

The Price of Water

Surplus and Subsidy in the California State Water Project

Michael Storper

School of Architecture and Urban Planning
University of California, Los Angeles

Richard A. Walker

Department of Geography
University of California, Berkeley



INSTITUTE OF GOVERNMENTAL STUDIES

University of California, Berkeley

1984

Contents

Foreword	vii
Acknowledgment	viii
Introduction	1
The Size of Intraproject Transfers	2
Rationales for Surplus Water Distribution	3
First Rationale: Demand Buildup	3
Second Rationale: Variability in Annual Yields	5
Third Rationale: Large Public Works Justify Special Pricing	6
Fourth Rationale: The People of California Are the Ultimate Beneficiaries of Cheap Water	8
Economics and Politics Behind the Water Supply	9
Conclusions and Recommendations	12
Notes	14
Appendix	19
Tables	
1. Entitlements and Deliveries	22
2. Surplus (and Deficit) Water Deliveries	24
3. Overpayments by Metropolitan Water District (MWD)	26
4. Underpayments by Kern County Water Agency (KCWA)	27
Notes	29

Foreword

The price of water—which is both the topic and title of this monograph—is based on a set of inherently political decisions, rather than primarily economic ones. The question of who pays for water development and delivery in California—farmers, consumers, homeowners, taxpayers (local, state, and federal), landowners, renters, industry—is difficult to answer with precision, because all of them pay. Indeed, a single individual may serve in several capacities, and thus pay in several ways. The argument is further complicated by disagreement over what constitutes an unwarranted subsidy, as contrasted with desirable public support of water development.

This essay deals with an important aspect of the continuing debate: the distribution of the State Water Project's costs and benefits (1) to agricultural interests served by the Kern County Water Agency, and (2) to people served by the Metropolitan Water District of Southern California. The authors' principal conclusion is that costs are shifted from the Kern County agency to southern California residents. This, they argue, constitutes a subsidy that cannot be justified on the basis of sound water practice, and permits agricultural firms to irrigate submarginal lands.

Merely posing this conclusion highlights the controversial nature of the essay. Others inside and outside the University who study the economics and politics of water will undoubtedly challenge some of the authors' interpretations of the facts, as well as the conclusions drawn from them.

In another place a colleague and I noted how, more than many other problems, water issues "...dramatize the difficulties confronting the people of California and their political leaders. That these difficulties can be overcome is also clear. The next generation of Californians deserves no less."* It is the hope of the Institute of Governmental Studies that this paper will contribute to the further discussion and debate that are essential to a resolution of this critical problem.

Eugene C. Lee
Director

* Eugene C. Lee and Harrison C. Dunning, "Political Dynamics and Decision Making," Ernest A. Engelbert with Ann Foley Scheuring, eds., *Competition for California Water: Alternative Resolutions* (Berkeley: University of California Press, 1982), p. 197.

INTRODUCTION

On June 6th, 1982, the people of California voted overwhelmingly against authorizing construction of storage and delivery facilities—including the Peripheral Canal—to complete the State Water Project (SWP). These facilities, hereafter referred to as “Phase II,” would have doubled the capacity of the SWP and cost about \$20 billion, including interest and inflation, thus ranking as one of the world’s largest public works projects.¹

Despite the election results, demands for the expansion of California’s water supply continue to be made. Hence it is essential that both current operations and future development of the SWP be critically evaluated. During the 1982 election campaign most of the discussion concerned the Peripheral Canal, the Delta region, loss of Colorado River water to Arizona, and the regional rivalry between southern and northern California.² But basic questions of project economics—who pays, who benefits, and how these transactions would relate to the need for more water—were not dealt with adequately or answered definitively. This monograph treats the SWP’s intraproject finance and management, and will attempt to advance the discussion by focusing on the two major water consumers, the Metropolitan Water District of Southern California (MWD), and the Kern County Water Agency (KCWA).

To sum up at the outset, our investigations led to the following conclusions:

1. The SWP involves large subsidies to agricultural contractors, just as does the federally built and operated Central Valley Project.³ The people of metropolitan southern California pay a majority of the state project’s fixed costs, but receive a considerably smaller proportion of its average water yield. The effective amount of this intraproject subsidy is currently about \$25 million per year.

2. The people of southern California do not now need as much project water as they are paying for, nor will they for many years. From the perspective of urban users, the SWP was built at least 20 years too soon. If construction of Phase II were to proceed soon, it will also be finished long before it is needed, and massive intraproject financial transfers would have to continue for decades to pay for it.

3. There are much better ways of dealing with the threat of water shortages than augmenting the SWP too soon, or making it excessively large. A more sensible “insurance policy” against shortages would be managing several major resources—the SWP, groundwater, and the Colorado River—in a coordinated way to maintain average long-run yields.

4. The pricing policy of the SWP cannot be justified on the basis of economic theory, in light of steeply increasing costs of expanding the system.

5. San Joaquin Valley growers and landowners are the principal beneficiaries of the SWP. Current pricing policies effectively halve the valley users' average unit costs of water, compared to what they would pay under a "proportional share" cost allocation scheme.⁴ These reduced costs are not ordinarily passed on to consumers in the form of lower prices.

6. Agricultural contractors would not be able to pay their "proportional share" of project costs. Hence project subsidies represent an intentional strategy that allows irrigation of submarginal lands. Elimination of subsidies would result in some of these lands being removed from production. While the effects of this in Kern County would probably be substantial, they would be negligible in the rest of the state.

These findings prompt us to urge further public inquiry into water pricing and allocation practices, before proceeding with plans to expand the SWP. More attention should be given to ways of making better use of the enormous water supply now already available to California. To this end, we conclude by recommending alternative pricing and management policies that we believe to be reasonable, practical, and readily available.

We now address the principal issues in detail.

THE SIZE OF INTRAPROJECT TRANSFERS

Two of the 31 contractors for SWP water—Metropolitan Water District of Southern California and Kern County Water Agency—are entitled to approximately three-fourths of the project's anticipated full delivery capacity. MWD has contracts for approximately 47.5 percent of capacity, and KCWA for 27.3 percent. The contractors are legally obliged to repay the project's costs, although doubts have been raised about the *overall* repayment of those costs.⁵

We are concentrating on a different, but equally important, question: Does each contractor's share of project benefits (water delivered) correspond to its share of payments? We found that the Department of Water Resources (DWR) does not manage the project according to its stated principle of cost-recovery, i.e., on a "proportionate use of facilities basis." MWD receives much less than its "proportional share" of water, measured by its proportion of repayment, and the KCWA receives much more. Conversely, MWD pays much more than its "proportional share" of costs for the water it actually receives, and KCWA pays much less. This is due primarily to the disbursement of large amounts of surplus water to KCWA. (Each year that the total project yield is equal to that projected for a dry year ["firm yield"] or better, each contractor is entitled to a quantity of water called the "published annual entitlement." Any amount of water greater than total published entitlements in a given year is considered "hydrologic surplus." For a more detailed explana-

tion of these terms and a systematic critique of DWR methods of calculating surplus and repayment shares, see Appendix.)

During the project's first eight years, MWD gave up a surplus of 3.46 million acre-feet (MAF). Approximately two-thirds of this went to KCWA, which received 2.35 MAF. A substantial financial transfer was implicit in this water reallocation, MWD being "overcharged" by \$170 million, or \$21.2 million per year, while KCWA was "undercharged" by \$176 million, or \$22.0 million per year. For KCWA this meant a saving of \$30.21 per acre-foot, and for MWD an extra cost of \$60.13 per acre-foot. Put another way, MWD took 26.6 percent of total project deliveries for the eight-year period, while its share of capital cost repayment was 57.3 percent. In contrast, KCWA received 45.7 percent of water deliveries, but paid only 13.9 percent of capital costs. (See Appendix for supporting calculations.)

Thus, in effect, MWD pays for water it does not receive, while KCWA receives surplus water it does not pay for. In evaluating the significance of this finding, we need to examine the basis of DWR's pricing policies.

RATIONALES FOR SURPLUS WATER DISTRIBUTION

Four rationales have been offered to counter charges that policies on surplus water distribution and pricing are not equitable.⁶ It is alleged that (1) because of increasing demand the surplus phenomenon will be temporary and transfers will soon end; (2) the surplus policy is an effective way to ensure against climatic variability; (3) the low price of surplus water is dictated by the composition of project costs, as well as by good economic theory; and (4) subsidized water for agriculture ultimately benefits the urban consumer and the state's economy. None of these rationales can survive close scrutiny.

The First Rationale: Demand Buildup

Officials of the Department of Water Resources argue that revenue transfers will characterize only the early years of the State Water Project, and will be eliminated as contractors' water demands build up and surpluses disappear during the next two decades. DWR depicts Phase II as providing the necessary facilities to complete the SWP and keep up with anticipated growth in water demand in the MWD service area. To the contrary, our analysis shows that metropolitan southern California does not need additional supplies, and that it is principally San Joaquin Valley agriculture that would use the additional surplus water generated by an expanded SWP.

DWR anticipates that MWD will need 1.17 MAF of project water in 2000.⁷ This amount could, in fact, be supplied *without the addition of any Phase II facilities*, as long as MWD receives its full contractual share, or "ultimate entitlements" (47.5 percent) of the dry-year ("firm yield") of existing project capa-

city.⁸ The MWD's year-2000 total regional water demand of 3.2 MAF can be met by the State Water Project (1.17 MAF), the Colorado River (0.5 MAF), Owens Valley (0.5 MAF), and local groundwater (1.0 MAF).⁹ This assumes worst-case conditions, with both SWP and Colorado River imports at a minimum, and no drawdown of local water tables. (The low probability of such a worst-case combination of events is discussed later.) In short, even without Phase II there is no medium-term danger of water shortage in metropolitan southern California. Moreover, without Phase II, "surplus" water transfers to KCWA would be eliminated by the year 2000 as deliveries to MWD increase, thus equalizing water delivery shares and payments. (The impact of ending surplus water deliveries to KCWA is considered later.)

