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Summary and Analysis:

Principles for Agreement on Bay/Delta Standards Between the State of California and the Federal Government, as Signed on December 15, 1994

*David Fullerton**

I. INTRODUCTION

On December 15, 1994, the state and federal governments, major water users, and environmental groups announced an agreement (hereinafter "Bay/Delta Agreement" or "Agreement") on the Bay/Delta environmental standards (hereinafter "Standards") that will govern the Bay/Delta Estuary (hereinafter "Estuary") over the next three years. The Agreement is a major milestone in the history of California water management, representing the first time that the major interests involved in California water management—the state and federal governments, the water users, and the environmental community—have agreed to implement a specific list of protective measures for the Estuary.

Much work remains. The Bay/Delta Agreement solves neither the environmental problems in the Estuary, nor the very real water supply problems now experienced by many urban and agricultural agencies. Those problems will only be solved by much more fundamental changes in California's plumbing and water management practices. But the Agreement is a good start. Not only does the Agreement provide significant environmental protections for the Estuary; equally important, it demonstrates clearly that when all sides work together in good faith, they can break through the gridlock and create workable solutions to California's water and environmental problems.

This Comment attempts to answer key questions about the December 15 Agreement:

- What is in the Agreement? Is it biologically protective? What are its strengths and weaknesses?
- What is the context of the Agreement? Why did it take place when it did, the way it did?
- What happens now?

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II. SNAPSHOT OF THE STANDARDS

The Standards generally build upon the D1485 standards set by the State Water Resources Control Board (hereinafter "SWRCB") in 1978. Key elements are as follows:

- The Standards will be implemented immediately by the federal government through the Endangered Species Act (hereinafter "ESA")
- The SWRCB will adopt the Standards in March 1995 and will then begin a water rights process to determine responsibility for meeting the standards.
- Until the SWRCB finalizes responsibility for the Standards, the state and federal projects will have sole responsibility for the Standards.
- The Standards are designed to satisfy all flow and diversion standards required by the federal government under the Clean Water Act (hereinafter "CWA") and the ESA. However, take limits will remain for listed species (winter run salmon and Delta smelt).
- Water supply impacts are expected to average 400 kaf/year on average, with impacts rising to 1.1 maf/year in critical years.
- The protections include:
 - Salinity standards for protection of estuarine habitat similar to those promulgated by EPA.
 - Significant reductions in Delta exports during the critical spring period (February-June).
 - Increases in San Joaquin flows and reductions in export pumping to protect Fall-Run San Joaquin salmon.
 - Frequent closures of the Delta Cross Channel gate to keep down-migrating salmon from being swept into the Central Delta.
 - Restrictions on the take of endangered species (implemented through the U.S. Fish & Wildlife Service (hereinafter "USFWS") and the National Marine Fisheries Service (hereinafter "NMFS")) only.
 - Real time operation of Delta pumps so that pumping is reduced below the standards when necessary to reduce environmental impacts and increased above the Standards when higher pumping is safe.
- A \$180 million fund designed to improve habitat conditions through upstream restoration, screening intakes, and (possibly) the purchase of water.

The Agreement is attractive to the state and federal governments, to the water users, and to the environmental community for the following reasons:

- The environment will get state-endorsed standards in the Estuary hopefully sufficient to stabilize populations.

- The federal government will be able to step back and let the state take a greater role in water management.
- Urban and agricultural agencies will get much greater predictability in water supply at a price they can afford.
- The Agreement opens the door to adaptive management, which offers the potential of greater environmental protection without increased hits on water users.
- The Agreement also opens the door to a new long-term planning process with the potential to provide for quantum leaps in environmental conditions and in urban and agricultural water supplies.

III. HISTORY OF BAY/DELTA ENVIRONMENTAL PROCESSES

Focused efforts to achieve improvements in the environmental conditions in the Bay-Delta Estuary might be said to have begun in 1987 with the beginning of the so-called Bay-Delta Hearings (hereinafter "Hearings"), held under the auspices of the SWRCB. During those Hearings, the Bay Area community presented strong scientific evidence demonstrating the decline of the estuarine environment and implicating both the reduction in fresh water flow through the Estuary and the impact of massive Delta diversions as a major cause of this decline.

The environmental community was so successful in its advocacy that in 1988 the SWRCB published a draft set of water quality standards requiring major increases in spring Delta outflow and major reductions in export pumping. The water user community, particularly the San Joaquin and Southern California water agencies dependant upon Delta exports, reacted very negatively to the draft standards, and they were quickly withdrawn.

In 1994, San Joaquin and Southern California export water agencies were in the vanguard insisting that the SWRCB adopt a set of strong and comprehensive standards to protect the Estuary. On December 15, 1994, urban, agricultural, and environmental organizations, as well as the state and federal governments signed a dramatic agreement that not only promised strong Bay-Delta standards, but also \$180 million over three years for habitat restoration and modifications of water project operations on a daily basis to reduce the impacts of pumping.

The odyssey from firestorm to consensus resembles, in some ways, the plot line of the movie "Groundhog Day," in which the protagonist is doomed to repeating the same basic chain of events until he can get it right.¹ In any case, the key elements in the process can be summarized as follows:

1. Tim Quinn of the Metropolitan Water District first came up with this analogy, as best I can remember.

The Three-Way Process

The "Three-Way Process" began when environmentalists met from 1991 through 1993 with agricultural and urban representatives in an effort to reach agreement on a program to meet the needs of each interest. The talks did not lead to specific actions, but they did lay the conceptual foundations for the 1994 Agreement. In essence, during these three-way talks, most water users came to accept that the environmental problems in the Estuary were so severe that productive discussion on such issues as water development and Delta transfer would never occur until environmental conditions were stabilized. For this reason, the Three-Way Process developed a proposal for (1) immediate environmental improvements in the Estuary, linked to (2) a long-term planning process designed to improve conditions for water users and the environment (hereinafter the "Three-Way Formula"). The linkage of immediate environmental benefits with long-term planning was the foundation for the Governor's water policy in 1992 and for a state-federal framework agreement in 1994.

