SANTA BARBARA COUNTY STATE WATER PROJECT ALTERNATIVES

Department of Water Resources
Southern District
in cooperation with
Santa Barbara County Flood Control
and Water Conservation District

APRIL 1985

GEORGE DEUKMEJIAN, Governor
STATE OF CALIFORNIA

GORDON K. VAN VLECK, Secretary
THE RESOURCES AGENCY

DAVID N. KENNEDY, Director
DEPARTMENT OF WATER RESOURCES

Santa Barbara County
State Water Project Alternatives

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FOREWORD

Through the years, Californians have recognized the need for maintaining a long-range perspective on the problems of keeping their water requirements and supplies in balance. In 1957, the Department of Water Resources released Bulletin 3, "The California Water Plan", as "a master plan to guide and coordinate the planning and construction by all agencies of works required for the control, protection, conservation, and distribution of California's water resources ....."

As part of its effort to update that plan, the Department in May 1981 released the report "Water Action Plan for the San Luis Obispo - Santa Barbara Counties Area". It contained information on existing and future water demands and existing and potential water supply sources, including conservation and water reclamation, and pointed out major problems and issues.

The purpose of the study described in this report is to provide the Santa Barbara County Flood Control and Water Conservation District with an analysis of local project options as alternatives to the County's direct use of State Water Project water, delivered via the Coastal Branch of the California Aqueduct. In this report, estimates of existing and future deficiencies are updated and potential sources of supplemental water are analyzed from economic, financial, and environmental standpoints. The most promising options, selected local projects supplemented by various Coastal Branch sizes, are analyzed in detail and grouped into various alternatives that are capable of providing the District with an amount of water equal to its entitlement from the State Water Project.

During the time that the Santa Barbara County State Water Project Alternatives study has been under way, the Department has become aware of increased financial stresses on State Water Project water users, which have resulted in increased emphasis on obtaining future water supplies at lower costs. The financial evaluation used in this report assumes that the other State Water Project contractors are willing and able to accept the repayment obligations resulting from the assumed level of State funding for the various local projects. Future discussions will be needed with the contractors to test this assumption.

From this analysis, local water agencies will be able to make informed decisions regarding the alternatives that best serve their mutual interests and needs.

James M. Stubchaer, Manager
Santa Barbara County Flood Control
and Water Conservation District

Jack J. Coe, Chief
Southern District
Department of Water
Resources

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State of California
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STUDY COMMITTEES AND ACKNOWLEDGMENTS

A Management Committee and a Technical Committee were formed at the beginning of the study to provide direction in the planning and to give technical assistance during the conduct of the study.

The management committee was made up of four members: two from the Department of Water Resources and two from the Santa Barbara County Flood Control and Water Conservation District and Santa Barbara County Water Agency. The Technical Committee was composed of representatives from the various water districts and cities in Santa Barbara County and Vandenberg Air Force Base. In addition to the two committees, Carlos Madrid of the Department of Water Resources managed and coordinated the study activities between the Department and the District and reported on the results of the study. Special acknowledgment is made of the efforts of James U. McDaniel (then Chief of the Statewide Planning Branch in the Department's Sacramento Office) and Richard E. Angelos (then Chief of the Water Projects Branch), who were instrumental in initial efforts to plan and scope this cooperative study.

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Division of Planning
Department of Water Resources

Carlos Madrid**
Water Projects Branch
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Engineering and Contracts Branch
Vandenberg Air Force Base

*Replaced James U. McDaniel in December 1983.
**Replaced Richard E. Angelos in March 1984.
***Replaced by Lawrence McPherson in October 1984.

In addition to the valuable assistance and support provided by the two committees, who met monthly throughout the investigation, information and data from the offices of the State Department of Health Services and the County Farm Advisor were particularly helpful and are appreciated. The Division of Design and Construction of the Department of Water Resources also provided valuable assistance in the conduct of the study. A special expression of appreciation is directed to the public-at-large who participated in the three public information meetings and gave generously of their time and knowledge toward shaping the alternatives that were developed.

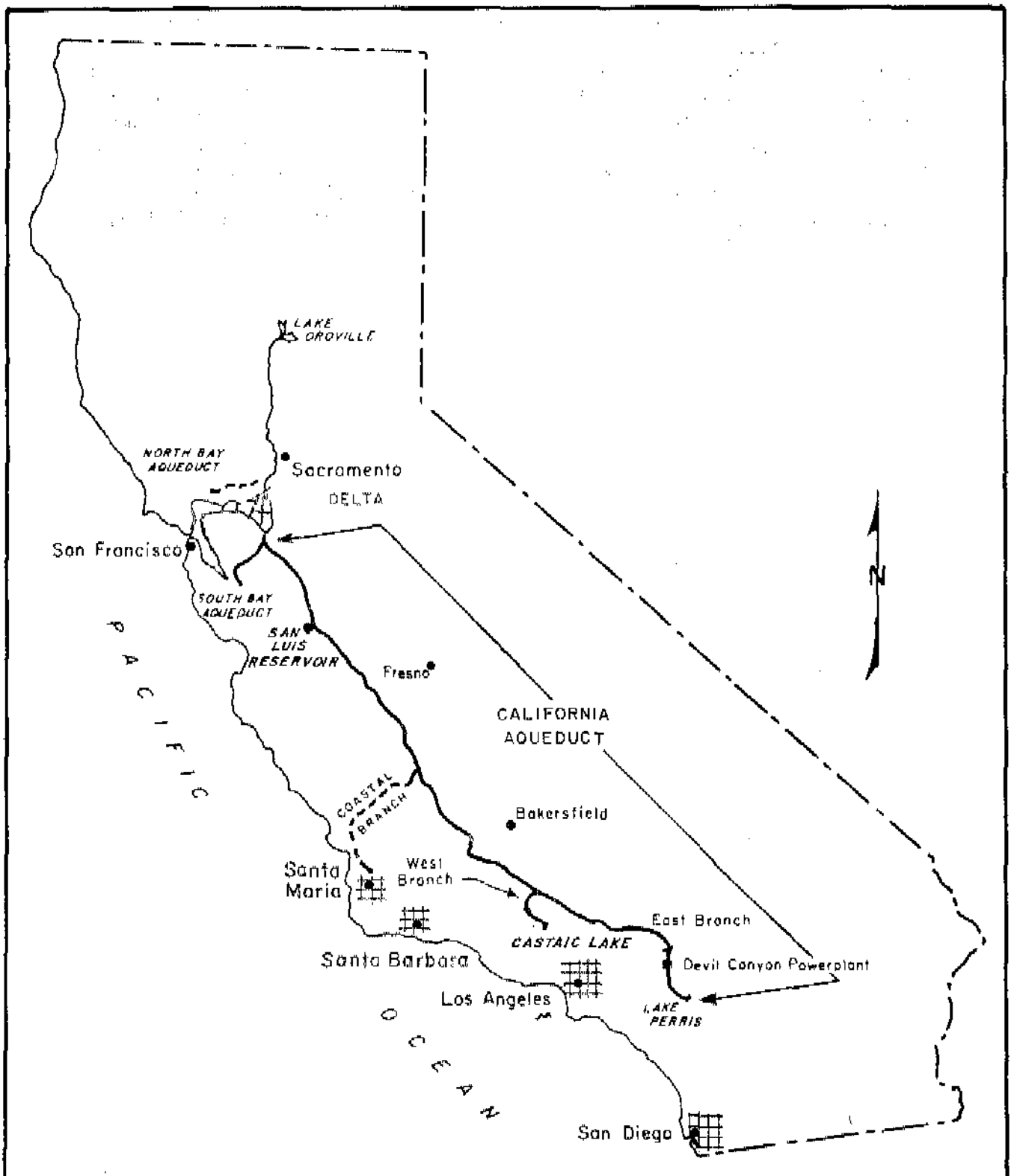

Figure 1 - CALIFORNIA STATE WATER PROJECT (SWP)

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1985

CHAPTER I. INTRODUCTION

The entire water supply for Santa Barbara County comes from its local ground water basins and surface reservoirs; none is imported from outside the County. Therefore, to ensure a continuing supply, annual use of water should not, over the long term, exceed average annual replenishment by rainfall, runoff, and return flows. However, water demand in Santa Barbara County has increased over the years until it now exceeds annual replenishment by more than 65,000 acre-feet. This deficit is projected to continue to grow under the current water use practices.

This is a report on an investigation of possible ways and means to help meet the projected water demands economically. It takes a technical approach toward acquiring a water supply and does not address the political issues that would need to be considered and resolved before a specific water supply plan could be developed.

Background

Large ground water basins can often be utilized at a deficit for years without ill effects on either the water supply or the basin itself, but the Santa Barbara County ground water basins are small and many already show evidence of overpumping. The capacity of the surface reservoirs in Santa Barbara County is also limited. Because planning and development of new water supplies takes years before materializing into water deliveries, the citizens of the County are confronted with the need to make decisions now in order to provide a timely, good quality water supply.

The County's capacity to import State Water Project (SWP) water was first considered in the Department of Water Resources (DWR) 1963 Bulletin 119-21, "Feasibility of Serving Santa Barbara County Flood Control and Water Conservation District from the State Water Project." In that report, it was concluded that Santa Barbara County Flood Control and Water Conservation District (SBCFCWCD) had the economic justification and the financial capability required to enter into a contract with the State of California for the service of water from the planned facilities that would come to be known as the SWP. (See **Figure 1.**)

On the basis of that conclusion, a water supply contract was executed on February 26, 1963, between the State and SBCFCWCD for a maximum annual entitlement of 50,000 acre-feet, with a special provision for an additional 10,000 acre-feet per year (maximum), which SBCFCWCD would furnish to Vandenberg Air Force Base. Shortly thereafter, it was determined that SBCFCWCD would require a maximum annual entitlement of only 57,700 acre-feet per year, with initial deliveries scheduled to begin in 1980. Later, SBCFCWCD requested a reduction in its maximum annual entitlement, and on August 31, 1981, a contract amendment was signed to reduce SBCFCWCD's maximum entitlement to 45,486 acre-feet per year.

To deliver SWP water, the remaining 83 miles of the Coastal Branch of the California Aqueduct, through San Luis Obispo County to Santa Barbara County, would have to be completed. The cost of the Coastal Branch would probably be shared with the San Luis Obispo County Flood Control and Water Conservation District (SLOCFCWCD), which has contracted for 25,000 acre-feet per year of SWP water. However, either district can choose to reduce or decline delivery of SWP water. If one district chooses not to purchase SWP water, the other can request construction of the Coastal Branch sized to meet its needs. However, because of the

effect of economy of scale, the unit cost of water from a downsized pipeline would be greater than that from the full size pipeline shared by the two counties.

Since SBCFCWCD and SLOCFCWCD contracted for the water, escalating costs and a desire by many to limit growth in the counties have given cause for reexamining the advisability of going ahead with the Coastal Branch. Therefore, both SBCFCWCD and SLOCFCWCD have requested and have been granted a number of postponements in beginning construction of the Coastal Branch. The latest delay will permit the districts to reevaluate their water supply needs and study the advantages of developing local water supply projects in conjunction with various sizes of the Coastal Branch.

It will also permit the exploration of funding partially or fully by the State under a concept described in the DWR "Revised Guidelines on Funding Local Water Supply Projects for Inclusion in the State Water Project," dated December 29, 1982, in lieu of delivery of all or part of their SWP entitlements. Under the guidelines, these local projects could be funded to the extent that they make possible the elimination or reduction of the proposed Coastal Branch and additional SWP conservation (storage) facilities. State participation in local projects will also depend upon the availability of SWP funds.

The water supply developed from local projects under the guidelines cannot exceed the SWP entitlement and would not eliminate the total shortfall in the County water supply anymore than would the 45,486 acre-feet entitlement. Some of the water deficit in the County would be mitigated through conservation in the use of water for both urban and agricultural purposes, but applied water conservation would not significantly affect the water shortage problem.

In an effort to help resolve Santa Barbara County's water supply problems and to provide guidance to DWR in its future plans for the Coastal Branch, DWR and SBCFCWCD entered into a cooperative agreement on January 21, 1983, to equally fund this joint study.

Objective

The objective of this investigation was to assess demand and to formulate alternative plans, on a reconnaissance basis, consisting of combinations of local projects and/or different capacity versions of the SWP Coastal Branch, that would have the potential to deliver 45,486 acre-feet of water annually to SBCFCWCD.

In the study, special consideration was given to projects that would provide the best quality of water. This is to improve the quality of both the water supply and the discharge water which, in turn, would improve the quality of the receiving ground water.

Similar alternative water supply studies are being made for San Luis Obispo County to assist the SLOCFCWCD in its future plans for the Coastal Branch. The selected alternatives and the decisions on the use of SWP water by the two districts will be brought together to help DWR, SBCFCWCD, and SLOCFCWCD in their future plans for the Coastal Branch.

Scope and Conduct

Previous studies, published data, and files of the Santa Barbara County Water Agency, SBCFCWCD, DWR, and other agencies (see listing in Appendix A) were depended upon heavily for information utilized in this reconnaissance study. Where information was out of date or not available, current data were developed by DWR and SBCFCWCD staff members in conjunction with a Technical Committee. Detailed analysis concerning local projects and alternatives investigated in this study, are available at the DWR and SBCFCWCD offices.

The County was divided into five basic subareas, as shown in **Figure 2.** These

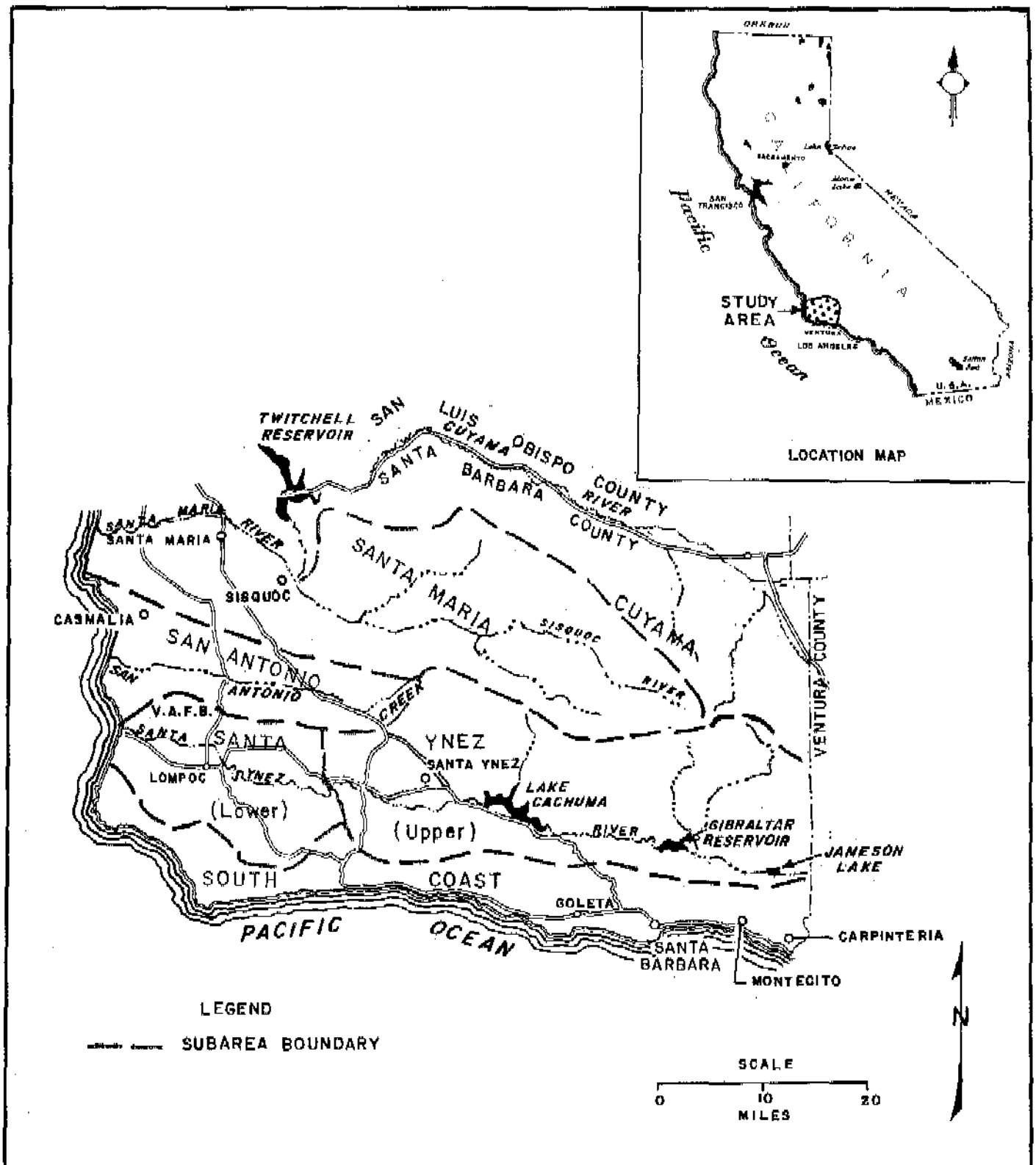

Figure 2 - STUDY AREA AND SUBAREAS

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1985

subareas are similar to those described in DWR's May 1981, Southern District Report "Water Action Plan for the San Luis Obispo-Santa Barbara Counties Area". The subareas are:

1. Cuyama (portion within Santa Barbara County only) - included within the larger Santa Maria-Cuyama Drainage Basin.

2. Santa Maria (within Santa Barbara County only) - included within the larger Santa Maria-Cuyama Drainage Basin.

3. San Antonio.

4. Santa Ynez (lower and upper).

   - Lower is sometimes known as the Lompoc Valley.

   - Upper is sometimes known as the Santa Ynez Valley.

5. South Coast.

The division of the County into subareas facilitated an orderly, systematic approach for defining water demand and supplies and for evaluating the merits of local water supply options. Each water supply option was evaluated for further study according to its economic and engineering feasiblity as a water supply project.

DWR was responsible for managing and coordinating the study, making preliminary designs and cost estimates for the Santa Ynez River dams and other potential projects, and evaluating the merits of the various water supply options. SBCFCWCD contributions included computer programming and using computer time to evaluate and compare various aspects of the projects, such as hydrology and unit cost of the options, estimating costs of various sizes of the SWP Coastal Branch, and doing word processing for the preparation of this report. The Technical Committee, consisting of the managers of major water purveyors within the County, reviewed the report at various stages of its preparation and made valuable comments and suggestions. Private citizens asked questions and made worthwhile suggestions at public meetings, at which the scope and status of the report were discussed.

The water supply options were then grouped into various alternative plans that could provide 45,486 acre-feet per year of SWP water as contracted for by SBCFCWCD. The alternative plans were then evaluated and are presented here to assist the people of the several subareas in making decisions on a plan that could provide future water supplies.

This study did not consider the development of a water supply that would eliminate the total water deficit in all subareas. This was because the primary purpose of the study was to evaluate the alternatives that could deliver to SBCFCWCD its SWP entitlement and thus would be eligible for State financing. These alternatives would provide different levels of benefits and yields in each of the five subareas and, in each case, it was assumed that water development would be limited to the subarea's allocation of SWP entitlement.

Study Area

The study area, shown in Figure 2, consists of Santa Barbara County and does not include the small adjoining areas that are hydrologically connected to subareas in the County. The study area covers 2,700 square miles and is located in the Central Coastal Hydrologic Area.

Santa Barbara County is bordered on the north by San Luis Obispo and Kern Counties, on the east by Ventura County, and on the south and west by the Pacific Ocean. The County is traversed by mountain ranges that separate it into the four fairly distinct drainage areas that were used in this investigation as study subareas, with the division of the Santa Maria-Cuyama drainage basin into the Cuyama and Santa Maria Subareas. (See Figure 2.) Mountain ranges include the Sierra Madre, which parallels the northern border of the County; the San Rafael, which traverses southeast to northwest through the center of the

County; and the Santa Ynez, which parallels the South Coast. Located in the northeastern mountainous region is the Los Padres National Forest.

There are four major drainage systems in Santa Barbara County. On the north is the Santa Maria-Cuyama watershed, which includes the Cuyama and Sisquoc Rivers; these join to become the Santa Maria River. The Santa Ynez River is the major stream in the central County, and its watershed extends from Ventura County on the east to the Pacific Ocean on the west. Between the western parts of the Santa Ynez and Santa Maria-Cuyama watersheds is the smaller San Antonio watershed. The area between the crest of the Santa Ynez Mountains and the ocean is composed of a number of small watersheds drained by steep intermittent streams and is known as the Santa Barbara watershed.

The climate is predominantly Mediterranean. Temperature patterns vary throughout the County. Average maximum temperature in July can range from the 60s along the coast to the 90s inland. Average precipitation is about 18 inches per year; however, it will range from less than 10 inches in the Cuyama Valley to more than 30 inches in the mountainous areas. Nearly 90 percent of the precipitation falls from November through April.

Santa Barbara, Santa Maria, and Lompoc are the largest of the five cities located in the County. They account for nearly 50 percent of the County's estimated January 1984 (by the California State Department of Finance) population of 320,400. Carpinteria and Guadalupe are the other cities. Much of the population lives in the unincorporated areas of Montecito, Goleta, Santa Ynez, Los Olivos, Solvang, Buellton, Mission Hills, Vandenberg Village, Vandenberg Air Force Base (VAFB), Los Alamos, Orcutt, Garey, Sisquoc, and New Cuyama.

Agriculture in the Cuyama, Santa Maria, San Antonio, Lompoc, and Santa Ynez Valleys and the South Coast is an important element of the County's basic economy. Military and space activities at VAFB, the University of California at Santa Barbara, research, light manufacturing, government, construction, and tourism are other major sources of the area's income.

Abbreviations Used in Report

AF - Acre-foot or acre-feet

AFB - Air Force Base

AFY and AF/YR - Acre-feet per year

CRWQCB - California Regional Water Quality Control Board

CU - Conjunctive Use

DWR - Department of Water Resources

EIR - Environmental Impact Report

gpm - Gallons per minute

gpcd - Gallons per capita per day

ICDS - Intra-County Distribution System

kWh - kilowatthours

MFL - Million fibers per litre

MGD - Million gallons per day

M&I - Municipal and Industrial

mg/L - Milligrams per litre

O&M - Operations and Maintenance

SBCFCWCD - Santa Barbara County Flood Control and Water Conservation District

SLOCFCWCD - San Luis Obispo County Flood Control and Water Conservation District

SW - State Water

SWP - State Water Project

SWRCB - State Water Resources Control Board

SYRWCD - Santa Ynez River Water Conservation District

TDS - Total dissolved solids

TH - Total hardness

THMs - Trihalomethanes

USBR - United States Bureau of Reclamation

VAFB - Vandenberg Air Force Base

Definitions of Terms Used in Report

ACRE-FOOT - The quantity of water required to cover one acre to a depth of one foot; equal to 43,560 cubic feet, or 325,851 gallons.

APPLIED WATER DEMAND - The quantity of water that would be delivered for urban or agricultural applications if no conservation measures were in place.

ARTIFICIAL RECHARGE - The addition of water to a ground water reservoir by human activity, such as irrigation or induced infiltration from streams, wells, or recharge basins. See also GROUND WATER RECHARGE, RECHARGE BASIN.

BRACKISH WATER - Water containing dissolved minerals in amounts that exceed normally acceptable standards for municipal, domestic, and irrigation uses. Considerably less saline than sea water.

CONJUNCTIVE USE - The operation of a ground water basin in coordination with a surface water storage and conveyance system. The purpose is to recharge the basin during years of above-average water supply to provide storage that can be withdrawn during drier years when surface water supplies are below normal.

CONSERVATION - As used in this report, urban water conservation includes reductions realized from voluntary, more efficient, water use practices promoted through public education and from State-mandated requirements to install water-conserving fixtures in newly constructed and renovated buildings. Agricultural water conservation, as used in this report, means reducing the amount of water applied in irrigation through measures that increase irrigation efficiency. See NET WATER CONSERVATION.

CRITICAL DRY PERIOD - A series of water-deficient years, usually an historical period, in which a full reservoir storage system at the beginning is drawn down (without any spill) to minimum storage at the end.

CRITICAL DRY YEAR - A dry year in which the full commitments for a dependable water supply cannot be met and deficiencies are imposed on water deliveries.

DESALTING - A process that converts sea water or brackish water to fresh water or an otherwise more usable condition through removal of dissolved solids. Also called "desalination".

FIRM YIELD - The maximum annual supply of a given water development that is expected to be available on demand, with the understanding that lower yields will occur in accordance with a predetermined schedule or probability.

GROUND WATER - Water that occurs beneath the land surface and completely fills all pore spaces of the alluvium or rock formation in which it is located.

GROUND WATER BASIN - A ground water reservoir, together with all the overlying land surface and underlying aquifers that contribute water to the reservoir.

GROUND WATER MINING - The withdrawal of water from an aquifer greatly in excess of replenishment; if continued, the underground supply will eventually be exhausted or the water table will drop below economically feasible pumping lifts.

GROUND WATER OVERDRAFT - The condition of a ground water basin in which the amount of water withdrawn by pumping exceeds the amount of water that replenishes the basin over a period of years.

GROUND WATER RECHARGE - Increases in ground water by natural conditions or by human activity. See also ARTIFICIAL RECHARGE.

GROUND WATER STORAGE CAPACITY - The space contained in a given volume of deposits. Under optimum use conditions, the usable ground water storage capacity is the volume of water that can, within specified economic limitations, be alternately extracted and replaced in the reservoir.

GROUND WATER TABLE - The upper surface of the zone of saturation (all pores of subsoil filled with water), except where the surface is formed by an impermeable body.

MILLIGRAMS PER LITRE - The weight in milligrams of any substance dissolved in one litre of liquid. Nearly the same as parts per million. Abbreviation: mg/L.

NET WATER CONSERVATION - The difference between the amount of applied water conserved and the amount by which this conservation reduces usable return flows.

NET WATER DEMAND - The applied water demand less water saved through conservation efforts (= net applied water = actual water used).

PERCOLATION - The downward movement of water through the soil or alluvium to the ground water table.

RECHARGE BASIN - A surface facility, often a large pond, used to increase the infiltration of water into a ground water basin.

RECLAIMED WATER - Urban waste water that becomes suitable for a specific beneficial use as a result of treatment.

RETURN FLOW - The portion of withdrawn water that is not consumed by evapotranspiration and returns instead to its source or to another body of water.

REUSE - The additional use of once-used water.

SAFE YIELD (GROUND WATER) - The maximum quantity of water that can be withdrawn from a ground water basin over a long period of time without developing a condition of overdraft. Sometimes referred to as sustained yield.

SALINITY - Generally, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids), electrical conductivity, or osmotic pressure. Where sea water is known to be the major source of salt, salinity is often used to refer to the concentration of chlorides in the water. See also TOTAL DISSOLVED SOLIDS.

SEA WATER INTRUSION - The movement of salt water into a body of fresh water. It can occur in either surface water or ground water bodies.

TOTAL DISSOLVED SOLIDS - A quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per litre. Abbreviation: TDS. See also SALINITY.

WATER RECLAMATION - The treatment of water of impaired quality, including brackish water and sea water, to produce a water suitable for the intended use.

WATER RIGHT - A legally protected right to take possession of water in a water supply and to divert that water for beneficial use.

CHAPTER II. SUMMARY OF FINDINGS AND CONCLUSIONS

Summary Of Findings

Among the salient points that came from the information developed in this and previous studies are the following:

1. The population in Santa Barbara County is projected to increase from 299,000 in 1980 to 368,000 by 2010; irrigated agricultural land is projected to increase from 94,000 acres in 1980 to 101,000 acres in 2010.

2. Assuming that present trends prevail, the projected annual applied urban water demand after conservation would rise from 71,000 to 79,000 acre-feet per year (AFY) between 1980 and 2010, while applied annual agriculture demand after conservation would drop slightly from 213,000 AFY in 1980 to 205,000 AFY in year 2010. Therefore, total water demand after conservation would remain constant at about 284,000 AFY between 1980 and 2010. The 1980 demand and supply for each subarea and for the whole county are displayed in Figure 3.

3. The estimated dependable supplies of the County (surface water, tunnel infiltration, ground water, and reclaimed water), after taking into account effects of conservation on return flows,

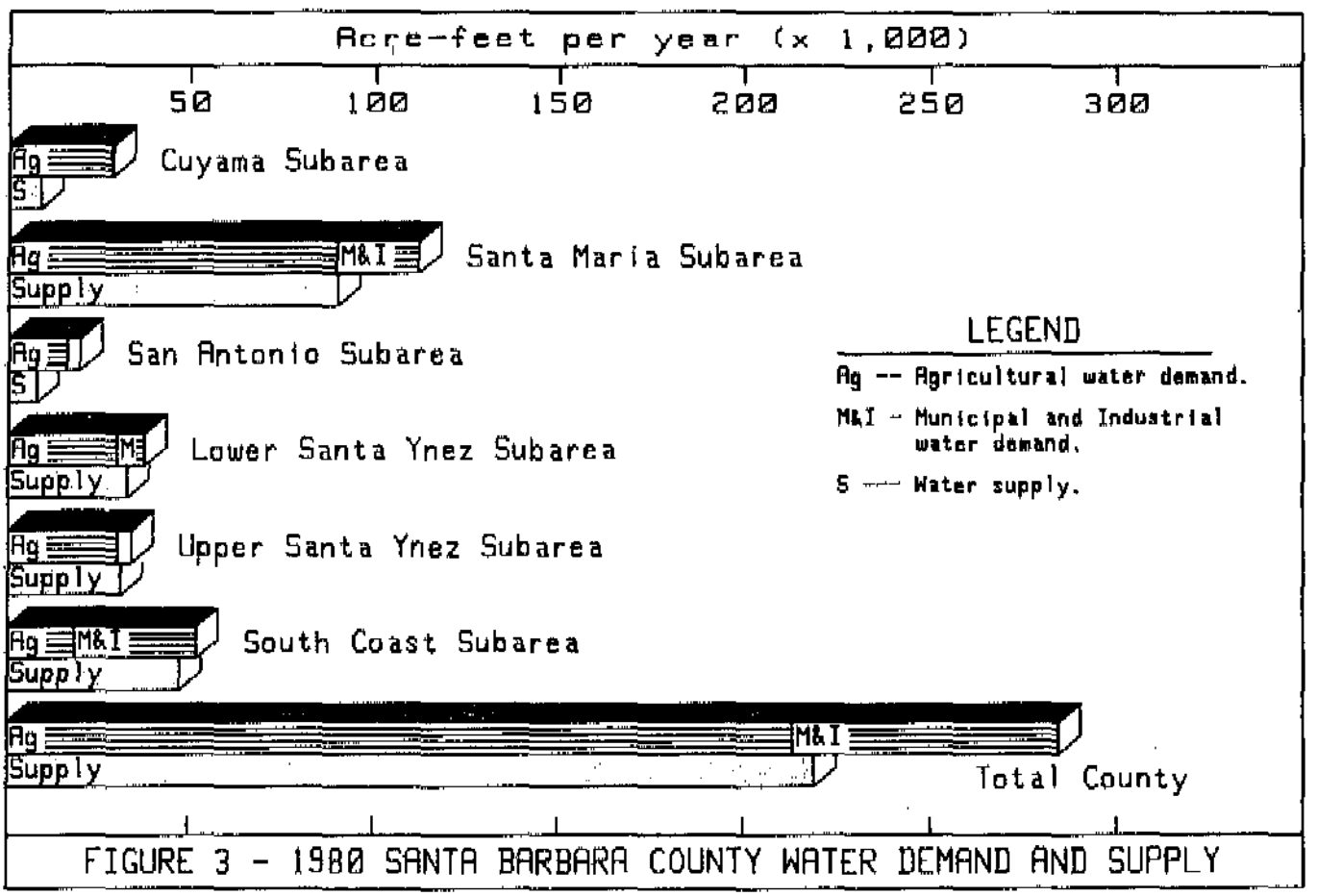

FIGURE 3 - 1980 SANTA BARBARA COUNTY WATER DEMAND AND SUPPLY

would drop from 219,000 AFY in 1980 to 216,000 AFY in 2010.

4. Thus the Countywide dependable water supply, which was 65,000 AFY short of meeting the total 1980 net water demand*, will be 68,000 AFY short of meeting the projected total net water demand in 2010. The 1980 shortage of 65,000 AFY was made up of the following shortages:

   Cuyama Subarea 20,000 AFY; Santa Maria Subarea 22,000 AFY; San Antonio Subarea 12,000 AFY; Santa Ynez Subarea 7,000 AFY; and South Coast Subarea 4,000 AFY.

5. The difference between demand and dependable supply is being met by long-term overdraft of the ground water basins and, to a much lesser extent, by use of excess water accumulated in surface reservoirs during wet years. Long-term overdraft of the ground water basins has caused ground water level declines and gradual water quality degradation in many parts of the County, especially in the Cuyama, Santa Maria, and lower Santa Ynez Subareas.

6. All new water supplies identified to date are much more expensive than present supplies.

7. To meet the anticipated future shortage, the SBCFCWCD, on February 26, 1963, contracted for SWP water. On August 31, 1981, the initial contract for 57,700 AFY of entitlement was reduced to 45,486 AFY. All this entitlement is assumed to be for municipal and industrial uses and not for agricultural use. However, agricultural water users would benefit indirectly from any development of an additional supply.

8. Completion of the SWP's Coastal Branch would provide the facilities to deliver the SWP water to Santa Barbara County, as well as to San Luis Obispo County. However, both counties have requested and have been granted delays in beginning construction of the Coastal Branch.

9. As outlined in the "Revised Guidelines on Funding Local Water Supply Projects for Inclusion in the State Water Project", December 29, 1982, SWP funds and energy might be available for at least partial funding and power requirements of local supply projects. Specific engineering, economic, financial, environmental (including water quality), and institutional criteria would have to be met. The water supplied by the local projects would be delivered in lieu of SWP water from the Delta through the California Aqueduct and the Coastal Branch. Also, SWP funds would have to be available for such a program. Local projects could be used to supply the entire SWP entitlement to water or only a portion of the SWP entitlement, and the remainder could be supplied via a downsized Coastal Branch. It should be noted that further evaluation of the guidelines will continue, along with the examination of methods of financing future SWP features, which include local projects, because of the present uncertainties regarding SWP funds.

10. The following **local projects**, by subarea, have been selected as the most practical potential water supply options which could develop water within Santa Barbara County. While the listed local projects have potential within various subareas, some may not be economically feasible or competitive with imported water. Some also have water quality problems and potential for causing significantly adverse environmental impacts.

    Cuyama Subarea

    Santa Barbara Canyon Reservoir

    Santa Maria Subarea

    Round Corral Reservoir

* Equal to applied water use less effects of water conservation efforts.

Desalination of sea water

San Antonio Subarea

None

Santa Ynez Subarea (upper and lower)

Cachuma Reservoir (existing) plus conjunctive use *

Cachuma Dam enlargement (27-, 33-, or 42-foot increase in water surface elevation) plus conjunctive use. *

New Gibraltar Reservoir plus conjunctive use. *

Santa Ynez Subarea (lower only)

Salsipuedes Reservoir

Desalination of sea water

South Coast Subarea

Cachuma Reservoir (existing) plus conjunctive use.**

Cachuma Reservoir enlargement (27-, 33-, or 42-foot increase in water surface elevation) plus conjunctive use.**

New Gibraltar Reservoir plus conjunctive use.**

Goleta water reuse

Santa Barbara City regional water reuse

Desalination of sea water

11. Combinations (referred to as alternatives) of these local water supply options, with or without a downsized Coastal Branch, could be developed to deliver SBCFCWCD's 45,486 AFY of SWP entitlement in accordance with the SWP contract and DWR policy.

12. The four water supply alternatives that were found to be the least costly are Alternatives 11, 12, 13, and 16, which are described in **Table 1.** For comparison, Alternatives 14, which develops Gibraltar plus conjunctive use, and 15, which delivers SWP water, are also described.

13. Determination of the least cost alternatives was based on April 1984 United States Bureau of Reclamation (USBR) Construction Cost Indices and economic, financial, and repayment considerations and formed a basis for comparison of alternatives. Considerable effort was expended in developing the best cost data based on past studies and some new evaluations, such as those done by DWR (local projects on the upper Santa Ynez River system, desalination of sea water, and water reuse project at Goleta) and SBCFCWCD (Branch Canyon, Santa Barbara Canyon, and San Antonio Creek Reservoirs). The actual costs, methods of financing and repayment, and allocation of costs will be the subject of further discussions among SWP water supply contractors, SBCFCWCD, its member agencies, SLOCFCWCD, and DWR, as specific projects, or options, are identified.

14. In addition to the options included in the alternatives in **Table 1,** water conservation, watershed management, and weather modification programs were considered important.

15. Before any of the alternatives or their components can be implemented, SBCFCWCD must inform DWR as to its preferred alternative or other water supply option and DWR must determine its feasibility based on engineering, economic, financial, legal (local water

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* Delivery of Santa Ynez River water from a reservoir in the upper watershed to the lower Santa Ynez Subarea would require a pipeline from Cachuma Reservoir to Lompoc.

**Water development shared between Santa Ynez and South Coast Subareas.

TABLE 1

MOST PROMISING WATER SUPPLY ALTERNATIVES TO MEET SANTA BARBARA COUNTY WATER ENTITLEMENTS FROM THE STATE WATER PROJECT

(Unit Cost in $/AF; Annual Cost in $/Yr)

SUBAREA (SWP Entitlement) / Water supply option	Alt.#11, SW to Cu,SMV,SA, & LSY; All else Local			Alt.#12, SW to Cu,SMV,SA, & LSY; All else Local			Alt.#13, SW to Cu,SMV,SA, & LSY; All else Local			Alt.#14, SW to Cu,SMV,SA, & LSY; All else Local			Alt. #15, SW to All Participating Purveyors			Alt.#16, SW to Cu,SMV,SA, & VAFB; All else Local		
	Amount AFY	Unit cost	Annual cost	Amount AFY	Unit cost	Annual cost	Amount AFY	Unit cost	Annual cost	Amount AFY	Unit cost	Annual cost	Amount AFY	Unit cost	Annual cost	Amount AFY	Unit cost	Annual cost
CUYAMA (1,600)																		
Santa Barbara Canyon Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Water Project	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
Totals	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
SANTA MARIA (16,850)																		
Round Corral Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Water Project	16850	462	7784700	16850	462	7784700	16850	475	8003750	16850	462	7784700	16850	430	7245500	16850	485	8172250
Totals	16850	462	7784700	16850	462	7784700	16850	475	8003750	16850	462	7784700	16850	430	7245500	16850	485	8172250
SAN ANTONIO (23)																		
State Water Project	23	630	14490	23	630	14490	23	674	15502	23	630	14490	23	598	13754	23	700	16100
SANTA YNEZ, LOWER (12,000)							Cachuma (42ft) Conj. Use									Cachuma (42ft) Conj. Use		
Gibraltar + Lompoc Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cachuma + Lompoc Pipeline	0	0	0	0	0	0	2477	850	2105450	0	0	0	0	0	0	4500	659	2965500
Salsipuedes Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Water Project	12000	725	8700000	12000	725	8700000	9523	766	7294618	12000	725	8700000	12000	693	8316000	7500	715	5362500
Totals	12000	725	8700000	12000	725	8700000	12000	783	9400068	12000	725	8700000	12000	693	8316000	12000	694	8328000
SANTA YNEZ, UPPER (2,578)	Cachuma (27ft) Conj. Use			Cachuma (33ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use						Cachuma (42ft) Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	2578	427	1100806	0	0	0	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2578	126	324828	2578	140	360920	2578	171	440838	0	0	0	0	0	0	2578	171	440838
State Water Project	0	0	0	0	0	0	0	0	0	0	0	0	2578	830	2139740	0	0	0
Totals	2578	126	324828	2578	140	360920	2578	171	440838	2578	427	1100806	2578	830	2139740	2578	171	440838
SOUTH COAST (12,435)	Cachuma (27ft) Conj. Use			Cachuma (33ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use						Cachuma (42ft) Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	10542	427	4501434	0	0	0	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	10942	126	1378692	12435	140	1740900	12435	171	2126385	0	0	0	0	0	0	10412	171	1780452
Goleta Water Reuse	845	1737	1467765	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB Regional Water Reuse	648	1177	762696	0	0	0	0	0	0	1052	1151	1210852	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	841	1211	1018451	0	0	0	2023	1135	2296105
State Water Project	0	0	0	0	0	0	0	0	0	0	0	0	12435	880	10942800	0	0	0
Totals	12435	290	3609153	12435	140	1740900	12435	171	2126385	12435	541	6730737	12435	880	10942800	12435	328	4076557
COUNTYWIDE (45,486) Totals	45486	489	22223571	45486	448	20391410	45486	479	21776943	45486	574	26121133	45486	669	30448194	45486	502	22824145

rights), and institutional considerations and their environmental impact. If a Santa Ynez River system project is selected, agreement as to its yield and distribution of other project yields on the river system must be reached among all affected parties. In addition, DWR, in cooperation with the SWP water supply contractors, must determine its method of financing and whether it fits into the overall SWP future facilities financing program. If it meets these criteria, DWR must also determine the method of repayment. Moreover, SWP financing of local projects is subject to availability of funds and requirements for construction of future SWP facilities.

16. The development of an alternative to supply and deliver water to Santa Barbara County water purveyors could not be realized for 7 to 10 years after a decision is reached by all parties.

Conclusions

On the basis of findings in this study, the following conclusions can be drawn:

1. Santa Barbara County has a current and long-term water shortage, which could have adverse consequences.

2. Delivery of SBCFCWCD's full entitlement of SWP water, whether via the Coastal Branch or local supply projects, will not meet Santa Barbara County's entire projected shortage. However, if delivered to subareas in the quantities presently allocated (**Table 2**), the total shortage would be concentrated in the Cuyama and San Antonio Subareas. There are no local projects in these subareas that could make up the projected deficits.

3. If the ground water basins continue to be overdrafted, deterioration in ground water quality will persist, particularly in Cuyama, Santa Maria, and lower Santa Ynez Subareas. In coastal sections, it could cause sea water intrusion. Moreover, a continued decline in water levels means an increase in pumping costs.

4. Water conservation is one way to help Santa Barbara County decrease its water supply deficit, but conservation alone cannot significantly affect the supply and demand balance.

5. Continued emphasis should be placed on on-going watershed management and weather modification programs as a desirable means of developing additional water in the County.

6. The importation of good quality SWP water would result in better quality effluent from waste water treatment plants and would improve the quality of the receiving ground water in northern subareas. Although the SWP entitlement water is not scheduled for direct agricultural use, agricultural water users would benefit from its importation. The amount of ground water available for agriculture would increase both from increased return flows and from less pumping for municipal and industrial uses. This would result in higher ground water levels than would otherwise occur, and this would decrease the pumping lift for ground water users, thereby saving energy costs.

7. In the South Coast and upper Santa Ynez Subareas, imported water is not economically competitive with local projects partially financed by the SWP.

8. In the Cuyama, Santa Maria, and San Antonio Subareas, no local projects are economically competitive with imported water.

9. In the lower Santa Ynez Subarea, local projects are economically marginal when compared with imported water.

10. The enlargement of Cachuma Reservoir by raising Bradbury Dam 27, 33, or 42 feet and the building of a New Gibraltar Reservoir, plus conjunctive

TABLE 2
STATE WATER PROJECT ENTITLEMENT BY SUBAREA

SUBAREA Agencies	Amounts, in acre-feet per year		
CUYAMA			
Cuyama Community Services District		1,000	
Cuyama Valley Community, Inc.		600	
Subarea Total			1,600
SANTA MARIA			
City of Santa Maria		11,300	
Southern California Water Company (Orcutt)		3,000	
Reserved SWP entitlement		2,550 *	
Subarea Total			16,850
SAN ANTONIO			
Casmalia Community Services District		23	
Subarea Total			23
SANTA YNEZ			
UPPER			
Buellton Community Services District	578		
Santa Ynez River Water Consv Dist, ID #1	2,000		
Subtotal		2,578	
LOWER			
City of Lompoc	4,000		
Mission Hills Community Serv Dist	500		
Vandenberg Air Force Base (VAFB)	7,500 **		
Subtotal		12,000	
Subarea Total			14,578
SOUTH COAST			
Carpinteria County Water District		2,700	
Goleta Water District		3,000 ***	
La Cumbre Mutual Water Company		1,000	
Montecito Water District		2,185	
Morehart Land Company		200	
City of Santa Barbara		3,000	
Santa Barbara Research Center		50	
Summerland County Water District		300	
Subarea Total			12,435
SBCFCWCD TOTAL			45,486

* 2,050 acre-feet originally allocated to Goleta and 500 acre-feet originally reserved for VAFB are shown as 'Reserved SWP Entitlement' in the Santa Maria Subarea.

** Original request for 8,000 acre-feet has been reduced as shown.

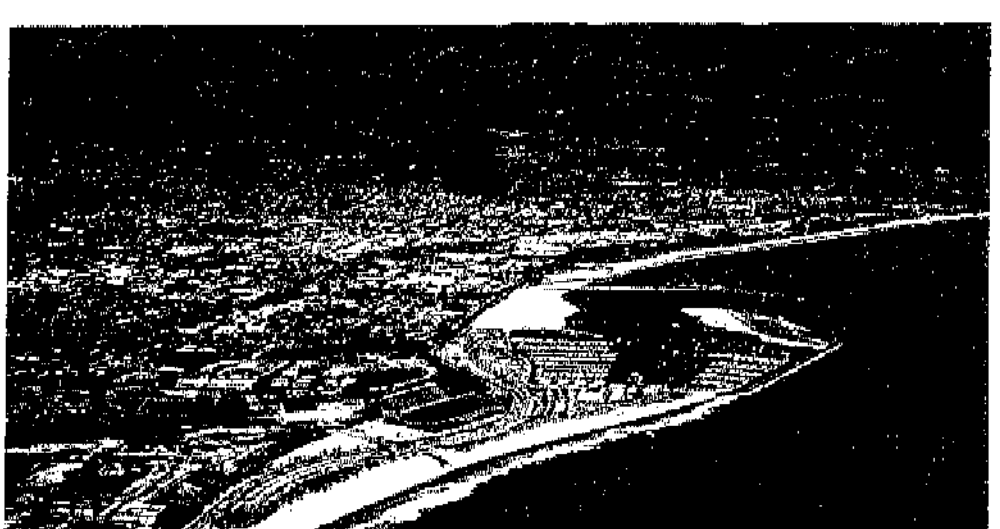
*** Original allocation of 5,050 acre-feet has been reduced as shown, pending results of the June 1985 election on retaining entitlement.

use in both cases, are the main options for the upper Santa Ynez and South Coast Subareas in terms of least cost alternatives.

11. The only significant potential for reclaiming water is in the South Coast Subarea, because its treated waste water is discharged through outfalls to the ocean and is lost as a source of supply. However, because of the large amount of energy required for treatment and the necessity to provide a separate distribution system, reclamation is an expensive source for water with limited uses. In the other four subareas, the effluent from waste water treatment plants and septic tanks largely returns to the ground water basins and is not lost.

12. An early decision on the alternative to be considered by all parties is desirable because of the long lead time (7 to 10 years) required to analyze, plan, and construct supply and delivery facilities.

SANTA BARBARA COUNTY contains both agricultural and urban areas. In upper photo is scene in Cuyama Subarea, taken near the community of New Cuyama. Lower photo shows the City of Santa Barbara in the South Coast Subarea. The City is the county seat and largest city in the County.



CHAPTER III. WATER DEMAND PROJECTIONS AND COMPONENTS OF EXISTING SUPPLY

This report summarizes and updates water demand and supply information that has been developed by the Santa Barbara County Water Agency, the State, the SBCFCWCD, other local agencies, and consultants. The purpose of the updating is to define the adequacy of current water supplies in terms of anticipated water demands and to determine the extent to which any deficits could be offset by local projects, a combination of local projects and a downsized Coastal Branch, or the importation of the full SWP entitlement. Water demand and water supply have been projected to the year 2010 by subarea.

As is pointed out in DWR's Bulletin 198-84, "Water Conservation in California", in order to plan future water development properly, the effect of conservation on future water use must be considered. The way in which conservation programs will affect the supply and use of water is not always obvious. Water does not disappear when it is used; in most cases, some of it can be recovered and used again. Thus, a reduction in water use will not always result in a real saving of water.

Water is lost to further use when it flows to the sea or a salt lake, seeps to a body of saline ground water, or passes into the atmosphere. A reduction in these losses is a water supply saving.

Whether or not a particular conservation measure will result in a water supply saving depends on where the water is being used. Just over half of the water delivered by urban water utilities in California is used indoors for washing and for flushing toilets. Virtually all this water is collected by sewers, treated, and then discharged to a river, the sea, or land disposal areas. In areas where sewage effluent is discharged to rivers or percolation ponds and becomes part of the supply, a reduction in indoor use will not be a water supply saving because it will reduce the supply. However, when the sewage effluent is discharged to the sea or to a river or an estuary when there is no downstream use, reductions in indoor use will be water supply savings because no downstream users will be affected.

Much of the water used for watering lawns and gardens is lost to the atmosphere. Reductions in this consumptive use will be water supply savings. Some of the water used on gardens runs off and eventually flows into storm drains. Reductions in this runoff of excess water will be water supply savings only when water from the storm drains is discharged to the sea or is otherwise lost to further use.

When water is used for irrigation, some is lost to the atmosphere as transpiration from the crop and evaporation from the soil surface, some runs off the end of the field, and some seeps into the ground. In most cases, the water that runs off the end of the field and seeps into the ground is available for use elsewhere. Most improvements in irrigation practice do not affect the amount of water lost to the atmosphere. Consequently, reductions in applications of irrigation water will not generally result in water supply savings. Real savings in the amount of water used in agriculture can be achieved only by changes in the crops grown and improvements in irrigation practice in places where runoff and seepage go to the sea, a salt lake, a body of saline ground water, or is otherwise unusable.

