

SURVEY OF LOWER REACH OF PUEBLO CAÑON SOUTHWEST OF SANTA FE,

N. MEX.

1970-1971

By Harold E. Malde

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VIGIL NETWORK SITE: LOWER REACH OF PUEBLO CAÑON SOUTHWEST OF SANTA FE,
NEW MEXICO, U.S.A.

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Pueblo Cañon is an ephemeral stream 6.8 miles long that joins Gallina Arroyo 12 miles south-southwest of Santa Fe, New Mexico (fig. 1).

Figure 1.--NEAR HERE.

Pueblo Cañon flows entirely in a dissected upland formed by the Ancha Formation, a bolson deposit of poorly sorted, uncemented gravel, sand, and silt, but the head reaches within a mile of Precambrian granite in foothills of the Sangre de Cristo Mountains. The actual channel follows a narrow swath of alluvium of late Quaternary age, which is locally indurated by caliche. The caliche occurs in relic soil horizons several feet below the surface.

The land drained by Pueblo Cañon, an elongate basin of 8.6 square miles, has been under more or less continual use as a cattle range for several decades (fig. 2). However, the upper part of the drainage

Figure 2.--NEAR HERE.

basin, an area of 3.2 square miles, is within a large tract that will soon be developed as a suburban subdivision (the Cañada de los Alamos Grant). The data given in this report is intended to describe the character of the channel of Pueblo Cañon before work on the subdivision begins.

Figure 1.--Parts of Albuquerque and Santa Fe, N. Mex., U.S. Geological
Survey topographic maps, scale 1:250,000, showing location of
Pueblo Cañon.

Figure 3.--Parts of Turquoise Hill and Seton Village, N. Mex., U.S.

Geological Survey topographic maps, scale 1:24,000, showing survey stations along lower reach of Pueblo Cañon.

This report deals with the lower 20,000 feet of Pueblo Cañon, as shown on the U.S. Geological Survey topographic maps, "Turquoise Hill, N. Mex., 1952" and "Seton Village, N. Mex., 1952", scale 1:24,000, and on topographic maps, "Albuquerque, N. Mex., 1963" and "Santa Fe, N. Mex., 1954," scale 1:250,000. This reach extends from NW 1/4 NW 1/4 sec. 19, T. 15 N., R. 9 E., to Upper Vicinity Well in the Cañada de los Alamos Grant. The middle of the reach is at latitude 35°31'34"N. and longitude 105°59'38"W. A survey of this reach was completed during two intervals of field work, Aug. 20-24, 1970, and June 30-July 21, 1971 (tables 1-42). The lower part of Pueblo Cañon is

Tables 1-42.--NEAR HERE

on property owned by Tilly Jarrot, who lives 7 miles west, and the upper part is on property owned by the American Realty and Petroleum Company (AMREP) of New York.

The altitude of Pueblo Cañon ranges from 6292 feet at the mouth to nearly 6,900 feet at the head. The relief ratio is, therefore, 0.017.

The vegetation of the area drained by Pueblo Cañon changes gradually from a grassland of grama grass (Bouteloua) on the west to a woodland of juniper and some pinyon on higher ground to the east (fig.s 3-9).

Figures 3-9.--NEAR HERE.

Snakeweed (Gutierrezia sarothrae) is common along the valley floor in the western part, and rabbitbrush (Chrysothamus) is found along the channel in the eastern part. The grassland is dotted with sparse clumps of Cholla. Yucca grows in scarce stands on higher ground.

Table 1.--Channel stations upstream along Pueblo Cañon, from confluence
with Gallina Arroyo to Upper Vicinity Well, Turquoise Hill and
Seton Village 1:24,000 U.S. Geological Survey topographic maps.

Tables 2-42.--Cross-sectional surveys of ground-surface elevations, in
feet, stations 0+00 to 200+00.

Figure 3A.--View N. 15 E. of arroyo of Pueblo Cañon upstream from station 60+00, as seen on August 24, 1970, at 1445 hours Mountain Daylight Time. This photograph is by H. E. Malde in the Field Records of the U.S. Geological Survey, Denver, Colo., and is identified by field number 70 M 127.

Figure 3B.--Repeat of photograph 70 M 127 after passage of flood of July 26, 1971. This photograph was made on August 2, 1971, at 1436 hours Mountain Daylight Time. The photograph is identified by field number 71 M 127 and in one member of a stereo pair.

Figure 4A.--View S. 57 W. along road breached by arroyo of Pueblo Cañon at station 60+00, as seen on July 3, 1971, at 1338 hours Mountain Daylight Time. Since the road was last used, which was surely within the present century, the arroyo has cut headward 573 feet. This photograph is identified by field number 71 M 62. and is one member of a stereo pair.

Figure 4B.--Repeat of photograph 71 M 62 after passage of flood of July 26, 1971. This photograph was made on August 1, 1971, at 1336 hours Mountain Daylight Time. The channel has been deepened by as much as 2 feet and the near bank has been cut back several feet. The photograph is identified by field number 71 M 125 and is one member of a stereo pair.

Figure 5A.--View N. 81 E. of headcut on Pueblo Cañon at station 65+73, as seen on July 3, 1971, at 1239 hours Mountain Daylight Time. This photograph is identified by field number 71 M 61 and is one member of a stereo pair.

Figure 5B.--Repeat of photograph 71 M 61 after passage of flood of July 26, 1971. The headcut has retreated 34 feet. This photograph was made on August 1, 1971, at 1246 hours Mountain Daylight Time. The photograph is identified by field number 71 M 124 and is one member of a stereo pair.

Figure 6A.--View N. 81 E. of headcut on Pueblo Cañon at station 133+61, as seen on July 22, 1971, at 1028 hours Mountain Daylight Time. This photograph is identified by field number 71 M 86 and is one member of a stereo pair.

Figure 6B.--Repeat of photograph 71 M 86 after passage of flood of July 26, 1971. The headcut has retreated 6.7 feet. This photograph was made on August 1, 1971, at 1028 hours Mountain Daylight Time. The photograph is identified by field number 71 M 122 and is one member of a stereo pair.

Figure 7A.--View N. 67 E. of headcut and channel on Pueblo Cañon at station 133+61, as seen on July 22, 1971, at 1114 hours Mountain Daylight Time. This photograph is identified by field number 71 M 87 and is one member of a stereo pair.

Figure 7B.--Repeat of photograph 71 M 87 after passage of flood of July 26, 1971. The headcut has retreated 6.7 feet, but the channel apparently was flooded only to a depth of about a foot. This photograph was made on August 1, 1971, at 1115 hours Mountain Daylight Time. The photograph is identified by field number 71 M 123 and is one member of a stereo pair.

Figure 8.--View N. 79 E. of Pueblo Cañon upstream from station
165+00, as seen on July 23, 1971 at 0925 hours Mountain Daylight
Time. This photograph is identified by field number 71 M 93-1
and is one member of a stereo triplet.

Figure 9.--View S. 10 E. across valley of Pueblo Cañon at Upper Vicinity
Well, as seen on July 22, 1971, at 0918 hours Mountain Daylight
Time. This photograph is identified by field number 71 M 85
and is one member of a stereo pair.

To reach Pueblo Cañon, one may proceed 11.3 miles south from Santa Fe on U.S. Highway 285, turn west and then southwest for 1.2 miles on an ungraded dirt road, and then generally westward 3.8 miles on an ungraded dirt road to Upper Vicinity Well. This brings one to the head of the reach considered in this report.

The permanent reference points along Pueblo Cañon are 41 pairs of rods driven into the ground at opposite ends of sections across the channel. These rods protrude a little less than a foot above the ground. At a few places along the channel other rods have been installed in order to provide marks for measurement of headcuts on arroyos, as indicated in the tables. The elevations measured from these rods are judged to be repeatable with an accuracy of 0.1 foot. The accuracy would be considerably better except that differences arise from variable placement of the stadia rod on the ground surface. Other rods have been placed at the sites of photographs so that these photographs can be easily and accurately repeated. Records of these photographs are kept with the original negatives in the Photographic Library, Field Records, U.S. Geological Survey, Denver, Colorado, 80225.

Besides these permanent reference points, headcuts are marked with erosion pins at six places (see sites 71 M 113, 114, 115, 116, 117, and 118 on fig. 2, and sketch maps, figs. 10-15). Each erosion pin consists

Figure 10-15.--NEAR HERE.

of a 10-inch nail put through a washer and driven flush with the wall face at a level about 2 feet below the ground surface. Increments of erosion can be determined by repeated measurements of the position of each nail with respect to the wall, the nails being again driven flush after each observation.

Figure 10.--Sketch showing approximate position of erosion pins at site
71 M 113, near section 65+00, Pueblo Cañon. Pins driven flush with
headwall, July 30, 1971.

Figure 11.--Sketch showing approximate position of erosion pins at
site 71 M 114, near station 133+00, Pueblo Cañon. Pins driven flush
with headwall, July 30, 1971. .

Figure 12.--Sketch showing approximate position of erosion pin at site
71 M 115, near station 168+00, Pueblo Cañon. Pin driven flush
with headwall, July 30, 1971.

Figure 13.--Sketch showing approximate position of erosion pins at site
71 M 116, 1,100 feet N. 42 E. of Upper Vicinity Well, Pueblo
Pins
Cañon./ driven flush with headwall, July 30, 1971.

Figure 14.--Sketch showing approximate position of erosion pin at site
71 M 117, 1,825 feet northeast of Upper Vicinity Well, Pueblo
Pin.
Cañon./ driven flush with headwall, July 30, 1971.

Figure 15.--Sketch showing approximate position of erosion pins
at site 71 M 118, 3,400 feet N. 61 E. of Upper Vicinity Well,
Pueblo Cañon. Pins driven flush with headwall, July 30, 1971.

As a result of heavy rain on July 26, 1971, an arroyo along Pueblo Cañon that heads near station 66+00 overflowed and caused 34 feet of headward erosion (fig. 16). In order to measure the changes

Figure 16.--NEAR HERE

caused by this flood, the reach from station 35+00 to station 67+00 was surveyed again on Aug. 3-6, 1971 (tables 1, 9-15). Also, by identifying fine-textured flotsam deposited by the flood, the flood crest was permanently marked with steel rods as far downstream as section 5+00 (fig. 17). Using data from the second survey and field

Figure 17.--NEAR HERE

observations by Arthur G. Scott of the channel roughness, Mervin S. Petersen of the Water Resources Division has calculated a flood discharge of 4,870 cubic feet per second, as given in a separate section of this report. This discharge came from a basin area of 5.2 square miles, of which 2.3 square miles lies in the Cañada de los Alamos Grant. It is unlikely, however, that rain over the whole basin accounted for the size of the flood, because the arroyo at station 133+00 was flooded to a depth not greater than 1 foot (fig. 7B). The rainstorm that caused this flood thus appears to have followed a rather narrow path, the most intense rain having been between station 133+00 and station 66+00.

Figure 16.--Diagram showing change in the position of a headcut near
channel station 66+00, Pueblo Cañon, as a consequence of flood
of July 26, 1971.

Figure 17.--Profile of flood crest on Pueblo Cañon southwest of Santa
Fe, New Mexico, July 26, 1971.

By my observation, the rainstorm of July 26, 1971, lasted only a short time--the greatest intensity of rainfall (and hail) having been about 30 minutes long. A recording raingage in the path of this rainstorm at Cañada de la Cueva, 5 miles south, indicates that 80 percent of the rain fell in the first 20 minutes (written commun., Arthur G. Scott, March 1, 1972).

The flood on Pueblo Cañon also drained away quickly, as indicated by some features caused by large hail that fell with the rain. In the flood plain above the arroyo banks, the hail left a blanket of shredded cactus under Cholla plants in the path of the flood, thus demonstrating that the flood had begun to subside when the hail fell. Even more striking, sand bars on the floor of the arroyo, and deltas that were deposited at junctions with tributary arroyos, were pock-marked by the impact of the hail, thus showing that the flood had drained from the arroyo before the last damaging hail had fallen. In the light of my observation on the length of the rainstorm (and my exposure to its heavy hail), this evidence shows that the flood of July 26, 1971, on Pueblo Cañon almost surely did not last longer than half an hour.

Bank erosion as a consequence of this flood, except very locally (fig. 4), was not measurable, but the 600 feet of channel that stretches downstream from the headcut near station 66+00 was deepened 1-2 feet. Sand along the channel floor for another 2,000 feet downstream was scoured to a depth of about a foot but was re-deposited at its former grade. Some aspects of changes caused by this flood are illustrated by figures 3-7.

Pueblo Canon near Santa Fe, New Mexico
Rio Grande Basin
Part 8 - 1971 Miscellaneous Site

Flood of July 26, 1971

Type of estimate: 6 section slope-area.

Location of site: Site was selected and survey ran by Hal Malde (Geologic Division, USGS) and party on June 30, July 2, August 3, 5, 22 and 24.

Discharge and gage height: 5,000 cfs, arbitrary datum.

Nature of the flood: Flood was the result of locally heavy rainfall.

Field conditions: This flood was investigated by Hal Malde and party of the Geologic Division, USGS, in connection with a study of the basin. The flood occurred while they were there, and they decided to get some field data to document it. They obtained many cross sections of the stream and surveyed the high-water profile through a considerable reach.

Following the field season, Hal came to my office to find out if we could make a computation of the discharge based on his field data. I looked at the data and determined that a computation could be made, but the accuracy would be questionable.

The field survey had cross sections every 500 feet in the reach of the channel selected. For a more accurate determination of discharge we would normally have cross sections every 100 to 200 feet with a total reach length of about 500-800 feet.