The Governor's Policy

Governor Wilson published a water policy in 1992 which echoed the Three-Way Formula with the significant difference that he would be the "honest broker" for the agreement (substituting himself for elaborate safeguards to assure fairness written into the Three-Way Formula). Accordingly, the SWRCB began work on draft decision (hereinafter "D 1630") for immediate environmental improvement while the Bay Delta Oversight Council (hereinafter "BDOC"), made up of urban, agricultural, and environmental representatives, began a long-term planning process for the Estuary. The attempt almost succeeded. Both the urban and environmental communities gave guarded support to D 1630, and all sides supported the BDOC process. Nevertheless, on April 1, 1993, Governor Wilson asked the SWRCB to withdraw D 1630.

The reasons for the Governor's decision were twofold. First, the agricultural agencies dependant upon export water—primarily Kern County Water Agency—had decided that they did not wish to exchange the certainty of supply losses represented by D 1630 for the possibility of supply improvements promised by the BDOC process. Second, the federal government was intervening in California water management under the ESA on behalf of both the winter run salmon and Delta smelt. Since the ESA protections were arguably more stringent than D 1630, Governor Wilson could, by withdrawing D 1630, place the blame for improved standards on the federal government.

What the Governor did not count on was that the environmental community would withdraw en masse from the BDOC process, thereby effectively eviscerating the second half of the Governor's policy. Moreover, by withdrawing from the field, the Governor had left the federal government to control the Delta using the harsh rules of the ESA.

Endangered Species Act

NMFS listed the winter run salmon as a threatened species in 1989. In 1992, the USFWS listed the Delta smelt as an endangered species. As a result of these ESA listings, NMFS and USFWS have imposed strict conditions on the operations of the state and federal water projects. Of particular concern were numerical limits on the number of Delta smelt and winter run salmon which could be taken at the pumps. Such take limits were objectionable to water users, not just because they had water costs, but because they decreased the reliability of supply and made planning difficult.²

The ESA Bay/Delta standards had two tremendously beneficial effects. First, they were the only regulatory mechanism able to protect the endangered species of the Estuary (and other species, because of overlaps) during the latter part of the 1987-92 drought. Secondly, by imposing painful water costs and unreliability on export agencies, the ESA made it much easier for export agencies to accept state-adopted standards; after the ESA, even strong environmental standards started looking good, provided that the reliability of supply could be improved.

Federal Legislation

In 1992, Congress passed, and President Bush signed, the Central Valley Project Improvement Act (hereinafter "CVPIA"). Among other things, the CVPIA dedicated some 800,000 acre-feet of water per year from the Central Valley Project (hereinafter "CVP") and created a \$50 million per year fund for

2. Inter-annual supply planning has always been difficult in California. Precipitation in one year is simply not well-correlated with precipitation in the previous year. California has developed enormous amounts of storage to carry water over from year to year to ameliorate this uncertainty.

By contrast, relatively sophisticated intra-annual supply planning is possible, because annual runoff levels are predictable with fair accuracy by March or April of each year; whether reservoirs are empty or full is known by this time. The predictability of supplies intra-annually is important, because it allows water users to make more efficient management decisions. Growers can predict how much acreage they can farm. Districts can decide whether to call for shortages or to seek temporary sources of supply. Based upon statistical analyses, districts can determine whether they should seek new permanent sources of supply.

Take limits threatened the intra-annual predictability of water supply for exporters, because the taking of fish at the export pumps is not well correlated with precipitation, since when the fish show up at the pumps is difficult to predict. Thus, even with a wet winter and full storage, exports might be low because of limits on takes. It is clear that water agencies consider the loss of intra-annual and inner-annual predictability caused by take limits to be more damaging to them than mere loss of water or the expenditure of cash to protect the environment.

environmental enhancement. As with the ESA, the CVPIA both provided protection on the ground and, by imposing stringent standards, made it easier for the federal water contractors to support state-adopted Delta standards.

Environmental Protection Agency Standards

The Environmental Protection Agency (hereinafter "EPA") is required, under the CWA to approve state water quality control plans. If the states do not adequately protect water quality, the EPA is required to step in and promulgate its own standards. When California withdrew D 1630, the EPA decided that it could no longer wait for the state to act, and it began its own promulgation process. The EPA standard-setting was perhaps less crucial than the ESA or the CVPIA in bringing water users to the negotiating table, since they were skeptical that the EPA could implement its new standards. However, the EPA process was a catalyst for a great deal of negotiation between the urban and environmental communities over standards which would protect the environment with the least possible impact on water users. Moreover, the EPA standards were, in fact, implemented as ESA standards by the USFWS and NMFS.

The State-Federal Framework Agreement

Almost immediately, the Wilson administration came to regret its decision to abandon the field. The press widely criticized the Governor's decision to abandon state standards. In practical terms, it left the state with no justification for easing the federal government out of water management. On the contrary, it strengthened the federal justification for intervention. Additionally, the federal actions under ESA to protect winter run salmon and Delta smelt were considered unnecessarily stringent by the water users. After prodding by the urban and business communities, the state essentially reversed course and negotiated a framework agreement with the federal government (hereinafter "Framework Agreement"). The Framework Agreement was, yet again, a restatement of the Three-Way Formula: immediate Bay/Delta improvements linked to a long-term planning process. In this case, the state of California would generate, through the SWRCB, standards comparable to the federal EPA and ESA standards. Once these standards were in place and implemented, the federal government would release primary control of the Delta to the state. At the same time, a new long-term planning process would take place, this time under joint state-federal auspices.

IV. BIOLOGY AND REMEDIATION

The Estuary has been subjected to a wide variety of injuries over the last century, including:

Land use changes

Throughout the Central Valley and in the Delta, tidal and seasonal wetlands were drained and diked. Rivers were forced into narrow channels. In the Delta, this phenomenon resulted in "islands" surrounded by narrow Delta channels. The result of these changes was a massive loss of fish, bird, and plant habitat.

