Regulatory Workgroup
(Formerly Tri-TAC)

The May 8, 2014 meeting will be held at:
Orange County Sanitation District
10844 Ellis Ave
Fountain Valley, CA 92708

General Meeting
9:30 a.m. – 10:00 a.m.

Committee Meetings
10:00 a.m. – 12:30 p.m.

NOTE: FOR COMPLIMENTARY TRANSPORTATION FROM JOHN WAYNE AIRPORT TO OCSD, RSVP TO Tom Meregillano at tmeregillano@ocsd.com or call (714) 593-7457 OR CELL (714) 655-7568
BY WEDNESDAY MORNING, 5/7/14.

PICKUP TIME: 9:00 A.M. AT SOUTHWEST PICKUP/ARRIVAL AREA (SEE WHITE VAN WITH OCSD LOGO)
DROP OFF TIMES: RETURN TRIPS MEET IN OCSD ADMINISTRATION LOBBY:
*12:00 P.M. FOR RETURN TO AIRPORT BY 12:15 P.M.
*2:30 P.M. FOR RETURN TO AIRPORT BY 2:45 P.M.

Next Meeting:
In Person
June 12, 2014
Carollo Engineers
2880 Gateway Oaks Drive, Suite 300
Sacramento, CA 95833

Directions to Orange County Sanitation District (Plant 1)

10844 Ellis Avenue, Fountain Valley, CA 92708

(714) 962-2411

Directions to Plant 1 (Administrative Offices)

Going South on the 405 freeway, exit at Euclid Ave., go straight through signal, enter main gate and turn right.

Going North (from John Wayne Airport) on the 405 freeway, exit at Euclid Ave., turn right, immediately after underpass turn left at signal, enter main gate and turn right.

Important Parking Information: <u>All drivers must stop at the guard shack to sign in and obtain a parking pass</u>. The meeting will be held in our Administration offices. Parking is available, immediately after passing the guard shack, on the right-side of the road next to the Administrative offices. Public entry is allowed through the front entrance only.

Regulatory Workgroup

Orange County Sanitation District 10844 Ellis Avenue Fountain Valley, CA 92708

THURSDAY, May 8, 2014

9:30 A.M. – 10:00 A.M. - GENERAL MEETING

1. Introductions
2. CASA Reg. Workgroup Attendance Roster from March 2014 Phone Meeting (P. 4-5)
3. Future Meeting Schedule and Locations (P. 6)
4. Presentation by Claudio Ternieden, WEF Director of Regulatory Affairs
5. Update on Hot Topic Issues In Water and Land Committees
6. Other Business and New Issues

10:00 A.M. – 12:30 P.M. – COMMITTEE MEETINGS

1. Land Committee Agenda (P. 7-8)
2. Water Committee Agenda (P. 9)
3. Committee Issue Summaries (P. 53 & 58)

CASA Regulatory Workgroup
April 10, 2014

Water Call Attendance

Carr, Seth
Carrillo, Dindo
Cobian, Paul
Dorn, Linda
Fono, Lorien
Franklin, Rebecca
Friess, Phil
Ghuman, Preeti
Hall, Tom
Haney, Lisa
Javier, Al
Kepke, Jackie
Link, Adam
Lofton, Jason
Mackie, Alec
Markle, Phil
Meregillano, Tom
Mysliwiec, Mitch
Oakley, Monica
Roa, Amanda
Shepardson, Jennifer

CASA Regulatory
Workgroup April 10, 2014

Land Call Attendance

Sierra, Natalie
Jones, Bonnie
Krupp, Matthew
Copeland, Matthew
Kepke, Jacqueline
Deslauriers, Sarah
Jones, Christina
Chakrabarti, Alicia
Link, Adam
Baroldi, Layne
Franklin, Rebecca
Meregillano, Tom

2014 CASA Regulatory Workgroup
Schedule & Locations
(EFFECTIVE January 7, 2014)

MEETING DATE	LOCATION	COMMENTS
January 9, 2014	**Conference Call** 8:30 – 10:30 Land Call 10:30- 12:30 Water Call	CASA Winter Conference January 15-17 Indian Wells, CA
February 13, 2014	Boy Scout Council 1001 Davis Street San Leandro, CA 94577	Pesticides Work Group 1-3pm CASA D.C. Conference February 24-26
March 13, 2014	**Conference Call** 8:30 – 10:30 Land Call 10:30- 12:30 Water Call	
April 10, 2014	**Conference Call** 8:30 – 10:30 Land Call 10:30- 12:30 Water Call	**CWEA Conference** April 29-May 7 **CASA Public Policy Forum** April 28-29, Sacramento, CA
May 8, 2014	Orange County Sanitation District 108 44 Ellis Avenue Fountain Valley, CA 92708	Schedule: Shuttle bus offered from John Wayne Airport at about 8:40 a.m.
June 12, 2014	Carollo Engineers 2880 Gateway Oaks Drive, Suite 300 Sacramento, CA 95833	
July 10, 2014	**Conference Call** 8:30 – 10:30 Land Call 10:30- 12:30 Water Call	
August 2014	No Meeting	CASA Conf. Aug. 20-22, Monterey
September 11, 2014	Boy Scout Council 1001 Davis Street San Leandro, CA 94577	Annual Retreat at EBMUD Pardee Center Valley Springs, CA
October 9, 2014	Orange County Sanitation District 108 44 Ellis Avenue Fountain Valley, CA 92708	Schedule: Shuttle bus offered from John Wayne Airport at about 8:40 a.m.
November 13, 2014	**Conference Call** 8:30 – 10:30 Land Call 10:30- 12:30 Water Call	
December 11, 2014	Carollo Engineers 2880 Gateway Oaks Drive, Suite 300 Sacramento, CA 95833	Annual Luncheon

- If you would like to add an agenda item or schedule a presentation for an upcoming meeting, please contact one of the committee co-chairs at least 14 days before the designated meeting date
- If you would like an "after CASA" meeting noted in the agenda package, please contact Jackie Kepke at least ten days before the designated meeting date.
- CASA is exploring video conference capabilities and may offer video locations along with Conference Calls as the year progresses.
- Air Committee is meeting on an Ad-Hoc Basis.

CASA BIOSOLIDS LAND COMMITTEE

AGENDA

Conference Call

May 8, 2014

Item No.	Topics	Lead Person	Est. Time (minutes)	Attachments
1.	**Regulatory/Legislative/Legal Updates**			
	▪ Ordinances Update – Imperial – San Luis Obispo – Solano	G. Kester/L. Baroldi	10	
	▪ Kern County (Measure E)/AB 371	G. Kester/D. Gilbert		
	▪ Gilbert v. Synagro Case	L. Baroldi		
2.	**State and Regional Updates**			
	▪ CalRecycle FOG/Food Waste Digestion	G. Kester	15	
	▪ CalRecycle 75% Diversion Plan	G. Kester		
	▪ CDFA Regulations on Rendering	G. Kester		
3.	**EPA and Nationwide Updates**			
	▪ Product Derived Biosolids – WEF/EPA meeting	T. Meregillano	10	
	▪ Arsenic Cancer Slope Factor	G. Kester		
4.	**Regional Facilities Updates**			
	▪ Bay Area Agencies	Z. Kay/B. Jones/N. Sierra	30	
	▪ So. Cal. & C.V.	T. Meregillano/E. Have/Randy Lee		
	▪ IERCF	M. Copeland		
	▪ Westlake Farms	M. Copeland		
	▪ TIRE	D. Gilbert		
5.	**Industry Association Updates**			
	▪ WEF	G. Kester	10	
	▪ CASA	G. Kester		
	▪ CWEA	J. Hay		
	▪ SCAP	M. Bao		
	▪ BACWA	Z. Kay		
	▪ CVCWA	TBD		
6.	**Emerging Contaminants**			
	▪ Pyrethroid Working Group	G. Kester	5	
	▪ Trace Organics Activities	G. Kester		
7.	**Energy Workgroup Crossover Updates**			
	▪ AB 32 Climate Change Scoping Plan Update – Relevant to Biosolids	G. Kester/ S. Deslauriers	10	
8.	**Biosolids Research**			
	▪ WEF Biogas Study	G. Kester	5	
	▪ UC. Berkeley Update on Survey Biosolids	G. Kester		
9.	**Conferences/Webinars** ▪ WEF Residuals and Biosolids	All	2	

Item No.	Topics	Lead Person	Est. Time (minutes)	Attachments
	2014: May 18 – 21, 2014 Austin Convention Center, Austin, TX. ▪ 2014 Soil in the City Conference in Chicago – Enhancing Urban Soils Living Landscapes and Healthy Communities. June 29-July 2, 2014. ▪ California Bioresources Alliance 9th Annual Symposium: The 2014 symposium will be held at the U.C. Davis Buehler Alumni Center, on June 3rd and 4th.			
10.	**Information Sharing**	All	5	

ITEM #	Topic	LEAD	Time (min)	Relevant material
Discussion Items:				
1.	CEC Pilot Study Monitoring Plan	Phil Friess	15	Attachments 1 and 2
2.	Statewide Nutrient Policy	Mitch Mysliwiec	10	
3.	Biological Objectives	Phil Markle	10	
4.	REC1 Bacteria Objectives Focus Group	Jason Lofton	5	
Updates				
1.	SWRCB Draft Regulations on Petition for Review Process	Adam Link	5	
2.	Recycled Water WDR	Jason Lofton	5	http://www.waterboards.ca.gov/water_issues/programs/land_disposal/waste_discharge_requirements.shtml
3.	Statewide Drinking Water NPDES Permit	Adam Link	5	http://www.waterboards.ca.gov/water_issues/programs/npdes/docs/dwsgp/dwsgp_stakeholder_snnouncement_12may2014.pdf
4.	Citizen Suit Reform White Paper - Wheeler Institute	Adam Link	5	http://www.casaweb.org/content/casa-continues-its-focus-clean-water-act-citizen-suit-reform
Items that are out there:				
Santa Maria Pesticide TMDL	Comments due May 21	http://www.waterboards.ca.gov/centralcoast/water_issues/programs/tmdl/docs/santa_maria/pesticide/index.shtml		
NPDES Enforcement Report		http://www.waterboards.ca.gov/publications_forms/publications/2013_13385report/index.shtml		

Monitoring of Constituents of Emerging Concern (CECs) in Aquatic Ecosystems – Pilot Study Requirements

Nathan G. Dodder, Alvine C. Mehinto and Keith A. Maruya
Southern California Coastal Water Research Project Authority
Costa Mesa, CA 92626

1 INTRODUCTION

In October 2009, the State of California Water Resources Control Board (SWB) provided support for a scientific advisory panel to review existing scientific literature on constituents of emerging concern (CECs) in aquatic ecosystems; determine the state of the current scientific knowledge regarding the risks that CECs in freshwater and marine water pose to human health and aquatic ecosystems; and provide recommendations on improving the understanding of CECs for the protection of public health and the environment. Seven experts were vetted and convened as the CEC Ecosystems Panel ("Panel") to provide information and recommendations on CECs[1] in coastal and marine ecosystems, and was subsequently tasked to expand the scope to include freshwater ecosystems. The Panel collaborated with stakeholders, who provided their perspective of the water quality issues and additional information, during the development of their recommendations. In their final report, Monitoring Strategies for Chemicals of Emerging Concern (CECs) in California's Aquatic Ecosystems: Recommendations of a Science Advisory Panel, SCCWRP Technical Report 692, Anderson et al. (2012) recommended a risk-based screening framework to identify CECs for monitoring, applied the framework using existing information to three representative receiving water scenarios to identify a list of appropriate CECs for initial monitoring, an adaptive phased monitoring approach and development of bioanalytical screening and predictive modeling tools to improve assessment of the presence of CECs and their potential risk to the environment.

Early in the process, the Panel was instructed by SWB staff to focus on ambient surface waters that receive discharge from sources regulated under the National Pollutant Discharge Elimination System (NPDES). As a result, permitted discharges from municipal wastewater treatment plants (WWTPs) and municipal separate stormwater systems (MS4) were considered as the primary sources of CECs to receiving waters. Waterbodies that receive agricultural runoff were not considered.

1.1 SUMMARY OF PANEL RECOMMENDATIONS

1.1.1 Adaptive Monitoring Strategy

The Expert Panel recommended an adaptive monitoring approach with four sequential phases described below (**Fig. 1.1-1**) that is responsive to advances in assessment and monitoring technology.

[1] CECs may include a wide variety of substances including pharmaceuticals, flame retardants, newly registered contemporary use pesticides, industrial and agricultural products, fragrances, hormones, antibiotics and nanoparticles that are not currently regulated in discharges to ambient waters across California.

Phase 1 – Develop initial CEC list. The Panel met with scientists, managers and stakeholder groups representing local, regional and statewide interests, to learn about current CEC studies, regional and statewide monitoring programs, and NPDES permitted discharges that are relevant statewide. The Panel created a risk-based framework to identify high priority CECs based on available, peer-reviewed occurrence and toxicity information. In applying this framework, the Panel identified three exposure scenarios where WWTP and MS4 discharge could impact receiving water quality. These scenarios are (1) WWTP effluent dominated freshwater (rivers); (2) coastal embayments receiving both WWTP effluent and stormwater discharge; and (3) ocean discharge from large WWTP (> 100 million gallons per day) outfalls. The initial list of CECs was generated by comparing measured or predicted environmental concentrations (MECs or PECs) in aqueous, sediment and/or tissue to MTLs (monitoring trigger levels based on biological effects thresholds) that incorporated safety factors. CECs recommended for initial monitoring exhibited an MTQ (monitoring trigger quotient, MTQ = MEC/MTL) that exceeded unity and for which sufficiently robust analytical chemistry methods were available. The recommendations for Phase 1 was documented in the Panel's final report (Anderson et al. 2012).

Phase 2 – Implement monitoring of CECs. The objectives of this phase are to: 1) verify the occurrence of high priority CECs in aqueous, sediment and tissue samples; 2) initiate compilation of a data set that characterizes their occurrence in source and receiving waters, and in appropriate matrices (i.e., water, sediment and tissue); 3) evaluate improved/supplemental methods and surrogate measures (e.g., bioanalytical screening tools); and 4) utilize, modify and/or initiate development of environmental fate models where appropriate. Screening-level mass balance models synthesize knowledge of CEC loading, and predict environmental compartment transfer and loss rates, as well as temporal CEC concentration trends. Through insight gained from these models, prioritization efforts in Phases 3 and 4 can subsequently focus on issues with the greatest potential risk.

Phase 3 – Update monitoring and response plans. Using results from Phase 2, the list of CECs is re-evaluated and, if warranted, re-prioritized. Results of environmental fate modeling are evaluated to prioritize future monitoring and to conduct a preliminary review of the impacts of management actions.

Phase 4 – Action plan to minimize impacts. If the assessment conducted during Phase 3 indicates certain CECs will persist and continue to present a concern, then during Phase 4 the Panel would develop guidance on the development and assessment of specific action plans for consideration by the SWB for implementation as part of their development of statewide policies, permits and/or guidance.

