2013-2014

ANNUAL MONITORING RESULTS

A report of the Regional Monitoring Program for Water Quality in the San Francisco Bay

SFEI | AQUATIC SCIENCE CENTER

RMP
REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN THE SAN FRANCISCO BAY

THIS REPORT SHOULD BE CITED AS:
SFEI. 2015. 2013-2014 Annual Monitoring Results. The Regional Monitoring Program for Water Quality in the San Francisco Bay (RMP). Contribution #758. San Francisco Estuary Institute, Richmond, CA.

TABLE OF CONTENTS

1. INTRODUCTION

PROGRAM STRUCTURE AND OBJECTIVES

The Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) is the primary source for long-term contaminant monitoring information for the Bay. The RMP is an innovative and collaborative effort among the scientific community, the San Francisco Bay Regional Water Quality Control Board (Water Board), and the regulated discharger community. The Program was initiated by the Water Board as a pilot study in 1989 and has been collecting water, sediment, and bivalve tissue data since its official inception in 1993. Regular monitoring of sport fish tissue and bird eggs for toxic contaminants was incorporated into the Program in 1997 and 2006, respectively.

The Program monitors the different matrices included in "status and trends" monitoring on varying schedules. In 2013, the RMP collected data on water only. In 2014, the Program monitored sediment, bivalves, and sport fish.

The purpose of this report is to document RMP monitoring activities in 2013 and 2014. The report is organized into chapters on water, sediment, bivalves, bird eggs, and sport fish. Each chapter contains information on:

- The locations where these samples were collected,
- The field sampling methods,
- The target analytes, laboratories, and analytical methods for each matrix, and
- Any problems encountered or non-conformances to planned procedures.

The report concludes with a chapter that provides the methods that the public can use to download the data and a link to the reports published by the RMP in 2013 and 2014.

The appendix to this report contains details of RMP contractors and coordinates of sampling locations in 2013 and 2014. It also contains a running list of target analytes and changes to the RMP sampling and analysis methods since the Program began.

2. WATER MONITORING FOR TOXIC CONTAMINANTS

BACKGROUND

For over two decades, the RMP has monitored waters of the Bay for trace elements, organic contaminants, and conventional water quality parameters. Water sampling was conducted annually from 1993 to 2011. A biennial sampling schedule began in 2013.

The following sections contain details about the toxic contaminant monitoring conducted by the RMP in 2013. The RMP also funds monthly monitoring of conventional water quality parameters by USGS, but these measurements are not described in this report.

SAMPLING SITES

In 2013, 22 sites were sampled for water (Figure 2.1). Five of these were the historic targeted stations (BA30-Dumbarton Bridge, BC10-Yerba Buena Island, BC20-Golden Gate, BG20-Sacramento River, and BG30-San Joaquin River). The remaining 17 sites were distributed through the five segments as follows: three per segment with the exception of the Lower South Bay, which had five.

Sampling of the 22 sites was successfully completed, with two changes made to the sampling plan. One target site, LSB059W, was removed from the site list for the cruise because of access restrictions due to its location between the Dumbarton Bridge and railroad bridge and was replaced with site LSB0060W. Another target site, SU045W, was rejected during the cruise because it was found to have insufficient depth for transit. Station SU047W was sampled as a replacement.

Station names, codes, location, and sampling dates for 2013 are listed in Appendix 2.

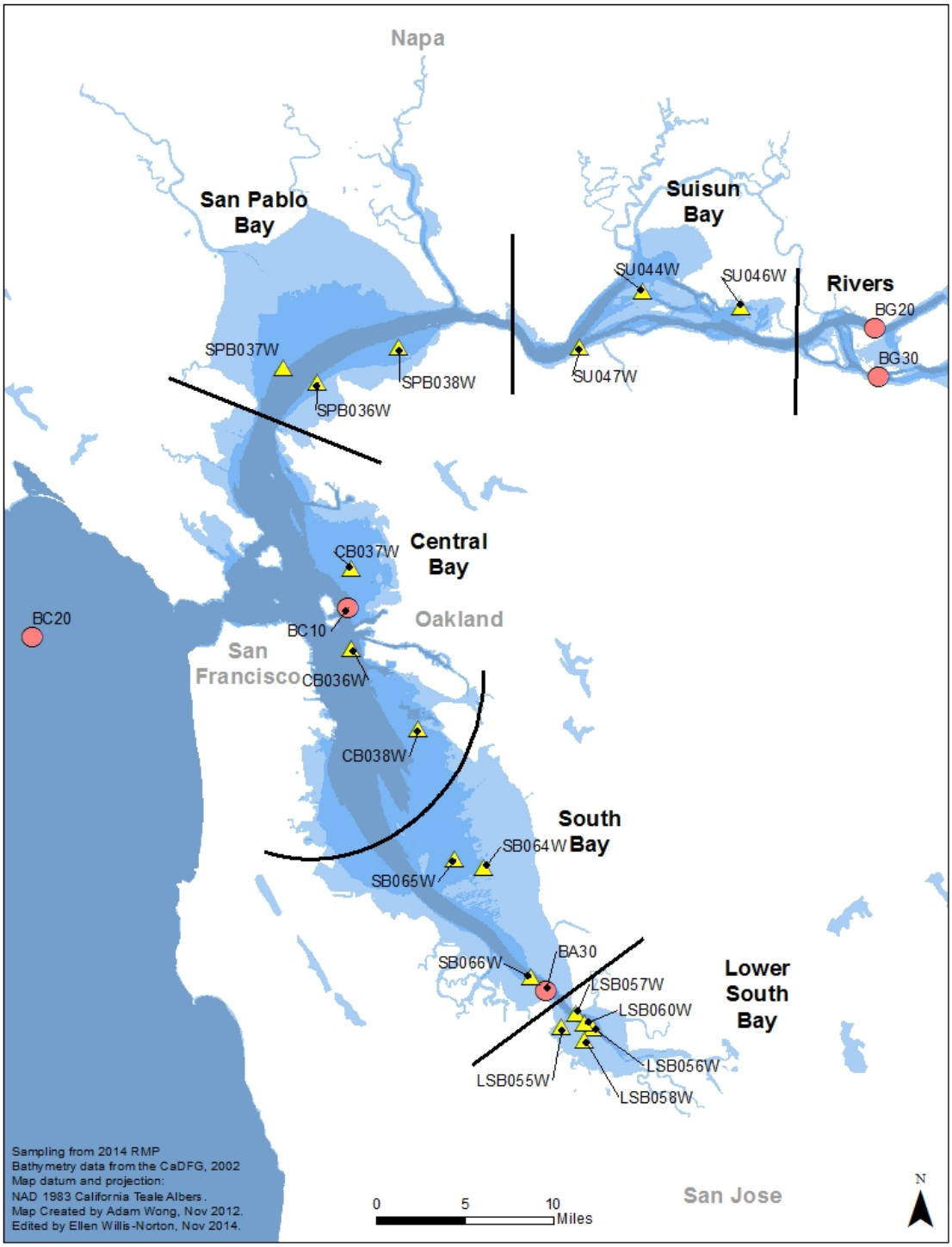

Figure 2.1 Map showing location of 2013 water stations

FIELD METHODS

In 2013, total and dissolved fractions of Estuary water were collected for trace element and select water quality analyses. All water samples were collected aboard the USGS research vessel (*RV Turning Tide*) between July 30 and August 8, 2013.

Water Sample Collection Methods

In order to attain the low detection limits used in the RMP, ultra-clean sampling methods were used in all trace metal sampling procedures. Sample containers are rinsed three times with site water before filling (except those containing a preservative), filled on deck on the windward side of the ship to minimize contamination from shipboard sources, handled only by a designated "clean-hands collector wearing polyethylene gloves, and stored double-bagged on ice (or with a preservative) (Flegal and Stukas, 1987; U.S. EPA, 1995; SFEI, 2014). Sample tubing and fittings are acid-cleaned polyethylene or fluoropolymer, and the inlets and outlets are kept covered except during actual sampling (SFEI, 2014).

Filtered field blanks were collected at one station in Lower South Bay prior to the collection of samples using the same acid-cleaned sampling assembly through which the water samples were collected. Ultra-clean deionized (DI) water was pumped through the apparatus and an acid-cleaned filter and was collected in sample bottles. The field blanks received the same handling and analyses in the laboratory as the field samples.

Difficulties Encountered

The container containing the Chlorophyll-a sample collected at site SB065W was broken in transport from the vessel and deemed unusable. After discussion with SFEI and EBMUD, it was decided to use the backup POC filter sample collected at the site in its place. Therefore, sample ID RMP-13WC-1371 was reassigned to analysis of Chlorophyll-a by EBMUD. This sample has had collection comments added within the sample ID spreadsheet to reflect this. The loss of the backup filter assigned to POC analysis did not affect results of POC reported by ALS because the primary filter was used for this analysis (reported associated with POC filter #1 at the site, RMP-13WC-1370).

Shortly after completion of the cruise, AMS was notified by Da Chen of the breakage of multiple sample containers collected for analysis of OP flame retardants due to a storage issue at the laboratory. Samples that were reported as broken were collected at sites LSB055W, LSB058W, LSB060W, SB065W, SB066W, and BLIND 3 (field duplicate for field sample collected at LSB060W). There was no attempt made to replace the compromised samples associated with the current sampling effort.

Shipboard Measurements

Conductivity, temperature and depth (CTD) casts were taken at all stations to document the water column profiles for these parameters. At each site, the CTD instrument was lowered to approximately one meter below the water surface and allowed to equilibrate to ambient temperature for 3 minutes. Following the sampling, the CTD instrument was then lowered to the bottom at approximately 0.15 meters per second and raised. However, only data from the down cast were kept. Data were downloaded onboard the ship and processed in the laboratory using Sea-Bird software.The CTD instrument measured temperature, conductivity, pressure, dissolved oxygen,

density, and backscatter at a sampling rate of two scans per second. After the cruise, the CTD profile data were post-processed to calculate the average value for each parameter in 0.25 m depth bins. At this time, salinity (based on conductivity measurements), and depth (based on pressure) were calculated from the indicated measures.

As in previous years, SFEI staff measured dissolved oxygen, conductivity/salinity, pH, and water temperature with a hand-held YSI-556 MPS instrument at all stations. At three stations (BA30, LSB055W, and LSB057W), staff was unable to get the pH meter to calibrate properly. Data for pH are not available for these three stations.

LABORATORY METHODS

SFEI contracts with a number of laboratories that provide high quality analytical services. The laboratories and analytical methods that were used to measure target analytes for the RMP Status and Trends Program are presented in Table 2.1 below. Additional target analytes for special studies or *pro bono* research by collaborators are listed below the table. SFEI maintains copies of the detailed protocols for all laboratory analyses – please contact Amy Franz (amy@sfei.org) for more details.

Table 2.1. Target Water Analytes: A summary table of the 2013 target analytes, special field handling requirements, analytical laboratories, and laboratory method

Analyte	Special Field Handling Requirements	Analytical Lab	Method #
Dissolved oxygen, conductivity, water temperature, optical backscatter density	None	Collected in field by AMS	SeaBird CTD instrument
Dissolved oxygen, conductivity/salinity, pH, water temperature	None	Collected in field by SFEI	Hand-held YSI (556 MPS)
Trace Elements (Ag, As, Cd, Co, Cu, Ni, Pb, Zn)	Field filtered, cooled with wet ice and refrigerated	BRL	EPA Method 1640, modified (reductive precipitation)
Iron and Manganese	Field filtered, cooled with wet ice and refrigerated	BRL	Digestion with HCl and HNO3 in a sand bath and measured by EPA Method 1638
Copper and Nickel	Field filtered, cooled with wet ice and refrigerated	City of San Jose (inter-comparison exercise with BRL)	EPA Method 1640 (column chelating)
Selenium	**Field filtered, c**ooled with wet ice and refrigerated	BRL	EPA Method 1640
Methylmercury	Preserved with sulfuric acid, cooled with wet ice and refrigerated	BRL	EPA method 1630, modified
Total Mercury	Cooled with wet ice and refrigerated	BRL	EPA Method 1631E, modified
Cyanide	Preserved with NaOH to a pH ≥ 12	CCCSD	Standard Method 4500-CN-C

Analyte	Special Field Handling Requirements	Analytical Lab	Method #
Dissolved Organic Carbon	Field filtered, preserved with 1-2 mL Sulfuric acid, cooled with wet ice and refrigerated	ALS	EPA Method 415.1
Particulate Organic Carbon	Field filtered, field frozen on dry ice	ALS	EPA Method 440
Chlorophyll/Phaeophytin	Field filtered, filter stored in 90% methanol in amber bottle, frozen on dry ice	EBMUD	Standard Method 10200 H-M v20 (fluorescence spectrophotometer)
Salinity and Hardness	Cooled with wet ice and refrigerated	EBMUD	Standard Method 2520B for salinity; Standard Method 2340C for hardness
Ammonia	Field filtered, preserved with sulfuric acid, cooled with wet ice and refrigerated	EBMUD	Indophenol reaction with o-phenylphenol (OPP) (Solorzano, L., 1969)
Phosphate	Field filtered, frozen on dry ice	EBMUD	EPA Method 365.3 by colorimetry
Nitrate and Nitrite	Field filtered, frozen on dry ice	EBMUD	EPA method 353.2 by flow injection analysis
Silica	Field filtered, preserved with nitric acid, cooled with wet ice and refrigerated	EBMUD	Combination of Standard Method 4500-SiO2 C and EPA Method 370.1
Suspended Sediment Concentration	Cooled with wet ice and refrigerated	EBMUD	ASTM D3977

All nutrient samples are field filtered. All trace elements were measured in both the total and dissolved phase.

Several requests were made for RMP special studies or by researchers outside of the RMP to collect samples to support research during the 2013 cruise. These requests were accommodated alongside regular Status and Trends sampling with minimal disruption to regularly planned sampling activities.

- Water was collected for analysis of fipronil by California Department of Fish and Wildlife.
- Water was collected for analysis of alternative flame retardants by Southern Illinois University (SIU)
- Water was collected for analysis of hydroxylated polybrominated diphenyl ethers by the University of Minnesota (UMN)

REFERENCES FOR ADDITIONAL DETAILS

2013 Water Cruise Report - http://www.sfei.org/sites/default/files/biblio_files/2013_RMP_Water_Cruise_Report_Final.pdf

Quality Assurance Project Plan - http://www.sfei.org/sites/default/files/biblio_files/2014_RMP_QAPP_1.pdf

3. SEDIMENT MONITORING

BACKGROUND

Since 1993, the RMP has routinely monitored contaminants in surface sediments (top 5 cm) collected at stations in Bay waters at depths greater than 1 m below mean lower low water (referred to as "open Bay"). Sediment sampling was conducted annually from 1993-2012. Biennial sampling was adopted for a brief period after 2012 (i.e., for 2014). This section describes the sampling conducted in 2014. In 2014 the Steering Committee, based on a recommendation from the Technical Review Committee, moved sediment sampling to a four-year cycle. The next round of RMP open Bay sediment sampling will occur in 2018. A pilot effort to sample Central Bay sediment at depths above 1 m below mean lower low water (the "Bay margins") is occurring in 2015.

SAMPLING SITES

In order to allow for analysis of long-term temporal trends, repeat sampling of a subset of random sites and continued (yearly) monitoring of historic sites in each of the six regions is conducted. The Rivers Region has two historic sites, the Sacramento River (BG20) and the San Joaquin River (BG30). All other regions have one historic site each: Suisun Bay (Grizzly Bay - BF21), San Pablo Bay (Pinole Point - BD31), Central Bay (Yerba Buena Island - BC11), South Bay (Redwood Creek - BA41) and Lower South Bay (Coyote Creek - BA10). These seven historic sites were selected because they have long-term synoptic chemistry and toxicity measures associated with them (SFEI, 2005). In addition to the monitoring of historic sites, sites included in the probabilistic design that end in 001S or 002S and are sampled each cruise while those ending in 003S and 004S are sampled on a 5 cruise interval. These sites were randomly allocated during the initial restructuring of the sampling scheme in 2002 (Lowe et al., 2005).

Every attempt is made to procure acceptable sediments from the target coordinates. Acceptable sediment consists of at least 60% fines and is determined by qualitative analysis. In the event that acceptable sediment is not able to be collected, the vessel is repositioned within a 100 m radius of the given coordinates. If sediment collection is still unsuccessful, the field crew proceeds to the next scheduled site and the failed site will be replaced with the next site on the list of available alternative sites, referred to as an oversample site.

