



September 18, 2013

**Attention: Imported Water Committee**

**Bay Delta Conservation Plan Estimated Export Yields (Discussion)**

**Purpose**

The purpose of this report is to: 1) discuss the major elements that influence the estimated export yields from the Bay Delta Conservation Plan (BDCP) alternatives; 2) provide a comparison of the estimated yields of BDCP alternatives; and 3) highlight areas of potential risk associated with achieving the estimated yields.

**Background**

A multi-disciplinary team of Water Authority staff has been engaged in a technical evaluation of the administrative draft planning and environmental documents produced by state and federal agencies as part of the BDCP process. These documents are preliminary and subject to change, but they provide a good preview of what the state and federal agencies are proposing in terms of a Delta solution. The administration expects to release the final public draft of the environmental documents and BDCP plan in October. Staff has also been reviewing conceptual proposals from the Natural Resources Defense Council (NRDC) and other environmental organizations as well as the Delta Vision Foundation (DVF) that suggest alternative paths to achieving the co-equal goals of water supply reliability and ecosystem restoration.

As part of this process, staff has been providing the Board with background information concerning key environmental and water resources issues, the environmental permitting process, and other foundational information required to evaluate the different alternatives. At the August 22, 2013 Imported Water Committee meeting, staff highlighted the two-step analytical process being taken to assess the four potential options being evaluated by the Water Authority.

Because limited information is available for the NRDC and DVF proposals, staff is first focusing on reviewing the BDCP proposed action and other BDCP alternatives with conveyance sized to best approximate the NRDC and DVF proposals. These alternatives involve reducing water exports by some amount from the existing through-Delta conveyance by constructing an additional north Delta diversion point. The BDCP proposed action recognizes the need to relieve pressure on exports from the south Delta as a means to lessen impacts on endangered and threatened fish species and improve water supply reliability and quality for water users. The NRDC and DVF concepts advocate for the inclusion of a portfolio of projects, such as south of Delta storage and additional local supply development, to explicitly be part of the Delta solution in conjunction with smaller north Delta facilities when compared with the BDCP proposed action. The BDCP planning documents and the BDCP Administrative Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) both analyze the different north Delta diversion capacities in each of the three options being analyzed by the Water Authority. A no action alternative is required as part of the EIR/EIS process and is also necessary in the BDCP to determine the incremental supply and economic benefits of the BDCP proposed action to water supply agencies.

The options being analyzed by the Water Authority, along with the conveyance capacities, are listed below:

- 1) No action alternative (included in BDCP administrative draft)
- 2) BDCP proposed action (9,000 cubic feet per second (cfs) conveyance) (included in BDCP administrative draft)
- 3) NRDC portfolio concept (3,000 cfs conveyance)<sup>1</sup>
- 4) Delta Vision BDCP Plus (6,000 cfs conveyance)<sup>2</sup>

The two-step process staff is taking to analyze the options is based on the data available for each of the options and is summarized below:

- 1) Utilize data from the administrative draft BDCP and EIR/EIS to initially assess the conveyance and other in-Delta features for all four options, which would include the conveyance alternative capacities of 3,000 cfs, 6,000 cfs and 9,000 cfs along with a no action alternative. Step one would also include a discussion on the water supply benefits, costs and risks of each conveyance alternative, including no action. When the public review draft of the BDCP and EIR/EIS is released by the California Natural Resources Agency (CNRA), which is currently planned for October 2013, staff will evaluate the alternatives to determine differences, if any, between the two releases.
- 2) Step two would involve a more qualitative assessment of how the added components from the NRDC Portfolio and DVF BDCP Plus options of local projects and storage could possibly enhance the benefits or mitigate any potential risks that were identified in step one of the analysis. Staff will also assess the risks associated with implementation of the local projects and storage components of these two alternatives and the requirements for additional data and project descriptions.

This two-step approach to the analysis will allow staff to determine how these different options address the Board's Bay Delta Policy Principles and meet the supply reliability goals expressed in the 2010 Urban Water Management Plan. Results from the process could also be used as a basis for a comment letter prepared through the BDCP environmental review process.

As part of step one of the analysis, staff provided information on the alternative costs and economic benefits included in the BDCP along with a discussion on financing in a September 4, 2013 Committee memorandum. In addition, a panel of economists provided further information on these topics at a September 12, 2013 special committee meeting. The purpose of this report is to focus on the estimated export yield from the alternatives.

