

FLOODPLAIN INFORMATION
REPORT FOR
COAL CREEK
CRESTED BUTTE, COLORADO

September 18, 1992

Prepared for:

Town of Crested Butte
P.O. Box 39
Crested Butte, CO 81224

Prepared by:

RBD, Inc. Engineering Consultants
2900 South College Avenue
Fort Collins, Colorado 80525
(303) 226-4955

RBD Job No. 460-002



Engineering Consultants

2900 South College Avenue
Fort Collins, Colorado 80525
303/226-4955
FAX: 303/226-4971

September 18, 1992

Mr. Bill Crank
Crested Butte Town Manager
Town of Crested Butte
P.O. Box 39
Crested Butte, CO 81224

Re: Floodplain Information Report
For Coal Creek
RBD Job No. 460-002

Dear Mr. Crank:

We are pleased to submit to you this Floodplain Information Report for Coal Creek in Crested Butte. We have work closely with the Colorado Water Conservation Board in development of the current hydrology for Coal Creek.

Thank you for the opportunity to complete this report. Please call us should you have any questions about the Floodplain Information Report.

Sincerely,
RBD Inc. Engineering Consultants

A handwritten signature in blue ink that reads 'Kevin W. Gingery'.

Kevin W. Gingery, P.E.
Project Engineer

A handwritten signature in blue ink that reads 'Deryl W. Gingery'.

Deryl W. Gingery, P.E.
Project Manager



TABLE OF CONTENTS

<u>DESCRIPTION</u>	<u>PAGE</u>
I. INTRODUCTION	1
II. COAL CREEK BASIN DESCRIPTION	2
III. HYDROLOGIC ANALYSIS	2
IV. HYDRAULIC ANALYSIS	4
V. REFERENCES	9
TABLE 1 100 YEAR FLOOD ELEVATIONS	5
TABLE 2 100 YEAR FLOODWAY DELINEATION	8
EXHIBITS A	
SHEET 1 - BASIN MAP	
SHEET 2 - INDEX MAP	
SHEET 3 - COAL CREEK EXISTING 100 YEAR FLOODPLAIN SECTIONS 50 - 39	
SHEET 4 - COAL CREEK EXISTING 100 YEAR FLOODPLAIN & PROPOSED FLOODWAY SECTIONS 38 - 13	
SHEET 5 - COAL CREEK EXISTING 100 YEAR FLOODPLAIN & PROPOSED FLOODWAY SECTIONS 12 - 9	
SHEET 6 - COAL CREEK NORTH OF BUTTE AVENUE	
SHEET 7 - COAL CREEK AT CONFLUENCE WITH THE SLATE RIVER	
SHEET 8 - COAL CREEK FLOOD PROFILES SECTIONS 1 - 9	
SHEET 9 - COAL CREEK FLOOD PROFILES SECTIONS 9 - 27	
SHEET 10 - COAL CREEK FLOOD PROFILES SECTIONS 27 - 50	
EXHIBITS B	
SHEET 1 - GUNNISON COUNTY, COLORADO FLOOD INSURANCE RATE MAP COVER	
SHEET 2 - GUNNISON COUNTY, COLORADO FLOOD INSURANCE RATE MAP LEGEND	
SHEET 3 - SLATE RIVER FLOOD HAZARD AREA DELINEATION	

FLOODPLAIN INFORMATION REPORT FOR COAL CREEK CRESTED BUTTE, COLORADO

I. INTRODUCTION

In December 1976, Engineering Consultants, Inc. prepared a Floodplain Information Report for Coal Creek through Crested Butte, Colorado. The 100 year flow was estimated at approximately 480 cfs and the 500 year flow was estimated at approximately 600 cfs. This flow estimate was developed from a regional frequency analysis of stream flow data in the region, because limited flow records were available for Coal Creek. In 1978 and 1979, according to a letter issued by Mr. Larry Lang, Chief Flood Control and Floodplain Management Section at the Colorado Water Conservation Board, the snow melt flows measured in Coal Creek through Crested Butte were:

1. 1978 $Q = 580$ cfs
2. 1979 $Q = 600-630$ cfs.

The Colorado Water Conservation Board found that the 1976 study was based on a hydrologic analysis that significantly understates potential flood flows. They concluded that the 100 year flow should have been in the range of 750-800 cfs.

The purpose of this study is to redefine the potential flooding problems in the Town of Crested Butte caused by flooding of Coal Creek during a 100 year snow melt condition. The scope of the study is to:

1. Develop the proper Hydrology for the Coal Creek Basin.
2. Visit the area, layout the cross sections needed for the study, and determine what changes have been made since the 1976 study.
3. Utilize the 1976 two-foot contour base mapping from the Colorado Water Conservation Board. Obtain a field survey to generate the cross section data required for the hydraulic analysis.
4. Perform a detailed hydraulic analysis for the 100 year Peak flow from snow melt.
5. Update the base map with pertinent features.
6. Perform a detailed hydraulic analysis for a possible 100 year floodway for the northern portion of the Town.

II. COAL CREEK BASIN DESCRIPTION

Coal Creek through Crested Butte, Colorado is located approximately 30 miles north of Gunnison, Colorado in Gunnison County. Sheet 1 of 10 (following the text of this report) delineates the Coal Creek drainage basin boundary. Coal Creek headwaters originate in the Elk Mountains, approximately 10 miles west of Crested Butte. The Coal Creek basin study area contains approximately 21 square miles of mountainous terrain ranging in elevation from 8,880 to 12,207 feet above mean sea level. Major tributaries of Coal Creek include Elk Creek, Splains Gulch, and Wildcat Creek.

Coal Creek flows easterly through a canyon composed mainly of shale material. Native vegetation consists of willow and box elder along the canyon. Coal Creek enters Crested Butte from the southwest and angles through the western portion of Town in a north-easterly direction as shown on sheet 2 of 10. At its confluence lies the Slate River. Copies of the Federal Emergency Management Agency "Flood Insurance Rate Map", for the Slate River floodplain delineation, have been included in the rear of this report. Within the Town limits of Crested Butte, Coal Creek is bridged by five roads, six pedestrian bridges, and one building deck.

III. HYDROLOGIC ANALYSIS

Flood flows on Coal Creek are caused primarily by rapid melting of the snowpack during the months of May and June of each year. The high water problems that the Town experienced in 1978 and 1979 were the result of snow melt from a heavy snowpack according to Mr. Larry Lang. During May and June of each year, precipitation is generally observed to be low at most stations within the Gunnison River Basin. Convective type thunderstorms occur extensively over the Gunnison River Basin during the summer months. The extent of these thunderstorms is small and they do not cause peak flows in Coal Creek at Crested Butte.

The hydrology developed for the 1976 study was based on two recognized methods. The first method was a regression equation developed by the U.S.G.S., and the second method was a U.S. Soil Conservation Service curve number method. Stream flow records available at the time for Coal Creek included the period 1943-1946, as measured at a location upstream of the Town of Crested Butte.

Three hydrologic methods were utilized in this study to develop the proper hydrology for Coal Creek. Each of the three hydrologic methods studied is explained below, along with the results of each hydrologic analysis. Included in the Technical Appendix, under separate cover, are the detailed computations of the three hydrologic methods.

METHOD 1 - UTILIZING STREAM FLOW REGRESSION RELATIONS FOR THE MOUNTAIN REGION

From the reference titled "Estimation of Natural Streamflow Characteristics in Western Colorado", a summary of regression relations for various mountain regions and related regression models is provided. For the Coal Creek Basin, the parameters of drainage area and overall basin slope were required in the regression model. The overall basin slope was determined by averaging twenty five equally spaced grid slopes within the Coal Creek Basin. Given the basin size of 21 square miles and the average basin slope of 0.385 ft/ft, the regression model yielded a 100 year peak flow in Coal Creek of 536 cfs.

