

DRY CREEK FLOOD REVIEW

JULY 9, 1996

Pueblo, Colorado

Prepared by:



Colorado Department of Natural Resources
Colorado Water Conservation Board
Flood Control and Floodplain Management Section
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July 1997

Dry Creek Flood Review

Pueblo, Colorado - July 1996

Background

On July 9, 1996 an intense thunderstorm occurred over the Dry Creek watershed which resulted in a major flood event. The area of flooding occurred in the southeast sector of Pueblo, Colorado. The Dry Creek basin encompasses 5.4 square miles, with the headwaters located near Southern State University.

Dry Creek, which is an ephemeral stream, originates at the southern extremity of Baculite Mesa in the high plains northeast of Pueblo and flows southerly to discharge into the Arkansas River within the City of Pueblo. The stream flows result from rainfall runoff from early spring to late fall.

Floods in Dry Creek normally originate from runoff of the entire watershed due to the limited areal extent of the drainage. The steep slopes and short time of concentration are conducive to fast rises and high peak flows of short duration. The average slope of the watershed is approximately 114 feet per mile (approximately 2.2%).

Analysis of climatological data and inspection of the flood history show that the most severe flood-producing storms occur during the late spring or summer months. The spring season is the transitional period between the occurrence of the instability and frontal activity and result in heavy spring snow storms in the higher elevations or high intensity rains over the plains region. These storms and the physical features of the area can produce the rapid concentration of runoff that characterizes flash floods of high peak flows, small volumes, and short duration.

Problem Description

The intense thunderstorm event on July 9, 1996 caused flooding problems throughout the basin. However, a serious flood problem occurred in the reach of Dry Creek downstream of the Missouri - Pacific Railroad (See Attachment A for the locations). Floodwaters were not contained within the main channel and circumvented a levee located just downstream of the county road crossing. The diverted flow then traveled "behind" the levee causing serious flood damage to homes, landscaping, and other features.

Hydrologic and Hydraulic Determinations

The hydrologic and hydraulic characteristics and parameters are taken from the Flood Insurance Study entitled "Flood Insurance Study, Pueblo County, Colorado Unincorporated Areas - September 29, 1989." This report was designated by the Colorado Water Conservation Board as floodplain resolution No. 96-415. The 100-year discharge for the subject stream reach is 2,900 cfs (See Table 1 on Attachment B).

The CWCB staff visited the site on May 12, 1997 and measured cross-sectional areas and high water marks (HWM's) to estimate the July 9, 1996 flood discharge. The measurements were performed using conventional field survey techniques. Good HWM's did exist at the subject site. The staff

surveyed two channel and floodplain cross sections. From the field data, CWCB staff computed a flood discharge from the July 9, 1996 flood event using the slop-area method. The estimated discharges are 3,100 cfs and 3,600 cfs respectively (See Attachment C-1 and C-2).

Hydraulic characteristics for the Flood Insurance Study were computed using the Corp's HEC-2 program. Flood profiles were drawn showing the computed water surface elevations for floods of the selected recurrence intervals (See Attachment D). The water surface elevations and inundation areas for the 100-year flood event are shown on Attachment E.

Study Findings

The Board staff finds that the July 9, 1996 flood event was greater than the 100-year flood event. The roadway crossing of the stream immediately downstream of the Missouri-Pacific Railroad is a concrete "ford," otherwise known as a "Texas Crossing." It appears that the stream crossing does not have enough capacity to contain the 100-year flood flow. During the July 9, 1996 flood, high water overtopped the right overbank and flooded Booth Street, causing a flood condition in areas not identified on the FEMA floodplain map (Attachment E).

Recommended Flood Mitigation Measures - Structural

The Board staff's flood mitigation recommendations are shown on Attachment F. The structural flood mitigation measures are:

