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# Water Management of the Future: A Ground Water Storage Program for the California State Water Project

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Escalating costs of surface water facilities, continued reliance on ground water, environmental considerations, and recent legal decisions regarding ground water rights have provided new economic and practical incentives for comprehensive management of California's vital ground water resources. Undoubtedly, the time is ripe for California to take advantage of these considerations to enable it to meet the future water demands of the state.<sup>1</sup> Just how California will proceed to counter these demands has not been fully answered.

Many western states, including Nevada, Arizona, and New Mexico,

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The views expressed are those of the authors and not necessarily those of the State of California.

Drawings utilized in this article were prepared by the staff of the Department of Water Resources.

1. As completed to date, the State Water Project [hereinafter referred to as SWP] provides about half the maximum annual amount it can be obligated to deliver under the water supply contracts. Deliveries in 1979 will be about 1.7 million acre-feet, with a gradual building over the years to the contract maximum. (One acre-foot of water consists of 325,000 gallons.) The demand will soon exceed the current SWP yield. *See* CAL. DEP'T OF WATER RESOURCES, CAL. STATE WATER RESOURCES BULL. NO. 160-74, THE CALIFORNIA WATER PLAN OUTLOOK IN 1974 at 145, 146, 155 (1974) [hereinafter cited as WATER PLAN OUTLOOK].

have attempted to resolve several of the water law issues presented herein; however, very few of these states have directed efforts at implementing a complete water management scheme. California faces a crucial decision concerning its approach for the protection of vital water resources. Deciding water law issues on a case by case basis with the expectation that this method will produce an environment conducive to the protection of such a vital natural resource is doomed to failure from the outset.

This article, adopting a management or administrative perspective, proposes that ground water storage of State Water Project supplies be utilized in conjunction with existing surface storage facilities in order to accommodate the future needs of this state. It is the purpose of this article to present a water management plan that other states may follow in order to make better use of their facilities and resources.

In advocating a conjunctive use program<sup>2</sup> this article first will compare the relative efficiency of ground water and surface water storage including cost effectiveness and environmental considerations. A theoretical model is provided to help identify the institutional, operational, and environmental factors that must be considered before a ground water storage program can be introduced. Next, this article will analyze the legal authority, controversy, and needed legislation pertaining to ground water rights. In this regard, the California Governor's Commission proposed legislation<sup>3</sup> will be analyzed in light of resolving a major legal issue surrounding water storage priorities. Finally, a working ground water demonstration project is provided to show how a ground water storage program used in conjunction with surface water can work successfully.

#### RELATIVE EFFICIENCY OF GROUND WATER AND SURFACE WATER STORAGE

Beginning in 1976, California experienced the most severe drought ever to face the State,<sup>4</sup> which resulted in practically empty reservoirs in the fall of 1977. Beginning in December of 1977, the rains came and by mid-February 1978, a short space of two months, precipitation had totaled that of a normal year: subsequent rain and snow totaling 200-300

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2. "Conjunctive use" usually refers to the underground storage of surface water supplies. *See id.*; CAL. DEP'T OF WATER RESOURCES, CAL. STATE WATER RESOURCES BULL. NO. 118, CALIFORNIA'S GROUND WATER at 121 (1975) [hereinafter cited as CALIFORNIA'S GROUND WATER].

3. See note 74 *infra*.

4. See generally CAL. DEP'T OF WATER RESOURCES, SPECIAL REPORT ON DRY YEAR IMPACTS IN 1976 (Feb. 1976); THE CALIFORNIA DROUGHT-1976 (May 1976); THE CALIFORNIA DROUGHT, 1977: AN UPDATE (Feb. 1977); THE CONTINUING CALIFORNIA DROUGHT (Aug. 1977); THE 1976-77 CALIFORNIA DROUGHT: A REVIEW (May 1978).

percent of normal during the spring months refilled all but a few reservoirs to their normal levels. This type of wide precipitation variation found in California's climate, together with the fact that virtually all of California's rain falls in the months of October through May, requires that in order to develop a steady water supply, surface water available during rainy periods must be stored for later use during dry periods. The State's gross surface storage capacity in the form of surface reservoirs, now constructed and being used, totals approximately 39 million acre-feet.<sup>5</sup> California's gross underground storage capacity totals approximately 1.3 billion acre-feet in 248 major ground water basins throughout the State<sup>6</sup> and basins totaling more than 143 million acre-feet of storage capacity are near enough to the surface and have a high enough permeability to be utilized conjunctively. At present, fifty-two million acre-feet of that capacity are empty.<sup>7</sup>

When the ground water storage program is fully integrated into the State Water Project (hereinafter referred to as SWP)<sup>8</sup> operations it will be the first basic change in operation of that monumental project since its inception in 1959.<sup>9</sup> Under this program, ground water basins—in effect, underground reservoirs—will be used in conjunction with SWP surface water supplies, facilities, and reservoirs to store underground a portion of the SWP water developed in Northern California from surface sources to meet increased future demand.<sup>10</sup>

Traditionally, surface water storage, through construction and utilization of dams to create reservoirs, has been the primary means by which California has maintained a relatively stable water supply. Surface water facilities now enable water originating in the north to reach the Mexican border and the water from the Colorado River to cross the State to the south coast.<sup>11</sup> Utilization of the vast amounts of empty

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5. WATER PLAN OUTLOOK, *supra* note 1, at 91. No estimate of yield is possible.

6. See CALIFORNIA'S GROUND WATER, *supra* note 2; WATER PLAN OUTLOOK, *supra* note 1; Gleason, *Water Projects Go Underground*, 5 *ÉCOLOGY* L.Q. 625, 625-29 (1976); Address by Michael Glazer, Eleventh Biennial Conference on Ground Water (Sept. 15-16, 1977), *reprinted in* PROCEEDINGS OF THE ELEVENTH BIENNIAL CONFERENCE ON GROUND WATER at 152 (Nov. 1977).

7. CALIFORNIA'S GROUND WATER, *supra* note 2, at 7, 129.

8. The California SWP consists of a great network of surface water storage and transportation facilities [see Appendix 1] including 641.5 miles of aqueducts, 8 power plants, 21 pumping plants and 25 dams and reservoirs. The State has contracted to deliver 4.23 million acre-feet of water on a long-term basis to 31 public agencies throughout California. In return for those deliveries, the 31 public agencies have agreed to repay the cost of the Project. See *Metropolitan Water Dist. v. Marquardt*, 59 Cal. 2d 159, 182, 195, 379 P.2d 28, 40, 48, 28 Cal. Rptr. 724, 736, 744 (1963). The Project also provides flood control, hydroelectric power generation, salinity control, wildlife protection, and recreation.

9. CAL. DEP'T OF WATER RESOURCES, CAL. STATE WATER RESOURCES BULL. NO. 186, A GROUND WATER STORAGE PROGRAM FOR THE STATE WATER PROJECT: SAN FERNANDO BASIN THEORETICAL MODEL at iii (May, 1979) [hereinafter cited as THEORETICAL MODEL].

