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Draft CALFED New Asset List
Including both EWA and Water User Assets
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INTRODUCTION.

CALFED must solve the Delta operations problem to succeed. The success of the EWA depends upon the existence of significant flexibility in the export system. Flexibility is created by the existence of surplus exportable water relative to deliveries (i.e., the existence of numerous possible pumping patterns, all delivering the same amount of export water over one or several years) and access to enough storage to buffer the differences between various possible export pumping patterns. Surplus exportable water can be created in a number of ways. Increased upstream water development might inject more water into the Delta at times when the water can be exported. Increased export pumping capacity can allow a larger amount of Delta inflow to be exported. Reduced export area demand reduces the need for exports and creates flexibility. The relaxation of export standards (or Delta outflow standards) would increase the amount surplus exportable water.

The existing export system has very little flexibility remaining. In dry years, upstream supplies are limited and Delta export standards are very limiting. Water users rely upon storage to help compensate for the severe limits on exportable water. In wet years, the system is also highly constrained. Upstream supplies are not limiting. However, environmental export restrictions may limit exports during the VAMP period and beyond (as witnessed during 1999). Moreover, legal constraints on export capacity imposed by the COE restrict the ability of the export pumps to take advantage of high flows. Finally, storage may be limiting in export areas such that, even if water can be pumped, there is no place to store the water.

As an example, assuming that exports are about 6 maf per year and that export capacity is 11 kcfs for 11 months and 3 kcfs for one month (during VAMP), then the export pumps must average 8.2 kcfs or about 80% of allowed capacity just to meet demand. This ignores fluctuations in Delta inflow, export standards outside the VAMP period, outages for maintenance, and periods when demand is met and storage is full. Thus, in practice, the export system is highly constrained – the export system has only a limited ability to pursue alternative export pumping patterns without significantly reducing the reliability of project deliveries. During 1999, a reduction in exports for water year 1999 of less than 10% to protect Delta smelt caused a major crisis during the peak summer demand period because of the lack of enough project storage to buffer the outage. Even though a cool summer and borrowed storage allowed the projects to get through the summer, significant amounts of additional water must be exported this winter to in order to recoup the losses. If the lost pumping cannot be made up this winter, deliveries to water users may be reduced next year.

In addition to the problem to generating system flexibility for the EWA, CALFED must confront demands by the water community to boost average and (particularly) dry year exports. The same tools which can be used to increase system flexibility – upstream water development, increased export capacity, increased export area storage, reduced demand (by leaving more water for remaining users) and relaxation of standards -- can also be used to increase effective water deliveries.

These two goals – the creation of system flexibility and increases in average and dry year exports – are, if not contradictory, at least frequently in competition. Water transfers made for the EWA reduce the pool of water available to the water users and increase the cost. New export capacity used by the projects cannot simultaneously be used for EWA water. Fortunately, in practice the two goals are not always in competition. The demand for water and storage capacity south-of-the-Delta are limited. Provided that demands are met and storage is filled, the water users are not harmed by the use of flexibility by the EWA.

Nevertheless, CALFED will need to develop a water management package proposal that accomplishes three things simultaneously:

1. Allow increases in the effective delivery of water to export areas.
2. Mitigates for these increases in delivery to export areas.
3. Increases system flexibility controllable by the EWA to protect fish through optimized export patterns.

SUMMARY OF POSSIBLE ASSETS

The various tools available for these purposes are listed in the table below. A few comments on the various tools may be useful.

- **Increased allowable pumping capacity at Banks.** This is the single most cost-effective measure that could be taken, whether to increase system flexibility, system exports or some combination. Delta outflows routinely rise above 100 kcfs during winter storms. Even during dry years, outflows will frequently rise above 40 kcfs for limited periods. Yet, total export capacity is generally limited to 11 kcfs. An increase in total export capacity from 11 kcfs to 15 kcfs could create an enormous amount of new flexibility during wetter years to meet export demands, despite using more fish-friendly export patterns. During dry years, it could allow for increased exports during occasional high flow periods.[1] It could make south-of-Delta surface and groundwater storage far more cost-effective by increasing the likelihood that storage could be filled on a regular basis. Finally, it would strengthen operational contact between export areas and upstream storage and improve the cost-effectiveness of upstream storage, whether for environmental purposes or for increasing deliveries.[2]

