RIVERSIDE COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT
RIVERSIDE, CALIFORNIA

MASTER DRAINAGE PLAN

FOR THE

WEST ELSINORE AREA

ZONE 3

APR. 1986

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TABLE OF CONTENTS

PURPOSE

The purpose of this report is to investigate and evaluate the drainage problems of the West Elsinore area and to develop an economical drainage plan which provides flood protection for both existing and future development.

This Master Drainage Plan is located northwest of Lake Elsinore. It is bounded roughly by Lakeshore Drive, Riverside Drive, the Ortega Highway and the ridge line of the Santa Ana Mountains.

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

It should be noted by the reader that this report 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 facilities 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 consists of approximately 10.5 square miles, and ranges from moderately flat valley terrain to foothills with steep slopes. The extent of the studies establishing this master plan includes:

1. Preparation of a drainage area map.

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

3. Determination of the quantity of debris produced by major canyons in the watershed.

4. Determination of the location and size of the proposed drainage facilities.

5. Investigation of alternative routes and methods as a basis for selecting the most economically and engineeringly sound plan.

6. Preparation of preliminary design plans and supporting cost estimates.

GENERAL DISCUSSION

This report provides a Master Drainage Plan for the West Elsinore area. The plan consists of a debris basin and a system of open channels and underground storm drains. The proposed facilities will carry storm runoff through this area, outletting into Lake Elsinore.

A majority of the developed and developable areas within the plan are located on alluvial fans. Uncontrolled floodwaters affecting such fans can be extremely devastating due to the unpredictability of their flow paths, high velocities, and potential for debris transport.

During periods of runoff, floodwaters, silt, and other debris impact the developing community causing property damage and leaving roads and streets impassable. As development continues to increase in the eastern portion of the watershed, these problems are expected to intensify, thus requiring a greater need for flood protection.

The master drainage plan presented herein provides an economical method of collecting and conveying storm runoff through the study area with the least interruption to public services. The proposed drainage system 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 facilities proposed in this plan are intended primarily to collect and control storm flows emanating from the major canyons and convey them safely through the lower valley area outletting them into the lake. Additionally, local urbanized runoff is also addressed.

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 conveyors, open channels provide an outlet for the underground facilities proposed in this plan as well as local drainage facilities to be built by developers and others. All of the open channels proposed in this report are intended to carry the runoff from a 100 year frequency storm.

The underground facilities shown in this plan are proposed only where the application of open channels is not feasible, either because of topographic constraints or existing development. Most of the underground portions of the A, B, and D drainage systems are sized to carry the runoff generated by a 10 year storm event. During a 100 year storm event, the excess flow is expected to be carried in the street section above the facility. In some cases where this is not possible or where dictated by other reasons, underground facilities are sized to convey the 100 year storm runoff. Where possible, the underground storm drains proposed in this plan are located in existing or future street rights of way.

Two reports were used as a basis for computing the amount of debris produced by a watershed during a 100 year storm. These are the "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 Corps of Engineers District, dated 1963. The larger and more conservative debris yield from these two methods was used to size the debris basin proposed in the plan.

The alignments of all channels and underground storm drains as well as the location of the debris basin are based on hydraulic efficiency, engineering judgement, 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.

Future land use assumptions used throughout the plan were based on the "City of Lake Elsinore General Plan Land Use Map, 1992", adopted on December 14, 1982.

EXISTING FACILITIES

There are several District operated drainage facilities existing within the West Elsinore Master Drainage Plan. They are the Leach Canyon Debris Dam, the Leach Canyon Channel, the South Riverside Channel, the Laguna Storm Drain, and the Four Corners Storm Drain. A brief description of these existing facilities, which are an integral part of the master plan, follows:

Leach Canyon Debris Dam - This dam was built in 1955 in conjunction with the U. S. Department of Agriculture, Soil Conservation Service. It is located about 3400 feet west of Grand Avenue and has a crest height of 30 feet. The primary purpose of the dam is to capture the debris emanating from Leach Canyon.

Leach Canyon Channel - Leach Canyon Channel, completed by the District in 1979, is a concrete lined trapezoidal channel that stretches from the lake across Riverside Drive to Machado Street. Line B of this plan is proposed to join this facility and extend it upstream.

South Riverside Channel - The District's South Riverside Channel was completed in 1970. This facility, which is about 4000 feet in length, is a concrete lined trapezoidal channel that extends from the lake across Riverside Drive and Grand Avenue to Laguna Drive. This channel serves as a major receptor of runoff generated in the southern portion of the watershed. The upper end of this facility functions as an outlet for the existing Laguna Storm Drain and the proposed Line A-4 of the master plan. In addition, Line A of this plan is proposed to confluence with this existing facility, just upstream of Riverside Drive.

Laguna Storm Drain - The Laguna Storm Drain, completed in 1972, is an underground reinforced concrete pipe that extends northwesterly in Laguna Drive from the upper end of the existing South Riverside Channel to a point just below Sherwood Drive. The facility, which is 1400 feet long, ranges in size from 24 inches to 39 inches in diameter.

