RMP
REGIONAL MONITORING
PROGRAM FOR WATER QUALITY
IN SAN FRANCISCO BAY

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2017 RMP Water Cruise Plan

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8/25/17

1. Introduction

This report details plans associated with the annual Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP) water cruise. The RMP water sampling program was redesigned in 2002 to adopt a randomized sampling design at thirty-one sites in place of the twenty-six base program stations sampled previously. In 2007, the number of sites was decreased to twenty-two stations, and it remains as such for 2017.

2. Key Personnel and Approvals

Oversight of the 2017 Water Cruise is by AMS and SFEI senior managers shown in Table 1. These key personnel have indicated their approval of the Cruise Plan by adding their initials and date in the far right column.

Personnel participating in the cruises are shown on Table 2. AMS staff will be responsible for oversight of sampling operations, compliance with cruise plan and quality assurance guidelines, maintenance of the sample field log, chain-of-custody procedures, and CTD profiling. Captain Vallee will be responsible for vessel operation and safety. SFEI staff will alternate trace metals and ancillary sampling. Other representatives of program sponsors may be aboard the *RV Turning Tide* during portions of the cruise to observe sampling operations.

Contact information for participating laboratories are shown in Table 3.

Table 1. Approvals of Cruise Plan

Name	Affiliation	Duties	Cell	Initial and Date to Indicate Approval of Plan
Paul Salop	AMS	Cruise Manager	510-323-6523	
Phil Trowbridge	SFEI	RMP Program Manager	603-340-5220	PT 8/25/17
Jay Davis	SFEI	RMP Lead Scientist	530-304-2308	
Don Yee	SFEI	RMP QA Officer	510-508-2995	
Amy Franz	SFEI	RMP Data Manager	510-282-5012	AF 8/25/17
Rebecca Sutton	SFEI	RMP Senior Scientist (CECs)	510-701-7050	RAS 8/23/17

Table 2. Personnel for Water Cruise

Name	Affiliation	Duties	Cell
Paul Salop	AMS	Cruise Manager	510-323-6523
Aroon Melwani	AMS	Cruise Manager	831-917-9243
Winn McEnery	AMS	Cruise Manager	707-832-2091
Natalie Dornan	AMS	Cruise Manager	916-813-6592
Don Yee	SFEI	Field Sampling	650-530-0603
Amy Franz	SFEI	Field Sampling	510-282-5012
Diana Lin	SFEI	Field Sampling	714-932-8085
Jennifer Sun	SFEI	Field Sampling	949-202-6671
Phil Trowbridge	SFEI	Field Sampling	603-340-5220
Adam Wong	SFEI	Field Sampling	530-400-5192
Lawrence Sim	SFEI	Field Sampling	818-606-8467
Emily Clark	SFEI	Field Sampling	770-375-0629
Katie McKnight	SFEI	Field Sampling	252-725-9883
Shira Bezalel	SFEI	Photography	510-761-3321
Chris Vallee	USGS	Captain, RV Turning Tide	916-764-2419
Jerry Eldorado	Aloha Trans	Logistics	925-640-1600

Table 3. Laboratory Contact Information

Lab / Company	Name	Phone	Shipping Address
BAL	Lydia Greaves	206-632-6206	18804 North Creek Parkway, Suite 100 Bothell, WA 98011
ALS	Shar Sami	360-501-3293	1317 South 13th Avenue Kelso, WA 98626
PER	Scott Ogle	707-207-7760	2250 Cordelia Rd. Fairfield, CA 94534
CCCSD	Tri Nguyen	925-229-7216	5019 Imhoff Place Martinez, CA 94553
Southern Illinois University	Yan Wu (US lab contact) Da Chen (PI - email only)	618-305-5701 dachen@siu.edu	1125 Lincoln Drive Life Science II, Room 251 Southern Illinois University Carbondale, IL 62901
SGS AXYS	Sean Campbell	250-655-5834	2045 Mills Road West Sidney, BC, Canada V8L 5X2
Cutter Lab	Gregg Cutter	(757) 683-4929	Old Dominion University 4600 Elkhorn Ave. Norfolk, VA 23529-0276
USGS Lab	Robin Stewart	650-329-4550	345 Middlefield Rd. MS496 Menlo Park, CA 94025

3. Cruise Plan

3.1. Sample Process Design

All sampling will be conducted from the *RV Turning Tide*. The objectives of the sampling effort are to collect the following:

Collect Real-time Data on Field Parameters

1. Real-time data over the duration of sampling for conductivity, temperature, optical back scatter (OBS), and dissolved oxygen (DO) by AMS (1 meter CTD cast for duration of sampling, plus a full water column profile where water depth allows).
2. Water samples from 22 sites for on-board (field meter) measurement of DO, pH, salinity, conductivity, and temperature by SFEI.
3. Document current and recent weather conditions at each site.

Collect Water Samples - Total Fraction (Unfiltered water samples)

4. 22 sites (and 1 replicate and 1 blank) for analysis of Weak Acid Dissociable (WAD) Cyanide by colorimetry (ALS)
5. 22 sites (and 1 replicate and 1 blank) for analysis of SSC (ALS)
6. 9 sites (and 0 replicates) for analysis of aquatic toxicity by Pacific EcoRisk (PER). In addition, 2 extra 5-gal carboys will be collected at BG20 and BG30 each for potential TIEs.
7. 22 sites (and 2 replicates and 1 blank) for analysis of bisphenols and phosphate flame retardants (SIU).
8. 22 sites (and 2 replicates and 1 blank) for analysis of neonicotinoids by SGS AXYS
9. 1 site (and 1 replicate, plus extra samples for lab QC taken at the same site) for analysis of total phosphorous (CCCSD)
10. 1 site (and 1 replicate, plus extra samples for lab QC taken at the same site) for analysis of organic nitrogen (CCCSD)

Collect Water Samples - Particulate Fraction (Filters)

11. 22 sites (and 1 replicate and 1 blank) for Particulate Organic Carbon (POC) analysis by ALS Environmental (ALS) [1 filter per sample]
12. 22 sites (and 2 replicates and 1 blank and 1 extra sample for lab matrix spike) for analysis of MeHg by ethylation/CVAFS, Cu by column chelation and ICP-MS, and Se by column chelation and ICP-MS (BAL) [3 filters of 0.4 um pore size, 47 mm diameter per sample]
13. 5 sites for analysis of Se for lab intercomp study (Cutter lab) [3 filters per site, same type as BAL]
14. 5 sites for analysis of Se for lab intercomp study (USGS lab) [3 filters per site, same type as BAL]
15. 5 sites for analysis of Se for lab intercomp study (CCSF lab) [1 to 3 filters per site, same type as BAL] This task should be only done as filtering time allows. Try for at least one filter at all 5 intercomp stations, more than one filter as time allows. Separately packed filters if possible (small ziplocks rather than multiple in a single centrifuge tube)
16. 1 site (and 1 replicate and 1 extra sample for lab QC) for analysis of chlorophyll-a (CCCSD)

Collect Water Samples - Dissolved Fraction (Filtrate)

17. 22 sites (and 2 replicate and 1 blank) for analysis of MeHg by ethylation/CVAFS (BAL)
18. 22 sites (and 2 replicate and 1 blank) for analysis of Cu by column chelation and ICP-MS (BAL)
19. 22 sites (and 2 replicate and 1 blank) for analysis of Se by IC column separation and ICP-MS (BAL)
20. 22 sites (and 2 replicate and 1 blank) for analysis of Se by RP separation and ICP-MS (BAL)
21. 5 sites for analysis of Se for lab intercomp study (Cutter lab) in glass
22. 5 sites for analysis of Se for lab intercomp study (USGS) in glass
23. 5 sites for analysis of Se for lab intercomp study (CCSF), in HDPE
24. 22 sites (and 1 replicate and 1 blank) for analysis of DOC (ALS)
25. 22 sites (and 1 replicate) for analysis of hardness (ALS)
26. 1 site (and 1 replicate) for analysis of silica (ALS)

Filtered (using labeled FlipMate Filter Assemblies)

27. 1 site (and 1 replicate plus extra samples at the same site for lab QC) for analysis of nitrate, nitrite (CCCSD)
28. 1 site (and 1 replicate plus extra samples at the same site for lab QC) for analysis of orthophosphate (CCCSD)
29. 1 site (and 1 replicate plus extra samples at the same site for lab QC) for analysis of ammonium (CCCSD)

Table 4: RMP Samples to be Collected by Site. Numbers of samples at each site indicated.

