

## MEMORANDUM

**DATE:** November 14, 2012

**SUBJECT:** Optimizing Management and Use

**PREPARED BY:** Karl Longley, ScD, and M. Daniel DeCillis, PhD

## BACKGROUND

The California Council on Science and Technology (CCST) is preparing a report on technology needs to be used by the 2013 California Water Plan (CWP) Technology Caucus as input for the 2013 CWP. CCST has conducted a survey to elicit information from individuals in the many sectors of the water community regarding their thoughts on technology needs for effective water management. A review of the survey data reveals that many of the comments focused on aspects of data acquisition and management, including monitoring (many comments were also received in the areas of irrigation technology, water treatment and watershed management). This memorandum focuses on the issue of optimizing management and use, beginning with a general overview of the topic as addressed in the 2009 CWP. This is followed by a review of CCST survey results, a discussion of the available information, and finally some preliminary conclusions and recommendations.

### Chapter 6, Integrated Data and Analysis, 2009 CWP

The 2009 CWP makes the following statement regarding data management:

*Purpose and Motivation -- Investment in our analytical capabilities lags far behind the growing challenges facing water managers and resource planners. We need significant new investment in our technical capabilities to advance integrated water management, to improve sustainable management of the Sacramento-San Joaquin River Delta (the Delta), and to prepare for future impacts of climate change, extended droughts, and flood events. Improving communication between technical experts and decision-makers goes hand in hand with improving our technical capabilities because sound technical information is critical to making difficult and robust policy decisions and making decisions for sustainable outcomes in light of uncertainty. Needed technical improvements are described for two essential capabilities:*

- *Decision-making in light of uncertainties*
- *Supporting integrated water management, including integrated flood management, regionally and statewide*

Additional side bar comments in Chapter 6 of the 2009 CWP are:

- *Analytical approaches need to be improved to effectively quantify where scientific uncertainties exist, allow for collaborative decision-making to help overcome political and social disagreements, and identify actions that will have sustainable outcomes.*

- *California needs to create a new water information exchange and management system and more integrated analytical tools that can be used to document and share knowledge.*

The lack of shared data and data gaps results often in poor management of scarce water resources and costs California dearly. Examples of data that is expensive to compile and data gaps listed in Chapter 6 of the 2009 CWP are:

- *Statewide land use—native vegetation, urban footprints, nonirrigated and irrigated • agriculture*
- *Groundwater<sup>1</sup>—total natural recharge, subsurface inflow and outflow, recharge of applied water, extractions, groundwater levels, pumping-induced land subsidence, and water quality*
- *Surface water—natural and incidental runoff, local diversions<sup>2</sup>, return flows, total streamflows, conveyance seepage and evaporation, runoff to salt sinks, and water quality*
- *Consumptive use—evaporation and evapotranspiration from native vegetation, wetlands, urban runoff, and nonirrigated agricultural production*
- *Soil moisture characteristics—water saturation, porosities, and field capacities*
- *Environmental/biological data—species monitoring and their habitat and water requirements*
- *Land elevations and channel bathymetry*
- *Current and future price of water by supply source*

The summary of Chapter 6 of the 2009 CWP states:

*California needs significant improvements in its analytical tools and data to effectively evaluate the costs, benefits, and trade-offs of alternative water management strategies and support decision-making. These improvements must be done in a way that promotes integrated water planning and fosters collaboration. A tremendous amount of work needs to be done to provide the desired quantitative deliverables for future Water Plan updates. This work will have to be done with limited budgets and considerable uncertainty related to the health of the Delta, future climate change, and droughts. Achieving these advances requires significant investments in better information management systems; additional data collection; and more sophisticated, transparent, and accessible analytical tools. This chapter describes some of the critical activities undertaken recently to improve our technical information and identifies several critical activities that must be conducted for the next Water Plan update to continue progress.*

*It concludes with a summary of the technical accomplishments from Water Plan Update 2009 and summarizes other recently completed studies that highlight our current technical capabilities and limitations for describing future uncertainties and to provide decision-makers with insight into the challenges and opportunities facing water managers.*

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<sup>1</sup> Senate Bill 6, enacted in November 2009, provides a significant improvement in access to groundwater information by requiring local agencies to monitor groundwater levels.

