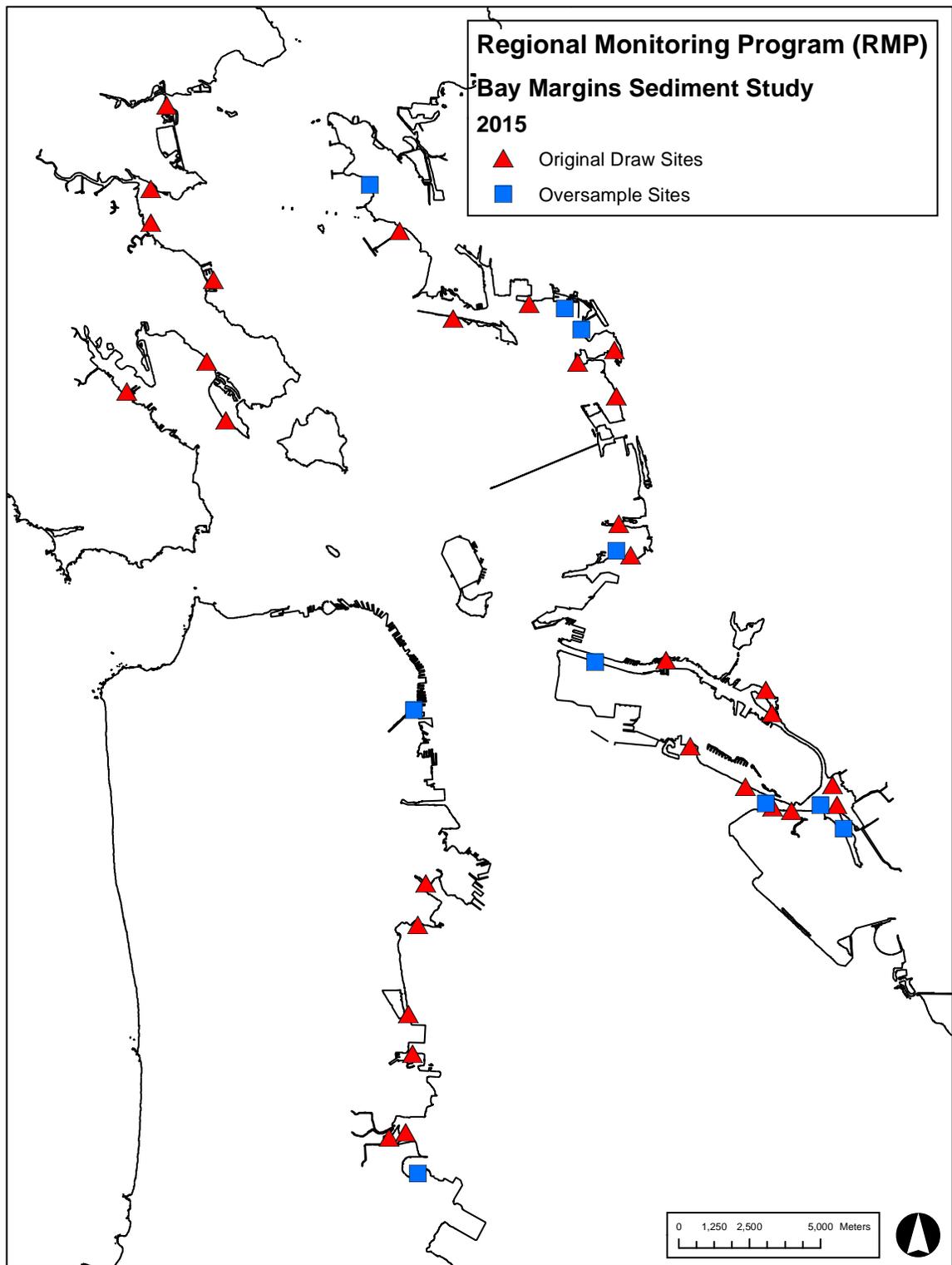


Figure 1: Locations of all 40 sites sampled under the Bay Margins Sediment Study in 2015.

