

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

REPORT ON

**MASTER DRAINAGE PLAN
FOR
THE SEDCO AREA**

ZONE THREE

MARCH 1982

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PURPOSE

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

The Sedco watershed is located approximately 3 miles southeast of the City of Lake Elsinore. The study area is bounded roughly by Mission Trail and Corydon Street on the west, Bundy Canyon Road on the south and Malaga Road on the north. The divide in the hills to the east serves to complete the boundary of the drainage area.

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 it 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.

In short, 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 consists of approximately 4.5 square miles, and ranges from moderately flat valley terrain to foothills with relatively steep slopes. The scope of this master plan includes:

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 Sedco area. The facilities in the plan include a major retention basin on the upstream side of Highway I-15 and a network of open channels and underground storm drains downstream of the Freeway. This proposed system will safely convey storm runoff through the area, outletting into Lake Elsinore, downstream of either Mission Trail or Corydon Street.

During periods of runoff the floodwaters, silt, and other debris produced in the hills upstream of the Freeway, impact the developing community, causing property damage and leaving roads and highways impassible. Subdivision activity within the plan area has increased substantially within the last several years, and with this increased development the attendant need for a greater degree of flood protection has become apparent.

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 facilities proposed in this plan are intended primarily to collect the runoff flowing through the Freeway culverts and pass it safely through the area.

The underground facilities shown in this plan are proposed only where the construction of open channels is not feasible, either because of topographic constraints or existing development. The underground portions of lines A, B, and C are sized to convey the flow generated by a 10 year frequency storm. During a 100 year event, the excess flow will be carried in the street section. All other underground drains within the plan are sized to convey the 100 year discharge. This is necessitated when the quantity of water tributary to the system is too large for the street to convey or when containment of the entire 100 year flow is needed to protect existing structures. Where possible, storm drains proposed in this plan are located in existing street or Freeway rights of way.

Open channels are 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

the open channels proposed in this plan are designed to carry the runoff from a 100-year frequency storm.

The primary intent of the retention basin 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 need for facilities downstream, in many cases, can be obviated. The retention basin is designed by routing the 100 year flood volume through the outlet structure and the 1000 year flood over the spillway.

The alignments of all channels and drains as well as the location of the retention basin are 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, 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.

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 costs shown on the enclosed map include right of way and 30% for engineering, administration and contingencies.

Line A

Line A will consist of two segments; an underground storm drain segment, and an open channel segment.

Two 36 inch diameter corrugated steel pipe (CSP) culverts convey the flow tributary to Line A under the Freeway. From the culvert outlets on the west side of the Freeway, the flow will be conveyed in an existing low to the intersection of Lakeview Terrace and Sylvester Road. At this point, inlets provided on the upstream side of Lakeview Terrace will allow the 10 year flow of 50 cubic feet per second (cfs) to enter Line A while at the same time forcing the balance of the 100 year flow to cross Lakeview Terrace to be

point just east of Tokay Road. It then will run southeasterly, picking up the flows from another five freeway culverts and will deliver a combined 100 year flow of approximately 365 cfs to Line D at the intersection of Vine Street and the Freeway. The line will vary in size from a 39 inch to a 66 inch diameter reinforced concrete pipe located within the Freeway right of way.

Beginning within the Freeway right of way, about 800 feet south of Vine Street, Line D will convey the flow exiting the four 48 inch CSP freeway culverts northerly to junction with the flows from Line D-1. The 100 year flow of 325 cfs tributary to the upper end of Line D will be carried in a 2 foot wide, 4 foot deep trapezoidal channel to Vine Street. At this point, the 100 year combined flow of 695 cfs, will be conveyed down Vine Street in a RCP storm drain ranging in size from 66 inches in diameter to 81 inches. The lower end of Line D will cross under Mission Trail and outlet its flow into the Lake below the 1260 foot elevation.

Lines E, E-1, and E-2

These three lines will serve to accept the flows released from the Freeway culverts between Lime Street and Waite Street. This will be accomplished by either a direct connection to the culvert as with Lines E and E-1, or by picking up the flow in catch basins at a point of concentration as with Line E-2.

Line E connects directly to the downstream end of the 84 inch CSP culvert passing under the Freeway just north of Waite Street. From this point, Line E will continue westerly in an unnamed street approximately 330 feet north of Waite Street to Almond Street. Here, the storm drain will turn north in Almond Street and convey flows to a point midway between Waite Street and Lemon Street where it will outlet into the open channel portion of Line E. This storm drain portion of Line E will vary in size from 45 inches to 60 inches in diameter. The open channel portion of Line E will convey a 100 year flow of from 410 cfs to 450 cfs in a trapezoidal channel section, 4 feet wide at the bottom, ranging from 4.5 feet to 5 feet in depth. The channel will run midway between Waite Street and Lemon Street until it crosses Mission Trail at which point it will change alignment so as to cross Corydon Street at a right angle. It will then continue to the 1260 foot elevation where it will outlet into the Lake.