Water Demand

Urban and agricultural use are the main categories of water demand. Of the combined net urban and agricultural applied water demand in 1980, 75 percent was for

agriculture and 25 percent was for urban use. Urban water use in 1980 was about 5 percent higher than in the mid-1970s, even though there was some retrofitting of water-saving devices in older homes and the mandatory installation of water-conserving equipment in new houses. The urban water use increase simply seems to have run in proportion to the increase in population (although five years is probably too short a period in which to obtain an accurate estimate of water use trends).

The 1980 countywide water demand to support both urban and agricultural activities is shown in **Figure 4** and is summarized for 1980 to 2010 in **Table 3**. **Figure 5** shows 1980 water demand by subareas.

Urban Water Demand

In this study, urban demand is defined as the water demand other than instream use and agricultural irrigation, whether in rural or city environment, and includes domestic, commercial, and industrial water uses. Under the assumption that only water from the current supply would be available, water demand was projected to the year 2010 on the basis of population projections and per capita water use. With more water available, population and water demand might be slightly higher, but this is not entirely predictable, as by far most of the water used in Santa Barbara County is for agriculture.

Table 4 shows eight calendar years of urban water production by subarea and purveyor. The urban water use shown in this table represents almost all urban or domestic water use in Santa Barbara County.

Future urban water demand in Santa Barbara County, based upon population and per capita water use, is shown in **Table 5**. A breakdown of urban demand and conser-

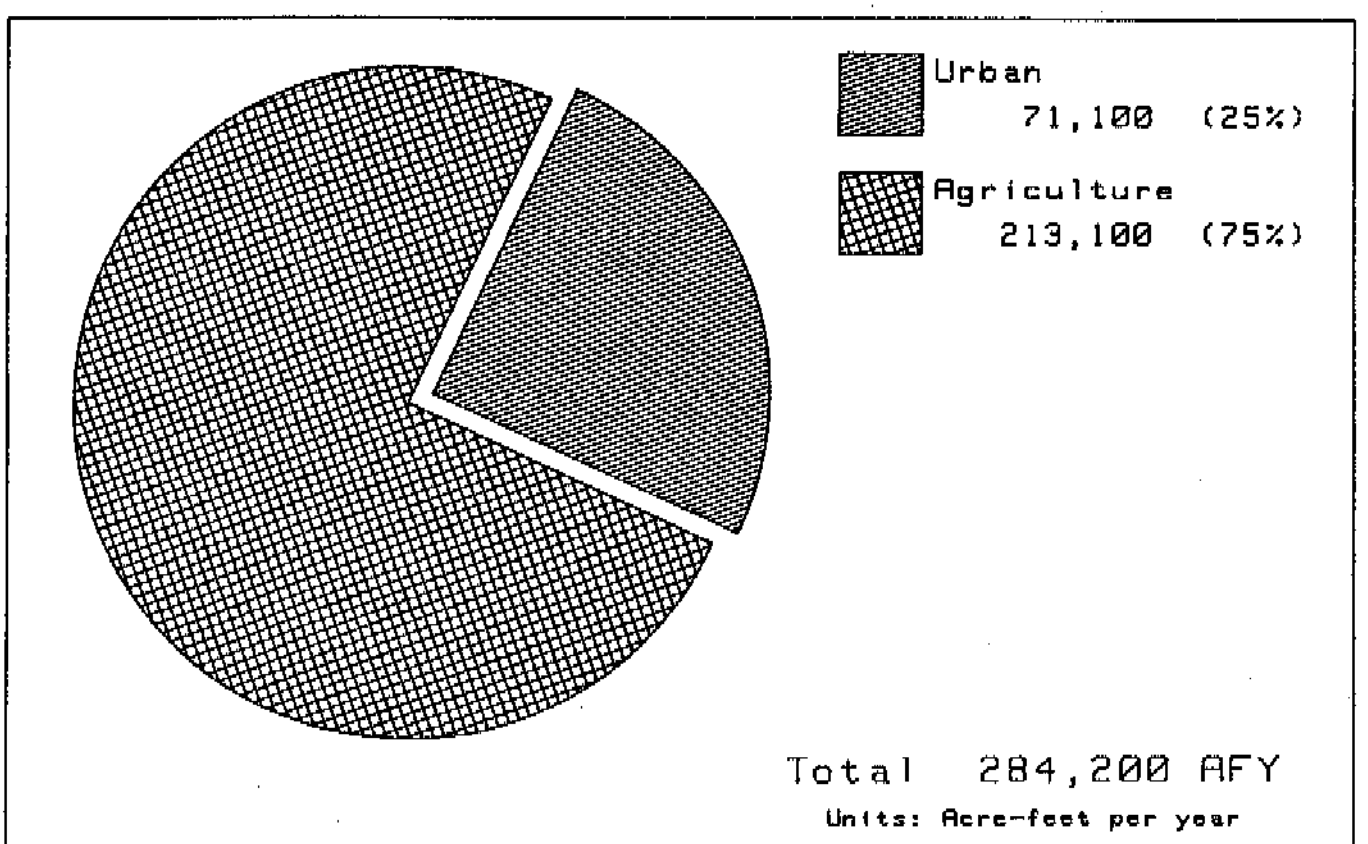


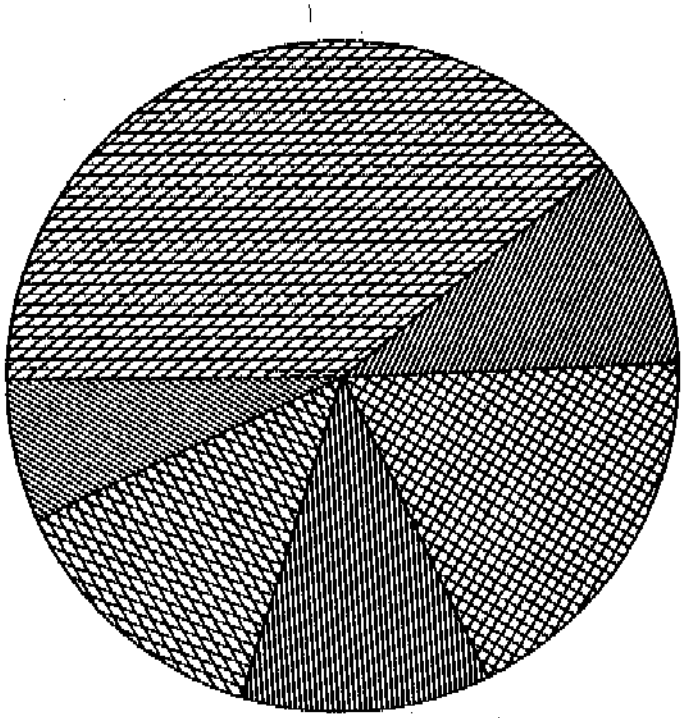
Figure 4. 1980 SANTA BARBARA COUNTY WATER DEMAND BY TYPE USE

TABLE 3
TOTAL WATER DEMAND

In acre-feet per year

Item	1980	1990	2000	2010
Total urban/agricultural unadjusted water demand	307,100	323,650	329,720	331,100
Total urban/agricultural existing and anticipated conservation*	- 22,900	- 36,450	- 42,920	- 46,800
Total urban/agricultural water demand	284,200	287,200	286,800	284,300

* Actual water savings are considerably less than conservation amounts shown because of the effect conservation has on supply, i.e., reducing return flows.



Cuyama 28,900 (10%)
Santa Maria 111,600 (39%)
San Antonio 19,800 (7%)
Lower Santa Ynez 37,600 (13%)
Upper Santa Ynez 34,200 (12%)
South Coast 52,100 (18%)
Total 284,200 AFY
Units: Acre-feet per year

Figure 5. 1980 SANTA BARBARA COUNTY WATER DEMAND BY SUBAREAS

TABLE 4
SANTA BARBARA COUNTY WATER PRODUCTION - URBAN (M&I) USE
In acre feet per year

MAJOR WATER PURVEYORS	CALENDAR YEARS 1975	1976	1977	1978	1979	1980	1981	1982	4 Yr. Ave 1975-78	4 Yr.Ave. 1979-82
New Cuyama	288	300	321	300	295	292	333	262	302	296
Cuyama	75	75	75	75	75	75	75	75	75	75
Ventucopa & Misc.	9	9	9	9	9	9	9	9	9	9
SUBTOTAL, CUYAMA	372	384	405	384	379	376	417	346	386	380
City of Santa Maria	8,063	8,033	7,509	7,446	8,142	8,754	8,621	8,313	7,763	8,458
SoCalif.Wtr.Co.(Orcut&Sisq)	3,780	4,014	4,474	4,359	4,847	5,349	5,851	5,299	4,157	5,337
City of Guadalupe	850	845	781	722	666	762	738	675	800	710
Lake Marie Water Co.	143	316	375	262	252	259	238	195	274	236
Misc. SM Valley & Industrial	7,650	7,400	7,400	7,450	7,650	8,090	7,000	6,300	7,425	7,260
SUBTOTAL, SANTA MARIA	20,286	20,608	20,539	20,239	21,557	23,214	22,448	20,782	20,418	22,000
Los Alamos Comm.Serv.Dist.	150	158	158	161	205	230	211	211	157	214
SurroundingRanches(private)	80	80	80	80	80	80	80	80	80	80
Casmalia	16	16	17	15	16	17	27	27	16	22
SUBTOTAL, SAN ANTONIO	246	254	255	256	301	327	318	318	253	316
City of Lompoc	3,301	3,314	3,300	3,173	3,573	3,775	3,654	3,632	3,272	3,659
Vandenberg Air Force Base	3,898	4,392	4,455	4,021	4,096	4,831	5,076	4,781	4,192	4,696
ParkWtrCo.(VanVil.&GolfCor)	1,777	1,878	1,804	1,649	1,870	1,877	1,944	1,651	1,777	1,836
Mission Hills Wtr.Co.	493	500	500	500	500	583	492	417	498	498
Misc. Lower Santa Ynez	150	150	155	160	165	165	165	165	154	165
SUBTOTAL, LOWER SANTA YNEZ	9,619	10,234	10,214	9,503	10,204	11,231	11,331	10,646	9,893	10,853
SY Riv.Wtr.Cons.Dist.ID#1	1,218	1,221	1,072	1,077	1,203	1,256	1,219	1,108	1,147	1,197
Solvang Mun.Improv.Dist.	1,200	1,264	1,198	1,098	1,122	1,231	1,622	1,569	1,190	1,386
Buellton Comm.Serv.Dist.	450	535	528	641	716	752	770	725	539	741
Misc. Upper Santa Ynez	500	530	560	580	600	605	610	610	543	606
SUBTOTAL, UPPER SANTA YNEZ	3,368	3,550	3,358	3,396	3,641	3,844	4,221	4,012	3,418	3,930
Carp.Co.Wtr.Dist.	2,038	2,233	1,902	1,887	2,029	2,065	2,268	2,140	2,015	2,126
Summerland Co.Wtr.Dist.	150	162	131	127	109	137	113	110	143	117
Montecito Water District	3,806	3,546	3,213	2,960	3,358	3,599	3,800	3,112	3,381	3,467
City of Santa Barbara	15,854	14,665	12,917	12,586	13,954	14,750	14,305	13,330	14,006	14,085
Goleta Water District	11,200	12,361	10,665	11,112	11,971	12,018	11,731	10,401	11,335	11,530
La Cumbre Mutual Wtr.Co.	1,593	1,505	1,408	1,340	1,396	1,525	1,357	1,248	1,462	1,382
Misc.South Coast Areas	855	875	875	895	905	915	920	920	875	915
SUBTOTAL, SOUTH COAST	35,496	35,347	31,111	30,907	33,722	35,009	34,494	31,261	33,215	33,622
TOTAL URBANIZED AREA OF SANTA BARBARA COUNTY	69,387	70,377	65,882	64,685	69,804	74,001	73,229	67,365	67,583	71,100

NOTES: 1. All values are in AFY and are derived from monthly and annual production figures supplied to the Water Agency by the various water purveyors.
2. The City of Santa Barbara and Goleta Water District figures are adjusted in their annual production values by the amount of the City exchange value.
3. Goleta Water District is further adjusted by the amount delivered to La Cumbre Mutual Water Company each year.
4. The Santa Ynez ID#1 and Solvang Municipal Improvement District values are adjusted to reflect the deliveries from ID#1 to SMID.
5. Vandenberg Village (Park Water Co.) use is augmented by the estimated golf course water use (330 AFY in 1975 to 360 AFY in 1982).
6. Water Purveyors are grouped into Subareas where principal use occurs. Sources of water may be from other areas (as per Casmalia & Vandenberg AFB).

TABLE 5
URBAN WATER DEMAND

In acre-feet per year

Item	1980	1990	2000	2010
Unadjusted applied water demand	76,100	85,250	89,520	90,700
Existing and anticipated conservation*	- 5,000	- 8,150	-10,270	-11,600
Total urban water demand	71,100	77,100	79,250	79,100

*Actual water savings are considerably less than conservation amounts shown because of the effect conservation has on supply, i.e., reducing return flows.

vation by each subarea is contained later in this chapter.

Population. The Santa Barbara County-Cities Area Planning Council "Forecast 82" population projections (to the year 2000) for the County were distributed among the five subareas. A rational projection was then made from the "Forecast 82" data for 2000 to arrive at the figures used for 2010. The projections are presented in Table 6.

In 1980, about 57 percent of the population was concentrated in the South Coast Subarea, where the communities of Goleta,

TABLE 6
POPULATION PROJECTIONS

Subarea	1980	1990	2000	2010
Cuyama	1,200	1,700	2,400	3,000
Santa Maria	67,400	88,000	95,000	100,000
San Antonio	1,400	1,800	2,200	2,500
Santa Ynez	57,600	71,500	75,500	79,000
Lower	43,900	54,000	57,000	60,000
Upper	13,700	17,500	18,500	19,000
South Coast	171,100	178,000	181,000	183,000
Total	298,700	341,000	356,100	367,500

Santa Barbara, Summerland, Montecito, and Carpinteria and the University of California are located. Other major urban areas are Santa Maria, Guadalupe, and Orcutt in the Santa Maria Subarea; Lompoc, Vandenberg Air Force Base, Vandenberg Village, and Mission Hills in the lower Santa Ynez Subarea; and Buellton, Solvang, Los Olivos, and Santa Ynez in the upper Santa Ynez Subarea.

Growth is projected to be greatest in Santa Maria and lower Santa Ynez Subareas.

Countywide, the population is projected to increase by 23 percent, or 69,000, by year 2010.

A January 1, 1984, County population estimate of 320,362 by the California Department of Finance indicates that the population in Santa Barbara County is growing about in step with the prediction of "Forecast 82", which projected population at 325,900 by 1985.

Per Capita Use. Per capita water use differs from one subarea to another because of a number of variables, among which are differences in climate, industrial and commercial development, economic status, and availability of water. Each subarea is unique in its combination of factors contributing to per capita water use. Few of these factors are directly measurable.

Appendix B shows the 1979-1982 calendar year average water use of the major water purveyors in Santa Barbara County. For the South Coast and upper Santa Ynez, only part of the supply is ground water. For the rest of the County, the water production is exclusively ground water. The last two columns display the purveyor area 1980 population and the gallons per capita per day (gpcd).

Using water use information found in Appendix B, the per capita urban water use by subareas was determined and is presented in Table 7. Private industrial (mainly oil field activities and vegetable processing and cleaning) use in Santa Maria Valley and Vandenberg AFB use (only part of which is for domestic-type applications) were excluded from the gpcd calculations, but included in the overall calculations of urban water demand.

TABLE 7
1980 URBAN PER CAPITA WATER USE
IN SANTA BARBARA COUNTY

Subarea	Gallons per capita per day	
Cuyama		283
Santa Maria*		197
San Antonio		201
Santa Ynez		182
Lower**	154	
Upper	256	
South Coast		175

*Private industrial pumpage (oil companies, etc.) is excluded from Santa Maria Subarea calculations.

**Vandenberg AFB is excluded from lower Santa Ynez calculations.

Urban Water Conservation. Conservation measures in Santa Barbara County are expected to reduce applied urban water demand by approximately 13 percent, or about 11,600 acre-feet annually, by 2010. Net water conservation is considerably less than applied water conservation because the reduction in return flows decreases supplies.

Reductions would be realized from voluntary, more efficient water use practices promoted through public education and from State-mandated requirements to install water-conserving fixtures in newly constructed and renovated buildings.

Updated anticipated savings, from Bulletin 160-83, "California Water Plan - Projected Use and Available Water Supplies to 2010", published December 1983, attributable to conservation measures are presented in Table 8.

TABLE 8
URBAN WATER CONSERVATION *

In acre-feet per year

Subarea	1980	1990	2000	2010
Cuyama	20	50	100	100
Santa Maria	800	2,050	2,900	3,500
San Antonio	16	50	70	100
Santa Ynez	500	1,300	1,700	1,900
Lower	300	800	1,000	1,100
Upper	200	500	700	800
South Coast	3,700	4,700	5,500	6,000
Total	5,036	8,150	10,270	11,600

* Net conservation is less than conservation amounts shown due to reductions in return flows.

Agricultural Applied Water Demand

Agricultural applied water demand, the amount of water applied to irrigate crops in the field, is calculated by multiplying the area devoted to the various crops by the unit applied water use values for those crops. The unit water use by a given crop can vary from one subarea to another depending upon the particular combination of growing conditions. The Santa Barbara County unit values for this report were derived from DWR's Bulletin 160-83.

Agricultural water demand has been projected to the year 2010, as shown in **Table 9**. Agricultural water demand, which was modified to reflect Santa Barbara County Cooperative Extension estimates and projections, is projected to increase gradually to the year 2000 and then hold almost level to 2010.

Irrigated Land. Based upon a crop survey by the University of California at Santa Barbara, there were approximately 85,000 acres under irrigation in Santa Barbara County in 1975. By 1980, irrigated acreage had increased to 94,000 acres. Much of the increase is in orchards (avocados) in the South Coast Subarea and vineyards in the north county subareas (Santa Ynez, San Antonio, and Santa Maria).

Table 10 shows the projected irrigated agriculture to 2010, assuming that only current water supplies are available. The total irrigated agriculture is projected to increase steadily to year 2000 and then hold almost level to year 2010. Only Cuyama Subarea will experience a steady decline in irrigated acreage, because of its limited water resources.

Unit Water Use. Unit agricultural applied water use, including evapotranspiration of applied water, was obtained from data used in Bulletin 160-83 that was estimated by means of formulas based on climatic and operating conditions in each of the five subareas for each of the following crops: grain and hay, field, alfalfa, pasture, truck, deciduous, citrus and subtropical, and vineyards.

Agricultural Water Conservation. Conservation, as used in this section, means reducing the amount of water applied in

TABLE 9
AGRICULTURAL WATER DEMAND *

In acre-feet per year

Item	1980	1990	2000	2010
Unadjusted applied water demand	231,000	238,400	240,200	240,400
Anticipated conservation	- 17,900	- 28,300	- 32,650	- 35,200
Total agricultural water demand	213,100	210,100	207,550	205,200

* Water demand with current water supply. Effect of conservation on supply, by reducing return flows, not included.

irrigating crops. It does not mean net water conservation, which is the savings in water after accounting for loss of return flows to ground water. Net conservation in most subareas is much less than the agricultural water conservation. Agricultural water conservation will not add more than 3 percent to the water supply north of the Santa Ynez Mountains where the major deficits exist.

Although much of the excess water applied to crops returns to ground water storage and can be pumped again so that little

TABLE 10
PROJECTED IRRIGATED AGRICULTURE *

In acres

Subarea	1980	1990	2000	2010
Cuyama	8,000	7,000	6,600	5,400
Santa Maria	38,800	40,000	41,000	42,000
San Antonio	8,800	10,600	11,000	11,500
Santa Ynez	25,000	25,500	25,800	26,000
South Coast	13,000	15,000	15,500	16,000
Total	93,600	98,100	99,900	100,900

* Irrigated acres in Santa Barbara County only.

METHODS FOR AGRICULTURAL CONSERVATION

Conservation methods from DWR Bulletin 198-84, "Water Conservation in California," (July 1984) that offer some potential for reducing applied (but not net use of) agricultural water are as follows:

- **The irrigation method.** For each crop, soil, and terrain situation there is an irrigation method more efficient than the others, which should be utilized when compatible with other operating considerations.
- **Irrigation scheduling.** Water use can be reduced by scheduling irrigation according to the climate, soil character, type of crop, and management requirements.
- **Good drainage.** Poor drainage can detrimentally affect crop production and result in higher water use per crop yield. Besides wasting water, poor drainage can lead to salt buildup in the root zone as well as saturating crop lands. Improving the drainage can result in higher yields as well as saving water.
- **Salt management.** Carefully regulating the amount of irrigation water needed to meet both the plant and leaching requirements of the soil is part of conservation.
- **Rainfall utilization.** Water savings can be realized when irrigation and crop planting are scheduled in coordination with rainfall.
- **Weed and phreatophyte control.** Water losses can be reduced by removing weeds and phreatophytes in areas of high water tables and open ditches.
- **Evaporation and evapotranspiration suppression.** Some water savings can be realized by reducing soil moisture during certain stages of the growing period without damaging production.
- **System automation.** The use of automatic irrigation mechanisms prevents excessive water application and also enables cyclic, short periods of irrigation for more efficient water use on soils with low intake rates.
- **Land use.** Conservation is related to the efficient use of cropland. Selecting crops on the basis of soil and slope conditions increases the potential for high irrigation efficiency and high crop yields.
- **Institutional.** This means taking advantage of the information and services that are available. Federal, State, and local agencies have programs and services to promote more efficient use of water. These include conducting experiments and research to develop better irrigation methods and providing advisory services and legal and institutional means to promote water conservation.

water is actually lost, there are good reasons for conservation of water in agricultural application. The main reason is the high cost of energy to lift and deliver excess irrigation water.

Agricultural water conservation begins with reviewing all phases of irrigation operations and modifying them to reduce water usage where possible through efficient irrigation practices. Irrigation water demands include the water consumed through evapotranspiration, the water applied to meet the leaching requirements of soils, and the water applied to operate the system. In each case, the amount of water required depends upon a number of factors, such as soil characteristics, quality of water, drainage, and climate.

Water conservation that can probably be attained through diligent but practical con-

servation practices has been estimated to be from 8 to 15 percent between 1980 and 2010. Anticipated water conservation, as shown in **Table 11**, is expected to result from projected increases in the proportion of irrigated crops that have a lower demand for irrigation and expected moderate increases in irrigation efficiencies. Net conservation reflects reductions in return flows due to conservation.

Water Supply

All the present water supply for Santa Barbara County originates as precipitation, mainly rain, which falls on the four watersheds of the County. Three of these watersheds are almost entirely within the County. Only the Cuyama River drainage area of the Santa Maria-Cuyama watershed has substantial areas outside the County. Most of the rainfall is used by vegetation in watershed areas, but some percolates through the soil into aquifers to become ground water and some runs off on the surface and becomes streamflow. Return flows of excess applied water are a significant portion of the available ground water.

Local ground water basins and surface reservoirs provide most of the water supply in Santa Barbara County at present. **Figure 6** shows existing water sources in the County. A third source, reclaimed waste water, currently provides only a small part of the Countywide supply.

Ground Water Basins

Ground water from wells is by far the largest source of water for Santa Barbara County. Much of Santa Barbara County is mountainous and composed of nonwater-bearing rock or material of low permeability, but ground water basins exist in alluvial valleys along the main drainage channels in the Cuyama, Santa Maria, San Antonio, and Santa Ynez Subareas. There

TABLE 11
AGRICULTURAL WATER CONSERVATION *

In acre-feet per year

Subarea	1980	1990	2000	2010
Cuyama	180	1,000	1,200	1,400
Santa Maria	10,400	15,000	17,000	19,000
San Antonio	1,300	2,400	2,450	2,400
Santa Ynez	5,000	8,900	11,000	11,400
Lower	2,500	4,400	5,400	5,600
Upper	2,500	4,500	5,600	5,800
South Coast**	1,000	1,000	1,000	1,000
Total	17,880	28,300	32,650	35,200

* Net conservation is less than conservation amounts shown due to reductions in return flows.

**Conservation is expected to be constant because of the limited additional opportunities for conservation efforts in the area. Most crops are under drip irrigation at present.

are also ground water basins in the South Coast Subarea, between Santa Ynez Mountains and the ocean **(Figure 7).** These are the Goleta, Santa Barbara, Montecito, and Carpinteria Ground Water Basins and, although small, they form a significant ground water resource.

Local ground water is pumped extensively for both urban and agricultural use in the five subareas. Usable storage and safe yield estimates for each subarea are given in **Table 12.**

Reservoirs

Surface reservoirs, which provide only about 16 percent of Santa Barbara County's total water supply **(Figure 6)**, are an important source for certain areas **(Figure 7).** Three reservoirs - Lake Cachuma, Gibraltar, and Jameson Lake - which are on the Santa Ynez River, provide water directly to the South Coast and upper Santa Ynez Subareas. Water is also released from Lake Cachuma to the Santa Ynez River to provide replenishment of downstream ground water basins. A fourth project, Twitchell Reservoir on the Cuyama River, provides flood control and stores seasonal runoff for later release to replenish the Santa Maria Ground Water Basin, but it is not a surface water supply because it does not provide water through pipelines. The reservoirs are listed with their capacities and yields in **Table 13.**

Three tunnels through the Santa Ynez Mountains, Tecolote from Cachuma, Mission from Gibraltar, and Doulton from Jameson Lake, convey Santa Ynez River water to service areas in the South Coast Subarea. Their primary purpose is to transfer water to the service areas, but the tunnels also function incidentally as horizontal wells, intercepting ground water. The ground water seeping into the tunnels is included in the yield of the project.

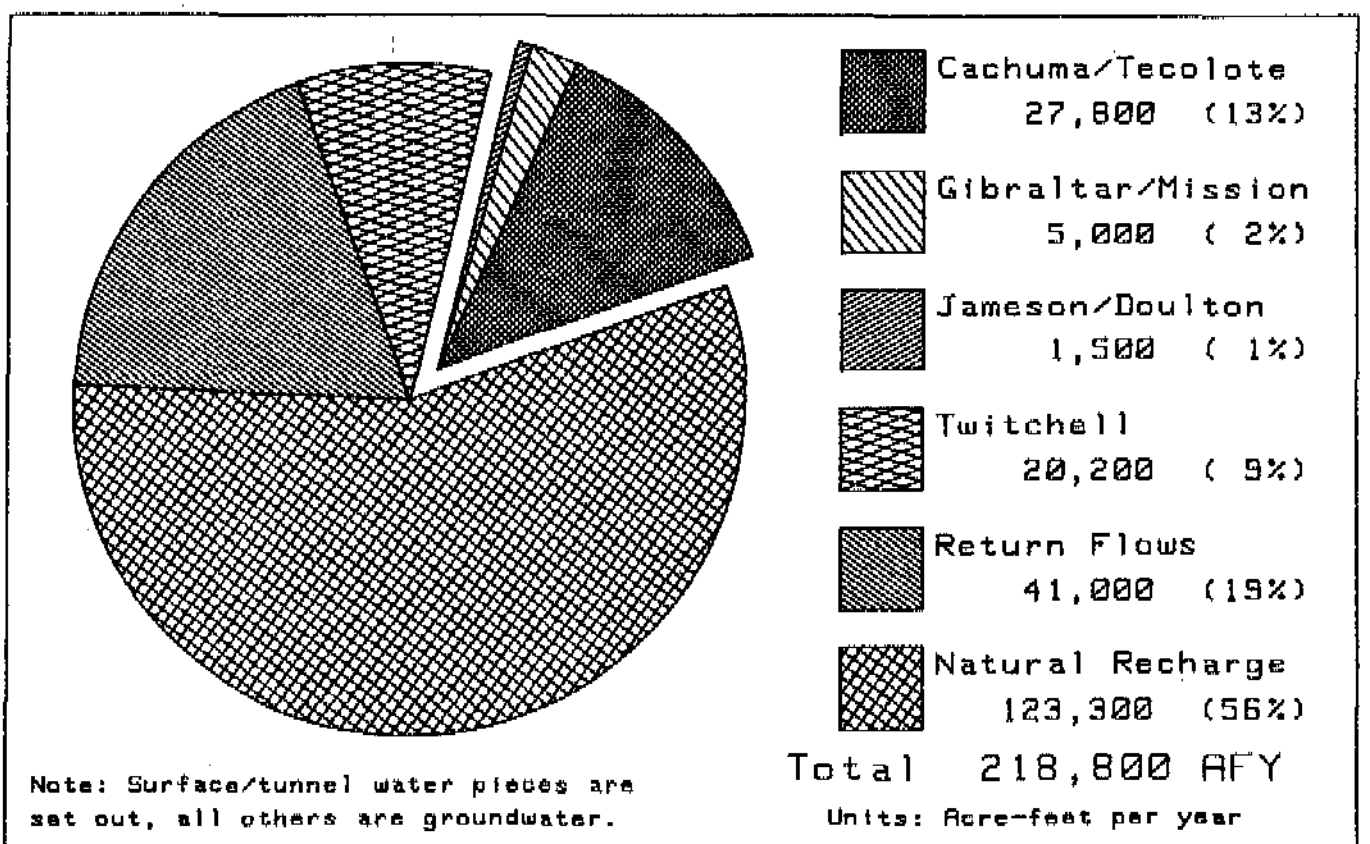


Figure 6. EXISTING WATER SOURCES FOR SANTA BARBARA COUNTY

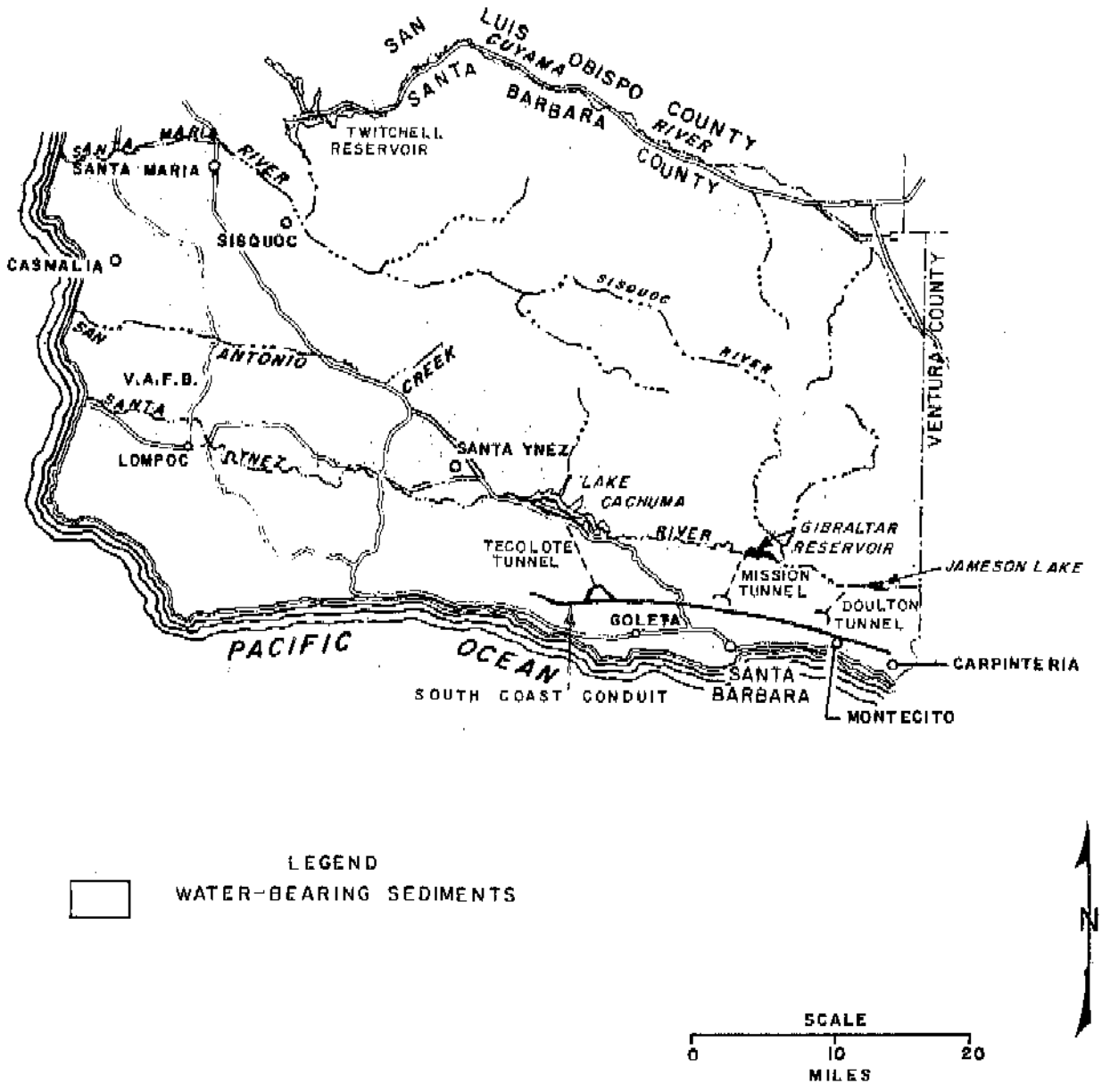


Figure 7 - SANTA BARBARA COUNTY WATER RESOURCES AND WATER SUPPLY FACILITIES

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1985

TABLE 12
GROUND WATER STORAGE CAPACITIES

In acre-feet

Subarea	Estimated working storage capacity	Safe yield
Cuyama	900,000	9,000*
Santa Maria	1,200,000	90,000**
San Antonio	500,000	8,000
Santa Ynez	1,100,000	61,000
Lower	300,000	33,000 ***
Upper	800,000	28,000 ***
South Coast****	130,000	16,500
Total	3,830,000	184,500

* Portion of total basin yield lying within Santa Barbara County.
** Portion of total basin yield lying within Santa Barbara County, including Twitchell Reservoir yield.
*** Yields shown include riparian pumpages, which are considered to be "safe" over a range of pumpage levels.
**** Includes coastal ground water basins from Carpinteria through Goleta Valleys (with a yield of about 12,500 AFY) plus part of the mountain areas behind these basins and the area west of Goleta Valley as far as Tajiguas (yield estimated at 4,000 AFY).

TABLE 13
RESERVOIRS IN SANTA BARBARA COUNTY

In acre-feet per year

Reservoir	Capacity	Lake yield	Average tunnel seepage	Total yield
Cachuma	205,000	24,800	3,000	27,800
Gibraltar	9,000	4,000	1,000	5,000*
Jameson Lake	5,750	1,000	500	1,500
Total	219,750	29,800**	4,500	34,300**
Twitchell ***	224,000	20,200	--	20,200

* Represents long-term average yield; annual diversions vary considerably.
** Does not include Twitchell yield, which is included in ground water yield.
*** Not a surface supply; used for ground water recharge.

TABLE 14
SANTA BARBARA COUNTY WASTE WATER PRODUCTION AND RECLAMATION

Treatment Plant	Design capacity		Waste water, in acre-feet per year			Place of discharge**
	MGD	Acre-feet per year	Production	Reused	Discharged	
Cuyama Valley Community,Inc.	0.15	170	40		40	Stream
Santa Maria, City of*	6.5	7,280	4,930	1,040	3,890	Ponds
Laguna County Sanitation District Santa Maria*	2.4	2,680	1,460	1,460		
Guadalupe, City of*	0.5	560	560	20	540	Ponds and land
Sinton and Brown Santa Maria	1.0	1,120	635	180	455	Land
Lompoc, City of	5.0	5,600	3,580	30	3,550	Stream
Mission Hills Community Services District	0.4	450	195		195	Land
U.S. Penitentiary, Lompoc*	0.3	340	325	325		Land
Buellton Community Services District	0.3	340	260		260	Land
Solvang Municipal Improvement District*	0.5	560	460	275	185	Irrigation and percolation ponds
Cachuma Sanitation District	0.2	220	20		20	Land
Goleta Sanitary District	10.5	11,760	6,680	120	6,560	Ocean
Santa Barbara, City of*	11.0	12,320	9,520	340	9,180	Ocean
Montecito Sanitary District	1.0	1,120	880		880	Ocean
Summerland Sanitary District	0.15	170	140		140	Ocean
Carpinteria Sanitary District	2.0	2,240	1,460	20	1,440	Ocean
COUNTYWIDE TOTAL	41.90	46,930	31,145	3,810	27,335	

* Data were provided by Department of Health Services, in 1983 conditions.
**If discharged waste water goes to ponds or streams, it is largely recharged into ground water and reused.

Reclaimed Water

Reclaimed water is generally the treated effluent from domestic waste water treatment plants that is utilized for a designated beneficial use. In each case, it must meet standards of the California Department of Health Services and the discharge requirements of the California Regional Water Quality Control Board (CRWQCB) for the specified use. The quality of the effluent, legal constraints on its use, environmental considerations, cost of providing adequate treatment, and public acceptance are other factors that have a bearing on the extent reclaimed water is utilized. The treatments that would usually be required to meet standards of the Department of Health Services and requirements of CRWQCB range from primary treatment for irrigation of pasture, fodder, and seed crops; through secondary treatment for landscape and golf course irrigation; to advanced secondary treatment for the irrigation of food crops. Each step to upgrade the quality of the effluent becomes increasingly costly.

When reclaimed water replaces potable water for such uses as landscape or golf course irrigation, there is a benefit in that about 70 percent of the amount of potable water replaced becomes available for higher uses. (More reclaimed water must be applied to leach salts from the soil; therefore, there is not a one for one benefit.)

Reclaimed water used directly accounts for a small portion of the water supply in Santa Barbara County. Currently, ten plants treat and reuse 3,810 acre-feet of effluent per year for in-plant uses and pasture or fodder irrigation. These treatment plants are listed in **Table 14.**

In addition to the direct beneficial use of treated effluent, there is the substantial incidental benefit of recharge to the ground water basin when waste water discharged to oxidation ponds infiltrates to the ground water. Thus, most of the effluent from treatment plants in Cuyama, Santa Maria, San Antonio, and Santa Ynez Subareas returns to replenish the ground water reservoir and is available for reuse.

Only the effluent from the communities in the South Coast Subarea discharges to the ocean and does not replenish the ground water supply. However, some waste water in the South Coast Subarea might be reused in the future.

Currently, there are two proposals under study to utilize waste water treatment plant effluent in the South Coast Subarea. One is in Goleta, which could eventually reclaim up to 8,600 acre-feet annually, and the other is at Santa Barbara Wastewater Treatment Plant, which could reclaim as much as 2,560 acre-feet annually, including for ground water recharge. These studies are described in Chapter V.

Other Water Supplies

Other water supplies occur occasionally or may be put to use temporarily without detrimental effects upon the long-term water supplies. These water supplies include excess surface runoff and ground water flows that discharge to the ocean and are lost as water supply.

Excess Runoff and Ground Water. In the past, runoff and spills from the reservoirs during extended storms have resulted in large discharges to the ocean. This water constitutes an untapped potential water resource that could be developed for local supplies by some of the projects proposed in this study.

Similar losses from coastal ground water basins occur during wet periods when there is insufficient capacity in basins to store additional water. Sometimes potential recharge is rejected because ground water levels are high.

Ground Water Mining. Pumping more ground water from a basin than is replenished over a long period is known as mining the basin. A water supply may be sustained by taking water from storage as long as it is available. Ground water may be mined from some basins for years with little or no apparent ill effects, but as water levels

decline, the practice can result in intrusion of connate brines in all basins and sea water intrusion in coastal basins, reduction in aquifer storage capacity (compaction of clays) with possible land surface subsidence, increased energy costs as the lift increases, failure of production wells, and water quality degradation as deeper and older sediments are dewatered, causing intrusion of connate brines. However, mining a basin can be an important part of water supply planning if the possible detrimental effects have been carefully considered and are resolved in the overall plan.

Currently, the use of water in storage is part of the regular supply in the Cuyama, Santa Maria, San Antonio, and Santa Ynez Subareas. The Cuyama Subarea is an inland basin where continued mining has resulted in increasing costs as the water level declines. The Santa Maria, lower Santa Ynez, and South Coast Subareas have coastal basins, and continued heavy pumping could eventually result in sea water intrusion of the aquifers adjacent to the ocean.

Mining ground water was therefore not considered as a water supply option for the following reasons:

- Ground water is already an important source of supply in the County, and mining more ground water would not qualify under the guidelines on funding local water supply projects.

- Because ground water is now being overdrafted, increasing the practice would have possible detrimental effects on the basins (coastal sea water intrusion).

- Mining ground water may deteriorate the quality of ground water even more, as is evidenced by the degradation that has taken place in areas such as Lompoc and Santa Maria.

Water Quality

The quality of the ground water in most subareas generally meets the drinking water standards of Title 22 of the California Administrative Code, which limit the chemical concentrations in drinking water in California. The hardness of the water is excessively high for many beneficial uses and shortens the life expectancy of appliances and water pipes. Total dissolved solids (TDS) and hardness in the water are used here as measures of its quality to compare and evaluate the water quality in the subareas.

Table 15 summarizes ranges in TDS and TH concentrations of more than 85 percent of the water samples taken in recent years of ground water in the respective subareas. Individual well samples may deviate significantly from these values. Hardness of the water is high in most of the subareas. The CRWQCB, Central Coast Region, is currently reevaluating the water quality objectives in the Santa Maria Ground Water Basin as a result of deterioration of the ground water quality. A review of ground water data indicates there is a salt imbalance in this basin, as may be the case in other basins in the County.

Surface water analyses for typical intermediate flow levels are also summarized in **Table 15.** The TDS concentrations fall within the allowable limits of the drinking water standards. The hardness, however, is high in every sample.

Water from the SWP is of considerably better quality than the water from local sources. The 1984 average chemical makeup of the SWP water sampled near the diversion to the Coastal Branch (Check 21), in the partially completed Coastal Branch (Check 5), and near the proposed diversion to the Cuyama Branch (Check 29) is summarized in **Table 16.**

Asbestos, which occurs naturally in the mountains of Northern and Central California and in the Coast Range is present to some degree in the rivers of Northern and Central California. Consequently, SWP water, which originates in Northern and Central California, contains varying amounts of asbestos. Because of the association of lung disease with exposure to airborne asbestos, there has been some

concern in recent years about the possible health risk of ingesting asbestos with drinking water.

The effects on human health associated with prolonged inhalation of asbestos particles has long been documented by the State Department of Health Services. However, the risks from exposure to asbestos resulting from the ingestion of fibers in the water supply are not presently known. The overall incidence of cancer of the digestive system, the most likely part of the human body that would be affected, has been steadily declining in the United States. Evidence presented in the medical literature neither supports nor refutes the thesis that ingested asbestos fibers are harmful. Animal feeding studies have utilized massive quantities of asbestos, far in excess of that which would be present in domestic water and, even then, no incontrovertible data have been obtained.

Until more is known about the relationship of ingested asbestos and its effect on human health, the State Department of Health Services provides recommendations only and has not set any health standards for asbestos limits in drinking water.

Asbestos exists in water as suspended fibers and is reported in units of million fibers per litre (MFL). Some water supplies in Northern California contain asbestos in concentrations of 15 000 to 20 000 MFL without apparent harm to the population served. Water samples from the aqueduct near the Coastal Branch turnout have usually contained asbestos in concentrations of about 1 000 MFL. Higher concentrations occur during storms in the San Joaquin Valley when flood waters in the vicinity of Coalinga enter the California Aqueduct. Generally, these peak concentrations do not exceed 6 000 MFL; however, peaks of 18 000 MFL have been recorded.

TABLE 15
WATER QUALITY IN SANTA BARBARA COUNTY

Source	Concentrations in mg/L	
	Total dissolved solids (TDS)	Total hardness (TH)
Ground water*		
Cuyama Subarea	900 - 2,600	300 - 1,500
Santa Maria Subarea	500 - 1,600	300 - 1,400
San Antonio Subarea	300 - 1,500	200 - 600
Santa Ynez Subarea		
Lower	400 - 2,000	140 - 1,400
Upper	300 - 1,300	150 - 900
South Coast Subarea	400 - 1,300	250 - 900
Surface water		
Santa Ynez River at Lompoc	950	600
Sisquoc River	720	480
Salsipuedes Creek	850	520
Cachuma Reservoir	590	385

* Water quality of more than 85 percent of wells sampled falls between these ranges.

TABLE 16
STATE WATER PROJECT WATER QUALITY

Constituents	January-October 1984 average*		
	Check 21**	Check 5***	Check 29#
Total dissolved solids##	182	185	184
Total hardness##	75	75	75
Chlorides##	37	37	37
Sulfates##	29	30	29
Sodium##	31	31	31
Percent sodium##	47	46	47
Specific conductance##	311	307	308
pH (moles/litre)	7.8	7.8	8.0
Boron	0.2	0.2	0.2
Fluoride	0.1	0.1	0.1
Lead	0.0	0.0	0.0
Selenium	0.00	0.01	0.01
Hexavalent chromium	0.00	0.00	0.00
Arsenic	0.00	0.00	0.00
Iron	0.03	0.09	0.08
Manganese	0.01	0.01	0.01
Magnesium	9.0	8.00	8.0
Copper	0.03	0.02	0.01
Calcium	16.0	17.0	17.0
Zinc	0.03	0.03	0.02
Phenol	0.001###	0.003###	0.004###
Color (units)	16.0	--	7.0

* Specific conductance in microsiemens per centimetre and all other constituents in milligrams/litre unless otherwise noted.
** Located on California Aqueduct near Kettleman City about 12 miles north of Coastal Branch turnout.
*** Located on Coastal Branch near Devils Den about 12 miles west of Coastal Branch turnout.
\# Located on California Aqueduct near proposed Cuyama Branch turnout near Maricopa and south of the Kern River Intertie.
Values correlated from continuous specific conductance.
Two-month average.

DWR is monitoring and developing a long-term solution for this problem. Asbestos occurs naturally in Cachuma Lake in concentrations of 2 800 MFL. It should be noted that ordinary filtration removes over 95 percent of asbestos fibers.

SWP water contains organic material which will form trihalomethanes (THMs) in the presence of chlorine. The production of THMs can be reduced or avoided by filtration and by substituting chloramines (chlorine and ammonia) for chlorine.

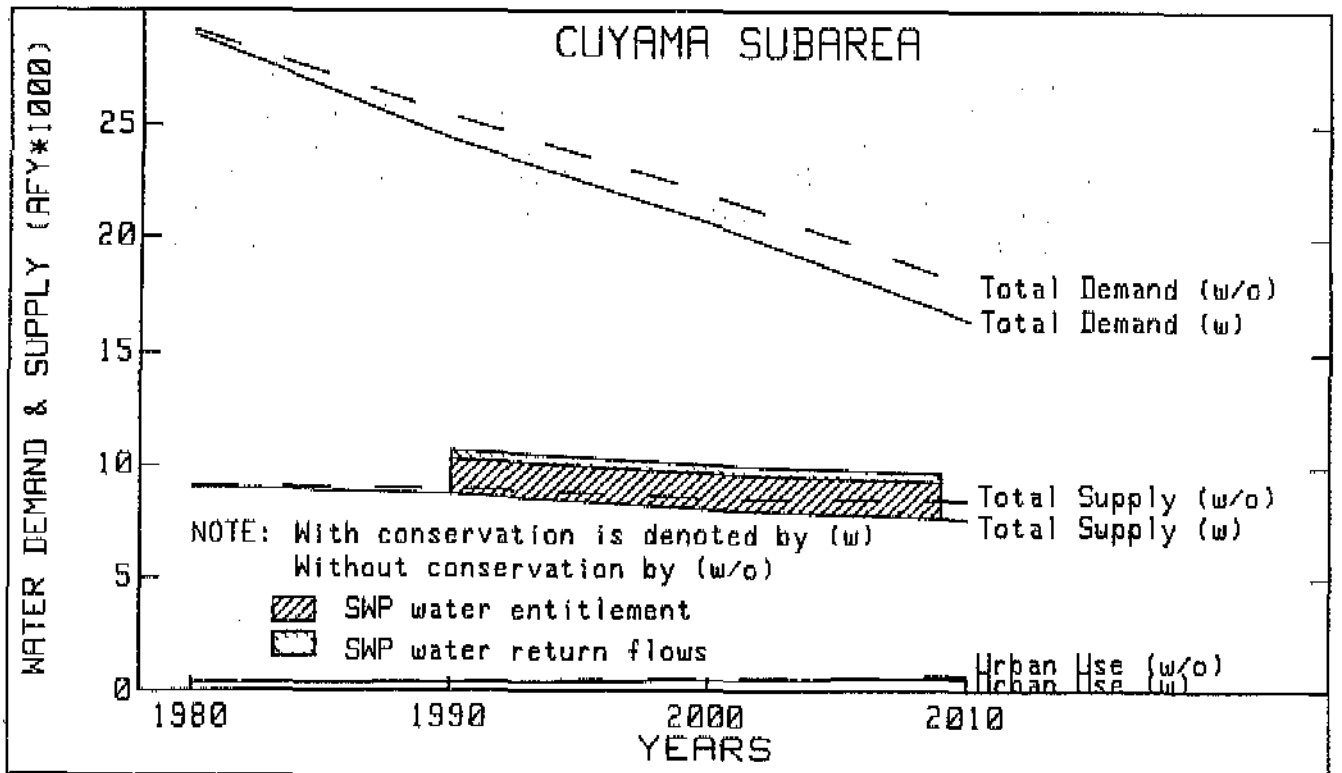


Figure 8 . WATER DEMAND AND SUPPLY FOR CUYAMA SUBAREA

TABLE 17

CUYAMA SUBAREA WATER SUPPLY BALANCE

In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	400	450	600	700
Agricultural	28700	24900	21300	17200
Total demand (w/o)*	29100	25350	21900	17900
Conservation				
Urban	20	50	100	100
Agricultural	180	1000	1200	1400
Total	200	1050	1300	1500
Total demand (w)*	28900	24300	20600	16400
Water supply				
Total supply (w/o)*	9050	8950	8500	8400
Redu in return flows (w)*	50	250	500	800
Total supply (w)*	9000	8700	8000	7600
Water supply balance without supplemental water	-19900	-15600	-12600	-8800
Supplemental water				
SWP entitlement**	0	1600	1600	1600
Return flows	0	400	400	400
Total additional water	0	2000	2000	2000
Water supply balance with supplemental water	-19900	-13600	-10600	-6800

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.

