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Dear Rick:

Following up on my letter to you of yesterday on the water quality component of CALFED, last evening I attended a Cache Creek watershed stakeholders meeting at which William Croyle of the CVRWQCB distributed your December 18, 1996 memorandum to the Water Quality Technical Group covering the December 9, 1996 meeting. This memorandum answers a number of the questions I had about the current CALFED water quality issues and raises a number of concerns about the technical appropriateness of the approaches being followed in the Water Quality Technical Group to address real water quality issues that should be addressed as part of the CALFED Prop. 204 activities. As I indicated, while I have been involved in Delta water quality issues now for over seven years and have published a number of papers on this topic, and even though I am on the mailing list for the CALFED Bay-Delta Program and I understand from your December 18, 1996 memorandum that over 100 announcements were mailed out, somehow I was not notified of the Water Quality Technical Group meeting that was held on December 9, 1996. As I indicated in my letter of yesterday, please place me on the mailing list to receive all materials distributed by you as well as each of the subgroups.

In early December, I attended a meeting on Sacramento River water quality monitoring as part of the USGS NAWQA program where I met Sarah Holmgren who I understand is associated with one of the firms that has a CALFED contract for helping to facilitate the Water Quality Program. It was through discussions with her that I learned of this program. At that time, I provided her with my business card indicating that I would like to be placed on the mailing list to receive materials developed in the program. At that time, she indicated she would do this. However, evidently she did not do this since I have received nothing on the Water Quality Program from anyone, other than at the Cache Creek watershed meeting that was held last evening.

In your December 18, 1996 memorandum, you indicated that you wish additional suggestions and comments and would like to receive these by January 10, 1997. Unfortunately, since I was not placed on the mailing list to receive this material as requested, I did not receive your December 18, 1996 memorandum until January 14, 1997. Presented below are some of my initial comments on what I perceive to be significant technical problems with some of the issues raised in your December 18, 1996 memorandum covering the December 9, 1996 meeting.

When reviewing the subgroups' write-ups provided in your December 18, 1996 memo, I find a number of technical and regulatory policy errors in what the subgroups have stated relative to water quality issues. By far the most important errors and problems occurred in the Urban and Industrial Runoff Subgroup. For example, the second bulleted item states, "Chlorpyrifos should be removed from the list of parameters of concern associated with urban runoff because it is not used in urban areas. Used on rice." Whoever provided and then reviewed that information does not know the topic with which they are dealing. Chlorpyrifos is extensively used in urban areas by commercial applicators and by homeowners. Some of the most commonly used ant control materials that can be purchased in any hardware store, such as Chevron's Ortho-Klor "Ant Killer Dust," is chlorpyrifos. It has been routinely found in stormwater runoff from urban areas in a number of parts of the state, including the Sacramento area. It is an important cause of aquatic life toxicity in stormwater runoff from urban areas. In the Orange County area, chlorpyrifos is used almost exclusively for "structural" pest control. It is certainly extensively used in the Delta watershed region for this purpose, as well.

In my letter of yesterday, I mentioned that I am working on the implementation of an Evaluation Monitoring program for defining real water quality problems in Upper Newport Bay in Orange County, California. One of the components of this program is the examination of aquatic life toxicity in the tributary waters of the Bay. Chlorpyrifos was identified in these studies as a major cause of aquatic life toxicity of the tributary waters to the Bay for two major storm runoff events that were monitored this past fall. Further, chlorpyrifos has accumulated in the sediments of Upper Newport Bay and potentially represents a significant cause of aquatic life toxicity to benthic organisms.

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Chlorpyrifos from urban as well as other uses should be a high priority for attention in urban stormwater runoff as it may influence Delta water quality. If there is interest, I would be happy to take the lead on helping to organize efforts to address this issue. The area of concern is that while there is no doubt that chlorpyrifos causes aquatic life toxicity in the Delta and Delta tributary waters, the significance of this toxicity to the beneficial uses of the Delta, including its tributaries near the Delta is unknown. However, there is substantial reason to believe that the diazinon - chlorpyrifos pulses through the Delta that occur each winter are significantly detrimental to some forms of Delta aquatic life.

