SPECIAL FLOOD HAZARD INFORMATION REPORT

BEAR CREEK

DENVER METROPOLITAN AREA

PREPARED FOR
COLORADO WATER CONSERVATION BOARD

BY

DEPARTMENT OF THE ARMY, OMAHA DISTRICT, CORPS OF ENGINEERS, 68102

DECEMBER 1972

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Introduction

A previous study of this area was included in a report published in January 1966 as Flood Plain Information Report, Metropolitan Region, Denver, Colorado, Volume III, Bear and Clear Creeks. Hydrologic and hydraulic studies made in conjunction with the authorized Bear Creek Lake project, which included the hydrologic experience of the 1965 flood, have resulted in a revised definition of the flood potential in the study reach. This report, requested by the Colorado Water Conservation Board, presents the results of the revised work, particularly as to changed flood stages and redefined flooded areas under conditions of development in 1970. The Intermediate Regional and Standard Project Floods, defined in the Glossary, are used to illustrate the flood hazard potential. These two floods should be given appropriate consideration in planning for safety of developments in the flood plain.

Flooded area maps show the approximate areas that would be flooded under current conditions by the two potential floods. Profiles indicate the depths of potential floods relative to the streambed and to bridges, and show the elevations that represent the flood water surface across the width of the valley. Cross sections show relative ground and flood levels across the valley at selected points along the stream.

The use to which flood plain information will be put, such as zoning or other regulations, is the responsibility of local authorities. The information given in this report does not imply any Federal interest or authority to zone or regulate use of the flood plains, nor should it be construed as obligating the Government to investigate, construct or maintain any facility discussed in the report. The Omaha District, Corps of Engineers will provide, upon request, technical assistance to Federal, State and local agencies in the interpretation and use of the information contained in this report. A pamphlet "Guidelines for Reducing Flood Damages," and a booklet "Introduction to Flood Proofing" can be supplied.

Basin and Stream Characteristics

Bear Creek drains 261 square miles and joins the South Platte River at Sheridan, Colorado, a southwest suburb of Denver. The basin is about

36 miles long and has a maximum width of about 13 miles. Approximately 90 percent of the basin is in the mountains and the remainder of the basin is in the foothills and high plains region. Turkey Creek is a major tributary that drains 52 square miles and enters Bear Creek about two miles downstream from Morrison. A map of Bear Creek basin is on plate 1.

The study reach for this report extends 7.5 miles from the mouth of Bear Creek to about 1.8 mile upstream from South Kipling Street.

Bear Creek has been altered by relocation, straightening, or enlargement throughout the downstream half of the study reach. Riprap has been used extensively to combat the erosive forces of Bear Creek floods. Upstream from Wadsworth Boulevard the stream is in its natural state except for gravel mining operations and averages 80 feet wide, 7 feet deep, and slopes 7.2 feet per thousand. Downstream from Wadsworth the channel averages 80 feet wide, 9 feet deep, and slopes 5.3 feet per thousand. Channel conditions are illustrated by the following photographs taken in 1970.

Figure 1 - Bear Creek near mouth, looking upstream.

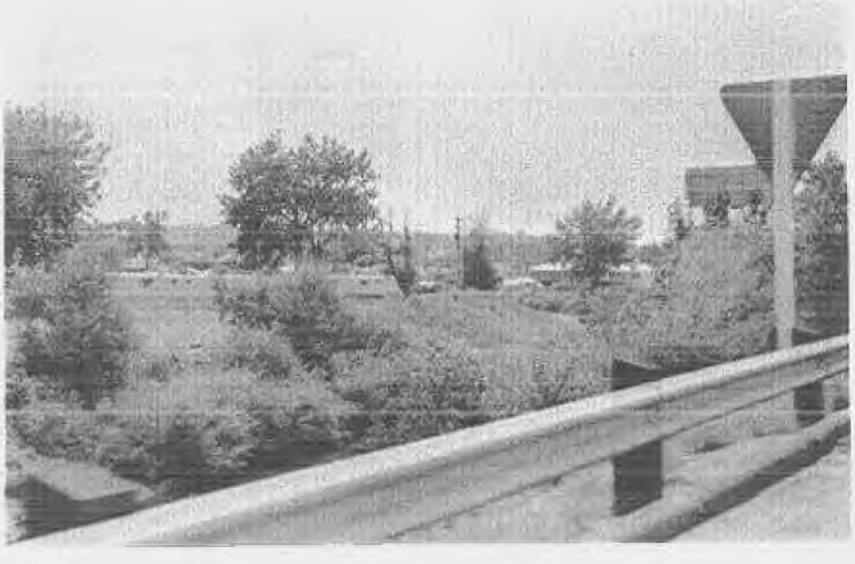


Figure 2 - Looking upstream on Bear Creek from Hampden Avenue.

Figure 3 - Bear Creek, view west to Sheridan Blvd.

Figure 4 - View downstream from Wadsworth Blvd.

Development on the Flood Plain

The flood plain in the study reach averages about 1,500 feet wide. Development began near the mouth of Bear Creek and has progressed upstream. The flood plain is about 70 percent developed in the reach from the mouth to Wadsworth Boulevard. From Wadsworth Boulevard to the upstream limit of the study reach there is little development and agriculture is the predominant use. Land use in the overall study reach is about 12 percent commercial, 24 percent residential, 9 percent transportation, 4 percent public property, with the balance in miscellaneous uses. In 1970 about 6,050 people lived in the Bear Creek flood plain in the study reach. An estimated 1,600 persons are employed there. With expected greater development in the area it will become increasingly important to regulate building in the flood prone areas if increased risk of future flooding is to be avoided.

Flood History in the Study Reach

The Bear Creek channel has a capacity of about 2,500 cubic feet per second (c.f.s.) without causing flood damage. Floods in the basin usually result from intense rainstorms in the summer months. The Sheridan stream gage, with stream flow records from 1927 to the present, is located at Lowell Boulevard. A second stream gage is located at Morrison, about 2 miles upstream of the study reach, with partial records dating back to 1888. Table 1 shows the largest floods that were recorded at the gages since 1927.

Table 1

FLOOD PEAK DISCHARGES ON BEAR CREEK

Year	Date	Sheridan Gage Maximum Discharge (c.f.s.)	Morrison Gage Maximum Discharge (c.f.s.)
1933	7 July	3,000	8,110
1934	9 Aug.	1,300	4,620
1938	2 Sept.	2,810	6,200
1957	21 Aug.	2,560	1,640
1965	25 July	2,900	1,030
1969	7 May	8,150	2,340

Table I shows a large variance in the peak discharges for each flood from gage to gage. In 1933, 1934 and 1938 the storm was apparently concentrated in the mountains and the flood attenuated while traveling from the Morrison gage to the Sheridan gage. For the remaining floods shown in table I the runoff was from the area downstream from Morrison, producing the highest flow at the Sheridan gage. Turkey Creek was undoubtedly a large contributor to the increased flows between the two gages. Fortunately, past floods were produced by flows originating either above or below Morrison but never from both drainage areas at the same time.

Floods on Bear Creek, of which little information is available, occurred in May, 1876, May and June of 1894, and in July of 1896. The peak discharge for the 1896 flood was estimated to be 8,600 c.f.s. at the Morrison gage, about 2 miles upstream of the study reach. High, sustained flows through the study reach on 9 May 1957 caused severe bank erosion and damage to a bridge under construction at Wadsworth Avenue as well as to residential lots abuting the stream. Minor flooding occurred in the study reach on 23 and 24 July 1965 and 25 families were evacuated, 19 basements and a tourist court were flooded, and several bridges were damaged. Heavy rains from 4 through 8 May 1969, with a total storm rainfall of 11.27 inches at Morrison, caused the greatest flood of record in the study reach. Many people were evacuated from houses and trailers near Bear Creek from Lowell Boulevard to the mouth. Many homes sustained basement and first floor damage.

