Robert Pyke, Consulting Engineer

February 21, 2011

Mr. Phil Isenberg
Chair, Delta Stewardship Council
980 Ninth St. Suite 1500
Sacramento, California 95814

Re: Comments on the First Staff Draft of the Delta Plan

"It doesn't appear anyone has yet identified a sweet spot combining economics, environment and political feasibility," Jonas Minton, quoted by the Associated Press.

Dear Chair Isenberg and Council Members,

Because the first staff draft of the Delta Plan is long on hand-wringing and short on policies and solutions, I wish to emphasize two things in the following comments. One is that there have been many excellent ideas submitted to you as part of the EIR scoping process, and otherwise, that do not appear to be reflected in this first draft. I will attempt to use some of these as examples, but will by no means be complete. The second thing that I would emphasize is that there appears to me to be more common ground in these written comments than is apparent from many of the oral presentations at Council meetings. I would suggest that you need to find ways both to be more responsive to comments from both the general public and organized stakeholders, and to bring all these various people together so that there is some reasonable consensus on the final Delta Plan. I really believe that this is possible. Unlike the Murray-Darling Basin in Australia, where there is not enough water to go around on a long-term basis, it is my judgment that in California there is enough water to go around, if its use is optimized, and if you can pry people away from the positions to which they have been anchored, in some cases for thirty years or more. In the end you, the Council, may still need to make some tough decisions, but, based on my conversations with a number of people from various stakeholder groups, I believe that you may be able to tease out more of a consensus than you expect at this point. So, rather than waiting for a more substantive draft from the staff, I am going ahead and offering some of my own suggestions on the basis that these are ideas that you should discuss with other interested citizens and stakeholder groups in an appropriate forum.

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General comments

1. **Scope**

With regard to the scope of the Delta Plan and the accompanying EIR, should you choose to complete one, I commend to you the comments of the State and Federal Contractors Water Agency dated January 28. When they say that "overbroad objectives for the content of the Delta Plan will undermine the process as well as the product", they are correct. I also agree with their assertion that "section 85021 of the (Delta Reform) Act is inappropriately included in the NOP as providing definition to the Delta Plan's objectives". But I would also suggest that the preceding section, 85020, is also misinterpreted in both the NOP and the First Staff Draft. These two sections are very clearly stated to be the policy of the State and to be "inherent in the co-equal goals", but they were not intended to be the primary basis for the Delta Plan. The specific directives regarding the content of the Delta Plan come later in Sections 85300-85309. In support of this interpretation I note that 85020(h) talks about establishing a new governance structure. You do not have to do that even though it is part of State policy. The legislature did that, and you are a key part of that new governance structure.

If you choose to complete an EIR, then no doubt the secondary planning area has to include both the Delta watershed and the areas outside the watershed serviced by the State Water Project, but regardless of the Act and of the requirements of CEQA, as a practical matter there is not much that you can do to directly mess with areas outside the Delta. Although both urban and agricultural waste water that is discharged into the rivers that flow through the Delta must have an impact on both the water quality in, and the ecology of, the Delta, there is simply not much that you can do about it. That is the job of the Water Boards, and all that you can do is jawbone about it. Likewise, statewide water conservation and water use efficiency has some impact on the demand for exports from the Delta, but while you can and should jawbone about that, there is not much that you can do about it directly. However, there are some aspects of ecological restoration of the Delta and flood management as it impacts the Delta, that might require going some distance into the watershed and additional south of Delta storage might be required as part of a long-term conveyance solution. Thus, I am not in complete agreement with ACWA, who state in their letter also dated January 28, that "the legislation limits the scope of the Council and hence the Delta Plan to actions within the legally defined Delta", but that is what you should focus on: conveyance through, ecosystem restoration within, water quality within, flood management within, and land use within the Delta. Come up with rational policies for these five issues, and find ways to finance them, and do not get into other fights that you cannot win.

Longer term, it is likely that issues such as regulation of groundwater, water rights and rational pricing of water will need to be addressed by the State, but to get sidetracked on these issues initially is, well, to get sidetracked. Therefore my comments are directed to what can be accomplished within the existing framework of dams, canals, complex water rights and screwed-up pricing. And what can be accomplished is significant. Fortunately it is not necessary to wait for solutions to these longer term problems, to solve the basic problems of the Delta. Unlike the Murray Darling Basin in Australia, there is still enough water, on average, to satisfy most if not all of the demands in California, provided that the *variability* of supply is accommodated. I will develop this thought further below in discussion of Chapter 5.

2. Use of best available science

The Act specifically calls for the Delta Plan to "be based on the best available scientific information and the independent science advice provided by the Delta Independent Science Board". This is right and proper and I commend the staff for coming up with a reasonable definition for "the best available science". The ecosystem restoration element of the Plan should not be based on anything other than the best available science. However, as illustrated by the recent report of the ISB on ranking of stressors, the best available science may not go very far in lighting the way to solutions. More generally, I would caution you not to think that every problem has a solution with a strictly scientific basis, or a calculated solution with little uncertainty, even within the ecosystem restoration element. Many of the solutions will necessarily be based more on consensus good management practices than on pure science. And other elements, such as conveyance and flood management, are almost purely engineering problems, not scientific problems. Use of "the best-available science" or "good science" is necessary, but not sufficient, to address complex environmental and engineering problems such as those being faced in the Delta.

Science after all is the systematic gathering and assessment of observable phenomena. It is directed to unraveling the mysteries of the universe rather than to solving problems. Scientists are people who like to unravel and study problems. Engineering, on the other hand, is about using one's ingenuity to solve problems. The term "engineer" comes from a French word that means ingenuity. Engineers are people who like to solve problems, or at least they used to be before bureaucracy took over.

"Good engineering" requires consistency with "good science". That has always been true, from Babylonian through Egyptian and Roman times down to present day, but for most of this time political and military objectives have dominated over the objectives of

compatibility with the environment and sustainability. In the mid-twentieth century, when the Central Valley Project and the State Water Project were constructed, political and short-term economic objectives dominated over the objectives of compatibility with the environment and sustainability. Today, however, population growth and the damage to natural ecosystems that have resulted from an "extraction economy" require that engineers pay much closer attention to the environment, "good science" and sustainability.

Thus new thinking is required to solve the problems facing the Delta. Thinking that accounts for both the wide variation in precipitation in the catchment area that feeds the Delta and the need for as much as possible of the natural flows to pass through the Delta before any water that is surplus to the needs of the Bay-Delta ecosystem is extracted. That may require some ingenuity. That requires "good engineering".

But good engineering and good science are still insufficient to solve complex problems. Good management is also required. In this connection it is worth taking note of a quote in a recent New York Times article about development in China " Clark Manus, who is the president of the American Institute of Architects, has a theory about the streamlined Chinese process. 'The U.S. political establishment is mostly attorneys and other people who are involved with political science', he says. 'In China, the highest-ranking officials tend to be engineers. They see a problem, they allocate money and effort toward a solution'." This is not to say that that this approach can only be executed by engineers, but the crafting of the Delta Plan must recognize the need for all three of "good science", "good engineering" and "good management", and be driven by a problem-solving mentality.

3. **Whom to believe?**

One of the challenges facing the Council is that on at least some subjects, and possibly many subjects, you will have apparently well-qualified experts offering differing opinions on technical topics. So how do you choose between those opinions? In order to trigger intelligent discussion of this subject, I offer my own version of "A Layperson's Guide to Weighting Expert Opinion".