Destruction of spawning habitat

Dams constructed on most Central Valley streams and rivers destroyed much of the habitat for Chinook salmon. Salmon spawning is now generally restricted to short stretches of river below dams on the valley floor. Spawning within these restricted areas can be harmed by improper temperatures, fluctuations in outflows, and toxic releases.

Reduced outflows

A significant portion of the water that once flowed through the Central Valley watershed is now diverted, either upstream or from the Delta, for urban and agricultural use. Because the spring months are characterized by high flows (from snowmelt) with little fear of flooding, diversions of flows are particularly high during this period. Unfortunately, the spring is also a key period for many Delta species. Statistical analysis indicates convincingly that higher Delta outflows in the spring are correlated with the health of many Delta species.

Diversions

The diversion of water harms the ecosystem, not just by reducing flows, but also by physically drawing fish into the pumps (or into the vicinity of the pumps, where predators await them). The state and federal pumps in the southern Delta are the two most notorious examples. However, thousands of additional diversion points exist within the Delta islands and along the Central Valley tributaries. The amount of harm caused by diversions is difficult to quantify, since much of the damage is caused in the vicinity of the pumps and not in the pumps themselves. The impact, however, is certainly large.

Because of the problems outlined above, numerous species and populations dependant upon the Estuary and the Central Valley watershed are on the verge of extinction. These species include the winter and spring run Chinook salmon, Delta smelt, Longfin smelt, and Sacramento splittail. The threat of extinction has become so great that nearly everyone now agrees that something must be done to remedy retrieve the situation.

The protection and restoration of the Estuary requires remedial measures to undo the impacts of past environmental insults. Categorizing

these remedial measures in terms of possible short-term, medium-range, and long-term goals generates the following rough list:

Measures that can be taken immediately.

- Control Delta inflow and outflow through operation of the state and federal projects. Increased Delta outflow is particularly needed during the spring months.
- Control the operation of gates within the Delta.
- Close gates (at the Delta Cross Channel in the north Delta and the Old River Barrier in the South Delta) in order to help keep salmon migrating down the Sacramento and San Joaquin Rivers away from the Central Delta and away from the export pumps.
- Control diversions at the export facilities by limiting exports at times when the diversion of water causes biological damage. The most important period for the reduction of pumping in order to minimize biological damage appears to be in the spring.

Measures that can be taken within a few years.

- Control Delta inflow and outflow by regulating the operation of all Central Valley water users (and thus, control inflow by tributary). This measure requires a water rights decision by the SWRCB or an environmental purchase mechanism.
- Limit impact of Delta island and tributary diversions through screening of intakes or changing of diversion patterns.
- Develop an adaptive management system in which diversions (and outflows) are attuned to biological conditions in real-time.
- Reduce toxic discharges.

Measures that may take a decade or more.

- Major new plumbing in the Delta or in the Central Valley (e.g., replacement of the Delta export pumps with an isolated transfer system).
- Development of an integrated groundwater management system in the Central Valley.
- Major additions to storage (including surface and groundwater storage facilities).
- Restoration of large areas of the Delta to riparian, wetland, and shallow tidal habitat.

This topology and the severity of the remedial measures explain the strategy which was developed in the Three-Way Process and which is being played out with the December Agreement and the long-term planning

process. The first step is to implement those measures which can be taken immediately to stabilize the environment of the Estuary (the short- and middle-term measures). Then, using the breathing space created by the implementation of the initial measures, consideration can be given to longer-term actions.

V. STRATEGIES, TACTICS, AND POLITICS

The process by which the Agreement came together was convoluted. All sides were tempted to walk away from the negotiations. In fact, this nearly happened. In the end, however, the desirability of the Agreement from all perspectives provided the impetus to keep everyone at the negotiating table. Before describing how the Agreement coalesced, it is useful to discuss the motivations of each of the key players.

The State

The state administration was very ambivalent toward the negotiations and implementation of the State-Federal Framework Agreement. The Framework Agreement was good policy, but the politics were dicey. In addition to the same considerations which led Governor Wilson to withdraw D 1630, other concerns surfaced.

- By engineering a collapse of joint state-federal protection and management in the Estuary and forcing the federal government to take full responsibility for protecting the Estuary. Governor Wilson could blame the feds for any economic repercussions and argue that he was defending the state's rights against imperial Washington.
- Any agreement by California in 1994 to implement standards under the direction of the federal government would be seen as a turnaround from 1993, when Governor Wilson retracted his own standards rather than enter into negotiations with the federal government.
- A joint state-federal long-term planning process would wipe out the state's own long-term process and would be an admission that the state could not plan and manage the Delta without federal involvement.
- If export agriculture representatives, especially those from Kern County, were not amenable to the Agreement, then implementation of SWRCB standards could cost the administration a major source of political support.

On the other hand, cooperation with the federal government on developing SWRCB standards and a long-term process offered several advantages, including:

- Strong SWRCB standards could wrest primary control over the Delta away from the federal agencies. In particular, a proactive state position on standards would provide leverage to get NMFS and USFWS to ease their strict take limits at the export pumps.
- The Agreement could be seen as fulfillment of the Governor's water policy.
- Important constituencies within the urban, business, and agricultural communities were strongly supportive of reaching a stable agreement.

In the fall of 1994, the state administration decided to force a state-federal crisis by having the SWRCB adopt draft standards which would be too weak for the federal government to accept. However, under pressure from the urban and business communities and parts of the agricultural community, the state agreed to make an effort to accommodate the federal government, and the door was open to reaching an agreement. Even then, state support for the Agreement was clearly conditioned on the acceptability of the Agreement to the Kern County Water Agency (hereinafter "KCWA"). If the KCWA refused to approve the Agreement, the state would almost certainly have backed away the Agreement (echoing the state's decision to back away from D 1630).

The Federal Government

The federal administration was strongly supportive of reaching an accommodation with the state on SWRCB standards and the long-term process. The administration did not want to give Governor Wilson an opportunity to use a Bay/Delta crisis as an opportunity to bash the federal government and the ESA. The federal government also did not wish to remain in the business of managing the Delta on a long-term basis. On the other hand, the federal government was obligated to protect the Estuary under a variety of federal laws, including the ESA, CWA, and the CVPIA.

