

THE URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
 Lucas Building, 181 East 56th Avenue, Denver, Colorado 80216. Telephone: (303) 534-0105

SANDERSON GULCH FLOOD CONTROL PLAN PROPOSED

(Reprinted from the Rocky Mountain News, July 21, 1972)

Urban Drainage and Flood Control District directors Thursday authorized L. Scott Tucker, the district's executive director, to proceed on negotiations with Denver and Lakewood for drainage improvements in Sanderson Gulch.

Tucker also was directed to enter into agreements with the two cities on maintenance of the gulch improvements and to provide information and other services the two cities may need.

Action of directors came after Tucker gave a report on a financial plan being proposed to the two cities to improve the Sanderson Gulch drainage.

The Sanderson Gulch starts above Alameda Parkway in the Green Mountain area with its drainage running along both sides of W. Jewell Avenue.

The gulch runs through Smith and Kendrick Reservoirs, along W. Jewell Avenue to Sheridan Boulevard, through Denver, entering the South Platte River at approximately W. Florida Avenue.

BRANCH INCLUDED

Included in the proposed drainage improvement plan is North Sanderson Gulch which enters the main gulch at about W. Jewell Avenue and Harlan Street.

Tucker told directors that while the final engineering study will not be completed until August 17, preliminary engineering studies indicate the total cost will be \$1,421,000 for 8.7 miles of stream improvements along the gulch.

He said cost sharing between the two cities is based on total development of the drainage area over the next 10 years as it will apply to each city.

The study, he said, indicates 48.5 per cent of impervious surface will be located in Denver development and 51.5 per cent in Lakewood.

The impervious surface results from such developments and improvements as housing, shopping centers, roads and other construction which will add to the water runoff into the gulch.

Of the total cost, Tucker said \$849,000 is allocated to drainage, and based on the percentage formula Denver's share is \$411,765 and Lakewood's \$437,235.

OPEN SPACE ADDED

Costs allocated to parks, open space and additional drainage would fall more in Denver with the city's share at \$260,000, while Lakewood's would be \$100,000, for a total of \$360,000.

Street crossing improvements across the gulch for new culverts, gutters and road building would total \$212,000 with \$165,000 falling in Lakewood and \$47,000 in Denver.

Total gross cost of the project would be \$718,765 for Denver and \$702,235 for Lakewood, subject to change with the final engineering report, Tucker said.

Tucker pointed out, however, that because of state and federal funding, the total project cost will be about \$476,000, with net costs of \$246,515 to Denver and \$229,485 to Lakewood.

He said the recent General Assembly appropriated \$350,000 toward the project. Using the previous men-

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DENVER HELD VULNERABLE TO FLOODS

(Reprinted from the Rocky Mountain News, June 17, 1972)

Flash floods of the kind that devastated Rapid City, S.D., can occur at any time in the highly populous metropolitan Denver area, according to L. Scott Tucker, executive director of the Urban Drainage and Flood Control District.

Despite construction of two or three protective dams, Tucker said, flood plains along many streams and gulches in Denver and its suburbs stand exposed to disastrous floods. Many of these flood plains have commercial and residential developments where flood damage might compare with or be worse than that in Rapid City.

"Our mayors, councilmen and county commissioners have been doing their best to alert the public to the need for preventive action against floods, and for property owners in flood-prone areas to buy flood insurance," Tucker said. However, he added "It seems almost impossible to wake people up to the danger."

Tucker pointed out that the office of the Flood Control District has ample information available, including maps

showing endangered flood plain areas in all of the communities surrounding Denver as well as in Denver itself.

"About 25 per cent of the major drainageways passing through Denver are already built up, but on the other 75 per cent still undeveloped, effective flood plain regulation could avoid multi-million dollar losses from future floods. The District is working with municipalities to implement flood plain regulations," Tucker said.

"The government-subsidized flood insurance is the best way ever for people with property in flood plain areas, and yet not one property owner in 50 has taken advantage of it," he said. "The rates are about one-tenth regular actuarial rates.

