

RIVERSIDE COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT

RIVERSIDE, CALIFORNIA

REPORT ON
MASTER DRAINAGE PLAN
FOR
THE CITY OF RIVERSIDE
(LA SIERRA AREA)
ZONE ONE

JULY 1965

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RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
LA SIERRA WATERSHED
LA SIERRA MASTER DRAINAGE PLAN

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SUMMARY

The La Sierra area of the City of Riverside is experiencing rapid urban development which is causing serious drainage and flood control problems and considerable public inconvenience due primarily to the increased runoff created by such urban development.

A Master Drainage Plan is presented in this report which provides an economically feasible solution to the drainage problems in the La Sierra area. The plan consists of a series of underground storm drains and appurtenances that would intercept storm runoff before the street system becomes overloaded with flood waters. The storm drains would all discharge into the La Sierra Channel which serves as the main outlet drain for the entire La Sierra drainage area.

The recommended improvements, when constructed, will offer a high degree of protection to the residents of the La Sierra area and eliminate a great deal of public inconvenience that is now prevalent on the occurrence of normal rainfall. The total estimated cost of the plan is \$4,166.050.

INTRODUCTION

General Statement - The Riverside County Flood Control and Water Conservation District, in cooperation with the City of Riverside, is developing a Master Drainage Plan for the entire city. This report considers the southwesterly section of the city, commonly referred to as the La Sierra area. A report providing a Master Drainage Plan for the Central Area of Riverside was completed in 1961 and a report is being prepared on a master drainage plan for that area of the city located between the La Sierra area and Central area.

This report provides a Master Drainage Plan for the La Sierra Area. The plan consists of a network of underground storm drains, channels, and inlets which intercept surface runoff, thus reducing storm water damage and inconvenience to the public.

Purpose - The purpose of this report is to investigate and analyze the drainage problems within the La Sierra area and to develop an economically feasible master drainage plan. The master plan will serve as a guide in programming a coordinated storm drain construction program in the city, as well as influence land development and street design.

Scope - The general boundaries of the drainage area included in this study are Arlington Avenue on the north, the Riverside Freeway on the south, Van Buren Boulevard and the Arlanza area to the east, and the La Sierra hills to the west. The scope of the studies establishing the master plan include:

1. Determination of the amounts and points of concentration of storm runoff in the area.
2. Preparation of a drainage map showing all of the subdrainage areas tributary to each system of drains.
3. Location and size of all proposed storm drains and location of inlets which will be required for ultimate development of the plan.
4. Investigation of alternative routes and methods of control to assure the most economical and feasible alignments.
5. Preparation of preliminary design plans and cost estimates.

Description of the Problems - The La Sierra area is a typical example of a predominately rural-agricultural area being caught up in the population explosion and urban development in Southern California. There have been extensive single family subdivisions and multiple family or apartment developments constructed during the past few years. In 1964, the La Sierra area was annexed to the city of Riverside.

The drainage area comprises about 5,820 acres. The hills to the west are relatively steep and barren. Most of the remaining area is relatively flat with some small hills and rolling topography east of Jones Avenue.

In the past, storm runoff from the hills and orchards flowed through the streets and overland concentrating in a low along Hole Avenue between Mitchell and Jones Avenues. Downstream from Hole Avenue there was no well-defined wash or channel. An existing broad shallow swale with a very flat gradient provided the only means of draining the upstream area.

As a result of this condition storm runoff would pond extensively and flow very slowly from Hole Avenue downstream to Magnolia Avenue. As development began to take place and the flooding problems became more apparent, the local residents requested the District do something about the problem.

A key feature to any drainage or flood control plan is to be able to properly dispose of storm waters that are collected in a system of storm drains and channels. The natural point of disposal of storm runoff in the La Sierra area is the Arlington Valley Storm Channel which was constructed by the District in 1952. It was apparent several years ago that it would be necessary to construct a channel to convey the storm runoff through the La Sierra area to

the Arlington Channel. Therefore, in 1959, the District initiated construction of the La Sierra Channel. This channel has been a stage construction operation and is expected to be completed in 1966. The channel extends from the confluence with the Arlington Channel at Magnolia Avenue upstream to Norwood Avenue between Mitchell Avenue and La Sierra Avenue. The Jones Lateral Channel extends downstream from the intersection of Jones and Hole Avenues, joining the La Sierra Channel between Hole Avenue and Collett Avenue. These channels serve as an outlet for the drainage system described in this report and become an integral part of the Master Drainage Plan.

DISCUSSION

General - With the urbanization taking place in the La Sierra area and the increased storm runoff resulting from such urbanization it is not possible to carry all storm flows in the street. The damages and public inconvenience which would occur as a result of uncontrolled storm runoff in the developed area would cause a substantial economic loss to both individual property owners and the community.

The Master Drainage Plan presented herein provides an economical method of collecting storm runoff in a system of underground storm drains which would discharge into the La Sierra Channel. The plan provides a high degree of protection throughout the area and utilizes the street system to the greatest extent possible.

Criteria - The rational method of computing runoff, as adopted by the District and used for the other areas in the city, was used for this report. The basic equation for the rational method is $Q=CIA$, where Q is the quantity of flow in cubic feet per second; C is a runoff coefficient based on soil type, slope of land, type of development and intensity of rainfall; I is the rainfall intensity in inches per hour; and A is the size of a contributing area in acres.

The U. S. Soil Conservation Service was consulted regarding soil classification in the La Sierra area.

