FLOODS IN THE FLOYD RIVER BASIN, IOWA

By Albert J. Heinitz

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DONALD PAUL HODEL, SECRETARY

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FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI)

Multiply inch-pound units	By	To obtain SI units
	-Length-	
inch (in)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometers
	-Area-	
square foot (ft^2)	0.0929	square meter
square mile (mi^2)	2.590	square kilometers
	-Flow-	
cubic feet per second (ft^3/s)	0.02832	cubic meter per second

National Geodetic Vertical Datum of 1929 (NGVD of 1929): A geodetic datum derived from a general adjustment of the first-order nets of both the United States and Canada, formerly called mean sea level.

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ABSTRACT

Flood elevation profiles and flood peak discharges for the floods of 1953, 1962, 1973 and 1983 in the Floyd River basin are given in this report. The profiles cover the Floyd and West Branch Floyd Rivers. The 1953 flood is the greatest known on the Floyd River since at least 1892.

INTRODUCTION

Purpose and Scope

Evaluation of flood hazards, and the planning, design, and operation of various facilities on flood plains require information on floods. This report provides information on flood stages and discharges, flood magnitude and frequency, bench mark data, and flood elevation profiles of the 1953, 1962, 1973 and 1983 floods. The profiles cover 88 miles on the Floyd River and 30 miles on the West Branch Floyd River.

Acknowledgments

This report is the twelfth in a series prepared in cooperation with the Highway Research Board, Highway Division, Iowa Department of Transportation. Various Federal, State and local agencies cooperated in the collection of the streamflow records used in this report, acknowledgment of which is contained in the annual streamflow reports of the U.S. Geological Survey.

STUDY AREA

The Floyd River is located in northwestern Iowa and enters the Missouri River at Sioux City (fig. 1). The basin covers 921 square miles and includes parts of 6 counties. Land use in the basin is predominently agricultural with some livestock operations.

A complete description of the topography and geology of the Floyd River basin is given by Wahl and others (1982).

Normal annual precipitation (1951-1980) for the area is about 26 inches, based on data of the National Oceanic and Atmospheric Administration. Average annual runoff is from 2.5 to 3.0 inches. A majority of the annual runoff occurs during times of flood or high streamflow shortly after a rain.

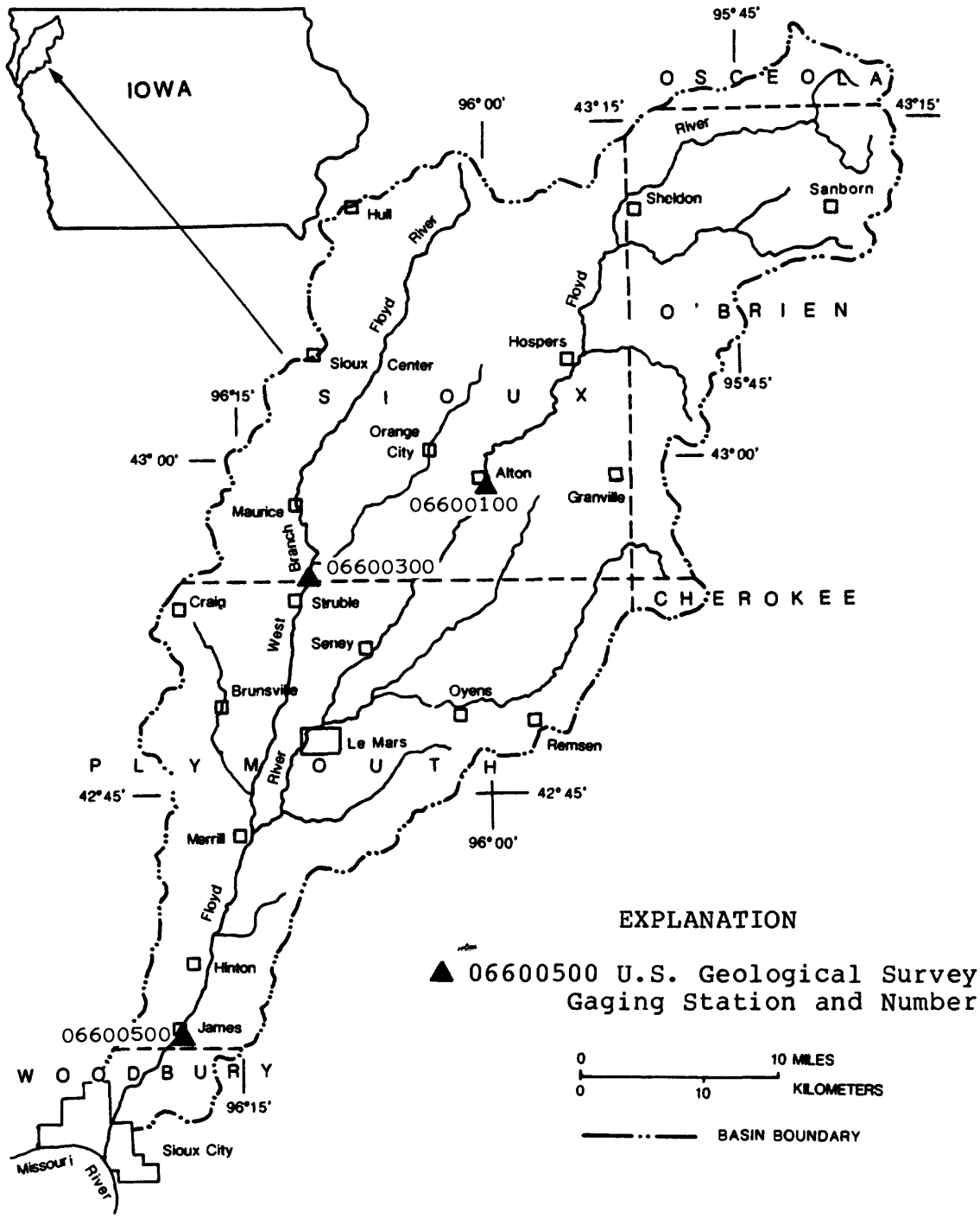

Figure 1.--Floyd River basin

FLOOD HISTORY

Floods in the Floyd River basin have been documented since 1935 in annual reports of the U.S. Geological Survey (see references). The gaging station on the Floyd River at James (06600500) was established in water year 1935. Gaging station records on the Floyd River at Alton (06600100) and the West Branch Floyd River near Struble (06600300) began in water year 1956.

The maximum flood event during the period of record for each gaging station are listed in table 1. Also listed are the discharges at the gaging stations for each of the flood profiles. Graphs of the annual peak flood discharges for the 3 gaging stations are shown in figures 2-4. The graphs illustrate that the 1953 and 1983 flood peaks are among the greatest on record.

Supplemental documentation for the 1953 flood in the Floyd River basin is given by the U.S. Geological Survey (1953) and the U.S. Army Corps of Engineers (1954). The 1953 flood resulted from extensive rainfall over a large area centered in the northwest corner of Iowa on June 7, 1953. Rainfall amounts as much as 11 inches were reported at unofficial measurement sites, whereas several official U.S. Weather Bureau sites reported measurements of 7 inches. The U.S. Weather Bureau (1953) published a brief account of the meteorology, rainfall and resulting flood associated with the June 7 storm.

Table 1.--Flood peak discharges at gaging stations for flood elevation profiles in the Floyd River basin.

Station number	Station name and location	Drainage area (mi^2)	Date	Gage 1/ height (feet)	Dis-charge (ft^3/s)	Recurrence interval (years)
06600100	Floyd River at Alton (mile 58.1)	268	06----53	---	*45,000	#2.4
			03-28-62	18.35	12,200	20
			03-03-73	15.95	2,750	-
			06-20-83	18.54	16,300	50
06600300	West Br. Floyd River nr Struble (mile 45.24)	180	03-28-62	15.63	*8,060	10
			03-03-73	14.30	3,100	2
			06-20-83	15.86	7,590	9
06600500	Floyd River at James (mile 9.5)	886	06-08-53	25.3	*71,500	#2.3
			03-29-62	22.41	20,600	17
			03-04-73	20.46	5,660	-
			06-21-83	28.85	18,000	11

1/ Gage datum for station 06600100 is 1,239.55 feet, NGVD
1/ Gage datum for station 06600300 is 1,239.40 feet, NGVD
1/ Gage datum for station 06600500 is 1,092.59 feet, NGVD, since Oct. 1970 and 10 feet higher prior to this date.
(profile flood elevation = gage datum + gage height)

* Maximum flood-peak discharge known for site.
# Ratio of flood discharge to that of the regional 100-year flood.

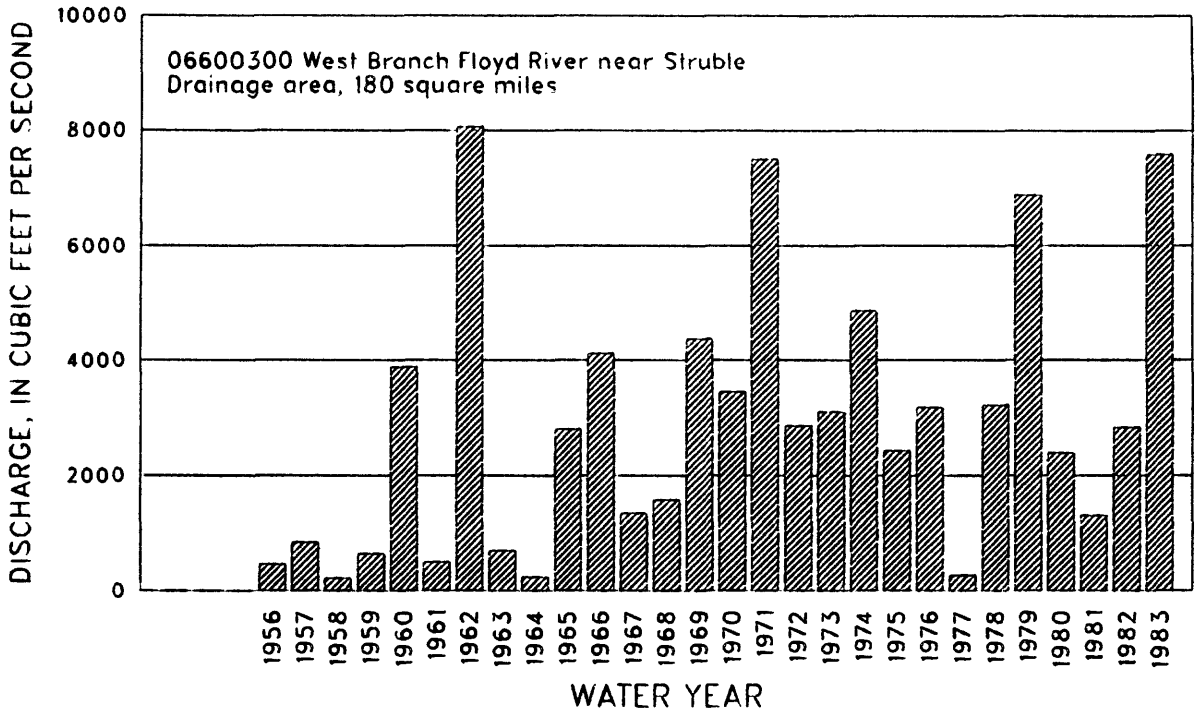

Figure 3. – Annual peak discharges for period of record for West Branch Floyd River near Struble gaging station

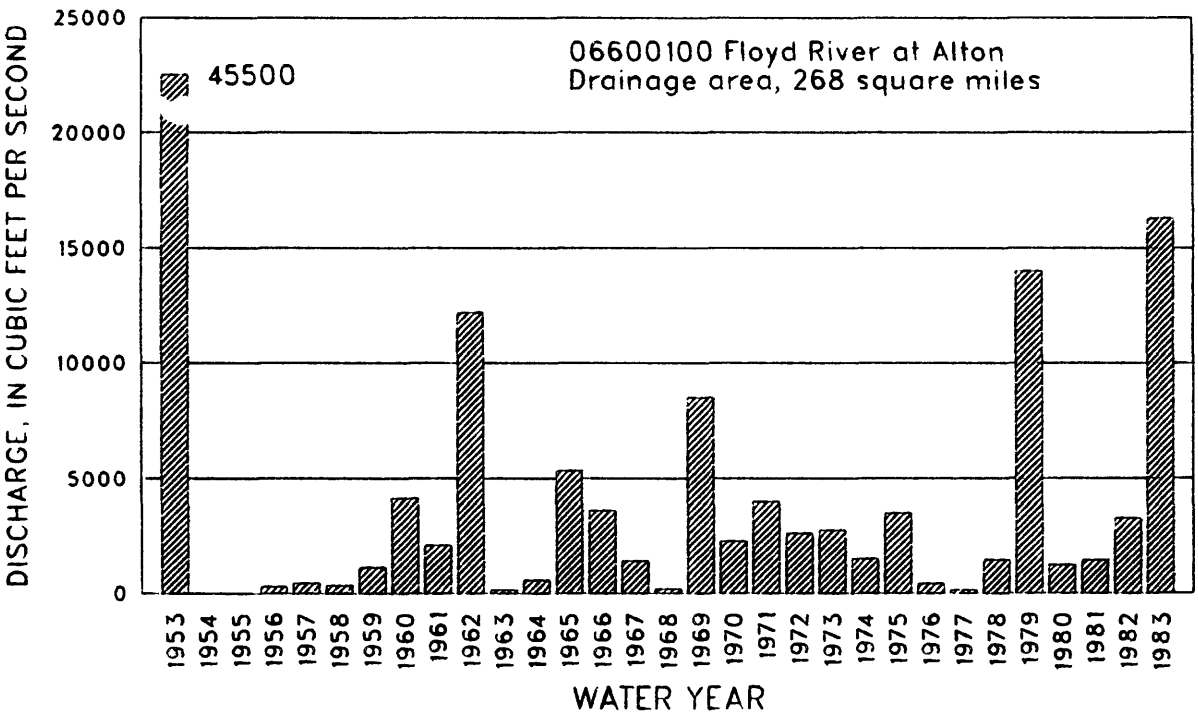

Figure 2. – Annual peak discharges for period of record for Floyd River at Alton gaging station.

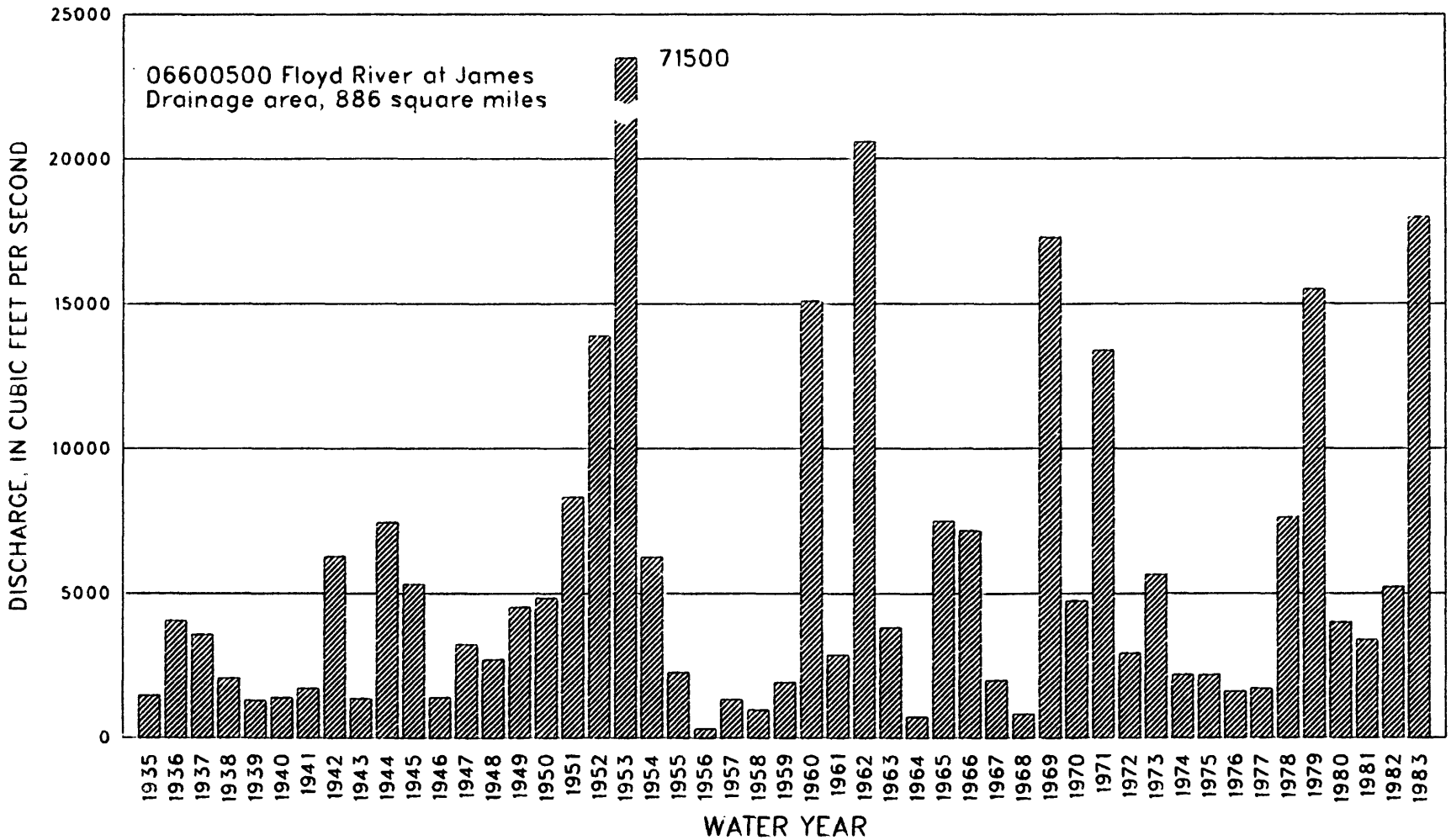

Figure 4. – Annual peak discharges for period of record for Floyd River at James gaging station.