From this we conclude that it is not necessary to build Phase II as planned, and that it would in fact exacerbate the surplus water situation because demand from MWD would not rise fast enough to absorb additional supplies in a reasonable period of time. DWR's own figures show this. The projected Phase II construction program is divided into two stages.¹⁰ The first stage includes the Peripheral Canal, Los Vaqueros Reservoir, groundwater storage programs, Cottonwood Creek unit, new Delta pumps, and enlargement of the East Branch of the California aqueduct. The second consists chiefly of the Glenn Reservoir complex.¹¹

A comparison of demand and supply for the year 2000 shows that with the first stage of Phase II complete, total SWP yields will rise to 3.49 MAF in a dry year and 4.33 MAF in a wet year.¹² MWD demand will be 1.17 MAF as before. Assume that contractors other than MWD ask for their full published entitlements, a total of 2.16 MAF. Even in a dry year, capacity would still exceed deliveries by 0.16 MAF.¹³ Thus, with the first segment of Phase II in place, MWD would need only 33.5 percent of the project water delivered in a dry year 2000, and only 27.0 percent of project water in a wet year 2000. MWD's repayment obligation would remain at a level of at least 47.5 percent, however, leaving substantial financial transfers between contractors.

If the second stage of Phase II were finished as planned by 2020, the project would have a total dry-year (firm) yield of 4.19 MAF, and a wet-year yield of 5.33 MAF.¹⁴ Projected water deliveries to MWD are estimated as increasing to 1.71 MAF by 2020. If all agencies other than MWD were again to take their full published entitlements, or 2.16 MAF, total demand for project water would be 3.86 MAF, comfortably below dry-year yield. In a wet year, there would be a surplus of 1.47 MAF.¹⁵ Thus, in a dry year MWD would receive 40.8 percent of projected deliveries and in a wet year only 32.1 percent, compared to its repayment share of at least 47.5 percent. Again, there would be financial transfers in all years, wet or dry.

To sum up, if State Water Project capacity is expanded according to Department of Water Resources plans, surplus water transfers will continue. The Metropolitan Water District will go on underwriting the capital costs of a project that provides a disproportionate share of benefits to agricultural users.

In short, large intercontractor subsidies will be *permanently* built into the SWP just as they have been in the past.¹⁶ The proximate reason for this

situation is that water demand in the MWD service area has not materialized as originally anticipated when the plans for the SWP were drawn up in the 1950s (see Appendix). Revised demand estimates show both phases of the SWP to be "too much, too soon" in providing water supplies.

Second Rationale: Variability in Annual Yields

A second rationale holds that the surplus water policy is a sensible way to deal with fluctuations in annual rainfall and project yield. DWR argues that the price charged for shares of firm yield should be higher than for surplus water, because the former are dependable, while the latter are unpredictable and undependable.¹⁷ This argument is based on erroneous assumptions regarding climatic variation, as well as the best way to ensure against dry-period water shortages. While we cannot be certain ahead of time how much runoff will occur in any given year, precipitation patterns and project yields are reasonably predictable *as long-run statistical norms*. Indeed, "firm" (dry-year) yield, the current benchmark for project planning, is precisely such a long-run statistic.

It is therefore realistic to base contracts and pricing on long-run *average* yields, with appropriate planning for the established range of annual deficits or surpluses above and below the average. Average-yield management would be superior to the current practice of trying to base contractual obligations on dry-year yield: as previously shown, the latter simply builds in surpluses for most years, engendering a false sense of security and misallocating available water resources. Moreover, average-yield management would not necessarily mean supply shortages for contractors in below-average years, as one might at first suppose. Instead, all available surface and groundwater supplies in every major state water basin could be managed for long-run, stable average yield. To achieve this, conjunctive management of surface and groundwater supplies would have to become a guiding policy for SWP operations. DWR and KCWA would calculate the total annual inflow into Kern County, including groundwater, SWP proportional-share yield, and local surface sources, allowing growers to withdraw shares from all sources at a rate equal to long-run average yield. In wet years, SWP surpluses would be used to recharge groundwater supplies, and in dry years groundwater would be drawn upon to make up the shortfall. This would (1) solve the problem of groundwater overdrought, and (2) shift a larger portion of project yield out of the "surplus" category and into the category of "entitlements." This shift would raise the price of water that KCWA receives from the SWP, but would not change the total amount.

There are ample precedents for such average-yield, joint-resource management. When project surpluses are available, Kern County growers reduce groundwater pumping, thus reserving the groundwater for heavier withdrawals in drier years. In short, Kern County users attempt to "average" their total water supply over multiyear periods. In the process, however, they have come to treat the temporary surplus water, derived from the slow buildup of MWD demand, as if it were firm-yield, and therefore theirs to depend on per-

manently. They have found this cheaper and easier than to live within their real water means and to deal with the persistent groundwater overdraft in parts of the county.¹⁸ (As noted earlier, the economic impact on Kern County agriculture of revised water-management policies will be taken up later in the discussion.)

Conjunctive use would be even more effective in managing the groundwater basins of southern California, where MWD can draw on both groundwater and the Colorado River, as well as the State Water Project. This way of coping with dry years undermines the argument of MWD officials that paying extra for excess SWP capacity is a justifiable "insurance premium" against drought. MWD's best insurance lies in conjunctive management to balance imports from the SWP and the Colorado aqueduct with local surface and groundwater supplies. MWD already manages groundwater by replenishing it in wet years. To get the full effect of groundwater storage as a buffer against drought, however, MWD would have to pump more during dry years than it does at present.¹⁹

In addition, MWD should investigate the possibility of a "water banking" arrangement with other contractors for Colorado River and SWP water, as there is less likelihood of a drought that simultaneously affects both the Sacramento River and Colorado River basins than of a more restricted drought that affects one or the other, but not both. The historical record of the 20th century does not include a drought so widespread that it affected both the Colorado River basin and the Sacramento River basin at the same time. Moreover, the combined storage capacities of the reservoirs on the two river systems provide extra protection. Accordingly, MWD could rely more heavily on whichever basin is having a wetter year, while receiving credits from other users for not taking its full share from the drier basin. The credits earned could be used when the basins' precipitation patterns were reversed.²⁰

Third Rationale: Large Public Works Justify Special Pricing

In a third rationale, DWR argues that its policy of "surplus" versus "base water" pricing is justified because the ordinary rules of economic efficiency do not apply to the SWP.²¹ (See Appendix.) We argue, however, that the economic problem has not been posed properly, and that the present scheme is not the only acceptable solution to the problem of public goods pricing and allocation.

Under neoclassical economic theory, the most efficient mode of allocating resources is to set prices equal to *marginal* costs, i.e., the cost of producing the *last* unit of output. In most industries, marginal costs are greater than average costs, and are rising in the relevant range of output.

This situation is often reversed, however, in the case of large public works. Economies of scale in such undertakings mean that both marginal and average costs fall continuously as the size of a project increases, so that marginal costs are lower than average costs. Moreover, the output of certain public goods is

"lumpy" and cannot be easily divided into individual units for calculating marginal costs or charging individual user fees. For example, state parks are not bought and sold in square-foot lots. Marginal-cost pricing rules break down for such public goods, and the government must use other approaches to recover costs and to distribute benefits and costs equitably.

DWR argues that the SWP is such a public work/public good for which marginal-cost pricing is not feasible. That is, the costs are "sunk" in a large capital investment that carries economies of scale, and investments cannot be adjusted to determine the marginal costs of capacity. Consequently, it is argued that surplus water should be treated for all practical purposes as if it were a zero-cost product. In order to recover capital outlays, fixed charges are levied against contractors on the basis of their payment capacity. The water customers and property owners of the MWD service area have a greater ability to pay than the agricultural contractors.²² Surplus water can be regarded as a "bonus" output of the project, which goes to those who have high needs but limited ability to pay, i.e., agricultural contractors.

We argue that this system is not the only public-goods pricing rule that could be applied. Two other schemes are equally acceptable on efficiency grounds: (1) open-market sales of output, and (2) average-cost pricing. Some economists consider the open market the best solution, allocating the output of the project to the highest bidders (or at a market clearing price), and assuring that the water will go to what is defined as its "highest and best" economic use.²³ Yet in practical terms it is unlikely that the existing politically planned and financed system, based on administered prices, will ever entirely give way to open-market transactions.

While open-market sale thus does not seem feasible, average-cost pricing of public goods is another approach that is perfectly sound on both theoretical and practical grounds when marginal costs cannot be determined. Average-cost pricing is easily administered, secures full cost recovery, and allows even-handed distribution of the repayment burden. Most of all, it avoids creating the illusion of "free" surplus water.

We have already argued that the most practical and reasonable water allocation policy is to use average yields from the SWP and groundwater together. If in wet years DWR used above-average SWP yields to recharge groundwater, there would be no surplus to dispose of at low prices. A single average-cost pricing rule would then suffice: capital costs could be repaid in direct proportion to contractual shares of average project yield.²⁴ Such average-cost pricing for shared fixed costs would be equivalent to the "proportional share" repayment standard used as a benchmark in our calculation of intraproject subsidies. (See earlier discussion.) Average-cost/proportional-share pricing would raise average water charges to KCWA, which now benefits from the disposition of cheap surplus water. It would reduce the prices paid by MWD.

There is a further argument against DWR's justification of its surface water pricing system. It is not really correct to regard the SWP as a one-time investment, involving sunk costs and fixed output, and with indeterminate or no continuing costs. On the contrary, the present SWP facilities are only one link

in a long chain of water resource development investment in California. The SWP is itself an expanding system, with a whole series of new facilities on the drawing board. In this situation, *long-run* marginal cost can in fact be approximated using the average costs of each new unit to be constructed. DWR estimates show these long-run costs of supply expansion to be *rising*, not falling. Moreover they are substantially higher than current average costs.²⁵ Given these circumstances, *long-run marginal cost pricing* is probably the best policy, because it would reflect the increasing cost of providing further supplies of a scarce resource, and would encourage more efficient use of existing supplies.²⁶ The low prices now paid by Kern County users (averaging below \$20 per acre-foot, including pumping charges) do not provide adequate incentives for the kinds of conservation measures and water-use efficiency justified by the high real cost of additional water, which is at least \$250 per-acre foot.²⁷ In fact, the enormous future cost of increasing water supplies puts a premium on conservation and efficient water use as the most prudent and economical way to expand the state's *effective* supply.²⁸ In a world where additional water supplies cost \$250 per acre-foot, there should be no place for the fiction of "surplus" water.

