RIVERSIDE COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

RIVERSIDE, CALIFORNIA

REPORT ON

MASTER DRAINAGE PLAN

FOR

CATHEDRAL CITY

ZONE SIX

JUNE 1965

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PLATES

SUMMARY

The rapidly developing residential areas south of Terrace Road in Cathedral City are subject to flooding from local storm runoff due to the lack of an adequate drainage system. There have been several instances of flooding and property damage in this area during the past three years and continued urban development will only serve to worsen the flooding problems.

A Master Plan for Drainage has been developed and is presented in this report as providing an economical and satisfactory solution to the problem. The plan proposes reconstruction of three streets to serve as major drainage collectors. The storm flows within these streets would discharge into the main East and West Cathedral Canyon flood control channels through three existing and two additional inlet structures proposed to be constructed. The plan also proposes improving several north-south streets with standard concrete curbs and gutters to contain all storm runoff entering therein and the reconstruction of several intersections to keep the flows within the water carrying streets.

The reconstruction of the three streets and construction of new channel inlets should be completed as early as possible. This will then eliminate the most serious flooding problem. As the remainder of the area

develops, improvement of the remaining street system in accordance with the master plan can be accomplished by the land developers.

The recommended plan, when constructed, will eliminate all serious flooding and drainage problems in this area.

INTRODUCTION

General - Cathedral City, an unincorporated community located about four miles southeast of Palm Springs, has been experiencing rapid suburban development during the past several years. In 1950, the District completed construction of two flood control channel improvements to protect Cathedral City from major flooding from East and West Cathedral Canyons. The construction of these channels made it possible for the area to develop by eliminating a serious flood hazard.

There is, however, an area of about one square mile between the two channels, constituting the developed area of Cathedral City, that can produce substantial quantities of storm runoff. Such runoff combined with the steep gradients on the alluvial cone, can cause serious drainage problems in the absence of an adequate drainage system. There was considerable thunderstorm activity in the desert regions of the District in August and October 1963, with small storms centering over Cathedral City. The resultant runoff and flooding that occurred brought clearly to the attention of the local residents the lack of an adequate drainage system to handle the storm runoff in Cathedral City.

The solution to the problem is to conduct the runoff via the street system to key inlets into the flood control

channels. By providing for several inlets to the East and West Cathedral Canyon Channels it is possible to handle all of the runoff within the streets and avoid the need for costly underground storm drains.

Purpose - The purpose of this study is to develop an economical drainage plan for the area that would eliminate existing flooding problems and assure satisfactory protection from storm runoff for all future developments.

Scope - This study is limited to the area of Cathedral City south of Terrace Road since this area has the greatest problem and suffered the most damage from past storms. The study includes the following:

(1) Determination of the amounts and points of concentration of storm runoff in the area.

(2) Determination of the degree of control or level of protection that can be economically provided.

(3) Investigations of alternative methods of controlling the storm runoff.

(4) Preparation of a master drainage plan and preliminary design and cost estimates for the required channel inlet structure.

Description of Watershed - The total drainage area within the limits of this study covers approximately 325 acres (see Plate 1). About 40 acres located at the south end

of the drainage area consists of steep mountainous terrain. The remaining 285 acres consists of existing or future residential subdivision land.

The residential area lies on an alluvial fan, located at the base of the mountains, formed by the historic flooding and deposition from East and West Cathedral Canyons. Elevations vary from 400 feet above mean sea level at Terrace Road to 700 feet at Foothill Road, and 1318 feet at the highest point in the watershed. The average gradient from Foothill Road to Terrace Road is about 5.5 percent and from Foothill Road to the mountain peak about 60 percent.

The mountainous portion of the watershed has considerable rock outcropping, some soil mantle and no vegetation whatsoever. The soil in the residential area is sandy and gravelly. Vegetation is sparce, consisting mainly of that provided by homeowners in landscaping.