Four Corners Storm Drain - The Four Corners Storm Drain is a system of open channel and underground storm drain designed to relieve the flooding problems at the intersection of Riverside and Lakeshore Drives. This drainage system, built in 1981, is proposed to be extended by Line D of this master plan.

RECOMMENDED IMPROVEMENTS

The improvements proposed in this plan 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's office. Costs shown on the enclosed map include construction, right of way and 31% for engineering, administration and contingencies (see Table I, Cost Summary). This map not only shows proposed alignments, but pertinent preliminary size information as well as design flow rates.

In general, the open channels proposed in this plan are trapezoidal shaped facilities with concrete paving on the sides and bottom. The sides slope upward from the bottom at a rate of one foot vertically for every 1.5 feet horizontally. The channels in this plan range in size from a bottom width of 3 feet

to 12 feet and in depth from 4 feet to 11 feet. In addition, the channel right of way required will accommodate the channel as well as one or two maintenance roads.

The proposed underground storm drains generally consist of reinforced concrete pipe (RCP) ranging in size from 27 inches to 96 inches in diameter. The cost of the drains shown in Table I includes manholes and catch basins in addition to the cost of the pipe installed. Manholes are located as necessary with a maximum spacing of 500 feet. Catch basins are not specifically located but the total number of lineal feet is computed and costed.

The design engineer should be aware 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 reveal utilities that will necessitate minor alignment or size changes, or utility relocations.

During the course of this study, controlling the debris produced in the two major watersheds (Leach and McVicker Canyons) was recognized as equally as important as controlling the flood runoff emanating from these canyons. As stated earlier, the U. S. Department of Agriculture Soil Conservation Service built a debris basin in Leach Canyon to capture debris and to prevent it from causing property damage to downstream development. The potential danger from debris, however, still exists in the McVicker Canyon area. It is now the intent of this report to propose a major structure designed to control this problem.

The McVicker Debris Dam is located at the upstream end of Line B-1. The dam height is proposed to be about 46 feet. The topography of this canyon allows for a spillway cut through a notch in the northeast abutment of the dam. The design debris storage volume for this facility is 154 acre-feet of debris.

As mentioned previously, the purpose of this facility is to trap debris and release "clear water". This will allow smaller, less costly facilities to be constructed downstream. While the prime function of the facility is debris reduction, some flow attenuation will be realized, especially during smaller storms or the early stages of design magnitude storms. However, since this peak flow reduction is not guaranteed, the design of downstream facilities assumes that the peak flow rate passes unreduced through the dam.

ALTERNATIVE STUDIES

In developing this Master Drainage Plan a number of alternatives were developed and studied for their hydraulic and economic feasibility.

A combination debris and retention dam was originally envisioned at the site of the proposed McVicker Debris Dam. The alternative structure was over 20 feet higher than the proposed debris dam and was able to reduce an inflow rate of 2530 cfs to

an outflow rate of 900 cfs. The reduced peak flow rate resulted in a less costly downstream facility. However, the cost savings realized in the downstream facility did not nearly offset the increased cost of the higher dam embankment and, therefore, this alternative was disregarded.

Alternative alignments for Lines B and C were also explored (see Figure 1, Page 9). Preliminary study indicates that these alternatives are undesirable due to the following reasons:

1. Severe right of way restrictions are anticipated to be a major problem for Line B because of existing developments. Relocation of existing homes may be required.

2. Topographical constraints are the major setback for the alternative Line C alignment. It is considered unwise and unsafe to propose an alignment running perpendicular to the slope over a considerable distance.

Consideration was also given to changing the designations of Lines B and B-1 from open channels to underground facilities. Preliminary cost estimates indicate that by doing this, the cost increases by 95%. Given the current availability of necessary rights of way and the significant cost differential, the concept of open channels is very well justified.

Another alternative involves the relocation of Line C to an alignment about 400 feet west of Joy Avenue. This alignment would result in a slight decrease in the cost of this facility. However, due to the existing school and other existing development in the area, construction difficulties are anticipated to be a major problem, and hence, this option was dismissed.

A number of other smaller alternatives were pursued and eventually disregarded as being too costly or not providing adequate protection.

CONCLUSIONS

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

1. The West Elsinore area has experienced serious flooding problems in the past. As this area continues to urbanize 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 feasible 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 construction, rights of way, engineering, administration and contingencies, is estimated to be $9,768,000.

RECOMMENDATIONS

It is recommended that:

1. The Master Drainage Plan as set forth herein be adopted by the City Council of the City of Lake Elsinore 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 rights of way required for the plan be protected from encroachment.

4. The West Elsinore Area Drainage Plan, prepared by the Riverside County Flood Control and Water Conservation District, be adopted by the City Council of the City of Lake Elsinore and the Riverside County Board of Supervisors as a means through which funding may be procured for implementation of the plan and that other funding sources be investigated and adopted so as to complete the plan at the earliest possible date.

