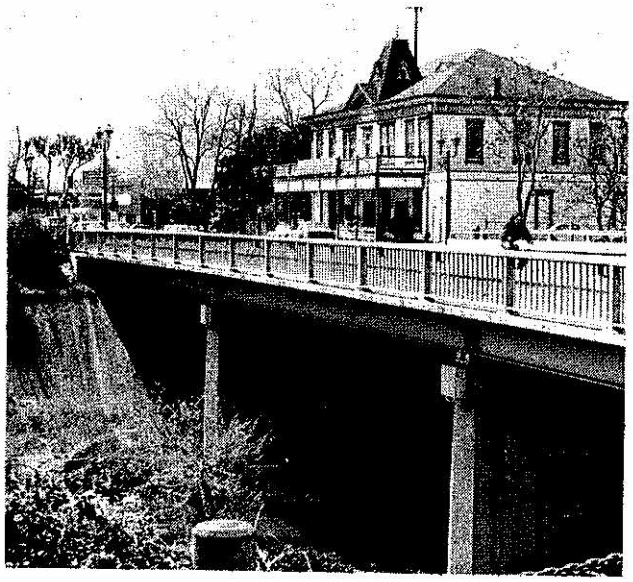
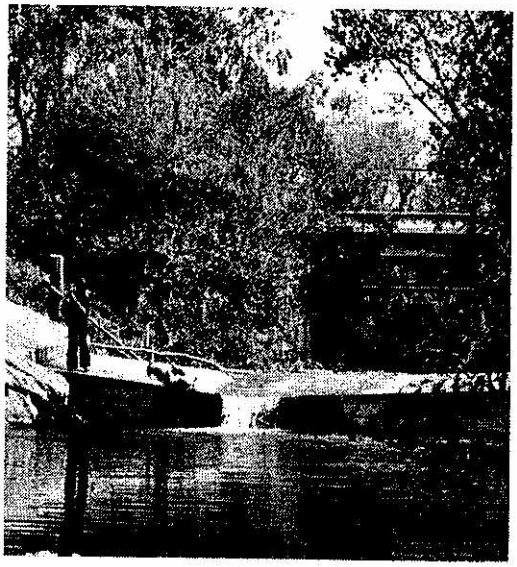
Alameda Creek Urban Streams Study



PROGRESS REPORT

OCTOBER 1980



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FOREWORD

Urban growth often replaces an area's natural features with asphalt, concrete, glass, and steel. This is partly unavoidable in a technological society, yet it is regrettable that so much of an area's natural surroundings are sacrificed as it develops. Usually, the magnitude of the the loss is not appreciated until it is too late.

Streams have always held a special attraction for people. They help mitigate the harshness of the urban environment. But streams in urban areas suffer from attempts to control their flows or use their banks as building sites.

The objective of the Urban Streams Program is to restore and maintain natural watercourses that are found in existing or potential urban areas. Alameda Creek is the program's "pilot" stream. Experience to date has shown considerable local interest and effort in preserving the creek's natural qualities and increasing its summer flow. During this investigation, there was excellent cooperation from local water and recreation districts.

This report describes progress to date on preserving the natural character of Alameda Creek and augmenting channel flows to make it a "live" stream through more of its length. Some questions remain unanswered and will need more information or trial operations to be fully resolved. However, a good beginning has been made and enough is presently known to proceed toward the objectives of this program.

This Department's efforts have helped to organize and heighten the interest in Alameda Creek that already existed. Now the local agencies and citizens must assume most of the responsibility for bringing the experiment to fruition. The findings and recommendations of this study should help provide direction for that work.

Albert J. Dolcini, Chief
Northern District

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Edmund G. Brown Jr., Governor
THE RESOURCES AGENCY
Huey D. Johnson, Secretary for Resources

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CHAPTER I. SUMMARY

Water management policy of the Department of Water Resources states: "Instream water uses for recreation, fish, wildlife, and related purposes shall be balanced with other uses." One expression of this policy is the Urban Streams Program, which was started to encourage the preservation of natural streams in rapidly growing areas and to improve degraded stream systems in heavily urbanized areas.

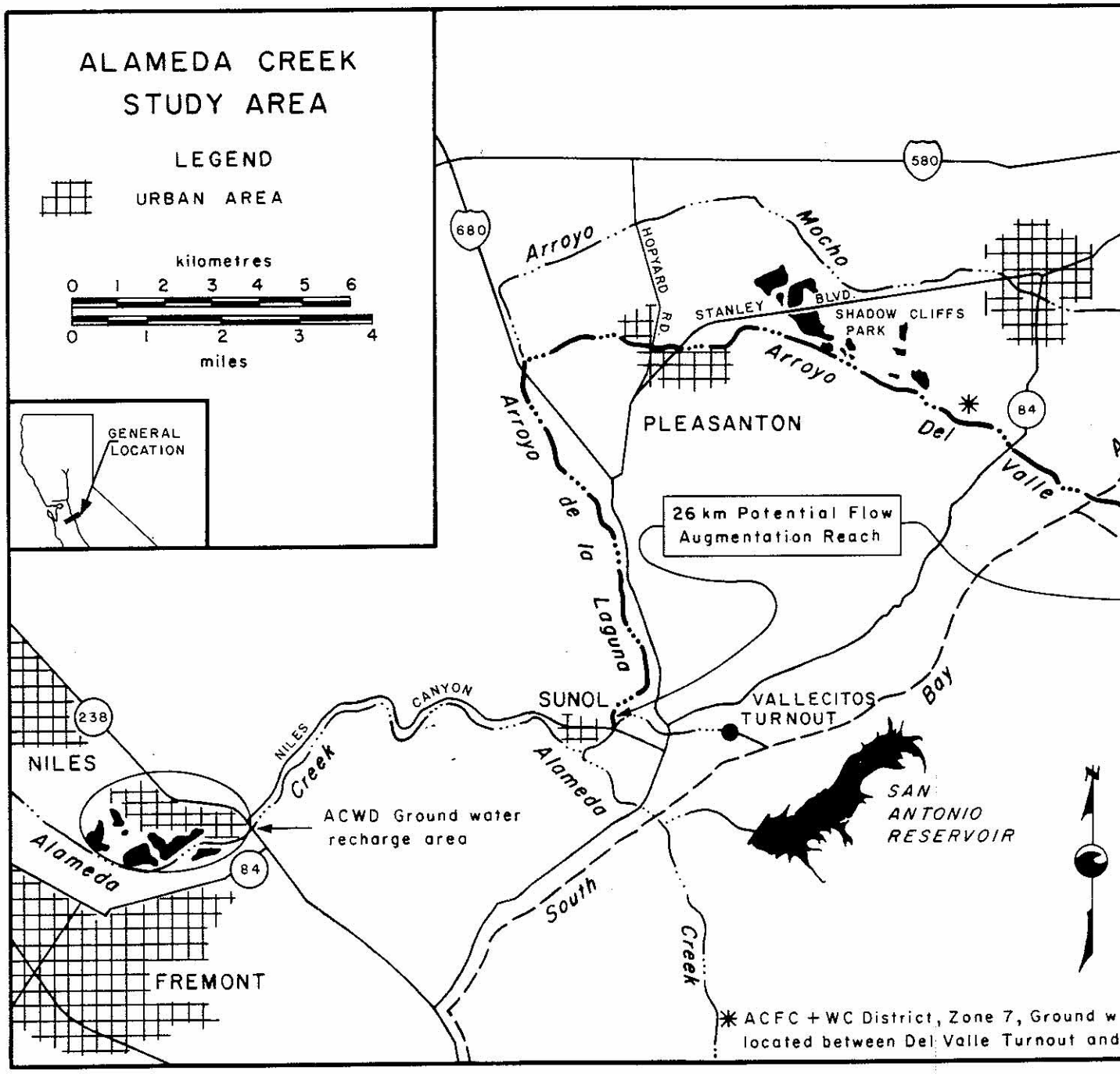
To begin this program, a survey was conducted of potential study streams in the two major urban areas of California, the greater San Francisco Bay Area, and the Los Angeles Basin. Alameda Creek, in the Bay Area, was selected for three reasons: it is heavily used for recreation, it is threatened by future development, and there are resources for increasing its streamflow through releases from the State Water Project South Bay Aqueduct (SBA).

Local interest and cooperation in enhancing this stream system for recreation, fishery, wildlife preservation, and scenic beauty has come from many agencies and individuals. The two local water districts have released steady ground water recharge flows in quantities and from locations that resulted in substantial summer streamflow throughout the major urbanized portion of the Alameda Creek Basin. In particular, Arroyo Del Valle, from Del Valle Dam through Pleasanton, and Arroyo Mocho, through the Livermore area, have benefited (see Figure 1). Continuation and possible increase of these flows will be a long step toward realizing the goals of the Urban Streams Program in this area.

The best plan for increasing fishery and recreation use of Alameda Creek tributaries involves changing the location where the Alameda County Water District (ACWD) gets most of its ground water recharge flows. By releasing more water from the Del Valle turnout instead of the Vallecitos turnout, ACWD could greatly increase flow in a 26-km (16-mi) reach of creek channel from Del Valle Dam to Sunol. This change in turnouts would have to be accomplished without significant loss of water or operational flexibility to the water district. Much of this report deals with realizing this possibility.

Findings and Conclusions

1. Several Alameda Creek tributaries have good potential for recreation and fish and wildlife use if they remain relatively undisturbed by urban development and if they have adequate summer flows. The stream reach with the greatest potential includes the tributary called Arroyo Del Valle from Del Valle Dam to where it joins Arroyo de la Laguna, then Arroyo de la Laguna to its confluence with Alameda Creek, then the creek itself to Fremont. Arroyo Mocho through Livermore also has good recreation potential and is presently protected from distructive urban development. This stream now receives adequate flows from local water


ALAMEDA CREEK
STUDY AREA
LEGEND
URBAN AREA
kilometres
0 1 2 3 4 5 6
0 1 2 3 4
miles
GENERAL LOCATION
580
680
Arroyo Mocho
HOPYARD RD.
STANLEY BLVD.
SHADOW CLIFFS PARK
Arroyo
PLEASANTON
Del Valle
84
Arroyo de la Laguna
26 km Potential Flow Augmentation Reach
238
NILES
CANYON
NILES Creek
SUNOL
VALLECITOS TURNOUT
Bay
Alameda
ACWD Ground water recharge area
SAN ANTONIO RESERVOIR
Alameda
South Creek
FREMONT
ACFC + WC District, Zone 7, Ground w
located between Del Valle Turnout and

district groundwater recharge releases. Most of this study was concentrated on the Arroyo Del Valle channel reach between Del Valle Dam and Fremont.

2. Urban growth in the Livermore Valley part of the study area is a moderate two percent per year and is controlled by the limited availability of sewer hookups. The area's growth potential far exceeds the actual growth, so long-term, steady urban expansion is a likely future prospect.

3. Interest in preserving the natural character of Alameda Creek and its tributaries has been expressed by several local agencies and private groups. Both the cities of Livermore and Pleasanton have zoned the arroyos as open space lands in their general plans. Some adjacent landowners have opposed increased recreation use of Arroyo Del Valle through Pleasanton because of concerns over home security and vandalism.

4. Two water districts in the Alameda Creek watershed get water from the State's South Bay Aqueduct. They are the Alameda County Water Conservation and Flood Control District (referred to in this report as Zone 7), located in the Pleasanton-Livermore area, and the Alameda County Water District (ACWD), in the Fremont area. These districts support maintaining summer flows in Alameda Creek tributaries if it is not costly to them. They have made steady releases down Arroyo Del Valle during the summers of 1978 and 1979, partly in response to instream flow needs.

5. Use of Alameda Creek for fish, wildlife, and recreation can be enhanced if ACWD takes its ground water recharge releases from the Del Valle turnout instead of the Vallecitos turnout of the SBA. This change results in additional transportation water losses due to the longer travel distance to the recharge area. These losses will have to be compensated by release of State recreation water at the Del Valle turnout for as much as six months of the year. These releases could range from 0.028 to 0.084 m^3/s (1 to 3 ft^3/s) over a six-month period for a maximum quantity of 444 to 1 332 dam^3 (360 to 1,080 ac-ft) annually.

6. The upper water district--Zone 7--must release continuous ground water recharge flows throughout the summer in order for ACWD to release any of their SBA water from the Del Valle turnout. Otherwise, water released to ACWD would infiltrate into the Zone 7 ground water system. Until recently Zone 7 had a policy of continuous ground water recharge through 1983, when the Delta water charge will increase significantly due to a rise in power costs. But Zone 7 is now reevaluating their recharge program and may reduce recharge flows before 1983.

7. A recreation survey conducted over a four-day period in June 1979 counted 967 recreationists along Alameda Creek. This is a little more than a tenth as many as used Lake Del Valle during the same period. Use of Alameda Creek would increase greatly if: (1) more creek area were made legally accessible, (2) sanitary facilities were provided, and (3) high, steady streamflows were provided.

8. Water quality surveys in the summers of 1978 and 1979 showed that mid-summer water temperatures in Alameda Creek were generally too high to support the planting of catchable trout except through the Niles Canyon area and immediately below the Del Valle turnout in Livermore's Veterans Park. Electrical conductivity and turbidity were occasionally in the medium-to-high range during the summer. Water quality in Arroyo de la Laguna and lower Alameda Creek improved after February 1980, when treated sewage was no longer discharged to the creek.

9. The amount and release schedule of local ground water recharge flows depends on several factors, including spring ground water levels, water year classification (wet or dry), condition of recharge facilities, and decisions of water district boards. Because of these variable factors, it will be necessary to reach agreement on coordinated release of recharge and recreation water from the Del Valle turnout on an annual basis.

10. One problem adversely affecting fish life and recreation use of Arroyo Del Valle has been resolved. Before 1980, SBA releases of less than 0.28 m^3/s (10 ft^3/s) at the Del Valle turnout were made on an intermittent (every other day) basis. This was necessary because the flow-metering device was not accurate to less than 0.28 m^3/s (10 ft^3/s). Recently a second flow meter was installed which can accurately register flows down to 0.17 m^3/s (6 ft^3/s), thus eliminating the need for future intermittent flows. This steady flow release should make Arroyo Del Valle near Veterans Park suitable for planting catchable trout in the spring, early summer, and fall.

Recommendations

1. The Department should continue collection of hydrologic data to determine the irrecoverable water losses to ACWD from changing their major release point along the SBA. New information is needed because treated sewage flows that were to be released into Arroyo de la Laguna during earlier hydrologic studies are now exported out of the basin.

2. The Department should meet with both water districts in early 1981 to agree upon a tentative spring and summer Alameda Creek flow release schedule. The Department should be prepared to commit State Water Project recreational releases to cover ACWD's losses from changing their major water release point.

3. The Department should continue to work with Zone 7 to establish a mutually agreeable means whereby entitlement ground water recharge flows can be maintained in the stream channel from the Del Valle turnout to the Pleasanton stream gage station after 1983. If agreement is reached, ACWD would probably continue making major releases at the Del Valle turnout, and high sustained summer flows would continue from Del Valle Dam through Niles Canyon.

4. Local governments, recreation districts, water districts, and interested citizens groups should continue to work toward the preservation and

enhancement of natural stream channels. The streams and riparian zones are uniquely valuable, and they should be preserved for water supply, recreation, and fish-and-wildlife purposes. Urban encroachment upon these channels and adjacent riparian land should not be allowed.

5. The two water districts, Zone 7 and ACWD, should continue to coordinate their ground water recharge releases from the Del Valle turnout to yield sustained summer flows in Arroyo Del Valle, Arroyo de la Laguna, and Alameda Creek.

CHAPTER II. INTRODUCTION AND BACKGROUND

The California landscape once contained thousands of miles of small, natural, tree-lined stream channels. They afforded drainage, water supply, habitat for fish and wildlife, pleasant scenery, and places of recreation. Fishing or just relaxing by a stream soothed and refreshed the spirit.

Slowly at first and then faster, these areas of refuge have been changed or destroyed, so that natural streams are now rare in heavily populated areas of the State. Most urban streams have been diverted, dammed, channelized, buried in culverts, stripped of riparian vegetation, or used for refuse disposal. In the name of progress and efficiency, metropolitan streams have been considered expendable.

As with much of our environmental legacy, the true value of these streams was not recognized until after many of them were lost. Now a change in thinking has occurred which places greater value upon natural systems and often insists that future development be accomplished without harming the environment. This new ethic has brought policy changes in government agencies.

California Water Code Section 11900 (The Davis-Dolwig Act) requires that the Department of Water Resources preserve and enhance the environment in the process of meeting California's water needs. This act stipulates that recreation and fish and wildlife enhancement are among the purposes of the State Water Project.

In 1975, the Department of Water Resources published a new water management policy which said in part that "instream water uses for recreation, fish, wildlife, and related purposes shall be balanced with other uses". In later statements this policy has been broadened to assert that instream water uses should be given equal consideration with other beneficial uses in formulating State water policy. The Department has therefore become increasingly involved in preserving instream water uses. Instream studies, including the Urban Streams Program, are examples of this involvement.

The urban streams investigation was begun in 1976. The initial step of this program was to identify streams in or near urban areas that should receive special attention to ensure their preservation or restoration. Next we selected the most favorable stream (Alameda Creek) and began working with local groups to accomplish the necessary planning for its preservation and enhancement. While preservation of Alameda Creek is mainly the responsibility of local planning agencies, the State will support the effort wherever it can be of service. Enhancement of Alameda Creek can be accomplished by: (1) maintaining summer streamflow in reaches of creek which otherwise would go dry, (2) planting these new "live" reaches with catchable fish whenever conditions are favorable, and (3) providing access sites and sanitary facilities. Although live summertime flows did not occur historically in much of Alameda Creek, a flowing stream provides much greater fish, wildlife, and recreation use. The Department of Water Resources can aid the local area in maintaining live summertime flows in the creek.

Criteria for Selecting Study Streams

The initial phase of the Urban Streams Program was aimed at developing selection criteria and preparing a list of potential streams for study. The Director specified that the study concentrate on the heavily urbanized areas of the Los Angeles Basin and the San Francisco Bay Area. He assigned the Northern District to begin the investigation.

The following criteria were used to select potential study streams:

1. The streams should be located in the Los Angeles Basin and the San Francisco Bay Area.

2. The streams should be within a metropolitan setting or within an hour's driving distance from such a center.

3. There should be reasonable assurance of public access to streams selected. Where urban development has spread over the lands adjacent to the streambanks, it may be very difficult to provide access for recreation users.

4. The stream should either have enough water for the intended recreational uses or potential for development of sufficient water.

5. There should be local support for the goals of the Urban Streams Program. This support may come from local public agencies or from citizens groups.

6. There should be environmentally oriented organizations or agencies willing to assume leadership in the enhancement program once it is developed. The Department's role should be limited to performance of initial studies, and to helping develop a water supply if necessary. We should serve as a catalyst to get the process going.

Streams Considered for Study

Streams were selected after discussions with representatives of the Departments of Fish and Game, Public Health, and Parks and Recreation, and others. Also, various plans were reviewed, including the California Coastal Plan, the California Protected Waterways Plan, the California Outdoor Recreation Resources Plan, and the Santa Monica Mountains State Park Plan.

Although preference was given those streams closest to metropolitan areas, streams somewhat further away were not ignored. Especially important were streams still generally unspoiled by urban growth.

After research and consultation, the following streams were selected. They are listed alphabetically, not in order of priority.

TABLE 1

URBAN STREAMS INITIALLY CONSIDERED FOR STUDY

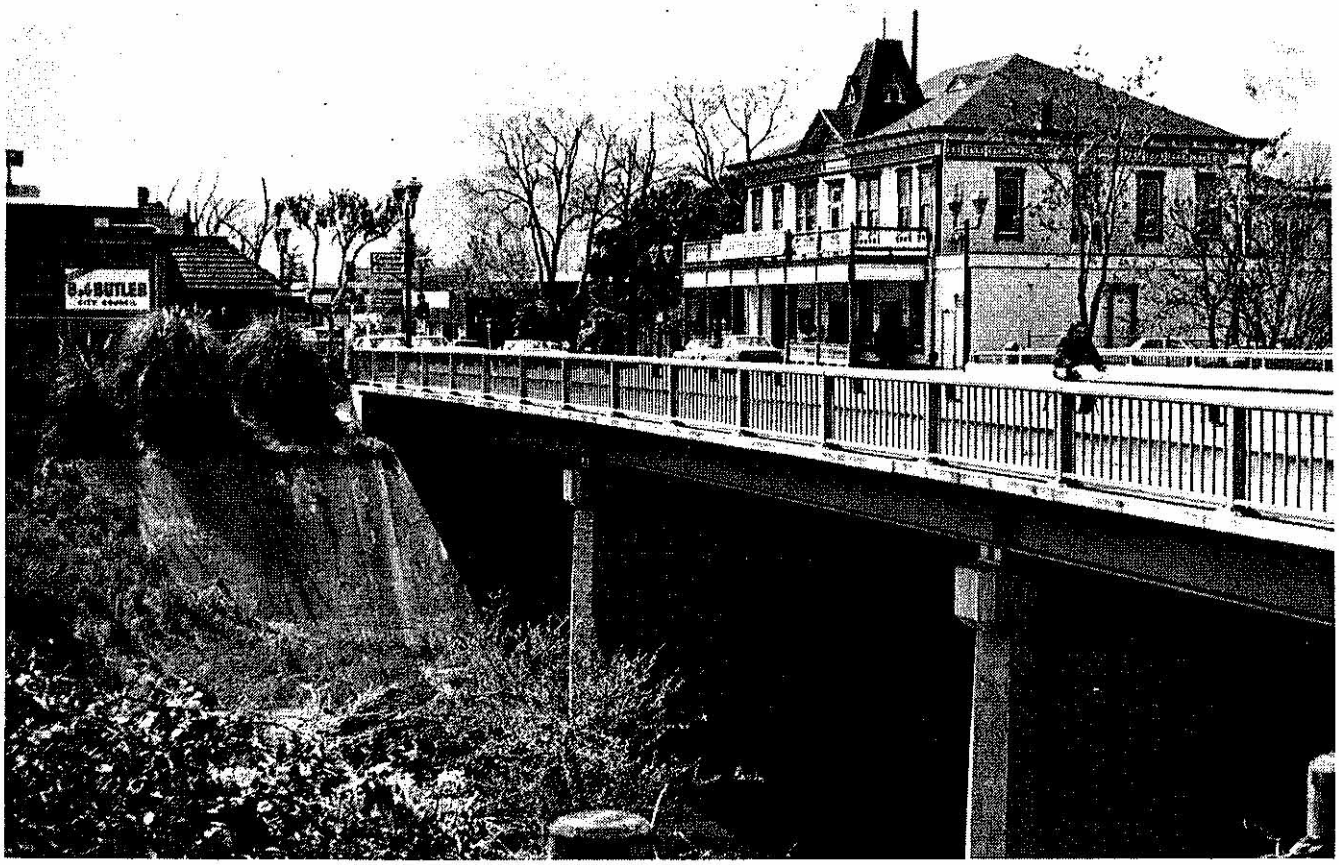
	Stream	County
	Southern California Area	
1.	Aliso Creek	Orange
2.	Arroyo Seco & Tributaries	Los Angeles
3.	Ballona Creek	Los Angeles
4.	Escondido Creek	San Diego
5.	Fallbrook Creek	San Diego
6.	Laguna Creek	Orange
7.	Malibu Creek	Los Angeles
8.	Mission Creek	Santa Barbara
9.	San Diego Creek	Orange
10.	San Diego River	San Diego
11.	San Gabriel River	Los Angeles
12.	San Juan Creek	Orange
13.	San Jose Creek	Los Angeles
14.	San Luis Obispo Creek	San Luis Obispo
15.	Santa Ana River	Orange
16.	Santa Clara River	Ventura
17.	Topanga Creek	Los Angeles
18.	Ventura River	Ventura
19.	Verdugo Wash & Tributaries	Los Angeles
20.	Zuma Creek	Los Angeles
	San Francisco Bay Area	
1.	Alameda Creek	Alameda
2.	Aptos Creek	Santa Cruz
3.	Corte Madera Creek	Marin
4.	Coyote Creek	Santa Clara
5.	Crow Creek	Alameda
6.	Mill Creek	Marin
7.	Napa River	Napa
8.	Pescadero	San Mateo
9.	San Gregorio Creek	San Mateo
10.	San Francisquito Creek	San Mateo
11.	San Leandro Creek	Alameda
12.	San Lorenzo Creek	Alameda
13.	San Lorenzo River	Santa Cruz
14.	San Pedro Creek	San Mateo
15.	Soquel Creek	Santa Cruz
16.	Stevens Creek	Santa Clara
17.	Walker Creek	Marin
18.	Walnut Creek	Contra Costa

After identification of these streams, the Southern District was assigned responsibility for continued study of those in Southern California. They have written memorandum reports on several streams, including Aliso Creek, Escondido Creek, Fallbrook Creek, Oso Creek, and the Santa Clara River.

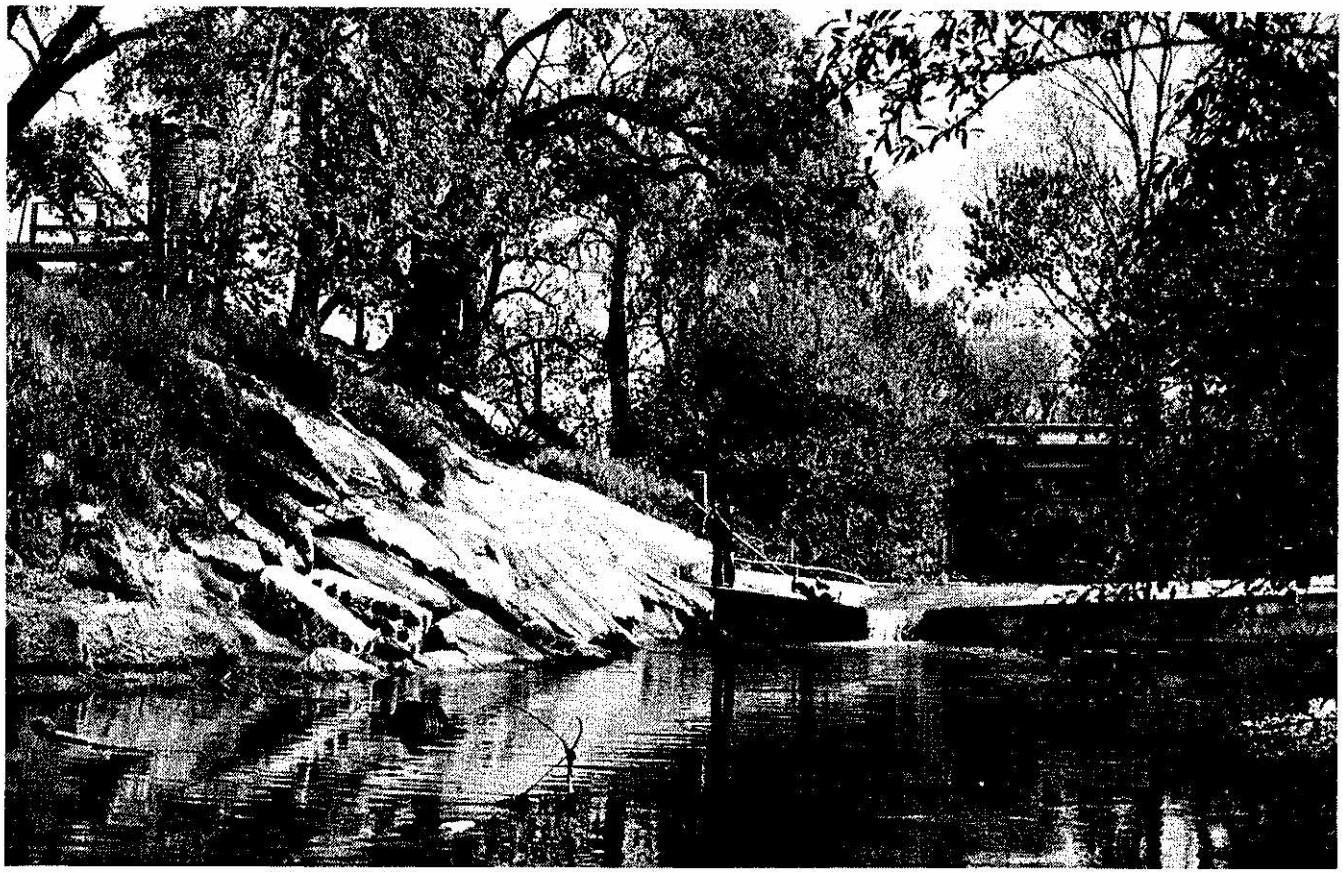
The Northern District was assigned responsibility for further investigation of the San Francisco Bay Area stream. An inventory of these was made and Alameda Creek was identified as having the greatest potential for urban recreational purposes for the following reasons:

1. It is the largest stream in Alameda County.
2. It is still largely in its natural condition.
3. It is located in a growing area. Without protection, its natural features will be altered or destroyed.
4. It contains several native fish species and receives considerable recreation use.
5. Several local agencies and citizens groups are interested in preserving it.
6. The State-operated South Bay Aqueduct delivers water within the watershed and provides a potential source of supplemental instream water supply.

Sunol Dam at the upper end of Niles Canyon receives considerable recreation use. This is the upstream terminus of a nearly completed hiking trail which will run along Alameda Creek to San Francisco Bay.



Arroyo Del Valle flows through the town of Pleasanton. Much of the stream has retained its secluded and natural appearance.