In order to make a computation, "n" values or roughness coefficients had to be assigned. Hal had one or two black and white photos of the creek I could use. I made a preliminary assessment of "n" values, and then called the USGS, WRD, office in Santa Fe, New Mexico, and asked them to go out and look at the site and assign some "n" values for the reach. This they did, and the "n" values I had selected from the picture were decreased by approximately 10-15 percent.

I then coded the information for a computer computation of the discharge with 6 cross sections in a 2,500 ft reach of the creek.

Roughness coefficients used were as follows:

<u>Section</u>	<u>Overflow</u>	<u>Main Channel</u>	<u>Overflow</u>
60	050	035	050
55	050	035	050
50	050	035	
45	050	035	
40		035	
35	050	035	

Computations

<u>Section</u>	<u>Area</u>	<u>h_v</u>	<u>Alpha</u>	<u>Fall</u>	<u>F</u>	<u>Length</u>
60	496.28	1.688	1.127		0.643	
55	418.05	2.369	1.1223	5.20	.786	500
50	494.95	1.639	1.089	4.70	.625	500
45	335.46	3.449	1.0523	4.70	1.002	500
40	337.18	3.244	1.0000	4.10	.923	500
35	342.73	3.208	1.0217	4.10	1.067	500

Reach 60-55	5920 cfs	contracting
Reach 55-50	6850 cfs	expanding
Reach 50-45	4480 cfs	contracting
Reach 45-40	4170 cfs	constant
Reach 40-35	4130 cfs	constant
Reach 60-35	4870 cfs	

Final discharge used was by computation of the multi-section formula and the use of all six sections.

Note that Froude numbers indicate tranquil flow in the first 3 sections and super critical flow from section 45 on to section 35. This lends additional skepticism to the accuracy of the discharge figure.

Evaluation: Use a discharge of 5,000 cfs and rate it poor. I would prefer not to call it a measurement, but rather a computed estimate. The discharge could be in error by as much as 50%. There was some scour noted at some of the sections as a result of the flood.

The New Mexico District maintains a gaging station on a stream 3-4 miles distant from this site, Canada de la Cueva near Galisteo, New Mexico, and has a recording gage. They monitored this same storm July 26 at that site. Drainage area of 1.79 square miles, and had a flood peak of 649 cfs. This would indicate a flood recurrence interval of approximately a 6-8 year frequency.



M. S. Petersen
May 25, 1972

Table 1.--Channel stations upstream along Pueblo Canon, from confluence with Gallina Arroyo to Upper Vicinity Well, Turquoise Hill and Seton Village 1:24,000 U.S. Geological Survey topographic maps.

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section at station	Elevation at Station	
				Aug. 20-24, 1970	Aug. 3-6, 1971
	-(2+00)	N 64 W		^{1/} 6292.554	
2	0+00	S 64 E	North	6291.57	
	1+00	East		6292.09	
	2+00	S 84 E		6292.00	
	3+00	S 70 E		6292.64	
	4+00	S 61 E		6293.06	
3	5+00	S 51 E	N 33 E	6294.43	
	6+00	S 62 E		6295.04	
	7+00	S 51 E		6295.90	
	8+00	S 47 E		6297.10	
	9+00	S 65 E		6297.53	
4	10+00	S 69 E	N 25 E	6298.61	
	11+00	S 60 E		6299.58	
	12+00	S 61 E		6300.71	
	13+00	S 76 E		6301.97	
	14+00	N 61 E		6303.32	
5	15+00	N 57 E	N 33 W	6302.87	
	16+00	N 62 E		6303.38	
	17+00	N 63 E		6303.72	

^{1/} U.S. Geological Survey Bench Mark determined by third-order leveling, sea level datum of 1929.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station	
				Aug. 20-24, 1970	Aug. 3-6, 1971
6	^{2/} 18+00	N 57 E		6303.97	
	19+00	^{3/} N 79 E		6304.41	
	20+00	S 64 E	N 35 E	6305.23	
	21+00	S 46 E		6306.23	
	22+00	S 48 E		6306.71	
	23+00	S 57 E		6307.36	
7	24+00	S 65 E		6308.04	
	25+00	S 58 E	N 36 E	6308.55	
	26+00	S 50 E		6309.77	
	27+00	S 88 E		6310.91	
	28+00	N 66 E		6311.74	
	29+00	N 42 E		6312.09	
8	30+00	N 36 E	N 53 W	6312.28	
	31+00	N 34 E		6312.79	
	32+00	S 60 E		6313.30	
	33+00	S 40 E		6314.05	
	34+00	S 52 E		6314.42	
9	35+00	S 81 E	N 1 E	6315.20	6314.86

^{2/} Right bank of channel 1 foot high at station 17+95.

^{3/} Measured around bend in channel. Direction given for direct line. Distance on direct line is 99.1 feet.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station Aug. 20-24, 1970	Elevation at Station Aug. 3-6, 1971
	36+00	S 82 E		6315.62	6315.42
	37+00	N 82 E		6316.18	6316.14
	38+00	N 74 E		6316.75	6316.59
	39+00	N 60 E		6317.59	6317.31
10	40+00 (Ground)	N 51 E	N 39 W	6318.31	6318.07
	40+00 (Top of rod)			^{4/} 6319.43	^{5/}
				<u>June 30- July 21, 1971</u>	
	41+00	N 45 E		6319.02	6318.73
	42+00	N 44 E		6319.51	6319.31
	43+00	N 45 E		6320.36	6320.14
	44+00	N 43 E		^{6/} 6321.90	^{7/} 6322.35
11	45+00	^{8/} N 38 E	N 56 W	6322.39	6322.26
	46+00	N 25 E		6323.43	6323.00
	47+00	^{9/} N 22 E		6323.64	6323.38
	48+00	N 79 E		6324.38	^{10/} 6325.04

^{4/} Steel rod 3.3 feet long placed on Aug. 24, 1970.

^{5/} Top of steel rod tilted downstream at angle of 50° to vertical by flood of July 26, 1971.

^{6/} On gravel bar on inside of channel bend.

^{7/} At eroded downstream end of gravel bar.

^{8/} Measured in direct line over gravel bar at inside of channel bend. Gravel bar on June 30, 1971, reached from 43+95 to 44+90. Gravel has angular stones to 6-inch size.

^{9/} Measured around bend in channel. Direction given for direct line over gravel bar at inside of channel bend. Distance on direct line is 94 feet. Gravel bar on direct line on June 30, 1971, reached from 46+05 to 46+70.

^{10/} Near downstream end of gravel bar.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station	
				June 30- July 21, 1971	Aug. 3-6, 1971
	49+00	East		6325.52	^{11/} 6325.35
12	50+00	S 72 E	N 5 E	6326.40	6326.43
	51+00	^{12/} N 82 E		6327.50	6327.46
	52+00	N 42 E		6328.49	6328.54
	^{13/} 53+10	N 24 E		6329.67	6329.65
	54+00	N 13 E		6330.47	6330.51
13	55+00	N 3 W	N 81 W	6331.66	6331.76
	56+00	N 21 E		6332.84	6332.97
	57+00	N 24 E		6333.88	6333.80
	58+00	N 34 E		6334.99	6334.74
	59+00	N 10 E		6336.37	^{14/} 6335.76
14	60+00	N 5 W	N 89 W	6337.21	6336.31
	60+42 (Pothole)				6334.81
	60+51 (Brown ledge)				6337.63
	60+76				6336.44
	60+82 (Brown ledge)				6338.37
	61+00	N 10 E		6338.80	6338.10
	62+00	N 15 E		6339.83	6339.36
	62+28 (Pothole)				6338.27

^{1/} On gravel bar that extends downstream beyond station 48+00.

^{2/} Measured around bend in channel. Direction given for direct line. Distance on direct line is 95.2 feet.

^{3/} Channel blocked by tumble weed on July 2, 1971.

^{4/} Outcrop of brown ledge.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station	
				June 30- July 21, 1971	Aug. 3-6, 1971
	62+45				6338.77
	62+95 (Pothole)				6336.99
	63+00 (Ledge)	N 14 E		6340.96	6340.55
	63+50 (Pothole)				6340.48
	63+85 (Pothole)				6340.00
	64+00	^{15/} N 23 E		6342.46	6342.10
	64+21 (Caliche butress)				6343.92
	64+30 (Sand)				6342.72
15	65+00 (Ground)	^{16/} N 38 E	N 48 W	6344.38	6344.20
	65+00 (Top of rod)			^{17/} 6345.28	^{18/}

^{5/} Measured around bend in channel. Direction given for direct line. Distance on direct line is 99.8 feet.

^{5/} Measured around bend in channel. Direction given for direct line. Distance on direct line is 99.0 feet.

^{7/} Steel rod 3.3 feet long placed on July 2, 1971. Distance upstream from rod to headcut on July 2, 1971, was 72.9 feet.

^{3/} Top of steel rod tilted downstream at angle of 40° to vertical by flood of July 26, 1971.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station	
				June 30- July 21, 1971	Aug. 3-6, 1971
	^{19/} 65+74 (Sand)				6345.20
	66+00-A (Ground)	^{20/} N 48 E		6351.18	6351.20
	66+00-A (Top of rod)			^{21/} 6351.71	6351.71
	66+00-B (Ground)	^{22/} N 54 E			6346.14
	66+00-B (Top of rod)				^{23/} 6346.70
	^{24/} 66+5.5				6350.99
	67+00 (Ground)	^{25/} N 86 E		6351.46	6351.44
	67+00 (Top of rod)				^{26/} 6351.99
	68+00	N 76 E		6352.86	
	69+00	S 89 E		6354.12	
16	70+00	N 71 E	N 23 W	6355.79	

^{19/} Upstream reach of channel floor on Aug. 3, 1971. This is approximately the position of the headcut before the flood of July 26, 1971. Hummocky earth that slumped from the arroyo walls as a consequence of this flood occupies the arroyo upstream to the new headcut.

^{20/} Direction given for direct line through apex of headcut on July 2, 1971.

^{21/} Steel rod 3.3 feet long placed on July 2, 1971. Distance downstream from rod to headcut on July 2, 1971, was 27.1 feet.

^{22/} Direction given for direct line toward apex of headcut on Aug. 3, 1971.

^{23/} Steel rod 3.3 feet long placed on Aug. 3, 1971. Distance upstream from rod to headcut on Aug. 3, 1971, was 5.5 feet. (See fig. 16.)

^{24/} Station at lip of headcut that formed as a consequence of the flood of July 26, 1971.

^{25/} Direction given from station 66+00-A.

^{26/} Steel rod 3.3 feet long placed on Aug. 3, 1971. Direction from station 66+00-B is N 80 E. Distance downstream from rod to headcut on direct line to station 66+00-B is 89.5 feet. (See fig. 16.)

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station June 30- July 21, 1971
	71+00	N 63 E		6356.59
	72+00	N 49 E		6357.37
	73+00	N 42 E		6358.64
	74+00	N 34 E		6359.02
17	75+00	N 67 E	N 16 W	6359.75
	76+00	N 80 E		6360.29
	77+00	S 88 E		6361.08
	78+00	S 80 E		6362.22
	79+00	S 52 E		6363.27
18	80+00	S 41 E	N 44 E	6365.24
	81+00	S 48 E		6366.11
	82+00	N 81 E		6367.42
	83+00	N 86 E		6368.28
	84+00	S 85 E		6369.14
19	85+00	S 78 E	N 6 E	6370.62
	86+00	East		6371.54
	87+00	N 70 E		6372.60
	88+00	N 57 E		6373.57
	89+00	N 39 E		6374.77
20	90+00	N 33 E	N 54 W	6375.59
	91+00	N 39 E		6376.96
	92+00	N 40 E		6378.12
	93+00	N 39 E		6380.74

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station June 30- July 21, 1971
	94+00	N 40 E		6382.80
21	^{27/} 95+00	N 54 E	N 32 W	6381.43
	96+00	N 62 E		6386.10
	97+00	N 79 E		6387.77
	98+00	N 81 E		6388.71
	99+00	N 82 E		^{28/} 6388.37
22	100+00	S 84 E	N 11 E	6389.71
	101+00	S 76 E		6390.64
	102+00	S 64 E		6391.80
	103+00	S 71 E		6393.05
	104+00	S 82 E		6394.61
23	105+00	N 80 E	N 12 W	6395.29
	106+00	N 76 E		6396.54
	107+00	N 76 E		6397.58
	108+00	N 82 E		6398.66
	109+00	N 86 E		6400.10
24	110+00	N 85 E	North	6402.06
	111+00	S 80 E		6403.51
	112+00	N 54 E		6405.75

^{27/} Headcut at station 95+05.

^{28/} Station in cattle trail.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station June 30- July 21, 1971
	^{29/} 113+00	N 56 E		6405.60
	114+00	N 60 E		6405.66
25	115+00	N 48 E	N 39 W	6406.07
	116+00	N 55 E		6407.69
	117+00	N 48 E		^{30/} 6409.74
	^{31/} 118+00	N 58 E		6413.01
	119+00	N 53 E		6414.31
26	^{32/} 120+00	N 44 E	N 40 W	6415.21
	121+00	N 59 E		6415.81
	122+00	N 45 E		6416.33
	123+00	N 39 E		6416.87
	124+00	N 33 E		6417.41
27	^{33/} 124+80	N 34 E	N 58 W	6417.69
	126+00	N 31 E		6418.85
	127+00	N 55 E		6419.54
	128+00	N 64 E		6419.42
	129+00	N 56 E		6419.81
28	130+00	N 43 E	N 55 W	6420.27

^{29/} Downstream end of sandy channel is between stations 112+00 and 113+00.

^{30/} Elevation of ponded water in channel, which comes from overflow of Lower Vicinity Well.

^{31/} Station on rim of headcut adjacent to ponded water of station 117+00. Apex of headcut at station 118+02.

