SAN JOAQUIN DELTA: IS NEGOTIATION A SOLUTION?

I. INTRODUCTION

The Sacramento and San Joaquin rivers, which together drain one-third of California, join in a complex of waterways known as the Delta, and from there flow together into the San Francisco Bay and the Pacific Ocean. (See Figure 1.) Once a large marshy area, the rich farmlands of the Delta now include parts of six counties and encompass about 738,000 acres. It is recognized as an area of major agricultural, industrial, and recreational importance.

The Delta's boundaries were officially defined in 1959[1] when legislative responses to the north-south water fights and the passage of the Burns-Porter Act gave wide recognition to statewide water problems. The Delta's integral relation to those problems hinges on its function as a collection and distribution center for the state's ambitious inter-basin water transfer project, which will transform the 700 miles of Delta channels into an artificially controlled waterworks. However, the success of that gathering function is endangered by the possible degradation of both the exported and remaining waters.

The major threat to the quality of the Delta waters is incursion of sea water from the San Francisco and Suisun Bays.[2] Sea water incursion threatens the Delta during the summer months when the fresh water outflow so decreases that the waters of the Bay actually diffuse back "upstream" into the depleted channels. This decrease in outflow is due to natural seasonal variations, which are intensified in magnitude by upstream depletions for irrigation and by direct withdrawals from the Delta for export to other areas of the state.

There is also a significant threat of pollution caused by agricultural drainage. The development of irrigation in the San Joaquin Valley has resulted in increased amounts of salt-laden waters which drain into the San Joaquin River and eventually flow through the Delta. Such waters become increasingly harmful to crops as they are reused, and they eventually present a problem of waste disposal.

Saline degradation affects all users of the Delta region; industrial, municipal, and agricultural interests suffer measurable damage as the salt concentration increases. Other, less finite, damage occurs to recreational, fish, and wildlife interests. Water users located outside the Delta are also affected. The

[1] CAL. WATER CODE § 12220 (West Supp. 1968).

[2] The term "incursion" is used to refer to seawater which moves into an estuary; "intrusion" has been adopted to refer to underground invasion. This chapter does not cover problems of intrusion. Similarly, saline incursion is not "pollution" in the narrow sense of being caused by "waste" (*see e.g.*, CAL. WATER CODE § 13005 (West Supp. 1968)), but is rather a pollution or degradation of water quality partially attributable to man's activity.

pollution seriously threatens the quality of the waters available for export and determines the quality of the river waters flowing into San Francisco Bay.

The problem of sea invasion of a river estuary is not unique to California. Similar situations have been reported on the Delaware and Hudson rivers,[3] in Louisiana and Florida,[4] at the head of the Persian Gulf,[5] and in the Netherlands. Each of these areas, however, has adopted different means of dealing with the problem.

This Chapter is concerned with the problems posed by degradation of the Delta's waters. It is restricted to the portion of the Delta known as the "lowlands," the 415,000 acres that lie at elevations between five feet above and twenty or more feet below sea level.[6] The "uplands," by contrast, have different drainage, diversion, and use practices which are less affected by salinity problems. "[A]n improvement in water quality would provide only small economic advantages to the uplands."[7]

The Delta's problems reflect its complex geographical, economic, political, and hydrologic conditions. Hence, the first sections of this Chapter explore the geographical data and the conflicting parties involved in the Delta controversy. Similarly, various technical concepts and means of water quality measurement are discussed, since some familiarity with the underlying factors is essential to an understanding of the Delta's water problems. With these underlying factors established, the negotiations and positions of the involved parties are analyzed in light of the group interests which they represent. Finally, the major legal factors are analyzed and applied to the present conditions of the Delta.

II. The Major Characteristics of the Delta

A. Physical Characteristics

1. Reclamation and Salinity

The Delta area originally consisted of a swamp of boggy peat, interlaid with occasional layers of silt and decayed vegetation. There were large areas of aquatic vegetation which were subject to tidal action.[8] Reclamation of the Delta lowlands began in earnest in the 1860's under the Board of Swampland Commissioners, established by the state legislature in 1861.[9] Coopera-

[3] *Salt Threat Eases in Delaware River,* 43 CHEM. & ENG. NEWS, July 19, 1965, at 30; *Bubbles Balk Ocean's Intrusion,* 176 ENGINEERING NEWS-RECORD, Mar. 10, 1966, at 18.

[4] *See* CALCASIEU RIVER SALT WATER BARRIER, LOUISIANA, H. R. DOC. NO. 582, 87th Cong., 2d Sess. (1962); *See* FLA. STAT. ANN. §§ 373.194–95 (1968).

[5] Gholizadeh & Petersen, *Proposed Project For a Salinity Problem at Abdan,* 93 PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, JOURNAL OF THE IRRIGATION AND DRAINAGE DIVISION 43 (No. IR 1, Mar. 1967).

[6] CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 76, DELTA WATER FACILITIES 8 (1960) [hereinafter cited as BULL. 76].

[7] CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 76 APPENDIX, DELTA WATER REQUIREMENTS 116 (1962) [hereinafter cited as BULL. 76 APP. WR].

[8] CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 123, DELTA AND SUISUN BAY WATER QUALITY INVESTIGATION 3 (1957) [hereinafter cited as BULL. 123].

[9] Cal. Stat. 1861, ch. 352, at 355. The Board was subsequently abolished by Cal. Stat. 1866, ch. 570, § 5, at 800.

tive levee construction was undertaken, and by the late 1920's the area was completely reclaimed and in production.[10]

The lowlands cover vast peat beds with depths of up to 40 feet. These land surfaces subside about three inches yearly, due to oxidation and wind erosion. Subsidence accounts for the increasing seepages characteristic of much of the island farming.[11]

Salinity incursion in the Delta is not a new phenomenon. Rather it is the extent, magnitude, and duration of the incursion which is of significance.[12] Reports from 1775, 1841 and the 1870's mention brackish water in the river channels, indicating that pre-reclamation incursion "extended only a short distance above the confluence of the Sacramento and San Joaquin rivers even in dry years. . . . Prior to 1920, the invasion of saline tidal waters above Antioch happened at such rare intervals that their occurrence was news."[13]

As reclamation and flood control efforts began, new channels were created, the main Sacramento River channel was widened, and formerly reclaimed areas were reflooded. These changes have been cited by many authorities as allowing increased tidal incursion and a consequential rise in the average salinity readings which occurred thereafter.[14]

The full effect of the various alterations became evident during the dry cycles which followed:

> The dry years of 1917 to 1919, combined with increased upstream irrigation diversions, especially for rice culture in the Sacramento Valley, had already given rise to invasions of salinity into the upper bay and lower delta channels of greater extent and magnitude than had ever been known before. At the beginning of 1920, it was evident that another dry year was impending which might result in serious water shortage and a possibly greater saline invasion.[15]

Whatever the cause, the fact remains that the invasions increased dramatically in the early 1920's.[16] High levels of salinity incursion continued spo-

[10] CALIFORNIA STATE DEP'T OF PUBLIC WORKS, DEP'T OF WATER RESOURCES, BULLETIN 27, VARIATION AND CONTROL OF SALINITY IN THE SACRAMENTO-SAN JOAQUIN DELTA AND UPPER SAN FRANCISCO BAY 157–60 (1931) [hereinafter cited as BULL. 27].

[11] BULL. 76 at 18–19; *see* BULL. 76 APP. WR 80–81.

[12] Some care is necessary when evaluating salinity records. Too often the figures cited or lines drawn represent a maximum incursion of salinity for the particular year as it occurred on the worst day of that year. These figures should not be confused with the control lines established by the criteria mentioned elsewhere in this Chapter, *e.g.*, the November 19th Agreement, which refer to approximations of year-round salinity measurements at a particular location.

[13] California State Water Rights Board Decision D 990, at 13 (1961) (Dissent of Board Member W. P. Rowe) [hereinafter cited as 990 Dissent], citing BULL. 27, at 161. *But see* BULL. 76, at 12; *cf.* CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 76 APPENDIX, SALINITY INCURSION AND WATER RESOURCES 36–38 (1962) [hereinafter cited as BULL. 76 APP. SI & WR].

Continuous references to the historical records have been made by all concerned parties to the Delta disputes. Most of the citations lead to BULL. 27, at 46–50. Note that most of the references are to salinity in Suisun Bay, and only rarely to what are now considered Delta lowlands.

[14] 990 Dissent 19, 22; *see* BULL. 27, at 161–62.

[15] BULL. 27, at 22.

[16] 990 Dissent 19–22.

radically until 1944, when the controls made possible by the construction of Shasta Dam increased the summer outflows through the Delta and thereby greatly decreased the maximum extent of the incursions.[17] A comparison of reported incursions reveals the success which the Shasta outflows had in repelling salinity.[17a] The lines of maximum incursion extend to a much greater distance upstream in the period from 1920 to 1944 than from 1944 onward. As will be developed later, that change was one of the intended results of the project. This fluctuating history figures importantly in determining the present water rights of Delta users.

2. Existing Inflow and Outflow: The Water Balance of The Delta Pool

The Delta acts as the "hub" of the water transfer projects operated by the Federal Bureau of Reclamation and the State Department of Water Resources. It receives the flows of the Central Valley rivers, and is then used to transfer those flows to the export pumps in its southern portion. Any consideration of the amounts of water which might be available for export, local consumptive use, or salinity repulsion must therefore be predicated on the delicate balance to be maintained among those uses. The balance in turn depends on the available supply (inflow), local consumption, and the various possible outflows.

The Delta's watershed covers more than one-third of California, and presently yields an annual inflow of about 16.8 million acre feet of water to the Delta. This is a depleted figure as compared with the 30.3 million acre feet which are estimated to have occurred under natural circumstances.[18] As demand for water increases, however, the total inflow to the Delta will be supplemented by waters imported from presently uncontrolled rivers in the far northern part of the state, which are expected to yield as much as ten million additional acre feet annually.[19]

Historically, the Sacramento River has accounted for about 67 percent of the inflow and the San Joaquin River about sixteen percent, with the remaining amount from smaller eastern streams. At present, besides the variations in river flow, Delta inflow is affected by upstream consumptive use, exports to non-Delta muncipalities, upstream reservoir and power operations, and the importation from newly developed projects upstream.[20] The inflow will be further supplemented by increased agricultural wastes "imported" via the federal and state drainage systems[21] and the rapidly increasing municipal and industrial wastes from the western Delta area.[22]

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[17] BULL. 76, at 12; *accord*, BULL. 76 APP. SI & WR 39; *see* 990 Dissent 44.

[17a] *See* BULL. 76 APP. SI & WR plate 12.

[18] U.S. DEP'T OF THE INTERIOR, FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, SAN JOAQUIN MASTER DRAIN: EFFECTS ON WATER QUALITY OF SAN FRANCISCO BAY AND DELTA 13 (1967) [hereinafter cited as FWPCA REPORT].

[19] CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 160–66, IMPLEMENTATION OF THE CALIFORNIA WATER PLAN 72–74 (1967); *cf.* BULL. 76 APP. SI & WR 117–21.

[20] BULL. 76 APP. SI & WR 69–86.

[21] The drains are discussed in text accompanying notes 27–28, 65–82 *infra*.

[22] State Water Resources Control Board, San Francisco Bay-Delta Water Quality Control Program, Press Release, June 7, 1968.

The inflow-outflow equation, which is used to determine the net flows through the Delta, must also account for consumptive uses within the Delta. Agriculture is presently the largest direct consumer of Delta water, since a substantial portion of the industrial and municipal requirements are met by waters supplied by the export agencies.

Delta outflow is primarily composed of export waters and salinity control flows. Hence, although export of water is just beginning to get under way on a large scale (amounting to 1,465,000 acre feet in 1966), it is expected to increase to over ten million acre feet by 2020.[23]

The amount of water which flows out of the Delta's natural channels is strictly controlled during the summer, and future plans provide for almost complete year-round control. The amount of outflow considered necessary for safe maintenance of the Delta is a major concern of this Chapter. Here it is necessary only to note that the present outflow (about 15,422,000 acre feet) is presently at 53 percent of its natural level, and is expected to reach eight percent of that level by 2020, when all presently planned projects are in operation.[24]

B. Social and Political Characteristics: Users

The agricultural, municipal, and industrial consumers in the Delta now share with the export agencies those waters which once seemed so abundant. Depletion of the water supply has resulted from many causes, but the greatest single factor affecting the quality and volume of the present and future supply is the operation of the export projects.

1. The Export Agencies and Their Projects

The largest single diverters of Delta waters are undoubtedly the export projects operated by the Federal Bureau of Reclamation and the California Department of Water Resources. The Bureau's principal function has been the construction and operation of the Central Valley Project, an undertaking originally conceived by the state, but constructed and operated by the federal government after state efforts at financing failed during the depression.[25] The primary objective of the CVP is to store the surplus waters of the Sacramento and San Joaquin Valleys and transport them to the lower San Joaquin Valley. Its principal Delta facilities are the Contra Costa Canal, the planned Kellogg Unit (also in Contra Costa County), and the Tracy Pumping Plant which supplies the Delta-Mendota Canal.

The Department of Water Resources, although it continues to operate the California version of the Central Valley Project, is presently constructing the State Water Project, a manifestation of the California Water Plan of 1957.[26] As authorized by the California Water Resources Development

[23] FWPCA REPORT 15.

[24] *Id.* at 15–17, 28–31.

[25] For a short discussion of the history of the CVP, see Ivanhoe Irrig. Dist. v. All Parties, 47 Cal. 2d 597, 615–16, 306 P.2d 824, 834–35 (1957).

[26] CALIFORNIA STATE DEP'T OF WATER RESOURCES, DIV. OF RESOURCES PLANNING, BULLETIN NO. 3, THE CALIFORNIA WATER PLAN (1957). The plan is adopted by CAL. WATER CODE §§ 10004–07 (West Supp. 1968).

Bond Act,[27] the facilities of the State Water Project which are pertinent to the Delta include the North and South Bay Aqueducts, the California Aqueduct, and the Delta Pumping Plant. The federal and state pumps are used to transport water (through the Delta-Mendota Canal and the California Aquaduct, respectively) to Contra Costa County, parts of the San Francisco Bay area, the San Joaquin Valley, and southern California.

Both the state and federal governments plan to build large drains to remove polluted agricultural waters from the San Joaquin Valley. The drains will probably discharge in the Delta near Antioch, and are expected to significantly affect the quality of the receiving waters.

Perhaps the most important of the "Delta facilities" will be the Peripheral Canal. Planned as a joint project of the two exporting agencies, it will take waters from the Sacramento River at the upper end of the Delta and isolate them in a separate channel for conveyance to the export pumps to the South. Controlled releases of water will be made at specified points along its route to maintain the necessary distribution of flow in the original Delta channels.

The contracting agencies in southern California to whom the Bureau and the DWR sell water constitute a large and important group of Delta "users." Because they are not direct parties to the dispute, they are mentioned here only in recognition of their immense economic and political power. They include the Metropolitan Water District of Southern California, which serves the entire Los Angeles-San Diego area, and numerous irrigation districts in the southern San Joaquin Valley. These entities comprise one of the most powerful interest groups in the California Legislature, and as such have a significant voice in the resolution of the Delta controversy.

2. Local Users of Delta Waters

Agricultural users of the Delta were responsible for the original reclamation efforts and continue to occupy the majority of the Delta acreage. Little expansion of agricultural use is possible, but it is expected that gradual encroachment by other users will occur, thus decreasing the lands used for agriculture from the present 605,500 acres to an estimated 580,000 acres by 2020.[28]

The principal industrial and municipal users of Delta water are the cities in the extreme western portion, and the contiguous industries along the Contra Costa shoreline. The availability of large quantities of water for cooling and waste assimilation purposes was one of the primary reasons for the settlement of industry in that area, and it remains a major draw.[29] However, because of the increasingly poor quality of the water available

[27] CAL. WATER CODE §§ 12930–44 (West Supp. 1968).

[28] BULL. 76 APP. WR 40 listed the following estimates of agricultural acreage:

Year	Total Agricultural Lands
1960	605,500
1990	596,000
2020	580,700

[29] The industrial attractions of the area are widely noted and recognized. *See* BULL. 76 APP. WR 9–12.

directly out of the river, these users have been forced since 1940 to rely heavily on the Bureau of Reclamation's Contra Costa Canal.

Other uses of the Delta include recreation and navigation. Neither affects the water quality substantially, but recreation is itself affected by any degradation which may occur. Recreational use of the Delta is big business; estimated use in 1960 was three million recreation-days[30] with a total value of over 25 million dollars in 1965.[31] These uses include all the water contact sports, as well as boating, fishing, and hunting.

The Delta fisheries not only contribute heavily to its recreational advantages,[32] but also serve to maintain California's commercial salmon industry, which has a net income of three million dollars. The protection of these fisheries has become a factor of major importance in determining water quality criteria for the Delta, and in evaluating the various proposals for Delta control.

3. The Parties Involved: Representative Organizations for the Local Users

The export projects are under the guidance and control of powerful governmental entities. The local users, however, are represented by smaller governmental and voluntary organizations which reflect their widely disparate interests. It is this wide range of needs and philosophies which accounts for the devisive battling between the user groups.

The Sacramento River and Delta Water Association (SRDWA), an agricultural group organized in 1955, represents a large number of water districts and individual users throughout the northern Delta area. Originally formed to protest applications made by the export agencies (which were thought to threaten its members' water supplies), SRDWA eventually signed a tentative quality criterial agreement with those agencies known as the "November 19th Water Quality Agreement."[33]

The southern portion of the Delta is largely represented by the Delta Water Users Association (DWUA). Formed in 1956, the DWUA also protested the exporters' applications; it was not for several years, however, that they realized that quality and not quantity should be their major concern. Thus, this group joined with representatives from the San Joaquin County Board of Supervisors to form the "San Joaquin Water Rights Com-

[30] CALIFORNIA STATE DEPARTMENT OF WATER RESOURCES, BULLETIN 76 APPENDIX, RECREATION 43 (1962). A "recreation day" is defined as "a portion or all of one day's activity spent by a single recreationist in the pursuit of any type of recreation." *Id.* at 24; *cf.* FWPCA REPORT 32.

[31] FWPCA REPORT 32–33; *accord,* METCALF & EDDY, REPORT TO THE CONTRA COSTA COUNTY WATER AGENCY ON A STUDY OF THE EFFECTS OF THE PROPOSED FEDERAL SAN LUIS INTERCEPTOR DRAIN AND THE STATE SAN JOAQUIN VALLEY MASTER DRAIN 34 (1964) [hereinafter cited as CCCWA DRAIN REPORT].