			Cruise Date -->	8/29						8/30					8/31			9/6				9/7					
Parameter	Type	Lab	Sampling Plan	BA30	LSB068W	LSB069W	LSB067W	LSB072W	LSB070W	Blank @ SB073W	SB073W	SB072W	SB071W	CB046W	BC20	CB045W	BC10	CB043W	SPB043W	SPB044W	SPB042W	SU051W	SU053W	SU052W	BG20	BG30	Total
CTD profile	Field	AMS	22 sites	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
DO, SC, pH, T, Sal	Field	SFEI	22 sites	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
POC	Filter	ALS	22 sites, 1 field blank, 1 field dupe	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
DOC	Water - Vac Pump Filtrate	ALS	22 sites, 1 field blank, 1 field dupe	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
MeHg, Cu, Se	Filter	BAL	22 sites, 1 field blank, 2 field dupes, plus extra dupe at CB046W for lab QC.	3	3	3	3	3	3	3	3	3	3	9	3	3	3	3	3	3	6	3	3	3	3	3	78
Se	Filter	Cutter	5 sites + 1 dupe	3													3					6			3	3	18
Se	Filter	USGS	5 sites + 1 dupe	3													3					6			3	3	18
Se (optional)	Filter	CCSF	5 sites	1													1					1			1	1	5
CN (WAD)	Water - Unfiltered	ALS	22 sites, 1 field blank, 1 field dupe	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
SSC	Water - Unfiltered	ALS	22 sites, 1 field blank, 1 field dupe	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
MeHg	Water - Peri Pump Filtrate	BAL	22 sites, 1 field blank, 2 field dupes	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	25
Cu	Water - Peri Pump Filtrate	BAL	22 sites, 1 field blank, 2 field dupes	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	25
Se	Water - Peri Pump Filtrate	BAL	22 sites, 1 field blank, 2 field dupes	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	25
Se	Water - Peri Pump Filtrate	BAL	22 sites, 1 field blank, 2 field dupes	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	25
Se	Water - Peri Pump Filtrate	Cutter	5 sites				1						1					1			1	1					5
Se	Water - Peri Pump Filtrate	USGS	5 sites				1						1					1			1	1					5
Se (optional)	Water - Peri Pump Filtrate	CCSF	5 sites				1						1					1			1	1					5
Hardness	Water - Peri Pump Filtrate	ALS	22 sites, 1 field blank, 1 field dupe	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24

Table 4: RMP Samples to be Collected by Site. Numbers of samples at each site indicated.

			Cruise Date -->	8/29						8/30						8/31			9/6				9/7					
Parameter	**Type**	**Lab**	**Sampling Plan**	**BA30**	**LSB068W**	**LSB069W**	**LSB067W**	**LSB072W**	**LSB070W**	**Blank @ SB073W**	**SB073W**	**SB072W**	**SB071W**	**CB046W**	**BC20**	**CB045W**	**BC10**	**CB043W**	**SPB043W**	**SPB044W**	**SPB042W**	**SU051W**	**SU053W**	**SU052W**	**BG20**	**BG30**	**Total**
Tox (& TIE)	Water - Unfiltered	PER	9 sites, extra volume at 2 sites.	1			1						1				1	1			1	1			3	3	13
Bisphenols & Phosphate Flame Retardants	Water - Unfiltered	SIU	22 sites, 1 field blank, 2 field dupes	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25
Neonics	Water - Unfiltered	SGS-AXYS	22 sites, 1 field blank, 2 field dupes	2	2	2	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	50
Organic N	Water - Unfiltered	CCCSD	1 site, 1 field dupe, extra volume for QC tests.												5												5
NO3, NO2	Water - FlipMate Filtrate	CCCSD	1 site, 1 field dupe, extra volume for QC tests.												5												5
NH4	Water - FlipMate Filtrate	CCCSD	1 site, 1 field dupe, extra volume for QC tests.												5												5
Total P	Water - Unfiltered	CCCSD	1 site, 1 field dupe, extra volume for QC tests.												5												5
OrthoP	Water - FlipMate Filtrate	CCCSD	1 site, 1 field dupe, extra volume for QC tests.												5												5
Silica	Water - Peri Pump Filtrate	ALS	1 site, 1 field dupe.												2												2
Chla	Filter	CCCSD	1 site												3												3

Table 5: Containers and Handling Requirements for Samples.

Parameter	Type	Lab	Container	Handling Requirements
CTD profile	Field	AMS	None	CTD deployment
DO, SC, pH, T, Sal	Field	SFEI	None	Grab measurement on board vessel
POC	Filter	ALS	1 filter per site	Field filtered; quick freeze on dry-ice to –20C.
DOC	Water - Vac Pump Filtrate	ALS	250 ml HDPE	Field filtered (filtrate of POC sample); has 1-2 mL H2SO4 in bottle so do not rinse or overfill. Store on wet-ice. Do not freeze.
MeHg, Cu, Se	Filter	BAL	3 filters per sample, all put into 1 50-mL tube	Field filtered; quick freeze on dry-ice to –20C.
Se	Filter	Cutter	3 filters per sample, all put into 1 50-mL tube	Use the same filters and process as for BAL. Analysis by hydride generation, AAS detection
Se	Filter	USGS	3 filters per sample, all put into 1 50-mL tube	Use the same filters and process as for BAL. Analysis by hydride generation-isotope dilution ICP-MS.
Se (optional)	Filter	CCSF	1 filter per sample, 50ml tube (or ziploc)	Use the same filters and process as for BAL. ONLY as sample volume & filtering time allow, use ziploc if not enough tubes. More filters (max 3) OK if enough time, each filter & recorded vol separate (CCSF will analyze some as lab dupes if conc high enough).
CN (WAD)	Water - Unfiltered	ALS	500 mL HDPE	Do not rinse. Bottles are preloaded with NaOH. Store on wet-ice. Check pH after sample collection. Store on wet-ice. Additional NaOH may be needed to reach pH>12. In this case, additional NaOH needs to be obtained.
SSC	Water - Unfiltered	ALS	1 L	Store on wet ice.
MeHg	Water - Peri Pump Filtrate	BAL	250 ml FLPE	No rinse; has 2 ml 6% HCl preloaded in sample bottles. Store on wet-ice.
Cu	Water - Peri Pump Filtrate	BAL	1 L HDPE	Store on wet-ice. Analysis of Cu by Column Chelation
Se	Water - Peri Pump Filtrate	BAL	1 L glass	Store on wet-ice. Analysis of Se by EPA 1640 with RP separation.
Se	Water - Peri Pump Filtrate	BAL	125 mL glass	Store on wet-ice. Analysis of Se by EPA 1640 with IC column separation.
Se	Water - Peri Pump Filtrate	Cutter	1 L glass	use the same containers and process as for BAL
Se	Water - Peri Pump Filtrate	USGS	1 L glass	use the same containers and process as for BAL
Se (optional)	Water - Peri Pump Filtrate	CCSF	1 L HDPE	insufficient 1L glass for CCSF, use some of leftover HDPEs originally meant for total metals. Store on wet-ice.
Hardness	Water - Peri Pump Filtrate	ALS	125 ml PE	Store on wet-ice.

Table 5: Containers and Handling Requirements for Samples.

