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WATER QUALITY CONTROL: INTEGRATING BENEFICIAL USE AND ENVIRONMENTAL PROTECTION

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I. Introduction

A. Summary

About 70% of precipitation in California falls in the northern third of the state. Because of the growth of southern California metropolitan areas and the intense agricultural development in the lower reaches of the San Joaquin Valley, about 80% of water use falls in the southern two-thirds of the state.

The California legislature, recognizing this supply-demand imbalance, adopted a state water plan in the early 1900's. That plan outlined a scheme to develop water in the northern part of the state and ship it south. Two major projects, one federal and one state, compatible with the foregoing scheme were constructed. Those projects transport water through the fertile Sacramento-San Joaquin Delta Estuary to the south. This transport scheme, together with upstream development projects, have produced impacts on beneficial uses in the Delta and adjacent San Francisco Bay.

This presentation will examine the significance of the Bay-Delta Estuary in terms of the beneficial uses being made of Bay-Delta water. In other words, we will look at what the State Water Resources Control Board is trying to protect. Further, it will

explore the water supply and demand situation in California, how the major water projects were designed to solve the supply-demand inequity, and the perceived water quality impacts this physical solution has had on the Bay-Delta beneficial uses. Lastly, we will look at the process the California State Water Resources Control Board is using to identify and address these water quality problems.

B. References

1. Important State Board Decisions Affecting Water Quality Standards

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State Water Resources Control Board.1971.Water Right Decision 1379

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2. Description of Beneficial Uses and Levels of Protection

Regional Water Quality Control Board,Central Valley Region. 1975. Water Quality Control Plan,"Sacramento River Basin 5A,Sacramento-San Joaquin Delta Basin 5B,San Joaquin Basin 5C"

Regional Water Quality Control Board,San Francisco Bay Region.1975. Water Quality Control Plan,"San Francisco Bay Basin 2"

State Water Resources Control Board.1978.Water Quality Control Plan, "Sacramento-San Joaquin Delta and Suisun Marsh"

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State Water Resources Control Board.1987.Transcripts of the Bay-Delta Hearing, Volumes 1 through 62

3. California's Water Distribution Scheme

California Department of Water Resources,1930.Bulletin No.25 and 1957. Bulletin No. 3,"The California Water Plan"

4. Guidance for the Standards Setting Process

State Water Resources Control Board.1987.Workplan for the Hearing process on the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

California v. United States (1978) 438 U.S. 645, 98 S. Ct. 2985

II. The Bay-Delta Estuary

A. Definition of the Delta

The Delta is formed by the Sacramento and San Joaquin Rivers with some input on its eastern fringes from the Consumnes, Mokelumne and Calaveras Rivers. This 738,000-acre area of sloughs, rivers and fertile peat and mineral soils is roughly triangular in shape. It extends from Chipps Island (downstream of the confluence of the Sacramento and San Joaquin Rivers) in the west, to the city of Sacramento on the Sacramento River in the north, to the town of Vernalis on the San Joaquin River in the south. The boundary of the Delta is legally defined in Section 12220 of the California Water Code.

B. Definition of San Francisco Bay

San Francisco Bay (Bay) is comprised of six embayments--generally from north to south these are Honker Bay, Grizzy Bay, Suisun Bay, San Pablo Bay, Central Bay and South Bay. The Bay has about 306,400 acres of water surface area. Most freshwater inflow (greater than 90%) enters the Bay from the Sacramento and San Joaquin Rivers at the northeast end near Suisun Bay.

The most significant area within the Bay complex is Suisun Marsh (Marsh), a 113,000-acre brackish marsh located north of Honker, Grizzly and Suisun Bays. With its 85,000 acres of marshlands and waterways, it ranks as the largest contiguous brackish water marsh in the United States.

C. Significance of the Bay-Delta Estuary

1. The Bay

Besides being a center for international trade on the west coast, San Francisco Bay at one time supported a viable shellfish industry. The Suisun Marsh portion of the Bay comprises 15 percent of the remaining natural wetlands in the State of California. Less than ten percent of the historic wetlands in California remain.

Suisun Marsh provides habitat for almost one-third of California's waterfowl. It also is home for some 36 species of mammals and greater than 200 species of birds. Of the foregoing, seven species fall in the rare or endangered category.

