

**RIVERSIDE COUNTY FLOOD CONTROL AND  
WATER CONSERVATION DISTRICT  
RIVERSIDE, CALIFORNIA**

**REPORT ON**

**MASTER DRAINAGE PLAN  
FOR  
THE GREEN ACRES AREA**

**ZONE FOUR**

**JULY 1981**

**KENNETH L. EDWARDS  
CHIEF ENGINEER**

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MASTER DRAINAGE PLAN

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Green Acres Master Drainage Plan	Envelope
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## PURPOSE

The purpose of this report is to investigate and evaluate the drainage problems of the Green Acres area and to develop an economical drainage plan that considers flood protection of both existing development and potential future development.

The Green Acres watershed is located approximately 4 miles west of the City of Hemet on Highway 74. It is bounded on the east and west by natural divides within the Lakeview Mountains. The Juniper Flat area is located at the north boundary with the small community of Green Acres at the south boundary.

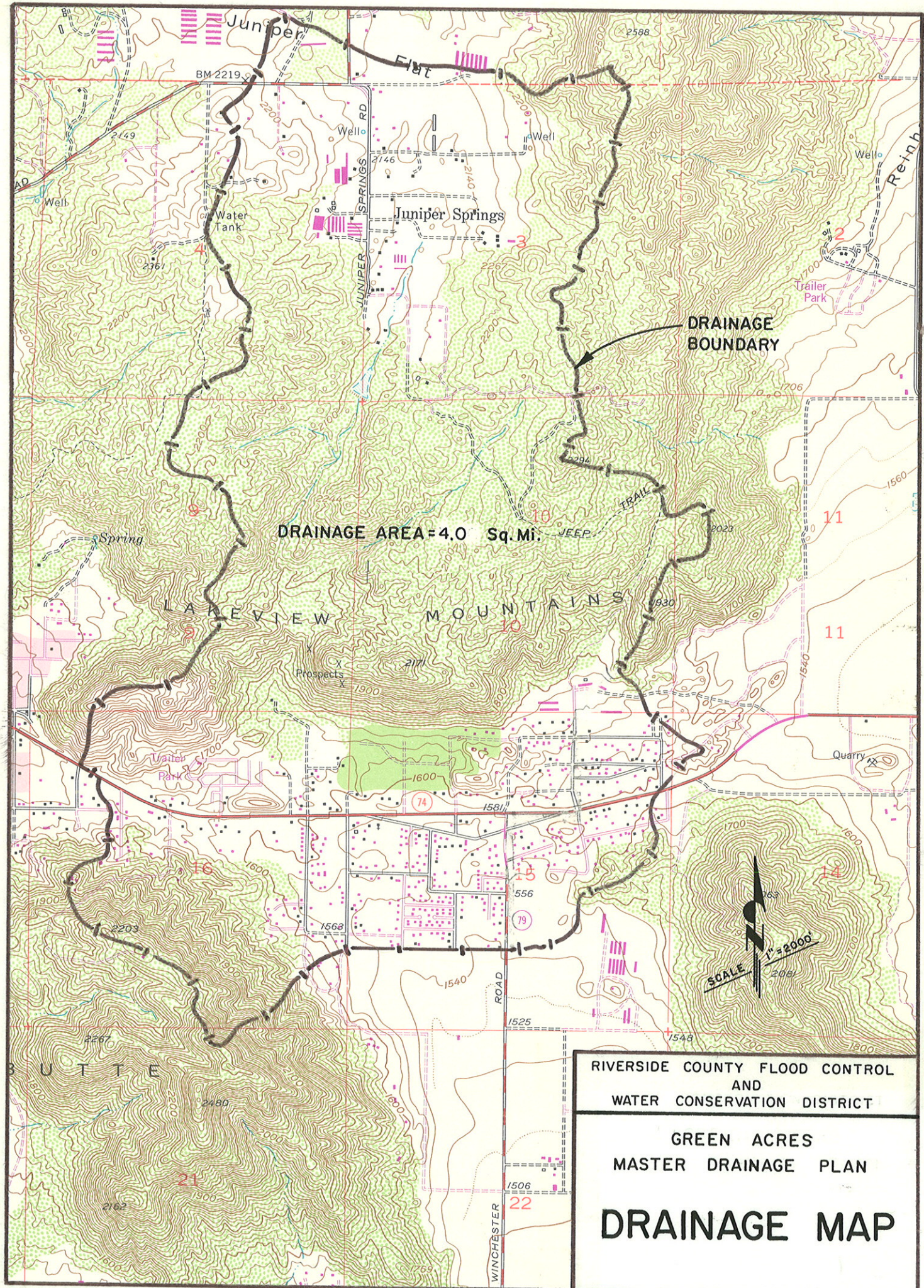
The plan presented herein, when implemented, will provide adequate flood protection to the community and will serve as a guide for the long term construction scheduling of the primary drainage facilities. The plan will also act as a guide for the location and sizing of local drainage facilities to be constructed by developers and others within the area.