<sup>2</sup> Senate Bill 8, enacted in November 2009, provides for improved accounting of location and amounts of surface water diversions.

## **Overview of Current California Water Data Management.**

SB 1070 (Attachment 1) was signed into law by Governor Schwarzenegger on September 29, 2006. SEC. 4. Section 13181 of SB 1070, as added to the Water Code, reads as below:

*13181. (a) (1) On or before December 1, 2007, the California Environmental Protection Agency and the Resources Agency shall enter into a memorandum of understanding for the purposes of establishing the California Water Quality Monitoring Council, which shall be administered by the state board.*

The below discussion shown below as recorded by Dr. Karl Longley was provided by Dr. Jon Marshack, Coordinator, California Water Quality Monitoring Council on October 25, 2012.

The main technology need of the Monitoring Council is access to data from a variety of agencies and other sources. Agency data exist in unconnected databases, spreadsheets, hard copy and PDF reports. They need to be made available to other agencies and to the public. Our *My Water Quality* portals ([www.CaWaterQuality.net](http://www.CaWaterQuality.net)) currently draw data from the California Environmental Data Exchange Network (CEDEN), a Water Board system that is connected to the Water Quality Exchange (WQX) of USEPA and USGS. We have four Regional Data Centers for CEDEN at SCCWRP, Moss Landing Marine Labs, SFEI, and Davis that are charged with helping citizen monitoring groups and other NGO to get their data either connected or added to CEDEN with proper QA. State and federal agencies need to add web services or other tools to their data structures that allow other agencies to gain access to their data remotely without having to work through staff channels. This is currently available for CDEC at the Department of Water Resources, but largely absent elsewhere.

That said, a major barrier to the success of the Monitoring Council is a lack of dedicated funding. Senate Bill 1070 (2006), which called on Cal/EPA and the Natural Resources Agency to establish the Council, came with no funding. Most of the cost to develop the *My Water Quality* portals has come from the Water Boards and USEPA, with the exception of funding for development of the Estuary Portal from the state and federal water contractors. What we really need is funding committed to implementing SB 1070 and the Monitoring Council's comprehensive monitoring program strategy. Some of that funding could be used to establish the data linkages previously mentioned above. Collaboration costs money to initiate and to maintain.

As excerpted from the EPA website (<http://www.epa.gov/storet/wqx/>):

The Water Quality Exchange (WQX) is a new framework that makes it easier for States, Tribes, and others to submit and share water quality monitoring data over the Internet. States, Tribes and other organizations can now submit data directly to the publicly-accessible STORET Data Warehouse using the WQX framework. The STORET Data Warehouse will continue to be the repository for all modern STORET data and will now also be the new

home for data submitted through WQX. WQX will eventually replace the distributed STORET Database (including the STORET Data Entry Module, Reports Module, and STORET Import Module or SIM) as the primary means of submitting water quality monitoring data to EPA.

The USGS and EPA entered into an agreement (Attachment 2) on the management of water quality data ([http://www.epa.gov/storet/usgs\\_memo.html](http://www.epa.gov/storet/usgs_memo.html)). This agreement will result in the delivery of "... data from USGS/NWIS and EPA/STORET in a common format to Federal, State, and Tribal organizations, as well as to the general public and scientific community to:

"1. Analyze and report on the state of the nation's water environment

"2. Provide a common basis for integrated water-quality analysis and protection

"3. Provide an information base for scientific inquiry about water quality"

"An underlying goal is to ensure that the data from these important government databases are documented to describe their quality so that users can establish the utility and comparability of the data."

## CCST SURVEY OVERVIEW

CCST administered an online questionnaire targeted to water professionals in state and local government, academia, federal funded laboratories, and related industries. Over 700 potential participants were directly contacted via email between July and October 2012. In addition, CCST sought assistance in distributing the survey from CCST Council members and affiliate representatives (e.g., deans of research) who have access to broader lists of researchers with relevant expertise. Recipients were also encouraged to forward the survey to others and to provide names and contact information for additional potential participants.