In 2014, 27 sites were targeted for sediment sampling. Seven of the targeted sites were historic sites that have been included in the RMP sediment monitoring program since 1993. Three randomly allocated sites that were initially targeted had to be pre-abandoned during the planning phase of the cruise.

- Site LSB059 was located in a shipping channel between the Dumbarton Bridge and an adjacent railroad bridge in an exclusion zone around the bridges and in a no anchoring area around submerged pipelines. It was replaced with LSB046S.
- In 2008, one of the annual sites, SU001S, located in Suisun Bay, was permanently replaced with site SU073S. Historically, SU001S was a sandy site which resulted in repeatedly failed attempts at obtaining acceptable grabs. The area was then subject to active dredging which changed the bottom profile significantly. Therefore, this site was pre-abandoned and replaced with SU073S.
- SPB003S was located on a shoal in an area north of China Camp that has multiple hazards identified on nautical charts and was pre-abandoned. It was replaced with site SPB046S.

No sites had to be abandoned during the cruise but site SB111S was located outside of the 100m radius around the target coordinates due to pipes in the area that prevented anchoring. The decision was made to keep the site and sample outside of the 100m area. A comparison of target and final anchoring coordinates found that the vessel was approximately 150m north of the target coordinates.

Sites monitored in 2014 are shown in Figure 3.1. Site names, codes, coordinates, and sampling dates for the 2014 sediment monitoring effort are listed in *Appendix 2*.

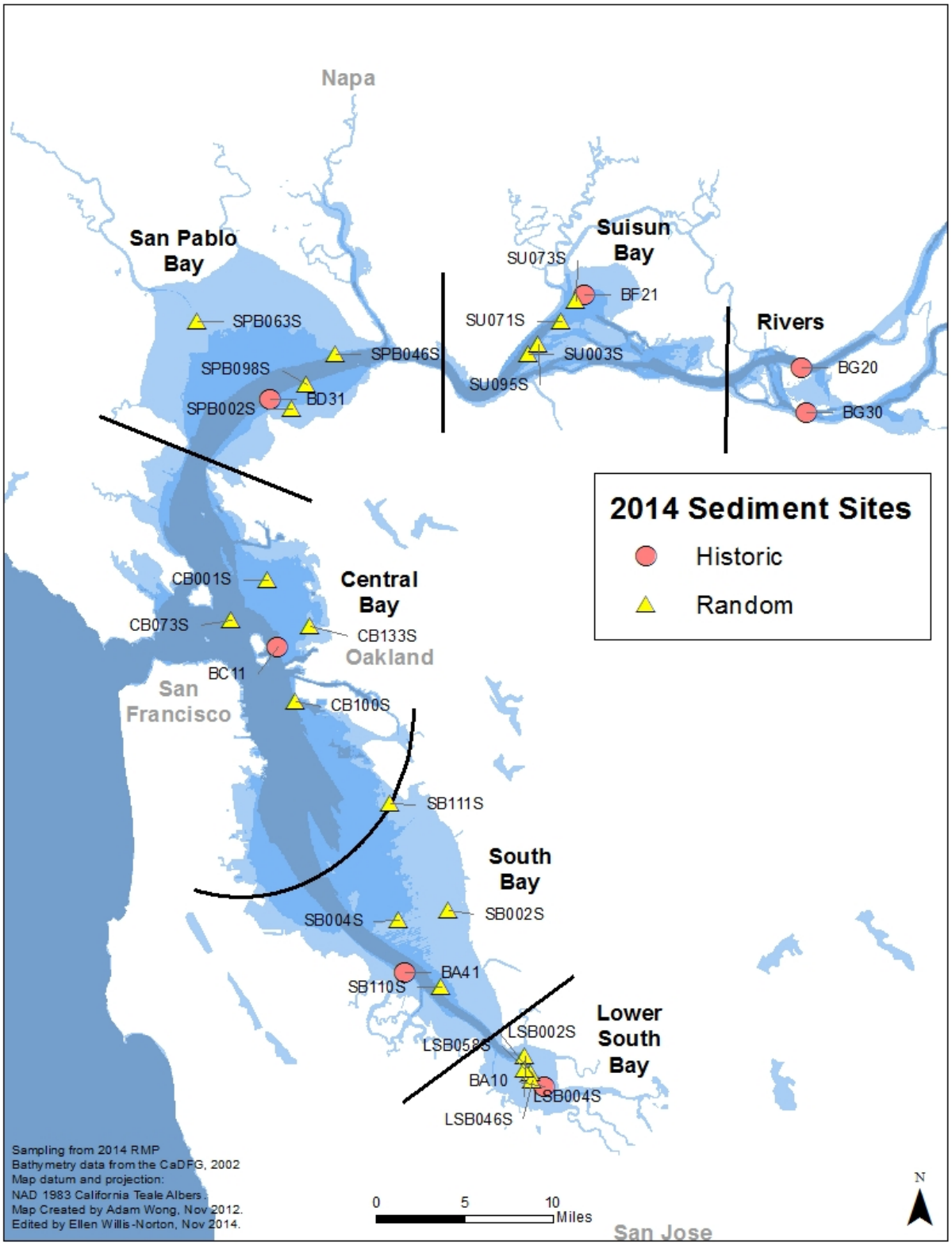

Figure 3.1 Location of 2014 Sediment Stations

FIELD METHODS

All 2014 sediment samples were collected aboard the *RV Turning Tide* operated by the U.S. Geological Survey (USGS) during August 5, 2014 – August 15, 2014.

Shipboard Measurements

Conductivity, Temperature, and Depth (CTD) measurements were taken by Applied Marine Sciences (AMS-CA) at each site. A Sea-Bird SBE19 CTD instrument was used to measure water quality parameters at depths throughout the water column. At each site, the CTD instrument was lowered to approximately one meter below the water surface and allowed to equilibrate to ambient temperature for 3 minutes. Following the sampling, the instrument was then lowered to the bottom at approximately 0.15 meters per second and raised. However, only data from the down cast were kept. Data were downloaded onboard the ship and processed in the laboratory using Sea-Bird software.

The CTD instrument measured water temperature, conductivity, pressure, dissolved oxygen, and backscatter at a sampling rate of two scans per second. These data were compiled and averaged into 0.25 m depth bins during processing. At this time, salinity (based on conductivity measurements), and depth (based on pressure) were calculated from the recorded measurements.

Measurements of Oxidation-Reduction Potential (ORP) and pH in the sediment were taken by SFEI staff at each site.

- Measurements of *in situ* pH were recorded onboard the sampling vessel by submerging a Hach™ pH probe directly into the sediment sample to approximately 1" in depth after the Van Veen grab was brought on deck. A total of four measurements (two from each grab) were recorded at each station.
- Sediment ORP was measured in a cored sub-sample of the Van Veen by probe inserted (WTW Sentix ORP, KCl electrolyte) to depths of 1 cm and 6 cm from the sediment surface, and 1 cm from the core bottom. The probe was equilibrated for 10 minutes before recording each measurement.

Sediment Sampling Field Methods

Multiple (two to three) sediment grabs were taken at each site, with sediment sub-samples collected for ancillary and chemical analyses. Sediment samples were collected using a Young-modified Van Veen grab with a surface area of 0.1 m^2. The grab is made of stainless steel, and the jaws and doors are coated with Dykon® (formerly known as Kynar®) to make them chemically inert. All scoops, buckets, and stirrers used to collect and homogenize sediments are constructed of Teflon® or stainless steel coated with Dykon®. Sediment sampling equipment was thoroughly cleaned (sequentially with detergent, acid, methanol, and rinsed with ultrapure water) at each sampling location prior to each sampling event. In order to further minimize sample contamination, personnel handling samples wore gloves and employed adapted clean hands techniques. The sampling crew handling sample materials did not contact any materials or equipment that were not already otherwise in contact with the sample (the grab, compositing buckets, etc).

To ensure the quality of the sediment samples, each grab must satisfy several criteria in order to be accepted: complete closure, no evidence of sediment washout through the doors, even distribution of sediment in the grab, minimum disturbance of the sediment surface, and minimum overall sediment depth appropriate for the sediment type. Overlying water was drained off an accepted grab. The top 5 cm of sediment was collected from each of the

grabs (avoiding portions cored or probed) and placed in a compositing bucket to provide a single composite sample for each site. Between sample grabs, the compositing bucket was covered with aluminum foil to prevent airborne contamination. After all sediment grabs (or at least two if complications prevented collection of sufficient material within 20 minutes) were placed into the compositing bucket, the bucket was taken into the ship's cabin and thoroughly mixed to obtain a uniform, homogeneous mixture. Aliquots were subsequently split into appropriate containers for analysis of sediment quality, trace metals and trace organics, trace metals archive and trace organics archive.

A separate sediment grab was taken for collection of perfluorinated compounds, precursors and total organic fluorine. These samples were collected directly from the grab into the sample container, avoiding any areas that may have come into contact with the Dykon® coated grab.

Difficulties Encountered

Several samples were compromised to some extent during the collection or shipping and handling phase of the project. Actions taken to address specific issues are listed below:

- The BRL trace metals sample at station SB111S was inadvertently not collected while on station. This omission was noted shortly after leaving the site, and the corrective action taken was to allocate one of the two trace metals archive samples for this analysis. Therefore, only a single trace metals archive container remains for the site.
- Water and sediment samples shipped to Environment Canada (EC) were held up in customs for approximately one week due to inability of the broker to obtain release of the shipment in a timely fashion. As the broker is contracted to Environment Canada, the RMP or AMS had no ability to affect a more timely release of materials. Follow-up discussions with the Environment Canada representative, Xiowa Wang, suggested that samples arrived in acceptable condition to support analyses.

Laboratory Methods

SFEI contracts with a number of laboratories that provide high quality analytical services. The laboratories and analytical methods that were used to measure target analytes for the RMP Status and Trends Program are presented in Table 3.1 below. Additional target analytes for special studies or *pro bono* research by collaborators are listed below the table. SFEI maintains copies of the detailed protocols for all laboratory analyses – please contact Amy Franz (amy@sfei.org) for more details.

Table 3.1 Target Sediment Analytes: A summary table of the 2014 target analytes, analytical laboratories, reporting units, and method codes.

Analyte	Analytical lab*	Reporting Unit	Method #
Total Solids	BRL/ALS/CCSF/ DFG-WPCL /EBMUD	%	Various
Depth	AMS	m	RV Turning Tide Depth Meter
pH (porewater, interstitial sediment)	AMS	pH	Cole Parmer pH meter Model 20
Sediment Grain Size	ALS	% dw	ASTM D422
Total Solids	ALS	%	Total Solids Method EPA 160.3
Total Organic Matter	ALS	% dw	Walkley-Black
CHN	ALS	% dw	ASTM D5291-09
Aluminum (Al)	CCSF	mg/Kg dw	EPA 6020A, modified
Cadmium (Cd)	CCSF	mg/Kg dw	EPA 6020A, modified
Copper (Cu)	CCSF	mg/Kg dw	EPA 6020A, modified
Iron (Fe)	CCSF	mg/Kg dw	EPA 6020A, modified
Lead (Pb)	CCSF	mg/Kg dw	EPA 6020A, modified
Manganese (Mn)	CCSF	mg/Kg dw	EPA 6020A, modified
Nickel (Ni)	CCSF	mg/Kg dw	EPA 6020A, modified
Silver (Ag)	CCSF	mg/Kg dw	EPA 6020A, modified
Zinc (Zn)	CCSF	mg/Kg dw	EPA 6020A, modified
Arsenic (As)	BRL	mg/Kg dw	EPA 1638, modified
Mercury (Hg)	BRL	mg/Kg dw	EPA 1631 E, Appendix
Mercury, Methyl (MeHg)	BRL	µg/Kg dw	EPA 1630, modified
Selenium (Se)	BRL	mg/Kg dw	EPA 1638, modified
PAHs	EBMUD	µg/Kg dw	EPA 8270 Mod.
PCBs 209	EBMUD	µg/Kg dw	EPA 1668A
Pesticides	EBMUD	µg/Kg dw	EPA 1668A, modified
PBDEs	EBMUD	µg/Kg dw	EPA 1614, modified
Fipronil (part of pesticide analysis)	EBMUD	µg/Kg dw	EPA 1668A, modified
PFC compounds	AXYS	µg/Kg dw	AXYS MLA-041 using LC-MS/MS
Perfluoroalkyl precursors (PFAA)	AXYS	µg/Kg dw	AXYS MLA-095 using LC-MS/MS
Polyfluorinated phosphonates (PFPA)	AXYS	µg/Kg dw	AXYS MLA-093

*see Appendix 1 for a list of acronyms

In 2014, several requests were made by researchers outside of the RMP to collect samples to support their research during the 2014 cruise. These requests were accommodated alongside regular S&T sampling with minimal disruption to regularly planned sampling activities.

- Sediment was collected for analysis of total organic fluorine (at 10 sites) by the California Department of Toxic Substances Control
- Water and sediment samples were collected for analysis of hindered phenols (at 12 sites) by Environment Canada
- Sediment was collected for analysis of alternative flame retardants (at 10 sites) by Southern Illinois University for a RMP Emerging Contaminants special study
- Sediment was collected for analysis of microplastics (at 10 sites) by SUNY Fredonia for a RMP Emerging Contaminants special study
- Sediment was collected for analysis of triclosan and hydroxylated polybrominated diphenyl ethers (at 24 sites) by the University of Minnesota (UMN)
- Sediment was collected for analysis of quaternary ammonium compounds (South and Lower South Bay, 10 sites) by Stony Brook University (SBU)

REFERENCES FOR ADDITIONAL DETAILS

2014 Sediment Cruise Report - http://www.sfei.org/sites/default/files/biblio_files/2014_RMP_Sediment_Cruise_Report_Final.pdf

Quality Assurance Project Plan – http://www.sfei.org/sites/default/files/biblio_files/2014_RMP_QAPP_1.pdf

4. BIVALVE MONITORING

BACKGROUND

The RMP has been analyzing bivalve tissue samples for trace contaminants since 1993. The RMP is continuing the long-term monitoring of the State Mussel Watch Program, which monitored sites throughout the Estuary beginning in 1976. Bivalve monitoring was conducted annually from 1993-2006. Biennial monitoring began after 2006, with sampling conducted in 2008, 2010, 2012, and 2014. Biennial bivalve monitoring is planned to continue for at least the next 10 years.

SAMPLING SITES

The bivalve sampling sites fall into three categories.

Bivalve Transplant Sites (n=7). Mussels (*Mytilus californianus*) were collected from Bodega Head, an uncontaminated "background" site of known chemistry, and transplanted to 7 targeted sites within the Bay. Three transplant sites were within the Lower South Bay-South Bay, two transplant sites were in Central Bay and two transplant sites were in San Pablo Bay. Three of the 7 transplant sites serve as back-ups in case something goes wrong with the transplants at one of the primary sites.

Resident Bivalve Sites (n=2). Resident clams (*Corbicula fluminea*) were collected from 2 sites: BG20 on the Sacramento River and BG30 on the San Joaquin River.

"Time Zero" (T-0) Bivalve Site (n=1): A subset of the mussels from Bodega Head are stored and then analyzed after the 100-day deployment period along with the transplanted samples. A new batch of mussels from Bodega Head is collected after 100 days to use a control for mussel growth during the 100-day deployment.

Station names, codes, location, and sampling dates for the 2014 monitoring effort are listed in Appendix 2 and shown in Figure 4.1.