METHOD 2 - FLOOD FLOW FREQUENCY ANALYSIS FITTING THE LOG-PEARSON TYPE III DISTRIBUTION

Stream flow records available for Coal Creek include the period 1943 - 1946. These records were measured at a U.S.G.S. gaging station upstream from the Town of Crested Butte. The gaging station had a drainage area of approximately 8.5 square miles upstream. The reference manual utilized was "Guidelines for Determining Flood Flow Frequency" Bulletin # 17B. The 1943 - 1946 gage data was adjusted on a straight line proration basis for the entire 21 square mile Coal Creek Basin. The two additional years of field measured data for 1978 and 1979 was combined with the gaging data and the data base for the updated Log-Pearson Type III Distribution was achieved. The Flood Flow Frequency Analysis computer model was run with six years of data and the model yielded a 100 year peak flow in Coal Creek of 815 cfs.

METHOD 3 - UTILIZING ADJACENT DRAINAGE BASIN INFORMATION

To verify that 815 cfs of flow as derived in Method 2 was reasonable or required adjustment, various other basins were selected in the central and southwest mountain areas of Colorado with longer gage records and better flow projections. For the selected streams, plus Coal Creek at Crested Butte, the multiple linear regression analysis computer program Minitab was utilized to obtain a best fit line through the data. The three variables used in the analysis were basin slope, basin area, and discharge per square mile. The variables used were based on snow melt peaks for elevations above 9000 feet. Basins with somewhat similar orientation, a variety of basin slopes but not extreme slopes, and a substantial area above 10,000 feet in elevation, were utilized. The resultant regression equation yielded a 100 year peak flow in Coal Creek, of 805 cfs.

In a letter dated March 5, 1985 from Mr. Larry Lang to Mr. Doug Gore at FEMA, Region VIII, the Colorado Water Conservation Board concluded that the appropriate range for a 100 year flow in Coal Creek at Crested Butte should be 750 to 800 cfs. Based on the findings in Method 3 above and the findings in 1985 by the Colorado Water Conservation Board, a 100 year peak flow value of 805 cfs for Coal Creek at Crested Butte was selected for this study.

IV. HYDRAULIC ANALYSIS

FLOODPLAIN DELINEATION

The hydraulic analysis included computation of the water surface profile of Coal Creek through the Town of Crested Butte. Water surface profiles were determined using 49 channel cross sections, and the Corps of Engineers HEC-2 computer program. Results of the 100 year flood computations from HEC-2 are shown in Table 1. The 100 year flood profiles and cross section locations are shown on sheets 8 through 10. The cross sections used were obtained from a field survey by RBD Inc. in May 1992. The location of the cross sections are shown on the Floodplain delineation sheets 3 through 5. The contour base mapping utilized on sheets 2 through 5 was obtained from the Colorado Water Conservation Board and was also used in the 1976 Floodplain Information Report on Coal Creek by Engineering Consultants, Inc.. Regrading adjacent to Coal Creek, through the Town of Crested Butte, has occurred since the original report in 1976. The floodplain delineation shown on sheets 3 through 5 was based on the individual cross sections and not the base map contours. New base mapping of Coal Creek through Crested Butte would need to be obtained in order for the cross section water surface elevations to match the base mapping contours.

The water surface elevations presented in Table 1 are based on the HEC-2 computations assuming no reduction in the channel or hydraulic structure conveyance capabilities due to debris accumulation. Peak runoff flows, through the Town of Crested Butte, begin between 4 and 5 P.M. and remain until dark each day of the runoff. Debris can accumulate every day that the peak flow exceeds that of the previous day. Because the peak runoff flows begin between 4 and 5 P.M. and last until dark, we have assumed that the Town of Crested Butte maintenance staff keep the debris clear of obstructions during the high flow periods each summer. Therefore we have modeled Coal Creek through the Town of Crested Butte assuming no debris accumulation in the channel or at hydraulic structures. A channel roughness coefficient of 0.038, through the Town of Crested, was utilized in the hydraulic computations. The value of 0.038 was confirmed by actual field measurements upstream of the Maroon Street bridge on June 15, 1978, according to the Memorandum from the Colorado Water Conservation Board to the Town of Crested Butte dated August 24, 1978.

Included in the Technical Appendix, under separate cover, are the detailed computations of the hydraulic calculations.

The survey bench mark descriptions and elevations used in obtaining the cross section data for Coal Creek were:

- a. U.S. Coast and Geodetic Survey, 1934, No. Y 157 Located behind the Old Jail House at Elevation 8908.699
- b. U.S. Coast and Geodetic Survey, 1934, No. Z 157 Located at the High School at Elevation 8885.343

As shown on sheet 3 and 4, the banks of Coal Creek upstream of Elk Avenue cannot convey 805 cfs of flow and split flows occur. The HEC-2 computer program utilized the split flow analysis to determine the amount of the 100 year flow leaving the left and right banks of Coal Creek. The split flow analysis found that between station 51+32 and station 51+50 (cross sections 36 and 37), 43 cfs of flow leaves Coal Creeks northern embankment (left bank). The split flow analysis further found that from station 51+89 to station 53+94 (cross sections 38 through 42), 86 cfs of flow leaves Coal Creeks southeastern embankment (right bank). The HEC-2 computer program automatically subtracted the split flow loss from the 805 cfs initial flow, thus 676 cfs of flow continued downstream below station 51+32 (section 36) in Coal Creek.

The remaining 676 cfs of flow in Coal Creek does not leave the banks of the creek as it is conveyed downstream, through the Town of Crested Butte. The split flows occurring through the Town of Crested Butte are upstream of Elk Avenue. Ponding occurs at Elk Avenue against the pedestrian bridge on the south side of the street, but does not spill onto Elk Avenue at the Coal Creek crossing. This study is an existing floodplain analysis, and therefore routing of 805 cfs of flow completely through town is not a part of this analysis. If Coal Creek were improved to convey 805 cfs of flow downstream to Elk Avenue, Elk Avenue and various other restrictions downstream, through the Town of Crested Butte, would cause additional flow splits due to restricted openings and low channel embankments.

TABLE 1
100 YEAR FLOOD ELEVATIONS

Cross Section Number	Cross Section Station	Existing Stream Bed Min. Elevation	100 Year Snow Melt Flood Elev.	Flow (cfs)
1	2+00	8841.40	8845.71	676.5
2	3+13	8842.10	8846.81	676.5
3	5+67	8843.60	8848.02	676.5
4	8+48	8846.60	8850.21	676.5
5*	N/A	N/A	N/A	N/A
6	22+58	8858.10	8860.67	676.5
7	24+58	8860.10	8862.68	676.5
8	27+88	8863.00	8866.42	676.5
9	29+75	8866.50	8869.18	676.5
10	32+44	8871.20	8873.39	676.5
11	34+71	8873.80	8876.75	676.5
12	36+51	8877.80	8880.17	676.5
13	39+23	8882.10	8884.58	676.5
14	39+90	8883.90	8886.76	676.5
15	40+60	8883.50	8888.04	676.5
16	42+47	8886.50	8890.40	676.5
17	42+55	8886.60	8890.12	676.5
18	43+32	8887.10	8891.56	676.5
19	43+82	8888.40	8893.32	676.5
20	44+28	8889.40	8893.67	676.5
21	44+56	8890.10	8893.77	676.5
22	46+09	8891.80	8896.16	676.5
23	46+17	8892.10	8897.31	676.5
24	46+63	8892.90	8897.59	676.5
25	47+98	8895.60	8899.17	676.5
26	48+46	8895.80	8901.43	676.5
27	48+66	8896.50	8901.43	676.5
28	49+16	8898.00	8901.84	676.5
29	49+23	8898.20	8902.65	676.5
30	49+28	8898.50	8902.42	676.5
31	49+73	8898.80	8904.18	676.5
32	49+78	8898.90	8904.35	676.5
33	49+85	8899.00	8904.66	676.5
34	50+30	8899.20	8904.66	676.5

TABLE 1
100 YEAR FLOOD ELEVATIONS

Cross Section Number	Cross Section Station	Existing Stream Bed Min. Elevation	100 Year Snow Melt Flood Elev.	Flow (cfs)
35	51+27	8901.20	8907.26	676.5
36	51+32	8901.25	8907.52	676.5
37	51+50	8901.60	8907.65	719.2
38	51+89	8902.20	8907.85	719.2
39	52+54	8903.80	8909.24	791.0
40	52+88	8904.70	8909.08	799.3
41	52+94	8904.70	8909.83	799.3
42	53+94	8905.90	8911.17	805.0
43	55+04	8908.00	8913.77	805.0
44	55+54	8908.40	8914.52	805.0
45	57+19	8911.60	8916.49	805.0
46	58+11	8914.00	8918.14	805.0
47	60+05	8918.10	8923.06	805.0
48	60+43	8919.30	8923.53	805.0
49	60+83	8920.10	8925.03	805.0
50	61+30	8921.30	8925.20	805.0

* Permission to survey cross section number 5 across private property was not granted by the property owner.