For these reasons, the federal government was in a difficult position. If it took a very hard line on standards, the state would walk away from the negotiations. If it took a soft line, the state would score a political victory, and the environmental organizations would sue the federal government for failure to comply with environmental laws.

Moreover, the federal government was not unified internally. Both NMFS and USFWS were taking a hard line on the flows and take standards needed to protect winter run salmon and Delta smelt. In particular, both were committed to a standard which would limit reverse flows and to stringent limits on the take of these fish at the pumps. Water user groups opposed both issues because of the water costs (with reverse flows) and decreased reliability of supply (from take limits). The federal administration finally convinced both NMFS and USFWS to consider alternative approaches to the protection of endangered species, provided that protection was not jeopardized. The willingness by NMFS and

USFWS to look at a variety of approaches eased the resolution of the disputes over export pumping controls and take limits.

The Environmental Organizations

The primary environmental organizations involved in the negotiations leading up to the Agreement were the Bay Institute, the Environmental Defense Fund, and the Natural Heritage Institute.

These organizations generally accepted the Three-Way Formula: immediate environmental improvements with added protection and restoration in the long-term planning process. For this reason, environmental groups were not seeking to gain full environmental protection from the negotiations, but rather standards adequate to stabilize the estuarine environment and assure protection of endangered species.

This strategy was based on the assumption that water interests could and would block any environmental restoration program that caused major new shortages in export areas. Therefore, while protection adequate to stabilize the situation in the Estuary was necessary and possible in the short term, full restoration in a single step was not. Additional improvements in the Estuary would have to be part of a future long-term planning effort; this effort would begin in 1995 under joint state-federal auspices. The sooner that planning effort could begin, the sooner the environment could expect to achieve major additional gains in protection.

Moreover, the environmental groups were reluctant to rely upon the federal government and particularly upon the ESA as the primary bulwark of protection for the Estuary. For this reason, environmental groups were willing to accept somewhat less than they might have hoped for from the ESA in return for the assurance that all sides (especially the state and the water users) would support the new Standards. The wisdom of this strategy was borne out by the November elections.

Urban Water Agencies

The urban water agencies, like the environmental organizations, believed that the Three-Way Formula of immediate environmental protections coupled with a long-term planning process was the best way to achieve their goal of a high-quality, reliable, and affordable water supply. This conclusion was based upon the following considerations:

- Urban water agencies generally were not facing an immediate major water supply problem. With water conservation, reclamation, and a major reduction in baseline demand due to the previous drought, demand would not outstrip supply for a decade or more. Water transfers from agriculture provided an additional buffer.
- However, urban agencies were facing immediate water quality and security problems, and, given current trends, would face project water supply problems within a decade or so.

Water quality. Delta water had high amounts of organics, which reacted with disinfectants during treatment to form compounds which might be carcinogenic. EPA water quality standards for these compounds would have made treatment of Delta water increasingly expensive.

Security. There was a significant probability that a major earthquake near the Delta would lead to the collapse of many Delta islands simultaneously. Since the islands were below sea level, a collapse would cause water to rush into the islands, probably from the Bay. The inrush would bring salty water into the Delta, making the water undrinkable for many months, if not longer.

Water supply. The current physical and regulatory arrangements in the Delta virtually cut off southern California from additional Sacramento Valley water supplies. In the long run, Southern California either had to be prepared to meet future demands from existing supplies, cannibalize west side agriculture, or get access to additional supplies from the Sacramento Valley (whether by using adaptive management techniques or a safer transfer facility).

- Until the Delta environment was stabilized, no other water management initiatives involving the Delta would be achievable. Instead, most attention would continue to be given to the needs of endangered species and new standards, and water supplies would be cut in unpredictable ways. Certainly, few environmentalists would be willing to support long-term planning and water management strategies when the Estuary was continuing to collapse in the short term.
- The water and financial cost to urban agencies of immediate standards to protect the Estuary were affordable. On the other hand, the costs of not proceeding with a long-term planning process were potentially enormous.

In essence, the urban agencies embarked upon a 20-year strategic plan: supporting standards for the Estuary and giving up water in the short term, in exchange for (1) gaining middle-term stabilization of the estuarine environment and reduction in the risk of unforeseen shortages and (2) laying the foundation for a long-term planning process that would provide for urban needs well into the 21st century. In many ways, the urban and environmental visions were compatible, provided that future modes of water acquisition were environmentally friendly. However, accepting the urban offer of short- and long-term environmental gains for the Estuary and for Central Valley rivers implied that environmentalists had to abandon attempts to use water shortages to constrain urban growth. While some environmentalists might be unwilling to give up this leverage, the question is best left for another day.

Agriculture

Of all the interest groups, agriculture had the greatest reservations about the Three-Way Formula:

Upstream agriculture. A state commitment to implementing new standards to protect the Estuary would require water. Upstream agriculture had, in the past, demanded that junior users (e.g., the state and federal projects) bear the full burden of protective standards. In practice, there was a significant likelihood that the SWRCB, in its water rights process, would attempt to reallocate some water from upstream users relying on the public trust doctrine and other authorities. Therefore, since upstream agriculture was generally water rich, it arguably had fewer gains and greater risks from state implementation of short-term standards and a long-term planning process.

Nevertheless, the position of upstream agriculture was ambiguous. The Northern California Water Association signed the Agreement 15 on behalf of a number of agricultural districts (primarily rice-growing) in the Sacramento Valley. However, other upstream agricultural districts were conspicuous in their absence from the signing of the Agreement. Despite any ambiguities, upstream agriculture would most probably not oppose the SWRCB Standards; of course, this could all change when the SWRCB determines who should give up water to meet the standards.

