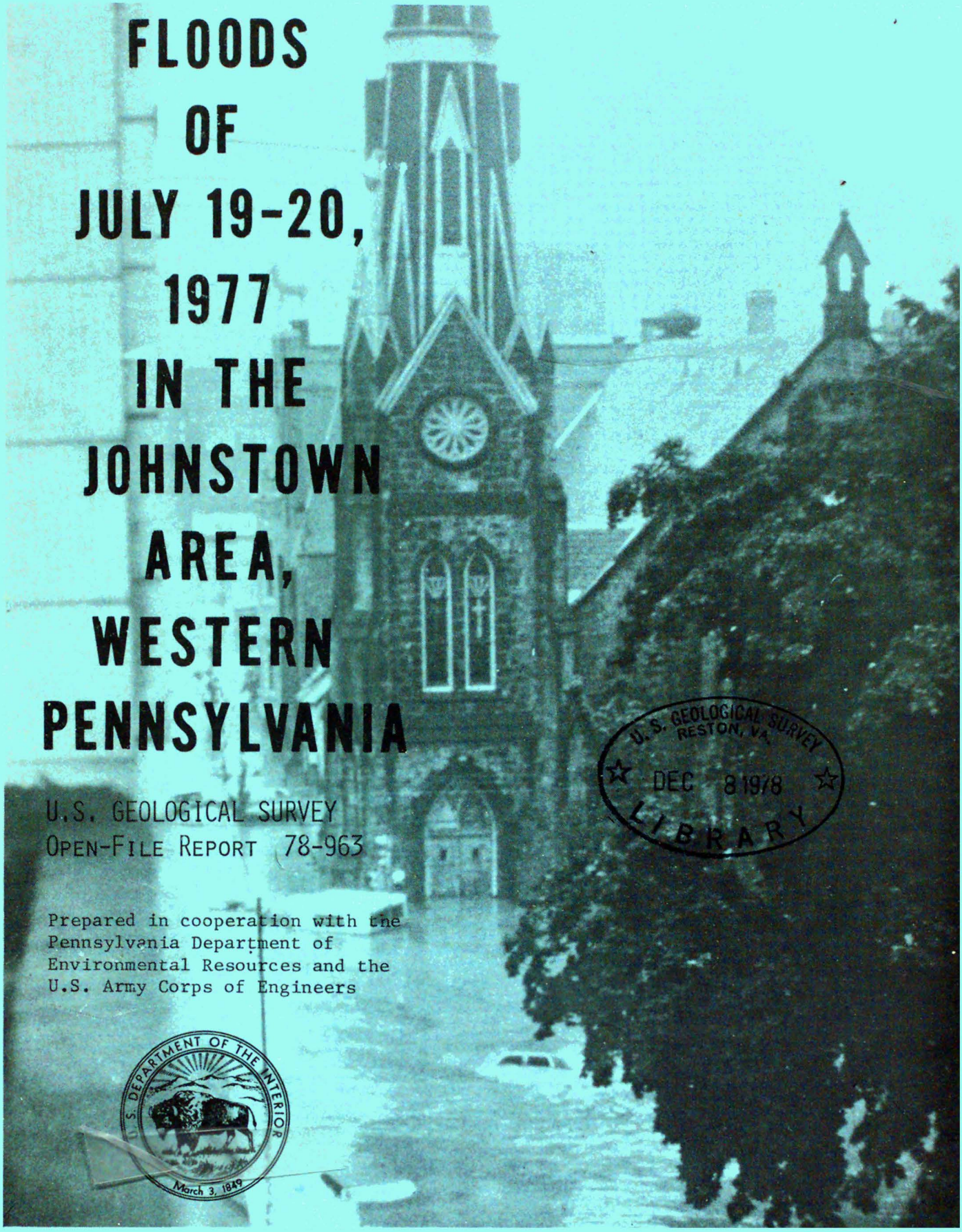
FLOODS OF JULY 19-20, 1977 IN THE JOHNSTOWN AREA, WESTERN PENNSYLVANIA



U.S. GEOLOGICAL SURVEY
OPEN-FILE REPORT 78-963

Prepared in cooperation with the Pennsylvania Department of Environmental Resources and the U.S. Army Corps of Engineers

U.S. DEPARTMENT OF THE INTERIOR
March 3, 1849

Cover.--Flooding at Franklin Street United Methodist Church in downtown Johnstown, Pennsylvania (Johnstown Tribune-Democrat Photo).

UNITED STATES
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

[Reports- open file series]

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By Stan A. Brua

Open-File Report 78-963

Prepared in cooperation with
the Pennsylvania Department of
Environmental Resources, and the
U.S. Army Corps of Engineers,
Pittsburgh District.

Harrisburg, Pennsylvania

July 1978

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FACTORS FOR CONVERTING U.S. CUSTOMARY UNITS TO INTERNATIONAL SYSTEM (SI) UNITS

Multiply English units	By	To obtain SI units
LENGTH		
inches (in)	25.4	millimeters (mm)
	.0254	meters (m)
feet (ft)	.3048	meters (m)
miles (mi)	1.609	kilometers (km)
AREA		
square miles (mi^2)	2.590	square kilometers (km^2)
acres	4047	square meters (m^2)
	.4047	square hectometers (hm^2)
VOLUME		
cubic feet (ft^3)	28.32	cubic decimeters (dm^3)
	.02832	cubic meters (m^3)
million gallons (10^6 gal)	3785	cubic meters (m^3)
acre-feet (acre-ft)	1233	cubic meters (m^3)
FLOW		
cubic feet per second (ft^3/s)	28.32	liters per second (L/s)
	28.32	cubic decimeters per second (dm^3/s)
	.02832	cubic meters per second (m^3/s)
cubic feet per second per square mile [$(ft^3/s)/mi^2$]	.01093	cubic meters per second per square kilometer [$(m^3/s)/km^2$]

GLOSSARY

Antecedent moisture. The moisture which is present in a drainage basin before a storm.

Continuous-record station. A gaging site where a record of the flood hydrograph is collected systematically.

Crest-stage station. A gaging site where information on flood peaks is collected systematically.

Cubic foot per second (ft^3/s). The rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meters per second.

Cubic foot per second per square mile [$(ft^3/s)/mi^2$]. The average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Current meter. An instrument for measuring the speed of flowing water.

Datum of the gage. The elevation of the "zero" reading of a streamflow-gaging station above National Geodetic Vertical Datum of 1929.

Discharge. The volume of water (or more broadly, volume of fluid plus suspended sediment), that passes a given point within a given period of time.

Drainage area of a stream at a specific location. That area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontribution areas, within the area unless otherwise noted.

Flood-wave routing model. A mathematical model for determining the timing and shape of a flood wave at successive points along a stream.

Gage height. The water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term "stage", although gage height is more appropriate when used with a reading on a gage.

FLOODS OF JULY 1977 IN WESTERN PENNSYLVANIA

Stan A. Brua

ABSTRACT

Intense rainfall on the evening of July 19 and early morning hours of July 20, 1977 resulted in moderate to record flooding throughout much of an eight-county area of southwest Pennsylvania. In a 400-square-mile area directly north and east of Johnstown, rainfall totals of 6 to 12 inches were measured in a six to eight-hour period.

Flood peaks having recurrence intervals greater than 100 years were recorded at several sites, primarily in the Conemaugh River basin. Runoff rates were as high as 2,390 cubic feet per second per square mile, in a 5.86-square-mile drainage area in the Little Conemaugh River basin. The Conemaugh River at Seward, which drains 715 square miles, had a peak discharge of 161 cubic feet per second per square mile. The flood waters claimed at least 78 lives and caused total losses in excess of $300 million. Also, seven earthfill dams, used mainly for water supply in the Johnstown area, failed.

This report describes the storm and the associated flooding. A tabulation of peak gage heights and discharges for the July 1977 flood and for the maximum flood previously known is included for 57 sites. Data pertaining to the dams that failed are also included.

INTRODUCTION

During the afternoon of July 19, 1977 a band of light thundershower activity moved southeastward across western Pennsylvania. That evening, as it approached the western slopes of the Allegheny Mountains, the storms intensified and became almost stationary. The storms continued throughout much of the night, with up to 12 inches of rain falling in six to eight hours. Flash flooding occurred on most small streams, particularly in the central part of the Conemaugh River basin near Johnstown, Pa. Moderate to record flooding was reported along most of the larger streams in the basin, including the main stem Conemaugh River. Severe flooding also occurred in the Crooked Creek, Mahoning Creek, Redbank Creek, and West Branch Susquehanna River basins to the north and in the Juniata River basin to the south and east of the Conemaugh River basin (see fig. 1).

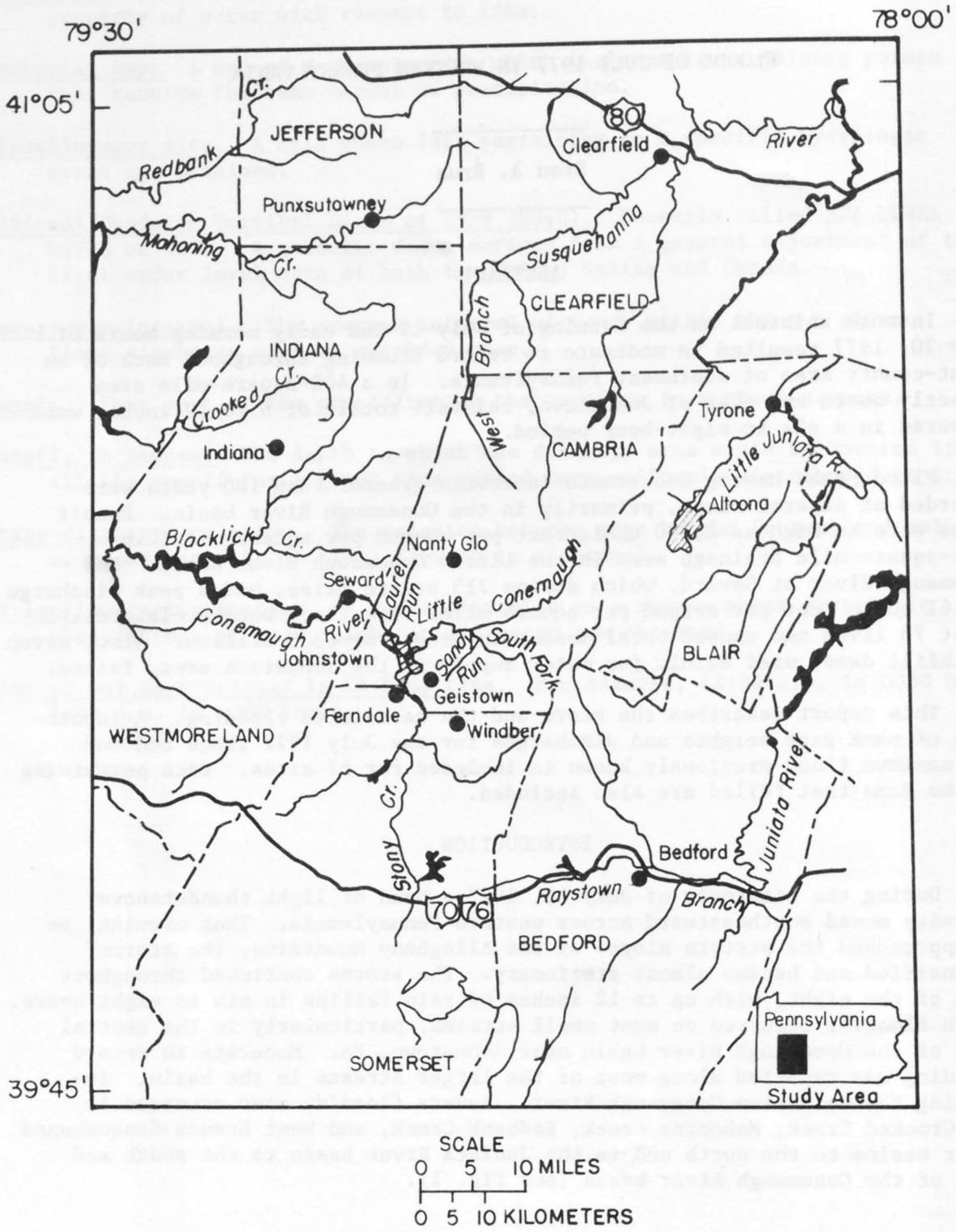

Figure 1.--Flood-affected area.

Peak discharges of many streams were the highest of record, and in some instances exceeded maximum discharges that are likely to occur on the average of once in 100 years.

In some areas flooding came in the night without warning. Streams rose higher and faster than at anytime within the experience of long-term, local residents. Seven earthfill dams were breached, creating serious flooding reminiscent of the historical Johnstown flood of 1889, when a dam failure on South Fork Little Conemaugh River caused much destruction and resulted in 2,200 deaths.

The failure of the seven dams did not cause the floods on mainstem streams at Johnstown. Laurel Run, the largest dam, was located downstream from Johnstown. Also, rainfall for the 1977 flood was greater than that in 1889.

At least 78 deaths were attributed directly to the flood and eight persons were reported missing. The total losses in the flood area, comprised of Bedford, Blair, Cambria, Clearfield, Indiana, Jefferson, Somerset, and Westmoreland counties, is expected to exceed $300 million according to the Pennsylvania House of Representatives (1977).

Elevations, used in this report, are referred to National Geodetic Vertical Datum of 1929 (NGVD), unless otherwise qualified. At stream-gaging sites, elevations of the water surface may be obtained by adding the gage height to the datum of the gage given in the Appendix. The datum of the gage above NGVD is the elevation of the "zero" reading above NGVD.

ACKNOWLEDGEMENTS

The hydrologic data presented in this report were collected as part of the cooperative program between the U.S. Geological Survey, U.S. Army Corps of Engineers, and the Pennsylvania Department of Environmental Resources.

Data provided by the U.S. Army Corps of Engineers and the Pennsylvania Department of Environmental Resources are noted in the text.

THE STORM

During the afternoon and early evening of July 19, 1977, an organized band of convective storms moved slowly south-southeastward into southwestern and south-central Pennsylvania. Moist low-level air then flowed eastward over the rain-cooled thunderstorm area and triggered new thunderstorm activity on the northwest periphery of the area near Johnstown. These thunderstorms then moved southeastward causing heavy rains along the western slopes of the Appalachian mountains. The storms continued for several hours, producing a seemingly stationary precipitation pattern. As much as 12 inches of rain in 6 to 8 hours were observed in the area just north and east of Johnstown. These series of violent thunderstorms and heavy rains were associated with weak, upper-level weather systems.

Rainfall during the two weeks immediately preceding the flood nearly equaled or exceeded the normal July total of approximately 4 inches. Between July 6 and 18, rainfall ranged from 2 to 5 inches in the area surrounding Johnstown. Johnstown 2 reported 4.42 inches during this period; 1.34 inches fell just two days before the major storm. Antecedent-moisture conditions are, therefore, considered to have contributed significantly to the high rates of storm runoff.

Precipitation data are listed in table 1 for 40 sites where storm rainfalls were greater than two inches. The distribution of rainfall with respect to time is shown in figure 2 for three sites. An isohyetal map showing the areal distribution of rainfall for the storm is presented in figure 3.

DESCRIPTION OF THE FLOODS

Setting

The worst flooding associated with the storm of July 19-20, 1977 occurred in the Conemaugh River basin in Cambria, Indiana, Somerset and Westmoreland counties. The area is part of the Appalachian Plateau province and is characterized by steep-sided hills and narrow valleys, making it very susceptible to severe flooding.

Stony Creek is the largest tributary to the Conemaugh River and drains a 467-square-mile area in the southern part of the basin. The Little Conemaugh River, draining 190 square miles, flows westward to Johnstown, where it forms the Conemaugh River at its confluence with Stony Creek. Blacklick Creek, the third major tributary, enters the Conemaugh River near the midpoint in the Conemaugh River Reservoir, a major flood-control project operated by the U.S. Army Corps of Engineers. The 418-square-mile drainage area of Blacklick Creek forms the northwest part of the Conemaugh basin. The basin's eastern boundary is the drainage divide between the Ohio River and the Susquehanna and Potomac Rivers.

