RIVERSIDE COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT
RIVERSIDE, CALIFORNIA

MASTER DRAINAGE PLAN

FOR THE

DESERT HOT SPRINGS AREA

ZONE SIX

KENNETH L. EDWARDS
CHIEF ENGINEER

FEB.1982

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PURPOSE

In 1966 the District completed a master drainage plan study for the Desert Hot Springs area. The plan was never formally approved but has been used as a planning guide for the area for the past 15 years. The purpose of this report is to investigate the drainage problems that currently exist in the area and evaluate the adequacy of the earlier plan to solve these present needs. Where deficiencies have been found, this plan proposes the necessary facilities to deal with them.

The Desert Hot Springs area is comprised of the City of Desert Hot Springs and the surrounding County area. The watershed is roughly bounded by West Drive, Fourteenth Avenue, Long Canyon and the divide in the hills to the north.

The plan presented herein will provide adequate flood protection to the community when implemented and will serve as a guide for the long term construction scheduling of the primary drainage facilities. The plan will also act as a planning 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, should be read and 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 facilites proposed in this Master Drainage Plan are general; precise facility locations will be dictated by conditions and other factors existing at the time of design. Similarly, the sizing information shown 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 14 square miles in size. The terrain varies from the rugged slopes of the Little San Bernardino Mountains to the steep alluvial slopes emanating from the mountains. The extent of the studies establishing this master plan includes:

1. Determination of the quantity and points of concentration of storm runoff in the area.

2. Preparation of a drainage boundary map. (see pg. 3)

3. Determination of the location and size 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 plans and profiles, and supporting cost estimates.

GENERAL DISCUSSION

This report provides a Master Drainage Plan for the Desert Hot Springs area. The plan consists of a debris basin, several levees and a network of open channels and underground storm drains. The proposed system will collect storm runoff and convey it through this developing community.

The Desert Hot Springs community is located on an alluvial fan. Uncontrolled floodwaters impacting such a fan can be very devastating, primarily due to the unpredictability of their flow path and their high velocities. At present, during periods of runoff, floodwaters, silt and other debris impact the developing community, causing property damage and leaving roads and highways impassable. Subdivision activity within the plan area has increased substantially in recent years. As development continues to escalate, so will the drainage problems of the area, thus requiring a greater need for flood protection.

DRAINAGE AREA = 13.9 Sq. Mi.

DRAINAGE BOUNDARY

SCALE 1" = 2000'

RIVERSIDE COUNTY FLOOD CONTROL
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DRAINAGE MAP

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

All underground storm drains proposed in this plan are intended to collect local urban runoff and are located either in existing or proposed street rights of way. Runoff from a 10 year frequency storm is allowed to accumulate in the streets until it reaches the top of the curb. At this point, the plan proposes the initiation of an underground drain which will intercept and convey the entire 10 year storm runoff to an outlet downstream. Flows exceeding the 10 year frequency storm will generally be carried within street rights of way and the combination of both the street and the underground storm drain provides 100 year protection.

Open channels are proposed when the discharge is large and the construction and right of way costs for a channel prove to be less than the cost of an underground storm drain. Where open channels are provided, they are designed to carry the runoff from a 100 year frequency storm.

In a few instances, circumstances have dictated that an underground drain be sized for the full 100 year flow instead of only the 10 year capacity.

The alignment and location of all drainage facilities proposed in this plan is based on hydraulic efficiency, the ability to drain tributary areas, and economics.

HYDROLOGY

Two methods of hydrology were used in this plan to determine design discharges. For smaller tributary areas, up to 500 acres in size, the Modified Rational Hydrology Method was used. The Synthetic Unit Hydrograph Method was used for larger areas. The design discharges used in sizing all future appurtenant facilities in the study area should be determined by one of these two methods.

Methodology and supportive data for the rational and synthetic hydrology can be found in "The Riverside County Flood Control and Water Conservation District Hydrology Manual" dated April 1978.