Description of the Problem - From the description of the watershed previously given it is quite apparent that storm runoff concentrates rapidly and runs off swiftly in this area. Storm waters flowing overland also transport substantial amounts of sediment because of the type of soil and lack of vegetative cover.

Runoff from the mountain area concentrates at the intersection of Elna Way and Foothill Road. As the flows proceed north along Elna Way, additional runoff entering

the street exceeds the capacity of the street. The excess flows then proceed overland through homes and property fronting on Elna Way and Paradise Way. As the storm waters proceed downstream in a northeasterly direction, additional areas contribute to and increase the quantity of runoff. At Valley Vista Drive the flows proceed north in Paradise Way, Bel Air Drive and Vista Drive. However, since these streets are not improved with curbs and gutters their water carrying capacity is limited and will not handle the runoff coming from upstream areas. The excess flows again proceed overland in a northeasterly direction toward the intersection of Terrace Road and Chuperosa Lane.

Under present conditions about 40 percent of the 325 acre watershed drains into the West Channel through the inlet north of the intersection of Vista Drive and Terrace Road, and about 52 percent of the watershed concentrates at the inlet located at the east end of Terrace Road. The remaining eight percent of the total watershed drains into the west channel through an inlet from Channel Drive north of Carroll Drive.

The inlet at the east channel and Terrace Road does not have capacity for the maximum discharge from the area presently draining to it. The inlet structure at Vista Drive had insufficient capacity for runoff from recent storms, causing extensive flooding and damage to homes located immediately downstream. The inlet at Channel Drive is adequate for the contributing storm runoff.

HYDROLOGY

General - Cathedral City is located at the base of the Santa Rosa Mountains in an arid desert region. The climate is characterized by extreme heat and dryness during the summer months and mild temperatures during winter months. Based on a 17-year record, the mean seasonal precipitation in Cathedral City is 3.02 inches per year. Most of the precipitation generally occurs during the winter months. However, thunderstorms frequently occur during the months of August, September and October, and create the most potential flood threat. These storms are of a high intensity and short duration. It is possible for the mean annual precipitation to be exceeded in one month from such thundershowers.

Design Storm Frequency - The District generally designs major flood control facilities to control a once in 100-year flood. The East and West Cathedral Canyon Channels were constructed to pass the 100-year peak discharge. In urban areas, where essentially all of the runoff originates within developed areas, the most economical level of protection has been found to be from a once in 10-year storm event. The storm runoff is usually carried in the streets until the flow reaches the top of the curb, at which time it is taken into an underground drain. The once in 10-year storm frequency was adopted for this study since more than 90 percent of the drainage area will be developed primarily into residential use.

An intensity-duration curve was developed for the Cathedral City area from data contained in U. S. Weather Bureau Technical Paper No. 24 and correlated with the limited rainfall records the District has for this area. The curve is shown as Figure 1 of this report.

Design Discharge - The rational method of computing runoff as adopted by the District was used for this report. In using the rational method it is necessary to determine a coefficient of runoff "C" for the drainage area. The value of "C" is based on the soil type, slope of land, type of development and intensity of rainfall. The values of "C" used in this study varied from 0.85 for the mountain areas to 0.60 for the residential areas. Peak discharges in cubic feet per second were computed at all street intersections and the flows routed through the proposed major water carrying streets to points of discharge into the main channels. The peak design discharges at the proposed channel inlet structures are as follows:

Inlet Location	Peak Discharge in Cubic Feet Per Second
Channel Drive and West Channel	50
Elna Way and West Channel	94
Vista Drive and West Channel	160
Valley Vista Drive and East Channel	80
Terrace Road and East Channel	125