Similar situations exist with respect to a number of other organophosphorus pesticides, such as diazinon, except that diazinon does not accumulate in sediments. It is, however, causing aquatic life toxicity in stormwater runoff from urban and agricultural areas. This toxicity also needs to be investigated with reference to its significance in adversely impacting the beneficial uses of the Delta and its nearby tributaries.

The third bulleted item under Urban and Industrial Runoff states, "Later analysis should use urban runoff data from individual cities rather than assume that Sacramento data is applicable everywhere." While this statement is not clear, as presented it appears to imply that there is need to monitor stormwater runoff from a number of cities that contribute to Delta tributary waters and

to the Delta because there might be some differences between stormwater runoff among the various cities. Those familiar with this topic area, however, know that typically urban area, residential and commercial stormwater runoff, while variable in composition at any one location, is on the average remarkably similar between locations. I published a paper on this topic (Lee, G.F. and Jones, R.A., "Suggested Approach for Assessing Water Quality Impacts of Urban Stormwater Drainage," In: Symposium Proceedings on Urban Hydrology, American Water Resources Association Symposium, November 1990, AWRA Technical Publication Series TPS-91-4, AWRA, Bethesda, MD, pp. 139-151, 1991) a number of years ago which presented the summary results from the US EPA NURP on the chemical characteristics of stormwater runoff from cities across the US.

Further, as discussed in the enclosed summary write-up on Evaluation Monitoring that will be published in the Society for Environmental Toxicology and Chemistry's *SETAC News*, a number of professional organizations, such as the Engineering Foundation and ASCE, have recently held workshops concerned with urban area and highway stormwater runoff monitoring. The conclusion of the professionals involved in this topic area from across the country is that there is no need for further runoff monitoring. What is needed is to provide guidance on how regulatory agencies and others can determine on a site-specific basis whether the regulated as well as unregulated constituents present in urban area and highway stormwater runoff are adverse to the designated beneficial uses of the receiving waters for the runoff. It is because of this situation that Dr. Anne Jones-Lee and I have developed and are now implementing the Evaluation Monitoring approach for defining real water quality problems in Upper Newport Bay due to urban area, highway and agricultural runoff.

In my letter of yesterday, I suggested that there is need for the CALFED Water Quality Program to adopt an Evaluation Monitoring approach for defining real water quality problems that need to be addressed as part of managing Delta water quality. Now that I have seen the summary of the December 9, 1996 meeting of the CALFED Water Quality Program, it is clear that my suggestion is appropriate. The Evaluation Monitoring approach would quickly sort through the unreliable information that is being provided in defining water quality problems in the Delta and its tributaries.

AVM [The Urban and Industrial Runoff write-up in the last bulleted item, states, "*Action 18 should be reworded to read 'Reduce urban and industrial water quality parameter of concern loadings to the Delta and its tributaries through enforcement of existing storm water permit conditions'.*" Because of the unreliable information provided in other aspects of Urban and Industrial Runoff, I am concerned that this statement reflects more inappropriate approaches where the implication is the Central Valley Regional Water Quality Control Board is not enforcing existing stormwater permit conditions for NPDES stormwater runoff permit holders. If that is the intent of this bulleted item, then those who authored this item and those who reviewed it do not understand what is actually being done today in NPDES stormwater runoff permit enforcement. The facts are that the permits require that stormwater runoff-caused pollution be controlled to the maximum extent practicable through the use of BMPs. The basic problem is that

during the first five-year permit the focus of the monitoring program associated with implementing the program was on runoff monitoring. However, those who understand water quality monitoring know that runoff monitoring cannot be used to define true water quality impairment in the receiving waters for the runoff. While the City of Sacramento has done some receiving water studies associated with stormwater runoff, the amount and character of these studies has been severely limited compared to that needed to properly define what real pollution-use impairment occurs and, most importantly, the control programs that need to be implemented to control this pollution in a technically valid, cost-effective manner.

