Comments on CALFED Meeting, August, 1997

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Appropriate Goals For CALFED Water Quality Remediation Programs

Via e-mail

August 16, 1997

Richard Woodard
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1416 Ninth Street; Suite 1155
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Dear Rick:

I wish to follow up on the discussions of the August 6, 1997 CALFED Water Quality Task Group meeting concerning appropriate approaches for defining Delta water quality remediation goals for CALFED's Water Quality Program. Bob Berger independently raised the issue that I have repeatedly raised throughout my now eight months of reviewing CALFED WQTG materials, of focusing on chemical impacts rather than chemicals in evaluating the success of a CALFED program. In defense of managing chemicals rather than chemical impacts, at the August 6, 1997 meeting you raised the argument that you have raised in the past of having to use a "legally defensible" tool, such as a chemical concentration, relative to the water quality objectives. That approach is only legally defensible for point source dischargers of domestic and industrial waste waters where such dischargers are obligated to meet water quality standards (objectives) at the edge of a mixing zone. It is not a legally defendable approach for urban stormwater and non-point source discharges, which are likely to be the primary sources of materials that are of concern in Delta Water quality.

The legally defendable pollution control program for the NPDES regulated urban stormwater discharges in the Delta watershed is defined by the US EPA as controlling **pollution** to the **maximum extent practicable** (MEP) through the use of **best management practices** (BMPs). While water quality standards are the ultimate goals of such control, both the US EPA and the State Water Resources Control Board have adopted positions that violation of a water quality standard in an ambient water receiving regulated urban stormwater runoff does not constitute a violation of the NPDES permit. It

is important to note that the stormwater discharges of communities with a population of less than 100,000 are, at this time, unregulated. While the US EPA is discussing the developing of an NPDES permit program for regulating stormwater runoff for communities between 50,000 and 100,000, it will likely be many years, if ever, before such a program is in place where these communities must meet water quality standards in their stormwater runoff.

I have previously provided you with a discussion of why US EPA water quality criteria and state standards based on these criteria are inappropriate goals for urban stormwater runoff water quality management. The basic problem is that regulating urban stormwater runoff using the same approach as NPDES municipal and industrial waste water discharges, i.e. meeting water quality standards at the edge of a mixing zone where there is no more than one violation of a standard every three years, will cost the regulated community one to two dollars per person per day forever. It is for this reason that the US EPA and the WRCB backed off from Clean Water Act requirements in regulating urban stormwater runoff.

Independent of that situation, as discussed in my review of this issue that was sent to you, there are fundamental technical issues as to why urban stormwater runoff should be regulated differently that relate to the concentration of available forms duration of exposure relationships that typically occur in urban stormwater runoff relative to the same relationships in the typical stormwater runoff event. It is the US EPA recommended policy now that regulated urban stormwater dischargers should focus on finding real water quality problems - use impairments in the receiving waters caused by stormwater runoff associated constituents. Where such problems are found, then these should be controlled using BMPs to the MEP. This is the legally defensible approach and the approach that CALFED should follow in establishing goals for chemical constituents that are derived from regulated urban stormwater runoff.

A basic problem of CALFED adopting water quality standards as remediation goals, in which CALFED programs are assessed in terms of achieving the standard, is that there are no statewide water quality standards (objectives) in California today. The US EPA, under the National Toxics Rule, has recently promulgated proposed standards. However, it will likely be years before these standards are actually adopted and implemented into permits. Meanwhile, CALFED will have to formulate WQTG programs. It is my understanding that it will likely be a number of years before the new standards will be legally defensible standards for the few regulated dischargers to which these standards apply. A key issue that remains to be resolved is the adequacy of the US EPA's economic analysis for the application of these standards to NPDES dischargers. Many municipalities and industries find that the US EPA's approach for conducting economic analyses is inadequate. This approach could be challenged in the courts and voided by the courts. This is what happened to the state standards adopted by the Water Resources Control Board in the early 1990s. Therefore, there is considerable uncertainty as to when the National Toxics Rule based criteria will become legally defensible standards in California that are applicable to NPDES permits. CALFED could readily find itself in a

position of trying to implement chemical constituent control programs that are not in accord with legally defensible requirements by focusing on chemically based criteria.

Another aspect of this situation is the one I have discussed in other correspondence of the growing recognition that the US EPA made a significant error in adopting the Independent Applicability Policy. At the last national Water Environment Federation conference a full session was devoted to this problem. I have also published on this problem and believe I sent you a copy of that paper. It is available from my web site (http://members.aol.com/gfredlee/gfl.htm). The Agency has proposed to change this policy through its current announced proposed rule making for water quality standards. If this policy is changed, as it should be, then the chemically based water quality criteria/standards will not be the legally defensible requirements. Instead, they would be used as triggers to allow the regulated community to determine whether the exceedance of a criterion represents a real water quality use impairment. This is the approach that CALFED should use in establishing water quality remediation goals.

With respect to legally defensible approaches to regulating non-point source discharges/runoff, the situation is not clear on the role of achieving water quality standards (objectives). Until such time as legally defensible objectives are in place and have been through court challenges, the current situation of not having numeric chemical standards for most regulated chemical constituents will likely continue to prevail. I have been trying for almost two years to get the Central Valley Regional Water Quality Control Board (CVRWQCB) to fully enforce US EPA water quality criteria in ambient waters for an NPDES regulated discharger. Thus far, this Board has chosen not to do so. The former executive officer for the Board was terminated over this issue. It remains to be seen what the new executive officer and Board will do in fully enforcing the use of US EPA criteria as legally defensible standards in regulating NPDES permitted discharges of wastewaters. Recently, the University of California, Davis has announced its plans to challenge the CVRWQCB's implementation of US EPA criteria into its NPDES permit since these criteria have not been formally adopted by the Regional Board through a public review process. UCD administration has indicated that there are several other communities that will join with them in this effort. While it has been assumed that US EPA criteria could be used by the Regional Boards as legally defensible standards, the appropriateness of this approach is now somewhat in doubt. The same situation will apply for a number of years with respect to the National Toxics Rule criteria that the US EPA has recently proposed.

The CVRWQCB has, as one of its Basin Plan objectives, control of toxicity in ambient waters. CALFED has as a constituent of concern "unknown toxicity." It would seem appropriate that the CALFED approach for assessing the adequacy of constituent of concern control programs for potentially toxic constituents is the use of the US EPA standard three-species test as well as the chemical test and, to the extent that funds were available, developing aquatic organisms assemblage information. At the August 6th meeting, Val Connor recommended a best professional judgement weight of evidence triad approach, where appropriately conducted chemistry, biological effects based assessments such as toxicity tests and information on the numbers, types and

characteristics of the organisms present relative to the habitat characteristics and reference areas with similar habitat, be used to assess whether there is a water quality problem due to potentially toxic chemicals. While there are some, like the person from the Bureau of Reclamation, who will speak out against toxicity testing because of the lack of familiarity of how the tests are used and their effectiveness, such testing addresses real potential water quality problems. These types of tests are legally defensible and should be used by CALFED as a basis for implementing its Water Quality Program objectives of controlling potentially toxic chemicals and unknown toxicity.

This is a far more technically valid approach than trying to control aquatic life toxicity based on chemical measurements where it is necessary to try to extrapolate from a chemical measurement to a water quality impact of concern to people. Those with an elementary knowledge of aquatic chemistry have known since the late 1960s chemical concentrations are not a valid tool for assessing toxicity. They are an indicator of potentially toxic chemicals. While there are questions about the interpretation of toxicity test results with respect to such issues as whether the toxicity test species (the three-standards species) are representative of all species that are present in the Delta, these questions are small compared to the magnitude of the justified well-known questions about the validity of relying on chemical concentration-based numbers as a goal. At least with toxicity testing the issue of biological effects has been addressed to a considerable extent. With chemicals it is not addressed at all. On a site specific basis it assumes that the Delta is made up of water like Lake Superior and that the chemicals that go into the Delta are identical to the most toxic available forms that are available from chemical supply houses in reagent grade chemicals.