FLOODWAY DELINEATION

The hydraulic analysis included computation of the water surface profile of Coal Creek through the Town of Crested Butte. Water surface profiles were determined using the 49 channel cross sections and the Corps of Engineers HEC-2 computer program. The floodway computations were completed using a maximum of a one foot rise in the water surface elevation as established by the State of Colorado regulations. The floodway analysis was completed with 805 cfs of flow in Coal Creek assuming that Coal Creek is improved to convey this flow through the Town of Crested Butte. A floodway is defined as an improved and narrowed channel capable of conveying the 100 year occurrence flows while creating a rise of not more than one foot in the water surface elevation of the unimproved channel. The floodway analysis was completed for only the unimproved portion of Coal Creek between station 29+75 (section 9) and station 39+90 (section 14). Results of the 100 year floodway computations from HEC-2 are shown in Table 2. The floodway

encroachment was established by reducing the existing Coal Creek width an equal distance from both top of existing bank locations using HEC-2 Encroachment Method 1. Cross sections used were those obtained from a field survey by RBD Inc.. The location of the cross sections are shown on the Floodplain delineation sheets 4 and 5. The contour base mapping utilized on sheets 4 and 5 was obtained from the Colorado Water Conservation Board and was used in the 1976 Floodplain Information Report on Coal Creek by Engineering Consultants, Inc.. Regrading adjacent to Coal Creek, through the Town of Crested Butte, has occurred since the original report in 1976. The floodway delineation shown on sheets 4 and 5 was based on the individual cross sections and not the base map contours. The floodway delineation has been referred to on the exhibit sheets as the Proposed Floodway only for use by the Town of Crested Butte in the possible event this reach of Coal Creek is improved at one time. Included in the Technical Appendix, under separate cover, are the detailed computations of these hydraulic calculations.

The floodway delineation and water surface elevations presented in Table 2 are based on the HEC-2 computations assuming no reduction in the channel or hydraulic structure conveyance capabilities, due to debris accumulation, as in the floodplain delineation.

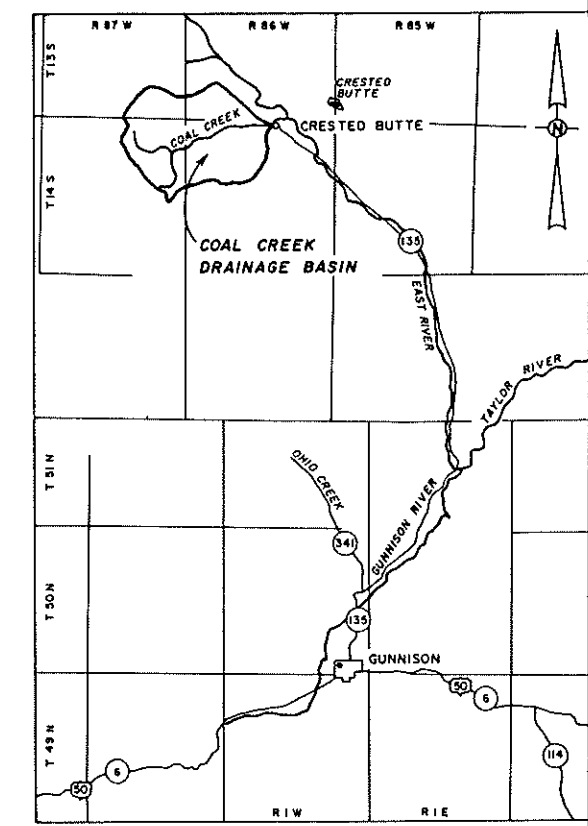
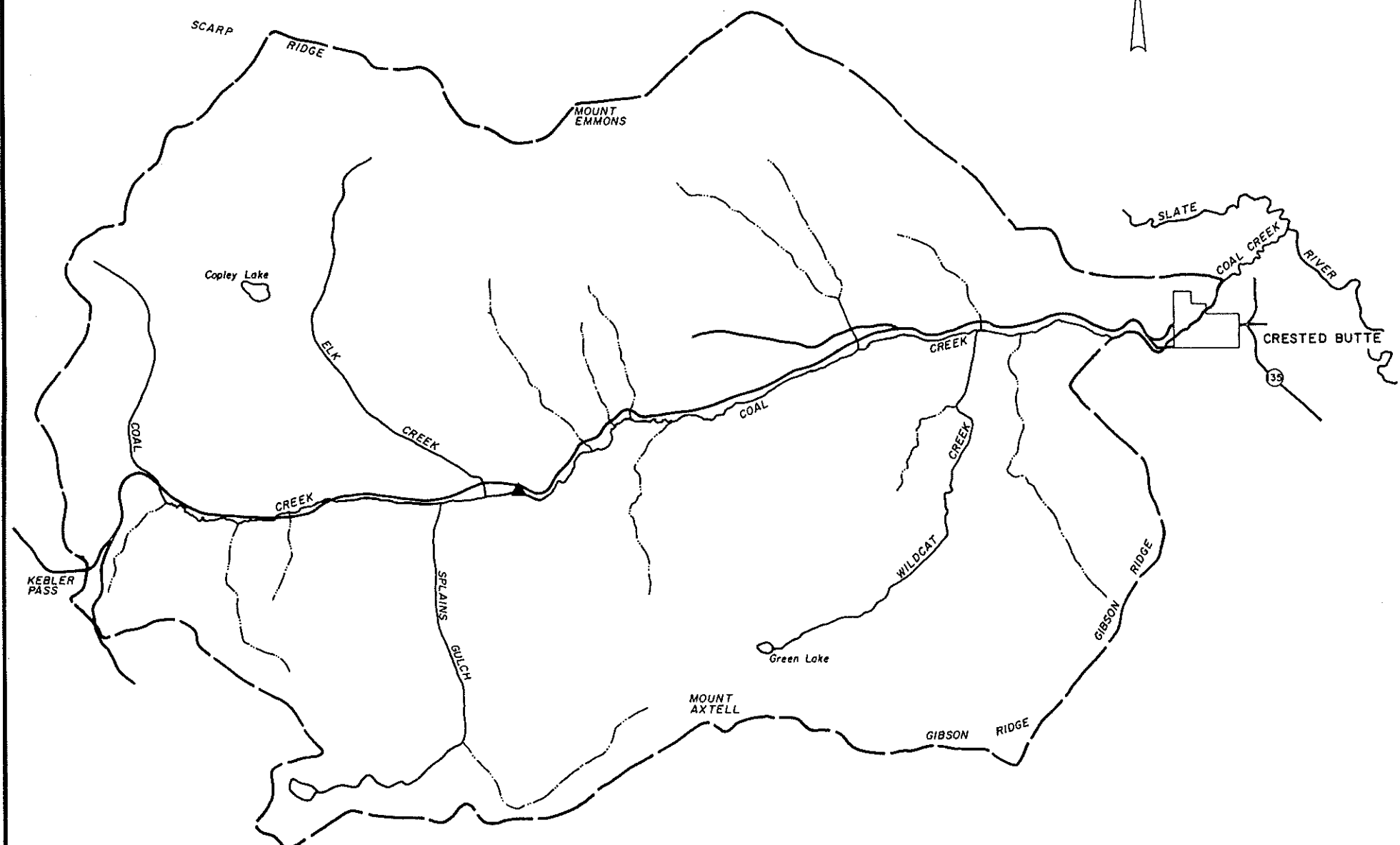
TABLE 2
100 YEAR FLOODWAY DELINEATION

