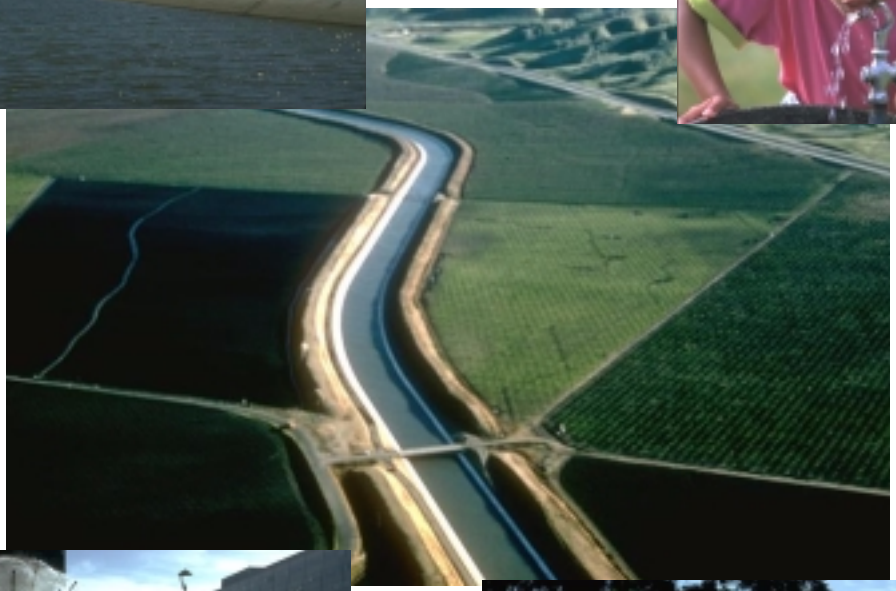
Delta Water Quality

Program Review



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Executive Summary

Purpose of Report

The purpose of this report is to examine and evaluate the Department's water quality programs operating in the Bay-Delta estuary. The report was developed in response to a directive from the Department's Chief Deputy Director subsequent to DWR management's recognition of increasing need for important water quality information in support of ongoing water project operations, implementation of the CALFED program and compliance with State Water Resource Control Board decisions. It was also developed to address concerns expressed by the State Water Contractors and the California Urban Water Association about water quality data and information needs. The four water quality programs reviewed in this report are in the Divisions of Planning and Local Assistance (including Central District's program), Operations and Maintenance, and in the Environmental Services Office (Executive Division).

Chapter I describes the questions specifically addressed, the review process that lead to the recommendations herein, and the organization of the report. Chapter II provides a brief description of each water quality program. Chapter III contains the discussions and recommendations summarized below.

Summary of Issues and Recommendations

In response to the guidance provided by DWR management in review of the water quality programs, five issues were assessed:

A. Value of Water Quality Programs to Customers

B. Water Quality Data Management

C. Development of Baseline Conditions

D. Coordination With Other Programs

E. Organization of Water Quality Programs

F. Other Issues

Each issue is briefly summarized below, followed by the Review Team's recommendations.

A. Value of Water Quality Programs to Customers

The question addressed here is, “Are DWR's water quality programs of value to the customers they serve?” Not surprisingly, managers of the water quality programs reviewed here responded that their programs are of significant value. This was the same view expressed by representatives of the State Water Contractors and CUWA when the review team met with them on April 5, 2000.

However, while DWR program managers and customers acknowledge that current information needs have been sufficient, they also acknowledge that improvements within each program could significantly improve the type of data collected and information reported. Chapter III A (pages 35 to 42) discusses those important components that comprise “value.” The components addressed are:

- Development of information—To what extent are data converted to information and what are the means and frequency of disseminating the information.
- Database management—Consistent and reliable means of storing and processing data, and making the data readily available in a timely manner.
- Program improvements—Addresses the question of whether the programs are providing the kind and quality of data and information needed by their customers.
- Program planning and development—Addresses how or whether the water quality programs set objectives and develop program plans for the coming year.

Recommendations

Recommendations for each of the components described above are presented in Chapter III A. and repeated here for purposes of this summary.

Development of Information

- ESO and MWQI should make it a priority to bring their annual summary reports up to date. ESO should consider preparing one report covering the period 1997-1999 rather than preparing three separate annual reports. MWQI is also behind by a couple of years on their annual report and should consider preparing one report covering several years.
- O&M and CD should begin preparing annual reports that describe at least, what was accomplished during the past year, what was spent, the status of conditions and trends in constituents being measured, and discuss any unusual or interesting observations or trends noticed through the monitoring and assessment.

- The State Water Contractors suggested preparing one annual water quality report, instead of separate reports for each program. Water quality program managers should consider this request by assessing the type of information contained in the report, how it would be reported, who the audience would be, logistics of cooperating on a joint report and other pertinent features. Meetings should then be arranged with the State Water Contractors and management to address the opportunities and constraints of developing an annual joint report. Expanding the water quality chapter of Bulletin 132 may be a possible forum for a single water quality report.

Database Management

- Continue development of local Bay Delta Tributary Data Base client databases to store water quality data for the MWQI, ESO, O&M and CD programs. Using the BDTDB system will ensure the Department's water quality data (at least for these programs) is readily accessible in one location.

- ESO should complete improvements to their data management and distribution system by the end of this year, as planned.

- Because all the water quality programs rely to one extent or another on real-time monitoring using continuous recorder systems, and because the State Water Contractors and other customers have requested access to processed real-time data, the programs should work together to either develop or share technologies that allow for post-processing techniques (such as conversion into graphs), that result in increased flexibility in data presentation.

Program Improvements

All the water quality programs (with the exception of O&M, see note below) identified the need for program improvements.

- Using the recent SWRCB Control Plan and Decision and/or CALFED's current goals and objectives for environmental and drinking water quality as a basis for program review, the programs should conduct a coordinated and comprehensive review of their monitoring, research, and assessment functions. Coordination should occur among DWR's water quality programs, CALFED, and other major water quality programs conducting work within the watershed (San Francisco Estuary Institute, USBR, USGS, Sacramento River Watershed Program and DWR's Northern District Office). We recommend this review start within the next 2 months, and be completed within 12 months. DWR management needs to appoint a chair for this coordinated effort. The chair is responsible for ensuring the process is completed in a timely manner and will result in water quality programs capable of meeting anticipated needs.

Note: O&M reports that its Delta program collects sufficient data and does not require improvements. However, O&M also reported that the O&M statewide monitoring program could be improved. Chapter III F, “Other Major Issues,” includes a comment from Jerry Boles (DWR's Northern District) describing the issue. Addressing the issues raised in this comment would entail a separate review.

Program Planning and Development

- Program managers of DWR water quality programs should consider developing an annual workplan describing at least, the program to be conducted the following year (variables to be monitored, where and why-what questions/ issues will be addressed), resources allocated to the program and cost.

- A section of the annual plan, titled “Five Year Plan” should describe program objectives, work projections, resource needs, and issues on a yearly basis projected over the next five years. These projections should be based on work and issues currently being addressed. The plan should include a general description of the work needed to be done, why it is important, resource needs, a description on obtaining those resources, and general schedule to meet the objectives outlined in the plan.

Note: O&M staff believes that their meetings with the State Water Contractors already provide sufficient planning and development coverage. ESO and MWQI staff do develop annual work plans.

- Each water quality program should consider establishing a review process of the workplan for the customers they serve. This process would review current and projected goals, alternatives, action steps, and schedule as described in the workplan.

Note: O&M staff believe their meetings with the State Water Contractors already provide a sufficient review process. The MWQI Program has a formal committee of water contractors and agency representatives that reviews its annual work plan.

B. Water Quality Data Management

Over the past 15 years the Department has struggled with the modernization of its water quality data management system (formerly known as WDIS). Subsequently, program managers have made separate arrangements to manage their water quality data. Water quality data are stored in a variety of formats and on unique data management systems. Over the past 18 months, the Department has developed two new approaches to managing data. They are the Water Data Library (WDL) and the Bay Delta Tributaries Data Base (BDTDB). These databases focus on long-term data storage and dissemination.

A data management team working with the water quality review team assessed the qualities of these databases (and another called Field and Laboratory Information Management System or FLIMS) to store and disseminate data. Results of their assessment are found in Chapter III B (pages 43 to 46). Recommendations resulting from the assessment are as follows:

Recommendations

- Develop local BDTDB client databases to store FLIMS water quality data for the MWQI program, ESO, O&M, and a pilot project in DPLA Northern District. Import historical data into the new database format.

- Continue developing and using the WDL database for groundwater and climatology data.

- DPLA will create its own Internet access for water quality analysis results using BDTDB.

- Cooperatively develop the surface water data set.

C. Baseline Conditions

The four water quality programs considered in this review can be divided into two general categories: (1) drinking water quality (MWQI and O&M water quality programs) and (2) environmental water quality (CD and ESO water quality programs). The consensus among the review team is that three of the water quality programs considered in this review (MWQI, CD, and ESO) also provide information important to establishing baseline conditions for the CALFED Program. However, a specific baseline program addressing CALFED's water quality needs is lacking. A description of the baseline information provided by each program and recommendations for how the water quality programs could better address baseline conditions in the Delta are described in Chapter III C (pages 47 to 49). The recommendations in that section are included below.

Recommendations

- Increase coordination in the areas of data management and analyses, sharing of resources, and program planning among the three programs (MWQI, CD, and ESO) to improve the overall ability of the Department to provide cost-effective assessments of water quality conditions.

- Increase the use of automated continuous recorders and telemetry systems in areas where additional data are needed.

- Develop a coordinated baseline water quality monitoring program, specific to the needs of CALFED that address environmental and drinking water quality

issues. It is recommended that CALFED fund the development of a water quality baseline study plan.

- Develop a contaminants monitoring program. The routine monitoring of environmental contaminants in the Delta is not a part of any existing DWR program. The information may be needed for CALFED Stage I actions. CALFED should fund the development of a study plan for contaminants monitoring. The plan should consider the best agency or entity to implement a program in the Delta.

D. Coordination With Other Programs

Although coordination does occur between individual water quality programs and outside programs or agencies, coordination among the four programs reviewed here has generally been lacking. Despite this, the review indicates that there is not a large amount of duplication among the programs, with the exception of some field sample collection efforts. Possibly due to the lack of major overlapping activities, the programs have previously not found a need to develop a structured form of internal coordination.

Interestingly, there has been a much greater amount of coordination among DWR's programs and outside agencies where objectives, responsibilities, and activities are similar and may overlap.

An assessment of this subject is found in Chapter III D (pages 51 to 54). Recommendations from the section are provided below.

Recommendations

- Establish a formal internal coordination process between the four water quality programs, which may include annual meetings to discuss program objectives and results.

Note: A detailed description of this formal coordination process is found on page 53.

E. Organization of Water Quality Programs

The four water quality programs reviewed in this report belong to three different organizational structures within the Department and report to three different Deputy Directors. The State Water Contractors and some Department Deputy Directors and Division Chiefs have questioned whether this organizational structure provides efficiency in terms of accountability, communication, and elevation of water quality concerns within the Department.

In Chapter III E (pages 55 to 60), the issue of reorganization is addressed in terms of improving efficiencies of operation. The Review Team presents two alternative recom-

mendations in this section. The first, a non-structural alternative ("Significantly Increase Coordination Through a Formal Committee") was the preferred recommendation of the Team based on the original direction provided by DWR management. Subsequent to the development of this recommendation, the Review Team received Director Hannigan's memorandum dated August 18, 2000, addressing reorganization needs for he Division of Planning and Local Assistance and the Office of State Water Project Planning to implement the CALFED program. Additional consultation with DWR management resulted in a structured organizational alternative ("Physical Reorganization of the Department's Water Quality Programs"), resulting in an Office of Water Quality.The basis for both of these recommendations is a detailed assessment of the elements listed below. The elements were assessed in relation to alternative organizational structures. This assessment is found in Appendix E.

- Consistency of management oversight
- Accountability
- Management attention to water quality concerns
- Coordination
- Staff resources
- Efficiency

In addition, five "business case" components were also assessed in relation organizational structures:

- Greater importance to WQ programs by DWR management
- Maximum efficiency and cost-effectiveness of WQ programs
- Development of reliable and relevant baseline conditions
- Availability of one-stop shopping for data
- Better coordination with other water quality programs within and outside of, DWR

Recommendation

The Review Team declined to recommend an alternative organizational option. Initially, the Team recommended the non-structural alternative as the best alternative to address the issues facing the Department's water quality programs. However, the Team quickly recognized the non-structural alternative may not meet the Department's impending needs as outlined in Director Hannigan's memorandum addressing organizational needs

to efficently implement elements of the CALFED Program. For that reason the Team developed the structural alternative.

The Team declined to recommend an alternative primarily because the Team does not have sufficient knowledge about the Department's reorganizational needs. The Team does feel that either alternative would significantly address the water quality program issues identified in this report, but also recognizes that neither offers a full range of solutions to the identified problems. If so desired, the Review Team offers its services to DWR management to further refine management's preferred alternative.

F. Other Major Issues

Five additional significant issues were identified through this review:

1. Drinking water quality vs. operations.
2. Standardize QA/QC procedures used in all the programs.
3. Eliminate redundancy between DWR programs and between State and federal agencies.
4. Review the continuous monitoring networks operated by various water quality sections in the Department and develop standard operating procedures.
5. Issues associated with DWR's Districts' water quality activities.

Discussions on each of these topics occur in Chapter III F (pages 61 to 63). No specific recommendation is provided for issue number 1, management attention to water quality, other than to urge DWR management and the State Water Contractors to decide on the priority of water quality versus quantity in operating the SWP. However, the team felt it important that this topic be included.

At this time, (because the issue is outside the geographic scope of this review and because it was brought to the table very late), no recommendation is provided regarding the issues associated with the various Districts' water quality activities. This subject can be reviewed at a later date. Recommendations from Chapter III F follow:

Recommendation

- Management should establish clear guidelines and criteria for altering operations for drinking water quality, and the State Water Contractors need to agree to the criteria and be willing to make the trade of quantity for quality.
- Standardize QA/QC procedures in all of the water quality units in the Department for sampling and testing. Reestablish QA/QC training and reaffirm the

responsibilities of DPLA's Quality Assurance Unit to monitor the implementation and continued use of accepted procedures.

- Implement and coordinate a review of sites and programs among the State and federal agencies sampling in the Delta with the objective of eliminating redundancies in data collection.

- Conduct a review of the continuous monitoring stations operated by O&M, DPLA, CD and ESO for assessment of standard operating procedures, instrumentation, power, data storage and quality control measures. Phase II of this review should include other agencies such as USBR and USGS to examine opportunities for site consolidation to reduce redundancies.

Chapter 1. Introduction

In response to recent comments from the State Water Contractors (SWC), the California Urban Water Association (CUWA), CALFED's growing water quality monitoring and data analyses needs, and the Department of Water Resources' needs to ensure the Department's water quality programs are efficient and effectively managed, Department management upgraded an existing ad hoc evaluation of three key DWR water quality programs to a more formal effort.

In a memorandum dated February 14, 2000, addressed to Randall Brown, Stephen Kashiwada, and William Bennett, Chief Deputy Director Steve Macaulay directed the formation of a work group to address general questions related to DWR's water quality programs. The work group members were Phil Wendt, Dan Otis, Zach Hymanson, Dan Peterson, Larry Joyce, Bob Nozuka and Leo Winternitz. Leo Winternitz represented the Executive Division and chaired the group.

Questions to be Addressed by the Water Quality Program Review Team

Chief Deputy Director Macaulay's memorandum requested the work group address the following questions and report back to DWR management.

- Are DWR's water quality programs providing the kind and quality of water quality data needed by DWR, CALFED, State Water Resources Control Board (SWRCB), CUWA, SWC, and others from environmental and drinking water perspectives?

- Are the data (and metadata) stored in a way that they are readily accessible and useable by interested individuals and organizations?

- Are the data being converted into information and made available in a timely manner?

- Do CALFED and others have a good description of baseline conditions to judge the success of CALFED Stage I measures?

- Are the programs fully coordinated with other efforts collecting similar or complementary data?

- Does DWR's internal organization of its water quality programs maximize the ability to meet various data needs in an efficient manner?

Review Process

To address these particular questions and other general issues, the water quality work group first met with DWR management (Randall Brown) to review the direction provided in the memorandum. The group then developed a work plan and schedule and began working on specific tasks.

1. Each water quality manager and their staff gave a presentation of their program including program objectives, customers served, constituents monitored, geographic scope, and data management. Discussions were held after each presentation.

2. Another meeting focused specifically on databases and data management with database program managers providing information and associated recommendations. A report was subsequently developed from this and other meetings. A section on data management is found in Chapter III B and the data management report is included in this report as Appendix A.

3. The water quality work group met with the CUWA and State Water Contractors and their representatives to discuss issues and concerns they have with the Department's water quality programs. Their concerns are reflected in each section of Chapter III.

4. A questionnaire addressing the issues was sent to each water quality manager. Each manager and staff completed the questionnaire. The responses were used as a basis for many sections of this report. The questionnaire and responses are included in this report as Appendices B and C, respectively.

5. An outline of the report was developed and each program manager was assigned a portion to complete.

6. A draft report was completed and sent to DWR management for review.

7. Meetings were arranged with DWR management to discuss the report, recommendations, and courses of action.

8. The draft report was revised accordingly, and a final report prepared.

9. Meetings were held with DWR management to discuss the report. Copies of the report were sent to stakeholders; meetings to discuss the report were scheduled with the stakeholders.

Organization of the Report

Executive Summary

The Executive Summary provides a summary of the major issues addressed in the report and recommendations.

Chapter I—Introduction

Chapter I describes the purpose of the report and issues addressed in the report. This chapter also describes the process used by the review team in addressing the issues and developing recommendations.

Chapter II—Program Overview

Chapter II provides a brief description of each water quality program reviewed including organizational structure, data collected and information developed, data management system, and how information is made available to customers.

Chapter III—Discussion

This chapter is the "heart" of this document. It addresses the issues identified in the memorandum that directed a review of the water quality programs. It discusses the activities being done well and not being done well by the individual programs and provides recommendations for improvements. Information in this chapter is derived from the review process, which included self-evaluations and meetings with stakeholders and staff. The issues addressed in each section of the chapter are listed below.

- **Value of program to customers**—Addresses how the programs are of value to customers in terms of information provided.

- **Data management**—Addresses how data are managed by the programs, consistency of management and timely availability of data.

- **Baseline conditions**—Addresses the kinds of variables being measured and whether they are sufficient for current and known future needs.

- **Coordination with other programs**—Addresses the extent to which coordination takes place internally (within DWR) and externally with other water quality programs.

- **Organization of water quality programs**—Describes the extent to which various improvements may be possible through a reorganization of the current programs. Provides a recommendation for addressing the issues. Much of the earlier and subsequent material developed in this section is found in Appendix E, including a discussion of alternative reorganization scenarios.

- **Other major issues**—Addresses other major issues identified during this review.

- **Appendices**—Provides the detailed information including analyses, reports, and responses to questionnaires that provide the backup material for the report's chapters.

Table 2 Duplication of sampling stations among four DWR water quality programs

	DWR Water Quality Monitoring Programs			
Area Description and Station Identification	*ESO*	*DPLA*	*CD*	*O&M*
Mallard Island				
D10	X			
MALLARDIS		X		
Sacramento River @ Emmaton				
D22	X			
EC1120			X	
San Joaquin River @ Twitchell Island				
D16	X			
TWITCHELLPP01		X		
EC5060			X	
Old River @ Bacon Island				
D28A	X			
BACONNO1, OLDRIVBACISL		X		
EC5250, OR@BACON ISLAND			X	
Clifton Court Forebay				
C9	X			
CLIFTON COURT				X
Sacramento River @ Hood				
70		X		
GREENES/HOOD	X	X		
San Joaquin River near Vernalis				
C10	X			
VERNALIS		X		

Section A. Environmental Services Office

The Compliance Monitoring Program for the San Francisco Estuary was formally initiated in 1978 to fulfill the water quality monitoring and reporting requirements mandated in Water Right Decision 1485 (D-1485). This Program was designed to document environmental water quality conditions potentially affected by operation of the SWP and CVP through the monitoring of numerous physical, chemical, and biological constituents at sampling stations located throughout the Sacramento-San Joaquin Delta westward to San Pablo Bay.