It should be noted by the reader that the cover of this report clearly states it is a master plan and, therefore, it should be used with this in mind. Simply stated, this plan is an overview, a study of the drainage problems that exist in a specific geographical area, and a conceptual solution to those problems. As stated elsewhere in this report, the selection of the facilities presented in this plan is based on engineering and economic considerations and is by no means the only solution.

The alignment and location of the facilities proposed in this Master Drainage Plan are general; precise facility location will be dictated by conditions and other factors existing at the time of design. Similarly, the sizing information shown on the plates in this report as well as on the enclosed map is preliminary. A more detailed analysis performed at the design stage will determine final sizing.

## SCOPE

The drainage area covered by this plan is approximately 4.0 square miles, and ranges from moderately flat valley terrain to foothills with relatively steep slopes (See Page 2). The scope of this master plan includes:



RIVERSIDE COUNTY FLOOD CONTROL  
 AND  
 WATER CONSERVATION DISTRICT  
 GREEN ACRES  
 MASTER DRAINAGE PLAN  
**DRAINAGE MAP**

1. Determination of the quantity and points of concentration of storm runoff in the area.
2. Preparation of a drainage area map.
3. Determination of the location, size and capacity of the proposed drainage structures.
4. Investigation of alternate routes and methods as a basis for selecting the most economically and engineeringly sound plan.
5. Preparation of preliminary design plans and supporting cost estimates.

#### GENERAL DISCUSSION

This report provides a Master Drainage Plan for the Green Acres area. The proposed facilities in the plan include two major retention dams, several collector dikes and a network of open channels and underground storm drains located downstream of the dams and dikes. This proposed system will safely convey storm runoff through the community, outletting in the natural watercourses near Stetson Avenue, west of Winchester Road.

At present, during periods of runoff, the floodwaters, silt and other debris produced in the hills impact the community, causing property damage and leaving roads impassible. There are two mapped flood plains through the Green Acres community as shown on the National Flood Insurance Maps (See Page 4).

The Master Drainage Plan presented herein provides an economical method of collecting and conveying storm runoff through the study area. The proposed drainage structures will also provide an outlet for local drainage facilities built by developers and others as growth occurs in the area. When completed, the facilities will provide the area with improved drainage and protection from the once in 100 year flood.

#### CRITERIA

The underground storm drain facilities shown in this plan are proposed when the construction of open channels is not feasible, either because of topographic constraints or existing development. A storm drain in lieu of an open channel may be economically justifiable particularly when considering the cost of an easement for an underground facility as compared to fee title for an open channel. Fee title is generally two to four times more costly than an easement. All underground drains proposed in this plan have 100 year discharge capacity.