There is a vast arena of unregulated stormwater runoff that is a source of potentially significant water quality use impairment within the Delta and its tributaries. Runoff from ag lands, forests, and communities with less than 100,000 people are essentially unregulated with respect to being required to achieve water quality standards in ambient waters. CALFED's currently proposed approach of trying to use chemically-based target ranges as set forth in Table 3.4 of the draft "Component Report" is not only technically invalid for many of the constituents of concern, it is also not legally defensible for both regulated and unregulated dischargers. The CALFED Water Quality Program should not be based on an exceedance of a numeric water quality standard, but must be based on finding a real water quality problem in CALFED waters, determining the cause of the problem and the source of the specific constituents responsible for the problem. This approach is legally defensible and readily implementable. It is one that CALFED can gain public support for.

It is important to understand that I have not heard anyone advocate the abandonment of measurement of chemical concentrations. We are advocating that CALFED not mechanically use chemical concentrations as the remediation goal - target objective. Certainly I and I know others are concerned that toxicity measurements be included in the evaluation of CALFED program effectiveness as a parameter for potentially toxic chemicals. Failure to do so will clearly cause CALFED Water Quality Task Group activities to be judged significantly technically deficient and will lead to a potential effort

to redirect CALFED to focus on real water quality issues as opposed to those that are contrived out of overly protective approaches. A failure to routinely measure toxicity will also mean that the CALFED Water Quality Program will fail to fulfill its obligation to adequately and reliably address unknown toxicity as well as the CVRWQCB Basin Plan requirements of no toxicity in ambient waters. I, for one, and I believe others would work with CALFED management in developing appropriate approaches for using toxicity test results as the goal for CALFED control programs for potentially toxic chemicals and unknown toxicity.

In summary, your advocating chemically-based water quality standards as legally defensible goals has limited applicability to a few wastewater dischargers in the Delta watershed. Even here it may be many years before that approach is legally defensible. There is need for CALFED to develop legally defensible goals for the regulated community such as urban stormwater dischargers as well as the vast unregulated community of non-point source dischargers. Biological effects-based test approaches using toxicity tests and bioaccumulation are legally defensible goals that can be readily implemented. They should become the target objectives for evaluating CALFED's Water Quality Program effectiveness.

If you or others in CALFED management have questions on this matter, please contact me.

Sincerely yours,

Fred

G. Fred Lee, PhD, DEE

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COMMENTS ON
CALFED ECOSYSTEM RESTORATION PROGRAM PLAN
VISION FOR ECOSYSTEM MONITORING

Via e-mail

August 16, 1997

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Dear Rick:

At the August 6, 1997 meeting of the CALFED Water Quality Program, you and Bellory Fong presented a discussion on the Comprehensive Monitoring, Assessment, and Research Program. It was indicated that there was interest in receiving comments on the Volume III: *Ecosystem Restoration Program Plan, Vision for Ecosystem Monitoring*, Review Review Draft: July 16, 1997 that was distributed at that meeting. Overall, there are some problems with descriptions of parameters and their use as well as some of the proposed monitoring program components. Please find presented below my comments on this program.

Page 101, second column states that the Sub-Program purpose is *"To routinely monitor the basic water quality variables (listed below) that define the fundamental conditions of aquatic habitat in the Bay-Delta system."* CALFED should be careful to not get into the trap of routinely monitoring selected parameters because this is traditionally done, but intelligently monitor focusing the resources available on addressing issues that are of potential importance to Delta ecosystems and water quality.

Discussions of "Sub-Program Element Descriptions (parameters)" for temperature should be expanded to include rate of temperature change. The rate of temperature change is as important, if not more important, in some situations than the absolute temperature. Under "Salinity" the word is "specific conductance," not conduction, and it should read: "Specific conductance is a more appropriate measure of salt content than salinity in freshwater systems."

Under "Chlorophyll concentration," there will be many who will not understand what "traditional box" means.

Under "pH" the statement: *"A quantitative expression for acidity or alkalinity of the area sampled"* is in error. pH is not a measure of acidity or alkalinity; they are different parameters related to buffer capacity. pH is a measure of the hydrogen ion activity in the water sample.

Page 102, under "Organic Carbon," states that *"Organic Carbon - Provides information on sources and fluxes of the primary support of the estuarine food chain."* This statement, as well as other statements made by various CALFED staff and others, shows a lack of understanding of the characteristics of organic carbon. A number of years ago I wrote an invited review on this issue in which I pointed out what was well-known then and is still well known today, that most of the organic carbon in aquatic systems is not suitable food; it is the residues after bacteria and other organisms have extracted the useful components from the organic carbon. Many waterbodies have from two to 10 mg/L organic carbon, much of which is dissolved and is inert. It does not serve as a food base for any organism; it is a residue, much as humus in soils is a residue left over from previous metabolic activity. CALFED needs to begin to address the issue of what forms of organic carbon are in fact useable as food and refine the general statements about how organic carbon extracted from Delta Islands as part of farming activities is an important food source for aquatic life. Much of what is extracted from the peat soils is non-useable by bacteria and other forms of aquatic life as food.

Page 103, under "Key Focused Research Areas," mentions in item 2: *"Development of a plan for storage, retrieval and analysis of water quality data."* I have recently provided guidance on the approach that, based on my experience, should be considered for the Sacramento River Watershed Program data storage and retrieval system. Those in CALFED concerned with this may want to review the comments of the workgroup that is addressing these issues for the Sacramento River system.

Page 103, "Key Focus Research Areas," item 3: *"Development of a computer model or models to predict water quality conditions in unmonitored areas and evaluate restoration scenarios."* That approach is dangerous and portrays a blind faith in the ability of computer modeling to provide useful information. Computer models of the type that are available today, relating physical, chemical and biological characteristics of waterbodies have limited predictive capability to assess the impact of altering load driving parameters on the response of an aquatic system. Modeling of the type that is typically done today involving physical, chemical and biological characteristics of waterbodies is largely a mathematical game that has little or no utility in predicting impacts of constituents and are not reliable for evaluating altered loads of constituents through CALFED restoration programs. The way to make that type of assessment is through measurements - proper monitoring. It can not be made through modeling. Mathematical models are useful in organizing thoughts regarding understanding the system. They are not useful for predicting or evaluating a system, and they can certainly never predict the water quality characteristics of unmonitored areas. Such areas have to be monitored.

Page 104, top of the first column, "Sub-Program Purpose," states *"To monitor levels of contaminants potentially harmful to aquatic life, system-wide, in water, sediments, and biota for documenting trends in contamination levels, bioaccumulation, and identifying potential biological effects and to identify time periods and locations where specific contamination reduction efforts should be focused."* While that objective is appropriate, the program that is proposed will fall short of that objective since the monitoring that has been done, or is being done, is not utilizing information available on what is known about

how chemical constituents impact aquatic life. It appears that the CALFED monitoring program, as it is formulated, will be another program that will generate massive amounts of data, at great expense, where in the end the data will be filed in a file cabinet (computer data storage based system) and will become more of what is known as "file cabinet fodder" since it does not provide a significant amount of useful information on the key issues that need to be addressed.