Potential Floods

Two large potential floods are used to study flood hazards in the Bear Creek study reach. The Intermediate Regional Flood, commonly called the 100 year flood, has a 1 percent chance of occurring in any year and is generally accepted by the public as a minimum limit for application of local regulations. Based upon a probability analysis of Bear Creek gaging records and records of other typical Front Range streams, peak discharge for the Intermediate Regional Flood at various points in the study reach were computed and are presented in table 2.

The Standard Project Flood is presented as a practical upper limit of flooding. It is difficult to assign frequencies of occurrence for

such a flood, but their magnitude can be approximated by the floods that occurred on several streams in the Denver area in 1965. The peak discharge for the Standard Project Flood on Bear Creek in the study reach would be 76,500 c.f.s.

Floods smaller than the Intermediate Regional Flood are much more common, as evidenced by peak discharges of historical floods in Table 1, but can cause damage and hardships. Floods larger than the Standard Project Flood are possible, but the combination of factors to produce such floods would be extremely rare.

Table 2

INTERMEDIATE REGIONAL FLOOD DISCHARGES
BEAR CREEK

Location	Peak Discharge c.f.s.
Upstream limit of study reach	30,000
Kipling Street	27,000
Wadsworth Avenue	25,000
West Hampden	22,500
Mouth	19,500

Hazards of Large Floods

The areas flooded by the Intermediate Regional and Standard Project Floods are shown on plates 2, 3 and 4. Profiles and cross sections, on plates 5 through 10, show flood depths in relation to channel features and ground levels on the flood plain. Reference points are shown on these drawings to correlate them with data presented in table 3. The data in table 3 includes distance from the mouth, streambed elevation, and the water surface elevations for the Intermediate Regional and Standard Project Floods. The flood outlines were produced by projecting the computed water surface elevations onto U. S. Geological Survey quadrangle maps and surveyed cross sections. The outlines are reasonable rather than precise. Where accuracy is needed, it will be necessary to take the appropriate flood elevation from the reference table or profiles and find by survey the corresponding location on the flood plain.

Bear Creek is crossed by 7 highway and street bridges. The profiles and reference table show that the bridge crossings sometimes create obstructions to flood flows. Flood stages upstream of the bridges would be even higher if debris were to catch on the bridges and block the flow area. The flood elevations shown in this report were based upon the bridges remaining open. Buildings, fences and other structures in the flood plain also obstruct flood flows.

The area covered by the Intermediate Regional Flood varies in width from 500 feet to 1,700 feet upstream of South Estes Street, while the area covered by the Standard Project Flood varies from 700 feet wide to 2,100 feet wide in the same reach. The Standard Project Flood reaches the fringe of a large residential area on the left bank downstream from South Estes Street. From South Wadsworth Boulevard to South Lowell Boulevard large residential areas on the left bank are subject to flooding. From South Lowell Boulevard to the mouth several large mobile home parks are subject to flooding, as well as many permanent residences. Scattered commercial developments in the study reach are subject to flooding including the large Bear Valley shopping center at South Sheridan Boulevard.

The Denver office, National Oceanic and Atmospheric Administration (NOAA) National Weather Service is responsible for providing flash flood warnings for streams in the Denver area. The Weather Service radar facility at Limon, Colorado is capable of immediate detection and evaluation of rainfall intensity and location and movement of storms and areas of heavy rainfall. River stage forecasts for Bear Creek are made by the River Forecast Center at Kansas City through the River District Office at Denver, and are based on radar coverage, reports from one river station, and reports from about 5 rainfall reporting stations in or near the basin. Weather Service information is released to the news media and to local officials in the area of potential flooding. The lead time between forecast and flood crest is normally about 6 hours.

Large floods in other densely populated areas such as Great Falls, Montana in 1964 and in Rapid City, South Dakota in 1972 have demonstrated that some people ignore flood warnings or evacuation appeals until the danger is close at hand. Fast peaking time during a large flood on

Bear Creek calls for immediate emergency action to reduce property damage and save lives. Those who linger or do not respect the hazard of floods endanger not only themselves but those who might later be required to risk their lives in rescue attempts.

Water velocities would be a hazard during large floods in the study reach. Water velocities over the Bear Creek flood plain can reach 7 feet per second. Velocities greater than 3 feet per second combined with flood depth of 2 feet or more are generally considered hazardous. This would occur at many locations along Bear Creek during a large flood. Travel through any flooded area should be avoided except for emergency actions.

Duration of flooding is also a flood hazard factor. A large flood may persist for up to 12 hours. Steady rains combined with snowmelt run-off can result in high flows for 30 days or more, causing severe erosion damage.

GLOSSARY OF TERMS

Bearing

The horizontal angular measurement of a line, in degrees, east or west of a north-south reference line.

Flood

An overflow on lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river or stream or an ocean, lake or other body of standing water.

Normally a flood is considered as any temporary rise in stream flow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased stream flow, and other problems.

Flood Crest

The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Plain

The relatively flat area or low lands adjoining the channel of a river, stream or water course or ocean, lake or other body of standing water, which has been or may be covered by floodwater.

Flood Profile

A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage

The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Head Loss

The effect of obstructions, such as narrow bridge openings or buildings that limit the area through which water must flow, raising the surface of the water upstream from the obstruction.

Intermediate Regional Flood

A flood having a one percent probability of occurrence in any year or an average frequency of occurrence in the order of once in 100 years. The flood may occur in any year. It is based on statistical analyses of stream flow records and analyses of rainfall and runoff characteristics in the general region of the watershed.

Left Bank

The bank on the left side of a river, stream or water course, looking downstream.

Reference Point

A numbered point identifying a specific location for correlating the data shown in various forms throughout the report.

Right Bank

The bank on the right side of a river, stream or water course, looking downstream.

Standard Project Flood

The flood that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations.

Peak discharges for these floods are generally about 40 percent to 60 percent of the Probable Maximum Floods for the same basins. Such floods, as used by the Corps of Engineers, are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Top of Waterway

This is the roof of the opening in a stream crossing through which water flows under normal conditions. It is the underside of the deck span - sometimes called "low steel," the roof of a box culvert or the crown of an arched or circular culvert.

AUTHORITY, ACKNOWLEDGEMENTS AND INTERPRETATION OF DATA

This report has been prepared in accordance with the authority granted by Section 206 of the Flood Control Act of 1960 (Public Law 86-645), as amended.

* * *

The assistance and cooperation of the Colorado Water Conservation Board, the Urban Drainage and Flood Control District, and local officials are appreciated.

* * *

This report presents the flood situation along the downstream reaches of Bear Creek in the Denver metropolitan area. The Omaha District, Corps of Engineers will provide interpretation and limited technical assistance in application of data presented in the report.