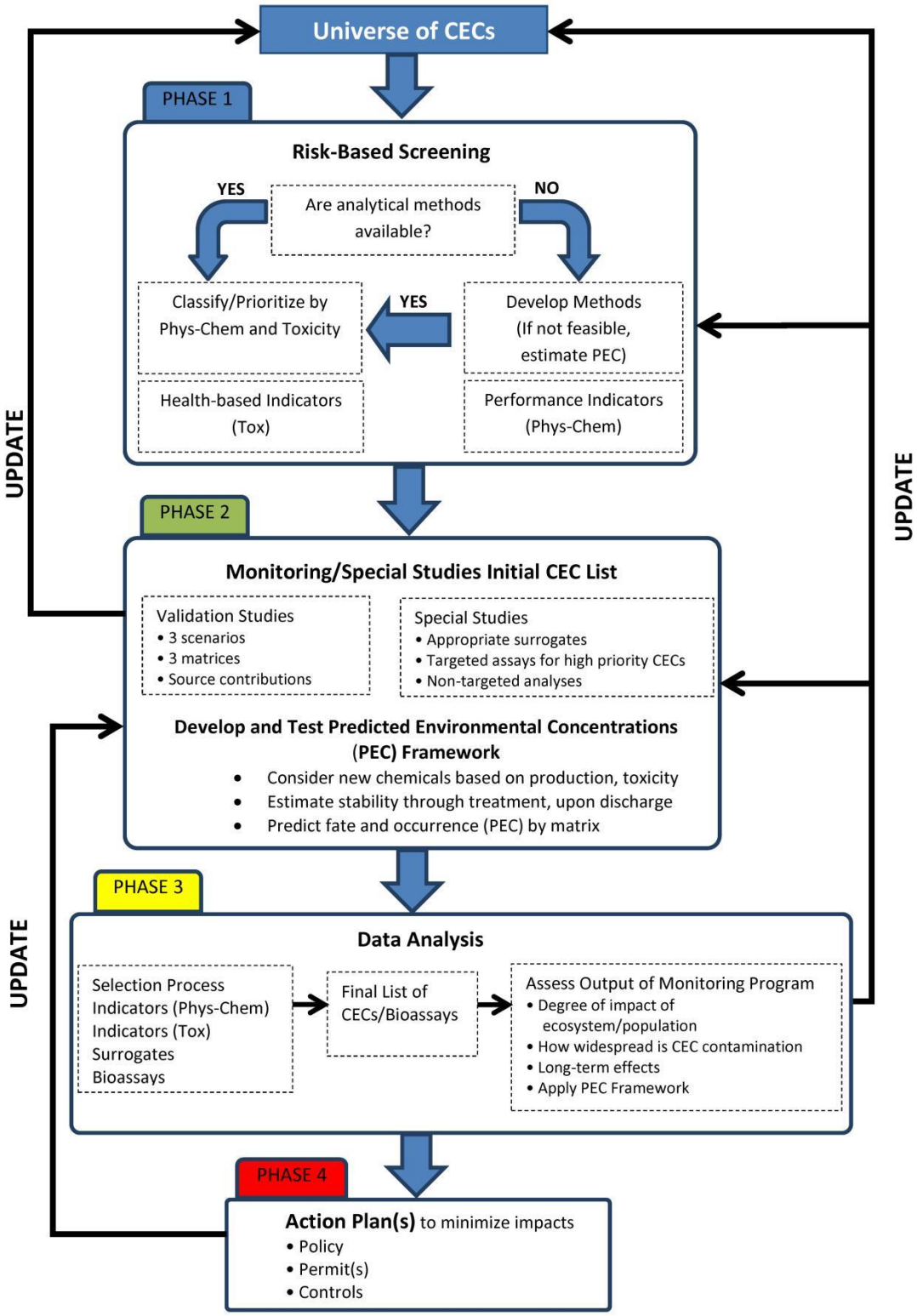

Fig. 1.1-1. The adaptive monitoring strategy for constituents of emerging concern (CECs) developed by the CEC Ecosystems Panel convened to recommend monitoring in California surface waters impacted by NPDES permitted discharges (i.e. treated wastewater effluent and stormwater runoff).

1.1.2 Discharge Scenarios

With guidance from the SWB and stakeholder community, the Panel identified three receiving water scenarios for which to provide CEC monitoring recommendations. These scenarios were selected based on the expected magnitude of CEC discharge from NPDES permitted sources and severity of exposure to both human and ecological receptors.

1. Inland freshwaters where flow is dominated by treated WWTP effluent discharge (dry season).
2. Coastal embayments receiving treated WWTP effluent and stormwater (MS4) discharge (dry and wet seasons).
3. Offshore marine waters receiving treated effluent from large (>100 mgd) WWTPs.

These scenarios were considered separately because they have distinct differences in spatial and temporal source characteristics, fate and transport processes, and receptors of interest that define beneficial uses of the resource. A detailed description of relative CEC source contributions and exposure conditions for each of the three scenarios is provided in the Panel's final report (Anderson et al. 2012).

1.1.3 Initial List of CECs by Discharge Scenario ("Targeted Monitoring")

A total of 16 individual CEC analytes were recommended for chemical-specific (or "targeted") Phase 2 monitoring; however not all 16 CECs were selected for all scenarios (**Table 1.1-1**). Due primarily to the limited degree of attenuation (e.g. by dilution), the number of CEC analytes recommended for monitoring was greatest for the WWTP effluent dominated inland freshwater (Scenario I). In contrast, the smallest number of CECs recommended were for sediment and tissue, due in large part to the paucity of MECs and MTLs available for these matrices compared with water (aqueous phase).

The Panel was also charged to provide guidance on implementation of targeted CEC monitoring. Guidance on the number of waterbodies and discharges, spatial coverage and temporal (frequency of monitoring) considerations from the Panel was given to address the highest priority questions identified by the Panel (**Table 1.1-2**), e.g. what is the occurrence (magnitude, pervasiveness) of target CECs in waterbodies representing each scenario? What is the spatial and temporal variation in CEC occurrence in these scenarios?

1.1.4 Special Studies to Improve CEC Monitoring

One of the key limitations to the risk-based framework utilized by the Panel to identify CECs for targeted monitoring is the lack of robust monitoring/occurrence/toxicity data (i.e. MECs and MTLs) for the vast array of possible environmental contaminants. In recognition of this limitation, the Panel recommended a number of special studies using emerging technologies and/or methods that if successful, will provide a more comprehensive and efficient monitoring program for receiving waters (Anderson et al. 2012). These studies will complement and/or direct traditional targeted analytical methods while providing additional information on the occurrence of unknown CECs, and based on biological responses of aquatic organisms at the cellular (bioanalytical screening) and organism (in vivo testing) level (**Table 1.1-3**).

Table 1.1-1. Constituents of emerging concern (CECs) recommended for pilot (Phase 2) monitoring by the CEC Ecosystems Panel. Each column lists exposure scenarios (E = coastal embayment; F = inland freshwater, O = ocean) and matrices of interest (i.e., aqueous, sediment, tissue). M = monitor; NA = not applicable. WWTP – municipal wastewater treatment plant.

Scenario	Source: WWTP Effluent	Source: Storm Water (MS4)	Scenario 1 Effluent Dominated Inland Freshwater	Scenario 2 Embayment		Scenario 3 Ocean	All Scenarios
Matrix	Aqueous	Aqueous, Sediment	Aqueous	Aqueous	Sediment	Sediment	Tissue
Additional Information in Panel Report			Tables 6.1 & 6.6	Table 6.2	Table 6.3	Table 6.4	Table 6.5
Bis(2-ethylhexyl) phthalate (BEHP)	O	NA	NA	NA	NA	M	NA
Butylbenzyl phthalate (BBP)	O	NA	NA	NA	NA	M	NA
p-Nonylphenol	O	NA	NA	NA	NA	M	NA
Bifenthrin	E F	M	M	M	M	NA	NA
Permethrin	E F	M	M	M	M	NA	NA
Chlorpyrifos	E F	M	M	M	NA	NA	NA
Estrone	E F	M	M	M	NA	NA	NA
17-beta estradiol	E F	M	M	M	NA	NA	NA
Galaxolide (HHCB)	E F	M	M	M	NA	NA	NA
Bisphenol A	E F	M	M	M	NA	NA	NA
Ibuprofen	F	M	M	NA	NA	NA	NA
Diclofenac	F	M	M	NA	NA	NA	NA
Triclosan	F	M	M	NA	NA	NA	NA
PBDE -47 and -99	E F O	M	NA	NA	M	M	M
PFOS	E F O	M	NA	NA	M	M	M

Table 1.1-2. Preliminary design guidance for pilot monitoring of CECs (Phase 2) in each of the three receiving water scenarios and for stormwater (MS4) discharge. F = freshwater; M = monitor; NA = not applicable; RW = receiving water.

	Source	**Scenario 1**	**Scenario 2**	**Scenario 3**
General Monitoring Design Parameters	Stormwater (MS4) Discharging to Receiving Water[a]	WWTP Discharging to Inland Freshwater[b]	WWTP Discharging to Coastal Embayment [c]	WWTP Discharging to Ocean [d]
Spatial coverage – Receiving Water (RW)	1-D gradient (up to 6 sites for each location)	1-D (up to 6 sites for each location)	2-D gradient (up to 7 sites in estuary)	2-D grid (up to 7 sites each location)
Number of POTW and/or FW Locations	Two large FW streams and the Delta	Two POTWs and RW	Five POTWs in one estuary/embayment	Two POTWs and corresponding RWs
Frequency	Wet and Dry Season over three years	Wet and Dry Season over three years	Semi-annual (aqueous) or annual (sediment, tissue) over three years	Semi-annual (aqueous) or annual (sediment, tissue) over three years
Background	M	M	M	M
Aqueous (non-filtered)	M	M	M	NA
Sediment (top 5 cm)	M	M	M	M
Tissue [e]	M	M	M	M

a - Potentially conduct pilot investigation for one stream in the San Francisco Bay Area; one stream in Southern California, and one stream in the Sacramento-San Joaquin Delta.

b - Potentially conduct pilot investigation in Southern California.

c - Daily discharge <100 mgd; potentially conduct pilot investigation in San Francisco Bay.

d - Daily discharge $\geq$100 mgd; potentially conduct pilot investigation in southern California.

e - Identify appropriate species and tissues (e.g., bivalve and fish tissue for PBDEs; bird eggs for PFOS).

Table 1.1-3. Special studies recommended for pilot evaluation (Phase 2) to improve CEC monitoring in aquatic ecosystems. WWTP – municipal wastewater treatment plant.

Special Study	WWTP Discharging to Inland Freshwater (Scenario 1)	WWTP Discharging to Coastal Embayment (Scenario 2)	WWTP Discharging to Ocean (Scenario 3)	Stormwater (MS4) Discharging to Receiving Water
Bioanalytical Screening Assays[a]	yes	yes	yes	yes
Toxicity[b]	yes	yes	yes	no
Antibiotic Resistance[c]	yes	yes	no	no
Passive Sampling Devices (PSDs)[d]	yes	no	yes	no

a – Conduct evaluation and validation of bioanalytical screening methods in combination with targeted and non-targeted chemical analyses to identify bioactive substances using a toxicity identification evaluation (TIE) process.

b – e.g. 21 d fathead minnow recrudescence assay for freshwater matrices. Implement periodic reproduction assessments using appropriate fish and invertebrate species. Coordinate efforts with NPDES WET and bioassessment monitoring. This assay should be used for investigative purposes.

c -- Conduct a pilot investigation using a bioassay to screen for antibiotic resistance in effluent, water and/or sediment.

d – Conduct a pilot investigation using PSDs that provide adequate capacity to concentrate the CECs in the priority list. These devices should have demonstrated acceptable performance in laboratory or field validation studies, and published guidance on translation of results.

1.2 Pilot Monitoring (Phase 2) Design Requirements

The objective of this document is to generate requirements for pilot monitoring and special studies for CECs that address elements described in Phase 2 of the Panel's adaptive monitoring strategy (Fig. 1.1-1). These elements are broadly classified into targeted (chemical-specific) monitoring and special studies. ***The intent of this effort is to translate the Panel's guidance into requirements at a sufficient level of specificity and detail that can direct and be incorporated into local, regional and/or statewide workplans for future monitoring***.

To ensure relevance to the management decision making process, the Panel emphasized the need for a purposive (i.e. question or hypothesis driven) approach to monitoring, offering several questions to be answered by the proposed pilot monitoring and special studies monitoring:

1. Which CECs are detected in freshwaters and depositional stream sediments, and in which large California watersheds are they detected?
2. Which CECs are detected in marine waters and sediments adjacent to WWTP and significant stormwater outfalls and how quickly do they attenuate?
3. Which CECs are detected in coastal embayment/estuarine water and sediments?
4. What is the relative contribution of CECs in WWTP effluent vs. stormwater?

5. What is the extent and magnitude of PBDE and PFOS contamination in tissues of aquatic wildlife across the State? Does tissue occurrence correspond with sediment occurrence?
6. What is the direction and magnitude of change in CEC concentrations (in water, sediment and tissues) over a multi-year (3 to 5 year) time period?
7. How does the Panel's assumed relationships, based on the new CEC data (e.g., MEC or PEC, NOEC and MTL), change the estimated MTQs?
8. Does the new information (Question 7 above) modify the Panel's assumption regarding CEC potential risk and if so, does it trigger the need to evaluate CEC control efforts?
9. Which bioanalytical screening assays are effective to screen for target CECs in environmental samples?
10. How efficient are bioanalytical screening tools to detect unknown CECs?
11. What is the relationship between effects of CECs in vitro and toxicity observed in vivo?
12. What are the toxic effects of CECs of aquatic organisms?
13. How do CECs affect microbial antibiotic resistance?
14. Can passive samplers be used as a robust monitoring tool for CECs?

1.2.1 Targeted Monitoring

The design requirements to be specified for targeted monitoring for the CECs, scenarios and matrices listed in Tables 1.1-1 and 1.1-2, and as described in project agreement, are:

1. List of target CEC analytes, preferred methods and desired reporting limits
2. List of candidate waterbodies that represent exposure scenarios identified by the Science Advisory Panel
3. List of target media (e.g. water, sediment, biological tissue), and candidate target species
4. Frequency, number, and location of sampling stations with each candidate waterbody
5. QA/QC goals for measurement of CECs for incorporation into the Project Quality Assurance Project Plan (QAPP) (see Task 5 in Contract)
6. List of appropriate monitoring questions for each exposure scenario
7. Data analysis and assessment methods for each exposure scenario
8. Data management plan
9. Strategy to coordinate with existing monitoring programs

The development of targeted monitoring requirements is addressed in Section 2 of this document.

1.2.2 Special Studies

The design requirements to be specified for special studies monitoring for the elements in Table 1.1-3, and as described in project agreement, are:

1. List of target parameters, preferred methods and desired measurement goals
2. List of candidate waterbody(ies) for each special study
3. List of target media (e.g. water, sediment, biological tissue), and candidate target species
4. Frequency, number and location of sampling stations to be evaluated within each candidate waterbody

5. Quality assurance/quality control (QA/QC) goals for measurement of specific parameters
6. Rationale for exclusion/inclusion of studies that differ from the Panel's final recommendations

The development of special studies requirements is addressed in Section 3 of this document.

1.2.3 SUPPORTING/RELATED DOCUMENTATION

In addition to the design requirements specified herein, a quality assurance project plan (QAPP) will be generated as a supplement to this document. The QAPP will provide criteria and guidelines to ensure that robust measurement of targeted monitoring and special study parameters is achieved.

1.3 PAST AND ON-GOING EFFORTS TO PRIORITIZE/MONITOR CECs (UNDER CONSTRUCTION)

1.3.1 Statewide Projects

1.3.1.1 SWAMP (including BOG)

1.3.2 Regional Efforts

1.3.2.1 San Francisco Bay

Regional Monitoring Program

BASMAA

1.3.2.2 Southern California

Bight Regional Monitoring Program

Stormwater Monitoring Coalition

1.3.2.3 Delta Regional Monitoring Program

2 TARGETED CEC MONITORING PROGRAM DESIGN

2.1 REVISIONS AND ADDENDUMS TO PANEL RECOMMENDATIONS

Subsequent to the Panel's final report (Anderson et al. 2012), the compilation of occurrence and toxicological data for fipronil, a phenypyrazole insecticide whose applications statewide increased during the period 2000-2010, was updated (**Tables 2.1-1 and -2**). The updated monitoring trigger quotients (MTQs) exceeded unity for the aqueous phase in inland freshwater and coastal embayment scenarios (1 and 2). In addition, the MTQ exceeded unity for freshwater sediments, suggesting the need to monitor fipronil in inland freshwater (Scenario 1) sediments, a matrix that was not included for targeted CEC monitoring by the Panel. Since the parent compound is transformed in aquatic systems to several known metabolites, monitoring of these degradates is also recommended.

Table 2.1-1. Ecotoxicological data for fipronil.

	Aqueous Freshwater	**Aqueous Saltwater**	**Sediment Freshwater**	**Sediment Saltwater**
Reference	Ali, 1998	USEPA, 1996	Maul, 2008	Chandler, 2004
Organism	Chironomid	Mysids	Chironomid	Amphiascus
LC or EC	420 ng/L	<5 ng/L	0.90 ng/g dw	65 ng/g dw
Safety Factor	10	None	10	10
MTL	42 ng/L	5 ng/L	0.090 ng/g dw	6.5 ng/g dw

Table 2.1-2. Monitoring trigger quotients (MTQs) > 1 for fipronil by scenario and matrix. MEC - maximum measured environmental concentration. PEC - maximum predicted environmental concentration. The PECs for embayments (Scenario 2) were calculated assuming a 10-fold dilution factor of MECs representing inland fresh waterways (Scenario 1).

Scenario	**Matrix**	**MEC or PEC**	**MTQ**	**Reference**
Inland Freshwater -1	Aqueous	10,004 ng/L (MEC)	240	Gan et al., 2012
Inland Freshwater -1	Aqueous	2110 ng/L (MEC)	50	Ensminger et al., 2013
Inland Freshwater -1	Sediment	1.1 ng/g dw (MEC)	12	Lao et al., 2010
Inland Freshwater -1	Sediment	0.4 ng/g dw (MEC)	4.4	Delgado-Moreno et al., 2011
Embayment -2	Aqueous	1000 ng/L (PEC)	200	Gan et al., 2012
Embayment -2	Aqueous	211 ng/L (PEC)	42	Ensminger et al., 2013

2.2 TARGETED CONTAMINANTS AND REPORTING LIMITS

Reporting limits for the target CECs are based on the monitoring trigger levels (MTLs) recommended by the Panel. A goal of monitoring is to assess if the MTQ is greater than 1 (indicating it should continue to be monitored) or less than 1 (indicating it is no longer necessary to monitor). Assuming variance in the measurement accuracy (typically 30%), the required reporting levels should extend below the MTL to

ensure confidence the MTQ is greater or less than 1. Thus, the required reporting levels are set at ½ the MTL for each scenario and matrix (**Tables 2.2-1 through 2.2-5)**. Reporting limits (RLs) for monitoring of WWTP effluent and in MS4 receiving waters are assumed to be same as for Scenario 1 and 2 receiving waters, respectively.

