

## SMALL TRIBUTARIES LOADINGS

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**ESTIMATED COST: \$511,000**

**OVERSIGHT GROUP:** Sources Pathways and Loading Work Group (SPLWG)

### PROPOSED DELIVERABLES AND TIMELINE

Task	Deliverable	Due date															
		2014				2015											
		S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	Small tributaries wet weather characterization [MQ 1]																
1a	Wet season monitoring			!		!		!	!								
1b	Quality Assurance & Data Management																
1c	Interpretation & reporting													!		!	
2	Regional watershed spreadsheet model (RWSM) y5 [MQ 2]																
2a	Finalize work plan based on latest info. and priorities									!!							
2b	Compile latest data (GIS & stormwater data (Task 1)										!	!	!				
2c	Recalibrate model, estimate loads, & update model report													!	!	!	
3	Watershed loadings trends strategy support [MQ 3]																
3a	Devise & prioritize study questions (STLS oversight)					!	!										
3b	Identify analysis/interpretative methods (SPLWG oversight)							!!									
3c	Complete analysis & present prelim. findings to SPLWG								!	!!							
3d	Complete white paper (STLS/SPLWG review)										!		!				
4	Small tributaries loading strategy coordination support					!		!		!		!		!		!	

[MQ] = Municipal regional stormwater permit (MRP) and small tributary is loading strategy management questions

! = STLS check in for review and coarse corrections

!! = STLS/SPLWG oversight and review

### Background

The San Francisco Bay Hg and PCB TMDLs call for a reduction in loads by 50 and 90% respectively. In response, the Municipal Regional Permit for Stormwater (MRP) Provision C.8.e. calls for a range of actions including gaining a better understanding of which Bay tributaries contribute most loading to sensitive areas of biological interest on the Bay margin, better quantification of loads of sediments and trace contaminants on a watershed basis and regionally, a better understanding of how and where trends might best be measured, and an improved understanding of which management measures may be most effective in reducing impairment. These same needs are reflected in the small tributary loading strategy (STLS) priority questions listed below. In addition, the Water Board, through provision C.11. and C.12. of the permit, called for PCB and mercury source and source area identification to identify a set of sites for pilot testing the efficacy of various best management practices for addressing loads and impairments.

Beginning with planning efforts in 1999 (first report of the Sources, Pathways and Loadings Workgroup and the "Urban run-off literature review") and field studies beginning water year (WY) 2001 at Mallard island on the Sacramento River (which was then perceived as the largest single PCB and Hg loading pathway to the Bay), and continuing the following wet season with the instigation of a loading study on the Guadalupe River in San Jose (also perceived as a large loading pathway for both Hg and PCBs), the RMP made considerable progress on investigating the magnitude of loading to San Francisco Bay from WY 2001-2006. This effort continued with another fixed station loading study at a small 100% urban and industrial tributary called Zone 4 Line A in Hayward.

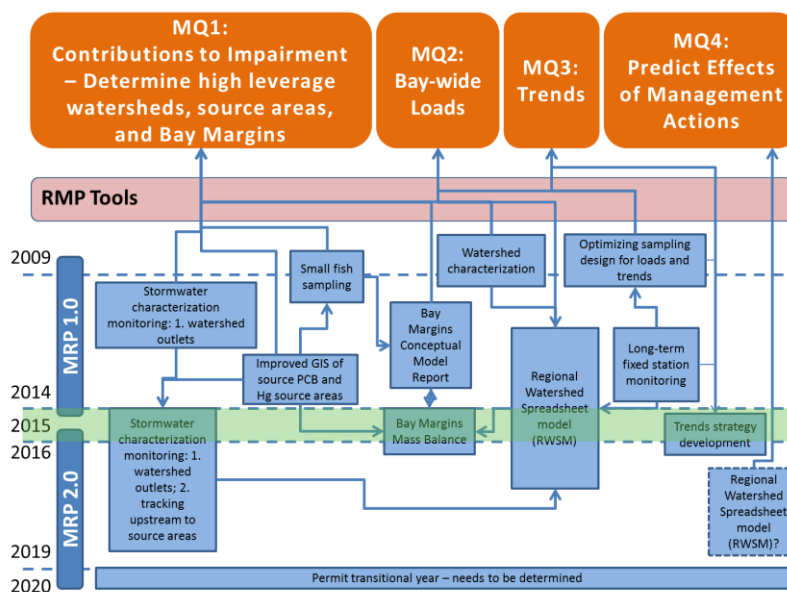
These studies provided basic information to inform TMDL implementation as well as providing a valuable dataset for many other purposes, including reevaluating study design in relation to the issuance

