FLOOD HAZARD AREA DELINEATION

LOWER DAD CLARK GULCH AND DFA 0068

URBAN DRAINAGE & FLOOD CONTROL DISTRICT

CITY OF LITTLETON

NOVEMBER 1990

CENTENNIAL ENGINEERING INC

CENTENNIAL ENGINEERING INC

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November 30, 1990

Mr. L. Scott Tucker, P.E., Executive Director
Urban Drainage & Flood Control District
2480 West 26th Avenue, Suite 156B
Denver, CO 80211

Re: Lower Dad Clark Gulch &
DFA 0068
Flood Hazard Area
Delineation Report
CEI - 906.00

Dear Mr. Tucker:

The Flood Hazard Area Delineation for Lower Dad Clark Gulch and DFA 0068 has been completed in accordance with Agreement No. 89-02.06, as amended.

This report presents the results of the floodplain analysis for three separate drainageways: Rangeview Gulch, Jackass Gulch, and Lower Dad Clark Gulch. Included in the report is the hydrologic data, the floodplain and floodway data, and the half size reductions of the 22" x 34" plan and profile flood hazard area delineation drawings.

Enclosed are 60 copies of the above mentioned report. Transmitted under separate cover are the following items:

1. One set of complete 22" x 34" plan and profile FHAD mylars.
2. One set of hydraulic calculations for the project.

We would like to express our appreciation to Ben Urbonas, Barb Benik, and Bill DeGroot of the District Staff and Bob Deeds of the City of Littleton for their assistance and attention during the preparation of this report.

Very truly yours,

CENTENNIAL ENGINEERING, INC.

Douglas C. Weber, P.E.
Chief Civil Engineer

David L. Mallory, P.E.
Project Manager

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FLOOD HAZARD AREA
DELINEATION
DAD CLARK GULCH & DFA 0068

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1.0 PREFACE

1.1 Authorization

This report was authorized by the Urban Drainage & Flood Control District. The District has the power to enact District-wide floodplain regulations. At present, the District makes floodplain information and mapping available for local agencies to adopt and administer their own floodplain regulations with the assistance of the District.

The Colorado Water Conservation Board has the power and duty

> "...to designate and approve storm or floodway runoff channels or basins, and to make such designations available to legislative bodies of cities and incorporated towns; to county planning commissions; and to boards of adjustment of cities; incorporated towns; and counties of this state..."

as stated in Section 37-60-106 (1) (c) of the Colorado Revised Statutes 1973. The cities, incorporated towns and counties within the study area may provide zoning regulations...

> "...to establish, regulate, restrict, and limit such uses on or along any storm or floodwater runoff channel or basin, as such storm or floodwater runoff or basin has been designated and approved by the Colorado Water Conservation Board, in order to lessen or avoid the hazards to persons and damage to property resulting from the accumulation of storm or floodwaters..."

as stated in Section 30-28-111 for the county governments and Section 31-23-301 for municipal governments of the Colorado Revised Statutes 1973.

Upon acceptance of this report by the Urban Drainage and Flood Control District and the designation and approval of this report by the Colorado Water Conservation Board, the areas described as being inundated by the 100-year flood (Intermediate Regional Flood) can be designated as flood hazard areas and their use regulated accordingly.

It should be noted that the terms "Intermediate Regional Flood," "100-year Flood," and "one percent flood" can be used interchangeably as they all define the same type of flood event.

1.2 Purpose of Scope

This study consists of a floodplain analysis of Rangeview Gulch, Jackass Gulch, Lower Dad Clark Gulch, and the adjacent direct flow areas.

The purpose of this report is to provide local officials with a guide for floodplain management so that flood hazards and environmental problems can be controlled. The 100-year event is the regulatory flood as identified by the District, the Colorado Water Conservation Board, the Federal Emergency Management Agency, the City of Littleton, and Arapahoe County. The information in this report does not imply any action by the District or the State of Colorado to regulate use of floodplains. The District has the authority to regulate floodplains, but currently has chosen to leave this responsibility with local governments.

The 100-year floodplain was delineated based on future developed basin conditions for each of the three drainageways analyzed in this study. Both floodplain maps and flood profiles were prepared. In addition, floodways were identified. The floodway is a high hazard area characterized by deep water and high velocity flows during flood events and should remain free of any development which would obstruct flow. As an amendment to the Scope of Work, two separate floodplain analyses were prepared for the Lower Dad Clark Gulch drainageway--one without flood attenuation in McLellan Reservoir (the current situation) and one with flood attenuation in McLellan Reservoir. Other unrecognized flood control facilities or possible future improvements were not considered in this report.

Flood water profiles and floodplain boundaries are often changed by road and bridge construction, floodplain development, flood control improvements, or natural processes. Prior to utilization of this report for planning or design purposes, the user is advised to contact the Urban Drainage and Flood Control District to determine if the information in this report has been revised.

1.3 Acknowledgements

This report was prepared by Centennial Engineering, Inc., consulting engineers of Arvada, Colorado, at the request of the Urban Drainage and Flood Control District.

All surveying and topographic data for this study was based on the USGS datum for mean sea level and was collected and compiled by Landmark, Ltd., Denver, Colorado, under a separate contract with the Urban Drainage and Flood Control District.

Various agencies, including the City of Littleton, provided information pertaining to the analysis of these basins. Also, coordination was done with J.F. Sato & Associates, (subconsultant to DeLeuw Cather) on the improvements to Santa Fe Drive. Technical data developed in this study is on file with the Urban Drainage and Flood Control District.

2.0 STUDY AREA DESCRIPTION

2.1 Location

This report addresses the drainage basins of Rangeview Gulch, Jackass Gulch, Lower Dad Clark Gulch (downstream of McLellan Reservoir), and the direct flow areas to the South Platte River located between the gulches.

The study area is located almost entirely within the limits of the City of Littleton. It lies just north of County Line Road and is bounded on the west by the South Platte River and on the east by South Broadway. The drainage basins include approximately 2.6 square miles. The project location is shown on the vicinity map in Figure 2-1.

2.2 Drainage Basin Characteristics

Some important physical features of the overall study area are discussed below and are labeled on the Location Sheets (Sheets 2 and 3):

1. Santa Fe Drive, the Denver & Rio Grande Western Railroad (D&RGW), and the Atchison, Topeka and Santa Fe Railroad (AT&SF): These features are located adjacent to each other and run north and south through the study area. These features greatly influence the natural westerly drainage patterns.

2. City Ditch: The ditch (owned by Englewood) flows to the north and is located in the lower portion of the basin, mostly on the west side of Santa Fe Drive. In the future, the ditch is planned to be enclosed in a 60-inch pipe.

3. Highline Canal: This feature is owned and operated by the Denver Water Department and crosses the upper basins of Rangeview and Jackass Gulches. Drainage from the Rangeview basin upstream of the Highline Canal would normally flow across the canal into Rangeview Gulch. However, development in the area directs the 100-year flow through a storm sewer system to the Jackass Gulch basin. Flows from the Upper Jackass basin cross the canal in a storm sewer system. Storm runoff from the South Park commercial area just south of the Upper Jackass basin is discharged into the Highline Canal through several onsite detention facilities. During the 100-year event, the total discharge from these facilities is approximately 550 cfs.

   Routine Highline Canal releases during rainfall events have caused local flooding in the Lee Gulch drainageway. From the Highline Canal Master Plan study done in 1975, the capacity of the canal between Lee Gulch

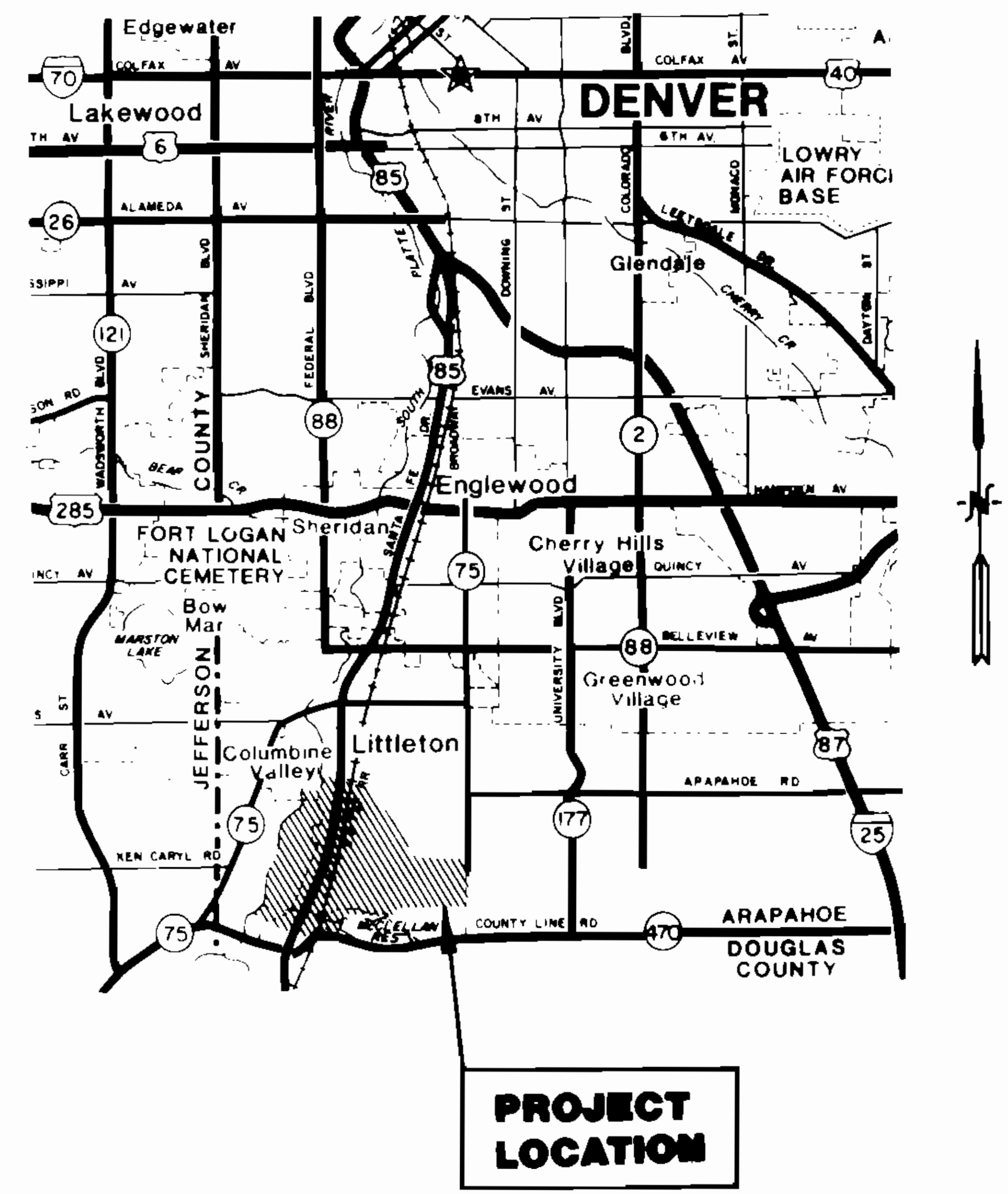


FIGURE 2-1
LOWER DAD CLARK GULCH & DFA 0068
VICINITY MAP

and Little Dry Creek was found to be approximately 600 cfs. The portion of the Highline Canal which crosses the study area was assumed to have a similar capacity.

4. McLellan Reservoir: The reservoir is owned and operated by Englewood as a water supply facility and is located in the Dad Clark Gulch basin just north of County Line Road. Currently, it is not used as a flood control facility.

The study area drains to the west toward the South Platte River. Each of the three major drainage basins (Rangeview, Jackass, and Lower Dad Clark) are served by existing drainage systems. The six direct flow areas do not have a significant drainage system. Records of previous flooding in the area are non-existent.

The Rangeview Gulch basin is approximately 430 acres in size and is almost entirely residential. The drainage system in the upper basin (east of the railroad lines) is mostly open channel with several irrigation ponds. An existing 30" RCP storm sewer system is located in Curtice Street in the residential area between Ridgeview Park and Turtle Lake (also known as Lynhardt Reservoir No. 2). However, during a major storm event, most flows will occupy the street. At Turtle Lake, low flows are intercepted by the City Ditch before they reach the lake. Flows discharged from Turtle Lake historically went directly to the South Platte River. However, due to the construction of the AT&SF Railroad embankment, these flows now go north along the east side of the railroad and discharge into Lee Gulch. Neither Ridgeview Park nor Turtle Lake were considered to detain flood waters because they are currently not recognized as public detention facilities.

The Jackass Gulch basin is just south of Rangeview Gulch and is approximately 500 acres in size. It is an elongated basin extending from South Broadway to the South Platte River and is zoned almost entirely as Planned Development (PD, PD-R, PD-C & RD-I). The upper basin (east of the Highline Canal) is mostly commercial with some residential. All of the existing developments in the upper basin have been designed to detain storm runoff for the 100-year event with private onsite detention facilities. The area between the Highline Canal and the railroad lines is zoned residential. The storm drainage system in the area consists of a natural channel with a municipal detention facility at the railroad lines. The lower basin (west of Santa Fe Drive) is a commercial area and has a 60" RCP storm outfall system which discharges into an open channel which in turn outfalls to the South Platte River. Currently, over half of the Jackass Gulch basin is undeveloped. None of the upper basin detention facilities were recognized since they are all private facilities. The municipal detention pond at the railroad tracks was considered in the floodplain analysis.

The Lower Dad Clark Gulch basin extends from the outfall of McLellan Reservoir to the South Platte River. The basin is approximately 290 acres in size and contains residential, commercial and industrial areas. Most of the basin is undeveloped at the present time. A portion of the South Park residential area is included in this basin. The drainage system is an open channel with bridge structures at the railroad and Santa Fe Drive crossings. The existing detention ponds in the South Park residential area were not considered in the analysis because they are private facilities.

2.3 Sub-basin Delineation

The direct flow areas and the sub-basins of each of the three major basins were delineated by differences in land use, major drainage features, and topography. The size of each basin was limited to a maximum of 130 acres with an average sub-basin size no larger than 100 acres.

3.0 HYDROLOGY

The Urban Drainage and Flood Control Design Criteria and the City of Littleton Storm Drainage & Technical Criteria were used as a basis for all hydrologic analysis.

3.1 Basin Parameters

Sub-basin areas, lengths, centroids, and slopes were determined from 1"=200', 2-foot contour interval topographic mapping. Times of concentration were also determined for each sub-basin. Detention storage depths were taken as the same for all basins -- 0.35 inches and 0.05 inches for pervious and impervious areas, respectively. Infiltration rates, which are based on soil type, varied depending on location. However, most soils in the area were Type C with initial and final infiltration rates of 3.0 in./hr. and 0.50 in./hr., respectively. An infiltration decay coefficient of 0.0018 was used for all soils. Imperviousness was determined for each sub-basin with the aid of the Littleton Zoning Plan and Zoning Regulations. Refer to Appendix A, Table A-1 for a list of all sub-basins with their associated parameters and Figures A-2a and A-2b for the sub-basin boundaries.

3.2 Design Rainfall

The 1-hour rainfall depths for the 10-, 50-, and 100-year events were determined from the Littleton Drainage Criteria and are shown in Table 3-1.

TABLE 3-1
1-Hour Rainfall Depths

FREQUENCY	RAINFALL DEPTH Inches
10-yr	1.65
50-yr	2.32
100-yr	2.67

3.3 Hydrographs

Runoff hydrographs were developed for each sub-basin using the Colorado Urban Hydrograph Procedure (CUHP). The hydrographs were based on fully-developed land use conditions.

For basins under 90 acres, a modified time to peak was used in accordance with Drainage District policy. Since all basins were under 160 acres, an estimated peak flow was calculated using the Rational Method.

The only basins not analyzed by the CUHP method were those upstream of McLellan Reservoir. The hydrographs from these basins were determined from previous studies.

3.4 Flood Routing

The hydrographs developed from CUHP were routed using a modified portion of the Environmental Protection Agency's Storm Water Management Model (UDSWMM). The storm routing networks represent the existing drainage system, but do not recognize any detention features unless publicly owned. This includes detention behind railroad embankments, non-recognized detention facilities, and privately owned detention ponds. Flood discharge profiles were developed using the UDSWMM output and are shown in Figures A-3, A-4 and A-5.

3.5 Upper Dad Clark Gulch Basin

The initial review of the background hydrology for Upper Dad Clark Gulch revealed that a 100-year composite inflow hydrograph for McLellan Reservoir was not available.

The following studies were reviewed:

1. Master Plan of Drainage, Dad Clark Gulch, prepared by Jack G. Raub Company for Mission Viejo Company and UD&FCD, April 1980, revised November 1980.

2. Final Report on the Investigation of the 100-Year Flood Plain on Dad Clark Gulch Across Santa Fe Park Development, prepared by Sellards & Grigg, Inc., for the Hardin Company, March 1985.

In order to obtain a composite 100-year inflow hydrograph for McLellan Reservoir, seven previously developed 100-year hydrographs were routed using the UDSWMM computer model. Utilizing the results of the CUHP analysis for other sub-basins in the FHAD study, ratios of the 10- and 50-year peak flows to the 100-year peak flow were determined. These ratios were applied to the seven 100-year hydrographs and were routed to obtain 10- and 50-year composite inflow hydrographs for McLellan Reservoir. The hydrology for the Upper Dad Clark Gulch basin was combined with the lower basin hydrology to obtain peak flows downstream of McLellan Reservoir.