Export agriculture. Export agriculture had historically opposed new standards for the Estuary because, even if upstream agriculture contributed some water, export agriculture would continue to bear a major part of the burden. Unlike the urban agencies, export agriculture was already suffering from water shortages. Contributions to Delta protection meant that land would have to be fallowed and/or groundwater tables would have to drop. Some farmers might go bankrupt. Therefore, the sacrifices involved in accepting Delta Standards had greater immediate consequences to export agriculture than to urban exporters. The fear of losing water led the KCWA to oppose D 1630 in 1993. On the other hand, export agriculture was subject to the same dynamics as the urban export agencies: without a settlement in the Delta, water supply conditions would only get worse. For this reason, export agriculture was internally divided on the advisability of supporting Delta standards. Hardliners, intent on resisting the implementation of new standards, held the upper hand. Recently, the burden of complying with the stringent ESA and CVPIA requirements gave the moderate faction grudging support for standards with the argument that new standards would improve, not worsen water supply conditions.

VI. THE DEAL IS CUT

The EPA was required under court order to issue its final Standards for the Estuary on December 15, 1994. Both the NMFS and USFWS also determined that they would issue their biological opinions for winter run salmon and Delta smelt on the same date. The biological opinions

represented de facto Delta standards because they set flow, export, and take limits for the state and federal projects. Water users had been very unhappy with the biological opinions of 1993 and 1994, because they felt that the loss of water and reliability were unreasonably high. In any case, the federal government was ready to propose and implement a set of strong Bay/Delta standards for 1995.

Under the Framework Agreement, the SWRCB was obligated to issue draft Bay/Delta Standards by December, 1994, and to promulgate final standards by early 1995. If the Standards were adequate to satisfy federal mandates, then the federal government would step back and let California resume active control over Delta management. If the standards were too weak, however, the federal government would refuse to accede to the Standards and continue its operation of the Delta. Thus, the stage was set for either consensus or conflict between the state and federal governments.

As discussed above, the federal, urban, and environmental players all had reasons to avoid a breakdown in negotiations between the state and federal governments. Thus, in early 1994, urban and environmental interests, in cooperation with the EPA, nearly agreed on the measures needed to implement the EPA standards. This agreement would serve as one of the foundations of the Bay/Delta Agreement.

Urban interests, calculating that the state administration would not support state standards equivalent to the federal standards without approval from export agriculture, abandoned their bilateral discussions with the environmental community and opened a dialogue with the agricultural community on the possibility of comprehensive Bay/Delta standards. The urban and agricultural groups together spent close to \$1 million developing biologically-based standards which would have minimum impact on water users.

The joint urban/agriculture proposal (hereinafter "Urban/Ag Proposal") is described in detail in other documents. In essence, the Urban/Ag Proposal would have provided for:

- Spring Delta outflows somewhat lower than outflows in the EPA standards.
- Exports less than 30% of inflows to the Delta from February to June, 35% in July, and 65% for the rest of the year.
- Permanent closure of the Delta Cross Channel gates from February through May (to protect winter run salmon), with 30 days of closure from November through January.
- Spring pulse flows in April and May on the San Joaquin River, coupled with closure of the Old River Barrier, and a requirement that export pumping could never be greater than the pulse flow to protect fall run salmon.
- The standards assumed that the federal agencies would eliminate their take requirements.

The original joint urban/agriculture/state (hereinafter "Urb/Ag/State") plan was to present a set of standards for adoption by the SWRCB that were relatively strong, but not as strong as the federal requirements. The Governor and the federal government representatives would then be placed in a battle of wills, "staring down" the other to see who blinked first. During this period, the Urb/Ag/State group refused to discuss any modification of their proposal with the federal government or the environmental community. However, the Urb/Ag/State group then inexplicably decided to make a good-faith effort to resolve its differences of opinion with the federal/environmental side. The change in tactics was probably due to pressure from the urban agencies and the business community, as well as signals from the federal agencies and the environmental community that they were willing to be flexible on the form of the standards.

At a meeting in Monterey on December 1, the state and federal governments continued their stalemate, with the federal government promising to move ahead with the ESA standards on December 15th unless agreement was reached and the Urb/Ag/State group predicting that such a move would cause all efforts toward accommodation to collapse. However, at the same meeting, it became clear to all sides that the scientific justification for export controls, whether based upon reverse flows or percentage of Delta inflow, was very weak and that accommodations might be possible which cost less water while maintaining equivalent levels of protection. The Urb/Ag/State group further conceded by committing funds for non-water-related habitat improvements, such as screening of diversions. Despite the apparent stalemate, it became clear that all sides wanted to reach an agreement.

On December 6th, key representatives from state and federal agencies, and the urban, agricultural, and environmental groups met in Los Angeles. At that meeting, the federal agencies agreed to use the Urb/Ag/State proposal as the basis for further discussions. While consideration was given to allowing negotiations to continue after the December 15th deadline as long as progress was being made, most representatives felt that the chances of reaching a successful conclusion would be greatly reduced, if the discussions were not fruitful by the deadline. Also, the state pushed strongly for delay of the federal decision on whether to list the Sacramento splittail as threatened or endangered. The listing would not have cost any more water, but it would have undermined the state's argument that it had triumphed over the federal government on the ESA. The USFWS acceded to this request and delayed its listing decision for six months.

Starting on December 12, 1995, all the representatives met in Sacramento for three days of marathon negotiations. While the KCWA (and, therefore, the state) nearly withdrew from the negotiations on December 13th, the parties finalized a package that modified the Urb/Ag/State proposal in the following ways (ignoring minor changes):

- The amount of allowable exports in February was significantly reduced. In return, the amount of allowable exports from March through July was raised slightly.
- Flows in the San Joaquin River in April and May were significantly increased.
- The number of days of closure of the Delta Cross Channel were increased.
- The water cost of the Standards were increased slightly, from about 1.0 MAF in critical years to less than 1.1 MAF in critical years.
- Greater flexibility was built into the Standards, allowing exporters to make up for water lost as a result of reduced pumping due to limit concerns (if consistent with environmental protection).
- The state and federal governments and the water users agreed to provide \$180 million in funds over three years for non-water-related environmental improvements.