Parameter	Type	Lab	Container	Handling Requirements
Tox (& TIE)	Water - Unfiltered	PER	20 L carboy	Place on wet ice. Deliver to PER morning after sampling (36 hrs hold time). Collect 2 extra carboys at BG20 and BG30.
Bisphenols & Phosphate Flame Retardants	Water - Unfiltered	SIU	4 L amber glass	Fill approx ¾ full (leave headspace). Store on wet ice. 3 day hold time. AMS will ship bisphenol samples the day after they are collected except for 8/31 and 9/7. On 8/31, SFEI will deliver samples to FedEx, boat should be returning to dock early for nutrient sample delivery. On 9/7, if there is not time for same-day delivery, AMS will ship the following Monday.
Neonics	Water - Unfiltered	SGS-AXYS	2 1-L amber glass per site	Amber glass, fill with 1-2 cm headspace. Keep in dark and cooled at 4 deg C (wet ice). (9-day hold time in the dark at 4 deg C). AMS will ship samples on blue ice overnight on 8/30, 9/5, 8/11.
Organic N	Water - Unfiltered	CCCSD	HDPE	Do not field filter. Collect full bottle with 0.5" headspace for mixing. Do not flush container because of preservative. Add H2SO4 to the container beforehand, about 0.5-ml per liter. Check the pH when you are back on land and add more acid as needed to achieve pH<2. Use pH paper provided by lab. Keep at or below 4 deg C. 3 samples at BC20: sample, field dupe, extra volume for MS/MSD.
NO3, NO2	Water - FlipMate Filtrate	CCCSD	FlipMate Unit, 125 mL container	Field filter via FlipMate after collection. Collect full bottle with 0.5" headspace for mixing. Do NOT acidify. Keep at or below 4 deg C. 3 samples at BC20: sample, field dupe, extra volume for MS/MSD.
NH4	Water - FlipMate Filtrate	CCCSD	FlipMate Unit, 125 mL container	Field filter via FlipMate. Collect full bottle with 0.5" headspace for mixing. Keep at or below 4 deg C. 3 samples at BC20: sample, field dupe, extra volume for MS/MSD.
Total P	Water - Unfiltered	CCCSD	HDPE	Collect full bottle with 0.5" headspace for mixing. Preserve with H2SO4 to a pH < 2 by preloading bottls with H2SO4 day of, and test with pH strips; add additional acid as necessary. No field filtering. Keep at or below 4 deg C. 3 samples at BC20: sample, field dupe, extra volume for MS/MSD.
OrthoP	Water - FlipMate Filtrate	CCCSD	FlipMate Unit, 125 mL container	Field filter via FlipMate within 15 minutes of collection. Collect full bottle with 0.5" headspace for mixing. Keep at or below 4 deg C. 3 samples at BC20: sample, field dupe, extra volume for MS/MSD.
Silica	Water - Peri Pump Filtrate	ALS	500 mL HDPE	Field filtered (BAL cartridge filters). Store at 4 deg C (28 day hold time). Mark as saltwater on COC.
Chla	Filter	CCCSD	1 filter (25 mm GF/F filter)	Use provided porcelain filter crucible and filtration flask. Field filter at least 100 mL (as much as practical on each filter) within 2 hours of sample collection. Place filter in centrifuge tube and freeze on dry ice. Keep frozen if not delivered day-of. (deliver ASAP, 1 day hold time). Record sampled volume on COC. Do NOT add methanol (will extracted with acetone).

3.2. Sampling Methods

Field Parameters

CTD Profiler

The following steps describe the CTD deployment and data management process:

1. Initialize CTD via laptop.
2. Disconnect communication cord from CTD and replace rubber cap.
3. Ensure that rope is securely fasted to vessel and to CTD containment cage.
4. Ensure that DI syringe is disconnected from CTD input.
5. Turn CTD on by moving switch completely to on position (fully up).
6. Place CTD into the water, with intake approximately 1 meter below water surface (typically a bit lower in the column to allow for any seas).
7. Leave CTD deployed for duration of sampling.
8. When sampling is completed, slowly lower CTD to the bottom (at a rate less than 1' per second) until rope goes slack or the end of the rope is reached. With strong currents, the rope may extend at a severe angle precluding its reaching the bottom. As soon as the CTD reaches the bottom, immediately begin moving to surface so as to minimize the amount of sediment pulled into the intake. The CTD can be moved to the surface at any rate as data is only collected on the downcast.
9. When CTD is at the surface, return to the vessel deck and place the switch in the off position (fully down).
10. Download the data between stations.
11. At day's end (or after stations where CTD intake may have become fouled with sediment or vegetation) rinse the CTD with distilled water, flush the intake with a minimum of three syringes full of distilled water, and store the CTD with a full syringe of DI inserted onto the intake and partially emptied into the CTD.
12. Replace batteries when battery level drops below 7 volts.

YSI Hand-Held Field Meter

Field parameters (DO, conductivity, salinity, and pH) will be collected using a YSI water quality meter provided by SFEI. The YSI meter should be calibrated for conductivity, pH, and DO at the start of each day, and calibration results recorded on the station field sheet and laptop access form. When recording field readings, the sampler should ensure that the YSI electrode is fully submerged and not surrounded by any bubbles.

The following steps describe the YSI deployment and data management process:

Programming the YSI

1. Hit 'Esc' to go to menu
2. Arrow down to "Logging Setup"
3. Go to 'edit site list' – delete old sites or just add in new sites
4. Enter sites then press enter to store the site
5. Hit 'esc' to get out of the menu

Calibrating the YSI

- Calibrate the YSI for conductivity, pH and DO once per day at the beginning of the day prior to sampling
    - Conductivity
        - fill the calibration cup 1/3 full with 12,800 uS/cm standard (enough to submerge both the metal tip probe with no trapped air pocket in the side port – note that the port assembly has substantial volume and may overflow the cup if it is overfilled)
        - submerge the probe in the calibration cup, and allow the meter reading to equilibrate
        - hit 'esc' to go to menu, go to 'calibrate,' and choose 'Specific Conductance' (NOT 'Conductivity')
        - set the calibration standard to 12.8 mS/cm, and press enter to calibrate
    - pH
        - fill the calibration cup 1/4 full with pH 7 buffer (probe is near the tip)
        - submerge the probe in the calibration cup, and allow the meter reading to equilibrate
        - hit 'esc' to go to menu, go to 'calibrate,' choose 'pH', and choose '2 point'
        - set the calibration standard to 7, and press enter to calibrate
        - pour out the pH 7 buffer, rinse the cup and probe, and repeat with pH 10 buffer
    - DO
        - fill the calibration cup about 1/8 full with DI water, screw on to the probe, and shake vigorously to wet the DO probe
        - unscrew the cup and pour out the water
        - loosely screw the cap back onto the probe, and allow the meter reading to equilibrate
        - hit 'esc' to go to menu, go to 'calibration,' choose 'DO 2 mil PE (Blue),' choose 'DO %,' and set the barometric pressure to 760 mmHg (sea level)
        - press enter to calibrate
- Rinse the probe and calibration cup with DI water in between calibrations. Make sure the calibration cup is dry before adding new calibration solution.