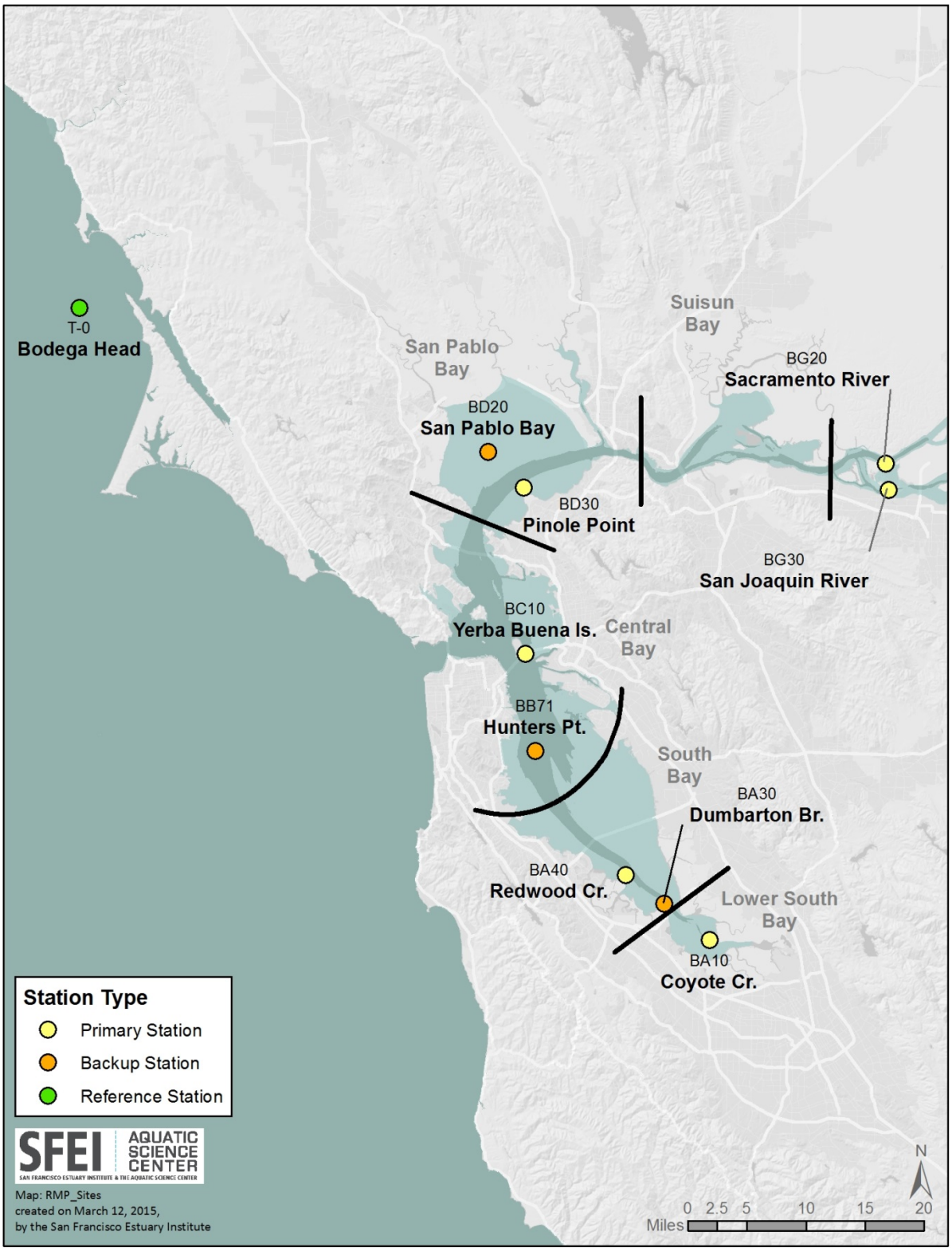

Figure 4.1 Map of 2014 Bivalve Monitoring Stations

FIELD METHODS

The RMP sampling plan for bivalve sampling is to transplant the samples during the dry season, usually in June, and retrieve the samples after approximately 100 days. In 2014, the samples were collected on May 16, transplanted on June 10-12 and retrieved on September 16-19.

Bivalve Sample Collection Methods

At each transplant site, 240 mussels were randomly allocated and placed into predator resistant cages for deployment. Mussels of approximately the same shell length were used (49-81 mm). The same number was also used for the reference (T-0) sample, which was used to provide a baseline on "pre-deployment" tissue condition before deployment.

The cages were constructed out of rigid plastic mesh and PVC pipe. The mesh overlapped around itself to keep predators from slipping through any gaps between the edges. After the cages were built, they were soaked in water for at least a day to remove potential contamination associated with the adhesives used for the construction.

At each site, a line ran from the bottom of the fixed structure out to the bivalve mooring, which consisted of a large screw (earth anchor) that was threaded into the bottom and was associated with pilings or other permanent structures. A large subsurface buoy was attached to the earth anchor by a one to two meter line. The bivalve cages were attached to the buoy line, which kept the bivalves off the bottom to prevent smothering. Since the beginning of the program, loss of a mooring has occurred on only two occasions, probably due to being ripped out by a vessel anchor. Mooring installation, bivalve deployment, and retrieval were all accomplished by SCUBA divers.

Upon retrieval, the bivalve cages were cut off the buoy line and taken to the surface. On the vessel, the number of dead organisms was recorded. Bivalves allocated for trace organic, selenium, microcystin, siloxane, and alternative flame retardants analyses were not rinsed, wrapped in two layers of aluminum foil, placed in 2-gallon zip-top bags and placed on dry ice. Bivalves allocated for growth analysis were rinsed in the field to remove overlying mud, placed in 2-gallon zip-top bags and placed on dry ice. Over the course of deployment, the bivalve cages at site Coyote Creek (BA10) were covered by three to four feet of sediment, mainly sand and shell hash, causing complete mortality. Bivalves from the backup site, Dumbarton Bridge (BA30), were analyzed in place of the planned BA10 location.

Resident clams at sites BG20 and BG30 were collected using a clam dredge approximately two feet wide by three feet long and 50 pounds in weight. The dredge was deployed from a boat and was dragged along the bottom. When brought to the surface, the clams were placed into a clean plastic container and packaged for organics analysis. At both sites, there were not enough clams encountered for all of the intended analyses. At site BG20, there was only enough sample for PCB and PBDE analyses. At site BG30, there was only enough sample for PCB, PAH, and PBDE analyses.

Based on findings by Stephenson (1992) during the RMP Pilot Program, bivalve guts were not depurated before homogenization for tissue analyses. However, sediment in bivalve guts may contribute to the total tissue concentration for trace organic contaminants.

Shipboard Measurements

CTD profiles were collected at each bivalve site during both deployment and retrieval cruises to help determine how ambient environmental factors affect the transplanted bivalves. Salinity, dissolved oxygen, temperature, and total suspended solids impact bivalve health and could affect contaminant bioaccumulation rates.

LABORATORY METHODS

SFEI contracts with a number of laboratories that provide high quality analytical services. The laboratories and analytical methods that were used to measure target analytes for the RMP Status and Trends Program are presented in Table 4.1 below. Additional target analytes for special studies or *pro bono* research by collaborators are listed below the table. SFEI maintains copies of the detailed protocols for all laboratory analyses – please contact Amy Franz (amy@sfei.org) for more details.

Table 4.1 Target Analytes: A summary table of the 2014 target analytes, field preparation codes, analytical laboratories, reporting units, and method codes

Analyte	Analytical Lab	Reporting Unit	Method #
Growth	AMS	g	AMS-CA Growth SOP
PAHs	AXYS	ng/g (ppb)	EPA 8270M
PBDEs	AXYS	ng/g (ppb)	EPA 1614M
PCBs	AXYS	ng/g (ppb)	EPA 1668AM
Selenium	BRL	ug/g (ppm)	EPA 1638M

In 2014, several requests were made by researchers outside of the RMP to collect samples to support their research during the 2014 cruise. These requests were accommodated alongside regular S&T sampling with minimal disruption to regularly planned sampling activities. Samples collected for these studies are listed below.

- Alternative flame retardants by Southern Illinois University (SIU) for a RMP Emerging Contaminants Special Study
- Microcystin analysis in bivalves by Kudela Laboratory, UC Santa Cruz for a Nutrient Management Strategy study
- Siloxanes analysis by Environment Canada

Bivalve Growth and Survival

Applied Marine Sciences (AMS) calculated the growth mean of transplanted bivalves as a measure of bivalve health measure. The growth mean is a measure of growth of the composite of bivalves at a particular site in comparison to the T-0. The growth mean was determined by taking the dry weight of each individual and subtracting the mean

dry weight of the T-0 for that species. This calculation was done for each individual bivalve. The mean of the difference of all the individuals at a particular site was then calculated to give the growth mean.

REFERENCES FOR ADDITIONAL DETAILS

2014 Bivalve Deployment Cruise Report - http://www.sfei.org/sites/default/files/biblio_files/2014_RMP_Bivalve_Deployment_Cruise_Plan_Final.pdf

2014 Bivalve Retrieval Cruise Report – http://www.sfei.org/sites/default/files/biblio_files/2014_RMP_Bivalve_Retrieval_Cruise_Report_Final.pdf

Quality Assurance Project Plan – http://www.sfei.org/sites/default/files/biblio_files/2014_RMP_QAPP_1.pdf

5. SPORT FISH MONITORING

BACKGROUND

The purpose of this field effort was to collect sport fish for a seventh season (prior sampling years were 1994, 1997, 2000, 2003, 2006, and 2009) in the ongoing study of contamination in San Francisco Bay sport fish.

The core of the sport fish monitoring program targets species that are frequently caught and consumed by Bay anglers at popular fishing areas in the Bay. This monitoring provides information on long-term trends in mercury, PCBs, PBDEs, PFCs, and dioxins. In 2014, this monitoring program no longer included analyses for legacy pesticides, but included analyses for PFCs, which began in 2009.

In 2014, the program also included analyses for selenium, which will be used support the development of a selenium TMDL in the North Bay. Selenium concentrations were analyzed in several species, including shiner surfperch, striped bass, jacksmelt, and white sturgeon. In white sturgeon, the proposed target species in the selenium TMDL under development, selenium concentrations were measured in muscle fillets, muscle plugs, and ovaries. White sturgeon muscle fillets were also analyzed for carbon, nitrogen, and sulfur isotopes, which will provide information on sturgeon diet and habitat use and may offer some insight into possible drivers of observed selenium concentrations.

In 2015, leftover funds from the 2014 sport fish monitoring program will be used to run additional analyses on striped bass caught in the Artesian Slough, near the outfall of the San Jose-Santa Clara Regional Wastewater Facility (SJSCRWF). Results from this study will provide information about the impact of effluent from the SJSCRWF on persistent organic pollutant and trace metal concentrations in sport fish. Funding provided by the SJSCRWF will allow for analysis of mercury, PCBs, PBDEs, and PFCs in largemouth bass and carp caught in Artesian Slough. This sampling effort is not included in this report but a sampling plan for the Artesian Slough is available (SFEI, 2015).

SAMPLING SITES

In 2014, sport fish samples were collected at eight sampling locations. Sport fish have been monitored at five of these sampling locations since monitoring began as part of the RMP in 1994. Additional sampling occurred in Suisun Bay to support the development of the selenium TMDL in the North San Francisco Bay. Collection of core monitoring species occurred in all areas according to the study design.

Station names, codes, location, and sampling dates for the 2014 monitoring effort are listed in Appendix 2 and shown in Figure 5.1.

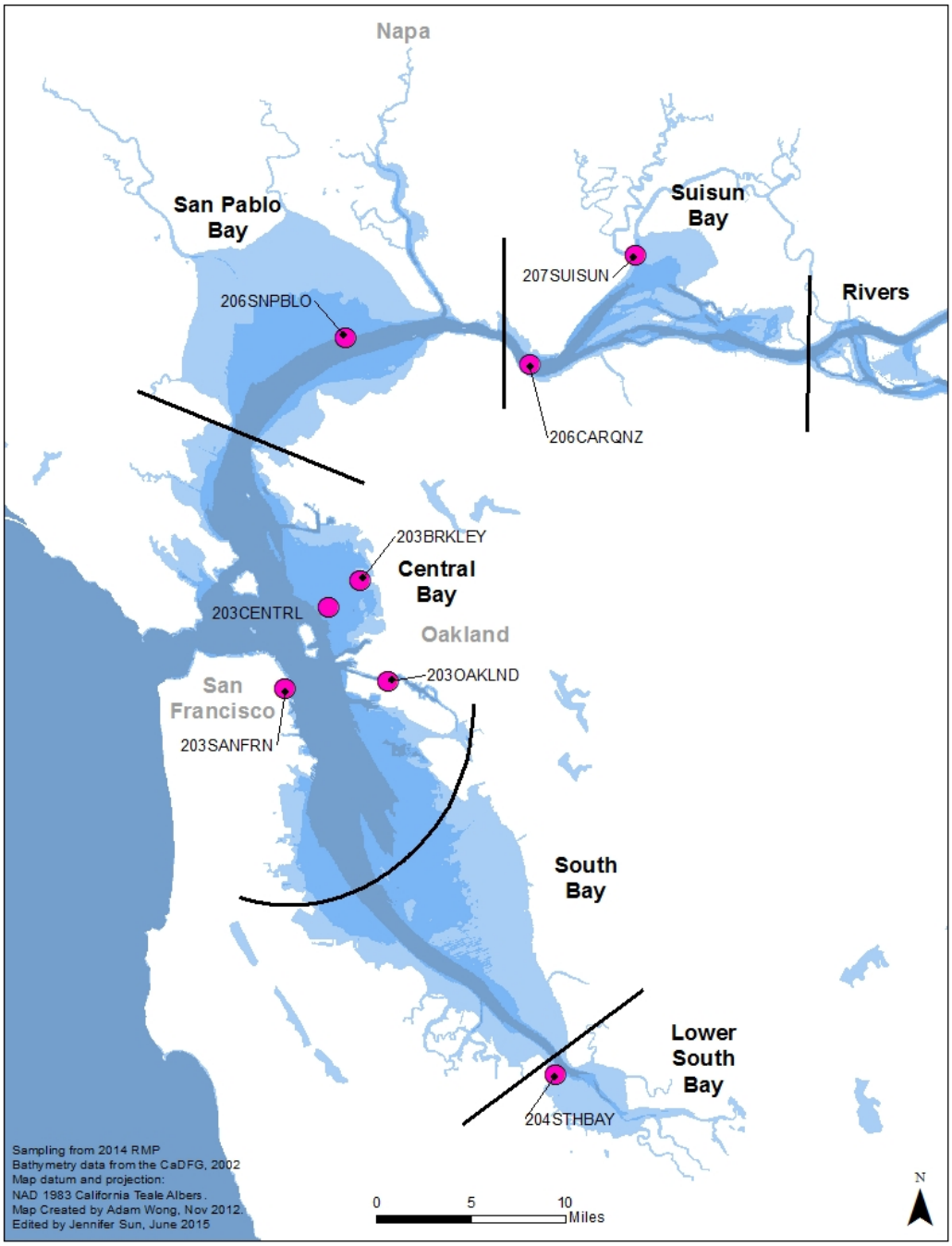

Figure 5.1 Map of 2014 Sport Fish Monitoring Stations

FIELD METHODS

Sport fish samples were collected by Coastal Conservation & Research (CC&R) over a 3.5 month period (April 21st through August 7th, 2014) across eight trips. CC&R conducted sampling on 35 days, and were successful in catching fish on 32 of these days. In addition, the RMP coordinated with the Department of Fish and Wildlife's Herring Project, which provided samples of herring caught in December 2013.

Field crews conducted or set 213 otter trawl, gill net, and hook and line events, with 69 of these events successful in catching targeted fish. A total of 1,660 fish were caught and kept for potential chemical analyses, meeting or surpassing the study design objectives depending on the fish species. Collection of core monitoring species occurred in all areas according to the study design (Table 5.1). Non-target species collected included pacific sardines, white perch, pile perch, barred surfperch, and walleye perch (categorized as "other surfperch"). Several rubberlip perch were collected but not processed or analyzed. Table 5.1 lists the species and target size range of the fish collected.

All fish were processed on the sampling vessel immediately after being caught in a similar manner to previous RMP fish sampling events (SFEI, 1999). Total length and total body mass of each fish were measured in the field. Larger fish were partially processed to allow them to be stored and transported frozen in the field. Tissue samples were preserved on dry ice immediately after field processing. Precautions were taken to keep all preparations away from possible contamination, such as vessel exhaust. The tissue samples of all species were prepared as muscle fillets without skin except white croaker, shiner surfperch, northern anchovy, staghorn sculpin, and pacific sardine, which were prepared including the skin and skeleton but no scales, head, tail or guts.

Fish samples were sent to Moss Landing Marine Laboratories (MLML), where samples were fully dissected and aliquots from each fish were extracted and homogenized into composite samples using methods established during previous RMP fish sampling events (SFEI, 1999). Composites were formed from fish within the same size class, and equal weight fillets were taken from each fish in the composite. The length of the smallest fish in each composite was no less than 75% of the length of the largest fish, except for California halibut composites and where noted by MLML. In these cases, this 75% rule was unable to be met when the number of fish collected of a particular species was limited (i.e., other surfperch) or limited at each sampling site (i.e., California halibut). Table 5.1 lists the target number of fish per composite for each species, as well as the target and actual number of composites analyzed for each analytical parameter (actual number of composites / target number of composites).