In the first place use common-sense – spot check some facts where possible – ask around and get multiple recommendations. Then, in approximate order of importance, give more weight to the opinions of those experts:

1. Who have formal qualifications and are licensed to practice in the field in question; for example, my brother is professor of law in Brisbane Australia – he is

a pretty smart guy and a quick study so he might quickly be able to make some sage comments on California water law, but you would hardly want to rely on his opinion alone, and he could not represent you in court in California.

2. Who have practical experience not only in the field in question but also in the relevant geographic area. This is particularly important in a field like engineering which is still as much an art as a science. Experience and common-sense still outweigh the ability to do sophisticated calculations. All other things being equal, preference should be given to the opinions of people who have actually signed design drawings and stood behind their work. For example, engineers who have actually participated in the design and maintenance of levees should be given more weight than those who have performed only academic studies.

3. Who have superior academic qualifications. On the other hand, all other things being equal, higher degrees count. I would be the first to admit that a Ph.D. does not necessarily mean a heck of a lot, and in fact in some cases it is an indication of lack of common-sense, but it is an indication that you have the ability to study something in detail, and if the person in question has kept up in his/her field, that provides an understanding of what it takes to stay up to date in other fields.

4. Who are *not* trying to dredge up additional research funding by grandstanding and making problems appear to be worse than they really are.

4. **Adaptive management**

The Act specifically calls for the inclusion of "a science-based, transparent, and formal adaptive management strategy for ongoing ecosystem restoration and water management decisions". Again that is right and proper as far as it goes, but a successful adaptive management strategy requires good engineering and good management as much as good science. As an example, much of the discussion regarding the inclusion of adaptive management in the Bay Delta Conservation Plan (BDCP) has been misplaced. Adaptive management is not a substitute for a well-thought-out plan in the first place. A robust adaptive management plan requires a well-thought-out plan of action or roadmap with quantified or otherwise measurable goals, for which the consequences and effects have been modeled using robust tools. These tools can then be used to back-analyze the observed effects and can be used to test why the observed effects may have varied from the predicted effects. Then there is a basis for changes in the plan of action rather than those changes being just another guess. Moreover, there has to be a management structure that enforces discipline and can respond appropriately and logically to deviations from the predicted behavior. The subject is not called adaptive

management for nothing.

To the extent that one develops a robust plan that encompasses best management practices, the need for adaptive management should be reduced. However, there are some issues such as possible systematic climate change that can only be addressed using adaptive engineering and management. For instance, it makes no sense to design and build even critical facilities for the more extreme predictions of sea-level rise that have very low probabilities of occurrence – so low in fact that no-one can really say what they are. However, it does make sense to design facilities on a "no regrets" basis, so that they can be modified by future generations if the more extreme predictions of sea-level rise start to be confirmed by observations. That means, for instance, providing sufficient right of way for levees so that they can be safely raised, and protecting the westernmost Delta islands as a bulwark against salt water intrusion. To the extent that sea level actually rises a meter or two, further engineering measures would be required to limit salt water intrusion and damp out tidal energy in tidal marshes as it approaches the Delta, so while the initial Delta Plan should not include such measures, neither should it do anything that might make their subsequent construction more difficult. An excellent example of the intelligent application of adaptive engineering and adaptive management to the design of improvements to low-lying land is provided by the proposed development of Treasure Island in San Francisco Bay.

Finally, there is no need for a Chapter 4, especially if it just talks about science and logic-chains – that could be an appendix. Comments on adaptive *management* should be included in the actual elements of the plan, Chapters 5-9, as appropriate and should be tied to the content of those elements. Fortunately, in this case, the basic management structure is already in place in that the Council is required to update the Plan every 5 years. But that updating and adapting might require more than just jawboning to bring other agencies and their policies in line with the Delta Plan - it likely will require new legislation as well. That would be adaptive management!

5. **The need for an EIR**

At the EIR scoping meeting in Stockton I stuck my neck out a bit and questioned the need for an EIR: "While I am not a lawyer, let alone a specialist in environmental law, I find the arguments made by the State and Federal Contractors Water Agency, which is led by lawyers, and others, to be persuasive on this matter - they argue that even a programmatic EIR is not required for you to adopt and enforce the Delta Plan . I understand that, as a State agency, you are likely obliged to follow the advice of the Attorney General's Department on this matter, but I note that the Attorney General's Department is not always right – witness the Paterno case! The reason that I raise this

question is simply that you, your staff and consultants have limited time and resources to develop the Delta Plan. It would appear that sooner or later you are going to have to devote more effort to studying alternatives for conveyance, ecosystem restoration, flood management and land use, and to crafting a meaningful plan that integrates all of these elements, possibly at the expense of completing an EIR. And, if that is true, you had best address this issue sooner rather than later. An EIR for a plan that has no real content, is like a suit of armor with no-one inside it."

Further, organizations with generally opposing views, such as SFWCA and the Board of Supervisors of San Joaquin County, have made persuasive arguments that the Notice of Preparation is inadequate and needs to be revised if you are intent on proceeding with an EIR. I particularly like SFWCA's quoting of "the purpose of CEQA is not to generate paper, but to compel the government at all levels to make decisions with environmental consequences in mind". Clearly the legislature has already done that and if you complete a Delta Plan in accordance with the legislature's directives, you will be doing that also.

As I understand it, the intent of a programmatic EIR is to provide a basis for subsequent environmental documents that actually implement projects. A programmatic EIR can establish mitigation ratios or offset/describe cumulative effects or even describe large-scale effects. It is also common for a programmatic EIR to have project-specific elements that can be implemented immediately following the certification of the EIR. Generally, however, programmatic EIRs are a waste of time because they are overly broad and don't provide any value for the subsequent documents. However, the Delta Plan is required by law to include "quantified or otherwise measurable targets associated with achieving the objectives of the Delta Plan". If such targets are actually developed, they might form the basis for a useful programmatic EIR.

Organization of My Comments

My remaining comments are aligned with the chapters of the first staff draft starting at Chapter 5. Although I believe that the titles of some of these chapters could be more to the point, I commend the staff for sorting the issues into the five basic elements. Also, as recognized by the staff in the title of Chapter 12, these elements are not separate and distinct but must be integrated and include features that benefits multiple goals. I have been surprised by the degree to which that is possible. But it is possible if the Plan is based on two foundation stones. One is that the plan for conveyance must not be at odds with ecosystem restoration but should by itself, even without any add-on conservation measures, constitute a major step forward in repairing the damaged Delta ecosystem. The second is that it must be recognized that the Act does not allow for the

PPIC death wish for the Delta – acceptance that over time agriculture is unsustainable, levees will fail, and at least parts of the Delta will be converted to an inland sea. That is not even be the lowest cost solution, as the cost of re-routing the existing infrastructure that passes through the Delta likely exceeds the cost of making the existing levee system robust in the face of floods, earthquakes and possible sea-level rise. Certainly land-use in the Delta may evolve, and there may be some changes in the landscape, but the charge in the Act to the Council and to the Delta Protection Commission, is to "protect, enhance, and sustain the unique cultural, historical recreational, agricultural and economic values of the Delta as an evolving place .." This charge does not allow the Council to stand by and do nothing to maintain and improve the existing system of levees that, for better or worse, create the existing landscape of the Delta. But, just as conveyance should be handled in a way that promotes repair of the ecosystem, improvement of the levees should be handled in such a way that it serves multiple ends – not only flood protection and limiting salt water intrusion even in the face of sea-level rise, but also ecosystem repair through the restoration or addition of various forms of native vegetation on the water side of every mile of the Delta levees, providing interconnected habitat for at least some species, and adding to the recreational and tourism value of the Delta.