It was determined that two basic soil types, Placentia Loam and Hanford Fine Sandy Loam, exhibited similar permeability characteristics to the soils in the La Sierra area. Figure 1 delineates the areas where runoff coefficients were based on these soil types. Intensity duration curves have been developed for the Riverside area from U. S. Weather Bureau data and the curves used in this report are the same as those used for other areas in the city.

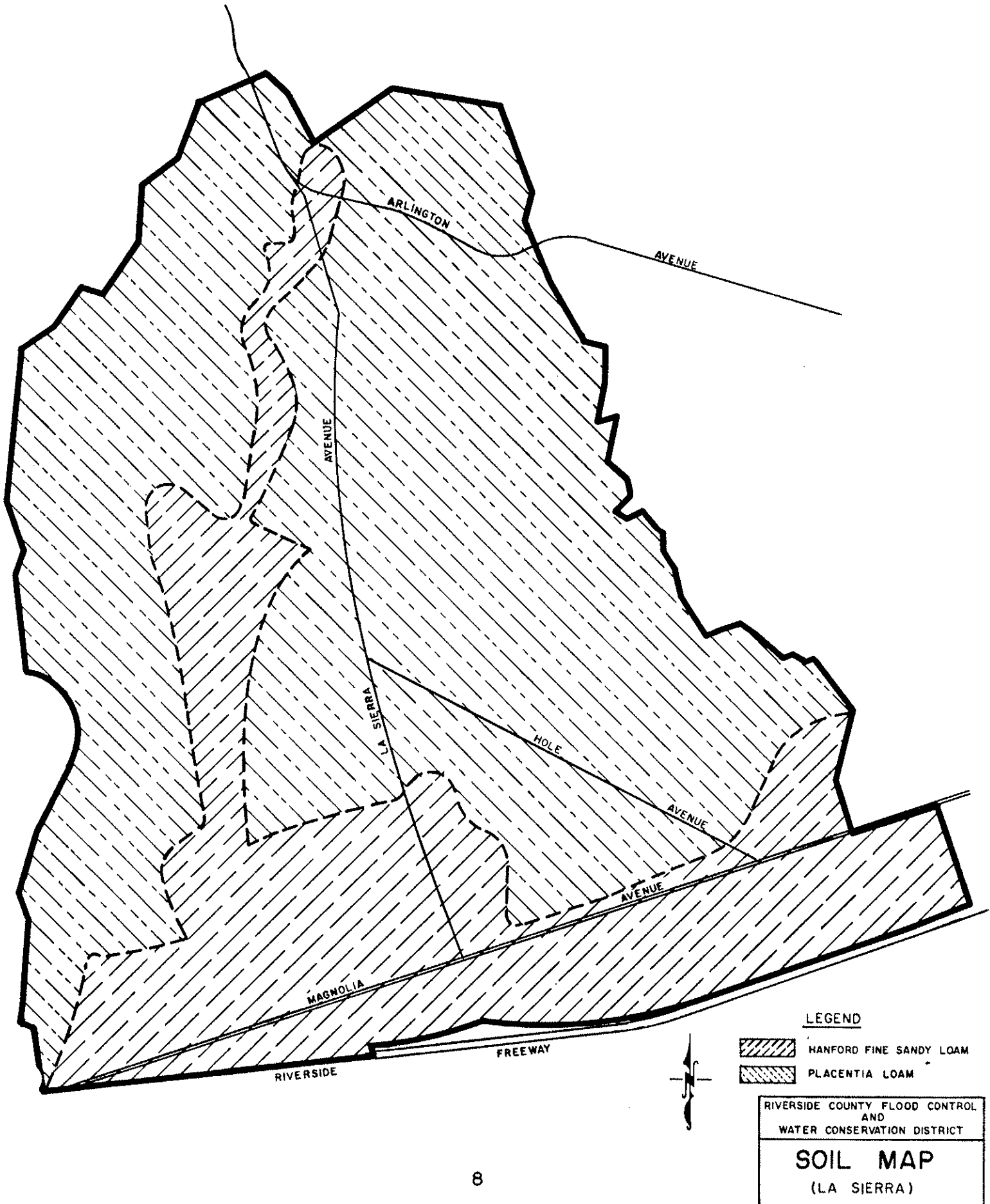
The storm drain network proposed in this report was developed on the basis of providing a drain when:

- (a) street flow reaches the top of curb level,
- (b) relief for a major street intersection is needed,
- (c) economic considerations dictated a diversion from the normal path of storm flows.

In all open or undeveloped areas drainage efficiency and storm drain economics were the prevalent factors which influenced alignments of the drains and assumed future street patterns. Where a significantly different street pattern is adopted than that indicated in the plan, the preliminary storm drain design must be reevaluated.

Maps and Plates - A map depicting the drainage plan is included as Plate 2 and a composite drainage map is included in the report as Plate 51. Preliminary plan and profile drawings indicating pertinent details for each storm drain are also included in this report (Plates 3 to 50).

FIG. 1



Recommended Improvements

La Sierra Avenue Storm Drain - The La Sierra Avenue Storm Drain serves the northwestern section of the drainage area. The drain is designed to intercept flows from an existing asphalt lined channel located near the intersection of La Sierra and Arlington Avenues. These flows, in addition to side drainage intercepted at various points in La Sierra Avenue, are to be carried underground to the upstream end of the La Sierra Channel located near Mitchell and Norwood Avenues. Preliminary plan and profile drawings of the drain are shown on Plates 3 to 6. The estimated construction cost is \$376,500.