4.0 FLOODPLAIN EVALUATION

4.1 Introduction

A floodplain evaluation was done for each of the major drainage basins for the 10-, 50-, and 100-year events for developed basin runoff conditions. Also, floodways were determined for the 100-year frequency. The HEC-2 Water Surface Profile Computer Program, developed by the Army Corps of Engineers, was used in the evaluation.

4.2 Design Criteria

Channel cross-section locations were chosen along each drainageway so that prominent drainage features were represented. The spacing between cross-sections was limited to no greater than 1000 feet (the average spacing was no greater than 500 feet). The coordinate data for each cross-section was determined by Landmark, Ltd. from 1"=200', 2-foot contour interval topographic mapping. The left and right bank locations were chosen at points where either the grade changed dramatically or the ground cover changed. Channel distances between cross-sections were measured from 1"=200' mapping. Roughness coefficients for channel and overbank areas were estimated by field inspection. The roughness, or Manning's "n", values varied considerably and ranged from 0.020 for paved surfaces to 0.070 for heavily vegetated areas. Expansion and contraction coefficients were chosen respectively as 0.3 and 0.1 for open channel reaches and 0.5 and 0.3 for bridge transition areas. Culvert crossing structures were analyzed using the special bridge routine. Significant storm sewer systems were accounted for by subtracting the flow capacity of the system from the design discharge. The storm sewer systems in the upper Jackass Gulch basin, the culverts under Jackass Hill Road, and the 60" RCP outfall for Jackass Gulch were the only storm sewers considered to be significant. The 30" RCP in the Rangeview Gulch basin and other small storm sewers or culverts, which have minimal capacity and have high potential for blockage, were ignored in the analysis. The bridge structures on Lower Dad Clark Gulch were modeled by cross-sectional data obtained from J.F. Sato & Associates. The City Ditch flume structure just downstream of these bridges was assumed to collapse during a major storm event. Therefore, it was not considered as an obstruction in the analysis.

Starting water surface elevations for profiles beginning at the South Platte River were taken from the Flood Insurance Rate Maps for Arapahoe County (Map Number 08005C0065F, April 17, 1989). The starting elevations for Rangeview Gulch discharging into Lee Gulch were taken from the Lee Gulch Little Creek FHAD, October 1977. The 10- 50- and 100-year events were analyzed for the existing channel conditions with developed basin runoff rates. Also, a floodway analysis based on a 0.5 foot rise in the 100-year water surface was performed.

The drainage patterns downstream of Santa Fe Drive are poorly defined for all three drainage basins and separate computer runs were done for shallow flooding areas.

4.3 Analysis

Four profile runs were analyzed for each basin: the 10-year flood profile, the 50-year flood profile, the 100-year flood profile, and the 100-year floodway profile. The floodway was determined by encroaching on both sides of the floodplain until either the water surface or energy grade line rose 0.5 foot or the channel banks were reached, whichever came first. Since the floodway was limited by the channel banks, the water surface did not rise 0.5 foot in all areas of the drainageway. In fact, for some areas, the floodplain was completely within the bank limits.

Rangeview Gulch had to be analyzed in two steps. First, the reach upstream of the railroad tracks was analyzed to determine how much flow continues north along the east side of the tracks and how much flow spills over the tracks (the split-flow option was used for this). A second profile was then run from the South Platte River to the railroad tracks using a lower discharge based on the first analysis.

On Jackass Gulch, a flow separation occurs downstream of Santa Fe Drive. Some flow goes along the north side of Mineral Avenue and some flow goes along the south side. The amount of flow which split to the north was estimated based on the proportion of flow on that side of the street. The south side was analyzed using the entire 100-year discharge.

On Lower Dad Clark Gulch, two separate runs were analyzed: one run considering no flood attenuation at McLellan Reservoir (Q100 = 1780 cfs) and one with flood attenuation (Q100 = 870 cfs). Also, since the lower basin floodplain is bounded on the north side by a berm which acts as a levee, a separate 100-year floodplain was analyzed for the condition without the berm.

4.4 Flood Problems

The potential flood problem areas that presently exist are listed below:

Rangeview Gulch.

- Several houses along South Curtice Street between Rangeview Park and Turtle Lake are inundated by flood waters.
- The mobile home park just west of Santa Fe Drive will be affected by shallow flooding due to storm water overtopping the AT&SF railroad embankment.

Jackass Gulch.

- Flood waters will pond at the intersection of Santa Fe Drive and Mineral Avenue causing traffic problems. During a 100-year event, ponding will be over 7 feet deep.

Lower Dad Clark Gulch.

- Flood waters will only affect one house which is built near the channel banks.

4.5 Floodplain and Floodway Data

The limits of future flooding are outlined on the Flood Hazard Area Delineation drawings and are tabulated in Table B-1. The drawings graphically represent the 100-year water surface profile, channel thalweg profile, channel thalweg reference line, and floodplain limits. The table lists the 100-year flood discharge, flood elevations, flooding widths, and channel thalweg elevations at each cross-section of the drainage reaches studied.

Floodways were also computed for each drainageway. A floodway represents that portion of the floodplain which is required to pass the 100-year flood event without raising the water surface more than an acceptable amount and which represents hazards to personal safety and welfare. In this study, the maximum amount of rise was 0.5 foot. Floodway widths, which represent the maximum limits of encroachment into the floodplain, are tabulated in Table B-1 along with the floodplain data. The locations of encroachments and expected water surface elevations after encroachment are also tabulated. In some locations, the 100-year water surface is contained entirely within a well-defined channel.

APPENDIX A

HYDROLOGIC DATA SUMMARY

TABLE A-1
BASIN PARAMETERS

SUB BASIN I.D.	TRIBUTARY AREA (ac)	TRIBUTARY AREA (mi^2)	BASIN LENGTH (mi)	CENTROID LENGTH (mi)	BASIN SLOPE (ft/ft)	TIME OF CONCENTRATION (min)	PERCENT IMPERVIOUSNESS (%)	DEPRESSION STORAGE AND INFILTRATION RATE (See Note)
010	44	.0688	.5530	.2936	.0094	26	4	(1)
015	51	.0797	.4564	.2576	.0162	22	51	(1)
020	48	.0750	.3977	.1326	.0493	23	7	(1)
025	98	.1531	.8902	.5208	.0118	31	64	(1)
030	64	.1067	.3788	.2178	.0227	16	48	(1)
040	48	.0750	.4830	.2652	.0097	24	76	(1)
050	56	.0875	.5966	.3693	.0063	28	42	(1)
060	27	.0422	.4072	.1799	.0074	22	18	(1)
105	90	.1406	.5114	.2462	.0274	25	9	(1)
110	84	.1313	.5019	.1894	.0328	25	14	(1)
115	35	.0547	.5777	.2462	.0294	25	27	(1)
120	31	.0484	.3314	.1610	.0355	18	43	(2)
125	57	.0891	.5208	.1989	.0189	24	43	(3)
130	45	.0703	.5587	.2178	.0180	26	28	(1)
133	10	.0156	.3977	.2178	.0070	22	25	(4)
135	24	.0375	.3600	.1420	.0232	20	39	(3)
140	28	.0438	.3220	.1705	.0267	19	46	(2)
145	28	.0438	.2652	.1326	.0210	18	77	(2)
203	53	.0833	.4450	.2180	.0212	17	87	(1)
205	83	.1297	.6250	.3880	.0076	28	80	(1)
210	52	.0808	.6250	.2936	.0053	28	83	(1)
215	45	.0703	.5019	.2936	.0113	25	95	(1)
220	16	.0250	.2652	.0947	.0164	17	50	(1)
225	54	.0844	.3598	.1799	.0179	21	43	(1)

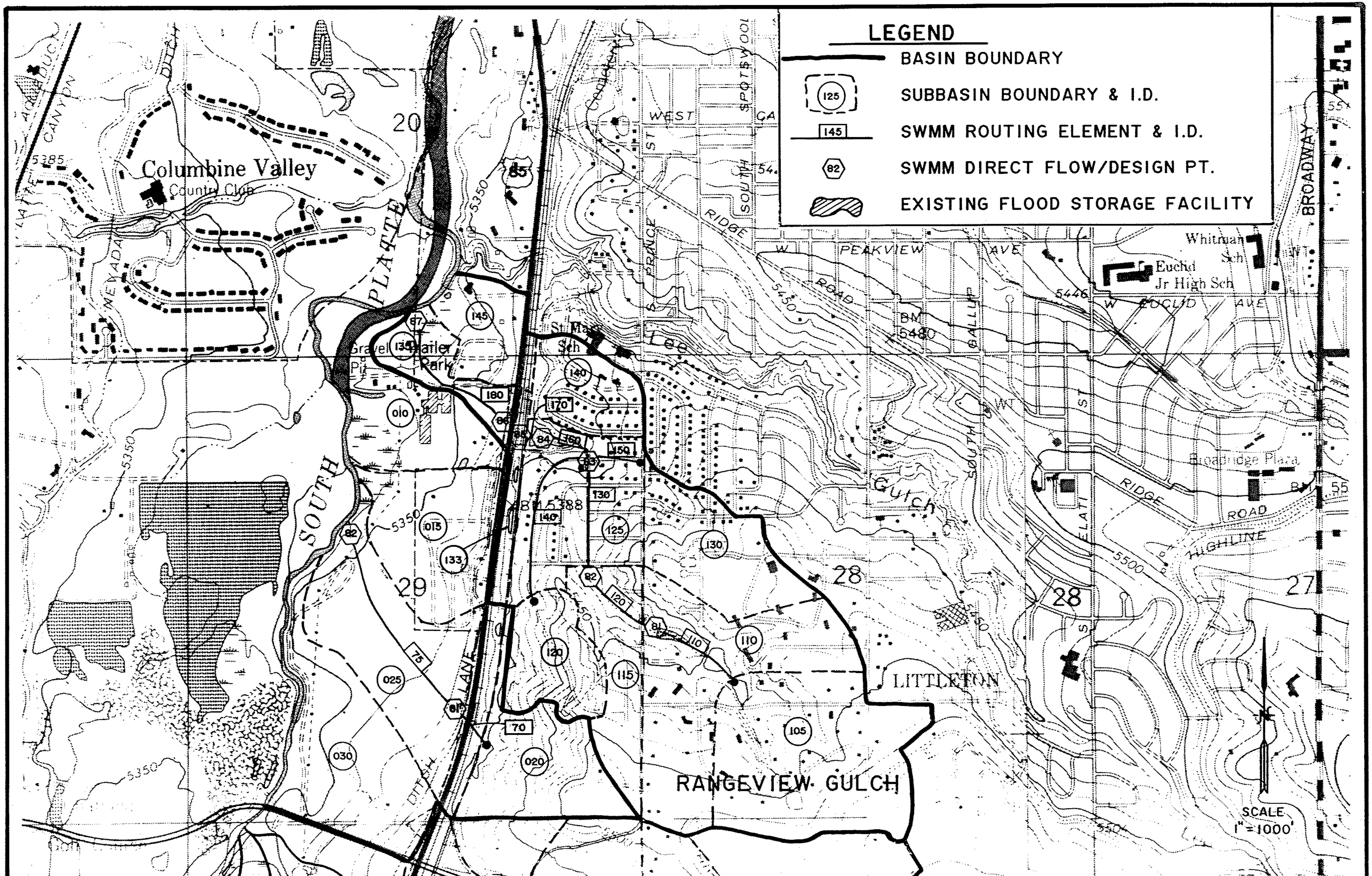
TABLE A-1
BASIN PARAMETERS
(Continued)

SUB BASIN I.D.	TRIBUTARY AREA (ac)	TRIBUTARY AREA (mi^2)	BASIN LENGTH (mi)	CENTROID LENGTH (mi)	BASIN SLOPE (ft/ft)	TIME OF CONCENTRATION (min)	PERCENT IMPERVIOUSNESS (%)	DEPRESSION STORAGE AND INFILTRATION RATE (See Note)
230	25	.0391	.2746	.0947	.0297	18	20	(1)
235	11	.0172	.2936	.1515	.0303	19	23	(1)
240	40	.0625	.5966	.2178	.0286	28	58	(1)
245	60	.0938	.5492	.2462	.0307	26	43	(1)
250	17	.0266	.2273	.0947	.0607	17	54	(1)
255	23	.0359	.3030	.0852	.0450	19	79	(1)
260	18	.0281	.4072	.2273	.0223	21	69	(1)
360	42	.0656	.5227	.2273	.0206	25	45	(1)
365	51	.0797	.6061	.3409	.0326	28	64	(1)
370	41	.0641	.5303	.2652	.0332	20	13	(1)
375	34	.0531	.4830	.2557	.0439	24	80	(1)
380	8	.0125	.3125	.1515	.0150	19	36	(1)
385	16	.0250	.4545	.2178	.0140	23	32	(1)
390	98	.1531	.6345	.3598	.0100	23	66	(1)

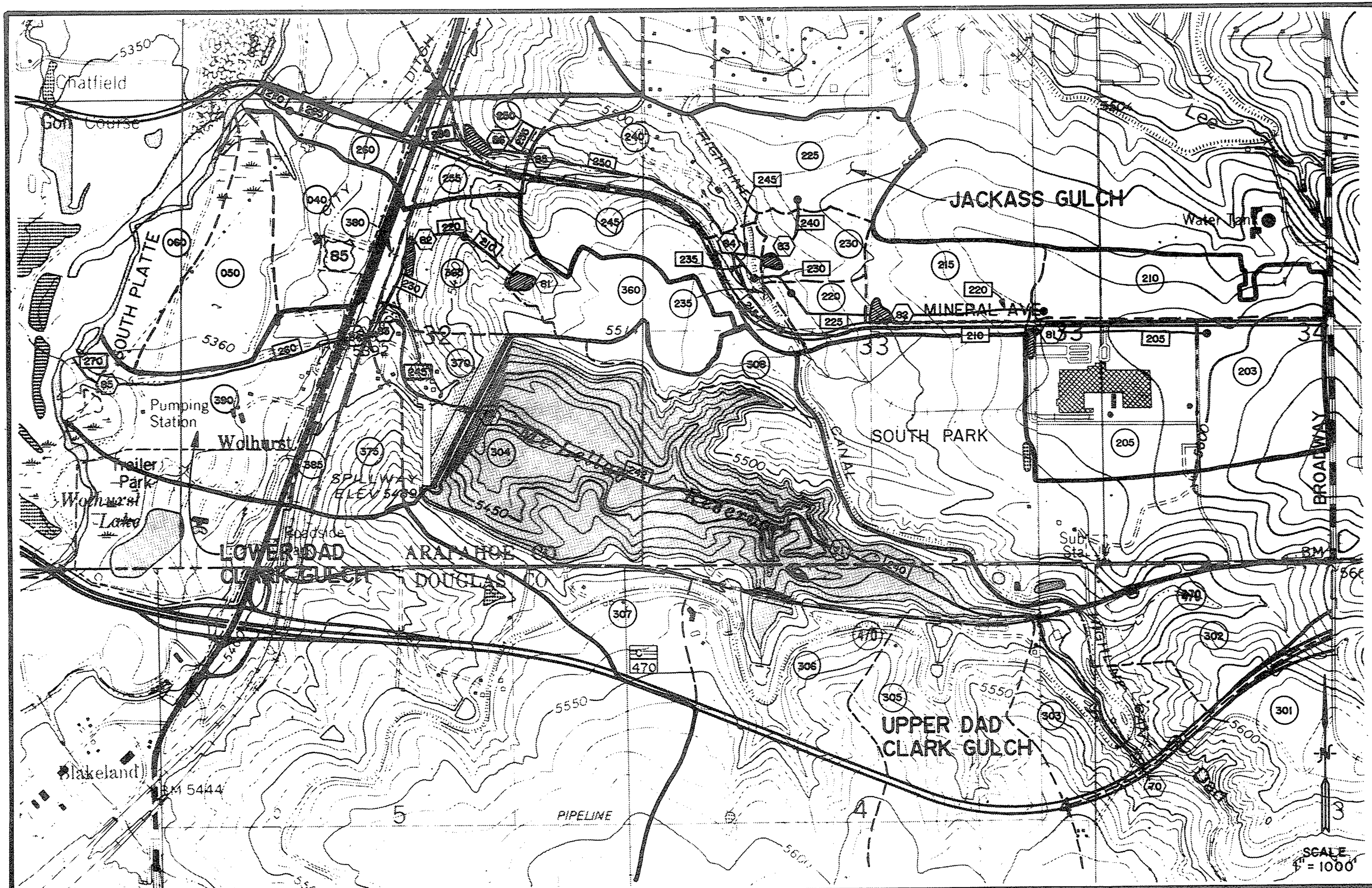
NOTE: Depression storage was taken as the same for all basins: Impervious Areas = 0.05 inches
Pervious Areas = 0.35 inches

Infiltration rates were one of four types:

	Initial Rate	Final Rate	Decay Coeff.
(1)	3.0	0.5	0.0018
(2)	3.4	0.52	0.0018
(3)	3.7	0.55	0.0018
(4)	4.5	0.6	0.0018

