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Report to CALFED on Water Supply and Water Quality Measures for Evaluation as Potential Stage 1 Implementation Measures

Prepared by the NoName Group and additional stakeholders, a sub-committee of the CALFED Operations Group

August 27, 1998

Draft 5

Executive Summary

Purpose of report

The purpose of this report is to recommend for further evaluation by CALFED the water supply and water quality measures that are capable of being implemented within Stage I of the CALFED Bay-Delta Program (early implementation). The analysis includes immediate-term measures (0-2 years), near-term measures (3-7 years) and measures that warrant further evaluation, in order of their promise for success in the 7-10 year time frame. These measures should integrate with other Stage I CALFED measures and goals in a manner which is also compatible with the eventual long-term CALFED solution.

Recommendations

- The following measures are recommended for further evaluation and consideration for early implementation, based on the evaluation by the participants. (JPOD, ISDP, Intertie, Madera, Shasta, In-delta storage, and then the longer short list)
- There are unresolved issues related to all measures that require further work and/or mitigation measures.
- Operational criteria are a key element in determining the water supply benefits or impacts of any measures.
- The NoName Group and the DEFT should continue to work on operational criteria that will be needed in conjunction with water supply measures for the protection of fisheries.

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- Water quality measures should continue to be evaluated to help provide benefits or offset impacts of water supply measures or operational criteria.
- The report also discusses other measures not included in the above list. CALFED should continue to consider these as measures that can be integrated later in Stage 1 or in subsequent stages.

Qualifications on recommendations

- There is no formal endorsement of any individual measure or groups of measures.
- Further analyses of all proposals require import analysis on fisheries, water quality, water supplies of non-export users.
- It should be recognized that while some measures produce "new" water, others involve more efficient use of existing supplies and still others involve re-distribution of supplies.
- The role and impacts of meeting a portion of demands with transfers was not analyzed, nor is it possible without specific information on each transfer to make this analysis.
- In most cases, project specific environmental documentation is needed prior to the ROD if early implementation is desired. Exceptions are: JPOD, ISDP, Delta Wetlands (all have draft EIR/EIS documents). In all cases, final permitting is required.
- Because of the time delays in permitting, environmental documentation should be expedited for those projects CALFED chooses to implement early in Stage 1.
- Alternative methods for meeting flows in the San Joaquin River have been proposed and should be examined.
- A number of near term water quality measures have been proposed. These have not yet been discussed in detail and still need to be considered.

Limitations on modeling

- Water supply analyses do not always meet all requirements. Example include: Vernalis water quality and flow standards, Shasta Reservoir levels required to ensure downstream temperature control. Had these requirements been met water supply impacts to users (including non-exporters) could be significant.
- A number of baseline issues were not resolved, including Trinity River flows, overall Delta requirements, San Joaquin River flows, full compliance with the water quality control plan.
- In none of the cases, were the assumed 1995 demands met (in every year), including the basecase and cases with the additional projects.
- The level of demands used in the studies may not reflect actual current demand levels.

Summary of results (preliminary modeling results)

With and without measures	Conditions	Dry period deliveries (TAF/yr)	Average deliveries (TAF/yr)	Comments
ISDP, JPOD & DMC-CA Intertie	Accord + upstream AFRP	70	240	
ISDP, JPOD & DMC-CA Intertie	Accord + upstream AFRP + in-Delta AFRP	70	240	
ISDP, JPOD & DMC-CA Intertie	Accord + upstream AFRP + in-Delta AFRP + prelim. DEFT (NNG)	20	190	
ISDP, JPOD & DMC-CA Intertie	Accord + upstream AFRP + adjusted Trinity R.	100	230	
ISDP, JPOD & DMC-CA Intertie Madera Ranch GW	Accord + upstream AFRP + in-Delta AFRP	140	250	Madera Ranch GW project yield will vary w/ ops rules
Shasta Expansion		TBD	TBD	
In-Delta Storage		TBD	TBD	

Next Steps

- Continue work on bundling operations and water supply measures through the NoName-DEFT coordination group.
- Continue evaluation of water quality measures.
- Continue evaluation of alternative measures that show promise and could be used to resolve other identified issues such as San Joaquin River flows.

1. Purpose

The purpose of this report is to recommend for further evaluation by CALFED the water supply and water quality measures that are capable of being implemented within Stage I of the CALFED Bay-Delta Program (early implementation). The analysis includes immediate-term measures (0-2 years), near-term measures (3-7 years) and measures that warrant further evaluation, in order of their promise for success in the 7-10 year time frame. These measures should integrate with fish protection and water quality measures and goals in a manner which is also compatible with the eventual long-term CALFED solution.

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This report was prepared by members of the NoName Group, a subcommittee of the CALFED Operations Group with participation and input from other stakeholders. The tasks were limited to: 1) identification of potential near term measures that can be implemented to enhance water supply; 2) coordination with the Diversions Effects on Fisheries Team (DEFT) in development of operations scenarios; 3) screening of the measures according to criteria developed by the participants; 4) prioritization of the elements that CALFED should focus on in developing further information and 5) identification of specific items where more studies or information are needed before moving forward on specific measures. How water might be used that is developed from these measures (i.e. for consumptive use or to allow environmental protection measures or offset their impacts, or directly for instream flows) was not addressed; it is assumed this would be a policy discussion for CALFED.