- **South-of-Delta storage.** Without increases in allowable pumping capacity at Banks, the value of south-of-Delta storage to CALFED is rather limited. Surplus water to put into storage does occasionally occur under present circumstances. However, given that the EWA will consume much of the remaining flexibility in the system, the availability of surplus water to put into storage without increased Banks pumping capacity will drop even below current levels. For example, as a result of the May – June export reductions for Delta smelt in 1999, the SWP will not fill its share of San Luis Reservoir until the end of January, despite reducing interruptible supplies. The CVP share of San Luis will take even longer to fill. Without the Delta smelt export reduction (the kind of action we might expect from the EWA), San Luis might have filled as soon as December. Since new south-of-Delta storage capacity only represents new usable storage after San Luis fills, delays in filling San Luis reduce the utility of new south-of-Delta storage. Given that allowable Banks pumping will be increased as part of CALFED (and that not all of the new flexibility will be consumed by EWA actions), new SOD storage begins to look more attractive. The storage can be filled with water during wetter than normal years. If used for export water users, the storage can be used to boost dry year deliveries. If used for the EWA, the water can be used to help supply replacement water when pumping reductions are made to protect fish.

- **Upstream storage.** Upstream storage is intrinsically capable of modulating flow patterns between the intake/release point and the Delta. Thus, a groundwater storage project on the Feather River could be used to improve local instream flows, improve Delta inflow, improve Delta outflow, generate local yield, and produce water for downstream or export users. Moreover, since discretionary reservoir releases upstream of the Delta are frequently in excess of regulatory requirements, storage can frequently be moved (or "backed") from one storage site to another to increase the utility of the

[1] This water could either be used to increase dry year water supplies, or to jusify modifications in export pumping to protect fish.
[2] Export capacity limitations frequently isolate the export area from upstream storage for extended periods of time. For example, during 1999, there is adequate upstream storage to compensate for export reductions required during May and June. However, due to limited export capacity, the water could not be moved into the export areas during the benign export months of July – September.

water.[3] Finally, upstream storage can be used to improve dry year exports. However, during non dry years, the ability of upstream storage to support increases in exports will be limited until greater surplus capacity is created at the export pumps as discussed above.

- **Near Delta storage.** Storage connected to both the export canals and to the Delta has even greater utility than south-of-Delta storage. It has all the benefits of south-of-Delta storage, plus the additional advantage that it can divert water even during periods when the export canals are full. Given the great variability in Delta outflow patterns, this is a great advantage. Examples would include Delta island storage or an enlarged Los Vaqueros Reservoir. Delta islands storage non directly connected to the export pumps is essentially identical to storage upstream of the Delta.

- **High priority access to surplus capacity.**
  Joint Point of Diversion

  Surplus pumping, conveyance, and storage capacity exist within the state and federal projects. That is, there are periods when the canals and reservoirs have empty space. This surplus can be converted into operational flexibility and used to protect the environmental (if capacity is given to the EWA). Alternatively, the surplus can be used to increase total water diversions. The Joint Point of Diversion would give the Projects automatic access to surplus diversion capacity at each other's Delta pumping plants. Also, state legislation allows non Project water transfers to move through Project facilities.

  The prioritization of the use of surplus capacity is a key issue. JPOD is an obvious way to increase CVP exports from the system. Capacity in the DMC is very small compared to export demand on the CVP. Any significant reduction in allowable pumping at Tracy (e.g., for VAMP) cannot be recouped by the CVP at other times of the year. The JPOD would allow the CVP access to the SWP export facilities – the Banks pumping plant and the CA Aqueduct -- when surplus capacity exists. In essence, some existing flexibility in the SWP system would be converted into greater water diversions for the CVP.

  But JPOD will limit the ability of the EWA to export water on its own behalf. Both JPOD and EWA operations will limit capacity available in the market. One way out of this dilemma is to increase the amount of surplus capacity available by increasing available pumping capacity at Banks. In any case, it is quite clear from simulations run to date that routine, high priority access to Project facilities (pumping, conveyance, and storage) is essential to the success of the EWA.