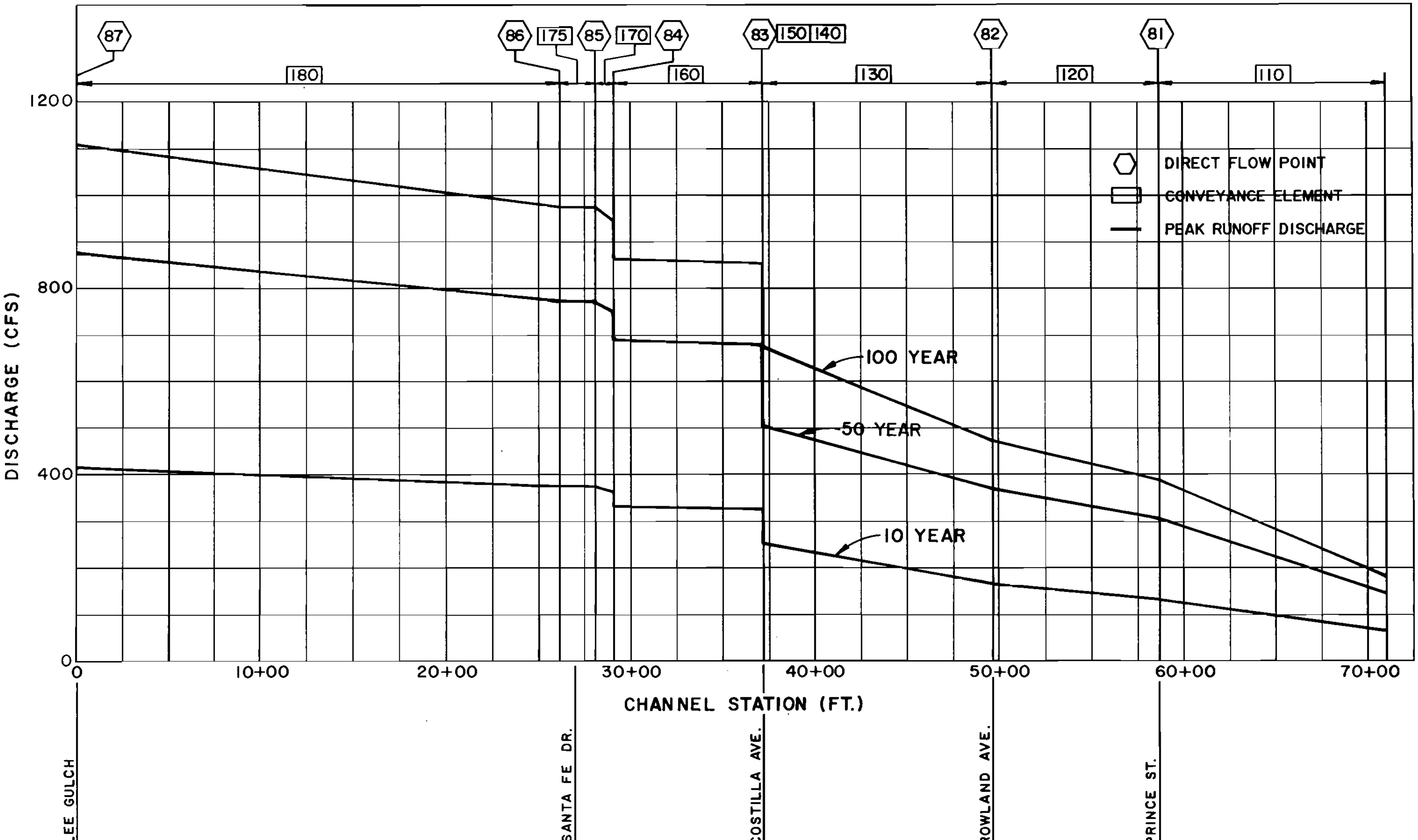


BASE MAP UNITED STATES GEOLOGICAL SURVEY MAP LITTLETON QUAD HIGHLANDS RANCH QUAD	CENTENNIAL ENGINEERING INC	DESIGNED DJN DATE 10/89 DRAWN G.G.H. DATE 10/89 CHECKED DLM DATE 10/89 REVISED DATE	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0068	RANGEVIEW BASIN CUHP AND SWMM NETWORK	FIGURE A-2a CEI JN 906.00



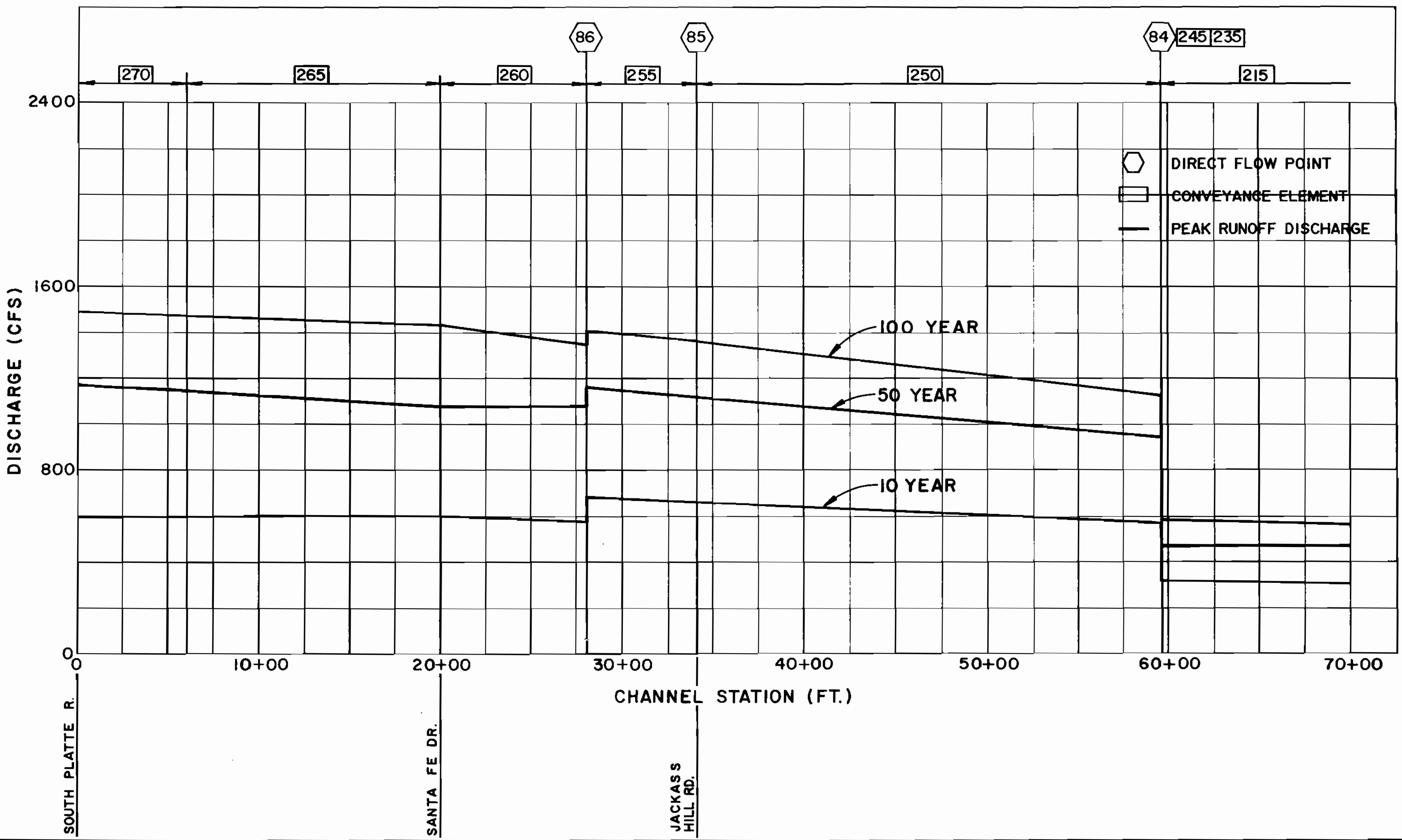
BASE MAP UNITED STATES GEOLOGICAL SURVEY MAP LITTLETON QUAD HIGHLANDS RANCH QUAD	CENTENNIAL ENGINEERING INC	DESIGNED D.J.H. DATE 10/89 DRAWN G.C.H. DATE 10/89 CHECKED DLM DATE 10/89 REVISED ____ DATE ____	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0065	JACKASS & LOWER DAD CLARK BASINS CUHP AND SWMM NETWORK	FIGURE A-2b CEI JN 305.00

RANGEVIEW GULCH



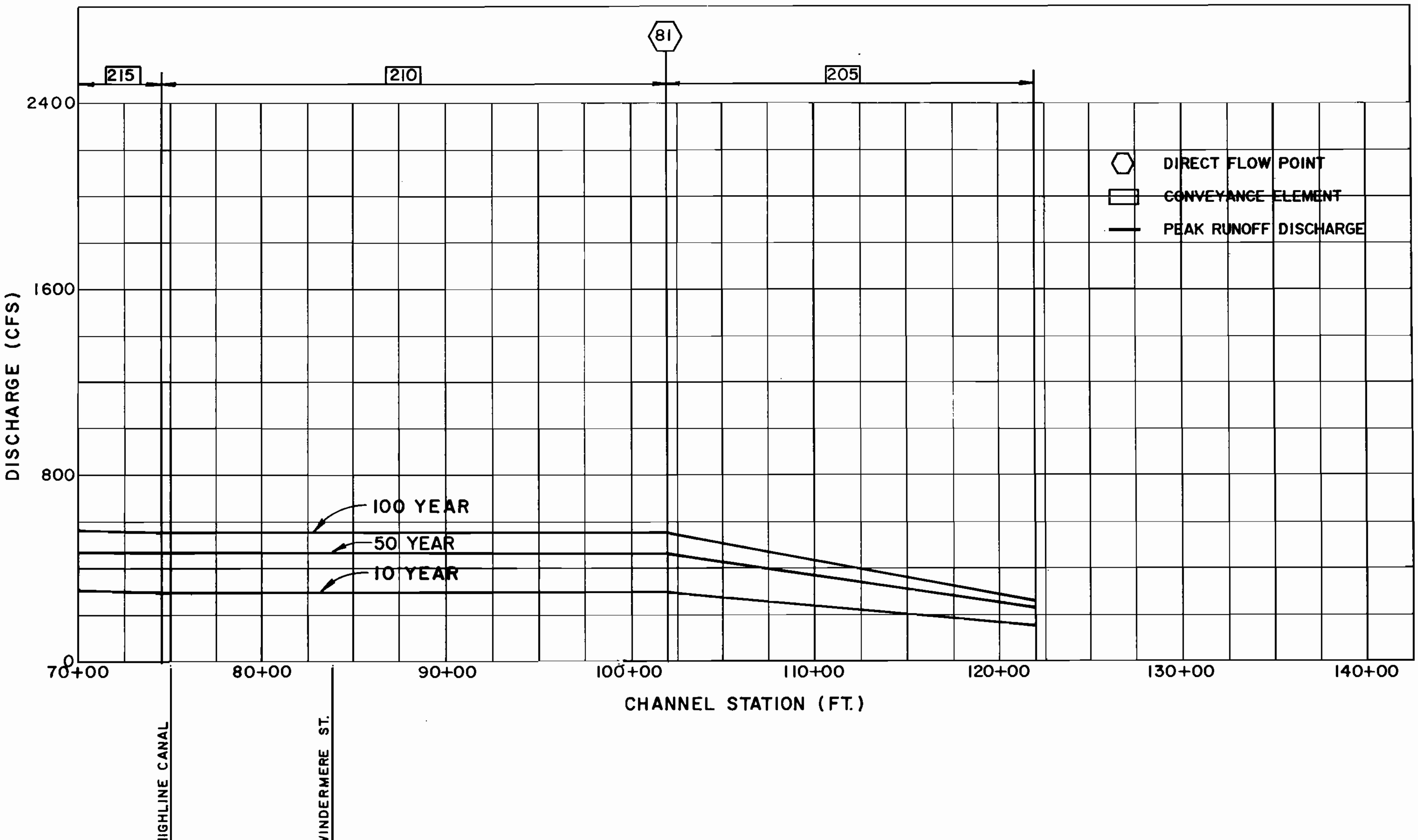
CENTENNIAL ENGINEERING INC	DESIGNED DJN DATE 10/89 DRAWN CJH DATE 10/89 CHECKED DLM DATE 10/89 REVISED ____ DATE ____	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0068	RANGEVIEW GULCH DISCHARGE PROFILE DEVELOPED CONDITION	FIGURE A-3 CEI JN 906.00

JACKASS GULCH



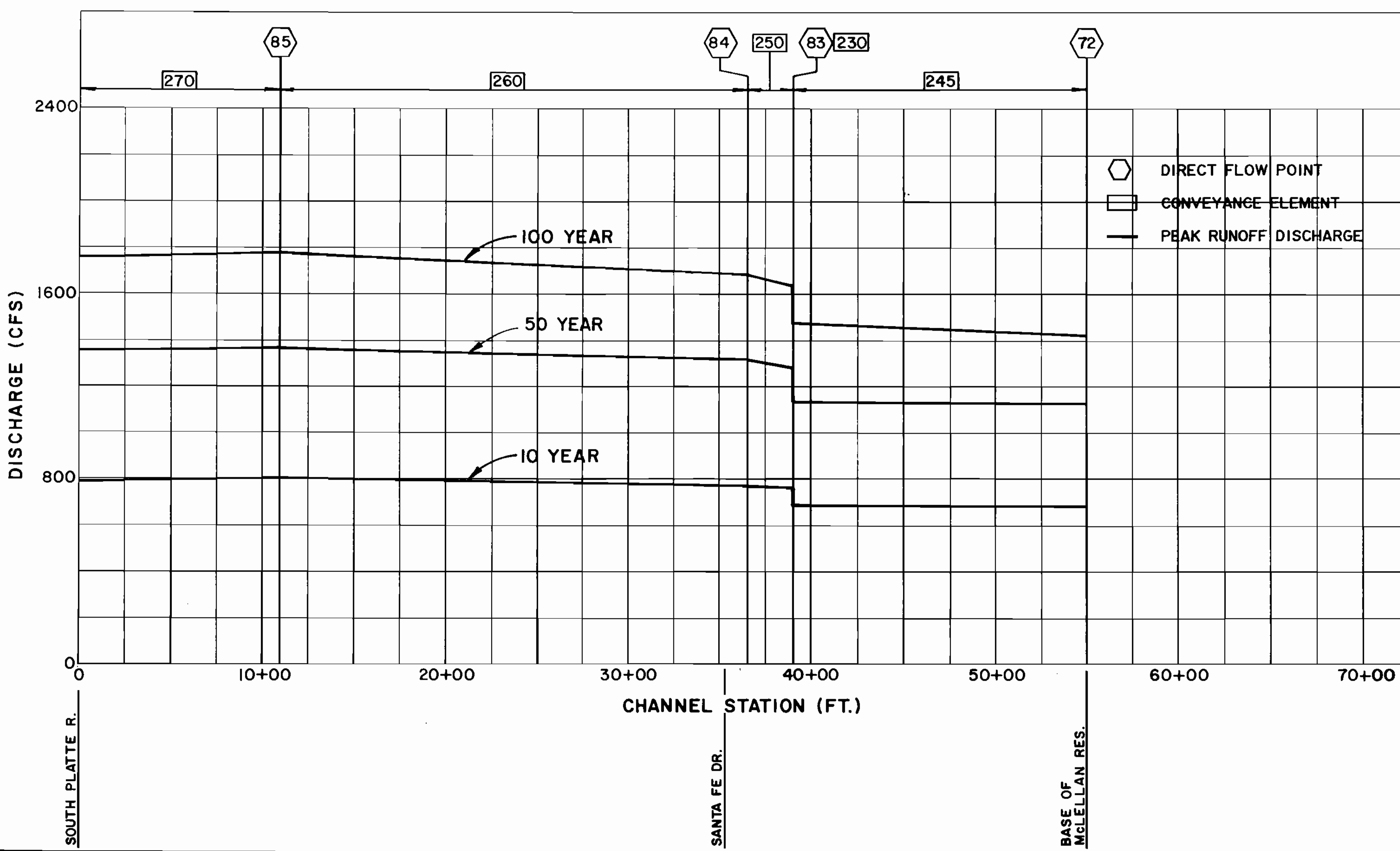
CENTENNIAL ENGINEERING INC	DESIGNED DRN DATE 10/89 DRAWN CJH DATE 10/89 CHECKED DLM DATE 10/89 REVISED ____ DATE ____	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0068	JACKASS GULCH STA. 0+00 TO STA. 70+00 DISCHARGE PROFILE DEVELOPED CONDITION	FIGURE A-4a CEI JN 906.00

JACKASS GULCH



CENTENNIAL ENGINEERING INC	DESIGNED DTN DATE 10/89 DRAWN C.J.H. DATE 10/89 CHECKED DLM DATE 10/89 REVISED ____ DATE ____	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0066	JACKASS GULCH STA. 70+00 TO STA. 122+00 DISCHARGE PROFILE DEVELOPED CONDITION	FIGURE A-4b CEI JN 906.00

LOWER DAD CLARK GULCH



CENTENNIAL ENGINEERING INC.	DESIGNED D.J.N. DATE 10/89 DRAWN C.J.H. DATE 10/89 CHECKED D.L.M. DATE 10/89 REVISED ____ DATE ____	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0068	LOWER DAD CLARK GULCH DISCHARGE PROFILE DEVELOPED CONDITION	FIGURE A-5 CEI JN 906.00