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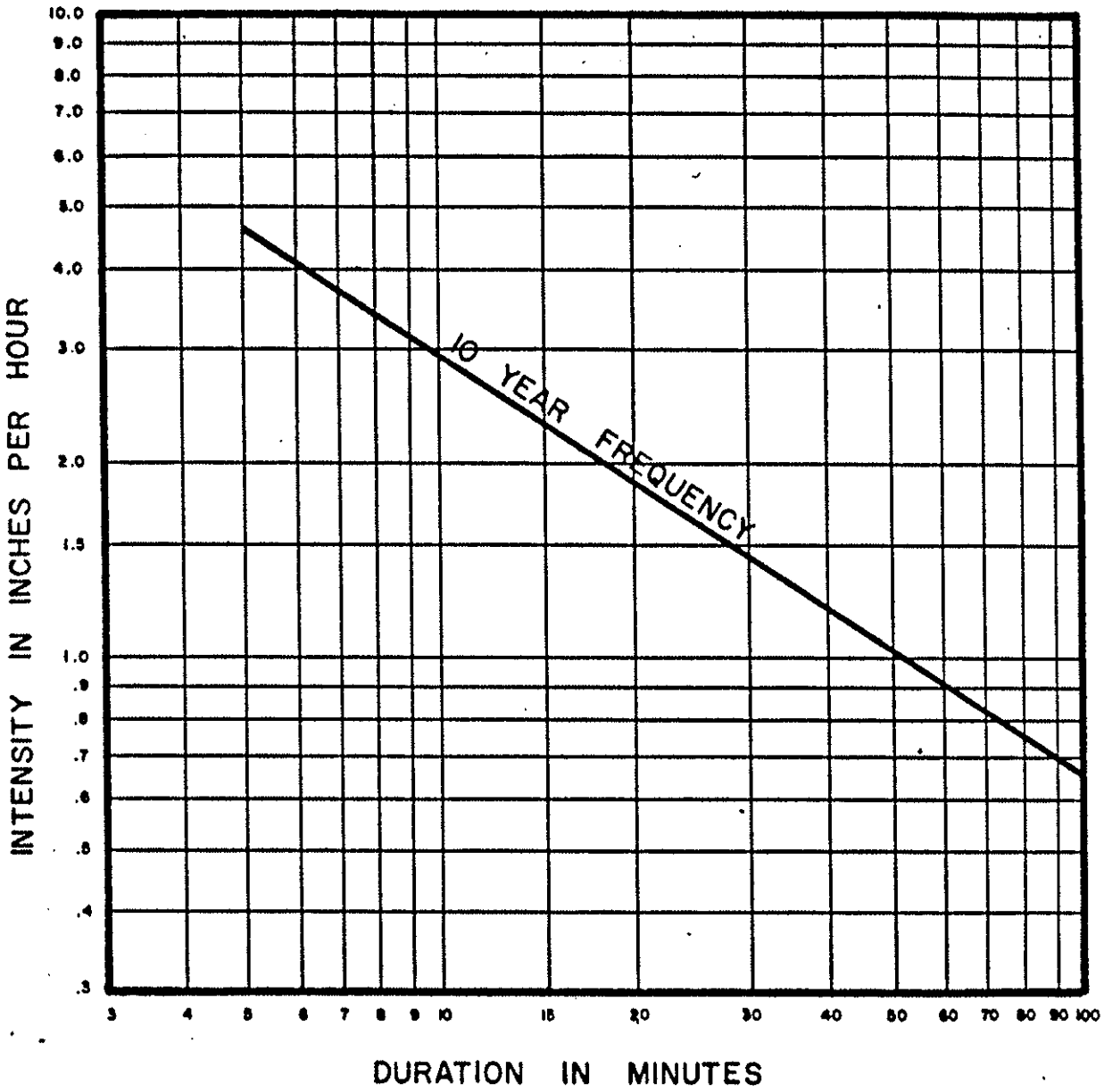

FIGURE 1

CATHEDRAL CITY - INTENSITY DURATION CURVE

PLANS OF IMPROVEMENT CONSIDERED

General - In evaluating the drainage problems in the study area, it was felt that maximum use should be made of the existing street system for handling the storm runoff in order to minimize the need for costly underground storm drains. Because of the amount of sediments carried in storm flows in this area, maintenance of underground facilities would also be more costly than street maintenance.