Our proposal for average-cost pricing therefore represents only a minimal reform of a pricing system that is seriously distorted.²⁹ It would, however, be a significant move in the right direction, toward pricing on the basis of long-run marginal costs. It would also reduce or eliminate the heavy subsidy that irrigators of the southern San Joaquin Valley currently receive, and also greatly reduce their effective demand and presumed future need.

Fourth Rationale: The People of California Are the Ultimate Beneficiaries of Cheap Water

The final argument by proponents of the surplus water disposal policy holds that subsidized agricultural water ultimately benefits urban consumers through lower food prices, thus helping the state's economy by achieving higher levels of agricultural production. These propositions rest on several erroneous assumptions about the farm economy.

First, farm production costs, including the cost of water, do not account for a major share of the total cost of food, which also includes transportation, processing, and distribution costs.

Second, if the water subsidy were removed, production costs would not rise an equal amount. Most growers could adjust to higher water prices by investing in water-saving equipment and labor and by altering their planting strategies to include crops that need less water. This would cost them something, of course, but the evidence of greater water-use efficiency among growers facing high water costs is impressive, suggesting substantial room for improvement before irrigation becomes uneconomical.³⁰

Third, higher production costs in Kern County would have a virtually undetectable effect on prices of major food and fiber crops. Agricultural mar-

kets are acknowledged to be very large, highly competitive, and extremely adaptable to such changes. The SWP serves only about 300,000 acres in Kern County, or about 3 percent of California's irrigated farmland. Kern growers would not be able to pass their higher water costs on to the consumer, because they would be undercut by competitors. Alternatively, if some Kern land were withdrawn from production, farmers elsewhere would take up the slack, keeping prices stable.³¹

Fourth, the one place where a reduction in Kern County's output may be felt is in certain specialty crops. Kern County grows mainly cotton and luxury crops, such as table grapes, pistachios, walnuts, and almonds. But here production cutbacks in Kern County would benefit competing producers elsewhere in California, so the state as a whole would not lose. What happened with olives is instructive: massive plantings in the southern San Joaquin Valley in the last decade, spurred by tax incentives and combined with deals struck with processors, hurt many northern California olive producers.³²

The principal false assumption behind the water subsidy argument is that we are operating in a world of scarce food and fiber, but abundant water. The reverse is nearer the truth. Agricultural markets are notoriously prone to overproduction rather than shortages.³³ Marketing boards and government programs have traditionally helped restrict output. After uncharacteristically strong world demands in the middle 1970s, prices have begun falling again. Producers are eagerly looking for outlets for their surpluses, and the Reagan administration is actively seeking ways to curb excessive production. This would be aided in at least a small way by production cutbacks in Kern County due to water reform.

Kern County growers and landowners are the only substantial beneficiaries of the water subsidy policies of the SWP, and hence the only real losers if higher water prices were imposed.³⁴ Because of their reduced profits and rents, attributable to higher production costs, they might do considerable switching to less valuable crops, and even cease production on certain lands. At first glance, such a redistribution of state income away from Kern County seems unjust, but such a view rests on a mistaken perception of who the "farmers" are and why we arrived at the present dilemma.

We can now turn from the rationales constructed by those who have an interest in perpetuating the SWP water subsidy, to a consideration of the real economic and political reasons on which this policy is based.

ECONOMICS AND POLITICS BEHIND THE WATER SUPPLY

If intraproject subsidies cannot be justified on the basis of future water needs, good water management, prudent economics, or lower food prices, then perhaps their real justification lies in an intentional policy that benefits the large growers of Kern County. First, consider why they need the subsidy.

The evidence strongly suggests that the repayment capacity of Kern County growers is not sufficient to cover *unsubsidized* costs of water in quantities as large as are being delivered today. Because of the poor quality of much Kern County land and/or lack of adequate local water supplies, large areas would never have been put into intensive production without the availability of subsidized SWP water. The state DWR's estimate of average payment capacity for water in Kern County is approximately \$50 per acre-foot (1980 dollars).³⁵ Average fixed charges to KCWA are currently running about \$13 per acre-foot; pumping charges are \$3.50; and the additional costs of local delivery systems and pumping average about \$20.³⁶ The total average price of water on the farm is thus now more than \$36 per acre-foot. If KCWA paid a "proportional share" price, as defined earlier, its fixed charge would rise to \$43, and the on-farm price of water would rise to \$66 per acre-foot, exceeding average payment capacity by more than \$15.³⁷ Price reform would therefore have a dramatic impact on irrigated agriculture in much of Kern County.³⁸

It should be pointed out, however, that even without reform, growers are already feeling the pinch of rising electricity prices, because DWR's long-term contracts with private electric utilities were cancelled on April 1, 1983.³⁹ This has pushed SWP pumping costs to about \$87.03 for KCWA, and total delivery costs to \$172.00 (1983 dollars).⁴⁰ Finally, by 1990 DWR expects the delivery price of water to KCWA to approach \$83 per acre-foot (1981 dollars),⁴¹ or a minimum of \$100 at the farm gate. This is more than twice the growers' expected repayment capacity. Moreover, it does not include projected drainage costs, which in many areas are at least \$23 per acre-foot.⁴² Recent econometric studies confirm the conclusions based on these rough figures: as water prices increase due to rising energy costs, agricultural water demand in the southern San Joaquin Valley will fall by several hundred thousand acre-feet.⁴³

The grim picture these figures paint for Kern County agriculture is not well known outside the area, but is clearly understood locally. The manager of the Kern County Water Agency openly acknowledged at an Assembly committee hearing that without the SWP's surplus water pricing provisions, the agency would never have signed its contract.⁴⁴ In addition, several large landowners in the Tulare Lake service area north of Kern County broke with KCWA and opposed authorization of Phase II, fearing they would not be able to afford the water that would be provided. They favor what they believe to be a less expensive alternative: a cross-Delta channel instead of the Peripheral Canal, reduced Delta water standards, and fewer auxiliary water storage facilities.⁴⁵

A look into the history of SWP policy shows that from the early stages of contract negotiation both the state and KCWA were aware of the need to subsidize Kern County's water costs. A 1963 DWR report provides clear evidence of intent.⁴⁶

During the negotiations [over water service contracts] it became evident that *the Agency [KCWA] would not have the ability to pay for the 1.4 MAF it had originally requested.* Consequently, studies were made to determine the means of reducing the average cost of water to farmers in the Agency service area...and to achieve a bal-

ance between the resulting cost of water and the amount of water that could be taken at that cost. *At a high cost of water, only the urban areas and the lands capable of producing high value crops could take water.* [emphasis supplied]⁴⁷

The report continues:

if water were sold in the KCWA service area at the full cost of delivering water an effective demand for about 400,000 acre feet of irrigation water could be realized in 1990. At the same time, about 140,000 acre feet of urban water would be used. As was previously pointed out, however, to overcome the groundwater overdraft and assist the economy of this agriculturally-oriented county there is a need to deliver more water for agricultural purposes. *This additional water would be used for irrigation only if the water cost to the user were decreased from the full cost.* [emphasis supplied]⁴⁸

The means to this end was "surplus" water:

Surplus water, with its effect on the weighted cost of all irrigation water, is expected to allow the farming of lower value non-specialty crops...

During the early critical years of the project from 1968 to 1981, it is estimated the blended cost to the agency [KCWA] for annual entitlements and surplus water for agriculture would average \$14.80 per acre foot. [emphasis supplied]⁴⁹

Realizing their dilemma, the two agencies first turned to the Legislature for relief:

Attempts were made during the period of negotiation to obtain legislation which would lower water charges. The Agency [KCWA] would be able to lower its average charge to water users, especially in the early years of development, and thus allow agriculture to participate in the project to a larger extent if some relatively minor amendments were made in the prototype water contract. *These amendments involve modifications in the surplus water provisions of the prototype contract to give preferential treatment to the sale of surplus water for agriculture and groundwater replenishment...* [emphasis supplied]⁵⁰

When legislative relief was not provided, DWR subsequently acceded to KCWA's request that surplus water provisions be written into the SWP contracts in 1973. Ironically, the original version of the contracts provided for maximum cost recovery from sales of surplus water, with rebates to contractors in proportion to their contribution toward fixed costs—a policy quite in accord with our suggested "reforms."⁵¹

The surplus-pricing policy is thus a quietly-arrived-at, friendly arrangement between water agencies; the policy has never been explicitly approved by the public who voted on the bond issue in 1960, or by the Legislature when it authorized the project in 1957 and 1959. The benefits to Kern County growers are enormous, nonetheless. Former Governor Edmund G. "Pat" Brown

observed:

You see, under the federal reclamation act they sell that water for \$3.50 an acre-foot, and it costs about \$18 to deliver. So there's a \$15 an acre-foot subsidy to these big farmers—Southern Pacific, Standard Oil, Kern County Land—and those people just reaped a terrific wealth there from the federal government. Now, under the state project, as it later developed, we charged them for—*not the actual cost of the water because the domestic user paid for most of it*—but we did charge them a much higher price for the water.... This project was a godsend to the big landowners of the state of California. It really increased the value of their property tremendously. [emphasis supplied]⁵²

Big landowners are the norm in Kern County. This part of the valley has never been characterized by small holdings. Eight corporations own more than 50 percent of the land in the KCWA service area, and most of the rest is held in parcels of over 2,000 acres.⁵³ These facts, plus a knowledge of water economics and politics, lead to a conclusion that the surplus water policy is largely attributable to a calculated exercise of power by Kern County landowners to increase their wealth at the expense of other farmers and citizens of the state. In any event, this special-interest windfall was never publicized or put to a popular vote.