The NoName Group has largely not addressed the "stakeholder support" measure criterion, and how it pertains to assurances and mitigation. Most of the measures under consideration have a much greater potential to garner general stakeholder support when carefully packaged with appropriate assurances and mitigation and other CALFED programs that are capable of being implemented in the near term. This assessment will occur in the next phase of the NoName Group analysis and discussions.

Participants in the development of the report are not necessarily supporting implementation of any measure at this moment, but simply recommending that the measures described below merit further evaluation for potential inclusion in Stage I implementation.

2. Introduction

The NoName Group (NNG) was asked to provide a forum for stakeholder and agency discussions related to operations of the SWP and CVP in the context of the CALFED early implementation proposal. A key task is to develop a package of water supply measures that could be implemented in the near-term and that are consistent with ecosystem protection and enhancement. Other CALFED forums are currently developing near-term water quality and ecosystem programs, and measures from these groups may be integrated with the measures reviewed by the NNG. The NNG was suggested by the CALFED Management Team because the NNG was already working on Project operational issues (e.g., joint point of diversion).

The NoName Group is not tasked with the allocation of water supply benefits that can be derived from the implementation any of the measures. This would be a policy decision that is left for CALFED, however recommendations on how this allocation might be made are being considered during joint meetings of the NoName Group and DEFT.

The NoName Group is also not tasked with the determination of the appropriate sources of funding for implementation of any measure, nor with the allocation of costs. This document is intended solely as guidance on evaluation of potential Stage 1 measures; it is

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not intended as guidance for decisions on implementation or decisions on funding and appropriations at this time.

In June, the NNG undertook the operational issues related to the implementation of the CALFED Program and began to assist in the coordination of other key CALFED groups associated with Stage I implementation. These groups are the Diversion Effects of Fisheries Team (DEFT), the CALFED Fish Facilities Workgroup and the groups engaging on South Delta facilities (DWR / DFG / USFWS) and Delta water quality.

The measures under consideration started with the "tools" developed by the Toolbox Group for the CVPIA 3406 b(2) discussion of the Garamendi process. The starting point included a broader list than the refined list presented in Interior's November 1997 proposal. Other measures not considered during the CVPIA process were added because the implementation time frame for CALFED Stage I is considerably longer. The group narrowed the list by eliminating the measures which were specific to the implementation of the AFRP in 1998 or were otherwise obsolete. The alternatives were evaluated against a wide range of criteria and ranked accordingly.

Bundling of measures was also considered to integrate and/or combine certain measures to achieve multiple benefits (e.g., conjunctive use programs that can utilize pre-banked water supplies to offset pumping restrictions in the S. Delta to protect fish). Bundling individual actions together to produce benefits in each area will be critical to the overall success of actions. Group members agree that water supply measures must be evaluated by CALFED in conjunction with DEFT and water quality actions as an integrated package for Stage I implementation - the measures cannot be judged independently from the DEFT and water quality actions.

The CVPIA Toolbox Group made significant progress towards the identification of measures, cost assessment, water supply benefits, and implementation time frame. The "Summary of Tools" paper prepared by the b(2) Toolbox Committee, dated July 24, 1997, served as an useful reference for a description and analysis of CVPIA measures. This work was incorporated into the list of measures considered, when applicable, in addition to the broader set of measures identified by the group.

3. Qualifications and concerns

- The focus on export impacts and benefits as well as the operational criteria involve implicit assumptions about how water is used. It is however assumed that water supply benefits may be shared.
- There is no formal endorsement of any individual measure or groups of measures.
- Further analyses of all proposals require import analysis on fisheries, water quality, water supplies of non-export users.
- It should be recognized that while some measures produce "new" water, others involve more efficient use of existing supplies and still others involve re-distribution of supplies.

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- The role and impacts of meeting a portion of demands with transfers was not analyzed, nor is it possible without specific information on each transfer to make this analysis.
- In most cases, project specific environmental documentation is needed prior to the ROD if early implementation is desired. Exceptions are: JPOD, ISDP, Delta Wetlands (all have draft EIR/EIS documents). In all cases, final permitting is required.
- Because of the time delays in permitting, environmental documentation should be expedited for those projects CALFED chooses to implement early in Stage 1.
- Alternative methods for meeting flows in the San Joaquin River have been proposed and should be examined.
- A number of near term water quality measures have been proposed. These have not yet been discussed in detail and still need to be considered.

Limitations on modeling

- Water supply analyses do not always meet all requirements. Example include: Vernalis water quality and flow standards, Shasta Reservoir levels required to ensure downstream temperature control. Had these requirements been met water supply impacts to users (including non-exporters) could be significant.
- A number of baseline issues were not resolved, including Trinity River flows, overall Delta requirements, San Joaquin River flows, full compliance with the water quality control plan.
- In none of the cases, were the assumed 1995 demands met (in every year), including the basecase and cases with the additional projects.
- The level of demands used in the studies may not reflect actual current demand levels.

Note: The development of water quality actions was beyond the current NoName Group charge. However, stakeholder evaluation of water quality actions developed in CALFED's Water Quality group may be an appropriate task. Additionally, there may not be a CALFED forum in which water quality operational rules are being developed (only source control measures) so it may be proper to include some reference here.