CHAPTER IV. COMPARISON OF WATER DEMAND AND SUPPLY PROJECTIONS

Based on the compilations given in the previous chapter, water demand and water supply projections for each of the subareas and for Santa Barbara County as a whole were made.

Cuyama Subarea
(Figure 8 and Table 17)

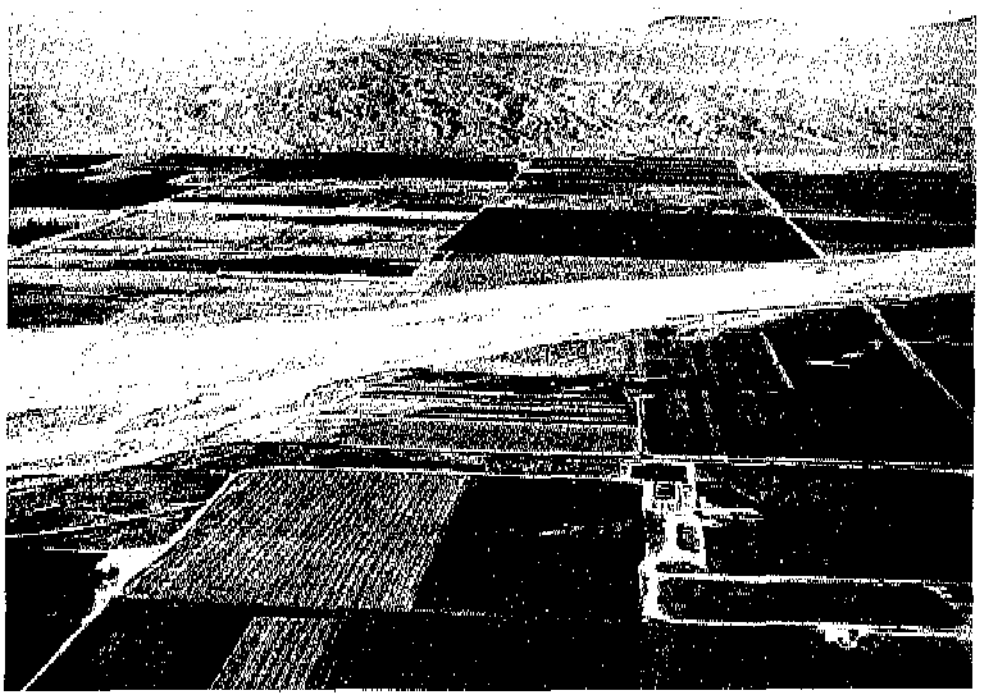
Urban water demand in Cuyama Subarea is minimal and is expected to change only slightly in the future due to a proposed residential development at New Cuyama.

Because urban demand is limited, water saved through urban conservation efforts (100 acre-feet annually by 2010) will have minimal effect upon the overall supply.

Agricultural applied water demand is projected to decline between 1980 and 2010, the rate of decline accelerating over time. Demand is projected to drop by 40 percent, or 11,500 acre-feet, over the 30-year period between 1980 and 2010. The decline is expected as a result of the reduction in the irrigated acreage and a change from growing alfalfa, which has a high water use, to irrigated wheat and vegetables, which require much less water.

Conservation could reduce agricultural applied water demand by 4 percent, or 1,000 acre-feet per year, in 1990, and 8 percent, or 1,400 acre-feet per year, by 2010. Net savings would be less because of the reduction in return flows. The total net deficit with conservation could be 15,600 acre-feet in 1990 and 8,800 acre-feet in 2010. The annual deficit decreases mainly because the irrigated acreage would be decreasing also.

The Cuyama Subarea has entitlement to 1,600 acre-feet of SWP water. Local projects to develop this supplemental water supply are investigated in this study. If 1,600 acre-feet is applied, the increase in return flow is estimated to be 400 acre-feet per year.



DRY CHANNEL of Cuyama River crossing Cuyama Subarea.

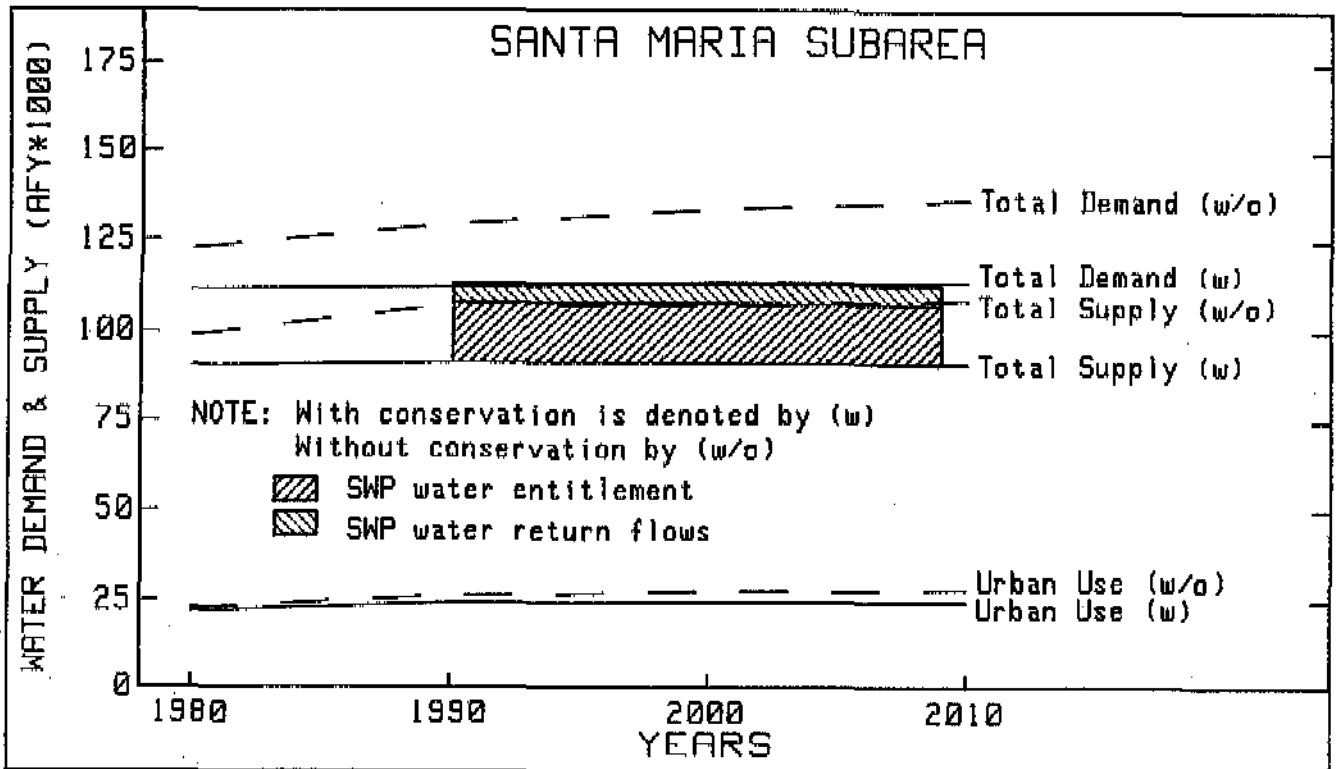


Figure 9 . WATER DEMAND AND SUPPLY FOR SANTA MARIA SUBAREA

TABLE 18

SANTA MARIA SUBAREA WATER SUPPLY BALANCE

In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	22800	26450	27600	28300
Agricultural	100000	103000	106000	108000
Total demand (w/o)*	122800	129450	133600	136300
Conservation				
Urban	800	2050	2900	3500
Agricultural	10400	15000	17000	19000
Total	11200	17050	19900	22500
Total demand (w)*	111600	112400	113700	113800
Water supply				
Total supply (w/o)*	98800	107500	107000	109000
Redu in return flows (w)*	8800	16200	16100	18500
Total supply (w)*	90000	91300	90900	90500
Water supply balance without supplemental water	-21600	-21100	-22800	-23300
Supplemental water				
SWP entitlement**	0	16850	16850	16850
Return flows	0	5350	5350	5350
Total additional water	0	22200	22200	22200
Water supply balance with supplemental water	-21600	1100	-600	-1100

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.

Santa Maria Subarea
(Figure 9 and Table 18)

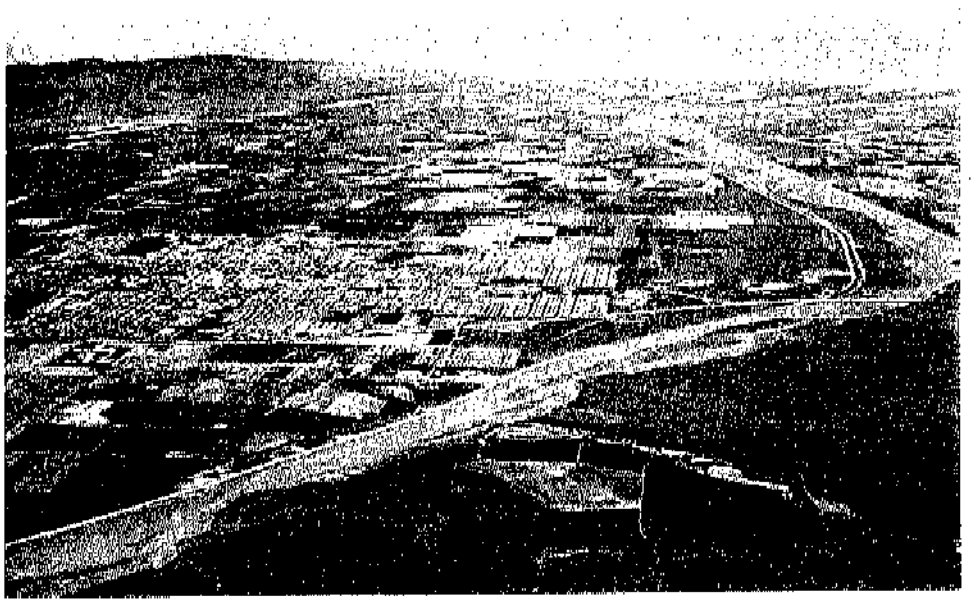
Urban applied water demand in the Santa Maria Subarea is projected to increase by 5,500 acre-feet, or 24 percent, between 1980 and 2010.

Agricultural applied water demand has been projected to increase by 8,000 acre-feet, or 8 percent, between 1980 and 2010.

When the demands are compared with the reliable water supply, including effects of conservation on demand and supply (return flow), the total annual deficits are projected to increase by 8 percent, or 1,700 acre-feet, between 1980 and 2010.

The Santa Maria Subarea has an entitlement to 16,850 acre-feet from the SWP. The increase in return flow from supplemental water is estimated to be 5,350 acre-feet per year, or 32 percent of the applied SWP water. Local projects to develop this supply are investigated in this study.

AGRICULTURE in Santa Maria Subarea is an important element in the economy of Santa Barbara County.



SANTA MARIA VALLEY lies in both Santa Barbara and San Luis Obispo Counties. The City of Santa Maria, in the center of the picture, is in Santa Barbara County.

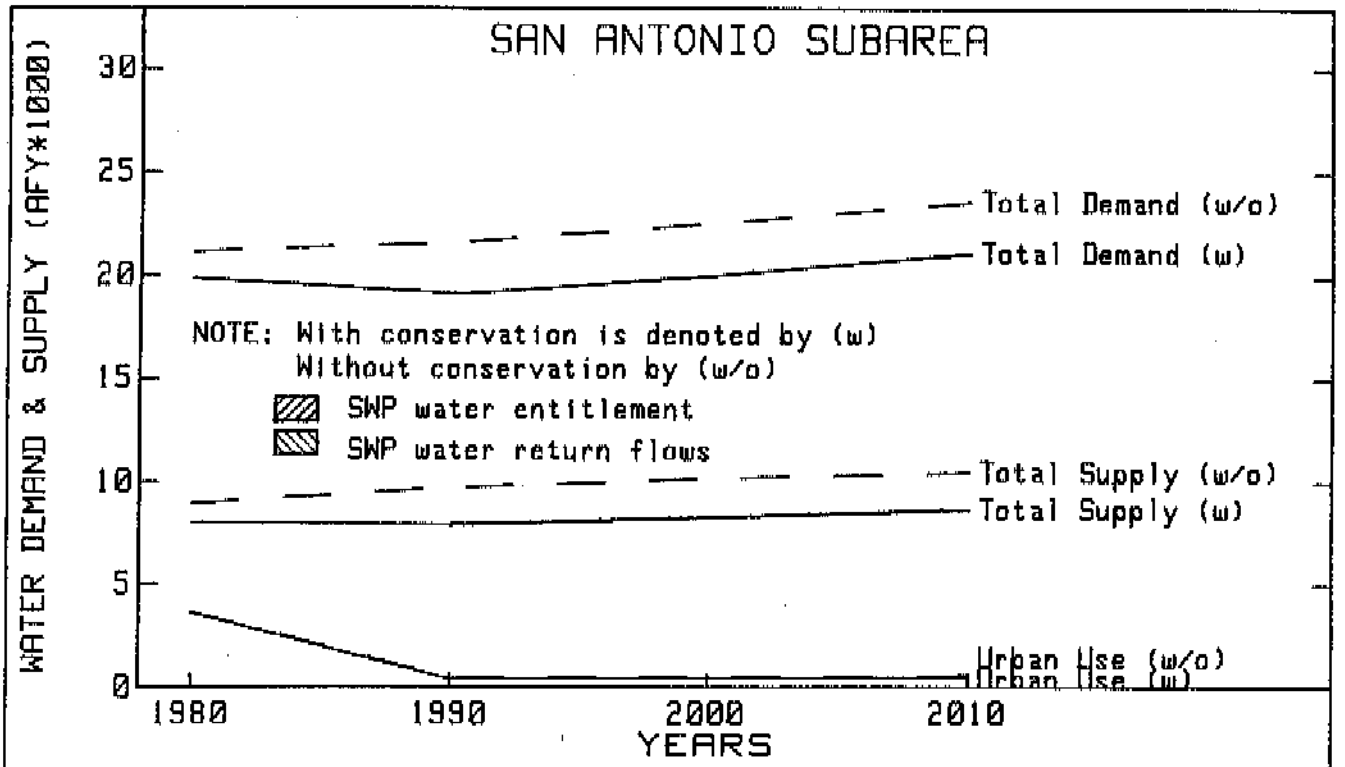


Figure 10. WATER DEMAND AND SUPPLY FOR SAN ANTONIO SUBAREA

TABLE 19

SAN ANTONIO SUBAREA WATER SUPPLY BALANCE

In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	3616	450	520	600
Agricultural	17500	21100	22000	23000
Total demand (w/o)*	21116	21550	22520	23600
Conservation				
Urban	16	50	70	100
Agricultural	1300	2400	2450	2400
Total	1316	2450	2520	2500
Total demand (w)*	19800	19100	20000	21100
Water supply				
Total supply (w/o)*	8950	9750	10200	10500
Redu in return flows (w)*	950	1850	1900	1800
Total supply (w)*	8000	7900	8300	8700
Water supply balance without supplemental water	-11800	-11200	-11700	-12400
Supplemental water				
SWP entitlement**	0	23	23	23
Return flows	0	0	0	0
Total additional water	0	23	23	23
Water supply balance with supplemental water	-11800	-11177	-11677	-12377

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.

San Antonio Subarea
(Figure 10 and Table 19)

The annual applied urban water demand is projected to decrease substantially between 1980 and 2010. This is because Vandenberg Air Force Base is expected to develop a supplemental supply or to switch its pumping of ground water from the San Antonio Subarea to the lower Santa Ynez Subarea by 1990 or thereabouts (i.e. because of the overdraft situation in the San Antonio Ground Water Basin, it is assumed that Vandenberg develops its supply elsewhere by 1990).

Agricultural applied water demand has been projected to increase from 17,500 acre-feet per year in 1980 to 23,000 by 2010, which is an increase of 31 percent, or 5,500 acre-feet. There have been substantial increases in irrigated land in San Antonio Subarea above those originally projected by other studies. There have been increases in vineyards, irrigated pasture, and vegetables.

Long-term conservation practices could decrease projected urban applied water demand 17 percent and agricultural applied water demand by 10 percent by 2010. Net savings from conservation would be less because of reduced return flows.

When demand is compared with the reliable water supply and effects of conservation on demand and supply are considered, the deficit in water supply, projected at 10-year intervals, would drop slightly between 1980 and 1990, then increase gradually to 12,400 acre-feet per year by 2010.

To meet future urban demands, Casmalia, which is within the San Antonio Subarea, has an entitlement to 23 acre-feet of SWP water. There is no return flow in the Casmalia area because of the local geology. Although Vandenberg Air Force Base presently uses considerable ground water from the San Antonio Subarea, its SWP entitlement is assumed to be received in the lower Santa Ynez Subarea.

LOOKING WEST across San Antonio Valley from the community of Los Alamos.

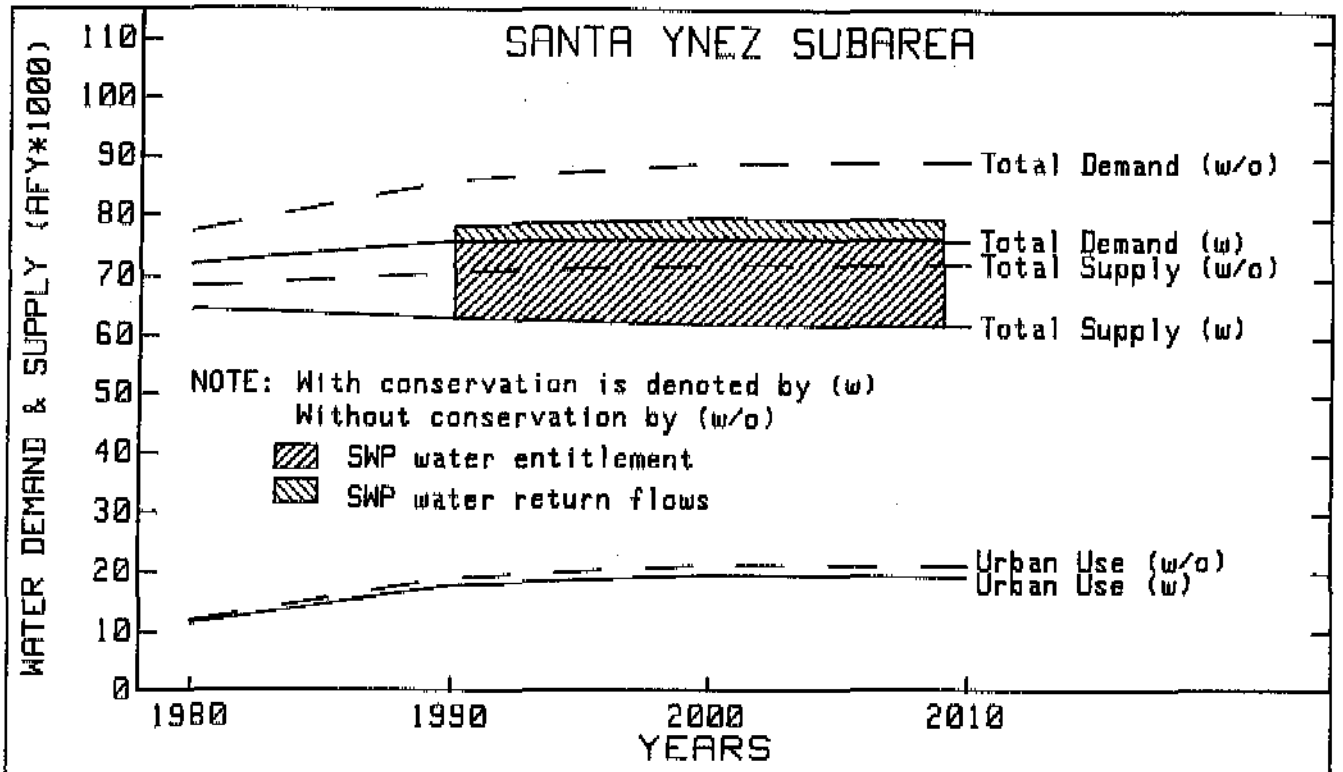


Figure 11. WATER DEMAND AND SUPPLY FOR SANTA YNEZ SUBAREA

TABLE 20

TOTAL SANTA YNEZ SUBAREA WATER SUPPLY BALANCE

In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	12000	19000	21300	21100
Agricultural	65300	66900	67600	68200
Total demand (w/o)*	77300	85900	88900	89300
Conservation				
Urban	500	1300	1700	1900
Agricultural	5000	8900	11000	11400
Total	5500	10200	12700	13300
Total demand (w)*	71800	75700	76200	76000
Water supply				
Total supply (w/o)*	68100	70700	71900	72300
Redu in return flows (w)*	3800	7900	10100	10600
Total supply (w)*	64300	62800	61800	61700
Water supply balance without supplemental water	-7500	-12900	-14400	-14300
Supplemental water				
SWP entitlement**	0	12738	14568	14578
Return flows	0	2678	3319	3322
Total additional water	0	15416	17887	17900
Water supply balance with supplemental water	-7500	2516	3487	3600

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.

Santa Ynez Subarea
(Figure 11 and Table 20)

The annual applied urban water demand in the total Santa Ynez Subarea is projected to increase by about 9,100 acre-feet, or 76 percent, between 1980 and 2010. Long-term conservation practices could reduce applied urban water demand in 2010 from 21,100 acre-feet per year to 19,200 acre-feet per year. The net savings would be less because of reduced return flows.

Agricultural water demand has been projected to increase slowly between 1980 and 2010.

Through conservation, agricultural water demand could be reduced by approximately 11,400 acre-feet, or 17 percent, to 56,800 acre-feet in 2010. Net water savings would be much less because of reduced return flows to ground water.

When the demand is compared with the reliable water supply of approximately 64,000 to 62,000 acre-feet per year and the effects of conservation on demand and supply are taken into consideration, the total deficits in water demand are projected to be 7,500 to 14,300 acre-feet per year between 1980 and 2010.

To meet future needs, the Santa Ynez Subarea has an entitlement to 14,578 acre-feet per year of SWP water. Return flow from applied SWP water is estimated to be 3,322 acre-feet per year, or 23 percent of the applied SWP water.

Figure 12 and **Table 21** and **Figure 13** and **Table 22** show projected supplies and demands for the lower and upper Santa Ynez Subareas considered separately.

LOWER SANTA YNEZ SUBAREA looking west toward the ocean over the City of Lompoc.

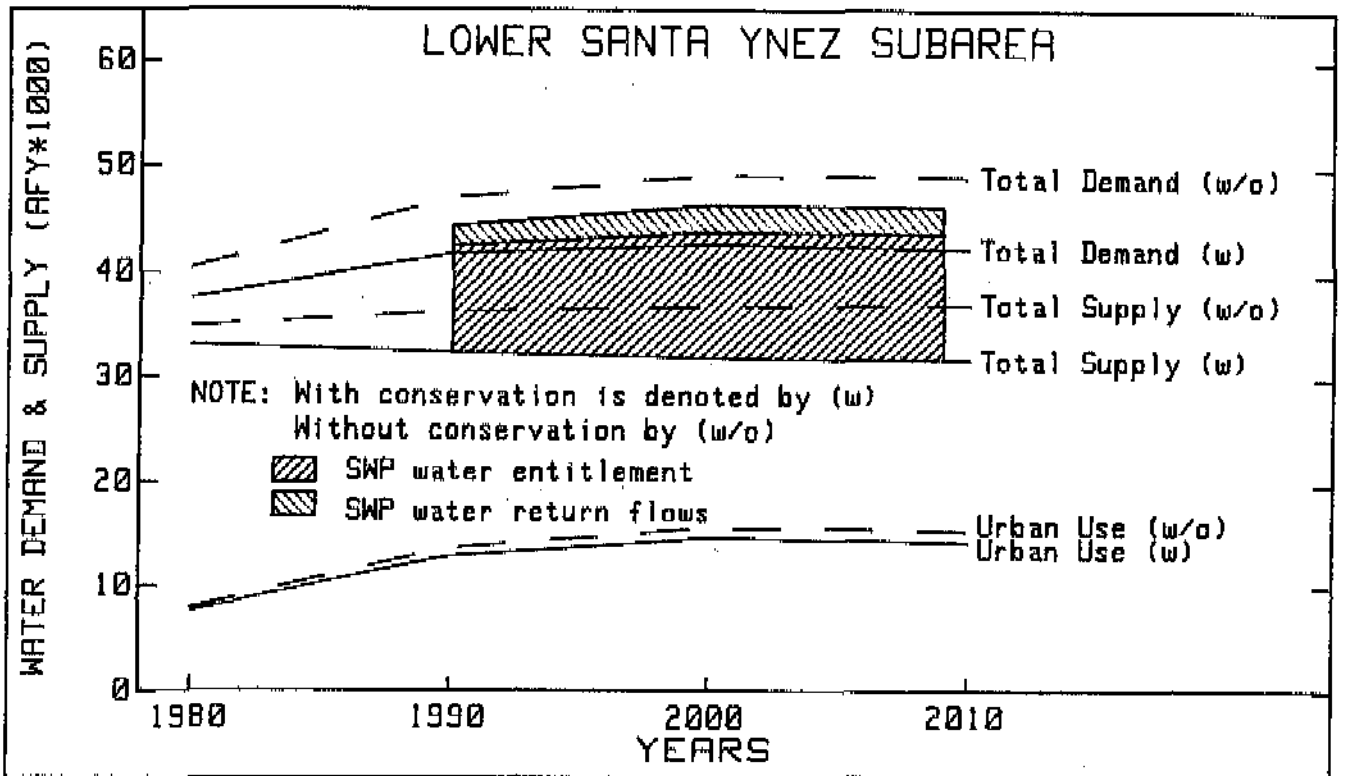


Figure 12. WATER DEMAND AND SUPPLY FOR LOWER SANTA YNEZ SUBAREA

TABLE 21

LOWER SANTA YNEZ SUBAREA WATER SUPPLY BALANCE

In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	7900	13800	15800	15400
Agricultural	32500	33200	33400	33600
Total demand (w/o)*	40400	47000	49200	49000
Conservation				
Urban	300	800	1000	1100
Agricultural	2500	4400	5400	5600
Total	2800	5200	6400	6700
Total demand (w)*	37600	41800	42800	42300
Water supply				
Total supply (w/o)*	34900	36400	37000	37100
Redu in return flows (w)*	1900	4000	5100	5400
Total supply (w)*	33000	32400	31900	31700
Water supply balance without supplemental water	-4600	-9400	-10900	-10600
Supplemental water				
SWP entitlement**	0	10160	11990	12000
Return flows	0	1856	2497	2500
Total additional water	0	12016	14487	14500
Water supply balance with supplemental water	-4600	2616	3587	3900

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.

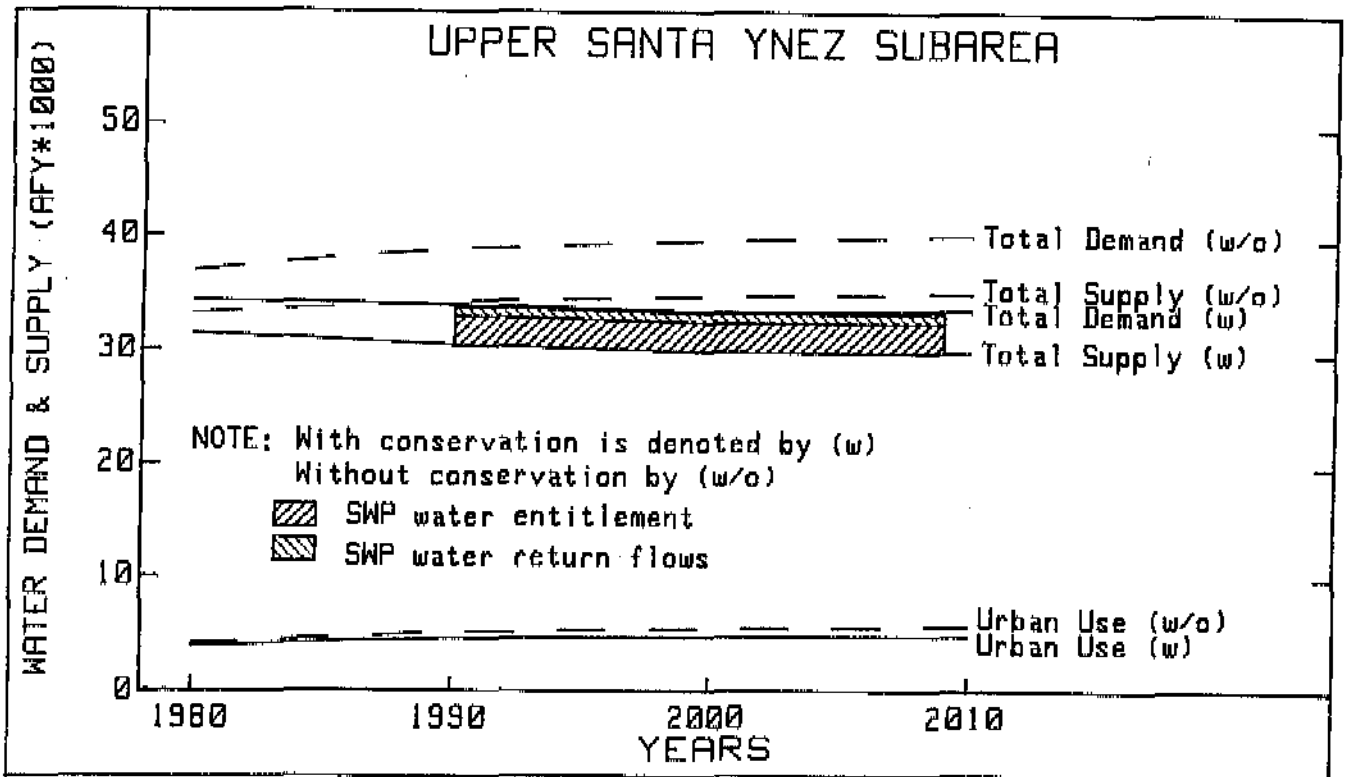


Figure 13. WATER DEMAND AND SUPPLY FOR UPPER SANTA YNEZ SUBAREA

TABLE 22

UPPER SANTA YNEZ SUBAREA WATER SUPPLY BALANCE

In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	4100	5200	5500	5700
Agricultural	32800	33700	34200	34600
Total demand (w/o)*	36900	38900	39700	40300
Conservation				
Urban	200	500	700	800
Agricultural	2500	4500	5600	5800
Total	2700	5000	6300	6600
Total demand (w)*	34200	33900	33400	33700
Water supply				
Total supply (w/o)*	33200	34300	34900	35200
Redu in return flows (w)*	1900	3900	5000	5200
Total supply (w)*	31300	30400	29900	30000
Water supply balance without supplemental water	-2900	-3500	-3500	-3700
Supplemental water				
SWP entitlement**	0	2578	2578	2578
Return flows	0	822	822	822
Total additional water	0	3400	3400	3400
Water supply balance with supplemental water	-2900	-100	-100	-300

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.

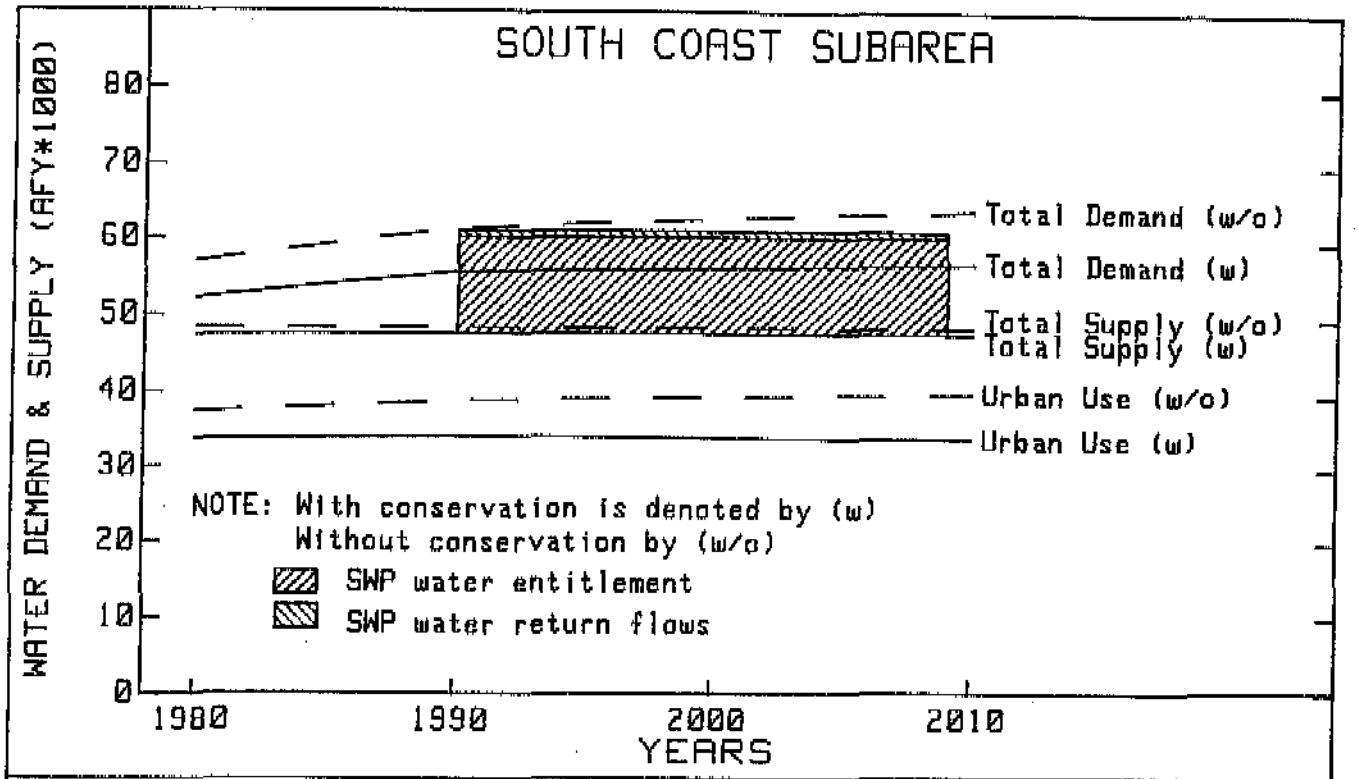


Figure 14. WATER DEMAND AND SUPPLY FOR SOUTH COAST SUBAREA

TABLE 23

SOUTH COAST SUBAREA WATER SUPPLY BALANCE

In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	37300	38900	39500	40000
Agricultural	19500	22500	23300	24000
Total demand (w/o)*	56800	61400	62800	64000
Conservation				
Urban	3700	4700	5500	6000
Agricultural	1000	1000	1000	1000
Total	4700	5700	6500	7000
Total demand (w)*	52100	55700	56300	57000
Water supply				
Total supply (w/o)*	48200	48500	48600	48600
Redu in return flows (w)*	700	700	700	700
Total supply (w)*	47500	47800	47900	47900
Water supply balance without supplemental water	-4600	-7900	-8400	-9100
Supplemental water				
SWP entitlement**	0	12435	12435	12435
Return flows	0	865	865	865
Total additional water	0	13300	13300	13300
Water supply balance with supplemental water	-4600	5400	4900	4200

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.

South Coast Subarea
(Figure 14 and Table 23)

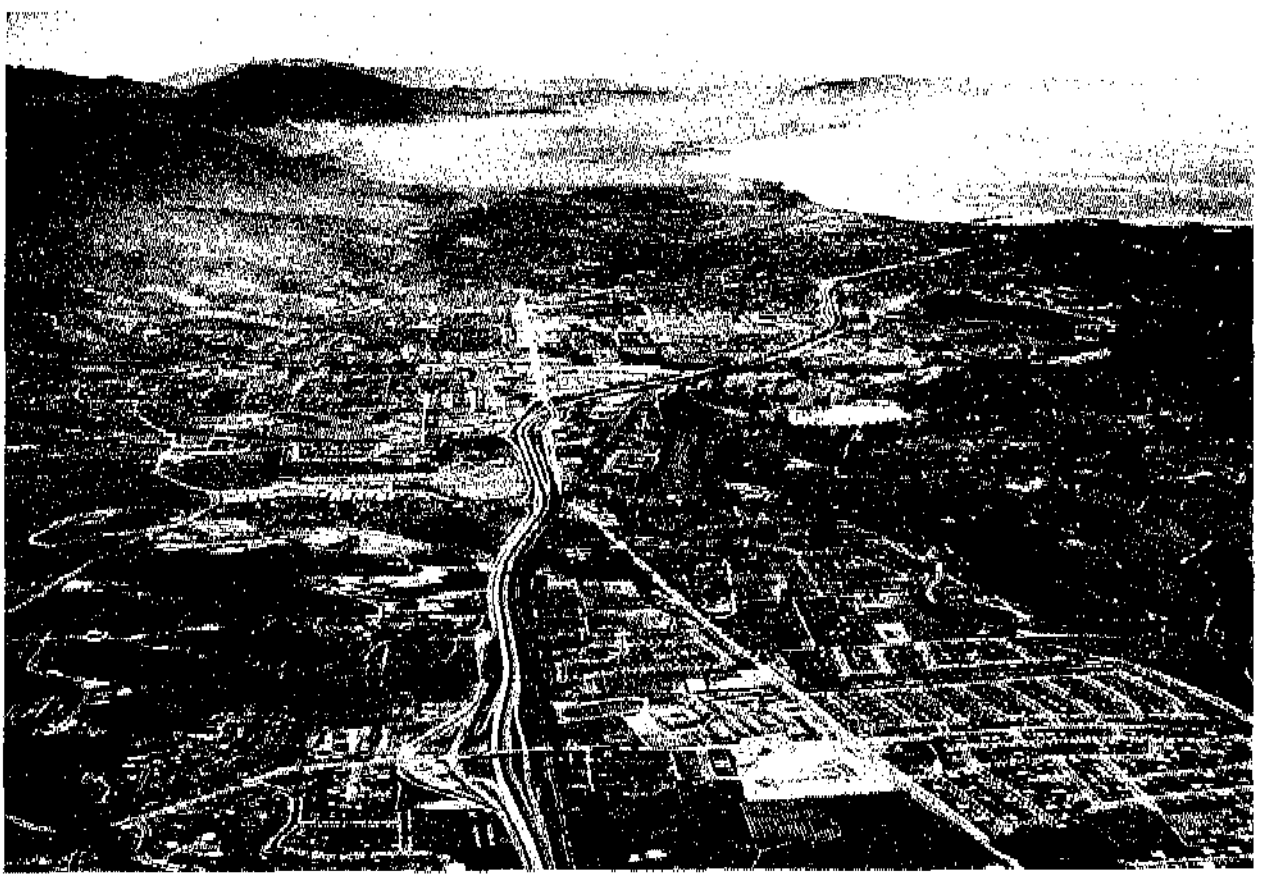
The annual urban applied demand is projected to increase by 7 percent, or 2,700 acre-feet, between 1980 and 2010.

Agricultural applied water demand has been projected to increase by 23 percent, or 4,500 acre-feet, between 1980 and 2010.

Conservation practices will decrease urban applied water demand about 15 percent and agricultural applied water demand by about 4 percent by 2010.

When the demand is compared with the reliable water supply of approximately 48,000 acre-feet per year and the effects of conservation on demand and supply are considered, the anticipated deficit in the combined urban and agricultural demand, projected over the 30 years 1980-2010, would be 4,600 to 9,100 acre-feet per year.

To meet future water demands, the South Coast has an entitlement to 12,435 acre-feet per year of SWP water. Additional return flow from the use of SWP water, estimated at 7 percent in the South Coast, would be about 900 acre-feet per year. A delivery system for SWP entitlement water or local water supply projects is developed in this study for analysis.



SOUTH COAST SUBAREA, looking east from Goleta Valley toward the cities of Santa Barbara, Montecito, Summerland, and Carpinteria.

TABLE 24
WATER SUPPLY BALANCE WITHOUT SUPPLEMENTAL WATER SUPPLY *

In acre-feet per year

Subarea	1980	1990	2000	2010
Cuyama	-19,900	-15,600	-12,600	- 8,800
Santa Maria	-21,600	-21,100	-22,800	-23,300
San Antonio	-11,800	-11,200	-11,700	-12,400
Santa Ynez	- 7,500	-12,900	-14,400	-14,300
Lower	-4,600	-9,400	-10,900	-10,600
Upper	-2,900	-3,500	- 3,500	- 3,700
South Coast	- 4,600	- 7,900	- 8,400	- 9,100
Total	-65,400	-68,700	-69,900	-67,900

* Considering the effects of conservation on demand and supply.

TABLE 25
WATER SUPPLY BALANCE WITH A
SUPPLEMENTAL WATER SUPPLY *

In acre-feet per year

Subarea	1990	2000	2010
Cuyama	-13,600	-10,600	- 6,800
Santa Maria	+ 1,100	- 600	- 1,100
San Antonio	-11,177	-11,677	-12,377
Santa Ynez	+ 2,516	+ 3,487	+ 3,600
Lower	+2,616	+3,587	+3,900
Upper	- 100	- 100	- 300
South Coast	+ 5,400	+ 4,900	+ 4,200
Total	-15,761	-14,490	-12,477

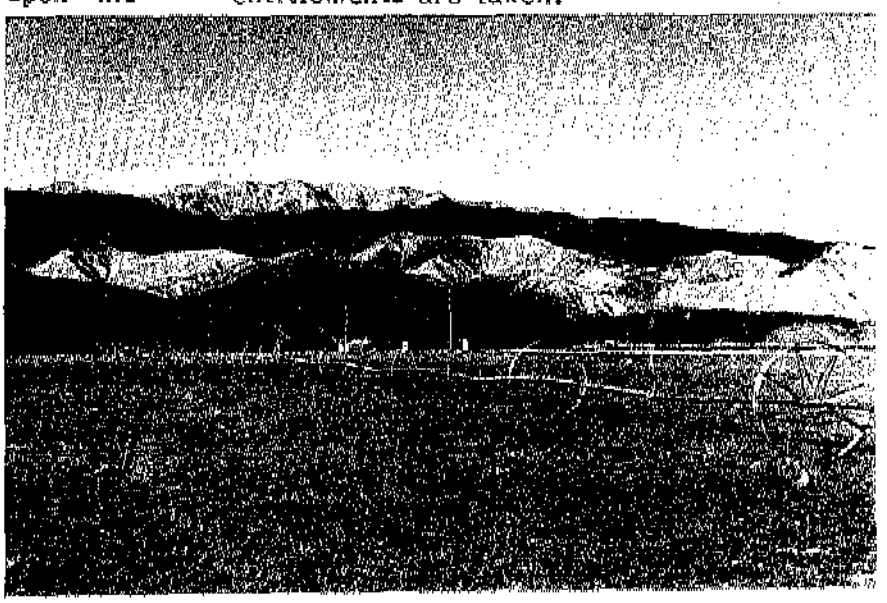
* Assumes water deliveries up to SWP entitlement levels after considering the effects of conservation on demand and supply.

Countywide Summary of Water Supply Deficits

The water demand, after considering effects of conservation on demand and supply, in Santa Barbara County has exceeded the existing water supply by an estimated 65,400 acre-feet in 1980 and is predicted to exceed it by 67,900 acre-feet by 2010. With the delivery of the full SWP entitlement or an equivalent supplemental water supply to Santa Barbara County of 45,486 acre-feet, plus return flow of 9,937 acre-feet, the deficit can be reduced to approximately 12,500 acre-feet in 2010.

The deficits by subareas based upon the current local water supply, without and with a supplemental supply, and anticipated demand are summarized in **Tables 24 and 25. Figure 15** and **Table 26** depict quantities on a countywide basis.

Figure 16 and **Table 27** show the combined net water supply balance for all subareas except Cuyama and San Antonio. These displays focus on the subareas where some supplemental supply is most likely to be developed. In these subareas, the net water supply balance shown for the year 2010 is a deficit (-46,700 acre-feet per year) without a supplemental supply, but is a surplus (of 6,700 acre-feet per year) if full SWP entitlements are taken.



CUYAMA VALLEY. Irrigation wheel line in alfalfa field.

JAMESON LAKE and Juncal Dam in upper Santa Ynez watershed.

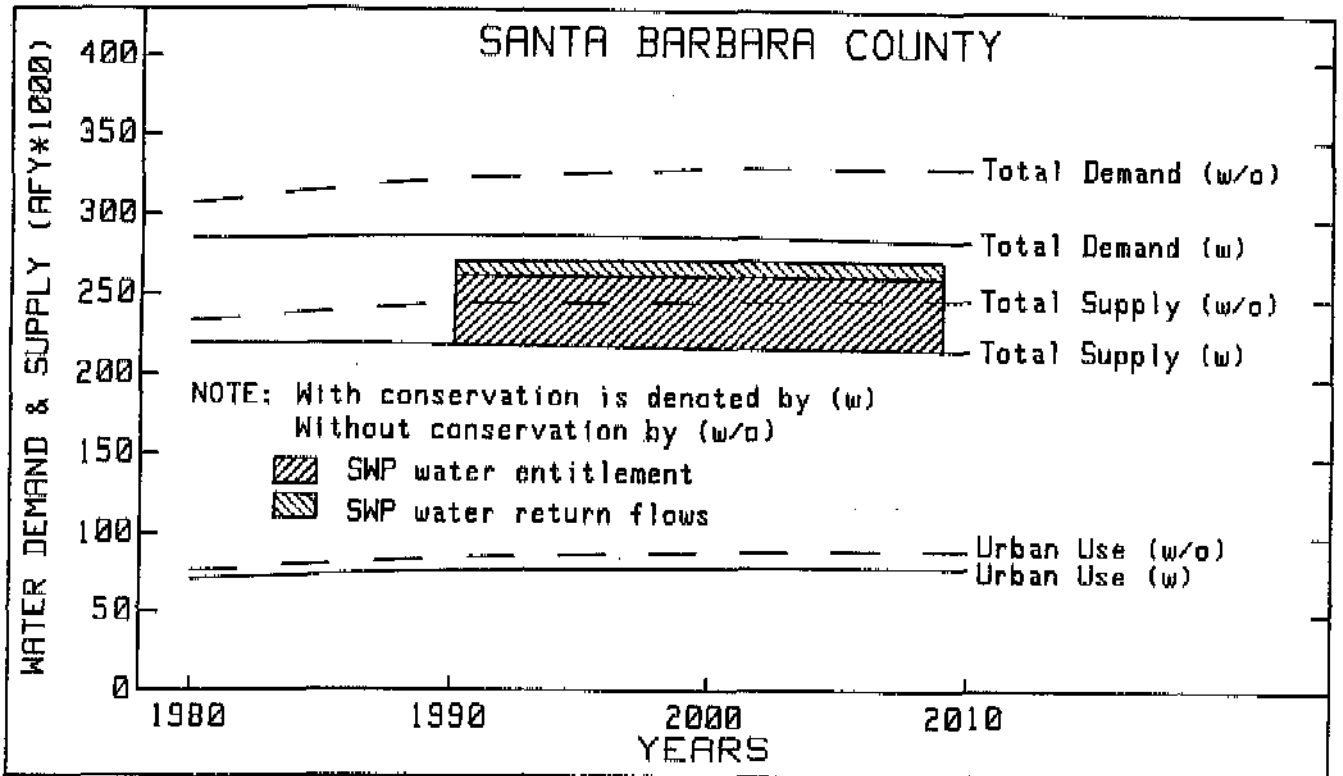


Figure 15. WATER DEMAND AND SUPPLY FOR SANTA BARBARA COUNTY

TABLE 26

TOTAL SANTA BARBARA COUNTY WATER SUPPLY BALANCE

In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	76100	85250	89520	90700
Agricultural	231000	238400	240200	240400
Total demand (w/o)*	307100	323650	329720	331100
Conservation				
Urban	5000	8150	10270	11600
Agricultural	17900	28300	32650	35200
Total	22900	36450	42920	46800
Total demand (w)*	284200	287200	286800	284300
Water supply				
Total supply (w/o)*	233100	245400	246200	248800
Redu in return flows (w)*	14300	26900	29300	32400
Total supply (w)*	218800	218500	216900	216400
Water supply balance without supplemental water	-65400	-68700	-69900	-67900
Supplemental water				
SWP entitlement**	0	43646	45476	45486
Return flows	0	9293	9934	9937
Total additional water	0	52939	55410	55423
Water supply balance with supplemental water	-65400	-15761	-14490	-12477

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.