TABLE I

WEST ELSINORE MASTER DRAINAGE PLAN

COST SUMMARY

FACILITY	CONSTRUCTION*	RIGHT OF WAY	TOTAL COST
Line A	$ 649,000	$ 151,000	$ 800,000
A-1	416,000	3,000	419,000
A-2	217,000	0	217,000
A-3	22,000	1,000	23,000
A-4	232,000	0	232,000
Line B	543,000	92,000	635,000
B-1	1,038,000	302,000	1,340,000
B-2	346,000	2,000	348,000
B-3	354,000	0	354,000
Line C	2,067,000	255,000	2,322,000
C-1	145,000	44,000	189,000
Line D	1,010,000	0	1,010,000
D-1	100,000	0	100,000
D-2	106,000	0	106,000
D-3	43,000	0	43,000
D-4	46,000	0	46,000
D-5	121,000	4,000	125,000
McVicker Canyon Debris Basin	1,112,000	347,000	1,459,000
TOTAL	$8,567,000	$1,201,000	$9,768,000

*includes 31% for Engineering, Administration and Contingencies

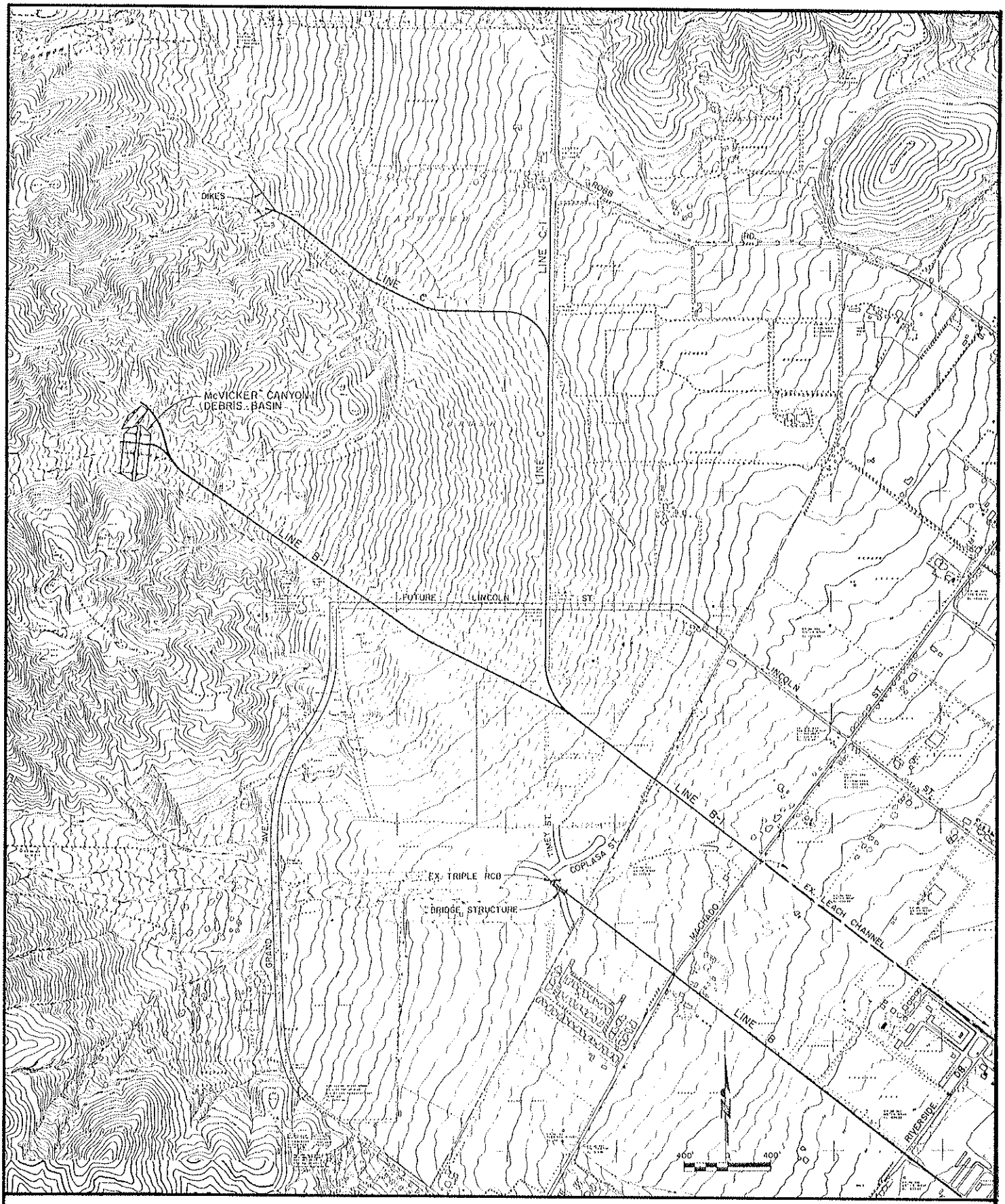

FIGURE I – ALTERNATIVE ALIGNMENT FOR LINES B AND C