Cross Section Number	Cross Section Station	Floodway Width (feet)	Water Surface Elevation with Floodway	Water Surface Elevation with out Floodway	Diff. (ft.)
8	27+88	N/A	8866.6	8866.6	0.0
9	29+75	33	8870.0	8869.3	0.7
10	32+44	31	8874.6	8873.6	1.0
11	34+71	29	8877.8	8877.0	0.8
12	36+51	29	8881.3	8880.4	0.9
13	39+23	29	8885.6	8884.7	0.9
14	39+90	29	8887.2	8887.0	0.2
15	40+60	N/A	8888.9	8888.3	0.6
16	42+47	N/A	8890.8	8890.9	-.1
17	42+55	N/A	8890.5	8890.6	-.1
18	43+32	N/A	8892.1	8892.1	0.0

V. REFERENCES

1. Floodplain Information Report Coal Creek Crested Butte, Colorado, by Engineering Consultants, Inc., December 1976.
2. Floodplain Information Report Lake Fork of the Gunnison & Henson Creek at Lake City, by WestWater Engineering, Inc., October, 1985.
3. Computer Program NCALC User's Manual-Verification of Manning's Roughness Coefficient in Channels, Water-Resources Investigations Report 85-4317, U.S. Geological Survey, 1985.
4. Summary of Basin and Streamflow Characteristics for Selected Basins in Western Colorado and Adjacent States, Open File Report 84-137, U.S. Geological Survey, 1984.
5. Estimation of Natural Streamflow Characteristics in Western Colorado, Water Resources Investigations Report 85-4086, U.S. Geological Survey, 1985.
6. Guidelines For Determining Flood Flow Frequency Bulletin # 17B, U.S. Department of the Interior Geological Survey, March 1982.
7. HEC-2 Water Surface Profiles User's Manual, U.S. Army Corps of Engineers Hydrologic Engineering Center, September 1990.
8. Floodway Determination Using Computer Program HEC-2, Training Document No. 5, U.S. Army Corps of Engineers Hydrologic Engineering Center, January 1988.
9. Paleohydrologic Techniques Used to Define the Spatial Occurrence of Floods, Robert D. Jarrett, January 10, 1990.
10. Paleodischarge of the late Pleistocene Bonneville Flood, Snake River, Idaho, Computer From New Evidence, Robert D. Jarrett, February 12, 1987.
11. Hydrology of Floods and Droughts Paleohydrology and Its Value in Analyzing Floods and Droughts, Robert D. Jarrett, National Water Summary 1988-89.
12. Hydrologic and Hydraulic Research in Mountain Rivers, Robert D. Jarrett, June 1990.

EXHIBITS A



VICINITY MAP

SCALE IN MILES

LEGEND

- DRAINAGE BASIN BOUNDARY
- ▲ STREAM GAGING STATION
- 39 STATE HIGHWAY

SCALE IN MILES

NO.	BY	DATE	REVISION	DESCRIPTION

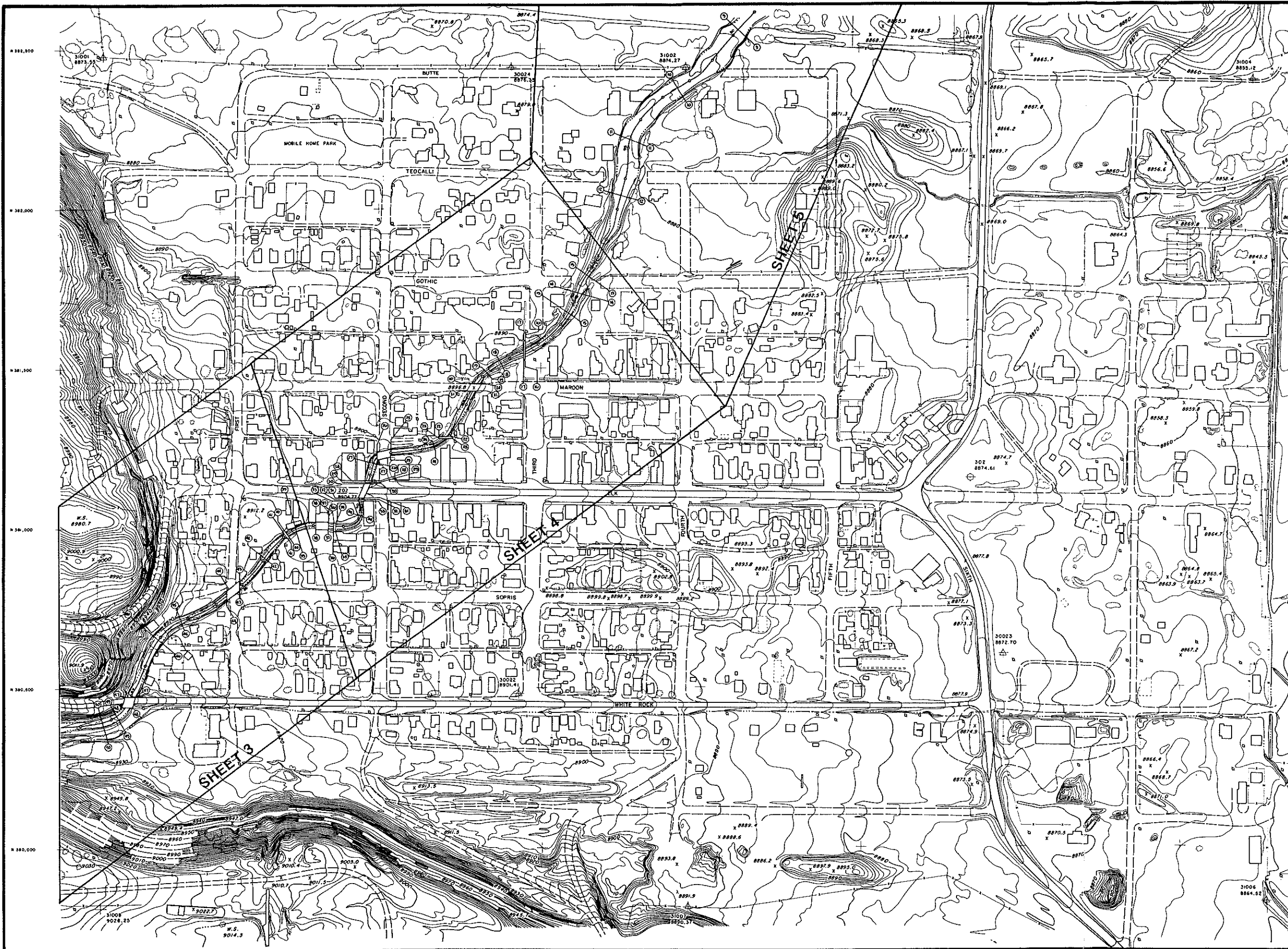
JB
 DRAWN
KWC
 DESIGNED
 8/92
 DATE
460-002
 CHECKED
 PROJECT NO.

RED Engineering Consultants
 2900 South College Avenue
 Fort Collins, Colorado 90525
 303/228-4955
 2480 West 26th Avenue, Suite 1308
 Denver, Colorado 80211
 303/458-5844
 800 Certman, Suite 103
 Longmont, Colorado 80501
 303/478-9884
 963 S. Frontage Rd. West, Suite 201
 Vail, Colorado 81657
 303/478-6340

TOWN OF CRESTED BUTTE

COAL CREEK
BASIN MAP

SHEETS	SHEET
10	1



SCALE: 1"=300'

LEGEND

- COAL CREEK
- EXIST. CONTOUR
- 8880
- CHANNEL CROSS SECTION NUMBER

CONTOUR BASE SHEET
FROM THE COLORADO
WATER CONSERVATION
BOARD
DATED 1975

NO.	BY	DATE	REVISION	DESCRIPTION

JBB DRAWN	KWG DESIGNED	CHECKED
8/92	460-002	
APPROVED	DATE	PROJECT NO.