Chapter 5 – Manage Water Resources – i.e. Conveyance

As noted previously, this chapter or element should focus on conveyance and not get caught up on issues such as statewide water conservation, treatment and re-use of storm water and waste water, and trading of paper water, no matter how important those issues may be. It should focus on conveyance, and it should grapple with the questions of defining what a "reliable water supply" means and establishing "quantified or otherwise measurable targets" for the delivery of water to the Central Valley Project and the State Water Project. I don't mean to neglect the legitimate needs of the Contra Costa Water District, the Solano County Water Agency, the City of Antioch and other in-Delta users, but the CVP and the SWP are the elephants in the room.

There are two keys to addressing the conveyance issue: (1) Recognition that manmade alteration of the Delta in combination with larger export flows has turned the Delta from an estuary into a weedy lake which favors invasive species over native species; and (2) Recognition that precipitation in California is extremely variable and that past and future variability, which many climate scientists predict might be greater, must be addressed in any sustainable water management plan.

Therefore, two principles must be followed: (1) That natural flows through the Delta should be restored to the maximum practical extent; and (2) That much more water

should be extracted at periods of high flow and much less, or zero, water should be extracted at periods of low flows.

Adherence to these principles, with appropriate pumping and temporary storage facilities, will allow simultaneous recovery of the Delta ecosystem and sustainable exports at levels which might approach, equal, or even exceed the maximum past figure of something like 6 million acre-feet per year.

Implementation of a plan that adheres to these principles might involve four physical elements:

1. Restoration of floodplains on the Sacramento and San Joaquin Rivers and their tributaries in order to stretch out the flood hydrograph and allow export pumping at high levels for as long as possible;

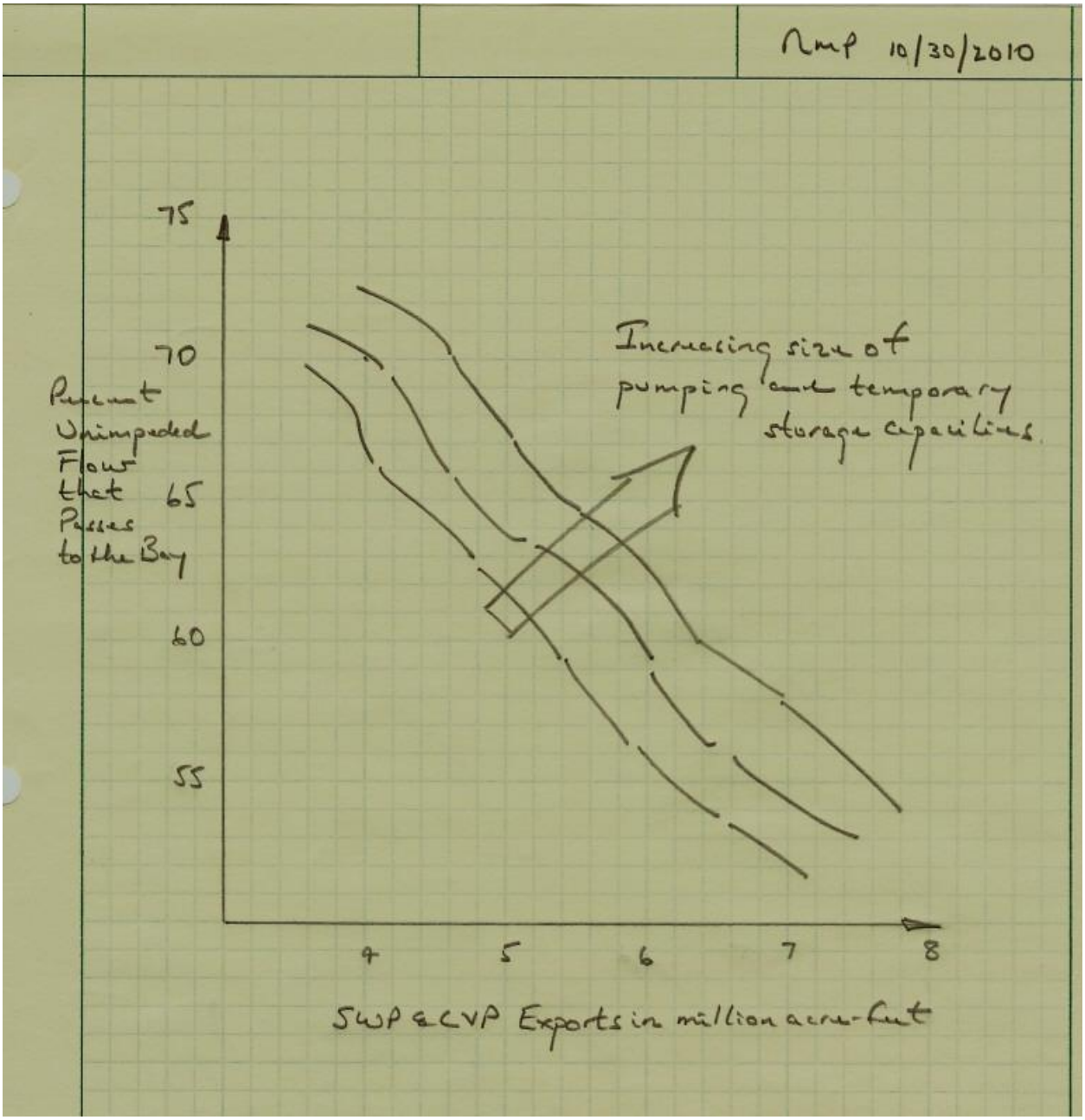
2. New pumping facilities somewhere in the Western Delta to allow flows to pass through the Delta in a natural way before surplus flows are extracted; these facilities might include some temporary storage;

3. One or more tunnels that can move the extracted water to a large temporary storage facility until the existing pumps can move it south; this storage facility would likely be located adjacent to and might incorporate the existing Clifton Court Forebay;

4. Additional south-of-Delta storage, much of it likely as groundwater but also including new Westside surface storage.

All these facilities should be designed in such a way that they can be progressively enlarged if that is justified by the initial performance. Note that the first element also provides significant flood management and ecosystem enhancement benefits.

They key to the optimum sizing of these facilities, as well as to establishing what reliable water supply means, and answering the question that has been repeatedly posed by Tom Zuckerman and others: “how much surplus water is there?” is illustrated by the graph on the following page.



Graph illustrating the trade-off between flows out of the Delta and the level of sustained exports. The size of the pie can be increased by increasing the size of the pumps and temporary storage facilities provided that they are properly located. The sizes of these pieces of the pie are also a function of the pieces of the pie not shown, which include net upstream diversions and in-Delta uses. To the extent that these uses are modified, the remainder of the pie is increased or decreased.

The numbers shown on the axes of the graph are for illustrative purposes only. The wavy lines in the figure are intended to indicate uncertainty. But there is some reason to believe that the numbers shown might be in the ballpark. The preliminary calculations made by Chris Enright at the request of Cliff Dahm that were presented at the last Council meeting, even though they were in terms of actual flow at Freeport rather than unimpeded flow, provide some support for the notion that with sufficiently large pumping and temporary storage capacity, exports at the levels desired by the Contractors might be possible at the same time that "environmental flows" approach the 75 percent of unimpeded flows that the Water Board has set as a desirable target. There is clearly a trade-off here - higher environmental flows mean lower exports, and vice versa. The Contactors can also get reliable supply at higher levels with a larger investment in new pumping and temporary storage facilities in the Delta and additional south-of-Delta storage facilities, but the Contactors would have to bear most of that cost and that has to be balanced against the willingness of both urban and agricultural water users to pay these costs, which in turn is a function of worldwide agricultural economics and the cost of alternate water supplied for urban users. Notwithstanding these complications, I believe that it is essential that you, the Council, commission a small study to develop a more formal version of this graph as part of the development of the Delta Plan. That is an essential first step in addressing questions that have been waiting for answers for far too long and providing a basis for you responding to the requirements of the Act. While it is possible that some reasonable consensus might emerge once everyone is looking at the same set of numbers, and while you should be informed by input from the Water Board and the Department of Fish and Game on the need for environmental flows, the Water Board is not going to make a determination about balancing the need for environmental flows and exports in time for inclusion in the Plan, and possibly in our lifetimes, so that it is more than likely that you will ultimately have to make a Solomon-like decision about where the sweet spot lies on the graph. But it can be done.