Lateral "A" - This lateral is designed to intercept runoff from the hills west of the Arlington Avenue - La Sierra Avenue intersection. The drain extends from the base of the hills easterly in a future street to the confluence with the La Sierra Avenue Storm Drain. A preliminary plan and profile of the drain is shown on Plate 7. The estimated construction cost is \$27,070.

Alpine Way Lateral - The Alpine Way Lateral drains a sump area located in Arlington Avenue east of La Sierra Avenue. The drain is aligned in a natural low and is to conform to a future street alignment. The drain extends southerly from

the low in Arlington Avenue to Alpine Way and thence westerly to the La Sierra Avenue Storm Drain. A preliminary plan and profile of the drain is shown on Plate 8. The estimated construction cost is \$60,310.

Gramercy Place Storm Drain - The Gramercy Place Storm Drain is designed to take flows out of a street which has been designated by the City to be a major east-west arterial street. Runoff is to be intercepted in a newly subdivided area at the intersection of Peacock Lane and Barclay Place and carried in an underground storm drain southerly to Gramercy Place, thence easterly in Gramercy Place to the confluence with the La Sierra Avenue Storm Drain. Preliminary plan and profile drawings are shown on Plates 9 to 11. The estimated construction cost is \$210,180.

Mitchell Avenue Storm Drain - The Mitchell Avenue Storm Drain serves the north-central section of the drainage area. The drain is designed to eliminate runoff in Arlington and Mitchell Avenues. Flows are intercepted in an underground drain near the Sandy-Arlington Avenue intersection and carried easterly to Mitchell Avenue. The drain then proceeds southerly in Mitchell Avenue to the upstream end of the La Sierra Channel at Norwood Avenue. Preliminary plan and profile drawings of the drain are shown on Plates 12 to 15. The estimated construction cost is \$414,400.

Arlington Avenue Lateral - The Arlington Avenue Lateral intercepts runoff in Arlington Avenue approximately 400 feet east of Mitchell Avenue and extends westerly to the confluence with the Mitchell Avenue Storm Drain. A preliminary plan and profile is shown on Plate 16. The estimated construction cost is \$12,980.

Cypress Avenue Lateral - This lateral is designed to intercept runoff at the intersection of Cypress and Stover Avenues that normally proceeds overland in a southerly direction. The drain extends in a westerly direction in Cypress Avenue about 750 feet to the Mitchell Avenue Storm Drain. A preliminary plan and profile of the lateral is shown on Plate 17. The estimated construction cost is \$29,010.

Campbell Avenue Lateral - The Campbell Avenue Lateral drains an area tributary to Campbell and Norwood Avenues. The lateral begins at the intersection of Campbell and Norwood Avenues and proceeds west in Campbell Avenue to the Mitchell Avenue Storm Drain. A preliminary plan and profile is shown on Plate 18. The estimated construction cost is \$33,810.

Jones Avenue Storm Drain - The Jones Avenue Storm Drain serves the northeastern section of the La Sierra area. The drain begins at the intersection of Keller and Tyler Avenues

and proceeds west in Keller Avenue to Jones Avenue, thence southerly in Jones Avenue to the intersection of Jones and Hole Avenues where the drain discharges into Jones Lateral Channel. Preliminary plan and profile drawings of the drain are shown on Plates 19 to 22. The estimated construction cost is \$297,760.

Cook Avenue Lateral - This lateral intercepts flows at the intersection of Mobley and Cook Avenues and extends westerly in Cook Avenue to the intersection of Jones and Cook Avenues where it joins the Jones Avenue Storm Drain. A preliminary plan and profile is shown on Plate 23. The estimated construction cost is \$25,720.

Hole Avenue Storm Drain - The Hole Avenue Storm Drain is designed to relieve a serious drainage problem along Hole Avenue between Jones Avenue and Bonita Avenue and a large area north and west of the County Hospital. This drain begins about 800 feet west of Harrison Street in Bolton Avenue and proceeds in a southerly and then westerly direction to the intersection of Bonita and Tyler Avenues. This portion of the drain is aligned in a natural low which should be adaptable to a future street layout. From the intersection of Bonita and Tyler Avenues the drain extends southerly in Bonita Avenue to Hole Avenue and thence westerly in Hole Avenue, terminating at the Jones Lateral Channel. Preliminary plan and profile drawings of the drain are shown on Plates 24 to 28. The estimated construction cost is \$387,050.

Mobley Avenue Lateral - The Mobley Avenue Lateral intercepts runoff that concentrates approximately 500 feet north of Hole Avenue in Mobley Avenue. At present flows meander overland through commercial property fronting on Hole Avenue. This drain begins about 500 feet north of Hole Avenue and proceeds southerly in Mobley Avenue to Hole Avenue. A preliminary plan and profile of the drain is shown on Plate 29. The estimated construction cost is \$16,260.

Norwood Avenue Storm Drain - This storm drain is designed to drain the area between Gramercy Place and Norwood Avenue, and Sierra Vista Avenue and La Sierra Avenue. The drain begins at Rindge Road and proceeds easterly in Norwood Avenue to the La Sierra Channel. Preliminary plan and profile drawings of the drain are shown on Plates 30 and 31. The estimated construction cost is \$92,800.

Norwood Avenue Lateral - The Norwood Avenue Lateral drains the street intersection at Mitchell and Norwood Avenues. The lateral extends westerly in Norwood Avenue from the intersection to the La Sierra Channel. A preliminary plan and profile of the lateral is shown on Plate 32. The estimated construction cost is \$9,370.

