# PROJECT PLAN

# JOINT STORMWATER AGENCY PROJECT TO STUDY URBAN SOURCES OF MERCURY AND PCBs

Submitted to the Executive Officer
California Regional Water Quality Control Board for the San Francisco Bay Region

July 1, 2000

A collaborative project of the following agencies:

- Santa Clara Valley Urban Runoff Pollution Prevention Program
- Contra Costa Countywide Clean Water Program
- San Mateo Countywide Stormwater Pollution Prevention Program
- Marin County Stormwater Pollution Prevention Program
- Vallejo Flood Control and Sanitation District
- Fairfield-Suisun Sewer District

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## Introduction

This project plan was developed and approved by the following stormwater programs:

- Santa Clara Valley Urban Runoff Pollution Prevention Program
- Contra Costa Countywide Clean Water Program
- San Mateo Countywide Stormwater Pollution Prevention Program
- Marin County Stormwater Pollution Prevention Program
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The plan is being submitted individually by each agency in response to identical May 3 letters sent individually to each agency by the Regional Board.

## Background

Bay area cities, towns, counties and flood control districts have monitored runoff and studied sources of urban runoff pollutants since 1986. From 1989 to 1996, through stormwater pollution prevention programs, they conducted fixed-station sampling of runoff and analysis of the samples for various pollutants. In September 1996 Regional Board staff requested that the stormwater programs cease fixed-station monitoring and redirect the resources to more focused studies. For over a decade, the stormwater programs have conducted and sponsored special studies which focused on sources, fate, effects, and control of urban runoff pollutants.

In June 1999 Regional Board staff presented to the Regional Board as an information item a workplan for conducting TMDLs for pollutants currently on the 303(d) list for San Francisco Bay: mercury, exotic species, PCBs, selenium, dioxin-like compounds, "legacy" pesticides (chlordane, DDT, and dieldrin) diazinon, copper, and nickel. TMDLs for PCBs and mercury are scheduled to be completed in 2003.

At meetings of the BASMAA Monitoring Committee, Regional Board staff made presentations regarding these two pollutants and stated that they needed additional information to complete the TMDLs.

Fred Hetzel and Tom Mumley of Regional Board staff attended the April 27, 2000 meeting of the BASMAA Board and requested assistance in obtaining additional information regarding urban sources of these pollutants. The BASMAA Board asked that this request be put in writing so that the stormwater programs could respond in an orderly way. The Regional Board staff responded with identical May 3 letters sent to each stormwater program. That letter requested a response by July 1, 2000. Around the same time, the Regional Board formally requested, under California Water Code Section

13267, that PG&E and nine current users of PCBs provide information, by September 1, 2000, on their current management practices and status of any historical spills.

**Project Objectives**

The Regional Board's letter requests assistance with answering questions regarding the role of urban storm drain systems in conveying PCBs to the Bay. It identifies three questions:

(#1) - Are PCBs distributed somewhat evenly throughout the landscape resulting in relatively similar PCB discharges from storm water conveyance systems?

(#2) - Are storm drains or other surface drainage pathways sources of PCBs in themselves?

(#3) - Are there specific locations within watersheds where prior or current use of PCBs result in land sources contributing to continued PCBs discharges through stormwater conveyance systems?

The letter states: "Your monitoring program may be designed in phases. Phase one should focus on identifying specific conveyance systems with elevated concentrations of PCBs in suspended or bedded sediments and calculating PCB loads to the Bay from these and other selected conveyance systems. The following phases should concentrate on (1) identifying the causes of elevated PCBs in those watersheds and (2) potential actions to reduce the discharge of PCBs from these conveyance systems."

The general objective of the project is to assist the Regional Board to answer the questions posed in the May 3 letter. The specific objectives are:

1. Determine the range of concentrations of PCBs and mercury in urban storm drain embedded sediments.
2. Note any outliers that might be attributed to specific sources within the watershed.
3. Compare sediments from stations draining urban areas against those draining open space.
4. Determine if there are significant differences between stations draining residential/commercial land uses vs. those draining industrial land uses.
5. Determine if there are significant differences between watersheds.
6. Contribute information that the Regional Board might use to calculate loadings of PCBs and mercury from urban areas.