ESO Compliance Monitoring Program Objectives

1. Document compliance with Bay-Delta water quality objectives.
2. Maintain a long-term baseline record and provide a consistent, long term record of trends.
3. Develop and improve predictive tools to assess changes within the Bay and Delta including impacts from operation of the SWP and CVP.
4. Provide accurate and validated water quality information on a timely basis in a format appropriate for a variety of users.
5. Respond to the findings of ongoing monitoring, changing conditions within the Bay and Delta, and the needs of Management with special studies to provide needed information in a timely manner.

The program has evolved over time. Some of the more significant changes that have occurred include: 1) modifications to the number extent of benthic sampling stations; 2) a reduction in the number of discrete water quality sampling stations and a concurrent increase in the number of multi-parameter stations; 3) upgrade of the vessel-based continuous monitoring equipment to allow both vertical and horizontal water quality profiles; and 4) integrated, contemporaneous sampling for water quality, phytoplankton, and zooplankton from a single vessel.

Internal Structure of Program

The Compliance Monitoring Program occurs within the DWR Environmental Services Office (ESO), Monitoring and Analysis Branch. The ESO is part of the Executive Division reporting through an office chief to the chief deputy director. The Monitoring and Analysis Branch consists of three sections reporting to an Environmental Program Manager I. Staff within two sections is responsible for completion of the Compliance Monitoring Program. The program budget supports nine permanent full-time staff, nine permanent intermittent and hourly employees, and a portion of the program manager position. The

USBR also provides field staff for the program. The DFG and USGS[1] each provide 25% of a person-year as support to field efforts.

The Compliance Monitoring Program is an element within the Interagency Ecological Program (IEP). Staff within the program develop and annual work plan as part of the IEP annual planning process. The IEP Water Quality Project Work Team reviews the annual work plan, and upon approval, the work plan is forwarded to the IEP Management Team. The IEP Management Team and Coordinators provide program oversight, while the Water Quality Project Work Team serves as a technical advisory committee. Program implementation is the responsibility of the Branch Chief and two Section Chiefs.

The Department's annual budget for this program-excluding the zooplankton-monitoring element-is approximately $1,750,000. Approximately $206,000 (12%) of the funds for this program are provided to the Department by the USBR. The zooplankton-monitoring element is managed by the DFG and has an annual cost of approximately $174,000 (94% from the Department and 6% from USBR). The internal USBR contribution to the program is approximately $150,000. The annual budget is subject to the normal Departmental budget approval process and the IEP review process.

Relevancy of Program to Current Needs

The Compliance Monitoring Program is designed to document the status and trends of physical, chemical, and biological conditions in the Delta, Suisun Bay, and San Pablo Bay. The program was initiated to fulfill the water quality monitoring and reporting requirements mandated in the SWRCB Water Right Decision 1485 (D-1485). This program is also a requirement of the succeeding Water Right Decision, D-1641. In addition, this monitoring program provides environmental information needed by CALFED. The program provides baseline environmental information useful in tracking the condition of the upper estuary, and the program provides information from special studies useful to the adaptive management process. Entities interested in the data and information developed through the Compliance Monitoring Program include: SWRCB, DWR, USBR, USGS, DFG, NMFS, EPA, USFWS, CALFED, State and federal water contractors, environmental stakeholders, and academic institutions.

Data Management System

The Compliance Monitoring Program generates an extensive volume of data from both discrete and continuous, multiparameter sampling (Table 1). The program is a client of the Bay-Delta Tributaries Data Management Program. Data from the discrete sampling program is edited, verified, and ultimately stored in relational databases. The major interrelated data files include (1) water quality measurements; (2) benthos abundance and diversity (organism identification and enumeration); (3) phytoplankton composition

1. The DFG staff commitment is funded by the Department, and the USGS staff commitment is funded by USBR.

(organism identification and enumeration); and, (4) chlorophyll a concentration (an estimate of phytoplankton biomass). Select data from five of the continuous monitoring sites is telemetered to the California Data Exchange Center in Sacramento and is available on a near real-time basis. All discrete and continuous data are ultimately entered into the comprehensive IEP database through the central IEP file server. This file server provides common access to all users. Specific information concerning program data is available in the metadata files at the IEP website (http://www.iep.ca.gov).

Information Dissemination

Information from the Compliance Monitoring Program is presented in a variety of ways including: annual reports submitted to the SWRCB, IEP technical reports, peer-reviewed journal articles, Departmental bulletins such as Bulletin 132, the IEP Newsletter, and posters and talks presented at a variety of professional and DWR-sponsored conferences. Recent reports have covered topics such as dissolved oxygen conditions in the lower San Joaquin River, changes in the zooplankton community in the upper estuary, the influence of climate on the phytoplankton community, and changes in the benthos of the upper estuary.

Data from the compliance monitoring program are available on request. Data from the multiparameter stations is available through CDEC or through direct request from program staff. These data are regularly used by staff in the Division of Operations and Maintenance to prepare some real-time reporting documents including the Daily Operations Report. In addition, multiparameter data are also used to calibrate and verify models for the estuary. Data from the discrete sampling stations and vertical and horizontal profiles are also available on request. Staff is currently working to provide these data through the Bay-Delta Tributaries Database System.

Section B. Division of Planning and Local Assistance

Internal Structure of Program

The Municipal Water Quality Investigations (MWQI) Program is managed in the Water Quality Assessment Branch of the Division of Local Assistance located in downtown Sacramento. The program budget is approximately $1.9 million, which comes mainly from State Water Project funds. Within the Water Quality Assessment Branch, a multidisciplinary staff is dedicated to the program. Approximately 9 staff members with expertise in water quality, toxicology, geology, agriculture, and technical support are drawn upon to conduct program studies. Of those 9 people, three field staff members conduct extensive year round water quality monitoring associated with the program. These staff members work out of the Bryte facility in West Sacramento. They have two mobile labs at their disposal, as well as equipment storage and sample processing capabilities.

The MWQI Committee, consisting of the 29 urban water contractors of the SWC, DWR O&M, EPA, and DHS, provides guidance to the MWQI Program. The MWQI Program develops an annual work plan that details each work element of the program, element goals and deliverables, personnel costs, and lab and material costs. The work elements are developed in conjunction with the MWQI Committee. A work plan subcommittee develops the initial plan and then review and approval is sought for the plan from the larger MWQI Committee. A technical advisory committee or TAC may oversee individual study elements of the program.

Relevancy of Program to Current Needs

The mission of the MWQI Program is to determine and evaluate the sources of constituents that affect the drinking water quality of the Sacramento-San Joaquin Delta and to provide information necessary for planning Delta water quality improvements.

MWQI Program Objectives

1. Alert water agencies about current and potential contaminants in Delta water supplies.
2. Assist water supply agencies in planning, protecting, and improving drinking water sources and water supply facilities.
3. Document water quality under a variety of hydrologic conditions for studying water transfer alternatives, water quality standards.
4. Develop and use predictive modeling capabilities.

Under the MWQI Program, water quality studies are undertaken to develop an understanding of the sources of drinking water pollutants that affect the quality and the ability to treat the water supplied to municipal water purveyors. MWQI Program staff provide technical water quality expertise to other units within the Department, to local municipal water agencies, and to the State and Regional Water Quality Control boards, and contribute water quality expertise while participating in regulatory and planning processes.

Data Management System

Significant attention is paid to QA/QC to assure the reliability of MWQI data to our stakeholders. The majority of study and monitoring data is generated by FLIMS (Field and Laboratory Information Management Systems). This system captures Bryte lab's analytical results, as well as contract lab data. QA information is also generated by this system, and passed on to the end users. The MWQI Program uses a relational Microsoft Access database that is compatible with FLIMS. Data are downloaded directly from FLIMS into this database, which is then used by the project managers to store their project data, as well as provide a QA review of the project results.

Information Dissemination

Limited water quality data have been posted on the MWQI website for three years. Flat files are currently available for download from the website. Files have not been updated since last year pending a review of this access system. The MWQI Program can also provide specific downloads for interested parties. Staff is currently working with ESO to provide the data through the Bay Delta Tributaries Data Base. MWQI has already provided ESO with the most recent two years of MWQI data, and will be providing the rest as soon as staff can assess the success of loading this data set.

The MWQI Program responds to data requests on the average of five per month. Staff can create queries to match requests and then provide the requested data in EXCEL spreadsheets. Stakeholders often request monitoring data sets for their own analyses. The program also receives requests for the data from consultants, non-profit groups, and federal and State agencies. The Department's modeling group routinely uses MWQI data extensively in model development and use.

There are two basic types of data collected: monitoring data and data collected as part of special studies. The MWQI Program is currently working on using this continuous data record to develop “baseline” conditions for use in the CALFED process. This data is also used in collaboration with the OSWPP Modeling group to develop and enhance the Department's water quality models.

The program does not currently have the capability for producing real-time monitoring data conversion into graphs. Hard copy reports are created and distributed once a study is done. The program is also responsible for an annual report of monitoring data and a status of projects.

Data from special studies are turned into information reflecting the original intent of conducting the study. The analytical reports are published throughout the year as part of the normal MWQI program. Recently produced reports cover such areas as SMARTS (flooded peat soil experiments), Agricultural Drainage Reduction, CMARP, CALFED requested study proposals, Pathogens, Barker Slough Watershed Study, Interim South Delta Program studies, the Drinking Water Treatment Cost Model, the Watershed Compendium, and other reports.

MWQI staff makes every attempt to make the data available in the timeliest manner. Data have usually been available within 30 to 60 days of collection. Data requests from the Contractors and other users are usually fulfilled within 24 hours, depending on the nature of the request.

Table 3 MWQI program costs for fiscal year 2000–2001 [a]

Item	*Cost ($)*
Staff Labor	1,284,337
External Consultant	300,000
External Lab	71,167
DWR Modeling	85,000
Travel	9,000
Technical Writing	35,000
Equipment	231,000
Operating Expenses	77,000
Supplies	45,000
Training	11,000

[a] [a] MWQI program total annual budget: $1,801,000.

Section C. Division of Operations and Maintenance

Internal Structure of Program

The SWP Water Quality Monitoring program is a coordinated program involving O&M Headquarters and the five Field Divisions. The Water and Plant Engineering Office has seven positions dedicated to water quality. One position is exclusively responsible for water treatment plant oversight and two positions are classified as Permanent Intermittent. That leaves four full-time positions in headquarters assigned exclusively to SWP water quality monitoring and analysis.

Except for Southern Field Division, the field divisions do not have organizations exclusively dedicated to water quality monitoring. Water operations staff is responsible for the water quality activities in Oroville Field Division, which requires about the equivalent of one position. Within the Delta Field Division Water Operations Section, the equivalent of two positions are needed do water quality monitoring. San Luis Field Division uses about the equivalent of one position in the Surveillance unit for water quality activities. Water quality monitoring in San Joaquin Field Division requires less than one full-time position from the Water Operations Section. Southern Field Division has five positions in the Water Quality Section, however, two are currently vacant.

Annual costs for the SWP water quality monitoring program are difficult to estimate because each field division and headquarters budget independently for their individual activities. Also, special events such as floods, contamination events or other special studies can effect the overall cost in any given year. The approximate costs are presented in the table below.

DWR Organizational Unit	*Cost*
O&M Headquarters	$500,000
Oroville Field Division	$100,000
Delta Field Division	$300,000
San Luis Field Division	$200,000
San Joaquin Field Division	$200,000
Southern Field Division	$500,000
Total	$1,800,000

The SWP water quality program is reviewed annually by the Department and the State Water Contractors management as part of the budget process. State water contractors have direct input to program activities at the Contractors board meetings where SWP

water quality information is presented each month. In addition, SWP staff frequently meets directly with water quality staff from the water contractors on specific issues.

Relevance of Program to Current Needs

The purpose of the monitoring is to provide any water quality information necessary for operational needs of both the SWP and water contractors.

O&M Monitoring Program Objectives

1. Assess the influence of hydrological conditions and water operations on SWP water quality.
2. Evaluate and document long-term changes in SWP water quality.
3. Provide water contractors with water quality data to assess water treatment plant operational needs.
4. Identify, monitor, and respond to water quality emergencies and determine impacts to the SWP.
5. Assess the relative quality of SWP water by comparing it to water contracts Article 19 Objectives or Department of Health Services Drinking Water Standards.
6. Address water quality issues of particular concern to water contractors and perform studies.
7. Collect, store, and maintain SWP water quality data.
8. Miscellaneous tasks, such as operate SWP water treatment plants, prepare Appendix E and other sections of Bulletin 132.

Water quality samples are collected at 29 stations throughout the SWP from the upper Feather River watershed in Plumas County to Lake Perris in Riverside County. A combination of grab samples and automated water quality stations are used to measure water quality.

Water quality data have been collected on the project since operations began in 1968. However, the year that data collection began varies by constituent. Initially, salts were the greatest concern and most of the early data were the standard minerals. Over the years, other issues became important like selenium because of the Kesterson problem and asbestos from floodwater inflows at Arroyo Pasajero during the 1980s. Around 1990, nutrients and organic carbon became the hot issues and were added to the analyses. The duration of sampling varies by parameter and station. As new facilities were added and parameters of concern changed, the locations and parameters monitored have changed. Current water quality issues are pathogens, MTBE, TOC, and salinity.

Grab samples are collected by the Oroville, Delta, San Luis, San Joaquin, and Southern Field Divisions on routine or as needed schedule. Samples are shipped to the Department's Bryte Chemical Laboratory for analysis. Automated water quality monitoring stations measure conventional parameters such as conductivity, temperature, or turbidity at locations throughout the SWP.

Data Management System

All SWP water quality data are presently archived on a personal computer in a Foxpro database maintained by the Water Quality Section in the Water and Plant Engineering Office. The database contains over thirty years of measurements for some parameters and locations while data is more limited for other parameters which have just recently become important from a drinking water perspective. The Foxpro Files are in a DBF format and can readily be manipulated and converted to spreadsheets for graphing and presentation. Recent data (beginning in 1999) from the Bryte Laboratory FLIMS database may also being transferred to the Water Data Library which is under development. Work has begun to convert the SWP water quality database system to Access 2000. Both discreet grab sample data and real time hourly monitoring data (uploaded daily) are accessible through the O&M Water Quality website at http://wwwomwq.water.ca.gov.

Information Dissemination

SWP water quality data are presented in many O&M reports including Bulletin 132, Bulletin132 Appendix E, SWP Operations Data (monthly report), Water Quality Assessment of the SWP (biennial report), and other reports documenting special studies. A monthly water quality report is presented at the State Water Contractors Board of Directors meeting. Data are also reported on the O&M water quality website at http://wwwomwq.water.ca.gov.

Section D. Central District

Internal Structure of Program

Central District is part of the Division of Planning and Local Assistance. The Water Quality Evaluation Section is under the Resource Assessment Branch of Central District and is staffed by a senior engineer, an associate engineer, an engineer and a student assistant. Currently, the section implements several programs in the Delta as well as a water quality network in the Truckee River and active involvement in four local watershed groups.

The Water Quality section funding is predominantly through the general fund (approximately $200,000 annually). However, the section is gaining programs that are project funded through the Office of State Water Project Planning (OSWPP) and Operations and Maintenance (O&M). During execution of these programs, the section provides water quality data periodically to the programs funding the monitoring. Some programs require an end of year summary analyzing the monitoring results and the need for improvements.

The Surface and Ground Water Data Section in Central District also implements two water quality monitoring program in the Delta. The same senior engineer that supervises the Water Quality Section also supervises this section. The Surface and Ground Water Section has an engineer, one WR Technician II, and four WR Technicians I assigned to conduct water related work. Due to a high workload in the Water Quality Section, the Surface Water Section was tasked to implement these water quality programs. These programs are project funded by the OSWPP and O&M which provides approximately $40,000 and $50,000, respectively.

Relevancy of the Program to Current Needs

Two Central District sections implement five water quality programs in the Delta. The Water Quality Section is currently implementing three projects while the Surface and Ground Water Section implements two projects.

Water Quality Section

The Department implemented the South Delta Temporary Barriers Project in 1991 to address the South Delta Water Agency's concerns about SWP impacts on water quality, water levels, and circulation patterns in the south Delta. An oversight committee comprising of both State and federal agencies, chaired by ESO, gathers data and annually evaluates the impacts the barriers have on water and environmental conditions in the South Delta. The Water Quality Section has recently installed four continuous monitoring water quality stations that measure and record water temperature, pH, specific conductance (salinity), dissolved oxygen (DO), and turbidity readings hourly and stores the data in

memory. These stations will be operated year-round to generate time series data reflecting both with and without temporary barrier conditions in the South Delta. The data gathered are being used by the Department and Department of Fish and Game to evaluate how the temporary barriers, freshwater inflows, tidal fluctuations and SWP pumping impact water conditions in the Delta on an hourly basis. The evaluation will assist the Department and the USBR in modifying operation of the SWP and the CVP to maximize pumping and water conditions in the Delta. These time series data will also be used by Delta modelers to calibrate their models so future model runs will be able to characterize these water quality parameters.

Through DFG, the Water Quality Section will be installing two multiparameter water quality stations in the Port of Stockton to measure and record DO fluctuations. The South Delta Temporary Barriers Program (from OSWPP) is providing the funding to implement this program. DFG is concerned about DO levels at the Stockton Port which may be attributed to the temporary barriers as well as non point sources. These stations will be operated year-round to monitor changes to DO levels based on various hydrodynamic conditions.

The third water quality program supports the Delta Compliance Section in O&M. The Water Quality Section has installed a multiparameter water quality instrument in Old River on Bacon Island specifically to monitor chlorides. The chloride data assists the Delta Compliance Section in monitoring chloride levels at the inflow into Rock Slough that supplies water to the Contra Costa Canal.

Surface and Ground Water Section

The section conducts weekly DO monitoring at ten sites in the South Delta during the period the temporary barriers are in place. Dissolved oxygen, water temperature, specific conductance (salinity), and turbidity are measured each Tuesday morning. Every other Tuesday, water samples are also collected at each site for lab analysis. The samples are analyzed for chlorophyll, orthophosphate, nitrate, nitrite, ammonia, organic nitrogen, and pheophytina. Both the Department and DFG analyze these data to evaluate impacts the barriers have on water conditions in the South Delta that may affect fisheries and aquatic habitat.

The section also operates and maintains 18 specific electrical conductivity stations in the Delta for Delta Compliance. Salinity data are measured and recorded every 15 minutes. The data are used by the Delta Compliance Section to confirm the Department's conformance with established Delta water quality standards. Murray, Burns, and Kienlen Engineers is also provided specific conductance data for six stations on a monthly basis. The data are also used by the Delta Modeling Section to calibrate their Delta computer models.

Data Management System

The Water Quality Section currently uses three databases to store data.

1. Time-series data from the multiparameter water quality stations are processed and stored in a flat file. A QA/QC procedure has been implemented for the time-series data. A Microsoft Access data base is currently under development in the Water Quality section that will house the data. The Microsoft Access file will be compatible with either the Water Data Library or IEP database.

2. The time-series data from the specific conductance stations are processed and QA/QC'd by a dedicated hydrology database software (Western Hydro) and stored on Iomega ZIP cartridges.

3. The weekly DO data are processed and stored in a flat file (Microsoft Excel).

Information Dissemination

The time-series data (specific electrical conductance and chloride stations) are provided on a monthly basis to IEP for inclusion into their website. The weekly DO data collected (with the biweekly lab analysis results) are provided annually to the Temporary Barriers Program's oversight committee in tabular form (Microsoft Excel) with an accompanying written analysis of the data. This information is included in an annual report compiled by ESO discussing the impacts of the South Delta temporary barriers. A data dissemination procedure for the recently established multiparameter water quality instruments has yet to be incorporated.

Chapter III. Discussion

Section A. Value of Water Quality Programs to Customers

For purposes of this report, value is defined as the intrinsic worth, or utility of the programs to its customers. To help better define this worth or utility, several important components are addressed in relationship to each program. The narrative describes where programs may be strong or deficient within a component and any corrective actions being taken to address deficiencies. Managers were also asked a basic question about value for each program:

Are DWR's water quality programs of value to the customers they serve?