Bushnell Avenue Lateral - This lateral drains the street intersection at Mitchell and Bushnell Avenues. The lateral

extends from the intersection westerly in Bushnell Avenue to the La Sierra Channel. A preliminary plan and profile of the lateral is shown on Plate 33. The estimated construction cost is \$18,820.

Wells Avenue Lateral - This lateral drains the street intersection at Mitchell and Wells Avenue. The lateral extends westerly in Wells Avenue from the intersection to the La Sierra Channel. A preliminary plan and profile of the drain is shown on Plate 34. The estimated construction cost is \$9,410.

Pierce Place Storm Drain - The Pierce Place Storm Drain is designed to relieve a major east-west arterial street in the commercial shopping area in La Sierra. The limits of the drain are as follows: Beginning at Rindge Road and Pierce Place the drain extends northeasterly in Pierce Place to La Sierra Avenue, thence southeasterly in Hole Avenue to the La Sierra Channel. Preliminary plan and profile drawings of this drain are shown on Plates 35 and 36. The estimated construction cost is \$88,100.

Kaselack Avenue Storm Drain - This storm drain serves the southwesterly portion of the drainage area, draining a large hillside area. The drain will intercept flows that in the past have flooded the commercial shopping area. The drain

begins at the intersection of Norwood Avenue and Peacock Lane and extends easterly in Norwood Avenue to Sierra Vista Avenue, thence southerly in Sierra Vista Avenue to Pierce Street in the vicinity of La Sierra College. The drain then follows an easterly direction to the intersection of Schuyler Avenue and the extension of Kaselack Avenue and thence south to the La Sierra Channel. The drain becomes an open channel south of Collett Avenue due to economic and engineering considerations. Preliminary plan and profile drawings of the drain are shown on Plates 37 to 40. The estimated construction cost is \$353,130. The estimated cost of right of way for the open channel is \$13,600.

Pierce Street (North and South Laterals)- The North Lateral drains Pierce Street south of Collett Avenue. This drain intercepts runoff that concentrates approximately 1100 feet south of Collett Avenue and extends southerly in Pierce Street to the La Sierra Channel. A preliminary plan and profile is shown on Plate 41. The estimated construction cost is \$51,120.

The South Lateral intercepts flows from a drainage ditch located in the freeway right of way. The freeway drainage ditch carries flows from Magnolia Avenue along the freeway to Pierce Street. The drain is about 260 feet long, beginning at the freeway right of way and extending north

in Pierce Street to the La Sierra Channel. A preliminary plan and profile is shown on Plate 41. The estimated construction cost is \$8,990.

Collett Avenue Storm Drain - The Collett Avenue Storm Drain is designed to intercept storm flows at Polk Avenue. The drain begins at Polk Avenue and extends west in Collett Avenue to the La Sierra Channel. A major portion of this storm drain has been constructed by a subdivider. Approximately 940 feet remains to be constructed to complete the drain. A preliminary plan and profile of the portion of the drain to be constructed is shown on Plate 42. The estimated construction cost is \$21,730.

Cochran Avenue Storm Drain - This storm drain intercepts flows at Polk Street and Cochran Avenue and carries them westerly in Cochran Avenue to the confluence with the Magnolia Avenue Storm Drain. Preliminary plan and profile drawings are shown on Plates 43 and 44. The estimated construction cost is \$82,030.

Magnolia Avenue Storm Drain - The Magnolia Avenue Storm Drain is a major facility that serves the southerly part of the drainage area and drains a major arterial street. The drain begins at Harrison Street near the County Hospital and proceeds west in Magnolia Avenue to La Sierra Avenue, thence

north in La Sierra Avenue to the intersection with Cochran Avenue, thence northwesterly to the La Sierra Channel. Preliminary plan and profile drawings of the drain are shown on Plates 45 to 50. The estimated construction cost is \$530,180.

Inlets - Inlets are an integral part of any storm drain system as they provide the means of taking flow from the street into the drain. The inlets to be used in this plan are primarily curb opening type catch basins. Field investigations have been made in order to generally establish basin locations. Existing catch basins were located and are utilized in the proposed plan. Table I lists the location of existing and proposed catch basins and the lengths of curb opening required to intercept the storm runoff.

* * * * *

TABLE I

PROPOSED INLETS FOR MASTER DRAINAGE PLAN

Line	Drainage Area No.	Location	Proposed Inlets (Feet)		
			Total	Exist- ing	Pro- posed
La Sierra	79	La Sierra @ Lat. "A"	4	0	4
Ave. Storm Drain	79	" " @ Alhambra Rd.	4	0	4
	80	" " @ Future St.	4	0	4
	80	" " @ Alpine Way	4	0	4
	80,81	" " @ Cypress	32	0	32
	83,83A	" " 1200' S/o Cypress	30	0	30
	82,84	" " @ Campbell	32	0	32
Lateral "A"	79	Future St. W/o La Sierra	63	0	63
Alpine Way	64	Arlington	40	15	25
Lateral	65	Alpine Way E/o La Sierra	30	0	30
Gramercy Pl. Storm Drain	87	Peacock Lane @ Barclay	140	0	140
	37	Gramercy @ Peacock Lane	72	0	72
	85	" @ Rindge	30	0	30
	86	" @ La Sierra	31	4	27
Mitchell Ave. Storm Drain	62	Sandy Ave.	51	0	51
	62	Arlington @ Mitchell	25	6	19
	61,63,66	Mitchell @ Cypress	41	0	41
	67,68	" @ Campbell	37	0	37
	109,109A	" @ Gramercy	55	0	55
Arlington Ave. Lateral	60	Arlington	37	9	28
Cypress Ave. Lateral	54-59	Cypress @ Stover	62	0	62
Campbell Ave. Lateral	70-77	Campbell @ Norwood	42	0	42
	78	" @ Stover	5	0	5
	69	" @ Mitchell	31	0	31

