



Water Resources Data Michigan Water Year 1985



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-85-1
Prepared in cooperation with the State of Michigan
and with other agencies

CALENDAR FOR WATER YEAR 1985

1984

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by John B. Miller, John L. Oberg, and James C. Failing



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Prepared in cooperation with the State of Michigan
and with other agencies

UNITED STATES DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For information on the water program in Michigan write to
District Chief, Water Resources Division
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1986

PREFACE

This volume of the annual hydrologic data report of Michigan is one of a series of annual reports that document hydrologic data gathered from the U.S. Geological Survey's surface- and ground-water data-collection networks in each State, Puerto Rico, and the Trust Territories. These records of streamflow, ground-water levels, and quality of water provide the hydrologic information needed by State, local, and Federal agencies, and the private sector for developing and managing our Nation's land and water resources.

This report is the culmination of a concerted effort by dedicated personnel of the U.S. Geological Survey who collected, compiled, analyzed, verified, and organized the data, and who typed, edited, and assembled the report. In addition to the authors, who had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to Geological Survey policy and established guidelines, the following individuals contributed significantly to the collection, processing, and tabulation of the data:

S.M. Beall	J.M. Ellis	P.J. Klimek	R.G. Nettleton
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R.R. Eagle	G.C. Huffman	G. Lansky	T.J. Spicer
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This report was prepared in cooperation with the State of Michigan and with other agencies under the general supervision of T.R. Cummings, District Chief, Michigan, and S. P. Sauer, Regional Hydrologist, Northeast Region.

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CONTENTS

	Page
Preface	iii
List of gaging stations, in downstream order, for which records are published	vi
List of counties for which records of ground-water levels are published	ix
Introduction	1
Cooperation	1
Summary of hydrologic conditions	2
Streamflow	2
Chemical quality of streamflow	2
Ground-water levels	4
Special networks and programs	5
Explanation of records	5
Station identification numbers	6
Downstream order system	6
Latitude-longitude system	6
Local well numbers	6
Records of stage and water discharge	7
Data collection and computation	7
Data presentation	8
Identifying estimated daily discharge	9
Accuracy of the records	9
Other records available	9
Records of surface-water quality	9
Classification of records	10
Arrangement of records	10
On-site measurements and sample collection	10
Water temperature	10
Sediment	10
Laboratory measurements	11
Data presentation	11
Remark codes	11
Records of ground-water levels	12
Data collection and computation	12
Data presentation	12
Access to WATSTORE data	13
Definition of terms	13
Publications on Techniques of Water-Resources Investigations	20
Station records, surface water	27
Discharge at partial-record stations and miscellaneous sites	254
Low-flow partial-record stations	254
Crest-stage partial-record stations	258
Miscellaneous sites	262
Analyses of samples collected at water-quality miscellaneous sites	265
Station records, ground water	269
Ground-water levels	269
Ground-water temperatures	287
List of discontinued gaging stations	288
Index	293

ILLUSTRATIONS

Figure 1. Comparison of discharge at three long-term representative gaging stations during 1985 water year with mean discharge for period 1951-80	3
2. System for numbering wells (latitude and longitude)	6
3. Local well numbering system in Michigan	6
4. Map showing identification number and location of active surface-water gaging stations in Upper Peninsula of Michigan	22
5. Map showing identification number and location of active surface-water gaging stations in Lower Peninsula of Michigan	23
6. Map showing identification number and location of active surface-water-quality stations in Upper Peninsula of Michigan	24
7. Map showing identification number and location of active surface-water-quality stations in Lower Peninsula of Michigan	25
8. Map showing identification number and location of active surface-water-quality stations in Grand Traverse County	26
9. Location of water-quality temperature recorders and surface-water gaging stations in and around the Greenwood Reservoir complex	59
10. Map showing location of observation wells published in this report	268

Letter after station name designates type of data: (d) discharge, (c) chemical, (g) gage height,
(m) microbiological, (p) pesticide, (r) radio-chemical, (t) water temperature, (s) sediment

ST. LAWRENCE RIVER BASIN**STREAMS TRIBUTARY TO LAKE SUPERIOR**

Washington Creek at Windigo (dcmrt)	27
Middle Branch Ontonagon River near Paulding (d)	32
Bond Falls Reservoir:	
Bond Falls Canal near Paulding (d)	33
Bond Falls Reservoir near Paulding (d)	34
Middle Branch Ontonagon River near Trout Creek (d)	35
Middle Branch Ontonagon River near Rockland (d)	36
West Branch Ontonagon River near Bergland (d)	37

South Branch Ontonagon River:

Cisco Branch Ontonagon River at Cisco Lake Outlet (d)	38
Ontonagon River near Rockland (dcms)	39

Portage River (Portage Lake):

Sturgeon River near Sidnaw (d)	42
Sturgeon River near Alston (d)	43
Sturgeon River near Chassell (dcms)	44
Trap Rock River near Lake Linden (d)	46
Carp River near Negaunee (d)	47
Sand River Wildlife Flooding at Sand River (g)	48
Tahquamenon River near Tahquamenon Paradise (dcms)	49

STREAMS TRIBUTARY TO ST. MARYS RIVER

St. Marys River above Sault Ste. Marie (dcmr)	52
---	----

STREAMS TRIBUTARY TO LAKE MICHIGAN

Manistique River near Manistique (d)	54
Manistique River above Manistique (dcms)	55
Sturgeon River near Nahma Junction (d)	57
Middle Branch Escanaba River at Humboldt (d)	58
Greenwood Reservoir near Greenwood (d)	60
Greenwood Afterbay near Greenwood (t)	61
Greenwood Diversion near Greenwood (d)	63
Greenwood Release (Middle Branch Escanaba River) near Greenwood (d)	64

Schweitzer Creek (head of East Branch Escanaba River):

Schweitzer Reservoir near Palmer (d)	65
Schweitzer Creek near Palmer (d)	66
Escanaba River at Cornell (dcms)	67
Ford River near Hyde (dcms)	70

Brule River (head of Menominee River):

Brule River near Florence, WI (d)	73
Paint River at Crystal Falls (d)	74
Paint River near Alpha (d)	75
Michigamme River near Crystal Falls (d)	76
Menominee River near Florence, WI (d)	77
Menominee River below Pemene Creek near Pembine, WI (d)	78
Menominee River near McAllister, WI (d)	79
St. Joseph River near Burlington (d)	80

Coldwater River:

Hog Creek near Allen (d)	81
Coldwater River near Hodunk (d)	82
Nottawa Creek near Athens (d)	83

Portage River:**Gourdneck Creek:**

Gourdneck Canal near Schoolcraft (d)	84
Prairie River near Nottawa (d)	85

Crooked Creek (head of Fawn River):

Lime Lake Outlet at Panama, IN (d)	86
St. Joseph River at Mottville (d)	87
Pigeon River near Scott, IN (d)	88
North Branch Elkhart River at Cosperville, IN (d)	89
Elkhart River at Goshen, IN (d)	90
St. Joseph River at Elkhart, IN (d)	91
St. Joseph River at Niles (dcmts)	92
Dowagiac River at Sumnerville (d)	95
Paw Paw River at Riverside (d)	96
South Branch Black River near Bangor (d)	97

Kalamazoo River:

Battle Creek at Battle Creek (d)	98
Kalamazoo River near Battle Creek (d)	99
Augusta Creek near Augusta (d)	100
Kalamazoo River at Comstock (d)	101
Portage Creek at Portage (d)	102
Portage Creek near Kalamazoo (d)	103
West Fork Portage Creek near Oshtemo (d)	104
West Fork Portage Creek at Kalamazoo (d)	105
Portage Creek at Kalamazoo (dt)	106
Kalamazoo River near Fennville (d)	109
Rabbit River near Hopkins (d)	110
Kalamazoo River at Saugatuck (dcms)	111

<u>ST. LAWRENCE RIVER BASIN</u> --Continued	Page
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued	
Macatawa River near Zeeland (d)	113
Grand River at Jackson (d)	114
Red Cedar River near Williamston (d)	115
Deer Creek near Dansville (d)	116
Sloan Creek near Williamston (d)	117
Red Cedar River at East Lansing (d)	118
Grand River at Lansing (d)	119
Looking Glass River near Eagle (d)	120
Maple River at Maple Rapids (d)	121
Grand River at Ionia (d)	122
Flat River at Smyrna (d)	123
Thornapple River near Hastings (d)	124
Thornapple River near Caledonia (d)	125
Grand River at Grand Rapids (d)	126
Grand River at Eastmanville (dcms)	127
Muskegon River:	
Clam River at Vogel Center (d)	129
Muskegon River at Evart (d)	130
Little Muskegon River near Morley (d)	131
Muskegon River at Newaygo (d)	132
Muskegon River near Bridgeton (dcms)	133
Bear Creek near Muskegon (d)	135
White River near Whitehall (d)	136
Pere Marquette River at Scottville (d)	137
Manistee River:	
Fife Lake Outlet near Fife Lake (dcs)	138
Anderson Creek near Buckley (dcs)	139
Manistee River near Sherman (d)	140
Manistee River near Manistee (d)	141
Manistee River at Manistee (dcms)	142
Betsie River:	
Mason Creek near Crawn (dcs)	144
Duck Lake Outlet near Interlochen (dcs)	145
Green Lake Inlet near Interlochen (dcs)	146
Betsie River near Karlin (dcs)	147
Boardman River:	
South Branch Boardman River near South Boardman (dcs)	148
North Branch Boardman River near South Boardman (dcs)	149
Boardman River at Brown Bridge Road near Mayfield (dcs)	150
Boardman River below Brown Bridge Pond near Mayfield (dcs)	151
East Creek:	
Jackson Creek near Kingsley (dcs)	152
East Creek near Mayfield (dcs)	153
Boardman River near Mayfield (dcs)	154
Swainston Creek at Mayfield (dcs)	156
Jaxon Creek:	
West Branch Jaxon Creek near Mayfield (dcs)	157
Boardman River near Traverse City (dcs)	158
Boardman River at Traverse City (dcs)	159
Hospital Creek at Traverse City (dcs)	160
Mitchell Creek at Traverse City (dcs)	161
Acme Creek at Acme (dcs)	162
Yuba Creek near Acme (dcs)	163
Tobeco Creek near Elk Rapids (dcs)	164
Elk River:	
Battle Creek near Williamsburg (dcs)	165
Williamsburg Creek near Williamsburg (dcs)	166
Jordan River near East Jordan (d)	167
STREAMS TRIBUTARY TO LAKE HURON	
Pine River near Rudyard (d)	168
Burt Lake (head of Cheboygan River):	
Sturgeon River near Wolverine (d)	169
Indian River (outlet of Burt Lake):	
Pigeon River near Vanderbilt (d)	170
Cheboygan River (continuation of Indian River):	
Black River near Tower (d)	171
Cheboygan River at Cheboygan (dcms)	172
Thunder Bay River near Alpena (dcmts)	174
Au Sable River at Grayling (d)	180
South Branch Au Sable River near Luzerne (d)	181
Au Sable River at Mio (d)	182
Au Sable River near Au Sable (dcms)	183
Rifle River near Sterling (dcms)	185
Shiawassee River (head of Saginaw River) at Linden (d)	188
Shiawassee River at Owosso (d)	189
Flint River:	
South Branch Flint River:	
Farmers Creek near Lapeer (d)	190
South Branch Flint River near Columbiaville (d)	191

ST. LAWRENCE RIVER BASIN--Continued

STREAMS TRIBUTARY TO LAKE HURON--Continued

Shiawassee River (head of Saginaw River):

Holloway Reservoir near Otisville (d)	192
Flint River near Otisville (d)	193
Kearsley Creek near Davison (d)	194
Flint River near Flint (d)	196
Cass River at Cass City (d)	197
Cass River at Wahjamega (d)	198
Cass River at Frankenmuth (d)	199

Tittabawassee River:

Chippewa River near Mount Pleasant (d)	200
Pine River at Alma (d)	201
Pine River near Midland (d)	202
Tittabawassee River at Midland (d)	203
Saginaw River at Saginaw (dcms)	204
Pigeon River near Caseville (dcms)	207

STREAMS TRIBUTARY TO ST. CLAIR RIVER

St. Clair River at Port Huron (dcm)	209
Black River near Fargo (d)	211
Belle River:	
North Branch Belle River at Imlay City (d)	212
Belle River at Memphis (d)	213

STREAMS TRIBUTARY TO LAKE ST. CLAIR

Clinton River:

Sashabaw Creek near Drayton Plains (d)	214
Clinton River near Drayton Plains (d)	215
Galloway Creek near Auburn Heights (d)	216
Paint Creek at Rochester (d)	217
Stony Creek near Romeo (d)	218
Stony Lake near Washington (d)	219
Stony Creek near Washington (d)	220
Red Run near Warren (d)	221
Big Beaver Creek near Warren (d)	222
Plum Brook at Utica (d)	223
Clinton River near Fraser (d)	224

North Branch Clinton River:

East Pond Creek at Romeo (d)	225
--	-----

Coon Creek:

East Branch Coon Creek at Armada (d)	226
North Branch Clinton River near Mount Clemens (d)	227
Clinton River at Mount Clemens (dcms)	228

STREAMS TRIBUTARY TO DETROIT RIVER

Detroit River at Detroit (dcm)	231
River Rouge at Birmingham (d)	233
River Rouge at Southfield (d)	234
Evans Ditch at Southfield (d)	235
Upper River Rouge at Farmington (d)	236
River Rouge at Detroit (d)	237
Middle River Rouge near Garden City (d)	238
Lower River Rouge at Inkster (d)	239

STREAMS TRIBUTARY TO LAKE ERIE

Huron River at Milford (dcmps)	240
Huron River near New Hudson (dcmps)	243
Huron River near Hamburg (d)	246
Huron River at Delhi Mills (p)	247
Huron River at Ann Arbor (d)	248
River Raisin at Manchester (d)	249
River Raisin near Adrian (d)	250
River Raisin near Monroe (dcms)	251

LIST OF COUNTIES FOR WHICH RECORDS OF GROUND-WATER LEVELS ARE PUBLISHED

ix

	Page
Alger	269
Alpena	269
Arenac	269
Baraga	270
Barry	270
Bay	271
Branch	271
Calhoun	271
Cass	272
Cheboygan	272
Chippewa	273
Clinton	273
Crawford	274
Delta	274
Dickinson	274
Eaton	275
Genesee	275
Grand Traverse	275
Hillsdale	276
Ingham	276
Iosco	277
Iron	277
Jackson	277
Kalamazoo	278
Kent	278
Lake	279
Leelanau	279
Lenawee	280
Livingston	280
Mackinac	280
Marquette	281
Menominee	281
Monroe	281
Muskegon	282
Oakland	282
Oceana	283
Ogemaw	283
Ontonagon	283
Otsego	284
Presque Isle	284
Roscommon	284
Saginaw	285
Sanilac	285
Schoolcraft	285
Van Buren	286
Washtenaw	286

INTRODUCTION

The Water Resources Division of the U.S. Geological Survey, in cooperation with State agencies, obtains a large amount of data pertaining to the water resources of Michigan each water year. These data, accumulated during many water years, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the Geological Survey, the data are published annually in this report series entitled "Water Resources Data - Michigan."

This report includes records on both surface and ground water in the State. Specifically, it contains: (1) Discharge records for 135 streamflow-gaging stations, 30 low-flow partial-record stations, 52 crest-stage partial-record stations, and 41 miscellaneous sites; (2) stage only records for 1 streamflow-gaging station; (3) stage and content records for 5 lakes and reservoirs; (4) water-quality records for 52 streamflow-gaging stations, 1 miscellaneous site, and 1 precipitation site; (5) water-level records for 53 observation wells; and (6) water-temperature records for 6 observation wells. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State, Local, and Federal agencies in Michigan.

This series of annual reports for Michigan began with the 1961 water year with a report that contained only data relating to the quantities of surface water. For the 1964 water year, a similar report was introduced that contained only data relating to water quality. Beginning with the 1975 water year, the report format was changed to present, in one volume, data on quantities of surface water, quality of surface and ground water, and ground-water levels.

Prior to introduction of this series and for several water years concurrent with it, water-resources data for Michigan were published in U.S. Geological Survey Water-Supply Papers. Data on stream discharge and stage and on lake or reservoir contents and stage, through September 1960, were published annually under the title "Surface-Water Supply of the United States, Part 4." For the 1961 through 1970 water years, the data were published in two 5-year reports. Data on chemical quality, temperature, and suspended sediment for the 1941 through 1970 water years were published annually under the title "Quality of Surface Waters of the United States," and water levels for the 1935 through 1974 water years were published under the title "Ground-Water Levels in the United States." The above mentioned Water-Supply Papers may be consulted in the libraries of the principal cities of the United States and may be purchased from Distribution Branch, Text Products Section, U.S. Geological Survey, 604 South Pickett Street, Alexandria, VA 22304.

Publications similar to this report are published annually by the Geological Survey for all States. These official Survey reports have an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report MI-85-1." For archiving and general distribution, the reports for 1971-74 water years also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the District Chief at the address given on the back of the title page or by telephone (517) 377-1608.

COOPERATION

The U.S. Geological Survey and agencies of the State of Michigan have had cooperative agreements for the collection of water-resource records since 1930. Organizations that assisted in collecting the data in this report through cooperative agreement with the Survey are:

Michigan Department of Natural Resources, R.O. Skoog, Director, through Water Management Division, L.N. Witte, Chief, and Geological Survey Division, T.R. Segall, Chief.

Michigan Department of State Highways, J.P. Pitz, Director.

Assistance with funds or services was given by the U.S. Army Corps of Engineers in collecting records for 13 gaging stations published in this report. Assistance was also furnished by the National Weather Service, National Oceanic Atmospheric Administration, U.S. Department of Commerce, U.S. Environmental Protection Agency, and the National Park Service.

The following organizations aided in collecting records:

Macomb County Board of Supervisors; Oakland County Drain Commission; Genesee County Drain Commission; Huron-Clinton Metropolitan Authority; Cities of Ann Arbor, Clare, Coldwater, Flint, Imlay City, Kalamazoo, Lansing, Mason, Portage, St. Johns, and Ypsilanti; Allied Paper Inc.; American Aggregate Corp.; Beatrice Meats; Consumers Power Co.; Cleveland Cliffs Iron Co.; Fisher Body Division of General Motors Corp.; Michigan Power Co.; Michigan Sugar Co.; Upper Peninsula Power Co.; and Wisconsin-Electric Power Co.

Organizations that supplied data are acknowledged in the station descriptions.

SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

Streamflow was above normal for the 1985 water year in both the Upper and the Lower Peninsulas. Figure 1 compares mean discharges in 1985 to median discharges during 1951-80 at three index stations. Excessive runoff occurred in March, April, and September in the Upper Peninsula; and in January through April and September in the Lower Peninsula. The combined effects of above-normal precipitation, saturated soils, large amounts of water contained in snow cover, and above-normal river levels, caused considerable flooding throughout the State in February, March, and April.

In the Upper Peninsula, 80°F temperatures accompanied by an average of 3 inches of rain falling on heavy snow cover caused major flooding during April 20-24. Record or near-record runoff was recorded throughout the peninsula, with the heaviest runoff occurring in Marquette County and affecting the Escanaba and Michigamme River basins. A new maximum stage of 8.54 ft (feet) was recorded on Lake Michigamme where record has been collected since 1942. Estimated flood damage in Marquette County was \$3.1 million. The following table is a summary of peak discharges that occurred during the storm at several sites.

Station No.	Station Name	Peak (ft ³ /s)	Date	Previous Peak (ft ³ /s)	Date
04040500	Sturgeon River near Sidnaw	4,570	Apr. 20	4,630	Apr. 24, 1960
04044400	Carp River near Negaunee	918	Apr. 20	545	May 30, 1983
04045500	Tahquamenon River near Tahquamenon Paradise	6,700	Apr. 25	6,990	May 10, 1960
04056500	Manistique River near Manistique	13,200	Apr. 22	16,900	May 11, 1960
04057800	M. Br. Escanaba River at Humboldt	1,930	Apr. 20	1,640	Apr. 24, 1960
04057900	Black River near Republic	1,160	Apr. 20	590	Sep. 12, 1978
04058100	M. Br. Escanaba River at Princeton	4,200	Apr. 22	3,850	Apr. 25, 1960
04058400	Goose Lake Outlet near Sands Station	710	Apr. 20	458	May 31, 1970
04058500	E. Br. Escanaba River at Gwinn	2,700	Apr. 21	2,390	June 1, 1970
04059000	Escanaba River at Cornell	10,600	Apr. 22	10,700	Apr. 26, 1979
04062200	Peshekee River near Champion	6,100	Apr. 21	3,610	May 8, 1965
04062300	Michigamme River at Republic	5,270	Apr. 24	3,950	May 10, 1965
04127918	Pine River near Rudyard	4,320	Apr. 21	4,190	June 18, 1975

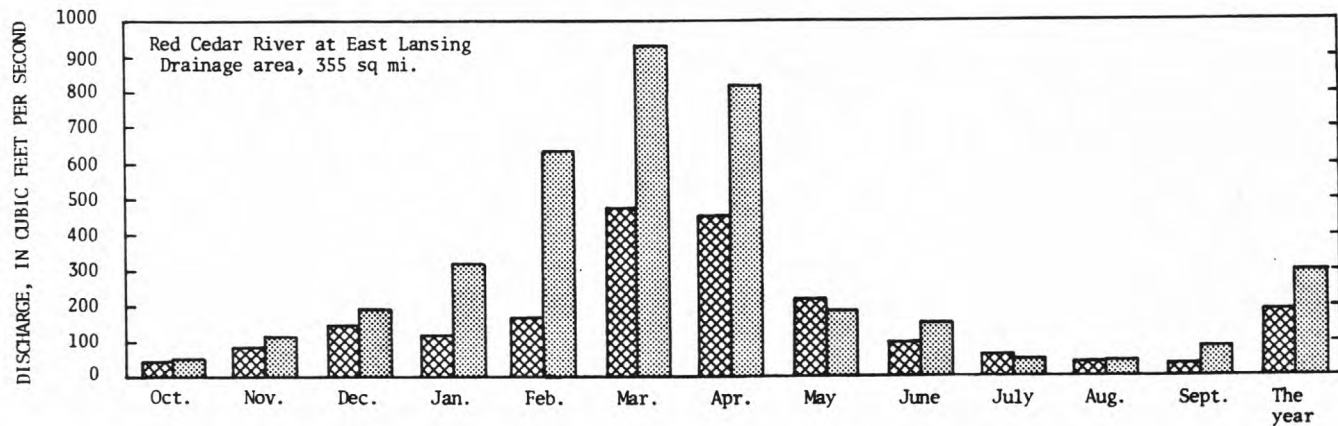
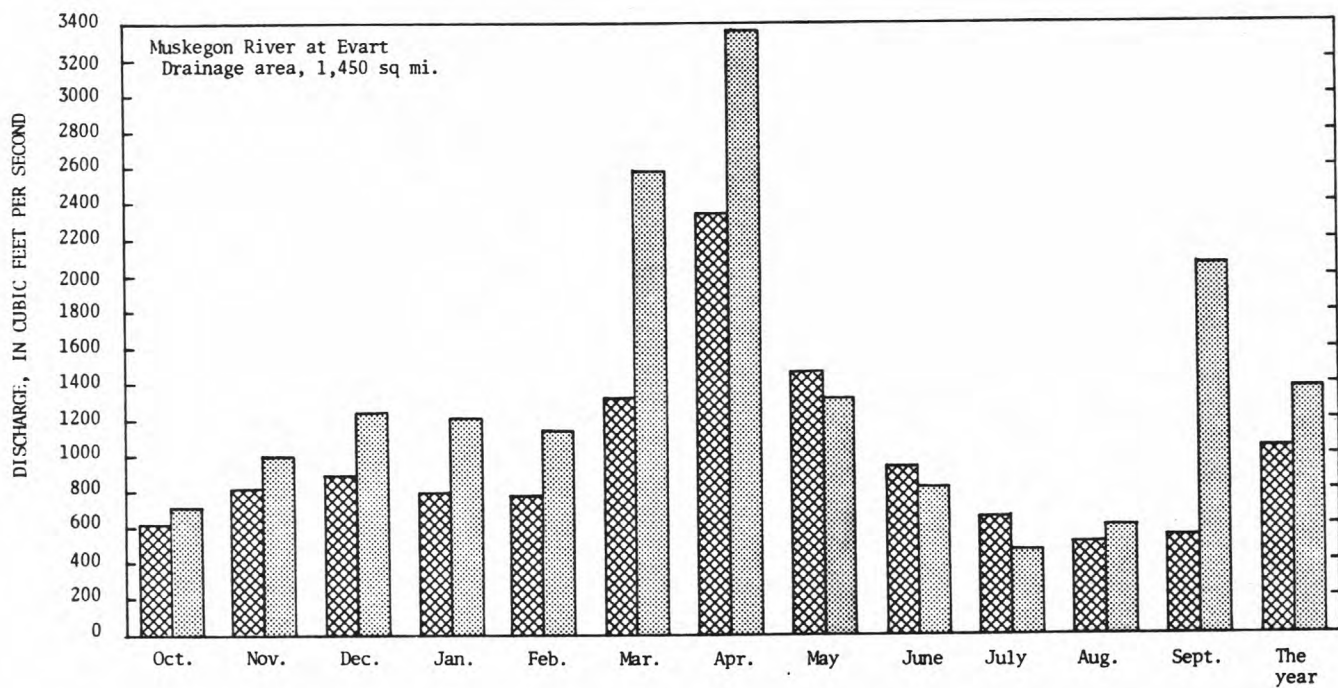
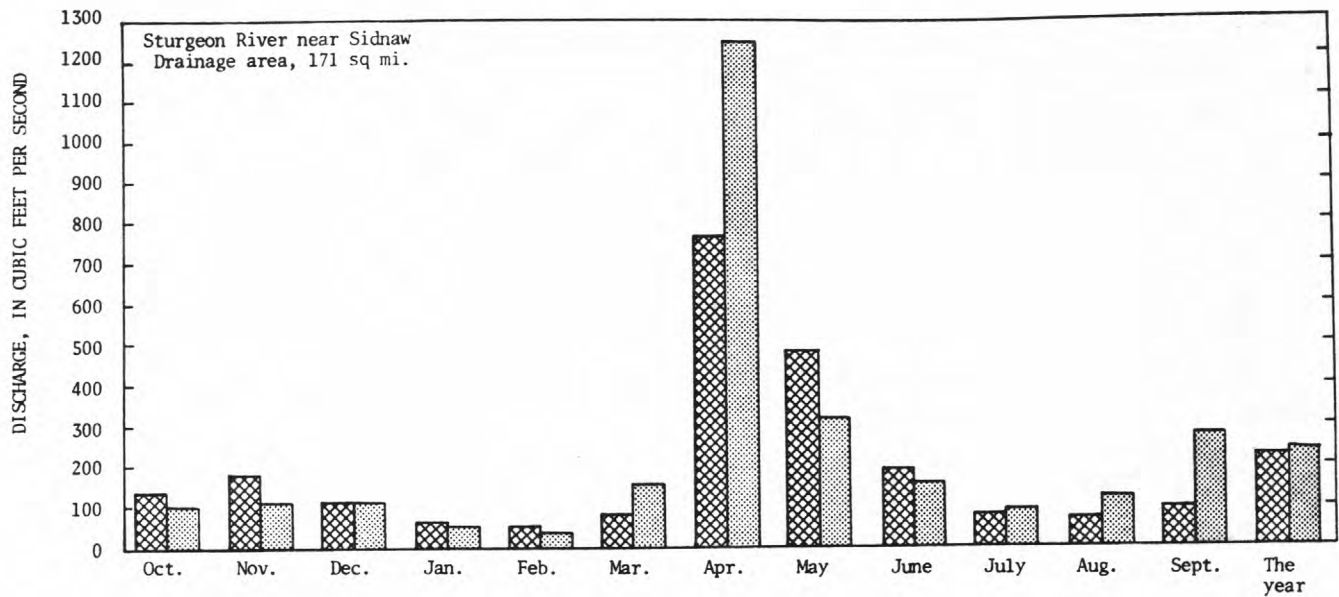
In the Lower Peninsula, new peak discharges occurred during February at several sites in southwestern Michigan. Heavy precipitation on April 5 caused record discharges in the Cass River basin. On the night of September 5 through the morning of the 6th, slow-moving thunderstorms resulted in large amounts of rainfall over east-central Michigan. More than 12 inches of rain fell in an 8-hour period in the Flint area. The Flint River at Flint gaging station recorded a new peak stage of 16.83 ft on September 6. This stage was 5.8 ft above flood stage and the highest in 53 years of record. Intermittent thunderstorms continued for the next few days, causing flooding on other areas of Genesee, Saginaw, Lapeer, and Alcona Counties. Estimated damages in these counties was more than \$60 million. Agricultural damage was estimated at \$18.5 million, with about \$7 million occurring in Saginaw County alone. The following table lists sites where record peak discharges occurred in the Lower Peninsula.

Station No.	Station Name	Peak (ft ³ /s)	Date	Previous Peak (ft ³ /s)	Date
04096515	Hog Creek near Allen	664	Feb. 25	524	Mar. 17, 1982
04096600	Coldwater River near Hodunk	2,280	Feb. 26	2,260	Mar. 18, 1982
04096900	Nottawa Creek near Athens	1,340	Feb. 26	1,120	June 29, 1978
04097540	Prairie River near Nottawa	797	Feb. 26	698	Mar. 20, 1982
04101800	Dowagiac River at Sumnerville	1,590	Feb. 24	1,280	June 26, 1968
04102500	Paw Paw River at Riverside	2,980	Feb. 27	2,830	Mar. 9, 1979
04111379	Red Cedar River near Williamston	1,790	Feb. 26	1,390	Mar. 15, 1982
04118000	Thornapple River near Caledonia	6,700	Feb. 27	6,290	May 10, 1956
04146000	Farmers Creek near Lapeer	1,380	Sep. 9	1,280	Apr. 6, 1947
04146063	S. Br. Flint River near Columbiaville	3,090	Sep. 9	2,510	Mar. 15, 1982
04148140	Kearsley Creek near Davison	1,500	Sep. 9	1,430	Apr. 21, 1975
04150500	Cass River at Cass City	8,650	Apr. 6	8,460	Mar. 20, 1948
04150800	Cass River at Wahjamega	12,000	Apr. 6	11,700	Mar. 6, 1976
04175600	River Raisin near Manchester	869	Feb. 24	565	Mar. 5, 1976

Water levels of the Great Lakes in the spring, summer, and fall of 1985 reached or exceeded record seasonal levels. In March, April, and May, record levels occurred on Lakes Michigan, Huron, St. Clair, and Erie; record levels continue to persist in 1986. These high levels are the result of more than a decade of above-average precipitation over nearly 300,000 square-mile drainage basin for the lakes. Because of these high levels, erosion has become a major problem for shoreline property owners.

Water Quality

Water-quality data collected at 20 stations in Michigan were used in a recently completed study to develop regression equations relating loads of dissolved and suspended substances to discharge (Cummings, 1984). Estimated annual yields for 19 substances and properties are listed for each water-quality station. Also listed in the report are maximum, mean, and minimum concentrations for each station.



Median of monthly and yearly mean discharge for period 1951-80.

Monthly and yearly mean discharge during 1985 water year.

Figure 1. Discharge during 1985 water year compared with median discharge for period 1951-80 for three representative stations.

Samples collected during 1985 at the 20 stations indicate the dissolved and suspended substances generally fall within the range of concentrations previously sampled at each site. However, for several rivers sampled at the highest stages at which water-quality samples have been collected, new minimum concentrations were determined.

Although many rivers are sampled at monthly, bimonthly, or quarterly intervals it is desirable to sample at high streamflows to determine if undesirable substances are present. During rapid snowmelt or abundant rainfall, excessive land runoff and flooding may cause unintentional introduction of contaminants into watercourses. Municipal storm drains or sewer systems sometimes are unable to handle excessive flow, and adequate treatment (decontamination) is not feasible. Improper treatment may allow contaminants to reach the discharge point--usually a river.

Chemical and physical characteristics of precipitation also influence the quality of water in streams. (See Wagner Precipitation Gage data.) The release of land-based material into the atmosphere and subsequent deposition by precipitation in other areas is another way in which surface water can be contaminated (U.S. Geological Survey, 1984, p. 61).

The quality characteristics of ground water entering a stream is another factor affecting the quality of water in the stream. Studies are being made to determine how ground water affects and interacts with surface water (U.S. Geological Survey, 1984, p. 45).

Some water-quality investigations are implemented to evaluate changes in drainage basins; other investigations (Grand Traverse County) are undertaken to assess the influence of land use or water quality within governmental boundaries.

A chemical leak entered the St. Clair River (a NASQAN station) during the water year. The leak was reported by the news media and is documented in an official publication.

High water levels in the Great Lakes probably affects the quality characteristics of water collected at water-quality stations near the mouths of rivers tributary to the Great Lakes.

Ground Water

The principal aquifers in Michigan are the outwash in glacial deposits and the sandstone, limestone, and dolomite in bedrock. The following table lists the aquifers and some of their characteristics.

Aquifer name and description	Well characteristics				Remarks
	Depth (ft)		Yield (gal/min)		
	Common range	May exceed	Common range	May exceed	
Glacial aquifers:					
Outwash: Mostly sand and gravel.	25-200	400	1-1,000	2,000	Water generally hard; iron concentrations common; deep wells may produce salty water in places.
Lacustrine sand: Mostly sand, some gravel.	25-100	200	80-500	500	Used for domestic supplies in Saginaw Bay and Detroit areas; is salty in places at depth.
Till: Intermixed clay, silt, sand, gravel and boulders; abundant sand and gravel lenses in some areas.	25-200	400	5-200	200	Primary source of domestic supply in western Upper Peninsula.
Bedrock aquifers:					
Saginaw Formation: Sandstone, siltstone, some shale, limestone, and coal.	25-300	500	100-300	1,000	One of Michigan's most important bedrock aquifers; water generally hard; salty in places at depth.
Marshall Formation: Sandstone and siltstone.	25-200	400	100-500	1,500	Another of Michigan's important bedrock aquifers; salty in places and at depth.
Silurian-Devonian rocks: Limestone and dolomite; some shale and sandstone.	25-150	200	10-300	500	Important aquifer in parts of eastern Upper Penin- sula; water commonly hard.
Cambrian-Ordovician rocks: Sandstone, limestone, and dolomite.	25-150	200	10-100	500	Important aquifer in east- ern Upper Peninsula; wat- er commonly very hard; salty in places and at depth.
Precambrian sandstone: Sandstone interbedded with siltstone.	25-400	500	5-50	100	Important aquifer in west- ern Upper Peninsula; salty in places.

Glacial deposits cover most of the State. The outwash sand and gravels in these deposits are the most productive aquifers in the State. Lacustrine sand also is very productive. Mixtures of clay, silt, sand and gravel, which form some till deposits, generally are poor aquifers; clay deposits generally yield little or no water. In most areas of the State, glacial deposits are less than 200 ft thick. In the northern part of the Lower Peninsula, however, the deposits in some areas are more than 800 ft thick.

Sandstone, limestone, and dolomite are the principal bedrock aquifers. Where near enough to land surface to be recharged by precipitation, they yield freshwater. Where deeply buried, however, these rocks yield brackish or saline water.

Annual recharge to aquifers in Michigan ranges from 3 to 18 inches and is derived from precipitation, which averages 31 inches annually.

Water levels were measured in 113 wells during 1985. Of these, 53 were selected to the national network of observation wells (figure 10)—a network designed to provide statewide areal coverage and to define ground-water conditions in the important aquifers in the State. Water levels in wells in the southcentral and southeastern part of the Lower Peninsula and the eastern half of the Upper Peninsula were below average during much of the year. However, because precipitation, the major source of recharge to freshwater aquifers in the State, was above normal in most areas in 1985, water levels rose in most wells by year end.

Chemical characteristics of natural ground water in Michigan are determined primarily by geologic environment through which the water flows. Natural ground water generally is suitable for human consumption and most other uses. Water from glacial deposits, at places, contains large concentrations of iron [2.5 to 5.0 milligrams per liter (mg/L)]; water from carbonate rocks is likely to be very hard (400 to 900 mg/L as calcium carbonate); and water from the Saginaw aquifer in the Saginaw Bay-Thumb area commonly is very mineralized (2,000 to 80,000 mg/L of dissolved solids). Throughout the State, saline water underlies fresh water at depths ranging from about 100 ft in the eastern part of the Lower Peninsula to about 900 ft in the northern part. Average dissolved-solids concentration of water from bedrock (535 mg/L) is about twice as great as the average concentration from glacial deposits (241 mg/L) (Cummings, 1980).

REFERENCES CITED

- Cummings, T. R., 1980, Chemical and Physical Characteristics of Natural Ground Waters in Michigan—A Preliminary Report: U.S. Geological Survey Open-File Report 80-953, 34 p.
- _____, 1984, Estimates of Dissolved and Suspended Substance Yield of Stream Basins in Michigan: U.S. Geological Survey Water-Resources Investigations Report 83-4288, 57 p.
- U.S. Geological Survey, 1984, National Water Summary 1983—Hydrologic Events and Issues, Water-Supply Paper 2250, p. 45, p. 61.
- _____, 1985, National Water Summary 1984, Water Supply Paper 2275, p. 255-260.

SPECIAL NETWORKS AND PROGRAMS

Hydrologic Bench-Mark Network is a network of 57 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

National Stream Quality Accounting Network (NASQAN) is a nationwide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water-quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

Radiochemical Program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

EXPLANATION OF THE RECORDS

The surface-water and ground-water records published in this report are for the 1985 water year that began October 1, 1984, and ended September 30, 1985. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, water-quality data for surface water, and ground-water-level data. The locations of the stations and wells where the data were collected are shown in figures 4-9. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

Station Identification Numbers

Each data station, whether streamsite or well, in this report is assigned a unique identification number. This number is unique in that it applies specifically to a given station and to no other. The number usually is assigned when a station is first established and is retained for that station indefinitely. The systems used by the U.S. Geological Survey to assign identification numbers for surface-water stations and for ground-water well sites differ, but both are based on geographic location. The "downstream order" system is used for all surface-water stations and the "latitude-longitude" system is used for wells.

Downstream Order System

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a mainstream station are listed before that station. A station on a tributary that enters between two mainstream stations is listed between them. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary with respect to the stream to which it is immediately tributary is indicated by an indentation in the "List of Stations" in the front of this report. Each indentation represents one rank. This downstream order and system of indentation shows which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

The station-identification number is assigned according to downstream order. In assigning station numbers, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete eight-digit number for each station, such as 04037500, which appears just to the left of the station name, includes the two-digit Part number "04" plus the six-digit downstream-order number "037500." The Part number designates the major river basin; for example, Part "04" is the St. Lawrence River basin.

Latitude-Longitude System

The identification numbers for wells are assigned according to the grid system of latitude and longitude. The number consists of 15 digits. The first six digits denote the degrees, minutes, and seconds of latitude, the next seven digits denote degrees, minutes, and seconds of longitude, and the last two digits (assigned sequentially) identify the wells or other sites within a 1-second grid. This site-identification number, once assigned, is a pure number and has no locational significance. In the rare instance where the initial determination of latitude and longitude are found to be in error, the station will retain its initial identification number; however, its true latitude and longitude will be listed in the LOCATION paragraph of the station description. (See figure below.)

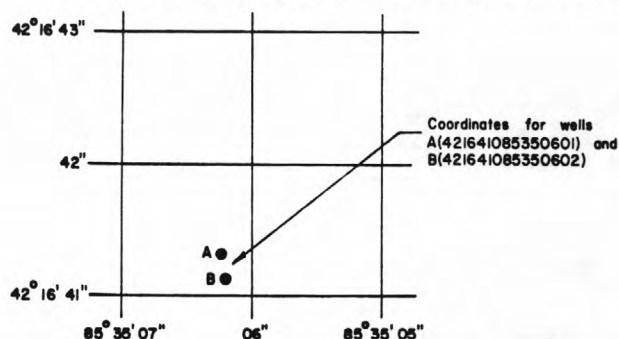


Figure 2. System for numbering wells (latitude and longitude).

Local Well Numbering System

The local well number indicates the location of wells within the rectangular subdivision of land with reference to the Michigan meridian and base line. The first two segments of the well number designate township and range, the third segment of the number designates the section and the letters A through D designate successively smaller subdivisions of the section as shown in figure 3. Thus, a well designated as 32N 6E 16CCCB would be located to the nearest 2.5 acres and would be within the shaded area in section 16. In the event that two or more wells are located in the same 2.5 acre tract, a sequential number designation follows the letter designations—for example, 16CCCB1, 16CCCB2, 16CCCB3, etc.

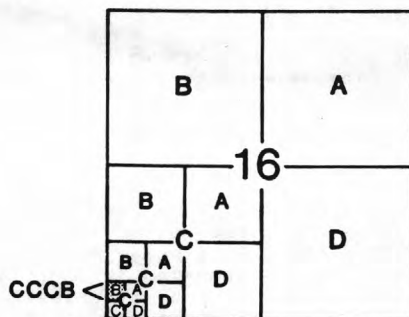


Figure 3. Local well numbering system in Michigan.

Records of Stage and Water Discharge

Records of stage and water discharge may be complete or partial. Complete records of discharge are those obtained using a continuous stage-recording device through which either instantaneous or mean daily discharges may be computed for any time, or any period of time, during the period of record. Complete records of lake or reservoir content, similarly, are those for which stage or content may be computed or estimated with reasonable accuracy for any time, or period of time. They may be obtained using a continuous stage-recording device, but need not be. Because daily mean discharges and end-of-day contents commonly are published for such stations, they are referred to as "daily stations."

By contrast, partial records are obtained through discrete measurements without using a continuous stage-recording device and pertain only to a few flow characteristics, or perhaps only one. The nature of the partial record is indicated by table titles such as "Crest-stage partial records," or "Low-flow partial records." Records of miscellaneous discharge measurements or of measurements from special studies, such as low-flow seepage studies, may be considered as partial records, but they are presented separately in this report. Location of all complete-record water-discharge stations for which data are given in this report are shown in figures 4 and 5.

Data Collection and Computation

The data obtained at a complete-record gaging station on a stream or canal consist of a continuous record of stage, individual measurements of discharge throughout a range of stages, and notations regarding factors that may affect the relationships between stage and discharge. These data, together with supplemental information, such as weather records, are used to compute daily discharges. The data obtained at a complete-record gaging station on a lake or reservoir consist of a record of stage and of notations regarding factors that may affect the relationship between stage and lake content. These data are used with stage-area and stage-capacity curves or tables to compute water-surface areas and lake storage.

Continuous records of stage are obtained with analog recorders that trace continuous graphs of stage or with digital recorders that punch stage values on paper tapes at selected time intervals. Measurements of discharge are made with current meters using methods adopted by the Geological Survey as a result of experience accumulated since 1880. These methods are described in standard textbooks, in Water-Supply Paper 2175, and in U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter A6.

In computing discharge records, results of individual measurements are plotted against the corresponding stages, and stage-discharge relation curves are then constructed. From these curves, rating tables indicating the approximate discharge for any stage within the range of the measurements are prepared. If it is necessary to define extremes of discharge outside the range of the current-meter measurements, the curves are extended using: (1) logarithmic plotting; (2) velocity-area studies; (3) results of indirect measurements of peak discharge, such as slope-area or contracted-opening measurements, and computations of flow over dams or weirs; or (4) step-backwater techniques.

Daily mean discharges are computed by applying the daily mean stages (gage heights) to the stage-discharge curves or tables. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is determined by the shifting-control method, in which correction factors based on the individual discharge measurements and notes of the personnel making the measurements are applied to the gage heights before the discharges are determined from the curves or tables. This shifting-control method also is used if the stage-discharge relation is changed temporarily because of aquatic growth or debris on the control. For some stations, formation of ice in the winter may so obscure the stage-discharge relations that daily mean discharges must be estimated from other information such as temperature and precipitation records, notes of observations, and records for other stations in the same or nearby basins for comparable periods.

At some stream-gaging stations, the stage-discharge relation is affected by the backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage; at these stations the rate of change in stage is used as a factor in computing discharge.

In computing records of lake or reservoir contents, it is necessary to have available from surveys, curves or tables defining the relationship of stage and content. The application of stage to the stage-content curves or tables gives the contents from which daily, monthly, or yearly changes then are determined. If the stage-content relationship changes because of deposition of sediment in a lake or reservoir, periodic resurveys may be necessary to redefine the relationship. Even when this is done, the contents computed may become increasingly in error as the lapsed time since the last survey increases. Discharges over lake or reservoir spillways are computed from stage-discharge relationships much as other stream discharges are computed.

For some gaging stations, there are periods when no gage-height record is obtained, or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are estimated from the recorded range in stage, previous or following record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins. Likewise, daily contents may be estimated from operator's logs, previous or following record, inflow-outflow studies, and other information. Information explaining how estimated daily-discharge values are identified in station records is included in the next two sections, "Data Presentation" (REMARKS paragraph) and "Identifying Estimated Daily Discharge."

Data Presentation

The records published for each gaging station consist of two parts, the manuscript or station description and the data table for the current water year. The manuscript provides, under various headings, descriptive information, such as station location; period of record; average discharge; historical extremes; record accuracy; and other remarks pertinent to station operation and regulation. The following information, as appropriate, is provided with each continuous record of discharge or lake content. Comments to follow clarify information presented under the various headings of the station description.

LOCATION. --Information on locations is obtained from the most accurate maps available. The location of the gage with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

DRAINAGE AREA. --Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

PERIOD OF RECORD. --This indicates the period for which there are published records for the station or for an equivalent station. An equivalent station is one that was in operation at a time that the present station was not, and whose location was such that records from it can reasonably be considered equivalent with records from the present station.

REVISED RECORDS. --Published records, because of new information, occasionally are found to be incorrect, and revisions are printed in later reports. Listed under this heading are all the reports in which revisions have been published for the station and the water years to which the revisions apply. If a revision did not include daily, monthly, or annual figures of discharge, that fact is noted after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the most recently revised figure was first published is given.

GAGE. --The type of gage in current use, the datum of the current gage referred to National Geodetic Vertical Datum of 1929 (see glossary), and a condensed history of the types, locations, and datums of previous gages are given under this heading.

REMARKS. --All periods of estimated daily-discharge record will either be identified by date in this paragraph of the station description for water-discharge stations or flagged in the daily-discharge table. (See next section, "Identifying Estimated Daily Discharge.") If a remarks statement is used to identify estimated record, the paragraph will begin with this information presented as the first entry. The paragraph is also used to present information relative to the accuracy of the records, to special methods of computation, to conditions that affect natural flow at the station and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir.

COOPERATION. --Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

AVERAGE DISCHARGE. --The discharge value given is the arithmetic mean of the water-year mean discharges. It is computed only for stations having at least 5 water years of complete record, and only water years of complete record are included in the computation. It is not computed for stations where diversions, storage, or other water-use practices cause the value to be meaningless. If water developments significantly altering flow at a station are put into use after the station has been in operation for a period of years, a new average is computed as soon as 5 water years of record have accumulated following the development.

EXTREMES FOR PERIOD OF RECORD. --Extremes may include maximum and minimum stages and maximum and minimum discharges or content. Unless otherwise qualified, the maximum discharge or content is the instantaneous maximum corresponding to the highest stage that occurred. The highest stage may have been obtained from a graphic or digital recorder, a crest-stage gage, or by direct observation of a nonrecording gage. If the maximum stage did not occur on the same day as the maximum discharge or content, it is given separately. Similarly, the minimum is the instantaneous minimum discharge, unless otherwise qualified, and was determined and is reported in the same manner as the maximum.

EXTREMES OUTSIDE PERIOD OF RECORD. --Included here is information concerning major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the U.S. Geological Survey.

EXTREMES FOR CURRENT YEAR. --Extremes given here are similar to those for the period of record, except the peak discharge listing may include secondary peaks. For stations meeting certain criteria, all peak discharges and stages occurring during the water year and greater than a selected base discharge are presented under this heading. The peaks greater than the base discharge, excluding the highest one, are referred to as secondary peaks. Peak discharges are not published for canals, ditches, drains, or streams for which the peaks are subject to substantial control by man. The time of occurrence for peaks is expressed in 24-hour local standard time. For example, 12:30 a.m. is 0030, and 1:30 p.m. is 1330. The minimum for the current water year appears below the table of peak data.

REVISIONS. --If a critical error in published records is discovered, a revision is included in the first report published following discovery of the error.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because, for these stations, there would be no current or, possibly, future station manuscript published to document the revision in a "Revised Records" entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the offices whose addresses are given on the back of the title page of this report to determine if the published records were ever revised after the station was discontinued. Of course, if the data were obtained by computer retrieval, the data would be current and there would be no need to check because any published revision of data is always accompanied by revision of the corresponding data in computer storage.

Manuscript information for lake or reservoir stations differs from that for stream stations in the nature of the "Remarks" and in the inclusion of a skeleton stage-capacity table when daily contents are given.

The daily table for stream-gaging stations gives mean discharge for each day and is followed by monthly and yearly summaries. In the monthly summary below the daily table, the line headed "TOTAL" gives the sum of the daily figures. The line headed "MEAN" gives the average flow in cubic feet per second during the month. The lines headed "MAX" and "MIN" give the maximum and minimum daily discharges, respectively, for the month. Discharge for the month also is usually expressed in cubic feet per second per square mile (line headed "CFSM"), or in inches (line headed "IN."), or in acre-feet (line headed "AC-FT"). Figures for cubic feet per second per square mile and runoff in inches are omitted if there is extensive regulation or diversion or if the drainage area includes large noncontributing areas. In the yearly summary below the monthly summary, the figures shown are the appropriate discharges for the calendar and water years. At some stations monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversions or reservoir contents are given. These figures are identified by a symbol and corresponding footnote.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. The tables of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified either by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated," or by listing the dates of the estimated record in the REMARKS paragraph of the station description.

Accuracy of the Records

The accuracy of streamflow records depends primarily on: (1) The stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements; and (2) the accuracy of measurements of stage, measurements of discharge, and interpretation of records.

The accuracy attributed to the records is indicated under "REMARKS." "Excellent" means that about 95 percent of the daily discharges are within 5 percent of their true values; "good," within 10 percent; and "fair," within 15 percent. Records that do not meet the criteria mentioned are rated "poor." Different accuracies may be attributed to different parts of a given record.

Daily mean discharges in this report are given to the nearest hundredth of a cubic foot per second for values less than 1 ft³/s; to the nearest tenth between 1.0 and 10 ft³/s; to whole numbers between 10 and 1,000 ft³/s; and to 3 significant figures for more than 1,000 ft³/s. The number of significant figures used is based solely on the magnitude of the discharge value.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff, in inches, are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

Other Records Available

Information used in the preparation of the records in this publication, such as discharge-measurement notes, gage-height records, temperature measurements, and rating tables are on file in the Michigan District office. Also, most of the daily mean discharges are in computer-readable form and have been analyzed statistically. Information on the availability of the unpublished information or on the results of statistical analyses of the published records may be obtained from the Michigan District office.

Records of Surface-Water Quality

Records of surface-water quality ordinarily are obtained at or near stream-gaging stations because interpretation of records of surface-water quality nearly always requires corresponding discharge data. Records of surface-water quality in this report may involve a variety of types of data and measurement frequencies.

Classification of records

Water-quality data for surface-water sites are grouped into one of three classifications. A continuing-record station is a site where data are collected on a regularly scheduled basis. Frequency may be once or more times daily, weekly, monthly, or quarterly. A partial-record station is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A miscellaneous sampling site is a location other than a continuing or partial-record station where random samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between "continuing records", as used in this report, and "continuous recordings," which refers to a continuous graph or a series of discrete values punched at short intervals on a paper tape. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report are shown in figures 6 and 7.

Arrangement of Records

Water-quality records collected at a surface-water daily record station are published immediately following that record, regardless of the frequency of sample collection. Station number and name are the same for both records. Where a surface-water daily record station is not available or where the water quality differs significantly from that at the nearby surface-water station, the continuing water-quality record is published with its own station number and name in the regular downstream-order sequence. Water-quality data for miscellaneous sampling sites appear in a separate table following the table of discharge measurements at miscellaneous sites.

On-site Measurements and Sample Collection

In obtaining water-quality data, a major concern needs to be assuring that the data obtained represent the in situ quality of the water. To assure this, certain measurements, such as water temperature, pH, and dissolved oxygen, need to be made onsite when the samples are taken. To assure that measurements made in the laboratory also represent the in situ water, carefully prescribed procedures need to be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in publications on "Techniques of Water-Resources Investigations," Book 1, Chap. D2; Book 3, Chap. C2; Book 5, Chap. A1, A3, and A4. All of these references are listed under "PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS" which appears at the end of the introductory text. Also, detailed information on collecting, treating, and shipping samples may be obtained from the Geological Survey Michigan District office.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentration and for use in calculating load. Many samples obtained for the National Stream Quality Accounting Network (see definitions) are obtained from at least several verticals. Whether samples are obtained from the centroid of flow or from several verticals depends on flow conditions and other factors which must be evaluated by the collector.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum, minimum, and mean values for each constituent measured and are based upon hourly punches beginning at 0100 hours and ending at 2400 hours for the day of record. More detailed records (hourly values) may be obtained from the Geological Survey Michigan District office whose address is given on the back of the title page of this report.

Water temperature

Water temperatures are measured at all the water-quality stations. In addition, water temperatures are taken at time of discharge measurements for water-discharge stations. Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures and/or maximum and minimum temperatures for each day are published. Water temperatures measured at the time of water-discharge measurements are on file in the Michigan District office.

Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section.

At some stations, suspended-sediment samples were collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observations, such data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of the stream.

Laboratory Measurements

Sediment samples were analyzed in the Geological Survey laboratory in Harrisburg, Pennsylvania. Samples for biochemical-oxygen demand (BOD) were analyzed locally. All other samples were analyzed in the Geological Survey laboratories in Arvada, Colorado or Doraville, Georgia. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chap. C1. Methods used by the Geological Survey laboratories are given in TWRI, Book 1, Chap. D2; Book 3, Chap. C2; Book 5, Chap. A1, A3, and A4.

Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data, and so forth, obtained at a frequency less than daily are presented first. Tables of "daily values" of specific conductance and water temperature then follow in sequence.

In the descriptive headings, if the location is identical to that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. The following information, as appropriate, is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.--See Data Presentation under "Records of Stage and Water Discharge;" same comments apply.

DRAINAGE AREA.--See Data Presentation under "Records of Stage and Water Discharge;" same comments apply.

PERIOD OF RECORD.--This indicates the periods for which there are published water-quality records for the station. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

INSTRUMENTATION.--Information is given only if a water-quality monitor or temperature recorder is or was in operation at a station.

REMARKS.--Remarks provide added information pertinent to the collection, analysis, or computation of the records.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

EXTREMES.--Maximums and minimums are given only for parameters measured daily or more frequently. None are given for parameters measured weekly or less frequently, because the true maximums or minimums may not have been sampled. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.--If errors in published water-quality records are discovered after publication, appropriate updates are made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. Environmental Protection Agency's STORET system. Because the usual volume of updates makes it impractical to document individual changes in the State data-report series or elsewhere, potential users of U.S. Geological Survey water-quality data are encouraged to obtain all required data from the appropriate computer file to insure the most recent updates.

The surface-water-quality records for miscellaneous sampling sites are published in a separate table following the table of discharge measurements at miscellaneous sites. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

Remark Codes

The following remark codes may appear with the water-quality data in this report:

<u>PRINTED OUTPUT</u>	<u>REMARK</u>
E	Estimated value
>	Actual value is known to be greater than the value shown
<	Actual value is known to be less than the value shown
K	Results based on colony count outside the acceptance range (non-ideal colony count)
L	Biological organism count less than 0.5 percent (organism may be observed rather than counted)
D	Biological organism count equal to or greater than 15 percent (dominant)
&	Biological organism estimated as dominant

Records of Ground-Water Levels

Only water-level data from a national network of observation wells are given in this report. These data are intended to provide a sampling and historical record of water-level changes in the Nation's most important aquifers. Locations of the observation wells in this network in Michigan are shown in figure 9.

Data Collection and Computation

Measurements of water levels are made in many types of wells under varying conditions, but the methods of measurement are standardized to the extent possible. The equipment and measuring techniques used at each observation well ensure that measurements at each well are of consistent accuracy and reliability.

Tables of water-level data are presented by counties arranged in alphabetical order. The prime identification number for a given well is the 15-digit number that appears in the upper left corner of the table. The secondary identification number is the local well number, an alphanumeric number, derived from the township-range location of the well.

Water-level records are obtained from direct measurements with a steel tape or from the graph or punched tape of a water-stage recorder. The water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the elevation of the land-surface datum is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (eom).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth to water of several hundred feet, the error of determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water, the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given to a tenth of a foot or a larger unit.

Data Presentation

Each well record consists of two parts, the station description and the data table of water levels observed during the water year. The description of the well is presented first through use of descriptive headings preceding the tabular data. The comments to follow clarify information presented under the various headings.

LOCATION.--This paragraph follows the well-identification number and reports the latitude and longitude (given in degrees, minutes, and seconds); the hydrologic-unit number; the distance and direction from a geographic point of reference; and the owner's name.

AQUIFER.--This entry designates by name (if a name exists) and geologic age the aquifer(s) open to the well.

WELL CHARACTERISTICS.--This entry describes the well in terms of depth, diameter, casing depth and/or screened interval, method of construction, use, and additional information such as casing breaks, collapsed screen, and other changes since construction.

INSTRUMENTATION.--This paragraph provides information on both the frequency of measurement and the collection method used, allowing the user to better evaluate the reported water-level extremes by knowing whether they are based on weekly, monthly, or some other frequency of measurement.

DATUM.--This entry describes both the measuring point and the land-surface elevation at the well. The measuring point is described physically (such as top of collar, notch in top of casing, plug in pump base and so on), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above (or below) National Geodetic Vertical Datum of 1929 (NGVD of 1929); it is reported with a precision depending on the method of determination.

REMARKS.--This entry describes factors that may influence the water level in a well or the measurement of the water level. It should identify wells that also are water-quality observation wells, and may be used to acknowledge the assistance of local (non-Survey) observers.

PERIOD OF RECORD.--This entry indicates the period for which there are published records for the well. It reports the month and year of the start of publication of water-level records by the U.S. Geological Survey and the words "to current year" if the records are to be continued into the following year. Periods for which water-level records are available, but are not published by the Geological Survey, may be noted.

EXTREMES FOR PERIOD OF RECORD.--This entry contains the highest and lowest water levels of the period of published record, with respect to land-surface datum, and the dates of their occurrence.

A table of water levels follows the station description for each well. Water levels are reported in feet below land-surface datum and all taped measurements of water level are listed. For wells equipped with recorders, only abbreviated tables are published; generally, only water-level lows are listed for every fifth day and at the end of the month (eom). The highest and lowest water levels of the water year and their dates of occurrence are shown on a line below the abbreviated table. Because all values are not published for wells with recorders, the extremes may be values that are not listed in the table. Missing records are indicated by dashes in place of the water level.

ACCESS TO WATSTORE DATA

The National Water Data Storage and Retrieval System (WATSTORE) was established for handling water data collected through the activities of the U.S. Geological Survey and to provide for more effective and efficient means of releasing the data to the public. The system is operated and maintained on the central computer facilities of the Survey at its National Center in Reston, Virginia.

WATSTORE can provide a variety of useful products ranging from simple data tables to complex statistical analyses. A minimal fee, plus the actual computer cost incurred in producing a desired product, is charged to the requester. Information about the availability of specific types of data, the acquisition of data or products, and user charges can be obtained locally from the Michigan District office.

General inquiries about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
437 National Center
Reston, Virginia 22092

DEFINITION OF TERMS

Terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined below. See also table for converting English units to International System (SI) Units on the inside of the back cover.

Acre-foot (AC-FT, acre-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Adenosine triphosphate (ATP) is an organic, phosphate-rich, compound important in the transfer of energy in organisms. Its central role in living cells makes it an excellent indicator of the presence of living material in water. A measure of ATP therefore provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter of the original water sample.

Algae are mostly aquatic single-celled, colonial, or multi-celled plants, containing chlorophyll and lacking roots, stems, and leaves.

Algal growth potential (AGP) is the maximum algal dry weight biomass that can be produced in a natural water sample under standardized laboratory conditions. The growth potential is the algal biomass present at stationary phase and is expressed as milligrams dry weight of algae produced per liter of sample.

Aquifer is a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian means confined and is used to describe a well in which the water level stands above the top of the aquifer tapped by the well. A flowing artesian well is one in which the water level is above the land surface.

Bacteria are microscopic unicellular organisms, typically spherical, rodlike, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, while others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

Total coliform bacteria are a particular group of bacteria that are used as indicators of possible sewage pollution. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°C. In the laboratory these bacteria are defined as all the organisms that produce colonies with a golden-green metallic sheen within 24 hours when incubated at 35°C plus or minus 1.0°C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal coliform bacteria are bacteria that are present in the intestine or feces of warm-blooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory they are defined as all organisms that produce blue colonies within 24 hours when incubated at 44.5°C plus or minus 0.2°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal streptococcal bacteria are bacteria found also in the intestine of warm-blooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as Gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at 35°C plus or minus 1.0°C on KF-streptococcus medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Bed material is the sediment mixture of which a streambed, lake, pond, reservoir, or estuary bottom is composed.

Biochemical oxygen demand (BOD) is a measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by micro-organisms, such as bacteria.

Biomass is the amount of living matter present at any given time, expressed as the mass per unit area or volume of habitat.

Ash mass is the mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature of 500°C for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter (g/m³), and periphyton and benthic organisms in grams per square meter (g/m²).

Dry mass refers to the mass of residue present after drying in an oven at 105°C for zooplankton and periphyton, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry-mass values are expressed in the same units as ash mass.

Organic mass or volatile mass of the living substance is the difference between the dry mass and ash mass and represents the actual mass of the living matter. The organic mass is expressed in the same units as for ash mass and dry mass.

Wet mass is the mass of living matter plus contained water.

Bottom material: See Bed material.

Cells/volume refers to the number of cells of any organism which is counted by using a microscope and grid or counting cell. Many planktonic organisms are multicelled and are counted according to the number of contained cells per sample, usually milliliters (mL) or liters (L).

Chemical oxygen demand (COD) is a measure of the chemically oxidizable material in the water and furnishes an approximation of the amount of organic and reducing material present. The determined value may correlate with natural water color or with carbonaceous organic pollution from sewage or industrial wastes.

Chlorophyll refers to the green pigments of plants. Chlorophyll a and b are the two most common green pigments in plants.

Color unit is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Color is expressed in units of the platinum-cobalt scale.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross section over a long reach of the channel.

Control structure as used in this report is a structure on a stream or canal that is used to regulate the flow or stage of the stream or to prevent the intrusion of salt water.

Cubic feet per second per square mile (CFSM) is 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.

Cubic foot per second (ft³/s) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meters per second.

Cubic foot per second-day [(ft³/s)/d] is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, about 646,000 gallons, or 2.445 cubic meters.

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

Mean discharge (MEAN) is the arithmetic mean of individual daily mean discharges during a specific period.

Instantaneous discharge is the discharge at a particular instant of time.

Dissolved refers to that material in a representative water sample which passes through a 0.45 μ m membrane filter. This is a convenient operational definition used by Federal agencies that collect water data. Determinations of "dissolved" constituents are made on subsamples of the filtrate.

Dissolved-solids concentration of water is determined either analytically by the "residue-on-evaporation" method, or mathematically by totaling the concentrations of individual constituents reported in a comprehensive chemical analysis. During the analytical determination of dissolved solids, the bicarbonate (generally a major dissolved component of water) is converted to carbonate. Therefore, in the mathematical calculation of dissolved-solids concentration, the bicarbonate value, in milligrams per liter, is multiplied by 0.492 to reflect the change.

Drainage area of a stream at a specified location is 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 stream above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise specified.

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Gage height (G.H.) is 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.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is computed as the sum of equivalents of polyvalent cations and is expressed as the equivalent concentration of calcium carbonate (CaCO_3).

Hydrologic Bench-Mark Network is a network of 57 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

Hydrologic unit is 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 on the State Hydrologic Unit Maps; each hydrologic unit is identified by an eight-digit number.

Land-surface datum (lsd) is a datum plane that is approximately at land surface at each ground-water observation well.

Measuring point (MP) is an arbitrary permanent reference point from which the distance to the water surface in a well is measured to obtain the water level.

Metamorphic stage refers to the stage of development that an organism exhibits during its transformation from an immature form to an adult form. This developmental process exists for most insects, and the degree of difference from the immature stage to the adult form varies from relatively slight to pronounced, with many intermediates. Examples of metamorphic stages of insects are egg-larva-adult or egg-nymph-adult.

Methylene blue active substances (MBAS) are apparent detergents. The determination depends on the formation of a blue color when methylene blue dye reacts with synthetic anionic detergent compounds.

Micrograms per gram ($\mu\text{g/g}$) is a unit expressing the concentration of a chemical constituent as the mass (micrograms) of the element per unit mass (gram) of material analyzed.

Micrograms per liter ($\mu\text{g/L}$, $\mu\text{g/L}$) is a unit expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Milligrams per liter (mg/L , mg/L) is a unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represents the mass of solute per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/L and is based on the mass of dry sediment per liter of water-sediment mixture.

National Geodetic Vertical Datum of 1929 (NGVD of 1929) is a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in this series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

National Stream Quality Accounting Network (NASGAN) is a nationwide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASGAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASGAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water-quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

Organism is any living entity.

Organism count/area refers to the number of organisms collected and enumerated in a sample and adjusted to the number per area habitat, usually square meter (m^2), acre, or hectare. Periphyton, benthic organisms, and macrophytes are expressed in these terms.

Organism count/volume refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually milliliter (mL) or liter (L). Numbers of planktonic organisms can be expressed in these terms.

Total organism count is the total number of organisms collected and enumerated in any particular sample.

Parameter Code is a 5-digit number used in the U.S. Geological Survey computerized data system, WATSTORE, to uniquely identify a specific constituent. The codes used in WATSTORE are the same as those used in the U.S. Environmental Protection Agency data system, STORET. The Environmental Protection Agency assigns and approves all requests for new codes.

Partial-record station is a particular site where limited streamflow and/or water-quality data are collected systematically over a period of years for use in hydrologic analyses.

Particle size is the diameter, in millimeters (mm), of a particle determined by either sieve or sedimentation methods. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube) determine fall diameter of particles in either distilled water (chemically dispersed) or in native water (the river water at the time and point of sampling).

Particle-size classification used in this report agrees with the recommendation made by the American Geophysical Union Subcommittee on Sediment Terminology. The classification is as follows:

<u>Classification</u>	<u>Size (mm)</u>	<u>Method of analysis</u>
Clay.....	0.00024 - 0.004	Sedimentation
Silt.....	.004 - .062	Sedimentation
Sand.....	.062 - 2.0	Sedimentation or sieve
Gravel.....	2.0 - 64.0	Sieve

The particle-size distributions given in this report are not necessarily representative of all particles in transport in the stream. Most of the organic matter is removed, and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water. Chemical dispersion is not used for native-water analysis.

Percent composition is a unit for expressing the ratio of a particular part of a sample or population to the total sample or population, in terms of types, numbers, mass, or volume.

Periphyton is the assemblage of microorganisms attached to and living upon submerged solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms.

Pesticides are chemical compounds used to control undesirable organisms. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides.

Picocurie (PC, pCi) is one trillionth (1×10^{-12}) of the amount of radioactivity represented by a curie (Ci). A curie is the amount of radioactivity that yields 3.7×10^{10} radioactive disintegrations per second. A picocurie yields 2.22 dpm (disintegrations per minute).

Plankton is the community of suspended, floating, or weakly swimming organisms that live in the open water of lakes and rivers.

Phytoplankton is the plant part of the plankton. They are usually microscopic and their movement is subject to the water currents. Phytoplankton growth is dependent upon solar radiation and nutrient substances. Because they are able to incorporate as well as release materials to the surrounding water, the phytoplankton have a profound effect upon the quality of the water. They are the primary food producers in the aquatic environment and are commonly known as algae.

Blue-green algae are a group of phytoplankton organisms having a blue pigment, in addition to the green pigment called chlorophyll. Blue-green algae often cause nuisance conditions in water.

Diatoms are the unicellular or colonial algae having a siliceous shell. Their concentrations are expressed as number of cells per milliliter (cells/mL) of sample.

Green algae have chlorophyll pigments similar in color to those of higher green plants. Some forms produce algae mats or floating "moss" in lakes. Their concentrations are expressed as number of cells per milliliter (cells/mL) of sample.

Zooplankton is the animal part of the plankton. Zooplankton are capable of extensive movements within the water column and are often large enough to be seen with the unaided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers.

Polychlorinated biphenyls (PCBs) are industrial chemicals that are mixtures of chlorinated biphenyl compounds having various percentages of chlorine. They are similar in structure to organochlorine insecticides.

Primary productivity is a measure of the rate at which new organic matter is formed and accumulated through photosynthetic and chemosynthetic activity of producer organisms (chiefly, green plants). The rate of primary production is estimated by measuring the amount of oxygen released (oxygen method) or the amount of carbon assimilated by the plants (carbon method).

Milligrams of carbon per area or volume per unit time [$\text{mg C}/(\text{m}^2 \text{ time})$] for periphyton and macrophytes and [$\text{mg C}/(\text{m}^3 \text{ time})$] for phytoplankton are units for expressing primary productivity. They define the amount of carbon dioxide consumed as measured by radioactive carbon (carbon 14). The carbon 14 method is of greater sensitivity than the oxygen light and dark bottle method and is preferred for use in unenriched waters. Unit time may be either the hour or day, depending on the incubation period.

Milligrams of oxygen per area or volume per unit time [$\text{mg O}_2/(\text{m}^2 \text{ time})$] for periphyton and macrophytes and [$\text{mg O}_2/(\text{m}^3 \text{ time})$] for phytoplankton are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved-oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

Recoverable from bottom material is the amount of a given constituent that is in solution after a representative sample of bottom material has been digested by a method (usually using an acid or mixture of acids) that results in dissolution of readily soluble substances. Complete dissolution of all bottom material is not achieved by the digestion treatment and thus the determination represents less than the total amount (that is, less than 95 percent) of the constituent in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Return period is the average time interval between occurrences of a hydrological event of a given or greater magnitude, usually expressed in years. May also be called recurrence interval.

Runoff in inches (IN., in.) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Bed load is the sediment that is transported in a stream by rolling, sliding, or skipping along the bed and very close to it. In this report, bed load is considered to consist of particles in transit within 0.25 ft of the streambed.

Bed load discharge (tons per day) is the quantity of bed load measured by dry weight that moves past a section as bed load in a given time.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 ft above the bed) expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L).

Mean concentration is the time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

Suspended-sediment discharge (tons/day) is the rate at which dry mass of sediment passes a section of a stream or is the quantity of sediment, as measured by dry mass or volume, that passes a section in a given time. It is calculated in units of tons per day as follows: concentration (mg/L) x discharge (ft³/s) x 0.0027.

Suspended-sediment load is a general term that refers to material in suspension. It is not synonymous with either discharge or concentration.

Total-sediment discharge (tons/day) is the sum of the suspended-sediment discharge and the bed-load discharge. It is the total quantity of sediment, as measured by dry mass or volume, that passes a section during a given time.

Total-sediment load or total load is a term which refers to the total sediment (bed load plus suspended-sediment load) that is in transport. It is not synonymous with total-sediment discharge.

7-day 10-year low flow (7 Q 10) is the discharge at the 10-year recurrence interval taken from a frequency curve of annual values of the lowest mean discharge for 7 consecutive days (the 7-day low flow).

Sodium-adsorption-ratio (SAR) is the expression of relative activity of sodium ions in exchange reactions within soil and is an index of sodium or alkali hazard to the soil. Waters range in respect to sodium hazard from those which can be used for irrigation on almost all soils to those which are generally unsatisfactory for irrigation.

Solute is any substance that is dissolved in water.

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in microsiemens per centimeter at 25°C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in microsiemens). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height (stage) and volume of water, per unit of time, flowing in a channel.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Substrate is the physical surface upon which an organism lives.

Natural substrate refers to any naturally occurring emerged or submersed solid surface, such as a rock or tree, upon which an organism lives.

Artificial substrate is a device which is purposely placed in a stream or lake for colonization of organisms. The artificial substrate simplifies the community structure by standardizing the substrate from which each sample is taken. Examples of artificial substrates are basket samplers (made of wire cages filled with clean streamside rocks) and multiplate samplers (made of hardboard) for benthic organism collection, and plexiglass strips for periphyton collection.

Surface area of a lake is that area outlined on the latest U.S.G.S. topographic map as the boundary of the lake and measured by a planimeter in acres. In localities not covered by topographic maps, the areas are computed from the best maps available at the time planimetered. All areas shown are those for the stage when the planimetered map was made.

Surficial bed material is the part (0.1 to 0.2 ft) of the bed material that is sampled using U.S. Series Bed-Material Samplers.

Suspended (as used in tables of chemical analyses) refers to the amount (concentration) of undissolved material in a water-sediment mixture. It is associated with the material retained on a 0.45-micrometer filter.

Suspended, recoverable is the amount of a given constituent that is in solution after the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all the particulate matter is not achieved by the digestion treatment and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the sample. To achieve comparability of analytical data, equivalent digestion procedures are required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Determinations of "suspended, recoverable" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total recoverable concentrations of the constituent.

Suspended, total is the total amount of a given constituent in the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to determine when the results should be reported as "suspended, total."

Determinations of "suspended, total" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total concentrations of the constituent.

Taxonomy is the division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchical scheme beginning with Kingdom and ending with Species at the base. The higher the classification level, the fewer features the organisms have in common. For example, the taxonomy of a particular mayfly, Hexagenia limbata, is the following:

Kingdom.....	Animal
Phylum.....	Arthropoda
Class.....	Insecta
Order.....	Ephemeroptera
Family.....	Ephemeridae
<u>Genus</u>	<u>Hexagenia</u>
<u>Species</u>	<u>Hexagenia limbata</u>

Thermograph is an instrument that continuously records variations of temperature on a chart. The more general term "temperature recorder" is used in the table headings and refers to any instrument that records temperature whether on a chart, a tape, or any other medium.

Time-weighted average is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the year.

Tons per acre-foot indicates the dry mass of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration of the constituent, in milligrams per liter, by 0.00136.

Tons per day (T/DAY) is the quantity of a substance in solution or suspension that passes a stream section during a 24-hour period.

Total is the total amount of a given constituent in a representative water-suspended sediment sample, regardless of the constituent's physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total." (Note that the word "total" does double duty here, indicating both that the sample consists of a water-suspended sediment mixture and that the analytical method determined all of the constituent in the sample.)

Total discharge is the total quantity of any individual constituent, as measured by dry mass or volume, that passes through a stream cross-section per unit of time. This term needs to be qualified, such as "total sediment discharge," "total chloride discharge," and so on.

Total, recoverable is the amount of a given constituent that is in solution after a representative water-suspended sediment sample has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all particulate matter is not achieved by the digestion treatment, and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the dissolved and suspended phases of the sample. To achieve comparability of analytical data, equivalent digestion procedures are required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Tritium Network is a network of stations which has been established to provide baseline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

Water year in Geological Survey reports dealing with surface-water supply is the 12-month period October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1985, is called the "1985 water year."

WDR is used as an abbreviation for "Water-Data Report" in the REVISED RECORDS paragraph to refer to State annual hydrologic-data reports (WRD was used as an abbreviation for "Water-Resources Data" in reports published prior to 1976).

Weighted average is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharges. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

WSP is used as an abbreviation for "Water-Supply Paper" in reference to previously published reports.

The U.S. Geological Survey publishes a series of manuals describing procedures for planning and conducting specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, Section A of Book 3 (Applications of Hydraulics) pertains to surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises.

The reports listed below are for sale by the U.S. Geological Survey, Branch of Distribution, 604 South Pickett St., Alexandria, VA 22304 (authorized agent of the Superintendent of Documents, Government Printing Office). Prepayment is required. Remittance should be sent by check or money order payable to the U.S. Geological Survey. Prices are not included because they are subject to change. Current prices can be obtained by writing to the above address. When ordering or inquiring about prices for any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations."

- 1-D1. *Water temperature--influential factors, field measurement, and data presentation*, by H. H. Stevens, Jr., J. F. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.
- 1-D2. *Guidelines for collection and field analysis of ground-water samples for selected unstable constituents*, by W. W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages.
- 2-D1. *Application of surface geophysics to ground-water investigations*, by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages.
- 2-E1. *Application of borehole geophysics to water-resources investigations*, by W. S. Keys and L. M. MacCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.
- 3-A1. *General field and office procedures for indirect discharge measurements*, by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages.
- 3-A2. *Measurement of peak discharge by the slope-area method*, by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages.
- 3-A3. *Measurement of peak discharge at culverts by indirect methods* by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages.
- 3-A4. *Measurement of peak discharge at width contractions by indirect methods*, by H. F. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 Pages.
- 3-A5. *Measurement of peak discharge at dams by indirect methods*, by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages.
- 3-A6. *General procedure for gaging streams*, by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages.
- 3-A7. *Stage measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A7. 1968. 28 pages.
- 3-A8. *Discharge measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A8. 1969. 65 pages.
- 3-A9. *Measurement of time of travel and dispersion in streams by dye tracing*, by E. F. Hubbard, F. A. Kilpatrick, L. A. Martens, and J. F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1982. 44 pages.
- 3-A10. *Discharge ratings at gaging stations*, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A10. 1984. 59 pages.
- 3-A11. *Measurement of discharge by moving-boat method*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.
- 3-A13. *Computation of continuous records of streamflow*, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A13. 1983. 53 pages.
- 3-A14. *Use of flumes in measuring discharge*, by F. A. Kilpatrick and V. R. Schneider: USGS--TWRI Book 3, Chapter A14. 1983. 46 pages.
- 3-A15. *Computation of water-surface profiles in open channels*, by Jacob Davidian: USGS--TWRI Book 3, Chapter A15. 1984. 48 pages.
- 3-B1. *Aquifer-test design, observation, and data analysis*, by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.
- 3-B2. *Introduction to ground-water hydraulics, a programed text for self-instruction*, by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages.
- 3-B3. *Type curves for selected problems of flow to wells in confined aquifers*, by J. E. Reed: USGS--TWRI Book 3, Chapter B3. 1980. 106 pages.

- 3-C1. *Fluvial sediment concepts* by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.
- 3-C2. *Field methods for measurement of fluvial sediment* by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.
- 3-C3. *Computation of fluvial-sediment discharge* by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.
- 4-A1. *Some statistical tools in hydrology*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.
- 4-A2. *Frequency curves* by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages.
- 4-B1. *Low-flow investigations*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages.
- 4-B2. *Storage analyses for water supply*, by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages.
- 4-B3. *Regional analyses of streamflow characteristics*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages.
- 4-D1. *Computation of rate and volume of stream depletion by wells* by C. T. Jenkins: USGS--TWRI Book 4, Chapter D1. 1970. 17 pages.
- 5-A1. *Methods for determination of inorganic substances in water and fluvial sediments* by M. W. Skougstad and others, editors: USGS--TWRI Book 5, Chapter A1. 1979. 626 pages.
- 5-A2. *Determination of minor elements in water by emission spectroscopy*, by P. R. Barnett and E. C. Mallory, Jr.: USGS--TWRI Book 5, Chapter A2. 1971. 31 pages.
- 5-A3. *Methods for analysis of organic substances in water*, by D. F. Goerlitz and Eugene Brown: USGS--TWRI Book 5, Chapter A3. 1972. 40 pages.
- 5-A4. *Methods for collection and analysis of aquatic biological and microbiological samples*, edited by P. E. Greenson, T. A. Ehlike, G. A. Irwin, B. W. Lium, and K. V. Slack: USGS--TWRI Book 5, Chapter A4. 1977. 332 pages.
- 5-A5. *Methods for determination of radioactive substances in water and fluvial sediments*, by L. L. Thatcher, V. J. Janzer, and K. W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages.
- 5-A6. *Quality assurance practices for the chemical and biological analyses of water and fluvial sediments*, by L. C. Friedman and D. E. Erdmann: USGS--TWRI Book 5, Chapter A6. 1982. 181 pages.
- 5-C1. *Laboratory theory and methods for sediment analysis*, by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.
- 7-C1. *Finite difference model for aquifer simulation in two dimensions with results of numerical experiments*, by P. C. Trescott, G. F. Pinder, and S. P. Larson: USGS--TWRI Book 7, Chapter C1. 1976. 116 pages.
- 7-C2. *Computer model of two-dimensional solute transport and dispersion in ground water*, by L. F. Konikow and J. D. Bredehoeft: USGS--TWRI Book 7, Chapter C2. 1978. 90 pages.
- 7-C3. *A model for simulation of flow in singular and interconnected channels*, by R. W. Schaffranek, R. A. Baltzer, and D. E. Goldberg: USGS--TWRI Book 7, Chapter C3. 1981. 110 pages.
- 8-A1. *Methods of measuring water levels in deep wells*, by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages.
- 8-A2. *Installation and service manual for U.S. Geological Survey manometers* by J. D. Craig: USGS--TWRI Book 8, Chapter A2. 1983. 57 pages.
- 8-B2. *Calibration and maintenance of vertical-axis type current meters*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 8, Chapter B2. 1968. 15 pages.

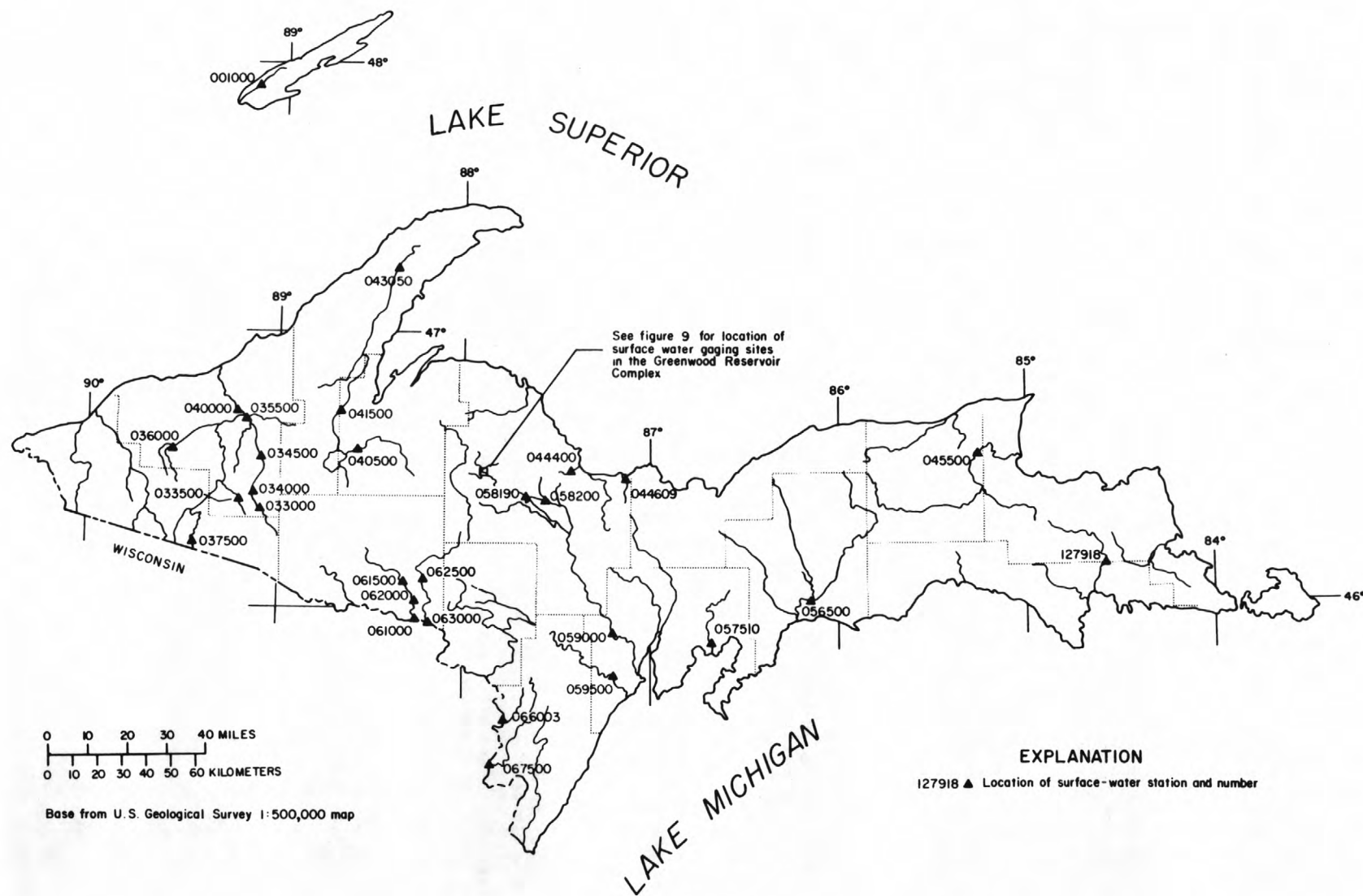


Figure 4.--Map showing identification number and location of active surface-water gaging stations in Upper Peninsula of Michigan. (Prefix 04 to all station numbers)

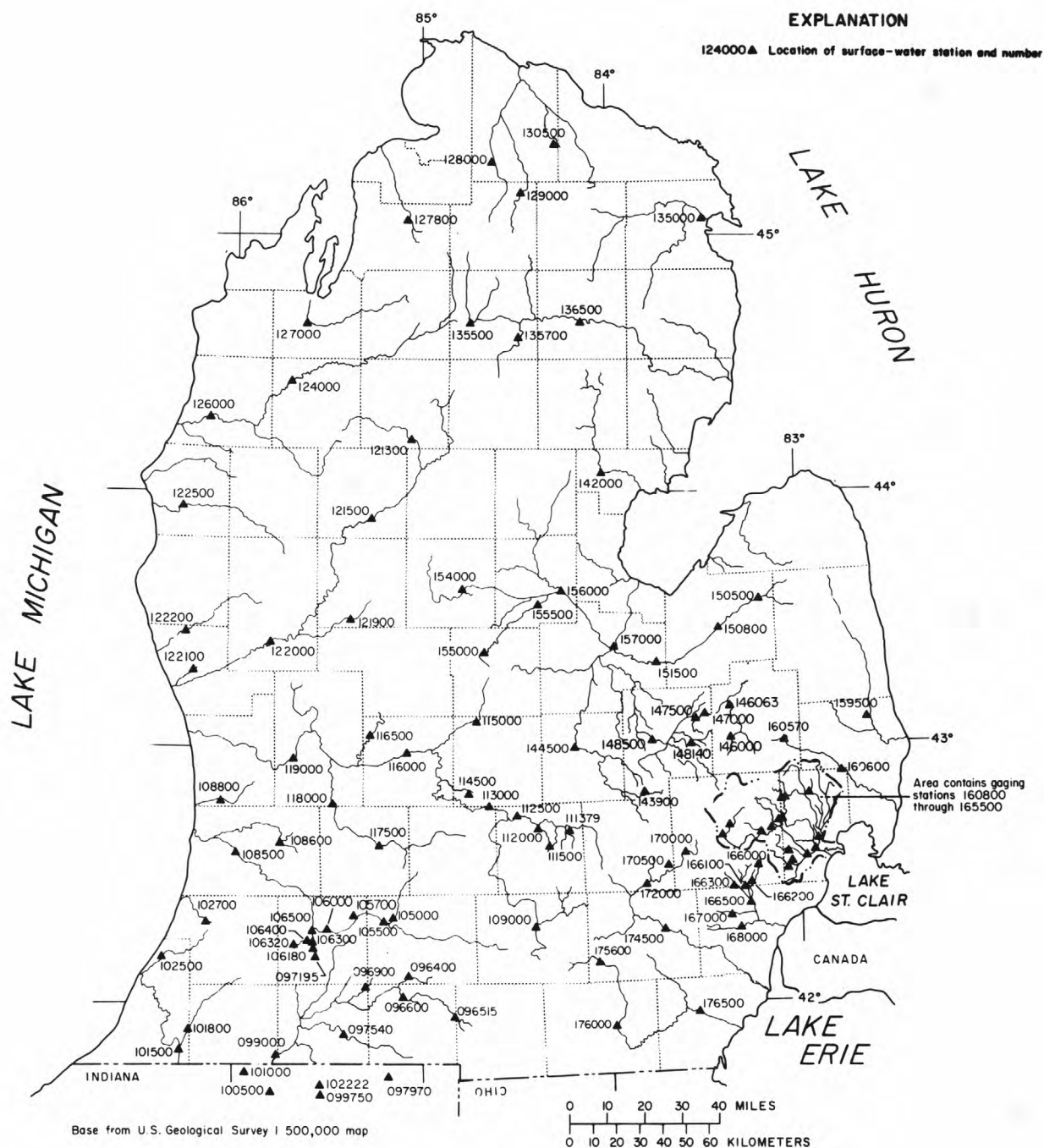


Figure 5.--Map showing identification number and location of active surface-water gaging stations in Lower Peninsula of Michigan. (Prefix 04 to all station numbers)

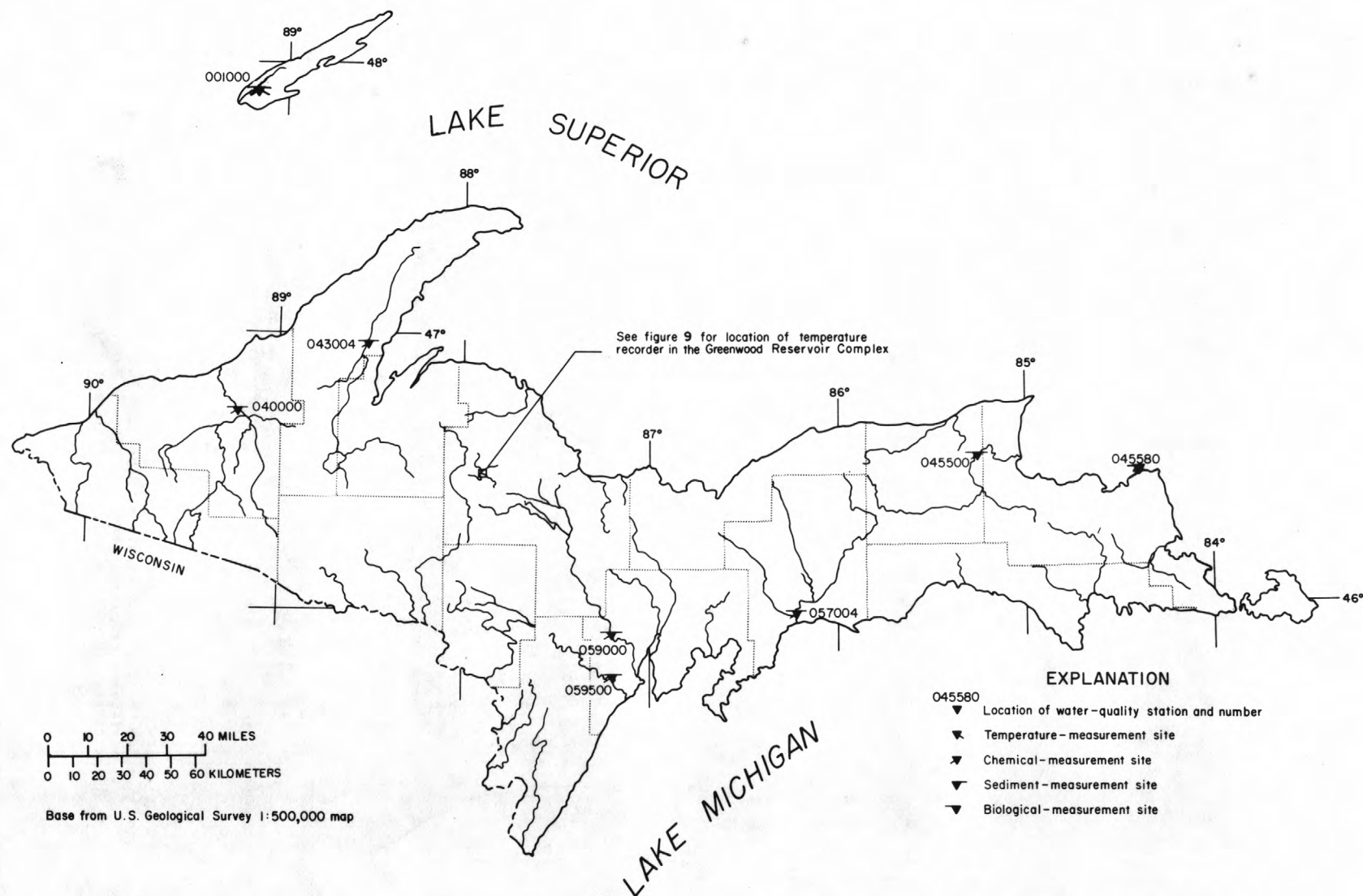


Figure 6.--Map showing identification number and location of active surface-water-quality stations in Upper Peninsula of Michigan. (Prefix 04 to all station numbers)

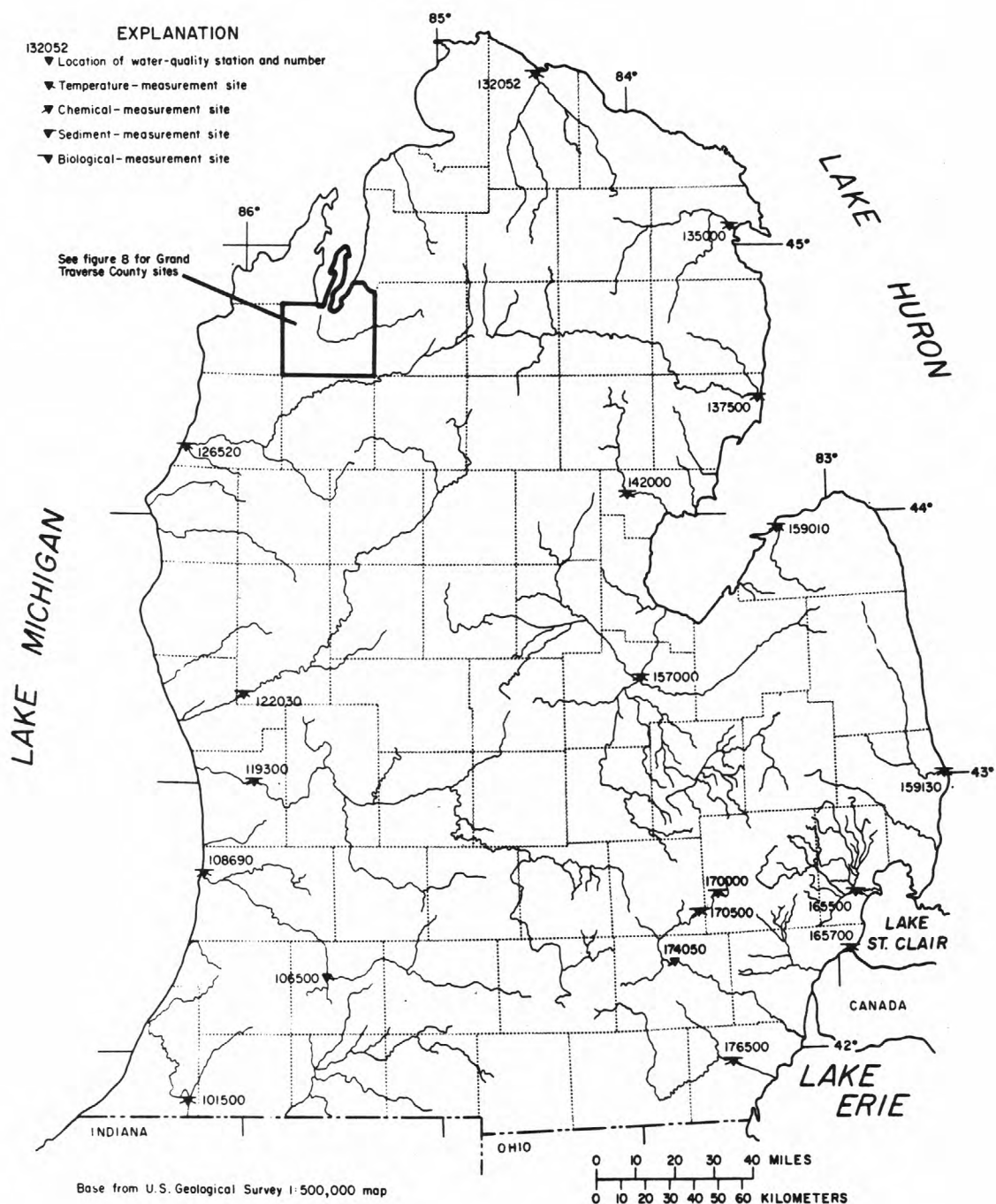


Figure 7.--Map showing identification number and location of active surface-water-quality stations in Lower Peninsula of Michigan. (Prefix 04 to all station numbers)

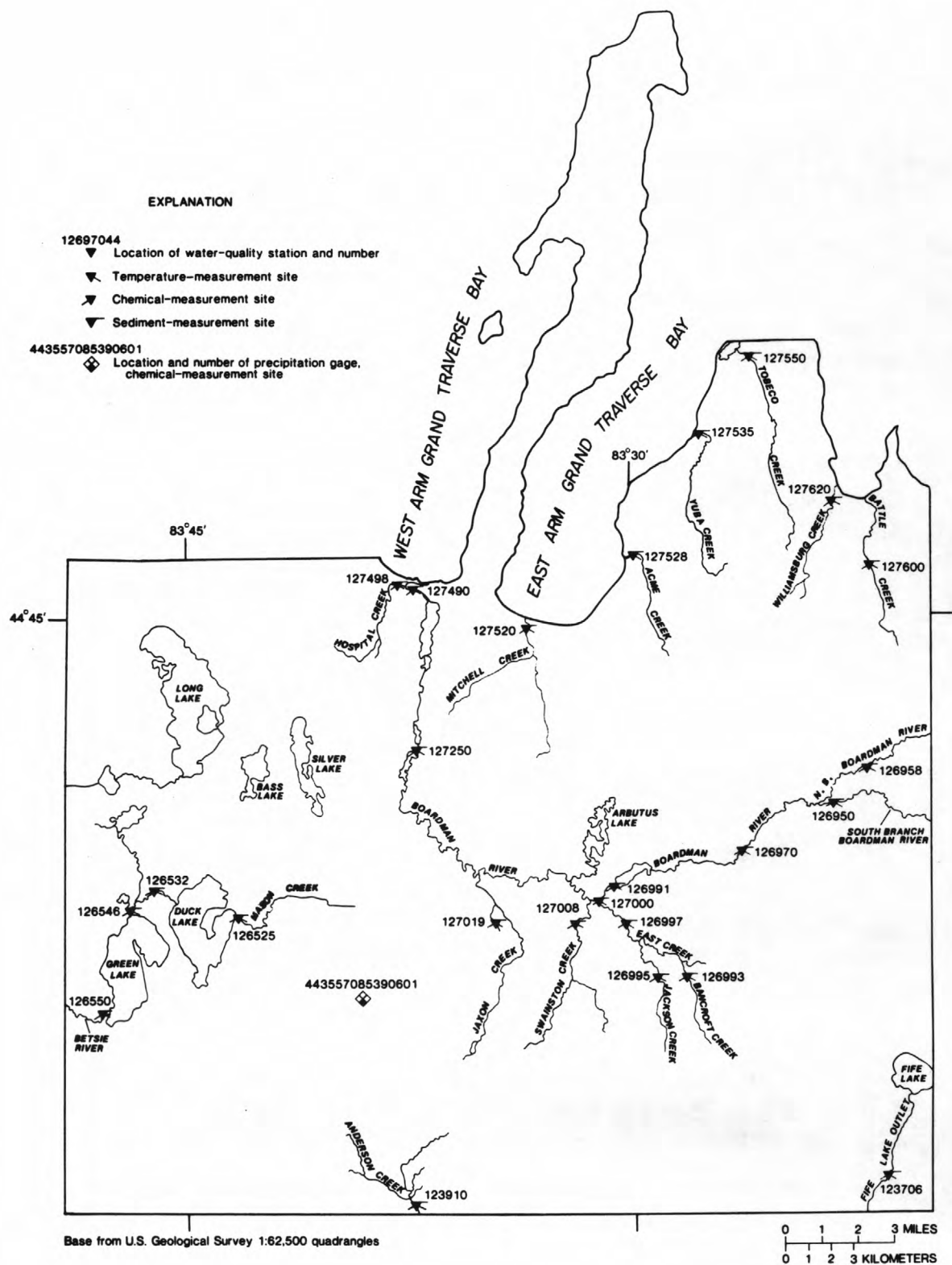


Figure 8.--Map showing identification number and location of active surface-water-quality stations in Grand Traverse County. (Prefix 04 to all station numbers)

LOCATION.--Lat 47°55'23", long 89°08'42", in NW1/4 sec.28, T.64 N., R.38 W., Keweenaw County, Isle Royale National Park, Hydrologic Unit 04020300, on left bank 0.8 mi northeast of Windigo, and 35 mi southwest of Rock Harbor.

WATER-DISCHARGE RECORDS

REMARKS.--Estimated daily discharges: Dec. 3-8, Mar. 5, and Apr. 7. Water-discharge records good except those greater than 80 ft³/s, which are fair. Recording rain gage at station and capacity rain gage located near mouth.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 480 ft³/s, May 1, 1972, gage height, 6.82 ft, from rating curve extended above 160 ft³/s based on runoff characteristics of nearby stations; maximum gage height, 6.88 ft, Jan. 13, 1975, backwater from ice; minimum daily discharge, 0.44 ft³/s, Aug. 25, 1977; minimum gage height, 2.55 ft, Aug. 29, 30, 31, Sept. 2, 3, 7, 9, 10, 11, 12, 1976.

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Mar. 28	1300	112	4.60	Apr. 22	2200	*368	*6.27

Minimum discharge, 1.7 ft³/s, Feb. 19, gage height, 2.80 ft.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.4	22	11	8.7	3.2	2.7	26	48	37	15	4.7	4.1
2	6.7	16	9.6	7.8	2.8	2.6	21	40	31	11	4.2	3.8
3	5.6	14	9.2	7.6	2.6	2.6	17	35	25	9.0	3.9	31
4	5.3	16	8.8	7.6	2.4	2.8	15	39	20	9.1	3.6	29
5	6.6	17	8.5	7.3	2.2	2.9	12	48	17	8.2	3.6	21
6	6.0	14	8.0	7.3	2.2	3.0	11	45	14	6.7	4.0	14
7	5.7	12	7.6	7.6	2.3	3.0	10	47	13	7.6	3.4	12
8	5.1	13	7.4	7.3	2.3	2.9	9.6	41	11	7.8	2.8	8.8
9	4.8	14	7.2	6.8	2.3	2.8	9.0	36	9.8	6.2	2.6	7.5
10	4.5	12	7.3	6.3	2.3	3.0	9.8	32	8.4	5.2	4.5	6.4
11	4.5	10	7.5	5.9	2.3	3.3	20	34	7.5	4.7	4.3	5.7
12	4.3	8.8	8.5	5.9	2.3	3.2	17	38	6.6	4.2	7.5	5.1
13	4.2	8.3	7.8	5.9	2.3	3.2	16	40	6.0	4.8	41	4.8
14	4.3	8.2	6.7	5.9	2.2	3.3	20	34	5.4	6.7	26	4.5
15	3.9	13	6.6	6.1	2.2	3.2	37	31	5.0	6.4	16	4.3
16	4.1	12	31	5.7	2.1	3.2	54	34	4.9	6.6	11	4.1
17	9.9	9.5	53	5.4	2.1	3.2	67	34	12	5.5	9.8	4.9
18	9.2	7.9	48	5.2	2.1	3.3	57	30	9.3	24	18	4.6
19	17	6.6	37	5.0	2.0	3.6	69	27	9.3	29	13	4.4
20	20	5.9	28	4.5	1.9	4.1	119	24	7.5	21	10	4.2
21	15	5.2	25	4.4	1.9	3.8	210	21	6.7	34	8.4	3.7
22	13	5.4	26	4.2	2.1	3.8	302	18	16	21	6.8	4.5
23	11	5.7	21	4.5	2.1	5.3	268	15	15	15	6.1	11
24	9.3	6.1	20	4.4	2.2	5.1	173	15	11	14	6.8	35
25	8.4	6.7	18	4.4	2.2	5.0	119	14	9.3	21	7.1	24
26	8.1	7.7	14	4.1	2.4	5.7	92	16	30	14	6.0	18
27	8.6	10	13	4.0	2.6	36	71	14	48	11	5.3	13
28	14	19	13	3.9	2.6	96	59	12	40	8.5	4.8	11
29	12	17	13	3.9	---	90	58	11	28	7.0	4.6	9.4
30	12	14	11	3.8	---	54	56	11	20	6.0	4.3	28
31	11	---	9.5	3.6	---	28	---	31	---	5.2	4.0	---
TOTAL	261.5	337.0	502.2	175.0	64.2	394.6	2024.4	915	483.7	355.4	258.1	341.8
MEAN	8.44	11.2	16.2	5.65	2.29	12.7	67.5	29.5	16.1	11.5	8.33	11.4
MAX	20	22	53	8.7	3.2	96	302	48	48	34	41	35
MIN	3.9	5.2	6.6	3.6	1.9	2.6	9.0	11	4.9	4.2	2.6	3.7
CFSM	.64	.85	1.23	.43	.17	.96	5.11	2.24	1.22	.87	.63	.86
IN.	.74	.95	1.42	.49	.18	1.11	5.70	2.58	1.36	1.00	.73	.96

CAL YR 1984	TOTAL	5897.4	MEAN	16.1	MAX	103	MIN	2.1	CFSM	1.22	IN	16.62
WTR YR 1985	TOTAL	6112.9	MEAN	16.7	MAX	302	MIN	1.9	CFSM	1.27	IN	17.23

STREAMS TRIBUTARY TO LAKE SUPERIOR

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1964 to current year.

INSTRUMENTATION.--Water-temperature recorder since Oct. 20, 1964. Digital recorder set for one-hour-interval punches.