VII. UNDERSTANDING THE STANDARDS: THEORIES OF WATER MANAGEMENT IN THE DELTA

As discussed above in section IV on Biology and Remediation, any standards aimed at quick improvements in environmental conditions in the Estuary must be primarily based upon:

- Control over flows into and out of the Estuary.
- Diversions from the Estuary.
- The movement of water within the Estuary.
- Other fast-track projects which do not involve the movement of water, such as screening of diversions or control of poaching.

Delta Outflow Standards are Well-Developed

The goal is to provide optimum conditions for the ecosystem at an acceptable cost to water users. In some areas, correlations between physical conditions and biological health serve as guides. In particular, there is strong scientific evidence to indicate that strong Delta outflow in the spring is correlated with biological health. The spring outflow (or salinity) standard is widely supported and is part of the package of Standards.

Competing Theories of Control Over Exports

There is very little information on which to set the standards for the export pumps. Instead, standards are set according to conceptual models of how movement of water in the Delta affects biology. However, there are two

competing theories forming the basis for these conceptual models: one theory holds that the net flows of water are biologically dominant, while the other contends that the tidal effects are dominant. The standards which emerge from each theory are quite different:

Net Flows. The net flow theory follows the average flow of water in the Delta and assumes that biota are carried with that net flow. In this conceptual model, the Delta can be thought of as a set of pipes. If there is a net flow through the pipes toward the export pumps, then fish and salt will tend to be swept into the pumps over a period of time. Under this theory, fish can be isolated from the effects of the pumps (and the pumps from salt) by assuring that net flows toward the pumps are minimal when species of concern are in the Delta. Adherents of this school would advocate limits on reverse flows and strict pumping limits when salmon are migrating through the Delta. This model has been the accepted model for several decades, and it has major implications for policy. Under this model, export pumping from the south Delta must be severely constrained to protect the Delta, and it is, therefore, intuitively attractive to environmentalists. However, since the net flow problem can be solved by connecting the export intakes to an isolated transfer system around the Delta, this model has also served as the foundation for arguments in favor of a peripheral canal.

This theory also implies that frequent choices must be made between closing the Delta Cross Channel to keep salmon in the Sacramento River (and out of the Central Delta) and opening the Delta Cross Channel to avoid the effect of reverse flows on Delta smelt. In other words, gate closures may help salmon by keeping them in the Sacramento River, but may hurt Delta smelt by creating reverse flows which sweep them to the pumps.

Tidal Action. In the Delta, flows due to tidal action are perhaps 100 times greater than tidal flows on average. Supporters of the tidal action theory analogize the mixing action induced by the tides in the Delta to a swirling bowl of soup; within this analogy, the export pumps are like straws stuck into the soup. Under this theory, fish reaching the tidal zone are not necessarily swept into the pumps (a basic assumption of the net flow theory), but are just as likely to be swept away from the pumps. The most important factors to consider under the tidal action theory are the concentration of fish in the vicinity of the intakes and the rate of pumping—in other words, how thick is the soup and how intense is the suction through the straw. Therefore, net flows (e.g., reverse flows) into the pumps are not very important per se for either biological protection or for salinity control. Since reverse flows are irrelevant to the movement of fish in the Delta under this theory, closure of the Delta Cross Channel is not considered to cause a problem for Delta smelt. The tidal action theory, therefore, tends to be less restrictive on pumping.

There is very little evidence to show which theory is correct. The tidal action theory may be accurate short-time scales, while the net flow theory may apply to longer-time scales. Another complication is the behavior of

fish; many fish do not simply float with the currents, but instead move according to their own logic (whether toward a desired salinity level or out to the ocean). In any case, no generally accepted export standard currently exists to accurately pinpoint when it is safe to operate the pumps.

Both theories are imbedded in the Standards in ways that are not entirely consistent. The tidal action theory is the basis for the primary export standard. The overall limit on exports is calculated (ignoring some complications) by adding up the total amount of Delta inflow and multiplying by a fraction (.35 from February to June, .65 for other months). Except for a 30-day period in April and May (when exports cannot exceed San Joaquin inflows), there is no consideration given to the Delta inflow origins.

On the other hand, the Standards provide for closing the Delta Cross Channel gates for only 45 days during the period from November through January, because of concerns that longer closures would create reverse flows harmful to Delta smelt. Ironically, the application of the net flow theory in this case by USFWS greatly reduces the protection for spring run salmon smolts as they migrate down through the Delta in November, December, and January.

Non-Water Factors in Environmental Protection

Water users correctly argue that reduced flows and increased exports are not the only cause of environmental problems within the Estuary. Accordingly, they complain that increased flows and reduced diversions should not be the only tools used to protect the Delta. In the past, environmentalists were suspicious of such claims, not necessarily because they were wrong, but because they were generally presented as reasons for not setting stronger water quality standards. However, this conflict seems to have abated.

While water users continue to place great emphasis on environmental protection through non-water-related means, they now concede that such measures should be implemented *in addition to* improved flow and diversion standards. Therefore, the Agreement includes a provision for \$180 million for measures such as: screening diversions, waste discharge control, reduction of illegal fishing, and riparian, wetland, and estuarine habitat restoration.

Water users benefit from this provision in two ways: (1) the money increases the likelihood that the new Standards will actually stabilize the Bay/Delta environment; and (2) successful non-water-related programs would demonstrate that water-related measures could be replaced, thereby reducing pressure for additional flow standards in the future.

VIII. THE STANDARDS

This section describes key elements of the Standards in greater detail.

The Agreement attempts to develop an ecosystem approach to environmental protection in the Estuary using tools readily available over the next three years (flows, diversions, gates, and simple non-water

measures). The ecosystem approach was formulated by the conflict between legal and ecological desire to protect endangered species and the need to keep water supply losses within politically-acceptable levels.

Estuarine Habitat Standard

This Standard can be thought of as either a Delta outflow standard or a Delta salinity standard. The Standard requires (roughly speaking) that salinity (and outflow) conditions from February through June be maintained at levels that would have existed in Suisun Bay, given water operations in about 1970. In other words, the Standard forces the water projects to go back to 1970 levels and let out more water in the late winter and spring.