How much of this should end up being in the Plan? As a minimum, the two principles enunciated above must form the core of the conveyance element of the plan. The plan must also require that a study that producing results of the kind illustrated in the graph on page 10 be developed as part of any conveyance alternative. No conveyance alternative should be acceptable unless it provides satisfactory data on the long-term implications for environmental flows and sustainable water exports. I don't know how far you might want to go in specifying acceptable minimums, but any alternative that provides less than say 60-65 percent unimpeded flows for the environment and less than 5-6 million acre=feet per year in sustainable exports does not solve the present technical and political problem.
Should the Plan spell out the four physical elements enunciated above? Not necessarily, but unless someone else comes up with a conveyance alternative that satisfies the two basic principles, this is the only game in town. Note that in addition to being inherently consistent with the co-equal goals, a conveyance alternative based on these four physical

elements also does the following: in Element One, it provides additional ecosystem restoration and flood management benefits; in Element Four it encourages conjunction use of surface water and groundwater; and in Element Two, by providing a huge suck in the Western Delta at times of high flow, it reduces maximum water surface elevations in the Delta and hence the height to which levees need to be raised. One of the findings of the development of the Central Valley Flood Protection Plan that you should be aware of is that improvement of riverine levees actually increases peak flows in the Delta! That should not be allowed to happen and it is another item on which you should be jawboning, but whether that happens or not, very large pumps in the Western Delta will help move water through the Delta with lower maximum water surface elevations at times of high flow. They could also do the reverse – they could move saline water closer to, or into the Delta, at times of low flow and/or king tides. However, this conveyance alternative is self-regulating because unless the Contactors want to pay the additional cost for brackish water desalination, excessive pumping in periods of low flow will just suck salt water into the pumps!

As indicated, conveyance necessarily includes additional storage, likely in both groundwater and surface storage facilities, but I believe that the Council's emphasis should be on South of Delta storage. In fact, although this topic is a political hot potato, I would suggest that the Plan might jawbone about the fact that additional upstream storage, notwithstanding potential water supply and flood management benefits, is not desirable because it can only further disrupt the natural flows that ultimately pass through the Delta. Those water supply and flood management benefits at this point can be better provided by re-activating floodplain storage and by taking out surplus water once it has passed through the Delta.

As to who should manage and operate new Delta conveyance facilities and new South of Delta storage facilities, the answer is clear in the case of the latter – they should be planned, managed and operated by the San Joaquin Valley water users. I believe that the best solution for planning, management and operation of new Delta conveyance and temporary storage facilities would be a new JPA including the Delta Counties and Water Agencies. I can already hear the shrieks from the Contactors who seem to have the mindset of resisting things that are in their best interests, but since the kind of conveyance and storage that I have suggested represents the best chance that they have to maximize sustained exports, maybe you can bring them around. Planning, management and operation of re-activated floodplain storage is perhaps the hairiest of these management issues. Although such measures have apparently been talked about in the Central Valley Flood Protection Plan development, and have been promoted by various environmental interests, as I understand it no-one has yet reached out to the farming interests that would be impacted to start exploring solutions that might be of mutual benefit. This is something that the Council might start exploring at an early point.

In many ways the problem of constructing short-term operating rules for the CVP and SWP exports is more difficult than solving the long-term problem. While BDCP has many other problems, this is one of the major issues that has caused BDCP to founder. The Act states that "the department (DWR), in consultation with the United States Army Corps of Engineers and the Central Valley Flood Protection Board, shall prepare a proposal to coordinate flood *and water supply operations of the State Water Project and the federal Central Valley Project*, and submit the proposal to the council for consideration for incorporation into the Delta Plan". I have no idea where that proposal stands, but I would not hold out much hope that these three agencies plus the Bureau of Reclamation will offer you a proposal than you can include directly in the plan and it may be that in the short-term you can do no more than go down to Fresno and have lunch with Judge Wanger to sort out who is going to set these rules.

Chapter 6 – Restore Delta Ecosystem

Although not specifically required by the Act, it is desirable that this element of the Delta Plan be informed by input from the Delta Conservancy. I understand that that development of the Conservancy's strategic plan has been delayed as a result of funding issues, but that you have been working to help the Conservancy in that regard and I commend you for that.

As indicated above, ecosystem restoration – more properly ecosystem repair, since we are not talking about restoring the Delta to any specific previous condition – starts with a solution to the existing conveyance problems that, rather than aggravating the present situation, makes a significant improvement. But many additional "conservation measures" will need to be taken to fully achieve the co-equal goals. The broad principles that should be followed are relatively clear and should include restoring connectivity, complexity and variability to the Delta ecosystem on a landscape scale, that is throughout the Delta, rather than on a piece-meal basis. It must also be recognized that the Delta ecosystem is not a closed system and that the ocean-bay-Delta-rivers system must be addressed as a whole. But a systematic ranking or prioritization of possible conservation measures has never been done. I have suggested to the Delta Conservancy that a starting point for such an effort might be the working paper by Sandstrom et al., which draws heavily on the companion paper by Moyle et al. (both produced by the Center for Watershed Sciences at UC Davis).

Such a prioritization necessarily starts with some assessment of the drivers or stressors that impact the ecology of the Delta. The Independent Science Board having whiffed on that, I offer my own sorting of stressors. This is not a strict ranking of stressors, since I

don't know how to do that either, but it sorts the stressors into groups and makes a start at a connection with remedies. My sorting draws heavily on both the working paper by Moyle et al. and the POD report of the Inter-Agency Ecological program. In defense of the ISB, I note that, as explained in the landmark paper on altered flow regimes by Bunn and Arthington, the necessary detailed observations were not made during the decline of most rivers and estuaries to allow the development of robust detailed correlations of causes and effects on a scientific basis. Bunn and Arthington express the hope that that will be done as these ecological systems are repaired, and that that will guide adaptive management, but in the meantime there is a need to go forward in accordance with broader principles and best management practices.

Tentative ranking of stressors

1. The first order factors:

a. Climate variability, including both the magnitude of winter and spring freshwater pulses and oceanic conditions (which are very significant for anadromous fish but not so significant for other species) - *out of our hands*.

b. Flow regime – *we have significant but not complete control (reservoir operations, upstream diversions and conveyance/pumping operations)*

2. Landscape - *have all been altered by man, we have limited but nonetheless some significant opportunities to reverse course*:

a. Connectivity
b. Complexity
c. Variability

3. The second order factors - *which are mostly a function of 1 and 2, and are not really independent unless you want to physically stir up turbidity or construct salinity control barriers:*

a. Salinity
b. Temperature
c. Turbidity
d. Natural nutrients

4. Introduced stuff - *should all be eliminated – you use the waters of the state, you return them to the river in the same condition*:

a. Unnatural nutrients

b. Contaminants
c. Disease

5. Harvest- *the first of these should be eliminated or at least reduced to insignificant levels*:

a. Entrainment
b. Predation
c. Fishing

Tentative list of conservation measures

On the basis of this sorting of stressors, the following can be suggested as the more obvious things to do (in addition to regulating flow which is addressed in Chapter 5 and regulating water quality which is addressed in Chapter 7 – also note that some of these actions are necessarily integrated with actions discussed in Chapters 8 and 9):

1. Restore sunken islands including Franks Tract, Mildred Island and Western Sherman Island as tidal marsh and/or tule marsh.