CHAPTER III. ALAMEDA CREEK STUDY AREA DESCRIPTION

The Alameda Creek watershed is in the southeastern San Francisco Bay Area. It is about 71 km (44 mi) long and 26 km (16 mi) wide and has an area of about 1 800 km^2 (700 mi^2). It is the largest watershed in Alameda County and in the southeast Bay Area. Communities within it are Livermore, Pleasanton, Dublin, San Ramon, and parts of Fremont, Newark, and Union City. More than 100,000 people live in the watershed, and several million people live within an hour's drive.

Major tributaries to Alameda Creek are Arroyo Del Valle and Arroyo Mocho. Arroyo de la Laguna connects these two tributaries near Pleasanton to Alameda Creek at Sunol. The urban streams study concentrated on the middle and lower reaches of the creek system, where it flows through populated areas. Most of the population is in the Livermore-Amador Valley, in the northern third of the watershed. There is considerable pressure for growth in the valley, but general plan policy and the limited number of sewage hookups have kept growth to about 2 percent a year for the last decade. Much of the population works outside of the valley in the industrial and commercial corridor of the East Bay. Major employers in the valley are the Lawrence Livermore Laboratory, gravel quarry operators, Alcoa Aluminum, commercial and retail businesses, agriculture, and government.

Except for the populated Livermore-Amador Valley and coastal plain area, this watershed is generally grass-woodland mountainous terrain. Elevations range from sea level to 1 284 m (4,213 ft) at Mt. Hamilton in the southern basin.

Weather in the watershed is characterized by hot, dry summers and cool, wet winters. Temperatures are less extreme than the Central Valley and less moderate than the coastal Bay Area. Rainfall averages around 381 mm (15 in) per year.

Alameda Creek watershed provides excellent fish and wildlife habitat. Large undeveloped areas support a variety of native mammals, reptiles, and birds. Riparian habitat through Niles Canyon and along Arroyo de la Laguna is among the best in the Bay Area. Alameda Creek, in contrast to many nearby streams, has retained most of its native fish species, and DFG plants catchable trout in the Niles Canyon area from the end of April until Labor Day. DFG reports that Alameda Creek has the best stream fishery habitat and the most stream anglers in the East Bay.

Historically Alameda Creek has been a pretty and productive stream. A book entitled Picturesque California, edited by John Muir and published in 1894, describes the Niles Canyon area:

> "Beyond Haywards is Niles, another picturesque little town, in the very mouth of the charming Alameda Cañon, having the tillable land and valley spread out before it.

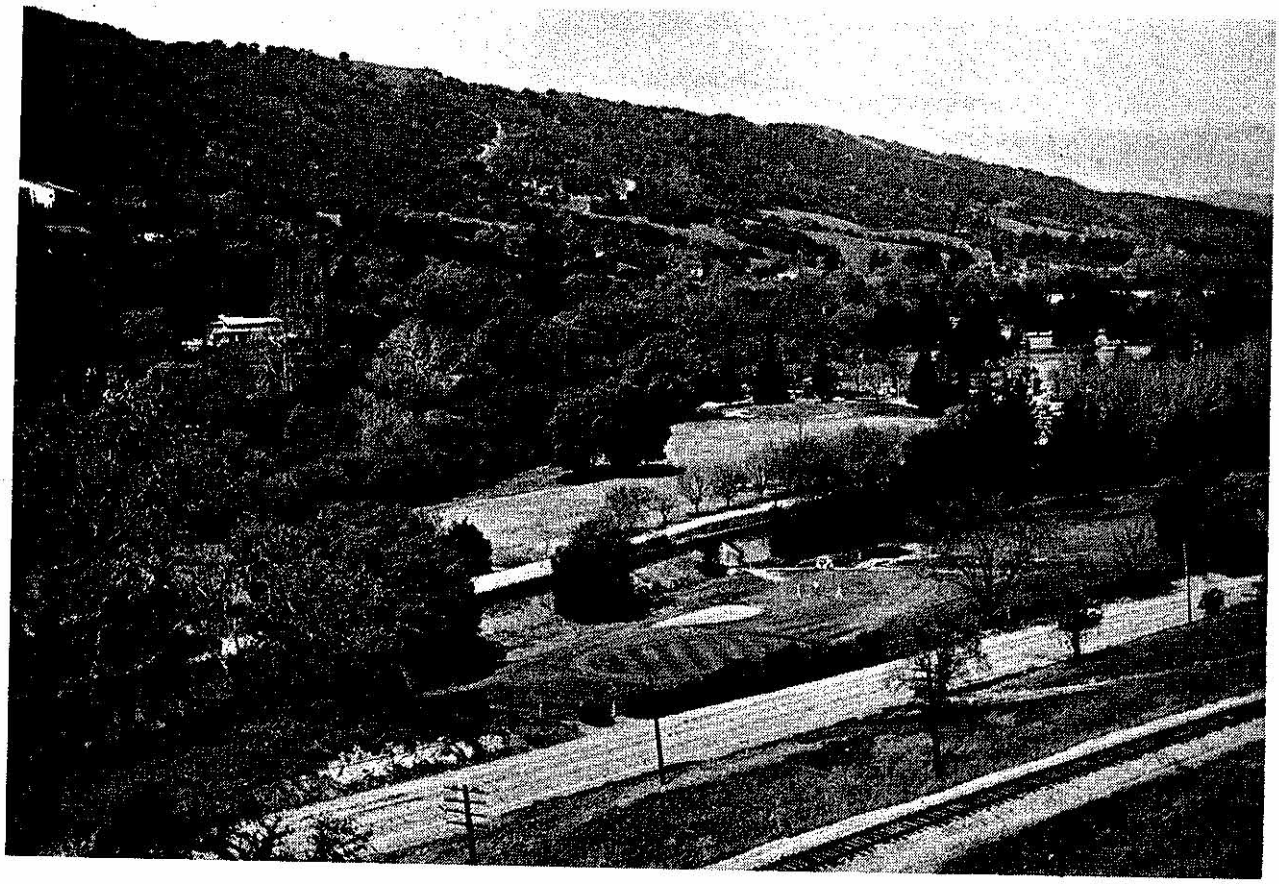
"The cañon--sometimes called Niles Cañon--pierces the foot-hills of the Coast Range, extending from Niles to Sunol, a distance of seven miles. It is christened after Alameda Creek, a sparkling stream which rises in the mountains and dances lightly along its rocky bed, singing softly to the hills and trees that line its course, cheerily greeting the little tributaries that join it at the mouths of deep ravines, now and then taking a wild plunge over a ledge of rocks only to recover its accustomed dignity the next moment, and at length to spread out, clear and placid, upon the breast of the valley.

"Alameda Cañon has long been a favorite resort for sportsmen. Its streams are stocked with trout, and abound in pike and perch. It is a favorite haunt for many sorts of wild fowl; while the hills which retreat from it on either side are the resort of larger game, including an occasional deer. When we remember that this rare bit of rural beauty and wildness is almost on the threshold of a populous city, our appreciation is quickened and heightened."

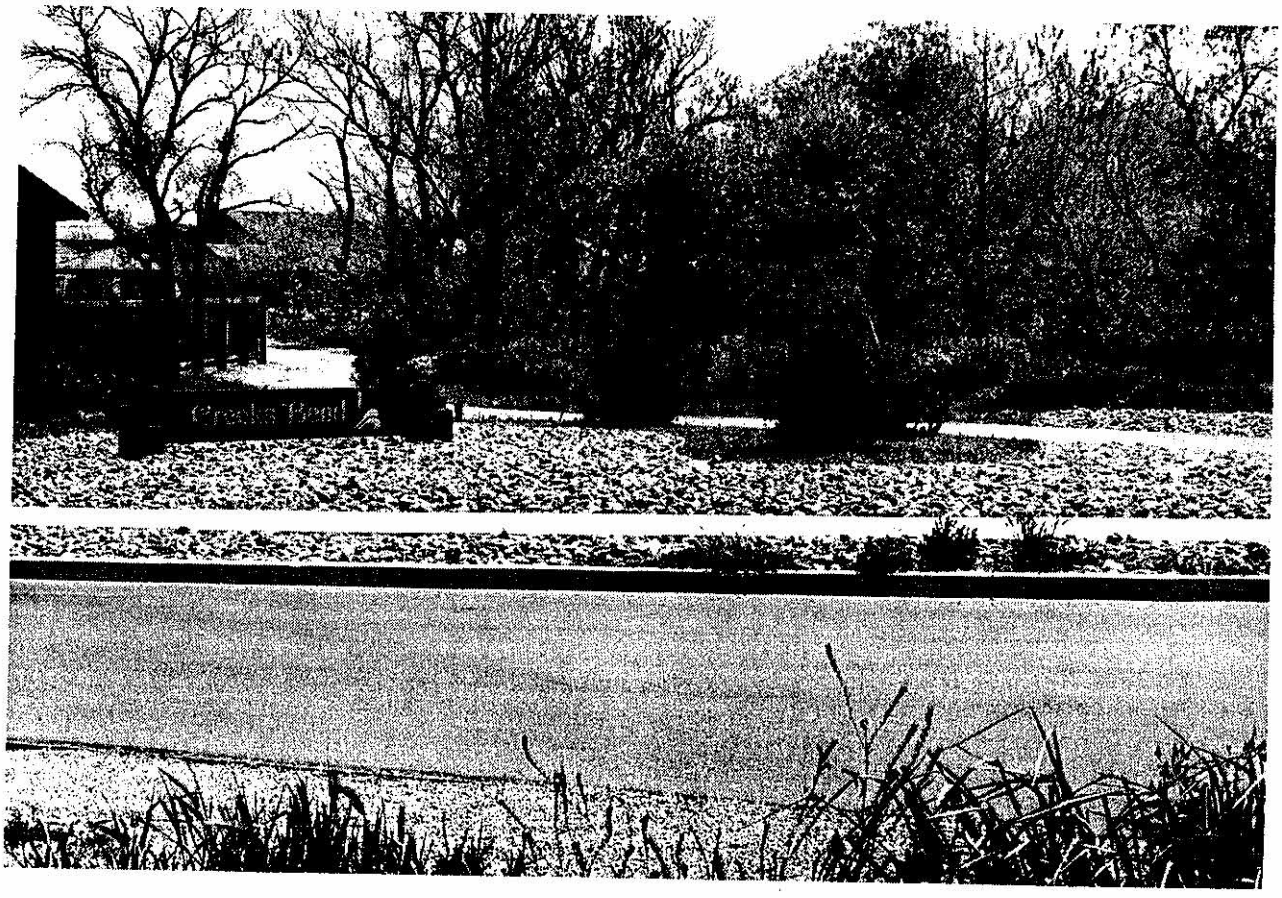
There has been much water development in the Alameda Creek watershed. Around the turn of the century, the City of San Francisco built a well field in western Pleasanton and creekbed filter galleries near Sunol, for export of water to San Francisco. In 1925 the City built Calaveras Dam and in 1964 San Antonio Reservoir to augment their water supply. The well field is no longer used, but the filter gallery and dams completely control the runoff of the Alameda Creek branch south of Sunol. San Francisco owns a sizable portion of the watershed, including much of Niles Canyon.

In 1962 the first section of the State Water Project South Bay Aqueduct began delivering water to the area. The State's Del Valle Dam and Reservoir, built for water supply, recreation, and flood control, was completed as part of the South Bay Aqueduct system in 1968. Water from these projects has provided summer flows in many reaches of Alameda Creek which would normally be dry. The summer flows have promoted the growth of riparian vegetation as shown in the following photographs.

Lush riparian vegetation along Alameda Creek tributaries provides excellent wildlife habitat from the mouth of Niles Canyon (above) past Sunol (below).

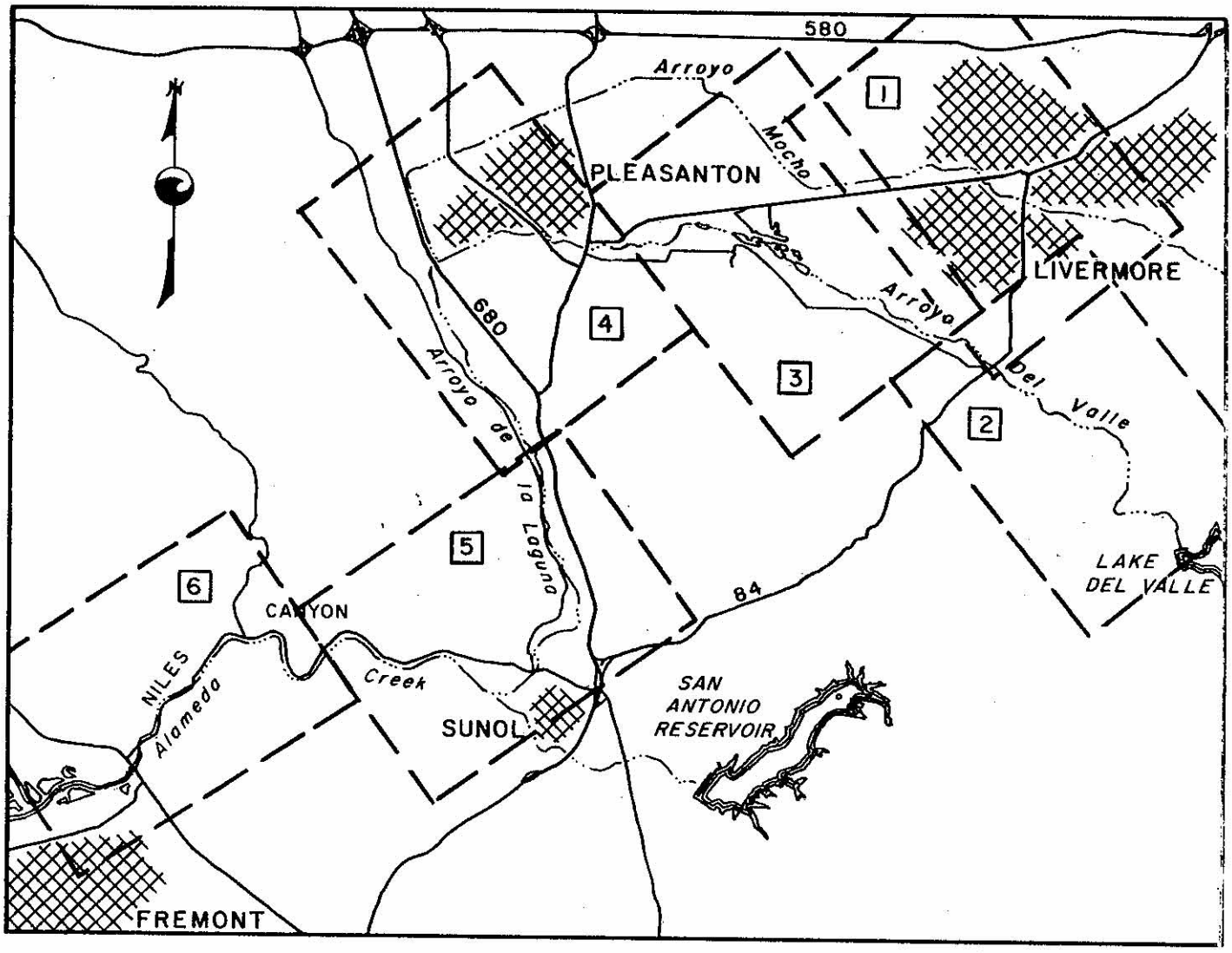


Views of the creek along Arroyo de la Laguna through Castlewood Golf Course (above) and Arroyo Del Valle through the Pleasanton urban area (below) to Lake Del Valle (next page).



ALAMEDA CREEK AREA MAP-AND-PHOTO ATLAS

The following is an atlas of the Alameda Creek watershed. It covers portions of Arroyos Del Valle, Mocho, de la Laguna, and Alameda Creek downstream of the South Bay Aqueduct. Stream reaches above the SBA were not included because there was no apparent way to keep them flowing during the summer recreation season. A northern tributary, Arroyo Las Positas, was investigated briefly but dropped because of its poor recreation potential and the low priority assigned it by local recreation interests. The atlas shows geographic features, area development, creekside property ownership, river miles, and stream gage station locations.



Location Map

LEGEND

~·~·~	Stream channel
– – – –	Property line
▲	Gaging station
(5)	Stream mileage
P	Private land under 10 acres in size
RW	Right-of-way for railroads, roads, and land belonging to SFWD

SFWD	San Fransico City and County Water District
SBA	South Bay Aqueduct
SPRR	Southern Pacific Railroad
WPRR	Western Pacific Railroad

Photography Description: Flown by U-2 aircraft March 4, 1974, flight No. 74-030

Map Description: USGS 7½ minute series quadrangle map

Scale: Both Altas Maps and Photos are 1:24,000

PLATE IA

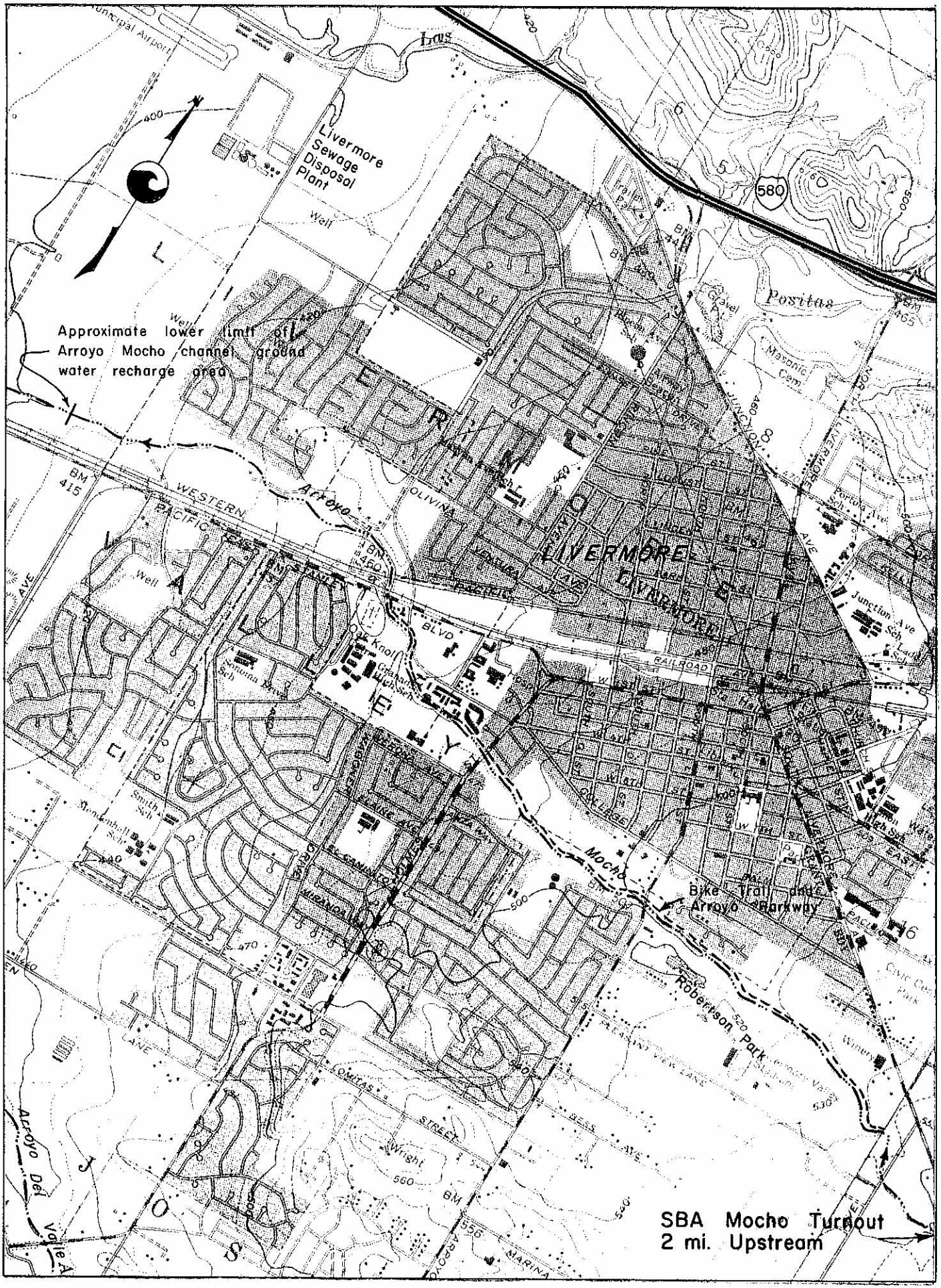

Livermore Sewage Disposal Plant
Approximate lower limit of Arroyo Mocho channel ground water recharge area
LIVERMORE
Arroyo Mocho
Bike Trail and Parkway
Robertson Park
Arroyo Del Valle
SBA Mocho Turnout
2 mi. Upstream

PLATE 2A

PLATE 2B

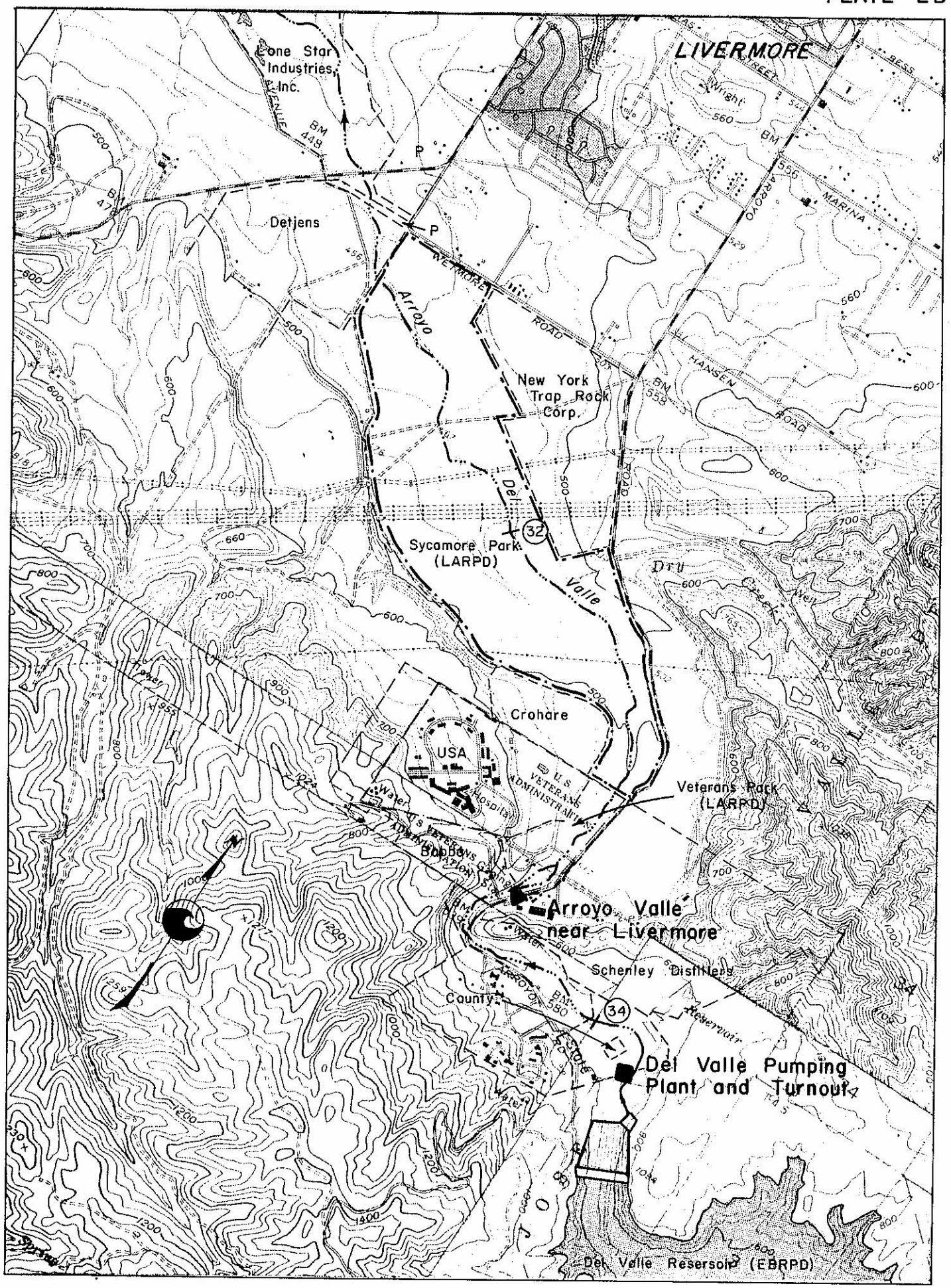
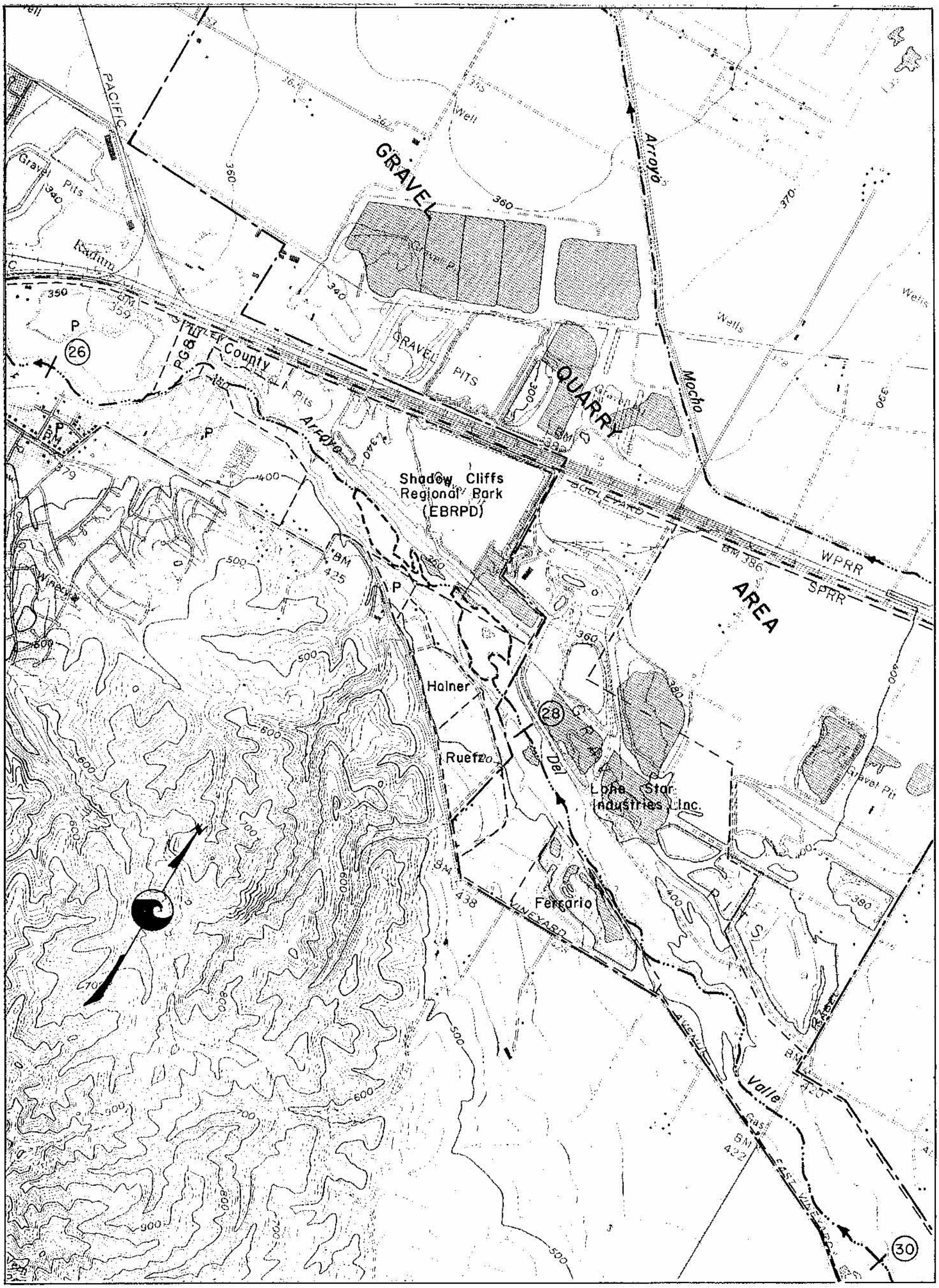

LIVERMORE
Cone Star Industries, Inc.
Detjens
Arroyo
New York Trap Rock Corp.
Sycamore Park (LARPD)
Del Valle
Dry Creek
Crohare
USA
Veterans Park (LARPD)
Arroyo Valle near Livermore
Schenley Distillers
Del Valle Pumping Plant and Turnout
Del Valle Reservoir (EBRPD)

PLATE 3A


GRAVEL
QUARRY
AREA
Shadow Cliffs
Regional Park
(EBRPD)
Arroyo
Mocho
Arroyo
Del
Valle
Holner
Ruefz
Ferrario
Lone Star
Industries Inc.
GRAVEL PITS
Gravel Pits
WPRR
SPRR
PACIFIC
PG&E
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VINEYARD
26
28
30