The managers of the water quality programs reviewed reported that each of their programs are of substantial value to the customers they serve. This was the same view expressed by representatives of the State Water Contractors in a meeting with the water quality review team met with them on April 5, 2000. However, while DWR program managers and SWC and CUWA representatives acknowledge that current basic information needs have been met, they also acknowledge that improvements should take place within each program and among DWR's water quality programs to significantly improve the type of data collected and information reported. DWR program managers also realize that the information-hungry CALFED program is posing new water quality related questions that the programs are ill-suited to address with current work plans and resources.

Examples of the type of “value” provided by the water quality programs are described below.

Municipal Water Quality Investigations

Customers of the MWQI program are principally SWP contractors.The MWQI program provides several elements that are of considerable value. One is the State Water Project Sanitary Survey. The Sanitary Survey is a Department of Public Health regulatory requirement of all Municipal and Industrial SWP contractors. Every 5 years the MWQI program conducts the research and analysis required to develop the Survey report, and prepares the report. The next report is due January 3, 2001. Completing the survey satisfies the requirement for all contractors using surface water provided by the SWP. This relieves each individual agency of the cost and time required to develop the survey themselves.

For the past four years, the MWQI program has also been aiding the North Bay Aqueduct users by investigating the sources of water quality problems in the Barker Slough watershed. These investigations have led to the Solano County Water Agency receiving a watershed grant for source water improvement.

The MWQI program also provides access to monitoring data through customer queries. This provides data sets for stakeholders to conduct their own analyses, such as potential impacts from proposed projects like Delta Wetlands.

Environmental Services Office

The water quality program of ESO started in the 1970's to fulfill the water quality monitoring and reporting requirements mandated in Water Right Decision 1485. As such, the program documents compliance with Bay-Delta water quality objectives, and maintains a long-term baseline record, and provides a consistent, long-term record of trends. Customers of the ESO program include SWP contractors, and the public at large including state and federal agencies, universities, and scientific organizations.

Information from this program is developed annually, and reported in an annual report, Interagency Ecological Program newsletter articles, and in technical forums. Relevant information using data collected from the program and developed by program staff includes a report on warming temperature trends, a change in phytoplankton and zooplankton composition, documentation of the introduction and spread of introduced species, notably *P. amurensis* and most recently, the mitten crab, and data and information regarding depleted dissolved oxygen conditions in the San Joaquin River. This last subject has resulted in specific actions by the Central Valley Regional Water Quality Control Board and subsequent grants to State, federal and municipal entities to resolve the problems.

The program has developed an extensive and historical database which is made available to interested parties. This database has been accessed by consultants, universities, scientific institutions, and other state and federal agencies, and has resulted in numerous articles and reports, including “state of the estuary” type information.

Division of Operations and Maintenance

Customers of the SWP water quality program are principally SWP contractors. The SWP program involves O&M headquarters and five Field Divisions. Water quality data are collected from SWP transmission facilities to identify and respond to water quality emergencies such as biological or chemical contamination, and to provide water contractors with water quality data to assess water treatment plant operational needs. The program also operates SWP water treatment plants, and collects, stores and maintains SWP water quality data.

SWP data are presented in O&M reports including Bulletin 132, SWP Operations Data (monthly report) and Water Quality Assessment of the SWP, a biennial report.

Central District

Principal customers of the Central District's water quality program are other organizations within the DWR. The Central District's water quality program provides technical support to Department programs, such as the South Delta Temporary Barriers Project, and the O&M Delta Compliance Section. The District's efforts involve gathering both time series and laboratory analyzed data of water quality conditions from a number of sites in the Delta. The data are used to evaluate water quality conditions that occur as a result of tidal exchanges, freshwater flows, agricultural diversions and CVP/SWP operations. These data enable the other programs to operate according to their regulatory and operational requirements. The program also collects data that is used by the Department's Delta Modeling Section to calibrate their Delta computer models.

Development of Information

Is information being made available in a timely manner?

A common desired improvement is the ability to get information, including annual and other reports, made available in a timely manner. For example, ESO's program is about four years behind in its annual summary reports to the State Board[1] and the MWQI program is also behind schedule with its annual report and work plan. MWQI reports that staff are needed to commit to analyzing current monitoring data as it is generated. While the Central District program's submittal of annual reports to ESO as part of its contractual obligations to the South Delta Improvement Project have been timely, the data collected for the SDIP for compliance monitoring activities are not available for public access. The O&M water quality program does not prepare annual reports; rather, their water quality data are presented monthly at State Water Contractor board meetings. O&M data are also summarized each year in Bulletin 132 and in the annual and monthly *Report of SWP Operations*. O&M reports that all data are available on their website and that the Contractors have dial-up capability to obtain current information from O&M automated stations.

The Contractors also expressed the concern that the water quality programs are spending much money on data collection, but not all of the data are being turned into information. The Contractors suggested the need for timely annual reports from all the programs, and additionally suggested that a single, annual, coordinated water quality report be prepared for all DWR water quality programs.

1. Though four years behind in completing annual summary reports to the SWRCB, current information is provided to the public through the *IEP Newsletter* and other media as necessary. Recent data collections are available on the IEP website and analyses of trends and other findings are presented at workshops, conferences, and technical meetings with other agencies.

Database Management

Are data stored in a manner that makes them accessible and usable?

One condition necessary for development of timely information is a reliable data management system. ESO data management and distribution system is being updated and improved, in part through development of the Bay Delta Tributaries Data Base (BDTDB). These improvements will substantially aid in timely processing, reduction, and analysis of data from which information can be derived. Limitations in staff expertise, resources, and obsolete equipment have hindered improvements to the system. Improvements to the data management system will be completed by January 2001.

The MWQI is also making improvements to its data management system by working with the BDTDB to host their data and information electronically, thus making them accessible to the public. They also report that they currently do not have the capability for converting real-time monitoring data into graphs; rather, hard copy reports are created and distributed once a study is completed.

Central District needs to adopt new data processing software that can provide enhanced QA/QC capabilities and increased flexibility in data presentation. As mentioned earlier, data collected for the SDIP and compliance monitoring are not available for public access at this time. Improvements to its system will be made as funding allows.

As a result of high staff turnover, and consequently a lack of trained staff, it has been difficult for O&M to collect, maintain, and report data in a timely manner. However, they believe their data management system is adequate for their data storage, reduction, and dissemination needs. Nonetheless, a water quality data management review team and this report's section on data management (Chapter III B) recommend that local BDTDB modules be developed for all the DWR water quality programs under review, including O&M's program. (O&M has recently acquired a full-time database manager which should help alleviate problems with data management.)

During their meeting, the Contractors stated that it is very difficult to find water quality data variables and information located in different databases. They requested that all water quality data, to the extent possible, be located in one place. Development and use of BDTDB modules for the water quality programs will allow this to happen.

Program Improvements

Are the water quality programs providing the kind and quality of Delta water quality data and information needed by their customers?

As with the answer to the question of value, water quality program managers also responded affirmatively. However, they also pointed out that significant improvements could and should be made to their programs to address the questions CALFED and other customers are now asking.

ESO's program manager is planning for a technical-based review of current program activities to ensure the program remains cost-effective and technically relevant over the long term. For example, the program could do a better job of monitoring total organic carbon and its components through the estuary by means of continuous recording stations. (Meetings between ESO, MWQI, and USGS are occurring to address this issue.) The program also lacks an effective baseline-monitoring element for contaminants and has suggested that better water temperature monitoring in the upper estuary could be helpful to project operations. The new SWRCB Water Quality Control Plan and CALFED's goals for environmental water quality could serve as the basis for this program review.

The MWQI reports that its current work plan is not adequate to address many of the questions CALFED is asking regarding drinking water quality; that attempts at using the data set for establishing a drinking water quality “baseline” have met with limited success because the monitoring program was not designed for that purpose. Increased sampling frequency and number of locations are needed for the data to be used to detect potential water quality impacts from CALFED actions in the Delta. To meet this need, the program has begun work on developing real-time total organic carbon monitoring capabilities and has submitted a proposal to CALFED to establish a series of real-time multiparameter stations at key locations as a first step towards meeting the modeling needs for more frequent data.

Central District's water quality program recognizes a need for improvements to increase efficiency in providing data. In addition to obtaining data processing software to provide increased QA/QC capabilities and increased flexibility in data presentation (mentioned earlier) the District would also like to deploy multiparameter, continuous recording instruments at ten locations to provide hourly data that are logged into memory. This will provide 168 readings per week per station as compared to the one reading per week now recorded. Additionally, the District would like to telemeter all of their 20 compliance monitoring stations. Their goal is to provide real-time data for all their stations. Funding and additional staff are needed to fully implement the program, that is, operate and maintain the stations and maintain the water quality data base. The District hopes to have the system in place by spring 2001, provided funding and staff are available.

The O&M program focus is the SWP and not the Delta. The O&M program has only three Delta stations and no changes in Delta water quality monitoring are anticipated.

Program Planning and Development

Another component of value to customers is an open planning process wherein program goals and objectives for the coming years are developed in partnership with the customers being served. Through this process, customers know in advance what work elements the program will be conducting, why, the costs involved, and when results will be available. Annual and longer-term plans are developed in a partnership between the customer and program manager. Not all programs engage in an open planning process.

ESO's program prepares an annual work plan as part of the IEP's planning process. A water quality project work team, comprised of colleagues from State and federal agencies as well as interested stakeholders, helps develop and reviews the work plan. An interagency management team and IEP Coordinators from each agency provide program oversight. The water quality work plan (as well as other work plans produced by various IEP teams) are also presented to and reviewed by a Science Advisory Team and Management Advisory Group that are comprised of agency managers and stakeholders.

The MWQI program develops an annual work plan that describes work elements, goals, deliverables, and costs. The work elements are developed in coordination with an MWQI committee comprised of 29 urban water contractors and State and federal agency representatives. A work plan subcommittee develops the initial plan which is then reviewed and subsequently approved by the larger MWQI committee.

Central District's program reports that they do not develop an annual work plan, nor do they have a mechanism established for clients to review work.

O&M's program reports that they do not develop an annual work plan, primarily because the program is well defined and does not change annually. However, O&M staff work with the Contractors on an as-needed basis to discuss and implement agreed upon changes.

Recommendations

Development of Information

- ESO and MWQI should make it a priority to bring their annual summary reports up to date. ESO should consider preparing one report that includes the period 1997-1999 rather than preparing four separate annual reports.

- ESO and MWQI should assess the value of their annual reports. Are they being read? Are they being used? How? Could an alternative to an annual report provide a more useful function?

- O&M and CD should consider preparing annual reports that describe (at least) what was done over the past year, what was spent, status of conditions and trends of variables being measured, and discussion of any unusual or interesting variables or trends noticed through the monitoring and assessment.

- In line with Contractors suggestions, consider preparing one comprehensive annual water quality report instead of separate reports. Schedule a meeting with the Contractors and management to address the opportunities and constraints of developing an annual joint report.

Database Management

- The Department needs to dedicate adequate resources to develop and support necessary database management systems, including FLIMS and BDTDB, in order to meet the data needs of the Department and its clients.

- Continue development of local BDTDB client databases to store water quality data for the MWQI, ESO, O&M and CD programs. Use of the BDTDB system will ensure that the Department's water quality data (at least for these programs) will be accessible in one location.

- The Department should establish standards for storage of distributed data (particularly water quality data), which will ensure that it is of uniform quality and easily shared using standard interchange formats.

- ESO should complete improvements to their data management and distribution system by the end of this calendar year, as planned.

- Because all the water quality programs rely to one extent or other on real-time monitoring using continuous recorder systems, and because the Contractors and other customers have requested access to processed real-time data, the programs should work together to either develop or share technologies that allow for post-processing techniques (such as conversion into graphs), that result in increased flexibility in data presentation.

Program Improvements

All the water quality programs (with the exception of O&M) identified the need for program improvements.

- Using the recent SWRCB Water Quality Control Plan and Water Rights Decision and CALFED's current goals and objectives for environmental and drinking water quality as a basis for program review, the programs should conduct a coordinated and comprehensive review of their monitoring, research, and assessment functions. Coordination should occur among DWR's water quality programs, CALFED, and other major water quality programs conducting work within the watershed (USGS and Sacramento River Watershed Program). Reviews of programs should be conducted even if, reorganization and consolidation of programs occur. This review should start one month after acceptance of recommendations in this report, and be completed 12 months hence.

Program Planning and Development

- Each DWR water quality program should develop an annual workplan describing (at least) the program to be conducted the following year (including what

variables will be monitored, where and why-what questions/issues will be addressed), resources allocated to the program and cost.

- Each water quality program should establish a review process of the workplan for the customers they serve.

Section B. Water Quality Data Management

Background

Data management is important to all aspects of the Department's water quality data collection and dissemination processes. Ultimately, the Department must make data readily accessible to its staff, other agencies' staff, and stakeholders.

Water quality data collected by DWR needs to be made available comprehensively and further combined with data collected by other agencies and stakeholder groups to meet the data needs of water diverters and exporters in the South Delta, of groups conducting planning studies, researchers who are further evaluating alternatives for the Delta and other research needs. In addition to project operators, agency staffs, stakeholder, University and private sector groups are better served by having access to a comprehensive or “one stop shopping” source for these data.

CALFED has now embarked, using the Department's Bay Delta and Tributaries database to create comprehensive source of Bay Delta and Tributaries data. CALFED needs access to the Department's water quality data.

The Department has struggled over the past 25 years with the modernization of its water quality data management system (formerly known as WDIS). As a result, program managers have had to make other arrangements to manage their water quality data. Currently water quality data are stored in a variety of formats and on unique data.

Modern database systems can include the features needed to manage, convey, and combine data in addition to providing features to help with the local management of data. These systems can include Internet accessibility, geographical information system (GIS) features, selectable output options, and local data management with the centralization of data from multiple sources. The Department should use these available technologies to facilitate the development of applications such as GIS or models to process and analyze water quality data and provide access to it. In addition, a Departmental data management system can provide common naming conventions for the monitored analytes, available through Bryte lab, that would make data from different programs more interchangeable.

Current Activities

Over the past 18 months the Department has developed two new approaches to managing data, the Water Data Library (WDL) and the Bay Delta Tributaries Data Base. These databases focus on long-term data storage and dissemination. A third data system in use in the Department is the Field and Laboratory Information Management System, or FLIMS, which focuses on the field and laboratory data collection efforts. For a more com-

plete discussion of the data management systems and a schedule of suggested activities, refer to Appendix A (pages 63 to 68).

Field and Laboratory Information Management Systems

FLIMS was developed by DPLA to modernize water quality data collection and management at Departmental field offices and Bryte Analytical Laboratory. It focuses on capturing data in the collection and laboratory analysis phases of a water quality sample. In contrast, WDL and BDTDB focus on the long-term storage and dissemination of the analytical results. It has been in production for just over two years. Implementation of FLIMS has considerably reduced paperwork, increased the efficiency of the laboratory, and reduced overall program costs. The State Water Contractors fund about 85% of the analyses performed by Bryte lab. The WQA program at DPLA Headquarters has funded most of the development and maintenance of FLIMS.

FLIMS is written in Microsoft Access and uses a distributed data management model. Analytical results have been disseminated in hard copy or electronic form. FLIMS data are archived each month, pending completion of larger database suitable for permanent data storage, such as WDL or BDTDB.

Water Data Library

WDL, being developed for DPLA, is a database comprised of four data types, including water quality, climatology, surface water flow, and groundwater levels. The database has been designed to store the Department's large historic record, as well as new data processed through the Bryte lab's database, FLIMS. Although the emphasis of WDL is on data generated primarily by DPLA, it is designed for use by all within the Department. WDL is also designed to provide the permanent data storage required by Bryte lab. The geographic scope of the data set is the entire State of California.

WDL uses the Department standard enterprise database, Oracle. Data in WDL are stored in a single, standardized repository, utilizing central data management, administration, and backup services of ISSO.

The chief advantage to the WDL approach is that database administration is simpler because changes to the user interface and database occur at only one place. This also ensures control over the uniformity of the data. The chief disadvantage of the WDL approach is that users do not have physical custody of their data. The uniformity and control afforded by data centralization also isolates users from their data, making end-user innovation more difficult and inviting an “us versus them” mentality.

Bay Delta and Tributaries Data Base

BDTDB is designed to meet the data access needs of many different groups. These include DWR, the Interagency Ecological Program, the Central Valley Project Improve-

ment Act Comprehensive Assessment Monitoring Program, the Sacramento River Watershed Program, and the CALFED Bay Delta Program. The geographic scope of the BDTDB includes the San Francisco Bay, Sacramento-San Joaquin Delta and the Sacramento and San Joaquin rivers watershed area. The data types encompassed by BDTDB include water quality, surface water flow, and a diverse number of environmental parameters, e.g., phytoplankton, fish, and vegetation data. BDTDB is designed to manage and provide access to these data from a wide range of data sources, both inside and outside the Department. The Department uses the BDTDB for a wide range of monitoring, planning, and SWP operations studies. ESO has five staff working on various aspects of the DBMS and web pages serving the data. BDTDB Project receives funding from the Interagency Ecological Program, Central Valley Project Improvement Act/Comprehensive Assessment Monitoring Program, Sacramento River Watershed Program, DWR, CALFED and shares resources with California Urban Water Association.

BDTDB uses a distributed client-server data-management model. A client database, developed in Microsoft Access, is configured and installed by ESO staff. Users in the local offices are responsible for managing and maintaining the data in their local database. When the local users are ready to publish their data, they export a copy to the BDTDB. BDTDB uses Informix for its database engine. Data are served to Internet users from the IEP website. The Microsoft Access databases are developed to help local data providers manage their data and to provide the infrastructure necessary for these providers to participate in the comprehensive data management system. Many data provides do not have sufficiently developed data management systems to convey their data to the BDTDB or meet their internal data management and reporting needs.

The chief advantage of the BDTDB approach is that local users have direct access and control of their data sets, and they may use them in any manner they choose. This is an important consideration for gaining user acceptance and use of the database. The chief disadvantage of the BDTDB approach is that updates to the generic client database must be coordinated and propagated to many individual offices.

Recommendations

- The Department should select a data management system that will house all of the water related data collected and disseminated by the Department.
- The system chosen should be configured with the goal of providing good quality data that can be accessed by authorized users efficiently.
- This system should be funded and staffed to adequately address all concerns and needs identified by the data providers and users.

DWR's water quality data management system should provide the following:

1. “One stop shopping” for all water related data within the Department.

2. Standardization of the procedures in formatting and receiving data from the database.

3. A platform for outside agencies to present their data for public use.

4. 4.Relief of the need for certain units within the Department to maintain a database.

A DWR Water Quality Data Management Work Group, which includes staff from ESO and DPLA who are working on the WDL and BDTDB, are currently working together to implement a prototype Regional Database Management System that will meet the Department's and Bay-Delta communities' need for water quality data. The RDBMS will allow data providers to manage their data locally, as well as provide monitoring data to a comprehensive database that can be viewed by other groups within the Department and other agencies and users. As mentioned previously, the BDTDB staff work cooperatively with various data providers to provide the necessary IT infrastructure so they can improve their local data management capabilities and provide their data to the BDTDB.

For a more complete discussion of the data management systems and a schedule of suggested activities, refer to Appendix A (pages 65 to 70).

Section C. Baseline Conditions

Overview

The four water quality programs considered in this review can be divided between two general categories: (1) drinking water quality (MWQI and O&M water quality programs), and (2) environmental water quality (CD and ESO water quality programs). Three of these programs provide data in compliance with contractual obligations Article 19 Objectives in SWP water contracts (O&M), State Water Resources Control Board water rights decisions (ESO), or terms and conditions of the South Delta Temporary Barriers Army Corps permit (CD). Although these categories are a convenient way to think about the programs, it is important to recognize that there is overlap among the programs. For example, There is spatial overlap in the Delta sampling stations among several of the programs (Table 2). In addition, there is overlapping interest in several of the constituent monitored (e.g., salinity, total organic carbon, turbidity, and temperature) and the effects these constituents have on environmental conditions in the Delta. The constituents monitored under these programs are identified in Table 1.