Sport fish monitoring is inherently variable and difficult to execute exactly according to plan. The analyses that occurred do not reflect original laboratory contracts, but match the field work plan approved by the RMP lead scientist and the compositing recommendations approved by the lead RMP scientist and MLML staff. Table 5.1 shows that samples were collected roughly according to the plan for 8 of the 10 target species. The substantial deviations from the original plan were:

1. Analyses on Pacific herring were not conducted, because samples were received by the compositing laboratory past the sample hold time for omega-3 fatty acids, a primary contaminant of interest.
2. White croaker samples were processed as whole body with no head, tail, or guts instead of muscle fillets with skin off as originally intended. All laboratory analyses were run on the improperly processed white croaker samples.
3. Shiner surfperch were analyzed for 40 PCBs rather than 209 PCBs. The sport fish monitoring element typically includes analysis of the 40 PCBs. The PCB workgroup recommended periodically testing this indicator species for the full list of 209 PCBs, but in 2014 the group agreed to reduce costs by analyzing only 40 PCBs and using the remaining budget to fund sport fish sampling and analysis in the Artesian Slough. This sampling is scheduled to occur in June-July 2015.
4. Striped bass of the target sizes (45-82 cm) were mistakenly analyzed for mercury in 6 composite samples (3 fish per composite) rather than 18 individual samples as planned. However, 4 individual large (> 82 cm) and 2 juvenile striped bass (< 42 cm) were analyzed for mercury.

Table 5.1 RMP sport fish sampling summary: a summary table of the 2014 target species, size range, number of fish per composite, tissue type, and actual number of composites or individuals analyzed for each analytical parameter versus the target number

Species	Target size range (cm, total length)	Target # fish per composite	Tissue Sample Type	Number of Samples Analyzed (actual / target)									
				PCB-40	PBDE	PFC	Dioxin	Hg	Se	C,N Iso-topes	S Iso-topes	Omega 3	PCB-209
TARGET SPECIES													
Pacific Herring[1]	>16.5	20-30+	Whole body with no head, tail or guts	0/3				0/3					
Pacific Herring[1]	>16.5	20-30+	Muscle fillets with skin off	0/2				0/2				0/2	
White croaker[2]	20–30	5	Muscle fillets with skin off	0/12		0/3	0/12	0/12	0/12				
White croaker[2]	20–30	5	Whole body with no head, tail or guts	12/0		3/0	12/0	12/0	12/0				
Shiner surfperch	10–15	20	Whole body with no head, tail or guts	16/18	16/18	3/3	16/18	16/18	16/18				0/18
Striped bass	Small: 45-59	3	Muscle fillets with skin off	4/3		1/1		4/0	4/3				
Striped bass	Medium: 60-82	3	Muscle fillets with skin off	2/3		2/2		2/0	2/3				
Striped bass	Small: 45-59	1 (Individual Fish)	Muscle fillets with skin off					0/9					
Striped bass	Medium: 60-82	1 (Individual Fish)	Muscle fillets with skin off					0/9					
Striped bass	Juveniles: < 42 cm	1 (Individual fish)	Muscle fillets with skin off					4/0					
Striped bass	Large: > 82 cm	1 (Individual fish)	Muscle fillets with skin off					2/0					
White sturgeon	102-152 fork length (legal size)	4	Muscle fillets with skin off	4/4		3/3		4/4					

Species	Target size range (cm, total length)	Target # fish per composite	Tissue Sample Type	Number of Samples Analyzed (actual / target)									
				PCB-40	PBDE	PFC	Dioxin	Hg	Se	C,N Iso-topes	S Iso-topes	Omega 3	PCB-209
White sturgeon	102-152 fork length (legal size)	1 (Individual Fish)	Muscle fillets with skin off						12/12	12/12	12/12		
White sturgeon	102-152 fork length (legal size)	1 (Individual Fish)	Muscle Plugs with skin off						12/12				
White sturgeon	102-152 fork length (legal size)	1 (Individual Fish)	Ovary						3/0				
Northern anchovy	Legal size	20-30+	Whole body with no head, tail or guts	6/6				6/6					
Staghorn sculpin	> 10.0	20	Whole body with no head, tail or guts	4/3				4/3					
Black perch	> 15.0	10	Muscle fillets with skin off	3/3				3/3					
California halibut	55-92	3	Muscle fillets with skin off					3/3	3/3				
Jacksmelt	21-30	5	Whole body with no head, tail or guts					6/4	6/4				
NON-TARGET SPECIES													
Pacific sardine	20-30[3]	10	Whole body with no head, tail or guts	1/0									
Other surfperch[4]	>16.0	variable	Muscle fillets with skin off	5/0				5/0					

1 – Pacific herring samples were not processed or analyzed because they were received past their hold time (1 year).

2 – White croaker samples were intended to be prepared as fillets without skin. In 2014, samples were mistakenly prepared as whole body composites with no head, tail, or guts. All analyses were run on these samples except for selenium, which was only run on two of the improperly composited samples.

3 – Pacific sardine was not a target species during this sampling cruise. Fish included in this composite ranged from 24.4 – 27.6 cm in length.

4 – Other surfperch include:

Barred surfperch – 1 composite of 3 fish, did not meet 75% rule

Pile perch – 1 composite of 10 fish, did not meet 75% rule

White perch – 2 composites of 10 fish each

Walleye – 1 composite of 7 fish

LABORATORY METHODS

SFEI contracts with a number of laboratories that provide high quality analytical services. The laboratories and analytical methods that were used to measure target analytes for the RMP Status and Trends Program are presented in Table 5.2 below. SFEI maintains copies of the detailed protocols for all laboratory analyses – please contact Amy Franz (amy@sfei.org) for more details.

The number of target and actual number of samples analyzed for each analytical parameter is listed in Table 5.1. Percent moisture was reported by each lab for each composite or individual fish sample analyzed for metals or organics. Percent lipid was reported by each lab for each composite sample analyzed for organic compounds.

Table 5.2 RMP Status and Trends Program Target Analytes: A summary table of the 2014 target analytes, field preparation codes, analytical laboratories, reporting units, and method codes

Analyte	Analytical Lab	Reporting Unit	Method #
PCB (40 congeners)	SJSURF (WPCL)	ng/g ww	EPA 8082M
PBDE	SJSURF (WPCL)	ng/g ww	EPA 8081BM
Mercury (Hg)	SJSURF (MLML)	µg/g ww	EPA 7473
Selenium (Se)	SJSURF (MLML)	µg/g ww	EPA 200.8
PFC	AXYS	ng/g ww	MLA-043 Rev 08
Dioxin	AXYS	pg/g ww	MLA-017 Rev 20
$\delta^{13}C$ isotope	UCR	$\delta^{13}C$ ‰ vs VPDB	Reston Stable Isotope Laboratory Code 1832, Book 10 Section C
$\delta^{15}N$ isotope	UCR	$\delta^{15}N$ ‰ vs Air-N2	Reston Stable Isotope Laboratory Code 1832, Book 10 Section C
$\delta^{34}S$ isotope	UCD	$\delta^{34}S$ vs. VCDT	UCD-ISF-EASU01.1 (EA-IRMS)
Moisture	SJSURF (MLML, WPCL), AXYS	%	
Lipids	SJSURF (WPCL), AXYS	%	

REFERENCES FOR ADDITIONAL DETAILS

2014 Sport Fish Cruise Report – http://www.sfei.org/sites/default/files/biblio_files/2014_RMP_Sportfish_Cruise_Report_Final.pdf

Quality Assurance Project Plan – http://www.sfei.org/sites/default/files/biblio_files/2014_RMP_QAPP_1.pdf

6. BIRD EGG MONITORING

BACKGROUND

Triennial Double-crested Cormorant and Forster's Tern bird egg monitoring was incorporated into the RMP's Status and Trends Program in 2009. Substantial monitoring of eggs (cormorant in 2002, 2004, and 2006, and tern in 2002 and 2003) were previously conducted through RMP Exposure and Effects Pilot Studies. Cormorant eggs are collected at Wheeler Island, Richmond Bridge, and South Bay PG&E towers and analyzed for mercury, selenium, PBDEs, PCBs, PFCs, and pesticides. Tern eggs are collected at six sites, primarily in the South Bay, and analyzed for mercury, selenium, and PBDEs. In 2013 and 2014 bird eggs were not collected.

7. DATA ACCESS AND REPORTS

ANNUAL MONITORING ONLINE GRAPHICS AND DATA ACCESS TOOLS

Web Tools: Contaminant Data Display and Download (CD3)

The RMP Status and Trends data are available online using a dynamic mapping and graphing tool. The online Contaminant Data Display and Download (CD3, http://cd3.sfei.org) can be used to view, summarize, or download all water, sediment, and tissue monitoring results that have met specific data quality objectives and have passed a rigorous QA/QC evaluation as outlined in the RMP's Quality Assurance Project Plan.

All of the 2013 RMP data that passed the QA/QC protocols are available through CD3. The 2014 data are not yet available because they still being quality assured. Although the CTD profile data are not available for download using the CD3, SFEI maintains these data in a database. Data are available upon request (contact Cristina@sfei.org).

Several software programs were used to develop the online graphics in CD3. The R statistical analysis software package *spsurvey*, which is designed specifically by EPA for GRTS sample designs was used to calculate estimates of the regional and Estuary-wide contaminant mean, variance, standard deviation, standard error, and CDFs. The R program is an implementation of the S language developed at AT&T Bell Laboratories and can be downloaded for free from the Comprehensive R Archive Network (CRAN). The spsurvey library for the analysis of probability surveys is available from USEPA's Aquatic Resources Monitoring - Monitoring Design and Analysis. In the calculations, values reported below the method detection limit (MDL) are estimated to be ½ of the MDL in all calculations and graphics. Some organic compounds are summed based on the target list of RMP congeners (*Appendix 4*) for that specific compound group (e.g., PBDEs, PAHs, and PCBs). When laboratory or field replicate data are available, the average of all the replicate concentrations is provided.

8. REFERENCES

SFEI. 1999. Contaminant Concentrations in Fish from San Francisco Bay, 1997. San Francisco Estuary Institute, Richmond, CA.

SFEI. 2014. Quality Assurance Program Plan for The Regional Monitoring Program for Water Quality in San Francisco Bay. San Francisco Estuary Institute, Richmond, CA.

SFEI. 2015. Sampling and Analysis Plan for Sport Fish in Artesian Slough. San Francisco Estuary Institute, Richmond, CA.

Flegal, A.R. and V.J. Stukas. 1987. Accuracy and precision of lead isotopic composition measurements in seawater. *Marine Chemistry* 22:163-177.

Lowe, S., Thompson, B., Hoenicke, R., Leatherbarrow, J., Taberski, K., Smith, R., and D. Stevens Jr. 2005. Re-design Process of the San Francisco Estuary Regional Monitoring Program for Trace Substances (RMP) Status & Trends Monitoring Component for Water and Sediment. San Francisco Estuary Institute, Oakland, CA.

Solorzano, L., 1969. Determination of ammonia in natural waters by the phenolhypochlorite method. *Limnology and Oceanography* 14:799-801.

U.S. EPA. 1995. Method 1669: Sampling ambient water for trace metals at EPA water quality criteria levels. EPA 821-R-95-034, United States Environmental Protection Agency, Washington, D.C.

Stephenson, M. 1992. A report on bioaccumulation of trace metals and organics in bivalves in the San Francisco Bay submitted to California Regional Water Quality Control Board San Francisco Region. California Department of Fish and Game.

9. APPENDIX TABLES

APPENDIX 1 RMP CONTRACTORS AND PRINCIPAL INVESTIGATORS IN 2013 AND 2014

Acronym	Laboratory/Contractor	Contact
Field Contractors		
AMS	Applied Marine Sciences Livermore, CA	Mr. Paul Salop salop@amarine.com
USGS	United States Geological Survey Sacramento, CA	Mr. Chris Vallee cvallee@usgs.gov Captain, *RV Turning Tide* Ship Captain - Sediment and Water Cruise
RTC	Romberg Tiburon Center Tiburon, CA	Mr. David Morgan dmorgan@sfsu.edu Captain, *RV Questuary* Ship Captain – Bivalve Cruise
Analytical Laboratories		
ALS	ALS Environmental Kelso, WA	Mr. Howard Boone howard.boorse@alsglobal.com Mr. Ralph Poulsen rpoulsen@caslab.com
AXYS	AXYS Analytical Services Ltd. (AXYS), Sidney, BC	Mr. Kalai Pillay kpillay@axys.com
BRL	Brooks-Rand Laboratory Seattle, WA	Ms. Tiffany Stilwater tiffany@brooksrand.com
CCCSD	Central Contra Costa Sanitary District Martinez, CA	Ms. Mary Lou Esparza mesparza@centralsan.org
CCSF	City and County of San Francisco Laboratory San Francisco, CA	Anthony Rattonetti trattonetti@sfwater.org
City of San Jose	City of San Jose, California Environmental Services Dept. San Jose, CA	Jo Andrade-Bunnell 408-945-3711
DFG-WPCL	Department of Fish and Game – Water Pollution Control Laboratory	Mary Curry mary.curry@wildlife.ca.gov

EBMUD	East Bay Municipal Utility District Oakland, CA	Ms. Nirmela Arsem narsem@ebmud.com
UCD	UC Davis Stable Isotope Facility - Department of Plant Sciences Davis, CA	Emily Schick sif@ucdavis.edu
UCR	UC Riverside Riverside, CA	James Sickman james.sickman@ucr.edu

APPENDIX 2 SUMMARY OF 2013 AND 2014 RMP SAMPLING STATIONS

Cruise Type	Region	Site Code	Site Type	Collection Date	Latitude	Longitude	Site Depth (m)
WATER	South Bay	BA30	Historical	2013-07-31	37.51416	-122.13558	4.6
WATER	Central Bay	BC10	Historical	2013-08-02	37.82232	-122.3494	6.1
WATER	Central Bay	BC20	Historical	2013-08-05	37.79199	-122.67404	27.8
WATER	Rivers	BG20	Historical	2013-08-08	38.05983	-121.81085	10
WATER	Rivers	BG30	Historical	2013-08-08	38.02041	-121.80537	10.7
WATER	Central Bay	CB036W	Random	2013-08-02	37.78961	-122.3447	9.8
WATER	Central Bay	CB037W	Random	2013-08-05	37.85417	-122.34626	3
WATER	Central Bay	CB038W	Random	2013-08-02	37.72531	-122.27373	2.7
WATER	Lower South Bay	LSB055W	Random	2013-07-31	37.48458	-122.11815	1.8
WATER	Lower South Bay	LSB056W	Random	2013-07-30	37.48478	-122.08614	3.6
WATER	Lower South Bay	LSB057W	Random	2013-07-31	37.49578	-122.10458	12.2
WATER	Lower South Bay	LSB058W	Random	2013-07-30	37.47475	-122.09463	2.6
WATER	Lower South Bay	LSB060W	Random	2013-07-30	37.48787	-122.09483	2.7
WATER	South Bay	SB064W	Random	2013-08-01	37.61362	-122.2018	3
WATER	South Bay	SB065W	Random	2013-08-01	37.6199	-122.23308	3
WATER	South Bay	SB066W	Random	2013-08-01	37.52519	-122.15136	12.8
WATER	San Pablo Bay	SPB036W	Random	2013-08-06	38.00562	-122.38651	3
WATER	San Pablo Bay	SPB037W	Random	2013-08-06	38.01686	-122.42175	6.1
WATER	San Pablo Bay	SPB038W	Random	2013-08-06	38.03585	-122.3024	4