PLATE 4A

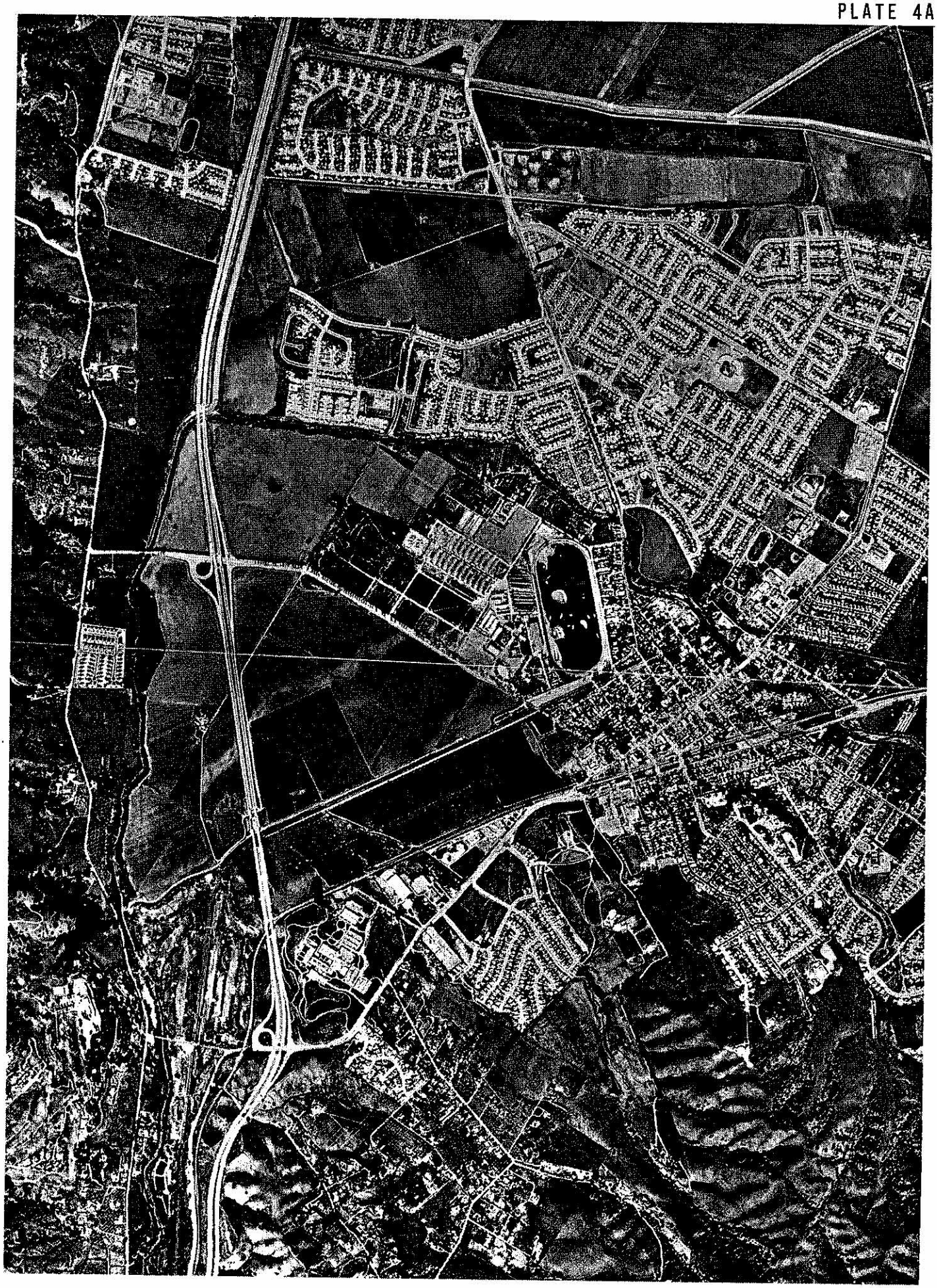


PLATE 4B

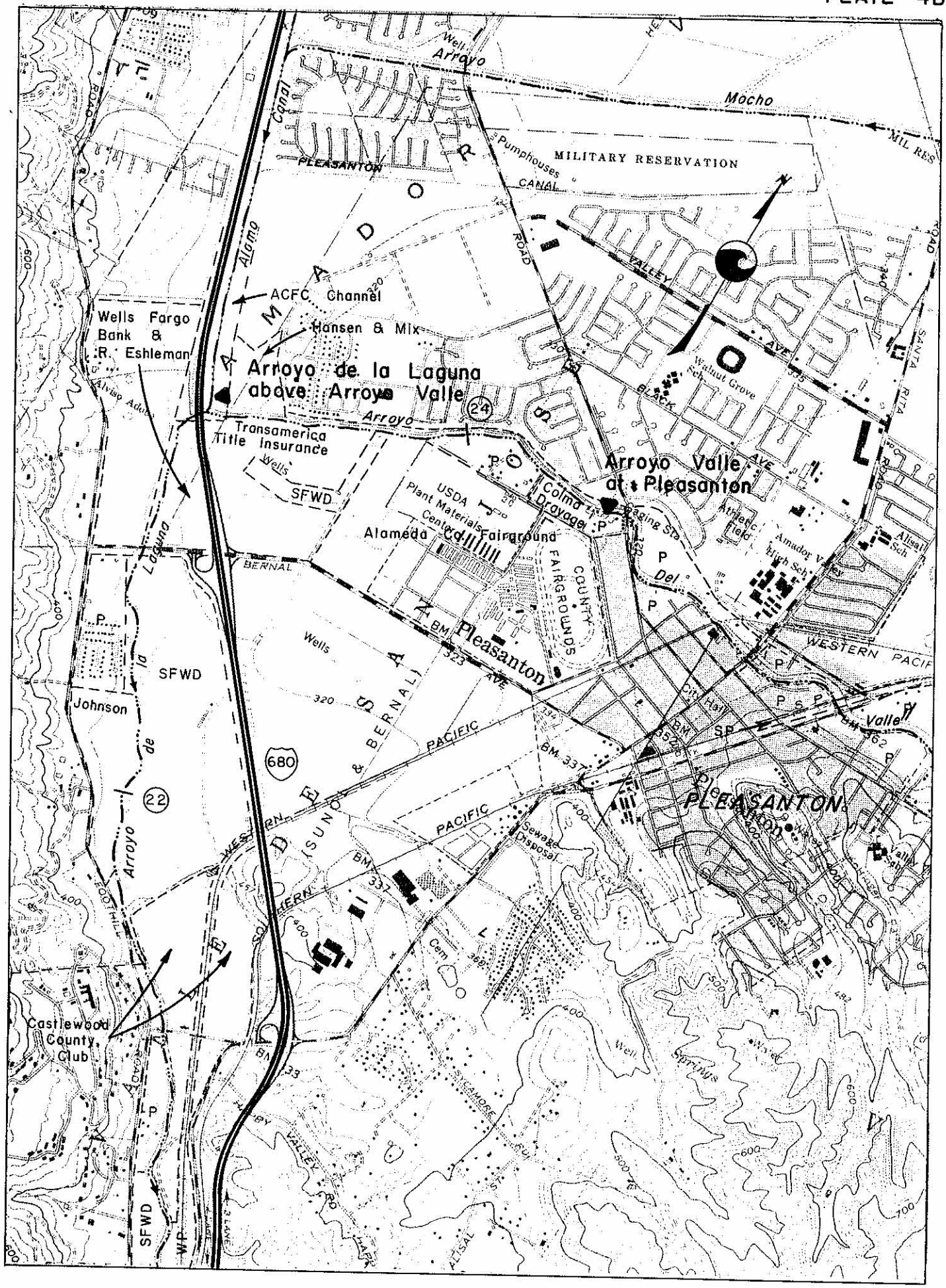
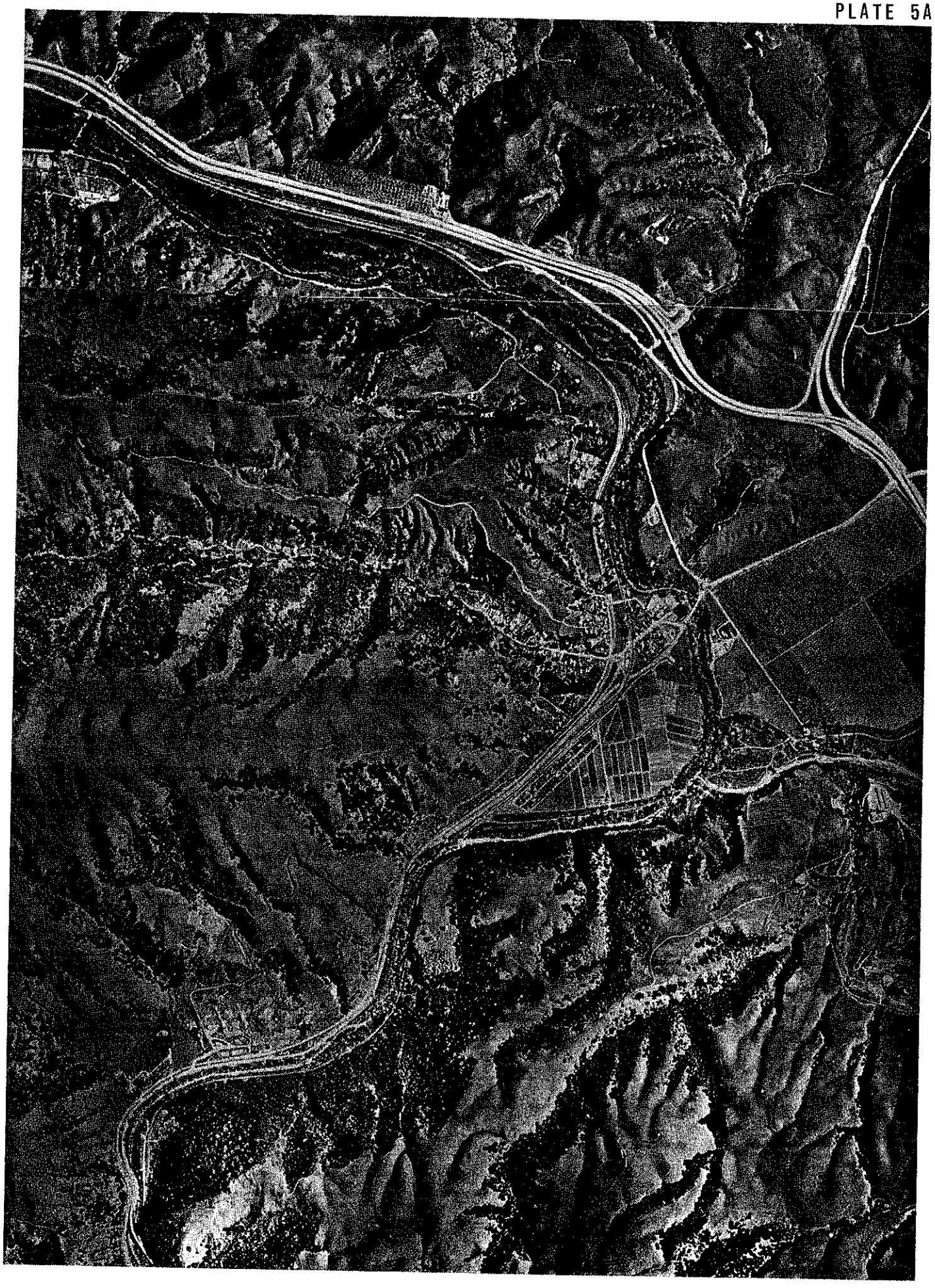

Arroyo de la Laguna above Arroyo Valle
Wells Fargo Bank & R. Eshleman
ACFC Channel
Hansen & Mix
Transamerica Title Insurance
Wells
SFWD
Arroyo Valle at Pleasanton
Alameda Co. Fairground
USDA Plant Materials Center
Colma Drayage
Pleasanton
Johnson
Castlewood County Club
MILITARY RESERVATION
PLEASANTON
Mocho
Arroyo
Canal
Alamo
Laguna
BERNAL
PACIFIC
SOUTHERN
VALLEY
ROAD
AVE
680
22
24

PLATE 5A



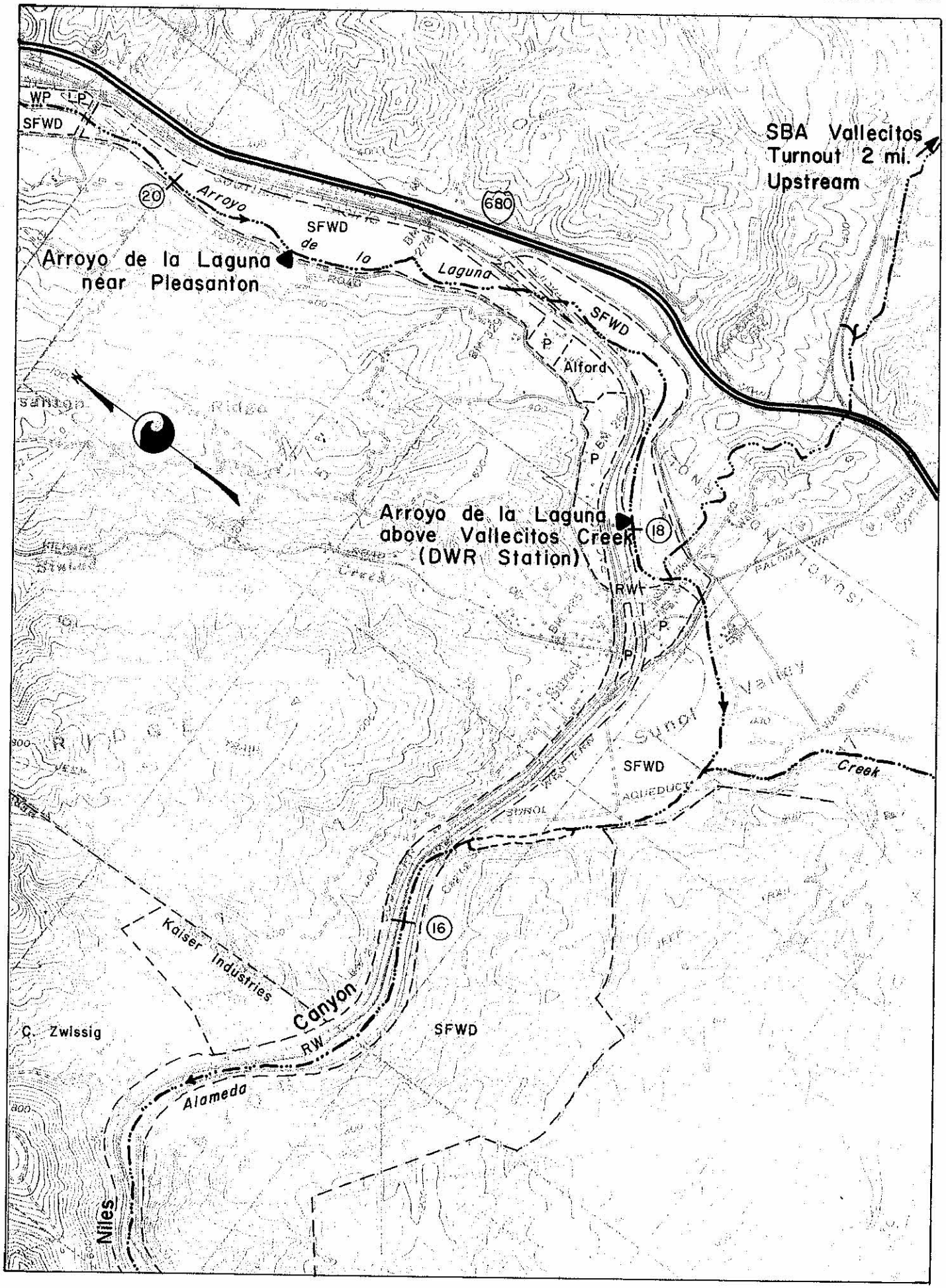

WP
LP
SFWD
SBA Vallecitos
Turnout 2 mi.
Upstream
20
Arroyo
SFWD
de
la
Laguna
680
Arroyo de la Laguna
near Pleasanton
SFWD
Alford
Arroyo de la Laguna
above Vallecitos Creek
(DWR Station)
18
RW
SFWD
Creek
AQUEDUCT
16
Kaiser Industries
Canyon
C. Zwissig
RW
SFWD
Alameda
Niles

PLATE 6A

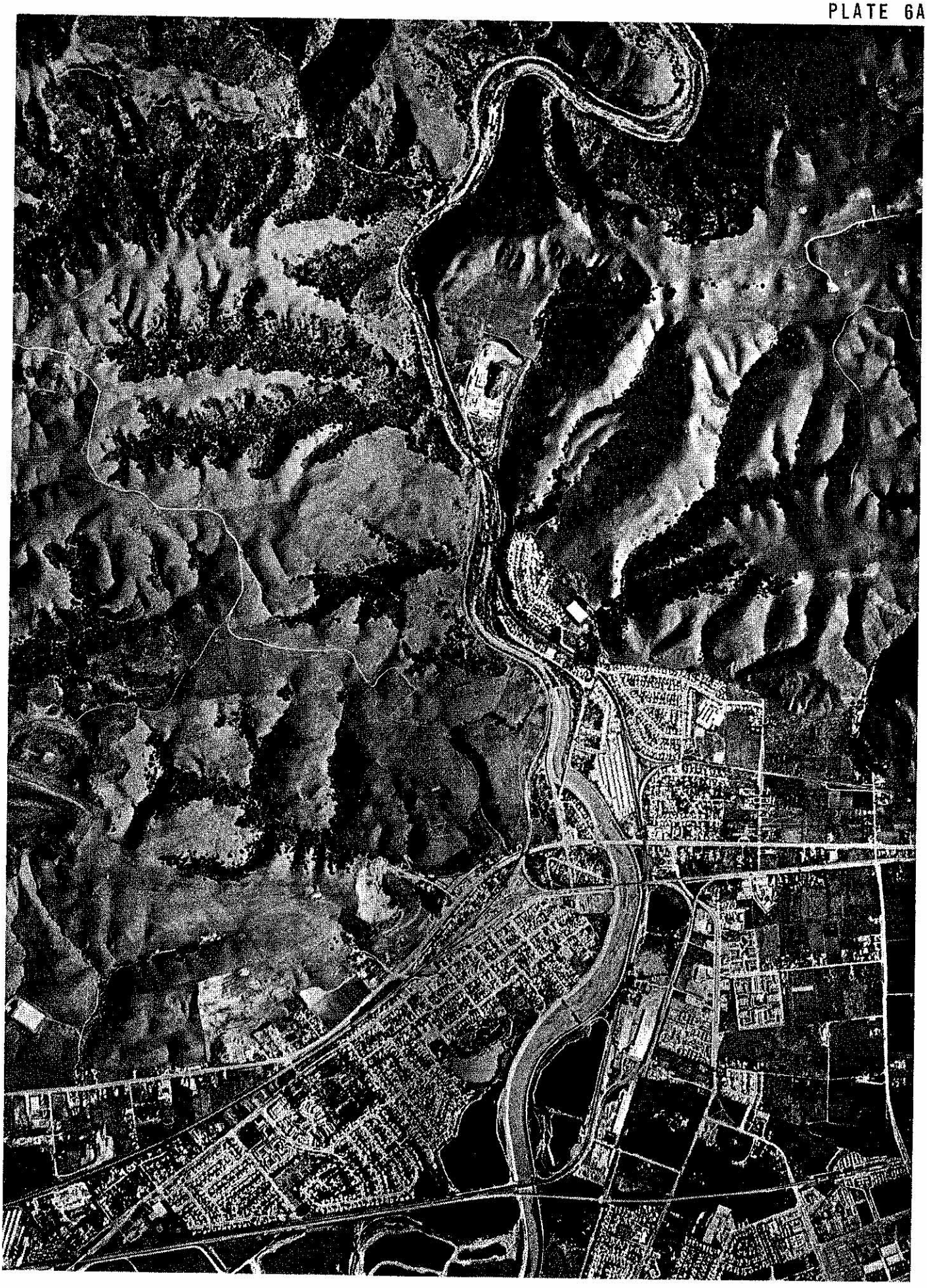
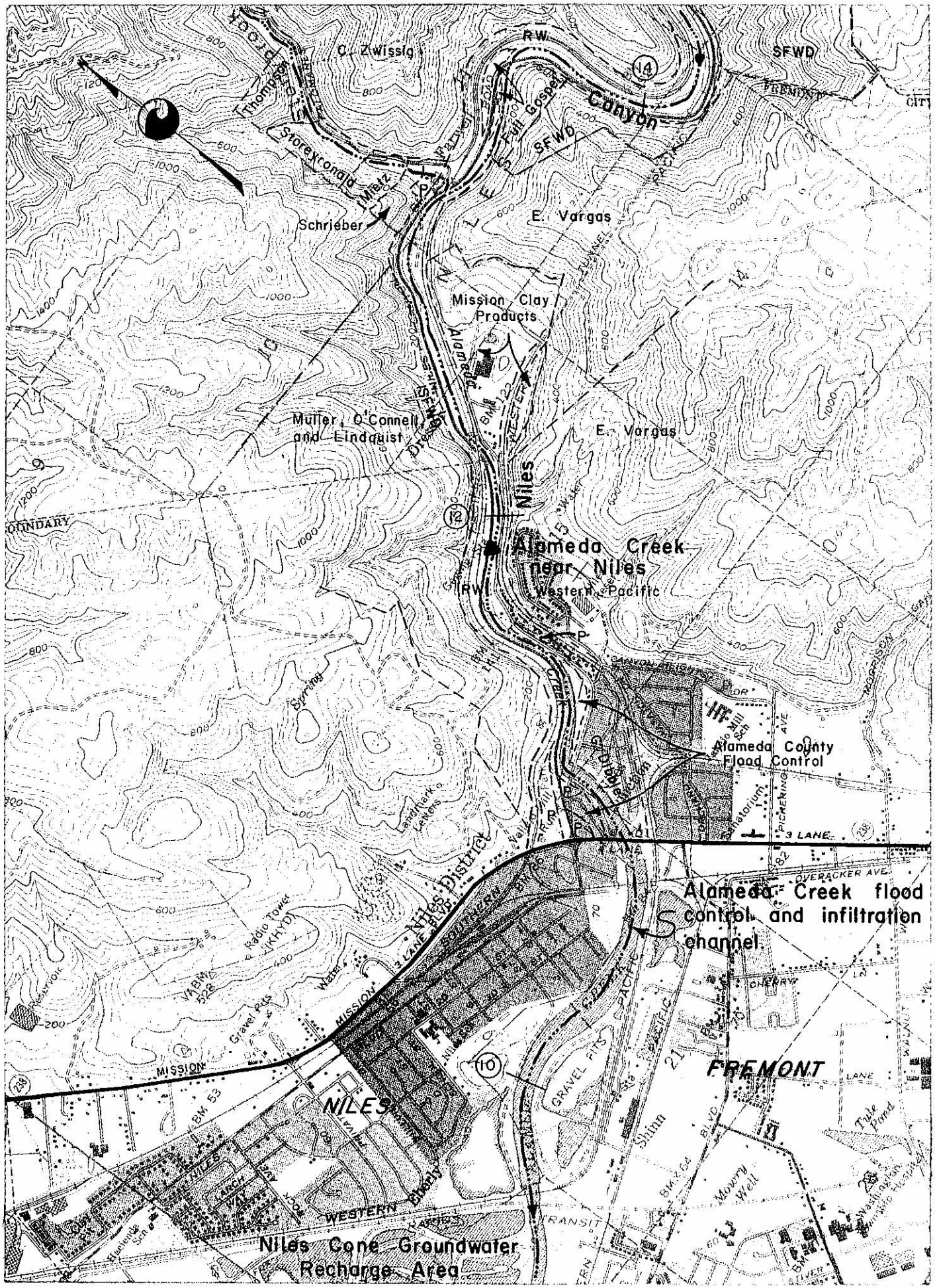


PLATE 6B


C. Zwissig
Thompson
Storey
Condit
Melz
Schrieber
Full Gospel
Canyon
SFWD
E. Vargas
Mission Clay Products
Alameda
Muller, O'Connell and Lindquist
Niles
Alameda Creek near Niles
Western Pacific
Alameda County Flood Control
Alameda Creek flood control and infiltration channel
Niles District
Radio Tower (KHYD)
MISSION
NILES
FREMONT
GRAVEL PITS
Mowry Well
Niles Cone Groundwater Recharge Area

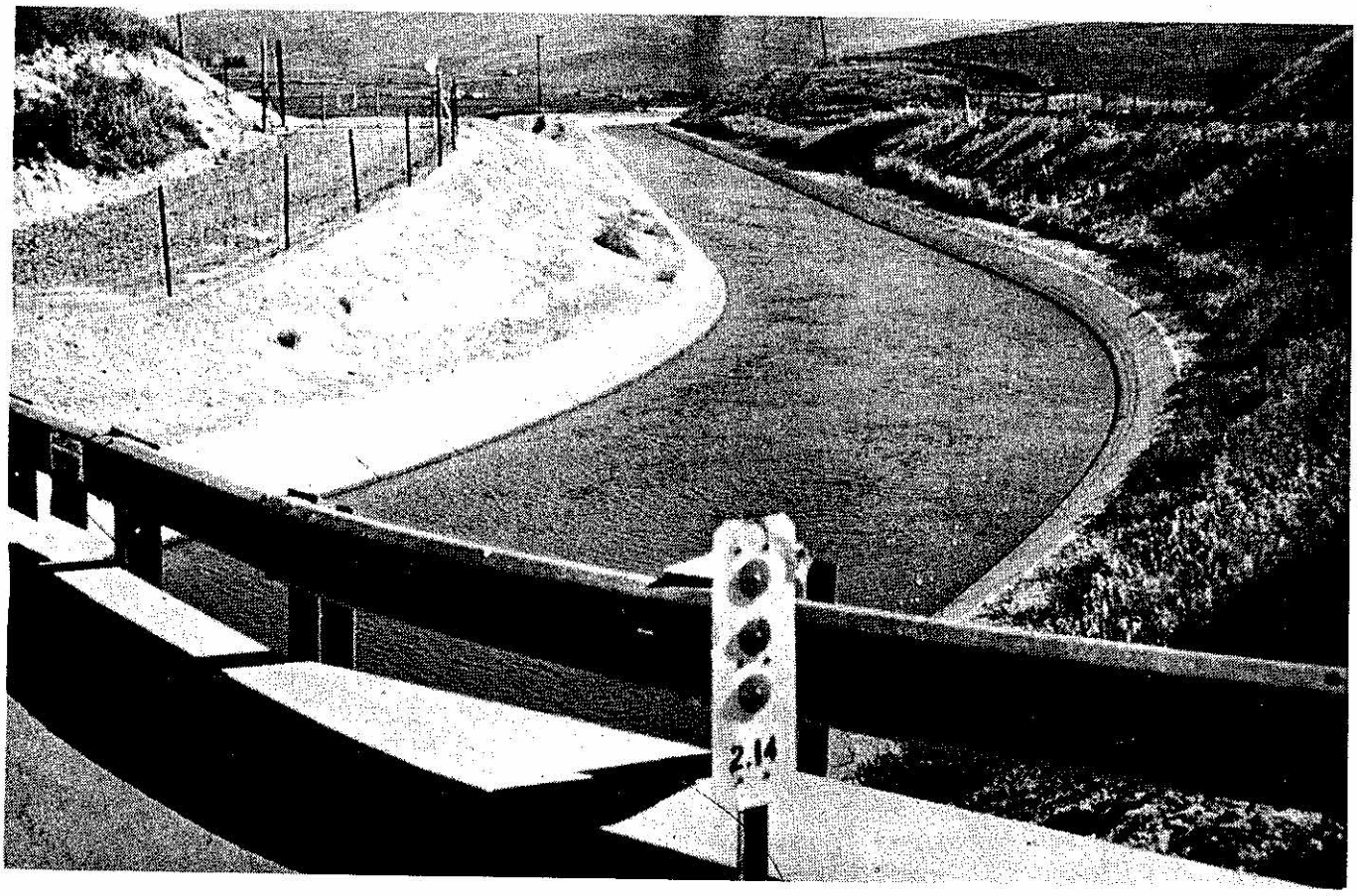
CHAPTER IV. FLOW AUGMENTATION PLAN

Investigation of the Alameda Creek watershed has resulted in a plan for summer flows in a 27-km (17-mi) reach of Arroyo Del Valle and Arroyo de la Laguna to be increased substantially during most years. This would result in higher recreational use and greater fish and wildlife habitat in a creek reach through three parks, past the City of Livermore, and through Pleasanton. The increased summer flow could be accomplished largely by switching ACWD's major water source from the Vallecitos to the Del Valle turnout.