"The government may not continue this subsidy indefinitely, and property owners would do well to get the cheap flood insurance while they can do so," he added.

Tucker urged the public to work with local officials to minimize losses from floods and to take preventive action before another disaster occurs.

URBAN DRAINAGE and Flood Control DISTRICT

L. SCOTT TUCKER, EXECUTIVE DIRECTOR

FLOOD HAZARD NEWS

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Trying to Avoid a Rude Awakening

Through press, television and radio, and talks to public gatherings, flood-wary officials have been trying to alert the general public to the need for action. The media have provided whole-hearted cooperation, as indicated by the newspaper story reprinted on the front page of this issue.

"We remember the costly floods of 1965 caused by cloudbursts in the Plum Creek Basin," said Scott Tucker. "It could happen again, any time, on any of the gulches and creeks here in Colorado, just as it happened in the Black Hills area."

"What if the intense rainfalls that occurred in the Rapid City area, or along our own Plum Creek, occurred on the Little Dry Creek Basin in Douglas and Arapahoe counties? On Sanderson Gulch Basin in Lakewood and Denver? On Goldsmith Gulch in Arapahoe county and Denver?"

"And remember that we, too, have dams that could go out if subjected to the very intense rainfalls that caused the tremendous runoffs and devastating floods in Rapid City," Tucker added.

"Lesson for Boulder in Rapid City Flood," was the headline of a front-page feature in the *Boulder Daily Camera*, with pictures of an early-day flood and extensive quotations from Ted Dieffenderfer, city operations director.

This article (Sunday, June 18, 1972) referred to master plan studies now nearing completion which are expected to go to city council next September.

Today about 50 per cent of the city of Boulder would be "subject to some form of flood damage" in the event of a 100-year flood, but the proposed plan could reduce the affected area to 3 to 5 per cent of the city, Dieffenderfer said, adding that, "all we need is money."

Flood's — Man's Worst Enemy?

Writing in *National Observer* (July 15, 1972) concerning Hurricane Agnes, David W. Hecker cited some flood figures from the Office of Emergency Preparedness: 10,000,000 Americans are living in "significantly defined flood plains," and another 25,000,000 could be affected by floods. There are 50,000,000 acres in the nation subject to flooding. Flood losses are running around \$1 billion annually, a figure doubled if not tripled by Hurricane Agnes. Between 1955 and 1971, all but two states received Red Cross flood assistance.

Flood is man's greatest natural adversary. He can, of course, do something about it, such as throw up dams and levees, but there always remains weather—fickle, unpredictable.

Weathermen see no newly emerging weather pattern that makes the next hurricane or tropical storm any more, or any less, of a potential disaster than Agnes, or Camille in 1969, or Diane in 1955.

DIDS stands for *Decision Information Distribution System*, a three-channel low-frequency radio network with transmitter and receivers to be tested in March, 1973. The hope is to develop receivers which can be bought for between \$5 and \$10, "so that every Tom, Dick, and Harry in the country can own one," according to the Office of Telecommunications Policy in the White House, which has been assigned the task of developing a system for immediate and direct warning to all citizens in case of flood or other disaster.

Project REUSE Yields Major Spinoff:

PRESCRIPTION FOR PREVENTING FLOODS

Fame of a sort has come to an insignificant-looking little lake situated in the southwest sector of Denver's metropolitan area. The drainage basin named for the small lake has been subjected to Urban Systems Engineering as a case study. From this analysis has come a report, elaborately illustrated and documented, MASTER PLAN FOR MAJOR DRAINAGE—HENRY'S LAKE AREA.

The Henry's Lake report provides, "a preventive master planning methodology that can be applied to major drainage channels." The Master Plan is already in use by the District, which is utilizing the recommended processes on several ongoing projects.

The drainage basin named for Henry's Lake is tributary to Bear Creek in Jefferson County and the City of Lakewood. The significance of the Model Plan emerging from Project REUSE was this conclusion reached by the engineers:

"It is clear that serious problems do not yet exist on almost half of the major drainage channels identified, and that a dedicated effort of preventing problems from developing by master planning can produce valuable results in terms of future problem prevention.