^{32/} Station 125 feet upstream from Lower Vicinity Well.

^{33/} Station 125+00 obstructed by juniper trees.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station June 30- July 21, 1971
	131+00	N 31 E		6420.81
	132+00	N 68 E		6421.63
	133+00 (Ground)	N 58 E		6422.41
	133+00 (Top of rod)			^{34/} 6423.44
	134+00 (Ground)	N 54 E		6432.86
	134+00 (Top of rod)			^{35/} 6433.74
29	135+00	N 44 E	N 44 W	6434.28
	136+00	N 50 E		6435.71
	137+00	N 58 E		6436.89
	138+00	N 66 E		6437.94
	139+00	N 70 E		6439.04
30	140+00	N 74 E	N 10 W	6440.05
	141+00	East		6440.84
	142+00	N 89 E		6442.22
	143+00	N 82 E		6443.77
	144+00	N 75 E		6445.36
31	145+00	N 51 E	N 40 W	6446.05
	146+00	N 47 E		6447.79

^{34/} Steel rod 3.3 feet long placed on July 10, 1971.

^{35/} Steel rod 3.3 feet long placed on July 10, 1971. Distance downstream from rod to headcut on July 10, 1971, was 39.3 feet. Distance to headcut on July 30, 1971, was 33.0 feet on the line to station 133+00. Distance to apex of headcut about 3 feet south of line was 32.6 feet.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station June 30- July 21, 1971
	147+00	N 51 E		6449.72
	148+00	N 84 E		6450.86
	149+00	N 80 E		6452.03
32	150+00	S 85 E	North	6453.77
	151+00	N 85 E		6454.99
	152+00	N 84 E		6455.79
	153+00	N 80 E		6457.06
	154+00	N 63 E		6458.76
33	155+00	N 66 E	N 19 W	6460.08
	156+00	N 78 E		6461.61
	157+00	N 70 E		6462.86
	158+00	N 65 E		6465.28
	159+00	N 77 E		6466.57
34	160+00	N 87 E	N 8 W	6467.59
	161+00	S 62 E		6468.47
	162+00	N 83 E		6469.09
	163+00	N 82 E		6469.20
	164+00	N 82 E		6469.30
				^{36/} 6466.81
35	165+00	N 81 E	N 13 W	6469.33
				^{37/} 6467.14

^{6/} Elevation of depression in channel between station 164+00 and station 155+00.

^{7/} Elevation of depression in channel between station 165+00 and 166+00.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station June 30- July 21, 1971
	^{38/} 165+84.5			6469.11
	166+00 (Ground)	N 76 E		6470.61
	166+00 (Top of rod)			^{39/} 6471.23
	167+00 (Ground)	S 88 E		6471.49
	167+00 (Top of rod)			^{40/} 6472.59
	^{41/} 167+97.6			6473.19
	168+00 (Ground)	N 71 E		6475.91
	168+00 (Top of rod)			^{42/} 6476.52
	169+00 (Ground)	N 88 E		6476.92
	169+00 (Top of rod)			^{43/} 6477.69
³⁶	170+00	S 79 E	N 1 E	6477.87
	171+00	N 86 E		6479.61

- ^{38/} Station at base of small headcut.
- ^{39/} Steel rod 3.3 feet long placed on July 15, 1971. Distance downstream from rod to small headcut on July 15, 1971, was 15.5 feet.
- ^{40/} Steel rod 3.3 feet long placed on July 15, 1971.
- ^{41/} Station at base of headcut.
- ^{42/} Steel rod 3.3 feet long placed on July 15, 1971. Distance downstream from rod to headcut on July 15, 1971, was 2.4 feet. Distance to headcut on July 30, 1971, was 1.4 feet.
- ^{43/} Steel rod 3.3 feet long placed on July 15, 1971.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station June 30- July 21, 1971
	172+00	N 85 E		6480.85
	173+00	S 87 E		6482.80
	174+00	N 86 E		6484.11
37	175+00	S 89 E	N 4 E	6484.91
	176+00	S 85 E		6485.89
	177+00	S 88 E		6486.85
	178+00	S 77 E		6488.04
	179+00	S 74 E		6488.36
38	^{44/} 179+95	S 74 E	N 16 E	6489.60
	^{45/} 181+00	S 80 E		6490.54
	182+00	S 85 E		6491.24
	183+00	S 78 E		6493.77
	184+00	S 85 E		6493.56
39	^{46/} 184+50	N 67 E	N 7 E	^{47/} 6493.18
	185+00	S 87 E		6495.63

^{44/} Station 180+00 obstructed by juniper trees.

^{45/} Station in cattle trail.

^{46/} Cross-section at station 185+00 obstructed by juniper trees.

^{47/} About 0.15 feet of mud accumulated in channel during rainstorm of night of July 19, 1971.

Table 1.--Continued

Table	Cross-section station	Direction along channel from previous station	Direction of cross-section	Elevation at Station June 30- July 21, 1971
	186+00 (Ground)	N 85 E		6496.04
	186+00 (Top of rod)			^{48/} 6497.00
	^{49/} 186+15.5			6499.52
	187+00	S 82 E		6500.40
	188+00	S 80 E		6501.79
	189+00	N 72 E		6502.59
40	190+00	N 67 E	N 41 E	6504.80
	191+00	N 25 E		6505.61
	192+00	N 35 E		6506.35
	193+00	N 42 E		6507.07
	^{50/} 194+00	N 51 E		6508.39
41	^{51/} 194+95	N 80 E	N 15 W	6508.18
	196+00	N 71 E		6510.23
	197+00	N 66 E		6511.03
	198+00	N 85 E		6512.35
	199+00	S 70 E		6513.51
	200+00 (Ground)	S 62 E	N 34 E	6514.88
42	200+00 (Top of rod)			^{52/} 6515.87

^{8/} Steel rod 3.3 feet long placed on July 19, 1971. Distance upstream from rod to headcut on July 19, 1971, was 15.5 feet.

^{9/} Station at lip of headcut on July 19, 1971.

^{0/} Station adjacent to lower barren ground.

^{1/} Station 2.5 feet east of fence at boundary of Cañada de los Alamos Grant. Station 195+00 obstructed by juniper tree.

^{2/} Steel rod 3.3 feet long placed on July 20, 1971.

Table 2.--Cross-sectional survey of ground-surface elevation, in feet, station 0+00.

Distance from RBBM	Elevation August 20, 1970
<u>1/</u> 0 (RBBM)	6292.37
0.0 (Ground)	6291.37
10.1	6291.14
25.0	6290.77 (Edge of sand)
34.6	6291.38
44.3	6291.41
54.4	6291.50
62.8 (Station 0+00)	6291.57
73.0	6291.73
82.3	6291.32 (Edge of sand)
92.5	6291.62
103.1	6291.79
115.4	6292.03
122.6	6291.92
141.1	6292.21
151.9	6292.96
162.6 (Ground)	6294.31
<u>2/</u> 162.6 (LBBM)	6295.29

1/ This bench mark placed in channel of Gallina Arroyo on Aug. 20, 1970. Elevation measured from U.S. Geological Survey Bench Mark 6292.554. Bench mark found in place and vertical on Aug. 1, 1971, after passage of flood of July 19, 1971, along Gallina Arroyo. Sand that was deposited at this bench mark by the flood of July 19, 1971, raised the channel floor about half a foot. This channel fill was undercut about 1 foot by passage of the flood of July 26, 1971, along Pueblo Canon.

2/ Near this bench mark, flotsam of flood of July 26, 1971, on Pueblo Canon appears to be mixed with flotsam of flood of July 19, 1971, on Gallina Arroyo.

Table 3.--Cross-sectional survey of ground-surface elevation, in feet, station 5+00.

Distance from RBBM	Elevation August 21, 1970
0 (RBBM)	6296.62
0.0 (Ground)	6295.72
9.5	6295.41
20.4	6295.13
30.6	6294.95
41.1	6294.96
50.2	6294.98
60.1	6295.63
70.7	6295.66
88.0	6295.96 (Gravel)
104.3	6296.04 "
120.3	6296.22 "
131.4	6295.69 "
134.0	6295.39 "
136.9	6295.02 "
141.0	6294.92 "
145.4	6294.97 (Edge of sand)
151.7	6295.10
158.0	6295.11
159.9	6294.62 (Edge of channel)
164.7	6294.69
166.0	6294.62

Table 3.--Continued

167.0	6294.44
167.8	6294.20
169.8	6294.25
172.0	6294.41
176.1	6294.37
181.4	6294.47
184.9 (Station 5+00)	6294.43
188.7	6294.39
189.4	6294.78
190.7	6294.53
191.5	6294.44
192.6	6294.31
194.9	6294.20
196.7	6294.14
199.5	6294.19
201.0	6294.29 (Edge of channel)
202.5	6294.66
203.8	6294.89
204.9	6295.08
206.3	6295.23
208.6	6295.29
211.5	6295.21
212.8	6294.95
213.9	6294.64
215.3	6294.46
217.2	6294.45

Table 3.--Continued

219.1	6294.63
222.5	6294.95
225.2	6295.16
230.5	6295.03
236.9	6295.23
241.8	6295.56
245.4 (Ground)	6295.77
<u>1/</u> 245.4 (LBBM)	6296.78

1/ Placed steel rod 18 feet southwest of LBBM on
Aug. 2, 1971, as marker for flood crest of
July 26, 1971.

Table 4.--Cross-sectional survey of ground-surface elevation, in feet, station 10+00.

Distance From RBBM	Elevation August 21, 1970
0 (RBBM)	6300.63
0.0 (Ground)	6300.06
10.7	6299.66
20.2	6299.68
30.5	6299.69
40.9	6299.74
51.2	6299.67
61.4	6299.62
71.5	6299.49
82.0	6299.35
94.2	6299.21
101.8	6298.89
112.5	6298.82
120.7	6298.48
132.6	6298.55 (Edge of channel)
138.0	6298.51
143.1	6298.61
147.5 (Station 10+00)	6298.61
152.8	6298.79
154.4	6298.81
156.3	6298.53
159.5	6298.49

Table 4.--Continued

162.2	6298.32 (Edge of channel)
165.0	6298.72 (Bar)
167.1	6299.10 "
170.0	6299.52 "
172.3	6299.43 "
174.6	6299.38 "
178.0	6299.68 "
183.4	6299.82 "
186.1	6299.72 "
187.5	6299.29 (Edge of channel)
189.4	6298.93
191.5	6298.75
194.4	6298.83
197.8	6298.90
201.9	6298.95 (Edge of channel)
203.3	6299.34 (Bar)
206.9	6299.42 "
211.3	6298.93 "
216.3	6298.60 "
218.3	6297.97 "
220.0	6297.44 (Edge of channel)
224.2	6297.56
227.8	6297.51
230.9	6297.56 (Edge of channel)
232.6	6298.19

Table 4.--Continued

236.5	6298.79
240.8	6298.96
248.9	6299.14
257.9	6299.22
266.1	6299.44
274.6 (Ground)	6299.82
<u>1/</u> 274.6 (LBBM)	.6300.32

1/ Placed steel rod 15 feet southwest of LBBM on
Aug. 2, 1971, as marker for flood crest of
July 26, 1971.

Table 5.--Cross-sectional survey of ground-surface elevation, in feet, station 15+00.

Distance from RBBM	Elevation August 22, 1970
0 (RBBM)	6304.04
0.0 (Ground)	6303.38
10.8	6303.09
20.4	6302.98
32.1	6302.87
44.3	6302.94
56.8	6303.22
69.0	6303.37
83.4	6303.52
96.4	6303.58
105.9	6303.58
113.1	6303.45
117.1	6303.31
122.3	6302.83 (Edge of channel)
129.5	6302.91
136.8	6303.09
145.8 (Station 15+00)	6302.87
154.0	6302.92
161.0	6302.85
167.6	6302.88
172.8	6303.16 (Edge of channel)
173.9	6303.41

Table 5.--Continued

174.5	6303.70
175.3	6304.16
182.5	6304.40
191.1	6304.69
202.3	6304.64
216.2	6304.68
230.4	6304.61
249.2	6304.35
267.7	6304.28
286.9	6304.13
300.0	6304.07
306.9	6304.13
313.2	6304.00
324.8	6304.03
334.1	6303.99
342.5 (Ground)	6304.03
<u>1/</u> 342.5 (LBBM)	6304.67
<u>1/</u> Placed steel rod southeast of LBBM on Aug. 2, 1971, as marker for flood crest of July 26, 1971.	

Table 6.--Cross-sectional survey of ground-surface elevation, in feet, station 20+00.

Distance from LBBM	Elevation August 22, 1970
<u>1/</u> 0 (LBBM)	6309.43
0.0 (Ground)	6308.54
12.0	6308.20
22.9	6308.56
33.4	6308.74
44.8	6308.63
54.0	6308.50
61.0	6307.99
63.5	6307.55
65.4	6307.29
66.8	6306.98
68.9	6306.44
71.3	6306.11 (Edge of channel)
74.8	6305.93
78.6	6306.10
80.0	6305.38
83.8	6305.31
89.4	6305.36
94.9 (Station 20+00)	6305.23
100.3	6305.10

Table 6.--Continued

104.2	6305.20
106.0	6305.68 (Edge of channel)
106.3	6306.75
109.3	6307.85
111.5	6308.49
118.1	6308.63
123.5	6309.19
137.4	6308.96
146.8	6309.16
156.0	6309.29
164.6 (Ground)	6309.59
164.6 (RBBM)	6310.11

1/ Placed steel rod southwest of LBBM on Aug. 2, 1971,
as marker for flood crest of July 26, 1971. Flood
crest above LBBM and RBBM.

Table 7.--Cross-sectional survey of ground-surface elevation, in feet, station 25+00.