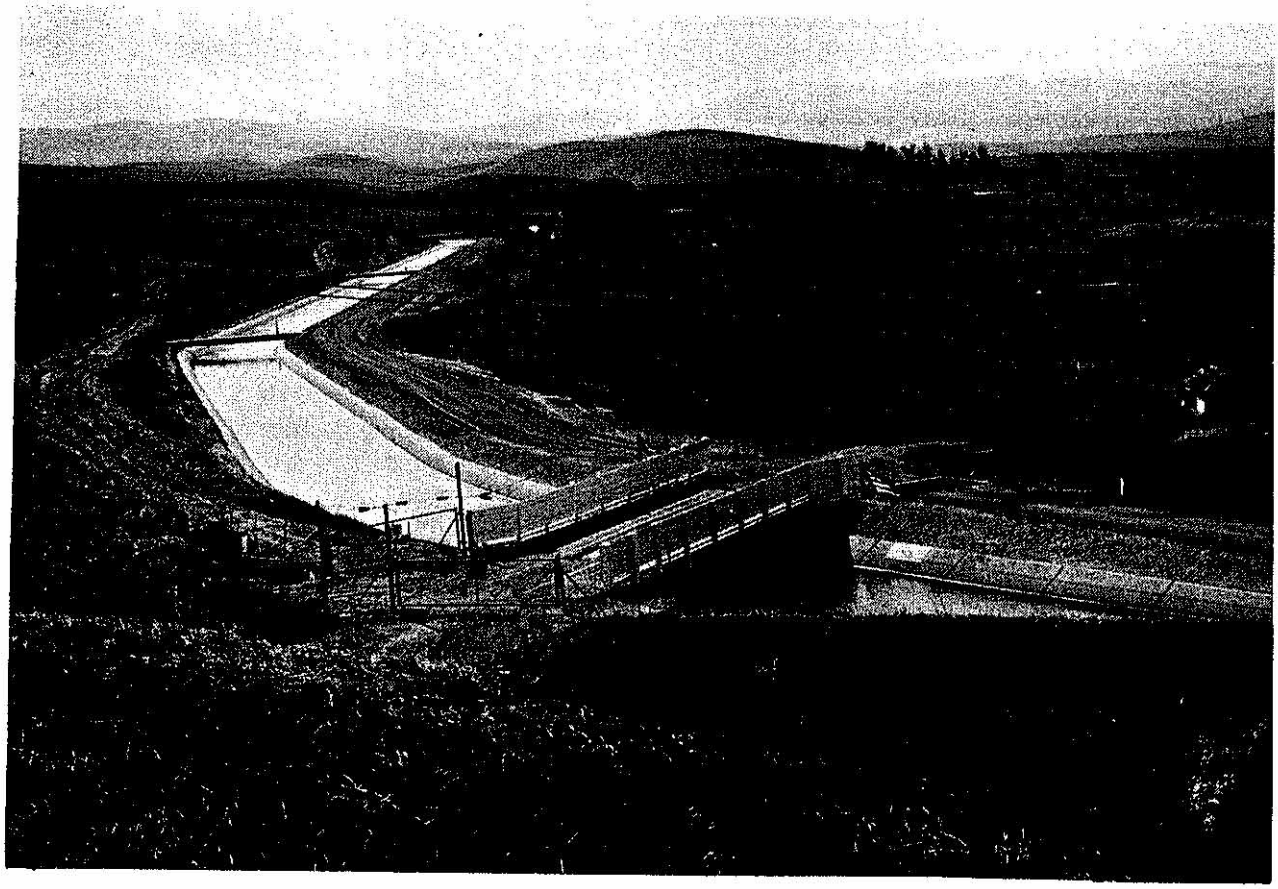
Before construction of the South Bay Aqueduct, Alameda Creek tributaries flowed only for short periods after rains. After the beginning of SBA operation in 1963, ACWD and Zone 7 started releasing periodic surface flows of 0.28 to 1.42 m^3/s (10 to 50 ft^3/s) for recharge of their depleted ground water basins. These flows enhanced Arroyo Mocho through Livermore, Arroyo Del Valle between Del Valle Dam and Pleasanton, and Alameda Creek between Sunol and Niles. However, stretches of the creek between Pleasanton and Sunol were still dry part of the summer, and flows were not reliable for recreation and fishing. Flows were periodically stopped, killing fish. Annual plots of Alameda Creek hydrology from 1973 through 1980 (see Appendix A) and the photograph on page 35 graphically illustrate these problems.

Since completion of the SBA, the upper water district, Zone 7, has taken most of its entitlement surface water releases at the Del Valle turnout near Del Valle Dam, and the lower water district, ACWD, has taken most of its entitlement releases at the Vallecitos turnout near Sunol (Figure 2, page 38). Entitlement water is the contracted amount which each district has a right to receive from the SBA each year. Releases of entitlement water are generally made at the turnout closest to the district's recharge areas in order to minimize transportation losses. Also, better control of releases is maintained by using the closest turnout. This is important to the more complicated ACWD recharge system (Figure 4, page 45), where fast control of flows is necessary to keep the diversion dams and infiltration ponds full for maximum recharge, but not overflowing, which would result in irrecoverable water losses. Quick start-up and shutdown of surface supplies are not as critical to Zone 7, because their recharge area is the natural stream channels (no diversion dams), and surface water bypassing their recharge area flows to the ACWD recharge area and is paid for by the lower district.

In addition to entitlement water, both Zone 7 and ACWD share equally 18 500 dam^3 (15,000 ac-ft) of water conservation storage in Del Valle Reservoir. When this or a greater amount of natural runoff occurs in the winter above Del Valle Dam, both districts release 9 250 dam^3 (7,500 ac-ft) in spring and summer at the Del Valle turnout. ACWD releases Lake Del Valle water from the Del Valle turnout because an additional transportation cost is charged if it is released at the Vallecitos turnout. However, ACWD can only release water at the Del Valle turnout when Zone 7 is also releasing there. This is because considerable streamflow is lost to percolation between the Del Valle turnout and Pleasanton. This would be a loss to ACWD and would increase the groundwater storage of Zone 7.



The South Bay Aqueduct provides Delta water to Alameda Creek tributaries for recharge of local ground water systems. It also supplies water for irrigation, municipal, and industrial needs.



Fish kills result when creek flows are periodically terminated.

During wet years, when the districts have the maximum **amount** of storage in Del Valle Reservoir, there are adequate summer fish and recreation flows if both districts release this water simultaneously. The summer of 1980, when 1.13 m^3/s (40 ft^3/s) was released continuously from the Del Valle turnout, is an example of this type of operation. However, in drier years, when less than adequate local runoff is stored in Del Valle Reservoir to sustain summer flows down Arroyo Del Valle, it would be necessary to augment these flows with entitlement water to maintain live flows from Del Valle turnout to Sunol. Zone 7 has released entitlement flows down that stream in the past to raise their ground water levels. The district had planned to continue these releases through 1983, at which time the cost of entitlement water will increase significantly due to power rate increases. However, their groundwater recharge program has been accelerated during the last two years and the water table has risen rapidly. Higher ground water levels are interfering with gravel extraction work at the extensive quarry areas in the center of the Livermore-Amador Valley. Zone 7 is reevaluating their recharge program and may decide to reduce recharge flows before 1983. If Zone 7 summer recharge flows are reduced to the point where no water passes Pleasanton, it would not be practical for the ACWD to release their recharge flows at the Del Valle turnout. Thus, the live stream portion of the Urban Streams Program would have to be postponed until such time as the basin is drawn down and requires recharge flows.

In light of California's need for additional water supplies, the Livermore-Amador Valley groundwater basin is a valuable resource which would likely be operated (drawn down and refilled) in future years either to supply

the local area directly or to augment the yield of the State Water Project during drought years. Therefore, even if live flows in Arroyo Del Valle and Arroyo de la Laguna cannot be continuously maintained after the early 1980's, it is still probable that they can be reestablished at some later date and that the instream flow objectives of the urban stream study can be accomplished at that time.

From 1972 through 1979, ACWD released 80 percent of its ground water recharge flows from the Vallecitos turnout and 20 percent from the Del Valle turnout. Recreation and fishing would benefit if more is released from the Del Valle turnout. Discussions with the ACWD about this have been positive. District representatives appear willing to change release points for the benefit of creek flows as long as the district will not incur greater water losses by doing so. During these discussions, the Department has agreen in principle to release enough SWP recreation water at the Del Valle turnout to make up for any increase in transportation losses to ACWD. These losses would occur mainly in Arroyo de la Laguna between the Highway 680 crossing and Sunol.

The reduced flows in Arroyo de la Laguna caused by recent out-of-basin export of treated sewage discharge has affected the hydrologic balance in Arroyo de la Laguna above Sunol. Therefore, the long-term irrecoverable water losses to ACWD are not precisely known but can be determined through continued hydrologic monitoring. During the summer of 1980, DWR operated a stream gage station on Arroyo de la Laguna at Sunol to collect hydrologic data for water loss determination. This station should be operated for at least three summers when Arroyo de la Laguna is carrying flows above 0.28 m^3/s (10 ft^3/s) before a firm estimate of losses is made.

The last three pages of Appendix A show past summer water losses and gains in Arroyo de la Laguna above Sunol. During the summers of 1977 through 1979, this creek reach gained more water than it lost, and the maximum water loss was around 0.085 m^3/s (3 ft^3/s). Therefore, the loss in this reach for purposes of this report is estimated to be in the range of 0.028 to 0.85 m^3/s (1 to 3 ft^3/s). ACWD will also have to be compensated for losses resulting from decreased operational flexibility caused by an increase in turnout response time from around 8 hours at the Vallecitos turnout to nearly 30 hours at the Del Valle turnout. One possible approach to this problem is for the State to release additional recreation water equal to any losses suffered by ACWD from increased turnout response time. Such losses are expected to occur infrequently, and the average annual loss would not exceed about 120 dam^3 (100 ac-ft).

There is presently adequate uncontracted capacity in the SBA for recreation releases from 0.028 to 0.85 m^3/s (1 to 3 ft^3/s) for 6 months (April through September), as shown in Table 2. There is no indication that this capacity will be needed to supply increasing demands. This is due to the area's slow growth rate, the large and increasing SBA water entitlement in comparison to actual use, and increasing emphasis on water conservation and reclamation. Water released from the SBA solely for recreational purposes would be paid for by nonreimbursable project funds or special use funds (general funds) and not by the water contractors. Also, a proportionate use-capacity charge for repayment of SBA capital costs is assignable to this recreation water. The total unit cost in 1980 would be around \$44 per dam^3 (\$54 per ac-ft). If 0.085 m^3/s (3 ft^3/s) of recreation water were released

for 6 months, the total cost would be approximately $59,000. This is the annual cost of the estimated maximum State-contributed release necessary to offset ACWD irrecoverable losses if they change their major diversion point from the Vallecitos to the Del Valle turnout. Further hydrologic investigation may reveal that the long-term irrecoverable losses are less than this preliminary estimate.

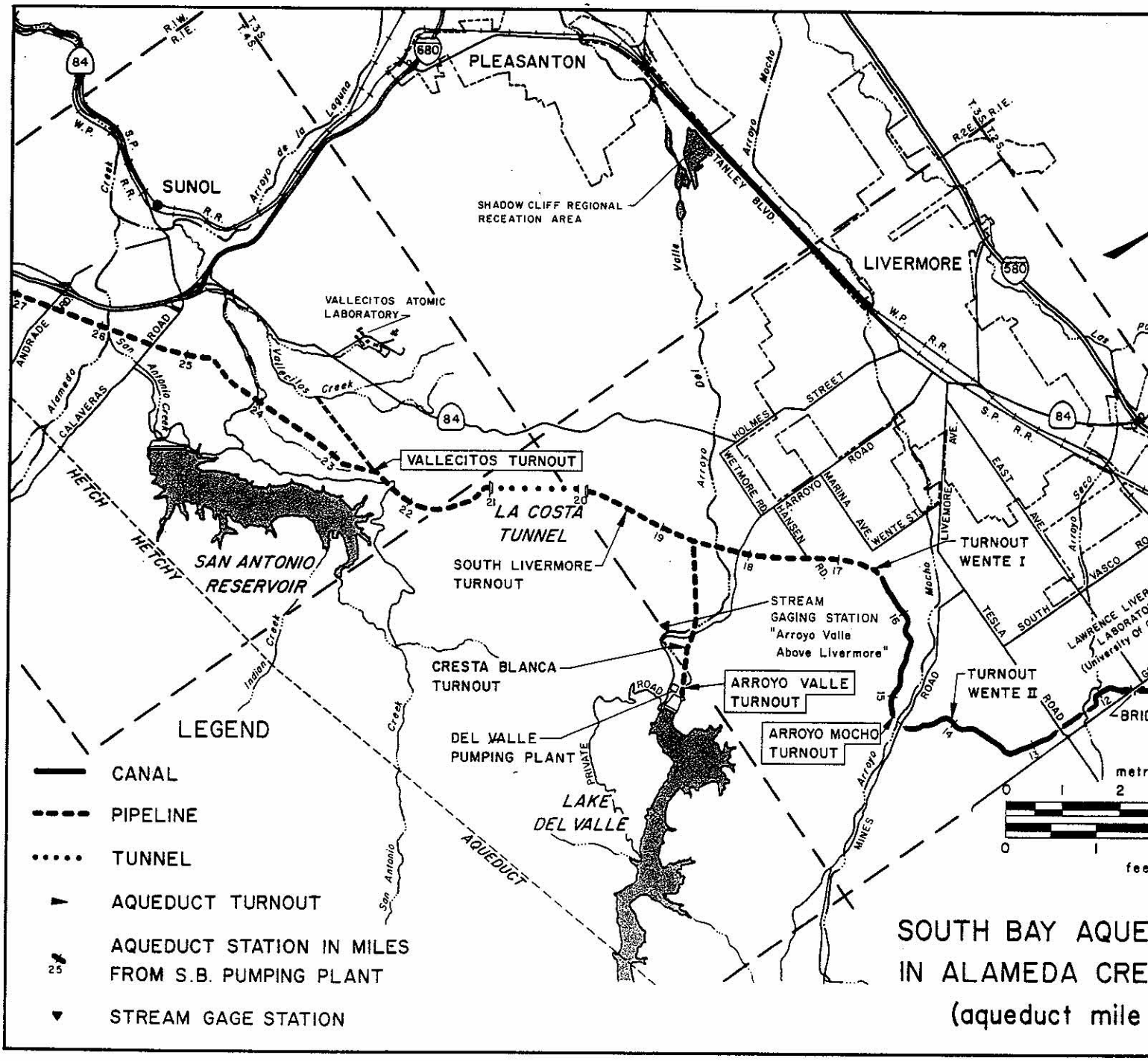
TABLE 2

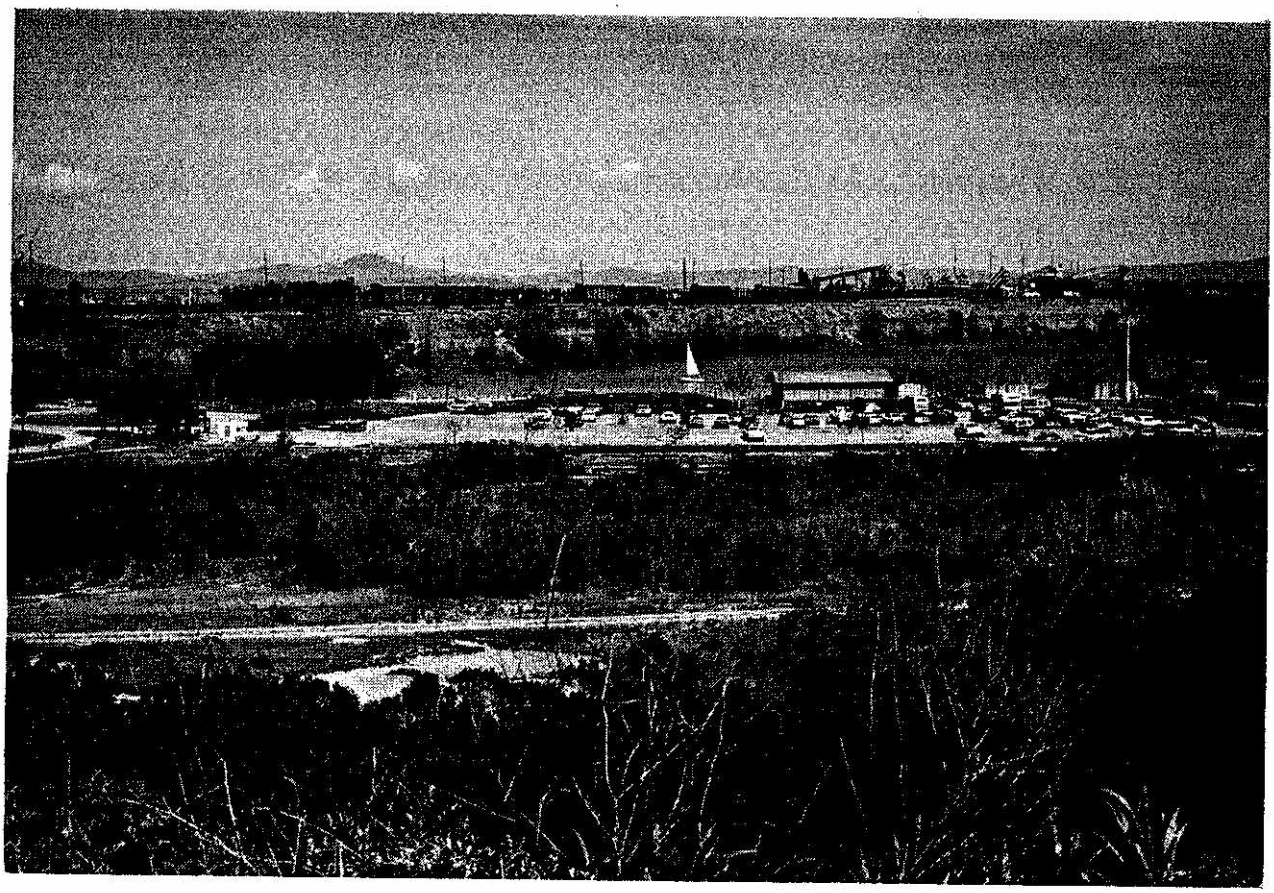
SBA CAPACITY FOR FUTURE CONTRACTS

Reach	Description	Uncontracted Capacity			
		dam^3	(ac-ft)	m^3/s	(ft^3/s)
1	Bethany Reservoir through Altamont turnout	2 911	(2,360)	0.35	(12.3)
2	Altamont turnout through Patterson Reservoir	2 911	(2,360)	0.35	(12.3)
4	Patterson Reservoir to Del Valle Junction	2 911	(2,360)	0.35	(12.3)
6	Del Valle Junction through South Livermore turnout	1 234	(1,000)	1.40	(49.5)
7	South Livermore turnout through Vallecitos turnout	1 234	(1,000)	1.26	(44.4)
8	Vallecitos turnout through Alameda-Bayside turnout	3 083	(2,500)	1.56	(55.0)
9	Alameda-Bayside turnout through Santa Clara Terminal Facilities	0	(0)	0	(0)

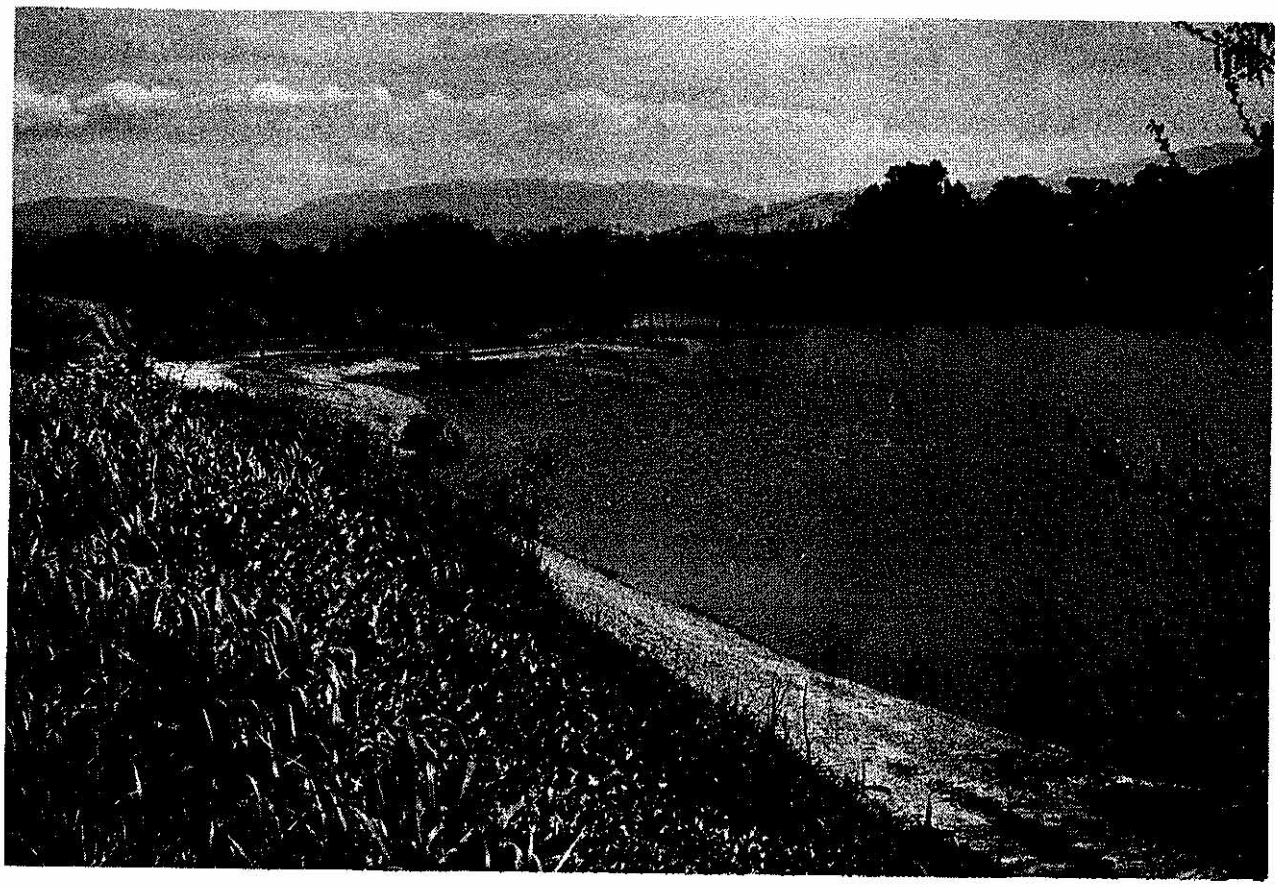
During dry and critically dry years, the release of recreation water to stream channels would have to be reduced by at least the same percentage that water contractor supplies were reduced. Also, during low water supply years the local water districts may choose to draw heavily from ground water storage and temporarily reduce or curtail recharge operations to conserve water. Therefore, stream channel recreation releases may not be made every year.

The ACWD builds temporary earthfill diversion dams each May and removes them in September. The district must reduce flows at the Niles gage to approximately 0.28 m^3/s (10 ft^3/s) during this one- to two-week construction period, so recreation flows would also have to be reduced.


PLEASANTON
SUNOL
LIVERMORE
SHADOW CLIFF REGIONAL RECEATION AREA
VALLECITOS ATOMIC LABORATORY
VALLECITOS TURNOUT
LA COSTA TUNNEL
SOUTH LIVERMORE TURNOUT
SAN ANTONIO RESERVOIR
HETCH HETCHY
STREAM GAGING STATION "Arroyo Valle Above Livermore"
CRESTA BLANCA TURNOUT
ARROYO VALLE TURNOUT
ARROYO MOCHO TURNOUT
TURNOUT WENTE I
TURNOUT WENTE II
DEL VALLE PUMPING PLANT
LAKE DEL VALLE
AQUEDUCT
LEGEND
CANAL
PIPELINE
TUNNEL
AQUEDUCT TURNOUT
AQUEDUCT STATION IN MILES FROM S.B. PUMPING PLANT
STREAM GAGE STATION
SOUTH BAY AQUE
IN ALAMEDA CRE
(aqueduct mile



Shadow Cliffs Regional Park (above), operated by the East Bay Regional Park District, is a major recreational attraction in the Amador-Livermore Valley. Arroyo Del Valle flows through the southern half of the park and fills two moderate-size extraction pits (below).



CHAPTER V. FEASIBILITY

This chapter discusses the feasibility of a long-term urban stream program in Alameda Creek.

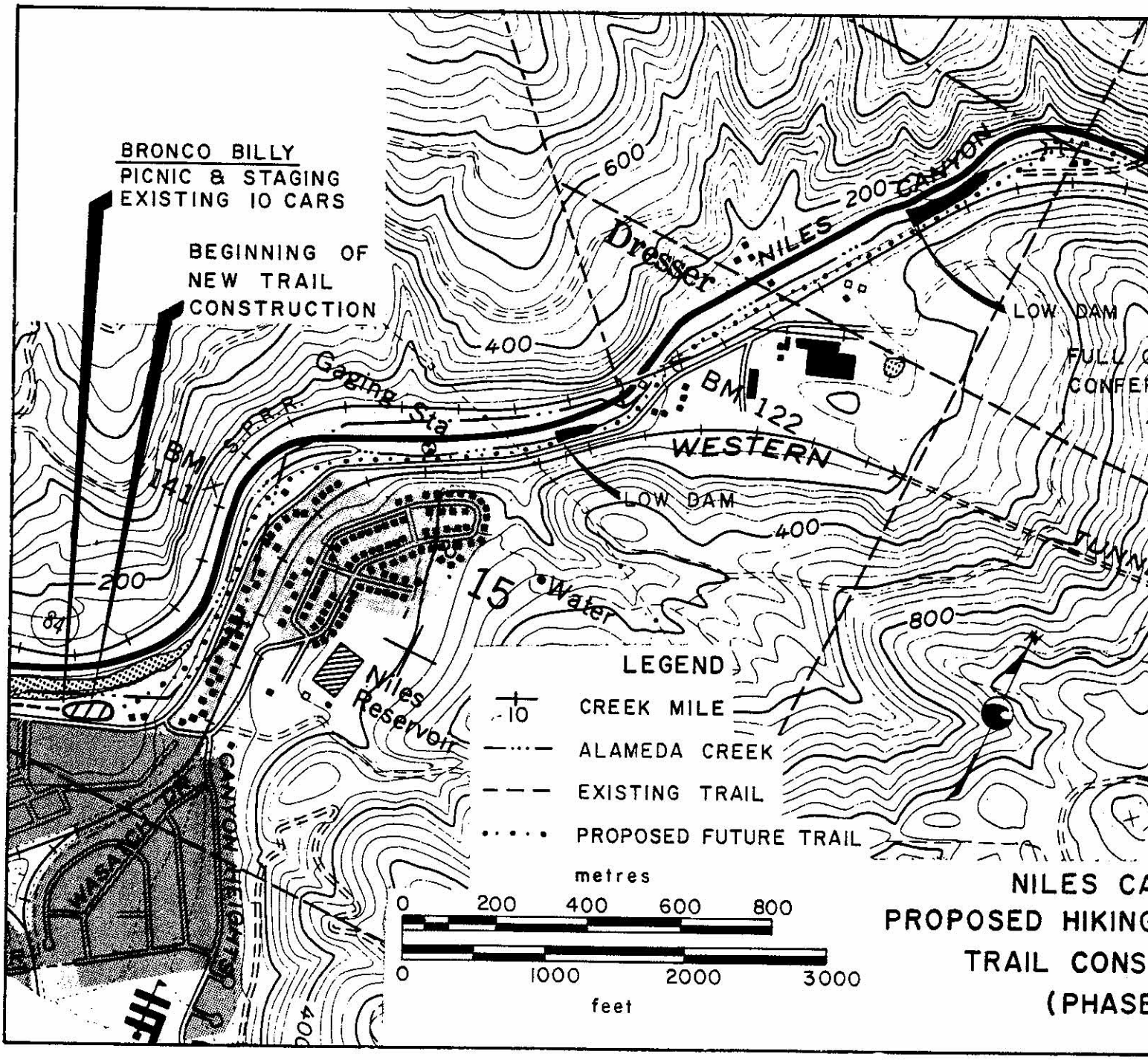
Local Participation

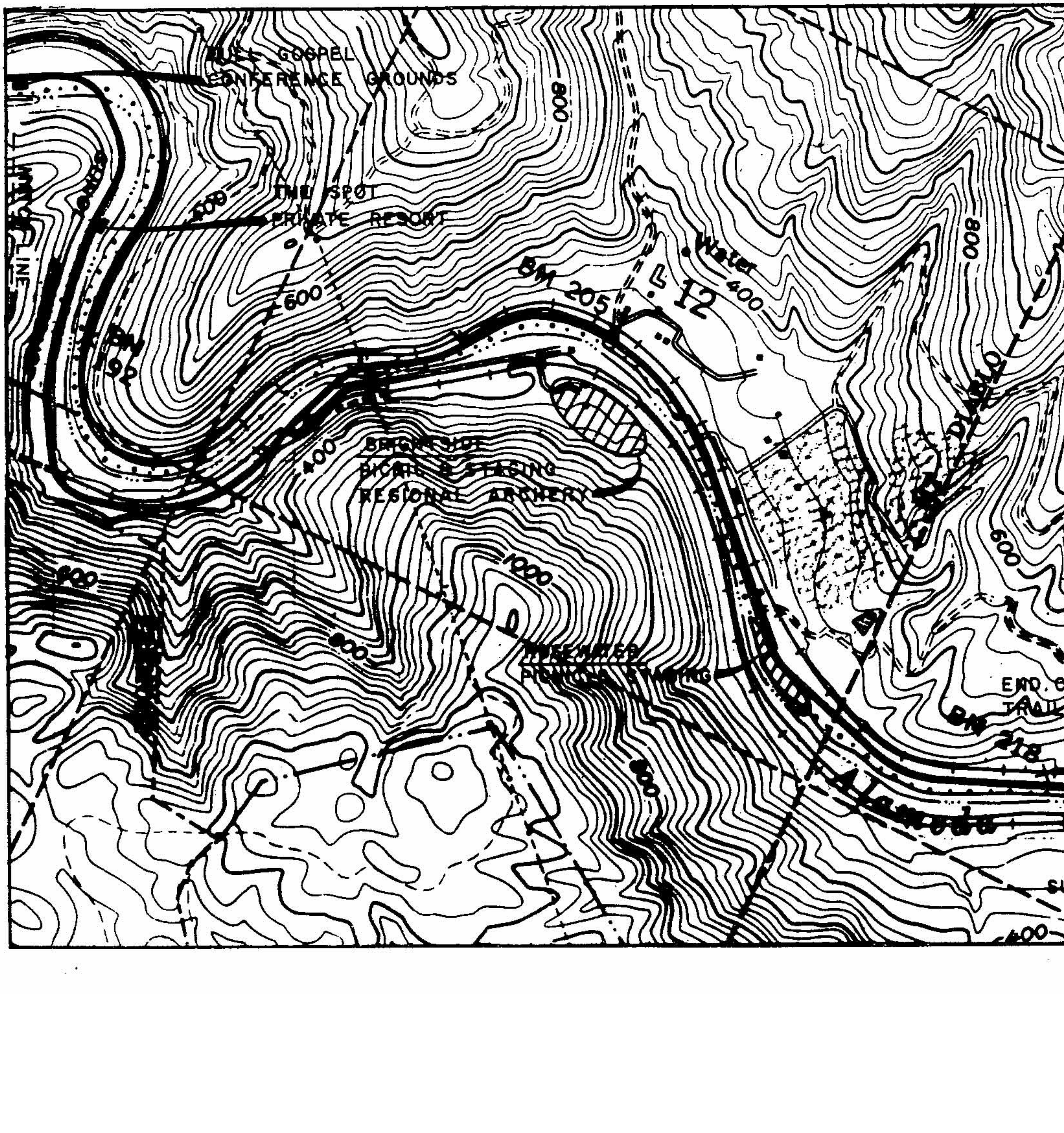
In the early phase of this study, local organizations were contacted to determine their interest. Response was positive. Much thought and planning had already been done to preserve the arroyos in their natural condition and make them available for recreation. The following is a list of organizations contacted and their views on the program. Addresses are given in Appendix B.