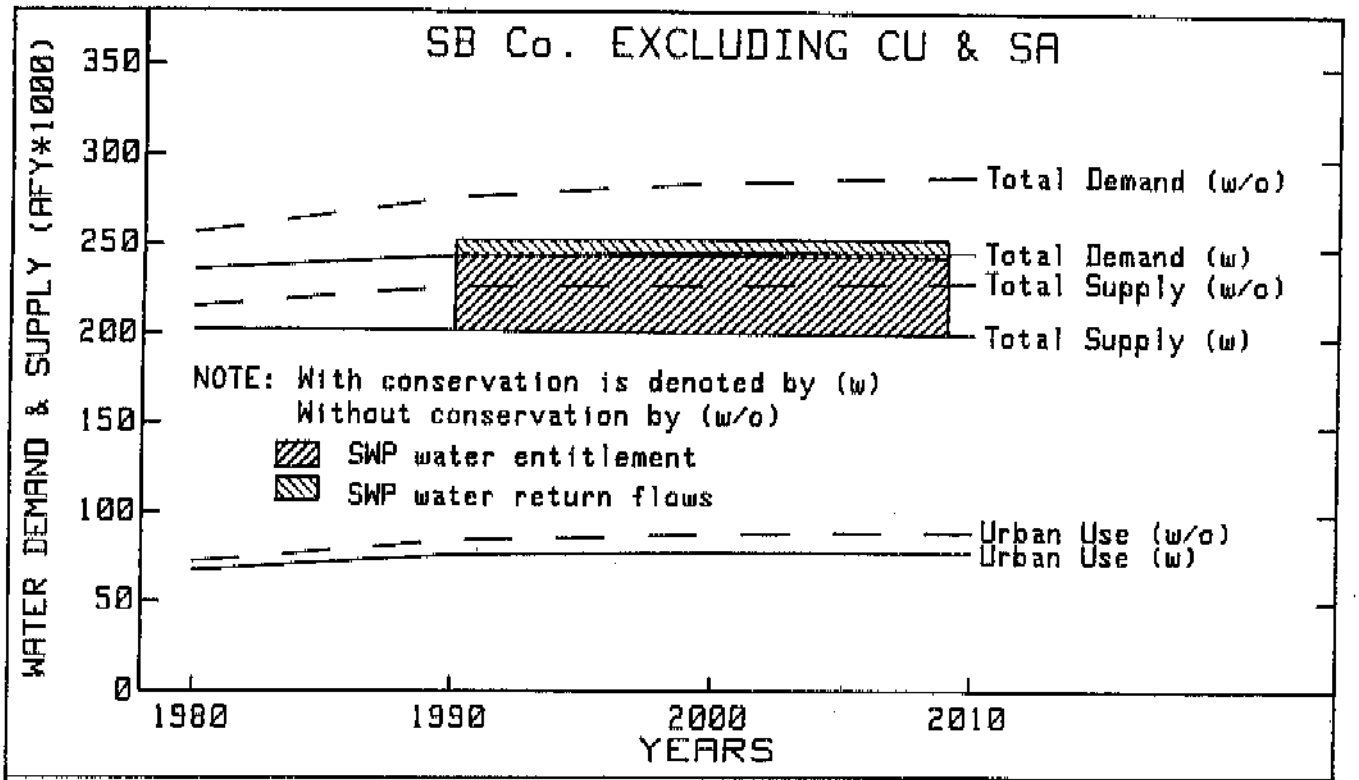


Figure 16. COUNTY DEMAND AND SUPPLY LESS CUYAMA AND SAN ANTONIO

TABLE 27

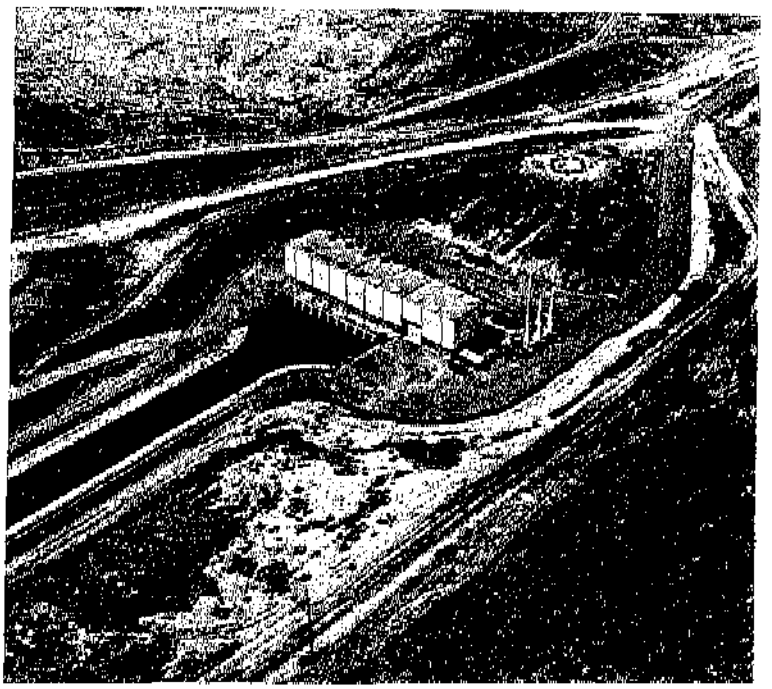
COUNTY WATER SUPPLY BALANCE LESS CUYAMA AND SAN ANTONIO

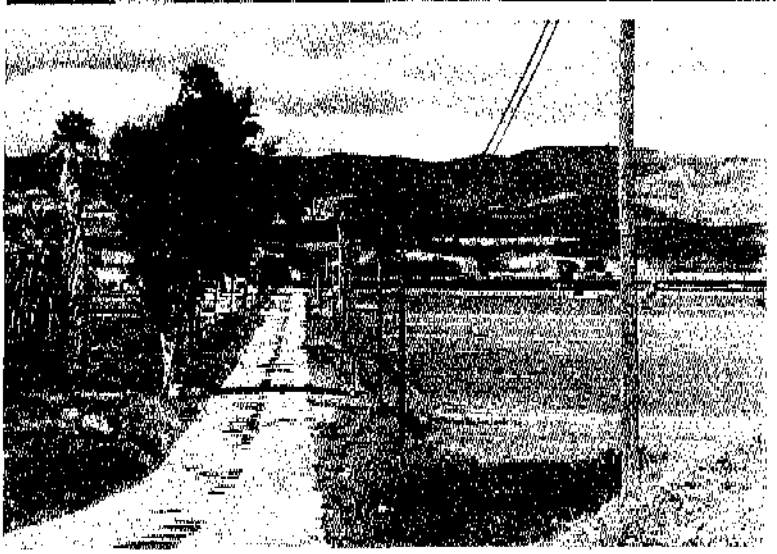
In acre-feet per year

	1980	1990	2000	2010
Applied water demand				
Urban	72100	84350	88400	89400
Agricultural	184800	192400	196900	200200
Total demand (w/o)*	256900	276750	285300	289600
Conservation				
Urban	5000	8050	10100	11400
Agricultural	16400	24900	29000	31400
Total	21400	32950	39100	42800
Total demand (w)*	235500	243800	246200	246800
Water supply				
Total supply (w/o)*	215100	226700	227500	229900
Redu in return flows (w)*	13300	24800	26900	29800
Total supply (w)*	201800	201900	200600	200100
Water supply balance without supplemental water	-33700	-41900	-45600	-46700
Supplemental water				
SWP entitlement**	0	42023	43876	43886
Return flows	0	8893	9534	9537
Total additional water	0	50916	53410	53423
Water supply balance with supplemental water	-33700	9016	7810	6723

* Note: (w/o) denotes without or before conservation measures are employed, while (w) denotes with or after conservation measures are employed.

** To be met by development of local projects, delivery of SWP water, or both.





ROUTE THAT STATE WATER PROJECT WATER WOULD FOLLOW

Two pumping plants are in operation on the existing portion of the Coastal Branch of the California Aqueduct: Las Perillas (above left) and Badger Hill (above right). If extended its final 83 miles, the Coastal Branch would terminate at the Santa Maria River near the San Luis Obispo-Santa Barbara County line (left). Water would then be distributed within Santa Barbara County by means of an Intra-County Distribution System (ICDS). Possible route of the ICDS through Santa Maria Subarea would be about one mile east of and parallel to the road shown at the bottom left.

CHAPTER V. IDENTIFICATION OF WATER SUPPLY OPTIONS

Through the years, numerous local water supply projects have been explored in Santa Barbara County. For the current study these projects have been reviewed. In addition, the public was asked to suggest other local projects, and these were also included for consideration. In all cases, the projects considered should be capable, either on their own or in combination with others, of delivering up to 45,486 acre-feet of water per year, which is equivalent to the SBCFCWCD contractual entitlement to SWP water.

In this study, the water supply options that were identified for each subarea consisted of both local projects and the SWP.

State Water Project

SWP water originates with releases from Oroville Reservoir and unregulated flows in the Sacramento-San Joaquin Delta that go into the California Aqueduct for conveyance to the State's 30 water service contractors, including the SBCFCWCD. As originally envisioned, delivery to Santa Barbara County would be diverted from the California Aqueduct via the Coastal Branch, which would pass through San Luis Obispo County and terminate near Santa Maria.

The Coastal Branch, if completed, would extend about 98 miles from the main California Aqueduct at Milepost 184.63, near Kettleman City in the San Joaquin Valley, to a terminus at the Santa Maria River near the San Luis Obispo-Santa Barbara County line (**Figure 17**). Phase I, known as the Coastal Stub, was placed in operation in January 1968, in Kings and Kern Counties. It consists of some 15 miles of canal, Las Perillas and Badger Hill Pumping Plants, and discharge lines, with the terminus at Berrenda Mesa Water District's pumping plant (near the site of the proposed Devil's Den Pumping Plant). Water deliveries are made to Devil's Den Water District and to Berrenda Mesa Water District from the Coastal Stub.

Phase II, the remaining 83 miles of the Coastal Branch yet to be completed, would deliver water to SLOCFCWCD and SBCFCWCD. This phase would probably include three additional pumping plants and a power-recovery plant, with the 83 miles of pipeline.

Water would be delivered within Santa Barbara County through an Intra-County Distribution System (ICDS), which would be constructed by the local agencies. (See **Figure 18.**) Delivery of SWP water to the Santa Maria terminus would be common to all subareas; however, the ICDS alignment and configuration would depend on the level of participation by each subarea, which would be determined by the local water options selected.

For this study, apportionment of SWP entitlements was made among the five subareas and local water agencies to approximate Resolution No. 1266 of the SBCFCWCD Board of Directors, dated December 6, 1982, as shown in **Table 2** in Chapter II.

Because DWR is faced with the eventuality that total contractual demands on the SWP will exceed its existing dependable yield, DWR is making the following efforts to obtain additional yield:

- Evaluating alternative management plans to make maximum use of existing resources so that the long-range water supply obligations of the SWP can be met.
- Studying a large-scale water supply project in an effort to provide substantial amounts of additional SWP yield, and

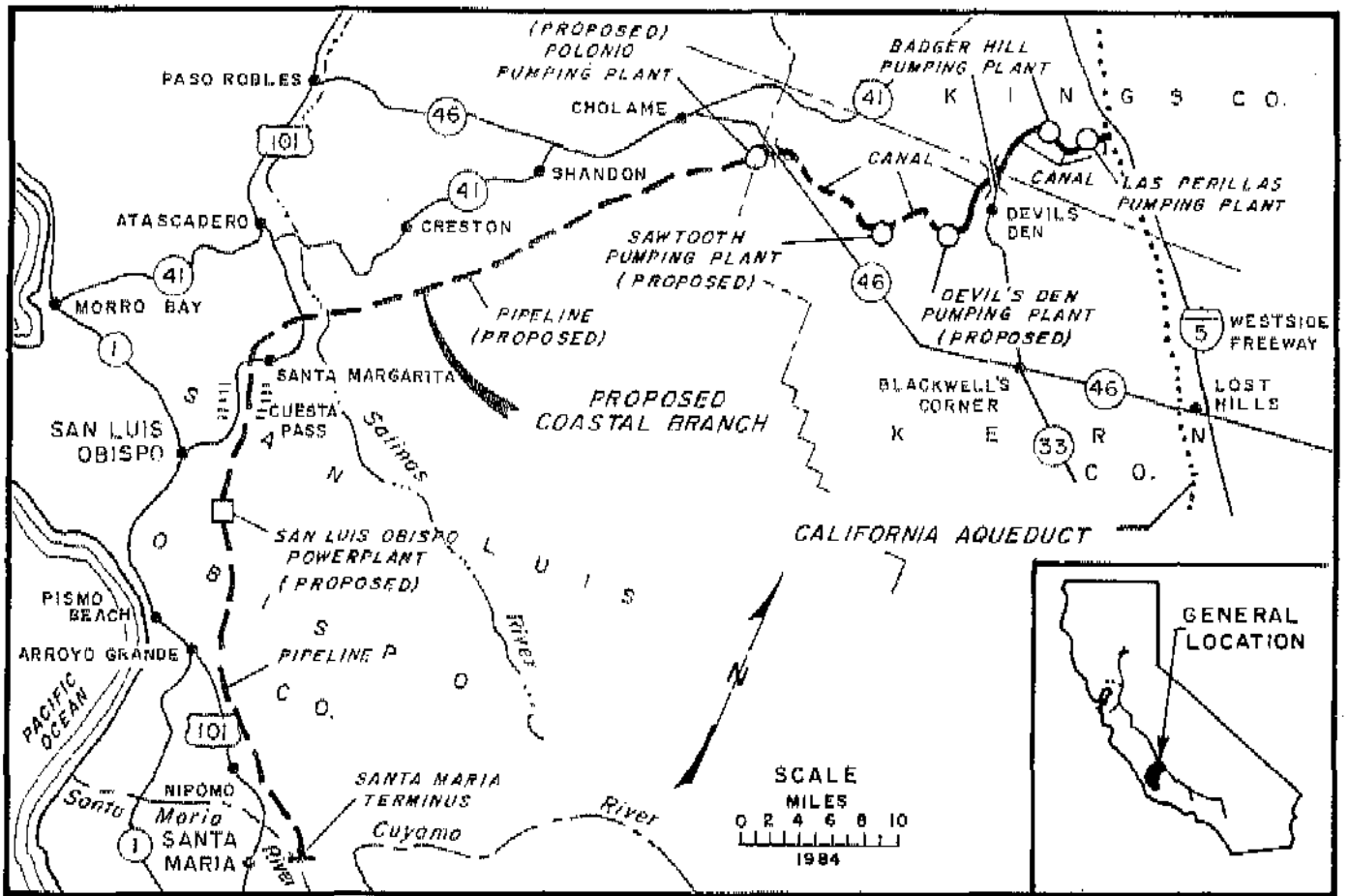


Figure 17 – PROPOSED COASTAL BRANCH OF CALIFORNIA AQUEDUCT

- o Investigating local water supply projects as new sources of water for the State Water Resources Development System (which includes the SWP) as alternatives or additions to those sources previously considered.

DWR is continually studying the hydrology of the Sacramento and San Joaquin River basins and the future probable operation of the SWP. One of the outputs is the projected capability and reliability of water deliveries to SWP contractors under varying assumptions of available supply and service area demands.

The studies are conducted at various levels of assumed development. Project operation is simulated over a 57-year period using data from 1922 through 1978. Each operation study assumes certain facilities in place and functional. The validity of the facility development assumptions is subject to many factors external to the operation study.

Based on currently available study results which assume development of specified facilities, the probability of the SWP imposing a reduction in its requests for entitlement water in the year 2000 is approximately 70 percent. Annual entitlement requests for the project as a whole would typically be reduced up to 20 percent in 2000. If conditions were similar to the extended dry period experienced in the Sacramento-San Joaquin Valley during the 1928-34 drought, necessary reduction would be about 30 percent. Smaller deficiencies would occur in less severe droughts. However, the actual reduction, if any, for municipal users such as in Santa

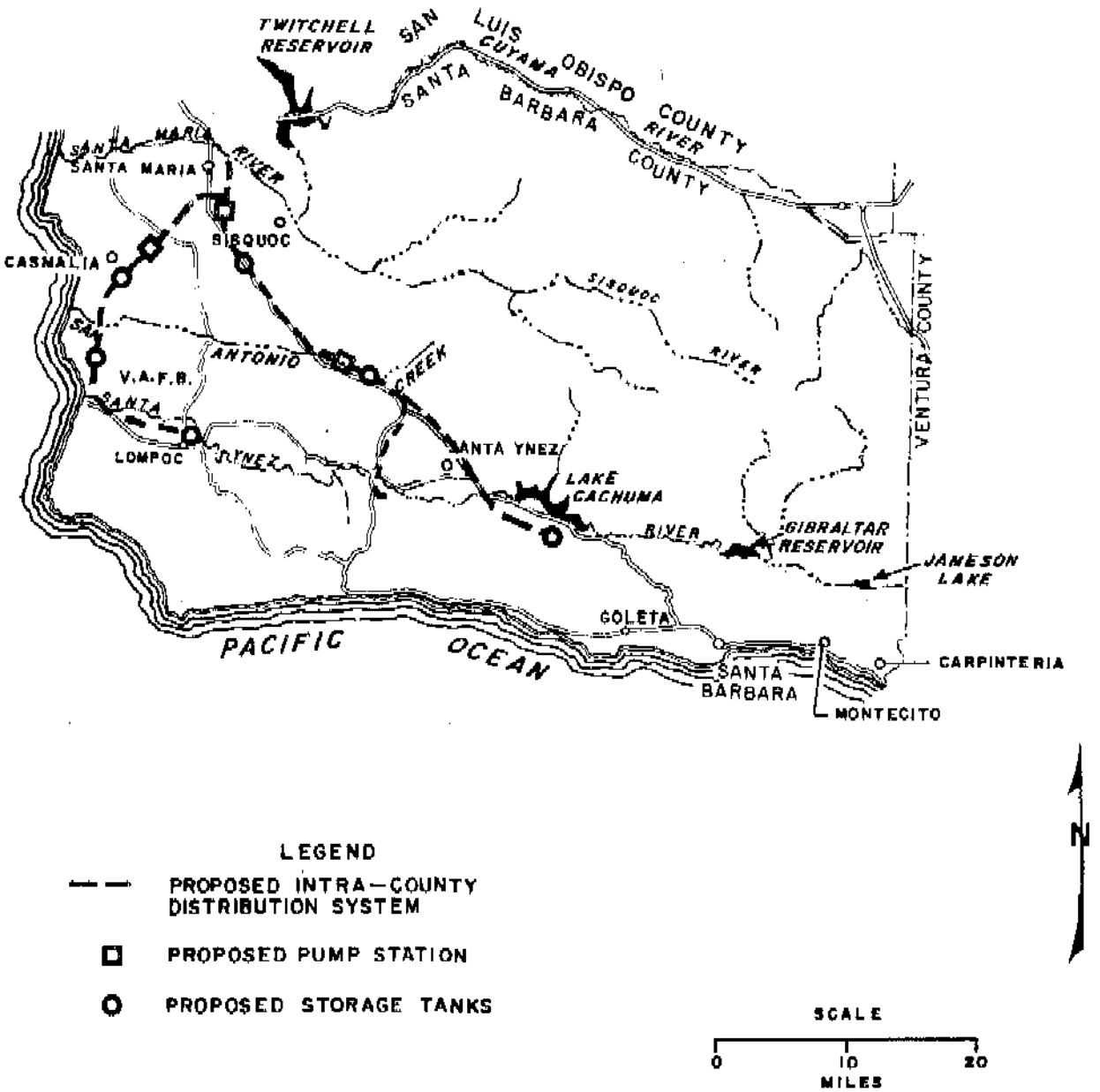


Figure 18 - PROPOSED ALIGNMENT OF SANTA BARBARA COUNTY INTRA-COUNTY DISTRIBUTION SYSTEM (ICDS)

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1968

Barbara County would be much less and less frequent, since agricultural users are required to take deficiencies of up to 50 percent in a single year and 100 percent in any consecutive 7-year dry period before any reduction is made for other users.

These results assume the following facilities are in place: the existing SWP facilities, North Bay Aqueduct, enlarged Delta pumping plant, enlarged East Branch (600 cfs), Sherman Island overland facilities, Delta transfer facilities, Los Banos Grandes with 500,000 acre-feet of storage capacity, and extended Coastal Branch to serve San Luis Obispo and Santa Barbara Counties.

Generally, except for desalination, the results indicate SWP water deliveries are comparable in reliability to the alternatives presented in this study.

Incorporation of Local Projects

Local water supply projects, which include reservoirs, water reclamation projects, and ground water storage programs, are now being considered as sources of additional water for the SWP because of environmental, energy, and cost considerations. Local projects may be able to decrease SWP energy requirements by minimizing the need for transporting water over long distances from the Sacramento-San Joaquin Delta to SWP service areas.

Water supply contractors within SWP service areas, such as SBCFCWCD, are being encouraged to study and develop proposals for local projects, with the understanding that DWR will investigate only those projects that appear to be feasible on an engineering and financial basis and are economically and environmentally sound. To facilitate evaluation and inclusion of local projects into the SWP, DWR prepared "Revised Guidelines on Funding Local Water Supply Projects for Inclusion in the State Water Project", dated December 29, 1982.

The use of such local projects is in keeping with the expressed wishes of the local residents in Santa Barbara County, who have encouraged their local water agencies to develop a number of possible projects for consideration by DWR.

In this study, each local water supply project was analyzed on the same basis, taking into consideration the following:

- Incremental Project Yield Reliability. To what extent can the project be relied on as a water source during a drought period (critical dry period)?
- Estimated Cost. What is the project's capital cost (April 1984 dollars) and what is its annual unit cost in dollars per acre-foot of water delivered?
- Financing by SWP. Does the project meet the eligibility criteria for financing by the SWP?
- Engineering Considerations. Is the project engineeringly feasible? Can it be built to meet existing standards by acceptable techniques?
- Net Energy Required. Will the project rely heavily on energy consumption (energy-intensive project) or will it generate power?
- Water Quality and Environmental Considerations. What are the water quality and environmental impacts of the project? Will its water quality have a positive or adverse impact on the existing water supply? Will it have a minor or a major impact on the environment? What are some of the benefits? **Figure 19** shows the quality in terms of total dissolved solids (TDS) content of water from the options discussed in this report.
- Legal and Institutional Considerations. What legal or institutional constraints, if any, are present and can they be overcome? What agencies are involved and what agreements must be reached?

This approach provided an opportunity to consider all possible water supply projects,

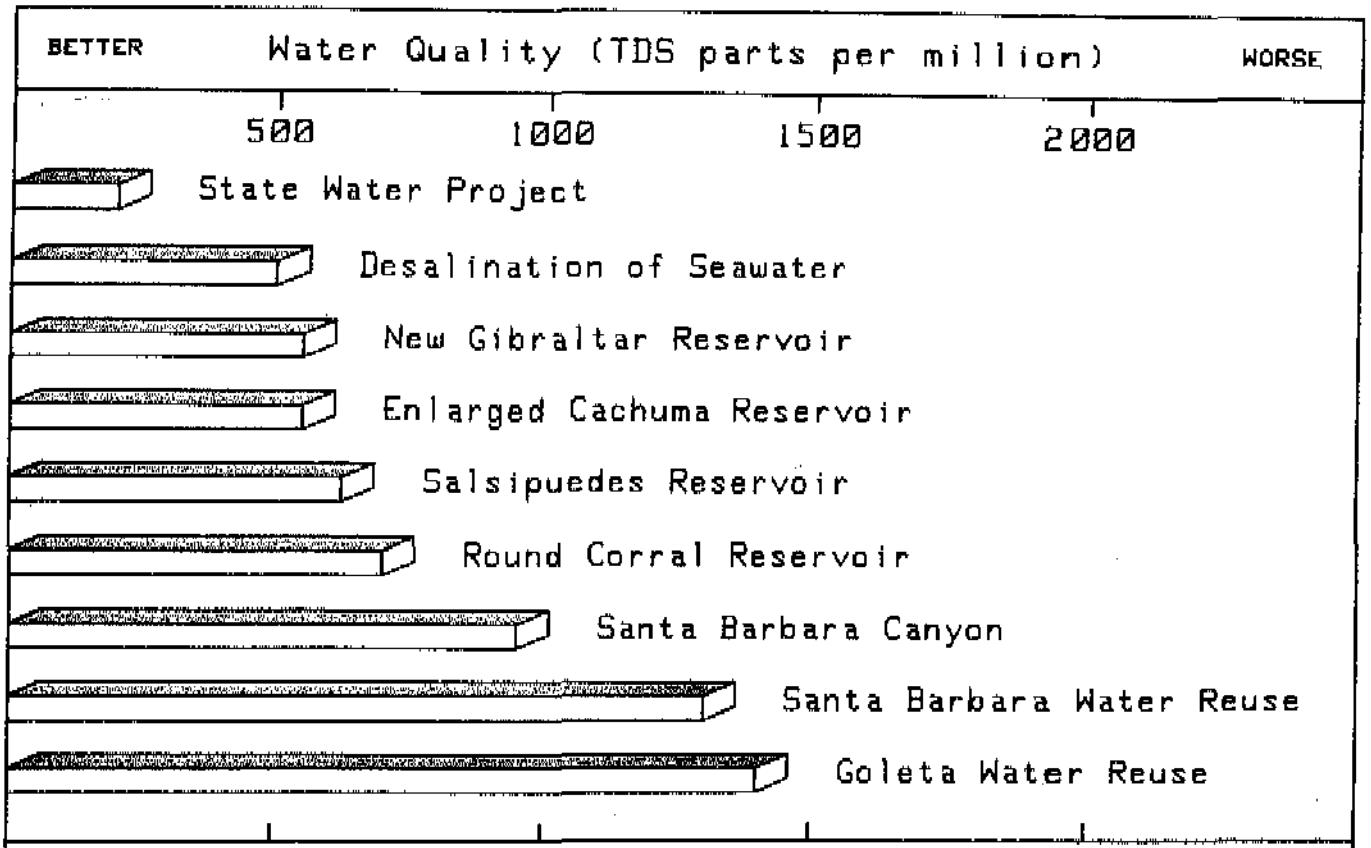


FIGURE 19 - RELATIVE WATER QUALITY OF WATER SUPPLY OPTIONS

to bring to the surface their merits and shortfalls, and finally to screen the best possible options for further consideration within each subarea.

Watershed management was considered within each of the subareas. Management of watershed vegetation to increase runoff is a method of increasing the yield of reservoirs and ground water recharge facilities. Such increase in runoff results from the temporary clearing of brushlands, understory in woodlands, permanent brush to grass conversion where appropriate, and timber harvest. On a general basis, annual evapotranspiration can be reduced in proportion to precipitation on the treated areas by amounts that range from none at 16 inches of precipitation to 5 inches at 30 inches of precipitation. When shrubs and trees are allowed to regenerate after clearing, the additional runoff declines to nothing in about 7 years. Therefore, a good management program would include provision to clear enough land each year to maintain a given mean annual water salvage. To achieve this objective would involve monitoring the effects of wildfires; conducting chaparral management (for fire hazard reduction), including range improvement, timber harvest, and reforestation activities of others; and, when necessary to achieve the water salvage objective, offering incentives to secure more clearing than would occur in the normal course of events. A typical plan would call for clearing brushlands on a 25-year cycle, or an average of about 4 percent of the brushlands in the watershed each year. It should be noted that such management will substantially improve wildlife habitat and may satisfy the requirement to provide substitute habitat for that lost to inundation by new reservoirs.

The amount by which the water supply from reservoirs or ground water basins is

augmented will be substantially less than the increase in runoff due to vegetation management. Most of such increase occurs during the rainy season. Therefore, the additional runoff must be regulated to the time of need (dry season), which limits the usable portion to the otherwise unused space in reservoirs or capacity for diversion and spreading of such water by ground water recharge facilities.

This alternative was not chosen for further study because it did not meet the test of providing a significant dependable supply increment during later years of a critical dry period. In addition, it is an operational practice that can be instituted at any time by local agencies, without construction of facilities. The first cost will be development of a management plan and negotiation of a "coordinated resource management agreement" with other land or resource management agencies.

Water Supply Options for Each Subarea

The various local and imported water supply projects that appear to be viable options have been analyzed for each subarea. These options are described in the following sections and grouped by subarea.

CUYAMA SUBAREA

Table 28 contains a summary of the options considered for Cuyama Subarea. Their locations are shown in **Figure 20.** Of the numerous options investigated, the following appear most promising (not necessarily in order of preference) and were used for incorporation into alternatives and further analysis.

Santa Barbara Canyon Reservoir. This reservoir has two potential damsites in Santa Barbara Canyon. Conditions appear favorable for developing a supplemental water supply reservoir at either location. Site I (lower) is in Section 27, T9N/R25W, and site II (upper) is about 2.5 miles upstream in Section 7, T8N/R25W.

Site I has a watershed of 47 square miles. A dam at this site would have a crest length of about 2,100 feet and would require 5 million cubic yards of material for construction. The resulting lake would have a surface area of 550 acres and a storage capacity of 32,000 acre-feet.

Site II has a watershed of 37.3 square miles. A dam at this site would have a crest length of 1,100 feet and would require 4 million cubic yards of material for construction. The resulting lake would have a surface area of 355 acres and a storage capacity of 32,000 acre-feet.

Site II appears to be more favorable for a dam and reservoir for the following reasons: (1) Although the reservoir would have a smaller surface area, it would have a maximum water surface elevation of 3,350 feet (mean sea level) and water depth of 240 feet; therefore, it would impound the same amount of water as site I; (2) it would have 35 percent less surface area; consequently, less water would be lost to evaporation; (3) although the dam would be smaller and less costly, the annual yield would be approximately the same, about 1,500 acre-feet.

About $3 million would be needed for the outlet, $11 million for the spillway, and $22 million for the dam and reservoir, giving a total of about $36 million to construct the dam and reservoir at site II.

A pipeline from the reservoir to a filtration plant would be needed. It would add approximately $250 per acre-foot to the cost of water supply. The plant to filter approximately 2 to 2.5 cubic feet per second would be required for a potable water supply.

State Water Project. A SWP system that would serve Cuyama Subarea would require the construction of a separate water system (Maricopa to New Cuyama) unrelated to the Coastal Branch. This Cuyama Branch would extend about 27 miles from the main California Aqueduct near Check 29, northeast of Maricopa in the San Joaquin Valley, to a terminus near New Cuyama. A pipeline, mainly 12-inch, would parallel State Highway 166 with pumping stations to

TABLE 28
SUMMARY OF CUYAMA SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
1. SANTA BARBARA CANYON-RESERVOIR				A significant fault of unknown age and activity crosses close to the axis of the dam.	Minimal	The reservoir would store poor quality water and would be susceptible to siltation.	Construction of the reservoir project could decrease the inflow to Twitchell Res; this could be considered as infringement on prior vested rights. If SWP water is delivered to Santa Maria, a water rights exchange could negate water rights issues.	A previous study considered it highly unlikely that construction of the dam would retain a significant amount of water in Cuyama Valley.
Site I	1100	39.0			May provide hydro-electric power			
SITE II	1500	36.0	2517	Geological investigation would be necessary to ensure that construction of a dam at this site is practicable.		Rare & endangered species immigrate or reside in Santa Barbara Canyon area. Impact must be assessed before proceeding in further studies.		
2. Branch Canyon Reservoir				Geologic investigation would be necessary to ensure that construction of a dam at this site is practicable.	Minimal		Same as Santa Barbara Canyon Dam and Reservoir Project.	
Site I	400	12.0	3210		May provide hydro-electric power			
Site II	300	8.0						
3. Ground water recharge	Minimal			Previous study shows that only a small portion of the floodflows leaving the valley could be captured by any reasonable program of augmentation.	None	Water quality in the area is comparatively poor. Locally unsuitable for domestic uses. TDS ranges from 900 to 2600 mg/L along river & valley floor. Sulfate concentrations frequently exceed 500 mg/L, hardness ranges from 300 to 1500 mg/L. Nitrates and chlorides generally are not considered a problem.	Conjunctive use of surface and ground water basin could infringe on prior vested water rights. If SWP water is delivered to Santa Maria, a water rights exchange could negate water rights issues.	Cuyama Valley has been identified by DWR as an area subject to critical conditions of overdraft.
4. Desalination of oil field brines	450			Treatment facilities, pumping stations, and pipelines can be constructed at the proposed site, and the engineering features of the project can be constructed.	4900	Desalted water would be for urban use or ground water recharge; water quality good. (TDS = 500 mg/L.)	Agreements would be required among the various local agencies, DWR, and the oil company.	Supply would decline with time and is interruptable, depending upon oil field operations.

TABLE 28 (Continued)
SUMMARY OF CUYAMA SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
4. Desalination of oil field brines (Continued)				Special treatment may be required due to potential toxicity hazards.		Minimum adverse environmental impact would occur during the construction of the desalting plant and the transportation facilities. The use of local desalted water would help conserve the fresh water supplies of the area.		
5. Watershed management	*	*	*	Management areas must be upstream from reservoir or ground water recharge facilities in order to regulate the additional runoff.	Unknown	Whether the sediment yield effects are beneficial or detrimental will depend on the care exercised in the management program.	A Coordinated Resource Management Agreement will be required to secure the cooperation of other state and federal resource and land management agencies.	Vegetation management can be initiated and benefits realized within 2 or 3 years after need for additional streamflow is ascertained.
6. Weather modification	1000 to 2000** *	*	*	Cloud seeding appears to be most effective when conducted from aircraft.	Minimal	The effects of increased seasonal rainfall on fish and wildlife are impossible to determine.		This project is ongoing; new SWP yield would result only from additional cloud seeding.
7. Water rights exchange	N/A	N/A					(See Santa Barbara Cyn., Branch Cyn, and ground water recharge remarks.)	
8. STATE WATER PROJECT	1600	N/A	1119	Importation of SWP water to Cuyama Valley would require construction of a separate system (Maricopa to New Cuyama) unrelated to Coastal Branch. System requirement: over 27 mi. of 8- to 12-inch pipeline 2 pumping stations, and 2 regulatory storage sites (2 tanks, 50,000 gallons/site). Total lift of 2,500 feet.	4030	The quality of SWP water would be good. Average 1984 constituents (in mg/L at Check 29-near Maricopa) are shown in Table 16.	Importation of water from distant sources for agricultural use appears to be beyond the payment capacity of crops currently raised or suitable to the area.	It is technically feasible to deliver SWP water from the Calif. Aqueduct; a turnout could be built near Taft/Maricopa.

* Not determined.
** Yield cannot be estimated within reasonable accuracy.

Note: Options in CAPITAL LETTERS are included in selection of alternatives.

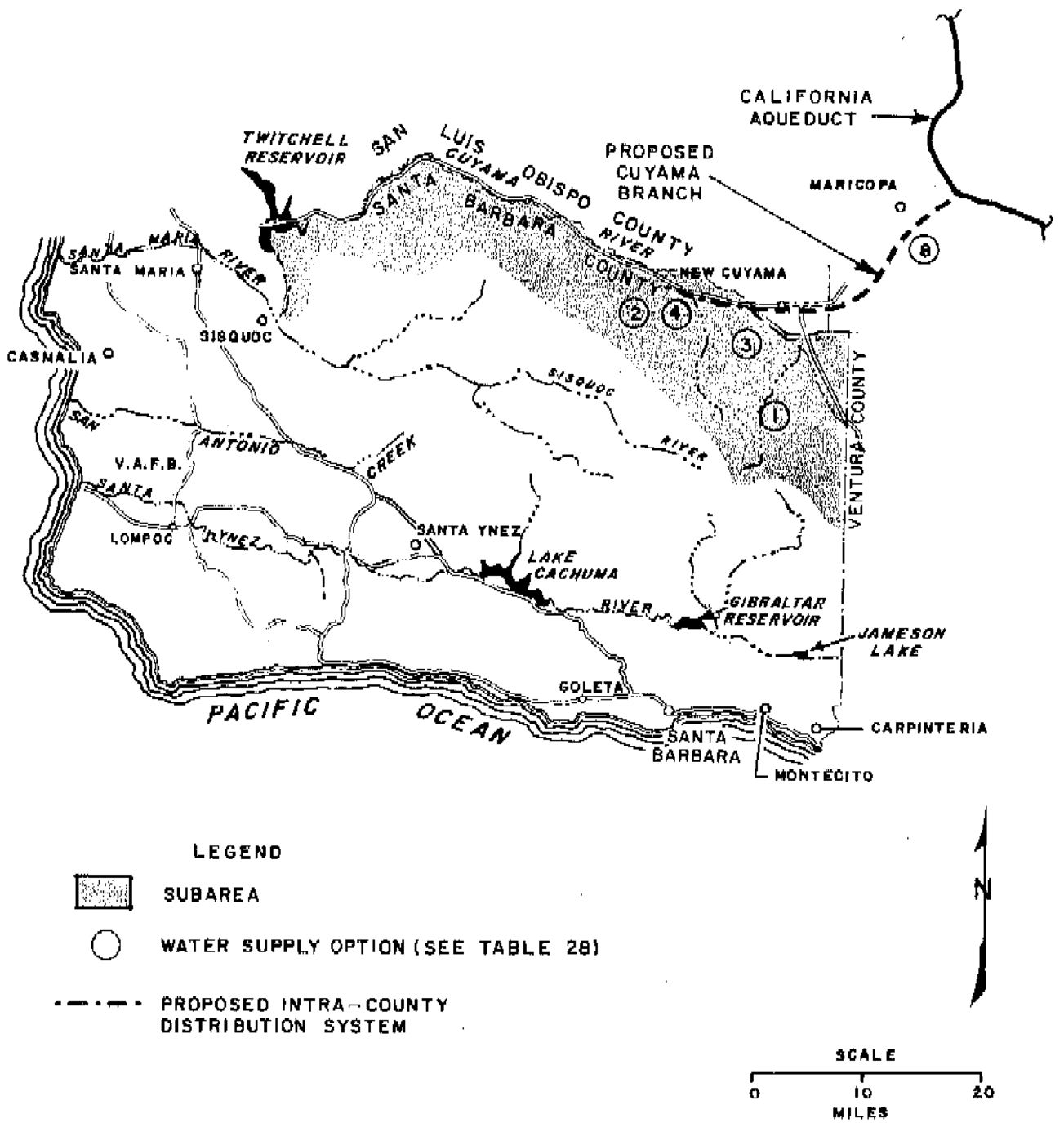


Figure 20- CUYAMA SUBAREA WATER SUPPLY OPTIONS

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lift water about 2,500 feet into the Cuyama Subarea. Regulation would require one 50,000-gallon tank at two different sites.

Although water delivered would be of good quality (average TDS content was 184 mg/L in 1984), it would require filtration prior to use for domestic purposes. Use for agricultural purposes appears to be beyond the payment capacity of crops currently raised or suitable to be grown in the area.

Options Not Selected. Other options which were analyzed but not selected are listed below. Descriptions of these options and reasons for not selecting them are summarized in **Table 28.**

- Branch Canyon Reservoir
- Ground water recharge
- Desalination of oil field brines
- Watershed management
- Weather modification(already implemented)
- Water rights exchange

SANTA MARIA SUBAREA

This subarea's water supply options are listed and summarized in **Table 29** and located on **Figure 21.**

Of the nine options investigated, the following three appear most promising (not necessarily in order of preference), and they were incorporated in the alternatives.

Round Corral Reservoir. This option is a proposal to construct a dam (Round Corral Dam) on the Sisquoc River to develop a reservoir that would provide 5,500 to 6,700 acre-feet of water per year for ground water basin recharge.

The Round Corral Dam is proposed for a site a few hundred feet downstream of Round Corral Canyon, nine miles east and upstream of Sisquoc. The watershed upstream from the proposed damsite comprises 290 square miles of mountainous terrain, most of it wild and undeveloped. The land that would be inundated by the reservoir is generally unsuited for farming and there appears to be no major improvement or utility to relocate.

Two sizes of reservoir are being considered. The USBR estimates that a 50,000-acre-foot reservoir would have an annual yield of 5,500 acre-feet, and an 82,000-acre-foot reservoir, an annual yield of 6,700 acre-feet. Runoff captured during the wet season would be released later in the year in a ground water replenishment operation that would help mitigate overdraft conditions downstream in the Santa Maria Valley. However, because Twitchell Reservoir already discharges into the Santa Maria River to recharge the basin, the river may not be capable of handling the additional flow from Round Corral Reservoir. New recharge facilities may be needed, but are not included in the costs of the Round Corral project.

Desalination of Sea Water. In the past, desalination of sea water has been developed only in special cases because of its high energy cost. However, the technology to desalt water has improved and, as the cost of other water supplies increases, desalination of sea water is becoming more competitive as an alternative water supply.

DWR has been evaluating the role that desalination of sea water and brackish waters can play in providing a part of California's water supply. There are no significant technical problems in obtaining fresh water from sea water by desalination. Large quantities of fresh water for municipal use are provided by this means in several parts of the world where natural supplies of fresh water are in short supply and desalination of sea water is the lowest cost alternative means to provide a water supply. The trend in improvements in sea water desalting technology tends to reduce the cost of sea water desalting. However, the effects of inflation and increased costs of energy have had a net effect of increasing the costs, and energy cost does impact desalination costs more than the

TABLE 29
SUMMARY OF SANTA MARIA SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
1. ROUND CORRAL RESERVOIR	6700	83.3	902	Casmuesa fault runs south east to northwest through the project area, but it is considered to be inactive. A small fault could be present in the south abutment. No major improvements would need to be acquired or relocated due to project construction. If the water produced is used to recharge the Santa Maria Basin, additional recharge facilities will, in all likelihood, need to be developed as part of the project, because the existing Santa Maria River channel may be capable of handling only water presently discharged from Twitchell.	Minimal May provide hydroelectric power	Construction of the project may promote increased human use and development of the area which could threaten the habitat of both the California condor and American peregrine falcon. Construction of the dam would have significant long-term adverse impacts on the wildlife resources of the Siaquoc River.	The reservoir area is under the ownership of Siaquoc Ranch.	The proposed reservoir would be operated conjunctively with the existing Twitchell Reservoir to increase the recharge of the Santa Maria Valley Ground Water Basin.
2. Twitchell Reservoir Enlargement	Minimal	Unknown			Minimal	Water eventually recharges Santa Maria Basin. Its quality dependent on volume and quality of upstream flows. Generally poor, TDS 550 and 1600 mg/L for high and low flows. Basin of poor quality.		Natural runoff of watershed is not sufficient for project.
3. Twitchell Reservoir, Modified Operations (Improved Water Conservation)	*	0.015		The existing facilities would not be modified in any way.	Minimal			This project is ongoing; arrangements are being made to implement this concept on a long-term basis.
4. Santa Maria River Off-Channel Recharge				It would be necessary to build a diversion facility.	None	500 acres of prime agricultural land would be displaced.		Loss of large agricultural acreage not acceptable.

TABLE 29 (Continued)
SUMMARY OF SANTA MARIA SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (KWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
5. DESALINATION OF SEA WATER	10150 to 16850	46.0 to 74.4	1185 to 1143	Treatment facilities, pumping stations, and pipelines can be constructed at the proposed site and the engineering features of the project can be constructed to desirable standards by accepted techniques.	7550	Desalted water of good quality would be for urban use. Minimum adverse environmental impact would occur during construction of the desalting plant & the transportation facilities. The use of local desalted water would help conserve the fresh water supplies of the area. Reliable water supply.	Agreements would be required between the various local agencies and DWR. Construction of the desalting plant near the coast must be approved by the Coastal Commission and the California Regional Water Quality Control Board, Central Coast Region.	Desalination plant size depends on whether or not Round Corral Reservoir is constructed. Very energy intensive.
6. Desalination of oil field brines	2350	11.0		Desalination would be by means of reverse osmosis or the equivalent. An entire new treatment plant would have to be constructed.	4900	The product water would be used for municipal & industrial purposes. Special treatment may be required due to potential toxicity hazards as related to petroleum-related chemicals and heavy metals.	Agreements would be required among the various local agencies, DWR, and the oil company.	It is not known if the supply of source water would be available to meet demands beyond the year 2000. Very energy intensive.
7. Watershed Management	**	**	**	Management areas must be upstream from reservoir or ground water recharge facilities in order to regulate the additional runoff.	Unknown	Whether the sediment yield effects are beneficial or detrimental will depend on the care exercised in prescribed burning.	A Coordinated Resource Management Agreement will be required to secure the cooperation of other state & federal resource & land management agencies.	Vegetation management can be initiated and benefits realized within 2 or 3 years after need for additional streamflow is ascertained.
8. Weather Modification	3000 to 6000***	**	**	Cloud seeding appears to be most effective when conducted from aircraft.	Minimal	The effects of increased seasonal rainfall on fish and wildlife are impossible to determine.		This project is ongoing; new SWP yield would result only from additional cloud seeding.
9. STATE WATER PROJECT	16850	N/A	430 to 535	Must build Coastal Branch plus part of the ICDS (river crossing plus one pumping plant and pipeline) which is engineeringly feasible.	1985	The quality of SWP water would be good. Average 1984 constituents (in mg/L at Check 5-Coastal Branch) are shown in Table 16.	Contract between State and SBCFCWCD is in place for ease of implementation. Contracts between SBCFCWCD and agencies that are to receive SWP water may be needed. No major legal or institutional problem is anticipated.	Unit cost will be dependent on the amount of water delivered to other areas within the County.

* Presently being done; therefore, there is no new water yield involved.
** Not determined.
*** Water yield cannot be estimated within reasonable accuracy.
Note: Options in CAPITAL LETTERS are included in selection of alternatives.

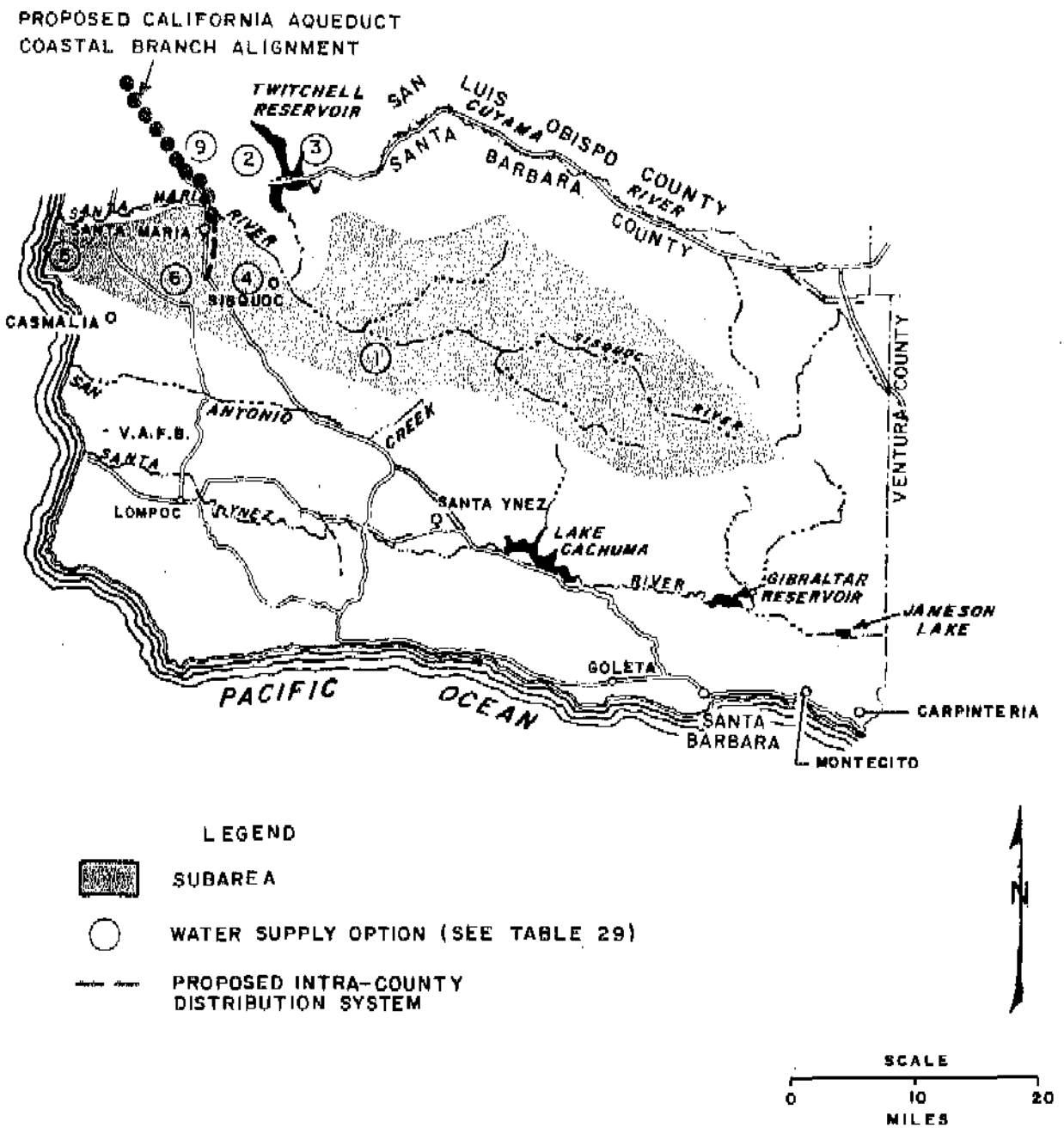

Figure 21—SANTA MARIA SUBAREA WATER SUPPLY OPTIONS

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other alternatives. It is not possible to accurately predict how these factors will influence the future cost of desalting. The costs shown in this report reflect DWR's best estimate of future costs.

Because the projected water demand in Santa Maria Subarea indicates a need for more water than is available locally, desalination of sea water is a potential source for part of its future water. Costs developed for the desalination of sea water in Santa Maria Subarea using reverse osmosis are given in **Table 30.**

TABLE 30
DESALINATION OF SEA WATER
BY REVERSE OSMOSIS
IN SANTA MARIA SUBAREA

Plant capacity, AFY	16,850
Capital cost	$ 74,400,000
Annual capital cost	$ 4,735,000
Annual operating cost	$ 10,970,000
Annual local transportation cost	$ 3,555,000
Total annual cost	$ 19,260,000
Unit water cost/AF	$ 1,143

Assumptions and Method of Computation
1. Plant life expectancy, 30 years.
2. Interest rate, 9.5 percent.
3. Unit energy consumption, 7550 kWh/AF.
4. Unit energy cost, $0.085/kWh(local) and $0.03/kWh (State).
5. Energy recovery equipment cost included in capital cost.
6. Operating time, 85 percent; maintenance time, 15 percent; fresh water recovery, 30 percent.
7. Sea water TDS content, 35 000 mg/L.
8. Plants made up of 5 MGD or smaller modules.
9. April 1984 cost base.