Table 2.2-1. Recommended reporting limits (RLs) for aqueous phase CECs in effluent dominated inland waterways (Scenario 1).

Compound	**Freshwater MTL (ng/L)**	**Reporting Limit (ng/L)**
Bifenthrin	0.4	0.2
Permethrin	1	0.5
Fipronil	42	21
Fipronil (sediment)	0.090 ng/g dw	0.045 ng/g dw
Chlorpyrifos	5	2.5
Estrone	6	3
Ibuprofen	100	50
Bisphenol A	60	30
17-beta-estradiol	2	1
Galaxolide (HHCB)	700	350
Diclofenac	100	50
Triclosan	250	125

Table 2.2-2. Recommended reporting limits (RLs) for aqueous phase CECs in coastal embayments (Scenario 2).

Compound	**Estuarine MTL (ng/L)**	**Reporting Limit (ng/L)**
Bisphenol A	6	3
Bifenthrin	0.04	0.02
Permethrin	0.1	0.05
Fipronil	5	2.5
Chlorpyrifos	1	0.5
Estrone	0.6	0.3
17-beta-estradiol	0.2	0.1
Galaxolide (HHCB)	70	35

Table 2.2-3. Recommended reporting limits (RLs) for sediment-associated CECs in WWTP-effluent dominated inland waterways (Scenario 1).

UNDER CONSTRUCTION

Table 2.2-4. Recommended reporting limits (RLs) for sediment-associated CECs in coastal embayments (Scenario 2).

Compound	Estuarine Sediment MTL (ng/g dw)	Reporting Limit (ng/g dw)
Bifenthrin	0.052	0.026
PBDE-47 and -99	0.03	0.015
Permethrin	0.073	0.0365
Fipronil	6.5	3.25

Table 2.2-5. Recommended reporting limits (RLs) for sediment-associated CECs in ocean discharge (Scenario 3).

Compound	Marine Sediment MTL (ng/g dw)	Reporting Limit (ng/g dw)
Bis(2-ethylhexyl) phthalate (BEHP)	130	65
p-nonylphenol	14	7
PBDE-47 and -99	0.30	0.15
Butylbenzyl phthalate (BBP)	6.3	3.15

Table 2.2-6. Recommended reporting limits (RLs) for CECs in tissue (all scenarios).

Compound	Tissue MTL (ng/g dw)	Reporting Limit (ng/g dw)
PBDE-47 and -99	28.9	14.45
PFOS	1000	500

2.3 DESIGN REQUIREMENTS BY SCENARIO

2.3.1 WWTP Effluent Dominated Inland Freshwater (Scenario 1)

Scenario 1 examines inland freshwater systems including rivers and lakes where the majority of the flow or volume during the dry season is WWTP effluent. Treated wastewater is considered to be the largest source of CECs during this time period.

Study Questions:

1. Which CECs are detected in freshwaters and depositional stream sediments, and in which large California watersheds are they detected?
2. Can the CECs be shown to originate from the inland POTW, or are they present at background concentrations?
3. How quickly (i.e., at what distance) do the CECs attenuate once discharged?
4. What are the concentrations and loadings of target CECs in the dry vs. wet seasons?
5. Does the new occurrence data change the estimated MTQs?

Examples of waterbodies that represent Scenario 1 are the Los Angeles, Santa Clara, San Gabriel, Santa Ana, and San Diego Rivers. Ideal candidates for this pilot study are waterways with well-characterized

source and flow inputs. The LA River and the Santa Clara River are proposed as candidates in southern California. No similar waterways have been identified in the San Francisco Bay and/or Delta regions.

The effluent of selected inland WWTPs and their corresponding waterways will be monitored. To determine the occurrence and attenuation of target CECs downstream of each identified WWTP (or series of upstream WWTPs), a minimum of 7 stations will be monitored: one station just downstream of the WWTP discharge location(s), five stations further downstream of the WWTP(s), and one background station located upstream of the WWTP(s) (**Fig. 2.3-1**) . Both the wet and dry seasons will be monitored over a 3 year period (**Table 2.3-1**). For fipronil, sediment analysis is also recommended based on Scenario 1 sediment MTQs > 1.

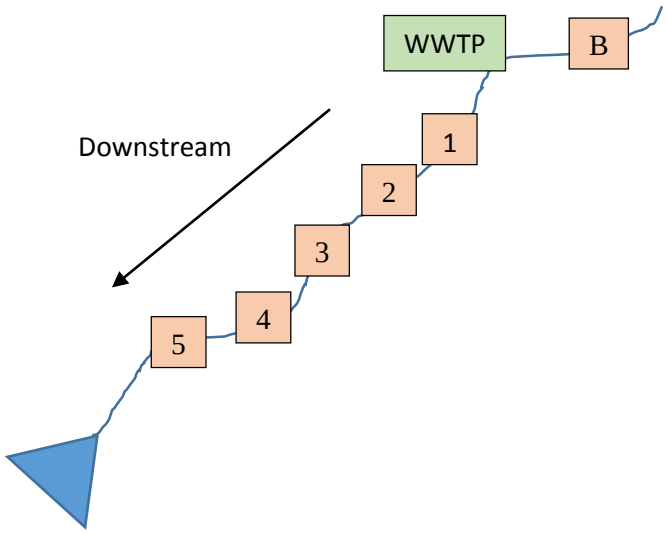

Fig. 2.3-1. Design schematic for monitoring of CECs in a WWTP-effluent dominated inland waterway (Scenario 1).

Table 2.3-1. Aqueous sampling frequency for WWTP-effluent dominated inland waterways (Scenario 1).

Source	Receiving Water	Years	Waterways	Total Samples
POTW effluent 1 station Wet and dry season Samples = 2/yr	River 6 stations Wet and dry season Samples = 12/yr	3	3	Effluent = 18 FW = 108

SEDIMENT SAMPLING FREQUENCY UNDER CONSTRUCTION

2.3.2 Coastal Embayment (Scenario 2)

Scenario 2 examines coastal embayments that receive CEC inputs at the land-ocean interface, which may originate from upstream WWTP discharge, direct WWTP discharge into the embayment, or stormwater runoff. This scenario is monitored exclusively in San Francisco Bay.

Study Questions:

1. Which CECs are detected in coastal embayment/estuarine water and sediments?
2. What are their concentrations and how quickly (i.e., at what distance) do the CECs attenuate once discharged?
3. Can the CECs be shown to originate from the outfalls, or are they present at background concentrations?
4. Is there a sub-annual change in discharged CECs?
5. Are the concentrations at co-located sediment and aqueous stations correlated?
6. Does the new occurrence data change the estimated MTQs?

UNDER CONSTRUCTION

Fig. 2.3-2. Design schematic for monitoring of CECs in a coastal embayment (Scenario 2).

Table 2.3-2. Aqueous sampling for Scenario 2.

Table 2.3-3. POTW effluent sampling for Scenario 2.

Table 2.3-4. Sediment sampling for Scenario 2.

Table 2.3-5. Tissue (Bioaccumulation) sampling for Scenario 2.

2.3.3 WWTP Effluent Discharge to the Ocean (Scenario 3)

Scenario 3 examines WWTP effluent discharged by outfalls at mid-Continental Shelf depths (50-100 m). Discharged CECs are diluted by the ambient water, transformed into breakdown products and/or are transported away from the outfall by currents. This scenario is monitored exclusively at marine outfalls within the southern California Bight.

Study Questions:

1. Which CECs are detected in marine waters and sediments adjacent to WWTP and significant stormwater outfalls, what are their concentrations, and how quickly do they attenuate?
2. Can the CECs be shown to originate from the outfalls, or are they present at background concentrations?
3. Is there a sub-annual change in discharged CECs?
4. Does the new occurrence data change the estimated MTQs?
5. What is the relative contribution of CECs in WWTP effluent vs. stormwater? (See the MS4 study design.)

The effluent and sediments at two POTW ocean outfalls will be monitored, with a grid of to 8 sediment stations at each outfall (**Fig 2.3-2**). The exact locations will consider the oceanic conditions and historic depositional patterns at each outfall and may be changed based on the results of initial monitoring. Three stations will be located down current from the zone of initial dilution (ZID), three will be located cross current, and one background station will be located up current of the outfall. The frequency of analysis is semi-annual (wet and dry) for the effluent and annual for the sediment (**Table 2.3-6**).

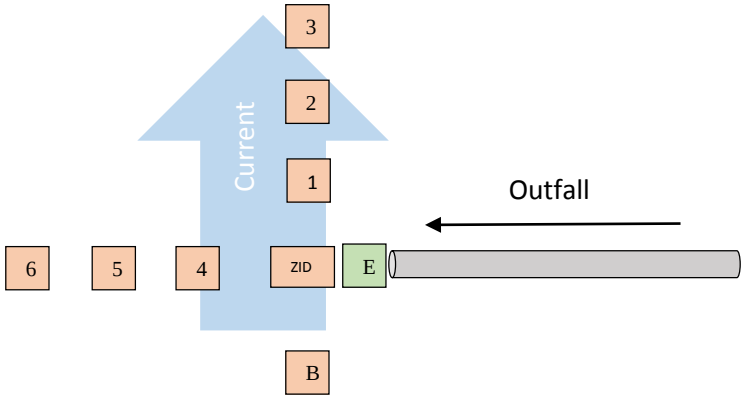

Figure 2.3-3. Design schematic for monitoring of CECs in ocean water receiving WWTP-effluent discharge (Scenario 3).

Table 2.3-6. Aqueous sampling for Scenario 3.

Source	Sediment	Years	POTWs	Total Samples
POTW effluent 1 station Samples = 2/yr	Grid 8 stations Samples = 8/yr	3	2	Effluent = 12 Sediment = 48

2.3.4 Stormwater Discharge to Receiving Waters (MS4)

Unlike WWTP effluent, the vast majority of annual stormwater runoff and discharge occurs during the wet season (November through April) in all but the most arid regions of the State. Materials from various sources/surfaces (e.g. road dust, topsoil, sediments) are mobilized during wet weather events, transporting suspended particulates and associated contaminants, including some CECs, into receiving waters. Thus, annual loading (on a mass per year basis) of particle reactive CECs into receiving waters is highly seasonal. Receiving water impacts resulting from such loading can be direct, e.g. release of pesticide residues from sediments transported into receiving waters resulting in invertebrate or fish toxicity, or indirect, e.g. bioaccumulation of sediment-associated CECs (e.g. PBDEs) by benthic organisms and subsequent trophic transfer into higher biota (e.g. fish and humans). During the dry season, in contrast, incidental runoff (e.g. due to excess irrigation of gardens and/or parks) may contain CECs (e.g. water soluble pesticides) at higher concentrations, since runoff volume and base flow to the receiving water are relatively small. Moreover, particulate loading is typically negligible under these conditions, directing attention to dissolved, aqueous phase (i.e. more water soluble) CECs. Thus, it is critical to address both short term toxicity vs. long term loading, as well as to take into account the distribution and fate of CECs for MS4 monitoring.

2.3.4.1 Study Questions:

1. Which CECs are detected in waterways dominated by stormwater?
2. What are their concentrations and loadings in the dry vs. wet seasons?
3. What is the relative contribution of CECs in WWTP effluent vs. stormwater? (See the Scenario 3 study design.)
4. What is the spatial and temporal variability in loadings and concentrations (e.g. between storm variability during the wet season; in stream attenuation rate during low flow, dry season conditions)?

2.3.4.2 Design Considerations

Wet Weather: Since annual loading is the main concern during wet weather, a design that focuses on estimating total loads into MS4 receiving waters is the primary goal. Current wet weather monitoring relies on sampling at fixed mass emission (FME) stations located at the bottom of MS4 permitted watersheds. Flow weighted sampling at FME stations for two storms per year per watershed will provide data to address questions 1-3. A minimum of three watersheds statewide should be assessed over a 3-year pilot study period. Addressing question 4 will necessitate more intensive sampling during and/or between storm events, and should be planned during Years 2 and 3, after initial occurrence and loading data have been obtained and analyzed in Year 1. Non-filtered, whole water samples should be analyzed when addressing loading. Filtered water samples maybe adequate for effects/toxicity evaluation. Sufficient sample size and analytical methods should be specified to meet target detectability of CECs (see also Sec 2.1 and QAPP).

Dry Weather: Since short term maximum concentrations resulting in acute toxicity is the main concern, a strategy that focuses on capturing worst case exposure conditions for a relevant endpoint/receptor of interest is the primary goal. A design that targets known or suspected incidental runoff sources, e.g. culverts or sections that drain parks or golf courses, is needed to include worst case exposure scenarios. Depositional area sediments (river mouths, oxbows, retention basins) should be sampled at the start and end of the dry season to examine (1) what has been washed in during the previous wet season and (2) degree of attenuation occurring during the dry season. Unless unexpectedly high total suspended solids (TSS) samples are encountered, non-filtered aqueous samples should be sufficient for monitoring and assessment during dry weather. To address chronic exposure of CECs, base flow conditions over longer time periods (weeks to months) can be assessed using emerging technology, e.g. passive sampling devices that provide a time-average concentration of CECs that have been pre-calibrated in the laboratory (see Sec 3.x). Such extracts are also amenable, without fortification, for toxicity screening.

2.3.4.3 Coordination with Special Studies

Samples collected for targeted chemistry will also be evaluated for toxicity parameters as specified in Section 3. Bioanalytical screening assays will be adapted and evaluated on organic extracts of water and sediment samples collected as part of 2.2.4.2. Targeted CEC monitoring that require detection limits not readily achievable using conventional or commercially available methodology shall utilize passive sampling devices (PSDs), where such technology is appropriate (e.g. for determination of long term, time-averaged concentrations).

2.3.4.4 Candidate watersheds:

- San Francisco Bay: TBD
- Delta/Central Valley: Steelhead Creek, Morrison Creek, Hood (an integrator site), Arcade Creek, and the Natomas and American Rivers.
- Southern California: watersheds monitored by the Stormwater Monitoring Coalition (SMC), including those in San Diego (San Diego River), Orange (San Diego Creek/Newport Bay), Los Angeles (Ballona Creek) and Ventura (Santa Clara River) counties.

UNDER CONSTRUCTION

Fig. 2.3-4. Sampling strategy for MS4 watersheds during (o) dry and (x) wet weather.

Table 2.3-7. Aqueous sampling for stormwater.

Waterway Stormwater	Waterway Sediments	Receiving Water Sediments	Years	Waterways	Total Samples
? stations Wet and dry season Samples = ?/yr	? stations Wet and dry season Samples = ?/yr	? stations Wet and dry season Samples = ?/yr	3	3	FW = ? Sediment = ?

2.3.5 Tissue Monitoring Design

Study Questions:

1. What are the concentrations of CECs in tissues?
2. What is the temporal trend?
3. Are there spatial differences in tissue concentrations (inland vs. coastal vs. marine and northern vs. southern California)?
4. Are there differences among species (i.e., what are the appropriate sentinel species)?
5. What are the concentrations of biomagnifying CECs at the highest trophic levels (i.e.; those species with potentially the greatest risk)?
6. Does the new occurrence data change the estimated MTQs (when NOECs are available)?

2.3.5.1 Design Considerations

UNDER CONSTRUCTION

2.3.5.2 Design Requirements

UNDER CONSTRUCTION

3 SPECIAL STUDIES DESIGN REQUIREMENTS

3.1 INTRODUCTION

The Panel recommended that a number of special studies be conducted as part of a statewide CEC pilot monitoring program in order to evaluate and where possible, validate these methods prior to full implementation (Table 1.1-3). These studies largely address the potential for adverse effects of CECs in aquatic organisms (e.g. animal toxicity; microbial resistance) and will complement the traditional targeted analytical methods (as described in section 2) by providing additional information on the occurrence of known and unknown CECs (e.g. bioanalytical screening assays), and evaluation of emerging technology for sampling of low-level CECs in environmental media (e.g. passive sampling).