Among other information, the questionnaire asked respondents to identify:

- Existing technologies with the potential for broader application
- Emerging technologies with similar potential
- Which water technologies the state should invest in
- Projected impacts of all of the above
- Principal barriers to implementation or reform

Approximately forty percent of respondents were from either state or federal agencies, with the largest state contingent coming from the Department of Water Resources and regional water control boards; most federal responses were from the USDA. Approximately twenty percent were from faculty at the University of California. Responses were also obtained from Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, JPL, industry consultants, nonprofit environmental organizations, CSU campuses, and private academia.

Most respondents indicated that technologies exist to significantly improve California's water supply and management which are either ready for deployment or which can be commercialized/scaled up within three to five years. The most common technologies suggested included better access to and use of data and modeling; onsite monitoring of water quality and

environmental conditions; use of remote sensing to evaluate snowpack and other water supply conditions; and water treatment technologies such as membrane filtration and desalination.

Numerous logistical barriers to implementation of these technologies were cited, with the most frequently cited being lack of funding.

In the next phase of the project, CCST will follow up the online survey with a series of focus groups, conference calls, and one-on-one interviews to discuss and expand upon the results of the online survey.

## **SURVEY RESPONSES BY AREA**

*(Please note that the following lists are partial results and are not intended to be all-inclusive. A complete list of survey responses will be made available in a later iteration of this report.)*

### CCST Survey Results Regarding Data Acquisition and Management

Typical responses suggesting useful existing technologies included:

- Better IT systems for sharing data from across government agencies with the public.
- Time series data management capability.
- Use of web-based data exchange.
- Use of CalSim 2, CalLite and Plexos (Power Benefits Model)
- Development of system optimization and simulation, from economic, engineering, and environmental perspectives.
- Improved use of field and remotely-sensed data.
- More critical thinking about the value of particular technologies for specific applications.
- Use of social media and collaboration tools.
- Visualization and access to real time data sets as are available from CDEC. If more implemented for the data of other agencies as a web based service.

Typical responses suggesting promising, emerging technologies in the responder's area of interest included:

- Remote sensors to measure water quality attributes
- "Better computer / mathematical models for ecological networks.
- "Modular water management system simulation models that capture integrated water management objectives related to water supply, water quality, ecosystem restoration, flood management, water demand, climate change, drought management, water-energy and others.
- Web based information exchange systems utilizing a distributed data model that allows different entities to maintain and share data."
- Real-time data QA/QC.
- Information technology and GIS techniques help to better define water rights and online systems provide platforms for trading.
- Real-time visualization & analysis of environmental data

- The development of CalSim3 which includes a better representation of groundwater modeling, temperature models coordinated with CalSim, surface and ground water integrated modeling.
- Management and analysis of information involving many large datasets.
- Use of software permitting stakeholders to collaborate online by having access to all data sets from different governmental agencies, water districts, universities, etc.
- Integrated cyber infrastructure (sensing, data acquisition and management, integrated modeling and forecasting, optimization algorithms) for assessing water quantity and quality in natural and engineered systems in California (massive expansion of CDEC scope and capabilities).
- Geographic / visualization tools linked to databases (similar to Google Earth) that provide improved understanding of system connectivity.
- Database integration to track and balance infrastructure investments, operating costs, and water/energy efficiency responses for rate optimization.
- High performance computing resources for management and understanding of large scale, coupled environmental water and regional climate systems, with applications that address climate change impacts (adaptation), energy supply research, and water supply and water quality concerns associated with population growth.
- Consolidated databases that are searchable online and geo-referenced.
- GIS-based web services having remote sensing applications and GIS-based decision support systems.
- Integrated data analysis will not hold promise unless we take a hard look at carrying-capacity and sustainability.
- Web-based and easily accessed control systems.