The Urban and Industrial Runoff states in item 6, "*Storm water detention basins should be built in urban watersheds shown to be a major source of metals. (Action 17).*" This statement reflects a complete lack of understanding of modern day water quality evaluation and management as applied to urban area and highway stormwater runoff. Study after study across the country has shown that heavy metals in such runoff are in non-toxic, non-available particulate forms. Detention basins are only effective in potentially removing particulate forms. There is no point in wasting the public's money building detention basins to remove particulate forms of metals in urban stormwater runoff if they are not adverse to the beneficial uses of the receiving waters for the runoff. Further, those familiar with this topic area know that in May 1995, the US EPA officially adopted the policy of only regulating dissolved heavy metals, except for mercury and selenium, as part of implementation of the National Toxics Rule. Therefore, not only is it technically invalid to control heavy metals in stormwater runoff from urban area, residential and commercial areas, but also, it is not required by current federal regulations.

While there are some who assert that detention basins should be built to control particulate heavy metals in urban and highway stormwater runoff because they will accumulate in the sediments of the receiving waters for the runoff, such assertions reflect a lack of understanding of sediment water quality issues. I have done over \$2 million of research on this topic and can unequivocally state it would be indeed rare that particulate heavy metals in urban area and highway stormwater runoff will be adverse to the receiving water beneficial uses due to the accumulation in the receiving water sediments. Further, there are well-defined procedures that have been available for over 20 years that can be used to determine on a site-specific basis whether any constituents, including heavy metals in the sediments of a particular waterbody, are adverse to the beneficial uses of the waterbody. I can readily provide you with extensive publications on this topic if this is of interest.

Your write-up mentions a list of constituents of concern in urban runoff. This list was not included with your December 18, 1996 memo. If possible, please send it to me.

The issue of heavy metals occurs in a number of the CALFED Water Quality Program write-ups as water quality problems. While there are real water quality problems in the Delta watershed due to mine discharges, typically, these problems disappear within a relatively short distance downstream of the discharges of the receiving waters for the discharge. This is true of the Iron Mountain Mine's copper, zinc and cadmium discharges that occur near Redding. While

these discharges increase the concentration of total metals in the Sacramento and other river systems as they enter the Delta, to my knowledge, and I believe I am familiar with the topic area, there has been no demonstrated water quality problems due to heavy metals other than mercury and possibly selenium in the Delta.

In my discussions with Sarah Holmgren in early December, she made the statement that the literature had documented many water quality problems due to heavy metals, such as copper, zinc and cadmium, in the Delta. I asked her for any documentation that she was aware of to support her statement. As of yet, she has provided nothing. It appears to me that these are some loose statements being made by a CALFED staff member who may not understand real water quality issues governing the impact of heavy metals on the beneficial uses of a waterbody. This is a topic that I have been working on for over 35 years, and I have published extensively on it. The key to assessing whether a heavy metal or other constituent is causing a real water quality use impairment of the type that Prop. 204 funds should be spent on is a proper understanding of aquatic chemistry and toxicology/water quality as applied to a particular discharge/receiving water situation. It is not possible to use heavy metal concentrations in discharges from any source to predict water quality impacts in receiving waters. Site-specific investigations need to be conducted.

In the case of copper in the Delta and San Francisco Bay, while the concentrations found exceed water quality criteria/objectives for both total and dissolved copper, studies by the San Francisco Estuary Institute over the past three years have conclusively demonstrated that the copper as well as other constituents in the water column are in non-toxic, non-available forms. Through the use of the same organism used to develop the water quality criterion for copper in marine waters, it has been found that there is no real water quality problem in San Francisco Bay waters due to copper. Further, while there is toxicity in some San Francisco Bay sediments, there is an inverse relationship between the copper concentration and toxicity. It appears that copper is not responsible for this toxicity.

The problem with copper in San Francisco Bay is an administrative problem, not a real water quality problem that is related to an inappropriate approach that is being used by the US EPA in implementing its water quality criteria into state standards related to the Agency's Independent Applicability Policy. The Agency understands this problem and has proposed to correct it as part of its 1996 Interim Draft Advance Notice of Proposed Rulemaking on the water quality standards regulation at 40 CFR 131 (ANPRM). Therefore, the administrative water quality problem due to copper in San Francisco Bay will likely disappear when the Agency corrects the error it made several years ago in adopting the Independent Applicability Policy. It would certainly be inappropriate to throw Prop. 204 funds at copper issues because the total copper in the Delta or San Francisco Bay exceeds an overly-protective water quality criterion/standard that does not properly reflect what has been known for over 20 years about the aqueous environmental chemistry of copper and its toxicology.