Moreover, the special study bioassay components target and/or link the responses across increasingly complex levels of biological organization, and thus can be integrated in a multi-tiered interpretive framework (**Figure 3.1-1**). In Tier I, high-throughput *in vitro* assays are conducted to screen for the occurrence of chemicals, including CECs, in water and sediment samples based on their mode of action (MOA). *In vitro* assays are an efficient way to assess the ability of CECs to activate cellular receptors but stop short of predicting adverse outcomes at the organismal or population level. The Panel recommended whole organism toxicity testing to determine if CECs present in aquatic ecosystems can have adverse effects at the organism level (Tier II), e.g. impaired reproduction in fish exposed to model chemicals, receiving water samples and/or treated WWTP effluent. In the case that samples of interest demonstrate effects in Tier II analyses that warrant further investigation, Tier III analyses focus on in situ evaluation, e.g. field collection of biological samples of sentinel organisms (e.g. invertebrates, fish, birds and/or mammals), specifically to investigate whether such MOAs identified using Tier 1 *in vitro* cell assays and adverse outcomes indicated by Tier II analyses are prevalent in the receiving water environment. Tier III tools/endpoints would incorporate both advanced molecular tools such as qPCR or gene microarrays as well as more conventional monitoring and assessment parameters (e.g. tissue histology, species abundance/diversity).

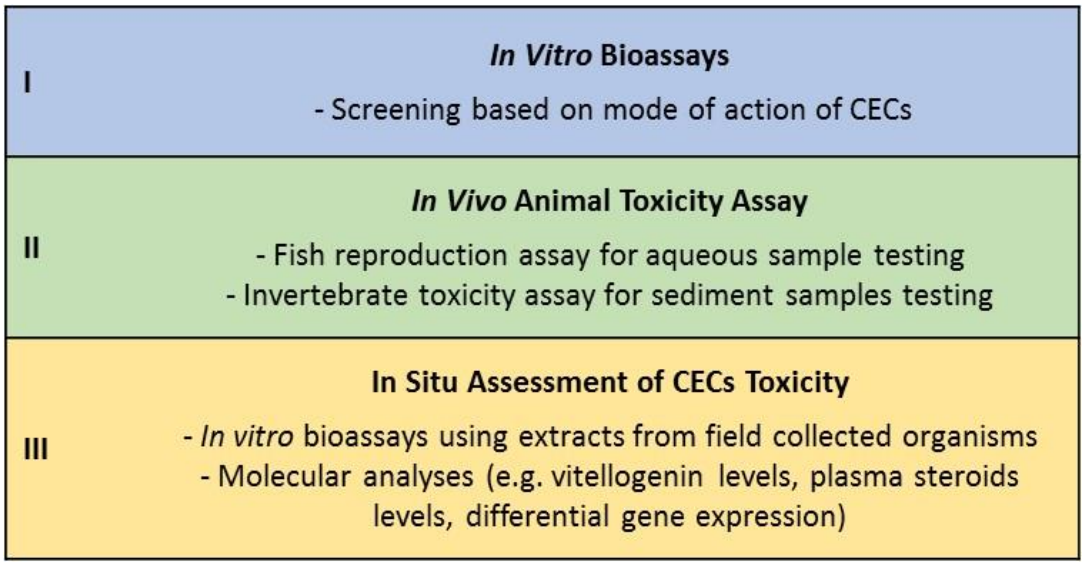

Figure 3.1-1. Proposed framework for biological assessment of CECs in aquatic environments.

3.2 TIER I – BIOANALYTICAL SCREENING USING HIGH-THROUGHPUT *IN VITRO* ASSAYS

In vitro bioassays can be used to screen a large number of chemicals based on a MOA paradigm. Selected cell assays are currently being evaluated for screening of recycled and drinking water quality (Leusch et al. 2010; Escher et al. 2014), with encouraging results for the detection of endocrine disrupting CECs. To address the Panel's recommendations, a number of cell assays are proposed to assess the capability of environmental CECs to activate endocrine-related receptors, induce xenobiotic metabolism and cause cell death (**Table 3.2-1**). Some chemicals are also known to suppress the activity of endocrine-related receptors causing adverse effects. For example, male fish exposed to anti-androgenic compounds or females exposed to anti-estrogenic compounds can cause reproductive impairment via alteration of plasma sex steroids levels and subsequent reduction in fertility and fecundity (Panther et al., 2004; Filby et al., 2007). To screen for these outcomes, estrogen receptor (ER) and androgen receptor (AR) assays will be conducted in agonist (receptor activation) as well as antagonist (suppression of activity) mode. In some cases, bioassays can screen for exposure to known high priority CECs, but potential adverse outcomes linked to these endpoints are diverse and/or not yet well defined (e.g. AhR and PXR). In other cases, the MOA is known and relevant, but a suitable bioassay is either in the development stage and not yet commercially available (e.g. genotoxicity).

Table 3.2-1. In vitro bioassays that screen for endocrine disruption, xenobiotic metabolism and general cell toxicity. *Table adapted from Anderson et al. (2012).*

Endpoint	Response	Mode of Action	Potential Adverse Outcome
Estrogen Receptor Alpha (ERa)	Activation and suppression	Estrogen signaling	Feminization of males. Impaired reproduction, cancer
Androgen Receptor (AR)	Activation and suppression	Male sexual phenotype	Androgen insensitivity, masculinization of females, impaired reproduction
Glucocorticoid Receptor (GR)	Activation	Cortisol binding, regulation of gene transcription	Development, immune diseases, diabetes
Progesterone Receptor (PR)	Activation	Embryonic development, cell differentiation	Cancer, diabetes, hormone resistance syndrome
Aryl Hydrocarbon Receptor (AhR)	Activation	CYP1A metabolism induction	
Pregnane X Receptor (PXR)	Activation	CYP3A metabolism induction	
TBD	Activation	Genotoxicity	
Cytotoxicity	-	General cell toxicity	Tissue damage, death

TBD – to be determined

Two types of investigations are recommended. First, a battery of candidate *in vitro* bioassays will be evaluated to determine their response to the list of Panel recommended CECs at exposure concentrations of monitoring relevance (see section 2). Second, the bioassays will be evaluated to determine the magnitude and range of response associated with real environmental samples and to assess the concordance with responses predicted using traditional analytical chemistry results. Because the output parameters resulting from bioassays are not directly comparable with individual chemical concentrations, translation of bioassay into equivalent concentrations, or bioassay equivalents ("BEQs), is necessary (**Table 3.2-2**).

Table 3.2-2. Output parameters of *in vitro* assays

	In vitro assays with reference toxicant	**In vitro assays without reference toxicant**
Calibration	Dose response curve with reference toxicant	N/A
Concentration effect assessment	Relative Enrichment Factor (REF) (enrichment factor of extraction process and dilution of the extract in the bioassay)	
Data analyses	Effect concentration (EC)	Induction ratio (IR)
Output parameter	Bioanalytical equivalent concentration (BEQ)	

3.2.1 *In vitro* screening of targeted CECs

Study Questions:

1. Which priority CECs are detectable at environmentally relevant RLs using the endocrine-related cell assays?
2. Which priority CECs are detectable at environmentally relevant RLs using other relevant endpoints (e.g. AhR, PXR, TR)?
3. What are the effects (additive or antagonist) of priority CECs mixtures using the selected cell assays?

Seventeen CECs (including fipronil) have been selected for target monitoring in water, sediment and/or tissue. The objective of this study is to identify the most sensitive and reliable cell assays to screen for priority CECs at environmentally relevant levels (**Table 3.2-3**). For each chemical, four concentrations will be selected based on their monitoring trigger levels (MTLs – lowest test concentration)(Tables 2.2-1 through 2.2-6). A mixture of the selected CECs will also be tested at MTLs to determine the additive or antagonist effects that may occur.

Table 3.2-3. *In vitro* assays for screening of priority CECs.

Endpoint	Priority CECs	Other CECs
ERa	BEHP, BBP[1] Galaxolide (Anti-ER)[2] Chlorpyrifos[3], PFOS[4] 17-beta estradiol – known strong ER agonist Estrone – known moderate ER agonist BPA, nonylphenol – known weak ER agonist	
AR	Galaxolide (Anti-AR)[2] No AR activation data for CECs of interest	
AhR	PBDE-47 and -99 Chlorpyrifos[5]	PCBs
GR	No GR activation data found for CECs of interest	
PR	No PR activation data found for CECs of interest	Progestins (e.g. levonorgestrel)
PXR	All[6]	

[1]Harris et al. 1997; [2]Schreurs et al. 2005; [3]Juberg et al. 2013; [4]Kjeldsen and Bonefeld-Jorgensen 2013; [5]Long et al. 2003; [6]Moore and Kliewer 2000.

3.2.2 *In vitro* screening of environmental extracts

Study Questions:

1. How sensitive and precise are the candidate in vitro bioassays in detecting CECs in aqueous samples of interest (e.g. WWTP effluent and receiving waters from all Scenarios)?
2. How do cell assay responses correlate with analytical chemistry data?

Aqueous environmental samples contain complex mixtures of CECs. Thus, it is important to determine if the different classes of CECs can be quantitatively screened for using the selected cell assays. This pilot study will be conducted over a three-year period. Water samples will be collected, extracted and split on an annual schedule for targeted monitoring (see section 2 of this document) and all *in vitro* assays (**Table 3.2-4**). Prior to *in vitro bioassay* screening, the extracts will be solvent exchanged to DMSO.

Table 3.2-4. Sampling locations and frequency for *in vitro* testing

	Sample Type	Location	Sampling Frequency
Scenario 1 Freshwater	WWTP effluent	Outfall	2/year (wet & dry season)
	River water	Station #2 and 5 (section 2.2.1)	2/year (wet & dry season)
Scenario 2 Estuaries	WWTP effluent	Outfall	1/year
	Receiving water	TBD	1/year
Scenario 3 Oceans	WWTP effluent	Outfall	1/year
	Receiving water	Station #ZID, 3 & 6 (section 2.2.3)	1/year
Scenario 4 MS4	Stormwater run-off	TBD	2/year (wet & dry season)
	Watershed	TBD	2/year (wet & dry season)

3.2.3 *In Vitro* Assays Parameters and Optimized Methods

A number of commercially available cell assays have been identified for screening CECs in the environment. Among those, the GeneBLAzer assays (Life Technologies) and the CALUX assays (BioDetection Systems) have shown promising results (Escher et al., 2014), however, differences in operating procedures exist among the endpoints and manufacturers.

UNDER CONSTRUCTION

Table 3.2-5. Summary of validation parameters for each endpoint

	Reference chemical	# cells/well	DMSO content	Relative enrichment factor (REF)
Estrogen receptor alpha (ERa)	17-beta estradiol (+) 4-hydroxy-tamoxifen (-)		0.5 % per well	5 to 20 X
Androgen receptor (AR)	Methyltrienolone(R1881) (+) flutamide (-)		0.5 % per well	20 to 50 X
Progesterone receptor (PR)	Levonorgestrel (+)		0.5 % per well	20 to 50 X
Glucocorticoid receptor (GR)	Dexamethasone (+)		0.5 % per well	20 to 50 X
Aryl hydrocarbon receptor (AhR)	PCB 126		0.5 - 1% per well	TBD
Pregnane X receptor (PXR)	TBD (+)		0.5 - 1% per well	TBD
Genotox endpoint	TBD (+)		TBD	
Cytotoxicity	15% DMSO (+)			

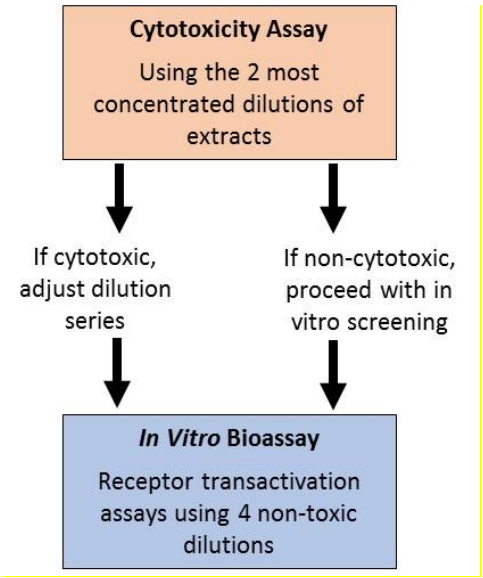

Figure 3.2-2. In vitro bioassay endpoints are sequenced to screen for cytotoxicity prior to testing for specific mode of actions.

Table 3.2-6. Test conditions for all *in vitro* bioassays

Parameters	***In Vitro* Bioassays Test Conditions**
Assay plates	96- or 384-well plates, black wall clear-bottom
Test samples	4 non-cytotoxic dilutions run in triplicate
Test solvent	Extracts in DMSO
Reference chemicals (if appropriate)	Potent chemical used to calculate bioassay equivalent (BEQ) - 9 dilutions in duplicate in first assay plate - 4 dilutions in duplicate in subsequent plates (sample precision)
QA/QC	on each plate - blank response – assay media only - negative control – cells only, no DMSO - positive control – cells and DMSO, no water extract
Acceptability criteria	Cytotoxicity assay- 80% or more survival compare to control; % response for blank sample, negative and positive control response should be less than 10% of sample response

3.3 TIER II – TOXICITY TESTING USING WHOLE ORGANISMS

The Panel recommended that *in vivo* tests be conducted to evaluate the effects of environmental CECs on key biological processes such as development, growth, reproduction and behavior at the tissue and organism level. Toxicity testing using whole organisms will be implemented to (1) determine the levels of exposure to CECs and complex mixtures affecting sensitive organisms; and (2) to establish linkage between *in vitro* screening results and *in vivo* apical endpoints.

3.3.1 *Linkage of in vitro responses and effects on fish reproduction using model compounds*

Study Questions:

1. What are the NOECs and LOECs of model CECs *in vivo*?
2. What is the relationship between *in vitro* assay responses and adverse effects on fish reproduction?

This study will provide quantitative linkage between effects measured *in vitro* (i.e. induction/ suppression of receptor activity) and *in vivo* (i.e. reproductive output, sexual characteristics). The fathead minnow (*Pimephales promelas*) reproductive assay will be performed following the EPA guidelines (see section 3.3.3). Specific parameters for this study are described in **Table 3.3-1**. The toxicity of model compounds known to affect ER and AR receptors will be investigated. Water samples from the exposures will be extracted and analyzed using the appropriate cell receptor assay.

Table 3.3-1. Test parameters for linkage study of in vitro and in vivo responses to model compounds

	Test parameters - ER agonist
Chemicals	17-beta estradiol, concs 5, 50, 500 ng/L Solvent control (TEG or ethanol, less than 0.05%) Water control (no solvent)
In vitro endpoint	ER receptor transactivation
Fish assay endpoints	- % survival and changes in behavior relative to controls - No. eggs laid and fertilized - Levels of plasma steroids and vitellogenin relative to controls - Reduction of the number of nuptial tubercles in males - Gonadosomatic index - Gonad histopathology (possible testis-ova in males) - qPCR (e.g. vtg, aromatase) and/or microarrays
	Test parameters - AR agonist
Chemicals	Trenbolone, conc TBD Solvent control (TEG or ethanol, less than 0.05%) Water control (no solvent)
In vitro endpoint	AR receptor transactivation

Fish assay endpoints	- % survival and changes in behavior relative to controls - No. eggs laid and fertilized - Levels of vitellogenin (in females) and plasma steroids and relative to controls - Appearance of nuptial tubercles in females - Gonadosomatic index - Gonad histopathology (possible ovo-testis in females) - qPCR (e.g. vtg) and/or microarrays
	Test parameters - ER antagonist
Chemicals	TBD
In vitro endpoint	ER receptor suppression
	Test parameters - AR antagonist
Chemicals	Flutamide, conc TBD Solvent control (TEG or ethanol, less than 0.05%) Water control (no solvent)
In vitro endpoint	AR receptor suppression
Fish assay endpoints	- % survival and changes in behavior relative to controls - No. eggs laid and fertilized - Levels of plasma steroids and relative to controls - Reduction of the number of nuptial tubercles in males - Gonadosomatic index - Gonad histopathology (possible testis-ova) - qPCR and/or microarrays

3.3.2 Toxicity of complex mixtures of CECs in environmental aqueous samples on fish reproduction.

Study Questions:

1. How sensitive and reliable is the 21-day fathead minnow assay in identifying presence of CECs in complex mixtures?
2. What is the relationship between results of *in vitro* and *in vivo* assays?

The fish reproduction assay will be conducted using water samples from locations previously monitored using targeted analyses and Tier I *in vitro* analyses, according the schedule in **Table 3.3-2**.

Table 3.3-2. Aqueous test samples for fish reproduction assay

Scenario	Sample and location	Dilutions	Sampling Frequency
Freshwater	3 POTW effluents	1x – undiluted effluent	
	Receiving river water Station #2 & 5 (section 2.2.1)	1x – undiluted samples	
Estuaries*	2 POTW effluents	1x – undiluted effluent 10x – worst case 100x – best case	
Oceans*	2 POTW effluents	1x – undiluted effluent 50x – worst case > 1000x – best case	

* Dilutions of the POTW effluents will be tested using the Freshwater Fathead Minnow Assay until an estuarine/marine fish model is developed.

3.3.3 Protocol for Aqueous Toxicity Testing Using Freshwater Fish Reproduction Assay

The 21-day fathead minnow reproduction assay has been developed and vetted to assess the toxicity of endocrine disrupting chemicals (EPA, http://www.epa.gov/endo/pubs/att-f_fish_assay_protocol.pdf). Test parameters of the assay are presented below (**Table 3.3-3**).