When this study was initiated the hydraulic capacities of the existing inlets at Terrace Road and the east channel, and Vista Drive and the west channel, were considerably less than the 10-year storm runoff from the drainage area. The cost of conveying all storm waters in properly constructed streets to the existing but enlarged inlets, was evaluated versus the cost of providing additional channel inlets upstream with less required street improvements.

Recommended Drainage Plan - The plan herein recommended for control of storm runoff within the study area consists of (1) reconstruction of Elna Way from south of Carroll Drive to the intersection with Grandview Avenue, (2) reconstruction of Valley Vista Drive from Paradise Way to the intersection with Vista Drive, (3) reconstruction of Terrace Road from Dorn Road to Chuperosa Lane, (4) construction of additional inlets at Elna Way and the west channel and Valley Vista Drive and the east channel, and (5) improvement of the existing inlet at Vista Drive and the west channel.

The proposed street sections for the streets to be reconstructed are shown on Plate 1. The two additional inlets proposed at Elna Way and Valley Vista Drive are shown on Plate 2. The District recently completed improvement of the Vista Drive inlet in accordance with the proposed plan.

There is available land north of Terrace Road between the west channel and the Vista Drive inlet channel that will probably be developed in the future. In connection with the development of this property it will be necessary to provide a drainage facility along the west channel dike to convey flows from the intersection of Paradise Way to the inlet structure, and to extend Bel Air Drive as shown on the plan to convey storm flows to the inlet. The construction of these features should be the responsibility of the developer since the storm waters presently flow across the property.

In addition to the above-mentioned improvements, several north-south streets should be improved with concrete curbs and gutters, and several intersections should be reconstructed to insure that storm flows remain within the streets. A detail of a typical street intersection with a water carrying street and a tabulation of those requiring reconstruction are shown on Plate 1. Charlesworth Drive, Paradise Way, Bel Air Drive and Vista Drive should be improved with 6-inch concrete curbs from Valley Vista Drive

to the Vista Drive channel inlet. Dorn Road and Chuperosa Lane should be improved with 8-inch concrete curbs, throughout their length south of Terrace Road.

Alternative Plans Considered - The alternative to the recommended plan would be to enlarge the two existing inlet facilities and route all flows through the street system to these facilities. This plan would require reconstruction of Bel Air Drive and Paradise Way from Valley Vista Drive to Terrace Road and the construction of a new street adjacent to the west channel from Grandview Avenue to Terrace Road. The reconstruction of Elna Way and Terrace Road as proposed in the recommended plan would still be necessary in the alternative plan. The alternative plan would require 6,000 additional feet of street construction or improvement over the recommended plan.

Another consideration which makes the alternative plan less desirable is the fact that a few streets would be required to carry large volumes of water at high velocities for considerable distances. This presents a serious hazard in itself. The recommended plan provides for lesser volumes of water in any one street over shorter distances.

CONCLUSIONS

On the basis of the studies made for this report, it is concluded that:

1. A serious flooding problem exists in the Cathedral City area south of Terrace Road because of the lack of an adequate drainage system.
2. Satisfactory control of the local drainage can be accomplished by proper utilization and design of the present street system, along with adequate inlet facilities to convey the storm runoff into the flood control channels.
3. By reconstructing Elna Way, Valley Vista Drive and Terrace Road to act as storm water collector streets and providing standard concrete curbs and gutters along the north-south streets north of Valley Vista Drive, and by providing additional channel inlet structures at Elna Way and Valley Vista Drive, the storm runoff will be adequately controlled in this area.

RECOMMENDATIONS

It is recommended that:

1. Elna Way, Valley Vista Drive and Terrace Road be reconstructed at the earliest practicable time in accordance with the recommended plan.
2. The additional channel inlet structures be constructed at the time the street improvements are made along Elna Way and Valley Vista Drive.
3. All future developments in this area be required to conform to this master drainage plan.