Table 3

FLOOD PLAIN REFERENCE DATA
BEAR CREEK

Identification	Reference Point Number	Survey Symbol	Distance From Mouth Feet	Stream Bed Elevation Ft. M.S.L.	Intermediate Regional Flood Elevation Ft. M.S.L.	Standard Project Flood Elevation Ft. M.S.L.	Bearing
Cross Section 1-1	1	BC-7	39,550	5500.9	5512.1	5513.6	N 33° W
	2	BC-8	39,080	5497.9	5508.6	5512.7	N 32° W
Wier	3	BC-9	38,950	5498.6	U/S 5508.6 D/S 5500.1	U/S 5512.7 D/S 5504.0	--
	4	BC-10	38,900	5488.3	5499.4	5504.0	N 25° W
	5	BC-12	38,100	5482.7	5493.4	5497.5	N 42° W
	6	BC-13	37,500	5475.5	5490.0	5494.7	N 21° W
	7	BC-15	36,460	5470.7	5484.0	5490.0	N 10° W
	8	BC-17	35,260	5463.9	5475.9	5481.1	N 42° W
	9	BC-19	34,250	5451.9	5467.1	5470.9	N 25° W
	10	BC-21	33,150	5448.8	5457.7	5463.6	N 35° W
	11	BC-23	32,000	5435.3	5451.2	5456.2	N 12° W
	12	BC-25	31,150	5429.3	5444.1	5449.1	N 8° W
Cross Section 2-2	13	BC-27	30,300	5425.6	5444.1	5447.9	N 0° W
South Kipling St.	14	BC-28	30,240	5425.8	U/S 5444.1 D/S 5436.0	U/S 5447.9 D/S 5440.4	N 0° W
	15	BC-30	29,780	5424.7	5432.6	5436.8	N 0° W
	16	BC-32	28,700	5415.4	5424.8	5429.1	

Table 2 (Continued)

FLOOD PLAIN REFERENCE DATA
BEAR CREEK

Identification	Reference Point Number	Survey Symbol	Distance From Mouth Feet	Stream Bed Elevation Ft. M.S.L.	Intermediate Regional Flood Elevation Ft. M.S.L.	Standard Project Flood Elevation Ft. M.S.L.	Bearing
Diversion	17	BC-34	28,250	5414.7	U/S 5421.1 D/S 5421.0	U/S 5425.4 D/S 5425.4	--
	18	BC-35	27,950	5410.1	5418.6	5423.1	N 30° W
	19	BC-37	27,000	5398.3	5411.7	5415.4	N 4° E
Cross Section 3-3	20	BC-38	26,500	5396.7	5409.4	5413.0	N 2° E
	21	BC-39	26,075	5396.2	5407.7	5410.5	N 0° W
Estes Street	22	BC-40	26,000	5396.2	U/S 5407.2 D/S 5406.7	U/S 5410.5 D/S 5410.4	N 0° W
	23	BC-41	25,940	5395.9	5406.7	5410.4	N 0° W
	24	BC-43	24,830	5390.9	5401.5	5405.0	N 3° W
	25	BC-45	23,800	5387.4	5395.1	5399.0	N 20° W
Cross Section 4-4	26	BC-47	22,560	5374.2	5388.7	5391.9	N 1° W
	27	BC-49	21,600	5371.0	5385.4	5387.4	N 0° W
So. Wadsworth Blvd. and State Hwy. 121	28	BC-50	21,450	5370.5	U/S 5385.3 D/S 5382.7	U/S 5386.8 D/S 5386.1	N 0° W
	29	BC-52	20,800	5366.2	5379.9	5385.5	N 0° W
	30	BC-54	19,550	5361.9	5374.5	5380.0	N 29° E
	31	BC-56	18,500	5353.3	5367.1	5374.9	N 2° E
	32	BC-57	18,100	5351.1	5364.3	5372.7	N 3° E

Table 2 (Continued)

FLOOD PLAIN REFERENCE DATA
BEAR CREEK

Identification	Reference Point Number	Survey Symbol	Distance From Mouth Feet	Stream Bed Elevation Ft. M.S.L.	Intermediate Regional Flood Elevation Ft. M.S.L.	Standard Project Flood Elevation Ft. M.S.L.	Bearing
	33	BC-58	17,700	5349.5	5361.6	5370.8	N 3° E
	34	BC-59	17,100	5346.0	5357.7	5365.3	N 6° E
	35	BC-60	16,500	5344.0	5353.5	5360.7	N 2° E
	36	BC-61	15,900	5340.3	5353.0	5360.5	N 20° E
	37	BC-62	15,300	5338.6	5351.1	5356.6	N 43° E
Cross Section 5-5	38	BC-64	14,050	5334.2	5349.0	5355.2	N 12° E
	39	BC-66	13,100	5330.7	5347.9	5353.8	N 13° E
	40	BC-67	12,650	5330.5	5347.4	5352.8	N 10° E
	41	BC-68	12,160	5329.8	5345.0	5348.6	N 1° E
So. Sheridan Blvd. and State Hwy. 95	42	BC-69	12,050	5330.0	U/S 5344.7 D/S 5341.6	U/S 5348.6 D/S 5348.6	N 0° W
	43	BC-72	11,650	5321.7	5341.8	5348.4	N 7° E
	44	BC-73	11,100	5319.1	5338.4	5345.4	N 7° E
W. Hampden Ave. State Hwy. 70 U. S. Hwy. 285	45	BC-74	10,900	5317.8	U/S 5336.9 D/S 5335.0	U/S 5341.5 D/S 5337.8	--
	46	BC-75	10,600	5316.7	5332.3	5336.3	N 20° E
	47	BC-76	10,330	5316.6	5329.7	5334.7	N 4° E
	48	BC-77	10,250	5316.3	5329.0	5334.3	N 2° W

Table 2 (Continued)

FLOOD PLAIN REFERENCE DATA
BEAR CREEK

Identification	Reference Point Number	Survey Symbol	Distance From Mouth Feet	Stream Bed Elevation Ft. M.S.L.	Intermediate Regional Flood Elevation Ft. M.S.L.	Standard Project Flood Elevation Ft. M.S.L.	Bearing
Cross Section 6-6	49	BC-80	9,100	5313.8	5322.9	5327.6	N 7° W
Small Dam	50	BC-81	8,900	--	U/S 5321.4 D/S 5319.6	U/S 5326.9 D/S 5326.9	--
	51	BC-82	8,775	5308.9	5319.5	5326.8	N 25° W
	52	BC-83	8,300	5304.1	5318.0	5325.2	N 15° W
	53	BC-85	7,240	5301.0	5315.9	5324.3	N 1° W
	54	BC-87	6,175	5295.0	5315.3	5323.8	N 23° E
So. Lowell Blvd.	55	BC-88	5,900	5293.5	U/S 5315.1 D/S 5311.6	U/S 5323.6 D/S 5319.7	--
	56	BC-89	5,800	5293.0	5311.3	5317.7	N 13° E
	57	BC-91	5,020	5290.0	5304.6	5310.6	N 0° W
Cross Section 7-7	58	BC-93	4,375	5287.0	5303.9	5309.9	N 12° E
	59	BC-94	3,850	5284.4	5300.0	5309.1	N 0° W
So. Federal Blvd. and State Hwy. 75	60	BC-95	3,800	5284.1	U/S 5300.0 D/S 5299.6	U/S 5309.1 D/S 5307.6	--
	61	BC-98	3,430	5283.8	5297.4	5302.0	N 4° W
	62	BC-99	3,100	5281.1	5295.4	5300.2	N 4° W
	63	BC-100	2,700	5281.9	5294.1	5298.0	N 3° E
	64	BC-101	2,350	5278.9	5290.0	5296.0	N 8° E
Cross Section 8-8	65	BC-102	2,000	5278.0	5287.8	5292.6	N 17° E
	66	BC-104	1,200	5271.3	5284.0	5286.5	N 11° E