Collectively, the Bay and Marsh are home and nursery for many species of fish. Most noteworthy are the striped bass and salmon.

2. The Delta

About two-thirds (510,000 acres) of the fertile Delta is devoted to agricultural pursuits. One of the prime crops grown in the Delta is corn. Half of the acreage in production is used to grow corn with a yield per acre greater than our mid-western corn-growing states.

The Delta also contains a major industrial and municipal corridor in the vicinity of the city of Antioch. A prime industry is paper making with the paper mills providing an annual payroll in excess of $30 million. Drinking supplies for more than a quarter of a million people are drawn from the Delta.

Half of the State's anadromous fishery passes through or resides in the Estuary. Striped bass, one of those anadramous fish, besides generating countless revenue in recreation, supports a $15 million annual commerical fishery. Seventy-five to 80 percent of the ocean catch of salmon off the California coast pass through the Delta.

III. The Water Supply-Demand Situation

Having examined the significance of the Bay-Delta complex and beneficial uses being made of it, we turn our attention to the supply-demand situation and how solution of the inherent inequity problem have impacted the Bay-Delta beneficial uses.

A. Supply and Demand

About 70 percent of precipitation in California falls in the northern third of the state, whereas 80 percent of water use occurs in the southern two-thirds of the state. The hydrologic basin contributing water to the Bay-Delta complex represents about 40% of California's land area. It extends from the Oregon border to the Tehachapi Mountains north of Los Angeles.

Two-thirds of the water consumed in the state comes from this watershed. This same basin also supplies 40 percent of California's drinking water. Over 15,000 water users have rights to divert water from water courses in this basin.

B. Project Development

The state legislature adopted the California Water Plan early in the 20th century. Part of the plan put forth a scheme to develop water resources in the north and supply the water to the areas of demand in the south.

1. The Central Valley Project (CVP)

During the 1930 depression when the state could not sell bonds to finance construction of the State Central Valley Project portion of the State Water Plan, the federal government picked up the project as a public works program. Initial facilities

were completed in the mid-1940's. The Central Valley Project, operated by the U.S. Bureau of Reclamation, relies mostly on storage to create yield (4 million acre-feet annually north of the Delta).

Exportable yield of 3.2 million acre-feet is routed from storage facilities in the north (Clair Eagle Lake, Shasta Dam, Folsom Dam) via natural waterways through the Delta to export pumps on its southern fringe near the town of Tracy. That water is carried in the Delta Mendota Canal to temporary storage in the San Luis Reservoir, thence further south to the Mendota Pool. From here, the water is distributed north throughout the Central Valley for irrigation purposes.

Water is also diverted within the Delta into the Contra Costa Canal. That canal distributes water for municipal and industrial use within the area southeast of the Bay. Most water from the CVP, however, is used for irrigation purposes within the San Joaquin Valley.

Water from the San Joaquin River that was formerly used for irrigation north of the Mendota Pool, is intercepted by other CVP facilities. This water is shipped to the southern extremities of the Central Valley for agricultural use.

2. The State Water Project (SWP)

The SWP, operated by the California Department of Water Resources relies mainly on direct diversion of uncontrolled flow to meet demand. Presently the project, completed in 1968, developes an exportable yield of 2.3 million acre-feet. Like the CVP, water stored north of the Delta is transported via natural waterways through the Delta to the Banks pumping plant at its southern edge. Here, water released from storage and uncontrolled flow is pumped into the California aqueduct to begin its 400-mile journey south over the Tehachapi Mountains into the Los Angeles Basin.

IV. Perceived Impacts

Water diversions by the CVP and SWP as well as other upstream appropriators are alleged to have caused a variety of impacts on the beneficial uses being made of Bay-Delta water.

A. Biological Resources

1. Fish

Diversion of water for export purposes and upstream use are thought to have caused a decline in the striped bass and salmon fisheries. One theory offered is that exports have created flow reversals in the San Joaquin River, thus interfering with

"homing" instincts of both species when making spawning runs. Flow reductions, and increased flow velocities are also thought to interfer with phytoplanton and zooplanton production by decreasing resident time in food production areas. The foregoing are key food chain elements for striped bass and salmon.