For more than 50 years California agribusiness, operating with probably the most concentrated agricultural land ownership pattern in the nation, has been remarkably resourceful in securing highly favorable irrigation policies from both the federal and state governments.⁵⁴ We believe it is time for such favors to be given critical scrutiny, and that it would not be unfair or inappropriate to reduce or terminate subsidies that do not contribute to identifiable public purposes. Small farmers would not suffer. Economic efficiency would be promoted. The effective long-term supply of California water would be increased substantially, without having to build more dams or canals in the near future.

CONCLUSIONS AND RECOMMENDATIONS

Management of the State Water Project is not purely a technical matter, but involves major policy issues that call for public airing and discussion. If the goal is to provide adequate future water supplies for metropolitan southern California, then changes in water management could supply the Metropolitan Water District's service area until the next century, without additional projects. A bigger State Water Project may well be needed for the next century, but that cannot be sensibly determined at this time. Debate should be put off until the 1990s, when better evidence will be available.

On the other hand, if the objective is to supply water for the southern San Joaquin Valley, we believe the beneficiaries in that area should pay their proportional share of costs. It seems highly doubtful that all present users could

do this. In short, agricultural water demand would very likely decline under an average cost/proportional share allocation system. This would eliminate the purported need to expand the State Water Project to serve agriculture.

We conclude by recommending several pricing and management reforms to improve the SWP's performance and fairness:

1. For each major hydrologic basin the state should pursue a management policy emphasizing average total water yield, and limiting withdrawals to the long-run average of groundwater recharge, local surface inflows, and SWP deliveries.

This policy would have to be coupled with effective groundwater law reform and conjunctive-yield management of aquifers.

2. MWD should encourage a policy of "water banking" between the Colorado and Sacramento river systems, thus maximizing its insurance against below-average yields from either source. In effect, an average-yield policy would integrate the management of both rivers.

3. DWR should institute a "proportional share/average cost" pricing system to allocate repayment obligations for jointly incurred fixed costs in proportion to each contractor's average share of water deliveries. (Additional distance and pumping charges should be retained.) Concurrently, entitlements should be brought into line with actual demands under average-yield basin management. These changes should be phased in over a period of years to reduce their dislocating effects on Kern County.

4. Even under the above conditions, in certain years some contractors would find themselves with more water than they could use, while others would be short of water. Consequently, a short-term (less than five years) resale "market" for water should be created for individual short-term, voluntary transactions. The revenues from such sales would be used to lower a contractor's fixed payment obligation.

Needless to say, efforts to implement these reforms would encounter many obstacles. These include the legal structure of the present water system, existing well-defined contractual relationships, water rights that are sometimes poorly defined, and property rights that are based on current economic relationships.⁵⁵ Other institutional obstacles include California's more than 3,000 water agencies, 1,000 of which are publicly chartered. They are experienced in managing a complex physical system, but are not especially disposed to adopt a statewide perspective in planning for better water use, allocation, and conservation. It is difficult and costly to change institutions, particularly when they are highly decentralized. Finally, there are political obstacles. Elected officials are loath to contradict water agencies that are considered to have great technical and organizational capabilities, and that demonstrate substantial political clout. Moreover, the political power of large agribusiness in the state is well known.

Despite the obstacles, however, there is as much justification for optimism with respect to water policy reform as there is for pessimism. The contractors have unanimously approved contract amendments in the past, and the legal structure of the system is the result of a *political* process of negotiation and bargaining. Institutions tend to reflect and adapt to the realities of their times.

The voters' overwhelming rejection of the Peripheral Canal and Phase II in June 1982 may have ended an era of relatively unopposed water-project expansion. A more thoughtful and searching debate over water issues is now both necessary and possible. As part of this indepth review of water policy, the water agencies and the Legislature should reconsider the finance and management of the water supplies in California, and especially the SWP, with a view to devising more efficient and equitable arrangements for water allocation and cost repayment.

NOTES

1. Estimate based on figures in California, Department of Water Resources, Bulletin 132-79, *The California State Water Project—1978 Activities and Future Management Plans* (Sacramento: Department of Water Resources, 1979), hereafter DWR, Bulletin 132-79. The Department lowers the total for public relations reasons by variously omitting interest charges, the inflation factor, the Glenn Reservoir complex, and other facilities scheduled to be built by the year 2000. See also California, Commission for Economic Development, *Report of the Task Force on California's Water Future* (Sacramento: 1982).

2. For a review of these issues, see R. Walker and M. Storper, "California Water System: Another Round of Expansion?" *Public Affairs Report*, 20(2) (Berkeley: Institute of Governmental Studies, University of California, April 1979).

3. On the massive subsidies incurred by the Central Valley Project, see E. Phillip LeVeen, "Reclamation Policy at a Crossroads," *Public Affairs Report*, 19(5) (Berkeley: Institute of Governmental Studies, University of California, October 1978).

4. The meaning of the term "proportional share" is by no means evident without further explanation. Much of this article is an extended defense of our concept of proportional share management and repayment.

5. There is considerable doubt whether the project will ultimately be paid for by contractors. The \$25 million annual transfer from tidelands oil revenues to the project (via the California Water Fund) is supposed to be repaid in the future, but no funds have as yet come in. Repayment depends on whether the costs of Phase II could be absorbed by the contractors. Serious questions in this regard are treated in the text. See also G. Baker, "The story on water project financing," *Sacramento Bee*, March 21, 1982, pp. A1, C1.

6. The authors gleaned these rationales from numerous hearings and debates featuring testimony and statements by agencies.

7. DWR, Bulletin 132-81, *The California State Water Project—1980 Activities and Future Management Plans* (Sacramento: Department of Water Resources, 1981), tables B-4 and B-5B.

8. We estimate dry-year yield to be 2.7 MAF, using the DWR's own "Rule Curve" method.

9. MWD itself has a higher demand estimate of 3.6 MAF for the year 2000. This appears to be exaggerated in at least two ways. First, most of the predicted population growth will be in the San Bernardino-Riverside-Ontario area, resulting in the conversion of about 75,000 acres of farmland to urban uses. At 3 acre-feet of water per acre, about 0.225 MAF of agricultural demand will be eliminated, yet MWD does not allow for this. Second, MWD does not properly account for the future growth of developed areas in condominiums and apartments, which have lower per capita water use than homes.

10. DWR's plans keep changing. Three years ago, the agency was still proposing to complete the first segment by 1990 and the second by 2000. It now postpones the same goals to 2000 and 2020, respectively, although this does not substantially affect the analysis.

11. The first stage would generate additional yields of 0.79 MAF in a dry year, and 1.63 MAF in a wet year. The second stage would generate an additional 0.64 MAF in a dry year, and 1.0 MAF in a wet year. DWR, *Key Elements—SB 346* (Sacramento: California Department of Water Resources, 1977), p. 28. This document was prepared for the original Phase II legislation, but nothing of importance was altered in SB 200.

12. *Ibid.*

13. DWR, Bulletin 132-81, Table B-5B.

14. DWR, *Key Elements*. . . . These yield totals would be reduced by 200,000-400,000 acre-feet if the federal government were to build the Mid-Valley canal. Because the two projects compete for Delta water, but only the SWP is obligated to maintain Delta water quality beyond a certain point, additional federal withdrawals would mean less state water.

15. DWR claims that 4.23 MAF is the maximum amount that will ever be delivered by the SWP and that hydrologic surpluses above this amount will not be shipped south for two reasons: surplus water must be used for Delta protection, and upstream diversions will eliminate the surplus in any case. We do not find this position tenable. In fact, Delta water quality standards apply only to minimum flows, which will be exceeded in years with project hydrologic surpluses. Upstream diversions are economically doubtful and unlikely to take place.

16. J. Hirschleifer, J. DeHaven, and J. Milliman, *Water Supply: Economics, Technology and Policy* (Chicago: University of Chicago Press, 1960).

17. This argument is of course not relevant to the question of entitlement surpluses. It deals only with hydrologic surpluses above firm yields. (See Appendix for terms.)

18. The problem is that pumping is unregulated, exceeding the long-run average inflow into the aquifer, hence groundwater levels are falling. This is a typical case of competitive abuse of a common property resource. See California, Governor's Commission to Review California Water Rights Law, *Final Report* (Sacramento: 1978).

19. Charles Meade, "Using Groundwater Storage as an Alternative to SB 200" (Washington, DC: Public Interest Economics—West, May 1982).

20. MWD already has first rights to California's share of Colorado River surplus. It also appears there would be no legal problems of "renegotiating" SWP water contracts for the elimination of surplus water. There is precedent for such behavior: in the 1977 drought MWD relinquished its entitlement water and increased imports from the Colorado, which was running very full that year. MWD is cooperating in a study of water banking by the Colorado River Board of California, but so far considers it only a minor part of their overall supply strategy.

21. SWP water charges are a variant on a well-known pricing formula for certain "public goods." It is a two-part tariff that consists of a base levy (or tax) to cover fixed costs, and a variable levy (or user fee) to cover specific variable costs. The former bears no close relation to water delivery and is therefore like a general property tax. Conversely, surplus water bears no portion of fixed costs and is subject only to a user fee to pay for the costs of pumping.

22. On the high water-rate payment capacity of urban areas, see Michael B. Teitz and Richard A. Walker, "Industry," E. Engelbert with A. F. Scheuring, eds., *Competition for California Water: Alternative Resolutions* (Berkeley: University of California Press, 1982), pp. 59-75. Hereafter, *Competition*. . . .

23. DWR's pricing policies manifestly do not follow such a rule. It is widely acknowledged that if open market transactions were allowed, the price of (surplus) water now going to agriculture would be bid up (unless, of course, the project's capacity continues to be overexpanded, resulting in continuing large surpluses). See R. Howitt, D. Mann, and H. Vaux, Jr., "Economics," *Competition* . . . , pp. 136-162 and Introduction.