TABLE 1.--PRECIPITATION AT SELECTED SITES, JULY 19-20, 1977

(Data furnished by National Weather Service unless otherwise noted)

DRAINAGE BASIN Sub-basin	STATION NAME OR Location	COUNTY	LATITUDE	LONGITUDE	24-HOUR TOTAL (inches)
CONEMAUGH RIVER	Johnstown 2	Cambria	40°19'	78°55'	[a/] 8.96
	New Florence	Indiana	40°23'	79°04'	4.0
	near Laurel Run Dam	Cambria	40°23'	78°55'	[b/] 12.0
	near Cramer	Cambria	40°26'	78°56'	[b/] 12.0
	Laurel Run Dam	Cambria	40°23'	78°55'	[b/] 11.86
Stony Creek	Johnstown	Cambria	40°18'	78°56'	8.75
	Hooversville	Somerset	40°09'	78°55'	3.67
	Rummel	Somerset	40°13'	78°48'	[b/] 5.5
Little Conemaugh River	[1/] Cresson 1 SE	Cambria	40°27'	78°34'	[a/] 4.00
	Dunlo	Cambria	40°17'	78°43'	[a/] 9.90
	Ebensburg Swg Pl	Cambria	40°28'	78°44'	4.63
	near Dunlo	Cambria	40°18'	78°45'	12.0
	Cresson	Cambria	40°27'	78°34'	[b/] 4.5
Blacklick Creek	Indiana 3 SE	Indiana	40°36'	79°07'	5.27
	Strongstown	Indiana	40°33'	78°55'	[a/] 7.49
	Onberg	Indiana	40°40'	79°04'	[b/] 4.0
	Josephine	Indiana	40°28'	79°11'	[b/] 8.2
	Nanty-Glo	Cambria	40°28'	78°50'	[b/] 12.0
CLARION RIVER	Brookville Swg Pl	Jefferson	41°09'	79°05'	3.86
	Clarion 3 SW	Clarion	41°12'	79°26'	3.42
REDBANK CREEK	Cool Spring	Jefferson	41°03'	79°05'	2.70
	Truittsburg	Clarion	41°03'	79°17'	4.85
	Reynoldsville	Jefferson	41°06'	78°53'	5.30

TABLE 1.--PRECIPITATION AT SELECTED SITES, JULY 19-20, 1977 (Continued)

DRAINAGE BASIN Sub-basin	STATION NAME OR Location	COUNTY	LATITUDE	LONGITUDE	24-HOUR TOTAL (inches)
MAHONING CREEK	Punxsutawney	Jefferson	40°57'	79°00'	3.1
	Putneyville 2 SE Dam	Armstrong	40°55'	79°17'	3.10
	Stump Creek 2 SW	Jefferson	41°00'	78°51'	6.00
CROOKED CREEK	Creekside	Indiana	40°41'	79°12'	4.51
	Ford City 4 S Dam	Armstrong	40°43'	79°30'	2.05
	Home	Indiana	40°45'	79°06'	3.31
	Marion Center 2 SE	Indiana	40°45'	79°02'	5.21
	Sagamore	Armstrong	40°47'	79°14'	4.92
	Marion Center	Cambria	40°46'	79°03'	b/ 3.0
	Plumville	Indiana	40°48'	79°11'	b/ 3.0
	Gaibleton	Indiana	40°43'	79°06'	b/ 5.0
JUNIATA RIVER					
Frankstown Branch	Altoona 3 W	Blair	40°30'	78°28'	2.57
	Blue Knob	Blair	40°20'	78°34'	5.40
Raystown Branch	Buffalo Mills	Bedford	39°57'	78°39'	4.70
	Kegg	Bedford	39°59'	78°43'	4.81
	Wolfsburg	Bedford	40°03'	78°32'	4.98
WEST BRANCH SUSQUEHANNA RIVER	Carrolltown 2 SSE	Cambria	40°35'	78°42'	2.34

a/ Hourly precipitation data plotted on Figure 3.
b/ Furnished by U.S. Army Corps of Engineers.
1/ Not the National Weather Service's official "Dunlo" rainfall station.

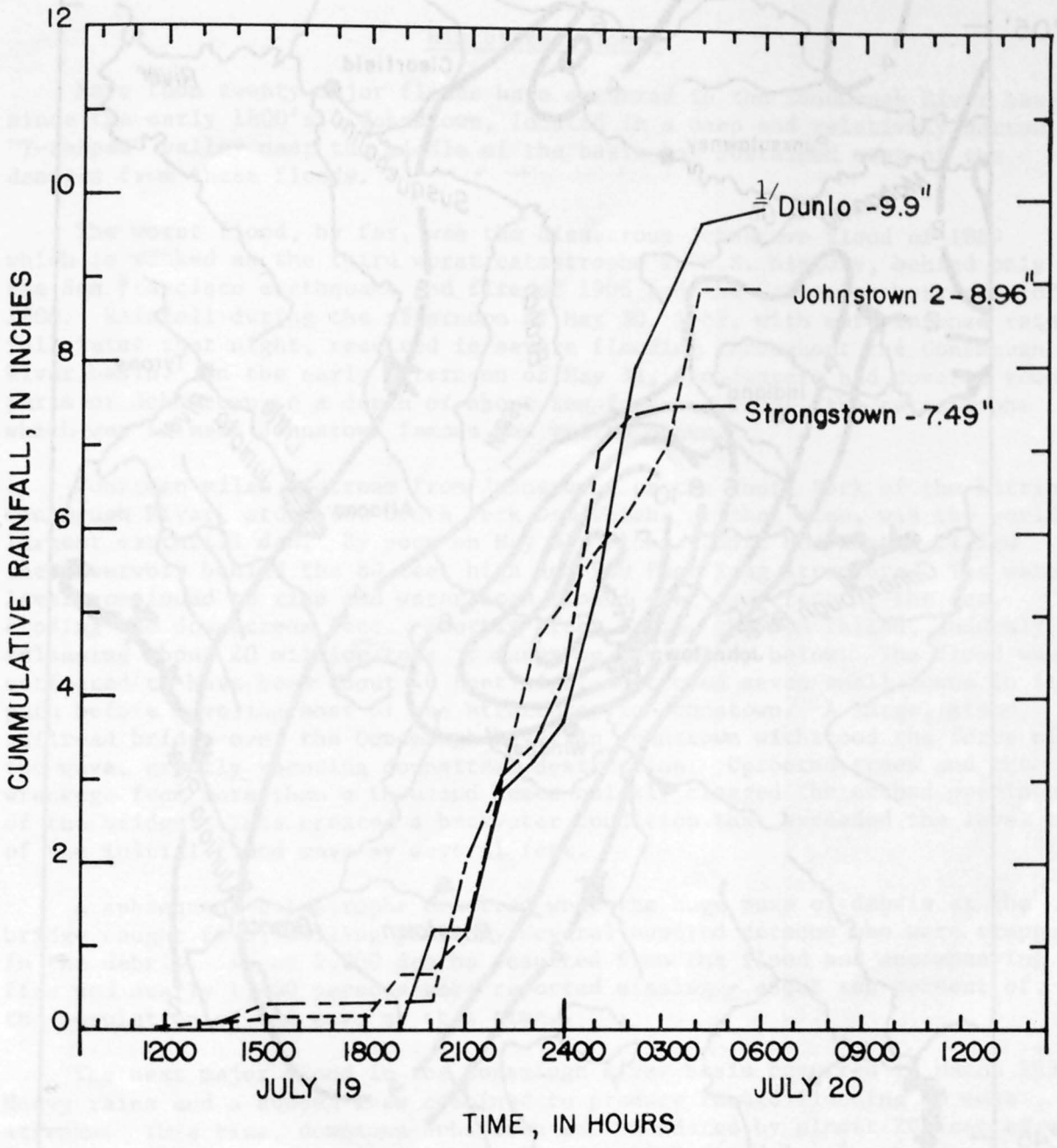

Figure 2.--Cummulative rainfall at 1/ Dunlo, Johnstown 2 and Strongstown, Pa., July 19-20, 1977 (Based on data furnished by the National Weather Service).

1/ Not the National Weather Service's official "Dunlo" rainfall station.

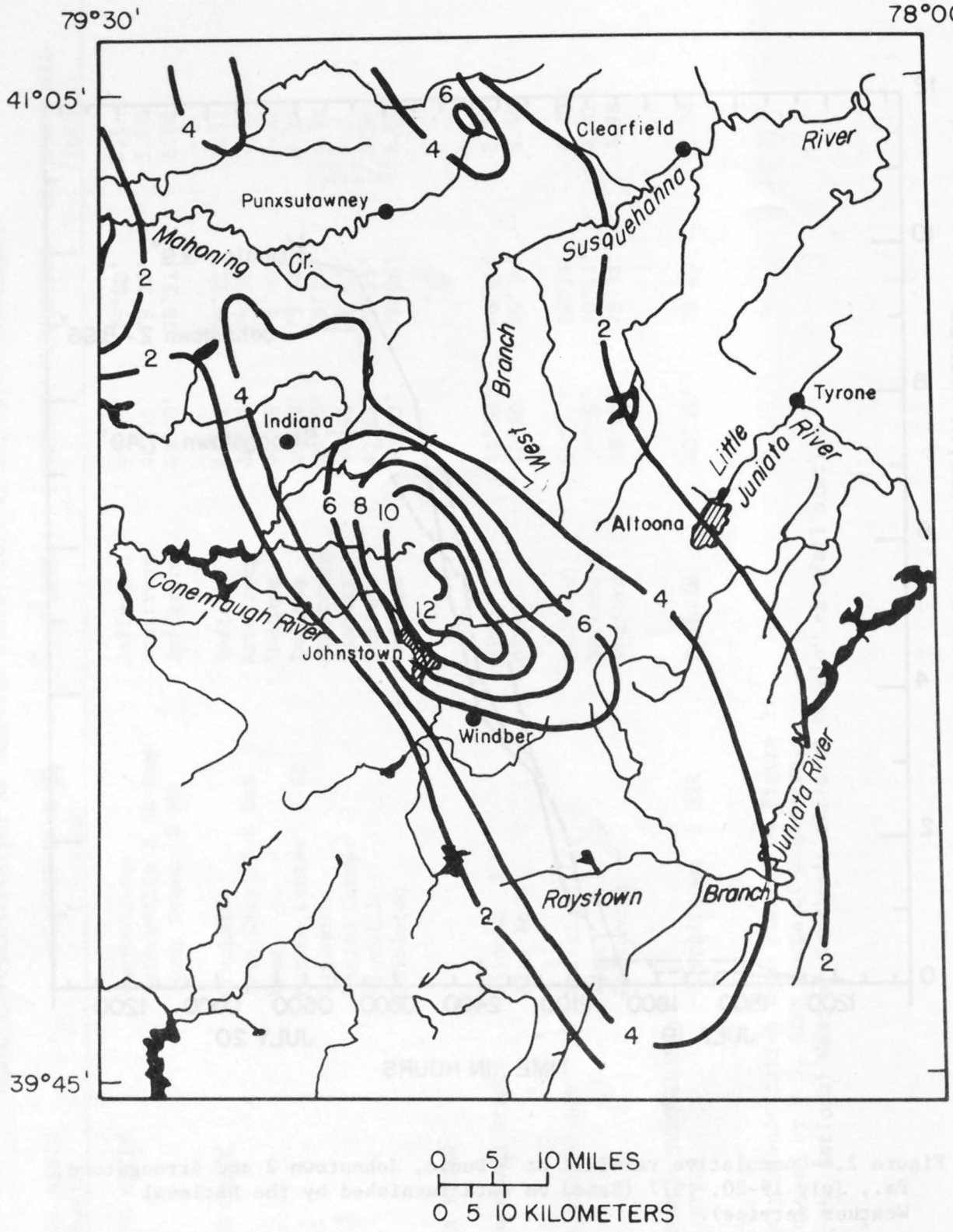

Figure 3.--Isohyetal map of total rainfall (in inches) for storm of July 19-20, 1977. (Adapted from map by National Weather Service)

Historical Floods

More than twenty major floods have occurred in the Conemaugh River basin since the early 1800's. Johnstown, located in a deep and relatively narrow "Y-shaped" valley near the middle of the basin has sustained most of the damages from these floods.

The worst flood, by far, was the disastrous Johnstown flood of 1889 which is ranked as the third worst catastrophe in U.S. history, behind only the San Francisco earthquake and fire of 1906 and the Galveston hurricane of 1900. Rainfall during the afternoon of May 30, 1889, with more intense rainfall later that night, resulted in severe flooding throughout the Conemaugh River basin. In the early afternoon of May 31, floodwaters had covered some parts of Johnstown to a depth of about ten feet. However, the catastrophe which was to make Johnstown famous was yet to occur.

Fourteen miles upstream from Johnstown, on the South Fork of the Little Conemaugh River, stood the South Fork Dam which, at that time, was the world's largest earthfill dam. By noon on May 31, flood runoff had nearly filled the reservoir behind the 80 feet high and 900 feet long structure. The water level continued to rise and water soon flowed over the crest of the dam, eroding the downstream face. Shortly after 3 p.m. the dam failed, suddenly releasing about 20 million tons of water on the valley below. The flood wave, estimated to have been about 40 feet high, destroyed seven small towns in its path before leveling most of the structures in Johnstown. A large, stone railroad bridge over the Conemaugh River in Johnstown withstood the force of the wave, greatly reducing downstream destruction. Uprooted trees and the wreckage from more than a thousand homes quickly clogged the arched openings of the bridge. This created a backwater condition that exceeded the level of the initial flood wave by several feet.

A subsequent catastrophe occurred when the huge mass of debris at the bridge caught fire, killing possibly several hundred persons who were trapped in the debris. About 2,200 deaths resulted from the flood and accompanying fire and nearly 1,000 persons were reported missing - about ten percent of the population of the area at that time.

The next major flood in the Conemaugh River basin occurred in March 1936. Heavy rains and a sudden thaw combined to produce record flooding on most streams. This time, downtown Johnstown was inundated by almost 20 feet of water. Although only about four feet lower than the 1889 flood level, the destruction and death toll were considerably less as water levels rose much less rapidly. Twenty-five deaths occurred in the Johnstown area.

The rainfall associated with Hurricane Agnes in June 1972, caused widespread flooding, but water levels in the Conemaugh basin were generally lower than the 1936 flood levels. No significant flooding occurred at Johnstown. Channel improvements made on the Little Conemaugh River, Stony Creek, and the Conemaugh River in Johnstown by the U.S. Army Corps of Engineers following the 1936 flood, were credited with preventing serious floods.

Flood of July 19-20, 1977

The storm of July 19 and 20, 1977 was responsible for the worst flooding in the Coneamaugh basin since the 1889 disaster. Locations of the sites where flood data were obtained are shown in figure 4 and described, in detail, in the Appendix.

In the Stony Creek basin, flooding, such as that shown in figure 5, was most severe along small streams in the lower half of the basin. Runoff rates greater than 1,000 $(ft^3/s)/mi^2$ occurred on Seese Run at Windber (Site No. 11, fig. 4) and Sams Run at Geistown (Site No. 14) and Lorain (site No. 15). Drainage areas at these sites are 4.66, 1.28, and 2.17 mi^2, respectively.

Peak flows along Stony Creek increased sharply as the flood crest proceeded downstream toward Johnstown, but fell short of the record level set during the 1936 flood. At Ferndale (Site No. 13), a suburb of Johnstown, the peak discharge of Stony Creek was 48,000 ft^3/s, 19 percent less than the 1936 discharge.

The peak flow of the Little Conemaugh River at the gaging station at East Conemaugh (site No. 23) was 40,000 ft^3/s, about 40 percent higher than the previous record discharge in 1936. Severe flooding was reported along the entire main stem, as well as on most of the tributary streams. The 5.86 mi^2 drainage area of Sandy Run above Sandy Run Reservoir (site No. 21) had a unit discharge of 2,390 $(ft^3/s)/mi^2$, the maximum known natural runoff rate for the entire flood area.

Johnstown's business district, situated at the confluence of Stony Creek and the Little Conemaugh River, was inundated by as much as 10 feet of water (figs. 6-8). A local newspaper, The Tribune-Democrat, reported more than 200 businesses and about 1,500 dwelling units (apartments and homes) in the downtown area were affected by the flood. Initial reports by the U.S. Corps of Engineers state that the flood level in downtown Johnstown would have been about 11 feet higher if the channel improvements, completed in 1943, had not been built. Flooding at City Hall was 10.1 feet below the 1936 flood level and 14.1 feet below the level of the flood of 1889 (fig. 9).

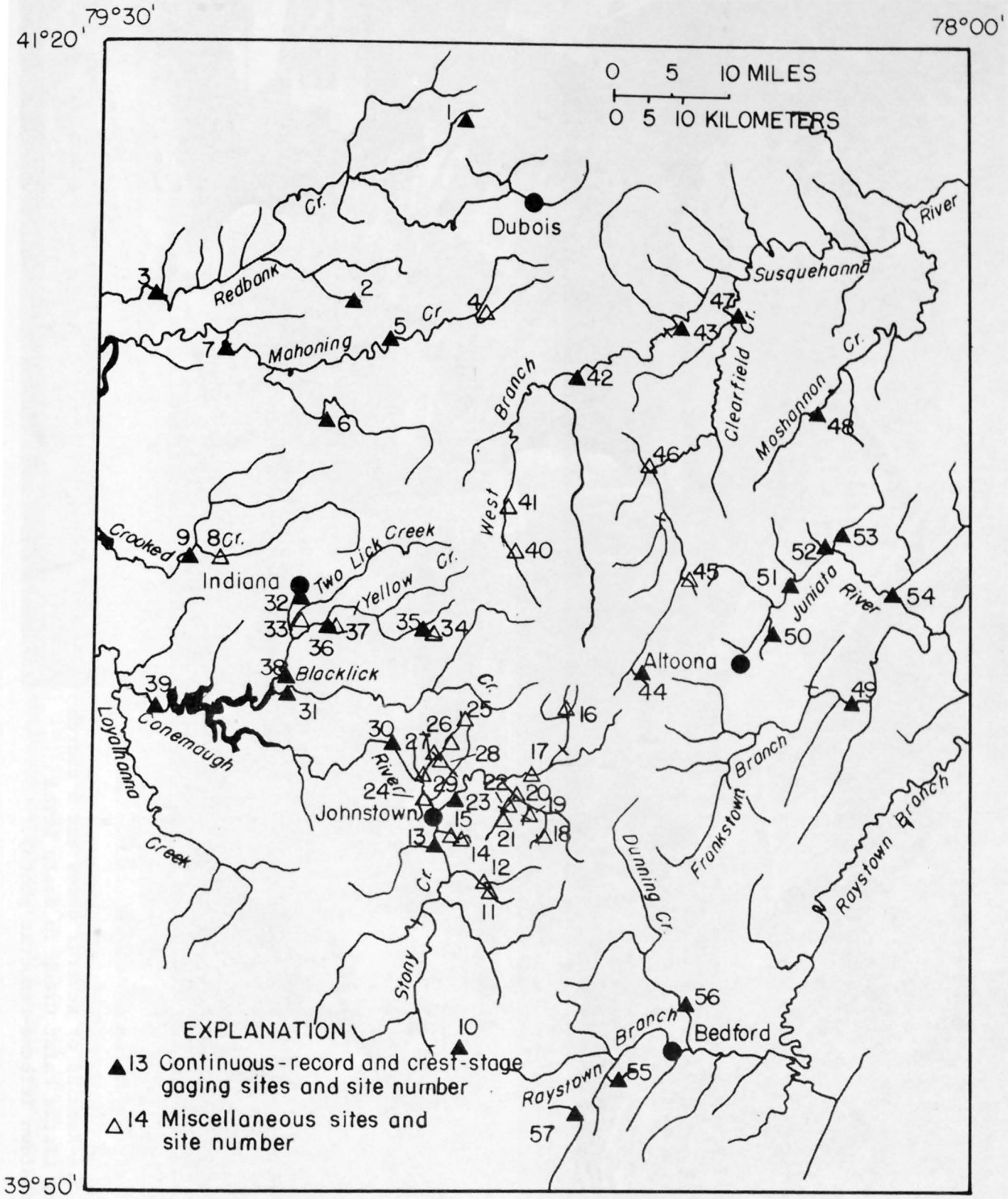

Figure 4.--Location of flood-determination sites.