Suggestions for technology to be considered for development included:

- Analytical tools that can capture broad integrated water management objectives unlike the very expensive and cumbersome performance of this type of analyses with today's technology.
- The facilitation of sharing information across institutions to support integrated water management.
- Improved real-time monitoring and modeling technologies.
- Improved availability of data of all types (water use and supply, quality, energy impacts, costs, etc.)
- The use of currently available data and GIS technology as investment in specific technology devices may be better done by others (Note: This appears to be a minority viewpoint).
- Increased use of *in situ* sensing to provide near-real-time data with less cost of field sampling.
- Open-source web tools with easy-to-use data quality assurance (data editing, data grading) software.
- Spatial database of groundwater, soil and surface water contamination (types, concentrations, locations).
- Integrated flow and temperature modeling since both parameters are extremely important to meet fishery needs coupled with fine-tuned fishery models.

- Modeling and geo-referenced data analysis and access tools including collaboration tools and decision support tools.
- Satellite Radar Imagery for water elevation change mapping in wetlands, 2) real-time multi-spectral airborne imagery for water quality, and 3) Bathymetry Lidar for mapping under water topography.
- Enhanced ground-based sensor networks for snowpack, soil moisture, energy balance, and hydrologic modeling of mountain water cycle, using currently available models.
- Sensor networks for measurement of groundwater recharge, storage and withdrawal at key locations such as water banks.
- Cyber infrastructure to archive and serve data/information, and to integrate data and models.
- Hydrological modeling showing ability to preserve and restore river health with reduced demands for potable and agricultural water diversions; accuracy and accountability for required Urban Water Demand Plans.
- Better use of high performance computing resources for management and understanding of coupled environmental water and regional climate systems at a statewide scale, with applications that address climate change impacts (adaptation), energy supply research, and water supply and water quality issues associated with population growth including greater development, use, and integration of isotopic methods and hydrologic data sensor networks, including satellite data, into these efforts.
- Airborne and *in-situ* data network that would baseline water resources in the state, as well as monitor it and used in conjunction with a sophisticated modeling infrastructure to provide more complete estimates of the state of the water in California. This would be the basis for making objective predictions at time scales from seasonal to decades and which can include measures of uncertainty.
  - Routine processing of InSAR time series to get the data and information into the hands of Water Resource Managers.
  - More well monitoring, both spatially (adding new wells) and temporally (measuring more often) to correlate with InSAR time series to allow inference of storage coefficients.
- Real-time data quality assurance data processing and integrated environmental sensor networks.
- Advanced metering infrastructure and data communication tools to communicate real time water usage to customers as well as web platform interface for both website and smart phone apps of water use data to customers thereby promoting customer awareness of water use often resulting in significant water savings.

The most commonly cited critical barrier to new innovative technology and implementation strategies (by 33% of respondents) was funding. Other barriers cited included:

- Research and development support for prototypes (short term), investment capital for full-scale systems (short to medium term) and stakeholder acceptance of change (medium to longer term).
- Barriers to innovative technology is getting people to learn to use it versus a system that has been in place for a long time and how existing data can be or will be integrated. Implementation is getting the data from previous years to be understood.

- Many existing users are not interested in the most efficient solutions, as they benefit from inefficiencies in the system. The challenge is to make sure that they still get something in return for any improvement in H2O allocation.
- High variation in supporting technology and access to technology
- Incomplete and poorly defined water rights to ground and surface water.
- Traditional approaches and procedures within multiple hydrological agencies. It is usually easier to maintain procedures in place than to work to replace them.
- Public perception/acceptance, policy, and regulation
- Divide between academia and water professionals.
- Too many lawsuits to prevent trying new methodology or products
- A lack of mechanical expertise. We have found a very disturbing lack of practical and mechanical experience with most of the people involved in research.
- Grower education and understanding of new technologies (since they are new, and likely not understood, growers are often reluctant to use these; also, providing growers incentive to use these technologies to continue to improve water use efficiency, such
- Nearly complete lack of understanding by citizens that water in semiarid regions cannot be regarded the same way as it is in humid regions when there are other public funding priorities.
- Public perception and quantifiable long-term confirmation of non-impact to humans who would imbibe the water.
- It is too easy to confuse toxicity with the presence of a chemical, ignoring that one of the bases of toxicology is "it is the dose that makes the poison."