10. See note 24 *infra*.

11. CALIFORNIA'S GROUND WATER, *supra* note 2, at 127.

storage capacity in California's ground water basins to store part of the water from the State's great surface water network would more fully make use of a natural resource and greatly lessen the need for more expensive surface water storage facilities.

The Southern California Water Conference<sup>12</sup> and the California Department of Water Resources have made preliminary studies of the feasibility of storing SWP water in Southern California ground water basins, where several million acre-feet of storage capacity is unused.<sup>13</sup> Storage of water which could be conveyed through unused capacity of the State Water Project aqueduct<sup>14</sup> will provide supplies for use during dry periods or during any prolonged disruption of SWP service.

Basically, such ground water storage of surface SWP water can be accomplished in two ways. By the direct method, SWP water will be artificially recharged<sup>15</sup> into ground water basins for storage, then pumped out when SWP surface supplies are inadequate.<sup>16</sup> By the "in lieu" or indirect method, SWP surface water will be delivered to users during wet periods, in lieu of pumping by those users. Then during dry periods ground water would be pumped out to supplement SWP surface water supplies.<sup>17</sup> Thus, the in lieu method makes maximum use of surface water supplies during wet periods. This in turn eliminates the need for pumping during the periods when surface water is most plentiful. In order to evaluate the effectiveness of a conjunctive use program for water management, environmental and cost-efficiency considerations must be analyzed.

#### A. Environmental Considerations

Such a program of conjunctive use<sup>18</sup> is environmentally favorable for several reasons. First, storage of surface water in natural underground basins avoids nearly all the surface *land use dislocations* and *stream effects* that would otherwise result,<sup>19</sup> since the building of surface reser-

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12. THEORETICAL MODEL, *supra* note 9, at 2. The Southern California Water Conference is an organization comprising more than 100 public officials and business leaders involved with Southern California's water supply.

13. CALIFORNIA'S GROUND WATER, *supra* note 2, at 127.

14. See Appendix I.

15. CALIFORNIA'S GROUND WATER, *supra* note 2, at 120. Artificial recharge refers to the release or spreading of water into a permeable area of the ground surface, so that the water will filter into the ground and percolate into the underground basin.

16. See Appendix II.

17. See Appendix III. Surface water supplies basically are amounts of water which are delivered from surface reservoirs through the California Aqueduct and other surface facilities.

18. See note 2 *supra*.

19. For example, the land overlying a ground water basin remains available for any other use. Further, whereas stream flows are necessarily altered when surface reservoirs are constructed, utilization of underground basins for water storage allows the stream to remain essentially in its otherwise natural condition, thereby preserving the streamflow as a source for fish, wildlife, etc.

voirs often requires extensive land excavation as well as the rerouting of local streams. Second, loss of water through evaporation is greatly lessened.<sup>20</sup> Third, ground water tends to be of higher quality than surface water because underground storage provides natural filtration, and ground water is less prone to natural or people-caused deterioration than is water stored in surface reservoirs.<sup>21</sup> Finally, an SWP ground water program will add flexibility to SWP operations and can be a hedge against earthquake or other disablement of the California Aqueduct.

Along with the above-mentioned natural conservation benefits that will occur under a conjunctive use program, the program will significantly remedy an adverse environmental impact of ground water pumping. Overuse of ground water supplies by local users can result in a significant lowering of the basin water level, or table, over time. When such lowering of the water level occurs, the basin is usually in overdraft.<sup>22</sup> This results in the deepening or replacement of pump bowls that are used to pump water out of the basin. Thus, more energy must be used to pump water from the lower ground water level to the land surface. By using the vacant space caused by the overdraft to store SWP water by either the direct or the in lieu method, energy savings accrue to these local users. The savings occur because the water level in the basin would be higher than without the SWP water. Thus, if the direct or in lieu methods are used, local users would be pumping the shorter distance from the higher water level to the land surface from the time the SWP water is stored until it is withdrawn some time later.

An additional energy savings would accrue under an SWP conjunctive use program if the in lieu method is utilized. Under this method, local agencies would utilize SWP surface water in lieu of pumping ground water. Stored ground water would only be pumped in dry periods or other times when the surface supply is inadequate; thus, energy savings would accrue to the local users through less ground water pumping.

From an environmental perspective, it has been shown that a program of conjunctive use is favorable for natural resource protection as

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20. CALIFORNIA'S GROUND WATER, *supra* note 2, at 129.

21. *Id.*

22. *Id.* See also WATER PLAN OUTLOOK, *supra* note 1, at 141-42 for discussion. "Safe yield" is the maximum amount of water that can be pumped out of a ground water basin without gradually lowering the ground water level so that eventually the ground water supply in the basin will be depleted. When over time a greater quantity of water is extracted from a basin than has flowed into the basin, extraction has gone beyond the basin's "safe yield" and the basin is said to be in "overdraft". See *City of Los Angeles v. City of San Fernando*, 14 Cal. 3d 199, 278-79, 537 P.2d 1250, 1308, 123 Cal. Rptr. 1, 59 (1975); WATER PLAN OUTLOOK, *supra* note 1, at 141.

well as energy conservation considerations. Consideration of the relative cost of ground water and surface water storage is also important, however, when determining the feasibility of the conjunctive use program.

*B. Relative Cost of Ground Water and Surface Water Storage*

*1. Comparison of Water Development Costs*

A major advantage of using ground water basins to store water that otherwise would be stored in surface reservoirs is the decreased need for construction of extremely costly surface storage reservoirs. Current SWP annual water yield is about 2.3 million acre-feet.<sup>23</sup> Eventually the SWP's contract obligations will reach 4.23 million acre-feet of water annually.<sup>24</sup> Therefore, to accommodate the expected increased demand for water, more surface reservoirs must be built and/or a ground water storage program must be incorporated into the SWP.

The Department of Water Resources recently completed a major study of new sources of water and Delta transfer needs for the SWP through the year 2000. Department of Water Resources Bulletin Number 76 (hereinafter referred to as *Delta Water Facilities*)<sup>25</sup> incorporates the recommendations of this study<sup>26</sup> and includes California's first major legislative proposal to integrate a comprehensive ground water storage program into the existing SWP surface water storage program.<sup>27</sup> The Department of Water Resources has compared the water development costs of ground water and surface water storage for the facilities presented in *Delta Water Facilities*:

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23. CAL. DEPT OF WATER RESOURCES, CAL. STATE WATER RESOURCES BULL. NO. 76, DELTA WATER FACILITIES (July 1978) [hereinafter cited as DELTA WATER FACILITIES]. This amount is the amount available under 1929-34 drought conditions, including contract shortages. In most years considerably more water is available for delivery to SWP customers.