[32] Sport fishing occupies three million angler-days annually. RESOURCES AGENCY OF CALIFORNIA, DELTA FISH AND WILDLIFE PROTECTION STUDY, REPORT NO. 7, WATER DEVELOPMENT AND THE DELTA ENVIRONMENT 3 (1967) [hereinafter cited as F & G REPORT].

[33] The signers of the November 19th Agreement were the California Department of Water Resources, Sacramento River and Delta Water Association, San Joaquin Water Rights Committee, and the United States Bureau of Reclamation. The Agreement is often referred to as the "November 19th Criteria."

mittee" which then negotiated and signed the November 19th Agreement. The owners of several large tracts, however, have chosen to remain independent of these groups, and a few have actively opposed the November 19th Agreement as providing water of inadequate quality.

Potentially the most powerful entity will be the Delta Water Agency, which was established by a 1968 act of the Legislature.[34] It represents essentially the same area of the Delta as do the signers of the November 19th Agreement, and was expressly designed to make the agreement binding on all users within the area encompassed by its boundaries. Both SRDWA and the San Joaquin interests were active in the creation of the agency, an undertaking aided by representatives from the DWR and the Bureau of Reclamation.

The November 19th Agreement contains important payment provisions which will be effectuated by the Delta Water Agency's per acre assessments. The assessments are expected to provide a $200,000 annual payment to the Bureau of Reclamation, an amount which theoretically offsets the Bureau's cost of providing the water quality called for by the November criteria. Because it is impossible to appraise the value of water quality, the payments in fact act more as insurance premiums than as direct compensation. Furthermore, the scheme does not yet provide for payments to the DWR.

The above-mentioned organizations are generally considered to be representative of agricultural interests in the eastern Delta. Because the location of their lands requires less "protection" than the lands to the west (which are of lower elevation and closer to the saline channels), they have less demanding requirements for salinity protection. Thus, criteria acceptable to the eastern groups may very well not be adequate to protect western Delta lands against salt incursion.

The western Delta interests are far less cohesive than those eastern groups committed to the November 19th Agreement. Because water quality becomes increasingly degraded nearer to the Bay, the western users have lower qualities available to them. And, although a portion of this heavily affected land lies in Sacramento County, the majority of western Delta users are located in Contra Costa County.

The Contra Costa County Water Agency (CCCWA) was established in 1957 and given a wide range of powers. It "may do any and every act necessary . . . so that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants of the agency . . . ."[35] It also has full powers of litigation in any action which involves the use or ownership of water used within the agency's area. Such powers are rather unique. Unlike the majority of the county water agencies in the state, the CCCWA is neither a user nor supplier of water. Rather than operating as a source of water, it is designed to represent the water users within its

[34] The Delta Water Agency Act of 1968, CAL. WATER CODE APP. §§ 108–1.1 to –10.2 (West Supp. 1968).

[35] Contra Costa Water Agency Act, CAL. WATER CODE APP. § 80–11 (West 1968).

boundaries. In doing so, it has been able to make comprehensive technical studies and reports.

The CCCWA has been active since its inception, usually in conscientious and vociferous opposition to the standards embodied in various plans for the development of the Delta. There is little doubt that its technical and representational capabilities give the agency the potential of playing a significant role in a resolution of the Delta disputes. Unfortunately, it has not yet succeeded in that goal. Although the CCCWA represents a large area, the users within that area do not rely upon it as the sole representative of their interests. Thus, many western Delta farmers work in an informal coalition with the CCCWA, but are also represented by private counsel. Similarly, the industrial firms along Contra Costa County's northern shoreline have remained essentially independent. They negotiate for water quality control with the exporting agencies on a private basis.

Two agricultural water supply agencies within Contra Costa County have chosen to side with the eastern Delta groups. The Byron-Bethany Irrigation District is a member of DWUA, while the East Contra Costa Irrigation District is a member of SRDWA. Both groups are committed to the November 19th Agreement.

The two largest municipal consumers in the area have also followed an independent route toward the resolution of the difficulties posed by a degraded and decreasing water supply. Their particular needs and politics dictated that independent negotiations be pursued. Those negotiations have resulted in contracts with the Department of Water Resources.

III. The Effects of Quality Degradation on Delta Users

A. Water Degradation and the Export Agencies

The degradation of the Delta affects all users of its water, both local users and exporters. It seems clear, however, that it is due to the impact of degradation on the export projects that the "Delta Facilities" (which will control the area's hydrology) are to be built and operated. Thus, one of the most important effects of degradation has been its impact on the water-exporting agencies. The export waters must conform to the strict quality standards required for municipal and industrial use in southern California. The degradation which endangers the local waters therefore threatens the export waters as well. However, under the present hydrologic conditions of the Delta, protection of the export waters requires that an increase in export volume be accompanied by a yet greater increase in the outflows needed for salinity control.[36] The dual demand therefore necessitates the release from storage of large and expensive quantities of water.[37]

[36] Bull. 76, at 17, 45.

[37] "There is a direct relationship between the amounts of water that might be committed to salinity repulsion and those available for other purposes. As Delta outflows are increased, the water available for use in the Central Valley above the Delta and for export from the Delta diminishes; if outflows are decreased, the quantities available for other uses increase." California State Water Resources Control Board, Staff Comments Concerning Proposed Supplemental Delta Water Quality Standards 2 (October 24, 1968).

Once the Peripheral Canal is operational the export waters will be protected. Even then, however, the export agencies estimate that the outflows necessary for complete salinity control would be prohibitively expensive.[38] The desire for water salvage has thus been the major impetus for Delta facility development, and the cause of the water battles within the Delta.

B. Water Degradation and Agriculture

Agriculture in the Delta lowlands is dependent upon the water supplied in the channels surrounding the islands. However, as the salinity of that water increases, the growth and yield of the Delta's crops can be expected progressively to decline.[39]

1. Salinity Generally

The effect of salts on a particular crop depends on a variety of factors.[40] The most commonly recognized variants are the plant's level of tolerance to salts, the permeability and other characteristics of the soil, the climate, the length of the growing season (or particularly critical stages of growth), and of course the kinds of salts and ions involved. The salts may be present in the soil, the water applied to it, or both. These factors must be considered as they interact with the height of the water table, the frequency of irrigation (and/or leaching), and drainage. In each case, however, the rigid limits of the various systems for classifying irrigation waters must yield to local conditions in judging the suitability of water for irrigation.

The best waters for irrigation are generally those which contain little or no salts. As the levels of salinity increase, both yield and growth decline. Since several salts (including the chloride in sea water) may reach a toxic level, injury and eventual loss of the crop may ensue if excess amounts are applied to the plants. As a result, any increase in salinity which occurs may require a change in irrigation methods, selection of different and more tolerant crops, or even abandonment of the land.

Various means of describing "water quality" have been developed. Among those now generally recognized are:

1) "parts per million" (ppm), which refers to the number of parts of a particular mineral constituent per million parts of irrigation water. This is the most widely used description in the Delta literature, and usually refers to parts per million of the chloride ion, thus indicating the presence of sea incursion.

2) "milliequivalents per liter" (me./L), which refers to the amount of particular ions (*e.g.*, chloride) in solution;

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[38] Cost of the outflows is discussed in text accompanying notes 122–23 *infra*.

[39] U. S. DEP'T OF AGRICULTURE, INFORMATION BULLETIN NO. 283, SALT TOLERANCE OF PLANTS 5 (1964).

[40] *Id.; see* U. S. DEP'T OF AGRICULTURE, AGRICULTURE HANDBOOK NO. 60, DIAGNOSIS AND IMPROVEMENT OF SALINE AND ALKALI SOILS (1954). *See* U. S. DEP'T OF AGRICULTURE, AGRICULTURE INFORMATION BULLETIN NO. 213, USE OF BRACKISH WATER FOR IRRIGATION IN HUMID REGIONS (1960). Crops with good salt tolerance are barley, cotton, and some vegetables; moderately tolerant crops are wheat, corn, alfalfa, many vegetables; poor tolerance is found in beans, clovers, and most fruits.

3) "total dissolved salts" (TDS), which is measured in ppm and refers to the water's total mineral content;

4) "electrical conductivity" (EC), which is a quite exact measurement of the electrical conductance abilities of a water sample, and thus reveals the total dissolved salt content of the sample. Because a large unit is involved, it is usually expressed in millimhos/cm., and recorded as EC $\times 10^3$, or in micromhos/cm., recorded as EC $\times 10^6$.

It is the composition and concentration of the dissolved constituents in water which determine its suitability for irrigation. Hence, the above means of measurement have been used to establish various schemes of classification of agricultural water.

The early tables showed:

	Chloride salts[41]	*me./L*
Class I (excellent to good)	0–175 ppm	0–5
Class II (good to injurious)	175–350 ppm	5–10
Class III (injurious to unsatisfactory)	350–1000 ppm	10–29

A more recent, and perhaps the most widely used classification was that of the United States Salinity Laboratory (1954):[42]

Salinity Hazard	*EC $\times 10^6$*	*TDS in ppm*
Low	100–250	64–160
Medium	250–750	160–480
High (Salt-tolerant plants only)	750–2250	480–1440
Very High	2250 +	1440 +

Both of the above systems included other factors in addition to the concentration of the chloride ion which had to be considered in determining the suitability of a water supply. Recognizing the complex interactions involved, modern systems may consider the solubility of the salts, the sodium content of the irrigation waters (which affects the permeability of most soils but is of little consequence in peat soils[43]) and the specific toxicity of the elements present.[44] Such criteria obviously cannot be readily established on a wholesale basis, but instead are dependent on consideration of the particular circumstances of each application.

Rather than using one of the more complex sets of criteria, the parties to the Delta dispute instead rely almost entirely on a simple measurement (in ppm) of the chlorine ion. This is still "recognized as a simple and relatively good criterion for many waters used under most conditions"[45] and may

[41] Sea water has a TDS of about 34,000 ppm and a chloride ion content of about 18,000 ppm.

[42] AGRICULTURE HANDBOOK NO. 60, *supra* note 40, at 80.

[43] *See* BULL. 76 APP. WR 122–25.

[44] Doneen, Water Quality Requirements for Agriculture, Proceedings of the National Symposium on Quality Standards for Natural Waters, University of Michigan School of Public Health (1966); *cf.* BULL. 76 APP. WR 111–25.

[45] Doneen, *supra* note 44.

well be the best test available for area-wide measurement of sea water incursion. But there is no indication that the myriad of other factors essential to a measurement of water quality have been given serious consideration by the individual parties to the disputes. A line of 1000 ppm chlorides is at best a rough estimate; individual water users can make such criteria meaningful to particular areas only by relating it to the other factors mentioned above.

2. Salinity in The Delta

Although harmful to all agriculture, salinity presents a special hazard to the Delta islands which are below sea level. The farmer in the Delta lowlands simply siphons channel water down to his fields, irrigates with it, and then pumps the used portions over his levee and back into the channel. But these practices are heavily influenced by the seepage of channel waters under the levees and into the fields.

Water is applied to the crops either by normal surface application or, where subsidence is substantial, by subirrigation through "spud ditches." Where subirrigation is used, the water moves horizontally through the fields from supply ditches to drainage ditches and is then pumped out of the field and back to the channels from which it was siphoned. In some cases the hydrostatic pressure forces channel water into the fields; the water is then drained out as necessary. However, to the extent this occurs when the channel waters are brackish, higher quality water must be applied to leach the fields, and the injurious water kept below the root zone by pumping.[46]

Damage caused by contaminated seepage is a major problem when channel waters are allowed to be degraded, and overland supplies must be used.[47] It might be possible, however, effectively to control seepage through the application of fresh water by sprinklers and carefully engineered ditch systems.[48] The difficulties are compounded by the distribution and maintenance problems resulting from the unusual nature of the peat soils and the expense of developing overland supplies and sprinkler systems.[49]

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[46] For a discussion of Delta irrigation, see BULL. 76 APP. WR 80–81; H. MARCUS, D. EVENSON & D. TODD, SEEPAGE OF SALINE WATER IN DELTA LOWLANDS (Water Resources Center, Berkeley, Cal., Contribution No. 53, 1962).

[47] A more detailed discussion of overland supplies can be found in text accompanying notes 127–42 *infra*.

[48] Interview with L. D. Doneen, Professor of Water Science, University of California, Davis, Feb. 22, 1968; *accord*, H. MARCUS, D. EVENSON & D. TODD, *supra* note 46, at 22; METCALF & EDDY, SUPPLEMENTAL REPORT ON AN ECONOMIC EVALUATION OF SPECIFIC OFFSHORE WATER QUALITY CONDITIONS RESULTING FROM A HYDRAULIC BARRIER (draft version 1968) [hereinafter cited as METCALF '68].

Metcalf and Eddy note that in their studies, "It has also been assumed after consultation with recognized authorities familiar with Delta agriculture, that overland supplies for both Delta uplands and lowlands are physically and operationally possible. In the lowlands where both sub-irrigation and siphoning techniques are employed in crop irrigation, it has been determined that if good quality replacement water . . . is provided, very little change in the present method of operation and resulting crop yields would be experienced. The problem of controlling seepage of poor quality water surrounding the islands would be more than offset by the advantages of good quality water for improved plant metabolism and yield." *Id.* at IV-8.

[49] Interview with Jack Port and Oliver Smith of the Contra Costa County Water Agency, Feb. 7, 1968.

As noted earlier, salts reach the Delta from two sources, agricultural drainage and sea water incursion. Agricultural drainage presently reaches the Delta by way of the San Joaquin River, a system dangerously overloaded and underdiluted. This Valley drainage primarily affects the channels in the southeastern portion of the Delta. High salt concentrations increase leaching costs and impede reuse of the water in those areas. It is the purpose of the proposed federal and state drains to alleviate these problems. Once operative, the drains are not expected to affect agriculture adversely,[50] but they may prove detrimental to other uses of Delta waters.

The oceanic salinity threat is centered in the western Delta, where the channels are closest to the tidal waters and the land surfaces are at the lowest elevations. Estimates of the land area which may be adversely affected by degradation of the channel waters vary widely. Since the extent of incursion is generally inversely proportional to the outflow from the Delta, the seriously threatened areas under present conditions of Shasta regulation comprise a maximum of about 33,000 acres.[51] Future exports are variously estimated to affect 15,000,[52] 40,000,[53] 56,000,[54] and 65,000[55] acres of farmland once full operation of the planned Delta facilities has begun.[56]

Whether the potential economic life of some of the western lands merits the consternation caused by salinity threats might well be questioned. As noted earlier, the peat soils which cover many of the islands oxidize, thus causing the surface to subside and seepages to increase. The Bulletin 76 studies concluded that "significant tracts of Delta land will become impractical to farm unless seepage is controlled and the danger of inudation is reduced."[57] Continuing subsidence and resultant seepage are reflected in the higher pumping costs which are necessary in order to maintain proper drainage. The weak foundation afforded by the peat soils also causes problems of levee maintenance, which result in a certain risk inherent in farming the lower islands. Such factors have been cited as substantially threatening land values in parts of the Delta.[58]

However, the DWR's land use forecasts made no provision for agri-

[50] CCCWA DRAIN REPORT 72. Lack of anticipated effect is due to the location of the discharge point, and the expectation that little of the salts would effect the upstream agriculture. Indeed, both the Federal Water Pollution Control Administration and the DWR claim the drain will have a beneficial effect, at least at outflows below 2,800 cfs. *See* FWPCA REPORT 62–64.

[51] BULL. 76 APP. SI & WR 39.

[52] Address by William R. Gianelli, Director of the Department of Water Resources, Collision Courses Ahead—Water Quality and Regional Development, before the California State Chamber of Commerce, Oct. 24, 1967.

[53] BULL. 76, at 16.

[54] *See* Contra Costa County Water Agency [hereinafter the CCCWA], Projected Delta Water Quality Assuming a Calculated Net Delta Outflow of 1800 CFS After 90 Tidal Cycles (Undated Chart).

[55] FWPCA REPORT 73.

[56] The figures represent the estimates of affected acreage made by different agencies, under different assumed hydraulic conditions, at the various stages of Delta development. *See* text accompanying notes 112–23 *infra;* authorities cited note 128 *infra.*

[57] BULL. 76, at 19.

[58] CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 76 APPENDIX, ECONOMIC ASPECTS 36–37 (1961).

cultural land being put out of production because of subsidence.[59] It was assumed that technical advances could be counted upon to cope with problems of increasing seepage, and that the adverse effects of salinity incursion could be alleviated by replacement water facilities.[60] The assumption that the western lowlands could economically be kept in production would seem valid, but subsidence and seepage will continue under present methods of use until a finite limit is reached, or the present use patterns are discontinued. A major change in agricultural methods (*e.g.*, a shift to peat-preserving dairy pastures) or land use (such as reversion to salt marshes for recreation or development of residential marinas) may be expected to occur in the lowlands, but all estimates of such changes place them at least several decades in the future. In any event, it is doubtless highly desirable to keep such prime lands in production at least until such time as their future has a more finite limit.

C. Salinity Effects on Industry and Municipalities

Uses affected by saline waters vary by the type of industry. Process waters of chemical, primary metal, paper, and food plants must be of sufficient quality not to affect the products with which they come in contact. Waters used for industrial cooling must be of high quality, since the costs of demineralization and water softening increase as quality decreases.[61] However, many of the channels and supplementary supply sources (such as the Contra Costa Canal) contain saline waters. Hence, most of the industries have a dual water supply which draws from either the river or the canal, using whichever source offers the better quality at the time.[62] To the extent high quality supplies are required, the river source is becoming less desirable.

The western delta municipalities presently rely mainly on the Contra Costa Canal, although two municipal suppliers still partially rely on river waters when their quality is acceptable. Antioch's water requirement (2,900 acre feet in 1960) is supplied from the river channel for about nine months of the year. The other supplier, the Treated Water Division of the Contra Costa County Water District, took about 44 percent of its 15,100 acre feet from the channel. Further degradation of the waters, such as might be experienced as a result of agricultural drain discharge, has been estimated to cause an increased annual cost of $13,800 to these two agencies by 1975.[63]

The requirements of both industrial and municipal users are expected to increase considerably.[64] However, the increased demand will overtax the Contra Costa Canal, which is already affected by degradation. Thus, even those users who draw from the canal (which originates in the western Delta) will stand to be affected by saline incursion.

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[59] *See* BULL. 76 APP. WR 35–41, plate 6; *cf.* text accompanying note 17 *supra.*

[60] BULL. 76 APP. WR 96–97.

[61] *See id.* at 43–78.

[62] *See id.* at 126–27.

[63] CCCWA DRAIN REPORT 63–71; *cf.* FWPCA REPORT 30–31.

[64] BULL. 76, at 14–15.

D. Other Forms of Pollution and Their Victims

The danger of sea water incursion is probably the major water quality problem of the Delta. Nevertheless, a significant threat of pollution is posed by the mineral salts and toxic substances which may be deposited in the Delta by new agricultural drainage systems.