Another report, "Storm Rainfall in the United States" by the U.S. Army Corps of Engineers (1945) contains data on "three intense storms that caused notable floods in the area". These storms are: June 23-27, 1891, at Larrabee, Iowa, 13.0 inches of rainfall; July 14-17, 1900, at Primghar, Iowa, 13.6 inches of rainfall; and Sept. 17-19, 1926, at Boyden, Iowa, 24 inches of rainfall.

Descriptions of major floods in the Floyd River basin have been given front page coverage in newspapers published in Sioux City because of the intense commercial and industrial activity located in the Floyd River flood plain. According to news accounts, the first major flood on the Floyd River at Sioux City occurred May 18-19, 1892. It was described as the greatest known flood prior to the 1953 flood. Twenty five people drowned in Sioux City in the 1892 flood.

The flood peak elevations of the 1892, 1926 and 1934 floods at the 4th street crossing in Sioux City are shown in figure 7 (at the end of report).

HYDROLOGIC DATA

Gaging-station records are the primary source of data for analyzing and understanding the flood hydrology of a river basin. Flood information is obtained from the records of complete-record stations which provide a continuous chronology of streamflow. The specific locations of the gaging stations used in this study are shown in figure 1. Discharge records for these stations are published in the annual streamflow reports of the U.S. Geological Survey (see references). The data on flood-peak stages and discharges have been compiled and are listed in table 3 (at the end of report).

The derivation of discharge records at a gaging station depends basically upon the development of a relationship between water surface elevations (stages) and the corresponding flow rates. The highwater portion of stage-discharge relationships, or rating curves as they are sometimes called, generally tend to be relatively stable if the channel downstream from a gaging site remains unchanged. However, the rating curves for the gaging stations in the Floyd River basin have changed considerably, meaning that the stage (elevation) of a flood with the same magnitude of discharge can be different than that previously experienced. The changes in the ratings are illustrated in figure 5. The dashed lines represent rating curves that existed in the past as defined by measurements of stage and discharge. The primary reason for

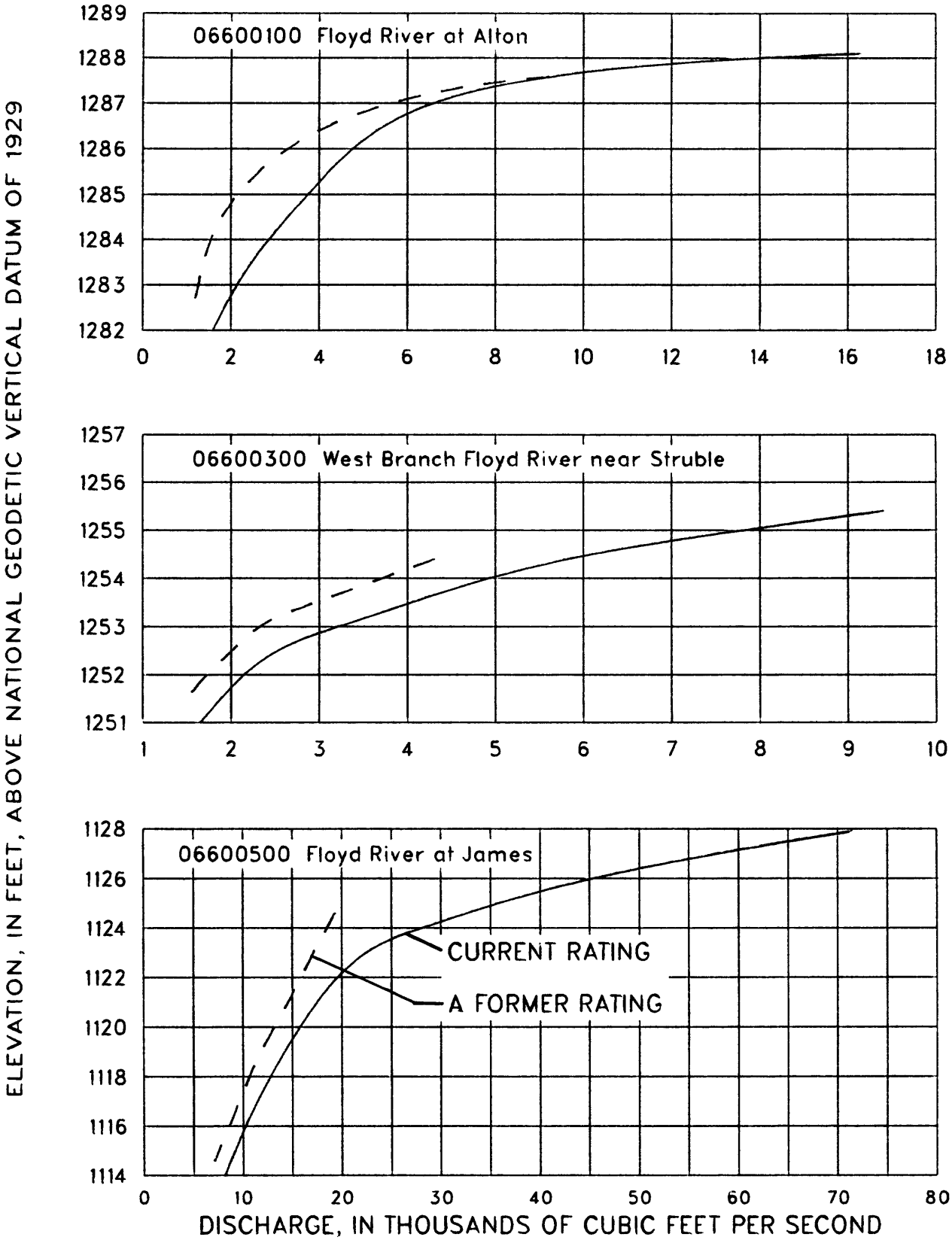

Figure 5.--Selected stage-discharge relations for gaging stations at Alton, Struble and James.

these changes may be due to degradation of the channel over time. Vegetation on the flood plain during the growing season can also have a considerable effect on the rating relation during periods of high water. Gaging stations are important control points for determining discharges for the flood profiles presented in this report.

In order to reference all the points along the profiles to a common datum, extensive leveling work was performed during which at least one bench mark and a reference point were established at each bridge in the profiled reaches. Bench mark and reference point descriptions and elevations are listed in table 4 (at the end of report).

FLOOD FREQUENCY AND MAGNITUDE

A flood event of a magnitude which is expected to be equalled or exceeded once on the average during any 100-year period (recurrence interval) has been commonly used as a standard against which flood peaks are measured. This event, commonly termed the 100-year flood, has a 1 percent chance of being equalled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year.

Methodology for determining flood-flow frequency discharges is outlined by the United States Water Resources Council (Interagency Advisory Committee on Water Data, 1981). The WRC recommends the use of the Pearson type III distribution with log transformation of the data as a base method for determining flood-flow frequency discharges. The discharges denoted by method "17B" in table 2 were determined using the above procedure.

A method for determining flood-flow frequency discharges at sites, including those not gaged, is described by Lara (1973). Regional equations are developed using the annual flood peak discharges for all gaging stations in a hydrologically homogeneous area thereby reducing potential errors associated with nonrepresentative, short-term stations.

Table 2.--Discharge and frequency of flood flows for continuous-record gaging stations in the Floyd River basin.

Station number	Station name	Method *	Discharge, in cubic feet per second, for indicated recurrence interval, in years					
			2	5	10	25	50	100
06600100	Floyd River	17B	1,820	5,270	8,820	14,800	20,400	26,800
	at Alton	Lara	3,920	7,230	9,760	13,200	16,000	18,900
06600300	West Branch Floyd	17B	2,140	4,900	7,180	10,400	13,000	15,700
	River nr Struble	Lara	3,170	5,920	8,070	10,000	13,400	16,000
06600500	Floyd River	17B	3,640	8,190	12,500	19,600	26,200	34,000
	nr James	Lara	7,440	13,200	17,300	22,800	27,000	31,300

* Method used:
17B - Bulletin 17B (Interagency Advisory Committee on Water Data, 1981)
Lara - Region I, Model 1 (Lara, 1973, p. 12)

For this reason, regional analysis may also produce improved estimates of the flood characteristics at gaged sites. Lara also used the Pearson type III distribution with log transformation as the base method for developing the regional equations. The curve for the regional 100-year flood for the Floyd River basin is shown in figure 6. Also shown for comparison are the Bulletin 17B 100-year flood discharges for the three gaging stations. The Bulletin 17B 100-year flood discharge for the Floyd River at the Alton gaging station (06600100) is 1.4 times that of the regional 100-year flood. The 100-year discharges for the other two gaging stations agree quite closely to the regional 100-year floods. A user of these data may have to consider using the Bulletin 17B flood peak discharges for the Floyd River at Alton rather than those defined by the regional relations.

The Bulletin 17B and the regional flood peak discharges for selected recurrence intervals for the gaging stations are listed in table 2. Data in this table can be used to plot comparisons of the regional 2-, 5-, 10-, 25- and 50-year flood discharges to those defined using Bulletin 17B as was done for the 100-year discharges shown in figure 6.

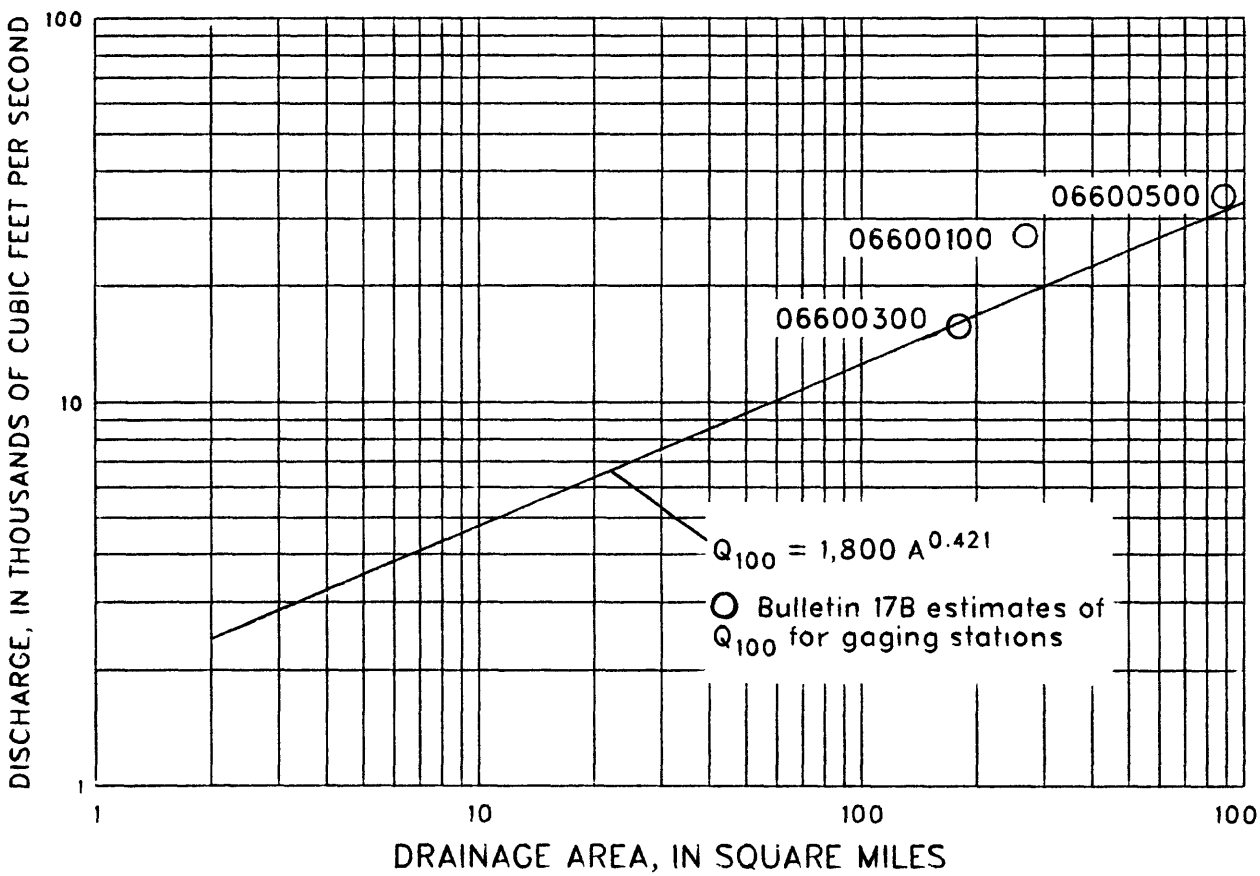

Figure 6.--Relationship of regional 100-year flood discharge with drainage area for streams in Floyd River basin (Lara, 1973).

FLOOD PROFILES

Figures 7-15 show elevation profiles of the 1953, 1962, 1973 and 1983 floods on the Floyd River and elevation profiles of the 1973 and 1983 floods on the West Branch Floyd River. The profiles were defined by field data obtained by the U.S. Geological Survey except for a few of the 1953 flood marks which were obtained by the Iowa Natural Resources Council or the U.S. Army Corps of Engineers. High-water marks located both upstream and downstream from bridges were identified within a few days of passage of the flood peaks and were referenced to a common datum by leveling. Profiles between the bridges are straight-line interpolations and, while providing an approximation of water surface elevations which occurred between the bridges, are subject to some error. A low-water profile is also shown to indicate the approximate range of stage that can occur within the profiled reaches. Discharges at gaging stations for the profiles are listed in table 1.

River mileages, determined from the best available maps, are referenced to the mouth of the Floyd River. Bridges and a few other points are designated by an index number that helps to identify their location. For example, 9046-30SE refers to a location in township 90 north, range 46 west, southeast 1/4 section 30.

DISCUSSION

The user of this report is cautioned that the elevation-discharge data presented herein are representative of the physical conditions of the basin at the time of the flood events shown. Changes in the basin can alter the flood magnitude for a given frequency. Examples of these changes include, but are not limited to, extensive urbanization, implementation of agricultural conservation practices, installation of drainage systems and construction of reservoirs. Changes in the channel conditions immediately downstream from a site can materially affect the elevation-discharge relationship. Examples of such changes include the construction of dams, bridges, or levees; changes in the flood-plain vegetative cover; straightening of the channel; and natural scour and fill. Temporary changes can be caused by ice and debris jams which produce backwater conditions and may cause the flood elevations to plot higher than the normal profile.

SELECTED REFERENCES

Interagency Advisory Committee on Water Data, 1981, Guidelines for determining flood flow frequency (2d ed., revised) [editorial corrections made March 1982]: Reston, Va., U.S. Geological Survey Office of Water Data Coordination, Hydrology Subcommittee Bulletin 17B, appendices 1-14, 28 p.

Lara, O.G. 1973, Floods in Iowa: Technical manual for estimating their magnitude and frequency: Iowa Natural Resources Council Bulletin No. 11, 40 p.

U.S. Army Corps of Engineers, 1954, Report on the Flood of June 1953 in the Floyd River basin: U.S. Army Corps of Engineers, Omaha District, Omaha, Nebraska, 43 p.

U.S. Geological Survey, issued annually to 1960, Surface-water supply of the United States, part 5, Hudson Bay and Upper Mississippi River basins, U.S. Geological Survey Water-Supply Papers.

--------,issued annually since 1961, Water Resources data for Iowa, U.S. Geological Survey Open-file Reports, Iowa City, Iowa, U.S. Geological Survey.

