

## **Robert Pyke, Consulting Engineer**

July 16, 2012

The Honorable Edmund G. Brown Jr.  
Governor of California  
State Capitol, First Floor  
Sacramento CA 95814

### **Is the BDCP Really the Only Comprehensive Approach on the Table? and Does the BDCP in Fact Deal with the Conveyance/Storage Crisis?**

Dear Governor Brown,

On July 9, 2012, United States Senators Feinstein and Boxer wrote to Ken Salazar, John Laird and Rebecca Blank urging them to “promptly identify a preferred project” for the Bay Delta Conservation Plan (BDCP) and to “finish drafting and producing the environmental documents for public review in accordance with all applicable laws.” There is nothing wrong with this except that perhaps they should have called more clearly for publication and public discussion of a draft of the evaluation of the alternatives that are being considered prior to the selection and announcement of a preferred alternative. Fifteen alternatives, albeit of the same basic idea, have been identified in documents released to date but no evaluation or scoring of these alternatives has been made public.

But the Senators also wrote “as you know, the Consolidated Appropriations Act of 2012 established February, 2013 as the deadline for completing the BDCP. Conclusion of this process is essential to protect (the) water supply for 25 million Californians, the long-term sustainability of the Delta ecosystem and the livelihoods of thousands of fishermen. Furthermore, the BDCP is the only comprehensive approach on the table to deal with the crisis.” Leaving aside the misleading portions of the Senators’ argument, or rather the argument of the flacks for the San Joaquin Valley / Southern California Water Lobby who no doubt prompted this letter, I want to focus on the two questions that I have used above as a heading. Is the BDCP really the only comprehensive approach on the table? And, does the BDCP in fact deal with the current conveyance/storage crisis with respect to statewide distribution and use of water in California? The short answers are “no” and “no”.

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## Background

Opponents of the BDCP frequently contend that the State has over-promised water - that there is, in other words, “not enough water to go around.” Without going into the detail of the numbers at this time it is my contention that there would be enough water to go around if we had the plumbing system in place to manage it more intelligently. Certainly by comparison with the Murray-Darling basin in Australia, where I was born and raised, the Sacramento-San Joaquin basin is relatively well-endowed with precipitation.

The over-riding problem in both California and Australia is that the basins in question are located between areas with reliable precipitation (think Seattle) and areas of low precipitation (think the deserts of Southern California and Nevada). Thus the variability of precipitation is just as, or even more, important than the average precipitation. And this variation is not completely random. There tend to be bunches of wetter-than-average years and bunches of drier-than-average years. The latter are known as droughts.

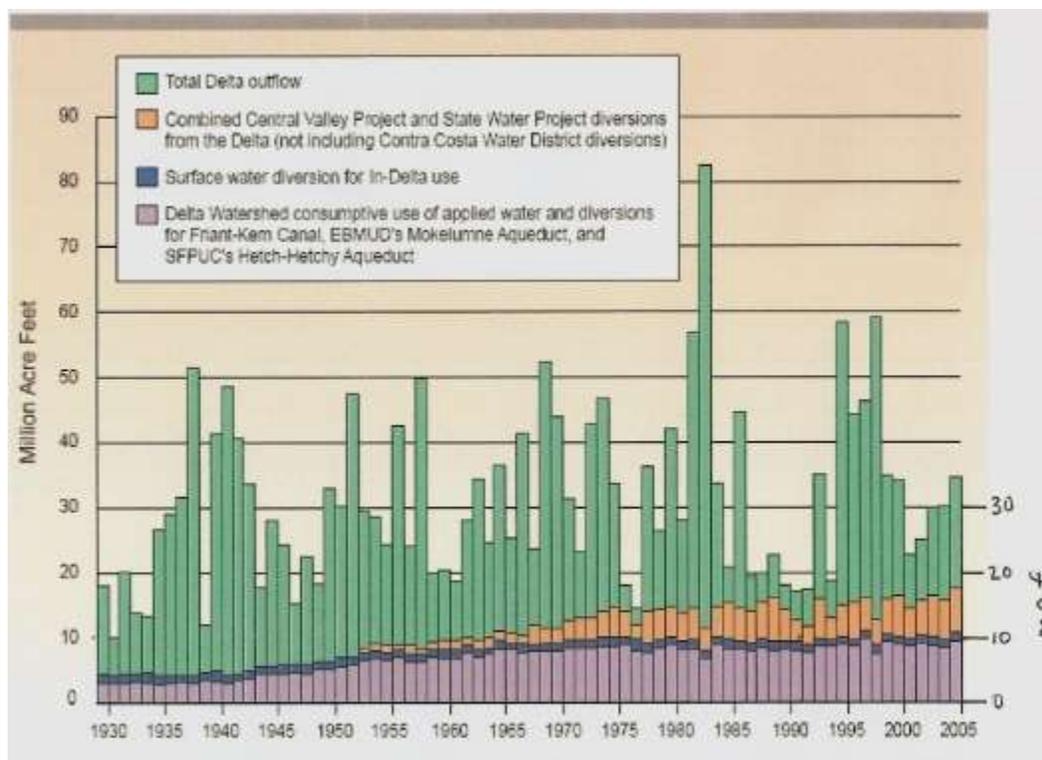
Australia suffered through a ten-year drought in the first decade of this century. Many Australians, including most politicians, seemed to have been surprised by this drought but they should not have been. Australia suffered through a similar ten-year drought a century earlier, a drought known as “the Federation Drought” because it coincided with the federation of the previous British colonies into a single independent country.