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<sup>1</sup> NRDC portfolio suggests a north Delta conveyance facility of at least 3,000 cfs; for ease of comparison in staff's analysis, 3,000 cfs is utilized as a proxy. The reduced conveyance is intended to be coupled with a portfolio of projects to augment the reduced export capacity.

<sup>2</sup> BDCP Plus suggests a north Delta conveyance facility of 5,000 cfs – 6,000 cfs; for ease of comparison, 6,000 cfs is utilized. Similar to NRDC portfolio, the reduced conveyance is to be coupled with a portfolio of projects to augment the reduced export capacity.

## Discussion

As noted in previous memorandums to the Committee, the BDCP is both a planning and permitting process that, if successful, will result in 50-year operating permits for Central Valley Project (CVP) and State Water Project (SWP) Delta water supply exports. The BDCP contains 22 conservation measures that collectively comprise the conservation strategy. As stated in the BDCP, the conservation strategy intends to achieve the BDCP's overall goal of "restoring and protecting ecosystem health, water supply, and water quality within a stable regulatory framework." A central element of the BDCP strategy is Conservation Measure 1 (CM1), Water Facilities and Operations. CM1 combines two major components: 1) dual-conveyance water facilities; and 2) operational scenarios under which the facilities would be managed. Both of these components can influence the export yields realized from this conservation measure. The water supply yield from the different alternatives is one factor in understanding whether implementation of the alternative and the conditions of the 50-year operating permits will improve reliability. The estimated export yield and the reliability of that yield, when compared to the yield without a project, is also a critically important measure in determining whether the amount of water available from the alternative is worth the cost of implementing it. The following describes in more detail the operating scenarios applied to the various conveyance options in the EIR/EIS, some of which were also used in the BDCP planning documents.

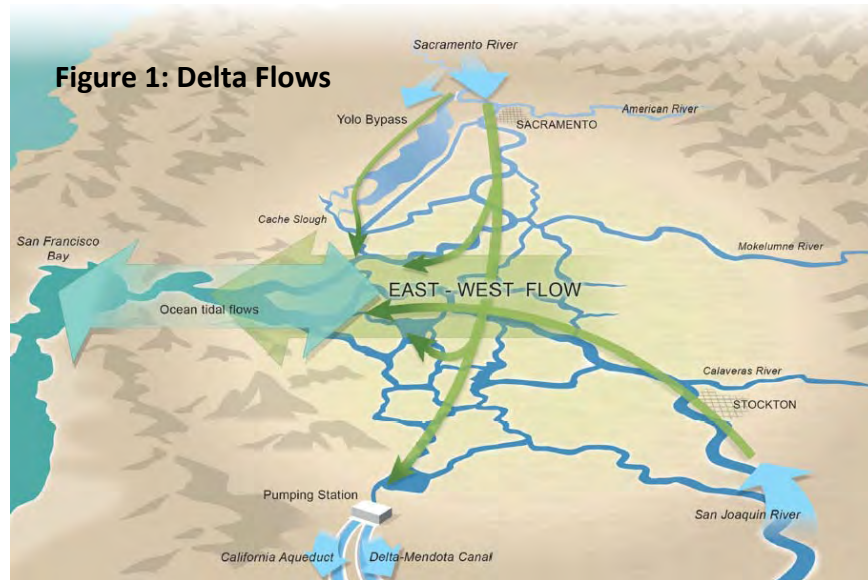
### Influence of Operating Scenarios on Export Yield

The Bay Delta is an environmentally sensitive estuary, home to fisheries and commercial agriculture as well as the water supply hub for 26 million Californians. Decades of conflicting uses in the Delta have shown that a balance among uses through carefully developed and scientifically based rules and guidelines is necessary to minimize conflicts. This especially applies to the export of water out of the Delta and away from the natural flow of rivers and streams through San Francisco Bay to the ocean (Delta outflow). There are numerous detailed rules and regulatory standards that govern how the SWP and CVP can be operated, which ultimately influence the supply available for export through the projects. As described in the EIR/EIS Chapter 3, *Description of the Alternatives*, Section 3.4.1.2, there are three main sets of rules under which the SWP and CVP, with a new Delta conveyance facility, would be operated:

- Maximum Allowable Export Rules (for example, constraints related to storage capacity of San Luis Reservoir and seasonal deliveries assumed for SWP and CVP contractors),
- Minimum Required Delta Outflow Rules (for example, Delta outflow indices to regulate salinity in the Delta), and
- New Operational Rules for North Delta Intake Diversions (for example, bypass flow requirements that generally limit the north Delta diversion to a proportion of Sacramento River inflow).