--------,Floods of June 1953 in Northwestern Iowa: Water-supply Paper 1320-A, U.S. Geological Survey, 68 p.

U.S. Weather Bureau, Climatological Data, Iowa: Vol. 64, No. 6.

Wahl, K.D., Meyer, M.J. and Karsten, R.A., 1982, Hydrology of the Surficial Aquifer in the Floyd River Basin, Iowa: Water Supply Bulletin No. 12, Iowa Geological Surver, 53 p.

Table 3.--Peak stage and discharge records for gaging stations, Floyd River basin, Iowa

The peak stage and discharge data for this report were compiled through September 30, 1983 for the three Floyd River basin gaging stations. The flood events, designated by calendar date, are in chronological order and grouped by water year (year ending September 30). In general, independent flood peaks above a pre-selected base (partial-duration series) are listed. The magnitude of the selected base discharge, given in the "Remarks" section of the headnote, was determined so that it would be equaled or exceeded on an average of about three times per year. Two flood peaks are considered independent if dry-weather flow is reached between them or if they are more than 48 hours apart and the discharge of the trough between them is 25 percent or more below that of the lower peak.

The gaging-station records are arranged in downstream order as explained in the annual water resources data reports of the U.S. Geological Survey (see references). Each gaging station is identified by a permanent number that is also used in figure 1 and in tables 1 and 2. The datum of the gage, when given, is the National Geodetic Vertical Datum of 1929 (previously called "mean sea level, 1929"). Flood stage, as determined by the National Weather Service, is the stage at which overflow of the natural banks of the stream begins to cause damage in the reach in which the elevation is measured.

The following notations are used in the gaging station records:

1. A line in the "water year" column denotes a break or gap in the record of peaks.
2. A line in the "gage height" column denotes a change in datum only.

The remainder of the information given is self-explanatory.

06600100 Floyd River at Alton, Iowa

Location.--Lat 42°58'55", long 96°00'03", in NE1/4 NE1/4 sec.11, T.94 N.,R.44 W., Sioux Co., on left bank at downstream side of Chicago and Northwestern Railway bridge at east edge of Alton, 34.3 mi upstream from West Branch Floyd River and at mi 58.1.

Drainage area.--268 mi^2.

Gage.--Water-stage recorder. Datum of gage is 1,269.55 ft National Geodetic Vertical Datum of 1929.

Flood stage.--12 ft.

Stage-discharge relation.--Defined by current-meter measurements.

Remarks.--Base for partial-duration series, 800 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1953	June 7 or 8, 1953	--	45,500 ab
1956	July 11, 1956	9.45	287
1957	July 4, 1957	10.54	440
1958	June 3, 1958	9.82	336
1959	June 1, 1959	12.77	1,130
	Aug. 2, 1959	12.72	1,110
1960	Mar. 28, 1960	17.27	4,150
	Apr. 2, 1960	16.06	2,740
	Aug. 28, 1960	12.12	830
1961	Mar. 3, 1961	15.73 c	2,100 a
	Mar. 18, 1961	13.08	1,150
1962	Mar. 28, 1962	18.35	12,200
	June 5, 1962	12.41	930
1963	Mar. 17, 1963	8.80 c	150 a
1964	July 11, 1964	10.89	565
1965	Apr. 1, 1965	17.36	5,340
1966	Feb. 9, 1966	16.62	3,600
1967	June 16, 1966	13.75	1,400
1968	July 20, 1968	8.61	198

a About. b From information by Corps of Engineers.
c Affected by ice.

06600100 Floyd River at Alton, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1969	Apr. 4, 1969	17.78	8,510
1970	Mar. 3, 1970	15.47	2,280
1971	Feb. 19, 1971	17.17 c	4,000 a
	June 5, 1971	15.62	2,240
	June 7, 1971	16.46	3,360
1972	Mar. 12, 1972	15.59	2,620
	June 8, 1972	13.74	1,410
1973	Jan. 19, 1973	--	1,000 a
	Mar. 3, 1973	15.95	2,750
	Aug. 24, 1973	13.58	1,330
1974	June 22, 1974	14.00	1,500
1975	Mar. 21, 1975	14.62	1,960
	Apr. 29, 1975	11.80	1,050
	June 5, 1975	16.55	3,490
	June 23, 1975	12.65	1,220
1976	Mar. 16, 1976	9.16	427
1977	July 24, 1977	7.46	148
1978	Mar. 19, 1978	13.37	1,450
1979	Mar. 23, 1979	18.4	14,000
	Mar. 30, 1979	--	1,600
	May 11, 1979	16.07	2,870
1980	Nov. 1, 1979	12.26	1,120
	June 6, 1980	12.68	1,230
1981	June 15, 1981	14.17	1,440
1982	Feb. 23, 1982	14.35	1,500
	July 6, 1982	16.39 d	3,270
1983	Mar. 1, 1983	15.26	2,060
	Mar. 7, 1983	15.32	2,110
	Apr. 4, 1983	--	900

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a About. c Affected by ice. d From floodmark.

06600100 Floyd River at Alton, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1983 cont.	Apr. 13, 1983	16.08	2,880
	May 3, 1983	13.68	1,360
	June 15, 1983	10.85	987
	June 20, 1983	18.54 e	16,300
	June 28, 1983	--	2,630
	July 1, 1983	--	2,750

e Peak stage did not reach bottom of gage.

06600300 West Branch Floyd River near Struble, Iowa

Location.--Lat 42°55'15", long 96°10'30", in NE1/4 NE1/4 sec.32, T.94 N., R.45 W., Sioux County, on right bank at downstream side of bridge on county highway B62, 2.2 mi northeast of Struble, 14 mi upstream from Floyd River, and 39.3 mi upstream from mouth of Floyd River.

Drainage area.--180 mi^2.

Gage.--Water-stage recorder. Datum of gage is 1,239.40 ft National Geodetic Vertical Datum of 1929 (State Highway Commision bench mark).

Stage-discharge relation.--Defined by current-meter measurements.

Flood stage.--14 feet.

Remarks.--Base for partial-duration series, 400 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1956	July 12, 1956	9.22	463
1957	June 28, 1957	9.50	430
	July 4, 1957	11.32	840
	July 8, 1957	9.96	500
1958	Apr. 6, 1958	7.34	218
1959	May 29, 1959	9.38	495
	May 31, 1959	10.27	646
1960	Mar. 29, 1960	14.72	3,880
	Apr. 2, 1960	14.62	3,630
	May 21, 1960	10.83	740
1961	Mar. 1, 1961	--	450
	June 13, 1961	8.08	402
	Aug. 22, 1961	8.55	501
1962	Mar. 28, 1962	15.63	8,060
	Apr. 3, 1962	10.64	1,110
	May 22, 1962	9.94	892
	June 5, 1962	8.00	480
	June 8, 1962	7.62	400
	June 17, 1962	11.28	1,320
1963	July 30, 1963	9.03	700
1964	May 24, 1964	6.72 a	236
	Sept. 8, 1964	7.14	--

a Backwater from vegetation.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1965	Apr. 1, 1965	14.49 b	2,800 c
	Apr. 6, 1965	11.93	1,520
	June 5, 1965	8.12	506
	June 7, 1965	9.08	719
	June 29, 1965	10.47	1,070
	July 7, 1965	9.04	710
1966	Oct. 1, 1965	9.63	851
	Feb. 9, 1966	15.27	4,120
	June 3, 1966	9.05	719
1967	Mar. 2, 1967	12.45 b	--
	Mar. 3, 1967	12.27 b	800 c
	June 9, 1967	10.12	974
	June 12, 1967	11.42	1,350
	June 16, 1967	10.47	1,070
	June 19, 1967	8.81	658
1968	July 20, 1968	12.14	1,580
	Sept.22, 1968	9.61	864
1969	Apr. 4, 1969	14.90 d	4,380
	June 25, 1969	10.87	966
	July 3, 1969	9.84	715
	July 8, 1969	10.05	762
1970	Mar. 3, 1970	--	1,900 c
	May 28, 1970	14.61	3,450
1971	Feb. 19, 1971	15.50	7,500
	June 10, 1971	14.00	2,450
1972	Mar. 12, 1972	11.14	1,230
	June 8, 1972	14.06	2,860
	July 21, 1972	7.50	464
1973	Dec. 30, 1972	14.35 b	800 c
	Mar. 3, 1973	14.30	3,100
	Mar. 11, 1973	7.45	446
	Mar. 14, 1973	7.96	550
	June 19, 1973	9.67	946
	July 10, 1973	10.71	1,240
	Aug. 24, 1973	7.60	501
1974	June 22, 1974	15.03	4,870

b Affected by ice. c About.
d Gage height in well, 15.4 ft, from outside gage.

06600300 West Branch Floyd River near Struble, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1975	Mar. 20, 1975	--	500 c
	Apr. 27, 1975	8.24	627
	June 4, 1975	13.58	2,430
	June 12, 1975	8.90	758
	June 17, 1975	7.86	519
	June 22, 1975	9.35	872
1976	May 21, 1976	14.38	3,180
1977	May 27, 1977	6.45	273
1978	Mar. 19, 1978	13.41	2,550
	July 6, 1978	14.19	3,220
	July 21, 1978	8.79	815
	July 22, 1978	13.14	2,370
1979	Mar. 20, 1979	b	830
	Mar. 22, 1979	15.16	6,880
	Mar. 29, 1979	10.66	1,360
	Mar. 30, 1979	12.77	2,150
	May 10, 1979	9.26	962
	July 30, 1979	8.03	636
1980	Oct. 31, 1979	8.15	659
	May 30, 1980	13.17	2,390
	June 5, 1980	7.17	444
	June 7, 1980	9.95	1,140
	July 4, 1980	7.11	432
1981	June 14, 1981	10.87	1,310
	July 4, 1981	10.33	1,150
1982	Feb. 23, 1982	14.63 d	2,830
	May 27, 1982	7.82	621
1983	Feb. 28, 1983	12.41	2,080
	Mar. 7, 1983	12.13	1,990
	Apr. 11, 1983	10.53	1,210
	Apr. 13, 1983	13.05	2,600

1983 CONTINUED ON NEXT PAGE

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b Affected by ice. c About.

06600300 West Branch Floyd River near Struble, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1983 cont.	Apr. 16, 1983	9.69	1,080
	May 3, 1983	10.56	1,330
	May 7, 1983	8.08	586
	June 14, 1983	8.77	744
	June 18, 1983	7.64	494
	June 20, 1983	15.86	7,590
	June 27, 1983	14.53	4,140
	July 1, 1983	10.12	1,090
	July 29, 1983	8.45	685

06600500 Floyd River at James, Iowa

Location.--Lat 42°34'36", long 96°18'43", in SE1/4 SE1/4 sec.30, T.90 N., R.46 W., Plymouth County, on right bank at downstream side of bridge on county road C70, 0.2 mi east of James, 14.3 mi downstream from West Branch Floyd River, and at mi 9.5.

Drainage area.--882 mi^2.

Gage.--Water-stage recorder. Datum of gage is 1,092.59 ft National Geodetic Vertical Datum of 1929. Prior to Sept.11, 1938, June 9 to Nov.5, 1953, and Oct.1, 1955, to May 22, 1957, nonrecording gage and May 23, 1957, to Sept.30, 1970, water-stage recorder at same site at datum 10.0 ft higher.

Flood stage.--26 ft.

Stage-discharge relation.--Defined by current-meter measurements below 16,000 ft^3/s and extended above on basis of contracted-opening and flow-over-embankment measurement of peak flow.

Remarks.--Base for partial-duration series, 2,500 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1935	June 28, 1935	15.2	1,460
1936	Mar. 10, 1936	18.1 a	4,050 b
1937	May 27, 1937	17.2	3,570
1938	Sept.15, 1938	16.5	2,060
1939	Mar. 12, 1939	16.1 a	1,300 b
1940	June 5, 1940	15.4	1,390
1941	Mar. 11, 1941	16.2	1,720
1942	June 4, 1942	18.8	6,280
1943	June 17, 1943	15.2	1,360
1944	Feb. 27, 1944	17.4	3,600
	May 13, 1944	18.8	7,440
	June 13, 1944	18.1	5,150
	July 7, 1944	17.7	4,350
	July 12, 1944	17.2	3,320
1945	Mar. 12, 1945	18.4	5,320
1946	Mar. 1, 1946	15.3	1,400

a Affected by ice. b About.

06600500 Floyd River at James, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1947	June 25, 1947	17.8	3,240
1948	Mar. 17, 1948	17.1	2,710
1949	Mar. 5, 1949	18.1	4,520
	Sept.12, 1949	18.1	2,720
1950	June 19, 1950	19.2	4,840
1951	Mar. 28, 1951	19.94	8,320
	Apr. 5, 1951	18.55	5,380
	May 3, 1951	17.37	3,520
	May 20, 1951	17.10	2,520
	June 19, 1951	17.65	3,040
	June 29, 1951	17.76	3,160
	July 5, 1951	19.95	5,980
	Aug. 15, 1951	19.35	5,020
	Sept.12, 1951	19.98	6,180
1952	Feb. 14, 1952	18.15	4,300
	Mar. 13, 1952	17.49	3,290
	Mar. 20, 1952	18.58	5,240
	Mar. 31, 1952	20.32	13,900
	July 7, 1952	19.12	4,700
1953	June 8, 1953	25.30 c	71,500
1954	Mar. 19, 1954	18.61	4,800
	June 22, 1954	19.88	6,250
1955	July 10, 1955	16.25	2,260
1956	July 13, 1956	8.60	318

1957	July 5, 1957	13.83	1,330
1958	May 31, 1958	13.12	970
1959	June 1, 1959	17.59	1,920
1960	Mar. 29, 1960	21.93	15,100
	Apr. 2, 1960	20.83	9,480
	May 22, 1960	17.22	2,710
1961	Mar. 2, 1961	18.00	2,870
1962	Mar. 29, 1962	22.41	20,600

c Maximum stage since at least 1892, from floodmarks, from information by Corps of Engineers.

06600500 Floyd River at James, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1963	June 2, 1963	18.33	3,810
1964	Sept. 9, 1964	11.66	726
1965	Apr. 2, 1965	20.20	7,500
1966	Feb. 10, 1966	20.09	7,170
1967	June 19, 1967	15.14	2,000
1968	July 21, 1968	10.57	829
1969	Apr. 5, 1969	21.59	17,300
	June 25, 1969	10.23	2,580
1970	Mar. 4, 1970	12.27	4,740

1971	Feb. 19, 1971	28.13	13,400
	June 9, 1971	22.90	7,440
1972	Mar. 6, 1972	18.66 a	--
	Mar. 13, 1972	17.63	2,940
1973	Dec. 30, 1972	--	2,500 b
	Jan. 19, 1973	17.74	2,870
	Mar. 4, 1973	20.46	5,660
	July 9, 1973	17.57	2,990
1974	June 23, 1974	16.63	2,180
1975	June 6, 1975	16.42	2,180
1976	May 22, 1976	14.95	1,610
1977	July 24, 1977	15.14	1,720
1978	Mar. 20, 1978	21.94	7,630
	July 6, 1978	18.08	3,800
	July 23, 1978	18.63	4,270
1979	Mar. 23, 1979	28.19	15,500
	Mar. 31, 1979	17.59	4,020
	May 12, 1979	16.97	3,550
1980	May 30, 1980	17.6	4,000
	June 7, 1980	16.15	2,960
1981	June 14, 1981	16.77	3,400
	July 4, 1981	15.94	2,780

a Affected by ice. b About.

06600500 Floyd River at James, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1982	Feb. 24, 1982	19.10 d	5,220
	July 8, 1982	16.42	3,130
	July 11, 1982	17.43	3,890
1983	Mar. 2, 1983	18.14	4,440
	Mar. 7, 1983	19.15	5,260
	Apr. 1, 1983	16.87	3,480
	Apr. 14, 1983	20.14	6,120
	May 3, 1983	18.26	4,500
	June 21, 1983	28.85 d	18,000
	June 28, 1983	24.69 d	11,800
	July 2, 1983	18.30 a	5,070

a Affected by ice.
d Peak stage did not reach bottom of gage.

Table 4. Temporary benchmarks, Floyd River Basin, Iowa

The temporary bench marks listed in this tabulation are those for which elevations have been established by the Water Resources Division, Iowa District, U.S. Geological Survey. The work was done as part of a stream profile project cooperatively financed by the Highway Research Board, Highway Division, Iowa Department of Transportation and the U.S. Geological Survey.

ALL LISTINGS OF BENCH MARKS FOR THE FLOYD RIVER BASIN, PUBLISHED BY THE IOWA DISTRICT OF THE U.S. GEOLOGICAL SURVEY, PRIOR TO THE ONE IN THIS REPORT SHOULD BE CONSIDERED OBSOLETE AND SUPERSEDED AND SHOULD NOT BE USED.