## CONCLUSIONS

*(Please note that analysis of the survey responses is still in the preliminary stage and any conclusions reached to date are strictly provisional.)*

Respondents provided a variety of recommendations for state investment in various technologies, depending on their areas of expertise; however, a sizeable minority suggested that minimal investment is actually necessary and that the main challenge is one of better access to and use of data. Several (though not all) respondents indicated that this challenge is primarily procedural rather than technological, asserting that adequate computing and networking capacity already exists.

The procedural issues impeding data sharing and use appears to be symptomatic of deeper disconnects between different sectors of those involved in water technology development, implementation, and analysis. Many respondents expressed criticism of varying existing water management policies, frequently citing a lack of coordination and distributed information as primary obstacles to implementation of greater efficiencies in management. Respondents also cited disconnects between policymakers, regulatory officials, academia, and the public (including the agricultural sector).

The most commonly cited barrier by nearly every respondent to better water management is lack of funds. (This was sometimes expressed in the "barriers" section of the survey and sometimes expressed elsewhere in responses to other questions.) For some, the lack of funds reflects a generally inadequate level of investment in water technology and maintenance; for others, the issues are, in whole or in part, logistical, with funding going to the wrong sources or being administered in a way that does not support efficient technology development or implementation.

**Attachment 1**

**Senate Bill No. 1070**

CHAPTER 750

An act to amend Section 13167 of, and to repeal and add Section 13181 to, the Water Code, relating to water.

[Approved by Governor September 29, 2006. Filed with Secretary of State September 29, 2006.]

LEGISLATIVE COUNSEL'S DIGEST

SB 1070, Kehoe. Water quality information.

(1) Existing law, the Porter-Cologne Water Quality Control Act, requires the State Water Resources Control Board, in conjunction with the California regional water quality control boards, to implement a public information program on matters involving water quality and to maintain an information file on water quality research and other pertinent matters. This bill would require the state board, with the assistance of the regional boards, to implement a public information program on water quality matters and to place and maintain on its Internet Web site a public information file on water quality monitoring, assessment, research, standards, regulation, enforcement, and other pertinent matters, as prescribed.

(2) The act requires the state board and the regional boards to carry out various monitoring functions. The act requires the state board, to the extent that funds are available, to prepare and complete, on or before January 1, 2000, an inventory of existing water quality monitoring activities within state coastal watersheds, bays, estuaries, and coastal waters. The federal Clean Water Act prohibits the Environmental Protection Agency from approving certain grants for state pollution control programs in the absence of a determination that the state has provided or is carrying out an appropriate monitoring and reporting program, as specified.

This bill would repeal the provision relating to the preparation of an inventory and would require the California Environmental Protection Agency and the Resources Agency, on or before December 1, 2007, to enter into a memorandum of understanding for the purposes of establishing the California Water Quality Monitoring Council, which the state board would be required to administer. The bill would require the monitoring council to review existing water quality monitoring, assessment, and reporting efforts and to recommend specific actions and funding needs necessary to coordinate and enhance those efforts. The bill would require the memorandum of understanding to describe the means by

which the monitoring council shall formulate recommendations to (a) reduce redundancies, inefficiencies, and inadequacies in existing water quality monitoring and data management programs and (b) ensure that water quality improvement projects financed by the state provide specific information necessary to track project effectiveness with regard to achieving clean water and healthy ecosystems. The bill would require the monitoring council to undertake various actions relating to water quality data collection. The bill would require the Secretary of the California Environmental Protection Agency, commencing December 1, 2008, to conduct a triennial audit of the effectiveness of a comprehensive monitoring program strategy, which the state board would be required to develop in accordance with the Clean Water Act.

*The people of the State of California do enact as follows:*

SECTION 1. The Legislature finds and declares all of the following:

- (a) The Legislative Analyst's Office has concluded that ambient water quality monitoring is the foundation for much of the work of the State Water Resources Control Board, including basin planning, standards setting, and permitting.
- (b) The Government Accounting Office has determined that the United States Environmental Protection Agency (EPA) and the states need comprehensive water quality monitoring and assessment information on environmental changes and conditions over time and that, in the absence of this information, it is difficult for the EPA and the states to establish priorities, evaluate the success of programs and activities, and report on accomplishments.
- (c) The National Research Council has similarly recommended the development of a uniform, consistent approach to ambient water quality monitoring and data collection, increased resources for water monitoring, and improved coordination of monitoring.
- (d) According to California's 2002 biennial monitoring report to the EPA, the state can only report on the health of 22 percent of its coastal shoreline, 34 percent of its lakes and reservoirs, and 15 percent of its rivers and streams due to a lack of monitoring data. There is no single place where the public can go to get a specific look at the health of water bodies in its own backyard, or even to get an overall picture of the health of the state's waters.
- (e) State water board funding for ambient surface water monitoring has fluctuated significantly over the years, and is inadequate to ensure the assessment of all waters. The monitoring efforts that are underway could be enhanced significantly with increased coordination of the many separate monitoring activities that are going on at the local, state, and federal levels. Historically, the use of different protocols and data management systems have typically precluded the full and effective use of available water quality monitoring data.
- (f) The development of new programs to control agricultural and timber

pollution, and the implementation of hundreds of new projects financed by bond funds to improve water quality, may produce water quality improvements that should be documented. The State of California cannot afford to waste the opportunities provided by these and other water quality improvement programs.

(g) Numerous water monitoring efforts are conducted by local, state, and federal agencies, regulated entities, and citizen monitoring groups. Many of these efforts are uncoordinated, and as a result funds and information are not being used as effectively as they could be. In addition, redundant monitoring activities can occur because of a lack of basic information relative to the scope of monitoring activities throughout the state. For example, there are 100 water quality monitoring efforts underway in the central valley alone, and coordination is minimal.

(h) Better coordination of ongoing monitoring efforts, and more targeted identification of specific monitoring needs, would place California in a better position to obtain additional needed monitoring funding, particularly federal funding. Additional support can be found through the savings provided by increased coordination and integration of existing monitoring efforts.

(i) Californians should be able to readily access basic information that already exists about the state's waters and how those waters are protected and restored. By their recent approval of a constitutional amendment (Proposition 59), California voters have indicated their strong support for open and transparent government. The "government" of state waters should be carried out in a similarly open manner. At a minimum, all information that is currently available to agencies should be made readily available to the public via the Internet.

SEC. 2. Section 13167 of the Water Code is amended to read:

13167. (a) The state board shall implement, with the assistance of the regional boards, a public information program on matters involving water quality, and shall place and maintain on its Internet Web site, in a format accessible to the general public, an information file on water quality monitoring, assessment, research, standards, regulation, enforcement, and other pertinent matters.

(b) The information file described in subdivision (a) shall include, but need not be limited to, copies of permits, waste discharge requirements, waivers, enforcement actions, and petitions for review of these actions pursuant to this division. The file shall include copies of water quality control plans and policies, including any relevant management agency agreements pursuant to this chapter and Chapter 4 (commencing with Section 13200), and monitoring data and assessment information, or shall identify Internet links to that information. The state board, in consultation with the regional boards, shall ensure that the information is available in single locations, rather than separately by region, and that the information is presented in a manner easily understandable by the general public.

SEC. 3. Section 13181 of the Water Code is repealed.

SEC. 4. Section 13181 is added to the Water Code, to read:

13181. (a) (1) On or before December 1, 2007, the California Environmental Protection Agency and the Resources Agency shall enter into a memorandum of understanding for the purposes of establishing the California Water Quality Monitoring Council, which shall be administered by the state board.

(2) As used in this section, “monitoring council” means the California Water Quality Monitoring Council established pursuant to this section.

(3) The monitoring council may include representatives from state entities and nonstate entities. The representatives from nonstate entities may include, but need not be limited to, representatives from federal and local government, institutions of higher education, the regulated community, citizen monitoring groups, and other interested parties.

(4) The monitoring council shall review existing water quality monitoring, assessment, and reporting efforts, and shall recommend specific actions and funding needs necessary to coordinate and enhance those efforts.

(5) (A) The recommendations shall be prepared for the ultimate development of a cost-effective, coordinated, integrated, and comprehensive statewide network for collecting and disseminating water quality information and ongoing assessments of the health of the state’s waters and the effectiveness of programs to protect and improve the quality of those waters.