Table 3.3-3. EPA validated methods for short term toxicity testing using fathead minnow

Parameters	Test Conditions
Test type	Flow-through system
Test chamber size	10 or 18L glass tank
Test volume	8 or 10L
No exchanges of test solutions	6 per day
No. replicate chambers	4 per test condition
Age of organisms	5 – 6 months old reproductive fathead minnow
No. fish per chamber	2 males and 4 females
Feeding regime	Brine shrimp twice a day
Water quality	Temperature 25 ± 2°C, pH 6.5 - 9 D.O. > 4.9 mg/L (60% of saturation)
Test controls	Dilution water (e.g. clean dechlorinated tap water) Solvent control (if solvent used)
Pre-exposure period	14 days
Test sample exposure period	21 days
Endpoints	- % survival and changes in behavior relative to controls - No. eggs laid and No. eggs fertilized

	- Levels of plasma sex steroids and vitellogenin relative to controls - Changes in secondary sex characteristics (nuptial tubercles) - Gonadosomatic index (GSI) and gonad histopathology

3.4 TIER III (IN SITU)

UNDER CONSTRUCTION

3.5 PASSIVE SAMPLING

UNDER CONSTRUCTION

3.6 ANTIBIOTIC RESISTANCE

UNDER CONSTRUCTION

3.7 NON-TARGETED CHEMICAL ANALYSIS

UNDER CONSTRUCTION

4 STATEWIDE CEC MONITORING PROGRAM

4.1 Relationship between targeted monitoring and special studies

A comprehensive, tiered monitoring strategy for aquatic ecosystems combines elements of targeted and special study monitoring as described in this pilot study (**Fig. 4.1-1**). In Tier 1, newly developed in *vitro* transactivation bioassays screen for known and unknown CECs in concert with conventional targeted chemical analysis. Because all possible MOA and/or effects at the organism level are not addressed by currently available in vitro bioassay endpoints, in vivo testing is also recommended in Tier 1. If, however, screening level in vitro bioassay results are below pre-established thresholds deemed protective, the frequency of in vivo testing can be reduced. If in vitro bioassay results exceed thresholds, confirmatory evaluations (Tier II) using appropriate sentinel species and more advanced diagnostic (non-targeted) chemical analysis are undertaken to determine the likelihood and severity of impact, as well as the likely causative stressors. The information gleaned in Tiers I and II are used to reconcile observations from routine or periodic surveys of environmental condition performed in situ.

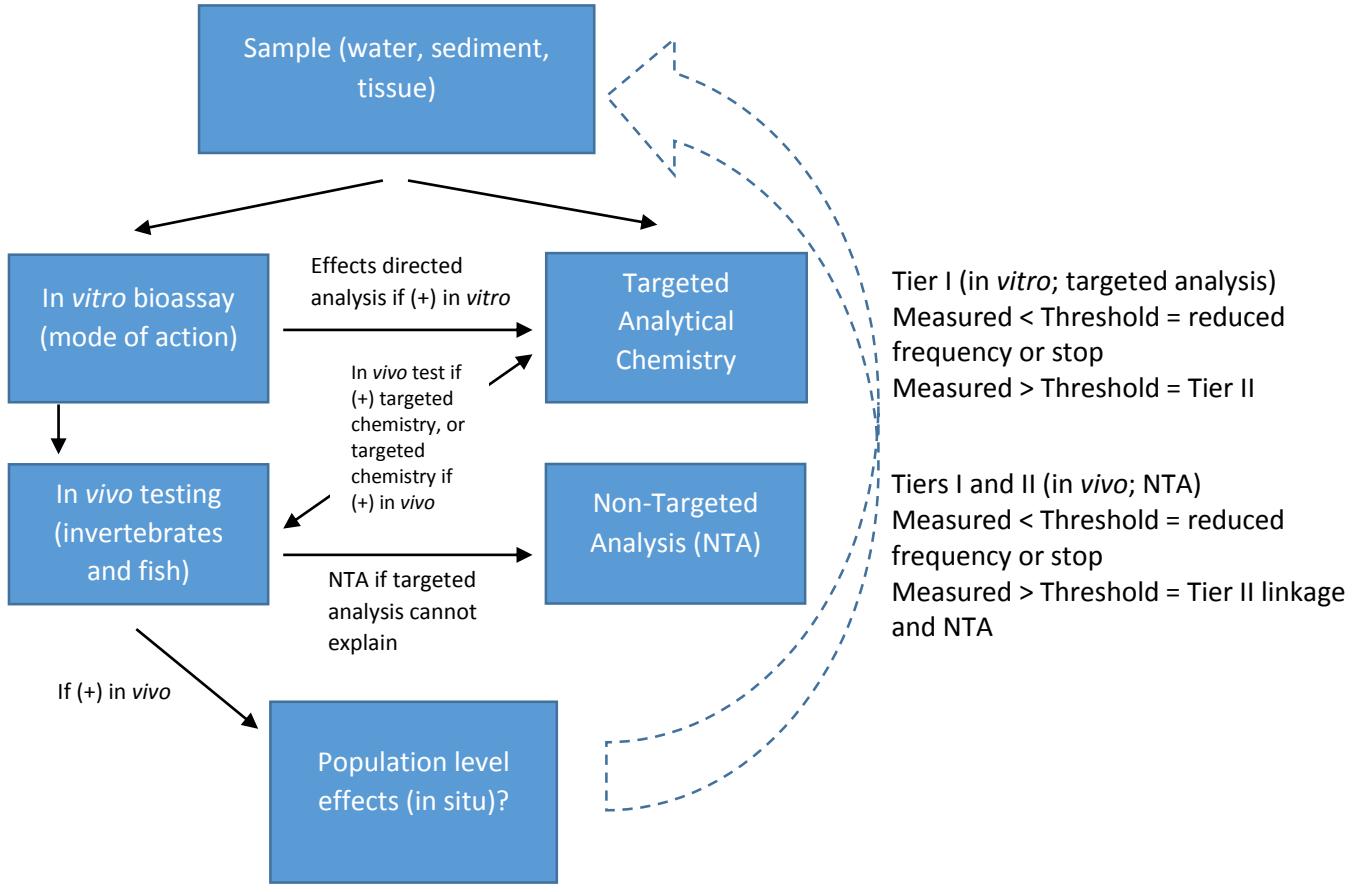

Figure 4.1-1. A comprehensive, tiered monitoring approach utilizes the results of targeted and special study components to efficiently screen for CECs and identify potential causative agents when biology is impacted.

4.2 Coordination with statewide, regional and local monitoring efforts

UNDER CONSTRUCTION

5 RESEARCH NEEDS

UNDER CONSTRUCTION

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APPENDICES

UNDER CONSTRUCTION

Southern California Bight 2013 Targeted CEC Survey

A Bight '13 Special Study was implemented to address Scenario 3 monitoring. This study is intended as a pilot project, and future surveys may be modified based on the results of this initial monitoring. The design addresses Scenario 3 questions regarding marine outfall discharge, as also compares marine outfall receiving stations with storm water receiving stations. All samples are sediments.

Aim 1. Compare CEC sediment concentrations impacted by the three sources (marine outfalls, storm water, and inland waste water). Only marine outfall zone-of-initial-dilution (ZID) stations will be used for this purpose. Outfall contaminant concentrations are expected to be highest in the ZID and are potentially more variable than stations further out. To account for this potential variability, three sub-stations within the ZID were be sampled, and the composite will be analyzed as a single sample.

Aim 2. Verify CECs originate from the outfalls and are not simply at background concentrations. Decreasing CEC concentrations down-current away from the outfall will indicate the compounds originate at the outfall. Also, stations up current (presumably at background), and cross-current station will indicated if the outfall is the source. Outfall stations were assigned in consultation with the dischargers and based on 1) the predominant current direction throughout the year, and 2) spatial trends of legacy contamination. The main gradient direction relative to the outfall varied among locations. For example, the LACSD outfall is perpendicular to the current in that region, but the OCSD outfall is parallel the current. The selected station distance is expected to show a decrease in CEC concentrations away from the outfall, based on legacy data.

Target Compounds

The four analyte classes are alkylphenols (APs), perfluorinated compounds (PFCs), pyrethroids/fipronil, and polybrominated diphenyl ethers (PBDEs). They will be measured at all stations in the survey. Phthalates, recommended by the Panel for Scenario 3 monitoring, will not be measured due to resource limitations.

Survey Design

Fifteen river-mouth samples throughout southern CA were obtained as part of the regular Bight '13 sediment survey (sampled July – September 2013). There was 1 station per river-mouth. Ten stations receive storm water and 5 receive both storm water and waste water discharge.

Table 1. River Mouth Samples in the Bight '13 Special Study

B '13 Station ID	Region	Source
8040	San Diego Bay	storm water
8077	San Diego Bay	storm water
8136	San Diego River	storm water

8163	Mission Bay	storm water
8169	Los Penasquitos Lagoon	storm water
8187	San Dieguito Lagoon	storm water
8189	San Elijo Lagoon	storm water
8202	Batiquitos Lagoon	storm water
8219	Agua Hedionda Lagoon	storm water
8411	Ballona Creek	storm water
8250	Santa Margarita Estuary	wastewater and storm water
8292	Upper Newport Bay	wastewater and storm water
8378	San Gabriel River Estuary	wastewater and storm water
8390	Los Angeles River	wastewater and storm water
8421	Mugu Lagoon-South	wastewater and storm water

The 5 outfalls were City of LA Hyperion (CLA), LA County Sanitation District's outfall off Palos Verdes (LACSD), Orange County Sanitation District (OCSD), and the two City of San Diego (CSD) outfalls Point Loma and South Bay. There are 5 stations at each outfall, and three sub-stations within the ZID station. Samples were collected in January 2014. The outfall stations are shown in Figures 1-5.

Relationship to the Panel's original marine outfall design. For this pilot survey we expanded the number of outfalls from 2 in the original design to 5. This required a reduction in the number of stations per outfall from 7 to 5. Increasing the number of outfalls provides more ZID stations for comparison to the river-mouth concentrations (see Aim 1), and provides information on CEC occurrence at all major ocean outfalls in the region.

Figure 1. City of Los Angeles Marine Outfall

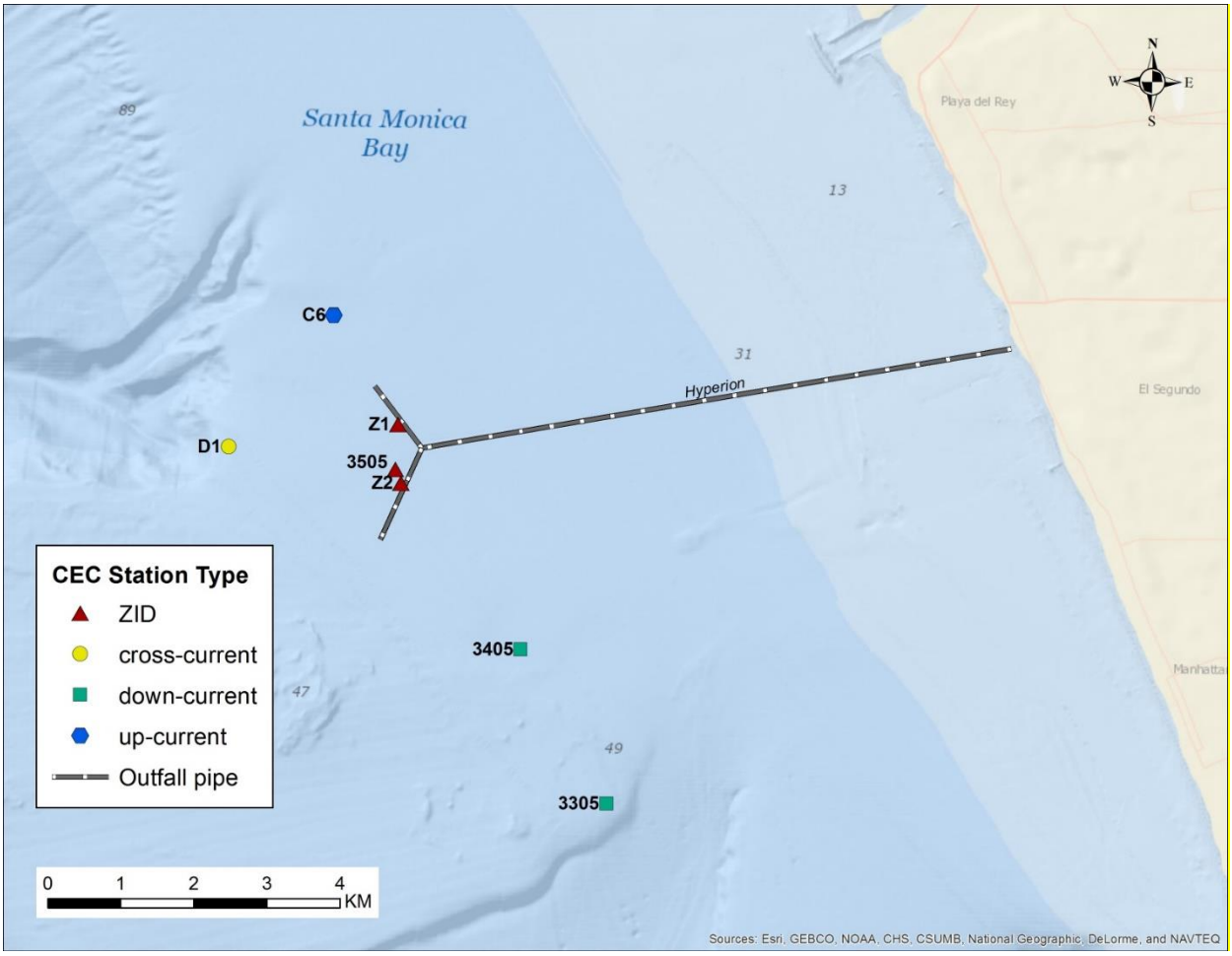
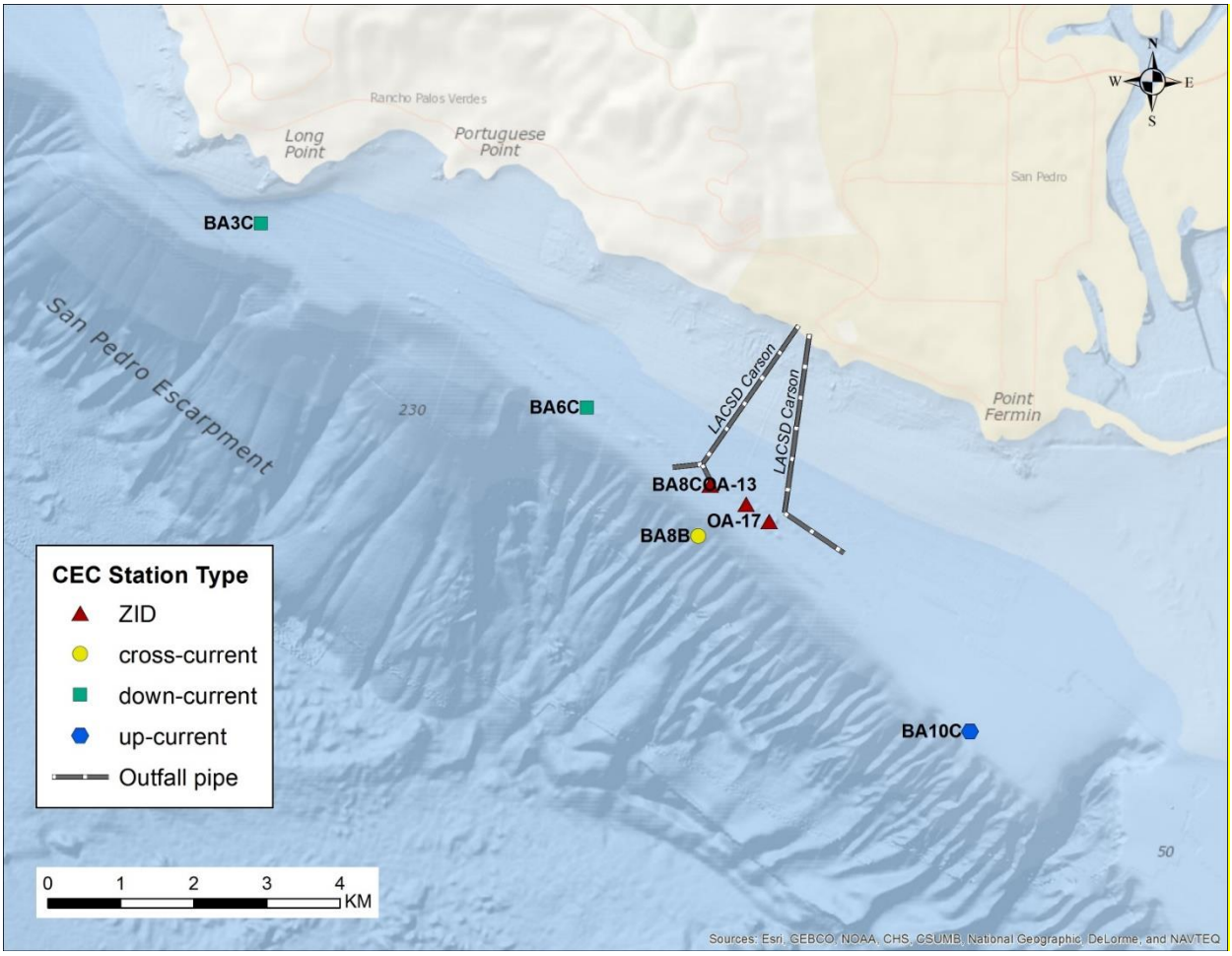


Figure 2. Los Angeles County Sanitation Districts Marine Outfall



Both outfalls are active.