"The Henry's Lake Area Master Plan is an application of the preventive master planning methodology to a real world situation. It provides a practical demonstration of how potential problems can be anticipated and resolved, through efficient management of the urban drainage system."

This is the first application of urban systems engineering to urban drainage in the Denver Region. In explaining why this location was chosen, the engineers point out:

"The Henry's Lake Area, which has already started the rapid transition from rural agriculture to urban development, can become a model of effective urban drainage management if the Henry's Lake Area Master Plan is fully implemented and effectively administered."

Credit for developing the Master Plan goes largely to Leonard Rice Consulting Water Engineers, a Denver firm, consultant to Martin Marietta Corporation, which conducted the REUSE project for the Denver Regional Council of Governments, in cooperation with the Urban Drainage and Flood Control District. Federal funding was supplied through a HUD grant, No. COLO-USE-1.

The following Abstract describes the report on the Master Plan:

"The report illustrates and demonstrates application of a systems engineering methodology as a prototype for future master planning of the regional major drainage system. The methodology incorporates a functional description of the urban drainage system, and a systematic process of data acquisition, runoff analysis, concept identification and selection, and master plan development and presentation. A detailed master plan and implementation recommendations for the Henry's Lake Area are included. The same methodology is applicable to the approximately 1200 miles of major drainage channels in the Denver region. The report is one of a series related to urban drainage and flood control resulting from Project REUSE (Renewing the Environment through Urban Systems Engineering)."

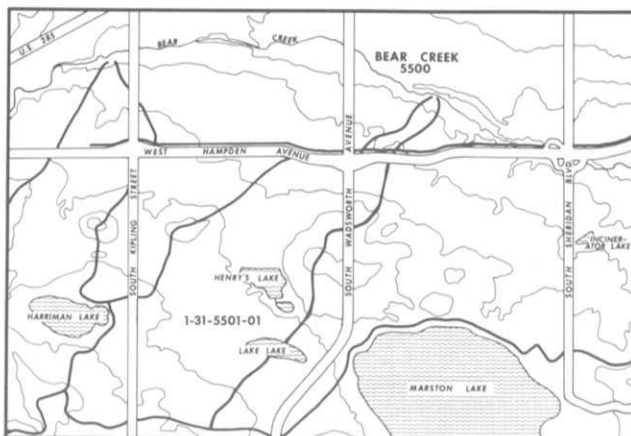
Characteristic of the problems involved in approaching solutions to drainage problems was the multiplicity of agencies and governmental units concerned. "The City of Lakewood and Jefferson County are the two primary local government agencies having jurisdiction within the Henry's Lake Area. There are, however, in addition the Federal Correctional Institute, several water and sanitation districts, and other governmental and nongovernmental agencies all of which were contacted and interviewed to determine the status of planning and to identify interfaces with the various urban subsystems listed below.

1. Construction and Urban Development
2. Irrigation (Agriculture)
3. Urban Drainage and Flood Control
4. Parks, Open Space, and Recreation
5. Sanitary Sewer and Wastewater
6. Solid Waste
7. Transportation
8. Water Supply and Distribution
9. Public Health and Safety

"The process of interviewing agencies to collect and correlate information is one of the most informative of the master planning effort. . ."

The Master Plan was issued in June 1972 as a 64-page report, with supplementary maps and appendices. One of the charts from the Master Plan is presented on the following pages.