REMARKS.--In addition to the daily-temperature record, quarterly samples were collected during the year. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from the samples were not published.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 22.5°C, July 29, Aug. 6, 1983; minimum, 0.0°C on many days during winter.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 20.5°C, Aug. 6, 7; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT 29...	1530	12	102	7.6	3.5	1.4	12.3	95	28	120
FEB 12...	1500	2.2	169	7.6	.0	1.0	13.5	94	K2	K1
MAY 06...	1830	47	65	7.7	5.5	2.1	12.0	99	K8	K2
JUL 10...	1830	5.1	118	8.0	15.0	1.0	9.0	92	--	53

DATE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 29...	50	1	13	4.3	2.6	10	.2	.40	2.4	9.7
FEB 12...	79	6	21	6.4	4.2	10	.2	.50	3.5	6.3
MAY 06...	33	4	8.8	2.6	1.5	9	.1	.40	1.1	5.4
JUL 10...	59	0	16	4.7	2.6	9	.2	.40	1.2	4.5

STREAMS TRIBUTARY TO LAKE SUPERIOR

29

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 29...	1530	2.8	<.10	11	54	74	.07	1.7	<.10
FEB 12...	1500	5.0	.10	15	113	100	.15	.67	.16
MAY 06...	1830	1.4	<.10	8.6	54	46	.07	6.9	<.10
JUL 10...	1830	2.5	.10	9.5	97	77	.13	1.3	.11

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 29...	.040	.30	<.010	<.010	<.010	4	.13	75
FEB 12...	.170	.40	.020	<.010	--	2	.01	100
MAY 06...	.030	1.0	<.010	<.010	<.010	9	1.1	88
JUL 10...	.370	.80	<.010	<.010	--	4	.06	66

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC, DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM, DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 29...	40	<1	12	<.0	<1	2	<3	3	250	1
MAY 06...	50	<1	9	.6	<1	<1	<3	3	140	4

DATE	LITHIUM, DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY, DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 29...	<4	10	<.1	<10	1	<1	<1	27	<6	9
MAY 06...	<4	4	<.1	<10	<1	<1	<1	17	<6	8

DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L)	URANIUM DIS- SOLVED, EXTRAC- TION (UG/L)
OCT 29...	1530	<1.4	<.4	1.2	<.4	1.1	<.4	.05	.01

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	11.0	7.0	9.0	17.0	13.5	15.5	18.0	13.5	15.5	15.0	13.0	13.5
2	12.0	8.5	10.0	18.0	13.5	16.0	18.0	13.0	15.5	13.0	10.0	11.5
3	13.0	8.5	10.5	17.5	14.0	16.0	17.5	15.0	16.5	13.0	11.5	12.5
4	12.0	9.0	10.5	18.0	15.5	16.5	19.5	15.0	17.0	14.0	13.0	13.5
5	13.5	8.5	11.0	18.0	15.0	16.5	18.5	17.0	17.5	15.0	13.0	14.0
6	14.5	9.0	11.5	18.0	14.5	16.0	20.5	16.5	18.5	16.5	14.0	15.0
7	16.0	11.5	13.5	16.5	13.5	15.0	20.5	16.5	18.5	15.0	13.5	14.5
8	14.5	12.0	13.5	18.0	13.5	15.5	19.5	15.0	17.5	14.5	13.5	14.0
9	13.0	12.0	12.5	17.5	14.5	16.0	18.0	17.0	17.5	13.5	12.0	13.0
10	14.5	10.0	12.0	15.5	13.0	14.0	17.5	16.0	17.0	13.0	11.5	12.0
11	13.0	9.5	11.5	15.0	11.5	13.5	16.5	13.0	14.5	11.5	9.0	10.5
12	14.0	9.5	12.0	16.5	12.5	14.0	15.0	13.5	14.0	10.5	8.0	9.5
13	13.5	9.5	11.5	16.0	12.5	14.5	16.5	13.5	15.0	10.5	7.5	9.0
14	15.5	9.5	12.0	16.5	13.5	15.0	15.5	14.5	15.0	10.5	7.5	9.0
15	16.5	11.0	13.5	16.0	13.5	14.5	15.0	12.5	14.0	11.5	8.0	10.0
16	15.0	11.5	13.5	16.0	12.0	14.0	15.5	12.5	14.0	13.0	10.0	11.5
17	14.0	11.0	12.5	16.5	12.5	14.5	15.0	14.0	14.5	15.0	12.5	13.5
18	13.0	10.5	11.5	15.0	14.5	15.0	14.5	13.5	13.5	16.5	14.0	15.0
19	15.0	10.5	12.5	17.5	14.5	16.0	13.5	13.0	13.0	17.5	15.0	16.0
20	15.5	10.5	13.0	18.0	14.5	16.5	13.5	13.0	13.0	17.0	13.5	15.5
21	14.0	13.0	13.5	17.5	15.5	16.5	13.5	11.5	12.5	13.0	10.5	11.5
22	13.5	12.0	13.0	16.5	13.5	15.0	13.0	10.5	12.0	12.5	10.5	11.5
23	13.0	11.0	12.0	16.0	14.0	15.0	13.0	12.5	12.5	11.5	11.0	11.5
24	14.5	9.5	12.0	16.0	14.5	15.0	13.5	12.5	13.0	11.0	9.5	10.0
25	13.0	12.0	12.5	16.5	13.5	15.0	14.5	11.5	13.0	9.5	8.5	9.0
26	13.0	11.5	12.0	16.5	13.5	15.0	14.5	11.5	13.0	8.5	7.0	7.5
27	15.0	11.5	13.0	17.0	13.5	15.0	15.5	12.5	14.0	8.5	6.0	7.0
28	17.5	14.5	16.0	18.5	14.5	16.5	14.5	11.5	13.0	9.5	8.0	8.5
29	16.5	14.0	15.0	18.0	15.0	16.0	14.0	13.0	13.0	8.5	8.0	8.5
30	16.5	13.0	14.5	16.5	13.5	15.0	13.5	10.0	12.0	8.0	6.5	7.5
31	---	---	---	18.0	13.5	15.5	13.5	10.5	12.0	---	---	---
MONTH	17.5	7.0	12.5	18.5	11.5	15.5	20.5	10.0	14.5	17.5	6.0	11.5

STREAMS TRIBUTARY TO LAKE SUPERIOR

04033000 MIDDLE BRANCH ONTONAGON RIVER NEAR PAULDING, MI

LOCATION.--Lat 46°21'25", long 89°04'38", in SE1/4 NE1/4 sec.29, T.46 N., R.38 W., Ontonagon County, Hydrologic Unit 04020102, Ottawa National Forest, on right bank 25 ft downstream from bridge on Forest Service Road 172, 2.4 mi upstream from Bond Falls Reservoir, and 5.7 mi southeast of Paulding.

DRAINAGE AREA.--164 mi².

PERIOD OF RECORD.--June 1942 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,485.66 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Sept. 28, 1942, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 17-26, Dec. 3-15, and Dec. 19 to Mar. 25. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 175 ft³/s, 14.49 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,050 ft³/s, Apr. 30, 1951, gage height, 10.0 ft, from high-water mark; minimum, 27 ft³/s, Nov. 22, 1946, result of freezeup; minimum gage height, 2.96 ft, Nov. 26, 1942, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,400 ft³/s, Apr. 21, gage height, 9.16 ft; minimum daily, 98 ft³/s, Feb. 6-9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	134	193	144	150	105	130	162	357	330	139	117	134
2	130	188	131	145	105	135	278	321	290	139	116	131
3	126	210	125	140	100	135	290	299	256	138	114	249
4	120	178	120	135	100	125	245	281	222	134	114	469
5	120	174	120	135	100	120	228	262	200	202	117	388
6	118	167	115	130	98	125	215	252	186	208	123	300
7	117	162	115	130	98	130	206	252	182	187	126	243
8	127	161	115	130	98	130	198	234	183	171	123	247
9	127	159	115	130	98	135	196	215	334	156	127	234
10	125	155	115	130	100	135	192	220	331	149	186	213
11	128	150	120	125	100	140	218	316	266	143	192	194
12	127	145	130	125	105	140	239	285	224	135	161	178
13	127	147	140	125	110	135	325	261	199	130	172	167
14	127	143	160	125	110	135	435	232	185	128	164	160
15	127	147	200	125	110	130	534	216	176	127	146	158
16	139	145	233	125	110	130	637	222	179	125	138	159
17	175	140	278	125	110	130	666	223	187	121	135	154
18	192	135	206	125	110	125	642	209	188	135	143	148
19	178	123	185	125	110	125	703	194	186	163	142	143
20	174	120	165	125	110	125	1080	181	171	148	137	143
21	162	115	160	120	115	130	1370	171	160	140	133	140
22	155	110	155	120	115	130	1290	163	184	132	131	145
23	150	110	150	120	120	135	1060	156	207	128	163	183
24	145	110	150	115	125	140	938	150	180	127	205	373
25	142	110	150	115	130	150	837	148	163	148	189	347
26	147	120	150	115	130	166	745	201	155	147	168	290
27	153	140	150	115	125	229	637	215	160	132	153	243
28	190	165	155	110	125	287	541	187	163	126	146	217
29	186	162	160	110	---	269	466	172	131	123	144	235
30	172	152	165	110	---	237	403	253	145	118	143	403
31	176	---	160	110	---	213	---	319	---	117	138	---
TOTAL	4516	4438	4734	3865	3072	4701	15976	7167	6143	4436	4508	6788
MEAN	146	148	153	125	110	152	533	231	205	143	145	226
MAX	192	210	275	150	130	287	1370	357	334	208	205	469
MIN	117	110	115	110	98	120	162	148	145	117	114	131
CFSM	.89	.90	.93	.76	.67	.93	3.25	1.41	1.25	.87	.88	1.38
IN.	1.02	1.01	1.07	.88	.70	1.07	3.62	1.63	1.39	1.01	1.02	1.54

CAL YR 1984 TOTAL 63181 MEAN 173 MAX 712 MIN 80 CFSM 1.06 IN 14.33
WTR YR 1985 TOTAL 70344 MEAN 193 MAX 1370 MIN 98 CFSM 1.18 IN 15.96

STREAMS TRIBUTARY TO LAKE SUPERIOR

33

04033500 BOND FALLS CANAL NEAR PAULDING, MI

LOCATION.--Lat 46°23'57", long 89°08'47", in SW1/4 NE1/4 sec.11, T.46 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 40 ft upstream from intake to pipeline No. 2, 0.8 mi downstream from Bond Falls Reservoir on Middle Branch Ontonagon River, and 1.6 mi east of Paulding.

PERIOD OF RECORD.--July 1942 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,441.59 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, nonrecording gage at datum 3.00 ft higher.

REMARKS.--Estimated daily discharges: Feb. 2-6. Records excellent except those below 10 ft³/s, which are poor. Canal diverts water from Bond Falls Reservoir (station 04034000) to South Branch Ontonagon River; water is used for power production at Victoria Dam near Rockland. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 143 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 368 ft³/s, May 5, 1960; no flow at times during water years 1962-84; minimum gage height observed, -0.03 ft, Apr. 17, 1963, present datum (two drain holes in weir open and canal gate closed).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	159	107	106	111	182	202	4.3	4.8	11	9.6	299	291
2	195	107	106	111	180	201	4.0	57	11	9.5	299	289
3	255	107	106	110	180	201	3.7	178	11	53	298	162
4	254	107	106	110	180	201	2.9	179	69	138	297	8.5
5	254	146	106	110	180	198	.30	180	146	81	211	7.6
6	275	192	122	109	180	198	.10	206	186	10	93	7.6
7	302	203	144	109	182	195	.10	277	188	9.9	158	7.6
8	301	203	144	127	212	194	.10	327	189	10	306	7.6
9	299	202	144	166	212	190	.10	318	189	46	307	7.6
10	298	202	144	198	212	188	.10	318	158	88	305	7.6
11	297	201	144	198	212	183	.40	318	119	94	304	53
12	297	224	144	198	212	106	.50	316	110	95	303	148
13	296	246	144	198	214	4.9	1.5	214	152	94	302	207
14	294	246	144	198	215	110	.80	121	186	95	301	263
15	297	244	144	196	212	225	.80	156	186	94	303	321
16	300	243	91	196	212	225	.60	251	186	95	300	319
17	299	242	7.4	196	210	223	.60	310	186	95	300	318
18	298	240	6.8	196	207	238	.70	270	186	96	298	316
19	210	206	55	195	207	272	1.2	200	156	175	298	314
20	122	120	120	182	225	277	1.1	200	120	295	198	310
21	114	106	110	182	233	272	.80	260	151	319	50	300
22	113	106	109	183	207	271	.80	318	137	262	8.5	307
23	152	106	109	183	207	272	1.0	318	103	106	159	264
24	189	106	109	182	206	269	1.4	316	103	106	300	113
25	189	106	110	180	206	257	2.3	316	48	180	300	14
26	234	106	110	180	204	160	2.4	314	10	303	298	14
27	286	106	110	180	204	4.4	2.4	314	9.7	303	298	14
28	283	106	75	180	204	4.8	3.5	312	9.5	302	296	14
29	219	106	16	183	---	4.9	4.0	310	9.5	142	294	14
30	120	106	13	180	---	4.6	4.4	310	9.5	50	294	14
31	107	---	58	177	---	4.5	---	160	---	196	292	---
TOTAL	7308	4848	3157.2	5204	5697	5356.1	46.90	7648.8	3335.2	3952.0	8069.5	4433.1
MEAN	236	162	102	168	203	173	1.56	247	111	127	260	148
MAX	302	246	144	198	233	277	4.4	327	189	319	307	321
MIN	107	106	6.8	109	180	4.4	.10	4.8	9.5	9.5	8.5	7.6
CAL YR 1984	TOTAL	63651.80	MEAN	174	MAX	345	MIN	.70				
WTR YR 1985	TOTAL	59055.80	MEAN	162	MAX	327	MIN	.10				

STREAMS TRIBUTARY TO LAKE SUPERIOR

04034000 BOND FALLS RESERVOIR NEAR PAULDING, MI

LOCATION.--Lat 46°24'29", long 89°07'42", in SW1/4 sec.1, T.46 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, at Bond Falls Dam on Middle Branch Ontonagon River, 2.5 mi east of Paulding.

DRAINAGE AREA.--190 mi².

PERIOD OF RECORD.--June 1942 to current year. Prior to October 1950, monthend contents only published in WSP 1307.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1,335.59 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Reservoir is formed by earthfill and concrete dam with one taintor gate; dam completed 1937. Usable capacity, 41,300 acre-ft between gage heights of 120 ft (maximum drawdown) and 141 ft (full pond). Dead storage unknown. Water diverted to South Branch Ontonagon River through Bond Falls Canal (station 04033500); water used for power production at Victoria Dam near Rockland.

COOPERATION.--Gage-height record provided by Upper Peninsula Power Co. and converted to acre-feet by Geological Survey.

EXTREMES FOR PERIOD OF RECORD (SINCE 1947).--Maximum contents observed, 42,980 acre-ft, July 3, 1953, gage height, 141.7 ft, of which 1,680 acre-ft was uncontrolled storage; no usable storage at times; minimum gage height observed, 116.0 ft, Mar. 21, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 38,440 acre-ft, May 5, gage height, 139.8 ft; minimum, 900 acre-ft, Mar. 26, gage height, 120.6 ft.

MONTHEND GAGE HEIGHT AND CONTENTS AT 1200, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre- feet)	(equivalent in ft ³ /s)
Sept. 30	132.7	22900	--	--
Oct. 31	129.0	15700	-7200	-117
Nov. 30	128.0	13800	-1900	-31.9
Dec. 31	128.9	15510	+1710	+27.8
CAL YR 1984	--	--	-14510	-20.0
Jan. 31	126.6	11140	-4370	-71.1
Feb. 28	123.4	5340	-5800	-104
Mar. 31	122.3	3470	-1870	-30.4
Apr. 30	138.8	36140	+32670	+549
May 31	137.2	32460	-3680	-59.8
June 30	138.2	34760	+2300	+38.7
July 31	137.0	32000	-2760	-44.9
Aug. 31	132.4	22300	-9700	-158
Sept. 30	134.0	25500	+3200	+53.8
WTR YR 1985	--	--	+2600	+3.6

STREAMS TRIBUTARY TO LAKE SUPERIOR

35

04034500 MIDDLE BRANCH ONTONAGON RIVER NEAR TROUT CREEK, MI

LOCATION.--Lat 46°28'40", long 89°05'25", in SW1/4 sec.8, T.47 N., R.38 W., Ontonagon County, Hydrologic Unit 04020102, on right bank 0.1 mi upstream from State Highway 28, 3.8 mi west of village of Trout Creek, and 7.5 mi downstream from Bond Falls Reservoir.

DRAINAGE AREA.--203 mi².

PERIOD OF RECORD.--June 1942 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,132.03 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 4, 1942, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 22-26, Jan. 2, 3, 19-21, Jan. 29 to Feb. 9, Feb. 15, 19, Mar. 6, 27-30, and Apr. 1-8. Records good. Flow regulated by Bond Falls Reservoir (station 04034000) 7.5 mi upstream. Diversion to South Branch Ontonagon River 8.5 mi upstream by Bond Falls Canal (station 04033500). Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 66.4 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,750 ft³/s, Nov. 7, 1951, gage height, 5.05 ft; minimum, 14 ft³/s, sometime during period Jan. 23 to Feb. 13, 1947, gage height, 1.14 ft, from recorded range in stage, caused by ice jams upstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 153 ft³/s, Apr. 19, gage height, 2.17 ft; minimum daily, 39 ft³/s, Mar. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	49	53	46	52	46	47	52	51	58	59	55	51
2	49	48	45	51	46	45	52	51	63	60	55	52
3	48	48	47	51	46	44	52	51	60	58	55	92
4	48	49	42	50	46	39	52	51	60	74	53	61
5	48	49	44	50	46	46	52	51	60	78	53	48
6	48	48	45	50	46	46	52	52	58	67	54	46
7	49	48	47	50	46	46	52	52	61	61	55	45
8	50	48	48	49	46	45	52	50	60	60	53	46
9	50	48	48	49	46	45	52	48	68	60	56	45
10	49	48	47	50	45	45	55	53	61	58	60	45
11	48	47	47	49	45	44	61	57	59	58	53	45
12	49	47	48	48	45	44	64	53	58	58	54	44
13	48	46	44	48	45	44	101	50	58	58	55	44
14	48	47	49	47	45	44	91	49	58	58	53	44
15	48	47	52	50	45	44	92	49	58	58	52	44
16	48	46	62	49	45	44	92	50	58	58	52	44
17	54	46	58	48	45	43	75	51	60	58	53	44
18	50	46	48	48	46	44	75	50	60	63	53	44
19	50	46	50	48	45	44	138	48	59	60	52	44
20	48	45	53	48	45	44	105	48	58	58	51	43
21	48	43	51	48	46	44	79	47	59	57	52	43
22	49	49	52	48	46	46	69	46	62	57	52	44
23	48	47	52	47	45	50	69	46	59	57	63	63
24	48	46	52	46	45	51	74	46	59	59	58	68
25	49	46	52	46	45	51	68	48	58	58	54	48
26	50	46	52	46	45	54	59	51	61	57	53	46
27	50	48	53	46	44	58	55	48	64	57	52	45
28	50	48	53	46	45	56	54	46	59	55	51	45
29	48	46	52	46	---	54	53	47	58	55	53	53
30	50	46	49	46	---	52	52	58	58	55	52	95
31	49	---	51	46	---	51	---	57	---	55	51	---
TOTAL	1518	1415	1539	1496	1271	1454	2049	1555	1792	1844	1668	1521
MEAN	49.0	47.2	49.6	48.3	45.4	46.9	68.3	50.2	59.7	59.5	53.8	50.7
MAX	54	53	62	52	46	58	138	58	68	78	63	95
MIN	48	43	42	46	44	39	52	46	58	55	51	43
CAL YR 1984	TOTAL	19370	MEAN 52.9	MAX 99	MIN 41							
WTR YR 1985	TOTAL	19122	MEAN 52.4	MAX 138	MIN 39							

STREAMS TRIBUTARY TO LAKE SUPERIOR

37

04036000 WEST BRANCH ONTONAGON RIVER NEAR BERGLAND, MI

LOCATION.--Lat 46°35'15", long 89°32'30", in SW1/4 NE1/4 sec.3, T.48 N., R.42 W., Ontonagon County, Hydrologic Unit 04020102, on right bank 0.4 mi downstream from dam at outlet of Gogebic Lake, and 1.5 mi east of Bergland.

DRAINAGE AREA.--162 mi².

PERIOD OF RECORD.--July 1942 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,290.81 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 5, 1942, nonrecording gage 0.4 mi upstream at different datum.

REMARKS.--No estimated daily discharges. Records excellent. Flow regulated by Gogebic Lake, usable capacity, 35,200 acre-ft. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 176 ft³/s, 14.75 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,400 ft³/s, Apr. 26, 1960, gage height, 5.98 ft; minimum daily, 0.70 ft³/s, Sept. 26 to Oct. 19, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1000 ft³/s, Apr. 22, gage height, 5.05 ft; minimum daily, 10 ft³/s, Aug. 31 to Sept. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	202	205	100	138	144	160	231	377	246	329	25	10
2	209	183	101	162	140	156	235	369	261	351	25	10
3	191	182	109	180	138	150	244	298	250	358	24	80
4	187	165	112	189	134	160	245	241	247	362	23	230
5	207	159	108	185	130	168	250	220	239	393	23	317
6	219	156	109	179	187	158	253	166	233	415	23	422
7	211	157	109	179	222	156	254	82	233	421	22	438
8	208	152	106	178	216	158	255	46	221	412	22	421
9	206	137	105	172	212	155	256	48	264	395	22	306
10	205	125	103	167	213	152	257	47	241	377	23	164
11	203	132	102	167	210	148	258	255	234	352	22	102
12	202	135	101	165	205	149	269	574	218	337	23	98
13	202	136	99	157	203	148	322	513	212	327	23	42
14	209	138	100	157	201	144	383	206	209	304	21	14
15	213	147	101	156	193	141	442	148	199	287	20	13
16	208	126	110	177	190	141	514	142	199	148	19	13
17	225	108	55	190	188	139	576	148	198	79	19	13
18	199	112	15	183	181	139	626	144	179	84	19	13
19	214	108	49	180	179	138	712	144	215	81	19	13
20	210	108	104	180	178	134	829	117	231	80	19	96
21	187	105	124	177	178	133	905	94	229	77	19	99
22	186	105	134	173	177	134	940	39	251	43	19	83
23	235	104	132	169	171	131	953	28	229	26	15	148
24	268	103	132	168	170	131	956	28	209	26	12	397
25	251	100	131	167	168	137	940	27	203	26	12	458
26	216	98	138	164	167	140	900	28	209	25	12	436
27	205	101	146	160	163	152	877	28	269	25	11	432
28	210	115	145	157	166	167	854	99	353	25	11	411
29	194	102	145	154	---	188	835	152	346	25	11	397
30	185	96	143	150	---	197	570	159	339	25	11	457
31	186	---	140	148	---	210	---	167	---	25	10	---
TOTAL	6453	3900	3408	5228	5024	4714	16141	5134	7166	6240	579	6133
MEAN	208	130	110	169	179	152	538	166	239	201	18.7	204
MAX	268	203	146	190	222	210	956	574	353	421	25	458
MIN	185	96	15	138	130	131	231	27	179	25	10	10

CAL YR 1984 TOTAL 56100 MEAN 153 MAX 891 MIN 15 CFSM .94 IN 12.88
WTR YR 1985 TOTAL 70120 MEAN 192 MAX 956 MIN 10 CFSM 1.19 IN 16.10

STREAMS TRIBUTARY TO LAKE SUPERIOR

04037500 CISCO BRANCH ONTONAGON RIVER AT CISCO LAKE OUTLET, MI

LOCATION.--Lat 46°15'12", long 89°27'05", in NE1/4 sec.32, T.45 N., R.41 W., Gogebic County, Hydrologic Unit 04020102, on left bank 80 ft downstream from Cisco Lake Dam, 2.5 mi upstream from Langford Creek, 5.0 mi upstream from U.S. Highway 2, and 13 mi west of Watersmeet.

DRAINAGE AREA.--50.7 mi².

PERIOD OF RECORD.--October 1944 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,672.69 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, nonrecording gage at same site and at datum 4.00 ft higher.

REMARKS.--Estimated daily discharges: Jan. 1-7. Records good except those below 1.5 ft³/s, which are poor. Flow completely regulated by Cisco Lake, usable capacity, 15,600 acre-ft. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--41 years, 47.7 ft³/s, 12.78 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 288 ft³/s, May 1-4, 1951, gage height, 6.10 ft, present datum; minimum daily, 0.09 ft³/s, June 4-23, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 190 ft³/s Sept. 3, gage height, 5.60 ft; minimum daily, 0.37 ft³/s, Aug. 3-5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	.83	83	1.2	34	53	127	146	141	34	.85	29
2	.70	.59	82	1.2	34	52	126	140	134	2.0	.57	30
3	.48	.55	83	1.2	34	51	124	130	112	1.7	.37	129
4	30	.47	82	1.2	33	54	122	112	95	1.5	.37	186
5	68	.45	81	1.2	33	55	119	109	61	1.8	.37	181
6	67	.49	66	1.2	33	54	116	131	2.3	1.9	.43	176
7	65	15	36	18	33	53	114	73	1.1	2.3	.59	136
8	64	47	26	34	33	53	112	2.6	1.3	2.0	.55	73
9	64	63	5.3	35	33	52	90	1.2	2.4	2.0	.92	65
10	63	61	5.5	35	33	51	4.5	.57	49	2.1	46	50
11	83	60	6.4	35	34	51	4.3	14	130	12	94	49
12	109	59	6.3	35	34	52	3.6	29	97	76	94	21
13	104	59	6.6	35	34	52	27	26	3.6	97	91	1.9
14	104	59	7.3	35	34	51	47	31	3.4	92	46	1.1
15	102	58	8.5	35	34	41	97	68	3.3	51	.79	.73
16	99	30	10	35	34	33	135	94	3.4	1.7	.63	.66
17	102	.95	50	35	34	33	139	92	70	1.0	.53	.66
18	99	.85	92	35	34	33	139	61	125	1.2	.40	.76
19	98	.85	91	36	34	33	146	15	77	1.2	.40	1.1
20	93	.85	89	36	34	33	167	15	32	1.3	.40	.90
21	89	.85	89	36	35	33	155	15	34	1.3	.42	.82
22	87	.75	90	35	35	33	101	15	93	1.2	.43	.82
23	84	.87	88	35	35	33	102	15	125	1.4	1.0	47
24	83	.70	86	35	35	33	135	15	86	1.6	11	147
25	69	.58	85	35	35	33	150	16	53	53	17	178
26	60	21	83	35	45	32	156	19	53	97	16	171
27	61	70	81	35	54	77	154	19	54	95	16	118
28	59	88	80	35	53	126	155	64	52	92	16	70
29	60	85	79	34	---	125	137	119	51	45	17	72
30	31	84	78	34	---	124	133	135	50	.92	17	100
31	1.2	---	44	34	---	125	---	146	---	.85	27	---
TOTAL	2144.38	869.63	1799.9	864.2	1000	1714	3337.4	1868.37	1794.8	774.97	518.02	2037.45
MEAN	69.2	29.0	58.1	27.9	35.7	55.3	111	60.3	59.8	25.0	16.7	67.9
MAX	109	88	92	36	54	126	167	146	141	97	94	186
MIN	.48	.45	5.3	1.2	33	32	3.6	.57	1.1	.85	.37	.66
CAL YR 1984	TOTAL	15573.34	MEAN	42.6	MAX	135	MIN	.16	CFSM	.84	IN	11.43
WTR YR 1985	TOTAL	18723.12	MEAN	51.3	MAX	186	MIN	.37	CFSM	1.01	IN	13.74

STREAMS TRIBUTARY TO LAKE SUPERIOR

39

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI
(National stream-quality accounting network station)

LOCATION.--Lat 46°43'15", long 89°12'25", in NE1/4 sec.20, T.50 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 50 ft downstream from bridge on Victoria Road, 1.8 mi southwest of Rockland, and 2.4 mi downstream from confluence of Middle and West Branches.

DRAINAGE AREA.--1,340 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1942 to current year.

REVISED RECORDS.--WSP 1387: 1943, 1946-47. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 638.72 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 23, 1943, nonrecording gage and Nov. 23, 1943 to Oct. 17, 1967, water-stage recorder at site 50 ft upstream at same datum.

REMARKS.--Estimated daily discharges: Dec. 6-14 and Dec. 18 to Mar. 25. Water-discharge records good except for estimated daily discharges, which are fair. Flow regulated by Victoria powerplant on West Branch 5 mi upstream; Bond Falls Reservoir (station 04034000) 34 mi upstream; Gogebic and Cisco Lakes, combined usable capacity, 50,800 acre-ft, in headwaters.

AVERAGE DISCHARGE.--43 years, 1,428 ft³/s, 14.47 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 42,000 ft³/s, Aug. 22, 1942, gage height, 28.6 ft, from floodmark, from rating curve extended above 14,000 ft³/s on basis of slope-area measurement of peak flow; minimum daily, 192 ft³/s, July 28, 29, 1963.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 9,000 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Mar. 27	2100	10,100	13.07	May 10	2400	10,600	13.31
Apr. 13	2000	11,000	13.52	Sept. 3	1400	10,000	13.02
Apr. 19	1800	*19,300	*17.25	Sept.30	2300	10,900	13.43

Minimum daily discharge, 380 ft³/s, Aug. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1130	1230	817	800	750	1000	2190	1700	2760	1020	380	746
2	1090	1320	831	800	720	1000	2030	1370	2180	973	676	663
3	938	1160	608	840	700	1000	2760	1320	1560	936	634	6090
4	962	957	578	860	700	950	3430	1340	1220	903	596	6310
5	941	935	638	760	700	980	3270	1320	1010	1880	660	3360
6	866	921	650	820	740	950	2780	1380	960	2660	618	2940
7	970	879	600	740	760	980	2540	1210	965	2400	584	2080
8	948	957	700	760	780	980	2260	1160	871	1710	548	1380
9	1180	879	750	740	780	980	1880	1430	811	1160	681	1010
10	1120	942	750	780	780	980	1930	3260	1340	1070	1680	1050
11	1070	750	750	820	840	900	3540	6540	1250	1050	1170	913
12	1060	872	750	800	800	1000	4160	3090	1090	1000	1050	610
13	1080	824	770	840	800	900	8760	2860	1060	954	1070	780
14	1030	907	800	830	800	850	9470	1910	828	1040	1070	701
15	1140	879	824	800	780	800	8750	1510	941	921	923	602
16	1070	886	1400	800	820	980	9410	1200	984	768	924	726
17	1170	817	2970	830	820	900	7330	1460	866	710	759	684
18	1260	699	1800	900	800	850	6730	1700	833	658	775	721
19	1230	757	1150	940	740	1000	13100	1720	921	659	628	676
20	1210	693	1050	780	900	1100	14900	1410	907	681	752	677
21	1180	614	1000	800	850	1400	10700	1110	1070	665	679	660
22	1080	506	950	820	880	1700	7970	704	1010	815	578	858
23	1010	790	900	840	880	2200	6060	828	1080	658	578	1200
24	851	637	800	800	920	2600	5470	730	828	590	1520	4690
25	1040	655	700	780	1000	3300	5340	784	1020	518	1430	3770
26	1040	631	800	780	1050	4450	4100	747	853	490	1270	2550
27	1010	686	900	780	1000	7660	3050	861	2030	646	883	1760
28	1140	790	1000	760	1000	8460	2660	824	2480	782	787	1520
29	1230	750	900	760	---	5600	2430	877	2100	700	800	1580
30	1220	790	820	760	---	4060	2360	1560	1160	739	821	6600
31	1180	---	800	760	---	3070	---	2090	---	566	761	---
TOTAL	33466	25133	28776	24880	23090	63580	161360	50005	36988	30324	26285	57907
MEAN	1080	838	928	803	825	2051	5379	1613	1233	978	848	1930
MAX	1260	1320	2970	940	1050	8460	14900	6540	2760	2660	1680	6600
MIN	851	506	578	740	700	800	1880	704	811	490	380	602
CAL YR 1984	TOTAL	484840	MEAN	1325	MAX	9860	MIN	318	CFSM	.99	IN	13.46
WTR YR 1985	TOTAL	561794	MEAN	1539	MAX	14900	MIN	380	CFSM	1.15	IN	15.60

STREAMS TRIBUTARY TO LAKE SUPERIOR

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1972 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to September 1981.

WATER TEMPERATURE: October 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Oct. 15, 1975 to Sept. 30, 1977.

REMARKS.--Quarterly cross-sectional samples were collected during the year at upstream side of bridge on Victoria Road. Daily record for water years 1975, 1978-81 is from once-daily observer samples.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-80): Maximum recorded (more than 20 percent missing record), 192 microsiemens, Mar. 26, 1977, May 28, 1978; minimum daily, 45 microsiemens, Dec. 2, 1975.

WATER TEMPERATURE (water years 1975-77, 1979-80): Maximum, 28.0°C, July 19, 1977; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI KF AGAR (COLS. PER 100 ML)
OCT 23...	1600	1140	124	7.8	8.0	9.8	11.2	96	K16	K11
JAN 23...	1530	1080	139	7.7	.0	.50	12.8	91	K11	K5
APR 24...	1115	4990	88	8.3	13.0	80	9.7	97	93	210
JUL 22...	1530	880	115	8.2	22.5	2.0	8.4	99	K10	67

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 23...	58	0	16	4.4	2.5	8	.1	.90	1.8	4.4
JAN 23...	66	2	18	5.0	2.4	7	.1	.90	2.5	3.7
APR 24...	43	0	13	2.5	1.5	7	.1	1.0	.4	4.6
JUL 22...	58	0	16	4.4	2.3	8	.1	.80	.7	6.5

STREAMS TRIBUTARY TO LAKE SUPERIOR

41

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 23...	1600	2.6	<.10	7.4	74	73	.10	228	<.10
JAN 23...	1530	2.9	<.10	9.5	94	81	.13	274	.15
APR 24...	1115	2.8	.10	5.7	63	57	.09	849	<.10
JUL 22...	1530	2.4	<.10	6.5	86	75	.12	204	<.10

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 23...	.010	.60	.040	.010	--	23	71	83
JAN 23...	.040	.30	<.010	<.010	<.010	--	--	--
APR 24...	<.010	.50	.070	<.010	.010	392	5280	90
JUL 22...	<.010	.40	.030	<.010	<.010	27	64	81

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 23...	30	<1	29	<.0	<1	2	<3	2	150	<1
JAN 23...	30	<1	30	<.5	<1	9	<3	2	140	<1
APR 24...	150	1	25	<.5	<1	8	<3	5	210	2
JUL 22...	10	1	28	<.5	<1	8	<3	6	130	1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 23...	<4	29	<.1	<10	<1	<1	<1	38	<6	5
JAN 23...	5	6	.2	<10	<1	<1	<1	40	<6	6
APR 24...	<4	13	.2	<10	1	<1	<1	29	<6	5
JUL 22...	5	4	.3	<10	3	<1	<1	40	<6	6

STREAMS TRIBUTARY TO LAKE SUPERIOR

04040500 STURGEON RIVER NEAR SIDNAW, MI

LOCATION.--Lat 46°35'03", long 88°34'33", in NE1/4 SE1/4 sec.5, T.48 N., R.34 W., Baraga County, Hydrologic Unit 04020104, on right bank 30 ft downstream from highway bridge, 3.0 mi downstream from Rock River, 3.5 mi northwest of Covington, 6.5 mi upstream from Perch River, 8.5 mi northeast of Sidnaw, and at mile 71.

DRAINAGE AREA.--171 mi².

PERIOD OF RECORD.--October 1912 to September 1915, April 1943 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1507: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,214.40 ft above National Geodetic Vertical Datum of 1929. October 1912 to September 1915, nonrecording gage at site 200 ft upstream at different datum. Apr. 2, 1943 to Oct. 1, 1946, nonrecording gage at present site and datum.

REMARKS.--Estimated daily discharges: Oct. 9-16, Nov. 17-22, Dec. 2-10, and Dec. 18 to Mar. 25. Records good except for periods with ice effect, Nov. 17-22, Dec. 2-10, and Dec. 18 to Mar. 25, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years, 217 ft³/s, 17.23 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,630 ft³/s, Apr. 24, 1960, gage height, 11.63 ft; minimum, 2.7 ft³/s, Sept. 13, 1976, gage height, 3.17 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,570 ft³/s, Apr. 20, gage height, 11.07 ft; minimum, 15 ft³/s, Aug. 4, gage height, 3.28 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	138	213	114	76	44	60	362	494	477	46	21	146
2	125	232	105	74	42	86	390	425	438	44	18	111
3	108	218	105	72	40	94	356	371	368	38	18	568
4	97	186	97	68	38	90	365	329	293	68	16	720
5	89	178	88	65	35	87	350	311	237	448	20	620
6	82	163	96	62	37	85	341	299	198	390	56	533
7	76	148	98	60	38	84	314	284	178	296	106	409
8	92	138	100	57	37	80	293	251	172	203	83	329
9	102	130	100	55	35	79	266	278	203	152	59	278
10	105	121	100	54	34	77	278	700	181	118	142	243
11	105	114	102	53	34	84	368	632	148	97	186	203
12	100	110	108	53	34	93	409	548	121	80	150	172
13	95	96	102	53	35	86	678	467	105	65	257	146
14	92	94	97	54	36	81	795	393	94	57	234	127
15	90	90	96	56	38	78	965	341	85	53	174	114
16	88	82	146	57	40	76	1230	332	87	50	123	100
17	90	68	254	57	44	80	1230	365	99	44	102	91
18	89	64	210	55	45	81	1120	347	108	44	92	83
19	100	62	180	54	45	81	2570	305	165	53	83	79
20	111	60	150	53	47	80	4320	266	152	54	90	72
21	105	59	140	53	52	80	4450	226	125	48	89	61
22	100	58	130	53	58	95	3800	198	114	39	80	59
23	96	60	120	54	62	120	2920	174	106	34	193	178
24	93	61	115	54	60	155	2480	152	95	32	229	588
25	87	64	110	55	57	200	2000	136	80	38	254	403
26	93	68	105	56	53	257	1550	144	70	41	221	320
27	99	77	100	55	50	494	1180	148	71	40	167	257
28	142	110	95	53	49	560	925	136	62	36	134	216
29	172	130	90	50	---	491	710	121	56	32	138	278
30	174	127	85	48	---	464	584	278	51	27	178	783
31	174	---	80	46	---	377	---	419	---	24	167	---
TOTAL	3309	3381	3618	1765	1219	4935	37599	9870	4739	2791	3880	8287
MEAN	107	113	117	56.9	43.5	159	1253	318	158	90.0	125	276
MAX	174	232	254	76	62	560	4450	700	477	448	257	783
MIN	76	58	80	46	34	60	266	121	51	24	16	59
CFSM	.63	.66	.68	.33	.25	.93	7.33	1.86	.92	.53	.73	1.61
IN.	.72	.74	.79	.38	.27	1.07	8.18	2.15	1.03	.61	.84	1.80

CAL YR 1984 TOTAL 66336 MEAN 181 MAX 1710 MIN 10 CFSM 1.06 IN 14.43
WTR YR 1985 TOTAL 85393 MEAN 234 MAX 4450 MIN 16 CFSM 1.37 IN 18.58

STREAMS TRIBUTARY TO LAKE SUPERIOR

43

04041500 STURGEON RIVER NEAR ALSTON, MI

LOCATION.--Lat 46°43'35", long 88°39'43", in SE1/4 sec.15, T.50 N., R.35 W., Baraga County, Hydrologic Unit 04020104, on right bank in powerhouse of Upper Peninsula Power Co. at Prickett Dam, 4.0 mi upstream from Clear Creek, 5.0 mi southeast of Alston, and at mile 45.

DRAINAGE AREA.--346 mi².

PERIOD OF RECORD.--February 1932 to June 1941, October 1942 to current year. Monthly discharge only for some periods, published in WSP 1307.

GAGE.--Water-stage recorder. Datum of gage is 710.3 ft mean tide at New York City datum (levels by Corps of Engineers). Prior to Jan. 5, 1948, nonrecording gage and Jan. 5, 1948 to Sept. 30, 1963, water-stage recorder at same site at datum 40.00 ft lower.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by powerplant at station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--51 years (water years 1933-40, 1943-85), 423 ft³/s, 16.60 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,360 ft³/s, Apr. 24, 1960, gage height, 13.09 ft, present datum; minimum daily, 1 ft³/s, Aug. 14-19, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,950 ft³/s, Apr. 21, gage height, 11.43 ft; minimum daily, 14 ft³/s, Nov. 25, Jan. 13, 20, 27.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	258	320	220	217	217	263	596	858	796	160	219	264
2	258	387	221	217	220	304	597	638	627	217	219	215
3	221	429	220	217	15	360	594	670	623	221	16	455
4	268	428	220	219	222	356	862	737	624	223	16	935
5	277	400	219	218	221	354	669	699	623	416	221	977
6	270	421	220	219	216	356	592	618	621	589	271	831
7	273	352	217	217	244	353	592	618	422	529	271	1340
8	276	239	217	215	205	351	591	617	387	587	220	745
9	274	323	218	207	195	353	586	619	198	630	220	615
10	224	321	268	207	16	351	396	1460	505	625	324	550
11	224	273	264	218	239	356	329	1530	372	386	323	364
12	223	221	267	216	70	391	429	950	323	274	325	361
13	150	195	269	14	68	398	1200	916	322	220	373	312
14	16	206	217	217	54	324	1440	794	320	16	374	242
15	223	219	218	218	201	326	1500	663	275	221	157	222
16	202	220	265	219	16	391	1800	612	274	147	412	334
17	254	219	269	216	16	215	1750	610	272	210	426	310
18	249	219	421	218	213	84	1540	610	271	221	426	228
19	276	221	416	216	112	205	2900	610	256	221	323	250
20	277	221	418	14	86	206	5240	601	273	220	387	312
21	277	219	367	218	206	260	5750	422	262	16	168	213
22	277	219	318	263	146	352	4930	329	272	221	271	216
23	278	217	317	209	213	349	4200	318	274	220	371	449
24	275	219	216	218	210	349	3670	320	273	221	476	879
25	225	14	217	239	208	349	2950	323	213	219	982	898
26	224	194	215	205	283	389	2340	322	220	219	689	611
27	222	219	217	14	266	608	1990	271	221	16	546	610
28	222	219	217	210	264	1530	1170	232	220	16	301	605
29	221	219	216	212	---	1190	980	268	220	171	259	606
30	271	219	219	209	---	597	968	410	17	220	263	1600
31	321	---	218	210	---	597	---	451	---	220	263	---
TOTAL	7506	7792	8001	6126	4642	12867	53151	19096	10576	8092	10112	16549
MEAN	242	260	258	198	166	415	1772	616	353	261	326	552
MAX	321	429	421	263	283	1530	5750	1530	796	630	982	1600
MIN	16	14	215	14	15	84	329	232	17	16	16	213
CFSM	.70	.75	.75	.57	.48	1.20	5.12	1.78	1.02	.75	.94	1.60
IN.	.81	.84	.86	.66	.50	1.38	5.71	2.05	1.14	.87	1.09	1.78
CAL YR 1984	TOTAL	130351	MEAN 356	MAX 2470	MIN 14	CFSM 1.03	IN 14.01					
WTR YR 1985	TOTAL	164510	MEAN 451	MAX 5750	MIN 14	CFSM 1.30	IN 17.69					

STREAMS TRIBUTARY TO LAKE SUPERIOR

04043004 STURGEON RIVER NEAR CHASSELL, MI
(National stream quality accounting network station)

LOCATION.--Lat 46°58'28", long 88°31'21", in NE1/4 SW1/4 sec.20, T.53 N., R.33 W., Houghton County, Hydrologic Unit 04020104, 2.2 mi upstream from bridge on county road, 3.5 mi south of Chassell, and at mile 5.2.

DRAINAGE AREA.--723 mi².

PERIOD OF RECORD.--Water years 1978 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: March 1978 to September 1981.

WATER TEMPERATURE: March 1978 to September 1981.

REMARKS.--Quarterly cross-sectional samples were collected during the year at bridge 2.2 mi downstream from gage, or in the winter through the ice in the vicinity of the gage. The high flow sampling in April 1985 was collected as a cross-sectional sample from the U.S. Highway 41 main channel and slough bridges 5 mi downstream. Diurnal fluctuation and occasional slight regulation by powerplant at Prickett Dam at mile 45.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1979-81): Maximum daily, 267 microsiemens, Feb. 19, 1980; minimum daily, 46 microsiemens, Apr. 26, 27, 29, 1979.

WATER TEMPERATURE (water years 1979-81): Maximum daily, 26.0°C, July 26, 1978, July 13, 1979; minimum daily, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. / 100 ML)
OCT 24...	0930	642	152	7.8	8.0	3.6	10.8	93	13	K8
JAN 24...	1130	484	154	7.6	.0	1.0	11.6	83	K1	K6
APR 23...	1630	8980	51	7.4	10.5	30	9.0	85	K8	68
JUL 23...	1200	440	152	7.9	20.5	3.5	8.1	92	42	34

DATE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CAO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 24...	75	2	21	5.4	2.9	8	.2	.90	2.2	4.4
JAN 24...	73	2	20	5.5	2.6	7	.1	.80	3.4	3.7
APR 23...	25	7	7.0	1.7	1.1	9	.1	.90	1.4	12
JUL 23...	76	0	21	5.6	2.5	7	.1	1.0	2.0	5.6

STREAMS TRIBUTARY TO LAKE SUPERIOR

45

04043004 STURGEON RIVER NEAR CHASSELL, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLORIDE, DIS-SOLVED (MG/L AS CL)	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)
OCT 24...	0930	2.2	< .10	8.6	89	90	.12	154	< .10
JAN 24...	1130	2.9	< .10	11	98	90	.13	128	.12
APR 23...	1630	2.1	.10	5.0	42	41	.06	1020	< .10
JUL 23...	1200	2.0	< .10	7.5	101	94	.14	120	< .10

DATE	NITRO- GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, DIS-SOLVED (MG/L AS P)	PHOS- PHORUS, DIS-SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODI- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 24...	.010	.60	< .010	< .010	< .010	19	33	83
JAN 24...	.100	.20	.010	< .010	--	10	13	80
APR 23...	< .010	.90	.060	< .010	< .010	400	9700	21
JUL 23...	.040	.50	.030	< .010	< .010	10	12	93

DATE	ALUM- INUM, DIS-SOLVED (UG/L AS AL)	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL- LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO- MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)
OCT 24...	20	1	36	< .5	1	5	<3	1	170	<1
JAN 24...	20	<1	37	< .5	<1	10	<3	<1	240	<1
APR 23...	130	1	25	< .5	<1	5	<3	4	290	3
JUL 23...	10	1	37	< .5	<1	8	<3	5	250	<1

DATE	LITHIUM DIS-SOLVED (UG/L AS LI)	MANGA- NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE- NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON- TIUM, DIS-SOLVED (UG/L AS SR)	VANA- DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)
OCT 24...	<4	27	< .1	<10	1	<1	<1	54	<6	7
JAN 24...	<4	22	.1	<10	<1	<1	<1	50	<6	<3
APR 23...	<4	21	.2	<10	2	<1	<1	16	<6	6
JUL 23...	<4	21	< .1	<10	3	<1	<1	57	<6	13

STREAMS TRIBUTARY TO LAKE SUPERIOR

04043050 TRAP ROCK RIVER NEAR LAKE LINDEN, MI

LOCATION.--Lat 47°13'43", long 88°23'07", in SE1/4 SE1/4 sec.20, T.56 N., R.32 W., Houghton County, Hydrologic Unit 04020103, on right bank 20 ft upstream from bridge on county highway, 2.0 mi northeast of Lake Linden, and 3.0 mi upstream from mouth.

DRAINAGE AREA.--28.0 mi².

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Datum of gage is 621.7 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Nov. 17, 21, Dec. 3-14, 18-22, Jan. 4, 15-18, 20-23, Feb. 1-20, 27, Mar. 1-8, 15, 18, 20, 21, and Mar. 30 to Apr. 2. Records good except for estimated daily discharges, which are fair. From April 1973 to December 1977, flow includes about 0.1 ft³/s mine pumpage. Small diversions for sprinkler irrigation. Discontinued publication of daily water temperature record September 30, 1983. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 46.3 ft³/s, 22.46 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,590 ft³/s, May 10, 1979, gage height, 10.72 ft; minimum daily, 6.8 ft³/s, Oct. 3, 1976; minimum gage height, 3.85 ft, June 23, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 380 ft³/s and maximum(*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Apr. 16	0100	520	7.23	Sept. 3	1700	558	7.47
Apr. 22	0200	*892	*9.04				

Minimum discharge, 14 ft³/s, Oct. 15, July 16-18, Aug. 8, 9, gage height, 3.95 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	75	31	27	20	32	70	63	112	22	17	20
2	20	54	27	26	20	45	68	54	66	20	21	19
3	19	39	25	24	20	55	69	49	46	19	18	344
4	17	35	24	24	20	35	93	53	36	19	16	153
5	17	34	23	24	20	30	91	75	33	21	16	83
6	18	30	22	24	20	29	93	66	31	21	17	59
7	18	27	23	24	20	28	78	62	30	23	16	46
8	17	31	23	23	21	27	66	59	28	29	15	35
9	16	31	23	23	21	27	58	55	27	22	15	31
10	16	28	24	22	21	30	70	48	24	20	24	31
11	16	26	24	22	22	35	128	54	23	18	24	26
12	15	24	24	22	22	32	117	53	22	16	20	23
13	15	23	24	22	22	30	286	52	21	16	45	22
14	15	23	24	21	23	29	338	44	20	16	29	20
15	15	25	24	21	23	28	351	44	19	15	22	21
16	15	25	57	21	23	27	430	47	18	15	18	24
17	20	22	92	21	23	25	264	46	18	14	17	22
18	22	20	62	21	23	26	306	40	18	29	23	20
19	37	20	50	21	23	27	538	41	19	47	21	18
20	49	19	40	21	24	30	664	39	18	29	19	17
21	35	19	30	21	25	30	857	34	19	41	17	17
22	28	19	28	21	29	30	696	31	68	32	16	20
23	26	20	27	21	29	44	526	29	57	23	17	44
24	23	22	27	21	27	47	479	28	34	32	50	269
25	21	22	26	19	26	47	228	27	26	135	72	115
26	23	24	26	20	26	53	140	32	25	60	37	67
27	25	34	26	20	26	98	104	30	62	36	28	47
28	48	62	28	20	25	149	87	27	42	27	23	36
29	33	47	37	20	---	129	77	25	29	23	23	36
30	45	36	32	20	---	100	71	43	24	20	29	141
31	57	---	29	20	---	75	---	74	---	18	23	---
TOTAL	762	916	982	677	644	1429	7443	1424	1015	878	748	1826
MEAN	24.6	30.5	31.7	21.8	23.0	46.1	248	45.9	33.8	28.3	24.1	60.9
MAX	57	75	92	27	29	149	857	75	112	135	72	344
MIN	15	19	22	19	20	25	58	25	18	14	15	17
CFSM	.88	1.09	1.13	.78	.82	1.65	8.86	1.64	1.21	1.01	.86	2.18
IN.	1.01	1.22	1.30	.90	.86	1.90	9.89	1.89	1.35	1.17	.99	2.43

CAL YR 1984 TOTAL 18235 MEAN 49.8 MAX 498 MIN 12 CFSM 1.78 IN 24.23
WTR YR 1985 TOTAL 18744 MEAN 51.4 MAX 857 MIN 14 CFSM 1.84 IN 24.90

STREAMS TRIBUTARY TO LAKE SUPERIOR

47

04044400 CARP RIVER NEAR NEGAUNEE, MI

LOCATION.--Lat 46°31'29", long 87°34'25", in SE1/4 sec.29, T.48 N., R.26 W., Marquette County, Hydrologic Unit 04020105, on right bank 30 ft downstream from bridge on U.S. Highway 41, and 2.0 mi northeast of Negaunee.

DRAINAGE AREA.--51.4 mi².

PERIOD OF RECORD.--July 1961 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,319.90 ft above National Geodetic Vertical Datum of 1929 (Michigan Department of Highway and Transportation benchmark). Prior to Aug. 24, 1961, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 17, 18, Dec. 2-9, 14, 15, Dec. 18 to Mar. 25, July 19-24, Aug. 23-27, and Sept. 18-30. Records good except for periods with ice effect, Dec. 2-9, 14, 15, and Dec. 18 to Mar. 25, which are fair and periods of indefinite stage-discharge relation, Nov. 17, 18, July 19-24, Aug. 23-27, and Sept. 18-30, which are poor. Flow regulated by Deer Lake storage reservoir (capacity, 22,500 acre-ft) 5 mi upstream. The reservoir was drained during October, November, and December; natural streamflow remainder of water year, except for some regulation during parts of April and May. The city of Ishpeming diverted an average of 2.2 ft³/s into basin as waste effluent (station 04058200). Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--24 years, 62.7 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 918 ft³/s, Apr. 20, 1985, gage height, 6.83 ft; minimum, 3.7 ft³/s, July 29, 1965; minimum gage height, 1.94 ft, Aug. 1, 1962; minimum daily discharge, 3.9 ft³/s, July 29, 30, 1965.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 918 ft³/s, Apr. 20, gage height, 6.83 ft; minimum, 17 ft³/s, Aug. 20, 21, gage height, 2.36 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	91	120	153	36	27	30	79	205	136	31	34	43
2	98	119	120	35	26	29	62	201	126	32	30	41
3	102	111	100	34	25	29	67	211	113	32	30	62
4	120	110	90	34	25	29	100	211	94	40	30	93
5	108	109	86	34	24	30	107	209	72	119	32	82
6	100	108	82	33	23	31	90	200	60	137	47	76
7	107	127	80	33	23	31	79	223	58	125	60	70
8	111	154	78	33	23	32	77	230	60	114	58	96
9	114	143	76	33	23	32	73	224	67	101	58	85
10	120	155	73	33	23	33	68	223	60	85	61	73
11	120	155	112	33	23	33	86	219	54	66	58	64
12	119	152	141	33	24	32	107	214	50	54	55	58
13	118	152	157	33	24	32	129	207	47	46	71	53
14	118	155	160	33	25	31	178	197	45	42	67	48
15	117	160	145	33	26	31	243	197	44	40	65	45
16	117	162	123	33	28	30	275	206	43	37	64	42
17	121	160	130	33	28	30	263	245	44	36	71	39
18	121	160	120	33	28	30	265	208	54	37	59	37
19	123	164	100	33	28	30	594	192	63	38	55	36
20	121	154	80	33	28	31	853	184	58	35	19	34
21	118	169	70	32	29	31	582	176	52	33	26	34
22	114	167	60	31	30	32	420	205	50	31	42	37
23	112	136	50	30	30	33	341	206	48	29	55	47
24	112	136	40	30	30	36	293	190	43	28	37	57
25	112	134	36	29	30	45	244	169	40	36	46	53
26	115	133	35	29	30	71	209	156	37	37	49	55
27	116	154	35	29	30	102	222	140	35	36	40	57
28	127	174	35	29	30	130	220	117	34	35	36	54
29	122	165	36	28	---	143	215	83	33	33	44	62
30	116	156	42	28	---	160	210	119	33	36	52	127
31	113	---	38	27	---	120	---	144	---	37	47	---
TOTAL	3543	4354	2683	990	743	1519	6751	5911	1753	1618	1498	1760
MEAN	114	145	86.5	31.9	26.5	49.0	225	191	58.4	52.2	48.3	58.7
MAX	127	174	160	36	30	160	853	245	136	137	71	127
MIN	91	108	35	27	23	29	62	83	33	28	19	34
CAL YR 1984	TOTAL	27523	MEAN	75.2	MAX	174	MIN	35				
WTR YR 1985	TOTAL	33123	MEAN	90.7	MAX	853	MIN	19				

STREAMS TRIBUTARY TO LAKE SUPERIOR

04044609 SAND RIVER WILDLIFE FLOODING AT SAND RIVER, MI

LOCATION.--Lat 46°29'14", long 87°07'30", in SW1/4 NE1/4 sec.12, T.47 N., R.23 W., Marquette County, Hydrologic Unit 04020201, on right bank at dam at Sand River, and 1.2 miles upstream from mouth.

DRAINAGE AREA.--28.6 mi². Area of Sand River Wildlife Flooding is 0.6 mi².

PERIOD OF RECORD.--October 1983 to current year (gage heights only).

GAGE.--Water-stage recorder. Datum of gage is 600.0 ft above National Geodetic Vertical Datum of 1929 (Michigan Department of Natural Resources benchmark).

REMARKS.--Pond level regulated by concrete dam with two 20-foot stop-log bays and a 20-foot radial gate. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 11.51 ft, Apr. 20, 1985; minimum, 5.81 ft, Apr. 12, 1985.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 11.51 ft, Apr. 20; minimum, 5.81 ft, Apr. 12.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.45	9.50	8.04	7.76	7.55	---	8.69	8.78	10.05	9.02	7.88	7.68
2	9.41	9.55	7.98	7.73	7.53	---	8.60	8.82	10.02	8.98	7.83	7.67
3	9.36	9.60	7.95	7.71	7.51	---	8.59	8.97	9.93	8.93	7.78	7.71
4	9.32	9.59	7.89	7.68	7.49	---	8.60	9.19	9.87	8.89	7.73	7.76
5	9.27	9.59	7.84	7.67	7.48	---	8.61	9.35	9.82	8.91	7.68	7.78
6	9.25	9.58	7.81	7.66	7.47	---	8.60	9.34	9.78	8.90	7.65	7.79
7	9.22	9.56	7.77	7.66	7.46	---	8.55	9.31	9.76	8.90	7.61	7.81
8	9.20	9.56	7.77	7.67	7.45	7.84	8.50	9.30	9.73	8.89	7.56	7.87
9	9.18	9.54	7.76	7.66	7.44	7.84	8.23	9.34	9.70	8.87	7.52	7.92
10	9.17	9.55	7.77	7.63	7.44	7.87	7.24	9.42	9.67	8.83	7.50	7.95
11	9.15	9.59	7.80	7.63	7.45	7.90	6.31	9.52	9.63	8.78	7.49	7.96
12	9.13	9.61	7.87	7.61	7.47	7.93	6.49	9.57	9.61	8.74	7.51	7.96
13	9.12	9.61	7.92	7.61	7.48	7.93	8.36	9.58	9.58	8.70	7.58	7.95
14	9.11	9.59	7.92	7.61	7.50	7.93	9.55	9.59	9.57	8.65	7.59	7.94
15	9.10	9.57	7.91	7.61	7.50	7.91	9.53	9.60	9.54	8.61	7.58	7.94
16	9.09	9.61	7.97	7.60	7.50	7.92	9.64	9.62	9.51	8.56	7.57	7.94
17	9.09	9.63	8.21	7.61	7.50	7.90	9.58	9.69	9.48	8.52	7.57	7.94
18	9.08	9.59	8.25	7.62	7.50	7.88	9.25	9.73	9.47	8.48	7.57	7.92
19	9.11	9.57	8.16	7.62	7.51	7.91	9.95	9.75	9.45	8.45	7.57	7.92
20	9.13	9.54	8.08	7.61	7.51	7.94	11.25	9.73	9.42	8.40	7.56	7.89
21	9.13	9.51	7.98	7.61	7.53	7.93	10.27	9.69	9.41	8.36	7.56	7.85
22	9.14	9.48	7.95	7.61	---	7.95	8.74	9.67	9.39	8.31	7.56	7.85
23	9.14	9.48	7.89	7.61	---	8.00	7.90	9.64	9.35	8.26	7.60	7.89
24	9.14	9.47	7.84	7.60	---	8.04	9.06	9.61	9.32	8.22	7.66	7.90
25	9.14	9.48	7.79	7.61	---	8.07	9.48	9.59	9.29	8.20	7.65	7.89
26	9.15	9.32	7.75	7.60	---	8.14	9.53	9.59	9.26	8.16	7.66	7.88
27	9.19	8.60	7.73	7.60	---	8.35	9.46	9.59	9.21	8.11	7.66	7.88
28	9.26	8.31	7.77	7.60	---	8.64	9.29	9.58	9.16	8.07	7.66	7.89
29	9.35	8.18	7.82	7.58	---	8.79	9.07	9.57	9.10	8.04	7.67	7.91
30	9.40	8.10	7.83	7.57	---	8.84	8.80	9.71	9.06	7.98	7.67	8.13
31	9.43	---	7.80	7.57	---	8.81	---	9.91	---	7.94	7.68	---
MEAN	9.21	9.38	7.90	7.63	---	---	8.86	9.50	9.54	8.54	7.62	7.88
MAX	9.45	9.63	8.25	7.76	---	---	11.25	9.91	10.05	9.02	7.88	8.13
MIN	9.08	8.10	7.73	7.57	---	---	6.31	8.78	9.06	7.94	7.49	7.67

STREAMS TRIBUTARY TO LAKE SUPERIOR

49

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI
(National stream-quality accounting network station)

LOCATION.--Lat 46°34'30", long 85°16'10", in NE1/4 sec.11, T.48 N., R.8 W., Luce County, Hydrologic Unit 04020202, on left bank 0.7 mi upstream from Tahquamenon (Big) Falls, 11.5 mi west of Tahquamenon Paradise, and 19 mi northeast of Newberry.

DRAINAGE AREA.--790 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1953 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 697 ft from river-profile map (nearest ft).

REMARKS.--Estimated daily discharges: Nov. 17 to Dec. 11 and Feb. 1-19. Water-discharge records good except for period of no gage-height record, Nov. 17 to Dec. 11, which is fair.

AVERAGE DISCHARGE.--32 years, 942 ft³/s, 16.19 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,990 ft³/s, May 10, 1960, gage height, 10.26 ft; minimum, 157 ft³/s, July 26, 1955; minimum gage height, 2.86 ft, July 7, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,700 ft³/s, Apr. 25, gage height, 10.07 ft; minimum, 263 ft³/s, July 21, gage height, 3.21 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1150	1410	1450	1060	470	656	1700	5580	894	548	415	573
2	1110	1620	1450	1050	460	718	1740	5300	989	480	390	526
3	1000	1740	1400	1010	450	764	1760	5000	1040	443	359	619
4	936	1800	1350	945	450	797	1770	4690	1070	413	330	769
5	853	1850	1250	880	440	815	1810	4460	1020	400	313	809
6	780	1850	1100	819	430	820	1680	4200	976	393	325	785
7	705	1800	1150	773	430	806	1740	3920	910	397	333	729
8	657	1740	1200	728	430	783	1790	3660	837	390	336	682
9	629	1660	1200	690	425	770	1790	3360	768	384	328	633
10	599	1600	1150	652	420	762	1800	3050	702	368	305	595
11	572	1580	1100	624	420	762	1810	2760	641	349	303	555
12	544	1560	1150	600	430	811	1840	2470	577	334	305	521
13	515	1520	1230	583	430	860	1970	2160	530	322	321	489
14	488	1450	1230	567	430	888	2170	1910	494	302	323	464
15	469	1380	1200	556	430	904	2440	1690	459	301	326	437
16	510	1340	1280	539	430	910	2800	1520	429	299	322	412
17	618	1300	1470	523	430	905	3220	1380	420	300	317	393
18	700	1200	1540	511	430	897	3590	1280	429	289	354	379
19	815	1150	1530	507	430	873	4050	1210	465	284	409	385
20	942	1100	1470	508	428	865	4760	1110	501	289	444	370
21	1020	1050	1420	496	426	864	5570	1030	501	288	444	382
22	1110	1000	1350	482	435	853	6140	950	587	278	430	401
23	1150	950	1280	475	462	852	6440	854	741	286	408	441
24	1170	900	1190	473	508	883	6570	754	827	279	518	563
25	1150	870	1100	474	544	926	6670	682	853	274	657	667
26	1160	880	997	478	572	980	6600	642	845	291	706	737
27	1180	960	898	479	598	1130	6490	614	801	308	722	788
28	1220	1100	859	475	626	1300	6310	601	735	344	711	798
29	1260	1300	925	475	---	1450	6140	576	664	384	686	797
30	1280	1500	1000	473	---	1560	5870	588	603	427	653	828
31	1310	---	1040	473	---	1670	---	710	---	429	622	---
TOTAL	27602	41160	37959	19378	12864	28834	109030	68711	21308	10873	13415	17527
MEAN	890	1372	1224	625	459	930	3634	2216	710	351	433	584
MAX	1310	1850	1540	1060	626	1670	6670	5580	1070	548	722	828
MIN	469	870	859	473	420	656	1680	576	420	274	303	370
CFSM	1.13	1.74	1.55	.79	.58	1.18	4.60	2.81	.90	.44	.55	.74
IN	1.30	1.94	1.79	.91	.61	1.36	5.13	3.24	1.00	.51	.63	.83

CAL YR 1984 TOTAL 341032 MEAN 932 MAX 3450 MIN 251 CFSM 1.18 IN 16.06
WTR YR 1985 TOTAL 408661 MEAN 1120 MAX 6670 MIN 274 CFSM 1.42 IN 19.24

STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1973 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to September 1981.

WATER TEMPERATURE: October 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Oct. 1, 1975 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected during the year at cableway 40 ft downstream from gage. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from samples were not published. Complete ice cover during the winter period at gage. Beginning 300 ft downstream, no significant ice cover.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1976-77, 1979-81): Maximum recorded (more than 20 percent missing record), 238 microsiemens, Jan. 24, 1977; minimum, 34 microsiemens, Apr. 17, 18, 1976.

WATER TEMPERATURE (water years 1976-77, 1979-81): Maximum, 26.5°C, May 21, 1977; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. / PER 100 ML)
OCT 15...	1430	467	135	7.6	12.5	2.0	7.6	73	K6	K3
JAN 16...	1400	532	142	7.2	.0	2.0	7.7	54	K5	K2
APR 16...	1315	2860	70	7.3	1.0	1.5	9.8	70	K5	K4
JUL 16...	1530	293	164	8.0	22.0	2.0	7.6	89	K12	K14

DATE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 15...	71	9	20	5.2	1.7	5	.0	.70	3.1	11
JAN 16...	69	9	19	5.3	2.0	6	.1	.70	7.3	10
APR 16...	35	8	9.8	2.6	1.1	6	.0	.80	2.6	6.2
JUL 16...	89	9	25	6.4	1.9	4	.0	.40	1.5	11

STREAMS TRIBUTARY TO LAKE SUPERIOR

51

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLORIDE, DIS-SOLVED (MG/L AS CL)	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N)
OCT 15...	1430	3.0	<.10	6.8	112	87	.15	141	<.10
JAN 16...	1400	2.6	<.10	8.4	98	85	.13	141	.14
APR 16...	1315	2.5	<.10	4.9	42	45	.06	324	.11
JUL 16...	1530	1.4	<.10	5.5	121	100	.16	96	<.10

DATE	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DIS-SOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	SEDIMENT, DIS-SOLVED SUSPENDED (MG/L)	SEDIMENT, DIS-SOLVED SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 15...	.060	.60	.030	.020	.010	6	7.6	86
JAN 16...	.060	.60	.020	.010	.010	4	5.7	81
APR 16...	.070	--	.020	<.010	<.010	8	62	71
JUL 16...	.050	.40	<.010	<.010	<.010	16	13	59

DATE	ALUMINUM, DIS-SOLVED (UG/L AS AL)	ARSENIC, DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYLLIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM, DIS-SOLVED (UG/L AS CD)	CHROMIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)
OCT 15...	80	<1	24	<.5	<1	<1	<3	3	420	8
JAN 16...	70	<1	21	<.5	<1	<1	<3	3	420	8
APR 16...	110	<1	15	<.5	<1	1	<3	2	280	4
JUL 16...	20	<1	25	<.5	1	4	<3	4	580	5

DATE	LITHIUM, DIS-SOLVED (UG/L AS LI)	MANGANESE, DIS-SOLVED (UG/L AS MN)	MERCURY, DIS-SOLVED (UG/L AS HG)	MOLYBDENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELENIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRONTIUM, DIS-SOLVED (UG/L AS SR)	VANADIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)
OCT 15...	<4	25	.3	<10	6	<1	<1	48	<6	<3
JAN 16...	<4	39	<.1	<10	2	<1	<1	44	<6	15
APR 16...	<4	13	<.1	<10	7	<1	<1	23	<6	29
JUL 16...	<4	2	<.1	<10	3	<1	<1	61	<6	4

STREAMS TRIBUTARY TO ST. MARYS RIVER

04045580 ST. MARYS RIVER ABOVE SAULT STE. MARIE, MI
(National stream quality accounting network and radiochemical station)

LOCATION.--Lat 46°29'29", long 84°25'17", in NW1/4 sec.10, T.47 N., R.1 W., Chippewa County, Hydrologic Unit 04020300, at Sault Ste. Marie municipal raw-water intake at Big Point, 2.6 mi west of the International Bridge, at Sault Ste. Marie.

DRAINAGE AREA.--80,900 mi², approximately.

PERIOD OF RECORD.--Water years 1970 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: March 1974 to September 1981.

WATER TEMPERATURE: March 1974 to September 1981.

REMARKS.--Quarterly samples were collected during the year at the raw-water tap in Sault Ste. Marie municipal water plant at Big Point. Intake is 1,500 ft out from water plant at a depth of 30 ft, 10 ft above bottom of channel. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected, analytical results from samples were not published.

COOPERATION.--Discharge figures are monthly means provided by U.S. Army Corps of Engineers, Sault Ste. Marie.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-81): Maximum daily, 113 microsiemens, Oct. 26, 1980; minimum daily, 76 microsiemens, Apr. 24, 1975.

WATER TEMPERATURE (water years 1975-81): Maximum daily, 24.0°C, July 25, 1979; minimum daily, 0.0°C, Mar. 14, 15, 1974, Feb. 1, 1979.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	DIS- CHARGE, IN CUBIC FEET PER SECOND	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, O. 7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. / 100 ML)
OCT 16...	0940	70400	89	7.6	12.5	.30	10.6	101	<1	<1
JAN 17...	1010	68500	89	7.6	.0	.40	14.0	100	<1	<1
APR 17...	0830	70100	94	7.4	.5	.60	13.8	97	<1	<1
JUL 17...	1400	58800	92	8.0	21.0	.80	9.9	114	K2	<1

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 16...	44	0	13	2.7	1.3	6	.0	.50	2.2	3.6
JAN 17...	47	3	14	2.9	1.3	6	.0	.50	2.1	3.5
APR 17...	44	0	13	2.8	1.4	6	.0	.60	3.4	3.4
JUL 17...	44	0	13	2.7	1.3	6	.0	.50	.8	3.6

04045580 ST. MARYS RIVER ABOVE SAULT STE. MARIE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

		CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)
DATE	TIME						
OCT 16...	0940	1.3	<.10	2.2	52	52	.07
JAN 17...	1010	1.5	<.10	2.4	52	53	.07
APR 17...	0830	1.7	<.10	2.5	58	52	.08
JUL 17...	1400	1.5	.20	2.1	57	51	.08

		SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)
DATE	TIME							
OCT 16...	9880	.28	.030	.30	.040	.030	.010	
JAN 17...	9620	.26	<.010	.20	--	.010	<.010	
APR 17...	11000	.22	.030	--	<.010	--	<.010	
JUL 17...	9050	.27	.020	.60	<.010	<.010	<.010	

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 16...	20	<1	14	<.5	<1	<1	<3	2	5	5
JAN 17...	10	<1	14	<.5	<1	<1	<3	3	4	6
APR 17...	20	<1	15	.6	<1	<1	<3	3	18	2
JUL 17...	10	<1	14	.6	<1	3	<3	5	<3	3

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 16...	<4	<1	<.1	<10	1	<1	<1	22	<6	46
JAN 17...	<4	<1	<.1	<10	1	<1	<1	23	<6	44
APR 17...	<4	1	<.1	<10	10	<1	<1	23	<6	69
JUL 17...	<4	1	<.1	<10	4	<1	<1	23	<6	45

DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L)	URANIUM DIS- SOLVED, EXTRAC- TION (UG/L)
OCT 16...	0940	1.2	<.4	1.6	<.4	1.4	<.4	.05	.04
APR 17...	0830	<1.3	<.4	1.2	<.4	1.0	<.4	.04	.08

STREAMS TRIBUTARY TO LAKE MICHIGAN

04056500 MANISTIQUE RIVER NEAR MANISTIQUE, MI

LOCATION.--Lat 46°01'50", long 86°09'40", in SE1/4 sec.15, T.42 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, on left bank 1.0 mi downstream from West Branch, 6.0 mi northeast of Manistique, and at mile 19.5.

DRAINAGE AREA.--1,100 mi², approximately.

PERIOD OF RECORD.--March 1938 to current year.

REVISED RECORDS.--WSP 1387: 1940-42(M), 1943, 1945. WSP 1627, 1727: 1938, 1939.

GAGE.--Water-stage recorder. Elevation of gage is 608 ft, from river-profile map (nearest ft). Prior to July 15, 1939, non-recording gage at site 1,600 ft upstream at different datum.

REMARKS.--Estimated daily discharges: Nov. 11-22, Dec. 6-15, Dec. 18 to Mar. 27. Records good except for estimated daily discharges, which are fair. Since July 1948, slight regulation by dam on outlet of Manistique Lake. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--47 years, 1,448 ft³/s, 17.88 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,900 ft³/s, May 11, 1960, gage height, 12.85 ft; minimum, 288 ft³/s, Oct. 4, 1948; minimum gage height, 1.01 ft, Aug. 23, 1941.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 13,200 ft³/s, Apr. 22, 23, gage height, 12.35 ft; minimum, 585 ft³/s, July 24; minimum gage height, 3.01 ft, Aug. 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1400	1690	2280	1200	840	940	3240	5550	1960	966	713	728
2	1280	2000	2240	1200	840	1000	3180	4720	2220	935	670	707
3	1170	2170	2200	1150	820	1050	3100	4140	2270	904	639	712
4	1090	2220	2120	1150	820	1050	3050	3690	2200	887	611	768
5	1030	2190	1970	1100	800	1100	3120	3340	2070	902	604	866
6	984	2100	1700	1100	800	1050	3290	3110	1910	874	635	902
7	956	1990	1600	1050	780	1050	3300	2970	1810	822	665	926
8	933	1890	1700	1050	780	1050	3280	2840	1720	796	682	1150
9	914	1810	1800	1000	760	1050	3230	2720	1670	781	664	1410
10	900	1790	1800	1000	760	1100	3180	2630	1600	768	647	1430
11	884	1750	1850	980	740	1100	3130	2540	1500	739	635	1350
12	868	1700	1900	980	740	1100	3130	2480	1400	707	643	1230
13	850	1700	1900	960	740	1100	3390	2370	1340	686	694	1140
14	831	1650	1850	960	740	1150	3870	2250	1270	668	708	1040
15	823	1600	2000	960	740	1150	4460	2150	1190	659	685	966
16	834	1550	2210	960	740	1150	5290	2090	1160	661	668	905
17	861	1550	2380	940	740	1150	6160	2040	1120	642	641	863
18	900	1500	1900	920	720	1150	6750	1990	1130	632	636	834
19	1010	1450	1800	900	720	1200	7650	1920	1160	629	650	810
20	1270	1400	1700	900	700	1250	8970	1870	1170	623	660	792
21	1410	1350	1550	880	700	1300	11000	1810	1150	620	652	786
22	1450	1300	1450	880	720	1350	12900	1740	1220	606	637	817
23	1420	1290	1400	860	750	1400	12900	1670	1450	593	630	853
24	1340	1240	1350	860	780	1550	12400	1600	1540	590	664	972
25	1260	1220	1300	860	800	1750	11600	1540	1450	612	759	1130
26	1240	1210	1250	860	840	2100	10400	1510	1330	618	869	1200
27	1270	1250	1250	860	860	2400	9070	1510	1220	622	902	1250
28	1390	1610	1250	860	900	2540	7970	1480	1130	613	878	1240
29	1560	2050	1200	860	---	2650	7070	1430	1060	632	822	1190
30	1620	2240	1200	860	---	2880	6340	1410	1010	725	783	1200
31	1600	---	1200	840	---	3100	---	1580	---	739	753	---
TOTAL	35348	50460	53300	29940	21670	44960	186420	74690	44430	22251	21499	30167
MEAN	1140	1682	1719	966	774	1450	6214	2409	1481	718	694	1006
MAX	1620	2240	2380	1200	900	3100	12900	5550	2270	966	902	1430
MIN	823	1210	1200	840	700	940	3050	1410	1010	590	604	707
CFSM	1.04	1.53	1.56	.88	.70	1.32	5.65	2.19	1.35	.65	.63	.92
IN.	1.20	1.71	1.80	1.01	.73	1.52	6.30	2.53	1.50	.75	.73	1.02

CAL YR 1984 TOTAL 517124 MEAN 1413 MAX 4820 MIN 531 CFSM 1.29 IN 17.49
WTR YR 1985 TOTAL 615135 MEAN 1685 MAX 12900 MIN 590 CFSM 1.53 IN 20.80

STREAMS TRIBUTARY TO LAKE MICHIGAN

55

04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI
(National stream quality accounting network station)

LOCATION.--Lat 45°58'18", long 86°14'35", in SE1/4 SE1/4 sec.1, T.41 N., R.16 W., Schoolcraft County, Hydrologic Unit 04060106, at Wyman State Nursery, 0.7 mi downstream from Indian River, 0.8 mi upstream from U.S. Highway 2, and 1.8 mi upstream from mouth.

DRAINAGE AREA.--1,445 mi², approximately.

PERIOD OF RECORD.--Water years 1976 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1975 to September 1981.

WATER TEMPERATURE: October 1975 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Oct. 1, 1976 (revised) to Sept. 30, 1981.

REMARKS.--Bimonthly cross-sectional samples were collected at railroad bridge 1,200 ft downstream. Occasional regulation by dam 0.4 mi downstream. Prior to Oct. 1, 1975, water-quality data were collected at Manistique (station 04057005), 1.5 mi downstream.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1976-81): Maximum, 254 microsiemens, Nov. 24, 1977; minimum, 57 microsiemens, Apr. 25, 1979.

WATER TEMPERATURE (water years 1976-80): Maximum, 26.5°C, July 15, 23, 1979; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT 31...	1050	2130	157	7.9	6.0	5.1	10.9	88	K22	K21
JAN 10...	1130	1730	190	7.3	.0	2.5	10.6	73	K3	K1
MAR 06...	1130	1400	188	7.3	.0	1.5	10.0	70	K2	<1
APR 23...	1645	14200	58	7.2	11.0	3.6	8.0	75	K1	K2
JUL 10...	1045	1120	178	8.1	20.5	3.3	8.0	92	K23	K22
SEP 25...	1440	1800	191	8.1	13.0	3.0	9.3	90	K16	K11

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 31...	77	13	22	5.3	1.5	4	.0	.50	1.6	21
JAN 10...	92	22	27	6.0	1.5	3	.0	.60	6.8	23
MAR 06...	90	20	26	6.1	1.6	4	.0	.60	6.8	20
APR 23...	30	10	8.6	2.0	.70	5	.0	.50	2.4	7.4
JUL 10...	92	19	27	5.9	1.4	3	.0	.60	1.1	21
SEP 25...	99	23	29	6.4	1.5	3	.0	.60	1.2	24

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 31...	1050	2.8	.10	5.3	112	98	.15	644	<.10
JAN 10...	1130	1.8	<.10	6.3	142	110	.19	663	<.10
MAR 06...	1130	2.0	<.10	7.0	123	110	.17	465	.12
APR 23...	1645	1.6	<.10	3.3	53	37	.07	2030	<.10
JUL 10...	1045	1.8	<.10	5.1	129	110	.18	390	<.10
SEP 25...	1440	2.1	<.10	6.3	139	120	.19	676	<.10

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 31...	.040	.40	.020	<.010	<.010	4	23	71
JAN 10...	.090	.70	--	.010	<.010	4	19	62
MAR 06...	.060	.30	<.010	<.010	<.010	9	34	66
APR 23...	<.010	.50	--	.010	<.010	25	958	30
JUL 10...	.030	.30	<.010	<.010	<.010	5	15	73
SEP 25...	.220	.50	.040	.010	--	15	73	69

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 31...	40	1	19	<.5	<1	<1	<3	1	440	<1
JAN 10...	30	<1	21	<.5	<1	10	<3	2	360	1
APR 23...	70	<1	14	<.5	3	<1	<3	2	400	5
JUL 10...	30	1	18	<.5	<1	3	<3	<1	660	5

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 31...	<4	15	<.1	<10	1	<1	<1	67	<6	<3
JAN 10...	<4	27	<.1	<10	<1	<1	<1	75	<6	7
APR 23...	<4	21	<.1	<10	1	<1	<1	20	<6	13
JUL 10...	<4	23	<.1	<10	3	<1	<1	75	<6	5

STREAMS TRIBUTARY TO LAKE MICHIGAN

57

04057510 STURGEON RIVER NEAR NAHMA JUNCTION, MI

LOCATION.--Lat 45°56'35", long 86°42'20", in SW1/4 SE1/4 sec.17, T.41 N., R.19 W., Delta County, Hydrologic Unit 04030112, Hiawatha National Forest, on left bank 30 ft upstream from bridge on Forest Service Road 2231, 500 ft downstream from Mormon Creek, 0.1 mi east of Federal Forest Highway 13, and 3.2 mi north of Nahma Junction.

DRAINAGE AREA.--183 mi².

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Datum of gage is 610.99 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Nov. 10-23, Dec. 3-15, Dec. 18 to Mar. 25. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 209 ft³/s, 15.51 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,120 ft³/s, Apr. 21, 1985, gage height, 11.50 ft; minimum, 35 ft³/s, Sept. 11, 12, 13, 14, 1976, gage height, 3.58 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,120 ft³/s, Apr. 21, gage height, 11.50 ft; minimum, 56 ft³/s, Aug. 4, 5, gage height, 3.78 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	178	352	353	155	100	110	295	504	480	92	62	108
2	156	449	307	150	96	110	299	445	421	92	61	98
3	141	387	250	145	84	110	291	396	342	91	58	149
4	133	345	200	140	80	110	336	360	281	88	56	181
5	132	310	195	135	82	110	363	342	236	105	75	162
6	133	285	195	130	86	110	370	334	204	110	108	144
7	128	259	200	130	90	115	356	355	189	109	90	143
8	125	248	210	130	88	115	338	334	192	104	81	330
9	122	243	215	130	86	120	311	309	223	105	78	378
10	119	235	215	125	86	125	305	366	195	100	87	340
11	116	230	210	120	84	130	352	342	166	91	94	273
12	112	220	210	120	84	130	382	314	150	86	90	222
13	111	210	205	120	86	130	478	287	138	82	101	183
14	109	205	200	120	86	130	571	256	130	80	93	157
15	107	200	225	120	88	130	688	242	124	78	84	138
16	114	195	299	125	90	130	822	239	132	77	77	124
17	138	190	392	130	90	130	870	236	131	73	74	119
18	155	180	300	130	90	135	843	226	160	72	114	124
19	277	175	240	115	90	135	1090	209	177	74	114	118
20	352	170	210	100	92	140	1670	203	157	71	102	110
21	297	165	200	105	96	145	2030	194	138	68	93	105
22	260	160	190	105	98	160	2030	180	161	66	84	112
23	222	155	180	100	110	180	1810	168	171	64	80	152
24	192	153	175	100	110	220	1560	158	144	63	123	229
25	175	152	170	98	110	260	1340	155	127	75	145	235
26	194	157	170	98	110	300	1120	188	117	73	124	219
27	200	258	165	96	110	389	931	212	110	69	114	196
28	296	488	165	96	110	424	782	185	104	69	117	172
29	273	464	165	98	---	383	661	164	99	68	126	170
30	246	402	160	100	---	348	574	177	96	64	133	247
31	234	---	160	105	---	329	---	288	---	64	121	---
TOTAL	5547	7642	6731	3671	2612	5593	23868	8368	5495	2523	2959	5438
MEAN	179	255	217	118	93.3	180	796	270	183	81.4	95.5	181
MAX	352	488	392	155	110	424	2030	504	480	110	145	378
MIN	107	152	160	96	80	110	291	155	96	63	56	98
CFSM	.98	1.39	1.19	.65	.51	.98	4.35	1.48	1.00	.45	.52	.99
IN.	1.13	1.55	1.37	.75	.53	1.14	4.85	1.70	1.12	.51	.60	1.11
CAL YR 1984	TOTAL	72051	MEAN 197	MAX 845	MIN 67	CFSM 1.08	IN 14.65					
WTR YR 1985	TOTAL	80447	MEAN 220	MAX 2030	MIN 56	CFSM 1.20	IN 16.35					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057800 MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MI

LOCATION.--Lat 46°29'57", long 87°53'11", in SW1/4 sec.1, T.47 N., R.29 W., Marquette County, Hydrologic Unit 04030110, on left bank 15 ft upstream from county highway, 1.5 mi downstream from Halfway Creek, and 0.3 mi north of Humboldt.

DRAINAGE AREA.--46.0 mi².

PERIOD OF RECORD.--June 1959 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. V-notch sharp-crested weir since Oct. 3, 1960. Datum of gage is 1,521.20 ft above National Geodetic Vertical Datum of 1929 (Cleveland-Cliffs Iron Co. benchmark). Prior to Sept. 1, 1960, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Oct. 22 to Dec. 12, Dec. 22 to Jan. 4, Jan. 7-13, 15, 16, 20, 21, 26, Feb. 1, 2, 16, Mar. 5-7, and Mar. 30 to Apr. 7. Records good except for periods with ice effect, Dec. 22 to Jan. 4, Jan. 7-13, 15, 16, 20, 21, 26, Feb. 1, 2, 16, and Mar. 5-7, which are fair and periods of indefinite stage-discharge relation, Oct. 22 to Dec. 12 and Mar. 30 to Apr. 7, which are poor. From July 1960 to June 1972, some diversion 100 ft upstream by industry for iron ore processing; figures of runoff adjusted. Several measurements of water temperature were made during the year.

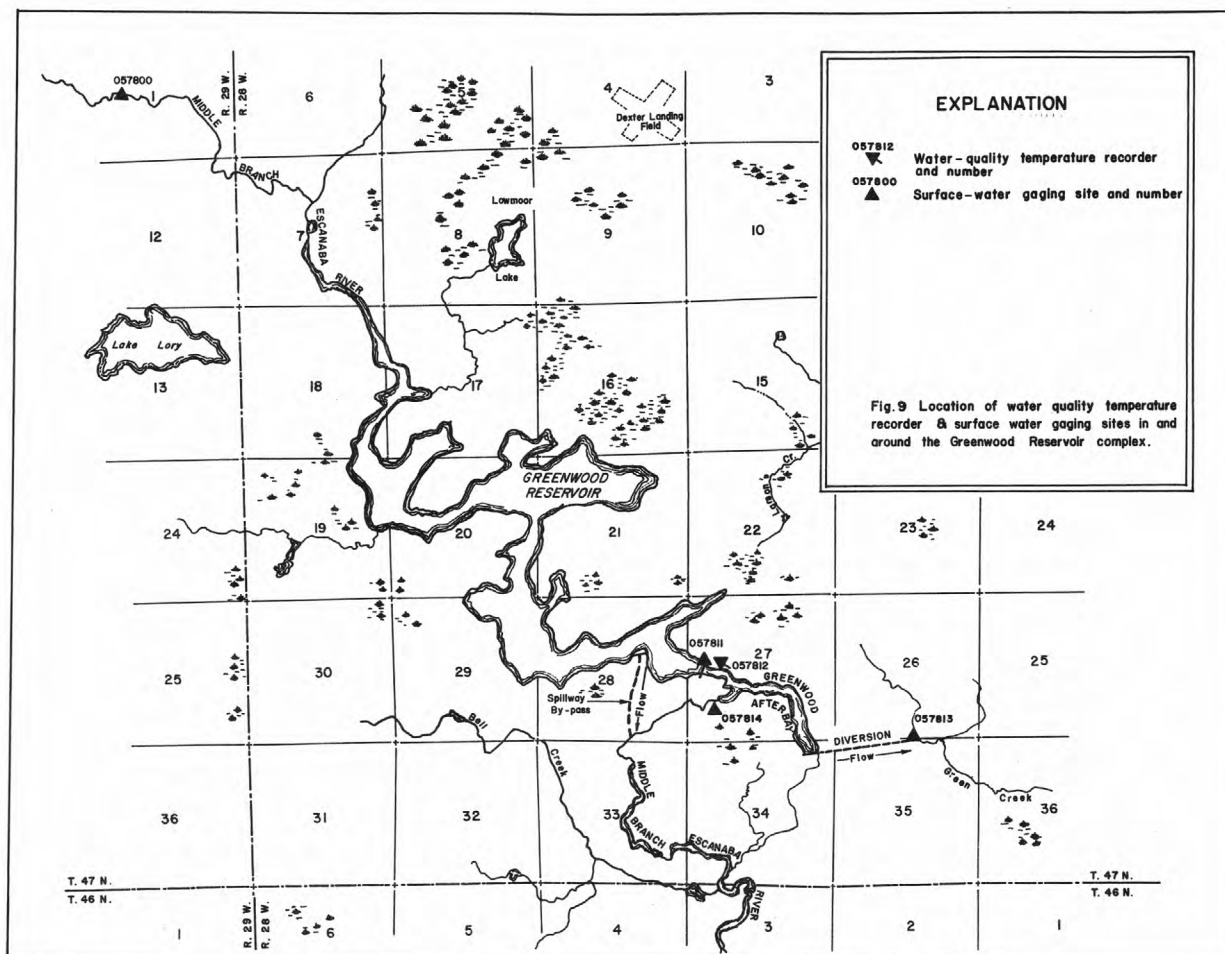
AVERAGE DISCHARGE.--26 years, 62.2 ft³/s, 18.36 in/yr, adjusted for diversion 1960 to 1972.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,930 ft³/s, Apr. 20, 1985, gage height, 9.21 ft; minimum, 4.0 ft³/s, Sept. 12, 1976; minimum gage height, 1.07 ft, Aug. 24, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,930 ft³/s, Apr. 20, gage height, 9.21 ft; minimum, 11 ft³/s, Aug. 5, gage height, 1.68 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	78	54	33	23	25	54	158	192	19	13	45
2	26	88	48	32	22	27	52	135	150	21	12	38
3	35	74	44	31	21	25	54	117	103	23	12	81
4	24	64	39	30	20	24	58	109	81	28	12	205
5	21	56	35	30	19	25	64	114	67	82	15	262
6	20	50	33	30	19	26	64	106	57	104	37	228
7	20	46	32	30	19	27	62	98	53	76	49	221
8	25	42	31	30	17	27	58	88	52	56	38	182
9	27	40	32	30	17	26	55	85	59	43	30	178
10	25	38	32	30	18	27	56	119	57	37	46	127
11	24	36	33	29	18	29	71	120	47	29	45	89
12	22	35	32	29	20	28	77	105	43	24	35	69
13	22	33	32	29	21	27	122	92	38	21	56	58
14	22	30	31	29	22	26	169	80	35	19	53	50
15	22	28	31	29	25	25	211	74	31	23	37	42
16	24	27	43	29	25	25	270	80	34	23	29	38
17	36	26	84	29	25	25	337	103	35	19	25	37
18	49	24	79	29	25	26	302	91	61	20	27	35
19	53	23	63	29	25	25	719	77	70	26	26	34
20	58	23	55	29	24	28	1830	70	57	23	24	32
21	50	22	49	29	25	27	1760	62	45	19	22	29
22	43	22	46	29	28	26	1730	55	40	17	21	33
23	39	22	44	27	27	31	1350	50	37	15	26	50
24	35	22	42	26	26	33	985	47	33	16	56	119
25	32	23	40	26	24	34	666	45	30	32	53	121
26	33	28	39	26	23	37	477	55	28	25	41	93
27	40	48	38	26	23	62	357	55	25	20	33	76
28	56	74	37	25	22	79	277	51	23	18	28	60
29	63	68	36	25	---	73	227	46	21	16	38	70
30	65	60	35	25	---	70	188	133	21	15	76	181
31	70	---	34	24	---	60	---	211	---	14	60	---
TOTAL	1109	1250	1303	884	623	1055	12702	2831	1625	923	1075	2883
MEAN	35.8	41.7	42.0	28.5	22.3	34.0	423	91.3	54.2	29.8	34.7	96.1
MAX	70	88	84	33	28	79	1830	211	192	104	76	262
MIN	20	22	31	24	17	24	52	45	21	14	12	29
CFSM	.78	.91	.91	.62	.49	.74	9.20	1.99	1.18	.65	.75	2.09
IN.	.90	1.01	1.05	.71	.50	.85	10.27	2.29	1.31	.75	.87	2.33
CAL YR 1984	TOTAL	18566.3	MEAN	50.7	MAX	379	MIN	8.7	CFSM	1.10	IN	15.01
WTR YR 1985	TOTAL	28263.0	MEAN	77.4	MAX	1830	MIN	12	CFSM	1.68	IN	22.86



Greenwood Reservoir is formed by an earth/rockfill main dam (Greenwood Dam) and several earthfill dikes surrounding the storage area. Storage began Dec. 22, 1972, and the fixed-crest concrete spillway was completed in September 1973. The usable capacity of the reservoir is 23,300 acre-ft at a spillway elevation of 1,515 ft. At pool elevation exceeding 1,515 ft, water flows over the spillway into the Middle Branch Escanaba River downstream from Greenwood Release (04057814). At lower pool elevations, outflow from Greenwood Reservoir into Greenwood Afterbay is completely regulated by the multiport outlet of Greenwood Dam. Greenwood Afterbay has two outlets; one for diversion by pipeline into Green Creek and the second for releasing flows to Middle Branch Escanaba River. Water temperatures are measured directly downstream from Greenwood Dam (Greenwood Afterbay, 04057812).

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057811 GREENWOOD RESERVOIR NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'32", long 87°48'02", in NW1/4 SW1/4 sec.27, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, at downstream side of dam, on Middle Branch Escanaba River, 3.7 mi southwest of Greenwood.

DRAINAGE AREA.--67.4 mi².

PERIOD OF RECORD.--December 1972 to current year (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft above National Geodetic Vertical Datum of 1929 (levels by Cleveland-Cliffs Iron Co.); gage readings have been reduced to elevations NGVD. Prior to Feb. 20, 1973, nonrecording gage at same site and datum.

REMARKS.--The reservoir is formed by an earth/rockfill main dam and several earthfill dikes surrounding the storage area. Storage began Dec. 22, 1972. The fixed-crest concrete spillway was completed in September 1973. The usable capacity of the reservoir is 23,300 acre-ft at spillway elevation 1,515 ft. Above elevation 1,515 ft, water flows over concrete spillway into Middle Branch Escanaba River about 2,000 ft downstream from Greenwood Release (station 04057814). The main dam is equipped with an outlet structure with 4 valves to control flow to afterbay (conservation pool) which has a capacity of 420 acre-ft at elevation 1,480 ft. Two outlet systems from the afterbay provide for diversion and release flow. Diverted flow to Green Creek gaged at Greenwood Diversion (station 04057813); released flow to Middle Branch Escanaba River gaged at Greenwood Release (station 04057814). Reservoir impounds water for diversion to Schweitzer Reservoir (station 04058190), for use in iron ore processing.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 26,520 acre-ft, Apr. 21, 22, 23, 1985, elevation, 1,517.3 ft; minimum since first filling, 3,240 acre-ft, Mar. 12, 1977, elevation, 1,491.1 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 26,520 acre-ft, Apr. 21, 22, 23, elevation, 1,517.3 ft; minimum, 18,540 acre-ft, Oct. 15, 16, 17, 18, elevation, 1,511.2 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre- feet)	Change in contents (equivalent in ft ³ /s)
Sept. 30	1511.5	18900	--	--
Oct. 31	1511.7	19140	+240	+3.9
Nov. 30	1512.6	20220	+1080	+18.1
Dec. 31	1513.4	21220	+1000	+16.3
CAL YR 1984	--	--	-2080	-2.9
Jan. 31	1512.9	20580	-640	-10.4
Feb. 28	1511.9	19380	-1200	-21.6
Mar. 31	1511.9	19380	0	0
Apr. 30	1515.6	24140	+4760	+80.0
May 31	1515.5	24000	-140	-2.3
June 30	1515.0	23300	-700	-11.8
July 31	1514.7	22910	-390	-6.3
Aug. 31	1515.0	23300	+390	+6.3
Sept. 30	1515.4	23860	+560	+9.4
WTR YR 1985	--	--	+4960	+6.9

STREAMS TRIBUTARY TO LAKE MICHIGAN

61

04057812 GREENWOOD AFTERBAY NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'32", long 87°48'02", in NW1/4 SW1/4 sec.27, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, in control house on downstream side of Greenwood Dam on the Middle Branch Escanaba River, 3.5 mi southwest of Greenwood.

DRAINAGE AREA.--67.4 mi².

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: January 1973 to current year.

INSTRUMENTATION.--Water-temperature recorder since Jan. 31, 1973. Sensor is located in discharge structure from reservoir to afterbay.

REMARKS.--Flow regulated by the multi-port outlets of Greenwood Reservoir. Elevations of outlets are: (No. 1) 1,505 ft, (No. 2) 1,495 ft, (No. 3) 1,485 ft, (No. 4) 1,478 ft, above National Geodetic Vertical Datum of 1929. Outlet No.3 was open Oct. 1 to Sept. 30.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 24.5°C, July 14, 15, 1974; minimum, 0.0°C on many days during January to March 1973.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 17.5°C, Aug. 18-21; minimum, 1.5°C, Apr. 14-21.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	12.5	12.5	8.0	7.0	2.5	2.0	2.5	2.5	2.0	2.0	2.0	2.0
2	12.5	12.0	7.0	6.5	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
3	12.0	12.0	6.5	6.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
4	12.0	12.0	6.0	5.5	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
5	12.0	11.5	5.5	5.5	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
6	11.5	11.5	5.5	5.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
7	11.5	11.5	5.0	5.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
8	11.5	11.5	5.0	5.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
9	12.0	11.5	5.0	5.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
10	12.0	12.0	5.0	4.5	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
11	12.0	12.0	4.5	4.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
12	12.0	12.0	4.0	4.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
13	12.0	12.0	4.0	4.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
14	12.0	12.0	4.0	4.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
15	12.0	12.0	4.0	3.5	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
16	12.0	12.0	3.5	3.0	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
17	12.0	11.5	3.0	2.5	2.0	2.0	2.5	2.5	2.0	2.0	2.0	2.0
18	12.0	12.0	2.5	2.0	2.5	2.0	2.5	2.5	2.0	2.0	2.0	2.0
19	12.0	11.5	2.5	2.0	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0
20	11.5	11.0	2.5	2.0	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0
21	10.5	10.5	2.5	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0
22	10.5	10.0	2.5	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0
23	10.0	10.0	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0
24	10.0	9.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0
25	9.5	9.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0
26	9.5	9.0	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0
27	9.0	9.0	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0
28	9.0	9.0	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0
29	9.0	8.5	2.5	2.5	2.5	2.5	2.0	2.0	---	---	2.0	2.0
30	8.5	8.0	2.5	2.5	2.5	2.5	2.0	2.0	---	---	2.0	2.0
31	8.0	8.0	---	---	2.5	2.5	2.0	2.0	---	---	2.0	2.0
MONTH	12.5	8.0	8.0	2.0	2.5	2.0	2.5	2.0	2.0	2.0	2.0	2.0

04057812 GREENWOOD AFTERBAY NEAR GREENWOOD, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	2.0	2.0	7.0	6.5	10.5	10.0	14.5	14.5	16.0	15.5	16.5	16.5
2	2.0	2.0	7.0	7.0	11.0	10.5	14.5	14.5	16.0	16.0	16.5	16.5
3	2.0	2.0	7.0	7.0	11.0	10.5	14.5	14.5	16.0	16.0	16.5	16.5
4	2.0	2.0	7.0	7.0	10.5	10.5	14.5	14.5	16.0	15.5	16.5	16.5
5	2.0	2.0	8.5	7.0	11.0	10.5	14.5	14.5	16.0	15.5	16.5	16.5
6	2.0	2.0	7.5	7.5	11.0	10.5	14.5	14.5	16.0	15.5	16.5	16.0
7	2.0	2.0	7.5	7.5	11.0	11.0	14.5	14.5	16.0	15.5	16.0	16.0
8	2.0	2.0	7.5	7.5	11.0	11.0	14.5	14.5	16.0	16.0	16.0	16.0
9	2.0	2.0	8.5	7.5	15.5	11.0	14.5	14.5	17.0	16.0	16.0	16.0
10	2.0	2.0	8.0	7.5	12.5	11.5	14.5	14.5	17.0	16.0	16.0	16.0
11	2.0	2.0	8.0	8.0	12.5	12.5	14.5	14.5	16.5	16.5	16.0	16.0
12	2.0	2.0	8.5	8.0	13.5	13.0	14.5	14.5	16.5	16.5	16.0	16.0
13	2.0	2.0	9.5	7.5	13.5	13.0	14.5	14.5	17.0	16.5	16.0	15.5
14	2.0	1.5	8.5	7.5	13.5	13.5	14.5	14.5	17.0	17.0	15.5	15.5
15	1.5	1.5	8.0	8.0	13.5	13.0	14.5	14.5	17.0	17.0	15.5	15.5
16	1.5	1.5	8.0	8.0	13.5	13.5	14.5	14.5	17.0	17.0	15.5	15.5
17	1.5	1.5	9.0	8.0	13.5	13.0	15.0	14.5	17.0	17.0	15.5	15.5
18	1.5	1.5	9.0	8.5	13.5	13.5	15.0	15.0	17.5	17.0	15.5	15.5
19	1.5	1.5	9.0	8.5	13.5	13.5	15.0	15.0	17.5	17.5	15.5	15.5
20	1.5	1.5	9.0	8.5	13.5	13.5	15.0	15.0	17.5	17.5	15.5	15.5
21	2.0	1.5	9.0	9.0	13.5	13.5	15.0	15.0	17.5	17.0	15.5	15.5
22	2.0	2.0	9.5	8.5	15.0	13.5	15.0	15.0	17.0	17.0	15.5	15.5
23	2.5	2.0	9.5	8.5	15.5	14.0	15.5	15.0	17.0	17.0	15.5	15.0
24	3.0	2.5	9.5	9.0	15.0	14.5	15.0	15.0	17.0	17.0	15.0	15.0
25	3.5	3.0	9.5	9.0	14.5	14.5	15.0	15.0	17.0	16.5	15.0	14.5
26	4.5	3.5	9.5	9.5	14.5	14.5	15.5	15.0	16.5	16.5	14.5	14.0
27	4.5	4.5	10.0	9.5	14.5	14.0	15.5	15.0	16.5	16.5	14.0	13.5
28	5.0	4.5	10.0	9.5	14.5	14.0	15.5	15.5	16.5	16.5	13.5	13.0
29	5.5	5.0	10.5	9.5	14.5	14.0	15.5	15.5	16.5	16.5	13.0	13.0
30	6.5	5.5	10.0	10.0	14.5	14.5	15.5	15.5	16.5	16.5	13.0	12.5
31	---	---	11.5	9.5	---	---	15.5	15.5	16.5	16.5	---	---
MONTH	6.5	1.5	11.5	6.5	15.5	10.0	15.5	14.5	17.5	15.5	16.5	12.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

63

04057813 GREENWOOD DIVERSION NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'04", long 87°46'10", in NW1/4 NE1/4 sec.35, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, on left bank at downstream end of pipeline, 200 ft upstream from Green Creek, 0.7 mi downstream from Greenwood Afterbay, and 3.6 mi south of Greenwood.

PERIOD OF RECORD.--December 1972 to current year.

GAGE.--Water-stage recorder and concrete flume. Datum of gage is 1,454.57 ft above National Geodetic Vertical Datum of 1929 (Cleveland-Cliffs Iron Co. benchmark). Prior to Aug. 22, 1973, nonrecording gage at same site and datum.

REMARKS.--No estimated daily discharges. Records excellent, except those below 4.0 ft³/s, which are poor. Flow completely regulated. A pipeline, 0.7 mi long, diverts water from Greenwood Reservoir (station 04057811) into Green Creek, tributary to Schweitzer Reservoir (station 04058190). Water is used for iron ore processing; some returned to Middle Branch Escanaba River 27 mi downstream via another Green Creek; some returned 31 mi downstream via Goose Lake Outlet and East Branch Escanaba River. Several observations of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 30 ft³/s, June 25-28, 1977, Nov. 9, 1979; no flow Dec. 27, 1972 to Jan. 6, 1973; minimum daily discharge since diversion began, 0.02 ft³/s, Nov. 3-22, 1977.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.6	7.8	8.7	8.8	20	21	19	.07	4.9	7.4	7.1	22
2	4.6	8.8	8.7	9.7	20	21	19	.07	4.9	7.8	7.0	22
3	4.6	8.7	8.7	11	20	21	19	1.3	4.9	7.8	7.1	19
4	4.5	8.7	8.7	11	20	21	19	4.6	4.9	7.9	7.2	13
5	4.5	8.7	8.7	11	20	21	14	4.5	4.9	8.0	8.3	16
6	4.4	8.7	8.7	11	21	21	11	4.5	4.9	7.9	9.3	16
7	4.5	8.7	8.7	11	21	21	11	4.5	4.9	7.9	9.4	16
8	5.6	8.7	8.7	13	21	21	11	4.5	4.9	7.9	9.4	16
9	7.1	8.7	8.7	13	21	21	11	4.5	4.9	7.9	9.4	16
10	7.0	8.7	8.7	13	21	20	11	4.6	4.9	7.9	9.3	16
11	6.9	8.7	8.8	13	21	20	9.5	4.7	4.7	7.8	9.3	16
12	6.9	8.7	8.8	13	21	20	8.6	4.7	4.8	7.8	9.2	16
13	6.8	8.7	8.8	13	21	20	8.7	4.9	4.7	7.8	9.1	16
14	6.5	8.7	8.8	13	21	20	8.7	4.9	4.7	7.8	9.1	16
15	6.6	8.7	8.8	14	21	20	8.9	4.9	4.7	7.8	9.2	16
16	6.6	8.7	8.9	16	21	20	9.0	4.9	4.7	7.8	9.2	16
17	6.6	8.7	8.9	17	21	20	9.0	5.0	5.9	7.8	9.2	12
18	6.6	8.7	8.9	17	21	20	9.1	5.0	7.2	7.8	9.3	8.5
19	6.7	8.6	8.8	20	21	20	9.3	5.0	7.2	7.8	12	8.6
20	6.8	8.8	8.8	20	21	20	3.9	4.9	7.2	7.8	15	8.7
21	6.8	8.8	8.8	20	21	20	.07	4.9	7.2	7.8	15	8.7
22	6.8	8.7	8.8	20	21	20	.07	4.8	7.2	7.7	15	8.8
23	6.8	8.7	8.8	20	21	20	.10	4.8	7.3	7.5	16	8.8
24	6.8	8.7	8.8	20	21	20	.07	4.9	7.0	7.5	21	8.8
25	6.8	8.7	8.8	20	21	20	.07	4.9	6.7	7.4	23	8.8
26	6.8	8.7	8.7	20	21	20	.07	4.9	6.8	7.3	23	8.8
27	6.8	8.7	8.7	20	21	21	.07	4.9	6.8	7.3	23	8.8
28	6.8	8.7	8.8	20	21	21	.07	4.9	6.9	7.3	22	8.8
29	6.8	8.7	8.8	20	---	21	.07	4.9	7.0	7.3	22	8.8
30	6.8	8.7	8.8	20	---	21	.07	5.0	7.0	7.3	22	8.9
31	6.8	---	8.8	20	---	20	---	5.0	---	7.2	22	---
TOTAL	193.2	260.3	271.9	488.5	583	633	230.43	135.94	174.7	238.0	408.1	395.8
MEAN	6.23	8.68	8.77	15.8	20.8	20.4	7.68	4.39	5.82	7.68	13.2	13.2
MAX	7.1	8.8	8.9	20	21	21	19	5.0	7.3	8.0	23	22
MIN	4.4	7.8	8.7	8.8	20	20	.07	.07	4.7	7.2	7.0	8.5
CAL YR 1984	TOTAL	5778.60	MEAN	15.8	MAX	26	MIN	4.3				
WTR YR 1985	TOTAL	4012.87	MEAN	11.0	MAX	23	MIN	.07				

LOCATION.--Lat 46°26'22", long 87°47'52", in NW1/4 SW1/4 sec.27, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, on left bank at outlet of Greenwood Afterbay releasing to Middle Branch Escanaba River, 2.6 mi upstream from Bell Creek and 3.8 mi southwest of Greenwood.