of the MRP in October 2009. As a result of this permit and the need to better understand which tributaries were contributing to greatest load per unit area (MQ 1), the RMP funded a reconnaissance study, the data from which (along with other information) supported the instigation of four additional fixed station loading studies in WY 2012 and two more, for a total of six, in WYs 2013 and 2014 that were deemed “no regret watersheds” and suitable for baseline information on which to measure future trends (MQ 3).

In addition the RMP funded the development of the Regional Watershed Spreadsheet Model (RWSM) as a tool for estimating regional and sub-regional loads (MQ 2) and an additional study component recommended by the STLS team to improve our understanding of source areas (GIS layer development) and event mean concentrations (EMC); the loading coefficients associated with each of the source areas (MQ 1).

The data obtained from the reconnaissance study (MQ 1) and the loading study (MQ 3) as well as efforts to better quantify the characteristics of our PCB and source areas (MQ 1)), together constituted an entire program of investigation. Of course, this was not occurring in a vacuum in relation to other strategies, in particular the Bay modeling strategy and the PCB and Hg strategies (and associated small fish studies) as illustrated in Figure 1. Indeed, the ongoing success of the STLS program component as a whole cannot occur without sustained support from the RMP and a programmatic vision with appropriate linkages across other strategies. As with all programs, the individual tasks must and do connect together as illustrated by the arrows (Figure 1). For example, characterization data obtained from field studies primarily aimed at answering MQ 1 are also needed to provide calibration data for the RWSM modelling effort being developed to answer MQ 2. The fixed station loading studies aimed at providing baseline data against which to measure future trends in relation to management actions (MQ 3), also provide data for helping to verify the RWSM. In addition, BASMAA utilized these data in Part C of their Integrated Monitoring Report to independently estimate regional loads and loads associated with specific land uses and provide the basis for predicting the effects of management actions (MQ 4). The development of GIS data and the back calculation of EMC data in relation to source identification (MQ 1) provide the necessary input data for the RWSM (MQ 2). Going forward, the small fish studies, the Bay margins conceptual model report, and the proposed conceptual model development for priority Bay margin units will provide an even greater linkage between sensitive biological areas on the Bay margin and upstream sources and potential management actions.

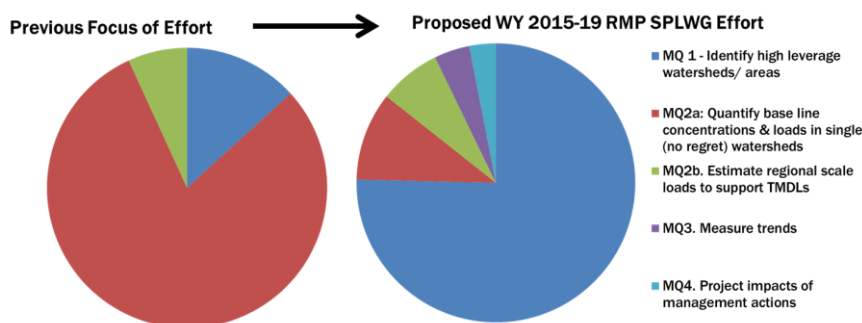
**Figure 1.** Key linkages between RMP funded studies within the overall small tributaries loading programmatic strategy. Highlighted in green are the proposed elements for 2015 put in context with previous funded elements and possible future elements.