24. These reforms would not affect current policies on distance or pumping charges, which are quite rational.

25. DWR, Office of State Water Project Analysis, "The SB 200 Pay As You Go Study" (Sacramento: Department of Water Resources, 1982). See also *Competition* . . .

26. This argument is strengthened if we recognize that water itself has an opportunity cost. Even though the size of project facilities cannot be adjusted nor the rainfall controlled, DWR can adjust the amount of water diverted from the Sacramento River. Those diversions most certainly have an increasing marginal cost for the environment of the Delta-Bay estuary. They are completely unaccounted for by DWR's pricing policy. On the environmental costs of the SWP see discussion in Walker and Storper, "California Water. . . ."

27. *Ibid.*

28. On the responsiveness of agricultural water demand to price, see the review of literature in B. D. Gardner, et al., "Agriculture," *Competition* . . .

29. The criticism of two-part pricing for base and surplus water also applies to DWR's system of different computation methods for repayment of fixed transportation costs between municipal-industrial and agricultural contractors. (See Appendix.) There is no apparent economic rationale for this policy.

30. W. Watson, C. Nuchton, and R. Howitt, *Crop Production and Water Supply Characteristics of Kern County*, Giannini Foundation Bulletin 1895 (Berkeley: Giannini Foundation of Agricultural Economics, 1980), Table II, p. 49; B. D. Gardner, "Agriculture," *Competition* . . . , pp. 11-36; Advisory Panel on Agricultural Water Conservation, *Report of Findings* (Sacramento: California Department of Water Resources, May 1979). In fairness to Kern County, it is one of the state's more efficient water-using areas because it faces the highest prices. Other areas, such as the rice district along the Sacramento River, and the Imperial Valley, are considerably less efficient. But water efficiency in Kern County varies systematically with price, indicating that there is room for improvement. Calculations from figures in Watson, et al., *Crop Production* . . .

31. Given the elasticity of agricultural markets, much of the water subsidy passes into higher land values. The principal effect of raising water prices would probably be to drive land values down toward the low levels that obtained prior to irrigation, eliminating windfall rents. More expensive water would certainly take some Kern County land out of production.

32. Don Villarejo, *New Lands for Agriculture: The California State Water Project* (Davis: California Institute for Rural Studies, 1981). See also the prediction that expansion of specialty crop acreage in newly irrigated lands in the western San Joaquin Valley would undercut existing east side farmers, in G. Dean and G. King, *Financial Analysis of Potential Agricultural Development on the San Joaquin Valley Westside*, Giannini Foundation Research Report #316 (Berkeley: Giannini Foundation of Agricultural Economics, July 1971).

33. G. Johnson and C. Quance, *The Overproduction Trap in U.S. Agriculture* (Baltimore: Johns Hopkins Press, 1972).

34. The share of Kern County agriculture in state income is not a valid argument for water subsidies. First, local income effects in the nonowner-operator population are likely to be small, given the nature of Kern County agribusiness—capital intensive and

linked to distant suppliers, processors, and profit centers. See W. Goldschmidt, *As Ye Sow* (Englewood Cliffs: Allenheld, Osmun, 1978). Second, state income effects would be limited because of the positive response of growers elsewhere in the state (see text). Third, and most important, the presumed "multiplier" effects from agricultural income apply to every other sector as well. The water subsidy takes from other California businesses and workers what it gives to agriculture, and the ramifications of their income losses are very likely just as significant as the income gained from agricultural subsidy. (Agriculture is also no longer California's prime industry, now being exceeded in annual sales by finance, aerospace, and electronics.)

35. Ronald B. Robie (Director of DWR), "The State Water Project and its Financing," paper presented at the San Francisco Municipal Forum, San Francisco, October 8, 1980.

36. Computed by E. Phillip LeVeen from Watson et al., *Crop Production*. . . . Table II, p. 49.

37. E. Phillip LeVeen, "Financing SB 200—Is Proposition 9 Affordable?" (Washington, DC: Public Interest Economics—West, May, 1982). Note that "payment capacity" refers to the result obtained when full production costs and return to labor are deducted from gross revenues.

38. DWR's figures for average payment capacity are somewhat misleading, however, since they do not adequately allow for adjustment in crops or techniques on the better lands, as argued previously. Thus, the impact on Kern County will be less devastating than these simple computations make it first appear.

39. Robert Gough, MWD Assistant General Manager, quoted in *Los Angeles Times*, Part II, p. 1, March 10, 1982. The new prices merely catch up with past energy price increases, so the rise will not be lessened by recent declines in oil prices.

40. DWR, Bulletin 132-83, Table B-24. These figures are for reach 17E of the SWP, which is actually the Edmonston pumping plant, at the lower end of Kern County. They may slightly overstate costs to the upper and middle parts of the county.

Our point that costs are rising dramatically on the margin is reinforced, inadvertently, by DWR's method of presenting cost data. In Table B-24b, they present the unit costs of water to each reach, via a method that takes into account all the water delivered to date and expected to be delivered throughout the entire project repayment period. With this method, the costs for pumping are only \$50.72 to this reach and total delivery costs \$91.43, an obvious consequence of the early, cheap phases of the project. In Table B-23, they carry this a step further, taking into account all water delivered to date and expected to be delivered to *each contractor* over the entire project repayment period. With this method, they get pumping costs of only \$11.55 to KCWA and total charges of only \$49.55.

41. DWR, Bulletin 132-81, p. 13.

42. San Joaquin Interagency Drainage Program, *Agricultural Drainage and Salt Management in the San Joaquin Valley: Final Report* (Sacramento: United States Bureau of Reclamation, California Department of Water Resources and California State Water Resources Control Board, 1979).

43. Howitt, Mann, and Vaux, "Economics. . . ." See also M. Christensen, G. Harrison, and L. Kimball, "Energy," *Competition*. . . .

44. Statement by Stuart Pyle before the California Assembly Committee on Water, Parks and Wildlife, Hearing on AB 2249, Los Angeles, December 4, 1981.

45. Letter to the editor from James B. Fisher, President, J. G. Boswell Co., *Los Angeles Times*, March 5, 1981.

46. California, Department of Water Resources, *Feasibility of Serving the Kern County*

Water Agency from the State Water Project, Bulletin 119-8 (Sacramento: California Department of Water Resources, 1963).

47. Ibid, p. 3.

48. Ibid, pp. 48-49.

49. Ibid, pp. 47, 61. This turned out to be a remarkably good guess.

50. Ibid, p. 30.

51. See section 21 of original master contract, November 4, 1960, and Amendment 12(a) to section 47 of the contract, dated 1973.

52. Oral History Interview by the Regional Oral History Office with Edmund G. "Pat" Brown, 1979, on file at The Bancroft Library, University of California, Berkeley.

53. Don Villarejo, *Getting Bigger* (Davis: California Institute for Rural Studies, 1980). E. Liebman, "Large Landholdings in the History of California Agriculture," unpublished Ph.D. dissertation. Berkeley: University of California, 1981, Appendix B (the most thorough compilation of agricultural landholdings in excess of 2,000 acres).

54. See E. Liebman, *Large Landholdings*. . . ; P. Taylor, "California Water Project: Law and Politics," *Ecology Law Quarterly* 5(1): 1-52 (1975); and E. Phillip LeVein, "Natural Resource Development and State Policy: Origins and Significance of the Crisis in Reclamation," *Antipode*, 11(2): 61-80 (1979).

55. See California, Governor's Commission to Review California Water Rights Law, *Final Report* (Sacramento: 1978).

ACRONYMS AND ABBREVIATIONS

DWR	Department of Water Resources
JFC	Joint Fixed Costs
KCWA	Kern County Water Agency
KwH	Kilowatt-hour
MAF	Million Acre-Feet
MWD	Metropolitan Water District of Southern California
OMP&R	Operation, Maintenance, Power and Replacement
SWP	State Water Project

APPENDIX**THE EVIDENCE FOR TRANSFERS
BETWEEN CONTRACTORS****Water Allocation and Pricing Policies
of the State Water Project**

In the early 1960s the Department of Water Resources signed contracts with 31 local water agencies for the delivery of water from the State Water Project. Each contractor was thereby entitled to a fixed share of the projected 4.23 million acre-feet (MAF) "firm yield" delivery capacity of the system upon its projected completion around the year 1990.¹ We call these shares "ultimate entitlements." By far the largest contractors are the Metropolitan Water District and the Kern County Water Agency, which hold approximately 47.5 percent and 27.3 percent of ultimate entitlements, respectively. Attention will be focused on these two agencies.

The 31 contractors are legally obliged to repay the costs of the project. Our calculations show that MWD is paying too much for the water it receives, whereas KCWA is paying far too little. This finding holds for a range of reasonable definitions of "proportional shares" of water deliveries and repayment obligations of the two agencies. Because the definitions of how much water each contractor should receive and how much it should pay are highly controversial, and because they have never been made explicit by the DWR, we wish to explain our reasoning with some care. While it has been necessary to make some simplifying assumptions in doing the calculations, reviewers at DWR have not challenged the basic accuracy of the numbers.

The method by which DWR determines contractors' repayment obligations (pricing) and allocations of water (entitlements and deliveries) is quite complex. Water deliveries are computed as follows.

DWR begins by calculating the total annual yield of the SWP based on estimated runoff in four major northern California watersheds and a "Rule Curve" that makes some allowance for future storage needs, should there be a drought.² There are six official types of hydrologic years: wet, above normal, normal, below normal, dry, and critical. DWR uses the dry-year figure to set a "firm yield" so that it can meet its contractual obligations even with low runoff. Runoff is greater than the dry-year amount in about six out of every seven years.

If the total project yield is firm or better, each contractor has a right to a quantity of water known as "published annual entitlements." These are predetermined amounts listed in Table A of the water contracts. They bear no exact relation to the contractors' shares of "ultimate entitlements" in 1990. Instead, they represent DWR's original estimates of demand and supply buildup over the years; at the point of project completion annual entitlements and ultimate entitlements are the same.