As defined in the EIR/EIS, Delta outflow is the net amount of water at a given time flowing out of the Delta toward the San Francisco Bay. It equals Delta inflow minus the water used within the Delta and exported from the Delta. Therefore, criteria established that requires increased Delta outflow will likely result in a decrease in the amount of water available for export. **Figure 1** shows the Delta outflow and east-west flow patterns in the Delta that can influence species existence and recovery and ultimately the amount of water available for export.

The EIR/EIS reviewed 15 alternatives along with a no action alternative. The alternatives reviewed include various combinations of water conveyance capacities and operational scenarios. Eight different operating scenarios were identified through the alternatives screening process. The EIR/EIS combines one of the eight operational scenarios with a conveyance option to form an alternative. **Figure 2** illustrates how the alternatives are formed.



**Figure 2: Formation of the Alternatives**



Each operating scenario identified in the EIR/EIS includes many of the current operating rules as well as several modified or new rules. Depending upon the set of rules (operating scenario) applied, and the conveyance option, the export yield from the alternatives will vary. It is important to note, in general, that the amount of export yield is largely governed by the operating rules rather than the conveyance size.

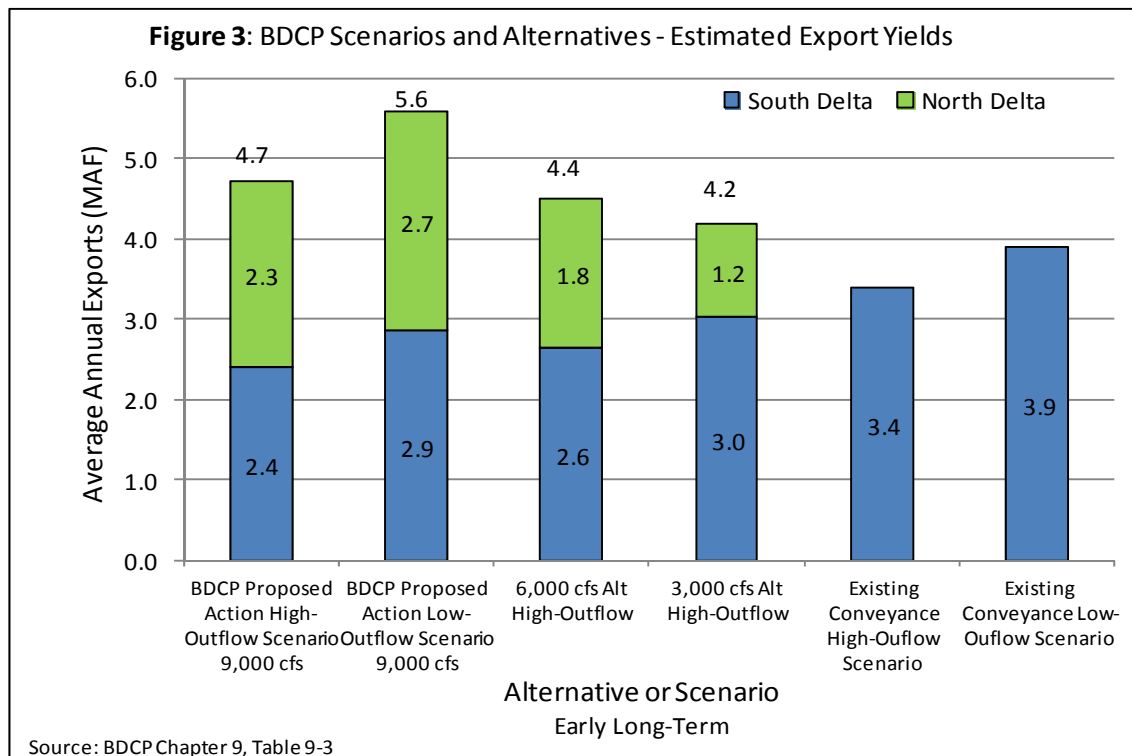
With the differing operating scenarios applied in the EIR/EIS and the influence they have on the estimated export yield, it is difficult to conduct an “apples to apples” comparison of the estimated yields based on conveyance capacities. As stated in the EIR/EIS, the alternatives were developed to address their effect on environmental stressors in order to comply with California Environmental Quality Act and National Environmental Policy Act and not to focus on water supply yield comparisons from the perspective of a water supply agency. For example, in the EIR/EIS analysis less stringent operating criteria were applied to smaller conveyance capacities and more stringent operating criteria to larger conveyance capacities to specifically assess environmental impacts. Comparing the alternative conveyance capacities under different operating scenarios will not allow for an “apples to apples” analysis of the relative yields.