WATER	Suisun Bay	SU044W	Random	2013-08-07	38.08577	-122.05145	2.3
WATER	Suisun Bay	SU046W	Random	2013-08-07	38.07495	-121.94905	3.4
WATER	Suisun Bay	SU047W	Random	2013-08-07	38.03967	-122.11595	11.6
BIOACCUMULATION	Lower South Bay	BA10	Historical	2014-09-16	37.46983	-122.06383	4.5
BIOACCUMULATION	South Bay	BA30	Historical	2014-09-16	37.51333	-122.13467	2.5
BIOACCUMULATION	South Bay	BA40	Historical	2014-09-16	37.547	-122.195	3
BIOACCUMULATION	Central Bay	BB71	Historical	2014-09-17	37.6955	-122.33967	10.3
BIOACCUMULATION	Central Bay	BC10	Historical	2014-09-17	37.81392	-122.35873	3
BIOACCUMULATION	San Pablo Bay	BD20	Historical	2014-09-18	38.059	-122.42367	2.5
BIOACCUMULATION	San Pablo Bay	BD30	Historical	2014-09-18	38.01667	-122.3675	4.3
BIOACCUMULATION	Sacramento River	BG20	Historical	2014-09-19	38.0557	-121.80593	-88
BIOACCUMULATION	San Joaquin River	BG30	Historical	2014-09-19	38.02362	-121.80048	-88
BIOACCUMULATION	Reference Site	T-0Bodega	Historical	2014-06-11	38.30477	-123.06563	0
SEDIMENT	Lower South Bay	BA10	Historical	2014-08-05	37.46818	-122.06444	2.3
SEDIMENT	South Bay	BA41	Historical	2014-08-06	37.55905	-122.2107	3
SEDIMENT	Central Bay	BC11	Historical	2014-08-07	37.82219	-122.34961	7.4
SEDIMENT	San Pablo Bay	BD31	Historical	2014-08-11	38.02415	-122.36372	6.2
SEDIMENT	Suisun Bay	BF21	Historical	2014-08-12	38.11533	-122.04073	2.3
SEDIMENT	Sacramento River	BG20	Historical	2014-08-13	38.05907	-121.81435	9.4
SEDIMENT	San Joaquin River	BG30	Historical	2014-08-13	38.02288	-121.80834	6.4

SEDIMENT	Central Bay	CB001S	Random	2014-08-07	37.87655	-122.3615	3.8
SEDIMENT	Central Bay	CB073S	Random	2014-08-07	37.84318	-122.39795	13.1
SEDIMENT	Central Bay	CB100S	Random	2014-08-06	37.77725	-122.32939	7.9
SEDIMENT	Central Bay	CB133S	Random	2014-08-07	37.83953	-122.3167	3
SEDIMENT	Lower South Bay	LSB002S	Random	2014-08-05	37.47918	-122.07781	8.7
SEDIMENT	Lower South Bay	LSB004S	Random	2014-08-05	37.49313	-122.08549	2.4
SEDIMENT	Lower South Bay	LSB046S	Random	2014-08-05	37.47322	-122.07744	2
SEDIMENT	Lower South Bay	LSB058S	Random	2014-08-05	37.4813	-122.0848	2.3
SEDIMENT	San Pablo Bay	SB002S	Random	2014-08-06	37.61039	-122.167	2.2
SEDIMENT	San Pablo Bay	SB004S	Random	2014-08-06	37.60085	-122.21859	3.5
SEDIMENT	San Pablo Bay	SB110S	Random	2014-08-05	37.54753	-122.17277	3.7
SEDIMENT	San Pablo Bay	SB111S	Random	2014-08-06	37.69587	-122.22957	2.7
SEDIMENT	South Bay	SPB002S	Random	2014-08-11	38.01672	-122.34073	2.9
SEDIMENT	South Bay	SPB046S	Random	2014-08-11	38.06184	-122.29739	9
SEDIMENT	South Bay	SPB063S	Random	2014-08-11	38.08596	-122.4407	2.1
SEDIMENT	South Bay	SPB098S	Random	2014-08-11	38.03675	-122.32614	6.6
SEDIMENT	Suisun Bay	SU003S	Random	2014-08-12	38.06542	-122.09664	8.7
SEDIMENT	Suisun Bay	SU071S	Random	2014-08-12	38.09327	-122.06348	6.7
SEDIMENT	Suisun Bay	SU073S	Random	2014-08-12	38.11052	-122.04891	2.2
SEDIMENT	Suisun Bay	SU095S	Random	2014-08-12	38.07392	-122.08728	5.5

SPORTFISH	Berkeley Marina	203BRKLEY	Historical	2014-04-21 to 2014-08-07	37.8669	-122.32	N/A
SPORTFISH	Central Bay	203CENTRL	Historical	2014-04-21 to 2014-08-07	37.8452	-122.35	N/A
SPORTFISH	Oakland Inner Harbor	203OAKLND	Historical	2014-04-21 to 2014-08-07	37.7902	-122.29	N/A
SPORTFISH	Central Bay	203SANFRN	Historical	2014-04-21 to 2014-08-07	37.7824	-122.39	N/A
SPORTFISH	Lower South Bay	204STHBAY	Historical	2014-04-21 to 2014-08-07	37.4927	-122.12	N/A
SPORTFISH	San Pablo Bay	206SNPBLO	Historical	2014-04-21 to 2014-08-07	38.0519	-122.34	N/A
SPORTFISH	Suisun Bay	207SUISUN	Historical	2014-04-21 to 2014-08-07	38.1198	-122.06	N/A
SPORTFISH	Carquinez Strait	206CARQNZ	Historical	2014-04-21 to 2014-08-07	38.035	-122.16	N/A

Appendix 3 analytes reported in water samples (1993-2014)

Shaded areas indicate that parameters that were analyzed for RMP Status and Trends Sampling.

Parameter Type Codes: ANC = Ancillary Parameters, ORGS = Organic Parameters, PESTs = Pesticide Parameters, SYN = Synthetic Parameters, TE = Trace Metal parameters, WaterTOX = Toxicity Parameters

* Data available upon request

Reportable Water Parameter	Parameter Type	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2013
Ammonium as N	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Chlorophyll a	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CTD*	ANC		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Dissolved Organic Carbon	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Hardness as CaCO3	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Nitrate as N	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Nitrite as N	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Oxygen, Dissolved	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■
Particulate Organic Carbon	ANC												■	■	■	■	■	■	■	■	■
pH	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■
Pheophytin a	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Phosphate as P	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Salinity (by salinometer)	ANC	■		■	■	■	■	■	■	■	■	■	■	■	■						
Salinity (by SCT)	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Salinity (by Solomat)	ANC					■															
Silica	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
SpecificConductivity	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■
Suspended Sediment Concentration	ANC										■	■	■	■	■	■	■	■	■	■	■
Temperature	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■
Total Suspended Solids	ANC	■	■	■	■	■	■	■	■	■				■	■	■					
Alkanes (C10-C34)	ORGS	■	■	■																	
Dioxins/Furans	ORGS																	■		■	
PAHs (biennially beginning 2008)	ORGS	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			■	
PAHs Alkylated (biennially beginning 2008)	ORGS						■	■	■	■	■	■	■	■	■	■	■			■	
PBDEs (annually)	ORGS										■	■	■	■	■	■	■	■	■	■	
PCBs 209 (biennially beginning 2008)	ORGS																	■		■	
PCBs 40 (biennially beginning 2008)	ORGS	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Pharmaceuticals	ORGS														■						

Reportable Water Parameter	Parameter Type	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2013
Phthalates	ORGS										■	■									
Chlordanes	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Chlorpyrifos	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■				■		■	
Cyclopentadienes	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Dacthal	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
DDTs	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Diazinon	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■				■		■	
Endosulfan I	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Endosulfan II	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Endosulfan Sulfate	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
HCHs	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Hexachlorobenzene	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Mirex	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	
Oxadiazon	PESTs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
p-Nonylphenol	SYN										■	■									
Triphenylphosphate	SYN										■										
Arsenic	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Cadmium	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Chromium	TE	■	■	■	■	■	■	■		■											
Cobalt	TE								■	■	■	■	■	■	■	■	■	■	■	■	■
Copper	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Cyanide	TE	■	■															■		■	■
Iron	TE							■	■	■	■	■	■	■	■	■	■	■	■	■	■
Lead	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Manganese	TE							■	■	■	■	■	■	■	■	■	■	■	■	■	■
Mercury	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Mercury, Methyl	TE							■	■	■	■	■	■	■	■	■	■	■	■	■	■
Nickel	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Selenium	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Silver	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Zinc	TE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Cell Count	WaterTox	■																		■	

Reportable Water Parameter	Parameter Type	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2013
Mean % Normal Development	WaterTox	■	■	■	■	■														■	
Mean % Survival	WaterTox		■	■	■	■	■	■	■	■	■					■				■	
SWI Mean % Normal Alive	WaterTox							■	■	■						■	■			■	

Appendix 4 Analytes reported in sediment samples (1993-2014)

Shaded areas indicate that parameters that were analyzed for RMP Status and Trends Sampling.

Parameter Type Codes: ANC = Ancillary Parameters, ORGS = Organic Parameters, PESTs = Pesticide Parameters, SYN = Synthetic Parameters, TE = Trace Metal parameters, WaterTOX = Toxicity Parameters

* Data available upon request

Reportable Sediment Parameter	Parameter Type	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
% Solids	ANC		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Ammonia	ANC			■	■	■	■	■	■	■													
CTD*	ANC		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Eh*	ANC											■	■	■	■	■	■	■	■	■	■		■
Grainsize - Clay <0.0039 mm	ANC																■	■	■	■	■		
Grainsize - Clay <0.005 mm	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			■	■	■		■
Grainsize - Fine <0.0625 mm	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Grainsize - Granule + Pebble 2.0 to <64 mm	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■		■
Grainsize - Sand 0.0625 to <2.0 mm	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Grainsize - Silt 0.0039 to <0.0625 mm	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Hydrogen Sulfide	ANC			■	■	■	■	■	■	■													
pH	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Total Nitrogen	ANC	■					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Total Organic Carbon	ANC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Total Sulfide	ANC			■	■	■	■	■	■	■													
Benthos	Benthos																■	■	■	■	■		
Dioxins/Furans	ORGS																	■	■				
PAHs	ORGS	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
PAHs Alkylated	ORGS	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
PBDEs	ORGS										■		■	■	■	■	■	■	■	■	■		■
PCBs 209	ORGS																	■	■	■	■		■
PCBs 40	ORGS	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■		■
Phthalates	ORGS										■	■											
Chlordanes	PESTs	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■		■
Cyclopentadienes	PESTs	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■		■
DDTs	PESTs	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■		■
Fipronil	PESTs																	■	■	■	■		■
HCHs	PESTs	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■		■

Hexachlorobenzene	PESTs																						
Mirex	PESTs																						
Pyrethroids	PESTs																						
Mean % Normal Alive	SedTox																						
Mean % Survival	SedTox																						
p-Nonylphenol	SYN																						
Aluminum	TE																						
Arsenic	TE																						
Cadmium	TE																						
Copper	TE																						
Chromium	TE																						
Iron	TE																						
Lead	TE																						
Manganese	TE																						
Mercury	TE																						
Mercury, Methyl	TE																						
Nickel	TE																						
Selenium	TE																						
Silver	TE																						
Zinc	TE																						

Appendix 5 Analytes Reported in Bivalve Samples (1993-2014)

Shaded areas indicate that parameters that were analyzed for RMP Status and Trends Sampling.

Parameter Type Codes: ANC = Ancillary Parameters, EC=Emerging Contaminants, ORGS = Organic Parameters, PESTs = Pesticide Parameters, SedTOX = Toxicity Parameters, SYN = Synthetic Parameters, TE = Trace Metal parameters

* Data available upon request

Reportable BivalveTissue Parameter	Parameter Type	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007[1]	2008	2009	2010	2011	2012	2013	2014
% Moisture	ANC		■	■	■	■	■	■	■	■	■	■	■		■		■		■		■		■
% Solids	ANC	■	■	■	■	■	■	■	■	■	■	■	■				■						
% Survival per Species	ANC	■	■	■	■	■	■	■	■	■	■	■	■				■						
% Survival per Species (caged)	ANC														■		■						
Condition Index Mean	ANC	■	■	■	■	■	■	■	■								■						
CTD*	ANC							■	■	■	■	■	■		■		■		■		■		■
Dry Weight	ANC	■	■	■	■	■	■	■	■	■	■	■	■		■		■		■		■		■
Gonad Index CI Mean	ANC							■	■	■													
Growth Mean	ANC							■	■	■	■	■	■		■		■		■		■		■
209 PCBs	ORGS																		■		■		■
40 PCBs	ORGS	■	■	■	■	■	■	■	■	■	■	■		■	■		■		■		■		■
Alkanes (C10-C34)	ORGS	■	■	■																			
Musk	ORGS										■	■	■										
PAHs	ORGS	■	■	■	■	■	■	■	■	■	■	■		■	■		■		■		■		■
PAHs Alkylated	ORGS	■	■	■	■	■	■	■	■	■	■	■			■		■		■		■		■
PBDEs	ORGS										■	■		■	■		■		■		■		■
Phthalates	ORGS										■	■	■										
Chlordanes	PESTs	■	■	■	■	■	■	■	■	■	■	■		■	■		■		■		■		■
Cyclopentadienes	PESTs	■	■	■	■	■	■	■	■	■	■	■		■	■		■		■		■		■
DDTs	PESTs	■	■	■	■	■	■	■	■	■	■	■		■	■		■		■		■		■
HCHs	PESTs	■	■	■	■	■	■	■	■	■	■	■		■	■		■		■		■		■
Hexachlorobenzene	PESTs	■	■	■	■	■	■	■	■	■	■	■		■	■		■		■		■		■
Mirex	PESTs	■	■	■	■	■	■	■	■	■	■	■		■	■		■		■		■		■
p-Nonylphenol	SYN										■	■	■										
Triphenylphosphate	SYN										■	■	■										
Aluminum	TE		■	■		■	■	■	■	■							■						
Arsenic	TE	■	■	■	■	■	■	■															
Cadmium	TE	■	■	■	■	■	■	■	■	■							■						
Copper	TE	■	■	■	■	■	■	■	■	■							■						

Chromium	TE																						
DBT (Dibutyltin)	TE																						
Iron	TE																						
Lead	TE																						
Manganese	TE																						
MBT (Monobutyltin)	TE																						
Mercury	TE																						
Methyl Mercury	TE																						
Nickel	TE																						
Selenium	TE																						
Silver	TE																						
TBT (Tributyltin)	TE																						
TTBT (Tetrabutyltin)	TE																						
Zinc	TE																						

[1]Beginning in 2007, bivalve monitoring occurs biennially for trace organics and every 5 years for trace metal parameters.