What are now known as the State Water Project (SWP) and the Central Valley Project (CVP) were precipitated by a six-year drought in California from 1928-1934. In more recent times we have come close to having two additional six-year droughts although in each case a single wet year or wet month staved off disaster - and this was before the last housing boom and the conversion of large swaths of the Central Valley to permanent crops.

The peripheral canal was always part of the grand plan for California water that was hatched after the 1928-1934 drought and was an idea that made some sense when it was planned to divert additional water from three northern rivers into the Sacramento in order to make up for the flows that would be carried around the Delta for export. This plan would have better maintained natural flows through the Delta, although it would have further damaged the ecosystems of the northern rivers. Thus, I believe on Jerry Meral’s advice, you did the right thing back in 1980 by renouncing those diversions forever; but at the same time he shot you in the foot relative to “the Canal.”

The pattern in California precipitation of bunches of wet years and bunches of dry years is illustrated in Figure 1, which was developed for the Delta Vision effort. Note that the legend is misleading because the amount of water diverted by the Mokelumne and Hetch-Hetchy aqueducts is insignificant compared to the diversion of the San Joaquin River into the Friant-Kern canal, which by itself accounts for about one-third of

**Figure 1 – Sacramento – San Joaquin Rivers Flow and Usage**



all upstream diversions. But also note that the combination of upstream diversions and in-Delta use was only a fraction of the total flow in the rivers, even in drought years, for the first half of the last century. It is only in the second half of the last century, when the CVP and the SWP start operating in earnest, that the total diversions grow to well over half the natural flow in the rivers and approach the entire natural flow in the worst years. The State Water Board has opined that, based on worldwide observations, the ecosystem is damaged if any more than 25 percent of the natural flow is taken out of a river but you do not have to be a highly trained ecologist to conclude that the pattern shown in Figure 1 is alarming. Clearly there is not enough water to go around in dry years.

An oddity that can be observed in Figure 1 is that in very wet years, such as 1983 or 1998, the total diversions are smaller than usual. That occurs for the obvious reason

that in those years there is water, water everywhere, but isn't that when greater volumes of water should be diverted and placed in storage?

A final observation that can be made about Figure 1 is that there are three big bumps in precipitation and river flows in the late sixties through the early seventies, the late seventies and the early eighties, and the late nineties. These all correspond to periods of much higher salmon runs. While it is true both that there are multiple stressors impacting the river-Delta-Bay ecosystem and that ocean conditions for salmon might also have been better during those same periods, the conclusion that more water is good for fish is inescapable. The corollary of that is that efforts to create improved habitat and food supply for fish without increased flows are unlikely to be successful.

Given this pattern of precipitation and history, it would seem that there are two keys to addressing the crisis that the senators talk about. These are:

- (1) Recognizing that increasing diversions have played a major role in turning the Delta from an estuarine environment into a more lacustrine environment which favors invasive species over native species; and
- (2) Recognizing that precipitation in California is extremely variable and that past and future variability, which many climate scientists predict might be even greater, must be addressed in any sustainable water management plan.