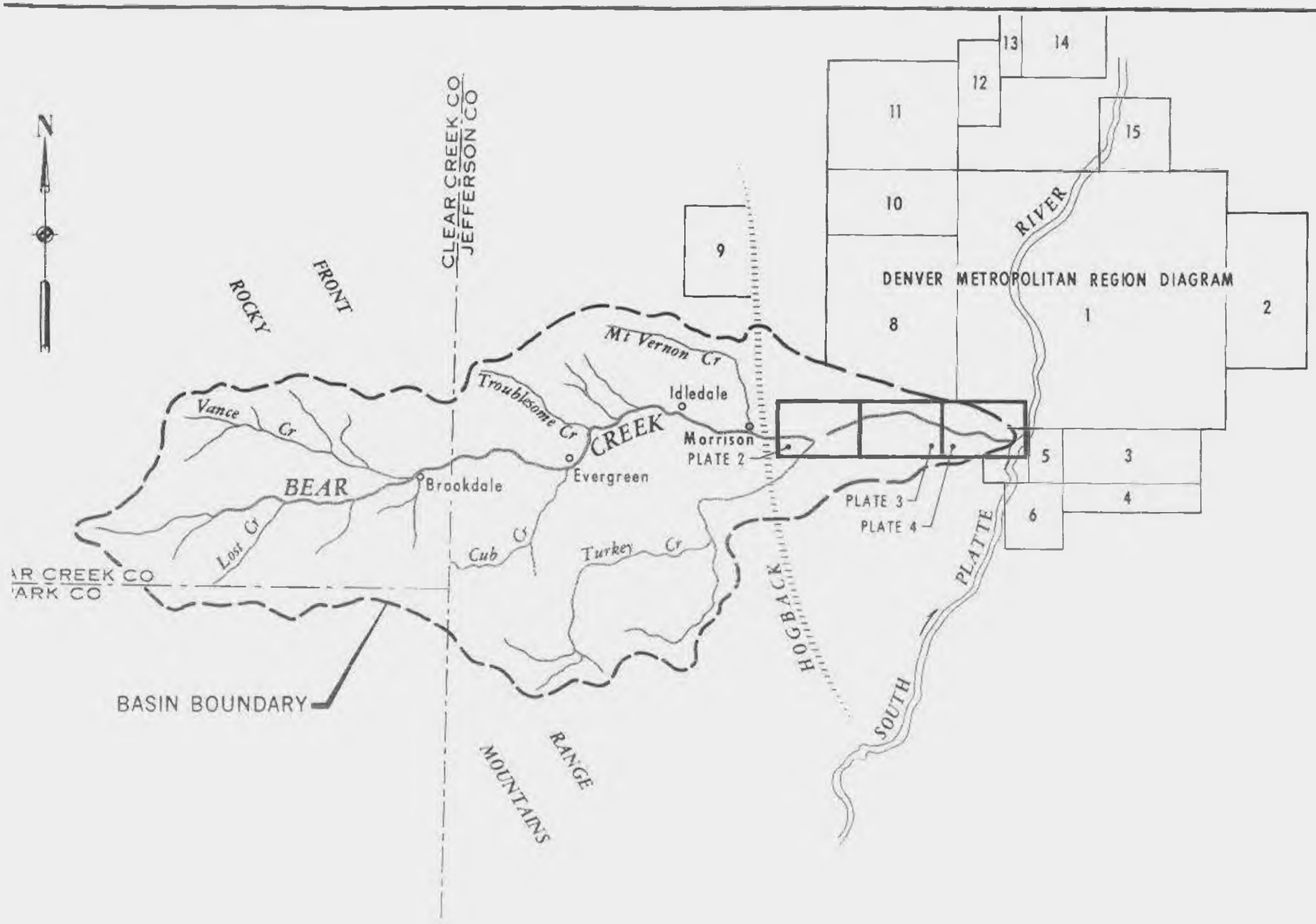


DIAGRAM LEGEND:

1. Denver
2. Aurora
3. Cherry Hills Village
4. Greenwood Village
5. Englewood
6. Littleton
7. Sheridan
8. Lakewood
9. Golden
10. Wheat Ridge
11. Arvada
12. Westminster
13. Federal Heights
14. Thorton
15. Commerce City

NO SCALE

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

BEAR CREEK
BASIN MAP
AND
PLATE INDEX MAP

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972

LEGEND:

INTERMEDIATE REGIONAL FLOOD
STANDARD PROJECT FLOOD

3 — Channel and Valley Cross Section

2 — Reference Point - Also locations of surveyed cross sections

NOTES:

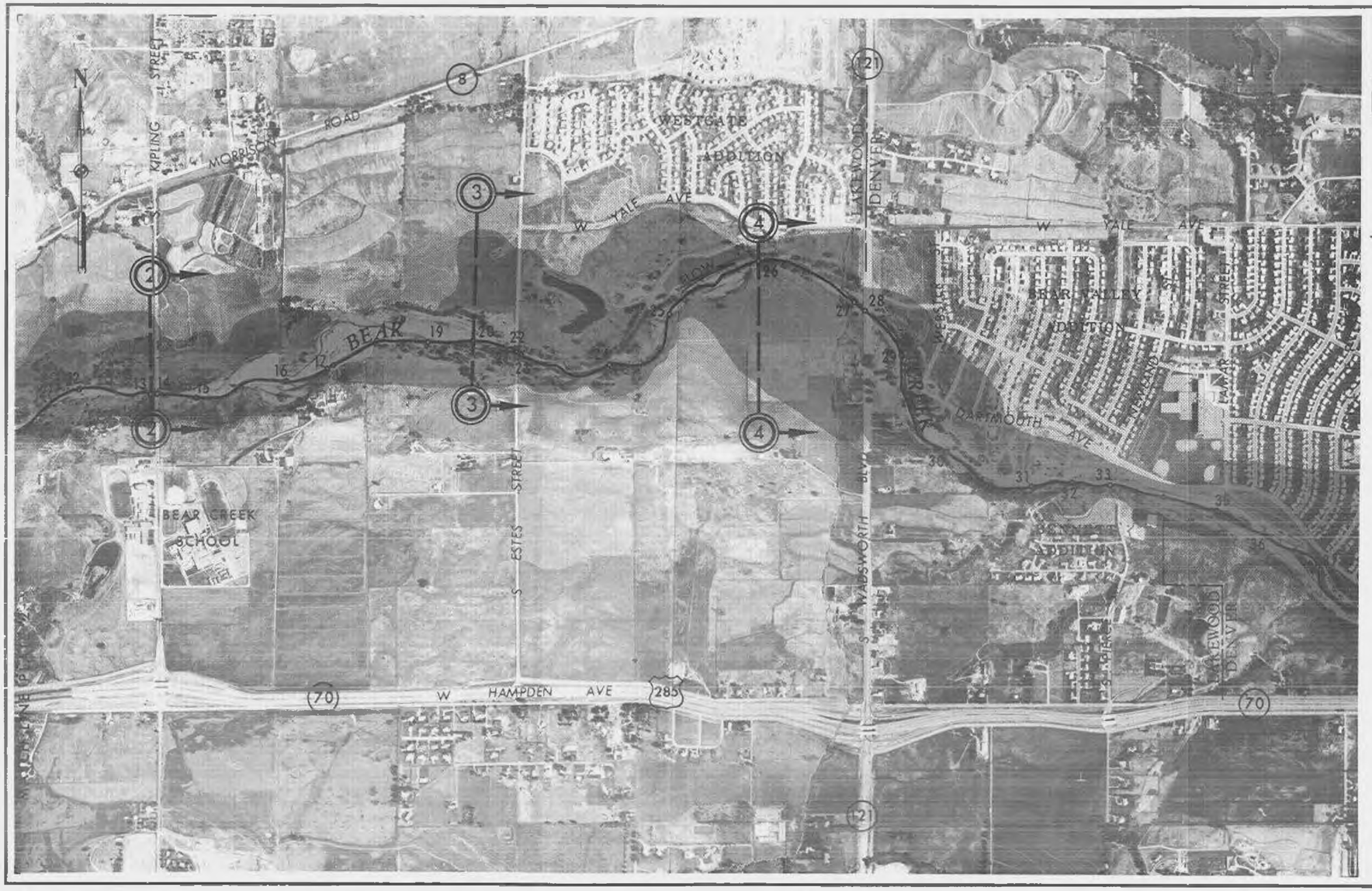
1. For the location of this plate see Plate Index Map (Plate 1).
2. For Illustrated Cross Section, see plate 7.
3. For Profile, see plate 5.
4. For flood elevations at the reference points, see Table 3.