2. Work with the Bay Conservation and Development Commission (BCDC) and the existing landowners, who are primarily duck clubs, to convert the Suisun Marsh into tidal and sub-tidal wetlands

3. Encourage the growth of native vegetation on the water side of all Delta levees which will not only provide significant ecological benefits but also recreational and tourism benefits. At selected locations this vegetation may be extended into the existing waterways on berms, or up widened levees to create riparian habitat.

4. Preserve the tradition of agriculture in the Delta as much as possible while developing mechanisms to encourage agricultural interests to adopt habitat friendly agricultural practices such as those employed by The Nature Conservancy on Staten Island, providing benefits to wildlife, recreation and tourism.

5. Restore some measures of complexity to the Delta waterways by, in addition to creating more natural channel margins as discussed in (3) above, making use of both set-back levees and berms to create more natural slough geometries, and using rock barriers to create more dead-end waterways.

6. Convert additional lands to tidal marsh and sub-tidal habitat.

I defer to others on the subject of establishing quantified or otherwise measurable targets for the combined effects of all the ecological repair related actions discussed under chapters 5-9, but note that the Act refers to doubling salmon population – I have no idea what the base is for that, but getting the combined salmon runs back to the order of a million or more might be a better target. In my judgment the goal should be not just to avoid jeopardy for listed species but to obtain a flourishing ecosystem, which might not be as rich as that which existed before European development, when native Americans lived in harmony with their brothers and sisters in the plant and animal worlds, but is still the envy of the developed world.

Chapter 7 – Improve Water Quality

There are three big water quality issues in the Delta: (1) flow and circulation; (2) salt water intrusion; and (3) introduction of nutrients and contaminants from the watershed and from within the Delta itself.

The first of these is under your direct control and will be addressed largely, but not entirely, by adopting a rational solution for conveyance. The principle element that will still be missing is the need for further increased flows in the San Joaquin River but that is a tough nut to crack and it is one of the fights that you would be wise not to get into in the initial Delta Plan.

The second of these big water quality issues is also under your control, or rather under the joint control of the Council and of BCDC. It is obviously strongly impacted by the solution for conveyance and the Solomon-like decision that you are going to make on flow criteria. But longer-term, depending on the observed rate or sea-level rise, other actions may need to be taken in concert with BCDC. In dealing with tidal influence on top of sea-level rise, there is the option of restoring additional tidal wetlands around the Bay, as opposed to diking off the lands around the Bay, thus absorbing more tidal energy within the Bay, or doing the same thing around Suisun Bay and in the Suisun Marsh. Likely both would be needed and the Council and BCDC will need to act together to promote the restoration of further wetlands, even if it means rolling back existing development in some cases. Fortunately, this is not an immediate concern and in my judgment this is not an issue that needs to be addressed in the initial 5-year Delta Plan, but during that initial 5-year period, longer-term solutions, which might include restricting flows in and out of the Delta but narrowing channels or by the construction of engineered barriers, will need to be studied.

The third big water quality issue, that of the introduction of nutrients and contaminants from the watershed and from within the Delta itself, without additional legislation, is clearly more the responsibility of the Water Boards than of the Council. But the Council can and should jawbone on this issue. My phrase "*you use the waters of the state, you return them to the river in the same condition*" has attracted some attention in earlier drafts of this document! But, it seems to me that that should be the long-term goal. And, some intelligence needs to be applied to the issue. Individual farmers, particularly in the Delta, but also elsewhere, cannot be expected to fully treat all return flows, but there is no excuse not to have tertiary treatment of all return flows from urban areas and aggregations of farmland. In the short-term, one of the most significant things that you might do is to apply pressure to the Bureau of Reclamation to solve the San Luis Drain problem in a satisfactory manner. It is my understanding that that remains their legal responsibility and you might use that fact as a bargaining tool in any discussions regarding both short and long-term flow criteria. I also commend to you the comments of the Contra Costa Water District regarding water quality.

Chapter 8 – Reduce Risks to People, Property, and State Interests in the Delta – i.e. Flood Management

Flood management in the Delta is mostly, but not entirely, about levees. The Delta Plan is supposed to be informed by the Central Valley Flood Protection Plan, especially with respect to flood flows and maximum water surface elevations, but it does not appear that that can be done using real numbers until the second edition of the Delta Plan. In the meantime a rational policy on Delta levees needs to be enunciated which can cope with whatever maximum water service elevations are determined subsequently. In some respects this is not a major problem because, although I believe that the target must be to have significant levee improvements in place within the next ten years, final design of these improvements cannot commence until financing is in place, and that might take several years.

As noted previously, the Act also states, with different emphasis this time, that "the department (DWR), in consultation with the United States Army Corps of Engineers and the Central Valley Flood Protection Board, shall prepare a *proposal to coordinate flood* and water supply *operations of the State Water Project and the federal Central Valley Project*, and submit the proposal to the council for consideration for incorporation into the Delta Plan". I assume that the flood control part of that proposal will be included in the Central Valley Flood Protection Plan in due course.

As you are aware, the Delta levees have become something of a technical and political football and I will therefore spend some time addressing some of the background issues before suggesting a rational Delta levee policy.

For starters, it does not seem to me that letting Delta levees fail is an option. This is the result in part of the language in the Act: " the council, in consultation with the Central Valley Flood Protection Board, shall recommend in the Delta Plan priorities for state investments in levee operation, maintenance, and improvements in the Delta, including both levees that are a part of the State Plan of Flood Control and non-project levees"; "the Delta Plan shall attempt to reduce risks to people, property, and state interests in the Delta by promoting effective emergency preparedness, appropriate land uses, and strategic levee investments". Abandoning the Delta levees is also at odds with the core requirement to "protect, enhance, and sustain the unique cultural, historical recreational, agricultural and economic values of the Delta as an evolving place .."

And, the arguments to the contrary, such as that made by Jeff Mount in his letter to you dated January 7 commenting on the Flood Risk White Paper
"to date, all planning efforts have failed to consider that it is more economically efficient to allow some islands to remain flooded following levee failure. New policies need to be established that address this" are flawed. It is not at all clear that it is more economically efficient to allow the Delta islands to remain flooded, should there be a levee failure. This conclusion is, I assume, based on the economic analyses in the PPIC reports which failed to account properly for non-agricultural uses and values. It is true that one of the desirable characteristics of a good investment in the Delta that was suggested by Moyle et al. in the working paper previously cited is "create/allow large expanses of low salinity (1-4 ppt) open water habitat in the Delta"; but this is at odds with more general water quality goals and it must be noted that the historic Delta in fact never contained large expanses of open water. Flooded islands also have other undesirable features such as increasing the loads on adjacent levees and potentially eliminating habitat for listed terrestrial species. Thus, a more rational strategy is not only to work to limit or prevent future levee failures, but also to restore in some form the presently flooded islands.