4. Measure evaluation and screening criteria

The evaluation and screening criteria are listed in detail in Appendix A. The criteria were divided into the following categories:

- Consistency with CALFED, stakeholder support, and assurances related to the operation of the measure;

- Availability/sources of funding for the measure, cost, general implementability, time frame of implementation, and mitigation potential for the measure;

- Benefits to export water supply, water quality, and the ecosystem related to the measure;

- Impacts to export water supply (per operation models), other water supply (qualitatively or through other modeling work), water quality, and the ecosystem related to the measure;

- Unresolved issues, remaining issues, needed information

NNG participants also stressed the need for CALFED to broadly explore water quality operational rules. CALFED's current Stage I implementation proposal does not contain significant measures to enhance water quality beyond the suggested measures for source control. Therefore, any measure development related to quality from the NNG would be especially useful.

5. Immediate and near-term proposal

In relation to the CALFED early implementation plan (Stage I), the task was to define measures that produce water supply ("real" water) or increase system flexibility and are capable of implementation in the immediate- to near-term. The immediate need for these measures requires the initial analysis to occur at the existing (1995) demand level. The operations models used for these studies do not include delivery adjustments for transfers that may be initiated when various contractors receive less than their entitlement (see Appendix B for more details on demand assumptions). It is also important to note that as demand increases the performance of the measures may change, including the relative impacts on various users. For example, demand increases over time could change the usage of JPOD because of reduced wheeling capacity in the California Aqueduct.

The following are water supply measures that are the product of the NNG evaluation and screening process that are recommended for continuing evaluation. In addition to these measures, expanded real-time monitoring and flexible operating rules may allow more positive environmental and water supply performance throughout the year, and mitigate for the water supply impacts of increased environmental protection during high risk periods.

Immediate/near-term measures:

- Interim South Delta Program
- Joint point of diversion (full, unlimited)
- DMC/California Aqueduct physical intertie (possibly not needed if the first two measures occur)
- South of Delta ground water storage (Madera Ranch project or similar)

An initial set of modeling studies is being completed to assess the water supply improvements associated with the above list of measures.

"Add-ons" for additional analysis:

- Small enlargement of Shasta Dam by 6.5 feet (giving roughly 300 TAF of new storage)
- In-Delta storage (for the purpose of this analysis the Delta Wetlands Project was used; CALFED proposals for in-Delta storage could also be considered)

Other near-term measures (some of which could be immediate, e.g., Kern Water Bank):

- Kern Water Bank
- Cross Valley Canal exchanges
- Semitropic ground water projects
- General rescheduling, exchanges, MWD demand shifting
- Water purchases and transfers
- Variable pumping at Tracy Pumping Plant
- Removal of smaller dams for ecosystem access (e.g., Battle Creek, Englebright)
- Others?

Future analysis will include the determination of available conveyance for water transfers and exchanges

The NNG will continue to identify, to the extent possible, near-term actions that are related to operations that improve drinking water quality. These actions include in-Delta channel improvements to reduce tidal mixing and seawater intrusion and alteration of export timing to improve export quality. The NNG will also continue to evaluate a proposal involving a screened central Delta intake (subject to fishery concerns).

6. Description of NoName Group measures

Interim South Delta Program (ISDP): The project will improve Delta hydraulic conditions (through channel enlargements, construction of a new intake structure at Clifton Court Forebay, and flow control structures in the South Delta) such that diversions into Clifton Court Forebay can be increased. These improvements would allow the relaxation of the existing limitation on diversions into Clifton Court Forebay, per the US Army Corps of Engineers Public Notice 5820-A. The SWP would then be able to maximize the frequency of full pumping capacity (10,300 cfs) at the Harvey O. Banks Pumping Plant subject to limitations in the Accord and/or new operating rules.

To evaluate the water supply potential of the ISDP, the NNG has initially chosen to only evaluate the increased SWP pumping capacity element of the ISDP. The exact form of the other elements will be evaluated in the next phase of NNG analysis. It is implicitly assumed that the ISDP can and would be implemented in a way that resolves fish and water quality impacts. This is an item that needs resolution before the ISDP can be implemented.

[Note: Banks Pumping Plant currently operates under a nationwide permit and guidelines provided in a US Army Corps of Engineers Public Notice 5820A. An application for a specific permit under Section 10 of the Rivers and Harbor Act would be required to increase to the pumping capacity to 10,300 cfs.]

Joint point of diversion at the export pumps: This measure would allow the CVP to use available capacity at the Banks PP to wheel CVP water supplies. (Technically, the CVP could wheel for the SWP as well but this would rarely occur and is not modeled.) Operational restrictions have not been determined but a range of options exists for this measure.

Currently both the SWP and CVP are authorized to shift their respective exports between points of diversion to minimize take, provided that this operation does not increase net exports. The SWP is also permitted to wheel water for the CVP at Banks PP if Tracy PP is reducing exports to provide additional fish protection, again with no net increase to exports.

The NoName Group suggestion for initial study is full or unlimited JPOD which implies that the CVP could always utilize available Banks PP capacity - subject to the combined physical export capacity of the two projects and applicable operational restrictions (such as the USACE Public Notice 5820-A restriction). Remaining unresolved issues relate to the operational range, "place of use" for new water and south Delta water stage levels. Full implementation of JPOD may require mitigation with the use of tidal barriers.