- The East Bay Regional Park District (EBRPD) is a limited-purpose government agency formed in 1934 to develop and operate facilities for public recreation in an area covering most of Alameda and Contra Costa Counties. It administers about 16 600 ha (41,000 acres) of parklands and had 9 million visitors in 1975. Major facilities operated by the district in the Alameda Creek watershed are: (1) the 1 376-ha (3,400-acre) Del Valle Regional Park around Del Valle Reservoir, 12.9 km (8-mi) south of Livermore; (2) Shadow Cliffs Regional Recreation Area, a 101-ha (249-acre) water recreation area around an abandoned gravel quarry between Pleasanton and Livermore; (3) Sunol Regional Wilderness, south of Sunol, has 1 416 ha (3,500 acres) for picnicking, camping, and hiking; and (4) Alameda Creek Quarries Recreation Area near Fremont has 121 ha (300 acres) of undeveloped water recreation area presently in land-bank status.

  The district's Regional Trails Plan, shown in Figures 3 and 7, proposes development of hiking and riding trails along Alameda Creek and its tributaries from Del Valle Dam to San Francisco Bay. The district is enthusiastic about the urban stream study because it would enhance recreation. It would have an advisory role in any long-term implementation of the program.

- The Livermore Area Recreation and Park District (LARPD) was established in 1947 to provide park facilities and recreation programs in a 63 455-ha (245-mi^2) area in eastern Alameda County. Livermore is the only urban area within this district. Many of the district's existing recreation areas are located along Arroyos Mocho and Del Valle. The district operates 29-ha (72-acre) Robertson Park in Livermore along Arroyo Mocho, a bike trail along Arroyo Mocho, 13-ha (32-acre) Veterans Park along Arroyo Del Valle below Del Valle Dam, and 147-ha (364-acre) Sycamore Park just below Veterans Park along Arroyo Del Valle. In 1974, the district published a master plan which recommended acquisition of the Arroyo Mocho and Arroyo Del Valle creekside lands for preservation as nature areas. Limited development in these creekside natural corridors would include minimum picnicking and camping areas, hiking and riding trails. A public survey, conducted as part of the master plan,


BRONCO BILLY
PICNIC & STAGING
EXISTING 10 CARS
BEGINNING OF
NEW TRAIL
CONSTRUCTION
600
200
400
Dresser
NILES
CANYON
LOW DAM
Gaging Sta
BM 122
WESTERN
LOW DAM
BM 144
SPRR
200
84
15
Water
800
Niles
Reservoir
CANYON HEIGHTS
LEGEND
10 CREEK MILE
ALAMEDA CREEK
EXISTING TRAIL
PROPOSED FUTURE TRAIL
metres
0 200 400 600 800
0 1000 2000 3000
feet
NILES CA
PROPOSED HIKING
TRAIL CONS
(PHASE


GOSPEL
CONFERENCE GROUNDS
THE SPOT
PRIVATE RESORT
800
600
400
1000
Water
BM 205
L 12
BM 218
Alameda

showed that local residents wanted only minimum recreation development of the arroyos. They seemed to feel that young people would benefit from having access to undeveloped natural areas close to the urban center. The LARPD strongly supports the urban stream study and will be involved in future decisions.

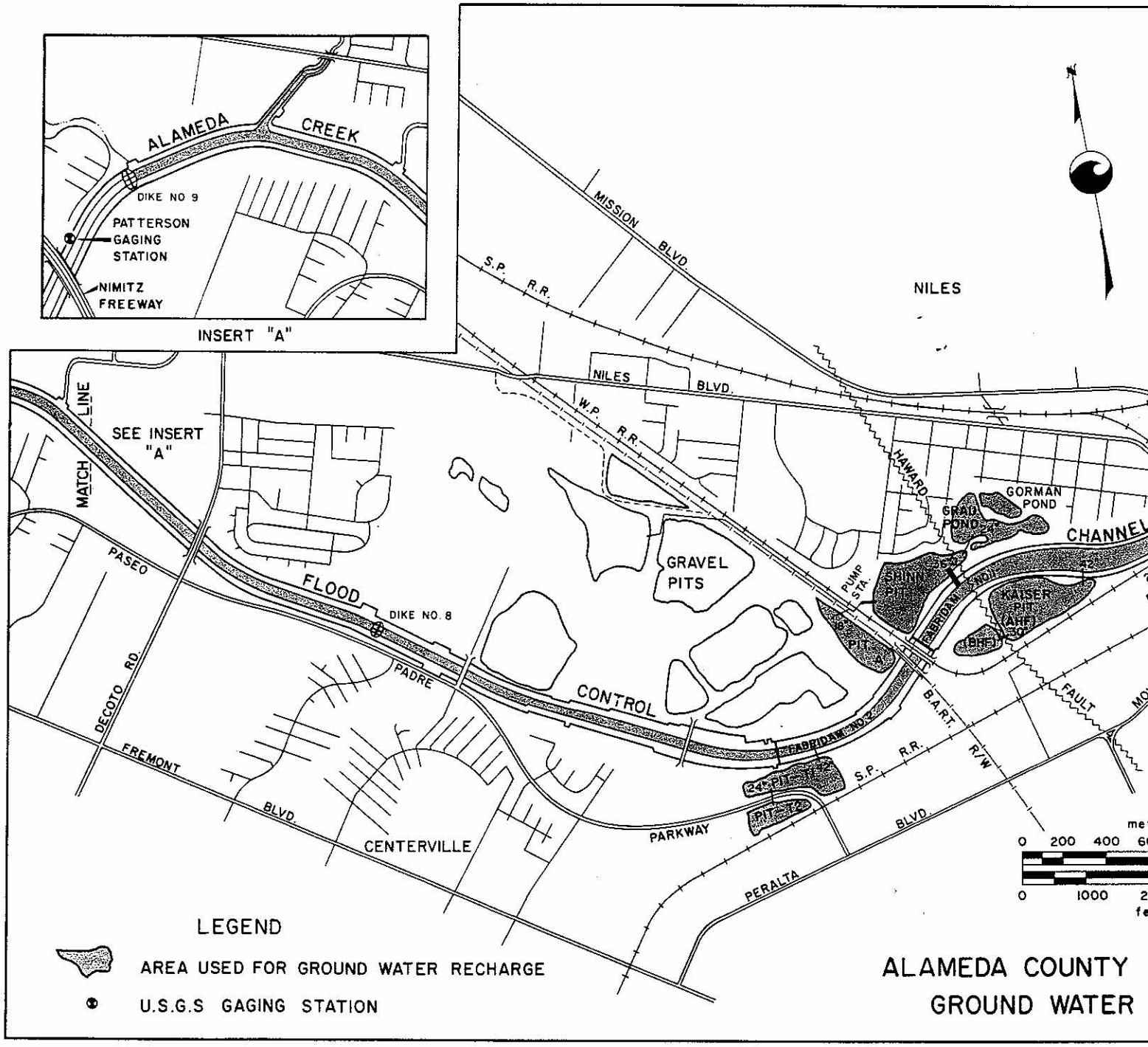
- The Arroyo Study Committee, composed of representatives from the City of Livermore, LARPD, the Livermore School District, and the two affected water districts, was very active in working to preserve the Livermore area arroyos in their natural condition at the beginning of the Urban Streams Program. This committee succeeded in preventing flood control channelization of the natural drainages and in securing over 95 percent of the riparian habitat to public ownership. Committee members were excited about the possibility of stream enhancement through additional flow releases from the South Bay Aqueduct. They volunteered assistance; however, during the last couple of years this committee has been inactive.

- Alameda County Flood Control and Water Conservation District, Zone 7, is the major water supplier in the Livermore-Amador Valley. This public agency is one of the two water contractors in the Alameda Creek watershed which purchases water from the State Water Project through the South Bay Aqueduct. Zone 7 supplies water directly from the South Bay Aqueduct to municipal, industrial, and agricultural customers and is responsible for operation of the extensive ground water system. Zone 7 releases water from the SBA into Arroyo Mocho about 3.22 km (2 mi) above Livermore and releases water into Arroyo Del Valle at Del Valle Dam for the purpose of recharging the ground water system. This released water flows for several kilometres and percolates into the ground water system where it is stored for later use. Ground water is pumped by agricultural users, private water suppliers, and individuals, but its greatest value is for protection against drought when other water sources are diminished.

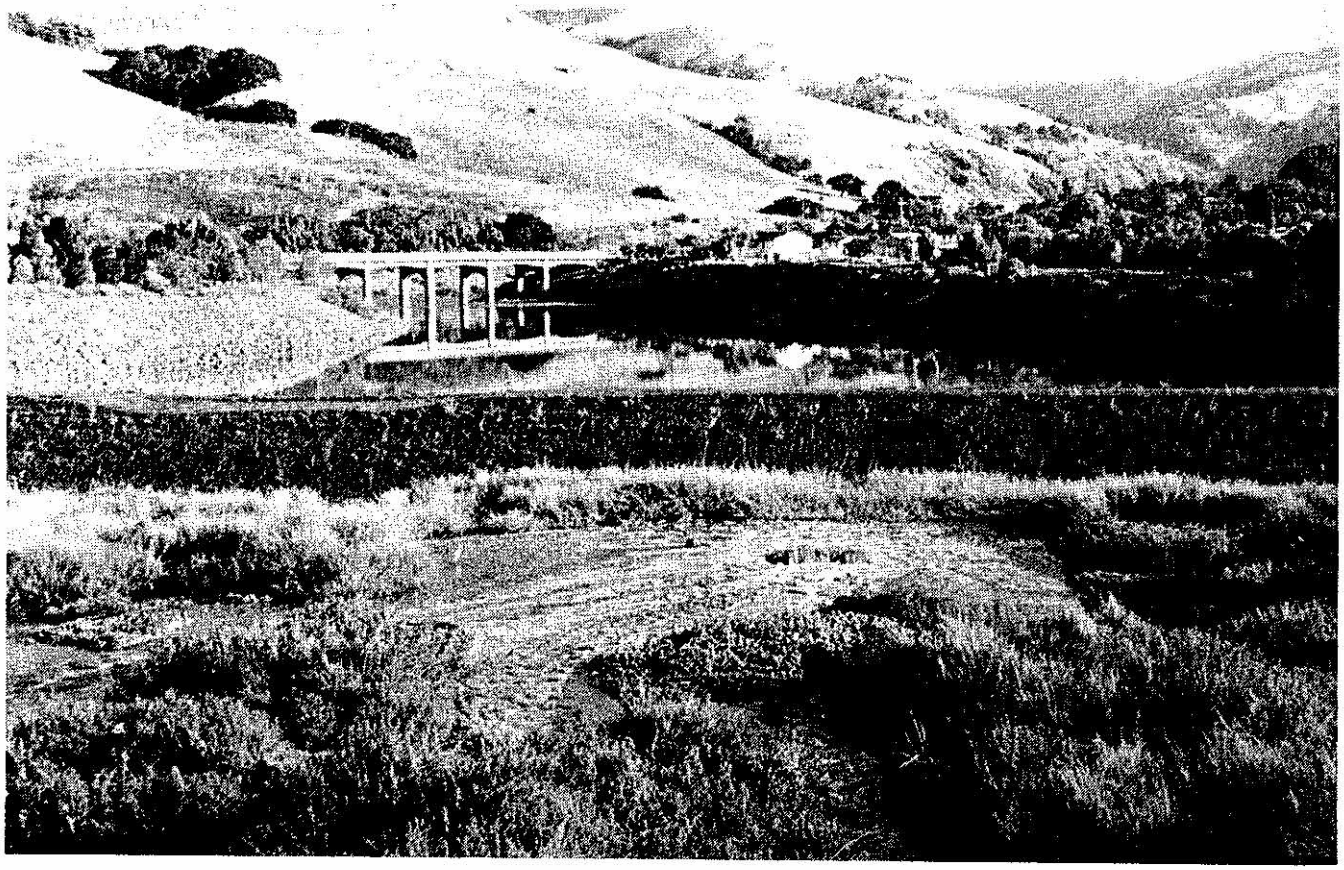
  During most of the last decade, the ground water recharge program has generally been intermittent, but during the last two years it has become more continuous. These continuous flows are expected to last at least through 1983, at which time the cost of water from the South Bay Aqueduct will increase significantly due to increased power costs.

  Although Zone 7 is primarily interested in water supply matters, they have cooperated with our studies and have shown a willingness to accommodate the needs of the program as much as possible, while still fulfilling their water supply responsibilities.

- Alameda County Water District is located at the mouth of the watershed, immediately below Niles Canyon, and is responsible for supplying water to the Fremont-Newark-Union City area. Water supplies are derived from a combination of natural surface flow, ground water, and imports from the SWP and the City of San Francisco Aqueduct. A great deal of water from the South Bay Aqueduct is imported for recharge of the Niles Cone Ground Water Basin underlying the district. The Alameda County Water District has a history of involvement in water-oriented recreational development. They have worked cooperatively with the EBRPD to acquire abandoned gravel quarries in the Niles area for a combination of ground water recharge and recreational purposes (Figure 4).


ALAMEDA CREEK
DIKE NO 9
PATTERSON GAGING STATION
NIMITZ FREEWAY
INSERT "A"
MISSION BLVD
S.P. R.R.
NILES
NILES BLVD.
W.P. R.R.
HAYWARD
GORMAN POND
GRAD. POND
CHANNEL
MATCH LINE
SEE INSERT "A"
PASEO
FLOOD
DIKE NO. 8
GRAVEL PITS
PUMP STA.
SPINNEY PIT
FABRIDAM NO. 1
KAISER PIT (AHF)
PIT A
DECOTO RD.
PADRE
CONTROL
FABRIDAM NO. 2
B.A.R.T. R/W
FAULT
FREMONT BLVD.
24" PIPE
PIT 2
S.P. R.R.
PARKWAY
CENTERVILLE
PERALTA BLVD.
0 200 400
0 1000
LEGEND
AREA USED FOR GROUND WATER RECHARGE
U.S.G.S GAGING STATION
ALAMEDA COUNTY
GROUND WATER

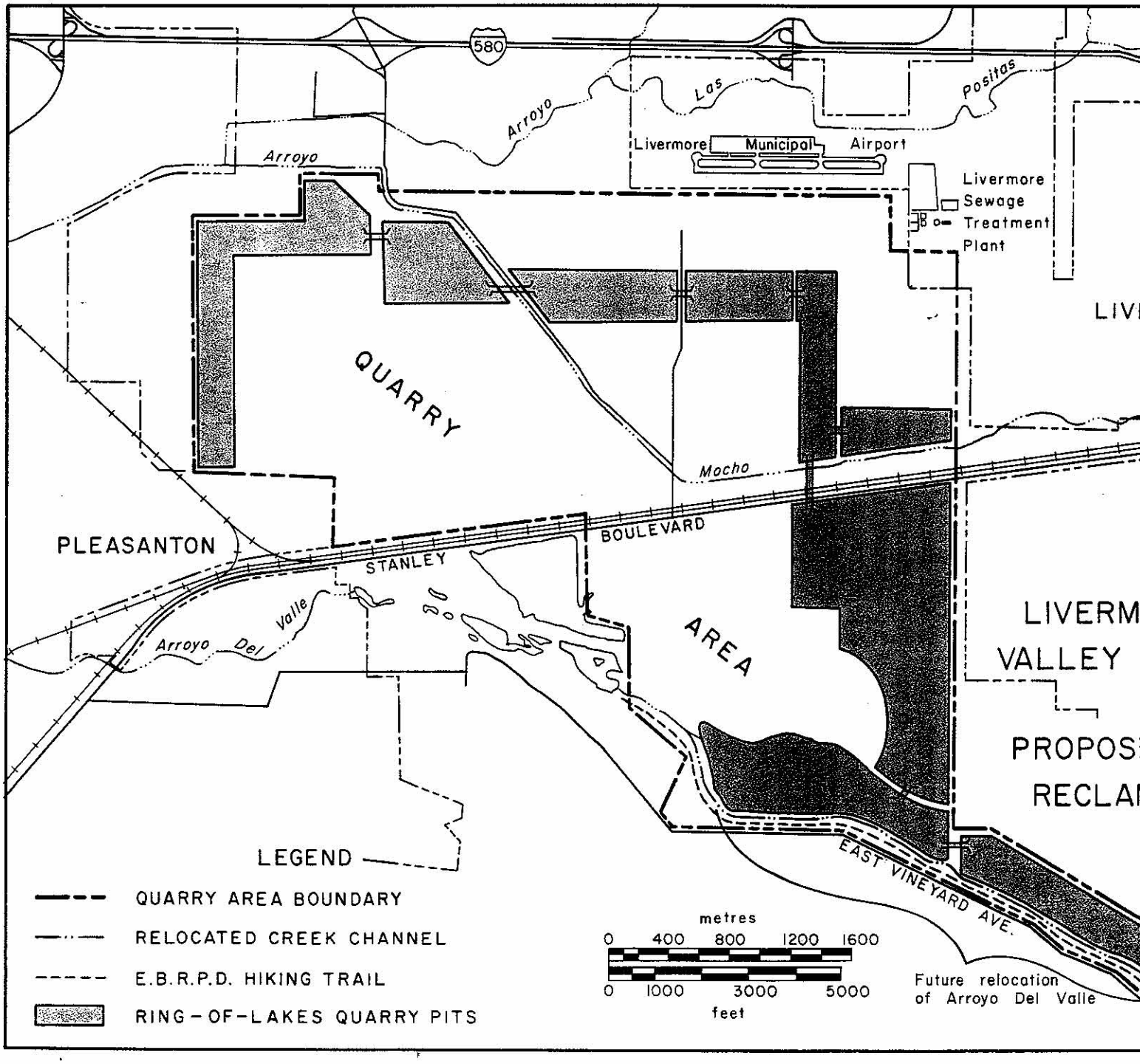
The attitude of ACWD representatives during discussions of the urban stream study has been cooperative and encouraging. The district has voluntarily released much water from the Del Valle turnout for the last two summers, and the resulting summer flow in Arroyo Del Valle and de la Laguna has been the highest in the last decade. However, the ACWD boundaries extend upstream only to the beginning of Niles Canyon and do not include any portion of Arroyos Valle and de la Laguna. Therefore, it would be unreasonable to expect ACWD to make significant sacrifices or use their funds to increase recreation use in the Livermore-Amador Valley area.



The Alameda County Water District recharges their groundwater basin by ponding water in the stream channel and diverting water to abandoned gravel quarries adjacent to lower Alameda Creek. The upper infiltration dam and reservoir immediately upstream of Mission Blvd. are shown above.

Livermore-Amador Valley Gravel Mining

In the midst of the Livermore-Amador Valley, between Livermore and Pleasanton, 15.5 km^2 (6 mi^2) of land are being mined for gravel (Figure 5). Arroyos Valle and Mocho flow through this area and will be affected by future mining. In 1974, this area produced 76 percent of the aggregate mined in Alameda County and supplied about half of the sand and gravel used in the Bay Area. Mining is expected to continue for about 50 years.


580
Arroyo
Las
Positas
Livermore Municipal Airport
Arroyo
Livermore Sewage Treatment Plant
QUARRY
Mocho
PLEASANTON
BOULEVARD
STANLEY
Arroyo Del Valle
AREA
LIVERM
VALLEY
PROPOS
RECLA
EAST VINEYARD AVE.
LEGEND
QUARRY AREA BOUNDARY
RELOCATED CREEK CHANNEL
E.B.R.P.D. HIKING TRAIL
RING-OF-LAKES QUARRY PITS
metres
0 400 800 1200 1600
0 1000 3000 5000
feet
Future relocation of Arroyo Del Valle

Because of concern by Alameda County and regulatory agencies over the long-term effect of mining on the land and underlying ground water resources, the three aggregate companies (Kaiser Sand and Gravel, Lone Star Industries, Inc., and Rhodes and Jamieson, Ltd.) prepared a quarry reclamation plan in January 1977. In July 1979, Alameda County published a Draft Environmental Impact Report on the Quarry Reclamation Plan, and a modified reclamation plan was published by the gravel companies in April 1980.

The essence of this reclamation plan is the "chain-of-lakes" concept, whereby the exhausted quarries would become a series of connected lakes around the present mining area. These lakes would insure hydrologic continuity of the upper ground water aquifer, and could serve as water storage reservoirs, ground water recharge areas, and water-oriented recreation areas. Another possible use, now being tried experimentally, is commercial fish-raising.

The gravel mining operations could affect the Urban Streams Program in two ways. Zone 7's ground water recharge program is vital to the success of an Urban Streams Program because it keeps live flows in both Arroyos Mocho and Del Valle through most of the year. However, as this recharge program raises the valley's ground water level, it becomes more difficult for quarry operators to extract gravel by economical dry methods, using scrapers instead of draglines. These operators try to keep the ground water level low in the quarry area by pumping from their active pits into Arroyo Mocho. Much of this water was originally recharged into the ground water system by Zone 7. When it is pumped into Arroyo Mocho by the quarry operators, some flows out of the Livermore-Amador Valley area and is lost to Zone 7 for recharge purposes.

A second potential problem is future planned gravel extraction by one of the quarry operators along a 4.8-km (3-mi) stretch of Arroyo Del Valle from Vallecitos Road to near the eastern boundary of Shadow Cliffs Recreation Area. The creek in this reach would be relocated close to Vineyard Avenue, and two long, narrow lakes would be created. Unless properly planned and constructed, relocation of this creek could result in an artificial-looking straight-line channel, devoid of riparian vegetation, fish and wildlife. In order to be suitable for recreational purposes, the relocated channel should be removed some distance from Vineyard Avenue and revegetated with natural riparian species. If constructed properly, with adequate forethought to ultimate recreation use, construction of gravel extraction pits in the area could enhance this reach by making it similar to the creek channel through Shadow Cliffs Park (see photo, page 39).

Effects of Proposition 13

At the beginning of the Urban Streams Program in 1977, discussions with local agencies were characterized by cooperation and enthusiasm. Some participants volunteered to help collect data and promote the program at their own expense. However, in June 1978, Proposition 13 passed and these agencies' funds and staffs were significantly reduced. For most of them, this was a time of stress, uncertainty, and concern for survival of existing programs. The Urban Streams Program, being new, was regarded as less urgent than other ongoing programs.

In the two years since passage of Proposition 13, most agencies have recovered some of the funds initially cut, but overall funding is still considerably lower than before. Enthusiasm for the Urban Streams Program remains, but the local districts are financially unable to contribute much to the program's planning and operational expenses.

Vandalism and Policing Problems in Recreation Areas

Unlawful behavior in unsupervised recreation areas in the Alameda Creek watershed has increased in recent years to the point that several recreation areas have been closed or their use restricted. The LARPD closed Veterans Park in 1978, and Sycamore Park in 1979, due to lack of sufficient personnel to ensure public safety. These parks are now open, but their access and use are strictly controlled. The City of San Francisco Water Department closed public access to Arroyo de la Laguna below Castlewood Golf Course because of policing problems. In 1979, the Alameda County Water District suffered losses of more than $500,000 from vandalism along their recharge channel. In one instance, a vandal repeatedly cut and destroyed an inflatable rubber fabre dam diversion structure. The district must now post guards at two of these structures. For agencies or individuals to open more land for recreation, adequate policing must be provided. The present trend is toward closing land to the public.

The trend in the study area is toward closing more land to public access.

Mosquito Control

Releasing more water into Alameda Creek tributaries during the summer may increase mosquito-breeding habitat. In the upper reaches of Arroyo Del Valle, between Veterans Park and Shadow Cliffs Park, mosquito habitat would probably increase due to the broad and braided channel bottom. Much of this reach has been surface-excavated for gravel, and there are many low areas

alongside the stream channel. These contain shallow, stagnant water, conducive to mosquito breeding. The best solutions to this problem appear to be reshaping the stream bottom to eliminate these low areas, or to connect them with the stream to create flowing water conditions.

In the reach between Shadow Cliffs Park and the Pleasanton streamgage station, mosquitos breed under normal summertime flow conditions. Water released from the Del Valle turnout for ground water recharge by Zone 7 largely infiltrates the streambed upstream of the channel through Pleasanton. The remaining warm, shallow, slow-moving water provides mosquito habitat. An increase of flow in this area would help reduce mosquitos. Aquatic vegetation in Alameda Creek channels becomes very concentrated after mid-summer. This growth tends to protect the mosquito larvae from fish. Higher water levels in the creek would tend to increase fish access to the larvae and decrease the mosquito population.

The overall effect of increased streamflows on mosquito populations can probably be determined in the future by correlating future mosquito counts at traps along Alameda Creek with streamflow levels.

Recreation Use

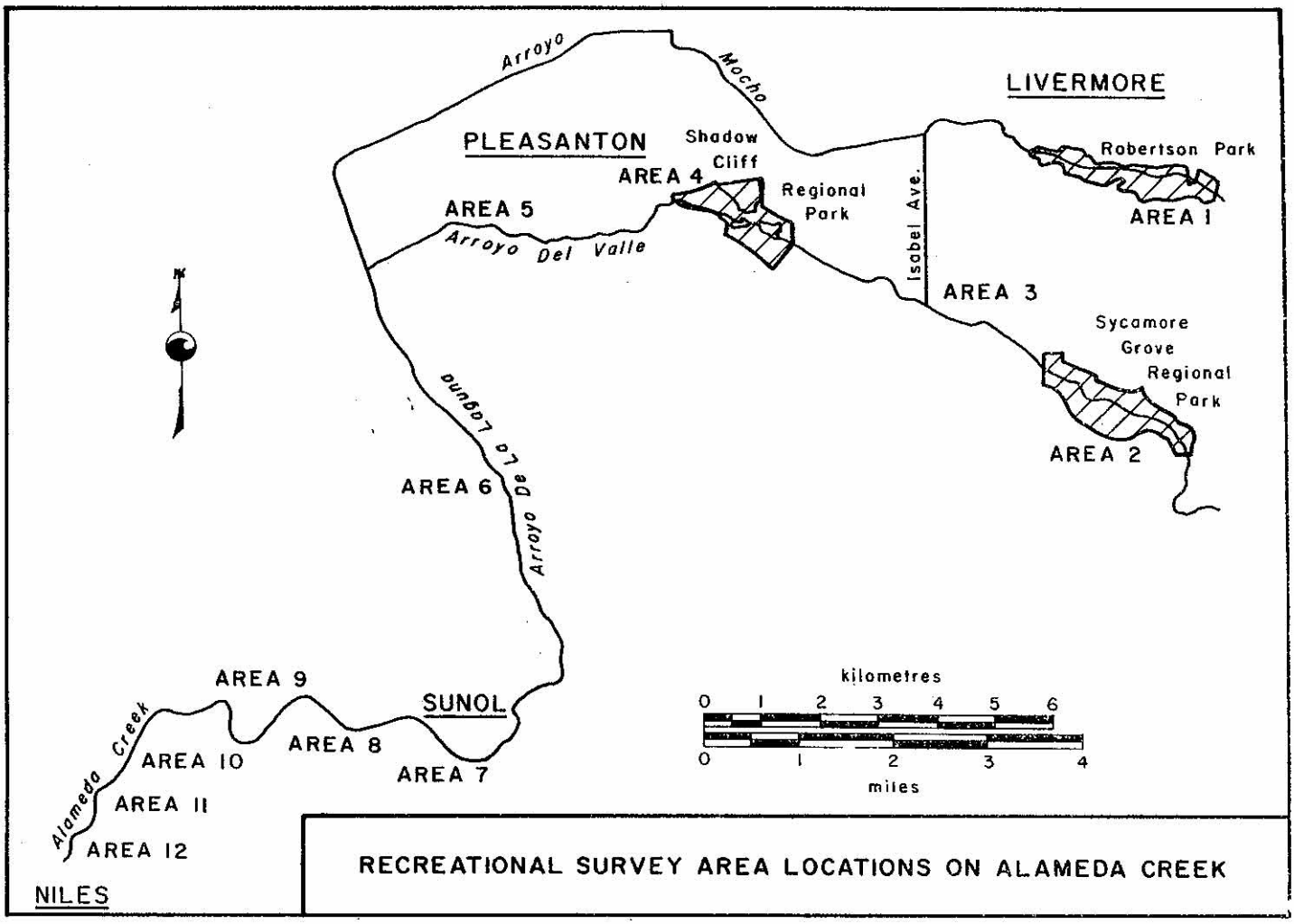
From July 20 through July 23, 1979, a recreation use survey was conducted on Arroyos Mocho and Del Valle and Alameda Creek through Niles Canyon. Twelve survey areas were selected, as shown in Figure 6. The criteria for site selection were availability for public use and ease of access. Creel censuses, recreation use counts, and recreation interviews were conducted at these areas. This brief survey was done to get an indication of the type and relative intensity of recreation use at various locations along the Alameda Creek tributaries. It was not intended as a comprehensive evaluation. A more complete recreation memorandum is available from DWR's Northern District office. A statistical summary of recreation use is shown in Table 3.