24. WATER PLAN OUTLOOK, *supra* note 1, at 145, 155.

25. DELTA WATER FACILITIES, *supra* note 23. The program presented in *Delta Water Facilities*, including a comprehensive ground water storage program, was incorporated in SB 346, 1977-78 Regular Session. SB 346 failed in 1978. Although the so-called "Peripheral Canal" bill was well conceived and written, it failed in 1978 for political reasons not associated with its substance. Similar legislation, including provisions for ground water storage, has been introduced in 1979 in both houses of the legislature.

26. DELTA WATER FACILITIES, *supra* note 23.

27. The Department of Water Resources currently has authority to implement a ground water storage program as part of the SWP, regardless of whether SB 346 was enacted. SB 346 would have further specified particular areas for such conjunctive use.

COMPARISON OF WATER DEVELOPMENT COSTS  
GROUND WATER STORAGE vs. SURFACE WATER STORAGE FOR  
FACILITIES PRESENT IN *DELTA WATER FACILITIES*<sup>1</sup>

Proposed Development	Capital Cost <sup>2</sup> (Dollars)	Annual Yield <sup>3</sup> (acre-feet)	Averaged Cost Per unit of Annual Yield <sup>4</sup> (Dollars per acre-foot)
<i>Ground Water Basins</i>			
1. <i>Southern California</i> , includes enlargement of East Branch of California Aqueduct	240,000,000	160,000	1,500
2. <i>San Joaquin Valley</i>	120,000,000	240,000	500
Totals	360,000,000	400,000	900
<i>Surface Storage Reservoirs</i>			
Cottonwood Creek Project	320,000,000	170,000	1,882
Glenn Reservoir-River Diversion	1,160,000,000	1,000,000	1,160
Los Vaqueros Reservoir	540,000,000	160,000	3,375
Totals	\$2,020,000,000	1,330,000	\$1,519

<sup>1</sup> *Supra* note 23 at 91, 105, 110.

<sup>2</sup> Costs based on prices in 1977.

<sup>3</sup> Estimated incremental annual yield that would be added to the State Water Project and Central Valley Project systems.

<sup>4</sup> Averaged cost per unit of annual yield is computed as capital cost divided by annual yield.

This table illustrates the cost effectiveness of storing water in underground water basins. A major reason for the savings which would be realized upon utilization of natural ground water basins over development of surface storage reservoirs is that a ground water storage program, particularly one using the in lieu method, would normally require the construction of only a few additional facilities. Instead, it would make use of existing surface facilities.<sup>28</sup> On the other hand, developing a water program that emphasizes surface water storage requires the construction of costly surface reservoirs as well as the rerouting of surface streams.

It should be noted that comparing the construction costs of the facilities necessary to implement the storage of ground water or surface water program is only one factor pertinent to the issue of relative cost effectiveness. It is also necessary to consider the implication for the State water contractors who pay these costs.

28. For this reason it must be noted that any comparison of surface and ground water storage costs depends upon the number and availability of existing surface storage facilities.



## 2. *Implication for State Contractors*

Under the contracts of the State of California to supply water to local agencies,<sup>29</sup> the 31 agencies have agreed to repay the cost of the SWP, which includes repayment for project conservation facilities.<sup>30</sup> Since conservation facilities benefit all of the agencies, all agencies pay for them in proportion to the annual amounts of water to which they are entitled. Cities that pump their local water supply from many basins would benefit from higher ground water tables while the SWP ground water was stored in the basin. As pointed out earlier, reducing the pumping lift would reduce pumping water costs. Furthermore, treatment would not be required for the ground water that was not pumped.

Evaluating the relative efficiency of ground water and surface water storage requires consideration of environmental and cost factors, including the implication for State contractors. The preceding review of these factors leads to the conclusion that a ground water storage program should be implemented to meet California's future needs. The development of a theoretical model serves as proof of the above conclusion and points to areas in need of further clarification.

### THEORETICAL MODEL

On the basis of a Department of Water Resources report<sup>31</sup> concluding that a ground water storage program augmenting the SWP supply was feasible, the Southern California Water Conference<sup>32</sup> recommended that the Department of Water Resources undertake additional studies and negotiate with SWP water contractors and local agencies using ground water basins. The goal of these negotiations would be to develop agreements to implement a ground water storage program in Southern California. A theoretical model such as that described herein serves to identify the factors—institutional, operational, and environmental—that must be considered before a long-term program can be implemented.

The ground water basin selected for the theoretical model of the ground water storage program was the San Fernando Basin in Los Angeles County.<sup>33</sup> This Basin was selected largely because more is known about its geology and hydrology than any other basin in Southern Cali-

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29. See note 8 *supra*. For precise provisions, see STANDARD PROVISIONS FOR WATER SUPPLY CONTRACTS (approved 1962) and CALIFORNIA DEPARTMENT OF WATER RESOURCES BULL. NO. 141 (Nov. 1965) and subsequent amendments.

30. See note 48 *infra*.

31. CAL. DEP'T OF WATER RESOURCES, DISTRICT REPORT, SOUTHERN DISTRICT, GROUND WATER STORAGE OF STATE WATER PROJECT SUPPLIES (1974).

32. See THEORETICAL MODEL, *supra* note 9, at 2.

33. See Appendix I.

fornia. Also, the Basin appeared to have the spreading grounds,<sup>34</sup> pipelines, and well fields that could be used, with only minor construction, to provide a workable program. Finally, the Basin is well managed<sup>35</sup> and its water rights have been identified and recently adjudicated.<sup>36</sup>

As in many large scale public and private operations, institutional problems pose persistent obstacles. In considering the integration of a comprehensive ground water storage program into the SWP, these problems must be overcome. Operation of the ground water storage program under the management plan for the theoretical model, including both local surface water and ground water, would be supervised by an operating agency. This agency would serve as a coordinator of all activity performed by various interested parties. This operating agency would have overall discretionary responsibility to make management decisions involving use of the basin. The agency members would report back to the parties. The State would determine, in cooperation with the operating agency, when water would be stored and when it would be pumped out. Furthermore, protection of the rights of each entity which stores or purchases the water would require supervision by a court-appointed administrator (watermaster) who would perform purely ministerial functions such as record-keeping.<sup>37</sup> The committee, however, would have the authority to request or approve all watermaster determinations, and if a disagreement arises between the watermaster and the committee, the matter would be submitted to the court for resolution.

Before a ground water storage program can become operational in any basin, agreements have to be entered into by the State and all the participating agencies to set forth the methods, procedures, and responsibilities for delivery, storage, and recapture<sup>38</sup> of SWP water. To ensure the yield of a ground water storage program, the participating local agencies would have to agree to guarantee a minimum storage

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34. See note 15 *supra*.

35. The San Fernando Basin underlies the cities of Los Angeles, Burbank, Glendale and San Fernando, all of which receive SWP water through the Metropolitan Water District of Southern California. Facilities for extracting water from the Basin are operated by Los Angeles, Burbank, and Glendale. Recharge facilities are operated by Los Angeles and the Los Angeles County Flood Control District. The Basin has been operated under a watermaster, a court-appointed administrator, for several years.

36. See *City of Los Angeles v. City of San Fernando*, No. 650070, Judgment, Superior Court of the County of Los Angeles, January 26, 1979.