Line E-1 will also employ a direct connection to a freeway culvert, in this case a 66 inch CSP currently outletting just south of Olive Street. The

drain proceeds in a westerly direction down an existing driveway to Almond Street where it turns south and continues to Line E. The mild slope of Almond Street forces the storm drain to increase in size to a diameter of 54 inches in order to convey the 100 year peak flow of 230 cfs.

Line E-2 begins in Lemon Street at a point approximately 200 feet east of Loquat Street. Catch basins will be provided to pick up the 100 year flow of 65 cfs tributary to this point. The 30 inch diameter RCP storm drain will increase in size to 33 inches in diameter before discharging into Line E at Loquat Street.

Lines F and G

The topography of the area south of Bundy Canyon Road and west of the Freeway is traversed by well defined lows with no single large concentration of flows except in the area around Mission Trail and Canyon Drive. In this area there are two fairly substantial watercourses that currently tend to sheet flow across Mission Trail.

Line F is provided to convey the more northerly of the two watercourses across Mission Trail to Line G. The upper end of Line F is a double cell, reinforced concrete box (RCB) culvert, each cell being 10 feet wide, 4 feet high. The box culvert is located midway between Bundy Canyon Road and Canyon Drive and it empties into a 5 foot wide, 5 foot deep concrete channel that transports the 100 year flow of over 500 cfs westerly about 700 feet to outlet into Line G.

Line G begins as a 12 foot wide, 4 foot high RCB under Canyon Drive, about 300 feet east of Mission Trail. From here, a 4 foot wide trapezoidal channel, 4 feet deep will convey the 270 cfs westerly across Mission Trail to its confluence with Line F. From this point downstream, a combined 100 year flow of 775 cfs will be transported in a 6 foot wide, 5.5 feet deep channel section. Again, this facility will outlet into Lake Elsinore at the 1260 foot elevation.

Sedco Retention Basin

The Sedco Retention Basin will be located approximately 1000 feet north of Bundy Canyon Road, slightly more than 1/4 mile east of the Freeway. Presently, at the proposed site, there exists a retention basin of approximately the same dimensions as the proposed basin. Although the present structure was built with assistance from the United States Soil Conservation Service, lack of proper maintenance may

conveyed in Sylvester Road. The reach of Line A between Lakeview Terrace and Mission Trail will be a 24 inch diameter reinforced concrete pipe (RCP) located in Sylvester Road. Just upstream of Mission Trail, catch basins will be provided to pick up the remainder of the 100 year flow and the storm drain size will increase to a 33 inch diameter. The open channel portion of Line A will be a concrete lined, trapezoidal channel. It will serve as the outlet for the underground portion of the Line, extending from just downstream of Mission Trail to the 1260 foot elevation where it will daylight. The 100 year peak flow of 95 cfs will be conveyed in a trapezoidal channel section having a 3 foot wide bottom, 2.5 feet deep.

Line B

Line B is similar in concept to Line A. The runoff tributary to it passes under the Freeway in a 42 inch CSP culvert and then flows in a natural watercourse to Lakeview Terrace. At this point, as in Line A, the 10 year flow of 45 cfs is picked up in a 24 inch diameter RCP storm drain that runs down Elberta Road. As the slope of the road begins to decrease just upstream of Mission Trail, the drain increases to 30 inches in diameter. Again, as for Line A, the balance of the 100 year peak flow is picked up in catch basins just upstream of Mission Trail and the entire flow is conveyed under the roadway and released into the open channel portion of Line B. This channel, a concrete lined V-section, 3 feet deep, will carry the 100 year flow of 75 cfs, approximately 200 feet to outlet at the 1260 foot elevation.

Line C

Line C is also similar to both lines A and B. The storm drain, located in Sedco Boulevard, will carry a 10 year flow of 80 cfs in a 30 inch diameter RCP. The open channel portion of the line will be a concrete trapezoidal section with a bottom width of 2 feet, a depth of 3 feet and the capacity to carry a 100 year peak flow of 125 cfs.

Lines D and D-1

Lines D and D-1 combine to receive the flow emanating from eight major freeway culverts and consolidate those flows into a single storm drain in Vine Street.