For over a year now I have been concerned about a real water quality use impairment due to a heavy metal, mercury, in the Delta and San Francisco Bay. Some of the fish in this area have excessive mercury. This is a real water quality use impairment. I have been following the work that Chris Foe and others have been doing on identifying the sources and significance of mercury contributed to the Delta through Cache Creek. This was the reason that I attended the Cache Creek watershed meeting that was held last evening. I am part of a group that Chris Foe has organized that is specifically dealing with an issue that I raised over a year ago when the high concentrations of mercury were reported by Chris in the high flows of Cache Creek and the Sacramento River system. I pointed out that it is important that efforts be made to determine whether the particulate mercury present in the high flows was a significant contributor to excessive mercury bioaccumulation within the Delta and the Bay. Through my work on mercury at other locations, I am well aware of the literature on mercury methylation and specifically that it is not possible to utilize total mercury concentrations to evaluate potential mercury problems due to excessive bioaccumulation within aquatic life tissue. I have suggested to Chris a set of studies that should be conducted to determine whether the mercury present in the high flows does, in fact, lead to increased methyl mercury production within the Delta and San Francisco Bay. Based on the responses I have received from Chris's ad hoc mercury group to my suggestions, there seems to be agreement that this is an area that needs to be addressed. If there is interest, I would be happy to work with the CALFED Water Quality Program in helping to develop and implement a program to evaluate whether mercury from any particular source is, in fact, a potentially significant cause of water quality use impairments within the Delta or Bay due to excessive mercury bioaccumulation. Please let me know if this is of interest.

Several of the other numbered items in the Urban and Industrial Runoff are also of concern based on the information provided. For example, item 8 states, *"Improve street-sweeping and garden waste pick-up in larger cities. (Action 18)."* If litter in the receiving waters is a problem, such action is justified. It may, however, have little or no impact on the beneficial uses of receiving waters.

One of the problems with reviewing your December 18, 1996 memorandum is that the list of action items is not available. Further, the information provided in the write-up on the action items is too brief to enable someone who understands water quality issues to be able to comment on the appropriateness of the item based on their expertise and experience.

While there is not time to comment on all of the problems that I find with the statements made in your December 18, 1996 memorandum, I want to comment on one additional aspect concerning the High Priority Projects - Surface Drainage Source Control where the statement is made under item 2, *"However, regulatory hurdles for pesticide registration are currently very rigorous."* I have repeatedly heard those concerned with continuing the use of pesticides, even though it is obvious that they should be discontinued from use because of their environmental impacts, make statements of this type. I am highly familiar with pesticide registration procedures and pesticide regulation. While teaching at the University of Wisconsin, Madison, I served as the technical secretary for the Pesticide Review Board for the state of Wisconsin. This Board

reviewed the registration of pesticides and imposed the state's registration requirements on the federal requirements. Further, I have been involved in ASTM Committee E-35 on pesticides where I initiated and chaired for a number of years the Water Quality Modeling Section devoted to water quality modeling of pesticide fate and effects. Further, I am highly familiar with a number of the pesticide water quality problems that occur in the Sacramento.- Delta region. I can unequivocally state that the US EPA's pesticide registration procedures have been and continue to be significantly deficient compared to what should be done to properly evaluate the use of pesticides in agricultural and urban areas in order to protect aquatic life from adverse impacts.

The Agency has not incorporated the kind of pre-evaluation screening that should be conducted to eliminate the kinds of widespread problems that are being found now with organophosphorus pesticides. These kinds of problems were known in the 1950s when I was a graduate student where organophosphorus pesticides were being found then to cause significant aquatic life problems due to the inability of those using the pesticides to control their entrance into surface waters. This same problem exists today. As I discussed yesterday, this is one of the most significant water quality problems that needs to be addressed in the Delta in order to protect the Delta's aquatic life components of the designated beneficial uses.