MASTER PLAN FOR MAJOR DRAINAGE Henry's Lake Area Subbasin 1-31-5501-01



PROJECT REUSE
Final Report—Supplemental Publication



DENVER REGIONAL COUNCIL OF GOVERNMENTS
AND
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT



ONE OF THE CHARTS FROM THE MASTER

PLAN FOR MAJOR DRAINAGE BASINS

Editor's Note: We have appended a portion of another of the charts, below in the lower left corner, to indicate continuity and sequence

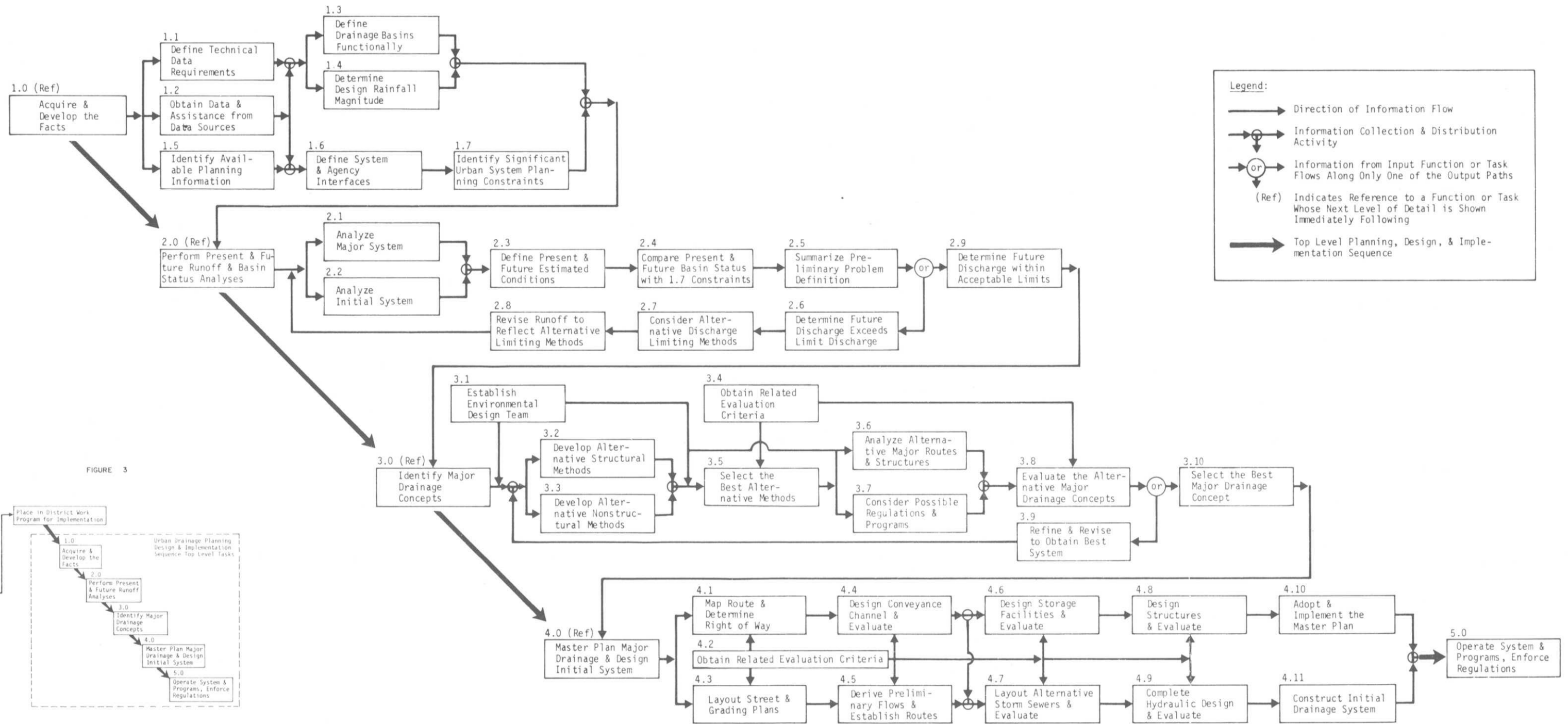
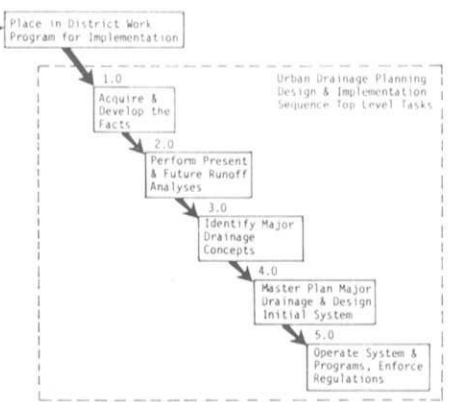