APPENDIX B

FLOODPLAIN AND FLOODWAY REFERENCE DATA

TABLE B-1
FLOODPLAIN AND FLOODWAY
REFERENCE DATA

Cross Section Number	Station[1]	Stream Thalweg Elevation	Floodplain Data				Floodway Data					10-Year Data		50-Year Data	
			100-Year Discharge (cfs)	100-Year Water Surface Elevation	Floodplain Top Width (ft)	100-Year Channel Velocity (ft/sec)	Floodway Water Surface Elevation	Floodway Top Width (ft)	Floodway[2] Width Left (ft)	Floodway[2] Width Right (ft)	Floodway Channel Velocity (ft/sec)	Discharge (cfs)	Water Surface Elevation	Discharge (cfs)	Water Surface Elevation
RANGEVIEW GULCH															
2.3	12+10	5358.0	650 [3]	5361.1	52	8.0	[4] 5361.7	63	30	33	8.6	370	5360.3	750	5360.9
2.5	14+60	5364.0	650 [3]	5368.5	30	9.0	[4] 5369.3	34	14	20	9.7	370	5367.6	750	5368.4
3.0	17+45	5372.0	650 [3]	5374.5	51	3.4	[4] 5375.1	63	17	46	4.3	370	5373.7	750	5374.3
3.5	19+55	5372.0	820 [3]	5375.8	85	2.4	[4] 5376.5	89	19	70	2.4	370	5374.9	750	5375.6
3.8	22+80	5368.0	950	5376.1	176	0.7	[4] 5376.7	180	40	140	0.6	370	5375.0	750	5375.9
4.0	24+70	5372.0	950	5376.1	93	1.9	[4] 5376.7	97	24	73	1.6	370	5375.0	750	5375.9
4.5	26+20	5372.0	950	5376.3	77	2.3	[4] 5376.8	80	18	62	2.0	370	5375.1	750	5376.0
70	29+25	5370.3	870	5376.9	369	1.6	5377.2	371	188	183	1.3	340	5375.3	690	5376.6
75	34+80	5382.7	870	5384.6	125	6.4	5384.6	86	28	58	6.9	340	5383.9	690	5384.4
80	36+12	5385.8	870	5388.5	89	7.3	5388.5	89	59	30	7.2	340	5387.7	690	5388.3
85	37+08	5390.3	870	5391.5	265	6.4	5391.8	120	72	48	7.4	340	5391.1	690	5391.4
90	40+05	5399.6	680	5401.3	225	6.6	5401.3	110	50	60	7.5	260	5400.8	500	5401.1
95	44+48	5410.0	560	5411.6	140	6.7	5411.6	77	28	49	7.3	200	5411.0	420	5411.4
100	49+05	5419.5	560	5420.7	138	5.4	5420.7	102	32	70	5.7	200	5420.2	420	5420.5
105	49+60	5419.5	480	5421.4	107	4.6	FLOODWAY IN CHANNEL					170	5420.9	370	5421.2
110	54+90	5420.1	480	5424.1	84	2.8	"					170	5423.0	370	5423.8
115	57+40	5423.8	480	5426.6	35	7.7	"					170	5425.5	370	5426.3
120	58+45	5437.3	390	5438.5	144	4.5	"					140	5438.1	310	5438.4

TABLE B-1
(Continued)

Cross Section Number	Station[1]	Stream Thalweg Elevation	Floodplain Data				Floodway Data					10-Year Data		50-Year Data	
			100-Year Discharge (cfs)	100-Year Water Surface Elevation	Floodplain Top Width (ft)	100-Year Channel Velocity (ft/sec)	Floodway Water Surface Elevation	Floodway Top Width (ft)	Floodway[2] Width Left (ft)	Floodway[2] Width Right (ft)	Floodway Channel Velocity (ft/sec)	Discharge (cfs)	Water Surface Elevation	Discharge (cfs)	Water Surface Elevation
RANGEVIEW GULCH (continued)															
130	58+90	5429.4	390	5438.9	311	0.3	5438.9	245	148	97	0.3	140	5438.3	310	5438.7
135	63+15	5436.2	390	5438.9	128	1.4	5438.9	102	46	56	1.4	140	5438.3	310	5438.7
140	67+25	5452.1	260	5454.3	42	5.9	FLOODWAY IN CHANNEL					90	5453.6	180	5454.0
145	71+30	5460.4	190	5461.5	175	1.8	"					70	5461.1	140	5461.4
150	73+40	5460.5	190	5461.9	154	1.0	"					70	5461.4	140	5461.8
160	74+85	5468.1	190	5468.6	162	3.5	5468.6	124	13	111	3.7	70	5468.4	140	5468.5
170	75+20	5462.6	190	5468.8	188	0.5	5468.8	97	52	45	0.5	70	5468.5	140	5468.7
175	78+20	5469.5	100	5470.6	37	4.6	5470.6	32	18	14	4.7	40	5470.2	70	5470.4
180	82+60	5482.4	50	5483.3	57	2.6	FLOODWAY IN CHANNEL					20	5483.1	35	5483.2
185	84+80	5488.0	50	5489.1	30	3.0	"					20	5488.8	35	5489.0

[1] Stationing based on distance in feet upstream of confluence (Beginning station at confluence with Lee Gulch is 10+00)
[2] Measured from stationing line looking downstream.
[3] Total discharge is 950 cfs. Reduction due to overflow between cross sections 3.0 and 3.8.
[4] Floodway based on no overflow between cross sections 3.0 and 3.8.

TABLE B-1
(Continued)

Cross Section Number	Station[1/]	Stream Thalweg Elevation	Floodplain Data: 100-Year Discharge (cfs)	Floodplain Data: 100-Year Water Surface Elevation	Floodplain Data: Floodplain Top Width (ft)	Floodplain Data: 100-Year Channel Velocity (ft/sec)	Floodway Data: Floodway Water Surface Elevation	Floodway Data: Floodway Top Width (ft)	Floodway Data: Floodway[2/] Width Left (ft)	Floodway Data: Floodway[2/] Width Right (ft)	Floodway Data: Floodway Channel Velocity (ft/sec)	10-Year Data: Discharge (cfs)	10-Year Data: Water Surface Elevation	50-Year Data: Discharge (cfs)	50-Year Data: Water Surface Elevation
JACKASS GULCH															
10	1+40	5348.6	1500	5350.4	518	6.4	FLOODWAY NOT DEFINED					690	5350.1	1170	5350.3
20	7+40	5349.5	1500	5354.6	213	5.5	"					690	5353.7	1170	5354.3
30	9+40	5362.0	1240	5365.5	170	6.0	"					430	5364.6	910	5365.1
40	12+80	5372.7	1240	5373.9	230	5.6	"					430	5373.4	910	5373.8
50	16+90	5380.2	1240	5382.1	240	4.5	"					430	5381.4	910	5381.8
60	26+60	5397.6	1240	5400.0	179	6.1	"					430	5399.2	910	5399.8
65	27+90	5413.0	1240	5413.7	433	4.5	"					430	5413.4	910	5413.6
70	30+65	5412.8	1500	5416.9	136	4.2	FLOODWAY IN CHANNEL					690	5416.0	1170	5416.7
75	33+05	5417.7	1500	5420.5	108	7.7	"					690	5419.7	1170	5420.2
85	34+80	5419.4	1300	5436.1	247	1.0	5436.1	88	33	55	1.2	640	5434.9	1070	5435.9
86	36+10	5424.0	1300	5436.1	131	1.7	5436.1	76	48	28	1.9	640	5434.9	1070	5435.9
90	41+50	5431.8	1300	5438.0	42	9.9	FLOODWAY IN CHANNEL					640	5436.6	1070	5437.6
95	48+20	5450.9	1300	5459.0	43	10.0	"					640	5456.3	1070	5458.4
100	54+25	5466.7	1300	5472.3	48	9.7	"					640	5471.0	1070	5471.9
105	60+00	5481.2	1300	5486.9	51	9.4	"					640	5485.6	1070	5486.5
110	61+75	5491.5	1300	5493.8	120	7.1	"					640	5493.1	1070	5493.6
115	69+40	5507.9	450	5511.0	61	6.3	"					180	5510.4	330	5510.8
120	73+15	5523.7	450	5525.6	55	6.4	FLOODWAY NOT DEFINED					180	5524.9	330	5525.3

TABLE B-1
(Continued)

Cross Section Number	Station[1]	Stream Thalweg Elevation	Floodplain Data				Floodway Data					10-Year Data		50-Year Data	
			100-Year Discharge (cfs)	100-Year Water Surface Elevation	Floodplain Top Width (ft)	100-Year Channel Velocity (ft/sec)	Floodway Water Surface Elevation	Floodway Top Width (ft)	Floodway[2] Width Left (ft)	Floodway[2] Width Right (ft)	Floodway Channel Velocity (ft/sec)	Discharge (cfs)	Water Surface Elevation	Discharge (cfs)	Water Surface Elevation
JACKASS GULCH (continued)															
125	80+60	5543.0	450	5544.4	125	5.0	FLOODWAY NOT DEFINED					180	5544.1	330	5544.3
130	88+05	5555.0	450	5556.5	124	5.0	"					180	5556.1	330	5556.3
135	95+60	5564.5	450	5565.7	165	5.0	"					180	5565.3	330	5565.5

[1] Stationing based on distance in feet upstream of confluence.
[2] Measured from stationing line looking downstream.
[3] Total discharge for the lower reach is 1500 cfs. For cross sections 30, 40, 50, 60, and 65, 260 cfs is in storm sewer system and 1240 cfs flows overland.

TABLE B-1
(Continued)

Cross Section Number	Station[1]	Stream Thalweg Elevation	Floodplain Data: 100-Year Discharge (cfs)	100-Year Water Surface Elevation	Floodplain Top Width (ft)	100-Year Channel Velocity (ft/sec)	Floodway Data: Floodway Water Surface Elevation	Floodway Top Width (ft)	Floodway[2] Width Left (ft)	Floodway[2] Width Right (ft)	Floodway Channel Velocity (ft/sec)	10-Year Data: Discharge (cfs)	Water Surface Elevation	50-Year Data: Discharge (cfs)	Water Surface Elevation
LOWER DAD CLARK GULCH (WITHOUT MCLELLAN FLOOD STORAGE)															
1	8+95	5356.5	1780	5359.3	362	5.5	5359.3	330	305	25	5.7	810	5358.9	1380	5359.1
2	17+95	5362.4	1780	5364.4	851	1.7	5364.9	574	565	9	2.5	810	5364.0	1380	5364.3
45	25+30	5366.3	1780	5368.5	402	8.6	5368.8	298	286	12	9.4	810	5368.1	1380	5368.3
50	32+95	5370.8	1780	5375.2	132	5.0	5375.3	124	75	49	4.9	810	5374.0	1380	5374.8
55.2	34+90	5372.6	1780	5376.2	59	10.0	FLOODWAY IN CHANNEL					810	5374.9	1380	5375.7
55.3	35+60	5372.7	1780	5378.0	57	7.6	"					810	5376.4	1380	5377.4
61.4	36+00	5373.4	1780	5378.4	71	8.0	"					810	5376.6	1380	5377.7
61.5	36+22	5373.8	1780	5378.6	74	9.1	"					810	5376.8	1380	5377.9
66.6	37+20	5374.2	1780	5380.5	148	4.0	5380.4	90	42	48	4.5	810	5378.3	1380	5379.6
67.7	38+00	5374.6	1780	5380.6	83	6.6	FLOODWAY IN CHANNEL					810	5378.8	1380	5379.9
67.8	38+15	5374.8	1780	5381.0	84	5.9	"					810	5379.3	1380	5380.3
70	39+40	5377.5	1780	5381.8	144	6.8	5381.8	75	23	52	7.2	810	5380.3	1380	5381.2
80	44+50	5380.0	1490	5385.2	214	6.3	5385.5	65	40	25	6.4	690	5384.1	1160	5384.8
85	49+60	5382.4	1490	5387.9	83	6.8	5388.2	55	32	23	6.6	690	5386.5	1160	5387.4
90	53+60	5388.0	1490	5392.4	83	9.4	5392.4	50	30	20	10.4	690	5391.1	1160	5392.0
100	55+87	5387.0	1490	5393.7	97	2.3	5394.1	97	45	52	2.2	690	5392.1	1160	5393.2

[1] Stationing based on distance in feet upstream of confluence.
[2] Measured from stationing line looking downstream.

TABLE B-1
(Continued)

Cross Section Number	Station[1]	Stream Thalweg Elevation	Floodplain Data				Floodway Data					10-Year Data		50-Year Data	
			100-Year Discharge (cfs)	100-Year Water Surface Elevation	Floodplain Top Width (ft)	100-Year Channel Velocity (ft/sec)	Floodway Water Surface Elevation	Floodway Top Width (ft)	Floodway[2] Width Left (ft)	Floodway[2] Width Right (ft)	Floodway Channel Velocity (ft/sec)	Discharge (cfs)	Water Surface Elevation	Discharge (cfs)	Water Surface Elevation
LOWER DAD CLARK GULCH (WITH MCLELLAN FLOOD STORAGE)															
1	8+95	5356.5	870	5358.9	354	4.6	5358.9	288	272	16	4.8	385	5358.6	700	5358.8
2	17+95	5362.4	870	5364.0	847	1.4	5364.5	522	510	12	2.1	385	5363.7	700	5363.9
45	25+30	5366.3	870	5368.1	394	7.0	5368.5	273	265	8	8.3	385	5367.8	700	5368.1
50	32+95	5370.8	870	5374.1	120	3.8	5374.3	83	39	44	3.8	385	5373.1	700	5373.8
55.2	34+90	5372.6	870	5375.0	56	7.8	FLOODWAY IN CHANNEL					385	5374.1	700	5374.8
55.3	35+60	5372.7	870	5376.5	52	5.7	"					385	5375.4	700	5376.1
61.4	36+00	5373.4	870	5376.7	50	6.5	"					385	5375.6	700	5376.4
61.5	36+22	5373.8	870	5376.9	46	7.4	"					385	5375.8	700	5376.6
66.6	37+20	5374.2	870	5378.5	107	4.0	5378.4	90	25	65	4.0	385	5377.0	700	5378.0
67.7	38+00	5374.6	870	5378.9	75	6.3	FLOODWAY IN CHANNEL					385	5377.8	700	5378.5
67.8	38+15	5374.8	870	5379.4	77	4.8	"					385	5378.5	700	5379.1
70	39+40	5377.5	870	5380.4	86	6.0	5380.4	75	23	52	6.0	385	5379.4	700	5380.1
80	44+50	5380.0	850	5384.3	100	5.1	5384.6	42	24	18	5.3	385	5383.2	655	5383.9
85	49+60	5382.4	850	5386.9	69	5.4	5387.3	55	32	23	4.9	385	5385.7	655	5386.4
90	53+60	5388.0	850	5391.4	67	8.2	5391.4	40	20	20	8.9	385	5390.5	655	5391.1
100	55+87	5387.0	850	5392.5	97	1.6	5392.7	97	45	52	1.6	385	5391.2	655	5392.0

[1] Stationing based on distance in feet upstream of confluence.
[2] Measured from stationing line looking downstream.

FLOOD HAZARD AREA DELINEATION

LOWER DAD CLARK GULCH AND DFA0068

The Urban Drainage and Flood Control District
City of Littleton

LEGEND

* PLAN VIEW *

30 — REFERENCE LINE

10 — FLOODPLAIN CROSS SECTION (FROM LEFT TO RIGHT LOOKING D/S)