Under Agricultural Drainage Problems Identified - Surface Drainage Source Control, item 12, it states, "*Review sludge management in land application systems. (Action 11).*" While what is meant by "sludge" is not identified, if those responsible for this statement mean domestic wastewater sludges (now called biosolids), then I can possibly be of assistance in this area. Last fall I was appointed a member of a Water Environment Federation Research Foundation committee that is advising the Foundation on developing research devoted to protecting ground and surface waters from pollution by nitrogen in land-applied biosolids. The US EPA, as part of developing its biosolids application regulations, focused on heavy metals and other toxic constituents. The Agency did not give adequate attention to the nitrogen problems associated with the organic nitrogen and ammonia present in biosolids which can lead to nitrate. The objective of the WEF Research Foundation research project on this topic is to develop guidance that can be used by those who wish to apply sewage sludge to their lands to do this without polluting surface or groundwaters.

One of the issues that I do not see mentioned in your December 18, 1996 write-up is groundwater quality protection. Groundwater quality protection is an important component of Delta water quality issues through the fact that as groundwaters are polluted, increasing use of surface waters (Delta) and its tributary sources will be made. A good example of this is occurring in Yolo County where ag interests have been and continue to pollute groundwaters with nitrogen fertilizers. As I am sure you know, under current regulatory requirements ag can apply fertilizers at will without regard to whether they are polluting groundwaters. The current voluntary approach towards controlling ag pollution of groundwaters by nitrogen fertilizers is not working; pollution continues to occur at high rates. An example of how this could affect the Delta is the domestic water supply situation for the City of Davis near where I live where the City has several city wells that show ever-increasing nitrate concentrations. The increased nitrate is due to

improper use of nitrogen fertilizers by ag interests. Within a few years, the City is going have to abandon the use of several wells because of the problems due to the increased nitrate concentrations. The City is now discussing the possibility of obtaining surface waters that would normally go to the Delta as a supplemental supply. While the City will return these surface waters to the Delta in part in its wastewater discharges, the character of the water entering the Delta will be significantly degraded because of the City's use.

Another significant groundwater pollution issue is associated with municipal landfills. While the state of California has regulations (WRCB Chapter 15) which could and should protect groundwaters from pollution by landfill leachate, in fact, the way these regulations have been implemented by the regional boards since they were adopted in 1984 only postpones when groundwater pollution will occur by today's landfills. I have filed a petition with the State Board to try to get the State Board to force the regional boards to implement the regulations in accord with the what is known today about the ability of today's landfill liner systems and groundwater monitoring systems to protect groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. It is obvious that since the wastes in a municipal landfill will be at threat forever and eventually the plastic liners will fail, future generations will face increasing groundwater pollution due to landfills that are being constructed today. There is need to get today's solid waste generators (the public) to pay the true cost of solid waste management through the use of landfills that can be readily developed that will, in fact, protect groundwaters from pollution by landfill leachate for as long as the wastes represent a threat as required by Chapter 15. If there is interest, I can provide a copy of my petition to the State Board on this issue which summarizes these points.

The Water Quality Program for CALFED should include a groundwater quality protection component. In my previous work with various water utilities in the state, I have provided guidance on how water utilities should protect their groundwater resources from pollution. I will be presenting a paper on this topic at the AWWA Watershed Conference that will be held in Seattle next August. I could, if there is interest, assist CALFED in addressing this issue as part of the Water Quality Program.

I have heard a number of individuals who are knowledgeable in water quality issues express the concern that the current CALFED water quality component is rushing to demonstrate some kind of accomplishment with Prop. 204 money without properly laying the foundation for the nature of the problem to be addressed and its significance to the Delta and its tributaries. While I cannot verify that these comments are appropriate, from my own familiarity with the program and from the introduction to it based on the materials presented in your December 18, 1996 memorandum, I, too, am concerned about this issue. It is very important that CALFED not try to make up for the years of neglect of Delta water quality issues by now rushing into crash programs to demonstrate water quality management without properly defining real water quality use impairments of such significance to the public so that the public will in a few years look back on CALFED Water Quality Program activities and conclude that their money was well spent.

About a year and a half ago, I was asked to make a presentation at a Toxics and Water Quality Modeling Workshop, Bay Delta Forum, held in August 1995. I discussed "Water Quality Modeling Issues in the Delta & San Francisco Bay." While there were no proceedings from this workshop, I have enclosed the abstract from my presentation as well as copy of the slides. A number of the issues that need to be addressed as part of the CALFED Water Quality Program are summarized in these materials. A number of the same issues were discussed in the materials I sent you yesterday. If you have questions about any of the items listed, please contact me.