Under "Sub-Program Element Descriptions," item 1 mentions herbicides, pesticides and metals as the parameters to be monitored. In collaboration with existing programs, the monitoring of pesticides, herbicides and metals will not provide information on anything other than the concentrations present as a result of the fact that it is not possible to relate concentrations measured by various techniques commonly used in monitoring programs to water quality impacts. The first step in monitoring of the Delta should not involve throwing large amounts of money at monitoring various conventional pollutants, but should instead focus on finding real water quality use impairments in the Delta that need to be managed. For example, copper or, for that matter, many other constituents in the Delta is not a problem per se, unless it affects the numbers, types and characteristics of desirable forms of aquatic life. The monitoring, therefore, must be focused on finding real water quality use impairments determining the cause of the use impairment and the constituents responsible. Based on this information, through forensic analysis, the monitoring program should determine the source of the constituents responsible for causing the use impairment. Rather than measuring chemicals and trying, unsuccessfully, to extrapolate to impacts, focus on impacts and then determine through relatively simple, straight-forward procedures that have been available for many years, the significance, cause and source of the constituents responsible.

I have been involved in water quality monitoring programs throughout my over 37 year professional career. I have helped design major monitoring programs for components of the Great Lakes and have been involved in many large, as well as small, scale studies, where monitoring was a key component. It became clear to me several years ago that the traditional approach, which is the approach that CALFED is proposing, has limited utility for monitoring and helping to identify and manage real water quality use impairments that are of concern to the people who voted for the restoration of the Delta. Because of the shortcomings in conventional monitoring, Dr. Anne Jones-Lee and I have developed what we call Evaluation Monitoring, which changes the focus from ambient water monitoring or source monitoring to problem identification and characterization monitoring. Extensive information on Evaluation Monitoring is available from my web site (http://members.aol.com/gfredlee/gfl.htm), which includes summary papers and an over 100-page guide devoted to implementing this approach on a group of waterbodies. These papers and reports are available as downloadable files, and I would be happy to answer any questions about them.

It is my recommendation that a significant part of CALFED's monitoring efforts be specifically focused on developing and implementing an Evaluation Monitoring program for the Delta. This will not be a routine monitoring program of the type described in the Ecosystem Restoration Program Plan, Vision for Ecosystem Monitoring draft, July 16,

1997. That proposed program will cost large amounts of money and fall far short of providing the information needed to restore the Delta.

Evaluation monitoring is not simply some toxicity measurements or bioaccumulation measurements or fish condition measurements which are added on as part of the routine monitoring. Such problem identification issues such as toxicity, bioaccumulation, and fish condition, become the focal point of the monitoring. Do not measure heavy metals and try to extrapolate to toxicity. Measure toxicity, find out what it is due to. If it is due to a heavy metal, what are the sources of the toxic components of heavy metals that caused the toxicity in the system of concern?

Page 104, second column, second paragraph states, *"Toxicity monitoring has the potential to be logistically difficult and expensive."* This is a typical statement made by those who are not familiar with toxicity monitoring. Toxicity monitoring is far less expensive and easily implemented than properly conducted chemical monitoring. With respect to the SFEI bioaccumulation monitoring, mention should be made here that the Sacramento River Watershed Program has also developed a bioaccumulation monitoring program that is being implemented this summer.

The statement is also made about using the State's Mussel Watch program in the Delta monitoring. Great caution must be exercised in using Mussel Watch data. It is not reliable for identification of problems unless people eat mussels or freshwater clams. Mussel Watch data is subject to many factors that are not related to the available concentrations of constituents in the waterbody. Further, it is not possible to relate Mussel Watch bioaccumulation data to concentrations of constituents in aquatic life of concern to people who use the organisms as food.

Page 104, item 4, "Fish Condition Monitoring" is an area that needs attention for problem identification, although it will almost certainly prove to be frustrating for many years because of the difficulty in trying to relate morphological changes in fish to environmental factors. A number of groups have been working on this problem for many years with limited success. It does not mean it should not be done. It should be understood, however, that fish condition monitoring is necessary for problem identification, but will not likely yield useful results in the near term other than problem identification.

Page 105, "Key focused-Research Topic Areas," mentions in item 2, *"Pilot-level water and sediment contaminants ..."* The issue of sediment monitoring for chemical constituents and toxicity is an issue that I have focused on for over 30 years. I have conducted over $2 million in research on this topic and have published over 50 papers and reports dealing with various aspects of it. While there is need for studies on sediment impacts on water quality, to conduct a routine monitoring program of chemical concentrations of constituents and sediments is of limited utility. Even toxicity measurements in sediments, while far more reliable than chemical concentration measurements for identifying toxic conditions, still do not provide interpretable results with respect to the significance of chemical constituents in sediments that impact the

beneficial uses of the waterbody in which the sediments are located. Last fall I presented an invited paper, Lee, G.F. and Jones-Lee A., "Evaluation of the Water Quality Significance of the Chemical Constituents in Aquatic Sediments: Coupling Sediment Quality Evaluation Results to Significant Water Quality Impacts," In: WEFTEC '96, Surface Water Quality and Ecology I & II, Vol 4, pp 317-328, Proc. Water Environ. Fed. Annual Conference (1996), in which I discussed the interpretation of sediment toxicity issues relative to water quality - use impairment impacts and natural toxicity of sediments. This paper is available as a downloadable file from my web site (http://members.aol.com/gfredlee/gfl.htm).

Based on my experience, CALFED needs to carefully formulate a sediment quality investigation program that properly incorporates what is well known in the field today with how chemical constituents in sediments potentially impact the beneficial use of a waterbody. CALFED needs to develop a program that begins to address the highly significant data gaps that exist between measurement of a characteristic of a sediment and the beneficial use of the waterbodies in which the sediments are located. CALFED water quality sediment programs should be based on an effects-based approach rather than a chemical approach. The US EPA and Corps of Engineers, as part of managing open water disposal of contaminated dredged sediments, adopted an effects-based approach in the late 1970s. The approach has been reaffirmed a number of times by both agencies. It has been through public Federal Register review and is an effective, reliable approach for assessing the potential impacts of chemical constituents in sediments. There are peer review guidance manuals on various testing procedures that are used to evaluate the effects of constituents in sediments that are jointly developed by the US EPA and Corps of Engineers. This is a far more reliable approach than the chemically-based approach. While bureaucratically simpler to implement, the chemically-based approach is technically invalid and can readily result in massive waste of public and private funds in sediment constituent control that will have no impact on the beneficial uses of the waterbody in which the sediments are located. I have published a number of papers on these issues which are available from my web site.

Page 105, under "Key Focused-Research Topic Areas," item 3, *"Development and implementation of biomarkers..."* indicates that CALFED plans to devote resources to this area. CALFED should proceed cautiously with devoting resources to trying to use biomarkers as a tool to identify adverse impacts of chemicals to aquatic life. The biomarker concept and approach has been around since the late 1960s. I have been following the use of biomarkers for assessing impacts of chemicals on aquatic organisms since the 1960s. While this is an area of interest, it is not one that should receive a lot of CALFED funding. A couple of years ago the ASTM held a three day conference devoted to a review of what is known about the reliability of biomarkers as an indicator of water quality/ecosystem impacts of chemical constituents, this resulted in the symposium proceedings entitled, *Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment*, Fifth Volume, STP 1306 (1996). The consensus of the group at the meeting was that while biomarkers are of interest, they are years away from being a reliable tool to evaluate the potential for chemical constituents to adversely impact aquatic organisms, ecosystems or water quality. Basically, biomarkers are now only

useful to indicate that there has been an exposure to a chemical. What the biomarker response means is largely unknown and is not likely to be elucidated in time to be of much value to at least the first 10 years of CALFED.