- **Access to unused Project, non Project and EWA storage.** Just as the use of unused capacity can create flexibility and/or yield, the use of unused stored water can create flexibility and/or yield. For example, in the use of **demand shifting**, the EWA would induce (in a market setting) local agencies to temporarily rely upon unused local storage in order to maintain storage in San Luis Reservoir. Similarly, if San Luis Reservoir has unused storage (i.e., storage that is not immediately needed by the Projects), the EWA could borrow that storage (based upon solid collateral and a commitment to replace the storage before it is needed). Finally, the Projects may be able to utilize unused EWA storage in San Luis Reservoir in order to deliver more water during the summer without running into low point problems.

- **Water, Storage Purchases and Efficiency**. Functionally, water purchases and efficiency are very similar. In both cases, CALFED or the EWA will make an investment in return for reduced demand by a water user. To be useful, that reduced demand must be convertible into real benefits. Thus, for example, the EWA might buy water from farmers in the export area. As part of the transaction, the Projects would deliver less water to the farmers and more water to the EWA. Whether the reduced demand is a result of improved efficiency (e.g., changed irrigation) or fallowing does not change the

[3] Whenever a reservoir is making discretionary releases above local regulatory minima (e.g., to support exports or Delta outflows), the releases could be reduced and storage built up in the reservoir, if an equivalent amount of water is released from another storage site to maintain total releases.

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operational characteristics of the transaction. Similarly, CALFED could invest in water reclamation in southern California. CALFED could either donate the water saved to the Projects (in which case CALFED would get credit for creating new export supplies) or CALFED could require that the EWA would receive water from the Projects equal to the amount of water saved by the reclamation projects. Combining these two approaches, we might assign the water to the users during dry years (when they need the water the most) and to the EWA in wetter years (when the EWA has very great needs for water). Similarly, CALFED or the EWA might invest in agricultural efficiency in order to reduce applied water and fish entrainment at the ag diversion point. The transaction might not generate water, but it could have valuable fish benefits nonetheless.

The market is not merely a water acquisition tool for the EWA, however. It is also a transportation tool. With the exception of the export canals, California's conveyance infrastructure is quite limited. Plumbing limitations directly affect the ability of the EWA to move water to where it is most needed in the system. In particular, it is frequently impossible to back water up from export storage to upstream storage, or from one upstream basin to another. However, if water is difficult to transport, money is not. Markets provide the ability for the EWA to sell water in one area, take the proceeds and purchase new water elsewhere at a location of greater environmental need. EWA will also have the ability to purchase storage rights from local dam and groundwater operators in a market. For this reason, we cannot assume in advance that the EWA will necessarily drive up the price of water in export areas. The EWA may end up becoming a major seller of water in the export area, driving prices back down.

- **Regulatory Modifications.** Any relaxation in the regulatory constraints that govern operations will, by definition, increase available capacity in the system. That increased capacity can either be converted into increased flexibility and used by the EWA or it can be converted into an increase in total exports. The relaxation of the COE requirements on Banks (discussed above) is a good example. As another example, relaxation of the E/I standard increases allowable export pumping. If that relaxation is controlled by the EWA, it can be used on a real time basis to modify export pumping patterns to improve fish protection without reduction in overall exports. Alternatively, the E/I relaxations could be used to support increased overall exports. Or a combination is possible. Similarly, the X2 standard could be relaxed in such a way as to increase flexibility for the benefit of fish, or converted into greater overall diversions. Again, a combination is possible. An E/I relaxation under the control of the EWA has been gamed extensively by the DNCT and appears to be very valuable. Similarly, we could consider giving the EWA the right to modify the X2 standard in order to generate upstream or export area storage. Another approach would be to modify the E/I and/or X2 standards and to share the operational benefits between the EWA and the water users.

PRIORITIZATION

It is impossible analytically to come up with a priority list of assets with their allocation between the EWA and the users. In some cases, particular assets seem indispensable. In other cases, however, numerous combinations of assets could provide similar benefits. In such cases, the correct choice will be determined as much by political as technical considerations. With that said, here are a few rough thoughts:

- Expansion of the allowable capacity of Banks is a sine qua non. In theory, the EWA could survive without major increases in surplus pumping capacity through massive efficiency and export market programs. In practice the size of the compensatory efficiency/ market programs is probably infeasible. The EWA must share in the benefits of expanded allowable export capacity. Otherwise, the expansion of Banks will actually damage the EWA's ability to protect fish.
- Efficiency programs appear to have strong political support, despite their high cost. CALFED funded efficiency could generate over 100 kaf per year of efficiency water, to be shared between water users and the EWA. This is a sizable chunk of the needed water.
- EWA initiated water purchases appear to be necessary, particularly during the first few years. As the EWA gains access to larger amounts of storage over time, the need for transfers will decline. However, access to markets is likely to always be a part of the EWA program. Purchases may, in fact, be the main form of EWA activity on certain non Project tributaries well into the future.