Figure 5.--Remains of several homes and a church along Little Paint Creek in Scalp Level (Johnstown Tribune-Democrat photo).

Figure 6.--Flooded businesses in downtown Johnstown at Park Place (Johnstown Tribune-Democrat photo). (The peak stage was about eight inches higher than shown.)

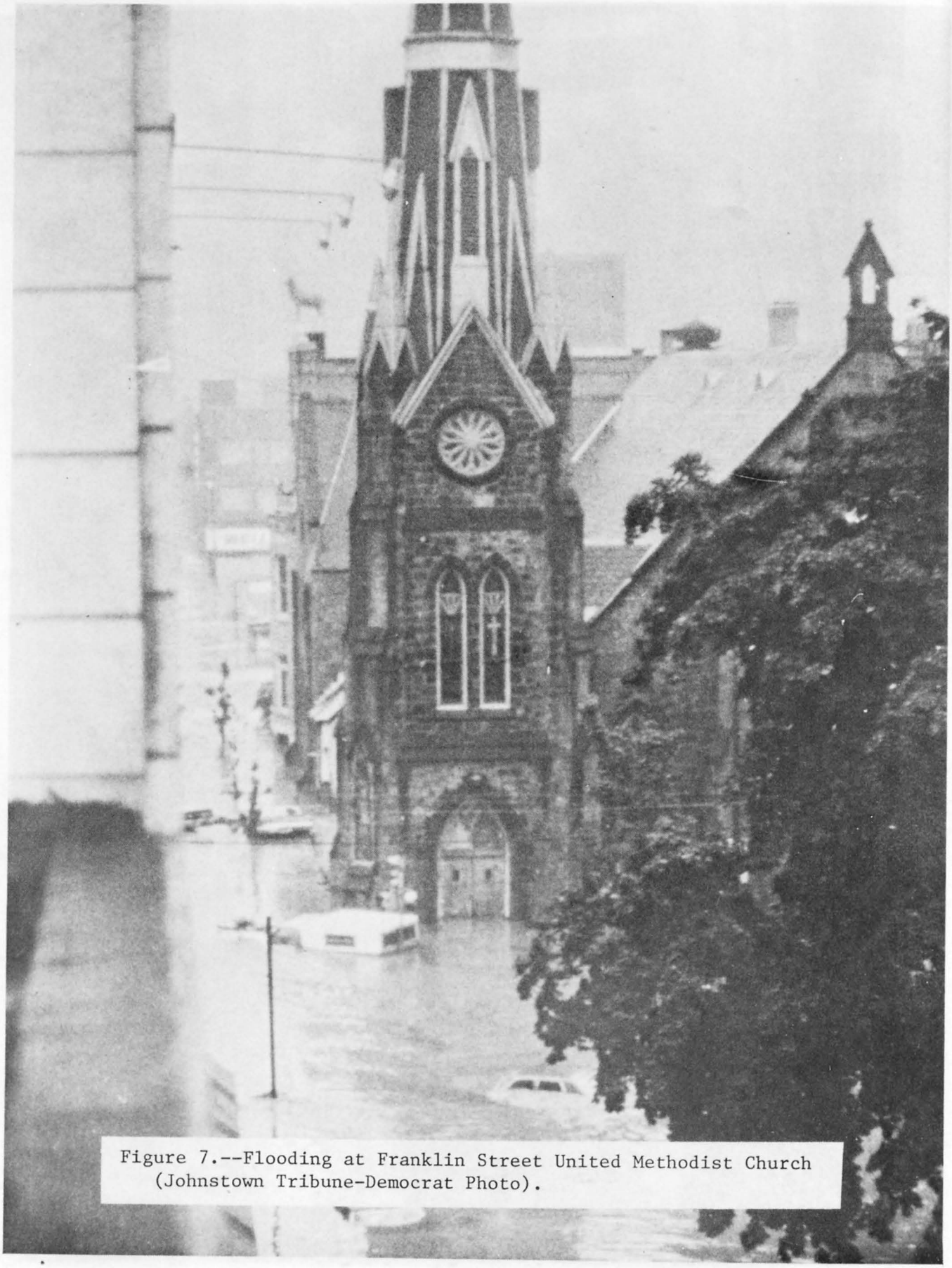

Figure 7.--Flooding at Franklin Street United Methodist Church (Johnstown Tribune-Democrat Photo).

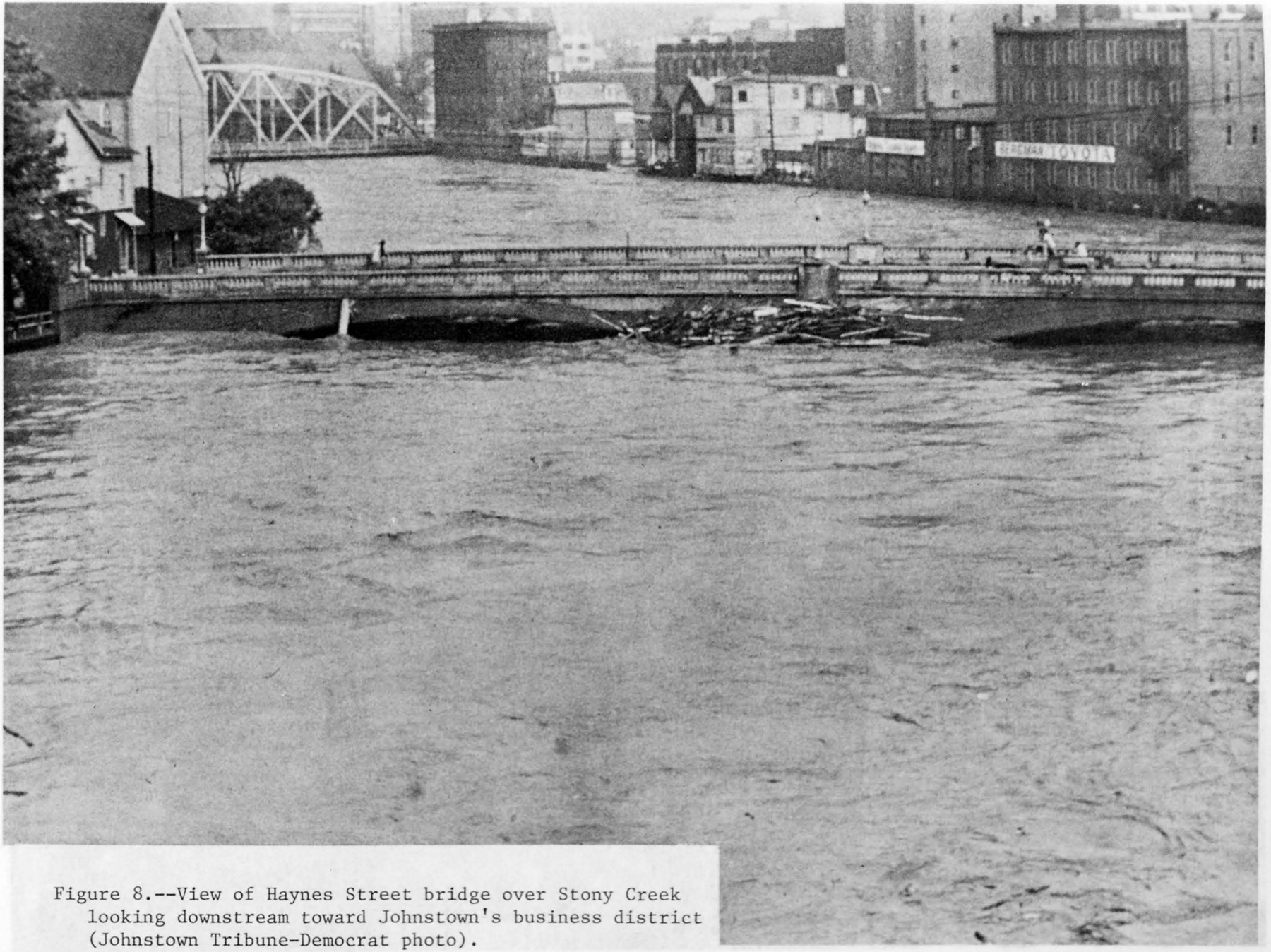

Figure 8.--View of Haynes Street bridge over Stony Creek looking downstream toward Johnstown's business district (Johnstown Tribune-Democrat photo).

Figure 9.--Maximum heights of the 1889, 1936, and 1977 floods at Johnstown's City Hall at northeast corner of Main and Market Streets.

At Seward (Site No. 30), seven miles northwest of Johnstown, the Conemaugh River reached a stage of 27.06 feet, surpassing the 1936 flood stage by 4.11 feet. The peak discharge for the 715 mi^2 drainage area was 115,000 ft^3/s. High flows caused severe flooding as far downstream as the Conemaugh River Reservoir. The peak flow downstream from the dam at Tunnelton (Site No. 39) was only 23,600 ft^3/s, about 80 percent less than the flow at Seward.

Flood peaks reported at the five gaging sites in the Blacklick Creek basin ranged from 1.6 to 5.2 times greater than the previous record flows of 1972. The peak discharge for Blacklick Creek at Josephine (Site No. 31) was 45,800 ft^3/s from 192 square miles. The runoff from a 0.76 mi^2 area near Strongstown (Site No. 34) yielded the maximum known unit discharge for this basin of nearly 2,000 $(ft^3/s)/mi^2$.

Record flooding occurred in the upper part of both the Redbank Creek and Mahoning Creek basins as a result of a second storm center that resulted in about 6 inches of rain on a small area 50 miles north of Johnstown. On Big Run near Sprankle Mills (Site No. 2), the peak discharge was 960 ft^3/s, 10 percent higher than the record discharge of a localized flood in February 1975. At Punxsutawney (Site No. 5) the peak stage for Mahoning Creek was 0.3 foot higher than the previously known maximum that occurred in 1972. However, the discharge of 12,700 ft^3/s was about 25 percent less than that in 1972 because of a decrease in the carrying capacity of the stream in the vicinity of the gage.

In the Susquehanna River basin, new flood records were established at two gaging sites. The peak discharge for Dunning Creek at Belden (Site No. 56), located 25 miles southeast of Johnstown, was 19,400 ft^3/s, or 2,500 ft^3/s greater than that in 1936. At the gage on Buffalo Run tributary near Manns Choice (Site No. 55), the stage of 5.12 feet and discharge of 1,120 ft^3/s were the highest since 1961.

SUMMARY OF FLOOD STAGES AND DISCHARGES

Peak stages, discharges, and unit discharges for the July 1977 flood are presented in Table 2 for 30 streamflow-gaging stations (26 continuous-record and 4 crest-stage) and 27 miscellaneous sites. Comparative data for previous floods is also included. The station numbers in Table 2 are in downstream order and are the same as those used in annual U.S. Geological Survey streamflow data reports.

During flood periods, it is frequency impossible or impractical to physically measure peak discharges by conventional current-meter methods. Consequently, 34 of the peak discharges contained in this report were determined by indirect methods after the passage of the flood. These methods include slope-area, contracted-opening, flow-over-dam, and flow-through-culvert, which are described in Dalrymple and Benson (1967), Matthai (1967), Hulsing (1967), and Bodhaine (1968), respectively. Peak discharges at the remaining sites were determined from established stage-discharge relationships.

TABLE 2.--SUMMARY OF FLOOD STAGES AND DISCHARGES

Site number on fig. 4	Station number	Stream and place of determination	Drainage area (mi^2)	Maximum flood previously known: Period	Month and year	Gage height (feet)	Discharge (ft^3/s)	Flood of July 1977: Date	Gage height (feet)	Discharge (ft^3/s)	Unit discharge [(ft^3/s)/mi^2]	Recurrence interval (years)
		REDBANK CREEK BASIN										
1	03031780	Mill Creek near Brockway	2.12	1965-	Feb 1966	6.43	306	(Below base flood)				
2	03031950	Big Run near Sprankle Mills	7.38	1963-	Feb 1966	6.23	822	19	6.22	960	130	15
					Feb 1975	6.12	858					
3	03032500	Redbank Cr at St. Charles	528	1910-	Mar 1936	[a]/18.60	50,000	20	14.72	19,500	37	5
		MAHONING CREEK BASIN										
4	03033220	Stump Cr at Big Run	26.8	-	-	-	-	-	-	5,240	196	-
5	03034000	Mahoning Cr at Punxsutawney	158	1938-	Jun 1972	15.94	17,300	20	16.22	12,700	80	40
6	03034500	Little Mahoning Cr at McCormick	87.4	1939-	Jun 1972	13.20	6,200	20	12.77	5,770	66	20
					Feb 1977	[b]/14.03	-					
7	03036000	Mahoning Cr at Mahoning Cr Dam	344	1938-	Mar 1942	8.10	[c]/10,400	22	7.35	[c]/6,560	19	3
		CROOKED CREEK BASIN										
8	03037300	Crooked Cr at Shelocta	117	-	-	-	-	-	-	9,940	85	-
9	03038000	Crooked Cr at Idaho	191	1936-	Mar 1936	18.6	19,400	20	13.38	[c]/8,860	46	10
		CONEMAUGH RIVER BASIN										
10	03039200	Clear Run near Buckstown	3.68	1961-	Feb 1961	[a]/5.30	-	20	5.03	366	99	30
					Jun 1972	4.53	266					
11	03039910	Seese Run at Windber	4.66	-	-	-	-	-	-	5,760	1,240	-
12	03039914	Paint Cr at Windber	21.8	-	-	-	-	-	-	19,000	872	-
13	03040000	Stony Cr at Ferndale	451	1913-	Mar 1936	[a]/30.26	[c]/59,000	20	23.21	[c]/48,000	106	[d]/100
14	03040016	Sams Run at Geistown	1.28	-	-	-	-	-	-	1,600	1,250	-
15	03040018	Sams Run at Lorain	2.17	-	-	-	-	-	-	2,960	1,360	-
16	03040095	North Br Tributary near Ebensburg	.80	-	-	-	-	-	-	[e]/1,040	1,300	-
17	03040300	Little Conemaugh River at Summerhill	91.1	-	-	-	-	-	-	8,670	95	-
18	03040420	Otto Run at Salix	3.70	-	-	-	-	-	-	[e]/2,120	573	-
19	03040430	South Fork Tributary at St. Michael	1.70	-	-	-	-	-	-	[e]/4,300	2,530	-
20	03040500	South Fork Little Conemaugh River at Fishertown	52.6	-	-	-	-	-	-	24,000	456	-
21	03040503	Sandy Run above Sandy Run Reservoir near St. Michael	5.86	-	-	-	-	-	-	14,000	2,390	-
22	03040505	Sandy Run below Sandy Run Reservoir at St. Michael	7.61	-	-	-	-	-	-	[e]/15,300	2,010	-
23	03041000	Little Conemaugh River at East Conemaugh	183	1936-	Mar 1936	-	[c]/28,800	20	18.85	[c]/40,000	219	[d]/>100
					Jun 1972	10.48	[c]/16,600					
24	03041030	Elk Run at Morrellville	1.99	-	-	-	-	-	-	1,900	955	-
25	03041038	Laurel Run at Chickaree	.055	-	-	-	-	-	-	19	345	-
26	03041039	Laurel Run above Laurel Run Reservoir near Coopersdale	7.56	-	-	-	-	-	-	10,500	1,390	-
27	03041040	Red Run near Coopersdale	2.00	-	-	-	-	-	-	4,000	2,000	-
28	03041043	Laurel Run below Laurel Run Reservoir near Coopersdale	11.0	-	-	-	-	-	-	[e]/37,000	3,360	-
29	03041046	Wildcat Run at Coopersdale	1.97	-	-	-	-	-	-	2,440	1,240	[d]/-
30	03041500	Conemaugh River at Seward	715	1936-	Mar 1936	22.95	[c]/75,000	20	27.06	[c]/115,000	161	>100
31	03042000	Blacklick Creek at Josephine	192	1952-	Jun 1972	13.99	20,800	20	19.89	45,800	239	>100

See footnotes at end of table.