Page 105, right column, Sub-Program Element Descriptions, the development of wetlands and riparian habitat. As an individual who did some of the first, if not the first work ever done on chemical characteristics of fresh water wetlands and who has been involved in wetlands water quality issues over the last 30 years, I am strongly supportive of work in this area. However, great caution must be exercised to be sure that the monitoring programs properly evaluate the chemical/biochemical characteristics of wetlands. There is considerable misconception about these areas and especially how such areas handle potential pollutants. Generally wetland areas tend to be able to detoxify, immobilize or otherwise render inert large amounts of potentially harmful chemical constituents. They can, however, be overloaded. Further, in evaluating wetlands, it is important to look at the annual cycle and not just the growing season. Large amounts of materials that are taken up by vegetation during the growing season are released in short periods of high flow during the late winter/early spring.

Another area of concern is the use of contaminated dredged sediments for shallow water habitat development. I have submitted a proposal to CALFED to work with CALFED management and others in developing a program where contaminated dredged sediments could potentially be used for shallow water habitat development. This will require an intensive monitoring program to be certain that the contaminants in the sediments do not adversely affect aquatic as well as terrestrial life and other aspects of Delta water quality. If the proposal is funded, I will be able to assist in these areas as an active participant. As discussed in the proposal, I have considerable experience and expertise in wetlands development from contaminated sediments through the work I have done over the years with the Corps of Engineers in their Dredged Material Research Program.

Page 106, right column, Sub-Program: Estuary Primary Productivity and Nutrient Monitoring indicates that *"particulate, dissolved, and total organic carbon"* will be measured. In addition, there is need to characterize the organic carbon with respect to its suitability as a food source. Much of the organic carbon that is present in the Delta and in many aquatic systems is a residue after bacteria, etc. have made use of all the degradable components. Even a simple BOD test would be useful to determine how much of the organic carbon is in fact degradable/useable as food.

The bulleted items under the Sub-Program include dissolved nitrogen. In addition, soluble orthophosphate, organic nitrogen and total phosphate should be measured. While, in general, the Delta primary production appears to be limited by available nitrogen in the form of nitrate and ammonia, there is potential for some parts of the Delta and estuary to have surplus nitrate and ammonia compared to available phosphorus. By measuring the soluble orthophosphate and the total phosphate, it is possible to predict the algal available phosphorus. This is of potential importance since it may be possible to limit excessive algal growth in some parts of the Delta by limiting the phosphorus input to the Delta from

domestic wastewater sources. Development of this type of data will enable a proper evaluation of this approach to be made.

In addition to measuring chlorophyll, presumably from planktonic algae, there is also need to assess the amount of attached algae and macrophytes. Some parts of the Delta are experiencing prolific growths of non-planktonic aquatic plants. It is important to gain some information on this biomass since it will directly compete with the planktonic algae for nutrients. Someone highly familiar with data of this type should review the USGS data that has been collected over the years as part of their standard cruises to determine what additional information is needed to understand the issues. This is an area in which I could be of assistance if there is interest.

Page 107, under "Key Focused Research Areas," there is need to examine the productivity of algae attached to surfaces. Also, since wetland areas can have appreciable nitrogen fixation occur on the surface of macrophytes and emergent plants, consideration should be given to assessment to nitrogen fixation in the Delta as a source of nutrients.

In the 1970s, I was asked by the US EPA to develop a water quality monitoring program for hazardous chemicals in the Great Lakes. When I moved back to California in 1989, I updated that program and expanded its scope in the form of a report entitled, "Guidance for Conducting Water Quality Studies for Developing Control Programs for Toxic Contaminants in Wastewaters and Stormwater Runoff" (1992). This report discusses many of the key issues that need to be considered in formulating a technically valid, cost effective water quality and ecosystem monitoring program for the Delta. The report is available as a downloadable file from my web site. Another source of information on developing monitoring programs is the National Research Council's "Assessment of Marine Monitoring: Managing Troubled Waters," 1990. It also provides guidance on the issues that should be considered by CALFED in formulating the Delta's Water Quality Monitoring Program.

Over the past year and a half, I have been active in the Sacramento River Watershed Program where a considerable part of my time has been devoted to discussion of issues that should be considered in formulating a water quality monitoring program for the Sacramento River system. Many of the same issues that have been addressed as part of that system have direct applicability to the Delta system as well. A number of my comments on issues that should be considered in developing a comprehensive monitoring program for the Sacramento River system are available from my web site.

Overall, I feel that there is need for further refinement of the Ecosystem Restoration Program Plan Vision for Ecosystem Monitoring to address the various issues I have raised in these comments. I would be happy to discuss these with anyone interested and be of assistance to the extent that I can. Please contact me if you have questions on these comments.

Sincerely yours,

Fred

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Comments on
CALFED Water Quality Program Component Report

VIA e-mail:

August 15, 1997

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Dear Rick:

Please find presented below my comments on the August, 1997 draft for the CALFED Water Quality Program Component Report that was passed out, in part, at the August 6, 1997 Water Quality Technical Group meeting. I received the August 1, 1997 "working draft" of this report on the afternoon of August 4, 1997. There was not time to comply with the request of providing comments by 10 am Tuesday, August 5, 1997. The "working draft" did not contain key information that was needed to conduct a review, such as several of the important figures and tables, as well as the references. At the August 6, 1997 meeting some of these deficiencies were corrected; however, new ones occurred related to how the draft was photocopied, in which many of the key pages were left out. These were supplied several days later, however, as of yet I still have not received the references for this draft.

At the August 6, 1997 meeting, I specifically indicated to Carol Howe that my approach to reviewing documents is based on having the authors provide a draft that represents the best of their ability to assemble a document that is ready for review. Having been involved in reviewing many reports of this type over the last 37 years, I have repeatedly

found that the piecemeal approach toward review leads to poor quality final reports. Most people who can perform adequate reviews do not have time to re-review drafts where the second and third reviews are caused by the first draft not being adequately prepared before distribution. While my comments on this draft were largely prepared on August 5, 1997 I have held off sending them until the due date of August 15, 1997 since I had hoped that my request for the references, which serve as an important basis for some of the statements made in the draft, would have been fulfilled. Since I have not received the references I am sending these comments indicating that there may be significant additional problems with this draft that would surface as a result of a proper review, which would include checking the references to be certain that the statements made in this draft are appropriate based on the content of the reference material. I have repeatedly found over the years that the authors of materials will fail to adequately or reliably report on issues discussed in a reference, either because they do not understand the material that they are referencing or because they wish to present a particular slant on an issue in support of a particular position.

The request for comments indicated, "Due to time constraints it would be most helpful if you would submit exact wording or references you believe should be included." The writing quality and accuracy of some sections of the current draft is inadequate for a report of this type. As discussed herein, the problems are not of the type that can be addressed by minor changes in wording, or adding a few references. Some parts of the draft need to be rewritten by someone who understands the topic of water quality and the relationship of chemical constituents and pathogenic organisms to water quality.

Page 1-3 discusses Stakeholder Involvement. There is a growing consensus that the stakeholder involvement in formulating the current CALFED Water Quality Program has been far less than what should have taken place in developing this program. The initial round of meetings held last fall and winter developed documents that had a number of significant technical errors in proposed approaches for defining water quality problems and developing approaches for their management. There should have been a series of stakeholder meetings in which these issues were discussed and resolved. Instead, CALFED staff has proceeded with Water Quality Program development, largely without stakeholder involvement. This could prove to be significantly detrimental to developing and implementing the CALFED Water Quality Management Program. It will be important for the CALFED Water Quality Program to develop a true broad-based stakeholder involvement approach for further program development, where draft materials are prepared in a high quality form, and provided to stakeholders, with adequate time for review before holding open stakeholder meeting(s) to discuss issues. There should be no more piecemeal review of draft documents. These meetings should not be like the August 6, 1997 meeting where therewas limited opportunity to address issues in the depth that is necessary for proper program development.

