

## Special Study Proposal: Small Tributaries Loading Regional Watershed Spreadsheet Model

**Summary:** The goal of the Small Tributaries Loadings Strategy (STLS) Program over the next few years is to continue to provide information to RMP Stakeholders and the public that directly supports the identification and management of PCBs and Hg sources, concentrations, loads, and the determination of trends in relation to management efforts and beneficial uses in San Francisco Bay. To support improved estimates of regional scale watershed loads, the outcome of this proposal will be a GIS map of watershed scale loads for the region estimated from the RWSM that will be calibrated or verified with a minimum of 60 sites now characterized for of PCBs and Hg concentrations<sup>1</sup>. The information generated from this model, including updated land use specific yields, will also be useful for assisting BASMAA program staff at smaller scales with their proposed effectiveness evaluation methods for stormwater BMPs.

**Estimated Cost:** Option 1: \$40,000

**Oversight Group:** STLS/SPLWG

**Proposed by:** Jing Wu, Lester McKee, Alicia Gilbreath (SFEI)

### PROPOSED DELIVERABLES AND TIMELINE

Task	Deliverable	Due date															
		2016				2017											
		S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
A	Finalize work plan based on latest info. and priorities		!!														
B	Compile latest data (GIS & stormwater data)	!		!													
C	Recalibrate model, estimate loads, & update model report	!		!!		!		!!	!	!!							

[MQ] = Management Questions given in Provision C.8.f. of the Municipal Regional Stormwater Permit (MRP 2.0)

! = STLS check in for review and course corrections

!! = SPLWG oversight and review

### Background

The San Francisco Bay Hg and PCBs TMDLs call for a reduction in loads by 50 and 90% by 2028 and 2030, respectively. In response, the first Municipal Regional Permit for Stormwater (MRP) Provision C.8.f. (SFRWQCB, 2009) called for a range of actions including gaining a better understanding of which Bay tributaries contribute the 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 at a regional scale, 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 water quality impairment. These same needs were reflected in the small tributary loading strategy (STLS) (SFEI, 2009). On November 19, 2015, the second MRP was issued and provided an updated set of management questions (provided below) (SFRWQCB, 2015).

The development of the Regional Watershed Spreadsheet Model (RWSM) was recommended in the Strategy to support improved estimates of regional scale loads (primarily), to provide a quantification of the relative concentrations and loads between watersheds to help focus management, and possibly to help identify areas within watersheds for further investigation as part of the weight of evidence approach. Starting in 2010, a multi-year effort was undertaken to systematically develop and calibrate the Model. The development process has been documented through four previous progress reports. The Model was structured to use either a hydrology model or suspended sediment (SS) model as the basis for the

<sup>1</sup> Data were also collected by the Santa Clara and San Mateo Stormwater programs using the watershed characterization reconnaissance study design. This data should be made available in later fall for comparison to the RMP data during the reporting phase of the project.

pollutant models. The modeling effort also included linkages to other efforts by Bay Area Stormwater Management Agencies Association (BASMAA) and the RMP. Milestones achieved to date include:

- Developing and calibrating the hydrology model and the completion of pollutant profiles for PCBs, Hg, SS, Cu, Se, OC pesticides, and PBDEs (Lent and McKee, 2011; Lent et al., 2012),
- Improving GIS data about the sources of PCBs and Hg (McKee et al., 2014; Wu et al., in SPLWG review), and
- Improving the model calibration procedure to include analysis of modeling errors and output of the first reasonable model calibrations for PCBs (Wu et al., in SPLWG review).

Additional improvements to the model are being made during 2016 using the RWSM model development funding (\$35,000) that was approved in the 2016 budget. The work plan for the 2016 funding includes:

1. Further refinement of the GIS layers including exploring land use and source area anomalies in watersheds that are currently poorly calibrated,
2. Exploration of improved model parameterization,
3. Exploration of the calibration data to remove outliers and development of a method to estimate variability associated with composite data,
4. Further refinement of the calibration procedures including possible exploration of:
  - a. Calibrating to a larger group of watersheds (41 now available rather than 22)
  - b. Calibrating to the loads data set rather than to concentrations
  - c. Hybrid calibration (iterative auto and manual calibration)
  - d. Other recommendations by our advisors

## Study Objectives and Applicable RMP Management Questions

The main study objectives are three fold:

1. Determine regional scale loads of PCBs and Hg
2. Determine which individual watersheds may be producing disproportionately high loads per unit watershed area and then rank and separate these from lower yielding watersheds
3. Perform model runs to provide information on loading coefficients or loads at user requests, such as providing updated land use based yields or fine scale GIS information to BASMAA to support their proposed effectiveness evaluation methods for stormwater BMPs and treatment retrofit.

These objectives address management question (MQ) 4 primarily but also supports MQ1 by providing a quantified load rankings by watershed, MQ2 by its use for estimating loading to priority margin units, and MQ 3 by providing a maps of concentrations and loads Bay Area wide as a basis to support effectiveness evaluation methods for stormwater BMPs. While the STLS Trends Strategy has a management question that includes forecast modeling, it has not yet been determined which modeling platform would be most suitable. During the model calibration process, watersheds that do not calibrate well are further investigated virtually to try to understand land use or source area anomalies - a part of the calibration process that directly links to MQ1.

MRP 2.0 Q1: Source Identification / Leverage: Which sources or source areas provide greatest opportunity for load reductions?

MRP 2.0 Q2: Impairment: Which source areas contribute most to impairment of Bay?

MRP 2.0 Q3: Management effectiveness: Provide support for planning future management actions or evaluate existing actions.

MRP 2.0 Q4: Loads: Assess POC loads, concentrations, or presence/absence.

MRP 2.0 Q5: Trends: What are the spatial and temporal trends in loads or concentrations?

## Approach

By mid-2016, it is anticipated that an improved calibration of the PCB and mercury model will be completed based on data from about 41 calibration watersheds. Pending the outcomes of the 2016 work plan, STLS and the SPLWG will be consulted to agree upon and recommend a work plan for 2017. The goal of the additional work will be to get the PCB and Hg models sufficiently calibrated to meet the needs of BASMAA and other partners. The menu of options that will be considered to achieve this goal includes:

1. Recalibration of the hydrology model
2. Further (slight) improvements to the parameterization
3. Recalibration of the PCB and Hg models using data from 60+ watersheds (additional data collected by the RMP during WY 2016 and possibly data collected by the Santa Clara and San Mateo Stormwater programs using the RMP watershed characterization reconnaissance study methodology)
4. Response to user requests; for example in relation to effectiveness evaluation of stormwater BMPs
5. Completion of a user manual and full model documentation

## Reporting

A summary of the model updates, the results of the model calibration, and the regional loads will be presented in a technical report (draft in March 2017, final in June 2017).

## Linkages to other RMP Workgroups

The RWSM is being used to estimate the loads to the Priority Margin Units (PCB WG).

## References

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