- No calibration is needed for salinity or temperature

Running the YSI

1. hit ‘esc’ to go to the menu
2. go to logging setup menu and set the logging interval to 5 minutes
3. go to ‘start logging’ and press enter
4. select site from site list and press enter
5. screw the metal cage onto the probe sensor assembly
6. lower the probe sensor assembly to 1 m below the water surface, and fix cable to the boat railing to keep the probe at that depth for the duration of the time on station
7. to stop logging – go to ‘stop logging’ and hit enter
8. record DO, pH, salinity, conductivity, temperature, site code, and sampling date/time on the YSI field sheet, usually requested near start or middle of time on station

Lab Parameters

Pump station set-up, sample collection, and take-down

Trace metal samples will be collected using clean hands-dirty hands protocol. This requires three samplers:

1. Red text = "Super Dirty" = no gloves (touches pump and table, sampling pole, bungees)
2. Orange text = "Dirty Hands" = vinyl or nitrile gloves (vinyl is ideal for Trace Metals sampling) (touches outer bags, un-bagged bottles, ringstand & clamps, covered pump switches, coolers, weight and float set-up)
3. Green text = "Clean Hands" = vinyl gloves (optionally nitrile inside) provided by BRL for Trace Metal sampling and nitrile gloves for CTR sampling (touches double-bagged bottles and "inside" bag, last 3 inches of tubing, and filter only)

Replace gloves as frequently as needed if a contaminated surface is touched or a glove is ripped

STATION SET-UP (first station of each day)

1. Super Dirty sets up table, pump, and tubing stand. Wrap the middle of the plastic tubing holder on the sampling pole.
2. Dirty puts on a pair of nitrile gloves and opens the outside bag of vinyl gloves, optionally opening the inner bag without directly touching the bag (e.g. using inner face of outside bag to peel apart inner bag opening)
3. Clean puts on nitrile gloves, opens inner bag if needed, and pulls out a pair of vinyl gloves by the cuffs and puts them on carefully, touching a minimum of the glove outside with nitrile (e.g. touch the cuff only on the first glove. Once one hand is in vinyl, minimize touching the cuff of the first glove, which was semi-dirtied by touching with nitrile).
4. Once Clean puts vinyl gloves on – DO NOT TOUCH ANYTHING – HANDS OFF EVERYTHING EXCEPT INSIDE THE TUBING BAG AND TUBING ENDS
5. Dirty opens outside tubing bag.
6. Clean opens inside tubing bag and pulls out the tubing by grabbing both ends (2-3 inches from the ends) and holding the middle loops. Be careful not to allow either end of the tubing to touch other surfaces on the boat (personnel, clothing, etc). Do not let go of tubing. It is acceptable to allow the middle of the tubing to touch other surfaces if necessary for maneuvering the tubing ends, though this should be minimized if possible.
7. Dirty grabs the tubing at the joint between the rubbery and teflon tubing, and attaches outtake side of tubing (rubbery side near the join with teflon tubing)) to the pump and stand (handling only the stand, clamp, and tubing 6" or more from the end - only Clean touches the last 3 inches of tubing).
8. Dirty covers the pump face (switches etc) with the now empty tubing bag, tucking under bungees, taking care not to touch exposed tubing end (only at first station of each day).
9. Super dirty gets the bag with the floats, weights and ties from storage spot and opens the bag. Dirty gets the floats, weights and ties out of the bag and attaches the weight to the float and the float to the sampling pole using weedwacker line. Attach the weight to the intake end of the teflow tubing using the Masterflex ties, leaving at least 1.5 feet free at the end of the teflon tubing to avoid contamination by the float or weight. Orient the weight such that the free end is pointing

towards the end of the tubing. Clean should continue holding the end of the tubing during this process.

10. Super dirty wraps the plastic holder around the tubing to secure it to the sampling pole (in the midsection of the pole only: the inlet end should be free to angle downward into the water, and the pump end should be free enough to allow lifting of the pole around the rail), and maneuvers pole upward and outward over edge of boat.
11. When ready to deploy, clean hands releases intake end of tubing. Super dirty secures the sampling pole to the boat railing and heavy coolers using bungees. Pole should be pointing out perpendicular from the side of the boat to maximize distance of inlet from the boat.

SAMPLING PROCEDURE

12. Dirty opens cooler. Super Dirty secures cooler open with duct tape or bungee, and arranges coolers/buckets/seats to suit Dirty & Clean preferences.
13. Run the pump at least one minute to flush. Dirty should rinse off gloves in the flush stream, taking care not to touch exposed tubing.
14. Super dirty fills POC/DOC bottle, (and any others that require field filtering) and takes it to the filtering station
15. For each sample, Dirty opens outside bag.
16. Clean opens inside bags and handles & fills bottles with Dirty controlling the pump on/off switch.
17. Dirty fills bottles that are not double-bagged.
18. Fill all total fraction bottles. Clean handles ONLY double-bagged bottles and inner bags.
19. Hand all filled bottles to super dirty to arrange in a storage cooler.
20. When all total fraction bottles, are filled, Dirty opens the outer bag of the filter.
21. Clean pulls out the filter and attaches it to the end of the tubing and puts the inner filter bag back inside the outer..
22. Dirty arranges the clamp jaws to hold the filter. Dirty closes and drops the empty outer filter bag into the cooler – the inner filter bag will be later used to cover the teflon tubing end during transit.
23. Run the pump one minute to flush. Especially at stations where the water looks cloudy/dark in the POC and other bottles, don't run too long, or filter will clog and blow itself off from backpressure.
24. Fill all dissolved fraction bottles.
25. Once done with all samples, Dirty opens the outer filter bag, and clean pulls out the inner filter bag, which will be used to cover the intake end of the tubing during transit.
26. Super dirty pulls pole up.
27. Dirty grabs the weight, careful not to let the intake end strike anything.
28. Clean grabs the intake end of the tubing about two inches above the end, and covers it with the empty inner filter bag (or alternatively an unused plastic glove). The weight is placed in the overflow sink with the covered end not touching anything but pointing in a direction to minimize accidental contact. Avoid laying the tubing on the deck of the boat as much as possible.
29. Leave the filter on the outtake end of the tubing during transit.

At subsequent stations, before beginning the steps listed above:

30. Dirty unclamps the filter and hold the bottom of the filter to stabilize it while Clean removes the filter from the outtake end of the tubing. Clean will touch ONLY the top end of the filter where it joins with the tubing (ie. where the filter has not touched the dirty clamp or previous station's site water)
31. Dirty moves the filter clamp jaws out of the way, being careful not to touch the outtake end of the tubing

32. Super dirty maneuvers the pole upward and outward over the edge of the boat, while Dirty holds the intake end of the tubing by the weight. When ready to deploy, Dirty removes the filter bag (or plastic glove) cover, being careful not to touch the end of the tubing. Super dirty makes sure the pole is extended upward & outward enough, then dirty releases the weight and attached tubing, allowing it to drop outward and downward into the water without striking the boat or anything else.
33. Super dirty secures the sampling pole to the boat railing and heavy coolers using bungees.
34. Proceed to step 12

35. At the end of the day, the weight and ties are removed from the tubing, with the tubing stored in the discarded inner bag from the days tubing, and the weight and ties placed in used outer bag.

Sample labeling

AMS field staff will print out and provide sample labels to sampling personnel prior to arrival on station. The sample ID naming convention is as follows:

RMP-17WC-xxxx

where xxxx is a four-digit number assigned by the sample tracking and labeling application.

For double bagged samples, printed labels are dropped inside the outer bag, and a sharpie is used to write the site code and fraction (T or D) on the label on the outer bag. Labels should be attached directly to bottles without bags, and the site code, analyte, and fraction should be written on the bottle lid.

POC filters should be individually wrapped in foil provided by ALS, which will be placed inside ziplock bags. The ziplock bag should be labeled with the filtered volume.

Blank sample collection

One field blank will be collected prior to field sample collection at station SB073W. This blank will be taken at the beginning of the day, before any other sample collection, to ensure the sample is collecting using a clean sampler (ie. no site water contamination). Prior to field blank sample collection, sample tubing is rinsed with lab blank water for at least 30 seconds (may vary depending on how much water is provided by labs and how much is required for analyses - pump rate is about 1L per minute).

DI water will be provided by BAL for metals, ALS for ancillary parameter blanks, and SIU for bisphenols/phosphate flame retardants (combined sample). Because there is only one POC and DOC field blank, it will be collected from filtered blank waters.

Sample Collection

Sample tubing must be rinsed with site water prior to any sample collection for at least a minute (total fraction) and for only one minute (dissolved fraction, to not clog the filter). The overflow sink drains to a 5 gallon bucket or water jug to avoid contaminating the site with water flowing off the boat deck. If a blank sample will be collected that day, do not attach the float and weight or flush the sampler until after the blank sample has been collected.

The “clean hands” sampler will rinse all bottles without preservative with site water before filling - for ancillary and trace metal samples, all non-preserved sample containers should be rinsed at least twice. To rinse, partially fill a bottle (5-10 seconds, enough to rinse the interior surface), close the cap, shake/swirl thoroughly, and dispose of the rinsate. Bottles with preservative are filled directly, without overflowing. Bottles that will be frozen are filled to 3/4 of the total bottle volume (none on this cruise). See Table 8 for a list of sample bottles by parameter and bottle handling instructions.