37. Since the court's May 1975 decision in *City of Los Angeles v. City of San Fernando*, 14 Cal. 3d 199, 537 P.2d 1250, 123 Cal. Rptr. 1 (1975), the Department of Water Resources has been monitoring the extractions from the San Fernando Basin under an interim agreement between the four parties. This function is strictly administrative. The negotiated judgment in this case, see note 36 *supra*, provides for a court-appointed watermaster and an Administrative Committee composed of the various parties having rights to extract ground water.

38. "Recapture" refers to the process of extracting water from a ground water basin through pumping methods.

capacity within the basin and to store and recapture water within a reasonable period of time. Agreements between the State and the local agency may also specifically include provisions for recapture scheduling, criteria for extractions, priority for use of storage basins, and provisions for in lieu storage.<sup>39</sup>

In regard to the San Fernando Basin, two agreements would be required—one between the State and the Metropolitan Water District of Southern California<sup>40</sup> and a second that would include the local member agencies of the Metropolitan Water District. These agreements would formalize the operating procedure and would create the operating agency described in the preceding section of this text, and would formalize and create guidelines for the operating procedure. In addition, the agreements would resolve the various issues surrounding the program.

The State agreement—between the Department of Water Resources and the Metropolitan Water District—would describe the methods, procedures, and responsibilities for delivering SWP water to the District and the provisions for payment. On the other hand, the local agreement—which would include the Department of Water Resources, Metropolitan Water District, and its affected member local agencies and the Los Angeles County Flood Control District—would provide the mechanisms for getting the water in the ground and for its recapture. These mechanisms would have to be coordinated with all parties who spread water or have rights to produce ground water. This coordination would be done through the operating agency. The local agreement would also provide the guidelines and criteria that would govern the activities of the operating agency to ensure that water quality would be maintained, damage from high water levels would be prevented, and losses of SWP ground water minimized. The local agencies' commitment to provide a minimum quantity of firm storage capacity would also be included in the local agreement.<sup>41</sup>

As was discussed earlier,<sup>42</sup> use of a conjunctive use program of water management in the San Fernando Basin would eliminate the need for large scale construction of surface reservoirs, protect the natural flow of

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39. Similar provisions appear in surface reservoir storage contracts.

40. The Metropolitan Water District of Southern California is the SWP's largest water supply contractor. Its maximum contractual entitlement exceeds two million acre-feet of water per year. The District includes the counties of Ventura, Los Angeles, Orange, Riverside, San Diego, Imperial, and a portion of San Bernardino County.

41. Additional agreements would be entered into as necessary to provide for construction of facilities to transport water from the Metropolitan Water District's system to the spreading grounds.

42. See text accompanying notes 11-23 *supra*.

local surface streams, insure the purity of the water, and reduce the need for pumping.

The selection of the San Fernando Basin as a theoretical model has served to identify the institutional, operational, and environmental factors that must be considered before a ground water storage program can be implemented. A brief review of such factors indicates that the obstacles to implementation of a ground water storage program are minimal. Next this article will analyze the legal hurdles to be overcome before a ground water storage program can be utilized in conjunction with surface water facilities.

#### LEGAL AUTHORITY, PROBLEMS, AND PROPOSED REMEDIES

Legal uncertainties regarding ground water storage rights have been raised continually as a serious obstacle to developing a comprehensive program of ground water storage and management. When the California Conservation Commission was considering the task of including a statutory scheme for ground water in the Water Commission Act of 1913, it decided that "well considered statute laws" should govern ground water.<sup>43</sup> The Commission then went on to decide that the subject matter was "so vast" that it "had neither the time nor the funds necessary to make a satisfactory investigation of it."<sup>44</sup>

The question of whether ground water legislation should be enacted in California has been debated since the time of the Commission's report, while other states have provided legislatively for state control over ground water.<sup>45</sup> To date, California legislation in this area has been sparse; California's general ground water law has essentially been developed by the judiciary. Yet, notwithstanding recent and far-reaching judicial decisions,<sup>46</sup> there is still an important need for a more precise identification of ground water storage rights.

In discussing the legal authority needed to implement a comprehensive ground water management program an analysis of statutory authority and recent judicial developments will be undertaken.

#### *A. Statutory Authority*

In contrast to the sparse legislation developing the State's general

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43. See generally CALIFORNIA CONSERVATION COMMISSION, REPORT 31 (1913).

44. *Id.*

45. See Schneider, *Ground Water Rights in California*, GOVERNOR'S COMMISSION TO REVIEW CALIFORNIA WATER RIGHTS LAW, STAFF PAPER No. 2 at 2 (1977) for a review of the many State codes which provide for State control over ground water.

46. See *City of Los Angeles v. City of San Fernando*, 14 Cal. 3d 199, 537 P.2d 1250, 123 Cal. Rptr. 1 (1975); *Alameda County Water Dist. v. Niles Sand and Gravel Co.*, 37 Cal. App. 3d 924, 112 Cal. Rptr. 846 (1974), *cert. denied*, 419 U.S. 869 (1974).

ground water law, the Department of Water Resources does have sufficient existing statutory authorization to implement a ground water storage program as part of the SWP without additional legislation.

The California Water Resources Development Bond Act<sup>47</sup> provides authority and funds to assist in the construction of the State Water Resources Development System, of which the SWP is a part. An SWP ground water storage program is authorized and may be funded under this Act and under the State Central Valley Project Act.<sup>48</sup> Pursuant to these acts, and to the contracts between the State and its 31 water supply contractors,<sup>49</sup> the Department of Water Resources is given broad authority to develop the facilities and means of construction and operation, which can include a ground water storage program as part of the SWP in order to provide SWP water in the amounts and at the time such water is needed.<sup>50</sup>

The water supply contracts authorized by the California Water Resources Development Bond Act provide for repayment by the water contractors of the costs of the SWP, including the costs of project conservation facilities. For the purposes of the Theoretical Model, the Department of Water Resources considers the ground water storage program an "additional project conservation facility"<sup>51</sup> as provided for in the contracts.

### *B. Recent Judicial Developments*

Although communities have relied on rudimentary ground water storage programs for some time, courts have very recently entered the area of ground water storage rights. Two cases in particular have far-reaching implications on the rights of the State and its contracting agencies to implement a ground water storage program. The principle questions answered by these cases are: 1) who has the right to use underground storage space, and, 2) does a person storing water have a right of recapture.

In *Niles Sand and Gravel Company v. Alameda County Water District*,<sup>52</sup> a California landowner operated a commercial sand and gravel extraction operation on its land. This land was overlying a ground water basin which was managed by the Alameda County Water Dis-

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47. CAL. WATER CODE §§12930-12944.5. This act is also known as the Burns-Porter Act.

48. CAL. WATER CODE §§11100-11922.9.

49. See notes 8 and 29 *supra*.

50. Metropolitan Water Dist. v. Marquardt, 59 Cal. 2d 159, 379 P.2d 28, 28 Cal. Rptr. 724 (1963). See generally THEORETICAL MODEL, *supra* note 9, at Ch. V.