Figure 3. Orange County Marine Outfall

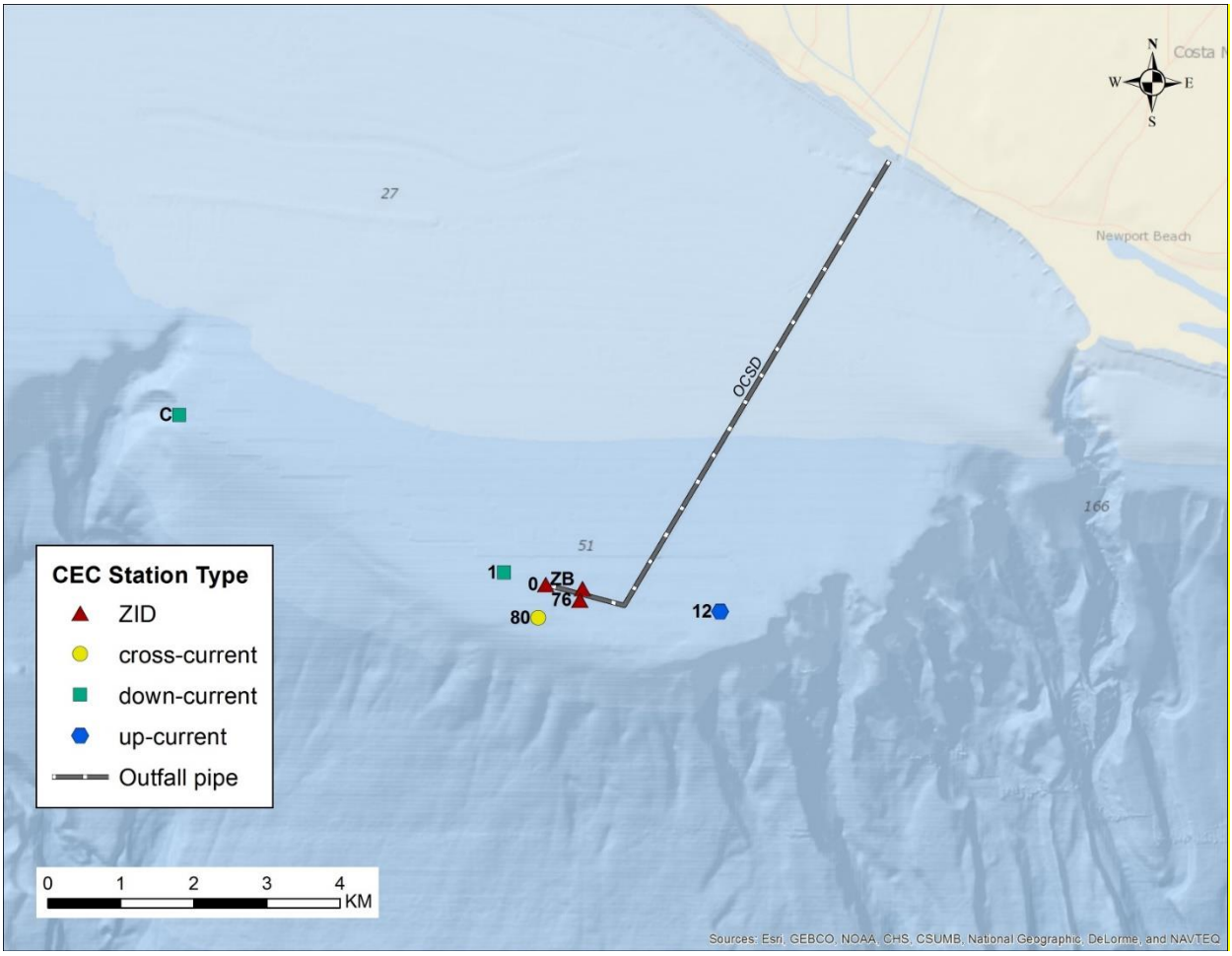


Figure 4. City of San Diego – Point Loma Marine Outfall

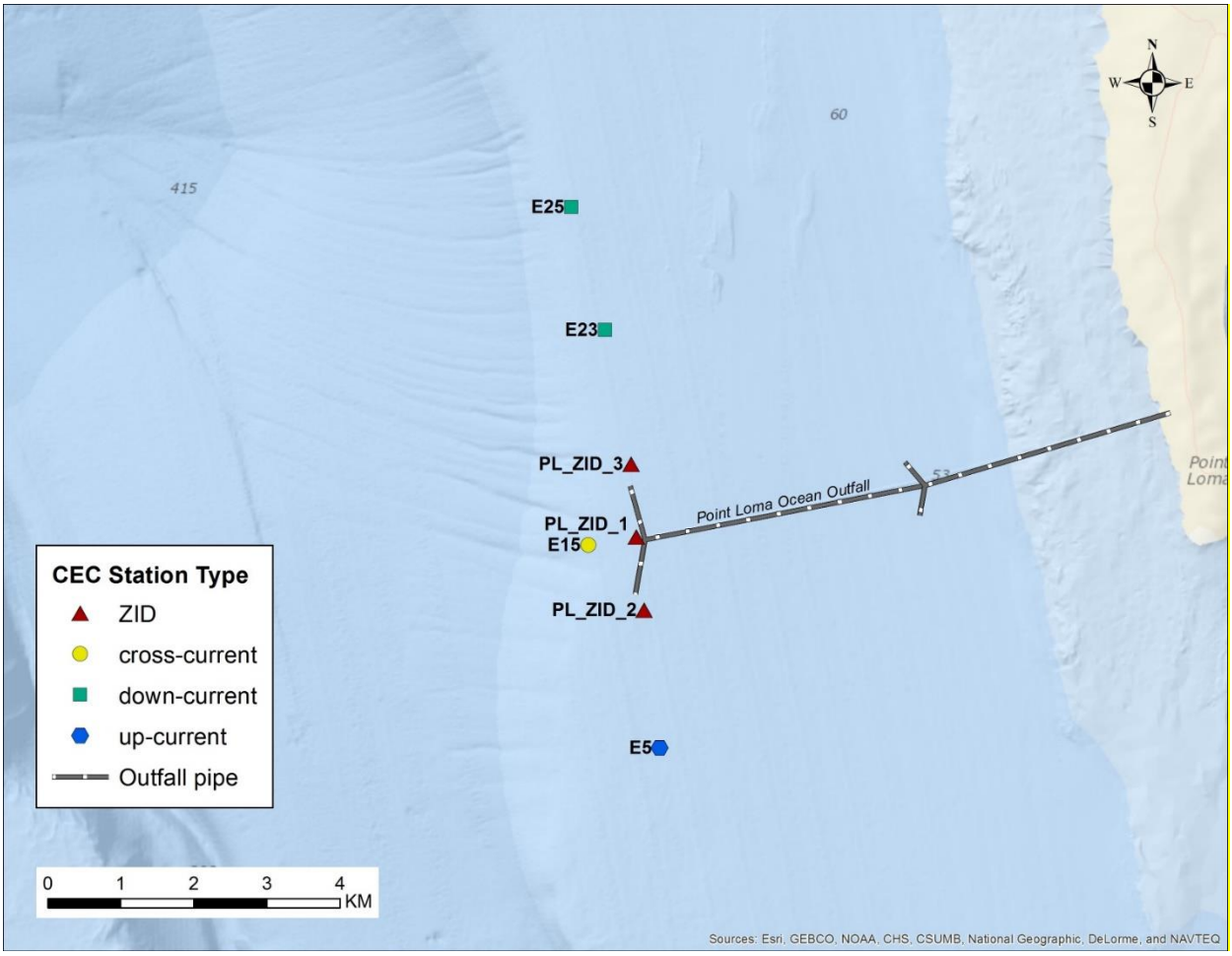
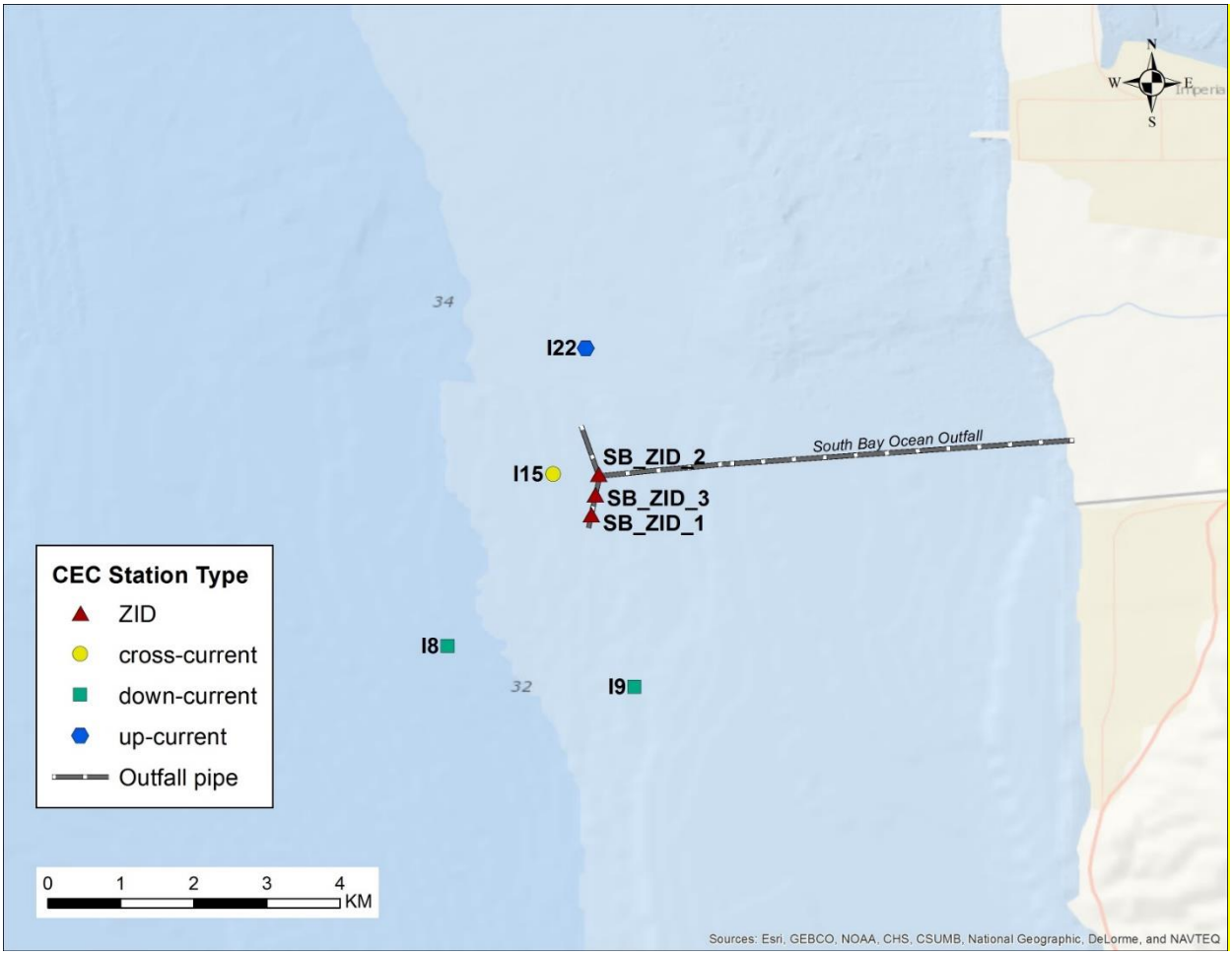


Figure 5. City of San Diego – South Beach Marine Outfall



The northern diffuser is inactive.

Input Regarding Inclusion of Pesticides in Targeted CEC Monitoring Lists

General context

Summary: Pesticides are different than all other CECs. DPR is the lead agency for monitoring and managing pesticides.

--Pesticides differ from all other CECs in that there are laws to control their sale and use, and pesticides regulators at DPR and EPA's Office of Pesticide Programs have the authorities--and the responsibility--to prevent pesticides water pollution.

--DPR and the Water Boards have a written "Management Agency Agreement" that defines roles for managing pesticides water pollution. DPR has primary responsibility; the Water Boards maintain authorities to act if DPR does not fulfill its responsibility.

--While pesticides regulators have not done a great job historically, in the last few years, DPR has stepped up its surface water protection programs. Changes include increased staffing (staffing doubled in FY 2014), budgeting, monitoring, and growing cooperation with the Water Boards.

--The Water Boards are rethinking the way that pesticides are addressed in NPDES permits--including monitoring. There is internal discussion of a new approach, which will soon be considered by the Water Boards' Management Coordinating Committee (MCC). The lead for this is Region 5, which has the largest number of pesticides-impaired waters. Region 4 is also involved (Man Voong is the regional representative).

- An overview of surface water pesticide monitoring in California is provided in a diagram below.

Pesticides Monitoring in California Urban Watersheds

Summary:

(1) DPR is the lead for pesticides surface water monitoring and is partnering with the Water Boards SWAMP program. These programs cover urban watersheds, but do not include POTW discharges.

(2) Plenty of data exist for pyrethroids, fipronil, and chlorpyrifos in California urban watersheds--additional data are unnecessary.

(3) POTW discharges are not currently routinely captured in the state's pesticide monitoring program, but special studies have addressed them. DPR is currently reviewing available fipronil data for POTW effluent and determining whether additional data are needed.

(4) DPR and SWAMP have not addressed triclosan, which has both pesticide and non-pesticide uses. Although it has been widely used outdoors, it is largely perceived as an indoor chemical that would flow to surface water primarily through POTW effluents.

--In the late 2000s, DPR initiated a regular monitoring program in California's urban areas. This program is designed to include frequent monitoring of a small number of "sentinel" urban watersheds. DPR collects and analyzes 700-800 samples a year from 4 urban watersheds in Northern and Southern California.

--In addition to conducting its own monitoring, DPR is partnering with the Water Board SWAMP program. DPR has funded SWAMP to conduct pesticides sampling in watersheds across the state. Currently this monitoring involves pyrethroid, fipronil (and degradates), and toxicity in

sediments. Expansion of the partnership to include some water column monitoring is under discussion. SWAMP sampling involves 80-100 watersheds, including 10 urban indicator watersheds.

--DPR has a systematic method for identifying the pesticides to monitor in urban watersheds that is based not only on past monitoring data, but also on use data and DPR's assessment of water quality risks.

--The Water Boards have reviewed (and generally agree with) DPR's monitoring plans and DPR's prioritization scheme for urban monitoring.

--In 2013, CASQA compiled pyrethroids and fipronil (and degradates) monitoring data from California urban watersheds. The available data are extensive--thousands of samples from dozens of watersheds in every urbanized region in California, including 9200 pyrethroid analyses and 3200 fipronil analyses. DPR's data comprise the largest fraction of all of the data points. The monitoring data compilation is available on the Internet at https://www.casqa.org/sites/default/files/library/technical-reports/casqa_review_of_pyrethroid_fipronil_and_toxicity_monitoring_data_-_july_2013.pdf

--In 2011, DPR determined that there were sufficient data to justify management action for pyrethroids in urban watersheds; it adopted regulations in 2012 that modeling indicates should reduce pyrethroids toxicity in urban watersheds by 80-90%. DPR and the Water Board are monitoring effectiveness of the regulations. DPR has pledged additional action if necessary to end water pollution (however, they may need EPA action on some products).

--DPR required pyrethroids manufacturers to conduct a survey of influent, effluent, and biosolids pyrethroids concentrations in 32 California POTWs. The survey is complete and is available on the Internet at http://www.curesworks.org/research/potw.pdf. Preliminary Water Board response is that the survey is robust. DPR is currently determining next steps, which may include a source identification study.

--Fipronil has been monitored in effluents of 30-40 POTWs nationwide, including several in California.