In order to address the crisis one then needs to observe two principles:

- (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.

I believe that adherence to these principles, with appropriate pumping and temporary storage facilities, will allow simultaneous recovery of the Delta ecosystem and sustainable exports at existing levels.

### **Does the BDCP in Fact Deal with the Conveyance/Storage Crisis?**

As indicated in the introduction, the short answer is "no". Unless flows in the Sacramento River are somehow magically increased, all that moving the export intakes from the South Delta to the North Delta accomplishes is the changing of the flow regime

in the Delta from cross flows to low flows and you cannot make up for that by tacking on numerous but ineffective “conservation measures.” That is why the BDCP is struggling to produce an “effects analysis” that shows any benefit to the ecosystem. And, the BDCP includes no storage or other plumbing for extracting more water in wet winters in order to make up for extracting little or no water in dry winters.

The status of the BDCP effects analysis is best indicated by the “Effects Analysis Phase 2 Partial Review” by the Independent Science Review Panel assembled, I believe, at the request of the BDCP by the Delta Science Program of the Delta Stewardship Council:

*“The Panel encountered many obstacles to reviewing such a long, highly detailed, yet fragmented and ultimately incomplete Effects Analysis. While recognizing the challenge of integrating such a complex and voluminous body of analyses and supporting documentation, the Panel universally believes Chapter 5: Effects Analysis fails to achieve the fully integrated assessment that is needed to draw conclusions about such a momentous Plan. By missing or obscuring key concepts and specifics, it falls short of presenting an analytical framework for a compelling and rigorous analysis of whether and how the BDCP would achieve its biological and other objectives.”*

This does not sound to me like an effort that is going to come together by February 2013 or ultimately to survive any appeal to the DSC should the Department of Fish and Game accept the BDCP as a Natural Communities Conservation Plan. You may well be able to force a decision on the preferred alternative but what good is that if the consulting team cannot complete acceptable supporting documents?

Furthermore, the BDCP includes no provision for storage and has no mechanism for extracting more water in wet years than in average years. Dr. Meral talks about taking more water in wet years and less in dry years, but that is just glib talk. Without a mechanism to take more water in wet years than in average years, he is just accepting that the bypass flows imposed on the BDCP, like the current Biological Opinions, will limit the water that can be taken in dry years.

In fact, in spite of the promises made to the Contractors to keep them at the table, the long-term average exports under the BDCP may not be significantly greater than they are under the Biological Opinions. Thus it turns out that the BDCP is basically about water quality. Improved export water quality, which can be obtained by grabbing surplus water before it goes through the Delta rather than afterwards, is of real value to both urban and agricultural Contractors, but, according to separate economic benefit studies by Dr. Jeffrey Michael and Dr. David Sunding, the water quality benefits obtained by this grab are worth at best a quarter of the expected cost. And, this is

without even including the cost of reducing water quality to farmers in the Delta and the Contra Costa Water District, which draws its supplies from the Delta.

In summary, it is unclear whether there are going to be any ecosystem benefits from the BDCP. If there aren't significant ecosystem benefits, there can be no regulatory assurances regarding exports at the level that the Contractors desire. That leaves only water quality benefits that don't come close to justifying the cost of the conveyance component, let alone the cost of the conveyance component plus the unfunded ecosystem restoration component of the BDCP.

### **Is the BDCP Really the Only Comprehensive Approach on the Table?**

Again the short answer is "no". There is at least one comprehensive approach that has been widely noticed for the last eighteen months. It is possible that others might also emerge should the BDCP or a similar program actually conduct an open and honest evaluation of the various possible alternatives.