51. There is some question whether other interested parties would consider the ground water storage program "an additional project conservation facility," thus triggering repayment by the water contractors of the costs of a ground water storage program.

52. 37 Cal. App. 3d 924, 112 Cal. Rptr. 846 (1974), *cert. denied*, 419 U.S. 869 (1974).

tract. Water had been imported to and extracted from this basin as part of the District's ground water storage program since 1935. In 1969 the overlying quarry pit had encroached vertically far enough into the basin to cause seepage of stored ground water into the pit, which seriously impaired the quarry operation even though the owner pumped large amounts of the seepage into the San Francisco Bay. The amount pumped out impaired the District's ground water storage program. When the quarry owner sued for damages, the court held that the owner had failed to establish the existence of any property interest affected by the District's storage of water under his land.<sup>53</sup>

The court took the view that the District has a public duty under enabling statutes to maintain the underground water level so as to prevent saline intrusion, and it found that the District's actions had been carried on in the exercise of its police power.<sup>54</sup> As to the owner's inverse condemnation claim, the court stated that as the owner had lost no rights which it had *in fact*, there had been no "taking" or "damaging" of its property which was compensable under the California Constitution.<sup>55</sup> The court held that public entities need not pay overlying landowners for using ground water basin storage space, even if use of that basin for storage interferes with the use of a valid overlying property right.<sup>56</sup> In this case the use of the basin for storage caused the flooding of the owner's subsurface quarry operation, which seriously impaired the landowner's commercial activity.<sup>57</sup>

The decision of the court of appeal in *Niles* is significant in that it extended underground public storage rights to limit overlying private property rights.<sup>58</sup> It is interesting to note that California has codified the common law rule giving surface owners rights in anything *permanently* situated beneath the surface of their land.<sup>59</sup> The court refused, however, to apply this rule of absolute ownership to ground water,<sup>60</sup>

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53. *Id.* at 935, 112 Cal. Rptr. at 854.

54. *Id.* at 932-37, 112 Cal. Rptr. at 852-55. The court found a legitimate exercise of the police power under Article XIV, Section 3 of the California Constitution (now Article X, Section 2), which requires conservation of the life-giving waters of the State. *Id.* at 935-37, 112 Cal. Rptr. at 854-55.

55. *Id.* at 854, 112 Cal. Rptr. at 935. The court instead found that the surface owner was making an unreasonable use of underground storage space. *Id.*

56. *Id.* at 935-37, 112 Cal. Rptr. at 854-55.

57. The court based its decision on Article XIV, Section 3 of the California Constitution (now Article X, Section 2), which declares that the general welfare of the citizenry requires the beneficial and reasonable use of the State's water resources, and cited the company's waste of the water.

58. The court found a public servitude for groundwater and this included a public right to store water underground. See Gleason, *Water Projects Go Underground*, 5 *ECOLOGY* L.Q. 625, 625 (1976).

59. CAL. CIV. CODE §829.

60. See also *Katz v. Walkinshaw*, 141 Cal. 116, 74 P. 766 (1903).

since ground water is not permanently situated beneath the surface. Thus, the rights of the surface owner were diminished.

In *City of Los Angeles v. City of San Fernando*,<sup>61</sup> Los Angeles filed suit in 1955 to quiet title to water underlying the Upper Los Angeles River Area<sup>62</sup> to obtain a declaration of its prior rights to that water and to enjoin neighboring cities (particularly Glendale and Burbank) from extracting that water without its permission. All three cities had for several years pumped out of the basin which led to an annual overdraft<sup>63</sup> of ground water in the basin. In 1975, in a unanimous decision, the California Supreme Court answered the important legal question as to the rights of entities storing water underground. The court awarded Los Angeles an *exclusive* right to recapture the imported waters that the City had added to the basin.<sup>64</sup> Furthermore, the court gave the City exclusive right to recapture the water that it had sold to its customers for use and which eventually percolated into the basin. Finally, the court held that the defendant cities had similar recapture rights to the water they used.<sup>65</sup>

The effect of *San Fernando* was to prevent prescription of public water rights.<sup>66</sup> As a result of this decision, a governmental agency in California can import water and use such water to recharge ground water basins, knowing that third parties cannot establish prescriptive rights to the continued use of a portion of those waters. "This judicial protection of a public entity's investment in underground storage . . . is a significant factor in reducing the real cost of such [ground water storage] projects."<sup>67</sup> The real cost of the project is reduced because the governmental agency no longer is concerned with paying funds to private entities based on prescriptive rights.

*Niles* and *San Fernando* recognized several rights which form the basis for the implementation of a ground water storage program: (1) the right of a public entity to import water into ground water basins when space is available without paying overlying landowners; (2) the right of a public entity to protect water that it has stored in the basin from expropriation by others; and (3) the right of a public entity to recapture water it has stored in the basin when it is needed. This latter

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61. *City of Los Angeles v. City of San Fernando*, 14 Cal. 3d 199, 537 P.2d 1250, 123 Cal. Rptr. 1 (1975).

62. The Upper Los Angeles River Area is the entire watershed of the Los Angeles River. *Id.* at 208, 537 P.2d at 1259, 123 Cal. Rptr. at 10.

63. *Id.* at 212, 537 P.2d at 1262, 123 Cal. Rptr. at 13.

64. *Id.* at 263-64, 537 P.2d at 1291-92, 123 Cal. Rptr. at 47-48.

65. *Id.* at 287-92, 537 P.2d at 1314-17, 123 Cal. Rptr. at 65-68.

66. *Id.* at 264-86, 537 P.2d at 1297-1313, 123 Cal. Rptr. at 48-64.

67. Thorson, *Storing Water Underground: What's the Aquifer?*, 57 NEB. L. REV. 581, 604 (1978) [hereinafter cited as Thorson].

right includes water the public entity sold and which eventually percolated into the basin naturally. Together, these two cases cleared the way for public agencies to implement comprehensive ground water storage programs by giving them authority, in the public interest, to preserve a basin's storage capability for the overlying community's water supply and to implement ground water storage programs rather than building surface storage reservoirs. In order to implement smoothly a fully comprehensive ground water storage program, priorities in ground water storage rights should be established. The courts, however, have left the questions of ground water storage priority rights largely unanswered.<sup>68</sup> Although multiple parties stored water in *San Fernando*, the court did not address the issue of priority of storage rights because there was no shortage of underground storage space at the time.<sup>69</sup> Until this issue is resolved, potential conflicts are possible.