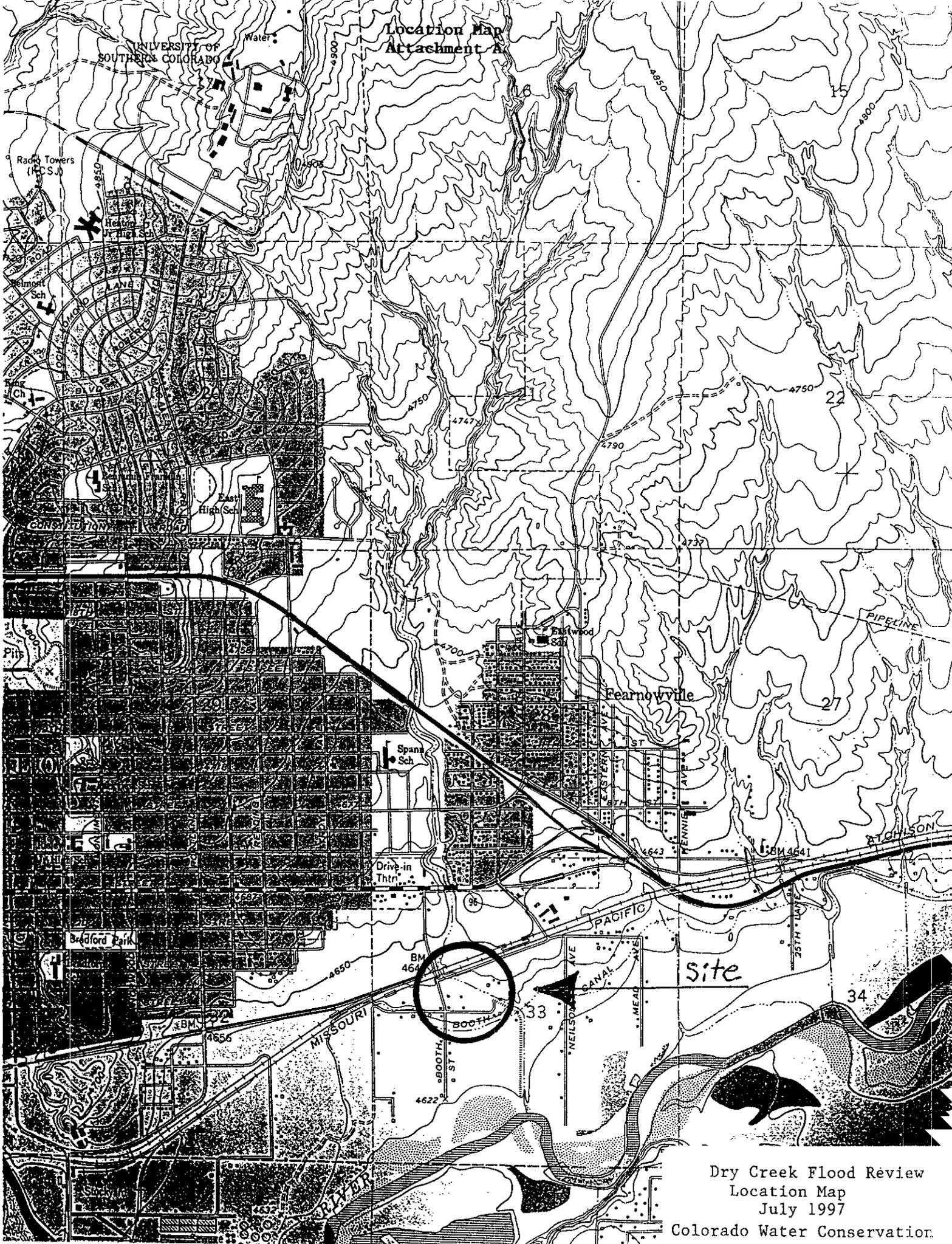
- 1) Construct a deflective jetty upstream of the county road on the right bank.
- 2) Extend the "ford" (Texas Crossing) of the county roadway into the left overbank.
- 3) Add rip-rap material to the existing right bank rip-rap to lower the roughness and friction coefficient, which would help create a smoother flow regime.
- 4) Widen the channel cross-section downstream of the Missouri-Pacific Railroad to a point 500 feet downstream of the county road.
- 5) Add freeboard to the overall project design.

Non-Structural Mitigation

Non-structural flood mitigation measures include:

- 1) Purchase of flood insurance by residents.
- 2) Implementation of flood-proofing measures by residents.
- 3) Relocation of residents in flood prone areas.
- 4) Informing the area residents that floods larger than the 100-year event can and do occur.