FIGURE 3



LEONARD RICE Consulting Water Engineers Denver, Colorado

URBAN DRAINAGE PLANNING, DESIGN AND IMPLEMENTATION SEQUENCE SUMMARY

TUCKER—TALK

by L. SCOTT TUCKER



Timely Comment from the District's Executive Director

ALTERNATIVE SOLUTIONS DESIGNATED. At the April meeting of the District Board of Directors, an alternative for solving the drainage problems on Sanderson Gulch was selected. An alternative solution for Weir Gulch was approved by the Board at its May meeting. The engineer expects to complete his work on Sanderson and Weir Gulches in August.

HOW TO FINANCE IMPROVEMENTS. Now that the studies are nearing completion, the next step is to determine how the improvements can be financed. We are concentrating first on financing the Sanderson Gulch improvements, and much effort has been spent in this regard in the past two months. The District is now negotiating with Denver and Lakewood on how to allocate the improvement costs for Sanderson Gulch.

The State Legislature appropriated \$350,000 during its last session, to be used for drainage improvements on Sanderson Gulch. This money will provide the catalyst needed to generate both local and federal funds. Senator Joe Shoemaker is to be credited for seeing this appropriation through the Legislature. (See page 1 on this topic).

A proposal for \$500,000 in funds has been submitted to the Department of Housing and Urban Development for drainage improvements on Sanderson Gulch. Should Federal funds be obtained, the local cost requirements will be reduced to a manageable amount.

STUDIES ON OTHER DRAINAGE BASINS. Other ongoing projects include drainage studies on Little Dry Creek in Arapahoe County, South Boulder Creek in Boulder County, and Big Dry Creek in Adams County. The engineering firm for Little Dry Creek is McCall-Ellingson, which is scheduled to complete Phase A in mid-November.

Little Dry Creek is particularly interesting because it involves five local governmental jurisdictions: Douglas County, Arapahoe County, Greenwood Village, Cherry Hills Village, and the City of Englewood. This is a good example of the function the District can perform in bringing several local jurisdictions together on one problem.

The Big Dry Creek study in Adams County extends from Standley Reservoir downstream to the Adams/Weld County line. The engineer for the Big Dry Creek project is Ken Wright. Phase A is expected to be completed by mid-October. The local jurisdictions involved in the Big Dry Project are Adams County and Westminster.

The South Boulder Creek project involves Boulder County and the City of Boulder. The engineer for this project is R. W. Beck and Associates. The project was delayed because of some mapping problems, but Phase A is now expected to be completed in mid-September.

DRAINAGE STUDIES PLANNED. It is also expected that drainage studies will be initiated soon on Goldsmith Gulch in Arapahoe County and Denver; also one on Brighton drainage, involving the City of Brighton and Adams County.

We hope that each of the drainage studies can be followed by an implementation program. An implementation program can take basically two forms; one is prevention through flood plain zoning, and the other is solving existing problems through construction activities.

PROCEDURE FOR DRAINAGE STUDIES. All District drainage studies have thus far consisted of two phases. During Phase A, the engineer defines the drainage problems and develops the hydrology, and defines alternatives to solve the drainage problems. At the completion of Phase A, the local jurisdictions in cooperation with the Drainage District select one alternative. The engineer then proceeds to complete the master drainage plan for the selected alternative during Phase B.

ADDITIONAL RESEARCH NEEDED. The experience with the several drainage projects now underway has identified certain areas requiring additional research. We have found that existing practice does not provide satisfactory means for developing the hydrology for intermediate sized urbanized drainage basins. We have also found it difficult to handle the benefit/cost analysis. Particularly frustrating is the inability to assign dollar benefits to intangible benefits such as provision of parks and open spaces, urban bike and pedestrian trails, pollution reductions, and protection of thoroughfares to handle emergency traffic during high water periods. These are certainly real benefits but they are difficult to quantify. Consideration is being given to examining these problem areas during 1973 and the revising the Urban Storm Drainage Criteria Manual accordingly.