DMC/California Aqueduct (to use additional 400 cfs) – The permitted export capacity of the Tracy PP is 4,600 cfs. The conveyance capacity of the upper DMC is about 4,200 cfs. During the non-irrigation season when demand in the upper DMC is low the Tracy PP is restricted to exporting about 4,200 cfs. This measure would involve a pipeline connecting the DMC (near Mile Post 8) to the California Aqueduct to allow the Tracy PP to export at full capacity when this condition occurred. Preliminary design was completed 10 years ago. Bethany Reservoir was also identified as a location to which CVP water from the DMC could be transferred into the California Aqueduct. The maximum available capacity was identified as 180 AF/yr. Modeling is required to quantify the actual yield. If Banks PP is ever pumping at its maximum physical capacity (10,300 cfs), there may not be conveyance capacity in the California Aqueduct to wheel this water. However, DWR staff note that recent hydraulic capacity tests of the California Aqueduct indicated that the actual capacity was closer to 11,000 cfs.

It may not be worth it depending on the operating regime (relaxation may imply more usage). The cost benefit of this may need to be assessed and the preceding measures may need to e assessed.

This option may also be obsolete (and at a minimum, benefits reduced) if JPOD and ISDP are implemented but could still be useful for fishery protection under a different operating

regime. The cost/benefit of this measure with the preceding ones may need to be considered. The 2-4 year implementation time frame is probably optimistic.

Madera Ranch – Existing dewatered pumping hole/aquifer with up to 350,000 AF of storage potential. The recharge and extraction capacities are about 400 cfs and 200 cfs, respectively. The project could provide banking service during surplus periods. Operation of the project could be to recharge the aquifer with water from the Mendota Pool. Recharge to basin may also occur from surplus flows on the San Joaquin River (see below regarding water rights issues). Pumping from the aquifer could be to the San Joaquin River or back to the Mendota Pool. Cost: $110-125M in capital (40% land, 60% facilities).

Benefits include creation of seasonal wetlands, reduced groundwater pumping costs for neighbors, implementation in three years. (The cost of the water is not included in these estimates.) Water rights issues may need consideration For example, banking of unappropriative water on San Joaquin River. However, the initial NNG modeling assumed that this project only involved CVP through the Delta.

Unresolved issues include the impacts on groundwater levels and groundwater quality, on water quality in the Mendota Pool, and the impact of a local aquitard (clay layer) on recharge and storage potential.

Small enlargement of Shasta Dam – The current proposal is to raise the dam 6.5 feet. The corresponding increase to Shasta storage would be about 300 TAF. The small expansion could improve temperature control in the upper Sacramento River, replace water lost to the Trinity River reoperation, and provide other water supply and environmental benefits. Unresolved issues include cost, environmental impact, and whether the length of time necessary for review and completion qualify this measure as appropriate for Stage 1. Water rights issues associated with this increase in capacity may be within the existing water rights. A site specific EIR would still be required, however.

In-Delta storage (e.g., CALFED proposal, Delta Wetlands) – The general concept is to divert excess Delta outflow onto Delta islands. Water is then released back to the Delta for export or for outflow requirements. Delta storage could also be used to temporarily store transferred water (to take advantage of pumping opportunities) and to re-regulate upstream releases for water quality control. Variations of the project could include a direct connection to Tracy PP or Clifton Court Forebay to avoid additional entrainment exposure to fish and impacts to water quality (need to check with DWR staff who may have estimated the cost of such a connection). In-Delta storage releases could also be directly exported by the CVP-DMC for agricultural use if connected directly to Tracy Pumping Plant. This direct alternative connection would protect urban water districts from the water quality impacts that could occur when water is stored on Delta islands for an extended period (that is, upper DMC demand would be provided for by Tracy PP while SWP and additional CVP demand would be met through Banks PP and/or San Luis releases, when possible). In-Delta storage capacity varies depending on the project.

The Delta Wetlands Project identified 240 TAF of storage capacity on two Delta islands. Long-term and critical-year yield were about TAF and TAF, respectively. Other issues that would need resolution are water quality impacts to urban users and possibly other issues and these may decrease project yield above. Incorporation into a CALFED solution would probably entail a revised operational scheme that allowed any impacts to be addressed within the overall package and may increase project yield.

Kern Water Bank – This description is based on Dave Schuster's July 17, 1997 memo prepared during the CVPIA toolbox meetings. The measures identified in that memo were intended to assist implementation of the b(2) proposal (see below). The long-term availability of these measures for CALFED purposes will depend on KCWA's long-term usage of the Kern Water Bank.

> Rescheduling: Kern districts with access to Lake Isabella and SWP project supplies could adjust scheduling for both supplies to assist operations. Financial incentive would be needed. No new water would be developed under this proposal but the flexibility benefits may be worth pursuing.
>
> Pre-delivery to groundwater storage: Water could be delivered to Kern County for local recharge. Extraction could be used in lieu of KCWA SWP entitlement supplies. The total cost of pre-storage and extraction would range from $110 to $175/AF.

Exchanges involving the Cross Valley Canal – A form of re-criculation has been proposed that involves use of the Cross Valley Canal in Kern County. The proposed exchange would use the Cross Valley Canal (operated by Kern County Water Agency) to deliver Delta water from the California Aqueduct to Arvin-Edison Water Storage District, a Friant-Kern Canal contractor. Water delivered to Arvin-Edison Water Storage District would be exchanged for Friant-Kern Canal supplies that could be released into the San Joaquin River at Millerton, or an alternative location. The proposed exchange would not provide new water, but would increase flows and improve water quality conditions in the lower San Joaquin River. The potential for such an exchange is considered to be extremely limited because much of the Arvin-Edison Water Storage District's Friant-Kern Canal entitlement has already been exchanged to other users and the Cross Valley Canal is frequently subject to capacity limitations that would prevent the proposed exchange.

