2018 RMP Bivalve Retrieval

Cruise Plan

Contract #1343

September 13, 2018

Contribution #893

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1. Introduction

This report details plans associated with the biennial Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) bivalve retrieval cruise. This Cruise Plan was developed based upon the decisions of the RMP Technical Review Committee in 2002 to reduce the number of bivalve transplant stations from twelve to nine, utilize deployment cages rather than bags at all stations, and deploy only Mytilus californianus. These changes went into effect with the 2003 program and continued through the 2012 deployments. In 2014, the RMP Technical Review Committee reduced bivalve deployment transplant stations from 9 to 7 stations, 3 of which are back-up deployment sites. In addition, as instituted initially with the 2006 deployments, there is no mid-deployment maintenance cruise, as previous analyses showed no difference in bivalve growth or survival between maintained and unmaintained deployments. In the spring of 2018, the Technical Review Committee and Steering Committee approved the RMP's purchase of remote acoustic-release sampling equipment to eliminate the need to tether bivalve cages to moorings and reduce effort and cost for both the deployment and retrieval cruises.

2. Cruise Plan

2.1. Objectives

All sampling will be conducted from the *RV Questuary.* The target mass and number of mussels and mass for each site are shown in Table 1. The objectives of the sampling effort are as follows:

1. Retrieve *Mytilus californianus* (MCAL) deployed at seven sites during the deployment cruise (July 17-18, 2018).
2. Harvest resident *Corbicula fluminea* (CFLU) from two sites, historic San Joaquin River and Sacramento River stations.
3. As available, divide surviving bivalves as follows:
   Target allocations (all sites)
   - 100 bivalves (minimum of 90) for preparation of homogenate and analysis for PAHs (AXYS), Se (BAL), algal toxins (UCSC), and preparation of an archive (AXYS).
   - 25 bivalves (minimum of 21) for analysis of microplastics (UofT)
   - 25-30 bivalves (no minimum) for analysis of growth and survival by AMS

   QA allocations
   - At two target sites with good survival, allocate an additional 10 bivalves for lab duplicate and MS/MSD analysis (and identify on the bag and COCs these additional analyses). Primary Bay sites (BA10, BA30, BC10, & BD30) are the preferred sites for QA if they yield enough mass. Once received, AXYS is to communicate sample masses to RMP staff who will decide which sites to select for QA analyses. See table 8 for a list of prefered sites for QA analysis.
4. Collect a CTD water column profile at nine sites (7 transplant and 2 resident sites)

Table 1. Target Number of Mussels and Sample Mass For Each Site (all sites receive the same amount)

Sample	Target Mass (g ww)	Target Number of Individuals
AXYS Composite for S&T (PAHs + Se), Algal Toxins, & Archives	180	100
PAHs	15	10
Extra Mass for PAHs QA/QC	10[1]	
Se	10	5
Algal toxins	5	5
Archive	144	80
Microplastics	N/A	25
Growth	N/A	25-30

[1]An additional 10 g-ww sample is needed from two sites for PAHs QA/QC analysis (lab duplicate and a matrix spike). I.e., The PAH subsample will need to be 25 g-ww (rather than 15 g-ww) for two of the four Bay site-composites analyzed.

[2] The average mass of a mussel has been assumed to be 1.5-2 g-ww/mussel.

2.2. Personnel

The personnel and work assignments for this cruise are shown in Table 2.

Table 2. Personnel for 2018 RMP Bivalve Retrieval Cruise

Name	Affiliation	Duties
Paul Salop	AMS	Cruise manager, bivalve processing, dive tender (as needed)
Winn McEnery	AMS	Technical lead, CFLU collections, diver (as needed)
Clifton Herrmann	AMS	Bivalve processing, CFLU collections, diver (as needed)
Meg Sedlak/Ila Shimabuku	SFEI	Bivalve processing
Natasha Klasios	UofT	Bivalve processing, CFLU collections?
David Bell	RTC	Vessel skipper

Mr. McEnery, Melwani, and Salop will be responsible for equipment retrieval and bivalve processing. Captain Morgan will be responsible for vessel operation and safety. Mr. Salop will be responsible for overall cruise management, including permitting.