Sampling Stations

Samples will be collected at two pump and tubing set-ups, each corresponding to a pump and pre-cleaned sampling tubing assembly. Metals and ancillary parameters will be collected at station 1; and toxicity samples will be collected using a high-volume pump at station 2.

DOC/POC samples will be collected as whole water samples at the metals sampling station, and will be filtered using a vacuum pump and pre-ashed filters inside the boat cabin. Bisphenol/phosphate flame retardant samples will be collected by submerging the sample bottle using a steel sampling pole, and neonicotinoid samples will be collected the same way with the 1-L bottle sampling pole.

Staff will be roughly assigned to sampling stations in the following order:

- Staff 1 (Team 1) - Station 1 “clean hands”
- Staff 2 (Team 1) - Station 1 “dirty hands”
- Staff 3 (Team 2) - Station 1 “super dirty hands”, help setting up toxicity station and with CEC sampling, nutrients
- Staff 4 (Team 2) - CEC sampling, toxicity sampling, POC/DOC filtering, metals particulates filtering
- Staff 5 - CTD, YSI, labeling, help with CEC sampling and toxicity sampling

Additional staff will assist with sample labeling, organization, and equipment cleaning.

Station 1: Metals & Ancillary parameters

A low-volume peristaltic pump will be provided by SFEI and 9 sampling tube assemblies (one each for 5 sampling dates and 4 backups) will be provided by SFEI and pre-cleaned by BAL. Each tubing assembly consists of 16 ft of PVDF and 3 ft of silicone tubing attached with zip ties.

Samples should be collected using clean hands-dirty hands technique in the order listed below. Bagged samples should be collected before unbagged samples within each group (unfiltered samples, and later for in-line filtered samples).

A. DOC/POC

Wear nitrile gloves and filter samples inside the boat cabin to protect bottles from the sun. DOC/POC filtering will serve as rinsing between trace particulate metals filtering, so avoid contamination.

Particulate organic carbon:

1. Rinse with site water and collect samples into clean 2 L sample bottles (metals sampling station)
2. Rinse filter apparatus with squirts of ~100 mL of lab DI water, rinse funnel (potentially with carryover particulates from prev station/cabin environment, especially on the shoulder and/or bottom edge in contact with filter) separate from fritted glass support-keep funnel from touching support unless there is a filter in between.
3. Place pre-ashed filter on the filter apparatus with the grid side facing down. The grid side will have a faint imprint or cross-hatching from resting on a screen during manufacture. That side should stay down in sampling.
   Remove filters from packaging using forceps only
   i. Be sure not to knock filter off center when placing funnel on
   ii. If filter repeatedly moves off center, briefly turn on vacuum to suck it into position while attaching funnel
4. Swirl sample and pour out measured volume of water using graduated cylinders. Record volume and pour all contents into funnel. If filtering fast, quickly prepare for next addition.
5. Swirl sample holding bottle, and add water in 20-100 mL increments to graduated cylinder (add less each time as filter slows), record volume, and dump entire grad cylinder contents to funnel, repeat until filter clogs. Drip rate of around 1 drop per second is enough, move onto next filter.
   i. As fluid level approaches the shoulder of the funnel, check for settled material, and especially if filter nearly clogged/last addition, swirl to knock material off.
   ii. **Do not let filter run dry between additions, and turn off pump well in advance as residual vacuum continues to pull quickly especially when filter is not clogged. Do not add water too quickly or in large volumes: water may become trapped on top of clogged filter. On final addition for a given filter, filter can run dry.**
6. Keep track of total amount of water filtered and record this amount on the field sheet. Also record the pre-assigned number of the filter on the field sheet

i. A contingency if you messed up the volume recording, if there is a balance on board, weigh the filtration flask when done with filter, and after emptying to determine volume of water by difference (convert weight to volume based on station salinity). Worry about getting the filter packed away first though.

7. Carefully lift filter funnel/funnel straight up to avoid knocking off filtered material. Leaving filter pump on can help prevent filter lifting with funnel.
8. Fold filter in half carefully to not expose any filtered material, and taking care not to touch filtered material with forceps. Use a second pair of forceps or the filter funnel if necessary to flatten/fold filter. Try and observe dominant grain of fibers, filter will fold more easily along that direction
9. Individually wrap filters in foil pouches provided by ALS using forceps, and place these pouches inside ziplock bags along with pre-printed label.
10. Label the ziplock bags with the filtered volume and immediately freeze the sample on dry ice.
11. At end of day rinse off collection bottles with DI. Close collection bottles to avoid collecting dust overnight.

Dissolved organic carbon

1. Pour some of the filtrate (water in the bottom of the flask after the POC sample has been collected on the filter) into 250-mL bottles (this will be the DOC fraction).
   *Make sure there is no head space, but do not overfill to keep preservative intact.
2. Refrigerate the DOC, do not freeze.
3. *(skip if particulate metals to be done)* Rinse filtration apparatus with DI between stations, and wipe off and rinse with DI any material accidentally left on forceps when done.

B. Particulate (MeHg, Cu, Se)

1. Rinse filter apparatus with 10% HCl on the boat deck (or into the boat sink) at the beginning of each sampling day. Thoroughly rinse with DI after.
2. Collect samples into cleaned (1x DI rinsed and drained between stations, then 3x rinsed in site water at current site) extra 1 L HDPE bottles from BAL for metals. For intercomp stations, plan on up to 8L (2L max per intercomp lab)
3. *(skip if DOC/POC done immediately prior)* Rinse filter apparatus with squirts of ~100 mL of lab DI water, rinse funnel (potentially with carryover particulates from prev station/cabin environment) separate from fritted glass support- keep funnel from touching support unless there is a filter in between.
4. Place polycarbonate plankton filter on the filter apparatus.
   Remove filters from packaging using forceps only
   i. Be careful to not knock the filter off center placing funnel on
   ii. If filter repeatedly moves off center, briefly turn on vacuum to suck it into position while attaching funnel
5. *(skip if DOC/POC done immediately prior)* Pour 100 mL of lab DI water through filter. Discard that water.
6. Swirl sample and fill graduated cylinder with ~250 mL sample (we will filter as much water as reasonable through each filter, up to 2L max for 3 or fewer filters. Based on experience with POC sample, guess the amount that will easily filter, the polycarbonate filters usually have ~25% less capacity, so add less based on best judgement if the POC was already clogged at 250ml).
   i. For intercomp sites use similar procedure but spread filters for each lab across collected holding bottles (see item 12 below)
7. Rather than refill the grad cylinder and add to filter from the cylinder in increments, because we can mix the holding bottle much more easily, swirl sample holding bottle, and add to graduated cylinder in 20-100 mL increments (amount based on how slow filter already is) record amount, and dump entire grad cylinder content into funnel, and repeat until filter clogs. Drip rate of around 1 drop per second, move onto next filter.
   i. As fluid level approaches the shoulder of the funnel, check for settled material, and especially if filter nearly clogged/last addition, swirl to knock material off.
   ii. **Do not let filter run dry between additions, and turn off pump/release sidearm clamp well in advance as residual vacuum continues to pull quickly especially when filter is not clogged. Do not add water too quickly or in large volumes: water may become trapped on top of clogged filter. On final addition for a given filter, filter can run dry.**
8. Keep track of amount of water filtered and record this amount on the field sheet. You should have been recording volume added to grad cylinder each time before dumping into funnel. Also record the pre-assigned number of the filter on the field sheet IF there is one (more likely for POC than metals filters)..
   i. A contingency if you messed up the volume recording, if there is a balance on board, weigh the filtration flask when done with filter, and after emptying to

determine volume of water by difference (convert weight to volume based on station salinity).Worry about getting the filter packed away first though.