Note: Capacity constraints, if there are any, could be reduced in the future through expansion and possibly extension of the Cross Valley Canal. Changes involving the Cross Valley Canal are contingent upon the USBR's successful adoption of the consolidated place of use.

Semitropic expansion – Semitropic Water Storage District has developed a groundwater banking program in its service area that can receive water through in-lieu recharge and

can return banked water either through direct pump back or by exchange for State Water Project supplies. Most of the initial ground water banking program has been allocated to the purchasing water agencies. Semitropic is investigating an expansion of the banking program to provide increased take capacity. Water supplies could be banked in either the remaining capacity in the initial development phase or the additional capacity developed as a result of the take capacity expansion.

Opportunities for reoperation (ie, flexibility): This measure generally refers to the ability of the system to be reoperated for the enhancement of one beneficial use without negatively affecting others. For example, delivery of CVP level 4 refuge supplies could be made during periods when the delivery would not constrain other CVP deliveries. The water would then be stored until actually needed by the refuges. This example, and most others may only be reliably feasible with additional storage.

Time-based pricing: Shift SWP and CVP pricing structures to encourage wet year and low impact deliveries. Differential pricing system could be set so water users would receive an incentive to bank water in wet periods and no incentive (that is, no penalty is levied) in dry periods for exports (similar to DWR's interruptible program). Example: Incentives for groundwater banking and changed use patterns for altered groundwater pumping patterns.

MWD demand shifting – There are times when export pumping needs to be reduced for meeting Delta requirements or due to fish take. Export deliveries would then be met from storage in San Luis Reservoir. MWD could reschedule its SWP delivery patterns, with the use of its local surface and groundwater storage capacity, to take less water during certain months. The shifted demand can help to reduce the likelihood that low storage levels in San Luis Reservoir will constrain Federal deliveries; however, this action does not produce any new water.

Water Transfers - CALFED should consider a transfer program with water rights protections, community and third-party protections, and predictable environmental rules. The program should allow local interests to the have the right to participate and should allow for reoperation of the SWP and CVP to optimize transfers and entitlement deliveries. Environmental transfers would use the same rules as others. During dry or balance conditions transferred water may not be "real". Transfers must be done as to not injure downstream users. Facility rights and capacities should be honored. Examples:

> Purchase reduced demand – This concept refers to south of Delta water purchases. The purchases would either reduce export demand in order to reduce the impacts of the export pumps or be stored in San Luis Reservoir to reduce potential impacts on CVP deliveries due to low storage levels. The determination of whether purchases should or should not be linked to land-use changes would be a CALFED policy decision. Environmental mitigation associated with this measure could be limited to consultation with the appropriate agencies.

[Questions: Are we restricted to the consideration of land retirement/fallowing for water quality purposes? Does "new" water remain in the District? If so, then there is no opportunity to reduce entrainment impacts.]

Long-term purchases for long term water: This category may be within CALFED's scope as it refers to the purchase of environmental water. CALFED is considering the purchase of environmental water to be a major responsibility of the proposed ecosystem manager. Within CALFED, there has not been any discussion limiting the ability of that manager to make long-term purchases of water.

Long-term purchases for short-term options: This refers to long-term water transfer agreements which limit the number of years in which the option can be invoked. For example, a purchase might be limited to no more than 2 years in 5 and 3 years in 10.

Short-term purchase program: This basically refers to a mechanism to allow any entity (environmental, ag, urban) the opportunity to purchase water, similar to the spot market.

Variable pumping at Tracy PP – This measure is not completely defined but is generally related to the actual pumping arrangement at Tracy PP which may not permit a specific export rate because of the plant's coarse pumping settings. For example, the desired and maximum allowed export rate at Tracy PP may be 4,400 cfs for some condition/time but actual available pumping rates may be 4,300 cfs or 4,500 cfs due to the availability and limitations of pumps so the lower rate must be chosen. (Is this practical when the cost of installing variable rate pumps is considered?)

Removal of smaller dams/reservoirs for ecosystem access – This measure refers to the dismantling of smaller diversion dams to enhance fish migration and provide access to upstream spawning habitat. The reservoirs being considered for removal are not operated for water supply (except locally, possibly) or flood control. Water supply benefit to the ecosystem would be measured in miles of free-flowing water created and upstream spawning habitat made accessible.

7. Modeling results related to the near-term proposal

The modeling results that are presented in this section are intended to provide information regarding the water supply benefits of specific measures and operating regimes and do not include a full examination of the associated impacts involved with the implementation of any measure. In particular, water quality impacts, fishery impacts and impacts on non-export water users are not evaluated in operations studies. These sorts of analysis are available in draft environmental documentation for some of the projects analyzed, but none of these projects has final permits and additional analysis is required.

Preliminary studies were undertaken to assess the potential water supply gains of the following measures: Interim South Delta Program (for the purpose of the modeling, it was simply assumed this program would allow 10,300 cfs capacity at the Banks pump plant; the actual program and operational criteria are still under discussion for the ISDP) unlimited Joint Point of Diversion, and a 400 cfs intertie between the DMC and the California Aqueduct. Other studies included Madera Ranch Groundwater Storage with the aforementioned projects, and the addition of the small Shasta expansion and in-Delta storage (Delta Wetlands was used in this case). Additional storage projects as other measures should probably be examined in the future. These cases were examined because they probably could be implemented during Stage 1 and because they are sufficiently well defined that they can be modeled. It should be noted there is not formal endorsement of these projects.