Page 2-1, first paragraph provides a reference to Arthur and Ball, 1978. No references were provided in the draft Water Quality Technical Program report that was sent out for review, as well as subsequent drafts. This has been a problem with some previous WQTG reports, where interested parties have not been able to obtain a copy of the references that

WQTG staff have cited as supporting a particular position that they have advocated. Material should not be sent out for review without references, since it means that the reviewers would have to examine the items at least twice in order to see if the references cited are appropriate and that the materials that were used by the author, which are supposed to be based on the references, do in fact represent proper interpretation of the reference material.

Page 2-4 first paragraph under the "Environment" states that "Mercury can bioaccumulate in the upper levels of the food chain, affecting larger fish, birds and mammals." I would be interested in seeing any evidence that supports the position that bioaccumulation of mercury affects fish. Any statement of this type must be referenced to an authoritative source, since it is not in accord with what is generally known today, with respect to mercury bioaccumulation issues.

Throughout this section the emphasis on nutrients is on algal blooms. The Delta also experiences other types of aquatic plant growth which are not algae. They should be mentioned.

I would be interested in the references to the statement that industrial water is impacted by phosphate and ammonia at the concentrations that are likely to be present in Delta water. I have been involved as a consultant in industrial water treatment for many years and have taught graduate level environmental engineering courses on this topic for over 30 years. It would be highly unusual that phosphate and ammonia, present in Delta waters, are adverse to industrial water quality.

Page 3-1 provides a list of parameters that are of concern. Often a reference is made to a State Water Resources Control Board publication as justification for listing the parameter. However, there is no reference as to what publication is being cited. Further, it should be understood and discussed that the State Water Resources Control Board as well as the Central Valley Regional Water Quality Control Board have certain legal constraints for listing parameters of concern which relate to Clean Water Act requirements. It is well understood, however, that many of these listings are not necessarily technically valid. Jerry Bruns discussed this at our Parameter Assessment Team meeting last spring.

While the parameter can be of concern certainly before any program is mounted to control that parameter by CALFED, actual adverse impact, due to the parameter, should be documented. The Parameter Assessment Team made it clear to CALFED Water Quality Program management at the meeting this spring that they should not mechanically use Clean Water Act designated parameters, but should in fact determine that the parameter that has made a particular Clean Water Act list is adverse to the beneficial uses of the Delta and/or its aquatic resources.

Page 3-3, first paragraph on "Organics/Pesticides" mentions the National Academy of Sciences standards. The National Academy of Sciences has no standards for excessive concentrations of bioaccumulatable chemicals. This is an error that was made by the

Water Resources Control Board staff many years ago and it persists. CALFED should not persist in making this error. Further, as discussed in recent correspondence on CALFED's Water Quality Program, the key information on excessive concentrations of bioaccumulatable chemicals are the recent US EPA guidelines that were used in the fish bioaccumulation studies in San Francisco Bay, published by the State Water Resources Control Board in 1995, not the Food and Drug Administration values. FDA values are well known to be based on factors other than health effects, which tend to cause them to be significantly higher than those currently recommended by the US EPA.

Page 3-4 under "Chloride" does not provide a reference to the statements made on the importance of chloride to agriculture. This is an issue that I tried to follow up on after the Parameter Assessment Team meeting where I asked Sarah Holmgren for specific reference to the statements made about the sensitivity of ag crops to chloride. Thus far, four months later she has not provided this information, even though she indicated that she would do so at the meeting last spring.

Page 3-4, in the first sentence under "Disinfection Byproducts in Treated Drinking Water" the statement is incorrect with respect to "chloroform and brominated methanes." It should read chlorinated and brominated methanes, since there are other chlorinated forms of THMs that are not chloroform. In that same paragraph there is a statement "The suspected carcinogenic risk to humans from THMs has led some communities to study and change their methods of disinfecting drinking water." Delete the word "to study." In the next sentence, I do not believe that "chloramination" leads to bromate. This is a problem related to ozone use with bromide present in the water.

The statement in the last sentence of this paragraph about reduced "... removal of DBPs after being formed can reduce DBP levels but may be quite expensive." That is a comparative that needs to be discussed to properly understand its meaning and to reliably convey what the author thinks is expensive compared to what others might conclude. Based on MWD data, for 12-cents per person per day, the disinfection byproduct problem disappears; is that quite expensive? Comparatives of this type should be discussed so that the reader can understand the context of the writer's views on issues.

Page 3-4, end of the second paragraph, the statement is made: "(For more information on Chloride see Disinfection By-Products)." Examination of the disinfection byproducts section shows that there is essentially no discussion of chloride. There is a discussion of bromide. Bromide should be the chemical listed, not chloride in the referenced paragraph.

Page 3-5, the second paragraph discussion on the relative molecular weights of bromide versus chlorine is inappropriate when compared with the superficial discussion of many of the other key issues that need to be discussed, such as the availability of heavy metals to be toxic. To dwell on disinfection byproduct molecular weight issues and not discuss the relative availability of heavy metals as toxicants for aquatic life, is inappropriate. This is a problem throughout this draft. Some sections go into great detail about minor issues, with or without references, while in other sections blanket statements are made without

references. Further, in some cases fundamental issues that will be strongly influential in formulating CALFED's program are not discussed.

Page 3-5, the third paragraph on "Total and Dissolved Organic Carbon" mentions pesticides and herbicides. It is inappropriate to list pesticides and herbicides as a source of TOC and DOC. Their concentrations in water would never represent a measurable increase in organic carbon.

Page 3-6, under "Dissolved Oxygen," the statement: "The capacity of water to dissolve oxygen decreases with increasing temperature and often varies with the cycle of daily photosynthetic activity of algae and plants" is incorrect. The capacity of water to dissolve oxygen (which should have been said is dissolved oxygen saturation) does not change with photosynthetic activity. The concentrations of dissolved oxygen change with photosynthetic activity. This kind of problem is persistent throughout the document where the statements made are not in accord with the basic science involved.

Page 3-6 under "Nutrients," the first sentence states that nitrogen and phosphorous "...trigger algal growth at elevated concentrations." Algal growth occurs at low concentrations as well; the nutrients trigger excessive algal growth. In the next sentence, it is stated that "...as nutrient concentrations increase algal productivity increases." Algal productivity is not the issue with respect to excessive fertilization. What is of concern is algal biomass. There are waterbodies with high productivity, but relatively low biomass because of grazing.

Page 3-6 under "Nutrients," the statement "A self perpetuating cycle of nutrient enrichment, plant growth, accumulation of muck, oxygen depletion, and nutrient recycling from the sediment follow" is not an appropriate discussion of eutrophication issues. As someone who has conducted several million dollars in research on excessive fertilization, I can unequivocally state that this characterization of the eutrophication process is in error. Those familiar with the elements of eutrophication issues know that the nutrient residence times in waterbodies is short compared to the hydraulic residence times. Nutrients tend to accumulate in sediments or are flushed out of the waterbody. Only a small part of the nutrients that enter the sediments are returned in algal available forms. It has been well known for over 25 years through eutrophication management programs that reducing the nutrient load to a waterbody results in the waterbody achieving a new level of eutrophication within three times the limiting nutrient residence time. The actual hold over from sediment accumulated nutrients is rapidly dissipated. Several years ago I wrote a review on this topic that I can provide to CALFED if there is interest.