9. Remove filter and carefully fold and place filter in 50 mL centrifuge tubes.
10. Repeat steps 4-9 for second and third filter. BAL is fine with all filters in one tube, final volume for all filters combined recorded.
11. For dupe or Se intercomparison sites, set up 2 filtration stations with Y connector attached to two filtration flasks with pinch locks on each set up tubing to allow independent control*. Be careful to keep track of volume filtered through each filter.
    i. The pinch lock may be counterintuitive as one of the filters get clogged. When filter clogged, the pinch traps the vacuum in the sidearm flask. If in doubt, vacuum off, all pinch locks open will (eventually) get to ambient pressure. When running 2 stations simultaneously, really focus on the faster flowing station until it's kind of slow. It may be wise to just do one (other pinched closed) until slow enough to not need to do panic speed refills.
12. For Se intercomparison sites, combine up to 3 filters, from up to 2L volume, for each lab into one vial. The order for the combinations should be somewhat randomized using the following procedure in case there is a general trend (partitioning, settling) over time:
    i. Prepare 3 vials, one for each lab, hypothetically called A, B, C;
    ii. Put first completed filter (filter 1) into Vial A, 2 in B, 3 in C;
        1. If there is leftover volume in a holding bottle after filter 3 save for CCSF particulate sample. Start with new holding bottle for filter 4
    iii. Put filter 4 into B, 5 into C, and 6 into A;
        1. If there is leftover volume in a holding bottle after filter 6 save for CCSF sample. Start with new holding bottle for filter 7
    iv. Put filter 7 into C, 8 into A, and 9 into B. (If 2L got through 2 filters this step moot)
        1. Save leftover volume for CCSF particulate composite
    v. CCSF intercomp sample is done as time allows, combine leftover unfiltered water bits from bottles for 3 other labs as a composite, and filter as much as time allows. (other labs get composite by including filters from multiple holding bottles, CCSF composite is from combining leftover volumes in the partial used bottles for other labs)

13. Once completed all filters go into freezer/on dry ice
14. At end of day rinse off collection bottles, filter units, and filter flasks with DI. Close collection bottles to avoid collecting dust overnight.

C. Unfiltered Water Samples

1. CN-WAD

   Bottles are pre-loaded with NaOH pellet, and should be preserved to a pH > 12. After sample collection, check pH with pH strip. If additional NaOH is necessary, then need to obtain NaOH pellets for the following cruise dates since the lab did not provide additional NaOH.

2. SSC
Because ALS only sent 1L bottles, guesstimate the sample volume to collect for each station. As a rule of thumb: at any stations deeper than 20 ft with only a hint of color in POC water bottle (Central Bay, Golden Gate), collect 1L. If the sample is slightly cloudy, collect around 500 mL or a bit less (½ full). If the water is cloudy (brownish around the boat, less than 6 ft depth, rocked by wind/waves) collect around 250ml (¼ full). Most sites should be in the slightly cloudy category.

Completed water samples are kept refrigerated or chilled in coolers with wet ice or ice packs (0 to 5 C)

D. Dissolved (or Filtered) Water Samples

After collecting whole water samples, the "clean hands" sampler should attach a pre-cleaned filter provided by BAL to the end of the tubing. The "dirty hands" sampler should use a clamp to hold the filter in place. The filter should be flushed for at least 1 minute before collecting the first dissolved sample.

Fill the containers for the parameters listed above. Bagged samples should be collected before unbagged samples.

1. Trace metals (Cu, Se)
2. MeHg (bottles pre-loaded with HCl preservative - no rinse)
3. Hardness

Completed water samples are kept refrigerated or chilled in coolers with wet ice or ice packs (1 to 5 C)

Station 2: Toxicity

A high-volume peristaltic pump will be provided by AMS and 9 sampling tube assemblies (one per toxicity station) will be pre-cleaned by Pacific Eco Risk. Collect samples into a 5 gallon carboy and place the bottle label directly on the bottle. Sampling personnel should use gloves (nitrile or vinyl OK) while handling the pump and tubing. Bottles should be left with some headspace after filling, surrounded by wet ice, and transported to the laboratory as soon as possible, but well within maximum hold time of 36 hours.

For sites where extra water is collected for TIE analysis (sites BG20 and BG30), two additional carboys will be collected.

Station 3: CECs: Bisphenols and Phosphate Flame Retardants, and Neonicotinoids

Prior to sampling, rinse the outside of bottles in site water before opening the cap. Only remove cap with clean hands in nitrile gloves.

Bisphenol samples will be collected by submerging the sample bottle using a steel sampling pole. Fill containers with about 3L of water (3/4 full). Slowly pull the sampling pole directly out of the water and into the boat with the non-sampling end angled upwards until the bottle can be reached. Pour off any volume required to reach optimal level and cap as soon as possible. Phosphate flame retardants will be analyzed from the same sample.

Neonicotinoid samples will be collected in the same way as the bisphenol samples, leaving 1-2 cm of headspace in the bottle (1L amber glass). Two 1-L bottles will be filled for each sample, with the second bottle collected as backup. Sample bottle will be filled by submerging the sample bottle.

Completed water samples are kept refrigerated or chilled in coolers with wet ice or ice packs (1 to 5 C)

Station 4: Nutrients (Site BC20 only)

A. Dissolved
    a. Nitrate, Nitrite:
        1. Assemble labeled FlipMate unit. FlipMate units are an assembly of filters and cups that make it easy to collect filtered sample with the use of two threaded digestion cups, tubing (provided), and vacuum pressure. The sample is placed in one cup, the filter assembly threaded onto the top of the cup, then the cup and filter are flipped, the receiving cup attached, vacuum tubing attached, vacuum pressure applied, and the sample is then pulled from the sample cup, through the filter assembly, and into the empty cup. FlipMate units come with different filter sizes.
        2. Remove the filter (top) and cap the sample container (bottom) with the cap provided.
        3. Fill sample container with 0.5" of headspace (approximately 100 ml). DO NOT acidify the sample.
        4. Store sample on wet ice after collection.
    b. Orthophosphate: Follow the same procedures to filter sample. *Ortho-P sample must be filtered within 15-min of sample collection.*
    c. Ammonium: Follow the same procedures to filter sample.
    d. Silica: Will be filtered at Station 1 with peristaltic pump through pre-cleaned cartridges for metals analysis after all metals samples have been collected. Store sample on wet ice.
B. Total (Organic-N, Total Phosphorous)
    a. Add provided 5N H_2SO_4 to bottles morning of prior to cruise departure with Eppendorf pipette. Current best estimate is to add 0.5 mL of acid to sample bottles.
    b. On station, fill labeled sample container to 0.5" of headspace.
    c. Store sample on wet ice after collection.
    d. Check pH with provided strips and additional acid as necessary (desired pH is <2). If cruise is very unstable, then add additional acid when back on land.

Completed water samples are kept refrigerated or chilled in coolers with wet ice or ice packs (1 to 5 C)

C. Particulate (Chlorophyll-a):
    1. Filter sample as soon as possible and within 2 hours after sample collection and keep in subdued light to prevent chlorophyll concentrations from changing.
    2. Assemble filtering flask and ceramic crucible to vacuum pump (should not exceed 20 kPa) with 25 mm GF/F filter paper.
    3. Thoroughly agitate sample container to suspend particulates, and pour in clean graduated cylinder. Add as much water sample as will fit through filter (target 100 mL or more up to 4 L). Do not suck filter dry with vacuum during filtering nor at the end. Release vacuum as a last bit of water is drawn through the filter.
    4. Remove filter with tweezers with particulate matter inside. Lightly blot filter with Kimwipe to remove excess water if necessary.
    5. Record volume of water filtered.
    6. Rinse crucible with DI water between samples.
    7. DO NOT add methanol for preservation.
    8. Put filter in the provided HDPE centrifuge tube, and freeze sample on dry ice and in the dark.

