

Assessment of TOC Loads

TITLE: Assessment of total organic carbon loads from the upstream watersheds to the Delta for Water Years 1980 to 1999

PROBLEM

Organic carbon compounds are major constituents of concern for drinking water due to the ability of organic carbon to be transformed into THMs during water treatment. A preliminary estimate of sources of TOC to the Delta system indicated that the upstream watersheds contribute over half the load (Jassby, 1999). An assessment of these loads that characterizes the timing and magnitude of tributary inputs to the Delta and the upstream land use sources of these TOC loads to the watersheds is important to identifying those carbon sources most closely linked to drinking water quality problems and prioritizing potential source control measures.

OBJECTIVES

The objectives of the study are:

- To evaluate historical data to determine the loads and major sources of total organic carbon to the Delta from the watersheds;
- to evaluate whether the concentrations and loads have been increasing or decreasing over the past 20 years; and
- to identify data gaps and monitoring needs for organic carbon to identify source areas.

Information from this study will be used in several different ways to support the CALFED drinking water program. Information on the timing and magnitude of TOC loads will support future analyses of TOC concentration patterns in Delta channels and water supply intakes. Upper watershed information will be used to identify general land uses and discharges associated with TOC loading and support prioritization of more detailed studies of carbon quantity and quality from those land uses. Finally, the retrospective analysis of TOC in the upper watersheds will also support CALFED Ecosystem Restoration Program projects with respect to changes in overall productivity of restored riparian sites.

APPROACH

Task 1 – Compile database

Subtask 1.1: Retrieve data.

Data will be retrieved from STORET, NWIS, DWR, and the Bay-Delta and Tributaries Database (Karl Jacobs). Data retrieved will include TOC and assorted field parameters. Streamflow data for water-quality sites will be retrieved from USGS and DWR gages. The Principal Investigator has talked with Karl Jacobs and will coordinate with Karl in adding data to and retrieving data from his database.

Subtask 1.2: Screen data.

The goal of the project is to define the TOC concentrations/loads in representative ambient surface water conditions in the upstream watersheds and use that information to define major source areas. Thus, several types of sites will be screened from the database, including: (1) water supply canals, (2) small agricultural drains and evaporation ponds, (3) wastewater treatment plant effluents and sites just downstream of effluent discharges, (4) lakes and reservoirs, (5) urban runoff sites, and (6) inadequately defined sites. This screening method was recently used by the Principal Investigator on historical water-quality data for the San Joaquin River Basin (Kratzer and Shelton, 1998).

Task 2 – Describe available database

Subtask 2.1: Identify location of sampling sites.

All sites used in the final database will be plotted in a GIS coverage.

Subtask 2.2: Identify timing of sample collections.

The frequency of sample collection will be evaluated on a seasonal basis and a streamflow basis. This will help to identify if there is any such bias in the database (i.e., more samples during summer or at low flows, etc).

Task 3 – Evaluate concentrations

Subtask 3.1: Evaluate concentration trends over time.

Using ESTREND (Schertz and others, 1991) or a similar program, flow-adjusted concentration trends in TOC will be defined for as many sites as possible.

Subtask 3.2: Evaluate concentration versus streamflow relations.

A good relation between concentration and streamflow is essential to load calculations, plus can be very instructive about the processes affecting transport.

Task 4 – Calculate loads

Subtask 4.1: Calculate annual loads.

Using ESTIMATOR (Cohn and others, 1989) or a similar program, monthly loads will be calculated for as many sites as possible. These loads will be presented on an annual basis to highlight yearly variations.

Subtask 4.2: Calculate seasonal loads.

The loads will also be presented on a seasonal basis to evaluate seasonal variations.

Subtask 4.3: Evaluate loads for source areas.

Loads will also be evaluated for drainage basins and subbasins to help identify major source areas.

Task 5 – Report writing and printing

The final task will be to summarize the data analysis and interpretation in a final report.

REPORTS AND PUBLIC COMMUNICATION

A draft report summarizing and interpreting the data will be completed by July 2001. This draft will be provided to two members of the CALFED Drinking Water Committee for peer review and also to an outside USGS person. After peer review is completed, the draft will be revised and finalized as a WRIR by the end of September, 2001.

Interim presentations of preliminary findings will be made by USGS staff to participants in the CALFED Drinking Water Program before the draft report. These presentations will be timed to coincide with completion of analyses (for example, at the completion of Tasks 3 and 4) and information needs of the Program.

BUDGET

The total cost for the project is \$180,000. A detailed budget is shown in table 1.

PERSONNEL

The tasks of data retrievals, screening, trend and load calculations, and GIS coverages will be conducted by Hydrologists from the USGS California District office in Sacramento. Personnel costs include time for the Principal Investigator to analyze and interpret data and write a report.

WORKPLAN

The major tasks in this proposal are the evaluation of historical data for TOC in the upstream watersheds and calculating loads and trends. An evaluation of major source areas in the upstream watersheds will also be done based on the load calculations. A draft project completion report will be available by July 2001.

MAP

See attached.

References

- Cohn, T.A., DeLong, L.L., Gilroy, E.J., Hirsch, R.M., and Wells, D.K., 1989, Estimating constituent loads: *Water Resources Research*, v. 25, no. 5, pp. 937-942.
- Jassby, A., 1999, Organic carbon in the Delta: an ecological perspective: CALFED Bay-Delta Program Organic Carbon Drinking Water Quality Workshop, August 26 and 27, 1999, Sacramento, CA, Draft Proceedings, pp. 8-12.
- Kratzer, C.R., and Shelton, J.L., 1998, Water quality assessment of the San Joaquin-Tulare Basins, California: analysis of available data on nutrients and suspended sediment in surface water, 1972-1990: U.S. Geological Survey Professional Paper 1587, 92 p.
- Schertz, T.L., Alexander, R.B., and Ohe, D.J., 1991, The computer program ESTIMATE TREND (ESTREND), a system for the deduction of trends in water-quality data: U.S. Geological Survey Water-Resources Investigations Report 91-4040, 63 p.