Before beating to death some of the technical issues involved in the debate over Delta levees I should emphasize that there is really not that much difference between the "doomsday school", represented by Jeff Mount and Ray Seed, and the "they are not so bad, but they could be better" school, represent by Gil Cosio and myself. These differences get amplified in public discussion for various reasons, but can be bridged in private discussions. It is certainly true that the "doomsday school" can sometimes be correct. I am one of many engineers who knew that the New Orleans flood protection

system was a disaster waiting to happen and, like Bob Bea, I regret not having spoken out more publically on that issue. But more often than not, the "doomsday school", both in engineering and in environmental science, blows up a legitimate smaller concern into a larger concern for in part the same reasons that minor differences between experts get amplified in public debate or lawsuits. The best local example that I can give of the "doomsday school" run amok is the story of the BART Transbay Tube Uplift. As part of an overall system vulnerability study, a large A-E firm in consort with a professor of structural engineering, raised the specter of the Transbay Tube floating to the surface of the Bay in an earthquake and this became the center-piece of BART's effort to pass a bond measure to finance the overall system improvements. Some test sections costing millions of dollars were constructed to evaluate possible mitigation techniques and the cost of mitigating the alleged problem the full length of the tube was estimated to be in the order of $300 million. However, this issue had been considered by the original designers of the tube, who had advisers that included that late Professor Harry Seed, and there was in fact no mechanism that would allow uplift. This was finally confirmed by an updated engineering study that included both advanced analyses and centrifuge tests at UC Davis and the $300 million has been reallocated – although you have never read that in the press!

Next, it is necessary to make some comments about the Delta Risk Management Strategy (DRMS) and the recent presentation to the Council on earthquake hazards and the risk to levees by three geologists from the US Geological Survey (USGS), because the actual DRMS documents and the USGS presentation and the subsequent debate over them, unnecessarily colors rational consideration of the Delta levees.

As you are aware, DRMS was a study of overall risks to the Delta, but with prime emphasis on levees, commissioned by DWR in response to AB 1200. It was extensively reviewed, including a review by an independent review panel assembled by the Cal-Fed Science Program. That review concluded that "the revised DRMS Phase 1 report is now appropriate for use in DRMS Phase 2 and serves as a useful tool to inform policymakers and others concerning possible resource allocations and strategies for addressing risks in the Delta". But the IRP then went on to say: "This conclusion, however, is subject to some important caveats. First, the IRP cautions users of this revised DRMS Phase 1 Report that future estimates of consequences must be viewed as projections that can provide relative indicators of directions of effects, not predictions to be interpreted literally."

Notwithstanding the overly scientific bias of the IRP, I believe they were correct in concluding that DRMS developed a good framework for assessing risks to the Delta levees but that one should be wary of taking the results literally. That is no reflection on the co-PI's, Marty McCann and Said Salah-Mars, in part because the DRMS effort was

schedule driven and had data gaps that were drawn to DWR's attention but never filled. It is well known that lack of data and knowledge in this kind of study tends to drive the estimates of fragilities down, and the risks up. Further, significant improvements have been made to some Delta levees under the subventions program since DRMS was completed, so that DRMS may already be out-of-date. Also, in addition to the on-going studies performed for various reclamation districts, it is my understanding that additional data has been acquired on the northern Delta levees as part of DWR's Non-Urban Levee Evaluation program and that further data may be acquired in the Central and South Delta under that program. The Corps of Engineers, in collaboration with DWR, has also embarked on their own "Delta Islands and Levees Feasibility Study", and that may develop additional data. Thus, rather than relying on results from DRMS, I would suggest that you should take the lead in drawing on the results of these additional studies and use the DRMS framework to make updated and better estimates of current and future risks to the Delta levees.

But much more egregious than misuse of the DRMS results by a variety of people was both the invitation to the USGS to speak, and the content of the USGS presentation at the last Council meeting. I am sure that Eric Nichols was well-intentioned, but anyone with even modest knowledge of this field knows that the USGS personnel tend to grandstand and at best they should be included in a panel discussion that includes people with other views. I note that the co-PI's have written to both you and to the USGS and that in response USGS management has issued a qualified retraction, but the initial presentation was widely reported, including in your own newsletter, without qualification, and the damage that was done, as with the misleading statements in Joe Grindstaff's cover memo to the first staff draft, is difficult to contain.

Briefly, what was wrong with the presentation is that most of it was showboating and the USGS geologists were wrong on at least two key issues. The showboating included showing examples of levees failures which are largely irrelevant to the Delta. I happen to be very familiar with Christchurch, New Zealand, for instance (it is the only place in the world where I have ever been an expert witness on the losing side of a lawsuit). The levees that deformed or "failed" there sat directly on top of very recent and loose sand deposits. The natural sand deposits that some people worry about liquefying in the Delta are <u>under</u> the peat and thus much older – but perhaps I am getting too technical. Joe's Fletcher citing of amplifications of ground motion by a factor of 40 in the Mexico City earthquake was purely scare tactics. We know why such amplifications occurred in Mexico City and why they will not happen in the Delta.

Marty and Said have elaborated on the major criticism made by USGS of DRMS, which was that only firm soil attenuation relationships were used. It is true that the section of the DRMS report that deals with seismic risk to the levee system runs some 270 pages

and so not many people have actually read it, but if you do read it, it is clear that as a first, logical step, DRMS used firm soil attenuation relationships, but then in a second step they conducted both equivalent linear and nonlinear analyses of the response of the local soil conditions and levees. It may well be true that the activity of the Greenville fault may now be thought to be greater than it was even a few years back, but that still does not make a dramatic difference to the seismic hazard in the Delta, and it was outrageous for Dave Schwartz to say that prior studies, meaning DRMS, made "very, very unrealistic" assumptions.

A second major error in the USGS presentation was Dave's statement that "We are less sophisticated at retrofitting levees for earthquake risks as we are at retrofitting buildings". I have two problems with that. One problem is that, although Dave is an unusually well qualified and able tectonic geologist, our relative ability to retrofit buildings and levees is an engineering question, not a geologic question. The second problem is that the assertion is just not correct. Nor was Joe Grindstaff's comment, reported by Matt Weiser in the Sacramento Bee, that "We have no earthquake standard for levees in the state, it's not something we design a levee around yet." It is true that DWR has been slow to develop procedures for analyzing the earthquake hazard to levees and in drawing up standards, but the DWR Urban Levee Evaluation includes consideration of earthquake shaking and so does the recently released 4th draft of the DWR Interim Levee Design Criteria. While specifically for urban levees, these criteria address what are called "non-intermittent" levees, i.e. Delta levees and constitute a useful step towards developing appropriate standards for Delta levees. Otherwise, in addition to working on both Delta and riverine levees, including serving as an expert witness in the Paterno Case, I have worked on evaluating the earthquake hazard to levees around San Francisco and San Pablo bays since at least 1977. These levees protect both homes and landfills that contain varying amounts of toxic waste. Neither BCDC, nor the multiple agencies that regulate landfills, will accept even low probabilities of failure of these levees. As to whether it is easier to retrofit a levee or a building structure, as someone who has also worked on the BART seismic retrofit program and the design of the new East Bay Bridge, as well as a number of school and hospital buildings, I will assert that making a levee robust to withstand earthquake shaking is a lot simpler than retrofitting or even designing a new building or bridge structure to be robust. Basically it just takes a wider cross-section and more dirt

Now to some relatively brief comments on the Flood Risk White Paper. I refer you to the comments submitted by the Central Valley Flood Control Associates and by MBK Engineers for additional comments.