TABLE 2.--SUMMARY OF FLOOD STAGES AND DISCHARGES (Continued)

Site number on fig. 4	Station number	Stream and place of determination	Drainage area (mi^2)	Maximum flood previously known: Period	Month and year	Gage height (feet)	Discharge (ft^3/s)	Flood of July 1977: Date	Gage height (feet)	Discharge (ft^3/s)	Unit discharge [$(ft^3/s)/mi^2$]	Recurrence interval (years)
		CONEMAUGH RIVER BASIN (Continued)										
32	03042170	Stoney Run at Indiana	4.39	1963-	Sep 1974	8.87	505	-	[f]/10-11	-	-	-
33	03042180	Two Lick Creek near Homer City	95.5	-	-	-	-	-	-	16,500	173	-
34	03042198	Little Yellow Creek tributary at Strongstown	.76	-	-	-	-	-	-	1,450	1,910	-
35	03042200	Little Yellow Creek near Strongstown	7.36	1959-	Jun 1972	6.10	820	20	9.31	4,250	577	>100
36	03042280	Yellow Creek near Homer City	57.4	1967-	Feb 1971	[b]/8.37	-	20	12.60	[c]/15,000	261	
					Jun 1972	7.46	4,100					-
37	03042282	Ferrier Run near Homer City	2.14	-	-	-	-	-	-	890	416	-
38	03042500	Two Lick Creek at Graceton	171	1951-	Jun 1972	14.69	[c]/19,600	20	18.65	[c]/32,000	187	[d]/>100
39	03044000	Conemaugh River at Tunnelton	1,358	1939-	Mar 1945	21.0	[c]/59,200	21	11.98	[c]/23,600	17	3
		WEST BRANCH SUSQUEHANNA RIVER BASIN										
40	01540600	West Branch Susquehanna River at Barnesboro	25.8	-	-	-	-	-	-	2,400	93	-
41	01540650	West Branch Susquehanna River at Cherry Tree	58.8	-	-	-	-	-	-	6,000	102	-
42	01541000	West Branch Susquehanna River at Bower	315	1889,	May 1889	18.5	27,000	20	16.23	19,200	61	30
				1913-	Mar 1936	19.74	31,500					
43	01541200	West Branch Susquehanna River at Curwensville	367	1955-	Mar 1964	14.19	15,700	23	8.47	[c]/5,660	15	3
44	01541308	Bradley Run near Ashville	6.77	1967-	Jun 1972	3.82	679	20	3.65	602	89	15
45	01541321	Brubaker Run at Dean	3.82	-	-	-	-	-	-	1,370	359	-
46	01541365	North Witmer Run at Irvona	30.8	-	-	-	-	-	-	10,000	325	-
47	01541500	Clearfield Creek at Dimeling	371	1913-	Mar 1936	[a]/18.49	30,600	20	11.27	[c]/9,210	25	4
48	01542000	Moshannon Creek at Osceola Mills	68.8	1940-	Jun 1972	14.25	5,120	20	1.97	339	5	1
		JUNIATA RIVER BASIN										
49	01556000	Frankstown Branch Juniata River at Williamsburg	291	1889,	Jun 1889	19.1	35,500	20	8.11	2,930	10	1
				1916-	Mar 1936	18.58	30,000					
50	01556400	Sandy Run near Bellwood	5.58	1962-	Sep 1967	6.25	900	20	5.89	550	99	10
51	01556500	Little Juniata River at Tipton	93.7	1946-	Jun 1972	9.24	6,140	20	9.07	5,580	60	10
52	01557100	Schell Run at Tyrone	1.68	1958-	Jul 1969	3.00	225	20	1.97	45	27	1
53	01557500	Bald Eagle Creek at Tyrone	44.1	1936,	Mar 1936	[a]/15	-	20	1.41	112	3	1
				1944-	Nov 1950	[a]/ 7.5	5,140					
54	01558000	Little Juniata River at Spruce Creek	220	1936-	Mar 1936	19.1	39,800	20	7.52	5,760	26	3
55	01559700	Buffalo Run tributary near Manns Choice	5.28	1961-	Sep 1967	4.26	1,010	20	5.12	1,120	212	20
56	01560000	Dunning Creek at Belden	172	1936-	Mar 1936	[g]/17.8	16,900	20	14.15	19,400	113	>100
		POTOMAC RIVER BASIN										
57	01600700	Little Wills Creek at Bard	10.2	1961-	Sep 1967	8.91	1,100	20	11.00	3,000	294	70

[a]/ Different site or datum
[b]/ Backwater from ice
[c]/ Regulated by reservoirs upstream
[d]/ Recurrence interval computed using natural and regulated flows
[e]/ Downstream of breached dam
[f]/ Peaked 1-2 feet above gage
[g]/ Backwater from Raystown Branch Juniata River

Recurrence intervals for the 1977 flood discharges are included in table 2 and computed using guidelines of the U.S. Water Resources Council (1976). The recurrence interval is the average interval of years within which a given flood discharge will be exceeded once. It is inversely related to the chance of the given discharge being exceeded in any year. For example, a flood having a recurrence interval of 50 years, would have one chance in 50 (2 percent chance or 0.02 probability) of being exceeded in any year. The occurrence of floods is erratic and a flood of a given magnitude may occur in any year; it may occur in successive years; or it may not occur for a period much greater than the designated recurrence interval.

Figure 10 illustrates the relative magnitude of peak discharge at each site as a function of drainage area. One method of evaluating the severity of flood runoff or the maximum peak flow expected to occur in a given geographic region is given by the Jarvis-Myers equation. The solid lines in figure 10 were constructed using the following form of the equation:

$b=qA^{1/2}/100$, where q is the peak discharge in cubic feet per second per square mile. A is the drainage area in square miles, and b is the "Myers rating" expressed as a percentage of a given discharge to a supposed maximum discharge, when b = 100.

Data compiled by Crippen and Bue (1977) indicate that the Myers rating of 58 computed for Sandy Run (Site No. 21) is one of the highest for any known natural discharges in the northeast United States.

The dashed line in figure 10 was adapted from a curve by Crippen and Bue, which enveloped all previously known maximum discharges in their "Region 4" (comprised of West Virginia, most of Pennsylvania and New York, and parts of Kentucky, Maryland, New Jersey and Ohio). In addition to providing a means of comparing the severity of the July 1977 flood with others, the curve also attempts to define the maximum potential floodflows for this region, based on drainage areas.

Stage and discharge hydrographs for four sites in the Conemaugh River basin are presented in figures 11 to 14. Sufficient information is provided in the Appendix to reconstruct flood hydrographs at most continuous-record gaging stations in the flood-affected area.

IMPOUNDMENT STRUCTURES IN FLOOD AREA

In addition to high surface runoff, some flooding was caused by the failure of seven earthfill-gravity-type dams. The locations of these dams, all within the Conemaugh River basin, are shown in table 3. Data pertaining to the age and size of each structure are also provided and were furnished by the Pennsylvania Department of Environmental Resources.

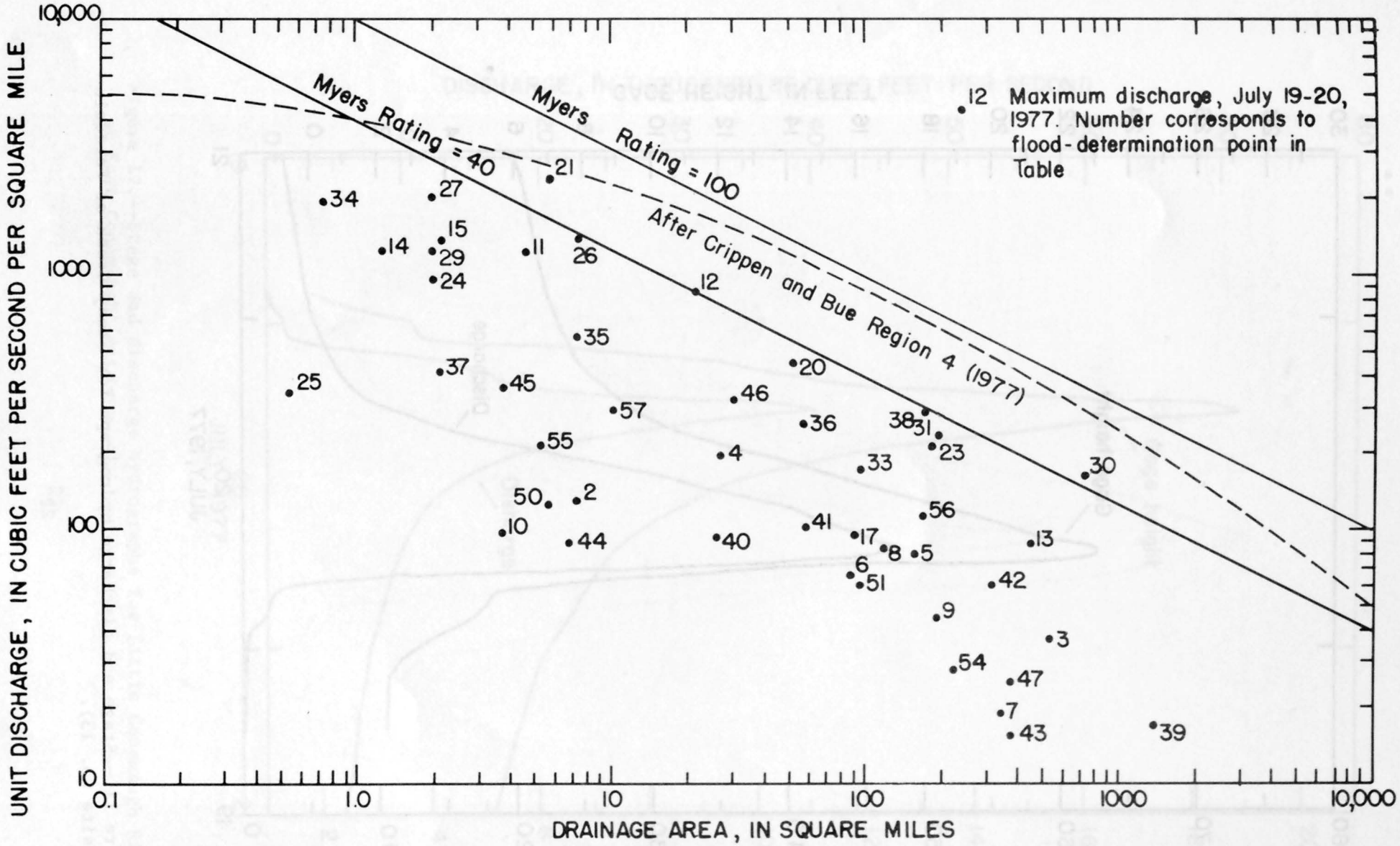

Figure 10.--Relation of peak unit discharge to drainage area, flood of July 19-20, 1977.

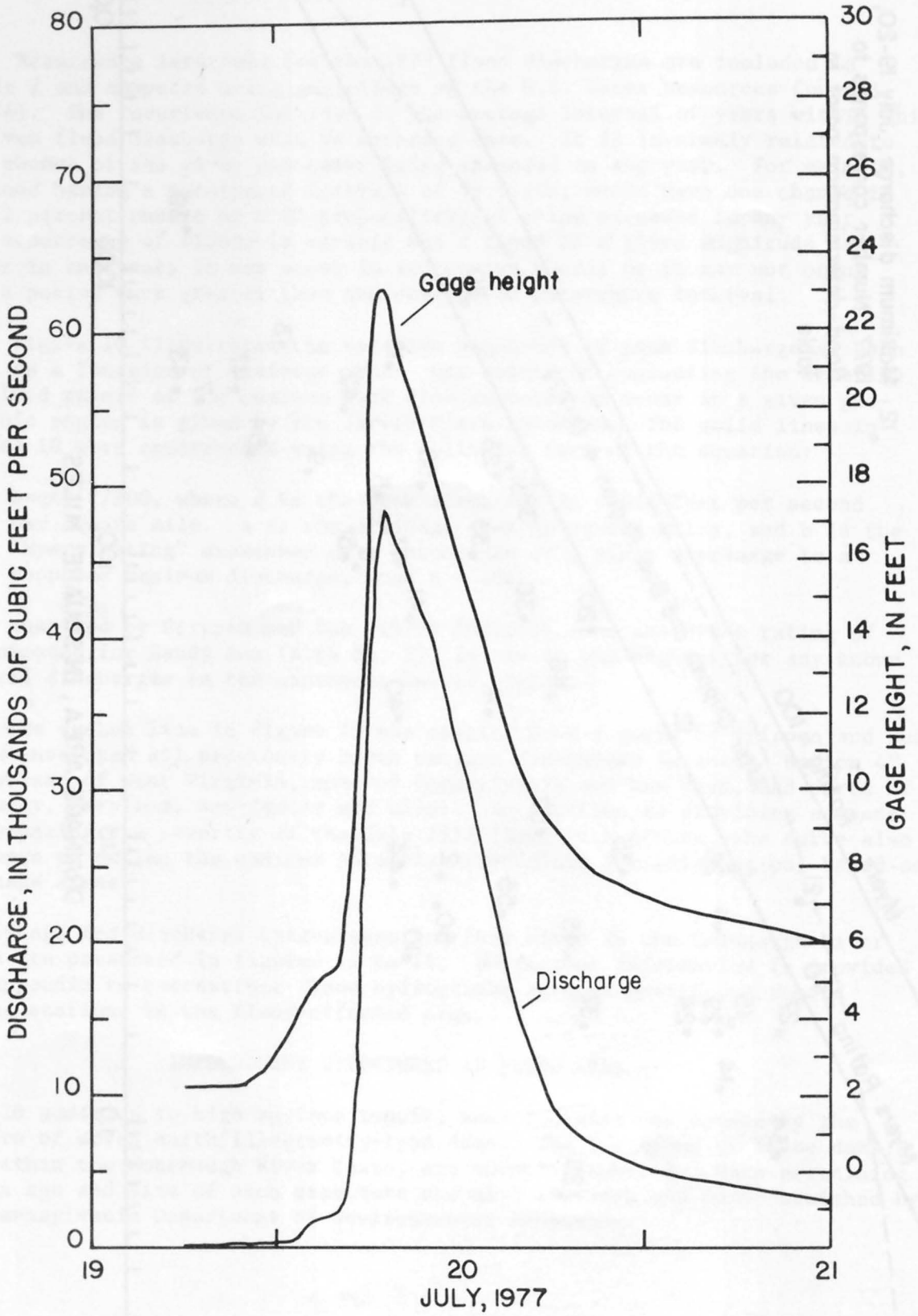

Figure 11.--Stage and discharge hydrograph for Stony Creek at Ferndale (site no. 13).

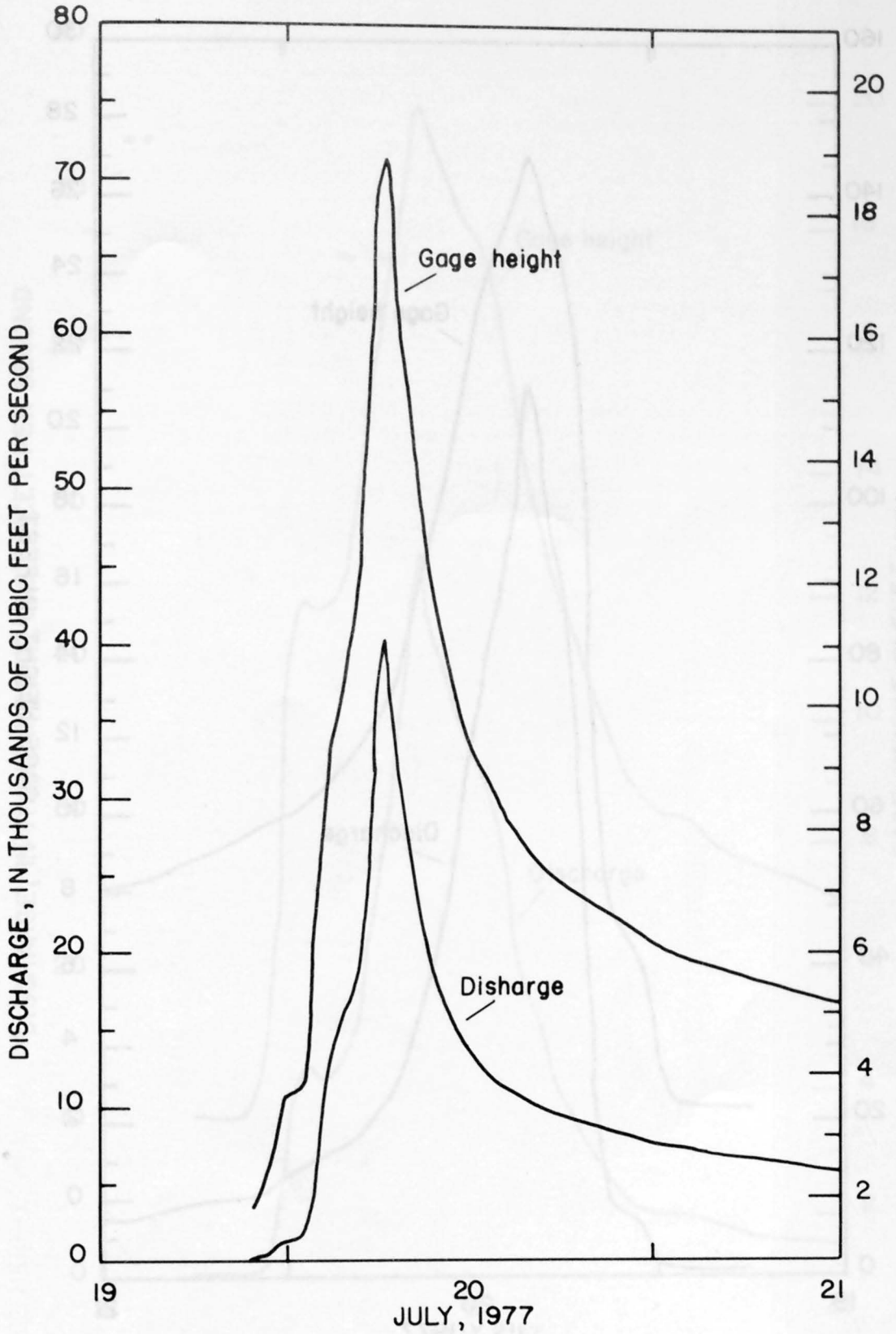

Figure 12.--Stage and discharge hydrographs for Little Conemaugh River at East Conemaugh (site no. 23).