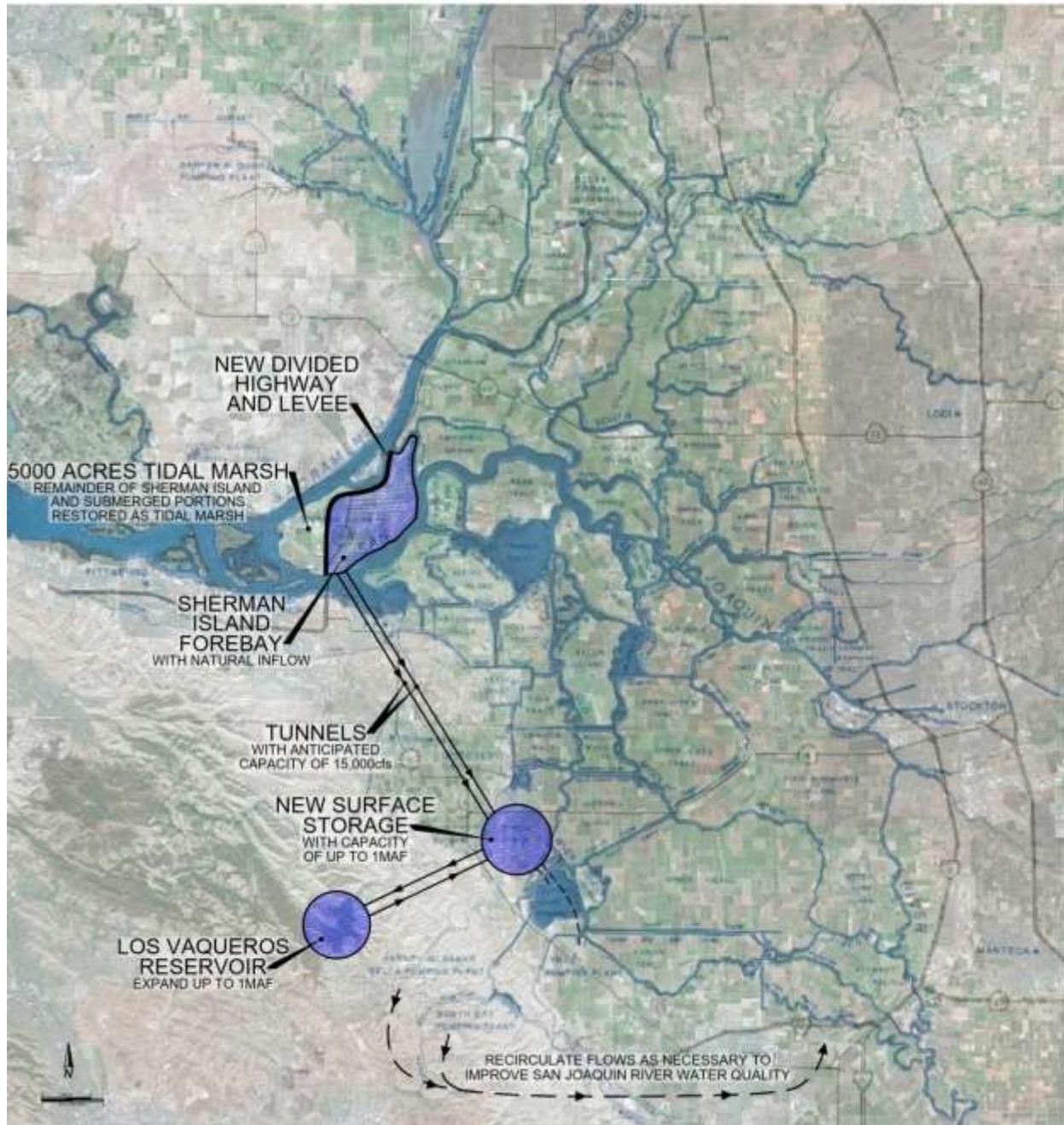
The one comprehensive approach that has been widely noticed and discussed is the Western Delta Intakes Concept (WDIC), originally sparked by my involvement in formally reviewing the BDCP for the Delta Stewardship Council and concluding that it was fatally flawed, but developed by a team of outstanding engineers and environmental scientists, aided by helpful interaction with the staff of a major metropolitan water agency.

The WDIC is based on the two principles enunciated above: (1) natural flows through the Delta should be restored to the maximum practical extent; and (2) 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. This would be accomplished by constructing the facilities shown in Figure 2.