CURRENT ESTABLISHED 100-YEAR FLOODPLAIN BOUNDARY

100-YEAR FLOODPLAIN BOUNDARY

REDUCED 100-YEAR FLOODPLAIN BOUNDARY

100-YEAR SHALLOW FLOODING

REDUCED 100-YEAR SHALLOW FLOODING

10 — 100-YEAR BASE FLOOD ELEVATION

10 — REDUCED 100-YEAR BASE FLOOD ELEVATION

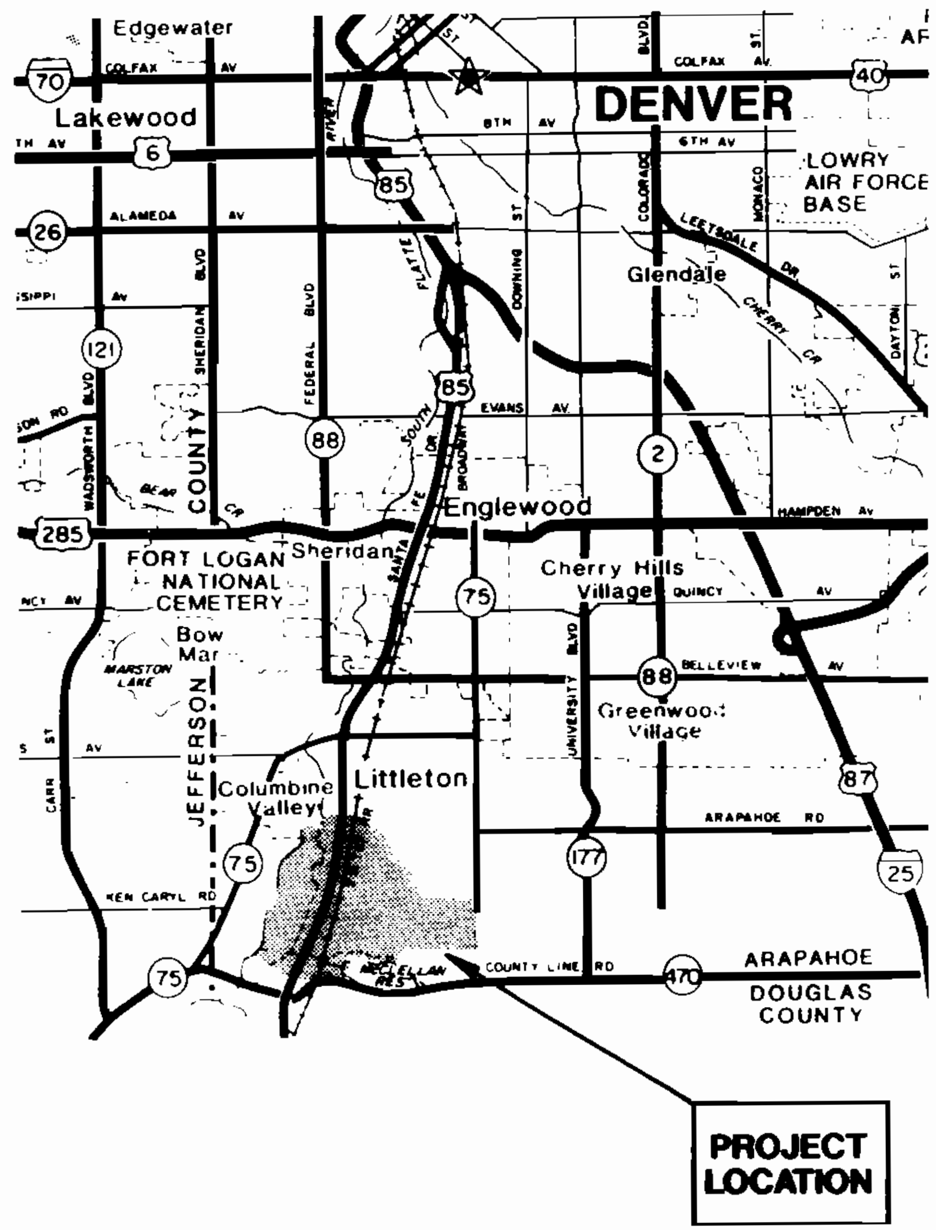
* PROFILE VIEW *

100-YEAR WATER SURFACE

10-YEAR WATER SURFACE

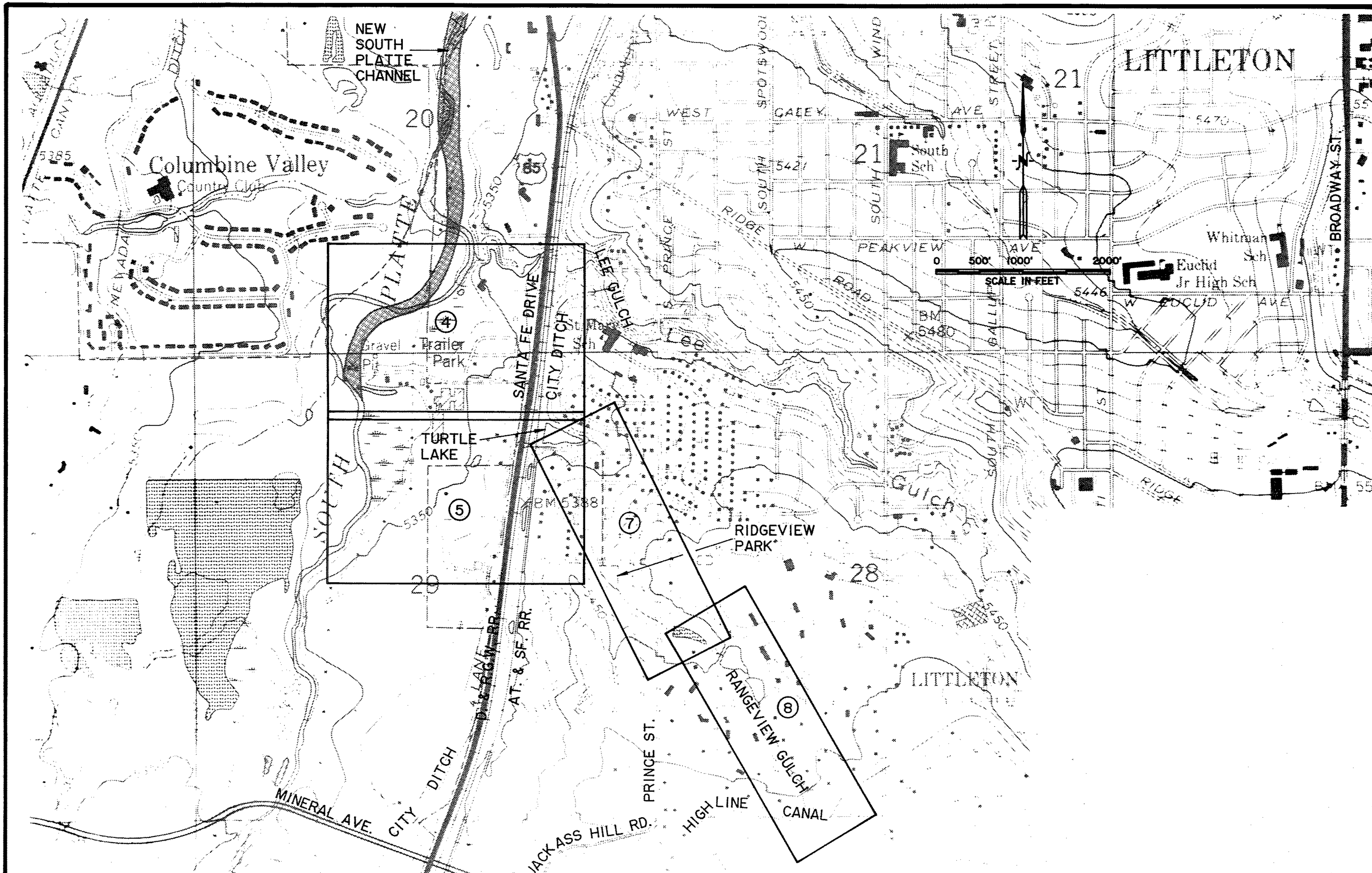
10 — FLOODPLAIN CROSS SECTION LOCATION

EXISTING PIPE

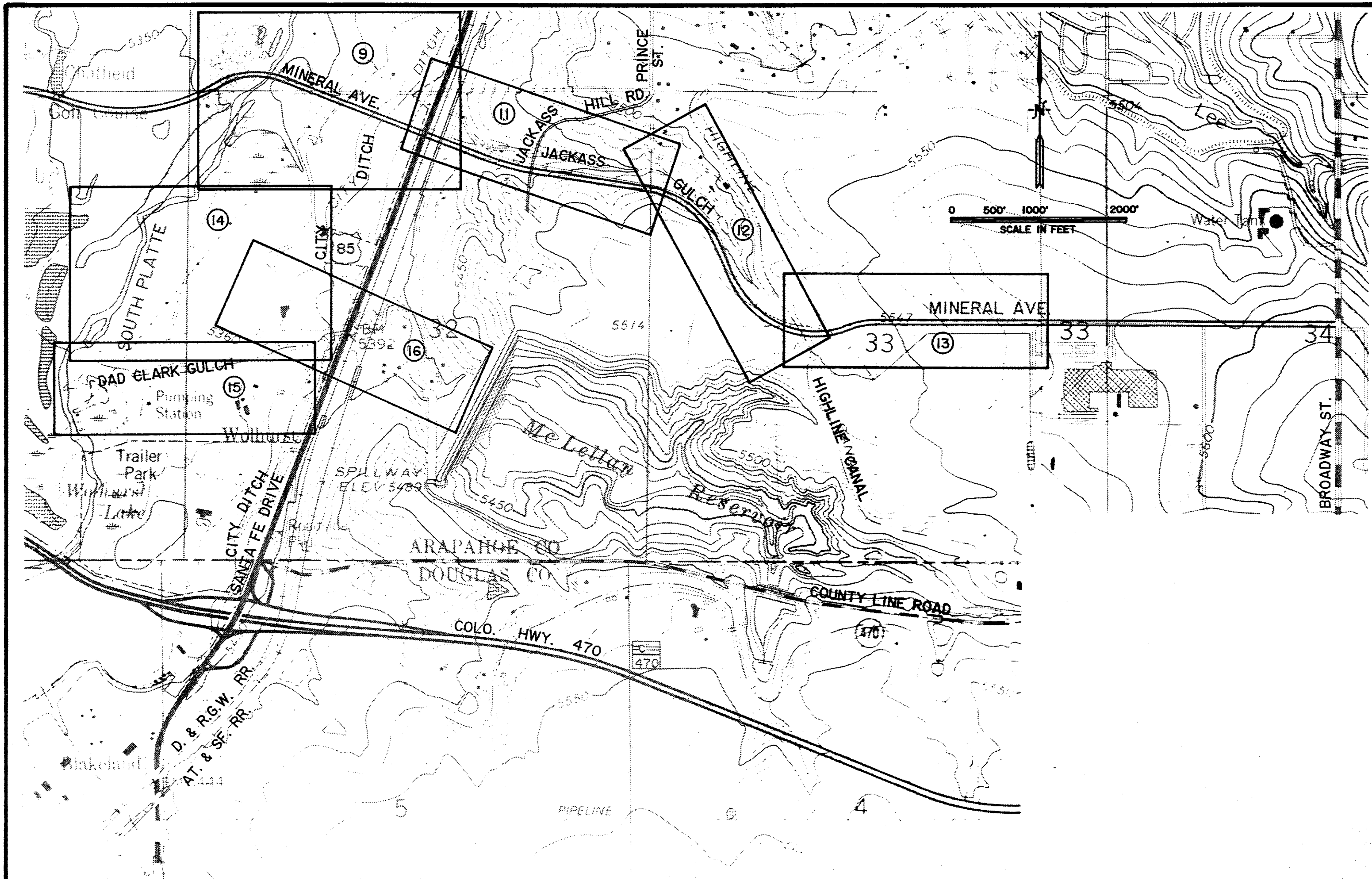


SHEET INDEX

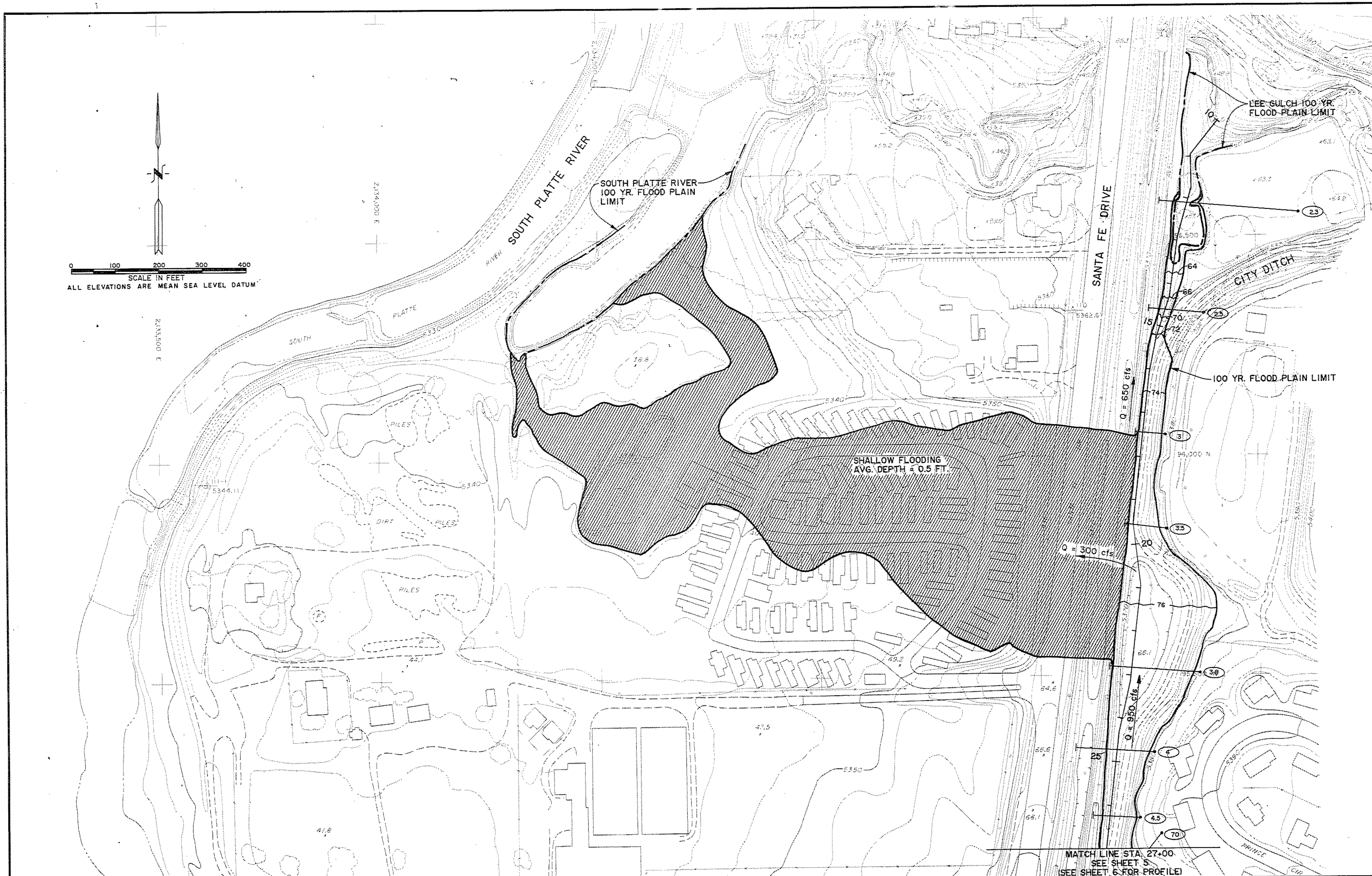
Sheet No.	Title			
1	Title Sheet			
2-3	Location Sheets			
4	Plan	Rangeview Gulch	Stations	10+00 to 27+00
5	Plan	Rangeview Gulch	Stations	27+00 to 33+00
6	Profile	Rangeview Gulch	Stations	10+00 to 33+00
7	Plan and Profile	Rangeview Gulch	Stations	33+00 to 61+00
8	Plan and Profile	Rangeview Gulch	Stations	61+00 to 88+00
9	Plan	Jackass Gulch	Stations	0+00 to 20+00
10	Profile	Jackass Gulch	Stations	0+00 to 20+00
11	Plan and Profile	Jackass Gulch	Stations	20+00 to 48+00
12	Plan and Profile	Jackass Gulch	Stations	48+00 to 75+00
13	Plan and Profile	Jackass Gulch	Stations	75+00 to 96+00
14	Plan	Lower Dad Clark Gulch		Shallow Flooding
15	Plan and Profile	Lower Dad Clark Gulch	Stations	0+00 to 28+00
16	Plan and Profile	Lower Dad Clark Gulch	Stations	28+00 to 56+00



BASE MAP	CENTENNIAL ENGINEERING INC	DESIGNED DJN DATE 7/90 DRAWN G.D.F. DATE 7/90 CHECKED DLM DATE 9/90 REVISED ______ DATE ______	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	FLOOD HAZARD AREA DELINEATION	LOCATION SHEET	SHEET 2 OF 16
UNITED STATES GEOLOGICAL SURVEY MAP LITTLETON QUAD HIGHLANDS RANCH QUAD			CITY OF LITTLETON	LOWER DAD CLARK GULCH AND DFA 0068	RANGEVIEW GULCH	CEI JN 906.00



BASE MAP UNITED STATES GEOLOGICAL SURVEY MAP LITTLETON QUAD HIGHLANDS RANCH QUAD	CENTENNIAL ENGINEERING INC	DESIGNED DJN DATE 7/90 DRAWN G.D.F. DATE 7/90 CHECKED DLM DATE 9/90 REVISED ____ DATE ____	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0068	LOCATION SHEET JACKASS AND DAD CLARK GULCHES	SHEET 3 OF 16 CEI JN 906.00



GROUND CONTROL SURVEY BY LANDMARK, LTD. AERIAL PHOTOGRAPHY BY SCHARF & ASSOC. TOPOGRAPHIC MAPPING BY LANDMARK, LTD. CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89	CENTENNIAL ENGINEERING INC ARVADA CO. 80001 420-0221 CEI JN. 906.00	DESIGNED DJN DATE 4/90 DRAWN G.G.H. DATE 7/90 CHECKED DLM DATE 7/90 REVISED DATE	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0068	PLAN RANGEVIEW GULCH STA. 10+00 TO STA. 27+00	SHEET 4 OF 16

GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

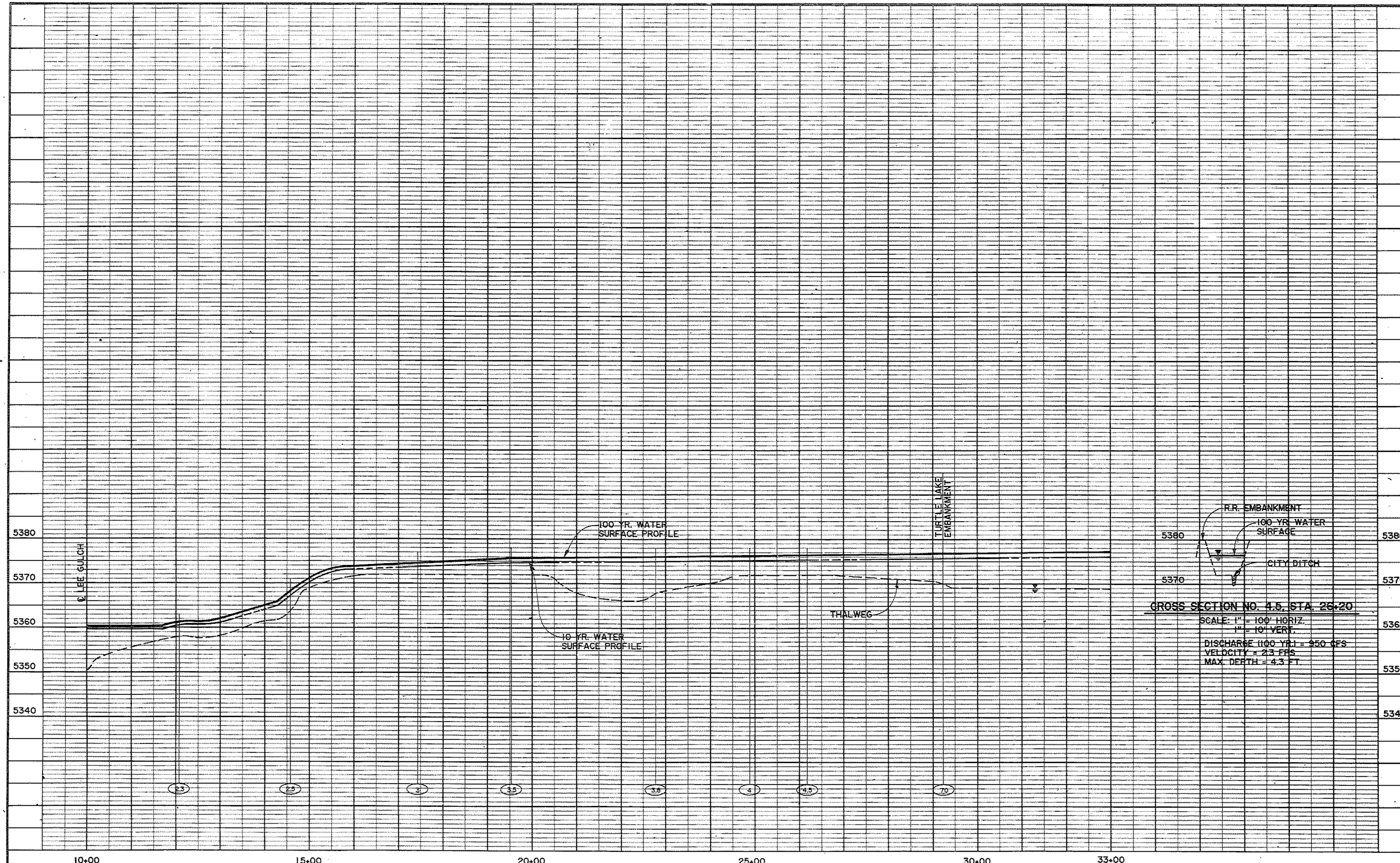
DESIGNED DJN DATE 4/90
DRAWN G.G.H. DATE 7/90
CHECKED DLM DATE 7/90
REVISED ______ DATE ______

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
CITY OF LITTLETON

FLOOD HAZARD AREA DELINEATION
LOWER DAD CLARK GULCH AND DFA 0068

PLAN
RANGEVIEW GULCH
STA. 27+00 TO STA. 33+00

SHEET 5 OF 16



(SEE SHEET 4 & 5 FOR PLAN)

GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

DESIGNED DJN DATE 4/90
DRAWN G.G.H. DATE 7/90
CHECKED DLM DATE 7/90
REVISED DATE

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

CITY OF LITTLETON

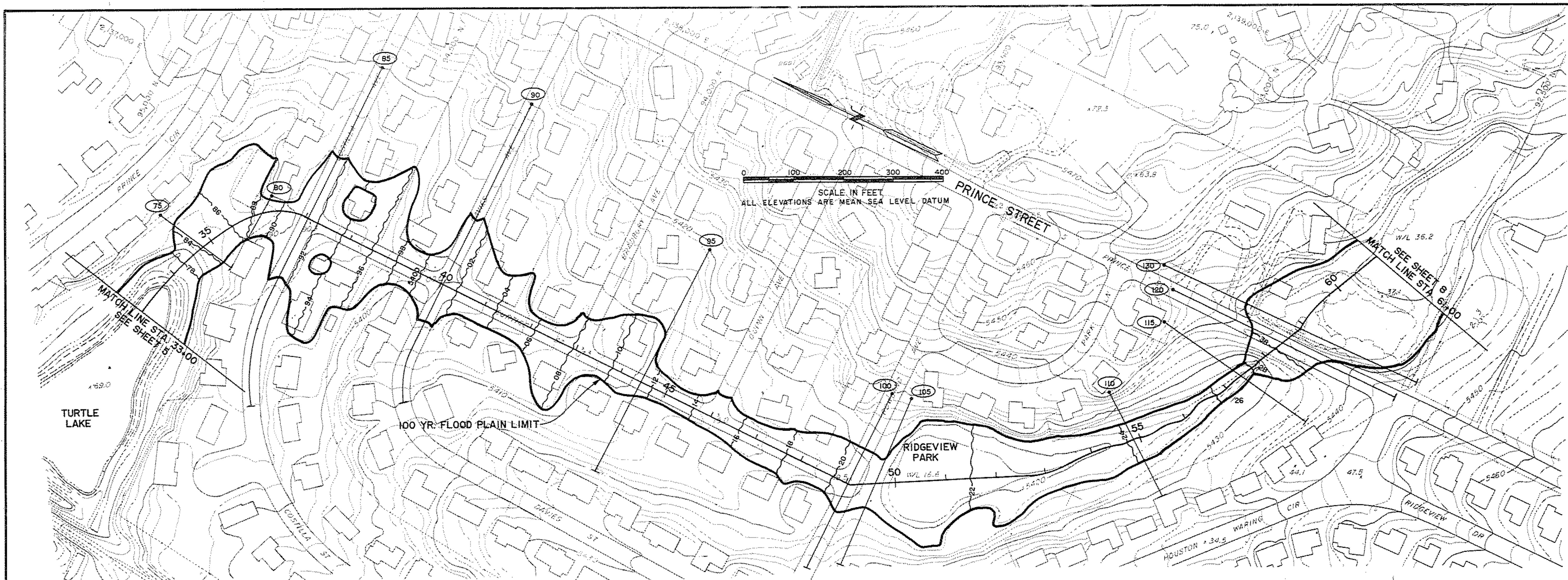
FLOOD HAZARD AREA DELINEATION

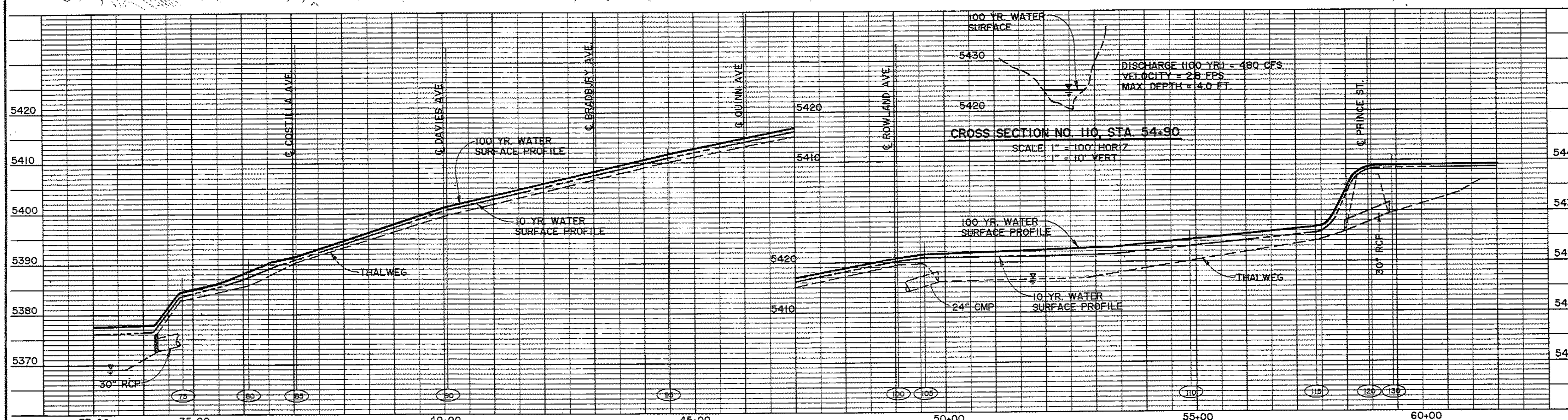
LOWER DAD CLARK GULCH AND DFA 0068

PROFILE

RANGEVIEW GULCH

STA. 10+00 TO STA. 33+00





GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

DESIGNED DJN	DATE 4/90
DRAWN G.G.H.	DATE 7/90
CHECKED DLM	DATE 7/90
REVISED	DATE

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

CITY OF LITTLETON

FLOOD HAZARD AREA DELINEATION

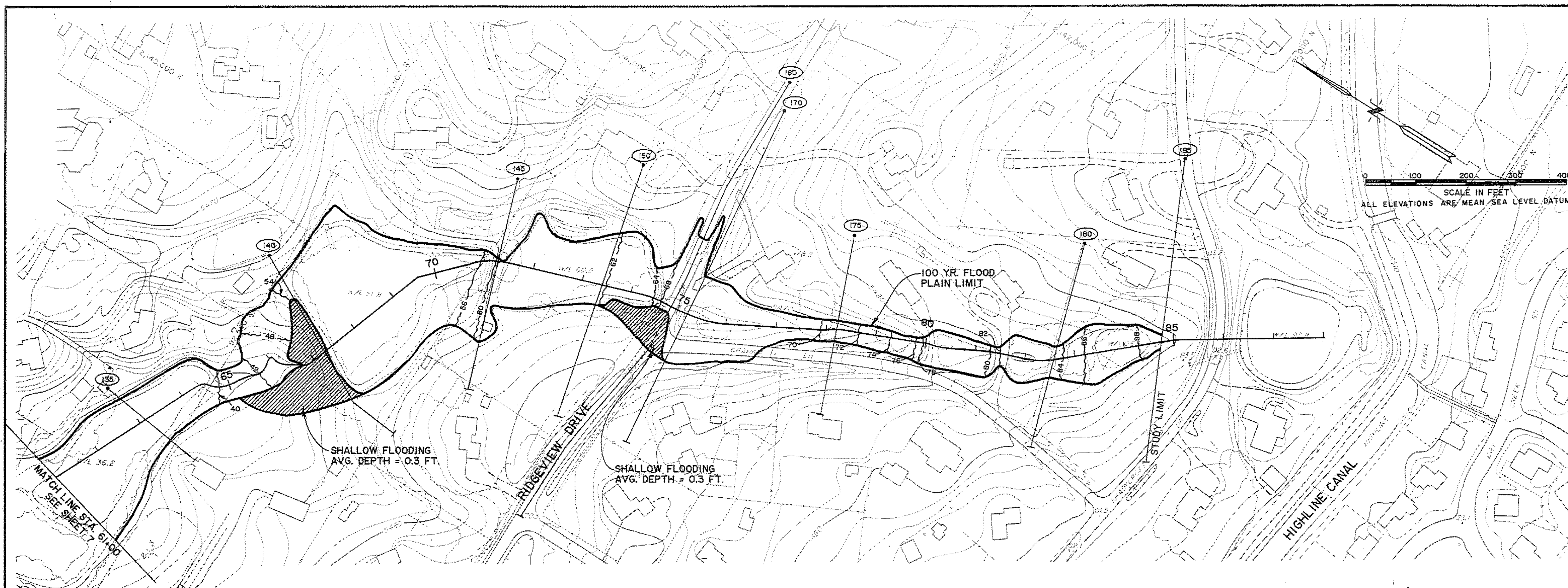
LOWER DAD CLARK GULCH AND DFA 0068

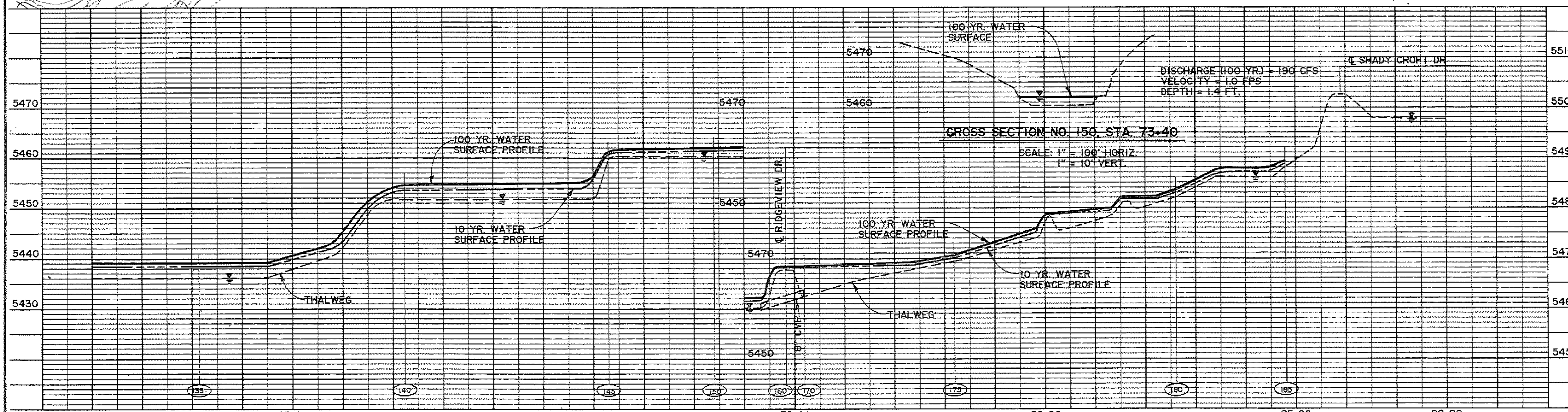
PLAN AND PROFILE

RANGEVIEW GULCH

STA. 33+00 TO STA. 61+00

SHEET 7 OF 16





GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

DESIGNED	DJN	DATE	4/90
DRAWN	G.G.H.	DATE	7/90
CHECKED	DLM	DATE	7/90
REVISED		DATE	

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

CITY OF LITTLETON

FLOOD HAZARD AREA DELINEATION

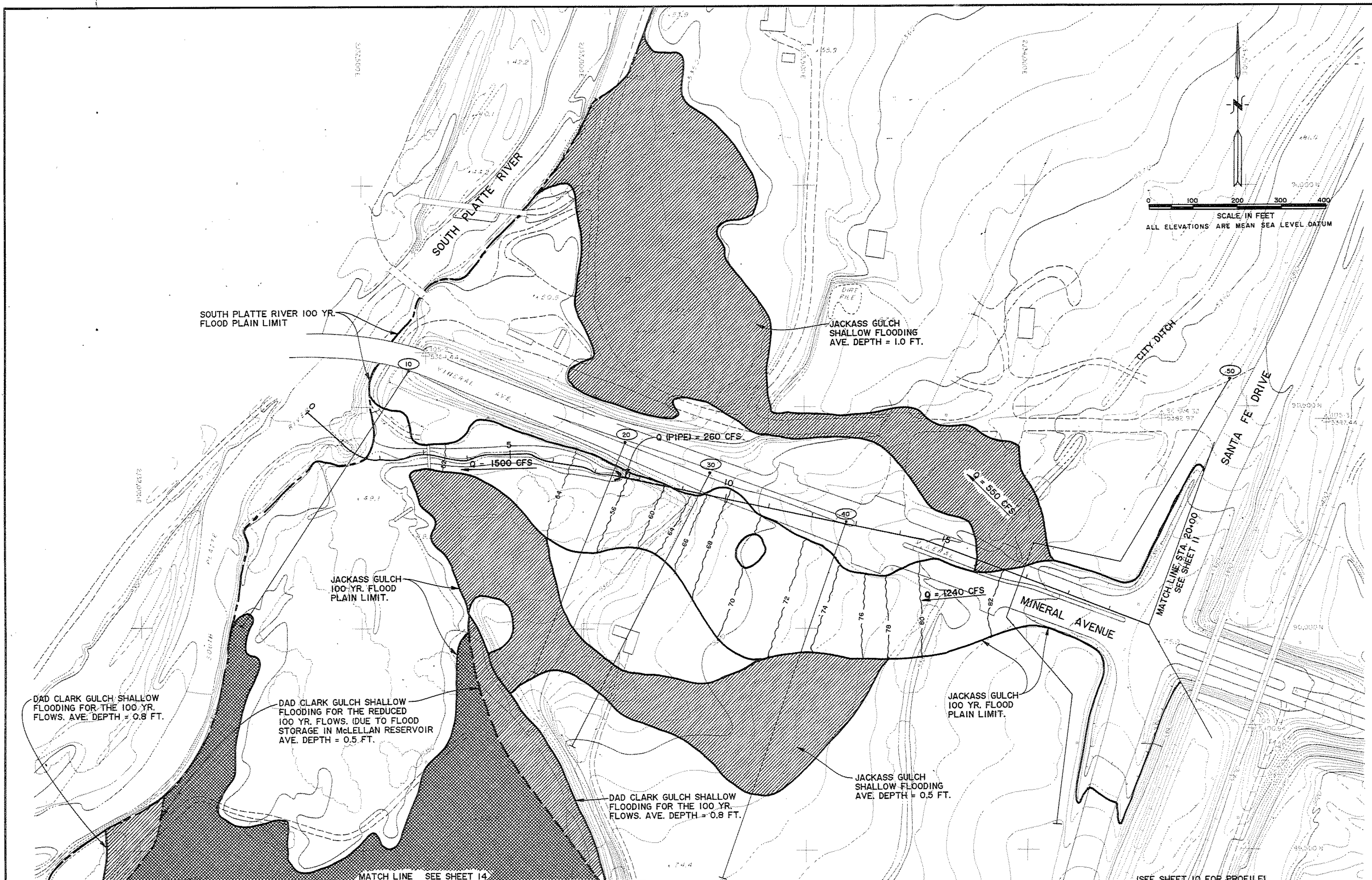
LOWER DAD CLARK GULCH AND DFA 0068

PLAN AND PROFILE

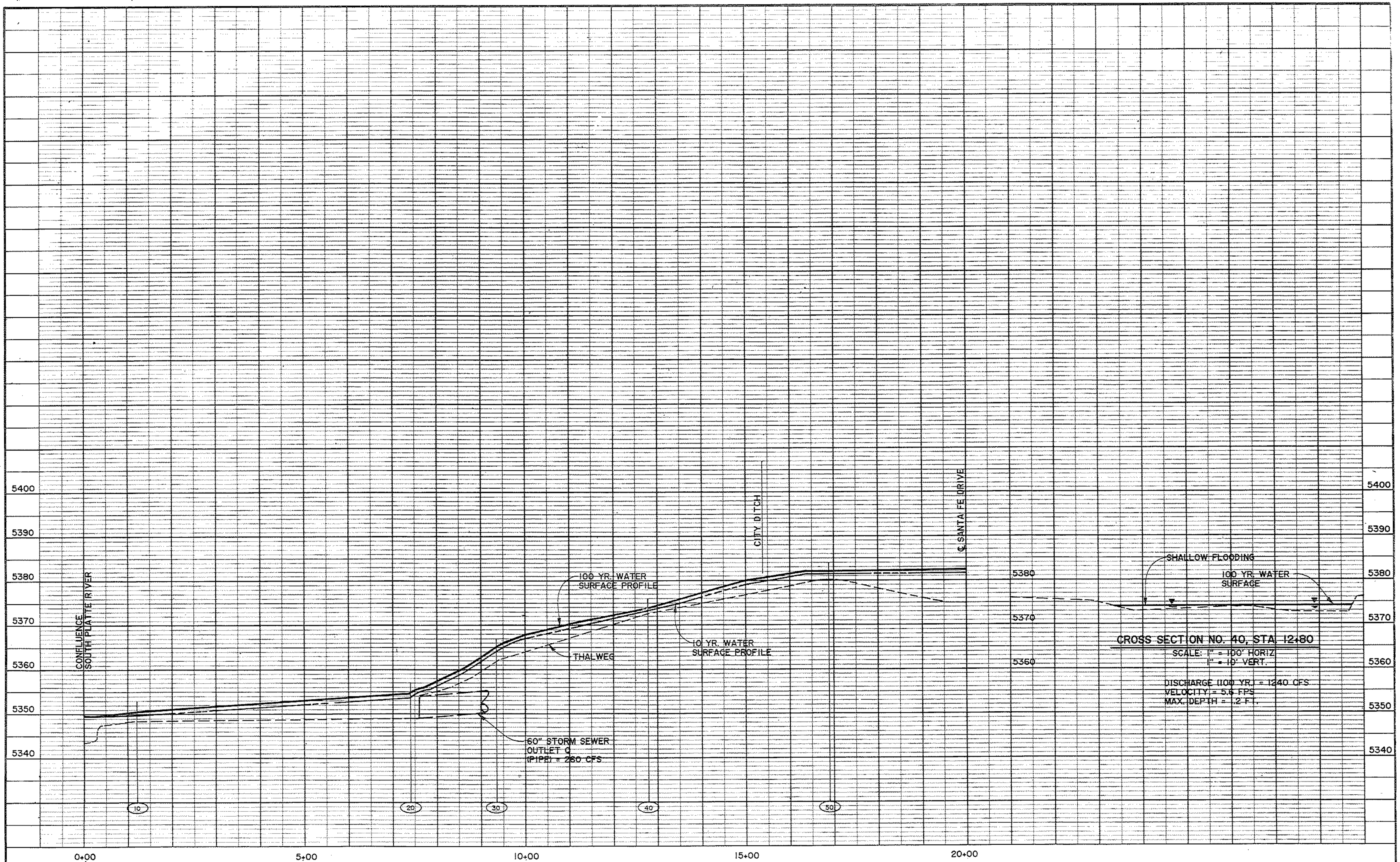
RANGEVIEW GULCH

STA. 61+00 TO STA. 88+00

SHEET 8 OF 16



GROUND CONTROL SURVEY BY LANDMARK, LTD. AERIAL PHOTOGRAPHY BY SCHARF & ASSOC. TOPOGRAPHIC MAPPING BY LANDMARK, LTD. CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89	CENTENNIAL ENGINEERING INC ARVADA CO. 80001 420-0221 CEI JN. 906.00 DESIGNED DJN DATE 4/90 DRAWN GGH DATE 7/90 CHECKED DLM DATE 7/90 REVISED DATE	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0068	PLAN JACKASS GULCH STA. 0+00 TO STA. 20+00	SHEET 9 OF 16



(SEE SHEET 9 FOR PLAN)

GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

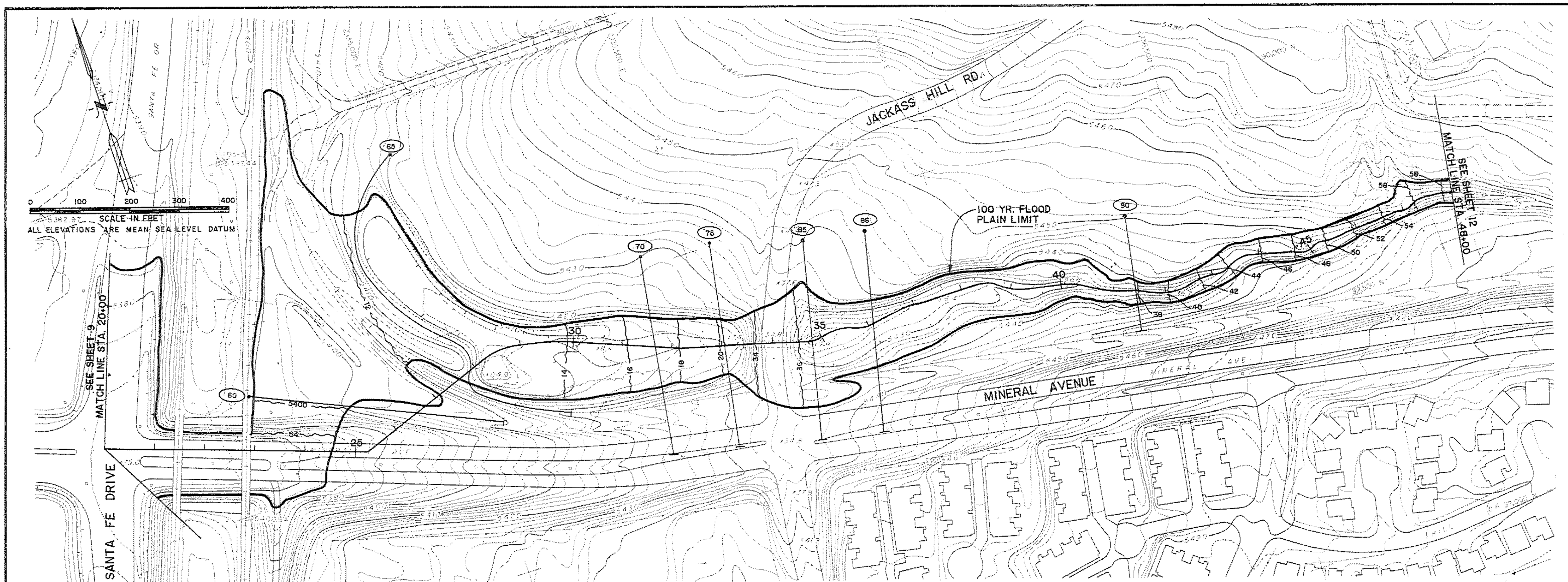
DESIGNED DJN DATE 4/90
DRAWN G.G.H. DATE 7/90
CHECKED DLM DATE 7/90
REVISED ____ DATE ____

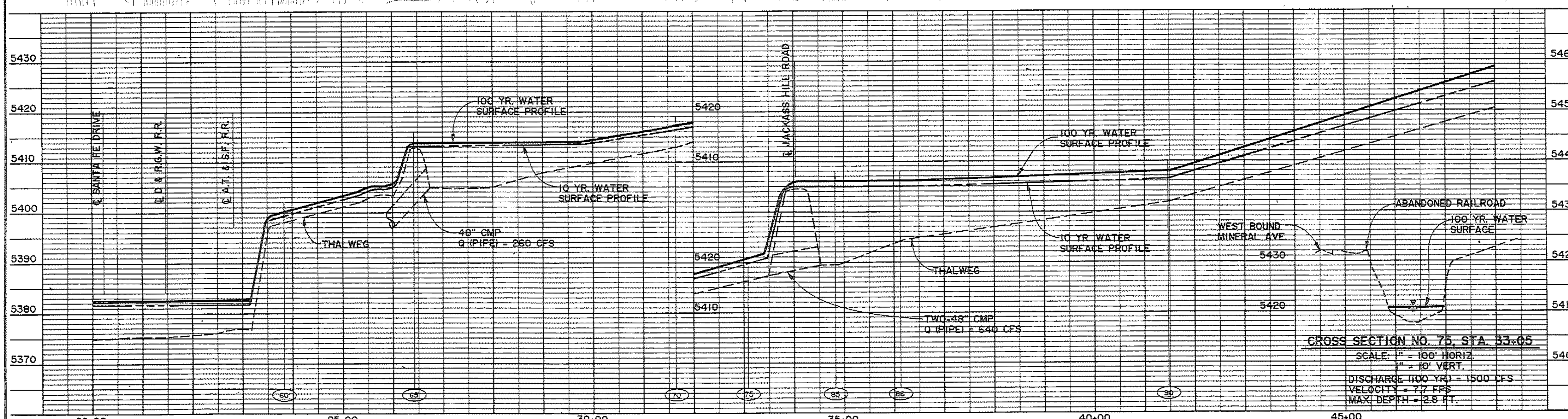
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
CITY OF LITTLETON

FLOOD HAZARD AREA DELINEATION
LOWER DAD CLARK GULCH AND DFA 0068

PROFILE
JACKASS GULCH
STA. 0+00 TO STA. 20+00

SHEET 10 OF 16





GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT. DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

DESIGNED DJN DATE 4/90
DRAWN G.G.H. DATE 7/90
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REVISED DATE

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

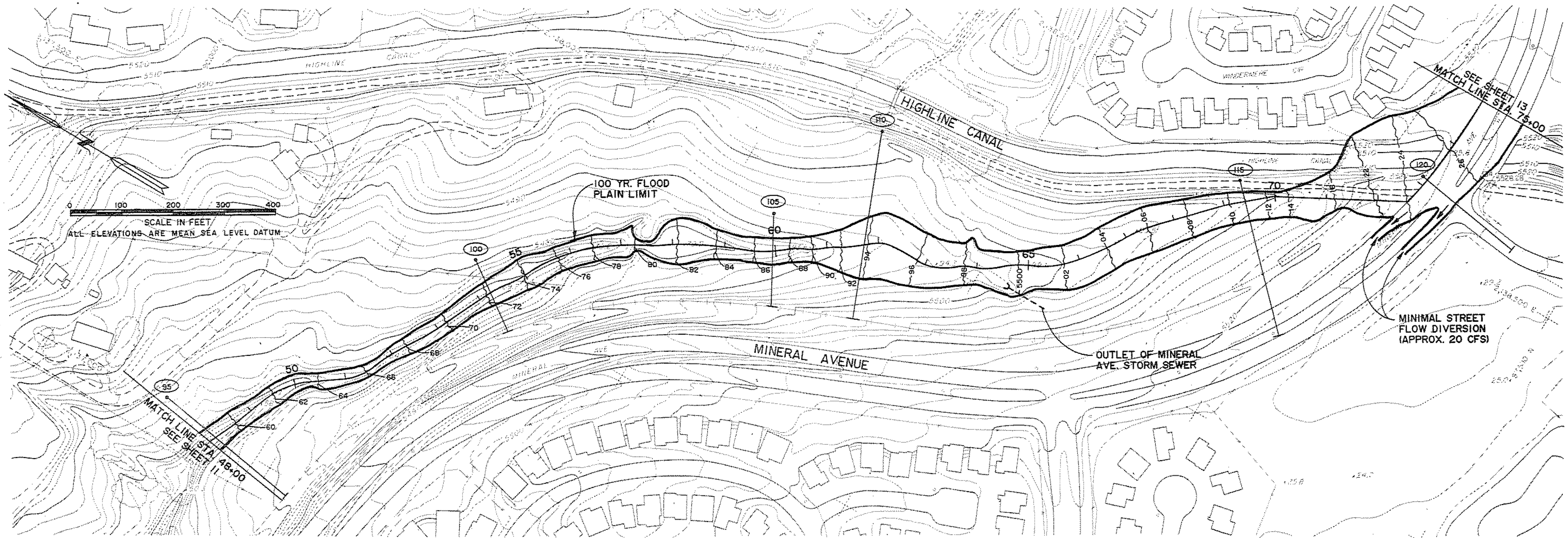
CITY OF LITTLETON

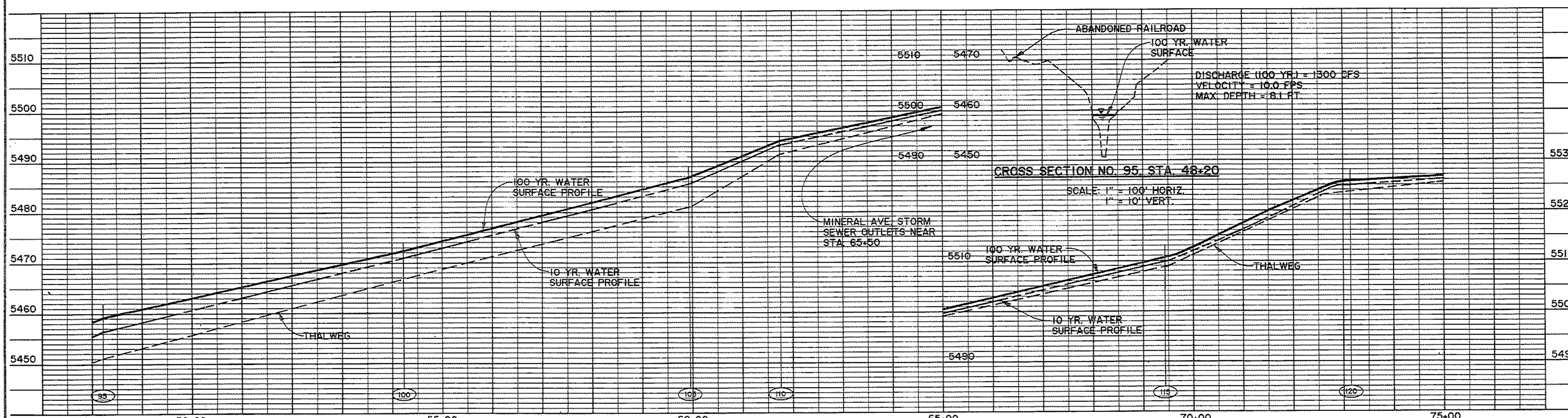
FLOOD HAZARD AREA DELINEATION

LOWER DAD CLARK GULCH AND DFA 0068

PLAN AND PROFILE
JACKASS GULCH
STA. 20+00 TO STA. 48+00

SHEET 11 OF 16





GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

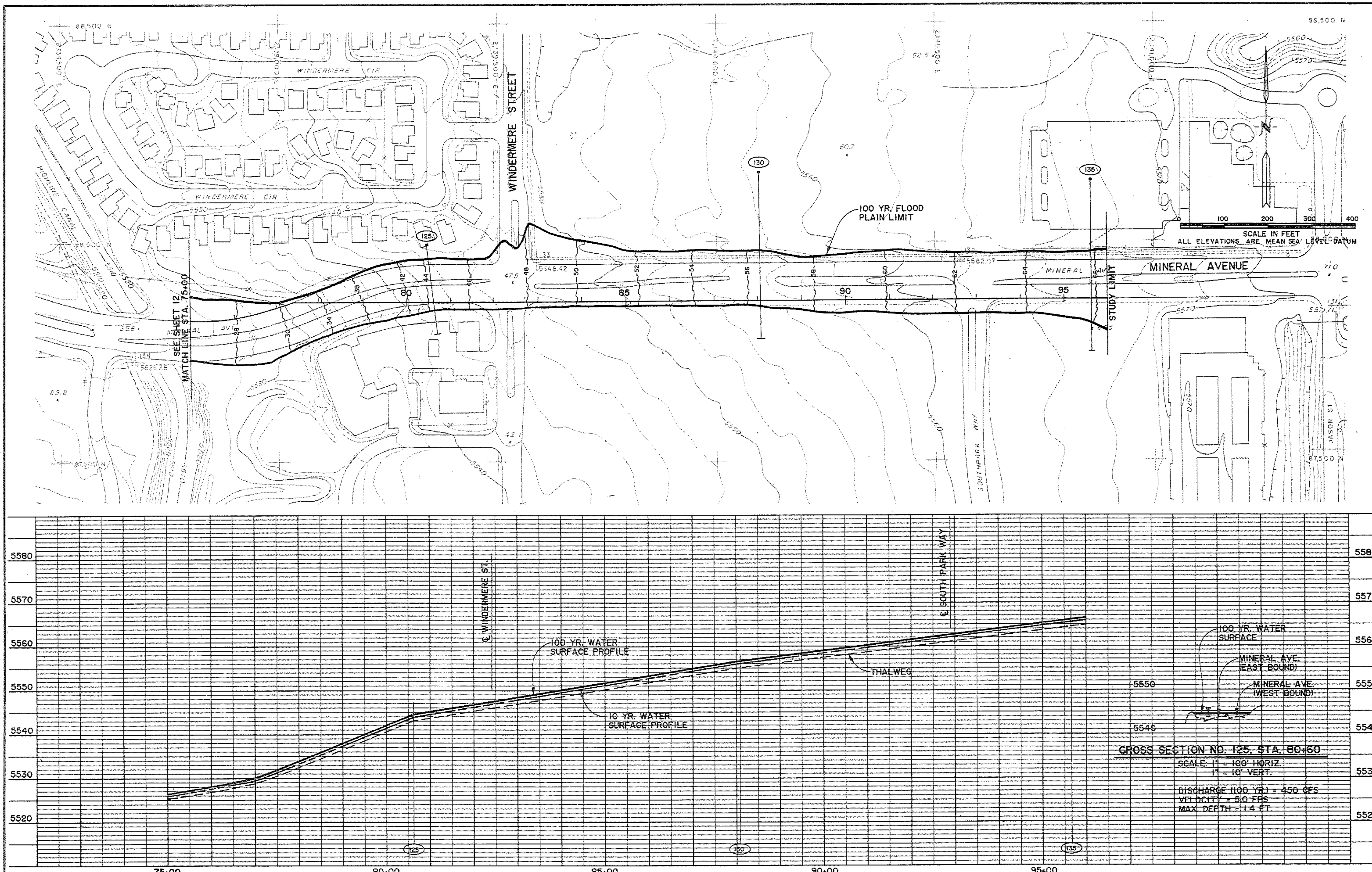
DESIGNED DJN DATE 4/90
DRAWN G.G.H. DATE 7/90
CHECKED DLM DATE 7/90
REVISED DATE