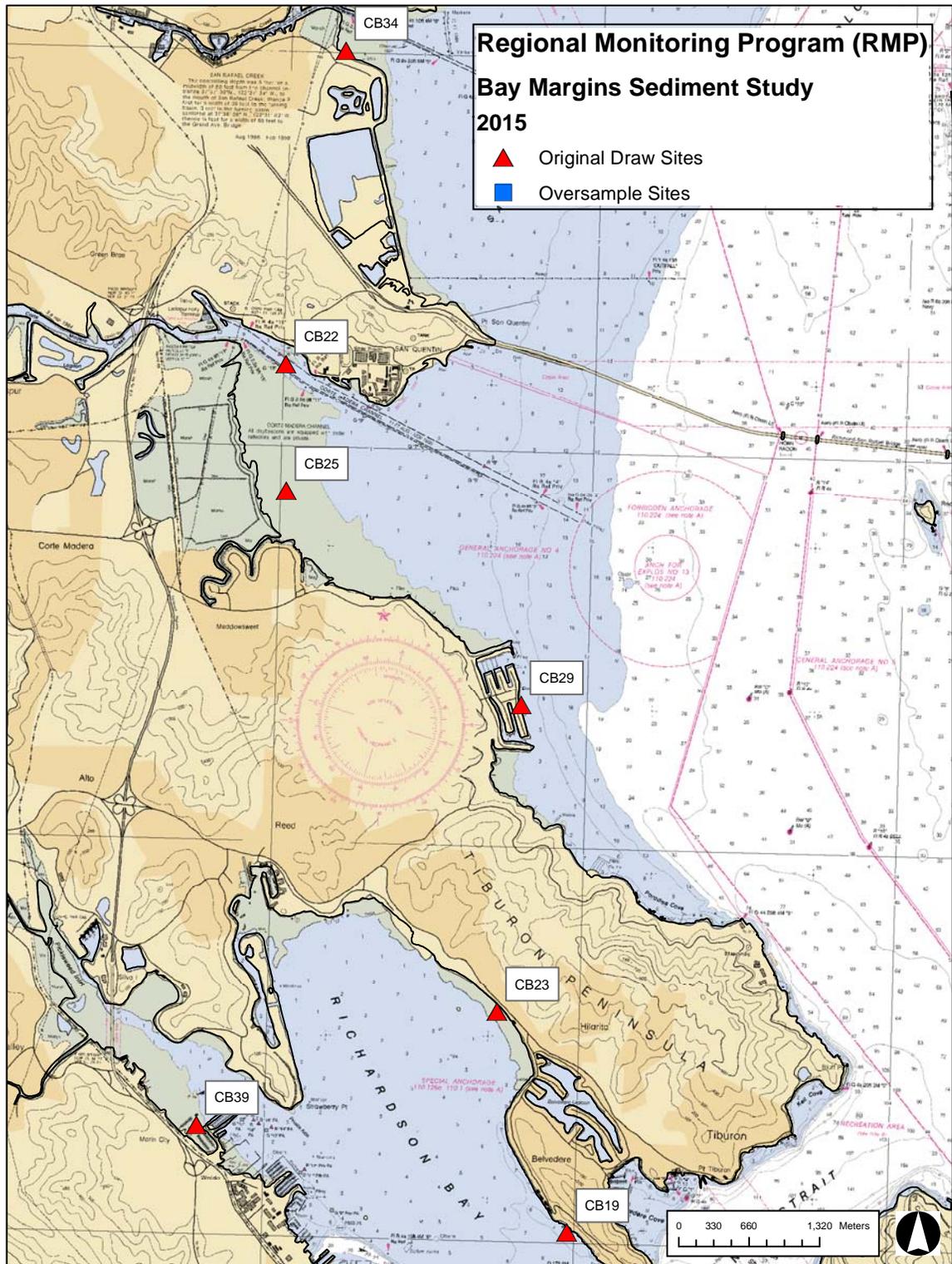


Figure 2: Sampling locations in Marin and northwest Central Bay.