During the four-day survey, 967 recreationists were counted. Thirty-five percent were observed on Friday and Monday and 65 percent on Saturday and Sunday. Fishing, swimming, and relaxing constituted about 60 percent of the use. Other activities were walking, camping, bicycling, horseback riding, sightseeing, birdwatching, and rafting.

During the survey, 138 anglers were interviewed. Ninety-three percent were shore fishing and seven percent were crayfishing. Anglers fished 225 hours and caught 35 rainbow trout, 18 bluegills, 9 squawfish, 5 largemouth bass, 1 white catfish, and 1 carp. Twelve crayfish were caught in 16 hours. Recreational interviews were conducted with 157 groups totaling 474 people. These interviews showed that 93 percent of the recreationists used the area only during the day and that 7 percent were camped in the area. Most of the use was by local people. Eighty-seven percent were from Alameda County and eight percent from neighboring counties. Five percent were from distant locations. The relative use by creek location was as follows: Area 1, 6 percent; Areas 2 through 6, 19 percent; Areas 6 through 12, 75 percent.

The areas (1 through 6) which would receive augmented flows now receive only about one quarter of the overall creekside recreation use.

FIGURE 6



RECREATIONAL SURVEY AREA LOCATIONS ON ALAMEDA CREEK

TABLE 3

ALAMEDA CREEK RECREATION SURVEY STATISTICS
(Percent of People Involved in Specific Activities)

Weekdays, N[1/] = 336

Date	Fishing	Beach Use and Swimming	Picnicking	Camping	Relaxing	Walking	Sightseeing	[2/] Riding	Children Playing
7-20-79	11.8	19.5	0	2.5	9.2	0.6	0.3	4.2	5.7
7-23-79	8.0	9.8	0	6.3	6.4	0	0	2.6	0.6
Total	19.8	29.3	0	8.8	16.6	0.6	0.3	6.8	6.3

Weekends, N[1/] = 631

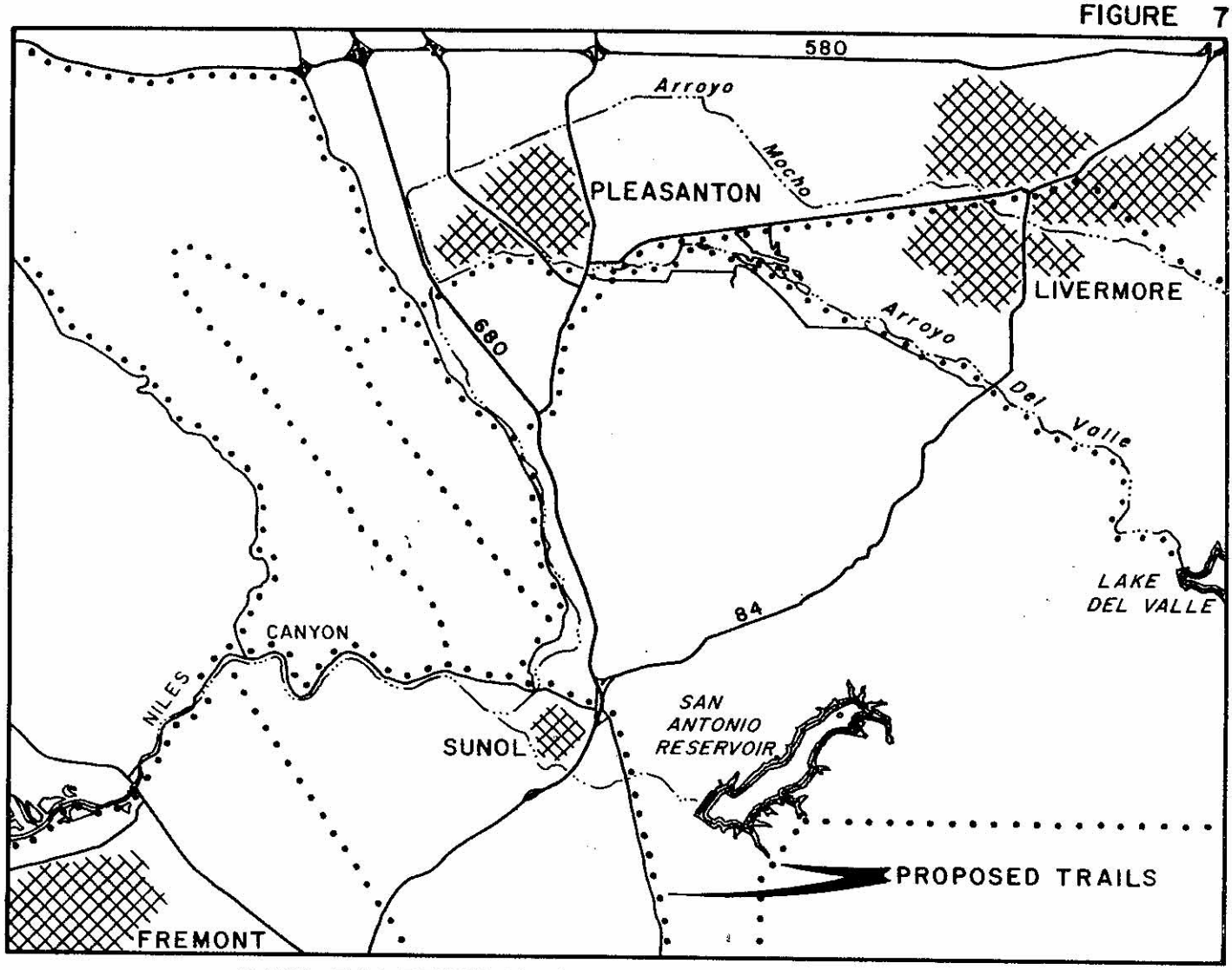
Date	Fishing	Beach Use and Swimming	Picnicking	Camping	Relaxing	Walking	Sightseeing	[2/] Riding	Children Playing
7-21-79	8.4	3.0	0.3	7.4	2.7	4.4	1.6	2.1	1.0
7-22-79	12.2	11.9	9.0	1.4	18.8	4.3	1.0	5.9	1.9
Total	20.6	14.9	9.3	8.8	21.5	8.7	2.6	8.0	2.9

1/ Total number of recreationist observed.

2/ Includes bicycling, horseback riding, and motorcycling.

3/ Includes birdwatching, rafting, rollerskating, trash collecting, and hunting.

FIGURE 7

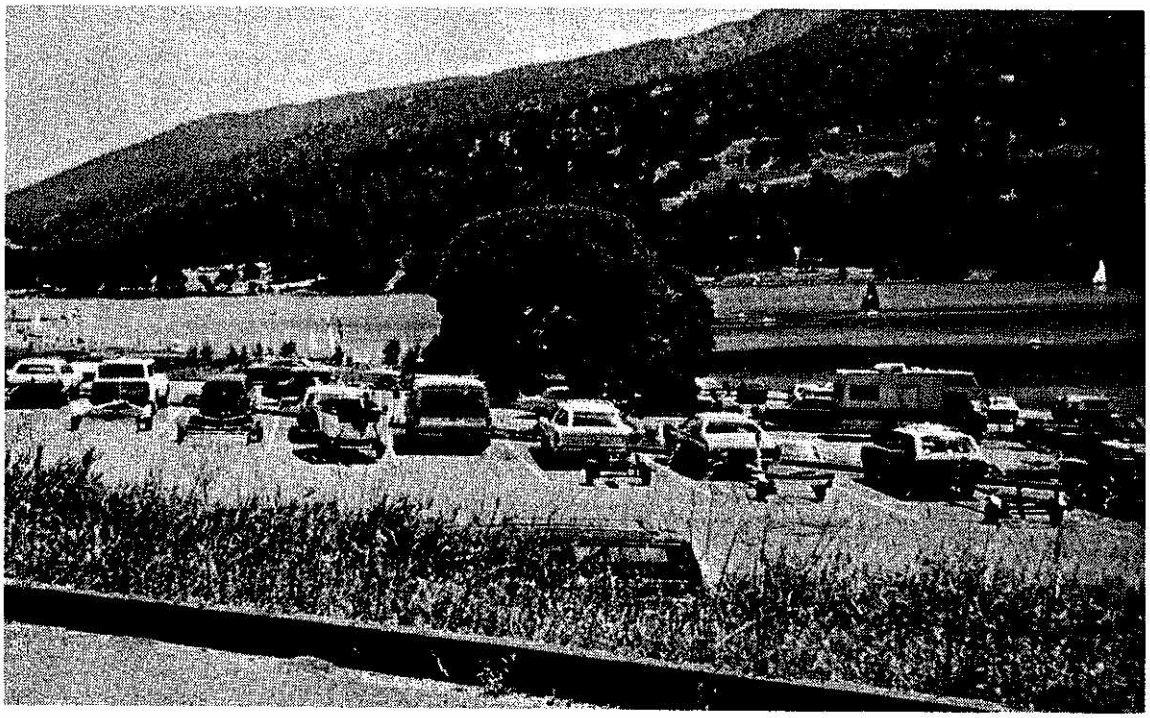


EAST BAY REGIONAL PARK DISTRICT TRAILS PLAN

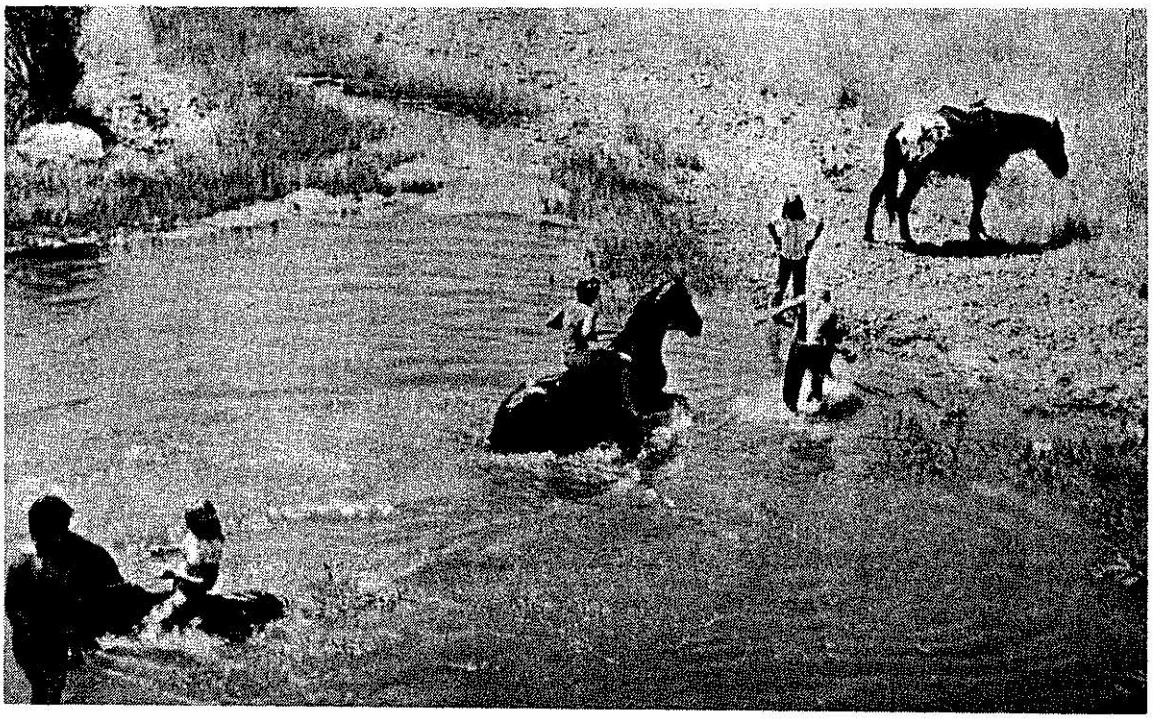
This level of use would increase substantially if Arroyo de la Laguna and Arroyo Del Valle creekside lands, owned by the San Francisco Water District, the gravel quarry operators, and other private parties were opened to recreation use and if a high level of steady streamflow were maintained. The Federal Land and Water Conservation Fund Program may represent a partial (50 percent) source of funding for acquisition of recreational lands in this area. Some public agency would have to be responsible for maintaining and policing these additional recreation areas.

Even without further acquisition of recreation lands, the level of creekside recreation use from Del Valle Dam to Sunol will be much higher if live flows are maintained in the stream channels.

Alameda Creek has good recreation potential and is already heavily used. The California Department of Fish and Game has written that "no other stream in the East Bay provides, or is capable of providing, the amount of angler use that exists on Alameda Creek". EBRPD describes the Niles Canyon

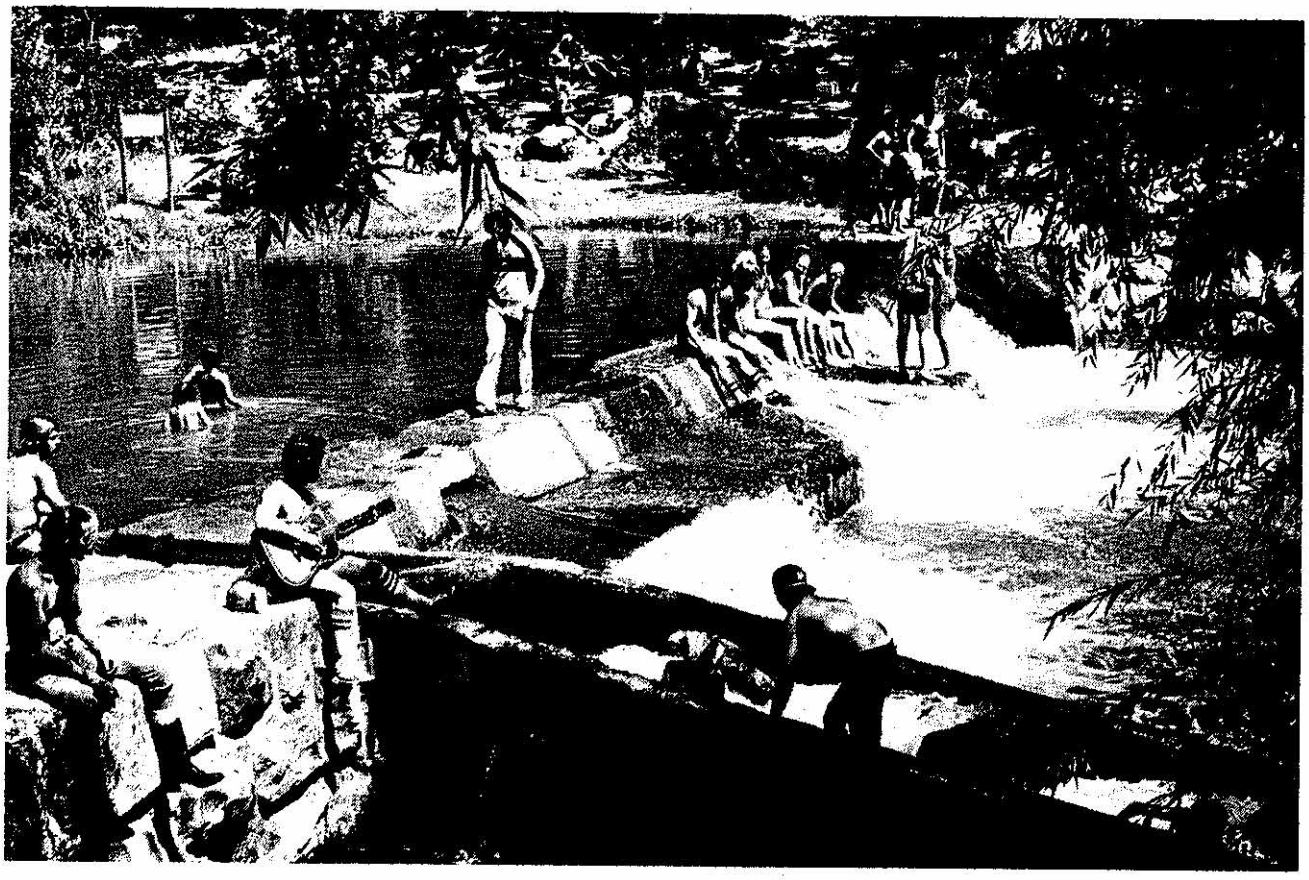


The greatest recreation use in the study area occurs at Lake Del Valle (above). Arroyo Mocho (below) flows through the city of Livermore and provides recreational opportunities for many urban residents.



Arroyo Del Valle between Isabel Avenue near Livermore (above) and downstream around Shadow Cliffs Park near Pleasanton provides a long reach of open space creek habitat where on warm days young people are found wading, swimming, fishing, or just throwing rocks into the water.

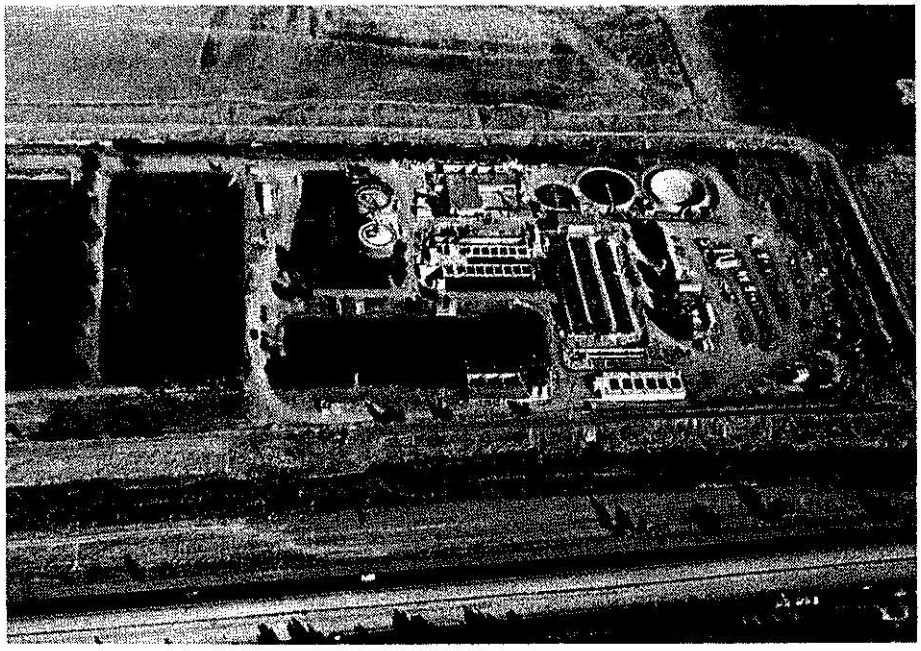
Arroyo Del Valle as it flows through Pleasanton (above) is a place of refuge from the surrounding urban environment. Lower Alameda Creek through Niles Canyon (below) receives heavy recreation use during the warmer months. This area is stocked with catchable trout throughout the spring and summer.



portion of Alameda Creek as having high resource and scenic value, with good recreational potential. This agency was building a hiking and bridle trail through the canyon in the summer of 1980 and plans to build a bicycle trail on the Southern Pacific Railroad bed after it is abandoned in the near future (Figure 3). One of the greatest barriers to full recreational use of Alameda Creek is lack of sanitation facilities and a responsible agency to adequately regulate use. These problems will be resolved in the Niles Canyon area when EBRPD builds their trail, but sanitation facilities will still be needed in middle basin reaches, outside formal recreation areas.

Water Quality

Water quality in the Alameda Creek drainage has received considerable attention in earlier studies. There is local concern over the long-term trends in ground water quality because of past declines in the purity of these supplies. Before February 1980, when a regional sewage export pipeline came on line, the two sewage treatment plants near Pleasanton and Livermore discharged tertiary treated water directly into Alameda Creek tributaries. This was bacterially safe and contributed to instream flows, but it had a salt content considerably above 250 TDS, which was the maximum level allowable for ground water recharge in the Fremont area, where ACWD is trying to reduce the salt content of their ground water system. This sewage effluent is now pumped through a pipeline along Dublin Canyon and discharges along with other East Bay treated sewage into South San Francisco Bay.



The Dublin-San Ramon CSD Sewage Treatment Plan discharged effluent into Arroyo de la Laguna until early 1980, when it started being pumped through a pipeline to San Francisco Bay.

Water quality factors of concern to the Urban Streams Program are those which affect a stream's desirability for fish, wildlife, and recreation use. These factors are temperature, turbidity, dissolved oxygen (DO), and electrical conductivity (EC). In streams with flows of 0.28 m^3/s (10 ft^3/s) or greater, the DFG uses the general criteria of 75°F (24°C) maximum regular occurring water temperature and 5 parts per million minimum (ppm) DO for planting catchable trout. Turbidity is discoloration of water and EC measures the salt load. Generally, fresh water EC is considered low if below 300, high if above 800, and medium if between these two. During the summers of 1978 and 1979, DWR collected physical and biological water quality data at ten locations on Alameda Creek tributaries. Additional data at gaging station locations were available from U. S. Geological Survey publications.

Analysis of the data shows that Alameda Creek water quality is generally good, but high water temperatures between the downstream boundary of Sycamore Grove Park and the Pleasanton stream gage station in July and August make this reach unsuitable for planting trout in mid-summer (Figure 8). DO at all stations was above the minimum 5 ppm in the flowing stream. It only dropped below this level in the deeper portions of the two gravel pits located along the stream channel in Shadow Cliffs Regional Park. Copper sulfate is used periodically in the South Bay Aqueduct to control algae growth and could be a problem to fish if released to the stream channels in concentrations greater than 0.75 ppm (Brown, AWA, 1978, Ecology of Pesticides). However, during the short copper sulfate treatment periods, the SBA Arroyo Del Valle turnout could be shut off as the copper sulfate treatment cloud passes. During this short period, water from Del Valle Reservoir could be released to the channel to keep the stream live. No evidence of high copper sulfate concentrations in the stream channels was found during the water quality work or in other available data. Fish have previously been planted below Del Valle Dam with no ill effects from copper sulfate reported.

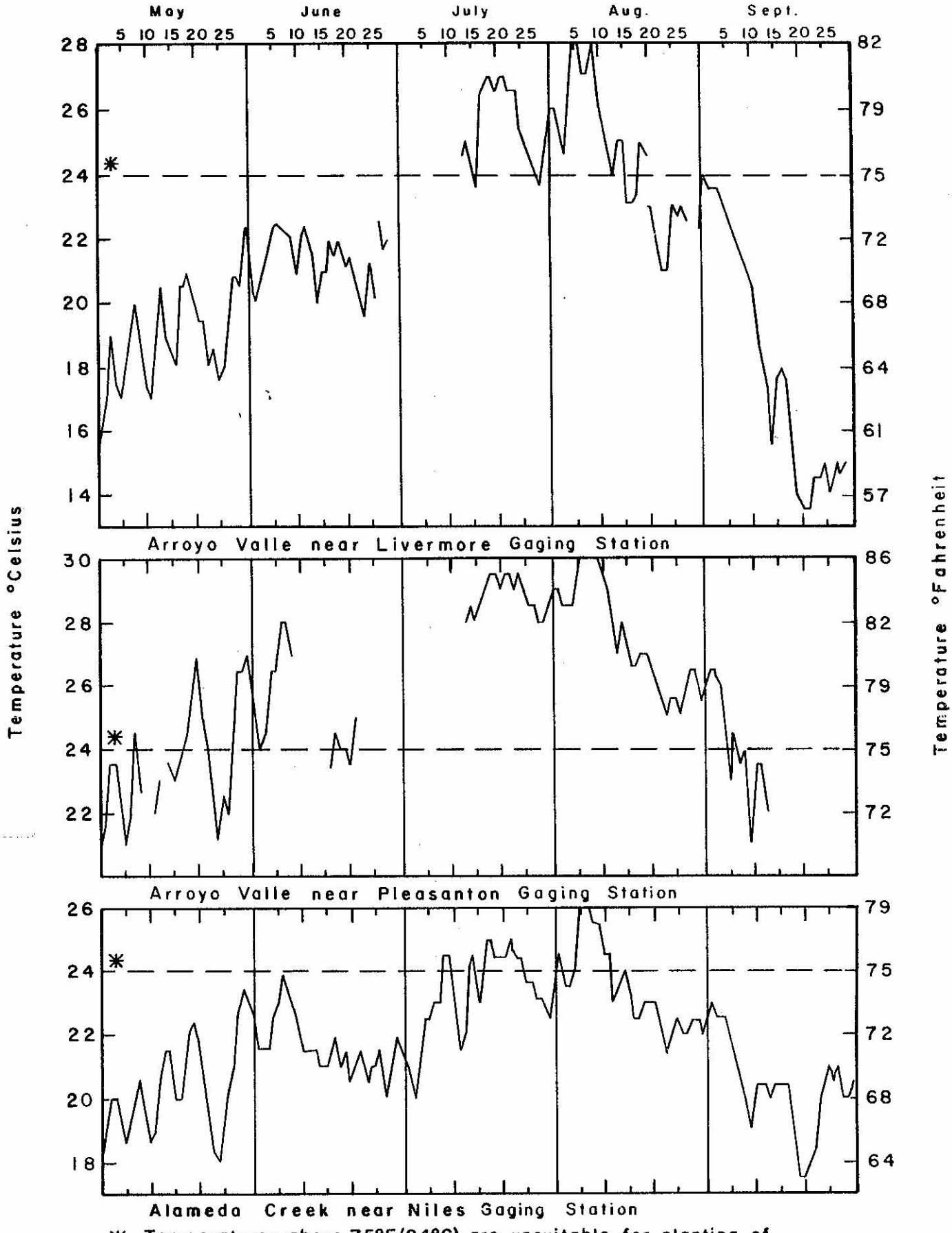
A summary of the water quality at each sampled location is presented in the following paragraphs. A more complete water quality memorandum is available from DWR's Northern District office.

- Arroyo Del Valle at Veterans Hospital, Stream Mile 33.2 (53.4 km)

  Twenty-four-hour (diurnal) surveys were conducted August 30 and 31, 1978, and June 19 and 20, 1979. Streamflow and temperature data are from the USGS gaging station immediately upstream. A DWR thermograph was installed in 1979 after USGS stopped recording temperature at this location. Maximum water temperatures above 24°C (75°F) occur from the middle of June to the middle of August, and minimum temperatures occur in January and February. Water flow is controlled by downstream water user releases from the South Bay Aqueduct and Del Valle Reservoir. DO levels were well above minimum required for aquatic organisms, including various fish species. DO levels followed the typical pattern of decreasing concentration through the night and increasing concentration through the day. Field pH measurements ranged between 7.3 and 8.4, which is within the acceptable range for freshwater aquatic organisms. EC ranged between 380 and 540, which is within the moderate range acceptable to aquatic life. Maximum turbidity was 8.2 Jackson Turbidity Units, which caused a slight discoloration of the water but was other wise harmless. Benthic organism counts show that the stream has only a

COMPARATIVE 1978 SUMMER WATER TEMPERATURES OF ARROYO DEL VALLE AND ALAMEDA CREEK

FIGURE 8



✳ Temperatures above 75°F (24°C) are unsuitable for planting of catchable trout.

moderate-to-poor productivity, typical of slightly silted streambeds composed of small gravels.

- Arroyo Del Valle at Vallecitos Road, Stream Mile 30.7 (49.4 km)

A single diurnal study in June 1979 was conducted at this site. A DWR thermograph operated from the end of April to the middle of September 1979. Benthic samples were collected on August 1, 1979. Water temperatures at this location 4.3 km (2.7 mi) downstream from the Veterans Hospital station were as much as 6.5°C (12°F) higher during the day. Thus, this location would be unsuitable for planting catchable trout throughout the summer, although several varieties of warmwater fish inhabit this area. Higher water temperatures caused a reduction in DO, although it remained well above the critical level for aquatic organism survival. EC and turbidity were similar to the Veterans Hospital station. Benthic organisms were the same types found at the upstream station, although numbers were slightly greater.

- Arroyo Del Valle at USGS Gage in Pleasanton, Stream Mile 24.5 (39.4 km)

Maximum observed water temperature was 30°C (86.9°F), which is much too hot for catchable trout survival but acceptable for warmwater fish. Water temperatures in the unshaded channel between the Veterans Hospital and the Pleasanton gage increases as the water moves downstream. Temperatures begin to cool below the Pleasanton gage as the channel enters a heavily shaded reach. Increasing the streamflow appears to have little cooling effect on creek water temperatures. Most other water quality parameters were similar to those of upstream stations. Benthic productivity was only fair.