The issue of priority of storage rights clearly is presented when there is competition for the storage capacity of a ground water basin. This problem occurs when a full aquifer (ground water basin) overflows during a particularly wet season. The rainfall that caused the overflow and also replenished the aquifer is not owned by the storing agency, but rather by the overlying landowner.<sup>70</sup> The overflow represents a loss that must be allocated. If only one storing agency is involved, the storing agency, rather than those holding native ground water rights, normally bears the loss.<sup>71</sup> The problem occurs, however, when more than one agency is storing water in the basin. Allocation of the loss becomes difficult because there have been no storage priorities among agencies under the law.<sup>72</sup>

In the face of no statutory authority and no judicial decisions on point, the Governor's Commission to Review California Water Rights Law has identified important areas in which clarification and legal support is greatly needed in order to provide a basis upon which to develop a comprehensive ground water storage program such as that proposed to supplement the SWP surface water supply.<sup>73</sup> The Com-

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68. In the absence of judicial authority or legislation, the only means by which storage priorities among participants can be established currently is if the parties can agree among themselves.

69. 14 Cal. 3d at 264, 537 P.2d at 1297, 123 Cal. Rptr. at 48.

70. Gleason, *Water Projects Go Underground*, 5 *ECOLOGY L.Q.* 625, 665 (1976).

71. Gleason, *The Legalization of Ground Water Storage*, *AMERICAN WATER RESOURCES ASSOCIATION, WATER RESOURCES BULL.*, Vol. 14, No. 3, at 532 (June 1978).

72. It is noted in *THEORETICAL MODEL*, *supra* note 9, at 60, however, that such a problem of storage priorities would not arise if the San Fernando theoretical program were to become operational at the present time because the San Fernando Basin contains more unused storage capacity than users require so there would be no surplus water that cannot be held in the Basin. The problem of storage priorities does occur, however, in many other ground water basins.

73. Areas so identified are (1) strong state policy of ground water resources protection; (2) need for flexibility; (3) local control of ground water transfers; and (4) changes in procedures of



mission has drafted proposed legislation which, if enacted, would provide a statutory framework for such a conjunctive use program.<sup>74</sup> An analysis of the Commission's proposals will now be undertaken.

### PROPOSED REMEDIES

The statutory framework proposed by the Governor's Commission would greatly facilitate the local entities as well as the State in their implementation of conjunctive use programs by: (1) addressing the important problem of storage priorities; (2) providing for the designation of ground water management areas in which there would be a single management authority which could contract with the Department of Water Resources or any other agency in the establishment of a ground water storage program;<sup>75</sup> and (3) expressing a legislative policy that conjunctive use be encouraged and that the right to store water underground and later recapture an equal amount be recognized.<sup>76</sup>

#### *A. Storage Priorities in Ground Water Basins*

Present law does not allocate storage rights among agencies concurrently storing water in a basin. The Commission's draft recommendations would provide a mechanism for allocating available storage capacity among agencies as well as the priorities that local ground water management authorities would apply in allocating that capacity.

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adjudication. GOVERNOR'S COMMISSION TO REVIEW CALIFORNIA WATER RIGHTS LAW, FINAL REPORT at 165-69 (Dec. 1978) [hereinafter cited as FINAL REPORT].

74. *Id.* at 170-250. SB 47, 1979-80 Regular Session, *as amended*, February 9, 1979, essentially incorporates this proposed legislation. AB 442, 1979-80 Regular Session, *as amended* June 28, 1979, includes provisions for ground water management which are along the same lines as the Commission's proposed legislation.

75. FINAL REPORT, *supra* note 73, at 179-88. Pursuant to legislation enacted in 1978 (California Water Code Section 12924), the Department of Water Resources is investigating ground water basins and identifying basins on the basis of geological and hydrological conditions and considerations of political boundary lines. Under this legislation, the Department is required to report its findings to the legislature by January 1, 1980. Under the Commission's proposed legislation the Department would also establish ground water management area boundaries in that report, which would be subject to disapproval by the legislature. *Id.* at 179-81. The proposed legislation provides for an "inactive classification" for these management areas which are exempt from designating a ground water management authority. *Id.* at 181-83. Other areas would be required to designate an authority which would be responsible for carrying out specified ground water management programs. These authorities would have broad power to manage the basin, including the authority to levy a pump tax, *id.* at 208, 216-20, and to provide for conjunctive use of ground and surface waters. *Id.* at 208, 231-36.

The authorities would be responsible for adopting management programs which conform to the policies stated in the legislation and regulations adopted by the Board. *Id.* at 188-91. At least every two years each authority would prepare a report detailing its performance. Each authority's performance would then be evaluated by the Board in light of the legislative policy and the management objectives as stated in that program. If a program or performance of a program is found to be inadequate, the Board may request the Attorney General to file an action to adjudicate the rights to extract water from the basin, including the appointment of a watermaster to manage the area, or to obtain other relief. *Id.* at 188-93.

76. *Id.* at 231-36. The proposal also recognizes the different methods by which water may be stored in a ground water basin. *Id.* at 231-32.

First, the Commission proposes that the ground water management authority “have the power to determine the amount of ground water basin storage space within the area . . . .”<sup>77</sup> The Commission further proposes that “all ground water storage by a person, other than the ground water management authority in the area, shall be conducted pursuant to a ground water storage agreement between that person and the ground water management authority . . . .”<sup>78</sup> Currently, in many areas there is a lack of local expertise and familiarity with the basin to manage the resource. Without this expertise it is difficult to make a determination of space availability. Even if there is a local entity with sufficient expertise to make such a determination, that entity does not have clear legal authority to allocate agreed-upon available storage space. In developing programs to test the feasibility of ground water storage as part of the SWP, the State has been dealing with its water supply contractors as the local management entity.

Second, the Commission proposes the priorities for storage space that ground water management authorities will have to apply. The proposed legislation states:

In allocating the use of ground water basin storage space, the ground water management authority shall give priority to the reasonable water supply needs of the area overlying the basin and the area historically supplied by the basin’s water supply and to replenishment of the basin pursuant to a management program. Any remaining ground water basin storage space shall be available for the use and benefit of other users outside of the ground water management area.<sup>79</sup>

This recommendation, giving priority to the reasonable needs of the area, is not surprising given prevalent attitudes toward ground water and its uses.<sup>80</sup>

If this proposal were enacted, the local management authority, to allocate storage space, would have to determine what constitutes the “reasonable water supply needs of the area overlying the basin and the area historically supplied by the basin’s water supply . . . .” (emphasis added).<sup>81</sup> This determination would be made, presumably, on a case-by-case basis, upon each application to enter into a ground water storage agreement.

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77. *Id.* at 231.

78. *Id.* at 233. For a good discussion of the various alternatives in allocating storage rights, see Thorson, *supra* note 67, at 621-24.

79. FINAL REPORT, *supra* note 73, at 233.

80. *See City of Pasadena v. City of Alameda*, 33 Cal. 2d 908, 925-26, 207 P.2d 17, 23 (1949), *cert. denied*, 399 U.S. 937 (1950); *Katz v. Walkinshaw*, 141 Cal. 116, 134-36, 74 P. 766, 771-72 (1903).