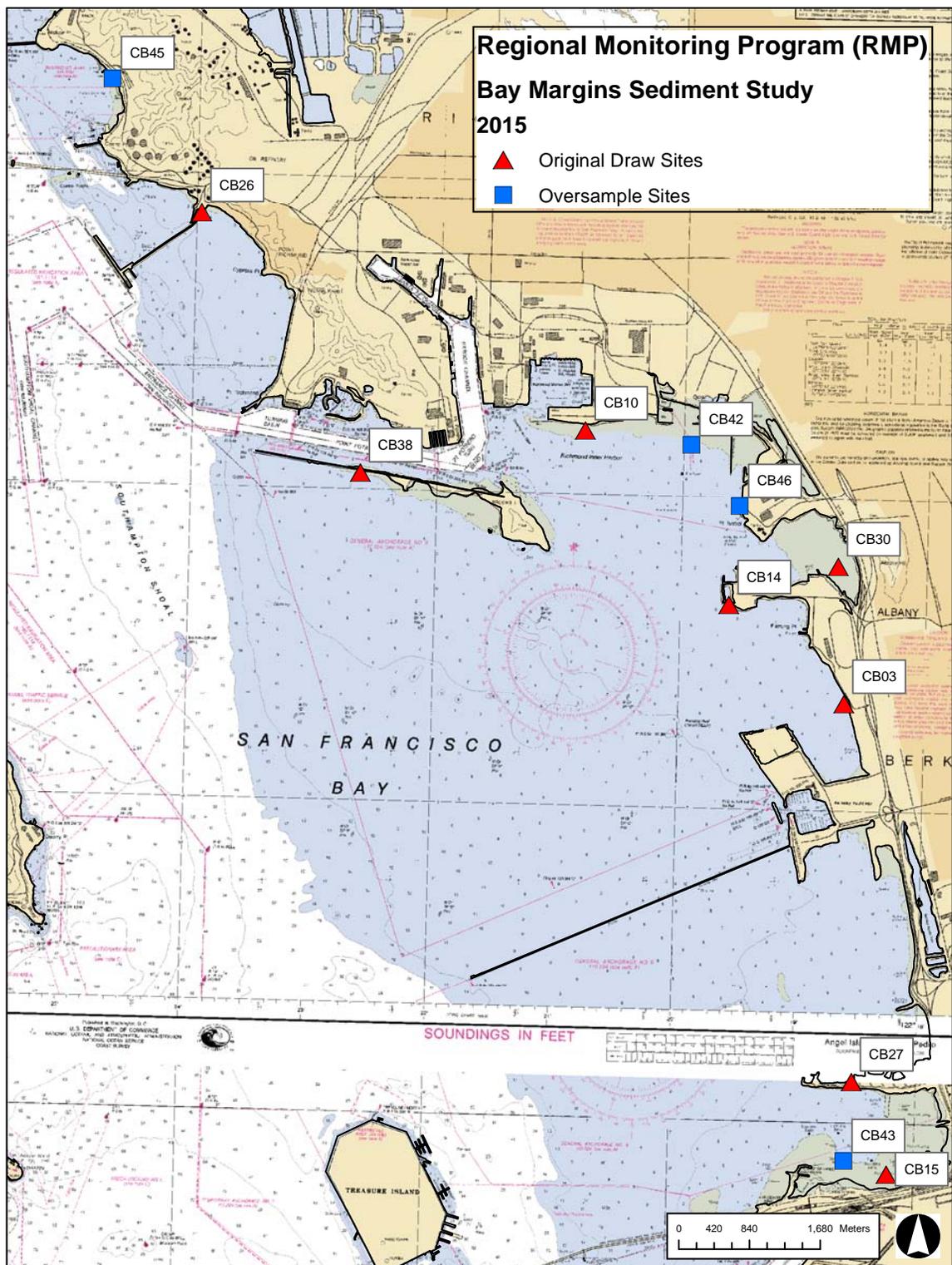


Figure 3: Sampling locations in the Richmond and Berkeley areas of Central Bay.