Location Map
Attachment A



Dry Creek Flood Review
Location Map
July 1997
Colorado Water Conservation
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TABLE 1 - SUMMARY OF DISCHARGES

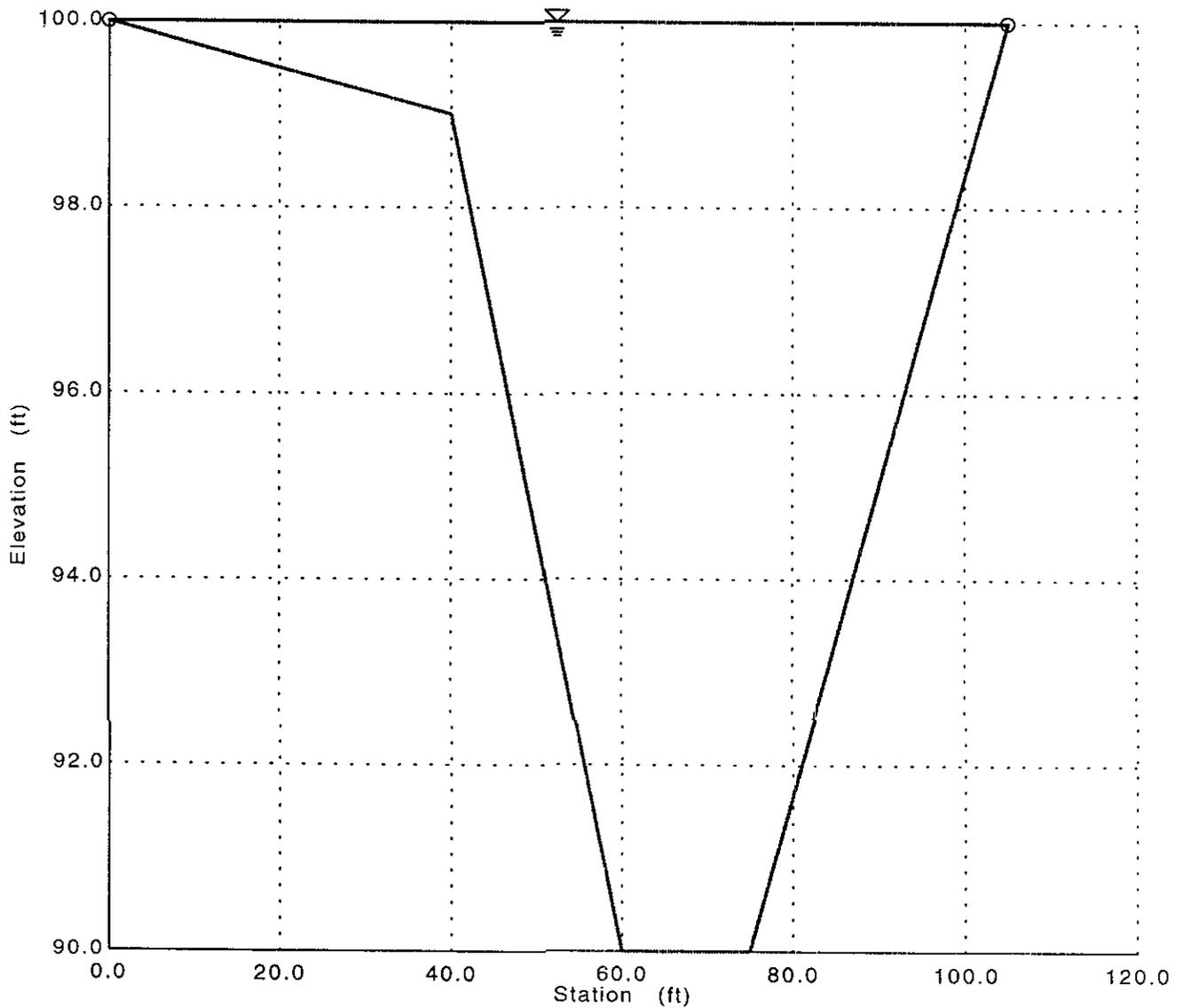
<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (SQ MILES)</u>	<u>PEAK DISCHARGE (cubic feet per second) 100-YEAR</u>
St. Charles River At the confluence with Greenhorn River	421	42,600
At river mouth	482	58,000
Salt Creek	N/A	9,182
Sixmile Creek	N/A	19,379
Wild Horse-Dry Creek D. & R.G.W. Railroad Bridge	82.8	19,600
.75 mile below U.S. Highway 50	69.6	19,000
Dry Creek At the mouth	5.4	2,900
About .10 mile upstream of U.S. Highway 50 Bypass	4.1	2,750
Goodnight Arroyo At the mouth	5.9	3,100
.40 mile upstream of Red Creek Road	5.1	3,000

Attachment C-1

Dry Creek at Pueblo, downstream section
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\drycrk-1.fm2
Worksheet	Dry Creek at Pueblo, downstream section
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Wtd. Mannings Coefficient	0.040
Channel Slope	0.006000 ft/ft
Water Surface Elevation	100.00 ft
Discharge	3,097.37 cfs