Instead of utilizing modeling results from the EIR/EIS alternatives analysis, staff decided that it is more appropriate for the Water Authority's evaluation to use the estimated yields modeled in the BDCP Chapter 9, *Alternatives to Take*, to compare the relative yields between conveyance options. The federal Endangered Species Act requires an analysis of “take alternatives” in a habitat conservation plan that may avoid or reduce the take of various species covered by the BDCP. “Take” is basically defined as any activity that could harm, wound, or kill any threatened or endangered species. The BDCP take alternatives include conveyance options of 15,000 cfs, 6,000 cfs and 3,000 cfs, and the BDCP proposed action of 9,000 cfs.

A key factor in evaluating water supply benefits and yield is whether the alternatives are operating under high Delta outflow criteria (which can reduce water supply exports) or low Delta outflow criteria (which can increase exports). The operating scenarios in BDCP Chapter 9 that are combined with each of the conveyance options being evaluated by Water Authority staff utilize the same high-outflow scenario, which allows for a consistent “apples to apples” comparison among the alternatives. Utilizing the high-outflow criteria is also the more conservative approach in estimating and comparing yields and incremental benefits. The modeling conducted in Chapter 9 combines a low-outflow criterion with just the proposed action and existing conveyance scenarios. The use of low-outflow criteria would increase water supply yield, but is subject to the future decision tree process discussed below.

Estimated Export Yields from the Administrative Draft BDCP

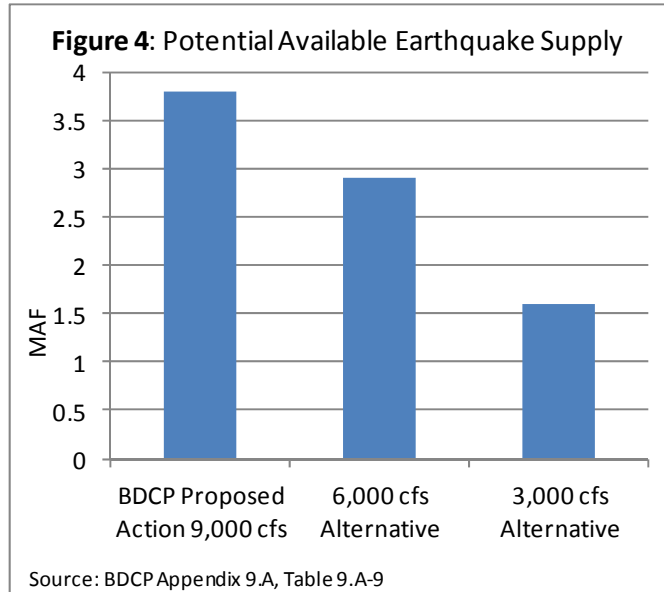
In BDCP Chapter 9, *Alternatives to Take*, the economic benefits analysis included a modeling of the alternatives to generate an estimated yield. By using similar operating scenarios, the export yield from the different conveyance options can be compared. **Figure 3** below includes the average annual deliveries in the early long-term for each of the three conveyance options (3,000 cfs, 6,000 cfs, 9,000 cfs), plus existing conveyance (no action alternative). As stated in the BDCP, the “early long-term” is the implementation period that extends 11 to 15 years after the



BDCP permit term is initiated. The “late long-term” refers to the BDCP implementation period that extends 16 to 50 years after the BDCP permit term is initiated. The estimated split between north and south Delta exports is also contained in the figure. These data are taken directly from BDCP Chapter 9 and represent information that has been made publicly available by BDCP.

As shown in the figure, the estimated yield from the BDCP proposed action scenarios and two other conveyance alternatives all exceed the “existing conveyance scenarios.” The “existing conveyance scenarios” that are used as baselines in the economic benefit analysis assume the same operational criteria, but without the new north Delta facilities. They are more stringent operating scenarios (less export yields) than applied in the EIR/EIS No Action Alternative. The BDCP states the reason being that the take alternatives and analysis serve a specific regulatory purpose separate from the EIR/EIS. Although the BDCP utilizes the “existing conveyance scenario” as the baseline to which alternatives are compared in the economic benefits analysis, there remain questions and different perspectives as to whether the baselines selected in BDCP Chapter 9 are a valid or appropriate baseline. Staff will continue to investigate the operating scenarios utilized in the different baseline alternatives to more thoroughly understand the basis for the decisions and whether they are appropriate. Staff will provide assessment in a future memo.