Most of the bench marks listed in this report were originally established in the late 1950's and were compiled in an administrative listing dated January 1964 and later published in an administrative report in January 1972. Several bridges have been destroyed since then and a number of the old bridges have been replaced. As a result, many of the original bench marks have been destroyed. The status of the original bench marks at intermediate points between the bridges is not known. If bench marks don't exactly match the descriptions given, the user should be cautious as to the validity of the bench mark and the elevation given for the particular bench mark.

That part of the Floyd River covered by the level work was from

the north part of Sioux City to Sheldon, Iowa, and the West Branch Floyd River from its mouth to State Highway 10 near Maurice, Iowa. Bench marks were set at all bridges and at intermediate points between bridges, generally at road intersections at one mile intervals.

Level lines were commenced and terminated at first or second order benchmarks that were established and adjusted by the U.S. Coast and Geodetic Survey to National Geodetic Vertical Datum of 1929. Errors of closure found by the level work were adjusted, throughout the line, to the elevations published for the higher order benchmarks. The elevations of the temporary benchmarks shown herein are of third order accuracy.

The benchmarks have been identified by an index number which is composed of the Congressional township, range, section number and quarter-section in which they are located. The township and range numbers have been combined into a four-digit number, such as 8007 for Township 80 North and Range 7 West. This is followed by a dash and the section number in which the mark is located. Within the section, the quarter in which the mark is located is designated by NE, SE, NW, and SW. A number in parentheses following this letter designation indicates the numerical order among the marks located in that particular quarter. The index number serves to describe the landline location of the mark without further reference in the body of the description.

Standard marks such as chiseled squares and crosses were used on concrete or steel. On trees or poles a 20-penny pole spike driven through a short piece of 1/8 inch galvanized pipe and placed horizontally was used. Existing marks were used wherever available and the agency responsible for the mark, when known, is indicated in the description. If the agency is unknown, the mark is indicated as found. Marks indicated as (REFERENCE MARK) following the name of the stream were established to permit water surface elevations to be determined by use of a tape and weight. The terms "right" and "left" in the descriptions were determined facing in the direction of the flow of the stream.

Additional information, if available, can be obtained by writing to the following address: U.S. Geological Survey, P.O. Box 1230, 400 South Clinton Street, Iowa City, Iowa 52244.

8946-06 NW (1) - (BENCHMARK AND REFERENCE POINT) - About one mile southwest of James, Iowa, in the northeast corner of Sioux City, at an east-west country road bridge over the Floyd River, on the right downstream bearing plate, right downstream rivet, chiseled cross. Elev. 1115.89 feet.

8947-01 NE (2) - About on mile north of Highway 75 overpass in north Sioux City, about 110 yards south of signal tower No. 504.2, beside second telephone pole east of railroad tracks and north of road leading to KSCJ radio station. Corps of Engineers bronze tablet set in concrete post. Elev. 1113.98 feet.

8947-01 SE (1) - About 3/4 mile southwest along Highway 75 from north city limits of Sioux City just south of "M & M Products & Trucking Co.", which is located on landward side of Highway 75, on left downstream corner of RR creek bridge (No. 217.3) nearest the river, in stringer resting on abutment pile cap; spike and collar. Elev. 1116.72 feet.

8947-01 SW (1) - About 3/4 mile southwest along Highway 75 from north city limits of Sioux City, just south of "M & M Products & Trucking Co." which is located on landward side of Highway between Highway 75 and RR tracks, in top of upstream right guardrail end, 1-1/2 inch bronze plug marked C-E. Elev. 1120.78 feet.

8947-12 NW (1) - On Highway 75 at south end of RR and Leeds exit overpass, on power line pole directly downstream and streamward from curve sign on north bound land; spike and collar. Elev. 1109.32 feet.

8947-12 SW (1) - In north Sioux City on first road bridge (41st Street over Floyd River north of Highway 75 bridge over Floyd River, at right downstream abutment on top of concrete corner post; chiseled square. Elev. 1117.67 feet.

8947-12 SW (2) - (REFERENCE POINT) - In north Sioux City at 41st Street bridge over Floyd River (First bridge over Floyd River upstream from Highway 75 bridge over Floyd River), on 9th downstream guardrail post from the right end of bridge; chiseled square. Elev. 1117.70 feet.

8947-14 NW (1) - In north Sioux City at the Highway 75 bridge over the Floyd River upstream curb, Iowa Highway commission plug. Elev. 1118.16 feet.

8947-14 NW (2) - In north Sioux City at Highway 75 bridge over Floyd River, on right downstream wingwall, USCE disc. Elev. 1118.11 feet.

8947-14 NW (3) - (REFERENCE POINT) - In north Sioux City at Highway 75 bridge over Floyd River, on downstream curb at the right side of the 34th guardrail post from the right end of the bridge; chiseled cross. (Found). Elev. 1118.84 feet.

9046-09 NW (1) - On county road C60 bridge over Floyd River east of Hinton, Iowa, on upstream left wingwall at end; chiseled square with diagonal marks at corners. Elev. 1144.37 feet.

9046-09 NW (2) - (REFERENCE POINT) - About 1/2 mile east of Hinton on county road C60 bridge over Floyd River, on top of twelfth downstream guardrail post from right downstream end of bridge, chiseled arrow. Elev. 1147.12 feet.

9046-09 NW (3) - At Hinton, Iowa, 125 yards north of the CStPM & O RR Station, 48.6 feet west of the west rail of GN RR, 46.0 feet east of east rail of IC RR tracks, 31.7 feet east of east rail of east side of track, 42.7 feet northwest of pole marked BM 1145/8, 2.0 feet west of R.O.W. fence; a standard disc stamped "H-15, 1934" and set in top of a concrete post 3 inches high. (USC & GS) Elev. 1145.828 feet.

9046-09 NW (4) - At the north edge of Hinton, on Highway 75 bridge #7509 over small creek, on inside portion of right downstream wingwall; chiseled square. Elev. 1148.76 feet.

9046-20 SW (1) - About 2 miles south of Hinton along Highway 75 at a point where power and transformer towers cross highway, on RR bridge No. 214.7 nearest the river, in third crossbeam from right downstream end of bridge; pole spike and collar. Elev. 1133.85 feet.

9046-20 SW (2) - About 2 miles south of Hinton at point along Highway 75 where steel hi-line crosses highway and transformer station is located, on second RR bridge from river, in first pile bent from left downstream abutment, on downstream end of pole cap, pole spike and collar, painted red. Elev. 1134.57 feet.

9046-30 SE (1) - At USGS recording gage, at bridge over Floyd River on county road C70 east of James, Iowa, USGS gage benchmark No. 7 on upstream right wingwall; chiseled square. Elev. 1126.11 feet.

9046-31 SW (1) - At Plymouth-Woodbury county line, on RR creek bridge nearest the Floyd River and above county line road, at right downstream corner in 8" x 8" cross beam next to abutment, pole spike and collar, painted red. Elev. 1118.85 feet.

9046-31 SW (2) - At Plymouth-Woodbury county line in north bound lane of divided Highway 75, at creek bridge above county line road, in right upstream wingwall at upstream corner, Iowa Highway Commission plug. Elev. 1121.44 feet.

9146-01 NW (1) - 1.5 miles northeast of Merrill along Highway 75 on CStPM & O RR on southwest corner of signal base; chiseled cross in top of bolt, painted red. Elev. 1181.91 feet.

9146-02 SE (1) - At Hwy 75 bridge over the West Branch Floyd river at the NE corner of Merrill, behind left downstream abutment guardrail post; chiseled square. Elev. 1182.12 feet.

9146-02 SE (2) - (REFERENCE POINT) At Highway 75 bridge over West Branch Floyd River at the northeast corner of Merrill, on downstream curb 1.0 feet left of 13th guardrail post from right end of bridge; chiseled square. Elev. 1182.19 feet.

9146-11 NE (1) - On county road C44 bridge east of Merrill on left downstream abutment curb; USGS standard disc stamped 1957, Elev. 1179 feet (painted on abutment: 1179/1). Elev. 1179.265 feet.

9146-11 NE (2) - (REFERENCE POINT) - East of Merrill at county road C44 bridge over Floyd River, on brace holding guardrail to guardrail post at 13th post from left downstream end of bridge; chiseled arrow. Elev. 1181.60 feet.

9146-11 SW (1) - 0.7 mile south of the CStPM & O RR station at Merrill, 60.0 yards south of signal tower 492.2, 38 yards north of intersection of road and railroad, 49 feet east of east rail of main track, 1.0 foot east of R.O.W. fence; a standard disc stamped "L-15 1934", set in concrete post 4 inches above ground. (USC & GS) Elev. 1164.171 feet.

9146-15 NE (1) - About 1-1/2 miles south of the RR station at Merrill, 100 yards west of Great Western RR bridge (middle bridge) No. 207.4, at new creek bridge in south bound lane of Highway 75, on right downstream curb; Iowa Highway Commission brass plug. Elev. 1169.50 feet.

9146-22 NW (1) - About 1-3/4 miles south of the southwest edge of Merrill, at "T" intersection to the west, 100 yards west of mile post and bridge No. 208 in middle pair of tracks, at downsteam curb, Iowa Highway Commission brass plug. Elev. 1167.01 feet.

9146-28 SE (1) - About 2-3/4 miles north of Hinton along railroad tracks, 3/4 mile north of signal tower 496.3 at point where double poles of power line cross the railroad and Highway 75, at first set of poles east of railroad tracks, on south side of south pole; pole spike and collar. Elev. 1152.83 feet.

9146-33 NE (2) - 2 miles northeast of CStPM & O RR station at Hinton, 54 yards southwest of signal 496.2, 169 yards northeast of intersection of railroad, 48.6 feet southeast of southeast rail of main track, 39.1 feet southeast of southeast rail of side track, about 30 feet southeast of telephone pole marked BM 1147/7, at edge of field by a steel post, a standard USC & GS disc stamped "J-15, 1934" and in top of concrete monument at ground level. Elev. 1147.691 feet.

9146-34 SW (1) - About 2 miles north of Hinton at east-west county road bridge over the Floyd River, in right downstream bridge seat; pole spike and colar. Elev. 1147.22 feet.

9146-34 SW (2) - (REFERENCE POINT) - About 2 miles north of Hinton at east-west county road bridge over Floyd River, on guardrail on right side of second vertical member from right downstream end of bridge, chiseled arrow. Elev. 1152.21 feet.

9245-04 NE (1) - About 2 miles north of LeMars, Iowa, on county road just off Highway 33 to east, in first power pole east of railroad tracks and south of county road; spike and collar 6 inches from bottom of pole, painted red. Elev. 1212.14 feet.

9245-04 NE (2) - About one mile above LeMars on the CStPM & O RR bridge No. 799 overthe Floyd River, on left downstream abutment, on top of bolt in southeast corner of bearing plate; chiseled cross. 1209.34. feet.

9245-04 NE (3) - About 1-1/2 miles north of the north edge of LeMars at east-west pony truss bridge over the Floyd River, on right downstream pneumatic pier, chiseled square. Elev. 1211.02 feet.

9245-04 NE (4) - (REFERENCE POINT) - About 1-1/2 miles north of the north edge of LeMars at east-west pony truss bridge over the Floyd River, on right side of the first vertical member from right downstream end of bridge about 1/2 inch above guardrail level on upstream side of member, chiseled arrow. Elev. 1215.73 feet.

9245-04 NE (5) - (REFERENCE POIDNT) - About one mile above LeMars on the CStPM & O RR bridge No 799 over the Floyd River, on left downstream side of 10th cross member from the left end of bridge, or the 3rd cross member from the left end of right truss about 2 feet downstream of downstream rail, chiseled arrow. Elev. 1213.33 feet.

9245-06 NW (1) - About 2 miles northwest of LeMars, at county road bridge over West Branch Floyd River, at right downstream corner of bridge, on right upstream corner of 4 inch channel beam; chiseled cross. Elev. 1215.29 feet.

9245-06 NW (2) - (REFERENCE POINT) - About 2 miles northwest of LeMars, at county road bridge over West Branch Floyd River, on top of downstream headwall, at center of headwall; chiseled square. Elev. 1216.29 feet.

9245-08 NE (1) - On Highway 75 and 60 bridge over Floyd River at north edge of LeMars on curb inside wingwall on right upstream end of west bridge, Iowa Highway Commission plug. Elev. 1213.03 feet.

9245-08 NE (2) - (REFERENCE POINT) - At Highway 75 bridge over Floyd River at the north edge of LeMars, on downstream curb at left side of 21st guardrail post from left end of bridge, chiseled square. Elev. 1213.46 feet.

9245-08 SW (1) - At the west edge of LeMars at Highway 3 and 5 bridge over the Floyd River, on the upstream (north) curb in middle of the bridge, chiseled square, (USGS TOPO). Elev. 1206.67 feet.

9245-09 NW (1) - (BENCHMARK & REFERENCE POINT) - At the north edge of LeMars at Highway 75 bridge over Floyd River, on upstream (east) bridge, on downstream guardrail aboudt 4.2 feet from left end of steel portion of bridge; chiseled arrow. Elev. 1214.66 feet.

9245-17 NW (1) - About 1 mile west of LeMars, at State Highway 3 bridge over Floyd River, on top of left upstream wingpost. Chiseled square. Elev. 1211.44 feet.

9245-17 NW (2) - (REFERENCE POINT) - At west edge of LeMars on Highway 3 & 5 bridge over the Floyd River, on top of the downstream guardrail over second vertical member from the right end of the steel section of bridge; chiseled arrow. Elev. 1209.95 feet.

9245-17 SW (1) - About one mile southwest along Highway 75 from junction of Highway 75 & 3 in LeMars, 150 yards northwest of northwest corner of "Wells Blue Bunny Dairy", at a concrete box culvert under Highway 75, on south corner of east headwall, chiseled square. Elev. 1212.53 feet.

9245-19 NE (2) - About 2 miles southwest of LeMars, at county road bridge over Floyd River, about 1/2 mile west of Highway 75, on top of right downstream wingwall, chiseled square. Elev. 1199.53 feet.

9245-30 NW (1) - About 1-1/2 miles southwest along Highway 75 from the southwest corner of LeMars, at bridge over the Floyd River, in left upstream wingwall of west bridge; chiseled square. Elev. 1197.12 feet,

9245-30 NW (2) - (REFERENCE POINT) - About 1-1/2 miles southwest along Highway 75 from the southwest corner of LeMars, at bridge over the Floyd River, on downstream curb at left side of 22nd guardrail post from right end of west bridge; chiseled square. Elev. 1197.45 feet.

9245-30 NW (3) - (BENCHMARK & REFERENCE POINT) - About 1-1/2 miles southwest of the southwest corner of LeMars at CStPM & O RR bridge over Floyd River, on right side of the downstream end of the 5th cross member from the left end of bridge, chiseled arrow (between east rail and side of bridge). Elev. 1190.92 feet.

9245-30 NW (4) - (REFERENCE POINT) - About 1-1/2 miles south-west along Hwy 75 from the southwest corner of LeMars at west bridge over Floyd River, top of downstream curb, left of 17th guardrail post from left end bridge; chiseled arrow. Elev. 1197.44 feet.

9245-30 NW (5) - About 1-1/2 miles southwest along Hwy 75 from the southwest corner of LeMars, at west bridge over Floyd River, on top at end of left downstream wingwall, a standard USGS tablet "1GDS, 1967". Elev. 1197.163 feet.

9245-31 NW (1) - About 3 miles north of Merrill on county road C38 bridge over Floyd River on right downstream wheel guard at abutment; chiseled square. Elev. 1188.94 feet.

9245-31 NW (2) - (REFERENCE POINT) - About 3 miles southwest of the southwest corner of LeMars at county road C38 bridge over Floyd River, on top of downstream guardrail at 10th guardrail post from right end of bridge; chiseled arrow. Elev. 1191.14 feet.

9246-01 SE (1) - About 2 miles northwest of LeMars, at intersection of county road and Great Northern RR tracks, in SE corner of intersection, in west side of power pole, pole spike and collar. Elev. 1219.88 feet.

9246-12 NE (1) - About 1-1/2 miles NW of LeMars, at bridge #200.1 on Great Northern RR track, at 4th pile bent from left end bridge, in right side of downstream pile cap; pole spike and collar. Elev. 1206.70 feet.

9246-12 SE (1) - About 2-1/4 miles west along Hwy 3 & 5 from the junction of Hwys 75, 3 & 5 at LeMars, at Hwy bridge over West Branch Floyd River, on right upstream curb; Iowa Highway Commission brass plug. Elev. 1214.67 feet.