The federal systems will accommodate only agricultural waste waters. The state drain, although predominantly agricultural, will also carry municipal, industrial, and oil field wastes as these in turn become critical disposal problems. Thus, besides the estimated 50 million tons of leached salts to be removed from the valley by the drain during its first 30 years of operation, nitrogen and phosporous (fertilizer constituents), various pesticides, oils, and phenols will be included in varying amounts.[65]

It is generally agreed that increased nutrients, pesticides, and toxic substances pose no threat to agricultural, municipal, or industrial users of the Delta, under conditions of sufficient outflow. However, the drains' possible impact on aquatic life and recreation has been seriously questioned. [66]

1. Pesticides

Pesticides are found throughout the waters and bottom sediments of the Bay-Delta system, with the highest concentrations found in the western Delta and the bays seaward from it.[67] The DWR has indicated that the "concentrations of pesticides in the drain discharge will not be significantly different than those already in the Delta," but at the same time it has admitted that "[t]he total effects of pesticides on the aquatic environment are . . . not well understood. The whole matter of pesticides in water requires continuous reevaluation."[68]

It is probable, however, that much of the agricultural drainage will be from tile drains, which are used to collect and dispose of subsurface saline waters. Nitrates and phosphates flow easily into such drains, but some pesticides do not reach subsurface levels. Hence, surface drainage would collect far greater amounts of harmful pesticides. Therefore, reuse of the surface drainage and exclusion of such waters from the Drain facilities would decrease the potential harm of drain waters. [69]

The toxic substances already present in the Bay-Delta waters, however, may already have proven lethal to wildlife. Fish kills have increased, and

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[65] CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 127, THE SAN JOAQUIN MASTER DRAIN 2, 16, 19–23 (1965) [hereinafter cited as BULL. 127].

"The drainage disposal service to be provided by the San Luis Drain will be available to Districts only in accordance with service contracts [which] . . . provide for disposal of subsurface agricultural drain flows and will prohibit discharge into the drainage systems of refuse, garbage, sewage effluent, industrial waste, oil, mine tailings or other pollutants." Letter from E. F. Sullivan, Acting Regional Director of the Bureau of Reclamation, to *U.C.D. Law Review*, Nov. 6, 1968.

[66] CCCWA DRAIN REPORT; FWPCA REPORT.

[67] FWPCA REPORT 54; BULL. 127, at 38.

[68] BULL. 127, at 38.

[69] FWPCA REPORT 37, 39–43; *see* note 65 *supra*.

large amounts of pesticides have been reported in the tissues of Delta fish.[70] Because of such factors, the Department has admitted its uncertainty about the dangers of pesticides and nutrients, and has indicated that it may extend the drain to a discharge point closer to the Pacific Ocean.[71] But in considering the pesticide problem alone, the Federal Water Pollution Control Administration has taken the position that tile drainage waters, combined with the increasing shift to biodegradeable pesticides, will not significantly increase the pesticide concentrations in the receiving waters of the Delta.[72] Whether the drain poses a significant threat to the Delta therefore seems to depend on the possible effects of an increase of nutrients.

2. Nutrients

Small quantities of nitrogen and phosphorous are beneficial to aquatic life; however, concentrations above such minimal amounts result in prolific weed, algae, and plankton growth or "blooms." The presence of large amounts of nutrients stimulates algal growth which usually results in a marked alteration in the amounts of dissolved oxygen in the receiving waters. These changes can be extremely detrimental to the fisheries.[73]

The DWR has indicated that the initial discharges of nutrients will be in relatively small amounts compared to other waste waters discharged elsewhere in the Bay system.[74] Nevertheless, depending on the amount of outflow, the DWR's estimate of 21 ppm was felt by the Federal Water Pollution Control Administration to be sufficient to result in high nitrogen concentrations in the western Delta and in Suisun Bay (downstream from the drain outlet).[75] Such increases of total nutrients in the system would then be

[70] "Chlorinated hydrocarbons above levels regarded as safe for human tolerance have been found in striped bass caught in San Francisco Bay and the Delta. Not enough yet is known on this subject to predict possible effects of pesticides on fish and wildlife in the estuary." State Water Resources Control Board, San Francisco Bay-Delta Water Quality Control Program, Bay-Delta Report for July–August, 1968, at 6. The same report notes that a preliminary report by the Department of Fish and Game declared that "water of questionable quality often influences fish populations less by direct sudden killing than by affecting behavior patterns and ability to cope with stress. Thus, adverse changes can occur subtly over a relatively long period of time, making it difficult to trace cause and effect relationships and making it doubly difficult to measure 'safe' water quality." *Id.* at 5.

[71] "If the master drain, including the planned . . . safeguards, impairs the use of the receiving waters or adjacent areas, the Department of Water Resources would extend the master drain to a more westerly location, such as Suisun, San Pablo, or Monterey Bay." BULL. 127, at 38. The cost of such extensions would be, respectively, $50, $129, or $235 million as of 1970. *Id.* at 31 (Table 10).

[72] FWPCA REPORT 66.

[73] *Id.* 49, 74–78; CCCWA DRAIN REPORT 35.

[74] BULL. 127, at 37–38. "Despite this nitrogen-laden agricultural drainage flow, that source would amount to no more than 7 percent of the total nitrogen load from all waste sources" in the entire Bay-Delta system. Press Release, *supra* note 22.

[75] BULL. 127, at 21; FWPCA REPORT 39. "Removal of accumulated nutrients in the North [San Francisco] Bay depends upon Delta outflow. Under expected conditions of reduced outflow resulting from upstream water storage and diversion projects, the Bay system will accumulate significantly increased quantities of nutrients—which could lead to accelerated algal growth and thus a speedup in Nature's process of converting shallow water bodies to marshland—[*i.e.*,] euthrophication." Bay-Delta Report for July–Aug., 1968, *supra* note 70, at 7.

magnified when the Peripheral Canal transports water directly to the export pumps, thus preventing the pumps from removing some of the nitrogen from the Delta channels. It was the final conclusion of the Federal authorities that "the water quality objective required to protect the anadromous fishery will be greatly exceeded [*i.e.*, to a detrimental extent] throughout Suisun Bay and the Delta due to the discharge of treated municipal and industrial waste effluents, the Master Drain, tributary streams, and local agricultural drainage. . . . This information . . . indicate[d] that significant fishery losses would result if these conditions are allowed to prevail. Losses were estimated as $4.4 to $9.1 million in 1990, and $8.0 to $12.4 million in 2020."[76]

Other consequences of nitrogen enrichment are primarily recreational and aesthetic. Fouling organisms thrive in the enriched waters, creating increased boat hull and wharf maintenance costs. Algae growths also restrict water contact sports and decrease aesthetic enjoyment, since they create nuisance conditions of bad taste, odor, and excretions toxic to other animal forms.[77]

IV. Proposed Physical Solutions to The Agricultural And Oceanic Pollutions

A. Agricultural Pollution—The Drains

The San Joaquin Master Drain, as envisioned by the Department of Water Resources in Bulletin 127, was designed to prevent the leached salts of the valley from entering the Delta by way of the San Joaquin River. Instead, if the waters were concentrated in a drainage system and deposited well downstream from the export pumps and major Delta users, it was thought that the salts and pollutants could be discharged with little danger to the receiving waters. Operation of the Drain was to include surveillance facilities to monitor the quality of the discharged waters, and a detention reservoir capable of storing, diluting, and treating the waste waters if they were found to be harmful to the Delta or Bay.

The Master Drain was to have been a joint federal-state project, in order to "eliminate the otherwise unavoidable high cost of duplicate facilities."[78] Thus the state's drainage authorization and plans[79] were coordinated with those of the federal San Luis Project[80] and tentative agreements for construction were negotiated. In 1967, however, the state's plans for funding proved infeasible, and DWR withdrew its participation in the proposed federal-state drainage facility.[81]

Because it is uncertain whether the state will resume participation, the USBR has on its own behalf begun construction of the first sections of its San Luis Drain. The drain will be a 188-mile concrete-lined canal, stretching from Antioch to Kettleman City, the first units of which are expected to be

[76] FWPCA Report 39, 64–65, 76–77.
[77] *Id.* 78–80.
[78] Bull. 127, at 34; *see* FWPCA Report 1, 11–12.
[79] Cal. Water Code §§ 12931, 12934(d)(4) (West Supp. 1968).
[80] San Luis Authorizing Act, Pub. L. No. 86-488, 74 Stat. 156 (1960).
[81] California State Dep't of Water Resources, Bulletin 132–67, The California State Water Project in 1967, at 28–29, 295 (1967).

operational by 1969. The effluents will be stored in the Kesterson Regulating Reservoir until such time as an outlet is provided near Antioch.[82] The design and construction of an outlet, however, must await further determinations of feasibility and effectiveness by the USBR and the FWPCA.

B. Oceanic Pollution—Barriers and the Peripheral Canal

Salinity incursion, perhaps the most pressing problem in the Delta, was first systematically studied in 1924 in preparation for a joint state-federal report[83] on the feasibility of a salt water barrier "below the confluence of the Sacramento and San Joaquin Rivers." It was noted in that report (Bulletin 22) that:

> Obviously any effort made toward the elimination of salinity in the delta region must be directed either toward increasing the discharge of the rivers during critical periods through release of winter water stored in mountain reservoirs to act as a natural barrier, or toward excluding the tidal currents from the region through construction of an artificial, positive barrier. Objections to the first plan have been raised on the ground that no fresh water should be sacrificed in the manner proposed for the reason that ultimately, every drop of water in the rivers in normal years will be required in irrigation or for other efficient use. The contracts under which the investigation was made provide for study of the latter plan only.[84]

This concept of either hydraulic or physical barriers as the solution of the "delta problem" was to remain viable well into the 1960's.

A year after the above report, Bulletin 25 presented proposals for a state water plan. It recognized three important regions as the initial units of that plan, the first of which was "the water problem in the Sacramento River Basin . . . of invasion of saline water into the upper San Francisco Bay and delta region." The proposed plan for the relief of those areas was:

> the construction of the Kennett reservoir [now Lake Shasta] and Contra Costa County conduit. . . . The reservoir could be operated to attain the following accomplishments: . . . 5. Control salinity to the lower end of the Sacramento-San Joaquin Delta by release of water to maintain a fresh water flow past Antioch into Suisun Bay of not less than 3300 second-feet. 6. Make available in the delta a water supply, without deficiency, for the developed industrial and agricultural area along the south shore of Suisun Bay in Contra Costa County.[85]

The report went on to conclude that such releases could positively control the invasion of saline waters, and that a physical salt water barrier would be neither necessary nor economically justified as a unit of that plan.[86]

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[82] Letter from E. F. Sullivan, *supra* note 65.

[83] CALIFORNIA STATE DEP'T OF PUBLIC WORKS, DIVISION OF WATER RESOURCES, BULLETIN 22, REPORT ON SALT WATER BARRIER BELOW CONFLUENCE OF SACRAMENTO AND SAN JOAQUIN RIVERS, CALIFORNIA (1929) [hereinafter cited as BULL. 22].

[84] *Id.* at 38.

[85] CALIFORNIA STATE DEP'T OF PUBLIC WORKS, DIVISION OF WATER RESOURCES, BULLETIN 25, REPORT TO LEGISLATURE OF 1931 ON STATE WATER PLAN 44 (1930) [hereinafter cited as BULL. 25].

[86] *Id.* at 55–56.

1. Physical Barriers

Prior to the Bulletin 22 salt water barrier report, physical barriers had been proposed in the 1860's, 1880, and 1921.[87] Nor did the idea die when "vetoed" by the later commitments to controlled releases. The releases from Shasta, begun in 1944, established a fairly effective means of control, but "at the cost of water sorely needed in other parts of California."[88] Reports to the legislature spurred legislation[89] which resulted in a further study of physical barriers and an "interim" report, Bulletin 60.[90]

The most commonly proposed physical barrier was to be at Chipps Island, a narrow spot in the Sacramento River about four miles below its confluence with the San Joaquin.[91] It would be an earthen embankment, with a floodway structure, navigation locks, fish ladder, and an emergency navigation "plug" which could be opened in the barrier if necessary.

Such a barrier would allow positive salinity control, provide a ready source of fresh water for Delta users and exporters, and of course salvage water otherwise used for salinity repulsion. A physical barrier, however, was considerably more expensive than other means of control.[92] Other detriments recognized were the potentially polluted quality of the waters trapped above the barrier, the necessity of strengthening the levee system, the effect the barrier would have on the migratory fish populations, and the impediment to navigation posed by the presence of locks on the river.[93]

Later legislation provided for further barrier studies which also encompassed flood control, water supply, exports to Southern California, and salinity control. The comprehensive study authorized by the California legislature[94] was reflected by Bulletin 76 and its four published appendices. Simultaneously, the Army Corps of Engineers and the Bureau of Reclamation were studying the Delta, each with its own proposals for control.[95]

The complexity of the problem and the competing interests of the agencies and Delta users created an impasse, which was somewhat resolved by the formation of the Interagency Delta Committee in 1961. Composed of representatives from the Department of Water Resources, the Bureau of Recla-

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[87] Several organized groups have actively proposed barriers, *e.g.*, The Salt Water Barrier Association of California, Inc., a group of western Delta industrialists especially active from 1924–1930.

[88] CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 60, INTERIM REPORT TO THE CALIFORNIA STATE LEGISLATURE ON THE SALINITY CONTROL BARRIER INVESTIGATION 25 (1957) [hereinafter cited as BULL. 60].

[89] Abshire-Kelly Salinity Control Barrier Act of 1955, Cal. Stat. 1955, ch. 1434, at 2603.

[90] BULL. 60, *supra* note 88.

[91] *Id.; cf.* BULL. 76, at 30.

[92] INTERAGENCY DELTA COMMITTEE, PLAN OF DEVELOPMENT, SACRAMENTO-SAN JOAQUIN DELTA 7 (1965) [hereinafter cited as IDC REPORT]; BULL. 76, at 53.

[93] BULL. 76, at 30–31, 49, 50. Barriers appear to be feasible elsewhere. *See* notes 4–5 *supra.*

[94] Abshire-Kelly Salinity Control Barrier Act of 1957, Cal. Stat. 1957, ch. 2092, at 3717 (*as amended* Cal. Stat. 1959, ch. 1765, § 3, at 4246 and Cal. Stat. 1959, ch. 2038, § 1, at 4719).

[95] A summary of the Army's proposals is found in *San Francisco Salt Water Dams Found Feasible,* 171 ENGINEERING NEWS-RECORD, Aug. 15, 1963, at 22.

mation, and the Corps of Engineers, the Committee submitted a Plan of Development in 1965.[96]

Although the recommendations of the Committee were not binding on any of the member agencies, they were generally considered to resolve the major problems, and have since been accepted by at least the DWR and the Bureau.[97] The physical barrier concept was laid to rest by that report.

2. Hydraulic Barriers

A hydraulic barrier is any controlled release of fresh water the force and presence of which will repel the threatening sea waters. Any discussion of salinity control outflows must therefore clearly define the magnitude of flow and control under consideration. In 1961 the State Water Rights Board (now the State Water Resources Control Board) concluded that "it would be unreasonable to dedicate for salinity repulsion purposes the large quantities of water that would be required to flow out to the sea."[98] That conclusion, however, was predicated upon the use of a lesser outflow as an essential part of any Delta plan. Similarly, the hydraulic barrier concept considered and rejected by the Interagency Delta Committee was one which used fresh water outflow, within the then existing channels of the Delta, as the major means of control.[99] In contrast, the "control flows" discussed here as later versions are those which will be released into the Delta as it is now planned for development, and are recognized as one element of the overall plan now foreseen for the Delta.

The specific degree of Delta outflow required for salinity repulsion has never been definitely agreed on, due largely to the difficulty of measurement and the wide seasonal and yearly fluctuations in stream flow. But it should also be remembered that the outflow affects the winter flushing, fisheries, and ecological balance of the channels.[100]

a. The Original Criteria

The early studies had recognized that invasions of salinity occurred during the periods of deficient stream flow; hence:

> the primary requirement for control and prevention of the invasion of salinity into the delta is the furnishing of a sufficient water supply flowing into the delta to fully satisfy the consumptive demands of crops . . . .

[96] IDC REPORT.

[97] The Army still likes barriers. "We believe that this positive permanent control of salinity by barrier construction would generally resolve the water transfer problems from the north to southern California by way of the delta. . . . [The Peripheral Canal] would fulfill a portion of the function of the barrier plan. [When studies are completed] . . . we expect to be able to examine the impact of the peripheral canal on the delta area and its effect on the water quality of that area and of the bay." Statement of Brig. Gen. John A. B. Dillard, U.S. Army Division Engineer, in *Hearings on Water Pollution—Central and Northern California Before the Natural Resources and Power Subcomm. of the House Comm. on Gov't Operations*, 90th Cong., 1st Sess., at 106 (1967).

[98] California State Water Rights Board Decision D 990, at 56 (1961) [hereinafter cited as D 990].

[99] IDC REPORT 6; *cf.* F & G REPORT, at 25–28.

[100] FWPCA REPORT 17–18; BULL. 123, at 16; F & G REPORT; *see also* note 75 *supra*.

> After this primary requirement is satisfied, additional water is necessary to repel tidal action and the tidal diffusion of salinity resulting therefrom. The amount of additional water required varies with the location at which control is sought or desired and the degree of salinity desired to be controlled at the particular location.[101]

The Department of Public Works study reported in Bulletin 27 therefore sought to establish the most desirable location and degree of control, and then determine the outflow necessary to maintain that standard. Its final recommendation was based on several important assumptions:

> The degree of control required is dependent upon the quality of water necessary for agricultural, industrial and municipal demands. For agricultural use with average conditions and crops in the delta, it has been assumed that water having a salinity of over [1000 ppm of chlorine] . . . would not be suitable for irrigation . . . .
>
> The water required for use . . . by industries and for general domestic use . . . must be much fresher in quality. The maximum salinity allowable for these uses should not exceed . . . [250 ppm] and preferably not over . . . [100 ppm].[102]

It was decided to use the agricultural requirement as the most practical criterion, since the outflows necessary to maintain either the municipal or industrial standards were considered uneconomical.