State Water Project. Delivery of SWP water would require the completion of the Coastal Branch, as described earlier. The Santa Maria Subarea is conveniently located near the terminus of the Coastal Branch and would require only construction of a pipeline from the Santa Maria Terminus of the Coastal Branch to a point on high ground east and midway between the City of Santa Maria and Orcutt. Final configuration and cost would depend on the level of participation within Santa Maria Subarea and the other subareas in the County. Construction of the Coastal Branch would be a State responsibility, but construction of the pipeline, as part of the ICDS, and a filtration plant would be a local responsibility.

If SWP water is delivered to Santa Maria Subarea and integrated into the water system of the City of Santa Maria or Orcutt, it will require the construction of a filtration plant for the SWP water. Nevertheless, SWP water would be of very good quality when compared to existing ground water. Direct use for agriculture appears to be beyond the payment capacity of crops currently raised and is not projected in this study.

Importation of SWP water to the Santa Maria Subarea would improve the local water quality. It is also to Santa Maria's advantage to use the best quality water available throughout its system to meet the stringent waste water discharge requirements that have been established.

Options Not Selected. Other options that were analyzed but not selected are listed below. Descriptions of these options and the reasons for not selecting them are summarized in **Table 29.**

- Twitchell Reservoir enlargement
- Twitchell Reservoir modified operations (already implemented)
- Santa Maria River off-channel recharge
- Desalination of oil field brines
- Watershed management
- Weather modification (already implemented)

SAN ANTONIO SUBAREA

Land use in the San Antonio Subarea is devoted almost entirely to agriculture; urban water demand is minimal. Local ground water is the only supply in the subarea. Ground water is also exported to Vandenberg Air Force Base and provides 70 percent of its water supply. Total water demand exceeds replenishment, but local water supply options are limited and there are no supplemental water supply projects planned for the subarea.

This subarea has an allocation of 23 acre-feet of SWP water, but a delivery system for this small subarea alone would be prohibitively costly. In any event, SWP water would be the only supplemental supply for Casmalia, where some urban water demand is concentrated, and then only if the ICDS pipeline to the lower Santa Ynez Subarea were routed close to the town, thereby minimizing its costs. Casmalia is in a small adjacent watershed but is grouped with the San Antonio Subarea.

The potential water supply options are described in **Table 31** and located as shown on **Figure 22**. Only SWP appears to be viable and is included in the alternatives.

State Water Project. SWP water delivery to the San Antonio Subarea would require continuation of the ICDS pipeline to Vandenberg Air Force Base and/or lower Santa Ynez Subarea, as described under Santa Maria Subarea.

The pipeline would parallel Betteravia Road to Mahoney Road, turn southwest along Black Road, then extend to Casmalia. A pumping station would be required just beyond Cabrillo Highway to cross the Casmalia Hills north of Casmalia where a terminal storage tank would be located.

Options Not Selected. Other options that were analyzed but not selected are listed below. Descriptions of these options and the reasons for not selecting them are summarized in **Table 31**.

- San Antonio Creek Reservoir
- Watershed management
- Weather modification(already implemented)

SANTA YNEZ SUBAREA

The subarea is topographically separated into an upper and lower valley by a difference in elevation and by a narrowing of the watershed and river channel about three miles west of Buellton.

The upper portion of Santa Ynez Subarea, known as Santa Ynez Valley, is at elevations ranging from 400 to 900 feet above sea level. The communities of Santa Ynez, Los Olivos, Ballard, Solvang, and Buellton, together with small farms and large ranches, are found in this portion.

The projected water demand in the upper Santa Ynez Subarea exceeds the amount of water available from the existing sources of supply, and a new source of water will be needed to meet future water demands. Various options were analyzed and the following most promising ones were selected for further study:

- Cachuma Reservoir plus conjunctive use operations.
- Enlargement of Cachuma Reservoir (raising the dam by 27, 33, and 42 feet) with and without conjunctive use operations.
- New Gibraltar Reservoir with and without conjunctive use operations.
- State Water Project.

The local projects above would be shared with the South Coast Subarea and, in some cases, with the lower Santa Ynez Subarea.

The water supply that is potentially available from the Santa Ynez River through the proposed water supply projects would not be sufficient to meet the SWP entitlements of both Santa Ynez and the South Coast Subareas.

The results of the investigation for each

TABLE 31
SUMMARY OF SAN ANTONIO SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
1. San Antonio Creek Reservoir	1600	30.0		3 possible dam sites were identified in a previous study, however, feasibility was not established for any of the sites. The reservoir would be situated on deep, highly permeable alluvium.	Minimal	San Antonio Creek and Barka Slough are environmentally sensitive areas because of the presence of an endangered species.		Very poor dam site.
2. Watershed Management	*	*	*	Management areas must be upstream from reservoir or ground water recharge facilities in order to regulate the additional runoff.	Unknown	Whether the sediment yield effects are beneficial or detrimental will depend on the care exercised in the management program.	A Coordinated Resource Management Agreement will be required to secure the cooperation of other state and federal resource and land management agencies.	Vegetation management can be initiated and benefits realized within 2 or 3 years after need for additional streamflow is ascertained.
3. Weather Modification	2000 to 4000**	*	*	Determination of augmented water supply in surface reservoirs would require detailed operational studies. Cloud seeding appears to be most effective when conducted from aircraft. Cloud seeding is most productive during wet years and least productive in dry years.	Minimal	The effects of increased seasonal rainfall on fish and wildlife are impossible to determine.	Cloud seeding in one area could modify precipitation in another area.	This project is ongoing; new SWP yield would result only from additional cloud seeding.
4. STATE WATER PROJECT	23***	N/A	598 to 774	Routing via Coastal Branch and ICDS (Lompoc-VAFB Lateral: low energy and pressure route). Engineeringly feasible. Coastal Branch would require 3 pumping plants, five regulatory storage sites, one power recovery plant, and pipeline. The ICDS facility required would include one pumping plant plus pipeline.	2220	The quality of SWP water would be good. Average 1984 constituents (in mg/L at Check 5 - Coastal Branch) are shown in Table 16.	Contract between State and SBCFCWCD is in place for implementation. Additional contracts may be needed between SBCFCWCD and agencies that are to receive SWP water. No major legal or institutional problem is anticipated.	Project depends upon SWP water delivered to Santa Ynez or VAFB via San Antonio Subarea. Unit cost will be dependent on the amount of water delivered to other subareas.

* Not determined.
** Water yield cannot be estimated within reasonable accuracy.
*** Does not include any of the entitlement of VAFB; the yield would be delivered to Casmalia.
Note: Options in CAPITAL LETTERS are included in selection of alternatives.

TABLE 32
SUMMARY OF SANTA YNEZ (UPPER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
1. CACHUMA RESERVOIR								
a. CACHUMA RESERVOIR (EXISTING) + CONJ.USE	3500	6.9	76	22 new production wells would have to be constructed.	Minimal May provide hydroelectric power	Fluctuation of seasonal water level in excess of the existing water level changes may have some effects on water quality as well as on environment.	Any changes in operation of the reservoir would require the agreement of U.S.Bureau of Reclamation (USBR), Santa Ynez River Water Conservation District (SYRWCD), and Cachuma Member Units.	
b. CACHUMA RESERVOIR ENLGR.(27')	7770	51.7	264	The existing dam height would be raised 27 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir. Highway reinforcement needed.	Minimal May provide hydroelectric power	A portion of a county park would be inundated Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
c. CACHUMA RESERVOIR ENLRG.(27') + CONJ.USE	13520	60.8	126	29 new production wells would have to be constructed. Modified operation of the reservoir and ground water basin would be needed.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality as well as on environment.	Any enlargement and changes in operation of the reservoir would require the agreement of USBR, SYRWCD, and Cachuma Member Units.	20% (60.8/51.7x100) increase in first cost of project, due to conjunctive use, would result in 74% (13520/7770x100) increase in production.

TABLE 32 (Continued)
SUMMARY OF SANTA YNEZ (UPPER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
d. Cachuma Reservoir Enlrg.(33')	9270	61.1	300	The existing dam height would be raised 33 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. About 0.5 mile of Highway 154 would have to be raised. The outlet facilities would have to be extended 400 feet. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir.	Minimal May provide hydroelectric power	A portion of a county park would be inundated. Mitigation measures required. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored or authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
e. CACHUMA RESERVOIR ENLRG.(33') + CONJ.USE	15013	71.0	140	30 new production wells need to be constructed. Operation of reservoir and ground water basins would have to be modified.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality and environment.	Any enlargement and changes in operation of the reservoir would have to be approved by USBR, SYRWCD, and Cachuma Member Units.	16% (71.0/61.1x100) increase in first cost of project, due to conjunctive use, would increase the production by 62% (15010/9270x100)

f. CACHUMA RESERVOIR ENLRG.(42')	10590	80.0	361	The existing dam height would be raised 42 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. About 1.2 miles of Highway 154 would have to be relocated. The outlet facilities would have to be extended 400 feet. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir.	Minimal May provide hydro-electric power	A portion of a county park would be inundated. Mitigation measures required. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
g. CACHUMA RESERVOIR ENLRG.(42') + CONJ.USE	17490	90.0	171	32 new production wells need to be constructed. Operation of reservoir and ground water basins would have to be modified.	Minimal May provide hydro-electric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality and environment.	Any enlargment and changes in operation of the reservoir would have to be approved by USBR, SYRWCD, and Cachuma Member Units.	13% (90/80x100) increase in first cost of project, due to conjunctive use, would increase the production by 65% (17490/10590x100).

TABLE 32 (Continued)
SUMMARY OF SANTA YNEZ (UPPER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
2. Hot Springs Reservoir (excluding Lompoc Pipeline)	5920	73.6	936	Highway 154 and Paradise Road would have some relocation. (The Lompoc Pipeline could be included as part of this project.)	Minimal May provide hydro-electric power	Portion of Paradise area would be inundated. Most of the reservoir area is privately owned. Impairment of present water supply facilities not fully analyzed. Would offer additional recreational opportunities; waterfowl could use reservoir resting area along the Pacific Coast migration route. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	Need to establish yield obligation by prior rights. All established water rights must be satisfied. Must appropriate water through State Water Resources Control Board (SWRCB). Must enter into agreements with a number of agencies. Water rights have not been fully analyzed.	A preliminary review by DWR indicates that a feasibility-level investigation should be deferred until after a study is done regarding the enlargement of Cachuma Reservoir or constructing new Gibraltar Reservoir.
3. NEW GIBRALTAR RESERVOIR								
a. NEW GIBRALTAR RESERVOIR	8335	98.8	869	Existing inlet-outlet system must be replaced. Engineeringly feasible.	Minimal May provide hydro-electric power	No homes, roads, or utilities threatened. Increased recreational opportunities. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction. The habitat of the least Bell's vireo may be impacted.	Need to establish yield obligations by prior right. All established water rights must be satisfied. Must appropriate water through SWRCB. Must enter into agreements with a number of agencies.	Preliminary review by DWR indicates that the project warrants a feasibility-level investigation.

TABLE 31
SUMMARY OF SAN ANTONIO SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
1. San Antonio Creek Reservoir	1600	30.0		3 possible dam sites were identified in a previous study, however, feasibility was not established for any of the sites. The reservoir would be situated on deep, highly permeable alluvium.	Minimal	San Antonio Creek and Barka Slough are environmentally sensitive areas because of the presence of an endangered species.		Very poor dam site.
2. Watershed Management	*	*	*	Management areas must be upstream from reservoir or ground water recharge facilities in order to regulate the additional runoff.	Unknown	Whether the sediment yield effects are beneficial or detrimental will depend on the care exercised in the management program.	A Coordinated Resource Management Agreement will be required to secure the cooperation of other state and federal resource and land management agencies.	Vegetation management can be initiated and benefits realized within 2 or 3 years after need for additional streamflow is ascertained.
3. Weather Modification	2000 to 4000**	*	*	Determination of augmented water supply in surface reservoirs would require detailed operational studies. Cloud seeding appears to be most effective when conducted from aircraft. Cloud seeding is most productive during wet years and least productive in dry years.	Minimal	The effects of increased seasonal rainfall on fish and wildlife are impossible to determine.	Cloud seeding in one area could modify precipitation in another area.	This project is ongoing; new SWP yield would result only from additional cloud seeding.
4. STATE WATER PROJECT	23***	N/A	598 to 774	Routing via Coastal Branch and ICDS (Lompoc-VAFB Lateral: low energy and pressure route). Engineeringly feasible. Coastal Branch would require 3 pumping plants, five regulatory storage sites, one power recovery plant, and pipeline. The ICDS facility required would include one pumping plant plus pipeline.	2220	The quality of SWP water would be good. Average 1984 constituents (in mg/L at Check 5 - Coastal Branch) are shown in Table 16.	Contract between State and SBCFCWCD is in place for implementation. Additional contracts may be needed between SBCFCWCD and agencies that are to receive SWP water. No major legal or institutional problem is anticipated.	Project depends upon SWP water delivered to Santa Ynez or VAFB via San Antonio Subarea. Unit cost will be dependent on the amount of water delivered to other subareas.

* Not determined.
** Water yield cannot be estimated within reasonable accuracy.
*** Does not include any of the entitlement of VAFB; the yield would be delivered to Casmalia.
Note: Options in CAPITAL LETTERS are included in selection of alternatives.

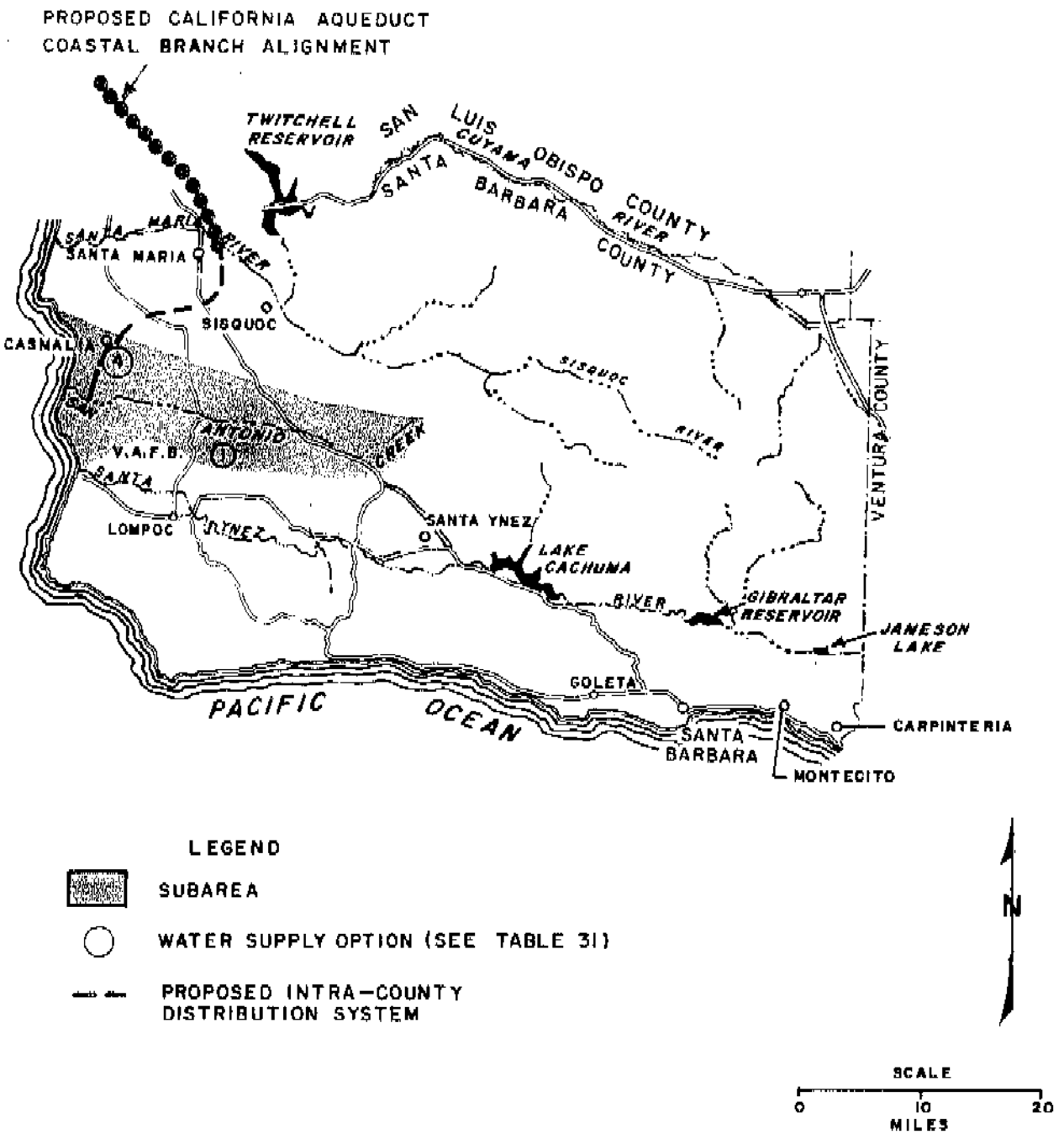

Figure 22—SAN ANTONIO SUBAREA WATER SUPPLY OPTIONS

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1965

option are summarized in **Table 32**, and their locations are shown on **Figure 23.** Maps depicting, in greater detail, proposed dam or reservoir sites and areas subject to inundation are on file at DWR and SBCFCWCD offices.

The lower portion of Santa Ynez Subarea, often referred to as the Lompoc Valley, with an elevation ranging from sea level to 400 feet above sea level, is separated from upper Santa Ynez by some low hills through which the Santa Ynez River has cut a channel. (See **Figure 24.**) The City of Lompoc, Vandenberg Village, Mission Hills, Vandenberg Air Force Base, and large flower seed and truck farms are found in this part of the subarea. Projected water demand for this portion of Santa Ynez Subarea exceeds the available supply and new sources of water will be needed to satisfy future demands.

After evaluating several water supply options described in **Table 33**, Salsipuedes Reservoir and the desalination of sea water options were selected, in addition to those options selected for the upper Santa Ynez, as the most promising projects for supplemental water. With the exception of water from the SWP, none of the options selected for upper Santa Ynez can be utilized in lower Santa Ynez without the addition of a pipeline (referred to as Lompoc Pipeline). This pipeline from Cachuma Reservoir to Lompoc would cost an additional $16.2 to $26.7 million, depending upon pipe size. The cost for that portion of the pipeline serving the upper Santa Ynez subarea would probably be shared between the upper and lower Santa Ynez.

As mentioned in Chapter III of this report, the water from existing sources of supply in the lower Santa Ynez Subarea is not of a good quality. The quality can be improved by importing better quality water and blending it with the water from local sources.

For all the options concerning Santa Ynez River (i.e., the existing or enlarged Cachuma or New Gibraltar Reservoirs) explained below, computer analyses for determination of yield were based on the following:

- Jameson Reservoir and Doulton Tunnel safe yield mode = 1,480 acre feet per year.

- Gibraltar Reservoir and Mission Tunnel plus a portion of the Santa Barbara ground water basin supply operated in a draft mode (with a combined constant annual yield of 7,000 acre-feet). Ground water pumpage to make up the whole 7,000 acre-feet is needed only during dry periods when the entire 7,000 acre-feet is not available from the reservoir and tunnel sources.

  It should be noted, for the purpose of this study, that this mode of operation of the existing Gibraltar Project is simply to serve as a base condition from which relative yields of an enlarged Gibraltar Reservoir may be determined.

  The actual distribution of these yields and the portion that would be allocated to the City of Santa Barbara would have to be agreed upon among the U.S. Bureau of Reclamation, Santa Barbara City, and other South Coast and Santa Ynez water purveyors. If additional analyses are required in order to reach an agreement, they can readily be performed as an aid to selecting a Santa Ynez River reservoir project for possible feasibility level investigation.

- Cachuma Reservoir and Tecolote Tunnel safe yield mode = 27,800 acre-feet per year.

- Downstream water rights are met as required by Gin Chow Court Decision and State Water Resources Control Board (SWRCB) Water Rights Decision 73-37.

Conjunctive Use. Generally, conjunctive use consists of managing surface reservoirs and ground water resources in a coordinated manner to obtain more water than would be developed otherwise. With conjunctive use, surface water would be used extensively

TABLE 32
SUMMARY OF SANTA YNEZ (UPPER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
1. CACHUMA RESERVOIR								
a. CACHUMA RESERVOIR (EXISTING) + CONJ.USE	3500	6.9	76	22 new production wells would have to be constructed.	Minimal May provide hydroelectric power	Fluctuation of seasonal water level in excess of the existing water level changes may have some effects on water quality as well as on environment.	Any changes in operation of the reservoir would require the agreement of U.S.Bureau of Reclamation (USBR), Santa Ynez River Water Conservation District (SYRWCD), and Cachuma Member Units.	
b. CACHUMA RESERVOIR ENLGR.(27')	7770	51.7	264	The existing dam height would be raised 27 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir. Highway reinforcement needed.	Minimal May provide hydroelectric power	A portion of a county park would be inundated Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
c. CACHUMA RESERVOIR ENLRG.(27') + CONJ.USE	13520	60.8	126	29 new production wells would have to be constructed. Modified operation of the reservoir and ground water basin would be needed.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality as well as on environment.	Any enlargement and changes in operation of the reservoir would require the agreement of USBR, SYRWCD, and Cachuma Member Units.	20% (60.8/51.7x100) increase in first cost of project, due to conjunctive use, would result in 74% (13520/7770x100) increase in production.

TABLE 32 (Continued)
SUMMARY OF SANTA YNEZ (UPPER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
d. Cachuma Reservoir Enlrg.(33')	9270	61.1	300	The existing dam height would be raised 33 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. About 0.5 mile of Highway 154 would have to be raised. The outlet facilities would have to be extended 400 feet. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir.	Minimal May provide hydroelectric power	A portion of a county park would be inundated. Mitigation measures required. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored or authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
e. CACHUMA RESERVOIR ENLRG.(33') + CONJ.USE	15013	71.0	140	30 new production wells need to be constructed. Operation of reservoir and ground water basins would have to be modified.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality and environment.	Any enlargement and changes in operation of the reservoir would have to be approved by USBR, SYRWCD, and Cachuma Member Units.	16% (71.0/61.1x100) increase in first cost of project, due to conjunctive use, would increase the production by 62% (15010/9270x100)

f. CACHUMA RESERVOIR ENLRG.(42')	10590	80.0	361	The existing dam height would be raised 42 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. About 1.2 miles of Highway 154 would have to be relocated. The outlet facilities would have to be extended 400 feet. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir.	Minimal May provide hydro-electric power	A portion of a county park would be inundated. Mitigation measures required. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
g. CACHUMA RESERVOIR ENLRG.(42') + CONJ.USE	17490	90.0	171	32 new production wells need to be constructed. Operation of reservoir and ground water basins would have to be modified.	Minimal May provide hydro-electric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality and environment.	Any enlargment and changes in operation of the reservoir would have to be approved by USBR, SYRWCD, and Cachuma Member Units.	13% (90/80x100) increase in first cost of project, due to conjunctive use, would increase the production by 65% (17490/10590x100).

TABLE 32 (Continued)
SUMMARY OF SANTA YNEZ (UPPER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
2. Hot Springs Reservoir (excluding Lompoc Pipeline)	5920	73.6	936	Highway 154 and Paradise Road would have some relocation. (The Lompoc Pipeline could be included as part of this project.)	Minimal May provide hydro-electric power	Portion of Paradise area would be inundated. Most of the reservoir area is privately owned. Impairment of present water supply facilities not fully analyzed. Would offer additional recreational opportunities; waterfowl could use reservoir resting area along the Pacific Coast migration route. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	Need to establish yield obligation by prior rights. All established water rights must be satisfied. Must appropriate water through State Water Resources Control Board (SWRCB). Must enter into agreements with a number of agencies. Water rights have not been fully analyzed.	A preliminary review by DWR indicates that a feasibility-level investigation should be deferred until after a study is done regarding the enlargement of Cachuma Reservoir or constructing new Gibraltar Reservoir.
3. NEW GIBRALTAR RESERVOIR								
a. NEW GIBRALTAR RESERVOIR	8335	98.8	869	Existing inlet-outlet system must be replaced. Engineeringly feasible.	Minimal May provide hydro-electric power	No homes, roads, or utilities threatened. Increased recreational opportunities. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction. The habitat of the least Bell's vireo may be impacted.	Need to establish yield obligations by prior right. All established water rights must be satisfied. Must appropriate water through SWRCB. Must enter into agreements with a number of agencies.	Preliminary review by DWR indicates that the project warrants a feasibility-level investigation.

b. NEW GIBRALTAR RESERVOIR + CONJ. USE	13120	104.4	427	18 new production wells would have to be constructed. Modifications of the reservoir and ground water basin operation would be needed.	Minimal May provide hydro-electric power	Fluctuation of seasonal water level in excess of the existing water level changes may have some effects on water quality as well as environment. See additional comments under (a) above.	Need to establish yield obligations by prior right. All established water rights must be satisfied. Must appropriate water through SWRCB. Must enter into agreements with a number of agencies.	6% (104.0/98.8x100) increase in first cost, due to conjunctive use, will increase the production by 57% (13120/8335x100).
4. Casuenas Reservoir (excluding Lompoc Pipeline)	8000	97.5	909	The Santa Ynez fault passes about 1.5 miles south of damsite. Rock in the left abutment has high permeability. New access roads would have to be constructed. (The Lompoc Pipeline could be included as part of this project.)	Minimal May provide hydro-electric power	Water would be potable and suitable for irrigation. Most of the reservoir area is public property. The reservoir would be vulnerable to reservoir siltation; however, a provision for siltation can be designated to the reservoir. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	Water rights have not been fully studied. Must enter into agreements with a number of agencies.	A preliminary review by DWR indicates that a feasibility-level investigation should be deferred until after a study is done regarding the enlargement of the Cachuma Reservoir or building new Gibraltar Reservoir.
5. Watershed Management	*	*	*	Management areas must be upstream from reservoir or ground water recharge facilities in order to regulate the additional runoff.	Unknown	Whether the sediment yield effects are beneficial or detrimental will depend on the care exercised in the management program.	A Coordinated Resource Management Agreement will be required to secure the cooperation of other state and federal resource and land management agencies.	Vegetation management can be initiated and benefits realized within 2 or 3 years after need for additional streamflow is ascertained.

TABLE 32 (Continued)
SUMMARY OF SANTA YNEZ (UPPER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: Tot cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
6. Weather Modification	3000 to 6000**	*	*	Determination of augmented water supply in surface reservoirs would require detailed operational studies. Cloud seeding appears to be most effective when conducted from aircraft. Cloud seeding is most productive during wet years and least productive in dry years.	Minimal	The effects of increased seasonal rainfall on fish and wildlife are impossible to determine.	Cloud seeding in one area could modify precipitation in another area.	This project is ongoing; new SWP yield would result only from additional cloud seeding.
7. STATE WATER PROJECT	2578	N/A	830	Importation of SWP water to the upper Santa Ynez Subarea would require the the completion of the Coastal Branch and ICDS (two pumping plants, three regulatory storage sites - tanks, plus pipeline.)	3130	The quality of SWP water would be good. Average 1984 constituents (in mg/L at Check 5-Coastal Branch) are shown in Table 16.	Contract between State and SBCFCWCD is in place for ease of implementation. Contracts between SBCFCWCD and agencies that are to receive SWP water may be needed. No major legal or institutional problem is anticipated.	A preliminary review by DWR indicates that the proposed project is not competitive economically with alternative sources of supply available to SWP.

* Not determined.
** Water yield cannot be estimated within reasonable accuracy.

Note: Options in CAPITAL LETTERS are included in selection of alternatives.

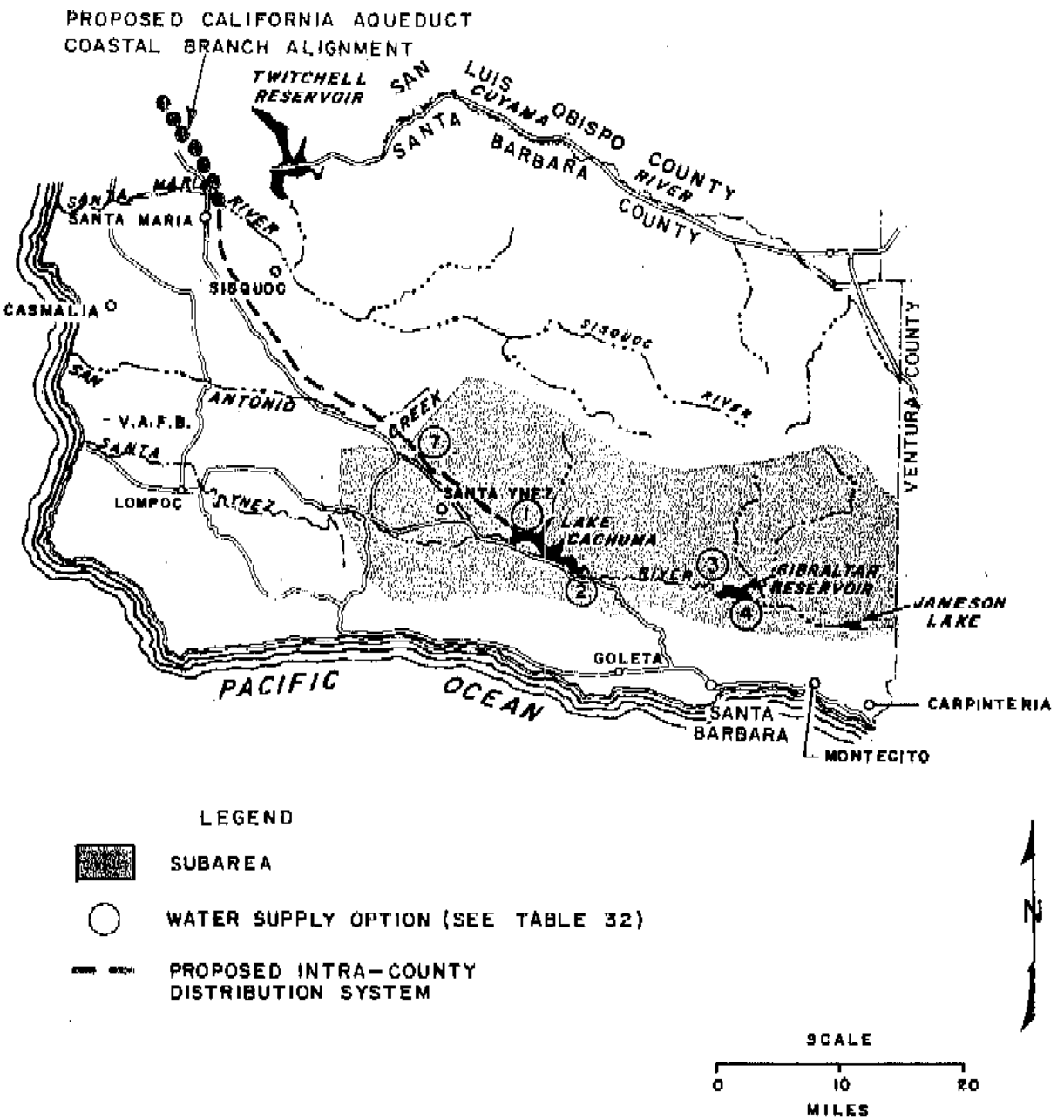

Figure 23- SANTA YNEZ (UPPER) SUBAREA WATER SUPPLY OPTIONS

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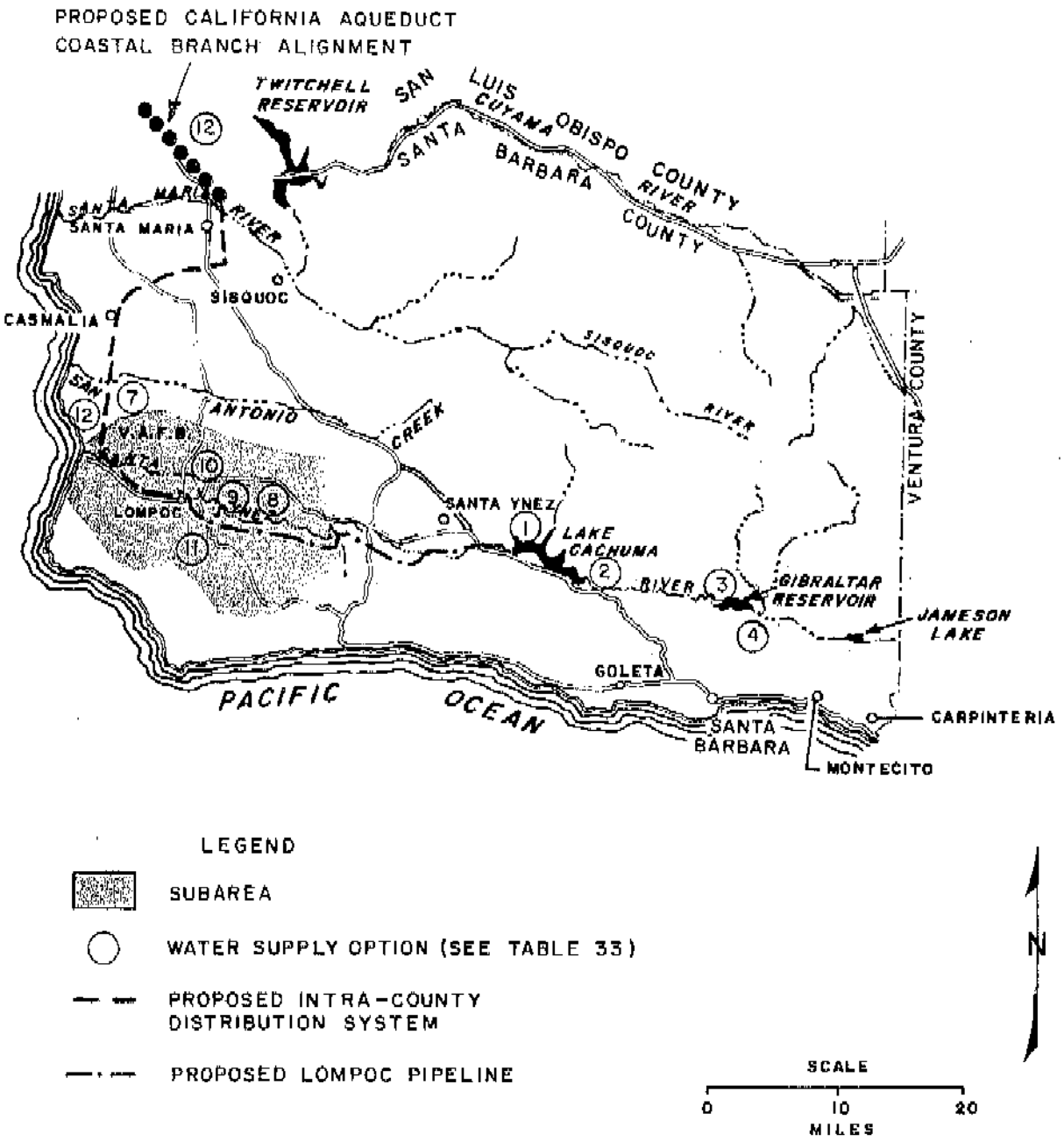


Figure 24– SANTA YNEZ (LOWER) SUBAREA WATER SUPPLY OPTIONS

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1985

TABLE 33
SUMMARY OF SANTA YNEZ (LOWER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
1. CACHUMA RESERVOIR								
a. Cachuma Reservoir (EXISTING) + Conj.Use	3500	6.9	76	22 new production wells would have to be constructed.	Minimal	Fluctuation of seasonal water level in excess of the existing water level changes may have some effects on water quality as well as on environment.	Any changes in operation of the reservoir would require the agreement of U.S.Bureau of Reclamation (USBR), Santa Ynez River Water Conservation District, (SYRWCD), and Cachuma Member Units.	
Plus Lompoc Pipeline	4000	16.2	498		May provide hydro-electric power			
b. CACHUMA RESERVOIR ENLRG.(27') (INCLUDING LOMPOC PIPELINE)	7770	51.7	1007	The existing dam height would be raised 27 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir. Highway reinforcement needed.	Minimal May provide hydro-electric power	A portion of a county park would be inundated Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
c. CACHUMA RESERVOIR ENLRG.(27') + CONJ.USE (INCLUDING LOMPOC PIPELINE)	13520	60.8	624	29 new production wells would have to be constructed. Modified operation of the reservoir and ground water basin would be needed.	Minimal May provide hydro-electric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality as well as on environment.	Any enlargement and changes in operation of the reservoir would require the agreement of USBR, SYRWCD, and Cachuma Member Units.	20% (60.8/51.7x100) increase in first cost of project, due to conjunctive use, would result in 74% (13520/7770x100) increase in production.

TABLE 33 (Continued)
SUMMARY OF SANTA YNEZ (LOWER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (KWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
d. Cachuma Reservoir Enlrg.(33')	9270	61.1	300	The existing dam height would be raised 33 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. About 0.5 mile of Highway 154 would have to be raised. The outlet facilities would have to be extended 400 feet. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir.	Minimal May provide hydroelectric power	A portion of a county park would be inundated. Mitigation measures required. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
Plus Lompoc Pipeline	4000	16.2	498					
e. Cachuma Reservoir Enlg.(33') + Conj.Use	15013	71.0	140	30 new production wells need to be constructed. Operation of reservoir and ground water basins would have to be modified.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality and environment.	Any enlargement and changes in operation of the reservoir would have to be approved by USBR, SYRWCD, and Cachuma Member Units.	16% (71.0/61.1x100) increase in first cost of project, due to conjunctive use, would increase the production by 62% (15010/9270x100)
Plus Lompoc Pipeline	4000	16.2	498					

f. CACHUMA RESERVOIR ENLRG.(42') (Including Lompoc Pipeline)	10590	80.0	1085	The existing dam height would be raised 42 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. About 1.2 miles of Highway 154 would have to be relocated. The outlet facilities would have to be extended 400 feet. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir.	Minimal May provide hydroelectric power	A portion of a county park would be inundated. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
g. CACHUMA RESERVOIR ENLRG.(42') + CONJ.USE (Including Lompoc Pipeline)	17490	90.0	573 to 850	32 new production wells need to be constructed. Operation of reservoir and ground water basins would have to be modified.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality and environment.	Any enlargement and changes in operation of the reservoir would have to be approved by USBR, SYRWCD, and Cachuma Member Units.	13% (90/80x100)increase in first cost of project, due to conjunctive use, would increase the production by 65% (17490/10590x100).

TABLE 33 (Continued)
SUMMARY OF SANTA YNEZ (LOWER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
2. Hot Springs Reservoir	5920	73.6	936	Highway 154 and Paradise Road would have some relocation.	Minimal	Portion of Paradise area would be inundated. Most of the reservoir area is privately owned.	Need to establish yield obligation by prior rights.	A preliminary review by DWR indicates that a feasibility-level investigation should be deferred until after a study is done regarding the enlargement of Cachuma Reservoir or constructing new Gibraltar Reservoir.
Plus Lompoc Pipeline	4000	16.2	498	(The Lompoc Pipeline could be included as part of this project.)	May provide hydro-electric power	Impairment of present water supply facilities not fully analyzed. Would offer additional recreational opportunities; waterfowl could use reservoir resting area along the Pacific Coast migration route.	All established water rights must be satisfied.	
						Unavoidable adverse effects require mitigation measures.	Must appropriate water through State Water Resources Control Board (SWRCB).	
						Fisheries resource may be disturbed during construction.	Must enter into agreements with a number of agencies.	
							Water rights have not been fully analyzed.	
3. NEW GIBRALTAR RESERVOIR								
a. New Gibraltar Reservoir	8335	98.8	869	Existing inlet-outlet system must be replaced.	Minimal	Potential disturbance of habitat & endangered species.	Need to establish yield obligations by prior right.	Preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
Plus Lompoc Pipeline	4000	16.2	498	Engineeringly feasible.	May provide hydro-electric power	No homes, roads, parks, or utilities threatened	All established water rights must be satisfied.	Alternative construction by roller compacted concrete was found to be infeasible at this damsite.
				Construction would not disturb existing water supplies, since dewatering of existing reservoir would not be required.		Increased recreational opportunities.	Must appropriate water through SWRCB.	
				Affords better flood control management and runoff capture efficiencies.		Unavoidable adverse effects require mitigation measures.	Must enter into agreements with a number of agencies.	
						Fisheries resource may be disturbed during construction.		
						The habitat of the least Bell's vireo be impacted.		

b. NEW GIBRALTAR RESERVOIR + CONJ.USE	13120	104.4	427	18 new production wells would have to be constructed. Modifications of the reservoir and ground water basin operation would be needed.	Minimal May provide hydro-electric power	Fluctuation of seasonal water level in excess of the existing water level changes may have some effects on water quality as well as environment. See additional comments in (a) above.	Need to establish yield obligations by prior right. All established water rights must be satisfied. Must appropriate water through SWRCB. Must enter into agreements with a number of agencies.	6% (104.0/98.8x100) increase in first cost of project, due to conjunctive use, would increase the production by 57% (13120/8335x100) Considering the new Gibraltar Reservoir option, transportation facilities would have to be upgraded & modified from the south portal of Mission Tunnel to Lauro Reservoir. Also, there exists an excellent hydroelectric power generation potential at the Lauro Reservoir.
4. Cameron Reservoir	8000	97.5	909	The Santa Ynez fault passes about 1.5 miles south of damsite. Rock in the left abutment has high permeability. New access roads would have to be constructed.	Minimal May provide hydro-electric power	Water would be potable and suitable for irrigation. Most of the reservoir area is public property. The reservoir would be vulnerable to reservoir siltation; however, a provision for siltation can be designed into the reservoir. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	Water rights have not been fully studied. Must enter into agreements with a number of agencies.	A preliminary review by DWR indicates that a feasibility-level investigation should be deferred until after a study is done regarding the enlargement of the Cachuma Reservoir or building new Gibraltar Reservoir.
5. Watershed Management	*	*	*	Management areas must be upstream from reservoir or ground water recharge facilities in order to regulate the additional runoff.	Unknown	Whether the sediment yield effects are beneficial or detrimental will depend on the care exercised in the management program.	A Coordinated Resource Management Agreement will be required to secure the cooperation of other state and federal resource and land management agencies.	Vegetation management can be initiated and benefits realized within 2 or 3 years after need for additional streamflow is ascertained.

TABLE 33 (Continued)
SUMMARY OF SANTA YNEZ (LOWER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
6. Weather Modification	2000 to 4000**	*	*	Determination of augmented water supply in surface reservoirs would require detailed operational studies. Cloud seeding appears to be most effective when conducted from aircraft. Cloud seeding is most productive during wet years and least productive in dry years.	Minimal	The effects of increased seasonal rainfall on fish and wildlife are impossible to determine.	Cloud seeding in one area could modify precipitation in another area.	This project is ongoing; new SWP yield would result only from additional cloud seeding.
7. STATE WATER PROJECT	12000	N/A	693 to 725	Importation of SWP water to the lower Santa Ynez Subarea would require the completion of the Coastal Branch and ICDS facilities (a pumping plant and 3 regulatory storage sites plus pipeline).	2220	The quality of SWP water would be good. Average 1984 constituents (in mg/L at Check 5-Coastal Branch) are shown in Table 16.	Contract between State and SBCFCWCD is in place for ease of implementation. Contracts between SBCFCWCD and agencies that are to receive SWP water may be needed. No major legal or institutional problem is anticipated.	Unit cost will be dependent on the amount of water delivered to other areas within the County. Water quality in area would be enhanced.
8. Lompoc Reservoir	16600	216.2	1022	An auxiliary dam and an additional dike are necessary in conjunction with this project. Extensive excavation in the foundation would be needed to install an adequate cutoff wall. About 4.5 miles of State Highway 1 road relocation would be necessary. There would be significant costs associated with outlet works and requirements for a major spillway.	Pumping plants would be needed to deliver water in storage; requiring 181 kWh/AF	The project would inundate sizable tracts of productive ranch and farmland in the Santa Ynez River Valley.	It has not been decided how the yield of the project would be divided among agencies that could benefit from the project.	Studies for SBCFCWCD & VAFB state that the project is not considered a viable, cost-effective alternative. When reanalyzed by the Bureau of Reclamation (USBR), following the 1969 flood, the project was not found economically justified.

9. Low Lompoc Reservoir Surface Delivery Operation	3190	64.4	1867	Similar to Lompoc Reservoir. No flood control benefits would be derived from the project.	Minimal			
10. Lompoc Off-stream Spreading	(See Engineering Considerations)	9.9		It would be difficult to convey diverted water from the narrows to the proposed spreading grounds. The ground water basin lacks sufficient storage space to make the program viable.	Minimal	Water quality in the ground water basin might be improved. It would be necessary for the State to purchase approximately 200 acres of land in the flood plain of the Santa Ynez River to develop spreading grounds. Ground water locally high in TDS for domestic and irrigation use.		A preliminary review by DWR indicates that the project does not warrant additional study.
11. SALSIPUEDES RESERVOIR SURFACE DELIVERY OPERATION	2850	33.5	922	Construction of a dam would require relocation of both State Highway 1 and Jalama Road. No recently active faults are known to pass through the dam or reservoir sites. Two large landslides have been mapped in the reservoir area. It has not been determined if construction materials are available.	Minimal May provide hydro-electric power	About 1000 acres of farm land would be inundated by the reservoir. Wildlife communities in the area could be displaced and fisheries could be enhanced. Water quality in the Lompoc Plain Ground Water Basin could be improved by storing better quality water from high flows. The reservoir might inundate potentially economically recoverable diatomite deposits.	It has not been decided how the yield of the project would be divided among agencies that could benefit from the project. No significant legal problems have been identified.	A recent study for VAFB states that this project should be considered as a potential source of supply.

TABLE 33 (Continued)
SUMMARY OF SANTA YNEZ (LOWER) SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
12. DESALINATION OF SEA WATER	6433 to 12000	29.3 to 54.2	1040 to 1854	Treatment facilities, pumping stations, and pipelines can be constructed at the proposed site to desirable standards by accepted techniques.	7550	Desalted water will be for urban use with good water quality. Minimum adverse environmental impacts are expected during the construction of the desalting plant and the transportation facilities. The use of local desalted water would help conserve the fresh water supplies of the area. Reliable water supply.	Agreements would be required among the various local agencies and DWR. Construction of the desalting plant near the coast must be approved by the Coastal Commission and the California Regional Water Quality Control Board, Central Coast Region.	Very energy intensive.

* Not determined.
** Water yield cannot be estimated within reasonable accuracy.

Note: Options in CAPITAL LETTERS are included in selection of alternatives.

when available, either directly or to recharge ground water basins. As a result, surface reservoirs would be drawn down more quickly than in a safe yield mode of operation, thus minimizing evaporation losses and maximizing the amount of storage capacity available for the next storm. At the same time, the use of ground water basins would be reduced, allowing the basins to fill without being subject to evaporation losses. During wet years, the surface reservoirs would be in a position to store more water and to experience less loss by spillage. During dry years, when reservoirs cannot supply normal amounts of water, the ground water basins would be relied upon to meet the shortage.

An estimated 3,500 to 6,900 acre-feet per year may be gained by conjunctive use operations in Santa Ynez and South Coast Subareas. An earlier version of a 10,000-acre-foot per year addition to the water supply by conjunctive use was analyzed by consulting engineers and the Santa Barbara County Water Agency. This earlier version was a complex program involving injection wells, lower operating levels in Cachuma Reservoir, dewatering of the basins downstream from Cachuma, and construction of a pipeline to the lower Santa Ynez Valley. It also included, as in all conjunctive use analyses, the coordinated fulfilling of the water rights of all member agencies and prior downstream rights as modified by SWRCB Water Rights Decision 73-37.

Although it would develop a larger yield, the earlier version would do so at the expense of heavy drafts on the ground water basins; therefore, it was found unacceptable.

A new conjunctive use program has been modeled for the existing Cachuma Reservoir, the three enlarged versions, and the New Gibraltar Reservoir. The program is based on modified reservoir operations, control of surface water, tunnel water, and some ground water. It does not rely on injection of water or spreading, only on indirect storage during wet periods by surface delivery of Santa Ynez River water for direct use in areas that normally use ground water, with cessation of or decrease in amount of ground water pumped so that the basin builds up naturally until its water is pumped later during dry periods (also known as the in-lieu-of-pumping method). The South Coast and upper Santa Ynez Subareas' ground water basins would be involved. The agencies receiving conjunctive use water yield would have to agree on the parameters, location of new ground water facilities, use of existing wells, and distribution of ground water when needed.

Project yields, ground water basin storage requirements, and ground water pumpage capacities and frequencies were analyzed so that conjunctive use operations would not stress the reservoirs to the point of no surface (i.e., tunnel water only) deliveries in the worst-case drought years. The worst-case drought delivery levels of surface plus tunnel waters were established at 70 percent of normal water deliveries occurring for most of the years in the hydrologic study period (1919-1984). Ground water withdrawal requirements were kept below the 200,000-acre-foot level. Results of the analysis are given in **Table 34.**

The present occasional high turbidity and seasonal quality variation of Cachuma Reservoir water delivered through the Santa Ynez outlet, which would be aggravated by a conjunctive use program, limits it mainly to agricultural use. The turbidity and quality problems are the result of taking water from a point close to the bottom of the reservoir. To correct these problems, the following three methods were considered, but not included in the costs:

1. Construct a new 20-cubic foot per second intake tower at Bradbury Dam, which forms Cachuma Reservoir. Approximate cost is $2.5 million.