Methodology and supportive data for the debris production methods can be found in "Los Angeles County Flood Control District Report on Debris Production Studies for Mountain Watersheds of Los Angeles County" by William R. Farrel, dated November 1959 and "A New Method of Estimating Debris-Storage Requirements for Debris Basins" by Fred E. Tatum, U. S. Army Engineers District, dated 1963.

Future land use assumptions used throughout the plan were based on "The City of Desert Hot Springs General Plan".

EXISTING FACILITIES

Currently there are three existing flood control facilities existing in the Desert Hot Springs area. They are the Desert Hot Springs Channel (Line E upstream of Eighth Street), Line E-1 and Line E-2.

Desert Hot Springs Channel

Since 1951, when the District first constructed a wire and rail channel between Eighth Street and Sixteenth Street, intermittent construction projects have brought the facility closer to completion. In 1978, when the concrete lining was extended from Twelfth Street to Sixteenth Street to meet the existing earth channel, the only portion of the channel still remaining as an interim facility was Eighth Street, which was built as an inverted street. Line E of this proposed plan will finally provide an adequate outlet and completion of this channel.

Line E-1 and Line E-2

Lines E-1 and E-2 were constructed in 1966 by a private developer. The construction was a condition of approval for Tract 3391. Additionally, the developer of this tract also built the double box culvert across the Desert Hot Springs Channel at Palm Drive.

These two storm drain lines were found to have sufficient capacity under current conditions with the exception of the inletting capabilities of Line E-1. Presently, the small ditch running along the east side of Verbena Avenue serves to collect flows and direct them into the storm drain. This is not seen to be the ultimate solution. For this reason, the report shows a cost for constructing additional catch basins on Verbena Avenue to replace this ditch.

RECOMMENDED IMPROVEMENTS

The recommended improvements discussed briefly below are shown on the enclosed map found at the back of this report. Supporting data for all proposed facilities is available at the Riverside County Flood Control and Water Conservation District office. Costs shown on the enclosed map include right of way and 30% for engineering, administration and contingencies (see Table I, Cost Summary). Preliminary size information as well as design flow rates are shown on the enclosed map as well as on the preliminary plan and profile plates included in this report.

Before any design is undertaken it should be noted that during preparation of preliminary plan and profile drawings, a detailed utility search was not completed. This means that, while major known facilities were dealt with, a more thorough search may discover utilities that will necessitate minor alignment or size changes, or utility relocation.

OPEN CHANNELS

The open channels proposed in this plan consist of two types; rectangular and trapezoidal. The chief difference between the two is that the rectangular channel requires construction with steel reinforced concrete. The trapezoidal channel, on the other hand, by virture of the support offered by the ground under the sloping sides, can be constructed with unreinforced concrete. The absence of reinforcing steel greatly reduces the cost of the construction and for this reason trapezoidal channels are used where possible. In some cases, however, the right of way required for the trapezoidal channel is either to costly or, as in the case of Line E, not available. For this reason, the portion of Line E running down the center of Eighth Street, is proposed as a rectangular channel.

In most instances, where open channels are proposed, the right of way required will accommodate the channel as well as one or two maintenance roads.

UNDERGROUND STORM DRAINS

The underground drains proposed in the plan consist of, for the most part, precast reinforced concrete pipe (RCP). In some cases, where special circumstances dictate, a drain may be a reinforced concrete box (RCB), but this is usually a considerably more expensive alternate and avoided when possible.

During the preparation of the construction plans for a particular line, the design engineer may consider the use of cast-in-place pipe (CIP) in lieu of RCP. The District would not be opposed to this concept as long as field conditions (trench stability, traffic flow, utilities, etc.) are favorable.

All underground drains in this plan are proposed within existing or assumed future street rights of way.

DEBRIS BASIN

The type of flood control basin employed by this plan is a debris basin. This type of basin is used to trap sedimentation. Flows on alluvial cones, most particularly those originating in natural or undeveloped areas, have a great potential for transporting large quantities of debris. With most of the facilities in this plan, the velocity of flow is high enough so that the debris is transported through the facility without deposition. Providing additional cross sectional area to a facility to account for debris bulked flow is a widely accepted method of dealing with the problem and has been used throughout this plan where applicable.