**FIRM**

**FLOOD INSURANCE RATE MAP**

**RIVERSIDE COUNTY,  
CALIFORNIA  
(UNINCORPORATED AREAS)**

**PANEL 2125 OF 3600**

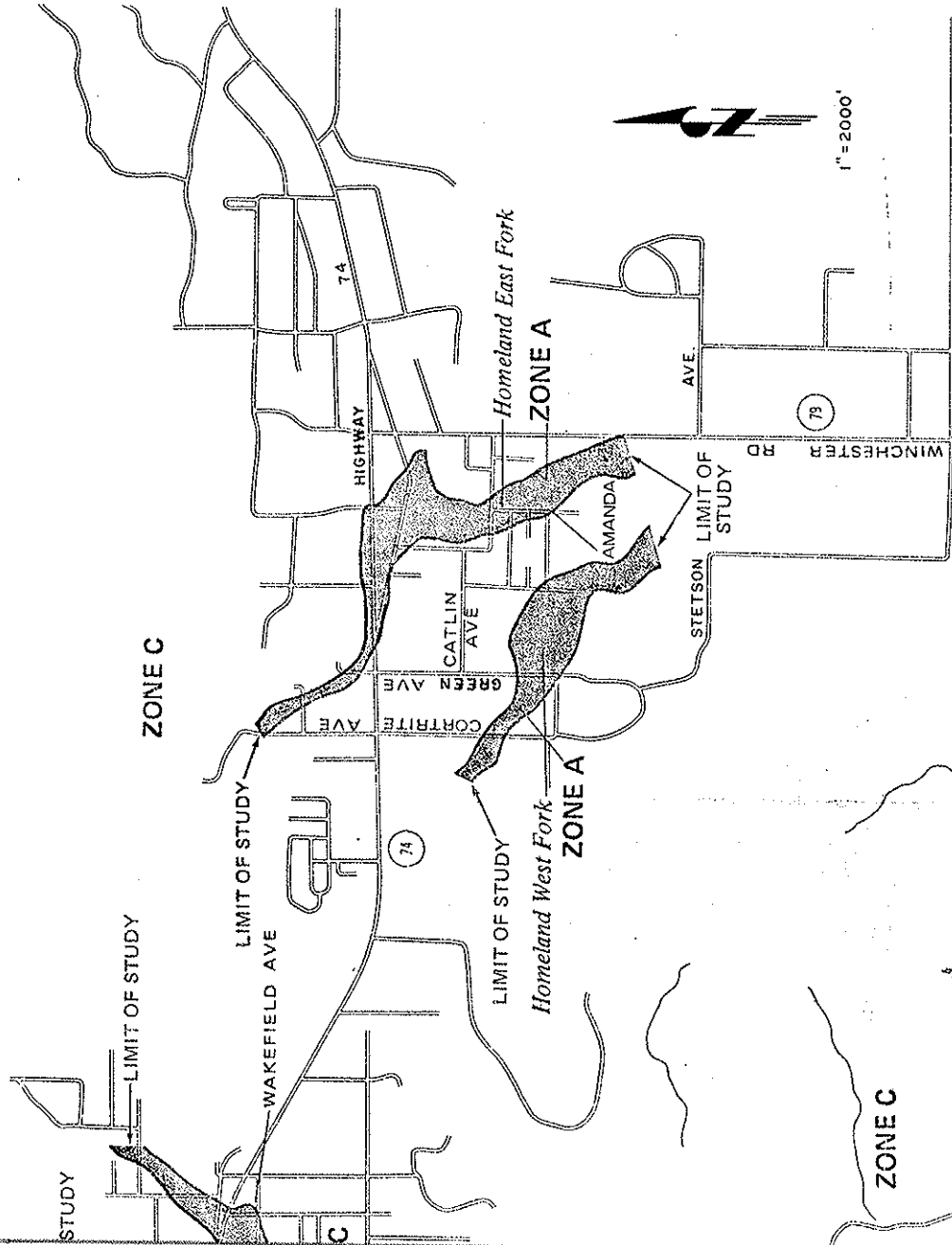
(SEE MAP INDEX FOR PANELS NOT PRINTED)

**COMMUNITY-PANEL NUMBER  
060245 2125 A**

**EFFECTIVE DATE:  
APRIL 15, 1980**



**U.S. DEPARTMENT OF HOUSING  
AND URBAN DEVELOPMENT  
FEDERAL INSURANCE ADMINISTRATION**



Open channels are generally considered the only economically feasible means of transporting large flood flows for any appreciable distance and are used where possible. In addition to their role as flow transporters, the open channels provide an outlet for the underground facilities proposed in this plan as well as local drainage facilities built by developers and others. All open channels proposed in this plan are designed to carry the runoff from a 100 year frequency storm.

The primary intent of the retention dams proposed in this plan is to reduce peak flow rates; that is, the outflow is much less than the inflow. The benefit of this concept is that the facilities needed downstream can be significantly reduced in size and cost. Due to the lesser flow rates the dams also serve as a means of collecting flows directing them into a single, confined outlet. The retention dams are designed to safely pass the 100 year storm through the outlet pipe and the 1000 year storm over the spillway.

The alignments and locations of all channels, drains and retention dams are based on hydraulic efficiency, the ability to drain tributary areas, and economics.

#### HYDROLOGY

The Synthetic Unit Hydrograph Method was used to determine all design discharges and storm volumes for the plan. Methodology and supportive data can be found in "The Riverside County Flood Control and Water Conservation District Hydrology Manual" dated April 1978.

#### RECOMMENDED IMPROVEMENTS

The recommended improvements discussed below are shown on the enclosed map found at the back of this report. Supporting data for all proposed facilities is available for review at the Riverside County Flood Control and Water Conservation District office. Estimated construction costs shown in Table I and on the enclosed map include right of way costs and 30% for engineering and administration contingencies.