- The EWA must have routine and high priority access to state and federal infrastructure.
- The utility of groundwater storage south of the Delta less than we might hope for. Input/output capacity constraints mean that groundwater storage cannot provide an immediate buffer against spring export reductions which may frequently total several hundred thousand acre-feet. The ability of the EWA to fill groundwater storage will be limited until allowable Banks capacity is substantially increased. Finally, the cost of using groundwater storage can be quite high. The major advantage offered by groundwater storage is that it represents collateral that can become the basis for storage loans from the projects and other operators of surface storage. This value alone may justify a groundwater storage program.
- Delta storage connected to the export pumps is everything that groundwater storage is not. It is easy to fill, easy to empty, and cheap to operate. It can provide increases in peaking Delta diversion capacity above and beyond the Banks capacity improvements, thereby increasing overall system flexibility. At the maximum size examined (200 kaf during game 2), it can substantially buffer reductions in spring exports made to protect fish. It might be operated to improve urban drinking water quality (if connected to the Delta Mendota Canal, the March TOC peak could be shunted away from urban supplies).
- E/I relaxations appear to be an essential tool for the EWA. The appearance of fish at the pumps is sporadic enough that significant net benefits can be generated if exports can be increased during periods when the fishery impacts of diversions are relatively low.

THE RELATIONSHIP BETWEEN EWA AND OTHER RESTORATION AND WATER MANAGEMENT TOOLS

The EWA is not being created in a vacuum. Other environmental water management programs exist (e.g., within the CVPIA). Non water environmental programs exist such as the ERP habitat program. The state and federal Projects already exist and already have developed rules of engagement with each other. Thus, the problem is not merely to create the EWA, but to create relationships with other efforts and other institutions. Below is a description of some of the needed work.

- **CVPIA – b(2).** DOI appears to be moving toward an accounting system for the b(2) water that closely resembles the EWA. There are strong operational reasons for closely coordinating (if not merging) b(2) and EWA operations. Many b(2) assets lie upstream in CVP numerous reservoirs. Most non market EWA assets are likely to come from new assets in the Delta or in the export system (increased Banks pumping, groundwater storage, Delta island storage). DOI does not have assured access to state facilities for the use of b(2) water. The EWA could provide this access. As an example, the Tracy pumps have little or no flexibility in operations. If b(2) water is to be exported to support modifications to the export pattern, the water will need to move through Banks and may need to be held within the state share of San Luis Reservoir. Thus, in order to make full use of the b(2) water, DOI would need, in any case, to negotiate an agreement with the SWP that looks something like the EWA.

- **ESA.** EWA could be defined as a general environmental enhancement tool that operates above all regulatory requirements, including the requirements of the ESA. Alternatively, the EWA could be oriented toward the protection of endangered species and, by committing to allocate its assets to protect endangered species, could allow regulatory certainty to be granted to water users by the ESA agencies. Many possible scenarios exist between these two extremes. Generally speaking, the more that water users are willing to pay into the EWA, the greater the insulation the EWA might provide the users against the implementation of the ESA.

- **State and Federal Projects.** The state and federal projects already have established rights from the SWRCB, contracts with a large number of water users, and a working relationship between each other via the Coordinated Operations Agreement (COA). The EWA must be grafted into this set of rights and relationships without harming existing users. In the short run, it is almost inevitable that the EWA will operate under the aegis of the state and federal Projects. The Projects control many of the rights and much of the infrastructure needed by the EWA. Indeed, the Projects could, if they so chose, modify their operational patterns to protect fish even without the existence of the EWA. However, to do so would jeopardize their contractual commitments to the water users. In many respects, therefore, the EWA may be seen as an institutional creation designed to eliminate the risk to the Projects deriving from more protective operations. The ability of the Projects to reoperate on behalf of the EWA (given the appropriate reimbursement and protections) will greatly simplify CALFED's task. However, difficulties remain, particularly with respect to the allocation of assets not yet on line. For example, what will be the EWA's rights to use new capacity at Banks? Do JPOD diversions take precedence over EWA diversions? How will rights to new Delta island storage be divided? What kind of collateral must exist before EWA can borrow unused storage?