Three of the water quality programs considered in this review (MWQI, CD, and ESO) also provide information important to establishing baseline conditions for the CALFED Program. The MWQI Program has contributed significantly to the development of baseline conditions for CALFED, primarily in the area of drinking water quality constituents. The MWQI water quality data set represents the most extensive data available to CALFED for establishing baseline drinking water quality conditions in the Delta. Data from the MWQI program are also being used to develop a predictive model for total organic carbon concentrations in the Delta. When complete, this model could be a valuable tool in assessing incremental effects (when compared to baseline conditions) of CALFED actions in relation to changes in total organic carbon concentrations.

Increased sampling frequency of certain constituents is needed to document the impacts to drinking water quality arising from future CALFED actions. MWQI Program staff has submitted a proposal to CALFED to establish a series of multiparameter stations at key locations (boundary inputs) in the Delta to meet the modeling needs for more frequent data. Other sites that may need additional monitoring will emerge once the preferred alternative is selected. The MWQI Program would use its existing field resources to maintain these sites, if established, in conjunction with other DWR programs.

The CMARP document for drinking water, developed under the leadership of the MWQI Program, defined a number of key constituents of concern:

1. organic carbon (disinfection by-product precursor)
2. bromide (disinfection by-product precursor)
3. pathogens

4. salinity and total dissolved solids
5. turbidity
6. nutrients
7. chemical contaminants (except MTBE)

In addition, impacts from other CALFED programs or actions, specifically restoration efforts, pose an unknown potential threat to drinking water quality. The MWQI Program has been working to investigate possible impacts from the restoration of wetland habitat in the Delta. These investigations take the form of applied research projects and should be useful in identifying and evaluating actions developed through the adaptive management process. In addition, CALFED has funded USGS research on total and dissolved organic carbon and the flow of carbon through the Delta food web.

The Central District (CD) water quality program has the potential to provide environmental water quality data important to assessing baseline and changing conditions in the south Delta. Staff in this program has collected discrete and continuous water quality data as part of the South Delta Temporary Barriers program. The South Delta Improvement Program is included in the CALFED Stage I actions. Water quality data collected before, during, and after program changes can serve to document changes in environmental water quality in the south Delta. Constituents to monitor include water temperature, stage, specific conductance (salinity), dissolved oxygen, nutrient concentrations, turbidity, and flow. Additional funding and staff are needed to obtain a fully operational water quality monitoring program in the South Delta.

The ESO water quality program provides a good description of broad baseline conditions of environmental water quality, phytoplankton, zooplankton, and benthos in the Delta, Suisun Bay, and San Pablo Bay (upper estuary). This program is specifically designed to document the status and trends of numerous constituents over a broad area of the upper estuary. Information developed in the ESO water quality program includes the status and trends in key water quality constituents such as temperature, specific conductance, turbidity, dissolved oxygen, and nutrient concentrations. Data from this program also document the status and trends in species composition and abundance of phytoplankton, zooplankton, and benthic organisms. Documenting the introduction and establishment of exotic organisms is an important element of the zooplankton and benthic monitoring. Concurrent collection of the physical, chemical, and biological data permits a comprehensive understanding of environmental conditions in the upper estuary. This program is well positioned to monitor system level conditions that may be affected by CALFED Stage I actions.

Recommendations

Listed below are consensus recommendations for how the existing DWR water quality programs could better address baseline conditions in the Delta.

Greater Coordination

Increased coordination among all four DWR programs could improve the overall ability of the Department to provide cost-effective assessments of water quality conditions in the Delta. Such coordination could allow for more efficient use of field staff and boats. Also, concurrent collection of data for both drinking water quality and environmental water quality could permit a more informative understanding of water quality conditions in the Delta. Coordination of data management and analysis activities should also be considered.

Increased Use of Continuous Recorders

Recent innovations in automated continuous monitoring equipment provide cost-effective opportunities for high frequency data of numerous constituents. Telemetry systems allow for remote access to the data further minimizing the cost of data collection and transfer. The O&M program would require field staff committed to the operation and maintenance of continuous monitoring equipment in order to implement this recommendation.

Development of a Coordinated Baseline Monitoring Program

DWR should recommend that CALFED fund the development of a study plan for a coordinated baseline water quality monitoring program. Elements of such a program exist in the technical appendices developed under the CMARP efforts, and more recently, the baseline aquatic monitoring program developed by Randy Brown. This program should be developed specifically to meet CALFED needs (that is, not simply rely on existing programs which were not designed to meet those needs) and address both environmental and drinking water quality issues.

Development of a Contaminants Monitoring Program

The routine monitoring of environmental contaminants (for example, pesticides, trace metals, or selenium) in the Delta is not a part of any existing DWR water quality monitoring program. Contaminants monitoring is needed to document the status and trends of contaminant concentrations in the Delta in relation to changes in land use, treatment plant operations, and implementation of CALFED Stage I actions. CALFED should fund the development of a study plan for contaminants monitoring. Such a program should be coordinated with existing efforts of the San Francisco Estuary Institute, the Sacramento River Watershed Association, and the USGS NAQWA program. The plan should consider the best agency or entity to implement and/or fund such a program in the Delta.

Section D. Coordination Among DWR Programs and Other Programs

Statement

Coordination among water quality program within the Department and with external water quality programs can eliminate redundancy and improve the sharing of information.

Assumptions

Water quality is not an isolated function: it pervades almost every division in the Department. It touches O&M for insuring regulatory compliance and meeting daily operational needs. It touches Flood Management, which provides much of the flow data needed to estimate loads. It touches ESO in understanding how biological processes affect organic carbon cycling. It touches the Districts in the use of their basic hydrology, water quality, and bathymetry data. It touches OSWPP in its extensive work in water quality model development and hearing support. It also touches the various DPLA land and water use functions in assessing how land use may affect water quality in the watershed (such as the NBA, and the San Joaquin River Drainage Management Program).

Due to the lack of major overlap of activities, the water quality program managers have previously not found a need to develop a structured form of internal (within the Department) coordination. There has been a much greater amount of coordination between these programs and outside agencies where objectives, responsibilities, and activities are similar and may overlap. Examples follow:

- The Central District Water Quality Evaluation Section is currently coordinating with USGS on implementation of acoustic instrumentation in the Delta to determine channel velocities. Eventually this information can be used to determine mass loading at various sections of the Delta. In other rivers in the Central District, the section is coordinating to conduct this type of data gathering in preparation of developing total maximum daily loads (TMDLs) for the Regional Water Quality Control boards.

- ESO's Compliance Monitoring Program coordinates its activities with the DFG, USGS, USBR, and SFEI. Much of this coordination occurs under the auspices of the IEP. The program also coordinates with the EPA and NOAA monitoring programs (for example, EMAP and Place-based Monitoring).

- The MWQI Program is coordinating with CUWA and CVRWQCB in the tri-annual review of the Regional Board's Basin Plan. The goal is to integrate the concerns of the Safe Drinking Water Act with the Clean Water Act. The program is also participating in the Sacramento River Watershed Program, pro-

viding direction for monitoring efforts, and coordinating with the Compendium of Water Quality Monitoring Programs. In addition, the program is also coordinating with USGS and ESO in the development of a proposal for CALFED drinking water quality studies.

- O&M's Water Quality Section occasionally coordinates with USBR in the Delta, with SWP contractors at their treatment plants, or with USBR on the DMC. This program is also part of the MWQI Advisory Committee and actively participates in MWQI program review functions.

Opportunities for increased coordination in the water quality programs do exist. Further coordination of water quality field programs could produce some small amount of increased efficiency and savings. Development of additional automated real time monitoring stations could significantly improve our data collection efficiency and the value of the data for modeling purposes, however, the cost in terms of equipment and manpower to maintain them can be significant.

Central District currently has four multiparameter water quality sampling instruments in use in the South Delta Improvement Program, and plans to increase that number to ten. This planned expansion provides an opportunity to coordinate with MWQI to include drinking water quality parameters at sites where needed, and to work with ESO's Compliance Monitoring Program to maximize coverage and avoid duplication of stations or data collected. Similarly, the Compliance Monitoring Program should coordinate with the Sacramento River Watershed Monitoring Program to avoid duplication of data collection, and to leverage available resources. The Program should also coordinate with SFEI in the development of a regional contaminants monitoring program for Suisun Bay and the Delta.

MWQI and USGS are both active in the investigation of organic carbon and its effects on drinking water quality. The programs have worked together in the past (Twitchell Island Study, CMARP, and CALFED drinking water quality study proposals), and should continue to coordinate where opportunities exist.

The Department is currently making an effort to develop a more unified approach to water quality data management and dissemination through a more integrated data base management system. This will use each program's individual database systems and make data more available to stakeholders through a common web-based interface. A draft report outlining this data management integration has already been prepared and is being reviewed by Department management.

Goals

The Department should eliminate what little overlap exists between water quality programs by encouraging coordination among programs and where possible the sharing of information and resources. Coordination with other agencies should occur were there are common interests. The objective should be to prevent redundant activities and

reduce costs in water quality programs statewide. The greatest benefit of improved coordination would be to provide management direct access to all the departments water quality expertise enabling informed decision making when addressing water quality issues.

Alternatives

Internal coordination between the Departments water quality programs is generally conducted on an as-needed basis. As there is only minimal overlap between programs this has been sufficient in the past. Unless greater internal and external coordination is necessary, the water quality program can continue to be coordinated on an as needed informal basis. Alternately, if a greater degree of program coordination can be achieved by establishing a forum for the exchange of information can be established.

The water quality programs have a large number of staff in the Environmental Specialist classification, and there is an annual Environmental Specialist Workshop at which these programs frequently present results of studies and projects. This might serve as the forum for program coordination. Either one day could be dedicated to water quality issues or concurrent presentations could be held in a separate meeting room.

Currently, the Environmental Specialists' Workshop content reflects the predominance of non water quality issues and most Environmental Specialists in the Department do not deal exclusively with water quality this would be require a significant departure for the past workshop agenda. In addition many individuals working in other classifications (including engineers and technicians) are involved in water quality programs. Therefore, it might prove beneficial for the Department to have annual workshops specifically to discuss water quality programs, and seek additional ways of coordinating their work, increasing efficiency and sharing resources. Such a work shop should involve all water quality staff including field personnel.

Another alternative would be to schedule regular program coordination meetings. Perhaps a half day on a quarterly basis, were managers and senior staff can discuss program activities. This could provide the management level coordination without disrupting the day to day program activities.

With the objective of increasing the water quality awareness of top management, it might be best for the Director or a designated Deputy to regularly meet with the water quality program managers on current issues. A monthly briefing would be a good forum for Department management to learn more about water quality issues and become incorporate water quality into operational decisions. Management would be aware of all the water quality activities, have access to all available resources, and be able to make informed decisions when addressing water quality issues.

Recommendations

No matter how we organize or reorganize the Department's water quality programs, there will always be a significant requirement for coordination with other DWR units and programs outside the Department on matters that relate to water quality. This is now a normal of part of the work, and it will have to continue no matter how water quality programs may be organized. Because water quality is not an isolated function, it will always take an coordinated interdisciplinary approach to solving the Department's water quality problems.

The best method of improving the coordination of the Departments water quality programs with both internal and external stakeholders is a combination of the alternatives discussed above. First, at the staff level it would be good to have an Annual Water Quality Workshop similar to the Environmental Specialist workshop. It can provide face to face contact among all water quality staff and be an excellent training opportunity. In addition, representatives from the water contractors and other organizations can be invited to make presentations improving external coordination. At another level, it is important for Department managers to have understanding of all the water quality issues to make informed decision. This can be accomplished through regular briefings by program managers.

Therefore, it is recommended that regular Director level water quality briefings begin, as soon as possible, and water quality staff be authorized to begin planning a Water Quality Workshop for the spring of 2001.

Section E. Organization of Water Quality Programs

During the meeting with State Water Project Contractors on April 5, 2000 the Contractors noted that the four water quality programs under review belong to three different organizational structures within the Department and report to three different Deputy Directors. They questioned whether this organizational structure provides efficiency in terms of accountability, communication, and elevation of water quality concerns within the Department.

Department management has also long thought about the current organizational structure of the Department's water quality programs and whether the current structure results in efficient operations and timely information. Reviews of individual programs have been conducted over the last five years, though this is the first comprehensive review since some water quality programs were reorganized in the early 1990s.

In an earlier draft of this report, we (a) identified the water quality issues raised that might be improved through a reorganization of programs and, (b) reviewed alternative organizational frameworks in terms of addressing the issues. Results of these analyses are found in Appendix E. At that time, the Review Team did not recommend any specific organizational structure, pending additional discussions with Department management on the issue.

Subsequently, in response to comments received by Department management on the draft May 2000 report, and after additional meetings with Department management, further analysis related to organizational issues was conducted. In this analysis, also included in Appendix E, we assessed organizational issues through analysis of "business case" scenarios; that is, identifying those products customers expect of the programs, and assessing from an organizational structure how they can best be developed. Business case components addressed are as follows:

- Greater importance to water quality programs by Department management
- Maximum efficiency and cost-effectiveness of water quality programs
- Development of reliable and relevant baseline conditions
- Availability of "one-stop shopping" for data
- Better coordination with other water quality programs within and outside of the Department.

The analysis indicated that changes in the way business is conducted are indeed necessary. Initial discussions resulted in disagreement about the necessity of physical reorganization. Subsequent discussions resulted in consensus: to correct the current problems and develop the key important products identified, a physical reorganization of the water

quality programs is not necessary; rather, significantly increased coordination among the programs should occur. However, on August 18, 2000, Director Hannigan released a memorandum to all employees (Appendix E) addressing reorganization needs for the Division of Planning and Local Assistance and the Office of State Water Project Planning to implement the CALFED Program. In response to this memorandum, the Review Team, with direction from Department management, developed a reorganizational alternative resulting in a consolidation of the Department's water quality programs.

The overall purpose of both alternatives would be to achieve the following goals:

- Increase coordination among the Department's water quality programs;
- Provide a forum to resolve conflicts among the programs and provide an opportunity to share resources between programs as needed;
- Promote a standardized approach to water quality data management, monitoring, assessment and research;
- Provide a direct conduit for information flow between stakeholders, program staff, and Department senior management;
- Provide a single point of contact for Department management and our stakeholders on water quality issues;
- Develop and recommend significant water quality policy to senior management.

Alternative 1—Significantly Increased Coordination Among Existing Programs Through a Formal Committee

This alternative keeps the water quality programs in their current organizations. For the purposes of this report, this Alternative is described in concept only. The specific details would be developed after adoption. In an attempt to resolve several identified issues, increased coordination on a regularly scheduled basis is recommended. Increased coordination would include the following:

1. Establishment of a Water Quality Coordination Committee (WQCC) composed of key staff from the various water quality programs. Members of the Committee, and its Chairperson would be appointed by the Chief Deputy Director. Initially, the Committee could be composed of a group similar to the Water Quality Review Committee. This would give strong focus and representation to the Delta-oriented, SWP-funded water quality programs of the Department. It would also include a representative of the District water quality programs who would serve as a liaison to all the District water quality programs. As significant issues arise beyond the

Committee's main focus, other individuals could be included to participate in resolving these water quality issues. The advantage of this approach is that it is flexible enough to include staff as needed from any water quality program, or any program in the Department that might not otherwise be included in a reorganization. It would also be of a manageable size to facilitate productive meetings.

2. The Chairman of the WQCC, who could be a designated manager at the Branch, Office, or Division Chief level, would also serve as the single point of contact for the Contractors on matters relating to water quality throughout the Department. Such an arrangement already exists relative to QA/QC, in which the Department QA Officer reports directly to the Director on matters relating to QA/QC issues. This person would have broad access to Department senior management on any matter pertaining to water quality in the Department.

3. The WQCC would report to the Operations Deputy Director. This relationship is recommended because the primary concerns regarding water quality by the SWCs ultimately related to operational issues, either as a matter of regulatory compliance or drinking water quality concerns. A major issue addressed in this report centered around the integration of water quality concerns into the Department's operational decision-making process. It is assumed that the Operations Deputy would also meet regularly with the Chief Deputy and the Director on matters relating to water quality. This would assure that water quality issues are receiving proper attention by the Department. The Chairmen of the WQCC would meet with the Operations Deputy on a monthly basis, or on a schedule deemed most appropriate by the Operations Deputy to discuss water quality issues and provide direction to the WQCC in developing recommendations on water quality policy. The Deputy would meet with the full WQCC on a quarterly or appropriate basis for updates and briefings.

4. The WQCC could also be structured to allow participation by, or more direct coordination with our stakeholders (the Contractors). This would provide for a more real-time coordination among staff and the Contractors on water quality matters. This could be accomplished by the addition of a Water Quality Advisory Committee, comprised of a small group of Contractors. The function of this Advisory Committee would be advisory only, and would provide Contractor insight and guidance on water quality issues. The WQCC and WQAC would meet quarterly to discuss significant water quality issues or concerns of the SWCs.

Alternative 2—Physical Reorganization of the Department's Water Quality Programs

This alternative involves physical relocation of Department water quality programs to a "core" program in a new "Office of Water Quality." Several core programs will be included in this Office:

- Division of Planning and Local Assistance Water Quality Programs Water Quality Assessment Branch, including the following Sections:

  Technical Support and Services Section

  Municipal Water Quality Investigations

  Field Support Unit

  Environmental Site Assessment

  QA/QC Program

  Bryte Laboratory

- Environmental Services Office Water Quality Programs Monitoring and Analysis Branch, including the following Sections:

  Bay-Delta Compliance Section

  Control Systems Section

- Division of Operations and Maintenance Environmental Assessment Branch, including the following Sections:

  Water Quality Control Specialist

  Water Quality Section

One optional program could also be included in an Office of Water Quality:

- Central District: Water Quality Evaluation Section

This program provides support to the Office of State Water Project Planning in the collection and analysis of water quality data in the Delta. Merging this program will provide better coordination and integration with the Department's overall water quality program function. This can be done by either moving the Central District staff to the Office of Water Quality, and/or redirecting this work to the Office of Water Quality from the Office of Water Project Planning.

Support Resources Needed for an Office of Water Quality

The new office will require administrative and data management staff to support the Office's activities and new programs. These support staff include:

- Administrative support staff
- Database management support—combining the existing programs offers an opportunity to elevate data management functions to the levels needed to support the water quality data requirements of the Department.
- Report Production Staff and Equipment—The water quality programs are report-intensive operations. Greater emphasis on increasing our leadership position within the water community will require an even greater report writing effort.

Management and Reporting Structure

"Stand-Alone" Office of Water Quality

Department management and the SWC each expressed an interest in elevating the importance of water quality within the Department. The Environmental Services Office was often cited as an example of how to respond to concerns about raising the stature of an issue within the Department. Building on this, one alternative is that the Office of Water Quality be headed by a CEA-level person, reporting directly to a Deputy Director responsible for Operations. This relationship also reflects the desire expressed by our stakeholders to have a much stronger relationship between water quality and operations. This structure communicates the strongest possible message to our stakeholders that Department shares their concern with water quality issues and is dedicated to providing the support needed to take a leadership role in this area.

Office of Water Quality Within an Existing or New Division

Another alternative is to house the Office of Water Quality within an existing Division, or within a new Division of Environmental Services. Water quality, whether it be for environmental purposes or for drinking water is directly linked with environmental quality. It is not possible to separate the two; in fact, water quality is environmental quality. In this alternative, a new Division of Environmental Services would house an Office of Water Quality and an Office of Biology (or some other appropriately named office). Unlike the previous alternative, the Office Chiefs would report to the ESO Division Chief. There would be a loss of direct authority from a Deputy Director; however, water and environmental quality would not be artificially separated by organizational structure.

A variation on this alternative is to house an Office of Water Quality within the Division of Operations and Maintenance. Arguably, a primary reason for review of the water quality programs are issues associated with drinking and export water quality, primary concerns

of, and factors affecting operations of the Division. Implementing this alternative demonstrates to our stakeholders the importance the Department places on drinking and export water quality. However, like the alternative described above, there would be a loss of direct authority from a Deputy Director unlike a “stand-alone” office, and potential loss of linkage to other water quality issues such as environmental water quality.