FLOOD PUBLICITY SPURS DEMAND FOR INSURANCE. Much local public interest was displayed after the flooding at Rapid City and in the Eastern United States. Many requests regarding the Federal subsidized flood insurance were received. Many callers asked if their homes were located in flood-prone areas. We answered each request by locating the individual's home on the map of the appropriate Flood Plain Information Study prepared by the Corps of Engineers. When a home was in a flood plain area, we sent the inquiring homeowner a copy of the Flood Plain Information Study for his area.

SERIES OF DRAINAGE BASIN STUDIES. The basic source of information regarding flood-prone areas are the Flood Plain Information Studies prepared by the U.S. Army Corps of Engineers. One report covers the main stem of the South Platte River with a flood plain over-

print based on the 1965 flood. Volume II, Boulder Metropolitan Region, includes studies on Boulder Creek. Both of these volumes are out of print but may be seen in the District library.

Volume III includes Bear and Clear Creeks. Volume IV includes Big Dry Creek in Arapahoe County, Greenwood Gulch, Weir Gulch, Lakewood Gulch, South Lakewood Gulch, McIntyre Gulch, Little Dry Creek and Grange Hall creek in Adams County.

Volume V includes Ralston Creek, Leyden Creek, Van Bibber Creek, Lena Gulch, Sanderson Gulch and North Sanderson Gulch.

Volume VI includes Goldsmith Gulch, Dutch Creek, Lilly Gulch, and Coon Creek. Another study includes Bear Creek and Mt. Vernon Creek. A study was also completed for Sand Creek, Toll Gate Creek, and lower Cherry Creek.

Some supplies of the reports are exhausted, but the District still has available the following reports:

1. The Appendix to Volume III
2. Volume IV
3. Volume V
4. Volume VI, and
5. The Bear Creek and Mt. Vernon Report.

Flood Protection Included in Boulder Library's MGR Center

MUNICIPAL GOVERNMENT REFERENCE CENTER is a library-within-a-library which is developing a highly useful section on flood control measures and related topics, along with a wide variety of other problems faced by local governments.

Staffed by a professional librarian and trained assistants, the Center is situated in the Boulder Public Library. Now on the second floor, current enlargements soon will provide main floor space for the Municipal Government Reference Center.

Started in 1965 by the City of Boulder, the Municipal League of Colorado, and the Colorado State Library, the MGRC was funded originally by the Federal government (1/3), state government (1/3), and local government (1/3). Now it is supported 95 per cent by local funds with no Federal assistance and only a small amount of State aid, as the Boulder library feels capable of doing the job alone now.

Inter-library loan service is afforded and the Center has its own microfilm and micro-fische equipment available for loan to those utilizing its materials. The Boulder Public Library has thoroughly up-to-date facilities as well as highly trained personnel.

The Urban Drainage and Flood Control District, like other organizations in highly-specialized inter-governmental fields, is glad to do whatever it can to strengthen the service afforded the public through Boulder Public Library's Municipal Government Reference Center.

Flood Plain Maps Among District Office Wares

Answering questions of property owners concerned with flood hazards in specific areas of Denver and suburban communities has become an important part of the service provided by the office of the Urban Drainage and Flood Control District.

The office is on the 6th floor of the Lucas building, 181 East 56th Avenue, Denver, on the east side of the Valley Highway near the Boulder turnoff. The building is close to the Denver Merchandise Mart and adjoins the Broncho's practice field.

Current materials on many aspects of zoning and flood control are available at the District office, but its principal "library service" is in maintaining maps and engineering data on specific flood-prone areas and projects.

For the broader aspects of flood prevention and control measures, the public is referred to the rapidly-developing flood control section of the Municipal Government Reference Center at the Boulder Public Library.

Perhaps the most-used information available at the District office is the set of maps and reports issued by the U.S. Army Corps of Engineers, which has been studying and mapping various portions of the South Platte River drainage basin for many years.