SCALE IN FEET
1000 0 1000 2000

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

BEAR CREEK
FLOODED AREAS

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972



LEGEND:

INTERMEDIATE REGIONAL FLOOD } STANDARD PROJECT FLOOD

3 Channel and Valley Cross Section

2 Reference Point - Also locations of surveyed cross sections

NOTES:

1. For the location of this plate see Plate Index Map (Plate 1).
2. For Illustrated Cross Sections, see plates 7 & 8.
3. For Profile, see plates 5 & 6.
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SCALE IN FEET
1000 0 1000 2000

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

BEAR CREEK
FLOODED AREAS

U. S. ARMY ENGINEER DISTRICT, OMAHA
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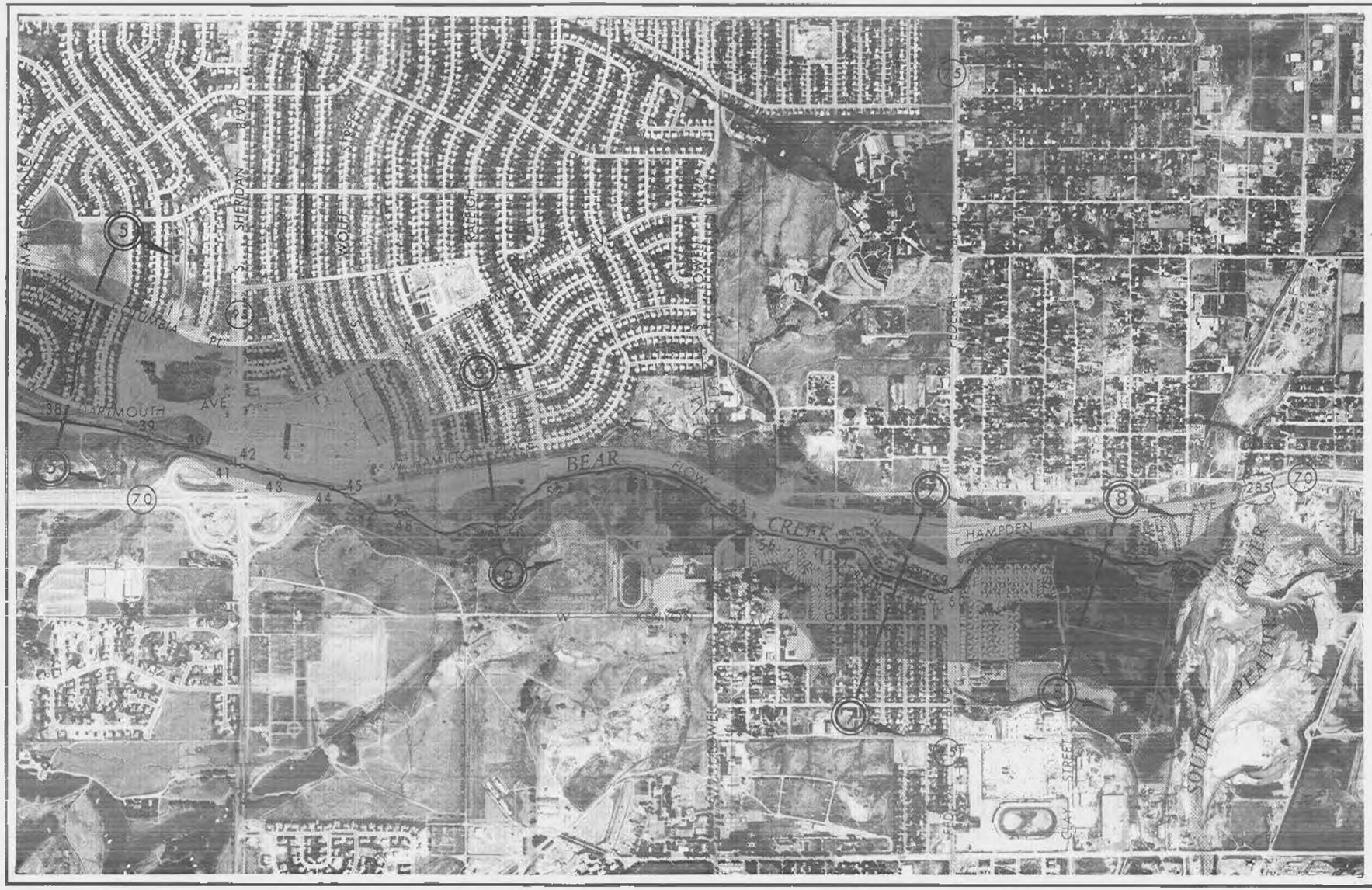


LEGEND:

INTERMEDIATE REGIONAL FLOOD
STANDARD PROJECT FLOOD

3 — Channel and Valley Cross Section

2 — Reference Point - Also locations of surveyed cross sections

NOTES:

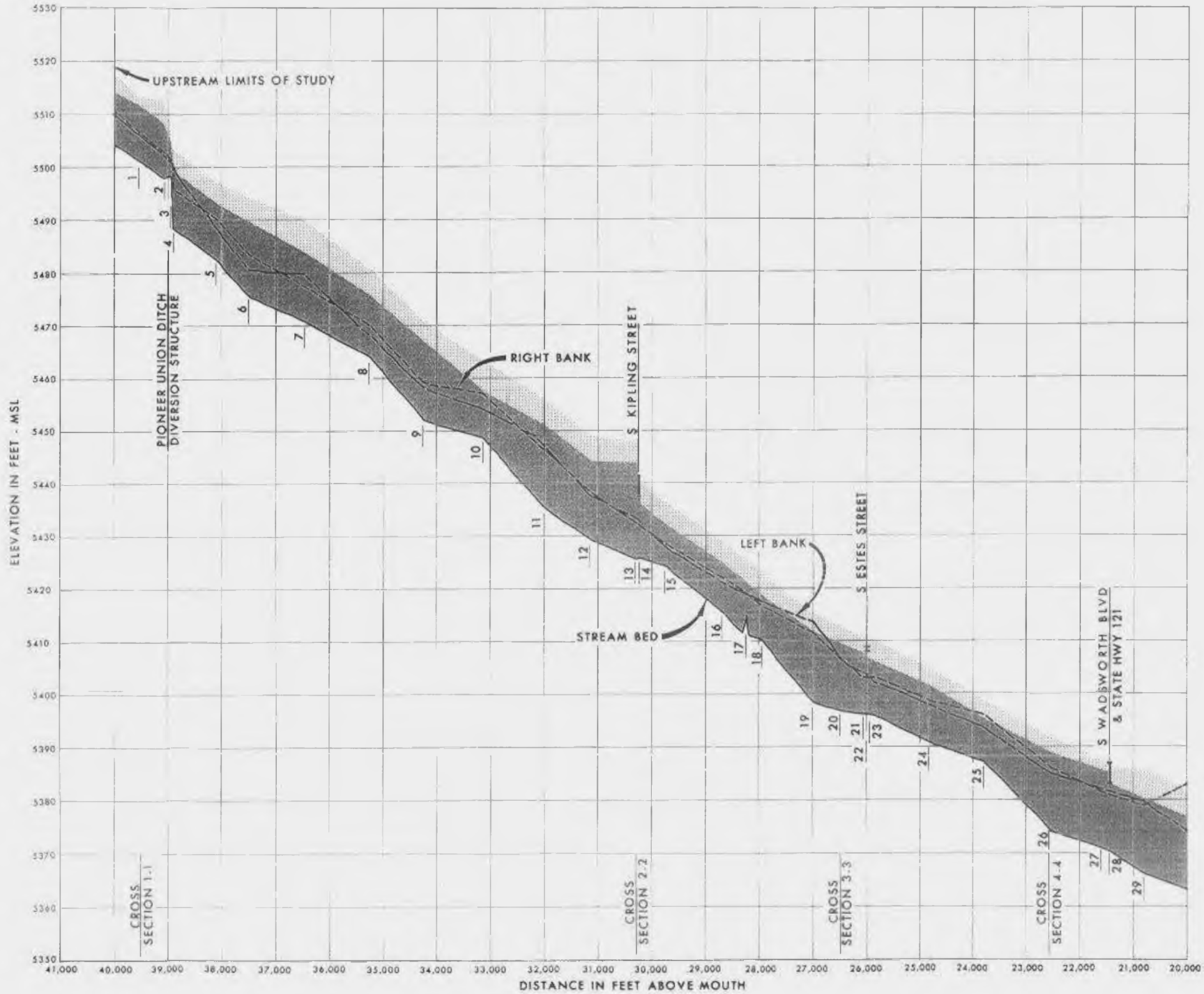
1. For the location of this plate see Plate Index Map (Plate 1).
2. For Illustrated Cross Sections, see plates 9 & 10.
3. For Profile, see plate 6.
4. For flood elevations at the reference points, see Table 3.