Office of Water Quality Within an Expanded, More Autonomous Central District

Another alternative is to house the Office of Water Quality within a Central District office that is given expanded responsibilities and authority in support of implementing CALFED programs in the Delta. This would be consistent and in keeping with one of several reorganization criteria outlined in Director Hannigan’s August memorandum, namely to “provide more direct role and visibility for the Department’s District Offices.” As such the District Chief would report directly to a Deputy Director, streamlining the flow of water quality information between the Department and its stakeholders. Prior to several reorganizations in the late 1980s and early 1990s, Central District housed many of the water quality programs and related Delta planning functions currently in the Environmental Services Office, Division of Planning and Local Assistance, and Office of State Water Project Planning. The Central District also, as now, collected Delta water quality data in support of operating the water projects. In retrospect, having Delta water quality monitoring administered by the Central District afforded an effective and efficient utilization and organization of the Department’s water quality monitoring staff on highly visible Delta planning efforts and water project operations. In conjunction with CALFED project planning and implementation responsibilities related to the Delta that could be assigned to the Central District, housing the Office of Water Quality in Central District would accomplish many of the desired business case objectives, most notably “one-stop shopping” for Delta information and data.

The disadvantage of this option is that it limits the water quality focus of the Office of Water Quality to just the Central District region. It is also unclear how the Operations and Maintenance related functions will fit within the context of this option. Because of the geographic limits of this option, it may not adequately convey to our stakeholders the Department’s commitment to the importance of water quality in its overall management strategy.

Remaining Issues

No one alternative presents a complete solution: each introduces a new set of issues. A stand-alone Office will tend to isolate the water quality program from closely linked environmental issues such as fishery resources and food web trophics. It will also tend to isolate drinking water quality and export water quality from operational issues primarily dealt with by the Division of Operations and Maintenance. In addition, an Office of Water Quality (as envisioned) does not include District water quality programs. To help bridge these issues, regardless of the final decision, the Review Team believes that an important component of reorganization is an internal formal coordination process to maintain close ties and working relationships with affected Divisions and District offices.

Section F. Other Major Issues

There are five other issues concerning the Department's water quality programs that should be addressed.

1. Determine the importance of water quality to the operation of the SWP.
2. Standardize the QA/QC procedures used in all of the programs.
3. Eliminate redundancy between DWR programs and between State and federal agencies.
4. Review the continuous monitoring networks operated by various water quality sections in the Department.
5. Issues associated with DWR's District's water quality operations.

Drinking Water Quality vs. Operations

Historically, the SWP has been operated with the overriding intent to maximize water deliveries while at times sacrificing the need to meet water quality standards. However, with the advent of more stringent water quality standards, the conflict of water quantity versus water quality is now a more apparent operational dilemma.

The water quality standards currently enforced in the Delta for both municipal and environmental uses have become more strict over the past decades with the distinct probability that it will only become even more stringent or involve more constituents in the future or both. If the Department's intent is to meet these future water quality standards, then there will most likely be more frequent disruptions of longer duration in SWP operations than currently exists. If the Department elects to try to meet future water demands as the top operational priority, then the Department will most likely violate water quality standards more often. Increased violations may result in a spiraling effect of closer scrutiny of SWP operations by outside interests, more severe violation penalties, and possibly more stringent enforcement of all aspects of water quality.

The Department and the Contractors must decide on this basic issue of water quantity versus water quality in operating the SWP. Once this issue is resolved, the Department can then develop a course of action that can address the issues raised during the November 1999 CUWA meeting about problems associated with the Department's water quality programs.

Quality Assurance/Quality Control

Although most or all of the sampling techniques used by the various water quality units in the Department are based on approved methods established by EPA or other regulatory

agencies, there are still variations derived from the attitude “that was how we did it in the past.” In some instances the differences in sampling procedures may not affect the results. However, many of the new water quality standards being implemented have ultra-low detection levels requiring that sampling and testing techniques adhere to accepted procedures. Mistakes made during sampling or testing may produce detrimental results that will affect the unit and the Department. Or at the very least, we will be presenting erroneous data for public use through our websites.

The Department should standardize the QA/QC procedures in all of the water quality units in the Department for sampling and testing. In the past, the Department provided a training class on accepted sampling and testing procedures; however, this class has not been taught in over four years. The Department should not only reestablish this training class but reaffirm the responsibilities of the Quality Assurance Unit in DPLA to monitor the implementation and continued use of these accepted procedures. With the implementation of this program, the Department will have higher confidence in the quality of the data being collected and presented to the data users. The implementation of the Department’s QA/QC responsibility can be made easier if the data collection can be centralized into only a few units.

Redundancy in Collection Sites

Based upon the input from the major water quality units in the Department, there does not appear to be redundancy in the coverage and constituents monitored between the various water quality programs. However, there are redundancies at several sites between State agencies and between the State and federal agencies. Vernalis on the San Joaquin River is a good example where we have several State agencies as well as a federal agency conducting similar water quality and quantity monitoring. There may well be other redundancies between the State and federal agencies and with local entities.

Consolidating the various databases within the Department will provide an excellent opportunity to confirm if redundancy does exist between Departmental units. Also a consolidated database will provide an opportunity for the Department to compare our water quality monitoring network with other agencies to determine if we can streamline our monitoring effort or identify gaps that need to be filled.

Water Quality as an Operational Criteria for the State Water Project

To what extent will the Department operate the project to maximize water quality, and specifically, drinking water quality? This is an appropriate issue to attempt to resolve before we consider any reorganization. Reorganization of the water quality programs in and of itself will not resolve this issue. If we reorganize, and have not resolved this issue, then the Contractors’ expectations will not be met, because the reorganization will not have translated to a greater influence of water quality in operating the project. This is an operations issue and not a planning or organizational issue.

Review of Continuous Monitoring Networks

Staff from the four DWR water quality programs should conduct a thorough review of the continuous monitoring stations operated by O&M, CD, ESO, and MWQI. Issues considered in this review should include standards for instrumentation, power, data storage and acquisition, and standard operating procedures including quality control measures. In the second phase of this review, the team should examine all continuous monitoring stations in the Delta, including those operated by USBR and USGS. This review should also consider station and constituent redundancy and opportunities for coordination and elimination of non-essential redundancy. DWR senior management should agree to implement the recommendations resulting from this review and should assist the team in securing similar agreements from senior management at USBR and USGS.

DWR's Districts' Water Quality Operations

Nearing the completion of this report, Jerry Boles, Environmental Specialist with the Northern District Office, delivered a message expressing concern with the water quality programs operated by the Department's District offices.

As required by a recent assembly bill, the State Water Resources Control Board is developing a statewide water quality monitoring program. It was thought that the Department's water quality monitoring and environmental programs operated by the Districts could meet much of the State's needs with appropriate funding. However, at a meeting with District representatives, Jerry Boles discovered that the Department's statewide water quality monitoring program is lacking in a number of significant areas.

Only few data developed by DWR are useful for assessing impaired water bodies as required of the SWRCB through the Clean Water Act because the monitoring conducted does not address many of the constituents causing impairment (pesticides, sediments, trace metals). Water quality emphasis at the Districts is placed on stream flow measurements. In addition, it is claimed that staff retirements and transfers have reduced expertise in the water quality arena and training has not been adequate for new staff.

One significant issue from this discussion arises: At what level of involvement should the Department be engaged with regards to monitoring statewide water quality? It could be argued that water quality monitoring is a purview of the SWRCB and its Regional Boards. Yet, the Water Code authorizes the SWRCB to contract with others to conduct monitoring, and the Dickey Water Pollution Act provides DWR the responsibility to investigate the quality of the State's water resources.

The legislature has appropriated $5.1 million to the SWRCB to conduct statewide water quality monitoring this fiscal year and has requested a report on funding needed in future years. The Department does not appear to be ready to take on the work at this time, but could be. The water quality review team, including District representatives, are available to discuss this issue.

Appendix A: Database Interactions

Resulting from the discussion at our March 31, 2000 meeting, this appendix summarizes the scope and database interaction between the Water Data Library, the Bay Delta Tributaries Data Base, and the Field and Laboratory Information Management System.

Field and Laboratory Information Management System

FLIMS was developed by DPLA to modernize water quality data collection and management at DWR field offices and Bryte Analytical Laboratory. It has been in production for just over two years. Implementation of FLIMS has considerably reduced paperwork, increased the efficiency of the laboratory, and reduced overall program costs. About 85% of the analyses performed by Bryte Lab are funded by the State Water Contractors. Funding for development and maintenance of FLIMS has been provided mostly by the WQA program at DPLA Headquarters.

FLIMS is written in Microsoft Access and uses a distributed data management model. It focuses on capturing data in the collection and laboratory analysis phases of a water quality sample. In contrast, the Water Data Library and Bay Delta Tributaries Data Base focus on the long-term storage and dissemination of the analytical results. DWR field staff uses the “Field Module” of FLIMS to plan their sampling runs, which become analytical requests at Bryte Lab when the samples are submitted. Bryte chemists enter results and laboratory QC data into the “Lab Module” of FLIMS. Analytical results have been disseminated in hard copy or electronic form. FLIMS data are archived each month, pending completion of larger database suitable for permanent data storage.

Water Data Library

WDL, being developed for DPLA, is a database comprised of four data types, including water quality, climatology, surface water flow, and groundwater levels. The database has been designed to store the Department's large historic record, as well as new data processed through FLIMS. Although the emphasis of WDL is on data generated primarily by DPLA, it is designed for use by all within the Department. WDL is also designed to provide the permanent data storage required by Bryte lab. The geographic scope of the data set is the entire State of California.

WDL uses a three-tier data management model. The first tier consists of a web browser interface (i.e. you can access the data from the web). The second tier is the application layer, which performs and enforces the business rules of the organization. WDL uses Active Server Pages (ASP) technology that is provided with standard Microsoft NT/2000 server configurations. The third tier is the backend database. WDL uses the DWR standard enterprise database, Oracle. Data in WDL are stored in a single, standardized repository, using central data management, administration, and backup services of ISSO.

The chief advantage to the WDL approach is that database administration is simpler because changes to the user interface and database occur at only one place. This also ensures control over the uniformity of the data. The chief disadvantage of the WDL approach is that users do not have physical custody of their data. The uniformity and control afforded by data centralization also isolates users from their data, making end-user innovation more difficult and inviting an “us versus them” mentality.

Bay Delta Tributaries Data Base

BDTDB is designed to meet the data access needs of several groups. These include stakeholders, the Interagency Ecological Program, the Central Valley Project Improvement Act Comprehensive Assessment Monitoring Program, the Sacramento River Watershed Program and the CALFED Bay Delta Program. Many of the data needs for the Department of Water Resources are also served by BDTDB. The geographic scope of the BDTDB includes the San Francisco Bay and Sacramento-San Joaquin Delta and the Sacramento and San Joaquin rivers watershed area. The data types encompassed by BDTDB include water quality, surface water flow, and a diverse number of environmental parameters, e.g., phytoplankton, fish, and vegetation data. BDTDB is designed to manage and publish the data from a wide range of data sources, both inside and outside the Department. During the completion of the FSR approving BDTDB, the project was defined as a mission-critical project within the Department of Water Resources. The Department uses the BDTDB for a wide range of monitoring, planning, and SWP operations studies.

BDTDB uses a distributed client-server data-management model. A client database, developed in Microsoft Access, is configured and installed by ESO staff. Users in the local offices are responsible for managing and maintaining the data in their local database. When the local users are ready to publish their data, they export a copy to the BDTDB. A special feature of the export process is that changes to the users database are automatically tracked and provided to the BDTDB. This user-initiated process helps to ensure that the BDTDB copy is synchronized with the user's database. BDTDB uses Informix for its database engine. Data are served to Internet users from the IEP website.

ESO has devoted significant resources to the development of their data management model and has successfully deployed numerous clients. They have leveraged their success to acquire more resources to expand development of their system. ESO has five staff working on various aspects of the DBMS and web pages serving the data.

The chief advantage of the BDTDB approach is that local users have direct access and control of their data sets, and they may use them in any manner they choose. This is an important consideration for gaining user acceptance and use of the database. The chief disadvantage of the BDTDB approach is that updates to the generic client database must be coordinated and propagated to many individual offices. In most cases, this could consist of a simple patch; in extreme cases, this could require complete reloading of data sets.

Potential Options for Interaction Between the Databases

There are many potential options for the interaction between the databases discussed above. However, they can be grouped into four broad categories as described below.

1. FLIMS is FLIMS.

Regardless of the interaction between WDL and BDTDB, FLIMS is a source of data to both databases. Neither WDL nor BDTDB can replace or supplant the operation of FLIMS. WDL and BDTDB both require the development of an interface to import FLIMS data. WDL's interface is already complete. Developing an interface for BDTDB should not be very difficult.

2. WDL and BDTDB interact only on the backend.

This is the original method of interaction planned between WDL and BDTDB. With this option, BDTDB gains access to all WDL data sets using database-to-database calls, by retrieving WDL data. Though the decision has been made to implement the BDTDB approach for water quality data, this remains a feasible solution for the groundwater and climatology data sets, which are nearing completion. The advantage to this option is that it utilizes a several month-long development effort that is nearly finished. This would also allow real-world experience with the WDL approach to data management. The disadvantage to this option is that it represents a separate data set within the Department with which BDTDB must interface. This should be a relatively easy task, since WDL simply represents another client to BDTDB. This can be easily tested.

3. WDL partially adopts the BDTDB approach.

Managers of the FLIMS, WDL, and BDTDB databases have agreed to adopt this option. Water quality client databases will be developed by BDTDB for the DPLA WQA and Northern District, ESO, and O&M. Water quality data will be managed at local sites and uploaded to BDTDB. If successful, additional clients will be developed for other DPLA sites, and DPLA will create its own Internet access for analysis results and evaluate the BDTDB Internet raw data query tool. The groundwater and climatology data sets of WDL will be completed to test the viability of this approach. At the same time, DPLA will gain experience with the BDTDB approach using water quality. The advantages and disadvantages to this option are the same as Option 2.

4. WDL completely adopts the BDTDB approach.

With this option, the current approach for developing is cancelled and DPLA adopts the BDTDB approach for all its data sets. Microsoft Access clients are developed for each of the district and headquarters sites, and BDTDB is used as the permanent repository for WDL data. DPLA would build its own Internet-access data portal using the BDTDB backend. The advantage to this option is that WDL data are immediately available to all BDTDB users. With this option, DPLA may also be able to leverage the staff and

resources of BDTDB to accelerate the development of its data management systems. The disadvantage of this option is that WDL development efforts nearing completion would be put on hold pending the implementation of the BDTDB method. In addition, the scope of BDTDB would need to be expanded include the entire State and the rest of the Department's data. Additional resources would be needed to incorporate this extra data.

Implementation

As originally planned, WDL was to have provided the permanent storage and dissemination of the FLIMS water quality QC and analytical results data. Due to a shortage of resources, however, the pace of WDL's development has been hindered. After several discussions, staff responsible for the development of the databases agreed on a plan to better coordinate the interaction of the databases. The revised plan calls for the distribution of the analytical results data to local Microsoft Access clients. After data exports from the clients, data will be disseminated through BDTDB. At the same time, an Informix database will be developed to permanently store the QC data collected in FLIMS by Bryte Laboratory.

The plan calls for the following details.

1. The development of local BDTDB client databases to store FLIMS water quality data for the MWQI program, ESO, O&M, and a pilot project in DPLA Northern District. The design of the client database is being developed cooperatively between DPLA and ESO. Historical data will be imported into the new database format. The permanent repository for FLIMS data will also be developed.

2. Continued deployment of the groundwater and climatology WDL modules as originally planned. These modules of WDL were developed with minimal funding are nearly complete. Their deployment will serve to test the viability of the WDL approach for these data sets. At the same time, DPLA will gain a better understanding of the issues and costs involved with implementing the BDTDB approach for the water-quality data set. If the water quality client databases are successful and resources are identified, the BDTDB approach could be adopted for the remainder of WDL.

3. DPLA will create its own Internet access for water quality analysis results using the BDTDB backend and evaluate the BDTDB Internet raw data query tool.

4. Cooperative development of the surface water data set.

The following schedule is planned for implementation.

End of May 2000

BDTDB water quality client databases installed at first test sites. The order of development will be ESO, MWQI, Northern District, and O&M. WDL data and application for groundwater levels installed and training session conducted.

May and June 2000

BDTDB water-quality client data database installed at all test sites. Identification of historical water-quality data sets and storage formats for conversion to BDTDB format. Initial data loading from FLIMS. Debug and test WDL groundwater application.

June through August 2000

Convert and load historical data to BDTDB, correct errors, evaluate data management approach and usability, and begin exporting data to BDTDB backend. Develop permanent repository for FLIMS QC data and procedures for linking to QC data from clients and/or BDTDB. Evaluate groundwater level and climatology modules of WDL and assess usability.

End of August 2000

Report on implementation and evaluation of the systems. Do the systems work according to plan? Do the systems meet our data management needs? Are we on schedule? What improvements are needed? What recommendations do we have for future work?

The timing of the appearance of water quality data in the BDTDB database will depend not only on the delivery of the client database, but also the effort to identify, load, and clean historical data sets. Ultimately, the appearance of data in BDTDB depends on local users allocating time and resources to accomplish this task, and their use of the “export” option to publish their data.

Remaining Issues

If the local BDTDB water-quality-client databases are successful, four critical issues remain to be addressed by the Department.

1. The Department needs a coherent way to manage all of its water data in a consistent way. The emphasis of current activity is on Bay-Delta and tributary water quality data within the geographic scope of BDTDB. Water quality data outside the geographic scope of BDTDB and other data types, notably groundwater and climatology, both inside and outside the BDTDB area of interest are important to the wider responsibilities of the Department. Additional resources need to be allocated to these data sets, within either the WDL or BDTDB framework, to promote data sharing and improve the consistency of the overall data set.

2. Databases such as FLIMS are an asset for the entire Department, which need regular maintenance and enhancement. Resources for completing the development of a permanent repository FLIMS and for maintaining the database through changes in software versions need to be identified and allocated.

3. DPLA's basic data quantity and quality program, which provides the historical baseline to the Department's statewide data program, has gradually eroded over years of budget cuts. Funding of this program, including data management, is critical to recovering and preserving the historical record and continuing the baseline 3. data collection upon which the impact of new water developments will be measured.

4. The user databases developed for the BDTDB will require further development and regular maintenance to serve internal Department needs.

Further Recommendations

1. The Department should establish standards for storage of distributed data (particularly water quality data) which will ensure that it is of uniform quality and easily shared using standard interchange formats.

2. When the BDTDB water quality clients are tested and determined successful, the Department should dedicate the small resources necessary to install and maintain these clients for all other water quality programs. These resources would also be used for maintenance of all BDTDB clients beyond initial development.

3. Additional permanent resources should be assigned to maintain FLIMS and WDL to ensure the continuity of data flow through the system.

Appendix B: Questions to be Addressed by the DWR Water Quality Program Review Team

1. Is your water quality program providing the kind and quality of Delta water quality data and information needed by DWR, CALFED, SWRCB, CUWA, SWC and others from environmental and drinking water perspectives? Briefly describe the data being developed and information reported.

    a. If yes, are any improvements needed? Describe the improvements.

    b. If not, why not? What is needed from your program to provide the quality data and information required?

    c. Does your Program develop an annual work plan? If so, briefly describe. If not, how are annual activities planned?

    d. Is there a process in place for periodic stakeholder review of your work plan or program?

2. Are the data (and metadata) stored in a way that they are readily accessible and useable by interested individuals and organizations?

    a. If yes, describe your data storage and retrieval system.

    b. If no, describe your current system and define what is needed and what is being done (if anything) to correct the situation.

    c. Also identify your main data users, the type of data they need, how the data are being used, time-sensitive data needs, and how current the data are that you provide.

3. Is the data being converted into information and made available in a timely manner?

    a. If yes, describe how this is being done. What information is being developed over what time period?

    b. If no, describe what improvements are necessary to correct the situation. What options are available?

4. Does your program develop sufficient information to provide a good description of baseline and changing conditions to judge the success of CALFED Stage I measures?

    a. If yes, describe the information developed, the key parameters against which baseline conditions are to be assessed.

b. If no, what improvements to your program are needed to provide a good description of baseline and changing conditions? What resources will be required of your program?

5. Is your program fully coordinated with other efforts collecting similar or complementary data (i.e., USGS, CCWD, Sacramento Watershed, SFEI)?

   a. What other programs (internal and external) do you coordinate with? Define how you coordinate with these other programs.

   b. Are there currently duplication of efforts between your program and other DWR WQ programs? (This includes common constituents monitored, stations, and/or schedules that could be coordinated to minimize duplication of effort).

   c. Is there duplication of efforts with any external WQ programs?

   d. What programs (external and internal) do you think you should be coordinating with that you currently are not? Define how you should be coordinating with them.