The statement is made in this same paragraph, "Eventually, the rate of oxygen consumption can exceed the rate of absorption, resulting in, blue green algae blooms, odors, and eventually the death of fish and aquatic life." This is an inappropriate discussion of the development of blue green algae. Blue green algae do not develop because oxygen consumption rates exceed absorption. Further, those who understand the elements of the eutrophication issues know that the rate of oxygen production through

photosynthesis exceeds the rate of consumption in the waters where the algae are present. There is a net surplus of dissolved oxygen in waters where there would be any significant transfer from the atmosphere into the water.

With respect to the next paragraph on agricultural impacts of nutrients, do the nutrients in Delta water ever achieve concentrations that would effect agriculture through reduced yield, etc.? This is highly unlikely. The section on ag and nutrients needs to be rewritten.

Page 3-6, last paragraph states, "Because coliforms are more abundant than pathogens in human waste by several orders of magnitude, the tests provide a margin of safety against pathogens." That is only true for certain forms of pathogens and certainly does not apply to viruses and parasites.

Tables like 3-2 must have a source reference.

Page 3-8, first paragraph under "Parasites," needs to be rewritten. What is meant by "...severely disrupt the intestinal tract?" Is it referring to humans, animals, birds?

The discussion in the second paragraph under "Giardia lamblia,"gets into far more detail than is appropriate for this type of document.

Page 3-8, under "Cryptosporidium parvum," the statement about "The oocyst (infective stage) dose necessary to cause an infection in humans is unknown..." is not in accord with what is known today. It is generally assumed today, based on substantial evidence, that one oocyst is needed to cause infection. This section relies on out dated information when referencing a 1986 publication on Cryptosporidium. There are far more up to date authoritative discussions of these issues than what is presented in this report.

Page 3-9, the first paragraph states, "...Cryptosporidium parvum levels do not correlate well with indicator coliform bacteria levels, so meeting standards for coliforms and turbidity (a measure of the reduction of clarity of a water by suspended particles) may not be a sufficient measure of treatment reliability for removal of Cryptosporidium." There is no issue about "may;" this has been well known since the 1940s. Meeting coliform standards does not protect against parasitic protozoans.

Page 3-9, discussion of pH, is somewhat misleading. The issue is not pH, but the deposition of scale forming chemicals. Again, no reference is provided to the source of this information.

Page 3-9, under "Sodium Absorption Ratio (SAR)," makes an error in the use of the term "absorption." It is not "absorption," but adsorption. These are significantly different processes. The word "absorbed," as used in this section, is incorrect.

Page 3-10 lists a CUWA/CALFED 1996 publication concerning salinity effects on agriculture. I would like to receive a copy of that publication. I do not know the names, since no references are provided in the document.

Page 3-10, the statement "Electrical Conductivity (EC), more correctly known as specific conductance..." is incorrect. Specific conductance is a measure of electrical conductivity, it is not more correct. Specific conductance refers to measurements with a certain electrode area and spacing. In the same paragraph, "EC is generally considered a conservative parameter..." is also an error. EC in a high calcium carbonate system is not a conservative parameter.

Page 3-10, in the fourth paragraph, "...crop uptake and evaporation remove pure water with some dissolved salts...", what is meant by "pure water?" Crops remove water.

Page 3-11, in the "Temperature" section, the statement is made that "Temperature governs rates of biochemical processes..." It also determines the rate of chemical processes. There are some biochemical processes, such as photosynthesis, that are not affected by temperature.

Page 3-11, under "Turbidity," the end of the statement "...of sediment material, or biological productivity" is incorrect. Again, it is not productivity, but biomass that causes turbidity. How fast the organisms are growing does not affect turbidity. They can be eaten as fast as they are growing and still cause little turbidity in the system. The statement, "Following major storms, water quality is often degraded by inorganic and organic solids and associated adsorbed contaminants (such as metals, nutrients, and agricultural chemicals) that are re-suspended or introduced in runoff." is loosely written and is not in accord with what is well known in the field. Particulate forms of constituents, such as heavy metals are not available to degrade water quality. This is not new information. The National Academies of Sciences and Engineering in their 1972 Bluebook Water Quality Criteria made it clear that particulate forms of heavy metals are non-toxic. The US EPA acknowledged this and began to change the implementation of its water quality criterion in 1992. This was formally adopted in 1995.

Page 3-12, "Data Available," states: "Data evaluation will be used more extensively as part of the EIR/EIS impact assessment process." From the problems found in this draft report, hopefully that data evaluation will more appropriately address water quality issues than has been done in this draft report. If this does not occur the data evaluation could be unreliable.

Page 3-12, "Target Ranges for Parameters," states: "For some parameters, particularly those affecting environmental beneficial uses, source water quality regulatory standards, objectives or criteria have been developed." What is meant by "source water quality?" The criteria standards and objectives are not related to any particular source water quality; they are ambient water quality.

Page 3-13 mentions that "Table 3.4 summarizes the source water quality targets for each parameter of concern." While this table was not present in the original materials that were sent out for review, it was subsequently provided. This document should not have been sent out for review without it.

Examination of Table 3.4 shows that significant technical errors have been made by CALFED management and staff in development of this table. All reference to sediment target ranges should be deleted from the table. They are based on Long and Morgan co-occurrence values which assume, without verification, that there is a cause and effect relationship between the total concentration of a constituent in sediments and its water quality impacts. It has been well documented for 25 years that this is an invalid assumption. Several years ago, I developed a review on this topic, "Co-Occurrence in Sediment Quality Assessment" (1996) that is available as a downloadable file from my website (http://members.aol.com/gfredlee/gfl.htm). There are several other papers that I have developed on this topic that also discuss these issues; these are also available from my website. For CALFED to now assert that these are reliable target values against which tens of millions of dollars will be spent to try to achieve shows a complete lack of understanding of sediment quality issues and the vast amount of work that has been done on this topic.

In the 1970s, the US EPA and Corps of Engineers conducted over 50 million dollars in research devoted to developing approaches for regulating open water disposal of contaminated dredged sediments. The issue of concern was whether contaminated dredged sediments could be placed at a particular location without significant adverse impact on aquatic life and other beneficial uses of the waterbody in which the sediments were being deposited. These issues are the same except for the physical impact of sediment deposition at the time of disposal (burial) as evaluating whether in-place sediments which contain certain chemical constituents are detrimental to the water quality for the water body in which the sediments are located. Based on the results of the research, the US EPA and Corps of Engineers adopted an effects-based sediment regulatory approach rather than a chemically based approach.

The effects-based approach directly measures toxicity in the sediments using standard procedures rather than measuring a chemical and trying to extrapolate in some way whether the chemical is toxic. That program has been extensively reviewed several times since it was first adopted in the late 1970s; each time it has been concluded that it is the appropriate approach to use in regulating contaminated sediments. This is the approach that CALFED should be using. It is not possible to use chemical concentrations in sediments to estimate impacts such as aquatic life toxicity. It is readily possible to measure toxicity directly. It is also possible to determine the cause of toxicity through sediment TIEs and through forensic studies to determine the source of the constituent responsible for the sediment toxicity.

Another significant error occurs in Table 3.4 with respect to the target range tissue concentrations. As has been discussed in materials provided to CALFED, and mentioned above, there are no reliable tissue concentrations of constituents that are recognized by the National Academies of Science and Engineering, the US EPA, other states, etc. The State Water Resources Control Board staff made a significant error in adopting the blue book values in its TSM work. The tissue concentration that should be used as target values are those that are set forth on Table 1 on page 97 of "Contaminant Levels in Fish Tissue from San Francisco Bay," Final Report, San Francisco Bay Regional Water

Quality Control Board, California Department of Fish and Game Marine Pollution Studies Laboratory, June, 1995. As discussed previously, if there is no US EPA guidance value for a constituent, then CALFED should not use the NAS/NAE value. The NAS/NAE values are badly out of date and do not reflect what is known today about the effect of chemicals on human health as a result of bioaccumulation in fish tissue.