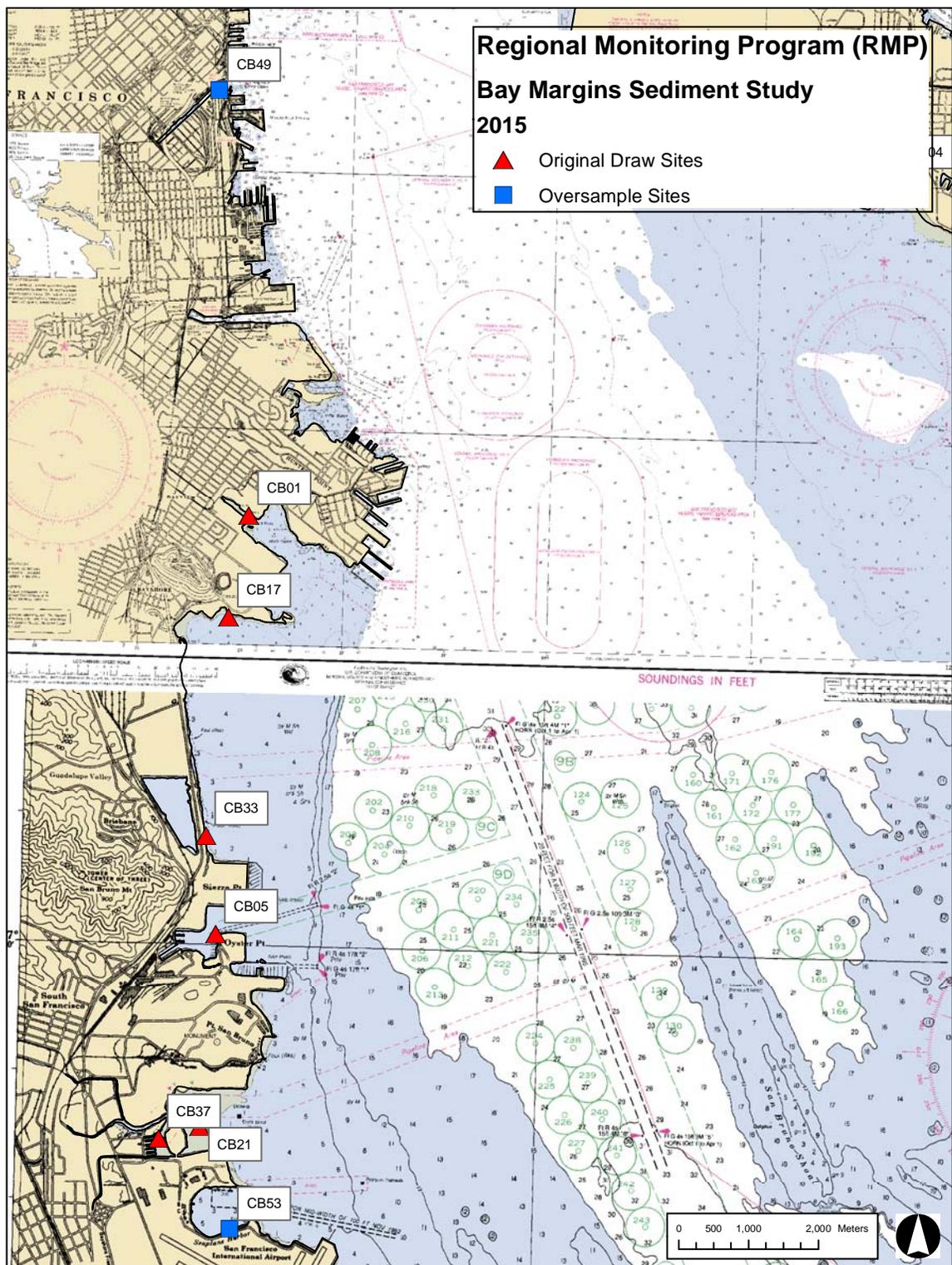


Figure 4: Sampling locations in the San Francisco and Oyster Point areas of Central Bay.

Appendix A: Target (LatDD, LongDD) and Actual (Act_LatDD, Act_LongDD) latitude and longitude coordinates for sites sampled.