81. FINAL REPORT, *supra* note 73, at 233.

An SWP ground water storage program may be given a high priority under the Commission's recommendation if the stored water is to be used to satisfy the needs of the area overlying the basin. If under the program the water was stored in the management area where it would ultimately be used, as in the theoretical model of the San Fernando Basin,<sup>82</sup> the water would be entitled to the first priority. While the water was in storage, it would raise the water level and reduce the costs of pumping from the basin.

In contrast, water temporarily stored in a basin for recapture and conveyance to another management area would not be allocated storage space on a first priority. This water would be given a lower priority since ultimately it would not be used in the area overlying the basin, though while in storage it would raise the water level and lower the pumping costs of management area pumpers.

The ground water management authority's allocation of storage space would carry with it the concomitant allocation of losses.<sup>83</sup> A person with a lower priority use of storage space would carry a greater potential for sustaining any losses. The draft provisions do not indicate whether all those in the same priority would share equally the losses allocated to that priority or whether losses would be assigned on a first (or last) in time basis within the priority. The former allocation is probably more equitable, however, given the cyclic nature of ground water storage. Thus, the Commission's proposals do provide a mechanism for allocating available storage capacity among agencies as well as the priorities that local ground water management authorities would apply in allocating that capacity.

### *B. Procedures for Ground Water Storage Agreements*

The Commission's draft recommendations contemplate the use of "ground water storage agreements" to implement conjunctive use programs.<sup>84</sup> As stated earlier, the recommendations would require that all storage be conducted under such an agreement with the management authority.<sup>85</sup> In order to facilitate the use of these agreements, the Commission recommended the following provision:

If, upon application by any person to enter into a ground water storage agreement for the benefit of users inside or outside of the ground water management area, the ground water management authority fails to enter into a ground water storage agreement within six

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82. See note 88 *infra*.

83. See also Thorson, *supra* note 67, at 625-32.

84. FINAL REPORT, *supra* note 73, at 233-35.

85. *Id.* at 233.

months of receipt of the application, the ground water management authority's inaction shall be subject to judicial review pursuant to Section 1094.5 of the Code of Civil Procedure. The court shall have the power to order the ground water management authority to enter into a fair and equitable ground water storage agreement, subject to appropriate terms and conditions, in accordance with the provisions of this part, unless it finds that the authority's inaction is based on substantial evidence that inadequate storage space is available to meet the reasonable water needs given priority pursuant to Section 16511, or that the agreement would unreasonably impair water supplies of the ground water management area.<sup>86</sup>

This provision is desirable from the standpoint of the Department, which is interested in entering into such agreements. The Department has encountered some reluctance on the part of local water management entities to deal expeditiously with ground water storage negotiations. Such a provision provides an incentive to the management authority to act, one way or the other, on an application to enter into an agreement. It also gives the applicant a redress if a satisfactory solution is not reached.<sup>87</sup>

As stated before, judicial decision and statutory authority are silent on the issue of ground water storage priorities. Until this issue is resolved, conflicts among storing entities can surely be anticipated. This article has suggested that the Governor's Commission proposed legislation adequately addresses and resolves the gap left in the law of ground water management. With the adoption of such legislation, California can go forward in fully implementing its conjunctive use program. To test the feasibility of implementing such a program, the San Bernardino Demonstration Project was conceived.

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86. *Id.* at 234-35.

87. The Department's water management program for the year 2000 (as presented in DELTA WATER FACILITIES, *supra* note 23, and incorporated into SB 346, 1977-78 Regular Session) is to provide authorization for additional water storage and transportation facilities to more fully meet existing SWP and Federal Central Valley Project contractual obligations to the year 2000 and relieve part of the ground water overdraft on the San Joaquin Valley. SB 346, 1977-78 REGULAR SESSION, at §11256(f). SB 200, 1979-80 REGULAR SESSION, also contains such a provision at Section 11255(f).

The Department's program, as incorporated in SB 200, would establish the policy of partially meeting the water needs of the State Water Resources Development System by storing water underground during wet years for withdrawal in dry years. The bills would authorize, among other facilities:

facilities determined feasible by the Department for utilizing ground water storage space for the purpose of providing yield for the State Water Resources Development System in conjunction with existing and future surface water supplies, by the recharge and extraction of ground water and including the capitalized cost of delivering water for filling or refilling ground water storage space in one or more of the following locations:

- (1) The south San Francisco Bay area . . .
- (2) San Joaquin Valley . . .
- (3) Southern California . . . .

*Id.* at §11256(f).

### SAN BERNARDINO GROUND WATER DEMONSTRATION PROJECT

Although ground water storage has been a goal of the Department of Water Resources for several years and the prototype studies in the San Fernando Basin for the theoretical model have been under way for some time, the opportunity came in 1978 to test the principles developed in the theoretical model in a demonstration project.

On July 7, pursuant to an agreement between the Department of Water Resources and the San Bernardino Valley Municipal Water District, a demonstration ground water storage program was put into operation. Under the agreement, unused ground water basin storage capacity within the District's boundaries<sup>88</sup> can be used for storage of up to 50,000 acre-feet of SWP water for later delivery to the District. Such capacity will thus serve as a temporary SWP conservation facility. The State began releasing SWP water from the California Aqueduct at the Devil Canyon-Castaic Afterbay<sup>89</sup> on July 7 with up to a total of 5,000 acre-feet in 1978 and up to 10,000 acre-feet in subsequent years. This water is placed in recharge basins owned and operated by the San Bernardino County Flood Control District. At the present time, the District is primarily utilizing the direct storage method. For each acre-foot the District later recaptures according to the schedule in the State-District contract, it has agreed to pay the State as if the recaptured water were delivered from the California Aqueduct in that year. The capital cost of any additional construction required to implement the program is included in the District's payments to the Department of Water Resources.

Under the basic agreement, the State is liable for any damage that may result only up to the point of release of the water from the Aqueduct to the District. Thereafter, the District becomes liable for any damage that may result from the District's storage, recapture, and delivery activities. This is the standard delegation of liability which is also found in all of the 31 water supply contracts.

At this time, no contracts have been signed to store State water in the San Fernando Basin despite the fact that negotiations have been proceeding for several years. However, negotiations are proceeding on contracts for storage of State water in other basins based on information that has been developed from the San Fernando negotiations. The San Bernardino Demonstration Project is the first truly conjunctive use

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88. The San Bernardino Valley Municipal Water District lies approximately 60 miles south-east of the City of Los Angeles, and includes the City of San Bernardino. The District is composed of approximately 210,000 square acres and supplies water to the 310,000 people within its boundaries.

89. The Devil Canyon-Castaic Afterbay is located approximately eight miles due north of the City of San Bernardino.

program that the State has put into operation. It is known that physically the operation is feasible; the main purpose of this project is to prove that it also works institutionally.

It is the hope of the Department that this type of operation will be utilized all over the Southern California area and in the San Joaquin Valley. Eventually a comprehensive ground water storage program integrated into the SWP surface supplies and facilities may involve enlargement of the East Branch Aqueduct.<sup>90</sup> By the year 2000, it is anticipated that SWP water will be stored in Southern California and South San Joaquin Valley ground water basins through agreements similar to those of the San Bernardino Demonstration Project. This Department of Water Resources program<sup>91</sup> will provide an additional yield to the SWP of 400,000 acre-feet annually.<sup>92</sup> Such storage will be necessary to accommodate the demands of the future.