9246-12 SW (1) - About 2 miles west of LeMars, at Hwy 3 & Great Northern RR tracks crossing, at north side of Hwy 3, on 4.4 feet wide oval culvert under RR tracks, westend of culvert; chiseled square. Elev. 1205.92 feet.

9246-13 NE (1) - About 1-3/4 miles west of the west edge of LeMars along Hwy 3 & 5 at "T" intersection to the south, in west corner of intersection at east side of corner power pole; top of orange railroad rail set vertically into the ground. (USGS TOPO) Elev. 1234.13 feet.

9246-13 NE (2) - About 2-1/4 miles west along Hwy 3 & 5 from the junction of Highway 75, 3 & 5 at LeMars, at bridge over West Branch Floyd River, on left downstream curb; top of 5.8 inch steel rod about flush with concrete. Elev. 1214.61 feet.

9246-13 NE (3) - (REFERENCE POINT) - About 2-1/4 miles west along Hwy 3 & 5 from the junction of Hwys 75, 3 & 5 at LeMars, at bridge over West Branch Floyd River, on downstream curb between 16th and 17th guardrail posts from left end of bridge; chiseled square. Elev. 1215.02 feet.

9246-13 NE (4) - (REFERENCE POINT) - About 1-1/2 miles west of LeMars, at Hwy 3 bridge over West Branch Floyd River, on top of downstream curb, 2.2 feet left of 15th guardrail post from left end bridge; chiseled arrow. Elev. 1215.00 feet.

9246-25 SW (1) - About 2 miles North of Merrill, at intersection 1 mile west of Hwy 75, at NE corner intersection, in power pole, west side of pole; pole spike and collar. Elev. 1232.48 feet.

9246-26 NE (1) - About 3 miles north of Merrill, at county road bridge over West Branch Floyd River, on top of left downstream wingwall, chiseled square. Elev. 1196.30 feet.

9246-26 NE (2) - (REFERENCE POINT) - About 3 miles north of Merrill, at county road bridge over West Branch Floyd River, on top of downstream guardrail of right truss, 3 inches right of vertical truss member at center of right truss; chiseled arrow. Elev. 1197.56 feet.

9246-35 NE (1) - About 2 miles north of Merrill, at county road bridge over West Branch Floyd River, on top of left downstream wingwall; chiseled square. Elev. 1193.58 feet.

9246-35 NE (2) - (REFERENCE POINT) - About 2 miles north of Merrill, at county road bridge over West Branch Floyd River, top of downstream handrail, to right of 9th handrail post from right; chiseled arrow. Elev. 1193.58 feet.

9246-35 NE (3) - About 2 miles north of Merrill, at county road bridge over Mink Creek 0.1 mile west of bridge over West Branch Floyd River, on right upstream wingwall. Chiseled square. Elev. 1192.94 feet.

9344-06 NE (2) - (BENCHMARK & REFERENCE POINT) - 6 miles south of and 1 mile west of the south edge of Orange City, at county road bridge over the Floyd River, on right downstream side of 2nd pile cap from the left; pole spike and collar. Elev. 1255.62 feet.

9344-06 SW (1) - Four miles north of the CStPM & O RR station at Seney, 119 yards south of mile post No. 235, 20 yards southeast of iron culvert No. 786 1/2, 46.6 feet east of east rail, 1.7 feet west of right-of-way fence, between second and third fence posts north of anchor gate post, a standard USC & GS disc stamped "W-15, 1934" and set at ground level. Elev. 1248.337 feet.

9344-07 NE (1) - About 6 miles east of Struble at county road C12 bridge over the Floyd River, on left downstream bridge seat; chiseled square. Elev. 1248.86 feet.

9344-07 NE (2) - (REFERENCE POINT) - About 6 miles east of Struble at county road C12 bridge over Floyd River, on downstream guardrail, at top right side of eighth guardrail post form right end of bridge. Elev. 1254.79 feet.

9345-05 NE (1) - About 1 mile north of Struble, at county road bridge over West Branch Floyd River, at right downstream side of pile cap; pole spike and collar. Elev. 1252.39 feet.

9345-05 NE (2) - (REFERENCE POINT) - About 1 mile north of Struble, at county road bridge over West Branch Floyd River, on downstream longitudional beam about 5 inches below road surface, near 1st guardrail post left of the right vertical truss member, 4 inches right of post; scaffold nail. Elev. 1255.59 feet.

9345-05 NW (1) - About 1 mile north of Struble, at intersection of county road and Great Northern RR tracks, at SW corner of intersection, in west side of telephone pole; pole spike and collar. Elev. 1269.25 feet.

9345-07 SE (1) - About 1 mile south of Struble, at county road bridge over W.B. Floyd River, at right upstream corner of bridge, in streamward side of pile cap; pole spike and collar. Elev. 1238.82 feet.

9345-08 NW (1) - In Struble, at intersection of county road and Great Northern RR tracks, at SE corner of intersection in east side of power pole, pole spike and collar. Elev. 1261.02 feet.

9345-08 NW (4) - About 0.5 mile east of Struble, at county road bridge over West Branch Floyd River, on left upstream corner of right upstream wingpost, chiseled square. Elev. 1253.34 feet.

9345-13 NE (1) - Two miles northeast of the CStPM & O RR station at Seney, about 10 feet north of mile post No. 237, 33.8 feet northwest of northwest rail; a standard USC & GS disc stamped "V-15, 1934". Elev. 1233.967 feet.

9345-18 NE (1) - About 1 mile south of Struble, 0.1 mile west from T road north, 800 feet west of steel framed bridge over West Fork Creek, 66 feet south, 39 feet east and 0.9 feet higher than center of E-W sec. line road crossing tracks, 47 feet east of east rail, 1 foot south of a T fence east, in a concrete post; tablet stamped "13WHV 1957 1247 ft". Elev. 1247.088 feet.

9345-18 NE (2) - (REFERENCE POINT) - About 1 mile south of Struble at county road bridge over W.B. Floyd River, on downstream guardrail, 2 feet left of center vertical truss member; chiseled arrow. Elev. 1244.94 feet.

9345-18 SE (1) - About 2 miles south of Struble, at county road bridge over W.B. Floyd River, on top of left upstream wingwall; chiseled square. Elev. 1231.77 feet.

9345-18 SE (2) - About 2 miles south of Struble, at intersection of county road and Great Northern RR tracks, at NW corner of intersection, next to west gate of field entrance, in east side of power pole; pole spike and collar. Elev. 1234.42 feet.

9345-19 NE (1) - (REFERENCE POIDNT) - About 2 miles south of Struble, at county road bridge over W. Branch Floyd River, on downstream center vertical truss member, on right side of member about 3 inches above guardrail height; chiseled arrow. Elev. 1236.82 feet.

9345-23 SE (1) - Four miles northeast of LeMars at northeast edge of Seney on CStPM & O RR creek bridge, on right downstream abutment (lower level) about 22 feet east of centerline of RR track, chiseled square. Elev. 1223.33 feet.

9345-24 NW (3) - About 1 mile northeast of Seney, on county road C16 bridge over the Floyd River, on top of right downstream wingwall, about 3 feet above the road, chiseled square. Elev. 1238.89 feet.

9345-24 NW (4) - (REFERENCE POINT) - About 1 mile northeast of Seney, on county road C16 bridge over the Floyd River, on top of 12th aluminum guardrail post from the right end of bridge, on right side of flange; chiseled arrow. Elev. 1238.50 feet.

9345-24 NW (5) - About 1 mile norhteast of Seney, at the southeast corner of the intersection of Highway 75 with an east-west county road, in power pole between the highway and the CStPM & O RR tracks; pole spike and collar. Elev. 1231.26 feet.

9345-26 NW (1) - At Seney on county road bridge over the Floyd River, on right downstream end of bridge in 4th rivet from backwall in downstream row of rivets; chiseled cross. Elev. 1232.55 feet.

9345-26 NW (2) - (REFERENCE POINT) - At Seney on county road bridge over the Floyd River, on downstream guardrail at left batter post; chiseled arrow. Elev. 1237.10 feet.

9345-26 NW (3) - (REFERENCE POINT) - At Seney on county road bridge over the Floyd River, on top of downstream guardrail at center of left truss; chiseled arrow. Elev. 1237.17 feet.

9345-30 NE (1) - About 3 miles south of Struble, at county road bridge over W. Branch Floyd River, top of right downstream corner of left downstream wingpost, chiseled square. Elev. 1239.43 feet.

9345-30 NE (2) - (REFERENCE POINT) - About 3 miles south of Struble, at county road bridge over W. B. Floyd River, on top of downstream guardrail post, 11th post from right end of bridge, chiseled arrow. Elev. 1239.38 feet. Used '76.

9345-30 NE (3) - About 3 miles south of Struble, at intersection of county road and Great Northern RR tracks, at SE corner of intersection, in east side of power pole, pole spike and collar. Elev 1238.45 feet.

9345-30 SW (1) - About 3 miles NW of LeMars, at intersection of county road and Great Norther RR tracks, at the NW corner of intersection, in east side of power pole; pole spike and collar. Elev. 1227.37 feet.

9345-31 NE (1) - About 3 miles NW of LeMars, at county road bridge over W.B. Floyd River, on top of right downstream wingwall, chiseled square. Elev. 1230.27 feet.

9345-31 NE (2) - (REFERENCE POINT) - About 3 miles NW of LeMars, at county road bridge over W.B. Floyd River, on top of downstream guardrail post, 13th post from right end bridge, chiseled arrow. Elev. 1232.64 feet.

9345-33 NE (1) - 3.8 miles north of the Chicago, St. Paul, Minneapolis and Omaha Railroad station at LeMars, at RR bridge No. 797 over a small creek, in left upstream (northwest) headwall; a standard USC & GS disc stamped "T-15, 1934".. Elev. 1219.502 feet.

9345-34 NW (1) - About 3 miles north of LeMars on county road bridge over Floyd River, on inside of left downstream wingwall at curb elevation; chiseled square, painted red. Elev. 1226.74 feet.

9345-34 NW (2) - (REFERENCE POINT) - About 1-1/2 miles southwest of Sweney at an east-west county road bridge over floyd River, on downstream curb at right side of 14th guardrail post form right end of bridge; chiseled square. Elev. 1226.60 feet.

9444-02-NE (1) - In northeast part of Alton, on CStPM & O RR bridge over the Floyd River downstream from the Highway 60 bridge, in 4th pile bent from the right downstream abutment, on landward side of pile cap; pole spike and collar. Elev. 1299.84 feet.

9444-02 NW (5) - (REFERENCE POINT) - At the north edge of Alton, on Hwy 10 bridge over the Floyd River, on 6th downstream guardrail post from right end of bridge; chiseled square. (Rerun in 1971) Elev. 1301.98 feet.

9444-02 NW (6) - At the north edge of Alton, on Highway 10 bridge over the Floyd River, on top of left downstream wingwall, chiseled square. Elev. 1301.79 feet.

9444-02 NW (8) - In Alton, on Highway 60 bridge over the Floyd River on top of left downstream wingwall; chiseled square. Elev. 1301.29 feet.

9444-02 NW (9) - (REFERENCE POINT) - In Alton, on Highway 60 bridge over the Floyd River, 6 inches left of 16th guardrail post from the left; chiseled square. Elev. 1299.15 feet.

9444-02 SE (2) - At southeast edge of Alton, Iowa, on highway bridge upstream from USGS recording gage on Floyd River, on right downstream abutment seat at corner; chiseled square, painted red. Elev. 1296.46 feet.

9444-02 SE (3) - At southeast edge of Alton, Iowa, on highway bridge upstream from USGS recording gage on Floyd River, on left upstream abutment seat; chiseled square, painted red. Elev. 1294.31 feet.

9444-02 SE (5) - In southeast Alton at Highway bridge upstream from USGS recording gage on Floyd River, on downstream end of second pier from right end of bridge; chiseled square. (Gage RM No. 3). Elev. 1294.51 feet.

9444-14 NW (2) - About one mile south of the south edge of Alton at bridge over Floyd River, on right downstream wingwall; chiseled square. Elev. 1289.79 feet.

9444-14 NW (3) - (REFERENCE POINT) - About one mile south of the south edge of Alton at bridge over Floyd River, on downstream guardrail, on left corner of 20th guardrail post from right end of bridge; chiseled cross. Elev. 1291.97 feet.

9444-21 SE (1) - About 1 mile northeast of Carnes along Highway 60, at the northeast corner of the intersection of Highway 60 and an E - W county road, in east side of telephone pole between the highway and the RR tracks; RR spike. (Found). Elev. 1288.88 feet.

9444-21 SE (2) - About one mile northeast of Carnes and 0.4 mile east of Highway 60, on bridge over the Floyd River, on top of right downstream abutment; chiseled square. Elev. 1282.66 feet.

9444-21 SE (3) - (REFERENCE POINT) - About one mile norhteast of Carnes and 0.4 mile east of Highway 60, on bridge over the Floyd River, on top of downstream guardrail, one foot right of 16th guardrail post from the right; chiseled arrow. Elev. 1282.80 feet.

9444-22 NW (1) - About 2.5 miles south along Highway 33 from Alton, Iowa, between RR tracks and Highway 60 in first telephone pole down-stream from county gravel road running E - W, in riverward side of pole; pole spike and collar. Elev. 1271.65 feet.

9444-22 NW (2) - 1.6 miles northeast of the CStPM & O RR station at Carnes, 176 yards northeast of a wooden trestle, 45.5 feet southeast of southeast rail, 2 feet northwest of right-of-way fence, 4 feet north of the 5th fence post from the post opposite mile post 231; a standard USC & GS disc stamped "Y-15" and set about ground level. Elev. 1283.852 feet (recently found with cap knocked off).

9444-22 NW (3) - About 2.5 miles south of Alton, Iowa, on an E-W county road, on bridge over Floyd River 1/8 mile east of Highway 60, on top of right downstream wingwall, chiseled square. Elev. 1285.73 feet.

9444-22 NW (4) - (REFERENCE POINT) - About 2.5 miles south of Alton, Iowa, on an E - W county road, on bridge over Floyd River 1/8 mile east of Highway 60, on top of 18th downstream guardrail post from right; chiseled arrow. Elev. 1285.99 feet.

9444-29 SE (1) - At Carnes, Iowa, 0.2 mile soutwest of Chicago, St. Paul, Minneapolis and Omaha Railroad station, 68 feet southweast of centerline of State Highway 33, 30.1 feet northwest of northwest rail of main track, 40.6 feet northwest of rail of side track; a standard USC & GS disc stamped "K-15, 1934" and set in top of concrete post five inches high. Elev. 1272.025 feet.

9444-32 SW (1) - Six miles south and one mile west of the south edge of Orange City, about 100 yards east of railroad and road crossing, in second telephone pole beside field entrance gate post; pole spike and collar. Elev. 1261.12 feet.

9444-32 SW (2) - About 6 miles south and 1 mile west of the south edge of Orange City, about 15 feet south of the 2nd telephone pole south of the CStPH & O RR and county road crossing, in south gate post; pole spike and collar. Elev. 1260.26 feet.

9445-05 NE (1) - (REFERENCE POINT) - About 2 miles north of Maurice, at Hwy 10 bridge over W.B. Floyd River, on downstream handrail, one foot left of 3rd vertical member from right end of bridge; chiseled arrow. Elev. 1305.41 feet.

9445-05 SE (1) - About 1 mile north of Maurice, at intersection of county road and Great Northern RR tracks, at NW corner of intersection, in west side of telephone pole; spike and collar. Elev 1301.80 feet.

9445-08 NW (1) - About 1 mile NE of Maurice, at county road bridge over W.B. Floyd River, in downstream end of pile cap, 3rd pile cap from right end of bridge; pole spike and collar. Elev. 1284.93 feet.

9445-08 SE (1) - At the west edge of Maurice, at intersection of county road and Great Northern RR tracks, at the NW corner of intersection; in west side of power pole; pole spike and collar. Elev. 1298.00 feet.

9445-17 NW (1) - About 1/2 mile west of Maurice, at county road bridge over W.B. Floyd River, on top of left downstream wingwall, chiseled square. Elev. 1284.88 feet.

9445-17 NW (2) - (REFERENCE POINT) - About 1/2 mile west of Maurice, at county road bridge over W.B. Floyd River, at downstream side of bridge, on guardrail at right side of 11th guardrail post from right end of bridge, chiseled arrow. Elev. 1286.64 feet.

9445-20 NE (1) - About 1 mile south of Maurice, at intersection of county road and Great Northern RR tracks, at SE corner of intersection in west side of power pole; pole spike and collar. Elev. 1289.02 feet.

9445-20 NW (1) - About 1 mile SW of Maurice, at county road bridge over W.B. Floyd River, on top of downstream portion of left downstream curb; chiseled square. Elev. 1276.00 feet.