RED INC Engineering Consultants
2800 South College Avenue
Fort Collins, Colorado 80526
303/228-4955

500 Coffman, Suite 103
Longmont, Colorado 80501
303/778-9554

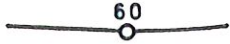
952 S. Frontage Rd. West, Suite 201
Vail, Colorado 81657
303/478-0340

TOWN OF CRESTED BUTTE

COAL CREEK
INDEX MAP

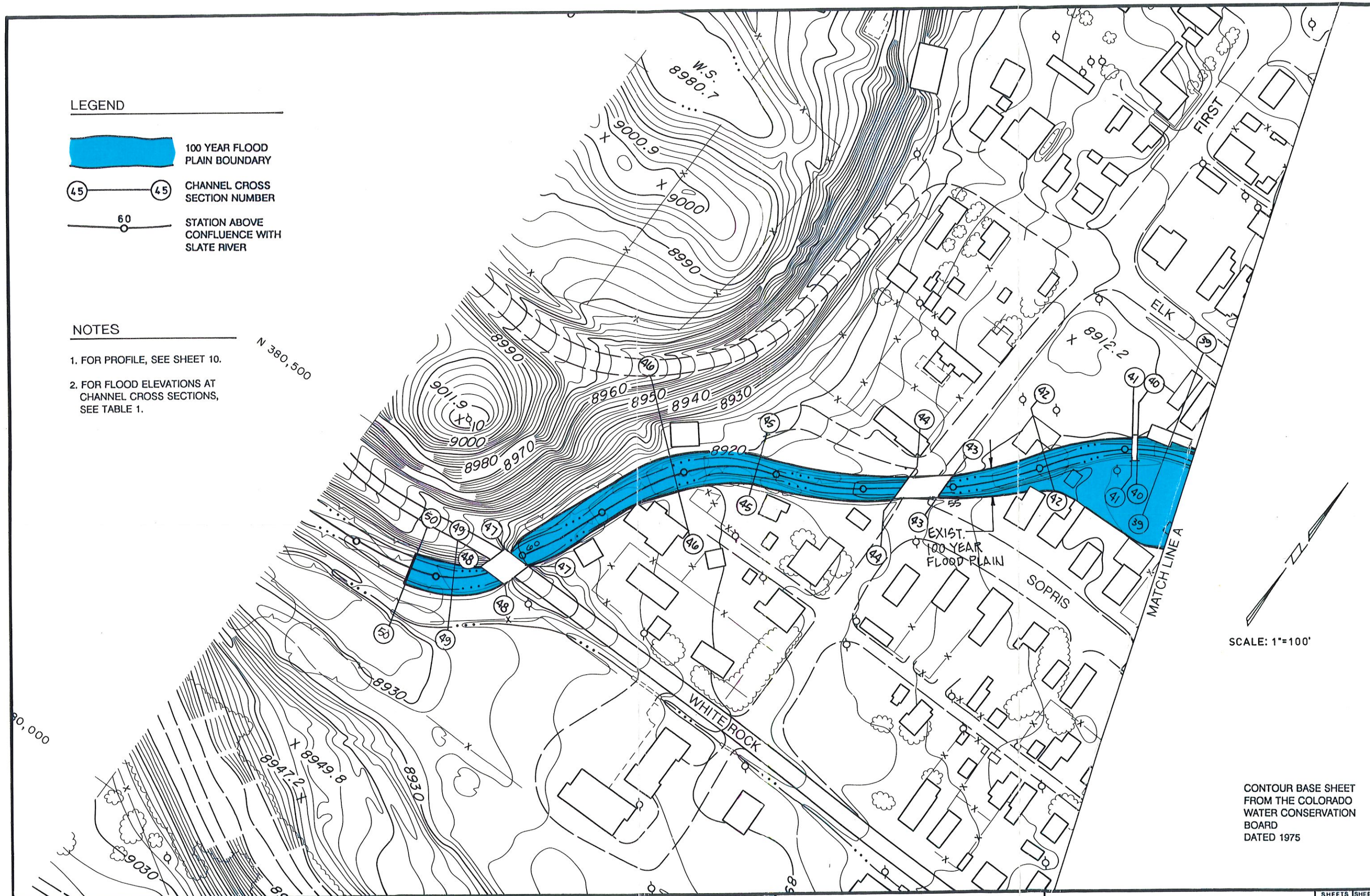
SHEETS	SHEET
10	2

LEGEND

-  100 YEAR FLOOD PLAIN BOUNDARY
-  CHANNEL CROSS SECTION NUMBER
-  STATION ABOVE CONFLUENCE WITH SLATE RIVER

NOTES

1. FOR PROFILE, SEE SHEET 10.
2. FOR FLOOD ELEVATIONS AT CHANNEL CROSS SECTIONS, SEE TABLE 1.



SCALE: 1"=100'

CONTOUR BASE SHEET
FROM THE COLORADO
WATER CONSERVATION
BOARD
DATED 1975

NO.	BY	DATE	REVISION	DESCRIPTION

JBB DRAWN	KWG DESIGNED 8/92	CHECKED 460-002
APPROVED	DATE	PROJECT NO.

RED Engineering Consultants
2800 South College Avenue
Fort Collins, Colorado 80525
303/228-4959

2480 West 28th Avenue, Suite 1308
Denver, Colorado 80211
303/458-5844

500 Coffman, Suite 103
Longmont, Colorado 80501
303/778-9584

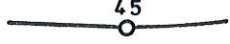
953 S. Frontage Rd. West, Suite 301
Vail, Colorado 81657
303/476-6340

TOWN OF CRESTED BUTTE

COAL CREEK EXISTING
100 YEAR FLOOD PLAIN

SHEETS	SHEET
10	3

LEGEND

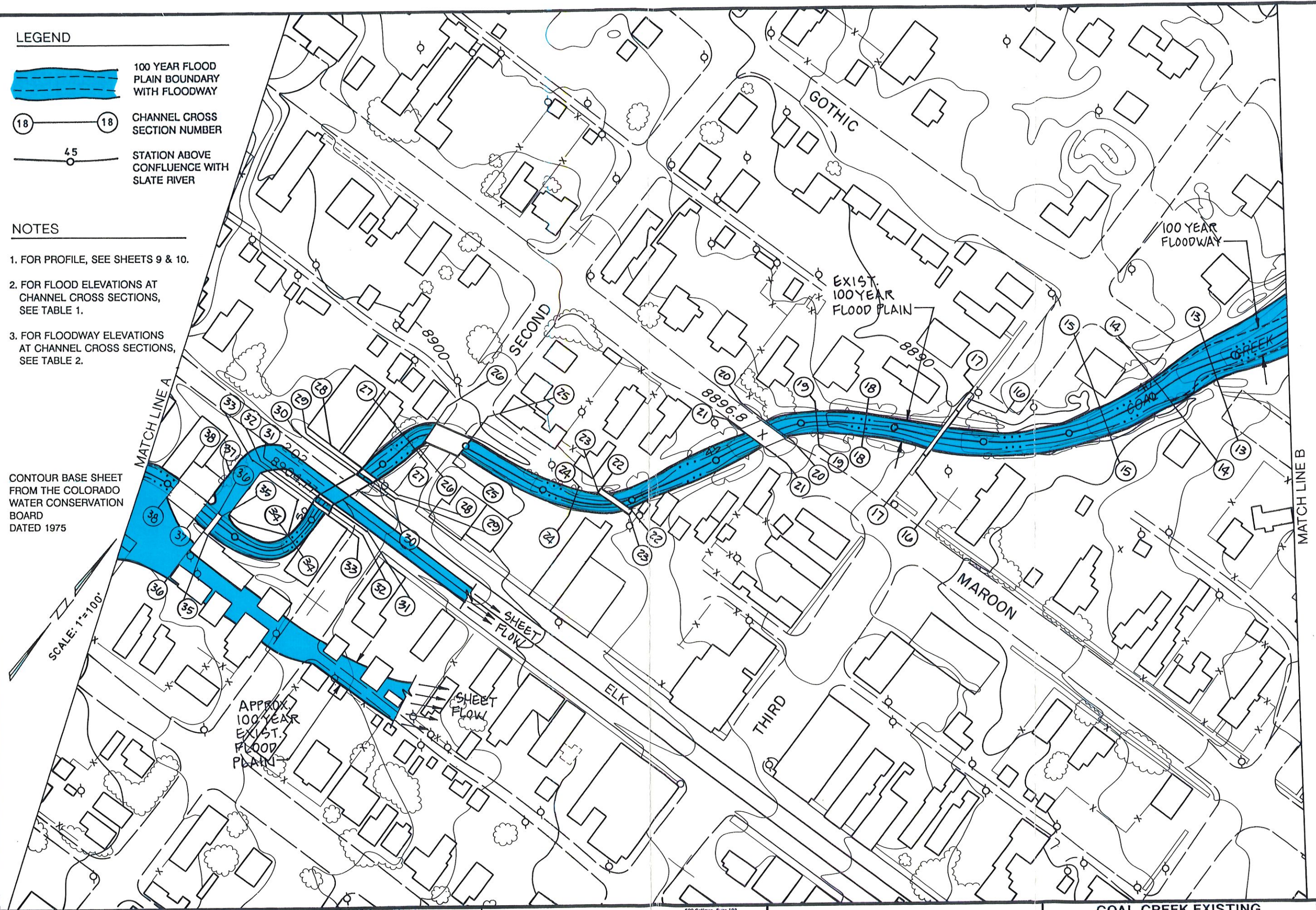
-  100 YEAR FLOOD PLAIN BOUNDARY WITH FLOODWAY
-  CHANNEL CROSS SECTION NUMBER
-  STATION ABOVE CONFLUENCE WITH SLATE RIVER