2.3. Cruise Schedule

This cruise schedule assumes that approximately 30 minutes will be required for operations at each site, and the vessel proceeds between stations at approximately 12 knots. Table 3 gives a tentative schedule for cruise operations. See Attachment 1 for a map of locations.

Table 3. Anticipated Cruise Schedule for 2018 RMP Bivalve Retrieval Cruise

Date	Time	Activity
Oct 9, 2018	1600-1730	Collect 30 T-1 Mussels, Bodega Head. Low tide 0.26' at 18:05. Place mussels on dry ice and transport to AMS.
Oct 22, 2018	0800-0815	Mobilize gear, load bivalves aboard *RV Questuary*, Pittsburg Marina. Depart for Sacramento River site.
	0915-1400	Collect resident CFLU at Sacramento River (BG20) and San Joaquin River (BG30) sites. Return to Pittsburg Marina
Oct 24, 2018	0630-0700	Mobilize gear aboard *RV Questuary*, Pittsburg Marina. Depart for San Pablo Bay.
	0930-1530	Retrieve bivalves from San Pablo Bay (BD20), Pinole Point (BD30), and YBI (BC11, tentative) sites. Return to Paradise Cay.
	1530-1730	Aloha Transportation meets vessel at Paradise Cay and retrieves bivalves and equipment. Aloha transfers personnel to personal vehicles in Pittsburg and remaining bivalves / equipment to AMS.
Oct 25, 2018	0700-0730	Mobilize equipment on *R/V Questuary* at Paradise Cay Marina. Depart for Coyote Creek (BA10).
	1000-1600	Retrieve bivalves from Coyote Creek (BA10), Dumbarton Bridge (BA30), Redwood Creek (BA40), Hunter's Point (BB71), and Yerba Buena Island (BC11, if not retrieved 10/24). Return to Paradise Cay.
	1600-1800	Retrieve all equipment and bivalves for return to AMS
Oct 26, 2018	0800-1300	Scheduled makeup dive day as required.

2.4. Sampling Sites

Coordinates for all RMP bioaccumulation monitoring sites are shown in Table 4 and Attachment 1. All scheduled samples to be collected at each site are shown in Table 5.

Table 4. Coordinates for 2018 RMP Bioaccumulation Cruise Sampling Sites. Coordinates recorded during 2018 deployments. All coordinates are listed in WGS-84 datum. Coordinates for BG20 and BG30 are approximate only – dredging locations will be established at time of sampling based upon populations present.

Site	Lat	Long	Comments
T-0	38.22050	-123.06550	Mussels collected from intertidal rock outcrops
BA10	37.47021	-122.06407	Adjacent to channel marker "B"
BA30	37.51377	-122.13491	Southeast of channel marker "14"

BA40	37.54737	-122.19524	North / northeast side of channel marker "4"
BB71	37.69547	-122.33933	South of channel marker "1"
BC10	37.81325	-122.35902	Southeast of previous monitoring site
BD30	38.01650	-122.36789	Approx 10 m west of channel marker "P"
BD20	38.05839	-122.43928	West of channel marker "4."
BG20	38.05570	-121.80593	Sacramento River (residents only): Near channel marker "8" N of Sherman Island
BG30	38.02362	-121.80048	San Joaquin River (residents only): Near channel marker "8" 0.75 nmi. E of Antioch Marina

2.5. Sampling Procedures

All mussels will be retrieved by triggering acoustic release devices from the vessel to release the deployment buoy to the water's surface. From there, field staff will use the vessel's A-frame to retrieve the bivalves and weights. For CFLU collection stations, field staff will tow a tooth bar dredge at slow speed across the bottom and repeat casts until an acceptable volume of CFLU have been obtained.