2. Construct a slanted 30-inch intake pipe to lay against the upstream face of the dam. Approximate cost is $1.0 million.

3. Install a low-head floating pump at Bradbury Dam. Approximate initial cost is $0.5 million plus annual cost of operation and maintenance.

TABLE 34
INCREASED YIELD AND COST OF CONJUNCTIVE USE OPERATIONS

Reservoir	Increased yield, acre-feet per year			No. of wells*	Annual O&M cost, ($1,000)	Initial capital cost ($1,000)
	Reservoir	Conjunctive use	Total			
Cachuma						
Existing		3,500	3,500	22	95	6,900
Enlargement(27')	7,770	5,750	13,520	29	147	9,100
Enlargement(33')	9,270	5,743	15,013	30	153	9,400
Enlargement(42')	10,590	6,900	17,490	32	170	10,000
New Gibraltar	8,335	4,785	13,120	18	112	5,600

*Pumping during the worst-case drought year is assumed to be 500 gpm/well.

Among the options considered were conjunctive use with the existing Cachuma Reservoir, enlarged Cachuma Reservoir (27-, 33-, and 42-foot enlargement), and New Gibraltar Reservoir.

Cachuma Reservoir Enlargement (27 feet). This option would add 27 feet to the height of Bradbury Dam, increasing the storage capacity of Cachuma Reservoir to 300,000 acre-feet. The increased capacity would add 7,770 acre-feet to the annual yield from Cachuma Reservoir. The dam enlargement, which may require some lowering of the water surface, but not a major dewatering of the reservoir, could cost $51.7 million. The added yield would be shared by the South Coast and upper Santa Ynez and possibly the lower Santa Ynez Subareas.

Cachuma Reservoir Enlargement (33 feet). This option would add 33 feet to the height of Bradbury Dam, increasing the storage capacity of Cachuma Reservoir to 326,500 acre-feet. The increased capacity would add 9,270 acre-feet to the annual yield from Cachuma Reservoir. The added yield would be shared by the South Coast and upper Santa Ynez and possibly the lower Santa Ynez Subareas. The dam enlargement, which may require some lowering of the water surface, but not a major dewatering of the reservoir, would cost $71 million. The cost was determined by straight line interpolation between the cost of the enlargements of 27 feet and 42 feet.

Cachuma Reservoir Enlargement (42 feet). This option would add 42 feet to the height of Bradbury Dam, thus increasing the storage capacity of the reservoir to 364,500 acre-feet. This would add 10,590 acre-feet to the annual yield from Cachuma Reservoir. The enlargement, which may require some lowering of the water surface, but not a major dewatering of the reservoir, would cost $80 million. The added yield would be shared by the South Coast and the upper Santa Ynez, and possibly the lower Santa Ynez Subareas.

New Gibraltar Reservoir. This reservoir would be created by construction of a dam approximately 0.8 mile downstream from the existing Gibraltar Dam. The existing dam site was not selected for enlargement because of the unfavorable geology and topography of the area for a higher structure at the existing site. The proposed new reservoir would have a surface area of 2,300 acres and a gross storage capacity of 175,000 acre-feet. It would have storage space for about 70 years' accumulation of silt before planned storage capacity would be affected, thereby solving the severe siltation problem of the existing Gibraltar

Reservoir. (The existing Gibraltar Reservoir has a surface area of 276 acres and a storage capacity of 9,000 acre-feet.) The proposed dam and reservoir, under a safe yield mode, would add 8,335 acre-feet per year to the annual yield of the present reservoir-tunnel-ground water system.

The dam would be 320 feet high and 1,570 feet long. The finished embankment would have a volume of 12.6 million cubic yards.

A pipeline to Lompoc could be included in this proposed project, if the Lompoc area were to participate. The pipeline would have to extend only from Cachuma Reservoir, although the actual yield (above existing yield conditions) would be developed by the construction of the new, enlarged Gibraltar Reservoir. Water allocated to the lower Santa Ynez from Cachuma Reservoir by water exchange would reach the lower Santa Ynez through the pipeline.

The dam construction would cost about $98.8 million, excluding the cost of right-of-way and the cost of relocating utilities.

State Water Project. Delivery of the entitlement of 2,578 acre-feet into the upper Santa Ynez Subarea would require building a pipeline from the Santa Maria terminus to a turnout near Highway 154 at Santa Ynez, in addition to completion of the 83-mile Coastal Branch of the California Aqueduct. It would not be economically feasible to import SWP water to upper Santa Ynez without the participation of the South Coast Subarea.

Delivery of the SWP entitlement of 12,000 acre-feet to the lower Santa Ynez Subarea would require completing a pipeline from the terminus of the Coastal Branch to the Lompoc area, as well as the 83-mile Coastal Branch. The pipeline, which would be routed to minimize pumping along the way, would convey the water through Santa Maria, Casmalia, and Vandenberg Air Force Base to Lompoc. This lateral is commonly referred to as the Lompoc-VAFB Lateral and would be built as part of the ICDS.

If the Lompoc-VAFB Lateral were built, it would require one pumping plant, 3 storage sites, and a 33-inch pipeline. The final configuration and cost would depend upon the actual level of participation in the lower Santa Ynez Subarea, as well as in the Santa Maria and San Antonio Subareas.

Importation of SWP water to the lower Santa Ynez Subarea would greatly improve the local water quality. It is also to the advantage of the City of Lompoc to use the best quality water available throughout its system to meet the stringent waste water discharge requirements that have been established.

Salsipuedes Reservoir. This reservoir would be located on Salsipuedes Creek, a major tributary to the Santa Ynez River. The proposed damsite is about 5 miles southeast of the City of Lompoc on Salsipuedes Creek, two miles upstream from its confluence with the Santa Ynez River. This is an option considered for the lower Santa Ynez Subarea only.

The proposed project would place a 170-foot high earth-filled dam of some 2.5 million cubic yards, depending upon the damsite, in Salsipuedes Creek to form a reservoir of 50,000 acre-feet capacity.

There is a wide variation in precipitation and runoff in the watershed from year to year. However, after releases to satisfy downstream water rights and losses to evaporation and unrecovered spills, possibly 6,500 acre-feet per year under a ground water recharge mode of operation or 2,850 acre-feet per year under a surface delivery safe yield mode of operation would be available to augment the local water supply under average climatic conditions. However, the estimated yield in the ground water recharge mode may be too high because of limited storage capacity in the Lompoc Ground Water Basin.

Desalination of Sea Water. In spite of its high cost, this option is considered a potential source for part of the future water supply in the lower Santa Ynez Subarea because of the limited number of water

supply options available for this subarea. Costs developed for the desalination of sea water in the lower Santa Ynez Subarea using reverse osmosis are given in **Table 35.**

Of all the proposed local water supply options, exclusive of the SWP option, only sea water desalination could provide sufficient water on its own to make up the deficit between the subarea's current water supply and its demand. But it would be an energy-intensive option at a high cost.

Options Not Selected. Other options that were analyzed but not selected are listed below. Descriptions of these options and the reasons for not selecting them are summarized in **Tables 32 and 33.**

- Hot Springs Reservoir

TABLE 35
DESALINATION OF SEA WATER
BY REVERSE OSMOSIS
IN SANTA YNEZ (LOWER) SUBAREA

Plant capacity, AFY	12,000
Capital cost	$54,200,000
Annual capital cost	$ 3,396,000
Annual operating cost	$ 9,240,000
Total annual cost	$12,636,000
Unit water cost/AF	$ 1,054

Assumptions and Method of Computation
1. Plant life expectancy, 30 years.
2. Interest rate, 9.5 percent.
3. Unit energy consumption, 7550 kWh/AF.
4. Unit energy cost,$0.085/kWh (local) and $0.03/kWh (State).
5. Energy recovery equipment cost included in capital cost.
6. Operating time, 85 percent; maintenance time, 15 percent; fresh water recovery, 30 percent.
7. Seawater TDS content 35 000 mg/L.
8. Plants made up of 5 MGD or smaller modules.
9. April 1984 cost base.

- Camuesa Reservoir
- Watershed management
- Weather modification
- Lompoc Reservoir
- Low Lompoc Reservoir
- Lompoc off-stream spreading

SOUTH COAST SUBAREA

The water supply options considered in the South Coast Subarea are described in **Table 36** and located in **Figure 25.** Because of the location of water supply options involving Santa Ynez River drainage systems (i.e., the Cachuma Reservoir enlargement and the New Gibraltar Reservoir), the water from these sources would have to be imported to the South Coast Subarea from the upper Santa Ynez Subarea.

The options selected for further study are:

Cachuma Reservoir (existing) with conjunctive use*

Cachuma Reservoir enlargement (27 feet) with and without conjunctive use*

Cachuma Reservoir enlargement (33 feet) with and without conjunctive use*

Cachuma Reservoir enlargement (42 feet) with and without conjunctive use*

New Gibraltar Reservoir with and without conjunctive use*

Goleta Water Reuse. Development of this option would involve upgrading the treatment facilities at the Goleta Sewage Treatment Plant to provide effluent suitable for landscape irrigation. However, Goleta Water District must request entitlement to SWP water in order that the project be fundable under the local projects guidelines. The project is described in this report to illustrate an available water supply that is

* See Santa Ynez Subarea for description.

TABLE 36
SUMMARY OF SOUTH COAST SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
1. CACHUMA RESERVOIR								
a. CACHUMA RESERVOIR (EXISTING) + CONJ.USE	3500	6.9	76	22 new production wells would have to be constructed.	Minimal May provide hydroelectric power	Fluctuation of seasonal water level in excess of the existing water level changes may have some effects on water quality as well as on environment.	Any changes in operation of the reservoir would require the agreement of U.S.Bureau of Reclamation (USBR), Santa Ynez River Water Conservation District (SYRWCD), and Cachuma Member Units.	
b. CACHUMA RESERVOIR ENLRG.(27')	7770	51.7	264	The existing dam height would be raised 27 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir. Highway reinforcement needed.	Minimal May provide hydroelectric power	A portion of a county park would be inundated. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
c. CACHUMA RESERVOIR ENLRG.(27') + CONJ.USE	13520	60.8	126	29 new production wells would have to be constructed. Modified operation of the reservoir ground water basin would be needed.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality as well as on environment.	Any enlargement and changes in operation of the reservoir would require the agreement of USBR, SYRWCD, and Cachuma Member Units.	20% (60.8/51.7x100) increase in first cost of project, due to conjunctive use, would result in 74% (13520/7770x100) increase in production.

TABLE 36 (Continued)
SUMMARY OF SOUTH COAST SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
d. Cachuma Reservoir Enlrg.(33')	9270	61.1	300	The existing dam height would be raised 33 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. About 0.5 mile of Highway 154 would have to be raised. The outlet facilities would have to be extended 400 feet. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir.	Minimal May provide hydroelectric power	A portion of a county park would be inundated. Mitigation measures would be required. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
e. CACHUMA RESERVOIR ENLRG.(33') + CONJ.USE	15010	71.0	140	30 new production wells need to be constructed. Operation of reservoir and ground water basins would have to be modified.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality and environment.	Any enlargement and changes in operation of the reservoir would have to be approved by USBR, SYRWCD, and Cachuma Member Units.	16% (71.0/61.1x100) increase in first cost of project, due to conjunctive use, would increase the production by 62% (15010/9270x100)

f. CACHUMA RESERVOIR ENLRG.(42')	10590	80.0	361	The existing dam height would be raised 42 feet. The existing spillway would have to be dismantled and a new spillway would have to be constructed. A new intake tower for the Tecolote Tunnel would have to be constructed. About 1.2 miles of Highway 154 would have to be relocated. The outlet facilities would have to be extended 400 feet. Construction may require some lowering of the water surface, but not a major dewatering of the reservoir.	Minimal May provide hydroelectric power	A portion of a county park would be inundated. Most of the land that would be inundated is owned by USBR. Water would be potable and suitable for irrigation. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	USBR has indicated that congressional authorization would be needed to enlarge the reservoir. USBR, SYRWCD, and Cachuma Member Units would have to agree to any enlargement before it could be sponsored and authorized.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation.
g. CACHUMA RESERVOIR ENLRG.(42') + CONJ.USE	17490	90.0	171	32 new production wells need to be constructed. Operation of reservoir and ground water basins would have to be modified.	Minimal May provide hydroelectric power	Fluctuation of seasonal reservoir water level in excess of the existing water level changes may have some effects on water quality and environment.	Any enlargement and changes in operation of the reservoir would have to be approved by USBR, SYRWCD, and Cachuma Member Units.	13% (90/80x100)increase in first cost of project, due to conjunctive use, would increase the production by 65% (17490/10590x100).

TABLE 35 (Continued)
SUMMARY OF SOUTH COAST SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs		Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
		1st cost, (Mil.$)	Unit cost, ($/AF)					
2. Hot Springs Reservoir	5920	73.6	936	Highway 154 and Paradise Road would have some relocation.	Minimal May provide hydro-electric power	Portion of Paradise area would be inundated. Most of the reservoir area is privately owned. Impairment of present water supply facilities not fully analyzed. Would offer additional recreational opportunities; waterfowl could use reservoir resting area along the Pacific Coast migration route. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	Need to establish yield obligation by prior rights. All established water rights must be satisfied. Must appropriate water through State Water Resources Control Board (SWRCB). Must enter into agreements with a number of agencies. Water rights have not been fully analyzed.	A preliminary review by DWR indicates that a feasibility-level investigation should be deferred until after a study is done regarding the enlargement of Cachuma Reservoir or constructing new Gibraltar Reservoir.
3. NEW GIBRALTAR RESERVOIR								
a. NEW GIBRALTAR RESERVOIR	8335	98.8	869	Existing inlet-outlet system not usable at new site. Engineeringly feasible.	Minimal May provide hydro-electric power	Appears environmentally sound. No homes, roads, or utilities threatened. Increased recreational opportunities. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction. The habitat of the least Bell's vireo may be impacted.	Need to establish yield obligations by prior right. All established water rights must be satisfied. Must appropriate water through SWRCB. Must enter into agreements with a number of agencies.	Preliminary review by DWR indicates that the project warrants a feasibility-level investigation.

b. NEW GIBRALTAR RESERVOIR + CONJ.USE (Including Lompoc Pipeline)	13120	104.4	925	18 new production wells would have to be constructed. Modifications of the reservoir and ground water basin operation would be needed.	Minimal May provide hydro-electric power	Fluctuation of seasonal water level in excess of the existing water level changes may have some effects on water quality as well as environment. See additional comments under (a) above.	Need to establish yield obligations by prior right. All established water rights must be satisfied. Must appropriate water through SWRCB. Must enter into agreement with a number of agencies.	6% (104.0/98.8x100) increase in first cost, due to conjunctive use, would increase the production by 57% (13120/8335x100).
4. Camuesa Reservoir	8000	97.5	909	The Santa Ynez fault passes about 1.5 miles south of dam site. Rock in the left abutment has high permeability. New access roads would have to be constructed. (The Lompoc Pipeline could be included as part of this project.)	Minimal May provide hydro-electric power	Water would be potable and suitable for irrigation. Most of the reservoir area is public property. The reservoir would be vulnerable to siltation; however, a provision for siltation can be designed into the reservoir. Unavoidable adverse effects require mitigation measures. Fisheries resource may be disturbed during construction.	Water rights have not been fully studied. Must enter into agreements with a number of agencies.	A preliminary review by DWR indicates that a feasibility-level investigation should be deferred until after a study is done regarding the enlargement of the Cachuma Reservoir or building new Gibraltar Reservoir.
Plus Lompoc Pipeline	4000	16.2	498					
5. Watershed Management	*	*	*	Management areas must be upstream from reservoir or ground water recharge facilities in order to regulate the additional runoff.	Unknown	Whether the sediment yield effects are beneficial or detrimental will depend on the care exercised in the management program.	A Coordinated Resource Management Agreement will be required to secure the cooperation of other state and federal resource and land management agencies.	Vegetation management can be initiated and benefits realized within 2 or 3 years after need for additional streamflow is ascertained.

TABLE 36 (Continued)
SUMMARY OF SOUTH COAST SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
6. Weather Modification	2000 to 4000**	*	*	Determination of augmented water supply in surface reservoirs would require detailed operational studies. Cloud seeding appears to be most effective when conducted from aircraft. Cloud seeding is most productive during wet years and least productive in dry years.	Minimal	The effects of increased seasonal rainfall on fish and wildlife are impossible to determine.	Cloud seeding in one area could modify precipitation in another area.	This project is ongoing; new SWP yield would result only from additional cloud seeding.
7. Eagle Canyon Reservoir	2000	42.8	2201	Existing conduit must be modified and a turnout facility would be required. An additional pumping station is needed. Appears engineeringly feasible.		It is anticipated that no rare or endangered wild-life species would be affected. Loss of 320+ acres of deer range/agricultural lands would have to be mitigated. Water is of good quality; however, requires treatment for M&I use.	Any attempt by Goleta Water District (GWD)to divert spill water for storage at the site may be challenged by the SYRWCD.	A preliminary review by DWR indicates that the proposed project is not competitive economically with alternative sources of supply available to the SWP.
8. GOLETA WATER REUSE				Treatment facilities, pumping stations, pipelines, and Eagle Canyon Reservoir (not same reservoir as mentioned above) can be constructed at proposed sites and to desired standard by accepted techniques. Project appears engineeringly feasible.		Precautions must be taken to ensure high quality reclaimed water and minimum health risks. Water reclaimed would maintain greenbelts. Effects of salt buildup in the root zone and on ground water quality should be monitored. Reuse of local waste water supplies would help conserve the fresh water supplies. Typical analysis of treated waste water in mg/L: TDS, 1,330; Na, 276; HCO3, 403; Cl, 328; and SO4, 315.	GWD has authority to construct, operate, and maintain the facilities. Approval needed from SWRCB, Calif. Dept. of Health Services, and Santa Barbara County Dept.of Health. Construction approval needed from Calif. Coastal Commission. Negotiation will be required between GWD, DWR, and SBCFCWCD.	A feasibility-level investigation conducted by DWR concluded that Phase I of the project is eligible for inclusion in the SWP. Phase II of the project could be included if Goleta Water District could show that there is an ensured market for the reclaimed water. Phase II dropped from further consideration for this reason.
PHASE I	845	12.8	1737		2000			
Phase II	2,800							

9. Goleta flood control and recharge (Corps of Engineers)	500	1.5***		The project consists of multi-purpose earthen dams on San Pedro, Las Vegas, and San Jose Creeks; releases would be controlled to percolate 500 acre-feet per year. The heights of the dams would range from 67 feet to 85 feet; width would be approximately 700 feet. Ground water pumping lifts would be decreased to a small degree.	Energy will be required to extract ground water	May displace some homes Would provide flood control and additional water conservation through artificial recharge of runoff that would be lost to the ocean. Some vegetation and orchards would be lost; however, downstream vegetation and wild life may benefit from continuous flow of water in creeks.	Agreements would be necessary between GWD, SBCFCWCD, DWR, and U.S. Army Corps of Engineers. Management of ground water replenishment and extraction required.	
10. SANTA BARBARA CITY REGIONAL WATER REUSE				Pretreatment facilities would be located at the existing Santa Barbara Wastewater Treatment Plant. The distribution system would require over 20 miles of pipelines. Two system storage facilities must be constructed.	High	Reclaimed water would be used for landscape irrigation. Precautions must be taken to minimize public contact with the reclaimed water. TDS of the reclaimed water would be about 1 300 mg/L.	Agreements would be required between the various local agencies, SBCFCWCD, and DWR.	A preliminary review by DWR indicates that the project warrants a feasibility-level investigation. Only 1,052 acre-feet of potable water would be available for higher use.
PHASE I (LANDSCAPE IRRIGATION)	648 to 1052#	11.4	1177- to 1151					
Phase II (Ground Water Recharge)	1000							

TABLE 36 (Continued)
SUMMARY OF SOUTH COAST SUBAREA WATER SUPPLY OPTIONS

Water supply option	Incremental project yield (AFY)	Estimated 1984 project costs: 1st cost, (Mil.$)	Estimated 1984 project costs: Unit cost, ($/AF)	Engineering considerations	Net energy required (kWh/AF)	Water quality and environmental considerations	Legal and institutional considerations	Remarks
11. DESALINATION SEA WATER	841 to 12435	3.3 to 56.1	1211 to 1091	Treatment facilities, pumping stations, and pipelines can be constructed at the proposed site to desirable standards by accepted techniques.	7550	Desalted water would be used for M&I purposes. Minimum adverse environmental impact would occur during the construction of the desalting plant and the transportation facilities. The use of local desalted water would help conserve the fresh supplies of the area. Realiable salt water supply.	Agreements would be required among the various local agencies and DWR. Construction of the desalting plant near the coast must be approved by the Calif.Coastal Commission and the Calif.Regional Water Quality Control Board, Central Coast Region.	Desalination plant size depends upon the yield provided by options selected for the reservoirs in the upper Santa Ynez Subarea. Very energy intensive.
12. STATE WATER PROJECT	12435	N/A	880	Importation of SWP water to the South Coast would require the completion of the Coastal Branch, 3 pumping plants, 3 regulatory storage tanks, 1 power recovery plant & 42- to 66-inch pipeline, and construction of the Intra-County Distribution System (ICDS), two pumping plants, three regulatory storage tanks, plus 30- to 39-inch pipeline.	3130	Quality of SWP water would be good. Average 1984 constituents (mg/L at Check 5-Coastal Branch) are shown in Table 16.	Contract between State and SBCFCWCD is in place for some of implementation. Contracts between SBCFCWCD and agencies that are to receive SWP water may be needed. No major legal or institutional problem is anticipated.	

* Not determined.
** Water yield cannot be estimated within reasonable accuracy.
*** Does not include new recharge facilities; recharge is assumed to occur in the creek channel.
\# The use of 1555 acre-feet of reclaimed water would free 1052 acre-feet of existing potable water for higher use.

Note: Options in CAPITAL LETTERS are included in selection of alternatives.

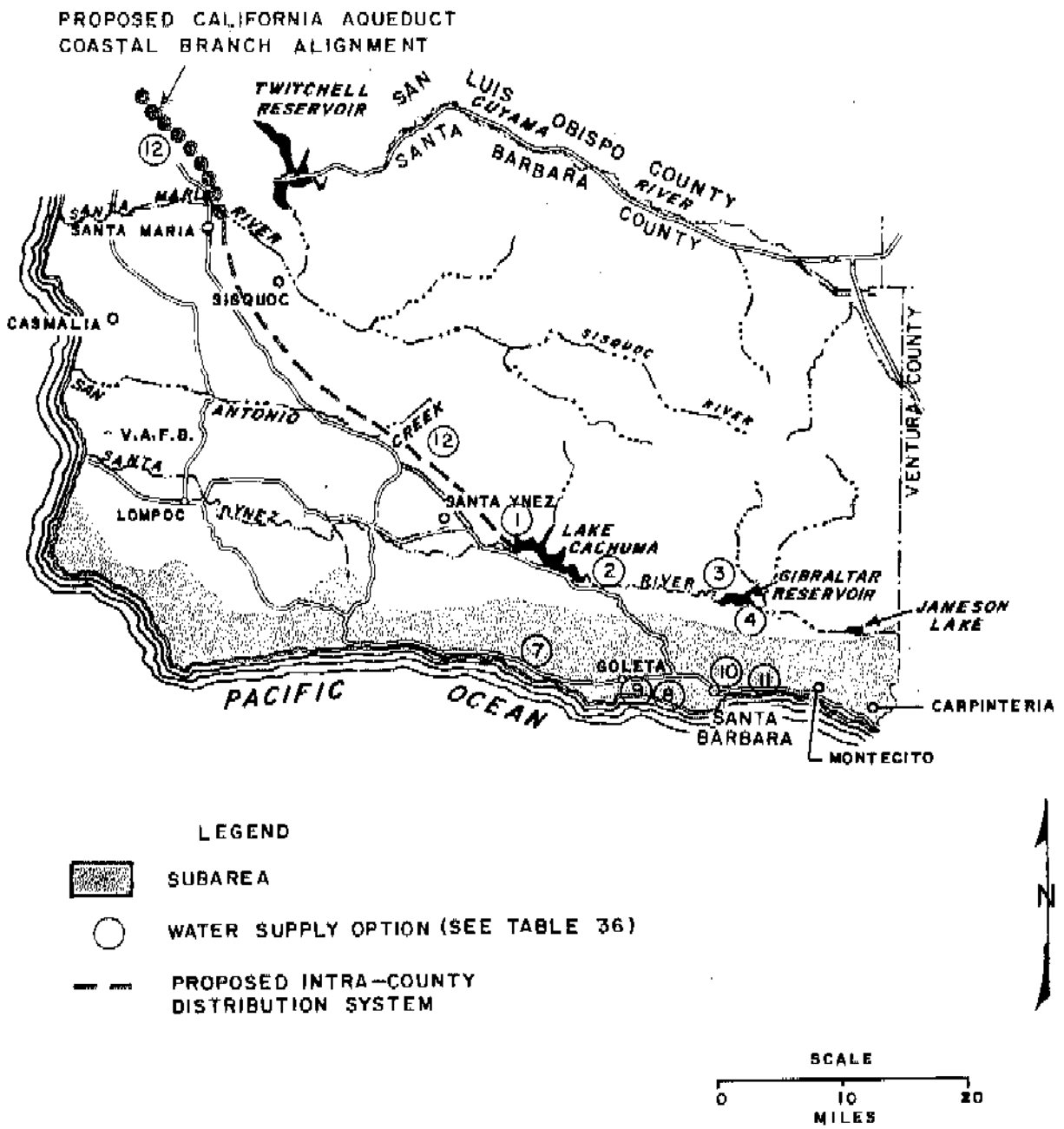


Figure 25- SOUTH COAST SUBAREA WATER SUPPLY OPTIONS

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1988

currently not developed.

The project is divided into two phases. Under phase I, secondary treatment facilities would be added to the current facilities to provide effluent of a quality adequate for irrigating landscapes and golf courses. Under phase II, additional secondary treatment facilities plus desalting capabilities would be added to further upgrade effluent quality to irrigate avocado and citrus groves. Water from the desalting facilities would be blended with effluent from the secondary treatment plant to produce water approximately equivalent in mineral quality to that of local water supplies. The water would not be potable, however, and would have only limited use. Both phases would include separate pumping stations and pipelines to distribute the reclaimed water.

Under phase I, 965 acre-feet of reclaimed water would be available annually to replace the 845 acre-feet of potable water currently used for irrigation that could, in effect, be added to the Goleta water supply. Adding phase II, up to 8,600 acre-feet of reclaimed water could be made available annually for landscape and agricultural irrigation. About 2,800 acre-feet per year of potable water now used for this purpose would be freed for urban use. Preliminary studies indicate that this project, through phase II, is economically and technically feasible, assuming that future agriculture will provide a market for the total reclaimed water that would be produced.

Santa Barbara City Regional Water Reuse. This option would provide 1,560 acre-feet of reclaimed water for landscape irrigation plus 1,000 acre-feet per year for recharge, subject to institutional constraints in Santa Barbara and nearby communities. The use of the reclaimed water would replace 1,050 acre-feet of potable water currently used for landscape irrigation, which could, in effect, be added to the City's and districts' water supply. The concept report on the reuse program by the City of Santa Barbara and adjacent south County communities estimated that the reclaimed water would cost approximately $1,151 per acre-foot. The same report indicates that the project is economically and technically feasible. The proposed project would add pretreatment facilities consisting of filters, supply pumps, controls, alum and polymers feed system, chlorination, and boosters to pump effluent to the reservoirs or directly for landscape irrigation.

Desalination of Sea Water. Sea water is readily available and the time required to build the facilities and deliver a water supply is relatively short compared to other options. Desalination is energy intensive and, therefore, future costs are less certain than for reservoir projects. Desalination could be provided in whatever quantities

TABLE 37
DESALINATION OF SEAWATER
BY REVERSE OSMOSIS
IN SOUTH COAST SUBAREA

Plant capacity, AFY	12,435
Capital cost	$ 56,100,000
Annual capital cost	$ 3,606,000
Annual operating cost	$ 8,108,000
Annual local transportation cost	$ 1,853,000
Total annual cost	$ 13,567,000
Unit water cost/AF	$ 1,091

Assumptions and Method of Computation
1. Plant life expectancy, 30 years.
2. Interest rate, 9.5 percent.
3. Unit energy consumption, 7,550 kWh/AF.
4. Unit energy cost, $0.085/kWh (local) and $0.03/kWh (State).
5. Energy recovery equipment cost included in capital cost.
6. Operating time, 85 percent; maintenance time, 15 percent; fresh water recovery, 30 percent.
7. Sea water TDS content, 35 000 mg/L.
8. Plants made up of 5 MGD or smaller modules.
9. April 1984 cost base.

might be desired and facilities could be constructed in stages more readily than other types of projects.

Table 37 contains a summary of costs to develop a water supply from desalination of sea water in the South Coast Subarea.

State Water Project. SWP water delivery to the South Coast would require completion of the Coastal Branch and the construction of the Santa Maria-Tecolote Tunnel aqueduct. The aqueduct would consist of a pressure pipeline that would parallel Telephone Road, U.S. Highway 101, and State Highway 154 to the north portal of Tecolote Tunnel. The system would contain two pumping plants, one southeast of Santa Maria and one north of the intersection of Highways 101 and 154, and three storage sites. The final configuration and cost would depend on the actual level of participation within the South Coast as well as the other subareas in the County. Construction of the Coastal Branch would be a State responsibility and construction of the pipeline (part of ICDS) would be a local responsibility.

SWP water would require treatment. The blending of Cachuma water with SWP water would improve the overall quality of water being served to the South Coast. The TDS content of Cachuma Reservoir water varies but usually averages about 590 mg/L, whereas SWP water averaged about 185 mg/L in 1984 near Devil's Den on the Coastal Branch. Use of SWP water for agricultural purposes appears to be beyond the payment capacity of crops currently raised and is not considered in this study.

Options Not Selected. Other options which were analyzed but not selected are listed below. Descriptions of these options and the reasons for not selecting them are summarized in Table 36.

- Hot Springs Reservoir
- Camuesa Reservoir
- Watershed management
- Weather modification
- Eagle Canyon Reservoir
- Goleta flood control and recharge

CHAPTER VI. FORMULATION OF ALTERNATIVES

During the screening process, a number of water supply options appearing to have the potential for supplying an equivalent of the subarea's SWP water entitlement were identified within each subarea. **Table 38** depicts, for comparison, the water yield, both capital and annual operation and maintenance (O & M) costs ranked by unit costs and energy required of these selected options, together with yield, costs, and energy required of other options not selected. **Table 39** depicts the same information, but ranked by yield. Selected options were found to meet the entire entitlement within each subarea except Cuyama and San Antonio Subareas. The water supply developed by some options was also assumed to be shared between subareas, such as those located on the Santa Ynez River system (Cachuma Reservoir enlargements, New Gibraltar Reservoir, etc.).

Since costs to develop future SWP supplies (conservation facilities) are not known, **Tables 38 and 39** depict a range of $400 to $200 per acre-foot of financing for future SWP supplies and its effect on local project financing. For this study, $400 per acre-foot of financing was assumed.

Tables 38 and 39 costs for local project alternatives were developed by SBCFCWCD and DWR. Considerable effort was expended in developing the best cost data based on past studies and some new evaluations, such as those done by DWR (local projects on the upper Santa Ynez River system, desalination of sea water, and water reuse project at Goleta) and SBCFCWCD (Branch Canyon, Santa Barbara Canyon, and San Antonio Reservoirs). Previous cost estimates were updated to April 1984 costs using the U.S. Bureau of Reclamation Construction Cost Index.

Costs shown in **Tables 38 and 39** for SWP water via the Coastal Branch are the sum of SBCFCWCD's share of related SWP facilities charges as shown in **Table 40** ($72 per acre-foot); estimated costs for completion of the Coastal Branch of the SWP, including pumping costs ($301 per acre-foot); and estimated costs for local distribution facilities for each subarea, plus pumping costs. Costs for SWP water via the Cuyama Branch are the sum of SBCFCWCD's assumed share of related SWP facilities charges as shown in **Table 40** ($49 per acre-foot); estimated costs for completion of the Cuyama Branch between Maricopa and the Santa Barbara County line, including pumping costs ($1,020 per acre-foot); and estimated costs for local distribution facilities between the county line and New Cuyama ($50 per acre-foot). Not included in the above costs are estimated costs for future SWP yield-producing facilities, which would increase costs for these alternatives. These estimates are discussed in Chapter VII.

Costs that were not included in the cost analysis for Santa Maria and Lompoc areas, but that should be considered in any final feasibility study, are treatment costs and consumer penalty costs (such as those from shortened lives of water heaters and plumbing fixtures and from increased use of soap, water softeners, and bottled water) resulting from use of poorer quality local water and economic benefits derived from use of better quality SWP water. **Table 41** compares estimated treatment (chemicals, electric power, natural gas, etc.) and consumer penalty costs. Capital costs for treatment plants are not included because each water source will require a treatment plant and this table is just for comparing costs. The consumer penalty costs shown are for water after receiving proposed municipal treatment. The penalty costs for ground water given only the existing treatment range from $60 per acre-foot in Lompoc to

TABLE 38: ESTIMATED COSTS OF SANTA BARBARA COUNTY WATER SUPPLY OPTIONS RANKED BY UNIT COSTS WITHIN SUBAREAS *

Assumed SWP avoided cost share of local project costs ------->$400/AF $200/AF							Unit cost local funds $/AF
SUBAREA Water supply option	Yield AFY	Capital cost $1000	Annual O&M ** $1000	Energy use kWh/AF	Unit cost $/AF	Unit cost $/AF	
CUYAMA							
SWP Water	1,600	-		4,030	1,119	1,119	1,119
Santa Barbara Cyn Reservoir	1,500	36,000	108	0	2,517	2,756	3,083
Branch Canyon Reservoir	400	12,000	36	0	3,210	3,449	3,776
SANTA MARIA							
SWP Water	16,850	-		1,985	430	430	430
Round Corral Reservoir	6,700	83,300	250	0	902	1,141	1,467
Desalination of Seawater	16,850	74,400	6,790	7,550	1,143	1,355	1,806
SAN ANTONIO SWP Water	23	-		2,100	598	598	598
LOWER SANTA YNEZ							
SWP Water	12,000	-		2,220	693	693	693
Salsipuedes Reservoir	2,850	33,500	101	0	922	1,161	1,487
Lompoc Reservoir	16,600	216,200	649	0	1,022	1,260	1,587
Desalination of Seawater	12,000	54,200	4,870	7,550	1,054	1,265	1,674
Low Lompoc Reservoir	3,190	64,400	193	0	1,867	2,106	2,433
Cachuma-Lompoc Pipeline ***	4,000	16,217					498
UPPER SANTA YNEZ SWP Water	2,578	-		3,130	830	830	830
UPPER SANTA YNEZ + SOUTH COAST							
Existing Cachuma + Conj Use	3,500	6,900	32	460	76	101	310
27' Enlrgd Cachuma + Conj Use	13,520	60,785	225	260	126	268	591
33' Enlrgd Cachuma + Conj Use	15,013	71,000	260	250	142	284	618
42' Enlrgd Cachuma + Conj Use	17,490	90,000	324	240	171	332	666
Enlrgd Cachuma (27 ft)	7,770	51,685	155	0	264	493	820
Enlrgd Cachuma (42 ft)	10,590	80,000	240	0	361	600	927
New Gibraltar Resv + Conj Use	13,120	104,400	354	220	427	661	996
New Gibraltar Reservoir	8,335	98,800	296	0	869	1,107	1,434
Camuesa Reservoir	8,000	97,524	293	0	909	1,147	1,474
Hot Springs Reservoir	5,920	73,557	221	0	936	1,175	1,502
SOUTH COAST ONLY							
SWP Water	12,435	-		3,130	880	880	880
Desalination of Seawater	12,435	56,100	5,000	7,550	1,091	1,303	1,712
SB Regional Water Reuse	1,052	11,377	197	1,500	1,151	1,370	1,759
Goleta Water Reuse	845	12,775	223	2,000	1,737	1,956	2,373
Eagle Canyon Reservoir	2,000	42,768	128	1,000	2,201	2,433	2,809

* With and without SWP funding of local projects. April 1984 price levels. Water quality considerations not included.

** Annual operation and maintenance costs, not including power costs.

*** The Lompoc Pipeline may be installed with any of the upper Santa Ynez River reservoirs. Costs shown are for locally financed pipeline alone and must be added to the cost of reservoir projects.

TABLE 39: ESTIMATED COSTS OF SANTA BARBARA COUNTY WATER SUPPLY OPTIONS RANKED BY YIELD WITHIN SUBAREAS *

Assumed SWP avoided cost share of local project costs ------->$400/af					$200/af		
SUBAREA Water supply option	Yield AFY	Capital cost $1000	Annual O&M ** $1000	Energy use kWh/AF	Unit cost $/AF	Unit cost $/AF	Unit cost local funds $/AF
CUYAMA							
SWP Water	1,600	-		4,030	1,119	1,119	1,119
Santa Barbara Cyn Reservoir	1,500	36,000	108	0	2,517	2,756	3,083
Branch Canyon Reservoir	400	12,000	36	0	3,210	3,449	3,776
SANTA MARIA							
SWP Water	16,850	-		1,985	430	430	430
Desalination of Seawater	16,850	74,400	6,790	7,550	1,143	1,355	1,806
Round Corral Reservoir	6,700	83,300	250	0	902	1,141	1,467
SAN ANTONIO: SWP Water	23	-		2,100	598	598	598
LOWER SANTA YNEZ							
Lompoc Reservoir	16,600	216,200	649	0	1,022	1,260	1,587
SWP Water	12,000	-		2,220	693	693	693
Desalination of Seawater	12,000	54,200	4,870	7,550	1,054	1,265	1,674
Low Lompoc Reservoir	3,190	64,400	193	0	1,867	2,106	2,433
Salsipuedes Reservoir	2,850	33,500	101	0	922	1,161	1,487
Cachuma-Lompoc Pipeline ***	4,000	16,217					498
UPPER SANTA YNEZ: SWP Water	2,578	-		3,130	830	830	830
UPPER SANTA YNEZ + SOUTH COAST							
42' Enlrgd Cachuma + Conj Use	17,490	90,000	324	240	171	332	666
33' Enlrgd Cachuma + Conj Use	15,013	71,000	260	250	142	284	618
27' Enlrgd Cachuma + Conj Use	13,520	60,785	225	260	126	268	591
New Gibraltar Resv + Conj Use	13,120	104,400	354	220	427	661	996
Enlrgd Cachuma (42 ft)	10,590	80,000	240	0	361	600	927
New Gibraltar Reservoir	8,335	98,800	296	0	869	1,107	1,434
Camuesa Reservoir	8,000	97,524	293	0	909	1,147	1,474
Enlrgd Cachuma (27 ft)	7,770	51,685	155	0	264	493	820
Hot Springs Reservoir	5,920	73,557	221	0	936	1,175	1,502
Existing Cachuma + Conj Use	3,500	6,900	32	460	76	101	310
SOUTH COAST ONLY							
SWP Water	12,435	-		3,130	880	880	880
Desalination of Seawater	12,435	56,100	5,000	7,550	1,091	1,303	1,712
Eagle Canyon Reservoir	2,000	42,768	128	1,000	2,201	2,433	2,809
SB Regional Water Reuse	1,052	11,377	197	1,500	1,151	1,370	1,759
Goleta Water Reuse	845	12,775	223	2,000	1,737	1,956	2,373

* With and without SWP funding of local projects. April 1984 price levels. Water quality considerations not included.

** Annual operation and maintenance costs, not including power costs.

*** The Lompoc Pipeline may be installed with any of the upper Santa Ynez River reservoirs. Costs shown are for locally financed pipeline alone and must be added to the cost of reservoir projects.

TABLE 40
ASSUMPTIONS FOR SWP CHARGES

In dollars per acre-foot

Charge Component	Via Coastal Branch	Via Cuyama Branch
Conservation facilities charge		
Existing	$ 12.87	$ 12.87
Future	7.13*	7.13*
Subtotal	$ 20.00	$ 20.00
Transportation facilities charge (including pumping costs)	$ 51.94**	$ 29.00**
Total	$ 71.94	$ 49.00

* Assumed year 1990 debt service for initial portion of (1984) Senate Bill 1369 facilities.
** Cost of existing facilities only, not including cost of completing Coastal and Cuyama Branches.

$285 per acre-foot in Santa Maria, where it receives chlorination only.

Mineral quality (salinity, sodium, boron, etc.) also exerts an impact upon agricultural water users. These penalty costs were not assessed in this study, but should be recognized in any final decision.

To meet the water supply requirements within Santa Barbara County as a whole, a number of options were combined. Matrices were developed and programmed to depict various combinations of options for each subarea within Santa Barbara County. Each combination was, in turn, referred to as an alternative and, subsequently, 16 were developed for evaluation. Table 42 displays the alternatives that were selected. Alternatives are numbered for identification, not in order of preference. Descriptions of the alternatives are given below:

(Note that these alternatives, with minor exceptions, produced a quantity of water equal to the County entitlement to SWP water.)

Alternative 1

All local projects (including raising Cachuma 27 feet).

- All entitlement water within each subarea is developed exclusively by local projects.
- Heavy reliance is placed on a variety of local projects such as: surface reservoirs — Santa Barbara Canyon, Round Corral, Salsipuedes, and Cachuma (27-foot enlargement); desalination of sea water in the Santa Maria, lower Santa Ynez, and South Coast Subareas; and water reuse at Goleta and Santa Barbara.
- Note that Santa Barbara Canyon Reservoir

would develop only 1,500 AFY of Cuyama Subarea's 1,600 AFY entitlement. This also applies to Alternatives 2, 4, and 7.

o Cachuma Reservoir yield is shared between the Santa Ynez (both upper and lower) and South Coast Subareas. However, the San Antonio Subarea (Casmalia) would receive no water.

Alternative 2

All local projects (including raising Cachuma 42 feet).

o Alternative 2 is identical to Alternative 1, except Bradbury Dam on Cachuma Reservoir is raised by 42 feet.

Alternative 3

Local projects for the South Coast and upper Santa Ynez Subareas (including New Gibraltar); SWP water to rest of County.

o SWP water is delivered via the Cuyama

TABLE 41
SUMMARY OF WATER QUALITY PENALTY COSTS
(TDS and TH only)

Water supply option	Quality				Municipal treatment costs,* in $/AF		Consumer penalty costs,** in $/AF	Total water quality penalty cost, in $/AF
	Source water		Product water					
	TDS mg/L	TH mg/L	TDS mg/L	TH mg/L	Existing	Proposed		
SWP Water (Check 5)	185	75	185	75	—	12	0	12
LOMPOC AREA:								
Salsipuedes Reservoir	850	520	595***	150#	—	100	60	160
Cachuma Reservoir Enlargement	590	385	430***	150#	—	75	60	135
Ground water##	1 400	850	850	150	160	160	60	220
Sea water	35 000	6000	500	86###	—	—	10	10*
SANTA MARIA AREA:								
Round Corral Reservoir	720	480	490***	150#	—	90	60	150
Ground water##	770	445	565***	150#	no treatment	85	60	145
Sea water	35 000	6 000	500	86###	—	—	0	0*

* Treatment costs based on existing costs at Lompoc Treatment Plant. Excludes treatment plant capital costs and ground water extraction costs. Also excludes capital and operation and maintenance costs for desalting sea water by reverse osmosis because they are already included in cost figures shown in this report. Cost of energy alone for desalination is approximately $642 per acre-foot.
** Penalty costs, after proposed municipal treatment, developed from generalized curve for cost impact of TH on consumers; cost adjusted to 1984 dollars.
*** TDS reduced in proportion to reduction in TDS and TH at Lompoc Treatment Plant.
# Assumption: Treatment will result in product water with quality similar to that of water supply from Lompoc Treatment Plant.
Current local water supply.
Assumption: TH reduced in direct proportion to reduction in TDS in product water.

TABLE 42
SUMMARY OF WATER SUPPLY ALTERNATIVES
TO MEET SBCFCWCD ENTITLEMENTS FROM THE STATE WATER PROJECT

SUBAREA (SWP Entitlement) / Water supply option	Alternatives ('C' includes conjunctive use)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CUYAMA (1,600 AFY)																
Santa Barbara Canyon Resv	X	X		X			X									
State Water Project			X		X	X		X	X	X	X	X	X	X	X	X
SANTA MARIA (16,850 AFY)																
Round Corral Reservoir	X	X														
Desalination of Seawater	X	X			X	X										
State Water Project			X	X			X	X	X	X	X	X	X	X	X	X
SAN ANTONIO (23 AFY)																
State Water Project			X	X				X	X	X	X	X	X	X	X	X
SANTA YNEZ, LOWER (12,200 AFY)																
Gibraltar + Lompoc Pipeline										C						
Cachuma + Lompoc Pipeline	X27	X42						C27	C42				C42			C42
Salsipuedes Reservoir	X	X					X									
Desalination of Seawater	X	X			X	X	X									
State Water Project			X	X				X	X	X	X	X	X	X	X	X
SANTA YNEZ, UPPER (2,578 AFY)																
New Gibraltar Reservoir			X	X						C				C		
Existing Cachuma, Conj. Use							C									
Enlarged Cachuma Reservoir	X27	X42			X27	X42		C27	C42		C27	C33	C42			C42
State Water Project															X	
SOUTH COAST (12,435 AFY)																
New Gibraltar Reservoir			X	X						C				C		
Existing Cachuma, Conj. Use							C									
Enlarged Cachuma Reservoir	X27	X42			X27	X42		C27	C42		C27	C33	C42			C42
Goleta Water Reuse	X	X	X				X	X	X		X					
SB Regional Water Reuse	X	X	X				X	X	X	X	X			X		
Desalination of Seawater	X	X	X	X	X	X	X	X	X	X				X		X
State Water Project															X	

Branch to the Cuyama Subarea and via a downsized Coastal Branch and ICDS to the Santa Maria, San Antonio (Casmalia), and Santa Ynez (lower) Subareas.

- Local projects such as New Gibraltar, which is shared by the Santa Ynez (upper) and South Coast Subareas, water reuse, and desalination of sea water, which is developed exclusively for the South Coast, make up the remaining water supply.

Alternative 4

SWP water to the Santa Maria, San Antonio, and lower Santa Ynez Subareas; local projects for other areas (including New Gibraltar).

- The Cuyama Subarea relies on water delivery of part of its entitlement by development of Santa Barbara Canyon Reservoir.
- SWP water is delivered via a downsized Coastal Branch and ICDS to the Santa Maria, San Antonio (Casmalia), and Santa Ynez (lower) Subareas.
- Water is provided to the rest of the County by local projects, such as New Gibraltar, which serves the Santa Ynez (upper) and South Coast Subareas, and desalination of sea water, which serves the South Coast.

Alternative 5

SWP water to Cuyama; local projects for all other subareas (including 27-foot Cachuma Reservoir and desalination of sea water).

- The entitlement for the Cuyama Subarea is met by delivery of SWP water via the Cuyama Branch.
- All other subareas will rely on local projects.
- The Santa Maria Subarea relies solely on development of sea water desalination; San Antonio (Casmalia) receives no water in this alternative because it is not economically feasible; the upper Santa Ynez and South Coast Subareas rely on enlargement of Cachuma Reservoir (27 feet), and the South Coast and lower Santa Ynez Subareas rely on desalination of sea water.
- Note that this alternative relies heavily on desalination of sea water and is an energy-intensive alternative.

Alternative 6

SWP water to Cuyama; local projects for all other subareas (including 42-foot Cachuma Reservoir and desalination of sea water).

- Alternative 6 is identical to Alternative 5, except the enlargement of Cachuma Reservoir is greater (42 feet), which reduces the overall requirement for sea water desalination in the South Coast Subarea.

Alternative 7

SWP water to Santa Maria Valley; rest local projects (including desalination of sea water, water reuse, and conjunctive use with existing Cachuma Reservoir).

- The Cuyama Subarea relies on delivery of part of its entitlement by development of Santa Barbara Canyon Reservoir.
- SWP water is delivered via the downsized Coastal Branch and ICDS to the Santa Maria Subarea.
- The San Antonio Subarea receives no water in this alternative because it is not economically feasible.
- The Santa Ynez and South Coast Subareas receive SWP entitlement water developed by local projects.
- The Santa Ynez (upper) Subarea receives conjunctive use water using the existing Cachuma Reservoir, which is shared with the South Coast Subarea.

- The Santa Ynez (lower) Subarea relies on Salsipuedes Reservoir and desalination of sea water.

- The South Coast Subarea also relies on desalination of sea water and water reuse (Goleta and Santa Barbara).

Alternative 8

SWP water to the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas; rest local projects (including 27-foot Cachuma Reservoir with conjunctive use).

- The Cuyama Subarea relies on delivery of SWP water via the SWP Cuyama Branch.

- SWP water is delivered via the downsized Coastal Branch and ICDS to meet all entitlement requirements in the Santa Maria and San Antonio Subareas and partially in the Santa Ynez (lower) Subarea.

- The Santa Ynez (upper and lower) Subarea shares water from Cachuma Reservoir enlargement (27 feet) and conjunctive use with the South Coast Subarea.

- The South Coast Subarea, in addition, relies on desalination of sea water and water reuse (Goleta and Santa Barbara).

Alternative 9

SWP water to the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas; other subareas rely on local projects (including 42-foot Cachuma Reservoir with conjunctive use).

- SWP water is delivered to the Cuyama, Santa Maria, and San Antonio Subareas as was done in Alternative 8.

- The Santa Ynez and South Coast Subareas are also operated as was done in Alternative 8, except that Cachuma Reservoir enlargement is greater (42 feet), which reduces the requirement for desalination of sea water.

Alternative 10

SWP water to the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas; other subareas rely on local projects (including New Gibraltar Reservoir with conjunctive use).