PERIOD OF RECORD.--October 1972 to current year.

GAGE.--Water-stage recorder and concrete flume. Datum of gage is 1,473.77 ft above National Geodetic Vertical Datum of 1929 (Cleveland-Cliffs Iron Co. benchmark). Prior to Nov. 7, 1973, nonrecording gage at same site and different datum.

REMARKS.--No estimated daily discharges. Records excellent. Since December 1972, flow from Greenwood Reservoir (station 04057811) below spillway elevation 1,515 ft is completely regulated by the afterbay release structure into the Middle Branch Escanaba River. Since January 1973, water diverted immediately upstream from station via Greenwood Diversion (station 04057813) to Green Creek for iron ore processing and some returned to Middle Branch Escanaba River 27 mi downstream via another Green Creek. Since October 1979, some of the diversion returned 31 mi downstream via Goose Lake Outlet and East Branch Escanaba River. Overflow from reservoir spillway bypasses and returns to the Middle Branch Escanaba River 0.5 mi downstream from station. Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge (prior to regulation), 290 ft³/s, Oct. 1, 1972; (since regulation began), 63 ft³/s, July 10, 11, 1974; minimum daily, 10 ft³/s, Dec. 29, 30, 1972, result of construction.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	30	27	27	26	26	25	24	24	25	26	24
2	34	29	27	27	26	26	25	24	24	26	26	24
3	33	29	27	27	26	26	25	23	24	25	26	25
4	32	28	26	26	26	26	25	23	24	26	26	26
5	32	28	26	26	26	26	25	23	24	27	26	27
6	32	28	26	26	26	26	25	22	24	27	27	27
7	32	28	26	26	26	26	25	22	24	26	27	28
8	32	28	27	26	26	26	25	22	24	26	27	28
9	31	28	27	26	26	26	25	22	24	26	27	28
10	31	28	27	26	26	25	25	22	24	26	27	28
11	31	28	27	26	26	25	25	23	24	26	26	28
12	30	28	27	26	26	25	25	24	23	26	26	28
13	30	28	27	26	26	25	26	24	23	26	27	27
14	30	28	27	26	26	25	26	25	24	26	27	27
15	30	28	27	26	26	25	27	25	24	26	26	27
16	29	28	27	26	26	25	27	25	24	26	26	27
17	29	28	27	26	26	25	27	26	24	26	26	27
18	29	28	27	26	26	25	28	25	24	26	27	24
19	29	27	27	26	26	25	29	25	23	26	27	30
20	29	27	27	26	26	25	31	25	23	26	26	31
21	29	27	27	26	26	25	30	24	23	26	26	31
22	29	27	27	26	26	25	30	24	23	25	26	32
23	29	27	27	26	26	25	29	24	23	25	26	32
24	29	26	27	26	26	25	29	24	23	26	27	32
25	29	26	27	26	26	25	28	24	23	26	26	32
26	29	26	27	26	26	25	27	24	23	26	26	32
27	29	27	27	26	26	25	26	24	24	26	25	32
28	30	27	27	26	26	25	26	24	25	26	25	32
29	30	27	27	26	---	25	25	24	25	26	25	33
30	29	27	27	26	---	25	25	24	25	26	24	33
31	29	---	27	26	---	25	---	24	---	26	24	---
TOTAL	940	829	833	809	728	784	796	738	713	804	809	867
MEAN	30.3	27.6	26.9	26.1	26.0	25.3	26.5	23.8	23.8	25.9	26.1	28.9
MAX	34	30	27	27	26	26	31	26	25	27	27	33
MIN	29	26	26	26	26	25	25	22	23	25	24	24
CAL YR 1984	TOTAL	9712	MEAN 26.5	MAX 34	MIN 23							
WTR YR 1985	TOTAL	9650	MEAN 26.4	MAX 34	MIN 22							

04058190 SCHWEITZER RESERVOIR NEAR PALMER, MI

LOCATION.--Lat 46°25'00", long 87°38'48", in SE1/4 NW1/4 sec.2, T.46 N., R.27 W., Marquette County, Hydrologic Unit 04030110, on left bank 120 ft upstream from dam on Schweitzer Creek, and 3.0 mi southwest of Palmer.

DRAINAGE AREA.--23.1 mi².

PERIOD OF RECORD.--January 1963 to current year (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is 1,300.00 ft above National Geodetic Vertical Datum of 1929 (Cleveland-Cliffs Iron Co. reference mark); gage readings have been reduced to elevations NGVD. Prior to Oct. 25, 1967, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed by an earthfill dam with fixed crest concrete spillway completed in 1963. Usable capacity of reservoir is 5,300 acre-ft at spillway elevation, 1,338.00 ft. The dam includes a discharge pipe equipped with valve to control release flow to Schweitzer Creek (station 04058200). An average of 2.2 ft³/s was diverted from the headwaters of basin by the city of Ishpeming for municipal supply and the effluent discharged to the Carp River basin. An average of 22 ft³/s was diverted from reservoir for iron ore processing, some returned to Middle Branch Escanaba River basin via Green Creek and some returned to the East Branch Escanaba River basin via Goose Lake Outlet. Since January 1973, controlled diversion from Greenwood Reservoir (station 04057811) via Greenwood Diversion (station 04057813) into Schweitzer Reservoir. Controlled inflow averaged 11.0 ft³/s for the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents recorded, 5,900 acre-ft, May 31, 1970, Apr. 20, 1985, elevation, 1,339.5 ft; minimum recorded since first filling, 2,920 acre-ft, Apr. 10, 1974, elevation, 1,329.7 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 5,900 acre-ft, Apr. 20, elevation, 1,339.5 ft; minimum, 4,170 acre-ft, Aug. 22, 23, elevation, 1,334.4 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Change in contents (equivalent in ft ³ /s)
Sept. 30	1337.2	5020	--	--
Oct. 31	1336.0	4650	-370	-6.0
Nov. 30	1335.9	4620	-30	-0.5
Dec. 31	1335.6	4530	-90	-1.5
CAL YR 1984	--	--	-770	-1.1
Jan. 31	1335.1	4380	-150	-2.4
Feb. 28	1335.1	4380	0	0
Mar. 31	1337.2	5020	+640	+10.4
Apr. 30	1338.2	5380	+360	+6.0
May 31	1338.2	5380	0	0
June 30	1336.8	4890	-490	-8.2
July 31	1335.8	4590	-300	-4.9
Aug. 31	1335.0	4350	-240	-3.9
Sept. 30	1337.9	5260	+910	+15.3
WTR YR 1985	--	--	+240	+0.3

STREAMS TRIBUTARY TO LAKE MICHIGAN

04058200 SCHWEITZER CREEK NEAR PALMER, MI

LOCATION.--Lat 46°24'40", long 87°37'27", in SW1/4 sec.1, T.46 N., R.27 W., Marquette County, Hydrologic Unit 04030110, on right bank 10 ft upstream from highway bridge, and 2.5 mi southwest of Palmer.

DRAINAGE AREA.--23.6 mi².

PERIOD OF RECORD.--October 1960 to current year.

GAGE.--Water-stage recorder. Concrete control since Oct. 1, 1963. Elevation of gage is 1,270 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft). Prior to Aug. 21, 1961, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 5, 23-27, Jan. 9, 10, 15, 19-21, 25, 31, Feb. 1-7, 9, 21, Mar. 6. Records good. Since August 1962, flow completely regulated by Schweitzer Reservoir (station 04058190) 1.0 mi upstream. An average of 2.2 ft³/s was diverted from headwaters of basin by the city of Ishpeming for municipal supply and the effluent discharged to the Carp River basin. An average of 22 ft³/s was diverted from Schweitzer Reservoir by industry for iron ore processing, some returned to the Middle Branch Escanaba River via Green Creek and some returned via Goose Lake Outlet and East Branch Escanaba River. Diversion into Schweitzer Reservoir from Greenwood Reservoir via Greenwood Diversion (station 04057813). Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 860 ft³/s, May 31, 1970, gage height, 6.50 ft; minimum, 0.4 ft³/s, Sept. 6, 1962, gage height, 1.22 ft; minimum daily, 1.0 ft³/s, Apr. 9-18, May 5, 6, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 751 ft³/s, Apr. 20, gage height, 6.44 ft; minimum daily, 4.6 ft³/s, Feb. 14, 16, 18, 19.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.4	5.7	5.1	5.1	4.8	5.0	5.7	22	49	5.4	4.9	4.9
2	5.4	5.1	5.2	5.0	4.8	4.9	5.6	18	33	5.4	4.9	5.0
3	5.3	5.2	5.1	5.1	4.8	4.9	5.9	14	20	5.3	4.9	5.7
4	5.2	5.1	5.1	5.0	4.8	4.8	5.9	12	10	6.4	4.9	5.1
5	5.3	5.1	5.0	5.0	4.7	4.9	7.6	15	7.0	6.2	5.6	5.0
6	5.3	5.1	5.0	5.0	4.7	4.9	15	14	6.0	5.8	5.4	5.0
7	5.3	5.1	5.0	5.1	4.7	4.8	13	13	6.3	5.6	5.5	5.0
8	5.4	5.2	5.1	5.1	4.7	4.9	12	9.9	5.9	5.5	5.1	5.2
9	5.3	5.1	5.1	5.0	4.7	5.0	10	9.2	6.7	5.4	5.1	5.0
10	5.2	5.2	5.1	5.0	4.7	5.1	10	11	5.8	5.4	5.4	5.1
11	5.2	5.1	5.2	4.9	4.8	5.1	15	22	5.8	5.4	5.0	5.0
12	5.1	5.1	5.3	4.9	4.8	5.1	23	25	5.8	5.3	5.2	5.0
13	5.1	5.1	5.1	4.9	4.7	5.0	50	18	5.7	5.3	5.7	4.9
14	5.1	5.1	5.2	4.9	4.6	4.9	76	11	5.7	5.4	5.0	5.0
15	5.1	5.2	5.1	5.0	4.7	4.9	107	9.7	5.7	5.4	5.0	5.1
16	5.1	5.1	5.9	4.9	4.6	5.0	149	14	5.7	5.3	4.9	5.1
17	5.6	5.1	5.7	4.9	4.7	4.9	138	36	5.7	5.3	5.0	5.1
18	5.4	5.1	5.4	4.9	4.6	5.0	102	42	6.1	5.5	5.3	5.1
19	5.6	5.1	5.2	4.9	4.6	5.1	286	25	5.8	5.3	5.0	5.0
20	5.3	5.1	5.1	4.9	4.7	5.1	699	13	5.6	5.1	4.9	5.1
21	5.2	5.0	5.2	4.9	4.8	5.1	559	7.3	5.6	5.1	4.9	5.0
22	5.2	5.0	5.2	4.9	4.9	5.3	380	6.1	5.8	5.1	4.8	5.6
23	5.1	5.1	5.2	4.9	5.0	5.4	242	6.0	5.6	5.1	5.4	5.7
24	5.1	5.0	5.2	4.9	4.9	5.5	159	6.0	5.5	5.7	5.2	5.4
25	5.2	5.0	5.2	4.9	4.9	5.6	117	6.1	5.5	5.4	5.0	5.3
26	5.2	5.0	5.2	4.9	4.9	5.7	80	6.2	5.5	5.2	4.9	5.3
27	5.4	5.7	5.2	4.9	4.8	6.9	56	6.0	5.4	5.1	4.9	5.3
28	5.5	5.6	5.2	4.9	4.8	6.3	43	5.9	5.4	5.1	4.8	5.2
29	5.2	5.3	5.2	4.9	---	5.9	35	5.9	5.5	5.1	5.2	5.8
30	5.3	5.1	5.1	4.8	---	5.7	29	9.9	5.4	5.0	5.0	7.5
31	5.3	---	5.1	4.8	---	5.8	---	42	---	4.9	4.9	---
TOTAL	163.4	154.8	161.0	153.2	133.2	162.5	3435.7	461.2	262.5	166.5	157.7	157.5
MEAN	5.27	5.16	5.19	4.94	4.76	5.24	115	14.9	8.75	5.37	5.09	5.25
MAX	5.6	5.7	5.9	5.1	5.0	6.9	699	42	49	6.4	5.7	7.5
MIN	5.1	5.0	5.0	4.8	4.6	4.8	5.6	5.9	5.4	4.9	4.8	4.9
CAL YR 1984	TOTAL	4652.1	MEAN	12.7	MAX	179	MIN	5.0				
WTR YR 1985	TOTAL	5569.2	MEAN	15.3	MAX	699	MIN	4.6				

STREAMS TRIBUTARY TO LAKE MICHIGAN

67

04059000 ESCANABA RIVER AT CORNELL, MI
(National stream quality accounting network station)

LOCATION.--Lat 45°54'31", long 87°12'49", in NW1/4 sec.32, T.41 N., R.23 W., Delta County, Hydrologic Unit 04030110, on right bank 50 ft downstream from bridge on County Road 519, 0.4 mi downstream from Bobs Creek, 0.7 mi northeast of Cornell, and 16 mi upstream from mouth.

DRAINAGE AREA.--870 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1903 to December 1912, January 1913 to November 1915 (gage heights only), October 1950 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "near Escanaba" 1903-15.

REVISED RECORDS.--WSP 1387: 1904. WDR MI-85: 1970 (M).

GAGE.--Water-stage recorder. Datum of gage is 749.26 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). August 1903 to November 1915, nonrecording gage at site 10 mi downstream at different datum.

REMARKS.--Estimated daily discharges: Nov. 22-25, Dec. 4-10, 14, 15, Dec. 18 to Mar. 26. Water-discharge records good except for estimated daily discharges, which are fair. Since 1950, diurnal fluctuation and occasional slight regulation by Boney Falls powerplant 7 mi upstream. Since August 1962, some regulation by Schweitzer Reservoir (station 04058190) about 50 mi upstream. Since December 1972, some regulation by Greenwood Reservoir (station 04057811) about 60 mi upstream.

AVERAGE DISCHARGE.--44 years (water years 1904-12, 1951-85), 894 ft³/s, 13.95 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,700 ft³/s, Apr. 26, 1979, gage height, 5.00 ft; maximum gage height, 6.40 ft, Apr. 9, 1971, backwater from ice; minimum discharge observed, 90 ft³/s, July 5, 1910, gage height, 1.5 ft, site and datum then in use, but may have been less during extended periods of no gage-height record during winter periods of 1903-12, or periods of ice effect in 1959.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 10,600 ft³/s, Apr. 22, gage height, 4.95 ft; minimum daily, 270 ft³/s, July 24.

REVISIONS.--The maximum discharge for the water year 1970 has been revised to 7,760 ft³/s, June 2, 1970, gage height, 4.40 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	786	1400	1130	700	450	540	874	2200	2160	361	329	377
2	720	1680	956	680	430	560	1190	1940	2050	377	319	370
3	772	1570	847	640	430	570	1210	1700	1660	344	287	454
4	671	1390	780	660	420	520	1280	1560	1350	366	273	610
5	589	1270	660	680	400	420	1300	1480	1140	310	297	759
6	566	1210	700	630	390	460	1230	1490	956	652	319	772
7	566	1070	740	600	370	520	1270	1440	900	800	326	733
8	577	984	780	600	360	560	1210	1370	951	749	400	900
9	577	944	760	600	350	540	1080	1320	922	759	389	929
10	577	1050	740	620	350	580	1080	2060	724	489	389	984
11	566	1100	694	610	350	610	1250	2140	687	488	403	780
12	555	1020	782	600	340	580	1360	2230	680	444	404	771
13	534	945	763	580	340	580	1730	2050	793	439	430	618
14	545	906	760	500	340	580	2250	1710	584	404	487	523
15	534	945	750	580	340	580	2850	1460	558	391	449	500
16	534	937	972	530	340	570	3660	1390	521	378	429	479
17	566	810	1230	580	340	560	3900	1430	533	365	396	416
18	746	793	1100	540	330	540	3730	1470	600	323	355	373
19	927	743	900	500	370	560	4270	1360	601	333	356	513
20	927	660	800	500	420	600	6790	1200	584	314	370	372
21	883	570	760	520	450	650	9390	1100	540	284	356	317
22	927	570	720	520	480	660	10400	982	674	293	346	375
23	660	570	680	520	490	700	9940	852	718	277	347	434
24	548	570	640	520	500	760	8460	818	621	270	363	600
25	584	560	560	520	510	820	7160	797	561	323	491	729
26	649	556	620	520	510	720	5790	831	534	329	514	706
27	744	744	720	520	520	1420	4520	1010	483	355	510	774
28	1090	1350	800	520	530	1930	3670	930	438	309	505	631
29	1240	1480	840	520	---	1920	3030	829	394	310	462	657
30	1150	1420	780	520	---	1580	2540	1180	369	295	465	1390
31	1170	---	720	520	---	1260	---	1920	---	317	436	---
TOTAL	22480	29817	24684	17650	11450	23450	108414	44249	24286	12648	12202	18846
MEAN	725	994	796	569	409	756	3614	1427	810	408	394	628
MAX	1240	1680	1230	700	530	1930	10400	2230	2160	800	514	1390
MIN	534	556	560	500	330	420	874	797	369	270	273	317
CFSM	.83	1.14	.92	.65	.47	.87	4.15	1.64	.93	.47	.45	.72
IN.	.96	1.27	1.06	.75	.49	1.00	4.64	1.89	1.04	.54	.52	.81
CAL YR 1984	TOTAL	331613	MEAN 906	MAX 4530	MIN 280	CFSM 1.04	IN 14.18					
WTR YR 1985	TOTAL	350176	MEAN 959	MAX 10400	MIN 270	CFSM 1.10	IN 14.97					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1969-73, 1975 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1975 to September 1981.

WATER TEMPERATURE: February 1975 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Oct. 15, 1975 to Sept. 30, 1981.

REMARKS.--Bimonthly cross-sectional samples were collected at or near the bridge. From October 1975 to September 1981, instrument-recorded specific conductance below 200 microsiemens does not represent the conductance of the cross section. Results of a study of conductance in the cross section are available in the District files.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975, 1978-81): Maximum daily recorded (more than 20 percent missing record), 360 microsiemens, Sept. 10, 1975; minimum measured, 114 microsiemens, Apr. 15, 1981.

WATER TEMPERATURE (water years 1975, 1977-81): Maximum daily recorded (more than 20 percent missing record), 35.0°C, July 31, 1975; minimum, 0.0°C on many days during winter.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 72 microsiemens was measured Apr. 24, 1985.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, O. 7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT 30...	1050	1100	199	8.3	6.0	1.3	12.2	100	17	42
JAN 09...	1200	480	268	7.7	.0	2.0	14.0	97	<1	<1
MAR 07...	1120	460	304	8.1	.0	1.0	12.4	87	K2	K8
APR 24...	1210	8530	72	7.6	10.5	3.5	10.5	98	K13	K32
JUL 09...	1320	772	226	8.5	23.0	1.5	9.1	111	K6	K3
SEP 24...	1400	600	244	8.6	15.0	1.5	10.4	107	--	K16

DATE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 30...	87	0	20	8.9	12	23	.6	.80	1.0	7.2
JAN 09...	100	0	25	10	19	28	.8	1.1	5.0	17
MAR 07...	100	0	24	10	24	34	1	1.1	2.1	18
APR 24...	37	6	9.1	3.4	2.4	12	.2	.80	1.5	6.3
JUL 09...	83	0	20	8.1	18	32	.9	1.0	.7	11
SEP 24...	99	0	24	9.4	18	28	.8	1.1	.6	12

STREAMS TRIBUTARY TO LAKE MICHIGAN

69

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 30...	1050	4.8	<.10	8.3	136	120	.19	404	.17
JAN 09...	1200	6.3	.20	11	182	170	.25	236	.22
MAR 07...	1120	7.1	.20	11	180	180	.24	224	--
APR 24...	1210	2.6	.10	5.3	50	49	.07	1150	<.10
JUL 09...	1320	5.3	.20	7.9	147	140	.20	306	<.10
SEP 24...	1400	5.8	<.10	8.5	169	150	.23	274	<.10

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 30...	.060	.20	<.010	<.010	<.010	5	15	62
JAN 09...	.020	.40	.020	--	<.010	6	7.8	53
MAR 07...	--	.30	--	.010	--	3	3.7	53
APR 24...	<.010	.80	.010	<.010	<.010	10	230	79
JUL 09...	<.010	.50	<.010	<.010	<.010	11	23	60
SEP 24...	.210	.50	.040	.010	--	11	18	69

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 30...	40	<1	12	<.5	<1	<1	<3	3	410	1
JAN 09...	40	1	15	<.5	<1	20	<3	3	370	2
APR 24...	60	1	12	<.5	1	3	<3	1	490	3
JUL 09...	50	2	12	<.5	1	3	<3	8	290	2

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 30...	<4	14	<.1	<10	3	<1	<1	30	<6	17
JAN 09...	<4	7	<.1	<10	<1	<1	<1	47	<6	8
APR 24...	<4	19	.2	<10	<1	<1	<1	23	<6	7
JUL 09...	<4	14	<.1	<10	5	<1	<1	39	<6	4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059500 FORD RIVER NEAR HYDE, MI
(National stream quality accounting network station)

LOCATION.--Lat 45°45'20", long 87°12'05", in SW1/4 sec.19, T.39 N., R.23 W., Delta County, Hydrologic Unit 04030109, on right bank 40 ft downstream from bridge on County Road 533, 1.4 mi downstream from Tenmile Creek, and 1.5 mi north of Hyde.

DRAINAGE AREA.--450 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1954 to current year.

GAGE.--Water-stage recorder. Datum of gage is 681.77 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Nov. 10-20, 22-25, Dec. 6-15, and Dec. 18 to Mar. 25. Water-discharge records excellent except for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--31 years, 390 ft³/s, 11.77 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,590 ft³/s, May 7, 1960, gage height, 8.27 ft; minimum, 18 ft³/s, Aug. 30, 1976, gage height, 1.33 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,580 ft³/s, Apr. 23, 24, gage height, 5.37 ft; minimum, 40 ft³/s, Aug. 4, 5, gage height, 1.53 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	589	954	714	180	86	160	681	1050	779	114	54	128
2	485	1070	568	175	82	160	685	885	832	102	48	114
3	384	1010	489	170	78	160	686	760	834	92	46	120
4	318	956	419	165	74	165	804	677	784	87	41	159
5	276	869	380	160	72	165	890	626	661	145	54	253
6	243	762	360	155	70	170	910	614	499	231	63	306
7	222	666	340	150	72	175	914	704	400	267	60	309
8	221	604	335	145	72	180	882	697	366	273	83	392
9	222	555	330	140	70	185	791	651	365	238	126	371
10	228	520	335	140	66	190	773	803	337	193	124	383
11	227	490	350	130	66	195	897	1010	298	159	97	358
12	219	460	355	130	66	195	993	1050	270	130	89	324
13	210	440	350	125	68	200	1140	1020	229	109	116	283
14	203	410	350	120	70	200	1400	942	198	95	122	227
15	200	390	360	120	74	200	1640	855	177	83	124	193
16	198	370	467	115	78	200	1940	776	164	77	130	166
17	219	340	654	110	84	200	1960	723	158	70	116	147
18	275	320	450	110	86	200	1930	684	206	67	109	133
19	516	300	350	105	88	200	2100	655	241	64	89	121
20	621	275	300	105	92	210	2420	620	230	60	80	110
21	605	270	275	100	98	250	2500	538	200	58	75	100
22	564	265	260	100	105	320	2530	464	279	55	72	111
23	515	260	245	98	115	450	2560	403	364	52	73	135
24	467	260	235	96	125	560	2540	350	339	48	94	215
25	419	260	225	94	135	700	2430	319	285	60	97	297
26	435	262	215	94	145	867	2170	356	232	60	124	350
27	443	414	210	94	155	989	1870	429	192	60	147	383
28	535	711	205	94	160	1120	1640	459	168	67	140	366
29	655	770	200	92	---	1060	1430	458	144	68	139	340
30	700	744	195	90	---	976	1230	462	129	64	145	499
31	698	---	190	88	---	868	---	598	---	60	141	---
TOTAL	12112	15977	10711	3790	2552	11870	45336	20638	10360	3308	3018	7353
MEAN	391	533	346	122	91.1	383	1511	666	345	107	97.4	245
MAX	700	1070	714	180	160	1120	2560	1050	834	273	147	499
MIN	198	260	190	88	66	160	681	319	129	48	41	100
CFSM	.87	1.18	.77	.27	.20	.85	3.36	1.48	.77	.24	.22	.54
IN.	1.00	1.32	.89	.31	.21	.98	3.75	1.71	.86	.27	.25	.61

CAL YR 1984 TOTAL 145801 MEAN 398 MAX 1720 MIN 59 CFSM .88 IN 12.05
WTR YR 1985 TOTAL 147025 MEAN 403 MAX 2560 MIN 41 CFSM .90 IN 12.15

STREAMS TRIBUTARY TO LAKE MICHIGAN
04059500 FORD RIVER NEAR HYDE, MI--Continued

71

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1956 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: December 1974 to September 1981.

WATER TEMPERATURE: July 1956 to September 1981.

INSTRUMENTATION.--Water-temperature recorder from July 20, 1956 to Sept. 30, 1975. Water-quality monitor from Oct. 1, 1975 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected during the year 75 ft upstream to 75 ft downstream from gage. Daily record of specific conductance for water year 1975 is from once-daily observer samples.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-77, 1979-81): Maximum, 482 microsiemens, Dec. 2, 1976; minimum recorded, 131 microsiemens, May 22, 1976, but may have been lower during instrument malfunction May 18-21, 1976.

WATER TEMPERATURE (water years 1956-81): Maximum, 31.0°C, July 31, 1975; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. / 100 ML)
OCT 19...	1215	548	302	8.2	10.5	2.3	10.3	96	K670	K480
JAN 08...	1330	144	348	7.7	.0	1.0	11.2	78	K3	K1
APR 18...	1130	1930	202	7.9	2.5	1.0	12.9	99	K5	K7
JUL 09...	1000	242	273	8.3	20.5	1.0	8.7	100	110	63

DATE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 19...	170	10	42	16	1.3	2	.0	1.0	2.0	7.0
JAN 08...	190	3	44	19	1.9	2	.0	.50	7.1	8.7
APR 18...	100	6	25	10	.80	2	.0	.90	2.4	5.2
JUL 09...	160	10	36	17	1.1	1	.0	.50	1.4	6.8

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059500 FORD RIVER NEAR HYDE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLORIDE, DIS-SOLVED (MG/L AS CL)	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N)
OCT 19...	1215	3.3	<.10	7.1	197	170	.27	291	<.10
JAN 08...	1330	2.7	<.10	8.8	235	200	.32	91	.46
APR 18...	1130	2.0	<.10	4.8	118	110	.16	615	<.10
JUL 09...	1000	2.0	<.10	5.8	196	160	.27	128	<.10

DATE	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DIS-SOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	SEDIMENT, DIS-SOLVED (MG/L)	SEDIMENT, DIS-SOLVED (T/DAY)	SEDIMENT, SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 19...	.040	.80	.040	--	.010	19	28	78
JAN 08...	.080	.60	<.010	<.010	<.010	7	2.7	61
APR 18...	<.010	3.3	--	<.010	--	43	224	21
JUL 09...	.020	.80	<.010	<.010	<.010	5	3.3	91

DATE	ALUMINUM, DIS-SOLVED (UG/L AS AL)	ARSENIC, DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYLLIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM, DIS-SOLVED (UG/L AS CD)	CHROMIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)
OCT 19...	30	<1	17	.0	<1	4	<3	1	140	<1
JAN 08...	10	<1	16	<.5	1	10	<3	2	120	1
APR 18...	20	1	13	<.5	<1	7	<3	2	69	6
JUL 09...	20	2	14	<.5	<1	3	<3	1	56	3

DATE	LITHIUM, DIS-SOLVED (UG/L AS LI)	MANGANESE, DIS-SOLVED (UG/L AS MN)	MERCURY, DIS-SOLVED (UG/L AS HG)	MOLYBDENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELENIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRONTIUM, DIS-SOLVED (UG/L AS SR)	VANADIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)
OCT 19...	<4	9	<.1	<10	1	<1	<1	53	<6	<3
JAN 08...	<4	7	<.1	<10	<1	<1	<1	51	<6	8
APR 18...	<4	4	.1	<10	1	<1	<1	26	<6	<3
JUL 09...	8	13	<.1	<10	6	<1	<1	48	<6	<3

STREAMS TRIBUTARY TO LAKE MICHIGAN

73

04061000 BRULE RIVER NEAR FLORENCE, WI

LOCATION.--Lat 45°57'31", long 88°15'57", in SE1/4 SE1/4 sec.11, T.41 N., R.32 W., Michigan Meridian, Iron County, Hydrologic Unit 04030106, on left bank 40 ft upstream from highway bridge, 1.0 mi upstream from Paint River, 2.5 mi north of Florence, and 5.0 mi upstream from confluence with Michigamme River.

DRAINAGE AREA.--389 mi².

PERIOD OF RECORD.--January 1914 to February 1916, June 1944 to current year.

REVISED RECORDS.--WSP 1387: 1914-16. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,200.55 ft above National Geodetic Vertical Datum of 1929 (levels by Owen Ayres Associates). Prior to Aug. 29, 1944, nonrecording gage at bridge 40 ft downstream at same datum.

REMARKS.--Estimated daily discharges: Nov. 18-27, Dec. 2 to Mar. 23, Apr. 1, July 13-31, Aug. 16-22. Records excellent except for estimated daily discharges, which are fair. Discharge includes some mine pumpage prior to August 1977. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--42 years (water years 1915, 1945-85), 364 ft³/s, 12.71 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,700 ft³/s, July 2, 1953, gage height, 6.57 ft; maximum gage height, 8.60 ft, Dec. 20, 1983, backwater from ice; minimum discharge, 118 ft³/s, Dec. 2, 1963 (discharge measurement); minimum gage height, 1.79 ft, July 24, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,370 ft³/s, Apr. 21, 22, gage height, 3.77 ft; maximum gage height, 7.30 ft, Dec. 24, backwater from ice; minimum daily discharge, 216 ft³/s, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	318	446	314	300	240	320	420	547	636	280	226	271
2	295	455	310	300	250	330	414	510	567	277	226	246
3	282	399	300	300	260	300	421	478	491	273	223	375
4	279	401	280	290	260	290	431	473	430	276	216	508
5	267	376	270	290	270	270	420	451	396	342	226	432
6	261	353	290	310	260	280	402	468	369	363	267	366
7	262	336	310	310	250	300	397	490	360	361	259	333
8	286	338	320	300	240	310	384	446	364	335	244	520
9	296	335	320	290	230	320	361	419	514	296	233	525
10	295	338	320	290	220	320	358	468	520	277	330	438
11	292	325	320	280	250	320	433	539	410	273	392	376
12	283	311	300	280	260	320	486	534	365	268	368	327
13	281	311	300	280	270	320	655	495	347	265	326	304
14	276	313	290	280	270	310	754	446	334	260	358	283
15	280	326	300	280	260	300	935	419	307	255	304	276
16	313	343	320	280	250	290	1040	429	338	250	290	263
17	425	326	350	280	250	300	1120	468	340	250	260	254
18	502	300	400	270	250	310	1090	462	340	270	250	251
19	477	280	360	260	250	320	994	424	340	290	265	247
20	450	270	310	250	260	320	915	392	339	270	285	245
21	413	270	290	260	280	330	1110	368	329	260	260	244
22	384	270	280	280	290	330	1070	353	335	255	250	269
23	340	270	270	280	290	330	1030	335	330	260	279	343
24	320	270	270	280	300	345	1040	326	303	270	368	557
25	309	280	270	280	300	345	1080	330	290	285	358	596
26	321	320	280	280	300	355	1010	478	282	300	326	512
27	338	400	310	280	300	439	870	556	302	280	308	451
28	471	413	350	280	310	590	736	462	342	270	299	390
29	457	371	320	280	---	550	644	392	332	260	287	432
30	391	331	320	260	---	466	596	506	318	245	280	821
31	371	---	310	250	---	429	---	652	---	230	286	---
TOTAL	10535	10077	9554	8730	7420	10659	21616	14116	11270	8646	8849	11455
MEAN	340	336	308	282	265	344	721	455	376	279	285	382
MAX	502	455	400	310	310	590	1120	652	636	363	392	821
MIN	261	270	270	250	220	270	358	326	282	230	216	244
CFSM	.87	.86	.79	.73	.68	.88	1.85	1.17	.97	.72	.73	.98
IN.	1.01	.96	.91	.83	.71	1.02	2.07	1.35	1.08	.83	.85	1.10
CAL YR 1984	TOTAL	138369	MEAN 378	MAX 1150	MIN 244	CFSM .97	IN 13.23					
WTR YR 1985	TOTAL	132927	MEAN 364	MAX 1120	MIN 216	CFSM .94	IN 12.71					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04061500 PAINT RIVER AT CRYSTAL FALLS, MI

LOCATION.--Lat 46°06'21", long 88°20'05", in SE1/4 sec.20, T.43 N., R.32 W., Iron County, Hydrologic Unit 04030106, on right bank 150 ft downstream from municipal powerplant at Crystal Falls, and 14.5 mi upstream from mouth.

DRAINAGE AREA.--597 mi².

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1174: 1947-48(m). WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,306.1 ft above National Geodetic Vertical Datum of 1929 (Wisconsin Electric Power Co. benchmark).

REMARKS.--Estimated daily discharges: Jan. 20 to Feb. 9. Records excellent. Diurnal fluctuation caused by powerplant immediately upstream; since storage capacity is small, daily flows are not affected appreciably. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--41 years, 605 ft³/s, 13.76 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,900 ft³/s, Apr. 25, 1960, gage height, 9.82 ft; minimum, 7.7 ft³/s, Sept. 17, 1950, gage height, 0.89 ft; minimum daily, 81 ft³/s, Nov. 1, 1947.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,250 ft³/s, Apr. 22, gage height, 7.95 ft; minimum, 116 ft³/s, June 24, gage height, 1.68 ft; minimum daily, 191 ft³/s, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	540	605	458	388	300	408	602	1420	1480	380	266	404
2	477	657	380	390	280	428	630	1210	1380	374	271	346
3	466	654	371	369	280	409	789	1040	1190	384	243	505
4	439	645	350	364	280	379	813	900	1010	322	191	1290
5	411	610	368	363	275	320	767	828	837	648	289	1470
6	414	553	402	352	285	369	726	770	730	863	309	1190
7	350	521	395	364	305	384	681	738	674	815	338	941
8	442	510	436	365	300	388	672	709	642	676	353	862
9	413	507	446	367	285	385	619	654	927	614	369	827
10	404	502	442	339	284	391	620	642	1020	517	510	798
11	405	471	419	348	319	413	690	746	786	443	626	712
12	411	457	426	340	301	407	828	1160	674	408	566	637
13	382	437	413	322	307	409	1210	1090	556	381	569	552
14	355	439	390	359	310	404	1800	990	495	301	594	471
15	400	437	399	338	313	398	2250	882	474	385	545	404
16	405	435	450	327	312	381	2920	828	477	316	498	423
17	468	367	536	340	309	381	3250	873	485	325	427	401
18	570	383	545	343	334	377	2900	909	493	325	414	405
19	608	356	487	315	312	386	2940	873	485	409	495	391
20	636	378	474	325	310	406	4570	786	477	411	444	375
21	545	331	443	325	325	407	6850	702	450	339	415	368
22	539	350	434	315	354	400	7050	630	432	367	393	350
23	509	406	423	315	384	428	5680	600	436	317	452	445
24	473	397	407	330	382	464	4330	530	473	328	656	829
25	462	406	394	335	379	500	3950	505	393	361	786	1330
26	470	410	387	315	387	536	3440	630	380	390	755	1170
27	488	443	408	295	388	651	2730	681	439	354	649	987
28	612	487	423	325	365	850	2280	681	618	295	567	851
29	658	496	432	315	---	921	1900	636	575	328	474	827
30	644	485	421	310	---	812	1620	827	432	290	448	1640
31	592	---	393	305	---	720	---	1400	---	285	422	---
TOTAL	14988	14135	13152	10503	8965	14512	70107	25870	19920	12951	14334	22201
MEAN	483	471	424	339	320	468	2337	835	664	418	462	740
MAX	658	657	545	390	388	921	7050	1420	1480	863	786	1640
MIN	350	331	350	295	275	320	602	505	380	285	191	346
CFSM	.81	.79	.71	.57	.54	.78	3.92	1.40	1.11	.70	.77	1.24
IN.	.93	.88	.82	.65	.56	.90	4.37	1.61	1.24	.81	.89	1.38
CAL YR 1984	TOTAL	216676	MEAN 592	MAX 2930	MIN 202	CFSM .99	IN 13.50					
WTR YR 1985	TOTAL	241638	MEAN 662	MAX 7050	MIN 191	CFSM 1.11	IN 15.06					

STREAMS TRIBUTARY TO LAKE MICHIGAN

75

04062000 PAINT RIVER NEAR ALPHA, MI

LOCATION.--Lat 46°00'40", long 88°15'30", in NW1/4 NW1/4 sec.25, T.42 N., R.32 W., Iron County, Hydrologic Unit 04030106, on right bank 0.6 mi downstream from Lower Paint Dam, 5.5 mi upstream from Brule River, and 6.0 mi southeast of Alpha.

DRAINAGE AREA.--631 mi².

PERIOD OF RECORD.--June 1952 to current year. Monthly discharge only for period October 1953 to September 1960, published in WSP 1727.

REVISED RECORDS.--WSP 1727: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,260 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).

REMARKS.--Estimated daily discharges: Nov. 8, 12, 18, Dec. 2-15, Dec. 18 to Mar. 21, Mar. 25, 29. Records good. Flow completely regulated by powerplant and Lower Paint Dam, 0.6 mi upstream. Records not adjusted for diversion to Michigamme River by Paint River diversion canal. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--33 years, 175 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,050 ft³/s, July 2, 1953, gage height, 10.50 ft; minimum daily, 62 ft³/s, Mar. 22, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,650 ft³/s, Apr. 22, gage height, 9.25 ft; minimum daily, 85 ft³/s, Apr. 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	93	91	91	88	90	283	820	628	93	100	96
2	98	91	91	91	88	90	156	400	626	93	100	96
3	94	91	91	90	88	90	99	90	363	93	101	129
4	93	91	91	90	88	90	118	88	88	94	101	134
5	97	91	91	90	88	90	86	88	88	99	102	120
6	97	91	91	90	88	90	86	88	88	93	103	96
7	95	91	91	90	88	90	86	88	99	91	103	96
8	95	91	91	90	88	90	86	88	89	97	103	96
9	94	91	91	90	88	90	86	88	90	93	103	95
10	93	91	91	90	88	90	86	91	89	93	103	95
11	93	91	91	90	88	90	86	88	88	93	103	95
12	93	91	91	90	88	90	87	478	88	95	103	94
13	93	91	91	90	88	90	88	820	88	95	103	93
14	93	91	91	89	88	90	85	810	88	95	103	93
15	91	91	91	89	88	90	105	464	89	95	101	93
16	91	91	95	89	88	90	335	88	88	95	98	102
17	93	90	93	89	88	90	928	89	89	95	98	93
18	91	91	100	89	88	90	848	89	88	95	98	93
19	93	91	96	89	88	90	589	89	89	95	102	95
20	93	90	91	89	88	90	1340	88	89	95	98	294
21	91	92	91	89	88	90	3890	88	91	96	98	511
22	91	91	91	89	88	89	4460	88	91	102	98	509
23	91	90	91	89	89	88	4270	88	91	97	98	509
24	92	89	91	89	90	89	3930	88	91	98	98	508
25	92	91	91	88	90	90	3670	89	91	98	98	522
26	92	91	91	88	90	88	3300	91	91	98	98	520
27	93	91	91	88	90	88	2790	91	91	98	309	359
28	93	91	91	88	90	91	1940	91	91	98	302	93
29	93	91	91	88	---	98	1220	91	93	98	300	94
30	92	91	91	88	---	223	1030	107	93	100	311	99
31	91	---	91	88	---	249	---	394	---	101	98	---
TOTAL	2889	2728	2841	2767	2475	3083	36563	6338	4046	2971	4334	5922
MEAN	93.2	90.9	91.6	89.3	88.4	99.5	1219	204	135	95.8	140	197
MAX	98	93	100	91	90	249	4460	820	628	102	302	522
MIN	91	89	91	88	88	88	85	88	88	91	98	93
CAL YR 1984	TOTAL	46991	MEAN 128	MAX 725	MIN 85							
WTR YR 1985	TOTAL	76957	MEAN 211	MAX 4460	MIN 85							

LOCATION.--Lat 46°06'50", long 88°12'57", in NW1/4 sec.20, T.43 N., R.31 W., Iron County, Hydrologic Unit 04030107, on right bank 400 ft upstream from highway bridge, 5.0 mi downstream from Michigamme Reservoir, 6.0 mi east of Crystal Falls, and 15 mi upstream from confluence with Brule River.

REVISID RECORDS.--WSP 1911: Drainage area.

REMARKS.--No estimated daily discharges. Records excellent. Flow regulated by powerplant and by Michigamme Reservoir, capacity, 119,950 acre-ft, 5 mi upstream. Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,260 ft³/s, Apr. 28, 1960, gage height, 10.73 ft; minimum daily, 71 ft³/s, Nov. 26, 1950.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,210 ft³/s, Apr. 26, gage height, 9.98 ft; minimum daily, 140 ft³/s, Mar. 12, 13.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	604	189	170	993	973	654	1080	2150	1270	642	831	998
2	599	184	170	990	967	704	1120	1510	1440	643	828	994
3	591	179	427	986	962	666	1040	1180	1440	644	825	840
4	629	178	622	983	953	602	987	1170	1160	660	803	419
5	662	176	663	980	948	580	494	1160	1150	399	809	200
6	661	175	692	979	942	552	173	1160	1020	175	826	200
7	661	174	692	1040	936	522	184	1160	803	436	845	198
8	661	173	692	1080	931	501	781	1160	689	580	846	206
9	659	175	688	1080	924	480	1180	1160	690	614	845	206
10	655	175	688	1140	919	468	1170	1170	683	646	709	206
11	655	173	688	1190	913	233	1240	1400	682	644	362	456
12	655	173	690	1190	905	140	1230	1730	676	645	156	574
13	655	171	687	1190	898	140	640	1730	675	645	171	800
14	653	171	690	1190	889	235	236	1720	672	643	174	1030
15	652	175	688	1190	881	212	253	1480	645	734	390	1020
16	652	171	695	1200	871	162	263	1200	613	853	656	1090
17	672	173	697	1200	860	162	257	1200	615	851	655	1200
18	662	173	695	1190	835	230	242	1200	615	606	752	1190
19	672	444	692	1180	787	164	273	1200	610	374	850	1180
20	667	594	689	1180	792	160	303	943	609	863	871	1170
21	663	595	808	1180	793	162	310	687	609	858	899	1150
22	660	592	908	1170	608	165	1310	684	614	855	895	1150
23	657	591	906	1170	150	484	3310	682	610	853	970	950
24	634	591	903	1160	492	790	4780	639	608	859	1050	633
25	605	591	900	1150	717	835	5000	601	599	737	1040	208
26	361	552	960	1150	700	884	5140	620	360	639	1030	197
27	175	367	1010	1140	677	896	5630	618	399	739	1030	196
28	182	170	1000	1130	661	1040	4890	614	731	843	1020	196
29	180	171	998	1040	---	1170	3680	611	645	836	1020	208
30	186	171	995	983	---	1130	2610	674	642	838	1010	283
31	178	---	995	977	---	1150	---	975	---	835	1000	---
TOTAL	17458	8589	22798	34401	22884	16273	49806	34188	22574	21189	24168	19348
MEAN	563	286	735	1110	817	525	1660	1103	752	684	780	645
MAX	672	595	1010	1200	973	1170	5630	2150	1440	863	1050	1200
MIN	175	170	170	977	150	140	173	601	360	175	156	196
CAL YR 1984	TOTAL	244142	MEAN 667	MAX	2040	MIN 150						
WTR YR 1985	TOTAL	293676	MEAN 805	MAX	3630	MIN 140						

STREAMS TRIBUTARY TO LAKE MICHIGAN

77

04063000 MENOMINEE RIVER NEAR FLORENCE, WI

LOCATION.--Lat 45°57'04", long 88°11'13", in NE1/4 sec.16, T.41 N., R.31 W., Michigan Meridian, Iron County, Hydrologic Unit 04030108, on left bank 0.5 mi downstream from confluence of Brule and Michigamme Rivers, 3.5 mi northeast of Florence, and at mile 117.

DRAINAGE AREA.--1,780 mi².

PERIOD OF RECORD.--January 1914 to current year. Published as "at Twin Falls near Iron Mountain, MI" 1914-57. Records published for both sites July 1950 to September 1957.

REVISED RECORDS.--WSP 1707: 1953(M). WSP 1911: Drainage area of former site.

GAGE.--Water-stage recorder. Datum of gage is 1,119.23 ft above National Geodetic Vertical Datum of 1929 (levels by Owen Ayres Associates). Prior to July 1950, headwater and tailwater gages and generation data entered hourly in daily log sheets by company employees at the Twin Falls Powerplant of Wisconsin Electric Power Co., 10.4 mi downstream.

REMARKS.--No estimated daily discharges. Records excellent. Prior to July 1950, discharge determined from powerplant records computed on basis of load-discharge rating of hydroelectric units and rating for tailwater gage during periods of spill. Rating developed by Geological Survey. Flow regulated by powerplants, Michigamme Reservoir, capacity, 119,950 acre-ft, and Peavy Pond, capacity, 33,860 acre-ft, on Michigamme River, and by many smaller reservoirs upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--71 years, 1,822 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 19,500 ft³/s, Apr. 26, 1960, gage height, 14.15 ft; minimum, 38 ft³/s, Aug. 21, 1962, Sept. 26, 1975; minimum gage height, 1.18 ft, Aug. 21, 1962, Nov. 4, 1965; minimum daily discharge, 57 ft³/s, Sept. 26, 1975.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 12,000 ft³/s, Apr. 23, gage height, 10.61 ft; minimum, 270 ft³/s, Oct. 3, gage height, 2.00 ft; minimum daily, 529 ft³/s, Nov. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1590	1690	618	1690	1680	1430	3220	4150	3820	1430	1450	1820
2	1650	2340	842	1690	1550	1810	3050	3460	3680	1630	1470	1660
3	1590	1460	1450	1800	1800	1630	2800	3070	3360	1550	1370	1960
4	1710	1460	1580	1900	1710	1790	2640	3040	2960	1330	1330	2120
5	1520	1500	1430	1750	1360	1920	1950	2790	2790	1860	1490	2100
6	1500	1290	1360	1750	1560	2070	1990	2770	2420	1770	1520	2210
7	1550	1200	1460	1890	1570	2130	1740	2500	1820	1900	1590	2200
8	1870	1230	1350	1880	1550	2020	1660	2410	1700	1700	1440	2170
9	1700	1430	1480	1940	1550	2010	1870	2500	1870	1890	1580	2140
10	1690	529	1640	1750	1600	1880	1830	2620	2340	1700	1510	1660
11	1760	821	1540	1900	1570	1850	1980	2970	2050	1680	1730	1610
12	1670	856	1480	1930	1430	1670	2550	3430	2380	1420	1820	1710
13	1700	1450	1590	1850	1500	1790	2600	3690	1880	1280	983	1850
14	1580	1430	1610	1770	1570	1800	2420	3650	1840	1480	1210	2260
15	1540	1340	1570	1900	1650	1680	2630	3500	1390	1070	1690	1930
16	1380	1390	1680	1970	1660	1730	3650	2910	1560	1340	1660	1960
17	1510	982	1680	1980	1590	1840	4510	2770	1800	1270	1930	1810
18	1470	682	1620	1850	1670	1930	4910	2450	1720	1300	2010	1960
19	1690	843	1630	1590	1450	1830	4490	2190	1780	1350	1530	1430
20	1370	1390	1610	1820	1390	1890	4950	1990	1580	1300	1680	1970
21	1420	1490	1830	1840	1590	1820	8290	1910	1700	1420	1600	1920
22	1510	745	1700	1810	1610	1800	9920	1910	1390	1370	1630	1990
23	1420	1350	1870	1850	890	1530	11700	1740	1410	1500	1970	1950
24	1450	994	1810	1990	1210	1740	10700	1660	1620	1510	1950	2040
25	1400	1050	1740	1830	1670	1960	10200	1450	1810	1560	1680	2220
26	1330	1430	1850	1900	1440	1850	10300	1740	1720	1560	1810	2340
27	1410	1770	1850	1880	1370	1720	9340	1520	1320	1400	1870	2260
28	1770	1610	1790	1900	1940	2350	7010	2010	2000	1400	1920	1740
29	1540	1540	1690	1830	---	2930	4930	1710	1270	1480	2060	1610
30	1440	1470	1760	1670	---	2970	4430	2480	1110	1490	2210	2770
31	1620	---	1880	1840	---	2690	---	3460	---	1480	1810	---
TOTAL	48350	38762	48990	56940	42730	60060	144260	80450	60090	46420	51503	59370
MEAN	1560	1292	1580	1837	1526	1937	4809	2595	2003	1497	1661	1979
MAX	1870	2340	1880	1990	1800	2970	11700	4150	3820	1900	2210	2770
MIN	1330	529	618	1590	890	1430	1660	1450	1110	1070	983	1430

CAL YR 1984 TOTAL 658836 MEAN 1800 MAX 4250 MIN 529
WTR YR 1985 TOTAL 737925 MEAN 2022 MAX 11700 MIN 529

STREAMS TRIBUTARY TO LAKE MICHIGAN

04066003 MENOMINEE RIVER BELOW PEMENE CREEK NEAR PEMBINE, WI

LOCATION.--Lat 45°34'46", long 87°47'13", in NE1/4 sec.29, T.37 N., R.28 W., Michigan Meridian, Menominee County, Hydrologic Unit 04030108, on left bank 40 ft downstream from County Trunk Z bridge, 0.9 mi downstream from Pemene Creek, 3.9 mi west of Nathan, 10.6 mi southeast of Pembine, WI, and at mile 64.3.

DRAINAGE AREA.--3,140 mi².

PERIOD OF RECORD.--October 1949 to current year. Published as "near Pembine, WI" prior to August 1982. Monthly discharge only for some periods, published in WSP 1307.

GAGE.--Water-stage recorder. Elevation of gage is 740 ft above National Geodetic Vertical Datum of 1929, from topographic map. October 1949 to Oct. 27, 1972, water-stage recorder at site 1.0 mi upstream at different datum, and Oct. 28, 1972, to August 1982, water-stage recorder at site 1.5 mi upstream at different datum.

REMARKS.--Estimated daily discharges: Dec. 3 to Mar. 26. Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants, by Michigamme Reservoir, capacity, 119,950 acre-ft, and Peavy Pond, capacity, 33,860 acre-ft, on the Michigamme River, and by many smaller reservoirs upstream from station.

AVERAGE DISCHARGE.--36 years, 3,019 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 26,900 ft³/s, May 8, 1960, gage height, 13.90 ft, site and datum then in use; minimum, 694 ft³/s, Sept. 3, 1969, gage height, 1.66 ft, site and datum then in use.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 16,300 ft³/s, Apr. 24, gage height, 14.08 ft; maximum gage height, 15.42 ft, Jan. 4, backwater from ice; minimum daily discharge, 1,200 ft³/s, Feb. 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2450	3670	2620	2600	2100	2000	4750	6980	6020	2180	1930	2430
2	2500	4290	2110	2600	2000	2300	4410	6160	5900	2310	1900	2470
3	2370	3430	1800	2500	1800	2300	4310	5040	5620	2530	1860	2130
4	2390	3210	1900	2500	1800	2200	4240	4540	4720	2210	1710	2630
5	2330	3130	2000	2600	1800	2200	4030	4680	4410	2690	1770	2770
6	2270	2810	2200	2600	1800	2300	3890	4430	4050	3040	2200	2980
7	2310	2660	2200	2700	1900	2400	3740	3970	3400	3010	2290	2850
8	2050	2630	2400	2400	1900	2300	3130	4140	3270	3090	2100	3510
9	2300	2630	2500	2400	1900	2200	3270	4110	3340	2900	1860	4230
10	2440	2300	2700	2600	1900	2300	3270	4380	3720	2920	2070	3280
11	2370	2210	2700	2600	1900	2400	3530	4930	4040	2710	2150	2840
12	2380	2260	2600	2500	2000	2400	3930	5180	3860	2360	2270	2900
13	2360	2450	2500	2500	1900	2300	5400	5670	3610	2180	2930	2690
14	2260	2510	2500	2600	1700	2400	5720	5580	3340	1830	1890	2740
15	2120	2530	2500	2500	1800	2400	5690	5090	2880	1950	1950	2840
16	2140	2580	2700	2400	1900	2200	6480	5040	2880	1740	2230	2720
17	2300	2350	2900	2400	2000	2300	8330	4500	3000	1720	2230	2540
18	2610	1790	3100	2500	1900	2400	8670	4400	3110	1740	2320	2420
19	3110	1820	2900	2500	2000	2500	8520	4000	3320	1720	2380	2510
20	3060	2120	2700	2400	2100	2600	9290	3800	3110	1810	2320	2400
21	2910	2300	2700	2300	2000	2500	10900	3510	2880	1880	2220	2610
22	2940	2010	2700	2300	1900	2400	14000	3060	2990	1800	2130	2570
23	2670	1740	2600	2300	2000	2600	15300	3140	2840	1960	2030	2640
24	2550	1910	2400	2400	1200	2900	16100	2590	2850	1910	2270	3190
25	2320	1660	2300	2400	1600	3300	15100	2590	2970	2120	2380	3750
26	2420	2010	2500	2400	2000	3600	14400	2800	2760	2330	2450	4010
27	2460	2430	2800	2400	2100	3480	14200	3590	2650	2100	2390	3720
28	2960	3090	3000	2400	2100	4520	12200	3660	2380	2070	2360	3370
29	3230	2860	2800	2400	---	5430	9040	3520	2110	2060	2640	2730
30	2900	3000	2600	2400	---	5160	6530	3490	2180	2030	2710	3850
31	2760	---	2700	2200	---	5220	---	4770	---	2020	2490	---
TOTAL	78240	76390	78630	76300	53000	87510	232350	133340	104210	68940	68430	88320
MEAN	2524	2546	2536	2461	1893	2823	7745	4301	3474	2224	2207	2944
MAX	3230	4290	3100	2700	2100	5430	16100	6980	6020	3090	2930	4230
MIN	2050	1660	1800	2200	1200	2000	3130	2590	2110	1720	1710	2130
CAL YR 1984	TOTAL	1036520	MEAN	2832	MAX	7550	MIN	1340				
WTR YR 1985	TOTAL	1145660	MEAN	3139	MAX	16100	MIN	1200				

STREAMS TRIBUTARY TO LAKE MICHIGAN

79

04067500 MENOMINEE RIVER NEAR McALLISTER, WI

LOCATION.--Lat 45°19'33", long 87°39'48", in SW1/4 SE1/4 sec.17, T.33 N., R.23 E., Marinette County, WI, Hydrologic Unit 04030108, on right bank 85 ft downstream from bridge on County Highway JJ, 2.9 mi downstream from Grand Rapids Dam, 2.6 mi east of McAllister, WI, 1.9 mi downstream from Little Cedar River, and at mile 22.6.

DRAINAGE AREA.--3,930 mi².

PERIOD OF RECORD.--March 1945 to September 1961; October 1961 to September 1979, miscellaneous measurements and peaks only; October 1979 to current year.

REVISED RECORDS.--WDR WI-80-1: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 622.20 ft above National Geodetic Vertical Datum of 1929 (Michigan Department of Transportation reference mark). Prior to May 15, 1945, nonrecording gage 1,400 ft downstream at same datum; May 16, 1945, to September 1961, water-stage recorder 1,000 ft downstream at same datum; October 1961 to September 1979, crest-stage gage 1,100 ft downstream at same datum.

REMARKS.--Estimated daily discharges: Dec. 6-10, 13-16, and Dec. 18 to Apr. 8. Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants, by Michigamme Reservoir, capacity, 119,950 acre-ft, and Peavy Pond, capacity, 33,860 acre-ft, on the Michigamme River, and by many smaller reservoirs upstream from station.

AVERAGE DISCHARGE.--22 years (water years 1946-61, 1980-85), 3,535 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 32,500 ft³/s, May 9, 1960, gage height, 20.0 ft, from graph based on gage readings; minimum observed, 538 ft³/s, Oct. 6, 1946, gage height, 7.29 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 17,800 ft³/s, Apr. 25, gage height, 16.62 ft; minimum daily, 1,810 ft³/s, July 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2740	4350	4020	2900	2400	2400	6800	7670	6010	2300	2150	2980
2	2910	5430	3620	3000	2400	2400	5800	7840	6650	2430	2170	2780
3	2710	5600	3280	2900	2300	2900	5600	7420	6550	2450	2200	2780
4	2710	4510	2140	2600	2200	2900	5600	6200	6060	2760	1860	2540
5	2680	4200	2290	3000	2200	2700	5600	4700	5050	2860	2230	3150
6	2650	3890	2500	3400	2200	2600	5600	5420	4510	3210	2690	3200
7	2600	3720	2500	3300	2000	3000	5400	5330	4210	3610	2860	3490
8	2550	3500	2800	3200	2000	3100	5400	4870	4020	3230	2750	3680
9	2350	3330	3200	3000	2100	2700	4930	5180	4050	3430	2660	4230
10	2680	3510	3100	2900	2100	2500	4520	4950	4330	3360	2330	4960
11	2670	3060	3380	3000	2400	3100	4870	5090	4620	3120	2430	3620
12	2780	3090	3310	3300	2200	3100	5400	5980	4960	2810	2440	3180
13	2650	3010	3100	2800	2000	2900	5720	6150	4460	2730	2670	3310
14	2660	3210	3000	2900	2000	2900	7170	6520	3580	2240	3090	3200
15	2590	3190	3000	3100	2000	3000	7530	6250	3520	2140	2400	2950
16	2500	3280	3300	2700	2200	3000	7700	5760	3360	1970	2300	3100
17	2450	3270	3860	2800	2400	2600	8790	6030	3300	2070	2760	3100
18	2790	3000	3800	2800	2300	3000	10100	5170	3570	1960	3040	2990
19	3550	2070	3600	2700	1900	3100	10400	5380	3540	2000	2890	2770
20	4300	2410	3400	2500	2400	3000	10400	4680	3700	1810	2760	2650
21	4050	2600	3500	2500	2300	3100	11100	4690	3460	1910	2740	2640
22	3630	2790	3100	2600	2200	3200	12800	3810	3490	1920	2730	2880
23	3580	2460	2600	2600	2200	3100	15700	3490	3310	1830	3110	2890
24	3330	2320	2800	2600	2100	3300	16800	3770	2950	2280	3230	3510
25	3050	2290	2500	2700	2100	4100	17300	2940	3100	2170	3190	4040
26	3230	2080	2500	2700	2200	4500	17100	3740	2940	2290	3120	4730
27	3160	2520	2800	2800	2300	5000	16300	4630	2860	2430	3370	4640
28	3600	3570	3500	2800	2400	5400	15300	5180	2910	2350	3220	4620
29	3970	4170	3700	2700	---	6600	13600	4630	2420	2300	3000	3530
30	4240	3860	3300	2700	---	7000	10400	4680	2240	2240	2860	4350
31	3630	---	3000	2600	---	6800	---	4650	---	2210	2910	---
TOTAL	94990	100290	96500	88100	61500	109000	279690	162800	119730	76420	84160	102490
MEAN	3064	3343	3113	2842	2196	3516	9323	5252	3991	2465	2715	3416
MAX	4300	5600	4020	3400	2400	7000	17300	7840	6650	3610	3370	4960
MIN	2350	2070	2140	2500	1900	2400	4520	2940	2240	1810	1860	2540
CAL YR 1984	TOTAL	1291500	MEAN	3529	MAX	9510	MIN	1580				
WTR YR 1985	TOTAL	1375670	MEAN	3769	MAX	17300	MIN	1810				

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096400 ST. JOSEPH RIVER NEAR BURLINGTON, MI

LOCATION.--Lat 42°06'10", long 85°02'25", in SW1/4 SW1/4 sec.20, T.4 S., R.6 W., Calhoun County, Hydrologic Unit 04050001, on right bank 10 ft upstream from bridge on 13 Mile Road, 2.0 mi east of Burlington, 4.0 mi downstream from Tekonsha Creek, and at mile 164.

DRAINAGE AREA.--201 mi².

PERIOD OF RECORD.--October 1962 to current year.

GAGE.--Water-stage recorder. Datum of gage is 916.21 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 8-10, 24-26, Jan. 8 to Feb. 22, and Aug. 30 to Sept. 6. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--23 years, 174 ft³/s, 11.76 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,340 ft³/s, Mar. 21, 1982, gage height, 5.78 ft; minimum, 8.0 ft³/s, Aug. 9, 10, 11, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,220 ft³/s, Feb. 27, gage height, 5.58 ft; minimum daily, 35 ft³/s, Sept. 3, 4, 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	62	89	141	412	145	1120	503	218	139	67	59	36
2	59	99	136	517	145	1010	506	208	128	66	56	36
3	56	108	135	473	140	886	524	200	120	64	52	35
4	53	111	131	420	140	829	534	193	114	61	48	35
5	51	106	122	434	140	806	563	187	111	61	50	35
6	50	102	120	450	135	736	778	186	108	70	63	37
7	54	97	121	448	135	667	780	180	103	74	67	40
8	62	94	120	415	135	640	692	173	99	69	61	52
9	67	95	120	370	135	633	644	167	96	64	55	70
10	73	106	120	340	135	600	606	160	91	71	50	78
11	68	171	114	310	135	577	580	154	93	86	48	76
12	63	194	118	290	135	564	547	150	106	77	45	67
13	62	199	135	280	135	540	511	145	111	77	43	59
14	64	201	150	260	135	525	478	140	106	95	42	54
15	62	198	164	250	135	506	451	141	103	116	50	51
16	63	193	166	240	135	485	424	147	112	129	57	48
17	63	190	163	230	135	465	399	158	114	124	61	45
18	61	180	157	220	135	440	378	156	111	115	58	43
19	65	167	154	210	135	416	359	151	107	101	53	41
20	66	153	150	205	133	391	338	147	99	91	50	38
21	101	142	153	200	133	365	318	149	94	85	48	37
22	112	134	185	195	160	344	304	139	94	80	47	37
23	111	129	194	190	370	333	290	132	94	73	45	40
24	104	126	190	180	867	328	280	128	92	67	45	52
25	96	123	180	175	1130	318	273	122	92	63	46	48
26	92	121	165	170	1050	308	259	118	86	64	46	54
27	90	119	157	165	1180	310	251	151	79	71	44	51
28	88	133	177	160	1140	350	246	185	75	71	42	48
29	83	139	271	155	---	460	235	176	73	63	39	45
30	79	143	314	150	---	488	226	167	71	58	38	45
31	77	---	306	145	---	482	---	154	---	58	37	---
TOTAL	2257	4162	5029	8659	8763	16922	13277	4982	3021	2431	1545	1433
MEAN	72.8	139	162	279	313	546	443	161	101	78.4	49.8	47.8
MAX	112	201	314	517	1180	1120	780	218	139	129	67	78
MIN	50	89	114	145	133	308	226	118	71	58	37	35
CFSM	.36	.69	.81	1.39	1.56	2.72	2.20	.80	.50	.39	.25	.24
IN.	.42	.77	.93	1.60	1.62	3.13	2.46	.92	.56	.45	.29	.27
CAL YR 1984	TOTAL	58799	MEAN 161	MAX 515	MIN 30	CFSM .80	IN 10.88					
WTR YR 1985	TOTAL	72481	MEAN 199	MAX 1180	MIN 35	CFSM .99	IN 13.41					

STREAMS TRIBUTARY TO LAKE MICHIGAN

81

04096515 HOG CREEK NEAR ALLEN, MI

LOCATION.--Lat 41°56'55", long 84°49'40", in NE1/4 SE1/4 sec.13, T.6 S., R.5 W., Branch County, Hydrologic Unit 04050001, on left bank 12 ft downstream from bridge on U.S. Highway 12, 1.0 mi downstream from Little Hog Creek, and 3.1 mi west of Allen.

DRAINAGE AREA.--48.7 mi².

PERIOD OF RECORD.--October 1969 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 1,010 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to May 23, 1970, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 3-9, 22-28, Jan. 2-5, Jan. 8 to Feb. 22, and Feb. 24-27. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--16 years, 43.6 ft³/s, 12.16 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 664 ft³/s, Feb. 25, 1985, gage height, 6.0 ft, from floodmarks; minimum, 1.2 ft³/s, Aug. 20, 21, 1971; minimum gage height, 1.32 ft, Aug. 25, 26, 27, 28, 1984.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 664 ft³/s, Feb. 25, gage height, 6.0 ft, from floodmarks; minimum, 4.1 ft³/s, Aug. 21, 22, gage height, 1.33 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.1	16	25	124	22	282	176	38	30	9.2	13	5.5
2	5.9	22	24	170	22	243	170	36	28	9.4	11	4.6
3	5.7	17	23	185	22	206	160	33	25	9.0	10	5.6
4	5.4	16	21	175	22	193	146	32	23	8.5	9.5	5.6
5	5.4	15	19	150	22	203	148	31	22	9.4	10	5.5
6	5.2	15	18	119	22	215	215	31	20	9.6	11	7.1
7	6.5	14	17	96	22	194	271	30	19	9.2	11	8.4
8	13	13	17	76	22	177	249	28	18	9.4	9.9	7.6
9	11	15	18	70	22	171	213	27	18	8.6	8.8	14
10	10	21	19	62	22	163	182	25	16	16	7.9	14
11	9.3	46	20	56	22	155	158	24	17	14	7.4	11
12	9.1	57	24	51	22	150	142	24	24	12	6.9	9.4
13	9.3	49	31	47	22	144	129	23	20	13	7.1	8.3
14	12	42	34	43	22	134	117	21	18	23	8.2	7.4
15	12	40	37	40	22	122	111	29	17	46	9.6	7.2
16	13	40	35	37	22	109	100	46	21	41	11	6.8
17	12	35	33	34	22	96	87	38	20	25	9.6	6.5
18	11	32	31	32	22	84	78	34	20	19	6.4	6.2
19	12	29	30	29	22	78	72	33	17	17	4.9	6.0
20	12	26	30	28	22	74	67	28	16	15	4.6	5.8
21	22	24	31	27	22	69	62	26	15	14	4.4	5.7
22	20	22	38	26	62	64	58	24	14	13	4.7	5.8
23	16	21	45	25	197	64	55	23	14	12	6.0	6.4
24	14	21	43	24	451	65	53	21	13	11	6.3	9.2
25	13	20	40	24	629	64	56	19	12	10	6.6	7.2
26	14	20	38	23	482	60	53	18	12	18	6.3	7.7
27	13	20	43	23	392	60	49	27	11	19	6.1	7.3
28	13	29	52	23	331	78	45	39	10	16	5.7	6.6
29	12	30	69	23	---	121	43	37	10	14	5.4	6.0
30	12	27	84	23	---	160	40	34	9.6	12	5.8	6.0
31	12	---	89	23	---	174	---	33	---	12	5.8	---
TOTAL	346.9	794	1078	1888	3006	4172	3505	912	529.6	474.3	240.9	220.4
MEAN	11.2	26.5	34.8	60.9	107	135	117	29.4	17.7	15.3	7.77	7.35
MAX	22	57	89	185	629	282	271	46	30	46	13	14
MIN	5.2	13	17	23	22	60	40	18	9.6	8.5	4.4	4.6
CFSM	.23	.54	.72	1.25	2.20	2.77	2.40	.60	.36	.31	.16	.15
IN.	.26	.61	.82	1.44	2.30	3.19	2.68	.70	.40	.36	.18	.17
CAL YR 1984	TOTAL	13782.2	MEAN	37.7	MAX	199	MIN	3.6	CFSM	.77	IN	10.53
WTR YR 1985	TOTAL	17167.1	MEAN	47.0	MAX	629	MIN	4.4	CFSM	.97	IN	13.11

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096600 COLDWATER RIVER NEAR HODUNK, MI

LOCATION.--Lat 42°01'45", long 85°06'25", in NW1/4 NE1/4 sec.22, T.5 S., R.7 W., Branch County, Hydrologic Unit 04050001, on downstream side of bridge on Girard Road, 2.5 mi northwest of Hodunk, and 3.5 mi upstream from mouth.

DRAINAGE AREA.--293 mi².

PERIOD OF RECORD.--October 1962 to current year.

REVISED RECORDS.--WDR MI-76-1: 1974.

GAGE.--Water-stage recorder. Elevation of gage is 900 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft). Prior to July 26, 1963, nonrecording gage and crest-stage gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 9, Jan. 11 to Feb. 17, and June 21 to July 7. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by mills upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--23 years, 255 ft³/s, 11.82 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,280 ft³/s, Feb. 26, 1985, gage height, 8.40 ft; minimum, 6.2 ft³/s, Sept. 26, 1964; minimum gage height, 2.28 ft, Oct. 4-14, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,280 ft³/s, Feb. 26, gage height, 8.40 ft; minimum, 32 ft³/s, Oct. 1, 3, gage height, 2.60 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	165	163	787	200	1620	984	349	165	48	99	56
2	33	167	161	1070	200	1460	997	336	163	47	92	55
3	33	174	153	1150	195	1320	958	296	159	46	88	55
4	33	170	153	1010	195	1280	940	198	157	44	86	52
5	33	161	145	953	195	1290	1020	198	151	43	88	53
6	34	157	143	885	190	1330	1320	194	145	50	88	56
7	40	153	147	775	190	1310	1600	192	139	52	61	59
8	50	149	145	682	190	1270	1480	190	133	52	58	61
9	55	149	145	604	190	1230	1370	184	129	50	55	75
10	55	157	145	517	190	1190	1270	178	125	69	52	81
11	53	192	145	485	195	1130	1170	174	125	75	50	79
12	52	224	155	440	200	1080	1080	172	133	74	50	74
13	52	226	167	415	200	1060	1010	165	135	70	49	70
14	56	218	182	400	205	997	949	165	127	121	52	70
15	58	215	190	380	210	940	889	167	129	192	65	67
16	61	209	196	370	210	885	831	176	133	192	72	67
17	90	200	190	350	210	827	779	190	133	186	69	65
18	129	190	184	345	209	775	724	194	110	167	67	64
19	131	182	182	335	211	728	682	192	75	155	64	62
20	131	176	176	330	209	690	644	184	72	149	62	61
21	291	172	184	325	209	652	601	176	70	145	59	59
22	444	167	213	317	242	561	564	170	67	139	64	59
23	402	163	237	300	587	458	532	165	66	112	65	64
24	310	161	235	280	1540	475	458	159	66	79	65	72
25	170	159	222	265	2220	490	394	153	64	77	65	67
26	170	170	196	250	2220	502	396	151	60	84	62	99
27	170	180	211	240	2030	496	388	172	56	104	61	153
28	167	180	246	230	1830	570	380	182	54	104	59	145
29	163	172	380	220	---	763	372	182	52	101	58	135
30	159	170	526	210	---	889	359	174	50	95	56	131
31	157	---	557	200	---	940	---	170	---	97	56	---
TOTAL	3815	5328	6474	15120	14872	29208	25141	5948	3243	3019	2037	2266
MEAN	123	178	209	488	531	942	838	192	108	97.4	65.7	75.5
MAX	444	226	557	1150	2220	1620	1600	349	165	192	99	153
MIN	33	149	143	200	190	458	359	151	50	43	49	52
CFSM	.42	.61	.71	1.67	1.81	3.22	2.86	.66	.37	.33	.22	.26
IN.	.48	.68	.82	1.92	1.89	3.71	3.19	.76	.41	.38	.26	.29
CAL YR 1984	TOTAL	89035	MEAN 243	MAX 945	MIN 22	CFSM .83	IN 11.30					
WTR YR 1985	TOTAL	116471	MEAN 319	MAX 2220	MIN 33	CFSM 1.09	IN 14.79					

STREAMS TRIBUTARY TO LAKE MICHIGAN

83

04096900 NOTTAWA CREEK NEAR ATHENS, MI

LOCATION.--Lat 42°03'20", long 85°18'30", in NW1/4 sec.12, T.5 S., R.9 W., St. Joseph County, Hydrologic Unit 04050001, on right bank at downstream side of bridge on Shorts Road, 4.2 mi southwest of Athens, and 5.0 mi downstream from Pine Creek.

DRAINAGE AREA.--162 mi².

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).

REMARKS.--Estimated daily discharges: Dec. 7, 8, 24-26, and Jan. 13 to Feb. 22. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 147 ft³/s, 12.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,340 ft³/s, Feb. 26, 1985, gage height, 6.03 ft; maximum gage height, 6.47 ft, June 29, 1978; minimum discharge, 21 ft³/s, July 28, 29, 30, Aug. 4, 6, 1977; minimum gage height, 0.37 ft, Oct. 16, 18, 20, 21, Nov. 8, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,340 ft³/s, Feb. 26, gage height, 6.03 ft; minimum, 40 ft³/s, Oct. 4, 5, 6; minimum gage height, 0.75 ft, Sept. 23, 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	88	134	466	115	985	501	163	153	68	61	64
2	47	115	119	581	115	829	477	156	137	68	54	63
3	45	131	114	608	115	692	444	151	126	65	49	63
4	42	127	108	559	115	607	417	147	119	61	47	62
5	41	111	101	468	115	574	442	145	115	65	54	59
6	40	98	98	396	115	583	613	149	111	67	67	57
7	49	91	95	337	115	576	784	156	107	64	72	58
8	70	86	92	284	110	568	805	155	105	63	71	61
9	80	86	90	233	110	573	734	149	103	59	64	60
10	79	104	92	205	110	572	635	141	98	66	57	80
11	67	166	99	190	110	556	553	135	100	67	49	93
12	56	202	110	172	110	544	483	131	113	61	43	98
13	54	206	135	165	110	527	429	129	119	67	45	91
14	59	192	160	160	110	497	390	124	111	90	52	76
15	63	167	181	150	110	459	365	123	106	108	70	67
16	60	148	187	145	115	417	347	130	113	104	80	63
17	58	135	181	145	115	380	324	134	121	90	79	61
18	54	123	165	140	115	343	296	133	119	73	72	59
19	63	114	150	140	115	313	275	133	111	66	63	58
20	77	106	139	135	115	293	255	130	101	65	62	57
21	113	100	140	135	115	271	238	129	93	66	62	56
22	137	94	183	130	130	252	223	125	93	65	62	54
23	148	95	211	130	309	241	211	122	95	61	61	52
24	145	95	200	130	750	239	202	118	97	57	61	66
25	126	94	180	125	1140	240	202	113	90	52	62	72
26	104	93	165	125	1320	231	201	105	83	54	65	68
27	94	96	145	125	1280	228	193	130	79	58	62	64
28	91	117	207	125	1140	250	184	168	75	55	60	60
29	86	139	263	120	---	363	176	188	73	54	58	55
30	81	144	343	120	---	482	166	184	70	50	58	56
31	78	---	380	120	---	502	---	170	---	54	62	---
TOTAL	2358	3663	4967	7064	8444	14187	11565	4366	3136	2063	1884	1953
MEAN	76.1	122	160	228	302	458	386	141	105	66.5	60.8	65.1
MAX	148	206	380	608	1320	985	805	188	153	108	80	98
MIN	40	86	90	120	110	228	166	105	70	50	43	52
CFSM	.47	.75	.99	1.41	1.86	2.83	2.38	.87	.65	.41	.38	.40
IN.	.54	.84	1.14	1.62	1.94	3.26	2.66	1.00	.72	.47	.43	.45

CAL YR 1984 TOTAL 44397 MEAN 121 MAX 427 MIN 34 CFSM .75 IN 10.19
WTR YR 1985 TOTAL 65650 MEAN 180 MAX 1320 MIN 40 CFSM 1.11 IN 15.08

LOCATION.--Lat 42°09'54", long 85°36'15", in NW1/4 sec.33, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050001, on right bank at downstream end of culvert on Osterhout Avenue, 3.8 mi northeast of Schoolcraft.

PERIOD OF RECORD.--October 1965 to December 1972, October 1982 to current year.

REMARKS.--No estimated daily discharges. Records poor. Canal diverts water from Gourdneck Creek to West Lake to sustain lake levels. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--10 years, 3.19 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 16 ft³/s, Dec. 10-12, 1966, Apr. 22-24, 1967; no flow on many days during November, December, 1970, January, February, 1971.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.70	.63	.14	1.1	.08	2.0	2.0	.70	.30	.77	.85	.63
2	.70	.44	.12	1.1	.06	2.0	1.8	.63	.39	.77	.94	.63
3	.63	.35	.14	.99	.08	1.9	1.7	.56	.39	.77	.94	.63
4	.63	.35	.10	.85	.17	2.3	1.5	.56	.39	.77	.85	.56
5	.63	.39	.08	.70	.26	2.6	2.0	.63	.39	.77	.94	.56
6	.63	.35	.08	.56	.30	2.5	2.6	1.0	.39	.77	1.0	.50
7	.70	.35	.08	.44	.17	2.4	2.6	.94	.39	.77	.94	.50
8	.70	.30	.06	.35	.14	2.5	2.4	.94	.39	.70	.99	.50
9	.56	.39	.08	.26	.14	2.5	2.2	.85	.39	.70	.99	.50
10	.56	.39	.08	.19	.14	2.5	2.0	.77	.39	.70	.94	.50
11	.56	.39	.08	.17	.19	2.6	1.8	.70	.44	.70	.94	.50
12	.56	.30	.10	.14	.17	2.8	1.7	.70	.39	.63	.85	.50
13	.56	.23	.08	.12	.17	2.7	1.5	.63	.39	.70	.85	.56
14	.56	.30	.17	.12	.19	2.6	1.5	.63	.39	.70	.85	.56
15	.50	.30	.14	.10	.17	2.5	1.6	.63	.44	.70	.94	.56
16	.50	.19	.12	.10	.17	2.3	1.6	.56	.44	.70	.85	.56
17	.50	.17	.12	.10	.14	2.2	1.4	.56	.50	.77	.85	.56
18	.50	.17	.10	.10	.14	2.0	1.2	.63	.50	.77	.85	.56
19	.63	.17	.10	.10	.12	1.9	1.1	.56	.50	.77	.85	.56
20	.63	.17	.06	.08	.12	1.8	.99	.56	.50	.85	.85	.56
21	.77	.17	.10	.08	.14	1.7	.94	.56	.56	.85	.85	.56
22	.63	.14	.12	.08	.26	1.6	.77	.56	.56	.85	.77	.56
23	.56	.14	.06	.08	2.0	1.6	.77	.63	.56	.77	.77	.56
24	.56	.14	.06	.08	2.5	1.6	.94	.56	.56	.77	.85	.50
25	.50	.14	.05	.08	2.3	1.5	.99	.56	.63	.85	.77	.44
26	.50	.17	.05	.08	2.2	1.4	.94	.56	.63	.85	.77	.39
27	.50	.19	.05	.08	2.3	1.6	.85	.63	.70	.85	.77	.35
28	.56	.23	.08	.08	2.2	2.0	.70	.50	.70	.85	.77	.39
29	.56	.17	.19	.08	---	2.3	.70	.50	.77	.85	.70	.39
30	.44	.14	.26	.08	---	2.2	.63	.50	.77	.85	.70	.50
31	.50	---	.23	.08	---	2.1	---	.44	---	.85	.70	---
TOTAL	18.02	7.96	3.28	8.55	17.02	66.2	43.42	19.74	14.74	23.97	26.48	15.63
MEAN	.58	.27	.11	.28	.61	2.14	1.45	.64	.49	.77	.85	.52
MAX	.77	.63	.26	1.1	2.5	2.8	2.6	1.0	.77	.85	1.0	.63
MIN	.44	.14	.05	.08	.06	1.4	.63	.44	.30	.63	.70	.35
CAL YR 1984	TOTAL 246.76		MEAN .67	MAX 8.0	MIN .05							
WTR YR 1985	TOTAL 265.01		MEAN .73	MAX 2.8	MIN .05							

STREAMS TRIBUTARY TO LAKE MICHIGAN

85

04097540 PRAIRIE RIVER NEAR NOTTAWA, MI

LOCATION.--Lat 41°53'18", long 85°24'34", in NW1/4 SW1/4 sec.6, T.7 S., R.9 W., St. Joseph County, Hydrologic Unit 04050001, on left bank 10 ft upstream from bridge on State Highway 66, 3.0 mi upstream from unnamed tributary, and 3.0 mi southeast of Nottawa.

DRAINAGE AREA.--106 mi².

PERIOD OF RECORD.--October 1962 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).

REMARKS.--Estimated daily discharges: Jan. 11 to Feb. 22. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--23 years, 94.3 ft³/s, 12.08 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 797 ft³/s, Feb. 26, 1985, gage height, 6.30 ft; minimum, 11 ft³/s, Aug. 9, 10, Sept. 8, 9, 10, 1964; minimum gage height, 1.77 ft, Aug. 9, 10, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 797 ft³/s, Feb. 26, gage height, 6.30 ft; minimum, 31 ft³/s, July 9, gage height, 2.21 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	49	78	96	228	95	533	334	126	82	44	43	35
2	48	86	93	270	90	454	332	124	78	43	44	35
3	46	89	91	302	88	394	317	120	76	41	41	35
4	43	88	87	322	86	379	297	115	75	40	38	35
5	41	85	84	317	85	377	306	110	73	37	41	34
6	40	82	81	288	85	379	367	110	70	35	50	40
7	44	80	79	258	85	384	400	107	68	35	60	50
8	56	76	78	234	85	384	424	103	66	35	64	56
9	66	77	78	218	84	362	429	98	65	33	61	64
10	67	80	80	195	84	336	382	95	64	56	56	72
11	64	105	81	180	84	315	339	92	65	59	52	79
12	60	121	85	165	83	300	305	90	69	56	48	79
13	59	125	92	160	83	285	278	88	70	51	47	73
14	62	121	100	155	83	270	258	85	70	61	49	68
15	61	116	106	150	83	255	246	83	71	73	66	62
16	59	110	109	145	83	241	233	84	75	75	73	58
17	58	105	108	135	83	229	220	87	78	73	73	54
18	56	100	105	130	83	217	208	88	79	68	70	51
19	59	95	102	130	83	207	197	89	76	61	64	48
20	62	92	100	125	84	199	188	88	72	56	60	46
21	83	88	101	125	84	191	179	86	68	56	56	44
22	101	86	115	120	100	183	171	83	68	52	53	43
23	106	83	124	120	231	178	164	80	66	47	50	47
24	101	81	125	115	498	175	159	77	64	42	49	58
25	94	80	119	115	685	171	157	73	60	38	48	60
26	90	79	105	110	782	167	152	71	57	43	46	58
27	87	79	103	110	761	167	147	78	53	47	43	55
28	83	89	118	108	644	190	142	88	51	51	40	53
29	80	95	134	105	---	233	137	91	48	50	38	50
30	77	98	158	105	---	264	131	91	45	46	37	49
31	74	---	173	100	---	306	---	87	---	43	36	---
TOTAL	2076	2769	3210	5340	5484	8725	7599	2887	2022	1547	1596	1593
MEAN	67.0	92.3	104	172	196	281	253	93.1	67.4	49.9	51.5	53.1
MAX	106	125	173	322	782	533	429	126	82	75	73	79
MIN	40	76	78	100	83	167	131	71	45	33	36	34
CFSM	.63	.87	.98	1.62	1.85	2.65	2.39	.88	.64	.47	.49	.50
IN	.73	.97	1.13	1.87	1.92	3.06	2.67	1.01	.71	.54	.56	.56
CAL YR 1984	TOTAL	36010	MEAN	98.4	MAX	256	MIN	20	CFSM	.93	IN	12.64
WTR YR 1985	TOTAL	44848	MEAN	123	MAX	782	MIN	33	CFSM	1.16	IN	15.74

STREAMS TRIBUTARY TO LAKE MICHIGAN

04097970 LIME LAKE OUTLET AT PANAMA, IN

LOCATION.--Lat 41°42'46", long 85°07'10", in NW1/4 NW1/4 sec.35, T.38 N., R.12 E., Steuben County, Hydrologic Unit 04050001, on right bank 10 ft downstream from dam for Lime Lake, 30 ft upstream from bridge on Orland Road, and 0.7 mi northwest of Panama.

DRAINAGE AREA.--17.5 mi², of which 3.68 mi² does not contribute directly to surface runoff.

PERIOD OF RECORD.--October 1969 to current year.

GAGE.--Water-stage recorder. Datum of gage is 950.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records good. Occasional regulation by control structure for Lime Lake.

AVERAGE DISCHARGE.--16 years, 7.96 ft³/s, 6.18 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 52 ft³/s, Apr. 10, 1985, gage height, 4.87 ft; no flow at times during 1971, 1972, and 1984.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 52 ft³/s, Apr. 10, gage height, 4.87 ft; minimum daily, 1.4 ft³/s, Oct. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	15	6.1	11	14	30	44	23	6.2	2.2	1.8	2.0
2	1.8	14	6.2	11	13	32	44	21	5.9	2.1	1.6	2.0
3	1.6	12	5.9	11	13	33	45	19	5.6	2.1	1.5	1.9
4	1.5	11	5.7	12	12	38	45	11	5.2	2.1	1.5	1.9
5	1.5	9.8	5.7	14	12	40	47	2.0	4.7	2.1	1.9	1.9
6	1.4	9.0	5.5	15	12	40	51	2.3	4.4	2.0	2.7	3.2
7	2.0	8.3	5.5	16	11	40	51	2.5	4.1	2.0	2.9	4.2
8	2.6	7.5	5.2	17	11	41	51	2.8	3.8	2.0	2.7	5.6
9	2.6	7.4	5.2	18	11	41	51	2.9	3.5	1.9	2.6	9.9
10	2.5	7.9	5.2	19	11	41	51	3.0	3.2	2.6	2.5	9.5
11	2.5	9.3	5.2	20	11	42	51	3.3	3.4	2.4	2.2	7.9
12	2.4	8.9	5.4	20	12	41	50	3.3	3.8	2.2	2.0	6.8
13	2.5	8.5	5.4	20	12	41	50	3.2	3.6	2.2	2.8	5.5
14	2.8	8.4	5.8	20	12	40	49	3.4	3.4	2.6	4.2	4.8
15	2.9	8.2	5.9	20	12	39	48	3.8	3.8	2.7	5.1	4.4
16	3.0	7.6	6.1	20	12	39	47	4.0	4.4	2.3	5.2	4.1
17	2.9	7.4	5.9	20	12	37	46	4.3	5.4	2.0	4.6	3.8
18	2.7	7.2	5.8	20	11	36	45	4.7	5.2	1.7	4.4	3.6
19	3.1	6.9	5.9	20	11	35	43	4.9	4.7	1.5	4.0	3.4
20	2.9	6.6	5.9	19	11	34	42	4.7	4.4	1.7	3.4	3.1
21	4.0	6.4	6.2	18	11	33	40	4.7	4.4	2.0	3.0	2.8
22	3.8	6.3	6.2	18	12	32	38	4.6	4.1	1.7	2.7	2.6
23	3.4	6.0	6.8	17	15	31	37	4.4	3.7	1.5	2.6	3.0
24	3.2	5.9	6.2	17	20	30	35	4.4	3.5	1.5	2.5	3.1
25	3.0	5.7	6.1	17	22	28	34	4.3	3.4	1.5	2.5	2.7
26	3.0	5.7	6.1	16	24	27	32	4.3	3.3	2.4	2.4	2.6
27	3.1	5.8	6.3	16	27	27	29	5.4	3.0	2.2	2.4	2.5
28	2.9	6.4	6.7	15	28	34	28	8.1	2.7	2.2	2.4	2.4
29	12	6.5	7.2	15	---	40	26	7.9	2.5	2.0	2.3	2.3
30	17	6.3	7.6	14	---	41	24	7.5	2.3	1.9	2.2	2.3
31	15	---	7.9	14	---	43	---	7.1	---	1.9	2.1	---
TOTAL	117.5	241.9	186.8	520	395	1126	1274	191.8	121.6	63.2	86.7	115.8
MEAN	3.79	8.06	6.03	16.8	14.1	36.3	42.5	6.19	4.05	2.04	2.80	3.86
MAX	17	15	7.9	20	28	43	51	23	6.2	2.7	5.2	9.9
MIN	1.4	5.7	5.2	11	11	27	24	2.0	2.3	1.5	1.5	1.9
CFSM	.27	.98	.44	1.22	1.02	2.63	3.08	.45	.29	.15	.20	.28
IN.	.32	.65	.50	1.40	1.06	3.04	3.43	.52	.33	.17	.23	.31
CAL YR 1984	TOTAL	2581.11	MEAN	7.05	MAX	20	MIN	.27	CFSM	.51	IN.	6.96
WTR YR 1985	TOTAL	4440.3	MEAN	12.2	MAX	51	MIN	1.4	CFSM	.88	IN.	11.97

STREAMS TRIBUTARY TO LAKE MICHIGAN

87

04099000 ST. JOSEPH RIVER AT MOTTVILLE, MI

LOCATION.--Lat 41°48'03", long 85°45'22", in SW1/4 sec.6, T.8 S., R.12 W., Michigan Meridian, St. Joseph County, Hydrologic Unit 04050001, on right bank 500 ft upstream from bridge on U.S. Highway 12 at Mottville, 0.4 mi downstream from Michigan Power Co. hydroelectric plant, 4 mi upstream from Pigeon River, and at mile 96.

DRAINAGE AREA.--1,866 mi².

PERIOD OF RECORD.--October 1923 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1930, 1932, 1938, 1940-42, 1945. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 755.3 ft, Michigan Power Co. datum. Prior to Oct. 1, 1951, at site 0.4 mi upstream at datum 4.2 ft higher.

REMARKS.--Estimated daily discharges: Jan. 9 to Feb. 22. Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--62 years, 1,593 ft³/s, 11.59 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,700 ft³/s, Apr. 27, 1950, gage height, 10.76 ft, present datum; minimum daily, 39 ft³/s, Oct. 19, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 9,680 ft³/s, Feb. 28, gage height, 9.57 ft; minimum, 180 ft³/s, May 29, gage height, 1.45 ft; minimum daily, 495 ft³/s, July 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1310	1380	1640	3650	1800	9470	4410	2530	1860	1030	806	575
2	997	1430	1690	4090	1750	8910	4640	2590	1510	1050	842	568
3	846	1510	1750	4550	1700	8020	4700	2330	1490	797	619	895
4	743	1680	1650	4550	1650	7620	4670	2240	1520	776	578	1090
5	966	1600	1370	4620	1600	6970	4760	2280	1490	836	814	683
6	688	1650	1630	4580	1600	6800	5220	2260	1300	647	991	707
7	711	1540	1440	4360	1600	6360	6310	2200	1070	648	997	554
8	1090	1400	1290	3770	1600	6360	6450	2000	1280	789	1070	564
9	1140	1450	1330	3500	1600	6200	6850	2190	1250	880	990	1110
10	1100	1410	1650	3200	1600	6020	6480	1940	1160	1030	600	1290
11	1060	1490	1490	3000	1600	5860	6090	1930	1350	1200	603	945
12	1110	1740	1510	2700	1600	5650	5660	1800	1200	639	964	1170
13	791	1760	1590	2600	1600	5290	5450	1770	1300	815	870	1050
14	787	1900	1680	2400	1600	5270	5230	1840	1390	905	862	904
15	1510	1900	1680	2350	1600	4840	4900	1640	1410	1550	1140	644
16	1240	1890	1750	2300	1600	4530	4710	1930	1450	1150	1010	818
17	983	1870	1870	2300	1600	4510	4190	1670	1470	900	1110	872
18	1000	1860	1920	2200	1600	4220	4190	1550	1350	1100	850	966
19	1100	1810	1870	2100	1600	3890	4090	1920	1540	1030	1100	795
20	980	1760	1790	2000	1600	4140	3830	1950	1350	853	1100	703
21	1460	1630	1820	2000	1600	3690	3670	1790	1340	932	762	549
22	1820	1570	1960	2000	1800	3590	3150	1590	1200	1220	817	561
23	1810	1670	2050	2000	2510	3530	3410	1660	998	1280	872	999
24	1750	1730	2050	2000	4590	3510	3130	1500	1200	714	545	918
25	1760	1560	2000	1800	6340	3130	3300	1470	1280	495	605	776
26	1870	1440	1850	2200	8320	3090	3070	1270	983	542	1160	796
27	1780	1510	1820	2150	9370	3070	3020	1530	1110	558	1000	912
28	1610	1670	1970	2100	9620	3350	2730	1920	1170	693	849	692
29	1590	1590	2160	2000	---	3450	2550	1700	786	884	814	651
30	1490	1640	2490	2000	---	3800	2610	1640	862	805	702	1120
31	1390	---	2820	1900	---	4460	---	1690	---	771	549	---
TOTAL	38482	49040	55780	86970	76650	159600	133470	58320	38669	27519	26591	24877
MEAN	1241	1635	1799	2805	2738	5148	4449	1881	1289	888	858	829
MAX	1870	1900	2820	4620	9620	9470	6850	2590	1860	1550	1160	1290
MIN	688	1380	1290	1800	1600	3070	2550	1270	786	495	545	549
CFSM	.67	.88	.96	1.50	1.47	2.76	2.38	1.01	.69	.48	.46	.44
IN.	.77	.98	1.11	1.73	1.53	3.18	2.66	1.16	.77	.55	.53	.50
CAL YR 1984 TOTAL	616821			MEAN 1685	MAX 3990	MIN 319	CFSM .90	IN 12.30				
WTR YR 1985 TOTAL	775968			MEAN 2126	MAX 9620	MIN 495	CFSM 1.14	IN 15.47				

STREAMS TRIBUTARY TO LAKE MICHIGAN

04099750 PIGEON RIVER NEAR SCOTT, IN

LOCATION.--Lat 41°44'56", long 85°34'35", in SE1/4 NW1/4 sec.14, T.38 N., R.8 E., Lagrange County. Hydrologic Unit 04050001, on right bank 20 ft downstream from bridge on County Road 750 North, 1,200 ft downstream from Page Ditch, 0.7 mi south of Indiana-Michigan State line, and 1.2 mi northwest of Scott.

DRAINAGE AREA.--361 mi², of which 53.9 mi² does not contribute directly to surface runoff.

PERIOD OF RECORD.--June 1968 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 815.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 8, 26, and Jan. 8 to Feb. 22. Records good.

AVERAGE DISCHARGE.--17 years, 368 ft³/s, 13.84 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,370 ft³/s, Mar. 21, 1982, gage height, 7.85 ft; minimum daily, 42 ft³/s, Oct. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,110 ft³/s, Feb. 25, gage height, 7.42 ft; minimum daily, 137 ft³/s, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	259	304	399	819	285	1900	1430	448	289	180	159	174
2	244	355	384	1120	280	1850	1490	430	279	176	154	175
3	228	366	379	1270	270	1790	1490	411	272	174	145	174
4	214	355	365	1220	265	1800	1470	397	262	170	137	172
5	204	345	345	1170	260	1830	1500	384	257	170	150	170
6	194	337	336	1150	260	1850	1670	376	250	175	175	194
7	208	332	328	1120	255	1760	1770	334	243	173	213	245
8	268	322	320	1070	250	1650	1670	341	235	169	190	218
9	286	316	313	1000	245	1570	1580	338	228	162	173	222
10	263	353	318	900	240	1490	1510	324	218	208	167	243
11	251	445	325	810	245	1410	1440	315	224	239	165	242
12	246	553	329	720	260	1340	1360	311	288	210	161	248
13	248	616	346	660	265	1270	1270	305	268	198	161	256
14	268	654	381	600	270	1210	1190	293	243	201	210	258
15	272	690	428	550	270	1130	1130	292	241	223	243	255
16	264	704	428	520	270	1060	1050	293	272	214	255	249
17	253	703	417	480	265	988	956	301	276	200	232	239
18	240	671	411	450	265	918	888	305	285	187	225	231
19	253	629	419	430	260	861	825	314	268	177	237	226
20	269	581	429	410	260	805	762	296	252	180	222	219
21	358	531	432	390	260	755	702	285	245	175	210	214
22	431	490	489	370	300	707	674	278	245	172	202	213
23	406	456	527	350	877	670	634	272	236	164	196	219
24	368	429	499	335	1690	622	609	264	231	150	193	263
25	346	405	471	330	2080	607	597	255	224	142	205	234
26	334	385	465	325	1980	584	565	249	213	189	206	220
27	324	374	458	320	1920	567	533	271	203	191	208	215
28	316	411	471	315	1910	647	509	335	193	170	204	203
29	298	446	537	310	---	1040	486	339	186	158	196	194
30	284	423	608	300	---	1420	465	308	185	150	187	193
31	275	---	648	290	---	1380	---	301	---	149	177	---
TOTAL	8672	13981	13005	20104	16257	37481	32225	9965	7311	5596	5958	6578
MEAN	280	466	420	649	581	1209	1074	321	244	181	192	219
MAX	431	704	648	1270	2080	1900	1770	448	289	239	255	263
MIN	194	304	313	290	240	567	465	249	185	142	137	170
CFSM	.91	1.52	1.37	2.11	1.89	3.94	3.50	1.05	.79	.59	.63	.71
IN.	1.05	1.69	1.58	2.44	1.97	4.54	3.90	1.21	.89	.68	.72	.80
CAL YR 1984	TOTAL	141186	MEAN	386	MAX	1080	MIN	100	CFSM	1.26	IN.	17.11
WTR YR 1985	TOTAL	177133	MEAN	485	MAX	2080	MIN	137	CFSM	1.58	IN.	21.46

STREAMS TRIBUTARY TO LAKE MICHIGAN

89

04100222 NORTH BRANCH ELKHART RIVER AT COSPERVILLE, IN

LOCATION.--Lat 41°28'54", long 85°28'32", in NE1/4 NW1/4 sec.22, T.35 N., R.9 E., Noble County, Hydrologic Unit 04050001, on right bank at downstream side of bridge on County Road 900 North, 1,300 ft downstream from Boyd Ditch, 1.7 mi upstream from Hustin Ditch, and 3.1 mi downstream from Waldron Lake.

DRAINAGE AREA.--142 mi².

PERIOD OF RECORD.--October 1971 to current year. October 1950 to September 1971 at site 3.1 mi upstream, published as North Branch Elkhart River near Cosperville. Records may not be equivalent.

GAGE.--Water-stage recorder. Datum of gage is 880.12 ft above National Geodetic Vertical Datum of 1929 (levels by Indiana Department of Natural Resources).

REMARKS.--Estimated daily discharges: Jan. 13, 19-26, Feb. 1-4, 7-9, 15, and 16. Records good. Flow regulated at times by dam at Waldron Lake.

AVERAGE DISCHARGE.--14 years, 141 ft³/s, 13.48 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 919 ft³/s, Mar. 23, 1982, gage height, 8.12 ft; minimum daily, 2.4 ft³/s, Nov. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 834 ft³/s, Feb. 27, gage height, 7.51 ft; minimum daily, 15 ft³/s, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	53	97	143	366	114	818	762	181	80	29	20	33
2	48	128	141	434	107	804	769	167	74	28	19	32
3	44	132	136	468	104	783	754	152	81	28	17	48
4	43	122	131	474	102	785	737	138	81	27	15	46
5	42	109	125	466	100	805	741	127	76	30	20	44
6	41	98	118	454	97	797	787	119	72	31	27	48
7	50	92	114	438	95	768	796	114	66	32	35	55
8	91	86	108	421	91	740	781	108	61	31	37	65
9	102	91	104	396	88	708	760	100	56	30	38	158
10	92	122	108	376	90	673	730	94	54	32	34	267
11	80	179	111	353	92	644	699	90	56	68	32	305
12	69	196	115	330	93	611	666	86	60	65	29	309
13	65	191	122	302	92	588	630	83	58	59	28	303
14	70	180	142	285	97	557	596	80	56	55	40	290
15	72	167	153	273	100	528	564	79	58	53	58	275
16	75	156	155	254	102	495	531	82	68	48	66	257
17	72	150	154	239	103	466	497	82	80	43	63	238
18	69	146	150	224	105	435	461	81	91	38	60	217
19	73	144	150	206	107	408	433	78	83	34	59	197
20	81	140	148	178	111	385	405	77	67	33	55	178
21	116	137	153	166	116	361	378	79	58	35	51	162
22	128	133	171	157	187	335	350	76	51	31	47	148
23	121	130	177	154	407	313	325	73	49	27	44	145
24	108	127	174	152	648	294	307	69	50	23	41	144
25	98	124	163	149	762	276	289	65	48	20	45	138
26	94	121	155	144	805	256	271	62	47	23	49	133
27	92	121	151	140	831	241	252	74	44	20	52	126
28	88	136	162	132	829	320	232	102	40	20	52	119
29	85	145	193	127	---	570	214	102	37	19	50	113
30	80	146	231	125	---	653	195	94	32	18	55	109
31	80	---	252	121	---	725	---	85	---	19	55	---
TOTAL	2422	4046	4610	8504	6575	17142	15912	2999	1834	1069	1293	4742
MEAN	78.1	135	149	274	235	553	530	96.7	61.1	34.5	41.7	158
MAX	128	196	252	474	831	818	796	181	91	68	66	309
MIN	41	86	104	121	88	241	195	62	32	18	15	44
CFSM	.55	.95	1.05	1.93	1.65	3.89	3.73	.68	.43	.24	.29	1.11
IN.	.63	1.06	1.21	2.23	1.72	4.49	4.17	.79	.48	.28	.34	1.24
CAL YR 1984	TOTAL	50356	MEAN	138	MAX	354	MIN	29	CFSM	.97	IN.	13.19
WTR YR 1985	TOTAL	71148	MEAN	195	MAX	831	MIN	15	CFSM	1.37	IN.	18.64

STREAMS TRIBUTARY TO LAKE MICHIGAN

04100500 ELKHART RIVER AT GOSHEN, IN

LOCATION.--Lat 41°35'36", long 85°50'55", in NE1/4 NE1/4 sec.8, T.36 N., R.6 E., Elkhart County, Hydrologic Unit 04050001, on right bank 20 ft downstream from River Avenue bridge at Goshen, 0.4 mi upstream from Rock Run, and at mile 16.1.

DRAINAGE AREA.--594 mi².

PERIOD OF RECORD.--April 1931 to current year.

REVISED RECORDS.--WSP 1337: 1939(M). WSP 1557: 1954. WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 769.43 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 20, 1931, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 5-9, Jan. 10-27, and Feb. 2-9, 14-17. Records good.

AVERAGE DISCHARGE.--54 years, 520 ft³/s, 11.89 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,360 ft³/s, Feb. 24, 1985; maximum gage height, 11.94 ft, Mar. 14, 1982; minimum daily discharge, 7.0 ft³/s, Aug. 11, 1964, result of extreme regulation.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,800 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 2	1100	3,300	7.88	Mar. 29	2400	5,000	10.05
Feb. 24	1400	*6,360	*11.87	Apr. 6	1900	4,080	8.74
Mar. 5	2000	3,830	8.37				

Minimum daily discharge, 142 ft³/s, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	255	476	660	2100	465	3210	3430	733	411	237	172	209
2	237	701	620	3100	440	3030	3180	704	387	226	170	204
3	222	768	614	2360	360	2840	2960	676	410	223	152	201
4	211	653	588	1960	380	2910	2770	648	393	218	142	194
5	204	591	540	1740	390	3680	2850	627	386	218	173	187
6	197	544	500	1580	390	3390	3920	615	377	215	198	204
7	224	507	480	1490	390	2900	3610	593	362	211	199	199
8	310	474	480	1400	390	2640	3090	540	348	216	197	195
9	393	476	500	1200	385	2450	2790	515	330	207	191	293
10	399	538	513	1100	382	2280	2580	495	316	241	181	657
11	377	761	532	980	388	2170	2400	483	332	281	170	625
12	352	1030	559	900	404	2130	2250	473	367	271	163	545
13	345	921	645	840	391	1990	2100	457	346	267	161	512
14	361	810	761	800	380	1820	1960	443	328	273	177	489
15	357	756	975	750	370	1700	1860	445	330	271	244	473
16	351	728	914	720	400	1580	1730	442	468	249	268	454
17	353	692	795	670	430	1470	1610	439	531	228	253	432
18	331	660	730	630	441	1370	1490	430	515	217	257	410
19	344	636	717	550	448	1280	1380	414	468	204	251	387
20	381	608	734	450	452	1210	1280	401	421	198	239	369
21	640	586	742	420	469	1130	1190	399	387	196	229	340
22	915	563	1060	480	726	1060	1120	392	360	199	220	330
23	752	547	1260	540	2810	1020	1060	380	341	182	211	327
24	593	533	977	550	6010	983	1010	368	324	171	226	361
25	544	518	816	560	4990	932	979	355	310	168	290	352
26	516	515	680	560	3770	887	923	340	293	188	256	330
27	493	515	698	550	3510	866	875	368	276	181	230	324
28	470	634	764	542	3410	1370	833	495	260	168	222	302
29	451	798	968	531	---	4000	796	513	246	158	215	286
30	441	720	1270	522	---	4440	758	467	238	152	233	283
31	422	---	1310	506	---	3540	---	444	---	165	219	---
TOTAL	12441	19259	23402	31081	33771	66278	58784	15094	10861	6599	6509	10474
MEAN	401	642	755	1003	1206	2138	1959	487	362	213	210	349
MAX	915	1030	1310	3100	6010	4440	3920	733	531	281	290	657
MIN	197	474	480	420	360	866	758	340	238	152	142	187
CFSM	.68	1.08	1.27	1.69	2.03	3.60	3.30	.82	.61	.36	.35	.59
IN.	.78	1.21	1.47	1.95	2.11	4.15	3.68	.95	.68	.41	.41	.66
CAL YR 1984	TOTAL	216287	MEAN	591	MAX	2300	MIN	169	CFSM	.99	IN.	13.55
WTR YR 1985	TOTAL	294553	MEAN	807	MAX	6010	MIN	142	CFSM	1.36	IN.	18.45

STREAMS TRIBUTARY TO LAKE MICHIGAN

91

04101000 ST. JOSEPH RIVER AT ELKHART, IN

LOCATION.--Lat 41°41'30", long 85°58'30", in SW1/4 NE1/4 sec.5, T.37 N., R.5 E., Elkhart County, Hydrologic Unit 04050001, on left bank 200 ft downstream from Elkhart River, 200 ft upstream from Main Street bridge in Elkhart, 2,000 ft downstream from Christiana Creek, 0.5 mi downstream from Elkhart Hydroelectric Plant, and at mile 76.5.

DRAINAGE AREA.--3,370 mi².

PERIOD OF RECORD.--August 1947 to current year. Gage heights at site 0.8 mile downstream at different datum from September 1924 to March 1926 are available from the district office.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 700.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 20-25, 27, 28, and Feb. 5, 7. Records good. Flow regulated by Elkhart Hydroelectric Plant.