9445-20 NW (2) - (REFERENCE POINT) - About 1 mile SW of Maurice, at county road bridge over W.B. Floyd River, at downstream side bridge, on guardrail to right of 9th guardrail post from left end bridge, chiseled arrow. Elev. 1278.06 feet.

9445-28 NW (1) - About 2 miles south of Maurice, at Hwy 75 bridge over W.B. Floyd River, on right downstream wingwall; chiseled square. Elev. 1264.43 feet.

9445-28 NW (2) -(REFERENCE POINT) - About 2 miles south of Maurice, at Hwy 75 bridge over W.B. Floyd River, on downstream guardrail, 1.5 feet right of 3rd vertical truss member from left end of bridge; chiseled arrow. Elev. 1267.30 feet.

9445-29 NE (1) - About 2 miles south of Maurice, at intersection of county road and Great Northern RR tracks, at SW corner of intersection, in west side of telephone pole; pole spike and collar. Elev. 1259.21 feet.

9445-29 NE (2) - About 2 miles south of Maurice, at east-west county road bridge over West Branch Floyd River, on left downstream abutment, on top of upper bolt, threaded end. Elev. 1264.86 feet.

9445-29 NE (3) - (REFERENCE POINT) - About 2 miles south of Maurice, at east-west county road bridge over West Branch Floyd River, in downstream side of 6th handrail post from right downstream end of bridge, scaffold nail. Elev. 1267.23 feet.

9445-29 NE (4) - About 2 miles south of Maurice, at Hwy 75 bridge over West Brnch Floyd River, north bridge of two over West Branch Floyd River on left downstream wingwall, IDOT plug. Elev. 1276.46 feet.

9445-29 NE (5) - (REFERENCE POINT) - About 2 miles south of Maurice, at Hyw 75 bridge over West Branch Floyd River, north bridge of two over West Branch Floyd River, on downstream edge of 14th handrail post from left downstream end of bridge chiseled arrow. Elev. 1276.30 feet.

9445-29 SE (1) - About 2.2 miles north of Struble, at Hwy 75 bridge over West Branch Floyd River, on left downstream wingwall; IDOT plug. Elev. 1271.35 feet.

9445-29 SE (2) - (REFERENCE POINT) - About 2.2 miles north of Struble, at Hwy 75 bridge over West Branch Floyd River, on top of 17th downstream post from left downstream end of bridge; chiseled arrow. Elev. 1271.41 feet.

9445-32 NE (1) - About 2 miles north of Struble, at intersection of county road with Great Northern RR tracks, at SW corner of intersection, in east side of telephone pole, pole spike and collar. Elev. 1273.17 feet.

9445-32 NE (2) - About 2 miles north of Struble, at county road bridge over West Branch Floyd River, at right downstream wingwall, in pile supporting wingwall, pole spike and collar. Elev. 1255.87 feet.

9543-03 SW (1) - In Hospers, at the intersection of Highway 60 and county road B40, on top of west end of 2 foot diameter concrete culvert at the northwest corner of the intersection; chiseled square. Elev. 1337.28 feet.

9543-03 SW (2) - At the northwest edge of Hosper, about 0.2 mile northwest of the C & NW RR tracks on county road running NW form Main Street in Hospers, on bridge, over the Floyd River, in streamward side of pole supporting the left downstream wingwall; pole spike and collar. Elev. 1334.35 feet.

9543-03 SW (3) - (REFERENCE POINT) - At the north-west edge of Hospers, about 0.2 miles northwest of the C & NW RR tracks on county road running NW from Main Street in Hospers, on bridge over the Floyd River, on right top of 8th downstream guardrail post from the left abutment; chiseled arrow. Elev. 1337.86 feet.

9543-09 SE (1) - About 1.2 miles southwest of Hospers, on a north-south county road bridge over the Floyd River side of left downstream pile cap next to abutment; pole spike and collar. Elev. 1326.87 feet.

9543-09 SE (2) - (REFERENCE POINT) - About 1.2 miles southwest of Hospers, on a north-south county road bridge over the Floyd River about 300 feet south of the crossing of power line, on top of downstream truss above right vertical member; chiseled arrow. Elev. 1333.92 feet.

9543-09 SE (3) - USC & GSE16 - 1.5 miles south west of Hospers along the C & NW RR, 105 yards SW of mile post 221, 48 yards NE of a section line road crossong, 45.6 feet NW of the NW rail, and 1.1 feet SE of ROW fence. Std. disc stamped "E16 1934" and set in top of concrete post at ground level. Elev. 1340.316 feet.

9543-10 NW (1) - About 1/4 mile west of the C & NW RR crossing in Hospers, on county road B40 bridge over the Floyd River, on top of left downstream wingpost over left abutment, chiseled square. Elev. 1338.19 feet.

9543-10 SW (1) - About 0.7 miles south west of Hospers, on a north-south county road, about 300 feet north of a bridge over the Floyd River, in the south side of the south pole of the power line crossing the road; pole spike and collar. Elev. 1324.65 feet.

9543-16 NW (1) - About 1.8 miles southwest of Hospers, about 0.3 mile west of the C & NW RR tracks, on an east-west county road bridge over the Floyd River, in streamward side of left downstream pile cap; pole spike and collar. Elev. 1325.23 feet.

9543-16 NW (2) - (REFERENCE POINT) - About 1.8 miles southwest of Hospers, about 0.3 mile west of the C & NW RR tracks, on an east-west county road bridge over the Floyd River, on the right downstream side of the 3rd vertical member from the left downstream, at guardrail level, chiseled arrow. Elev. 1330.07 feet.

9543-20 SE (1) - About 3.8 miles southwest of the south edge of Hospers, on an east-west gravel road bridge over the Floyd River, on top of pile on left upstream wingwall, railroad spikes. Elev. 1312.00 feet.

9543-29 NE (1) - About 3.7 miles southwest of the south edge of Hospers, on C & NW RR bridge #759, on left upstream abutment, lower lever, 4 feet southeast of the southeast rail, chiseled square. Elev 1323.57 feet.

9543-30 SE (1) - About 5.0 miles southwest of the south edge of Hospers, on C & NW RR bridge #762, on left upstream abutment, 3.5 feet southeast of the southeast rail, chiseled square. Elev. 1314.59 feet.

9543-30 SE (2) - About 4.6 miles southwest of the south edge of Hospers, on C & NW RR bridge #761, on left upstream abutment, lower level, 4 feet southeast of the southeast rail; chiseled square. Elev. 1320.55 feet.

9543-30 SE (3) - USC & GS C16 - 2.6 miles northeast along the C & NW RR from the station in Alton, 44 yards SW of milepost 225, about 36 yards north of road crossing, 47.1 feet NW of the NW rail, 3 feet SE of ROW fence, std. disc stamped "C16 1934" set in top of concrete post projecting 4 inches above ground. Elev. 1315.778 feet.

9544-25 SE (1) - About 1.6 miles northeast of the intersection of Highway 60 & 10 in Alton, on county road L14 bridge over Floyd River about 0.3 mile north of Highway 60, on right downstream wingwall; chiseled square. Elev. 1309.73 feet.

9544-25 SE (2) - (REFERENCE POINT) - About 1.6 miles north-east of the intersection of Highway 60 & 10 in Alton, on county road L14 bridge over the Floyd River about 0.3 mile north of Highway 60, on top of 13th aluminum guardrail post from right downstream; chiseled arrow. Elev. 1311.11 feet.

9544-25 SW (1) - About 1.2 miles north of Highway 10 in Alton, on creek bridge on county road B50, on right downstream (south) wingwall; chiseled square. Elev. 1309.96 feet.

9544-35 SE (1) - About 0.5 mile north of Highway 10 in Alton, on north-south gravel road bridge over the Floyd River, on top of right downstream wingwall; chiseled square. Elev. 1309.09 feet.

9544-35 SE (2) - (REFERENCE POINT) - About 0.5 mile north of Highway 10 in Alton, on north-south gravel road bridge over the Floyd River, on top of 15th guardrail post from left downstream; chiseled arrow. Elev. 1309.12 feet.

9545-32 SE (1) - About 2 miles north of Maurice, north of Hwys 10 and 75 intersection, at Hwy 75 bridge over West Branch Floyd River, on top of right downstream wingwall, top of large bolt head. Elev. 1304.62 feet.

9545-32 SE (2) - (REFERENCE POINT) - About 2 miles north of Maurice, north of Hwys 10 and 75 intersection, at Hwy 75 bridge over West Branch Floyd River, on downstream handrail, one foot right of 3rd vertical bridge member from right end of truss, chiseled arrow. Elev. 1305.31 feet.

9545-32 SE (3) - About 2 miles north of Maurice, at State Hwy 10 bridge over West Branch Floyd River, on top of left upstream wingpost, top of bolt head. Elev. 1305.04 feet.

9643-01 NE (1) - In Sioux county, 0.3 mile south along the CStPM & O RR from the station at Sheldon, O'Brien County, 40 yards north of milespost 212, 79 feet north west of a road crossing, 45.5 feet west of the west rail, 38.6 feet north of a fence corner, and 2 feet east of the right-of-way fence. A standard disc. stamped "K-16 1934" and set in the top of a concrete post projecting 5 inches above the ground. Elev. 1398.721 feet.

9643-01 NW (1) - Near the southwest edge of Sheldon, at county road bridge over Floyd River, on inside portion of left downstream wingwall; chiseled square. Elev. 1375.43 feet.

9643-01 NW (2) - (REFERENCE POINT) - Near the southwest edge of Sheldon, at county road bridge over Floyd River, on downstream guardrail post, top of right side of 17th post; chiseled arrow. Elev. 1377.28 feet.

9643-11 SE (1) - About 4 miles southwest of Sheldon, at east-west county road intersection with C & NW RR in north side of telephone pole at northwest corner of intersection; pole spike and collar. Elev. 1374.31 feet.

9643-14 NE (1) - About 3 miles south of Highway 18 in Sheldon and about 0.3 mile west of the C & NW RR tracks, on east-west county road bridge over the Floyd River, on top of landward side of the left downstream wingwall; chiseled square. Elev. 1366.89 feet.

9643-14 NE (2) - (REFERENCE POINT) - About 3 miles south of Highway 18 in Sheldon and about 0.3 mile west of the C & NW RR tracks, on east-west county road bridge over the Floyd River, on top of the right side of the 9th downstream guardrail post from the right; chiseled arrow. Elev. 1367.36 feet.

9643-14 SW (1) - About 4 miles north of Hospers, at county road bridge over Floyd River, in center of north headwall, UE36LMTC, chiseled square. Elev. 1358.60 feet.

9643-22 SE (1) - About 3 miles north of Hospers, at county road bridge over Floyd River, on top of wood piling on right upstream wingwall, one-half inch bolt and washer. Elev. 1347.13 feet.

9643-23 NE (1) - About 4 miles north of Hospers, at intersection of county road and Hwy 60, at the southwest corner of intersection, between Hwy 60 and C & NW RR tracks, in west side of power pole, pole spike and collar. Elev. 1362.62 feet.

9643-23 NW (1) - About 3 miles north of Hospers, at county road bridge over Floyd River, on top of inside portion of left downstream wingwall; chiseled square. Elev. 1358.50 feet.

9643-23 NW (2) - (REFERENCE POINT) - About 3 miles north of Hospers, at county road bridge over Floyd River, on top of downstream guardrail, between 3rd and 4th guardrail post from right; chiseled arrow. Elev. 1360.32 feet.

9643-26 NW (1) - About 3 miles norsth of Hospers, along the RR tracks, at southwest corner of the intersection of the RR tracks with east-west county road, in west side of telephone pole, one-hald inch bolt and washer. Elev. 1372.38 feet.

9643-26 SW (1) - About 2 miles north of Hospers along the C & NW RR tracks at bridge #747, just north of an E - W county road, on left downstream abutment, at lower level near the downstream end; chiseled square. Elev. 1349.94 feet.

9643-27 NE (2) - (REFERENCE POINT) - About 3 miles north of Hospers on an E - W county road bridge over the Floyd River about 1/4 mile west of the C & NW RR tracks, in top of piling cap on right downstream of bridge of abutment, 2 inch wood screw. Elev. 1345.76 feet.

9643-27 SE (1) - About 2 miles north of Hospers, on east-west county road bridge over Floyd River, in streamward side of left upstream pile cap, pole spike and collar. Elev. 1340.14 feet.

9643-34 NE (1) - (REFERENCE POINT) - About 2 miles north of Hospers, on east-west county road bridge over Floyd River, on right side of 2nd vertical member from right downstream end bridge, about 1.7 feet above guardrail level; chiseled arrow. Elev. 1346.29 feet.

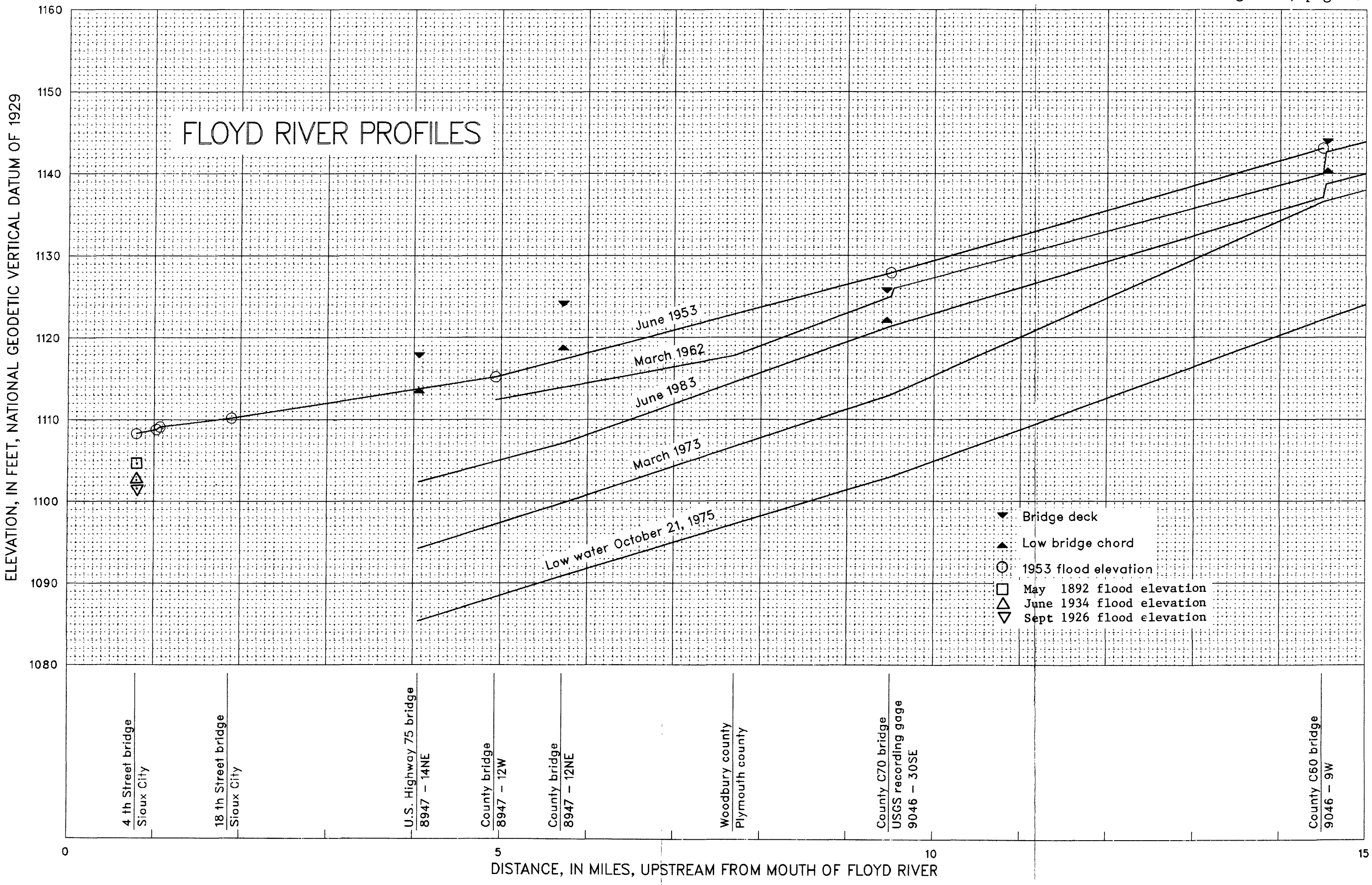
9742-31 SW (1) - At Sheldon, O'Brien county, at junction of the CSPM & O RR and the CMStP & P RR, 63.6 feet west of the west rail of CMStP & P RR, 25.7 feet west of west rail of CStPM & O RR and in line with a row of poles. Standard disc stamped "L16 1934" and set in top of a concrete post at ground level. Elev. 1413.347 feet.