The Standard is based upon mathematical correlations between the average location of 2 parts per thousand (ppt) salinity and biological indices for species such as longfin smelt, striped bass and neomysis mercedis. Basically, the correlations indicate that fish fare better if the average salinity is pushed farther downstream in the spring. Salinity conditions improve looking back in time, because reductions in spring outflows have been continuous over the last 50 years. Under the Standard, the greater the runoff of water in the Central Valley watershed from January through May, the more days the position of the 2 ppt salinity line must be downstream of two measuring stations in Suisun Bay from February through June. Additionally, the 2 ppt salinity line must be below the confluence of the San Joaquin and Sacramento Rivers for the entire February-June period to protect Delta smelt.³

Mathematical correlations aside, Suisun Bay was chosen as the area for maintenance of salinity conditions, because it contains the last prime fish habitat left in the Estuary. Most other habitat was diked up and converted to farming many years ago.

The Standard generally follows the EPA salinity requirements for estuarine habitat. Environmental groups and urban water agencies came to agreement on this Standard early in 1994. It has a strong scientific basis, provides significant environmental protection, and has water supply impacts which were acceptable to urban and, eventually, agricultural groups. However, because the Standard is tied to actual runoff conditions, both sides share the benefits and risks of wet and dry years.

Delta Export/Inflow Relationships

This is the primary Standard to control pumping by the state and federal export facilities in the south Delta. Basically, exporters are allowed

3. Delta smelt seek salinities slightly above 2 ppt. Therefore, if this line were moved into the Delta, the smelt would also move upstream - and into vicinity of the export pumps.

to pump no more than a given percentage of inflow at any given time. The allowable percentage varies over the year, with a low of 35% during February to June and a high of 65% during July to January.

There is an additional pumping limitation in the April-May period in order to protect San Joaquin River salmon (see below). Also, pumping is reduced, if necessary, to minimize the risk of danger to endangered species (see below). Otherwise, pumping is controlled by this Standard alone; absolute pumping limits and reverse flow standards have been superseded.

The basis for the export/inflow Standard is primarily intuitive. It seems logical that, if more water is flowing into the Delta, then pumping can be increased without causing additional impacts on the environment. Similarly, if inflow drops, then exports should also be curtailed. The controversy surrounding this logic is that the source of Delta inflow is not considered. For example, if Sacramento River inflow is high, but San Joaquin River inflow is low, then the level of pumping allowed under the Standard may actually be higher than what the San Joaquin River can sustain; conceivably, water from the Sacramento River will make its way across the Delta to the pumps, thereby adversely impacting the environment. The importance of this phenomenon depends upon whether the net flow theory or the tidal action theory is in fact the dominant physical mechanism governing the movement of biota in the Delta; this issue is discussed in greater detail in section VII, above.

The Standard will significantly reduce export pumping in the later winter and spring months compared to historical levels, which is something environmental groups have sought for many years because of this period's importance to the lifecycles of many species. On the other hand, the Standard will force greater pumping in the summer and fall months, and this may cause new problems to appear. Overall, however, the shift in pumping patterns away from the spring offers significant net benefits.

San Joaquin Fall Run Salmon Standards

Salmon smolts migrate down from the Stanislaus, Tuolumne, and Merced Rivers, into the San Joaquin River, into the Delta, and, eventually, out into the ocean during March, April, and May. It is very tricky getting these salmon past the pumps, which are located just west of the San Joaquin River. There are at least three different options: (1) reduce pumping; (2) wall off the San Joaquin River from the pumps by putting a barrier at "Old River," where a channel leading directly into the pumps splits off from the main San Joaquin River; or (3) increase flows in the San Joaquin River in order to transport the salmon away from the pumps as quickly as possible.

However, placing a barrier at Old River (the single most protective solution) causes more water to be sucked from the south Delta toward the pumps, which, in turn, might cause increased entrainment of Delta smelt. To solve this problem, export levels should be reduced during this critical three-month period, but these reductions would be unacceptable to water exporters.

Given the tradeoff between protection of salmon and protection of Delta smelt and the political/economic need to maintain significant exports during this three-month period, a Standard was developed which focused most protection efforts on a limited period during which a majority of the salmon would be migrating. Therefore, base flows of 700-3,400 cfs, depending on year-type, will be provided in the San Joaquin River from February through May of all years. However, primary protection efforts will occur over a 30-day period (not necessarily continuous) in April and May. During this "window of protection," pulses of water, varying from about 3,000-8,000 cfs, depending upon year-type, will be released down the three San Joaquin River tributaries to stimulate migration downstream. At the same time, a barrier will be placed at Old River and export pumping will be restricted to 100% of Vernalis San Joaquin inflow.

The compromise reflected in the Standard is not ideal from the standpoint of environmental protection. Significant numbers of salmon will migrate outside the window of protection and will suffer heavy losses. Even during the 30-day period, when the flow levels are good, exports will remain at dangerously high levels (though they will be reduced compared to past conditions). Also, compliance with the Standard will only be possible to the extent that the federal government can release water from New Melones, at least until the SWRCB water rights decision is promulgated; essentially, the full flow amounts may not be available for the first three years or so. For all its deficiencies, the Standard is a significant step forward from past conditions.

Bolstering this Standard through the purchase of additional water and export rights and through the flexibility in the Agreement to reduce pumping below nominal standards will be a high priority over the next few years.

Operational Flexibility and Adaptive Management

The Delta is a major ecological resource, which also serves as a major switching yard for some 6-7 MAF of pumped water/year. The incongruence of these two uses has been one of the primary causes of conflict over the Delta.

It is not possible to accurately predict when the pumps actually cause environmental damage. Therefore, whenever preset export standards are used, the restrictions exports must be very stringent in order to assure that protection will be achieved. Fixed standards strict enough to provide for significant restoration of the Estuary (i.e., to provide protection significantly beyond the current Agreement) would require that exports from the south Delta be reduced well below the export levels agreed to in the Bay/Delta Agreement.