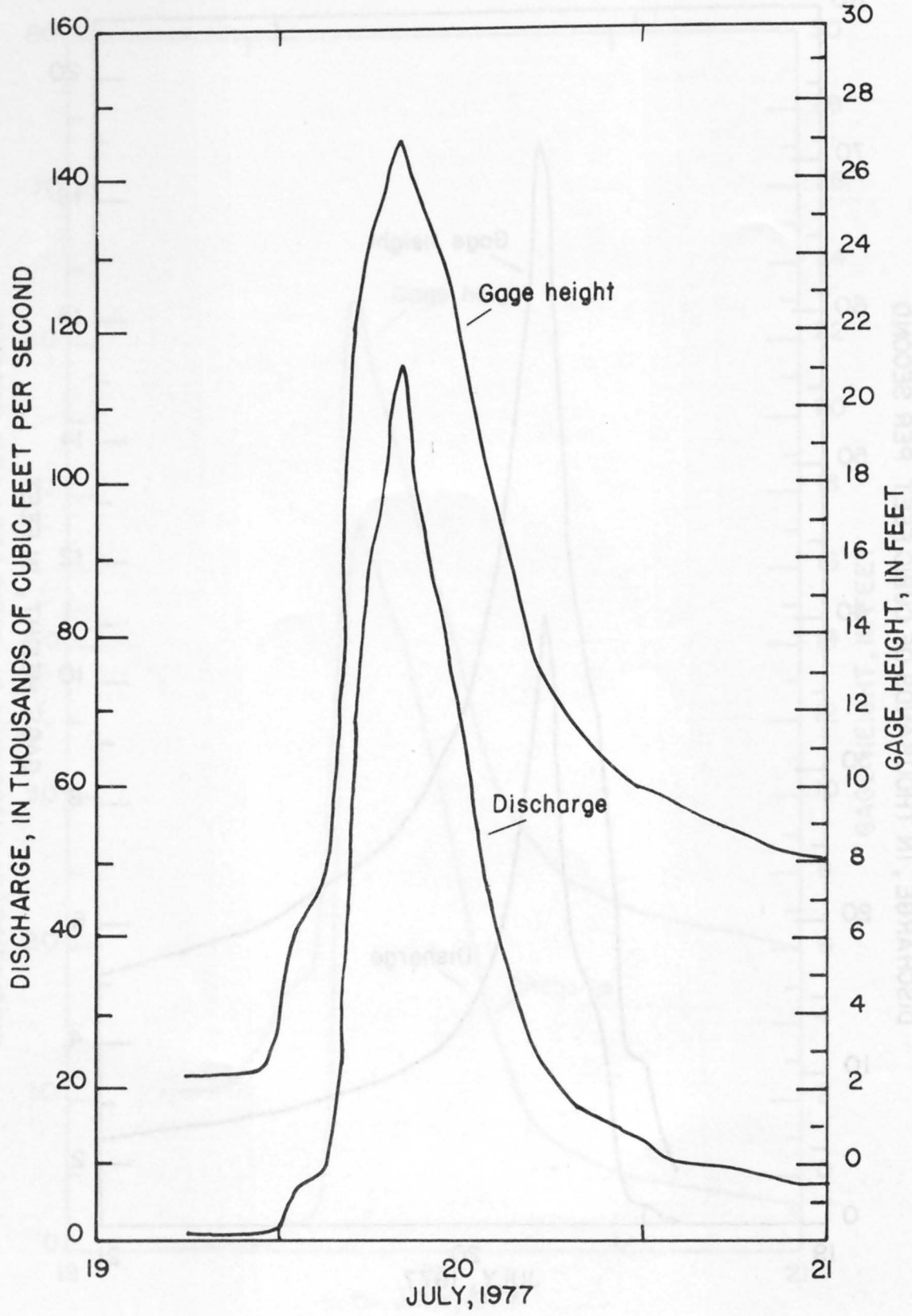

Figure 13.--Stage and discharge hydrographs for Conemaugh River at Seward (site no. 30).

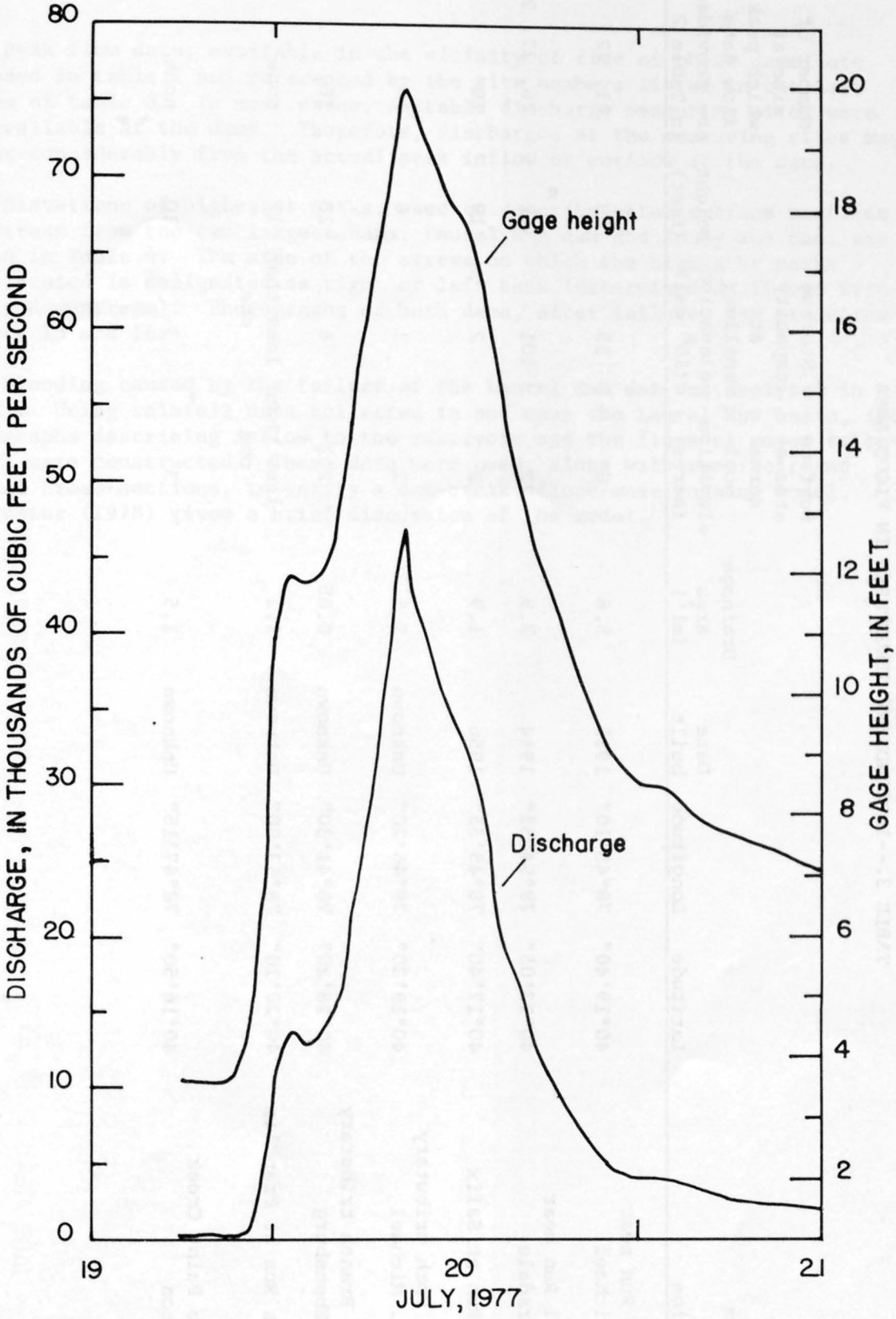

Figure 14.--Stage and discharge hydrographs for Blacklick Creek at Josephine (site no. 31).

TABLE 3.--IMPOUNDMENT STRUCTURES IN FLOOD AREA

Stream and Location	Latitude	Longitude	Date built	Drainage area (mi^2)	Surface area at normal pool elevation (acres)	Storage capacity at spillway elevation (10^6 gal)	Height (feet)	Number of site at which peak flow data are provided in Table 2
Sandy Run near St. Michael	40°19'40"	78°48'10"	1915	5.6	8	15	28	21, 22
Laurel Run near Coopersdale	40°23'05"	78°54'55"	1914	7.9	22	101	42	26, 27, 28
Otto Run at Salix	40°17'40"	78°45'35"	1956	1.9	2	2	19	18
South Fork tributary at St. Michael	40°19'30"	78°46'20"	Unknown	1.5	2	1	6	19
North Branch tributary near Ebensburg	40°28'20"	78°41'30"	Unknown	0.65	2.2	6	18	16
Peggys Run at Franklin	40°20'10"	78°53'00"	Unknown	1.1	less than one	less than one	12	none
Little Paint Creek at Elton	40°16'50"	78°47'15"	Unknown	1.5	3	3	10	none

Peak flow data, available in the vicinity of five of these dams, are included in table 2 and referenced by the site numbers listed in the last column of table 3. In most cases, suitable discharge measuring sites were not available at the dams. Therefore, discharges at the measuring sites may differ considerably from the actual peak inflow or outflow at the dams.

Elevations of highwater marks, used to describe water surface profiles downstream from the two largest dams, Laurel Run dam and Sandy Run dam, are listed in Table 4. The side of the stream on which the highwater marks were located is designated as right or left bank (determined as if one were facing downstream). Photographs of both dams, after failure, are presented in figures 15 and 16.

Flooding caused by the failure of the Laurel Run dam was analyzed in detail. Using rainfall data collected in and near the Laurel Run basin, flood hydrographs describing inflow to the reservoir and the flows of major tributaries were constructed. These data were used, along with reservoir and channel cross-sections, to verify a dam-break, flood-wave routing model. Armbruster (1978) gives a brief discussion of the model.

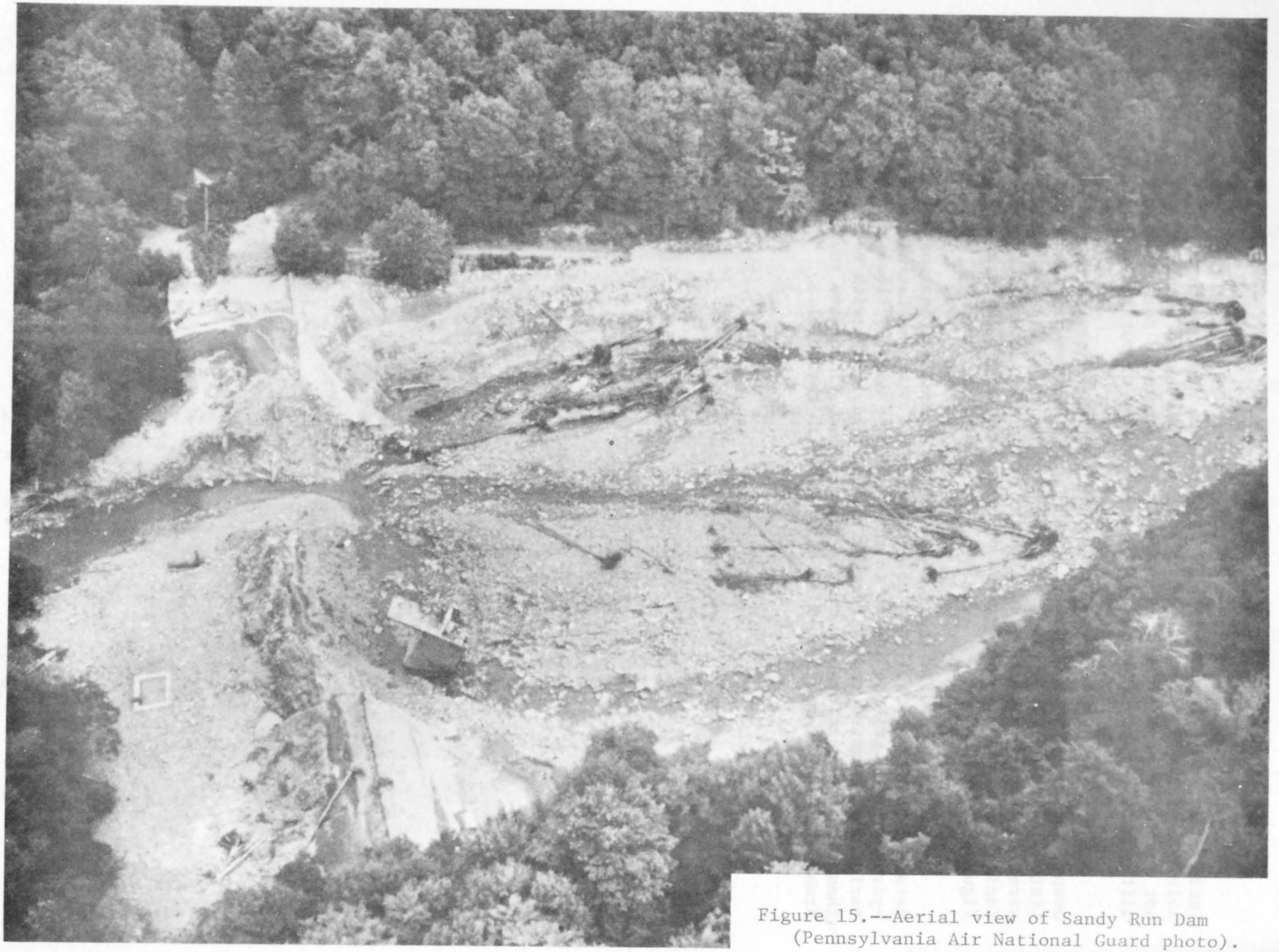

Figure 15.--Aerial view of Sandy Run Dam (Pennsylvania Air National Guard photo).

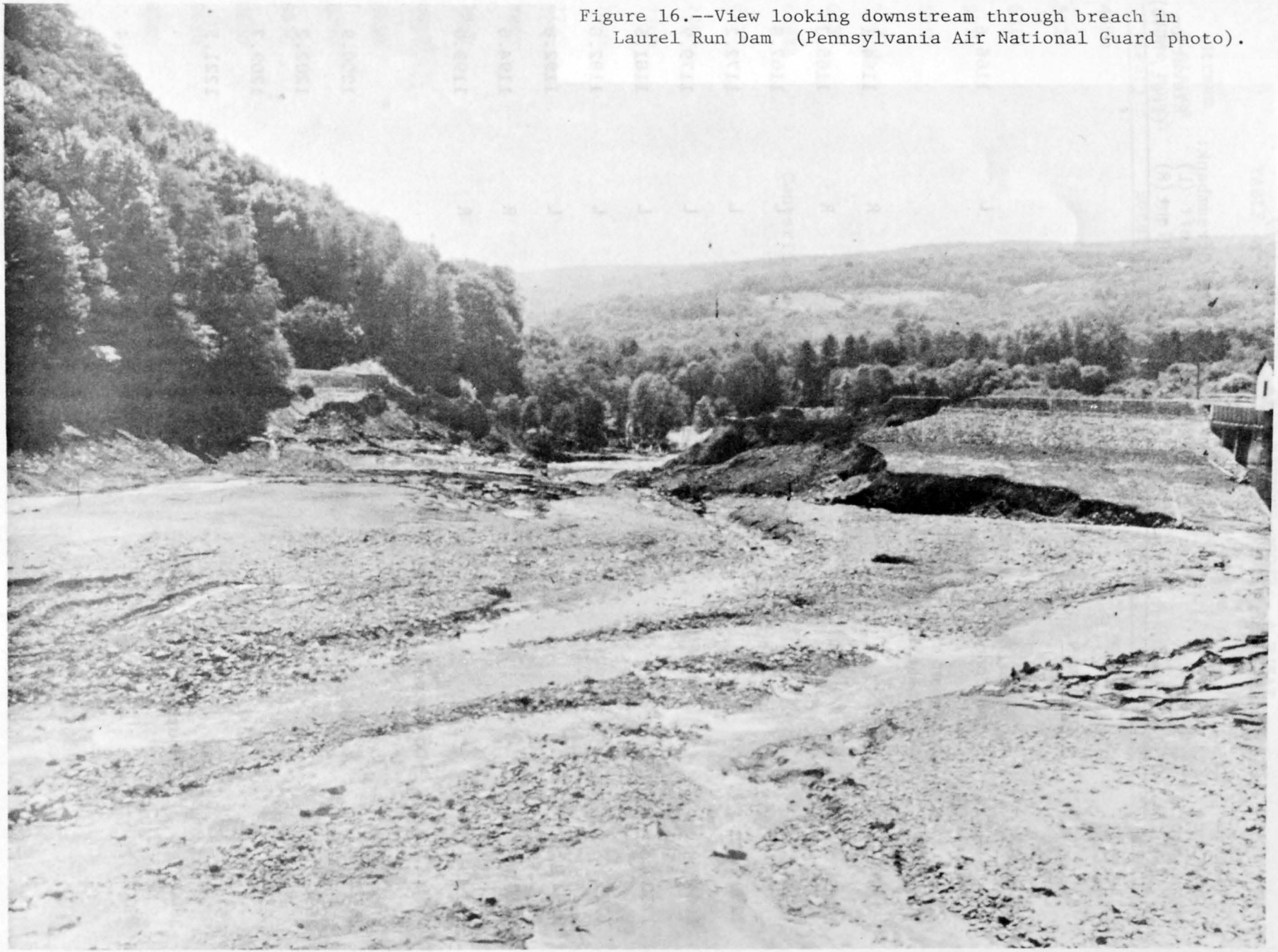

Figure 16.--View looking downstream through breach in Laurel Run Dam (Pennsylvania Air National Guard photo).