> [With control of 1000 ppm chlorine near Antioch] the salinity would be considerably less upstream, and the channels of over 95 per cent of the delta would have fresh water suitable for . . . [agricultural as well as] industrial and domestic use. . . . It is evident that the necessary supplies of fresh water for industrial and domestic use [downstream from Antioch] along Suisun Bay could be more economically obtained by conveying fresh water in special conduits from points within the delta, than by means of controlling salinity by stream flow to points farther downstream than the lower end of the delta.[103]

The study concluded that

> the most desirable and practical plan to adopt for controlling salinity by means of stream flow would be a control at a point near Antioch sufficient to limit . . . [salinity to 1000 ppm], and lesser degrees of salinity upstream. . . . A quantity of 3300 second-feet has been adopted as the recommended amount of net control flow to be provided as a minimum flow in the combined river channels past Antioch into Suisun Bay. This would put the control point for a maximum degree of . . . [1000 ppm] about 0.6 miles below Antioch.[104]

That determination was later adopted by Bulletin 25 as part of the State Water Plan[105] and is widely cited as evidence of a legislative commitment

[101] BULL. 27, at 220; *cf.* BULL. 76 APP. SI & WR 48–61.
[102] BULL. 27, at 221.
[103] *Id.* at 223.
[104] *Id.* at 224.
[105] BULL. 25, at 79; CAL. WATER CODE §§ 10000–03 (West Supp. 1968).

to a control flow of 3,300 cfs.[106] However, the present validity of the 3,300 second feet criteria would seem partially dependent on the continued validity of the above assumptions on which it was based. To this extent, the assumptions should be considered in conjunction with all the other criteria set forth from time to time by various Delta interests. But this is not an easy task.

b. Later Versions of Outflow Criteria

The State Water Plan, as set forth in Bulletin 25, established the 3,300 second feet outflow to maintain the 1,000 ppm line near Antioch.[107] The state's Central Valley Project was adopted directly from that plan, having salinity control as one of its objectives.[108]

When the Federal government took over the CVP, it was widely understood to have adopted the same operating criteria.[109] Thus, in a 1946 report by the Bureau of Reclamation on the Central Valley Reclamation Project (which was adopted by Secretary of the Interior Krug) it was stated that:

> 4. The project functions of salinity repulsion, fish protection, and recreation are not specifically mentioned in the legislation. It is concluded that salinity repulsion may be classified as a supplemental irrigation function . . . .
>
> 13. The Central Valley project . . . will provide the following services . . .:

[106] This particular standard has been embodied by reference in the legislation for both the state and federal projects. *See* text accompanying notes 110, 227–38, *infra*. It has thus acquired some status as a criterion and must be assessed in that light.

[107] BULL. 25, at 79; the original statement appears in BULL. 27, at 224.

[108] CAL. WATER CODE § 11207 (West 1956) provides: "Shasta Dam shall be constructed and used primarily for the following purposes: (a) Improvement of navigation . . . (b) Increasing flood protection in the Sacramento Valley (c) Salinity control in the Sacramento-San Joaquin Delta."

There is little doubt as to the legislative intent: "The Central Valley Project is designed to accomplish the following purposes: (1) To improve navigation, aid in flood control, and increase the summer supply of irrigation [water] . . . . (2) To provide, by means of . . . [Shasta Dam], flows adequate to prevent the intrusion of salt water through tidal action into the rich delta region of the Sacramento and San Joaquin rivers, to furnish a supply of fresh water for irrigation in the delta and to provide a supply of fresh water to the industrial and agricultural regions around Suisun Bay. The engineering reports state that the operation of . . . [Shasta Dam] would accomplish these purposes, by maintaining a river flow of not less than 3300 cubic feet of water per second past Antioch . . . ." California Water Resources Comm'n, Report to the Governor of California on State Water Plan 23 (1932).

[109] There is no doubt that "salinity control in the Delta is one of the purposes of the federally authorized Central Valley Project." D 990, at 48. Because Bulletin 25 recommended specific operating criteria for the project, it is generally assumed that the same criteria were adopted as a part of the plan by the federal operators of the project. BULL. 3, *supra* note 26, at 26, noted that the Federal CVP was "now being completed in substantial accord with the State Water Plan, as published in [Bulletin 25]." The plan appears to have been adopted in toto: "The [State CVP] act specifies and describes certain units of the project and also provides for the development of other units from time to time . . . . The initial Central Valley Project of the State Water Plan was authorized and adopted as a Federal undertaking, first by executive order in 1935, and subsequently by congressional authorization in 1937, and is now being constructed by the Bureau of Reclamation . . . ." U.S. Bureau of Reclamation, Comprehensive Plan for Water Development, Central Valley Basin, California 214 (unpublished manuscript 1945); *cf.* 990 Dissent 38, 48.

(c) Salinity Repulsion.—The maintenance of a minimum flow of approximately 3,300 cubic feet per second at Antioch as proposed in operating schedules for Shasta (estimates range from 3,300 to 5,000 cubic feet per second, and no final figure is closely assured) is believed sufficient to prevent salinity intrusion in the Sacramento-San Joaquin delta, thereby preventing such extensive crop damage as has been common in the recent past while at the same time permitting more beneficial use of lands in the affected area.

15. . . . (a) Shasta Dam . . . and reservoir [will] serve all the major functions of the project as a whole—flood control, navigation, salinity repulsion, irrigation, and municipal water storage, and . . . hydroelectric generation.[110]

As mentioned earlier, fairly effective salinity control has been achieved since the Shasta unit of the CVP went into effect.[111]

The Bureau has not maintained a position consistent with its early statements of purpose or criteria. Its present position on Delta outflow was set forth in 1957 in the "Spencer Letter," in which the Regional Director of the Bureau contended that the obligations of the Central Valley Project were satisfied when a satisfactory quality of water was provided at the intake to the Contra Costa Canal and Tracy Pumping Plant, located far inside the Delta. The Bureau determined that maintenance of that quality would require a minimum outflow of only 1,500 second feet, which would admittedly fail to protect the Delta to the extent recommended by the state in Bulletin 27.[112] It was the Bureau's position that some other system could be used "at far less cost than in precious water supplies . . . ."[113] The Bureau has thus adopted and followed a policy of giving prime consideration to those Delta waters which are to be exported to the South.

The DWR, in establishing a minimum outflow necessary for protection of both the local supplies and the export facilities under the Bulletin 76 recommendations, similarly decided to protect only 90 percent of the Delta. To do so would require a 1,000 second feet outflow. Substitute water facilities were to provide replacement water for the remaining ten percent of the Delta not protected. Without proper facilities constructed to protect the exported waters, the DWR found that an outflow of 6,000 second feet would be necessary.[114]

The position of the two agencies has fluctuated greatly over the years, partly dependent no doubt on their changing objectives and alterations in plans for facilities.[115] Their present positions still differ, making any agreement on a single Delta outflow criteria difficult to achieve, since the agencies jointly operate the Delta. The state now plans a Delta outflow of 1,800 cfs, while the Bureau maintains that 1,500 cfs is sufficient.[116]

[110] H.R. Doc. No. 146, 80th Cong., 1st Sess. 7–13 (1947).
[111] *See* text accompanying note 17 *supra*.
[112] BULL. 76 APP. SI & WR 64; *cf.* 990 Dissent 50–51; D 990, at 50.
[113] 990 Dissent 51.
[114] BULL. 76 APP. SI & WR 65, 67, 146; BULL. 76, at 34.
[115] For discussion of the varied estimates, see 990 Dissent 7, 44–48, 54–55.
[116] California State Water Rights Board Decision D 1275, at 32 (1967).

Although their outflow estimates differ, both agencies have based their estimates on the same "coordinated plan" for the operation of their projects.[117] Both the DWR and the Bureau signed the November 19, 1965, Delta Water Quality Criteria, an agreement between those agencies and two eastern Delta user groups.[118] It was the intent of the signers that the November 19th Agreement not be binding upon them, but rather that it be the working basis for later, more binding agreements. Recently, however, the agreement has acquired the status of a semi-official quality standard for the Delta which is considered to be binding on the DWR.[119] The agreement calls for a chloride measurement of 1,000 ppm at Jersey Point (on the San Joaquin River) and at Emmaton (on the Sacramento River) for at least seven months of a "critical" year. Both locations are about 7 miles upstream from the old "Antioch" measuring point. During the period from April 1 through May, the quality at those points must average 200 ppm chloride or less for at least ten consecutive days. Interior locations are to be maintained at readings of 450 to 800 ppm. Even as to these specific criteria, however, there is as yet no agreement on the outflow which is needed to attain such levels of control.

It is by no means clear that the November 19th Criteria can be easily met, either at DWR's proposed outflow of 1,800 cfs or the Bureau's 1,500 cfs. Many informed observers suggest that the upcoming Bay-Delta Study's outflow proposals will be much higher in magnitude, perhaps in the neighborhood of 4,000 cfs. Indeed, the FWPCA has flatly stated that the November 19th Criteria will be "grossly exceeded at the 1500 cfs outflow."[120] Such discrepancies undoubtedly result from the complex nature of the calculations necessary to estimate outflow, and may be due to differences in planned duration of flows or to the changes in Delta hydrology resulting from planned operation of the Peripheral Canal. The Contra Costa Water Agency believes that the latter factor alone will necessitate an outflow well above 1,800 cfs. However, the Director of the Department has recognized this discrepancy:

> There has been much speculation on whether or not the November 19, 1965, agreement can be met by various specified amounts of Delta outflow. . . . Whatever outflow is required will be provided by the Bureau of Reclamation and the State Department of Water Resources.[121]

The major factor in the outflow disputes is the cost and availability of the waters which must be used to maintain a minimum acceptable outflow. The DWR maintains that any deviation from the amounts necessary to main-

[117] *See, e.g.*, the May 16, 1960, agreement between the DWR and USBR, discussed in BULL. 76 APP. SI & WR 114.

[118] *See* text accompanying notes 33–34 *supra.*

[119] *See* text accompanying note 165 *infra.*

[120] FWPCA REPORT 73.

[121] Address by William R. Gianelli, Director of the Department of Water Resources, The Delta and the Peripheral Canal, before the Southern California Water Conference, May 27, 1968. Such an outcome would put the DWR in the anomalous position of providing an outflow which by their own reckoning might be highly detrimental to the project's fiscal integrity.

tain the November 19th Criteria would be prohibitively expensive.[122] They have estimated that to move the 1,000 ppm of chloride line downstream from the locations stipulated in the November 19th Criteria to "a point near Antioch" would require an additional outflow of 1,900 cfs, at an annual volume of about 1.3 million acre feet. They cite the annual cost of storing the necessary additional waters at over $13 million.[123]

Unfortunately, such estimates of cost are usually oversimplified. References to "additional" water often assume that it is possible to fully control the rivers, a feat which cannot truly be claimed until several decades in the future. To argue that some amount over 1,500 or 1,800 cfs will be allowed to flow ignores that large quantities of winter waters will continue to flow past Antioch for some years to come.

3. The Peripheral Canal and Overland Supplies

The Interagency Delta Committee, after rejecting the plans for either a physical or a hydraulic barrier, recommended a plan encompassing "an overall framework" within which many different facilities and agencies could be combined. The major component of the plan is a 43 mile Peripheral Canal, which would allow the export waters to bypass the portions of the Delta most subject to saline incursion and be carried directly to the export pumps (see figure 2). For the Department of Water Resources, it is an optimum solution to the Delta problem which "is the only project of the many alternatives studied that not only fulfills the needs of both the State Water Project and the Federal Central Valley Project, but also provides substantial benefits to the Delta."[124]

Several features of the canal plan relate directly to the salinity problem. The canal itself will contain and protect the export waters, while release facilities will allow some water to flow into the Delta channels and thus maintain the flows necessary for a substantial but controversial degree of salinity control and fishery maintenance. A report of the Department of Fish and Game has noted that "of the numerous plans proposed for water transfer in the Delta, the Peripheral Canal was found by far the most beneficial to the Delta's aquatic environment and fishlife."[125]

It is clear that the Department of Water Resources regards the Canal as an indispensable part of the State Water Project. The DWR has repeatedly stated that the Canal must be in operation no later than 1976 in order to avoid scour damage to the channels and "draw down" (abrupt lowering of the water level) problems in the southern Delta channels, to stop additional damage to the Delta fishery, and to assure that quality and quantity commitments to the water supply contractors south of the Delta can be met.[126]

[122] *See* text accompanying note 163 *infra*.

[123] Dep't of Water Resources, unpublished chart. The figures are frequently cited by the DWR, *e.g.*, address by William R. Gianelli, Director of the Department of Water Resources, The Delta Myth, before the Commonwealth Club of California, Water Problems Section, Jan. 11, 1968.

[124] Address by William R. Gianelli, *supra* note 121.

[125] F & G REPORT, *supra* note 32, at 11.

[126] Address by William R. Gianelli, *supra* note 121.

The DWR's strong desire to have the canal operational has been a major impetus in speeding some of the Delta negotiations.

a. Overland Supplies for Agriculture

A major component of the Peripheral Canal plan is its provision for the Western Delta Agricultural Water Facilities. These controversial facilities would operate as an overland replacement supply for the western Delta lands affected by salinity incursion. As presently planned, the substitute supply system would probably cost from $7 to $10 million.[127]

The overland supply facilities are designed to provide a water supply in lieu of that presently or formerly available in the river channels. However, estimates of the extent of land to be served vary, and will undoubtedly change further as more is known about the final extent of outflow and control to be applied by the agencies. Estimates made by the DWR as to the lands to be served vary from a figure of ten percent of the Delta to specific references to various islands.[128]

The form which such facilities might take is unclear. In 1962, the DWR planned "distribution canals along the toe of the levees [which] would provide a means of serving water to areas in which the adjacent exterior channels contain water too saline for use."[129] But many agriculturists maintain that canals are impractical in the unstable peat soils of the Delta islands. More recent statements have indicated that closed systems may instead be used.[130]

No one, however, appears to have definitive information about the cost or general practicability of any overland distribution system. The success of such a system will depend on a complex interaction of seepage pressures, water levels in the root zones, and distribution system engineering, as well as numerous other factors. And, although a canal system exists on Sherman Island (the western-most of the agricultural lands),[131] there have been no studies of replacement supply problems on any of the predominantly peaty islands in the rest of the western Delta.[132] Considering the emotionally

[127] Interview with W. R. Attwater, then an attorney for the DWR; *cf.* IDC REPORT 11; BULL. 76, at 52, 54.

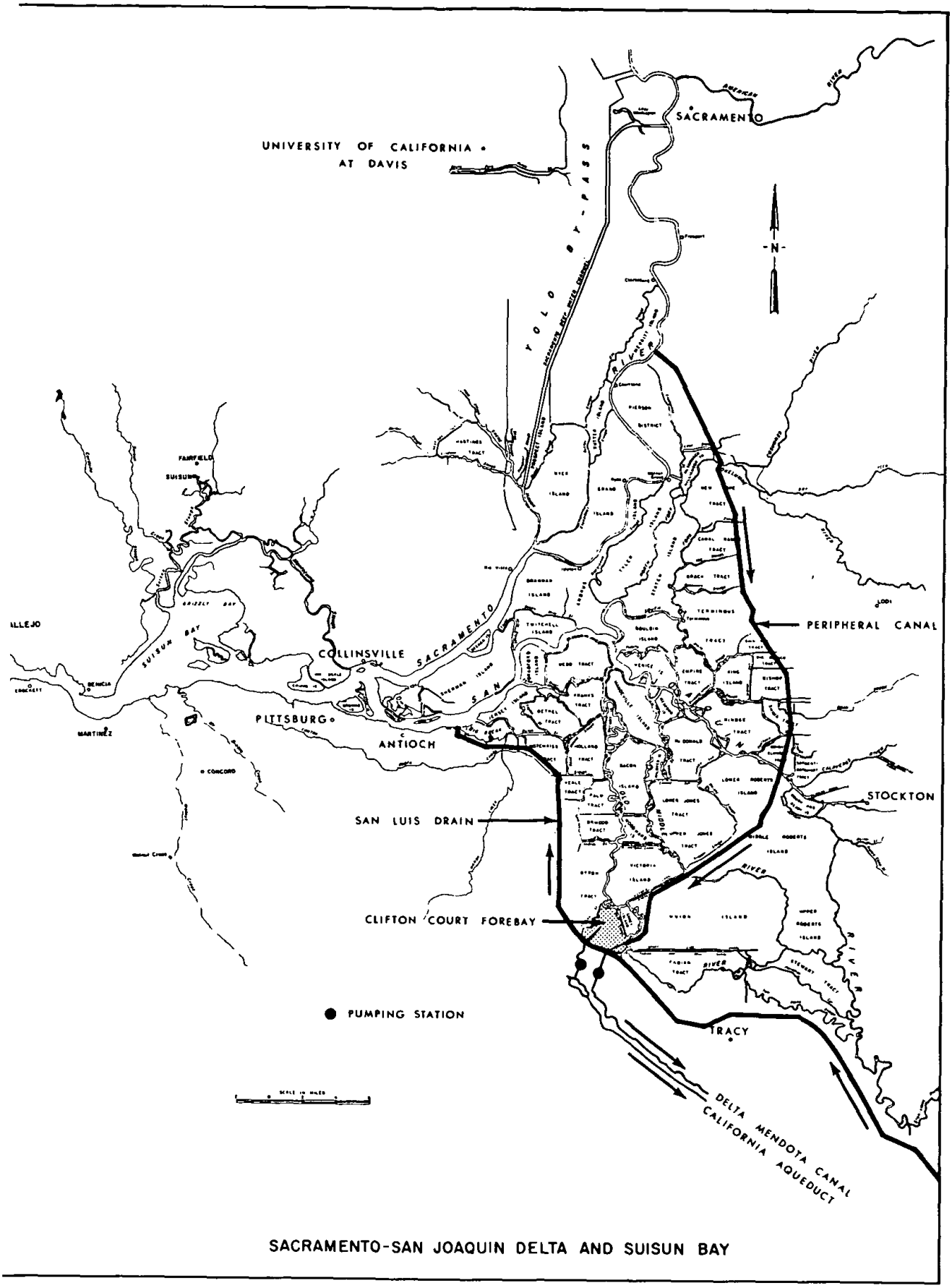
[128] BULL. 76, at 34 noted that "Water would be provided to all agricultural lands downstream of the line of *maximum* salinity encroachment of 500 ppm of chlorides." Applied to the November 19th Criteria, such a line would extend to a considerable portion of the Delta, larger than the ten percent figure mentioned in many of the other reports. (*See, e.g.*, note 114 *supra*); *cf.* D 990, at 55–56. In BULL. 76 APP. WR 145 it was stated that, "The service area of the replacement water facilities . . . will consist of all of the Delta lowlands within the western Delta study area which are or would be affected by salinity intrusion. This area includes all of Sherman, Twitchell, Bradford, and Jersey Islands, Bethel and Hotchkiss Tracts, and portions of Brannan Island, and Holland and Webb Tracts."

[129] BULL. 76 APP. SI & WR 125.