3.3. Cruise Schedule

Sampling activities for the 2017 RMP Water Cruise are shown in Table 6. The tentative schedule assumes that an average of forty-five minutes will be required for sampling at each station. Sampling times may also vary depending upon suspended sediment loads, number and type of samples collected, and other factors. The schedule is for planning purposes only, and may be revised during sampling operations to reflect weather conditions, equipment performance, or other factors. Any sites unable to be sampled at the scheduled time will be rescheduled later in the cruise if possible, or will be replaced with the first available site within the segment from the current 2017 sampling schedule (see Appendix A for site locations). A record of all sites not able to be sampled and why will be maintained as part of the cruise recordkeeping.

There are no target sites for 2017 within close proximity to sensitive areas. AMS personnel have arranged to check in with USCG Command Center **(415-399-3547)** as needed in attempt to minimize disruptions to sampling.

Table 6. Tentative Schedule for 2017 RMP Water Cruise

Date	Time	Activity
Aug 28	0900-1400	*RV Turning Tide* transits from Oakley to Redwood City Marina (675 Seaport Blvd, 650-363-1390).
	1400-1700	AMS and SFEI personnel mobilize sampling equipment and load aboard vessel *RV Turning Tide* at **Redwood City Marina.** Aloha Transportation (Aloha) meets vessel at Redwood City Marina and ferries skipper to Driftwood Marina to retrieve personal vehicle.
Aug 29	0700-1530	Mobilize remaining sampling gear aboard vessel at **Redwood City Marina**. Sample BA30, LSB068W, LSB069W, LSB067W, LSB072W, and LSB070W (low tide 3.2' at 13:10; high tide 6.5' at 07:48). Return to **Redwood City Marina** and demobilize vessel.
	1500-1730	Aloha retrieves all samples for transfer to AMS.
Aug 30	0700-1430	Mobilize sampling gear aboard vessel at **Redwood City Marina**. Sample field blank, SB073W, SB072W, SB071W, and CB046W (low tide 3.3' at 13:54, high tide 5.8' at 08:43). Transit to **Emeryville Marina** (3310 Powell St, Emeryville, 510-654-3716) and demobilize vessel.
	1100-1300	Aloha Transportation retrieves dry ice for delivery to vessel and 8/29 toxicity samples for delivery to PER.
	1415-1715	Aloha Transportation meets vessel at Emeryville Marina and retrieves all personnel for transfer to personal vehicles in Redwood City and all samples for transport to AMS.

Aug 31	0700-1315 1000-1200 1315-1700	Mobilize sampling gear aboard vessel at **Emeryville Marina**. Add H2SO4 to organic-N and Total P sample bottles on land. Bring acid and pH strips on boat to test. Sample BC20, CB045W, and BC10. Transit to **Emeryville Marina** and demobilize vessel. Aloha Transportation retrieves dry ice for delivery to vessel and 8/30 toxicity samples for delivery to PER. Aloha Transportation meets vessel at Emeryville Marina and retrieves all samples, delivers 8/31 toxicity samples to PER, nutrient samples to CCCSD (latest delivery is 3:30 pm), bisphenol samples to the Emeryville FedEx Center on Christie Street (latest delivery is 5:00 pm), and all remaining samples to AMS. If nutrient samples are not delivered before closing, then samples need to be frozen and delivered morning of the next day.
Sep 6	0730-1630 1600-1800	Mobilize sampling gear aboard vessel at **Emeryville Marina**. Sample CB043W, SPB043W, SPB044W, and SPB042W (low tide 0.1' at 7:25; high tide 5.9' at 13:46). Transit to **Benicia Marina** (266 East B St., Benicia, 707-745-2628) and demobilize vessel. Aloha Transportation meets vessel at Benicia Marina and retrieves all personnel for transfer to personal vehicles in Emeryville and all samples for transport to AMS.
Sep 7	0700-1445 1200-1700 1430-1700	Mobilize sampling gear aboard vessel at **Benicia Marina**. Sample SU051W, SU053W, SU052W, BG20, and BG30 (low tide 0.3' at 10:07, high tide 5.3' at 16:05). Transit to Driftwood Marina (6338 Bridgehead Rd, Oakley, 925-757-9449) and demobilize vessel. Aloha Transportation transfers 9/6/17 toxicity samples to PER. Meets vessel at Driftwood Marina and retrieves sampling personnel for transit to Benicia Marina and 9/7/17 toxicity samples for transfer to PER. Mr. Salop meets vessel at Driftwood Marina and sampling personnel demobilize all samples and sampling equipment. AMS retains all remaining samples and sampling equipment for delivery to AMS.
Sep 8	TBD	Contingency day, as needed.

3.4. Lodging and Vendors

Recommended lodging options for vessel personnel are shown in Table 7 and addresses for local dry ice vendors are shown in Table 8.

Table 7. Contact Information for Suggested RMP Water Cruise Lodging.

Location	Nights	Hotel
Redwood City	August 28,29	Comfort Inn 1818 El Camino Real Redwood City, CA 650-599-9636
Emeryville	August 30	Extended Stay America 3650 Mandela Pkwy Oakland, CA 510-923-1481
Benicia	September 6	Best Western Heritage Inn 1955 E 2nd St. Benicia, CA 94510 707-746-0401

Table 8. Dry Ice Vendors Proximate to RMP Water Cruise Berthing Locations.

Port City	Vendor	Address / Phone	Hours (M-F)
Redwood City	Albertsons	200 Woodside Place Redwood City 650-873-4212	0700-1600
Emeryville	Arco	889 West Grand Oakland 510-465-4450	24 hrs
Benicia	Concord Airgas	1825 Arnold Industrial Concord 925-825-8822	0700-1700
Oakley	Raley's	2077 Main Street Oakley 925-625-0744	0600-2300

3.5. Sampling Sites

2017 target sampling sites are shown in Figure 4 and listed in Table 9. All coordinates are in WGS-84 datum. The replacement-site pool is shown in Appendix A.

Two target sites for 2017 were removed from the site list during planning for the following reasons:

- CB044W was removed due to its location in the Oakland Inner Harbor near the 7th Street Marine Terminal (Figure 1). It was replaced with site CB046W.

- LSB071 was removed due to its location between the Dumbarton Bridge and the nearby railroad tracks and Hetch Hetchy pipeline, which would make anchoring difficult. It was replaced with site LSB072W.

Coordinates for two additional target sites, LSB068W and SPB043W, are in locations that may be difficult to access safely via vessel. LSB068W is located within a side channel of Lower South Bay with several obstructions noted on nautical charts (Figure 2). SPB043W is located on the far western edge of San Pablo Bay, and would require a long transit across a shallow water area (Figure 3). In both cases, sampling personnel will confirm with the vessel skipper about possible sampling based upon weather conditions present. If either or both are unable to be sampled safely, then the first replacement site for each embayment will be substituted for the target.