With respect to the metals and other constituents in Table 3.4, which use as their basis the US EPA Water Quality Criteria, the values given should be replaced by the recently published proposed US EPA criteria for the California Toxics Rule, with the understanding that these values will be modified if changes are made through the adoption of these values. Also, the final version of the Component Report should include a discussion of the fact that CALFED recognizes that US EPA Water Quality Criteria for some constituents such as heavy metals will likely be overprotective due to differences between water characteristics in the CALFED area of concern and the waters in which the criteria were developed. The US EPA criteria in general were developed for Lake Superior situations in which reagent grade chemicals were added to Lake Superior water and the toxicity measured under idealized laboratory conditions. Sacramento River Delta waters are significantly different in character from that of Lake Superior, where the Sacramento River waters tend to detoxify chemicals to a greater extent than Lake Superior waters. Further, most of the chemicals added to CALFED waters are not in reagent grade toxic available form. Much higher concentrations of constituents can generally be allowed in CALFED waters than the US EPA criterion value without adverse impacts.

The basic problem is that the US EPA, without public review, adopted the "independent applicability" policy in the early 1990s, which states that chemical criteria have to be met even though properly conducted site specific evaluations show that the criteria are overprotective. The US EPA recognizes the overly protective nature of its current independent applicability approach, and has proposed to modify this approach.

The appropriate approach for establishing target ranges should be based on finding a concentration of constituents in excess of the US EPA criterion being used as a trigger to initiate site-specific studies to determine whether the constituent of concern is in a toxic/available form that is potentially adversely impacting the beneficial uses of the waterbody being investigated. If CALFED persists with its current approach of trying to mechanically use US EPA criteria as a basis for establishing remediation goals, it will find that the Water Quality Program will justifiably be severely criticized because of its lack of technical validity. For example, it is well known that copper is present in many parts of the CALFED waters at concentrations well above Table 3.4 values without being toxic. For CALFED to spend Prop 204 money controlling copper inputs because the concentrations of copper at some locations exceed US EPA criteria when appropriately conducted toxicity tests show that the copper is in a non-toxic form will lead to significant problems for the credibility of CALFED's wise use of public funds.

It is important to understand that CALFED is not trying to make its own criteria or standards to replace US EPA values. It will be, if a technically valid approach is adopted,

developing appropriately conducted site specific investigations to determine whether public funds need to be spent controlling a particular constituent based on having found that the constituent is causing a real water quality use impairment in CALFED waters.

CALFED Water Quality Program needs to start over with respect to developing Table 3.4 in which the chemical based approach for sediment quality is abandoned in favor of a biological effects based approach. The NAS/NAE tissue approach should be abandoned in favor of US EPA guidelines for excessive concentrations in fish tissue that were developed for San Francisco Bay fish. Further, the US EPA water quality criteria set forth in Table 3.4 should be changed to the California Toxics Rule values where it is clearly indicated that these are triggers for further work designed to evaluate whether exceedance of the criteria represent real water quality use impairments that justify the use of CALFED money for their control.

Overall, the section on Parameters of Concern and their impacts is written rather loosely and does not properly present the basic and applied sciences pertinent to water quality issues. This section needs to be rewritten.

Page 4-1, "Sources of Parameters," as the first bulleted item, lists "... cadmium, copper, zinc, and mercury;" page 2-2 lists chromium as a constituent derived from historical mining activities. Should chromium be on the list of constituents of concern? Actually, chromium VI is one of the constituents that, based on information developed since the early 1980s, is not being adequately regulated to protect aquatic life from toxicity. As I discussed in a paper presented this past spring at the American Chemical Society national meeting, chromium VI is far more toxic than indicated by the US EPA criterion of 10 µg/L. It is toxic to zooplankton at 0.5 µg/L. Here is a case where toxicity tests would show that the US EPA criterion is not adequate to protect Delta beneficial uses. Is CALFED going to ignore the toxicity test results if these results show that meeting the criterion is not adequate to protect the designated beneficial uses of the Delta? This is what could happen if the mechanical approach toward the use of US EPA criteria persists in CALFED.

Several other issues arise from the page 4-1 bulleted items, such as whether mercury is a problem associated with acidic mine drainage. Under the second bulleted item, is selenium an important constituent in urban stormwater runoff? What is meant by "...municipal and industrial discharges...?" Should this be waste water discharges?

Section 4, "Sources and Loading of Parameters" should be omitted from the Component Report. It presents such sketchy data and is inaccurate in a number of respects, as to give a significantly wrong impression on key areas. What should be done is to present a discussion of the data gaps that exist in developing meaningful loading parameter estimates.

Section 5 states in the first sentence, "Defining what constitutes a 'problem' is a controversial and endlessly debatable issue." I strongly disagree. What constitutes a water

quality problem is well defined. Namely, an impairment of use. This is not debatable, it is defined by law in the Clean Water Act.

With respect to the listing on the first page of Section 5, I have provided detailed comments on the appropriateness of a number of the issues listed here. The discussion of what is meant by "impaired waterbodies" relates to a Clean Water Act US EPA definition, not to one that would be understood or accepted by the public. Most of the California public is not concerned about the concentration of a chemical constituent that under worst case conditions in some waterbodies, such as Lake Superior, could be adverse to the beneficial uses of lake water. The public is concerned about the impairment of the Delta waters and its resources. Delta waters are significantly different in their character and how they impact the water quality significance of chemical constituents than are Lake Superior waters. Lake Superior waters which serve as a basis for the development of many of the freshwater water quality criteria, which put constituents on the US EPA 303(d) list, are atypical of US waters and represent a worst case situation that would tend to over regulate chemical constituents in the Delta.

Page 2, paragraph 3 states, "Both the lower American River and the lower Feather River are similarly impaired." The phrase should be similarly legally impaired. However, there is no evidence that the mercury, diazinon and chlorpyrifos in these waters are actually impairing uses of concern to people. The next sentence states, "Elevated mercury in these tributaries may pose a risk to people that catch and consume fish." The issue is not catching the fish, but consuming fish from these waters. The statement is made that "In these three water bodies, urban runoff has been identified as a source of mercury;" how significant is this? This statement can be highly misleading compared to the other sources. The fourth paragraph states, "These bioaccumulative substances impair recreational beneficial uses (i.e. fishing) in these areas," referring to PCBs and mercury. The issue is not fishing, but the consumption of the fish, with excessive concentrations of the constituents that are used as food.

On Page 5-2 under "San Joaquin River Basin," statements are made about the relative significance of diazinon or chlorpyrifos from ag versus urban. It is stated, "However, in this basin, urban runoff is not considered a major source of diazinon or chlorpyrifos." Considered by whom? A statement of that type has to be referenced and a discussion should be presented of the technical basis for such a statement. The statement is made in the next paragraph under "Delta," that "...diazinon and chlorpyrifos ... impair environmental and recreational beneficial uses." That statement is not backed up by the information available. While diazinon and chlorpyrifos are present in the Delta, whether they impair the beneficial uses of the Delta is still unknown.