[130] "The Department and the U.S. Bureau of Reclamation propose to serve the freshwater needs of all the western Delta area including Contra Costa County, by overland conduits, pipelines, and reservoirs." Address by Robert E. Whiting, Chief of the Delta Studies Section, Sacramento District, Department of Water Resources, The Peripheral Canal and the Delta, before the Point San Pablo Yacht Club, Apr. 12, 1968.

[131] BULL. 76 APP. WR 127.

[132] The study of seepage of saline water, *supra* note 46, was concerned only with Sherman Island, which, although affected by incursion, is not typical of western Delta peat islands. *See* H. MARCUS, D. EVENSON & D. TODD, *supra* note 46, at 6.



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charged dispute which the overland supply plan has engendered, the absence of comprehensive feasibility studies is a curious omission which precludes meaningful discussions of the problem.

Assuming the overland supply concept is adopted, the decision on the form of the distribution system (whether it be canals, lined ditches, or pipes) will probably depend on the outcome of negotiations or future court battles. The question will probably center around just how "all-inclusive" the replacement system promised by DWR will be, and to what extent the farmers must pay any of the costs involved.[133]

The general concept of overland supplies appears to be consistent with the express provisions of §12202 of the Water Code which recognizes that "a substitute water supply" might be provided for Delta users "in lieu of that which would be provided as a result of salinity control." Delta interests complain that a substitute supply, even were it able to fulfill agricultural, municipal, and industrial uses, may not suffice for the in-place uses, such as recreation or ecological maintenance.[134]

The DWR had hoped to use the proposed industrial and municipal agreements (see below) as models for similar agreements with the agricultural interests. However, many of the western Delta agriculturists are adamantly against the replacement supply concept, and negotiations there have shown little progress. This obstacle may be overcome if the new Delta Water Agency is able to contract with the Department of Water Resources for an adequate supply system. Division One of the Agency includes most of the peat islands affected, and the Agency would probably have the power to commit those farmers to such a plan.[135]

If the remaining western Delta users refuse to accept the conditions offered by the exporters, their alternatives seem limited to attempts at legal action, condemnation of their lands, or resignation to the use of lower quality water. Since it appears to be the agricultural interests which now stand to be affected, lower grades of water would mean a change to more salt-tolerant crops, which produce lower and less valuable yields.[136] The Federal Water

[133] As to payment obligations by the parties to a water dispute, see text accompanying note 257 *infra*.

[134] Whether in-place uses merit protection is partially discussed in text accompanying notes 169–76, 245–53 *infra*.

[135] The Delta Water Agency Act of 1968, CAL. WATER CODE APP. § 108-4.1 (West Supp. 1968), provides in part: "The general purposes of the agency shall be to negotiate, enter into, execute, amend, administer, perform, and enforce one or more agreements with the United States and with the State of California, or with either, which have for their general purposes the following: (a) To protect the water supply of the lands within the agency against intrusion of ocean salinity; and (b) To assure the lands within the agency a dependable supply of water of suitable quality sufficient to meet present and future needs."

[136] Allen v. California Water & Tel. Co., 29 Cal. 2d 466, 483, 176 P.2d 8, 19 (1946), contains dicta which indicate that some prior users need not be forced to change their crops: "Neither is an overlying owner, considering the varying toleration of vegetation to salinity, limited to raising only such crops as have a high degree of tolerance. It should be assumed that he has made utility the primary consideration in farming his land and he is entitled to sufficient water for such crops as may normally be raised under conditions of noninfringement of his water supply."

Pollution Control Administration found such alternatives to be an intolerable detriment to Delta agriculture:

> Without a substitute overland supply of good quality water, forced abandonment of about 65,000 acres in the western Delta would likely occur representing a gross loss in crop production of about $19,000,000 annually. Decreased crop yields, forced switching to more salt tolerant crops, and sharply increasing farm irrigation and leaching costs would occur on about 182,000 acres. Leaching costs would likely increase on an additional 253,000 acres. Preliminary estimates of net detriments to Delta agriculture and to the local economy which would occur are quite conservatively estimated to range between 10 and 20 million dollars annually.[137]

It seems doubtful that such an outcome would ever actually occur, in light of political realities and the express provisions of Water Code § 12201 and § 12202, which provide for the maintenance of an "adequate water supply" in the Delta. However, the establishment of criteria by which adequacy might be determined remains central to the problem.

b. Other Overland Supplies[138]

Agriculture is not the only user for which substitute supplies are to be provided. The DWR has relied on the concept of substitute supply in order to negotiate solutions with those western areas which will be affected by the saline incursion expected to occur under operation of the Peripheral Canal plan.

Both of the municipal users which rely on the rivers for partial supply have recently agreed to purchase substitute supplies to make up for any loss of in-channel supply.[139] The replacement purchases are to be made from the Bureau of Reclamation's Contra Costa Canal and the proposed Kellog project. Under those agreements, the state is to reimburse the municipal suppliers for one third of the cost of the replacement waters and in return, the suppliers release the state from liability for any decrease in the availability of usable water.[140] The allocation to DWR of liability for one third of the loss, however, is a negotiated approximation of their responsibility, and does not necessarily reflect a tripartite "DWR-USBR-All Others" liability scheme.[141]

Negotiations are currently in progress with many of the industrial interests,

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[137] FWPCA REPORT 73.

[138] The original plan envisioned substitute supplies for municipal and industrial users, but not for agriculture. Note 104 *supra*.

[139] On April 21, 1967, an agreement was signed between the DWR and (the Treated Water Division of) the Contra Costa County Water District. The City of Antioch signed a similar agreement on April 11, 1968.

[140] The 1967 agreement, *supra* note 139, contemplates that the diversions by the Treated Water Division will be adversely affected due in part to the operation of the State Water Resources Development System. Clause 7 of the agreement provides that "[t]he District, in consideration of the payments by the State herein provided, releases the State from liability for a decrease in the availability to the District of usable river water at Mallard Slough caused by operation of the State Water Resources Development System during the term of this agreement."

[141] Interview with Frederick Bold, Jr., attorney for the Contra Costa County Water District and the City of Antioch.

similarly providing for payment of one-third of any water purchases made necessary because of the operation of the state project. Many of the firms with nationwide ownership seem willing to negotiate rather than become involved in an uncertain local issue, although none has signed yet. In the industrial contracts, the DWR has proposed to pay for any new equipment made necessary by degradation, but not to the extent that such equipment represents a "betterment"; hence, a new cooling apparatus, to the extent it improves upon former facilities, would be a benefit to an industrial plant for which it would not be reimbursed.[142]

V. Negotiation as a Solution

A. Policies of Negotiation[143]

The Director of the Department of Water Resources recently stated that "the key to the solution of water quality and water rights problems in the Delta is negotiation among the parties."[144] Negotiation has proved to be a fairly effective means of settling this complex problem, but it is not clear whether the processes of negotiation are well suited to the attainment of an optimal allocation of water resources.

There is little doubt that the DWR feels that it is far easier to negotiate than litigate:

> The Department believes that it is much better to enter into a contract to define and protect Delta entitlements than to rely on administrative decisions or legal action, both of which have considerable uncertainty attached to them.[145]

The DWR would prefer to reach a settlement on its own terms rather than those which may be imposed on it.

A joint report by the DWR and the Department of Fish and Game has disclosed another facet of negotiation. It was asserted that:

> Prematurely setting additional water quality criteria could restrict a meaningful operating agreement between the Department of Fish and Game and the project operators, and possibly negate the fishery protec-

[142] Interview with W. R. Attwater, *supra* note 127.

[143] The information in this Chapter has been drawn from personal observations and interviews with many persons involved in Delta matters. Among them were: W. R. Attwater, then an attorney for the Department of Water Resources; Frederick Bold, Jr., attorney for the Contra Costa Water District and the City of Antioch; Paul R. Bonderson, Chief of the Division of Water Quality of the State Water Resources Control Board; Verne H. Pynn, formerly Special Counsel to the Contra Costa County Water Agency; Edward V. Lane, Special Counsel to the Contra Costa County Water Agency; Martin McDonough, attorney for the Sacramento River and Delta Water Ass'n; and John A. Wilson, attorney for the Delta Water Users Ass'n. However, the statements and conclusions herein are entirely those of the author.

[144] Statement by William R. Gianelli, Director of the Department of Water Resources, before the State Water Resources Control Board, Oct. 3, 1968. In Central Basin Municipal Water Dist. v. Fosette, 235 Cal. App. 2d 689, 705, 45 Cal. Rptr. 651,660 (2d Dist. Ct. App. 1965), the court held that it is the policy of the law to encourage the compromise and voluntary settlement of water rights controversies.

[145] California State Dep't of Water Resources, The Delta and the Peripheral Canal 12 (May, 1967, unpublished mimeograph) [hereinafter cited as DWR 5/67 Mimeo].

> tion and enhancement potential of the project. Completion of . . . studies followed by a meaningful period of trial operation are necessary to assure the desired results.[146]

Taken together, the statements reflect the DWR's strong desire for operational flexibility in the face of changing developments. But they also indicate that unhindered negotiations allow the attainment of criteria favorable to the project's interests, free from the interference of a court or outside administrative agency.

In pursuit of its negotiation policies, the DWR has obtained a contractual release of liability from two major municipal water users. It hopes to obtain a similar contract with the eastern Delta groups and some of the industrial interests in the western Delta. In so doing, the DWR will diminish both the number of potential plaintiffs in any water rights battles which may arise and the number and extent of uses which the remaining plaintiffs could claim. Thus the negotiations would seem to undercut any opposition to the projects. Moreover, there is a pervasive tendency toward separate and individual negotiations, which appears to reflect a "divide and conquer" approach.

The major impediment to large, open negotiations is the wide range of quality requirements among Delta users, which vary from the municipalities in the west to the farmers in the highlands. The Department has been able to capitalize on these varied needs and temperaments, thereby preventing the Delta users from taking a united stand. Although such divisive requirements and goals have occasionally plagued all the Delta groups, perhaps the best example of negotiations which faltered due in part to varied requirements occurred in Contra Costa County.

When the possibility of making agreements was first posed to Delta groups in the early 1960's,[147] the Contra Costa County Water Agency (CCCWA) worked with the agricultural, industrial, and municipal interests within the county.[148] It also met with the eastern Delta groups who were later to sign the November 19th Agreement. Joint action by the eastern and western interests ceased, however, when it became evident that their widely divergent requirements and historical claims would prevent the groups from adopting similar objectives.

Negotiations between the DWR and Contra Costa interests occurred at

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[146] F & G REPORT 18.

[147] A speech by the Chief Deputy Director of the DWR is credited with proposing negotiations to break the impasse reached in the early 1960's. SRDWA and DWUA (see text accompanying note 33 *supra*) had both negotiated with the project operators at earlier dates, but with only mixed success. "Determinations as to existing water rights in the Delta cannot be made by the department alone. Litigation, however, is not a promising solution from any one's point of view. . . . We believe it is time for the commencement of negotiations among the concerned parties. . . . These negotiations should be directed towards agreement on the extent and character of the existing rights of the Delta water users . . . to the effect of the project on such rights, and, in case an impairment of these rights would otherwise be caused, to the physical solution or just compensation that should be made." Address by B. Abbott Goldberg, The State Water Project and the Delta, before the San Joaquin County Advisory Water Commission, May 8, 1963.

[148] See text accompanying notes 33–35 *supra*.

approximately the same time that the November 19th Agreement was being negotiated. The County was represented by the "Negotiating Committee for Contra Costa County's Water Requirements," a large group representing various county-wide interests. During the 1965 meetings, the Committee requested that the original criteria of 1,000 ppm at Antioch be maintained. Negotiations were discontinued after the two parties failed to reach agreement on outflows. The DWR later noted that progress was hampered by the "large size of the group and . . . the complexity and diverse requirements and problems of the many interests."[149]

There is little doubt that an extreme diversity existed among the water users on Contra Costa's north shore. Because of the progressively decreasing quality available, each user had different supply and demand requirements. Farmers and industrialists felt that their historical entitlements were a vested interest which necessitated holding firm. The municipal suppliers were concerned with the high quality requirements of an increasing demand for water which exerted a political pressure on them to reach a solution. The CCCWA itself had a broader outlook which tried, perhaps unsuccessfully, to encompass all these requirements.

Another factor which contributed to, and was intensified by, the negotiations was a mutual feeling of mistrust. The CCCWA is deeply suspicious of the goodwill of the DWR and the Bureau of Reclamation:

> The sole concern of these two agencies has been the delivery of water of high quality to Southern California and the San Joaquin Valley. There has been a ruthless and brutal disregard of the effect of these tremendous exports on the existing economy of the Delta and the Bay Region.[150]

Both the DWR and the Bureau of Reclamation at one time had similar outflow criteria (the 3,300 second feet outflow at Antioch), but these have gradually been altered to allow for calculated amounts of salinity incursion. Plans for replacement supplies have, in the view of these agencies, reduced the need for complete salinity control.[151] That change has resulted in an apparent lack of binding criteria which galls many Delta users.

> [W]hatever criteria are agreed upon, they should be a part of whatever statutory law is essential to the construction of the project . . . but when it comes time to draw the legislation, the protective feaures are not in there because, as the bureaucrat always says, everybody knows that is what we'll do. But everybody knows that sometimes that isn't what they do. . . . It seems to me that if they sell a project on some basis, they should prove it and then they should put it in the legislation.[152]

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[149] DWR 5/67 Mimeo 14.

[150] Statement of John A. Nejedly, District Attorney of Contra Costa County and attorney for the CCCWA, Press Release, Jan. 3, 1968.

[151] *See* text accompanying notes 113–14 *supra*.

[152] Statement of the late State Senator George Miller, Jr., before an ad hoc hearing committee investigating the Peripheral Canal, Martinez, California, Mar. 10, 1967, in Hearing Transcript at 55–56.

Both the lack of assurances as to criteria and the lack of estimates "from either State or Federal agencies as to the degree of change or . . . economic detriment" which might result from the altered criteria cause distrust.[153]

The CCCWA is now the only major Delta party which has not been able to come to some form of understanding with the exporters. To a certain degree this has weakened its bargaining position, since it must increasingly stand alone. Yet it has remained adamant because of a refusal to compromise its firm belief in an historical entitlement to good quality waters, and because of a strong interest in the offshore water quality which it feels is intimately connected to the county's well being.

This firm stand is baffling to the other major Delta interests, who regard it as somewhat unreasonable. But to the Department of Water Resources, it is exasperating.

> There is something almost schizophrenic about the saber-rattling of Contra Costa County's politically oriented water agency while those responsible parties delivering and using water in that county are cooperating . . . . [The State does not] intend to let a small band of western Delta extremists, who have no responsibility for delivering water to anyone, upset a plan for the protection of the Delta to which the vast majority of agriculturists and industrialists have agreed. It seems strange . . . that the extremists whose area has been getting a free ride for many years would attempt to jeopardize the future of their area . . . by opposing projects which are vitally needed to serve the vast majority of people within our State.[154]

As one might suspect, the relations between the DWR and Contra Costa's Water Agency are strained, and too often colored by emotion. But the CCCWA is attempting to guard against the degradation of the section of the Delta most subject to saline incursion, with a long history of economic and recreational development dependent on the availability of vast supplies of usable water. Conversely, the DWR, as a supplier of water on a scale hitherto unknown, has tremendous contract obligations to fulfill and too little water with which to placate all the interested parties.[155] The groups which have thus far successfully negotiated with the export project operators are those whose quality needs were extreme in comparison to those which were being sought for the western Delta. Thus, the signers of the November 19th Agreement only needed criteria which would protect eastern Delta farmers. Agreement was achieved because their demands could be met at relatively little cost to the exporters.

Similarly, the municipal suppliers had demands for such high quality water that they had little expectation of attaining offshore quality of that magnitude. They decided, therefore, to accept contractual arrangements which at least partially mitigated their expected losses.

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[153] METCALF '68, *supra* note 48, at I-3.

[154] Address by William R. Gianelli, *supra* note 123.

[155] *See* text accompanying notes 163–64 *infra*. If the fundamental role of the DWR has indeed become that of a mere vendor of water, the situation is akin to that of the fox put in guard of the henhouse.

Another major factor affecting any resolution of the Delta area's quality and allocation problems is the obvious disparity in the bargaining powers of the parties involved. The virtual control of the Delta hydrology by the project operators places them in a position so powerful as to preclude the normal presumption of fairness which arises in an arm's length transaction between coequal parties. Several other circumstances contribute to that disparity, one of which is the greater expertise and larger staffs available to the exporters. Nor do the exporters have significant reason to cooperate with the local Delta users; the projects are selling water to the lower valley and southern California, not to the Delta.

The eastern Delta groups, however, have a far better position than the western interests from which to bargain. Politically, they could muster the backing of large areas of the Delta, and perhaps as many as five different counties. Even here, however, there is a feeling that inevitable progress cannot be perpetually opposed, and that these large groups are at best in a weak position.

It is the proposed Peripheral Canal which presently provides the greatest impetus for quick settlement of the Delta disputes. The DWR regards the Canal as essential to its operations,[156] and recognizes that objections and suits by the local Delta interests could effectively block the needed congressional legislation for a painfully long period. Similarly, the Delta interests are anxious to reach a settlement before the Canal is built, for afterwards they would have little power and no assurance of quality water. Until the canal is built, the eastern farmers have the benefit of the export waters being transported through "their" channels.

Is negotiation the best means of settling the allocation, quality, and water rights problems of the Delta? The negotiation process certainly has some shortcomings, especially when deployed among parties of differing ability and power. It might also be observed that any system of bargaining for water rights appears to be of greater benefit to the party who is disputing the claims and uses of another, and who can therefore benefit by a compromise agreement. Thus, as will be seen, resolution of the Delta conflict does not appear to be based on classical concepts of water rights, but rather on extended negotiations which reflect physical and political, rather than legal, considerations. In this respect, the local Delta users are continually forced to assert their "rights" and claims to the channel waters, while the exporters assert a claim to any waters for which a direct diversion is not currently being made.

The alternatives to a system of negotiation, however, are hardly more encouraging. Litigation is recognized by all parties to the Delta disputes as uncertain, expensive, time consuming, and of doubtful efficacy in providing remedies or specific relief. Monetary damages are regarded as undesirable. The problems involve federal immunity, the necessity of joinder for the hundreds of claimants involved, and the great complexity of the Delta's hydrology. Operating agreements or settlements with administrative agencies are also mistrusted, since policies too often change with personnel. Admin-

[156] *See* text accompanying notes 124–26 *supra.*

istrative or governmental supervision, such as might be imposed by the Federal Water Pollution Control Administration, was not forthcoming until recently, and there is no guarantee that the attempts at exercising such powers will significantly affect the salinity problems of the Delta.