Distance from RBBM	Elevation August 22, 1970
<u>1/</u> 0 (RBBM)	6315.09
0.0 (Ground)	6314.19
11.8	6313.95
20.6	6313.70
28.5	6313.08
31.9	6312.05
34.9	6311.06
39.0	6310.20
43.7	6309.84 (Edge of channel)
47.5	6309.35
51.3	6308.93
56.3	6308.65
60.8	6308.36
66.3 (Station 25+00)	6308.55
71.7	6308.62
76.4	6308.50
80.2	6308.41 (Edge of channel)
82.4	6209.85
84.8	6313.88
91.2	6314.86
99.3 (Ground)	6315.53
99.3 (LBBM)	6316.35

1/ Flood crest of July 26, 1971, reached at least as high as 0.2 foot below RBBM; that is, a height of about 6315 feet.

Table 8.--Cross-sectional survey of ground-surface elevation, in feet, station 30+00.

Distance from RBBM	Elevation August 24, 1970
<u>1/</u> 0 (RBBM)	6318.19
0.0 (Ground)	6317.44
9.9	6317.25
20.7	6317.29
30.4	6316.82
39.0	6316.64
40.7	6315.24
42.7	6314.41
45.0	6313.84
48.4	6312.96 (Edge of channel)
51.7	6312.69
55.4	6312.56
61.0	6312.49
65.0	6312.45
70.1 (Station 30+00)	6312.28
78.6	6312.17
84.5	6312.10
88.0	6311.96 (Edge of channel)
94.0	6317.01
100.4	6317.63
105.2 (Ground)	6317.79
105.2 (LBBM)	6318.41

1/ Placed steel rod north-west of RBBM on Aug. 2, 1971, as marker for flood crest of July 26, 1971.

Table 9.--Cross-sectional survey of ground-
surface elevation, in feet, station 35+00.

Distance from RBBM	Elevation	
	August 24, 1970	August 5, 1971
0 (RBBM)	6323.48	6323.48
0.0 (Ground)	6322.46	6322.50
10.7	6322.35	6322.34
21.2	6322.27	6322.17
28.9	6321.53 (Top of bank)	<u>1/</u> 6321.49 (Top of bank)
32.2	6320.18	6320.01
32.7		6318.27 (Base of bank)
33.5	6318.30 (Base of bank)	
35.9		6317.35
37.3	6317.08	
41.0		6316.06
42.0	6316.09	
45.7		6314.97 (Edge of channel)
46.2	6315.06 (Edge of channel)	
51.5	6314.97	
52.9		6314.92
55.6	6315.11	
59.5 (Station 35+00)	6315.20	6314.86
65.5		6315.02
65.6	6315.23	
69.8	6315.09	

Table 9.--Continued

72.5	6315.79 (Edge of channel)	
72.7		6314.83 (Edge of channel)
74.5		6316.93
74.7	6317.26	
77.3	6318.10	
77.8		6318.03
80.2	6319.47 (Base of bank)	
80.4		6319.50 (Base of bank)
80.9	6322.67 (Top of bank)	
81.2		^{2/} 6322.66 (Top of bank)
82.7		6323.02
89.8	6323.37	6323.36
98.3	6324.36	6324.39
103.9 (Ground)	6325.05	6325.03
103.9 (LBBM)	6325.89	6325.89

^{1/} Flood crest of July 26, 1971, apparently slightly above top of bank.

^{2/} Flood crest of July 26, 1971, apparently at top of bank.

Table 10.--Cross-sectional survey of ground-surface elevation, in feet, station 40+00.

Distance from RBBM	Elevation	
	August 24, 1970	August 5, 1971
0 (RBBM)	6328.67	6328.67
0.0 (Ground)	6327.91	6327.95
9.7	6327.47	6327.46
19.2	6327.16	6327.15
26.5	6326.69 (Top of bank)	6326.64 (Top of bank)
28.2	6325.43	
28.8	6321.35 (Base of bank)	
29.0		6321.15 (Base of bank)
32.5		6319.83
32.9	6319.99	
38.1	6318.55 (Edge of channel)	
38.4		6318.21 (Edge of channel)
44.0	6318.13	
45.4		6318.17
46.4	6318.05	
52.9 (Station 40+00, ground)	6318.31	6318.07
52.9 (Station 40+00, top of rod)	<u>1/</u> 6319.43	<u>2/</u>
60.2	6318.39	
67.0	6318.75 (Base of bank)	
67.4		6317.86 (Base of bank)
68.8	6323.00	
70.3	6327.53 (Top of bank)	6327.66 (Top of bank)

Table 10.--Continued

72.3		^{3/} 6327.83 (Flood crest, 7/26/71)
76.7	6328.15	6328.15
80.9 (Ground)	6328.70	6328.72
80.9 (LBBM)	6329.48	6329.48

^{1/} Steel rod 3.3 feet long placed on Aug. 20, 1970.

^{2/} Top of steel rod tilted downstream at angle of 50° to vertical by flood of July 26, 1971.

^{3/} Placed steel rod on Aug. 2, 1971. Flood crest faintly marked by flotsam. From plot of flood profile (fig. 3), the interpolated height of this flood at station 40+00 is 6326.7 feet.

Table 11.--Cross-sectional survey of ground-
surface elevation, in feet, station 45+00.

Distance from RBBM	Elevation	
	June 30, 1971	August 5, 1971
0 (RBBM)	6331.57	6331.57
0.0 (Ground)	6330.58	6330.55
8.0	6329.93	6329.98
8.5		¹ / ₂ 6329.73 (Flood crest, 7/26/71)
13.5		6329.50
14.5		6329.24 (Top of bank)
14.8	6329.20 (Top of bank)	
15.2		6325.47
15.6	6325.60	
17.2		6322.68 (Base of bank)
17.7	6323.23	
20.5	6322.43 (Edge of channel)	
21.0		6322.37
23.5		6322.15
27.9	6322.32	
30.5		6322.36
35.9 (Station 45+00)	6322.39	6322.26
39.9		6321.98
42.5	6322.17	
45.2		6321.72
48.8	6321.97 (Edge of channel)	
50.1	6322.26 (Base of bank)	
51.5		6321.82 (Base of bank)

Table 11.--Continued

52.4	6329.81 (Top of bank)	6329.80 (Top of bank)
53.5		6330.10
59.8	6330.63	
60.4		6330.81
65.9 (Ground)	6331.34	6331.36
65.9 (LBBM)	6332.43	6332.43

1/ Placed steel rod on August 2, 1971. From plot of flood profile (fig. 3),
the interpolated height of this flood at station 45+00 is 6330.8 feet.

Table 12.--Cross-sectional survey of ground-
surface elevation, in feet, station 50+00.

Distance from RBBM	Elevation	
	July 2, 1971	August 5, 1971
<u>1/</u> 0 (RBBM)	6336.92	6336.92
0.0 (Ground)	6336.39	6336.39
13.8		6335.56
14.5	6335.35	
26.7	6334.63	
28.6		6334.59
33.6		6334.33
42.9	6333.59 (Top of bank)	<u>2/</u> 6333.54 (Top of bank)
43.1		6333.41
44.3		6329.52 (Base of bank)
44.5	6329.56 (Base of bank)	
48.1		6328.80
50.0	6328.47	
50.6		6328.13
55.4		6327.46
58.5	6327.63	
58.9		6327.06
66.0		6326.84
68.2	6327.28	
74.3		6326.68
75.9	6326.39	
80.6 (Station 50+00)	6326.40	6326.43
86.7		6326.22
89.6	6326.18	

Table 12.--Continued

90.8		6325.94
94.3		6325.96
94.8	6326.27 (Base of bank)	
95.0	6336.47 (Top of bank)	
95.4		6325.66 (Edge of sand)
96.4		6326.97
97.5		6328.18 (Base of bank)
97.9		^{2/} 6336.79 (Top of bank)
99.2		6337.02
106.2		6337.77
108.8	6337.72	
112.2		6337.87
119.2 (Ground)	6338.01	6338.03
^{1/} 119.2 (LBBM)	6338.60	6338.60

^{1/} Placed Copperweld rod as marker with cap stamped "50 00".

^{2/} Flood of July 26, 1971, apparently within banks, but height of flood at 50+00,--as interpolated from flood profile (fig. 3)--is 6335.5 feet.

Table 13.--Cross-sectional survey of ground-
surface elevation, in feet, station 55+00.

Distance from RBBM	Elevation	
	July 2, 1971	August 5, 1971
0 (RBBM)	6340.85	6340.85
0.0 (Ground)	6339.99	6339.96
7.9		6339.58
10.4		6339.33
10.5	6339.32	
19.1		6338.96
20.8	6338.93 (Top of bank)	6338.80 (Top of bank)
22.7	6334.09 (Base of bank)	6334.09 (Base of bank)
24.7		6333.21
26.5	6332.67	
26.6		6332.68
29.9		6331.62 (Edge of sand)
31.5	6331.62 (Edge of channel)	
34.2		6331.56
37.1	6331.68	
38.1		6331.68
41.9 (Station 55+00)	6331.66	6331.76
45.5		6331.82
47.5	6331.51	
50.8		6332.14
52.9	6331.74	
59.2	6332.14	
59.3		6332.34
62.2	6332.31 (Edge of channel)	

Table 13.--Continued

66.2	6333.33	
66.5		6332.69 (Edge of sand)
70.0	6335.25 (Base of bank)	
70.1	6338.86 (Top of bank)	
70.4		6333.85 (Base of bank)
70.8		6338.90 (Top of bank)
71.9		6339.01
74.5		6339.30
74.9	6339.16	
78.2 (Ground)	6339.36	6339.37
78.2 (LBBM)	6340.24	6340.24
85.0		6339.66
93.7		^{1/} 6340.21 (Flood crest, 7/26/71)

^{1/} Placed steel rod on August 2, 1971.

Table 14.--Cross-sectional survey of ground-
surface elevation, in feet, station 60+00.

Distance from LBBM	Elevation	
	July 2, 1971	August 3, 1971
<u>1/</u> 0 (LBBM)	6348.30	6348.30
0.0 (Ground)	6347.48	6347.47
12.4		6346.10
16.6	6345.73	
21.5		6345.38
27.4		<u>2/</u> 6345.04 (Flood crest, 7/26/71)
32.1	6344.56	
39.0		6343.98 (Cattle trail)
46.6		6343.82
49.1	6343.77 (Top of bank)	6343.77 (Top of bank)
49.8	6339.73 (Base of bank)	
50.0		6338.28 (Base of bank)
52.7		6338.43
53.2	6338.74	
56.1		6338.54
59.2		6337.80
60.0	6337.96	
62.8		6337.20
64.8		6337.64 (Gravel bar)
66.6	6338.61	
69.4		6337.77 (Gravel bar)
72.5	6338.23	
72.7		6337.76 (Gravel bar)

Table 14.--Continued

76.3		6336.87 (Sand)
76.9	6338.09 (Edge of channel)	
82.3	6337.32	
82.8		6336.54 (Sand)
84.8		6335.20
86.9		6336.19
88.3 (Station 60+00)	6337.21	6336.31
91.9		6336.10
92.8	6337.07	
96.3		6335.97
98.0	6337.07 (Edge of channel)	
99.5		6335.63
100.9		6335.72 (Base of bank)
102.9		6337.43
103.0	6337.73 (Base of bank)	
104.7	6344.44 (Top of bank)	6344.17 (Top of bank)
114.6		6344.79 (Cattle trail)
115.5	6344.83	
124.9 (Ground)	6346.10	6346.10
124.9 (RBBM)	6346.99	6346.99

1/ Elevation measured from U.S. Geological Survey Bench Mark 6355.14.

2/ Placed steel rod on August 2, 1971. Flood crest probably as high as 6345.52 feet as indicated by flotsam at 6345.23 feet on right bank 25 feet downstream (see fig. 3).

Table 15.--Cross-sectional survey of ground-
surface elevation, in feet, station 65+00.

Distance from LBBM	Elevation	
	July 3, 1971	August 3, 1971
0 (LBBM)	6353.57	6353.57
0.0 (Ground)	6352.80	6352.81
17.1	6352.56	6352.56
34.3	6351.74	6351.76
51.0	6350.85	6350.89
54.2		^{1/} 6350.60 (Flood crest, 7/26/71)
62.3		^{2/} 6350.22 (Top of bank)
63.0		6344.83 (Base of bank)
64.5	6349.74 (Top of bank)	
65.0	6345.73 (Base of bank)	
69.5	6345.46	
69.9		6344.91
75.5		6344.61
76.8	6344.52 (Edge of channel)	
77.4		6344.14
82.7		6344.11
82.8	6344.56	
87.6 (Station 65+00, ground)	6344.38	6344.20

^{1/} Placed steel rod on August 2, 1971.

^{2/} Local erosion at arroyo bank apparently caused by runoff along
cattle trail.

Table 15.--Continued

87.6 (Station 65+00, top of rod)	^{3/} 6345.28	^{4/}
91.9		6344.09
92.6	6344.58 (Edge of channel)	
95.2	6345.22	
98.0		6344.42
101.3	6345.95	
101.9		6344.13
108.0		6344.41
108.7	6346.90 (Base of bank)	
109.0	6350.15 (Top of bank)	
110.8		6344.11 (Base of bank)
111.0		6350.17 (Top of bank)
117.8		6350.36
117.9	6350.34	
128.2		6350.90
136.1	6351.28	
136.4		^{5/} 6351.32 (Flood crest 7/26/71)
148.2		6351.88
159.9 (Ground)	6352.67	6352.67
159.9 (RBBM)	6353.54	6353.54

^{3/} Steel rod 3.3 feet long placed on July 2, 1971.