Section 11a, page 5-9 and ff. **Earthquakes**. This section generally demonstrates a less than deep understanding of the issues. For instance, it is pointless to cite a DWR 1992

report (that is not listed in the references) and to include a chart from it as Figure 5-5. On the other hand, the seismic risk portion of DRMS was relatively well done and the results shown in Figure 5-14 can serve as a useful starting point for an intelligent discussion of earthquake-induced failure of levees. Figure 5-14 indicates that the 100 year return period peak ground acceleration (pga) in the Delta ranges from 0.1 to 0.2g in firm soils. The phenomenon of liquefaction is generally cited as the greatest contributor to the hazard faced by the delta levees and this level of acceleration is lower than that which has been observed to trigger liquefaction in hydraulically-placed dams and sand fills. Further, the examples of liquefaction-induced failures that are shown in Figures 5-8 to 5-13 are of questionable relevance. The subsurface conditions in the Delta are unique and unlike those of the case histories shown in these figures. In the Delta there are two different kinds of soils that may be susceptible to liquefaction. One is the topmost sand layer that underlies the peat. This, relatively thin, layer typically shows low penetration resistances and may be considered by some experts to be susceptible to liquefaction, however, these natural deposits are quite old, predating the formation of the peats, and others experts would argue that this reduces the probability of liquefaction considerably. The other kind of soil that is susceptible to liquefaction is hydraulically placed clean sand that has been dredged from the main river channels and placed in adjacent levees without compaction. The actual extent of these materials is unclear and it may be that these materials are sufficiently well drained that most of the excess pore pressures that are generated by earthquake shaking would quickly dissipate so that any deformations would be limited. Thus, a fair summary would be that the risk of failure of Delta levees due to earthquake shaking cannot be dismissed but that further detailed studies are required to determine whether it rises to significant levels.

Section 11b, pages 5-20 **Sunny Day Failures**. The White Paper cites numbers from DRMS in spite of the fact that the IRP cautioned against taking DRMS numbers at face value. And the number cited of a levee breach due to causes other than flood or earthquake of once every 10 years is inconsistent with the recent actual performance. In fact there have been three major “sunny day” failures in the last 30 years, the 1980 failure of Lower Jones Tract, the 1982 failure of McDonald Island and the 2004 failure of Upper Jones Tract, consistent with one failure every ten years, however the first two of these resulted from operation of the PG&E gas storage facility under McDonald Island (knowledge developed when I served as an expert witness in the litigation that followed the McDonald Island failure). Thus, the true rate of sunny day failures due to unknown causes is less than once every 30 years. Further, improvements in systems for monitoring the internal condition of levees (as was asked about by Council Member Hank Nordoff at an early Council meeting) should allow more prompt discovery of dangerous conditions in the future and further reduce the probability of sunny day failures.

If anyone is still reading at this point, I apologize for the long-winded introduction, but it is necessary to combat the misinformation that runs rampant on the subject of Delta levees and earthquakes. Finally, before getting to my suggested Delta levee policy, I want to repeat and comment on several other points contained in Jeff Mount's letter on the Flood Risk White paper:

- Levee fragility, including the different potential causes and consequences of levee failure, is highly variable in the Delta. Therefore, one-size-fits-all levee policies are unlikely to be successful.

- Current levee policy is driven by state and federal levee standards that are uniformly applied, regardless of risk. This leads to inefficiencies at mitigating risk and is unlikely to perform well under changing future conditions.

- Risk-based approaches, which seek to make strategic investments that yield the highest risk reduction, are likely to be most successful, as well as transparent and objective.

There is some validity to each of these points. However, the variability of subsurface and levee materials is routinely taken into account in the design of Delta levee improvements. And, in part it is because of variable soil conditions and properties that we always use factors of safety in geotechnical engineering. We know that we can't always control the properties of the materials that we have to work with. To be sure, existing state and federal levee standards are not directly applicable in the Delta. That is why you, the Council, should take the lead in developing a Delta-specific levee policy. As noted in Point 9 of my suggested Delta levee policy, it is impractical to design Delta levees, or in fact any levee system, to precisely have a uniform risk, although we should work in that direction. However, a more useful role for risk analysis would be to use the DRMS methodology with improved and updated data as a tool for evaluating progress on making the levees more robust. A first update should be completed in the near future to serve as the base case.

A rational policy for Delta levees

The historic Delta has been modified by the creation of islands surrounded by levees. The following points assume that this configuration will be largely preserved, partly to protect the existing infrastructure, including water conveyance, and partly to maintain the Delta as a Place. While some evolution in uses is likely, significant change in the geometry of the Delta islands is unlikely. The failure of Delta levees and the creation of

open water within the Delta will not restore the historic condition and is undesirable for a number of reasons. Restoration of some measure of complexity to the Delta waterways is desirable but this can best be accomplished by recovering the sunken islands, not as farmed islands but as tidal wetlands, by encouraging the growth of native vegetation on the water side of all the levees and perhaps adding water side benches, and possibly by restricting the flows in selected channels.

1. Opinions vary as to the current condition of the delta levees but these differences are exaggerated in public discussion as a result of posturing by one side or another.

2. Dave Mraz of DWR gave a very good summary at an early meeting of the Delta Stewardship Council of the current status of the Delta levees: (i) the levees hold back water every day so that their static stability and seepage control measures are pretty good; (ii) "sunny day failures" are still a problem but the likelihood of these failures can be minimized by better monitoring; (iii) earthquake-induced failures are a legitimate concern but opinions vary on how great the hazard really is and more precise evaluations are hampered by a lack of data (paraphrased).

3. The DRMS study is not a good basis for drawing any numerical conclusions because it was schedule-driven and hampered by big data gaps.

4. With continuing improvements funded by the State's subventions program and the $200m that is being made available by the Federal government through the Corps of Engineers, the Delta levees are, or will be, in not such bad shape for flood and earthquake loadings with a 100 year return period.

5. However, given the importance of the levees for maintaining the Delta as a place and protecting the vital infrastructure that runs through it, designing for a 100 year return period is inadequate. Critical structures in this state like schools and hospitals are designed for something like a 1000 year return period. The new East Bay Bridge, which is a critical structure, but no more critical than many of the Delta levees, was designed for 1500 year return period ground motions. On balance, design for flood and earthquake loadings with return periods in the order of 500 years would appear to be appropriate. This corresponds to higher probabilities of failure than are used for instance in the Netherlands, but the economics and politics are different in the Netherlands and they really don't meet their stated criteria anyway!

6. It is feasible to design for 500-year return period loadings by widening the existing levees on the land side as shown by the "super levees" designed for Delta

Wetlands. Such levees can be constructed at a cost which might be in the order of $5m per mile. These levees can also easily be raised as necessary to accommodate sea level rise.

7. A critical component of the ecosystem restoration element of the Delta Plan should be the restoration of native vegetation on the water side of every Delta levee. This might require the installation of an engineered rodent and root barrier but can otherwise be easily accommodated by using a more substantial levee section.

8. Other levee standards are not applicable to the Delta and the Delta Plan should include a Delta-specific levee standard. This standard should require advanced monitoring for defects on a regular basis and real-time alerts of deformation or failure. An attractive approach for the former has been developed by Professor Ken Stokoe of the University of Texas, and for the latter by Professor Jason de Jong of UC Davis.

9. Both Jeff Mount and Bob Bea are calling for wider use of risk- based approaches for dealing with the Delta levees. That is fine in theory, and an updated risk assessment might be a good way to prioritize spending on Delta levees, but it should be recognized that there are significant uncertainties in such analyses and that they cannot be used directly for design purposes. However, a suitable quantified and measurable target for evaluating Delta levees might be that, with the exception of designated non-critical islands, 90 percent of the remaining levees should offer 500-year protection against both flood and earthquake using a 50-year window, that is, they should have no more than a 10 percent chance of failing in the next 50 years, and the remaining 10 percent of the levees should have not less than 200-year protection. The goal should be to meet this target within 10 years.