## Project Approach and Study Design

The six objectives above can be grouped into two general areas of investigation:

1. Characterization of patterns of PCBs and mercury loading to urban storm drains.
2. Calculation of urban runoff loads of PCBs and mercury to San Francisco Bay.

### Characterization of Patterns of PCBs and Mercury Loading

Characterization of pollutant sources within watersheds has often followed a stepwise, downstream-to-upstream pathway. This strategy attempts to progressively narrow the drainage area from which pollutants are emanating until a source is found. Sampling might begin at the mouth of a major drainage, for example, and progress upstream by sampling different subcatchments or at different parts of the main stem.

One weakness of such a strategy is that pollutant concentrations can vary considerably with rainfall patterns and the storm-induced movement of sediment. With a limited number of samples it is difficult, if not impossible, to reliably determine whether apparently elevated pollutant concentrations from a particular catchment are due to variability in the data or indicate a potential "hot spot" within the watershed.

Another weakness of this strategy is that it is difficult to generalize the results of such an investigation to guide a control strategy covering whole watersheds or regions. Differences in concentrations within a particular watershed (even if identifiable) may simply reflect conditions specific to that watershed at that time. By contrast, a comprehensive control strategy should be based on routine and generalized implementation of BMPs that can successfully reduce pollutants from sources throughout the watershed. To accomplish that end, it is necessary to do more than just "find sources"; it is necessary to link variability in pollutant concentrations with variability that is apparent in the urban landscape — among different urban land uses, for example.

The questions posed in the Regional Board's May 3 letter point to a different approach. One key question is whether PCBs and mercury are distributed somewhat evenly throughout the urban landscape.

Our approach is to identify similar catchments throughout the Bay area that typify two land use categories: residential/commercial and industrial. By sampling similar residential/commercial catchments over a wide geographic range, we hope to be able to characterize whether concentrations of these pollutants are fairly consistent from one site to another. This would indicate that sources of these pollutants are fairly ubiquitous within urban watersheds, as seems to be the case for copper. This is likely to be the case for mercury if the principal sources are mobile exhaust emissions and air deposition. It is likely to be the case for PCBs if the principal sources in residential/commercial areas are PG&E transformers (atop light poles) and air deposition.

It is more difficult to find "typical" industrial sites; these sites vary more in age and history, and various pollutants that may have been in use over that time. However, it is apparent that runoff from industrial sites as a group tends to have higher concentrations of zinc. It may be that many types of industrial sites also have elevated concentrations of PCBs in runoff, reflecting the once-common use of PCBs in lubricants, paints, and other industrial materials.

It may also be that there is a general "background" level of PCBs or mercury at urban sites, but this generally consistent concentration is punctuated by much higher concentrations at some sites, indicating a "hot spot." Our sampling plan includes enough sites with wide enough distribution that we may encounter one or more "hot spots" should such phenomena exist; however, this result will be catch-as-catch-can (i.e. similar in this respect to the "downstream to upstream" approach).

A more systematic approach to identifying "hot spots" would be to identify sites with current and past use of PCBs, screen them for past and current management practices and other evidence of potential releases, examine each site to determine probability or evidence that releases are continuing or that past releases may still be retained in storm drain sediments (which may depend on the characteristics of the storm drain system), and then conduct sampling of downstream storm drains. We note that the Regional Board seems to be taking the first steps in this approach with their 13267 request to PG&E and nine current users of PCBs. We believe this is a more cost-effective way to identify potential hot spots than the "downstream to upstream" process.

Whichever approach is used to identify "hot spots," the statistics from a carefully selected set of "background" residential/commercial sites can probably be used as a baseline for defining what urban PCB and mercury concentrations are "elevated."

We plan to sample embedded sediments within storm drains, drainage channels and streams, rather than sampling runoff. Our experience with both modes of sampling (Cooke and Mineart 2000, Stevenson and Dorsey 2000) suggests that embedded sediments are a more robust indicator of pollutant sources than runoff concentrations, which vary with rainfall intensity and frequency and with runoff volume, as well as exhibiting random variability. Further, sampling can be conducted in the dry season and is not dependent on capturing a representative sample from a storm event.