The last paragraph, last sentence states: "Urban runoff from cities around San Francisco Bay and San Pablo Bay is a significant source of metals to the estuary." No discussion is presented, however, of the fact that the RMP has been examining aquatic life toxicity in San Francisco Bay and found no aquatic life toxicity could be attributed to heavy metals, and for that matter anything else except a few pesticides in the North Bay. To state that it is a source of metals, without discussing the data that is readily available from the San

Francisco Estuary Institute on the significance of the metals is highly misleading and inappropriate for a CALFED publication.

Page 6-1, last paragraph, is out of date with respect to the public meeting, etc.

Page 7-1, "Action Strategies," third paragraph, states that "For example, the target for copper in the Sacramento River is to reduce copper loadings in the Upper Sacramento River from 65,000 pounds to 10,000 pounds per year." No reference is given as to who developed this target, the technical basis for such a target and its validity.

Page 7-1, fourth paragraph states, "Indicators of success are generally numerical or narrative water quality targets have been developed for each parameter of concern. These targets relate to acceptable in-stream concentrations of parameters. They will be used to gauge action and alternative effectiveness at protecting beneficial uses." The rest of this paragraph discusses that basically US EPA water quality criteria and standards will be used as the targets. The Parameter Assessment Team made it clear to the CALFED WQTG that this approach is not a valid approach. The focus of CALFED's activities must be on real water quality use impairments in the Delta, not as proposed as to what would be the case if highly available forms of constituents were added to Lake Superior water. CALFED must, if it is going to develop a credible water quality management program for Delta problems that controls real water quality use impairments in a technically valid cost effective manner, invest sufficient funds to determine whether the proposed control programs, i.e. achieving water qualities objectives standards or criteria, will result in an improvement of the designated beneficial uses of concern to the public.

CALFED, as it is currently proposing, could spend many millions of taxpayer dollars controlling some constituent that has no impact on Delta water quality or its aquatic resources, because the constituent that is the focus of the control is only of concern in Lake Superior water. It is not of concern in Delta waters because of the significant difference in the aqueous environmental chemistry in these two systems and the characteristics of the sources of the constituents of concern that were used in the bioassay tests in the US EPA lab, i.e. toxic available forms, relative to the forms that enter the Delta and its tributaries. From the information available it appears that CALFED is ignoring the information provided by the Parameter Assessment Team guidance at the meeting last spring and proceeding down a path that was started last December, which is obviously technically invalid and could result in massive waste of CALFED funds, especially in some areas such as urban stormwater runoff.

Page 7-2, "Delta," third paragraph states "Urban and industrial runoff actions will help to reduce toxicity from the pesticides chlorpyrifos and diazinon, copper, and oxygen depletion in the Delta, and to reduce pathogens." Until such time as the significance of the limited scope toxicity due to diazinon and chlorpyrifos to only certain type of zooplankton organisms, is understood, it is inappropriate to conclude that reducing the toxicity due to these chemicals in urban runoff will have any impact on the beneficial uses of the Delta and its tributaries. Further, the statement about copper toxicity for urban and industrial runoff appears to be out of the air, without technical validity, unless some

specific industry has been found to be discharging available forms of copper, which are highly toxic in the Delta.

Page 7-3 discusses mine drainage with respect to mercury, cadmium, copper and zinc, yet, earlier in this document mention was made of chromium associated with mine drainage. It has not been carried through; is chromium a problem or not? The same problems exist with respect to urban and industrial runoff from the Sacramento Basin in controlling toxicity associated with chlorpyrifos and diazinon. Where is the problem? There is toxicity, but does it effect anything of concern to people?

Page 7-4, "Mine Drainage," again mentions reduction of copper loadings from 65,000 to 10,000 pounds. Again, no reference is given to the validity of this approach, in as it may affect water quality. The Indicators of Success in this same section, are presented as achieving the Basin Plan objectives for copper, zinc and cadmium. Where is the water quality problem that shows that these chemicals are adversely impacting the Delta or its resources?

Page 7-5, "Indicators of Success," is presented as achieving the US EPA 304(a) guideline for mercury in the Delta and its tributaries. This is not an appropriate objective. The objective should be is the second point mentioned, "Removal of fish health advisories." This is an appropriate indicator of success.

Page 7-5, "Urban and Industrial Runoff," the Action is stated as "Reduce toxic effects of copper, zinc and cadmium loadings to the Delta and its tributaries from urban and industrial runoff." Where is there evidence that there is significant toxicity that effects water quality/beneficial uses due to copper, zinc and cadmium from urban stormwater runoff? Again, there is a recurrence of the same problems that I have commented on previously. While CALFED proposes to focus control programs on achieving heavy metal concentrations in waters impacted by stormwater runoff that are equal to or less than the US EPA water quality criteria, CALFED states here that the purpose of the program is to reduce toxic effects of copper, etc. Since toxic effects cannot be judged by chemical concentrations, achieving the so-called "Action" item for urban and industrial runoff mandates that toxicity be the primary parameter of concern, not chemical concentrations.

In the section titled "Performance Measures," the "Reduction in copper loadings at selected stormwater monitoring stations," can readily result in massive waste of public funds, unless the copper that is being reduced is in fact, in a toxic form. The large amounts of data from San Francisco Bay shows that the copper in urban runoff is non-toxic. Once again, CALFED WQTG is ignoring that these heavy metals in urban stormwater runoff are in non-toxic, nonavailable forms. This has been substantiated by study after study and by various groups in various parts of the US.

Page 7-5, "Action," states "Reduce toxicity from the pesticides chlorpyrifos and diazinon in the Delta and its tributaries through source control of urban and industrial runoff." First, what evidence is there that industrial runoff contains chlorpyrifos and diazinon?

Page 7-6, "Performance Measure," states "Improved understanding of the toxicity and sources and mechanisms of chlorpyrifos and diazinon transport into the Delta." Is there a real water quality use impairment due to these chemicals in the Delta, due to urban stormwater runoff? It appears to me that this is highly unlikely. The problem due to these chemicals is ag runoff and atmospheric transport. Why specify in the same performance measures the three-species test? And why focus on improved survivability in this test and not chronic toxicity? Under "Indicator of Success," it states "Reduced toxicity from chlorpyrifos and diazinon in the Delta and its tributaries." This is a misdirected effort. The effort should be reduced toxicity due to these chemicals that significantly impair the designated beneficial uses of the Delta and its tributaries, that impair Delta aquatic resources.

Page 7-6, "Action," states "Reduce the toxic effects of nutrient loadings and consequently, oxygen depletion in the Delta and its tributaries through source control of urban and industrial runoff." What evidence is there that there are toxic effects of nutrient loadings that are impairing Delta water quality and its aquatic resources? Is it toxicity due to oxygen depletion? This appears to be a very limited problem near Stockton, in some dead end sloughs. Is CALFED going to apply this to the City of Sacramento to reduce the nutrient loads in this city's stormwater runoff? The same kinds of problems exist for wastewater and industrial discharges, ag pesticides, drinking water, etc.

Overall, CALFED's Water Quality Program is a long way away from developing a credible approach toward identification of water quality problems in the Delta, determining their cause and developing technically valid cost effective control programs for these problems. The Water Quality Program needs to start over, shifting the focus to identifying the real water quality use impairments that occur within the Delta and its tributaries that affect Delta resources, determining the specific causative agents for the use impairments considered of significance and developing control programs for the most significant use impairments that incorporate mid-1990 science and engineering into problem definition and control.

Please contact me if you have any questions about these comments.

Sincerely Yours,

Fred

G. Fred Lee, PhD, DEE

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GFL:ek

References as:"Lee, G. F., 'Comments on CALFED Meeting, August 1997,' Submitted to R. Woodard, CALFED Bay-Delta Program, Sacramento, CA, August, (1997)"