APPENDIX 6 – CHANGES TO THE RMP PROGRAM 1993-2014

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
D	1993-1998	CTD data are not available for tissue	CTD cast was not deployed.
D	1998-1999	Iron in bivalves is a non-target analyte and not reported via WQT	Iron in bivalves reported by lab, but is not available via WQT.
D	1999-2001	CTD data are available for Deployment, maintenance and retrieval tissue cruises	Began deploying CTD casts during tissue cruises.
A	1993	MeHg in bivalve tissue samples was only analyzed in 1993.	Since this was part of a pilot study, the results are not displayed via the WQT. Total mercury was analyzed each year through 1999.
P	1993	Implemented Regional Monitoring Program for Trace Substances in the San Francisco Estuary (RMP). Samples collected three times per year for conventional water quality parameters and trace analytes.	Samples were collected during the rainy season (March), during declining Delta outflow (May), and during the dry season (Aug - Sept).
P	1993	Implemented Regional Monitoring Program for Trace Substances in the San Francisco Estuary (RMP) samples. Samples collected twice a year for sediment quality parameters and trace analytes.	Samples were collected during the rainy season (March) and during the dry season (Aug-Sept).
P	1993	Implemented Regional Monitoring Program for Trace Substances in the San Francisco Estuary (RMP). Bivalve samples collected twice a year for transplanted, bagged bivalve bioaccumulation and condition.	Samples were deployed during the rainy season (March-May) and during the dry season (Aug-Sept) and retrieved between 90 and 100 days after deployment.
S	1993	Collected samples along the spine of the estuary at 16 set stations for water and sediment; toxicity was measured at 8 of these stations for each matrix. Bivalves were deployed at 11 of the stations.	Original RMP sampling design.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
D	1994	Prior to 2003, there are no records for individual fish stored in the database. Therefore, there are no records in the POEFish table.	Only composite information is available.
P	1994	Status and Trends Sport Fish Monitoring	Sport fish monitoring began as a pilot study funded by the Bay Protection and Toxics Cleanup Program.All fish were analyzed as individuals for mercury, PCBs, pesticides, and selenium.
S	1994	Added 2 stations for water and sediment sampling (previously 22) as part of the Local Effects Monitoring Program (LEMP): C-1-3 (Sunnyvale) and C-3-0 (San Jose)	Sites located by water pollution control plants. Added on a trial basis by Water Board. Sites were treated identically as RMP stations. Total water stations =24.
S	1994	Added 4 stations (previously 11) for bivalve tissue sampling	Total bivalve stations = 15.
S	1994	Added 6 stations for water and sediment sampling (previously 16): San Bruno Shoal (BB15), Alameda (BB70), Red Rock (BC60), Honker Bay (BF40), Petaluma River mouth (BD15), Coyote Creek mouth (BA10)	Sites selected to fill large areas in Estuary where no samples were taken and to better monitor areas around tributaries. Total water stations = 22.
A	1996	Added trace organics analysis for Southern Slough stations Sunnyvale (C-1-3) and San Jose (C-3-0)	Trace organics were not analyzed for Sunnyvale (C-1-3) during the July 1996 or August 1997 rainy season cruises, however samples were analyzed for trace metals and ancillary parameters.
S	1996	1996-04 Corbicula fluminea (CFLU) clams were collected from Putah Creek.	1996-04 Corbicula fluminea (CFLU) couldn't be retrieved from Lake Isabella so clams were collected from Putah Creek. Due to concerns with contamination, both pre- and post-depuration analysis was performed, but only the post-depurated results were reported. In September 1996, only post-depurated analysis was performed.
S	1996	Added 2 stations for water and sediment sampling (previously 24) as part the Estuary Interface Pilot Study: Standish Dam (BW10) and Guadalupe River (BW15)	Added as part of the Estuary Interface Pilot Study. Total water and sediment stations = 26.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
A	1997	Identified 40 target PCB congeners for labs to report: PCB 008, 018, 028, 031, 033, 044, 049, 052, 056, 060, 066, 070, 074, 087, 095, 097, 099, 101, 105, 110, 118, 128, 132, 138, 141, 149, 151, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, 203	Analysis of RMP data collected from 1993-1995 showed 40 congeners consistently quantified in Bay samples. It was found that 40 congeners would be a good representation (~80% representative) of the total mass of PCBs in the bay.
D	1997	Prior to 2003, there are no records for individual fish stored in the database. Therefore, there are no records in the POEFish table.	Only composite information is available.
D	1997	Total salinity measurements taken in the field are not available for the April cruise.	Measurements not available.
L	1997	Changed analytical lab for analysis of PCBs and PAHs in bivalve tissue samples	Central Contra Costa Sanitary District began analysis of PCBs and PAHs in bivalve tissue.
P	1997	Implemented Sport Fish Contaminant Study - Sport Fish will be collected on a three year cycle and analyzed for mercury, PCBs, legacy pesticides (DDT, dieldrin, chlordane), and Se	Study implemented as a follow up to a 1994 study conducted by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB).
P	1997	Status and Trends Sport Fish Monitoring	A special study was done to compare skin-on versus skin-off organics concentrations in white croaker.Analytes measured: mercury, PCBs, DDT's, chlordanes, dieldrin, dioxin and dioxin-like compounds, and selenium.Most samples were analyzed as composites except for mercury in striped bass and California halibut, and selenium in white sturgeon.EWG analyzed some archive 1997 RMP samples for PBDEs in 2002. These data are not available on the WQT.
A	1998	T-1 samples analyzed for trace organics and trace elements	While T-0 samples have been consistently analyzed throughout the years, T-1 samples were analyzed for only two cruises: 1998-04 and 2001-09. The decision to analyze was because a lot of the transplants died during deployment.
D	1998	Status and Trends Sport Fish Monitoring	Bivalves and crustaceans were analyzed as part of the sport fish study.
D	1998	Tissue results are not available for Sept. 1998 for BF20 (Grizzly Bay)	The bivalves Corbicula fluminea (CFLU) could not be found at the reference site Lake Chabot

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
D	1999	Status and Trends Sport Fish Monitoring	Bivalves and crustaceans were analyzed as part of the sport fish study.
L	1999	Changed analytical lab for analysis of mercury in water samples	University of Maryland, Center of Environmental Studies began analysis of Hg in water.
S	1999	Removed 1 station (previously 15) for bivalve tissue sampling BF20 (Grizzly Bay)	A bivalve reference site could not be found for Corbicula fluminea (CFLU). Total bivalve tissue stations = 14.
A	2000	Added Cobalt (Co) analysis in water and sediment samples	Co is a useful marker of geochemical processes in the Estuary, particularly as an indicator of metal fluxes from sub-oxic sediments. Added as part of the Fe/Mn/Co group.
A	2000	Added gonadal index and growth analysis in bivalve tissue samples	Growth analysis calculated by SFEI in 2000 and 2001. AMS started calculating growth analysis in 2002.
A	2000	Added Methyl Mercury analysis in water and sediment samples	Ratios of Methyl Mercury to Total Mercury can be used to determine environments that methylation is most likely to occur in.
A	2000	Removed Mercury (Hg) and Arsenic (As) analysis in bivalve tissue samples	RMP results (1993-99) indicated that there was very little bioaccumulation of Hg beyond background concentrations and there was an absence of serious As contamination.
D	2000	Prior to 2003, there are no records for individual fish stored in the database. Therefore, there are no records in the POEFish table.	Only composite information is available.
L	2000	Changed analytical lab for analysis of PCBs and PAHs in bivalve tissue samples	Texas A&M Geochemical and Environmental Research began analysis of PCBs and PAHs in bivalve tissue.
P	2000	Changed frequency of water sampling to twice a year for ancillary and trace metal analytes	Discontinued sampling during declining Delta outflow (May). Samples were collected during the rainy season (March) and during the dry season (Aug-Sept). It was determined that samples collected during the dry season were most indicative of ambient concentrations.
P	2000	Changed frequency of sediment sampling to once a year for ancillary, trace metal and organic analytes	Samples collected during the dry season (Aug-Sept).

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
P	2000	Changed frequency of water sampling to once a year for organic analytes	Samples collected during the dry season were analyzed for organic contaminants. Most organic contaminants are legacy pollutants which degrade slowly so analyzing more that once a year for these analytes was found to be unnecessary.
P	2000	Status and Trends Sport Fish Monitoring	A special study was done to compare organics concentrations across time during one year in the Oakland Inner Harbor. This study was to look at the seasonal variation of organic contaminants pre- and post-spawning. Analytes measured: mercury, PCBs, DDTs, chlordanes, dieldrin, PBDEs (qualitative), dioxin and dioxin-like compounds, and selenium.The 1998 crab data and 1999 clam data were reported in the 2000 report.Most samples were analyzed as composites except for mercury (California halibut, white sturgeon, leopard shark and striped bass) and selenium in white sturgeon.
A	2001	Removed Gonadal Index analysis in bivalve tissue samples	Unable to obtain sufficient level of precision in separating somatic and gonadal tissue.
A	2001	T-1 samples analyzed	While T-0 samples have been consistently analyzed throughout the years, T-1 samples were analyzed for only two cruises: 1998-04 and 2001-09. No rational was found for analyzing these samples.
D	2001	PBDE Tissue Data not reported	A minimum amount of QA/QC was conducted. Dataset was missing replicates and SRMs. Data was treated as a special study and not added to S&T db.
D	2001	Status and Trends Sport Fish Monitoring	Bivalves and crustaceans were analyzed as part of the sport fish study.
A	2002	Added PBDEs, phthalates, and p-nonylphenol analysis in water and sediment samples	Added potential persistent pollutants with the ability to bioaccumulate and cause toxicity.
A	2002	Added PBDEs, phthalates, p-nonylphenol, triphenylphosphate and nitro and polycyclic musks analysis in bivalve tissue samples	Added potential persistent pollutants with the ability to bioaccumulate and cause toxicity.
A	2002	Changed health indicator from Condition Index Mean to Growth Mean in bivalve tissue samples	Condition index is the ratio of tissue mass to shell volume and may be affected by factors other than health. Growth compares the pre- and post- deployment weight of each mussel and is a more direct measurement of health.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
A	2002	Reduced bivalve Trace Metals (Ag, Al, Cd, Cu, Ni, Pb, Se, Zn) analysis in bivalve tissue samples to 5 year cycle and removed tributyltin analysis in bivalve tissue samples	RMP results indicated that Trace Metals and tributyltin do not appreciably accumulate in bivalve tissue. Report link: http://www.sfei.org/rmp/Technical_Reports/RMP_2002_No109_RedesignProcess.pdf
A	2002	Removed chromium analysis in water, sediment and bivalve tissue samples	Technical Review Committee made decision based on findings by Khalil Abu-Saba that stated that the chromium found in the estuary was mostly of the trivalent form and none of the hexavalent form was detected. The concentrations in water and sediment were found to be essentially the same as those from the soils in the watersheds draining into the estuary.
D	2002	CTD casts were not taken during 2002 bivalve tissue maintenance cruise	The water and bivalve maintenance cruise occurred concurrently and it was decided that it was more important to take casts on the water cruise.
D	2002	Data unavailable/rejected for BDEs 82, 128, 203, 204, 205, 206, 207, and 209 for bivalve tissue samples	BDEs 82, 128, and 209 not part of standard mix reported by lab. BDEs 203, 204, 205, 206, 207 and 209 do not elute off of the GC-ECD columns.
D	2002	Data unavailable/rejected for PCB 132 analyzed in bivalve tissue samples	PCB 132 not analyzed in the lab due to co-elution problems.
L	2002	Changed analytical lab for analysis of mercury and methyl mercury in water	University of California, Santa Cruz Dept. of Environmental Toxicology began water Hg and MeHg analysis (formerly conducted by University of Maryland).
L	2002	Changed analytical lab for analysis of trace organics in bivalve samples	California Dept. of Fish and Game, Marine Pollution Control Laboratory began analysis of trace organics in bivalve tissue (including pesticides, PAHs, and PCBs).
L	2002	Changed analytical lab for water trace organics to AXYS	Analysis formerly conducted by University of Utah Energy and Geoscience Institute (UUEGI)
L	2002	Changed method for analysis of Total Suspended Solids (TSS) in water to Suspended Solid Content (SSC) in water	The SSC method analyzes the whole sample while TSS is a subsetting method. SSC poses less variability by human interference and attains better precision because heavier sand and sticky clay particles are not lost during analysis.
P	2002	Changed Aquatic Toxicity Testing from yearly to a five year cycle	From 1993 to 2002, a noticeable decline in aquatic toxicity to organisms was observed, especially during the dry season.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
P	2002	Implemented new random sampling design. Random sampling design based on spatially balanced probabilistic sampling design. The bay was divided into 5 hydrographic regions plus the Rivers segments. 7 Historic RMP sites were maintained in the program for sediment trends analysis and 3 (now 5) historic sites were maintained for water analysis	Sampling design will provide better statistical basis to answer regulatory questions. Will provide unbiased estimate of ambient conditions.
P	2002	Status and Trends Sport Fish Monitoring	The Environmental Working Group collected fish in 2002 from fishing piers around the Bay and analyzed fish for PBDE levels. SFEI reviewed this data set and added it to our Sportfish database. The data are not currently being included in the WQT due to some issues with the data. EWG also analyzed some archive RMP samples (1997) for PBDEs. These data are also not being displayed externally.
P	2002	Stopped Bivalve Maintenance Cruise	Cruise was found to be unnecessary.
D	2002-2003	Original results were rejected for pesticide, PCB, and PBDE sediment samples.	Samples were reanalyzed using HRGC/MS during 2008 so should show no bias relative to 2007 and later samples.
A	2003	Added PBDE analysis in sport fish samples collected for the Sport Fish Contaminant Study	Increasing PBDE concentrations in the bay area coupled with concern about the health effects on humans and wildlife led to adding PDBEs.
A	2003	CTD casts were not taken during 2003 bivalve tissue maintenance cruise	The water and bivalve maintenance cruise occurred concurrently and it was decided that it was more important to take casts on the water cruise.
D	2003	Data rejected for PAHs in bivalve tissue	Data was rejected by SFEI QA Officer due to many samples being qualified as Non Detect.
P	2003	Changed container for bivalves deployed from bags to cages. Some of the cages were maintained and some were un-maintained at each site	Findings from side by side deployment of bivalves in cages and in bags indicated that cages reduced the effects of bivalve predation. Report link: http://www.sfei.org/rmp/reports/431_AMS_bivalvestudies.pdf.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
P	2003	Status and Trends Sport Fish Monitoring	A special study to do preliminary screening of additional species began in 2003. Additional species were analyzed for mercury and PCBs. Species included anchovy, barred surfperch, black surfperch, brown rockfish, herring, Chinook salmon, diamond turbot, sardine, smooth hound shark, starry flounder, and walleye surfperch.Analytes measured: mercury, PCBs, DDT, chlordane, dieldrin, PBDEs.Most samples were analyzed as composites except for mercury (California halibut, striped bass, leopard shark, white sturgeon) and selenium in white sturgeon.
P	2003	Stopped deployment of bivalves Corbicula fluminea (CFLU) in the estuary. CFLU collection was continued in the delta by trawling at the Rivers sites BG20 (Sacramento River) and BG30 (San Joaquin River)	Findings from 2000-2002 special studies concluded that bioaccumulation of contaminants in the estuary could be monitored using only one species Mytilus californianus (MCAL).
S	2003	Removed three stations (previously 14) BD50 (Napa River), BD15 (Petaluma River in San Pablo Bay), and BC21 (Horseshoe Bay in Central Bay) for bivalve tissue monitoring	Findings indicated that only 2-3 stations were required to track long term changes in contaminant concentrations in bivalves. Stations = 11.
S	2003	Removed two water and sediment stations (previously 24) C-1-3 (Sunnyvale) and C-3-0 (San Jose), part of the Local Effects Monitoring Program (LEMP)	Funding ended for monitoring of trace organics in water and sediment which began in 1996 at these stations as part of the NPDES. Stations = 24.
S	2003	Removed water sampling from one random site in the South Bay segment and one random site in the Lower South Bay segment in order to add water sampling at historic sites BA30 (Dumbarton Bridge) in the South Bay and BC10 (Yerba Buena Island) in the Central Bay	Dropping these two random sites enabled the two historic sites to be added back into the sampling design at no additional cost to the program. These sites, along with BG20 (Sacramento River) are used by the Water Board for NPDES permit processing
A	2004	Added Particulate Organic Carbon (POC) analysis in water samples	Began analyzing for POC in order to be able to calculate Total Organic Carbon values (DOC+POC).