Much has been learned over the past 15 years and many of the efforts during the first MRP term from 2009 to 2014 were very well supported by the massive amount of data and information collected by the RMP through the oversight of the Sources Pathways and Loadings Workgroup. The focus, in terms of RMP funding, has largely been devoted to better understanding loadings (MQ 2) (Figure 2).

However, during the next permit term (MRP 2.0), the Water Board and BASMAA are asking for an increased focus on identifying watersheds and areas within watersheds that are producing disproportional loads in relation to impairment in Bay margin areas (MQ 1) while maintaining some effort on the loadings question (MQ 2), and developing and implementing a plan to determine trends (demonstrating that management efforts are effective at reducing impairment).

**Figure 2.** Illustration of the proposed programmatic change in focus between RMP STLS funded efforts during MRP 1.0 (2009-14) and proposed efforts during MRP 2.0 (2015-19). Note, direct effort by BASMAA through grants and their city/county resources are not included (but substantial).



At this time, the Water Board and BASMAA (through discussions within and outside the STLS) are not recommending any increased focus through the RMP on true source area identification (MQ 1) or predicting the potential effectiveness of management actions (MQ 4). Substantial efforts have been and are ongoing in relation to these management questions outside of RMP funding by BASMAA through a \$5 million EPA Water Quality Improvement Fund grant called Clean Watersheds for a Clean Bay (CW4CB). Pending the results of these studies, it is possible that, in the next 6 to 18 months, RMP support could be requested to build upon the results from these efforts. Results from the proposed elements within the PCBmercury strategy will also likely mature and give further support for increased understanding of true sources and the potential of source control and overall program of load reduction towards meeting TMDL goals.

#### ***Applicable RMP, STLS / MRP Management Questions (MQs)***

- Level I RMP, Q3: What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary?
- Level II RMP, Q3C: What is the effect of management actions on loads from the most important sources, pathways, and processes?
- Level III SPL Q2: What is the watershed-specific and regional total water flow, load of sediment, and load of contaminants entering the Bay from the urbanized small tributaries and non-urban areas draining to the Bay from the nine-county Bay Area and are there trends through time?
- Level IV STLS Q1: Impairment: Which are the “high-leverage” small tributaries that contribute or potentially contribute most to Bay impairment by pollutants of concern?
- Level IV STLS Q2: Loads: What are the loads or concentrations of pollutants of concern from small tributaries to the Bay?
- Level IV STLS Q3: Trends: How are loads or concentrations of pollutants of concern from small tributaries changing on a decadal scale?

Level IV STLS Q4: Support management actions: What are the projected impacts of management actions on loads or concentrations of pollutants of concern from the high-leverage small tributaries and where should management actions be implemented in the region to have the greatest impact?

### *Approach*

#### Task 1. Small tributaries stormwater characterization field study [MQ 1]

- Monitoring Design: 1 composite/site, unless unexpected low concentration and methods development for one remote sampler type at 12 locations. Methods inter-comparison study using 12 fractionated water samples versus remote sampler sediment data.
- Site Selection: A balance between two overarching rationale:
  - Nested sampling design to track sources upstream in known polluted areas to help better define source areas and management options.
  - Finding new polluted watersheds or sub-watershed areas (watershed locations near the Bay margin or at least further downstream than the source tracking approach).
  - Possible use of ELISA this summer to support site selection (c.f. PCB strategy and SPL recommendations for increased source I.D. effort (using remaining 2014 POC funding).
  - Other section rationale:
    - 1 site/yr large watershed [MQ 2]
    - Re-sampling potential false negatives [MQ 1 & 2]
    - Contingency for resampling Guadalupe River for trends [MQ 3]
    - Filling gaps along environmental gradients in relation to source areas (most specifically to support RWSM development [MQ 2])
- Remaining questions before design and budget can be finalized:
  - Final decision on the choice of remote sampler (need further expert input)
  - Final decision on analyte list and D.L.s (PCBs, Hg, org. carbon, GS, TMs at select sites)
  - Data management costs?
  - Final total number of field sites (largely the result of all other decisions)