## Calculation of Loadings of PCBs and Mercury

Pollutant loadings from urban runoff can be characterized by a simple method (Scheuler 1987). Subsequent comparisons with more sophisticated models suggest that there is little advantage in using them, given natural variability and uncertainty in runoff concentrations (Chandler 1994). This is the method that was used by the RMP in the recent report, pursuant to Assembly Bill 1429, on contaminant loads from stormwater to coastal waters in the San Francisco Bay region (SFEI 2000).

One specific difficulty in calculating pollutant loads from the data we intend to collect is that it may be necessary to extrapolate concentrations from embedded storm drain sediments by estimating the quantity of these sediments that may be carried to storm drain outfalls.

We suggest that the methodology for calculating loads, including the possibility of using some adaptation of the simple method or rational method, should be taken up within the stakeholder process for the respective TMDLs for PCBs and mercury. Among the issues that would need to be discussed is whether "average" annual loadings are a meaningful indicator of potential effects to beneficial uses, given the natural variation in year-to-year rainfall and loading, the relationship between loadings of bioaccumulative pollutants and the magnitude of potential effects of beneficial uses, and speciation and other aspects of environmental fate and transport.

**Project Tasks and Schedule**

First Phase

Task 1. Project Workgroup and Project Plan Review

The participating Programs will create a project workgroup and select a chairperson. The draft project plan will be circulated for comment among interested parties and to persons with expertise in the sampling and analysis of environmental pollutants. The project workgroup will receive comments from Regional Board staff and others and will decide how to incorporate comments into a final project plan.

Task 2. Selection and Retention of Contractors

SCVURPPP has expressed a willingness to act as the lead on this project. The project workgroup will identify appropriate procedures for selecting contractors to complete the following tasks.

Task 3. Identification and Selection of Monitoring Stations

Stations will be selected to represent a statistically significant sample of each of the following four categories:

- Urban residential/commercial catchments.
- Urban industrial catchments.
- Open space.
- Downstream sites representative of entire watersheds.

There will be approximately 40 - 50 stations in all. Sampling will be conducted at stations in each of the participating stormwater program jurisdictions. The Programs will be

requested to identify candidate stations. The apportionment of stations among jurisdictions will be in rough proportion to the Programs' contributions to the project.

The selection of stations presents considerable logistical difficulty. Stations must be safely accessible and must also reliably retain embedded sediments.Within groups, stations should be similar and should avoid potentially confounding influences. For examples, urban stations that receive sediments from eroding hillslopes or landscaping should be avoided.

Stations will be thoroughly documented so that they could be relocated for future studies.

Task 4. Quality Assurance Project Plan (QAPP)

The contractor will prepare a QAPP including the following information:

- Project management, including task descriptions and schedules, data quality objectives, measurement performance criteria, documentation and records.
- Stations to be sampled.
- Sampling and analytical methods and procedures.
- Quality control requirements and methods.

As much as possible, sampling and analytical protocols will be coordinated with the Alameda Countywide Clean Water Program's (ACCWP's) efforts in response to the same May 3 letter. A draft QAPP will be circulated to the project workgroup, interested parties and selected experts. Comments will be incorporated in a final QAPP.

Task 5. Sampling

Approximately 80 samples will be obtained, including replicates. All stations will be sampled around the same time to avoid variance related to season or rainfall. To minimize the potential for error due to differences in sampling technique, most sampling will be done by a single contractor. However, some Programs may choose to conduct their own sampling, in which case the contractor will work with Program staff to insure consistency in method and implementation of QA/QC.

It is intended to use sampling techniques similar to those used by the Regional Monitoring Program for Trace Substances (RMP), which may modified to be suitable for sampling storm drains.

Task 6. Laboratory Analysis

All samples will be analyzed for mercury, PCBs, particle size, and TOC using well-established and widely used methods and detection limits similar to those used by the RMP. A decision on the analysis of specific PCB congeners will be made in consultation with Regional Board staff and others prior to completion of the project plan.

Task 7. Data Analysis

All station information and analytical data including QA/QC, will be made available for review by the Regional Board and interested parties. Interpretation of data will include the following:

- Average, range, standard deviation, and other relevant statistics for all urban sites.
- Comparison of residential/commercial catchments to industrial catchments.
- Comparison of urban sites to open space sites.
- Spatial comparison of downstream sites.