- Arroyo de la Laguna near Pleasanton, Stream Mile 19.6 (31.5 km)

Maximum water temperatures were 3 to 5°C (5.4 to 9°F) cooler than Arroyo Del Valle at the gaging station in Pleasanton. Conductivity, alkalinity, and turbidity were all higher than Arroyo Valle stations, reflecting the influence of upstream sewage treatment plant effluent. Benthic production at this station was very poor and was composed of organisms preferring relatively silty conditions. Water quality at this and all downstream stations should be considerably improved in 1980 because of the recent export of treated sewage effluent from the basin.

- Alameda Creek near Niles, Stream Mile 11.9 (19.1 km)

Water temperature at this station is considerably cooler than that at the Pleasanton USGS station. Only briefly during mid-summer does the maximum temperature exceed 24°C (75°F), which is the preferred maximum for a successful catchable trout program. All other parameters were similar to those found at upstream station on Arroyo de la Laguna. Benthic production was somewhat higher at this station. Turbidity levels were as high as 37 JTU, which gives the water an undesirable dark color.

Hydrology

In order to simplify the hydrologic analysis of Alameda Creek tributary flows, a series of graphs was prepared showing plots of runoff at stream gage station and SBA turnout locations. Runoff was plotted in sequence from Del Valle Dam to the Niles stream gage by water years (October-September) 1973 through 1980 and is shown in Appendix A. The effect on creek flows of modifying releases at the three SBA turnouts can be visualized by referring to these plots. Much information about historic flows and water losses is contained in these plots. The following is a summary of this information:

1. Virtually all of the summer and fall flow in the Alameda Creek watershed results from releases at SBA turnouts. Until February 1980, approximately 0.28 m^3/s (10 ft^3/s) was contributed by the two sewage treatment plants. Sewage effluent is now exported via pipeline to San Francisco Bay. This will result in less flow in Arroyo de la Laguna unless ACWD releases more future water from the Del Valle turnout to make up for this reduction.

2. Historic releases from SBA turnouts have fluctuated widely and are turned off abruptly for prolonged periods. Using the Del Valle turnout as an example, it can be seen that releases have been made in blocks with interspersed periods of no releases. Some no-flow periods are very brief, but they can result in fish kills. In the future, short interruptions in releases will probably occur very infrequently because of the water districts' interest in creek fish and recreation use. However, prolonged periods of no releases will still occur because of the changing need for ground water recharge flows. Historically, when continuous releases averaging less than 0.28 m^3/s (10 ft^3/s) have occurred, they have been made on an every-other-day basis. Such intermittent flows were made from April through December 1976 because the meter at this turnout could not accurately measure flows less than 0.28 m^3/s (10 ft^3/s). This meter has recently been modified to be accurate to a minimum flow of 0.17 m^3/s (6 ft^3/s) and almost all flows can be released on a continuous basis.

3. Summer flows in Arroyo Del Valle at Pleasanton were generally adequate for recreation in 1973 and 1975 but there was no flow at this location during the summers of 1974, 1976, and 1977. From 1978 through 1980, summer flows have been above 0.28 m^3/s (10 ft^3/s) because of normal rainfall and water district cooperation in the urban stream study.

4. During the drought years of 1976 and 1977, large continuous releases were made by ACWD at the Vallecitos turnout. Zone 7 released an average of 0.14 m^3/s (5 ft^3/s) during the summer of 1976 and 0 m^3/s during the summer of 1977 from the Del Valle turnout. Had Zone 7 been able to release 0.42 m^3/s (15 ft^3/s) during both summers, and ACWD taken its releases at the Del Valle turnout, flows greater than 0.85 m^3/s (30 ft^3/s) would have occurred in the 32-km (20-mi) reach from the Del Valle turnout to the mouth of Niles Canyon.

5. Flows at Alameda Creek near Niles would not be affected by a change in ACWD major release location from the Vallecitos to the Del Valle turnout. However, the historic summertime flows at this location represent the magnitude of flow which would have existed from this station upstream to Del Valle Dam if almost all of the ACWD ground water recharge releases had been made at the Del Valle turnout.

6. Summer water recharge and losses along Arroyo Del Valle between the Livermore and Pleasanton stations were plotted on the hydrographs (third column from top, Appendix A) whenever there was flow passing the Pleasanton station. This plot includes percolation to ground water and evapotranspiration. They averaged about 0.34 m^3/s (12 ft^3/s) during 1973 and 1975, 0.48 m^3/s (17 ft^3/s) during 1978, and 0.42 m^3/s (15 ft^3/s) during 1979. They vary within these ranges depending on flow level, temperature, and time of year.

Losses in the 8-km (5-mi) reach between Arroyo Del Valle at Pleasanton and Arroyo de la Laguna near Pleasanton are quite small, as shown in Appendix A, pages 65 through 76. During the summers of 1977 through 1979, this portion of the creek gained up to 0.11 m^3/s (4 ft^3/s) the majority of the time. Losses occurred for about 27 percent of this period. During the summer of 1980, DWR installed a stream-gaging station on Arroyo de la Laguna in Sunol. This station's data are not yet sufficient to estimate losses in this reach.

Additional hydrologic analysis and coordinated experimental releases will probably be required to reach agreement with the ACWD on the overall impacts of changing their major point of ground water recharge releases from the SBA. During this continued experimental work, the objectives of the Urban Streams Program can continue to be met if precipitation is normal or above.

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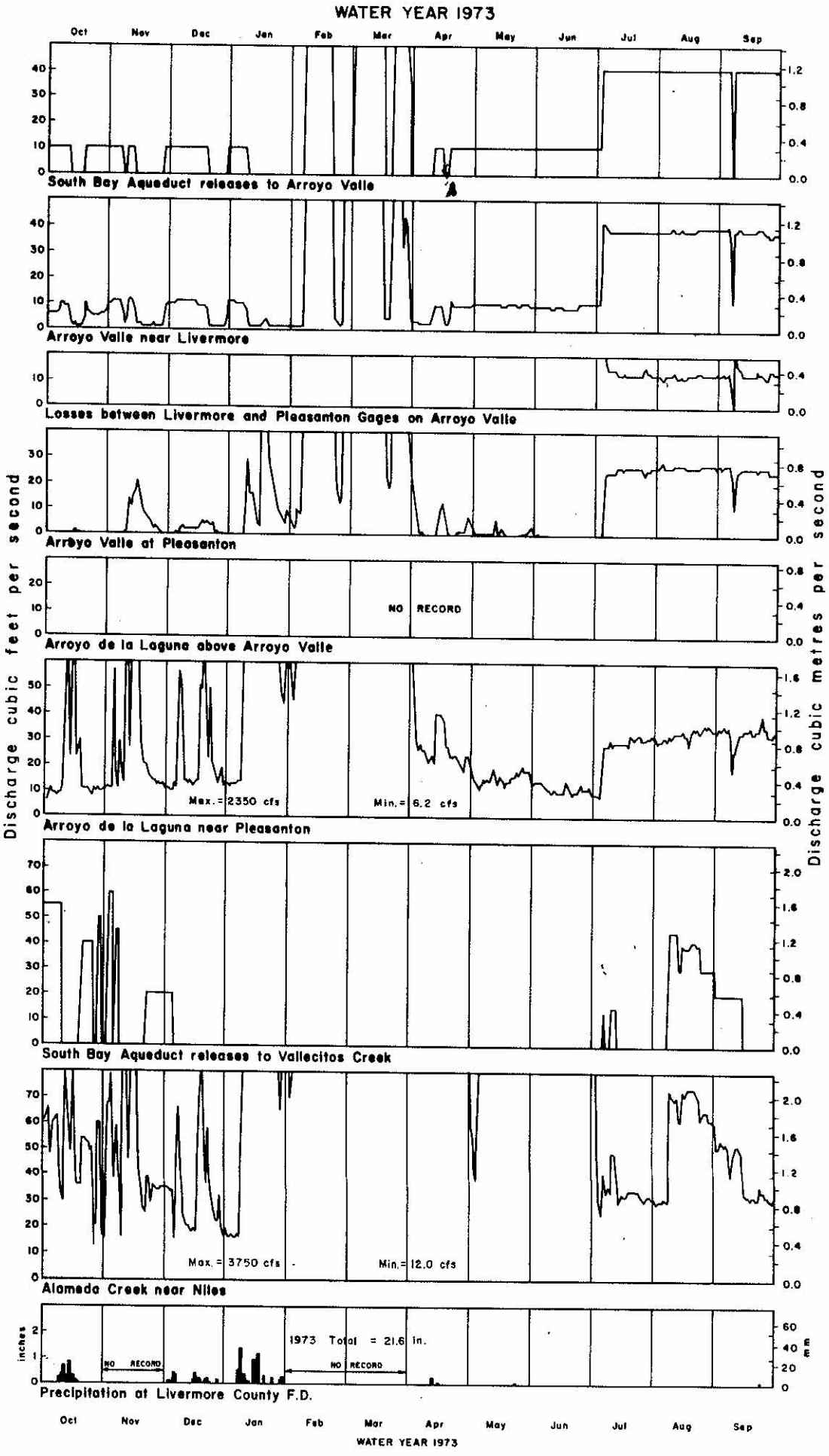
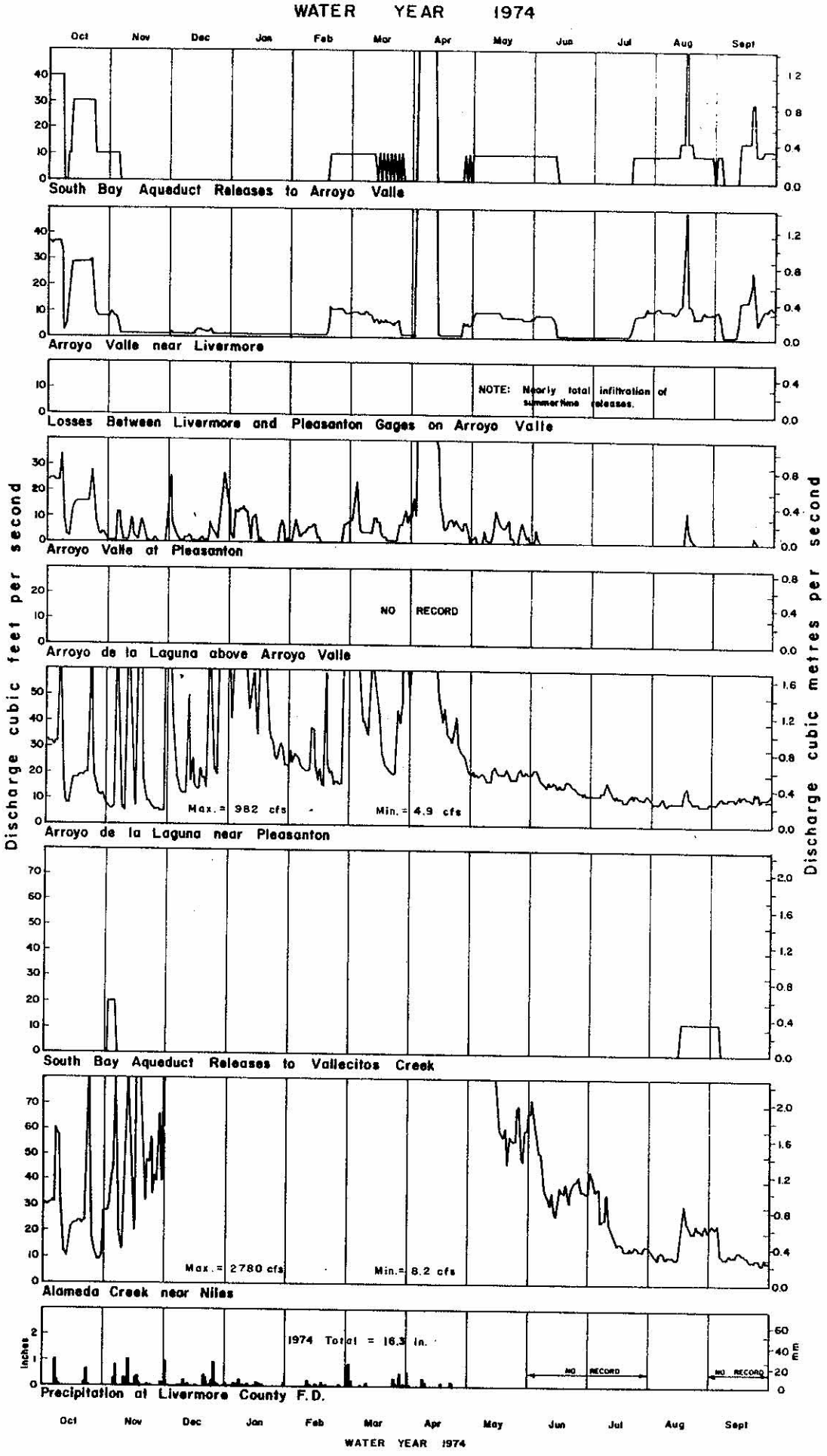
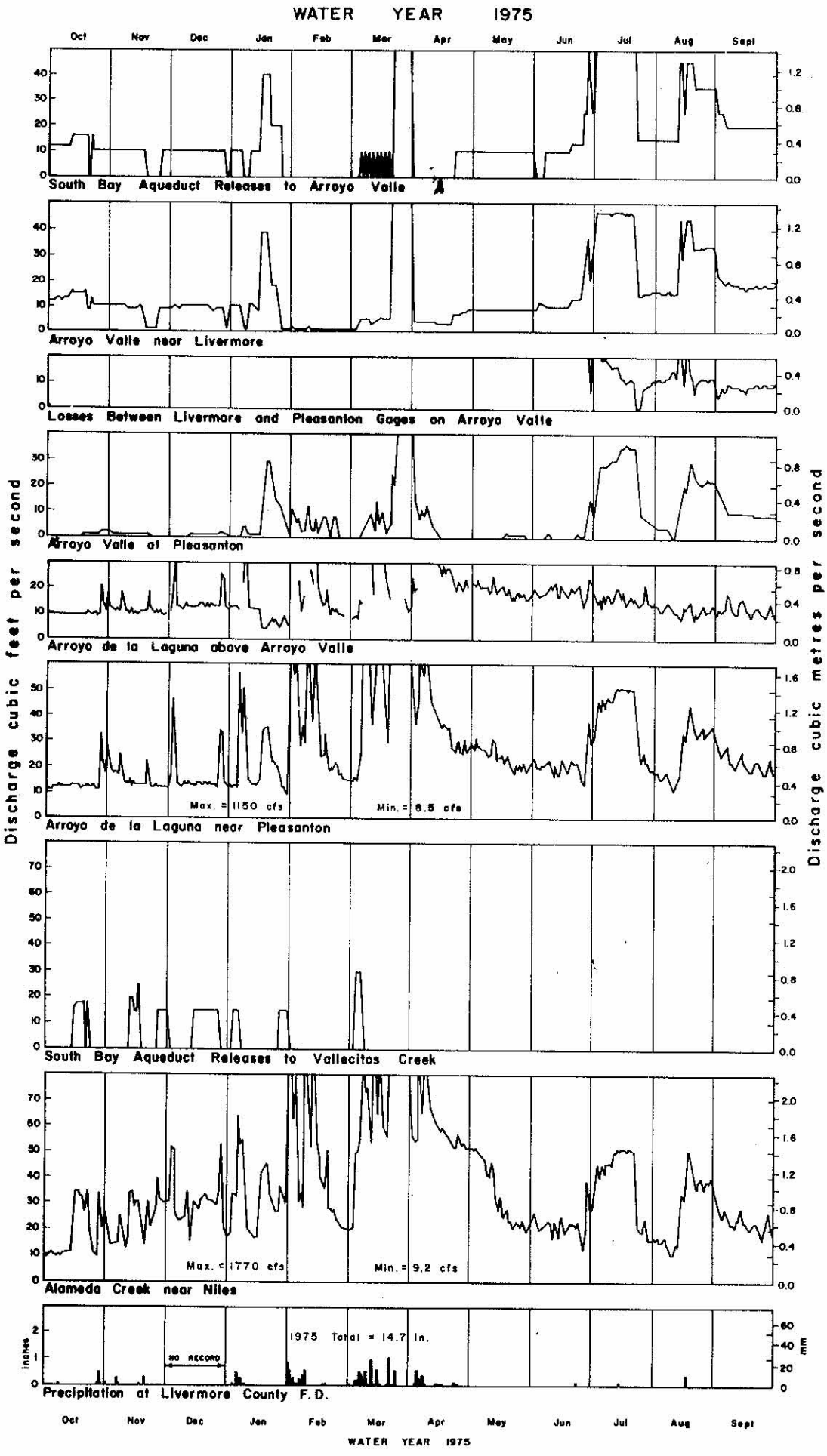
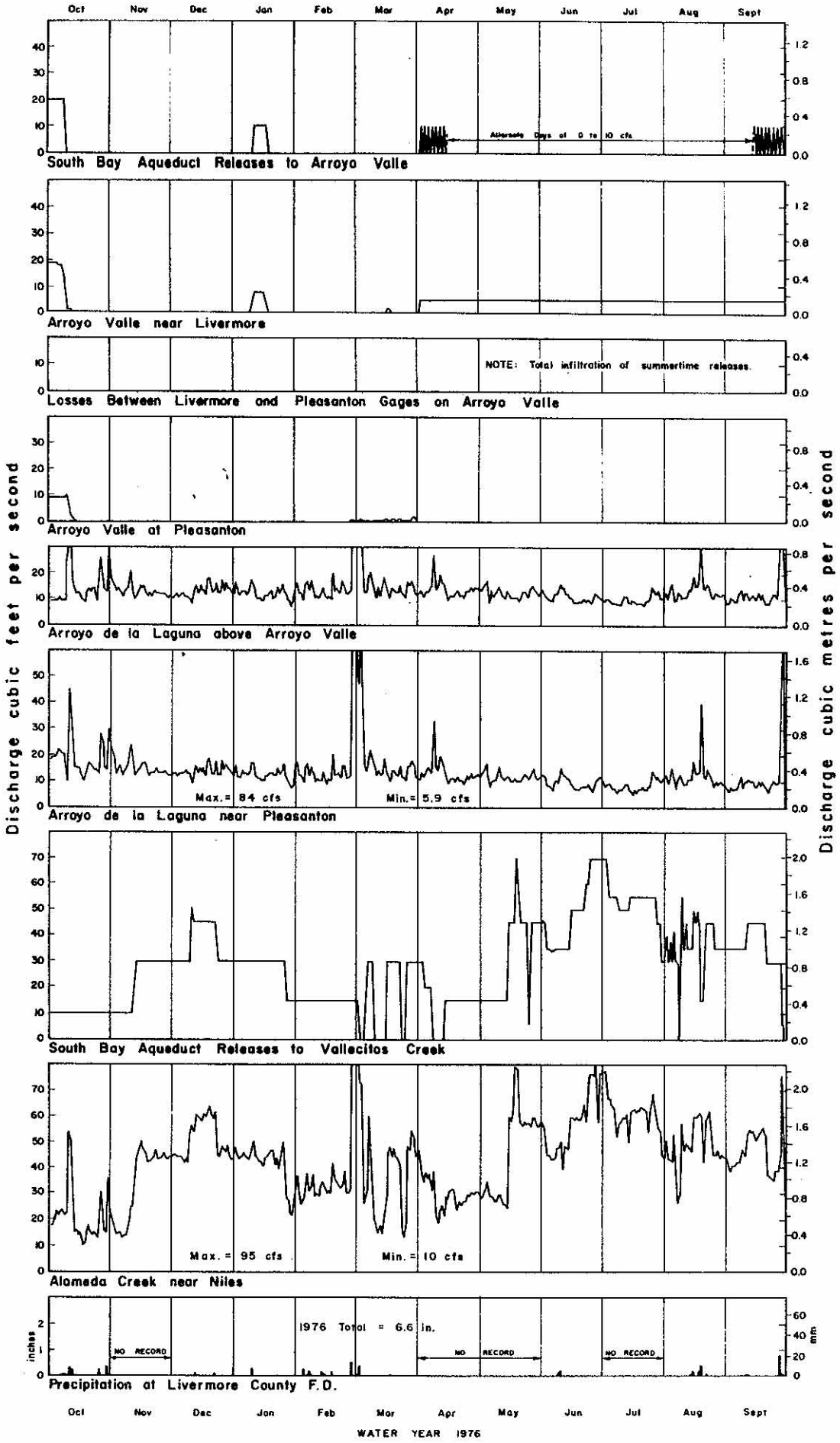
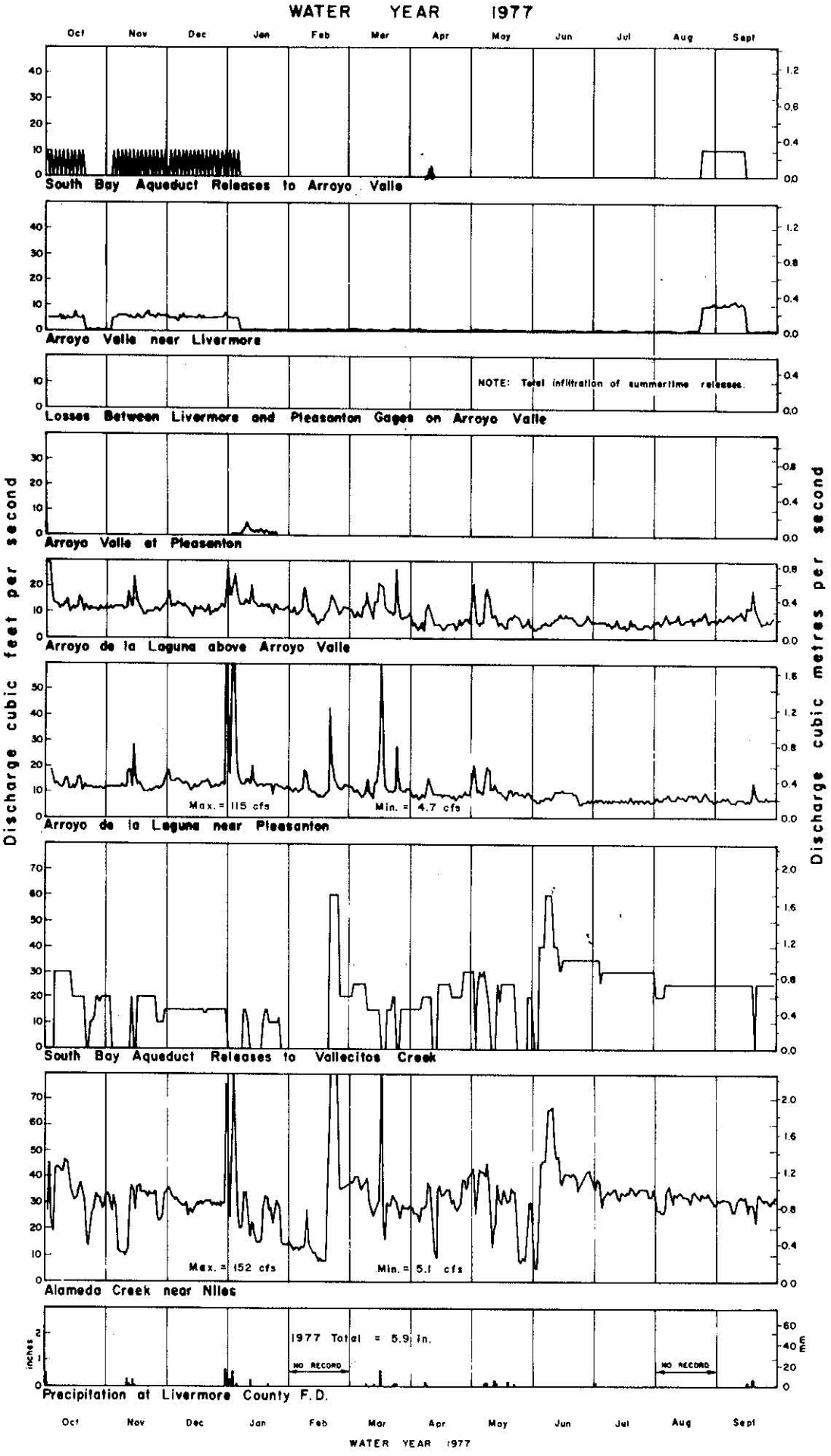
APPENDIX A. HYDROLOGIC PLOTS OF ALAMEDA CREEK TRIBUTARIES

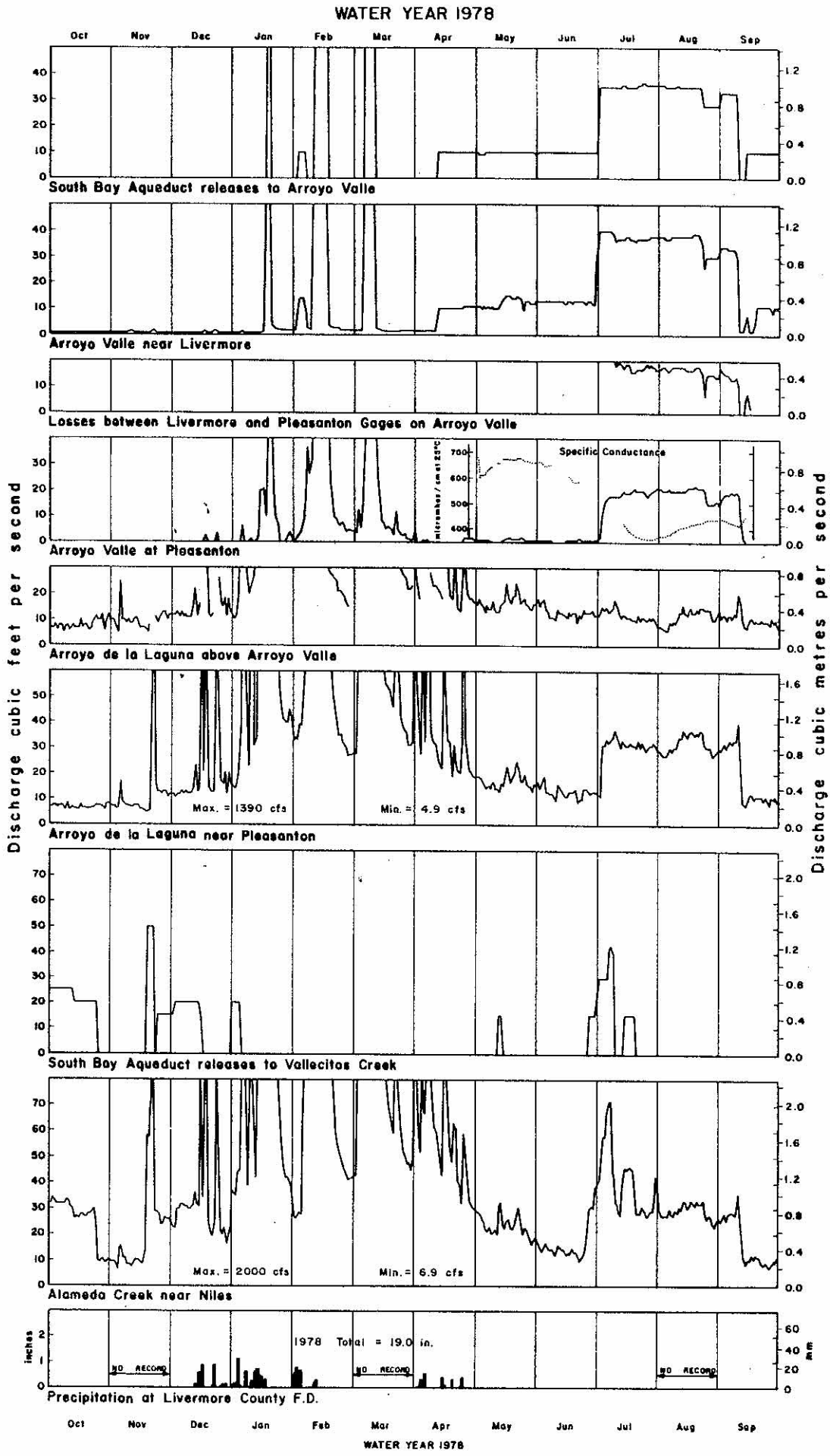

WATER YEAR 1973
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
South Bay Aqueduct releases to Arroyo Valle
Arroyo Valle near Livermore
Losses between Livermore and Pleasanton Gages on Arroyo Valle
Arroyo Valle at Pleasanton
NO RECORD
Arroyo de la Laguna above Arroyo Valle
Max. = 2350 cfs
Min. = 6.2 cfs
Arroyo de la Laguna near Pleasanton
South Bay Aqueduct releases to Vallecitos Creek
Max. = 3750 cfs
Min. = 12.0 cfs
Alameda Creek near Niles
1973 Total = 21.6 in.
NO RECORD
NO RECORD
Precipitation at Livermore County F.D.
inches
mm
Discharge cubic feet per second
Discharge cubic metres per second
WATER YEAR 1973