Negotiation thus appears to be almost the only means of resolution acceptable to the Delta parties. But at the risk of apparent cynicism, it would seem that such negotiated settlements are of benefit to society only if the agencies involved are dedicated to finding a solution which best satisfies all of society's interests. Negotiation offers little assurance that each of the multitude of water requirements, uses, and users will receive the proper consideration or representation.[157] Although some value judgments must be made as to the preferences to be accorded the various uses, that judgment is being made, not by society, but by parties with narrowly defined interests. The unbiased perspective so necessary to a major decision of this nature is missing from the negotiations.

B. Quality Criteria Under Negotiation

Resolution of the Delta's water quality difficulties will probably come about through the mutual adoption of a set of acceptable quality criteria. Those criteria would then become the guide for the control and operation of the Delta's hydrology by the export projects. Thus, instead of debating whether a particular outflow could provide sufficient protection, outflow volumes and other factors would instead be adjusted until the water quality met the level called for by the criteria.

It seems that the adoption of quality criteria was formerly a voluntary undertaking; the various standards assumed by the exporters were promulgated as a basis for their own considerations and planning, and only partially in response to those Delta interests who wanted assurances made. These statements, however, are increasingly seen as technical pronouncements of great importance, and the act of setting such criteria has become an event fraught with wider implications.

Various interest groups are now proposing different levels of control, and each proposal reflects the uses and values which that group considers as important. Thus, the DWR must consider the desires of both the Delta users and its many contractors, among them the politically powerful Metropolitan Water District of Southern California. The signers of the November 19th Agreement are solely concerned with agricultural requirements, just as the municipalities and industries are interested in their own direct needs. Contra Costa's Water Agency has been increasingly concerned with less direct uses, such as recreation and other "in-place" uses. Similarly, the Federal Water

[157] Unfortunately, the same may be said for the adjudicatory process. "The courts are not an adequate agency for insuring the optimum community benefits from water resources . . . the adversary process rivets the court's attention to the particular parcels of land in dispute and is not well designed for assisting the court to reach the best conclusion regarding social policy and the public interest." Trelease, *A Model State Water Code For River Basin Development,* 22 LAW & CONTEMP. PROB. 301, 317 (1957).

Pollution Control Administration has shown increased concern for fishery requirements, and both agencies have been backed by the Sierra Club.

At least five categories of criteria have been proposed:

1) The November 19th Agreement between eastern Delta interests and the exporters.[158]
2) The "Antioch" criteria asserted by CCCWA to be necessary for adequate protection of the offshore water quality.[159]
3) The criteria adopted by the State Water Resources Control Board in compliance with the Federal Water Pollution Control Act.[160]
4) Criteria which might be suggested by the Bay-Delta Study, whose report is expected in mid-1969.[161]
5) The "historical" levels of quantity and quality, which may be either "pre-Shasta Dam" (*i.e.,* prior to 1944) or the yet earlier "natural" conditions which existed before widespread reclamation. However, these conditions are usually cited as "entitlement levels" rather than criteria.

The November 19th Agreement has become the basic device by which the DWR would determine the outflow for the Delta. The DWR calls it "fair and equitable to all concerned, including the western Delta. It gives protection to the Delta water supply and guarantees adequate salinity control."[162] In short, the DWR regards them as the most desirable criteria for the Delta. The Department's Director made this clear when he stated that:

> The project cannot live with criteria more restrictive than those of the November 19, 1965, agreement. . . . [The adoption of more restrictive criteria] could require substantial amounts of water to be released from storage; reduce the amount of water available for agricultural, domestic, and municipal users in service areas of the State Water Project and the Central Valley Project; interfere with power capabilities of the projects

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[158] *See* note 33 *supra* and text accompanying note 118 *supra.*

[159] *See* text accompanying notes 101–06 *supra.*

[160] The requirement that each state adopt water quality standards in compliance with the Federal Water Pollution Control Act is discussed elsewhere in this volume; see page 71 *supra.* The standards are specific plans (known as "policies" in California) for each interstate, intrastate, or coastal body of water within the state. The Secretary of the Interior has required each state standard to include a statement of policy regarding the prevention of degradation in waters of present high quality. This requirement is known as the antidegradation policy. *See Hearings on Water Pollution Before House Comm. on Public Works,* 90th Cong., 1st Sess. 86–89 (1967); 2 CCH WATER CONTROL NEWS No. 39, at 9-10 (Feb. 12, 1968).

Because California has adopted separate policies for its waters, on Oct. 24, 1968 it adopted a general antidegradation policy affecting all the waters of the state. State Water Resources Control Board Resolution No. 68-16. That policy is based on a definition of "pollution" as "degradation resulting from discharge of sewage and other wastes." The policy therefore does not affect water quality degradation due to ocean water incursion. Statement of Paul R. Bonderson, Chief of the Division of Water Quality, State Water Resources Control Board, before the Board's Oct. 24, 1968, meeting. Of primary interest to the Delta is the policy adopted for that area. *See* note 173 *infra.*

[161] The San Francisco Bay-Delta Water Quality Control Program was established by the Water Pollution Control Law of 1965, Stat. 1965, ch. 1351, §§ 1–14, at 3239, and operates under the supervision of the State Water Resources Control Board.

[162] Address by William R. Gianelli, *supra* note 154.

> by reducing the dependable capacity; nullify many years of difficult negotiations for water right settlements in the Delta; and possibly destroy the financial integrity of the entire State Water Project. The State cannot adopt a course of action which would require release to the ocean of hundreds of thousands of acre-feet of water per year that is conserved by state and federal water projects and is earmarked and paid for by other interests.[163]

The latter remark reveals the basis of the DWR's concern. As of April 1, 1968, the entire "minimum" yield of the State Water Project was committed to contracting purchasers.[164] The commitment to the Delta of any waters in addition to those already allocated to it by the project operators would press the DWR into a highly uncomfortable dilemma.

Another characteristic of the November 19th Agreement is the almost universal trend to adopt it as representative of the standards which will eventually be set for the Delta. The November 19th Criteria have been imposed as a condition on some of the appropriation permits granted to the DWR by the State Water Rights Board in 1967, thus becoming part of those water rights.[165] Studies by the DWR and the Bay-Delta program have been based on the qualities thought to be attainable under the November 19th criteria and "other recommended alternatives." This acceptance of the November 19th Criteria would seem to reflect a practical evaluation of the Delta's politics. A representative of the Bay-Delta study group once commented that he doubted that they—or presumably anyone else—"could very effectively intrude on the negotiations."[166]

This indeed is the role seen for the November 19th Criteria by their draftsmen. Those criteria were adopted and settled by negotiation after study and consideration of the agricultural needs of the eastern Delta.[167] As such, they are seen by the user groups which signed them as a floor, a base, to which higher standards might be added.[168] It is their contention that parties re-

[163] Statement by William R. Gianelli, *supra* note 144.

[164] CALIFORNIA STATE DEP'T OF WATER RESOURCES, BULLETIN 132–68, THE CALIFORNIA STATE WATER PROJECT IN 1968, at 70 (1968).

[165] California State Water Rights Board, Decision D 1275, at 41 (1967). Conditions 16-a and 16-b refer to the November 19th Agreement. The State Water Resources Control Board is expected to reopen Decisions D 990 and D 1275 in July 1969.

[166] Comment by William S. Hyde, Assistant Project Director of the San Francisco Bay-Delta Water Quality Control Program, before a meeting of the Bay Counties Water Problems Committee and the Bay Area League of Industrial Associations, July 26, 1968.

[167] *Contra,* F & G REPORT 6: "While the criteria were negotiated with local agricultural interests, the Department of Water Resources had protection of aquatic life as one of the important objectives."

[168] "The position of San Joaquin County with regard to the November 19, 1965, Memorandum of Understanding is that the criteria therein set forth represent a negotiated compromise upon the minimum acceptable water quality in the Delta—not a settlement of water rights in the Delta. It is our anticipation that such criteria will be treated as minimum acceptable water quality standards with regard to the forthcoming negotiations to be conducted by the Delta Water Agency with the Department of Water Resources and the Bureau of Reclamation." Statement of Richard W. Dickenson, County Counsel of San Joaquin County and attorney for the San Joaquin County Flood Control and Water Conservation District, before the State Water Resources Control Board, Oct. 3, 1968.

questing more restrictive criteria should shoulder the responsibility of negotiating and providing the means of payment for such "supplementary" standards.

It is also understood by all concerned that adoption of the November 19th Agreement and operation of the Peripheral Canal would necessitate that some provision be made for overland supplies, since channel waters in the western Delta would be degraded to a measurable extent.

> For the extreme western Delta, the Department proposes that a water supply be provided by overland facilities, in lieu of in-channel supply. To provide a dependable freshwater supply to the western Delta through natural river channels would require vast quantities of stored water, most of which would waste to the Pacific Ocean.[169]

It is precisely the decision to allow the western Delta Channels to become degraded which brings the DWR its violent opposition from Contra Costa County. That county has advocated the Antioch Criteria for protection of its offshore supplies, but has finally resigned itself to the fact that even these criteria cannot guarantee *complete* protection.

> When Contra Costa County, around 1957, was alerted to the fact that Shasta Reservoir was not going to be operated as originally intended, i.e., with a 3300 cubic feet per second Delta outflow, and the State was planning to divert enormous quantities of water out of the Delta all year long, our first concern was the threat to our industrial development and to the fresh water intakes of our municipalities. It is now apparent that our greatest concern should rather have been directed toward our environmental needs. We have resigned ourselves to the fact that water supplies for our municipalities and industries will eventually come overland in manmade structures and the availability of fresh water in the Delta's channels and sloughs for these uses will be seriously diminished.[170]

Until recently, the Contra Costa County Water Agency was one of the few proponents of environmental considerations. A preliminary report of the Sierra Club, however, indicates that the Delta has become "an area of acute concern" to that group as a "priceless environmental resource, supporting a host of value-building activities from recreation to industry." Their report expresses concern for recreation, the fisheries, wildfowl, and the whole aquatic ecology.[171]

This is not to indicate that other concerned bodies, such as the Depart-

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[169] Addresses by William R. Gianelli, *supra* notes 121, 154.

[170] Statement of Jack Port, Executive Secretary of the Contra Costa County Water Agency, before a study session of the Northern California Regional Conservation Committee of the Sierra Club, June 22, 1968.

[171] San Francisco Bay Chapter of the Sierra Club, Bay-Delta Water Quality Preliminary Report, June 1968. The introduction to that report states that "The wholesale diversion of Delta water by projects now operating, under construction, or being planned, together with increasing additions of agricultural, municipal and industrial wastes may reduce water quality in the system to the point that it becomes nothing more than a stagnating and foul-smelling open sewage drain."

ment of Fish and Game, have been inactive. That Department's recommendations have generally been considered and incorporated, to greater or lesser degrees, by the DWR. "While the [November 19th] criteria were negotiated with local agricultural interests, the Department of Water Resources had protection of aquatic life as one of the important objectives."[172]

Many observers have felt, however, that wildlife requirements have not been given enough consideration by the DWR. Thus, the Federal Water Pollution Control Administration's "Proposed Supplemental Delta Water Quality Standard"[173] has been seen as a tacit rejection of some of the positions taken by DWR and the State Water Resources Control Board, and a recognition that at least the fisheries need protection greater than that formerly planned.

So too has the Bay-Delta Study shown great concern with the problems of aquatic ecology especially as it is influenced by changes in the Delta environment. Its director has "pointed out that the Bay-Delta Program is unique in the depth of its consideration of ecological factors in relation to waste discharges and water quality planning."[174] The goal of the Program is to make a comprehensive, area-wide study of the Bay and Delta and to develop the basic features of a plan for the control of water pollution. Its report is expected to set forth acceptable toxicity levels, outflow volumes, and other important water standards for the Bay and Delta.

The "historical entitlements" claimed by many of the Delta users should be distinguished from regulated outflows, the quantity and quality of which are determined through the political processes.

> The November 19 Criteria do not represent a settlement of water rights in the Delta. They were a statement, based upon the best information available in 1965, as to what quality of water at certain measuring points in the Delta would be necessary to meet the water quality objectives necessary to protect the Delta, and not an attempt to decide what

[172] F & G REPORT 6.

[173] "On June 14, 1967, the former State Water Quality Control Board adopted water quality control policy for the Sacramento-San Joaquin Delta. On June 23, 1967, this and other policies for California's interstate and coastal waters were submitted to the Secretary of the Interior as proposed federal water pollution control standards pursuant to the provisions of the Federal Water Pollution Control Act. . . . After reviewing these policies, the Federal Water Pollution Control Administration regional staff advised this Board that in its opinion the water quality criteria in the Sacramento-San Joaquin Delta policy does not adequately protect all of the beneficial uses identified in that policy. This regional staff has offered for consideration of the Board . . . [a supplemental policy]. . . . The water quality objectives contained in the . . . [proposed] 'Supplemental Water Quality Control Policy for Sacramento-San Joaquin Delta' are the same as Articles C and D of the 'November 19, 1965, Delta water criteria.' Said policy is [hereby] adopted as an addition to the 'Water Quality Control Policy for Sacramento-San Joaquin Delta' which was adopted . . . June 14, 1967." State Water Resources Control Board, Resolution 68-17, Adopting Supplemental Water Quality Control for Sacramento-San Joaquin Delta, Oct. 24, 1968. It is not yet known whether the new standards will be approved by the Secretary, since they fail to incorporate all the suggestions made by the regional staff. The Delta is reportedly the major issue in the approval proceedings. The Sacramento Bee, Nov. 18, 1968, at 1, col. 5.

[174] State Water Resources Control Board, San Francisco Bay-Delta Water Quality Control Program, Press Release, July 25, 1968.

> quality or quantity of water to which the Delta had become entitled historically.[175]

The entitlement concept is based on the theory that each user has a valid claim to a measurable amount and quality of water "historically" available in a particular area of use. Contra Costa County, for example, claims to be

> permanently entitled to the maintenance of an environment during the winter and early spring commensurate with the availability of a water supply at Mallard Slough having a chloride-ion content of 100 ppm or less for the number of days per year that such water was available up to . . . [the year the Delta Protection Act was added to the Water Code].[176]

As generally understood, the project operators would make some compensation to users (perhaps in kind) when the controlled outflow was less than the entitlement. Similarly, the user would pay the project operator whenever the the controlled flows exceeded the entitlement. The entitlement scheme is therefore more properly considered a water right, and should be evaluated as a legal element of the Delta problem.

VI. Water Rights Law and the Delta

There is considerable uncertainty about water rights law as it applies to the Delta controversy. As a result, the parties seem more comfortable with arguments of history and policy than with law. The widespread decision to negotiate reflects, at least in part, the apparent inadequacy of the legal system to solve a modern and complex problem of water allocation and control.[177]

A. Looking Backward

One direct result of the water shortages of the early 1920's was the "Antioch Suit," instituted by the City of Antioch against upstream appropriators.[178] Ostensibly brought by the city fathers, the moving force behind the suit was apparently a large coalition of Delta landowners.

The city claimed that excessive diversions by the upstream appropriators during the dry seasons had resulted in salt water incursion up the river to the city's point of diversion. They asked for (and received from the lower court) an injunction ordering the maintenance of a flow of 3,500 second feet.

The California Supreme Court held, however, that the city, as an appropriator of fresh water near the outlet of a river, did not have the right to insist that subsequent upstream appropriators "leave enough water flowing in the stream to hold the salt water of the incoming tides below his point of

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[175] Statement of Richard W. Dickenson, *supra* note 168.

[176] Metcalf '68, at III-1.

[177] "The key to maintenance of any specific levels of salinity in the Delta is the coordinated operation of the federal and state water development projects. . . . [But the implementation of standards resulting from such operation] cannot be enforced through either federal or state water quality control mechanisms. It can be achieved only within the framework of water rights administration at the state level and, hopefully, by negotiation and agreement between federal, state and local agencies." California State Water Resources Control Board, *supra* note 37, at 2.

[178] Antioch v. Williams Irrig. Dist., 188 Cal. 451, 205 P. 688 (1922).

diversion." To do so would be "extremely unreasonable and unjust to the inhabitants of the valleys above and highly detrimental to the public interest besides." As an aside, it was noted that by moving its pump a few miles up the river, the city could obtain water free from salinity.[179]

The court's reasoning is still persuasive today. The facts and rationale on which the decision is based, however, seem sufficiently distinguishable from present-day conditions to make the case primarily of historical interest.[180] But if it did nothing more, the Antioch case at least served the purpose of arousing attention to the salinity issue.

B. Statutes Affecting Delta Waters

1. The Watershed Protection Statutes

The advent of the Central Valley Project brought promise of governmental aid in salinity control. It also imposed certain policy considerations and operational restrictions on any water project developed or operated as part of the CVP. One such limitation is found in California's watershed protection statutes,[181] which are a direct limitation on the powers of the Department of Water Resources. The principal provision of that law provides that:

> In the construction and operation by the department of any project under the provisions of [the Central Valley Project] . . . a watershed or area . . . immediately adjacent thereto which can conveniently be supplied with water therefrom, *shall not be deprived by the department directly or indirectly of the prior right to all of the water reasonably required to adequately supply the beneficial needs of the watershed, area, or any of the inhabitants or property owners therein.*[182]

The areas protected are a "watershed" or the area "immediately adjacent" to a watershed which can be supplied with its water. Partly because of the difficulties in the precise construction to be given these terms,[183] special care was taken to insure that the statute applied to the Delta area. Thus, when the Burns-Porter Act was enacted in 1959, the State Water Facilities (which included those in the Delta)[184] were incorporated as a part of the Central Valley Project, and the act stated that "the Sacramento-San Joaquin Delta shall be deemed to be within the watershed of the Sacramento River."[185]

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[179] *Id.* at 465, 205 P. at 694.

[180] The case was decided under hydrologic and social conditions quite different from the present. The type of physical solution suggested by the court, note 179 *supra,* is no longer available at minimal cost. The case also predated the 1928 constitutional amendment calling for reasonable and beneficial use of water. *See* note 239 *infra; cf.* BULL. 27, at 23.

[181] CAL. WATER CODE §§ 11460–65 (West Supp. 1968); *see* CAL. WATER CODE § 11128 (West 1956), which provides in part: "The limitations prescribed in Section 11460 and 11463 shall also apply to any agency of the State or Federal Government which shall undertake the construction or operation of the project, or any unit thereof . . . ." These same statutes are sometimes referred to as the Watershed Protection Statutes.

[182] CAL. WATER CODE § 11460 (West Supp. 1968) (emphasis added).

[183] 25 OPS. CAL. ATT'Y GEN. 8, 19–20 (1965).

[184] CAL. WATER CODE § 12934(d)(3) (West Supp. 1968).

[185] CAL. WATER CODE § 12931 (West Supp. 1968).