TABLE 4.--FLOOD-PROFILE DATA, JULY 20, 1977

Stream distance above mouth (feet)	Location	Streambank: Left (L) Right(R)	Elevation (feet, NGVD)
	LAUREL RUN		
0	At mouth, at northernmost corporate limit of Johnstown	L	1166.6
330	Upstream side of 1st Cooper Ave. (State Rt. 403) bridge		
420		R	1164.1
740		R	1165.3
980		L	1167.8
1290		L	1172.2
1660		L	1179.9
1710		L	1181.6
1750		L	1182.8
2160		L	1192.8
2210		R	1194.6
2490		R	1199.0
2550	Downstream side of 2nd Cooper Ave. bridge		
2610		L	1200.9
2690		L	1202.2
3250		R	1209.7
2570		R	1221.5
3860	Mouth of Wildcat Run		
4000		L	1229.4

TABLE 4.--FLOOD-PROFILE DATA, JULY 20, 1977.--Continued

Stream distance above mouth (feet)	Location	Streambank: Left (L) Right(R)	Elevation (feet, NGVD)
4550		-	1239.9
5120		R	1253.2
5310		L	1252.5
5570		L	1260.0
5950		R	1262.1
6320			1272.4
6750		R	1278.6
6883	Centerline of 3rd Cooper Ave. bridge		
6900		R	1280.8
7260		L	1290.7
7350		L	1291.5
7640		R	1304.8
7720		R	1311.3
7850		L	1316.1
7930		L	1317.2
8010		R	1318.0
8050		L	1317.0
8280		R	1321.7
8570		L	1332.0
8620		R	1335.4
8620		L	1333.9
8680		R	1339.2

TABLE 4.--FLOOD-PROFILE DATA, JULY 20, 1977.--Continued

Stream distance above mouth (feet)	Location	Streambank: Left (L) Right (R)	Elevation (feet, NGVD)
9060		R	1350.4
9150	Upstream side of 4th Cooper Ave. bridge	L	1349.3
9220		L	1349.6
9230		L	1349.9
9460		R	1352.1
9860		R	1352.9
10240		L	1359.7
10680	Downstream rear corner of Methodist Church	R	1364.8
10970		L	1368.6
11450		L	1376.4
11610		R	1377.4
12100	Mouth of Red Run		
12320		L	1392.8
12600		L	1393.8
13130		L	1399.3
13250		R	1400.8
13280	Centerline of Laurel Run Dam		
13360		R	1437.5
13400		R	1437.8
13430		R	1437.7
13460		L	1437.4

TABLE 4.--FLOOD-PROFILE DATA, JULY 20, 1977.--Continued

Stream distance above mouth (feet)	Location	Streambank: Left (L) Right (R)	Elevation (feet, NGVD)
	SANDY RUN		
0	At mouth, one mile south of South Fork, Pa.		
300		R	1551.7
460	Unnamed county road bridge		
610		L	1555.3
850	Downstream side of State Route 869		
1,030		L	1569.8
1,070	Downstream side of bridge on entrance ramp to US Route 219 South	L	1570.5
1,300		R	1571.2
1,710		R	1583.0
2,130		R	1585.0
2,300		R	1587.4
2,480		R	1589.8
2,750		R	1593.3
2,750		L	1594.7
3,280		R	1607.6
3,320		L	1609.1
3,390		R	1609.4
3,940		L	1620.8
4,050		L	1623.6

TABLE 4.--FLOOD-PROFILE DATA, JULY 20, 1977.--Continued

Stream distance above mouth (feet)	Location	Streambank: Left (L) Right(R)	Elevation (feet, NGVD)
4,310	Benchmark on left upstream wingwall of roadway culvert under U.S. Route 219 (Elevation unknown)		
4,730		R	1630.0
4,990		R	1640.6
5,240		L	1641.2
5,260		R	1643.1
5,490	Downstream side of Sandy Run culvert under U.S. Route 219		
5,730	Benchmark on left upstream wingwall of Sandy Run culvert under U.S. Route 219 (Elevation 1653.15 feet, NGVD)		
5,800		L	1662.2
5,940		L	1661.4
6,060		L	1663.4
6,340		L	1669.4
6,760		L	1679.3
7,180		L	1687.4
7,380		L	1689.0
7,040	Centerline of embankment of old dam		
7,470	Right bank tributary		
7,510		R	1695.8
7,673		L	1699.0
7,970		L	1701.6
8,220		R	1705.0
8,390	Right bank tributary		

TABLE 4.--FLOOD-PROFILE DATA, JULY 20, 1977.--Continued

Stream distance above mouth (feet)	Location	Streambank: Left (L) Right(R)	Elevation (feet, NGVD)
8,660		R	1713.0
9,300		R	1726.8
9,700	18" Culvert drain	L	1733.1
10,130		L	1741.8
10,150	Centerline of 8' x 5' culvert under U.S. Route 219		
10,260		L	1745.1
10,700		L	1755.0
10,860		L	1760.7
10,900		L	1760.2
11,150		R	1766.0
11,410		R	1776.8
11,410		L	1776.8
11,760	Centerline of Sandy Run Dam		
11,810		L	1810.4
11,820		R	1810.2
11,900		L	1810.5

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United States Water Resources Council, 1976, Guidelines for determining flood flow frequency, Bulletin No. 17 of the Hydrology Committee: Washington, D.C., U.S. Government Printing Office, 197 p.

APPENDIX

Site Descriptions and Gage Height-Discharge Tables

Descriptions of the flood measurement sites used in this report are presented in the following pages according to the site numbers used in figure 4 and table 2. They include the location of the site, type of gage, its datum, and other pertinent information. A tabulation of gage heights and discharges at specific times is also included for many of the gaging stations where water-stage recorders are installed.

The numbers preceding the station names are U.S. Geological Survey identification numbers which are assigned according to the downstream order. In the site descriptions for the continuous-record gaging stations, a Hydrologic Unit number is provided following the county location. This number designates a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the Office of Water Data Coordination, U.S. Geological Survey.

Site No. 1

03031780 Mill Creek near Brockway

LOCATION.--Lat 41°14'53", long 78°50'08", Jefferson County, at culvert on State Highway 28, and 2 mi (3 km) west of Brockway.

GAGE.--Crest-stage.

Site No. 2

03031950 Big Run near Sprankle Mills

LOCATION.--Lat 40°59'30", long 79°05'26", Jefferson County, Hydrologic Unit 05010006, on right bank at downstream side of highway bridge, 0.5 mi (0.8 km) downstream from McCracken Run, and 1.3 mi (2.1 km) southeast of Sprankle Mills.

GAGE.--Water-stage recorder and crest-stage gage. Altitude of gage is 1,290 ft (393 m), from topographic map.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
0600	2.12	6.2	0100	5.38	588	0200	2.57	45
1200	2.12	6.2	0200	5.69	706	0600	2.50	38
1400	2.22	12	0300	5.86	774	1200	2.41	30
1600	2.75	57	0400	5.71	714	1600	2.36	26
1700	2.68	50	0500	5.27	550			
1800	2.51	35	0600	4.37	304			
1900	2.41	26	0800	3.53	160			
2000	3.26	114	1000	3.29	126			
2100	5.66	674	1200	3.15	108			
2200	6.07	838	1400	2.99	90			
2230	6.22	960	1600	2.88	78			
2300	6.13	905	1800	2.78	67			
2400	5.69	706	2000	2.68	56			
			2200	2.63	51			
			2400	2.60	48			

Total runoff, in inches ---------- 1.96

Site No. 3

03032500 Redbank Creek at St. Charles

LOCATION.--Lat 40°59'40", long 79°23'40", Armstrong County, Hydrologic Unit 05010006, on left bank 400 ft (120 m) downstream from highway bridge on Legislative Route 03117 at St. Charles, 0.3 mi (0.5 km) downstream from Leatherwood Creek, and 3 mi (5 km) west of New Bethlehem. Water-quality sampling site 400 ft (120 m) upstream.

GAGE.--Water-stage recorder. Datum of gage is 973.14 ft (296.613 m) NGVD, datum of 1912. Prior to July 10, 1940, nonrecording gage at site 500 ft (150 m) upstream at datum 3.10 ft (0.94 m) higher.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
0100	4.74	830	0100	7.79	3,830	0200	9.11	5,800
0600	4.63	775	0200	8.98	5,570	0400	8.78	5,250
1200	4.51	715	0300	10.86	9,020	0600	8.52	4,830
1800	4.50	710	0400	12.46	12,700	1200	7.98	4,074
2000	4.54	730	0500	13.23	14,800	1800	7.79	3,830
2100	4.76	840	0600	13.67	16,100	2000	7.82	3,870
2200	5.19	1,070	0700	14.15	17,500	2200	7.90	3,970
2300	5.82	1,560	0800	14.52	18,900	2400	7.82	3,870
2400	6.75	2,500	0830	14.72	19,500			
			0900	14.65	19,300	7/22		
			1000	14.50	18,800	0200	7.77	3,800
			1100	14.18	17,700	0600	7.56	3,530
			1200	13.78	16,400	0800	7.42	3,350
			1400	12.83	13,700	1200	7.23	3,100
			1600	11.94	11,400	1800	6.88	2,660
			1800	11.21	9,760	2400	6.62	2,340
			2000	10.60	8,500			
			2200	10.03	7,450	7/23		
			2400	9.52	6,540	0600	6.40	2,100
						1200	6.19	1,890
						1800	5.97	1,680
						2400	5.75	1,500
						7/24		
						0600	5.55	1,340
						1200	5.37	1,200
						1800	5.21	1,090
						2400	5.07	1,000

Total runoff, in inches ---------- 1.65

Site No. 4

03033220 Stump Creek at Big Run

LOCATION.--Lat 40°58'39", long 78°50'48", Jefferson County, at Baltimore and Ohio Railroad bridge, 0.5 mi (0.8 km) upstream of mouth, 1.0 mi (1.6 km) northeast of Big Run and 5.6 mi (9.0 km) south of Sykesville.

GAGE.--Miscellaneous site.

Site No. 5

03034000 Mahoning Creek at Punxsutawney

LOCATION.--Lat 40°56'21", long 79°00'31", Jefferson County, Hydrologic Unit 05010006, on right bank 75 ft (23 m) downstream from Williams Run, 1.9 mi (3.1 km) downstream from Sawmill Run, and 2 mi (3 km) west of Punxsutawney.

GAGE.--Water-stage recorder. Datum of gage is 1,206.14 ft (367.631 m) NGVD (Corps of Engineers bench mark). Prior to Oct. 1, 1946, at site 2.9 mi (4.7 km) upstream at datum 13.30 ft (4.054 m) higher.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
0100	2.77	478	0100	6.42	2,970	0200	7.40	2,760
0600	2.68	442	0200	8.22	4,610	0600	6.60	2,240
1200	2.60	410	0300	10.20	6,740	1200	6.34	2,080
1300	2.58	403	0400	11.30	8,170	1800	6.00	1,900
1400	2.60	410	0500	12.52	3,860	2000	5.90	1,850
1600	2.89	526	0600	13.62	9,740	2200	6.25	2,030
1800	3.06	610	0700	14.78	11,200	2400	6.40	2,120
2000	3.26	710	0800	15.68	12,200	7/22		
2100	3.58	878	0915	16.22	12,700	0600	5.95	1,880
2200	4.21	1,300	1000	16.13	12,400	1200	5.50	1,650
2300	4.92	1,790	1100	16.00	12,100	1800	5.10	1,450
2400	5.44	2,160	1200	15.57	11,200	2400	4.70	1,250
			1400	14.46	9,750	7/23		
			1600	13.14	8,170	0600	4.40	1,100
			1800	11.78	6,780	1200	4.05	925
			2000	10.44	5,440	1800	3.70	750
			2200	9.22	4,320	2400	3.50	670
			2400	8.14	3,350			

Total runoff, in inches ---------- 3.16

NOTE: Gage heights and discharges are estimated beginning at 1800 hours on July 21.

Site No. 6

03034500 Little Mahoning Creek at McCormick

LOCATION.--Lat 40°50'10", long 79°06'37", Indiana County, Hydrologic Unit 05010006, on left bank 200 ft (60 m) upstream from highway bridge at McCormick, 1 mi (2 km) west of Georgeville, 1.7 mi (2.7 km) upstream from Ross Run, and 4 mi (6 km) southeast of Smicksburg.

GAGE.--Water-stage recorder. Datum of gage is 1,164.88 ft (355.055 m) NGVD (Corps of Engineers bench mark). Prior to May 10, 1940, nonrecording gage at site 200 ft (60 m) upstream at same datum.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
0100	2.00	58	0100	5.69	896	0200	7.15	1,520
0600	1.94	53	0200	6.86	1,400	0400	6.51	1,260
1200	1.89	48	0300	7.70	1,750	0600	6.14	1,120
1800	1.91	50	0400	8.77	2,380	0800	5.85	1,000
1900	1.92	51	0500	9.81	3,080	1000	5.60	900
2000	2.23	82	0600	10.35	3,480	1200	5.39	827
2100	2.33	94	0700	10.80	3,840	1400	5.19	767
2200	2.66	138	0800	11.32	4,320	1500	5.10	740
2300	3.15	230	0900	11.95	4,950	1600	5.75	960
2400	3.97	425	1000	12.42	5,420	1800	7.15	1,520
			1100	12.68	5,680	2000	7.64	1,720
			1200	12.76	5,760	2200	8.19	2,030
			1230	12.77	5,770	2400	8.80	2,400
			1300	12.77	5,770	7/22		
			1400	12.68	5,680	0200	9.20	2,650
			1500	12.53	5,530	0230	9.21	2,660
			1600	12.30	5,300	0300	9.19	2,640
			1700	12.00	5,000	0400	9.04	2,540
			1800	11.63	4,630	0600	8.43	2,180
			2000	10.69	3,750	1200	6.43	1,230
			2200	9.48	2,850	1800	5.57	888
			2400	8.24	2,060	2400	4.92	686
						7/23		
						0600	4.54	572
						1200	4.27	498

Total runoff, in inches ---------- 2.99

Site No. 7

03036000 Mahoning Creek at Mahoning Creek Dam

LOCATION.--Lat 40°55'39", long 79°17'29", Armstrong County, Hydrologic Unit 05010006, on left bank at downstream side of highway bridge at McCrea Furnace, 700 ft (213 m) downstream from Camp Run, 0.9 mi (1.4 km) downstream from Mahoning Creek Dam, 1 mi (2 km) southwest of Eddyville, and 2.1 mi (3.4 km) upstream from Pine Run.

GAGE.--Water-stage recorder. Datum of gage is 1,003.39 ft (305.833 m) NGVD (Corps of Engineers bench mark). Prior to Feb. 1, 1940, nonrecording gage at same site and datum.

REMARKS.--Flow completely regulated since 1941 by Mahoning Creek Lake, 0.9 mi (1.4 km) upstream.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/21			7/24		
0100	3.84	1,020	0200	4.94	2,010	0600	7.01	5,720
0600	3.83	1,010	0400	4.95	2,030	1200	7.02	5,740
1200	3.81	998	0900	4.97	2,050	1800	7.02	5,740
1300	3.20	590	1000	5.74	3,080	2400	7.02	5,740
1800	3.08	530	1200	5.76	3,120			
2400	3.31	656	1300	6.88	5,400			
7/20			2400	6.88	5,400			
0100	3.49	773	7/22					
0200	4.32	1,420	0100	6.88	5,400			
0300	4.60	1,670	1200	6.88	5,400			
0400	4.13	1,250	1345	7.35	6,560			
0500	3.85	1,030	1400	7.35	6,560			
0600	3.75	955	1700	7.35	6,560			
0800	3.68	906	1800	6.85	5,330			
1000	3.60	850	2400	6.90	5,440			
1200	3.55	815	7/23					
1400	3.53	801	0600	6.99	5,660			
1600	3.89	1,060	1200	7.00	5,690			
1800	3.94	1,100	1800	7.00	5,690			
2000	4.86	1,930	2400	7.01	5,720			
2200	4.90	1,970						
2400	4.93	2,000						

Total runoff, in inches ---------- 2.47

Site No. 8

03037300 Crooked Creek at Shelocta

LOCATION.--Lat 40°39'35", long 79°18'40", Indiana County, 0.4 mi (0.6 km) upstream from State Highway bridge 156 and 0.5 mi (0.8 km) northeast of intersection of routes 422 and 156 at Shelocta.

GAGE.--Miscellaneous site.

Site No. 9

03038000 Crooked Creek at Idaho

LOCATION.--Lat 40°39'17", long 79°20'56", Armstrong County, Hydrologic Unit 05010006, on right bank at downstream end of old bridge abutment at Idaho, 0.4 mi (0.6 km) downstream from Keystone Generating Station, 1.5 mi (2.4 km) downstream from Plum Creek, and 2.4 mi (3.9 km) west of Shelocta.

GAGE.--Water-stage recorder and concrete weir control. Datum of gage is 961.04 ft (292.925 m) NGVD (Baltimore and Ohio Railroad bench mark).

REMARKS.--Flow regulated to some extent since March 1968 by Keystone Lake 7 mi (11 km) upstream, usable capacity, 22,010 acre-ft (27.1 hm^3). Evaporation from operation of steam-electric plant 0.4 mi (0.6 km) upstream, which began during July 1967, can amount to as much as 30 ft^3/s (0.85 m^3/s).

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/22		
1200	2.48	51	1400	12.44	7,730	0200	7.52	3,510
1500	2.61	72	1500	12.79	8,150	0400	7.66	3,610
1800	2.76	102	1600	13.10	8,520	0600	7.75	3,680
1900	2.76	102	1700	13.38	8,860	0700	7.76	3,680
2000	2.80	111	1800	13.25	8,700	0800	7.73	3,660
2100	3.38	340	1900	13.04	8,450	0900	7.63	3,590
2200	4.33	951	2000	12.62	7,940	1000	7.46	3,480
2300	5.59	1,920	2100	12.01	7,260	1200	6.92	3,040
2400	6.85	2,980	2200	11.40	6,650	1400	6.28	2,500
7/20			2300	10.78	6,030	1600	5.82	2,110
0100	7.48	3,480	2400	10.22	5,500	1800	5.50	1,850
0200	7.93	3,800	7/21			2400	4.83	1,310
0300	8.30	4,060	0200	9.33	4,780	7/23		
0400	8.68	4,330	0400	8.54	4,230	0600	4.45	1,040
0500	9.08	4,610	0600	7.77	3,690	1200	4.25	895
0600	9.54	4,930	0800	6.98	3,080	1800	4.05	755
0700	9.93	5,240	1000	6.19	2,420	2400	3.87	629
0800	10.30	5,570	1200	5.44	1,800	7/24		
0900	10.67	5,920	1400	5.03	1,470	0600	3.74	544
1000	11.06	6,310	1500	4.95	1,410	1200	3.67	502
1100	11.44	6,690	1600	5.24	1,640	1800	3.56	436
1200	11.82	7,070	1800	6.18	2,410	2400	3.48	390
1300	12.13	7,380	2000	6.86	2,990			
			2200	7.11	3,190			
			2400	7.30	3,340			

Total runoff, in inches ---------- 2.65

NOTE: Gage heights and discharges estimated from 1800 hours on July 20 to 1000 hours on July 21.

Site No. 10

03039200 Clear Run near Buckstown, Pa.

LOCATION.--Lat 40°02'49", long 78°50'00", Somerset County, Hydrologic Unit 05010007, on left bank at downstream side of bridge on State Highway 160, 0.8 mi (1.3 km) south of Reels Corners, and 2.3 mi (3.7 km) southeast of Buckstown.