According to BDCP modeling, under the high-outflow scenario, the difference in yields between the BDCP proposed action and the 3,000 cfs and 6,000 cfs alternatives are approximately 500,000 acre-feet and 300,000 acre-feet, respectively. **Figure 3** also demonstrates that if, under the decision-tree process described below, science indicates the Delta biological objectives can be met with lower outflows, the current modeling produced by BDCP shows that up to an additional 900,000 acre-feet would be available under the BDCP proposed action in an average year, compared to the more restrictive high-outflow scenario. This modeling result demonstrates that the operational rules play a significant role in the potential export yields. It should also be noted that, at this point, the probability or likelihood that BDCP low-outflow criteria would be utilized during operations is unclear. In a question and answer session with the Water Association of Kern County this July, Natural Resources Deputy Secretary Jerry Meral advised the participants to base their decision on whether or not to participate in a BDCP conveyance project on the high-outflow scenario.



When evaluating the alternatives, it is also important to consider the reliability of the yield. For the same supply reliability reasons the Water Authority approved construction of the Emergency Storage Project, the BDCP economic benefits analysis looked at the reliability of the conveyance options in an earthquake, when levees in the Delta region could potentially fail. As stated in BDCP Appendix 9.A, “An important benefit of an isolated conveyance facility is that it reduces the vulnerability of the water export system to seismic events in the Delta region.” As part of the evaluation undertaken by BDCP consultants, the analysis assumes a level of water supply

available following an earthquake that is directly tied to the size of the conveyance facility and not necessarily the operating scenarios. **Figure 4** shows the potential supply available under the three conveyance options. In BDCP Appendix 9.A, it states that there would be approximately 1.0 MAF of water supplies availability under the existing conveyance scenarios. As shown in the figure, the yield from the 3,000 cfs facility is much less due to significantly greater reliance on south Delta exports, which would be the most affected during a seismic event and Delta levee failure. However, as discussed during the September 12 special Imported Water Committee meeting by the economist panel, there are a range of opinions and data interpretations regarding the potential water supply available following a seismic event under a wide range of proposed alternative Delta fix options.

#### Initial Evaluation of Risks and Uncertainties Related to Estimated Yields

Based on initial review and evaluation of the administrative draft BDCP and EIR/EIS, the following are some of the potential risks and uncertainties associated with the estimated yields.

#### *Adaptive Management Program*

Because the BDCP results in 50-year operating permits for the CVP and SWP, there is a direct connection between species protection and recovery and long-term water supply exports. The very complex operating criteria that balance environmental issues, water quality, and water supply exports relies on the success of the habitat restoration and species recovery efforts. Adaptive management is a required component of any NCCP/HCP. Adaptive management recognizes that there could be unexpected events in the future that require adjustments and modifications to the original habitat and species management plans. There is an adaptive management program as part of the Water Authority's NCCP/HCP that provides long-term permits for both operating and capital improvement activities.

It is accepted practice that habitat restoration associated with resource agency permits have specific success criteria it must achieve. The criteria are typically evaluated several years after

the permitted facility has been built and is operating. The success of the habitat restoration is evaluated and additional work may be required in order to maintain the validity of the original permit conditions. For example, the Water Authority's wetlands mitigation lands must meet specific success criteria five years after completion to comply with resource agency permits issued for the Emergency Storage Project. In some instances, additional scientific studies may be required to make a final determination on mitigation or facility operation. Permits associated with the Water Authority's Carryover Storage component of the San Vicente Dam raise requires future biological studies to assess potential impacts to submerged vegetation around the new high water mark in the reservoir. Depending upon the outcome of those studies, further mitigation may be required.

The reliance on future science-based evaluation of efforts to restore and protect species and habitat is recognition that there is some amount of uncertainty at the outset in setting permit conditions and that using objective science-based standards to evaluate success and make modifications is the best way to address that uncertainty. Typically, the reliance on science, as in the case of submerged vegetation at San Vicente Reservoir, is to confirm what the permittee and the resource agency suppose to be an appropriate mitigation approach, but requires future study to validate. There is always a risk that the future studies could yield unanticipated results that add cost and conditions to the project.