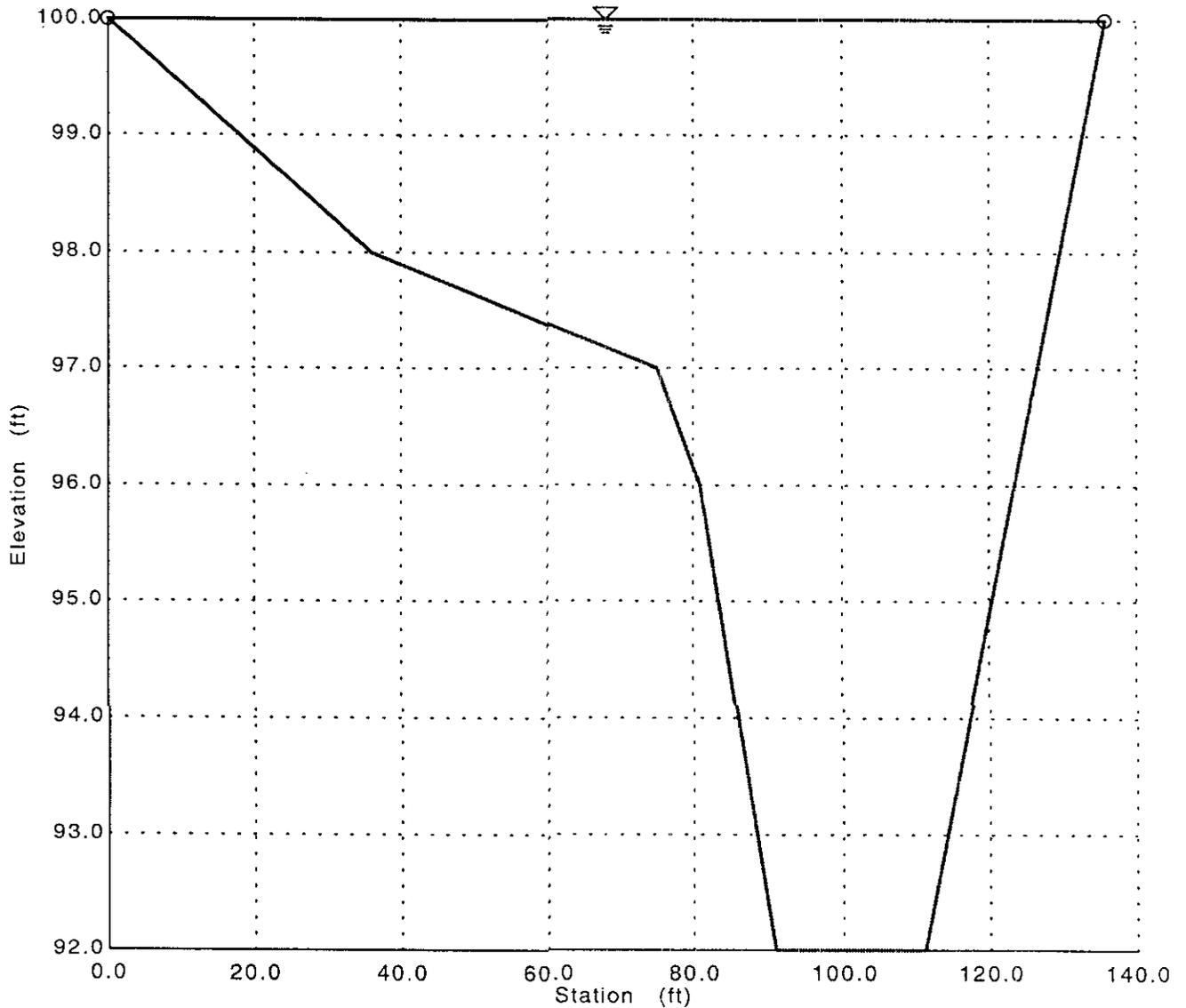


Attachment C-2

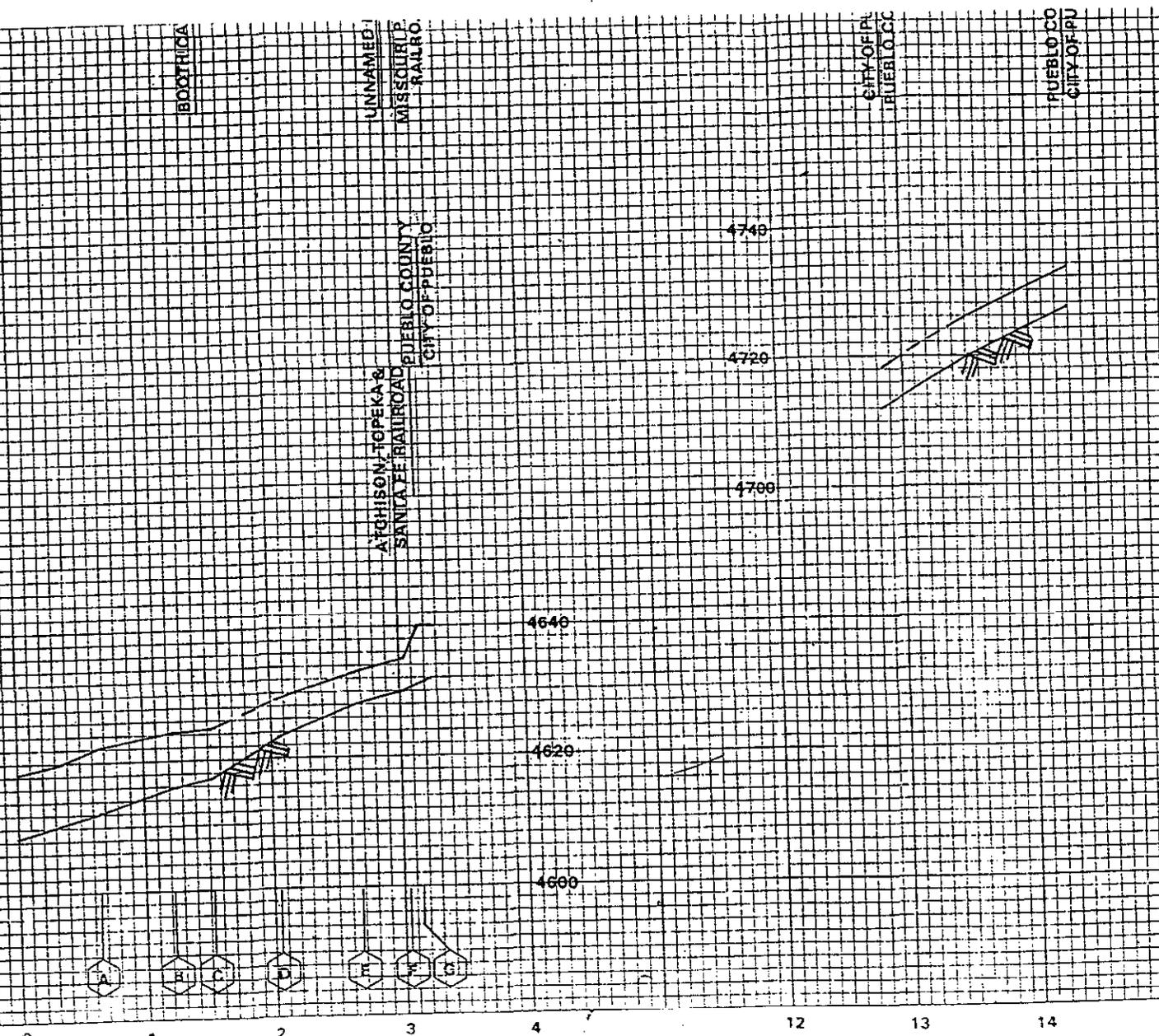
Dry Creek at Pueblo, upstream section
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\drycrk-1.fm2
Worksheet	Dry Creek at Pueblo, upstream section
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.040	
Channel Slope	0.008000 ft/ft	
Water Surface Elevation	100.00	ft
Discharge	3,588.65	cfs