Data collected by the ACCWP in response to the May 3 letter will be reviewed, and as much as possible, will be incorporated into our data sets for analysis.

Task 8. Report

A brief final report will document methods and results. The report will include a discussion of how the results apply to each of the project's specific objectives and the questions posed in the Regional Board's May 3 letter, and will include conclusions and recommendations for further action by the Regional Board and the programs.

A preliminary draft of the report will be reviewed and discussed by the Project Workgroup. The draft report will be circulated for one round of comments from Regional Board staff and other interested parties. Comments will be addressed or incorporated into a final report.

Future Phases

Additional work, if appropriate, will be recommended in the project report for the first phase and will be incorporated in the stormwater programs' future work plans. This additional work may include ways to track down any specific "hot spots" or potential sources of elevated PCBs or mercury to storm drains and further development, if required, of appropriate BMPs and their incorporation into program performance standards.

**Project Budget and Resources**

A final project scope and budget, including commitments by the urban runoff programs, will be developed following RWQCB review of this work plan, contractor selection, and negotiation of a contract.

The programs have identified the following resources available in their 2000-2001 budgets to apply as necessary toward completion of the this project:

| Program | Resources | Reference |
|---|---|---|
| SCVURPPP | $55,000 | 3/1/00 Workplan Table 4-3 |
| San Mateo STOPPP | $40,000 | |
| CCCWP | pending | |
| MCSTOPPP | $10,000 | |
| FSSD | $10,000 | |
| VFCSD | $10,000 | |

**References**

Chandler, Robert. 1994. Estimating Annual Urban Nonpoint Pollutant Loads. *Journal of Management in Engineering* Nov./Dec. 1994, 50:59.

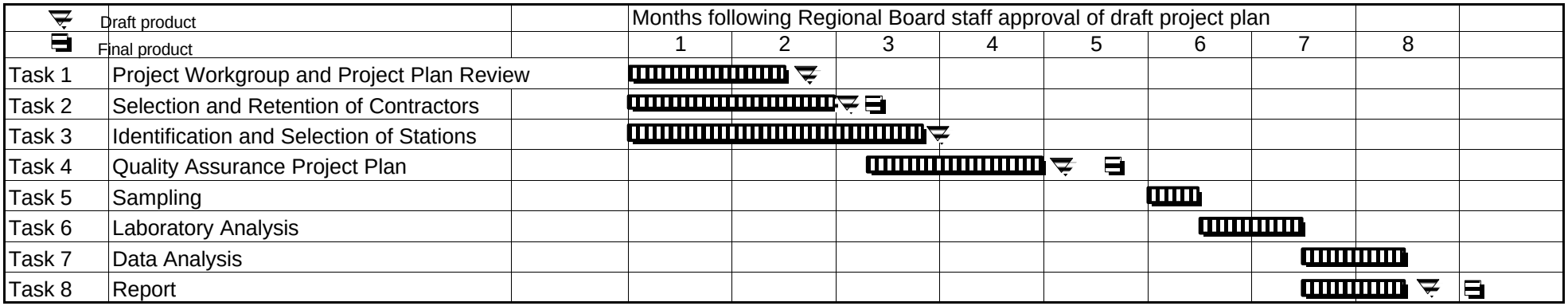
Cooke, Terry and Phil Mineart. 2000. *Stormwater Environmental Indicators Demonstration Project Technical Memorandum for Indicators #1: Water Quality Pollutant Constituent Monitoring and #4: Exceedance Frequencies of Water Quality Standards.* Santa Clara Valley Urban Runoff Pollution Prevention Program.

San Francisco Estuary Institute (SFEI). 2000. Contaminant Loads from Stormwater to Coastal Waters in the San Francisco Bay Region: Comparison to Other Pathways and Recommended Approach for Future Evaluation. May 17, 2000 draft.

Schueler, Thomas. 1987. *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs.* for Metropolitan Washington Council of Governments. July 1987.

Stevenson, Marty and Kathleen Dorsey. 2000. *Stormwater Environmental Indicators Demonstration Project Technical Memorandum: Indicator Profile #5 – Sediment Characteristics and Contamination.* Santa Clara Valley Urban Runoff Pollution Prevention Program.

Joint Stormwater Agency Project to Study Urban Sources of Mercury and PCBs
Project Schedule

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