However, it is not clear from the initial review of the administrative draft BDCP and EIR/EIS if the adaptive management program contains adequate assurances that the permitting agencies will not impose further restrictions on exports if the biological objectives are not being met during operation. At present, the adaptive management program “assurances” and “no surprises,” essential for any habitat conservation plan, are still being negotiated between the permitting agencies and DWR. It should be noted that involvement of the fisheries and wildlife agencies in the decision-tree process could help provide more regulatory certainty during facility operations and the adaptive management program.

#### *Decision-Tree Process*

In reviewing the February 2012 effects analysis (proposed action's “effect” on covered species), the fish and wildlife agencies identified a number of concerns with the preliminary proposal. As a result of those concerns, a new set of more stringent higher outflow operational criteria was developed. But uncertainties associated with the level of needed spring and fall outflows resulted in the agreement to adopt a “decision-tree” process prescribing selection of criteria at the time when the north Delta facilities become operational. The decision-tree process functions as an early part of the BDCP adaptive management and monitoring program. As stated in BDCP Chapter 3, *Conservation Strategy*, Section 3.4.1.4.4, the purpose of the decision-tree process is to address two key uncertainties:

- The importance of Delta outflow in the fall months (fall outflow) in achieving abundance and habitat objectives for Delta smelt, and
- The importance of Delta outflow in the spring months (spring outflow) in achieving the longfin smelt abundance objective.



As mentioned previously, the Delta outflow is the net amount of water at a given time flowing out of the Delta toward the San Francisco Bay. The decision-tree process combines differing spring and fall outflow criteria to derive four possible outcomes. The permit would cover all four outcomes.

Scientific hypotheses supporting each outflow criterion will be tested in detail during the years before dual-conveyance operations commence. At the time operations begin, the permitting agencies will have identified the spring and fall outflow criteria to be utilized at the time operations of the selected conveyance option begin. This will set the initial allowable export amount. At that point, the decision-tree process will end. The adaptive management and monitoring program will then continue as the primary process for adjusting all aspects of the conservation strategy, including any future changes to outflow criteria.

Of the four possible outcomes, the high Delta outflow scenario and low Delta outflow scenario currently serve to bracket the expected outcomes. As mentioned above and shown in **Figure 3**, the high-outflow operating criteria will result in less export yield and low-outflow will result in a higher yield.

The Decision-Tree Process and the subsequent Adaptive Management Program create uncertainty over the actual range of yield for all the alternatives with north Delta conveyance. Clearer descriptions of the minimum ranges of yield for these alternatives in the draft BDCP documents, due for release in October 2013, may help clarify this issue for further staff evaluation.

#### *Observations on Yield and Reliance on South Delta Diversions*

In comparing the water supply yields of the three dual conveyance alternatives with a north Delta diversion facility, and based on data provided in BDCP Chapter 9, the larger capacity alternatives result in more total Delta exports than the smaller capacity alternatives. Also, because of the larger north Delta diversion capacity of the proposed action and DVF option, both could provide better overall water quality in normal and wet periods in terms of salinity and other constituents. The single most significant factor that affects Delta export yields, and consequently SWP supplies, are associated with the uncertainty of additional fish protection measures that may further reduce south Delta diversions. All three of the Delta fix options under evaluation by Water Authority staff include implementation of a north Delta diversion point to reduce south Delta diversions and alleviate pressure on listed and threatened species in the south Delta.

An additional perspective on the reliability benefits of the alternatives is in the event of a physical failure of Delta levees. Whether caused by an earthquake or some other catastrophic event, Delta levee failure could result in islands being flooded and seawater being pulled further east into the Delta, reducing south Delta diversions for a period of time due to elevated salinity levels. Based on the BDCP analysis, alternatives that are more reliant on south Delta diversions will likely experience a decrease in overall export yields in such an event. It is also important to acknowledge that the actual water quality impacts from a Delta failure event will vary

significantly, depending upon whether the failure happens during times of heavy freshwater inflows or low Delta inflows.

Next Steps

In regard to the second step in the staff analysis on supply reliability, staff will compare the expected yields in relation to supply reliability planning and meeting future forecasted water demands. As part of this effort, the analysis will also look at the potential role additional local projects and storage, as outlined in the NRDC Portfolio and DVF BDCP Plus options, can play in providing additional reliability. It is anticipated that this analysis will be presented to the Board within the next two months.

Prepared by: Dana L. Frieauf, Principal Water Resource Specialist  
Prepared and Reviewed by: Ken Weinberg, Director of Water Resources  
Reviewed by: Dennis A. Cushman, Assistance General Manager