SCALE IN FEET
1000 0 1000 2000

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

BEAR CREEK
FLOODED AREAS

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972



LEGEND:

INTERMEDIATE REGIONAL FLOOD / STANDARD PROJECT FLOOD

Deck
Bridge
Top of Waterway
Reference Point

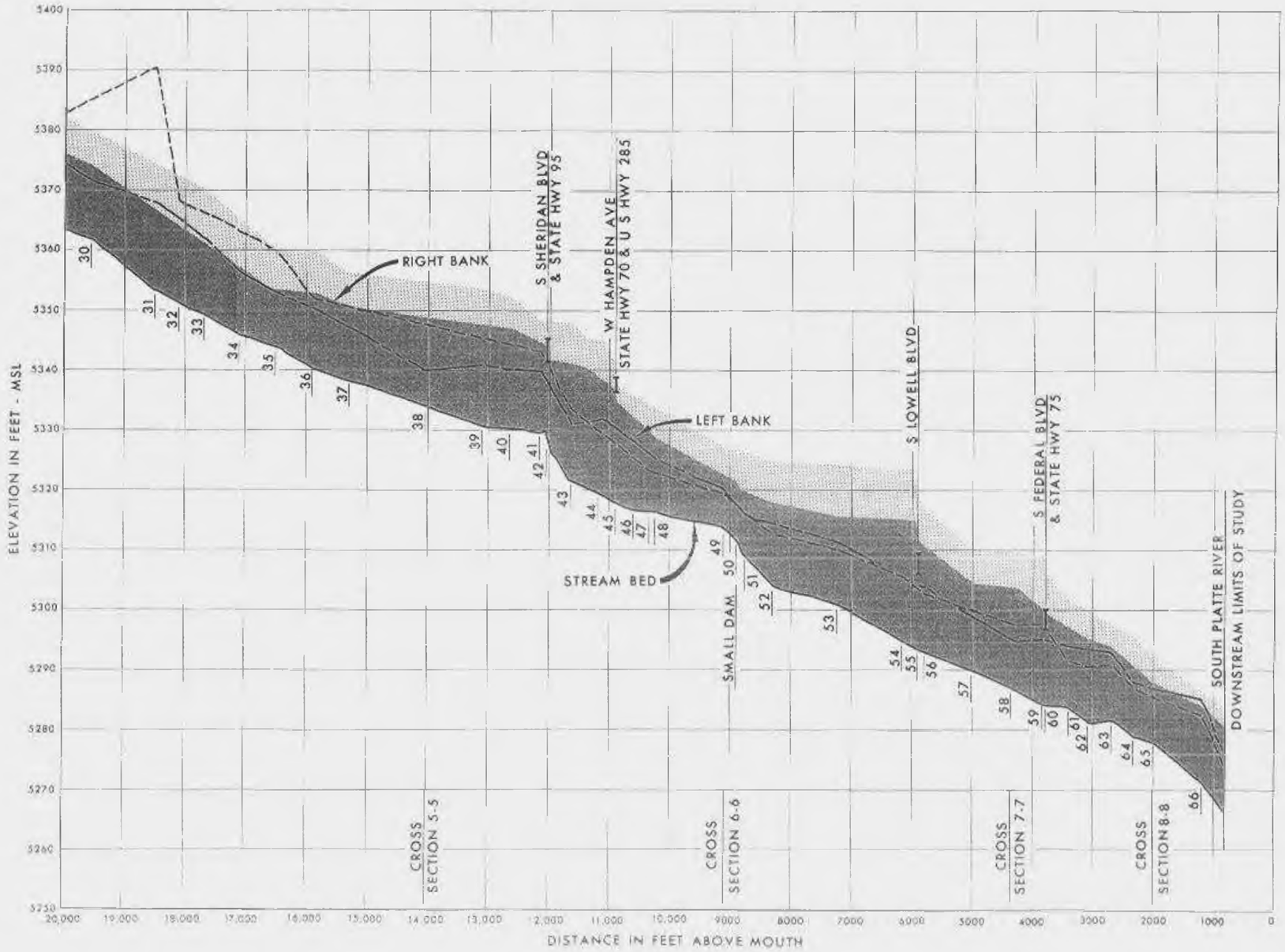
NOTES:
1. For location of Cross Sections, see Plates 2 & 3.
2. For Illustrated Cross Sections, see Plates 7 & 8.
3. For flood elevations at the reference points, see Table 3.

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

BEAR CREEK

PROFILE

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972



LEGEND:

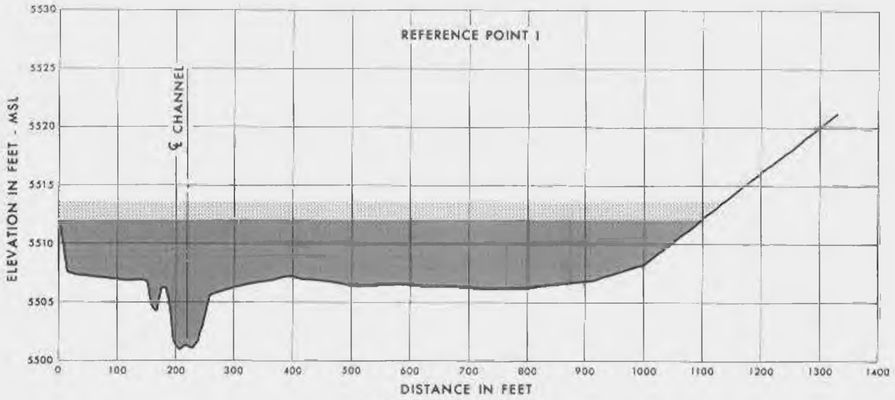
INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

Deck
Bridge
Top of Waterway
2 — Reference Point

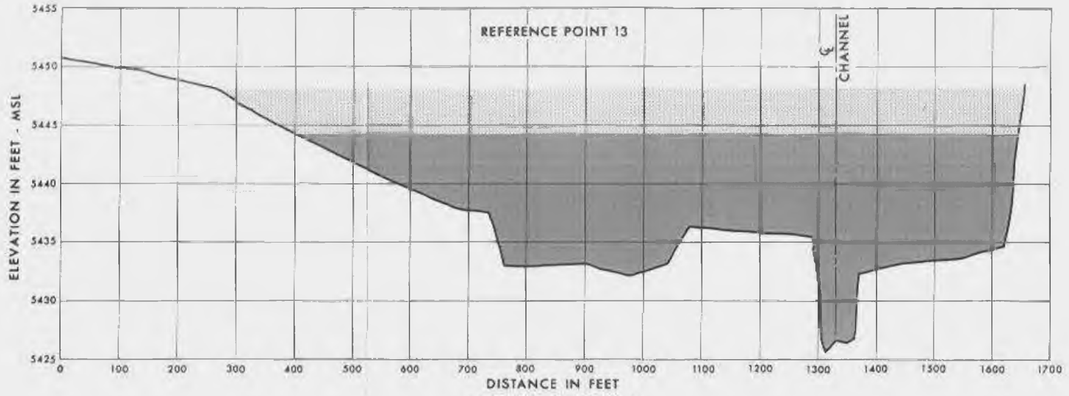
NOTES:

1. For location of Cross Sections, see Plate 4.
2. For Illustrated Cross Sections, see Plates 9 & 10.
3. For flood elevations at the reference points, see Table 3.