As stated above, information developed from the Project has aided the negotiating process on contracts for storage involving other ground water basins. The San Bernardino Demonstration Project has proven to be a successful, operational program. It is hoped that the Project will serve as a successful model to California and other western states of how a ground water storage program can work in conjunction with surface facilities.

#### CONCLUSION

To enable the California State Water Project to meet its existing water supply obligations, ground water storage of Project water should be used in conjunction with existing Project surface storage facilities. Escalating costs of surface water storage facilities, continued reliance on ground water, environmental considerations, and recent legal decisions regarding ground water rights have provided new economic and practical incentives for such conjunctive use.

The Department of Water Resources has sufficient existing statutory authorization to implement such a conjunctive use program. The Governor's Commission to Review California Water Rights Law, however, has drafted proposed legislation which would further assist the Department of Water Resources and local entities in the implementation of

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90. See Appendix I.

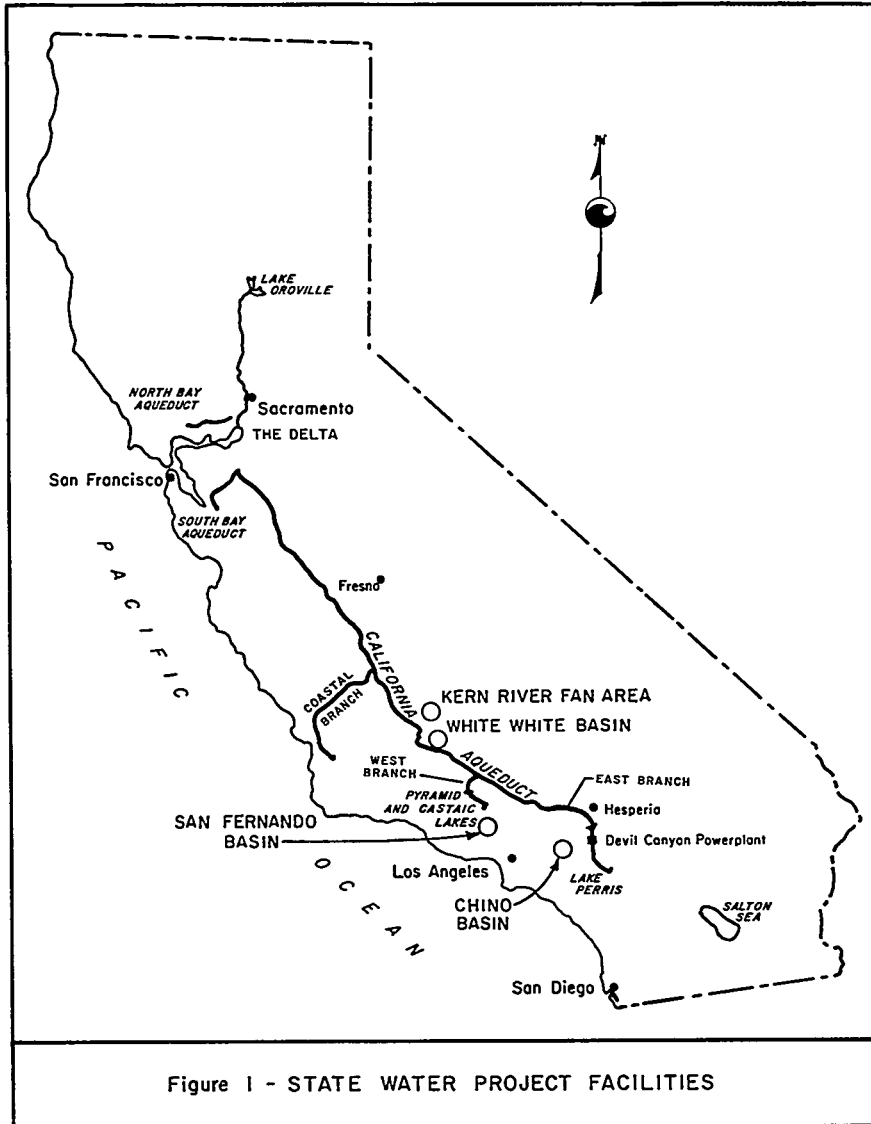
91. For additional details on the San Bernardino Demonstration Project, see CAL. DEP'T OF WATER RESOURCES, CAL. STATE WATER RESOURCES BULL. NO. 132-78, THE CALIFORNIA STATE WATER PROJECT—1977 ACTIVITIES AND FUTURE MANAGEMENT PLANS (Oct. 1978).

92. To put this amount in perspective, it can be compared with the 318,000 acre-foot anticipated annual yield of the giant Auburn Dam, which will be one of the five largest dams in California.

comprehensive management of California's ground water resources in conjunction with surface water storage facilities.

The vital need for thoughtful planning and actual trial implementation, such as is discussed in this article, is unquestionable. California has for years utilized the world's most advanced technology in its studies of ground water basins. Now, careful, imaginative, and innovative ground water management will lead to optimum use of the State's existing resources.

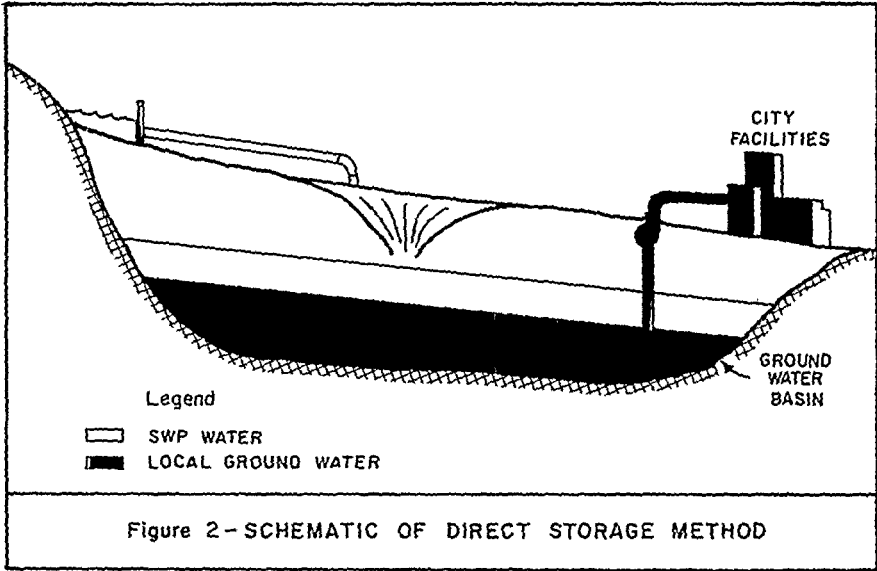
Appendix I



DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1978



Appendix II



Appendix III