When the bivalves are onboard the vessel, they will be carefully packaged for shipment to the analytical laboratories. Upon return to the surface, one cage will be opened and 25 bivalves allocated for analysis of microplastics will be removed by hand, wrapped in aluminum foil, and placed inside a 1 gallon zip-top bag. All remaining bivalves will be removed from the cages, placed into a cleaned cooler, and mixed well. Dead bivalves will be counted and collected for on-land disposal. Appropriate numbers of the live organisms will be allocated for chemical analyses and growth as shown in Table 5. Bivalves for chemical analysis will be processed following the instructions in Table 6.

Table 5. Bivalve Allocations for 2018 RMP Bioaccumulation Samples

Site Code	**Region**	**AXYS Composite[3] Total of 100 Bivalves**		**Microplastics (UofT)**	**Growth (AMS)**
		Analyses: *PAHs - AXYS; Se - BA; Algal Toxins - UCSC*	**Archives**		
T-0 Bodega	N/A	X	X	25	25-30
BA10	South Bay	X	X	25	25-30
BA30[1]	South Bay		X[1]	25[4]	25-30
BA40	South Bay	X	X	25	25-30
BB71[1]	Central Bay		X[1]	0[1]	25-30
BC10	Central Bay	X	X	25	25-30
BD30	North Bay	X	X	25	25-30
BD20[1]	North Bay		X[1]	0[1]	25-30

BG20[2]	Rivers	X	X	25	25-30
BG30[2]	Rivers	X	X	25	25-30
T-1 Bodega	N/A				25-30
# Analyses		**7**	**10**	**8**	**11**

Notes:

[1]Backup deployment site. Samples will be deployed and processed using the same methods as the primary sites but will only be analyzed by the laboratory if the primary sites cannot be sampled. **Samples from the backup sites will be shipped to AXYS, composited, and archived even if only the primary stations are used for targeted analyses.**

[2]Analysis to be performed on resident *Corbicula fluminea* only. Due to small size of individual clams, allocation of bivalves will be made on mass / volume basis.

[3]Allocation of homogenate for analysis of PAHs, selenium, algal toxins (domoic acid, microcystins, saxitoxin), and long-term archive will be made by AXYS from whole bivalves, and aliquots delivered back to AMS for AMS to ship to labs/archives.

[4]Samples from all primary and one secondary site (Dumbarton Bridge - BA30) will be analyzed for microplastics

Table 6. Sample Handling for 2018 RMP Bioaccumulation Samples

Sample	Container	Handling Requirements
AXYS Composite	1 gallon zip-top bag	Collect 100 organisms do not rinse, wrap in two layers of aluminum foil, place in zip-top bags, freeze or place on dry ice.
PAHs	N/A	Collected as split from homogenate.
Selenium	N/A	Collected as split from homogenate.
Algal Toxins	N/A	Collected as split from homogenate.
Archive	N/A	Collected as split from organics homogenate.
Microplastics	1- gallon zip-lock bag (double-bagged), bivalves wrapped in foil	25 bivalves allocated for analysis of microplastics will be removed by hand, wrapped in aluminum foil, and placed inside a 1 gallon zip-top bag. Place on wet ice.
Growth	1 gallon zip-top bag, double-bagged	Collect 25 to 30 organisms, rinse with site water, place in zip-top bags, freeze or place on dry ice.

2.6. Sampling Labeling

All bags will be labeled by station, date, analysis, and quantity of bivalves they contain. Bags will also include pre-printed labels that AMS include a unique sample ID, date & time, station code, and analyte group for all subsamples excluding long-term archives. NIST is responsible for creating labels for long-term archives and sending them to AXYS along with long-term archive containers. The sample IDs will be as follows:

RMP-18BC-**XXXX-##**

RMP	=	Project
18	=	Cruise Year
BC	=	Matrix (Bioaccumulation Cruise)
XXXX	**=**	**Unique ID number**
##	=	**Aliquot number (for archive samples only)**

2.7. Sample Shipping

At the conclusion of the cruise, the bivalves for chemical analysis will be shipped to the appropriate analytical laboratories for analysis and long-term archive. AMS will retain any remaining bivalves for analysis of growth. See Table 7 for shipping instructions. See Attachment 2 for lists of the RMP's specific target analytes, fractions, and reporting units for this study.