Any amount of water greater than total published entitlements in a given year is considered "hydrologic surplus." Contractors make annual requests for amounts of water. Some contractors may turn down a portion of their published entitlement water; this is made available to other contractors and is known as "entitlement surplus."

Water deliveries are essentially of two kinds, base and surplus. DWR determines the share of entitlement requests, called "base water," and how much extra, called "official surplus," each contractor will receive. Official surplus is a pool of hydrologic and entitlement surpluses. The sum of base and official surplus water is called "actual water deliveries" to a contractor.

The published official surplus figures are not, however, the last word on surpluses (and deficits). We therefore need additional categories for the surplus phenomenon.

First, base water does not always reflect published entitlements for the current year because of carryovers of unused annual entitlements from previous years used to make up deficits. This means that a contractor may be shorted on entitlements one year, but in the next receive the annual entitlement, plus previously unused entitlement, plus surplus water. *We define "surplus A" as the difference between each contractor's actual deliveries and published annual entitlements for that year.*

Second, published annual entitlements are not proportional to each contractor's share of ultimate entitlements because the contractors are building up their demands at different rates. *We define "surplus B" as the difference between actual deliveries and the contractor's share of ultimate entitlements, multiplied by the current annual project yield.*

Third, ultimate entitlement shares are not proportional to actual repayment shares because the capital costs of the project are not allocated to contractors in proportion to their shares of ultimate entitlements (more on this below).³ *We therefore define "surplus C" as the difference between each contractor's actual deliveries and the share of total deliveries that would be proportional to its repayment burden.*

Surplus A: Actual deliveries minus published annual entitlements

Surplus B: Actual deliveries minus share of annual yield proportionate to share of ultimate entitlements

Surplus C: Actual deliveries minus a share of annual yield proportionate to share of repayment burden

The systematic deviation from published figures involved in the water "transfers" from MWD to the San Joaquin Valley will make the logic of this set of definitions clearer. Surpluses B and C, in particular, help to capture entitlement water shifts among contractors that are not visible in official statistics.

Rules of priority were established for the allocation of base and surplus water in amendment 12(a) of the water supply contracts. If the project is unable to meet overall annual entitlement (or base) requests, municipal and industrial users have priority, and agricultural users must absorb the deficits. If, on the other hand, surplus water is available, the order of priority is agricultural use, groundwater replenishment, and municipal/industrial use. Almost

all surplus water to date has gone to agriculturalists in Kern and Kings counties.

The critical importance of surplus water lies in its low price. Essentially, surplus water is sold at the variable cost of delivery (consisting chiefly of energy costs of pumping). It bears none of the fixed costs of the project, which are already fully assigned to contractors as fixed repayment obligations.⁴

We now turn to the first decade of full operation of the SWP to see how much surplus water was given up and received by the two major contractors, and the size of the resulting implicit financial transfers.

History of Surplus Water Deliveries and Repayment (MWD and KCWA)

Water allocations for the first eight years of full SWP operation are shown in Tables 1 and 2. For the project as a whole between 1972 and 1979, all contractors received a total of 11.51 MAF. This exceeded the sum of published annual entitlements to all contractors, 11.34 MAF, by only a small margin because of the entitlement shortfalls in the severe 1977 drought. Cumulative annual "official surpluses" during this period were large, however, totalling 2.54 MAF or about 22 percent of all deliveries, because there were several years with ample available surpluses.

The main source of the official surpluses was the MWD, which did not take its published annual entitlement in any year. Even during the drought, MWD voluntarily transferred most of its annual entitlement to KCWA, relying exclusively on the Colorado River for supplemental water. Over the period, MWD yielded up entitlement surpluses (surplus A) of 1.92 MAF, 76 percent of the official surplus for the entire project. The principal recipient of this water was the KCWA, which gained an official surplus (surplus A) of 1.85 MAF. In addition, 0.35 MAF was provided to KCWA in makeup deliveries to compensate for entitlement shortfalls in 1977. All this surplus water was priced much lower than entitlement water.

Further surpluses were implicit in project operations. First, MWD's published annual entitlements were less than its share of ultimate entitlements. There is a difference of 2.64 MAF (surplus B) between actual deliveries and what MWD would have gotten if it had received its share of ultimate entitlements, 47.5 percent of annual yields. Second, even this understates the actual implicit transfer of surplus water, because MWD's repayment share of project capital costs was considerably greater than 47.5 percent. The difference between actual deliveries and what MWD would have received—if it had been given a share of annual yields proportional to its share of annual payments—amounts to 3.46 MAF (surplus C). Most of these implicit surpluses went to KCWA, which received 2.35 MAF more than its ultimate entitlement-equivalent share of annual project yields (surplus B), and 3.82 MAF more than its repayment-equivalent share of project yields (surplus C).

The financial impacts of the reallocation of water away from MWD and to

TABLE 1
Entitlements and Deliveries
(in acre-feet)

	I	II	III	IV	V
Year	Actual Deliveries	Base Water	Published Entitlements	Ultimate Entitlement Equivalent ^a	Repayment Equivalent ^a
Total State Water Project					
1972	1,037,770	1,037,770	741,759		
1973	994,596	737,532	986,252		
1974	1,294,871	878,947	1,182,200		
1975	1,851,515	1,230,830	1,386,869		
1976	1,960,234	1,380,124	1,508,387		
1977	582,381	582,381	1,667,321		
1978	1,474,948	1,458,733	1,840,534		
1979	2,313,287	1,666,457	2,028,088		
TOTAL	11,509,602	8,972,774	11,341,410		
Metropolitan Water District					
1972	71,938	71,938	154,772	493,493	47,035
1973	159,883	159,883	354,600	472,962	411,965
1974	277,717	277,717	454,900	615,752	773,647
1975	526,491	526,491	555,200	880,455	1,324,881
1976	618,451	618,451	655,600	932,154	1,190,530
1977	189,755	189,755	755,900	276,941	368,537
1978	507,565	507,565	856,300	701,385	899,784
1979	477,074	477,074	956,600	1,100,042	1,271,100
TOTAL	2,828,874	2,828,874	4,743,872	5,473,184	6,287,479
Kern County Water Agency					
1972	490,781	490,781	270,700	282,971	251,707
1973	505,243	341,469	310,500	271,199	175,083
1974	646,433	347,000	347,000	353,075	152,537
1975	821,640	410,820	410,820	504,856	178,466
1976	881,400	439,250	442,150	534,501	244,210
1977	191,307	191,307	483,600	158,799	73,137
1978	675,970	667,347	534,300	402,177	202,875
1979	1,270,293	746,046	583,900	630,769	387,203
TOTAL	5,483,067	3,634,020	3,382,970	3,138,347	1,665,218

a. Same as "actual deliveries," by definition.

KCWA are substantial. There are several ways of calculating these impacts, corresponding to the various definitions of entitlements and surplus. We have compared actual payments by the two agencies against three hypothetical shares, corresponding to their shares of (1) ultimate entitlements, (2) published entitlements, and (3) actual deliveries. We define the "proportional share" of divisible costs as the equivalent of a contractor's share of actual deliveries. Our reasoning is that regardless of ultimate or published entitlements, water deliveries create benefits (profits) for current users that should be paid for now. If MWD does not want water now, but KCWA does, the latter should pay for the water. Then, as MWD takes a larger share of yield in the future, its payments should rise, while KCWA's decline.⁵

The body of costs for which there should be shared repayment consists of the fixed costs of facilities north of the Edmonston pumping plant (including Delta charges and transportation charges for the California aqueduct). We refer to these as "joint fixed costs."⁶ (Variable costs are not considered in these calculations because they are charged to contractors by the amount of water delivered, and involve no subsidy.)

As shown in Tables 3 and 4, actual repayments deviate substantially from "proportional share" cost allocations. MWD was charged \$170 million more than its proportional share of joint fixed costs from 1972-79, an annual average overpayment of \$21.2 million. KCWA, on the other hand, was charged \$176 million less than its proportional share, an annual average underpayment of \$22.0 million. This represents a saving for KCWA of \$30.21 per acre-foot. Meanwhile, MWD paid \$60.13 too much for each acre-foot of water, or the difference between a proportional share price of \$52.00 and an actual price paid of \$112.13.⁷

The subsidy exists whether it is measured in terms of shares of published annual entitlements, ultimate entitlements, or actual payments (corresponding to transfers of surplus A, B, or C, respectively). MWD has received a mere

Explanation of Table 1

I. Column II plus official surplus as shown in Table 2, column I (DWR publishes no summary figure).

II. From DWR Bulletin 132-80, Table B-5B (DWR calls this "Annual Water Deliveries").

III. From DWR Bulletin 132-80, Table B-4 (from Table A of water contracts).

IV. Column I (Total State Water Project) multiplied by each contractor's shares of ultimate entitlements, from DWR 132-79, Figure 5, pp. 76-77. (Metropolitan Water District = .475532; Kern County Water Agency = .272672.)

V. Column I (Total State Water Project) multiplied by each contractor's share of current repayments as shown in Tables 3 and 4, column II.

TABLE 2
Surplus (and Deficit) Water Deliveries
(in acre-feet)

	I	II	III	IV
Year	Official Surplus	Surplus A	Surplus B ^b	Surplus C ^b
Total State Water Project				
1972	0 ^a	296,011		
1973	257,064	8,344		
1974	415,924	112,671		
1975	620,685	464,646		
1976	580,110	451,847		
1977	0	-1,084,940		
1978	16,215	-365,586		
1979	646,830	285,199		
TOTAL	2,536,828	168,192		
Metropolitan Water District				
1972	0	-82,834	-421,555	24,903
1973	0	-194,717	-313,079	-252,082
1974	0	-177,183	-338,035	-495,930
1975	0	-28,709	-353,964	-798,390
1976	0	-37,149	-313,703	-572,079
1977	0	-566,145	-87,186	-178,782
1978	0	-348,735	-193,820	-392,215
1979	0	-479,526	-622,968	-794,026
TOTAL	0	-1,914,998	-2,644,310	-3,458,605
Kern County Water Agency				
1972	0 ^a	220,081	207,810	239,074
1973	163,774	194,743	234,044	330,164
1974	299,433	299,433	293,358	493,894
1975	410,820	410,820	316,784	643,174
1976	442,150	439,250	346,899	637,194
1977	0	-292,293	32,508	118,174
1978	8,623	141,670	273,793	473,094
1979	524,247	686,393	639,524	883,094
TOTAL	1,849,047	2,100,097	2,344,720	3,817,844

a. Surplus water not counted separately before 1973.

b. Surplus B and C cannot exist for the project as a whole, by definition.