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
CITY OF LITTLETON

FLOOD HAZARD AREA DELINEATION
LOWER DAD CLARK GULCH AND DFA 0068

PLAN AND PROFILE
JACKASS GULCH
STA. 48+00 TO STA. 75+00

SHEET 12 OF 16



GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

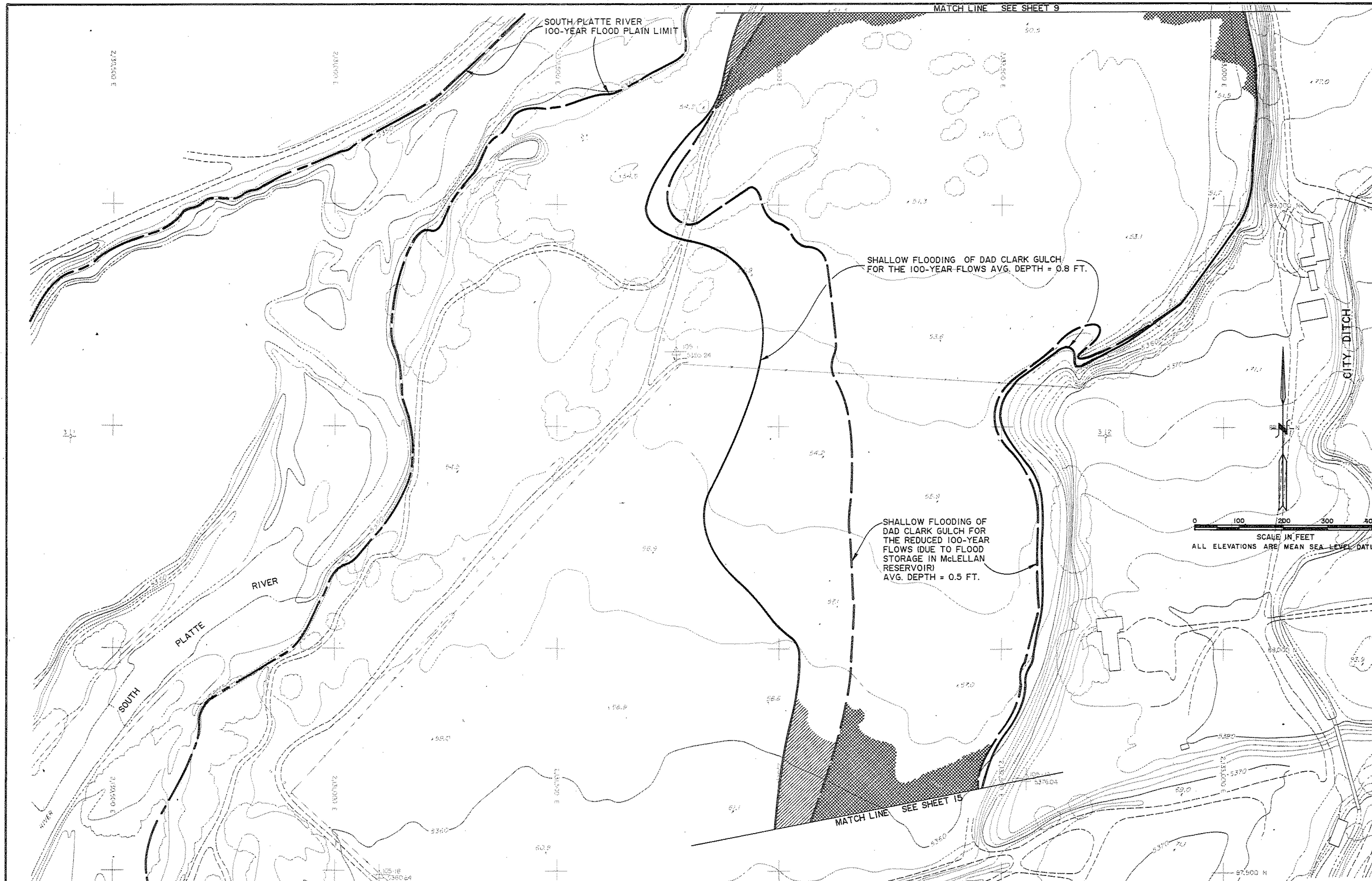
DESIGNED D.J.N. DATE 4/90
DRAWN G.G.H. DATE 7/90
CHECKED D.L.M. DATE 7/90
REVISED ______ DATE ______

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
CITY OF LITTLETON

FLOOD HAZARD AREA DELINEATION
LOWER DAD CLARK GULCH AND DFA 0068

PLAN AND PROFILE
JACKASS GULCH
STA. 75+00 TO STA. 96+00

SHEET 13 OF 16



GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

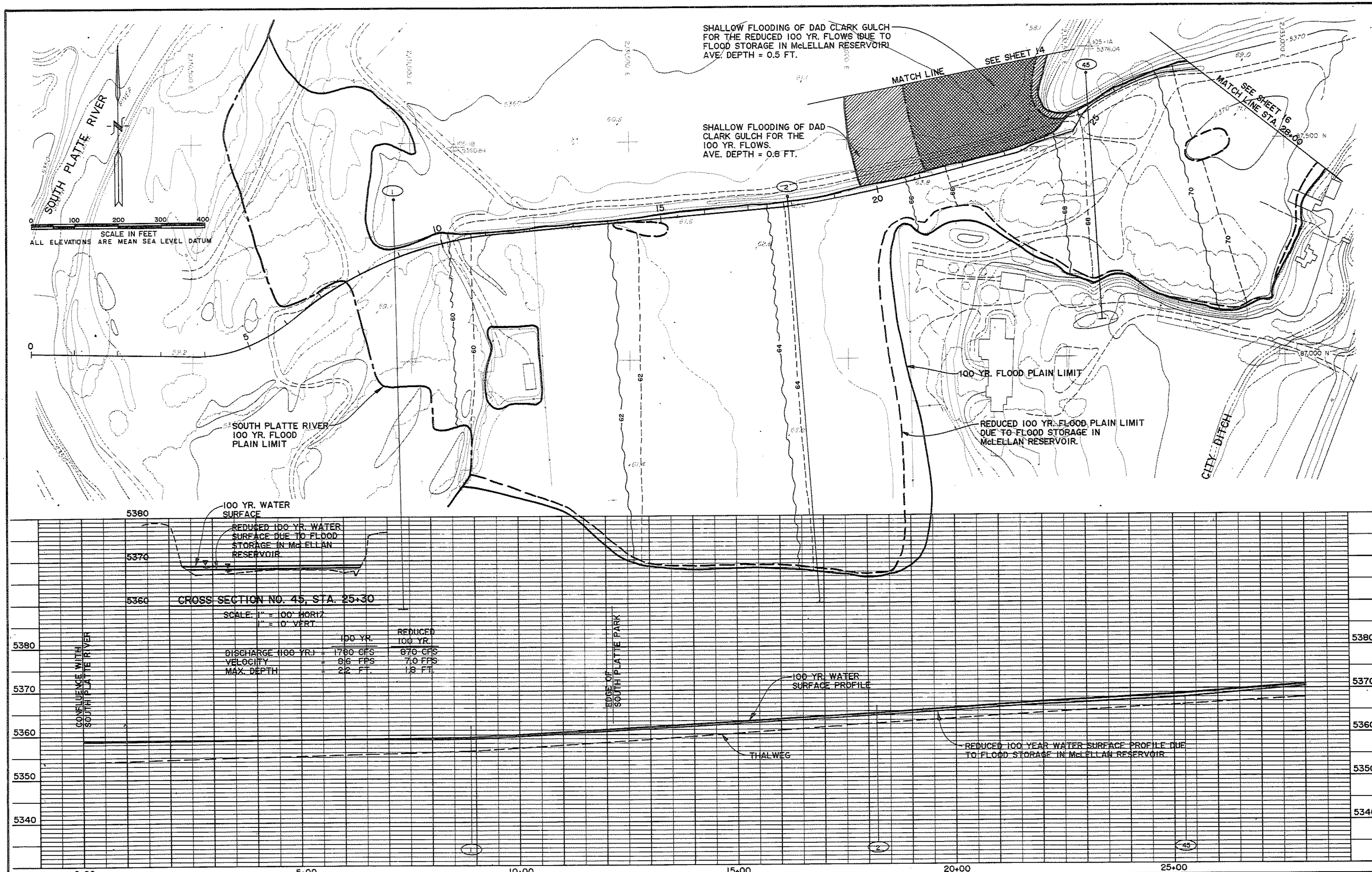
DESIGNED DJN DATE 4/90
DRAWN G.G.H. DATE 7/90
CHECKED DLM DATE 7/90
REVISED ______ DATE ______

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
CITY OF LITTLETON

FLOOD HAZARD AREA DELINEATION
LOWER DAD CLARK GULCH AND DFA 0068

PLAN
DAD CLARK GULCH
SHALLOW FLOODING

SHEET 14
OF 16



GROUND CONTROL SURVEY BY LANDMARK, LTD.
AERIAL PHOTOGRAPHY BY SCHARF & ASSOC.
TOPOGRAPHIC MAPPING BY LANDMARK, LTD.
CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89

CENTENNIAL ENGINEERING INC
ARVADA CO. 80001 420-0221
CEI JN. 906.00

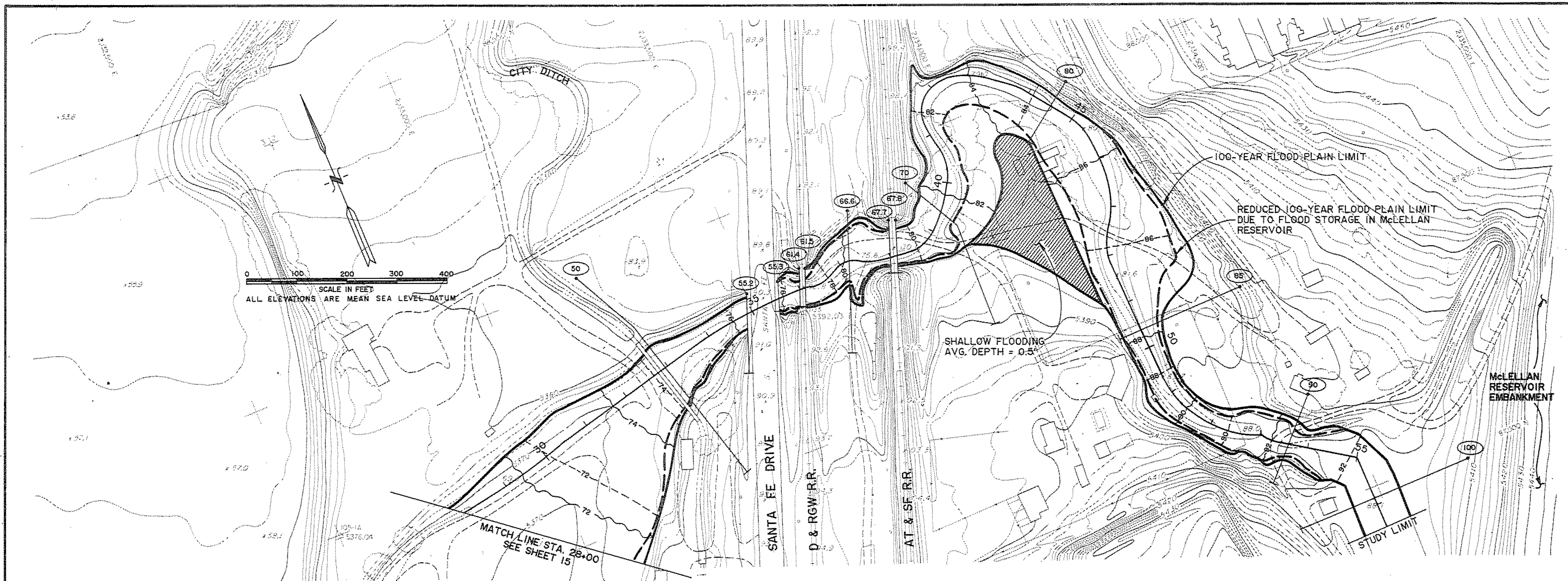
DESIGNED ABD DATE 4-90
DRAWN G.G.H. DATE 7/90
CHECKED DLM DATE 7/90
REVISED DATE

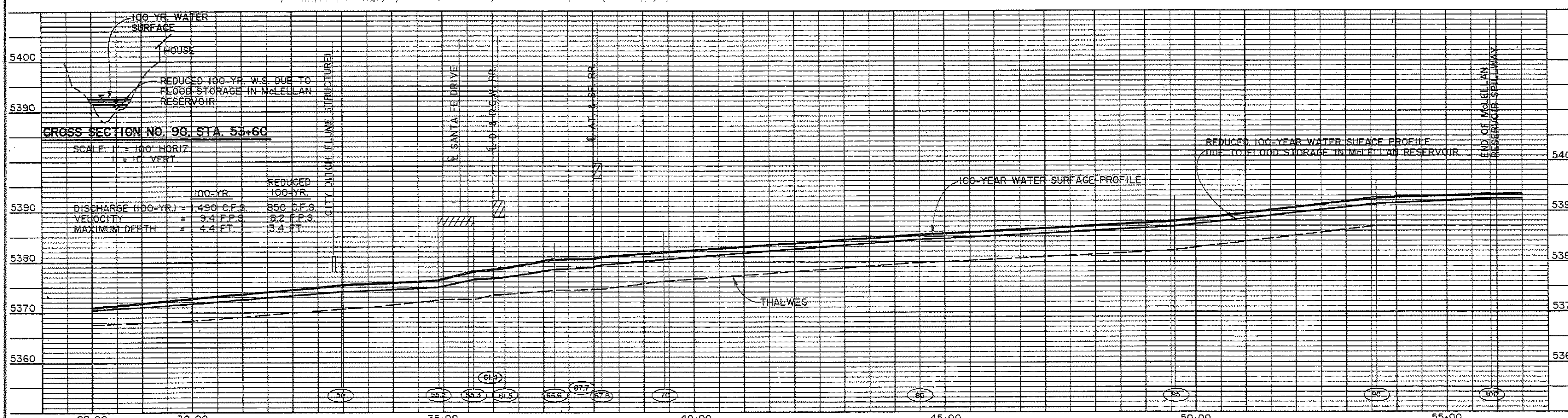
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
CITY OF LITTLETON

FLOOD HAZARD AREA DELINEATION
LOWER DAD CLARK GULCH AND DFA 0068

PLAN AND PROFILE
LOWER DAD CLARK GULCH
STA. 0+00 TO STA. 28+00

SHEET 15 OF 16





GROUND CONTROL SURVEY BY LANDMARK, LTD. AERIAL PHOTOGRAPHY BY SCHARF & ASSOC. TOPOGRAPHIC MAPPING BY LANDMARK, LTD. CONTOUR INTERVAL 2 FT DATE FLOWN 4-13-89	CENTENNIAL ENGINEERING INC ARVADA CO. 80001 420-0221 CEI JN. 906.00	DESIGNED [illegible] DATE 4-90 DRAWN G.G.H. DATE 7/90 CHECKED DLM DATE 7/90 REVISED DATE	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF LITTLETON	FLOOD HAZARD AREA DELINEATION LOWER DAD CLARK GULCH AND DFA 0068	PLAN AND PROFILE LOWER DAD CLARK GULCH STA. 28+00 TO STA. 56+50