Site	Panel	Sample Date	LatDD	LongDD	ACT_LatDD	ACT_LongDD
CB01	Central Bay	8/21/2015	37.72219	-122.38235	37.721950	-122.382250
CB03	Central Bay	9/14/2015	37.87813	-122.31086	37.878167	-122.310800
CB04	Central Bay	9/2/2015	37.76761	-122.27781	37.767583	-122.277750
CB05	Central Bay	8/20/2015	37.66805	-122.38605	37.667817	-122.385783
CB10	Central Bay	7/28/2015	37.90672	-122.34669	37.906683	-122.346670
CB12	Central Bay	9/2/2015	37.74892	-122.24421	37.748933	-122.244167
CB14	Central Bay	9/14/2015	37.88846	-122.32673	37.888183	-122.326833
CB15	Central Bay	9/1/2015	37.82789	-122.30356	37.827900	-122.303417
CB16	Central Bay	9/1/2015	37.75028	-122.21861	37.750317	-122.218517
CB17	Central Bay	8/21/2015	37.70890	-122.38523	37.708933	-122.385217
CB20	Central Bay	9/2/2015	37.77895	-122.24553	37.779033	-122.245583
CB21	Central Bay	8/31/2015	37.64308	-122.38789	37.643033	-122.387883
CB24	Central Bay	9/2/2015	37.78628	-122.24807	37.786350	-122.247483
CB26	Central Bay	7/29/2015	37.92903	-122.39946	37.929017	-122.399450
CB27	Central Bay	9/1/2015	37.83772	-122.30860	37.837633	-122.308500
CB28	Central Bay	9/2/2015	37.74807	-122.23674	37.748067	-122.237400
CB30	Central Bay	9/14/2015	37.89283	-122.31207	37.892833	-122.312000
CB31	Central Bay	9/14/2015	37.79494	-122.28850	37.795333	-122.288333
CB32	Central Bay	9/1/2015	37.75657	-122.22044	37.756633	-122.220400
CB33	Central Bay	8/20/2015	37.68066	-122.38804	37.680683	-122.388033
CB36	Central Bay	9/2/2015	37.75524	-122.25543	37.755083	-122.256283
CB37	Central Bay	8/31/2015	37.64142	-122.39454	37.641400	-122.394500
CB38	Central Bay	7/29/2015	37.90162	-122.37710	37.902000	-122.377100
CB42	Central Bay	9/14/2015	37.90550	-122.33233	37.905667	-122.332267
CB43	Central Bay	9/1/2015	37.82921	-122.30941	37.829283	-122.309350
CB44	Central Bay	9/1/2015	37.74994	-122.22518	37.749983	-122.225183
CB45	Central Bay	7/28/2015	37.94315	-122.41195	37.943133	-122.412080
CB46	Central Bay	9/14/2015	37.89904	-122.32557	37.899033	-122.325767
CB47	Central Bay	9/14/2015	37.79378	-122.31666	37.793817	-122.316800
CB48	Central Bay	9/1/2015	37.74275	-122.21561	37.742767	-122.215517
CB49	Central Bay	8/21/2015	37.77698	-122.38892	37.776967	-122.388917
CB52	Central Bay	9/2/2015	37.75012	-122.24702	37.750100	-122.246917
CB53	Central Bay	8/31/2015	37.62998	-122.38261	37.629933	-122.382617
CB19	Marin	7/27/2015	37.86751	-122.46740	37.086760	-122.467300
CB22	Marin	7/29/2015	37.94023	-122.49983	37.939933	-122.500000
CB23	Marin	7/27/2015	37.88603	-122.47549	37.052700	-122.475383
CB25	Marin	7/29/2015	37.92953	-122.49942	37.929567	-122.499433
CB29	Marin	7/29/2015	37.91195	-122.47372	37.911983	-122.473733

Site	Panel	Sample Date	LatDD	LongDD	ACT_LatDD	ACT_LongDD
CB34	Marin	7/27/2015	37.96681	-122.49430	37.966833	-122.494250
CB39	Marin	7/27/2015	37.87581	-122.50725	37.875833	-122.507250
CB19	Marin	7/27/2015	37.86751	-122.46740	37.086760	-122.467300