(B) For purposes of developing recommendations pursuant to this section, the monitoring council shall initially focus on the water quality monitoring efforts of state agencies, including, but not limited to, the state board, the regional boards, the department, the Department of Fish and Game, the California Coastal Commission, the State Lands Commission, the Department of Parks and Recreation, the Department of Forestry and Fire Protection, the Department of Pesticide Regulation, and the State Department of Health Services.

(C) In developing the recommendations, the monitoring council shall seek to build upon existing programs rather than create new programs.

(6) Among other things, the memorandum of understanding shall describe the means by which the monitoring council shall formulate recommendations to accomplish both of the following:

(A) Reduce redundancies, inefficiencies, and inadequacies in existing water quality monitoring and data management programs in order to improve the effective delivery of sound, comprehensive water quality information to the public and decisionmakers.

(B) Ensure that water quality improvement projects financed by the state provide specific information necessary to track project effectiveness with regard to achieving clean water and healthy ecosystems.

(b) The monitoring council shall report, on or before December 1,

2008, to the California Environmental Protection Agency and the Resources Agency with regard to its recommendations for maximizing the efficiency and effectiveness of existing water quality data collection and dissemination, and for ensuring that collected data are maintained and available for use by decisionmakers and the public. The monitoring council shall consult with the United States Environmental Protection Agency in preparing these recommendations. The monitoring council's recommendations, and any responses submitted by the California Environmental Protection Agency or the Resources Agency to those recommendations, shall be made available to decisionmakers and the public by means of the Internet.

(c) The monitoring council shall undertake and complete, on or before April 1, 2008, a survey of its members to develop an inventory of their existing water quality monitoring and data collection efforts statewide and shall make that information available to the public.

(d) All state agencies, including institutions of higher education to the extent permitted by law, that collect water quality data or information shall cooperate with the California Environmental Protection Agency and the Resources Agency in achieving the goals of the monitoring council as described in this section.

(e) In accordance with the requirements of the Clean Water Act (33 U.S.C. Sec. 1251 et seq.) and implementing guidance, the state board shall develop, in coordination with the monitoring council, all of the following:

(1) A comprehensive monitoring program strategy that utilizes and expands upon the state's existing statewide, regional, and other monitoring capabilities and describes how the state will develop an integrated monitoring program that will serve all of the state's water quality monitoring needs and address all of the state's waters over time. The strategy shall include a timeline not to exceed 10 years to complete implementation. The strategy shall be comprehensive in scope and identify specific technical, integration, and resource needs, and shall recommend solutions for those needs so that the strategy may be implemented within the 10-year timeframe.

(2) Agreement, including agreement on a schedule, with regard to the comprehensive monitoring of statewide water quality protection indicators that provide a basic minimum understanding of the health of the state's waters. Indicators already developed pursuant to environmental protection indicators for statewide initiatives shall be given high priority as core indicators for purposes of the network described in subdivision (a).

(3) Quality management plans and quality assurance plans that ensure the validity and utility of the data collected.

(4) Methodology for compiling, analyzing, and integrating readily available information, to the maximum extent feasible, including, but not limited to, data acquired from discharge reports, volunteer monitoring groups, local, state, and federal agencies, and recipients of state-funded or

federally funded water quality improvement or restoration projects.

(5) An accessible and user-friendly electronic data system with timely data entry and ready public access via the Internet. To the maximum extent possible, the geographic location of the areas monitored shall be included in the data system.

(6) Production of timely and complete water quality reports and lists that are required under Sections 303(d), 305(b), 314, and 319 of the Clean Water Act and Section 406 of the Beaches Environmental Assessment and Coastal Health Act of 2000, that include all available information from discharge reports, volunteer monitoring groups, and local, state, and federal agencies.

(7) An update of the state board's surface water ambient monitoring program needs assessment in light of the benefits of increased coordination and integration of information from other agencies and information sources. This update shall include identification of current and future resource needs required to fully implement the coordinated, comprehensive monitoring network, including, but not limited to, funding, staff, training, laboratory and other resources, and projected improvements in the network.