- In this alternative, the Cuyama, Santa Maria, and San Antonio Subareas are supplied as in Alternative 8, i.e., SWP water is delivered.

- The Santa Ynez (upper and lower) and South Coast Subareas rely on New Gibraltar Reservoir with conjunctive use; in addition, lower Santa Ynez Subarea relies on SWP water and the South Coast Subarea relies on water reuse (Santa Barbara only) and desalination of sea water.

Alternative 11

SWP water to the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas; rest local projects (including 27-foot Cachuma Reservoir with conjunctive use).

- In this alternative, the Cuyama, Santa Maria, and San Antonio Subareas are operated as in Alternative 8.

- The entitlement for the Santa Ynez (upper) Subarea is fully met from Cachuma Reservoir enlargement (27 feet) plus conjunctive use, and lower Santa Ynez Subarea's entitlement is met entirely with SWP water.

- The South Coast Subarea relies on the delivery of Cachuma Reservoir enlargement (27 feet) plus conjunctive use water and water reuse (Goleta and partially Santa Barbara).

Alternative 12

SWP water to the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas; rest local projects (including 33-foot Cachuma Reservoir with conjunctive use).

- o Same as Alternative 11, except Cachuma Reservoir is enlarged by 33 feet and conjunctive use operation was undertaken to deliver water which is shared by the upper Santa Ynez and South Coast Subareas.

- o Enlargement of the reservoir by 33 feet plus conjunctive use eliminates the requirement for development of water reuse projects in the South Coast Subarea.

Alternative 13

SWP water to the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas; rest local projects (including 42-foot Cachuma Reservoir with conjunctive use).

- o In this alternative, the Cuyama, Santa Maria, and San Antonio Subareas are supplied as in Alternative 8.

- o Cachuma enlargement (42 feet) plus conjunctive use supplies water to the upper and lower Santa Ynez and South Coast Subareas.

- o In addition, the lower Santa Ynez Subarea receives SWP water.

Alternative 14

SWP water to the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas; rest local projects (including New Gibraltar with conjunctive use).

- o In this alternative, the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas rely on the SWP water.

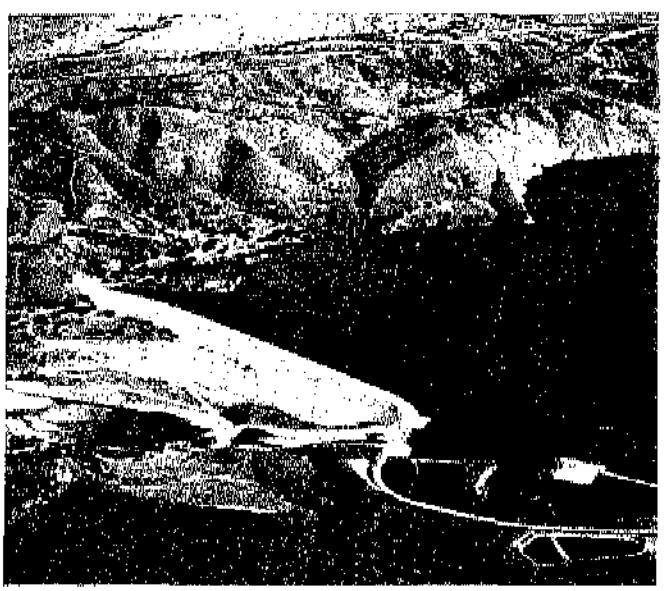
- o New Gibraltar Reservoir plus conjunctive use serves the full entitlement of the upper Santa Ynez and partial entitlement of the South Coast Subarea.

- o The South Coast Subarea receives its remaining entitlement from the Santa Barbara regional water reuse and desalination of sea water local projects.

Alternative 15

All SWP water.

- o All entitlement water is served from the



TWO OF THE DAMS AND RESERVOIRS serving Santa Barbara County are Gibraltar, on the left, and Bradbury Dam, which forms Lake Cachuma, on the right. Among the options being considered are construction of New Gibraltar Dam downstream from the present dam and enlargement of Bradbury Dam and Lake Cachuma.

SWP via the Coastal Branch, the ICDS, and the Cuyama Branch.

- o No local projects are involved in this alternative.

Alternative 16

SWP water to Cuyama, Santa Maria and San Antonio Subareas and Vandenberg Air Force Base in the lower Santa Ynez Subarea; other water purveyors in the lower and upper Santa Ynez and South Coast Subareas rely on local projects (including 42-foot Cachuma Reservoir with conjunctive use plus desalination of sea water in the South Coast Subarea).

- o SWP water is delivered to the Cuyama, Santa Maria and San Antonio Subareas and VAFB as was done in Alternative 8.
- o The Santa Ynez Subarea (excluding VAFB) shares water from Cachuma Reservoir enlargement (42 feet) and conjunctive use with the South Coast Subarea.
- o The South Coast Subarea, in addition, relies on desalination of sea water.

CHAPTER VII. ALTERNATIVES FOR FURTHER CONSIDERATION

Selection of alternatives for further consideration required an economic and financial analysis. Thus the various combinations of water supply options that went into formulating each alternative could be compared. In addition, other factors that were considered included availability of water within each subarea, regional water quality requirements, proposed ICDS alignments, and environmental and engineering aspects.

This chapter presents the results of the analysis and identifies the least cost alternatives. The actual costs and methods of financing and repayment will be the subject of further discussions among the SWP water supply contractors, SBCFCWCD, its local contracting agencies, and DWR, as specific projects or options are proposed.

Cost Analysis

It should be noted that all facilities of the SWP are basically designed either to store water (known as "project conservation facilities") or to convey water to the water supply contractors ("project transportation facilities"). The conservation facilities benefit all contractors; therefore, the contractors pay for the costs in proportion to their annual entitlements. The transportation facilities are for the benefit of specific contractors and the costs are paid accordingly. The Delta Water Charge is established to return to the State all appropriate reimbursable costs of the SWP conservation facilities, and the Transportation Charge is levied to recover costs of constructing, operating, and maintaining the SWP transportation facilities.

In developing the estimated costs for each water supply option, some basic assumptions were made. These included:

- All present SWP costs, shared by all SWP contractors including SBCFCWCD, are financed at a melded interest rate of 4.736 percent. DWR assumes that future SWP water supply facilities will be funded through proceeds from sale of revenue bonds at a 9.5 percent interest rate and that such facilities will be repaid at that rate separate from repayment of existing facilities. As used in this report, combining repayment of existing and future facilities would have the same effect as financing SBCFCWCD's share of existing SWP facilities and proposed local projects at an interest rate of 5.5 percent.

- The local interest rate will be 11.0 percent, which reflects the actual and estimated near future overall annual cost of local revenue bond financing.

- SWP power cost will be 3 cents per kilowatthour and local power cost will be 8.5 cents per kilowatthour through 1990. Any local project which becomes a unit of the SWP will be eligible for SWP energy to the extent the local project yield becomes SWP project yield and arrangements can be made with local utilities to deliver SWP energy.

- The charge for SWP facilities used in arriving at the cost of SWP water delivered to the various subareas was based on the data shown in **Table 40**.

- Although the trend in improvements in sea water desalting technology tend to reduce the cost of sea water desalting, the effects of inflation and increased costs of energy have had a net effect of increasing the costs. Energy cost does impact desalination costs more than the other alternatives. These factors will influence the future cost of desalting; therefore, the costs shown in this report

reflect the best estimate of future costs.

The information in **Table 40** does not reflect costs associated with completing the water supply features of the SWP. Present SWP dependable supplies (firm yield) amount to about 2.5 million acre-feet, while water supply contracts provide for ultimate delivery of about 4.2 million acre-feet. Facilities adequate to satisfy long-term contractual commitments are assumed to be built over the next several decades. As these facilities are built, costs will be shared by all SWP water contractors in proportion to their contractual amounts of water.

While costs to develop future SWP supplies are not known, **Table 43** shows future SWP charges assuming that needed future supplies are developed at annual costs of either $200 per acre-foot or $400 per acre-foot. The importance of **Table 43** is that it reflects the concept of increasing cost of SWP water supplies as new storage and diversion facilities are built and provides a range of charges based on a range of assumed future costs. **Table 43** charges for $200 per acre-foot new water range from $64 per acre-foot to $115 per acre-foot higher than the charges shown in **Table 40.** Similarly, **Table 43** charges for $400 per acre-foot new water are from $110 per acre-foot to $214 per acre-foot higher than **Table 40** charges. Thus, future increases in SWP charges will make SWP water and the alternatives developed in this study more costly than shown.

All the estimates and assumptions given above are applicable only for this study and will be subject to further refinement and applicability at the time a water supply option or alternative is implemented. The SBCFCWCD would be responsible for repayment (as part of the water delivery charges) of the funds that would be advanced by the State and used for building local water supply options or SWP facilities, such as the Coastal Branch.

Between the time that assumptions were made and this report completed, changes have been proposed in the method of repayment for future SWP water development projects. Repayment would

TABLE 43
FUTURE SWP CHARGES ASSUMING NEW SUPPLIES ARE PROVIDED AT INDICATED ANNUAL COST ON A SCHEDULE TO MEET WATER SUPPLY REQUESTS *

(dollars per acre-foot)

Year	Unit costs	
	$200/AF	$400/AF
1990	136	182
1995	161	233
2000	179	269
2010	187	286

* Also includes transportation and conservation facilities costs for existing facilities, but does not include cost of completing the Coastal Branch. In either case, local projects and completion of the Coastal Branch will be affected by the same amount.

most likely be based on the interest rate incurred from the sale of future water revenue bonds. Combining repayment of existing and future facilities would have the same effect as financing SBCFCWCD's share of existing SWP facilities and proposed local projects at an interest rate of 5.5 percent.

The unit cost of water developed by the options studied was compared with the equivalent SWP unit cost for each subarea. (See **Table 38** in Chapter VI and **Figures 26-31.**) The unit costs shown are based on SWP funding for the eligible costs and local funding for those costs that are not eligible for SWP funding. As shown in the figures, those options most desirable fall below the horizontal line and to the right of the vertical line. The least desirable options fall above the horizontal line and to the left of the vertical line.

In Chapter VI, 16 water supply alternatives were identified and a matrix was developed, then programmed and computerized to depict the various combinations of options. The computer program incorporated the unit costs and determined the least cost alternatives based on (1) partial or complete funding of the local projects by the SWP, and (2) no funding by the SWP.

Table 44 depicts the alternatives with **partial or complete funding by the SWP.** The matrix shows, by subarea, the selected water supply options with each alternative, their yield, unit costs, and annual costs. The matrix also shows the total yield and average unit and total annual costs for each subarea and for the County as a whole.

Alternative 12 appears to be the most economical. This alternative would deliver SWP water to the Cuyama, Santa Maria, San Antonio, and lower Santa Ynez Subareas, while the upper Santa Ynez and South Coast Subareas would depend on the enlargement of Cachuma Reservoir (33-foot) plus conjunctive use.

Alternative 13 is second best choice in terms of least cost. Alternative 13 is similar to Alternative 12 with the following two exceptions:

- Cachuma Reservoir is raised 42 feet vs 33 feet.

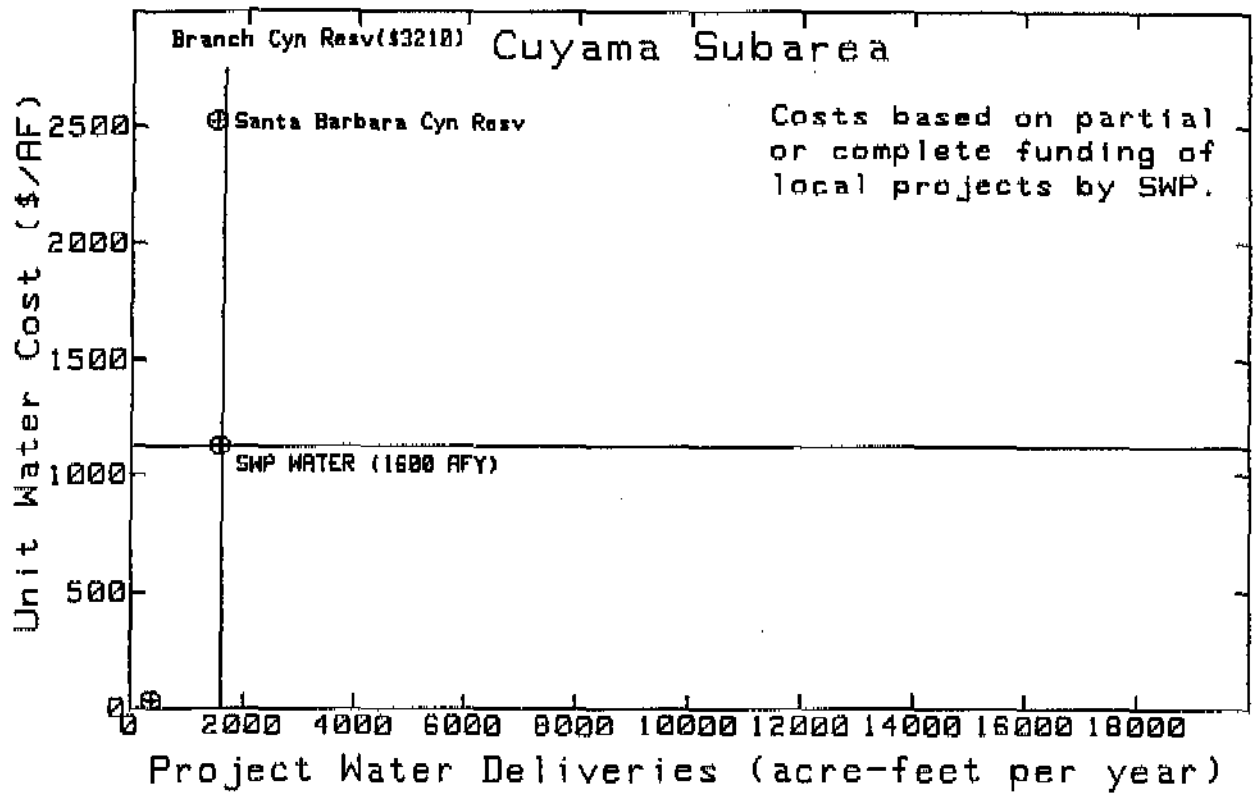
- Lower Santa Ynez Subarea does not receive its full entitlement from SWP. Instead, 2,477 acre-feet of its 12,000 acre-feet entitlement would come from Cachuma Reservoir via the Lompoc Pipeline, giving the water for lower Santa Ynez Subarea an estimated unit cost of $850 per acre-foot.

The delivery of 2,477 acre-feet of Cachuma Reservoir water to the lower Santa Ynez Subarea by releasing water from Cachuma Reservoir into the Santa Ynez River and allowing it to flow downstream to Lompoc and the ground water basin was found to be impractical. This is because historic data have shown that it takes more than two weeks for water released from Cachuma Reservoir to reach the lower Santa Ynez Subarea; therefore, a substantial amount of water would be lost through evaporation and transpiration by riparian vegetation. Releasing water along the Santa Ynez River would also interfere with the river's "new release schedule," which was established by the State Water Resources Control Board in 1973 as a means of optimizing the river's water supply downstream of Cachuma.

Alternative 11 was third best choice in terms of least cost. It is also similar to Alternative 12 but with a Cachuma Reservoir enlargement of 27 feet and conjunctive use plus water reuse at Goleta and Santa Barbara.

Alternative 16 was fourth best choice in terms of least cost. It would deliver SWP water to Cuyama, Santa Maria and San Antonio Subareas and Vandenberg Air Force Base in the lower Santa Ynez Subarea. Remaining water purveyors in Santa Ynez and South Coast Subareas depend on water from an enlarged Cachuma Reservoir (42-foot) plus conjunctive use. South Coast also relies on desalination of sea water.

Alternative 14, which included New Gibraltar Reservoir plus conjunctive use, ranked sixth, full delivery of SWP water throughout the County (Alternative 15)



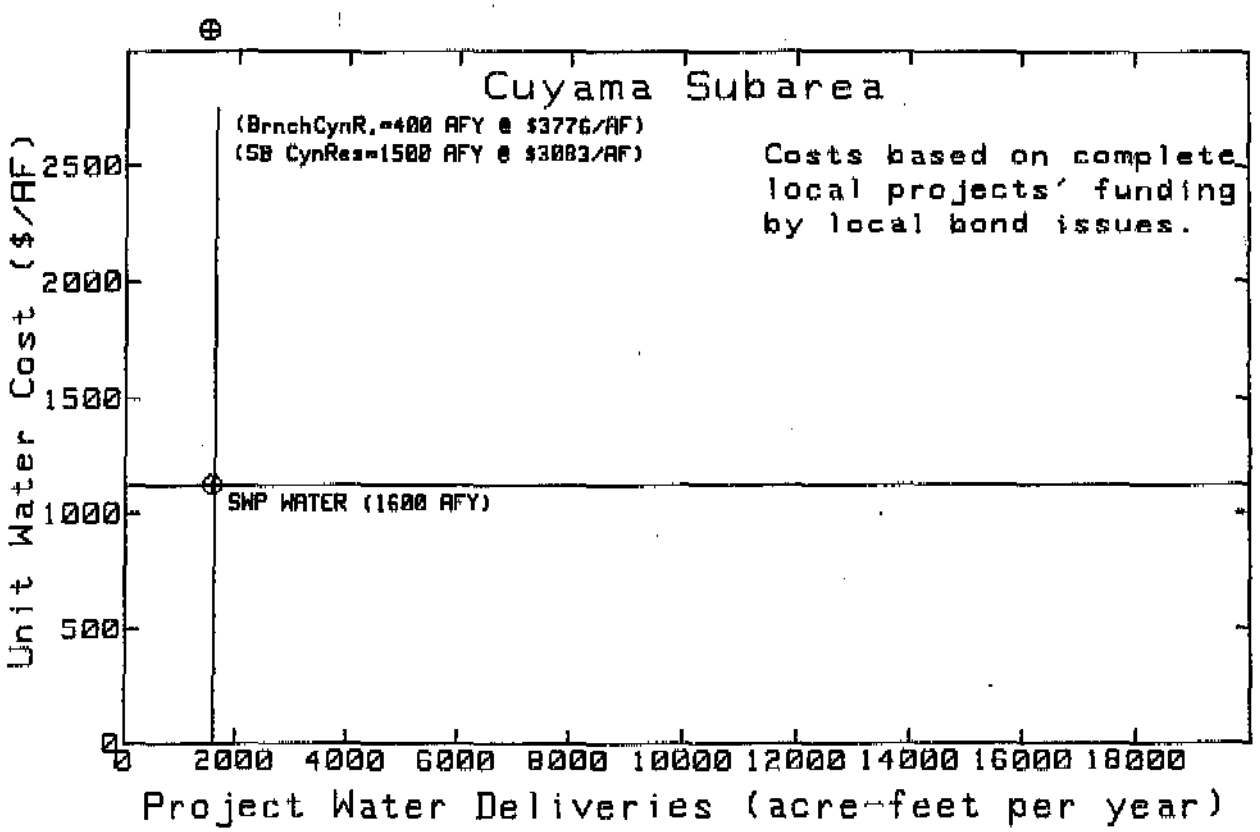
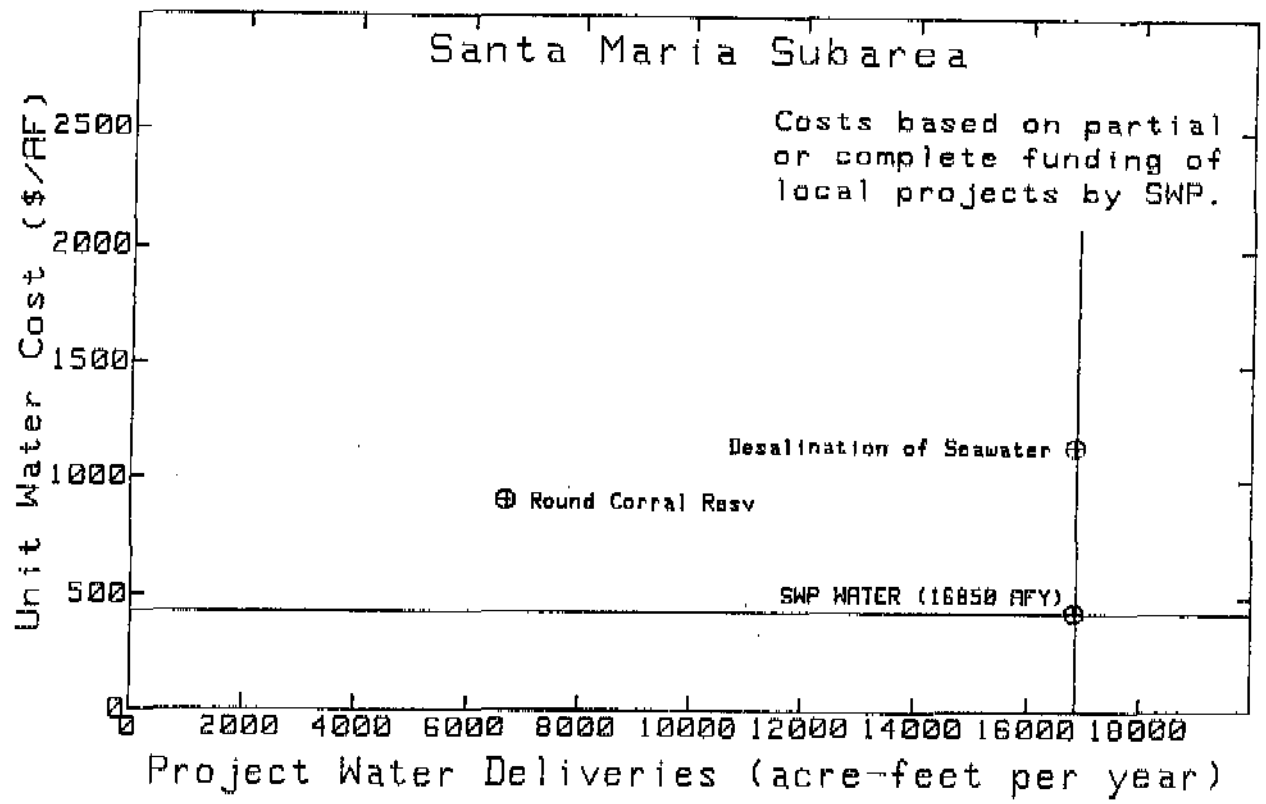


Figure 26 - RELATIVE COST COMPARISON OF CUYAMA SUBAREA WATER SUPPLY OPTIONS



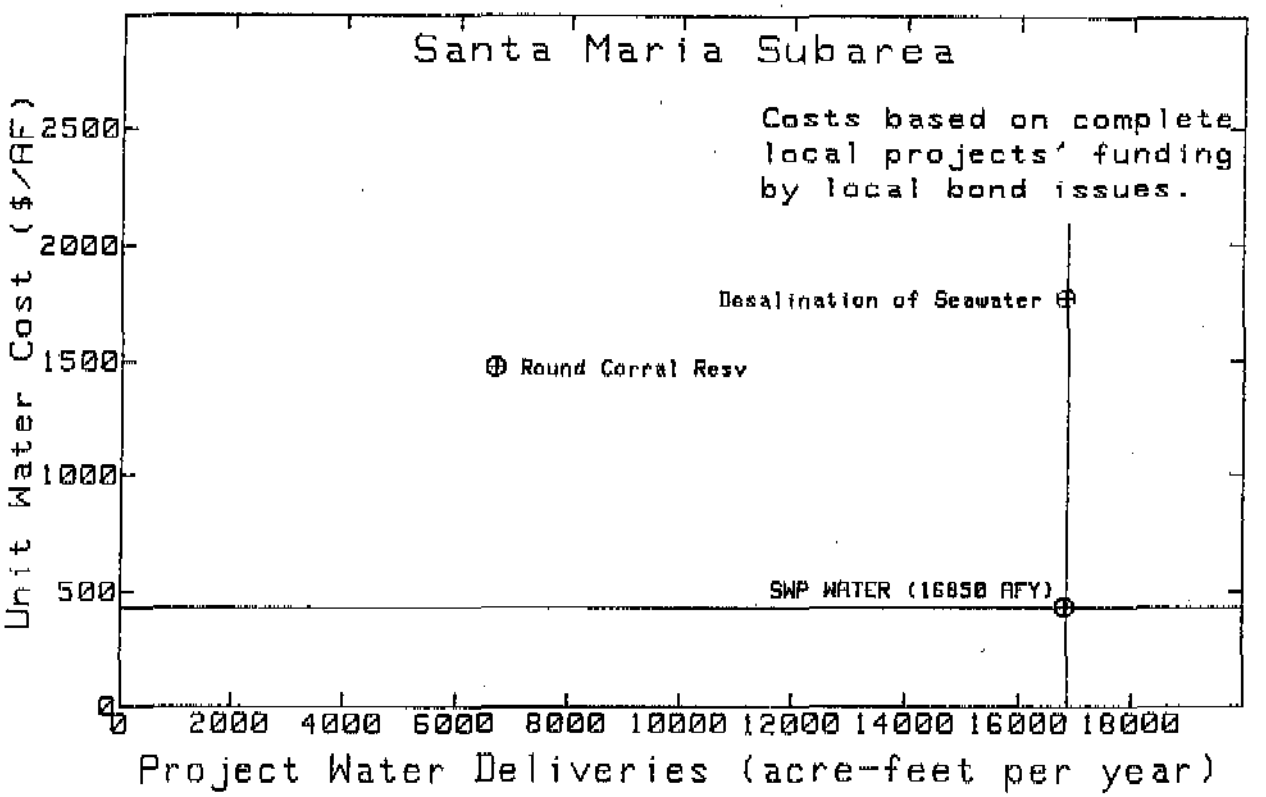
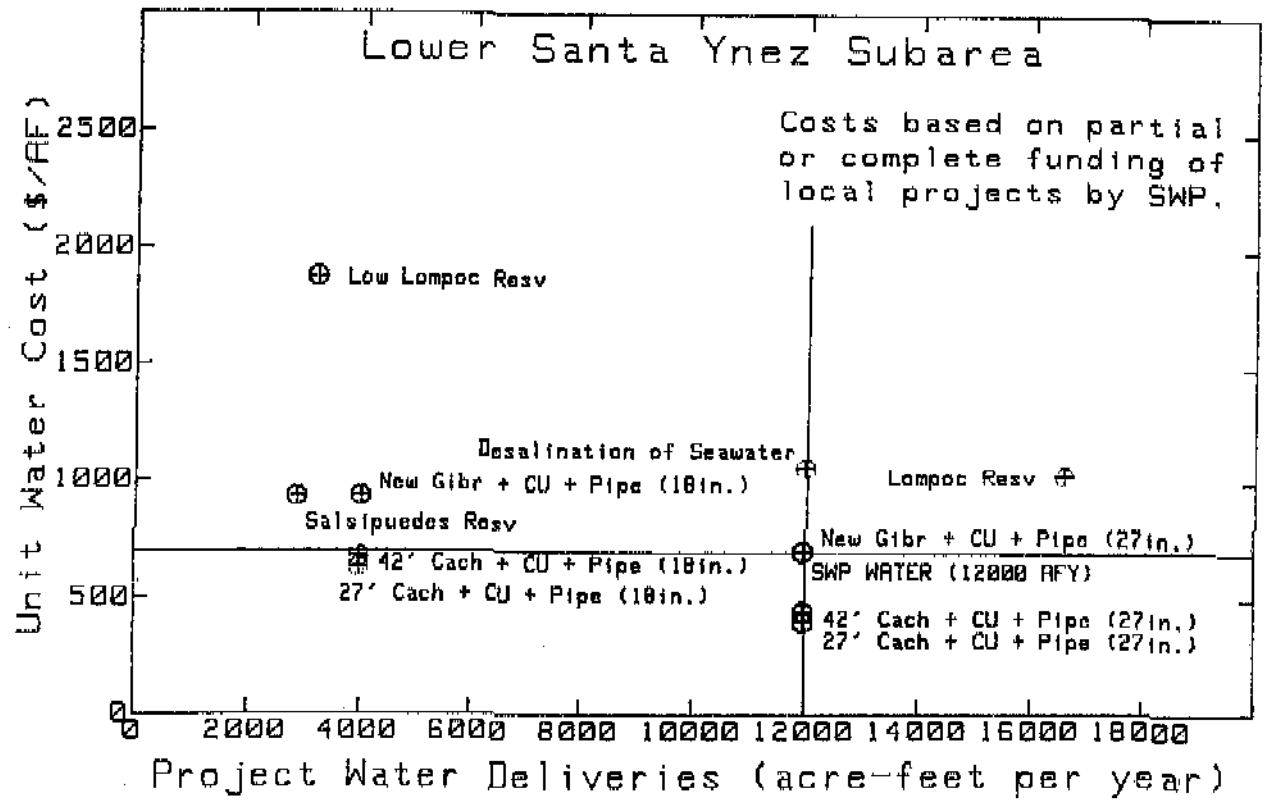


Figure 27 - RELATIVE COST COMPARISON OF SANTA MARIA SUBAREA WATER SUPPLY OPTIONS



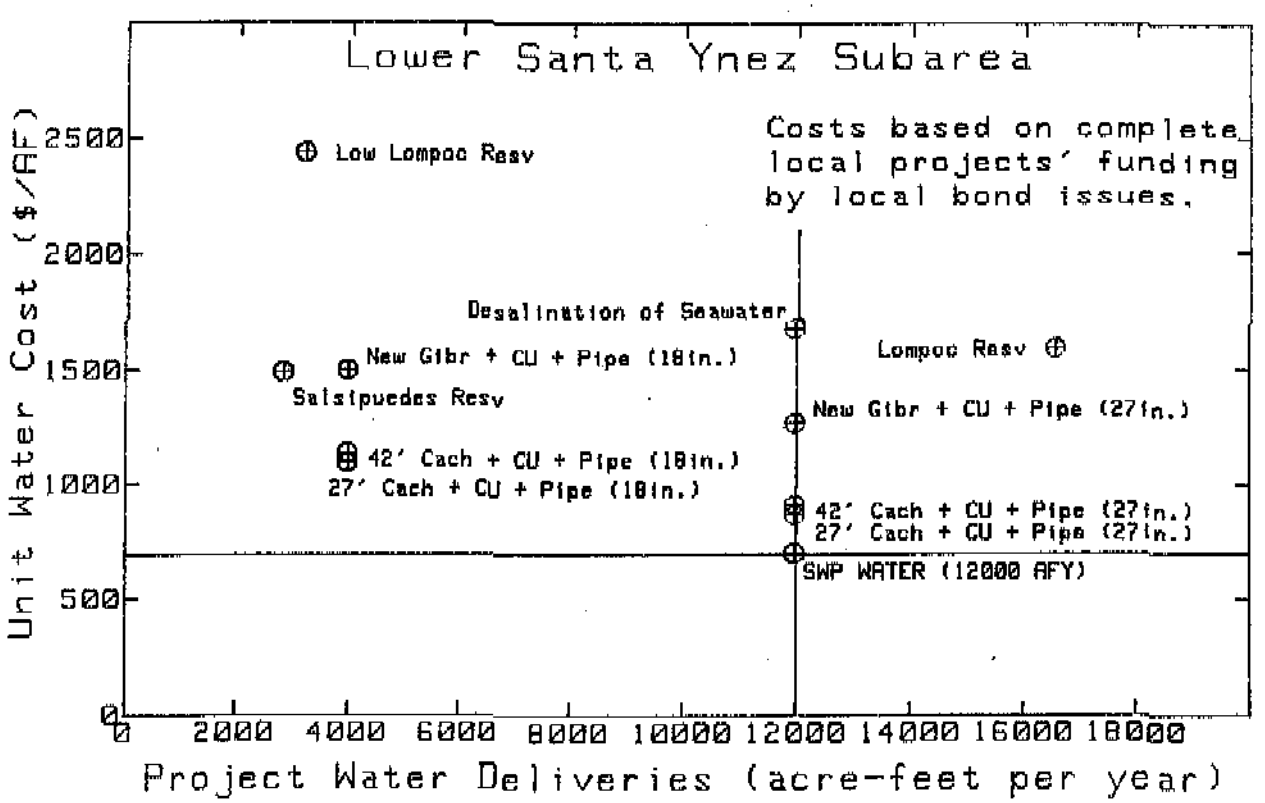
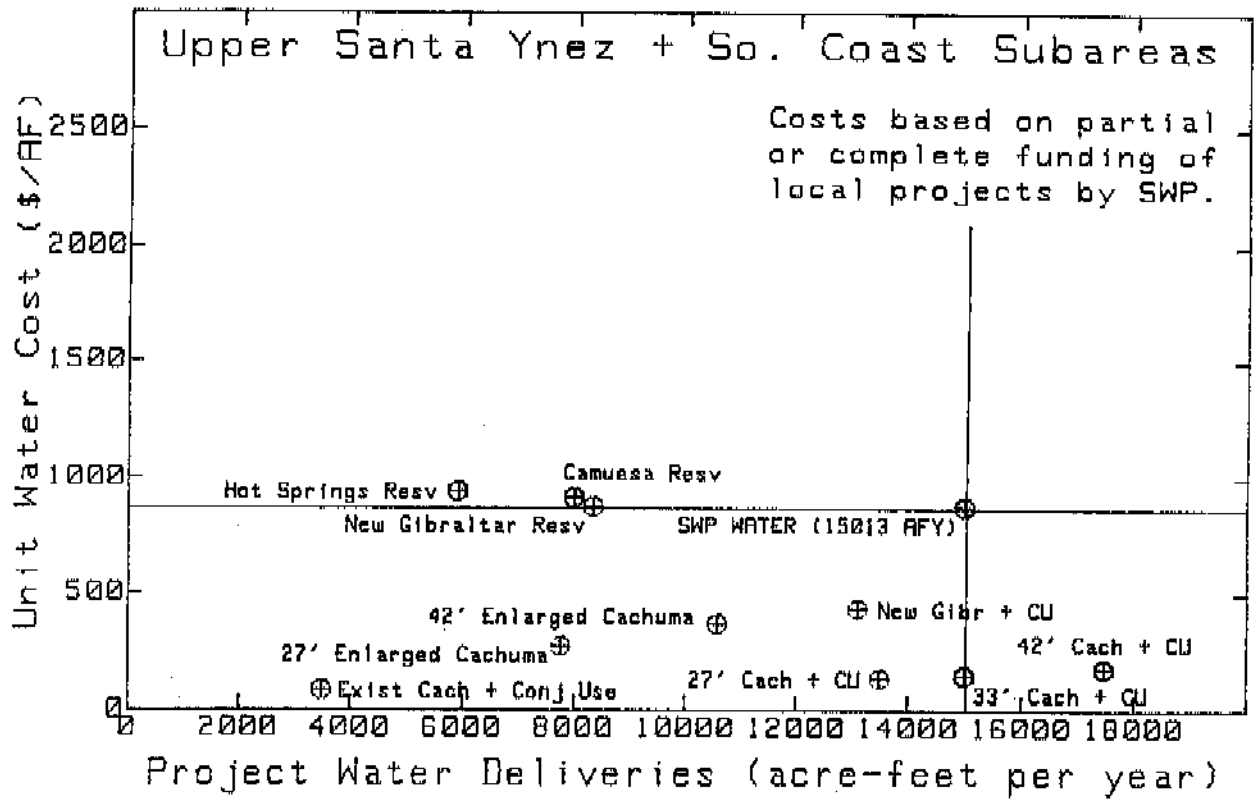


Figure 28 - RELATIVE COST COMPARISON OF LOWER SANTA YNEZ SUBAREA WATER SUPPLY OPTIONS



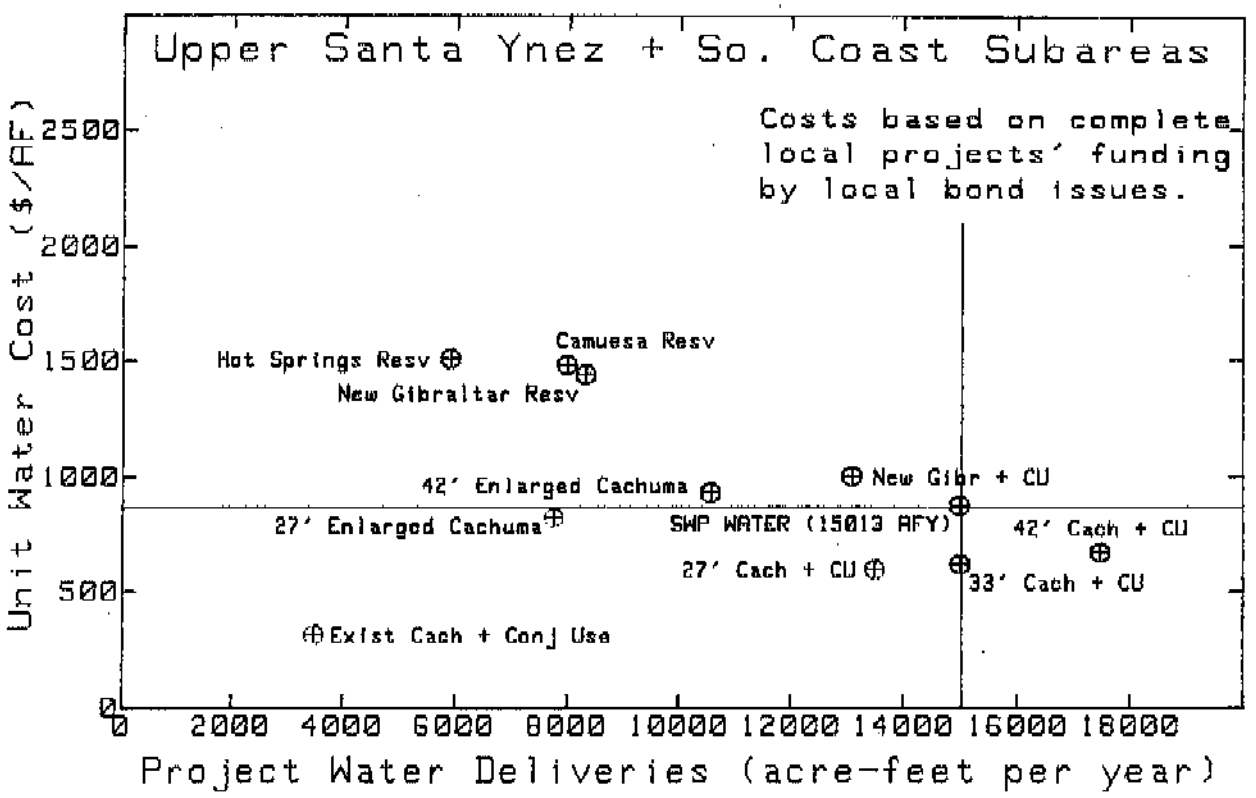
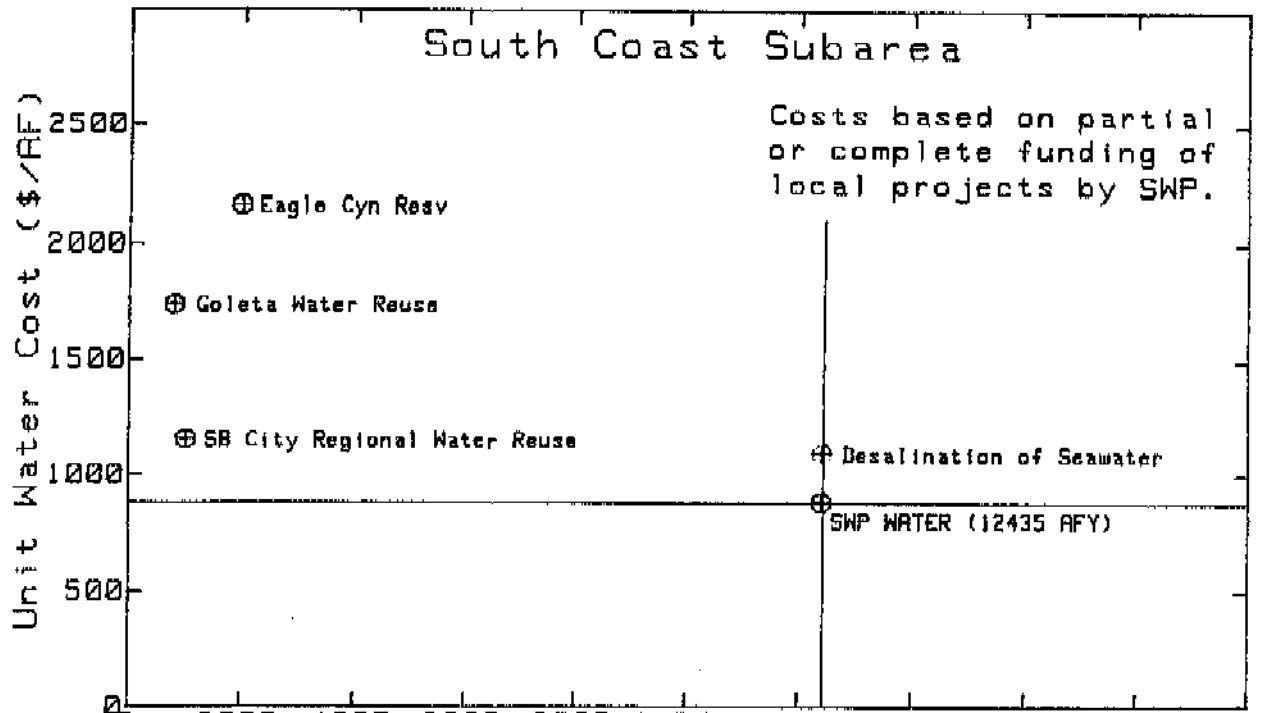


Figure 29 - RELATIVE COST COMPARISON OF UPPER SANTA YNEZ PLUS SOUTH COAST WATER SUPPLY OPTIONS



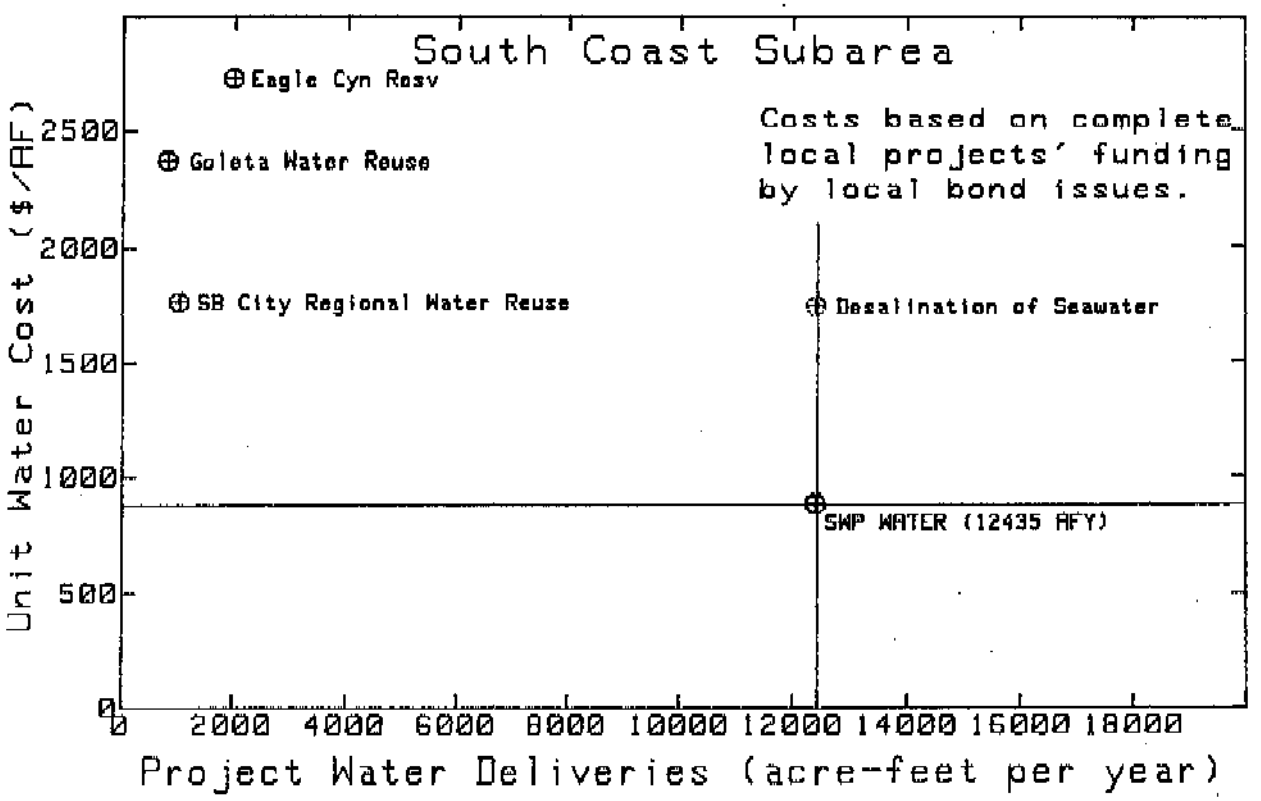
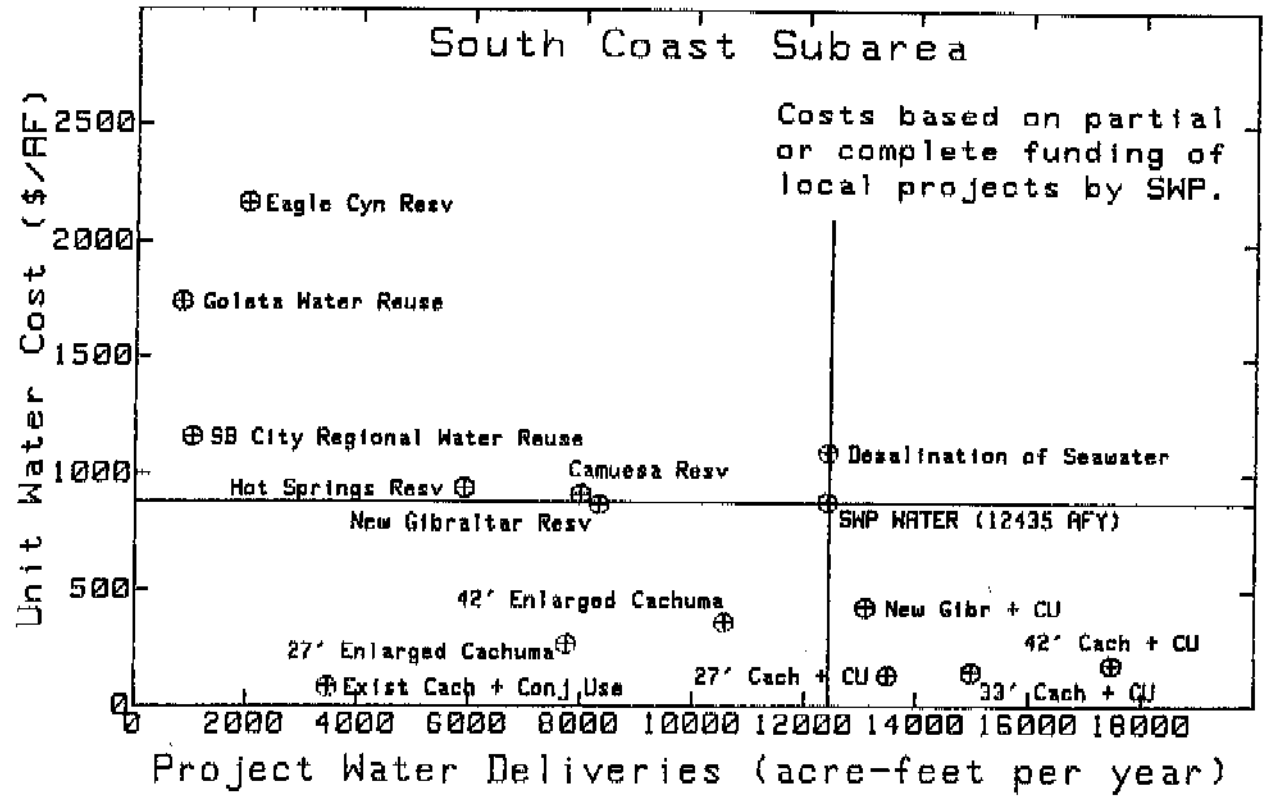


Figure 30 - RELATIVE COST COMPARISON OF SOUTH COAST SUBAREA WATER SUPPLY OPTIONS (WITHIN SOUTH COAST)



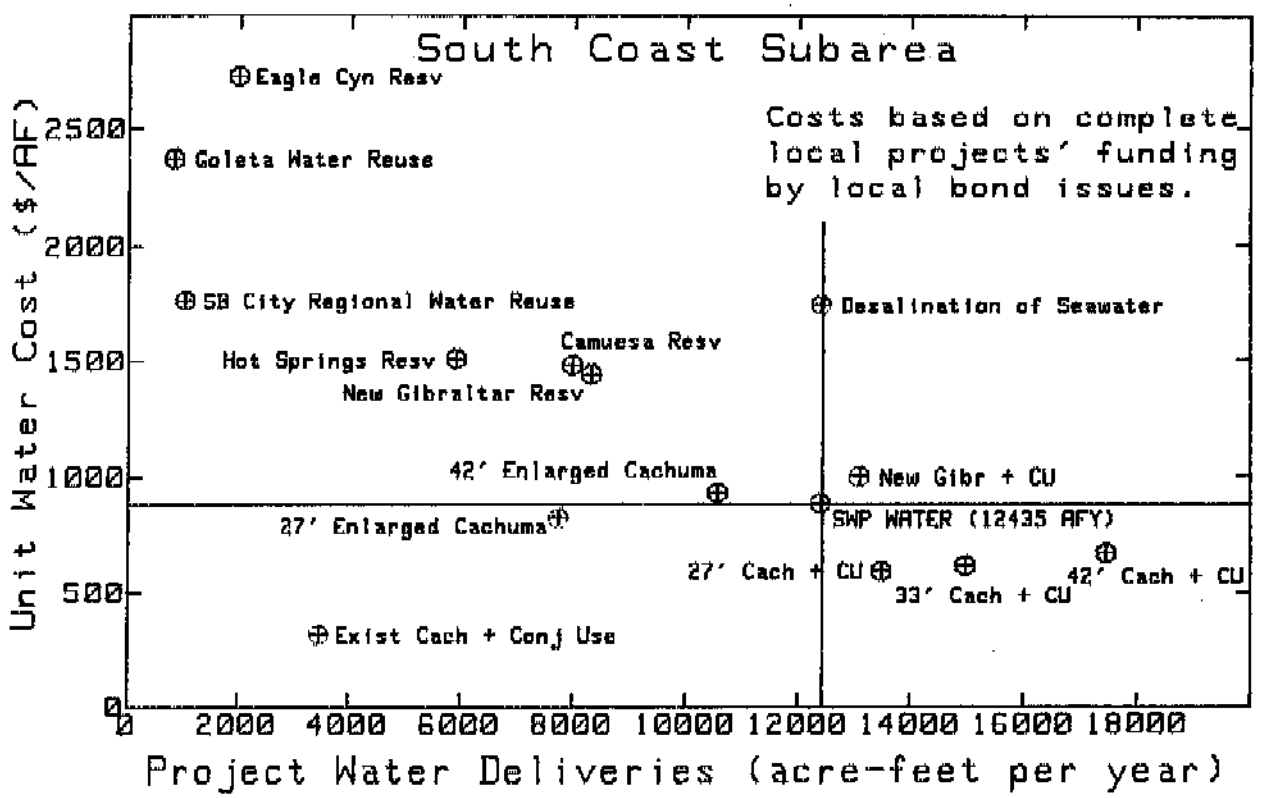


Figure 31 - RELATIVE COST COMPARISON OF ALL WATER SUPPLY OPTIONS AVAILABLE IN SOUTH COAST SUBAREA

TABLE 44

SUMMARY OF WATER SUPPLY ALTERNATIVES TO MEET SANTA BARBARA COUNTY WATER ENTITLEMENTS FROM THE STATE WATER PROJECT

STATE FUNDING (Costs based on partial or complete funding of local projects by the State Water Project)

SUBAREA (SWP Entitlement) / Water supply option	Alt. #1, All Local Projects			Alt. #2, All Local Projects			ALT. #3, SW to Cu,SMV,Sa, & LMV; All else Local			Alt. #4, SW to SMV, Sa, & LmV; All else Local			Alt. #5, SW to Guyama V. All else Local		
	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost
GUYAMA (1,600)															
Santa Barbara Canyon Reservoir	1500	2517	3775500	1500	2517	3775500	0	0	0	1500	2517	3775500	0	0	0
State Project Water	0	0	0	0	0	0	1600	1119	1790400	0	0	0	1600	1119	1790400
Totals	1500	2517	3775500	1500	2517	3775500	1600	1119	1790400	1500	2517	3775500	1600	1119	1790400
SANTA MARIA (16,850)															
Round Corral Reservoir	6700	902	6043400	6700	902	6043400	0	0	0	0	0	0	0	0	0
Desalination of Seawater	10150	1185	12027750	10150	1185	12027750	0	0	0	0	0	0	16859	1143	19259550
State Project Water	0	0	0	0	0	0	16850	462	7784700	16850	462	7784700	0	0	0
Totals	16850	1072	18071150	16850	1072	18071150	16850	462	7784700	16850	462	7784700	16850	1143	19259550
SAN ANTONIO (23)															
State Project Water	0	0	0	0	0	0	23	630	14490	23	630	14490	0	0	0
SANTA YNEZ, LOWER (12,000)	Enlarged Cachuma (27ft)			Enlarged Cachuma (42ft)											
Gibraltar + Lompoc Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cachuma + Lompoc Pipeline	2592	1007	2610144	2717	1085	2947945	0	0	0	0	0	0	0	0	0
Salsipuedes Reservoir	2850	922	2627700	2850	922	2627700	0	0	0	0	0	0	0	0	0
Desalination of Seawater	6558	1040	6820320	6433	1040	6690320	0	0	0	0	0	0	12000	1054	12648000
State Project Water	0	0	0	0	0	0	12000	725	8700000	12000	725	8700000	0	0	0
Totals	12000	1005	12058164	12000	1022	12265965	12000	725	8700000	12000	725	8700000	12000	1054	12648000
SANTA YNEZ, UPPER (2,578)	Enlarged Cachuma (27ft)			Enlarged Cachuma (42ft)			New Gibraltar Reservoir			New Gibraltar Reservoir			Enlarged Cachuma (27ft)		
New Gibraltar Reservoir	0	0	0	0	0	0	2578	869	2240282	2578	869	2240282	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2578	264	680592	2578	361	930658	0	0	0	0	0	0	2578	264	680592
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	2578	264	680592	2578	361	930658	2578	869	2240282	2578	869	2240282	2578	264	680592
SOUTH COAST (12,435)	Enlarged Cachuma (27ft)			Enlarged Cachuma (42ft)			New Gibraltar Reservoir			New Gibraltar Reservoir			Enlarged Cachuma (27ft)		
New Gibraltar Reservoir	0	0	0	0	0	0	5757	869	5002833	5757	869	5002833	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2600	264	686400	5295	361	1911495	0	0	0	0	0	0	5192	264	1370688
Goleta Water Reuse	845	1737	1467765	845	1737	1467765	845	1737	1467765	0	0	0	0	0	0
SB Regional Water Reuse	1052	1151	1210852	1052	1151	1210852	1052	1151	1210852	0	0	0	0	0	0
Desalination of Seawater	7938	1109	8803242	5243	1119	5866917	4781	1125	5378625	6678	1116	7452648	7243	1111	8046973
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	12435	979	12168259	12435	841	10457029	12435	1050	13060075	12435	1002	12455481	12435	757	9417661
COUNTY WIDE (45,486) Totals	45363	1031	46753665	45363	1003	45500302	45486	738	33589947	45386	771	34970453	45463	963	43796203

TABLE 44 (cont.)