NOTES

1. FOR PROFILE, SEE SHEETS 9 & 10.
2. FOR FLOOD ELEVATIONS AT CHANNEL CROSS SECTIONS, SEE TABLE 1.
3. FOR FLOODWAY ELEVATIONS AT CHANNEL CROSS SECTIONS, SEE TABLE 2.

CONTOUR BASE SHEET
FROM THE COLORADO
WATER CONSERVATION
BOARD
DATED 1975

SCALE: 1"=100'



NO.	BY	DATE	REVISION	DESCRIPTION

JOB
DRAWN
DESIGNED
CHECKED
APPROVED

KWG
8/92
460-002
DATE

PROJECT NO.

2900 South College Avenue
Fort Collins, Colorado 80526
303/228-4955

Engineering Consultants
2480 West 26th Avenue, Suite 1009
Denver, Colorado 80211
303/458-5844

500 Coffman, Suite 103
Longmont, Colorado 80501
303/778-9584
953 S. Frontage Rd. West, Suite 201
Vail, Colorado 81657
303/478-6340

TOWN OF CRESTED BUTTE

COAL CREEK EXISTING
100 YEAR FLOOD PLAIN &
PROPOSED FLOODWAY

SHEETS SHEET
10 4

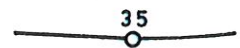
LEGEND



100 YEAR FLOOD
PLAIN BOUNDARY
WITH FLOODWAY



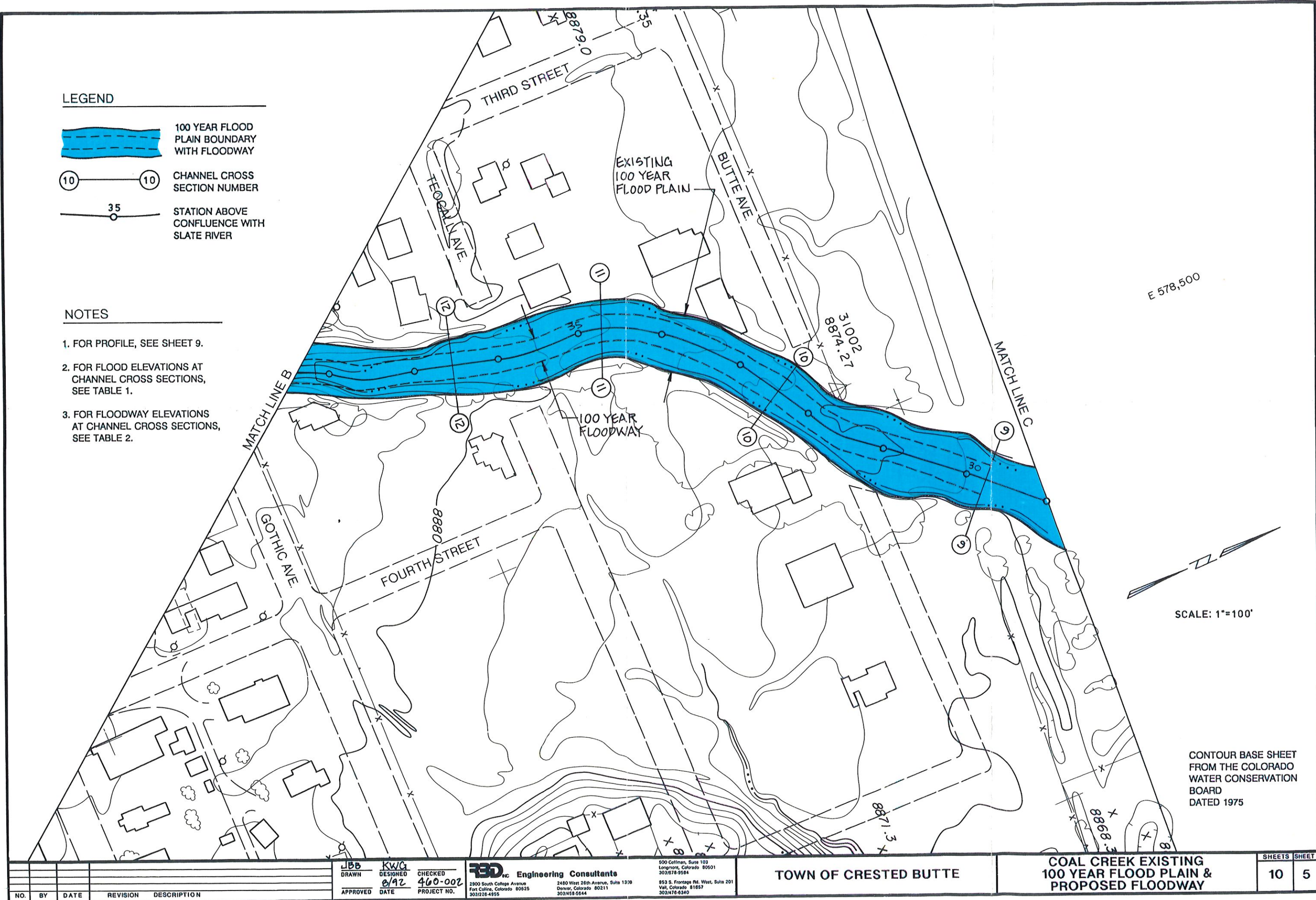
CHANNEL CROSS
SECTION NUMBER



STATION ABOVE
CONFLUENCE WITH
SLATE RIVER

NOTES

1. FOR PROFILE, SEE SHEET 9.
2. FOR FLOOD ELEVATIONS AT
CHANNEL CROSS SECTIONS,
SEE TABLE 1.
3. FOR FLOODWAY ELEVATIONS
AT CHANNEL CROSS SECTIONS,
SEE TABLE 2.



NO.	BY	DATE	REVISION	DESCRIPTION

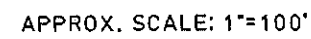
JB	DESIGNED	CHECKED
0/92	460-002	
APPROVED	DATE	PROJECT NO.