(f) The state board shall identify the full costs of implementation of the comprehensive monitoring program strategy developed pursuant to subdivision (e), and shall identify proposed sources of funding for the implementation of the strategy, including federal funds that may be expended for this purpose. Fees collected pursuant to paragraph (1) of subdivision (d) of Section 13260 may be used as a funding source for implementation of the strategy to the extent that the funding is consistent with subparagraph (B) of paragraph (1) of subdivision (d) of Section 13260.

(g) Data, summary information, and reports prepared pursuant to this section shall be made available to appropriate public agencies and the public by means of the Internet.

(h) (1) Commencing December 1, 2008, the Secretary of the California Environmental Protection Agency shall conduct a triennial audit of the effectiveness of the monitoring program strategy developed pursuant to subdivision (e). The audit shall include, but need not be limited to, an assessment of the following matters:

(A) The extent to which the strategy has been implemented.

(B) The effectiveness of the monitoring and assessment program and the monitoring council with regard to both of the following:

(i) Tracking improvements in water quality.

(ii) Evaluating the overall effectiveness of programs administered by the state board or a regional board and of state and federally funded water quality improvement projects.

(2) The Secretary of the California Environmental Protection Agency shall consult with the Secretary of the Resources Agency in preparing the

audit, consistent with the memorandum of understanding entered into pursuant to subdivision (a).

(i) The state board shall prioritize the use of federal funding that may be applied to monitoring, including, but not limited to, funding under Section 106 of the Federal Water Pollution Control Act, for the purpose of implementing this section.

(j) The state board shall not use more than 5 percent of the funds made available to implement this section for the administrative costs of any contracts entered into for the purpose of implementing this section.

## Attachment 2

### **USGS/EPA Agreement on the Management of Water Quality Data**

USGS and EPA will deliver data from USGS/NWIS and EPA/STORET in a common format to Federal, State, and Tribal organizations, as well as to the general public and scientific community to:

1. Analyze and report on the state of the nation's water environment
2. Provide a common basis for integrated water-quality analysis and protection
3. Provide an information base for scientific inquiry about water quality

An underlying goal is to ensure that the data from these important government databases are documented to describe their quality so that users can establish the utility and comparability of the data. The Water-Quality Data Elements (WQDE) developed and approved by Advisory Committee on Water Information (ACWI) provides the framework for such documentation. USGS and EPA jointly accept the goal that their data systems will include meta-data associated with each water-quality result, based on the WQDE, as soon as practicable. The agencies also recognize that much data exists for which available documentation is limited, and yet these data are useful for certain purposes. Therefore, the agencies will not exclude such data from their systems because of these limitations. Rather, the agencies will facilitate and encourage the maximum use of metadata, to enhance the usefulness of the information for multiple purposes.

As the primary goal in the delivery of these data, the USGS and EPA, working with the National Water Quality Monitoring Council (NWQMC), will develop a geospatial internet-based query tool. This tool should be designed to facilitate the greatest possible sharing of data from all sources to all users. It will be designed to help all users identify data that are relevant to their needs and direct the users to the specific data holdings in order for them to retrieve The data from the most appropriate source, along with consistently defined metadata. The goal is that this system would search many sources of information in addition to USGS and EPA sources.

A joint team of our technical staff will be convened to outline options and identify the tasks required to effectively provide our data to the user community. We will create and maintain a collaborative environment between USGS and EPA to facilitate the development, implementation, and refinement of effective tools to share data with the entire user community. We will do so in a manner that assures that each agency can engage in and understand the system design decisions of the other. The intent is to improve the coordination between the two database systems as they are each modified to meet their respective users' needs to facilitate the development and implementation of effective tools to share our data with the broadest possible user community. As external user groups are assembled for the NWIS and STORET systems, each agency will insure that the other is represented on these user groups.

# DRAFT

We will strive to achieve these objectives as soon as is practicable within the constraints of available resources. The technical team will report quarterly to USGS and EPA managers and also report to the NWQMC whenever requested.

This agreement supercedes the May 17, 2000 agreement between USGS and EPA on the issue of NWIS and STORET compatability.

This plan is agreed on and signed by:

/SIGNED/

**Robert M. Hirsch**, Associate Director for Water, U.S. Geological Survey

**February 25, 2003**