Table 7. Shipping Protocol

Analytes		After Collection, AMS...	After AXYS...	AMS Ships to
Whole Bivalves for Composite		Ships to AXYS	-	-
PAHs		-	Analyzes samples	-
Se		-	Ships to AMS	BAL
Algal toxins		-	Ships to AMS	UCSC
Archive	*Short-term*	-	Ships to AMS	Schaeffer's
	Long-term	-	Ships to AMS	NIST
Microplastics		Ships to UofT	-	-
Growth		Analyzes bivalves for growth	-	-

2.8. Sample Processing and Analysis

Samples shipped to AXYS are processed to generate an overall homogenate for each station. The mass from the homogenate is apportioned into containers for the different analyses and archives as shown in Table 8. Laboratory methods and contact information are given in Table 9 and Table 10, respectively.

Table 8. Sample masses, # QA analyses, & container type by analyte.

Analysis	# of Samples	Sample Mass per container (g-ww)	# of Containers	Sample Container
PAHs	7	15	1	AXYS analyzes subsample
Selenium	7	10	1	4-oz glass or plastic wide-mouth jars

Microplastics	8	42	1	Wrapped in foil inside ziploc
Algal Toxins	7	5	1	Glass Jar
Archives: Long-term	10	15	3	22 mL Teflon vial
Archives: Long-term	10	8	3	10 ml PP cryovial
Archives: Short term	10	15	3	60 mL amber glass jar
Archives: Short term	10	15	2	30 mL PP jar
Growth	7	NA	1	Rinsed, placed in zip-top bag

Table 9. Laboratory Methods

Analytes	Analyzing Lab	Lab Method
Composite	-	-
PAHs	AXYS	MLA-021 Rev 12 - LR-GC/MS
Se	BAL	EPA 1638, Mod with EPA 3050B digestion
Algal toxins	UCSC	Domoic Acid and Microcystin: LC/MS Saxitoxin: ELISA
Archive	TBD	-
Microplastics	UofT	N/A
Growth	AMS	N/A

Table 10. Laboratory Contact Information

Lab	Address	Contact
AMS	Paul Salop Applied Marine Sciences, Inc. 4749 Bennett Dr., Ste L Livermore, CA 94551	Paul Salop 510-323-6523 salop@amarine.com
SGS-AXYS	Sample Receiving AXYS Analytical Services Ltd. 2045 Mills Rd. Sidney, BC Canada V8L 5X2	Sean Campbell 250-655-5834 scampbell@axys.com
BAL	Lydia Greaves Brooks Applied Laboratories 18804 Northcreek Parkway, Suite 100 Bothell, WA 98107	Lydia Greaves 206-753-6127 lydia@brooksapplied.com
UCSC	Kendra Hayashi UCSC - Ocean Sciences, EMS A316 1156 High St. Santa Cruz, CA 98011	Kendra Hayashi 831-459-4298 khayashi@ucsc.edu
UofT	Chelsea Rochman 25 Wilcocks St, Room 3055	Chelsea Rochman 416-978-6952

	Toronto, ON M5S2G6	chelsea.rochman@utoronto.ca
NIST	Amanda Moors NIST Hollings Marine Laboratory 331 Ft. Johnson Rd. Charleston, SC 29412	Amanda Moors 843-460-9814 amanda.moors@noaa.gov

