Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1978

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HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS, METROPOLITAN AREA

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INTRODUCTION

Hydrologic investigations of urban watersheds in Texas were begun by the U.S. Geological Survey in 1954. Studies are now in progress in Austin, Dallas, Dallas County, Fort Worth, Houston, and San Antonio.

The Geological Survey, in cooperation with the Texas Department of Water Resources, began hydrologic studies in the Austin urban area in 1954. In cooperation with the city of Austin, the program was expanded in 1975 to include additional streamflow and rainfall gaging stations and the collection of water-quality data. In 1978, the program was expanded to include a ground-water resources study of the South Austin metropolitan area in the Balcones Fault Zone.

The objectives of the Austin urban-hydrology study are as follows:

1. To determine, on the basis of historical data and hydrologic analyses, the magnitude and frequency of flood peaks and flood volume.

2. To determine the effect of urban development on flood peaks and volume.

3. To determine the variations in water quality during different seasons in selected basins under various types of urban development.

4. To quantitatively appraise the ground-water resources along the Balcones Fault Zone, the effect of urbanization on the quality and quantity of recharge and discharge, and the extent of pollution in the Edwards aquifer.

This report presents the hydrologic data collected in the Austin urban area for the 1978 water year (Oct. 1, 1977 to Sept. 30, 1978). To facilitate the publication and distribution of this report at the earliest feasible time, certain material has been included that does not conform to the formal publication standards of the U.S. Geological Survey.

The inch-pound units of measurements used in this report may be converted to metric units by using the following conversion factors:

From		Multiply	To obtain	
Unit	Abbreviation	by	Unit	Abbreviation
inch	--	25.4	millimeter	mm
foot	--	0.3048	meter	m
mile	--	1.609	kilometer	km
square mile	mi^2	2.590	square kilometer	km^2
cubic foot per second	ft^3/s	0.02832	cubic meter per second	m^3/s
foot per mile	ft/mi	0.189	meter per kilometer	m/km
acre-foot	--	1233	cubic meter	m^3
		0.001233	cubic hectometer	hm^3

Additional explanations of terms related to streamflow, water quality, and other hydrologic data used in this report are defined in the U.S. Geological Survey annual report Water Resourses Data for Texas, TX-78-3, 1978.

LOCATION AND DESCRIPTION OF THE AREA

The Austin study area is about 80 miles northeast of San Antonio and about 160 miles northwest of Houston. The study area extends from the Hill Country at the eastern edge of the Edwards Plateau across the Balcones Escarpment to the Blackland Prairie of Texas. The land surface decreases in altitude from about 1,100 feet above NGVD (National Geodetic Vertical Datum of 1929) in the northwest to about 420 feet above NGVD level in the southeast.

Slopes generally range from 2 to 15 percent; slopes greater than 5 percent occur along the eastern edge of the Edwards Plateau, average about 5 percent within the Balcones Fault Zone, and are less than 5 percent east of the escarpment and along the flood plains and alluvial terraces of the Colorado River and its tributaries.

Soils overlying the hard limestone in the western half of the study area are in general poorly developed thin calcareous clays, clay loams, and stony clays. Bedrock is locally exposed. Soils on the soft limestones and shales of the Balcones Fault Zone are generally dark brown calcareous clays, clay loams, or silty clay loams 6 inches or more thick. Soils on the shaly formation in the eastern part of the area are dark gray to olive calcareous clays and clay loams, 12 inches or more thick. Soils on the flood plains and terraces of the Colorado River and its tributaries are dark gray to red-brown, calcareous, noncalcareous, sandy loams, silty clay loams, clay loams, and gravelly sands 12 inches or more thick.

Detailed descriptions of the soils in the Austin urban study area can be found in Soil Survey of Travis County, U.S. Dept. of Agriculture, 1974. Additional geologic information in the Austin urban study area can be found in publications by the University of Texas Bureau of Economic Geology.

The major streams in the study area are the Colorado River, Onion Creek, Barton Creek, Walnut Creek, Bull Creek, Boggy Creek, Shoal Creek, Williamson Creek, Slaughter Creek, and Waller Creek. Throughout the year, low flow for some of the smaller streams in the predominantly urban areas is partly sustained by return flow from commercial use; during the summer months, the low flow is partly sustained by drainage from municipal and private swimming pools and from residential use.

The climate of the Austin urban area is characterized by short mild winters, long moderately hot summers, moderately high humidity, and prevailing southerly winds. Records of the National Weather Service show that the mean annual temperature (based on the period 1941-70) is 70.6°F (21.5°C); the mean maximum temperature for July is 95°F (35.0°C); and the mean minimum temperature for January is 41°F (5.0°C). The average growing season is about 270 days.

The average rainfall (based on the period 1941-70) is 32.49 inches and is generally well distributed throughout the year; however, individual storms may cause flooding in any season. The major storms usually occur during the months of April-May and September-October.

DATA-COLLECTION METHODS

The drainage basins, locations of hydrologic-instrument installations, and surface-water-quality sampling sites in the Austin urban study area are shown on figure 1. The locations of hydrologic instruments and data-collection sites in the individual drainage basins are shown on figures 5-15.

Precipitation Data

Precipitation data are based on 24 recording rain gages. The gages are distributed throughout the drainage basins to measure total precipitation and to define rainfall intensities.

Precipitation at indivudual gages and weighted precipitation in each basin is given in the section "Compilation of data." Weighted-mean precipitation factors are shown in table 1. Weighted-mean precipitation for a study area is determined by the Thiessen method described by Linsley, Kohler, and Paulhus (1949). For example, the weighted-mean precipitation for the drainage basin upstream from the stream-gaging station Bull Creek at Loop 360 is computed as follows: Multiply the recorded precipitation at rain-gage 1-BUL by 0.57 and to that value, add the recorded precipitation at rain-gage 2-BUL multiplied by 0.43.

Rainfall for the current water year was unevenly distributed over the area. Individual station totals ranged from 23.95 inches at gage 6-R in the Waller Creek basin to 32.31 inches at gage 1-WLN in the Walnut Creek basin. The mean water-year total of all the rain gages is 27.83 inches as compared with the 30-year average (1941-70) of 32.49 inches at the Austin Municipal Airport. Daily and monthly precipitation data at individual gages in the study area are given in the section "Compilation of data."

Few storms of wide distribution produced rainfall totals of over 2 inches during the year. The most significant runoff-producing storm of the year occurred on May 2-3; rainfall totals for this storm ranged from 0.64 to 2.35 inches. Widespread showers also fell on February 12 and May 11. These storms produced rainfall totals ranging from 0.46 to 1.92 inches, and 0.03 to 1.88 inches respectively.