Hence, the watershed protection provisions were explicitly understood to apply to the State Water Project[186] and more specifically to the Delta proper.[187]

However, the range of protection of this statute is somewhat limited. The Water Code specifies that, "The provisions of this article shall not be so construed as to create any new property rights other than against the department . . . ."[188] That language has been interpreted by the California Attorney General as preventing the creation or the vesting of "a presently definable 'water right.' "[189] Instead, the "right" granted by the statute is wholly inchoate, and is perfected only as the needs of the watershed inhabitants develop and water is put to beneficial uses by them.[190] Consistent with that theory, the "prior right" is defined as "paramount, preferred, or superior,"[191] rather than prior in time. As their needs develop, the inhabitants must therefore apply for and perfect a water right by normal procedures of appropriation. The statute thus gives Delta users a right which is paramount to any appropriative right held by the DWR. Hence, if the DWR had been exporting water for which the watershed inhabitant later developed a reasonable need, an application made by the Delta users could not be denied them despite the prior in time appropriation and use by the DWR.

A second interpretation sees the right as more absolute in form. The California Legislative Counsel rendered several opinions in 1959 on some of the effects of the watershed protection statutes. One opinion noted that the watershed user could secure an appropriative right to needed water whenever the DWR left a sufficient amount of unappropriated waters to meet the needs of the area of origin.[192] However, if the Department failed to leave the amounts needed, or other water was not available, the Department's "obligation under the watershed protection provision" could be met in several ways, including importation of outside water and reducing the amount delivered under its existing contracts. It was concluded that if the DWR "failed to comply with the provisions of law . . . appropriate court action could be brought to compel compliance."[193]

The "correct" interpretation of the watershed protection statutes obviously is of importance to the Delta. In one of the few cases to discuss the statute, a federal district court noted the early California case law relating to protec-

[186] *See* the legislative counsel's opinions: 1959 CAL. ASSEM. J. 785 (February 11, 1959); 1959 CAL. SEN. J. 2943 (May 29, 1959); 1959 CAL. ASSEM. J. 5265 (June 10, 1959); 1959 CAL. ASSEM. J. 5666 (June 16, 1959). CAL. WATER CODE § 12931 (West Supp. 1968) also provides that the facilities authorized under either the CVP or the State Water Project "shall be acquired, constructed, operated, and maintained pursuant to the provisions of the code governing the [CVP] . . . ."

[187] In 1959 CAL. ASSEM. J. 5265, it was noted that: "[T]o the extent the area within the watershed of the Sacramento River is protected by the 'watershed protection' provisions, the Sacramento-San Joaquin Delta would likewise be protected."

[188] CAL. WATER CODE § 11462 (West Supp. 1968).

[189] 25 OPS. CAL. ATT'Y GEN. 8, 20 (1955).

[190] *Id.* at 20–21.

[191] *Id.* at 21.

[192] 1959 CAL. ASSEM. J. 5666.

[193] *Id.* at 5668.

tion of watershed areas and interpreted the statute to mean that diversions from the watershed area are subject to the prior right of plaintiffs and their class to all the water reasonably required to adequately supply their needs for reasonable and beneficial uses to which their land is now or may be adaptable in the future by reasonable methods of diversion.[194]

The most appealing interpretation of the effect of the statute would be that suggested by the statutory statement that a watershed "shall not be deprived by the department . . . of the prior right to all of the water reasonably required to adequately supply the beneficial needs of the watershed . . . ." It suggests that as against the department, in its export function, the Delta inhabitants have a prior and existing right to appropriate as much water as may be necessary for their beneficial uses. This interpretation is supported by section 11463 of the Water Code:

> "[N]o exchange of the water of any watershed . . . for the water of any other watershed . . . may be made by the department unless the water requirements of the watershed . . . in which the exchange is made are first and at all times met and satisfied to the extent that the requirements would have been met were the exchange not made, and no right to the use of water shall be gained or lost by reason of any such exchange."[195]

The watershed protection statutes cannot "require the department to furnish to any person without adequate compensation therefor any water *made available by the construction of any works by the department.*"[196] Thus, to the extent water is made available by the project works, no watershed user would be entitled to receive such water free of charge.[197] That provision has spawned varied interpretations. The DWR contends that the only "prior rights" granted to the Delta are certain preferential rights to contract for project water within the general framework established in the state water supply contracts, and therefore that those users within the areas of origin must pay the cost of project water on the same basis as others who buy water from the DWR.[198] This interpretation is obviously too narrow. The "prior right" is extended to more than project water. It includes all the water which originates within the watershed.[199] This is reflected by the Attorney General's observation that, "Assuming the application to be otherwise meritorious, the [State Water Resources Control Board] . . . would grant a permit in the usual form, and the . . . [Department] would thereafter be compelled

[194] Rank v. Krug, 142 F. Supp. 1, 151 (S.D. Cal. 1956). This was one of the several cases interpreting the statute which arose in the Friant Dam controversy of the mid-1950's.

[195] This section is substantially unchanged from the original, Cal. Stat. 1933, ch. 1042, § 11, at 2650.

[196] CAL. WATER CODE § 11462 (West Supp. 1968) (emphasis added). "The provisions of this article shall not be so construed as to create any new property rights other than against the department as provided in this part or to require the department to furnish to any person without adequate compensation therefor any water made available by the construction of any works by the department." *Id.*

[197] 25 OPS. CAL. ATT'Y GEN. 8, 24 (1955).

[198] Interview with W. R. Attwater, *supra* note 127.

[199] 25 OPS. CAL. ATT'Y GEN. 8, 20 (1955).

to honor the water right thus created and vested."[200] There could thus be an appropriation of watershed water, as distinguished from project water, which would not be subject to the payment provisions of section 11462.

The necessity of distinguishing between project and nonproject water raises numerous questions. Can a finite determination be made as to which waters are allocable to project construction and which comprise the preexisting natural flow? Would water made available by a non-Department project, such as the Bureau of Reclamation's Shasta Project, require compensation? Can a determination be made as to which waters are allocable to the federal project and which result from the state's Feather River project? One study of such an allocation problem determined that the contribution made by Shasta to the Delta water supply reflects a less than positive correlation, and that "the Bureau does not succeed in delivering to the Delta . . . water supplies equal to its gross diversions therefrom."[201] Simply stated, it is very hard to say how much water came from which source, or which water was "made available" from a department project. It is therefore likely that any charge made would have to reflect a reasonable cost allocation between project and watershed waters.

In summary, the watershed protection statutes appear to guarantee to the Delta users the right to appropriate water as future needs develop, regardless of the use of those waters by the department. Furthermore, payment would be required of Delta users only to the extent that the water appropriated by them is directly attributable to the results of development by a state project. Thus, the watershed protection statutes are of significant help to the Delta, because they guarantee the availability of water in the future. The amount of water, however, is subject to the basic limitation in California that only so much as is required for a reasonable and beneficial use may be appropriated.[202]

2. County of Origin Acts

A statute similar to the Watershed Protection Act is found in Water Code § 10505, the "County of Origin" statute:

> No priority under this part shall be released nor assignment made of any application that will, in the judgment of the board, deprive the county in which the water covered by the application originates of any such water necessary for the development of the county.[203]

The applications referred to are those made by the DWR to the State Water Resources Control Board.

The protection granted under § 10505 is limited to water which "originates" within the county.[204] One theory indicates that the county of origin

[200] *Id.* at 21. The State Water Rights Board, however, has attempted to limit the allowable priority by imposing an application deadline. *See* D 990, at 73.

[201] J. BAIN, R. CAVES & J. MARGOLIS, NORTHERN CALIFORNIA'S WATER INDUSTRY 704 (1966).

[202] CAL. CONST. art XIV, § 3 (West 1954); *see* CAL. WATER CODE § 100 (West 1956), and text accompanying note 239 *infra*.

[203] CAL. WATER CODE § 10505 (West Supp. 1968).

[204] 25 OPS. CAL. ATT'Y GEN. 8, 17–18 (1955).

acts might be "indirectly applicable" to the Delta, but only to the extent that the waters covered by the Act's provisions are merged with the waters used in the state CVP.[205] However, since the great portion of the Delta's waters comes from outside its counties, the section would appear to offer little protection to the Delta region. Indeed, there appears to be an inherent conflict between the Delta and those areas which claim county of origin privileges. Such counties would want to decrease exports, thus preventing such water from flowing through the Delta. In contrast, the Delta desires as much flow as possible.

The protection is also dependent upon the discretionary judgment of the State Water Resources Control Board and makes no specific provisions for future needs.[206] Thus, although various administrative and judicial safeguards have been built into the application procedures,[207] the inherent weaknesses in the statute would seem to preclude its viable application to the Delta.

The statutory provisions providing for preferential treatment of counties or watersheds of origin have been criticized as being too great an interference with statewide projects for the transfer of water.

> To the extent that these are thoughtful exceptions, preserving waters from immediate use in order to reserve them for a better future use, they may be wise laws. But to the extent that they reflect local pressures for preferred treatment, making blanket reservations of water for the uncertain future uses of the residents of the basin, they may foreclose valuable and needed projects which would otherwise be feasible under modern engineering methods.[208]

Such reservations of water rights are also feared to "pose such a threat to the firmness of water supplies for receiving regions as to deter the substantial investments required for major transbasin diversions."[209]

It is important to note that if it is found that the effect of the statutes is to constrict the operation of important projects, the state may still condemn the water rights arising under the statutes when and if they come into being, but not before.[210] This power does not render the protection completely illusory,

[205] 1959 CAL. SEN. J. 2943 (May 29, 1959).

[206] *See* 1959 CAL. ASSEM. J. 786; 25 OPS. CAL. ATT'Y GEN. 32, 35–37 (1955).

[207] Note, *State Water Development: Legal Aspects of California's Feather River Project,* 12 STAN. L. REV. 439, 452–53 (1960).

[208] Trelease, *A Model State Water Code for River Basin Development,* 22 LAW & CONTEMP. PROB. 301, 305 (1957). Some of the history and policies behind the statutes are discussed in Weatherford, *Legal Aspects of Interregional Water Diversion,* 15 U.C.L.A.L. REV. 1299, 1306–13 (1968).

[209] Johnson & Knippa, *Transbasin Diversion of Water,* 43 TEXAS L. REV. 1035, 1043 (1965); *accord,* Clark, *Northwest–Southwest Water Diversion—Plans and Issues,* 3 WILLAMETTE L.J. 215, 220 (1964–1965); *cf.* 25 OPS. CAL. ATT'Y GEN. 8, 27 (1955).

[210] 25 OPS. CAL. ATT'Y GEN. 8, 22–25 (1955). CAL. WATER CODE § 11461 (West Supp. 1968) provides: "In no other way than by purchase or otherwise as provided in this part shall water rights of a watershed, area, or the inhabitants be impaired or curtailed by the department, but the provisions of this article shall be strictly limited to the acts and proceedings of the department, as such, and shall not apply to any persons or state agencies."

but rather makes it clear that the statute serves only to protect[211] the future rights of the Delta region until a resolution of the needs of its inhabitants can be made.[212]

3. Collinsville Salinity Control and The Delta Protection Act

In 1957, a statute was added to the provisions relating to the CVP which was much more absolute in the protection of the status quo of the Delta than were the area of origin protections. Water Code § 11271 provides for salinity control at a point almost identical with the old Antioch criteria:

> In the operation of the North Bay Aquaduct, or any joint-use facilities of such unit or project, by the United States or the State, diversions from Sacramento-San Joaquin Delta sources of water shall not be made except when the residual surface outflow from the Sacramento-San Joaquin Delta is adequate to prevent the intrusion of ocean salinity at the town of Collinsville on the Sacramento River . . . .[213]

The implications of this section have never been litigated. It has been strongly relied upon by Delta interests as a mandate for salinity repulsion, but it is dismissed by the DWR as ineffectual, since it appears to have been superseded by the newer § 12202, described below.

The "Collinsville" provision was added to the Water Code[214] directly after publication of Bulletin 60, the salinity control barrier report of 1957.[215] The companion section to §11271 adopted the North Bay Aquaduct (as recommended and set forth in Bulletin 60) as a unit of the CVP.[216] It would thus appear that the provisions of § 11271 were based on the legislature's acceptance of at least part of Bulletin 60's findings and concepts of control,

> based upon the premise that salinity is being controlled by the Central Valley Project at the point [0.6 miles west of] . . . Antioch . . . and that this is being accomplished by a minimum fresh water flow to Suisun Bay of . . . 3,300 second-feet of surface inflow from the Sacramento and/or San Joaquin Rivers . . . ."[217]

The vague wording of § 11271 thus permits an inference that "salinity control" refers to something very like the "Antioch" criteria, and its firm prohibitions regarding diversions from the Delta become quite viable.

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[211] Even the statutory protection is misleading. CAL. WATER CODE § 12931 (West Supp. 1968) specifically recognizes the legislative authority to amend the State CVP Act, and therefore to amend the area of origin laws. *See* address by B. Abbott Goldberg, *supra* note 147.

[212] *See* 25 OPS. CAL. ATT'Y GEN. 8, 23 (1955). *But see* Milliman, *Water Law and Private Decision-Making: A Critique*, 2 J. LAW & ECON. 41 (1959). "Apparently, the lack of specification of water rights will mean that the allocation of water will not be determined by economic forces but rather by the political pressures present in the California legislature." *Id.* at 53.

[213] CAL. WATER CODE § 11271 (West Supp. 1968).

[214] Cal. Stat. 1957, ch. 2252, § 2, at 3917, *as amended* Cal. Stat. 1959, ch. 1269, § 5, at 3415; Cal. Stat. 1959, ch. 1750, § 3, at 4213; Cal. Stat. 1959, ch. 1774, § 2, at 4258. The authors of the legislation (Abshire, Coombs, Gibson, and John F. McCarthy) were instrumental in the whole barrier study movement. *See* note 89 *supra*.

[215] *See* text accompanying note 90 *supra*.

[216] CAL. WATER CODE § 11270 (West Supp. 1968).

[217] BULL. 60, at 25.

Only two years after the adoption of § 11271 the Delta Protection Act was passed in recognition of the "acute problem of salinity intrusion" in the Delta.[218] Section 12202 of that act provides that:

> Among the functions to be provided by the State Water Resources Development System . . . shall be the provision of salinity control and an adequate water supply for the users of water in the . . . Delta. *If it is determined to be in the public interest* to provide a substitute water supply to the users in said Delta in lieu of that which would be provided as a result of salinity control no added financial burden shall be placed upon said Delta water users solely by virtue of such substitution.[219]

That section clearly recognizes that a substitute water supply in lieu of that provided by salinity control might become necessary. Although it thus appears to establish an alternative to the salinity control required by § 11271 (which did not mention substitute facilities), it should be noted that the implementation of the § 12202 alternative is dependent upon a determination of the "public interest." It is not clear who is to make that determination. The contention that § 12202 prevails over § 11271 thus becomes a complex question of statutory interpretation.

General guidelines of statutory interpretation have been established by the California courts:

> It is the established law in California that it is the duty of courts when reasonably possible to harmonize apparently conflicting code provisions and, if such provisions can be reasonably construed so as to avoid conflict, such construction should be adopted.[220]

However, it has also been recognized that when the two provisions are "antagonistic" or there is an "irreconcilable conflict," the provision "last enacted should control, 'particularly if it be a special act applicable to a particular subject . . . on the theory that it is the last utterance of the legislature.' "[221]

Thus a holding that § 12202 prevails over § 11271 would have to be based on a finding that the two are irreconcilable. Since the Delta Protection Act's provision certainly does not exclude § 11271, but rather provides an alternative, the two sections could conceivably coexist without conflict. Only if the proper body were to make the finding of public interest required by § 12202 would a substitute supply come into being, and thus cause an irreconcilable conflict with § 11271. The "Collinsville" statute would therefore remain valid as a legislative mandate, at least until such a determination is made. It should be noted in this regard that the present plans of the DWR to pro-

[218] *See* note 1 *supra*. The Act was added in 1959. Cal. Stat. 1959, ch. 1766, § 1, at 4247.

[219] CAL. WATER CODE § 12202 (West Supp. 1968) (emphasis added).

[220] County of Los Angeles v. Craig, 52 Cal. App. 2d 450, 452, 126 P.2d 448, 449 (1942).

[221] Coker v. Superior Court, 70 Cal. App. 2d 199, 201, 160 P.2d 885, 886–87 (1945); *see* Spreckels v. Graham, 194 Cal. 516, 527, 228 P.1040, 1043–44 (1924).

vide overland substitute supplies[222] represent a nonbinding administrative determination originally made by the Interagency Delta Committee.

The 1959 statute was passed by a legislature which was fully aware of the Delta's role in the statewide water project,[223] and was the result of extensive hearings on the problems of the Delta.[224] It would seem to be significant that although the legislature had been fully informed on the past proposals and methods for salinity control,[225] it chose not to provide for a specific means of control nor for specific control criteria. Instead, the new act expressed only general policies of protection for the Delta and its waters.

Section 12202 should also be interpreted with the concurrent acts of the legislature providing for the further studies of the Delta which eventually resulted in Bulletin 76.[226] That fact would indicate that specific provisions for control of salinity were purposely avoided, at least until further analysis could be completed, and that it was the legislative intent to consider solutions other than the firm commitment implicit in the "Collinsville" provisions of § 11271.

4. The State Water Plan

A 1929 Act of the California Legislature called for work to be done on a "coordinated plan for the conservation, development and utilization" of the state's water resources.[227] One of the twelve bulletins issued by the Division of Water Resources in response to that directive was Bulletin 25, the summary report of the State Water Plan.[228]

Bulletin 25 is of some importance, since it recommended outflows of 3,300 cfs at Antioch as the best means of achieving salinity control in the Delta.[229] The bulletin was reported to the Legislature in 1931, and immediately served as a basis for the state's water planning.[230] The plan itself, however, was not officially adopted by the Legislature until 1941, nor codified until 1943.[231]

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[222] *See* text accompanying notes 127–37 *supra*.

[223] CAL. WATER CODE § 12200 (West Supp. 1968) provides that the "State Water Resources Development System has as one of its objectives the transfer of waters from water-surplus areas in the Sacramento Valley and the north coastal area to water-deficient areas to the south and west of the Sacramento-San Joaquin Delta via the Delta; water surplus to the needs of the areas in which it originates is gathered in the Delta and thereby provides a common source of fresh water supply for water-deficient areas."

[224] *See* Senate Interim Committee on Proposed Water Projects, Study of Sufficiency of Proposals and Some Effects of the California Water Development Program, 1959 CAL. SEN. J. (Appendix Vol. 2, May 14, 1959).