Figure 1. Location of 2017 RMP Target Station CB044W

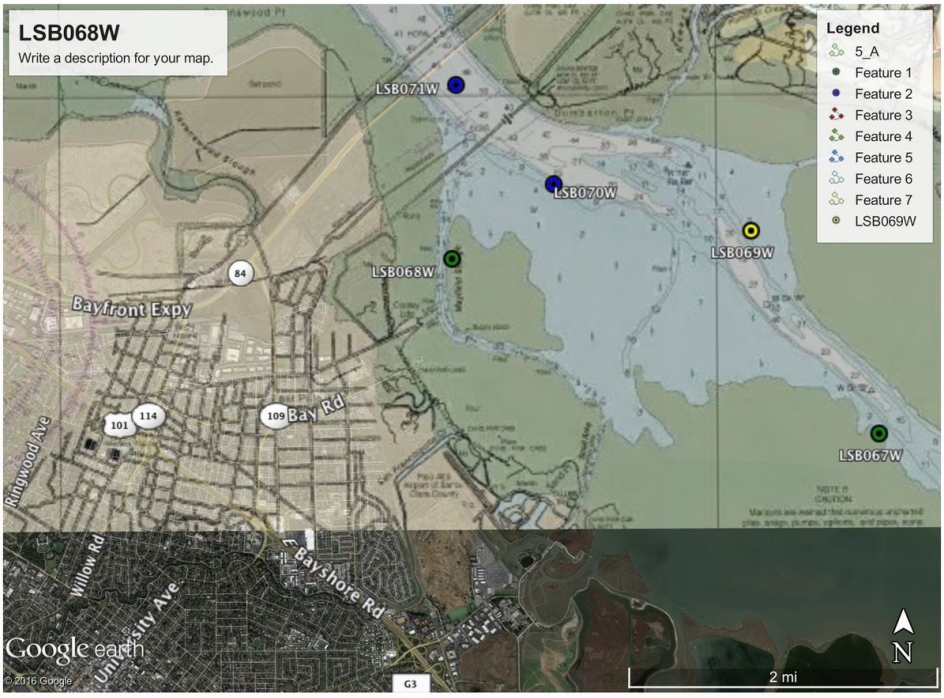

Figure 2. Location of 2017 RMP Target Stations LSB068W and LSB071W

Figure 3. Location of 2017 RMP Target Station SPB043W

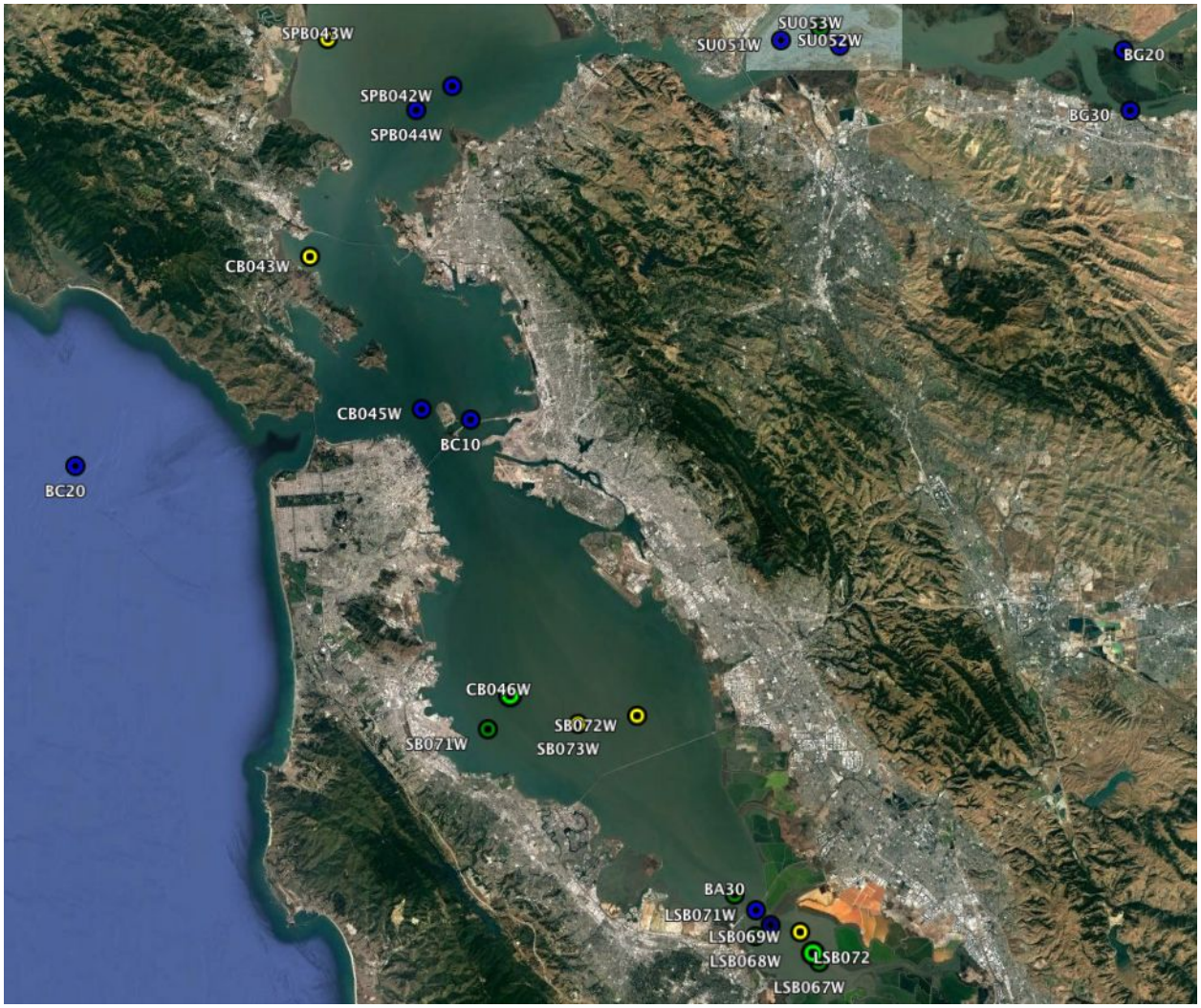

Figure 4. Location of 2017 RMP Target Water Stations

Table 9. Location of 2017 RMP Water Cruise Target Sampling Sites. Coordinates are in the NAD83 datum. The goal is to navigate to within 100 meters of these coordinates. If not possible, the lead scientist on the boat can make the call to accept a larger offset if it is "close enough" and the costs of rejecting the site and taking a replacement site are "too high". If the offset is greater than 200 meters, the station is rejected and replaced with a replacement site.

Region	Site Code	Site Type	Target Latitude	Target Longitude	Depth (ft)
RIV	BG20	Historic	38.05969966	-121.8112677	12+
RIV	BG30	Historic	38.02054094	-121.806267	12+
CB	BC10	Historic	37.8215833	-122.3495	
CB	BC20	Historic	37.7915	-122.67333	12+
SB	BA30	Historic	37.51375	-122.1346166	
SU	SU051W	Random	38.06700374	-122.0937161	12+
SU	SU052W	Random	38.06318259	-122.0453347	12+
SU	SU053W	Random	38.07464632	-122.0613253	6 to 12
SPB	SPB042W	Random	38.03763743	-122.3642433	12+
SPB	SPB043W	Random	38.06832963	-122.466697	3 to 6
SPB	SPB044W	Random	38.02219085	-122.3938438	12+
CB	CB043W	Random	37.92713888	-122.4811147	3 to 6
CB	CB045W	Random	37.82842369	-122.3895021	12+
CB	CB046W	Random	37.64343523	-122.3172908	12+
SB	SB071W	Random	37.62124822	-122.3357213	6 to 12
SB	SB072W	Random	37.62977094	-122.2138478	3 to 6
SB	SB073W	Random	37.6246372	-122.2620191	3 to 6
LSB	LSB067W	Random	37.46959684	-122.0656735	6 to 12
LSB	LSB068W	Random	37.48673013	-122.1177547	6 to 12
LSB	LSB069W	Random	37.4892963	-122.0811839	3 to 6
LSB	LSB070W	Random	37.49390204	-122.1052744	12+
LSB	LSB072W	Random	37.47575067	-122.0705836	12+

APPENDIX A

2017 Replacement Sites. All coordinates are in the NAD83 datum.

Region	Site Code	Target Latitude	Target Longitude	Depth (ft)
LSB	LSB073W	37.49195222	-122.083874	6 to 12
LSB	LSB074W	37.49130613	-122.1007743	12+
LSB	LSB075W	37.47856358	-122.0750837	12+
LSB	LSB076W	37.49450215	-122.0860241	3 to 6
SB	SB074W	37.53722916	-122.1759361	12+
SB	SB075W	37.62919913	-122.2680793	6 to 12
SB	SB076W	37.61765235	-122.2048574	3 to 6
CB	CB047W	37.82830794	-122.4414829	12+
CB	CB048W	37.77690076	-122.3050108	12+
CB	CB049W	37.86502945	-122.3598919	6 to 12
SPB	SPB045W	38.09315797	-122.3372935	3 to 6
SPB	SPB046W	38.05308001	-122.2977416	12+
SPB	SPB047W	38.08404421	-122.4290062	3 to 6
SU	SU054W	38.05072281	-121.9437816	12+
SU	SU055W	38.07262551	-122.0816759	6 to 12
SU	SU056W	38.06362236	-122.0079737	12+