GAGE.--Water-stage recorder, crest-stage gage, and concrete control. Datum of gage is 2,339.24 ft (713.00 m)NGVD. July 6, 1960 to Aug. 31, 1964, crest-stage gage at site 50 ft (15 m) upstream at same datum.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/20		
0100	2.18	.51	0400	2.38	1.7	1400	3.20	66
1200	2.18	.51	0500	3.81	23	1600	3.06	50
1800	2.17	.48	0530	5.03	366	1800	2.97	40
2200	2.16	.45	0600	4.68	296	2000	2.91	33
2300	2.31	1.1	0700	4.31	222	2200	2.86	28
2400	2.27	.88	0800	4.14	196	2400	2.82	24
7/20			0900	3.92	163	7/21		
0100	2.29	.99	1000	3.68	129	0600	2.74	17
0200	2.34	1.3	1100	3.53	108	1200	2.66	11
0300	2.34	1.3	1200	3.41	91	1600	2.62	8.8

Total runoff, in inches ---------- 0.76

Site No. 11

03039910 Seese Run at Windber

LOCATION.--Lat 40°13'44", long 78°49'43", Somerset County, at bridge on State Highway 160 in Windber, 0.4 mi (0.6 km) upstream from mouth.

GAGE.--Miscellaneous site.

Site No. 12

03039914 Paint Creek at Windber

LOCATION.--Lat 40°14'33", long 78°50'47", Somerset County, along State Highway 56, 0.4 mi (0.6 km) upstream of State Highway 601 near northwest corporate boundary.

GAGE.--Miscellaneous site.

Site No. 13

03040000 Stony Creek at Ferndale

LOCATION.--Lat 40°17'08", long 78°55'15", Cambria County, Hydrologic Unit 05010007, on right bank 50 ft (15 m) upstream from highway bridge at Ferndale 0.4 mi (0.6 km) downstream from Bens Creek, 1.2 mi (1.9 km) upstream from Johnstown city limits, and 5.2 mi (8.4 km) upstream from confluence with Little Conemaugh River.

GAGE.--Water-stage recorder. Datum of gage is 1,184.06 ft (360.901 m) NGVD. Prior to Mar. 19, 1936, nonrecording gage at site 3.5 mi (5.6 km) downstream at different datum. Dec. 8, 1938 to Jan. 30, 1940, nonrecording gage at site 50 ft (15 m) downstream at present datum.

REMARKS.--Regulation by mine pumpage and reservoirs and diversion above station ; the four largest reservoirs have a combined capacity of 42,360 acre-ft (52.2 hm^3).

Time		Gage height (ft)	Discharge (ft^3/s)	Time		Gage height (ft)	Discharge (ft^3/s)	Time		Gage height (ft)	Discharge (ft^3/s)
7/19	0100	2.26	97	7/20	0600	18.27	38,800	7/21	0600	6.50	4,050
	0600	2.23	92		0700	23.21	48,000		1200	6.00	3,280
	1200	2.19	84		0800	21.50	45,500		1800	5.64	2,530
	1800	2.19	84		0900	20.10	43,000		2400	5.32	2,090
	1900	2.26	97		1000	18.80	40,200				
	2200	2.27	99		1100	17.40	36,300	7/22	1200	4.79	1,520
	2300	2.53	169		1200	16.10	32,300		2400	4.46	1,190
	2400	2.99	350		1400	13.30	22,600				
					1600	10.70	14,100	7/23	1200	4.18	924
7/20	0100	3.72	796		1800	9.15	9,710		2400	3.94	732
	0200	4.64	1,640		2000	8.20	7,430				
	0300	5.07	2,070		2200	7.58	6,060				
	0400	5.38	2,420		2400	7.20	5,300				
	0500	8.99	9,330								

Total runoff, in inches ---------- 1.98

NOTE: Gage heights and discharges are estimated beginning at 0800 hours on July 20.

Site No. 14

03040016 Sams Run at Geistown

LOCATION.--Lat 40°17'20", long 78°52'58", Cambria County, 0.4 mi (0.6 km) upstream of corporate boundary at State Highway 756 bridge in Geistown.

GAGE.--Miscellaneous site.

Site No. 15

03040018 Sams Run at Lorain

LOCATION.--Lat 40°17'42", long 78°54'04", Cambria County, in artificial channel between city residence numbers 369 to 375, along State Highway 756 in Lorain.

GAGE.--Miscellaneous site.

Site No. 16

03040095 North Branch Tributary near Ebensburg

LOCATION.--Lat 40°28'05", long 78°41'31", Cambria County, at dirt road crossing 0.1 mi (0.2 km) downstream of Tong Club dam, 1.2 mi (1.9 km) upstream of mouth, 2.0 mi (3.2 km) southeast of Ebensburg and 2.1 mi (3.4 km) west of Munster.

GAGE.--Miscellaneous site.

Site No. 17

03040300 Little Conemaugh River at Summerhill

LOCATION.--Lat 40°22'19", long 78°46'00", Cambria County, at State Highway 53 bridge southwest of Summerhill, 500 ft (150 m) upstream from Penn Central Railroad bridge, 0.6 mi (1.0 km) downstream from Laurel Run and 1.5 mi (2.4 km) above South Fork Little Conemaugh River.

GAGE.--Miscellaneous site.

Site No. 18

03040420 Otto Run at Salix

LOCATION.--Lat 40°17'43", long 78°45'30", Cambria County, at bridge on paved road 0.5 mi (0.8 km) southeast of Salix, and 300 feet (90 m) downstream from small reservoir.

GAGE.--Miscellaneous site.

Site No. 19

03040430 South Fork Tributary at St. Michael

LOCATION.--Lat 40°19'35", long 78°46'23", Cambria County, 400 ft (120 m) downstream from reservoir, 0.6 mi (1.0 km) south of Saint Michael, 0.7 mi (1.1 km) upstream of mouth and 2.8 mi (4.5 km) southeast of South Fork.

GAGE.--Miscellaneous site.

Site No. 20

03040500 South Fork Little Conemaugh River at Fishertown

LOCATION.--Lat 40°20'54", long 78°46'32", Cambria County, at old South Fork Reservoir dam site at Fishertown, 0.1 mi (0.2 km) upstream from U.S. Highway 219.

GAGE.--Miscellaneous site.

Site No. 21

03040503 Sandy Run above Sandy Run Reservoir near St. Michael

LOCATION.--Lat 40°19'30", long 78°48'09", 0.2 mi (0.3 km) upstream from Sandy Run Reservoir and 1.8 mi (2.9 km) southwest of St. Michael.

GAGE.--Miscellaneous site.

Site No. 22

03040505 Sandy Run below Sandy Run Reservoir at St. Michael

LOCATION.--Lat 40°20'10", long 78°47'21", Cambria County, just upstream of U.S. Highway 219 bridge, 0.9 mi (1.4 km) west of St. Michael and 0.9 mi (1.4 km) northeast of Sandy Run Dam.

GAGE.--Miscellaneous site.

Site No. 23

03041000 Little Conemaugh River at East Conemaugh

LOCATION.--Lat 40°20'37", long 78°53'07", Cambria County, Hydrologic Unit 05010007, on right bank 100 ft (30 m) downstream from bridge on State Highway 271 at East Conemaugh, 0.3 mi (0.5 km) downstream from Clapboard Run, and 2.5 mi (4.0 km) upstream from confluence with Stony Creek.

GAGE.--Water-stage recorder. Datum of gage is 1,208.29 ft (368.287 m) NGVD. Prior to Feb. 1, 1940 nonrecording gage at site 100 ft (30 m) upstream at same datum.

REMARKS.--Flow regulated by reservoirs and diversion above station; the two most effective reservoirs have a combined capacity of 5,640 acre-ft (6.95 hm^3).

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
9/19			9/20			9/22		
1800	1.66	140	1100	10.21	15,500	0600	3.31	2,820
2100	1.66	140	1200	9.39	13,800	1200	2.95	2,280
2200	1.87	191	1400	8.45	11,900	1800	2.60	1,790
2300	2.62	542	1600	7.63	10,300	2400	2.35	1,460
2400	3.65	1,340	1800	7.16	9,400	9/23		
9/20			2000	6.80	8,740	0600	2.20	1,260
0100	3.75	1,460	2200	6.49	8,180	1200	2.03	1,040
0200	5.77	4,240	2400	6.16	7,590	1800	1.87	856
0300	9.27	13,000	9/21			2400	1.92	904
0400	10.60	16,300	0300	5.84	7,010	9/24		
0500	12.35	20,400	0600	5.58	6,540	0600	1.72	664
0600	18.09	37,100	0900	5.37	6,170	1200	1.68	618
0615	18.85	40,000	1200	5.19	5,840	1800	1.66	596
0700	17.45	34,700	1500	4.82	5,210	2400	1.64	574
0800	15.12	27,400	1800	3.77	3,530			
0900	12.86	21,700	2100	3.64	3,360			
1000	11.37	18,100	2200	3.67	3,420			
			2400	3.64	3,360			

Total runoff, in inches ---------- 4.70

Site No. 24

03041030 Elk Run at Morrellville

LOCATION.--Lat 40°20'33", long 78°56'39", Cambria County, just upstream from Fairview Avenue and St. Columbus Cemetery in Morrellville.

GAGE.--Miscellaneous site.

Site No. 25

03041038 Laurel Run at Chickoree

LOCATION.--Lat 40°26'54", long 78°53'09", Cambria County, at culvert on road between Chickaree and Vintondale, 0.25 mi (0.40 km) northwest of Chickaree.

GAGE.--Miscellaneous site.

Site No. 26

03041039 Laurel Run above Laurel Run Reservoir near Coopersdale

LOCATION.--Lat 40°23'16", long 78°54'34", Cambria County, at inlet to Laurel Run Reservoir and 1,900 ft (580 m) upstream from dam and 2.5 mi (4.0 km) north of Coopersdale.

GAGE.--Miscellaneous site.

Site No. 27

03041040 Red Run near Coopersdale

LOCATION.--Lat 40°22'57", long 78°55'09", Cambria County, at mouth, 0.3 mi (0.5 km) southwest of Laurel Run Dam and 2 mi (3 km) northeast of Coopersdale.

GAGE.--Miscellaneous site.

Site No. 28

03041043 Laurel Run below Laurel Run Reservoir near Coopersdale

LOCATION.--Lat 40°22'45", long 78°55'07", Cambria County, 300 ft (90 m) downstream from Cooper Avenue bridge, 0.9 mi (1.4 km) upstream from Wildcat Run, 1.6 mi (2.6 km) above mouth, and 1.5 mi (2.4 km) northeast of Coopersdale.

GAGE.--Miscellaneous site.

Site No. 29

03041046 Wildcat Run at Coopersdale

LOCATION.--Lat 40°22'10", long 78°55'58", Cambria County, at mouth, 1.0 mi (1.6 km) north of Coopersdale and 300 ft (90 m) downstream from Cooper Avenue.

GAGE.--Miscellaneous site.

Site No. 30

03041500 Conemaugh River at Seward

LOCATION.--Lat 40°25'09", long 79°01'35", Westmoreland County, Hydrologic Unit 05010007, on left bank at upstream side of bridge on State Highway 56 at Seward, 2.0 mi (3.2 km) downstream from Findley Run, and 9 mi (14 km) northwest of Johnstown.

GAGE.--Water-stage recorder. Datum of gage is 1,076.01 ft (327.968 m) NGVD.

REMARKS.--Flow regulated by steel mills and by reservoirs above station, the eight most effective reservoirs have a combined capacity of 51,850 acre-ft (63.9 hm^3).

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
0100	2.47	392	1200	21.73	65,500	1200	8.02	7,260
0600	2.42	494	1300	19.90	54,500	1400	7.86	6,690
1200	2.37	459	1400	18.23	44,500	1600	7.72	6,380
1800	2.34	438	1500	16.74	37,300	1800	7.78	6,520
2200	2.38	466	1600	14.70	29,300	2000	7.72	6,380
2300	2.55	585	1700	13.29	24,400	2200	7.72	6,380
2400	3.61	1,690	1800	12.52	22,100	2400	7.85	6,670
7/20			1900	11.88	18,800	7/22		
0100	6.16	6,250	2000	11.38	17,500	0600	7.48	5,860
0200	6.83	7,730	2100	10.98	15,900	1200	7.13	5,160
0300	7.55	9,440	2200	10.60	15,200	1800	6.82	4,540
0400	12.76	23,100	2300	10.30	13,900	2400	6.52	3,940
0500	22.09	68,300	2400	9.98	12,900	7/23		
0600	24.40	86,600	7/21			0600	6.28	3,340
0700	25.65	98,500	0200	9.48	10,200	1200	6.12	3,060
0800	27.06	115,000	0400	9.08	9,990	1800	5.92	2,720
0900	25.85	99,500	0600	8.80	9,560	2400	5.78	2,660
1000	24.75	88,800	0800	8.46	8,260			
1100	23.74	80,100	1000	8.20	7,660			

Total runoff, in inches ---------- 3.10

Site No. 31

03042000 Blacklick Creek at Josephine

LOCATION.--Lat 40°28'24", long 79°11'01", Indiana County, Hydrologic Unit 05010007, on right bank on upstream side of old concrete dam at Josephine, 0.9 mi (1.4 km) upstream from Two Lick Creek, and 5 mi (8 km) northeast of Blairsville. Water-quality sampling site 820 ft (250 m) downstream.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 975.82 ft (297.431 m) NGVD, datum of 1912. Prior to Aug. 25, 1953, nonrecording gage at same site and datum.

REMARKS.--Some regulation at low flow by mine pumpage above station.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/22		
0100	4.06	251	1200	17.94	34,200	0100	7.01	1,910
0600	3.84	180	1300	17.34	31,200	0200	7.00	1,900
1200	3.62	118	1400	16.29	26,300	0300	6.97	1,870
1800	3.59	111	1500	14.55	19,300	0800	6.83	1,730
2100	3.63	121	1600	13.65	16,300	1200	6.47	1,380
2200	4.16	289	1700	12.50	12,700	1800	6.19	1,150
2300	6.46	2,280	1800	11.80	10,800	2400	5.93	944
2400	10.87	10,600	1900	11.05	8,780	7/23		
7/20			2000	10.35	7,260	0600	5.74	804
0100	11.90	13,200	2100	9.65	5,860	1200	5.62	732
0200	11.79	12,900	2200	9.05	4,730	1800	5.47	642
0300	11.90	13,200	2300	8.75	4,240	2400	5.36	576
0400	12.55	15,000	2400	8.50	3,840	7/24		
0500	14.45	21,100	7/21			0600	5.25	515
0600	16.15	27,100	0200	8.40	3,700	1200	5.19	485
0700	17.70	33,800	0400	7.93	3,040	1800	5.14	460
0800	19.15	41,300	0600	7.68	2,720	2400	5.14	460
0830	19.89	45,800	0800	7.47	2,460			
0900	19.55	42,800	1000	7.29	2,250			
1000	19.00	39,500	1200	7.13	2,060			
1100	18.30	36,000	1800	6.80	1,700			
			2200	6.70	1,600			
			2300	6.76	1,660			
			2400	6.91	1,810			

Total runoff, in inches ---------- 4.93

Site No. 32

03042170 Stoney Run at Indiana

LOCATION.--Lat 40°36'31", long 79°09'49", Indiana County, at southwest edge of Indiana, 300 ft (90 m) west of U.S. Highway 119 and 0.1 mi (0.2 km) below Marsh Run.

GAGE.--Crest-stage.

Site No. 33

03042180 Two Lick Creek near Homer City

LOCATION.--Lat 40°33'51", long 79°09'42", Indiana County, at bridge of U.S. Highway 219, 4.2 mi (6.8 km) south of Indiana.

GAGE.--Miscellaneous site.

Site No. 34

03042198 Little Yellow Creek Tributary at Strongstown

LOCATION.--Lat 40°33'33", long 78°56'19", Indiana County, at highway culvert on U.S. Highway 422, 2,000 ft (610 m) upstream from mouth, 0.8 mi (1.3 km) northwest of Strongstown and 1.5 mi (2.4 km) southwest of Nolo.

GAGE.--Miscellaneous site.

Site No. 35

03042200 Little Yellow Creek near Strongstown

LOCATION.--Lat 40°33'45", long 78°56'44", Indiana County, Hydrologic Unit 05010007, on right bank 100 ft (30 m) downstream from concrete box culvert on U.S. Highway 422, 1.4 mi (2.2 km) northwest of Strongstown, 6 mi (10 km) upstream from mouth, and 11 mi (18 km) southeast of Indiana.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 1,586.83 ft (483.666 m) NGVD. August 25, 1959 to August 31, 1960, low-flow gage, and Nov. 6, 1959 to August 31, 1960, crest-stage gage at site 100 ft (30 m) upstream at same datum.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (cfs)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
1400	1.61	3.7	0100	7.84	2,040	0600	4.31	87
1500	1.83	8.7	0200	7.92	2,120	1200	4.17	70
1600	1.92	12	0300	7.57	1,770	1500	4.11	63
1700	1.95	13	0400	9.31	4,250	1600	4.41	102
2000	1.89	10	0500	8.37	2,690	1800	4.53	120
2100	4.31	252	0600	7.19	1,390	2000	4.42	103
2200	5.30	470	0700	6.59	903	2200	4.35	93
2300	5.60	560	0800	6.08	600	2400	4.29	85
2400	5.42	506	0900	5.73	452	7/22		
			1000	5.50	360	0600	4.15	68
			1200	5.14	252	1200	4.05	56
			1800	4.67	140	1800	3.96	47
			2400	4.45	108	2400	3.88	39
						7/23		
						0600	3.84	36
						1200	3.74	27
						1800	3.69	23
						2400	3.65	21

Total runoff, in inches ---------- 3.65

Site No. 36

03042280 Yellow Creek near Homer City

LOCATION.--Lat 40°34'18", long 79°06'13", Indiana County, Hydrologic Unit 05010007, on left bank 0.3 mi (0.5 km) upstream from Central Indiana County Water Authority dam and 3.5 mi (5.6 km) northeast of Homer City.

GAGE.--Water-stage recorder. Altitude of gage is 1,140 ft (347 m) from topographic map.