Engineering Consultants	500 Coffman, Suite 103 Longmont, Colorado 80501 303/778-9584
2480 West 28th Avenue, Suite 1308 Denver, Colorado 80211 303/459-5544	953 S. Frontage Rd. West, Suite 201 Vail, Colorado 81657 303/476-6340

TOWN OF CRESTED BUTTE

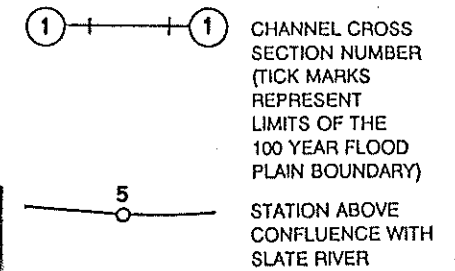
COAL CREEK EXISTING
100 YEAR FLOOD PLAIN &
PROPOSED FLOODWAY

SHEETS	SHEET
10	5



SLATE RIVER -

LEGEND



NOTES

1. SEE SHEET 8
FOR PROFILE.
2. FOR FLOOD
ELEVATIONS AT
CHANNEL CROSS
SECTIONS, SEE
TABLE 1.

AERIAL PHOTO FROM
THE "FLOODPLAIN
INFORMATION REPORT
COAL CREEK" BY ECI
DEC. 1976

MATCH LINE D

STATE HIGHWAY NO. 135

					JBB DRAWN	KWG DESIGNED	CHECKED	RED Engineering Consultants		500 Coffman, Suite 103 Longmont, Colorado 80501 303/678-9584	TOWN OF CRESTED BUTTE	COAL CREEK AT CONFLUENCE WITH THE SLATE RIVER	SHEETS	SHEET	
					APPROVED	4/92 DATE	400-002 PROJECT NO.	2900 South College Avenue Fort Collins, Colorado 80525 303/226-4955	2480 West 26th Avenue, Suite 1308 Denver, Colorado 80211 303/458-5644	953 S. Frontage Rd. West, Suite 201 Vail, Colorado 81657 303/476-6340			10	7	
NO.	BY	DATE	REVISION	DESCRIPTION											

NOTE:

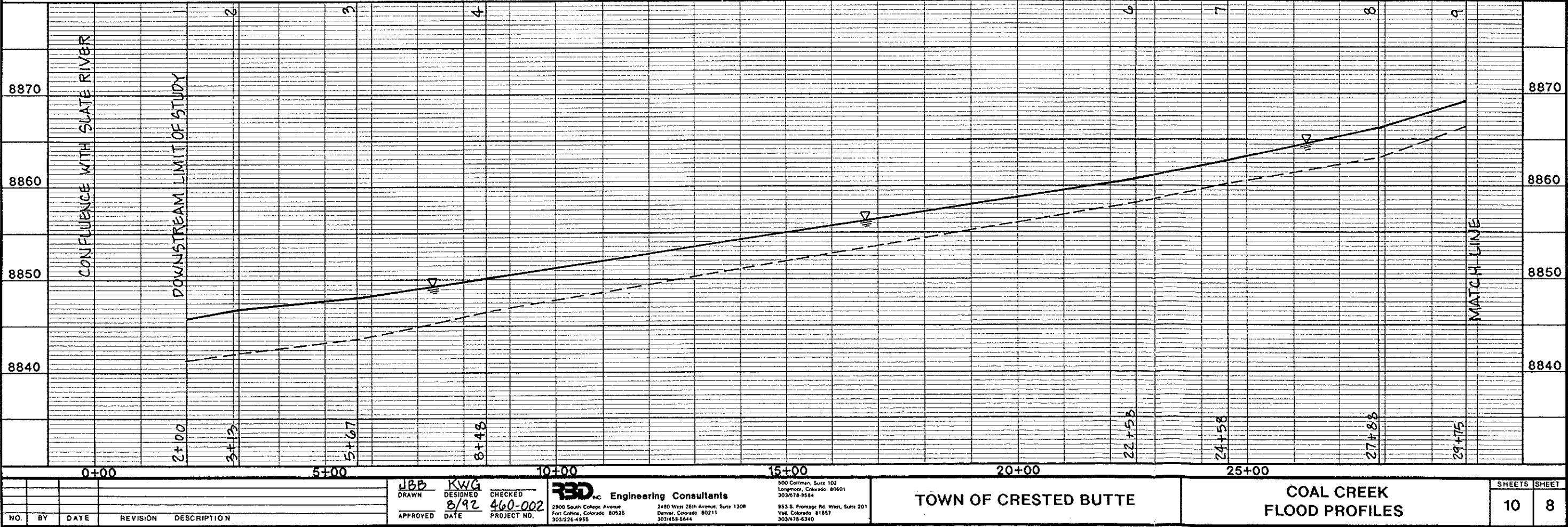
NO CROSS SECTIONS WERE TAKEN
BETWEEN STATION 8+48 AND
STATION 22+58 DUE TO PRIVATE
PROPERTY AND PERMISSION
DENIED TO ACCESS THE PROPERTY.

LEGEND

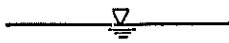
- 7 — 100 YEAR EXISTING
FLOOD ELEVATION
- --- EXISTING STREAM BED
MINIMUM ELEVATION
- 4 CROSS SECTION NUMBER
- 20+00 DISTANCE IN FEET ABOVE
CONFLUENCE WITH
SLATE RIVER

NOTES

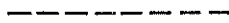
1. FOR LOCATION OF CROSS SECTIONS,
SEE SHEET 6 & 7
2. FOR FLOOD ELEVATIONS AT
THE REFERENCE POINTS,
SEE TABLE 1.