#### Task 2. Regional watershed spreadsheet model (RWSM) [MQ 2]

- Sub-regional scale loads needed to support TMDL updates and linked to PCB strategy a margins mass balance (2015 proposal)
- Pending the outcomes of the 2014 work plan, STLS to agree upon and recommend the workplan for 2015. 2014 work plan:
  - Use GIS databases incorporating the latest BASMAA improvements and fix anomalies (e.g. wrongly assigned open space or pervious areas land uses that don't make sense)
  - Coalesce small near homogeneous "watersheds" mostly on the Bay margin into nearby areas that correspond more directly to real-world land use zones
  - Use the uncalibrated parameters to explore ranking watersheds, sub-watersheds, or patches to support management prioritization
  - Rerun the model calibration based on the sediment base model, the GIS improvements, and an added data quality weighting factor, and regenerate watershed and regional load and sensitivity analysis
- Increase funding to ensure the model is completed? From \$35 - \$50k?
- Depending on 2014 outcomes, RMP 2015 funds might be used to:
  - Improve the basis of the model
    - Shift the model to a water-based starting point or
    - Complete further structural improvements to the sediment-based model including adding a hydrology parameter
  - Incorporate additional calibration watersheds (Task 1 [MQ 1] above) and BASMAA studies.

Task 3. Watershed loadings trends strategy support [MQ 3]

The SPL workgroup proposed an effort to define where and how trends may be most effectively measured in relation to management effort in the context of ensuring data collection methods deployed now [MQ 1] are able to support this future need. The SPL proposed development of a framework to define the long term trajectory of the STLS program and ensure that all MQs are answered in the timeframe needed.

- Develop a trends strategy White Paper (could include further power analysis of existing data).
  - Where (what scale) could trends be measured to demonstrate the effectiveness of management efforts in relation to environmental benefits?
  - What are the appropriate media and metrics upon which to measure trends and what constitutes a suitable baseline against which to measure future changes?
  - What data have been collected to-date which may serve as baseline data – is there a cost-effective and on to efforts to answer MQ 1? Is there a need for a fundamental rethink since the previous power analysis to support trends was based on fixed station monitoring data and large datasets?
  - What will be the reasonable temporal checkpoint for defining trends?
  - Develop a field work plan and costs, and set aside RMP contingency funds for sampling Guadalupe River under a large reservoir release event (which might end up being funded through task 1 or perhaps a request to the RMP on an as opportunity arises basis.
  - Develop a list of other potential sites for sampling trends under specific circumstances.

Task 4. Small tributaries loading strategy (STLS) coordination support.

- Local STLS meetings (agenda and meeting materials development)
- Phone conferences for product updates and review (agenda and meeting materials development)

***Proposed Budget (will be revised pending planning efforts during June-August)***

Task	Sub-Task	Deliverable	Estimated Budget
1. Small tributaries wet weather characterization [MQ 1]	1a	Stormwater monitoring	\$415k
	1b	Quality Assurance & Data Management	
	1c	Interpretation & reporting	
2. Regional watershed spreadsheet model (RWSM) [MQ 2]	2a	Finalize work plan based on latest info. & priorities	\$35k
	2b	Compile latest data (GIS & storm data (Task 1)	
	2c	Recalibrate model, estimate loads, & update report	
3. Watershed loadings trends strategy support [MQ 3]	3a	Devise & prioritize study questions	\$35k
	3b	Identify analysis/interpretative methods	
	3c	Complete analysis & present prelim. findings	
	3d	Complete white paper	
4. Small tributaries loading strategy (STLS) coordination support			\$26k

Note, the 6/9/14 STLS meeting reached agreement on proposed tasks but not absolute budget proportions. With the exception of Task 4, the tasks will be scoped according to budget available and better definition of priorities.