- **ERP Water Program**. CALFED's ERP has identified a number of flow targets upstream. Most people now consider it essential that the EWA both be made responsible for any ERP flows and that it be allocated the resources needed to develop those flows. Including these responsibilities under the EWA umbrella is likely to reduce overall costs since some of the ERP flows may be provided from EWA assets in the Delta (e.g., the EWA could back water upstream or could sell diverted water to provide the needed funds). Similarly, ERP water will frequently provide benefits downstream to the EWA (via rediversion or Delta outflow).

- **Others?**

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Table 1

Beginning of Stage 1 Possible Assets

Asset	Asset Defined	Feasibility as EWA Asset	Feasibility as Project Asset	Concerns/ constraints	Process for Approval (needs work)
Increased Banks Pumping Capacity	6.6 kcfs Nov – March + 1/3 SJR. 8.5 kcfs July – Sept	Medium. High by end of Stage 1.	Medium. High by end of Stage 1.	South Delta agriculture opposes current plan. Possible enviro opposition. Tides, vegetation could limit intake capacity	Corps of Engineers approval ESA agencies
	7.1 kcfs July - Sept	High	High		
Access to Surplus Project Capacity	Joint Point of Diversion	NA	High	Distribution of Rights w/r Projects and Users must be defined as one package. Possible conflicts w/ unscheduled water and markets	SWRCB ESA Agencies
	EWA access to surplus capacity	High	NA		
Right to Borrow Surplus Storage (Both EWA and Projects)	Assumes Collateral "No harm" basis	High	High	Must define collateral, penalty requirements	Projects/ contractors
Groundwater Storage SOD	Kern Bank: 300 kaf at 20 kaf/month in/out	High	Low	In/out capacities could limit utility of storage	Approval by agencies controlling groundwater.
	Semitropic: 100 kaf at 20 kaf/month in/out	High	NA		
Markets[4]	Sacramento R. = 200 kaf	High	High	Size of purchases unprecedented in non drought years w/ non ag buyers. Concern over impact on price of water	SWRCB Local Agencies
	San Joaquin R = 100 kaf				
	Export = 100 kaf				
Access non Project storage	Store EWA water Demand Shifting 100 kaf	High	NA		Approval by agencies controlling storage
E/I Variances	Varies	High	Low	Governance of EWA	SWRCB

[4] Total Potential is speculative. Probably no set cap, but depends on willingness to pay for water.

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Table 2

End of Stage 1 Possible Additional Assets

Asset	Asset Defined	Feasibility as EWA Asset	Feasibility as Project Asset	Concerns/ constraints	Process for Approval (needs work)
Increased Banks Pumping Capacity	10.3 kcfs. Water screened before entering CCFB	Medium	Medium	South Delta agriculture opposes current plan. Possible enviro opposition. Tides, vegetation could limit intake capacity.	Corps of Engineers ESA Agencies
Efficiency	120 kaf/ yr?	Medium	High	Urban concern over water leaving district	Local Agencies
Groundwater Storage	Gravelly Ford	Medium, increasing with time	Medium, increasing with time	Local government, landowners	?
Delta Island Storage	Webb Tract, Bacon = 240 kaf	High	High	Possible impact on urban drinking water quality. Impact on ag acreage.	SWRCB ESA agencies if operational rules are changed.
	Bacon connected to export pumps. 120 kaf	Medium, increasing with time	Medium, increasing with time		
	Victoria/ Woodward connected to export pumps. 80 kaf	Low, increasing with time	Low, increasing with time		
Shasta Dam expansion	50 kaf	High	High	Enviro opposition to expansion of reservoir capacity	SWRCB USBR
X2 Relaxation	Eliminate std below Delta outflows of 20 kcfs	Low?	Low	Enviro agency and groups opposition to reduced stds	SWRCB EPA ESA Agencies

Table 3

Post Stage 1 Potential Additional Assets

Asset	Asset Defined	Feasibility as EWA Asset	Feasibility as Project Asset	Concerns/ constraints	Process for Approval (needs work)
Need to Fill in.					

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