6. Does DWR's internal organization of our water quality programs maximize our ability to meet the various data needs in an efficient manner? This includes collecting and analyzing data, providing reports, coordinating with relevant Divisions and Offices within the Department and programs outside the Department, and identifying and responding to needed program changes in a timely manner.

   a. If yes, would you recommend keeping the organizational structure as is?

   b. If no, what is not being done efficiently and what changes in organizational structure would you recommend?

   c. What commonality of purpose exists among the DWR WQ programs? This includes areas beyond just data management, such as overall program goals, and research and assessment needs and goals.

   d. Is there enough commonality of purpose among these programs to suggest that reorganizing program structures would produce a gain in overall efficiency?

7. Do water quality concerns receive sufficient attention from DWR management?

   a. If yes, is the process for elevating the concerns a good, working process?

   b. If no, or sometimes no, how could the process work better?

Appendix C: Responses to Questions Addressed by the DWR Water Quality Program Review Team

Responses from the Environmental Services Office

1). Yes, the Compliance Monitoring Program does provide the kind and quality of environmental water quality information needed by DWR, CALFED, SWRCB, CUWA, and the SWC. DWR and USBR initiated this environmental monitoring program in August 1978 to fulfill the water quality monitoring and reporting requirements mandated in the SWRCB Water Right Decision 1485 (D–1485). This program is also a requirement of the succeeding Water Right Decision, D–1641. In addition, this monitoring program provides environmental information CALFED needs. The program provides baseline environmental information useful in tracking the condition of the upper estuary, and the program provides information from special studies useful to the adaptive management process.

The Compliance Monitoring Program is designed to document the status and trends of physical, chemical, and biological conditions in the Delta, Suisun Bay, and San Pablo Bay (collectively referred to as the “upper estuary”). Data for a variety of physical, chemical, and biological constituents are collected through discrete and continuous sampling efforts from 28 locations throughout the upper estuary (Table 1). DWR staff prepares annual reports and numerous other articles summarizing the water quality conditions within the upper. Some continuous monitoring data are available on a real-time basis for use in operation of the SWP and as input to hydrodynamic models. Data are also made available to the public, agency staff, and the academic community through the Bay-Delta and Tributaries data management program and the California Data Exchange Center (CDEC). These reporting and data distribution efforts are ongoing.

1a). Yes, several improvements are needed. The program is in the process of updating and improving its data management and distribution systems. Substantial improvements have been made to the benthos and phytoplankton data management and distribution systems. Improvements to the water quality program element (i.e., chemical and physical data) are underway. Processing of the continuous monitoring data is fully functional, but replacement of some obsolete instrumentation is needed. Improvements in the timely analysis and reporting of program data are also needed. Finally, a technical-based review of the Compliance Monitoring Program is needed to ensure it remains cost-effective and technically relevant over the long term. The SWRCB water quality control plan and CALFED goals for environmental water quality will serve as the basis for this program review.

1c, 1d). The Compliance Monitoring Program is an element within the Interagency Ecological Program (IEP). Staff within the program develop and annual work plan as part of

the IEP annual planning process. The IEP Water Quality Project Work Team reviews the annual work plan. The IEP Management Team and Coordinators provide program oversight, while the Water Quality Project Work Team serves as a technical advisory committee.

1e). Interested stakeholders are encouraged to join the Water Quality Project Work Team. This is the best forum for stakeholders to participate in review of the program or annual work plan.

2). Although more work is needed in this area, data and metadata generated from the Compliance Monitoring Program are ultimately stored in a readily accessible and useable way.

2a). The Compliance Monitoring Program generates an extensive volume of data from both the discrete and continuous multiparameter elements. Much of these data are entered into electronic data files at the time of collection, which substantially streamlines data collection and distribution. The major inter-related data files include (1) water quality measurements, (2) benthos abundance and diversity (organism identification and enumeration), (3) phytoplankton composition (organism identification and enumeration), and, (4) chlorophyll a concentration (an estimate of phytoplankton biomass). Select data from five of the continuous monitoring sites is sent by telemetry to the CDEC in Sacramento and is available on a real-time basis. These data are available at the CDEC WEB site (http://cdec.water.ca.gov/queryStation.html). All discrete and continuous data are ultimately entered into a comprehensive database through the central IEP file server, which provides common access to all users. Specific information concerning program data is available in the metadata files at the IEP WEB site (http://www.iep.ca.gov). QA/QC measures are completed throughout the data management process.

2b). As mentioned under question 1a, above, improvements to the data management and distribution system are underway. The data storage and retrieval system described under question 2a, above is under development and will be fully operational in 2000.

2c). Data users include agency staff from DWR Environmental Services Office, Division of Operations and Maintenance (O&M), and SWP Planning Office. Agency staff from the U.S. Geological Survey, U.S. Environmental Protection Agency, San Francisco Estuary Institute, Department of Fish and Game, and SWRCB also uses data generated from this program. Program staff also receives numerous data requests from consultants and academic scientists. Generally, these individuals are interested in the original data. Data are used to document environmental status and trends in the upper estuary, document the introduction and establishment of exotic organisms, as input for hydrodynamic models, to determine compliance with water quality standards, and to assist in operation of the SWP. Some continuous monitoring data are available on a real-time basis for use in planning SWP operations. We are able to provide benthic and phytoplankton data collected through 1999. Discrete water quality data collected through 1996 and continuous water quality data collected through 1999 are also available.

3). Staff from the Compliance Monitoring Program does convert data into information, although improvements in timeliness are needed.

3a). Qualified scientific staff completes data reduction and analyses using the most appropriate analytical techniques in response to the question or issue of interest. The results are presented in a variety of ways including: annual reports submitted to the Board, Interagency Ecological Program (IEP) technical reports, peer-reviewed journal articles, Departmental Bulletins such as Bulletin 132, the IEP Newsletter, and posters and presentations at a variety of professional and DWR-sponsored conferences. In addition, data from the continuous monitoring stations is converted into available databases using established methods. Staff in O&M uses these data to prepare a variety of real-time reporting documents including the Daily Operations Report. These data are also used as input for hydrodynamic and water quality models.

3b). The Compliance Monitoring Program does report some program findings and information in a timely manner; however, the program is behind in the completion of its annual summary report to the SWRCB. The last report produced considers data collected in 1995.

There are a number of factors that have contributed to delays in the completion of the annual summary report, including 1) delays in the availability of data; (2) completion of a programmatic review in 1994–95; (3) limitations in staff expertise and resources; and (4) consumption of staff time to complete redundant reporting requirements.

We need to examine the information needs of agency staff, academic scientists, and stakeholders as part of the programmatic review. This examination will aim to develop descriptions of information reporting needs and timelines. We will use these results to develop options for the analysis and reporting of program information. Geographic Information Systems, the World Wide Web, and data reporting processes developed as part of the real-time modeling project all provide new opportunities for reporting information from the Compliance Monitoring Program.

4). Yes. Data from the Compliance Monitoring Program provides a good description of baseline conditions of environmental water quality, phytoplankton, zooplankton, and the benthos. The Compliance Monitoring Program is specifically designed to document the status and trends of numerous constituents. This program is well positioned to monitor system level conditions that may be affected by CALFED Stage 1 measures.

4a). Information developed includes the status and trends in key water quality constituents such as temperature, specific conductance (salinity), turbidity, dissolved oxygen, and nutrient concentrations. We also document the status and trends in species composition and abundance of phytoplankton, zooplankton, and benthic organisms. Documenting the introduction and establishment of exotic organisms is an important element of the zooplankton and benthic monitoring. Concurrent collection of the physical, chemical, and biological data allows us to develop a comprehensive understanding of environmental conditions in the upper estuary.

4b). The program can do a better job of monitoring total organic carbon (TOC) and its components. TOC is important to both environmental quality and drinking water quality. Staff from ESO, MWQI, and USGS is working at the request of CALFED to develop continuous recording stations for TOC. The program is also lacking a baseline-monitoring element for contaminants. Finally, the program may need to do a better job of monitoring water temperature in the upper estuary. Changes in water temperature are an important indicator of fish reproduction. It may be possible to mange exports based in part on water temperature.

5). The Compliance Monitoring Program coordinates its activities with the DFG, USGS, USBR, and SFEI. Much of this coordination occurs under the auspices of the IEP. Program funding comes from DWR and USBR.

5a). The Compliance Monitoring Program also coordinates with the DWR Central District Surface Water Quality Monitoring Section, the DWR MWQI Program, and EPA and NOAA monitoring programs (e.g., EMAP and Place-based Monitoring). This program provides direct funding to the Central District. The program coordinates with MWQI Program in the development of multiparameter monitoring stations. Coordination with EPA and NOAA is mainly through provision of program descriptions and data to minimize duplication in their efforts.

5b). Yes there is likely some duplication of effort between the Compliance Monitoring Program and other DWR water quality monitoring programs although this duplication has not been quantified. Probably the greatest duplication of effort occurs between the Compliance Monitoring Program and the surface water quality monitoring conducted by Central District. Some duplication of effort between this program and the MWQI Program also likely occurs.

5c). There is likely duplication of effort and funds devoted to continuous monitoring stations operated by the Compliance Monitoring Program, USBR, and the Contra Costa Water District.

5d). The Compliance Monitoring Program should coordinate with the Sacramento Watershed Monitoring Program. Direct coordination should occur to minimize duplication and leverage available resources. The Compliance Monitoring Program should also coordinate with SFEI in the development of a regional contaminants monitoring program for Suisun Bay and the Delta.

6). DWR has a significant amount of expertise in the area of water quality and water quality monitoring. However distributing staff among four different programs in three different divisions does limit the potential and efficiency of these programs.

6a, b). Three areas where potential efficiencies exist include (1) field data collection efforts; (2) data storage and distribution processes; and (3) the operation and maintenance of continuous monitoring stations.

A careful examination of all field data collection activities should reveal inefficiencies and opportunities for coordination. All DWR water quality monitoring programs should become clients to the Bay-Delta and Tributaries data management program. DWR management should appoint staff from the various monitoring programs using continuous monitoring stations to form a team that can address issues relating to the operation and maintenance of continuous monitoring stations. This team could develop standard equipment lists, installation procedures, standard operating procedures, and quality assurance procedures. This team could also examine the locations of stations in the delta to identify redundancies and gaps.

6c). The programs are largely driven to fulfill regulatory mandates or document compliance with regulatory standards. Two of the programs (MWQI and the Compliance Monitoring Program) have an applied research component, although this is a secondary priority. All of the programs collect information needed for the CALFED program.

6d). Probably so, but more thoughtful discussion of this issue is needed.

7). No, water quality concerns do not receive sufficient attention from DWR management.

7a, b). First, we need to determine what the water quality concerns are. Second, we need to determine which program is responsible for generating the information that addresses each concern. Third, we need to determine which program or individual is responsible for responding to these concerns. Finally, we need to develop an organizational structure that minimizes the layers between the entity collecting the information and the entity needing the information. The overall goal is to maximize the potential for making informed decisions.

Responses from the Division of Planning and Local Assistance

1a, b, c, d). Kind of Data

The kind of data collected is related to our workplan (see “MWQI Water Quality Monitoring Stations and Parameters”, attached). We develop a detailed workplan every year, in collaboration with our MWQI Advisory Committee. The data we collect continues to reflect the overall scope and intent of the workplan, as it has since 1982 when the program was initiated. CALFED has posed new and expanded questions relating to drinking water quality, and our previous monitoring oriented workplan is inadequate to address these many new questions. We are currently working with our Advisory Committee to revise our workplan to provide greater support for CALFED activities and to meet the new needs of our stakeholders.

Data Quality

MWQI's data is of the highest quality in the Department, with significant attention paid to QA/QC to assure the highest quality data to our stakeholders. This was evident at the Delta Wetlands hearing, in which both sides of the WQ issue were making ample use of our data. Although there were many debates about the interpretation of that data, there were never any questions about the validity or quality of the data.

The MWQI Program has been integrated into the CALFED planning process since the beginning. Much of the problem definition and drinking water quality needs were developed with the MWQI Program's input. The MWQI program has functioned as an advocate for drinking water stakeholders in the CALFED process. Lack of a clear preferred alternative has prevented an assessment of the adequacy of existing data to develop an impact evaluation. The MWQI data set is the largest collection of drinking water quality data for the Delta. Attempts at using the data set for establishing a drinking water quality "baseline" has met with limited success because the monitoring program was not designed for this purpose. Increased sampling frequency and number of locations is needed in order for the data to be used to detect future water quality impacts from CALFED actions in the Delta, such as wetlands. In response to this need, the Program has begun work on developing real-time TOC monitoring capabilities, and has submitted a proposal to CALFED to establish a series of multiparameter stations at key locations to better meet the modeling needs for more frequent data. Other sites that may need additional monitoring will emerge once the preferred alternative is selected and CALFED actions are clearly identified.

Work Plan and Stakeholder Review

As mentioned above, the MWQI Program develops an Annual Work Plan that details each work element of the Program, element goals and deliverables, personnel costs, and lab and material costs. The work elements are developed in conjunction with the MWQI Committee, consisting of the 29 urban water contractors of the SWC, O&M, EPA, SWRCB, CCWD and DHS. A work plan subcommittee develops the initial plan and then review and approval is sought for the plan from the larger MWQI Committee.

2a, b, c). Our data has been posted on our MWQI Web site for quite some time. We can also provide specific downloads for interested parties. We are currently working with ESO in trying to provide our data through the Tributaries Database. We have already provided ESO with our most recent two years of MWQI data, and will be providing the rest as soon as we assess the success of loading the last two years.

Flat files are currently available for download from our web site. Files have not been updated since last year pending a review of this access system. The MWQI Committee has requested that we not commit resources to our own web page data access system. We are looking at other systems to host the data electronically, such as the Bay Delta Tributaries Data Base.

We respond to data requests on the average of 5 per month. We create queries to match their request and then provide the requested data in EXCEL spreadsheets attached to e-mail. Our stakeholders often request monitoring data sets for their own analyses, but we often also get consultant's requests for the data, as well as non-profit groups, and Federal and State agencies. DWR's modeling group routinely uses MWQI data extensively in model development and use.

3 a, b). Information

There are two basic types of data we collect: monitoring data and data collected as part of special studies. We are currently working on using this continuous data record to develop "Baseline" conditions for use in the CALFED process. This data is also used in collaboration with the OSWPP Modeling group to develop and enhance the Department's WQ models.

We do not currently have the capability for producing real-time monitoring data conversion into graphs. Hard copy reports are created and distributed once a study is done. We are also responsible for an annual report of monitoring data and a status of projects, but this has lagged behind lately due to higher priority work. We need additional staff in order to commit one person to analyze the current monitoring data as it is generated.

Data from special studies are turned into information reflecting the original intent of conducting the study. The analytical reports are published throughout the year as part of the normal MWQI program. Recently produced reports cover such areas as SMARTS (flooded peat soil experiments), Agricultural Drainage Reduction, CMARP, CALFED requested study proposals, Pathogens, Barker Slough Watershed Study, Interim South Delta Program Studies, the Drinking Water Treatment Cost Model, the Watershed Compendium, and other reports.

MWQI staff makes every attempt to make the data available in the timeliest manner. Data has usually been available within 30 to 60 days of collection. Data requests from the Contractors and other users are usually fulfilled within 24 hours, depending on the nature of the request. Special studies reports are sometimes delayed due to multiple review cycles and general lack of response/comments from Advisory Committee representatives in a timely manner. Recent shortages in staff resources have also delayed the completion of some reports as well. Report completion is an area that requires some attention both from the MWQI staff side and from our Advisory Committee in terms of responsiveness.

4 a, b). The MWQI Program has contributed significantly to the development of baseline conditions for CALFED, primarily in the area of drinking water quality constituents. Program staff has developed summary data outputs from our long term MWQI data record. The MWQI water quality data set represents the most valuable tool available to CALFED in attempting to develop a water quality baseline analysis. However, the MWQI monitoring program was never designed to provide this type of tool. This information is also being used in developing a model of baseline conditions using a newly recalibrated

DSM2 model. When completed, this model could be a valuable tool in assessing incremental effects (when compared to baseline conditions) of CALFED actions on various WQ constituents.

Increased sampling frequency of certain parameters is needed in order to provide the ability to actually measure impacts of future CALFED actions in the Delta. The Program has submitted a proposal to CALFED to establish a series of multiparameter stations at key locations (boundary inputs) to meet the modeling needs for more frequent data. Other sites that may need additional monitoring will emerge once the preferred alternative is selected. The MWQI Program would use its existing field resources to maintain these sites, if established, in conjunction with other DWR groups.

The CMARP document for drinking water, for which the MWQI Program was the lead group on the project, defined a number of key parameters of concern. These include:

- organic carbon (disinfection by-product precursor)
- bromide (disinfection by-product precursor)
- pathogens
- salinity and total dissolved solids
- turbidity
- nutrients
- chemical contaminants (except MTBE)

In addition, impacts from other CALFED programs or actions, specifically restoration efforts, pose an unknown potential threat to drinking water quality. The MWQI Program has been working to investigate possible impacts from the development of wetlands in the Delta.

5 a, b). Coordination

CVRWQCB—The Program is coordinating with CUWA while participating in the Triannual review of the Regional Board's Basin Plan. The goal is to integrate the concerns of the Safe Drinking Water Act with the Clean Water Act. Presentations and data have been provided to the process, along with participation.

SRWP—The MWQI Program is also participating in the Sacramento River Watershed Program, providing direction for monitoring efforts, and coordination with the Compendium of Water Quality Monitoring Programs. This document, based on a survey, identifies state, federal, and local groups conducting water quality monitoring in the San

Francisco bay, the Delta, and waters up through the Sacramento Valley to the Oregon border. The maps identify where each group conducts their monitoring.

MWQI has worked with CSU Chico to create an interactive public access web site for the Compendium. However, our SWC stakeholders have told us that they do not want the MWQI Program to fund this public access effort any longer.

Duplication of Effort

Yes, possibly. There is duplication at the Hood and Vernalis monitoring sites in that several agencies sample there. We are currently working with ESO to create a TOC autoanalyzer station at Hood to meet our needs for more frequent data. Eventually this station could provide a majority of all the other parameters we need in real time as well. Bromide and pathogens still require grab sampling at this time. Vernalis is a problem in terms of traveling distance and duplication of sampling. Seven different State and federal programs sample there, including four different DWR programs. However, the MWQI program may be the only program sampling for drinking WQ constituents.

MWQI also coordinates with O&M. This was not always the case. We no longer duplicate sampling at O&M facilities unless there is a special study, coordinated with O&M. O&M honors our requests and works cooperatively on sample collection. O&M also sits in on the MWQI Committee and is part of the process.

5 c). Yes, as mentioned above, other State and federal agencies sample at Vernalis.

5 d). Hydrology and water quality data collected needs to be available to a variety of interested parties. We also need dischargers to coordinate with DWR. We have been working with the CVRWQCB to inject Safe Drinking Water Act principles into the Clean Water Act process by requiring dischargers to monitor for drinking water parameters of concern. Other agencies include USGS, DPR, and local efforts. MWQI could also be linked to Delta operations, and all water quality programs should be integral to the SWP's operational decision process, not just used as a data source.

6 a, b). Yes. Any deficiencies or inefficiencies in the MWQI Program have not been due to an inability to coordinate with other DWR programs and organizations. Water Quality is not an isolated function; it pervades almost every Division in the Department. It touches O&M for insuring regulatory compliance and meeting daily operational needs. It touches Flood Management, which provides much of the flow data needed to estimate loads. It touches ESO in understanding how biological processes affect organic carbon cycling. It touches the Districts in the use of their basic hydrology, water quality, and bathymetry data. It touches OSWPP in our extensive work in WQ model development and Hearing Support. It also touches the various DPLA land and water use functions in assessing how land use may effect WQ in the watershed (such as the NBA, and the San Joaquin River Drainage Management Program). The point is that no matter how we organize or reorganize the Department's WQ programs, there will always be a significant requirement for coordination with other DWR units and programs outside DWR on mat-

ters that relate to WQ. We do this now as a normal of part of performing our work, and we will have to continue to do this now matter how WQ programs may be organized. This is because WQ is not an isolated function, and will always need an interdisciplinary approach to solving the Department's WQ-related problems.