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION
BEAR CREEK
PROFILE
U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972



CROSS SECTION 1-1



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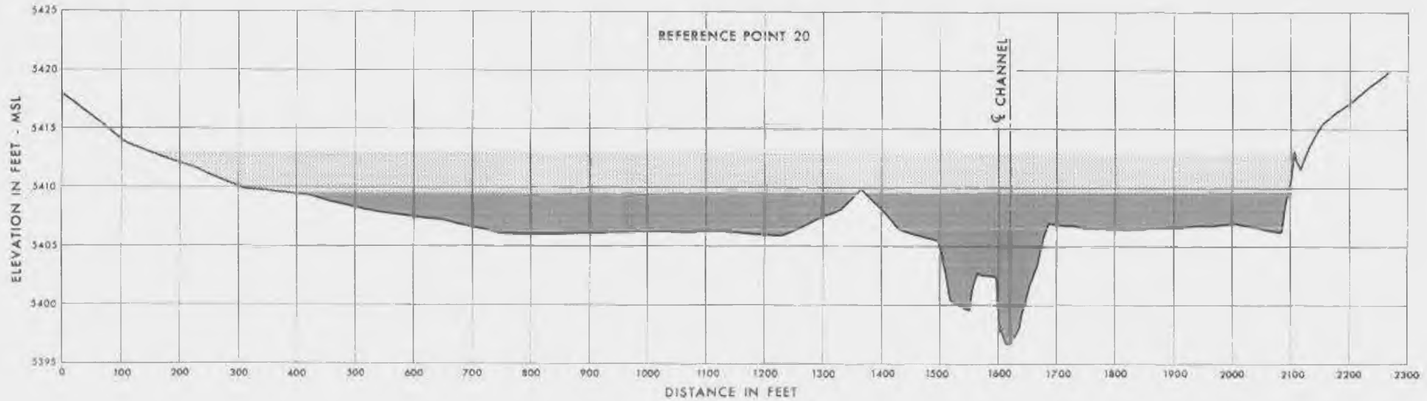


CROSS SECTION 3-3

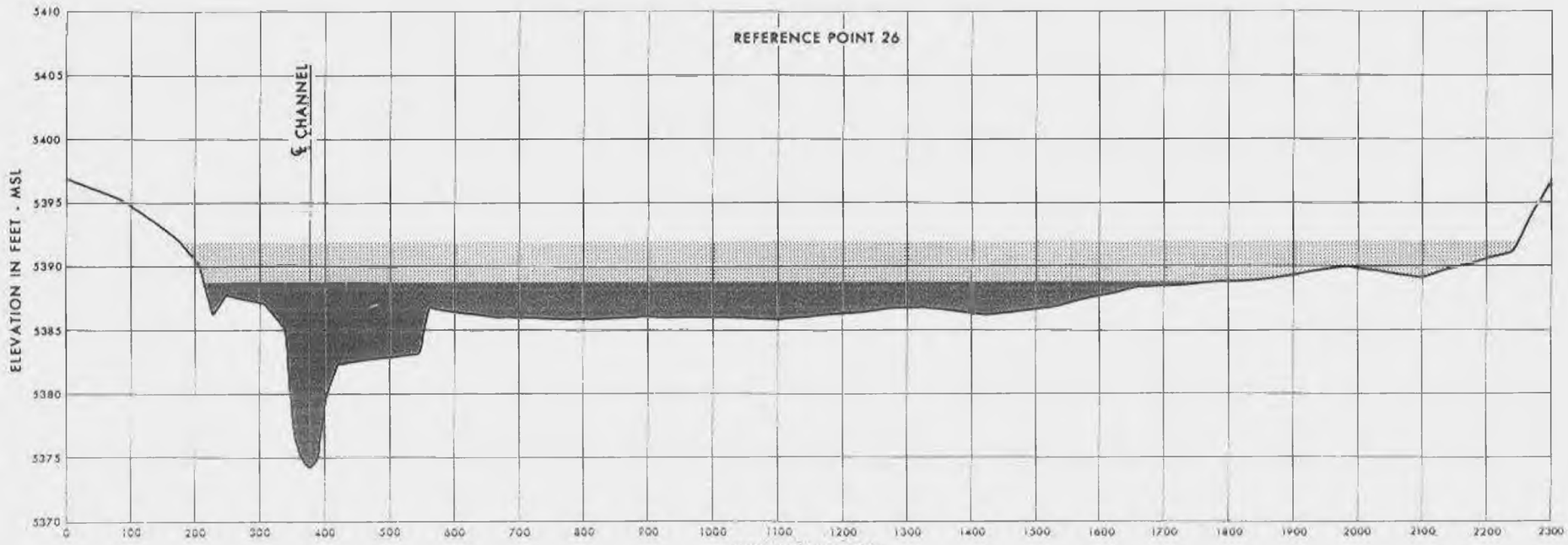
NOTES:
1. For location of Cross Sections, see Plates 2 & 3.

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

BEAR CREEK

CROSS SECTIONS

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972



CROSS SECTION 4-4

LEGEND:

INTERMEDIATE REGIONAL FLOOD

STANDARD PROJECT FLOOD

NOTES:

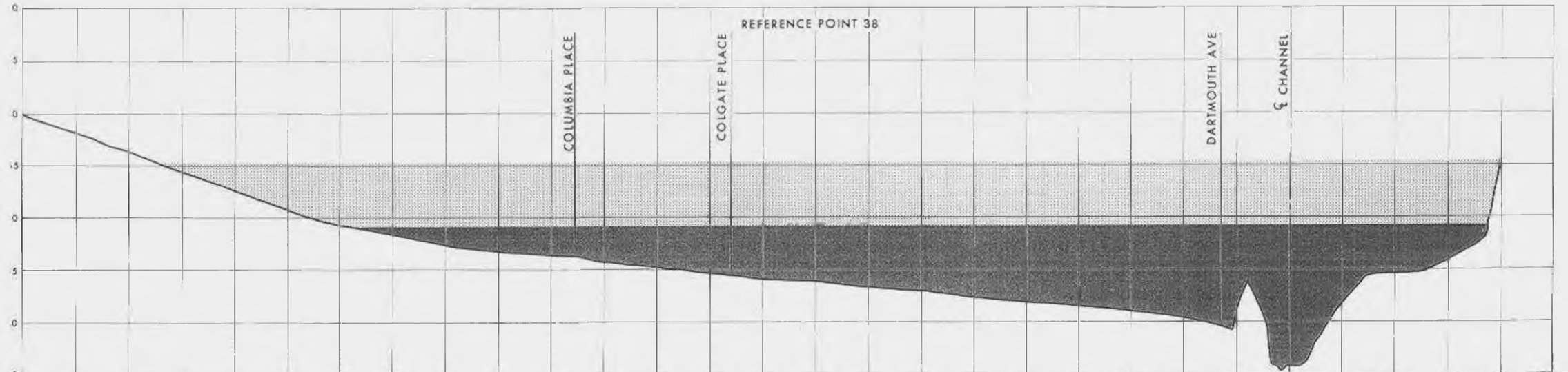
1. For location of Cross Section, see Plate 3.