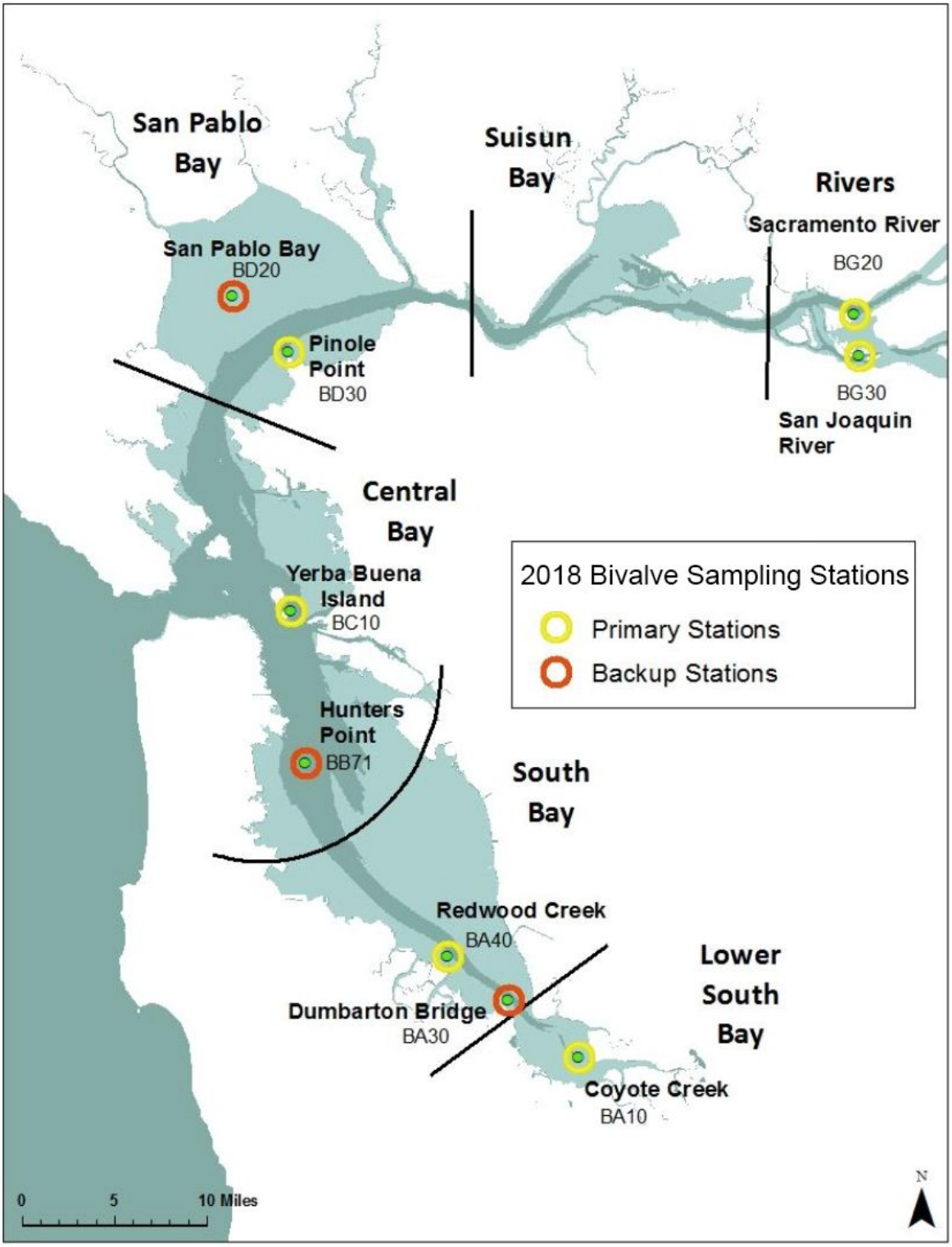
3. Attachments

Attachment 1. Map of Deployment / Collection Locations for 2018 RMP Bioaccumulation Program

Attachment 2. 2018 Bivalves Subsampling, Containers, & Handling
https://docs.google.com/spreadsheets/d/1DML8XUiJzyLqNU9pNfwUMwvQOWuWt6_F7cETctVJsF8/edit#gid=0