##### Lines A, A-1 and A-2

Line A serves as the primary outlet for the Green Acres Dam and Line B. At its outlet just west of Winchester Road and approximately 600 feet upstream of Stetson Avenue, Line A is discharging runoff from a 3.1 square mile drainage area. Throughout most of its length Line A is a concrete lined trapezoidal channel, varying from 5 feet to 7.5 feet in depth and 3 feet to 6 feet in bottom width. The lower 1200 feet of channel is unlined with a 20 foot bottom and a varying

depth. The varying depth allows the flow to spill gradually from the channel in an effort to reinstate the natural flood plain that exists in this area. Downstream of Catlin Avenue, Line A is a 12 foot wide by 6 foot high underground box conduit, aligned in Amanda Avenue. Upstream, or northerly of the intersection of Amanda and Catlin Avenues, the channel crosses private property until it reaches the old highway, here it turns westerly, paralleling the road to the point where it joins the existing Highway 74. A double 10 foot wide by 5 foot high box culvert exists under Highway 74. Because of the reduced outflow resulting from Green Acres Dam and the channelization proposed upstream of the culvert, only one cell of the box culvert is to be utilized to pass the design discharge of 620 cfs under the highway. Upstream of the highway the channel traverses private property ultimately making its way to Green Acres Dam. The 100 year discharges for Line A vary from 620 cfs to 1300 cfs.

Line A-1 is a storm drain lateral to Line A. The line begins at the intersection of Amanda and Catlin Avenues and extends upstream in the street to the intersection of Ide and Catlin Avenues. Flows tributary to this point have caused many problems during the last several years, since the natural outlet has been blocked by several mobile homes. The proposed 39 inch reinforced concrete pipe (RCP) is capable of carrying the 100 year discharge of 80 cfs.

There currently exists under Highway 74, some 200 feet west of Amanda Avenue, a 48 inch corrugated metal pipe (CMP) culvert. Line A-2, a 48 inch reinforced concrete pipe, will connect to the downstream end of this CMP and extend southerly to outlet into Line A. Construction of a headwall on the upstream end of the existing CMP is necessary to enhance its inletting capabilities and minimize the threat of water passing over the highway.

#### Lines B and B-1

Line B is responsible for safely conveying the discharge from a 0.6 square mile drainage area that lies north of Highway 74 on the prolongation of Winchester Road. The line begins as a 66 inch RCP at its confluence with Line A, and extends upstream across Highway 74 before turning easterly. An open channel is used as the line moves east, parallel to Highway 74, to the vicinity of Truelson Avenue. At this point Line B once again reverts to an underground drain and proceeds north in Truelson Avenue to Clinton Avenue. It is at this point that Line B-1 confluences with Line B. Upstream of Clinton Avenue, Line B once

again is an open channel, the upstream terminus of which is met by a dike that will direct natural stream flows into the channel inlet. There currently exists a small earth dike in this area; however, its small size and the uncertainty of its structural integrity make it necessary to propose a concrete faced dike. The 100 year discharges for Line B vary from 290 cfs to 455 cfs.

Line B-1 is also a concrete faced diversion dike that directs a natural watercourse to Line B. The concrete facing extends below the natural ground to protect the dike from erosion damage. This is also true of the dike at the upper end of Line B. The two dikes and the watercourses they direct to Line B (drainage area of 0.48 square mile) will do much to relieve the general flooding that occurs between Truelson and Calvert Avenues, north of Highway 74.

#### Lines C, C-1 and C-2

The primary function of Line C is to provide an outlet for the Cortrite Dam. The line is reinforced concrete pipe, with the exception of the unlined daylight ditch at the downstream end of the line. Pipe diameters vary from 39 inches to 33 inches.

Lines C-1 and C-2 divert the 100 year discharge from two small watersheds, 41 acres and 60 acres respectively, into Cortrite Dam. In each case a collection dike and an underground drain is responsible for delivering the flows. Line C-1 is a 45 inch diameter reinforced concrete pipe with a design discharge of 62 cfs. Correspondingly, Line C-2 is 36 inches in diameter and designed for 90 cfs.