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

BEAR CREEK

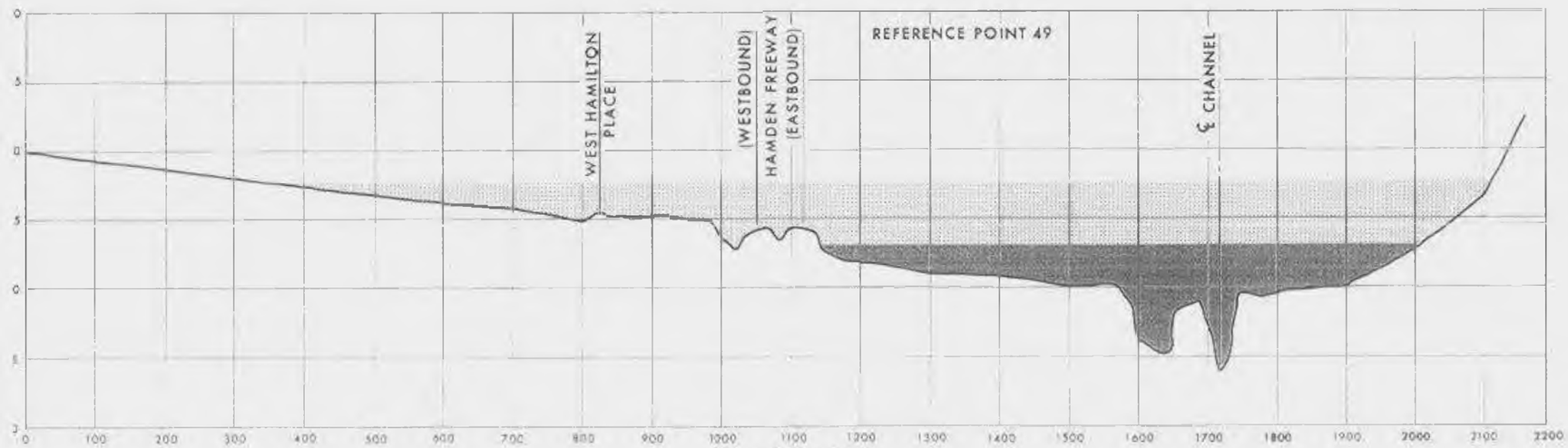
CROSS SECTION

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972



DISTANCE IN FEET

CROSS SECTION 5-5



DISTANCE IN FEET

CROSS SECTION 6-6

LEGEND:

INTERMEDIATE REGIONAL FLOOD

STANDARD PROJECT FLOOD

NOTES:

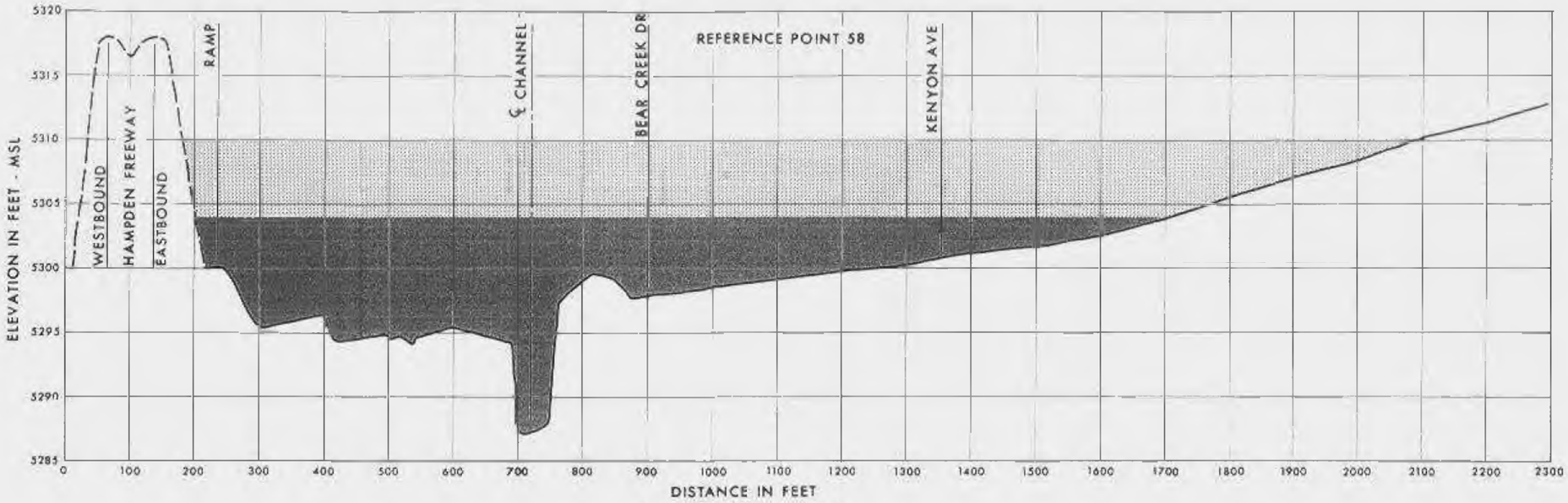
1. For location of Cross Sections, see Plate 4.

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

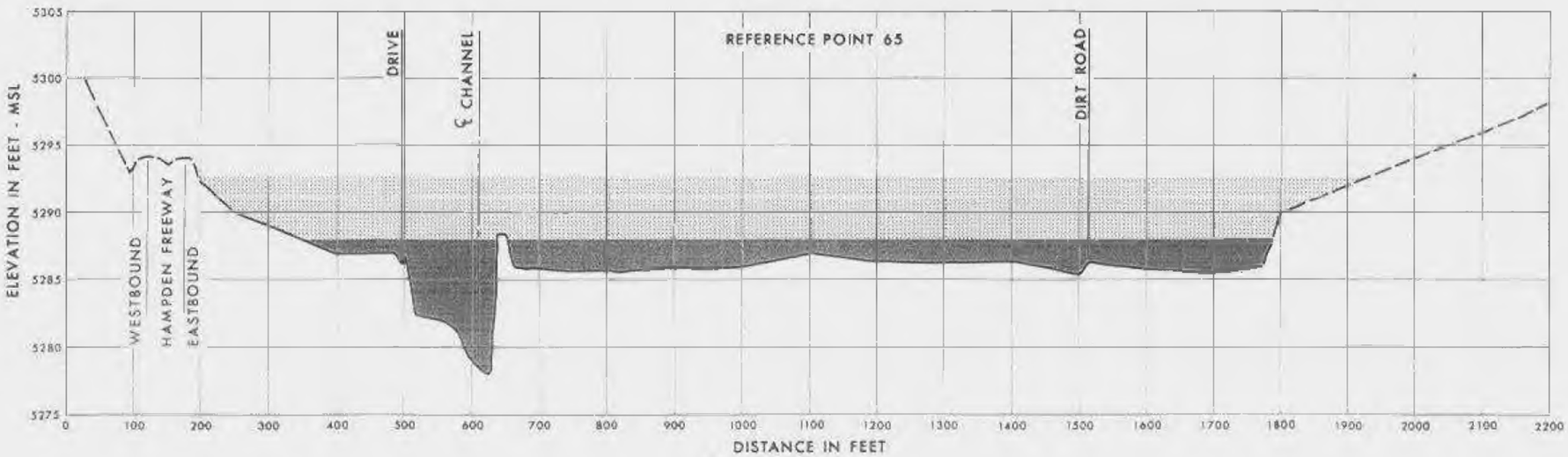
BEAR CREEK

CROSS SECTIONS

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972



CROSS SECTION 7-7



CROSS SECTION 8-8

LEGEND:

INTERMEDIATE REGIONAL FLOOD

STANDARD PROJECT FLOOD

NOTES:

1. For location of Cross Sections, see Plate 4

SOUTH PLATTE RIVER BASIN, COLORADO
DENVER METROPOLITAN REGION

BEAR CREEK

CROSS SECTIONS

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
DECEMBER 1972