Water surplus to the needs of upstream and in-Delta users and the environment would be extracted at Sherman Island. Most of the peat that underlies Sherman Island would be dredged out and used to reclaim the sunken portion of Sherman Island as tidal wetlands. Significant quantities of water would then percolate into Sherman Island from both the Sacramento and the San Joaquin Rivers through the underlying sand layers. In order to be able to extract up to 15,000 cubic feet per second (cfs) of water from Sherman Island, the levees along the Sacramento and San Joaquin Rivers would be reconstructed to be more porous but at the same time to have much improved flood and earthquake-resistance. The inflow velocities with this widely distributed intake system will be far lower than maximum approach velocities for which fish screens are

normally designed. These levees, with very wide crests, could also be readily raised as necessary to accommodate sea level rise.

**Figure 2 – The Western Delta Intakes Concept**



An important feature of extracting surplus water at Sherman Island is that the system would be self-regulating. Although I propose that these facilities be built and operated

by a JPA composed of Delta Counties and Water Districts, this JPA would finance the project by negotiating long-term supply contracts with the existing CVP and SWP Contactors. In addition to paying the debt on construction costs and covering the operating costs of the project, the JPA would also fund continuing ecosystem restoration or other local activities as it sees fit. In spite of local control, the JPA would thus have an incentive to maximize exports rather than restrict them, but it could not over-extract, regardless of any bypass flow requirements that might be negotiated among all the stakeholders, because it would then suck saltwater into the system.

This concept directly addresses one of the two predicted effects of climate change, namely the prediction that the climate in Northern California will become even more variable, by being serious about extracting more water in wet years and less in dry years. But it also addresses the possibility of more rapid sea-level rise more effectively than anything in the BDCP. The WDIC does assume that the Delta levee system will be further improved as recommended in the Economic Sustainability Plan of the Delta Protection Commission, but as explained in my letter to you dated July 12, that needs to be done anyway for other reasons. That letter also explains why improved Delta levees are rather more cost effective than the proposed BDCP conveyance solution, but improved Delta levees alone do not fully address the conveyance / storage / ecosystem restoration problem. However, with so-called “fat levees” throughout the lowland portion of the Delta, it will be easy to raise levees as necessary to keep ahead of any sea level rise. Those higher levees, in conjunction with the creation of more tidal wetlands around the bay, in the Suisun Marsh and west of Sherman Island and possible narrowing of the Sacramento and San Joaquin Rivers where they have been widened adjacent to Sherman Island, should allow operation of the existing reservoir system so that the saltwater – freshwater interface remains west of Sherman Island, even for the most extreme projections of sea level rise.

Water from Sherman Island would be carried by twin tunnels, similar to those proposed in the BDCP, to a new reservoir in the vicinity of the Clifton Court Forebay. This reservoir, tentatively called the Brushy Creek Reservoir, would feed water to the California Aqueduct of the SWP and the Delta-Mendota Canal of the CVP.

During normal or dry years, when there are low flows in the San Joaquin River, water would be extracted from the Delta only at Sherman Island. Water extracted in this way would be routed to the Banks and Jones pumping plants of the SWP and the CVP if the pool in the Brushy Creek Reservoir were low and directly to the Aqueduct and the Canal if the pool in Brushy Creek were sufficiently high. The minimum flow at Vernalis on the San Joaquin River that is necessary to maintain acceptable water quality in the South and Central Delta would be maintained by recirculating as necessary water extracted at Sherman Island from the Aqueduct and the Canal to the San Joaquin River in lined

channels. The extent to which this recirculation might be necessary is a function of future regulatory decisions that might be made by the State and Regional Water Boards, but regardless of those decisions, the WDIC will have maintenance of acceptable South and Central Delta water quality as one of its major goals.

In wet years, when flows in the San Joaquin River at Vernalis clearly exceed that flow required to maintain South and Central Delta water quality, it would also be possible to operate the existing Jones and Banks pumping plants drawing in water through new screened intakes on the Old River, with the quantity drawn increasing during flood flows up to these plants' maximum capacity of 15,000 cfs. At that point all Sherman Island water would be stored temporarily in the Brushy Creek Reservoir and in a Los Vaqueros Reservoir enlarged to up to as much as 1 maf. In this way, for as long as a month or two, the combined extraction rate could be as much as 30,000 cfs.

That is what it takes to put the "big gulp – little sip" theory into practice. In order to take a "big gulp" in wet years you need to be able to extract water at a rate of more than 15,000 cfs, not less. Even with dual conveyance, the BDCP is limited to an extraction rate of 15,000 cfs because that is the maximum capacity of the South Bay pumps and the two canals.