SUMMARY OF WATER SUPPLY ALTERNATIVES TO MEET SANTA BARBARA COUNTY WATER ENTITLEMENTS FROM THE STATE WATER PROJECT

STATE FUNDING (Costs based on partial or complete funding of local projects by the State Water Project)

SUBAREA (SWP Entitlement) / Water supply option	Alt. #6, SW to Cuyama V. All else Local			Alt. #7, SW to SMV All else Local			Alt. #8, SW to Cu,SMV,Sa, & LMV; All else Local			Alt. #9, SW to Cu,SMV,Sa, & LMV; All else Local			Alt.#10, SW to Cu,SMV,Sa, & LMV; All else Local		
	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost
CUYAMA (1,600)															
Santa Barbara Canyon Reservoir	0	0	0	1500	2517	3775500	0	0	0	0	0	0	0	0	0
State Project Water	1600	1119	1790400	0	0	0	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
Totals	1600	1119	1790400	1500	2517	3775500	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
SANTA MARIA (16,850)															
Round Corral Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desalination of Seawater	16850	1143	19259550	0	0	0	0	0	0	0	0	0	0	0	0
State Project Water	0	0	0	16850	535	9014750	16850	483	8138550	16850	496	8357600	16850	483	8138550
Totals	16850	1143	19259550	16850	535	9014750	16850	483	8138550	16850	496	8357600	16850	483	8138550
SAN ANTONIO (23)															
State Project Water	0	0	0	0	0	0	23	709	16307	23	774	17802	23	709	16307
SANTA YNEZ, LOWER (12,000)							Cachuma (27ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use		
Gibraltar + Lompoc Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	4000	925	3700000
Cachuma + Lompoc Pipeline	0	0	0	0	0	0	4000	624	2496000	6167	573	3533691	0	0	0
Salsipuedes Reservoir	0	0	0	2850	922	2627700	0	0	0	0	0	0	0	0	0
Desalination of Seawater	12000	1054	12648000	9150	1063	9726450	0	0	0	0	0	0	0	0	0
State Project Water	0	0	0	0	0	0	8000	794	6352000	5833	866	5051378	8000	794	6352000
Totals	12000	1054	12648000	12000	1030	12354150	12000	737	8848000	12000	715	8585069	12000	838	10052000
SANTA YNEZ, UPPER (2,578)	Enlarged Cachuma (42ft)			Exist. Cachuma Conj. Use			Cachuma (27ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	2578	427	1100806
Existing Cachuma, Conj. Use	0	0	0	2578	76	195928	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2578	361	930658	0	0	0	2578	126	324828	2578	171	440838	0	0	0
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	2578	361	930658	2578	76	195928	2578	126	324828	2578	171	440838	2578	427	1100806
SOUTH COAST (12,435)	Enlarged Cachuma (42ft)			Exist. Cachuma Conj. Use			Cachuma (27ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	6542	427	2793434
Existing Cachuma, Conj. Use	0	0	0	922	76	70072	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	8012	361	2892332	0	0	0	6942	126	874692	8745	171	1495395	0	0	0
Goleta Water Reuse	0	0	0	845	1737	1467765	845	1737	1467765	845	1737	1467765	0	0	0
SB Regional Water Reuse	0	0	0	1052	1151	1210852	1052	1151	1210852	1052	1151	1210852	1052	1151	1210852
Desalination of Seawater	4423	1123	4967029	9616	1105	10625680	3596	1137	4088652	1793	1140	2044020	4841	1125	5446125
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	12435	632	7859361	12435	1076	13374369	12435	615	7641961	12435	500	6218032	12435	760	9450411
COUNTY WIDE (45,486) Totals	45463	935	42487969	45363	853	38714697	45486	588	26760046	45486	559	25409741	45486	672	30548474

TABLE 44 (cont.)

SUMMARY OF WATER SUPPLY ALTERNATIVES TO MEET SANTA BARBARA COUNTY WATER ENTITLEMENTS FROM THE STATE WATER PROJECT

STATE FUNDING (Costs based on partial or complete funding of local projects by the State Water Project)

SUBAREA (SWP Entitlement) / Water supply option	Alt.#11, SW to Cu,SMV,Sa, & LMV; All else Local			Alt.#12, SW to Cu,SMV,Sa, & LMV; All else Local			Alt.#13, SW to Cu,SMV,Sa, & LMV; All else Local			Alt.#14, SW to Cu,SMV,Sa, & LMV; All else Local			Alt. #15, SW to All Participating Purveyors			Alt.#16, SW to Cu,SMV,SA, & VAFB; All else Local		
	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount AFY	Unit cost	Annual cost
CUYAMA (1,600)																		
Santa Barbara Canyon Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Project Water	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
Totals	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
SANTA MARIA (16,850)																		
Round Corral Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Project Water	16850	462	7784700	16850	462	7784700	16850	475	8003750	16850	462	7784700	16850	430	7245500	16850	485	8172250
Totals	16850	462	7784700	16850	462	7784700	16850	475	8003750	16850	462	7784700	16850	430	7245500	16850	485	8172250
SAN ANTONIO (23)																		
State Project Water	23	630	14490	23	630	14490	23	674	15502	23	630	14490	23	598	13754	23	700	16100
SANTA YNEZ, LOWER (12,000)							Cachuma (42ft) Conj. Use									Cachuma (42ft) Conj. Use		
Gibraltar + Lompoc Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cachuma + Lompoc Pipeline	0	0	0	0	0	0	2477	850	2105450	0	0	0	0	0	0	4500	659	2965500
Salsipuedes Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Project Water	12000	725	8700000	12000	725	8700000	9523	766	7294618	12000	725	8700000	12000	693	8316000	7500	715	5362500
Totals	12000	725	8700000	12000	725	8700000	12000	783	9400068	12000	725	8700000	12000	693	8316000	12000	694	8328000
SANTA YNEZ, UPPER (2,378)	Cachuma (27ft) Conj. Use			Cachuma (33ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use						Cachuma (42ft) Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	2578	427	1100806	0	0	0	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2578	126	324828	2578	140	360920	2578	171	440838	0	0	0	0	0	0	2578	171	440838
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	2578	830	2139740	0	0	0
Totals	2578	126	324828	2578	140	360920	2578	171	440838	2578	427	1100806	2578	830	2139740	2578	171	440838
SOUTH COAST (12,435)	Cachuma (27ft) Conj. Use			Cachuma (33ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use						Cachuma (42ft) Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	10542	427	4501434	0	0	0	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	10942	126	1378692	12435	140	1740900	12435	171	2126385	0	0	0	0	0	0	10412	171	1780452
Goleta Water Reuse	845	1737	1467765	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB Regional Water Reuse	648	1177	762696	0	0	0	0	0	0	1052	1151	1210852	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	841	1211	2018451	0	0	0	2023	1135	2296105
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	12435	880	10942800	0	0	0
Totals	12435	290	3609153	12435	140	1740900	12435	171	2126385	12435	541	6730737	12435	880	10942800	12435	328	4076557
COUNTY WIDE (45,486) Totals	45486	489	22223571	45486	448	20391410	45486	479	21776943	45486	574	26121133	45486	669	30448194	45486	502	22824145

ranked eighth, and the all-local projects alternative (Alternative 1) was ranked sixteenth in terms of cost.

Alternative 15 was the least cost alternative for Santa Maria, San Antonio, and lower Santa Ynez Subareas. Alternative 15, as well as Alternatives 3, 5, 6, 8-14, and 16 were also the least cost alternatives for Cuyama Subarea. Alternative 7 was the least cost alternative for the upper Santa Ynez Subarea, and Alternative 12 had the least cost for the South Coast.

Table 45 depicts the same combinations of options within each alternative, but on the basis that **local funding only** will be used for local projects and SWP funding for the Coastal and Cuyama Branches only. **Based on this funding, Alternative 12 still appears to be the most economical alternative, followed by Alternatives 11 and either 13 or 15, then 16.**

Comparison of local and State financing of local projects indicates that overall savings of $160 to $600 per acre-foot of water could be achieved among the alternatives. Such savings are based on a State contribution to local project financing of $400 per acre-foot (annual cost equivalent) as the assumed cost of new SWP yield-producing facilities, in addition to avoided costs associated with reducing the size of the Coastal Branch. (See discussion later in this Chapter.) As indicated in **Table 43**, however, estimates of annual costs for new SWP supplies are presently in the range of $200 to $400 per acre-foot. Consequently, the financing and cost advantage associated with SWP participation at a $200 per acre-foot annual cost level would be less. SWP financial participation is addressed in the last two sections of this chapter.

Thus far in this report, it has been assumed that SLOCFCWCD would participate in the construction of Phase II of the SWP Coastal Branch and would receive its full 25,000-acre-foot entitlement to SWP water. However, SLOCFCWCD has the same option as SBCFCWCD not to participate or to participate on a reduced basis in the construction and use of the Coastal Branch. Should SLOCFCWCD elect not to participate or to participate to a lesser extent, SBCFCWCD's cost would rise on the Coastal Branch because of a reduction in the economy of scale. To determine this impact, additional computer runs were made assuming SLOCFCWCD would opt to (1) receive one-half of its entitlement (12,500 acre-feet) and (2) not receive any SWP water. **Table 46** illustrates this impact.

Financial Considerations

In 1979, DWR released the first set of guidelines for funding local water supply projects for inclusion in the SWP. In late 1982, amendments to State Water Contracts were executed which permitted SWP funding of certain costs of local projects, based upon the avoided costs of developing a similar amount of water in Northern California. The guidelines were revised in 1982 and from time to time additional revisions have been considered. All versions of the guidelines have included a stipulation that the local project must not adversely affect either the costs or water deliveries to contractors other than the sponsoring contractor.

The "Revised Guidelines on Funding Local Water Supply Projects for Inclusion in the State Water Project" serve as a guide to local agencies, SWP water supply contractors, and DWR regarding funding local water supply projects as units of the SWP.

The conditions that must be met before a local project in Santa Barbara County can be considered for partial or complete funding by the SWP are as follows:

1. SBCFCWCD, as prime contractor with the State for SWP water, the other SWP water contractors, and DWR are involved.

2. The local project provides a water supply to help meet the SWP entitlement deliveries of SBCFCWCD.

3. The water supply developed by the local project is new, dependable, and of

TABLE 45

SUMMARY OF WATER SUPPLY ALTERNATIVES TO MEET SANTA BARBARA COUNTY WATER ENTITLEMENTS FROM THE STATE WATER PROJECT

LOCAL FUNDING (Costs based on complete funding of local projects by Local Bond Issues)

SUBAREA (SWP Entitlement) / Water supply option	Alt. #1, All Local Projects			Alt. #2, All Local Projects			Alt. #3, SW to Cu,SMV,Sa, & LMV; All else Local			Alt. #4, SW to SMV, Sa, & LmV; All else Local			Alt. #5, SW to Cuyama V. All else Local		
	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost
CUYAMA (1,600)															
Santa Barbara Canyon Reservoir	1500	3083	4624500	1500	3083	4624500	0	0	0	1500	3083	4624500	0	0	0
State Project Water	0	0	0	0	0	0	1600	1119	1790400	0	0	0	1600	1119	1790400
Totals	1500	3083	4624500	1500	3083	4624500	1600	1119	1790400	1500	3083	4624500	1600	1119	1790400
SANTA MARIA (16,850)															
Round Corral Reservoir	6700	1467	9828900	6700	1467	9828900	0	0	0	0	0	0	0	0	0
Desalination of Seawater	10150	1806	18330900	10150	1806	18330900	0	0	0	0	0	0	16850	1764	29723400
State Project Water	0	0	0	0	0	0	16850	462	7784700	16850	462	7784700	0	0	0
Totals	16850	1671	28159800	16850	1671	28159800	16850	462	7784700	16850	462	7784700	16850	1764	29723400
SAN ANTONIO (23)															
State Project Water	0	0	0	0	0	0	23	630	14490	23	630	14490	0	0	0
SANTA YNEZ, LOWER (12,000)	Enlarged Cachuma (27ft)			Enlarged Cachuma (42ft)											
Gibraltar + Lompoc Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cachuma + Lompoc Pipeline	2592	1563	4051296	2717	1651	4485767	0	0	0	0	0	0	0	0	0
Salsipuedes Reservoir	2850	1487	4237950	2850	1487	4237950	0	0	0	0	0	0	0	0	0
Desalination of Seawater	6558	1662	10899396	6433	1662	10691646	0	0	0	0	0	0	12000	1674	20088000
State Project Water	0	0	0	0	0	0	12000	725	8700000	12000	725	8700000	0	0	0
Totals	12000	1599	19188642	12000	1618	19415363	12000	725	8700000	12000	725	8700000	12000	1674	20088000
SANTA YNEZ, UPPER (2,578)	Enlarged Cachuma (27ft)			Enlarged Cachuma (42ft)			New Gibraltar Reservoir			New Gibraltar Reservoir			Enlarged Cachuma (27ft)		
New Gibraltar Reservoir	0	0	0	0	0	0	2578	1434	3696852	2578	1434	3696852	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2578	820	2113960	2578	927	2389806	0	0	0	0	0	0	2578	820	2113960
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	2578	820	2113960	2578	927	2389806	2578	1434	3696852	2578	1434	3696852	2578	820	2113960
SOUTH COAST (12,435)	Enlarged Cachuma (27ft)			Enlarged Cachuma (42ft)			New Gibraltar Reservoir			New Gibraltar Reservoir			Enlarged Cachuma (27ft)		
New Gibraltar Reservoir	0	0	0	0	0	0	5757	1434	8255538	5757	1434	8255538	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2600	820	2132000	5295	927	4908465	0	0	0	0	0	0	5192	820	4257440
Goleta Water Reuse	845	2373	2005185	845	2373	2005185	845	2373	2005185	0	0	0	0	0	0
SB Regional Water Reuse	1052	1759	1850468	1052	1759	1850468	1052	1759	1850468	0	0	0	0	0	0
Desalination of Seawater	7938	1730	13732740	5243	1740	9122820	4781	1746	8347626	6678	1737	11599686	7243	1732	12544876
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	12435	1586	19720393	12435	1438	17886938	12435	1645	20459817	12435	1597	19855224	12435	1351	16802316
COUNTY WIDE (45,486) Totals	45363	1627	73807295	45363	1598	72476407	45486	933	42445259	45386	984	44675766	45463	1551	70518076

TABLE 45 (cont.)

SUMMARY OF WATER SUPPLY ALTERNATIVES TO MEET SANTA BARBARA COUNTY WATER ENTITLEMENTS FROM THE STATE WATER PROJECT

LOCAL FUNDING (Costs based on complete funding of local projects by Local Bond Issues)

SUBAREA (SWP Entitlement) / Water supply option	Alt. #6, SW to Cuyama V. All else Local			Alt. #7, SW to SMV All else Local			Alt. #8, SW to Co,SMV,Sa, & LMV; All else Local			Alt. #9, SW to Co,SMV,Sa, & LMV; All else Local			Alt.#10, SW to Co,SMV,Sa, & LMV, All else Local		
	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost
CUYAMA (1,600)															
Santa Barbara Canyon Reservoir	0	0	0	1500	3083	4624500	0	0	0	0	0	0	0	0	0
State Project Water	1600	1119	1790400	0	0	0	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
Totals	1600	1119	1790400	1500	3083	4624500	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
SANTA MARIA (16,850)															
Round Corral Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desalination of Seawater	16850	1764	29723400	0	0	0	0	0	0	0	0	0	0	0	0
State Project Water	0	0	0	16850	535	9014750	16850	483	8138550	16850	496	8357600	16850	483	8138550
Totals	16850	1764	29723400	16850	535	9014750	16850	483	8138550	16850	496	8357600	16850	483	8138550
SAN ANTONIO (23)															
State Project Water	0	0	0	0	0	0	23	709	16307	23	774	17802	23	709	16307
SANTA YNEZ, LOWER (12,000)							Cachuma (27ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use		
Gibraltar + Lompoc Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	4000	1494	5976000
Cachuma + Lompoc Pipeline	0	0	0	0	0	0	4000	1089	4356000	6167	1068	6586356	0	0	0
Sabaipuedes Reservoir	0	0	0	2850	1487	4237950	0	0	0	0	0	0	0	0	0
Desalination of Seawater	12000	1674	20088000	9150	1684	15408600	0	0	0	0	0	0	0	0	0
State Project Water	0	0	0	0	0	0	8000	794	6352000	5833	866	5051378	8000	794	6352000
Totals	12000	1674	20088000	12000	1637	19646550	12000	892	10708000	12000	970	11637734	12000	1027	12328000
SANTA YNEZ, UPPER (2,578)	Enlarged Cachuma (42ft)			Exist. Cachuma Conj. Use			Cachuma (27ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	2578	996	2567688
Existing Cachuma, Conj. Use	0	0	0	2578	310	799180	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2578	927	2389806	0	0	0	2578	591	1523598	2578	666	1716948	0	0	0
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	2578	927	2389806	2578	310	799180	2578	591	1523598	2578	666	1716948	2578	996	2567688
SOUTH COAST (12,435)	Enlarged Cachuma (42ft)			Exist. Cachuma Conj. Use			Cachuma (27ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	6542	996	6515832
Existing Cachuma, Conj. Use	0	0	0	922	310	285820	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	8012	927	7427124	0	0	0	6942	591	4102722	8745	666	5824170	0	0	0
Goleta Water Reuse	0	0	0	845	2373	2005185	845	2373	2005185	845	2373	2005185	0	0	0
SB Regional Water Reuse	0	0	0	1052	1759	1850468	1052	1759	1850468	1052	1759	1850468	1052	1759	1850468
Desalination of Seawater	4423	1747	7726981	9616	1727	16606832	3596	1758	6321768	1793	1761	3157473	4841	1745	8447545
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	12435	1219	15154105	12435	1669	20748305	12435	1148	14280143	12435	1032	12837296	12435	1352	16813845
COUNTY WIDE (45,486) Totals	45463	1521	69145711	45363	1209	54833285	45486	801	36456998	45486	799	36357780	45486	916	41654790

TABLE 45 (cont.)

SUMMARY OF WATER SUPPLY ALTERNATIVES TO MEET SANTA BARBARA COUNTY WATER ENTITLEMENTS FROM THE STATE WATER PROJECT

LOCAL FUNDING (Costs based on complete funding of local projects by Local Bond Issues)

SUBAREA (SWP Entitlement) / Water supply option	Alt.#11, SW to Cu,SMV,Sa, & LMV; All else Local			Alt.#12, SW to Cu,SMV,Sa, & LMV; All else Local			Alt.#13, SW to Cu,SMV,Sa, & LMV; All else Local			Alt.#14, SW to Cu,SMV,Sa, & LMV; All else Local			Alt. #15, SW to All Participating Purveyors			Alt.#16, SW to Cu,SMV,SA, & VAFB; All else Local		
	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount afy	Unit Cost	Annual Cost	Amount AFY	Unit cost	Annual cost
CUYAMA (1,600)																		
Santa Barbara Canyon Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Project Water	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
Totals	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400	1600	1119	1790400
SANTA MARIA (16,850)																		
Round Corral Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Project Water	16850	462	7784700	16850	462	7784700	16850	475	8003750	16850	462	7784700	16850	430	7245500	16850	485	8172250
Totals	16850	462	7784700	16850	462	7784700	16850	475	8003750	16850	462	7784700	16850	430	7245500	16850	485	8172250
SAN ANTONIO (23)																		
State Project Water	23	630	14490	23	630	14490	23	674	15502	23	630	14490	23	598	13754	23	700	16100
SANTA YNEZ, LOWER (12,000)							Cachuma (42ft) Conj. Use									Cachuma (42ft) Conj. Use		
Gibraltar + Lompoc Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cachuma + Lompoc Pipeline	0	0	0	0	0	0	2477	1345	3331565	0	0	0	0	0	0	4500	1154	5193000
Salsipuedes Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Project Water	12000	725	8700000	12000	725	8700000	9523	766	7294618	12000	725	8700000	12000	693	8316000	7500	715	5362500
Totals	12000	725	8700000	12000	725	8700000	12000	886	10626183	12000	725	8700000	12000	693	8316000	12000	880	10555500
SANTA YNEZ, UPPER (2,578)	Cachuma (27ft) Conj. Use			Cachuma (33ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use						Cachuma (42ft) Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	2578	996	2567688	0	0	0	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	2578	591	1523598	2578	618	1593204	2578	666	1716948	0	0	0	0	0	0	2578	666	1716948
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	2578	830	2139740	0	0	0
Totals	2578	591	1523598	2578	618	1593204	2578	666	1716948	2578	996	2567688	2578	830	2139740	2578	666	1716948
SOUTH COAST (12,435)	Cachuma (27ft) Conj. Use			Cachuma (33ft) Conj. Use			Cachuma (42ft) Conj. Use			New Gibraltar, Conj. Use						Cachuma (42ft) Conj. Use		
New Gibraltar Reservoir	0	0	0	0	0	0	0	0	0	10542	996	10499832	0	0	0	0	0	0
Existing Cachuma, Conj. Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enlarged Cachuma Reservoir	10942	591	6466722	12435	618	7684830	12435	666	8281710	0	0	0	0	0	0	10412	666	6934392
Goleta Water Reuse	845	2373	2005185	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB Regional Water Reuse	648	1785	1156680	0	0	0	0	0	0	1052	1759	1850468	0	0	0	0	0	0
Desalination of Seawater	0	0	0	0	0	0	0	0	0	841	1833	1541553	0	0	0	2023	1760	3560480
State Project Water	0	0	0	0	0	0	0	0	0	0	0	0	12435	880	10942800	0	0	0
Totals	12435	776	9628587	12435	618	7684830	12435	666	8281710	12435	1117	13891853	12435	880	10942800	12435	844	10494872
COUNTY WIDE (45,486) Totals	45486	647	29441775	45486	606	27567624	45486	669	30436493	45486	764	34749131	45486	669	30448194	45486	720	32746070

TABLE 46
EFFECT ON SANTA BARBARA COUNTY OF REDUCTIONS IN DELIVERIES OF SWP WATER TO SAN LUIS OBISPO COUNTY

In dollars per acre-foot

Water supply alternative	Unit cost increase*	
	San Luis Obispo takes one-half deliveries	San Luis Obispo takes no deliveries
3	$ 25	$ 68
4	$ 25	$ 68
7	$ 47	$ 134
8	$ 30	$ 83
9	$ 33	$ 92
10	$ 30	$ 83
11	$ 25	$ 68
12	$ 25	$ 68
13	$ 29	$ 77
14	$ 25	$ 68
15	$ 3	$ 22
16	$ 32	$ 85

*Shown as increases in unit costs for SWP water

adequate quantity and quality to serve the intended beneficial uses that would otherwise be met from imported SWP supplies.

4. The local project is feasible on an engineering and financial basis and is economically and environmentally sound.

5. Local water rights are protected.

Funding would be based on the capital component of the melded costs associated with (1) the construction of future SWP conservation facilities and (2) those avoided costs of SWP transportation facilities not yet constructed and not needed. It is assumed that future SWP facilities, including local projects, would be financed by the sale of revenue bonds with an interest rate of 9.5 percent and a repayment period of 30 years, as described under "Cost Analysis" in this Chapter. In addition, a third source, local participation, would be required if the costs to construct the local project exceed the costs to construct the SWP facilities. It is assumed that local bonds would be sold with an 11 percent interest rate for 30 years. These three funding sources are explained below.

1. Funds Associated with Future SWP Conservation Facilities

The amount of SWP funding for a local project will be determined by multiplying the firm yield of the local project by a melded capital cost value (dollars per annual acre-foot). This value is derived from the ratio between the total first cost of additional Northern California conservation facilities and the total annual yield of the additional facilities, as determined by DWR.

2. Funds Associated with SWP Transportation Facilities Not Yet Constructed

The size and, consequently, the construction costs of future SWP transportation facilities not yet constructed may be reduced when a portion of the future SWP water deliveries can be provided by a proposed local project. The avoided costs of such unconstructed future SWP transportation facilities would be determined as being the difference in the construction cost of the future SWP transportation facilities needed to supply the remaining maximum entitlement deliveries with and without the local project.

3. Local Share of Construction Costs

Local agencies would assume all costs, if any, to construct, operate, and maintain the local project not covered by SWP funds made available.

If the local agency or SWP water supply contractor decides to retain a portion of the yield of a local project, the SWP can finance as a maximum amount only the total capital costs multiplied by the ratio that the portion of the firm yield assigned to the SWP is to the total local project yield.

Figure 32 depicts local project financing as envisioned by DWR.

Repayment to DWR of SWP funds for construction, operation, maintenance, energy, and replacement of proposed local projects and the Coastal Branch will be governed by the SWP water supply contracts, which would allow for repayment through the Delta Water Charge or an equivalent charge and equivalent Transportation Charge.

A proposed repayment methodology as envisioned by DWR under the local projects guidelines is depicted in **Figure 32.**

In addition, it should be noted that SWP energy may be available for use by the local project. If available, SWP energy may be used by a local project where only a part of the firm yield of the local project becomes yield to SWP, but only to the extent of the ratio that the yield to the SWP is to the total local project yield. The cost to the local project will be the melded SWP power rate as determined by DWR.

Future Decision-making Process

From all the analyses conducted and considered in this and in previous studies, it appears that at least six water supply alternatives should be given serious consideration by the SBCFCWCD and water purveyors within the County. The six alternatives are Alternatives 11 through 16.

The selection of these alternatives was strongly influenced by the need for water quality improvement and protection in the Cuyama, Santa Maria, and lower Santa Ynez Subareas. The existing and potential water quality problems can be avoided or improved by the importation and blending of SWP water. The Lompoc Pipeline would also serve to improve the water quality in the lower Santa Ynez Subarea by delivering better quality water from upstream on the Santa Ynez River directly to the lower area.

Economics and financial assistance were other key considerations. In this regard, the initial capital cost was considered less critical then the energy requirements. This

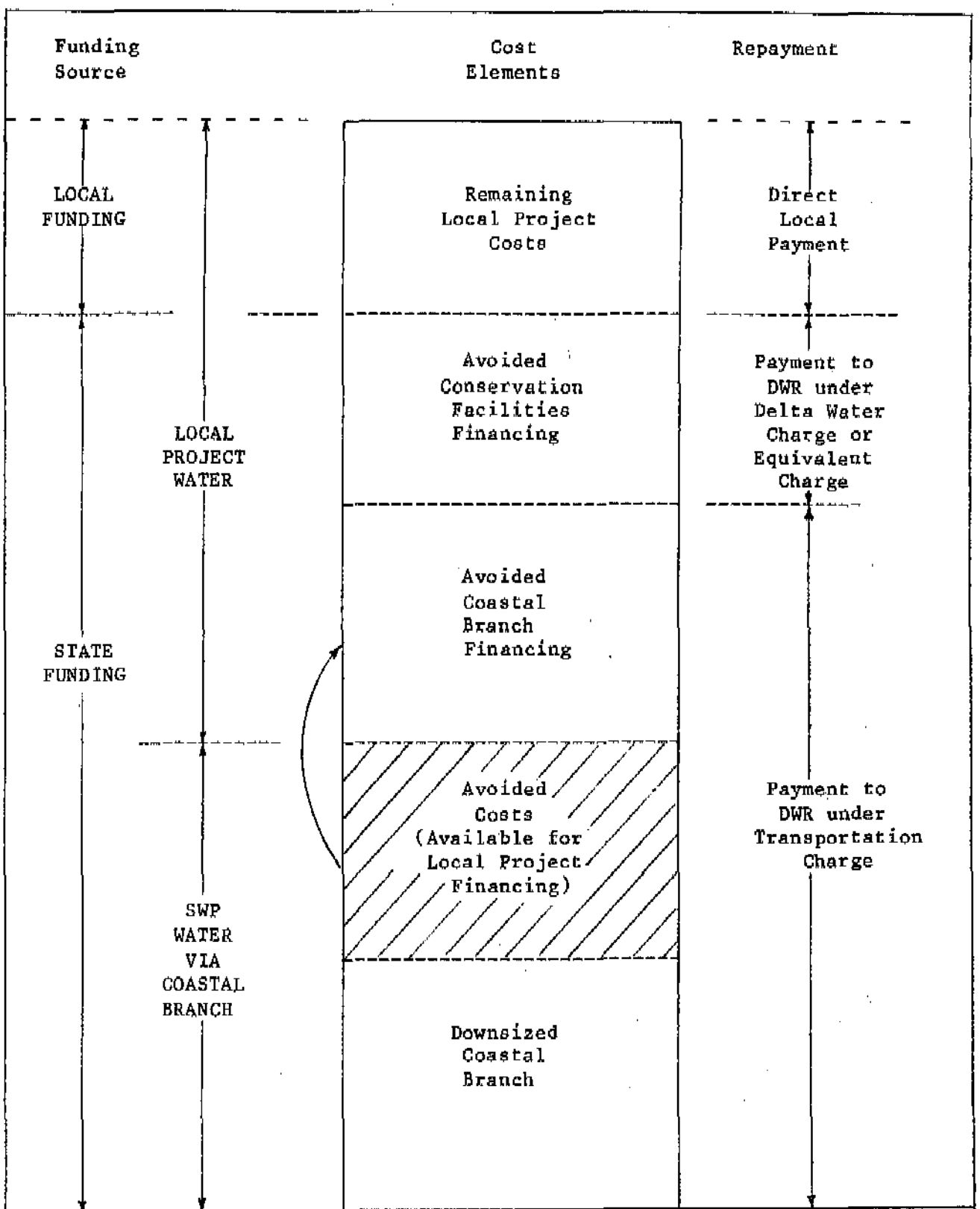


Figure 32 - LOCAL PROJECT FINANCING AND REPAYMENT

is because annual requirements for energy in energy-intensive projects will continue and the costs of energy undoubtedly will rise indefinitely, whereas capital costs (assuming no major wear or degradation of equipment) can be repaid once and for all.

The selection process also took into account water reuse potentials, environmental considerations, and engineering feasibility.

The selection of these alternatives does not negate or minimize the importance and need for continued water conservation, watershed management, and weather modification programs. Continued emphasis should be placed on urban and agricultural water conservation programs, which include public information and education, water management, better irrigation techniques and scheduling, regulations addressing water waste and water-use planning, and water emergency plans. Watershed management programs should be pursued to increase the yield of watersheds within the County and to reduce the risk and size of wild fires and losses. The weather modification program is a desirable means of developing additional water in the County. However, additional safe yield from watershed management and weather modification would require additional storage and that has limited the development of these methods.

Before any of the alternatives or their components can be implemented, additional information regarding the engineering feasibility, possible funding, economic, legal and institutional considerations, and environmental impacts will need to be addressed. SBCFCWCD, therefore, will have to inform DWR as to the preferred alternative, keeping in mind that even with any of the above alternatives, the County will not meet its entire projected future water demands and would have a deficit of 12,500 acre-feet by year 2010. The intent of this study was to provide the decision makers the opportunity to select an alternative that would supply a quantity of water equal to its entitlement of SWP water, or 45,486 acre-feet per year. Once SBCFCWCD requests DWR to proceed with an alternative that incorporates State funding, discussions will need to commence with the other SWP contractors and DWR.

The level of SWP participation in local water supply projects, as well as the degree of participation by all SWP water supply contractors in all future water supply facilities, will need to be determined. A number of the SWP contractors, including SBCFCWCD, have been actively discussing these issues for some time. While the concept of local project addendums to the SWP has been widely discussed among the contractors and contract amendments and guidelines formally adopted, it is not clear that the concept has full acceptance. To date, there has been no local project implemented. The funding level assumed for the draft report may now be higher than what would be acceptable to many of the SWP water contractors. Successful implementation of a local project addition to the SWP will require general agreement among the project contractors.

After all parties reach agreement, the feasibility and Environmental Impact Report (EIR) studies could begin. A funding commitment to proceed with specific facilities cannot be made before a complete feasibility study has been reviewed by DWR and the SWP water contractors.

Whatever the decision may be, any new water development for the County could not be fully implemented for another five to ten years. Even if SBCFCWCD and SLOCFCWCD decide in 1985 on a Coastal Branch or a downsized Coastal Branch plus local projects, 1993 would be the earliest that water would be delivered to the County, assuming the work and time schedule shown in **Figure 33** is followed.

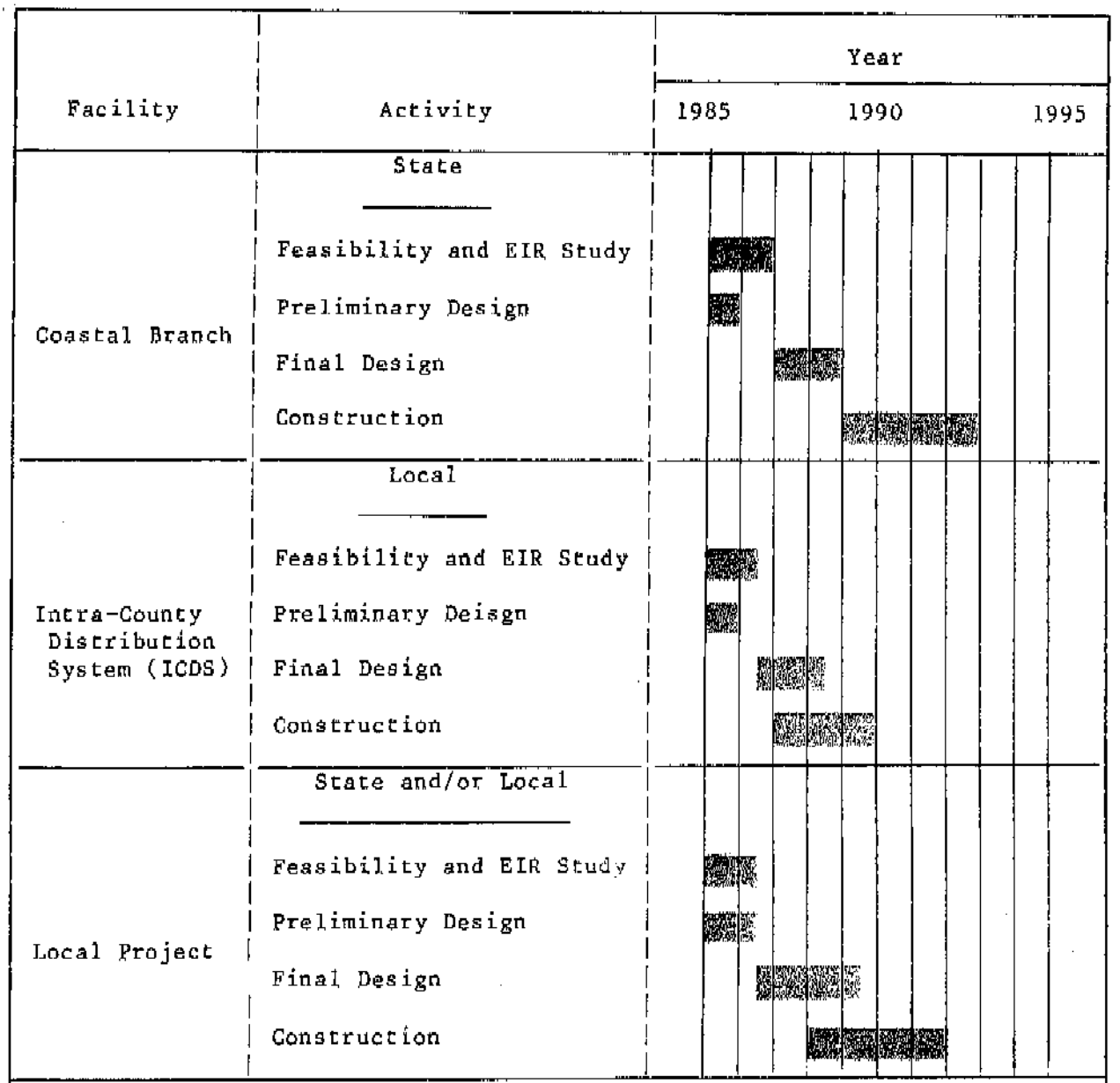


Figure 33 - ESTIMATED WORK AND TIME SCHEDULE REQUIRED FOR FUTURE WATER DEVELOPMENT IN SANTA BARBARA COUNTY

Appendix A

REFERENCES

APPENDIX A

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Appendix B

1979-1982 CALENDAR YEAR
AVERAGE WATER USE CONDITION BY AREAS

APPENDIX B
1979-1982 CALENDAR YEAR AVERAGE WATER USE CONDITION BY AREAS
In acre-feet per year

City or District / Area	City and district production			Private pumpage		Sources of water				Water use totals					Area population	Gal./capita/day
	Total	To urban	To ag	To urban	To ag	Cachuma/ Tecolote	Gibraltar/ Mission	Jameson/ Doulton	Ground water	Total	To urban		To ag			
New Cuyama CSD	296	296							296 100%	296	296	100%	0	0%	625	423
Misc. Cuyama Vly.				84	28520				28604 100%	28604	84	0%	28520	100%	575	130
CUYAMA VALLEY	296	296		84	28520				28900 100%	28900	380	1%	28520	99%	1200	283
City of SantaMaria	8458	8458							8458 100%	8458	8458	100%	0	0%	39685	190
Orcutt(So.Cal.Wtr)	5337	5337							5337 100%	5337	5337	100%	0	0%	22700	210
City of Guadalupe	710	710							710 100%	710	710	100%	0	0%	3700	171
Lake Marie Water	236	236							236 100%	236	236	100%	0	0%	515	409
Roral SM Valley				139					139 100%	139	139	100%	0	0%	800	155
SM Valley Industr.				7120	89600				96720 100%	96720	7120	7%	89600	93%		94
SANTA MARIA VALLEY	14741	14741		7259	89600				111600 100%	111600	22000	20%	89600	80%	67400	291
Casmalia CSD	22	22							22 100%	22	22	100%	0	0%	226	87
Los Alamos CSD	214	214							214 100%	214	214	100%	0	0%	734	260
Misc. SA Valley				80	16180				16260 100%	16260	80	0%	16180	100%	440	162
SAN ANTONIO VALLEY	236	236		80	16180				16496 100%	16496	316	2%	16180	98%	1400	201
Mission Hills CSD	498	498							498 100%	498	498	100%	0	0%	2755	161
Vandenberg Village	1836	1836							1836 100%	1836	1836	100%	0	0%	5839	281
City of Lompoc	3659	3659							3659 100%	3659	3659	100%	0	0%	26270	124
Vandenberg AFB	4696	4696							4696 100%	4696	4696	100%	0	0%	8136	515
Misc. Lower SY Vly				165	30000				30165 100%	30165	165	1%	30000	99%	900	164
LOWER SANTA YNEZ	10689	10689		165	30000				40854 100%	40854	10854	27%	30000	73%	43900	221
SantaYnezRWCD,ID#1	6096	1196	4900	450	600	3580	50%			3566	50%	7146	1646	23%	5500	77%	7712	191
Solvang MID	1386	1386				190	14%(purchased from ID#1)			1196	86%	1386	1386	100%	0	0%	2899	427
Buellton CSD	741	741								741	100%	741	741	100%	0	0%	2242	295
Misc. SY Valley				155	24800					24955	100%	24955	155	1%	24800	99%	847	163
UPPER SANTA YNEZ	8223	3323	4900	605	25400					30438	89%	34228	3928	11%	30300	89%	13700	256
Carpinteria CWD	5027	2126	2901	25	1500	4441	68%			2111	32%	6552	2151	33%	4401	67%	13410	143
Summerland CWD	197	117	80			197	100%			0	0%	197	117	59%	80	41%	1245	84
Montecito WD	3967	3467	500	375	100	1434	32%		2436 55%	572	13%	6442	3842	86%	600	14%	9964	364
Santa Barbara City	14085	14085		100	50	4970	35%	7324 51%		1941	14%	14235	14185	100%	50	0%	76705	165
La Cumbre Mut.WC	1535	1382	153			301	20%			1234	80%	1535	1382	90%	153	10%	4000	308
Goleta WD	15266	11530	3736	190	480	12430	78%			3501	22%	15936	11720	74%	4216	26%	64503	162
Outside Districts				225	9000					9225	100%	9225	225	2%	9000	98%	1273	158
SOUTH COAST	40077	32707	7370	915	11130	23773	46%	7324 14%	2436 5%	18584	36%	52122	33622	65%	18500	35%	171100	175
TOTAL, SANTA BARBARA COUNTY	74262	61992	12270	9108	200830	37303	13% (total surface+tunnel)			246892	87%	284200	71100	25%	213100	75%	298700	212

NOTE: All figures provided by cities, special districts, or small private water companies are metered water production values. As shown, some district production is delivered to agriculture (ag). The remaining private urban (M&I) type of use is estimated from information provided by local water managers. Private agricultural pumpage is estimated from earlier ag land use surveys updated by measured and estimated changes in irrigated land acreages.
The actual 1979-1982 average gpcd for Vandenberg AFB is calculated at 205. Its working population is about 14500; and about 20% of the AFB water production goes to Union Oil Co. and U.S. Penitentiary, Lompoc. Rainfall for these four years was some 10% above average.

CREDITS

The cover design was prepared by Audi Hill of Graphic Services, Department of Water Resources, Sacramento.

All photographs are from Santa Barbara County Flood Control and Water Conservation District except those of the pumping plants on page 52, which are Department of Water Resources photographs. Las Perillas is DWR 6226-23 and Badger Hill is DWR 6226-29.

CONVERSION FACTORS

Quantity	To Convert from Metric Unit	To Customary Unit	Multiply Metric Unit By	To Convert to Metric Unit Multiply Customary Unit By
Length	millimetres (mm)	inches (in)	0.03937	25.4
	centimetres (cm) for snow depth	inches (in)	0.3937	2.54
	metres (m)	feet (ft)	3.2808	0.3048
	kilometres (km)	miles (mi)	0.62139	1.6093
Area	square millimetres (mm^2)	square inches (in^2)	0.00155	645.16
	square metres (m^2)	square feet (ft^2)	10.764	0.092903
	hectares (ha)	acres (ac)	2.4710	0.40469
	square kilometres (km^2)	square miles (mi^2)	0.3861	2.590
Volume	litres (L)	gallons (gal)	0.26417	3.7854
	megalitres	million gallons (10^6 gal)	0.26417	3.7854
	cubic metres (m^3)	cubic feet (ft^3)	35.315	0.028317
	cubic metres (m^3)	cubic yards (yd^3)	1.308	0.76455
	cubic dekametres (dam^3)	acre-feet (ac-ft)	0.8107	1.2335
Flow	cubic metres per second (m^3/s)	cubic feet per second (ft^3/s)	35.315	0.028317
	litres per minute (L/min)	gallons per minute (gal/min)	0.26417	3.7854
	litres per day (L/day)	gallons per day (gal/day)	0.26417	3.7854
	megalitres per day (ML/day)	million gallons per day (mgd)	0.26417	3.7854
	cubic dekametres per day (dam^3/day)	acre-feet per day (ac-ft/day)	0.8107	1.2335
Mass	kilograms (kg)	pounds (lb)	2.2046	0.45359
	megagrams (Mg)	tons (short, 2,000 lb)	1.1023	0.90718
Velocity	metres per second (m/s)	feet per second (ft/s)	3.2808	0.3048
Power	kilowatts (kW)	horsepower (hp)	1.3405	0.746
Pressure	kilopascals (kPa)	pounds per square inch (psi)	0.14505	6.8948
	kilopascals (kPa)	feet head of water	0.33456	2.989
Specific Capacity	litres per minute per metre drawdown	gallons per minute per foot drawdown	0.08052	12.419
Concentration	milligrams per litre (mg/L)	parts per million (ppm)	1.0	1.0
Electrical Conductivity	microsiemens per centimetre (uS/cm)	micromhos per centimetre	1.0	1.0
Temperature	degrees Celsius (°C)	degrees Fahrenheit (°F)	(1.8 × °C)+32	(°F−32)/1.8