TABLE I
PROPOSED INLETS FOR MASTER DRAINAGE PLAN

Line	Drainage Area No.	Location	Proposed Inlets (Feet)		
			Total	Exist- ing	Pro- posed
Jones Ave. Storm Drain	1,2,3	Tyler @ Keller	50	0	50
	6,7,8,9	Jones @ "	45	0	45
	4,5,10,11	" @ Gramercy	35	0	35
	12,13	" @ Hedrick	21	0	21
	14-16	" @ Wells	35	0	35
	17-20	" @ Mobley	28	0	28
	22,23	" @ Cook	10	0	10
	27	" @ Hole	8	8	0
Cook Ave. Lateral	21,24-26	Cook @ Mobley	70	0	70
Hole Ave. Storm Drain	45	Bolton	44	0	44
	44,46,47	Megginson @ Co. Farm Road	43	0	43
	43	" @ John	18	0	18
	28-40	Tyler @ Bonita	57	0	57
	41,41A	" @ "			
	42,48,53	Hole @ "	26	0	26
	48	" @ Mobley	4	0	4
	50-52	" @ Polk	12	0	12
Mobley Ave. Lateral	49	Mobley	40	0	40
Norwood Ave. Storm Drain	89	Norwood @ Rindge	37	0	37
	90	" @ La Sierra	30	0	30
Norwood Ave. Lateral	91A	Norwood @ Mitchell	32	0	32
Bushnell Ave. Lateral	92-96	Bushnell E/o Mitchell	40	0	40
	97	" @ Mitchell	8	0	8
Wells Ave. Lateral	100-105,108	Wells @ Mitchell	37	0	37
Pierce Pl. Storm Drain	135	Pierce @ Rindge	37	0	37
	136	" @ La Sierra	20	0	20

TABLE I

PROPOSED INLETS FOR MASTER DRAINAGE PLAN

Line	Drainage Area No.	Location	Proposed Inlets (Feet)		
			Total	Exist- ing	Pro- posed
Kaselack Ave.	88	Norwood @ Peacock	92	0	92
Storm Drain	134	Sierra Vista @ Hazeldell	65	0	65
	127	Pierce @ La Sierra College	43	7	36
	128	Future St. N/o Collett	56	0	56
	129	Collett @ Kaselack	18	0	18
Pierce St.	131,132,	Pierce	100	0	100
N. Lateral	133,154A				
Pierce St.	115,125,	Pierce @ State Hwy. R/W	41	0	41
S. Lateral	126,153				
Collett Ave.	120-123	Collett @ Polk	10	0	10
Storm Dr.	124,143,145	" W/o Polk	20	20	0
Cochran Ave.	117	Cochran @ Polk	32	0	32
Storm	118	" @ Jones	21	0	21
Drain	119	" @ La Sierra	21	0	21
Magnolia Ave.	110,110A	Magnolia @ Harrison	50	6	44
Storm Dr.	111,111A	" @ Hughes Alley	30	9	21
	112	" @ Tyler	24	6	18
	113	" @ Polk	24	0	24
	114	" @ La Sierra	28	9	19
La Sierra Channel	98,99,137	Bushnell @ Channel	7	0	7
	138,140	Hole @ Channel	7	0	7
	107,141	Future St. @ Channel	18	0	18
	139,142	La Sierra @ "	70	0	70
	144-146				
	144A,147-150	Golden @ Channel	67	0	67
	116,130	Kaselack @ "	52	0	52
	151,152	" @ "			
	155A,158	Buchanan @ "	16	0	16
	156,157,160	Magnolia @ "	16	0	16
	159	Sampson @ "	22	0	22

Alternative Studies - Alternative studies were made of the alignment of several proposed storm drains along with consideration of retention basins to reduce pipe sizes. The alignments as proposed are the most economical and provide a more balanced discharge of storm waters into the La Sierra Channel throughout its length. Because of the lack of adequate sites and high land costs, retention basins were found to be uneconomical.

Estimated Cost - The estimated cost of construction for each storm drain is tabulated in Table II. Unit prices used in determining costs are based on present (July 1965) price levels. The costs for each drainage system, including engineering, contingency and right of way costs, are summarized in Table III.

TABLE II

PRELIMINARY CONSTRUCTION COST ESTIMATE

<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
<u>LA SIERRA AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	450	\$ 19.00	\$ 8,550
24-inch RCP	L.F.	630	16.00	10,080
36-inch RCP	L.F.	2,150	20.75	44,610
45-inch RCP	L.F.	350	28.25	9,890
54-inch RCP	L.F.	670	35.50	23,790
57-inch RCP	L.F.	1,990	37.75	75,120
60-inch RCP	L.F.	1,650	43.00	70,950
8'-6"x 3'-0" RCB	C.Y.	195	75.00	14,630
9'-0"x 5'-0" RCB	C.Y.	1,170	75.00	87,750
Catch Basins	Ea.	15	775.00	11,630
Manholes	Ea.	26	750.00	<u>19,500</u>
Total				\$376,500
 <u>LATERAL "A"</u>				
18-inch RCP	L.F.	180	\$ 19.00	\$ 3,420
27-inch RCP	L.F.	1,000	16.75	16,750
Catch Basins	Ea.	6	775.00	4,650
Manholes	Ea.	3	750.00	<u>2,250</u>
Total				\$ 27,070
 <u>ALPINE WAY LATERAL</u>				
18-inch RCP	L.F.	180	\$ 19.00	\$ 3,420
33-inch RCP	L.F.	2,070	20.00	41,400
36-inch RCP	L.F.	260	21.50	5,590
Catch Basins	Ea.	6	775.00	4,650
Manholes	Ea.	7	750.00	<u>5,250</u>
Total				\$ 60,310