26.58 percent share of total SWP deliveries. Yet its share of published annual entitlements was much greater, 41.65 percent; its share of ultimate entitlements greater still, 47.55 percent; and its share of capital cost repayment even larger, 57.31 percent.

The opposite situation prevailed for KCWA. It received an ample 45.72 percent of project yields over the period, although its share of published annual entitlements was much less, 29.68 percent; its ultimate entitlement share was still smaller, 27.26 percent; and most important, its share of capital cost repayments was only a modest 13.87 percent.

We had expected that at worst, payment shares would correspond to ultimate entitlement shares, but they are even more skewed. DWR has made an additional special allowance for deferred payments by KCWA and other agricultural contractors. In addition to the difference between base and surplus water pricing, DWR allocates capital cost repayments differently for municipal and industrial (M&I) contractors, as compared with agricultural contractors. DWR's principles of transportation capital cost allocation are as follows:

Project transportation capital costs allocated to each contractor are repaid on either of two different but economically equivalent schedules: (1) uniform capital recovery for M&I contractors, or (2) a unit rate basis for agricultural contractors. Both schedules recover all allocated costs including interest.

The M&I contractors repay their allocated capital transportation costs by a series of equal annual payments. These payments, which include interest, are computed without regard to amounts of water delivered in any given year. This method is provided for in Article 24(c) of the contract.

Agricultural contractors repay their allocated transportation capital costs through a unit charge (in dollars per acre-foot) imposed on each acre-foot of annual entitlement....

Because of this, annual capital cost repayments are less in the early

Explanation of Table 2

I. Actual deliveries less base water (column I minus column II, in Table 1). Surplus as calculated by DWR, Bulletin 132-80, Table B-25.

II. Actual deliveries less published entitlements (column I minus column III in Table 1).

III. Actual deliveries less ultimate entitlement equivalent share of deliveries (column I minus column IV in Table 1).

IV. Actual deliveries less current repayment equivalent share of deliveries (column I minus column V in Table 1).

TABLE 3
Overpayments by Metropolitan Water District (MWD)
(in dollars)

Year	I	II	III	IV	V
	Joint Fixed Costs (JFC)	Payments Toward JFC	Ultimate Entitlement Equivalent Share of JFC	Published Entitlement Equivalent Share of JFC	Actual Delivery Equivalent Share of JFC
1972	26,498,585	1,201,020 (.045324)	12,600,925 (.475532)	5,579,062 (.208655)	1,836,882 (.069320)
1973	41,546,575	17,208,726 (.414203)	19,756,725 (.475532)	14,937,780 (.359543)	6,678,695 (.160752)
1974	69,342,026	41,429,804 (.597470)	32,974,352 (.475532)	26,682,187 (.384791)	14,872,131 (.214475)
1975	64,312,611	46,019,642 (.715566)	30,582,704 (.475532)	25,746,010 (.400326)	18,287,741 (.284357)
1976	84,884,214	51,553,661 (.607341)	40,365,160 (.475532)	33,981,357 (.434636)	26,780,884 (.315500)
1977	90,706,242	57,399,799 (.632810)	43,133,720 (.475532)	41,122,763 (.453362)	29,554,452 (.325826)
1978	92,725,779	56,566,875 (.610045)	44,094,075 (.475532)	43,140,205 (.465245)	31,909,165 (.344124)
1979	83,427,500	45,841,658 (.549478)	39,672,445 (.475532)	39,350,749 (.471676)	17,205,420 (.206232)
TOTAL	553,443,532	317,221,185 (.5731) ^a	263,180,106 (.4755)	230,490,113 (.4165) ^a	147,125,370 (.2658) ^a
			VI	VII	VIII
			Overpayment A	Overpayment B	Overpayment C
1972			-11,399,905	-4,328,042	-635,862
1973			-2,547,999	2,270,946	10,530,031
1974			8,455,452	14,747,617	26,557,673
1975			15,436,938	20,273,632	27,731,901
1976			11,188,501	17,572,304	24,772,777
1977			14,266,079	16,277,036	27,845,347
1978			12,472,800	13,426,670	24,657,710
1979			6,169,213	6,490,909	28,636,238
TOTAL			54,041,079	86,731,156	170,095,815

a. Summary fractions do not equal the average of annual fractions in each column. Because water deliveries vary annually, costs must be allocated on an annual basis and summed; one cannot aggregate water shares across years and then allocate aggregate costs.

TABLE 4
Underpayments by Kern County Water Agency (KCWA)
(in dollars)

er District (MWD)

IV		V		I		II		III		IV		V	
Published Entitlement Equivalent Share of JFC	Actual Delivery Equivalent Share of JFC	Joint Fixed Costs (JFC)	Actual Payments Toward JFC	Ultimate Entitlement Equivalent Share of JFC	Published Entitlement Equivalent Share of JFC	Actual Delivery Equivalent Share of JFC	Year	Joint Fixed Costs (JFC)	Actual Payments Toward JFC	Ultimate Entitlement Equivalent Share of JFC	Published Entitlement Equivalent Share of JFC	Actual Delivery Equivalent Share of JFC	
5,579,062 (.208655)	1,836,882 (.069320)	26,498,585	6,427,141 (.242546)	7,225,422 (.272672)	9,670,481 (.364943)	12,531,684 (.472919)	1972	41,546,575	7,313,600 (.176034)	11,328,587 (.272672)	13,080,033 (.314828)	21,105,165 (.507988)	
14,937,780 (.359543)	6,678,695 (.160752)	69,342,026	8,168,955 (.117801)	18,907,628 (.272672)	20,353,306 (.499221)	34,617,321 (.499226)	1973	64,312,611	6,199,003 (.096389)	17,536,248 (.272672)	19,050,758 (.296221)	28,539,769 (.443766)	
26,682,187 (.384791)	14,872,131 (.214475)	84,884,214	10,575,021 (.124582)	23,145,548 (.272672)	24,881,905 (.293127)	38,167,346 (.449640)	1974	90,706,242	11,365,140 (.125296)	24,733,052 (.272672)	26,308,991 (.290046)	29,796,193 (.328491)	
25,746,010 (.400326)	18,287,741 (.284357)	92,725,779	12,754,184 (.137547)	25,283,723 (.272672)	26,917,932 (.290296)	42,496,307 (.458301)	1975	83,427,500	13,964,278 (.167382)	22,748,343 (.272672)	24,019,327 (.287901)	45,812,459 (.549129)	
33,981,357 (.434636)	26,780,884 (.315500)	TOTAL	76,767,322 (.1387) ^a	150,908,551 (.2727)	164,282,743 (.2968) ^a	253,066,244 (.4572) ^a	1976						
41,122,763 (.453362)	29,554,452 (.325826)						1977						
43,140,205 (.465245)	31,909,165 (.344124)						1978						
39,350,749 (.471676)	17,205,420 (.206232)						1979						
230,490,113 (.4165) ^a	147,125,370 (.2658) ^a						TOTAL						
VII		VIII		VI		VII		VIII					
Overpayment B	Overpayment C	Payment Deficit A	Payment Deficit B	Payment Deficit C	Payment Deficit A	Payment Deficit B	Payment Deficit C						
-4,328,042	-635,862	-798,281	-3,243,340	-6,104,543	-798,281	-3,243,340	-6,104,543						
2,270,946	10,530,031	-4,014,987	-5,766,433	-13,791,565	-4,014,987	-5,766,433	-13,791,565						
14,747,617	26,557,673	-10,738,673	-12,184,351	-26,448,366	-10,738,673	-12,184,351	-26,448,366						
20,273,632	27,731,901	-11,337,245	-12,851,755	-22,340,766	-11,337,245	-12,851,755	-22,340,766						
17,572,304	24,772,777	-12,570,527	-14,306,884	-27,592,325	-12,570,527	-14,306,884	-27,592,325						
16,277,036	27,845,347	-13,367,912	-14,943,851	-18,431,053	-13,367,912	-14,943,851	-18,431,053						
13,426,670	24,657,710	-12,529,539	-14,163,748	-29,742,123	-12,529,539	-14,163,748	-29,742,123						
6,490,909	28,636,238	-8,784,065	-10,055,049	-31,848,181	-8,784,065	-10,055,049	-31,848,181						
86,731,156	170,095,815	TOTAL	-74,191,229	-176,298,922	-74,191,229	-176,298,922	-176,298,922						

a. Summary fractions do not equal the average of annual fractions in each column. Because water deliveries vary annually, costs must be allocated on an annual basis and summed; one cannot aggregate water shares across years and then allocate aggregate costs.

of annual fractions in each column.
 be allocated on an annual basis and
 s years and then allocate aggregate

*years and more in later years than they would be under an M&I repayment schedule. [emphasis supplied]*⁸

This pricing policy accounts for the difference between the expected maximum repayment share (47.5 percent) percent and actual repayment share (57.3 percent) for MWD (and the corresponding underpayment by KCWA). It will not be neutral in its long-run effects, however, as DWR claims, unless three conditions are met. First, long-run water deliveries must be equal to repayment obligations. As we have already seen, this is not now the case. Nor will it be the case in the foreseeable future, as we note in the discussion of the "second rationale" for MWD overpayments to date. As a consequence, the department's differential transportation capital cost repayment scheme simply worsens the intraproject subsidies, as our calculations show.