Attachment 3. 2018 Bivalves Target Analytes Tables
https://docs.google.com/spreadsheets/d/1JZngldI8L9fvw9j7-Tq5qqlSQMB6ife470CvdUuyzkc/edit#gid=0

Attachment 1 – Map of Deployment / Collection Locations for 2018 RMP Bivalve Monitoring



Attachment 2 2018 Bivalves Subsampling, Containers, & Handling																
Analysis Priority	**AXYS Contract Task 2(c)**	**Sample Type**	**Analysis**	**Labeling Acronym**	**# of Samples**	**Sample Mass per container (g-ww)**	**# of Containers**	**Total Sample Mass (g-ww)**	**Target allocation (no. bivalves)**	**Sample Container**	**AXYS Recieves Containers From**	**Subsample Storage**	**AXYS Cooler Labeling for Shipment to AMS**	**AMS Shipping Instructions**	**AMS Shipping Destination**	**Comments**
			PAHs	PAH	7	15	1	15	10	Internal Containter Used By AXYS	AXYS		NA	NA	AXYS	
1	ii	S&T Target Analyte	PAHs QA/QC	PAHQA	2	10	Same container as parent sample	10	0		AXYS		NA	NA	AXYS	These samples should be additional mass from two different sites, i.e., and extra 10g-ww for a lab dupe from one site and 10g-ww for a matrix spike from another.
1	iii	S&T Target Analyte	Selenium	SE	7	10	1	10	5	4-oz glass or plastic wide-mouth jars	BAL	0-4 C during shipment; < -15 C in the lab	BAL - Selenium	Overnight on dry ice	1. AXYS; 2. BAL	
1	**N/A**	Add-On Target Analyte	Microplastics	MP	8	42	1	42	21	Wrapped in foil inside ziploc	N/A	N/A	N/A	Bivalves removed by hand, wrapped in aluminum foil, and placed inside a 1 gallon zip-top bag. Place on wet ice. Avoid using plastic materials when handling mussels designated for microplastics analysis. Natasha Klasios will be taking samples back to UofT by plane where Chelsea Rochman will composite the samples.	UofT	Meg asked for 21 mussels from each site. I estimated 2g-ww/mussel to come up with the 42g-ww per sample. Paul can change this sample mass of 42g-ww if need be.
2	iv	Add-On Target Analyte	Algal Toxins	AT	7	5	1	5	10	20mL Disposable Glass Scintillation Jar	SFEI	0 C	UCSC - Algal Toxins	Overnight on dry ice	1. AXYS; 2. UCSC	
3	v	Archive	Long-term	LTTV	10	15	3	45	23	22 mL Teflon vial	NIST	-150 C	NIST - Archives	Overnight on dry ice	1. AXYS; 2. NIST	if NIST doesn't have any, order and ship to NIST for cleaning and finally to AXYS
3	v	Archive	Long-term	LTCV	10	8	3	24	12	10 ml PP cryovial	NIST	-150 C	NIST - Archives	Overnight on dry ice	1. AXYS; 2. NIST	
4	v	Archive	Short-term	STGL	10	15	3	45	23	60 mL amber glass jar	AXYS	-18 C	AMS - Archives	NA	1. AXYS; 2. Schaeffers	
4	v	Archive	Short-term	STPP	10	15	2	30	15	30 mL PP jar	AXYS	-18 C	AMS - Archives	NA	1. AXYS; 2. Schaeffers	
5		S&T Target Analyte	Growth	GRW	7	NA	1	60	30	Zip-top bag	AMS	frozen	N/A	N/A	AMS	
						135		286	149							

Labeling Protocol:

Sample ID: RMP-18BC-xxxx-#

where 'xxxx' = container id assigned by AMS and '-#' = aliquot number assigned by compositing lab duing aliquoting for archives

ex. RMP-18BC-1052-1

CompositeID: 18RMPBR-SiteID##-AnalyteName-LabRep#(if >1)