#### Green Acres Dam

The Green Acres Dam is to be located at the base of the Lakeview Mountains just west of Cortrite Avenue and approximately 2000 feet upstream of Highway 74. The drainage area contributing to the dam is slightly larger than two square miles and includes a portion of the Juniper Flat area. The 27 foot high earth fill dam will experience a 1400 cfs peak inflow rate in the 100 year storm. By limiting the outlet to a 75 inch diameter pipe, thus forcing temporary storage of a portion of the inflow, the outflow rate is reduced to a peak of 620 cfs. This reduction in peak flow rate reduces the size of the needed downstream facilities and the concomitant costs. Construction of the dam, even without the proposed downstream facilities, will provide a certain degree of relief from the potentially pernicious flows that emanate from this large watershed.

To assure that flows exceeding those anticipated in the 100 year storm do not jeopardize the safety of the dam, a spillway will be cut into the right abutment of the dam. The spillway will safely pass the 1000 year peak flow of 2050 cfs with 3.5 feet of freeboard remaining to the dam crest.

#### CORTRITE DAM

The Cortrite Dam, located 1000 feet south of Highway 74 on Cortrite Avenue, is very similar in concept to the Green Acres Dam, but is dealing with a smaller watershed of 0.5 square mile. Including the diverted flows of Lines C-1 and C-2, the 100 year peak inflow into the dam is 460 cfs; the outflow is 46 cfs. In order to maintain adequate cover over Lateral C-1 in Cortrite Avenue, it was necessary to lower the 20 inch outlet orifice for the dam to an elevation 6.5 feet below the basin bottom. (See details on Plate 14 of the preliminary plans.)

The spillway for the dam goes over the embankment and is capable of passing the 1000 year peak flow of 650 cfs with 2.6 feet of freeboard remaining to the dam crest.

#### GROUNDWATER

In 1980, surfacing groundwater became a problem in the area between Truelson Avenue and Calvert Avenue near Highway 74. Groundwater problems, including surface and near-surface flows of water, have caused septic tanks to malfunction and overflow, street pavements to fail and building foundations to be threatened. In the Green Acres community these problems have manifested themselves in the area roughly bounded by Truelson and Calvert Avenues and Highway 74 and Beverly Drive.

The cause of the high groundwater is diverse. The heavy rains during the winters of 1978-1980, resulted in significant surface runoff, much of which infiltrated the alluvial soils in the area thus raising the water table. Effluent from septic tanks has further contributed to the problem.

The solution to the problem is beyond the scope of this master plan; however, implementation of the plan may alleviate, to some degree, future groundwater problems by virtue of the drainage system's ability to carry those flows intercepted by Line B and Lateral B-1, out of the area before significant infiltration can take place.

The California State Department of Transportation (Cal Trans) has closed the outside, westbound lane of Highway 74 for a considerable distance easterly of Truelson Avenue.

The closure is the result of subgrade failure that is directly attributable to high groundwater. Cal Trans is proposing to deal with the problem by constructing a subdrain system at the edge of roadway together with a 24 inch outlet drain, which will carry the flows easterly toward California Avenue.

#### ALTERNATIVE STUDIES

In developing this Master Drainage Plan, a number of alternates were developed and studied for their feasibility, both hydraulically and economically.

One of the major alternatives explored concerned Line A. As an alternative to the proposed plan, the Green Acres Dam was deleted and Line A, beginning at Highway 74, was sized and costed for the full 100 year discharge of 1400 cfs. The result was a system of comparable cost to the proposed plan. The reasons for not selecting this alternative were several. First, since the line began at Highway 74, no protection was offered to the properties upstream. Second, and most important, construction of Green Acres Dam without the costly outlet system provides some protection to the downstream community, whereas, the alternative can not boast of such protection unless the entire line is constructed.

In the early stages of the master plan study it was found that a small dam exists at the southwest corner of Section 3 in the Juniper Flat area. (See Page ) The dam and lake are privately owned and have a contributing watershed of 1.17 square miles (the upper 55 percent of the Green Acres Dam watershed). It was thought that improvements could be made to the dam to bring it up to District standards. It was found upon further analysis, however, that the cost of the improvements could not be justified based upon the minor benefits derived downstream. The development of the proposed plan assumed the existing dam to be nonexistent in the future.

Flows tributary to Highway 74 between Truelson Avenue and Calvert Avenue encounter a very flat slope ( $s=.0015$ ) toward the east. To deal with the poor flow characteristics in this area, an alternative was investigated that attempted to carry flows from Calvert Avenue westerly to Truelson Avenue and Line B. An open channel along the highway frontage was desirable, but the current degree of development made it impractical. An underground drain was considered, but because it was bucking the natural grade it was quite large and, therefore, costly. With Cal Trans' interest in this area (see Groundwater section), it was felt that the system at Highway 74 and Calvert Avenue, could be expanded to include several catch basins.