--In January 2014, DPR met with Water Boards & dischargers to review fipronil monitoring data. It committed to developing an Action Plan for fipronil, which is in process. DPR's preliminary assessment (to be finalized) is that there are sufficient monitoring data to justify regulatory action for urban runoff, and fipronil sources in urban runoff are clear. More data may be needed for POTW discharges--and sources are not clear, so more work would be needed to identify control strategies.

Specific pesticides

--Pyrethroids and fipronil have been extensively monitored in California urban watersheds, and a robust survey of pyrethroids in POTW effluent has been completed. Control strategies are underway. There may be a need for additional fipronil data in POTW effluents, but otherwise, additional data are unnecessary for management purposes.

--Nearly all use of chlorpyrifos was banned by EPA in the early 2000s, therefore it is not "emerging"—it is basically gone. Chlorpyrifos has been monitored in urban watersheds by both DPR and SWAMP. POTW effluents are not showing detectible chlorpyrifos (e.g., central valley region, where monitoring has been conducted in anticipation of a just-adopted Basin Plan Amendment regulating chlorpyrifos discharges). Additional monitoring data are unnecessary.

--Triclosan has not been monitored by DPR or SWAMP. It is different because it is an antimicrobial and is largely used indoors. DPR hasn't addressed antimicrobials yet & is struggling with how to integrate antimicrobials into its surface water protection programs. Another difference for triclosan is that it has widespread non-pesticide uses. Triclosan was widely used outdoors as well as indoors. Example – use in paint, which was recently phased out.

Gaps

--Current DPR and SWAMP monitoring programs do not address:

--POTW effluent

--Antimicrobials (example - triclosan)

--Estuaries

--To date, POTW effluent has been addressed through special studies

--To date, estuaries have been addressed through regional monitoring programs (SCCWRP, SFEI). So far, other than copper marine antifouling paint, no estuary-specific problems have been identified--all problems have been similar to those in fresh water, which have been managed largely on the basis of fresh water data.

Additional Information

--There is a statewide team of water board & DPR staff who have been managing and coordinating surface water pesticides monitoring for several years. The key players on the statewide team are Rich Breuer (State Board, OIMA deputy director who runs SWAMP program and Water Boards' official liaison to DPR), Tom Mumley (AEO Region 2 Water Board) and Danny McClure (Region 5 Water board, head of pesticides TMDL unit), and DPR management including Chuck Andrews (Associate Director of DPR) and Nan Singhasemanon (head of DPR's surface water group and official liaison to Water Boards).

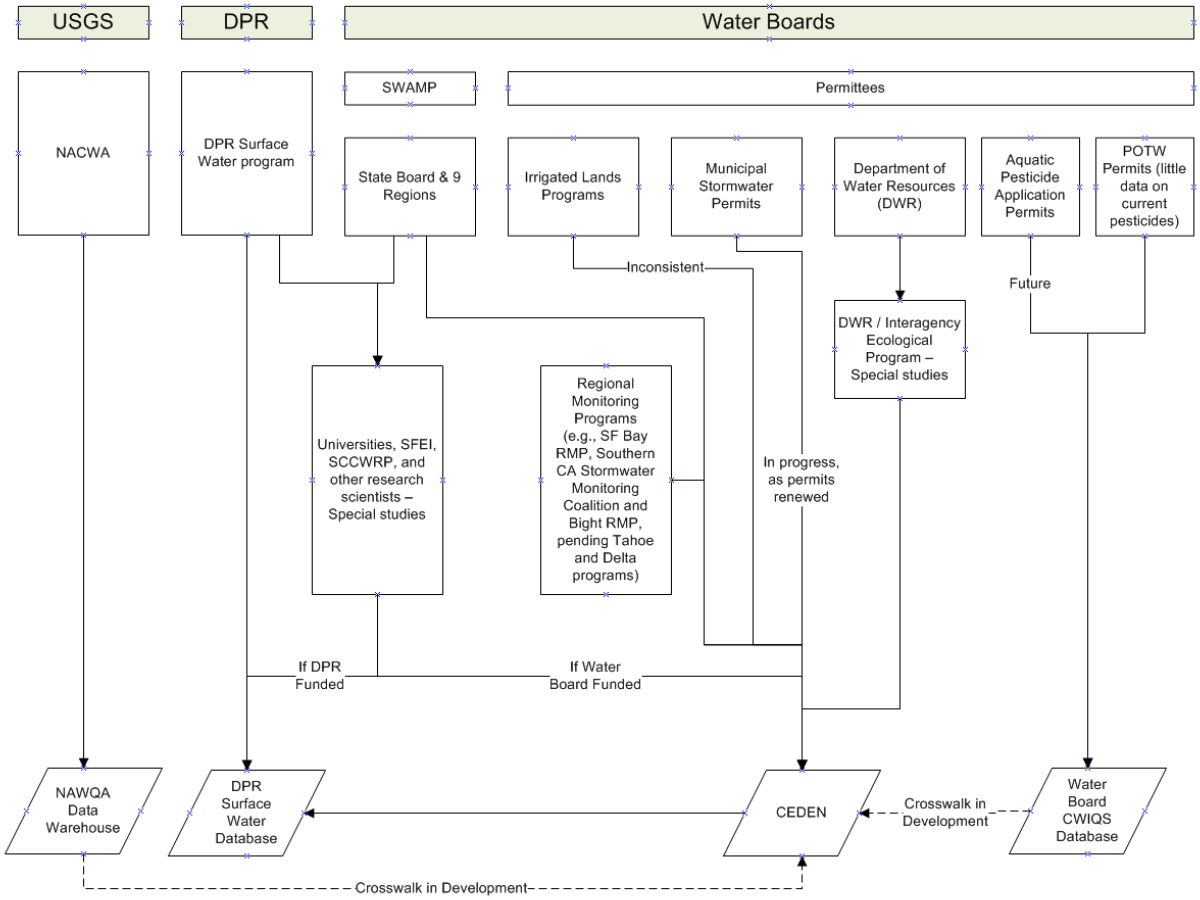
Recommendations

--DPR should *immediately* be brought to the table

--Monitoring of pyrethroids and chlopryrifos is unnecessary in this CECs project

--DPR should be approached for partnership on triclosan, and to initiate conversation about addressing the gaps in the state's current pesticides monitoring framework.

Simplified Overview of Pesticide Surface Water Monitoring in California



CASA Regulatory Workgroup Land Committee Key Issue Summary

(Updated as of May 1, 2014)

Item No.	Description	Issues for POTWs	Meeting Notes/Updates	Lead(s)	Next Steps	Due Date
Goal: Support Long-term Viability of Land Application Option						
1	**Local County Ordinances** ▪ Imperial	▪ Potential loss of existing and future land application practices. ▪ Increased biosolids management costs (e.g., longer hauling distances, more expensive alternative practices).	▪ Imperial: Advocacy efforts to challenge ordinance ban on biosolids is placed on hold until a final decision on Kern County Measure-E case is made.	G. Kester D. Gilbert L. Baroldi	▪ Imperial: No updates continue to track.	
	▪ San Luis Obispo: Ordinance placing restrictions on Class B biosolids land application.		▪ San Luis Obispo: On 3/12/13, the Board of Supervisors (BOS) unanimously approved the extension of the existing interim biosolids ordinance until March 2017 as requested by County staff and supported by wastewater agencies and CASA. By extending the interim ordinance until 2017, the County is provided time to review the science and the issues, and consult with others, while drafting a new ordinance. The BOS committed to providing funding as they go through their budget process to allow the Department of Health the ability to perform due diligence as they work on a new ordinance.		▪ San Luis Obispo: No updates continue to track.	
	▪ Kern (Measure E): A voter-approved ordinance that would prevent land application of biosolids in unincorporated parts of the county. A legal challenge was brought in state court in Jan 2011 after dismissal of a federal appeal by the 9th Circuit, in Nov 2010. A Preliminary Injunction (PI) was granted by Tulare County Judge Hicks in Jun 2011. ▪ AB 371 – Kern County Sewage Sludge Bill: This bill would require the state board from January 1, 2015 to December 31, 2016 to require additional testing 2 times per year on the effects of sewage sludge or other biological solids. The bill would require the state board to identify pathogens, endotoxins, and other hazards based on the potential for groundwater contamination and potential to adversely affect human health originating in sewage sludge. The state board is required to submit a report after each test to prescribed committees of the Legislature and the Kern County Board of Supervisors. This bill would make legislative findings and declarations as to the necessity of a special statute for Kern County.		▪ On January 27, 2014, Assemblyman Rudy Salas (Bakersfield) removed AB 371 from the inactive file, where it had been in abeyance since May 2013. The bill was revised, requiring additional testing for biosolids from outside of Kern County that is land applied in unincorporated areas of Kern County. The bill passed the Assembly's Env. Safety and Toxic Materials and Appropriations Committees and on January 30th, the bill passed the Assembly Floor (47-4 vote). CASA, SCAP and members agencies submitted opposition positions. ▪ City of L.A. is concerned of cost associated with additional testing and sampling (25 loads per day). City is preparing to oppose the bill. ▪ Bill is anticipated to be heard by the Senate Env. Quality Committee in June 2014. ▪ The California Supreme Court is scheduled to hear oral argument on the Measure E preliminary injunction case on May 6th in San Francisco. The Court granted review only to consider the lower court's application of a federal statute that sets a time limit on the re-filing of claims in state court after they have been dismissed from federal court. However after the Supreme Court rules, the case will return to the superior court for further proceedings.		▪ Continue to track - Preparing for opposition strategy as bill makes its way to Senate Committee.	
Goal: Sustain and Develop Biosolids Management Options with Focus on Sustainability						
2	**FOG/Food Waste Digestion Program Regulation** ▪ CalRecycle vs. State/Regional Board oversight	▪ Ensure that existing and future programs are regulated under NPDES permit framework by Water Boards rather than under SW regulations by CalRecycle. ▪ Review and comment on draft/proposed regulations that may impact existing and planned programs.	▪ Tom Howard, SWRCB Executive Officer, sent a letter to POTWs >1MGD, addressing multi-jurisdictional issues on co-digestion of organic material. The letter outlines steps to notify RWQCB of planned or existing co-digestion projects. ▪ CalRecycle formal rule making process on co-digestion exemption regulation is anticipated to start May 2014. CalRecycle will need to conduct a financial/economic impact analysis prior to formal rule making process (Composting and In-Vessel Rule). ▪ CalRecycle completed a draft fiscal analysis report, which was	G. Kester	▪ Continue to track.	

CASA Regulatory Workgroup Land Committee Key Issue Summary

(continued)

Item No.	Description	Issues for POTWs	Meeting Notes/Updates	Lead(s)	Next Steps	Due Date
			considered a major regulatory development – This officially starts the formal rule making process ▪ CASA is working with CWEA in developing an SOP training module. ▪ POTWs are advised to notify LEA for planned FOG projects. Contact Greg K. if there is any resistance from LEA. ▪ Despite SWRCB's letter, there were concerns raised that LEAs are still performing quarterly inspections and issuing permit fees to POTW that currently operate co-digestion facilities. Greg sent letter to Caroll Mortensen, Director of CalRecycle, regarding this issue and recommended that LEA cease inspections and fees. ▪ An impasse was reached with CalRecycle. Caroll Mortensen refused to recommend LEA to honor SWRCB's letter. She emphasized the importance of going through the formal rule making process first to finalize the draft exemption regulations, which will take about 12 months.			
3	**CalRecycle 75% Recycling, Composting or Source Reduction of Solid Waste by 2020 (AB341)**	▪ May prohibit agencies from claiming recycling credits for utilizing biosolids as an alternative daily cover (ADC) for landfills.	▪ In discussions with Mark De Bie, CalRecycle is not proposing a "ban" on biosolids at landfills nor on its use as ADC. However, they do not expect to allow its use as ADC to count toward the 75% recycling goal (it will still count for AB 939 diversion credit). ▪ As noted, ARB is proposing phasing out of organics at landfills in their scoping plan but biosolids are not included in that ban at this time. ▪ Basically we will need to pay attention to legislation resulting from the recycling plan, to regulations proposed by CARB, and to regulations proposed by CalRecycle to implement the recycling goal. But it does appear to be a favorable outcome for us at this point. ▪ CalRecycle delays diversion plan. There is no word on the schedule of release. ▪ Concerns regarding the elimination of organics as ADC have been mentioned in the following documents: 1) Landfill Methane control measures, AB 32 scoping plan (Waste Management Sector Plan), and Cap and Trade Grants and Loans. However the question on whether biosolids is considered an organic is still being discussed.	G. Kester	▪ Continue to track.	
4	**Rendering Facility Regulations** ▪ California Department of Food & Agriculture (CDFA)	▪ Ensure that existing and planned FOG acceptance programs are not subject to rendering facility permitting requirements by CDFA.	▪ CASA RW working with CDFA on Slaughter House Waste exemption. Possible concerns with prions. ▪ There is some movement on post-consumer meat waste (commercial, groceries stores). POTWs seem not to be included in CDFA's discussions. Not sure if POTWs are interested in taking this type of waste or need to seek exemption like FOG. G. Kester to track.	G. Kester	▪ Continue to track.	
5	**Biosolids Solid Waste Definition**	▪ CISWI rules could have applied to POTWs utilizing methane in an internal combustion (IC) engine.	▪ EPA released a clarification letter that it did not intend to define methane transported in a pipe for combustion in an IC engine as a solid waste.	G. Kester	▪ Ensure clarification letter is widely distributed.	
6	**Arsenic Cancer Slope Factor** ▪ In Feb 2010, EPA proposed a 17-fold increase in the cancer slope factor for inorganic arsenic based on questionable interpretations of available data.	▪ If adopted, the new cancer slope factor would likely impact recycled water, effluent and biosolids limits.	▪ The National Academies of Science recommended a defined process for determining which scientific studies were to be used in the development of Cancer Slope Factor and IRIS is now following those protocols. ▪ By the end of 2014, IRIS will release a report on the process and the science used, including the use of recommended background levels from the NAS and recommendations for a new CSF.	G. Kester	▪ Continue to track, monitor, and comment as efforts proceed.	
7	**EPA's Proposed Electronic NPDES Reporting Requirement**	▪ If adopted and among other requirements, NPDES regulated	▪ Public comments period has been extended to December 12, 2013 due to Federal Gov. shutdown.	G. Kester/T. Meregillano	▪ Continue to track.	

CASA Regulatory Workgroup Land Committee Key Issue Summary

(continued)

Item No.	Description	Issues for POTWs	Meeting Notes/Updates	Lead(s)	Next Steps	Due Date
	▪ Proposed regulations will require permittees and regulators electronically report information and data related to the NPDES permit program in lieu of written reports.	biosolids generators and handlers will be required to electronically submit data elements specific to biosolids annual program reports.	▪ General comments: 1) agree with the general goal to go paperless, 2) concerns with duplication of data entry (State/Fed), 3) concerns that the State's CIWQS system is not CROMERR certified, 4) ambiguity of SSO reporting, and 5) question on whether it is possible to request for biogas production information in platform. ▪ Tri-TAC/CASA joint letter. ▪ A Supplemental Notice is expected to be released this summer and will include a response to public comments, clarification on a number of items from the proposed rule, and a new public comment period. A Final Rule is expected to be released in early 2015.			
Goal: Share Information						
8	**Regional Facilities** ▪ Bay Area Agencies: Updates from Bay Area municipalities and Bay Area Biosolids to Energy Coalitions. ▪ Southern CA & Central Valley: Biosolids projects and facilities in Southern and Central Valley regions. ▪ Inland Empire Regional Composting Facility (IERCF): Indoor composting facility located in Rancho Cucamonga, owned by LACSD/IEUA. ▪ Westlake Farms: Covered ASP composting facility located in Kings County, CA developed by LACSD. ▪ Terminal Island: The City of Los Angeles and its partners operate the Terminal Island Renewable Energy (TIRE) biosolids injection project, which is designed to reduce greenhouse gas emissions and create renewable energy.	▪ Maintain awareness of collaborative efforts to develop regional biosolids management facilities. ▪ Understand challenges and lessons learned from new facilities in startup or operation.	▪ Bay Area Agencies: – Bay Area Biosolids to Energy Coalitions (BAB2E): A coalition of 19 agencies is developing a regional biosolids management facility. ○ BAB2E coalition has selected MaxWest and SCFI and is currently under negotiations with these firms. BAB2E may consider both firms at sites either at Delta Diablo or West County. – City of San Jose – Restarted their gasification pilot project – Feedstock wood waste and dewatered biosolids. This is a California Commission grant project with new vendor. – City of Palo Alto still on pace to build anaerobic digesters with thermo hydrolysis with CAMBI on the front end to accept biosolids and food waste. Council meeting to make decision on April 28th. ▪ Southern CA & Central Valley: – OCSD: ○ Lystek: On March 26th OCSD staff met with Lystek, a firm that provides services in the areas of biosolids processing, fertilizer production and wastewater treatment optimization. They utilize a thermo-alkaline treatment process for Class B biosolids using a combination of heat (steam-injection 70-75°C), high shear mixing, and sodium and potassium hydroxide (pH adjustment 9.5-10), to meet vector attraction reduction standards for a Class A product that is land applied or further liquefied for use on turf farms or golf courses. Lystek does all the marketing and manages the material treated onsite. – Encina Wastewater Authority (EWA): ○ EWA continues to make progress marketing their PureGreen product. Agency is pushing for more social media presence and concentrating on local customers within a 25 mile radius. ○ Corona and EWA working with Home Depot to sell. ○ FOG receiving facility to break ground this month.	B. Jones T. Meregillano M. Bao/M.Copeland D. Gilbert B. Gillette	▪ Continue to provide regional biosolids management updates.	