In addition, the District office has all reports so far available from Project REUSE, covering protective measures recommended for all drainage basins in the area. This project was funded by the Federal government, with the sponsorship of the Denver Regional Council of Governments, in cooperation with the Urban Drainage and Flood Control District.

Sanderson Gulch Flood Plan

(Continued from Page 1)

tioned percentage formula, \$169,750 will be allocated to Denver and \$180,250 to Lakewood.

Tucker said a funding request was submitted July 6 to Housing and Urban Development (HUD) for \$500,000 which would be divided \$242,500 to Denver and \$257,500 to Lakewood.

\$95,000 REQUEST

He said a request for \$95,000 also will be made to the Bureau of Outdoor Recreation for acquisition of adjoining easement along the gulch, open space and recreation.

Because greater costs would be borne by Denver, the city would receive \$60,000 of this grant while Lakewood would receive \$35,000.

Tucker expressed optimism federal funds will be approved because the drainage project is multijurisdictional—between two cities—and for a multiuse purpose, such as drainage and flood control, stream pollution control, open space, park and recreation.

ARE YOU RECEIVING DUPLICATE COPIES?

Computer printouts of our mailing lists show some duplications.

If you are receiving two copies of Flood Hazard News, please advise the District office (Phone 534-0105) so the duplication can be eliminated.

Thank you.

"Didn't have flood insurance," Victims Emphasise Disaster Protection Need

Thousands of property owners learned—too late—that buying the government-subsidized flood insurance is a good idea, especially for those living in flood-prone areas where experience with past floods was all too evident.

The wide-spread floods in the North Atlantic states from Virginia northward into Pennsylvania and New York emphasized the lesson taught a fortnight earlier in South Dakota.

Spokesmen for the Corps of Engineers pointed out once more that most of the buildings destroyed or damaged had been built on old river beds or flood plains. Construction of protective dikes and dams had provided safeguards for many communities. Losses in Pittsburgh would have been ten times greater, Corps spokesmen said, had it not been for a series of dams built upstream from the metropolitan area.

INSURANCE RATES REDUCED

In one more attempt to offset the apathy of property owners in flood-prone areas, the Federal Insurance Administration slashed rates for flood insurance, which already was considered a "best buy" at about one-tenth of actuarial rates.

Effective July 10, insurance rates were reduced. On a single family house valued at \$17,500 the old rates were 40 cents per \$100 coverage for the structure and 50 cents per \$100 to insure the contents. The new rates are only 25 cents for the structure and 35 cents for the contents.

Similar reductions were made for homes and businesses with values up to more than \$60,000.

Property owners should see their local insurance agents to get the government-subsidized flood insurance. At present the flood insurance is costing the government about \$6,000,000 a year for the subsidy. So far, more than half of the buyers of flood insurance have been on the Gulf Coast where hurricane threats occur several times a year.

Coupled with the flood insurance are improved zoning and land-use practices adopted by communities which qualify for flood insurance.

Encroachment on flood plains by people and structures diminishes a stream's natural ability to cope with intense rainfall and runoff water. Vegetation and absorbent soils beside a stream normally soak up some of the water. Where vegetation is removed and soils are covered by pavement, there is more rapid and more complete runoff with increased erosion wherever soil is exposed. This increases the sediment moved by the stream, eventually clogging its channel and causing further flooding.

Use of flood plains for park areas, golf courses and other recreational uses improves the environment and helps to check the rapid runoffs that intensify flood dangers.

It is estimated that 10 per cent of all homes in the nation are in flood-prone areas. Since the flood insurance program was initiated, about 1,200 of the 7,500 flood-prone areas in the nation have become eligible for Federal flood insurance, but by early July less than 100,000 policies had been written.

The slash in rates, it is hoped, will cause property owners to show more initiative in obtaining the government-subsidized flood insurance.

DEDICATED:

*to the health and safety of persons living in the urban area
to reducing the danger to property and minimizing flood losses*

THE URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
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