Opportunities for increased efficiency in the water quality programs do exist. The MWQI field unit is a possible area where further coordination with other field programs could produce some savings. We are already working with other units in developing a real time monitoring program, which could significantly improve our data collection efficiency. This is also true in the area of data management. We are also currently working with other Divisions to develop a more unified approach to data dissemination and management through a more integrated data base management system. This will utilize the work that we have each done to date on developing individual database systems, and make data more available to stakeholders.

The relatively small size of the Department's water quality effort creates problems in the area of staff resources. The individual water quality programs tend to be small, and promotional opportunities for staff with water quality expertise or interest are limited. Therefore we lose people to ecosystem, biological, or regulatory jobs searching for promotions. Also, we cannot afford to maintain specialized expertise (statisticians, environmental engineers, etc.).

There is a perceived lack of upper management support and understanding of the importance of water quality to our stakeholders. There needs to be a connection between the true importance of water quality to the stakeholders and the role water quality plays in DWR project operations.

6 c). O&M and the MWQI Program share a common purpose of providing water quality data related to municipal needs to the stakeholders, including the SWC. This includes keeping a historical record for planning and managing efforts, as well as emergency response (spills and floods), and special studies (pathogens). However, none of the Department's programs need to rely on the other to complete its mission. While a certain amount of coordination is necessary at times, and always will be, they are distinctly different programs with inherently different functions. O&M's WQ Program is focused primarily on near-term operational needs. The MWQI Program is a more long-term planning program and is interested in identifying solutions to existing drinking WQ problems. The Compliance Monitoring Program in ESO is focused on standards compliance, and relates more to in-stream beneficial uses, and not drinking water quality. Bringing these programs together will create little added efficiency that doesn't already exist, because how these programs relate to one another now has little to do with the successes or failures of any one program.

One relatively new factor that has caused greater coordination among these WQ programs is CALFED, which has provided a greater sense of commonality among these programs than existed before. CALFED will continue to exert greater pressure for these programs to coordinate their efforts in developing integrated responses to the many

CALFED challenges that lie ahead. We have already demonstrated that we can meet this challenge on many CALFED response exercises, including CMARP and the numerous CALFED document reviews that were very effectively coordinated among the three programs, and numerous others.

6d). The electronic world in which we currently live has many advantages, not the least of which is linking various groups together to enhance coordination. The sophisticated electronic network in which this Department has invested greatly reduces the reliance on organizational hierarchy to maximize efficiency. Our ability to effectively work with other units using this information network makes our respective organizational relationships somewhat irrelevant. It is this connectivity, and not our organizational relationship that gives us each the requisite tools to maintain the necessary coordination to successfully complete our respective missions. Making maximum use of this invaluable tool will greatly enhance our ability to maintain the necessary connectivity to integrate our respective programs and disciplines as needed.

Centralization of programs have their advantages and disadvantages. The main advantage of centralization is that there is greater flexibility in how resources can be utilized when they are pooled. The main disadvantage of centralization is that the synergy of integrating environmental scientists with engineers and others is greatly diminished. This is certainly more of an intangible, but a serious concern nonetheless. The emphasis in problem solving today is focused on an integrated, multidisciplinary approach. Centralization makes this more difficult. So much of our ability to complete the Department's mission will center on resolving predominantly environmental issues that relate to water management. This can't really occur in isolation, and the more our scientists become isolated from the broader business of water management, the more difficult it will become to provide rational, complete, integrated solutions to these problems. In general, centralization is an "Averaging" process, in which the more efficient programs are reduced in efficiency, and the less efficient programs gain slightly.

7 a, b). While the apparent consensus of the staff of the Department's water quality programs is that water quality is not a high enough priority for DWR management, there are perhaps several sub-questions to this that might refine our response.

1. **Is DWR management aware of the current status of our WQ programs and issues?**

YES. The Department has a well-defined system of communicating through its organizational hierarchy, including interlocking staff meetings. DPLA management is briefed weekly at regularly scheduled staff meetings. In addition, copies of all CALFED comments on their various documents are passed through DPLA management. Official correspondence on WQ issues outside DWR are also cc'd to DPLA management and other Department management as necessary.

2. **Is WQ considered a "celebrity" issue for DWR (i.e., is drinking WQ one of the top three issues for DWR?**

Probably not. Unlike some of its customers, the Department is not heavily regulated as a finished water supplier. Therefore, the focus of the Department's mission as it relates to drinking WQ issues tends to focus on the SWCs and meeting their needs. There is perhaps greater short-term emphasis on providing sufficient water quantity to our customers, with a longer term planning view towards increasing the quality of the raw supply. Department management is well aware of the SWCs concerns relating to drinking water and has made every attempt to address these concerns. Some concerns are not shared by all contractors (ag) and there are undoubtedly varying views among the contractors relating to drinking water quality and how the project should be operated relative to drinking WQ, and WQ in general.

3. **Is DWR a strong, proactive advocate for drinking WQ issues?**

When appropriate, the Department has actively pursued a drinking water quality agenda. The Department has met with the SWRCB and Regional boards on numerous occasions to discuss the role of drinking water quality in the overall basin planing process and as it may relate to the TMDL process. We also took an active role in the Delta Wetlands hearings and subsequent processes is defending the SWP in this matter, and bringing to light our significant concerns over drinking WQ.

4. **Does drinking WQ receive the same level of attention as ESA issues, especially in how the SWP is operated?**

NO. ESA issues directly affect the operation of the SWP, and carry heavy legal and institutional penalties for non-compliance. Drinking water quality issues carry no such penalties for the Department per se, and as such, the extent to which we operate the project for drinking WQ is strictly voluntary. There also has been no clear directive from the SWCs that they will be willing to accept less water of a higher quality in order to improve the quality of their supplies. This process could be improved by getting a clear signal from the SWCs as to their wishes concerning this issue. CALFED has already looked at optimizing project delivery quality through selective pumping. Reevaluating the current structure of the various real time project operation decision making process may also improve this situation.

Appendix Table 1 MWQI water quality monitoring stations and parameters

Channel Stations	*Constituents Analyzed*	*Frequency*
Sac. River @ West Sac. Intake (SACWSACINT)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly
American River @ W.T.P. Intake (AMERICAN)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly
Sac. River @ Hood (HOOD)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, Ammonia, MTBE	Weekly
San Joaquin River near Vernalis (VERNALIS)	Std. Mineral, Turbidity, UVA, DOC, Bromide, Ammonia, MTBE	Weekly
San Joaquin River near Highway 4 (SJOAQHWY4)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly
Old River at Bacon Island (OLDRIVBACISL)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly
Contra Costa Pumping Plant at Rock Slough (CONCOSPP01)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly
Old River near Byron Tract (STATION09)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly
Sac. River @ Mallard Island (MALLARDIS)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly
Delta Pumping Plant Headworks (BANKS) DWR O&M [a]	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide	Monthly (request change to weekly)
Delta-Mendota Canal, either at Tracy or McCabe Road DWR O&M [a]	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide	Monthly (request change to weekly)
Barker Slough Pumping Plant DWR O&M [a]	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide	Monthly
Agricultural Drains		
Natomas Main Drain (NATOMAS)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE, Coliforms	Monthly
Twitchell Island Agricultural Drain (TWITCHELLPP01)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly
Bacon Island Agricultural Drain (BACON01)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, MTBE	Monthly

[b] [a] Will request DWR O&M to increase sampling at Banks and the Delta-Mendota Canal.

Responses from the Division of Operations and Maintenance

1). The O&M water quality program does not focus exclusively on the Delta, but covers the entire SWP, and in most respects does a good job of giving DWR and SWP contractors what is needed. O&M collects water quality data at Barker Slough, Clifton Court Forebay, and Banks Pumping Plant in the Delta (frequency and parameter were described in prior submittals).

1a). There has been high turnover is staff and we have two Permanent Intermittent positions which we have had trouble filling. This has made it difficult to keep trained staff to collect, maintain and report the data in a timely manner. Assignment of permanent positions and better salaries may help retain staff.

1b). Not applicable.

1c). No. The monitoring program is well defined and does not change annually. Most other activities are in reaction to unusual events, such as groundwater pump-in, floods, or spills, which cannot be predicted or defined in a work plan.

1d). Water quality data are presented monthly at the SWC board meetings and specific contractor needs are discussed. Also, there is frequent communication with SWC water quality personnel.

2). Yes. So long as we can retain trained personnel.

2a). O&M water quality data are stored in a Foxpro database.

2b). Not applicable.

2c). DWR and SWP contractors are the main data users. Other users include Federal Contractors, consultants, DHS, SWRCB, and virtually anyone else interested in SWP water quality. Data are used for evaluation of historic water quality trends, planning operations and design of water treatment plants, compliance reporting to FERC and DHS, and a variety of other purposes. In most instances the data are not time sensitive, however, treatment plant operators do want access to real-time data continuously.

3). Yes.

3a). SWP contractors are given software and phone numbers for direct access to the automated real-time monitoring stations so that they can collect the hourly data at any time. In addition, all data are summarized and reported through the O&M water quality web page and various reports.

3b). Not applicable.

4). Good baseline data exist for many parameters (at the stations identified in number 1) for the life of the SWP. O&M is not been charged with judging the success of CALFED.

4a). Not applicable.

4b). Not applicable.

5). There is no other program charged with water quality monitoring in the SWP. Where there is an interface with other organizations such as MWQI, IEP, or USGS in the Delta, SWP contractors at their treatment plants, or USBR on the DMC most activities and data collection are coordinated.

5a). Most coordination is through direct contact, as need, or attendance of regularly scheduled meeting (such as with MWQI).

5b). There was some duplicate sampling by MWQI at some of the SWP Delta station. That has been eliminated. Both O&M and MWQI communicate frequently and share information to avoid duplication.

5c). No.

5d). Not applicable.

6). It is probably not possible to satisfy all perceived data needs of CALFED, CUWA, and all the other organizations identified above regardless of how DWR is organized. For purposes SWP operational needs, however, it may be beneficial to have a closer link between water quality and the operation center.

6a). Not applicable.

6b). The O&M water quality program could be better coordinated with project operations and the Delta Water Quality Compliance Section if the Environmental Assessment Branch is moved back into the Operations Control Office (where it was prior to opening the new JOC). Also, It would be helpful to have full-time positions in all the Field Divisions that are dedicated to water quality activities.

6c). The purpose of the O&M water quality program is unique and specific to the SWP.

6d). Not beyond what is identified under 6b above.

7). Management often is interested in water quality issues but usually reluctant to take decisive action on significant issues.

7a). Not applicable.

7b). O&M water quality activities should be moved back to the Operations Control Office creating a closer link between water quality and day to day operational decisions.

Responses from the Central District

1). There are two programs that we are in charge of that provides data on Delta water quality conditions: (1) our Delta compliance monitoring stations, and (2) South Delta Improvement Program.

Delta Compliance Stations

The 20 stations in the Delta that we operate provides data mainly for environmental purposes. Our stations monitor EC, temperature or chloride, or a combination of two of the parameters. Readings are taken every 15 minutes by an electronic data logger and stored in memory. About half of these stations are telemetered using either VHF radio or GOES satellite system to CDEC for immediate publishing on CDEC's web site. Information from our stations is used to verify DWR compliance in meeting SWRCB established WQ standards. EC data that is not telemetered is sent monthly (after QA/QC) to other units in the Dept and to private consultants to verify our compliance record.

1a). The information provided appears to be sufficient for now. I have not heard of complaints about the quality of the data. However, there are two improvements that I would like to make to the program to increase efficiency in providing data: (1) adopt a new data processing software that can provide enhanced QA/QC capabilities and increased flexibility in data presentation, and (2) telemeter all of our compliance monitoring stations. We have been evaluating the Hydron software that can process all hydrologic, hydraulic and water quality data that my section generates. It is adaptable to Oracle data base and is presently being used by PG&E and a number of international water agencies. As funding allows, we are very slowly upgrading our stations to provide telemetered data that can be viewed on CDEC. Our goal is provide real-time data for all of our stations.

1c). No, we do not produce an annual workplan. We produce an annual report that presents all of our water related data in my section. Our responsibilities in operating and maintaining our stations are built into our own section SOPs. Our work activities do not vary annually.

1d). We do not have a mechanism established for our clients to review our work.

South Delta Improvement Program (SDIP)

We currently conduct weekly water quality sampling in the south Delta when the temporary rock barriers in Old River, Middle River and Grant Line Canal are installed. Currently we conduct bi-weekly water sampling and lab testing at these sites. Wet chemistry testing includes orthophosphate, chlorophyll, nitrate/nitrite, and _____. Weekly in situ readings are taken and recorded. Weekly readings includes, temperature, dissolved oxygen, EC and turbidity. This information is provided to the Environmental Services Office in a summary report with graphs and tables. This information is also provided to OSWPP.

1a). We are providing the data as requested by OSWPP and ESO. However, improvements can be made. We are in the 1st phase of a three phase deployment of multi-parameter water quality instruments in support of the SDIP. Current monitoring only provides a single reading on WQ conditions in the Delta that is suppose to represent the entire week or two week period between sampling/monitoring. The multiparameter WQ instrument will conduct hourly readings and log the information into memory. This will provide 168 readings in a week versus 1 in the current method. Not all of the currently reported parameters can be monitored by the WQ instrument. However, most of the important parameters can be and a relational curve may be developed to calculate the unmonitored parameters. Currently 4 of these instruments are deployed in the south Delta that can monitor variations in WQ due to the barriers. A total of at least 10 multi-parameter WQ instrument stations are being targeted in providing adequate coverage for the SDIP.

1c). I have developed a workplan based on phase implementation. The workplan was submitted to OSWPP and outlined the need for time series WQ data that can be used to characterize the conditions in the south Delta when impacted by tides, agriculture pumping and discharges, SWP and CVP exports and freshwater inflows. The plan outlined our proposal and the cost involved in implementing it. We have just implemented this first phase for this summer's temporary barrier installation. Once we have evaluated the success of this first phase, I will be generating a workplan for the second phase of the WQ instrument implementation which will hopefully take place spring of 2001 based on funding availability.

1d). We submit an annual summary of the results of our sampling and testing to ESO for inclusion in an annual report on the Temporary Barriers Project. It is at this time that a review of the program is conducted and suggestions for improvements is entertained.

2 a, b). Currently our data for both compliance monitoring and SDIP is not available for public access. Requests are submitted to me by interested parties and we provide the data as long as it has already been QA/QC'd. We currently use Western Hydro software to process and store the compliance monitoring data (we plan to switch over to Hydron which will be Oracle/WDL compatible). The SDIP WQ data is stored in Excel. We plan to use Hydron to handle all of our WQ data and provide it to WDL or whatever database is determined as the Dept standard.

2c). The main users of our compliance monitoring data are (1) O&M, (2) OSWPP, (3) ESO, (4) Murray, Burns and Kienlen Consulting Engineers. For O&M, the critical data they need is telemetered already. They use the information to ensure that are meeting Delta water quality criteria as established by SWRCB. OSWPP and ESO are provided data on a monthly basis if the data is not already telemetered. Even with the telemetered data, we still provide monthly data after it has been QA/QC'd. CDEC data is raw and subject to change. They use the data to evaluate the effects of the temporary barriers have on south Delta water and for client use. Requested data is not time sensitive. MBK is provided the data on a monthly basis for 5 water quality stations. They use the data to ensure that their clients (Delta RDs) are getting the minimum required water quality.

3). Yes, as mentioned earlier, we are providing the requested data in a timely manner (most of the time based on work load and personnel allocation). We use Western Hydro software to process the compliance monitoring data (basically EC data). This information is provided on a monthly basis to specific requestors or is provided to the public in the form of an annual report.

The SDIP data is stored on Excel and provided when requested by ESO or OSWPP. Normal method of providing this data is by e-mail or periodic download in to the shared drive account on Central District's server. Otherwise, the data is included in an end of the year summary report to ESO for inclusion in the Dept's annual report on the Temporary Barriers Program.

4). Not yet. I believe that once our multiparameter WQ instrument network in the south Delta is fully engaged (after Phase III implementation), the time series data will provide the baseline WQ conditions in the Delta that can help calibrate computer models of the Delta (I proposed that our WQ instruments will be used in conjunction with a reduced but still present water sampling and lab testing program). Also, our multiparameter instruments can monitor the effects of changing conditions in the Delta which will enhance our understanding of the hydrodynamics in the south Delta. To get this program fully implemented, funding is required with additional staff to operate and maintain these stations as well as maintain our WQ data base.

5). We are currently coordinating with USGS on implementation of acoustic instrumentation in the Delta to determine channel velocities. Eventually this information can be used to determine mass loading at various sections of the Delta. In other rivers in the Central District, we are coordinating to conduct this type of data gathering in preparation of developing TMDL's for the Regional WQ boards. As far as I know, there are not any major duplication of efforts (internal or external) in WQ monitoring in the Delta. If you talk to modelers, we do not have enough monitoring stations in the Delta.

6). I think the WQ programs in DWR are pretty mutually exclusive and cater to a specific clientele or need. I don't think it will be efficient to centralize the Department's WQ programs because of the unique needs and requirements inherent in these programs. Establishing a parent unit to coordinate this effort may prove divisive in the long run. However, within the individual divisions, some consolidation may provide some efficiency in the use of personnel and funding. Consolidating the field and data management work into one unit and having the analysis and report writing in another unit will provide consistency and standardization in all aspects of WQ work. A consolidated field unit can allow less PYs needed to accomplish the same amount of work and will allow for cross-training to occur. Due to the nature of data work, data processors need to be in contact with the field people who actually collect the data. Data analysis and report writing can be handled by another unit that has the expertise and experience in data analysis and results/recommendation presentation (either verbal or written). Specifically this can be accomplished in DPLA where the data gathering and data processing can be handled at the District level while data analysis and report writing can be accomplished by DPLA HQs.

7). Sometimes no. It appears that the Dept is forever reacting to WQ issues and not trying to take a proactive stance. To understand an aquatic environment like the Delta, we need to understand how things were or currently are. We need to establish a baseline condition so we can see how changing input conditions in the Delta will impact (short and long term) the baseline condition. But we do not have the funding or personnel to try to establish a baseline condition. We are making gross assumptions on conditions in the Delta or how things have changed based on increased pumping or installation of the temporary barriers. These assumptions are based not on time series data, but on a "snapshot in time" monitoring program that extrapolates this one reading to represent a extended period of time. Or, worse yet, this one reading is used to cover an area of the Delta that is not currently monitored. The Dept must make data gathering and analysis a priority since all of our developed alternatives for the Delta are based on the data. We should increase funding for WQ monitoring in the Delta and for data processing and analysis. This will solidify the Department's stance on certain WQ issues in the Delta and will eliminate, or at least reduce arguments based on inadequate data.