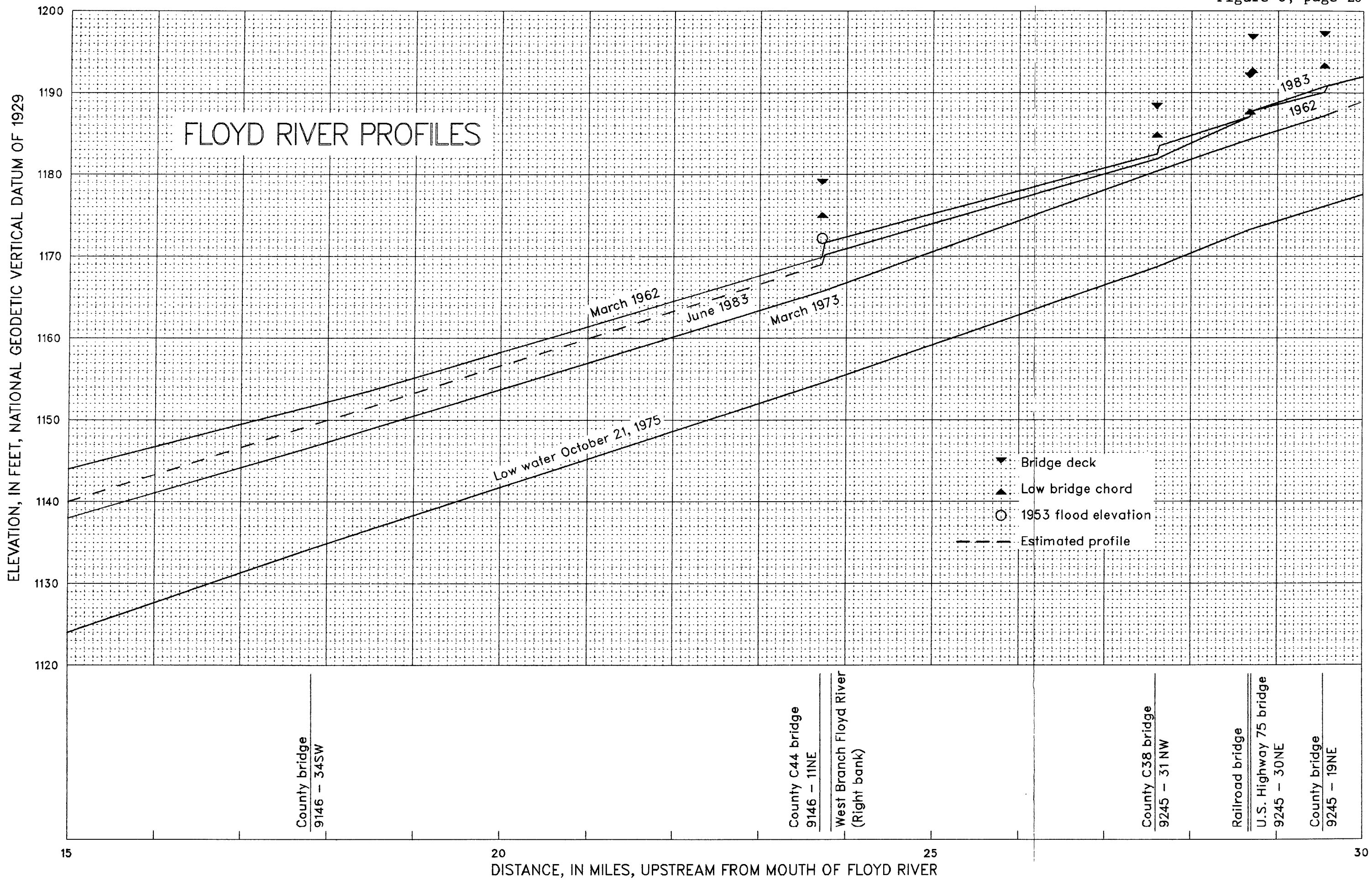
9743-36 NE (1) - Near west edge of Sheldon, at IC RR bridge over Floyd River, in downstream pile cap, 11th pile from left, in left downstream side of pile cap; pole spike and collar. Elev. 1383.91 feet.

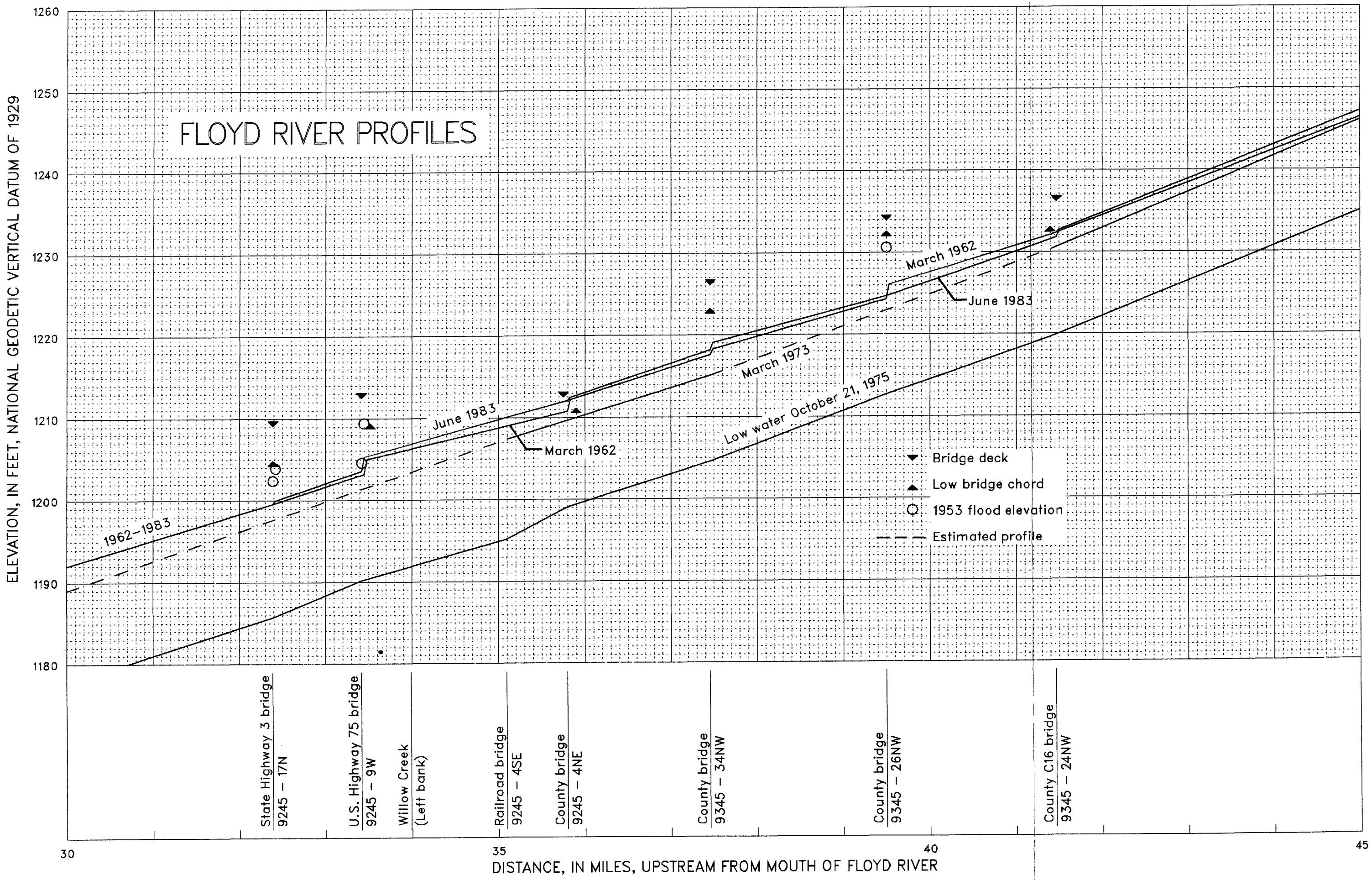
9743-36 NE (2) - At northwest edge of Sheldon, at Hwy 18 bridge over Floyd River, on top of left downstream wingwall; chiseled square. Elev. 1386.91 feet.

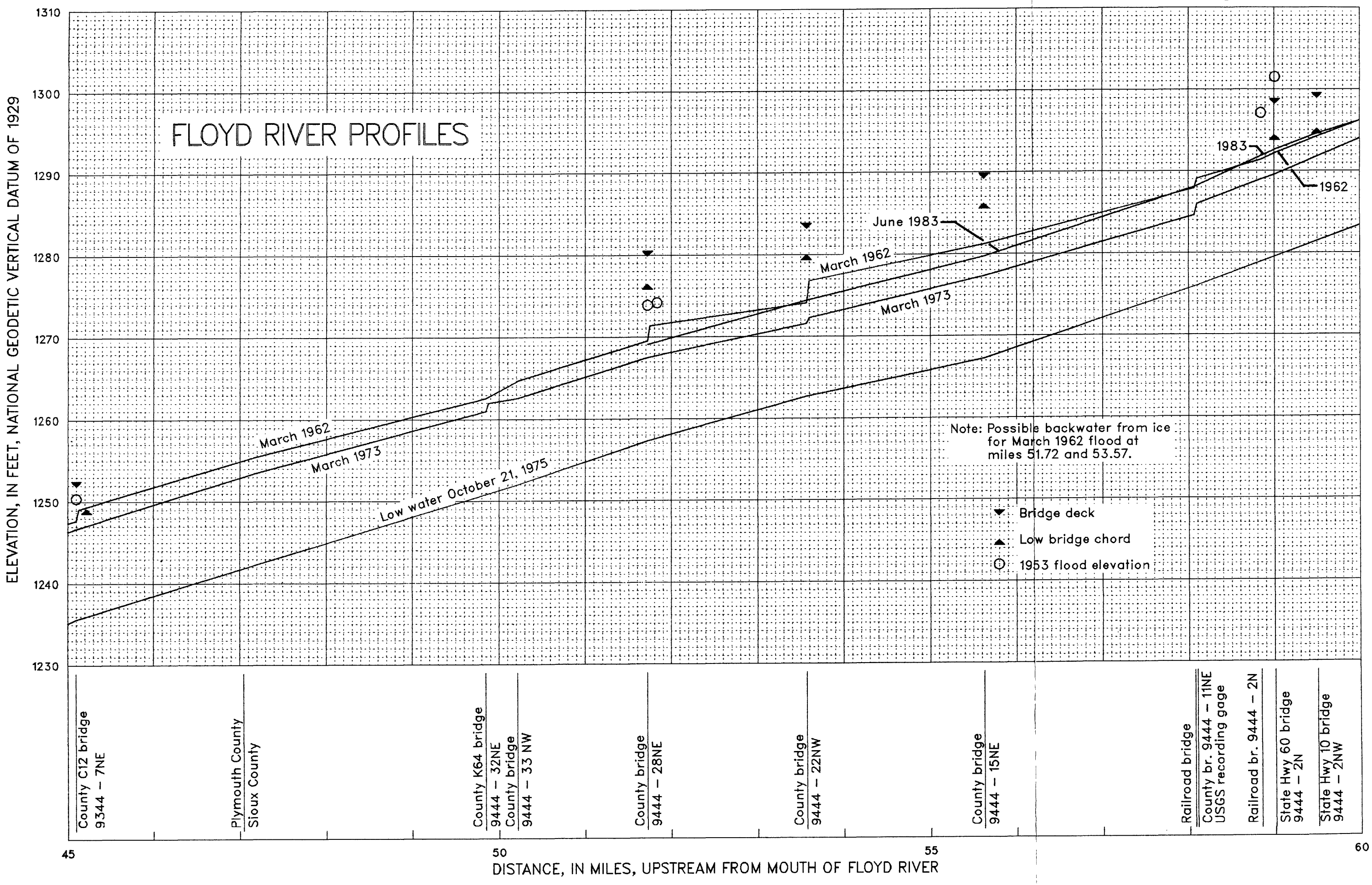
9743-36 NE (3) - (REFERENCE POINT) - At northwest edge of Sheldon, at Hwy 18 bridge over Floyd River, on downstream portion of downstream curb, left of 5th guardrail support from left end bridge, chiseled arrow. Elev. 1384.64 feet.

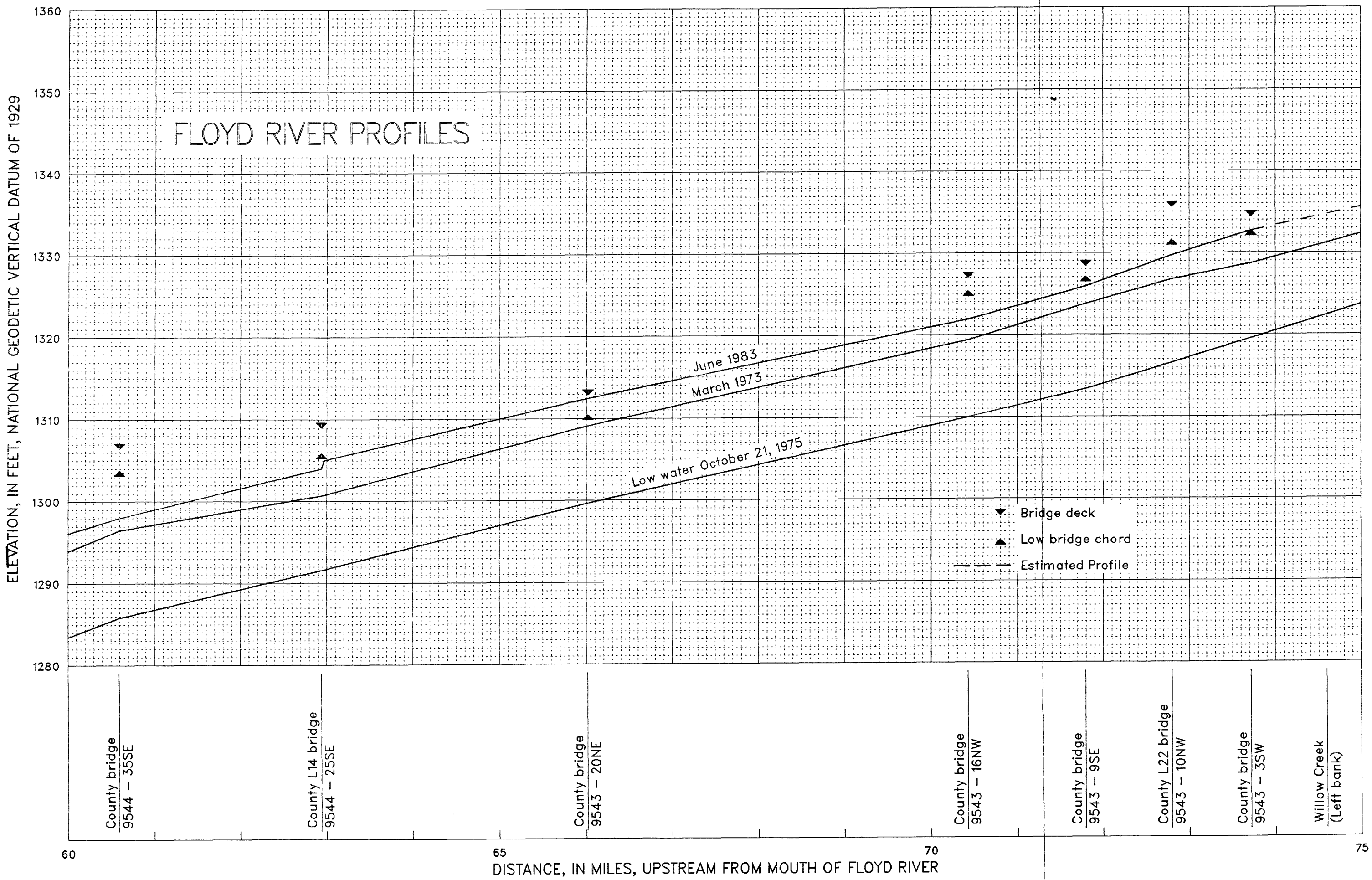
9743-36 NW (1) - About 1/2 mile west of Sheldon, at CMStP & P RR bridge over Floyd River, in downstream pile cap, 6th pile from right, on right side of pile cap; pole spike and collar. Elev. 1380.28 feet.