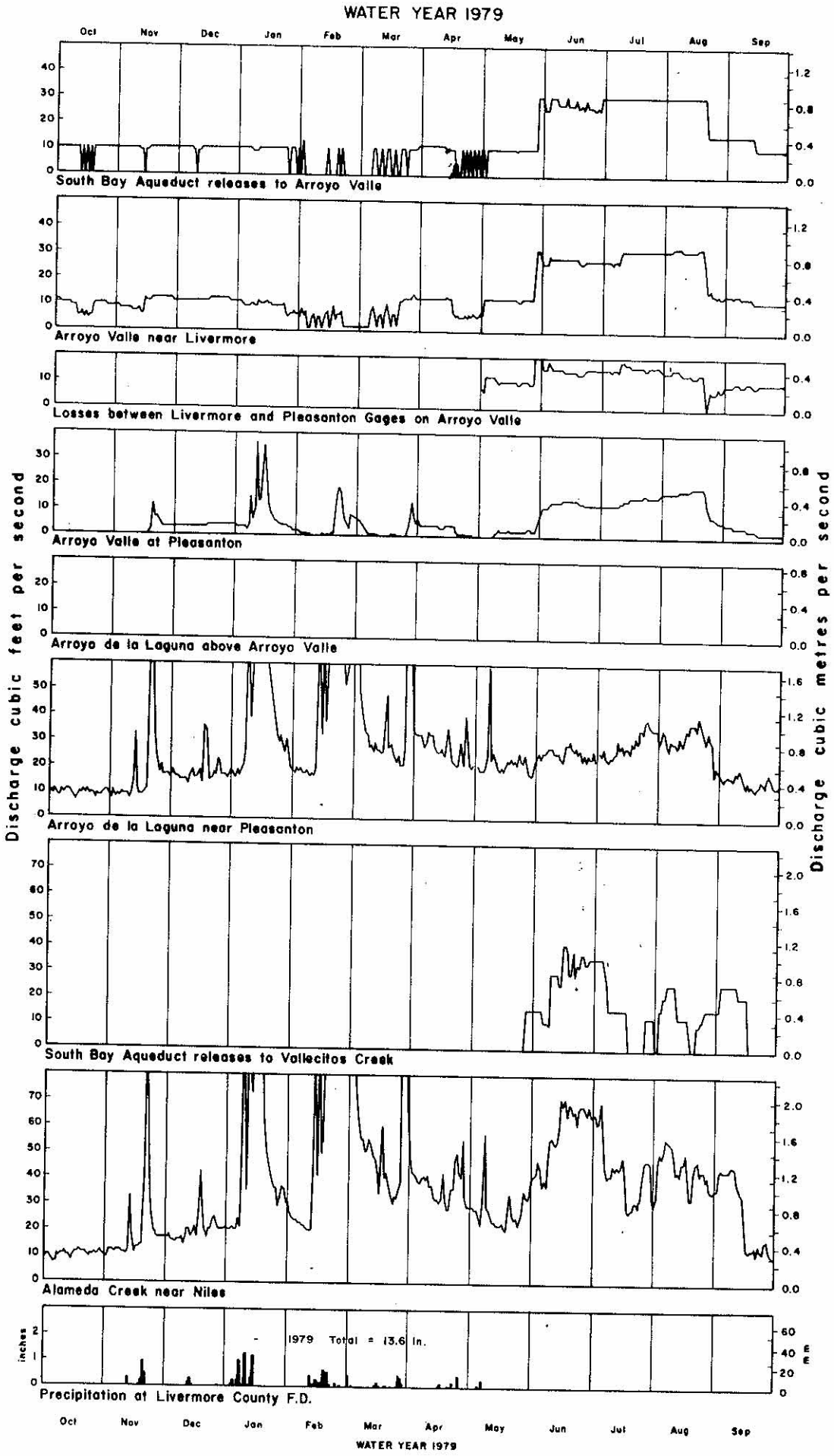

WATER YEAR 1974
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
South Bay Aqueduct Releases to Arroyo Valle
Arroyo Valle near Livermore
NOTE: Nearly total infiltration of summertime releases.
Losses Between Livermore and Pleasanton Gages on Arroyo Valle
Arroyo Valle at Pleasanton
NO RECORD
Arroyo de la Laguna above Arroyo Valle
Max. = 982 cfs
Min. = 4.9 cfs
Arroyo de la Laguna near Pleasanton
South Bay Aqueduct Releases to Vallecitos Creek
Max. = 2780 cfs
Min. = 8.2 cfs
Alameda Creek near Niles
1974 Total = 16.3 in.
NO RECORD
NO RECORD
Precipitation at Livermore County F.D.
Discharge cubic feet per second
Discharge cubic metres per second
inches
mm
WATER YEAR 1974

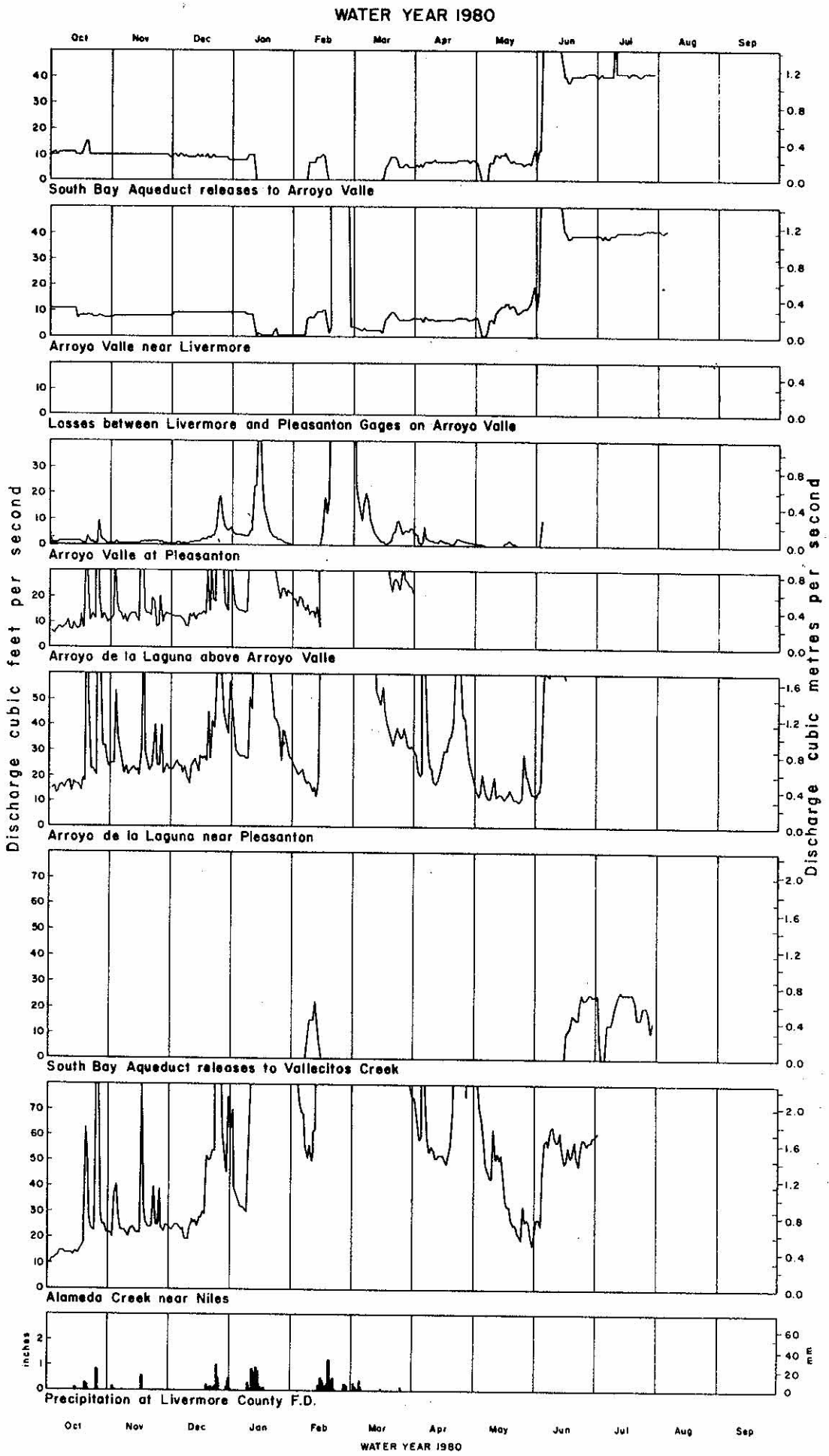

WATER YEAR 1975
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
South Bay Aqueduct Releases to Arroyo Valle
Arroyo Valle near Livermore
Losses Between Livermore and Pleasanton Gages on Arroyo Valle
Arroyo Valle at Pleasanton
Arroyo de la Laguna above Arroyo Valle
Max. = 1150 cfs
Min. = 8.5 cfs
Arroyo de la Laguna near Pleasanton
South Bay Aqueduct Releases to Vallecitos Creek
Max. = 1770 cfs
Min. = 9.2 cfs
Alameda Creek near Niles
1975 Total = 14.7 in.
NO RECORD
Precipitation at Livermore County F.D.
inches
mm
Discharge cubic feet per second
Discharge cubic metres per second
WATER YEAR 1975


WATER YEAR 1976
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sept
South Bay Aqueduct Releases to Arroyo Valle
Arroyo Valle near Livermore
NOTE: Total infiltration of summertime releases.
Losses Between Livermore and Pleasanton Gages on Arroyo Valle
Arroyo Valle at Pleasanton
Arroyo de la Laguna above Arroyo Valle
Max.= 84 cfs
Min.= 5.9 cfs
Arroyo de la Laguna near Pleasanton
South Bay Aqueduct Releases to Vallecitos Creek
Max.= 95 cfs
Min.= 10 cfs
Alameda Creek near Niles
1976 Total = 6.6 in.
NO RECORD
Precipitation at Livermore County F.D.
Discharge cubic feet per second
Discharge cubic metres per second
inches
mm
WATER YEAR 1976

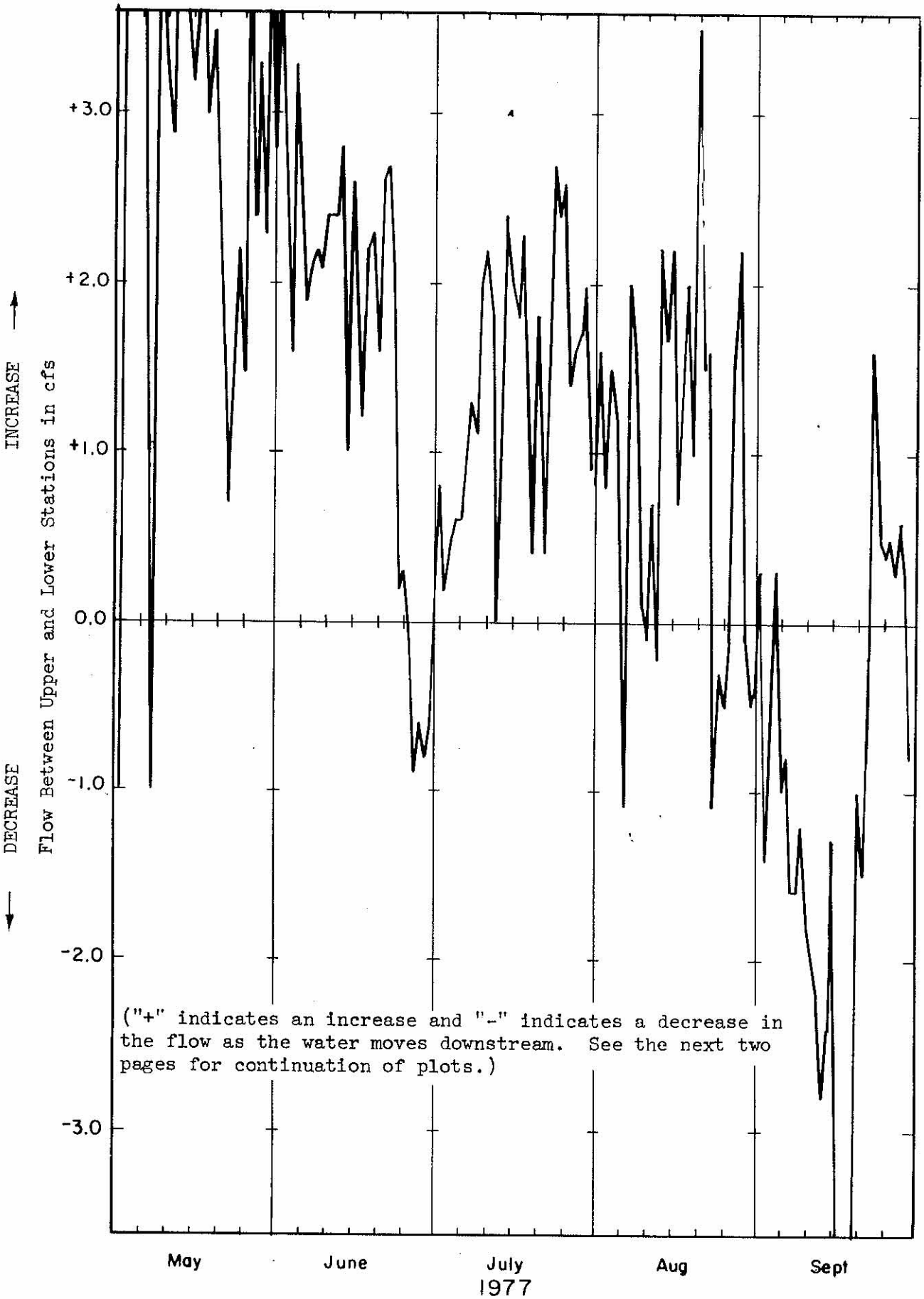

WATER YEAR 1977
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
South Bay Aqueduct Releases to Arroyo Valle
Arroyo Valle near Livermore
NOTE: Total infiltration of summertime releases.
Losses Between Livermore and Pleasanton Gages on Arroyo Valle
Arroyo Valle at Pleasanton
Arroyo de la Laguna above Arroyo Valle
Max. = 115 cfs
Min. = 4.7 cfs
Arroyo de la Laguna near Pleasanton
South Bay Aqueduct Releases to Vallecitos Creek
Max. = 152 cfs
Min. = 5.1 cfs
Alameda Creek near Niles
1977 Total = 5.9 in.
NO RECORD
NO RECORD
inches
mm
Precipitation at Livermore County F.D.
Discharge cubic feet per second
Discharge cubic metres per second
WATER YEAR 1977


WATER YEAR 1978
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
South Bay Aqueduct releases to Arroyo Valle
Arroyo Valle near Livermore
Losses between Livermore and Pleasanton Gages on Arroyo Valle
Specific Conductance
Arroyo Valle at Pleasanton
Arroyo de la Laguna above Arroyo Valle
Max. = 1390 cfs
Min. = 4.9 cfs
Arroyo de la Laguna near Pleasanton
South Bay Aqueduct releases to Vallecitos Creek
Max. = 2000 cfs
Min. = 6.9 cfs
Alameda Creek near Niles
1978 Total = 19.0 in.
NO RECORD
Precipitation at Livermore County F.D.
Discharge cubic feet per second
Discharge cubic metres per second
inches
mm
WATER YEAR 1978

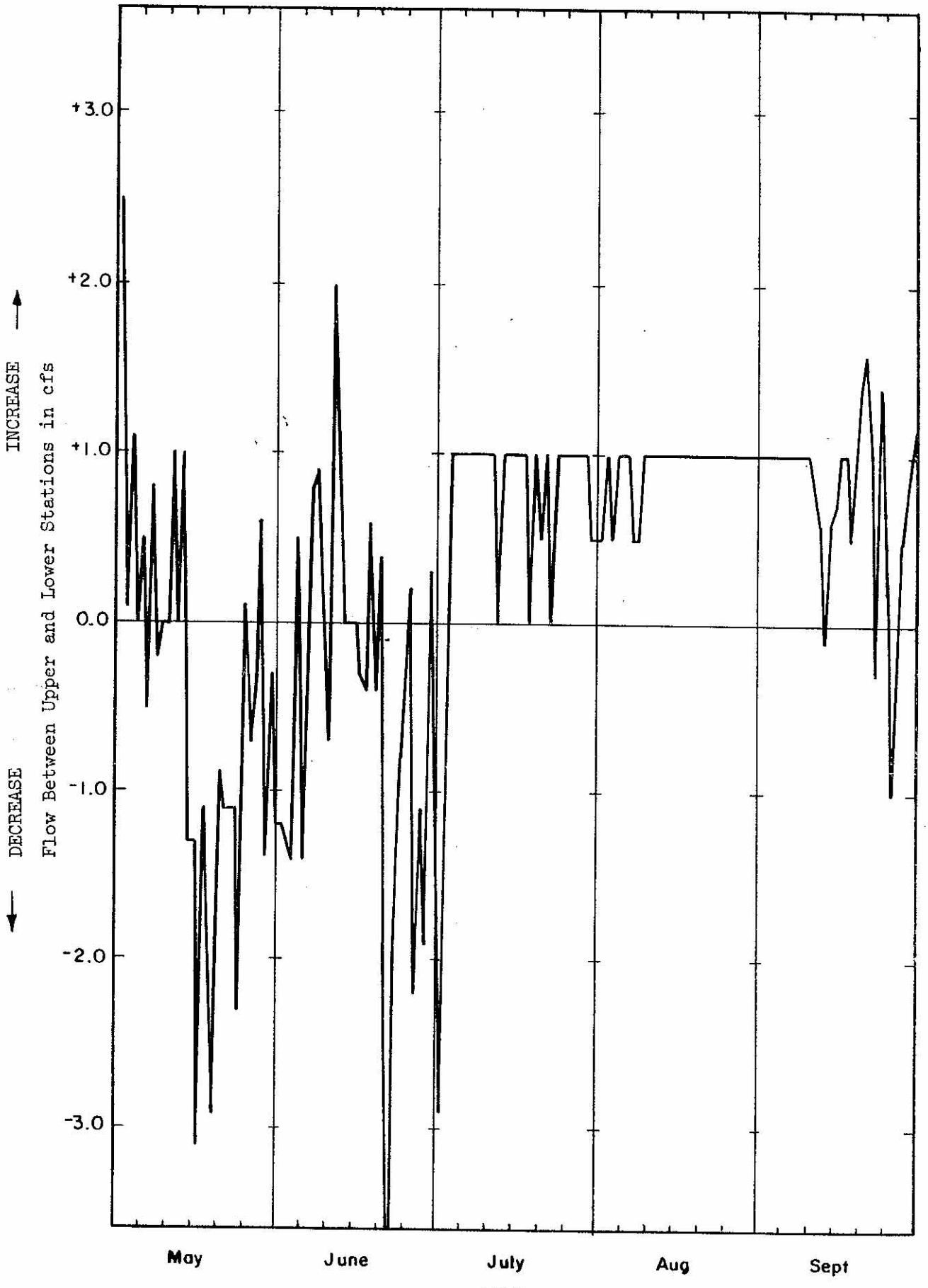

WATER YEAR 1979
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
South Bay Aqueduct releases to Arroyo Valle
Arroyo Valle near Livermore
Losses between Livermore and Pleasanton Gages on Arroyo Valle
Arroyo Valle at Pleasanton
Arroyo de la Laguna above Arroyo Valle
Arroyo de la Laguna near Pleasanton
South Bay Aqueduct releases to Vallecitos Creek
Alameda Creek near Niles
1979 Total = 13.6 In.
Precipitation at Livermore County F.D.
Discharge cubic feet per second
Discharge cubic metres per second
inches
WATER YEAR 1979


WATER YEAR 1980
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
South Bay Aqueduct releases to Arroyo Valle
Arroyo Valle near Livermore
Losses between Livermore and Pleasanton Gages on Arroyo Valle
Arroyo Valle at Pleasanton
Arroyo de la Laguna above Arroyo Valle
Arroyo de la Laguna near Pleasanton
South Bay Aqueduct releases to Vallecitos Creek
Alameda Creek near Niles
Precipitation at Livermore County F.D.
Discharge cubic feet per second
Discharge cubic metres per second
inches
mm
WATER YEAR 1980

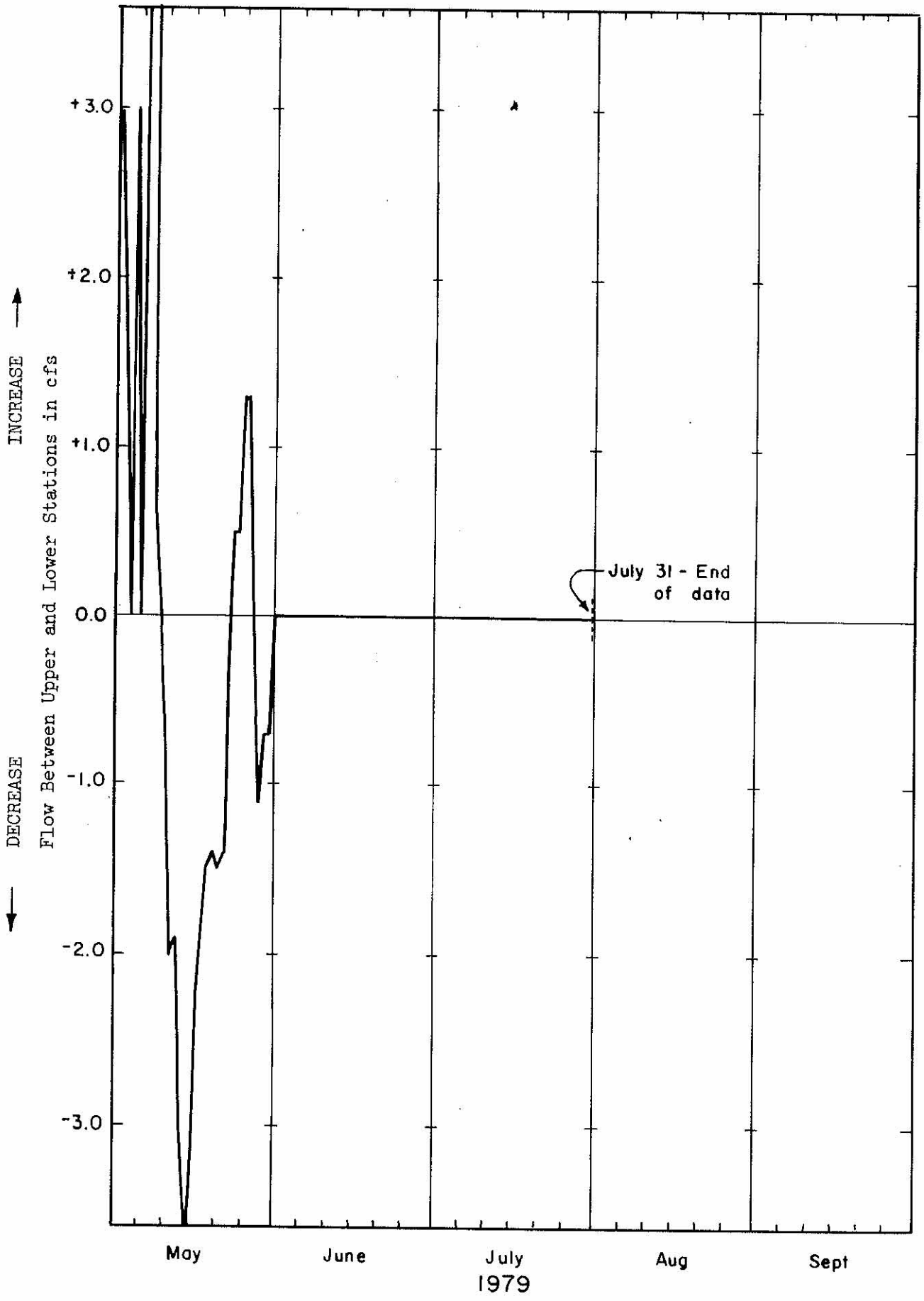
Comparison of Summer Flows at Arroyo de la Laguna near Pleasanton with the Summation of Flows at Arroyo de la Laguna above Arroyo Valle and Arroyo Valle at Pleasanton



("+" indicates an increase and "-" indicates a decrease in the flow as the water moves downstream. See the next two pages for continuation of plots.)


+3.0
+2.0
+1.0
0.0
-1.0
-2.0
-3.0
INCREASE
DECREASE
Flow Between Upper and Lower Stations in cfs
May
June
July
Aug
Sept

1978


+3.0
+2.0
+1.0
0.0
-1.0
-2.0
-3.0
INCREASE
DECREASE
Flow Between Upper and Lower Stations in cfs
July 31 - End of data
May
June
July
Aug
Sept
1979

APPENDIX B: LOCAL AGENCIES AND INDIVIDUALS CONTACTED

URBAN STREAM STUDY
ALAMEDA CREEK AGENCY CONTACTS

Agency	Representative
East Bay Regional Park District 11500 Skyline Boulevard Oakland, CA 94619 (415) 531-9300	Lewis P. Crutcher, Chief of Planning Peter Koos, Landscape Architect Karen Parsons, Landscape Architect
Alameda County Flood Control and Water Conservation District 399 Elmhurst Street Hayward, CA 94544 (415) 443-9300	Mun Mar, Chief of Water Resources Div. Jerry Killingstad, Supervising Civil Engr.
Alameda County Water District 38050 Fremont Boulevard Fremont, CA 94537 (415) 797-1970 (not a county agency)	Stanley R. Saylor, Chief Engineer Earl Lenahan, Senior Engineer
Livermore Area Recreation and Park District 71 Trevarno Road Livermore, CA 94550 (415) 447-7300	William T. Payne, General Manager
City of Pleasanton Park and Recreation Department City Hall 344 Division Street Pleasanton, CA 94566 (415) 846-3202	Bob Caperusso, Recreation Director
U. S. Army Corps of Engineers San Francisco District 211 Main Street San Francisco, CA 94105 (415) 556-4346	Wayne Olsen, Environmental Resources Planner
City of Livermore Planning Department 2250 First Street Livermore, CA 94550 (415) 449-4000	Howard Nies, Planning Director
Alameda County Mosquito Abatement District 3024 East 7th Street Oakland, CA 94601 (415) 533-7321	Fred C. Robert, Manager-Biologist

Agency	Representative
Arroyo Study Committee (now inactive) 420 Jackson Avenue Livermore, CA 94550 (415) 443-4513	Candace A. Simonen, Chairperson
Regional Water Quality Control Board San Francisco Bay Region 1111 Jackson Street, Room 6040 Oakland, CA 94607 8-415-464-1255	Harold Singer
Department of Fish and Game Region 3, Central District 411 Burgess Drive Menlo Park, CA 94025 8-415-326-0324	Keith Anderson, Assoc. Fishery Biologist

APPENDIX C: DESCRIPTION OF RECREATION SURVEY AREAS
(Corresponding Map - Figure 6)

DESCRIPTION OF RECREATION SURVEY AREAS

Area 1 - Includes Arroyo Mocho through Robertson Park in Livermore. The creek winds through the northern edge of the park. There are few large trees. Licorice weed and willow are the major plants near the creek. There are also large stands of aquatic watercress in the creek. Access to the creek is by dirt roads or a paved bicycle path that roughly follows it through the length of the park.

Area 2 - Arroyo Del Valle runs through Sycamore Grove Regional Park off Wetmore Road. This park has just opened after being closed for a year. Willow is the main riparian vegetation along with some cottonwood. Bird life is abundant. The creek may be reached by a paved bike path or horse trail. There is a Nature Area in the upper park which is open to foot traffic.

Area 3 - Arroyo Del Valle is crossed by Isabel Avenue, providing public access. Even though there is private land on both sides of the creek, there is recreation use at this area. Riparian vegetation consists mainly of willow and grass growing on gravel mounds.

Area 4 - Arroyo Del Valle is also accessible through the Shadow Cliffs Regional Recreation Area. The creek runs through two large gravel pits. Access is by walking a dirt road from Shadow Cliffs over a levee and down to the creek. Vegetation consists of bush with large cottonwoods, willows, and various types of berries. The gravel pits are very deep and provide good fishing and a pleasing recreational area.

Area 5 - Arroyo Del Valle runs through the City of Pleasanton and has access at several points. We chose a representative area off Golden Avenue near a DWR streamflow gage. This area is used frequently by children during the summer months. Vegetation consists of a few large oak trees overhanging the deeply trenched creek.

Area 6 - Arroyo de la Laguna has very little public access, as most of the creekside land is owned by private individuals or the San Francisco Water District, which has recently closed their portion of the creek to recreation use. We drove from Bernal Avenue along Foothill Road, crossed the creek again at Castlewood Drive to the Pleasanton-Sunol Road. The Verona Road Bridge was closed but broken glass scattered about suggests considerable use on the bridge, perhaps for beer-drinking parties.

Area 7 - After Arroyo de la Laguna enters Alameda Creek, there is an access area off Highway 84 just below Sunol. The railroad bridge crosses the creek here and there is a small dam with a decrepit fish ladder. The main vegetation is oak and willow. Litter is very bad.

Area 8 - This reach includes the next 6 km (4 mi) of creek along the highway. There are few suitable public access points, but people park, cross the railroad tracks, and walk down to the creek. Present access is hazardous.

Area 9 - This is a private campground with a day-use area. There is a grassy space, trash cans, and restrooms. There is also a small cafe-bar above the creek. Oak, willow, and some cottonwood make up the riparian vegetation. This is a commercial access site and there is a charge for day and overnight use.

Area 10 - This portion of the creek extends from Area 9 to the Union City-Fremont city limits. There are two swimming areas where small dams block the creek. Both of these have hazardous access and parking is prohibited, but recreationists park there anyway. Trash is a major problem here.

Area 11 - This is a day-use picnic area. The creek has been riprapped, so little vegetation remains. The picnic area has oak cover. There is a parking lot, picnic area, and fire trail.

Area 12 - Consists of the creek from the day-use picnic area (Area 11) to the Fremont-Union City city limits/ Access is off Old Canyon Road rather than Highway 84. Vegetation is quite dense, with oak, willow, and berries. Poison oak is also a problem. Crayfishing is popular here, as is swimming, fishing, and relaxing.

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

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