TABLE II

PRELIMINARY CONSTRUCTION COST ESTIMATE

<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
<u>GRAMERCY PLACE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	810	\$ 19.00	\$ 15,390
33-inch RCP	L.F.	80	19.00	1,520
39-inch RCP	L.F.	990	23.75	23,510
48-inch RCP	L.F.	2,200	31.25	68,750
51-inch RCP	L.F.	1,760	33.00	58,080
Catch Basins	Ea.	27	775.00	20,930
Manholes	Ea.	14	750.00	10,500
Sewer Relocation	L.S.		11,500.00	<u>11,500</u>
Total				\$210,180
 <u>MITCHELL AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	450	\$ 19.00	\$ 8,550
33-inch RCP	L.F.	1,170	19.50	22,820
42-inch RCP	L.F.	1,630	27.25	44,420
54-inch RCP	L.F.	2,085	36.25	75,580
69-inch RCP	L.F.	2,050	50.50	103,530
7'-6" x 3'-0" RCB	C.Y.	240	75.00	18,000
13'-5" x 5'-0" RCB	C.Y.	1,430	75.00	107,250
Catch Basins	Ea.	20	775.00	15,500
Manholes	Ea.	25	750.00	<u>18,750</u>
Total				\$414,400
 <u>ARLINGTON AVENUE</u>				
<u>LATERAL</u>				
18-inch RCP	L.F.	90	\$ 19.00	\$ 1,710
33-inch RCP	L.F.	420	19.50	8,190
Catch Basins	Ea.	3	775.00	2,330
Manholes	Ea.	1	750.00	<u>750</u>
Total				\$ 12,980

TABLE II

PRELIMINARY CONSTRUCTION COST ESTIMATE

<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
<u>CYPRESS AVENUE</u>				
<u>LATERAL</u>				
18-inch RCP	L.F.	180	\$ 19.00	\$ 3,420
42-inch RCP	L.F.	770	25.25	19,440
Catch Basins	Ea.	6	775.00	4,650
Manholes	Ea.	2	750.00	<u>1,500</u>
Total				\$ 29,010
 <u>CAMPBELL AVENUE</u>				
<u>LATERAL</u>				
18-inch RCP	L.F.	240	\$ 19.00	\$ 4,560
21-inch RCP	L.F.	520	16.00	8,320
27-inch RCP	L.F.	700	16.75	11,730
Catch Basins	Ea.	8	775.00	6,200
Manholes	Ea.	4	750.00	<u>3,000</u>
Total				\$ 33,810
 <u>JONES AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	660	\$ 19.00	\$ 12,540
36-inch RCP	L.F.	1,950	21.50	41,930
42-inch RCP	L.F.	750	25.25	18,940
45-inch RCP	L.F.	1,505	27.50	41,390
54-inch RCP	L.F.	1,950	35.50	69,230
60-inch RCP	L.F.	460	40.50	18,630
6'-6" x 5'-6" RCB	C.Y.	270	75.00	20,250
9'-0" x 5'-6" RCB	C.Y.	124	75.00	9,300
Catch Basins	Ea.	22	775.00	17,050
Manholes	Ea.	20	750.00	15,000
Sewer Relocation	L.S.		33,500.00	<u>33,500</u>
Total				\$297,760

TABLE II
PRELIMINARY CONSTRUCTION COST ESTIMATE

Description	Unit	Quantity	Unit Price	Total
<u>COOK AVENUE</u>				
<u>LATERAL</u>				
18-inch RCP	L.F.	210	\$ 19.00	\$ 3,990
33-inch RCP	L.F.	800	18.50	14,800
Catch Basins	Ea.	7	775.00	5,430
Manholes	Ea.	2	750.00	<u>1,500</u>
Total				\$ 25,720
 <u>HOLE AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	720	\$ 19.00	\$ 13,680
42-inch RCP	L.F.	1,600	24.75	39,600
45-inch RCP	L.F.	1,900	28.75	54,630
48-inch RCP	L.F.	1,700	32.75	55,680
51-inch RCP	L.F.	995	33.00	32,840
54-inch RCP	L.F.	1,280	35.50	45,440
72-inch RCP	L.F.	1,750	51.50	90,130
Catch Basins	Ea.	24	775.00	18,600
Manholes	Ea.	27	750.00	20,250
Sewer Relocation	L.S.		16,200.00	<u>16,200</u>
Total				\$387,050
 <u>MOBLEY AVENUE</u>				
<u>LATERAL</u>				
18-inch RCP	L.F.	120	\$ 19.00	\$ 2,280
36-inch RCP	L.F.	500	20.25	10,130
Catch Basins	Ea.	4	775.00	3,100
Manholes	Ea.	1	750.00	<u>750</u>
Total				\$ 16,260