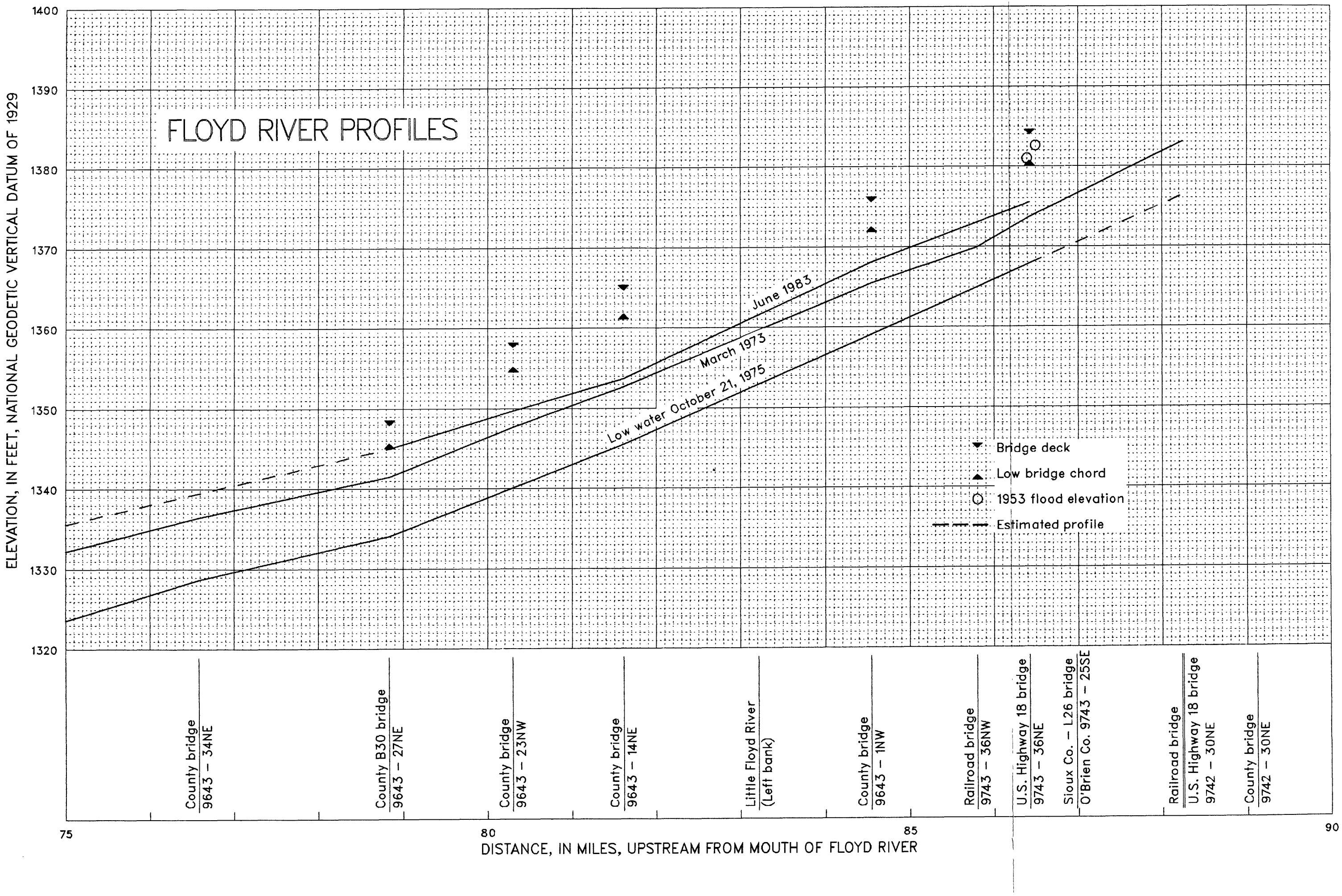

FLOYD RIVER PROFILES
ELEVATION, IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
1160
1150
1140
1130
1120
1110
1100
1090
1080
June 1953
March 1962
June 1983
March 1973
Low water October 21, 1975
Bridge deck
Low bridge chord
1953 flood elevation
May 1892 flood elevation
June 1934 flood elevation
Sept 1926 flood elevation
4 th Street bridge
Sioux City
18 th Street bridge
Sioux City
U.S. Highway 75 bridge
8947 – 14NE
County bridge
8947 – 12W
County bridge
8947 – 12NE
Woodbury county
Plymouth county
County C70 bridge
USGS recording gage
9046 – 30SE
County C60 bridge
9046 – 9W
0
5
10
15
DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF FLOYD RIVER

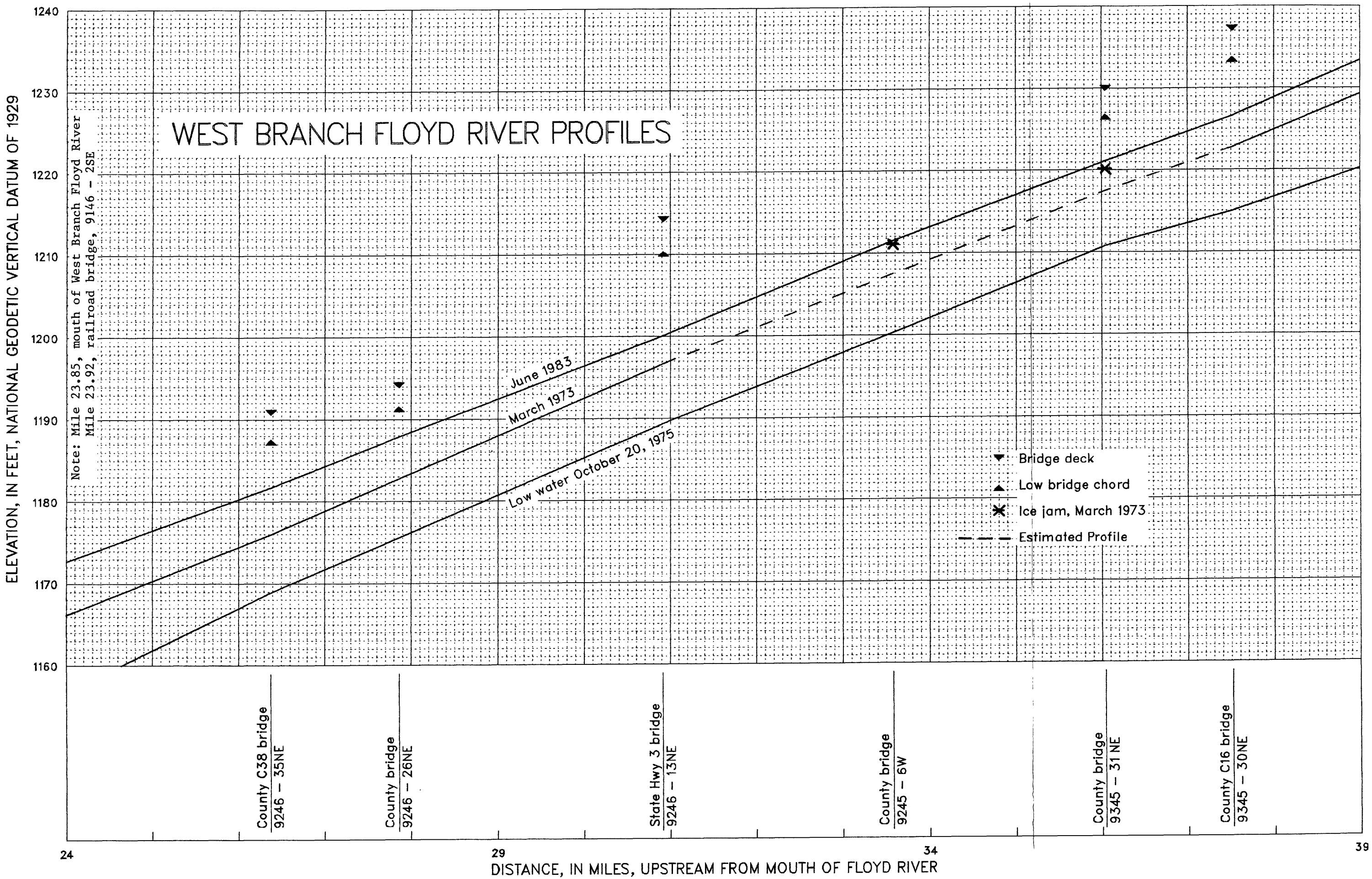

FLOYD RIVER PROFILES
ELEVATION, IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
1200
1190
1180
1170
1160
1150
1140
1130
1120
1983
1962
March 1962
June 1983
March 1973
Low water October 21, 1975
Bridge deck
Low bridge chord
1953 flood elevation
Estimated profile
County bridge
9146 – 34SW
County C44 bridge
9146 – 11NE
West Branch Floyd River
(Right bank)
County C38 bridge
9245 – 31 NW
Railroad bridge
U.S. Highway 75 bridge
9245 – 30NE
County bridge
9245 – 19NE
15
20
25
30
DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF FLOYD RIVER

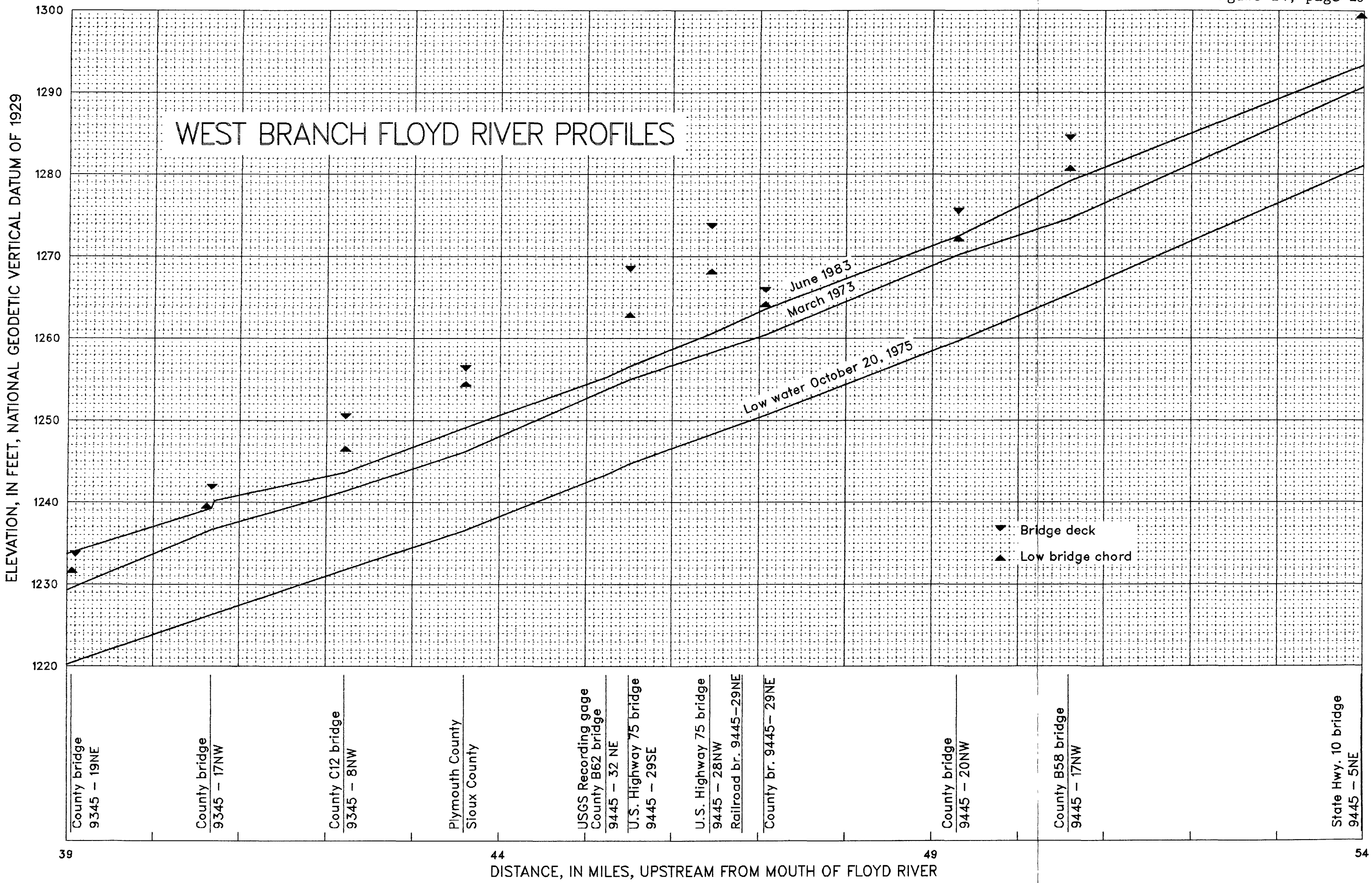

FLOYD RIVER PROFILES
ELEVATION, IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
1260
1250
1240
1230
1220
1210
1200
1190
1180
March 1962
June 1983
March 1973
Low water October 21, 1975
June 1983
March 1962
1962–1983
Bridge deck
Low bridge chord
1953 flood elevation
Estimated profile
State Highway 3 bridge
9245 – 17N
U.S. Highway 75 bridge
9245 – 9W
Willow Creek
(Left bank)
Railroad bridge
9245 – 4SE
County bridge
9245 – 4NE
County bridge
9345 – 34NW
County bridge
9345 – 26NW
County C16 bridge
9345 – 24NW
30
35
40
45
DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF FLOYD RIVER


FLOYD RIVER PROFILES
ELEVATION, IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
1310
1300
1290
1280
1270
1260
1250
1240
1230
1983
1962
June 1983
March 1962
March 1973
March 1962
March 1973
Low water October 21, 1975
Note: Possible backwater from ice for March 1962 flood at miles 51.72 and 53.57.
Bridge deck
Low bridge chord
1953 flood elevation
County C12 bridge 9344 – 7NE
Plymouth County
Sioux County
County K64 bridge 9444 – 32NE
County bridge 9444 – 33 NW
County bridge 9444 – 28NE
County bridge 9444 – 22NW
County bridge 9444 – 15NE
Railroad bridge
County br. 9444 – 11NE USGS recording gage
Railroad br. 9444 – 2N
State Hwy 60 bridge 9444 – 2N
State Hwy 10 bridge 9444 – 2NW
45
50
55
60
DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF FLOYD RIVER


FLOYD RIVER PROFILES
ELEVATION, IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
1360
1350
1340
1330
1320
1310
1300
1290
1280
June 1983
March 1973
Low water October 21, 1975
Bridge deck
Low bridge chord
Estimated Profile
County bridge 9544 – 35SE
County L14 bridge 9544 – 25SE
County bridge 9543 – 20NE
County bridge 9543 – 16NW
County bridge 9543 – 9SE
County L22 bridge 9543 – 10NW
County bridge 9543 – 3SW
Willow Creek (Left bank)
60
65
70
75
DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF FLOYD RIVER


FLOYD RIVER PROFILES
ELEVATION, IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
1400
1390
1380
1370
1360
1350
1340
1330
1320
June 1983
March 1973
Low water October 21, 1975
Bridge deck
Low bridge chord
1953 flood elevation
Estimated profile
County bridge 9643 – 34NE
County B30 bridge 9643 – 27NE
County bridge 9643 – 23NW
County bridge 9643 – 14NE
Little Floyd River (Left bank)
County bridge 9643 – 1NW
Railroad bridge 9743 – 36NW
U.S. Highway 18 bridge 9743 – 36NE
Sioux Co. – L26 bridge O'Brien Co. 9743 – 25SE
Railroad bridge
U.S. Highway 18 bridge 9742 – 30NE
County bridge 9742 – 30NE
75
80
85
90
DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF FLOYD RIVER


WEST BRANCH FLOYD RIVER PROFILES
Note: Mile 23.85, mouth of West Branch Floyd River
Mile 23.92, railroad bridge, 9146 - 2SE
ELEVATION, IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
1240
1230
1220
1210
1200
1190
1180
1170
1160
June 1983
March 1973
Low water October 20, 1975
Bridge deck
Low bridge chord
Ice jam, March 1973
Estimated Profile
County C38 bridge
9246 - 35NE
County bridge
9246 - 26NE
State Hwy 3 bridge
9246 - 13NE
County bridge
9245 - 6W
County bridge
9345 - 31 NE
County C16 bridge
9345 - 30NE
24
29
34
39
DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF FLOYD RIVER


WEST BRANCH FLOYD RIVER PROFILES
ELEVATION, IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929
1300
1290
1280
1270
1260
1250
1240
1230
1220
June 1983
March 1973
Low water October 20, 1975
Bridge deck
Low bridge chord
County bridge 9345 – 19NE
County bridge 9345 – 17NW
County C12 bridge 9345 – 8NW
Plymouth County Sioux County
USGS Recording gage County B62 bridge 9445 – 32 NE
U.S. Highway 75 bridge 9445 – 29SE
U.S. Highway 75 bridge 9445 – 28NW
Railroad br. 9445–29NE
County br. 9445– 29NE
County bridge 9445 – 20NW
County B58 bridge 9445 – 17NW
State Hwy. 10 bridge 9445 – 5NE
39
44
49
54
DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF FLOYD RIVER