LEGEND



100 YEAR EXISTING
FLOOD ELEVATION



EXISTING STREAM BED
MINIMUM ELEVATION



CROSS SECTION NUMBER



BRIDGE DECK



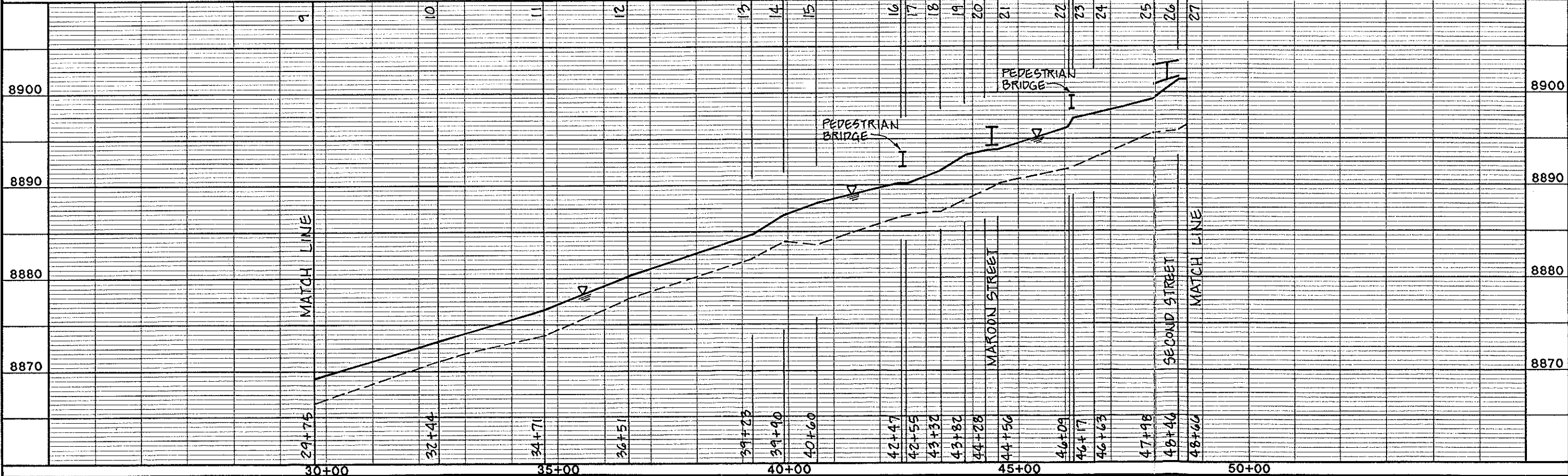
BRIDGE LOW CHORD



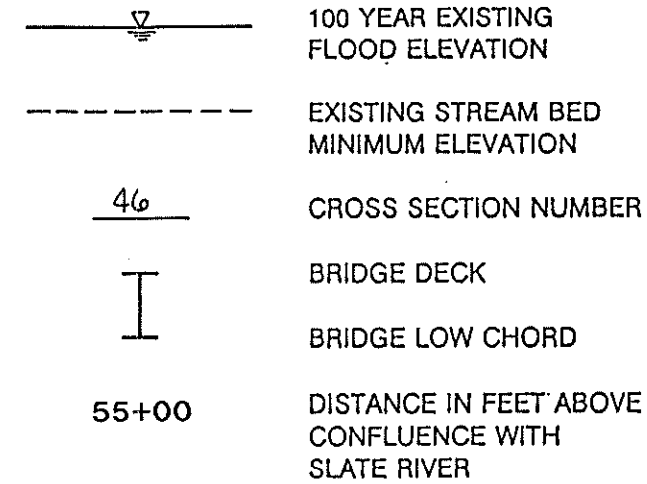
DISTANCE IN FEET ABOVE
CONFLUENCE WITH
SLATE RIVER

NOTES

1. FOR LOCATION OF CROSS SECTIONS,
SEE SHEET 4 & 5
2. FOR FLOOD ELEVATIONS AT
THE REFERENCE POINTS,
SEE TABLE 1.

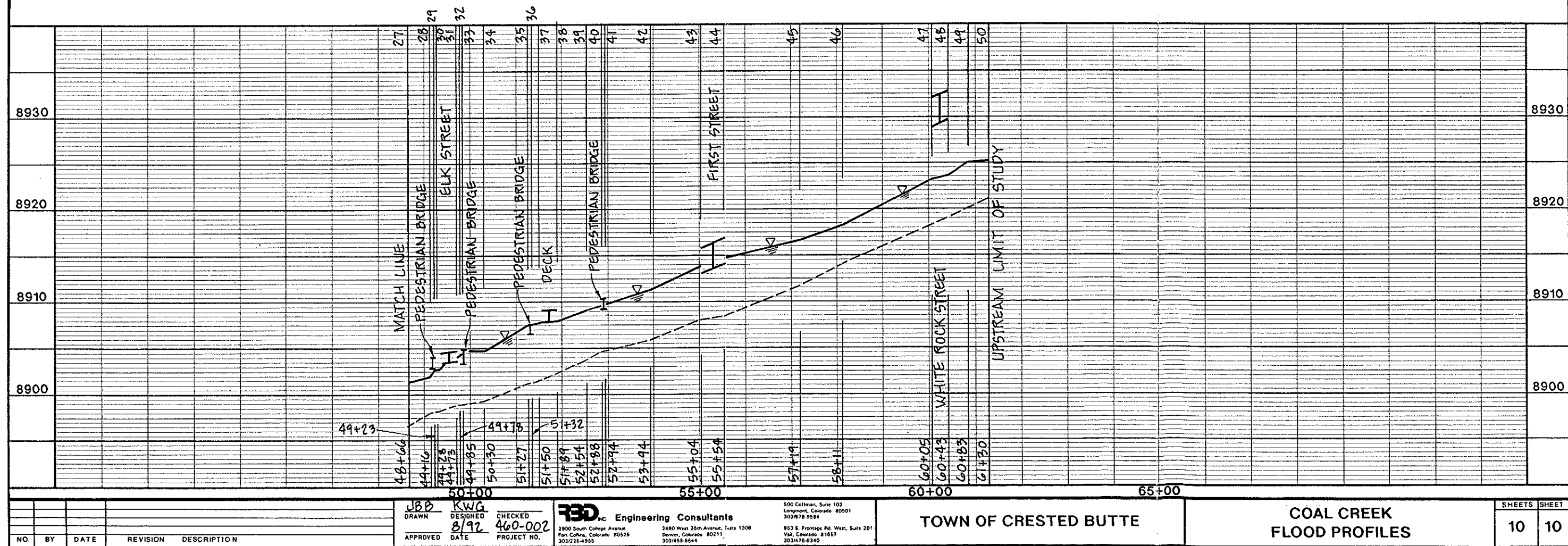


LEGEND



NOTES

1. FOR LOCATION OF CROSS SECTIONS, SEE SHEET 3 & 4
2. FOR FLOOD ELEVATIONS AT THE REFERENCE POINTS, SEE TABLE 1.



EXHIBITS B

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

**GUNNISON
COUNTY,
COLORADO**
(UNINCORPORATED AREAS)

PANEL 325 OF 975
(SEE MAP INDEX FOR PANELS NOT PRINTED)



PANEL LOCATION

COMMUNITY-PANEL NUMBER

080078 0325 B

EFFECTIVE DATE:
SEPTEMBER 29, 1989



Federal Emergency Management Agency

LEGEND



SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- ZONE A** No base flood elevations determined.
- ZONE AE** Base flood elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.



FLOODWAY AREAS IN ZONE AE



OTHER FLOOD AREAS

- ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.



OTHER AREAS

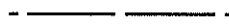
- ZONE X** Areas determined to be outside 500-year flood plain.
- ZONE D** Areas in which flood hazards are undetermined.



Flood Boundary



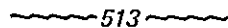
Floodway Boundary



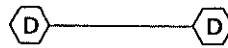
Zone D Boundary



Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.



Base Flood Elevation Line; Elevation in Feet*



Cross Section Line

(EL 987)

Base Flood Elevation in Feet Where Uniform Within Zone*

RM7_X

Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

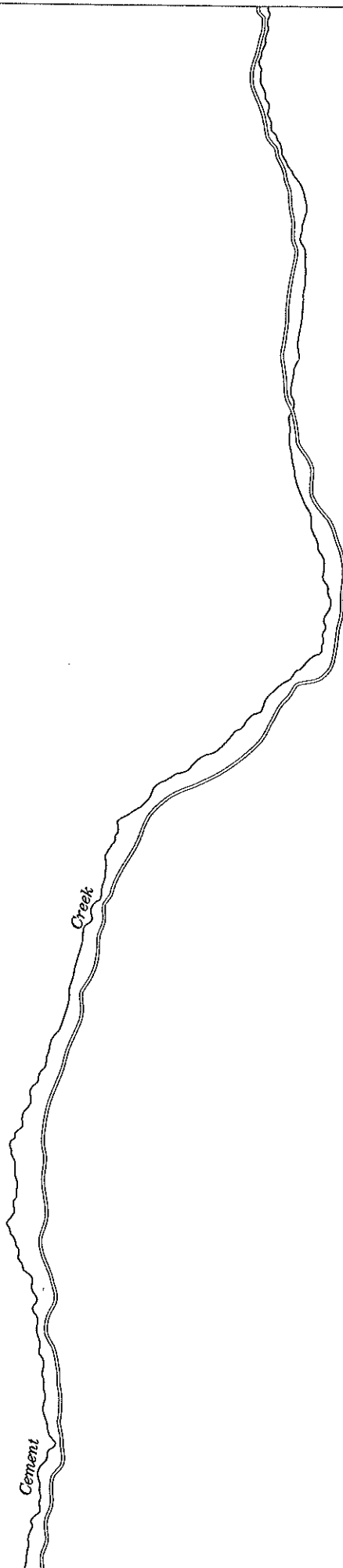
Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Elevations reference marks are described in the Flood Insurance Study



27

25

26

ZONE X

35

36

ZONE A

34

ZONE X

ZONE X

T. 13 S.
T. 14 S.

ZONE X

CITY OF
CRESTED BUTTE
AREA NOT INCLUDED

ZONE A

LAKE
GRANT

ZONE A

3

2

1

OLD

LIMIT OF STATE

10

11

12

ZONE A

ZONE X

ZONE X

Baxter

Guleh

RAILROAD

3
Slate