As an alternative to the Cortrite Dam proposal, the dam was eliminated and replaced, at the same location, with two collector dikes. Because there was no peak reduction, the outlet facility was an open channel. The cost of this alternate was just slightly more than the proposal that includes the dam. The major factor that influenced the selection of the dam alternative was, as in the case of the Green Acres Dam, its ability to provide significant downstream protection, even without the costly outlet system.

In an attempt to further lessen the flooding impacts downstream of the Green Acres community (considerable benefit will be derived from the Green Acres and Cortrite Dams), another retention site, just downstream of Stetson Avenue and west of Winchester Road, was investigated. In order to have an appreciable effect on the flood peak, the dam required was very large; greater than 50 acre feet of storage, more than 2000 feet long, 14 feet high and inundated some recently subdivided lots. The dam was not costed, but because of its size and effect upon the new lots, it was assumed to be very costly and, therefore, not included in the plan.

In addition to the major alternates discussed above, a number of smaller alternates were studied and eventually disregarded as being too costly or not providing adequate protection.

In short, the Green Acres Master Drainage Plan, as presented herein, is the coalescence of the best alternatives explored.

#### CONCLUSIONS

Based on the studies and investigations made for this report, it is concluded that:

1. The Green Acres area has experienced serious flooding problems in the past. As growth in the area continues to increase so will these problems. A more orderly pattern of development can safely occur with the construction of the proposed facilities.
2. A drainage system is required to safely convey storm runoff through the area with the least interruption to public services. The Master Drainage Plan presented in this report is such a system and is the most economical of the alternatives studied.
3. The proposed plan lends itself to stage construction as funds become available.

4. The total cost of the recommended improvements, including right of way, engineering, contingencies and administration is estimated to be \$3,412,000 (See Table I).

#### RECOMMENDATIONS

It is recommended that:

1. The Master Drainage Plan as set forth herein be approved by the Riverside County Flood Control and Water Conservation District's Board of Supervisors as part of the overall master plan for the County.
2. The Master Drainage Plan as set forth herein be used as a guide for all future developments in the study area and that such developments be required to conform to the plan insofar as possible.
3. The right of way required for the plan be protected from encroachment.

TABLE I  
GREEN ACRES MASTER DRAINAGE PLAN

COST SUMMARY

LINE & REACH	CONSTRUCTION COST	30% ENGINEERING & ADMINISTRATION	RIGHT OF WAY	MASTER PLAN COST
LINE A				
Outlet to Catlin	\$ 233,000	\$ 69,000	\$ 89,000	\$ 391,000
Catlin to Amanda	152,000	46,000	36,000	234,000
Amanda to Hwy. 74	115,000	35,000	12,000	162,000
Hwy. 74 to Dam	176,000	52,000	65,000	293,000
SUBTOTAL	\$ 676,000	\$ 202,000	\$ 202,000	\$1,080,000
LINE A-1	\$ 97,000	\$ 30,000	\$ -0-	\$ 127,000
LINE A-2	22,000	6,000	1,000	29,000
SYSTEM A TOTAL	\$ 795,000	\$ 238,000	\$ 203,000	\$1,236,000
LINE A to Hwy. 74	\$ 151,000	\$ 46,000	\$ 1,000	\$ 198,000
Hwy. 74 to Truelson	140,000	42,000	7,000	189,000
Truelson to LINE B-1	196,000	58,000	-0-	254,000
LINE B-1 to End	71,000	21,000	42,000	134,000
SUBTOTAL	\$ 558,000	\$ 167,000	\$ 50,000	\$ 775,000
LINE B-1	44,000	14,000	37,000	95,000
SYSTEM B TOTAL	\$ 602,000	\$ 181,000	\$ 87,000	\$ 870,000
LINE C	\$ 221,000	\$ 65,000	\$ 22,000	\$ 330,000
LINE C-1	74,000	22,000	12,000	108,000
LINE C-2	25,000	7,000	3,000	35,000
SYSTEM C TOTAL	336,000	100,000	37,000	473,000
GREEN ACRES DAM	203,000	62,000	202,000	467,000
CORTRITE DAM	203,000	62,000	101,000	366,000
TOTAL	\$2,139,000	\$ 643,000	\$ 630,000	\$3,412,000