AVERAGE DISCHARGE.--38 years, 3,203 ft³/s, 12.91 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 18,800 ft³/s, Feb. 27, 1985; maximum gage height, 27.91 ft, Mar. 21, 1982; minimum daily discharge, 336 ft³/s, Aug. 5, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 18,800 ft³/s, Feb. 27, gage height, 27.05 ft; minimum daily, 1,210 ft³/s, July 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
1	2200	2880	3490	7580	3720	16000	10700	4690	3100	1920	1470	1290	
2	2100	3220	3430	9510	3680	15300	10500	4560	2900	2010	1500	1290	
3	1780	3380	3470	9250	3560	14400	10400	4360	2720	1640	1300	1440	
4	1600	3530	3370	8680	3390	14000	10100	4150	2710	1590	1220	1880	
5	1830	3260	3080	8600	3300	14700	10300	4140	2700	1680	1450	1380	
6	1550	3300	3190	8320	3220	14000	12500	4140	2450	1510	1690	1480	
7	1620	3110	2980	7960	3200	12900	13100	4000	2320	1440	1770	1380	
8	2190	2830	2720	7540	3190	12400	12900	3720	2190	1520	1730	1390	
9	2300	2830	2820	6910	3190	12000	12700	3690	2380	1680	1710	1930	
10	2320	3090	3080	6900	3120	11400	12300	3530	2240	1880	1320	2630	
11	2230	3330	3120	6170	3160	11000	11500	3440	2390	2160	1280	2410	
12	2160	4060	3100	5820	3170	10800	10900	3320	2360	1550	1550	2220	
13	1960	3840	3360	5030	3390	10100	10300	3230	2480	1590	1530	2320	
14	1810	3920	3800	5200	3210	9800	9820	3030	2530	1770	1620	1950	
15	2450	3930	4010	4940	3100	9320	9430	3280	2500	2190	1940	1870	
16	2360	3890	3960	4710	3260	8660	8780	3240	2800	2380	1940	1800	
17	2130	3840	3930	4860	3380	8300	8460	3240	3000	1710	2010	1950	
18	2050	3790	3860	4540	3290	8000	7850	2870	2800	1720	1840	2000	
19	2420	3720	3880	4350	3260	7570	7660	3200	2940	1950	1880	1740	
20	2450	3600	3790	3400	3310	7310	7260	3540	2620	1500	1930	1650	
21	3120	3440	3770	2550	3290	7080	6860	3540	2540	1650	1730	1470	
22	3950	3270	4550	2630	4150	6640	6280	2960	2450	1730	1590	1450	
23	3810	3290	4740	3150	7340	6500	6210	2940	2250	2030	1650	1800	
24	3640	3380	4480	3700	14500	6370	5940	2800	2130	1590	1380	1900	
25	3420	3230	4210	4100	17500	5980	5960	2690	2540	1210	1460	1700	
26	3550	2960	3690	4220	17400	5250	5700	2480	2020	1320	1890	1710	
27	3320	3050	3790	4180	17900	5650	5470	2720	2040	1300	1920	1490	
28	3200	3420	4150	4140	16900	6540	5170	3230	2190	1360	1640	1260	
29	2520	3610	4790	4090	---	9370	4820	3270	1680	1570	1580	1650	
30	2880	3510	5420	4110	---	10900	4780	3140	1770	1480	1480	2170	
31	2810	---	5750	3940	---	11000	---	2980	---	1460	1320	---	
TOTAL	77730	102510	117780	171080	165080	309240	264650	106120	73740	52090	50320	52600	
MEAN	2507	3417	3799	5519	5896	9975	8822	3423	2458	1680	1623	1753	
MAX	3950	4060	5750	9510	17900	16000	13100	4690	3100	2380	2010	2630	
MIN	1550	2830	2720	2550	3100	5250	4780	2480	1680	1210	1220	1260	
CFSM	.74	1.01	1.13	1.64	1.75	2.96	2.62	1.02	.73	.50	.48	.52	
IN.	.86	1.13	1.30	1.89	1.82	3.41	2.92	1.17	.81	.57	.56	.58	
CAL YR 1984	TOTAL	1222820		MEAN	3341	MAX	7460	MIN	1020	CFSM	.99	IN.	13.50
WTR YR 1985	TOTAL	1542940		MEAN	4227	MAX	17900	MIN	1210	CFSM	1.25	IN.	17.03

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101500 ST. JOSEPH RIVER AT NILES, MI
(National stream quality accounting network station)

LOCATION.--Lat 41°49'45", long 86°15'35", in SW1/4 sec.26, T.7 S., R.17 W., Berrien County, Hydrologic Unit 04050001, on right bank 100 ft upstream from Main Street Bridge at Niles, 0.6 mi downstream from dam at French Paper Co., 1 mi upstream from Dowagiac River, and at mile 44.

DRAINAGE AREA.--3,666 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1931, 1933-36, 1940-43, 1945-46(M). WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 633.02 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, at datum 2.00 ft higher. Oct. 1, 1930, to Feb. 11, 1931, nonrecording gage on Main Street Bridge, and Feb. 12 to June 30, 1931, nonrecording gage 50 ft upstream from present site (gage heights referred to NGVD). Since Apr. 13, 1970, auxiliary water-stage recorder at sewage-treatment plant, 1.1 mi downstream from base gage at same datum. Oct. 1, 1943, to Apr. 12, 1970, auxiliary gage was headwater gage at hydroelectric plant at Buchanan Dam, 8 mi downstream from base gage at different datum.

REMARKS.--Estimated daily discharges: Feb. 5, 6, 8, and 9. Water-discharge records good except for estimated daily discharges, which are fair. Flow regulated by powerplants upstream from station.

AVERAGE DISCHARGE.--55 years, 3,288 ft³/s, 12.18 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 20,200 ft³/s, Apr. 5, 1950, gage height, 15.10 ft, present datum; minimum daily, 420 ft³/s, Aug. 30, 1931.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 19,900 ft³/s, Feb. 25, gage height, 14.96 ft; minimum daily, 1,650 ft³/s, Aug. 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2230	3310	3590	8210	3960	17000	11700	5310	3460	2190	1820	1810
2	2500	3480	3650	11300	3880	16300	11300	5080	3470	2280	1850	1790
3	2280	3550	3920	10700	3750	15500	10900	5010	3190	2280	1920	1710
4	2190	3950	3750	9400	3500	14900	10800	4560	3180	2100	1670	2100
5	1930	3500	3420	8920	3450	16500	11100	4430	3150	1980	1680	1870
6	2060	3360	3580	9270	3400	15800	13800	4680	3060	1950	1870	1810
7	2170	3650	3380	8320	3320	14300	14300	4540	2830	2020	2050	1970
8	2210	3320	2920	7950	3300	13300	13800	4460	2560	1950	2290	1820
9	2690	3020	3110	7200	3350	13000	13000	4100	2760	1930	2030	2120
10	2690	3140	3200	7190	3470	12400	13000	4260	2710	2450	2010	2810
11	2680	3820	3570	6630	3470	11800	12200	3980	2750	2400	1740	3010
12	2610	4000	3270	6170	3390	11500	11500	3990	2930	2400	1650	2640
13	2840	4390	3780	5840	3540	11100	11000	3770	2820	1970	2040	2680
14	2740	4130	4090	5470	3570	10400	10500	3660	2870	2080	1960	2580
15	2690	4110	4700	5090	3340	10200	9980	3890	3120	2220	2250	2450
16	3160	4060	4490	5140	3390	9460	9410	3610	3120	2840	2540	2220
17	2520	3970	4260	5000	3600	8940	9100	3910	3660	2270	2360	2170
18	2410	4000	4080	5020	3600	8370	8110	3640	3270	2050	2400	2340
19	2700	3940	4130	4610	3540	8050	8160	3460	3310	2230	2030	2330
20	3430	3880	4040	3840	3700	7780	7830	3900	3320	2280	2430	2230
21	3410	3660	4150	2740	3550	7740	7350	4110	3090	1970	2350	1940
22	4250	3480	4790	2720	4710	6990	6710	3870	2910	1980	1930	1920
23	4350	3460	5420	3270	7940	6930	6420	3400	2850	2220	1970	1900
24	3590	3500	4800	4130	16200	6840	6550	3440	2590	2350	2030	2250
25	3670	3510	4520	4510	19300	6510	6220	3310	2650	1880	1940	2420
26	3750	3350	3970	4430	17300	5910	6360	3170	2740	1860	1930	2090
27	3780	3350	4100	4220	17000	5810	5930	3170	2380	1740	2490	1890
28	3510	3540	4200	4390	17300	6870	5860	3570	2400	1730	2170	1750
29	3020	4090	5310	4320	---	10300	5330	4000	2440	1820	2020	1780
30	2810	3720	5940	4300	---	12100	5040	3570	2090	2000	2090	2280
31	3150	---	6110	4360	---	12000	---	3340	---	1930	1880	---
TOTAL	90020	110240	128240	184660	173820	334600	283260	123190	87680	65350	63390	64680
MEAN	2904	3675	4137	5957	6208	10790	9442	3974	2923	2108	2045	2156
MAX	4350	4390	6110	11300	19300	17000	14300	5310	3660	2840	2540	3010
MIN	1930	3020	2920	2720	3300	5810	5040	3170	2090	1730	1650	1710
CFSM	.79	1.00	1.13	1.63	1.69	2.94	2.58	1.08	.80	.58	.56	.59
IN.	.91	1.12	1.30	1.87	1.76	3.40	2.87	1.25	.89	.66	.64	.66

CAL YR 1984 TOTAL 1346310 MEAN 3678 MAX 8380 MIN 1050 CFSM 1.00 IN 13.66
WTR YR 1985 TOTAL 1709130 MEAN 4683 MAX 19300 MIN 1650 CFSM 1.28 IN 17.34

STREAMS TRIBUTARY TO LAKE MICHIGAN
04101500 ST. JOSEPH RIVER AT NILES, MI--Continued
WATER-QUALITY RECORDS

93

PERIOD OF RECORD.--Water years 1979 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1979 to September 1984.

WATER TEMPERATURE: February 1979 to September 1984.

INSTRUMENTATION.--Water-quality monitor from Oct. 9, 1980 to Sept. 30, 1984.

REMARKS.--Bimonthly cross-sectional samples were collected at Grant Street bridge 0.2 mi upstream from gage. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from these samples were not published.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1982, 1984): Maximum, 678 microsiemens, Feb. 16, 1982; minimum, 278 microsiemens, Mar. 19, 1982.

WATER TEMPERATURE (water years 1980, 1982-84): Maximum daily recorded (more than 20 percent missing record), 29.0°C, July 20, 21, 1980; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV 21...	1000	3890	575	8.2	3.5	1.7	13.0	97	4900	>10000
JAN 29...	1330	4440	618	8.1	.0	1.5	14.2	99	>6000	2800
MAR 22...	1100	7090	485	8.2	7.5	2.0	12.3	105	6000	4200
APR 26...	1000	6410	514	8.3	18.0	4.5	9.5	103	K870	220
JUL 16...	0900	2740	535	8.2	23.5	3.5	7.6	91	1900	K3500
SEP 11...	1000	3540	514	8.2	22.0	2.0	7.4	85	K12000	5000

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 21...	280	69	77	21	12	8	.3	2.2	2.5	60
JAN 29...	290	56	78	22	12	8	.3	2.0	3.5	56
MAR 22...	240	44	68	18	9.0	7	.3	1.7	2.4	50
APR 26...	260	39	72	19	9.4	7	.3	2.0	2.1	46
JUL 16...	250	34	67	21	14	11	.4	2.0	2.7	46
SEP 11...	240	24	63	21	15	12	.4	2.4	2.7	44

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101500 ST. JOSEPH RIVER AT NILES, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
NOV 21...	1000	24	.20	8.4	352	330	.48	3700	1.9
JAN 29...	1330	24	.10	8.7	405	340	.55	4860	2.3
MAR 22...	1100	19	.20	4.7	319	290	.43	6110	1.9
APR 26...	1000	20	.20	3.0	351	300	.48	6070	1.3
JUL 16...	0900	27	.20	4.0	339	310	.46	2510	1.1
SEP 11...	1000	25	.20	3.9	334	310	.45	3190	.81

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 21...	.270	2.2	.030	<.010	<.010	20	--	79
JAN 29...	.210	.40	.040	.010	--	58	695	68
MAR 22...	.050	.90	<.010	<.010	<.010	17	325	80
APR 26...	.100	1.0	.060	.020	.020	26	450	86
JUL 16...	.100	1.1	.080	<.010	<.010	26	192	88
SEP 11...	.340	1.1	.080	.020	<.010	33	315	60

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
NOV 21...	10	1	54	<.5	<1	2	<3	<1	16	1
MAR 22...	<10	<1	44	<.5	<1	<1	<3	3	23	3
APR 26...	20	1	60	<.5	<1	2	<3	2	17	2
SEP 11...	20	2	62	<.5	<1	<1	<3	3	<3	2

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
NOV 21...	6	13	.2	<10	<1	<1	<1	150	<6	17
MAR 22...	6	17	<.1	<10	1	<1	1	120	<6	<3
APR 26...	5	4	.2	<10	2	<1	<1	130	<6	11
SEP 11...	9	<1	<.1	<10	2	<1	1	130	<6	3

STREAMS TRIBUTARY TO LAKE MICHIGAN

95

04101800 DOWAGIAC RIVER AT SUMNERVILLE, MI

LOCATION.--Lat 41°54'57", long 86°12'47", in SE1/4 sec.30, T.6 S., R.16 W., Cass County, Hydrologic Unit 04050001, on right bank 30 ft upstream from bridge on Indian Lake Road, 0.3 mi west of Sumnerville.

DRAINAGE AREA.--255 mi².

PERIOD OF RECORD.--October 1960 to current year.

GAGE.--Water-stage recorder. Datum of gage is 692.62 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by millpond and lake-level control dam upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years, 287 ft³/s, 15.28 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,590 ft³/s, Feb. 24, 1985, gage height, 9.26 ft; minimum, 86 ft³/s, Sept.10, 1964; minimum gage height, 2.57 ft, Aug. 8, 9, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,590 ft³/s, Feb. 24, gage height, 9.26 ft; minimum, 155 ft³/s, Aug. 14, gage height, 3.17 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	263	398	326	850	302	826	607	342	262	185	181	168
2	247	519	309	863	290	733	574	331	251	184	180	168
3	233	449	341	651	268	675	544	314	238	181	173	168
4	223	395	320	516	289	801	529	305	230	181	167	166
5	216	365	297	465	293	1060	783	301	226	189	168	166
6	211	343	291	439	291	888	1110	337	219	187	174	166
7	279	327	286	423	283	757	947	326	214	182	179	166
8	399	315	284	406	283	747	744	309	209	178	177	170
9	365	319	278	382	269	747	647	299	204	176	172	191
10	321	353	297	366	293	701	595	287	197	186	165	199
11	297	364	327	354	293	703	563	277	207	190	165	193
12	278	353	373	349	301	690	537	272	249	185	161	185
13	325	332	448	335	281	640	518	266	231	182	158	180
14	391	319	464	339	296	610	505	255	222	228	161	176
15	370	310	463	331	298	572	505	261	243	310	278	174
16	337	296	408	333	293	541	495	263	294	262	267	173
17	313	287	384	333	300	516	475	266	297	238	224	170
18	296	282	355	332	295	494	459	262	290	225	242	167
19	327	277	345	320	296	487	445	255	258	214	240	166
20	345	270	337	233	296	473	430	251	244	206	215	165
21	485	267	349	301	305	455	417	268	235	198	206	162
22	506	261	471	331	476	445	408	253	233	192	199	164
23	431	261	425	319	949	441	400	246	229	183	193	168
24	377	259	385	317	1490	451	398	239	237	174	190	172
25	348	256	349	320	1550	441	405	225	221	169	194	172
26	334	255	321	313	1400	426	390	218	217	181	190	174
27	324	273	330	315	1240	466	380	261	206	181	185	178
28	316	401	405	315	993	643	372	300	199	174	180	178
29	303	389	490	311	---	757	357	277	192	170	177	175
30	293	350	536	307	---	690	349	261	187	166	181	176
31	290	---	484	307	---	628	---	270	---	167	172	---
TOTAL	10043	9845	11478	12076	14213	19504	15888	8597	6941	6024	5914	5196
MEAN	324	328	370	390	508	629	530	277	231	194	191	173
MAX	506	519	536	863	1550	1060	1110	342	297	310	278	199
MIN	211	255	278	233	268	426	349	218	187	166	158	162
CFSM	1.27	1.29	1.45	1.53	1.99	2.47	2.08	1.09	.91	.76	.75	.68
IN.	1.47	1.44	1.67	1.76	2.07	2.85	2.32	1.25	1.01	.88	.86	.76
CAL YR 1984 TOTAL	108497		MEAN 296	MAX 793	MIN 137	CFSM 1.16	IN 15.83					
WTR YR 1985 TOTAL	125719		MEAN 344	MAX 1550	MIN 158	CFSM 1.35	IN 18.34					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04102500 PAW PAW RIVER AT RIVERSIDE, MI

LOCATION.--Lat 42°11'10", long 86°22'06", in SW1/4 SE1/4 sec.23, T.3 S., R.18 W., Berrien County, Hydrologic Unit 04050001, on left bank 40 ft upstream from bridge on Coloma Road, 0.8 mi east of Riverside.

DRAINAGE AREA.--390 mi².

PERIOD OF RECORD.--October 1951 to current year.

REVISED RECORDS.--WSP 1337: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 588.80 ft above National Geodetic Vertical Datum of 1929. May 10, 1966, to July 11, 1967, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 11 to Feb. 22. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation, principally during low flow, caused by paper mill upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 447 ft³/s, 15.56 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,980 ft³/s, Feb. 27, 1985, gage height, 10.42 ft; minimum, 99 ft³/s, July 5, 1964, gage height, 2.66 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,980 ft³/s, Feb. 27, gage height, 10.42 ft; minimum, 257 ft³/s, July 30, 31, gage height, 4.08 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	423	417	467	926	460	2110	1570	524	387	296	294	281
2	389	475	468	1180	450	1930	1480	509	366	294	301	282
3	363	532	475	1050	440	1650	1280	496	355	291	311	275
4	335	524	474	1050	430	1560	1160	480	350	290	300	271
5	317	504	454	1070	430	1890	1230	464	340	303	292	269
6	310	499	437	1100	430	1740	1430	474	329	300	291	267
7	318	505	424	1080	430	1600	1380	482	321	298	302	265
8	351	505	418	991	430	1670	1370	481	324	293	305	266
9	383	492	408	873	430	1640	1510	470	326	287	309	281
10	398	485	413	776	430	1470	1450	459	315	283	306	318
11	406	484	430	700	430	1320	1270	453	326	282	294	352
12	415	472	454	640	430	1260	1130	438	357	282	281	361
13	429	467	507	600	430	1200	1020	412	361	279	276	350
14	443	470	565	560	430	1130	942	387	366	333	271	325
15	441	472	600	530	430	1070	879	390	372	385	311	301
16	436	468	623	510	430	1020	825	401	393	363	365	293
17	428	456	620	490	430	973	779	402	397	355	359	287
18	412	440	614	480	430	905	746	394	402	338	360	281
19	408	419	609	450	430	857	725	390	395	306	341	276
20	421	398	596	400	430	817	707	401	385	295	303	271
21	441	388	580	370	430	778	683	416	375	288	293	268
22	477	380	599	430	500	739	652	415	358	283	303	266
23	503	375	658	460	768	714	623	401	342	278	297	267
24	496	373	632	480	1690	702	609	396	343	273	282	276
25	485	372	600	480	1740	685	598	390	339	267	275	279
26	481	373	586	480	1720	661	581	377	333	273	292	280
27	481	378	566	480	2810	665	565	385	326	275	308	277
28	473	411	562	470	2630	918	556	398	316	297	292	275
29	458	451	630	470	---	1320	551	389	308	292	285	272
30	437	465	738	470	---	1150	539	395	300	262	282	273
31	410	---	778	470	---	1330	---	401	---	270	280	---
TOTAL	12968	13450	16985	20516	20948	37474	28840	13270	10507	9211	9361	8605
MEAN	418	448	548	662	748	1209	961	428	350	297	302	287
MAX	503	532	778	1180	2810	2110	1570	524	402	385	365	361
MIN	310	372	408	370	430	661	539	377	300	262	271	265
CFSM	1.07	1.15	1.41	1.70	1.92	3.10	2.46	1.10	.90	.76	.77	.74
IN.	1.24	1.28	1.62	1.96	2.00	3.57	2.75	1.27	1.00	.88	.89	.82
CAL YR 1984	TOTAL	169101	MEAN 462	MAX 1190	MIN 197	CFSM 1.19	IN 16.13					
WTR YR 1985	TOTAL	202135	MEAN 554	MAX 2810	MIN 262	CFSM 1.42	IN 19.28					

STREAMS TRIBUTARY TO LAKE MICHIGAN

97

04102700 SOUTH BRANCH BLACK RIVER NEAR BANGOR, MI

LOCATION.--Lat 42°21'15", long 86°11'15", in NW1/4 sec.28, T.1 S., R.16 W., Van Buren County, Hydrologic Unit 04050002, on left bank 50 ft upstream from bridge on 66th Street, 4.9 mi northwest of Bangor.

DRAINAGE AREA.--83.6 mi².

PERIOD OF RECORD.--June 1966 to current year. Prior to October 1981, published as Black River near Bangor.

REVISED RECORDS.--WDR MI-81: 1973-75(M), 1979(M).

GAGE.--Water-stage recorder. Elevation of gage is 610 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).

REMARKS.--Estimated daily discharges: Dec. 7, 8, 23-27, and Jan. 7 to Feb. 22. Records good except for estimated daily discharges, which are fair. Occasional regulation caused by mills upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 106 ft³/s, 17.22 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,680 ft³/s, Apr. 19, 1975, gage height, 13.16 ft; minimum, 20 ft³/s, Sept. 28, 1966, Aug. 18, 19, 1984; minimum gage height, 1.79 ft, Aug. 18, 19, 1984.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 2	1100	663	9.32	Mar. 29	0300	910	10.60
Feb. 24	1700	*1,400	*12.34	Apr. 6	1900	650	9.42
Mar. 5	1300	1,030	11.07				

Minimum discharge, 28 ft³/s, July 12, 13, 14, 24, 25, 29, 30; minimum gage height, 2.06 ft, July 12, 13, 14, 24, 25, 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	61	75	361	74	532	362	66	45	31	36	34
2	39	115	69	602	74	448	295	63	43	31	33	33
3	37	96	69	485	74	367	243	61	42	30	31	32
4	35	79	69	327	74	416	221	58	41	30	29	30
5	34	69	63	242	74	941	328	58	41	34	36	31
6	33	65	61	189	74	714	574	80	40	33	38	31
7	37	62	60	160	74	570	572	81	39	33	42	31
8	59	59	58	140	74	462	409	72	38	31	41	32
9	55	61	57	130	74	432	295	66	37	30	36	47
10	49	85	63	120	74	375	231	61	36	31	33	56
11	45	85	81	110	75	341	189	57	37	30	32	52
12	42	81	105	100	75	346	165	55	45	29	31	46
13	47	73	166	95	75	304	152	52	42	29	32	41
14	57	67	167	90	75	260	143	50	39	56	32	38
15	54	62	179	88	75	225	138	51	43	55	41	36
16	50	58	152	85	76	197	131	51	54	44	44	34
17	46	55	129	83	76	178	125	50	52	39	38	33
18	43	53	111	81	77	162	117	54	50	36	35	32
19	45	51	99	80	78	152	111	58	45	34	34	31
20	51	49	92	79	78	145	103	54	42	34	32	30
21	69	48	96	78	78	137	96	61	40	33	31	30
22	83	46	200	76	100	130	91	56	40	32	30	31
23	73	46	160	75	405	127	86	52	40	30	30	31
24	62	46	130	74	1210	131	84	49	43	29	30	31
25	56	45	118	74	1150	131	87	47	38	29	32	32
26	53	46	130	74	899	125	84	46	36	36	32	32
27	51	48	140	74	807	145	77	56	35	33	31	34
28	50	81	151	74	644	499	71	63	33	30	30	34
29	48	94	250	74	---	847	69	56	32	29	29	33
30	46	83	306	74	---	645	68	48	32	29	38	34
31	45	---	268	74	---	478	---	46	---	33	37	---
TOTAL	1536	1969	3874	4468	6793	10962	5717	1778	1220	1043	1056	1052
MEAN	49.5	65.6	125	144	243	354	191	57.4	40.7	33.6	34.1	35.1
MAX	83	115	306	602	1210	941	574	81	54	56	44	56
MIN	33	45	57	74	74	125	68	46	32	29	29	30
CFSM	.59	.79	1.50	1.72	2.91	4.23	2.29	.69	.49	.40	.41	.42
IN.	.68	.88	1.72	1.99	3.02	4.88	2.54	.79	.54	.46	.47	.47
CAL YR 1984	TOTAL	34641	MEAN	94.6	MAX	807	MIN 21	CFSM 1.13	IN 15.41			
WTR YR 1985	TOTAL	41468	MEAN	114	MAX	1210	MIN 29	CFSM 1.36	IN 18.45			

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105000 BATTLE CREEK AT BATTLE CREEK, MI

LOCATION.--Lat 42°19'55", long 85°09'15", in NW1/4 sec.5, T.2 S., R.7 W., Calhoun County, Hydrologic Unit 04050003, on right bank 350 ft upstream from Emmett Street Bridge at Battle Creek, and 3.0 mi upstream from mouth.

DRAINAGE AREA.--241 mi².

PERIOD OF RECORD.--October 1930 to September 1931, October 1932 to July 1933, January 1934 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1931, 1944. WSP 1507: 1956.

GAGE.--Water-stage recorder. Datum of gage is 823.24 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 14, 1951, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 20-24, Feb. 23-25, and Mar. 29 to Apr. 13. Records good except for estimated daily discharges, which are fair. Occasional slight regulation prior to November 1943. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--52 years (water years 1931, 1935-85), 201 ft³/s, 11.33 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,640 ft³/s, Apr. 7, 1947, gage height, 4.48 ft, from floodmark; minimum, 22 ft³/s, Aug. 14, 1934; minimum gage height, about -0.5 ft in July 1936 and on Aug. 31, 1939, due to opening of gates at dam forming control.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,040 ft³/s, Feb. 26, gage height, 3.98 ft; minimum, 60 ft³/s, Oct. 5, gage height, 0.62 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	77	125	172	750	149	2120	1100	251	272	89	89	83
2	81	176	166	893	150	1680	1000	237	284	84	87	82
3	70	213	164	961	144	1340	850	224	303	83	83	84
4	73	245	165	999	139	1120	780	213	309	81	79	78
5	64	261	152	1010	135	1020	830	203	288	86	80	71
6	73	255	141	803	130	966	950	267	255	88	85	77
7	70	219	113	662	126	1150	1200	300	223	88	89	68
8	90	171	114	525	126	1100	1500	322	191	87	92	84
9	108	166	128	408	126	1040	1600	346	166	83	93	149
10	103	158	125	406	124	1150	1400	351	144	79	89	205
11	92	172	127	355	118	1230	1200	325	138	78	83	211
12	85	189	135	327	111	1160	950	293	145	80	79	194
13	81	206	130	289	111	1070	790	263	147	76	76	173
14	85	214	167	269	111	984	708	237	146	139	76	161
15	90	214	189	236	115	874	644	224	146	185	86	130
16	90	203	210	215	122	756	576	213	146	219	96	103
17	85	182	221	198	123	658	521	207	154	215	108	78
18	78	167	222	183	130	581	480	201	154	211	114	87
19	89	162	214	169	133	517	448	190	144	198	116	87
20	99	142	192	160	137	468	417	180	136	179	112	84
21	148	135	174	150	143	428	389	176	130	151	104	81
22	178	129	204	145	163	396	365	174	125	129	94	76
23	193	126	231	140	300	372	339	166	120	115	86	84
24	198	123	252	140	1000	360	325	159	116	104	88	88
25	180	122	219	146	2000	351	310	150	111	96	99	89
26	149	121	194	149	3010	340	299	142	106	98	107	91
27	133	123	193	153	2780	339	292	147	100	100	110	94
28	124	144	253	154	2370	396	287	176	95	96	101	92
29	117	159	317	154	---	500	277	194	87	90	89	89
30	110	169	385	154	---	700	266	202	85	84	91	90
31	103	---	539	152	---	950	---	257	---	82	88	---
TOTAL	3316	5191	6228	11455	14326	26116	21093	6990	4966	3573	2869	3163
MEAN	107	173	201	370	512	842	703	225	166	115	92.5	105
MAX	198	261	539	1010	3010	2120	1600	351	309	219	116	211
MIN	64	121	113	140	111	339	266	142	85	76	76	68
CFSM	.44	.72	.83	1.54	2.12	3.49	2.92	.93	.69	.48	.38	.44
IN.	.51	.80	.96	1.77	2.21	4.03	3.26	1.08	.77	.55	.44	.49
CAL YR 1984	TOTAL	62499	MEAN 171	MAX 836	MIN 38	CFSM .71	IN 9.65					
WTR YR 1985	TOTAL	109286	MEAN 299	MAX 3010	MIN 64	CFSM 1.24	IN 16.87					

STREAMS TRIBUTARY TO LAKE MICHIGAN

99

04105500 KALAMAZOO RIVER NEAR BATTLE CREEK, MI

LOCATION.--Lat 42°19'26", long 85°11'51", in SW1/4 sec.1, T.2 S., R.8 W., Calhoun County, Hydrologic Unit 04050003, on left bank 20 ft upstream from bridge on Kendall Street in Battle Creek.

DRAINAGE AREA.--824 mi².

PERIOD OF RECORD.--July 1937 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 924: 1938-39. WSP 1387: 1938, 1945-46, 1948.

GAGE.--Water-stage recorder. Elevation of gage is 815 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 5 ft). Prior to Oct. 1, 1957, water-stage recorder at site 4.7 mi downstream at different datum. Oct. 1, 1957, to June 15, 1959, nonrecording gage at bridge 1,800 ft upstream at different datum. June 16, 1959, to Oct. 13, 1960, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Oct. 23-25, Nov. 3-13, 19-30, Dec. 29 to Feb. 23 and Apr. 23 to July 16. Records fair. Diurnal fluctuation below 1,500 ft³/s caused by powerplants upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--48 years, 664 ft³/s, 10.94 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,290 ft³/s, Apr. 7, 1947, gage height, 9.13 ft, site and datum then in use; minimum, 50 ft³/s, Sept. 22, 1939, site then in use; minimum daily, 86 ft³/s, Aug. 5, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,760 ft³/s, Feb. 26, gage height, 7.95 ft; minimum, 261 ft³/s, Aug. 23, gage height, 3.03 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	456	543	638	1650	730	4220	2140	840	800	390	454	411
2	434	624	624	1900	720	3300	1940	790	730	380	385	365
3	406	700	610	2000	680	2620	1730	730	680	380	370	367
4	400	800	537	2100	640	2240	1580	750	670	390	378	362
5	379	820	570	2100	630	2140	1710	800	650	400	417	351
6	379	800	511	1900	620	2680	2330	940	600	440	454	355
7	439	730	411	1700	650	2270	3070	970	560	410	410	350
8	475	640	463	1450	660	2250	3250	920	530	400	468	467
9	475	600	457	1200	620	2190	3120	880	500	400	393	628
10	457	630	537	1100	610	2260	2760	860	500	420	436	689
11	428	680	511	1100	630	2360	2090	830	530	430	360	637
12	417	750	543	1050	640	2310	2040	740	530	420	366	607
13	395	800	617	950	650	2170	1820	770	540	400	371	575
14	422	791	682	900	660	2010	1670	720	540	450	384	496
15	411	743	735	850	670	1810	1600	700	550	850	520	510
16	400	668	720	800	680	1660	1560	700	550	820	519	416
17	395	653	783	800	690	1560	1490	700	560	669	458	378
18	390	646	759	800	730	1430	1410	700	560	633	446	406
19	457	600	783	740	760	1310	1360	700	540	622	456	373
20	439	540	743	730	760	1230	1340	700	520	530	462	382
21	682	510	783	680	850	1190	1260	680	510	512	435	366
22	690	490	892	620	1150	1160	1190	620	490	515	381	394
23	700	480	936	590	1800	1040	1050	600	500	475	281	383
24	700	490	954	600	2540	991	1000	600	480	413	357	448
25	630	500	892	600	4210	1140	1020	600	460	434	415	462
26	530	520	874	620	5470	1080	1000	620	440	435	436	398
27	499	550	751	630	5510	1170	980	650	430	421	527	446
28	481	590	954	720	4840	1340	950	680	410	467	410	407
29	463	610	1250	760	---	1660	900	760	400	420	382	377
30	463	620	1300	760	---	2050	870	820	390	398	413	425
31	469	---	1450	740	---	2230	---	830	---	418	380	---
TOTAL	14761	19118	23270	33140	39820	59071	50230	23200	16150	14742	12926	13231
MEAN	476	637	751	1069	1422	1906	1674	748	538	476	417	441
MAX	700	820	1450	2100	5510	4220	3250	970	800	850	527	689
MIN	379	480	411	590	610	991	870	600	390	380	281	350
CFSM	.58	.77	.91	1.30	1.73	2.31	2.03	.91	.65	.58	.51	.54
IN.	.67	.86	1.05	1.50	1.80	2.67	2.27	1.05	.73	.67	.58	.60
CAL YR 1984	TOTAL	239156	MEAN 653	MAX 1850	MIN 222	CFSM .79	IN 10.80					
WTR YR 1985	TOTAL	319659	MEAN 876	MAX 5510	MIN 281	CFSM 1.06	IN 14.43					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105700 AUGUSTA CREEK NEAR AUGUSTA, MI

LOCATION.--Lat 42°21'12", long 85°21'14", in SW1/4 sec.27, T.1 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 15 ft downstream from bridge on EF Road, and 1.3 mi north of Augusta.

DRAINAGE AREA.--38.9 mi².

PERIOD OF RECORD.--October 1964 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 815 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to June 15, 1965, non-recording gage at same site and datum.

REMARKS.--Estimated daily discharges: Feb. 3-17. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 43.3 ft³/s, 15.12 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 560 ft³/s, June 27, 1978, gage height, 3.41 ft; minimum, 8.9 ft³/s, Jan. 26, 1978, result of freezeup; minimum gage height, 0.65 ft, Jan. 19, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 181 ft³/s, Feb. 24, gage height, 2.52 ft; minimum, 14 ft³/s, Feb. 20, gage height, 0.74 ft, caused by storage behind an ice jam upstream.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	53	41	89	31	94	88	55	56	31	40	34
2	29	64	40	88	32	85	82	54	52	31	37	35
3	34	59	53	78	34	80	81	52	48	30	34	34
4	33	50	49	64	34	83	78	51	46	30	33	34
5	31	43	44	59	34	94	94	54	42	30	38	34
6	33	39	42	53	34	94	136	79	38	29	41	33
7	40	37	39	50	34	90	135	78	35	29	42	33
8	46	35	39	46	34	88	111	69	35	29	39	40
9	32	39	38	40	34	90	94	62	34	28	37	55
10	29	48	40	41	34	89	88	57	32	29	35	53
11	26	49	41	36	33	90	84	54	36	30	34	46
12	26	45	45	38	33	91	82	52	43	30	35	40
13	26	41	50	34	33	87	80	51	41	29	35	37
14	26	39	51	38	33	83	79	49	39	69	36	35
15	27	38	53	32	33	77	88	49	42	79	55	34
16	29	37	50	35	33	73	87	50	49	78	55	33
17	29	36	47	34	30	70	80	50	48	67	48	32
18	27	35	44	34	24	67	75	49	46	54	45	32
19	35	34	43	33	19	65	72	48	43	46	43	37
20	40	32	41	32	19	63	69	49	40	44	40	37
21	61	32	44	36	24	62	67	52	38	42	38	35
22	61	32	57	36	53	60	65	47	38	38	36	35
23	53	32	52	36	94	61	63	46	38	35	35	35
24	45	33	47	35	158	63	64	45	38	33	40	35
25	39	33	39	34	174	63	66	44	36	34	46	34
26	37	33	39	34	154	61	64	43	38	45	44	35
27	36	34	42	34	130	68	62	65	36	42	43	35
28	35	48	55	33	107	98	60	67	34	38	40	34
29	32	47	76	33	---	124	58	59	33	35	38	33
30	30	43	81	33	---	109	56	52	32	33	39	35
31	30	---	76	36	---	98	---	61	---	37	36	---
TOTAL	1088	1220	1498	1334	1519	2520	2408	1693	1206	1234	1237	1094
MEAN	35.1	40.7	48.3	43.0	54.3	81.3	80.3	54.6	40.2	39.8	39.9	36.5
MAX	61	64	81	89	174	124	136	79	56	79	55	55
MIN	26	32	38	32	19	60	56	43	32	28	33	32
CFSM	.90	1.05	1.24	1.11	1.40	2.09	2.06	1.40	1.03	1.02	1.03	.94
IN.	1.04	1.17	1.43	1.28	1.45	2.41	2.30	1.62	1.15	1.18	1.18	1.05
CAL YR 1984	TOTAL	14377	MEAN 39.3	MAX 97	MIN 14	CFSM 1.01	IN 13.75					
WTR YR 1985	TOTAL	18051	MEAN 49.5	MAX 174	MIN 19	CFSM 1.27	IN 17.26					

STREAMS TRIBUTARY TO LAKE MICHIGAN

101

04106000 KALAMAZOO RIVER AT COMSTOCK, MI

LOCATION.--Lat 42°17'05", long 85°30'50", in NE1/4 sec.19, T.2 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank at downstream side of bridge on River Street in Comstock, 0.2 mi downstream from Comstock Creek.

DRAINAGE AREA.--1,010 mi², approximately.

PERIOD OF RECORD.--April to August 1931, October 1932 to December 1979, October 1984 to September 1985.
Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 824: 1933-36. WSP 1387: 1933, 1934(M), 1935, 1936(M), 1938(M), 1940(M), 1941.

GAGE.--Water-stage recorder. Datum of gage is 759.12 ft above National Geodetic Vertical Datum of 1929.
Prior to November 1945, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Oct. 1 to Nov. 26. Records good except for estimated daily discharges, which are poor. Flow regulated by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--48 years (water years 1933-79, 1985), 853 ft³/s, 11.47 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,910 ft³/s, Apr. 8, 1947, gage height, 7.94 ft; minimum, 119 ft³/s, May 29, 1958, gage height, 0.09 ft; minimum daily, 185 ft³/s, Aug. 7, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,410 ft³/s, Feb. 28, gage height, 7.91 ft; minimum, 120 ft³/s, Dec. 17, gage height, 0.20 ft; minimum daily, 519 ft³/s, Aug. 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	660	750	882	1750	889	5970	2940	1210	1300	623	675	643
2	670	800	842	2060	873	5400	2990	1200	1230	615	644	603
3	660	900	810	2340	855	4550	2800	1000	1050	614	631	600
4	620	970	938	2480	762	4220	2560	1030	1050	603	555	619
5	580	1000	954	2550	761	3810	2740	1050	1050	609	554	583
6	560	1020	890	2470	743	3260	2840	1180	1020	608	638	566
7	560	960	810	2280	738	3000	3110	1410	927	689	690	566
8	590	830	722	1870	797	3090	3670	1380	874	629	649	588
9	650	800	722	1620	812	3080	4000	1260	826	530	673	833
10	660	820	730	1260	714	3040	4000	1280	775	609	654	1260
11	660	870	746	1280	740	3230	3720	1270	777	698	636	1150
12	650	970	754	1310	770	3220	3140	1210	839	670	589	1010
13	630	1000	912	1170	796	3220	2700	1050	821	610	545	918
14	590	1000	945	1110	785	3080	2390	1150	848	727	551	879
15	580	970	882	1090	797	2890	2180	1020	858	1350	669	836
16	590	910	1050	934	817	2660	2120	1020	858	1350	753	697
17	630	880	948	1020	802	2360	1950	1040	858	1070	794	619
18	610	870	956	1040	811	2250	1770	1050	893	968	658	629
19	590	840	824	975	887	2030	1710	1050	874	906	688	632
20	640	800	858	970	933	1880	1710	1030	847	902	723	633
21	780	770	1010	970	910	1860	1660	1040	840	802	698	630
22	890	730	965	970	1030	1800	1450	1030	793	752	657	593
23	900	710	1000	875	1440	1760	1380	911	777	692	580	718
24	880	700	1070	795	2180	1710	1400	905	818	662	519	642
25	840	720	1060	923	2900	1610	1420	925	741	639	559	603
26	810	740	867	964	3920	1560	1420	878	738	699	621	680
27	770	770	749	935	5810	1580	1400	907	717	705	680	686
28	730	802	1000	910	6330	1850	1350	1010	674	663	737	675
29	710	914	1300	906	---	2150	1280	974	664	659	702	545
30	700	994	1450	906	---	2240	1200	1210	654	651	667	552
31	720	---	1560	906	---	2510	---	1310	---	685	665	---
TOTAL	21110	25810	29206	41639	40602	86870	69000	33990	25991	22989	20054	21198
MEAN	681	860	942	1343	1450	2802	2300	1096	866	742	647	704
MAX	900	1020	1560	2550	6330	5970	4000	1410	1300	1350	794	1260
MIN	560	700	722	795	714	1560	1200	878	654	530	519	545
CFSM	.67	.85	.93	1.33	1.44	2.77	2.28	1.09	.86	.74	.64	.70
IN.	.78	.95	1.08	1.53	1.50	3.20	2.54	1.25	.95	.85	.74	.78
WTR YR 1985 TOTAL	438449		MEAN 1201		MAX 6330	MIN 519	CFSM 1.19	IN 16.15				

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106180 PORTAGE CREEK AT PORTAGE, MI

LOCATION.--Lat 42°12'21", long 85°35'23", in SE1/4 sec.16, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank 750 ft upstream from bridge on Westnedge Avenue in Portage.

DRAINAGE AREA.--16.5 mi².

PERIOD OF RECORD.--October 1982 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--No estimated daily discharges. Records good. Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 58 ft³/s, Feb. 24, 1985; maximum gage height, 3.44 ft, Sept. 25, 1984; minimum discharge, 11 ft³/s, Aug. 26, 1984; minimum gage height, 1.83 ft, Sept. 14, 1983.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 58 ft³/s, Feb. 24, gage height, 3.40 ft; minimum, 12 ft³/s, Sept. 1, 7, 8, 17-20; minimum gage height, 2.10 ft, Oct. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	30	18	37	16	30	29	21	23	17	16	13
2	15	29	19	29	16	28	28	20	21	17	16	14
3	15	24	23	23	17	27	29	21	20	17	15	14
4	15	22	20	20	16	34	28	20	19	17	15	14
5	15	21	19	19	16	35	38	21	20	17	16	14
6	14	21	18	19	16	29	42	25	19	17	20	14
7	18	20	18	19	16	26	33	23	19	17	18	13
8	19	20	18	19	16	29	29	22	19	16	17	15
9	18	21	17	18	16	30	27	20	19	16	16	17
10	17	22	18	18	15	28	26	20	18	18	16	18
11	17	24	18	18	16	30	26	19	21	17	15	16
12	17	22	20	18	16	30	26	20	21	16	15	15
13	17	21	20	18	16	28	25	19	20	16	15	15
14	19	20	23	18	15	26	28	19	20	19	15	15
15	19	20	21	18	15	25	29	20	22	18	19	14
16	19	19	20	18	15	24	27	20	23	17	17	14
17	18	19	19	18	15	24	25	20	22	16	16	13
18	18	19	18	18	15	24	25	21	21	15	16	13
19	20	18	18	18	15	25	24	20	20	15	16	13
20	20	18	17	18	15	25	24	20	19	15	15	13
21	32	18	20	19	16	25	23	21	18	15	15	14
22	26	18	23	17	23	25	23	20	19	15	14	14
23	22	18	19	17	46	26	23	20	19	15	14	15
24	20	18	18	17	54	26	24	19	19	14	16	15
25	19	18	17	17	42	26	25	19	18	16	16	15
26	19	17	16	17	38	25	24	19	18	18	15	15
27	19	18	17	17	37	29	23	26	18	16	15	15
28	19	23	22	17	32	36	22	25	17	15	14	14
29	19	20	27	17	---	37	21	22	17	14	14	14
30	19	19	24	17	---	30	21	21	17	15	14	15
31	20	---	22	17	---	29	---	27	---	17	14	---
TOTAL	579	617	607	590	601	871	797	650	586	503	485	433
MEAN	18.7	20.6	19.6	19.0	21.5	28.1	26.6	21.0	19.5	16.2	15.6	14.4
MAX	32	30	27	37	54	37	42	27	23	19	20	18
MIN	14	17	16	17	15	24	21	19	17	14	14	13
CFSM	1.13	1.25	1.19	1.15	1.30	1.70	1.61	1.27	1.18	.98	.95	.87
IN.	1.31	1.39	1.37	1.33	1.35	1.96	1.80	1.47	1.32	1.13	1.09	.98
CAL YR 1984	TOTAL	6625	MEAN 18.1	MAX 38	MIN 12	CFSM 1.10	IN 14.94					
WTR YR 1985	TOTAL	7319	MEAN 20.1	MAX 54	MIN 13	CFSM 1.22	IN 16.50					

103

LOCATION.--Lat 42°14'46", long 85°34'33", in SE1/4 sec.34, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 5 ft upstream from bridge on Lovers Lane, and 3.0 mi south of Kalamazoo.

PERIOD OF RECORD.--October 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 814.88 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 20, 21. Records good. Flow includes water which is pumped from ground-water sources by industry and discharged into stream 2.0 mi upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 40.3 ft³/s, 24.43 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 290 ft³/s, June 26, 1978, gage height, 4.49 ft; minimum, 8.0 ft³/s, Jan. 19, 1965, gage height, 0.88 ft, result of bridge construction upstream.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 100 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 1	1400	108	1.82	Mar. 28	1900	133	1.91
Jan. 1	0800	124	1.88	Apr. 5	1900	162	2.07
Jan. 21	1100	--	*2.52	Apr. 14	2200	106	1.76
Feb. 24	0200	*168	2.11	May 27	0400	101	1.78
Mar. 4	2000	131	1.90	May 31	0600	113	1.85
Mar. 27	1600	105	1.75				

a Backwater from snow dump.

Minimum discharge, 22 ft³/s, Nov. 20, 22; minimum gage height, 1.24 ft, Nov. 20, 22, Dec. 25, 26, 27, Feb. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	65	29	84	30	59	63	55	42	37	32	30
2	30	44	28	48	31	56	60	52	39	38	31	30
3	30	34	42	38	29	55	64	49	40	38	28	34
4	30	30	31	34	29	83	63	46	40	34	27	34
5	29	29	30	32	30	76	104	51	39	33	34	33
6	29	28	28	31	31	62	97	62	37	33	38	33
7	35	27	27	34	31	59	68	54	37	34	33	29
8	37	29	27	34	30	68	63	52	35	36	31	38
9	33	32	27	34	29	66	59	52	35	38	31	44
10	30	31	33	34	27	62	57	51	36	41	28	36
11	29	33	34	32	32	67	58	48	45	36	27	31
12	30	30	41	26	37	63	59	48	43	34	32	30
13	30	29	40	26	36	58	57	48	40	33	36	29
14	32	29	47	30	36	56	67	49	40	43	36	30
15	31	29	38	32	31	55	68	50	52	35	45	29
16	29	28	34	31	29	54	62	47	45	33	36	31
17	26	26	34	31	29	51	59	50	49	33	34	32
18	26	23	33	30	31	52	61	50	46	31	37	32
19	36	25	33	30	31	52	62	47	45	31	37	31
20	29	24	31	30	32	52	58	52	41	30	36	30
21	59	25	39	31	34	51	57	50	40	29	35	28
22	38	23	39	31	57	52	58	48	42	31	32	28
23	32	23	32	31	125	53	58	46	39	32	33	32
24	32	24	29	32	120	53	60	46	41	29	38	30
25	29	23	26	32	73	54	60	44	39	33	35	31
26	30	25	28	31	69	52	59	43	37	35	34	33
27	31	28	29	27	70	68	51	69	38	27	35	32
28	28	42	44	29	62	97	51	56	37	26	34	30
29	29	33	50	31	---	89	54	50	35	28	33	28
30	31	32	38	29	---	66	54	50	34	30	35	34
31	37	---	37	31	---	63	---	70	---	38	32	---
TOTAL	987	903	1058	1036	1231	1904	1871	1585	1208	1039	1045	952
MEAN	31.8	30.1	34.1	33.4	44.0	61.4	62.4	51.1	40.3	33.5	33.7	31.7
MAX	59	65	50	84	125	97	104	70	52	43	45	44
MIN	26	23	26	26	27	51	51	43	34	26	27	28
CAL YR 1984	TOTAL	13348	MEAN 36.5	MAX 113	MIN 22							
WTR YR 1985	TOTAL	14819	MEAN 40.6	MAX 125	MIN 23							

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106320 WEST FORK PORTAGE CREEK NEAR OSHTENO, MI

LOCATION.--Lat 42°14'07", long 85°38'54", in SE1/4 sec.1, T.3 S., R.12 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank at upstream side of culvert on 12th Street, 2.1 mi southeast of Oshtemo.

DRAINAGE AREA.--13.0 mi².

PERIOD OF RECORD.--May 1972 to current year.

GAGE.--Water-stage recorder. Datum of gage is 868.86 ft, Kalamazoo County Road Commission datum.

REMARKS.--No estimated daily discharges. Records good. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--13 years, 6.89 ft³/s, 7.20 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 26 ft³/s, Aug. 31, 1975, gage height, 2.15 ft; minimum, 1.4 ft³/s, Aug. 25, 26, 1984, gage height, 0.98 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 15 ft³/s, Feb. 24, gage height, 1.70 ft; minimum, 2.1 ft³/s, Oct. 6, 7; minimum gage height, 1.10 ft, May 24, July 23, 24, 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.2	5.9	5.0	11	5.2	8.2	9.9	4.2	6.6	3.7	4.3	3.8
2	2.8	7.0	4.7	11	5.2	7.4	8.8	4.0	5.9	3.8	4.2	3.8
3	2.5	6.6	5.4	9.5	5.2	6.6	8.2	3.8	5.4	3.7	4.0	3.8
4	2.4	5.7	5.0	8.2	5.2	8.4	7.6	4.0	4.8	3.8	3.8	3.8
5	2.2	5.2	5.0	7.0	5.2	9.5	9.9	4.2	4.5	4.2	4.3	3.8
6	2.2	4.8	5.0	6.4	5.2	8.6	13	5.0	4.2	4.2	4.8	4.0
7	2.8	4.5	4.7	6.1	5.2	8.2	12	5.0	3.8	4.2	4.7	4.0
8	3.5	4.2	4.7	5.9	5.2	8.0	10	4.7	3.7	4.0	4.7	4.5
9	3.5	4.2	4.7	5.7	5.2	8.0	9.2	4.5	3.7	3.8	4.3	6.3
10	3.5	4.7	4.7	5.7	5.0	7.8	8.6	4.2	3.4	4.2	4.3	7.6
11	3.2	4.8	4.7	5.7	5.0	8.0	8.0	4.0	3.8	3.8	4.0	7.2
12	2.8	4.8	5.2	5.9	5.0	8.4	7.6	4.0	4.3	3.8	3.8	6.3
13	2.8	4.5	5.7	5.9	4.8	7.8	7.2	3.7	4.2	3.7	3.7	5.5
14	3.2	4.2	6.3	5.7	4.8	7.2	6.8	3.4	4.2	4.5	4.0	5.2
15	3.4	4.0	6.6	5.7	4.7	6.6	7.2	3.5	5.0	4.7	5.9	4.8
16	3.4	3.8	6.3	5.5	4.7	6.3	6.8	3.8	5.7	4.5	6.1	4.5
17	3.2	3.5	5.7	5.5	4.8	5.7	6.4	3.8	5.9	4.2	5.7	4.3
18	2.9	3.5	5.4	5.5	5.0	5.5	6.3	3.8	5.7	4.0	5.5	4.2
19	3.2	3.4	5.2	5.5	5.2	5.5	6.1	3.8	5.2	4.0	5.2	4.2
20	3.2	3.4	5.0	5.5	5.4	5.4	5.7	4.2	4.8	3.8	4.8	4.0
21	4.7	3.2	5.4	5.5	5.7	5.2	5.5	4.0	4.7	3.7	4.5	4.0
22	5.7	3.2	6.4	5.5	7.8	5.2	5.4	3.8	4.8	3.5	4.2	4.2
23	5.7	3.2	5.7	5.5	12	5.5	5.4	3.5	4.8	3.2	4.0	4.3
24	5.0	3.4	5.5	5.4	15	5.9	5.4	3.4	4.7	3.2	4.3	4.5
25	4.5	3.4	5.2	5.2	14	5.9	5.4	3.4	4.3	3.4	4.2	4.3
26	4.7	3.5	5.2	5.2	12	5.9	5.2	3.5	4.2	4.0	4.0	4.5
27	4.7	3.8	5.0	5.2	11	6.4	5.0	5.2	4.0	3.8	4.0	4.5
28	4.7	5.0	6.1	5.0	9.5	9.5	5.0	5.5	3.8	3.8	3.8	4.5
29	4.3	5.2	7.8	5.0	---	11	4.7	5.4	3.7	3.7	3.8	4.3
30	4.3	5.2	8.2	5.0	---	11	4.5	5.4	3.7	3.7	3.8	4.5
31	4.4	---	8.2	5.2	---	10	---	7.4	---	4.2	3.8	---
TOTAL	112.6	131.8	173.7	190.6	188.2	228.6	216.8	132.1	137.5	120.8	136.5	139.2
MEAN	3.63	4.39	5.60	6.15	6.72	7.37	7.23	4.26	4.58	3.90	4.40	4.64
MAX	5.7	7.0	8.2	11	15	11	13	7.4	6.6	4.7	6.1	7.6
MIN	2.2	3.2	4.7	5.0	4.7	5.2	4.5	3.4	3.4	3.2	3.7	3.8
CFSM	.28	.34	.43	.47	.52	.57	.56	.33	.35	.30	.34	.36
IN.	.32	.38	.50	.55	.54	.65	.62	.38	.39	.35	.39	.40
CAL YR 1984	TOTAL	1628.3	MEAN	4.45	MAX	10	MIN	1.5	CFSM	.34	IN	4.66
WTR YR 1985	TOTAL	1908.4	MEAN	5.23	MAX	15	MIN	2.2	CFSM	.40	IN	5.46

105

LOCATION.--Lat 42°14'40", long 85°36'50", in NE1/4 sec.5, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank 30 ft upstream from culvert on Oakland Drive, 2.5 mi upstream from mouth, and 3.7 mi southwest of main business district of Kalamazoo.

PERIOD OF RECORD.--September 1959 to current year.

REMARKS.--Estimated daily discharges: Jan. 25 to Feb. 1, and Feb. 10-21. Records good. At times, flow is affected by ground-water withdrawals. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 9.87 ft³/s, 7.17 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 41 ft³/s, Apr. 19, 1975, gage height, 3.32 ft; minimum, 1.0 ft³/s, Aug. 9, 1964; minimum gage height, 0.88 ft, July 30, 1963, caused by construction.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 34 ft³/s, Feb. 24, gage height, 3.11 ft; minimum, 5.1 ft³/s, Nov. 20-27, gage height, 2.35 ft.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.3	10	7.8	18	7.7	18	18	9.4	12	7.5	8.1	7.9
2	7.6	12	7.4	17	7.8	16	16	9.1	11	7.3	8.0	7.8
3	7.0	11	8.9	15	7.8	14	15	8.9	10	7.1	7.8	7.8
4	6.5	9.7	8.3	13	7.8	17	14	8.6	9.6	7.3	7.5	7.5
5	6.2	8.9	7.8	12	7.8	19	19	8.8	9.1	7.5	7.9	7.5
6	5.9	8.0	7.5	11	7.8	17	24	11	8.5	7.3	9.0	7.5
7	7.2	7.3	7.3	10	7.8	16	21	11	8.4	7.3	9.4	7.5
8	8.1	6.7	7.1	9.2	7.8	15	19	12	8.3	7.2	9.2	7.6
9	8.1	6.9	6.9	8.5	7.8	15	17	12	8.1	7.1	8.9	12
10	7.9	7.3	7.0	8.4	7.5	15	15	11	7.9	8.3	8.6	13
11	7.5	7.3	7.0	8.4	7.4	15	14	11	8.0	7.9	8.4	12
12	7.1	7.1	7.8	8.4	7.4	15	13	10	8.5	7.3	8.1	11
13	7.0	6.8	8.6	8.4	7.2	15	12	9.7	8.4	6.8	7.8	10
14	7.8	6.5	9.6	8.4	7.1	14	12	9.3	8.2	8.5	7.9	9.7
15	7.8	6.2	10	8.3	7.0	13	13	8.9	8.8	9.2	11	8.9
16	7.8	5.9	9.7	8.1	7.1	12	12	8.6	10	8.5	11	8.5
17	7.4	5.8	9.2	7.8	7.3	11	12	8.6	11	7.7	11	8.1
18	7.2	5.6	8.6	7.8	7.5	11	11	8.7	11	7.2	11	7.7
19	7.7	5.4	8.2	7.8	7.7	10	11	8.8	11	6.8	11	7.4
20	7.7	5.2	7.7	7.8	8.1	10	11	8.8	10	6.8	10	7.2
21	12	5.1	8.1	7.8	8.5	9.7	10	8.9	9.7	6.5	9.5	7.0
22	12	5.1	9.7	7.8	11	9.5	10	8.8	9.5	6.5	9.0	7.0
23	10	5.1	9.1	7.8	23	9.6	9.8	8.5	9.7	6.2	8.6	7.0
24	9.5	5.1	8.5	7.8	33	10	10	8.2	10	5.9	8.6	7.2
25	9.0	5.1	7.8	7.7	29	10	10	8.2	10	6.1	8.6	7.1
26	8.5	5.1	7.2	7.7	26	10	10	8.2	9.5	7.6	8.6	7.3
27	8.1	5.3	8.0	7.6	24	12	10	11	8.7	7.6	8.4	7.5
28	7.7	7.2	9.0	7.4	21	19	9.7	11	8.2	7.5	8.1	7.7
29	7.3	7.6	12	7.4	---	23	9.5	11	8.0	7.3	8.1	7.7
30	7.1	7.8	12	7.4	---	20	9.5	9.9	7.7	7.1	8.1	7.9
31	6.9	---	12	7.6	---	18	---	13	---	7.8	8.1	---
TOTAL	245.9	208.1	265.8	287.3	326.9	438.8	397.5	300.9	278.8	226.7	275.3	250.0
MEAN	7.93	6.94	8.57	9.27	11.7	14.2	13.3	9.71	9.29	7.31	8.88	8.33
MAX	12	12	12	18	33	23	24	13	12	9.2	11	13
MIN	5.9	5.1	6.9	7.4	7.0	9.5	9.5	8.2	7.7	5.9	7.5	7.0
CFSM	.42	.37	.46	.50	.63	.76	.71	.52	.50	.39	.48	.45
IN.	.49	.41	.53	.57	.65	.87	.79	.60	.55	.45	.55	.50
CAL YR 1984	TOTAL	2892.7	MEAN	7.90	MAX	23	CFSM	.42	IN	5.75		
KTR YR 1985	TOTAL	3502.0	MEAN									

LOCATION.--Lat 42°16'27", long 85°34'35", in NW1/4 NE1/4 sec.27, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 50 ft upstream from bridge on Reed Avenue in Kalamazoo, and 1.5 mi upstream from mouth.

WATER-DISCHARGE RECORDS

GAGE.--Water-stage recorder. Datum of gage is 761.50 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Dec. 15, 1947, to Dec. 7, 1955, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--21 years, 53.8 ft³/s, 15.61 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 580 ft³/s, sometime in July 1954, from rating curve extended above 165 ft³/s, gage height, 5.25 ft, caused by momentary gate opening of millpond; maximum gage height, 5.44 ft, June 26, 1978; minimum discharge, 2.0 ft³/s, May 8, 1956, gage height, 1.50 ft; minimum gage height, 1.41 ft, May 12, 13, 1980, Aug. 16, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 242 ft³/s, Feb. 24, gage height, 4.14 ft; minimum, 3.6 ft³/s, July 22, 23, gage height, 1.43 ft; minimum daily, 34 ft³/s, Oct. 6, Nov. 20.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	88	39	109	39	84	84	67	63	43	45	38
2	38	71	41	91	40	80	80	66	54	43	42	38
3	36	48	58	61	39	75	84	62	51	43	39	39
4	36	44	42	50	39	82	80	59	51	45	37	41
5	35	41	41	49	40	112	118	63	50	40	43	40
6	34	39	40	47	41	90	153	82	48	41	54	39
7	49	38	40	46	41	83	120	68	47	42	47	37
8	45	39	40	45	40	84	90	65	45	41	43	56
9	40	46	38	43	39	87	84	65	45	44	41	88
10	37	45	43	44	38	84	79	65	44	66	39	56
11	37	47	44	43	41	84	80	61	55	43	37	46
12	37	42	50	40	45	85	80	60	57	41	37	44
13	39	40	49	38	46	82	78	58	49	39	42	42
14	45	40	59	40	45	77	84	60	47	70	45	43
15	40	40	49	43	40	74	92	61	59	41	65	43
16	39	38	44	42	39	70	85	58	59	44	47	43
17	37	37	42	42	38	67	81	60	60	43	45	44
18	37	35	41	42	39	63	80	64	55	41	50	44
19	50	36	41	41	40	64	79	58	54	40	47	43
20	41	34	39	42	41	64	72	62	50	40	47	42
21	95	35	51	37	44	63	70	63	48	38	45	41
22	53	35	53	41	74	62	69	59	53	37	42	40
23	45	35	40	40	154	64	71	56	50	38	42	43
24	42	35	41	42	191	66	75	54	50	37	49	43
25	42	36	37	41	114	71	77	54	48	44	48	43
26	42	35	37	40	98	63	75	52	46	49	42	46
27	42	40	39	38	104	82	67	91	46	37	44	44
28	39	56	62	39	91	122	66	73	45	35	42	43
29	38	43	67	40	---	139	67	62	44	35	40	42
30	39	41	61	38	---	108	68	61	41	37	43	50
31	44	---	52	40	---	89	---	105	---	50	41	---
TOTAL	1311	1279	1420	1434	1680	2520	2488	1994	1514	1327	1370	1341
MEAN	42.3	42.6	45.8	46.3	60.0	81.3	82.9	64.3	50.5	42.8	44.2	44.7
MAX	95	88	67	109	191	139	153	105	63	70	65	88
MIN	34	34	37	37	38	62	66	52	41	35	37	37
CAL YR 1984	TOTAL	16827	MEAN	46.0	MAX	141	MIN	24				
WTR YR 1985	TOTAL	19678	MEAN	53.9	MAX	191	MIN	34				

STREAMS TRIBUTARY TO LAKE MICHIGAN

107

04106500 PORTAGE CREEK AT KALAMAZOO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: April 1972 to August 1974, August 1975 to current year.

INSTRUMENTATION.--Water-temperature recorder from Apr. 13, 1972 to Aug. 8, 1974, and from Aug. 6, 1975 to current year.

REMARKS.--Interruptions in the record were due to malfunctions of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE (water years 1972-73, 1976-81, 1985): Maximum, 32.5°C, Mar. 4, 1981; minimum, 0.0°C Dec. 31, 1976, Jan. 1, 2, 1977.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 27.5°C, July 8, 9; minimum, 1.0°C, Feb. 1-4, 9, 16.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	15.0	11.0	13.0	13.5	11.0	12.5	8.5	7.0	7.5	---	---	---
2	15.5	11.5	13.5	12.0	8.0	9.5	7.5	6.5	7.0	---	---	---
3	17.0	12.5	14.5	9.5	6.5	8.0	7.0	4.5	6.0	---	---	---
4	16.0	12.5	14.5	12.0	8.5	10.5	4.5	3.5	4.0	---	---	---
5	16.0	12.5	14.5	11.0	8.5	10.0	5.0	4.0	4.5	---	---	---
6	18.0	14.5	16.0	10.5	8.5	9.5	5.0	3.5	4.0	---	---	---
7	17.0	16.0	16.5	9.5	7.5	8.5	4.0	3.5	3.5	---	---	---
8	17.5	16.0	16.5	11.5	9.0	10.0	6.0	3.5	4.5	---	---	---
9	16.5	15.0	16.0	11.5	11.0	11.0	6.5	5.0	6.0	---	---	---
10	18.0	16.0	17.0	13.0	11.5	12.0	8.0	6.5	7.0	---	---	---
11	19.0	15.5	17.5	12.0	7.5	9.0	7.5	7.5	7.5	---	---	---
12	17.0	15.5	16.0	8.0	6.5	7.5	8.5	7.5	8.0	---	---	---
13	15.5	14.5	15.0	8.5	6.5	7.5	9.0	7.0	8.0	---	---	---
14	15.0	14.5	14.5	8.5	7.5	8.0	7.0	6.0	6.5	---	---	---
15	16.5	14.5	15.5	10.0	8.5	9.0	8.5	7.0	7.5	---	---	---
16	18.0	15.5	16.5	8.5	6.5	7.5	11.0	8.5	10.0	---	---	---
17	18.5	16.0	17.0	7.0	6.0	6.5	10.5	8.5	9.0	---	---	---
18	15.5	13.0	14.5	7.5	7.0	7.5	8.0	6.5	7.0	---	---	---
19	17.5	14.5	16.0	7.0	5.5	6.5	6.5	5.5	6.0	---	---	---
20	15.0	12.5	13.0	6.5	5.5	6.0	6.0	4.5	5.5	---	---	---
21	12.0	11.0	11.5	7.0	6.0	6.5	6.0	5.0	5.5	---	---	---
22	13.0	11.0	12.0	6.5	4.5	5.5	6.5	4.0	5.5	---	---	---
23	13.5	10.0	11.0	7.5	5.0	6.0	5.5	3.0	4.0	---	---	---
24	12.5	10.0	11.0	8.0	6.0	7.0	6.0	2.0	4.5	---	---	---
25	12.0	10.0	10.5	8.0	6.5	7.5	2.0	2.0	2.0	---	---	---
26	13.5	12.0	12.5	10.5	7.5	8.5	2.0	2.0	2.0	3.0	2.5	3.0
27	16.0	13.0	14.5	11.5	10.5	11.0	5.0	2.0	3.0	4.0	1.5	2.5
28	16.0	14.5	15.5	11.0	7.5	9.5	8.0	4.0	6.5	4.5	2.5	3.5
29	14.5	12.5	13.5	8.5	7.0	8.0	9.5	7.5	8.5	4.5	3.5	4.0
30	13.0	11.5	12.5	9.0	8.0	8.5	8.0	5.5	6.5	4.5	3.0	4.0
31	12.5	10.5	11.0	---	---	---	5.5	3.5	4.0	5.0	3.0	4.0
MONTH	19.0	10.0	14.5	13.5	4.5	8.5	11.0	2.0	6.0	5.0	1.5	3.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106500 PORTAGE CREEK AT KALAMAZOO, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	3.0	1.0	2.5	6.5	5.5	6.5	8.5	7.0	8.0	18.5	16.5	17.5
2	2.5	1.0	2.0	9.5	6.0	7.5	13.0	7.5	10.0	19.0	14.5	16.5
3	2.5	1.0	1.5	9.0	6.0	7.5	14.5	10.0	12.0	20.5	14.5	17.5
4	3.0	1.0	2.0	5.5	2.0	3.5	13.0	8.0	11.5	20.5	16.0	18.0
5	3.5	2.5	3.0	5.5	4.5	5.0	12.0	10.0	10.5	20.5	16.0	18.0
6	4.5	3.0	3.5	7.5	5.0	6.0	10.5	7.5	8.5	19.0	16.5	18.0
7	3.5	2.0	3.0	7.5	6.0	6.5	12.0	8.0	9.5	20.5	14.5	17.5
8	3.0	1.5	2.5	9.5	6.0	7.5	11.0	8.5	9.5	21.5	15.5	19.0
9	3.5	1.0	2.5	9.5	7.5	8.5	10.0	7.5	9.0	22.5	16.5	19.0
10	3.5	3.0	3.0	10.5	7.5	9.0	11.5	7.5	9.5	23.5	16.5	19.5
11	2.5	2.0	2.5	11.0	9.5	10.0	15.0	10.5	12.5	22.0	18.5	20.0
12	3.5	2.0	2.5	10.0	7.5	9.0	17.5	12.5	15.5	23.0	19.0	20.5
13	3.5	2.0	2.5	9.5	7.5	8.5	17.0	14.5	16.0	23.0	16.5	20.0
14	3.5	3.0	3.5	11.0	7.5	9.0	19.0	15.5	17.5	22.0	18.0	20.0
15	3.5	2.5	3.5	11.5	8.0	10.0	20.0	16.5	18.0	21.0	18.0	20.0
16	3.5	1.0	2.5	11.0	9.0	10.0	20.0	18.5	19.0	18.5	16.0	17.5
17	5.0	3.0	4.0	10.0	8.0	9.0	17.5	14.0	16.0	20.0	14.5	17.5
18	4.5	2.5	3.5	11.5	5.5	8.5	22.0	15.5	19.0	19.0	14.5	17.0
19	5.0	2.5	3.5	12.0	8.0	10.0	22.5	18.0	20.0	20.5	13.0	16.5
20	6.0	3.0	4.5	13.0	9.5	11.0	21.5	17.5	20.0	19.5	14.5	16.0
21	5.5	3.5	5.0	12.5	8.5	10.5	23.0	17.0	19.0	22.0	15.5	18.5
22	5.0	4.0	4.5	12.0	8.0	10.0	22.5	16.0	19.5	22.0	15.5	17.0
23	3.5	2.5	3.0	10.5	9.5	10.0	21.5	15.0	19.5	19.0	17.0	18.0
24	5.0	2.5	3.0	9.5	9.0	9.5	19.5	17.0	18.5	20.5	16.0	17.5
25	4.5	2.5	3.0	13.5	6.5	10.0	21.0	15.0	18.0	21.0	15.5	18.0
26	6.5	4.0	5.0	14.0	9.5	12.0	21.5	16.5	18.5	---	---	---
27	6.0	4.5	5.5	13.5	11.0	12.0	18.5	16.0	17.0	---	---	---
28	6.5	4.5	5.5	12.5	8.0	10.5	21.0	15.0	18.0	---	---	---
29	---	---	---	18.5	10.5	13.5	20.5	15.0	18.0	---	---	---
30	---	---	---	14.0	10.0	11.5	19.5	15.5	18.0	---	---	---
31	---	---	---	10.0	8.5	9.0	---	---	---	21.0	17.0	18.0
MONTH	6.5	1.0	3.5	18.5	2.0	9.0	23.0	7.0	15.0	23.5	13.0	18.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	23.5	16.5	19.5	24.0	20.0	22.0	22.5	15.5	19.0	22.5	19.5	21.5
2	23.5	18.0	20.5	25.5	20.5	23.0	22.5	17.0	20.0	22.5	20.0	21.5
3	23.5	17.0	20.0	26.0	20.5	23.0	23.5	17.5	20.5	23.5	21.0	22.0
4	23.0	16.0	18.5	25.0	19.5	22.5	22.5	18.0	20.5	25.0	20.5	22.5
5	22.0	15.5	19.0	24.5	21.0	22.5	21.0	18.5	19.5	25.0	21.5	23.5
6	22.5	16.0	19.5	23.5	20.0	21.5	22.0	18.5	19.5	23.0	20.5	21.5
7	23.5	18.5	21.0	23.5	19.0	21.0	23.0	18.5	20.5	22.0	19.0	20.0
8	25.5	21.0	23.0	27.5	21.0	23.5	24.5	18.0	21.0	19.5	15.5	17.5
9	25.0	18.5	22.0	27.5	22.0	24.5	24.5	18.5	22.0	19.5	19.5	19.5
10	24.0	16.0	20.0	24.0	22.0	22.5	22.5	20.0	21.5	19.5	19.0	19.0
11	16.0	14.0	15.0	23.5	19.5	21.5	23.0	17.0	20.5	19.0	18.5	19.0
12	17.0	12.5	14.5	26.0	20.0	22.5	23.5	18.0	21.0	18.5	18.5	18.5
13	21.0	16.0	18.5	26.5	21.0	24.0	24.0	19.0	21.5	18.5	16.5	17.5
14	21.5	16.5	19.0	25.5	22.0	23.0	22.0	19.5	20.5	17.0	16.5	17.0
15	17.0	15.5	16.5	26.0	21.5	23.5	21.0	18.5	19.5	18.5	17.0	17.5
16	19.0	16.5	17.5	24.5	19.5	22.0	19.5	16.5	18.0	23.0	18.5	20.0
17	20.0	16.0	18.0	25.0	18.0	21.5	18.5	15.0	16.5	22.0	18.5	20.0
18	21.5	16.0	19.0	25.5	19.0	22.0	18.5	15.0	17.0	22.0	22.0	22.0
19	23.0	17.0	20.0	23.5	20.0	22.0	19.5	14.5	17.0	22.0	21.0	21.5
20	23.5	18.0	20.5	24.0	19.5	21.5	20.0	15.5	17.5	21.0	20.5	20.5
21	23.0	18.5	21.0	23.0	20.5	22.0	19.0	17.5	18.0	---	---	---
22	24.5	19.0	21.5	24.0	19.5	21.5	21.0	17.0	18.5	---	---	---
23	22.5	19.0	21.0	24.0	17.5	20.5	20.5	17.0	18.5	---	---	---
24	25.5	18.5	22.0	25.0	18.0	21.5	22.5	17.0	19.5	---	---	---
25	25.5	18.5	22.0	25.5	21.0	23.0	23.0	18.5	20.5	---	---	---
26	26.5	19.5	23.0	25.5	20.5	23.0	22.5	19.0	20.0	---	---	---
27	25.0	19.0	22.0	25.0	19.0	22.0	22.5	18.5	21.0	14.5	14.5	14.5
28	25.0	19.0	22.0	25.5	19.5	22.5	21.5	16.5	19.0	14.5	14.5	14.5
29	25.0	19.5	22.0	26.0	20.0	23.0	21.0	16.5	18.0	14.5	14.5	14.5
30	25.5	19.5	23.0	23.5	19.5	20.5	22.5	17.5	19.5	14.5	14.5	14.5
31	---	---	---	19.0	17.5	18.0	22.5	18.5	20.5	---	---	---
MONTH	26.5	12.5	20.0	27.5	17.5	22.0	24.5	14.5	19.5	25.0	14.5	19.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

109

04108500 KALAMAZOO RIVER NEAR FENNVILLE, MI

LOCATION.--Lat 42°35'36", long 85°59'03", in NE1/4 sec.5, T.2 N., R.14 W., Allegan County, Hydrologic Unit 04050003, on left bank 40 ft upstream from bridge on State Highway 89, 2.1 mi downstream from Swan Creek, 4.0 mi downstream from Calkins Dam, and 6.1 mi east of Fennville.

DRAINAGE AREA.--1,600 mi², approximately.

PERIOD OF RECORD.--April 1929 to September 1936, October 1937 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "near Allegan" April 1929 to September 1932; as "at Calkins Bridge, near Allegan" October 1932 to September 1936, and October 1937 to September 1938; as "at Calkins Dam, near Allegan" October 1938 to September 1950.

REVISED RECORDS.--WSP 1387: 1929(M), 1930, 1933, 1934-36(M), 1938(M), 1939-40, 1942.

GAGE.--Water-stage recorder. Datum of gage is 586.51 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). April 1929 to September 1936 at bridge and October 1937 to September 1950 in powerplant, 4.0 mi upstream at NGVD (levels by city of Allegan).

REMARKS.--Estimated daily discharges: Oct. 1, 2, Jan. 20-28, and Feb. 1-3. Records good except for estimated daily discharges, which are fair. Flow regulated at low and medium stages by powerplants upstream from station and since June 1936 by Calkins Dam and powerplant, 4.0 mi upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--55 years, 1,430 ft³/s, 12.14 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,500 ft³/s, Apr. 11, 1947, gage height, 606.76 ft, site and datum then in use; minimum daily, 50 ft³/s, Aug. 19, 1976, caused by shutting off flow at Calkins Dam.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,850 ft³/s, Mar. 1, gage height, 13.38 ft; minimum daily, 801 ft³/s, June 22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1100	1420	1420	2970	1800	7640	3690	1970	1830	906	978	1090
2	1450	1390	1810	3070	1700	7450	3840	1930	2020	1020	998	1060
3	1440	1890	1630	3370	1600	7140	4300	1900	2000	957	1080	995
4	849	1890	951	3410	1480	6720	4300	1920	1520	858	1040	1000
5	839	1710	1420	3530	1420	6390	4480	1590	1540	855	1040	970
6	846	1410	1810	3600	1440	5790	4660	1650	1240	1330	1030	975
7	856	1430	1720	3390	1420	5860	5260	2100	1390	1270	1030	948
8	1360	1250	1550	3360	1510	4470	5000	1930	1540	819	1050	949
9	1500	1590	945	3220	1590	4480	4500	1920	1460	828	1050	991
10	1120	1860	1400	2650	1460	4800	4820	1920	1210	829	1030	1260
11	1280	1730	1440	2280	1470	4970	4900	1920	1200	1100	1000	1610
12	1200	1620	952	1930	1370	4410	4870	1910	1260	1300	1010	1970
13	1330	1410	1450	1930	1230	4580	4500	1910	1280	873	1030	1270
14	1160	1560	1900	1920	1640	4400	4380	1900	1280	863	1000	1090
15	877	1860	1860	1930	1560	4280	3770	1850	1290	1330	1050	1010
16	871	1640	1740	1700	1810	4230	3450	1790	1290	1500	1060	1190
17	1360	1400	1690	1390	1780	3940	3400	1610	1290	1680	1070	1400
18	1320	1630	1680	1520	1730	3660	3230	1200	1530	2140	1320	1250
19	887	1410	1680	1710	1410	3190	2880	1560	1790	1330	1110	1030
20	873	1670	1720	1700	1390	3120	2600	1860	1880	821	1100	1080
21	1410	1410	1600	1700	1840	2820	2730	1890	1310	854	1090	1050
22	1820	1620	1410	1400	2230	2500	2620	1880	801	1380	1090	1000
23	1630	922	1900	1350	2540	2490	2450	1550	969	1700	1070	972
24	1440	869	1910	1300	3740	2490	2410	1190	1700	1100	1050	1030
25	1800	1420	1810	1800	5340	2410	2390	1150	1640	978	1050	1010
26	1560	1650	1640	1800	5800	2570	2390	1500	1190	982	1050	1040
27	1370	952	1590	1800	5630	2450	2380	1760	1140	969	1030	956
28	1660	1410	1960	1800	6150	3070	2360	1670	894	1030	1000	895
29	1220	1640	2170	1750	---	4160	2160	1190	821	1060	1040	914
30	1230	1230	2420	1700	---	4420	1990	1510	870	1030	1250	967
31	1200	---	2600	1690	---	4020	---	1750	---	1060	1100	---
TOTAL	38858	44893	51778	68670	64080	134920	106710	53380	41175	34752	32896	32972
MEAN	1253	1496	1670	2215	2289	4352	3557	1722	1373	1121	1061	1099
MAX	1820	1890	2600	3600	6150	7640	5260	2100	2020	2140	1320	1970
MIN	839	869	945	1300	1230	2410	1990	1150	801	819	978	895
CFSM	.78	.94	1.04	1.38	1.43	2.72	2.22	1.08	.86	.70	.66	.69
IN.	.90	1.04	1.20	1.60	1.49	3.14	2.48	1.24	.96	.81	.76	.77
CAL. YR 1984	TOTAL	544102	MEAN	1487	MAX	3840	MIN	542	CFSM	.93	IN	12.65
WTR YR 1985	TOTAL	705084	MEAN	1932	MAX	7640	MIN	801	CFSM	1.21	IN	16.39

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108600 RABBIT RIVER NEAR HOPKINS, MI

LOCATION.--Lat 42°38'32", long 85°43'19", in SE1/4 sec.16, T.3 N., R.12 W., Allegan County, Hydrologic Unit 04050003, on left bank at downstream side of bridge on 18th Street, 2.5 mi northeast of Hopkins.

DRAINAGE AREA.--71.4 mi².

PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 700 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).

REMARKS.--Estimated daily discharges: Dec. 7, 8, and Jan. 4 to Feb. 26. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 56.8 ft³/s, 10.80 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,180 ft³/s, June 26, 1978, gage height, 9.56 ft; minimum not determined; minimum daily, 9.2 ft³/s, Aug. 27, 28, 1970, Sept. 18, 1971; minimum gage height, 1.79 ft, Aug. 28, 1984.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 300 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 29	2400	308	6.82	Mar. 9	0200	330	7.05
Feb. 24	--	*800	*a9.31	Mar. 29	0400	450	7.75
Mar. 5	1300	392	7.46	Apr. 6	0300	363	7.27

a Ice jam.

Minimum discharge, 16 ft³/s, July 25, 30, Aug. 3, 4; minimum gage height, 1.89 ft, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	41	33	111	38	276	153	48	32	22	19	20
2	21	67	31	103	37	258	134	46	30	20	18	20
3	20	52	32	90	37	225	135	44	29	20	17	20
4	20	43	30	80	36	209	129	42	28	20	16	19
5	19	39	31	70	35	375	285	42	28	21	19	19
6	19	35	30	63	34	321	354	58	28	21	23	20
7	22	33	30	59	33	241	288	55	27	21	24	21
8	35	32	30	57	32	247	199	50	27	22	22	20
9	35	34	30	55	31	316	148	46	26	20	19	22
10	29	63	29	53	31	290	127	43	24	19	18	26
11	27	59	30	50	30	278	115	40	24	18	18	24
12	27	49	39	48	30	284	106	39	30	18	18	22
13	28	42	74	47	30	244	100	37	28	17	18	21
14	29	38	61	46	30	189	96	35	26	18	19	20
15	29	37	67	44	30	155	98	34	26	24	22	19
16	30	35	58	43	30	136	94	35	38	25	24	19
17	29	33	52	42	30	122	85	38	38	22	21	19
18	28	32	45	41	31	106	80	36	35	21	20	19
19	32	31	41	40	32	100	75	35	31	20	21	19
20	37	29	38	39	32	95	70	33	29	20	20	18
21	46	29	42	38	35	87	66	36	28	20	19	17
22	51	28	111	38	85	82	63	34	28	19	18	18
23	42	28	69	38	240	80	60	32	29	18	18	19
24	36	27	55	37	700	91	60	31	30	17	23	20
25	33	27	39	37	650	89	68	29	27	17	32	19
26	32	27	62	37	540	81	63	29	26	22	28	20
27	33	27	65	38	473	110	58	32	25	19	25	22
28	35	37	122	38	339	327	55	43	23	18	23	21
29	33	39	257	39	---	407	52	36	23	17	21	19
30	31	35	276	39	---	281	50	33	23	17	21	20
31	29	---	177	39	---	185	---	34	---	18	21	---
TOTAL	939	1128	2086	1599	3711	6287	3466	1205	846	611	645	602
MEAN	30.3	37.6	67.3	51.6	133	203	116	38.9	28.2	19.7	20.8	20.1
MAX	51	67	276	111	700	407	354	58	38	25	32	26
MIN	19	27	29	37	30	80	50	29	23	17	16	17
CFSM	.42	.53	.94	.72	1.86	2.84	1.63	.55	.40	.28	.29	.28
IN.	.49	.59	1.09	.83	1.93	3.28	1.81	.63	.44	.32	.34	.31

CAL YR 1984 TOTAL 17326 MEAN 47.3 MAX 465 MIN 11 CFSM .66 IN 9.03
WTR YR 1985 TOTAL 23125 MEAN 63.4 MAX 700 MIN 16 CFSM .89 IN 12.05

STREAMS TRIBUTARY TO LAKE MICHIGAN

111

04108690 KALAMAZOO RIVER AT SAUGATUCK, MI
(National stream quality accounting network station)

LOCATION.--Lat 42°38'50", long 86°11'53", in NE1/4 sec.16, T.3 N., R.16 W., Allegan County, Hydrologic Unit 04050003, at bridge on Old US-31 between Saugatuck and Douglas, 7.9 mi downstream from Rabbit River, 17.6 mi downstream from gaging station near Fennville (04108500), and 2.9 mi upstream from mouth.

DRAINAGE AREA.--2,020 mi², approximately.

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1974 to September 1981.

WATER TEMPERATURE: May 1975 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Nov. 1, 1975 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at bridge.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975, 1978-81): Maximum recorded (more than 20 percent missing record), 747 microsiemens, Apr. 30, 1980; minimum recorded (more than 20 percent missing record), 172 microsiemens, Sept. 18, 1978.

WATER TEMPERATURE (water years 1977-81): Maximum recorded (more than 20 percent missing record), 31.5°C, July 20, 1977; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV 20...	1000	1420	619	7.9	3.0	1.8	11.6	86	K30	K40
MAR 21...	1200	3170	473	8.2	6.5	3.0	12.3	101	K6	K53
JUN 25...	1330	2040	590	8.2	22.0	2.5	9.1	106	250	70
SEP 10...	1245	--	562	8.2	23.5	3.3	6.8	81	320	110

DATE	HARD- NESS (MG/L AS CAO3)	HARD- NESS, NONCAR- BONATE (MG/L CAO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 20...	280	65	76	23	21	14	.6	2.3	5.3	63
MAR 21...	220	50	60	17	12	11	.4	1.7	2.1	47
JUN 25...	270	41	72	22	21	14	.6	1.6	2.8	45
SEP 10...	250	23	65	22	24	17	.7	3.0	2.8	41

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108690 KALAMAZOO RIVER AT SAUGATUCK, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
NOV 20...	1000	34	.30	9.2	380	360	.52	1460	1.5
MAR 21...	1200	23	.10	4.5	295	270	.40	2520	1.5
JUN 25...	1330	36	.20	5.4	393	340	.53	2160	1.1
SEP 10...	1245	39	.20	3.7	362	340	.49	--	.22

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 20...	.250	.80	.080	.050	.030	12	46	75
MAR 21...	.020	.70	<.010	<.010	<.010	9	77	90
JUN 25...	.090	.90	.120	.040	.020	14	77	78
SEP 10...	.130	.90	.130	.070	.030	--	--	--

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
NOV 20...	<10	1	62	<.5	<1	3	<3	<1	27	2
MAR 21...	<10	<1	47	<.5	<1	<1	<3	3	37	5
JUN 25...	10	1	55	<.5	<1	1	<3	2	9	2
SEP 10...	10	3	72	.5	<1	<1	<3	4	9	4

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
NOV 20...	8	19	.2	<10	2	<1	<1	170	<6	10
MAR 21...	<4	17	<.1	<10	2	<1	<1	120	<6	4
JUN 25...	6	11	.3	<10	6	<1	<1	150	<6	13
SEP 10...	<4	2	<.1	<10	3	<1	<1	150	<6	3

STREAMS TRIBUTARY TO LAKE MICHIGAN

113

04108800 MACATAWA RIVER NEAR ZEELAND, MI

LOCATION.--Lat 42°46'40", long 86°01'06", in NW1/4 sec.31, T.5 N., R.14 W., Ottawa County, Hydrologic Unit 04050002, on left bank 20 ft upstream from bridge on State Road, 0.2 mi downstream from South Branch, and 2.5 mi south of Zeeland.

DRAINAGE AREA.--65.8 mi².

PERIOD OF RECORD.--October 1960 to current year. Prior to October 1978, published as Black River near Zeeland.

GAGE.--Water-stage recorder. Datum of gage is 585.7 ft above National Geodetic Vertical Datum of 1929 (levels by Gove Associates, Inc.).

REMARKS.--Estimated daily discharges: Dec. 6, 7, Jan. 3-11, Jan. 17 to Feb. 23, Apr. 24 to May 16, and Sept. 28, 29. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years, 66.1 ft³/s, 13.64 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,220 ft³/s, May 11, 1981, gage height, 15.81 ft; minimum, 0.9 ft³/s, Aug. 24, 1962; minimum gage height, 1.61 ft, Sept. 3, 1983.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 900 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 29	2400	1,050	10.28	Mar. 9	0300	1,060	10.31
Feb. 24	1100	*3,690	*13.64	Mar. 28	1600	1,120	10.45
Mar. 5	1600	945	9.97				

Minimum discharge, 1.5 ft³/s, July 29, 30, Aug. 4, gage height, 1.63 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.3	58	19	86	44	470	76	14	5.7	2.7	2.6	4.3
2	3.6	83	17	80	43	466	58	14	5.3	2.7	2.4	4.5
3	4.7	26	18	72	42	306	103	13	4.9	2.6	2.0	4.3
4	5.6	18	15	66	40	242	76	12	4.7	2.4	1.8	4.1
5	6.4	15	14	59	39	838	641	13	4.5	2.8	5.5	4.3
6	7.1	13	14	55	38	621	817	17	4.0	2.9	6.7	5.5
7	12	12	13	52	37	282	417	16	4.0	3.2	5.0	6.0
8	28	11	13	48	36	583	124	15	3.7	3.1	3.4	7.1
9	6.3	70	14	45	36	830	71	14	3.3	2.9	2.8	56
10	3.1	265	16	42	35	510	58	13	3.8	2.5	2.6	33
11	2.5	87	22	38	34	516	51	12	4.6	2.2	2.5	13
12	2.4	37	164	32	32	545	44	11	5.5	2.2	2.3	8.2
13	2.4	24	346	46	31	242	41	11	4.6	2.0	3.3	6.5
14	2.6	20	122	29	32	135	41	11	4.2	2.4	4.0	5.8
15	2.6	19	200	43	33	103	44	12	5.2	3.4	3.8	5.5
16	2.6	17	100	35	34	84	36	13	7.0	2.8	3.5	5.2
17	2.5	15	75	36	35	72	29	13	6.3	2.3	2.9	5.0
18	2.5	14	44	37	36	53	27	12	5.8	2.2	4.9	5.1
19	2.7	13	31	38	36	52	27	11	4.6	2.3	3.7	5.2
20	2.8	12	26	39	38	50	20	11	3.9	2.5	2.9	5.1
21	10	12	63	40	47	41	17	11	3.5	2.4	2.9	5.9
22	8.3	11	317	40	240	37	18	9.4	3.4	2.1	2.7	6.8
23	4.1	12	71	41	1200	37	19	8.2	3.3	2.1	2.7	7.5
24	3.1	11	41	42	3440	65	21	7.5	3.2	2.1	14	7.7
25	2.8	11	37	43	2400	50	21	7.2	2.9	2.2	36	7.7
26	3.1	11	28	44	1420	38	19	6.7	2.6	2.4	11	9.4
27	3.0	13	31	45	1070	251	18	8.8	2.4	2.1	6.6	10
28	3.8	57	350	45	587	878	17	8.0	2.4	1.7	5.4	7.8
29	3.3	38	778	45	---	632	16	7.1	2.3	1.7	4.8	4.8
30	2.6	23	772	45	---	211	15	6.7	2.8	1.7	4.8	4.9
31	2.3	---	249	45	---	86	---	6.4	---	2.5	4.6	---
TOTAL	152.1	1028	4020	1453	11135	9326	2982	345.0	124.4	75.1	164.1	266.2
MEAN	4.91	34.3	130	46.9	355	301	99.4	11.1	4.15	2.42	5.29	8.87
MAX	28	265	778	86	3440	878	817	17	7.0	3.4	36	56
MIN	2.3	11	13	29	31	37	15	6.4	2.3	1.7	1.8	4.1
CFSM	.08	.52	1.98	.71	6.05	4.57	1.51	.17	.06	.04	.08	.14
IN	.09	.58	2.27	.82	6.30	5.27	1.69	.20	.07	.04	.09	.15
CAL YR 1984	TOTAL	23683.2	MEAN 64.7	MAX 2280	MIN 1.4	CFSM .98	IN 13.39					
WTR YR 1985	TOTAL	31070.9	MEAN 85.1	MAX 3440	MIN 1.7	CFSM 1.29	IN 17.57					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04109000 GRAND RIVER AT JACKSON, MI

LOCATION.--Lat 42°17'05", long 84°24'30", in sec.22, T.2 S., R.1 W., Jackson County, Hydrologic Unit 04050004, on left bank of sewage-treatment plant, 1 mi north of Jackson, 2.2 mi upstream from Portage River, and at mile 216.

DRAINAGE AREA.--174 mi².

PERIOD OF RECORD.--April 1935 to current year.

REVISED RECORDS.--WSP 974: 1937(M). WSP 1387: 1936. WSP 1727: 1950(M).

GAGE.--Water-stage recorder. Datum of gage is 900.00 ft, Fargo Engineering Co. datum. Prior to Sept. 24, 1935, nonrecording gage at same site and datum.

REMARKS.--No estimated daily discharges. Records good. Slight regulation by mills upstream from station. Flow includes about 17 ft³/s as sewage effluent, which originates from ground-water sources, from the city of Jackson. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--50 years, 123 ft³/s, 9.60 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,070 ft³/s, June 25, 1937, gage height, 13.50 ft; maximum gage height, 15.44 ft, June 25, 1968; minimum discharge, 9.2 ft³/s, Aug. 22, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 538 ft³/s, Apr. 5, gage height, 12.90 ft; minimum, 34 ft³/s, Sept. 2, gage height, 8.39 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	49	77	127	346	72	494	393	122	130	51	57	41
2	48	112	75	304	72	489	409	110	120	51	52	38
3	49	61	82	308	70	475	418	102	122	50	47	43
4	45	54	75	306	74	469	395	96	83	44	43	45
5	47	57	69	313	74	461	442	92	72	99	75	47
6	41	59	75	298	75	449	446	113	67	65	110	61
7	52	58	62	264	75	434	430	151	65	63	109	51
8	63	59	68	239	75	418	427	155	57	59	98	71
9	109	68	66	206	113	390	447	151	150	59	58	94
10	110	94	72	215	128	370	454	139	86	110	54	133
11	99	136	120	201	131	367	443	83	98	72	48	133
12	57	158	139	144	138	361	408	70	94	67	52	130
13	51	166	144	96	133	335	383	71	90	61	51	116
14	47	165	150	102	125	331	361	72	86	134	52	69
15	55	173	142	92	76	331	344	81	136	134	74	62
16	54	164	139	102	70	327	327	86	144	151	59	65
17	55	154	134	100	72	315	284	128	157	148	53	63
18	52	150	88	98	77	274	259	81	154	139	46	61
19	58	141	86	90	78	256	246	67	100	130	48	59
20	53	86	83	75	82	271	234	74	85	119	50	57
21	88	75	102	88	144	246	216	70	85	110	51	50
22	67	67	96	96	208	220	208	77	127	109	50	49
23	119	63	85	141	318	213	195	120	119	62	50	70
24	123	61	90	157	388	209	171	75	76	56	47	69
25	120	59	66	157	425	205	214	59	71	63	46	59
26	114	63	78	145	456	202	202	55	63	86	47	63
27	63	78	134	139	481	242	185	120	63	62	49	57
28	55	145	198	141	489	297	178	96	58	53	50	53
29	57	136	207	136	---	332	178	139	54	55	50	50
30	57	134	193	86	---	338	171	144	48	56	46	68
31	55	---	204	78	---	362	---	144	---	58	43	---
TOTAL	2112	3073	3449	5263	4719	10483	9468	3143	2862	2576	1765	2027
MEAN	68.1	102	111	170	169	338	316	101	95.4	83.1	56.9	67.6
MAX	123	173	207	346	489	494	454	155	157	151	110	133
MIN	41	54	62	75	70	202	171	55	48	44	43	38
CFSM	.39	.59	.64	.98	.97	1.94	1.82	.58	.55	.48	.33	.39
IN.	.45	.66	.74	1.13	1.01	2.24	2.02	.67	.61	.55	.38	.43
CAL YR 1984	TOTAL	47328	MEAN 129	MAX 466	MIN 23	CFSM .74	IN 10.12					
WTR YR 1985	TOTAL	50940	MEAN 140	MAX 494	MIN 38	CFSM .81	IN 10.89					

STREAMS TRIBUTARY TO LAKE MICHIGAN

115

04111379 RED CEDAR RIVER NEAR WILLIAMSTON, MI

LOCATION.--Lat 42°40'59", long 84°13'09", in NE1/4 sec.4, T.3 N., R.2 E., Ingham County, Hydrologic Unit 04050004, on right bank 20 ft upstream from bridge on State Highway 52, 1.5 mi upstream from Squaw Creek, and 3.5 mi east of Williamston.

DRAINAGE AREA.--163 mi².

PERIOD OF RECORD.--July 1975 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 870 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).

REMARKS.--Estimated daily discharges: Dec. 6-8, 25-27, and Jan. 2 to Feb. 25. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--10 years, 103 ft³/s, 8.58 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,790 ft³/s, Feb. 26, 1985, gage height, 9.07 ft; minimum, 2.6 ft³/s, Aug. 24, 27, 1984, gage height, 1.96 ft.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1975, reached a gage height of 10.41 ft Apr. 19, and a discharge of 2,640 ft³/s, Apr. 20.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,790 ft³/s, Feb. 26, gage height, 9.07 ft; minimum, 7.2 ft³/s, Aug. 12, 13, gage height, 2.15 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	35	47	361	52	958	403	82	139	30	18	29
2	18	50	44	500	50	813	383	75	155	30	18	27
3	16	43	44	540	48	679	362	67	168	30	15	24
4	15	39	43	490	46	609	341	60	168	29	15	22
5	15	37	37	420	45	608	466	59	157	29	15	22
6	15	34	35	370	44	599	869	90	137	29	17	30
7	15	32	32	320	44	531	940	122	113	29	18	43
8	19	31	31	250	44	515	873	133	88	29	17	79
9	23	31	31	150	44	608	772	131	73	28	15	97
10	21	41	33	120	44	611	655	116	79	24	14	96
11	20	73	36	100	44	586	555	94	76	22	13	86
12	18	93	41	90	44	562	469	74	82	22	10	78
13	18	94	53	84	43	513	407	63	89	22	11	69
14	17	83	63	74	43	464	358	54	87	20	11	59
15	17	74	71	70	46	419	316	50	76	26	17	50
16	19	71	75	64	46	378	285	69	76	32	23	44
17	20	66	72	60	47	344	257	86	79	30	26	38
18	20	60	66	56	48	311	237	86	83	27	31	35
19	23	54	61	54	49	284	215	77	81	25	35	33
20	24	49	57	54	51	260	194	67	71	28	31	30
21	34	44	53	54	56	235	173	65	62	27	28	27
22	40	38	88	54	80	213	150	62	58	25	25	28
23	39	39	101	53	300	195	132	55	54	23	22	27
24	35	38	93	53	900	190	120	49	48	21	26	31
25	31	36	80	53	1500	190	124	43	44	19	34	33
26	30	35	50	53	1700	184	128	39	43	29	34	34
27	31	34	65	53	1390	184	125	56	39	24	44	36
28	30	41	83	53	1130	253	114	79	34	21	35	33
29	28	49	151	53	---	386	102	84	34	19	33	30
30	27	50	249	53	---	405	91	76	33	18	34	29
31	25	---	259	54	---	403	---	88	---	18	33	---
TOTAL	722	1494	2246	4813	7982	13490	10616	2351	2526	785	718	1301
MEAN	23.3	49.8	72.5	155	285	435	354	75.8	84.2	25.3	23.2	43.4
MAX	40	94	259	540	1700	958	940	133	168	32	44	97
MIN	15	31	31	53	44	184	91	39	33	18	10	22
CFSM	.14	.31	.45	.95	1.75	2.67	2.17	.47	.52	.16	.14	.27
IN.	.16	.34	.51	1.10	1.82	3.08	2.42	.54	.58	.18	.16	.30
CAL YR 1984	TOTAL	27815.4	MEAN	76.0	MAX	354	MIN	5.1	CFSM	.47	IN	6.35
WTR YR 1985	TOTAL	49044.0	MEAN	134	MAX	1700	MIN	10	CFSM	.82	IN	11.19

STREAMS TRIBUTARY TO LAKE MICHIGAN

04111500 DEER CREEK NEAR DANSVILLE, MI

LOCATION.--Lat 42°36'30", long 84°19'15", in E1/2 sec.33, T.3 N., R.1 E., Ingham County, Hydrologic Unit 04050004, on right bank 15 ft upstream from bridge on Clark Road, 3.5 mi north of Dansville, and 7.2 mi upstream from mouth.

DRAINAGE AREA.--16.3 mi².

PERIOD OF RECORD.--May 1954 to current year.

REVISED RECORDS.--WSP 1727: 1954(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 889.08 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Estimated daily discharges: Jan. 20 to Feb. 22, and Mar. 4-25. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--31 years, 10.8 ft³/s, 9.00 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 962 ft³/s, Apr. 19, 1975, gage height, 12.18 ft, from flood mark, rating curve extended above 610 ft³/s; minimum, 0.04 ft³/s, Sept. 8, 9, 12, 1978, gage height, 2.58 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 100 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 29	2000	147	5.07	Mar. 8	--	145	unknown
Jan. 1	1500	269	7.32	Mar. 29	0300	158	5.24
Feb. 24	--	*528	*9.82	Apr. 6	0300	371	8.42
Mar. 5	--	132	unknown	May 31	1200	118	4.65

Minimum discharge, 0.39 ft³/s, Aug. 12, 13, 14, gage height, 2.69 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	8.1	8.2	210	5.5	59	45	5.9	59	1.6	.93	1.2
2	1.2	16	7.3	161	5.0	51	33	5.6	25	1.6	.66	1.1
3	1.1	9.3	8.8	75	4.0	40	31	5.2	14	1.6	.56	.95
4	.93	7.1	7.9	40	4.3	45	29	5.1	9.4	1.5	.50	.85
5	.90	5.9	6.7	30	4.6	100	177	5.2	7.5	1.9	.68	.85
6	.90	4.8	5.8	25	5.4	80	277	41	6.0	1.7	1.0	2.8
7	.99	4.2	5.6	22	4.7	56	135	28	5.1	1.3	1.0	3.7
8	1.5	3.9	5.1	16	4.3	110	81	17	4.1	1.2	.75	5.5
9	1.7	4.0	4.7	14	4.0	95	51	13	18	1.1	.57	28
10	1.6	6.0	5.1	11	4.4	65	39	9.8	11	1.1	.51	14
11	1.5	63	5.4	9.6	5.0	60	32	7.9	7.2	.97	.49	7.1
12	1.4	41	7.4	8.7	5.8	50	27	6.7	13	.93	.44	4.7
13	1.3	24	17	8.5	5.2	40	24	5.6	9.2	.86	.40	3.5
14	1.3	18	17	7.6	5.0	33	20	4.9	6.6	1.7	.42	2.9
15	1.3	17	23	7.0	5.0	29	18	4.6	5.7	3.0	2.2	2.5
16	1.3	17	19	6.4	5.0	25	16	4.8	8.5	2.6	2.4	2.3
17	1.2	13	16	6.8	4.9	23	15	5.3	8.0	1.5	1.3	2.0
18	1.1	12	13	6.7	4.8	20	16	4.9	7.2	1.2	1.7	1.9
19	1.2	10	12	6.1	4.7	18	14	4.2	5.4	1.1	2.8	1.8
20	1.4	8.3	10	5.6	4.7	16	12	3.8	4.5	1.5	1.6	1.6
21	6.0	7.3	12	5.2	6.0	15	11	4.1	3.7	1.4	1.4	1.5
22	7.3	6.6	39	6.0	70	14	9.9	3.6	3.7	1.2	1.2	1.5
23	4.8	6.4	23	6.2	267	14	9.0	3.3	3.5	.97	1.0	1.6
24	3.7	6.1	17	6.4	452	15	9.3	3.0	2.9	.81	1.4	2.0
25	3.1	5.9	15	6.3	242	14	11	2.7	2.5	.75	3.4	1.9
26	3.1	5.7	9.1	6.2	147	14	9.2	2.5	2.4	.88	2.7	1.9
27	3.1	5.8	9.7	6.2	112	21	8.0	5.9	2.2	.76	2.0	2.0
28	3.0	8.8	33	6.0	72	82	7.3	9.0	1.9	.63	1.6	1.8
29	2.7	11	102	6.0	---	133	6.7	6.5	1.9	.71	1.3	1.5
30	2.5	9.4	100	5.9	---	69	6.3	4.7	1.7	.58	1.5	1.5
31	2.4	---	55	5.8	---	49	---	74	---	.72	1.5	---
TOTAL	66.82	365.6	619.8	743.2	1464.3	1455	1179.7	307.8	260.8	39.37	39.91	106.45
MEAN	2.16	12.2	20.0	24.0	52.3	46.9	39.3	9.93	8.69	1.27	1.29	3.55
MAX	7.3	63	102	210	452	133	277	74	59	3.0	3.4	28
MIN	.90	3.9	4.7	5.2	4.0	14	6.3	2.5	1.7	.58	.40	.85
CFSM	.13	.75	1.23	1.47	3.21	2.88	2.41	.61	.53	.08	.08	.22
IN.	.15	.83	1.41	1.70	3.34	3.32	2.69	.70	.60	.09	.09	.24

CAL YR 1984 TOTAL 3739.80 MEAN 10.3 MAX 102 MIN .10 CFSM .63 IN 8.58
WTR YR 1985 TOTAL 6648.75 MEAN 18.2 MAX 452 MIN .40 CFSM 1.12 IN 15.17

STREAMS TRIBUTARY TO LAKE MICHIGAN

117

04112000 SLOAN CREEK NEAR WILLIAMSTON, MI

LOCATION.--Lat 42°40'33", long 84°21'50", in SE1/4 NE1/4 sec.1, T.3 N., R.1 W., Ingham County, Hydrologic Unit 04050004, on left bank 30 ft downstream from culvert on Meridian Road, 2.1 mi upstream from mouth, and 4.2 mi west of Williamston.

DRAINAGE AREA.--9.34 mi².

PERIOD OF RECORD.--June 1954 to current year.