Ex: 18RMPBR-BA30-PAH

Attachment 3 - 2018 Bivalves RMP Target Analytes Tables					
LabAgencyCode	**AnalyteName**	**UnitName**	**MethodName**	**MatrixName**	**FractionName**
AMS	Growth Standard Error	g	None	tissue	Total
AMS	Dry Weight	g	None	tissue	Total
AMS	Dry Weight Standard Error	g	None	tissue	Total
AMS	Growth (weight)	g	None	tissue	Total
AMS	Survival	%	None	tissue	Total

LabAgencyCode	AnalyteName	MatrixName	UnitName	FractionName	MethodName
AXYS	Lipid	tissue	% ww	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Moisture	tissue	% ww	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	1-Methylchrysene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	1,2-Dimethylnaphthalene 1	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	1,2,6-Trimethylphenanthrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	1,4,6,7-Tetramethylnaphthalene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	1,7-Dimethylfluorene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	1,7-Dimethylphenanthrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	1,8-Dimethylphenanthrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	2-Methylanthracene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	2-Methylfluorene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	2-Methylphenanthrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	2,3,6-Trimethylnaphthalene 1	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	2,4-Dimethyldibenzothiophene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	2,6-Dimethylphenanthrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	2/3-Methyldibenzothiophenes	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	3-Methylfluoranthene/Benzo(a)	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	3-Methylphenanthrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	3,6-Dimethylphenanthrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	5,9-Dimethylchrysene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	5/6-Methylchrysenes	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	7-Methylbenzo(a)pyrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	9/4-Methylphenanthrenes	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Acenaphthene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Acenaphthylene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Anthracene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Benz(a)anthracene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Benzo(a)pyrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Benzo(b)fluoranthene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Benzo(b/j/k)fluoranthene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Benzo(e)pyrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Benzo(g,h,i)perylene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Benzo(j/k)fluoranthene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Benzofluoranthenes	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Biphenyl	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C1-Acenaphthenes	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C1-Benz(a)anthracenes/Chrysen	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C1-Benzofluoranthenes/Benzop	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C1-Biphenyls	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C2-Benz(a)anthracenes/Chrysen	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C2-Benzofluoranthenes/Benzop	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C2-Biphenyls	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C2-Fluoranthenes/Pyrenes	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C3-Benz(a)anthracenes/Chrysen	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C3-Fluoranthenes/Pyrenes	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C4-Benz(a)anthracenes/Chrysen	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C4-Dibenzothiophene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	C4-Fluoranthenes/Pyrenes	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS

AXYS	Chrysene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Dibenz(a,h)anthracene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Dibenzothiophene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Dibenzothiophenes, C1-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Dibenzothiophenes, C2-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Dibenzothiophenes, C3-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Dimethylnaphthalene, 2,6-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Fluoranthene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Fluoranthene/Pyrenes, C1-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Fluorene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Fluorenes, C1-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Fluorenes, C2-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Fluorenes, C3-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Indeno(1,2,3-c,d)pyrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Methylnaphthalene, 1-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Methylnaphthalene, 2-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Methylphenanthrene, 1-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Naphthalene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Naphthalenes, C1-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Naphthalenes, C2-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Naphthalenes, C3-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Naphthalenes, C4-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Perylene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Phenanthrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Phenanthrene/Anthracene, C1-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Phenanthrene/Anthracene, C2-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Phenanthrene/Anthracene, C3-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Phenanthrene/Anthracene, C4-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Pyrene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Retene	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS
AXYS	Trimethylnaphthalene, 2,3,5-	tissue	ng/g dw	Total	AXYS MLA-021 Rev 12 - LR-GC/MS

LabAgencyCode	AnalyteName	MatrixName	UnitName	FractionName	MethodName
UCSC	Domoic Acid	tissue	ng/L	Total	LC/MS
UCSC	Saxitoxin	tissue	ng/L	Total	ELISA
UCSC	Microcystin	tissue	ng/L	Total	LC/MS