ATTACHMENT D



Dry Creek Flood Review

LEGEND	
	500 - YEAR FLOOD
	100 - YEAR FLOOD
	50 - YEAR FLOOD
	10 - YEAR FLOOD
	STREAM BED
	CROSS SECTION LOCATION

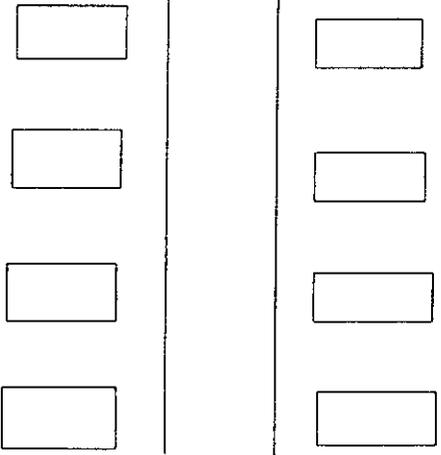
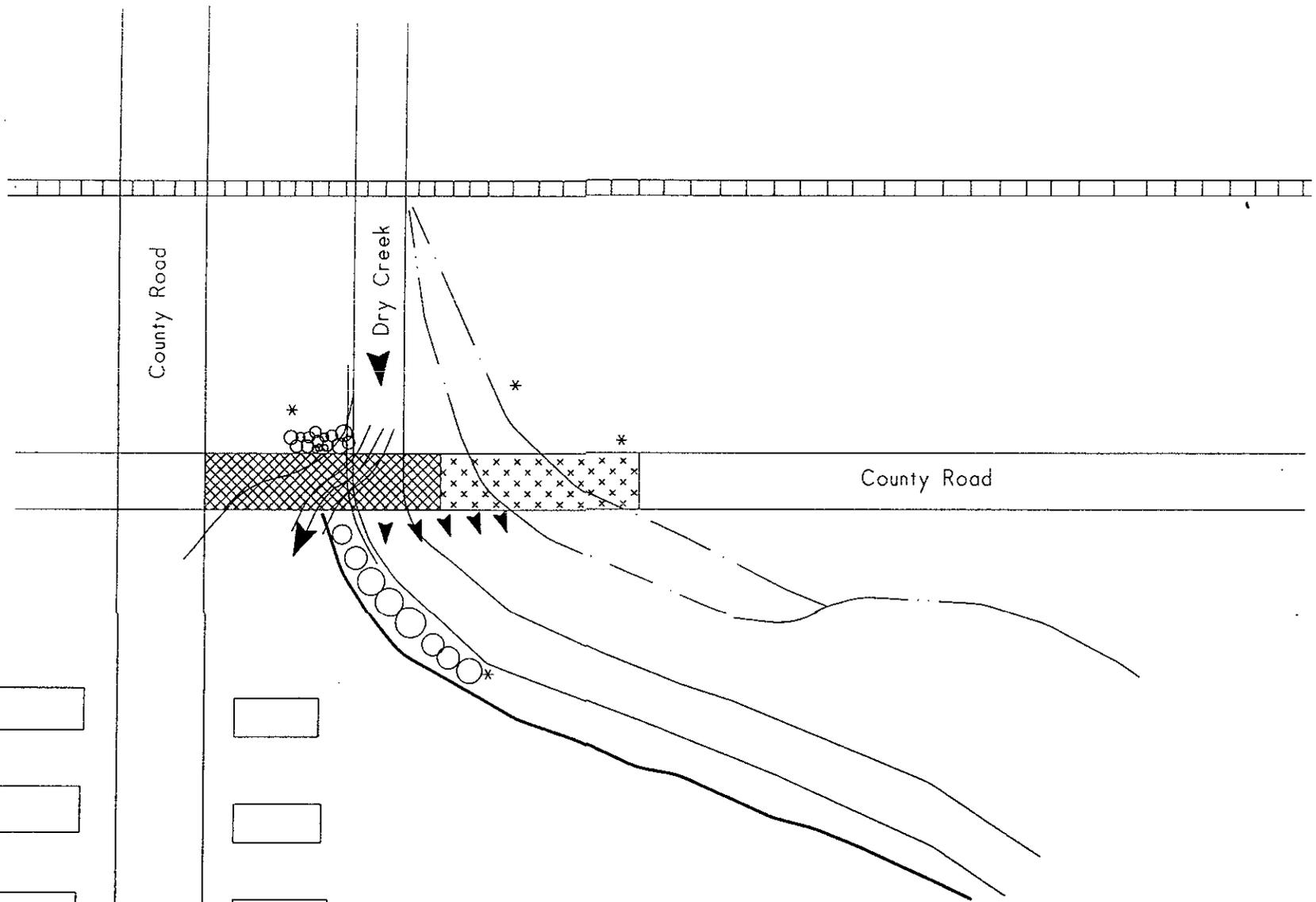
Attachment E

1" = 1,000'



Dry Creek Flood Review
 100-Year Floodplain Map
 July 1997

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- LEGEND -

Dike	Current Floodplain
Railroad	Proposed Floodplain
Deflection Jetty	Extended Crossing
6"-12" Rip Rap	Original Crossing
House	Overflow
Proposed Improvements	



Dry Creek Flood Review
 Downstream of Missouri-Pacific RR
 May 1997 **Attachment F**