Appendix D. SWP Water Quality Monitoring Schedule

Appendix Table 2 SWP Water Quality Monitoring Schedule

			Sampling Frequency 1/																
			Inorganics							Organics									
Waterbody or Facility	Station Name or Description	Station I.D.	Project Standard 2/	Project Additional 3/	Nutrients	Bromide	Major Minerals	Iron and Manganese	Suspended Solids	Chlorinated Organics	Organo-Phosphorus Pesticides	Herbicides	Carbamates	Purgeable Organics	Trihalomethane Form. Pot.	Total Organic Carbon	Dissolved Organic Carbon	UV 254	Automated Monitoring Station
Feather River Watershed	Antelope Lake	AN001000	A		A														
	Frenchman Lake	FR001000	A		A														
	Lake Davis	LD001000	A		A			M3											
	Oroville Lake	OR001000			M2														
	Thermalito Forebay	TF001000	Q	Q															
	Thermalito Afterbay	TA001000	M		M2	Q			Q										
North and South Bay Aqueducts	NBA, Barker Sl. Pumping Plant	KG000000	M	M	M			W1	Q	T	T	T	T	T	M4	M4	M4	M4	X
	NBA, Cordelia Forebay	KG002111	Q	Q															X
	SBA, Check 7	KB001632	M	M	M										M	M			X
	SBA, Del Valle Reservoir	DV001000			M														
	SBA, Del Valle Res. Outlet	DV000000	M1	M1	M1				M1										X
	SBA, Santa Clara Terminal Tank	KB004207	Q1	Q1		Q1													X
California Aqueduct and Coastal Branch	Clifton Court Forebay	KA000000				Q	Q												X
	Banks Pumping Plant	KA000331	M	M	M	M			M	T	T	T	T	T	M	M			X
	Check 12	KA006633					Q								Q				X
	Check 13	KA007089	M	M		M				T	T	T	T	T	M	M			X
	Check 21	KA017226	M	M		M			M	T	T	T	T	T	Q	Q			X
	Coastal Branch	KC000934	M	M					M						M				X
	Check 29	KA024454	M	M					M	T	T	T	T	T	M				X
	Check 41	KA030341	M	M	M	M			M	T	T	T	T	T	M	M			X
	Check 66	KA040341	Q		M										Q				X
	Devil Canyon Afterbay	KA041288	M	M	M	M			Q	T	T	T	T	T	M	M			X
San Luis Reservoir and Project Lakes in Southern California	San Luis Res., Trashracks	SL001000	M	M	M														
	San Luis Res., Tunnel Island	SL005000	M	M	M														X
	Pyramid Lake	PY001000	Q	Q	M														
		PY002000					(Special Monitoring Studies)												
		PY003000					(Special Monitoring Studies)												
	Castaic Lake	CA001000					(Special Monitoring Studies)												
		CA002000	Q	Q	M										Q	Q			
		CA003000					(Special Monitoring Studies)												
	Silverwood Lake	SI001000																	
		SI002000	Q	Q	M														
	Lake Perris	PE001000																	
		PE002000	Q	Q	M														
		PE003000					(Special Monitoring Studies)												
Central Valley Project	Delta Mendota Canal	DMC06716	M	M						T	T	T	T	T	M	M			

1/ Sampling Frequency : A=Annual Q=Quarterly Q1=Feb, May, Aug-Dec M=Monthly M1=Monthly When Flowing
M2=Apr-Nov M3=May-Sep M4=Weekly in Winter else Monthly, T=Mar, Jun, Sep, W1=Weekly in Winter

2/ Project Standard: Arsenic, Chromium, Copper, Iron, Lead, Manganese, Selenium, Zinc, Calcium, Magnesium, Sodium, Alkalinity, Sulfate, Chloride, Fluoride, Boron, Nitrate, Dissolved Solids, Turbidity, and Conductivity

3/ Project Additional: Barium, Cadmium, Aluminum, Mercury, and Silver.

Appendix E: Organization of the Water Quality Programs

Organization of Water Quality Programs

Reorganizations tend to either centralize or decentralize existing programs. Each has its strengths and weaknesses. The options provided herein are a combination of these same themes. Reorganizations usually occur for the purpose of either improving efficiencies of operation (economic and otherwise), or improving the synergism[1] among related programs. It is for these reasons that the subject of organization or more appropriately, reorganization of the water quality programs, is addressed in this report.

In reality, resolving the issues described below could lead to increased efficiencies in the water quality programs. Costs may not initially be lower, but over a period of time, as duplications of staff tasks and collections are eliminated, and as coordination among staff is improved to the point where resources (field technicians, field equipment and boats) are shared, then operating costs, and perhaps even capital costs, should be lower.

Issues That Need to be Addressed Through a Reorganization of Water Quality Programs

Management Attention to Water Quality Concerns

This is really the most significant issue driving this review.

The example given (about the December 1999 water quality standard infraction), whether appropriate or not, does lie at the root of many of the concerns expressed by the Contractors. Unfortunately, this is a much larger issue than can be resolved by reorganizing the Department's water quality programs. Management needs to establish clear guidelines and criteria for altering operations for drinking water quality, and the State Water Contractors need to agree to the criteria and be willing to make the trade of quantity for quality.

This was not an issue relating to lack of the appropriate information where and when it was needed, because all the necessary information was provided with sufficient time to react appropriately. This was an operational issue that could have been resolved by the appropriate Deputy.

1. Synergism is defined as the joint action of different substances in producing an effect greater than the sum of all the effects of all the substances acting separately (Funk and Wagnalls 1974).

The bigger issue is simply this: to what extent will the Department operate the Project for water quality, and specifically, for drinking water quality? This is an appropriate issue to attempt to resolve before we consider any reorganization. If we reorganize, and have not resolved this issue, than the State Water Contractors expectations will not be met, because the reorganization will not have translated to some greater deference given to water quality in operating the project. This is an operations issue, and not a planning issue.

Consistency of Management Oversight

As pointed out, the four programs are under two separate Divisions, one Office, and three separate Deputy Directors. Unless there is a good deal of coordination on a frequent and regular basis, this arrangement does not promote consistent management oversight, particularly necessary when program objectives overlap with each other.

Accountability

The current organizational structure precludes holding any one person accountable for the Department's water quality programs, particularly in areas of establishing priorities, setting objectives, and overseeing operations.

Management Attention to Water Quality Concerns

The Contractors, and DWR water quality program managers do not believe that water quality is a high priority of DWR management, resulting in concerns not receiving sufficient attention and consequently a reluctance to take decisive action on significant issues. An example provided by the Contractors was the December 1999 water quality standard violation incident where the Contractors believe that sufficient water quality warnings were expressed by the project operators, yet operational measures were not initiated in time to address these warnings.

Coordination

Though coordination between some individual water quality programs is occurring, coordination among the DWR water quality programs has generally been poor. Increased coordination could improve the overall ability of the Department to provide more cost-effective assessments of water quality conditions by allowing more efficient use of field staff, equipment and capital resources. Also, concurrent collection and assessment of both drinking water quality and environmental water quality could permit a more informative understanding of water quality conditions in the Delta, and reasons for changes in those conditions.

Staff Resources

The relatively small size of the Department's individual water quality programs create problems in the area of staff resources. Promotional opportunities for staff with water

quality expertise or experience are limited; consequently, people are lost through promotions to ecosystem, biological or regulatory jobs. It is also difficult to afford or maintain specialized expertise (statisticians, etc.) within smaller programs.

Efficiency

It is generally acknowledged that the water quality programs are doing their job, that is, providing essential data and information to their customers. The question is, are they doing it in the most efficient, cost-effective manner? Without full coordination and sharing of resources among the programs, the answer is probably, no.

Alternative Organizational Structures

Presented below are several alternative organizational structures (A through F). Each structure is followed by a short discussion of the issues the structure best addresses.

A. Significantly Increased Coordination Among Existing Programs Through a Formal Committee

This alternative keeps the water quality programs in their current organizations. In an attempt to resolve several identified issues, increased coordination on a regularly scheduled basis is recommended. Increased coordination could include the following:

1. Establishment of a Water Quality Coordination Committee (WQCC) composed of key staff from the various water quality programs. The advantage of this approach is that it is flexible enough to include staff as needed from any water quality program, or any program in the Department that might not otherwise be included in a reorganization.

2. The Chairman of the WQCC, which could be at the Branch, Office, or Division Chief level, would also serve as the single point of contact for the Contractors on matters relating to water quality throughout the Department. Such an arrangement already exists relative to QA/QC, in which the Department QA Officer reports directly to the Director on matters relating to QA/QC issues. This person would have broad access to Department senior management on any matter pertaining to water quality in the Department, and would meet regularly with the Chief Deputy to provide updates on various water quality issues.

3. The WQCC would also serve as a forum to discuss and resolve staffing shortages among water quality programs. This would include making temporary arrangements for sharing among existing staff in order to compensate for either staff shortages, or to bring expertise to bear on a specific problem as needed.

4. The WQCC could also be structured to allow participation by our stakeholders (the Contractors) to provide for a more real time coordination among staff and the Contractors on water quality matters.

Consistency of Management Oversight

The fact that several related programs reside in different divisions and report to different deputies can also be said for ESO and O&M as well. ESO interacts with O&M in a significant way on matters that can directly affect operational flexibility. This requires significant coordination as ESO-related issues affect operations on a real time, daily basis. Should ESO be transferred to O&M? This situation demonstrates that significant, real time coordination can occur across Divisional and Deputy Director boundaries without a major reorganization.

The matters that relate to project operations are appropriately managed through the O&M deputy. The same is true for ESO issues, and where ESO issues affect operations, there is a process to integrate those concerns/issues.

We have a mix of water quality functions: planning-related (MWQI), operations-related (O&M), and regulatory and compliance related (ESO). There are relatively few times in which these functions overlap. The need for “consistency” related to management oversight is more perceptual than real, as there are really few opportunities for inconsistency given the nature of these programs.

Accountability

Operational decisions are made by one deputy. This includes issues relating to water quality, and ecological issues as well. If the issue is how the Project is operated relative to water quality, then this can and should be more appropriately addressed by the Operations Deputy. This is routinely done across Division and Deputy lines with ESO-related issues.

The MWQI Program has primarily a planning function, and the Department already operates with separate planning functions in two different divisions (DPLA and OSWPP) and two deputies.

Is the concern about not having an “appropriate” level of concern for water quality-related issues at the Deputy and Division Chief level? Or is the concern about having one focal point for Contractors and stakeholders to address their concerns to regarding water quality? These are two different problems, requiring different solutions. In all likelihood, it is probably a combination of both concerns.

The real issue here is how to disseminate the necessary information to those who need it, and how to resolve policy level issues appropriately. That's as much about process as it is about organization.

Coordination

Coordination relates to two major situations: first, to coordination among the water quality programs, and second, to coordination between the individual water quality programs

and those who rely on the information generated by these programs (internal and external).

In the case of coordination among the water quality programs, this can certainly be improved through regular water quality coordination meetings. O&M and MWQI regularly meet through the MWQI Advisory Committee meetings, and the NBA Technical Advisory Committee meetings, and the various CALFED water quality committee meetings. Additional meetings can be scheduled to include Central District and ESO water quality staff. Perhaps the best way to coordinate information among these programs is to integrate data management into one common system-the single point of contact approach. We are currently moving in that direction, in which the Bay Delta Tributaries Data Base will be used as a data publishing venue for our respective water quality data.

In the case of coordination with our users, the integrated data management system will also greatly enhance our coordination capability. With the addition of real-time continuous monitoring devices in the Delta, this information will be available to our users on a more continuous, real-time basis.

Perhaps the greatest opportunity for improved coordination exists within the field aspects of these programs. While there is not any significant overlap in the parameters we each collect, there is some potential to combine efforts at common stations in the Delta.

All this can occur with or without reorganization, but none of it would require a reorganization to accomplish. This is really about providing information to those who need it. This can occur through greater integration of our data management programs and better use of the Internet for data and information dissemination.

Staff Resources

Opportunities exist for some sharing of field personnel in a more coordinated field sampling program. Filling existing vacancies in the MWQI program will greatly enhance our operational capability. Reorganizing for the purpose of providing greater promotional opportunity alone is not appropriate, and will not likely result in any greater promotional opportunities than already exist. Reorganization may actually produce fewer promotional opportunities as it may result in an overall smaller number of water quality-related positions. (Otherwise, where's the efficiency gain?)

Efficiency

Greater coordination can occur, as described earlier.

Because of the small overlap in purpose of these programs, reorganization will generally not produce much greater efficiency in any one program, as they operate fairly independently of one another. Again, the field program is one area where some efficiency could be achieved.

Reorganization could also increase overhead cost as additional administrative staff would need to be provided to the new organization if it is to be a new Office.

One issue that was also raised by the Contractors is the efficiency of using Bryte lab compared to contracting out for its services. In response to this question, an analysis was conducted comparing the price per sample for the constituents tested by Bryte lab with six other labs. Overall, Bryte lab was over 20 percent lower in cost for all analytes as compared to an overall average cost over the six labs examined. There were very few instances where Bryte lab's costs exceeded the average cost of the other six labs. This is not surprising since the lab has been operating as a business for many years now and has greatly improved its productivity and efficiency. Furthermore, the cost comparison did not include any storage or manipulation of electronic data for the six labs analyzed. QA/QC and a complete laboratory information management system is included in Bryte lab's costs, and if this service was contracted out, these data management related costs would have to be added to the costs of providing this service to the Department.

B. Move the O&M water quality program to the SWP Operations Control Office. Maintain status quo for the rest of the programs. Increase coordination among all programs.[2]

The O&M water quality program was originally a part of the SWP Operations Office. It was transferred to O&M's Water and Plant Engineering Office after SWP Operations moved to the El Camino Office. O&M staff believe that the water quality program could be better coordinated with project operations and the Delta Water Quality Compliance Section if the program were moved back to the Operations Control Office.

- Consistency of management oversight—May address the issue for O&M but not the other programs.
- Accountability—Does not address this issue.
- Management attention to water quality concerns—May address this issue for O&M, but not the other programs.
- Coordination—Addresses this issue.
- Staff resources—Does not address this issue.
- Efficiency—Could address this issue for all the programs.

2. Coordination would be increased informally as a opposed to formally as presented in Alternative A. Establishment of a formal coordinating committee was not considered for this alternative but could be made a part of it.

C. Combine the DPLA and O&M water quality programs under the SWP Operations Control Center. Redefine role and authority of all programs. Increase coordination among all programs.[2]

The DPLA and O&M water quality programs have similar missions-assess and provide information on drinking water quality. This alternative allows for a single drinking water quality program to be managed from the Operations Control Center, where, presumably, the data collected and information developed is used on a daily basis and as a planning tool in operating the SWP and CVP and developing operations plans.

- Consistency of management oversight-May address the issue for O&M and DPLA but not the other programs.
- Accountability-Does not address this issue.
- Management attention to water quality concerns-May address this issue for O&M, but not the other programs.
- Coordination-Addresses this issue somewhat.
- Staff resources-Addresses this issue somewhat.
- Efficiency-Addresses this issue for O&M.

D. Move the O&M water quality program to the SWP Operations Control Office. Combine DPLA's Water Quality Assessment Branch (including MWQI) and ESO programs under DPLA or ESO. Redefine the role and authority of all programs, in particular, Central District's program role with MWQI and ESO's program. Increase coordination among all programs.[2]

This alternative consolidates the DPLA's Water Quality Assessment Branch with ESO's Compliance and Monitoring Branch. (DPLA's Branch includes Technical Services, MWQI, Site Assessment Unit, Quality Assurance Control Unit, Field Support Unit, and Bryte Laboratory). As previously discussed, the O&M water quality program would be transferred to the Operations Control Center. The Central District program would remain with the District enabling it to conduct its local assistance programs through its District Offices as described in the Department's Strategic Business Plan (September 1997). However, roles and authorities of each water quality program would have to be re-defined.

- Consistency of management oversight-Provides better consistency than the previous alternatives. Strong coordination among programs at the management level would still be needed.

- Accountability-Provides increased accountability, but not to any one individual for the Department's water quality programs.

- Management attention to water quality concerns-May provide for increased management attention.

- Coordination-Addresses this issue only for SWP operations and O&M. Coordination of ESO's program with the IEP should be considered in the evaluation of this alternative.

- Staff resources-Addresses the issue somewhat.

- Efficiency-Addresses the issue for MWQI and ESO. Could address the issue for the others.

E. Combine the DPLA, O&M and ESO water quality programs into the Environmental Services Office organization. Redefine role and authority of all programs, in particular, consider Central District's program role with the others. Increase coordination among the combined programs and Central District's program.[2]

This alternative consolidates DWR water quality programs operated out of Sacramento from four to two. It preserves the autonomy of the Central District program, consistent with the programs operated by the Northern, San Joaquin, and Southern Districts. It envisions the Environmental Services Office becoming a Division with two offices: the Office of Water Quality and the Office of Ecological Services. Roles and authorities of Central District and the proposed Office of Water Quality would need to be defined.

- Consistency of management oversight-Provides good consistency of management oversight. Coordination with the Central District program at the management level would still be needed.

- Accountability-Provides better accountability. One individual is responsible for and accountable to three of four water quality programs operated from Sacramento.

- Management attention to water quality concerns-Provides for increased management attention, for the same reason as accountability.

- Coordination-Provides for increased coordination, including development of objectives, sharing of resources, quality control, and assessment of data.

- Staff resources-Directly addresses this issue by ensuring an office sufficiently large to support promotional opportunities and to attract expertise required.

- Efficiency-Addresses the issue by allowing for pooling of staff and resources. Costs may not initially be lower, but over a period of time as duplication of staff

tasks and redundancies in monitoring sites and collections are eliminated, and as coordination among staff is improved to the point where resources (field technicians, field equipment and boats) can be shared, then operating and perhaps even capital costs should be lower. Consolidation of programs allows this process to take place more quickly than voluntary coordination among separate programs.

F. Combine DPLA, O&M, and ESO water quality programs into one Office of Water Quality, reporting directly to a Deputy Director. Redefine Central District program's role with the others. Increase coordination among all programs.

This alternative provides the same six benefits of Alternative E above, with the potential for even greater management attention to water quality concerns, due to its independent “Office” status, and direct access to the deputy director level without the need to first go through ESO management.

G. Alternative to Option A: Phased approach with formal increased coordination and a physical relocation.

This alternative is a modification to Option A and addresses the current space limitations that will hinder the effectiveness of any proposed reorganization. Unfortunately space is not currently available to accommodate any reorganization within perhaps the next six months. However, DPLA is currently looking into vacating their current offices at 9th and K Streets, and combining with the Central District, if possible. The alternative proposed here would include the physical combining of ESO, Central District, and DPLA Headquarters into one location in Sacramento. This could take at least six months to accomplish. In the interim, Option A would be in effect as a trial to see if the increased coordination as proposed would be sufficient to address the concerns discussed earlier. Relocating these groups into one location will also generate significant benefits to increased coordination and could also increase efficiency through a potential sharing of common resources, including administrative, clerical, and technical resources. Enough space could be secured to accommodate the addition of the O&M water quality group at a later date should this option be desired.

This option has the advantage of working within the reality of existing space limitations, while still offering the opportunity to increase efficiency and coordination among the water quality programs. It also provides for the opportunity to increase the interaction and synergy between ESO and DPLA on many fronts, not just water quality. Reorganizations, while potentially resulting in some gain in efficiency, are also highly disruptive, and this more moderate, phased approach will give everyone involved a better opportunity to evaluate the effectiveness of these measures. Time may show that such a physical relocation may be sufficient to increase the efficiency of these organizations without the need for any organizational restructuring.

Appendix F. Definition of Acronyms

DOC . . . . . dissolved organic carbon

DPLA . . . . . Division of Planning and Local Assistance

DWR . . . . . California Department of Water Resources

EMAP . . . . . Estuary Monitoring and Assessment Program

EPA . . . . . Environmental Protection Agency

ESO . . . . . Environmental Services Office

FLIMS . . . . . Field and Laboratory Information Management System

FSR . . . . . Feasibility Study Report

GIS . . . . . Geographical Information System

IEP . . . . . Interagency Ecological Program of the Sacramento-San Joaquin Delta

ISSO . . . . . Information Systems and Services Office

MTBE . . . . . methyl *tert*-butyl ether

MWQI . . . . . Municipal Water Quality Investigations Program

NAQWA . . . . . National Water Quality Assessment Program (of the USGS)

NBA . . . . . North Bay Aqueduct

NMFS . . . . . National Marine Fisheries Service

NOAA . . . . . National Oceanic and Atmospheric Administration

O&M . . . . . Division of Operations and Maintenance

OSWPP . . . . . Office of State Water Project Planning

QA/QC . . . . . quality assurance and quality control

RDBMS . . . . . Regional Database Management System

SCADA. . . . . Supervisory Control and Data Acquisition

SDIP. . . . . South Delta Improvement Project

SFEI. . . . . San Francisco Estuary Institute

SWC. . . . . State Water Contractors (also “the Contractors”)

SWP. . . . . State Water Project

SWRCB . . . . . State Water Resources Control Board

TAC . . . . . technical advisory committee

TMDL. . . . . total maximum daily load

TOC . . . . . total organic carbon

USBR. . . . . United States Bureau of Reclamation

USFWS . . . . . United States Fish and Wildlife Service

USGS. . . . . United States Geological Survey

UVA . . . . . ultraviolet absorbance

WDIS . . . . . Water Data Information System

WDL. . . . . Water Data Library

WQ. . . . . water quality