GAGE.--Water-stage recorder and concrete control with V-notch sharp-crested weir. Datum of gage is 862.12 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Estimated daily discharges: Feb. 2-5. Records good. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--31 years, 5.73 ft³/s, 8.33 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,290 ft³/s, Apr. 18, 1975, gage height, 9.99 ft, from rating curve extended above 660 ft³/s on basis of computation of peak flow through culvert and over road embankment; minimum, 0.01 ft³/s, Sept. 11, 1954, Jan. 18, 1957, gage height, 1.10 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 120 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	0900	280	4.99	Mar. 28	1000	128	4.07
Feb. 24	0500	*474	*6.12	Apr. 5	2000	386	5.61

Minimum discharge, 0.06 ft³/s, Aug. 5, gage height, 1.25 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.18	2.0	2.2	150	1.5	30	23	2.1	1.6	.28	.15	.28
2	.19	4.2	2.0	54	1.4	27	16	1.9	1.1	.29	.12	.25
3	.16	2.0	2.2	30	1.1	21	15	1.8	.93	.28	.10	.21
4	.12	1.3	1.9	21	1.2	24	14	1.7	.79	.26	.10	.18
5	.12	1.0	1.7	15	1.3	56	172	1.7	.76	.26	.11	.18
6	.13	.79	1.7	10	1.5	37	139	4.1	.69	.26	.15	1.8
7	.17	.66	1.4	8.3	1.4	27	54	3.6	.65	.25	.16	2.5
8	.20	.60	1.3	6.4	1.2	62	35	2.8	.62	.24	.14	15
9	.19	.65	1.3	5.2	1.1	53	26	2.4	1.4	.20	.12	23
10	.18	2.1	1.4	4.5	1.2	36	21	2.1	1.6	.18	.10	8.9
11	.16	18	1.3	4.0	1.3	34	17	1.8	1.2	.17	.10	4.3
12	.15	10	1.7	3.6	1.6	29	14	1.7	1.6	.17	.09	2.8
13	.14	5.6	3.5	3.3	1.5	20	11	1.4	1.4	.16	.08	2.0
14	.15	4.2	3.8	3.1	1.4	16	8.5	1.3	1.0	.26	.08	1.5
15	.15	4.5	6.8	2.6	1.4	13	7.7	1.2	.98	.26	.30	1.2
16	.15	5.0	5.5	2.4	1.4	10	6.6	1.3	1.2	.21	.24	.98
17	.15	3.7	4.4	2.5	1.4	8.2	5.8	1.4	1.1	.19	.15	.81
18	.14	3.1	3.6	2.4	1.3	6.8	5.7	1.2	1.0	.19	.51	.71
19	.18	2.7	3.3	2.2	1.3	6.3	4.9	1.1	.85	.34	.31	.66
20	.18	2.2	2.8	1.7	1.3	5.7	4.4	1.0	.74	.38	.20	.56
21	.80	2.0	4.1	1.4	1.5	5.0	4.0	1.1	.62	.28	.18	.49
22	.66	1.7	23	1.7	21	4.8	3.7	.93	.76	.23	.17	.50
23	.51	1.7	9.5	1.7	189	4.7	3.4	.88	.88	.20	.16	.50
24	.42	1.5	6.1	1.8	307	5.5	3.4	.81	.62	.17	.40	.69
25	.35	1.4	4.2	1.8	102	5.2	3.3	.74	.49	.15	.59	.55
26	.34	1.3	3.5	1.7	65	4.8	3.0	.72	.44	.17	.79	.56
27	.33	1.3	3.5	1.7	49	9.2	2.7	1.1	.39	.15	1.8	.54
28	.30	1.9	20	1.7	34	68	2.5	1.1	.36	.13	.57	.49
29	.27	2.5	56	1.6	---	61	2.3	.90	.33	.12	.38	.42
30	.25	2.5	41	1.6	---	33	2.2	.85	.30	.11	.37	.41
31	.25	---	27	1.6	---	26	---	1.4	---	.13	.34	---
TOTAL	7.67	92.10	251.7	350.5	795.3	749.2	631.1	48.13	26.40	6.67	9.06	72.97
MEAN	.25	3.07	8.12	11.3	28.4	24.2	21.0	1.55	.88	.22	.29	2.43
MAX	.80	18	56	150	307	68	172	4.1	1.6	.38	1.8	23
MIN	.12	.60	1.3	1.4	1.1	4.7	2.2	.72	.30	.11	.08	.18
CFSM	.03	.33	.87	1.21	3.04	2.59	2.25	.17	.09	.02	.03	.26
IN.	.03	.37	1.00	1.40	3.17	2.98	2.51	.19	.11	.03	.04	.29
CAL YR 1984	TOTAL	1590.67	MEAN	4.35	MAX	56	MIN	.06	CFSM	.47	IN	6.33
WTR YR 1985	TOTAL	3040.80	MEAN	8.33	MAX	307	MIN	.08	CFSM	.89	IN	12.11

STREAMS TRIBUTARY TO LAKE MICHIGAN

04112500 RED CEDAR RIVER AT EAST LANSING, MI

LOCATION.--Lat 42°43'40", long 84°28'40", in SW1/4 sec.18, T.4 N., R.1 W., Ingham County, Hydrologic Unit 04050004, in left downstream bridge abutment of Farm Lane Bridge on Michigan State University Campus in East Lansing, 4.0 mi upstream from Sycamore Creek, and 5.6 mi upstream from mouth.

DRAINAGE AREA.--355 mi².

PERIOD OF RECORD.--August 1902 to December 1903, March 1931 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as Red Cedar River at Agricultural College, August 1902 to December 1903 and as Cedar River at East Lansing, March 1931 to September 1965. Gage-height records collected in this vicinity 1911-19, and for flood seasons only 1920-28, are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 1307: 1936(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 824.39 ft above National Geodetic Vertical Datum of 1929. August 1902 to December 1903 nonrecording gage at site 0.8 mi downstream at different datum. March 1931 to November 1940 water-stage recorder at site 250 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Jan. 10-20, Feb. 4-6, and Feb. 9-11. Records good except for estimated daily discharges, which are fair. Prior to April 1975, occasional regulation at low flow by mill at Williamston, 16 mi upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--55 years, 207 ft³/s, 7.92 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,940 ft³/s, Apr. 20, 1975, gage height, 11.95 ft; minimum, 3 ft³/s, July 31, 1931.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Mar. 24, 1904, reached a stage of 13.4 ft, discharge, 8,000 ft³/s.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,840 ft³/s, Feb. 26, gage height, 9.46 ft; minimum, 24 ft³/s, Aug. 14, gage height, 3.12 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	82	108	875	111	1990	935	226	247	65	38	57
2	38	105	102	1100	108	1640	845	216	307	72	38	53
3	36	105	102	1170	105	1360	765	208	307	67	38	49
4	36	87	100	975	100	1190	715	202	268	69	34	47
5	34	82	87	875	96	1230	1020	205	247	77	40	44
6	32	74	87	685	95	1260	2270	261	230	65	40	64
7	44	72	67	565	95	1240	2750	347	205	65	40	79
8	44	69	89	458	95	1160	2360	359	177	60	40	135
9	42	77	89	287	93	1370	1850	335	174	51	36	219
10	47	82	84	250	93	1440	1460	311	163	47	34	226
11	44	163	84	220	94	1320	1200	258	174	44	29	166
12	42	250	89	200	95	1220	990	208	163	44	28	135
13	44	233	108	180	97	1090	855	166	166	42	26	117
14	51	191	146	160	97	950	760	149	160	44	24	102
15	40	166	166	150	97	840	705	132	152	67	55	89
16	38	163	188	140	102	735	610	129	146	57	44	79
17	38	149	177	130	102	655	540	149	142	60	44	72
18	38	135	160	120	105	575	476	160	142	53	65	65
19	49	120	142	115	105	520	435	156	138	55	65	62
20	49	108	132	115	108	466	391	152	129	60	60	57
21	87	97	135	111	114	427	355	142	114	55	53	53
22	74	89	222	111	194	391	323	135	105	51	49	51
23	77	84	279	111	670	367	295	129	100	47	44	70
24	72	84	240	111	1780	367	275	120	89	42	67	65
25	62	84	149	111	3310	363	279	111	79	44	69	57
26	60	82	108	111	3790	347	275	102	74	49	77	62
27	57	82	149	111	3490	367	264	126	69	51	87	60
28	55	97	254	111	2630	765	258	142	65	44	79	57
29	53	105	505	111	---	1140	247	163	62	40	65	53
30	51	111	735	111	---	1180	236	160	62	36	67	53
31	51	---	700	111	---	1040	---	156	---	36	65	---
TOTAL	1525	3428	5783	9991	17971	29005	24739	5815	4656	1659	1540	2498
MEAN	49.2	114	187	322	642	936	825	188	155	53.5	49.7	83.3
MAX	87	250	735	1170	3790	1990	2750	359	307	77	87	226
MIN	32	69	67	111	93	347	236	102	62	36	24	44
CFSM	.14	.32	.53	.91	1.81	2.64	2.32	.53	.44	.15	.14	.24
IN.	.16	.36	.61	1.05	1.88	3.04	2.59	.61	.49	.17	.16	.26
CAL YR 1984	TOTAL	60005	MEAN 164	MAX 905	MIN 12	CFSM .46	IN 6.29					
WTR YR 1985	TOTAL	108610	MEAN 298	MAX 3790	MIN 24	CFSM .84	IN 11.38					

STREAMS TRIBUTARY TO LAKE MICHIGAN

119

04113000 GRAND RIVER AT LANSING, MI

LOCATION.--Lat 42°45'02", long 84°33'19", in NW1/4 sec.9, T.4 N., R.2 W., Ingham County, Hydrologic Unit 04050004, on right bank 30 ft upstream from bridge on North Grand River Avenue in Lansing, 2.0 mi downstream from Red Cedar River, and at mile 152.

DRAINAGE AREA.--1,230 mi², approximately.

PERIOD OF RECORD.--March 1901 to September 1906, October 1934 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "at North Lansing" 1901-6. Gage-height records collected in this vicinity 1907-10 (flood seasons only), 1911-19, 1920-28 (flood seasons only), since 1931 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 1174: 1949. WSP 1387: 1901, 1903-4, 1935, 1937, 1942.

GAGE.--Water-stage recorder. Datum of gage is 805.53 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to August 1906, nonrecording gage at same site at different datum. November 1934 to June 1949 water-stage recorder at site 1.8 mi downstream at datum 2.42 ft lower.

REMARKS.--No estimated daily discharges. Records good. Large diurnal fluctuation at medium and low flows caused by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--56 years, 839 ft³/s, 9.26 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 24,500 ft³/s, Mar. 26, 1904, gage height, 18.60 ft, datum then in use, from rating curve extended above 15,000 ft³/s; minimum, 2.8 ft³/s, Sept. 9, 1963, gage height, 0.85 ft; minimum daily, 20 ft³/s, Aug. 25, 1941.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1901, that of Mar. 26, 1904.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 9,660 ft³/s, Feb. 26, gage height, 14.12 ft; minimum daily, 131 ft³/s, Oct. 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	304	452	707	3130	581	6050	3640	1060	958	205	195	283
2	302	599	502	3530	592	5010	3310	1010	1100	314	216	227
3	242	537	580	3630	552	4400	3090	992	902	247	209	404
4	201	431	756	3180	489	4270	2980	829	843	216	244	259
5	235	500	407	3070	511	4410	4200	917	726	329	277	222
6	220	343	441	2680	491	4420	6850	1100	599	219	241	394
7	284	374	374	2290	489	4340	7640	1230	574	308	243	280
8	219	383	387	1900	494	4290	7170	1230	458	325	312	366
9	131	455	470	1320	487	4730	6080	1150	803	247	318	651
10	193	363	517	1360	476	4850	4920	979	832	304	289	689
11	394	663	417	1350	495	4660	4100	967	780	264	277	614
12	264	897	390	1300	502	4380	3680	807	784	315	176	575
13	198	1070	565	1120	515	4030	3330	757	768	187	182	543
14	341	903	778	1140	522	3630	3090	668	733	277	180	488
15	201	980	711	950	548	3390	2980	717	718	615	417	449
16	294	877	869	883	568	2930	2690	608	728	539	490	301
17	172	806	800	816	561	2780	2480	598	669	484	402	282
18	276	746	807	834	555	2550	2290	674	674	470	569	271
19	288	704	745	765	545	2370	2230	699	699	458	360	336
20	229	629	636	608	550	2230	2010	598	630	485	290	234
21	553	621	789	529	591	2060	1870	676	597	404	255	287
22	448	581	987	628	918	1940	1720	520	540	386	291	285
23	429	552	1040	615	2720	1930	1620	577	512	277	220	407
24	409	486	1000	604	5770	1840	1540	523	443	251	440	446
25	352	460	814	634	7730	1850	1540	471	394	358	372	279
26	459	332	598	671	9040	1780	1370	461	406	290	368	354
27	409	543	575	615	9030	1910	1380	604	295	240	389	293
28	378	470	930	699	7530	3270	1300	611	317	234	354	305
29	362	464	1960	627	---	3860	1220	564	333	242	287	299
30	328	582	2150	629	---	3930	1170	658	260	233	320	280
31	273	---	2160	666	---	3830	---	681	---	215	339	---
TOTAL	9388	17803	24862	42773	53852	107920	93490	23936	19075	9938	9522	11103
MEAN	303	593	802	1380	1923	3481	3116	772	636	321	307	370
MAX	553	1070	2160	3630	9040	6050	7640	1230	1100	615	569	689
MIN	131	332	374	529	476	1780	1170	461	260	187	176	222
CFSM	.25	.48	.65	1.12	1.56	2.83	2.53	.63	.52	.26	.25	.30
IN.	.28	.54	.75	1.29	1.63	3.26	2.83	.72	.58	.30	.29	.34
CAL YR 1984 TOTAL	272533			745		2610		95		61		8.24
WTR YR 1985 TOTAL	423662			1161		9040		131		.94		12.81

STREAMS TRIBUTARY TO LAKE MICHIGAN

04114500 LOOKING GLASS RIVER NEAR EAGLE, MI

LOCATION.--Lat 42°49'45", long 84°46'40", in sec.10, T.5 N., R.4 W., Clinton County, Hydrologic Unit 04050004, on right bank at upstream side of former bridge site, 1.5 mi northeast of Eagle, and 10 mi upstream from mouth.

DRAINAGE AREA.--281 mi².

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1387: 1946-47.

GAGE.--Water-stage recorder. Datum of gage is 747.09 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to June 2, 1962, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 5-10, 25-29, Jan. 3-5, and Jan. 8 to Feb. 26. Records good except for estimated daily discharges, which are fair. Small intermittent diversion at times into Lake Geneva when discharge is above 50 ft³/s. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--41 years, 174 ft³/s, 8.41 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,860 ft³/s, Apr. 5, 1947, gage height, 7.70 ft, from graph based on gage readings, from rating curve extended above 1,900 ft³/s; maximum gage height, 9.9 ft, Mar. 7, 1956 from high-water mark, backwater from ice; minimum discharge, 10 ft³/s, July 28, 1965, gage height, 1.01 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,200 ft³/s, Feb. 24; gage height, 7.26 ft, backwater from ice; minimum, 26 ft³/s, Oct. 5, 6; minimum gage height, 1.33 ft, Oct. 5, 6, Aug. 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	55	83	386	88	1080	645	238	136	48	46	88
2	30	76	83	461	86	1240	666	218	123	48	43	84
3	28	68	86	410	84	1350	717	201	119	45	41	77
4	27	65	82	400	82	1420	766	187	118	44	39	70
5	26	67	80	430	80	1690	1310	175	115	56	41	64
6	26	66	74	440	78	1720	1800	184	106	50	45	92
7	33	65	68	449	78	1620	1440	177	96	49	46	84
8	48	62	66	430	78	1600	1220	166	88	49	45	82
9	41	69	66	420	78	1700	1130	163	156	45	41	145
10	37	86	68	400	78	1530	1120	162	115	43	40	154
11	35	88	69	360	78	1440	1140	158	99	42	38	154
12	33	96	72	310	78	1370	1160	150	100	41	36	150
13	31	94	83	270	78	1260	1160	141	95	41	35	145
14	32	96	91	240	78	1180	1120	131	90	41	34	138
15	37	100	103	220	80	1110	1090	128	92	53	48	122
16	34	103	109	200	80	1050	1050	122	103	49	44	104
17	33	99	110	170	82	987	973	122	104	51	43	90
18	31	97	111	140	84	917	900	119	102	44	63	79
19	33	94	110	110	86	852	817	116	96	43	54	72
20	44	90	109	100	90	779	734	116	92	46	51	67
21	73	86	110	84	92	701	655	117	86	46	56	61
22	74	84	149	88	160	631	581	114	82	43	49	60
23	66	77	142	90	553	572	517	112	78	40	43	57
24	57	75	131	90	1820	532	474	109	73	40	186	67
25	55	74	120	90	1830	483	445	104	67	46	290	78
26	54	72	90	90	1290	436	385	98	63	123	178	82
27	52	71	120	90	1050	423	341	102	59	77	168	78
28	48	83	200	90	980	822	310	109	55	66	142	74
29	47	83	420	90	---	937	281	108	52	56	122	70
30	45	84	450	90	---	727	259	109	50	50	112	68
31	46	---	336	90	---	635	---	203	---	47	97	---
TOTAL	1286	2425	3991	7328	9399	32794	25206	4459	2810	1562	2316	2756
MEAN	41.5	80.8	129	236	336	1058	840	144	93.7	50.4	74.7	91.9
MAX	74	103	450	461	1830	1720	1800	238	156	123	290	154
MIN	26	55	66	84	78	423	259	98	50	40	34	57
CFSM	.15	.29	.46	.84	1.20	3.77	2.99	.51	.33	.18	.27	.33
IN.	.17	.32	.53	.97	1.24	4.34	3.34	.59	.37	.21	.31	.36
CAL YR 1984	TOTAL	51456	MEAN 141	MAX	530	MIN 26	CFSM .50	IN 6.81				
WTR YR 1985	TOTAL	96332	MEAN 264	MAX	1830	MIN 26	CFSM .94	IN 12.75				

121

LOCATION.--Lat 43°06'35", long 84°41'35", in sec.5, T.8 N., R.3 W., Clinton County, Hydrologic Unit 04050005, on right bank at downstream side of bridge on Maple Road at Maple Rapids, 50 ft upstream from Pine Creek, and 0.8 mi upstream from Hayworth Creek. Records include flow of Pine Creek.

GAGE.--Water-stage recorder. Datum of gage is 642.58 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 4, 1968, nonrecording gage at same site and datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 6,500 ft³/s, Mar. 20, 1948; maximum gage height, 11.22 ft, Mar. 20, 1948, from floodmark, backwater from ice; minimum discharge, 4.4 ft³/s, Aug. 13, 1965, gage height, 1.62 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,310 ft³/s, Mar. 4, gage height, 9.87 ft; minimum, 15 ft³/s, Oct. 2, gage height, 1.71 ft.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	50	97	1230	100	3590	1490	283	140	28	44	220
2	19	72	95	1140	100	4050	1460	252	142	23	40	234
3	19	91	90	1080	100	4020	1370	229	133	24	33	240
4	20	89	100	960	96	4080	1290	211	116	27	33	224
5	22	82	92	887	94	3600	1390	197	101	30	39	202
6	20	74	89	822	92	2680	2230	188	90	31	46	563
7	23	83	86	758	90	2180	2530	177	78	34	49	1380
8	30	117	76	722	88	1960	2610	168	65	34	47	2060
9	34	106	79	715	88	2060	2540	151	66	36	43	3000
10	34	119	78	650	88	2380	2330	139	96	32	39	2940
11	33	153	77	550	88	2880	2090	130	95	32	37	2490
12	32	168	82	450	88	3370	1770	120	89	32	33	2070
13	30	194	117	350	90	3370	1520	113	81	30	30	1700
14	29	175	169	300	90	2820	1330	107	76	27	29	1480
15	32	151	181	270	90	2370	1170	100	74	31	33	1280
16	34	134	193	240	92	1950	1040	100	85	30	34	1080
17	33	121	224	210	94	1680	949	102	92	27	34	923
18	35	109	222	190	96	1470	870	97	94	25	32	812
19	33	98	213	170	100	1290	819	92	92	24	34	708
20	39	87	201	160	105	1150	752	90	84	28	35	618
21	51	81	188	150	110	1020	690	83	66	29	35	545
22	67	75	201	140	150	921	630	83	58	31	35	479
23	75	79	225	130	291	847	555	82	60	30	33	421
24	70	78	254	120	540	793	503	69	59	25	51	374
25	63	75	245	110	976	746	462	64	45	24	150	344
26	59	72	229	100	1580	706	431	69	37	60	217	322
27	58	70	240	100	2400	680	399	92	37	90	234	297
28	56	77	469	100	2900	803	370	123	38	90	246	271
29	56	92	814	100	---	1120	341	122	35	74	256	248
30	51	99	1090	100	---	1420	310	115	33	58	257	229
31	51	---	1280	100	---	1510	---	116	---	49	241	---
TOTAL	1229	3071	7796	13104	10816	63516	36241	4064	2357	1145	2499	27754
MEAN	39. 6	102	251	423	386	2049	1208	131	78. 6	36. 9	80. 6	925
MAX	75	194	1280	1230	2900	4080	2610	283	142	90	257	3000
MIN	19	50	76	100	88	680	310	64	33	23	29	202
CFSM	.09	.24	.58	.98	.89	4. 72	2. 78	.30	.18	.09	.19	2. 13
IN.	.11	.26	.67	1. 12	.93	5. 44	3. 11	.35	.20	.10	.21	2. 38
CAL YR 1984	TOTAL	83046	MEAN	227	MAX	1340	MIN	14	CFSM	.52	IN	7. 12
WTR YR 1985												

STREAMS TRIBUTARY TO LAKE MICHIGAN

04116000 GRAND RIVER AT IONIA, MI

LOCATION.--Lat 42°58'20", long 85°04'13", in NW1/4 sec.30, T.7 N., R.6 W., Ionia County, Hydrologic Unit 04050006, on left bank 15 ft downstream from bridge on State Highway 66 at Ionia, 2.7 mi downstream from Prairie Creek, and at mile 87.

DRAINAGE AREA.--2,840 mi², approximately.

PERIOD OF RECORD.--March to June 1931, July and September 1931 (fragmentary), July 1951 to current year. Gage-height records for flood seasons collected in this vicinity 1907-28 are contained in reports of U.S. Weather Bureau.

GAGE.--Water-stage recorder. Datum of gage is 615.38 ft above National Geodetic Vertical Datum of 1929. Mar. 19 to Sept. 24, 1931, nonrecording gage at site 1.5 mi upstream at different datum.

REMARKS.--Estimated daily discharges: Dec. 26, 27, Jan. 8-10, and Jan. 13 to Feb. 24. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation below about 5,000 ft³/s caused by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--34 years (water years 1952-85), 1,921 ft³/s, 9.19 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 21,500 ft³/s, Apr. 1, 1960, gage height, 23.43 ft; minimum, 40 ft³/s, May 13, 1968, gage height, 5.61 ft; minimum daily, 109 ft³/s, July 16, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 20,500 ft³/s, Feb. 27, gage height, 23.15 ft; minimum, 289 ft³/s, Oct. 5, gage height, 6.96 ft; minimum daily, 367 ft³/s, Aug. 16.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	514	688	996	5510	1300	18000	8480	2440	1460	542	595	1290
2	445	786	1260	5990	1200	15300	7900	2300	1500	788	594	1240
3	542	1190	1090	6110	1150	13500	7360	2190	1780	513	555	974
4	556	1150	1140	5880	1100	12300	6920	2200	1650	754	515	1250
5	451	1060	1230	5520	1100	11500	7640	1970	1510	540	561	940
6	413	865	1090	5210	1050	11400	11600	1940	1280	802	652	1390
7	562	889	886	4800	1050	10800	15300	2070	1160	545	678	2130
8	549	818	874	4300	1050	10100	15400	2190	1150	1010	623	3280
9	812	813	885	3800	1050	10700	13900	2140	1520	1040	625	4320
10	531	1240	871	3400	1050	12000	12100	2080	1610	1130	641	5160
11	507	1200	919	2970	1050	12700	10400	1960	1860	1060	631	5270
12	490	1350	1060	2980	1100	13000	9150	1750	1420	921	583	4710
13	487	1480	1030	2700	1100	12900	8300	1670	1600	763	571	3950
14	766	1760	1200	2500	1150	11900	7660	1670	1350	735	545	3540
15	463	1660	1430	2300	1200	10600	7180	1350	1490	722	515	2900
16	794	1450	1560	2100	1200	9490	6760	1520	1380	668	367	2560
17	497	1750	1720	2000	1200	8440	6230	1470	1540	951	377	2330
18	497	1290	1580	1800	1200	7660	5790	1370	1440	814	468	2130
19	524	1270	1570	1700	1200	6970	5370	1480	1390	804	467	1980
20	796	1300	1490	1500	1200	6410	5000	1340	1370	828	444	1570
21	603	1130	1460	1400	1300	5570	4630	1420	1280	869	502	1490
22	1210	1080	1630	1300	1400	5200	4280	1370	1280	760	531	1640
23	1010	1030	2070	1300	1800	4850	3980	1190	1100	762	501	1290
24	733	1020	1970	1300	4500	4660	3730	1170	969	608	989	1210
25	895	935	1820	1300	11500	4480	3650	1150	1040	578	2690	1480
26	891	899	1650	1400	16500	4280	3420	1120	893	729	2590	1410
27	881	909	1400	1400	19900	4230	3240	1200	826	1010	2030	1330
28	881	1040	2340	1400	20100	5370	2900	1280	827	827	1970	1010
29	868	1070	3540	1400	---	8270	2930	1360	786	699	1660	1260
30	701	981	4980	1400	---	9580	2590	1280	783	649	1520	940
31	851	---	5450	1400	---	9190	---	1480	---	744	1390	---
TOTAL	20720	34103	52191	88070	99700	291350	213790	51120	39244	24165	27380	65974
MEAN	668	1137	1684	2841	3561	9398	7126	1649	1308	780	883	2199
MAX	1210	1760	5450	6110	20100	18000	15400	2440	1860	1130	2690	5270
MIN	413	688	871	1300	1050	4230	2590	1120	783	513	367	940
CFSM	.24	.40	.59	1.00	1.25	3.31	2.51	.58	.46	.28	.31	.77
IN.	.27	.45	.68	1.15	1.31	3.82	2.80	.67	.51	.32	.36	.86
CAL YR 1984 TOTAL	622629			MEAN 1701	MAX 6440	MIN 239	CFSM .60	IN 8.16				
WTR YR 1985 TOTAL	1007807			MEAN 2761	MAX 20100	MIN 367	CFSM .97	IN 13.20				

STREAMS TRIBUTARY TO LAKE MICHIGAN

123

04116500 FLAT RIVER AT SMYRNA, MI

LOCATION.--Lat $43^{\circ}03'10''$, long $85^{\circ}15'50''$, in NW1/4 sec.28, T.8 N., R.8 W., Ionia County, Hydrologic Unit 04050006, on right bank at downstream side of highway bridge, and 0.5 mi south of Smyrna.

DRAINAGE AREA.--528 mi².

PERIOD OF RECORD.--October 1950 to current year. Monthly discharge only for some periods, published in WSP 1727.

GAGE.--Water-stage recorder. Datum of gage is 729.53 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Estimated daily discharges: Dec. 8-10, 26, 27, and Jan. 10 to Feb. 20. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplants upstream from station prior to September 1956; occasional diurnal fluctuation since. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

AVERAGE DISCHARGE.--35 years, 435 ft³/s, 11.19 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,100 ft³/s, Apr. 22, 1967, gage height, 7.27 ft, caused by momentary release of water from storage upstream from station; maximum gage height, 8.26 ft Feb. 6, 1974, backwater from ice; minimum discharge, 7.4 ft³/s, Sept. 9, 1953; minimum daily, 70 ft³/s, Sept. 6, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,730 ft³/s, Mar. 14, gage height, 5.92 ft; maximum gage height, 7.30 ft, Jan. 17, backwater from ice; minimum discharge, 174 ft³/s, June 8, gage height, 3.33 ft; minimum daily, 188 ft³/s, July 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	263	361	400	1150	365	1180	1570	586	369	226	256	396
2	257	404	390	1080	355	1260	1460	540	299	226	249	462
3	245	404	417	925	350	1270	1370	479	237	218	229	456
4	209	465	381	907	350	1040	1270	437	242	211	218	420
5	198	448	358	970	350	1080	1310	434	333	238	267	382
6	198	336	327	895	350	1100	1440	439	364	240	333	807
7	243	288	303	817	350	1190	1420	436	299	233	355	928
8	308	354	300	669	350	1120	1410	415	202	237	335	918
9	363	402	305	543	355	1110	1370	363	277	229	309	867
10	360	445	310	500	355	1110	1300	404	336	209	283	807
11	347	454	321	450	355	1180	1200	387	399	205	269	737
12	248	450	352	425	360	1340	1110	363	411	202	257	653
13	250	436	396	400	360	1470	1060	336	408	197	288	582
14	250	428	409	390	360	1630	1010	337	333	190	315	528
15	279	430	491	385	365	1680	963	295	333	238	322	486
16	292	404	511	380	365	1610	940	332	378	228	318	452
17	280	374	495	380	365	1520	919	417	424	209	300	425
18	266	352	488	380	365	1410	899	408	496	190	324	402
19	282	337	469	380	370	1310	889	362	419	214	335	383
20	280	324	447	380	380	1210	880	364	420	272	315	357
21	321	311	437	380	384	1170	859	346	378	242	293	347
22	324	309	509	380	475	1120	818	289	344	219	280	348
23	319	300	511	380	601	1090	818	300	338	207	266	341
24	312	297	492	385	784	1090	792	334	323	188	460	339
25	308	295	313	390	879	1070	783	302	306	218	872	348
26	315	293	400	390	954	1060	746	260	272	416	989	351
27	331	276	500	390	1020	1120	730	383	327	393	801	343
28	334	335	611	385	1010	1380	702	432	261	318	640	340
29	328	344	859	380	---	1530	667	354	238	269	534	332
30	317	371	940	375	---	1640	630	344	230	246	463	340
31	310	---	1110	370	---	1650	---	367	---	245	421	---
TOTAL	8937	11027	14552	16611	13282	39740	31335	11845	9996	7373	11896	14877
MEAN	288	368	469	536	474	1282	1045	382	333	238	384	496
MAX	363	465	1110	1150	1020	1680	1570	586	496	416	989	928
MIN	198	276	300	370	350	1040	630	260	202	188	218	332
CFSM	.55	.70	.89	1.02	.90	2.43	1.98	.72	.63	.45	.73	.94
IN.	.63	.78	1.03	1.17	.94	2.80	2.21	.83	.70	.52	.84	1.05
CAL YR 1984	TOTAL	150254	MEAN 411	MAX 1110	MIN 150	CFSM .78	IN 10.59					
WTR YR 1985	TOTAL	191471	MEAN 525	MAX 1680	MIN 188	CFSM .99	IN 13.49					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04117500 THORNAPPLE RIVER NEAR HASTINGS, MI

LOCATION.--Lat 42°36'57", long 85°14'11", in SE1/4 sec.27, T.3 N., R.8 W., Barry County, Hydrologic Unit 04050007, on downstream side of highway bridge, 0.6 mi downstream from Cedar Creek, 2.0 mi downstream from Thornapple Lake, and 3.2 mi southeast of Hastings.

DRAINAGE AREA.--385 mi².

PERIOD OF RECORD.--October 1944 to current year.

GAGE.--Water-stage recorder. Datum of gage is 786.71 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1965, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Feb. 3, 8, and 9. Records good. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--41 years, 317 ft³/s, 11.18 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,810 ft³/s, Apr. 7, 1947, gage height, 10.20 ft, from graph based on gage readings; minimum, 33 ft³/s, Aug. 10, 1964, gage height, 2.71 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,140 ft³/s, Feb. 27, gage height, 9.80 ft; minimum, 95 ft³/s, July 13, 14, gage height, 2.94 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	137	177	235	1350	209	3650	1880	285	175	108	126	148
2	128	240	228	1330	204	2980	1720	266	175	105	123	142
3	120	288	241	1500	200	2430	1500	254	177	102	117	136
4	116	294	266	1420	198	2030	1310	245	171	103	111	130
5	111	272	255	1360	193	1850	1280	240	161	107	121	135
6	109	244	234	1240	194	1800	1770	297	154	110	144	141
7	121	223	211	1080	193	1820	2430	350	147	114	164	147
8	150	205	203	912	190	1750	2730	360	141	112	168	148
9	163	207	202	704	185	1870	2600	336	136	111	157	163
10	157	250	201	567	182	2050	2210	302	138	113	141	180
11	146	304	204	468	182	2100	1820	270	152	108	133	184
12	137	324	211	411	185	2040	1480	245	168	104	125	176
13	130	316	237	363	184	1910	1220	228	170	100	118	162
14	128	292	268	335	187	1690	1020	214	168	104	118	148
15	128	263	302	302	190	1460	925	205	167	133	150	140
16	127	246	337	277	199	1250	826	216	175	158	173	135
17	122	233	352	267	196	1080	727	222	181	161	173	130
18	122	223	337	263	198	925	642	216	181	156	172	126
19	127	212	311	252	205	801	590	203	175	146	169	125
20	146	201	284	238	204	710	543	197	165	142	160	121
21	194	192	272	226	209	635	504	203	154	136	152	120
22	261	185	334	222	249	575	465	200	147	132	143	118
23	287	180	434	231	462	531	427	191	146	125	134	116
24	267	178	475	232	1450	522	403	182	144	115	139	116
25	233	179	426	231	3380	518	395	172	138	110	193	117
26	212	178	345	228	4790	505	383	164	130	131	235	120
27	202	180	294	224	5030	507	366	167	124	142	241	124
28	194	205	362	222	4390	758	344	179	117	138	215	123
29	185	238	596	222	---	1280	319	183	111	128	188	123
30	173	243	938	220	---	1680	299	180	109	120	170	124
31	166	---	1180	219	---	1870	---	174	---	120	158	---
TOTAL	4999	6972	10775	17316	23838	45577	33128	7146	4597	3794	4831	4118
MEAN	161	232	348	559	851	1470	1104	231	153	122	156	137
MAX	287	324	1180	1530	5030	3650	2730	360	181	151	241	184
MIN	109	177	201	219	182	505	299	164	109	100	111	116
CFSM	.42	.60	.90	1.45	2.21	3.82	2.87	.60	.40	.32	.41	.36
IN.	.48	.67	1.04	1.67	2.30	4.40	3.20	.69	.44	.37	.47	.40
CAL YR 1984 TOTAL	98515		MEAN 269	MAX 1270	MIN 53	CFSM .70	IN 9.52					
WTR YR 1985 TOTAL	167091		MEAN 458	MAX 5030	MIN 100	CFSM 1.19	IN 16.14					

STREAMS TRIBUTARY TO LAKE MICHIGAN

125

04118000 THORNAPPLE RIVER NEAR CALEDONIA, MI

LOCATION.--Lat 42°48'40", long 85°29'00", in NW1/4 sec.22, T.5 N., R.10 W., Kent County, Hydrologic Unit 04050007, on right bank 200 ft downstream from LaBarge powerplant, 2.3 mi northeast of Caledonia, and 3.3 mi downstream from Coldwater river.

DRAINAGE AREA.--773 mi².

PERIOD OF RECORD.--October 1930 to September 1938, October 1951 to March 1982, October 1983 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 824: 1931-36. WSP 1307: 1931-37.

GAGE.--Water-stage recorder. Datum of gage is 676.31 ft, Consumers Power Co. datum. Oct. 1, 1930 to Sept. 30, 1938, nonrecording gage at same site and at National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 25 to Feb. 21. Records good except for estimated daily discharges, which are fair. Prior to Dec. 1, 1958, and since Oct. 1, 1983, large diurnal fluctuation at low and medium flow caused by powerplant upstream from station; occasional fluctuation during the interim period. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--40 years (water years 1931-38, 1952-81, 1984-85), 584 ft³/s, 10.26 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,700 ft³/s, Feb. 27, 1985, gage height, 11.43 ft; minimum, 1.0 ft³/s, May 28, 1968, gage height, 1.40 ft, result of regulation during bridge construction.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1947, reached a stage of 14.4 ft, from information by powerplant operator.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,700 ft³/s, Feb. 27, gage height, 11.43 ft; minimum, 29 ft³/s, July 25, 26, gage height, 1.74 ft; minimum daily, 218 ft³/s, Oct. 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	309	373	464	2150	400	6110	2860	592	473	260	302	335
2	302	489	432	2170	390	5250	2720	615	420	373	302	350
3	218	485	473	2220	380	4710	2520	592	416	257	228	306
4	260	528	448	2140	380	4150	2390	564	412	254	286	270
5	273	532	498	2120	380	3830	2610	550	412	309	276	350
6	273	502	469	1960	370	3500	3290	630	408	254	342	388
7	270	477	428	1690	370	3430	3910	681	346	254	377	295
8	357	424	408	1640	360	3120	3990	719	302	346	327	365
9	369	365	350	1140	360	3190	4050	697	302	254	361	392
10	245	568	400	1090	350	3420	3800	660	377	292	320	464
11	365	601	412	927	360	3750	3350	630	342	257	266	477
12	228	519	412	804	370	3640	2650	587	338	292	306	432
13	313	578	485	714	370	3340	2250	555	404	248	266	381
14	240	537	519	675	390	3090	2020	511	384	248	266	327
15	248	528	537	555	390	2710	1950	477	354	257	273	377
16	228	494	582	578	400	2390	1820	546	384	266	400	327
17	221	464	592	568	400	2080	1680	498	428	279	316	306
18	273	432	601	564	400	2170	1450	502	424	276	357	320
19	279	416	573	511	410	1900	1440	511	416	365	440	302
20	354	424	528	408	410	1640	1330	477	388	309	270	276
21	350	369	506	309	430	1540	1130	473	408	266	338	320
22	444	404	596	528	546	1350	1050	469	361	354	302	270
23	537	381	681	568	1240	1270	990	452	320	295	316	313
24	528	350	697	485	2650	1270	941	436	384	263	369	276
25	528	342	697	460	3790	1240	934	428	335	221	568	266
26	469	381	625	450	4840	1100	850	424	327	369	655	257
27	404	381	541	440	6170	1210	798	420	384	263	515	260
28	444	396	660	440	6490	2010	749	432	323	263	473	279
29	460	456	1260	430	---	2910	719	444	260	279	420	286
30	381	460	1860	420	---	3080	675	436	276	245	392	295
31	369	---	1970	420	---	3040	---	424	---	273	373	---
TOTAL	10539	13656	19704	29374	33796	87440	60916	16432	11108	8741	11002	9862
MEAN	340	435	636	954	1207	2821	2031	530	370	282	355	329
MAX	537	601	1970	2220	6490	6110	4050	719	473	373	655	477
MIN	218	342	350	309	350	1100	675	420	260	221	228	257
CFSM	.44	.59	.82	1.23	1.56	3.65	2.63	.69	.48	.37	.46	.43
IN.	.51	.66	.95	1.42	1.63	4.21	2.93	.79	.53	.42	.53	.47

CAL YR 1984 TOTAL 206982 MEAN 566 MAX 2280 MIN 157 CFSM .73 IN 9.96
WTR YR 1985 TOTAL 312770 MEAN 857 MAX 6490 MIN 218 CFSM 1.11 IN 15.05

STREAMS TRIBUTARY TO LAKE MICHIGAN

04119000 GRAND RIVER AT GRAND RAPIDS, MI

LOCATION.--Lat 42°57'52", long 85°40'35", in NE1/4 sec.25, T.7 N., R.12 W., Kent County, Hydrologic Unit 04050006, on right bank 500 ft upstream from bridge on Fulton Street, 1.7 mi upstream from Plaster Creek, and at mile 41.

DRAINAGE AREA.--4,900 mi², approximately.

PERIOD OF RECORD.--March 1901 to December 1905, January 1906 to August 1918 (gage heights only), October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height records collected in this vicinity since 1907 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 924: 1938(M). WSP 1387: 1901-5, 1940.

GAGE.--Water-stage recorder. Datum of gage is 585.70 ft above National Geodetic Vertical Datum of 1929 (levels by City of Grand Rapids). March 1901 to August 1918, nonrecording gage at Fulton Street Bridge 500 ft downstream and Oct. 1, 1930 to Oct. 26, 1953, water-stage recorder at sewage pumping station 1 mi downstream at datum 2.99 ft higher.

REMARKS.--Estimated daily discharges: Jan. 13 to Feb. 25, and Apr. 3-5. Records good except for estimated daily discharges, which are fair. Moderate diurnal fluctuation at low and medium flow caused by powerplants upstream from station. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--59 years, 3,591 ft³/s, 9.95 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 54,000 ft³/s, Mar. 28, 1904, gage height, 19.5 ft, from graph based on gage readings, site then in use; maximum gage height, 19.64 ft, Mar. 1, 1985; minimum daily discharge, 381 ft³/s, Aug. 9, 17, 1936.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1901, 54,000 ft³/s, Mar. 28, 1904.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 30,200 ft³/s, Mar. 1, gage height, 19.64 ft; minimum, 1,270 ft³/s, Oct. 6, gage height, 2.87 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1590	2070	2260	9250	2600	29500	14200	4720	2880	1870	1610	2560
2	1420	2140	2320	9360	2500	29000	14100	4690	2990	1710	1510	2540
3	1460	2190	2400	9370	2400	25700	13000	4900	2850	1920	1490	2430
4	1370	2440	2440	9290	2300	22900	12000	4640	2980	1640	1380	2190
5	1460	2340	2380	9200	2200	20300	12700	4050	2870	1940	1650	2280
6	1380	2410	2440	9030	2200	18200	13300	3550	2760	1860	1870	2580
7	1460	2190	2220	8590	2200	17300	14800	3420	2660	1930	1940	3320
8	1860	2020	2140	7990	2200	16700	17900	3530	2380	1750	1990	4220
9	1830	2160	2090	7010	2200	16500	20200	4010	2340	2060	1870	5870
10	1940	2350	2060	5940	2200	16400	20500	3980	2740	2040	1770	6770
11	1640	2810	2050	5590	2200	17400	19300	3830	3030	2160	1680	7080
12	1630	2680	2210	5310	2250	18800	17300	3650	3100	2000	1540	7030
13	1460	2770	2560	5000	2300	19700	15300	3320	2750	1860	1640	6420
14	1520	2990	2550	4600	2300	19600	13700	3100	2930	1660	1650	5570
15	1590	3200	2770	4200	2400	18800	12400	2900	2810	1560	1680	5030
16	1510	2990	3110	3900	2400	17500	11400	2820	2890	1580	1680	4380
17	1710	2810	3320	3600	2400	19900	10600	2810	2890	1560	1520	3920
18	1510	2870	3460	3400	2400	14200	9940	2840	2940	1720	1590	3680
19	1550	2900	3270	3100	2400	12800	9220	2800	2920	1770	1980	3290
20	1620	2360	3140	2800	2400	11600	8550	2840	2740	1800	1610	2990
21	1970	2370	3130	2700	2800	10500	7960	2770	2690	1800	1430	2580
22	1920	2160	3470	2700	4000	9500	7340	2710	2660	1740	1460	2450
23	2310	2150	3720	2700	6400	8640	6870	2590	2540	1630	1520	2510
24	2270	2090	4010	2700	9410	8170	6600	2430	2360	1530	1890	2290
25	2270	2030	3340	2800	11100	7870	6440	2450	2220	1410	3670	2160
26	2340	2030	2320	2800	13300	7510	6190	2500	2240	1450	5630	2330
27	2260	2030	1980	2800	18300	7690	5830	2550	2130	1870	5120	2290
28	2050	2160	4290	2800	24900	9300	5550	2640	2040	1990	4270	2220
29	1950	2220	5990	2800	---	10800	5260	2820	2010	1820	3710	2070
30	1730	2340	7550	2800	---	11900	5090	2790	1980	1620	3130	2200
31	1650	---	8630	2700	---	13300	---	2650	---	1530	2720	---
TOTAL	54230	72270	99620	156830	136660	483980	343540	101300	79320	54780	67800	107250
MEAN	1749	2409	3214	5059	4881	15610	11450	3268	2644	1767	2187	3575
MAX	2340	3200	8630	9370	24900	29500	20500	4900	3100	2160	5630	7080
MIN	1370	2020	1980	2700	2200	7510	5090	2430	1980	1410	1380	2070
CFSM	.36	.49	.66	1.03	1.00	3.19	2.34	.67	.54	.36	.45	.73
IN.	.41	.55	.76	1.19	1.04	3.67	2.61	.77	.60	.42	.51	.81
CAL YR 1984	TOTAL	1196582	MEAN	3269	MAX	11200	MIN	943	CFSM	.67	IN	9.08
WTR YR 1985	TOTAL	1757580	MEAN	4815	MAX	29500	MIN	1370	CFSM	.98	IN	13.34

STREAMS TRIBUTARY TO LAKE MICHIGAN

127

04119300 GRAND RIVER AT EASTMANVILLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°00'53", long 85°57'21", in NE1/4 NW1/4 sec.10, T.7 N., R.14 W., Ottawa County, Hydrologic Unit 04050006, at bridge on 68th Avenue in Eastmanville, 1.1 mi downstream from Deer Creek, and at mile 19.3.

DRAINAGE AREA.--5,230 mi², approximately.

PERIOD OF RECORD.--February 1979 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1979 to September 1983.

WATER TEMPERATURE: February 1979 to September 1983.

INSTRUMENTATION.--Water-quality monitor from Oct. 7, 1980 to Sept. 30, 1983.

REMARKS.--Bimonthly cross-sectional samples were collected at bridge.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1979-82): Maximum daily recorded (more than 20 percent missing record), 1,100 microsiemens, Mar. 2, 1979; minimum measured, 324 microsiemens, Mar. 24, 1982.

WATER TEMPERATURE (water years 1980-81, 1983): Maximum, 28.5°C, July 21, 1983; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. / 100 ML)
NOV 19...	1200	2860	686	8.1	3.0	3.4	14.2	106	K1400	410
DEC 28...	1100	4800	740	8.1	1.0	4.0	13.4	97	2500	1100
MAR 03...	1200	30800	367	7.9	.5	7.5	12.4	87	460	K2100
APR 25...	1245	7330	539	8.2	18.5	7.0	8.8	96	1000	170
JUN 26...	1030	2320	612	8.5	22.0	4.0	10.2	119	K85	440
SEP 09...	1530	6470	471	8.1	24.0	.60	6.6	80	--	--

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 19...	310	93	84	25	26	15	.7	2.9	3.4	80
DEC 28...	310	93	84	25	32	18	.8	2.6	3.4	89
MAR 03...	160	65	44	12	9.6	11	.3	3.0	2.3	36
APR 25...	260	120	71	19	15	11	.4	2.6	1.7	53
JUN 26...	260	65	68	23	25	17	.7	2.2	1.2	59
SEP 09...	210	25	54	17	16	14	.5	3.9	2.8	40

STREAMS TRIBUTARY TO LAKE MICHIGAN

04119300 GRAND RIVER AT EASTMANVILLE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
NOV 19...	1200	44	.20	7.7	392	400	.53	3030	1.7
DEC 28...	1100	60	.30	7.6	435	430	.59	5640	2.5
MAR 03...	1200	22	<.10	5.2	262	190	.36	21800	--
APR 25...	1245	32	.20	3.6	369	280	.50	7300	1.0
JUN 26...	1030	48	.20	3.7	429	350	.58	2690	.87
SEP 09...	1530	29	.30	7.6	304	280	.41	5310	.79

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 19...	.430	1.3	.080	.030	.020	21	162	76
DEC 28...	.530	1.3	.080	.030	--	22	285	80
MAR 03...	--	1.1	.100	.100	--	39	3240	68
APR 25...	.140	2.5	--	.020	<.010	44	871	91
JUN 26...	.150	1.7	.080	<.010	<.010	21	132	75
SEP 09...	.280	1.1	.110	.050	.030	108	1890	85

DATE	ALUM- INIUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
NOV 19...	<10	1	52	<.5	<1	<1	<3	2	15	2
MAR 03...	10	<1	30	<.5	<1	<1	<3	2	83	2
APR 25...	10	1	51	<.5	<1	1	<3	3	27	1
SEP 09...	<10	1	46	.5	<1	<1	<3	5	16	3

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
NOV 19...	9	7	.2	<10	10	<1	<1	290	<6	9
MAR 03...	8	17	<.1	<10	5	<1	<1	100	<6	5
APR 25...	9	6	.1	<10	5	<1	<1	200	<6	12
SEP 09...	<4	2	<.1	<10	4	<1	<1	190	<6	4

STREAMS TRIBUTARY TO LAKE MICHIGAN

129

04121300 CLAM RIVER AT VOGEL CENTER, MI

LOCATION.--Lat 44°12'02", long 85°03'10", in SW1/4 NW1/4 sec.21, T.21 N., R.6 W., Missaukee County, Hydrologic Unit 04060102, on left bank 10 ft downstream from bridge on 8-Mile Road, 0.5 mi north of Vogel Center, and 3.5 mi southeast of Falmouth.

DRAINAGE AREA.--243 mi².

PERIOD OF RECORD.--June 1966 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 1,130 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 5, 26, Jan. 3, 4, 6, 8, 10, 13, 15, 16, 18-20, Jan. 23 to Feb. 2, Feb. 4-10, 16-19, 28. Records good except for estimated daily discharges, which are poor. Some regulation at low flow by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 126 ft³/s, 7.04 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,150 ft³/s, Apr. 13, 1971, gage height, 6.33 ft; minimum, 29 ft³/s, Nov. 3, 1969, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 350 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 31	0300	583	4.99	Apr. 7	0400	566	4.93
Mar. 30	0600	*737	*5.49	Sept. 10	0300	592	5.02

Minimum discharge, 62 ft³/s, July 24, 25, Aug. 17, 18, gage height, 2.53 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	72	133	127	238	135	219	474	242	133	78	75	107
2	70	181	123	162	135	227	364	254	129	77	73	105
3	68	184	125	170	134	229	331	246	122	77	69	102
4	67	160	113	185	135	161	351	239	110	76	68	154
5	66	142	110	199	135	142	432	235	101	82	83	271
6	66	132	109	195	135	180	533	231	96	83	131	400
7	67	124	111	192	135	200	553	228	92	82	126	471
8	74	120	114	185	135	199	480	223	93	78	94	503
9	81	120	111	178	135	200	400	218	109	76	80	533
10	75	143	110	170	133	198	348	210	123	75	74	580
11	71	155	110	164	132	211	326	204	108	74	70	488
12	73	144	121	163	127	246	328	202	98	71	67	363
13	75	131	153	160	124	282	329	196	94	71	67	281
14	76	125	153	156	120	282	342	188	92	71	68	243
15	78	123	142	155	120	258	356	190	92	77	68	227
16	79	120	138	150	120	245	351	198	99	79	65	217
17	81	114	169	146	120	228	327	195	106	74	64	207
18	83	116	176	145	120	212	307	188	99	70	67	228
19	90	116	145	142	120	205	309	182	94	70	71	278
20	98	110	119	140	118	212	343	176	92	69	71	312
21	111	109	114	135	121	224	345	170	88	69	69	292
22	121	108	122	133	138	218	311	165	87	68	68	258
23	106	110	125	135	163	226	284	160	90	65	68	246
24	94	109	89	135	195	245	272	156	95	65	79	245
25	91	113	97	135	211	238	281	152	89	72	140	236
26	96	115	105	135	219	227	286	164	83	105	194	234
27	108	115	116	135	220	289	280	188	82	110	176	229
28	139	132	150	135	220	455	279	189	80	87	137	219
29	149	140	345	135	---	667	276	171	80	75	124	208
30	132	133	525	135	---	726	270	156	80	70	118	205
31	119	---	511	135	---	642	---	144	---	72	112	---
TOTAL	2776	3877	4878	4878	4055	8493	10468	6080	2936	2368	2836	8442
MEAN	89.5	129	157	157	145	274	349	196	97.9	76.4	91.5	281
MAX	149	184	525	238	220	726	553	262	133	110	194	580
MIN	66	108	89	133	118	142	270	144	80	65	64	102
CFSM	.37	.53	.65	.65	.60	1.13	1.44	.81	.40	.31	.38	1.16
IN.	.42	.59	.75	.75	.62	1.30	1.60	.93	.45	.36	.43	1.29
CAL YR 1984	TOTAL	42136	MEAN 115	MAX 525	MIN 56	CFSM .47	IN 6.45					
WTR YR 1985	TOTAL	62087	MEAN 170	MAX 726	MIN 64	CFSM .70	IN 9.50					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121500 MUSKEGON RIVER AT EVART, MI

LOCATION.--Lat 43°53'57", long 85°15'19", in NW1/4 NE1/4 sec.3, T.17 N., R.8 W., Osceola County, Hydrologic Unit 04060102, on right bank 500 ft downstream from bridge on U.S. Highway 10 in Ewart, 0.4 mi upstream from Twin Creek, and at mile 123.9.

DRAINAGE AREA.--1,450 mi², approximately.

PERIOD OF RECORD.--October 1930 to September 1931, October 1933 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1437: 1934, 1947(M).

GAGE.--Water-stage recorder. Datum of gage is 977.72 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 7, 1956, nonrecording gages at sites 400 ft and 500 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Jan. 1-4, 6-19, Jan. 23 to Feb. 23, Feb. 26, 28, and Mar. 2-6. Records good except for estimated daily discharges, which are poor. Some regulation at low flow by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--53 years, 1,005 ft³/s, 9.41 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,790 ft³/s, Mar. 29, 1976; maximum gage height, 14.42 ft, Apr. 9, 1959; minimum discharge observed, 164 ft³/s, Dec. 20, 1947, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,100 ft³/s, Apr. 1, gage height, 11.92 ft; minimum, 388 ft³/s, July 24, 25, gage height, 6.68 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	683	1010	998	2500	980	2030	5080	1880	1110	504	456	873
2	690	1120	984	1800	1000	2100	4810	1800	1070	489	450	784
3	694	1150	1010	1600	1000	2100	4400	1710	1030	469	434	717
4	680	1150	994	1500	1050	1700	4040	1630	994	455	415	935
5	662	1150	945	1480	1050	1550	4100	1570	959	481	503	1840
6	642	1100	897	1450	1000	1550	4440	1530	927	504	634	3100
7	643	1060	841	1400	1000	1590	4840	1490	899	501	687	3700
8	643	1040	858	1350	1000	1620	4950	1440	888	489	658	4450
9	611	1030	863	1300	1000	1760	4720	1390	1050	473	612	4290
10	611	1120	916	1250	1000	1910	4250	1350	1090	472	559	3640
11	615	1130	932	1200	1000	2130	3840	1320	973	462	523	3330
12	601	1100	1000	1200	1000	2600	3520	1290	889	450	487	2990
13	598	1080	1220	1150	1000	2960	3270	1250	824	472	481	2660
14	598	1050	1250	1150	1000	3000	3100	1220	782	501	473	2380
15	602	1040	1230	1100	1000	2930	3000	1190	758	493	468	2100
16	604	1010	1250	1100	1000	2760	2910	1210	853	492	461	1890
17	622	977	1360	1050	1000	2620	2850	1210	877	482	448	1730
18	648	951	1380	1050	1000	2460	2820	1170	835	461	463	1750
19	655	923	1310	1000	1000	2390	2800	1140	784	443	478	1840
20	683	899	1180	1010	1000	2500	2820	1110	735	442	466	1790
21	739	873	1040	989	1050	2520	2790	1090	697	424	465	1730
22	792	848	1170	979	1100	2490	2740	1060	675	407	474	1660
23	784	837	1170	980	1200	2550	2630	1030	655	400	468	1590
24	775	836	1040	980	1410	2610	2520	1010	633	389	532	1520
25	761	840	901	980	1560	2620	2450	991	617	417	800	1500
26	788	835	690	980	1700	2590	2340	1060	611	468	993	1470
27	849	844	724	980	1900	2880	2240	1390	588	484	1050	1450
28	990	940	1110	970	1950	3560	2170	1380	546	509	992	1400
29	1020	996	2840	970	---	4160	2070	1290	492	501	883	1340
30	1000	1000	3140	970	---	4680	1980	1210	502	473	927	1310
31	979	---	3160	970	---	4970	---	1160	---	452	933	---
TOTAL	22262	29939	38403	37388	31950	79890	100490	40571	24343	14459	18673	61759
MEAN	718	978	1239	1206	1141	2577	3350	1309	811	466	602	2059
MAX	1020	1150	3160	2500	1950	4970	5080	1880	1110	509	1050	4450
MIN	598	835	690	970	980	1550	1980	991	492	389	415	717
CFSM	.50	.69	.85	.83	.79	1.78	2.31	.90	.56	.32	.42	1.42
IN.	.57	.77	.99	.96	.82	2.05	2.58	1.04	.62	.37	.48	1.58
CAL YR 1984	TOTAL	354981	MEAN	970	MAX	3160	MIN	417	CFSM	.67	IN	9.11
WTR YR 1985	TOTAL	500127	MEAN	1370	MAX	5080	MIN	389	CFSM	.95	IN	12.83

STREAMS TRIBUTARY TO LAKE MICHIGAN

131

04121900 LITTLE MUSKEGON RIVER NEAR MORLEY, MI

LOCATION.--Lat 43°30'09", long 85°20'33", in SW1/4 SW1/4 sec.24, T.13 N., R.9 W., Mecosta County, Hydrologic Unit 04060102, on right bank at upstream side of highway bridge on 130th Avenue, 0.5 mi downstream from Rustford Dam, and 5.2 mi east of Morley.

DRAINAGE AREA.--138 mi².

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 920 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 7, 26, Jan. 2 to Feb. 21, and Mar. 5, 6. Records good except for estimated daily discharges, which are poor. Some regulation by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 126 ft³/s, 12.40 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,390 ft³/s, July 18, 1982, gage height, 6.98 ft; minimum, 22 ft³/s, July 21, 1979, gage height, 1.53 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 29	1600	*662	*4.45	Mar. 29	0430	604	4.22
Mar. 13	0230	492	3.77	Apr. 6	1030	444	3.57

Minimum discharge, 48 ft³/s, July 24, gage height, 1.66 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	68	132	110	278	120	274	364	144	90	66	79	110
2	68	152	107	240	120	269	325	136	84	66	64	104
3	64	132	114	220	120	247	318	130	79	64	61	81
4	60	120	109	200	120	186	316	114	77	64	61	80
5	62	114	107	180	120	200	370	116	76	71	151	94
6	65	109	97	175	120	205	433	118	74	72	201	243
7	74	103	96	170	120	197	418	116	71	70	145	312
8	105	99	94	165	120	192	364	112	73	67	113	246
9	103	109	94	160	120	220	310	109	134	62	97	203
10	90	168	95	160	120	234	285	107	127	60	86	191
11	92	152	99	155	120	312	256	103	99	58	81	162
12	86	128	122	150	120	437	240	105	98	58	76	139
13	86	116	180	145	120	469	229	103	92	57	81	123
14	92	109	158	140	120	411	231	99	85	70	81	112
15	90	107	142	135	120	355	238	95	88	67	77	108
16	90	109	156	135	120	323	223	105	202	61	75	85
17	86	101	166	130	120	318	214	105	191	57	71	79
18	82	101	150	130	120	281	251	99	145	55	75	79
19	92	97	128	125	125	272	251	97	124	55	77	84
20	95	94	118	125	130	298	236	95	110	57	73	87
21	118	92	126	125	140	289	223	94	100	55	71	83
22	124	90	158	120	166	274	197	90	96	53	69	83
23	110	94	148	120	201	287	176	88	90	51	66	94
24	99	99	124	120	278	307	190	94	77	50	81	93
25	95	95	124	120	303	289	242	82	71	72	235	88
26	101	94	124	120	314	274	207	86	69	187	248	102
27	105	97	122	120	307	350	178	110	68	129	172	114
28	150	136	201	120	278	536	168	112	68	97	135	102
29	150	132	617	120	---	594	162	94	67	86	123	94
30	132	118	610	120	---	511	150	88	67	78	123	96
31	120	---	465	120	---	409	---	97	---	77	117	---
TOTAL	2954	3399	5261	4643	4402	9820	7765	3243	2892	2192	3265	3671
MEAN	95.3	113	170	150	157	317	259	105	96.4	70.7	105	122
MAX	150	168	617	278	314	594	433	144	202	187	248	312
MIN	60	90	94	120	120	186	150	82	67	50	61	79
CFSM	.69	.82	1.23	1.09	1.14	2.30	1.88	.76	.70	.51	.76	.88
IN.	.80	.92	1.42	1.25	1.19	2.65	2.09	.87	.78	.59	.88	.99
CAL YR 1984	TOTAL	45772	MEAN 125	MAX 617	MIN 45	CFSM .91	IN 12.34					
WTR YR 1985	TOTAL	53507	MEAN 147	MAX 617	MIN 50	CFSM 1.07	IN 14.42					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04122000 MUSKEGON RIVER AT NEWAYGO, MI

LOCATION.--Lat 43°25'20", long 85°48'04", in NE1/4 NE1/4 sec.24, T.12 N., R.13 W., Newaygo County, Hydrologic Unit 04060102, on left bank near nonoperative powerplant at Newaygo, 600 ft downstream from Penoyer Creek, and at mile 39.1.

DRAINAGE AREA.--2,350 mi², approximately.

PERIOD OF RECORD.--July to December 1908, July 1909 to July 1915, January 1916 to December 1919, October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307. Records for June 1901 to December 1906, published in WSP 129, 170, and 206, are unreliable and should not be used.

REVISED RECORDS.--WSP 974: 1933, 1935, 1937-38. WSP 1307: 1940(M). See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 625.83 ft above National Geodetic Vertical Datum of 1929. October 1930 to January 1939, nonrecording gage, and Jan. 31, 1939 to Sept. 30, 1963, water-stage recorder at present site at datum 40.0 ft lower.

REMARKS.--Estimated daily discharges: Jan. 10-16, 20-28, and July 18 to Aug. 27. Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants upstream from station, the largest of which are Croton Dam, Hardy Dam (since 1931), and Rogers Dam. Since Dec. 27, 1965, powerplant at Newaygo nonoperative, and in January 1969, dam at Newaygo was removed. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--63 years (water years 1910-14, 1917-19, 1931-85), 1,981 ft³/s, 11.45 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 14,950 ft³/s, Mar. 25, 1913; minimum, 52 ft³/s, Oct. 2, 1965, gage height, 5.31 ft, result of regulation during pipeline repair; minimum daily, 330 ft³/s, Feb. 15, 1914.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,090 ft³/s, Dec. 30, gage height, 11.06 ft; minimum daily, 880 ft³/s, July 23, 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1340	2220	2410	6820	2880	4120	5380	3350	2160	1570	1150	2120
2	1390	2730	1970	4990	2990	4660	6010	2660	1950	1440	1000	1720
3	1340	2350	2180	4160	2280	4420	5750	2150	2140	1180	1200	1330
4	1370	2130	2040	2250	2320	4040	5540	2210	1910	1050	1200	1570
5	1390	2500	1850	2230	2260	3850	5330	2670	2030	1170	3300	1800
6	1340	2280	1530	2790	2550	3910	5740	2720	1420	1280	2800	4700
7	1340	2270	2110	3500	2780	3850	5930	2730	1400	1290	1400	5610
8	1560	2270	1580	3740	2850	3850	6320	2730	1590	1280	1650	5710
9	1490	2080	1860	3710	2910	4060	6710	2780	1590	1280	1650	5760
10	1510	2120	2180	3000	2760	3920	6760	2900	2110	1280	1600	6070
11	1340	2700	2050	2700	2780	4300	6500	2320	2220	1190	1200	5230
12	1390	2270	2050	2300	2780	4810	5420	2030	3670	1050	1200	4570
13	1400	2370	2380	2300	2780	5720	5080	2200	1960	1320	1300	4100
14	1450	2440	3250	2300	2780	6400	4760	2210	1470	1320	1350	3420
15	1450	2320	2790	2800	2780	6130	4720	2500	1760	1070	1250	2520
16	1450	2260	2820	2300	2780	5740	4280	2220	1780	1340	1200	2820
17	1450	1740	2850	2240	2780	5570	3940	2210	2370	1070	1180	3370
18	1450	2320	3560	2250	2780	5470	3920	1830	2460	1180	1250	2800
19	1550	1750	2540	2260	2800	4940	4190	1490	2070	1020	1200	2770
20	1620	1810	2290	2200	2960	4610	4460	1690	1590	1050	1150	3050
21	1720	1830	2300	1950	2990	4870	4460	2210	1520	1250	1150	3380
22	1740	1920	2290	1950	3200	4930	3910	2140	1530	1100	1150	2630
23	1970	1890	2840	1350	3420	4670	3660	1760	1390	880	1200	2890
24	1810	1830	2500	1800	3600	4460	3660	1540	1190	880	2100	2850
25	1790	1630	1760	2300	3740	4720	3940	1850	1040	900	3400	2230
26	1570	1430	1390	2400	4090	4610	3830	2220	1090	2050	3000	2640
27	1540	1840	1430	2600	4630	4060	3340	2350	1080	1500	1450	2740
28	2140	2260	2190	2300	4440	5170	3340	3000	1040	1250	2050	2210
29	2290	1900	6460	2220	---	5570	3320	2650	1040	1450	1690	2590
30	2260	1850	6920	2720	---	6040	2780	2230	1140	1300	2150	2480
31	2260	---	6820	2210	---	5450	---	2250	---	1000	2140	---
TOTAL	49710	63310	83190	84640	84690	148920	142980	71800	51710	37990	50710	97680
MEAN	1604	2110	2684	2730	3025	4804	4766	2316	1724	1225	1636	3256
MAX	2290	2730	6920	6820	4630	6400	6760	3350	3670	2050	3400	6070
MIN	1340	1430	1390	1350	2260	3850	2780	1490	1040	880	1000	1330
CFSM	.68	.90	1.14	1.16	1.29	2.04	2.03	.99	.73	.52	.70	1.39
IN.	.79	1.00	1.32	1.34	1.34	2.36	2.26	1.14	.82	.60	.80	1.55
CAL YR 1984	TOTAL	773922	MEAN	2115	MAX	6920	MIN	881	CFSM	.90	IN	12.25
WTR YR 1985	TOTAL	967330	MEAN	2650	MAX	6920	MIN	880	CFSM	1.13	IN	15.31

STREAMS TRIBUTARY TO LAKE MICHIGAN

133

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°19'05", long 86°02'11", in SW1/4 NW1/4 sec.30, T.11 N., R.14 W., Newaygo County, Hydrologic Unit 04060102, at bridge on Maple Island Road, 5 mi southwest of Bridgeton, 13 mi upstream from Muskegon Lake, and 20 mi downstream from gaging station at Newaygo.

DRAINAGE AREA.--2,420 mi², approximately.

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to September 1981.

WATER TEMPERATURE: November 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Nov. 12, 1975 to Sept. 24, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at or near Maple Island Road bridge. Water-discharge measurements were made at times of sampling. Some regulation by dams upstream.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975, 1978-81): Maximum, 1,550 microsiemens, Sept. 24, 1979; minimum, 69 microsiemens, May 3, 1979.

WATER TEMPERATURE (water years 1975, 1977-81): Maximum, 33.0°C, July 19, 1977; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, O.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. / PER 100 ML)
NOV 28...	1230	2220	392	8.2	6.0	2.0	--	--	K37	220
MAR 20...	1130	4820	321	8.0	1.0	2.0	12.7	90	K32	K4
MAY 15...	1000	2290	288	8.2	17.5	1.5	8.8	94	K33	91
AUG 27...	1400	2440	366	8.2	21.0	.60	8.3	94	100	55

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 28...	180	25	48	15	11	12	.4	1.1	1.9	25
MAR 20...	150	19	39	12	8.5	11	.3	1.3	2.5	18
MAY 15...	140	20	36	11	7.2	10	.3	1.1	1.4	15
AUG 27...	170	41	45	14	8.8	10	.3	1.0	1.6	17

STREAMS TRIBUTARY TO LAKE MICHIGAN

04122030 MUSKEGON RIVER NEAR BRIDGE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
NOV 28...	1230	17	.20	6.0	219	220	.30	1310	.46
MAR 20...	1130	16	.10	7.3	205	180	.28	2670	.52
MAY 15...	1000	13	<.10	3.4	209	160	.28	1290	.15
AUG 27...	1400	16	<.10	5.2	206	180	.28	1360	.13

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 28...	.030	.60	.100	.090	.020	17	102	19
MAR 20...	.070	.40	.070	.030	<.010	27	351	22
MAY 15...	.010	.90	<.010	<.010	<.010	19	117	20
AUG 27...	.030	.40	--	.050	<.010	15	99	--

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
NOV 28...	10	1	25	<.5	<1	1	<3	5	13	2
MAR 20...	<10	<1	21	<.5	<1	<1	<3	6	69	2
MAY 15...	30	<1	21	<.5	<1	<1	<3	5	28	1
AUG 27...	10	1	25	<.5	<1	<1	<3	3	9	1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
NOV 28...	<4	3	<.1	<10	<1	<1	<1	160	<6	36
MAR 20...	19	9	<.1	<10	2	<1	<1	110	<6	9
MAY 15...	<4	2	.3	<10	2	<1	<1	100	<6	6
AUG 27...	11	7	.1	<10	2	<1	<1	150	<6	9

STREAMS TRIBUTARY TO LAKE MICHIGAN

135

04122100 BEAR CREEK NEAR MUSKEGON, MI

LOCATION.--Lat 43°17'19", long 86°13'22", in SW1/4 NW1/4 sec.4, T.10 N., R.16 W., Muskegon County, Hydrologic Unit 04060102, on left bank at upstream side of bridge on North Getty Street, 1.5 mi upstream from Little Bear Creek, and 3.9 mi northeast of Muskegon.

DRAINAGE AREA.--14.8 mi².

PERIOD OF RECORD.--October 1965 to current year.

REVISED RECORDS.--WDR MI-80-1: 1976(M), 1978(M), 1979(P).

GAGE.--Water-stage recorder. Datum of gage is 590.00 ft above National Geodetic Vertical Datum of 1929 (Michigan Department of Natural Resources benchmark). Prior to Mar. 17, 1978, at different datum.

REMARKS.--Estimated daily discharges: Jan. 2-5, 7-28, Feb. 1-20, and Mar. 5, 6. Records good except for estimated daily discharges, which are poor. Some regulation during low flow by dams and irrigation upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 16.7 ft³/s, 15.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 930 ft³/s, Mar. 5, 1976, gage height, 11.00 ft, datum then in use; minimum, 1.0 ft³/s, Aug. 5, 17, 22, 1971.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 100 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 29	2030	104	13.82	Feb. 25	0230	*186	*14.70

Minimum discharge, 2.7 ft³/s, Aug. 4; minimum gage height, 10.31 ft, July 18, 19, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.2	18	12	31	15	62	37	17	7.2	4.4	4.9	9.8
2	4.8	21	12	30	15	74	35	16	6.6	4.1	3.6	9.3
3	4.4	15	19	28	15	52	46	15	6.4	4.0	3.3	8.5
4	4.3	13	15	26	15	39	40	15	6.1	3.7	3.2	8.0
5	4.7	12	13	24	15	39	48	15	6.2	6.0	25	8.4
6	4.6	11	13	23	15	38	63	15	5.7	5.0	18	21
7	5.4	9.6	13	22	15	36	69	15	5.6	5.1	13	15
8	6.7	9.5	12	21	15	42	49	14	5.5	4.8	9.5	14
9	6.3	14	13	19	15	66	43	13	5.1	4.2	8.2	28
10	6.0	30	13	18	15	67	38	12	4.9	4.1	7.6	23
11	6.0	18	15	17	15	78	35	12	6.1	4.5	6.6	17
12	5.8	15	32	16	15	92	32	12	6.7	4.3	6.2	13
13	6.8	13	40	16	15	66	30	11	6.2	3.8	8.2	12
14	7.2	12	28	15	15	56	31	11	5.5	3.7	7.3	11
15	7.0	12	29	15	15	47	31	11	7.1	3.8	7.5	9.6
16	6.9	11	28	15	15	42	27	11	8.3	3.5	6.4	9.1
17	7.0	10	25	15	16	39	26	11	7.4	3.2	5.6	8.9
18	6.8	11	20	15	16	34	26	10	6.4	3.1	5.5	8.3
19	11	10	18	15	16	33	24	9.4	5.8	6.3	5.3	8.2
20	8.6	9.8	17	15	17	32	23	9.1	5.1	6.4	5.1	7.1
21	14	9.5	18	15	18	29	21	8.5	4.9	4.5	5.0	7.3
22	12	9.2	29	15	41	29	20	8.4	5.4	3.7	4.6	8.7
23	9.8	9.2	21	15	60	28	19	8.2	4.9	3.4	4.3	13
24	8.9	9.1	18	15	139	34	28	7.7	4.8	3.3	11	15
25	8.5	8.9	19	15	140	31	35	7.3	4.5	5.0	21	11
26	9.2	8.8	20	15	112	28	27	7.7	4.3	7.2	28	13
27	9.8	12	24	15	80	31	23	12	4.1	4.8	17	13
28	18	21	38	15	58	46	21	10	3.9	3.9	13	11
29	13	16	85	15	---	50	19	8.5	4.0	3.4	12	9.3
30	11	14	62	15	---	37	18	7.9	5.2	3.2	14	13
31	10	---	36	15	---	33	---	7.8	---	5.1	11	---
TOTAL	249.7	392.6	757	561	953	1410	984	348.5	169.9	135.5	301.9	363.5
MEAN	8.05	13.1	24.4	18.1	34.0	45.5	32.8	11.2	5.66	4.37	9.74	12.1
MAX	18	30	85	31	140	92	69	17	8.3	7.2	28	28
MIN	4.3	8.8	12	15	15	28	18	7.3	3.9	3.1	3.2	7.1
CFSM	.54	.89	1.65	1.22	2.30	3.07	2.22	.76	.38	.30	.66	.82
IN.	.63	.99	1.90	1.41	2.40	3.54	2.47	.88	.43	.34	.76	.91
CAL YR 1984	TOTAL	6229.2	MEAN	17.0	MAX	171	MIN	3.4	CFSM	1.15	IN	15.66
WTR YR 1985	TOTAL	6626.6	MEAN	18.2	MAX	140	MIN	3.1	CFSM	1.23	IN	16.65

STREAMS TRIBUTARY TO LAKE MICHIGAN

04122200 WHITE RIVER NEAR WHITEHALL, MI

LOCATION.--Lat 43°27'51", long 86°13'57", in SE1/4 NW1/4 sec.4, T.12 N., R.16 W., Muskegon County, Hydrologic Unit 04060101, on right bank 30 ft downstream from bridge on Fruitvale Road, 6.3 mi downstream from North Branch, and 6.9 mi northeast of Whitehall.

DRAINAGE AREA.--406 mi².

PERIOD OF RECORD.--August 1957 to current year.

REVISED RECORDS.--WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 594.1 ft above National Geodetic Vertical Datum of 1929. Nov. 18, 1957 to Oct. 22, 1958, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 2 to Feb. 23. Records good except for estimated daily discharges, which are poor. Some regulation during low flow by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 439 ft³/s, 14.68 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,400 ft³/s, Sept. 1, 1975, gage height, 7.46 ft; minimum, 163 ft³/s, Aug. 18, 19, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,120 ft³/s, Feb. 25, gage height, 6.02 ft; minimum, 221 ft³/s, July 25, gage height, 1.59 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	336	554	535	1030	540	1250	1010	553	415	291	264	353
2	327	600	503	900	540	1250	979	534	405	283	259	331
3	317	734	500	820	540	1240	971	519	386	277	244	315
4	310	761	529	770	540	1040	1030	506	367	272	234	301
5	303	675	511	730	540	957	1040	503	358	286	326	302
6	300	613	479	700	540	917	1180	509	350	299	431	335
7	305	558	469	670	540	1000	1270	506	342	303	492	368
8	330	512	479	660	540	1000	1240	501	341	307	503	368
9	364	502	449	640	540	924	1120	488	343	298	488	395
10	371	549	438	630	540	879	1020	473	347	279	439	430
11	358	622	443	610	540	938	940	460	373	273	337	437
12	345	661	507	600	540	1200	882	451	379	268	305	389
13	338	620	614	590	540	1470	828	447	365	259	313	352
14	348	569	793	580	540	1350	788	441	352	255	336	330
15	368	520	806	570	540	1190	761	436	351	281	326	316
16	363	489	729	560	540	1120	745	439	398	258	312	306
17	367	472	718	560	540	1060	720	444	434	246	293	298
18	362	462	718	550	540	1010	695	440	423	242	283	295
19	385	454	680	550	540	927	691	429	403	255	278	294
20	425	443	623	550	550	880	681	416	373	261	274	287
21	463	433	577	550	560	883	663	402	350	249	272	281
22	479	424	565	540	610	861	643	393	335	228	268	287
23	508	417	612	540	800	832	618	386	327	224	261	318
24	482	414	617	540	1510	856	618	379	316	223	298	378
25	449	412	566	540	1990	887	654	370	306	235	411	377
26	424	409	521	540	1960	890	743	370	299	298	491	356
27	425	427	537	540	1630	862	705	421	292	299	510	345
28	482	487	655	540	1410	927	654	461	276	279	488	333
29	546	561	760	540	---	1170	613	457	275	253	471	323
30	586	570	1390	540	---	1180	577	434	285	238	421	327
31	552	---	1270	540	---	1070	---	421	---	245	382	---
TOTAL	12318	15924	19593	19220	21280	32020	25079	13989	10566	8264	11010	10127
MEAN	397	531	632	620	760	1033	836	451	352	267	355	338
MAX	586	761	1390	1030	1990	1470	1270	553	434	307	510	437
MIN	300	409	438	540	540	832	577	370	275	223	234	281
CFSM	.98	1.31	1.56	1.53	1.87	2.54	2.06	1.11	.87	.66	.87	.83
IN.	1.13	1.46	1.80	1.76	1.95	2.93	2.30	1.28	.97	.76	1.01	.93
CAL YR 1984	TOTAL	182531	MEAN 499	MAX 1460	MIN 249	CFSM 1.23	IN 16.72					
WTR YR 1985	TOTAL	199390	MEAN 546	MAX 1990	MIN 223	CFSM 1.35	IN 18.27					

STREAMS TRIBUTARY TO LAKE MICHIGAN

137

04122500 PERE MARQUETTE RIVER AT SCOTTVILLE, MI

LOCATION.--Lat 43°56'42", long 86°16'43", in NW1/4 NW1/4 sec.19, T.18 N., R.16 W., Mason County, Hydrologic Unit 04060101, on right bank 20 ft upstream from highway bridge at south edge of Scottville, 1.4 mi upstream from India Creek, and 5.6 mi downstream from Big South Branch.

DRAINAGE AREA.--681 mi².

PERIOD OF RECORD.--August 1939 to current year. Prior to October 1942, published as "at Custer".

REVISED RECORDS.--WSP 1437: 1941(M), 1943(M), 1949(M), 1950. WDR MI-81: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 597.66 ft above National Geodetic Vertical Datum of 1929. Prior to June 12, 1943, nonrecording gage at bridge 4.5 mi upstream at different datum.

REMARKS.--Estimated daily discharges: Dec. 7, 24-26, Jan. 7, 8, Jan. 11 to Feb. 22. Records good except for estimated daily discharges, which are poor. Some regulation at low flow. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--46 years, 677 ft³/s, 13.50 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,970 ft³/s, July 1, 1969, gage height, 6.26 ft; minimum, 209 ft³/s, Dec. 11, 1962, discharge measurement; minimum daily, 310 ft³/s, Aug. 9, 10, 1941.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,160 ft³/s, Feb. 23, gage height, 5.29 ft; maximum gage height, 5.31 ft, Jan. 24, backwater from ice; minimum discharge, 470 ft³/s, July 24, gage height, 2.00 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	672	959	871	1770	990	1720	1820	999	789	573	534	734
2	641	1080	840	1770	990	1780	1630	960	771	576	537	716
3	618	1150	829	1620	990	1800	1590	930	751	567	520	682
4	597	1190	845	1480	990	1730	1630	906	725	561	505	670
5	583	1190	859	1330	990	1660	1770	892	709	599	538	709
6	571	1110	839	1290	980	1520	1900	887	693	624	670	861
7	569	1020	810	1200	980	1410	2000	885	683	636	870	1040
8	651	956	772	1200	980	1310	2090	874	678	618	1120	1220
9	694	915	750	1160	980	1290	1970	859	704	599	1490	1410
10	667	919	744	1110	980	1260	1770	839	725	581	1530	1300
11	638	934	747	1080	980	1360	1630	822	764	566	1200	1190
12	617	958	842	1050	980	1670	1540	821	768	555	962	1110
13	604	954	928	1050	980	1980	1480	811	726	542	869	994
14	601	912	977	1050	980	2070	1440	791	700	535	801	895
15	608	863	1040	1030	980	2040	1400	773	691	527	763	816
16	620	825	1080	1020	980	1850	1330	768	739	519	732	762
17	625	800	1070	1000	980	1720	1280	779	767	511	699	731
18	624	787	1060	1000	980	1600	1240	780	813	503	671	715
19	708	772	1070	990	990	1510	1230	771	802	500	649	711
20	769	762	1030	990	1000	1430	1240	768	745	499	641	735
21	793	745	971	990	1200	1390	1230	758	705	496	625	743
22	814	729	923	990	1600	1380	1190	744	682	487	614	728
23	822	718	899	980	2110	1370	1130	730	666	479	605	741
24	819	710	920	980	2100	1360	1100	716	651	475	715	774
25	779	708	940	980	1870	1370	1110	705	636	542	822	864
26	748	704	960	980	1860	1380	1200	724	620	655	818	892
27	755	719	1120	980	1840	1400	1240	855	606	676	869	856
28	844	779	1060	980	1740	1490	1210	916	595	628	890	807
29	886	836	1060	980	---	1730	1110	961	586	564	827	769
30	898	870	1240	980	---	1940	1040	945	578	531	770	753
31	899	---	1500	980	---	2030	---	860	---	528	734	---
TOTAL	21734	26574	29596	34990	34000	49550	43540	25829	21068	17252	24590	25928
MEAN	701	886	955	1129	1214	1598	1451	833	702	557	793	864
MAX	899	1190	1500	1770	2110	2070	2090	999	813	676	1530	1410
MIN	569	704	744	980	980	1260	1040	705	578	475	505	670
CFSM	1.03	1.30	1.40	1.66	1.78	2.35	2.13	1.22	1.03	.82	1.16	1.27
IN.	1.19	1.45	1.62	1.91	1.86	2.71	2.38	1.41	1.15	.94	1.34	1.42
CAL YR 1984	TOTAL	306003	MEAN 836	MAX 1890	MIN 438	CFSM 1.23	IN 16.72					
WTR YR 1985	TOTAL	354651	MEAN 972	MAX 2110	MIN 475	CFSM 1.43	IN 19.37					

STREAMS TRIBUTARY TO LAKE MICHIGAN

04123706 FIFE LAKE OUTLET NEAR FIFE LAKE, MI

LOCATION.--Lat 44°31'36", long 85°21'27", in SE1/4 SE1/4 sec.26, T.25 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060103, at bridge on Ramsay Road, 3.5 mi south of Fife Lake.

DRAINAGE AREA.--23.6 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were collected at upstream side of bridge.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	1500	24.5	19	229	6.3	78	7.3	.84
OCT								
10...	1545	17.0	9.2	248	7.5	79	7.6	--
FEB , 1985								
12...	1100	.0	22	268	8.5	61	7.7	.99
JUN								
04...	0945	16.5	19	232	7.3	77	7.7	.53

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
JUN , 1984								
19...	.64	.160	.007	.03	.040	--	0	.00
OCT								
10...	.56	.040	<.001	--	.100	.080	1	.02
FEB , 1985								
12...	.84	.060	<.001	--	<.010	<.010	1	.06
JUN								
04...	.43	.070	.001	.03	<.010	<.010	2	.10

STREAMS TRIBUTARY TO LAKE MICHIGAN

139

04123910 ANDERSON CREEK NEAR BUCKLEY, MI

LOCATION.--Lat 44°30'44", long 85°37'19", in NW1/4 NE1/4 sec.3, T.24 N., R.11 W., Wexford County, Hydrologic Unit 04060103, at bridge on County Line Road, 2.8 mi northeast of Buckley.

DRAINAGE AREA.--32.3 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were collected in vicinity of bridge.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	1200	20.0	12	391	8.6	98	7.5	1.8
AUG								
01...	1600	18.0	6.8	453	9.4	102	8.4	--
SEP								
06...	1230	10.5	6.4	444	8.8	81	8.0	1.6
OCT								
10...	1430	13.5	6.8	426	7.6	74	7.7	1.2
NOV								
08...	1130	6.5	8.3	407	9.1	77	7.8	3.5
DEC								
04...	1330	.5	6.8	435	11.6	83	8.0	--
JAN , 1985								
09...	1030	1.0	9.5	412	11.1	80	7.9	2.1
FEB								
12...	1345	1.0	6.9	436	11.4	84	8.1	2.4
MAR								
26...	1100	4.5	15	399	10.8	86	7.9	1.6
APR								
24...	1315	15.0	21	344	7.0	72	7.9	1.1
JUN								
04...	1200	14.0	10	431	7.1	71	7.8	1.6
JUL								
16...	1130	20.0	8.5	451	5.9	67	7.8	.90
AUG								
20...	1130	17.0	8.8	439	6.5	69	7.7	1.1
SEP								
24...	1230	14.0	13	408	6.6	66	7.5	.99

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
19...	--	<.010	.017	.67	.010	.010	5	.16
AUG								
01...	--	--	.011	1.3	--	--	3	.06
SEP								
06...	.37	.130	.008	1.1	<.010	--	1	.02
OCT								
10...	.36	.040	.006	.76	.020	.010	4	.07
NOV								
08...	1.1	.160	.035	2.2	.010	--	5	.11
DEC								
04...	--	.040	--	--	<.010	<.010	8	.15
JAN , 1985								
09...	.45	.050	<.001	--	<.010	<.010	2	.05
FEB								
12...	--	<.010	.013	1.4	<.010	<.010	38	.71
MAR								
26...	--	<.010	<.001	--	<.010	<.010	2	.08
APR								
24...	.39	.110	.018	.57	.010	.010	7	.40
JUN								
04...	.67	.130	.017	.74	.010	<.010	5	.14
JUL								
16...	.44	.060	--	--	<.010	<.010	4	.09
AUG								
20...	--	<.010	.012	.38	.010	<.010	2	.05
SEP								
24...	--	<.010	.005	.49	.010	<.010	3	.11

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI

LOCATION.--Lat 44°26'11", long 85°41'55", in NE1/4 NE1/4 sec.36, T.24 N., R.12 W., Wexford County, Hydrologic Unit 04060103, on downstream side of bridge near right pier on State Highway 37, 250 ft upstream from Wheeler Creek, 0.9 mi north of Sherman, and at mile 60.8.

DRAINAGE AREA.--900 mi².

PERIOD OF RECORD.--July 1903 to May 1916, October 1930 to September 1931, October 1933 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1004: 1936(M). WSP 1307: 1911, 1913-14(M), 1934(M), 1936(M), 1937, 1939-40(M). WSP 1437: 1911, 1913(M), 1937.

GAGE.--Nonrecording gage. Elevation of gage is 804 ft, from river profile map. Prior to Apr. 13, 1934, at various datums.

REMARKS.--Estimated daily discharges: Oct. 28, 29, Nov. 28, Nov. 30 to Dec. 11, Dec. 23-25, Jan. 5-7, Jan. 11 to Feb. 1, Feb. 5-21, Apr. 17, May 5, 12, 18, 19, 24-27, June 18, Aug. 25, 26, and Sept. 8. Records fair except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--65 years (water years 1904-15, 1931, 1934-85), 1,056 ft³/s, 15.93 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,570 ft³/s, Mar. 25, 1913, gage height, 7.1 ft, from graph based on gage readings, datum then in use; minimum daily, 540 ft³/s, Feb. 21-23, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge observed, 2,450 ft³/s, Mar. 30, gage height, 14.70 ft; minimum observed, 776 ft³/s, Aug. 17, gage height, 10.85 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	824	1410	970	1840	830	1320	2220	1370	1120	898	886	1000
2	809	1520	980	1430	836	1310	2110	1340	1040	898	851	962
3	796	1410	970	1170	836	1290	1940	1270	1040	898	836	926
4	792	1250	960	1180	836	1280	1900	1240	1010	898	818	906
5	792	1210	940	1180	830	1210	1880	1250	994	910	857	914
6	788	1110	940	1180	820	1180	2410	1250	978	966	910	1020
7	788	1070	930	1180	820	1160	2400	1250	982	942	881	1200
8	942	1040	900	1190	830	1190	2260	1240	994	938	863	1500
9	930	1070	910	1120	830	1190	2260	1220	1130	930	839	1900
10	914	1120	820	1040	830	1230	2090	1210	1050	934	821	1900
11	894	1110	900	1000	830	1280	1910	1200	1000	898	812	1920
12	857	1100	962	960	830	1670	1900	1190	974	884	803	1820
13	842	1070	990	920	830	1670	1920	1180	962	872	798	1490
14	842	1020	1030	880	830	1660	2000	1150	950	872	796	1450
15	842	994	1020	870	830	1560	1980	1170	958	872	788	1420
16	842	974	1010	850	830	1430	1950	1180	1030	869	782	1350
17	836	958	1040	850	830	1430	2000	1190	1030	851	776	1290
18	836	954	1050	850	830	1310	2060	1160	1020	839	796	1240
19	851	946	1030	850	840	1290	2040	1140	1010	836	839	1340
20	898	930	1000	850	870	1330	2080	1110	990	827	827	1220
21	966	922	970	840	960	1330	1980	1110	970	821	803	1140
22	1050	922	950	840	1190	1280	1920	1110	974	812	790	1140
23	1020	914	960	840	1360	1330	1760	1100	1070	803	786	1170
24	962	906	1050	840	1520	1380	1720	1080	1040	796	796	1180
25	946	898	1300	830	1530	1390	1790	1050	994	950	870	1110
26	950	890	1590	830	1500	1380	1770	1100	966	1020	960	1090
27	970	890	1510	820	1390	1740	1700	1300	938	1020	1000	1060
28	1000	930	1500	820	1350	2200	1610	1430	910	1010	1000	1030
29	980	978	2140	830	---	2360	1520	1350	910	918	1000	1010
30	978	970	2120	830	---	2450	1430	1270	902	884	1010	1000
31	970	---	1960	830	---	2340	---	1170	---	881	1020	---
TOTAL	27707	31486	35402	30540	27448	46170	58510	37380	29956	27747	26614	37698
MEAN	894	1050	1142	985	980	1489	1950	1206	999	895	859	1257
MAX	1050	1520	2140	1840	1530	2450	2410	1430	1130	1020	1020	1920
MIN	788	890	820	820	820	1160	1430	1050	902	796	776	906
CFSM	.99	1.17	1.27	1.09	1.09	1.65	2.17	1.34	1.11	.99	.95	1.40
IN.	1.15	1.30	1.46	1.26	1.13	1.91	2.42	1.55	1.24	1.15	1.10	1.56

CAL YR 1984 TOTAL 383160 MEAN 1047 MAX 2140 MIN 748 CFSM 1.16 IN 15.84
WTR YR 1985 TOTAL 416658 MEAN 1142 MAX 2450 MIN 776 CFSM 1.27 IN 17.22

STREAMS TRIBUTARY TO LAKE MICHIGAN

141

04126000 MANISTEE RIVER NEAR MANISTEE, MI

LOCATION.--Lat 44°16'14", long 86°11'56", in NW1/4 NW1/4 sec.36, T.22 N., R.16 W., Manistee County, Hydrologic Unit 04060103, on right bank 6.4 mi northeast of Manistee, 7.8 mi upstream from Manistee Lake, and at mile 10.8.

DRAINAGE AREA.--1,780 mi², approximately.

PERIOD OF RECORD.--October 1951 to current year. Monthly discharge only for October, November, 1951, published in WSP 1727.

GAGE.--Water-stage recorder. Elevation of gage is 585 ft, from river-profile map.

REMARKS.--Estimated daily discharges: Jan. 19 to Mar. 4. Records good except for estimated daily discharges, which are fair. Flow regulated at all stages by Tippy hydroelectric powerplant 21 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 2,013 ft³/s, 15.36 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,120 ft³/s, Mar. 30, 1976, gage height, 8.37 ft; maximum gage height, 9.15 ft, Feb. 12, 1955, backwater from ice; minimum daily discharge, 570 ft³/s, June 18, 1980.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,910 ft³/s, Jan. 1, gage height, 8.36 ft; maximum gage height, 9.04 ft, Feb. 23, backwater from ice; minimum discharge, 964 ft³/s, Aug. 12, gage height, 4.41 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1880	2710	2390	6300	2400	2700	4870	2880	2600	1420	1590	1610
2	1710	3440	1740	4140	2000	2550	3850	3030	1620	1680	1650	1920
3	1520	3930	1990	2810	1200	2600	3760	2910	2050	1900	1530	1990
4	1470	3400	2190	2410	1100	2300	3640	2280	2140	1500	1390	2000
5	1580	2770	1910	2060	1800	3200	3640	2280	1960	2130	1260	2410
6	1840	2440	1720	1940	2000	2070	4010	2490	1860	1830	1970	3060
7	1340	2360	1960	2570	2300	2260	4200	2370	1990	1390	1740	3610
8	1720	2150	1650	2740	2200	2330	4580	2570	2050	1260	2070	3980
9	2000	2260	1480	2380	1900	2330	4730	2460	1890	2030	1930	3820
10	2460	2240	1640	2330	1200	2290	4200	2710	2360	1800	1790	3850
11	2330	2400	1980	1780	1700	2340	3670	2470	2580	1910	1300	4070
12	1430	1740	2170	1940	2300	2870	3640	2080	2200	1760	1160	4020
13	1900	2080	2310	1730	1900	3180	3700	1970	1920	1680	1590	3320
14	1950	2400	2430	1830	1800	3730	3520	2400	1950	1350	1830	3480
15	1800	2300	2470	2530	1750	3970	3440	2480	1910	1150	1440	2650
16	1750	2120	2070	2690	2400	3180	3700	3000	1910	1690	1690	2290
17	1890	1750	1850	2090	1500	2810	3800	3280	1810	1550	1510	2050
18	1720	1650	2420	2000	1700	2780	3770	1540	2380	1490	1400	2130
19	1890	1710	2730	2050	2000	2650	3820	1400	2260	1680	1380	2560
20	2360	2080	2150	2150	2050	2620	3870	2170	2040	1450	1450	3010
21	2390	1880	1970	1600	2100	2710	3750	2220	2000	1290	1610	3380
22	2380	1870	2090	2700	2900	2930	3780	1930	1880	1270	1590	2470
23	2230	2040	1780	1350	2900	2800	3670	2410	1590	1580	1560	2400
24	2180	1760	1730	1550	2300	2500	3320	1960	1930	1530	1830	2620
25	2170	1630	1960	1800	2500	2820	3290	2190	2880	1540	1650	2750
26	2420	1480	1930	2100	3500	2980	3630	2250	3030	1940	2530	2690
27	1950	1920	1680	2050	3100	3090	3670	2640	2410	2480	2440	2720
28	1770	2050	1900	1800	2800	3240	3660	2300	1120	1630	2520	2240
29	2080	2270	3100	2200	---	3910	2870	2880	1090	1640	2570	1990
30	2720	2180	3700	1950	---	4920	2790	2620	1140	1960	2710	1730
31	2390	---	4470	2400	---	4790	---	2610	---	1630	1510	---
TOTAL	61220	67010	67560	71990	59300	91450	112860	74780	60550	51140	54190	82820
MEAN	1975	2234	2179	2322	2118	2950	3762	2412	2018	1650	1748	2761
MAX	2720	3930	4470	6300	3500	4920	4870	3280	3030	2480	2710	4070
MIN	1340	1480	1480	1350	1100	2070	2790	1400	1090	1150	1160	1610
CFSM	1.11	1.26	1.22	1.30	1.19	1.66	2.11	1.36	1.13	.93	.98	1.55
IN.	1.28	1.40	1.41	1.50	1.24	1.91	2.36	1.56	1.27	1.07	1.13	1.73
CAL YR 1984	TOTAL	769240	MEAN	2102	MAX	4470	MIN	980	CFSM	1.18	IN	16.08
WTR YR 1985	TOTAL	854870	MEAN	2342	MAX	6300	MIN	1090	CFSM	1.32	IN	17.87

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126520 MANISTEE RIVER AT MANISTEE, MI
(National stream quality accounting network station)

LOCATION.--Lat 44°15'02", long 86°19'09", in SW1/4 SW1/4 sec.1, T.21 N., R.17 W., Manistee County, Hydrologic Unit 04060103, at upstream side of bridge on U.S. Highway 31, in Manistee, and 1.3 mi upstream from mouth.

DRAINAGE AREA.--2,000 mi², approximately.

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to September 1981.

WATER TEMPERATURE: November 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Mar. 18, 1977 to Sept. 30, 1981.

REMARKS.--Bimonthly cross-sectional samples were collected at Washington Street bridge. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from these samples were not published. Water-discharge measurements were made at times of sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-81): Maximum daily, 1,680 microsiemens, Nov. 18, 1974; minimum, 226 microsiemens, Apr. 22, 1980.

WATER TEMPERATURE (water years 1975-81): Maximum, 26.5°C, July 8, 1981, minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, O.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV 27...	1330	3270	336	7.9	7.0	5.0	--	--	K8	K27
JAN 08...	1330	3560	357	8.1	1.0	10	12.8	90	K20	K43
MAR 19...	1300	3230	353	8.0	1.5	6.0	12.0	88	<1	K12
MAY 16...	0930	3370	386	8.2	17.5	2.5	7.9	85	K42	180
JUL 31...	1330	2020	536	8.2	21.0	1.0	7.8	89	180	61
AUG 28...	1315	3100	381	8.1	20.0	2.0	7.8	86	410	K44

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 27...	160	37	45	12	6.6	8	.2	.90	3.0	14
JAN 08...	160	28	47	11	7.9	9	.3	1.0	2.1	14
MAR 19...	160	29	47	10	7.0	9	.3	1.0	2.5	13
MAY 16...	180	33	52	11	9.8	11	.3	1.3	1.7	11
JUL 31...	210	66	62	13	18	16	.6	1.5	1.7	15
AUG 28...	170	15	46	13	11	12	.4	.80	2.4	14

04126520 MANISTEE RIVER AT MANISTEE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
NOV 27...	1330	14	.10	8.1	176	180	.24	1550	.32
JAN 08...	1330	25	.10	7.9	215	200	.29	2070	2.0
MAR 19...	1300	28	.10	7.3	205	190	.28	1790	.24
MAY 16...	0930	33	<.10	6.2	235	210	.32	2140	<.10
JUL 31...	1330	63	.10	6.9	288	270	.39	1570	.10
AUG 28...	1315	21	<.10	7.6	216	210	.29	1810	<.10

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 27...	.030	.30	.070	.060	--	16	141	82
JAN 08...	.120	.50	--	.030	.010	12	115	85
MAR 19...	.060	.50	.020	<.010	<.010	15	131	71
MAY 16...	.050	1.1	<.010	<.010	<.010	13	118	60
JUL 31...	.050	.30	--	.030	--	6	33	94
AUG 28...	.040	.30	.050	.040	.030	30	251	74

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
NOV 27...	10	<1	20	<.5	<1	<1	<3	32	33	4
MAR 19...	<10	<1	17	<.5	<1	<1	<3	5	41	1
MAY 16...	30	<1	21	<.5	<1	<1	<3	4	38	2
AUG 28...	10	1	25	<.5	<1	<1	<3	7	19	1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
NOV 27...	<4	6	<.1	<10	1	<1	<1	120	<6	79
MAR 19...	32	7	.2	<10	8	<1	<1	230	<6	7
MAY 16...	11	3	<.1	<10	1	<1	<1	260	<6	7
AUG 28...	13	5	<.1	<10	<1	<1	<1	150	<6	8

04126525 MASON CREEK NEAR GRAWN, MI

LOCATION.--Lat 44°37'53", long 85°43'16", in SE1/4 SE1/4 sec.23, T.26 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at culvert on East Duck Lake Road, 2.8 mi southwest of Grawn.

DRAINAGE AREA.--16.9 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken upstream from culvert.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	1430	19.5	17	405	8.6	96	7.9	1.7
OCT								
09...	1305	12.0	7.6	433	--	--	7.2	1.2
FEB , 1985								
13...	1645	2.0	8.0	426	13.4	101	8.3	1.8
JUN								
06...	1045	10.0	9.7	469	10.7	97	8.2	1.7

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
JUN , 1984								
19...	1.3	.040	.004	.36	<.010	<.010	4	.18
OCT								
09...	--	<.010	.002	.86	.040	.010	8	.16
FEB , 1985								
13...	.78	.020	.013	.99	<.010	<.010	41	.89
JUN								
06...	.76	.040	.003	.89	<.010	<.010	4	.10

04126532 DUCK LAKE OUTLET NEAR INTERLOCHEN, MI

LOCATION.--Lat 44°38'29", long 85°46'01", in NW1/4 NE1/4 sec.21, T.26 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at bridge on State Highway 137, 0.2 mi south of Interlochen.

DRAINAGE AREA.--39.6 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken in vicinity of bridge and 0.7 mi downstream from Duck Lake.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	1430	24.5	37	288	8.3	102	8.5	--
OCT								
10...	0930	13.5	22	298	--	--	8.1	--
FEB , 1985								
13...	1530	.0	52	309	14.4	103	8.3	1.2
JUN								
05...	1330	20.0	27	306	9.6	108	8.6	.74

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
19...	.78	.020	.004	--	<.010	<.010	0	.00
OCT								
10...	--	<.010	.003	--	<.010	<.010	1	.06
FEB , 1985								
13...	1.1	.040	<.001	--	<.010	<.010	4	.56
JUN								
05...	.57	.130	.003	.03	.010	<.010	2	.15

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126546 GREEN LAKE INLET NEAR INTERLOCHEN, MI

LOCATION.--Lat 44°37'59", long 85°46'55", in NE1/4 SE1/4 sec.20, T.26 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at bridge on Diamond Park Road, 1.0 mi southwest of Interlochen.

DRAINAGE AREA.--47.0 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken about 300 ft upstream from inlet to Green Lake. A grab sample was taken Feb. 13, because of ice. Stream-flow affected by Green Lake.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1700	21.0	60	270	6.9	80	8.0	--
AUG								
01...	1430	20.5	18	310	7.8	89	8.2	--
SEP								
06...	1430	15.5	20	295	9.5	97	8.0	.45
OCT								
10...	1230	14.0	31	296	--	--	7.9	--
NOV								
08...	0945	7.5	56	301	10.1	87	7.8	.35
DEC								
04...	1130	.5	50	315	12.5	89	8.1	.74
JAN , 1985								
10...	1045	.5	58	321	12.1	86	8.0	.74
FEB								
13...	1430	.0	--	311	11.4	81	8.0	.98
MAR								
27...	0930	4.0	91	254	10.7	85	8.1	.53
APR								
24...	0945	15.5	119	290	7.2	75	8.0	.56
JUN								
06...	0930	15.0	42	322	8.0	81	8.2	--
JUL								
16...	1630	24.5	16	301	7.8	96	8.1	.48
AUG								
21...	1215	19.0	32	291	7.8	86	8.1	.71
SEP								
24...	1500	16.0	96	287	6.0	63	7.9	.58

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
18...	1.1	.040	<.001	--	<.010	<.010	3	.49
AUG								
01...	--	--	.011	.06	--	--	2	.10
SEP								
06...	.30	.100	.006	.04	.010	--	2	.11
OCT								
10...	--	<.010	.003	--	<.010	<.010	2	.17
NOV								
08...	--	--	.033	.12	<.010	--	2	.30
DEC								
04...	.46	.140	<.001	--	.010	--	11	1.5
JAN , 1985								
10...	.50	.100	<.001	--	<.010	<.010	3	.47
FEB								
13...	.77	.030	.003	.17	<.010	<.010	1	--
MAR								
27...	--	<.010	<.001	--	<.010	<.010	5	1.2
APR								
24...	.27	.130	.003	.15	<.010	<.010	2	.64
JUN								
06...	--	.070	.002	.06	<.010	<.010	4	.45
JUL								
16...	.38	.020	.010	.07	<.010	<.010	3	.13
AUG								
21...	.57	.030	.003	.10	.010	<.010	<1	--
SEP								
24...	--	<.010	.002	.07	.010	<.010	4	1.0

04126550 BETSIE RIVER NEAR KARLIN, MI

LOCATION.--Lat 44°35'35", long 85°47'48", in SW1/4 NW1/4 sec.5, T.25 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at bridge on Betsie River Road, 1.2 mi northwest of Karlin.

DRAINAGE AREA.--59.6 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken about 300 ft downstream from outlet of Green Lake in vicinity of bridge.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1500	20.0	66	279	9.0	103	8.6	--
OCT								
10...	1430	16.0	42	268	--	--	8.2	--
FEB , 1985								
13...	1215	1.0	79	326	13.3	98	8.3	.60
JUN								
05...	1215	18.0	78	243	9.4	102	8.5	.54

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
JUN , 1984								
18...	.67	.030	--	--	<.010	<.010	3	.53
OCT								
10...	--	<.010	<.001	--	<.010	<.010	2	.23
FEB , 1985								
13...	--	<.010	<.001	--	<.010	<.010	1	.21
JUN								
05...	.46	.040	.006	.04	.040	<.010	6	1.3

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126950 SOUTH BRANCH BOARDMAN RIVER NEAR SOUTH BOARDMAN, MI

LOCATION.--Lat 44°40'32", long 85°23'12", in NE1/4 SW1/4 sec.3, T.26 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at culverts on Broomhead Road, 5.8 mi northwest of South Boardman.

DRAINAGE AREA.--46.7 mi².

PERIOD OF RECORD.--Water years 1971, 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were collected downstream from culverts.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1445	14.5	70	274	8.8	90	7.6	1.5
OCT								
09...	1230	11.5	38	304	10.4	97	8.1	.94
FEB , 1985								
14...	1145	2.0	40	311	12.6	95	8.3	.87
JUN								
05...	1015	11.0	55	297	10.0	93	8.2	.84

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
18...	--	<.010	.010	.32	<.010	<.010	31	5.9
OCT								
09...	.46	.040	<.001	--	<.010	--	3	.31
FEB , 1985								
14...	--	<.010	<.001	--	<.010	<.010	7	.76
JUN								
05...	.38	.020	.005	.44	<.010	<.010	1	.15

04126958 (revised) NORTH BRANCH BOARDMAN RIVER NEAR SOUTH BOARDMAN, MI

LOCATION.--Lat 44°41'24", long 85°22'02", in NE1/4 SW1/4 sec.35, T.27 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at Broomhead Road, 5.5 mi northwest of South Boardman.

DRAINAGE AREA.--69.2 mi².

PERIOD OF RECORD.--Water years 1971, 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were collected downstream from culvert.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEDUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1300	17.0	91	273	8.0	86	7.6	1.3
OCT								
09...	1045	12.5	49	307	9.7	93	8.1	.71
FEB , 1985								
14...	1045	.0	43	332	12.8	91	8.1	1.4
JUN								
05...	0845	13.0	67	312	9.0	88	8.2	.72

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
JUN , 1984								
18...	--	<.010	.012	.30	<.010	<.010	21	5.2
OCT								
09...	.36	.040	.004	.30	<.010	<.010	3	.40
FEB , 1985								
14...	.78	.020	<.001	--	<.010	<.010	4	.46
JUN								
05...	.38	.020	.006	.31	<.010	<.010	4	.72

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126970 BOARDMAN RIVER AT BROWN BRIDGE ROAD NEAR MAYFIELD, MI

LOCATION.--Lat 44°39'24", long 85°26'12", in NE1/4 NE1/4 sec.18, T.26 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at bridge on county road near Ranch Rudolph, 5.1 mi northeast of Mayfield.

DRAINAGE AREA.--141 mi².