TABLE II
PRELIMINARY CONSTRUCTION COST ESTIMATE

Description	Unit	Quantity	Unit Price	Total
<u>NORWOOD AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	180	\$ 19.00	\$ 3,420
30-inch RCP	L.F.	1,780	18.50	32,930
36-inch	L.F.	1,600	24.75	39,600
Catch Basins	Ea.	6	775.00	4,650
Manholes	Ea.	10	750.00	7,500
Sewer Relocation	L.S.		4,700.00	<u>4,700</u>
Total				\$ 92,800
 <u>NORWOOD AVENUE</u>				
<u>LATERAL</u>				
18-inch RCP	L.F.	90	\$ 19.00	\$ 1,710
24-inch RCP	L.F.	300	15.25	4,580
Catch Basins	Ea.	3	775.00	2,330
Manholes	Ea.	1	750.00	<u>750</u>
Total				\$ 9,370
 <u>BUSHNELL AVENUE</u>				
<u>LATERAL</u>				
18-inch RCP	L.F.	150	\$ 19.00	\$ 2,850
36-inch RCP	L.F.	560	20.25	11,340
Catch Basins	Ea.	5	775.00	3,880
Manholes	Ea.	1	750.00	<u>750</u>
Total				\$ 18,820

TABLE II
PRELIMINARY CONSTRUCTION COST ESTIMATE

Description	Unit	Quantity	Unit Price	Total
<u>WELLS AVENUE</u>				
<u>LATERAL</u>				
18-inch RCP	L.F.	120	\$ 19.00	\$ 2,280
30-inch RCP	L.F.	190	17.25	3,280
Catch Basins	Ea.	4	775.00	3,100
Manholes	Ea.	1	750.00	<u>750</u>
Total				\$ 9,410
 <u>PIERCE PLACE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	180	\$ 19.00	\$ 3,420
33-inch RCP	L.F.	1,780	18.50	32,930
42-inch RCP	L.F.	1,600	24.75	39,600
Catch Basins	Ea.	6	775.00	4,650
Manholes	Ea.	10	750.00	<u>7,500</u>
Total				\$ 88,100
 <u>KASELACK AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	810	\$ 19.00	\$ 15,390
33-inch RCP	L.F.	1,970	19.00	37,430
48-inch RCP	L.F.	930	30.50	28,370
54-inch RCP	L.F.	1,555	37.75	58,700
63-inch RCP	L.F.	1,560	46.00	71,760
Concrete (includes excavation)	C.Y.	1,540	70.00	107,800
Catch Basins	Ea.	27	775.00	20,930
Manholes	Ea.	17	750.00	<u>12,750</u>
Total				\$353,130
Right of Way				<u>13,600</u>
Total				\$ 13,600

TABLE II

PRELIMINARY CONSTRUCTION COST ESTIMATE

Description	Unit	Quantity	Unit Price	Total
<u>PIERCE STREET</u>				
<u>(NORTH & SOUTH</u>				
<u>LATERALS)</u>				
18-inch RCP	L.F.	120	\$ 19.00	\$ 2,280
30-inch RCP	L.F.	265	17.25	4,570
54-inch RCP	L.F.	1,110	35.50	39,410
Catch Basins	Ea.	14	775.00	10,850
Manholes	Ea.	4	750.00	<u>3,000</u>
Total				\$ 60,110
 <u>COLLETT AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	60	\$ 19.00	\$ 1,140
30-inch RCP	L.F.	750	17.25	12,940
36-inch RCP	L.F.	190	20.25	3,850
Catch Basins	Ea.	2	775.00	1,550
Manholes	Ea.	3	750.00	<u>2,250</u>
Total				\$ 21,730
 <u>COCHRAN AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	150	\$ 19.00	\$ 2,850
39-inch RCP	L.F.	2,760	22.50	62,100
Catch Basins	Ea.	5	775.00	3,880
Manholes	Ea.	8	750.00	6,000
Sewer Relocation	L.S.		7,200.00	<u>7,200</u>
Total				\$ 82,030

TABLE II
PRELIMINARY CONSTRUCTION COST ESTIMATE

Description	Unit	Quantity	Unit Price	Total
<u>MAGNOLIA AVENUE</u>				
<u>STORM DRAIN</u>				
18-inch RCP	L.F.	720	\$ 19.00	\$ 13,680
36-inch RCP	L.F.	2,290	20.75	47,520
39-inch RCP	L.F.	1,350	23.00	31,050
42-inch RCP	L.F.	1,510	26.00	39,260
45-inch RCP	L.F.	1,180	28.25	33,340
63-inch RCP	L.F.	2,710	45.00	121,950
66-inch RCP	L.F.	1,750	47.75	83,560
75-inch RCP	L.F.	1,840	56.75	104,420
Catch Basins	Ea.	24	775.00	18,600
Manholes	Ea.	36	750.00	27,000
Sewer Relocation	L.S.		9,800.00	<u>9,800</u>
Total				\$530,180
Catch Basin installa- tion along existing La Sierra Channel Ea.				
		30	1,250.00	<u>37,500</u>
Total				\$ 37,500

TABLE III
ESTIMATED PROJECT COST
FOR LA SIERRA
MASTER DRAINAGE PLAN

ITEM	La Sierra Ave. Storm Drain	Mitchell Ave. Storm Drain	Jones Ave. Storm Drain.	Hole Ave. Storm Drain	Kaselack Ave. Storm Drain	Magnolia Ave. Storm Drain	* Misc. Smaller Storm Drain
Storm Drain and Appurtenances	\$674,060	\$490,200	\$323,480	\$403,310	\$353,130	\$612,210	\$337,840
Right of Way	-0-	-0-	-0-	-0-	13,600	-0-	-0-
Engineering and Administration	121,330	88,200	58,200	72,600	63,600	110,200	60,800
Contingencies	<u>80,890</u>	<u>58,800</u>	<u>38,800</u>	<u>48,400</u>	<u>42,400</u>	<u>73,500</u>	<u>40,500</u>
	\$876,280	\$637,200	\$420,480	\$524,310	\$472,730	\$795,910	\$439,140

* Includes Norwood Avenue, Bushnell Avenue, Wells Avenue, Collett Avenue, Pierce Street storm drains and catch basins along channel.