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
A	2004	Data unavailable for pesticides, PAHs, PCBs, and PBDEs in bivalve tissue samples	Poor recovery and high detection limits created "too many holes in the dataset". Samples will be archived but not re-analyzed.
A	2004	Removed PBDEs, phthalates, p-nonylphenol, triphenylphosphate and nitro and polycyclic musks analysis in bivalve tissue samples	These analytes posed low levels of concern for the San Francisco Bay Region based on current literature.
A	2004	Removed phthalates and p-nonylphenol analysis in water and sediment samples	These analytes posed low levels of concern for the San Francisco Bay Region based on current literature.
D	2004	Bivalve Organics data are not available for pesticides, PAHs, PCBs, and PBDEs	Poor recovery and high detection limits created "too many holes in the dataset". Samples will be archived but not re-analyzed.
D	2004-2005	Tissue PAHs analzed by CDFG were rejected due to the method sensitivity	Most PAH measurements in transplant bivalve samples were below detection limits and thus not usable for trends analysis.
A	2005	Expanded target BDE analyte list for sediment and water samples	Based on results from BDEs sampled in previous years and capabilities of the RMP laboratories, increased number of analytes.
A	2005	Removed Toxicity Identification Evaluations (TIEs) from sediment toxicity analysis	Method development is needed to aid in understanding the toxicity found in the bay sediments. Toxicity Identification Evaluations (TIEs) will be conducted using contingency funds when sufficient toxicity is observed.
D	2005	2005 Bivalve samples were analyzed for orgaincs by CDFG. PAHs were rejected. PBDEs, PCBs and PESTS were approved.	About half the analytes in each group were NDs.
D	2005	7 archived bivalve samples (T-0,BA10,BA40,BC10,BD20,BD30,BG30) were reanalyzed in 2007 by AXYS for PBDES, PCBs, Pests and PAHs. 3 samples (BA40, BD20, BD30) were reanalyzed for PAHs using Base Extraction Method as a demonstration of appropriate lab method. Results were approved. Samples not reanalyzed included BB71, BC61, BG20, BD40, BA30. Due to lack of archived material not all samples were re-analyzed.	Reanalyzed in 2007 by AXYS as part of Intercomparison study with CDFG. The data available on the WQT include the 7 reanalyzed samples from AXYS and 5 samples analyzed in 2005 by CDFG.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
D	2005	Mallard Island PBDE Data for study year 2005 – 2006 should not be used in load calculations due to blank contamination and missing samples (especially 209).	Data should not be used in load calculations. Flagged during internal ratio review due to blank contamination and missing samples (especially 209).
L	2005	2005-09 archived bivalve tissue samples reanalyzed for organics by AXYS and CDFG in 2007	Data analyzed by two different labs: 5 samples were analyzed by CDFG and 7 samples reanalyzed by AXYS.
L	2005	Changed method for extraction of organic analytes in water samples	High blank contamination in 2003 PAH samples led to a change from the Soxhlet extraction method to an ambient temperature extraction method.
A	2006	Began collecting hardness data for all water stations where salinity <5ppt	Previously hardness data was collected at riverine stations where salinity <1ppt and estimated for estuarine sites.
A	2006	Removed BDE 82 from target analyte list	BDE 082 is not in any commercial mixtures and its rationale for reporting it was unclear as it is not a major congener.
D	2006	Analyses of 2006 bivalves for trace organics data were delayed until 2008.	Analysis was delayed pending a decision regarding a demonstration of lab capabilities.
D	2006	Tissue data are unavailable for Coyote Creek (BA10)	Nearly full mortality (1% survival) due to heavy biofouling and sedimentation
D	2006	Tissue data are unavailable for San Pablo Bay (BD20)	Mooring was removed during deployment period
D	2006	Water diazinon and chlorpyrifos data are not available	Initially, samples were not analyzed due to analytical issues. These issues were resolved. In 2010, the TRC decided to cancel the analysis due to the high cost and the lack of a pressing need for the data
L	2006	Changed lab for the water diazinon and chlorpyrifos analysis from CDFG to AXYS	Changed labs based on new method development for this analysis and difficulties with prior method for analyzing these compounds.
L	2006	Changed method for analysis of arsenic in water samples	Method changed from HGAA to ICP-MS as a cost saving measure for method development.
P	2006	Annual Bivalve Maintenance Cruise discontinued and biannual cruise implemented	TRC approved dropping the maintenance cruise after a study conducted from 2002-2005 showed no significant difference in survival of bivalves in maintained and non-maintained cages

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
P	2006	Changed program name to Regional Monitoring Program for Water Quality in the San Francisco Estuary	Previous name was the Regional Monitoring Program for Trace Substances in the San Francisco Estuary. This change is intended to more adequately express the objectives of the RMP.
P	2006	Status and Trends Sport Fish Monitoring	The special study to look at contaminants in other species continued in 2006. Barred surfperch, brown rockfish, black surfperch, Chinook salmon, rubber lip surfperch, walleye surfperch, and northern anchovy were analyzed for PCBs, PBDEs and mercury.Analytes measured: mercury, PCBs, PBDEs, dioxins, DDTs, dieldrin, chlordane, dioxin, and selenium.Archived 2003 white croaker samples were analyzed and reported with 2006 white croaker data in the 2006 report.Jacksmelt, leopard shark, and California halibut were discontinued as status and trends species.Most samples were analyzed as composites except for mercury in striped bass and selenium in white sturgeon.
P	2006	Stopped analyzing the dissolved water fraction for organics in water	California Toxics Rule (CTR) has only been established for the total fractions of organic contaminants. The dissolved fraction was removed as a cost saving measure. At three stations, the RMP will report our dissolved and particulate fractions separately for comparative purposes.
S	2006	Changed bivalve tissue site BD20 (San Pablo Bay) by a nautical mile. BD20 will be renamed.	USGS replaced the channel marker where bivalve mooring BD20 was attached. The site was moved from Petaluma Light 1 to Petaluma Light 4. A new mooring will be installed at that site.
A	2007	Added BDE 197 to target analyte list for water and sediment and BDE 196 for sediment only.	This will provide a more accurate estimate of total PBDEs since these congeners constitute a relatively high percentage of the Deca-BDE mix.
A	2007	Nitrogen results will be reported as "Nitrogen, Total Kjeldahl" in sediment. This is different from the historical RMP data.	Lab changed from UCSCDET to AMS-Texas.
D	2007	No bivalves data for 2007	Bivalves were not deployed in 2007. Sampling was changed to every other year.
D	2007	Water diazinon and chlorpyrifos data are not available	Initially, samples were not analyzed due to analytical issues. These issues were resolved. In 2010, the TRC decided to cancel the analysis due to the high cost and the lack of a pressing need for the data.
L	2007	Changed lab for the bivalve tissue analysis from CDFG to AXYS	2006 tissue analyses were conducted by AXYS. A subset of 2005 archive bivalves were reanalyzed by AXYS in 2007 and results much improved.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
L	2007	Changed lab from UCSCDET to AMS-Texas for analysis of sediment quality samples	Changed labs based on an evaluation of turn around time, cost, and analytical capabilities.
L	2007	Intercomparison study with UCSC (POC only) and AMS-Texas (POC/DOC) for ancillary analytes in water	UCSC sampled 9 of the 22 sites, AMS-Texas sampled all 22 sites.
L	2007	Intercomparison study with UCSC and AMS-Texas for grainsize, Total Organic Carbon and Total Nitrogen in sediment	UCSC sampled 9 of the 47 sites; AMS-Texas sampled all 47 sites.
L	2007	Intercomparison study with UCSC and BR for trace metals in water samples	UCSC sampled 9 of the 22 sites, BR sampled all 22 sites.
L	2007	Intercomparison study with UCSC and EBMUD for analysis of SSC, Pigments Nutrients, salinity, and hardness in water	UCSC sampled 9 of the 22 sites, EBMUD sampled all 22 sites. (Pigments (Chlorophyll & phaeophytin) & Nutrients (ammonia, phosphate, nitrate/nitrite, silica))
L	2007	SFEI begins taking shipboard total salinity measurements.	Switched labs for water ancillary data; new lab does not participate in cruises. UCSC used to also report salinity by SCT along with their analytical measurements.
P	2007	Modified sediment toxicity sampling design.	During 2002-2006, every other sediment sample was analyzed for toxicity, which spatially biased the samples to the Lower South Bay
P	2007	The number of water sites was changed from 31 to 22. Sampling will occur at 3 sites in each of the upper 4 segments and 5 sites in the Lower South Bay segment. The 5 historic sites will continue to be sampled.	The power analysis from San Jose suggests that this change will be able to detect about a 1 ug/L change (give or take) in dissolved copper in every segment at a very high 99% power. The TRC approved this change in December 2006.
P	2007	The S&T monitoring program was expanded to triennial bird egg monitoring (cormorant and tern).	Part of the redesign process implemented in 2006.
P	2007	Water toxicity sampling occurred in 2007. Toxicity sampling has been changed to a screening effort approximately every five years	RMP S&T aquatic toxicity monitoring in the Estuary has shown no toxicity over the past several years. Next scheduled sampling will occur in 2012.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
A	2008	Added benthos analysis (CCSF) and (MLML)	The addition of benthos collection will enable sediment assessments in accordance with the SQOs which use three lines of evidence, benthos, sediment chemistry and sediment toxicity.
A	2008	Added pyrethroids analysis in sediment (CDFG)	To investigate the potential toxicity of pyrethroids in the Bay.
A	2008	Added selenium analysis in tissue (BR)	Added to provide information for the Selenium TMDL
A	2008	PCBs were not analyzed in water. PAHs and Pesticides in water were not scheduled to be analyzed but were added into the sampling plan.	PCBs, PESTS, PAHs will be sampled every other year in water (on a biennial basis) based on recommendations from the redesign process. PAHs were analyzed because of the Cosco Busan oil spill, and PESTS were analyzed to validate the detection level for AXYS Analytical's MRES method using both whole water samples and 100L High volume extracts. Pesticide results were not reported because they were part of the Intercomparison study.
D	2008	2008 grainsize granule fraction is not available	Granule fraction was not analyzed. In 2008, RMP switched labs from UCSC-DET to MLML-Aiello. MLML did not analyze larger grainsize fractions, and only fractions <2mm are available.
D	2008	Grainsize determination changed to an optical method.	In 2008, RMP switched grainsize labs from UCSC-DET to MLML-Aiello where they employ a different method.
D	2008	Grainsize for 2008 are not comparable to previous years.	Grainsize in 2008 and later is reported for fractions 2mm and smaller, as a percentage of total volume determined by an optical (laser) method, as opposed to gravimetric measurement (as a percentage of mass) for mechanically separated samples used prior. Additionally, split samples analyzed mechanically in 2009 showed poor comparability to the optical method due to possible artifacts of handling in the mechanical separation method, usually yielding higher apparent coarse material due to aggregation of smaller particles during the drying of samples. The lab is currently testing a wet seiving method to resolve these artifacts.
D	2008	Manganese and iron in bivalves are non-target analytes and not reported via WQT	Manganese and iron are not reported as target analytes via WQT.
D	2008	Missing % Lipids for the trace metals bivalve analysis	Lab could not analyze for this.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
D	2008	MRS Pesticide Results should not be combined with prior years for Trends Analysis.	Axys switched to a multiple residue (MRES) method for pesticides. Whole water MRES samples typically showed higher concentrations than in solid phase (XAD) extracted samples, due to only partial retention of pesticides by the XAD. Interannual trends should therefore be evaluated only within any given collection type (i.e. whole water 2008 and later or XAD 2007 and before).
D	2008	Oxadiazon was not reported	The MRES method cannot analyze for Oxadiazon and because the 2008 demonstration project used only the MRES method, it was not possible to collect this data.
D	2008	Pyrethroid tralomethrin not analyzed in sediment samples	Tralomethrin was not analyzed in 2008 by CDFG, but will be in the future.
D	2008	Water MRES pesticide data	The 2008 samples were part of a demonstration project for the MRES method and were conducted on a subset of stations using whole water grabs (7 samples). These results were then compared to the extracts from the 100-liter infiltrex samples at the same location. These results will not be reported on the web.
L	2008	Added sediment-water interface cores exposure (SWIC) toxicity testing method for bivalve larval (Mytilus galloprovincialis) SWIC will be analyzed for toxicity by UCD-GC.	The Sediment Quality Objectives recommend using sediment–water interface core exposure (SWIC) for bivalve larva toxicity instead of elutriate testing for toxicity. Toxicity testing for amphipods will continue to be conducted using the elutriate method. TIEs will be conducted in samples that show significant toxicity.
L	2008	Changed lab for analysis of Total Organic Carbon and Total Nitrogen in sediment from UCSC to MLML – Hunter	Changed labs based on an evaluation of turn around time, cost, and analytical capabilities.
L	2008	Changed lab for analysis of grainsize in sediment from UCSC to MLML - Aiello	Changed labs based on an evaluation of turn around time, cost, and analytical capabilities.
L	2008	Changed lab for analysis of SSC, Pigments, Nutrients, salinity, and hardness in water from UCSC to EBMUD	Changed labs based on an evaluation of turn around time, cost, and analytical capabilities.
L	2008	Changed lab for POC and DOC analysis from UCSC and AMS-Texas to Columbia Analytical Services	Changed labs based on an evaluation of turn around time, cost, and analytical capabilities/ AMS-Texas went out of business.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
L	2008	Changed principle lab for trace metals in water from UCSC to BR and changed principle lab for trace metals in tissue from UCSC to BR (Se) and CCSF (other metals)	Changed labs based on an evaluation of turn around time, cost, and analytical capabilities such as elevated methyl mercury quantitation limits. Due to BR's method, metals (Al, Cd, Cu, Fe, Pb, Mn, Ni, Ag, and Zn) are no longer reported as near-total concentrations. UCSC extracted with a weak acid (pH < 2) for a minimum of one month, resulting in measurements that approximate bioavailability of these metals to Estuary organisms. BR used reductive precipitation according to EPA Method 1640.
L	2008	Intercomparison study with BR and City and County of San Jose for Copper and Nickel in water	Samples were analyzed by both labs at all 22 sites.
L	2008	Pesticide water analysis conducted by AXYS was performed using MRES method on samples collected on 100L infiltrix system. In previous years pesticides were analyzed using GC/LRMS which could not detect chlorpyrifos/diazinon.	The MRES method is able to detect the standard suite of RMP pesticides including chlorpyrifos/diazinon (oxadiazon is not tested for using MRES).
P	2008	Began reporting water particulate trace organic results.	New design of web query tool makes it easier to post particulate results.
P	2008	Benthos sampling was added as part of the sediment sampling cruise.	With all three lines of evidence (i.e., benthos, sediment chemistry and sediment toxicity), it will be possible to conduct sediment assessments in accordance with the Sediment Quality Objectives (SQOs), which are scheduled to be promulgated in 2008.
T	2008	Bivalve Trends	These are available in the AMR beginning in 2008 for years bivalves are collected, biennially for trace organic contaminants and every five years for trace metal contaminants.
A	2009	Cyanide was analyzed in water.	New site specific objective was developed for cyanide in water in San Francisco Bay.
A	2009	Dioxins were added as part of the Small Tributary Loading Study.	Data will fill the dearth of information that currently exists for dioxin. This is a special study.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
A	2009	Dioxins were analyzed for all 22 water stations, all 47 sediment stations, and in sportfish.	Data will fill the dearth of information that currently exists for dioxin. This is a 5 year special study that is not a part of the Status and Trends Component.
A	2009	Oxadiazon was dropped from the RMP target analyte list.	The different MRES method for analyzing pesticides in water adopted by the RMP doesn't include oxadiazon. Since concentrations of oxadiazon have remained relatively constant over time, the TRC approved removing it from the target list in July 2009.
A	2009	PFC analysis was added to bird samples.	Part of Exposure and Effects Pilot Study.
A	2009	PFC analysis was added to sportfish samples.	Part of Emerging Contaminants Special Study.
A	2009	PFC samples were collected at a subset of water stations.	Special Study - Added because of concern over elevated concentrations found in Bay Area tissue samples as compared to reference samples from Tomales Bay.
A	2009	The RMP PCB list was expanded from 40 congeners to 209 congeners for all matrices.	The non-Aroclor PCB, PCB 11, was unexpectedly observed in air and effluent samples outside the Bay Area in significant concentrations, prompting the expansion of the RMP PCB congener list to include all possible congeners.
A	2009	Water PAHs were not analyzed.	Due to the Cosco Busan oil spill, PAHs were analyzed in 2008. Because no significant changes in the water column were identified, PAH sampling was skipped in 2009 and 2010. Water PAHs are scheduled to be sampled again in 2011.
A	2009	Whole water samples were collected at 22 sites for analysis of pesticides.	Whole water samples are collected for the analysis of pesticides using MRES methods. Beginning in 2009, pesticides analyzed using the MRES method are considered the RMP's target analytes.
D	2009	2009 total cyanide water results are not reported.	The RMP's previous California Toxics Rule (CTR) work was based on the Weak Acid Dissociable (WAD) fraction. Total cyanide will most likely give an over-estimation of the bio-available fraction. Several of the 2009 total cyanide water results were above the cyanide trigger level (1.0 ug/L) for ambient monitoring as stated in the Basin Plan Amendment, which is based on the WAD fraction. Hence, at the request of the Water Board these samples were not reported to avoid confusion.
D	2009	Water PBDEs 196, 201, and 202 are not available.	AXYS has not developed a method for detecting these PBDEs in water.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
L	2009	Contra Costa County Sanitation District will analyze water for cyanide.	New analyte for analysis in water only.
P	2009	Added Pesticides Fipronil, Fipronil desulfinyl, Fipronil sulfide, and Fipronil sulfone for sediment analysis	These pesticides are highly used in the Bay Area and are of emerging concern. Fipronil is widely-used in flea/tick applications. It is exceedingly toxic to insects/crustaceans. There is relatively little Bay Area data so it would be very helpful to report these data when available.
P	2009	Changed the statistical design for sediment sampling from five-year panels to six-year panels	Changed to incorporate rainy season sediment sampling which will occur every other year starting in 2010. Rainy season sediment sampling will occur at 20 random sites and 7 historic sites. Dry season sediment sampling will continue to occur at 40 random sites and 7 historic sites.
P	2009	Dioxins were analyzed in water, sediment, sediment core, bird egg, small tributary loading, and sportfish samples.	The Dioxin Pilot Study is not part of the Status and Trends component, but samples were collected during regular RMP sampling events.
P	2009	Status and Trends Sport Fish Monitoring	The 2009 monitoring effort was combined with the BOG coast year 1 sampling effort. This resulted in adding one additional species to the RMP list: Jacksmelt.Most samples were analyzed as composites except for mercury in striped bass and selenium in white sturgeon.Analytes measured: mercury, PCBs, DDTs, dieldrin, chlordanes, PBDEs, dioxins, PFCs, and selenium.There were two side-by-side studies in 2009:Comparison of selenium concentrations in filet, muscle plug, and liver of white sturgeon. This was done for the development of the North Bay selenium TMDL. The comparison was also to determine if we could use muscle plugs (nonlethal) instead of filet (lethal) to determine selenium levels in white sturgeon.Comparison of skin-on and skin-off PCBs, legacy pesticides, PBDEs, and dioxin concentrations in white croaker. Starting in 2009, white croaker will be analyzed skin-off.
T	2009	Sport Fish	SWAMP/RMP/Bight Program Report on Contaminants in Fish from the California Coast. 2011.
A	2010	Began reporting Sum of PCBs 208 (SFEI)	This sum provides an index of the PCBs present in Aroclor mixtures. PCB-11 is excluded from the sum because it is a by-product of dye manufacturing and is not related to Aroclors. PCB 11 does not have dioxin-like potency and has different sources than Aroclors.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
A	2010	Pyrethroids Tetramethrin and piperonyl butoxide moved to a status of "Information only" by analytical lab	Compounds have a history of persisting high variability in Ongoing Precision and Recovery (OPR) and linearity data. Results are estimated to be accurate only within an order of magnitude.
D	2010	Added new PrepPreservation Code: FieldFiltered,FieldSolventPres,FieldFrozen	This code is used for Chlorophyll-a and Pheophytin samples beginning in 2010. We will not update previous years' sample records which have codes "FieldFiltered, LabAcidified" and "FieldFiltered, FieldFrozen" because it was determined that the benefit does not justify the time and effort at this time.
D	2010	Bivalve data not available for BD40 Davis Point Station because it was not sampled.	BD40 was not sampled due to terminal construction and weather issues.
D	2010	TRC cancelled scheduled analysis of archived 2006 and 2007 water samples for Diazinon and Chlorpyrifos	Initially, water samples were stored during method development for analysis once analytical issues were resolved. These issues have since been resolved. In 2010, TRC decided to cancel the analysis due to the high cost ($60,000) and the lack of a pressing need for the data.
D	2010	Whole water PBDE sample results are not available through the Web Query Tool.	In 2010, 4L whole water samples were analyzed for PBDEs as part of an intercomparison study. The Web Query Tool Does note report data from Intercomparison studies.
D	2010	YSI data collected by SFEI on water cruise are not available for 2010	Data were inadvertently deleted from YSI machine by staff working on another project before it was downloaded.
L	2010	Began adding LabPoisoned to the PrepPreservation code for organic water samples when samples tested positive for residual chlorine.	It was decided that we will not update the PrepPreservation code for samples prepped with poison from 2002-2009 because the benefit does not justify the time and effort at this time.
P	2010	Sediment samples will be collected in alternate seasons starting with a rainy season (winter) sampling event in February 2010.	There appears to be a seasonal element to sediment toxicity with winter sampling exhibiting higher toxicity. 27 samples will be collected during the dry season and 47 samples will be collected during the rainy season. February of 2010 was the first rainy season collection. The next sampling event is August 2011.
A	2011	Range dropped from grainsize parameter names and is now stored in fraction field.	Changed as part of effort to incorporate SWAMP comparability to SFEI data reporting.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
A	2011	Sediment toxicity test organisms changed at select sites.	In 2011 the TWG and EEWG switched to sediment bioassays using freshwater amphipods (Hyalella azteca) and daphnids (Ceriodaphnia dubia) instead of the previous amphipod (Eohaustorius estuarius) and bivalve (Mytilus galloprovincialis)larvae at BG20 and BG30.
A	2011	Three sums of PCBs: 40, 208, 209 will be reported through the Web Query Tool.	Three sums of PCBs: RMP 40, 208, 209 for all matrices and all studies. Sum of 209 PCBs is provided solely for comparison to other studies that use this statistic. SFEI does not recommend using this sum for comparison to any Aroclor-based thresholds (the TMDL target, OEHHA thresholds, etc.) - the Sum of 208 PCBs is better for that purpose because the sum of 208 does not include PCB 11.
D	2011	SWAMP has changed the definition of LCS Sample Type. The new definition indicates that LCS samples have gone through the entire QA process.	SWAMP has provided a new definition for samples that have not gone through the entire QA process. The new sample type code is 'UnkAcc' – Control Sample used to assess accuracy, unknown whether or not taken through the full analytical process. We will not go back and update the database for samples previously called LCS since we do not always know whether the samples have gone through the entire analytical process but in future data sets we will use the code 'UnkAcc'.
D	2011	Updated coelution flag for PCB 156(Surrogate) to DO156L. In previous years, the flag DO156 was reported.	The L indicates that it is a labeled compound. Including the 'L' in the coelution flag increases accuracy.
D	2011	Cyanide results are not available for SB061W	The sample was not analyzed due to hold time violations.
D	2011	2011 data from Brooks Rand was reanalyzed for As/Se and Pb, Ni, Zn	The metal trace elements in select 2011 samples were reanalyzed for Pb, Ni, and Zn due to average dissolved concentrations much (2-6x) higher than in previous years as well as sporadically high blank contamination and/or analytical interferences. Reanalyzed results were more in line with historical average concentrations.Several pairs of dissolved/total selenium and arsenic samples in 2011 were also reanalyzed, due to dissolved concentrations that were higher than total concentrations by amounts that could not be explained by typical (acceptable) analytical variation. The results on reanalysis were more consistent with expectations (total concentrations about equal to or greater than dissolved).