REMARKS.--Flows not adjusted for effect of Ferrier Run following flood-induced break in Ferrier Run diversion project. Ferrier Run now enters Yellow Creek between the dam (flow measurement site) and the gaging station, instead of downstream from the dam.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
1200	2.62	48	0700	12.60	15,000	0200	7.02	3,330
1800	2.64	51	0800	12.25	14,000	0400	6.79	3,050
2000	2.65	53	0900	12.02	13,400	0600	6.57	2,780
2100	3.06	148	1000	11.61	12,300	1200	5.98	2,080
2200	3.79	455	1100	11.28	11,500	2400	5.40	1,500
2300	5.12	1,470	1200	10.85	10,500	7/22		
2400	5.39	1,740	1400	10.01	8,620	1200	4.83	1,030
7/20			1600	9.17	6,840	2400	4.31	686
0100	5.55	1,900	1800	8.59	5,760	7/23		
0200	6.85	3,370	2000	8.11	4,980	1200	3.95	485
0300	8.21	5,140	2200	7.70	4,320	2400	3.69	366
0400	9.53	7,770	2400	7.39	3,850	7/24		
0500	11.11	11,100				1200	3.50	290
0600	12.03	13,400				2400	3.36	236

Total runoff, in inches ---------- 7.69

Site No. 37

03042282 Ferrier Run near Homer City

LOCATION.--Lat 40°34'18", long 79°06'13", Indiana County, at artificial channel near mouth near Yellow Creek near Homer City gaging station, 3.5 mi (5.6 km) northeast of Homer City and 4.5 mi (7.2 km) southeast of Indiana.

GAGE.--Miscellaneous site.

Site No. 38

03042500 Two Lick Creek at Graceton

LOCATION.--Lat 40°31'02", long 79°10'19", Indiana County, Hydrologic Unit 05010007, on right bank 0.8 mi (1.3 km) upstream from highway bridge on road leading west from Graceton, 1.1 mi (1.8 km) downstream from Tearing Run, 1.5 mi (2.4 km) upstream from Cherry Run, and 8 mi (13 km) northeast of Blairsville. Water-quality sampling site at bridge 0.8 mi (1.3 km) downstream.

GAGE.--Water-stage recorder. Datum of gage is 981.63 ft (299.201 m) NGVD.

REMARKS.--Diurnal fluctuation caused by mine pumpage and by sewage-disposal plant above station. Flow regulated since December 1968 by Two Lick Creek Reservoir 10 mi (16 km) upstream, capacity, 16,240 acre-ft (20.0 hm^3) and since July 1971 by Yellow Creek Lake 11 mi (18 km) upstream.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
0100	2.45	160	0800	17.75	29,500	1800	7.50	3,400
0600	2.42	151	0900	18.30	31,000	1900	7.71	3,610
1200	2.43	154	0930	18.65	32,000	2000	7.72	3,620
1400	2.46	163	1000	18.33	28,500	2100	7.55	3,450
1600	2.52	181	1100	18.08	27,000	2200	7.39	3,290
1700	2.55	190	1200	17.60	24,000	2400	7.16	3,080
1800	2.56	193	1400	17.00	21,600	7/22		
1900	2.53	184	1600	15.80	17,800	0600	6.77	2,720
2000	2.97	320	1800	14.40	13,900	1200	6.50	2,480
2100	5.53	1,700	2000	12.90	10,700	1800	6.25	2,280
2200	8.55	4,460	2200	11.40	8,200	2400	4.15	795
2300	10.12	6,540	2400	10.30	6,650	7/23		
2400	10.60	7,500	7/21			0600	3.93	685
7/20			0200	9.50	5,520	1200	3.70	590
0100	10.28	6,860	0400	9.08	5,050	1800	3.54	526
0200	10.34	6,980	0600	8.69	4,620	2400	3.40	470
0300	11.55	9,680	0700	8.50	4,410	7/24		
0400	12.68	12,800	1200	7.73	3,630	0600	3.31	434
0500	13.79	16,200	1400	7.47	3,370	1200	3.23	402
0600	15.16	20,500	1600	7.25	3,160	1800	3.14	366
0700	16.78	26,300	1700	7.23	3,140	2400	3.08	343

Total runoff, in inches ---------- 5.34

NOTE: Gage heights and discharges estimated from 1600 hours on July 20 until 0600 hours on July 21.

Site No. 39

03044000 Conemaugh River at Tunnelton

LOCATION.--Lat 40°27'16", long 79°23'28", Indiana County, Hydrologic Unit 05010007, on right bank at downstream side of highway bridge at Tunnelton, 0.9 mi (1.4 km) downstream from Boatyard Run, 2.0 mi (3.2 km) downstream from Conemaugh River Dam, 3.8 mi (6.1 km) southeast of Saltsburg, and 5.5 mi (8.8 km) upstream from confluence with Loyalhanna Creek.

GAGE.--Water-stage recorder. Datum of gage is 844.64 ft (257.446 m) NGVD. Prior to Oct. 1, 1952, nonrecording gage at same site and datum.

REMARKS.--Flow regulated since 1971 by Yellow Creek Lake, since 1952 by Conemaugh River Lake 2 mi (3 km) upstream and by reservoirs above station, the nine most effective of which have a combined capacity of 68,090 acre-ft (84.0 hm^3). Evaporation from operation of Homer City and Conemaugh generating stations, which began during 1969 and 1970 respectively, can amount to as much as 45 ft^3/s (1.3 m^3/s).

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/21			7/24		
1200	3.62	1,510	2300	11.98	23,600	0600	11.29	21,200
1800	3.61	1,500	2400	11.98	23,600	0900	11.23	21,000
2400	3.63	1,530	7/22			1000	10.31	18,100
7/20			0600	11.97	23,600	1100	10.09	17,400
0300	3.75	1,720	0900	11.94	23,500	1200	10.05	17,300
0600	3.88	1,950	1200	11.91	23,400	1500	10.00	17,100
0900	4.01	2,870	1500	11.87	23,300	1800	9.96	17,000
1200	4.56	3,170	1800	11.84	23,100	2400	9.86	16,700
1500	5.99	6,140	2100	11.81	23,000	7/25		
1000	7.34	9,450	2400	11.77	22,900	0600	9.76	16,400
2100	8.62	12,800	7/23			1200	9.72	16,200
2400	9.15	14,500	0300	11.73	22,700	1300	8.78	13,300
7/21			0600	11.69	22,600	1400	8.58	12,700
0300	9.51	15,500	0900	11.64	22,400	1500	7.60	10,100
0600	9.99	17,100	1200	11.59	22,300	1600	7.36	9,500
0900	10.24	17,800	1500	11.54	22,100	1800	7.33	9,400
1200	10.35	18,200	1800	11.50	22,000	2000	7.33	9,420
1500	10.77	19,500	2100	11.44	21,800	2200	7.32	9,400
1800	11.27	21,200	2400	11.39	21,600	2400	7.32	9,400
2100	11.62	22,400	7/24					
2200	11.89	23,300	0300	11.34	21,400			

Total runoff, in inches ---------- 2.82

Site No. 40

01540600 West Branch Susquehanna River at Barnesboro

LOCATION.--Lat 40°40'10", long 78°47'29", Cambria County, at 22nd Street bridge in Barnesboro.

GAGE.--Miscellaneous site.

Site No. 41

01540650 West Branch Susquehanna River at Cherry Tree

LOCATION.--Lat 40°43'34", long 78°48'20", Indiana County, at Highway bridge 5H580 in Cherry Tree, 200 ft (60 m) downstream from Cush Cushion Creek.

GAGE.--Miscellaneous site.

Site No. 42

01541000 West Branch Susquehanna River at Bower

LOCATION.--Lat 40°53'49", long 78°40'38", Clearfield County, Hydrologic Unit 02050201, on right bank at downstream side of highway bridge at Bower, 4.6 mi (7.4 km) downstream from Chest Creek and Mahaffey.

GAGE.--Water-stage recorder. Datum of gage is 1,207.14 ft (367.936 m) NGVD. Prior to Oct. 17, 1929, nonrecording gage at same site and datum.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
0600	5.24	313	0500	15.50	17,000	2100	10.10	4,740
1200	5.14	278	0600	15.18	16,000	2200	10.27	5,000
1300	5.12	271	0700	14.98	15,400	2300	10.23	4,940
1400	5.13	274	0800	14.85	15,100	2400	10.15	4,820
1500	5.12	271	0900	14.82	15,000	7/22		
1800	5.13	274	1200	14.83	15,000	0300	9.88	4,420
1900	5.16	285	1500	14.63	14,400	0600	9.39	3,740
2000	5.37	362	1800	14.52	14,100	0900	8.93	3,150
2100	5.65	474	2100	14.44	13,900	1200	8.64	2,800
2200	6.35	832	2400	14.32	13,600	1800	8.27	2,400
2300	9.60	4,030	7/21			2400	7.84	1,980
2400	13.00	10,200	0300	14.02	12,700	7/23		
7/20			0600	13.10	10,400	1200	7.24	1,450
0100	16.12	18,900	0900	11.40	6,850	2400	6.84	1,150
0130	16.23	19,200	1200	10.35	5,120	7/24		
0200	16.15	19,000	1500	9.77	4,270	1200	6.55	958
0300	15.98	18,500	1800	9.46	3,830	2400	6.30	802
0400	15.80	17,900	1900	9.55	3,960			
			2000	9.85	4,380			

Total runoff, in inches ---------- 3.37

Site No. 43

01541200 West Branch Susquehanna River at Curwensville

LOCATION.--Lat 40°57'41", long 78°31'10", Clearfield County, Hydrologic Unit 02050201, on left bank 30 ft (9 m) downstream from bridge on State Highway 453, 0.85 mi (1.37 km) downstream from Curwensville Lake, 1.1 mi (1.8 km) south of Curwensville and 1.8 mi (2.9 km) upstream from Anderson Creek. Water-quality sampling site at bridge 30 ft (9 m) upstream.

GAGE.--Water-stage recorder. Datum of gage is 1,124.52 ft (342.754 m) NGVD. Prior to Aug. 24, 1956, nonrecording gage and crest-stage gage 30 ft (9 m) upstream at same datum.

REMARKS.--Flow regulated by Curwensville Lake 0.85 mi (1.36 km) upstream.

Site No. 44

01541308 Bradley Run near Ashville

LOCATION.--Lat 40°30'33", long 78°35'02", Cambria County, Hydrologic Unit 02050201, on right bank 200 ft (60 m) downstream from bridge on State Highway 53 at Syberton, 0.2 mi (0.3 km) upstream from mouth, and 4.5 mi (7.2 km) southwest of Ashville.

GAGE.--Water-stage recorder. Altitude of gage is 1,770 ft (539 m) from topographic map.

Site No. 45

01541321 Brubaker Run at Dean

LOCATION.--Lat 40°37'20", long 78°30'12", Cambria County, at culvert on State Highway 53, at Dean, 0.1 mi (0.2 km) upstream from mouth.

GAGE.--Miscellaneous site.

Site No. 46

01541365 North Witmer Run at Irvona

LOCATION.--Lat 40°46'12", long 78°32'59", Clearfield County, at mouth at Irvona

GAGE.--Miscellaneous site.

Site No. 47

01541500 Clearfield Creek at Dimeling

LOCATION.--Lat 40°58'18", long 78°24'22", Clearfield County, Hydrologic Unit 02050201, on right bank at downstream side of highway bridge at Dimeling, 600 ft (180 m) downstream from Little Clearfield Creek, and 4 mi (6 km) southeast of Clearfield.

GAGE.--Water-stage recorder. Datum of gage is 1,146.08 ft (349.325 m) NGVD. Prior to Oct. 17, 1928, nonrecording gage and Oct. 17, 1928 to Oct. 25, 1967, water-stage recorder at site 200 ft (61 m) upstream, all at the same datum.

REMARKS.--Flow regulated by Glendale Lake about 25 mi (40 km) upstream.

Site No. 48

01542000 Moshannon Creek at Osceola Mills

LOCATION.--Lat 40°50'58", long 78°16'05", Clearfield County, Hydrologic Unit 02050201, on left bank 10 ft (3.0 m) upstream from Penn Central Railroad bridge at Osceola Mills, and 0.1 mi (0.2 km) downstream from Trout Run.

GAGE.--Water-stage recorder. Datum of gage is 1,446.98 ft (441.040 m) NGVD.

Site No. 49

01556000 Frankstown Branch Juniata River at Williamsburg

LOCATION.--Lat 40°27'47", long 78°12'00", Blair County, Hydrologic Unit 02050302, on left bank 10 ft (3 m) downstream from highway bridge at Williamsburg, 2.5 mi (4.0 km) upstream from Clover Creek.

GAGE.--Water-stage recorder. Datum of gage is 831.78 ft (253.53 m) NGVD, (Penn Central Railroad bench mark). Prior to Aug. 14, 1928, nonrecording gage at same site and datum.

REMARKS.--Regulation at low flow by mill above station.

Site No. 50

01556400 Sandy Run near Bellwood

LOCATION.--Lat 40°33'47", long 78°20'35", Blair County, at bridge on private road, 0.6 mi (1.0 km) above mouth, and 2.5 mi (4.0 km) south of Bellwood.

GAGE.--Crest-stage.

Site No. 51

01556500 Little Juniata River at Tipton

LOCATION.--Lat 40°37'40", long 78°17'38", Blair County, at Tipton, 100 ft (30 m) below bridge on State Highway 220, and 150 ft (45 m) downstream from Tipton Run.

GAGE.--Water-stage recorder and crest-stage. Datum of gage is 946.76 ft (288.57 m) NGVD.

Site No. 52

01557100 Schell Run at Tyrone

LOCATION.--Lat 40°40'00", long 78°15'00", Blair County, 0.2 mi (0.3 km) above U.S. Highway 220 between 5th Street and Shippen Street in Tyrone.

GAGE.--Water-stage recorder. Datum of gage is 919.11 ft (280.14 m) NGVD.

Site No. 53

01557500 Bald Eagle Creek at Tyrone

LOCATION.--Lat 40°41'01", long 78°14'02", Blair County, Hydrologic Unit 02050302, on left bank, 0.2 mi (0.3 km) upstream from plant of West Virginia Pulp and Paper Co. at Tyrone, 0.2 mi (0.3 km) upstream from Laurel Run, and 1.3 mi (2.1 km) upstream from mouth.

GAGE.--Water-stage recorder. Datum of gage is 921.80 ft (280.965 m) NGVD. October 1, 1944 to November 15, 1950, water-stage recorder, and Nov. 16, 1950 to Nov. 30, 1952, nonrecording gage at site 0.5 mi (0.8 km) downstream at datum 17.99 ft (5.483 m) lower.

Site No. 54

01558000 Little Juniata River at Spruce Creek

LOCATION.--Lat 40°36'45", long 78°08'27", Huntingdon County, Hydrologic Unit 02050302, on right bank 150 ft (46 m) downstream from Penn Central Railroad bridge, 0.5 mi (0.8 km) northwest of village at Spruce Creek, and 0.5 mi (0.8 km) upstream from Spruce Creek. Water-quality sampling site 0.4 mi (0.6 km) downstream.

GAGE.--Water-stage recorder. Datum of gage is 751.15 ft (228.951 m) NGVD.

Site No. 55

01559700 Buffalo Run Tributary near Manns Choice

LOCATION.--Lat 39°58'40", long 78°37'08", Bedford County, Hydrologic Unit 02050303, at left downstream end of bridge on State Highway 96, 2,000 ft (610 m) upstream from mouth, 2.3 mi (3.7 km) south of Manns Choice, and 11 mi (18 km) southwest of Bedford.

GAGE.--Water-stage recorder and crest-stage gage. Altitude of gage is 1,230 ft (375 m) from topographic map.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
1200	0.39	.34	0800	2.02	156	1200	.69	14
1800	.38	.28	0900	1.66	102	1700	.64	11
2400	.48	.77	1000	1.37	67	2000	.69	14
7/20			1100	1.23	53	2400	.65	12
0300	2.85	326	1200	1.15	45	7/22		
0400	2.73	298	1500	.96	30	1200	.59	8.6
0500	3.47	495	1800	.85	23	2400	.55	4.6
0600	3.68	560	2100	.80	20	7/23		
0620	5.12	1120	2400	.77	18	1200	.52	5.7
0700	2.74	300				2400	.49	4.6

Total runoff, in inches ---------- 1.09

Site No. 56

01560000 Dunning Creek at Belden

LOCATION.--Lat 40°04'18", long 78°29'34", Bedford County, Hydrologic Unit 02050303, on left bank 10 ft (3 m) upstream from highway bridge, 0.8 mi (1.3 km) southeast of Belden, 3.8 mi (6.1 km) north of Bedford, and 4.3 mi (6.9 km) above mouth.

GAGE.--Water-stage recorder. Datum of gage is 1,051.16 ft (320.394 m) NGVD.

Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)	Time	Gage height (ft)	Discharge (ft^3/s)
7/19			7/20			7/21		
1200	1.33	21	1100	13.84	17,500	1800	4.07	944
1800	1.35	23	1115	14.15	19,400	2100	4.04	934
2100	1.35	23	1130	13.91	18,000	2400	4.54	1,110
2400	1.47	39	1200	13.83	17,500	7/22		
7/20			1300	13.75	17,000	0100	4.63	1,110
0100	1.66	71	1700	12.35	10,900	0300	4.45	1,040
0200	2.02	157	1800	11.99	9,770	0600	3.90	840
0300	3.59	756	2100	10.83	6,470	0900	3.61	724
0400	6.47	1,790	2400	9.79	4,520	1200	3.44	648
0500	8.59	3,190	7/21			2400	2.95	440
0600	9.33	3,940	0300	8.43	3,050	7/23		
0700	10.30	5,350	0600	6.48	1,790	1200	2.75	328
0800	11.34	7,820	0900	5.27	1,330	2400	2.56	261
0900	12.57	11,700	1200	4.71	1,160	7/24		
1000	13.53	15,800	1500	4.32	1,030	1200	2.46	228
						2400	2.38	204

Site No. 57

01600700 Little Wills Creek at Bard

LOCATION.--Lat 39°55'35", long 78°39'40", Bedford County, at bridge on State Highway 96 at Bard.

GAGE.--Crest-stage. Datum of gage is 1,264.2 ft (385.3 m) NGVD.