There are a number of limitations to the models used. First, not all standards or requirements are assumed to be met, even in the base case. For example, Shasta is drawn down to below 1 MAF in some years, well below the NMFS criterion of 1.9 MAF. However, in the absence of clear direction on how to operate in very dry years, this is a best attempt to meet conflicting demands and priorities. Water quality and flow requirements on the San Joaquin River are not always met; again, in the absence of knowledge of where water would come from to meet these standards, a best attempt was made to model based on current knowledge. Finally, future Trinity River flow requirements are not known and a best guess was made for these. Meeting such requirements may result in significant impacts to both export and non-export water users and is an issue for resolution.

Demands were assumed at the 1995 ("current") level. These are issues related to how well the demands reflect current demands; this is a complicated issue because of the impacts of the recent drought, the issue of alternative supplies, the recent wet period in which some demand has been met by rainfall and available for developing estimates.

The data in the table below show gains for export was users as a result of adding the measures noted to the system. A variety of operating cases were examined including: 1) the Accord plus upstream AFRP actions, 2) the Accord plus upstream and Delta AFRP actions, 3) the Accord plus upstream and Delta AFRP actions, plus additional measures suggested by the DEFT for initial analysis, and 4) the Accord plus upstream AFRP actions plus Trinity River flows.

[insert table]

In no case, including the base cases were all export demands met. The table shows the gain in export water supply as a result of the measures (however, depending on other programs and policies, the water could be used in a number of ways). One feature of note is that for most base cases, the gain in export supply from the ISDP, JPOD and intertie is about the same regardless of base case operational criteria; the exception is when the

additional export restrictions suggested from the DEFT are added. In this case, there is a substantial reduction in the export supply gain.

The NNG and DEFT are now jointly considering operational criteria and combinations of measures that might also be considered for further analysis. Consequently, the above results should only be taken as ball-park "book-ends" with further refinement necessary.

8. Other measures worth pursuing

The following is a summary of actions that have been discussed within the NoName Group. Listing them here serves as a inventory of future actions which warrant consideration as the CALFED Program proceeds.

Raise Friant Dam – The concept is to raise existing dam such that storage increases from 500 TAF to 1.2 MAF. New yield from the project could provide supply and environmental benefits. The project also includes potential for substantial downstream water quality and flood protection benefits. Unresolved concerns include cost effectiveness and consistency with likely changes in reservoir releases as a result of litigation. The length of time necessary for review and completion will probably not qualify this measure as appropriate for Stage 1.

Expand Pacheco Reservoir – Pacheco Reservoir is located north of San Luis Reservoir. This facility could be expanded to provide more flexibility in San Luis operations and possibly water quality improvements to San Felipe contractors (for example, low-storage withdrawals from San Luis Reservoir to the San Felipe Unit, when quality is relatively bad, may be avoidable with this facility).

Eastern Contra Costa County groundwater program - The characteristics of the local groundwater basin are being determined by CALFED and local agencies. There may be potential for conjunctive use, depending on the results of the studies.

Pine Flat Lake expansion – Create a companion reservoir to Pine Flat Lake in an adjacent dry-creek watershed via a tunnel at the same elevation.

Central Delta intake –

The goal of this proposal is to provide a Stage 1 alternative that would do the following:

- Reduce direct and indirect impacts on fisheries from the State and Federal projects;
- provide improved water quality for Central and South Delta water users from a screened intake; and
- provide improved water quality for Delta water users, particularly urban users.

This project would keep all diversions entirely in the Delta, thus protecting the Delta pool; it would provide direct water quality benefits to both in-Delta and export users, and

would improve flexibility of operations to improve water supply reliability and environmental protections.

The concept is to provide one or more small screened intakes in or around MacDonald Island, or in that general vicinity. The project could be phased and could start with a single intake that would allow about 1000 cfs of capacity. Additional intakes could be added with time; these could be in different locations and of different sizes with different screen configurations (different screen configurations would allow testing of different screen designs).

There are several advantages to intakes at this location. One is water quality, as MWQI and other field and model data indicate that water quality in this area is significantly better than that found near Clifton Court Forebay and Tracy PP, particularly in the case of salinity but probably in the case of organic carbon as well. Consequently, use of the location could substantially improve water quality, especially in dry periods. Second, the area is heavily influenced by tides and would allow positive screens with substantial transport flows across the screens, thus allowing the likelihood of better protection. The intakes could be operated on the tides with gates behind the screens to prevent backflow; this would mean there would be no diversions on ebb tides, so that fish, eggs and larvae passing the screen on the outgoing tide (toward the western Delta and Bay) would pass without hindrance.

Operational criteria for the intake would be developed to allow more flexibility and fish protection than currently exist. Issues such as spring diversions during migration and spawning periods can be taken into account to ensure better protection than currently exists with Clifton Court Forebay and Tracy pump plants.