Explanation of Tables 3 and 4

I. Joint Fixed Costs defined as all fixed costs (Delta charges plus transportation capital plus minimum OMP & R) north of Edmonston pumping plant, as analyzed by DWR. (From DWR Bulletins 132-80, Tables B-1, B-2, B-10, B-11, B-15, B-16 and B-21.) (See text for assumptions.)

II. Contractors' payments toward Joint Fixed Costs (Delta charges plus transportation capital plus minimum OMP & R) north of Edmonston pumping plant. (Figure in parentheses equals contractors' payment as share of total joint fixed costs, or column II divided by column I.)

III. Hypothetical share of Joint Fixed Costs equivalent to each contractor's share of published annual entitlements (column I multiplied by .475532 or .272672).

IV. Hypothetical share of Joint Fixed Costs equivalent to each contractor's share of published annual entitlements (column I multiplied by the fraction in parentheses derived from Table 1, column III).

V. Hypothetical share of Joint Fixed Costs equivalent to each contractor's share of actual deliveries (column I multiplied by fraction in parentheses derived from Table 1, column I).

VI. Difference between actual payments and ultimate entitlement equivalent share of Joint Fixed Costs (column II minus column III).

VII. Difference between actual payments and published entitlement equivalent share of Joint Fixed Costs (column II minus column IV).

VIII. Difference between actual payments and actual delivery equivalent share of Joint Fixed Costs, i.e., how much each contractor should have paid to make its share of payments equivalent to its share of water received (column II minus column V).

be under an M&I repay-

between the expected maximum and actual repayment share (underpayment by KCWA). It is never, as DWR claims, unless deliveries must be equal to this is not now the case. Note the note in the discussion of the date. As a consequence, the most repayment scheme simply shows.

nd 4

Delta charges plus transportation pumping plant, as analyzed by DWR. (See B-11, B-15, B-16 and B-21.) (See

Delta charges plus transportation pumping plant. (Figure in total joint fixed costs, or column II

equivalent to each contractor's share of .475532 or .272672).

equivalent to each contractor's share of the fraction in parentheses derived

equivalent to each contractor's share of parentheses derived from Table I,

equivalent entitlement share of

published entitlement equivalent share

actual delivery equivalent share of would have paid to make its share of column II minus column V).

Second, the schedules of accelerated and deferred payments called for by DWR's differential transportation pricing policy must be equalized correctly, using appropriate discount rates; otherwise the present value of early repayment will exceed that of equal repayment made later. It has not been possible for us to determine whether DWR has made the correct adjustments.

Third, KCWA and other agricultural contractors must be able to purchase their full entitlement shares of project yield in the future.

The burden of deferred transportation costs will grow, over time, exacerbating the ability-to-pay problem discussed in the concluding portion of the article.

APPENDIX NOTES

1. Phase I facilities were essentially completed by 1972 when the California aqueduct began deliveries to the MWD service area. Existing capacity, however, is not 4.23 MAF, but nearer 2.7 MAF. Hence the purported need for Phase II to "complete" the project.

2. The Rule Curve was established after the excessive drawdown of reservoirs in 1976 that left too little storage buffer against the continuing drought of 1977. DWR hopes not to be caught short like this again.

3. Repayment shares differ from shares of yield in two ways. First, agricultural contractors are assessed on a per acre-foot basis, while municipal and industrial contractors are supposed to be assessed equal annual payments. According to DWR, this means that agricultural contractors' annual entitlements increase with time, reaching their maximum in about the year 1990. Because of this, annual capital cost repayments are less in early years and more in later years than they would be under a municipal and industrial repayment schedule. (Source: DWR letter to authors, August 13, 1982.) Second, actual deliveries projected well into the future differ considerably from both published annual entitlements and ultimate entitlements. Both of these sources of variation are examined in greater detail in the text.

4. Fixed costs are repaid in three components: (1) a "Delta charge" covers the capital and maintenance for facilities north of the Sacramento Delta, chiefly Oroville Dam and powerhouse; (2) a "capital charge for transportation facilities" covers the capital for the California aqueduct and pumping stations; and (3) a "minimum operation, maintenance, power and replacement (minimum OMP&R) charge for transportation" covers the basic maintenance costs of the aqueduct. Transportation charges increase with distance from the Delta because of the greater length of the aqueduct required to reach distant contractors. The variable costs of delivery, or "variable OMP&R charges for transportation," are assessed by quantity and by distance. For the record, it should be noted that DWR states the principle of project financing in the following manner: "Capital and operating costs (except pumping costs) of Project transportation facilities are allocated among water contractors on a proportionate use of facilities basis." (Source: Letter from DWR Director Ronald B. Robie to authors, August 13, 1982.) The principle of financing the Delta charge is also proportionate use, as stated in Article 22(d) of the contract.

5. Our definition of proportional is admittedly controversial, but the subsidy is still substantial even in terms of ultimate entitlements and published annual entitlements, which correspond to more official notions of proportional share.

6. The complexity of DWR's method of assigning costs required the following simplifying assumptions to make the calculations manageable: (1) all water delivered to KCWA passes through all reaches of the aqueduct up to Edmonston (some does not actually go this far); (2) MWD is entirely responsible for the approximately 30 percent of total fixed costs from Edmonston south. (MWD actually uses about 90 percent of all water from this point on); (3) ignoring the contractors north of Kern County does not affect the results because northern contractors take only about 20 percent of deliveries and the distance costs to them are less than to more southerly contractors; KCWA and MWD are responsible for a substantially higher share of total fixed costs than their joint 75 percent share of ultimate entitlements; (4) we also ignore cost and price differences within MWD and KCWA.

7. Variable costs would have to be added to these figures to arrive at the actual price of water delivered to KCWA. These currently amount to about \$3.50 per acre-foot to Kern County, and \$33.20 per acre-foot to southern California. The discrepancy is owing to the bill for using 3300 Kwh of electricity for each acre-foot pumped over the Tehachapi Range.

8. Letter from DWR Director Ronald B. Robie to authors, August 13, 1982.

RECENT INSTITUTE PUBLICATIONS

1984

Kramer, Ralph and Paul L. Terrell

Social Services Contracting in the San Francisco Bay Area. 42pp \$4.00

Nathan, Harriet and Stanley Scott, eds.

Emerging Issues in Public Policy: Research Reports Essays, Issues of *Public Affairs Reports*, bulletin of the Institute of Governmental Studies, 1977-1982. Four compilations sold separately: Politics, Government, and Related Policy Issues 36pp \$2.25; Health and Education 57pp \$2.50; Urban Issues, Growth, and the Economy 82pp \$3.25; The Environment, Water, and the Coast 108pp \$4.00 (Four-volume set \$10.00.)

Squire, Peverill and Stanley Scott

The Politics of California Coastal Legislation: The Crucial Year, 1976. 104pp \$11.00

Storper, Michael and Richard Walker

The Price of Water: Surplus and Subsidy in the California State Water Project, 30pp \$4.25

1983

Harrington, Charlene, et al.

Prepaid Long-Term Care Health Plans: A Policy Option for California's Medi-Cal Program (California Policy Seminar Final Report Number 4). 92pp \$5.50

Keating, W. Dennis

Rent Control in California: Responding to the Housing Crisis (California Policy Seminar Monograph Number 16). 24pp \$4.00

Shonick, William and Ruth Roemer

Public Hospitals Under Private Management: The California Experience. 127pp \$7.75

1982

Dunning, Harrison C.

Water Allocation in California: Legal Rights and Reform Needs (Institute of Governmental Studies Research Paper 1982). 62pp \$4.50

Guthrie, James W. and Ami Zusman

Mathematics and Science Teacher Shortages: What Can California Do? 18pp \$3.25

Minkler, Meredith and Stephen R. Blum

Community-Based Home Health and Social Services for California's Elderly: Present Constraints and Future Alternatives (California Policy Seminar Monograph Number 13). 29pp \$4.00

Zucker, Lynne G.

California's Proposition 13: Early Impact on Education and Health Services
(California Policy Seminar Monograph Number 15). 30pp \$4.00

1981

Brown, E. Richard

Public Medicine in Crisis: Public Hospitals in California (California Policy Seminar Monograph Number 11). 39pp \$4.25

Cretin, Shan and Nigel K. Roberts

Surgical Care for Cardiovascular Disease in California: Present Status and Future Policy (California Policy Seminar Monograph Number 8). 37pp \$3.75

Estes, Carroll L., et al.

Long-Term Care for California's Elderly: Policies to Deal with a Costly Dilemma (California Policy Seminar Monograph Number 10). 37pp \$4.25

Heckart, Ronald J., and Terry J. Dean

Proposition 13 in the 1978 California Primary: A Post-Election Bibliography. (Occasional Bibliographies Number 2). 168pp \$13.00

Kane, Robert L., et al.

A Geriatric Medical Policy for California: Manpower and Setting (California Policy Seminar Monograph Number 9). 27pp \$3.75

Mercer, Lloyd J. and W. Douglas Morgan

City and County User Charges in California: Options, Performance, and Criteria (California Policy Seminar Monograph Number 12). 29pp \$4.00

Scott, Stanley, ed.

Coastal Conservation: Essays on Experiments in Governance. 56pp \$5.50

1980

Butler, Lewis H., et al.

Medical Life on the Western Frontier: The Competitive Impact of Prepaid Medical Care Plans in California (California Policy Seminar Monograph Number 6). 19pp \$3.50

Hollon, Jennifer K.

Solar Energy for California's Residential Sector: Progress, Problems, and Prospects (Research Report 80-3). 71pp \$4.50

Monographs, Bibliographies, Research Reports and a full list of Institute publications are available from the Institute of Governmental Studies, 109 Moses Hall, University of California, Berkeley, California 94720. Checks should be made payable to the Regents of the University of California. Prepay all orders under \$30. California residents add 6% sales tax; residents of Alameda, Contra Costa and San Francisco counties add 6½% sales tax. Prices subject to change.