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
L	2011	Beginning in 2011, the MDLs from EBMUD for sediment trace organics are all 40CFRs.	EBMUD wanted to provide consistent MDLs between analytes.
P	2011	the name of the Web Query Tool (WQT) changed to Contaminant Data Download and Display (CD3).	This name is more descriptive and is more representative of what the SFEI data query tool does.
T	2011	Small fish Trends Report.	Report by Ben Greenfield will be published in 2011.
A	2012	Updated the parameter name for 'Phosphate as P' to 'Orthophosphate as P'.	Orthophosphate as P specifically indicates the type of phosphate being measured, removing all ambiguity as to what was measured.
A	2012	PBDEs PBDE 179, 184, 188, 200, 201, and 202 were added to the list of target analytes for bird egg analysis	
D	2012	1993-03 sediment Mn results have been updated to have a QACode of "VRVQ", a CompCode of "Rej", and a DisplayCode of "-40".	An external user noticed that the numbers looked unusually high for two stations, suspecting a subscription error. Since we do not have the raw results to verify that unit conversion calculations were done correctly and because the numbers are so much different than other years (about 10X higher than all other sediment Mn numbers reported by the same lab) the QA officer decided to flag and censor these results.
L	2012	Beginning in 2012, EBMUD will increase the batch size to reduce the number of QA samples they need to analyze.	Change in laboratory methodology.
L	2012	AXYS analytical samples that have been qualified in the LABQA Code field with 'G' - lock mass interference present, are given a QA code 'LRJA' - Data rejected - Analyte positively identified but quantitation is an estimate, flagged by laboratory.	This flag alerts data users to an increased uncertainty in the value where the severity of the impact cannot be categorized. This change was applied beginning with WY2012 POC data and 2012 RMP data.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
P	2012	In 2012 the sampling design was modified to alternate water and sediment to biennial sampling, e.g., 2012=sed, 2013 = water, 2014 = sed. Alternating between seasons (wet and dry sampling) will continue to occur for sediment (2012 Sed = wet, 2014 sed = dry).	The purpose for alternating seasons is to assess the potential for increased toxicity in the winter months.
P	2012	Whole bivalves will no longer be stored in short term archive storage.	Whole bivalves were subject to prevalent degradation. Homogonized bivalves will be stored in long term archive storage at NIST and if enough sample material remains, aliquots will be kept in short term storage.
A	2013	Reportable pyrethroid analyte name changed from Deltamethrin and Tralomethrin to the co-elution Deltamethrin/Tralomethrin.	The labs cannot separate these during analysis so report these analytes as a co-elution.
D	2013	Added QA code VNTR to Al and Cr sediment samples for all years.	VNTR: Not Total Recovery: Method typically provides <50% recovery of analyte in native samples despite good recovery in spiked samples, flagged by QAO. The results were flagged because hydrofluoric acid digestion was not used to extract the metals.
L	2013	EBMUD stopped subcontracting ALS for nitrate, nitrite, silica and phosphate analysis because SFEI was already sending samples directly to ALS. Now the RMP contracts analysis for these analytes directly with ALS.	This change created an efficiency in data reporting.
P	2013	Name changed from "Regional Monitoring Program for Water Quality in the San Francisco Estuary" to "Regional Monitoring Program for Water Quality in the San Francisco Bay"	The name change reflects the fact that the Delta RMP is forming and the there needs to be clear distinction between the Bay RMP and the Delta RMP.
A	2014	The target analytes for sediment samples in 2014 were Al, As, Cd, Cu, Fe, Pb, Mn, Ni, Se, Ag, Zn, Hg, MeHg, PCBs, PAHs, Pesticides, PBDEs.	

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
A	2014	Sediment benthos assessment was not conducted in 2014 as regularly scheduled.	The assessment method for sediment benthos data is uncertain. It was not considered prudent to collect more sediment benthos samples until the assessment method is ready.
A	2014	Sediment toxicity assessment was not conducted in 2014 as regularly scheduled.	The assessment method for sediment toxicity data is uncertain. It was not considered prudent to collect more sediment toxicity samples until the assessment method is ready.
A	2014	Starting with the 2015 water sampling event, the target analytes for water samples will be changed to the following: Cu, CN, Se, MeHg, ancillary, parameters, and aquatic toxicity (at a subset of sites). Every 10 years, PCBs, PAHs, and pesticides will be added to the target analyte list. These parameters were last monitored in 2011. The next sampling year for PCBs, PAHs, and pesticides is 2023.	Since the organic pollutants are hydrophobic, they are often below detection in the water column and there is no clear trend in the data. It is better to track these compounds in sediment and biota. Similarly, the only inorganic pollutants that will be routinely monitored are those that either have a TMDL or a site-specific objective. Finally, the frequency of aquatic toxicity monitoring was increased from every 5 years to every 2 years due to increased interest in this data related to the State Water Board's new rule on aquatic toxicity in effluent and receiving waters.
D	2014	The decision was made to not show any of the original 2004-2006 EBMUD sediment PAH and pesticde results on CD3 but to show the results from the reanalysis (the few samples that were reanalyzed with the latest method). Therefore, the 2004-2006 EBMUD sediment results for PCBs, pesticides, PAHs and PBDES have been censored in the RDC database. Records were censored by adding a QACode of "VRLB" (Data Rejected-Result Negatively Biased, Flagged by QAO), changing the compliance code to "Rej", and making the DisplayCode for the records "40".	EBMUD modified their drying and extraction technique starting with the 2007 sediment samples. For the 2004-2006 sediment samples, EBMUD used a different drying and extraction method that appears to have produced concentrations that were 2-5 times lower than the new method. The effect of the old drying and extracting method was discovered after a handful of archived samples were reanalyzed using the new method. As a result, the TRC requested that SFEI remove the 2004-2006 EBMUD sediment data from CD3 to prevent their use in assessments. The 2004-2006 sediment data for PCBs, PAHs, Pesticides, and PBDEs are available from SFEI upon request. The EBMUD sediment results from 2002-2003 are still valid because they were analyzed after 2006 using the new method.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
L	2014	Sediment grain size was reanalyzed in 2012 and the lab was changed from MLML-Aiello to ALS.	A combination of technical challenges compounding long turnaround times led to a change in the labs and method for sediment grain size analysis. Conventional mechanical grainsize methods typically use a large subsample (>10g sometimes up to 100g) of dried sediment, physical separation into several (few) size bins, and reporting as gravimetric percentages. Laser particle size analysis in 2008-2012 used a very small (<1g) subsamples of wet sediment, reporting results as % of total solids volume for potentially a large number of size bins (which can be aggregated into bins equivalent to those in conventional methods). Split samples analyzed by both methods for intercomparison showed good agreement in 2008, but in later years, results were more variable. The drying in conventional methods may bias size distributions larger when fine materials aggregate, and the small subsamples used in laser analyses may amplify variations among aliquots taken from a heterogeneous sediment despite best efforts to homogenize. When these variations were not eliminated by revisions to the method, a decision was made to analyze up to 10 subsamples from any sample showing heterogeneity (based on BPJ, typically ~20% or more difference in major size bins) in laser analyses to get a more representative characterization of average distribution. These technical challenges and use of an academic lab led to many reanalyses and especially long turnaround times for 2012 grainsize samples, so a decision was made to return to mechanical separation methods using a commercial contract laboratory in 2014.
P	2014	The number of sediment sites in each year was reduced from 47 to 27. The frequency of monitoring was reduced from every 2 years to every 4 years (2014, 2018, etc.). The sampling season will alternate between dry and wet seasons. In 2014, samples were collected in the dry season. In 2018, samples will be collected in the wet season.	The objective of this shift was to reduce the cost of S&T monitoring. A power analysis was performed to confirm that the reduced number of stations would not significantly affect the program's ability to answer management questions. The cost savings ($120k/year) will be used to monitor sediment quality in the bay margins.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.			
Action Code	**Year**	**Action**	**Detail/Rationale**
P	2014	Bivalve transplant deployment reduced from 11 stations to 9, 3 of which are back-up stations. Two stations were removed from the bivalve sampling design, Red Rock (BC61) and Davis Point (BD40). Monitoring will occur for samples collected from 6 stations BG20 (Sacramento River), BG30 (San Joaquin River), BD30 (Pinole Point), BC10 (Yerba Buena Island), BA40 (Redwood Creek), and BA10 (Coyote Creek). Additional samples will be deployed as back-up samples at 3 stations BD20 (San Pablo Bay), BB71 (Hunter's Point/Alameda), and BA30 (Dumbarton). In addition to the 6 transplant stations, bivalve samples will continue to be collected and analyzed at the Bodega Reserve site (T-0), the location from which the samples are collected for the transplant sites.	The objective of this shift was to reduce the cost of S&T monitoring. At the back-up stations, bivalves are deployed and collected, but are only analyzed if the samples from the primary stations are lost during deployment.
P	2014	For bivalve samples, pesticides and all trace metals except selenium were removed from the sampling design in 2014.	The objective of this shift was to reduce the cost of S&T monitoring.
P	2014	The target parameters for bivalve samples were changed to PCBs, PAHs, PBDEs, and Selenium. PAHs, PBDEs, and Selenium will be analyzed every sampling event (ever 2 years). PCBs will be measured every 8 years (2014, 2022, etc).	The objective of this shift was to reduce the cost of S&T monitoring.
P	2014	Sport fish collection was changed from a 3 year to a 5 year cycle. Sportfish were collected in 2009 and 2014. The next collection will occur in 2019.	The objective of this shift was to reduce the cost of S&T monitoring.

Action Codes: A= Analyte added or removed from sampling design; D= Data rejected or not available/data comparability issues; L= Change in laboratory conducting analysis or in laboratory methods; P= Change in program/sampling design; S= Station added or removed; T= Trends analysis performed.

Action Code	Year	Action	Detail/Rationale
P	2014	The purpose and outline of the Annual Monitoring Results report was changed. Its primary objective will be to describe the field sampling efforts in a "Annual Monitoring Report". Information on non-conformances with field and lab methods in the QAPP and cruise reports will be documented in this report. Quality assurance information on datasets will be documented in separate Quality Assurance reports. The 2013 & 2014 field activities will be combined together in one report as a "catch-up year". Subsequent reports will be written the year collection occurs. The CD3 tool will be have the ability to generate the sediment toxicity maps and bivalve trend graphs that the AMR used to contain.	The old format of the report contained a lot information that was already available in other sources such as the QAPP and the Detailed Work Plan. The report was always 2 years late because it was waiting for all the lab data to be reported and quality assured. Going forward, the main purpose of the report will be to capture sample monitoring activites that occured that year. A separate the QA report will be written after all data has been received and reviewed by the QA/QC review team.
S	2014	Added new site codes for RMP sport fish caught in Suisun Bay and Carquinez Strait for 2014 (207SUISUN, 206CARQNZ). Previously fish caught in Suisun Bay and Carquinez Strait were commented in the sample table under the code 206SNPBLO. Added new site code for RMP sport fish caught in Central Bay (203CENTRL).	The goal is to collect shiner surfperch in Suisun Bay and Carquinez Strait to have them as indicators of PCB concentrations in Suisun. The new Central Bay location is located in deeper waters of Central Bay.