^{4/} Top of steel rod tilted downstream at angle of 40° to vertical by flood of July 26, 1971.

^{5/} Placed steel rod on August 2, 1971.

Table 16.--Cross-sectional survey of ground-
surface elevation, in feet, station 70+00.

Distance from LBBM	Elevation July 3, 1971
0 (LBBM)	<u>1/</u> 6358.17
0.0 (Ground)	6357.37
15.8	6357.16
34.3	6356.17
47.5	6355.49
60.1	6356.06
70.7	6355.74
78.0	6356.04
85.2 (Station 70+00)	6355.79
97.5	6355.68
115.0	6355.17
127.9	6355.63
148.8	6357.37
168.9 (Ground)	6357.05
168.9 (RBBM)	<u>1/</u> 6357.90

1/ Bench mark below flood crest of July 26, 1971.

Table 17.--Cross-sectional survey of ground-surface elevation, in feet, station 75+00.

<u>Distance from LBBM</u>	<u>Elevation July 3, 1971</u>
0 (LBBM)	6363.58
0.0 (Ground)	6362.75
17.2	6362.61
40.0	6362.60
62.1	6362.65
81.0	6361.16
92.2	6360.39
105.0	6360.14
121.9	6360.03
127.4	6359.73
133.5 (Station 75+00)	6359.75
139.0	6360.03
146.3	6360.30
159.2	6360.55
168.9	6361.32
179.9	6362.36
192.4	6363.56
207.5	6364.62
217.8 (Ground)	6365.41
217.8 (RBBM)	6366.25

Table 18.--Cross-sectional survey of ground-surface elevation, in feet, station 80+00.

<u>Distance from LBBM</u>	<u>Elevation July 5, 1971</u>
0 (LBBM)	6366.87
0.0 (Ground)	6366.01
17.7	6365.91
40.6	6365.98
69.0	6365.80
97.0	6365.59
109.9	6365.43
120.0	6365.90
127.0	6365.48
133.3	6365.60
139.5	6365.94
148.8	6365.49
156.5 (Station 80+00)	6365.24
166.8	6365.53
182.5	6365.54
205.4	6365.61
224.0	6366.18
251.9	6367.34
276.9 (Ground)	6367.98
276.9 (RBBM)	6368.88

Table 19.--Cross-sectional survey of ground-surface elevation, in feet, station 85+00.

<u>Distance from LBBM</u>	<u>Elevation July 5, 1971</u>
0 (LBBM)	6374.22
0.0 (Ground)	6373.25
13.2	6372.01
22.3	6371.18
36.1	6370.63
41.4	6370.74
47.4	6370.54
52.9 (Station 85+00)	6370.62
56.8	6370.88
60.9	6370.68
64.9	6370.38
72.0	6370.86
84.7	6370.61
98.5	6370.39
102.0	6369.60 (Wheel rut)
105.5	6370.24
108.5	6369.65
110.5	6370.44
121.8	6370.66
135.1	6371.09
148.0 (Ground)	6371.73
148.0 (RBBM)	6372.63

Table 20.--Cross-sectionaal survey of ground-surface elevation, in feet, station 90+00.

<u>Distance from LBBM</u>	<u>Elevation July 5, 1971</u>
0 (LBBM)	6379.12
0.0 (Ground)	6378.18
10.0	6377.39
19.9	6377.10
33.0	6376.52
56.5	6376.21
92.0	6375.95
131.5	6375.77
163.5	6375.82
184.9	6375.72
202.9 (Station 90+00)	6375.59
218.3	6375.45
235.1	6375.68
236.7	6375.21 (Wheel rut)
241.4	6375.60
245.2	6376.03
246.6	6375.68 (Wheel rut)
247.8	6376.05
249.5	6375.63 (Cattle trail)
250.9	6375.90
254.5	6375.61

Table 20.--Continued

<u>Distance from LBEM</u>	<u>Elevation July 5, 1971</u>
258.6	6376.06
268.8	6376.24
278.7	6375.66
287.2	6375.93
300.0	6375.65
303.3	6375.33 (Wheel rut)
310.7	6375.48
328.3	6375.54
343.2	6376.02
364.0	6376.13
392.2	6376.73
419.5 (Ground)	6377.27
419.5 (RBBM)	6378.04

Table 21.--Cross-sectional survey of ground-surface elevation, in feet, station 95+00.

<u>Distance from LBBM</u>	<u>Elevation July 6, 1971</u>
0 (LBBM)	6387.72
0.0 (Ground)	6386.80
14.9	6386.34
25.5	6386.28
34.2	6386.17
35.4	6385.74 (Wheel rut)
36.8	6386.22
37.7	6386.07 (Wheel rut)
39.0	6386.27
40.5	6386.08 (Wheel rut)
42.7	6386.34
44.5	6386.03 (Cattle trail)
46.0	6386.28
55.2	6386.18
70.2	6385.52
81.8	6384.81
83.1	6384.19
91.2	6384.04
95.6	6384.43
103.4	6383.90
107.5	6384.21
111.0	6383.69

Table 21.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 6, 1971</u>
112.5	6381.60
114.0 (Station 95+00)	6381.43
115.1	6381.69
115.7	6382.87
117.6	6383.24
122.7	6383.74
125.1	6383.44 (Cattle trail)
128.2	6383.68
144.9	6384.04
163.0	6384.35
177.0	6384.43
198.2	6384.69
219.7	6384.84
238.4	6384.87
263.1	6384.59
281.2	6384.24
300.0	6384.11
318.6	6383.75
337.3	6383.79
354.5 (Ground)	6383.77
354.5 (RBBM)	6384.67

Table 22,--Cross-sectional survey of ground-surface elevation, in feet, station 100+00.

<u>Distance from LBEM</u>	<u>Elevation July 6, 1971</u>
<u>1/</u> 0 (LBEM)	6393.79
0.0 (Ground)	6393.05
13.2	6392.43
26.4	6391.76
43.6	6391.18
59.8	6390.81
71.7	6390.77
83.2	6390.28
84.0	6389.98 (Cattle trail)
84.7	6390.30
92.7	6389.48
99.7	6389.28
101.0	6389.00 (Cattle trail)
104.9	6389.66
106.8	6389.53
108.8	6388.92 (Wheel rut)
111.5 (Station 100+00)	6389.71
113.0	6389.80
114.0	6389.44 (Wheel rut)
115.1	6389.87
118.1	6389.79
120.5	6390.00
121.5	6389.75 (Cattle trail)

Table 22.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 6, 1971</u>
122.4	6389.98
124.5	6389.90
125.3	6389.78 (Wheel rut)
126.8	6389.88
133.3	6389.98
140.5	6390.21 (Edge of sand)
149.0	6390.08
156.8	6390.27
165.0	6390.05 (Edge of sand)
177.8	6390.38
192.9	6390.47
206.1	6390.72
227.8	6390.76
249.6	6390.80
271.2	6391.51
288.8 (Ground)	6392.10
<u>1/</u> 288.8 (RBBM)	6392.82

1/ Placed Copperweld rod as marker with capstamped "100 00".

Table 23.--Cross-sectional survey of ground-surface elevation, in feet, station 105+00.

<u>Distance from LBBM</u>	<u>Elevation July 8, 1971</u>
0 (LBBM)	6400.95
0.0 (Ground)	6399.77
10.9	6398.27
15.1	6397.79
16.5	6397.40 (Cattle trail)
17.6	6397.50
27.1	6396.21
39.2	6395.76
46.4	6396.12
54.5	6395.79
58.7	6395.75
59.4	6395.67 (Cattle trail)
60.0	6395.77
64.0	6395.45
67.4	6395.49
70.8 (Station 105+00)	6395.29
77.1	6395.33
84.9	6395.38
92.5	6395.74
102.2	6396.34

Table 23.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 8, 1971</u>
114.4	6396.72
132.2	6396.28
159.2	6396.96
185.4 (Ground)	6398.90
185.4 (RBEM)	6399.95

Table 24.--Cross-sectional survey of ground-surface elevation, in feet, station 110+00.

<u>Distance from LBBM</u>	<u>Elevation July 8, 1972</u>
0 (LBBM)	6406.41
0.0 (Ground)	6405.47
15.6	6404.78
30.9	6403.96
47.7	6402.82
60.0	6402.19
72.5	6401.69
82.1	6401.81
85.0	6401.59
91.2	6401.97
92.1	6401.68 (Cattle trail)
93.2	6402.02
97.9	6401.80
102.9	6401.78
107.0	6401.96
108.5	6401.55
109.9	6401.87
113.1	6402.02
117.2 (Station 110+00)	6402.06
118.2	6401.96 (Cattle trail)
119.6	6402.15
123.0	6402.34

Table 24.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 8, 1972</u>
127.4	6402.07
128.5	6402.00 (Cattle trail)
129.6	6402.14
133.9	6402.06
136.1	6401.86
137.3	6401.58
138.7	6401.88
142.1	6401.54
144.0	6401.50
145.9	6401.82
150.0	6401.75
153.9	6401.95
156.0	6401.83
158.0	6401.50
159.2	6401.25
160.4	6401.49
161.9	6401.22
164.5	6401.22
170.2	6401.59
174.5	6401.88
175.5	6401.79 (Cattle trail)
176.0	6401.94
180.7	6402.48
189.0	6403.02
203.4	6404.15
216.2 (Ground)	6404.82
216.2 (RBBM)	6405.70

Table 25.--Cross-sectional survey of ground-surface elevation, in feet, station 115+00.

<u>Distance from LBBM</u>	<u>Elevation July 8, 1972</u>
<u>1/</u> 0 (LBBM)	6414.23
0.0 (Ground)	6413.25
18.4	6413.04
41.0	6412.74
61.4	6412.53
62.2	6412.44 (Wheel rut)
63.6	6412.52
64.2	6412.43 (Wheel rut)
65.1	6412.51
66.7	6412.50
67.3	6412.36 (Wheel rut)
68.1	6412.45
68.8	6412.39 (Wheel rut)
69.4	6412.48
72.5	6412.46
73.2	6412.37 (Cattle trail)
74.0	6412.45
76.9	6412.33
77.8	6412.15 (Cattle trail)
78.5	6412.25
87.5	6412.36
88.1	6412.21 (Cattle trail)

Table 25.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 8, 1972</u>
89.1	6412.32
91.5	6412.31
92.4	6412.26
93.1	6412.45
96.3	6412.22
108.4	6412.05
126.1	6411.89
138.1	6411.72
148.1	6410.91
156.2	6410.71
171.0	6409.86
179.0	6409.39
185.9	6408.97
191.9	6408.69
198.2	6409.36
208.5	6409.62
216.7	6409.10
226.5	6409.56 (Fence)
240.8	6409.56
252.4	6408.53
253.9	6408.17 (Cattle trail)
255.5	6408.39
264.2	6408.18
265.9	6408.19 (Cattle trail)
266.9	6408.30

Table 25.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 8, 1972</u>
275.9	6408.27
278.8	6407.80 (Cattle trail)
280.1	6408.00
284.7	6407.78
288.2	6407.55
292.1	6407.95
297.2	6407.23
300.0	6407.98
300.9	6406.22
301.7 (Station 115+00)	6406.07
302.6	6406.26
302.9	6407.66
304.0	6408.21
306.0	6407.40 (Edge of sand)
309.9	6407.07
314.8	6407.30
319.2	6407.64 (Edge of sand)
321.1	6408.59
328.8	6408.82
330.0	6408.57 (Cattle trail)
330.9	6408.81
334.0	6409.16
337.0	6409.71 (Cattle trail)
341.8	6410.63
346.3	6411.34 (Edge of road)
350.7	6410.99 (Wheet rut)

Table 25.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 8, 1972</u>
353.2	6411.18
355.4	6410.97 (Wheel rut)
359.6	6412.29 (Edge of road)
365.2	6412.76
371.1 (Ground)	6413.49
371.1 (RBBM)	6414.36

1/ Elevation measured from U.S. Geological Survey Bench Mark 6453.301.

Table 26.--Cross-sectional survey of ground-surface elevation, in feet, station 120+00.

<u>Distance from LBBM</u>	<u>Elevation July 9, 1971</u>
0 (LBBM)	6420.88
0.0 (Ground)	6419.81
15.1	6418.83
39.3	6417.69
61.0	6417.29
85.0	6417.49
85.9	6417.39 (Wheel rut)
86.7	6417.52
89.9	6417.48
90.5	6417.38 (Wheel rut)
91.1	6417.47
98.2	6417.47
106.8	6417.23
107.5	6417.11 (Cattle trail)
108.5	6417.29
112.6	6417.24
113.2	6417.13 (Cattle trail)
114.1	6417.23
120.2	6417.23
123.3	6416.64
135.7	6416.30
138.0	6415.73
146.1	6415.33

Table 26.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 9, 1971</u>
154.1	6415.64 (Edge of road)
156.1	6415.47
159.2	6415.57 (Center of road)
162.5	6415.52
164.5	6415.65 (Edge of road)
167.0	6415.65 (Edge of sand)
170.3	6415.25
174.0	6415.61
177.1	6415.33
179.9 (Station 120+00)	6415.21
181.9	6415.36 (Edge of sand)
186.8	6415.69
196.2	6415.37
203.1	6415.35
208.5	6415.09
216.9	6415.54
232.2	6415.94
229.3	6416.49
237.4	6416.70
236.0	6416.59 (Cattle trail)
243.1	6416.69
250.1	6416.61 (Cattle trail)
252.7	6416.47

Table 26.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 9, 1971</u>
264.8	6416.43
275.8	6415.80
286.4	6415.60
294.0	6415.43
300.0	6415.62
307.9	6415.68
321.0	6416.06
337.5	6416.52
355.0	6416.79
371.5	6416.93
381.2 (Ground)	6417.07
381.2 (RBM)	6418.03

Table 27.--Cross-sectional survey of ground-surface elevation, in feet, station 124+80^{1/2}.