Change in flow patterns because of export pumping is also considered to impact fishery resources. Such changes misdirect eggs and young fish into the interior Delta and not into more hospitable nursery areas such as the Suisun Marsh.

Further, eggs and larvae are entrained on the export pump screens or if if lucky enough to pass through, are homogenized in the pumps or passed through to the canal and aqueduct and sent south. They are also sucked up by the unscreened irrigation pumps in the Delta.

2. Wildlife

Reductions in Delta outflow affect salinity levels in the Suisun Marsh area. A narrow range of salinity is necessary to promote the growth of waterfowl food supplies, such as brass buttons, fat hen and alkalai bullrush. Maintaining brackish conditions is also essential for maintaining habitat essential for the many varieties of marsh mammals and birds.

B. Agriculture

Reduction of inflows to the Delta causes stagnation in Delta sloughs particularly in the southern Delta area. The stagnation produces increased salinity which impacts salt sensitive crops grown in this area. Agricultural interests also allege that increased export pumping has lowered water levels making it more difficult if not impossible to pump irrigation water from the sloughs.

Leaching of salts in the soils before planting is also made more difficult by higher salinity water in Delta channels. Reduction in freshwater Delta inflow allows sea water to intrude further upstream into the Delta.

C. Municipal and Industrial

Increased diversions and export pumping generally means higher salinity. Taste considerations for water diverted into the Contra Costa Canal suggest that salinity levels be kept lower than the 250 mg/liter chloride standard set for drinking water, or the graduated standards set forth in Water Board Decision 1485.

Elimination or reduction of THM precusors, exacerbated by agricultural drainage from Delta farms, has been suggested by municipal water purveyors. Increased THM precusors increase the need for revised and more costly water treatment processes. Intrusion of ocean water further upstream because of the decrease of ocean water repelling Delta outflow also introduces bromide based THMs.

Elevated salinity levels also impact the manufacture of cardboard boxes. Those boxes, used to store canned goods, will corrode the cans if salinity levels are too high.

D. San Francisco Bay Impacts

Decrease of Delta outflow (or Bay inflow) is credited as causing impacts in two areas. First, the null zone, or zone where freshwater meets sea water, is considered to be an area of enriched productivity of food elements necessary for maintainance of higher level biological resources. Decreased outflow is thought to move the null zone too far upstream into the Delta where it is not as effectively used by higher trophic levels.

Advocates of increased Bay inflow also contend that increased inflow promotes greater tidal exchange and thus promotes greater pollutant flushing.

V. The Process to Develop Water Quality Solutions

The current three-year proceeding the California State Water Resources Control Board is using to set new or revised water quality standards is a continuation of a process started over twenty years ago.

A. Past Actions

The Board in 1967 issued Water Right Decision 1275 which approved appropriative water right permits for the SWP. Conditions were imposed on water right permits issued for the SWP to mitigate water quality impacts of the project, mainly on fishery resources.

In 1971 the Board issued Decision 1379. That decision established new water quality standards applicable to both the SWP and the CVP. The decision was immediately stayed by the courts as a result of a suit challenging the Board's authority to impose conditions on state permits held by a federal agency.

Again during the period 1976-1978, the State Board held hearings for purposes of receiving evidence relating to salinity control and protection of fish and wildlife in the Delta and Suisun Marsh. The authority of the Board to set standards via CVP water right permits was reinforced about the same time by the U.S. Supreme Court in the California v. U.S. suit (California v. United States (1978) 438 U.S. 645, 98 S.Ct. 2985). In August 1978 the Board produced a trilogy of documents--Decision 1485 which placed conditions on the SWP and CVP permits to implement water quality standards, a Delta Water Quality Control Plan which set salinity and flow standards, and an Environmental Impact Report which provided a foundation for the foregoing plan and decision.

B. The New Proceeding

Immediately after issuance of Decision 1485, fourteen lawsuits (collectively known as the Delta water cases) were filed. The state argued against setting aside Decision 1485 and its standards with the promise that the hearing would be reopened in about eight years. Physical changes in the Delta were anticipated in that time frame that could change the standards. The court agreed with this argument and allowed the decision and its standards to remain in force.