Therefore, to achieve optimal environmental restoration, there are three available alternatives: reducing export levels, moving the pumps out of the Delta (e.g., implementing an isolated transfer system), or finding ways to allow levels of exports near current levels but with reduced environmental impacts. As to this last option, the most promising method is adaptive

management, in which pumping is tied to the actual physical and biological conditions existing at any given time. For example, if large numbers of Delta smelt move into the vicinity of the pumps, then pumping could be suppressed before takes become a problem. During other times, if there are few fish in the vicinity of the pumps, then pumping could be increased. Such a management approach offers the possibility of highly efficient and highly protective biological standards, while also allowing for significant restoration of the Estuary without the need for dramatic reductions in exports or an isolated transfer facility (or its equivalent).

Adaptive management was introduced into the Agreement in order to assure water exporters that, if exports were reduced below nominal export standards to reduce the take of endangered species, pumping above the Standards would be allowed later in the year to compensate (provided that increased pumping was consistent with biological protection). In this way, endangered species could get adequate protection without dramatic reductions in the predictability of export supply (one of the key issues which exporters had with the ESA).

However, another section of the Agreement implies that reductions in pumping and subsequent increases can also be made at the request of an "Operations Group." This clause allows adaptive management to go beyond take limits. The Operations Group will be comprised of representatives from the key state and federal water management and wildlife protection agencies, as well as water user, environmental, and fisheries interests. In essence, exporters will have a water budget each year (the amount of water they could export given the nominal export standards), and, within that budget, water managers will be able to modify export controls to maximize environmental returns.

A major flaw in the concept of adaptive management is that it will not provide the promised benefits unless accurate predictions can be made as to when it is safe to operate the pumps. There are three critical elements to making adaptive management work: (1) developing a better understanding of the biological relationships that control how species respond to other species and to physical conditions, (2) monitoring fish populations to determine the locations of key species in the Delta at any given time to predict their future locations, and (3) developing institutions which insure that water is truly managed to maximize environmental benefits.

Although there is much work ahead, progress is being made on all three of these elements. In particular, a monitoring provision in the Agreement will help develop information for the first two elements. Also, the Operations Group formed by the Agreement provides a basis for an institutional structure to manage exports in the future.

Adaptive management will greatly benefit the environment and will dominate Delta water management within a decade. It can also be a frightening concept, because it is based on the assumption that institutions will make sound environmental decisions extemporaneously. Strictly-drawn

standards will no longer form the basis of water management, but these standards were extremely inefficient from an environmental perspective, because they reduced the amount of environmental protection to unacceptable levels in favor of political and economic justifications.

Monitoring

A key element of the Agreement is stepped monitoring programs to determine how well the Standards are working, locate fish concentrations to allow adaptive management, and help to develop new and improved standards in the future.

Category 3 Funding

The use of the \$180 million fund for non-water-related environmental protection was discussed above in section VII. A small portion of this money may also be used for additional flows to bolster weaknesses in the Agreement.

Endangered Species

The two Delta species listed under the ESA—winter run salmon and Delta smelt—receive relatively strong protection in this Agreement. The Standards reflect the needs of these species and ESA take limits remain as a bottom-line safety net. Environmentalists are more concerned with the species that are not currently listed, but probably deserve to be listed—spring run salmon, Sacramento splittail, and longfin smelt. The habitat needs of the splittail and the longfin smelt are generally met by the Standards, even though ESA take limits will not apply. However, the Sacramento spring run salmon is the species most at risk from these Standards.

As previously discussed, above, protection for the spring run salmon gave way to the needs of Delta smelt and water exporters. Spring run salmon need protection as they migrate down the Sacramento River during November, December, and January, and this protection can be provided by either closing the Delta Cross Channel (to keep them out of the Central Delta) or by reducing pumping during this period. However, full closure of the Delta Cross Channel was opposed by USFWS, because it would increase losses of Delta smelt. Also, reductions in exports were opposed by water exporters, because, with spring pumping greatly reduced by the new Standards, the November-January window was one of their main pumping opportunities.

The Agreement does provide for Cross Channel closures during 45 days in November-January, and this will help, particularly if the closures can be targeted when spring run salmon are likely to be present. Other measures that can be taken to bolster spring run salmon protection include convincing USFWS that full closure of the Cross Channel would not put Delta smelt at risk, spending Category 3 money on improving habitat conditions upstream,

using the flexibility in the Standards to reduce pumping when spring run salmon are likely to be present, and seeking a listing of spring run salmon as an endangered species.

In the past, environmental groups have held off seeking an ESA listing, because of its effect on the commercial fishing industry. In fact, if the other measures are successful, a listing might not be needed. However, all parties are aware that an ESA listing petition may be necessary to protect the spring run salmon.

A new ESA listing would not be welcomed by either the state or the federal government. The state forcefully insisted on inserting language into the Agreement which implied that the Standards were so complete that new listings would only occur as a result of "unforeseen circumstances." The federal government agreed that it would be responsible for any additional water costs which might occur as a result of new listings; in this regard, the state bears no obligation for at least three years.

IX. IMPLEMENTATION

The SWRCB is committed to implementing the new Standards through a water rights decision, scheduled to begin in 1995. Meanwhile, the Standards have been incorporated into the NMFS and USFWS biological opinions for winter run salmon and Delta smelt.

Since the biological opinions only apply to the state and federal projects, these projects will bear the brunt of compliance until the SWRCB spreads the burden through its water rights decision. This means that the two projects have every incentive to support rapid movement through the water rights process.

However, since the Agreement specified that the federal share of compliance water will come out of the 800 kaf dedicated to the environment in the CVPIA, during critically dry years, much of the CVPIA environmental water could be dedicated for Delta purposes, making it unavailable for its primary purpose—doubling anadromous fish.

The Agreement is limited to three years. Several factors could lead to its collapsing after three years, if not sooner: if the state fails to fulfill its obligations under the Agreement, if the Standards are ineffective, if new endangered species are listed, or if the Category 3 fund is not provided. On the other hand, if the process is going well, there is every likelihood that elements of the Agreement not covered by SWRCB standards will be extended.