<u>Distance from LBBM</u>	<u>Elevation July 10, 1971</u>
0 (LBBM)	6423.59
0.0 (Ground)	6422.74
11.4	6422.72
21.5	6422.02
28.8	6420.91
33.0	6420.22
40.7	6419.64
46.6	6418.84 (Cattle trail)
51.0	6418.80
59.4	6419.07
67.2	6418.57
69.9	6417.97 (Edge of sand)
74.3 (Station 124+80)	6417.69
77.2	6418.02 (Edge of sand)
85.5	6418.18
90.0	6418.27
94.7	6418.15
95.3	6418.05 (Cattle trail)
96.0	6418.14
100.8	6418.81
101.7	6418.68 (Cattle trail)
102.7	6418.81
106.7	6459.74

Table 27.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 10, 1971</u>
110.5	6420.53
115.5	6421.25
120.4	6421.72
128.2	6421.66
132.6	6422.19
140.0	6422.79
149.9	6422.77
159.5 (Ground)	6422.66
159.5 (RBBM)	6423.53

1/ Station 125+00 obstructed by juniper trees.

Table 28.--Cross-sectional survey of ground-surface elevation, in feet, station 130+00.

<u>Distance from LBBM</u>	<u>Elevation July 10, 1971</u>
0 (LBBM)	6429.97
0.0 (Ground)	6429.13
16.6	6428.84
26.5	6428.50 (Top of bank)
27.9	6425.09 (Base of bank)
31.7	6427.71 (Projection from bank)
33.1	6425.72
37.5	6424.31
47.3	6423.57
62.7	6422.64
80.8	6420.94
82.7	6420.28 (Edge of channel)
90.5 (Station 130+00)	6420.27
99.1	6420.52
100.4	6420.64
107.4	6421.74
111.8	6421.99
112.5	6421.91 (Cattle trail)
113.3	6422.17
122.0	6422.57
133.0	6424.06
138.6	6425.90

Tab

Table 28.--Continued

	<u>Distance from LBBM</u>	<u>Elevation July 10, 1971</u>
<u>D</u>	144.0	6427.36 (Top of bank)
	151.8	6428.05
	166.8	6428.11
	167.4	6428.02 (Cattle trail)
	168.0	6428.20
	180.1	6428.49
	192.8	6428.57 (Cattle trail)
	193.8 (Ground)	6428.71
	193.8 (RBBM)	6429.56

Table 29.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 10, 1971</u>
42.4	6435.46
43.5	6435.26 (Wheel rut)
46.0	6435.38
48.1	6435.01 (Wheel rut)
50.2	6435.17
51.8	6435.37
56.0	6434.81
59.5	6434.92
66.5	6435.29
69.9	6435.29
70.7	6434.95 (Cattle trail)
71.4	6435.28
88.8	6435.23
108.0	6435.24
127.1	6435.07
139.1	6434.92
151.0	6434.91
166.7	6434.87
183.9	6434.54
201.5 (Station 135+00)	6434.28
213.8	6434.18 (Cattle trail)
232.5	6434.36
247.7	6434.63
248.2	6434.37 (Cattle trail)

Table 29.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 10, 1971</u>
249.1	6434.56
261.2	6435.03
276.5	6435.79
287.8 (Ground)	6436.49
287.8 (RBBM)	6437.21

Table 30.--Cross-sectional survey of ground-surface elevation, in feet, station 140+00.

<u>Distance from LBEM</u>	<u>Elevation July 12, 1971</u>
0 (LBEM)	6442.46
0.0 (Ground)	6441.65
12.5	6441.13
25.7	6440.69
27.9	6440.29 (Wheel rut)
31.2	6440.50
33.8	6440.21 (Wheel rut)
38.1	6440.38
39.7	6439.52 (Wheel rut)
41.7	6440.18
42.9	6439.68 (Wheel rut)
44.2	6440.03
45.6	6439.58 (Wheel rut)
46.9	6440.01
48.0	6439.73 (Wheel rut)
50.6	6439.97
53.0	6439.75 (Wheel rut)
54.5	6439.82
55.9	6439.74 (Wheel rut)
58.5	6439.93
60.5	6439.78 (Wheel rut)
62.0	6439.92
78.1	6440.03
99.6	6439.92

Table 30.--Continued

120.7	6439.80
140.9	6439.74
157.6	6439.85
169.2	6439.93
184.9	6440.07
197.9	6440.14
209.0 (Station 140+00)	6440.05
227.0	6440.15
244.2	6440.18
263.2	6440.40
280.2	6440.46
291.6	6440.48 (Cattle trail)
300.0	6440.61
315.0	6440.84
338.1	6441.19
360.2	6441.58
378.2 (Ground)	6441.84
378.2 (RBEM)	6442.66

Table 31.--Cross-sectional survey of ground-surface elevation, in feet, station 145+00.

<u>Distance from LBBM</u>	<u>Elevation July 13, 1971</u>
0 (LBBM)	6451.40
0.0 (Ground)	6450.51
15.5	6449.92
34.8	6449.04
60.1	6448.40
63.9	6448.10 (Wheel rut)
66.2	6448.17
69.3	6447.72 (Wheel rut)
77.5	6447.64
79.5	6447.00 (Edge of cattle trail)
84.6	6446.69 (Cattle trail)
86.2	6446.98 (Edge of cattle trail)
86.8	6447.37
89.8	6447.27
91.1	6447.15 (Wheel rut)
92.9	6447.27
95.7	6446.72 (Wheel rut)
97.7	6447.13
99.0	6447.05 (Wheel rut)
101.1	6447.13
103.2	6446.76 (Wheel rut)
104.9	6446.86
106.2	6446.81 (Wheel rut)
108.1	6447.12
115.7	6447.20

Table 31.--Continued

<u>Distance from LBEM</u>	<u>Elevation July 13, 1971</u>
130.7	6446.84
142.3	6446.40
145.9	6445.88 (Cattle trail)
148.7 (Station 145+00)	6446.05
152.9	6445.97
154.8	6445.53 (Cattle trail)
156.9	6446.11
162.3	6445.93
170.1	6446.48
185.2	6446.91
198.1	6447.00
209.0	6446.97
226.6	6446.80
248.7	6446.63
269.0	6446.56
290.0	6446.53
300.0	6446.21
326.1	6445.86
346.9	6445.72 (Cattle trail)
369.2	6445.63
393.1	6445.71
416.1	6445.91
431.9	6446.95
449.4 (Ground)	6447.79
449.4 (RBBM)	6448.59

Table 32.--Cross-sectional survey of ground-surface elevation, in feet, station 150+00.

<u>Distance from LBBM</u>	<u>Elevation July 13, 1971</u>
<u>1/</u> 0 (LBBM)	6457.09
0.0 (Ground)	6456.39
16.0	6455.41
37.1	6454.49
44.0	6454.10
46.0	6453.96 (Wheel rut)
49.2	6454.14
52.5	6453.88 (Wheel rut)
58.1	6453.85
64.0	6453.77
64.7	6453.67 (Cattle trail)
65.6	6453.84
66.4	6453.59 (Cattle trail)
67.8	6453.85
68.8	6453.66 (Wheel rut)
69.9	6453.70
71.9	6453.60 (Wheel rut)
74.6	6453.75
76.0	6453.65 (Wheel rut)
77.3	6453.66
78.3	6453.63 (Wheel rut)
79.8	6453.72
81.3	6453.59 (Wheel rut)
83.5	6453.79

Table 32.---Continued

<u>Distance from LBBM</u>	<u>Elevation July 13, 1971</u>
85.9 (Station 150+00)	6453.77
86.9	6453.66 (Cattle trail)
97.6	6453.58
99.0	6453.27 (Wheel rut)
100.5	6453.54
101.3	6453.49 (Wheel rut)
103.0	6453.64
104.7	6453.36 (Wheel rut)
105.8	6453.62
106.7	6453.39 (Cattle trail)
108.8	6453.71
111.8	6453.54 (Wheel rut)
125.3	6454.06
145.8	6454.14
171.3	6454.05
189.0	6454.16
209.3	6454.18
230.2	6454.26
250.8	6454.44
273.0	6454.74
300.0	6455.54
314.2	6455.92
325.0	6456.35
343.0	6456.67

Table 32.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 13, 1971</u>
359.9	6457.27
379.4	6458.30
396.0 (Ground)	6459.12
<u>1/</u> 396.0 (RBBM)	6459.93
<u>1/</u> Placed <u>Copperweld</u> rod as marker with cap stamped "150 00".	

Table 33.--Cross-sectional survey of ground-surface elevation, in

feet, station 155+00.

Distance from IBBM		Elevation July 13, 1971
0	(IBBM)	6463.46
0.0	(Ground)	6462.57
18.2		6462.14
38.8		6461.74
66.7		6461.32
93.7		6460.78
95.2	(Wheel rut)	6460.67
98.6		6460.73
102.2	(Wheel rut)	6460.48
103.1		6460.62
114.7		6460.47
126.1		6460.16
132.5		6460.34
146.4		6460.24
147.2	(Cattle trail)	6460.04
149.0		6460.11
150.7	(Cattle trail)	6459.87
157.1	(Station 155+00)	6460.08
160.7		6460.08
161.6	(Wheel rut)	6459.67
162.8		6460.04
164.1		6459.95
166.0	(Wheel rut)	6459.73
168.9		6460.08
171.0		6459.36

Table 33.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 13, 1971</u>
173.2	6460.30
179.4	6460.33
185.0	6460.18
187.5	6460.11 (Wheel rut)
190.7	6460.33
193.1	6460.01 (Wheel rut)
194.0	6460.27
195.0	6460.03 (Wheel rut)
196.2	6460.48
197.9	6460.04 (Wheel rut)
200.6	6460.49
203.5	6460.24 (Wheel rut)
204.9	6460.43
206.4	6460.34 (Cattle trail)
207.6	6460.45
208.9	6460.22 (Wheel rut)
213.8	6460.52
219.9	6460.44
226.8	6460.96
244.0	6461.51
263.0	6462.32
282.5 (Ground)	6463.06
282.5 (RBBM)	6463.97

Table 34.--Cross-sectional survey of ground-surface elevation, in feet, station 160+00.

<u>Distance from LBEM</u>	<u>Elevation July 15, 1971</u>
0 (LBEM)	6472.30
0.0 (Ground)	6470.66
16.1	6469.94
38.8	6468.98
41.9	6467.57
50.0	6468.76
52.9	6468.10
55.9	6468.57
59.8	6468.09
62.1	6468.47
64.0	6468.13
66.0	6468.39
68.2	6468.02
72.7	6468.37
74.0	6468.07
81.7	6468.34
86.1	6467.98 (Wheel rut)
90.3	6468.34
92.0	6468.13 (Wheel rut)
93.7	6468.49
95.0	6467.99 (Cattle trail)
101.9	6468.89
103.1	6468.54 (Cattle trail)
105.0	6468.74
107.9	6468.11 (Edge of sand)

Table 34.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 15, 1971</u>
112.1	6468.18 (Edge of sand)
115.3	6469.08
118.2	6468.75
120.8	6468.93
123.7	6468.28 (Cattle trail)
127.4	6468.84
131.8	6468.11
140.3	6468.39
143.0	6467.86 (Wheel rut)
146.0	6468.36
148.9	6467.85 (Wheel rut)
154.7	6467.86
158.2 (Station 160+00)	6467.59 (Wheel rut)
162.0	6467.81
165.2	6468.37
171.0	6468.47
175.0	6468.02
177.9	6467.85 (Wheel rut)
182.1	6468.50
186.5	6468.59
189.0	6468.40 (Cattle trail)
196.0	6468.73
203.2	6468.79 (Wheel rut)
206.1	6468.95
208.8	6468.92 (Wheel rut)
226.9	6469.29

Table 34.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 15, 1971</u>
251.8	6469.55
276.2	6469.68
300.0	6470.27
320.2	6471.00
332.2	6471.33
334.7	6470.78 (Cattle trail)
336.0	6471.56
339.6	6471.62 (Cattle trail)
352.9 (Ground)	6472.31
352.9 (RBBM)	6473.27

Table 35.--Cross-sectional survey of ground-surface elevation, in feet, station 165+00.

<u>Distance from LBEM</u>	<u>Elevation July 15, 1971</u>
0 (LBEM)	6475.58
0.0 (Ground)	6474.67
21.0	6473.71
40.5	6473.18
62.1	6472.38
88.5	6471.71
115.0	6471.92
120.4	6471.80
129.0	6470.83
130.8	6470.34 (Cattle trail)
133.8	6470.08
136.8	6470.17
139.0 (Station 165+00)	6469.33
141.0	6469.86
146.4	6470.37
148.2	6471.66
154.0	6472.16
167.5	6472.39
169.3	6472.13 (Cattle trail)
173.0	6472.57
185.1	6472.39
187.5	6472.01 (Wheel rut in loose sand)
190.3	6472.47 (Loose sand)
192.9	6471.97 (Wheel rut in loose sand)
202.7	6471.34 (Edge of sand)

Table 35.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 15, 1971</u>
218.4	6470.70
243.4	6470.70
275.3	6470.97
300.0	6471.59
316.5	6472.47
331.5 (Ground)	6473.52
331.5 (RBBM)	6474.44

Table 36.--Cross-section survey of ground-surface elevation, in feet, station 170+00.