Diversions from the intakes would be transported off the island and through a siphon to Whiskey Slough, which would be enlarged as needed and connected to Trapper Slough (also modified as needed). They could also be transported via the chain of lakes. Current diversion points on these sloughs would continue to be used (the diversions would thus be screened and have improved water quality). The drain into Trapper Slough would be rediverted to another location, unless it does not significantly affect water quality. A siphon from Trapper Slough to North or Victoria Canal would pass under Middle River; North or Victoria Canal would be isolated and modified as necessary, with the water then transported directly to Tracy and the Banks Pump Plant through new facilities (Clifton Court would be avoided unless it is also screened).

This arrangement could be connected directly to Delta island storage. Water stored on a nearby Delta island could be discharged directly into this facility during periods when pumping is limited and transported to Tracy for export to the DMC for Ag export use or for a recirculation scheme. This would require a separation of the DMC and the State Aqueduct at O'Neil Forebay to ensure that water quality for urban areas is not mixed and degraded by the water stored on the islands (TOC and other constituents of concern). It

would also remove the need to divert, release and redivert water stored on islands, improving fish protection and possibly allowing improved efficiency of such projects.

The intake could also be used do provide water to South Delta and Central Delta water users. These users would then have the advantages of higher quality, screened water. The operation of this intake would need to protect any fish that could be in the vicinity including fish native to the Delta and native to all rivers tributary to the Delta. This intake is also expected to improve the quality of drainage water returned to the Delta.

Purchase of surplus Project water: -- USBR Section 215 (Reclamation Reform Act of 1982) water or DWR interruptible water -- The SWP and CVP both have mechanisms by contract or policy that allow contractors to purchase water in additional to their contractual entitlement under certain conditions. The USBR refers to this water as Section 215 water (per the Reclamation Reform Act of 1982). DWR refers to this water as interruptible water as defined in the Monterey Agreement. The common condition that applies to both projects is that the surplus water cannot be stored in CVP/SWP facilities but can be directly delivered to contractors in uncertain quantities for uncertain duration without affecting entitlement deliveries. Available non-Project storage would be critical to the usage of this water. Another important factor: typically USBR Section 215 and DWR interruptible water are used within the CVP and SWP, respectively. There is some question as to whether there are mechanisms in place that will allow entities outside of the CVP and SWP to purchase and wheel this water (wheeling would be at the lowest priority). If it is not possible for buyers outside the SWP and CVP to purchase this water, presumably a contract with an existing contractor could be written to make the purchase.

Purchase turnback water -- The SWP turnback pool is a mechanism provided for in the Monterey Principles which allows water to be reallocated within the SWP or sold outside of the SWP on a compensated basis. The level of compensation depends on when the water is placed in the pool. If another SWP contractor or DWR does not purchase the water, it can be sold to non-SWP parties.

Purchase releases from hydroelectric producers -- This concept would be to alter the hydroelectric production timing to produce new water. The existing downstream beneficial uses of hydro-related releases would need to be preserved if reoperation is considered. This measure would not produce water, it only allows for reoperation of existing supply and probably takes water from one period in the year and uses it in another. The impacts from this reoperation would need to be considered.

San Luis Reservoir – Available storage in San Luis could be coupled with available pumping capacity to move water through the Delta for contractor use or for pre-delivery of refuges supplies. This operation may be able to shift pumping out of the most environmentally sensitive periods, but it requires releases from upstream reservoirs to supply the water for export (note: the SWP may already do this to the extent that it is feasible). Other reop/shifting measures may utilize San Luis Reservoir so there may not be a need to single out this particular measure.

Mendota Pool pumping shifts – Irrigators using water from the Mendota Pool could shift to ground water instead of taking Project deliveries. This could help avoid problems in San Luis Reservoir associated with low storage in the summer. However, overdraft effects and recharge opportunities are in question.

CCSF/SCVWD exchange (no new water, only flexible operations potential) –

Option 1: CCSF's water system is interconnected with the S. Bay Aqueduct through a 30 cfs-capacity turnout near San Antonio Res. Water can be gravity fed from the Calaveras Res. into the S. Bay Aqueduct.

Option 2: CCSF increases deliveries to common CCSF-SCVWD customers; SCVWD pays back the water in subsequent years.

American River Exchanges: - Each measure involves a transfer of water out of the American River system to beneficial uses outside of the immediate basin. Potential fishery/habitat impacts in the lower American River can not be ignored and will need further evaluation. It is implicitly assumed that the East Bay Municipal Utility District's (EBMUD) American River Project can and would be implemented in a way that resolves fish and water quality impacts. This is an item that needs resolution before this project can be implemented.

American/Mokelumne River exchange - The premise for this alternative is that there are times when water is available on the American River to provide an environmental benefit to the Mokelumne River ecosystem without impacting the American River ecosystem. This premise must be confirmed prior to serious study of this alternative. The actual physical exchange would be for the EBMUD to take more water via its American River contract with the USBR for its customers in the East Bay in exchange for releasing additional water into the Mokelumne River downstream of Camanche Dam. This idea has not been studied to date to ascertain whether any additional quantities of water could be beneficially used by the ecosystem on the Mokelumne River for this purpose. The quantification of the benefit from this alternative would require matching American River excess flows with a water "need" on the Mokelumne at a time when there is available space in EBMUD's American River pipeline connection.

American River/South San Joaquin Irrigation District/Oakdale ID exchange - Surplus water from the American (either directly from the USBR or utilizing EBMUD's American River contract) could be delivered to SSJID and/or OID in exchange for their foregoing diversions from the Stanislaus R. This idea would not utilize any groundwater pumping but would rather trade American R. surface water for Stanislaus surface water when available. This project would require use of EBMUD's American River connection as well as the construction of an

additional 20-25 mile pipeline connection from the Mokelumne Aqueducts to SSJID.