LabAgencyCode	AnalyteName	MatrixName	UnitName	FractionName	MethodName
UoT-RL	Acrylic fiber	tissue	# / per sample	Total	N/A
UoT-RL	anthropogenic (cellulosic) fiber	tissue	# / per sample	Total	N/A
UoT-RL	Anthropogenic (non-plastic) fragment	tissue	# / per sample	Total	N/A
UoT-RL	Anthropogenic (plastic) fragment	tissue	# / per sample	Total	N/A
UoT-RL	Anthropogenic (protein) fiber	tissue	# / per sample	Total	N/A
UoT-RL	Anthropogenic (synthetic) fiber	tissue	# / per sample	Total	N/A
UoT-RL	Anthropogenic (unknown base) fiber	tissue	# / per sample	Total	N/A
UoT-RL	Anthropogenic (unknown base) fragment	tissue	# / per sample	Total	N/A
UoT-RL	Cotton fiber	tissue	# / per sample	Total	N/A
UoT-RL	ethylene-propylene copolymer fragment	tissue	# / per sample	Total	N/A
UoT-RL	Glass fragment	tissue	# / per sample	Total	N/A
UoT-RL	Glass sphere	tissue	# / per sample	Total	N/A
UoT-RL	High density polyethylene fragment	tissue	# / per sample	Total	N/A
UoT-RL	Inorganic natural material	tissue	# / per sample	Total	N/A
UoT-RL	Low density polyethylene fragment	tissue	# / per sample	Total	N/A
UoT-RL	Organic natural material	tissue	# / per sample	Total	N/A
UoT-RL	Paint fragment	tissue	# / per sample	Total	N/A
UoT-RL	Poly(acrylonitrile) fiber	tissue	# / per sample	Total	N/A
UoT-RL	Poly(methylhydrosiloxane) fiber	tissue	# / per sample	Total	N/A
UoT-RL	Polyacrylamide fiber	tissue	# / per sample	Total	N/A
UoT-RL	Polyester fiber	tissue	# / per sample	Total	N/A
UoT-RL	Polyethylene co-polymer fragment	tissue	# / per sample	Total	N/A
UoT-RL	polyethylene fragment	tissue	# / per sample	Total	N/A
UoT-RL	Polyethylene pellet	tissue	# / per sample	Total	N/A
UoT-RL	Polyethylene sphere	tissue	# / per sample	Total	N/A
UoT-RL	Polyethylene terephthalate fragment	tissue	# / per sample	Total	N/A
UoT-RL	Polyethylene wax fragment	tissue	# / per sample	Total	N/A
UoT-RL	Polyethylene wax sphere	tissue	# / per sample	Total	N/A
UoT-RL	Polyoxymethylene fragment	tissue	# / per sample	Total	N/A
UoT-RL	Polypropylene fiber	tissue	# / per sample	Total	N/A
UoT-RL	Polypropylene film	tissue	# / per sample	Total	N/A
UoT-RL	Polypropylene fragment	tissue	# / per sample	Total	N/A
UoT-RL	Polystyrene foam	tissue	# / per sample	Total	N/A
UoT-RL	Polystyrene fragment	tissue	# / per sample	Total	N/A
UoT-RL	Polytetrafluoroethylene fiber	tissue	# / per sample	Total	N/A
UoT-RL	Polyurethane fiber	tissue	# / per sample	Total	N/A
UoT-RL	Polyurethane foam	tissue	# / per sample	Total	N/A
UoT-RL	Polyurethane fragment	tissue	# / per sample	Total	N/A
UoT-RL	Rubber fragment	tissue	# / per sample	Total	N/A

LabAgencyCode	AnalyteName	UnitName	MethodName	MatrixName	FractionName
BAL	Moisture	% ww	SM 2540 G	tissue	Total
BAL	Selenium	ug/g dw	EPA 1638M	tissue	Total
BAL	Total Solids	%	SM 2540 G	tissue	Total