<u>Distance from LBBM</u>	<u>Elevation July 15, 1971</u>
0 (LBBM)	6481.05
0.0 (Ground)	6480.12
22.9	6479.30
47.8	6478.44 (Cattle trail)
48.9	6478.49
64.0	6478.14
70.0	6478.12
81.8	6478.06
96.5	6478.16
97.2	6477.96 (Cattle trail)
98.1	6478.28
103.0	6478.08
106.6 (Station 170+00)	6477.87
111.1	6478.08 (Cattle trail)
112.2	6478.23
125.8	6478.45
143.9	6478.48
157.6	6478.63
158.9	6478.22 (Cattle trail)
161.4	6478.50
163.9	6478.35 (Cattle trail)
166.8	6478.58
170.4	6477.99 (Wheel rut)
173.0	6478.45
175.7	6478.14 (Wheel rut)

Table 36.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 15, 1971</u>
178.9	6478.53
187.1	6478.52
195.1	6478.56
196.6	6478.33 (Wheel rut)
199.1	6478.55
201.5	6478.33 (Wheel rut)
204.0	6478.60
206.8	6478.15 (Wheel rut)
209.7	6478.43
212.4	6478.00 (Wheel rut)
214.0	6478.62
216.1	6478.46 (Wheel rut)
219.0	6478.68
221.9	6478.64 (Wheel rut)
234.9	6478.72
249.5	6479.18
270.3 (Ground)	6479.96
270.3 (RBBM)	6480.92

Table 37.--Cross-section survey of ground-surface elevation, in feet, station 175+00.

<u>Distance from LBBM</u>	<u>Elevation July 19, 1971</u>
0 (LBBM)	6486.42
0.0 (Ground)	6485.65
15.2	6485.38
30.8	6485.20
59.0	6484.93
79.5	6484.63
100.5	6484.65
124.6	6484.94
139.0	6485.05
147.7 (Station 175+00)	6484.91
162.8	6485.23
180.0	6485.24
199.6	6485.35
212.9	6485.26
229.4	6484.97
254.3	6484.82
277.6	6484.80
300.0	6484.96
313.8	6484.81
314.9	6484.57 (Wheel rut)
317.4	6484.76
320.1	6484.61 (Wheel rut)
322.8	6484.86
325.9	6484.53 (Wheel rut)
328.4	6484.82

Table 37.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 19, 1971</u>
330.9	6484.64 (Wheel rut)
332.4	6484.88
334.1	6484.55 (Wheel rut)
337.3	6484.75
339.9	6484.57 (Wheel rut)
344.8	6484.88
362.0	6485.02
393.5	6484.82
425.0	6485.22
452.3 (Ground)	6487.18
452.3 (RBEM)	6488.02

Table 38.--Cross-sectional survey of ground-surface elevations, in feet, station 179+95^{1/}.

<u>Distance from LBBM</u>	<u>Elevation July 19, 1971</u>
0 (LBBM)	6494.30
0.0 (Ground)	6493.45
14.9	6492.37
30.1	6491.74
41.8	6491.14 (Cattle trail)
48.9	6490.62
55.7	6489.77 (Barren ground)
62.6 (Station 179+95)	6489.60
66.2	6489.65
67.4	6489.48 (Cattle trail)
68.5	6489.98
71.8	6490.21
75.8	6489.74
77.1	6489.42
79.8	6489.76
86.2	6489.86
88.0	6489.10 (Cattle trail)
90.4	6489.84
91.5	6489.69 (Cattle trail)
92.8	6489.92
98.1	6489.85
108.9	6490.18
124.8	6490.67

Table 38.--Continued

<u>Distance from LBEM</u>	<u>Elevation July 19, 1971</u>
142.2	6491.63
159.9	6492.04
175.3 (Ground)	6492.32
175.3 (RBEM)	6493.15

1/ Station 180+00 obstructed by juniper trees.

Table 39.--Cross-sectional survey of ground-surface elevation, in feet, station 184+50^{1/}.

<u>Distance from LBBM</u>	<u>Elevation July 20, 1971</u>
0 (LBBM)	6501.15
0.0 (Ground)	6500.28
8.7	6499.43
16.9	6498.76
35.0	6497.25
48.1	6496.56
61.4	6495.99
72.9	6496.51
81.4	6495.50
87.6	6494.79
89.2	6493.36
90.6 (Station 184+50)	^{2/} 6493.18
92.7	6493.63
94.2	6495.61
99.0	6496.38
102.4	6496.12
103.5	6495.97 (Cattle trail)
105.9	6496.42
117.8	6497.28
131.9	6498.18
152.3	6498.78

Table 39.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 20, 1971</u>
171.0 (Ground)	6499.17
171.0 (RBEM)	6499.98

1/ Station 185+00 obstructed by juniper trees.

2/ About 0.15 feet of mud accumulated in channel during rainstorm of night of July 19, 1971.

Table 40.--Cross-sectional survey of ground-surface elevation, in feet, station 190+00.

<u>Distance from LBBM</u>	<u>Elevation July 20, 1971</u>
0 (LBBM)	6509.81
0.0 (Ground)	6509.02
14.5	6507.70
35.8	6506.40
56.7	6505.84
80.9	6505.41
99.4	6505.01
105.9 (Station 190+00)	6504.80
110.4	6504.96
120.8	6505.03
131.0	6505.07
141.2	6504.86
155.0	6505.07
171.9	6505.13
193.0	6505.49
215.4	6506.01
236.8	6506.34
254.6	6506.61
264.3 (Ground)	6506.75
264.3 (RBBM)	6507.46

Table 41.--Cross-section survey of ground-surface elevation, in feet, station 194+95^{1/2}.

<u>Distance from LBBM</u>	<u>Elevation July 21, 1971</u>
0 (LBBM)	6513.35
0.0 (Ground)	6512.51
17.0	6511.80
33.2	6511.06
47.9	6510.56
49.2	6510.51 (Wheel rut)
53.6	6510.53
59.5	6510.40 (Wheel rut)
71.7	6510.35
86.8	6510.10
105.0	6509.45
125.1	6509.19
128.7	6508.66
132.0 (Station 195+95)	6508.18
135.6	6508.83
139.5	6509.28 (Fence)
151.2	6509.42
171.6	6510.05
188.4	6510.71
212.0	6511.10
236.4	6512.01
237.0	6511.95 (Wheel rut)
239.6	6512.07

Table 41.--Continued

<u>Distance from LBBM</u>	<u>Elevation July 21, 1971</u>
243.0	6512.23 (Wheel rut)
257.8	6512.94
269.7	6513.15
274.1	6513.19 (Wheel rut)
287.2 (Ground)	6513.80
<u>2</u> /287.2 (RBBM)	6514.60

1/ Station 195+00 obstructed by juniper tree. Station 194+95 is

2.5 feet east of fence at boundary of Cañada de los Alamos Grant.

2/ Elevation measured from U.S. Geological Survey Bench Mark 6512.73.

Table 42.--Cross-sectional survey of ground-surface elevation, in feet, station 200+00.

<u>Distance from LBBM</u>	<u>Elevation July 21, 1971</u>
<u>1/</u> 0 (LBBM)	6519.50
0.0 (Ground)	6518.71
16.7	6517.24
38.8	6516.21
63.2	6515.79
83.2	6515.42
104.4	6515.52
212.2	6515.17
135.1	6515.16
152.0	6515.28
164.7	6515.03
167.1 (Station 200+00, ground)	6514.88
167.1 (Station 200+00, top of rod) <u>2/</u>	6515.87
170.0	6515.16
178.4	6515.21
195.5	6515.14
213.0	6515.38
236.6	6516.53
254.3	6517.75
271.0	6518.90
288.6 (Ground)	6519.68
<u>1/</u> 288.6 (RBBM)	6520.50

1/ Placed Copperweld rod as marker with cap stamped "200 00".

2/ Steel rod 3.3 feet long placed on July 20, 1971.

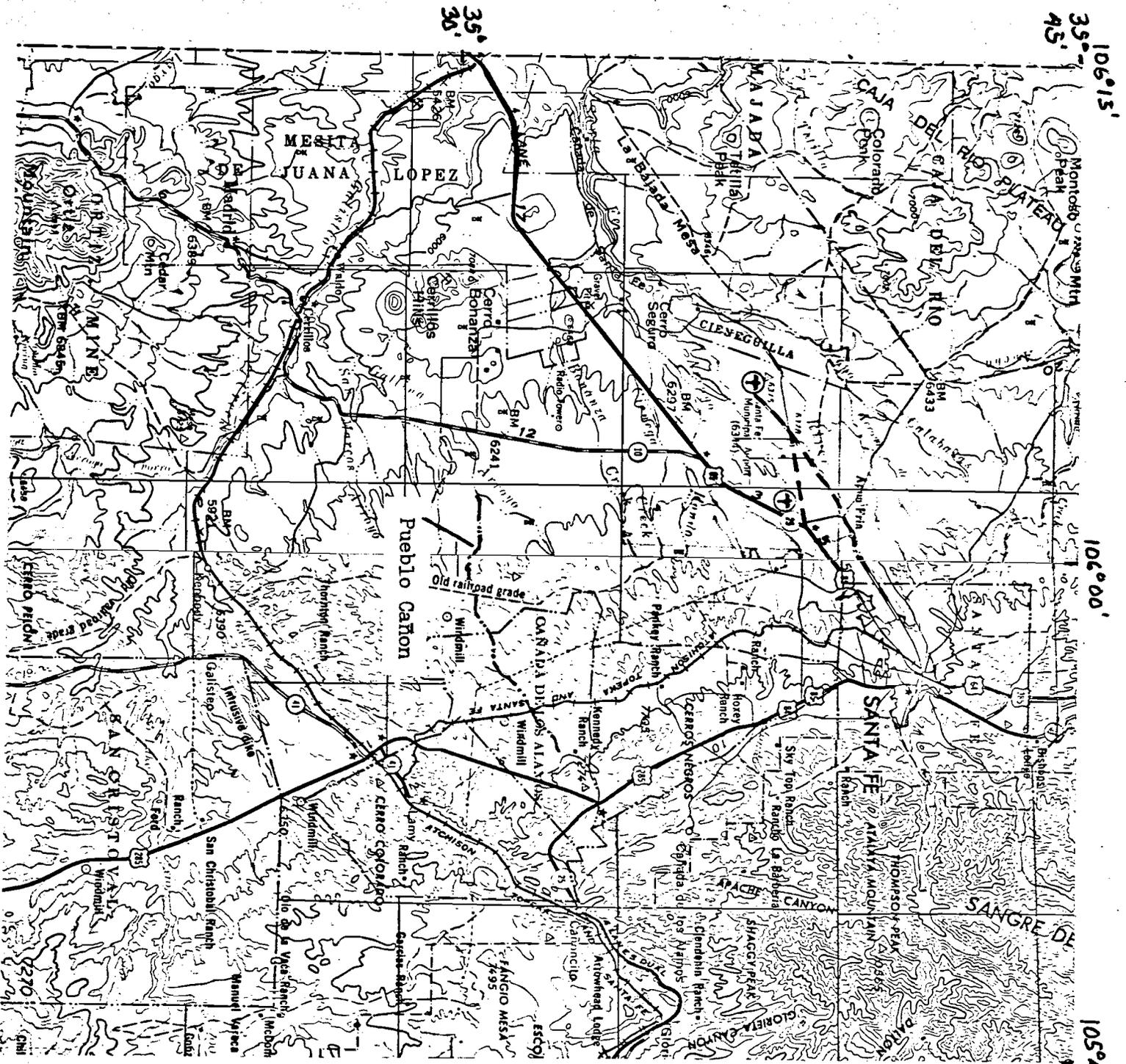


Figure 1.—Parts of Albuquerque and Santa Fe, N. Mex., U.S. Geological Survey
 topographic maps, scale 1:250,000, showing location of Pueblo Cañon.

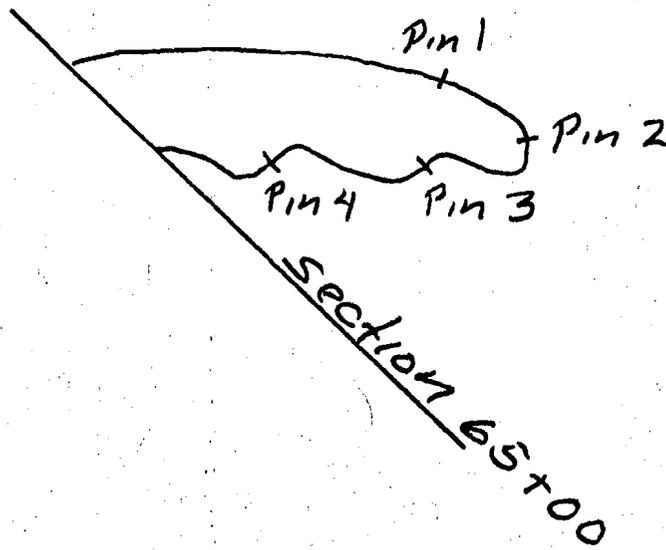


Figure 10.—Sketch showing approximate position of erosion pins
at site 71 M 113, near section 65 + 00, Pueblo Cañon.
Driven flush with headwall, July 30, 1971.