Folsom So. Canal to East SJ groundwater - CALFED has identified groundwater storage in San Joaquin County with active capacity of upto 740 TAF. This project would need to utilize conveyance facilities from the American River (EBMUD or other is FSC can be extended by CALFED/USBR) to San Joaquin County (Farmington Canal area). CALFED has suggested that delivery of surface water from the American River would be used in lieu of groundwater in the Stock East WD and S. San Joaquin ID areas. This would reduce the rate of underflow recharging the Stockton East WD area from the SSJID area and thereby make it possible to use groundwater in the SSJID area in lieu of diversions from the Stanislaus River. Those undiverted supplies could then be scheduled for release to the Delta from New Melones Reservoir. CALFED has identified a cost of $103.6M. However the March '97 CALFED Storage and Conveyance document indicates that this cost includes only a small portion of the conveyance facility construction cost (6% of FSC extension construction) and therefore the costs shown are probably low.

Water exchanges – These exchanges include "unbalanced exchanges" (e.g., 3 units of water in a wet/surplus period is exchanged for 1 unit in a drier period). Exchanges could also be made for water quality.

Increased usage of Colorado River water via conjunctive use or financial incentives – There are questions as to whether these supplies are already maximized. Colorado River water is much cheaper than Delta water for So. California. Colorado River supplies may already be maximized and there may be quality problems (Colorado Riv. TDS is about 700 mg/L). Is this a valid measure in light of the 4.4 plan?

Real-time operations with crediting (allow higher exports during safer periods in exchange for lower exports in sensitive periods via crediting) and /or adaptive export limits – Similar concept to "Water exchanges" (above). There could be disincentives for CVP water users to bank in wet years due to the tiered pricing structure in CVP long-term contract renewals. The CVPIA tiered structure could be modified to avoid this condition.

Reschedule water or shift to groundwater to get past low point in San Luis Res. – This measure represents the broader category of rescheduling that several other measures fall under.

Los Vaqueros Reservoir Coordination - Coordination with CCWD could, in some years, be carried out to allow a small amount of demand shifting to further protect fisheries. To implement this, there would need to be an assurance of no impact to CCWD's water supply or quality and that high quality water would be available for refilling Los Vaqueros Reservoir. CCWD or others could reduce pumping during fish sensitive periods and use water from the reservoir; this would be refilled later in the year. This

action would involve a small amount of water (5 TAF or so), and would not produce a long term yield; but the action could produce water quality and fisheries benefits in the years it could be done.

Contributions from other CVP contractors (e.g., Friant) and other water users to meet environmental objectives (including refuge water) – It may be possible to deliver refuge water from Friant and reduce the quantities exported from the Delta.

Recirculation – The concept is to release water through the Newman Wasteway to the San Joaquin River to provide up to about 30% of the desired Vernalis April 15 to May 15 pulse flow. This would be done on a basis of no-net-loss to contractors by the export pumps. The South Delta barriers would largely avoid recirculation of San Joaquin smolts and salt load back to the DMC. It would avoid either providing the April-May fish flow by reducing summer flow, or failing to provide the flows. It would be much less costly than water purchases. In years of greatest need it would save about 100,000 AF of water that would be available in the tributaries for other uses and subsequent export at times that exports are not curtailed. Unresolved concerns include the increased export pumping to implement this measure, the need and operation of south Delta barriers, and the impact on fisheries and water quality. There are potential imprinting problems for San Joaquin River salmon (concern from D. Daniel), and possible increased take of delta smelt (juvenile delta smelt generally appear at the pumps toward the end of May, there would probably need to be an adjustment to the incidental take levels to allow recirculation to occur).

Temporary storage of drainage water (managed releases into the San Joaquin R.) – Some growers in the drainage areas of concern may have local facilities to store water for a few weeks and could possibly time their releases into the San Joaquin River to lower salt concentration in the Delta. Overall loading will probably not be affected but South Delta salinity peaks could be lowered. Unresolved concerns include appropriateness of investment in actions which do not reduce mass loading from drainage, and the potential creation of "attractive nuisances" for wildlife at holding facilities.

Desalination – Could be prohibitively expensive but developing technology is lowering the cost. Price/AF can be greatly dependent on the salinity of the source water (seawater vs. Delta water). Example: paying Santa Barbara to operate their desalination plant in lieu of SWP supplies was identified as an expensive method to produce water.

Procedural Tools

- Coordinated Operating Agreement (COA) revisions
- Review the recent upstream contributions to meeting flow-related provisions of the 1995 WQCP and account for shifted CVP/SWP burdens since the Accord. Also review inequitable contributions to meeting the Accord among all water users.
- Section 1707: Dedication of in-stream flows for environmental purposes and/or Delta outflow

Combination Tools Vernalis Adaptive Management Program (VAMP): modification of nominal WQCP flows + acquisition of water through market and non-market methods. Possible use of Section 1707, ops group flexibility, CVPIA Section 3406 b(2)/b(3) water, environmental storage

Fullerton exchange proposal -- Language to be added by Dave Fullerton

Appendix A: Evaluation criteria

Appendix B: Outline of modeling studies, limitations and assumptions

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