CASA Regulatory Workgroup Land Committee Key Issue Summary

(continued)

Item No.	Description	Issues for POTWs	Meeting Notes/Updates	Lead(s)	Next Steps	Due Date
			○ BioCycle conference tour of EWA. ○ EWA developing plans to construct demonstration garden. ○ EWA continue to conduct a pyrolysis trial on PureGreen pellets with Anaergia (Pyrolysis) producing gas for energy recovery and concentrate that is fed back into digesters to enhance methane production. Working on permitting. – LACSD ○ IERCF: Facility continues to operate within its permitted capacity. ○ Westlake Farms: Construction is moving forward. Operation is anticipated to be completed by spring or summer 2014. They are looking into taking different types of feedstock including food waste along with biosolids. – City of L.A. ○ Greenwaste Issue: Kern County follow-up investigation concerning organic material piled west of Interstate 5, near Lebec by city of L.A. continues. City of L.A. has been cooperating with Kern County and informed them that the material is mulch (green waste not biosolids) for a farmer. The City provided the county information of the material, processing, and permitting/licenses as part of a Public Records request City stopped sending greenwaste/green material to Kern County. Kern conducted testing on the material and City is waiting for results. ○ Terminal Island: The City has started drilling an additional well (#4) which will be completed by the end of March. They are finding good geological formation. In the next six months and after testing, they will start drilling two additional wells for injection (150 Wet tons per day). There has been some interest in brine injection. EPA will not add a new classification under the UIC for biosolids injection. They are looking into using an existing class to allow this type of operation.			
9	**Regional Associations Report**	▪ Foster partnerships between regional associations by sharing info regarding new issues of concern, lessons learned, project updates, training and educational programs, and public outreach efforts.	▪ SCAP: Joint meeting CASA on May 8, 2014 at OCSD. SCAP Biosolids and Energy Committee meeting May 13, 2014 at Victor Valley Wastewater Treatment Plant, ▪ BACWA: Joint meetings held w/CASA meeting TBD ▪ TBD ▪ CVCWA: Joint meetings held w/CASA meeting TBD ▪ CWEA: Annual Conference (Santa Clara) April 29 – May 2nd 2014: Two sessions: Innovative biosolids technologies (Diane Gilbert Deep Well Injection) and Biosolids Management (Eric Have – Biosolids Marketing Lessons Learned).	M. Bao G. Kester J. Hay		
10	**Conferences/Webinars**	▪ Stay abreast of upcoming conferences, local seminars, and webinars.	▪ 2014 Soil in the City Conference in Chicago – Enhancing Urban Soils Living Landscapes and Healthy Communities. June 29-July 2, 2014.	All		

CASA Regulatory Workgroup Land Committee Key Issue Summary

(continued)

Item No.	Description	Issues for POTWs	Meeting Notes/Updates	Lead(s)	Next Steps	Due Date
			▪ WEF Residuals and Biosolids 2014: May 18 – 21, 2014 Austin Convention Center, Austin, TX. ▪ California Bioresources Alliance 9th Annual Symposium: The 2014 symposium will be held at the U.C. Davis Buehler Alumni Center, on June 3rd and 4th.			
Goal: Address Emerging Issues of Concern and Climate Change						
11	**Pyrethroids** ▪ Pyrethroid Working Group (PWG)	▪ Potential impacts (positive/negative) to existing programs, public perceptions. ▪ May provide opportunities for direct participation in research/studies to address local concerns/issues.	▪ PWG to submit final pyrethroid report to DPR. ▪ PWG working on scientific journal/article (summary) for distribution. ▪ Tri-TAC Steering working on next steps – Pyrethroid Strategic Plan, covering communication and regulatory advocacy.	G. Kester		
12	**Trace Organics Activities** ▪ Recognized need to fill data gaps to provide U.S. EPA data to conduct credible risk assessment on trace organics that may be present at low concentrations in biosolids.	▪ Potential impacts (positive/negative) to existing programs, public perceptions. ▪ May provide opportunities for direct participation in research/studies to address local concerns/issues.	▪ The Phase 2 report is completed and set for release by early summer. Phase 2 examined unpublished data (largely from manufacturers) to help fill data gaps for 62 constituents identified by U.S. EPA as high priority. Data was found for 29 of them. ▪ Phase 3 has started.	G. Kester	▪ Phase 3 will be scoped with an RFP developed by this fall. Will need to solicit funding from across the country, because this phase will involve actual research.	
13	**AB 32 Climate Change Scoping Plan Update** ▪ Scoping plan update focused on laying out the plan for next five years to reduce GHG and to meet targets for 2020 and 2050 goals. Nine focus areas: Transportation, Energy, Water, Waste Management, Agriculture, Natural Lands, Short lived Climate Pollutants, Green buildings, and Cap and Trade program	▪ Potential impacts on biosolids to energy projects	▪ Energy Workgroup and Bioenergy Association of California working to advocate for POTW interest during the scoping plan update, specifically on the following focus areas: Energy, Water, Waste, Transportation, Agriculture, Natural Lands and Short-lived climate pollutants.	G. Kester/S. Deslauriers	▪ Continue to track	
Goal: Maintain Awareness of Key Research Initiatives						
14	**Biosolids Research** ▪ WEF Biogas Study: Create a robust, consensus data set regarding the current and potential production of biogas from anaerobic digestion at WWTPs in the U.S.	▪ Potential impacts (positive/negative) to existing programs, public perceptions. ▪ May provide opportunities for direct participation in research/studies to address local concerns/issues.	▪ WEF Biogas Study published. ▪ SoCal Gas to look at biogas from wastewater treatment plants. ▪ In discussions with the CEC, G. Kester will initiate renewed efforts to capture biogas data used to estimate energy production from POTW.	G. Kester		

CASA Regulatory Workgroup Water Committee Key Issue Summary

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Item No.	Description	Issues for POTWs		Links	Lead(s)	Next Steps	Due Date
1	**Whole Effluent Toxicity** • State is developing a new Toxicity Polity that will dictate how toxicity is reported and enforced. The draft "Policy" is now being reformatted for distribution as a "Plan" with an expected update to become available in the summer of 2013 with eventual adoption in late 2013 or later.	• Draft State Toxicity Policy issued in 2011 would establish/ require: o numeric limits for chronic toxicity o use of Test of Significant Toxicity (TST) as statistical method to determine toxicity (concerns it will lead to more false positive results); o use of marine organisms in >1,000 mg/L salinity waters which affects current use of flow-though testing for acute-toxicity o single and multiple test numeric violations that will also trigger accelerated monitoring o RWQCB discretion on inclusion of acute toxicity in permits and whether to allow for dilution	•		Bobbi Larson, Phil Markle	• • We are currently waiting for the next release of the draft "Plan" to see if and how our previously voiced concerns have been addressed. • We will then conduct an evaluation of the required elements and determine the likelihood of a non-toxic effluent being in violation and the costs associated with such exceedances as well as the likelihood of non-toxic receiving waters being erroneously identified as impaired using the requirements of the Plan..	
2	**Recycled Water Policy** • State Water Board is modifying the monitoring requirements for CECs in the policy to implement the Expert Panel's recommendations.	•	•		Bobbi Larson	• Work on draft comment letter (possibly joint letter with other associations)	
3	**Nutrient Policy** • This effort is part of a statewide initiative, supported by the U.S. EPA Region IX and the SWRCB, to establish numeric water quality standards, expressed as NNEs, for State Waters	• Any POTW that discharges to inland surface water will be affected under the policy. • Adoption of a statewide approach to nutrient control will affect NPDES permitting, 303(d) listings, and TMDL development. • Possible outcomes associated with the policy include stringent numeric endpoints for total nitrogen and phosphorus.	•		Tom Grouvhog	• Develop a suggested monitoring template that will support CASA's recommendations for the nutrient policy.	
4	**CECs** • Pharmaceuticals and other trace constituents of emerging concern (CECs) are ubiquitous in wastewater at low concentrations and have unknown effects on aquatic organism	• The State Board, along with Southern California Coastal Water Research Project (SCCWRP), has been working with the Ecosystems Advisory Panel to determine next regulatory steps. • The panel will recommend monitoring wastewater for CECs, and possibly bioanalytical assays to test for toxic effects			Chris Stacklin	• Wait for final report and await Determine our preference for how this study should be conducted and funded.	
5	**Statewide Mercury Programs** • The Mercury Programs will incorporate methylmercury objectives and control plans for mercury impaired waterbodies • Mercury Control Program for Reservoirs will address all mercury impaired reservoirs included on the 2010 303(d) list	• Any wastewater that discharges to a mercury-impaired waterbody will eventually be included under the policy • The State Board is considering ways to harmonize efforts with existing TMDLs • If control program for NPDES permitted sources is developed implementation	•		Tom Grovhoug, Shannon Bishop	• Continue to provide input at public meetings and submit comments	

CASA Regulatory Workgroup Water Committee Key Issue Summary
(continued)

Item No.	Description	Issues for POTWs		Links	Lead(s)	Next Steps	Due Date
	• Future elements of the policy could include control programs for future impaired reservoirs, rivers/creeks/streams/enclosed bays/coastal bays/estuaries/lagoons impaired by mercury, NPDES permitted sources, and nonpoint sources	measures such as mercury-specific pollution prevention, installation of amalgam separators for dental offices, and improving wastewater treatment may be required.					
6	**Methylmercury Objectives** • State Board is developing a methylmercury fish tissue objective and implementation plan • The scientific underpinnings for the criteria development are still under consideration, but there will likely be two objectives in terms of fish tissue, one to protect human health and one to protect the California Least Tern	• The State Board staff are working on the implantation plan for the objectives.	•		Tom Grovhoug, Shannon Bishop	• Begin to work on internal strategy and then begin working with State Water Board and to iron out issues	
7	**Biological Objectives** • The State Board is developing a Biological Objective Policy that will incorporate bioassessment results into Basin Plans, impairment listing decisions and eventual enforcement actions to protect aquatic life beneficial uses.	• If biological impairment is found to be caused by a pollutant, it could impact how NPDES permits are written and permit limits.	•		Phil Markle	• There is a current Tri-TAC technical workgroup that has been involved in providing technical comments on various documents as they have been released. Tri-TAC is now in the process of forming a Policy workgroup to address policy issues of BO. Ann Heil should be included in the Tri-TAC working group since she is representing the POTW perspective on the working group.	
8	**SSS WDR** • The Monitoring and Reporting Program for the SSS WDR is being revised by the State Board	•	•		Bobbi Larson, Monica Oakley	• Continue to monitor the SSS WDR program for possible future changes and review data presented in the annual compliance reports. •	
9	**Delta Issues** • Standing topic to discuss issues in the Delta that can have statewide impact. • State Board is updating Bay Delta Plan	• Ammonia discharged from POTWs has been suggested to be disrupting the food-web, and ultimately contributing to the decline of pelagic fish populations in the Bay-Delta estuary • This rational was used by the Central Valley RWQCB to support requiring Sacramento Regional County Sanitation District to upgrade to nitrification, at an estimated cost of $800 million • Various studies to resolve uncertainties related to the impacts of ammonia are underway •	•		Terrie Mitchell	• Continue to track issues as they emerge and act on those with state-wide significance	
	•	•	•			•	
11	**EPA Ammonia Criteria** • EPA released the final version of the new freshwater ammonia criteria in August 2013.	• The 2013 freshwater ammonia criteria is lower than the 2009 draft criteria and depending on how the criteria is applied, it could be difficult for POTWs to meet to limits.	•		Tom Grouvhog/ Phil Markle	• Track and provide comments when necessary	

CASA Regulatory Workgroup Water Committee Key Issue Summary
(continued)

Item No.	Description	Issues for POTWs		Links	Lead(s)	Next Steps	Due Date

12	**EPA Water Quality Criteria**
	• EPA is proposing changes to the water quality criteria regulations regarding administrator determinations, attainable uses, triennial reviews, compliance schedules, antidegradation, and variances.
		• Key elements likely to be included in the regulation:
		  • Antidegradation- States must adopt binding anti degradation requirements and minimum implementation methods
		  • Attainable uses- when use is not attainable, State must specify next highest attainable use
		  • Triennial review- current criteria should be examined
		  • Variance- requirements will be specified
			•		Shannon Bishop	• Track and provide comments when necessary
						• Work with NACWA on comments	

13	**EPA Integrated Permitting** • EPA effort to integrate municipal stormwater and wastewater plans in relation to the CWA. The integrated planning process will potentially identify efficiencies in implementing overlapping and competing requirements that arise from separate wastewater and stormwater projects, including capital investments and operation and maintenance requirements.	• The integrated permitting approach could be beneficial for POTWs because it is intended to help municipalities meet their CWA obligations by optimizing their infrastructure improvement investments through the appropriate sequencing of work. • Is there a way to harmonize with Porter Cologne in California? • EPA integrated permitting document came out as a draft. This is driven by urban mayors. There wasn't a lot of substance, although one issue raised was removing 5-yr permit cycle			Ben Horenstein/ Jackie Kepke	• Continue tracking this effort along with NACWA • Review draft framework document when released	
14	**Electronic Reporting** • Agencies are now required to electronically report compliance data to their regional boards via CIWQS • State Board is working on eSMR 2.5 that will allow for electronic submittal of EPA required self-monitoring data	• Errors are often propagated when the data are made public, and they are also often presented out of context (e.g. presenting exceedences as violations) • Errors are difficult to correct • Finalization of eSMR 2.5 will require a different data file type to be submitted electronically	•		Shannon Bishop	• Submit comment letter to EPA regarding the proposed electronic reporting rule. • Work with the State Board to ensure that California's electronic reporting databases are CROMMER certified.	
15	**EPA Dental Amalgam** • October 26, 2011 - EPA released its 2010 Effluent Guidelines Program Plan announcing its intent to adopt guidelines on the use of dental amalgam by dentists	• Agencies are concerned that dentists' offices will be regulated as part of POTWs' pretreatment program • EPA will likely create a new category so that dentists will not be categorized as SIUs • They may also grandfather in existing regional dental amalgam programs	•		Tim Potter	• Comment on draft guidelines when they are released	
16	**Pesticides** • Cross-media issue • Some pesticides are toxic to sensitive organisms at extremely low concentrations. • Nanoparticles and some biocides have potential to interfere with biological treatment processes	• In the future, POTWs could be regulated for pyrethroids, which they can't control and are toxic to sensitive organisms at very low levels. Engagement at this stage could steer regulators to adopt strategies favoring source control • POTWs are participating in a long-term joint program with stormwater and the water boards to work cooperatively with pesticide	•		Pesticide Work Group: Greg Kester, Linda Dorn, Preeti Ghuman, Phil Markle, Dave Snyder, Melody LaBella, Karin North,	•	

CASA Regulatory Workgroup Water Committee Key Issue Summary
(continued)

Item No.	Description	Issues for POTWs		Links	Lead(s)	Next Steps	Due Date
	• Some pesticides like triclosan, fipronil, and nanosilver are considered CECs	regulators to use their pesticide regulatory authorities prevent pesticide-related POTW compliance and operational problems.					
17	**DTSC Safer Consumer Products Regulation** • The Department of Toxic Substances control is developing new regulations that will allow chemicals to be controlled without recourse to the legislature.	• This could be an important tool for POTWs to prevent the discharge of toxic substances to their influent.	•		Karin North, Melody LaBella, Kelly Moran	• Comment on Green Chemistry regulations due on October 11th. BACWA will write letter and Tri-TAC may sign on the letter if warranted.	
18	**State Water Board Resource Alignment** • This project was initiated by the State Water Board. The Board directed staff to assess and align State Water Board priorities, resources, and performance targets.	• This effort is an opportunity for POTWs to State Water Board's priorities, recommend ways to improve efficiencies in regulatory requirements, and hopefully improve cost-effectiveness of regulatory compliance.	•		Adam Link	• Working group will brainstorm implementation ideas for the State Board.	
19	**Statewide Cadmium and Hardness Policy** • The State Water Board staff is evaluating the cadmium criteria. As part of this policy, hardness selection criteria may be defined. • CEQA scoping began in fall 2008 but was stalled. State Water Board staff are continuing work on the project.	• The new policy will likely result in more stringent cadmium criteria.	•		Mitchell Mysliwiec	• Work with State Water Board staff to get update on the project to determine next steps.	