Now that I have seen something of the characteristics of the CALFED Water Quality Program based on the materials that were included in your December 18, 1996 memorandum on this program, I find I can, to the extent there is interest by those managing CALFED, serve as a technical resource on defining real water quality issues and their management. My interest lies primarily in seeing that good science and engineering are used in the decision-making process. I am interested and plan to attend future Water Quality Program meetings. Unfortunately, because of a previous conflict I will not be able to attend the January 30, 1997 CALFED meeting. I would, however, like to receive any materials that are made available on water quality issues at this meeting and will take time to comment on them. I do plan to attend the public workshop on February 4, 1997 and the next meeting of the WQTG on February 14, 1997.

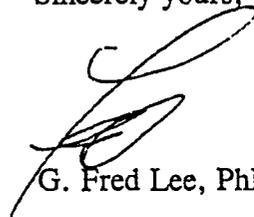
One of the issues that will need to be addressed is how to resolve conflicts between "experts" on water quality issues. I would be surprised if those who made the suggestions at the December 9, 1996 meeting that I have commented on above to the effect that chlorpyrifos is not used in urban areas but is used on rice, that detention basins should be used to remove heavy metals from urban stormwater runoff, etc. would not attempt to claim that their views on this matter as presented in your December 18, 1996 memorandum were technically correct. I have frequently observed situations where individuals with limited understanding of issues, especially in the areas of aquatic chemistry, aquatic toxicology and water quality, will make off-the-cuff comments on issues which if properly peer reviewed would be shown to be technically invalid. Further, I have frequently observed that individuals representing various entities will try to impose the entities' position on issues through claiming that their position is supported by the technical information available on the topic. The net result is that policy makers in the water quality field with limited expertise conclude that there are equal opposite views on the topic by experts and therefore they can ignore both views and make their decisions based on political or other bases which largely ignore the technical information available that should be incorporated to the maximum extent possible into the decision-making process. This issue has been of sufficient concern to me over the years so that Dr. Jones-Lee and I have developed a professional paper discussing how to resolve conflicts of this type. A summary of this paper was published in the ASCE "Forum." Enclosed is a copy of the summary as well as the original paper. Basically, we have found that in a situation in which there is controversy on technical issues, those who represent the different viewpoints should be required to document their viewpoints with any appropriate references to the literature, etc. and present these in a peer review arena for full, in-depth public review.

With few exceptions, I have found that this approach quickly identifies the self-serving positions held by those who wish to use technical information to attempt to advance their own position on issues as well as those that arise from a lack of understanding of current water chemistry, toxicology and water quality issues. I urge that the CALFED Water Quality Program consider utilizing a full public peer review process to resolve any differences on technical issues. For example, in the case of these comments, if someone disputes the technical validity of the position set forth in them, that individual/organization should be required to provide for public peer review a statement of the technical basis for their position on the issue. I will be happy to provide similar information beyond that which is already provided in these comments. The respective views can be peer reviewed in a public arena where both those who oppose my assessment as well as I have the opportunity to present supporting evidence for their positions.

For example, if Sarah Holmgren persists with her statement that the heavy metals other than mercury and possibly selenium cause significant water quality use impairments in the Delta, she should be required to provide documentation of that position so that it can be properly peer reviewed. Based on the principles of aquatic chemistry of heavy metals, their toxicology and the characteristics of Delta waters, it would be highly unlikely that heavy metals, other than selenium and mercury, would be a cause of water quality problems in the Delta. I can readily provide literature on this topic in support of my position. Further, I can critically review whatever Ms. Holmgren proposes that supports her position in a peer review arena for public and professional review. If you have questions about this peer review process, please contact me.

I appreciate that many of the materials in your December 18, 1996 memorandum are the result of committee meetings and do not necessarily represent your views on issues. If you have questions on my comments on the issues, please contact me.

Sincerely yours,



G. Fred Lee, PhD, DEE

Copy to: L. Snow
W. Croyle

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Enclosure