PERIOD OF RECORD.--Water years 1971, 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were collected in vicinity of bridge.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1730	16.5	187	284	8.7	92	7.7	1.4
JUL								
31...	1000	12.5	99	328	9.9	95	8.3	--
SEP								
05...	1100	10.0	113	315	10.4	94	8.1	.55
OCT								
09...	1100	12.0	110	314	9.6	90	8.1	1.1
NOV								
07...	1015	4.0	140	311	11.2	88	7.8	--
DEC								
03...	1045	3.5	114	322	11.8	92	8.3	1.1
JAN , 1985								
10...	1530	2.0	126	318	12.6	93	8.2	.86
FEB								
14...	0930	1.0	109	321	12.3	90	8.2	1.1
MAR								
27...	1400	7.0	209	266	10.3	89	8.1	1.3
APR								
23...	1100	16.0	242	262	8.8	92	8.1	1.5
JUN								
05...	1130	13.0	141	313	9.6	94	8.2	.62
JUL								
17...	1010	12.5	110	310	9.6	92	8.2	.67
AUG								
21...	1030	12.0	112	306	9.7	92	8.2	.59
SEP								
25...	1530	10.0	140	307	10.3	93	8.2	.59

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
18...	--	<.010	.009	.24	<.010	<.010	19	9.6
JUL								
31...	--	--	.008	.23	--	--	3	.80
SEP								
05...	.25	.050	.010	.24	.010	.010	4	1.2
OCT								
09...	.71	.090	.002	.31	.020	.020	3	.89
NOV								
07...	--	<.010	.015	.36	<.010	--	8	3.0
DEC								
03...	.63	.070	<.001	--	<.010	--	8	2.5
JAN , 1985								
10...	.35	.050	.029	.43	<.010	<.010	14	4.8
FEB								
14...	.59	.010	<.001	--	<.010	<.010	9	2.6
MAR								
27...	--	<.010	<.001	--	<.010	<.010	26	15
APR								
23...	1.3	.020	.003	.21	<.010	<.010	27	18
JUN								
05...	.06	.240	.003	.32	<.010	--	9	3.4
JUL								
17...	--	<.010	.007	.26	<.010	<.010	5	1.5
AUG								
21...	--	<.010	.005	.29	.010	.010	7	2.1
SEP								
25...	--	<.010	.002	.29	.010	<.010	5	1.9

STREAMS TRIBUTARY TO LAKE MICHIGAN

151

04126991 BOARDMAN RIVER BELOW BROWN BRIDGE POND NEAR MAYFIELD, MI

LOCATION.--Lat 44°38'37", long 85°30'23", in SE1/4 SW1/4 sec.15, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at outlet of Brown Bridge Pond, 1.6 mi northeast of Mayfield.

DRAINAGE AREA.--150 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were collected downstream from Brown Bridge Dam. Dissolved oxygen and water temperature were measured in pond.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUL , 1984								
31...	1145	16.5	106	314	10.4	109	8.3	--
SEP								
05...	1315	16.5	146	300	9.6	100	8.1	.60
OCT								
09...	1330	13.0	157	302	9.6	92	8.1	.44
NOV								
07...	1230	5.5	167	301	10.8	88	8.0	.82
DEC								
03...	1300	4.0	164	320	11.2	88	8.1	.71
JAN , 1985								
09...	1515	1.0	161	305	11.9	85	8.0	1.1
FEB								
13...	1130	.0	163	323	11.6	82	8.2	1.0
MAR								
26...	1430	4.5	159	287	11.2	89	8.1	.71
APR								
23...	1300	16.0	330	251	8.7	91	8.0	1.1
JUN								
05...	1500	19.0	254	303	9.1	101	8.2	.51
JUL								
17...	1120	19.5	161	302	9.0	100	8.5	.40
AUG								
20...	1600	19.0	168	292	9.8	108	8.4	.94
SEP								
25...	1415	13.5	183	312	8.9	87	8.1	.44

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
JUL , 1984								
31...	--	--	.013	.16	--	--	2	.57
SEP								
05...	.44	.060	.007	.09	<.010	<.010	1	.39
OCT								
09...	.27	.030	.002	.14	.010	<.010	1	.42
NOV								
07...	--	<.010	.034	.29	.010	--	3	1.4
DEC								
03...	.38	.020	<.001	--	<.010	<.010	4	1.8
JAN , 1985								
09...	.72	.080	<.001	--	<.010	<.010	1	.43
FEB								
13...	.68	.020	<.001	--	<.010	<.010	1	.44
MAR								
26...	--	<.010	<.001	--	<.010	<.010	2	.86
APR								
23...	.87	.030	.003	.19	<.010	<.010	1	.89
JUN								
05...	.28	.020	<.001	--	<.010	<.010	2	1.4
JUL								
17...	.29	.010	--	--	<.010	<.010	2	.87
AUG								
20...	--	<.010	.005	.13	.010	<.010	3	1.4
SEP								
25...	--	<.010	.003	.23	.010	<.010	3	1.5

04126995 JACKSON CREEK NEAR KINGSLEY, MI

LOCATION.--Lat 44°36'23", long 85°29'10", in SE1/4 NW1/4 sec.35, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, on Voice Road at culvert, 2.9 mi northeast of Kingsley.

DRAINAGE AREA.--9.1 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken upstream from culvert.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
OCT , 1984								
10...	1230	12.0	4.5	306	10.1	95	8.0	.68
FEB , 1985								
13...	1345	.5	5.6	294	12.9	93	8.2	1.4
JUN								
04...	1345	12.0	5.1	299	9.8	93	8.2	.70

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT , 1984								
10...	.36	.040	.001	.28	.090	<.010	2	.02
FEB , 1985								
13...	.88	.020	--	--	<.010	<.010	8	.12
JUN								
04...	.24	.060	.003	.40	<.010	<.010	1	.01

STREAMS TRIBUTARY TO LAKE MICHIGAN

153

04126997 EAST CREEK NEAR MAYFIELD, MI

LOCATION.--Lat 44°37'40", long 85°30'15", in NW1/4 NE1/4 sec.27, T.26 N., R.10 W., Grand Traverse County,
Hydrologic Unit 04060105, at bridge on Green Road, 1.3 mi east of Mayfield.

DRAINAGE AREA.--31.5 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were collected in vicinity of bridge.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	1330	15.5	32	286	9.4	96	7.7	1.6
JUL								
31...	1330	13.5	16	354	9.8	96	8.3	--
SEP								
05...	1515	10.0	16	339	10.7	97	8.3	1.3
OCT								
10...	1100	12.0	20	333	9.8	92	8.1	1.1
NOV								
07...	1400	5.0	26	312	12.0	96	8.0	.99
DEC								
03...	1415	3.0	28	312	12.2	94	8.0	1.0
JAN , 1985								
09...	1245	1.0	25	312	13.2	94	8.1	1.1
FEB								
13...	0945	1.0	20	326	13.2	96	8.3	1.4
MAR								
26...	1300	4.0	43	243	12.6	99	8.1	.50
APR								
23...	1415	15.0	43	268	9.3	95	8.2	1.9
JUN								
05...	1345	13.0	26	325	10.2	99	8.3	1.0
JUL								
16...	1445	15.0	20	326	9.8	99	8.3	1.1
AUG								
20...	1430	13.5	20	330	9.5	93	8.2	1.7
SEP								
25...	1315	10.0	34	300	10.7	97	8.1	.30

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
19...	--	<.010	.010	.47	.040	<.010	9	.78
JUL								
31...	--	--	.009	.98	--	--	--	--
SEP								
05...	.32	.080	.006	.91	<.010	<.010	2	.09
OCT								
10...	.33	.070	.005	.67	.010	<.010	6	.32
NOV								
07...	--	--	--	--	<.010	--	3	.21
DEC								
03...	.38	.020	<.001	--	<.010	<.010	13	.98
JAN , 1985								
09...	.37	.030	<.001	--	<.010	<.010	4	.27
FEB								
13...	--	<.010	<.001	--	<.010	<.010	5	.27
MAR								
26...	--	<.010	<.001	--	<.010	<.010	11	1.3
APR								
23...	1.3	.070	.002	.47	<.010	--	6	.70
JUN								
05...	.17	.030	.008	.82	<.010	<.010	3	.21
JUL								
16...	.40	.200	.009	.54	<.010	<.010	2	.11
AUG								
20...	--	<.010	.004	.83	.010	<.010	5	.27
SEP								
25...	--	<.010	.004	.09	.010	<.010	3	.28

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127000 BOARDMAN RIVER NEAR MAYFIELD, MI

LOCATION.--Lat 44°38'18", long 85°31'10", in SE1/4 NE1/4 sec.21, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, on right bank 25 ft downstream from Brown's Bridge, 300 ft downstream from East Creek, 0.9 mi downstream from Brown's Bridge Dam, 1.0 mi northeast of Mayfield, and 9.6 mi southeast of Traverse City.

DRAINAGE AREA.--182 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1952 to current year.

REVISED RECORDS.--WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 760 ft, by barometer.

REMARKS.--No estimated daily discharges. Water-discharge records good. Flow regulated by hydroelectric powerplant 0.9 mi upstream.

AVERAGE DISCHARGE.--33 years, 193 ft³/s, 14.40 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,220 ft³/s Sept. 14, 1961, gage height, 6.90 ft; minimum, 30 ft³/s, Jan. 15, 1965, gage height, 2.53 ft; minimum daily, 47 ft³/s, Nov. 2, 3, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 815 ft³/s, Sept. 8, gage height, 5.95 ft; minimum, 92 ft³/s, May 2, gage height, 3.01 ft; minimum daily, 139 ft³/s, Jan. 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	167	297	198	271	195	235	368	269	234	195	155	225
2	169	352	196	212	149	235	339	247	229	186	167	206
3	152	268	202	196	155	214	338	293	218	185	196	193
4	144	216	194	248	190	214	352	263	217	184	141	251
5	153	288	186	214	190	224	466	247	249	183	167	364
6	159	187	192	210	167	218	487	284	204	186	206	381
7	160	187	190	203	152	213	483	271	178	184	168	354
8	211	258	179	196	179	208	454	280	245	192	174	682
9	202	225	187	200	157	213	412	262	210	184	156	643
10	174	232	163	196	182	213	343	258	221	185	153	556
11	152	212	169	196	190	245	337	257	197	181	184	493
12	157	204	204	196	190	323	354	270	210	180	146	335
13	166	248	204	196	190	259	377	234	205	180	140	319
14	175	221	216	196	179	263	410	257	203	178	146	239
15	169	201	207	194	156	286	457	254	205	171	193	263
16	153	200	207	196	175	231	456	261	230	179	142	250
17	155	199	208	196	190	259	445	244	221	160	147	216
18	168	195	200	196	159	260	411	253	234	155	204	364
19	253	185	195	184	190	229	436	246	213	178	202	321
20	202	194	193	139	190	204	428	249	220	178	199	225
21	213	187	189	180	193	198	431	253	208	147	198	232
22	203	194	174	197	205	260	353	241	215	148	147	292
23	200	196	192	189	233	264	361	218	221	174	196	225
24	197	194	193	203	285	255	419	233	211	140	211	265
25	194	194	143	214	269	253	407	224	196	188	238	266
26	201	176	169	166	260	242	387	380	194	204	215	232
27	205	162	192	192	245	381	363	329	194	194	209	187
28	217	182	246	147	237	420	342	278	193	192	211	222
29	204	194	430	193	---	474	309	245	194	195	219	222
30	199	193	327	201	---	476	279	242	192	161	231	262
31	197	---	300	206	---	447	---	244	---	150	236	---
TOTAL	5671	6441	6445	6123	5452	8416	11804	8086	6361	5499	5697	9305
MEAN	183	215	208	198	195	271	393	261	212	177	184	310
MAX	253	352	430	271	285	476	487	380	249	204	238	682
MIN	144	162	143	139	149	198	279	218	178	140	140	187
CFSM	1.01	1.18	1.14	1.09	1.07	1.49	2.16	1.43	1.17	.97	1.01	1.70
IN.	1.16	1.32	1.32	1.25	1.11	1.72	2.41	1.65	1.30	1.12	1.16	1.90

CAL YR 1984 TOTAL 71540 MEAN 195 MAX 430 MIN 134 CFSM 1.07 IN 14.62
WTR YR 1985 TOTAL 85300 MEAN 234 MAX 682 MIN 139 CFSM 1.29 IN 17.43

STREAMS TRIBUTARY TO LAKE MICHIGAN

155

04127000 BOARDMAN RIVER NEAR MAYFIELD, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water year 1984

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1200	18.0	277	293	8.0	87	7.6	1.1

DATE	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDEDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY)
JUN , 1984							
18...	<.010	.008	.20	<.010	.170	6	4.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127008 SWAINSTON CREEK AT MAYFIELD, MI

LOCATION.--Lat 44°37'37", long 85°21'57", in NW1/4 NW1/4 sec.28, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at bridge on Mill Street in Mayfield.

DRAINAGE AREA.--10.0 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made downstream from dam at times of sampling. Cross-sectional samples were collected from crest of dam in spillway of Mayfield Pond. Dissolved oxygen and water temperature measured in pond.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	0930	12.5	12	369	10.5	101	7.6	.95
JUL								
31...	1430	14.0	11	387	12.8	128	8.4	--
SEP								
06...	1015	8.5	11	389	11.2	97	8.3	.89
OCT								
09...	1500	12.0	12	375	10.3	97	8.0	.57
NOV								
07...	1515	7.0	13	375	11.2	95	8.0	.80
DEC								
03...	1530	4.0	14	373	11.5	91	8.2	1.2
JAN , 1985								
09...	1415	2.5	12	378	12.5	93	8.2	.78
FEB								
12...	1530	2.0	12	385	11.8	89	8.3	.89
MAR								
26...	1545	8.0	17	345	12.0	104	8.3	1.0
APR								
23...	1515	14.0	16	355	9.9	99	8.3	1.4
JUN								
04...	1545	12.0	15	367	11.0	105	8.2	.60
JUL								
16...	1330	15.0	13	369	11.0	112	8.4	.67
AUG								
20...	1315	13.0	13	377	10.1	98	8.2	.53
SEP								
25...	1130	10.0	17	365	10.2	92	8.1	.67

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
19...	--	<.010	.004	.25	<.010	--	6	.19
JUL								
31...	--	--	.006	.28	--	--	8	.24
SEP								
06...	.55	.050	.008	.29	.030	<.010	4	.12
OCT								
09...	.25	.050	<.001	--	.020	<.010	8	.26
NOV								
07...	--	<.010	.016	.39	<.010	--	12	.42
DEC								
03...	.87	.030	<.001	--	.020	<.010	15	.57
JAN , 1985								
09...	.33	.070	<.001	--	<.010	<.010	19	.62
FEB								
12...	--	<.010	<.001	--	<.010	<.010	23	.75
MAR								
26...	--	<.010	<.001	--	.020	<.010	10	.46
APR								
23...	1.1	.030	<.001	--	<.010	<.010	43	1.9
JUN								
04...	.20	.100	<.001	--	<.010	--	3	.12
JUL								
16...	.31	.090	.007	.26	<.010	<.010	4	.14
AUG								
20...	.18	.020	.005	.32	.010	<.010	7	.25
SEP								
25...	--	<.010	.005	.27	.010	<.010	9	.41

STREAMS TRIBUTARY TO LAKE MICHIGAN

157

04127019 WEST BRANCH JAXON CREEK NEAR MAYFIELD, MI

LOCATION.--Lat 44°37'41", long 85°34'38", in NE1/4 NE1/4 sec.25, T.26 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, at culvert on Mill Street Road, 2.3 mi west of Mayfield.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-dicharge measurements were made at times of sampling. Cross-sectional samples were collected in vicinity of culvert.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1440	15.0	1.2	294	6.8	70	7.4	1.3
OCT								
09...	1615	12.0	.11	296	7.1	67	7.7	--
FEB , 1985								
13...	1510	2.5	.49	271	10.5	80	7.9	1.8
JUN								
04...	1445	11.5	.40	313	7.2	68	7.9	.68

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
JUN , 1984								
18...	1.2	.020	.014	.06	.020	--	4	.01
OCT								
09...	.25	.050	--	--	.010	<.010	1	.00
FEB , 1985								
13...	1.6	.040	<.001	--	<.010	<.010	12	.02
JUN								
04...	.53	.070	.012	.06	<.010	<.010	3	.00

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127250 BOARDMAN RIVER NEAR TRAVERSE CITY, MI

LOCATION.--Lat 44°41'54", long 85°37'14", in NE1/4 NE1/4 sec.34, T.27 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, at Keystone Dam on Cass Road, 4.6 mi south of Traverse City.

DRAINAGE AREA.--266 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling downstream from Keystone Dam (June to December 1984) and since January 1985 at Beitner Road upstream from pond. All samples were taken from Keystone Pond at dam.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	0930	17.0	441	329	8.5	89	7.8	.53
JUL								
31...	1615	20.0	217	350	10.0	112	8.3	--
SEP								
06...	1415	15.0	237	345	9.2	92	8.2	.67
OCT								
09...	1530	13.0	303	339	--	--	7.7	.42
NOV								
08...	1430	7.0	291	336	11.0	93	8.0	--
DEC								
04...	0945	3.5	280	347	11.9	91	8.0	--
JAN , 1985								
10...	1230	1.5	271	335	12.4	90	8.0	.77
FEB								
13...	0915	.5	272	352	13.1	94	8.1	1.2
MAR								
27...	1045	6.0	523	314	12.0	100	8.2	.65
APR								
24...	1055	16.5	480	277	8.8	93	8.1	1.0
JUN								
06...	1000	14.0	364	316	9.4	93	8.3	.72
JUL								
17...	1330	22.0	250	334	9.0	104	8.4	.50
AUG								
21...	1415	16.0	261	357	8.8	90	8.2	.50
SEP								
25...	1330	13.5	345	361	--	--	8.1	.55

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
19...	--	<.010	.008	.22	.030	<.010	4	4.8
JUL								
31...	--	--	.007	.20	--	--	1	.59
SEP								
06...	.43	.070	.009	.16	<.010	<.010	1	.64
OCT								
09...	--	<.010	.001	.22	<.010	<.010	2	1.6
NOV								
08...	--	<.010	.022	.36	<.010	--	13	10
DEC								
04...	--	.020	<.001	--	<.010	<.010	10	7.6
JAN , 1985								
10...	.36	.040	<.001	--	<.010	<.010	3	2.2
FEB								
13...	--	<.010	<.001	--	<.010	<.010	23	17
MAR								
27...	--	<.010	<.001	--	<.010	<.010	6	8.5
APR								
24...	.77	.030	.002	.23	<.010	<.010	9	12
JUN								
06...	.46	.040	.001	.22	<.010	<.010	8	7.9
JUL								
17...	--	<.010	.009	.19	<.010	<.010	5	3.4
AUG								
21...	--	<.010	.003	.19	.010	<.010	7	4.9
SEP								
25...	--	<.010	.006	.25	.010	<.010	5	4.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

159

04127490 BOARDMAN RIVER AT TRAVERSE CITY, MI

LOCATION.--Lat 44°45'44", long 85°37'25", in SE1/4 SE1/4 sec.3, T.27 N., R.11 W., Grand Traverse County,
Hydrologic Unit 04060105, at bridge on Union Street, in Traverse City.

DRAINAGE AREA.--275 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken
from downstream side of bridge. Station located 300 ft downstream from dam. Streamflow affected by Lake
Michigan.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEDUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	0930	21.0	464	319	8.6	98	8.3	1.3
AUG								
01...	0930	21.5	192	350	8.0	92	8.4	--
SEP								
06...	0945	17.5	279	361	8.2	86	8.4	.71
OCT								
09...	1430	13.5	295	378	9.6	93	8.2	.78
NOV								
08...	0945	7.5	271	365	11.4	97	8.3	1.0
DEC								
04...	0930	4.5	300	366	12.5	97	8.2	1.5
JAN , 1985								
09...	0930	1.0	292	353	13.8	97	8.2	1.2
FEB								
14...	1030	.5	314	363	14.1	101	8.2	1.4
MAR								
27...	0915	6.0	420	334	11.8	99	8.2	1.2
APR								
24...	0930	14.0	469	292	10.1	101	8.2	.90
JUN								
05...	0845	16.5	308	362	9.4	98	8.3	.70
JUL								
17...	0930	22.0	255	359	8.8	102	8.5	.93
AUG								
21...	1000	19.0	233	329	8.5	92	8.0	.93
SEP								
25...	0930	15.0	405	359	--	--	8.2	.84

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
19...	.93	.170	.009	.20	<.010	<.010	1	1.3
AUG								
01...	--	--	.017	.16	--	--	2	1.0
SEP								
06...	.32	.180	.034	.18	.020	.010	2	1.5
OCT								
09...	.24	.260	.010	.27	.020	.010	41	33
NOV								
08...	.18	.420	.052	.35	.090	--	3	2.2
DEC								
04...	.81	.290	.003	.39	.020	<.010	6	4.9
JAN , 1985								
09...	.47	.330	<.001	--	.060	<.010	6	4.7
FEB								
14...	.56	.340	<.001	--	<.010	--	2	1.7
MAR								
27...	.65	.250	<.001	--	.040	<.010	6	6.8
APR								
24...	.45	.150	.004	.29	.020	<.010	3	3.8
JUN								
05...	.20	.200	.008	.29	<.010	<.010	2	1.7
JUL								
17...	--	<.010	.014	.31	<.010	<.010	2	1.4
AUG								
21...	.49	.010	.007	.42	.050	.030	2	1.3
SEP								
25...	.37	.030	.014	.42	.030	<.010	8	8.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127498 HOSPITAL CREEK AT TRAVERSE CITY, MI

LOCATION.--Lat 44°45'54", long 85°37'59", in NW1/4 SW1/4 sec.3, T.27 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, at bridge on Maple Street, in Traverse City.

DRAINAGE AREA.--7.7 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken downstream from bridge.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	1215	14.0	14	534	9.1	90	8.0	1.5
AUG								
01...	1130	15.5	11	519	7.3	74	8.2	--
SEP								
06...	1130	11.0	10	559	10.1	92	8.2	.82
OCT								
09...	1630	14.0	10	556	9.0	88	8.0	.74
NOV								
08...	1130	8.0	12	559	10.4	90	8.2	--
DEC								
04...	1215	3.0	11	566	13.3	100	8.2	1.2
JAN , 1985								
09...	1130	2.0	11	549	13.1	95	8.1	1.1
FEB								
14...	1300	1.0	11	537	13.5	98	8.2	1.4
MAR								
27...	1115	7.0	44	412	11.0	94	8.1	1.5
APR								
24...	1115	12.0	18	530	9.5	91	8.2	1.5
JUN								
05...	1000	11.5	12	543	10.1	94	8.3	1.0
JUL								
17...	1115	13.0	8.5	561	9.8	94	8.3	.91
AUG								
21...	1200	13.5	10	567	9.9	96	8.3	1.2
SEP								
25...	1115	10.0	16	611	--	--	8.2	.91

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
19...	1.0	.060	.011	.41	.050	.010	33	1.2
AUG								
01...	--	--	.017	.48	--	--	32	.95
SEP								
06...	.37	.030	.012	.41	.030	.020	10	.27
OCT								
09...	.23	.070	.007	.44	.020	.020	49	1.3
NOV								
08...	--	.100	.023	.65	<.010	--	7	.23
DEC								
04...	.58	.120	<.001	--	.040	<.010	30	.89
JAN , 1985								
09...	.45	.050	<.001	--	.010	<.010	74	2.2
FEB								
14...	--	<.010	--	--	<.010	<.010	84	2.5
MAR								
27...	--	<.010	<.001	--	.050	<.010	73	8.7
APR								
24...	.85	.050	.011	.57	.020	.020	54	2.6
JUN								
05...	.34	.060	.012	.63	<.010	<.010	33	1.1
JUL								
17...	.38	.020	.010	.50	<.010	<.010	2	.05
AUG								
21...	.69	.010	.010	.44	.020	<.010	8	.22
SEP								
25...	--	<.010	.007	.41	.030	<.010	61	2.6

STREAMS TRIBUTARY TO LAKE MICHIGAN

161

04127520 MITCHELL CREEK AT TRAVERSE CITY, MI

LOCATION.--Lat 44°44'52", long 85°33'30", in SE1/4 SE1/4 sec.7, T.25 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at bridge on private drive, 250 feet south of U.S. Highway 31, on east side of Three Mile Road, in Traverse City.

DRAINAGE AREA.--14.6 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken in vicinity of bridge on private drive and 100 ft upstream from inflow of unnamed tributary.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	1200	16.0	17	420	7.9	81	8.0	1.3
JUL								
31...	1530	17.0	5.1	405	9.5	100	8.4	--
SEP								
06...	1300	12.0	6.5	422	10.4	97	8.3	1.2
OCT								
10...	0945	12.0	7.5	442	9.6	89	8.0	--
NOV								
08...	1400	8.5	8.5	437	11.0	96	8.3	1.3
DEC								
04...	1400	1.5	9.1	455	13.2	95	8.2	1.2
JAN , 1985								
09...	1400	1.5	9.0	429	13.5	96	8.2	1.2
FEB								
12...	1615	.5	8.8	422	13.7	97	8.2	2.2
MAR								
27...	1345	6.5	28	315	11.5	97	8.1	.65
APR								
24...	1330	13.0	13	388	9.0	88	8.2	1.2
JUN								
04...	1445	14.0	7.4	389	10.1	99	8.4	1.1
JUL								
16...	1600	18.0	4.7	433	8.9	95	8.4	--
AUG								
20...	1630	15.0	6.8	443	8.1	81	8.3	2.6
SEP								
25...	1445	10.5	14	486	--	--	8.2	.70

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
19...	.89	.110	<.001	--	.030	.020	9	.41
JUL								
31...	--	.120	.007	--	<.010	--	4	.06
SEP								
06...	.25	.050	.006	.86	.020	.010	3	.05
OCT								
10...	.33	.070	--	--	.030	<.010	31	.63
NOV								
08...	--	<.010	.023	.83	<.010	--	24	.55
DEC								
04...	.50	.100	<.001	--	.020	.010	12	.29
JAN , 1985								
09...	.48	.020	.002	.74	<.010	<.010	22	.53
FEB								
12...	--	<.010	<.001	--	<.010	<.010	39	.93
MAR								
27...	--	<.010	<.001	--	.020	<.010	29	2.2
APR								
24...	--	<.010	.007	.59	<.010	<.010	20	.70
JUN								
04...	.34	.060	.003	.72	<.010	<.010	8	.16
JUL								
16...	--	<.010	.013	--	<.010	<.010	5	.06
AUG								
20...	--	<.010	.008	.73	.030	<.010	77	1.4
SEP								
25...	--	<.010	.006	.39	.030	<.010	12	.45

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127528 ACME CREEK AT ACME, MI

LOCATION.--Lat 44°46'31", long 85°29'56", in SE1/4 SE1/4 sec.34, T.28 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at bridge on U.S. Highway 31, in Acme.

DRAINAGE AREA.--12.9 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken in vicinity of bridge.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
19...	0945	12.0	19	312	10.2	96	8.0	.74
JUL								
31...	1745	14.0	13	312	10.1	100	8.3	--
SEP								
05...	1600	11.0	15	330	10.8	99	8.3	.19
OCT								
10...	0945	10.0	15	259	10.8	96	8.3	.33
NOV								
07...	1545	7.5	16	326	11.7	99	8.1	.39
DEC								
03...	1630	5.5	18	332	11.8	95	8.2	.71
JAN , 1985								
09...	1515	4.0	15	328	13.1	100	8.2	.51
FEB								
12...	1500	3.5	15	316	12.8	99	8.3	.59
MAR								
26...	1500	8.0	22	307	12.2	105	8.3	.56
APR								
23...	1445	13.5	17	321	10.3	101	8.4	.74
JUN								
04...	1345	11.0	15	334	11.4	105	8.4	.33
JUL								
16...	1445	13.0	14	329	10.5	101	8.3	.35
AUG								
20...	1520	12.0	16	343	10.5	98	8.4	1.0
SEP								
24...	1615	12.0	18	358	--	--	8.3	.53

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
JUN , 1984								
19...	.56	.040	.004	.13	.030	.030	14	.72
JUL								
31...	--	<.010	.015	.05	<.010	--	3	.11
SEP								
05...	.08	.020	.002	.08	<.010	<.010	6	.24
OCT								
10...	.17	.030	<.001	--	.010	<.010	19	.77
NOV								
07...	.18	.020	.022	.17	.010	--	4	.17
DEC								
03...	.42	.080	<.001	--	.010	<.010	2	.10
JAN , 1985								
09...	.27	.030	.011	.19	<.010	<.010	20	.81
FEB								
12...	--	<.010	<.001	--	<.010	<.010	11	.45
MAR								
26...	--	<.010	<.001	--	<.010	<.010	15	.89
APR								
23...	--	<.010	.004	.14	<.010	<.010	6	.28
JUN								
04...	.17	.030	<.001	--	<.010	<.010	7	.28
JUL								
16...	.19	.010	.007	.15	<.010	<.010	8	.30
AUG								
20...	--	<.010	<.001	--	.020	<.010	5	.22
SEP								
24...	--	<.010	.003	.12	.020	<.010	14	.68

STREAMS TRIBUTARY TO LAKE MICHIGAN

163

04127535 YUBA CREEK NEAR ACME, MI

LOCATION.--Lat 44°49'28", long 85°27'30", in SE1/4 NE1/4 sec.13, T.28 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at culvert on U.S. Highway 31, 4.0 mi northeast of Acme.

DRAINAGE AREA.--8.4 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken downstream from culvert.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1800	18.0	22	310	5.9	64	7.5	1.9
AUG								
01...	1000	16.5	5.0	425	7.8	81	8.0	.77
SEP								
05...	1500	13.0	6.6	428	9.3	90	8.0	2.2
OCT								
10...	1045	12.5	11	439	7.7	72	8.0	1.5
NOV								
07...	1445	4.5	8.0	420	11.7	91	7.9	4.4
DEC								
03...	1500	2.5	10	409	11.8	88	8.1	3.7
JAN , 1985								
10...	0945	.5	7.1	417	12.6	88	8.0	2.4
FEB								
12...	1345	.0	7.8	404	12.3	86	8.1	2.5
MAR								
26...	1400	6.0	16	334	12.4	101	8.0	.76
APR								
23...	1345	17.0	9.5	395	9.2	98	8.2	2.6
JUN								
04...	1200	12.0	5.5	491	10.6	100	8.0	2.5
JUL								
16...	1400	19.0	5.0	478	7.9	86	8.1	1.3
AUG								
20...	1320	16.5	6.4	462	8.0	83	8.0	1.5
SEP								
24...	1430	14.0	16	436	--	--	8.0	.97

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
JUN , 1984								
18...	1.5	.060	.006	.30	.040	.020	29	1.7
AUG								
01...	.28	.020	.127	.34	<.010	--	2	.03
SEP								
05...	.45	.050	.005	1.7	.020	.020	1	.02
OCT								
10...	.34	.060	.002	1.1	.020	<.010	6	.18
NOV								
07...	--	<.010	.020	4.0	<.010	--	6	.13
DEC								
03...	.65	.050	<.001	--	.020	<.010	6	.16
JAN , 1985								
10...	.36	.040	.006	2.0	<.010	<.010	11	.21
FEB								
12...	--	<.010	<.001	--	<.010	<.010	12	.25
MAR								
26...	--	<.010	<.001	--	.010	<.010	9	.39
APR								
23...	1.3	.030	.011	1.3	<.010	--	27	.69
JUN								
04...	.33	.070	.006	2.1	.030	.010	2	.03
JUL								
16...	.67	.030	.013	.63	<.010	<.010	4	.05
AUG								
20...	--	<.010	.012	1.2	.050	.020	2	.03
SEP								
24...	--	<.010	.006	.36	.050	.020	8	.35

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127550 TOBECO CREEK NEAR ELK RAPIDS, MI

LOCATION.--Lat 44°51'14", long 85°25'55", in SW1/4 NW1/4 sec.5, T.28 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at culvert on U.S. Highway 31, 3.0 mi south of Elk Rapids.

DRAINAGE AREA.--10.8 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken upstream from culvert and approximately 400 ft downstream from dam in wildlife-flooding area.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1610	23.0	6.6	400	6.8	81	7.8	--
AUG								
01...	1145	21.5	.76	442	5.6	65	7.6	--
SEP								
05...	1345	17.0	8.0	433	8.2	87	7.7	.71
OCT								
10...	1200	15.5	4.5	456	7.5	75	8.0	--
NOV								
07...	1330	5.0	11	427	11.7	93	7.8	1.0
DEC								
03...	1400	2.0	7.1	418	12.2	90	8.1	1.2
JAN , 1985								
10...	1115	1.5	6.6	404	6.4	46	7.5	.94
FEB								
12...	1245	.5	5.4	491	5.0	36	7.4	1.2
MAR								
26...	1300	7.0	19	296	11.0	92	7.8	1.0
APR								
23...	1300	21.0	11	357	7.6	88	8.0	1.7
JUN								
04...	1300	18.0	4.0	449	8.3	89	8.0	--
JUL								
16...	1300	22.0	.61	499	5.4	63	7.9	.97
AUG								
20...	1420	19.5	1.5	491	6.2	68	7.9	1.4
SEP								
24...	1430	16.0	6.8	429	--	--	8.2	.72

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
18...	1.4	.030	.007	--	<.010	<.010	3	.05
AUG								
01...	.35	.050	--	--	<.010	<.010	0	.00
SEP								
05...	.66	.040	--	--	<.010	<.010	4	.09
OCT								
10...	1.2	.040	.003	--	<.010	<.010	26	.32
NOV								
07...	--	<.010	.028	.02	<.010	--	8	.24
DEC								
03...	1.1	.020	.012	.06	.010	<.010	19	.36
JAN , 1985								
10...	.67	.030	.002	.24	<.010	<.010	42	.75
FEB								
12...	1.1	.010	.007	.07	<.010	<.010	24	.35
MAR								
26...	--	<.010	<.001	--	<.010	<.010	7	.36
APR								
23...	--	<.010	.001	.02	<.010	<.010	4	.12
JUN								
04...	.85	.050	.003	--	.020	<.010	4	.04
JUL								
16...	.88	.020	.013	.06	<.010	<.010	3	.00
AUG								
20...	1.4	.020	.006	.04	.020	<.010	2	.00
SEP								
24...	.68	.020	.004	.02	.010	<.010	5	.09

STREAMS TRIBUTARY TO LAKE MICHIGAN

165

04127600 BATTLE CREEK NEAR WILLIAMSBURG, MI

LOCATION.--Lat 44°46'22", long 85°22'04", in NE1/4 NW1/4 sec.2, T.27 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, on State Highway 72 at culvert, 1.8 mi east of Williamsburg.

DRAINAGE AREA.--8.7 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken in vicinity of culvert. Stream has inflow from a spring, which is near left bank on north side of highway.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1200	13.0	19	272	9.4	92	7.8	1.3
JUL								
31...	1345	13.0	10	317	10.6	102	8.2	--
SEP								
05...	1000	9.5	11	343	11.0	98	8.3	.54
OCT								
10...	1515	11.5	11	329	10.7	98	8.3	.33
NOV								
07...	1000	6.0	11	328	11.9	97	7.9	--
DEC								
03...	1030	6.0	12	335	11.1	91	7.7	.94
JAN , 1985								
10...	1445	4.5	11	322	11.6	90	8.2	.61
FEB								
14...	1430	3.0	9.4	330	12.5	96	8.3	.51
MAR								
26...	1000	7.0	12	320	8.6	72	8.2	.89
APR								
23...	1030	10.0	12	289	10.7	97	8.3	.99
JUN								
04...	0945	9.0	12	329	11.4	100	8.3	.48
JUL								
16...	1000	11.5	12	340	10.4	97	8.2	1.0
AUG								
20...	1030	11.0	12	338	10.6	97	8.3	.49
SEP								
24...	1015	10.0	11	349	--	--	8.4	.32

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
18...	1.2	.010	.006	.13	.010	<.010	35	1.8
JUL								
31...	--	<.010	.077	.83	<.010	--	11	.30
SEP								
05...	.35	.050	.002	.13	.010	.010	19	.56
OCT								
10...	.17	.030	<.001	--	<.010	<.010	17	.50
NOV								
07...	--	.080	.024	.22	<.010	--	17	.50
DEC								
03...	.56	.140	<.001	--	<.010	<.010	11	.36
JAN , 1985								
10...	.35	.050	.007	.21	<.010	<.010	20	.59
FEB								
14...	--	<.010	<.001	--	<.010	<.010	25	.63
MAR								
26...	--	<.010	<.001	--	.020	<.010	17	.55
APR								
23...	--	<.010	<.001	--	<.010	<.010	15	.49
JUN								
04...	.24	.060	.005	.18	<.010	<.010	9	.29
JUL								
16...	--	<.010	.006	.20	<.010	<.010	55	1.8
AUG								
20...	--	<.010	.006	.19	.010	<.010	9	.29
SEP								
24...	--	<.010	.002	.12	.010	<.010	11	.33

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127620 WILLIAMSBURG CREEK NEAR WILLIAMSBURG, MI

LOCATION.--Lat 44°47'41", long 85°23'14", in SE1/4 NW1/4 sec.27, T.28 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at culvert on Ayers Road, 1.7 mi northeast of Williamsburg.

DRAINAGE AREA.--8.0 mi².

PERIOD OF RECORD.--Water years 1984 to current year.

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken downstream from culvert.

WATER QUALITY DATA

DATE	TIME	TEMPER- ATURE (DEG C)	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	PH (STAND- ARD UNITS)	NITRO- GEN, TOTAL (MG/L AS N)
JUN , 1984								
18...	1400	16.5	28	288	8.4	88	7.8	1.3
AUG								
01...	1345	17.0	12	320	8.2	86	7.8	--
SEP								
05...	1230	12.0	13	334	9.7	91	8.1	.51
OCT								
10...	1400	14.0	12	336	9.8	95	8.2	.34
NOV								
07...	1130	5.0	15	340	12.2	96	7.7	1.4
DEC								
03...	1215	3.5	15	348	11.7	90	8.2	1.1
JAN , 1985								
10...	1330	2.0	12	336	12.8	93	8.1	.48
FEB								
12...	1030	1.5	12	331	12.7	93	8.2	1.2
MAR								
26...	1130	6.5	15	323	9.1	75	8.2	.59
APR								
23...	1130	16.0	14	332	9.4	98	8.3	.75
JUN								
04...	1045	12.0	13	340	10.2	96	8.2	.50
JUL								
16...	1115	17.0	13	341	8.6	90	8.0	.42
AUG								
20...	1130	15.0	13	344	8.6	86	8.0	.51
SEP								
24...	1315	13.0	17	361	--	--	8.3	.88

DATE	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
JUN , 1984								
18...	--	<.010	.006	.05	<.010	<.010	1	.08
AUG								
01...	--	.050	.005	--	<.010	--	4	.13
SEP								
05...	.38	.020	.020	.09	<.010	<.010	3	.11
OCT								
10...	.15	.050	.001	.13	.020	<.010	9	.29
NOV								
07...	.84	.260	.030	.28	<.010	--	3	.12
DEC								
03...	.73	.070	<.001	--	<.010	<.010	6	.24
JAN , 1985								
10...	.18	.020	<.001	--	<.010	<.010	7	.23
FEB								
12...	--	<.010	<.001	--	<.010	<.010	6	.19
MAR								
26...	--	<.010	<.001	--	<.010	<.010	10	.41
APR								
23...	.65	.050	<.001	--	<.010	<.010	3	.11
JUN								
04...	.29	.110	<.001	--	<.010	<.010	2	.07
JUL								
16...	.05	.250	<.001	--	<.010	<.010	25	.88
AUG								
20...	--	<.010	.001	.10	.010	<.010	8	.28
SEP								
24...	--	<.010	.003	.47	.010	<.010	3	.14

STREAMS TRIBUTARY TO LAKE MICHIGAN

167

04127800 JORDAN RIVER NEAR EAST JORDAN, MI

LOCATION.--Lat 45°06'09", long 85°05'53", in NW1/4 NW1/4 sec.7, T.31 N., R.6 W., Antrim County, Hydrologic Unit 04060105, on right bank 600 ft downstream from Webster Bridge, 4.2 mi south of East Jordan, and 4.5 mi upstream from mouth.

DRAINAGE AREA.--67.9 mi².

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1960-65. October 1966 to current year.

REVISED RECORDS.--WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 610 ft above National Geodetic Vertical Datum of 1929, from topographic map. Nov. 19, 1959, to Sept. 30, 1966, nonrecording gage at present site and at site 600 ft upstream at same datum.

REMARKS.--Estimated daily discharges: Dec. 26, 28, 29, Jan. 9, 16, Jan. 20 to Feb. 6, Feb. 8-10, 15, and Mar. 5. Records good except for estimated daily discharges, which are fair. Some regulation at low flow by fish hatchery upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 188 ft³/s, 37.60 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,360 ft³/s, July 19, 1975, gage height, 6.51 ft; minimum, 91 ft³/s, Mar. 8, 1982, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 1	1800	507	4.94	Apr. 24	2300	425	4.68
Dec. 29	unknown	760	5.48	May 20	0900	488	4.89
Mar. 27	1900	510	4.95	July 25	2400	452	4.78
Apr. 5	0500	430	4.70	Sept. 8	0900	*1,010	*6.05

Minimum discharge, 150 ft³/s, Aug. 16; minimum gage height, 3.08 ft, Jan. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	164	333	179	189	180	218	223	189	193	166	166	168
2	163	264	176	193	180	217	213	187	180	168	162	166
3	162	192	188	188	180	201	264	187	178	167	161	163
4	161	185	179	186	180	185	268	191	177	165	160	200
5	161	182	174	186	180	190	359	200	178	169	162	197
6	161	179	174	184	180	193	365	204	176	190	172	237
7	174	175	170	188	180	189	264	210	178	181	163	219
8	242	181	174	175	180	191	248	193	188	171	160	750
9	184	181	176	180	180	198	217	188	202	166	157	230
10	173	228	180	180	180	200	213	197	178	169	162	188
11	169	187	185	180	178	223	224	190	176	164	159	176
12	167	177	229	180	180	323	227	187	176	164	157	171
13	167	172	214	180	178	248	314	183	178	163	163	168
14	168	173	181	184	179	221	324	180	175	164	158	168
15	166	180	180	180	180	209	289	193	174	164	157	167
16	175	186	191	180	178	218	251	222	193	167	154	165
17	190	177	190	181	178	212	222	208	188	164	153	163
18	177	179	179	181	180	194	222	188	197	163	195	233
19	277	174	174	174	181	203	225	193	187	163	170	194
20	199	172	173	175	178	215	222	390	177	161	176	171
21	205	172	171	180	192	198	209	217	174	160	164	170
22	200	172	189	180	246	206	201	194	188	159	159	179
23	179	178	175	180	233	231	198	188	178	159	161	181
24	175	176	175	180	291	240	260	184	171	159	241	176
25	176	174	171	180	246	229	286	186	170	320	214	182
26	220	173	175	180	224	254	211	303	168	276	219	179
27	198	184	175	180	214	424	200	233	168	177	200	175
28	211	203	360	180	205	363	200	193	166	169	221	171
29	182	181	550	180	---	359	195	186	168	207	224	169
30	176	178	225	180	---	270	192	183	167	175	209	184
31	172	---	196	180	---	235	---	188	---	170	175	---
TOTAL	5694	5668	6228	5624	5441	7257	7306	6335	5367	5480	5454	6062
MEAN	184	189	201	181	194	234	244	204	179	177	176	202
MAX	277	333	550	193	291	424	365	390	202	320	241	750
MIN	161	172	170	174	178	185	192	180	166	159	153	163
CFSM	2.71	2.78	2.96	2.67	2.86	3.45	3.59	3.00	2.64	2.61	2.59	2.98
IN.	3.12	3.11	3.41	3.08	2.98	3.98	4.00	3.47	2.94	3.00	2.99	3.32
CAL YR 1984	TOTAL	67696	MEAN 185	MAX 550	MIN 151	CFSM 2.73	IN 37.09					
WTR YR 1985	TOTAL	71916	MEAN 197	MAX 750	MIN 153	CFSM 2.90	IN 39.40					

STREAMS TRIBUTARY TO LAKE HURON

04127918 PINE RIVER NEAR RUDYARD, MI

LOCATION.--Lat 46°11'09", long 84°35'52", in NW1/4 NE1/4 sec.30, T.44 N., R.2 W., Chippewa County, Hydrologic Unit 04070002, on right bank 15 ft upstream from county highway bridge, 3.2 mi south of Rudyard.

DRAINAGE AREA.--184 mi².

PERIOD OF RECORD.--April 1972 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 600 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft). Prior to Aug. 4, 1972, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 16, 17, 19, 22, Dec. 3-10, Dec. 20 to Mar. 25. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--13 years, 240 ft³/s, 17.71 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,320 ft³/s, Apr. 21, 1985, gage height, 18.08 ft; minimum, 53 ft³/s, July 29, 30, 1982, gage height, 1.83 ft.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 50.3 ft³/s was measured Aug. 6, 1963.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,200 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Oct. 19	1600	1,640	8.58	Apr. 21	0100	*4,320	*18.08
Nov. 1	1900	2,660	12.55	Apr. 25	1400	3,330	14.77
Mar. 29	0100	1,670	8.69				

Minimum discharge, 68 ft³/s, Aug. 12, 13, gage height, 2.18 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	217	1640	297	185	115	190	1190	467	271	91	120	125
2	195	1650	261	180	115	195	1100	385	235	92	100	121
3	181	892	250	175	115	200	1050	331	200	93	80	131
4	168	593	245	170	115	200	991	315	175	91	75	190
5	158	477	240	165	115	200	1070	663	160	90	73	170
6	149	388	240	160	115	200	1120	543	149	90	81	148
7	137	326	240	155	115	200	988	455	142	112	93	141
8	167	311	250	155	115	200	758	415	149	111	86	138
9	191	331	260	150	115	195	564	340	144	110	77	134
10	174	650	280	150	115	195	418	352	134	101	73	130
11	158	532	349	145	115	195	394	314	125	92	72	122
12	145	362	703	140	115	200	411	286	118	87	70	115
13	133	309	541	140	115	200	747	269	114	84	83	109
14	129	268	372	140	115	205	1020	244	113	83	121	105
15	124	264	392	135	115	210	1260	245	110	81	97	102
16	129	250	484	135	115	215	1730	297	108	81	84	99
17	185	230	844	130	115	220	1610	276	110	81	78	95
18	228	223	465	130	120	225	1800	248	132	78	202	93
19	979	215	380	125	125	230	2720	222	135	86	276	99
20	871	219	350	125	130	245	3670	221	124	96	207	98
21	493	204	320	120	140	260	4050	209	119	91	160	95
22	416	200	300	120	155	290	3950	194	139	99	132	99
23	336	201	270	120	165	340	3400	183	182	95	120	134
24	286	218	260	120	170	450	2670	172	162	86	179	162
25	260	236	245	120	175	540	3230	165	142	100	250	202
26	372	233	235	120	180	680	2200	170	127	156	202	180
27	348	241	225	120	180	1080	1350	172	116	125	183	159
28	665	361	215	120	185	1560	937	163	108	155	180	142
29	481	330	205	120	---	1590	696	154	104	216	154	131
30	363	294	195	120	---	1500	566	154	97	186	147	136
31	320	---	190	115	---	1440	---	200	---	143	136	---
TOTAL	9138	12648	10103	4305	3680	13850	47660	8824	4244	3282	3991	3905
MEAN	295	422	326	139	131	447	1589	285	141	106	129	130
MAX	979	1650	844	185	185	1590	4050	663	271	216	276	202
MIN	124	200	190	115	115	190	394	154	97	78	70	93
CFSM	1.60	2.29	1.77	.76	.71	2.43	8.64	1.55	.77	.58	.70	.71
IN.	1.85	2.56	2.04	.87	.74	2.80	9.64	1.78	.86	.66	.81	.79
CAL YR 1984	TOTAL	84343	MEAN 230	MAX 1650	MIN 64	CFSM 1.25	IN 17.05					
WTR YR 1985	TOTAL	125650	MEAN 344	MAX 4050	MIN 70	CFSM 1.87	IN 25.40					

STREAMS TRIBUTARY TO LAKE HURON

169

04128000 STURGEON RIVER NEAR WOLVERINE, MI

LOCATION.--Lat 45°17'56", long 84°36'40", in SE1/4 NE1/4 sec.36, T.34 N., R.3 W., Cheboygan County, Hydrologic Unit 04070004, on left bank 1.8 mi north of Wolverine, 2.8 mi downstream from West Branch, and 9 mi upstream from mouth.

DRAINAGE AREA.--198 mi².

PERIOD OF RECORD.--April 1942 to current year.

REVISED RECORDS.--WSP 1307: 1944(M), 1948(M). WSP 1727: 1951(M). WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 740 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to June 15, 1942, nonrecording gage at site 1.0 mi upstream, and June 16, 1942 to Sept. 30, 1958, at site 0.7 mi upstream at different datums.

REMARKS.--Estimated daily discharges: Dec. 7, Jan. 2-4, 9-14, 16-19, Jan. 21 to Feb. 1, Feb. 3-20, and Mar. 5-7. Records good except for estimated daily discharges, which are fair. Prior to July 1975, intermittent regulation at low flows by ponds 2.4 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 220 ft³/s, 15.09 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,290 ft³/s, Sept. 29, 1972, gage height, 3.72 ft; maximum gage height, 4.48 ft, Sept. 14, 1961; minimum discharge, 94 ft³/s, Jan. 19, 1971, result of freezeup; minimum daily, 113 ft³/s, Aug. 6, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 750 ft³/s, Dec. 29, gage height, 3.06 ft; minimum, 150 ft³/s, Feb. 2; gage height, 1.59 ft, result of freezeup.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	195	322	223	281	200	284	337	258	282	185	209	234
2	191	386	219	280	181	285	317	254	255	187	194	219
3	188	275	237	275	205	264	343	250	242	191	191	213
4	184	251	234	270	215	239	358	247	229	185	186	305
5	186	241	219	272	215	250	410	275	225	185	188	294
6	187	230	215	262	215	250	491	278	220	203	202	336
7	202	222	215	261	215	250	398	305	217	221	194	280
8	261	225	217	233	215	245	361	275	224	207	187	384
9	233	224	217	235	215	253	327	265	242	196	180	366
10	215	266	226	230	215	254	319	264	228	188	182	286
11	206	252	231	230	215	276	328	254	215	183	203	235
12	199	225	266	230	215	365	338	245	213	185	197	229
13	199	213	286	225	215	325	429	238	215	178	199	221
14	200	208	246	220	215	288	487	228	211	183	197	214
15	198	216	239	215	215	271	479	240	207	184	190	214
16	223	225	257	215	215	271	485	336	213	182	187	212
17	239	213	280	210	220	268	412	295	223	183	183	204
18	235	214	246	210	225	249	375	266	241	178	246	222
19	343	213	226	205	230	265	433	269	239	179	218	267
20	313	201	217	201	240	270	409	515	215	175	216	224
21	277	194	211	200	245	252	384	402	207	172	208	220
22	294	191	225	205	320	255	350	306	218	170	197	241
23	247	198	221	205	312	273	321	273	224	171	194	245
24	228	204	208	205	375	281	315	250	206	169	326	224
25	223	208	191	205	342	279	334	242	199	245	361	227
26	298	208	235	205	303	298	298	356	199	344	371	232
27	267	221	280	205	292	459	282	381	193	230	278	235
28	270	269	368	205	284	504	279	303	188	205	289	222
29	242	249	704	205	---	490	269	263	189	312	306	212
30	229	227	520	205	---	445	263	249	187	268	306	223
31	219	---	319	205	---	371	---	247	---	227	269	---
TOTAL	7191	6991	8198	7010	6769	9329	10931	8829	6566	6271	7054	7460
MEAN	232	233	264	226	242	301	364	285	219	202	228	249
MAX	343	386	704	281	375	504	491	515	282	344	371	384
MIN	184	191	191	200	181	239	263	228	187	169	180	204
CFSM	1.17	1.18	1.33	1.14	1.22	1.52	1.84	1.44	1.11	1.02	1.15	1.26
IN.	1.35	1.31	1.54	1.32	1.27	1.75	2.05	1.66	1.23	1.18	1.33	1.40
CAL YR 1984	TOTAL	88543	MEAN 242	MAX 704	MIN 166	CFSM 1.22	IN 16.64					
WTR YR 1985	TOTAL	92599	MEAN 254	MAX 704	MIN 169	CFSM 1.28	IN 17.40					

STREAMS TRIBUTARY TO LAKE HURON

04129000 PIGEON RIVER NEAR VANDERBILT, MI

LOCATION.--Lat 45°10'15", long 84°26'18", in SE1/4 SW1/4 sec.9, T.32 N., R.1 W., Otsego County, Hydrologic Unit 04070004, on right bank at Pigeon River Headquarters, 11.1 mi east of Vanderbilt, and 26 mi upstream from Mullett Lake.

DRAINAGE AREA.--62.6 mi².

PERIOD OF RECORD.--September 1950 to current year.

REVISED RECORDS.--WDR MI-83: Drainage area.

GAGE.--Water stage recorder. Datum of gage is 886.24 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 2-5, 9-12, 17-23, Jan. 26 to Feb. 20, and Mar. 6. Records good except for estimated daily discharges, which are fair. Prior to May 16, 1957, and since Apr. 22, 1958, occasional regulation by Lansing Club Dam 3.5 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--35 years, 78.3 ft³/s, 16.99 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft³/s, May 15, 1957, gage height, 6.80 ft, from floodmark, from rating curve extended above 500 ft³/s, result of failure of Lansing Club Dam; minimum, 13 ft³/s, Jan. 8, 1957.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 375 ft³/s, Dec. 29, gage height, 4.87 ft; minimum, 49 ft³/s, July 21, gage height, 2.18 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	66	117	90	92	73	98	117	85	86	64	71	79
2	74	183	79	92	73	96	110	83	79	59	57	71
3	65	109	92	90	73	90	113	82	71	64	61	73
4	67	98	88	89	73	84	131	80	65	60	59	133
5	67	92	77	89	73	96	154	97	74	60	60	105
6	66	80	79	88	73	96	215	95	69	62	61	178
7	69	79	76	88	73	99	176	104	70	74	63	109
8	74	80	78	91	72	76	118	92	72	66	61	191
9	83	84	74	89	72	87	118	86	80	64	61	146
10	73	105	78	87	72	87	103	87	70	58	57	99
11	75	99	81	86	72	100	115	79	72	62	69	79
12	67	89	98	85	72	140	125	82	66	57	58	80
13	71	81	113	85	72	131	176	74	73	58	60	69
14	71	80	85	85	72	101	222	77	67	59	61	76
15	70	75	85	84	72	94	221	79	67	58	57	64
16	85	82	88	86	72	93	227	130	70	57	57	65
17	94	77	106	83	72	91	168	109	76	58	58	67
18	84	76	90	81	72	87	139	92	83	58	58	70
19	124	79	82	80	74	90	179	86	75	59	65	82
20	123	80	79	79	80	93	172	217	73	58	61	68
21	114	69	76	78	85	87	155	187	65	55	62	68
22	119	62	76	77	113	86	140	104	71	54	60	73
23	109	75	75	76	114	93	117	93	73	55	60	83
24	90	75	75	74	136	97	107	76	66	55	142	80
25	76	72	77	74	138	93	121	82	68	71	164	75
26	117	80	76	74	111	100	106	139	62	124	161	77
27	96	83	75	74	91	162	95	155	60	76	102	82
28	111	118	110	74	96	218	96	104	64	67	113	71
29	93	106	300	74	---	211	86	92	60	80	106	77
30	91	82	218	74	---	188	85	81	58	76	112	72
31	74	---	111	74	---	142	---	76	---	67	90	---
TOTAL	2658	2667	2987	2552	2361	3406	4207	3105	2105	1995	2387	2662
MEAN	85.7	88.9	96.4	82.3	84.3	110	140	100	70.2	64.4	77.0	88.7
MAX	124	183	300	92	156	218	227	217	86	124	164	191
MIN	65	62	74	74	72	76	85	74	58	54	57	64
CFSM	1.37	1.42	1.54	1.32	1.35	1.76	2.24	1.60	1.12	1.03	1.23	1.42
IN.	1.58	1.58	1.77	1.52	1.40	2.02	2.50	1.85	1.25	1.19	1.42	1.58

CAL YR 1984 TOTAL 31453 MEAN 85.9 MAX 340 MIN 46 CFSM 1.37 IN 18.69
WTR YR 1985 TOTAL 33092 MEAN 90.7 MAX 300 MIN 54 CFSM 1.45 IN 19.66

STREAMS TRIBUTARY TO LAKE HURON

171

04130500 BLACK RIVER NEAR TOWER, MI

LOCATION.--Lat 45°23'33", long 84°20'00", in SE1/4 NE1/4 sec.29, T.35 N., R.1 E., Cheboygan County, Hydrologic Unit 04070005, on right bank 400 ft downstream from Kleber Dam, 1,000 ft upstream from Milligan Creek, 3.0 mi northwest of Tower, and 10.8 mi upstream from Black Lake.

DRAINAGE AREA.--311 mi².

PERIOD OF RECORD.--October 1942 to current year. Monthly discharge only for October 1942, published in WSP 1307.

REVISED RECORDS.--WSP 1307: 1942. WDR MI-83: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 658.00 ft, Stanley Engineering Co. datum. Prior to Aug. 1, 1949, at site 1 mi upstream at different datum.

REMARKS.--No estimated daily discharges. Records good. Flow completely regulated by Kleber Dam 400 ft upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 273 ft³/s, 11.92 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,340 ft³/s, Apr. 17, 1960, gage height, 7.13 ft; minimum, 0.60 ft³/s, Mar. 11, 1950; minimum daily, 4.0 ft³/s, Nov. 27, 1949.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,270 ft³/s, Mar. 29, gage height, 5.24 ft; minimum, 12 ft³/s, May 28, gage height, 1.22 ft; minimum daily, 146 ft³/s, Aug. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	233	354	360	582	237	505	934	407	267	176	219	422
2	231	368	353	488	261	542	753	392	320	208	212	406
3	230	367	289	283	222	561	720	274	292	185	171	260
4	233	397	337	333	222	558	668	271	303	184	154	260
5	229	469	326	359	252	396	730	322	291	184	165	288
6	183	372	257	413	240	240	1020	364	280	190	167	376
7	184	225	217	412	228	329	939	421	249	230	167	417
8	224	210	186	404	244	441	1010	483	251	265	181	427
9	229	270	294	252	265	467	880	345	276	265	178	485
10	262	308	321	235	258	413	775	367	248	261	146	406
11	240	319	305	281	256	428	644	351	278	181	165	397
12	254	302	367	298	257	505	668	315	265	195	171	416
13	227	300	327	320	222	553	813	315	248	203	169	337
14	223	313	352	324	220	638	852	359	204	204	175	258
15	198	271	390	247	241	617	966	290	187	189	168	237
16	216	272	338	311	222	576	1060	307	229	184	163	235
17	196	274	404	276	221	535	1000	391	269	182	157	232
18	265	268	291	203	272	477	954	425	269	180	165	235
19	283	253	312	305	298	465	862	498	258	158	156	226
20	394	205	328	300	261	427	816	573	272	157	156	228
21	381	267	230	294	254	490	787	711	275	161	168	184
22	365	208	230	237	268	415	725	713	242	165	164	235
23	423	237	215	254	310	428	738	689	207	162	164	229
24	389	236	241	294	367	490	599	561	226	159	186	230
25	374	241	186	291	465	428	618	478	232	159	303	218
26	368	240	169	290	423	505	545	413	235	182	310	224
27	368	241	175	286	482	684	543	426	247	255	325	195
28	397	271	322	298	505	909	527	399	174	265	421	201
29	404	314	500	302	---	1080	501	528	185	304	508	208
30	470	299	501	235	---	1050	486	508	175	265	397	231
31	309	---	595	303	---	1010	---	473	---	257	348	---
TOTAL	8982	8671	9718	9710	7973	17162	23133	13369	7454	6315	6699	8703
MEAN	290	289	313	313	285	554	771	431	248	204	216	290
MAX	470	469	595	582	505	1080	1060	713	320	304	508	485
MIN	183	205	169	203	220	240	486	271	174	157	146	184
CFSM	.93	.93	1.01	1.01	.92	1.78	2.48	1.39	.80	.66	.70	.93
IN.	1.07	1.04	1.16	1.16	.95	2.05	2.77	1.60	.89	.76	.80	1.04
CAL YR 1984	TOTAL	116100	MEAN 317	MAX 985	MIN 142	CFSM 1.02	IN 13.89					
WTR YR 1985	TOTAL	127889	MEAN 350	MAX 1080	MIN 146	CFSM 1.13	IN 15.30					

STREAMS TRIBUTARY TO LAKE HURON

04132052 CHEBOYGAN RIVER AT CHEBOYGAN, MI
(National stream quality accounting network station)

LOCATION.--Lat 45°38'02", long 84°28'52", in NW1/4 NE1/4 sec.6, T.37 N., R.1 W., Cheboygan County, Hydrologic Unit 04070004, at upstream side of bridge on Lincoln Avenue in Cheboygan, 1.75 mi upstream from mouth.

DRAINAGE AREA.--1,500 mi², approximately.

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to September 1981.

WATER TEMPERATURE: October 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Oct. 7, 1976 to Sept. 30, 1981.

REMARKS.--Bimonthly cross-sectional samples were collected at Lincoln Ave. bridge. Water-discharge measurements were made at times of sampling. Flow regulated by dam 1,000 ft downstream.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-78, 1981): Maximum daily recorded (more than 20 percent missing record), 900 microsiemens, Apr. 24, 25, 1975; minimum daily recorded (more than 20 percent missing record), 140 microsiemens, Mar. 8, 1975.

WATER TEMPERATURE (water years 1976-78, 1981): Maximum, 27.0°C, July 20, 1977, July 8, 12, 13, 1981; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. / PER 100 ML)
OCT 29...	1130	2140	316	8.4	11.0	2.4	10.2	93	88	120
DEC 11...	1045	1450	326	8.3	3.5	15	12.5	96	K10	54
FEB 26...	1100	1740	341	8.0	1.5	1.0	13.1	96	K18	94
APR 09...	1130	3760	300	8.2	.0	1.4	13.9	96	K6	K8
JUL 09...	1300	1390	320	8.3	20.0	1.5	8.6	97	--	K19
SEP 17...	1330	1810	313	8.3	17.5	1.5	8.7	93	K26	K560

DATE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 29...	160	0	43	13	3.9	5	.1	.70	1.2	12
DEC 11...	170	13	46	13	3.9	5	.1	.80	1.5	12
FEB 26...	180	0	47	14	4.3	5	.1	.80	3.4	12
APR 09...	160	8	43	12	3.3	4	.1	.80	1.8	10
JUL 09...	150	34	42	12	3.7	5	.1	.70	1.2	11
SEP 17...	160	7	43	13	3.9	5	.1	.80	1.5	9.5

STREAMS TRIBUTARY TO LAKE HURON

173

04132052 CHEBOYGAN RIVER AT CHEBOYGAN, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 29...	1130	5.2	.10	7.6	193	180	.26	1120	<.10
DEC 11...	1045	5.6	.10	7.8	191	180	.26	748	<.10
FEB 26...	1100	6.3	.20	8.0	188	200	.26	883	--
APR 09...	1130	5.2	.20	7.2	188	170	.26	1910	<.10
JUL 09...	1300	5.0	.20	6.1	185	150	.25	694	<.10
SEP 17...	1330	5.2	.10	7.1	179	180	.24	875	<.10

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 29...	<.010	.50	.030	.030	.010	3	17	90
DEC 11...	.020	.30	.010	<.010	<.010	2	7.8	60
FEB 26...	--	.50	--	.020	--	1	4.7	83
APR 09...	.130	.30	.020	.020	<.010	2	20	30
JUL 09...	.080	.30	.060	.050	<.010	2	7.5	91
SEP 17...	<.010	.30	.040	.030	.010	7	34	63

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 29...	<10	<1	17	<.5	<1	<1	<3	5	11	2
FEB 26...	10	<1	19	<.5	<1	<1	<3	4	12	2
APR 09...	10	1	15	<.5	1	1	<3	7	22	2
SEP 17...	10	<1	17	<.5	1	4	<3	7	4	<1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 29...	6	1	<.1	<10	<1	<1	<1	97	<6	7
FEB 26...	<4	1	.1	<10	3	<1	<1	98	<6	7
APR 09...	6	2	<.1	<10	<1	<1	<1	81	<6	16
SEP 17...	5	<1	<.1	<10	<1	<1	1	91	<6	5

STREAMS TRIBUTARY TO LAKE HURON

04135000 THUNDER BAY RIVER NEAR ALPENA, MI
(National stream quality accounting network station)

LOCATION.--Lat 45°05'39", long 83°29'59", in SW1/4 SE1/4 sec.7, T.31 N., R.8 E., Alpena County, Hydrologic Unit 04070006, on left bank 1,000 ft downstream from Alpena Power Company Fourmile Dam, 2.5 mi upstream from Bagley Street in Alpena, and 6.0 mi upstream from mouth.

DRAINAGE AREA.--1,238 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional measurements made water years 1945-50. October 1979 to current year.

GAGE.--Two water-stage recorders. Elevation of gage on main (north) channel and secondary gage on (south) channel is 615 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 23 to Mar. 23, Mar. 28 to Apr. 2, Apr. 6-15, 19-24, and July 10 to Sept. 30. Water-discharge records good except for estimated daily discharges, which are poor. Flow regulated at all stages by hydroelectric plant 1,000 ft upstream.

AVERAGE DISCHARGE.--6 years, 872 ft³/s, 9.57 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 9,250 ft³/s, May 9, 1983; minimum daily, 33 ft³/s, Oct. 4, 1980, June 25, 1983.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 5,530 ft³/s, Mar. 30; minimum daily, 53 ft³/s, July 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	602	1200	1160	1240	899	1390	4240	1220	941	569	829	187
2	702	1210	498	1230	683	2140	3460	1220	783	723	457	372
3	718	1200	961	1230	667	2150	2910	1230	1070	748	176	981
4	715	1200	1180	1120	940	2140	2660	1030	1070	435	90	1230
5	734	1200	1180	1060	939	2150	2800	1080	969	762	497	1130
6	389	1200	1170	1150	912	1430	4350	1200	888	410	524	1320
7	473	1210	997	1260	506	1420	5120	1230	869	423	484	497
8	708	1320	514	1250	619	1410	5210	1240	410	694	493	1240
9	735	1320	523	1260	504	1420	4190	1240	362	733	532	1460
10	711	1150	1040	1260	774	1410	3130	1240	847	626	123	1470
11	735	494	1180	1110	1070	1410	2080	897	834	708	114	1470
12	747	1030	1200	649	863	1410	1950	822	852	655	468	1470
13	375	1260	1230	1080	878	1430	1860	1130	749	53	542	1450
14	472	1320	1230	1110	891	1450	1880	917	777	149	460	1400
15	797	1260	1030	1010	798	2560	2400	975	361	541	473	1300
16	757	1250	918	979	476	2560	3530	926	352	713	474	808
17	773	1310	1230	949	481	2570	3150	925	612	602	121	726
18	771	1270	1220	1050	895	2570	2830	525	698	468	150	801
19	789	1180	1220	689	890	1760	1910	723	686	479	367	1130
20	658	1230	1220	749	941	1770	1760	1210	710	183	466	914
21	1060	1230	1200	1010	922	1760	1710	1090	690	85	415	160
22	1110	805	907	809	958	1780	1680	1280	386	532	435	579
23	959	746	907	869	1220	2170	1640	1340	441	391	536	960
24	1120	622	796	949	784	2210	1620	1500	717	474	138	1270
25	1200	917	563	909	1110	2300	1590	1350	714	517	140	1130
26	1200	1100	758	909	1290	2220	1630	738	758	451	872	966
27	928	1140	776	769	1330	2990	1600	752	671	165	1220	718
28	1140	1180	894	1030	1310	4000	1550	947	561	158	1130	489
29	1150	1180	1040	1080	---	4980	1530	1220	66	481	1230	131
30	1190	1180	1240	942	---	5530	1340	1220	165	512	810	699
31	1190	---	1240	910	---	5480	---	1210	---	829	167	---
TOTAL	25608	33914	31222	31621	24550	71970	77310	33827	20009	15269	14933	28458
MEAN	826	1130	1007	1020	877	2322	2577	1091	667	493	482	949
MAX	1200	1320	1240	1260	1330	5530	5210	1540	1070	829	1230	1470
MIN	375	494	498	649	476	1390	1340	525	66	53	90	131
CFSM	.67	.91	.81	.82	.71	1.88	2.08	.88	.54	.40	.39	.77
IN.	.77	1.02	.94	.95	.74	2.16	2.32	1.02	.60	.46	.45	.86
CAL YR 1984	TOTAL	359830	MEAN	983	MAX	3840	MIN	87	CFSM	.79	IN	10.81
WTR YR 1985	TOTAL	408691	MEAN	1120	MAX	5530	MIN	53	CFSM	.91	IN	12.28

STREAMS TRIBUTARY TO LAKE HURON

175

04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--October 1979 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1979 to September 1985 (discontinued).

WATER TEMPERATURE: October 1979 to September 1985 (discontinued).

INSTRUMENTATION.--Water-quality monitor from Oct. 9, 1980 to Sept. 30, 1985 (discontinued).

REMARKS.--In addition to the water-quality monitor, samples were collected by a local observer approximately twice per week. Bimonthly cross-sectional samples were collected near the gage; the April sample was collected at Bagley Street bridge, 2.5 mi downstream from gage. Water-discharge measurements were made at times of sampling. From February 1979 to September 1979, samples were collected 6.9 mi downstream from gage (station number 04135020). Daily record for Apr. 10, 1985 was not published because it was a partial day.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1980-83): Maximum, 511 microsiemens, Jan. 2, 1982; minimum measured, 120 microsiemens, Dec. 19, 1981.

WATER TEMPERATURE (water years 1980-83): Maximum, 31.0°C, July 11, 12, 1981; minimum, 0.0°C on many days during winter.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum recorded (more than 20 percent missing record), 433 microsiemens, Nov. 15; minimum recorded (more than 20 percent missing record), 257 microsiemens, Apr. 10, but may have been lower during instrument malfunction Mar. 17 to Apr. 10.

WATER TEMPERATURE: Maximum recorded (more than 20 percent missing record), 30.0°C, July 20, 21; minimum recorded (more than 20 percent missing record), 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI KF AGAR (COLS. PER 100 ML)
OCT 30...	1130	1160	387	8.2	10.5	1.2	10.4	95	K26	K12
DEC 12...	1400	1210	395	8.1	1.0	1.5	13.7	97	K2	K6
FEB 27...	1345	1360	399	7.8	.5	1.5	10.1	71	K9	K28
APR 10...	1400	3160	261	7.9	4.0	1.4	13.2	103	K2	K2
JUL 10...	1330	1240	338	8.4	22.5	1.5	8.8	104	K6	K5
SEP 18...	1400	1210	362	8.1	16.5	2.0	--	--	<1	K8

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 30...	210	9	58	15	4.8	5	.2	1.2	2.4	9.1
DEC 12...	210	22	57	16	5.4	5	.2	1.0	2.9	12
FEB 27...	200	23	57	15	5.4	5	.2	.90	5.6	11
APR 10...	130	9	38	9.0	2.7	4	.1	1.1	3.0	9.8
JUL 10...	170	16	44	14	4.5	6	.2	.40	1.2	7.7
SEP 18...	190	9	51	14	5.3	6	.2	.90	2.7	13

STREAMS TRIBUTARY TO LAKE HURON

04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 30...	1130	7.2	.10	9.0	255	220	.35	799	<.10
DEC 12...	1400	7.0	.10	8.1	227	220	.31	742	<.10
FEB 27...	1345	6.8	.20	9.8	231	220	.31	848	--
APR 10...	1400	4.4	.10	4.6	159	140	.22	1360	<.10
JUL 10...	1330	4.3	.20	7.1	199	170	.27	666	.12
SEP 18...	1400	6.0	.10	11	226	210	.31	738	<.10

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 30...	<.010	.50	.030	.010	<.010	4	13	85
DEC 12...	<.010	.30	<.010	<.010	--	2	6.5	34
FEB 27...	--	.90	.010	--	--	3	11	31
APR 10...	.130	.60	.020	<.010	<.010	6	51	46
JUL 10...	.080	.40	<.010	<.010	<.010	2	6.7	67
SEP 18...	.020	.50	.060	.050	.020	14	46	82

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 30...	10	<1	24	<.5	<1	<1	<3	2	57	2
FEB 27...	20	<1	24	<.5	<1	<1	<3	3	45	1
APR 10...	20	<1	14	<.5	<1	<1	<3	6	48	2
SEP 18...	<10	<1	24	.7	<1	4	<3	4	70	<1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 30...	<4	7	<.1	<10	<1	<1	<1	130	<6	12
FEB 27...	<4	16	<.1	<10	2	<1	<1	110	<6	5
APR 10...	5	4	<.1	<10	<1	<1	<1	76	<6	10
SEP 18...	<4	5	<.1	<10	<1	<1	<1	100	<6	11

STREAMS TRIBUTARY TO LAKE HURON

177

04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEQ. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	376	358	362	400	368	389	385	382	383	389	372	383
2	371	350	361	407	382	396	387	383	385	382	375	378
3	383	355	360	405	363	391	385	381	383	379	377	378
4	363	337	356	401	375	388	382	380	381	384	381	382
5	375	316	349	401	358	388	382	381	381	389	387	388
6	370	335	355	404	358	388	381	380	381	394	387	392
7	387	337	361	414	374	395	385	380	382	392	387	389
8	393	326	361	416	376	396	390	385	388	391	386	389
9	380	329	350	408	367	389	392	389	391	389	384	387
10	395	318	351	424	368	395	391	389	390	386	383	385
11	409	350	383	422	386	401	389	388	388	---	---	---
12	425	356	392	423	380	396	396	386	391	---	---	---
13	430	324	348	431	386	407	409	368	392	---	---	---
14	345	341	344	424	390	408	384	366	374	---	---	---
15	358	353	356	433	377	407	390	388	389	---	---	---
16	358	356	357	429	391	408	391	388	390	---	---	---
17	361	367	359	431	329	372	392	386	389	---	---	---
18	363	372	363	383	347	364	391	389	391	---	---	---
19	366	355	364	397	362	372	394	392	393	---	---	---
20	368	384	367	392	370	379	394	390	392	---	---	---
21	370	380	369	381	379	380	396	392	394	---	---	---
22	370	375	370	384	379	382	396	393	395	---	---	---
23	375	367	373	385	381	384	398	395	396	---	---	---
24	380	363	378	384	381	383	401	399	400	---	---	---
25	384	363	382	381	378	380	404	400	402	---	---	---
26	387	385	386	382	378	380	406	404	405	---	---	---
27	390	388	389	385	383	384	410	398	403	---	---	---
28	391	388	390	384	382	383	409	400	404	---	---	---
29	391	388	390	384	382	383	407	405	407	---	---	---
30	396	371	390	385	383	384	409	402	405	---	---	---
31	407	369	390	---	---	---	405	387	395	---	---	---
MONTH	430	316	368	433	329	388	410	366	392	394	372	385

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	---	---	---	367	360	363	---	---	---	330	321	326
2	---	---	---	385	381	383	---	---	---	335	329	331
3	---	---	---	388	386	387	---	---	---	337	332	334
4	---	---	---	389	386	388	---	---	---	337	335	335
5	---	---	---	391	388	390	---	---	---	340	337	338
6	---	---	---	393	390	392	---	---	---	343	338	341
7	416	407	414	398	394	396	---	---	---	345	342	343
8	421	408	415	401	398	399	---	---	---	347	341	345
9	423	421	422	404	401	403	---	---	---	349	346	348
10	429	415	424	411	399	406	---	---	---	351	348	350
11	418	405	413	407	404	406	274	264	270	350	346	348
12	409	406	408	401	395	398	278	273	275	348	346	347
13	411	409	410	392	382	388	282	277	279	351	347	349
14	413	411	412	378	365	372	288	284	286	351	348	349
15	417	415	415	362	352	356	287	279	283	349	347	348
16	419	418	419	353	349	350	285	278	281	350	347	348
17	420	419	420	---	---	---	284	279	282	352	349	351
18	419	417	418	---	---	---	286	282	284	353	351	352
19	420	418	419	---	---	---	290	285	287	353	350	352
20	421	418	419	---	---	---	292	289	291	352	349	351
21	421	419	420	---	---	---	297	294	296	352	349	350
22	422	419	420	---	---	---	305	296	300	350	347	348
23	423	421	422	---	---	---	309	304	307	352	347	349
24	424	422	423	---	---	---	310	307	309	353	350	351
25	424	422	423	---	---	---	317	312	314	353	346	350
26	422	415	420	---	---	---	322	317	319	349	347	348
27	417	379	406	---	---	---	326	323	324	348	344	347
28	392	347	359	---	---	---	332	327	329	348	345	347
29	---	---	---	---	---	---	336	329	333	347	345	346
30	---	---	---	---	---	---	336	319	329	349	339	345
31	---	---	---	---	---	---	---	---	---	340	334	336
MONTH	429	347	415	411	349	386	336	264	299	353	321	345

STREAMS TRIBUTARY TO LAKE HURON
04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985												
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	343	336	340	368	348	358	341	315	323	386	337	354
2	346	342	344	371	331	348	356	319	334	400	335	367
3	344	340	342	341	338	340	349	318	329	405	367	384
4	344	340	341	348	337	340	328	296	313	410	364	383
5	346	343	344	339	334	337	323	308	316	399	357	375
6	347	345	346	370	333	348	323	290	306	394	353	369
7	348	344	346	349	347	348	317	286	300	396	337	365
8	348	345	346	348	345	346	329	285	298	394	330	367
9	357	344	348	346	345	345	310	293	300	399	346	365
10	349	345	347	355	340	344	344	292	306	391	347	369
11	350	345	348	338	336	337	383	311	332	---	---	---
12	348	343	346	348	332	336	327	313	319	---	---	---
13	345	342	343	347	335	339	346	312	322	---	---	---
14	344	341	342	343	328	332	333	316	324	---	---	---
15	345	342	343	353	321	335	342	317	324	---	---	---
16	345	343	343	351	321	343	330	315	323	---	---	---
17	354	341	344	356	317	338	330	316	322	---	---	---
18	354	342	344	379	338	356	335	285	317	---	---	---
19	346	343	344	380	344	361	330	316	323	---	---	---
20	346	344	345	374	340	353	335	313	323	---	---	---
21	345	339	342	361	334	348	344	316	327	---	---	---
22	346	338	341	354	317	340	376	314	333	---	---	---
23	340	338	339	347	315	327	342	296	324	---	---	---
24	351	341	343	340	310	324	343	302	320	---	---	---
25	347	344	345	330	296	316	330	297	317	---	---	---
26	345	343	344	336	291	315	339	318	326	---	---	---
27	351	346	347	332	301	315	344	318	326	---	---	---
28	352	342	347	347	300	319	343	312	327	---	---	---
29	352	344	348	351	263	321	352	319	332	---	---	---
30	368	340	350	350	312	325	367	322	342	---	---	---
31	---	---	---	342	310	320	359	297	331	---	---	---
MONTH	368	336	344	380	263	337	383	285	321	410	330	370

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985												
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	13.5	10.5	13.0	9.0	8.5	9.0	4.5	4.0	4.0	1.0	1.0	1.0
2	13.5	12.5	13.0	8.5	7.0	7.5	4.0	3.5	4.0	1.0	1.0	1.0
3	13.0	12.5	12.5	6.5	5.5	6.0	3.5	3.0	3.5	1.0	1.0	1.0
4	12.5	12.0	12.0	5.5	5.0	5.5	3.0	2.0	2.5	1.0	1.0	1.0
5	12.0	11.0	11.5	5.5	5.0	5.5	2.0	1.5	1.5	1.0	1.0	1.0
6	16.5	11.0	12.0	5.0	4.5	5.0	1.5	1.0	1.0	1.0	1.0	1.0
7	11.5	11.0	11.0	5.0	4.5	4.5	1.0	1.0	1.0	1.0	1.0	1.0
8	11.5	11.5	11.5	5.0	4.5	4.5	1.0	1.0	1.0	1.0	1.0	1.0
9	12.0	11.5	12.0	5.0	5.0	5.0	1.5	1.0	1.0	1.0	1.0	1.0
10	12.5	12.0	12.0	5.5	5.0	5.0	1.5	1.5	1.5	1.0	1.0	1.0
11	13.5	12.5	13.0	5.0	4.0	4.5	1.5	1.0	1.5	---	---	---
12	13.5	13.0	13.5	4.0	3.5	4.0	1.5	1.0	1.0	---	---	---
13	13.5	12.5	13.5	3.5	3.0	3.0	1.0	1.0	1.0	---	---	---
14	14.0	13.5	14.0	3.0	2.5	2.5	1.0	1.0	1.0	---	---	---
15	14.0	14.0	14.0	3.0	2.5	3.0	1.0	1.0	1.0	---	---	---
16	14.5	14.0	14.0	3.0	2.5	2.5	1.5	1.0	1.5	---	---	---
17	14.5	14.0	14.5	2.5	2.0	2.0	1.5	1.5	1.5	---	---	---
18	14.5	14.0	14.0	2.0	2.0	2.0	1.5	1.0	1.5	---	---	---
19	14.5	13.5	14.0	2.0	1.5	1.5	1.5	1.0	1.5	---	---	---
20	13.5	13.0	13.5	1.5	1.0	1.0	1.5	1.0	1.0	---	---	---
21	13.0	12.0	12.5	1.0	1.0	1.0	1.5	1.0	1.0	---	---	---
22	12.0	11.5	12.0	1.0	1.0	1.0	1.0	1.0	1.0	---	---	---
23	11.5	10.5	11.0	1.0	1.0	1.0	1.0	1.0	1.0	---	---	---
24	10.5	10.0	10.5	1.5	1.0	1.5	1.0	1.0	1.0	---	---	---
25	10.0	9.0	9.5	2.0	1.5	1.5	1.0	1.0	1.0	---	---	---
26	9.0	9.0	9.0	2.5	2.0	2.0	1.0	1.0	1.0	---	---	---
27	9.5	9.0	9.0	3.0	2.5	2.5	1.0	1.0	1.0	---	---	---
28	10.0	9.5	10.0	3.5	3.0	3.5	1.0	1.0	1.0	---	---	---
29	10.5	10.0	10.0	4.0	3.5	4.0	1.0	1.0	1.0	---	---	---
30	10.5	10.0	10.0	4.5	4.0	4.5	1.0	1.0	1.0	---	---	---
31	10.0	9.0	9.5	---	---	---	1.0	1.0	1.0	---	---	---
MONTH	16.5	9.0	12.0	9.0	1.0	3.5	4.5	1.0	1.5	1.0	1.0	1.0

STREAMS TRIBUTARY TO LAKE HURON

179

04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	---	---	---	.0	.0	.0	---	---	---	16.0	15.0	15.5
2	---	---	---	.0	.0	.0	---	---	---	16.0	15.0	15.5
3	---	---	---	.0	.0	.0	---	---	---	16.5	15.5	16.0
4	---	---	---	.0	.0	.0	---	---	---	16.0	15.5	15.5
5	---	---	---	.0	.0	.0	---	---	---	16.0	15.0	15.5
6	---	---	---	.0	.0	.0	---	---	---	15.5	14.5	15.0
7	.5	.5	.5	.0	.0	.0	---	---	---	14.5	14.0	14.0
8	.5	.5	.5	.0	.0	.0	---	---	---	14.5	13.5	14.0
9	.5	.5	.5	.0	.0	.0	---	---	---	15.0	13.5	14.5
10	.5	.5	.5	.0	.0	.0	---	---	---	16.0	14.5	15.0
11	.5	.5	.5	.0	.0	.0	4.0	3.0	3.5	17.5	16.0	16.5
12	.5	.5	.5	.0	.0	.0	5.0	4.0	4.5	18.5	17.5	18.0
13	.5	.5	.5	.0	.0	.0	5.5	5.0	5.5	20.0	18.5	19.0
14	.5	.5	.5	.0	.0	.0	6.5	5.5	6.0	20.0	19.0	19.5
15	.5	.5	.5	.0	.0	.0	8.5	6.5	7.0	19.5	19.0	19.5
16	.5	.5	.5	.0	.0	.0	9.5	8.5	9.0	19.5	19.0	19.0
17	.5	.5	.5	---	---	---	9.0	8.0	8.5	19.0	18.5	19.0
18	.5	.5	.5	---	---	---	9.0	7.5	8.0	18.5	17.5	18.0
19	.5	.0	.5	---	---	---	9.5	9.0	9.0	18.0	17.5	17.5
20	.5	.0	.5	---	---	---	11.0	9.5	10.0	17.5	17.0	17.0
21	.5	.0	.0	---	---	---	14.0	11.0	12.5	17.5	16.5	17.0
22	.5	.0	.0	---	---	---	16.5	14.0	15.0	17.5	16.5	17.0
23	.0	.0	.0	---	---	---	18.0	16.5	17.5	18.0	17.0	17.5
24	.0	.0	.0	---	---	---	18.0	18.0	18.0	19.5	18.0	18.5
25	.0	.0	.0	---	---	---	18.5	18.0	18.0	19.0	18.5	19.0
26	.0	.0	.0	---	---	---	18.0	17.0	17.5	18.5	18.0	18.0
27	.0	.0	.0	---	---	---	17.0	15.5	16.0	18.5	17.5	18.0
28	.0	.0	.0	---	---	---	16.0	15.0	15.5	18.0	17.0	17.5
29	---	---	---	---	---	---	15.0	14.5	15.0	17.5	17.0	17.0
30	---	---	---	---	---	---	16.0	14.5	15.5	18.5	17.0	18.0
31	---	---	---	---	---	---	---	---	---	19.0	18.0	18.5
MONTH	.5	.0	.5	.0	.0	.0	18.5	3.0	11.5	20.0	13.5	17.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	19.0	17.5	18.5	23.5	18.5	21.5	24.5	21.5	23.5	21.0	18.5	19.5
2	19.0	18.0	18.5	23.5	23.0	23.0	25.0	19.5	22.0	24.0	19.5	20.5
3	19.0	18.0	18.5	24.0	23.0	23.5	27.5	19.5	22.5	20.5	19.5	20.0
4	19.0	18.0	18.5	25.5	23.5	24.0	29.0	19.5	23.5	21.5	20.0	21.0
5	19.0	18.5	18.5	24.0	23.5	24.0	24.0	21.5	23.0	21.5	21.0	21.0
6	19.5	18.0	18.5	24.0	21.5	23.0	26.5	22.0	23.5	21.5	21.0	21.5
7	19.0	18.5	18.5	23.0	22.5	23.0	26.0	21.0	23.5	23.5	21.5	22.0
8	19.5	18.5	19.0	23.0	22.5	22.5	26.5	21.0	23.5	22.5	21.5	22.0
9	23.5	19.0	20.5	23.5	22.5	23.0	26.0	21.5	24.0	22.5	21.5	22.0
10	20.0	19.5	20.0	23.5	20.0	22.5	27.5	22.0	24.5	22.0	21.0	21.5
11	20.0	19.0	19.5	23.5	23.0	23.5	28.5	20.5	24.5	---	---	---
12	19.0	18.0	18.5	23.5	20.5	23.0	24.5	19.5	22.5	---	---	---
13	18.0	17.0	17.5	28.5	19.5	23.5	25.0	21.5	23.0	---	---	---
14	17.0	16.5	17.0	29.5	22.5	25.5	24.5	21.0	23.0	---	---	---
15	17.5	16.5	17.0	25.5	22.0	24.5	24.5	20.5	23.0	---	---	---
16	17.5	17.0	17.0	25.5	24.5	25.0	24.0	19.5	22.0	---	---	---
17	18.0	16.0	17.0	25.5	22.0	24.5	28.0	19.5	23.5	---	---	---
18	18.0	16.0	17.5	24.5	21.5	23.5	28.0	21.5	24.0	---	---	---
19	18.5	17.0	18.0	27.0	22.0	24.0	23.5	19.0	22.0	---	---	---
20	19.0	17.5	18.0	30.0	21.5	25.0	23.0	19.5	21.5	---	---	---
21	19.0	18.0	18.5	30.0	21.5	25.0	22.0	18.5	21.0	---	---	---
22	22.0	19.0	19.5	25.5	20.5	23.5	22.0	17.5	20.5	---	---	---
23	20.5	19.5	20.0	24.5	19.0	22.5	21.5	18.0	20.5	---	---	---
24	20.5	19.5	20.0	24.0	19.5	22.0	22.5	19.0	20.5	---	---	---
25	21.0	19.5	20.0	23.5	21.0	22.5	20.5	19.5	20.0	---	---	---
26	21.0	20.0	20.5	24.0	20.0	22.0	20.0	19.5	20.0	---	---	---
27	21.5	20.0	21.0	28.0	19.5	22.5	20.5	19.5	20.0	---	---	---
28	23.5	19.5	21.5	28.0	21.0	23.0	21.0	20.0	20.5	---	---	---
29	26.5	18.5	22.0	24.5	21.0	23.0	21.0	20.5	20.5	---	---	---
30	26.5	18.5	21.5	24.0	19.5	22.0	20.5	18.5	20.5	---	---	---
31	---	---	---	24.0	20.5	22.5	24.0	17.0	20.0	---	---	---
MONTH	26.5	16.0	19.0	30.0	18.5	23.5	29.0	17.0	22.0	24.0	18.5	21.0

STREAMS TRIBUTARY TO LAKE HURON

04135500 AU SABLE RIVER AT GRAYLING, MI

LOCATION.--Lat 44°39'35", long 84°42'45", in SE1/4 SE1/4 sec 7, T.26 N., R.3 W., Crawford County, Hydrologic Unit 04070007, on right bank 65 ft upstream from bridge on Interstate Highway 75 (Business Loop) in Grayling, 0.7 mi upstream from East Branch, and 114 mi upstream from mouth.

DRAINAGE AREA.--110 mi².

PERIOD OF RECORD.--October 1942 to current year. Monthly discharge only for some periods, published in WSP 1307. Prior to October 1954, published as Middle Branch Au Sable River at Grayling.

GAGE.--Water-stage recorder and steel-crested dam. Datum of gage is 1,123.49 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 29 to Jan. 20, Jan. 22 to Feb. 1, Feb. 3-18. Records excellent except for estimated daily discharges, which are fair. Prior to Dec. 31, 1952, diurnal fluctuation caused by powerplant 2.5 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 74.7 ft³/s, 9.22 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 274 ft³/s, June 2, 1943, gage height, 3.00 ft; minimum, 28 ft³/s, Apr. 21, 1946, gage height, 0.80 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 211 ft³/s, Sept. 9, gage height, 2.47 ft; minimum, 56 ft³/s, July 23, 24, gage height, 1.20 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	70	84	83	108	70	97	142	106	89	70	69	107
2	69	101	80	105	70	92	131	103	87	71	65	94
3	69	109	79	100	70	88	129	99	84	69	63	84
4	69	98	76	98	70	82	133	96	80	67	61	90
5	68	90	74	96	70	71	147	96	79	67	68	101
6	69	86	74	94	70	83	165	99	80	71	73	128
7	68	83	70	92	70	91	165	103	80	75	69	158
8	70	80	71	90	70	88	153	104	81	75	66	201
9	72	80	73	88	70	87	139	100	81	71	64	209
10	73	89	72	86	71	86	128	100	80	69	62	198
11	71	92	72	85	71	92	125	100	79	66	62	164
12	69	89	77	84	71	109	127	97	78	64	61	135
13	67	83	83	83	71	115	130	92	79	62	60	116
14	67	79	85	82	72	109	147	91	79	61	60	102
15	66	78	82	80	72	101	168	93	78	60	59	94
16	66	77	83	80	73	96	173	93	81	60	57	91
17	67	77	85	79	74	93	167	90	81	60	57	92
18	68	77	88	78	75	90	153	89	80	60	66	95
19	74	77	85	76	75	91	145	88	80	62	76	100
20	77	75	82	75	77	93	146	89	78	64	76	105
21	84	73	75	73	81	93	145	93	76	60	72	101
22	86	72	79	73	93	91	138	93	75	58	72	97
23	86	73	81	72	100	90	129	89	74	56	68	99
24	81	73	73	72	112	96	123	86	76	56	75	98
25	77	73	70	72	122	97	124	86	75	70	91	95
26	76	72	73	71	114	97	125	97	74	85	98	93
27	80	73	81	71	103	110	118	114	71	84	94	92
28	83	82	94	70	98	139	113	114	69	79	87	92
29	83	87	122	70	---	164	112	101	69	75	84	92
30	80	86	120	70	---	166	110	94	70	74	96	90
31	76	---	112	70	---	154	---	94	---	73	115	---
TOTAL	2281	2468	2554	2543	2255	3151	4150	2989	2343	2094	2246	3413
MEAN	73.6	82.3	82.4	82.0	80.5	102	138	96.4	78.1	67.5	72.5	114
MAX	86	109	122	108	122	166	173	114	89	85	115	209
MIN	66	72	70	70	70	71	110	86	69	56	57	84
CFSM	.67	.75	.75	.75	.73	.93	1.26	.88	.71	.61	.66	1.04
IN.	.77	.83	.86	.86	.76	1.07	1.40	1.01	.79	.71	.76	1.15

CAL YR 1984 TOTAL 29649 MEAN 81.0 MAX 167 MIN 59 CFSM .74 IN 10.03
WTR YR 1985 TOTAL 32487 MEAN 89.0 MAX 209 MIN 56 CFSM .81 IN 10.99

181

LOCATION.--Lat 44°36'53", long 84°27'20", in SE1/4 SE1/4 sec.29, T.26 N., R.1 W., Crawford County, Hydrologic Unit 04070007, on right bank 10 ft upstream from Smith Bridge, 400 ft downstream from bridge on State Highway 72, 4.6 mi upstream from mouth, and 9.1 mi west of Luzerne.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1951-66. October 1966 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 1,070 ft above National Geodetic Vertical Datum of 1929, from topographic map. Apr. 19, 1951 to Nov. 14, 1966, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--19 years, 224 ft³/s, 7.59 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,120 ft³/s, Mar. 28, 1976, gage height, 7.30 ft; minimum, 78 ft³/s, Feb. 12, 1981, gage height, 3.98 ft, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 746 ft³/s, Apr. 8, gage height, 6.34 ft; minimum, 119 ft³/s, Aug. 16, 17; gage height, 4.29 ft.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	154	276	252	358	201	298	671	374	237	159	133	156
2	150	290	251	319	200	289	626	357	207	159	131	147
3	148	280	248	294	200	283	605	345	194	159	128	141
4	145	282	236	287	200	281	601	336	185	158	125	150
5	144	279	213	279	200	259	644	333	181	156	143	199
6	144	265	202	267	198	246	720	333	176	158	168	321
7	145	252	198	267	198	239	733	335	173	164	165	303
8	157	245	204	256	197	244	742	333	177	159	147	415
9	170	242	206	253	192	261	706	328	190	154	138	446
10	166	270	203	250	190	273	665	324	186	152	132	398
11	159	274	205	252	186	296	634	314	178	151	131	364
12	159	264	227	242	186	349	618	306	172	150	127	326
13	165	260	252	239	180	357	614	297	170	146	128	286
14	166	251	252	237	180	383	632	286	168	148	125	261
15	169	246	247	230	177	376	649	282	167	156	124	252
16	173	240	265	235	178	391	659	284	196	157	121	251
17	177	231	290	235	178	369	645	278	209	152	121	249
18	177	229	288	232	182	358	622	272	221	145	148	257
19	187	227	269	223	179	358	602	268	222	144	149	265
20	188	212	257	223	177	358	601	259	210	140	138	260
21	204	206	228	222	180	356	591	234	190	139	130	259
22	215	197	234	220	202	376	572	215	180	135	126	259
23	212	209	210	218	222	386	542	206	188	133	124	255
24	209	210	202	215	254	390	515	201	203	128	142	249
25	201	209	198	214	263	387	501	204	197	144	189	246
26	206	208	218	215	275	396	477	279	181	170	199	248
27	222	211	223	211	273	441	459	334	172	167	196	249
28	237	240	233	208	274	513	438	318	167	150	179	245
29	259	244	382	208	---	619	413	315	164	140	175	244
30	260	247	386	208	---	675	393	300	162	135	181	246
31	255	---	366	206	---	698	---	274	---	137	170	---
TOTAL	5743	7296	7645	7523	5722	11485	17890	9124	5623	4645	4533	7947
MEAN	185	243	247	243	204	370	596	294	187	150	146	265
MAX	260	290	386	358	275	698	742	374	237	170	199	446
MIN	144	197	198	206	177	239	393	201	162	128	121	141
CFSM	.46	.61	.62	.61	.51	.92	1.49	.73	.47	.37	.36	.66
IN.	.53	.68	.71	.70	.53	1.07	1.66	.85	.52	.43	.42	.74
CAL YR 1984	TOTAL	80828	MEAN									

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI

LOCATION.--Lat 44°39'36", long 84°07'52", in SE1/4, NE1/4, sec.12, T.26 N., R.2 E., Oscoda County, Hydrologic Unit 04070007, on right bank 150 ft upstream from bridge on State Highway 33 in Mio, 500 ft downstream from Mio hydroelectric plant, 9.5 mi downstream from Big Creek, and 73.0 mi upstream from mouth.

DRAINAGE AREA.--1,100 mi², approximately.

PERIOD OF RECORD.--July 1952 to current year.

GAGE.--Water-stage recorder. Datum of gage is 929.60 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 13-16. Records excellent except for estimated daily discharges, which are fair. Flow regulated by Mio Dam 500 ft upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--33 years, 990 ft³/s, 12.22 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,170 ft³/s, Mar. 28, 1976, gage height, 6.14 ft; minimum, 7.0 ft³/s, Aug. 4, 1977, gage height, -0.09 ft; minimum daily, 21 ft³/s, Aug. 9, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,000 ft³/s, Dec. 30, gage height, 5.29 ft; minimum, 191 ft³/s, Sept. 19, gage height, 1.28 ft; minimum daily, 712 ft³/s, Jan. 21.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	835	1090	1030	1250	910	1230	2090	1360	1120	843	833	1000
2	803	1240	994	1030	730	1220	1920	1230	1060	851	874	1070
3	802	1180	1030	1080	745	1170	1850	1230	988	895	852	991
4	798	1120	1030	946	904	1160	1830	1240	972	890	794	968
5	769	1060	897	1200	976	949	2070	1210	978	846	806	1210
6	758	1040	877	1320	975	1030	2450	1260	947	851	974	1650
7	815	1020	855	1210	995	1240	2220	1250	944	871	921	1890
8	835	957	924	1050	806	1230	2260	1270	956	870	812	2310
9	856	997	959	728	915	1100	2090	1280	1080	869	828	2560
10	867	1130	876	908	930	1110	2040	1250	1010	859	835	2180
11	855	1160	884	1020	930	1200	1980	1230	931	830	815	1780
12	842	1070	974	1060	930	1490	1790	1150	944	828	778	1580
13	816	1050	1050	1060	930	1620	1900	1170	944	828	785	1360
14	810	1010	1100	1030	930	1550	1960	1170	931	798	789	1260
15	816	980	1050	1010	906	1390	2140	1100	910	807	785	1150
16	856	1000	978	780	893	1440	2250	1400	1020	822	772	1160
17	928	978	1080	963	919	1390	2270	1290	1070	822	756	1190
18	864	962	1170	1100	939	1290	2040	1190	1030	791	851	1180
19	857	940	1060	1010	912	1230	1890	1180	1030	778	893	1270
20	947	926	995	777	939	1240	1880	1150	1050	787	857	1300
21	980	901	934	712	976	1300	1840	1220	973	787	838	1220
22	1060	884	941	1030	1130	1300	1760	1160	937	787	799	1170
23	1020	884	958	1060	1140	1300	1690	1070	954	754	793	1170
24	942	902	860	991	1320	1480	1580	1010	963	742	936	1170
25	925	917	775	1050	1340	1390	1620	1000	925	787	1130	1100
26	926	908	739	979	1290	1300	1650	1160	905	999	1180	1100
27	1000	909	953	968	1290	1560	1420	1850	905	973	1040	1130
28	1070	1030	1290	1000	1180	2050	1390	1400	883	877	993	1130
29	1070	1120	1920	999	---	2350	1430	1310	872	859	1030	1100
30	1000	1070	1940	980	---	2420	1400	1260	873	821	1830	1090
31	967	---	1550	980	---	2240	---	1200	---	811	1230	---
TOTAL	27689	30435	32673	31281	27780	43969	56700	38250	29105	25933	28409	40439
MEAN	893	1015	1054	1009	992	1418	1890	1234	970	837	916	1348
MAX	1070	1240	1940	1320	1340	2420	2450	1850	1120	999	1830	2560
MIN	758	884	739	712	730	949	1390	1000	872	742	756	968
CFSM	.81	.92	.96	.92	.90	1.29	1.72	1.12	.88	.76	.83	1.23
IN.	.94	1.03	1.10	1.06	.94	1.49	1.92	1.29	.98	.88	.96	1.37
CAL YR 1984	TOTAL	370804	MEAN	1013	MAX	1940	MIN	713	CFSM	.92	IN	12.54
WTR YR 1985	TOTAL	412663	MEAN	1131	MAX	2560	MIN	712	CFSM	1.03	IN	13.96

STREAMS TRIBUTARY TO LAKE HURON

183

04137500 AU SABLE RIVER NEAR AU SABLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 44°26'09", long 83°26'28", in NE1/4 NW1/4 sec.35, T.24 N., R.8 E., Iosco County, Hydrologic Unit 04070007, at bridge on Rea Road, 5.5 mi northwest of Au Sable and 10.4 mi upstream from mouth.

DRAINAGE AREA.--1,540 mi², approximately.

PERIOD OF RECORD.--Water years 1978 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April 1978 to September 1981.

WATER TEMPERATURE: April 1978 to September 1981.

REMARKS.--Bimonthly cross-sectional samples were collected at or near bridge. Water-discharge measurements were made at times of sampling. Flow regulated by hydroelectric powerplant upstream.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1978-79): Maximum daily, 346 microsiemens, Nov. 21, 1978; minimum daily, 229 microsiemens, Apr. 19, 21, 1979.

WATER TEMPERATURE (water years 1979-80): Maximum measured, 28.0°C, Aug. 8, 1979; minimum daily, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT 31...	1100	2240	306	8.2	11.0	1.0	9.9	89	<1	K5
DEC 13...	1100	2280	299	8.3	2.0	.50	13.4	98	<1	<1
FEB 28...	1100	2510	319	8.0	1.0	1.0	11.8	85	K28	<1
APR 11...	1030	2950	246	8.3	4.5	1.5	12.0	93	<1	<1
JUL 11...	1100	2360	308	8.4	22.5	1.0	8.0	94	K3	23
SEP 19...	1000	2480	300	8.2	19.0	1.0	--	--	<1	K18

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 31...	150	0	43	11	4.6	6	.2	.60	1.9	9.2
DEC 13...	150	9	45	10	4.3	6	.2	.70	1.4	10
FEB 28...	160	4	46	11	4.5	6	.2	.60	3.0	11
APR 11...	120	4	36	8.5	3.4	6	.1	.60	1.2	9.4
JUL 11...	150	20	43	11	4.3	6	.2	.40	1.0	8.6
SEP 19...	150	0	42	10	4.2	6	.2	.50	1.9	8.5

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 31...	1100	5.3	<.10	8.3	182	180	.25	1100	<.10
DEC 13...	1100	6.0	<.10	8.3	168	170	.23	1030	<.10
FEB 28...	1100	5.6	<.10	9.3	176	180	.24	1190	--
APR 11...	1030	4.5	<.10	6.7	146	140	.20	1160	<.10
JUL 11...	1100	5.0	.10	7.7	181	160	.25	1150	<.10
SEP 19...	1000	5.9	<.10	8.4	170	170	.23	1140	<.10

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 31...	<.010	.20	.020	.020	<.010	4	24	40
DEC 13...	<.010	<.10	<.010	<.010	<.010	5	31	60
FEB 28...	--	.40	<.010	<.010	--	4	27	65
APR 11...	.130	.70	.030	.030	<.010	8	64	60
JUL 11...	.100	.30	<.010	<.010	.010	4	25	90
SEP 19...	<.010	.40	.040	.030	<.010	9	60	71

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 31...	<10	1	22	<.5	<1	<1	<3	3	<3	2
FEB 28...	<10	1	22	<.5	<1	<1	<3	4	24	2
APR 11...	20	<1	17	<.5	1	<1	<3	7	33	3
SEP 19...	<10	1	24	.5	1	<1	<3	6	7	<1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 31...	6	2	<.1	<10	<1	<1	<1	74	<6	5
FEB 28...	7	10	.1	<10	4	<1	<1	71	<6	10
APR 11...	8	9	<.1	<10	3	<1	<1	54	<6	6
SEP 19...	<4	1	<.1	<10	2	<1	<1	68	<6	9

185

LOCATION.--Lat 44°04'21", long 84°01'12", in NE1/4 SW1/4 sec.5, T.19 N., R.4 E., Arenac County, Hydrologic Unit 04080101, on left bank 30 ft downstream from bridge on Old M-70, 2.8 mi north of Sterling, and 20 mi upstream from mouth.

WATER-DISCHARGE RECORDS

REVISED RECORDS.--WSP 1437: 1937(M), 1939-40(M).

GAGE.--Water-stage recorder. Datum of gage is 649.48 ft above National Geodetic Vertical Datum of 1929. November 1905 to December 1908, nonrecording gage at site 400 ft downstream at different datum. Jan. 13, 1917, to Jan. 10, 1939, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 21, 22, Dec. 5-9, 22-28 and Jan. 1 to Mar. 11. Water discharge records good except for estimated daily discharges, which are poor. Occasional regulation by dams upstream from station.

AVERAGE DISCHARGE.--49 years, 311 ft³/s, 13.20 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,340 ft³/s Mar. 28, 1950, gage height, 13.74 ft, from rating curve extended above 3,800 ft³/s; minimum, 75 ft³/s Nov. 22, 1964, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,600 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 29	2300	1,630	6.32	Apr. 6	2000	*2,580	*8.62
Mar. 13	0400	1,950	7.13	Sept. 6	0400	1,740	6.60
Mar. 29	0400	2,210	7.78	Sept. 8	2300	1,770	6.68

Minimum discharge, 123 ft³/s, July 25, gage height, 1.30 ft.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	169	300	291	510	255	340	1200	331	352	165	149	227
2	172	515	278	400	255	350	984	324	299	166	144	205
3	165	403	328	390	255	370	981	307	259	169	138	192
4	158	325	375	390	255	390	1190	297	231	164	137	287
5	156	298	270	410	255	430	1930	311	222	161	147	852
6	156	278	250	420	255	440	2490	326	223	161	280	1550
7	180	262	240	430	255	450	2260	346	213	160	383	887
8	244	249	240	430	255	460	1590	336	219	158	228	1200
9	271	255	240	420	255	500	1130	311	241	155	183	1430
10	238	357	242	410	255	700	925	288	236	156	178	881
11	217	398	240	400	255	900	808	278	212	149	186	575
12	200	329	288	390	255	1570	733	272	205	147	169	431
13	217	295	566	380	255	1860	708	264	198	145	162	361
14	236	276	544	370	255	1570	698	247	189	145	161	322
15	227	276	413	350	255	1210	740	246	185	150	161	298
16	285	288	396	330	255	1050	710	341	299	154	156	279
17	323	271	544	310	255	966	632	364	352	147	148	261
18	290	255	524	290	260	822	554	309	294	142	173	431
19	281	246	398	280	260	790	558	278	257	145	178	572
20	355	233	332	275	270	946	656	268	231	144	156	439
21	369	230	304	270	270	948	598	263	210	139	154	390
22	395	220	350	265	275	883	521	242	216	132	152	366
23	326	216	300	260	280	935	478	228	222	129	148	356
24	289	222	270	260	290	999	461	219	227	129	197	316
25	254	225	250	260	300	897	505	226	209	142	425	287
26	263	228	400	260	310	865	470	376	193	238	362	275
27	263	235	480	260	320	1180	431	649	186	198	283	273
28	331	302	630	260	330	1920	408	541	179	163	239	267
29	388	381	1380	260	---	2180	375	397	175	151	220	240
30	306	314	1360	255	---	1980	351	335	169	147	252	235
31	274	---	880	255	---	1560	---	365	---	146	268	---
TOTAL	8018	8682	13603	10450	7500	30461	26075	9885	6903	4797	6316	14685
MEAN	259	289	439	337	268	983	869	319	230	155	204	490
MAX	395	515	1380	510	330	2180	2490	649	352	238	425	1550
MIN	156	216	240	255	255	340	351	219	169	129	137	192
CFSM	.81	.90	1.37	1.05	.84	3.07	2.72	1.00	.72	.48	.64	1.53
IN.	.93	1.01	1.58	1.21	.87	3.54	3.03	1.15	.80	.56	.73	

STREAMS TRIBUTARY TO LAKE HURON

04142000 RIFLE RIVER NEAR STERLING, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-72, 1974 (revised) to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to September 1981.