Line D-1 will have its upstream terminus at the 60 inch CSP culvert emerging from the Freeway at a

have rendered the structure inadequate and for this reason cost figures shown in this plan reflect a complete reconstruction of the facility. If though, after appropriate testing, the present embankment proves to be of suitable integrity, every effort should be made to incorporate the existing dam into the final design of the basin. When complete, the 3 acre retention site will provide approximately 30 acre feet of storage.

In addition to the dam embankment itself, the proper functioning of the basin will require an outlet pipe, a spillway, a channel to drain the smaller basin just upstream of the larger basin and some dike work.

The outlet pipe for the basin will be a 30 inch diameter RCP approximately 150 feet in length. This pipe, in conjunction with an outlet structure within the basin, will allow a peak outflow of less than 100 cfs in the 100 year event. Considering that the 100 year peak inflow into the basin is anticipated to be about 500 cfs, this represents a decrease of approximately 80% in peak flow just downstream of the basin.

A 50 foot wide, vertical wall, concrete spillway provided in the east dam embankment will allow the 1000 year peak flow of almost 700 cfs to pass safely through the basin without the danger of overtopping the embankment. Energy dissipators built at the base of the spillway will insure that flow coming over the structure will not cause any excessive erosion to the dam embankment or to properties downstream.

Presently, a somewhat smaller basin exists some 500 feet northeast of the main basin site. Rather than providing all necessary retention basin features at this location (i.e. outlet pipe and structure, and spillway), a small concrete channel will be constructed to link this basin directly with the larger basin downstream. This facility, a 2 foot wide, 4 foot deep trapezoidal channel section will be capable of handling close to 400 cfs, the expected 1000 year peak flow.

The dike work proposed by this plan deals chiefly with enlarging and providing erosion protection for an already existing dike. Currently, a small erosion dike exists just east of the smaller of the two basins. This plan proposes adding another 2 to 3 feet of height to the existing structure as well as lining the upstream face with concrete.

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 alternates studied involved the upstream limits of both Lines C and D. In the alternative alignment, line C was extended from its present upstream terminus, southerly in Lakeview Terrace to Muscatel Road. From here it turned east and went to the Freeway where, with the use of both open and underground drains, it captured the flow from three freeway culverts. This extension of Line C allowed quite a reduction in the length and size of Line D-1. There are two principal drawbacks to this alternate. First, the construction of a storm drain line in Lakeview Terrace would require cuts exceeding 20 feet in places. Second, this alternate would increase the overall cost of these two lines by over \$70,000.

A second alternate investigated the possibility of using an open channel for some or all of Line D-1. The use of an open channel for the entirety of Line D-1 proved infeasible because sections of an open channel would need to be substantially lower than the finished grade of the Freeway fill and this would necessitate excessive cuts and some sort of stabilization for the embankment. This would undoubtedly cause numerous problems during design and construction and be more costly than the chosen alternate. The use of a combination of both open channels and underground drains, initially seems like a workable alternate. However, the hydraulic problems encountered in making the numerous transitions from one system to the other lead to the rejection of this alternate.

A third major alternate explored the elimination of the Sedco Retention Basin and, in lieu of that facility, providing a major channel between the Freeway and the Lake. The only reasonable alignment for this channel would take it through the high school located between Bundy Canyon Road and Canyon Drive, west of Orange Street. The location of the school does not lend itself to a channel alignment along a boundary but rather one through the middle of the campus. This will force the use of a relatively long reach of an underground facility of substantial size. From an economic standpoint, this alternate would cost over 50% more than the proposed system and this would be reflected in the overall cost of the plan by an increase of more than \$500,000.

In addition to the 3 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 Sedco 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 Sedco 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 \$3,957,000.

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
SEDCO MASTER DRAINAGE PLAN
COST SUMMARY

LINE DESIG.	CONSTRUCTION COST	30% ENGINEERING & ADMINISTRATION	RIGHT OF WAY	MASTER PLAN COST
A	\$ 131,000	\$ 39,000	\$ 5,000	\$ 175,000
B	101,000	30,000	2,000	133,000
C	125,000	38,000	4,000	167,000
D	473,000	142,000	-	615,000
D-1	263,000	79,000	-	342,000
E	652,000	196,000	114,000	962,000
E-1	76,000	23,000	-	99,000
E-2	107,000	32,000	-	139,000
F	99,000	30,000	12,000	141,000
G	492,000	148,000	70,000	710,000
BASIN	267,000	80,000	127,000	474,000
TOTAL	\$ 2,786,000	\$ 837,000	\$ 334,000	\$ 3,957,000