As a result of the temporary storage provided by the Brushy Creek reservoir and a further enlarged Los Vaqueros reservoir, it should be possible to move up to 8-10 million acre feet (maf) water south in wet years and it is necessary to do that in order to make up for the fact that in dry years it might be possible to extract only 2-4 maf. The addition of a pumped storage power plant between the Brushy Creek and Los Vaqueros reservoirs would help offset the operating costs of the project.

With additional South of Delta storage, predominantly as groundwater in the aquifers that are presently overdrafted, the long-term average exports might be in the order of 6 maf per year, with a reliability that is much greater than the existing system provides. Over time the surplus that is exported in wet years can be used to recharge the aquifers that are presented overdrafted, drastically reducing the cost of pumping groundwater in dry years and building a reserve as of as much as 30 maf that can be drawn on in the event of a six-year drought.

When, courtesy of Assembly Member Joan Buchanan, I met with Secretary of Natural Resources John Laird, he said that he had never heard anyone talk of extracting as much as 8-10 maf a year. That is indicative of a problem. If a smart guy like John has not heard of the range of numbers that have to be considered to properly address the senators' crisis, then the discussions that he has been exposed to are too narrow. No wonder there is a crisis.

Because the WDIC would greatly improve the flow regime in the Delta, going at least some way to restoring more natural flows, and would provide tidal wetlands that are habitat for some species and food supply for other species, in a location where it would do the most good, the WDIC by itself should make a substantial contribution to restoration of the Delta ecosystem. The WDIC would also finance the construction and operation of a world-class fish and water quality monitoring system that would track the impact of the WDIC and allow optimum planning of additional conservation measures. The WDIC by itself does much more than the entire grab-bag of unfunded conservation measures that is included in the BDCP and it has no need to rely on lengthy discussions about adaptive management which, in the context of the BDCP, are really just a smokescreen for saying that if it doesn't work, we'll try something-else! However, as noted above, the mechanism that I am suggesting to finance construction and operation of the WDIC would also spin off funds for continuing ecosystem restoration projects that would be guided by the observations made by the monitoring system installed as part of the WDIC.

Another indication of the strange and sometimes ill-informed debate over Delta conveyance is provided by the hearing before the Assembly Water, Parks and Wildlife Committee into AB 2422. This bill, authored by Assembly Member Bill Berryhill, seeks to appropriate a small amount of existing bond funding to further study the WDIC. It passed out of committee and is now in appropriations limbo, but the bill was opposed in committee by the Association of California Water Agencies (ACWA) and the Metropolitan Water District of Southern California. To be sure, they put up only token opposition, but as the usual stream of lobbyists for big water came forward to oppose the bill, Chair Jared Huffman congratulated Assembly Member Berryhill for doing the impossible; for getting big water to oppose a bill that was actually proposing more storage! However, given that the bill passed out of committee, the good senators' assertion that the BDCP is the only comprehensive solution on the table is unsupportable.

## **Conclusion**

The WDIC is a viable alternative to the BDCP.

It is based on the following two principles:

- Natural flows through the Delta should be restored to the maximum practical extent; and
- 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.

Its basic goals are as follows:

- No messing with water rights or upstream users.
- Maintenance of acceptable Delta water quality
- Significant improvement in the flow regime and ecosystem of the Delta
- More reliable and larger exports of surplus water

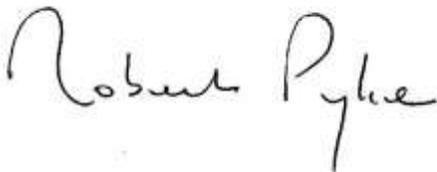
In other words, it complies more fully with the co-equal goals of the Delta Reform Act of 2009 than does the BDCP.

I urge you to think about this before you make a decision on the preferred alternative for the BDCP.

Again, I am a professional engineer rather than a politician, but even if I do not fully understand California politics, it seems to me that you are not getting the best possible advice on this important issue and I would urge you seek input from a wider circle of advisors so that you can make a decision about the BDCP based on facts rather than misinformation.

Let's get California working again!

Sincerely,

A handwritten signature in black ink that reads "Robert Pyke". The signature is written in a cursive, slightly slanted style.

Robert Pyke Ph.D., G.E.