WATER TEMPERATURE: November 1974 to September 1981.

SUSPENDED-SEDIMENT DISCHARGE: April to September 1966, October 1969 to September 1970, April to September 1972.

INSTRUMENTATION.--Water-quality monitor from Aug. 28, 1975 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at or near bridge. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from these samples were not published. Water-discharge measurements were made at times of sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-77, 1979-80): Maximum recorded (more than 20 percent missing record), 567 microsiemens, Sept. 6, 1979; minimum recorded (more than 20 percent missing record), 157 microsiemens, Aug. 31, 1975.

WATER TEMPERATURE (water years 1976-77, 1980): Maximum, 30.5°C, July 20, 1977; minimum, 0.0°C on many days during winter.

SEDIMENT CONCENTRATION (water years 1970, 1972): Maximum daily mean, 304 mg/L, Apr. 13, 1972; minimum daily, 0 mg/L on several days in water year 1972.

SEDIMENT LOAD (water years 1970, 1972): Maximum daily, 1,760 tons, Apr. 13, 1972; minimum daily, 0 ton on several days during 1972.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A suspended sediment concentration of 647 mg/L was measured Mar. 27, 1967, and a sediment load of 3,270 tons was calculated Mar. 27, 1967.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT 18...	1015	292	445	8.4	11.5	2.9	10.0	92	250	--
MAR 13...	1230	1850	272	7.8	1.0	15	13.7	98	K600	1600
MAY 23...	1030	242	438	8.4	15.0	2.5	9.8	99	K18	K6
AUG 06...	1100	307	404	8.2	19.5	20	8.2	92	690	11

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 18...	210	5	58	15	9.7	9	.3	1.4	1.5	28
MAR 13...	120	6	34	8.9	5.8	9	.2	2.1	3.5	17
MAY 23...	220	54	60	16	10	9	.3	1.0	1.2	27
AUG 06...	190	27	52	14	9.6	10	.3	.90	2.0	24

STREAMS TRIBUTARY TO LAKE HURON

187

04142000 RIFLE RIVER NEAR STERLING, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 18...	1015	15	.20	8.5	267	260	.36	211	.16
MAR 13...	1230	9.6	.10	5.8	155	150	.21	774	.56
MAY 23...	1030	19	.10	5.3	271	240	.37	177	<.10
AUG 06...	1100	15	.10	7.0	248	220	.34	206	.16

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 18...	.020	.60	.020	<.010	<.010	21	17	80
MAR 13...	.130	1.6	.070	.020	--	249	1240	41
MAY 23...	.030	.60	.050	<.010	<.010	9	5.9	90
AUG 06...	.050	.60	<.010	<.010	.010	101	84	75

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 18...	<10	2	53	<.5	<1	<1	<3	5	33	<1
MAR 13...	10	1	29	<.5	<1	<1	<3	6	95	<1
MAY 23...	10	2	49	<.5	<1	3	<3	3	19	1
AUG 06...	20	3	48	<.5	<1	3	<3	5	13	3

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 18...	<4	8	<.1	<10	<1	<1	<1	230	<6	4
MAR 13...	<4	23	.1	<10	<1	<1	<1	100	<6	7
MAY 23...	<4	11	.1	<10	1	<1	<1	250	<6	12
AUG 06...	7	4	.1	<10	3	<1	<1	220	<6	5

STREAMS TRIBUTARY TO LAKE HURON

04143900 SHIAWASSEE RIVER AT LINDEN, MI

LOCATION.--Lat 42°48'56", long 83°48'08", in SW1/4 sec.19, T.5 N., R.6 E., Genesee County, Hydrologic Unit 04080203, on right bank at upstream side of bridge on Hogan Road, 1.0 mi west of Linden.

DRAINAGE AREA.--81.2 mi².

PERIOD OF RECORD.--October 1967 to current year.

GAGE.--Water-stage recorder. Datum of gage is 844.96 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 5-8, 25-27, and Jan. 7 to Feb. 23. Records fair. Flow regulated by dam at Linden since 1967. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--18 years, 60.2 ft³/s, 10.07 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 476 ft³/s, Apr. 22, 1975, gage height, 7.43 ft; minimum, 0.74 ft³/s, May 22, 23, 1971; minimum gage height, 2.82 ft, Aug. 2, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 293 ft³/s, Mar. 2, 5, gage height, 6.58 ft, minimum, 13 ft³/s, Oct. 6, 7; minimum gage height, 3.57 ft, July 27, 28, 29, Aug. 8, 9, 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	52	61	112	45	281	136	68	69	27	23	40
2	24	42	46	131	45	288	138	61	70	25	22	52
3	26	36	59	162	44	283	141	57	70	26	22	71
4	33	37	50	163	43	278	146	56	66	26	22	81
5	25	39	40	173	43	286	164	54	60	29	23	76
6	14	48	41	164	42	261	202	53	52	30	23	73
7	16	52	47	150	41	243	208	58	46	29	23	77
8	18	45	54	140	41	230	205	63	44	31	22	92
9	17	38	56	130	41	224	212	62	42	40	22	126
10	24	42	59	125	41	213	209	58	40	36	23	127
11	32	52	61	115	40	205	211	62	40	29	22	116
12	33	59	63	100	40	198	209	63	41	27	22	109
13	26	68	64	90	40	189	205	61	31	30	22	96
14	20	79	63	76	40	182	194	55	30	30	23	87
15	22	87	62	70	39	175	191	54	30	30	23	67
16	24	88	61	64	39	171	172	57	32	27	23	68
17	26	87	58	59	39	162	164	53	33	26	23	85
18	27	84	59	56	39	154	158	53	33	28	23	68
19	38	82	60	53	39	149	135	49	34	69	23	38
20	42	82	67	52	39	141	140	49	35	88	23	56
21	45	82	68	51	40	133	123	53	35	80	23	35
22	42	81	70	50	55	127	112	54	36	65	23	25
23	42	73	68	49	100	119	116	51	41	35	23	28
24	41	64	67	49	178	119	82	49	47	23	24	34
25	41	63	64	48	192	113	67	45	45	23	24	37
26	42	66	64	48	206	108	61	44	47	24	24	42
27	42	71	74	47	237	107	68	52	53	22	24	40
28	41	69	80	46	275	120	71	55	41	22	24	39
29	44	67	83	45	---	131	71	56	31	22	25	39
30	48	64	94	45	---	132	70	57	28	23	32	42
31	50	---	106	45	---	133	---	64	---	23	36	---
TOTAL	990	1899	1969	2708	2103	5655	4381	1726	1302	1045	734	1966
MEAN	31.9	63.3	63.5	87.4	75.1	182	146	55.7	43.4	33.7	23.7	65.5
MAX	50	88	106	173	275	288	212	68	70	88	36	127
MIN	14	36	40	45	39	107	61	44	28	22	22	25
CFSM	.39	.78	.78	1.08	.93	2.24	1.80	.69	.53	.42	.29	.81
IN.	.45	.87	.90	1.24	.96	2.59	2.01	.79	.60	.48	.34	.90
CAL YR 1984	TOTAL	17827.7	MEAN	48.7	MAX	148	MIN	5.9	CFSM	.60	IN	8.17
WTR YR 1985	TOTAL	26478.0	MEAN	72.5	MAX	288	MIN	14	CFSM	.89	IN	12.13

189

LOCATION.--Lat 43°00'54", long 84°10'52", in SW1/4 sec.12, T.7 N., R.2 E., Shiawassee County, Hydrologic Unit 04080203, on right bank on grounds of sewage-treatment plant, 1.5 mi. north of Owosso.

PERIOD OF RECORD.--March 1931 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height record for flood seasons collected in this vicinity 1904, 1910-30 are contained in reports of U.S. Weather Bureau.

GAGE.--Water-stage recorder. Datum of gage is 707.25 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 15, 1933, at site 1.5 mi upstream at datum 5.46 ft higher.

AVERAGE DISCHARGE.--54 years, 335 ft³/s, 8.46 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,240 ft³/s, Apr. 6, 1947, gage height, 10.35 ft; minimum, 0.2 ft³/s, July 27, 1934, gage height, 1.12 ft; minimum daily, 2.0 ft³/s, July 28, 1934.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,500 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 30	0100	1,590	5.45	Mar. 8	2400	2,560	6.82
Jan. 2	0200	2,010	6.08	Mar. 29	0900	2,030	6.44
Feb. 27	2300	*4,220	*8.69	Apr. 6	0700	3,900	8.33

Minimum discharge, 48 ft³/s, Aug. 14; minimum gage height, 2.13 ft, Oct. 17, 18.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	113	181	238	1400	220	3650	1330	384	393	117	93	227
2	120	199	232	1940	215	3020	1300	365	364	116	91	282
3	108	196	230	1600	210	2510	1280	345	364	122	89	249
4	101	186	216	1290	205	2180	1180	326	356	115	88	212
5	103	176	175	1250	200	2360	2570	324	319	119	80	204
6	101	162	175	1150	195	2270	3650	328	288	111	71	578
7	132	152	180	950	195	1980	2960	332	255	111	64	525
8	115	148	195	750	195	2060	2730	360	224	145	76	449
9	110	194	264	600	195	2360	2590	385	206	120	72	791
10	113	219	246	520	190	2030	2450	370	184	111	64	906
11	125	277	228	470	190	1850	2230	338	181	112	61	691
12	110	295	231	420	195	1830	1890	308	180	115	57	506
13	110	313	258	380	200	1730	1520	279	175	115	55	421
14	122	353	274	340	200	1660	1300	257	182	110	49	375
15	111	397	292	310	205	1570	1170	243	193	114	72	334
16	85	407	304	290	210	1460	1000	249	194	99	71	302
17	79	390	308	270	215	1270	913	251	190	93	70	273
18	79	355	295	250	220	1120	837	265	186	110	87	257
19	104	316	289	240	225	978	762	280	186	121	90	246
20	111	293	280	235	230	805	710	282	184	113	78	230
21	182	277	289	230	240	704	672	273	182	108	77	216
22	159	262	433	230	300	648	619	257	178	138	100	193
23	163	258	422	230	1150	624	583	253	169	166	100	190
24	154	250	422	230	3200	636	548	250	154	80	333	192
25	143	243	312	230	3420	624	540	234	143	113	541	183
26	135	232	250	225	3510	576	544	232	138	216	355	186
27	133	221	276	225	4020	636	582	243	132	142	284	181
28	134	227	524	225	4050	1350	524	241	127	126	252	177
29	162	227	1210	225	---	1960	459	250	121	115	231	166
30	155	234	1460	225	---	1600	414	276	113	103	217	155
31	148	---	1160	225	---	1340	---	339	---	98	206	---
TOTAL	3820	7640	11668	17155	24000	49391	39857	9119	6261	3694	4174	9897
MEAN	123	255	376	553	857	1593	1329	294	209	119	135	330
MAX	182	407	1460	1940	4050	3650	3650	385	393	216	541	906
MIN	79	148	175	225	190	576	414	232	113	80	49	155
CFSM	.23	.47	.70	1.03	1.59	2.96	2.47	.55	.39	.22	.25	.61
IN.	.26	.53	.81	1.19	1.66	3.42	2.76	.63	.43	.26	.29	.68

STREAMS TRIBUTARY TO LAKE HURON

04146000 FARMERS CREEK NEAR LAPEER, MI

LOCATION.--Lat 43°02'41", long 83°20'14", in sec.6, T.7 N., R.10 E., Lapeer County, Hydrologic Unit 04080204, on left bank at sewage-treatment plant at Michigan Home and Training School, 2.0 mi west of Lapeer.

DRAINAGE AREA.--55.3 mi².

PERIOD OF RECORD.--October 1932 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 924: 1940. WSP 1084: 1942(M), 1943. WSP 1337: 1934-38, 1940(M), 1944(M), 1945, 1946(M), 1948-51(M). WSP 1727: 1952 (M). WDR MI-78: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 805.79 ft above National Geodetic Vertical Datum of 1929. Prior to May 25, 1954, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 8, 26, Jan. 4, Jan. 8 to Feb. 8, and Feb. 10 to Mar. 3. Records good except for estimated daily discharges, which are fair. Prior to 1941, occasional regulation by dam upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--53 years, 31.1 ft³/s, 7.64 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,380 ft³/s, Sept. 9, 1985, gage height, 20.95 ft, from floodmark; minimum not determined.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 160 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 3	1100	493	18.05	Mar. 31	1900	177	16.87
Feb. 26	--	640	ice jam	Apr. 8	0200	440	17.98
Mar. 6	1000	240	17.19	Sept. 9	0300	*1,380	*20.95
Mar. 12	1000	183	16.91				

Minimum discharge, 2.9 ft³/s, July 18, 19, gage height, 15.10 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	39	34	303	22	310	169	27	22	5.6	5.6	20
2	10	36	33	327	21	260	149	14	22	5.5	5.1	20
3	9.1	34	35	413	21	220	136	13	21	6.3	4.6	19
4	8.3	33	33	360	21	179	123	14	22	7.3	4.2	18
5	7.8	31	28	290	20	185	175	16	21	8.0	4.0	17
6	9.0	30	27	233	20	189	236	18	17	10	4.0	157
7	11	28	25	187	19	158	371	20	15	11	4.1	384
8	16	26	26	150	19	160	429	16	14	9.9	4.1	1080
9	16	27	26	110	18	160	363	7.7	12	9.5	3.9	1300
10	15	38	27	84	19	162	283	6.2	6.1	8.7	4.6	935
11	14	68	28	65	20	175	219	5.6	5.1	7.7	4.4	640
12	12	72	31	53	21	182	171	4.9	7.2	6.4	3.7	447
13	11	77	37	45	22	175	139	4.0	10	5.6	3.3	324
14	11	80	38	40	22	164	118	3.4	11	5.1	3.2	238
15	10	83	41	35	21	151	104	5.0	11	4.6	4.3	186
16	17	80	44	32	21	134	96	5.2	13	4.2	7.3	155
17	34	73	45	31	25	120	84	5.0	15	3.6	8.1	121
18	44	70	46	30	30	104	76	4.6	17	3.1	7.8	90
19	50	68	45	29	28	94	69	4.1	18	3.1	8.6	70
20	48	62	43	28	27	83	64	4.3	18	4.4	9.6	62
21	50	55	50	27	27	75	61	6.3	17	6.0	9.3	60
22	44	49	57	27	39	69	59	6.6	15	6.4	8.9	63
23	39	46	52	26	95	65	55	5.6	14	5.8	8.0	62
24	43	42	53	26	210	68	50	5.1	12	4.9	10	57
25	57	38	46	25	540	66	46	6.4	10	4.5	16	51
26	54	35	46	25	580	64	41	8.4	8.8	6.1	19	48
27	50	33	54	24	470	66	39	16	7.8	7.5	21	45
28	45	34	75	24	390	98	37	22	7.1	7.8	27	42
29	43	34	118	23	---	115	35	24	6.5	7.4	28	38
30	47	34	130	23	---	138	32	25	6.1	6.3	22	35
31	42	---	153	22	---	171	---	24	---	5.6	20	---
TOTAL	878.2	1455	1526	3117	2788	4360	4029	347.4	401.7	197.9	293.7	6784
MEAN	28.3	48.5	49.2	101	99.6	141	134	11.2	13.4	6.38	9.47	226
MAX	57	83	153	413	580	310	429	27	22	11	28	1300
MIN	7.8	26	25	22	18	64	32	3.4	5.1	3.1	3.2	17
CFSM	.51	.88	.89	1.83	1.80	2.55	2.42	.20	.24	.12	.17	4.09
IN.	.59	.98	1.03	2.10	1.88	2.93	2.71	.23	.27	.13	.20	4.56
CAL YR 1984	TOTAL	11996.6	MEAN	32.8	MAX	155	MIN	1.2	CFSM	.59	IN	8.07
WTR YR 1985	TOTAL	26177.9	MEAN	71.7	MAX	1300	MIN	3.1	CFSM	1.30	IN	17.61

STREAMS TRIBUTARY TO LAKE HURON

191

04146063 SOUTH BRANCH FLINT RIVER NEAR COLUMBIAVILLE, MI

LOCATION.--Lat 43°09'34", long 83°21'03", in NE1/4 NE1/4 sec.36, T.9 N., R.9 E., Lapeer County, Hydrologic Unit 04080204, on right bank at upstream side of bridge on Columbiaville Road, 3.0 mi east of Columbiaville, and 3.2 mi upstream from confluence of North and South Branches.

DRAINAGE AREA.--221 mi².

PERIOD OF RECORD.--March 1980 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 765 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 5-9, 25-27, and Jan. 4 to Feb. 26. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

AVERAGE DISCHARGE.--5 years, 192 ft³/s, 11.80 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,090 ft³/s, Sept. 9, 1985, gage height, 9.60 ft; maximum gage height, 9.61 ft, Feb. 26, 1985, backwater from ice; minimum daily discharge, 14 ft³/s, Aug. 27, 1984.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,090 ft³/s, Sept. 9, gage height, 9.60 ft; maximum gage height, 9.61 ft, Feb. 26, backwater from ice; minimum discharge, 18 ft³/s, Aug. 13, gage height, 1.38 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	62	95	163	785	115	1610	815	172	122	47	45	77
2	55	112	154	1070	115	1230	723	152	110	42	44	77
3	46	107	161	1080	115	1010	639	136	102	59	36	76
4	45	107	165	900	110	801	584	129	94	63	31	67
5	42	109	150	700	110	739	843	129	88	74	28	69
6	37	109	140	500	105	832	1620	132	81	88	27	200
7	40	107	135	400	105	752	1830	137	73	77	36	640
8	70	102	130	330	100	698	1650	138	70	69	34	1220
9	67	102	125	300	100	919	1390	124	65	66	32	2660
10	65	155	121	250	105	966	1100	112	57	66	26	2950
11	68	297	140	200	105	906	901	103	47	67	22	2370
12	77	460	156	170	110	900	774	86	57	53	20	1730
13	65	432	213	160	115	915	664	89	59	47	20	1230
14	56	384	231	150	110	815	572	86	62	43	21	907
15	55	363	223	145	105	713	503	82	64	40	22	693
16	57	394	217	145	105	623	453	86	72	43	31	547
17	68	347	207	140	110	550	398	84	76	42	33	432
18	81	306	192	140	110	475	363	84	86	39	33	360
19	90	279	178	140	115	412	339	84	92	35	33	322
20	93	250	166	135	115	373	322	82	87	42	36	281
21	118	217	162	135	115	336	301	92	86	48	35	250
22	149	187	256	135	140	308	281	94	81	48	34	234
23	136	184	267	130	320	288	264	89	74	41	32	228
24	120	176	236	130	1000	331	251	81	67	37	60	234
25	118	162	200	125	2500	405	255	72	58	36	91	230
26	125	159	190	125	2800	400	249	71	55	65	102	212
27	120	144	215	120	2510	375	226	130	54	70	88	206
28	114	150	271	120	2020	526	210	151	51	60	87	193
29	107	175	533	120	---	973	198	145	63	51	90	181
30	100	171	745	119	---	1020	186	133	53	48	92	169
31	97	---	808	118	---	886	---	132	---	43	89	---
TOTAL	2543	6342	7250	9237	13585	22087	18904	3417	2206	1649	1410	19045
MEAN	82.0	211	234	298	485	712	630	110	73.5	53.2	45.5	635
MAX	149	460	808	1080	2800	1610	1830	172	122	88	102	2950
MIN	37	95	121	118	100	288	186	71	47	35	20	67
CFSM	.37	.96	1.06	1.35	2.20	3.22	2.85	.50	.33	.24	.21	2.87
IN	.43	1.07	1.22	1.55	2.29	3.72	3.18	.58	.37	.28	.24	3.21
CAL YR 1984	TOTAL	56620	MEAN 155	MAX 808	MIN 14	CFSM .70	IN 9.53					
WTR YR 1985	TOTAL	107675	MEAN 295	MAX 2950	MIN 20	CFSM 1.34	IN 18.12					

STREAMS TRIBUTARY TO LAKE HURON

04147000 HOLLOWAY RESERVOIR NEAR OTISVILLE, MI

LOCATION.--Lat 43°07'15", long 83°29'45", in NW1/4 sec.11, T.8 N., R.8 E., Genesee County, Hydrologic Unit 04080204, in gatehouse on right side of Holloway Dam on Flint River, 3.5 mi southeast of Otisville.

DRAINAGE AREA.--526 mi².

PERIOD OF RECORD.--March 1954 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by city of Flint).

REMARKS.--Reservoir is formed by an earth-fill dam with concrete spillway completed in 1953. Capacity of reservoir, 1,256,000,000 cu ft at elevation 760.00 ft. The spillway section includes two 90 foot drum gates with minimum crest elevation of 751 ft, maximum at 755 ft, three 20-foot radial gates with sill elevation of 745 ft, and 2 sluices (each 4 by 6 ft), one on each side with valve controls. Entrance elevation of sluiceways is 724 ft. Reservoir is used to regulate flow for sewage dilution for city of Flint.

COOPERATION.--Reservoir elevations furnished by city of Flint.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 996,000,000 cu ft, Mar. 8, 1956, elevation, 757.4 ft; minimum, reservoir empty at times during October, November, 1954, January, February, 1955, October, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 952,000,000 cu ft, Apr. 7, elevation, 756.96 ft; minimum, 457,000,000 cu ft, Jan. 9, elevation, 750.74 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

Date	Elevation (feet)	Contents (millions of cubic feet)	Change in contents during month (millions of cubic feet)	(equivalent in ft ³ /s)
Sept. 30	755.00	770	--	--
Oct. 31	755.21	789	+19	+7.1
Nov. 30	751.49	502	-287	-111.0
Dec. 31	752.45	568	+66	+24.6
CAL YR 1984	--	--	+108	+3.4
Jan. 31	751.38	496	-72	-26.9
Feb. 28	755.71	834	+338	+140.0
Mar. 31	753.65	659	-175	-65.3
Apr. 30	755.33	800	+141	+54.4
May 31	755.16	784	-16	-6.0
June 30	754.28	709	-75	-28.9
July 31	754.10	695	-14	-5.2
Aug. 31	754.36	716	+21	+7.8
Sept. 30	753.72	665	-51	-19.7
WTR YR 1985	--	--	-105	-3.3

STREAMS TRIBUTARY TO LAKE HURON

193

04147500 FLINT RIVER NEAR OTISVILLE, MI

LOCATION.--Lat 43°06'40", long 83°31'10", in SE1/4 sec.9, T.8 N., R.8 E., Genesee County, Hydrologic Unit 04080204, on left bank 20 ft downstream from bridge on State Highway 15, 1.5 mi downstream from Holloway Reservoir, 3.5 mi upstream from Povers-Cullen Drain, and 3.8 mi south of Otisville.

DRAINAGE AREA.--530 mi².

PERIOD OF RECORD.--October 1952 to current year.

REVISED RECORDS.--WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 721.39 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Records good. Flow regulated by Holloway Reservoir, 1.5 mi upstream from station (see preceding page). Several measurements of water temperature were made during the year. City of Flint gage-height telemeter at station.

AVERAGE DISCHARGE.--33 years, 314 ft³/s, 8.05 in/yr, adjusted for storage since 1954.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,150 ft³/s, Apr. 1, 1960, gage height, 14.97 ft; minimum, 2.1 ft³/s, Oct. 11, 12, 1971, gage height, 1.57 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,850 ft³/s, Apr. 7, gage height, 14.80 ft; minimum, 41 ft³/s, Aug. 29, 30, 31, Sept. 1, 2, 3, gage height, 2.43 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	111	317	361	2200	255	4200	2100	425	314	126	95	41
2	108	458	376	2170	247	3580	1550	379	300	116	93	41
3	104	447	339	2100	239	2940	1110	330	279	108	93	42
4	104	441	361	2020	228	2460	1200	312	251	104	95	42
5	111	540	352	1940	227	2140	1670	301	230	104	95	44
6	113	883	326	1680	223	2000	3050	310	219	104	95	300
7	109	1090	284	1410	219	1960	3430	305	211	103	93	719
8	113	1060	265	1190	216	1920	4870	308	207	104	93	1610
9	121	703	277	745	211	1980	3810	281	204	104	91	2080
10	131	390	284	129	209	2160	2860	267	204	103	93	3340
11	136	458	284	356	221	2380	2350	260	204	103	93	3090
12	142	620	301	474	225	2470	2080	249	200	103	93	2490
13	141	736	374	474	235	2470	1750	241	199	101	93	1930
14	142	808	443	441	235	2390	1390	239	195	101	93	1080
15	142	845	477	396	228	2220	1360	225	195	103	93	1010
16	134	880	501	343	228	2000	745	214	197	100	85	777
17	133	880	534	341	234	1800	363	219	194	100	77	530
18	136	862	518	325	237	1600	611	207	194	100	79	609
19	137	815	502	316	242	1420	767	202	194	100	79	945
20	139	732	470	298	242	1290	772	202	194	100	77	938
21	180	656	455	281	445	1160	747	211	190	100	77	928
22	204	572	474	267	658	699	708	212	190	100	77	916
23	234	504	578	258	723	470	654	211	188	98	77	599
24	247	453	591	258	1200	716	624	209	187	98	80	136
25	251	410	530	262	1990	857	593	209	126	100	79	133
26	244	378	455	256	3280	935	578	211	98	98	79	133
27	239	350	466	253	4680	1010	550	251	129	98	79	133
28	230	345	558	253	4700	1280	508	277	129	98	79	133
29	227	360	984	253	---	1660	460	289	129	96	58	133
30	205	365	1480	253	---	2120	428	293	128	96	41	133
31	209	---	1990	256	---	2260	---	301	---	96	41	---
TOTAL	4977	18358	16190	22198	22277	58547	45688	8150	5879	3165	2565	25035
MEAN	161	612	522	716	796	1889	1523	263	196	102	82.7	835
MAX	251	1090	1990	2200	4700	4200	5430	425	314	126	95	3340
MIN	104	317	265	129	209	470	363	202	98	96	41	41
MEAN+	168	501	547	689	936	1823	1577	257	167	96.9	90.5	815
CFSM+	.32	.95	1.03	1.30	1.77	3.44	2.98	.48	.32	.18	.17	1.54
IN+	.36	1.05	1.19	1.50	1.84	3.97	3.32	.56	.35	.21	.20	1.72

CAL YR 1984 TOTAL 134854 MEAN 368 MAX 1990 MIN 33 MEAN+ 372 CFSM+ .70 IN+ 9.55
WTR YR 1985 TOTAL 233029 MEAN 638 MAX 5430 MIN 41 MEAN+ 635 CFSM+ 1.20 IN+ 16.27

+ Adjusted for change in contents in Holloway Reservoir.

STREAMS TRIBUTARY TO LAKE HURON

04148140 KEARSLEY CREEK NEAR DAVISON, MI

LOCATION.--Lat 43°02'01", long 83°34'53", in NE1/4 sec.12, T.7 N., R.7 E., Genesee County, Hydrologic Unit 04080204, on right bank 10 ft upstream from bridge on Davison Road (revised), 1.4 mi downstream from Black Creek, and 3.3 mi west of Davison.

DRAINAGE AREA.--99.4 mi².

PERIOD OF RECORD.--October 1965 to current year.

REVISED RECORDS.--WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 747.39 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 5-8, 25-27, Jan. 4 to Feb. 23, and Sept. 7, 8. Records good except for estimated daily discharges, which are fair. Some diurnal fluctuation caused by small dams, and occasional diversion for sprinkler irrigation upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

AVERAGE DISCHARGE.--20 years, 72.0 ft³/s, 9.84 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft³/s, Sept. 9, 1985, gage height, 11.85 ft, from floodmark; minimum, 2.5 ft³/s, Sept. 10, 1978; minimum gage height, 2.69 ft, Sept. 12, 1969.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 350 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 29	2200	475	8.34	Mar. 8	2400	519	8.69
Jan. 1	2000	643	9.54	Mar. 28	1900	578	9.13
Feb. 24	1100	1,220	11.24	Apr. 6	0400	882	10.36
Mar. 5	1900	447	8.12	Sept. 9	--	*1,500	*11.85

Minimum daily discharge, 6.6 ft³/s, Aug. 13.

REVISIONS.--The peak discharges and annual maximum (*) reported for water years 1968, 1973, 1975, and 1982 have been revised as shown in the following table; revised daily discharge for Apr. 21, 1975, in cubic feet per second, is given below. These figures supercede those published in the reports for 1968, 1973, 1975, and 1982.

Water year	Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Water year	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
1968	Feb. 2, 1968	1100	*858	*10.29	1975	Apr. 21, 1975	0700	*1,250	*11.32
1973	Dec. 31, 1972	0600	*753	*10.10	1982	Oct. 1, 1981	2000	*1,190	*11.18
1975	Apr. 19, 1975	1100	1,100	10.96	1982	Mar. 13, 1982	2000	1,090	10.92

Apr. 21, 1975 . . . 1,210

	TOTAL	MEAN	MAX	MIN	CFSM	IN
April 1975	10,498	350	1,210	121	3.52	3.93
Wtr Yr 1975	43,028	118	1,210	11	1.19	16.10
Cal Yr 1975	50,187	137	1,210	11	1.38	18.78

04148140 KEARSLEY CREEK NEAR DAVISON, MI--Continued

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	23	51	515	43	624	370	61	61	14	13	33
2	13	27	52	548	42	545	299	57	61	15	12	43
3	12	23	55	394	41	440	253	54	58	13	11	38
4	11	26	45	300	40	354	230	51	49	11	10	43
5	11	29	43	200	39	437	606	49	38	19	9.7	42
6	10	32	41	150	38	372	790	41	29	23	10	822
7	15	31	39	130	37	336	632	39	26	20	11	1120
8	17	30	37	110	37	380	612	44	24	20	9.7	1130
9	15	30	34	90	36	450	563	46	24	20	9.2	1370
10	15	50	43	70	36	367	451	45	22	32	7.9	896
11	15	90	46	60	37	354	318	42	24	32	7.7	655
12	15	115	61	55	40	350	253	39	24	25	7.0	565
13	14	99	78	53	41	310	220	37	23	19	6.6	497
14	15	103	75	51	40	278	197	34	23	16	6.8	411
15	14	105	77	50	38	254	171	32	24	14	13	310
16	14	111	76	50	38	231	155	34	27	13	9.7	211
17	14	88	71	50	39	209	146	39	25	13	10	142
18	14	80	65	50	39	182	144	37	27	12	14	120
19	15	73	61	50	40	155	135	38	27	14	12	110
20	15	62	52	49	40	142	124	43	27	14	14	100
21	35	63	80	48	41	131	118	42	23	14	15	97
22	27	53	134	48	130	119	107	40	23	15	14	91
23	26	55	94	47	400	112	99	40	20	15	12	77
24	27	48	90	46	1150	125	99	37	17	16	25	127
25	26	45	70	45	899	120	97	33	15	17	30	81
26	24	42	74	44	938	116	75	34	14	32	46	69
27	22	39	78	43	952	136	75	58	12	17	66	65
28	22	40	195	43	702	399	75	47	12	19	61	60
29	21	47	361	42	---	532	70	52	11	17	74	50
30	20	48	412	42	---	436	65	54	10	14	56	45
31	19	---	343	42	---	419	---	59	---	13	40	---
TOTAL	548	1707	3033	3515	5993	9415	7549	1358	802	548	643.3	9420
MEAN	17.7	56.9	97.8	113	214	304	252	43.8	26.7	17.7	20.8	314
MAX	35	115	412	548	1150	624	790	61	61	32	74	1370
MIN	10	23	34	42	36	112	65	32	10	11	6.6	33
CFSM	.18	.57	.98	1.14	2.15	3.06	2.54	.44	.27	.18	.21	3.16
IN.	.21	.64	1.14	1.32	2.24	3.52	2.83	.51	.30	.21	.24	3.53
CAL YR 1984	TOTAL	22878.7	MEAN	62.5	MAX	412	MIN	4.5	CFSM	.63	IN	8.56
WTR YR 1985	TOTAL	44531.3	MEAN	122	MAX	1370	MIN	6.6	CFSM	1.23	IN	16.67

STREAMS TRIBUTARY TO LAKE HURON

04148500 FLINT RIVER NEAR FLINT, MI

LOCATION.--Lat 43°02'20", long 83°46'10", in SW1/4 sec.4, T.7 N., R.6 E., Genesee County, Hydrologic Unit 04080204, on left bank on grounds of sewage-treatment plant, 1.2 mi upstream from Firnie Creek, and 5.0 mi downstream from Swartz Creek.

DRAINAGE AREA.--956 mi².

PERIOD OF RECORD.--September 1903 to March 1904 (gage heights only), August 1932 to current year. Gage-height records for flood seasons collected in this vicinity 1911-32, are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 954: 1941. WSP 1337: 1933-34(M), 1935-37. WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 678.80 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Weather Bureau and city of Flint).

REMARKS.--No estimated daily discharges. Records good. Some regulation by reservoirs upstream from station (station 04147000). Occasional diversion for industrial use. Since Dec. 17, 1967, flow contains up to 50 ft³/s as sewage effluent which originates outside the basin. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--53 years, 602 ft³/s, 8.55 in/yr, adjusted for storage since 1954.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,900 ft³/s, Apr. 6, 1947, gage height, 16.35 ft; maximum gage height, 16.95 ft, Sept. 6, 1985; minimum discharge, 9.0 ft³/s, Aug. 7, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 11,400 ft³/s, Sept. 6, gage height, 16.95 ft; minimum, 70 ft³/s, Oct. 20, gage height, 2.72 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	201	486	585	5200	456	7350	3670	747	538	178	179	273
2	196	680	591	5070	447	6270	3320	661	483	210	171	375
3	181	628	638	4150	423	5130	2420	580	455	319	160	229
4	187	615	606	3250	426	4810	2390	544	414	181	156	214
5	185	623	582	3030	413	4880	6300	521	379	216	166	231
6	186	887	555	2870	409	4170	8900	547	353	201	191	7860
7	336	1280	487	2320	398	3660	8190	526	330	185	198	4150
8	328	1240	460	1970	374	3930	8120	506	319	298	177	5850
9	250	1260	453	1470	373	4660	6780	469	352	253	154	8160
10	243	897	619	642	367	4140	5420	414	312	222	159	5990
11	239	1130	618	552	405	4300	4430	398	337	208	151	4980
12	250	1200	666	770	459	4500	3520	377	391	206	149	4320
13	243	1130	769	822	439	4200	2880	361	319	190	152	3580
14	358	1170	815	797	423	3930	2320	351	303	180	167	2330
15	376	1290	748	714	404	3660	2120	344	302	197	310	1880
16	439	1320	761	637	390	3150	1980	372	367	184	195	1400
17	98	1230	858	639	412	2790	846	358	324	174	163	949
18	213	1180	833	627	420	2500	1150	337	302	167	212	1100
19	353	1180	820	595	430	2150	1260	323	300	190	176	1530
20	323	907	762	485	434	2010	1280	360	298	241	158	1470
21	780	945	912	490	561	1810	1240	436	294	194	146	1320
22	323	861	1230	557	1320	1560	1200	357	383	187	161	1210
23	345	653	1100	512	4190	789	1100	342	307	181	155	1190
24	398	690	1030	509	8290	1210	1130	326	309	171	882	749
25	556	633	893	500	7170	1410	1100	306	289	220	656	363
26	289	596	781	474	6360	1590	1020	371	196	455	338	384
27	393	564	824	456	7870	1680	950	649	179	232	296	413
28	381	644	1150	476	7890	3810	893	521	184	186	482	383
29	379	602	2670	463	---	4940	831	469	177	179	473	367
30	361	599	3390	450	---	3980	791	458	173	187	332	363
31	353	---	3360	458	---	3960	---	566	---	178	245	---
TOTAL	9743	27120	30526	41955	51953	108929	87551	13897	9669	6570	7710	63613
MEAN	314	904	985	1353	1855	3514	2918	448	322	212	249	2120
MAX	780	1320	3390	5200	8290	7350	8900	747	538	455	882	8160
MIN	98	486	453	450	367	789	791	306	173	167	146	214
MEAN+	321	793	1009	1326	1995	3449	2973	442	293	207	257	2101
CFSM+	.34	.83	1.06	1.39	2.09	3.61	3.11	.46	.31	.22	.27	2.20
IN+	.39	.53	1.22	1.60	2.17	4.16	3.47	.53	.34	.25	.31	2.45

CAL YR 1984 TOTAL 251067 MEAN 686 MAX 3510 MIN 59 MEAN+ 689 CFSM+ .72 IN+ 9.82
WTR YR 1985 TOTAL 459236 MEAN 1258 MAX 8900 MIN 98 MEAN+ 1255 CFSM+ 1.31 IN+ 17.82

+ Adjusted for change in contents in Holloway Reservoir.

STREAMS TRIBUTARY TO LAKE HURON

197

04150500 CASS RIVER AT CASS CITY, MI

LOCATION.--Lat 43°35'03", long 83°10'34", in NE1/4 NE1/4 sec.4, T.13 N., R.11 E., Tuscola County, Hydrologic Unit 04080205, on left bank 600 ft downstream from bridge on Cemetery Road, 0.3 mi downstream from confluence of North and South Branches, and 1.1 mi south of Cass City.

DRAINAGE AREA.--359 mi².

PERIOD OF RECORD.--October 1947 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1337: 1949-50. WSP 1727: 1948(M), 1950. WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 697.92 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 14, 1952, nonrecording gage at site 600 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Dec. 5-9, 25-27, Jan. 2 to Feb. 24, and Mar. 3-7. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--38 years, 214 ft³/s, 8.10 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,650 ft³/s, Apr. 6, 1985, gage height, 15.61 ft; maximum gage height, 15.80 ft, Mar. 20, 1948, from graph based on gage readings; minimum discharge, 0.50 ft³/s, Sept. 26, 1948.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,400 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 12	0900	1,610	9.10	Feb. 28	1800	4,490	12.19
Nov. 16	1200	2,000	9.72	Mar. 12	2400	5,720	13.41
Dec. 22	2400	1,460	8.42	Mar. 29	0500	4,840	12.54
Dec. 30	0500	4,940	12.65	Apr. 6	1600	*8,650	*15.61

Minimum discharge, 5.6 ft³/s, Aug. 23, gage height, 4.43 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	113	276	1230	87	3550	1550	111	241	16	15	25
2	35	190	240	1100	87	3240	1110	104	138	16	12	23
3	33	210	290	800	87	2200	911	96	89	17	11	22
4	36	164	391	480	87	1500	952	92	69	15	10	24
5	33	166	210	370	87	1300	3800	93	57	17	9.2	34
6	29	173	160	220	87	1200	8080	94	51	29	9.3	106
7	31	147	140	160	87	1100	6210	94	46	65	9.5	101
8	55	126	125	130	87	1330	2720	91	41	34	9.5	124
9	93	117	130	120	87	2690	1430	86	42	23	9.7	184
10	92	284	135	110	87	3650	902	81	41	19	11	218
11	75	854	141	105	87	4550	673	77	38	16	8.9	187
12	62	1530	158	100	87	5340	542	76	37	15	8.3	112
13	55	1070	478	98	87	4980	486	72	39	13	7.5	70
14	51	669	608	96	87	3270	449	69	38	14	8.1	49
15	49	760	423	96	87	2710	416	68	34	14	8.9	38
16	54	1770	463	95	88	2070	381	65	40	13	9.2	32
17	61	1020	590	94	88	2220	319	60	66	12	9.1	27
18	65	579	434	92	90	1460	273	58	69	13	11	28
19	66	442	319	90	95	1120	251	58	59	11	11	37
20	67	333	260	90	100	1250	245	59	50	11	10	44
21	134	265	248	88	110	1040	227	62	42	11	11	37
22	316	222	829	87	200	898	205	68	37	11	9.5	34
23	232	199	1210	87	400	867	187	60	35	10	8.2	31
24	159	186	554	87	1000	1040	164	52	33	9.5	28	35
25	129	177	240	87	2940	1370	181	48	27	9.8	75	54
26	137	172	230	87	3250	1230	174	51	24	13	68	48
27	176	167	240	87	4070	1170	154	187	22	14	90	43
28	196	192	479	87	4350	2900	138	215	20	15	75	40
29	184	366	3480	87	---	4460	132	162	19	12	54	34
30	148	336	4480	87	---	2750	117	130	17	11	38	29
31	123	---	2270	87	---	1600	---	124	---	14	28	---
TOTAL	3014	12999	20231	6634	18086	70055	33379	2763	1561	513.3	682.9	1870
MEAN	97.2	433	653	214	646	2260	1113	89.1	52.0	16.6	22.0	62.3
MAX	316	1770	4480	1230	4350	5340	8080	215	241	65	90	218
MIN	29	113	125	87	87	867	117	48	17	9.5	7.5	22
CFSM	.27	1.21	1.82	.60	1.80	6.30	3.10	.25	.15	.05	.06	.17
IN.	.31	1.35	2.10	.69	1.87	7.26	3.46	.29	.16	.05	.07	.19
CAL YR 1984 TOTAL	134126.0			MEAN 366	MAX 4720	MIN 15	CFSM 1.02	IN 13.90				
WTR YR 1985 TOTAL	171788.2			MEAN 471	MAX 8080	MIN 7.5	CFSM 1.31	IN 17.80				

STREAMS TRIBUTARY TO LAKE HURON

04150800 CASS RIVER AT WAHJAMEGA, MI

LOCATION.--Lat 43°27'02", long 83°26'29", in NW1/4 NW1/4 sec.20, T.12 N., R.9 E., Tuscola County, Hydrologic Unit 04080205, on right bank 90 ft upstream from bridge on Chambers Road, on grounds of Caro Regional Center at Wahjamega, 1.9 mi downstream from Michigan Sugar Co. dam, and 40 mi upstream from mouth.

DRAINAGE AREA.--645 mi².

PERIOD OF RECORD.--October 1968 to current year.

REVISED RECORDS.--WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 650 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to June 19, 1969, nonrecording gage at bridge 90 ft downstream at present datum.

REMARKS.--Estimated daily discharges: Dec. 6-11, 25-27, Jan. 2 to Feb. 22 and Mar. 2-7. Records good except for estimated daily discharges, which are poor. Some regulation by dam at Michigan Sugar Co., 1.9 mi upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--17 years, 444 ft³/s, 9.35 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,000 ft³/s, Apr. 6, 1985, gage height, 20.56 ft; minimum, 20 ft³/s, Oct. 2, 3, 1979.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 2,400 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 12	1900	2,640	10.14	Mar. 13	0100	8,740	17.56
Nov. 16	2300	2,820	10.47	Mar. 29	1600	7,310	16.11
Dec. 30	1600	6,760	16.08	Apr. 6	2400	*12,000	*20.56
Feb. 28	0500	7,280	16.08				

Minimum discharge, 31 ft³/s, Aug. 14,15, gage height, 2.95 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	119	281	560	2390	195	6410	2490	307	495	53	44	68
2	113	386	495	1500	195	5300	2160	286	396	52	46	69
3	109	488	488	1200	195	4000	1590	266	257	53	43	61
4	102	409	689	900	195	2700	1650	254	192	53	41	82
5	103	371	482	700	195	2200	4200	257	163	54	40	98
6	98	376	330	550	195	2150	10600	259	144	57	39	216
7	110	391	310	400	195	2000	11000	252	134	73	38	261
8	159	306	290	300	195	2330	6410	238	121	97	37	329
9	218	289	280	270	195	3860	2870	228	119	73	36	348
10	235	449	270	250	195	6010	1740	202	114	60	35	379
11	206	1220	260	230	195	6860	1280	185	106	50	34	396
12	180	2400	330	220	195	8110	1030	175	108	46	34	299
13	164	2190	694	210	195	8330	911	165	110	43	32	212
14	156	1390	1200	205	195	6070	850	153	108	41	32	160
15	152	1210	910	205	195	4350	819	144	104	42	32	127
16	165	2260	780	205	200	3460	760	141	123	41	32	108
17	176	2260	941	205	200	3240	663	139	141	39	32	96
18	175	1220	833	200	205	2550	594	130	178	38	34	104
19	189	917	624	200	210	1820	559	121	163	37	35	134
20	201	723	509	200	215	1800	539	132	134	38	36	131
21	288	576	385	200	215	1680	492	146	115	38	36	126
22	635	471	956	195	250	1410	453	141	110	38	35	111
23	604	434	1670	195	719	1320	429	137	106	36	35	103
24	420	403	1120	195	2000	1550	450	121	95	36	113	116
25	330	385	540	195	4210	2170	460	112	86	35	150	117
26	325	372	500	195	5660	1980	414	123	78	39	160	138
27	382	361	520	195	6630	1800	377	252	71	43	143	135
28	429	387	733	195	6980	3330	372	404	65	45	141	123
29	425	553	3630	195	---	6860	343	336	60	45	122	109
30	361	665	6420	195	---	5780	324	266	57	45	101	97
31	304	---	4750	195	---	3110	---	312	---	42	80	---
TOTAL	7633	24103	32499	12690	30619	114540	56829	6384	4253	1482	1848	4853
MEAN	246	803	1048	409	1094	3695	1894	206	142	47.8	59.6	162
MAX	635	2400	6420	2390	6980	8330	11000	404	495	97	160	396
MIN	98	281	260	195	195	1320	324	112	57	35	32	61
CFSM	.38	1.25	1.63	.63	1.70	5.73	2.94	.32	.22	.07	.09	.25
IN.	.44	1.39	1.87	.73	1.77	6.61	3.28	.37	.25	.09	.11	.28
CAL YR 1984	TOTAL	238751	MEAN 652	MAX 7200	MIN 57	CFSM 1.01	IN 13.77					
WTR YR 1985	TOTAL	297733	MEAN 816	MAX 11000	MIN 32	CFSM 1.27	IN 17.17					

STREAMS TRIBUTARY TO LAKE HURON

199

04151500 CASS RIVER AT FRANKENMUTH, MI

LOCATION.--Lat 43°19'40", long 83°44'53", in NW1/4 SE1/4 sec.27, T.11 N., R.6 E., Saginaw County, Hydrologic Unit 04080205, on right bank 2,000 ft downstream from dam in Frankenmuth, 3,600 ft upstream from highway bridge on Dehmel Road, 3.4 mi upstream from Dead Creek, and 17 mi upstream from mouth.

DRAINAGE AREA.--841 mi².

PERIOD OF RECORD.--February 1908 to March 1909, July 1935 to September 1936, June 1939 to current year.

REVISED RECORDS.--WSP 1307: 1936(M), 1940(M). WSP 1727: 1952. WSP 1911: 1952. WDR MI-78: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 583.96 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). February 1908 to March 1909, nonrecording gage at site 2,000 ft upstream at datum 1.81 ft lower. July 18 to September 11, 1935, nonrecording gage, Sept. 12, 1935, to Sept. 30, 1936, June 20, 1939, to Sept. 30, 1949, water-stage recorder, at site 3,600 ft downstream at datum 0.04 ft higher.

REMARKS.--Estimated daily discharges: Dec. 5-11, 25-27, and Jan. 2 to Feb. 24. Records good except for estimated daily discharges, which are fair. Occasional regulation by dams upstream from station. Prior to 1950, regulation at low and medium flows by mill upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--47 years, 503 ft³/s, 8.12 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,700 ft³/s, Mar. 18, 1942, gage height, 20.88 ft, site and datum then in use; maximum gage height, 23.37 ft, Feb. 3, 1968, backwater from ice; minimum daily discharge, about 1.5 ft³/s, Aug. 6, 1944.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 31	0100	7,930	18.52	Mar. 30	0300	8,370	18.90
Feb. 26	1900	10,400	20.50	Apr. 7	0800	*12,700	*22.16
Mar. 13	0900	9,820	20.08				

Minimum discharge, 45 ft³/s, Aug. 13, 14, gage height, 3.30 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	153	386	699	3980	280	8230	3180	382	632	88	74	127
2	145	468	620	1900	280	7220	2900	360	604	88	74	115
3	140	569	594	1500	280	6480	2230	339	415	85	72	105
4	133	553	705	1200	280	5590	2090	320	307	84	66	103
5	122	484	550	900	280	4620	4680	320	257	87	64	176
6	122	471	450	700	280	4150	10500	331	221	92	63	225
7	132	460	420	500	280	3610	12500	323	201	93	65	365
8	203	418	390	400	280	3270	9880	312	189	113	63	385
9	278	400	370	350	280	4880	4950	287	176	132	58	483
10	311	550	360	330	280	6590	2670	275	171	107	53	577
11	298	1170	350	310	280	7610	1950	248	160	89	51	556
12	257	2270	525	300	280	8840	1580	233	162	82	48	473
13	225	2580	820	290	280	9680	1330	221	174	76	46	347
14	207	1840	1420	280	280	8160	1200	208	175	69	46	267
15	199	1400	1330	280	280	5640	1130	205	165	68	51	209
16	207	1920	1090	280	290	4440	1080	206	186	69	54	172
17	229	2640	1120	280	290	3710	937	199	219	67	50	149
18	230	1670	1150	280	300	3370	830	190	240	62	53	192
19	233	1140	917	280	310	2380	776	179	255	64	53	354
20	278	904	766	280	320	2100	752	178	217	66	52	273
21	387	728	641	280	340	2100	716	210	191	63	52	221
22	643	608	1140	280	400	1810	653	208	174	60	50	196
23	772	541	1800	280	800	1640	599	199	172	58	50	176
24	601	518	1720	280	2000	1890	569	188	156	55	111	182
25	469	494	650	280	6560	2520	587	170	141	59	241	195
26	433	479	620	280	8110	2510	599	168	133	74	223	200
27	467	467	660	280	9090	2290	536	276	120	72	215	218
28	521	492	1230	280	8740	3640	480	465	107	71	191	196
29	535	586	3930	280	---	7280	436	479	101	70	176	171
30	489	752	7110	280	---	7700	410	383	94	72	170	193
31	423	---	7250	280	---	4780	---	485	---	75	145	---
TOTAL	9842	27958	41397	17700	41750	148730	72730	8547	6515	2410	2780	7561
MEAN	317	932	1335	571	1491	4798	2424	276	217	77.7	89.7	252
MAX	772	2640	7250	3980	9090	9680	12500	485	632	132	241	577
MIN	122	386	350	280	280	1640	410	168	94	55	46	103
CFSM	.38	1.11	1.59	.68	1.77	5.71	2.88	.33	.26	.09	.11	.30
IN.	.44	1.24	1.83	.78	1.85	6.58	3.22	.38	.29	.11	.12	.33
CAL YR 1984	TOTAL	300602	MEAN	821	MAX	8460	MIN	80	CFSM	.98	IN	13.30
WTR YR 1985	TOTAL	387920	MEAN	1063	MAX	12500	MIN	46	CFSM	1.26	IN	17.16

STREAMS TRIBUTARY TO LAKE HURON

04154000 CHIPPEWA RIVER NEAR MOUNT PLEASANT, MI

LOCATION.--Lat 43°37'32", long 84°42'28", in NW1/4 NW1/4 sec.8, T.14 N., R.3 W., Isabella County, Hydrologic Unit 04080202, on right bank 12 ft downstream from bridge on South Leaton Road, 3.8 mi northeast of Mount Pleasant, and 36 mi upstream from mouth.

DRAINAGE AREA.--416 mi².

PERIOD OF RECORD.--October 1930 to September 1931, October 1932 to current year. Monthly discharge only for some periods published in WSP 1307. Gage-height records for flood seasons collected in this vicinity 1910-27, are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 744: Drainage area. WSP 1337: 1931, 1933-40, 1945, 1948-49.

GAGE.--Water-stage recorder. Datum of gage is 710.38 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 21, 1938, nonrecording gage at site 30 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Dec. 7, 8, 13, 14, 26, 27, 29-31, Jan. 2 to Feb. 28, Aug. 25-30 and Sept. 4-11. Records good except for estimated daily discharges, which are poor. Diurnal fluctuation below 750 ft³/s caused by powerplant at Mount Pleasant prior to 1962, occasional regulation at low flow since. Since July 30, 1968, occasional regulation by control structures on lake outlets. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--54 years, 310 ft³/s, 10.12 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,960 ft³/s, Mar. 8, 1946, gage height, 12.78 ft; minimum, 12 ft³/s, Aug. 18, 1945; minimum gage height, 2.70 ft, Oct. 8, 1966; minimum daily, 19 ft³/s, Aug. 16, 1936.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,000 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 29	--	unknown	unknown	Mar. 29	1100	*1,600	*7.66
Feb. 26	--	1,050	ice jam	Apr. 6	2200	1,420	7.13
Mar. 13	1200	1,580	7.62	Sept. 8	--	1,040	5.96

Minimum discharge, 144 ft³/s, July 25; minimum gage height, 2.88 ft, July 24, 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	191	369	324	798	330	742	1230	396	304	196	171	269
2	189	383	313	700	330	780	1100	394	290	193	167	254
3	188	360	334	640	330	748	1000	375	264	190	163	241
4	187	332	326	580	330	546	953	363	249	183	158	270
5	194	347	307	530	330	594	1060	355	244	185	205	330
6	185	338	304	490	330	720	1310	355	237	187	238	500
7	201	334	300	470	330	646	1310	352	230	185	252	700
8	243	331	293	450	571	540	1170	349	230	184	257	1000
9	250	340	284	440	330	630	1080	325	256	185	231	980
10	248	428	280	430	330	714	970	318	269	183	212	910
11	242	401	279	420	330	923	890	306	265	183	200	740
12	229	369	293	410	330	1370	812	297	262	175	186	654
13	221	353	330	400	330	1530	761	293	261	174	189	538
14	217	344	360	390	330	1340	733	280	243	171	190	443
15	223	342	350	380	330	1230	723	279	241	169	186	399
16	243	336	360	370	330	1150	702	287	302	164	186	398
17	235	326	430	360	335	1130	674	296	332	159	182	321
18	222	322	391	350	340	1010	698	293	335	157	180	350
19	225	320	365	343	350	910	624	282	320	157	181	426
20	228	316	351	340	360	936	639	284	289	158	181	449
21	253	311	352	335	370	896	629	273	271	157	175	438
22	272	306	440	330	420	844	607	266	268	153	172	382
23	294	303	401	330	480	831	589	253	258	149	170	359
24	292	301	380	330	620	831	567	251	234	147	174	336
25	275	299	373	330	780	815	561	249	224	151	230	308
26	298	296	390	330	900	799	541	250	220	180	270	298
27	338	296	430	330	860	860	517	275	213	193	310	313
28	339	331	473	330	777	1250	491	321	203	201	305	306
29	342	333	1200	330	---	1560	462	348	199	187	293	292
30	337	327	1310	330	---	1440	432	332	198	178	285	284
31	338	---	970	330	---	1320	---	325	---	171	274	---
TOTAL	7739	10116	13299	12928	12113	29635	23835	9624	7713	5409	6575	13450
MEAN	250	337	429	417	433	956	795	310	257	174	212	448
MAX	342	428	1310	798	900	1560	1310	396	335	201	310	1000
MIN	185	296	279	330	330	540	432	249	198	147	158	241
CFSM	.60	.81	1.03	1.00	1.04	2.30	1.91	.75	.62	.42	.51	1.08
IN.	.69	.90	1.19	1.16	1.08	2.65	2.13	.86	.69	.48	.59	1.20
CAL YR 1984	TOTAL	127654	MEAN	349	MAX	1380	MIN	139	CFSM	.84	IN	11.42
WTR YR 1985	TOTAL	152436	MEAN	418	MAX	1560	MIN	147	CFSM	1.01	IN	13.63

STREAMS TRIBUTARY TO LAKE HURON

201

04155000 PINE RIVER AT ALMA, MI

LOCATION.--Lat 43°22'46", long 84°39'20", in SW1/4 SE1/4 sec.34, T.12 N., R.3 W., Gratiot County, Hydrologic Unit 04080202, on right bank 270 ft downstream from Superior Street Bridge in Alma, 0.6 mi downstream from municipal reservoir, and 38 mi upstream from mouth.

DRAINAGE AREA.--288 mi².

PERIOD OF RECORD.--October 1930 to current year. Gage-height records for flood seasons collected in this vicinity 1910-28 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 744: Drainage area. WSP 1307: 1945(M). WSP 1337: 1931, 1932-34(M), 1936, 1939, 1945, 1949.

GAGE.--Water-stage recorder. Datum of gage is 718.37 ft above National Geodetic Vertical Datum of 1929. Prior to Dec. 10, 1930, nonrecording gage at Superior Street Bridge at different datum. Dec. 10, 1930, to June 15, 1938, nonrecording gage at site 70 ft downstream from bridge and June 16 to Oct. 25, 1938, nonrecording gage at bridge at present datum.

REMARKS.--Estimated daily discharges: Oct. 3-18, Dec. 4-10, 22-26, and Jan. 3 to Feb. 24. Records good except for estimated daily discharges, which are poor. Flow regulated by dam 0.6 mi upstream from station and by variable backwater from powerplant at St. Louis, 5.2 mi downstream. About 4.2 ft³/s diverted upstream from station for municipal and industrial use; sewage effluent is returned downstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--55 years, 217 ft³/s, 10.23 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,400 ft³/s, Mar. 19, 1948, gage height, 10.81 ft; minimum daily, 0.40 ft³/s, Sept. 6, 1964, caused by closing dam during construction of waterworks.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,080 ft³/s, Mar. 12, gage height, 7.64 ft; minimum, 24 ft³/s, July 24, 25, gage height, 0.64 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	105	170	201	1020	195	1140	1030	296	202	127	70	204
2	99	155	211	890	195	1140	861	314	195	100	68	199
3	91	188	198	540	195	1050	779	281	180	74	66	174
4	83	219	180	460	195	900	713	285	162	70	79	151
5	76	200	170	390	195	760	899	268	150	76	90	153
6	67	176	160	350	195	647	1220	253	153	75	87	436
7	63	154	155	310	195	582	1050	241	154	92	138	542
8	90	156	150	290	195	610	997	247	128	94	164	542
9	105	157	150	270	195	759	879	267	142	67	169	590
10	120	176	155	250	195	908	754	245	156	61	117	535
11	130	212	162	240	195	1240	667	214	186	57	88	468
12	135	240	180	230	195	1830	595	247	206	54	99	403
13	130	226	215	220	195	1760	553	216	187	48	100	323
14	115	213	250	210	195	1540	517	218	189	51	83	270
15	105	184	266	205	195	1460	510	187	166	50	102	264
16	115	154	284	200	195	1240	493	200	188	38	116	227
17	120	146	266	195	200	1060	501	256	213	38	138	196
18	125	151	273	195	205	885	507	263	265	35	186	209
19	127	150	274	195	205	806	584	238	258	37	164	221
20	118	150	243	195	210	770	642	219	271	39	171	200
21	156	142	231	195	220	709	629	208	230	47	171	203
22	176	128	215	195	240	678	582	184	194	53	167	181
23	171	125	200	195	300	665	535	187	188	58	137	184
24	178	118	185	195	450	679	475	191	166	47	160	191
25	159	117	175	195	763	682	476	179	161	53	305	191
26	156	120	170	195	950	659	434	181	153	143	359	194
27	145	130	181	195	1200	708	423	212	143	186	454	187
28	153	169	277	195	1200	1060	384	229	105	160	414	195
29	151	177	983	195	---	1210	351	264	104	100	318	197
30	161	193	1030	195	---	1210	320	245	128	78	253	198
31	147	---	979	195	---	1170	---	231	---	79	208	---
TOTAL	3872	4996	8769	9000	9263	30517	19360	7266	5323	2287	5241	8228
MEAN	125	167	283	290	331	984	645	234	177	73.8	169	274
MAX	178	240	1030	1020	1200	1830	1220	314	271	186	454	590
MIN	63	117	150	195	195	582	320	179	104	35	66	151
CFSM	.43	.58	.98	1.01	1.15	3.42	2.24	.81	.62	.26	.59	.95
IN.	.50	.65	1.13	1.16	1.20	3.94	2.50	.94	.69	.30	.68	1.06

CAL YR 1984 TOTAL 86536 MEAN 236 MAX 1030 MIN 62 CFSM .82 IN 11.18
WTR YR 1985 TOTAL 114122 MEAN 313 MAX 1830 MIN 35 CFSM 1.09 IN 14.74

STREAMS TRIBUTARY TO LAKE HURON

04155500 PINE RIVER NEAR MIDLAND, MI

LOCATION.--Lat 43°33'52", long 84°22'09", in SW1/4 NW1/4 sec.4, T.13 N., R.1 E., Midland County, Hydrologic Unit 04080202, on left bank at downstream side of bridge on Meridian Road, 7.2 mi southwest of Midland, and 7.8 mi upstream from Chippewa River.

DRAINAGE AREA.--390 mi², approximately.

PERIOD OF RECORD.--May 1934 to September 1938, February 1948 to current year.

REVISED RECORDS.--WSP 1207: Drainage area. WSP 1307: 1935(M). WSP 1337: 1936-38, 1948-49.

GAGE.--Water-stage recorder. Datum of gage is 623.94 ft above National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1938, nonrecording gage at same site, at datum 5.55 ft lower. Feb. 3, 1948, to Dec. 13, 1951, nonrecording gage at present site and datum.

REMARKS.--Estimated daily discharges: Dec. 5, 6, 22-28, Jan. 3 to Mar. 12, and Sept. 18-30. Records good except for estimated daily discharges, which are poor. Regulation at low and medium flows by hydroelectric powerplant at St. Louis. Some diversion upstream from station for irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--41 years, 301 ft³/s, 10.48 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,360 ft³/s, Mar. 20, 1948, gage height, 10.00 ft, from graph based on gage readings; maximum gage height, 12.08 ft, Feb. 2, 1968, backwater from ice; minimum discharge not determined.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,200 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 28	--	1,790	ice jam	Mar. 13	1300	*3,550	7.44
Dec. 30	0400	2,180	6.04	Mar. 29	0900	1,990	5.81
Feb. 28	--	2,320	ice jam	Apr. 6	1300	2,280	6.15
Mar. 12	1500	ice jam	*11.66	Apr. 20	0700	1,280	4.93

Minimum discharge, 44 ft³/s, July 15, gage height, 2.10 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	103	228	254	1320	200	2300	1230	344	265	78	138	189
2	115	390	210	1090	200	2100	1100	99	199	127	104	181
3	117	244	334	950	200	1700	963	418	189	164	127	192
4	118	232	242	860	200	1400	938	213	210	125	61	262
5	119	342	250	740	200	1100	1020	344	173	58	77	295
6	119	314	235	540	200	900	2020	304	140	117	209	615
7	92	266	217	500	200	750	1570	332	130	56	146	1070
8	206	221	215	490	200	860	1270	183	199	59	137	916
9	190	223	202	480	200	1000	1100	170	158	180	126	766
10	170	290	206	380	200	1200	949	261	123	80	213	824
11	221	281	237	340	200	1600	823	320	132	82	184	649
12	208	274	202	320	200	2500	697	142	130	77	85	544
13	209	385	271	310	200	3240	662	238	180	111	67	490
14	183	318	334	300	200	2280	649	161	145	54	192	389
15	162	297	352	290	200	2080	562	284	210	58	132	244
16	189	293	365	285	200	1900	570	193	210	140	98	281
17	199	247	458	280	205	1510	537	132	261	88	102	290
18	175	188	284	275	210	1230	590	273	220	51	62	130
19	204	182	356	270	215	1030	803	284	372	103	223	150
20	211	219	393	265	220	1070	1170	176	246	56	147	185
21	225	189	324	260	225	893	778	224	284	53	126	230
22	266	210	350	255	230	821	842	257	292	53	135	320
23	314	175	380	250	250	842	571	161	161	53	135	115
24	258	190	400	245	300	810	653	176	196	51	218	145
25	286	172	250	240	500	820	609	186	148	153	302	110
26	243	172	350	235	1000	877	567	173	130	196	538	170
27	287	166	700	230	1600	791	571	186	125	148	436	230
28	235	167	1200	220	2100	1350	639	235	164	224	523	260
29	271	211	1530	210	---	1770	411	231	130	220	447	210
30	227	257	1880	205	---	1480	425	308	54	150	350	170
31	224	---	1370	200	---	1350	---	246	---	71	321	---
TOTAL	6146	7343	14351	12835	10255	43554	25289	7254	5576	3236	6161	10622
MEAN	198	245	463	414	366	1405	843	234	186	104	199	354
MAX	314	390	1880	1320	2100	3240	2020	418	372	224	538	1070
MIN	92	166	202	200	200	750	411	99	54	51	61	110
CFSM	.51	.63	1.19	1.06	.94	3.60	2.16	.60	.48	.27	.51	.91
IN.	.59	.70	1.37	1.22	.98	4.15	2.41	.69	.53	.31	.59	1.01
CAL YR 1984	TOTAL	118999	MEAN 325	MAX 1880	MIN 62	CFSM .83	IN 11.35					
WTR YR 1985	TOTAL	152622	MEAN 418	MAX 3240	MIN 51	CFSM 1.07	IN 14.56					

04156000 TITTABAWASSEE RIVER AT MIDLAND, MI

LOCATION.--Lat 43°35'43", long 84°14'08", in NW1/4 NE1/4 sec.28, T.14 N., R.2 E., Midland County, Hydrologic Unit 04080201, on right bank 2,000 ft downstream from dam at Dow Chemical Co. powerplant in Midland, 0.7 mi upstream from Bullock Creek, 1.4 mi downstream from Chippewa River and 23 mi upstream from mouth.

DRAINAGE AREA.--2,400 mi², approximately.

PERIOD OF RECORD.--March 1936 to current year. Gage-height records for flood seasons collected in this vicinity 1910-26, 1928, and since 1946 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 1045: 1945. WSP 1144: 1948.

GAGE.--Water-stage recorder. Datum of gage is 580.28 ft above National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1955, at datum 10.00 ft higher.

REMARKS.--Estimated daily discharges: Jan. 3, 4, and Jan. 9 to Feb. 22. Records good except for estimated daily discharges, which are poor. Water is diverted from river a short distance upstream from station for industrial use. Small part returned to river 0.25 mi downstream from station, remainder returned 1 mi downstream. Extremes and daily discharges not adjusted for diversion. Prior to May 20, 1970, discharge below 4,000 ft³/s regulated by dam 2,000 ft upstream from station; fixed crest dam since. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--49 years, 1,703 ft³/s, 9.64 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 34,000 ft³/s, Mar. 21, 1948, gage height, 29.50 ft, current datum; minimum, 39 ft³/s, Oct. 1, 1942; minimum gage height, 8.98 ft, Aug. 26, 27, 1984; minimum daily, 111 ft³/s, Aug. 21, 1949.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known since at least 1907, 29.7 ft, Mar. 28, 1916, discharge, 34,800 ft³/s, from information by U.S. Weather Bureau.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 7,000 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 30	1430	14,300	22.54	Mar. 29	1830	16,600	23.77
Mar. 1	0300	10,700	20.47	Apr. 6	2330	15,700	23.32
Mar. 13	2100	*19,000	*24.93	Sept. 7	1200	9,300	19.56

Minimum discharge, 281 ft³/s, July 24, gage height, 9.18 ft; minimum daily, 337 ft³/s, July 21.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	604	1480	1000	6820	1900	10400	9110	1910	855	571	898	700
2	594	1370	844	4960	1900	9580	5980	1900	715	818	623	647
3	604	1120	1580	4360	1600	8650	5300	1830	860	1010	464	1280
4	599	751	1880	4050	1400	7780	5620	1320	930	548	368	1780
5	589	1420	1760	3770	1200	6280	8740	1080	797	866	442	2120
6	429	1650	1350	2290	1100	5680	14400	1270	781	521	651	6940
7	429	1180	1280	2460	1350	5280	14900	1840	876	384	1050	8980
8	941	1270	776	2510	1400	4770	10200	1470	623	521	1150	7610
9	1160	1350	715	2300	780	4930	6410	1430	627	807	1120	8810
10	1080	1210	1450	4050	720	5800	5350	1240	936	608	797	7420
11	936	1110	1500	4700	1200	7890	4750	975	855	571	580	4440
12	1330	1630	1700	3450	2000	13400	4350	844	807	557	715	3690
13	736	1890	2010	2350	2100	18300	4080	1180	932	434	761	3330
14	516	1840	2390	3050	1900	17400	3860	1470	1150	348	871	2130
15	969	1420	3020	4000	1700	13300	3850	1320	705	642	903	1190
16	920	1330	1580	3000	1400	10300	3780	1360	741	599	850	1360
17	986	866	2150	2950	1150	9480	3640	1250	1540	534	490	1300
18	1250	720	2370	2900	950	8010	3630	844	1810	503	392	1350
19	909	1320	2020	2000	1500	6050	3640	850	1890	539	751	2520
20	661	1350	2160	1250	2000	6430	4820	1400	1350	388	834	3420
21	585	1260	2040	1550	2500	6840	2970	1430	1010	337	637	3060
22	1060	751	2500	1900	3300	5890	2990	1210	823	485	498	2310
23	1200	1080	1930	2400	4520	5570	2690	1160	696	446	860	1680
24	1210	766	2020	2250	5800	6060	2760	850	807	434	671	1670
25	1380	681	1040	2700	7200	6720	3960	651	802	604	1350	1290
26	1250	969	1680	1700	8470	6130	3650	696	876	715	2170	1410
27	898	1130	2600	1150	10300	6360	2070	866	887	599	3020	1810
28	746	1640	2920	1300	10500	10800	1770	2380	730	594	2940	1240
29	1340	1820	7590	1800	---	15700	2140	2540	566	887	1660	948
30	1610	1360	13600	1700	---	15000	2020	2350	417	1010	1430	911
31	1500	---	11500	1850	---	10200	---	1460	---	604	887	---
TOTAL	29021	37734	82955	87520	81840	274980	153430	42376	27414	18484	30833	87346
MEAN	936	1258	2676	2823	2923	8870	5114	1367	914	596	995	2912
MAX	1610	1890	13600	6820	10500	18300	14900	2540	1890	1010	3020	8980
MIN	429	681	715	1150	720	4770	1770	651	417	337	368	647
†	15.2	12.8	14.2	9.6	11.3	14.7	14.1	14.2	10.7	15.8	15.2	20.9
MEAN‡	951	1271	2690	2833	2934	8885	5128	1381	925	612	1010	2933
CFSM‡	.40	.53	1.12	1.18	1.22	3.70	2.14	.58	.39	.26	.42	1.22
IN‡	.46	.59	1.29	1.36	1.27	4.27	2.38	.66	.43	.29	.49	1.36

CAL YR 1984 TOTAL 710960 MEAN 1943 MAX 13600 MIN 228 MEAN‡ 1956 CFSM‡ .82 IN‡ 11.09
WTR YR 1985 TOTAL 953933 MEAN 2614 MAX 18300 MIN 337 MEAN‡ 2628 CFSM‡ 1.10 IN‡ 14.85

† Diversion in cubic feet per second, furnished by Dow Chemical Co.

‡ Adjusted for diversion.

STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°24'46", long 83°57'47", in NW1/4 SE1/4 sec.26, T.12 N., R.4 E., Saginaw County, Hydrologic Unit 04080206, on right bank 1,000 ft downstream from bridge on Rust Avenue in Saginaw, 1.9 mi downstream from Tittabawasee River and 20.3 mi upstream from mouth. Water quality sampling site at downstream side of bridge on Rust Avenue.

DRAINAGE AREA.--6,060 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--1904, 1908-9, 1912-13, 1916, 1918-19, 1929-30, and 1942 (flood discharge for certain periods only) in WSP 1084; December 1942 to current year (high-water periods only); no high water 1944, 1949, 1953, 1955, 1958, 1961, 1963, 1964, 1966. Gage-height records for flood seasons collected in this vicinity 1910-20, and for entire years since 1921 are contained in reports of U.S. Weather Bureau.

GAGE.--Water-stage recorder. Datum of gage is 565.11 ft, International Great Lakes datum. Prior to Oct. 1, 1972, nonrecording gage at site 1.9 mi downstream at same datum. Auxiliary water-stage recorder on right bank near Aplin Beach, 19.9 mi downstream.

REMARKS.--No estimated daily discharges. Water-discharge records fair; only daily discharges greater than 10,000 ft³/s are published. Considerable diversion through metropolitan area of Saginaw. National Weather Service gage-height telemeter at station.

COOPERATION.--Auxiliary gage-height record furnished by NOAA-National Ocean Survey.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 68,000 ft³/s, Mar. 30, 1904, gage height, 24.9 ft, site then in use.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 39,100 ft³/s, Mar. 1; maximum daily gage height, 21.20 ft, Apr. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1			---	22200	---	39100	28300					---
2			---	20600	---	37500	22800					---
3			---	17700	---	36400	19300					---
4			---	16400	---	33200	15800					---
5			---	17000	---	30200	18300					---
6			---	13900	---	27700	28800					10600
7			---	11500	---	25400	34100					17600
8			---	10000	---	22500	37900					22000
9			---	---	---	22500	36900					22600
10			---	---	---	24400	34900					24000
11			---	---	---	26800	27900					21900
12			---	---	---	29900	23400					18500
13			---	---	---	33200	19200					16600
14			---	---	---	35600	16100					13600
15			---	---	---	39200	13000					10100
16			---	---	---	33600	11300					---
17			---	---	---	28700	11500					---
18			---	---	---	26000	---					---
19			---	---	---	21800	---					---
20			---	---	---	17900	10000					---
21			---	---	---	16400	---					---
22			---	---	---	15000	---					---
23			---	---	---	13000	---					---
24			---	---	13000	11700	---					---
25		11100	---	---	18100	13600	---					---
26		---	---	---	25400	13700	---					---
27		---	---	---	32100	13000	---					---
28		10000	---	---	34900	14700	---					---
29		12200	---	---	---	20900	---					---
30		17000	---	---	---	25400	---					---
31		20000	---	---	---	29400	---					---

STREAMS TRIBUTARY TO LAKE HURON

205

04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1975 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to September 1981.

WATER TEMPERATURE: November 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Nov. 6, 1976 to Sept. 30, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at Rust Ave. bridge. Occasional winter samples are collected near Court St. bridge. Water-discharge measurements were made at times of sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975, 1977, 1979): Maximum recorded (more than 20 percent missing record), 1,230 microsiemens, Jan. 5, 1977; minimum recorded (more than 20 percent missing record), 224 microsiemens, Mar. 13, 1977.

WATER TEMPERATURES (water years 1975-77, 1979): Maximum, 30.0°C, July 10, 14, 20, 1977; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, O.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
OCT 17...	1030	3180	691	8.2	16.5	12	6.4	67	220	210
MAR 12...	1030	29600	370	7.8	2.5	20	11.3	85	760	580
MAY 22...	1000	2560	640	8.4	18.5	5.5	8.9	96	K82	K46
AUG 08...	1000	2290	889	8.6	24.0	11	11.8	143	320	K60

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 17...	250	53	64	21	43	27	1	3.5	2.4	50
MAR 12...	160	38	43	12	10	12	.4	2.6	3.6	31
MAY 22...	260	50	69	21	34	22	1	3.1	1.6	43
AUG 08...	250	93	67	21	79	40	2	3.1	.8	50

STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 17...	1030	79	.30	5.0	412	380	.56	3540	1.2
MAR 12...	1030	24	.10	5.0	225	200	.31	18000	2.4
MAY 22...	1000	59	.30	2.1	421	360	.57	2910	.74
AUG 08...	1000	160	.30	3.8	510	480	.69	3150	.22

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, DIS- SOLVED TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 17...	.330	1.3	.110	.030	.030	57	489	96
MAR 12...	.180	1.2	.060	<.010	--	77	6150	67
MAY 22...	.200	1.1	.060	.030	<.010	28	194	81
AUG 08...	.040	.80	.060	<.010	<.010	33	204	99

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 17...	10	2	48	<.5	<1	<1	<3	7	14	<1
MAR 12...	<10	<1	26	<.5	<1	<1	<3	11	52	<1
MAY 22...	20	2	48	<.5	<1	4	<3	5	11	5
AUG 08...	20	2	43	<.5	<1	3	<3	6	6	<1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 17...	8	11	<.1	<10	2	<1	<1	370	<6	4
MAR 12...	<4	16	.1	<10	<1	<1	<1	130	<6	12
MAY 22...	5	11	<.1	<10	2	<1	<1	290	<6	8
AUG 08...	13	2	.9	<10	3	<1	<1	480	<6	<3

STREAMS TRIBUTARY TO LAKE HURON

207

04159010 PIGEON RIVER NEAR CASEVILLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°56'22", long 83°14'30", in SW1/4 NW1/4 sec.31, T.18 N., R.11 E., Huron County, Hydrologic Unit 04080103, at bridge on Kinde Road, 1.5 mi east of Caseville, and 3.1 mi upstream from mouth.

DRAINAGE AREA.--125 mi².

PERIOD OF RECORD.--January 1978 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April 1978 to September 1981.

WATER TEMPERATURE: April 1978 to September 1981.

REMARKS.--Quarterly cross-sectional samples were collected at or near bridge. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results from these samples were not published. Water-discharge measurements were made at times of sampling. Some regulation at low flows.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water year 1980): Maximum daily recorded (more than 20 percent missing record), 2,000 microsiemens, Oct. 20, 1979; minimum daily recorded (more than 20 percent missing record), 175 microsiemens, Mar. 6, 1979.

WATER TEMPERATURE (water year 1978): Maximum daily recorded (more than 20 percent missing record), 27.5°C, July 7, 1978; minimum daily recorded (more than 20 percent missing record), 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION	COLI- FORM, FECAL, O.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. / 100 ML)
OCT 16...	1330	8.0	731	8.1	15.5	2.3	6.3	64	K86	--
MAR 11...	1400	1560	438	7.7	1.5	20	10.4	77	440	4300
MAY 21...	1345	15	722	8.3	17.0	2.0	11.6	122	K70	K24
AUG 07...	1130	14	685	8.1	21.0	12	7.2	83	E1100	K12000

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 16...	360	96	95	30	20	11	.5	6.9	4.1	100
MAR 11...	200	57	56	14	5.1	5	.2	3.2	5.4	34
MAY 21...	380	110	100	31	13	7	.3	2.8	2.6	--
AUG 07...	310	120	82	26	19	11	.5	8.0	2.9	88

STREAMS TRIBUTARY TO LAKE HURON

04159010 PIGEON RIVER NEAR CASEVILLE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
OCT 16...	1330	46	.20	2.9	504	460	.69	11	.47
MAR 11...	1400	20	.20	5.7	313	220	.43	1320	5.5
MAY 21...	1345	--	.20	2.0	526	--	.72	21	1.6
AUG 07...	1130	42	.30	5.3	443	390	.60	17	9.2

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 16...	<.010	.80	.040	.010	.010	57	1.2	80
MAR 11...	.130	1.0	.210	.170	--	73	307	40
MAY 21...	.050	1.9	.050	.040	.020	19	.77	65
AUG 07...	.180	1.4	.300	.280	.260	19	.72	92

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
OCT 16...	<10	1	59	<.5	<1	<1	<3	5	35	<1
MAR 11...	--	1	26	<.5	<1	2	<3	5	530	1
MAY 21...	20	2	51	--	<1	4	<3	2	10	2
AUG 07...	20	3	46	<.5	<1	1	<3	4	16	3

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
OCT 16...	<4	52	<.1	<10	2	<1	<1	330	<6	5
MAR 11...	<4	18	.1	<10	<1	1	<1	100	<6	24
MAY 21...	4	31	.1	<10	<1	<1	<1	300	<6	6
AUG 07...	10	26	.2	<10	7	1	<1	320	<6	10

STREAMS TRIBUTARY TO ST. CLAIR RIVER

209

04159130 ST. CLAIR RIVER AT PORT HURON, MI
(National stream quality accounting network station)

LOCATION.--Lat 42°59'19", long 82°25'29", in SE1/4 sec.3, T.6 N., R.17 E., St. Clair County, Hydrologic Unit 04090001, at Port Huron municipal water-treatment plant in Port Huron.

DRAINAGE AREA.--222,400 mi², approximately.

PERIOD OF RECORD.--Water years 1970-73, January 1978 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April 1978 to September 1981.

WATER TEMPERATURE: April 1978 to September 1981.

REMARKS.--Bimonthly grab samples were collected near the Port Huron municipal water-treatment plant. Daily-mean water discharges reported for sampling times.

COOPERATION.--Water discharges were furnished by the National Oceanic and Atmospheric Administration.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1979-81): Maximum daily, 260 microsiemens, Dec. 18, 1980; minimum daily, 194 microsiemens, Jan. 27, 28, 1980.

WATER TEMPERATURE (water years 1979-81): Maximum daily, 24.0°C, Aug. 14-16, 1980; minimum daily, 0.0°C on many days during winter.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 265 microsiemens was measured Mar. 18, 1982. A specific conductance of 164 microsiemens was measured July 3, 1972.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	DIS- CHARGE, IN CUBIC FEET PER SECOND	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
NOV 23...	1300	231000	195	7.9	4.5	.50	12.3	96	K1	K3
DEC 12...	1500	219000	198	7.8	4.5	1.0	12.4	99	K3	K1
MAR 19...	1600	212000	223	8.0	1.5	1.5	14.0	102	K1	<1
MAY 31...	1100	219000	216	8.3	12.0	.70	11.8	114	E2	70
JUL 31...	1030	237000	211	8.3	20.5	1.0	8.5	96	K1	K11
AUG 27...	1500	231000	209	8.4	20.0	.30	9.0	100	<1	K2

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 23...	97	14	27	7.2	3.6	7	.2	.80	2.0	18
DEC 12...	95	3	26	7.2	3.3	7	.2	.80	2.8	17
MAR 19...	100	17	28	7.6	3.7	7	.2	.80	1.6	18
MAY 31...	100	15	28	7.3	3.9	8	.2	.80	.8	18
JUL 31...	97	14	27	7.3	3.6	7	.2	.60	.8	18
AUG 27...	97	15	27	7.2	3.7	8	.2	.80	.6	17

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159130 ST. CLAIR RIVER AT PORT HURON, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)
NOV 23...	1300	5.9	.10	1.4	125	110	.17
DEC 12...	1500	6.0	<.10	1.8	119	120	.16
MAR 19...	1600	6.4	<.10	1.1	126	120	.17
MAY 31...	1100	6.3	.10	.8	151	120	.21
JUL 31...	1030	6.4	.10	.5	138	110	.19
AUG 27...	1500	7.1	<.10	.6	117	110	.16

DATE	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)
NOV 23...	78000	.27	<.010	1.5	<.010	<.010	<.010
DEC 12...	70400	.30	<.010	<.10	<.010	<.010	<.010
MAR 19...	72100	.27	.020	.40	<.010	<.010	<.010
MAY 31...	89300	.34	.020	<.10	<.010	<.010	--
JUL 31...	88300	.25	.090	.20	<.010	<.010	<.010
AUG 27...	73000	.21	<.010	.60	.060	.030	<.010

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
NOV 23...	10	<1	18	<.5	<1	<1	<3	<1	<3	1
MAR 19...	<10	<1	17	<.5	<1	<1	<3	1	6	7
MAY 31...	20	<1	16	<.5	<1	6	<3	1	<3	4
AUG 27...	<10	<1	16	<.5	<1	<1	<3	2	4	1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
NOV 23...	4	<1	.2	<10	<1	<1	<1	98	<6	4
MAR 19...	<4	1	<.1	<10	1	<1	1	100	<6	4
MAY 31...	5	<1	<.1	<10	2	<1	2	100	<6	3
AUG 27...	<4	<1	<.1	<10	1	<1	<1	100	<6	4

STREAMS TRIBUTARY TO ST. CLAIR RIVER

211

04159500 BLACK RIVER NEAR FARGO, MI

LOCATION.--Lat 43°05'32", long 82°37'05", in NW1/4 sec.32, T.8 N., R.16 E., St. Clair County, Hydrologic Unit 04090001, on left bank 20 ft downstream from bridge on Norman Road, 2.1 mi east of Fargo, 5.3 mi upstream from Mill Creek, and 12 mi northwest of Port Huron.

DRAINAGE AREA.--480 mi².

PERIOD OF RECORD.--February 1944 to current year.

REVISED RECORDS.--WSP 1307: 1950(M). WSP 1627: 1956-58. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 613.75 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to July 9, 1954, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 15-28, Dec. 5-10, 25-28, and Jan. 6 to Mar. 4. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--41 years, 295 ft³/s, 8.35 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,400 ft³/s, Apr. 5, 1947, gage height, 16.06 ft, from floodmark, from rating curve extended above 9,500 ft³/s; maximum gage height observed, 18.05 ft, Feb. 20, 1951, backwater from ice; minimum discharge observed, 1.8 ft³/s, Sept. 18, 19, 1946.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 12	0900	4,160	10.46	Mar. 12	2300	6,500	12.60
Dec. 30	0800	5,180	11.58	Mar. 29	0800	5,370	11.54
Feb. 25	--	8,600	ice jam	Apr. 6	1500	*9,220	14.30
Feb. 26	1200	ice jam	*16.16				

Minimum discharge, 14 ft³/s, Aug. 18, gage height, 1.79 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	96	396	3960	53	5600	2590	125	206	30	22	39
2	50	105	310	3600	53	5050	1960	115	182	31	22	36
3	48	178	286	2560	53	4450	1220	106	111	35	21	31
4	47	180	408	1520	53	4200	1330	101	88	36	21	33
5	42	330	300	625	53	2970	4510	99	73	39	19	34
6	40	330	200	350	53	2020	8320	97	61	34	21	42
7	41	225	170	210	53	1840	7280	99	58	33	22	44
8	46	165	160	150	53	1920	6190	91	56	64	21	53
9	52	134	150	130	53	3400	4730	86	55	55	20	110
10	72	332	140	100	53	4620	2270	81	53	40	19	153
11	88	2410	139	90	56	5470	877	78	51	32	20	224
12	82	3880	159	80	65	6220	636	75	53	28	17	172
13	80	3100	518	70	130	6170	531	74	51	28	18	107
14	74	2400	858	65	115	5030	500	67	48	28	16	78
15	67	1300	626	64	95	4090	449	63	47	29	20	61
16	60	2900	579	63	85	3010	417	64	51	30	26	50
17	55	2400	636	62	75	2620	369	60	52	25	21	44
18	54	1800	521	60	72	1970	327	60	62	25	17	40
19	56	1300	365	59	70	1260	293	61	73	24	17	40
20	67	850	282	58	70	1300	283	60	70	24	19	41
21	86	600	218	57	70	1330	276	60	57	24	19	49
22	240	450	606	56	80	974	244	59	52	24	23	50
23	355	350	1570	56	250	921	215	58	49	22	20	43
24	208	300	894	55	1950	1390	195	53	45	20	32	43
25	145	250	365	55	8000	1960	187	51	42	20	50	39
26	117	230	245	54	7200	1720	184	51	38	22	100	38
27	126	220	210	54	6800	1530	172	73	35	24	114	45
28	159	245	700	54	6200	3390	155	168	33	25	73	44
29	165	636	3290	54	---	5240	140	179	33	26	52	41
30	139	592	4980	53	---	4590	130	129	32	25	46	39
31	110	---	4240	53	---	3510	---	123	---	22	43	---
TOTAL	3026	28288	24521	14477	31913	99765	46980	2666	1917	924	971	1863
MEAN	97.6	943	791	467	1140	3218	1566	86.0	63.9	29.8	31.3	62.1
MAX	355	3880	4980	3960	8000	6220	8320	179	206	64	114	224
MIN	40	96	139	53	53	921	130	51	32	20	16	31
CFSM	.20	1.97	1.65	.97	2.38	6.70	3.26	.18	.13	.06	.07	.13
IN.	.23	2.19	1.90	1.12	2.47	7.73	3.64	.21	.15	.07	.08	.14
CAL YR 1984	TOTAL	178872	MEAN 489	MAX 5200	MIN 31	CFSM 1.02	IN 13.86					
WTR YR 1985	TOTAL	257311	MEAN 705	MAX 8320	MIN 16	CFSM 1.47	IN 19.94					

STREAMS TRIBUTARY TO ST. CLAIR RIVER

213

04160600 BELLE RIVER AT MEMPHIS, MI

LOCATION.--Lat 42°54'03", long 82°46'09", in NW1/4 SE1/4 sec.35, T.6 N., R.14 E., St. Clair County, Hydrologic Unit 04090001, on right downstream side of bridge on State Highway 19 at Memphis.

DRAINAGE AREA.--151 mi².

PERIOD OF RECORD.--October 1962 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 720 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 8, 9, 26, 27, and Jan. 7 to Mar. 2. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--23 years, 89.6 ft³/s, 8.06 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,520 ft³/s, Apr. 19, 1975, gage height, 8.96 ft; minimum, 2.3 ft³/s, Sept. 6, 10, 1978; minimum gage height, 1.17 ft, Sept. 6, 1978.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1947, reached a stage of about 9 ft, from information by local residents.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 600 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Dec. 30	1000	1,250	6.50	Mar. 29	0600	1,200	6.37
Jan. 2	0500	1,790	7.32	Apr. 1	1300	650	4.75
Feb. 24	--	*2,700	*8.27	Apr. 6	1000	2,690	8.13
Mar. 9	0900	1,700	7.21	Sept. 9	0700	1,340	6.65

a Ice jam.

Minimum discharge, 7.0 ft³/s, Aug. 14, gage height, 1.41 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	19	84	998	40	800	593	49	30	13	12	20
2	19	21	70	1320	39	680	446	43	27	14	11	18
3	18	23	68	771	39	565	341	42	23	16	11	17
4	18	23	77	467	38	393	324	42	22	20	9.6	16
5	17	26	52	319	37	332	966	40	19	21	9.8	16
6	16	31	59	202	37	460	2410	44	19	20	11	377
7	17	28	56	130	36	495	1640	44	18	22	11	1020
8	18	26	45	90	35	572	731	44	17	19	10	1150
9	22	26	50	56	35	1390	463	41	19	17	9.0	1310
10	24	33	44	50	35	996	345	39	18	16	8.8	1090
11	20	266	57	49	36	738	329	37	17	14	8.9	624
12	20	435	70	48	40	717	319	34	18	13	8.9	374
13	19	325	189	48	43	727	257	32	22	13	8.4	252
14	19	193	255	47	50	488	217	30	22	12	7.9	183
15	19	163	191	47	45	378	189	27	22	14	12	146
16	18	313	163	46	40	299	169	25	22	12	15	115
17	19	285	133	46	37	266	143	26	26	11	16	97
18	21	172	103	45	33	212	114	26	30	10	14	87
19	22	124	81	45	32	178	97	25	36	10	13	83
20	21	97	69	45	31	169	100	24	31	12	13	74
21	26	77	62	44	31	156	94	27	28	16	13	60
22	39	68	201	44	32	134	86	30	25	14	12	55
23	36	57	240	44	85	131	78	27	22	15	12	57
24	30	54	151	43	1600	275	72	24	19	13	19	67
25	25	53	67	43	2300	437	70	21	17	12	39	83
26	24	51	65	42	1950	328	72	21	15	13	47	68
27	23	50	60	42	1800	281	62	24	14	16	40	59
28	22	58	135	41	1100	593	56	43	14	16	33	54
29	21	107	630	41	---	1150	51	43	13	13	25	49
30	20	97	1140	41	---	742	50	36	13	13	22	45
31	19	---	739	40	---	470	---	32	---	12	21	---
TOTAL	672	3305	5406	5534	9658	15572	10890	1046	638	454	503.3	7668
MEAN	21.7	110	174	179	345	502	363	33.7	21.3	14.6	16.2	256
MAX	39	435	1140	1520	2300	1390	2410	49	36	22	47	1310
MIN	16	19	44	40	31	131	50	21	13	10	7.9	16
CFSM	.14	.73	1.15	1.19	2.29	3.33	2.40	.22	.14	.10	.11	1.70
IN.	.17	.81	1.33	1.36	2.38	3.84	2.68	.26	.16	.11	.12	1.89
CAL YR 1984	TOTAL	34217.2	MEAN	93.5	MAX	1240	MIN	8.1	CFSM	.62	IN	8.43
WTR YR 1985	TOTAL	61346.3	MEAN	168	MAX	2410	MIN	7.9	CFSM	1.11	IN	15.11

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04160800 SASHABAW CREEK NEAR DRAYTON PLAINS, MI

LOCATION.--Lat 42°43'12", long 83°21'13", in SE1/4 sec.26, T.4 N., R.9 E., Oakland County, Hydrologic Unit 04090003, on right bank at upstream side of culverts on Maybee Road, 1.1 mi upstream from mouth, and 2.5 mi northeast of Drayton Plains.

DRAINAGE AREA.--20.9 mi².

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Metal V-notch weir Aug. 30, 1961, to Mar. 6, 1968. Elevation of gage is 970 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).

REMARKS.--Estimated daily discharges: Dec. 4-7, 23-25, Jan. 3, 4, Jan. 8 to Feb. 26, Feb. 28, and Mar. 6. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 12.4 ft³/s, 8.06 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 181 ft³/s, Oct. 1, 1981, gage height, 4.53 ft; minimum, 0.05 ft³/s, Aug. 21, 24, 27, 1984; minimum gage height, 1.59 ft, Aug. 1, 2, 1960.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 45 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	1900	52	3.18	Mar. 29	0600	49	3.12
Feb. 24	--	86	*a4.14	Apr. 6	0900	*87	3.76
Mar. 5	0700	67	3.49	Aug. 25	0200	75	3.65
Mar. 9	0200	67	3.49	Sept. 9	1000	46	3.10

a Ice jam.

Minimum discharge, 0.54 ft³/s, Oct. 4, gage height, 1.84 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.90	2.5	6.4	41	7.5	58	43	17	15	3.2	3.0	24
2	.90	3.2	5.9	42	7.5	55	40	16	13	3.3	2.6	24
3	.80	2.9	6.8	35	7.5	51	40	15	11	4.9	2.3	22
4	.70	3.6	6.2	30	7.5	48	38	14	9.4	4.1	2.0	20
5	.70	3.9	5.5	28	7.5	63	48	13	8.6	4.1	2.1	18
6	.70	3.3	5.2	26	7.5	55	81	25	7.8	4.6	2.5	20
7	1.1	2.9	5.0	24	7.5	52	69	23	7.1	3.8	2.5	22
8	1.8	2.7	4.9	22	7.5	55	61	20	6.8	29	2.3	24
9	1.6	3.1	4.8	20	7.5	64	55	18	6.4	20	1.9	42
10	1.4	4.7	5.9	18	7.5	60	49	16	5.8	12	1.8	34
11	1.2	19	6.6	16	7.8	59	46	14	6.4	8.4	1.7	30
12	1.2	14	7.7	15	8.4	61	43	13	9.1	6.8	1.6	26
13	1.2	10	9.3	14	9.4	58	40	12	7.7	5.7	1.5	24
14	1.4	9.1	9.0	13	11	53	38	12	6.8	5.3	1.6	21
15	1.4	10	9.2	13	13	49	37	11	6.4	6.6	14	19
16	1.8	11	8.8	12	12	46	35	13	9.1	7.7	11	17
17	1.6	9.6	8.4	11	10	43	32	15	9.2	6.0	6.9	17
18	1.6	8.7	8.0	10	9.0	40	32	14	12	5.1	12	16
19	2.0	7.8	7.8	9.8	8.5	38	31	12	10	4.6	17	16
20	2.0	6.8	7.4	9.6	8.5	36	29	12	8.4	4.9	9.8	14
21	3.8	6.2	8.1	9.4	8.5	35	28	13	7.2	4.7	7.9	13
22	3.8	5.8	11	9.0	12	33	26	11	6.7	4.4	6.7	13
23	3.1	5.6	9.5	8.6	30	33	25	10	6.4	3.8	5.8	13
24	2.7	5.5	8.2	8.2	75	38	25	9.6	5.5	3.2	31	17
25	2.3	5.3	7.2	8.0	70	37	26	8.6	5.0	2.9	62	15
26	2.6	5.1	5.9	7.8	70	34	24	9.0	4.7	5.9	46	14
27	2.5	5.0	6.1	7.6	79	35	23	16	4.2	4.9	43	12
28	2.3	6.7	10	7.6	65	45	21	19	3.8	4.0	36	11
29	2.1	7.3	23	7.6	---	48	20	15	3.5	3.2	31	9.9
30	2.0	6.9	26	7.6	---	45	19	15	3.4	2.8	29	9.5
31	1.9	---	21	7.6	---	43	---	19	---	2.9	27	---
TOTAL	55.10	198.2	274.8	498.4	582.1	1470	1124	450.2	226.4	192.8	425.5	577.4
MEAN	1.78	6.61	8.86	16.1	20.8	47.4	37.5	14.5	7.55	6.22	13.7	19.2
MAX	3.8	19	26	42	79	64	81	25	15	29	62	42
MIN	.70	2.5	4.8	7.6	7.5	33	19	8.6	3.4	2.8	1.5	9.5
CFSM	.09	.32	.42	.77	1.00	2.27	1.79	.69	.36	.30	.66	.92
IN.	.10	.35	.49	.89	1.04	2.62	2.00	.80	.40	.34	.76	1.03
CAL YR 1984	TOTAL	3433.47	MEAN	9.38	MAX	62	MIN	.06	CFSM	.45	IN	6.11
WTR YR 1985	TOTAL	6074.90	MEAN	16.6	MAX	81	MIN	.70	CFSM	.79	IN	10.81

STREAMS TRIBUTARY TO LAKE ST. CLAIR

215

04160900 CLINTON RIVER NEAR DRAYTON PLAINS, MI

LOCATION.--Lat 42°39'37", long 83°23'25", in NE1/4 sec.21, T.3 N., R.9 E., Oakland County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on State Highway 59, 1.0 mi downstream from State fish hatchery, and 2.0 mi south of Drayton Plains.

DRAINAGE AREA.--79.2 mi².

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 940 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft). Jan. 29 to July 9, 1964, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 25, Jan. 15, 20-22, Feb. 1-4, 8-10, 16, and 19. Records good. Some regulation and occasional diversion for lake-level control at many lakes upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 50.2 ft³/s, 8.61 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 276 ft³/s, Mar. 12, 1974, gage height, 4.95 ft; minimum, 2.4 ft³/s, May 31, 1961; minimum gage height, 1.23 ft, Jan. 4, 1961.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 183 ft³/s, Apr. 9, gage height, 4.60 ft; minimum, 9.5 ft³/s, July 3, 4, gage height, 2.08 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	23	52	82	61	150	136	80	73	14	23	129
2	23	23	51	82	60	152	139	75	78	13	22	122
3	23	22	53	83	59	152	141	43	78	10	22	114
4	23	23	55	85	57	163	141	14	77	9.8	20	108
5	23	22	61	86	57	168	141	14	75	12	14	103
6	21	22	62	85	57	163	143	17	58	11	14	99
7	21	22	62	85	56	159	139	16	18	11	14	95
8	21	22	61	86	55	158	177	17	12	42	14	64
9	19	23	57	83	54	159	183	21	12	87	13	44
10	19	28	56	81	52	162	181	38	11	88	13	73
11	19	50	53	78	53	160	177	44	13	73	13	75
12	17	78	51	74	56	162	176	60	13	31	13	78
13	16	72	50	72	57	165	172	70	13	29	13	78
14	16	71	48	70	57	167	167	64	13	28	13	78
15	18	74	45	68	56	166	161	60	15	31	30	76
16	20	73	44	65	55	162	146	52	31	29	45	72
17	21	73	43	67	53	157	134	30	55	29	45	48
18	27	73	42	66	52	150	122	27	68	28	56	24
19	38	72	44	67	52	140	117	26	75	29	54	25
20	36	69	45	66	50	121	113	28	74	27	68	30
21	42	66	48	66	50	108	109	39	65	27	87	42
22	40	63	50	65	57	100	107	38	28	26	85	40
23	38	61	53	64	71	98	101	37	26	25	58	41
24	38	60	57	64	85	98	99	34	26	25	57	44
25	37	57	57	64	90	96	95	32	26	27	94	41
26	36	55	56	63	109	95	86	28	26	31	125	43
27	26	54	58	62	135	97	88	25	22	29	133	44
28	25	57	61	62	150	104	86	43	15	29	150	46
29	23	56	66	61	---	110	84	66	15	28	155	47
30	23	54	66	61	---	125	81	65	14	28	153	47
31	23	---	67	61	---	134	---	68	---	24	142	---
TOTAL	795	1518	1674	2224	1856	4301	3962	1271	1125	930.8	1758	1970
MEAN	25.6	50.6	54.0	71.7	66.3	139	132	41.0	37.5	30.0	56.7	65.7
MAX	42	78	67	86	150	168	183	80	78	88	155	129
MIN	16	22	42	61	50	95	81	14	11	9.8	13	24
CFSM	.32	.64	.68	.91	.84	1.76	1.67	.52	.47	.38	.72	.83
IN.	.37	.71	.79	1.04	.87	2.02	1.86	.60	.53	.44	.83	.93
CAL YR 1984	TOTAL	12934.0	MEAN	35.3	MAX	101	MIN	4.9	CFSM	.45	IN	6.07
WTR YR 1985	TOTAL	23384.8	MEAN	64.1	MAX	183	MIN	9.8	CFSM	.81	IN	10.98

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161100 GALLOWAY CREEK NEAR AUBURN HEIGHTS, MI

LOCATION.--Lat 42°40'02", long 83°12'02", in SE1/4 sec.18, T.3 N., R.11 E., Oakland County, Hydrologic Unit 04090003, on right bank 12 ft downstream from wooden bridge on Oakland University property, and 2.7 mi northeast of Auburn Heights.

DRAINAGE AREA.--17.9 mi².

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 820.78 ft above National Geodetic Vertical Datum of 1929 (levels by Johnson & Anderson, Inc.).

REMARKS.--Estimated daily discharges: Dec. 6-15, Jan. 7 to Feb. 4, and Feb. 8-22. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 10.3 ft³/s, 7.81 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 536 ft³/s, Aug. 24, 1985, gage height, 5.62 ft; maximum gage height, 6.27 ft, June 25, 1968; minimum discharge, 0.01 ft³/s on many days during July and August, 1964; minimum gage height, 0.82 ft, Aug. 1, 1960.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 90 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 11	0300	92	3.78	July 8	0900	154	4.57
Jan. 1	1000	151	4.56	Aug. 15	0500	102	3.80
Feb. 24	0400	460	5.48	Aug. 24	2100	*536	*5.62
Mar. 8	2000	154	4.58	Aug. 26	1600	151	4.55
Apr. 6	0200	220	4.87				

Minimum discharge, 0.81 ft³/s, June 28, 29, Aug. 11, 12, gage height, 1.42 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	2.6	4.7	111	2.9	51	42	7.3	5.9	1.0	2.1	16
2	1.4	4.5	4.0	79	2.9	42	31	6.5	4.1	1.0	1.5	17
3	1.2	2.6	7.1	35	2.9	33	36	5.8	3.3	2.6	1.2	12
4	1.2	5.2	4.9	24	2.9	33	29	5.4	2.7	1.5	1.3	9.2
5	1.2	4.2	3.5	20	2.9	75	72	5.5	2.3	6.7	1.1	8.0
6	1.2	3.0	3.0	17	3.0	60	163	15	2.1	7.3	1.2	8.9
7	1.7	2.4	2.8	13	2.9	43	94	11	1.9	2.8	1.2	7.3
8	5.8	2.1	2.7	11	2.9	82	62	8.6	1.9	79	1.1	8.3
9	3.1	5.0	2.6	9.0	2.9	106	43	7.1	2.1	31	1.0	17
10	2.2	14	4.5	8.0	2.9	75	32	6.0	1.7	14	.96	13
11	1.7	78	5.5	7.0	3.0	61	28	5.1	3.7	8.3	.94	9.1
12	1.6	38	7.5	6.5	3.5	60	25	4.5	6.4	5.3	.91	6.8
13	1.4	19	11	6.0	4.5	46	23	3.9	3.6	3.5	.94	5.2
14	1.4	14	10	5.5	4.0	34	21	3.3	2.6	4.2	1.2	4.3
15	2.4	16	8.5	5.1	3.5	28	21	4.9	3.1	5.5	65	3.7
16	4.4	15	7.4	5.0	3.2	25	19	7.4	9.0	5.0	27	3.2
17	3.1	10	6.7	5.0	3.1	23	17	14	7.9	3.3	13	3.0
18	2.4	8.2	5.7	4.9	3.0	20	17	8.5	12	2.3	36	2.7
19	2.4	6.8	5.7	4.7	3.0	19	17	6.2	7.2	3.6	49	2.8
20	2.4	5.4	5.2	4.4	3.1	18	16	4.8	4.6	5.5	22	2.4
21	18	5.1	8.0	4.2	3.5	16	14	4.5	3.1	4.7	15	2.2
22	9.2	4.4	21	3.8	18	15	13	3.7	2.7	4.8	11	2.1
23	5.4	3.9	13	3.6	172	19	13	3.3	2.0	3.2	8.4	2.1
24	3.6	3.6	10	3.5	386	29	12	2.9	1.5	2.1	150	11
25	2.7	3.5	6.2	3.4	192	25	13	2.5	1.2	1.5	148	6.1
26	3.3	3.4	5.5	3.3	124	21	12	4.4	1.1	25	111	4.4
27	2.7	3.3	5.7	3.2	113	33	11	9.7	1.0	12	93	3.3
28	2.3	8.1	24	3.1	71	66	10	12	.95	6.0	44	2.7
29	2.1	7.0	51	3.0	---	71	8.9	7.2	.92	3.3	27	2.3
30	1.8	5.6	49	2.9	---	45	7.8	5.3	1.1	2.1	23	2.1
31	1.7	---	28	2.9	---	43	---	9.1	---	1.9	13	---
TOTAL	96.9	303.9	334.4	418.0	1142.5	1317	922.7	205.4	103.67	260.0	877.05	198.2
MEAN	3.13	10.1	10.8	13.5	40.8	42.5	30.8	6.63	3.46	8.39	28.3	6.61
MAX	18	78	51	111	386	106	163	15	12	79	150	17
MIN	1.2	2.1	2.6	2.9	2.9	15	7.8	2.5	.92	1.0	.91	2.1
CFSM	.18	.56	.60	.75	2.28	2.37	1.72	.37	.19	.47	1.98	.37
IN.	.20	.63	.69	.87	2.37	2.74	1.92	.43	.22	.54	1.82	.41
CAL YR 1984	TOTAL	3477.02	MEAN	9.50	MAX	188	MIN	.99	CFSM	.53	IN	7.23
WTR YR 1985	TOTAL	6179.72	MEAN	16.9	MAX	386	MIN	.91	CFSM	.94	IN	12.84

217

CAL YR 1984	TOTAL	15462.7	MEAN 42.2	MAX 353	MIN 7.0	CFSM .60	IN 8.11
WTR YR 1985	TOTAL	24685.0	MEAN 67.6	MAX 642	MIN 17	CFSM .93	IN 12.93

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161580 STONY CREEK NEAR ROMEO, MI

LOCATION.--Lat 42°48'03", long 83°05'25", in SW1/4 sec.31, T.5 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on Romeo Road, and 4.0 mi west of Romeo.