10. The cost of the required improvements is manageable relative to the value of the infrastructure that passes through the Delta (including water conveyance) and the cost of relocating this infrastructure. A mechanism for financing these improvements is discussed under Chapter 11.

Emergency planning

The Act states in part that “the council may incorporate into the Delta Plan the emergency preparedness and response strategies for the Delta developed by the California Emergency Management Agency pursuant to Section 12994.5”, however, progress in developing that strategy is slow and it might not be available for inclusion

directly in the Plan. In the meantime I would commend to you the comments submitted by Ron Baldwin of San Joaquin County dated February 17 and in particular "The Bold Vision for Future Delta Flood Fight Response".

I also note that DWR has actively been working on both emergency response and assessment of the time that export supplies might be interrupted by massive levee failures. My understanding is that current assessment is that supplies will not be disrupted for more than six months in the worst case and likely only for shorter periods. It is important that this finding be confirmed and publicized as it undercuts one of the main arguments that has been made for the need for a BDCP-like isolated conveyance.

Chapter 9 – Protect and Enhance the Unique Cultural, Recreational and Agricultural Values of the Delta as an Evolving Place

The Act requires the Delta Protection Commission to "develop, for consideration and incorporation into the Delta Plan a proposal to protect, enhance, and sustain the unique cultural, historical recreational, agricultural and economic values of the Delta as an evolving place, in a manner consistent with the co-equal goals", and to "include in the proposal a regional economic plan to support increased investment in agriculture, recreation, tourism, and other resilient land uses in the Delta". It is my understanding that the development of the economic plan and thus the proposal has been delayed by bureaucratic hurdles but that it still might be forthcoming in time to inform the Delta Plan. In the meantime here are my own thoughts on the subject.

A policy for protecting and enhancing the Delta as a Place

The historic Delta has been modified by the creation of islands surrounded by levees. The following points assume that this configuration will be largely preserved, partly to protect the existing infrastructure, including water conveyance, and partly to maintain the Delta as a Place. While some evolution in uses is likely, significant changes in the geometry of the Delta islands are unlikely. The failure of Delta levees and the creation of open water within the Delta will not restore the historic condition and is undesirable for a number of reasons. Restoration of some measure of complexity to the Delta waterways is desirable but this can best be accomplished by recovering the sunken islands, not as farmed islands but as tidal wetlands, by encouraging the growth of native vegetation on the water side of all the levees and perhaps adding water side benches, and possibly by restricting the flows in selected channels.

1. Preserving and evolving the Delta as a Place requires a rational policy for maintaining and improving Delta levees and a mechanism for funding these improvements. This is detailed elsewhere, but I note that the cost of improving the existing levees is manageable relative to the value of the infrastructure that they protect and/or the cost of relocating it.

2. The Delta levee and water conveyance policies should allow for adaptive management in order to adjust to sea level rise as necessary.

3. Encouragement of the growth of native vegetation on the water side of all Delta levees will not only provide ecological benefits but significant recreational and tourism benefits.

4. The tradition of agriculture in the Delta should be preserved to the maximum extent possible. However, mechanisms should be developed to encourage agricultural interests to adopt habitat friendly agricultural practices such as those employed by The Nature Conservancy on Staten Island, providing benefits to wildlife, recreation and tourism.

5. The Delta Stewardship Council, in conjunction with the Delta Protection Commission and the Delta Conservancy should establish a Delta Recreation and Tourism Board that will actively promote Delta recreation and tourism, with an emphasis on eco-tourism.

6. Subdivision-type development in the Delta should be discouraged but policies should be adopted to preserve and enhance the existing towns with an emphasis on supporting both agriculture and recreation and tourism.

7. Land-use planning policies should encourage the development of recreational and tourism facilities on broadened levees that provide positive flood protection as well as access to the water.

8. New intrusive infrastructure should be prohibited, except for improved highways, and existing intrusive infrastructure such as overhead power lines should re-replace or re-routed at the end of its useful life.

Chapter 10 – Governance Plan

As previously noted, there is really no need for a governance plan. The governance plan, for better or worse, has already been specified by the Act. To be sure, additional legislation will likely be needed to provide financing of implementation of the Delta Plan

and perhaps to clarify and extend the powers of the Council, but the governance structure consisting of the Council, the Delta Protection Commission and the Delta Conservancy, is already in place.

Chapter 11 – Finance Plan

"I should be clear up front. A realistic and ambitious Delta financing plan is possible. And beneficiaries should not pay for the entire cost of this plan. The investment of some public funds can be justified. After all, the Delta Plan should generate real public benefits. But the benefits to some stakeholders will be great and the limits on public funds are real. Relying primarily on public funding would be neither fair nor realistic". Barry Nelson, NRDC Switchboard.

I offer some initial suggestions on how various elements of the Delta Plan might be funded in general accordance with Barry's thinking.

Conveyance. Improved conveyance should be paid for by the Contractors but they should not be asked to pay under this element for any environmental restoration activities other than direct mitigation required as a result of construction activities, because any approved conveyance will by itself make enormous strides towards repairing the Delta ecosystem.

Ecosystem Restoration. Other ecosystem restoration efforts should be funded by state and Federal grants, because the Bay-Delta is an estuary of state and national significance, and by private monies that may be donated to the Delta Conservancy. However, a base level of funding should be generated by a fee imposed on all users of water from the Delta and the Delta watershed, that is, upstream diverters, in Delta users, and export Contractors. All these users have contributed to the damage to the Delta ecosystem and they should contribute to its repair.

Levees. Levee improvements should be financed in part by the Federal government because of its historic support for protecting navigable waterways and because of the national economic security implications of massive failures of the Delta levees. Otherwise the bulk of the monies required should be raised by imposing fees on an infrastructure that passes through the Delta. Until such time as new conveyance facilities are completed, the export Contractors should contribute to this fund but once those facilities are completed the Contractors should be excused since they will no longer be so dependent on the levees. Delta landowners should contribute at something like the level of their historic contributions but it should be recognized that Delta landowners also contribute sweat equity by service on reclamation boards and by providing inspection, maintenance and flood-fighting services.

Chapter 12 – Integration of Policies, Performance Measures and Targets, and Adaptive Management

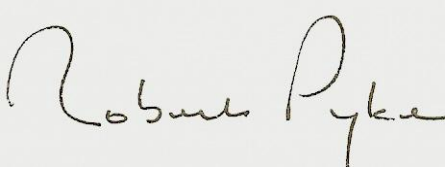
These subjects should be covered within each element and keyed to the specific policies and actions that are described in those elements, and a separate chapter is not required.

Closing Remarks

You, the Council, have been extraordinarily patient listening to presentations and public comments, but I think part of the problem is that at meetings you provide a forum for everyone to push their own point of view and this contributes to posturing and polarization. What is needed is more of what I might call "facilitated communication". There are various ways to do this and I urge you to explore them.

The choice of wording in this document is entirely my own but much of my thinking is based on the white paper by Tom Zuckerman and others that was prepared for Delta Vision. I would also like to acknowledge the help of a dozen or more people with whom I have had very useful discussions, and a subset of that group who have help edited drafts of this document. I would particularly like to acknowledge interaction with Rod Mayer, Mike Inamine, Dorian Fougeres and all the participants in the DWR Interim Levee Design Criteria process, who have demonstrated that facilitated discussion of complex issues can lead to positive results.

Respectfully,



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