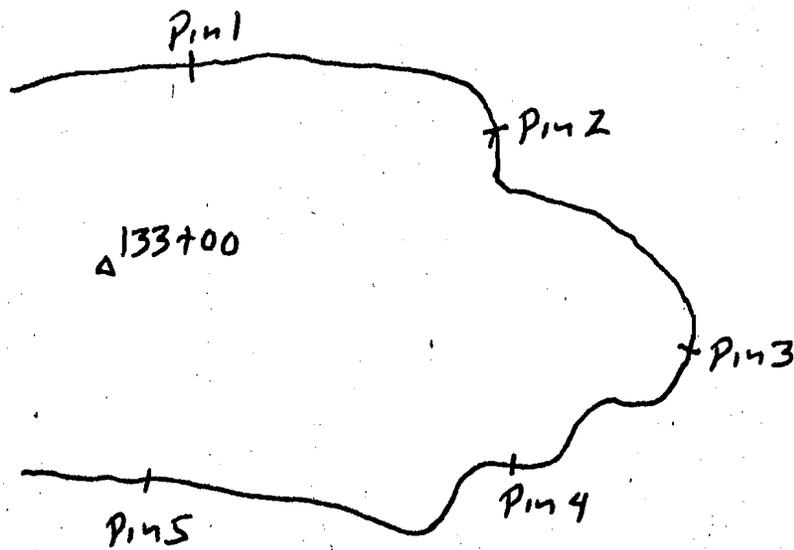


Figure 11.--Sketch showing approximate position of erosion pins
at site 71 M 114, near station 133 + 00, Pueblo Cañon.
Driven flush with headwall, July 30, 1971

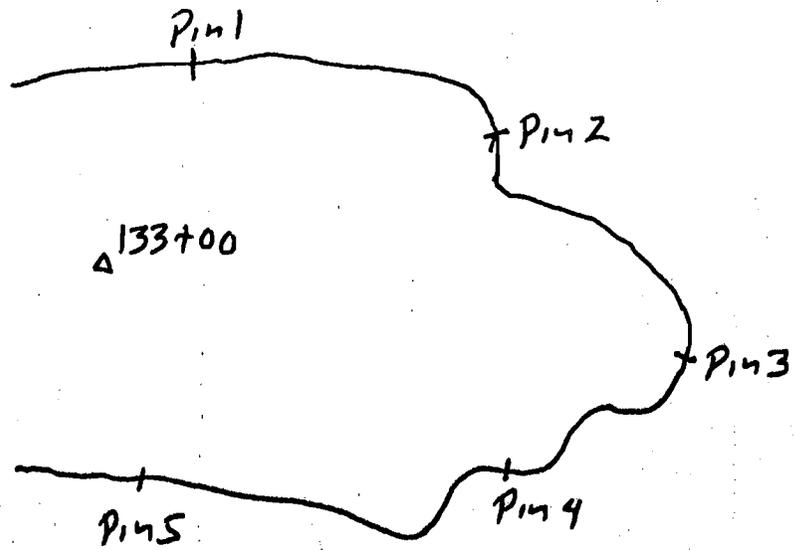


Figure 11.—Sketch showing approximate position of erosion pins
at site 71 M 114, near station 133 + 00, Pueblo Cañon.
Driven flush with headwall, July 30, 1971

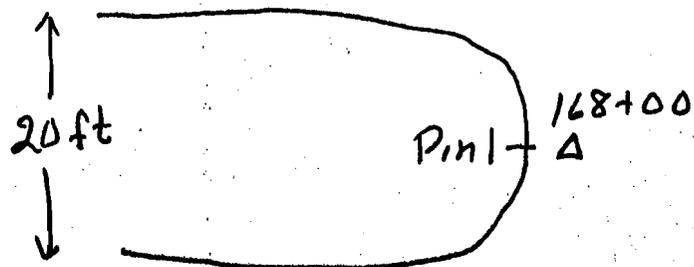


Figure 12.--Sketch showing approximate position of erosion pin
at site 71 M 115, near station 168 + 00, Pueblo Cañon.
Driven flush with headwall, July 30, 1971.

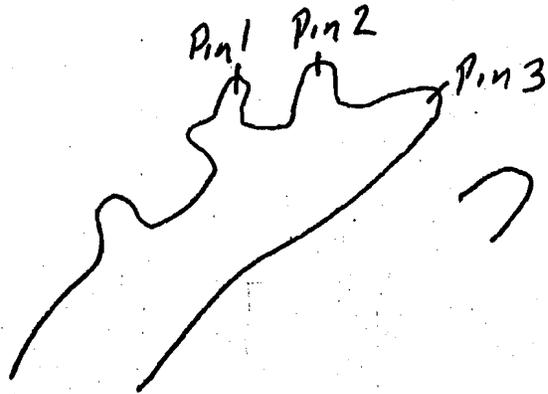


Figure 13.--Sketch showing approximate position of erosion pins
at site 71 M 116, 1100 feet N. 42 E. of Upper Vicinity Well,
Pueblo Cañon. Driven flush with headwall, July 30, 1971.



Figure 14.--Sketch showing approximate position of erosion pin
at site 71 M 117, 1825 feet northeast of Upper Vicinity Well,
Pueblo Cañon. Driven flush with headwall, July 30, 1971.

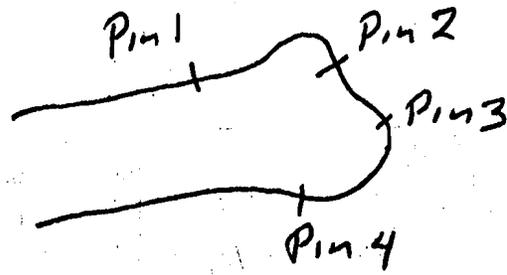


Figure 15.--Sketch showing approximate position of erosion pins
at site 71 M 118, 3400 feet N.61 E.of Upper Vicinity Well,
Pueblo Cañon. Driven flush with headwall, July 30, 1971.

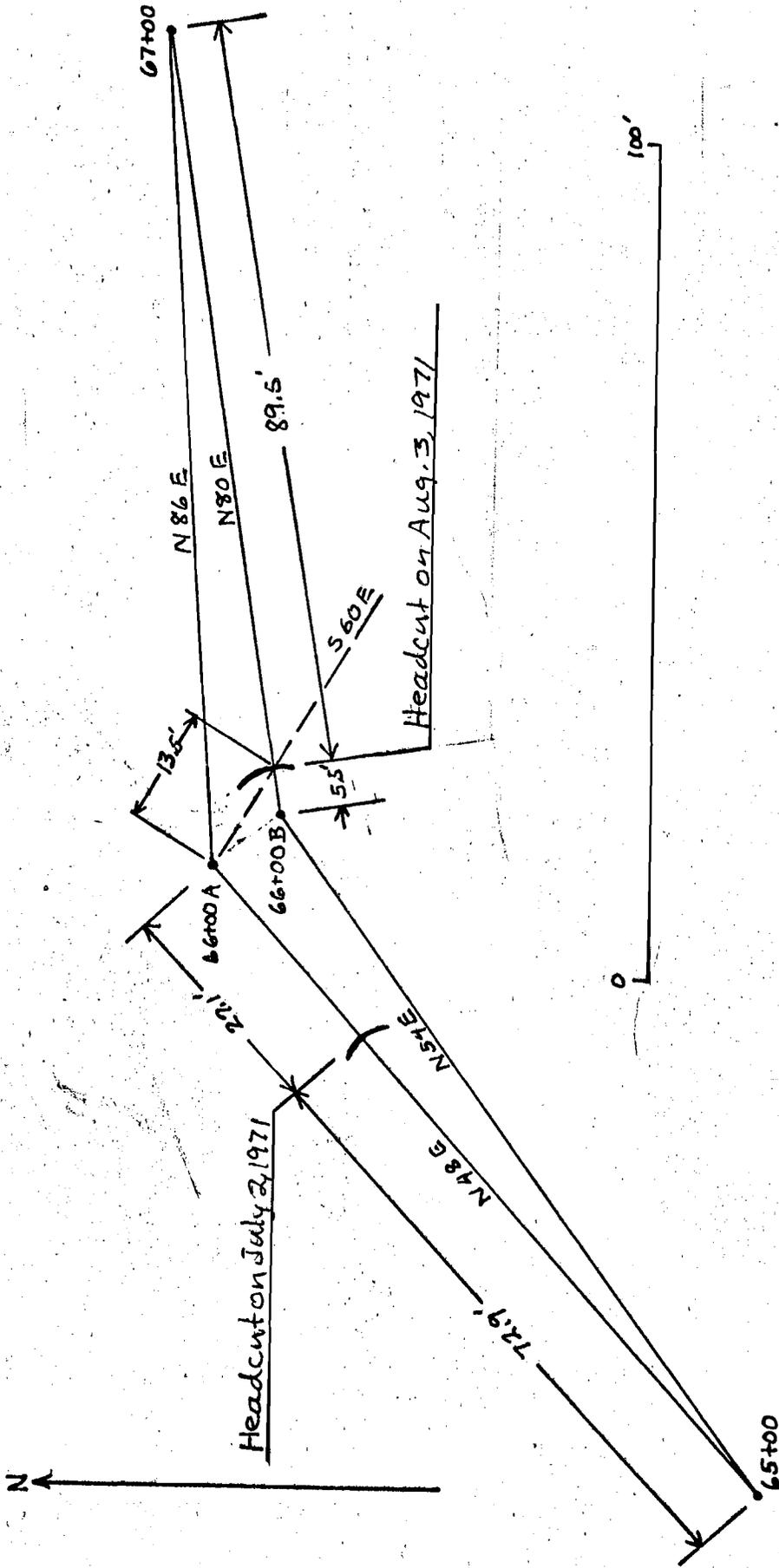


Figure 16.
 Diagram showing change in the position of a headcut near channel station 66+00, Pueblo Cañon, as a consequence of flood of July 26, 1971.

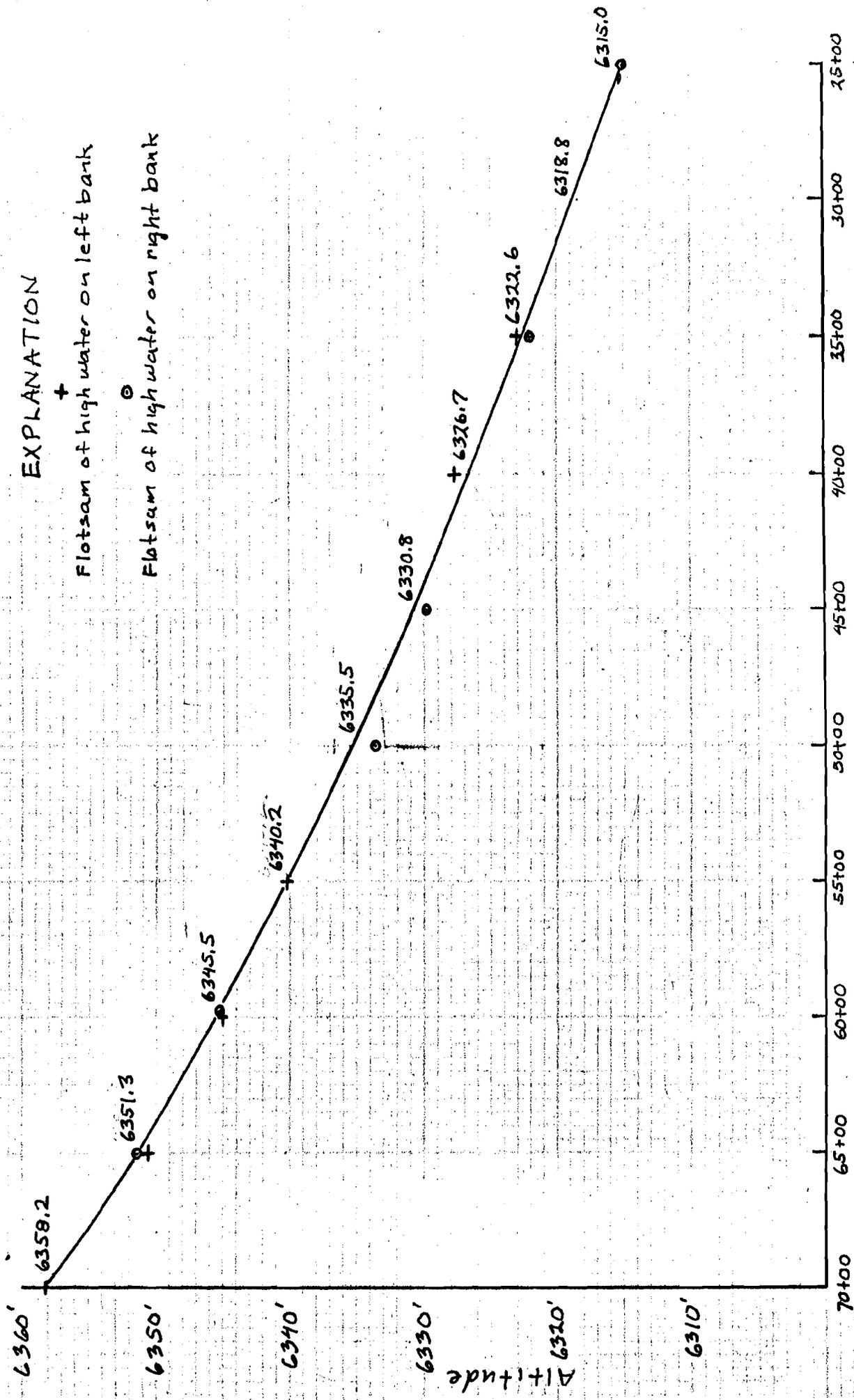
Pueblo Cañon, N. Mex.; flood of July 19, 1971

Discharge calculated by M. S. Petersen, WRD, 10/28/71, from data of H. E. Malde, based on preliminary estimates of roughness factor N.

Average sum of discharge between channel section 60 / 00 and 35 / 00 is 3924 cfs.

<u>Section</u>	<u>Froude number</u>	<u>Velocity</u>
60 / -00	0.6119	9.41 ft/sec
55 / 00	0.6558	9.87
50 / 00	0.5593	9.10
45 / 00	0.9681	12.50
40 / 00	0.7930	12.23

NO-7723



Channel stations

Figure 17
 Profile of flood crest on Pueblo Cañon southwest of Santa Fe, N. Mex., July 25, 1971