[225] *Id.*

[226] The Delta Protection Act was added by Cal. Stat. 1959, ch. 1766, § 1, at 4247. Enacted the same day was Cal. Stat. 1959, ch. 1765, at 4246, an act providing for further studies of the Sacramento-San Joaquin Delta and amending part of the legislation which authorized BULL. 76. Similarly, the Burns-Porter Act, Cal. Stat. 1959, ch. 1762, at 4235 failed to provide for specific physical solutions.

[227] Cal. Stat. 1929, ch. 832, at 1761.

[228] *See* note 85 *supra*. The State Water Plan is often confused with later plans, especially the California Water Plan. *See* text accompanying note 26 *supra*.

[229] *See* text accompanying note 104 *supra*.

[230] *See, e.g.*, U.S. Bureau of Reclamation, *supra* note 109, at 214.

[231] Cal. Stat. 1941, ch. 1185, § 1, at 2943; Cal. Stat. 1943, ch. 368, at 1742; Cal. Stat. 1943, ch. 370, at 1896. This legislation was codified in CAL. WATER CODE §§ 10000–01.

It has thus been discounted as "redundant,"[232] and perhaps subordinate to later code sections, since it was adopted long after the 1933 passage of the Central Valley Project.[233] However, since the CVP concept was taken directly from Bulletin 25, and had been revised during its takeover and operation by the federal government, some duplication is obviously to be expected. The salinity control sections, however, remain unaltered and continue as a viable portion of the plan. There is not such a conflict between the remaining portions of the plans that the CVP must perforce prevail over the State Water Plan.

The present validity of the State Water Plan is still questionable, since it could easily be argued that it has been effectively superseded by later commitments, such as the California Water Plan of 1957.[234] Its recommendations should be reassessed in light of the assumptions and findings made in the background studies.[235] It might also be asserted that any such plan is, by nature, tentative only.[236] However, the State Water Plan should not be discounted entirely; it is the result of a thoroughgoing investigation, and its salinity provisions are an integral part of the "coordinated" plan which has been made partially operational.[237] In that regard, the salinity provisions should be accorded some deference as a feature of the overall plan, at least in operation of the CVP.

Whatever the status of Bulletin 25's recommendations,[238] the exporting agencies will almost certainly continue to argue that maintenance of the "Antioch" flow, as recommended by the plan, would be an unreasonable waste of water.

C. Reasonable and Beneficial Use of Water

The California Constitution, as interpreted in *Peabody v. City of Vallejo,* declares:

1. The right to the use of water is limited to such water as shall be reasonably required for the beneficial use to be served.
2. Such right does not extend to the waste of water.

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[232] J. BAIN, R. COVES & J. MARGOLIS, NORTHERN CALIFORNIA'S WATER INDUSTRY 100 (1966).

[233] CAL. WATER CODE § 10002 (West 1956) specifies that in case of conflicts, provisions of the CVP will prevail over those of the State Water Plan. Note that the CVP was adopted directly from BULL. 25. See notes 85 and 109 *supra.*

[234] *See* note 26 *supra.*

[235] *See* text accompanying notes 101–104 *supra.*

[236] In Johnson Rancho County Water Dist. v. State Water Rights Board, 235 Cal. App. 2d 863, 870, 45 Cal. Rptr. 589, 594 (3d Dist. Ct. App. 1965), the court found the California Water Plan to have only a "general, tentative and flexible character." *See* CAL. WATER CODE § 10005 (West Supp. 1968). The State Water Plan, however, gives little indication of being provisional or tentative.

[237] "The various parts or units of this project are related, constituting a system of regulating the major streams of the Great Central Basin of California, and therefore it is by us, and in our opinion should be, treated as one project consisting of several units." California Water Resources Comm'n, *supra* note 108, at 24.

[238] The court will not consider engineering plans to contain irrefutable statements. *See* Beckley v. Reclamation Board, 205 Cal. App. 2d 734, 741–43, 23 Cal. Rptr. 428, 433–34 (3d Dist. Ct. App. 1962).

3. Such right does not extend to unreasonable use or unreasonable method of use or unreasonable method of diversion of water.[239]

The California Supreme Court recently reexamined this policy in *Joslin v. Marin Municipal Water District.*[240] The court there noted that "beneficial use" is not to be equated with "reasonable use"; therefore "the mere fact that a use may be beneficial to a riparian's lands is not sufficient if the use is not also reasonable within the meaning of Section 3 of article XIV . . . ."[241] Delta interests claim many beneficial uses, a few of which are enumerated in Water Code § 12581, which includes: "repulsion of salt water, preservation and development of fish and wildlife resources, and recreational facilities."[242]

In an important discussion of the meaning of "reasonableness," the *Joslin* court expanded upon the earlier definitions (which considered only the circumstances of each particular case) and noted that:

> such an inquiry cannot be resolved *in vacuo* isolated from state-wide considerations of transcendent importance. Paramount among these we see the ever increasing need for the conservation of water in this state. . . . On the other hand, unlike the unanimous policy pronouncements relative to the use and conservation of natural waters, we are aware of none relative to the . . . [plaintiffs' use]. Plaintiffs do not urge that the general welfare or public interest requires that particular or exceptional measures be employed to insure that . . . [their use] . . . should therefore be carefully conserved.[243]

The reasonableness of a beneficial use is thus partially determined in relation to the general welfare.

Unlike the plaintiff in *Joslin,* the Delta users can make a good argument that the general welfare requires that exceptional measures be employed to protect the various uses made of the Delta. Water Code § 12000 found the water problems of the Delta to be "unique within the State." Section 12201 relates the legislative finding that enactment of the Delta Protection Act "is necessary for the protection, conservation, development, control and use of the waters in the Delta for the public good." Thus, many of the beneficial uses claimed by the western Delta users would appear to meet the "statewide considerations" criteria of reasonableness.

The DWR contends that many of these uses, although beneficial, are not reasonable. Hence, the DWR does not contend that salinity repulsion is per

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[239] 2 Cal. 2d 351, 367, 40 P.2d 486, 491 (1935), Construing CAL. CONST. art. XIV, § 3 (West 1954). *See generally* 51 CAL. JUR. 2d §§ 30–32; Trelease, *The Concept of Reasonable Beneficial Use in the Law of Surface Streams,* 18 WYO. L. REV. 1 (1956). The concept of "beneficial use" has evolved somewhat differently in administrative usage. *See* page 14 *supra.*

[240] 67 Cal. 2d 132, 60 Cal. Rptr. 377 (1967).

[241] *Id.,* at 143, 60 Cal. Rptr. at 384.

[242] CAL. WATER CODE § 12581 (West 1956); *see* CAL. WATER CODE § 1243 (West Supp. 1968): "The use of water for recreation and preservation and enhancement of fish and wildlife resources is a beneficial use of water." *See also* CAL. ADMIN. CODE tit. 23, § 667.

[243] Joslin v. Marin Municipal Water Dist., 67 Cal. 2d 132, 140, 60 Cal. Reptr. 377, 382–83 (1967).

se unreasonable under the *Joslin* doctrine, but that the large releases needed for repulsion are unreasonable. Thus, whether the releases for repulsion of salt water are reasonable would appear finally to depend upon the amount of flow required. The DWR contends that any flow in excess of that required by the November 19 Criteria would per se amount to a wasteful excess. But such an assertion is difficult to assess or justify, since the outflows planned to meet the November 19th Criteria have no claim to unusual validity.[244] Indeed, the level of a reasonable outflow is one of the major unsolved problems of the Delta.

However, the DWR does contend that it would be unreasonable, as demonstrated by *Joslin,* to allow large quantities of water to be released to protect many of the in-channel or in-place uses which the Contra Costa interests contend are important to the Delta's economy.[245] Among those uses are protection of fish and wildlife, recreation, repulsion of marine borers, and a general maintenance of the environment in both an ecological and aesthetic sense.

It is not clear which of the uses affected by the availability of water are considered unreasonable by DWR, and which are merely considered not subject to significant impairment. The DWR apparently contends that recreational and fish and wildlife interests will not be damaged by the operation of its project. There is little evidence to substantiate or contest that assertion, due partially to the many factors involved and to the existence of intra-agency agreements between the Department of Fish and Game and the DWR which the Resources Agency has deemed "adequate" to protect wildlife interests.[246] Although some damage to recreational values has been noted,[247] the DWR contends there will be no significant damage.

The marine borers (Teredo navalis) were described in Bulletin 27 as "a species of shipworm living in salt water, having an extra-ordinary capacity for speedy and complete destruction of timber exposed to its ravages."[248] The estimated potential damage from this Liliputian invasion could amount to $3,867,800 in the Pittsburg area alone if the salinity is allowed to in-

[244] *See* text accompanying notes 121, 157, 165–68 *supra.*

[245] The in-place uses claimed by Contra Costa are discussed in METCALF & EDDY, AN ECONOMIC EVALUATION OF THE WATER QUALITY ASPECTS OF CONTRA COSTA COUNTY'S OFFSHORE WATER SUPPLY (1965). The effect of *Joslin* on recreational rights in water is discussed in Malakoff, *Erosion of a Water Right, or Just a Pile of Sand?,* 5 CAL. W. L. REV. 44, 62 (1968). Recent articles on the importance of recreational uses of water include Reis, *Policy and Planning for Recreational Use of Inland Waters.* 40 TEMP. L.Q. 155 (1967); Schiff, *Outdoor Recreation Values in the Public Decision Process,* 6 NAT. RES. J. 542 (1966); Tarlock, *Preservation of Scenic Rivers,* 55 KY. L.J. 745 (1967). Some problems of non-consumptive or in-place uses of water under the riparian system are discussed in Comment, *Water Recreation—Public Use of Private Waters,* 52 CALIF. L. REV. 171 (1964); problems under the appropriation system are discussed in Comment, *Water Appropriation for Recreation,* 1 LAND & WATER L. REV. 209, 214–21 (1966). The subirrigation practiced on many of the Delta islands, see text accompanying note 46 *supra,* may be another form of in-place use. *See* 1 S. WIEL, WATER RIGHTS IN THE WESTERN STATES § 367 (3d ed. 1911).

[246] F & G REPORT, *supra* note 32, at x; *cf.* text accompanying notes 146 and 173 *supra.*

[247] *See* text accompanying note 77 *supra.* Contra Costa interests also assert that a change from fresh to saline water will drive many water sports enthusiasts to other areas where fresh water is available. There is little evidence to support either contention.

[248] BULL. 27, at 435.

crease to the level at which the borer can invade the area.[249] To this the DWR has quixotically replied that to maintain the freshness of Delta waters to repel the borer would be just as unreasonable as flooding land solely for the purpose of drowning gophers.[250] Were borer control the only use involved, and it certainly is not, it obviously could not justify the large flows necessary for salinity control.

The general question of environmental control apparently includes aesthetics, maintenance of the ecological balance, and preservation of the wildlife and recreational assets of the area. As noted earlier,[251] this factor is intimately connected with Contra Costa's economy. In that respect, there is a close similarity to *City of Elsinore v. Temescal Water Company,*[252] where a lake's use for recreational purposes was upheld as reasonable. In that case a water company so interfered with the flow of a river that the level of the lake was disastrously lowered. Its unsuitability for any recreational purpose caused a loss of business to the inhabitants and a general decline in property values. The court held that the use of water to maintain the lake's level was not unreasonable.

> Neither the maintenance of health-giving recreational opportunities, nor the existence and continuance of large business interests devoted to and built up for the purpose of making those opportunities available to large numbers of its citizens, can be held to be against the public policy of this state.[253]

There is an obvious difference of degree between the Elsinore situation and that in the Delta, which would weaken the impact of that holding. However, it would certainly seem that fair consideration should be given to the Delta's unique environment, and the many changes which will occur under operation of the export projects.

The whole question of reasonableness of use requires a subjective analysis of each factor involved in a use of water. The proposed changes in the Delta ecology are on a far larger scale than the changes in *Joslin,* and would not yield as easily to a finding of imbalance in the public policies served. Yet the changes appear to impede rather than eliminate the major uses, and the damage which is likely to occur to Delta uses is of a sort not easily measured. Whether the Delta uses are reasonable will therefore be one of the thorniest problems encountered in any resolution of the Delta controversy.

D. The Doctrine of Physical Solution

When faced with a problem of water rights adjudication, the California courts often attempt to find a physical solution by which the optimum bene-

[249] METCALF '68, at V-11.

[250] In Tulare Irrig. Dist. v. Lindsay-Strathmore Irrig. Dist., 3 Cal. 2d 489, 568, 45 P.2d 972, 1007 (1935), the court held that to flood lands in order to kill a gopher infestation was not a reasonable and beneficial use of water.

[251] *See* notes 153 and 245 *supra.*

[252] 36 Cal. App. 2d 116, 97 P.2d 274 (1939).

[253] *Id.*, 36 Cal. App. 2d at 129, 97 P.2d at 280. *See also* City of Los Angeles v. Aitken, 10 Cal. App. 2d 460, 52 P.2d 585 (1935). Generally, however, California courts have refused to recognize aesthetic uses of water. H. ROGERS & A. NICHOLS, WATER FOR CALIFORNIA § 178(4) (1967). *But see* note 245 *supra.*

ficial use of waters may be made while avoiding the invasion of prior vested water rights.[254]

> If those prior vested water rights can be preserved and satisfied by giving them the water to which they are entitled, and at the same time waste can be prevented by reasonable changes in natural physical characteristics, then, under the California decisions, the court may solve that problem by the use of its injunctive powers, conditioned upon making those physical changes. . . . The efforts of the courts of California . . . have been to . . . satisfy the prior vested right . . . and at the same time make available, for appropriation and reasonable and beneficial use elsewhere, all water in excess of that required to satisfy those prior vested rights.[255]

In *City of Lodi v. East Bay Municipal Utility District,*[256] the court noted that the doctrine of reasonable and beneficial use:

> compels the trial court . . . to ascertain whether there exists a physical solution of the problem presented. . . . If a physical solution is to be worked out . . . any substantial expense incidental thereto should be borne by the . . . [subsequent appropriator]. The . . . [plaintiff] is a prior appropriator and as such cannot be compelled to incur any material expense in order to accommodate the subsequent appropriator.[257]

Thus the policy of the courts, which is to use physical solutions paid for by the junior appropriator, seems directly in accord with the policy of Water Code § 12202 which provides for a "substitute water supply."[258]

It is the contention of the DWR that the planned overland supplies for western Delta users and the negotiated agreements which provide for a substitute supply to cities and industries will constitute a negotiated physical solution. Such solutions by the parties are apparently to be encouraged.[259] It is equally clear, however, that the solution must be fair and equitable. Whether it is in the best interests of western Delta owners to accept the physical solution offered or to demand a court adjudication of the issues appears to be the question of the hour.

VII. Conclusion

Widely divergent requirements among the Delta users have resulted in a crazy-quilt of negotiations, agreements, and threats of litigation. Although

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[254] W. Hutchins, The California Law of Water Rights 351 (1956).

[255] Rank v. Krug, 142 F. Supp. 1, 164 (S.D. Cal. 1956).

[256] 7 Cal. 2d 316, 60 P.2d 439 (1936).

[257] *Id.* at 339–41, 60 P.2d at 450.

[258] *See* notes 218–22 *supra.*

[259] In City of Lodi v. East Bay Municipal Util. Dist., 7 Cal. 2d 316, 341, 60 P.2d 439, 450 (1936), the court noted: "Other suggestions as to possible physical solutions were made during the trial. The trial court apparently took the view that none of them could be enforced by it unless the interested parties both agreed thereto. That is not the law. Since the adoption of the 1928 constitutional amendment, it is not only within the power but it is also the duty of the trial court to admit evidence relating to possible physical solutions, and if none is satisfactory to it to suggest on its own motion such physical solution [citation omitted]. The court possesses the power to enforce such solution regardless of whether the parties agree."

some of the parties to the dispute have resolved their differences, others have taken inflexible positions in opposition to one another. The controversy is most extreme in the western Delta. There the export agencies' interest in water rationing and the resulting decreased flows is matched by Contra Costa's determination, in protection of its vested economic and emotional interests, to maintain a higher level of flow and attain public recognition of its dilemma.

Added to the opposing interests of the protagonists is the confusing and conflicting state of the information available to them. Better information is needed about acceptable levels of salinity, the effect of the Peripheral Canal on Delta hydrology, and the economic and physical feasibility of overland supplies for agriculture. Other studies and reports disagree as to the many effects which could result from various levels of outflow or other alterations in the Delta's hydrology. Misinformation thus serves to reinforce old positions and emphasize the discomforting fact that the effects of many changes are simply unknown. The confusing panorama of technical data and the divergent goals of the project operators and Delta users, therefore, seems to prohibit the rapid resolution of the controversy.

Whatever the amount of a "reasonable" flow, its determination beclouds the existence of the water rights claimed for the Delta. A standard of quality, not a measure of quantity, is the only meaningful protection. Although a "prior right" or "entitlement" undoubtedly exists, it is affected by the (reasonable) physical solution which apparently could be imposed on that prior right. Western Delta users would willingly pay for additional waters made available to them by the DWR, but by common law and statute they are also entitled to a physical solution in the form of a replacement or "substitute" source of water. It is not clear whether such a plan is feasible, nor which party would pay for the expensive local distribution systems necessary for overland supplies.

The DWR has steadfastly maintained that outflow beyond that contemplated by the November 19 Criteria is wasteful and prohibitively expensive. Yet those criteria were derived in negotiations between the DWR and various agricultural interests, and could hardly claim to represent an "optimum" allocation of water for the numerous uses which are possible within the Delta. Furthermore, obvious disparity of bargaining position and lack of participation by other Delta interests in each of the separate agreements weakens the DWR's claim that negotiated agreements represent fair criteria, applicable to all concerned. Whether those negotiations represent the state's best interests or merely speed the disposition of the Delta controversy is not clear.

The history of positions taken and pronouncements made by the export project operators shows a baffling array of changed plans which have eroded user groups' confidence in the finality of the project operators' assurances. But the Delta's problems are highly complex. Surely no one would hold the project operators to plans which no longer represent a desirable resolution of a problem. Similarly, Contra Costa's position of habitual opposition dem-

onstrates little willingness to compromise. But whether western Delta users should be expected to compromise, as have the eastern groups, depends on the degree to which their claims are valid.

All Delta users presently claim several historical entitlements, while Contra Costa also asks recognition of particular uses and the control flows necessary to protect those uses. But neither the validity of the entitlement claims nor the decision whether export of water is more "reasonable" than its reservation for in-place use has yet been settled. The complex policy decisions and legal determinations involved in answering those questions require thorough consideration and evaluation. Unfortunately, the final determination is instead being reached by negotiations among parties deeply involved in and affected by the controversy. Such negotiations seem to be of doubtful efficacy in discovering that solution which promotes optimum development and allocation of the state's water resources.

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