The Board designed a three-phase, three-year proceeding to reassess water quality standards. That proceeding was to begin in July 1987. The appellate court decision (United States v. State Water Resources Control Board (1986) 182 Cal.App.3d 82, 227 Cal.Rptr. 161) issued the preceeding summer when the hearing workplan was being developed supported the approach being considered by the Board.

1. Phase I of the Proceeding

The first hearing phase (July 1987-December 1987) of the proceeding was designed to receive evidence in a quasi-judicial setting that would define the beneficial uses being made of Bay-Delta water; the reasonableness of those uses; the levels of protection, in terms of flow and salinity, required to maintain those beneficial uses; and a program of how to implement those levels of protection. Other information addressing effects of pollutants other than salinity was also to be received.

Products emerging from information received during the Phase I hearing are a Bay-Delta Water Quality Control Plan for Salinity and a Pollutant Policy Document. The latter is a guide to be used by two of the Regional Water Control Boards in amending basin plans to control effects of pollutants on the beneficial uses. The former will spell out the new or revised flow and salinity standards.

2. Phase II of the Proceeding

A second hearing will start in September 1988 to receive comments on the two aforementioned documents. Upon conclusion of the Phase II hearings, the documents will be revised if necessary and adopted by the State Board.

After adoption of the Pollutant Policy Document, the Regional Water Quality Control Boards will begin their basin plan amendment process.

3. Phase III of the Proceeding

During the last phase of the proceeding, the Board, using its water right authority, will look at alternative ways of attaining the new standards through manipulation of existing water right permits and licenses. Impacts of these alternatives will be heard by the Board during the last round of hearings forecast to start in the spring of 1989.

Information received during that hearing phase will be used to construct an Environmental Impact Report. This document will then be used as a foundation for a new Board decision that will set forth conditions to achieve the revised or new standards. These conditions will be applied to water right permits and licenses. The proceeding should conclude in July 1990.

VI. Possible Solutions

Because of the nature of the proceeding, and because the Board solutions to the perceived water quality impacts have not yet been released, only a summary of advocate group recommended solutions will be addressed.

A. Fishery Resources

Numerous solutions were recommended. The salient ones were:

- Close the Delta cross channel gates during certain time periods to prevent eggs and larvae being routed into the interior Delta.

- Cease export pumping during downstream migration runs and set conditions to prohibit flow reversal in the San Joaquin River.

- Increase hatchery production to offset natural losses; release hatchery-raised fish far enough downstream in the Delta to avoid entrapment areas.

B. Wildlife

Impacts to wildlife were not thought to be severe because of mitigation agreements already in-place. However, some advocacy groups recommended that those agreements be reviewed because they were not felt to be adequate.

C. Agriculture

Suggestions made to mitigate impacts on Delta agriculture were:

- Provide higher quality water from storage facilities north of the Delta during a ten-day period in the fall to support more aggressive leaching practices.

- Maintain higher water levels and higher quality water during the growing season in the southern Delta through releases of water from storage facilities south of the Delta.

- Set water quality standards in the interior Delta (southern area) instead of just at the boundary.

- Use overland supplies of high quality water on certain islands for irrigation by placing the intake at upstream points where higher quality water is available.

D. Municipal and Industrial

Recommendations offered generally revolved around two points--provide water of 100 mg/liter chlorides at municipal/industrial intakes and reduce or eliminate THM precusors. The former is to be controlled by reduced export pumping and greater upstream storage releases; the latter is to be achieved through source control measures, e.g., discharge prohibitions or collection to a central discharge point with pre-discharge treatment.

F. San Francisco Bay

To solve the aforementioned problems, certain hearing participants recommended maintenance of high Delta outflow for certain thirty-day periods. The higher output to achieve null zone positioning in the upper embayments and stratification and vertical mixing in the South Bay could be achieved through control of upstream diversions and curtailment of export pumping.

VII. Conclusion

While outwardly the water quality problems don't appear so immense as to be unsolveable, and the recommended solutions don't appear complex, the interelationships that exist do compound the formulation of, as the appellate court decision puts it, a "globally" balanced solution affording reasonable protection to all beneficial uses.