CONCLUSIONS

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

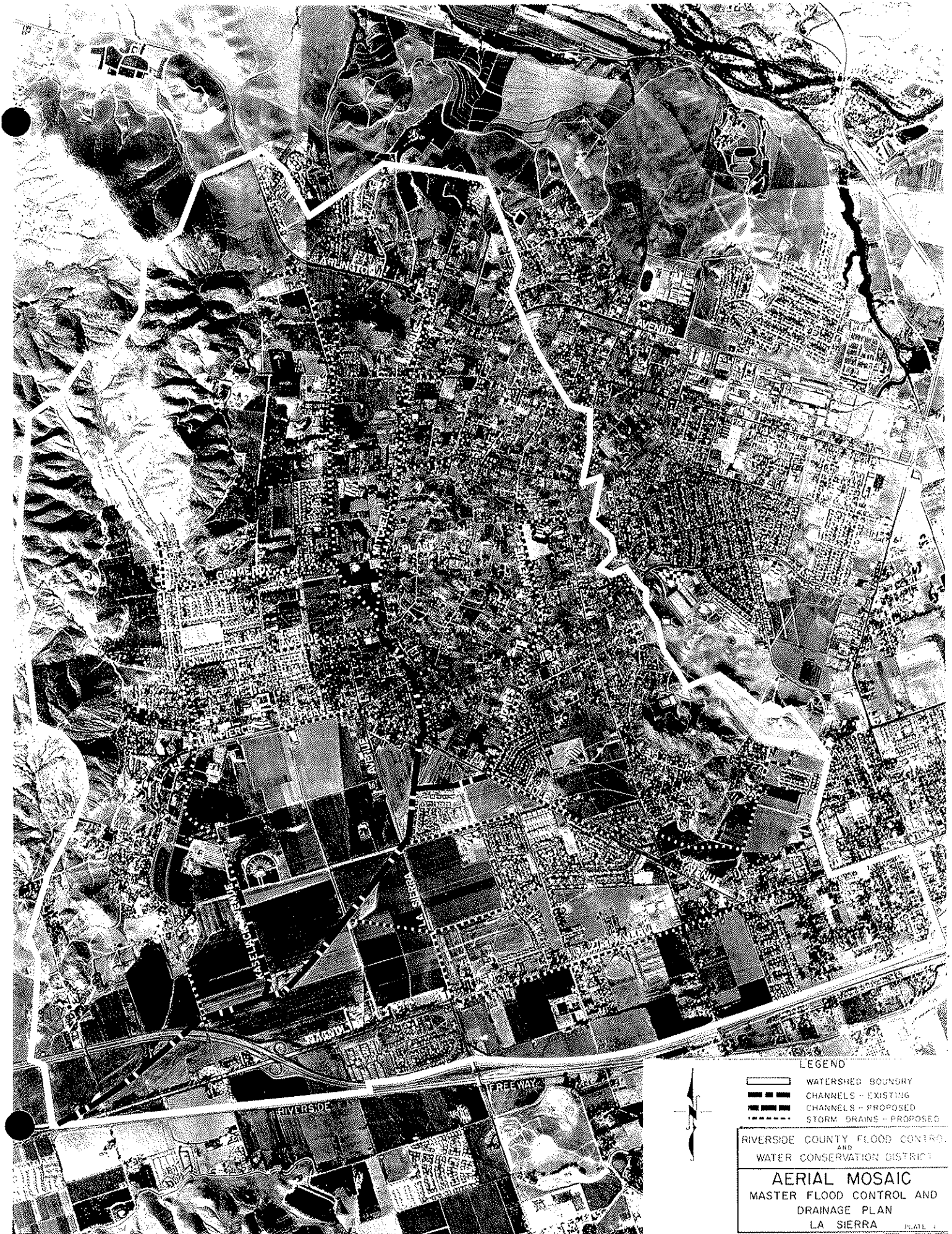
1. The La Sierra area of the City of Riverside is experiencing rapid urban development and with this development serious storm drainage problems are being created.
2. A system of underground storm drains will be required to safely convey storm runoff through the developed urban areas to the main La Sierra Channel.
3. The Master Drainage Plan proposed in this report is an economically feasible system of storm drains designed to eliminate the drainage problems in the area and will be a benefit to not only the La Sierra area, but the entire City of Riverside.
4. The total cost of the proposed improvements, including rights of way, is estimated to be \$4,166,050.

RECOMMENDATIONS

It is recommended that:

1. The Master Drainage Plan as set forth herein be adopted by the City of Riverside for the La Sierra area.
2. All future developments in this area be required to conform to the Master Drainage Plan insofar as it is possible to do so.
3. Right of way required for the proposed plan be acquired at the earliest practicable time to avoid excessive land costs.

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LEGEND

- WATERSHED BOUNDARY
- CHANNELS - EXISTING
- CHANNELS - PROPOSED
- STORM DRAINS - PROPOSED

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

AERIAL MOSAIC
MASTER FLOOD CONTROL AND
DRAINAGE PLAN
LA SIERRA PLATE 1