However, when these debris laden flows are collected by placing an embankment across their natural flow path, as with the Miracle Hill Debris Basin, the velocity is reduced to a range where the debris will settle out. In these cases, provisions must be made to accommodate this volume of sediment.

The Miracle Hill Debris Basin has sufficient storage volume behind the embankment for the anticipated debris flow. Prior to the point in time where the debris completely occupies this volume, some reduction in the peak flow rate will be realized downstream, however, this reduction was not considered in the design of the proposed downstream facilities.

ALTERNATE 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 alternates considered in this report dealt with the proposed Pierson Levee Collector System. One alternate involved incorporating a retention basin into this site. While this would allow for a reduction in cost for the downstream facilities it was found that the additional cost incurred at the basin site would increase the overall cost of the system. Furthermore, the proximity of this site to known earthquake faults made the concept of a large embankment undesirable.

Another alternate considered providing debris storage at this site. With the undesirability of large embankments already established, below ground storage seemed to be the only reasonable option. However, the cut slopes resulting from excavting such a basin would be subject to severe erosion from incoming flows. To mitigate this erosion, costly stabilization structures would have to be constructed. In the final analysis, it was found more cost effective to allow the debris to be transported in Line B in the form of bulked flows.

In an attempt to reduce the cost of Line C-1, a retention basin located in the canyon directly above the line was studied. It was found that in order to provide enough storage volume to significantly reduce flow rates, a substantial amount of excavation would have to be accomplished behind the proposed embankment. A cost analysis of this alternate showed that while the basin had the desired affect of decreasing the size and cost of Line C-1, the net effect of including the retention basin would be an increase of about $300,000 to the overall plan cost.

A number of other alternates involving minor realignments and underground facilities versus open facilities were studied and eventually disregarded as either being too costly or not providing adequate protection.

In short, the Master Drainage Plan for the Desert Hot Springs Area 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 Desert Hot Springs area has experienced serious flooding problems in the past. As this area continues to develop, these damages are expected to increase. A more orderly growth pattern can safely occur with the construction of these 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 $15,230,000.

RECOMMENDATIONS

It is recommended that:

1. The Master Drainage Plan as set forth herein be adopted by the Desert Hot Springs City Council as part of the overall master plan for the City and 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

DESERT HOT SPRINGS AREA MASTER DRAINAGE PLAN

COST SUMMARY

FACILITY	CONSTRUCTION COST*	RIGHT OF WAY	MASTER PLAN COST
Line A	$1,553,000	$ 130,000	$ 1,683,000
Line A-1	1,532,000	-0-	1,532,000
Line A-1a	231,000	-0-	231,000
Line A-1b	145,000	-0-	145,000
Line A-2	264,000	-0-	264,000
Line A-3	1,501,000	-0-	1,501,000
Line A-3a	136,000	-0-	136,000
Line A-3b	198,000	-0-	198,000
Line A-3c	147,000	-0-	147,000
Line B	1,376,000	165,000	1,541,000
Line B-1	1,207,000	-0-	1,207,000
Line B-1a	100,000	-0-	100,000
Line B-1b	351,000	6,000	357,000
Line B-1c	163,000	-0-	163,000
Line B-2	443,000	-0-	443,000
Line C	475,000	53,000	528,000
Line C-1	977,000	-0-	977,000
Line D	610,000	33,000	643,000
Line E	1,033,000	5,000	1,038,000
Line E-1	46,000	-0-	46,000
Line E-2	-0-	-0-	-0-
Line E-3	95,000	-0-	95,000
Line E-4	248,000	-0-	248,000
Line E-5	732,000	-0-	732,000

TABLE (Contd.)

DESERT HOT SPRINGS AREA MASTER DRAINAGE PLAN

COST SUMMARY

FACILITY	CONSTRUCTION COST*	RIGHT OF WAY	MASTER PLAN COST
Pierson Control Levees	868,000	95,000	963,000
Miracle Hill Levee	14,000	1,000	15,000
Miracle Hill Basin	280,000	17,000	297,000
TOTAL	14,726,000	504,000	15,230,000

* Includes 30% for engineering, administration and contingencies.