DRAINAGE AREA.--25.6 mi².

PERIOD OF RECORD.--October 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 861.64 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 8 to Mar. 4, Mar. 6, and June 29 to July 1. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 17.3 ft³/s, 9.18 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 290 ft³/s, Apr. 19, 1975, gage height, 5.19 ft; minimum, 0.92 ft³/s, Oct. 5, 9, 1967; minimum gage height, 1.28 ft, July 27, 28, 1965.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 100 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Feb. 24	1900	*189	4.25	Apr. 7	0600	130	3.81
Feb. 25	2000	ice jam	*4.33	Sept. 6	0900	101	3.60
Mar. 8	1900	133	3.77				

Minimum discharge, 2.7 ft³/s, Aug. 12; minimum gage height, 1.51 ft, Oct. 4, 5, 6, 7, Aug. 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	5.2	16	52	11	100	52	13	13	5.4	5.2	9.7
2	3.6	7.9	14	57	11	85	47	12	12	5.8	4.4	14
3	3.5	5.8	16	74	10	75	47	12	10	11	4.0	9.2
4	3.5	7.2	14	52	10	70	44	10	10	12	3.8	11
5	3.3	7.3	12	42	10	85	71	11	9.1	12	3.7	12
6	3.4	6.8	13	34	10	85	122	20	8.4	13	4.0	55
7	4.0	6.0	12	31	10	79	126	15	7.5	11	3.7	84
8	6.8	5.8	12	28	10	90	109	13	7.0	11	3.5	86
9	5.9	6.8	11	25	10	91	89	12	6.7	10	3.2	74
10	5.4	14	13	23	11	92	72	11	6.2	8.2	3.1	71
11	7.2	40	14	21	12	90	62	10	7.1	7.3	3.8	59
12	14	26	15	19	13	93	54	9.9	9.5	6.5	3.2	50
13	13	16	19	18	14	86	54	9.6	8.0	4.6	3.0	39
14	12	13	16	17	13	79	51	8.8	7.3	4.3	3.1	25
15	12	15	16	16	12	70	46	9.0	9.8	4.8	6.6	14
16	12	26	16	15	11	61	40	11	14	4.3	6.3	12
17	11	37	14	14	11	53	36	11	12	3.7	5.2	11
18	8.9	39	11	14	11	45	34	9.6	12	3.6	7.9	10
19	8.7	34	11	14	11	39	32	8.9	9.9	4.0	8.9	11
20	11	29	10	13	11	37	24	9.0	9.1	5.4	6.9	10
21	17	24	12	12	12	33	21	10	8.3	4.6	6.2	9.9
22	15	22	18	12	18	31	21	8.9	9.3	4.5	6.0	9.4
23	9.2	19	14	12	44	31	20	8.2	9.0	4.5	5.0	9.3
24	7.7	18	13	12	160	38	20	7.7	7.2	3.7	7.8	15
25	6.8	17	13	12	155	37	21	7.5	6.5	3.6	15	11
26	7.4	17	12	12	150	33	20	9.5	5.7	6.5	13	9.9
27	7.4	16	13	12	155	36	18	17	5.0	4.9	16	9.6
28	7.2	19	20	11	150	51	17	15	4.6	4.0	14	8.7
29	5.6	19	34	11	---	58	15	11	4.5	3.8	11	8.3
30	4.9	16	37	11	---	53	14	13	4.3	5.5	15	8.3
31	4.7	---	34	11	---	50	---	15	---	5.4	14	---
TOTAL	245.6	534.8	495	707	1066	1956	1399	348.6	253.0	198.9	216.5	766.3
MEAN	7.92	17.8	16.0	22.8	38.1	63.1	46.6	11.2	8.43	6.42	6.98	25.5
MAX	17	40	37	74	160	100	126	20	14	13	16	86
MIN	3.3	5.2	10	11	10	31	14	7.5	4.3	3.6	3.0	8.3
CFSM	.31	.70	.63	.89	1.49	2.47	1.82	.44	.33	.25	.27	1.00
IN.	.36	.78	.72	1.03	1.55	2.84	2.03	.51	.37	.29	.31	1.11
CAL YR 1984	TOTAL	5237.6	MEAN	14.3	MAX	85	MIN	2.0	CFSM	.56	IN	7.61
WTR YR 1985	TOTAL	8186.7	MEAN	22.4	MAX	160	MIN	3.0	CFSM	.88	IN	11.90

04161790 STONY LAKE NEAR WASHINGTON, MI

LOCATION.--Lat 42°42'58", long 83°05'58", in SE1/4 sec.31, T.4 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank 1,000 ft east of bridge over dam on Stony Creek, and 2.7 mi west of Washington.

DRAINAGE AREA.--68.0 mi².

PERIOD OF RECORD.--February 1963 to current year.

REVISED RECORDS.--WDR MI-77-1: 1976.

GAGE.--Water-stage recorder. Datum of gage is 790.00 ft above National Geodetic Vertical Datum of 1929 (levels by Huron-Clinton Metropolitan Authority). Gage readings have been converted to elevations NGVD.

REMARKS.--Reservoir is formed by an earthfill dam with concrete spillway completed in 1962. The spillway section includes a drum gate with minimum crest elevation of 796 ft, maximum of 802 ft; and 2 sluices, one on each side, with valve controls capable of draining lake. Total capacity (new capacity table put into use Oct. 1, 1973), 4,649 acre-ft at elevation of 802 ft. The reservoir began filling February 1963. Lake is used for recreational purposes.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 5,495 acre-ft, May 17, 18, 1974, Apr. 20, 1975, elevation, 803.6 ft; minimum recorded, 1,758 acre-ft, Nov. 21, 1967, elevation, 794.7 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 5,039 acre-ft, April 6, elevation, 802.75 ft; minimum, 3,904 acre-ft, Feb. 8-10, elevation, 800.48 ft.

MONTHEND ELEVATION AND CONTENTS AT 2400, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

Date	Elevation (feet)	Contents (acre-feet)	Change in contents during month (acre-feet)	(equivalent in ft ³ /s)
Sept. 30	802.1	4701	--	--
Oct. 31	802.2	4753	+52	+0.8
Nov. 30	801.5	4399	-354	-5.9
Dec. 31	800.9	4105	-294	-4.8
CAL YR 1984	--	--	+96	+0.1
Jan. 31	800.5	3913	-192	-3.1
Feb. 28	801.4	4349	+436	+7.9
Mar. 31	802.4	4857	+508	+8.3
Apr. 30	802.3	4805	-52	-0.9
May 31	802.2	4753	-52	-0.8
June 30	802.1	4701	-52	-0.9
July 31	802.1	4701	0	0
Aug. 31	802.2	4753	+52	+0.8
Sept. 30	802.2	4753	0	0
WTR YR 1985	--	--	+52	+0.1

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161800 STONY CREEK NEAR WASHINGTON, MI

LOCATION.--Lat 42°42'55", long 83°05'31", in SW1/4 sec.31, T.4 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on Mt. Vernon Road, 500 ft downstream from Stony Lake Dam, and 2.9 mi west of Washington.

DRAINAGE AREA.--68.2 mi².

PERIOD OF RECORD.--July 1958 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 772.59 ft above National Geodetic Vertical Datum of 1929 (15:vals by Huron-Clinton Metropolitan Authority).

REMARKS.--No estimated daily discharges. Records good. Occasional diurnal fluctuation caused by mills upstream from station prior to February 1963; occasional regulation by Stony Lake since (station 04161790). Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 42.2 ft³/s, 8.40 in/yr, adjusted for storage since 1963.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 427 ft³/s, Feb. 2, 1968, gage height, 5.86 ft; maximum gage height, 6.71 ft, Mar. 6, 1959, backwater from ice; minimum discharge, 0.9 ft³/s, July 10, 1963; minimum gage height, 1.79 ft, Apr. 6, 1979; minimum daily discharge, 1.3 ft³/s, July 31, Aug. 1, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 355 ft³/s, Feb. 27, gage height, 5.31 ft; minimum, 8.4 ft³/s, Aug. 12, 13, gage height, 2.17 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	23	47	125	32	267	142	49	31	17	15	36
2	14	24	42	137	30	243	136	44	32	22	12	41
3	14	22	42	119	29	208	136	38	31	29	11	37
4	13	27	40	104	29	195	131	36	26	26	11	34
5	13	34	51	95	29	185	153	36	25	33	12	34
6	12	35	50	85	29	178	249	44	25	35	13	51
7	15	36	41	76	29	172	266	49	23	31	14	87
8	21	39	48	66	28	174	247	49	24	34	14	115
9	21	34	46	56	28	203	214	43	23	32	13	128
10	22	38	48	53	28	207	185	41	21	29	13	126
11	21	60	51	51	31	114	167	40	26	24	13	113
12	20	69	45	49	37	121	147	38	24	22	9.2	100
13	21	67	61	46	39	111	132	36	24	20	8.7	84
14	24	57	67	44	36	138	123	33	24	19	9.7	75
15	28	52	52	42	33	150	116	31	26	22	34	61
16	31	65	46	38	32	141	112	31	32	22	32	49
17	31	60	45	40	31	132	99	34	37	18	27	43
18	29	58	42	40	31	119	95	29	47	16	33	40
19	29	61	40	40	32	109	91	28	40	15	42	39
20	27	77	38	37	32	102	86	27	36	18	35	37
21	33	77	36	33	33	93	79	29	31	17	30	35
22	33	58	41	32	41	88	71	28	29	16	27	31
23	34	50	41	32	74	87	48	27	27	12	24	31
24	32	46	43	33	207	97	46	25	26	10	41	36
25	29	43	40	34	343	98	46	23	24	11	65	34
26	29	41	37	33	344	95	40	23	21	22	54	34
27	28	50	40	33	347	100	46	31	20	20	48	32
28	28	53	41	32	301	125	50	34	19	17	43	30
29	27	61	57	32	---	149	48	32	18	16	40	29
30	24	55	79	32	---	153	47	31	18	15	38	28
31	23	---	91	33	---	141	---	33	---	14	36	---
TOTAL	744	1472	1488	1702	2315	4495	3548	1072	810	654	817.6	1650
MEAN	24.0	49.1	48.0	54.9	82.7	145	118	34.6	27.0	21.1	26.4	55.0
MAX	34	77	91	137	347	267	266	49	47	35	65	128
MIN	12	22	36	32	28	87	40	23	18	10	8.7	28
MEAN+	24.8	43.2	43.2	51.8	90.6	153	117	33.8	26.1	21.1	27.2	55.0
CFSM+	.36	.63	.63	.76	1.33	2.24	1.72	.50	.38	.31	.40	.81
IN+	.42	.71	.73	.88	1.38	2.59	1.92	.57	.43	.36	.46	.90

CAL YR 1984 TOTAL 13627.7 MEAN 37.2 MAX 185 MIN 3.6 MEAN+ 37.3 CFSM+ .55 IN+ 7.45
WTR YR 1985 TOTAL 20767.6 MEAN 56.9 MAX 347 MIN 8.7 MEAN+ 57.0 CFSM+ .84 IN+ 11.34

+ Adjusted for change in contents in Stony Lake.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

221

04162010 RED RUN NEAR WARREN, MI

LOCATION.--Lat 42°31'46", long 83°04'07", in SE1/4 NE1/4 sec.6, T.1 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at upstream side of bridge on Ryan Road, and 1.0 mi northwest of Warren.

DRAINAGE AREA.--Indeterminate.

PERIOD OF RECORD.--October 1979 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 620 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 6, 7, 24, 25, Jan. 3 to Feb. 12, Feb. 17-23, and Apr. 6-9. Records fair. Diversion from Big Beaver Creek basin via Henry-Graham Drain started in 1976, is ongoing and increasing with further development of new drains. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

AVERAGE DISCHARGE.--6 years, 30.5 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,940 ft³/s, Oct. 1, 1981, gage height, 30.2 ft, from floodmark; minimum daily, 0.30 ft³/s, Sept. 11, 1983.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,100 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 11	0030	1,160	15.50	May 31	0615	*1,950	*21.28
Jan. 1	0600	1,600	18.55	July 15	1230	1,140	15.34
Feb. 23	1345	1,720	19.48	Aug. 24	2100	1,110	15.11
Apr. 6	0015	1,530	17.99				

Minimum daily discharge, 2.2 ft³/s, Sept. 29.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.0	19	6.4	770	3.5	21	74	8.2	13	48	7.6	3.8
2	4.4	8.6	5.7	82	3.5	16	35	7.6	6.4	48	3.8	3.8
3	4.4	4.6	37	33	3.5	11	94	7.3	5.4	26	3.8	3.7
4	3.0	23	8.9	18	3.5	107	46	5.9	4.2	5.0	3.7	11
5	3.0	7.9	5.9	12	3.5	251	445	12	4.4	11	19	4.4
6	3.0	5.2	5.6	10	3.5	70	700	40	4.4	7.3	8.6	8.2
7	23	4.6	5.2	8.0	3.5	37	100	5.9	5.4	3.5	4.8	4.8
8	35	4.4	4.8	7.0	3.5	322	70	4.4	6.2	166	4.0	88
9	7.3	17	4.8	6.5	3.5	138	35	4.8	7.9	9.3	4.0	23
10	4.6	84	10	6.0	3.5	72	20	4.4	4.6	5.0	36	5.0
11	3.7	477	5.9	5.5	8.0	60	45	4.2	40	4.2	8.9	3.5
12	3.5	40	19	5.3	50	60	20	3.8	21	3.3	4.0	3.2
13	3.5	15	30	5.0	184	31	16	3.7	7.6	3.2	4.6	2.8
14	3.5	12	19	4.8	65	25	16	5.9	5.9	51	5.0	2.8
15	60	40	11	4.6	20	18	17	13	31	208	125	2.8
16	45	15	7.9	4.3	12	15	12	8.6	37	7.3	11	3.7
17	9.7	8.9	7.3	4.2	9.0	13	13	40	21	4.2	5.9	2.8
18	6.2	7.6	5.9	4.1	7.5	11	12	5.4	16	3.7	105	6.7
19	13	7.3	11	4.0	6.5	12	9.7	3.8	5.2	3.5	20	5.7
20	5.9	6.4	7.3	3.9	6.0	12	8.9	5.2	4.0	3.8	5.9	3.3
21	105	5.9	82	3.8	8.0	10	8.9	3.8	3.7	7.6	4.2	2.8
22	12	5.7	61	3.7	190	11	8.2	4.8	27	4.8	3.7	2.7
23	7.3	5.7	11	3.6	1300	53	8.9	3.5	5.4	3.3	3.3	13
24	5.9	5.4	8.6	3.5	911	94	18	3.5	3.7	3.5	304	32
25	5.2	5.7	7.0	3.5	195	31	15	3.3	3.8	7.6	94	4.2
26	8.9	6.2	6.4	3.5	74	18	8.2	13	3.7	154	56	3.7
27	5.2	6.2	8.2	3.5	69	133	7.0	69	3.7	5.9	15	2.8
28	4.8	46	149	3.5	23	218	7.9	37	3.5	4.0	7.3	2.4
29	4.4	9.7	176	3.5	---	197	8.2	5.4	6.4	4.2	5.4	2.2
30	4.4	7.0	65	3.5	---	46	8.2	9.3	5.7	3.8	20	4.6
31	4.8	---	36	3.5	---	147	---	355	---	9.3	5.0	---
TOTAL	413.6	911.0	828.8	1037.3	3173.0	2260	1887.1	701.7	317.2	829.3	908.5	263.4
MEAN	13.3	30.4	26.7	33.5	113	72.9	62.9	22.6	10.6	26.8	29.3	8.78
MAX	105	477	176	770	1300	322	700	355	40	208	304	88
MIN	3.0	4.4	4.8	3.5	3.5	10	7.0	3.3	3.5	3.2	3.3	2.2
CAL YR 1984	TOTAL	10098.14	MEAN	27.6	MAX	857	MIN	.63				
WTR YR 1985	TOTAL	13530.90	MEAN	37.1	MAX	1300	MIN	2.2				

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04162900 BIG BEAVER CREEK NEAR WARREN, MI

LOCATION.--Lat 42°32'31", long 83°02'52", in NW1/4 SW1/4 sec.33, T.2 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank between bridges on Mound Road, 1.0 mi north of Warren, and 2.0 mi upstream from mouth.

DRAINAGE AREA.--Indeterminate since 1976. Prior to 1976, 23.5 mi².

PERIOD OF RECORD.--October 1958 to current year.

GAGE.--Water-stage recorder. Datum of gage is 598.80 ft, Macomb County datum. Prior to Aug. 26, 1960, nonrecording gage and crest-stage gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 3 to Mar. 14. Records fair except those below 1.0 ft³/s, which are poor. Diversion from the basin via Henry-Graham Drain started in 1976, is ongoing and increasing with further development of new drains. Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,240 ft³/s, June 26, 1968, gage height, 14.45 ft; no flow on several days in June and July 1962, caused by unusual regulation upstream from gage; minimum discharge affected by diversion since 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 234 ft³/s, Feb. 23, gage height, 8.23 ft, from floodmark; minimum, 0.08 ft³/s, Aug. 9; minimum gage height, 4.75 ft, June 27.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.66	2.0	1.3	101	.60	3.0	9.6	.65	1.3	2.5	.62	.39
2	.59	2.0	1.2	15	.55	2.0	4.5	.61	.42	7.1	.31	.37
3	.59	1.1	4.9	6.0	.55	1.5	9.4	.62	.32	4.4	.20	.31
4	.59	1.6	1.9	3.5	.55	7.0	5.0	.62	.27	.76	.15	.83
5	.59	1.6	1.5	3.0	.55	30	41	1.1	.27	.76	1.1	.47
6	.59	1.0	1.3	2.5	.55	12	49	3.3	.25	.93	1.8	1.1
7	2.0	.92	1.2	2.0	.55	4.5	10	.77	.25	.43	.38	.53
8	4.2	.88	1.2	1.9	.55	35	6.9	.51	.30	29	.17	18
9	1.2	1.5	1.1	1.7	.55	25	3.8	.43	.39	4.6	.13	6.6
10	.80	7.3	2.0	1.5	.55	15	2.9	.39	.35	1.4	2.4	.78
11	.80	46	1.7	1.4	2.0	10	5.5	.39	2.6	.60	1.4	.50
12	.80	8.2	2.4	1.3	6.0	6.0	2.9	.47	2.9	.37	.34	.38
13	.80	3.1	4.8	1.2	21	5.0	2.3	.41	.67	.33	.31	.34
14	.80	2.1	3.4	1.1	10	3.4	2.1	.40	.69	3.0	.26	.33
15	4.9	4.9	2.7	1.0	4.0	2.5	2.1	1.3	2.2	2.0	8.4	.29
16	6.7	3.3	2.0	1.0	2.0	2.0	1.4	.93	3.9	.89	2.3	.31
17	1.6	1.9	1.8	.95	1.2	1.9	1.3	1.2	.81	.36	.40	.32
18	1.3	1.7	1.6	.90	1.0	1.5	1.4	.70	1.4	.25	6.3	.50
19	1.5	1.5	2.1	.85	.90	1.6	1.3	.42	.39	.20	3.3	.69
20	1.5	1.4	2.0	.85	.80	1.4	1.1	.43	.30	.23	.56	.42
21	14	1.3	12	.80	1.0	1.3	.99	.42	.20	.28	.27	.31
22	3.4	1.3	11	.80	15	1.2	.93	.30	3.7	.58	.21	.32
23	1.3	1.3	3.1	.75	150	4.4	.88	.24	1.2	.26	.18	.91
24	1.1	1.2	2.3	.75	120	10	1.2	.23	.28	.22	28	3.4
25	1.1	1.2	1.8	.70	35	4.1	1.4	.27	.18	.38	11	.52
26	1.5	1.2	1.6	.70	15	2.3	.83	.68	.14	9.7	7.2	.32
27	1.2	1.2	1.7	.65	9.0	12	.70	4.3	.14	.77	4.3	.27
28	1.2	5.4	23	.65	5.0	21	.72	3.9	.14	.29	.86	.25
29	1.1	2.4	21	.60	---	20	.70	.52	.32	.22	.49	.26
30	1.1	1.5	9.6	.60	---	6.4	.65	.91	.41	.20	2.1	.34
31	1.1	---	5.0	.60	---	16	---	15	---	.50	.66	---
TOTAL	60.61	112.00	134.2	156.25	404.45	269.0	172.50	42.42	26.69	73.51	86.10	40.36
MEAN	1.96	3.73	4.33	5.04	14.4	8.68	5.75	1.37	.89	2.37	2.78	1.35
MAX	14	46	23	101	150	35	49	15	3.9	29	28	18
MIN	.59	.88	1.1	.60	.55	1.2	.65	.23	.14	.20	.13	.25
CAL YR 1984	TOTAL	1495.41	MEAN	4.09	MAX	141	MIN	.17				
WTR YR 1985	TOTAL	1578.09	MEAN	4.32	MAX	150	MIN	.13				

STREAMS TRIBUTARY TO LAKE ST. CLAIR

223

04163400 PLUM BROOK AT UTICA, MI

LOCATION.--Lat 42°36'05", long 83°04'27", in SE1/4 NE1/4 sec.7, T.2 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at upstream side of bridge on Ryan Road, 1.0 mi southwest of Utica.

DRAINAGE AREA.--16.5 mi².

PERIOD OF RECORD.--July 1965 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 619.79 ft above National Geodetic Vertical Datum of 1929 (levels by Johnson & Anderson, Inc.).

REMARKS.--Estimated daily discharges: Dec. 4-7, 25, 26, and Jan. 7 to Feb. 24. Records good except for estimated daily discharges, which are fair. Occasional diversion for sprinkler irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 13.2 ft³/s, 10.86 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,160 ft³/s, June 26, 1968, gage height, 10.36 ft; no flow part of each day July 19, 28, 1966, Aug. 22-28, Sept. 3, 11, 1969; minimum gage height, 1.23 ft, Sept. 16, 1967.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	1300	343	7.73	Apr. 6	0400	353	7.81
Feb. 23	--	*600	*9.00	July 8	1000	266	6.98
Mar. 8	2100	280	7.12	Aug. 25	0100	282	7.17

a Ice jam.

Minimum discharge, 0.42 ft³/s, Aug. 12, 13; minimum gage height, 1.67 ft, June 28, 29, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.1	2.9	4.5	234	3.2	33	66	7.2	3.9	6.0	2.6	4.0
2	2.9	5.7	3.8	86	3.2	30	35	6.0	2.4	17	2.1	6.4
3	2.4	3.9	9.5	41	3.2	24	44	5.2	3.2	19	1.1	5.8
4	2.4	5.5	5.4	27	3.2	39	30	5.0	2.4	5.1	.96	4.1
5	2.2	6.4	3.8	16	3.2	115	102	5.6	1.6	12	2.8	4.1
6	1.5	3.8	3.1	14	3.2	71	235	15	1.2	12	4.3	8.3
7	2.6	4.5	2.9	15	3.2	48	64	7.7	1.0	5.1	2.4	6.5
8	7.7	4.1	2.8	11	3.2	135	50	5.5	1.1	147	1.3	4.6
9	3.8	12	2.7	8.0	3.2	119	41	4.6	1.4	33	.88	7.6
10	2.3	17	4.9	6.5	3.2	65	30	4.0	1.2	19	.86	4.8
11	2.0	84	5.1	5.5	5.5	51	30	3.2	2.8	11	1.4	3.9
12	2.0	36	5.3	4.5	12	41	22	3.4	8.1	6.5	.79	3.7
13	1.9	20	12	4.0	25	32	19	3.1	3.3	4.2	1.6	2.6
14	1.8	10	9.3	3.5	30	28	19	3.4	2.3	5.6	1.9	2.1
15	5.9	11	9.2	3.2	25	22	22	5.1	2.8	8.8	9.8	1.9
16	11	11	7.5	3.0	20	17	20	5.0	12	7.9	6.9	2.1
17	5.6	6.6	6.4	2.9	16	16	15	7.7	8.7	3.9	2.8	3.3
18	3.2	5.8	7.1	2.8	13	14	16	4.3	13	3.1	23	3.1
19	3.7	6.0	5.7	2.8	9.0	14	14	3.2	5.3	3.4	14	3.7
20	3.1	5.3	6.5	2.8	11	13	12	2.6	3.9	4.8	4.7	3.2
21	18	5.0	11	2.9	20	12	10	2.4	2.2	3.4	3.2	2.8
22	9.8	3.7	31	2.9	80	14	11	2.0	2.7	3.5	2.8	1.5
23	5.4	3.7	13	3.0	280	18	11	1.7	2.6	2.3	2.6	2.5
24	4.3	3.7	8.5	3.0	440	41	12	1.5	1.6	1.6	69	6.8
25	3.8	3.5	6.0	3.1	163	29	17	1.5	1.1	2.0	125	2.4
26	4.1	4.9	5.0	3.1	99	20	10	2.9	1.2	19	32	1.8
27	3.3	3.6	5.5	3.1	91	49	8.1	5.5	.94	4.5	23	1.7
28	2.7	8.4	42	3.2	45	104	7.5	12	.71	2.5	10	1.6
29	2.8	7.0	75	3.2	---	104	7.9	5.0	1.2	4.1	6.6	1.4
30	2.5	5.1	52	3.2	---	40	7.0	3.9	3.7	2.7	8.6	1.6
31	2.0	---	21	3.2	---	59	---	12	---	3.5	5.5	---
TOTAL	129.8	310.1	387.5	527.4	1416.5	1417	987.5	157.2	99.55	383.5	374.49	109.9
MEAN	4.19	10.3	12.5	17.0	50.6	45.7	32.9	5.07	3.32	12.4	12.1	3.66
MAX	18	84	75	234	440	135	235	15	13	147	125	8.3
MIN	1.5	2.9	2.7	2.8	3.2	12	7.0	1.5	.71	1.6	.79	1.4
CFSM	.25	.62	.76	1.03	3.07	2.77	1.99	.31	.20	.75	.73	.22
IN.	.29	.70	.87	1.19	3.19	3.19	2.23	.35	.22	.86	.84	.25
CAL YR 1984	TOTAL	4137.21	MEAN	11.3	MAX	315	MIN	.16	CFSM	.69	IN	9.33
WTR YR 1985	TOTAL	6300.44	MEAN	17.3	MAX	440	MIN	.71	CFSM	1.05	IN	14.20

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164000 CLINTON RIVER NEAR FRASER, MI

LOCATION.--Lat 42°34'40", long 82°57'00", in NW1/4 sec.20, T.2 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on left bank 800 ft downstream from bridge on Garfield Road, 2.8 mi north of Fraser, and 4.0 mi upstream from North Branch.

DRAINAGE AREA.--444 mi².

PERIOD OF RECORD.--May 1947 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 577.71 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 17, 1949, nonrecording gage at site 800 ft upstream at same datum.

REMARKS.--Estimated daily discharges: Jan. 10 to Feb. 28. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--38 years, 377 ft³/s, 11.53 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,840 ft³/s, Oct. 1, 1981, gage height, 19.56 ft; minimum, 47 ft³/s, Sept. 6, 1955; minimum gage height, 4.29 ft, Sept. 7, 1954.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20 ft, from floodmarks, discharge, 9,000 ft³/s.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 2,000 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	1300	3,830	15.57	Apr. 6	0300	4,000	15.75
Feb. 23	--	*5,730	*17.49	May 31	1100	2,330	13.73
Mar. 8	2200	2,320	13.60				

a Ice jam.

Minimum discharge, 122 ft³/s, Oct. 6; minimum gage height, 5.25 ft, Aug. 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	148	238	321	2670	230	1260	1180	353	403	162	201	390
2	153	296	295	1840	230	1160	906	345	280	318	171	419
3	149	198	409	966	230	1040	991	318	255	457	160	378
4	145	225	330	689	230	1030	873	286	236	206	147	385
5	135	244	289	656	230	1750	1350	264	231	265	161	464
6	132	201	303	561	230	1490	3140	442	226	337	257	398
7	180	185	276	531	230	1190	1970	338	218	213	171	471
8	327	187	267	488	230	1520	1380	292	202	1110	168	966
9	206	207	278	395	230	1940	1210	268	187	672	145	1210
10	169	362	313	350	230	1520	1110	258	166	328	211	653
11	160	1590	318	320	245	1260	1070	244	238	257	220	531
12	152	879	315	300	310	1100	936	238	389	226	135	445
13	147	449	397	290	420	1010	838	231	229	205	143	415
14	156	398	403	280	330	897	779	222	205	541	258	387
15	321	467	361	275	275	851	729	241	217	334	698	361
16	459	502	318	270	260	801	696	294	472	403	547	331
17	261	405	300	265	250	751	660	308	261	245	264	283
18	223	364	289	260	260	687	627	287	380	219	563	258
19	251	349	277	255	270	658	585	270	274	205	738	285
20	210	352	272	250	290	632	561	293	231	254	339	271
21	566	375	367	245	320	596	537	289	208	209	273	255
22	327	357	665	245	1270	549	513	215	333	207	265	236
23	252	329	341	240	4550	599	447	203	249	183	249	236
24	227	321	280	240	4500	881	387	195	198	166	638	475
25	218	314	230	240	2850	711	434	182	204	156	1660	293
26	258	308	216	235	1800	608	397	184	209	760	1520	259
27	238	313	290	235	1580	737	402	368	183	282	935	234
28	221	473	734	235	1440	1290	389	482	167	187	686	227
29	219	398	954	235	---	1570	370	256	159	166	501	218
30	208	346	936	230	---	1070	365	259	180	172	448	215
31	202	---	615	230	---	1170	---	1210	---	172	490	---
TOTAL	7020	11632	11959	14521	23520	32328	25832	9635	7390	10117	13362	11949
MEAN	226	388	386	468	840	1043	861	311	246	326	431	398
MAX	566	1590	954	2670	4550	1940	3140	1210	472	1110	1660	1210
MIN	132	185	216	230	230	549	365	182	159	156	135	215
CFSM	.51	.87	.87	1.05	1.89	2.35	1.94	.70	.55	.73	.97	.90
IN.	.59	.97	1.00	1.22	1.97	2.71	2.16	.81	.62	.85	1.12	1.00
CAL YR 1984	TOTAL	126677	MEAN	346	MAX	3320	MIN	105	CFSM	.78	IN	10.61
WTR YR 1985	TOTAL	179265	MEAN	491	MAX	4550	MIN	132	CFSM	1.11	IN	15.02

STREAMS TRIBUTARY TO LAKE ST. CLAIR

225

04164100 EAST POND CREEK AT ROMEO, MI

LOCATION.--Lat 42°49'21", long 83°01'13", in NE1/4 SE1/4 sec.27, T.5 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on State Highway 53, and 1.4 mi north of Romeo.

DRAINAGE AREA.--21.8 mi².

PERIOD OF RECORD.--September 1958 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 780 ft above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).

REMARKS.--Estimated daily discharges: Dec. 5-7, 25, Jan. 4 to Feb. 26, Feb. 28, Mar. 6, Mar. 27 to Apr. 3, May 1-5, 10-25, and June 2-5. Records fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 15.7 ft³/s, 9.78 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 358 ft³/s, Feb. 10, 1965, gage height, 4.48 ft; maximum gage height, 4.56 ft, Mar. 12, 1962, backwater from ice; minimum discharge, 0.8 ft³/s, July 30, 31, 1964, Aug. 6, 7, 1965; minimum gage height, 0.71 ft, July 21, 1959.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 80 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	1700	92	2.41	Apr. 5	2300	160	2.93
Feb. 24	--	*245	*3.86	Sept. 7	0400	241	3.66
Mar. 8	1900	107	2.45	Sept. 10	1000	182	3.21

a Ice jam.

Minimum discharge, 3.0 ft³/s, Jan. 30, Aug. 12, 13, 14, 15; minimum gage height, 0.92 ft, Aug. 12, 13, 14, 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.6	8.2	15	71	8.9	87	58	18	12	6.4	5.1	9.9
2	6.4	9.6	14	77	8.9	79	56	17	11	7.4	4.4	14
3	6.2	8.5	16	55	8.8	71	54	16	10	8.8	4.0	11
4	5.7	11	14	45	8.8	65	56	15	9.8	7.7	3.8	9.3
5	5.8	12	12	38	8.7	78	102	19	9.6	8.0	4.1	8.8
6	5.2	10	10	35	8.7	70	145	21	9.2	9.2	4.6	141
7	6.0	9.3	11	31	8.7	63	111	17	11	8.4	4.6	194
8	9.3	8.9	12	28	8.7	77	92	17	10	8.8	4.3	146
9	8.6	9.8	11	26	8.7	99	79	16	7.0	7.9	3.8	163
10	7.8	15	13	23	8.7	82	71	15	7.0	6.5	3.6	171
11	7.7	44	14	21	9.0	75	67	13	8.4	5.5	3.4	116
12	7.4	41	15	19	11	74	61	12	11	5.1	3.2	73
13	7.4	27	19	18	16	68	55	11	10	5.0	3.1	59
14	7.4	24	17	16	12	63	50	10	12	5.3	3.0	55
15	7.7	26	17	15	10	58	47	13	11	5.3	7.8	47
16	9.4	27	17	14	9.8	53	44	15	15	5.2	7.3	41
17	8.9	24	17	13	9.5	50	40	17	14	4.8	7.4	36
18	7.8	23	15	12	9.5	47	40	15	14	4.6	9.7	32
19	8.2	22	15	11	10	45	37	14	13	4.6	10	30
20	7.7	20	14	10	11	42	35	12	13	5.1	7.9	27
21	14	18	15	9.5	13	39	32	11	11	4.8	7.0	24
22	12	16	23	9.0	30	35	30	10	11	4.6	6.3	21
23	10	16	18	9.0	95	34	29	9.0	10	4.3	5.8	19
24	9.0	15	17	9.0	225	40	29	8.8	9.4	4.0	9.9	25
25	9.6	14	16	9.0	180	43	27	8.5	8.9	4.2	14	20
26	9.5	14	16	9.0	140	40	27	13	8.2	7.7	12	18
27	9.2	14	18	9.0	131	45	25	16	7.3	7.4	12	16
28	9.0	18	22	9.0	95	55	24	14	6.9	6.1	10	15
29	8.5	18	41	9.0	---	65	22	12	6.7	5.2	11	14
30	8.0	16	42	9.0	---	62	20	11	6.7	4.8	11	13
31	7.7	---	34	9.0	---	60	---	14	---	5.0	10	---
TOTAL	253.7	539.3	550	677.5	1104.4	1864	1565	430.3	304.1	187.7	214.1	1569.0
MEAN	8.18	18.0	17.7	21.9	39.4	60.1	52.2	13.9	10.1	6.05	6.91	52.3
MAX	14	44	42	77	225	99	145	21	15	9.2	14	194
MIN	5.2	8.2	10	9.0	8.7	34	20	8.5	6.7	4.0	3.0	8.8
CFSM	.38	.83	.81	1.01	1.81	2.76	2.39	.64	.46	.28	.32	2.40
IN.	.43	.92	.94	1.16	1.88	3.18	2.67	.73	.52	.32	.37	2.68
CAL YR 1984	TOTAL	5453.8	MEAN	14.9	MAX	106	MIN	2.5	CFSM	.68	IN	9.31
WTR YR 1985	TOTAL	9259.1	MEAN	25.4	MAX	225	MIN	3.0	CFSM	1.17	IN	15.80

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164300 EAST BRANCH COON CREEK AT ARMADA, MI

LOCATION.--Lat 42°50'45", long 82°53'06", in NE1/4 sec.23, T.5 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on right bank at downstream side of bridge on Prospect Street in Armada.

DRAINAGE AREA.--13.0 mi².

PERIOD OF RECORD.--October 1958 to current year.

REVISED RECORDS.--WDR MI-83: 1982.

GAGE.--Water-stage recorder and concrete control. Elevation of gage is 735 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Dec. 25-27, and Jan. 3 to Mar. 5. Records good except for estimated daily discharges and those below 0.5 ft³/s, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 7.03 ft³/s, 7.34 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 910 ft³/s, Apr. 19, 1975, gage height, 6.69 ft; no flow Jan. 25 to Feb. 9, 1961, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 100 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 12	0100	109	2.92	Mar. 9	2200	131	3.12
Dec. 29	2000	293	4.22	Mar. 28	1400	178	3.49
Jan. 1	1300	415	4.87	Mar. 29	0500	175	3.47
Feb. 24	1400	425	4.93	Apr. 6	0100	419	4.90
Feb. 26	2100	266	4.07	Sept. 6	1400	*543	*5.47
Mar. 8	2000	368	4.65	Sept. 8	1000	438	4.99

Minimum daily discharge, 0.01 ft³/s, Aug. 9, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.49	.67	4.5	249	.50	50	63	1.6	.39	.09	.24	.31
2	.53	.73	3.4	103	.50	30	23	1.5	.31	.42	.18	.39
3	.52	.64	4.5	25	.50	12	28	1.4	.24	.27	.12	.24
4	.59	1.0	4.9	9.0	.50	13	21	1.3	.23	.11	.03	.18
5	.67	1.1	3.2	6.0	.50	30	195	1.3	.18	.23	.08	.26
6	.58	1.2	2.4	5.0	.50	38	238	2.1	.19	.16	.05	266
7	.66	1.0	2.0	4.0	.50	32	73	1.6	.18	.12	.03	109
8	.66	.85	1.7	3.5	.50	135	45	1.3	.20	.13	.03	304
9	.47	1.1	1.6	3.0	.50	130	20	1.1	.22	.13	.01	152
10	.55	2.1	1.8	2.5	.50	83	12	.96	.25	.10	.01	59
11	1.1	55	2.2	2.2	1.5	73	19	.81	.28	.08	.05	37
12	1.2	68	2.8	2.0	4.5	76	14	.70	.12	.08	.05	27
13	1.3	23	14	1.8	10	45	9.2	.63	.09	.08	.05	18
14	1.2	11	17	1.7	30	28	6.9	.57	.06	.11	.08	10
15	1.3	9.3	13	1.7	20	19	6.0	.54	.11	.10	2.5	5.4
16	1.5	21	11	1.7	15	13	4.9	.53	.25	.07	.24	3.8
17	1.2	14	8.8	1.6	11	12	3.9	.59	.33	.05	.18	2.5
18	1.2	7.4	6.0	1.5	9.0	6.9	3.4	.53	.30	.06	.48	1.9
19	1.4	5.0	4.4	1.4	8.0	5.6	3.3	.40	.21	.19	.24	1.8
20	1.3	3.8	3.5	1.3	8.0	5.9	2.9	.45	.14	.10	.18	1.5
21	1.3	3.0	3.6	1.2	9.0	5.0	2.5	.44	.11	.08	.12	1.3
22	.77	2.4	31	1.1	12	4.2	2.2	.37	.10	.07	.12	1.2
23	.89	2.2	22	1.0	100	4.9	2.0	.31	.09	.07	.08	1.2
24	.67	2.1	10	.90	270	35	2.3	.27	.08	.05	1.5	1.6
25	.50	2.0	2.0	.80	170	37	2.4	.24	.05	.12	.97	2.2
26	.61	2.0	2.2	.70	150	14	2.0	.26	.04	.48	1.2	3.3
27	.69	1.9	2.5	.60	125	24	1.8	.80	.05	.05	.85	2.3
28	.62	3.1	18	.50	75	114	1.7	.55	.04	.05	.48	1.8
29	.58	7.5	170	.50	---	114	1.6	.37	.05	.08	.31	1.4
30	.56	5.8	107	.50	---	42	1.6	.28	.10	.12	.48	1.3
31	.57	---	40	.50	---	41	---	.55	---	.18	.31	---
TOTAL	26.18	259.89	521.0	435.20	1033.00	1272.5	811.6	24.35	4.99	4.03	11.25	1017.88
MEAN	.84	8.66	16.8	14.0	36.9	41.0	27.1	.79	.17	.13	.36	33.9
MAX	1.5	68	170	249	270	135	238	2.1	.39	.48	2.5	304
MIN	.47	.64	1.6	.50	.50	4.2	1.6	.24	.04	.05	.01	.18
CFSM	.07	.67	1.29	1.08	2.84	3.15	2.09	.06	.01	.01	.03	2.61
IN.	.07	.74	1.49	1.25	2.96	3.64	2.32	.07	.01	.01	.03	2.91
CAL YR 1984	TOTAL	2798.25	MEAN	7.65	MAX	305	MIN	.05	CFSM	.59	IN	8.01
WTR YR 1985	TOTAL	5421.87	MEAN	14.9	MAX	304	MIN	.01	CFSM	1.15	IN	15.51

STREAMS TRIBUTARY TO LAKE ST. CLAIR

227

04164500 NORTH BRANCH CLINTON RIVER NEAR MOUNT CLEMENS, MI

LOCATION.--Lat 42°37'45", long 82°53'25", in SW1/4 sec.35, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on left bank 30 ft upstream from bridge on State Highway 59, 2 mi north of Mount Clemens, and 3.6 mi upstream from mouth.

DRAINAGE AREA.--199 mi².

PERIOD OF RECORD.--May 1947 to current year.

REVISED RECORDS.--WSP 1437: 1948. WSP 1557: Drainage area.

GAGE.--Water-stage recorder. Concrete control since September 1961. Datum of gage is 576.38 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 15, 1949, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 5-7, 25-28, Jan. 7-15, Jan. 17 to Feb. 5, and Feb. 14-28. Records good except for estimated daily discharges, which are fair. Some regulation at times by mill upstream from station. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--38 years, 124 ft³/s, 8.46 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,700 ft³/s, Feb. 2, 1968, gage height, 18.62 ft; minimum, 0.2 ft³/s, Sept. 13, 14, 1954, July 30, 1965; minimum gage height, 3.12 ft, Sept. 13, 14, 1954.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20.0 ft, from floodmark.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,200 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 2	1500	2,390	13.94	Apr. 6	2400	3,310	15.08
Feb. 25	--	*5,140	*17.54	Sept. 7	1600	3,760	15.58
Mar. 9	2200	2,000	13.45	Sept. 9	1200	3,580	15.38

a Ice jam.

Minimum discharge, 1.8 ft³/s, Aug. 14, gage height, 3.91 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	21	80	894	34	1010	666	60	31	12	7.1	31
2	17	21	69	2020	34	815	742	59	30	15	7.1	41
3	16	24	64	1380	34	687	543	54	30	26	6.5	55
4	14	27	71	806	34	554	465	52	26	29	4.5	37
5	14	27	48	436	34	478	486	59	23	25	4.0	27
6	13	35	60	233	34	613	1970	59	20	23	5.0	139
7	13	33	58	154	36	797	2570	71	17	22	9.1	2620
8	15	30	42	123	37	754	1110	67	18	23	8.3	2640
9	21	28	50	102	37	1460	674	56	18	22	6.9	3220
10	23	30	44	92	38	1620	466	50	17	18	5.8	2240
11	22	107	49	83	38	1020	365	45	15	13	4.9	1140
12	20	305	60	72	39	851	341	43	17	11	4.2	597
13	20	344	79	67	46	822	300	41	23	8.6	3.0	340
14	19	256	121	64	52	703	243	39	24	7.8	2.2	197
15	20	135	127	64	45	510	208	37	23	11	3.7	144
16	21	124	111	47	40	374	186	35	25	12	17	115
17	22	147	102	45	40	292	158	35	33	11	20	96
18	24	127	92	43	42	243	139	35	41	8.5	19	84
19	23	98	81	41	45	193	135	32	45	7.9	23	79
20	22	83	72	39	50	173	125	32	40	8.8	25	78
21	25	71	63	38	56	160	115	29	39	11	20	69
22	37	63	155	37	80	140	103	31	32	12	16	61
23	47	59	232	36	250	131	94	29	27	11	14	56
24	38	55	201	35	1930	188	88	26	24	7.6	34	55
25	31	52	100	35	4800	335	88	24	20	5.7	113	75
26	27	50	70	35	2900	369	93	30	17	9.5	85	78
27	26	49	62	35	1980	275	83	26	14	15	89	62
28	26	51	106	34	1700	479	75	42	13	15	76	57
29	25	71	395	34	---	892	70	45	12	11	47	51
30	23	87	645	34	---	996	66	36	12	9.0	34	45
31	22	---	884	34	---	703	---	32	---	8.3	31	---
TOTAL	706	2610	4393	7192	14485	18637	12767	1311	726	429.7	745.3	14529
MEAN	22.8	87.0	142	232	517	601	426	42.3	24.2	13.9	24.0	484
MAX	47	344	884	2020	4800	1620	2570	71	45	29	113	3220
MIN	13	21	42	34	34	131	66	24	12	5.7	2.2	27
CFSM	.12	.44	.71	1.17	2.60	3.02	2.14	.21	.12	.07	.12	2.43
IN.	.13	.49	.82	1.34	2.71	3.48	2.39	.25	.14	.08	.14	2.72
CAL YR 1984	TOTAL	42207.37	MEAN	115	MAX	2780	MIN	.87	CFSM	.58	IN	7.89
WTR YR 1985	TOTAL	78531.00	MEAN	215	MAX	4800	MIN	2.2	CFSM	1.08	IN	14.68

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI
(National stream quality accounting network station)

LOCATION.--Lat 42°35'45", long 82°54'35", Macomb County, Hydrologic Unit 04090003, on left downstream side of bridge on Moravian Drive, 0.2 mi downstream from North Branch, and 0.5 mi west of Mount Clemens.

DRAINAGE AREA.--734 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1934 to current year.

REVISED RECORDS.--WSP 1084: 1943, 1945-46. WSP 1937: 1935, 1936(M), 1937-39, 1949(M), 1950. WSP 1557: Drainage area. WSP 1727: 1952(M), 1954(M).

GAGE.--Water-stage recorder. Datum of gage is 570.43 ft above National Geodetic Vertical Datum of 1929. May 10, 1934, to Jan. 11, 1939, nonrecording gage at same site and datum. Auxiliary gage is a water-stage recorder on right bank 2.0 mi downstream from base gage at same datum. Mar. 15, 1938, to Jan. 3, 1952, auxiliary nonrecording gage 1.6 mi downstream from base gage at same datum.

REMARKS.--Estimated daily discharges: Oct. 1-7, 10-15, 18-20, Oct. 25 to Nov. 1, Jan. 9 to Feb. 12, Feb. 15-25, Apr. 29 to May 5, May 8-26, 29, 30, June 2-11, 13-15, 17, 19-21, June 24 to July 1, July 4, 5, 7, 10-13, 17-25, July 27 to Aug. 14, Aug. 17, 21-23, Sept. 4, 17-23, and 26-30. Water-discharge records fair. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--51 years, 536 ft³/s, 9.92 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 21,200 ft³/s, Apr. 6, 1947, gage height, 23.55 ft, from floodmark; minimum not determined; minimum gage height, 2.72 ft, Nov. 29, 1963.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,000 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	1900	5,480	12.13	Mar. 29	1100	3,310	9.57
Feb. 25	--	*9,800	*16.25	Apr. 6	2100	7,400	13.29
Mar. 9	2100	4,630	11.00	Sept. 9	1000	4,500	10.99

a Ice jam.

Minimum daily discharge, 145 ft³/s, Oct. 6, Aug. 13; minimum gage height, 5.40 ft, Dec. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	165	260	459	3940	260	2960	2410	415	471	175	205	435
2	170	325	409	4490	255	2430	2050	405	310	321	175	491
3	165	228	539	2580	255	2100	1930	365	290	538	165	444
4	155	228	472	1580	255	1830	1640	340	265	245	155	425
5	130	284	389	1160	255	2760	2210	330	255	290	165	544
6	145	232	393	860	255	2660	6720	532	250	356	260	651
7	205	214	367	761	260	2480	5540	416	240	240	180	2730
8	350	218	340	664	260	2940	3030	360	225	1200	170	3470
9	212	221	359	505	260	4480	2090	325	205	812	155	4170
10	190	437	392	450	265	3980	1790	305	185	330	215	2980
11	180	1840	420	410	280	2940	1660	290	255	275	240	1890
12	170	1500	419	380	350	2560	1480	280	414	240	150	1150
13	165	885	567	350	448	2280	1330	270	250	220	145	807
14	175	736	603	345	356	1980	1210	260	230	518	265	614
15	350	694	573	335	310	1670	1140	285	240	784	694	520
16	523	762	501	320	295	1440	1060	330	530	470	622	451
17	288	630	460	310	285	1300	981	345	300	275	300	385
18	245	559	434	300	290	1150	906	325	439	230	564	345
19	275	501	387	295	295	1050	852	305	315	215	938	365
20	245	476	391	285	310	1010	770	325	275	260	359	345
21	629	483	464	280	335	950	740	315	250	220	295	325
22	377	449	1110	280	1300	846	687	255	384	220	280	295
23	301	423	698	275	4200	926	587	235	283	195	265	295
24	261	404	551	275	7200	1410	484	220	225	175	783	584
25	250	388	386	270	9200	1340	568	210	225	165	2190	365
26	285	382	346	265	6110	1210	491	220	220	837	1910	340
27	270	396	418	265	4600	1310	495	421	200	295	1280	295
28	250	578	1030	265	3700	2370	444	587	185	200	931	285
29	240	560	1770	260	---	3170	440	300	175	180	636	270
30	230	493	1970	260	---	2640	430	295	190	180	531	260
31	225	---	1740	260	---	2280	---	1310	---	180	553	---
TOTAL	7841	15786	19357	23275	42444	64452	46165	11176	8281	10841	15776	26526
MEAN	253	526	624	751	1516	2079	1539	361	276	350	509	884
MAX	629	1840	1970	4490	9200	4480	6720	1310	530	1200	2190	4170
MIN	145	214	340	260	255	846	430	210	175	165	145	260
CFSM	.35	.72	.85	1.02	2.07	2.83	2.10	.49	.38	.48	.69	1.20
IN.	.40	.80	.98	1.18	2.15	3.27	2.34	.57	.42	.55	.80	1.34

CAL YR 1984 TOTAL 191117 MEAN 522 MAX 5630 MIN 120 CFSM .71 IN 9.69
WTR YR 1985 TOTAL 291920 MEAN 800 MAX 9200 MIN 145 CFSM 1.09 IN 14.79

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD (REVISED).--Water years 1969, 1972 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to September 1981.

WATER TEMPERATURE: October 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Aug. 13, 1975 to Sept. 6, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at bridge.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-76, 1978-81): Maximum, 3,580 microsiemens, Jan. 26, 1978; minimum, 126 microsiemens, July 29, 1976.

WATER TEMPERATURE (water years 1975-81): Maximum, 29.5°C, Sept. 20, 1978; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
DEC 13...	1200	602	882	8.0	6.0	4.0	9.8	80	3200	1800
MAR 20...	1000	990	695	8.1	5.0	4.0	12.0	95	K1500	390
JUN 19...	1000	284	684	8.1	17.0	1.0	6.4	68	K760	460
AUG 28...	1000	980	605	8.1	21.0	25	7.2	81	K1900	940

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
DEC 13...	280	89	75	22	63	33	2	4.0	3.7	65
MAR 20...	260	60	71	20	47	28	1	2.7	3.1	56
JUN 19...	230	47	61	18	49	32	1	4.0	2.8	47
AUG 28...	220	38	59	17	39	28	1	3.4	2.8	74

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
DEC 13...	1200	110	.30	5.5	504	460	.69	819	2.4
MAR 20...	1000	86	.20	4.5	449	410	.61	1200	2.3
JUN 19...	1000	83	.10	4.8	411	380	.56	315	2.3
AUG 28...	1000	40	.10	6.0	372	350	.51	984	1.2

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
DEC 13...	.200	.90	.160	--	.090	38	62	69
MAR 20...	.140	.70	.040	<.010	<.010	20	53	96
JUN 19...	.090	.70	.120	.100	.100	46	35	99
AUG 28...	.070	.90	.140	.080	.030	99	262	95

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
DEC 13...	<10	<1	61	1.0	<1	1	4	4	21	1
MAR 20...	<10	<1	43	<.5	<1	<1	<3	5	11	4
JUN 19...	20	1	46	.6	<1	<1	<3	3	11	7
AUG 28...	<10	1	47	<.5	<1	<1	<3	4	21	<1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
DEC 13...	4	42	.1	<10	8	<1	<1	240	<6	20
MAR 20...	<4	37	<.1	<10	8	<1	<1	180	<6	8
JUN 19...	12	27	.1	<10	8	<1	<1	210	<6	11
AUG 28...	5	10	<.1	<10	5	<1	<1	190	<6	16

STREAMS TRIBUTARY TO DETROIT RIVER

231

04165700 DETROIT RIVER AT DETROIT, MI
(National stream quality accounting network station)

LOCATION.--Lat 42°20'50", long 82°57'31", in T.2 S., R.13 E., Wayne County, Hydrologic Unit 04090004, at Detroit municipal water treatment facility at Water Works Park at Detroit.

DRAINAGE AREA.--228,800 mi², approximately.

PERIOD OF RECORD.--Water years 1970 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1974 to September 1981.

WATER TEMPERATURE: October 1973 to September 1981.

REMARKS.--Quarterly grab samples were collected near the municipal water intake. The intake is located at the northeast end of Belle Isle near Blue Heron Lagoon. Daily-mean water discharges are reported for sampling times.

COOPERATION.--Water discharges were furnished by the National Oceanic and Atmospheric Administration.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1976-81): Maximum daily, 383 microsiemens, Apr. 8, 1979; minimum daily, 194 microsiemens, July 24, 1976.

WATER TEMPERATURE (water years 1974-81): Maximum daily, 24.5°C, July 21, 1977, Aug. 29-31, 1980; minimum daily, 0.0°C, Jan. 8, 1980.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 174 microsiemens was measured Jan. 12, 1982.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	DIS- CHARGE, IN CUBIC FEET PER SECOND	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, O.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
DEC 12...	1000	215000	204	7.9	2.0	1.0	13.0	97	K1	K1
MAR 19...	1100	221000	217	8.1	1.5	2.5	13.4	97	<1	K6
JUN 18...	1000	231000	212	8.3	15.5	20	6.6	68	K1	K17
AUG 27...	0930	234000	209	8.4	21.0	1.0	8.8	99	K5	K6

DATE	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg)	SODIUM, DIS- SOLVED (MG/L AS Na)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
DEC 12...	98	14	27	7.3	3.5	7	.2	.70	2.0	17
MAR 19...	98	17	27	7.3	4.3	9	.2	.80	1.2	18
JUN 18...	100	15	28	7.2	3.8	8	.2	.90	.8	18
AUG 27...	98	18	27	7.3	3.9	8	.2	.90	.6	16

STREAMS TRIBUTARY TO DETROIT RIVER

04165700 DETROIT RIVER AT DETROIT, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)
DEC 12...	1000	6.7	<.10	1.7	125	110	.17
MAR 19...	1100	7.2	<.10	1.4	128	110	.17
JUN 18...	1000	6.6	.20	.5	118	120	.16
AUG 27...	0930	7.4	<.10	.7	118	110	.16

DATE	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)
DEC 12...	72600	.44	.010	.30	.020	<.010	.010
MAR 19...	76400	.35	<.010	.40	<.010	<.010	<.010
JUN 18...	73600	.33	.030	.20	.020	<.010	<.010
AUG 27...	74600	.22	<.010	.60	.060	.030	<.010

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
DEC 12...	<10	<1	17	.5	<1	<1	<3	1	5	1
MAR 19...	<10	<1	17	<.5	<1	<1	<3	2	10	5
JUN 18...	10	<1	16	<.5	<1	2	<3	1	<3	3
AUG 27...	<10	<1	16	<.5	<1	<1	<3	2	4	1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
DEC 12...	<4	<1	.1	<10	1	<1	<1	99	<6	11
MAR 19...	7	2	.1	<10	1	<1	<1	98	<6	6
JUN 18...	5	<1	<.1	<10	3	<1	<1	100	<6	4
AUG 27...	4	<1	<.1	<10	1	<1	<1	100	<6	5

STREAMS TRIBUTARY TO DETROIT RIVER

233

04166000 RIVER ROUGE AT BIRMINGHAM, MI

LOCATION.--Lat 42°32'45", long 83°13'25", in NW1/4 sec.36, T.2 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on left bank 25 ft downstream from mouth of Quarton Lake outlet, and 100 ft upstream from bridge on Maple Road at Birmingham.

DRAINAGE AREA.--33.3 mi². Prior to water year 1971, drainage area was 36.9 mi². An area of 3.6 mi² noncontributing since then.

PERIOD OF RECORD.--June 1950 to current year.

REVISED RECORDS.--WSP 1387: 1951-52(M). WSP 1557: Drainage area.

GAGE.--Water-stage recorder. Concrete control since July 27, 1962. Datum of gage is 715.94 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Jan. 10-14 and Jan. 17 to Feb. 11. Records good. Occasional regulation by Quarton Lake upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years (water years 1951-70), 15.3 ft³/s, 5.63 in/yr; 15 years (water years 1971-85), 22.5 ft³/s, 9.18 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,390 ft³/s, June 26, 1968, gage height, 8.70 ft; minimum, 0.10 ft³/s, Aug. 8, 9, 1963; minimum gage height, 1.02 ft, Oct. 12, 1961.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 180 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	1100	275	3.77	Apr. 6	0200	369	4.27
Feb. 23	2100	*475	*4.77	May 31	0500	180	3.21
Mar. 8	2000	204	3.36	Aug. 24	2100	420	4.49

Minimum discharge, 4.7 ft³/s, Aug. 12, 13, 14, gage height, 1.61 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.0	9.7	10	193	11	52	63	26	25	7.7	8.0	16
2	6.6	13	9.2	82	11	48	47	24	17	14	7.0	16
3	6.2	9.2	15	43	11	42	57	23	16	16	6.0	15
4	5.6	14	13	31	11	58	48	23	15	9.7	5.7	15
5	5.5	14	10	26	11	105	114	25	15	17	5.6	14
6	5.3	10	9.6	23	11	64	241	38	14	17	6.5	16
7	9.7	8.1	9.1	22	11	53	90	28	13	11	6.3	13
8	21	7.3	8.5	19	11	104	70	24	12	70	6.6	12
9	13	10	8.8	17	11	110	58	23	14	29	5.6	16
10	8.4	23	11	16	11	75	52	21	12	18	9.3	13
11	6.9	101	11	16	13	67	54	21	16	13	5.9	11
12	6.4	38	14	15	18	66	47	21	23	10	5.0	10
13	6.2	25	21	14	20	53	42	20	15	8.9	4.8	9.5
14	6.2	17	16	14	17	46	39	20	13	14	4.8	9.9
15	15	26	15	14	15	40	39	22	16	15	21	9.9
16	23	24	13	14	14	37	37	27	31	13	15	9.2
17	13	16	12	13	14	35	35	29	25	10	8.1	9.0
18	8.5	13	11	13	14	33	35	22	39	8.6	31	9.6
19	10	12	12	13	14	32	33	21	20	8.1	32	11
20	9.4	12	13	13	15	31	30	18	16	9.1	15	10
21	26	11	21	13	16	29	29	16	14	8.6	9.2	9.1
22	17	9.6	39	13	66	28	28	15	15	7.5	8.2	9.4
23	12	9.4	21	12	272	36	27	12	14	6.5	7.7	11
24	8.8	9.0	16	12	401	58	33	11	12	5.7	132	20
25	8.2	9.0	13	12	176	43	34	10	11	9.1	173	11
26	9.5	8.8	11	12	95	35	27	15	9.4	37	54	8.6
27	9.0	9.4	13	12	95	63	26	30	8.8	15	42	7.4
28	7.9	16	42	12	60	96	26	32	7.8	9.8	26	6.8
29	7.3	15	82	11	---	92	25	16	7.7	9.4	23	6.5
30	7.9	12	61	11	---	57	25	14	7.9	7.6	22	7.0
31	8.3	---	35	11	---	66	---	63	---	7.7	19	---
TOTAL	324.8	511.5	596.2	742	1445	1754	1511	710	474.6	443.0	725.3	341.9
MEAN	10.5	17.1	19.2	23.9	51.6	56.6	50.4	22.9	15.8	14.3	23.4	11.4
MAX	36	101	82	193	401	110	241	63	39	70	173	20
MIN	5.3	7.3	8.5	11	11	28	25	10	7.7	5.7	4.8	6.5
CFSM	.32	.51	.58	.72	1.55	1.70	1.51	.69	.47	.43	.70	.34
IN.	.36	.57	.67	.83	1.61	1.96	1.69	.79	.53	.49	.81	.38
CAL YR 1984	TOTAL	7197.4	MEAN 19.7	MAX 295	MIN 2.2	CFSM .59	IN 8.04					
WTR YR 1985	TOTAL	9579.3	MEAN 26.2	MAX 401	MIN 4.8	CFSM .79	IN 10.70					

STREAMS TRIBUTARY TO DETROIT RIVER

04166100 RIVER ROUGE AT SOUTHFIELD, MI

LOCATION.--Lat 42°26'52", long 83°17'52", in SW1/4 sec.32, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on right bank at downstream side of bridge on Beech Road at Southfield, and 4.2 mi east of Farmington.

DRAINAGE AREA.--87.9 mi².

PERIOD OF RECORD.--April 1958 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 609.62 ft, city of Southfield datum. Prior to Sept. 30, 1958, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 7, 23-28, Jan. 1, 2, and Jan. 9 to Feb. 21. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 61.3 ft³/s, 9.47 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,900 ft³/s, June 26, 1968, gage height, 19.04 ft; minimum, 0.1 ft³/s, Aug. 2, 1964, gage height, 1.15 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 500 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	unknown	1,000	unknown	Mar. 29	0700	662	9.03
Feb. 24	0100	*1,830	*12.83	Apr. 6	0600	1,380	11.61
Feb. 27	0700	538	8.44	May 31	1500	1,380	11.59
Mar. 5	1100	570	8.60	Aug. 25	0900	574	8.62
Mar. 9	0600	808	9.65				

Minimum discharge, 15 ft³/s, Aug. 9, 10, 13, gage height, 2.79 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	34	36	500	36	186	230	56	171	24	23	37
2	20	50	33	700	36	167	141	52	78	34	19	34
3	20	34	54	175	36	140	183	49	60	100	18	32
4	19	47	43	111	36	160	140	48	50	32	17	35
5	19	49	40	95	36	483	281	49	45	48	18	34
6	19	36	33	77	36	251	1070	94	41	74	21	42
7	30	32	32	72	36	186	365	66	37	35	19	37
8	70	30	31	67	36	299	215	53	36	83	17	33
9	41	32	29	58	36	581	162	48	36	68	16	47
10	29	62	36	54	36	304	138	46	34	38	29	34
11	25	381	38	50	43	255	139	42	39	28	32	29
12	24	172	40	46	60	247	120	42	78	26	17	27
13	23	81	78	45	70	187	106	40	44	23	16	25
14	23	62	58	41	57	153	98	38	36	84	18	24
15	46	80	54	36	50	129	95	40	38	190	104	24
16	108	83	45	38	48	106	88	60	104	53	54	24
17	47	55	41	41	47	98	81	62	52	34	26	22
18	34	48	37	44	47	87	84	51	84	29	36	23
19	39	43	36	43	49	85	79	44	55	25	68	26
20	36	39	40	42	52	83	75	40	42	45	33	23
21	126	37	43	41	56	76	71	37	36	34	25	22
22	70	34	172	40	242	74	67	34	41	24	23	22
23	43	34	90	40	916	90	65	32	37	21	21	24
24	35	33	60	40	1670	183	75	29	29	19	122	59
25	31	33	45	39	1000	133	112	28	27	19	426	31
26	35	32	40	39	454	98	70	33	28	117	159	25
27	33	32	45	38	431	123	63	89	27	42	107	23
28	31	58	130	38	222	359	59	112	25	28	64	21
29	29	52	267	37	---	466	57	46	24	23	50	20
30	28	40	299	36	---	191	55	126	24	22	59	22
31	28	---	120	36	---	229	---	651	---	21	45	---
TOTAL	1183	1835	2145	2759	5874	6209	4584	2237	1458	1443	1702	881
MEAN	38.2	61.2	69.2	89.0	210	200	153	72.2	48.6	46.5	54.9	29.4
MAX	126	381	299	700	1670	581	1070	651	171	190	426	59
MIN	19	30	29	36	36	74	55	28	24	19	16	20
CFSM	.44	.70	.79	1.01	2.39	2.28	1.74	.82	.55	.53	.63	.33
IN.	.50	.78	.91	1.17	2.49	2.63	1.94	.95	.62	.61	.72	.37
CAL YR 1984	TOTAL	22027.7	MEAN	60.2	MAX	1050	MIN	8.0	CFSM	.69	IN	9.32
WTR YR 1985	TOTAL	32310.0	MEAN	88.5	MAX	1670	MIN	16	CFSM	1.01	IN	13.67

STREAMS TRIBUTARY TO DETROIT RIVER

235

04166200 EVANS DITCH AT SOUTHFIELD, MI

LOCATION.--Lat 42°27'28", long 83°16'03", in SE1/4 sec.28, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on right bank 20 ft upstream from bridge on Nine Mile Road at Southfield, 1.6 mi upstream from mouth, and 5.5 mi east of Farmington.

DRAINAGE AREA.--9.49 mi².

PERIOD OF RECORD.--September 1958 to current year.

GAGE.--Water-stage recorder. Datum of gage is 615.07 ft, city of Southfield datum.

REMARKS.--Estimated daily discharges: Jan. 21 to Feb. 19. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 8.39 ft³/s, 12.01 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,200 ft³/s, Oct. 1, 1981, gage height, 15.03 ft, from floodmarks, from rating curve extended above 410 ft³/s; no flow part of each day Aug. 30, 31, 1978.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 270 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Nov. 11	0330	335	8.84	July 14	1045	276	8.35
Jan. 1	0900	444	9.61	July 15	1100	474	9.79
Feb. 23	1530	485	9.90	July 26	0245	274	8.34
Apr. 6	0230	402	9.31	Aug. 24	1900	338	8.87
May 31	0845	*614	*10.85				

Minimum discharge, 0.95 ft³/s, Aug. 22, 23, 24; minimum gage height, 5.80 ft, July 13, Aug. 12, 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.7	11	3.6	186	2.7	12	18	2.9	11	2.6	2.7	2.3
2	2.8	5.1	3.2	18	2.7	11	12	2.7	6.2	28	2.5	2.1
3	3.3	2.7	13	9.9	2.7	9.0	26	2.7	5.8	17	2.0	1.9
4	3.1	13	3.9	7.6	2.7	38	16	2.5	4.7	2.8	1.8	9.7
5	3.0	4.0	3.3	6.6	2.7	52	93	5.8	4.1	5.7	2.0	3.5
6	3.2	3.0	3.2	6.2	2.7	22	110	13	3.8	5.4	3.0	10
7	14	2.8	2.9	6.3	2.7	16	18	3.0	3.8	2.3	1.9	2.9
8	18	2.8	2.8	5.4	2.7	75	13	2.6	4.0	10	1.8	23
9	4.6	8.3	2.7	4.0	2.8	31	9.4	2.3	4.5	2.4	1.7	13
10	3.3	19	5.9	3.9	2.8	21	8.9	2.2	3.2	2.2	12	3.4
11	3.0	121	3.7	3.9	2.9	20	13	2.2	18	2.2	3.5	2.4
12	3.0	17	8.4	3.9	7.2	20	8.3	2.2	8.4	2.3	1.7	2.2
13	2.8	8.3	12	3.7	6.0	12	7.6	2.1	4.6	1.9	1.9	1.9
14	3.3	7.6	11	3.5	4.4	10	7.3	2.0	3.4	51	4.5	2.0
15	28	22	5.8	3.1	4.1	8.4	7.1	6.4	20	109	53	1.9
16	28	9.1	5.0	2.8	4.0	8.1	6.2	4.1	16	7.6	5.2	1.6
17	6.1	6.0	4.9	3.4	4.0	7.5	7.0	9.6	6.1	4.5	2.6	1.5
18	4.8	5.4	4.3	3.3	4.0	6.3	6.4	3.6	4.6	3.7	23	2.0
19	9.3	4.7	7.0	3.1	4.1	6.5	5.9	2.5	3.5	3.3	4.1	2.0
20	4.8	3.9	4.9	3.0	5.5	6.1	5.2	2.0	3.2	15	1.5	1.7
21	33	3.6	27	3.0	11	5.5	4.8	2.4	3.1	5.3	1.3	1.8
22	5.1	3.5	17	3.0	72	5.5	4.5	1.7	15	3.4	1.1	2.0
23	3.6	3.6	6.2	3.0	324	18	4.2	1.8	3.8	2.9	1.0	7.7
24	3.2	3.8	5.7	3.0	195	25	19	1.9	2.7	2.9	75	15
25	3.5	3.6	4.2	2.9	36	9.5	7.3	2.0	2.6	4.5	13	2.1
26	5.5	3.6	3.6	2.9	25	7.4	4.0	5.2	2.3	47	20	1.5
27	3.3	3.5	5.0	2.8	26	29	3.5	29	2.4	3.9	4.7	1.4
28	3.4	16	41	2.8	13	52	3.4	11	2.3	2.8	2.7	1.5
29	3.6	4.9	42	2.7	---	39	3.1	2.3	2.6	2.3	2.2	1.4
30	3.3	3.9	14	2.7	---	14	3.1	36	3.0	2.1	15	2.1
31	3.3	---	10	2.7	---	40	---	150	---	2.6	3.5	---
TOTAL	221.9	326.7	287.2	319.1	775.4	636.8	455.2	319.7	178.7	358.6	271.9	127.5
MEAN	7.16	10.9	9.26	10.3	27.7	20.5	15.2	10.3	5.96	11.6	8.77	4.25
MAX	33	121	42	186	324	75	110	150	20	109	75	23
MIN	2.7	2.7	2.7	2.7	2.7	5.5	3.1	1.7	2.3	1.9	1.0	1.4
CFSM	.75	1.15	.98	1.09	2.92	2.16	1.60	1.09	.63	1.22	.92	.45
IN.	.87	1.28	1.13	1.25	3.04	2.50	1.78	1.25	.70	1.41	1.07	.50

CAL YR 1984 TOTAL 3182.0 MEAN 8.69 MAX 195 MIN 1.2 CFSM .92 IN 12.47
WTR YR 1985 TOTAL 4278.7 MEAN 11.7 MAX 324 MIN 1.0 CFSM 1.23 IN 16.77

STREAMS TRIBUTARY TO DETROIT RIVER

04166300 UPPER RIVER ROUGE AT FARMINGTON, MI

LOCATION.--Lat 42°27'52", long 83°22'11", in NW1/4 sec.27, T.1 N., R.9 E., Oakland County, Hydrologic Unit 04090004, on left bank 800 ft downstream from bridge on Shiawassee Road at Farmington.

DRAINAGE AREA.--17.5 mi².

PERIOD OF RECORD.--March 1958 to current year.

REVISED RECORDS.--WSP 1912: 1959(M), 1960(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 690.4 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Oct. 1-23, Jan. 3 to Feb. 25, Feb. 28 to Apr. 9, and Apr. 11 to May 24. Records fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 11.9 ft³/s, 9.23 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft³/s, June 25, 1968, gage height, 8.70 ft; minimum, 0.07 ft³/s, Aug. 30, 1966, result of regulation; minimum daily, 0.32 ft³/s, Aug. 10, 1964, Aug. 29, 1966.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 120 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 1	1000	161	4.29	Apr. 6	unknown	297	5.02
Feb. 23	--	*430	*a7.40	May 31	1000	382	5.42
Mar. 9	unknown	190	unknown				

a Ice jam.

Minimum daily discharge, 2.4 ft³/s, Aug. 4, 5, 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	4.8	5.3	114	5.5	30	31	7.9	79	3.0	3.7	4.9
2	3.3	6.3	4.7	56	5.5	25	20	7.7	34	5.1	2.8	4.2
3	3.1	4.7	6.7	30	5.5	20	26	7.2	21	9.7	2.6	3.5
4	2.9	6.5	5.6	23	5.5	23	20	7.0	14	4.8	2.4	3.9
5	2.8	6.5	4.8	17	5.5	70	45	7.2	11	9.2	2.4	5.2
6	2.8	5.1	4.3	12	5.5	37	150	13	8.9	11	3.3	11
7	5.0	4.4	4.1	10	5.6	27	55	9.5	7.7	5.9	3.4	8.3
8	11	4.5	4.0	9.5	5.6	45	40	8.0	6.8	5.9	2.8	5.7
9	7.0	5.3	3.5	9.0	5.6	100	35	7.0	6.8	4.4	2.4	7.5
10	4.7	9.8	5.2	8.5	5.8	45	27	6.5	5.9	3.5	4.6	5.3
11	3.7	57	5.3	8.0	8.0	38	19	6.1	9.1	3.1	5.3	5.0
12	3.4	21	6.5	7.6	9.0	37	17	5.9	15	2.9	2.9	4.5
13	3.2	10	10	7.2	10	28	15	5.7	9.3	2.7	2.7	3.9
14	3.2	7.6	8.5	7.0	8.5	23	14	5.5	7.6	13	3.1	3.6
15	7.0	9.7	8.4	6.9	7.7	19	13	6.5	9.3	36	20	3.3
16	14	10	7.5	6.8	7.4	16	12	8.5	19	14	12	3.3
17	7.0	7.5	6.6	6.7	7.3	14	12	9.0	13	7.3	6.1	3.4
18	4.5	6.3	6.2	6.6	7.2	13	12	7.5	11	5.0	6.0	3.3
19	5.2	5.6	5.9	6.5	7.2	12	11	6.5	9.1	4.3	7.5	3.4
20	5.0	5.1	5.8	6.4	7.8	12	11	5.9	7.7	6.4	5.2	3.0
21	19	4.7	10	6.3	9.0	11	10	5.4	6.5	6.0	4.1	2.8
22	10	4.6	24	6.2	30	11	9.8	5.0	6.3	4.0	3.3	2.9
23	7.2	4.7	11	6.1	110	13	9.5	4.5	5.9	3.5	3.0	3.4
24	5.4	4.7	8.9	6.0	240	26	11	4.0	4.6	3.0	23	9.3
25	4.6	4.6	6.4	6.0	140	20	16	3.5	4.1	3.9	27	5.1
26	4.8	4.4	6.1	5.9	97	15	11	4.7	4.0	29	40	4.1
27	4.6	4.5	6.6	5.9	96	18	9.5	16	3.3	9.1	19	3.5
28	4.4	7.4	26	5.8	40	50	9.0	19	3.3	5.3	9.5	3.1
29	4.0	7.0	49	5.7	---	65	8.2	9.2	3.0	4.0	6.4	2.7
30	3.4	5.8	37	5.6	---	28	8.0	44	3.0	3.3	7.5	2.5
31	3.4	---	20	5.5	---	31	---	195	---	3.6	6.1	---
TOTAL	173.1	250.1	323.9	423.7	897.7	922	687.0	458.4	349.2	231.9	250.1	135.6
MEAN	5.58	8.34	10.4	13.7	32.1	29.7	22.9	14.8	11.6	7.48	8.07	4.52
MAX	19	57	49	114	240	100	150	195	79	36	40	11
MIN	2.8	4.4	3.5	5.5	5.5	11	8.0	3.5	3.0	2.7	2.4	2.5
CFSM	.32	.48	.59	.78	1.83	1.70	1.31	.85	.66	.43	.46	.26
IN.	.37	.53	.69	.90	1.91	1.96	1.46	.97	.74	.49	.53	.29
CAL YR 1984	TOTAL	3915.3	MEAN	10.7	MAX	182	MIN	1.5	CFSM	.61	IN	8.32
WTR YR 1985	TOTAL	5102.7	MEAN	14.0	MAX	240	MIN	2.4	CFSM	.80	IN	10.85

STREAMS TRIBUTARY TO DETROIT RIVER

237

04166500 RIVER ROUGE AT DETROIT, MI

LOCATION.--Lat 42°22'20", long 83°15'20", in SW1/4 sec.27, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 500 ft upstream from bridge on Plymouth Road at Detroit, and 4 mi upstream from Middle River Rouge.

DRAINAGE AREA.--187 mi².

PERIOD OF RECORD.--October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1034: 1933(M). WSP 1054: 1939, 1943, 1945(M). WSP 1437: 1931-32, 1934, 1936(M), 1937-38, 1944(M), 1945. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 584.00 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 16, 1948, nonrecording gage at site 1 mi downstream at datum 4.6 ft lower.

REMARKS.--Estimated daily discharges: Oct. 1-7, 10-14, Nov. 6-9, Dec. 7, 8, Jan. 18 to Feb. 21, and May 31 to June 11. Records fair. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--55 years, 116 ft³/s, 8.42 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,000 ft³/s, Apr. 5, 1947; maximum gage height, 23.0 ft, Apr. 6, 1947, from floodmark, site and datum then in use; minimum discharge, 1.8 ft³/s, Aug. 1, 2, 1964, gage height, 3.00 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,200 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 2	0500	1,710	13.27	May 31	unknown	1,510	12.68
Feb. 24	1100	*3,420	*16.67	July 15	2200	1,540	12.78
Apr. 6	1400	2,390	14.84				

Minimum daily discharge, 27 ft³/s, Aug. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	65	56	877	58	326	501	81	300	54	44	65
2	33	106	49	1340	57	292	287	77	170	137	37	55
3	32	46	101	324	57	259	366	69	110	420	31	52
4	31	64	79	196	57	280	289	68	90	70	28	49
5	30	93	55	164	57	894	616	70	82	82	28	88
6	35	56	52	131	57	529	2040	235	76	179	40	146
7	50	50	48	128	57	371	1090	130	71	69	51	108
8	137	47	44	121	57	499	423	93	68	83	33	165
9	83	51	41	94	57	1020	319	75	67	113	28	191
10	48	157	52	95	57	542	268	69	66	60	27	92
11	42	745	62	90	70	428	267	64	100	47	86	57
12	39	430	60	81	110	425	234	62	196	43	32	48
13	37	156	132	79	150	345	201	59	80	38	28	44
14	37	108	122	76	120	275	184	56	61	304	284	42
15	113	137	102	67	90	228	180	68	67	846	388	40
16	210	180	75	64	80	188	161	138	227	506	222	39
17	92	97	65	70	76	174	145	161	103	87	69	38
18	50	74	60	72	76	149	154	104	113	63	148	37
19	46	68	62	70	76	140	139	81	91	53	190	41
20	64	60	69	68	78	138	130	89	72	71	72	40
21	256	55	91	65	85	123	122	74	59	111	52	37
22	172	49	336	64	485	116	109	54	99	53	45	35
23	78	48	147	63	1520	165	103	50	87	42	42	42
24	52	49	93	63	3200	354	132	44	51	38	133	176
25	45	46	73	62	2330	264	236	42	44	35	586	64
26	55	46	71	61	999	179	124	45	41	429	358	45
27	57	44	78	61	731	246	99	245	39	106	318	40
28	53	113	216	60	414	659	93	326	37	57	124	36
29	49	119	496	59	---	1020	86	115	35	43	86	34
30	47	65	496	58	---	426	84	346	39	39	136	33
31	47	---	228	58	---	456	---	1200	---	41	95	---
TOTAL	2155	3424	3711	4881	11261	11510	9182	4390	2741	4319	3841	1979
MEAN	69.5	114	120	157	402	371	306	142	91.4	139	124	66.0
MAX	256	745	496	1340	3200	1020	2040	1200	300	846	586	191
MIN	30	44	41	58	57	116	84	42	35	35	27	33
CFSM	.37	.61	.64	.84	2.15	1.98	1.64	.76	.49	.74	.66	.35
IN.	.43	.68	.74	.97	2.24	2.29	1.83	.87	.55	.86	.76	.39
CAL YR 1984	TOTAL	41806	MEAN 114	MAX 1600	MIN 15	CFSM .61	IN 8.32					
WTR YR 1985	TOTAL	63394	MEAN 174	MAX 3200	MIN 27	CFSM .93	IN 12.61					

STREAMS TRIBUTARY TO DETROIT RIVER

04167000 MIDDLE RIVER ROUGE NEAR GARDEN CITY, MI

LOCATION.--Lat 42°20'55", long 83°18'45", in SW1/4 NW1/4 sec.6, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 200 ft downstream from bridge on Inkster Road, 1.8 mi northeast of Garden City, and 6.0 mi upstream from mouth.

DRAINAGE AREA.--99.9 mi².

PERIOD OF RECORD.--October 1930 to September 1933 (published as "at Detroit"), June 1947 to September 1977, October 1983 to current year. Monthly discharge only for October, November, 1930, published in WSP 1307. Annual maximum only, water years 1978-83.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 600.95 ft above National Geodetic Vertical Datum of 1929. Nov. 21, 1930 to Sept. 30, 1933, nonrecording gage at site 4.8 mi downstream at datum 17.48 ft lower. June 6, 1947 to Oct. 18, 1948, nonrecording gage at site 200 ft upstream at present datum.

REMARKS.--Estimated daily discharges: Jan. 17 to Feb. 8. Records good. Occasional regulation by reservoirs upstream from station since 1956. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--35 years, 70.4 ft³/s, 9.57 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,330 ft³/s, June 26, 1968; maximum gage height, 10.50 ft, May 10, 1948; minimum discharge, 0.9 ft³/s, Aug. 16, 1956.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 700 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Feb. 24	0700	*1,620	*9.55	Apr. 6	1200	1,240	9.11

Minimum discharge, 16 ft³/s, Aug. 5; minimum gage height, 1.66 ft, Dec. 7, result of freezeup.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	39	33	589	33	275	321	50	163	27	27	41
2	27	53	29	459	33	234	229	47	96	57	24	34
3	26	29	57	254	33	200	232	45	60	76	22	32
4	26	37	38	145	32	232	201	43	44	36	21	31
5	26	35	30	110	32	409	440	46	40	55	18	33
6	24	28	29	87	32	340	1060	107	36	81	22	282
7	45	24	27	77	32	287	616	72	34	41	24	203
8	101	23	26	69	33	355	352	57	32	31	24	167
9	47	35	26	62	33	486	225	47	48	26	22	369
10	33	83	31	53	33	407	170	44	37	26	20	140
11	29	317	31	50	45	310	156	42	54	24	20	75
12	28	164	36	47	82	292	137	39	84	22	22	51
13	28	79	44	44	80	253	121	38	45	22	22	42
14	28	50	74	44	54	205	110	37	37	143	299	36
15	127	64	58	45	49	169	108	53	46	318	372	34
16	82	64	43	40	45	146	99	84	79	228	204	33
17	38	46	39	40	44	130	94	95	52	74	65	32
18	32	38	35	40	43	114	92	53	47	41	84	31
19	36	35	38	40	43	109	86	42	37	34	112	31
20	38	32	39	39	44	111	78	65	34	31	44	30
21	150	30	80	39	54	105	72	50	31	28	33	26
22	75	28	130	38	244	102	68	36	43	27	30	27
23	43	27	68	38	851	140	64	34	40	25	28	45
24	37	27	51	37	1550	199	102	32	28	24	65	128
25	34	28	38	37	1220	155	98	31	26	30	84	51
26	36	28	33	36	760	110	76	31	25	183	237	36
27	32	28	38	36	521	190	63	158	24	67	257	31
28	29	63	142	35	383	417	58	186	24	35	95	28
29	28	47	235	34	---	507	54	67	23	27	53	26
30	27	37	213	34	---	389	52	51	29	24	68	27
31	25	---	143	33	---	380	---	111	---	30	62	---
TOTAL	1365	1618	1934	2731	6438	7758	5634	1893	1398	1893	2480	2152
MEAN	44.0	53.9	62.4	88.1	230	250	188	61.1	46.6	61.1	80.0	71.7
MAX	150	317	235	589	1550	507	1060	186	163	318	372	369
MIN	24	23	26	33	32	102	52	31	23	22	18	26
CFSM	.44	.54	.63	.86	2.30	2.50	1.88	.61	.47	.61	.80	.72
IN.	.51	.60	.72	1.02	2.40	2.89	2.10	.70	.52	.70	.92	.80
CAL YR 1984	TOTAL	27764	MEAN	75.9	MAX	992	MIN	19	CFSM	.76	IN	10.34
WTR YR 1985	TOTAL	37294	MEAN	102	MAX	1550	MIN	18	CFSM	1.02	IN	13.89

STREAMS TRIBUTARY TO DETROIT RIVER

239

04168000 LOWER RIVER ROUGE AT INKSTER, MI

LOCATION.--Lat 42°18'00", long 83°18'00", in SW1/4 SE1/4 sec.19, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 10 ft downstream from bridge on John Daly Road, 0.6 mi northeast of Inkster, and 4.8 mi upstream from mouth.

DRAINAGE AREA.--83.2 mi².

PERIOD OF RECORD.--June 1947 to current year.

REVISED RECORDS.--WSP 1174: 1948(M). WSP 1437: 1949. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 593.14 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 20, 1948, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 7, 25-27, and Jan. 3 to Feb. 22. Records good except for estimated daily discharges and those for the month of October, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--38 years, 52.9 ft³/s, 8.63 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,600 ft³/s, June 26, 1968, gage height, 13.62 ft; minimum, 0.2 ft³/s, Sept. 13, 1955, Jan. 23, 1961.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 900 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Feb. 24	1300	*2,320	*12.13	Apr. 6	1900	1,410	10.80
Mar. 29	1800	1,100	9.93				

Minimum discharge, 1.0 ft³/s, Oct. 4, 5, gage height, 2.64 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.2	19	13	520	12	192	377	22	19	4.6	6.4	9.3
2	1.8	21	9.1	613	12	166	194	19	14	12	4.5	7.1
3	1.7	9.5	21	120	12	135	190	18	10	15	8.9	5.8
4	1.2	11	14	50	13	136	152	17	8.4	6.2	7.1	5.4
5	1.1	13	11	40	13	343	362	18	7.5	31	4.2	5.1
6	3.1	9.2	9.9	30	13	289	1130	35	7.9	32	3.6	221
7	11	7.3	9.5	25	13	225	541	22	8.3	15	15	118
8	34	7.0	7.2	23	13	355	206	19	6.7	10	20	49
9	17	11	5.7	20	13	594	136	17	8.4	9.1	8.9	162
10	7.3	33	9.2	18	13	271	102	18	8.5	26	10	71
11	6.3	204	7.9	17	19	206	91	15	40	11	6.1	34
12	5.2	112	11	16	31	222	76	13	45	6.5	4.4	20
13	2.8	44	14	15	27	156	64	12	19	4.9	3.6	17
14	3.0	25	28	15	21	119	59	11	11	61	61	12
15	51	28	30	15	17	103	54	32	16	71	144	10
16	35	34	22	15	16	82	49	34	28	36	75	8.9
17	13	27	18	15	16	75	45	32	16	15	27	8.5
18	7.7	17	15	14	16	63	43	18	14	11	61	8.0
19	11	13	17	14	16	62	40	14	11	10	53	7.3
20	15	11	16	14	16	55	35	24	9.1	6.0	27	7.0
21	58	11	41	14	25	51	32	34	7.5	5.0	16	7.0
22	22	9.7	103	14	160	47	29	14	21	5.1	10	9.8
23	14	7.3	49	14	773	70	29	9.3	11	4.1	7.1	15
24	8.4	6.9	29	14	1900	125	57	6.9	6.8	3.7	18	35
25	6.0	6.5	18	14	1550	107	49	6.2	5.6	6.1	18	15
26	6.4	6.4	15	14	681	77	32	5.3	4.8	81	78	12
27	4.9	6.4	16	13	465	167	26	108	5.9	15	61	8.3
28	4.3	22	85	13	253	732	23	118	8.1	8.2	25	7.6
29	4.4	21	209	13	---	1060	23	38	4.4	5.8	19	6.9
30	4.2	15	224	13	---	561	22	24	5.2	8.2	13	7.4
31	6.2	---	91	12	---	371	---	30	---	8.2	11	---
TOTAL	369.2	768.2	1168.5	1757	6129	7217	4268	803.7	388.1	543.7	826.8	910.4
MEAN	11.9	25.6	37.7	56.7	219	233	142	25.9	12.9	17.5	26.7	30.3
MAX	58	204	224	613	1900	1060	1130	118	45	81	144	221
MIN	1.1	6.4	5.7	12	12	47	22	5.3	4.4	3.7	3.6	5.1
CFSM	.14	.31	.45	.68	2.63	2.80	1.71	.31	.16	.21	.32	.36
IN	.17	.34	.52	.79	2.74	3.23	1.91	.36	.17	.24	.37	.41
CAL YR 1984	TOTAL	17407.4	MEAN	47.6	MAX	1050	MIN	1.1	CFSM	.57	IN	7.78
WTR YR 1985	TOTAL	25149.6	MEAN	68.9	MAX	1900	MIN	1.1	CFSM	.83	IN	11.24

STREAMS TRIBUTARY TO LAKE ERIE

04170000 HURON RIVER AT MILFORD, MI

LOCATION.--Lat 42°34'44", long 83°37'36", in NE1/4 sec.16, T.2 N., R.7 E., Oakland County, Hydrologic Unit 04090005, on left bank 40 ft downstream from bridge on General Motors Road, 0.5 mi downstream from Sherwood Creek, and 0.5 mi west of Milford.

DRAINAGE AREA.--132 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1948 to current year.

REVISED RECORDS.--WSP 1337: 1952(m). WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 880.00 ft above National Geodetic Vertical Datum of 1929. Prior to Apr. 1, 1970, at site 240 ft upstream at same datum.

REMARKS.--Estimated daily discharges: Dec. 14-22, Aug. 1-5, and Sept. 11-30. Water-discharge records good. Flow below about 300 ft³/s regulated by powerplant 1.5 mi upstream from station prior to May 20, 1957; occasional regulation for lake level control since.

AVERAGE DISCHARGE.--37 years, 97.4 ft³/s, 10.02 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 648 ft³/s, Oct. 3, 1981, gage height, 7.87 ft; maximum gage height, 8.26 ft, June 28, 1968; minimum daily discharge, 5.2 ft³/s, Oct. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 372 ft³/s, Apr. 7, gage height, 6.95 ft; minimum, 32 ft³/s, Aug. 13, gage height, 4.35 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	52	83	176	89	281	199	103	203	45	47	128
2	57	52	82	215	84	252	194	90	198	45	44	120
3	53	50	85	185	80	238	195	79	167	51	42	115
4	51	50	83	165	76	237	201	73	139	48	39	109
5	48	50	80	154	74	252	215	71	113	59	39	113
6	46	48	78	148	73	255	292	94	96	68	42	125
7	50	48	78	139	71	246	367	83	85	66	46	122
8	60	48	78	135	68	240	363	72	76	64	44	112
9	59	50	78	129	66	261	332	73	76	57	39	98
10	54	64	82	126	65	277	296	74	74	52	37	90
11	47	132	85	123	70	275	280	75	69	50	36	85
12	46	151	89	120	77	267	270	76	76	49	34	76
13	46	146	98	118	80	277	254	75	76	51	33	68
14	47	135	98	115	83	250	239	73	67	61	34	62
15	50	131	94	112	88	235	231	75	64	71	86	57
16	54	130	92	110	88	223	224	80	73	72	92	54
17	52	123	92	109	86	213	219	77	78	65	86	52
18	50	118	90	110	83	203	205	76	89	55	105	51
19	50	111	88	110	79	194	195	76	93	47	125	50
20	48	102	87	100	79	188	185	75	85	52	107	49
21	70	100	89	109	79	183	173	74	78	51	88	47
22	68	100	91	101	99	174	160	71	71	49	81	45
23	61	94	97	98	164	175	150	67	67	47	81	46
24	56	88	92	97	275	190	146	63	62	44	98	56
25	54	82	83	98	359	180	150	60	59	42	164	57
26	57	80	82	97	359	162	143	61	56	66	190	55
27	58	80	83	97	353	161	135	73	54	67	188	53
28	54	89	92	97	317	195	128	84	51	60	168	50
29	55	92	127	96	---	218	122	80	52	50	153	50
30	54	87	154	95	---	221	113	81	51	46	147	53
31	52	---	149	95	---	214	---	152	---	45	142	---
TOTAL	1663	2683	2859	3779	3564	6937	6376	2436	2598	1646	2657	2248
MEAN	53.6	89.4	92.2	122	127	224	213	78.6	86.6	54.7	85.7	74.9
MAX	70	151	154	215	359	281	367	152	203	72	190	128
MIN	46	48	78	95	65	161	113	60	51	42	33	45
CFSM	.41	.68	.70	.92	.96	1.70	1.61	.60	.66	.41	.65	.57
IN.	.47	.76	.81	1.06	1.00	1.95	1.80	.69	.73	.48	.75	.63
CAL YR 1984	TOTAL	27097	MEAN	74.0	MAX 196	MIN 25	CFSM .56	IN 7.64				
WTR YR 1985	TOTAL	39496	MEAN	108	MAX 367	MIN 33	CFSM .82	IN 11.13				

STREAMS TRIBUTARY TO LAKE ERIE

241

04170000 HURON RIVER AT MILFORD, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1970-75, 1984 to current year.

COOPERATION.--Biochemical-oxygen-demand samples were collected by U.S. Geological Survey and analyzed by Canton Analytical Laboratory.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, TOTAL, IMMED. (COLS. PER 100 ML)
OCT 05...	1200	49	600	8.2	14.0	1.3	9.8	97	150	K40
NOV 02...	1300	52	632	8.1	10.0	1.7	11.6	104	2.1	K180
DEC 07...	1200	79	638	7.9	1.5	3.0	13.5	100	4.0	K4200
JAN 03...	1300	184	581	8.0	1.5	4.0	13.8	100	2.0	1700
FEB 07...	1300	71	655	7.9	1.0	1.5	13.2	95	2.0	550
MAR 05...	1300	249	569	8.0	1.0	1.5	13.3	96	4.0	>4000
APR 04...	1200	198	548	8.1	6.0	1.5	12.0	101	5.0	>4000
MAY 09...	1200	74	583	8.3	18.0	2.4	9.8	106	2.4	210
JUN 06...	1230	96	605	8.3	20.0	1.2	9.4	106	1.7	K240
JUL 11...	1000	50	632	8.1	23.0	1.1	7.4	89	2.9	E10
AUG 08...	1245	44	634	8.2	24.0	1.0	8.0	98	2.2	3900
SEP 04...	1300	109	595	8.1	23.5	.60	8.6	105	1.0	K180

DATE	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
OCT 05...	K10	230	38	57	21	34	2.2	2.3	29	65
NOV 02...	K15	230	43	59	21	37	2.1	2.9	29	71
DEC 07...	48	260	44	67	22	39	1.9	5.2	36	65
JAN 03...	270	220	42	59	18	32	1.6	3.5	36	60
FEB 07...	K13	250	34	67	21	35	2.0	5.3	32	62
MAR 05...	K400	220	42	59	18	32	1.7	3.5	35	54
APR 04...	>120	210	35	58	17	28	1.7	2.8	33	50
MAY 09...	K19	230	28	60	19	30	1.8	1.9	31	54
JUN 06...	K8	230	33	62	19	31	1.5	1.9	30	56
JUL 11...	80	220	30	55	20	35	2.1	2.9	26	64
AUG 08...	72	230	27	56	21	44	2.2	2.4	27	71
SEP 04...	43	220	32	56	20	36	1.7	2.9	26	64

STREAMS TRIBUTARY TO LAKE ERIE

04170000 HURON RIVER AT MILFORD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 05...	1200	.30	7.7	347	330	--	.020	<.10	.070	.73
NOV 02...	1300	.20	7.4	369	340	.06	.040	.10	.160	.54
DEC 07...	1200	.20	7.8	350	370	.26	.040	.30	.340	.56
JAN 03...	1300	.20	7.5	355	320	.29	.010	.30	.230	.47
FEB 07...	1300	.20	8.2	351	360	.16	.040	.20	.330	.87
MAR 05...	1300	.20	6.9	320	310	.47	.030	.50	.240	.56
APR 04...	1200	.10	5.5	370	300	.28	.020	.30	<.010	--
MAY 09...	1200	.10	4.4	372	320	.07	.030	.10	.070	.43
JUN 06...	1230	.20	5.3	367	320	--	.010	<.10	.250	.65
JUL 11...	1000	.20	6.8	379	320	--	<.010	.20	.040	.56
AUG 08...	1245	.20	8.4	372	350	.02	.080	.10	.160	.44
SEP 04...	1300	.10	7.5	368	330	.17	.030	.20	.110	.39

DATE	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	PHENOLS TOTAL (UG/L)	2,4-D, DIS- SOLVED (UG/L)	2,4-DP DISSOLV (UG/L)	2,4,5-T DIS- SOLVED (UG/L)	SILVEX, DIS- SOLVED (UG/L)	SEDI- MENT, SUS- PENDED (MG/L)
OCT 05...	.80	--	--	.020	<1	--	--	--	--	28
NOV 02...	.70	.80	.070	.030	<1	--	--	--	--	33
DEC 07...	.90	1.2	.170	.050	1	--	--	--	--	25
JAN 03...	.70	1.0	.030	.010	<1	--	--	--	--	--
FEB 07...	1.2	1.4	.030	.020	--	--	--	--	--	77
MAR 05...	.80	1.3	.030	.010	--	--	--	--	--	4
APR 04...	.80	1.1	.060	<.010	--	--	--	--	--	3
MAY 09...	.50	.60	.030	.030	5	.10	<.01	<.01	<.01	6
JUN 06...	.90	--	.050	.030	--	.44	<.01	<.01	.02	4
JUL 11...	.60	.80	.090	.050	--	.26	<.01	<.01	.01	4
AUG 08...	.60	.70	.070	.050	--	--	--	--	--	6
SEP 04...	.50	.70	.080	.060	--	--	--	--	--	5

STREAMS TRIBUTARY TO LAKE ERIE

243

04170500 HURON RIVER NEAR NEW HUDSON, MI

LOCATION.--Lat 42°30'45", long 83°40'35", in NE1/4 sec.1, T.1 N., R.6 E., Livingston County, Hydrologic Unit 04090005, on right bank 150 ft downstream from Kent Lake Dam, 2 mi upstream from Woodruff Creek, and 3 mi west of New Hudson.

DRAINAGE AREA.--148 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1948 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 868.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharges. Water-discharge records good. Occasional regulation by Kent Lake.

AVERAGE DISCHARGE.--37 years, 111 ft³/s, 10.18 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,080 ft³/s, Dec. 29, 1950, gage height, 5.05 ft, from rating curve extended above 600 ft³/s; minimum, 2.6 ft³/s, May 27, 1963, gage height, 0.53 ft; minimum daily, 6.4 ft³/s, May 7, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 323 ft³/s, Feb. 27, gage height, 2.87 ft; minimum, 27 ft³/s, Apr. 25, Aug. 13; minimum gage height, 0.92 ft, Apr. 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	162	102	188	111	299	132	120	189	55	55	146
2	53	165	102	204	107	281	124	111	207	56	48	138
3	52	116	99	203	104	264	120	98	197	73	47	126
4	51	96	100	190	101	275	131	92	173	63	43	119
5	52	172	100	176	100	273	179	92	150	71	42	115
6	50	167	97	166	98	263	223	109	128	81	45	133
7	53	118	94	159	96	257	271	107	111	76	51	140
8	64	95	93	152	92	254	224	101	101	73	51	138
9	66	147	93	145	90	256	222	93	95	71	46	126
10	65	155	96	142	89	262	158	91	88	67	42	112
11	60	173	97	138	94	268	176	90	88	60	41	92
12	57	166	101	136	99	273	122	90	89	58	34	83
13	56	161	107	132	101	270	137	92	82	54	30	73
14	56	195	110	132	101	265	182	91	78	62	36	67
15	60	192	109	128	102	254	205	90	78	80	77	61
16	64	190	104	127	102	241	213	95	88	80	93	59
17	62	181	108	130	103	235	209	99	94	75	93	56
18	62	153	105	130	101	223	201	93	104	68	110	57
19	59	188	104	130	99	214	201	88	103	62	133	55
20	60	175	101	121	98	209	193	89	101	66	129	52
21	79	187	102	121	98	201	186	92	94	62	121	53
22	81	172	105	122	107	196	177	89	87	59	105	47
23	77	140	111	120	145	194	165	87	83	51	98	49
24	73	123	110	119	225	204	162	81	80	47	110	61
25	70	112	102	121	281	199	97	77	73	45	146	61
26	72	105	100	118	307	188	79	79	70	76	186	61
27	71	100	103	117	322	192	105	94	65	75	202	58
28	72	105	107	116	314	217	120	103	61	70	189	54
29	96	107	129	115	---	235	119	94	58	68	174	54
30	94	106	149	114	---	243	120	102	59	62	170	57
31	83	---	157	114	---	233	---	164	---	59	160	---
TOTAL	2025	4424	3297	4326	3787	7438	4953	2993	3074	2025	2907	2503
MEAN	65.3	147	106	140	135	240	165	96.5	102	65.3	93.8	83.4
MAX	96	195	157	204	322	299	271	164	207	81	202	146
MIN	50	95	93	114	89	188	79	77	58	45	30	47
CFSM	.44	.99	.72	.95	.91	1.62	1.12	.65	.69	.44	.63	.56
IN	.51	1.11	.83	1.09	.95	1.87	1.24	.75	.77	.51	.73	.63
CAL YR 1984	TOTAL	30655	MEAN	83.8	MAX 195	MIN 20	CFSM .57	IN 7.71				
WTR YR 1985	TOTAL	43752	MEAN	120	MAX 322	MIN 30	CFSM .81	IN 11.00				

STREAMS TRIBUTARY TO LAKE ERIE

04170500 HURON RIVER NEAR NEW HUDSON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1970-75, 1984 to current year.

COOPERATION.--Biochemical-oxygen-demand samples were collected by U.S. Geological Survey and analyzed by Canton Analytical Laboratory.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, TOTAL, IMMED. (COLS. PER 100 ML)
OCT 05...	0900	52	544	8.4	14.0	1.5	9.7	96	320	<2
NOV 02...	1000	169	579	8.1	11.5	2.6	9.8	91	2.2	K16
DEC 07...	0900	94	605	8.1	2.5	1.5	12.4	94	2.0	66
JAN 03...	1000	205	609	8.0	1.5	3.5	13.6	99	2.0	K1500
FEB 07...	1000	96	640	8.1	1.5	1.0	12.3	90	2.0	92
MAR 05...	1000	273	591	8.1	2.5	1.5	13.4	102	4.0	E460
APR 04...	0930	125	533	8.4	6.0	2.0	12.2	102	4.0	K440
MAY 09...	1000	91	545	8.3	17.0	1.0	8.2	87	3.0	K6
JUN 06...	1000	126	555	8.4	21.0	1.0	8.5	98	2.3	K10
JUL 11...	1230	60	530	8.5	25.0	.90	7.8	97	3.1	E96
AUG 08...	0945	50	500	8.4	23.5	1.7	7.2	87	7.8	160
SEP 04...	1000	121	520	8.5	23.5	2.5	8.2	100	4.0	K6

DATE	COLI- FORM, FECAL, 0.7 UM-MF (COLS. / 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
OCT 05...	<1	190	35	42	20	34	1.9	1.2	30	65
NOV 02...	K2	210	42	50	21	33	1.9	2.6	30	63
DEC 07...	63	240	39	62	21	33	1.8	3.1	35	58
JAN 03...	K4	240	47	62	20	35	1.8	3.7	34	57
FEB 07...	K2	250	32	66	21	31	1.9	3.4	35	58
MAR 05...	42	220	49	58	18	35	1.7	2.6	35	60
APR 04...	K1	210	30	56	17	26	1.6	1.4	34	47
MAY 09...	<1	220	32	59	18	26	1.8	1.8	34	47
JUN 06...	K3	230	50	59	20	30	1.4	1.4	32	51
JUL 11...	K6	210	31	51	19	30	1.7	1.1	32	57
AUG 08...	K1	180	28	40	19	33	1.9	1.1	25	59
SEP 04...	K2	190	35	45	20	35	1.6	1.0	24	62

STREAMS TRIBUTARY TO LAKE ERIE

245

04170500 HURON RIVER NEAR NEW HUDSON, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITU- ENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT										
05...	0900	.20	4.5	315	290	--	<.010	<.10	<.010	--
NOV										
02...	1000	.20	2.7	322	300	--	<.010	<.10	.400	.80
DEC										
07...	0900	.20	4.9	344	340	.19	.010	.20	.180	.52
JAN										
03...	1000	.20	6.1	352	330	.19	.010	.20	.270	1.0
FEB										
07...	1000	.20	8.0	338	350	.15	.050	.20	.360	.54
MAR										
05...	1000	.20	6.6	332	320	.58	.020	.60	.160	.64
APR										
04...	0930	.10	4.0	301	290	.19	.010	.20	<.010	--
MAY										
09...	1000	.10	.7	332	300	--	<.010	<.10	<.010	--
JUN										
06...	1000	.20	2.3	347	300	--	<.010	<.10	.030	.87
JUL										
11...	1230	.50	4.8	339	300	--	<.010	<.10	<.010	--
AUG										
08...	0945	.20	9.9	301	280	--	<.010	<.10	<.010	--
SEP										
04...	1000	.10	4.2	322	290	--	<.010	<.10	.070	1.0

DATE	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	PHENOLS TOTAL (UG/L)	2,4-D, DIS- SOLVED (UG/L)	2,4-DP DISSOLV (UG/L)	2,4,5-T DIS- SOLVED (UG/L)	SILVEX, DIS- SOLVED (UG/L)	SEDI- MENT, SUS- PENDED (MG/L)
OCT										
05...	.80	--	.130	<.010	<1	--	--	--	--	25
NOV										
02...	1.2	--	.090	.050	4	--	--	--	--	8
DEC										
07...	.70	.90	.040	--	2	--	--	--	--	17
JAN										
03...	1.3	1.5	.020	<.010	<1	--	--	--	--	18
FEB										
07...	.90	1.1	.020	--	--	--	--	--	--	47
MAR										
05...	.80	1.4	.060	.020	--	--	--	--	--	4
APR										
04...	.60	.80	.100	<.010	1	.04	<.01	<.01	<.01	19
MAY										
09...	.60	--	.050	.020	--	.03	<.01	<.01	<.01	11
JUN										
06...	.90	--	.030	.010	2	1.0	<.01	<.01	.02	5
JUL										
11...	.70	--	--	.020	<1	.18	<.01	<.01	<.01	2
AUG										
08...	1.0	--	.050	.040	--	--	--	--	--	2
SEP										
04...	1.1	--	.080	.050	--	--	--	--	--	13

STREAMS TRIBUTARY TO LAKE ERIE

04172000 HURON RIVER NEAR HAMBURG, MI

LOCATION.--Lat 42°27'55", long 83°48'00", in sec.24, T.1 N., R.5 E., Livingston County, Hydrologic Unit 04090005, on right bank at downstream side of bridge on Hamburg Road, 1.1 mi north of Hamburg, and 3 mi upstream from Strawberry Lake.

DRAINAGE AREA.--308 mi².

PERIOD OF RECORD.--October 1951 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 850.00 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Aug. 12, 1953, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 8, Dec. 26 to Jan. 13, and Jan. 16 to Feb. 24. Records good except for estimated daily discharges, which are fair. Occasional regulation by Kent Lake, 11 mi upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 211 ft³/s, 9.30 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,560 ft³/s, May 15, 1956; maximum gage height, 8.46 ft, June 30, 1968; minimum discharge, 32 ft³/s, July 2, 3, 1965; minimum gage height, 3.16 ft, Aug. 1-3, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 915 ft³/s, Feb. 28, gage height, 6.90 ft; minimum, 85 ft³/s, July 13, Aug. 14; minimum gage height, 3.52 ft, Oct. 6, 7.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	120	136	178	300	200	905	549	218	325	95	124	254
2	113	176	172	350	195	866	520	211	367	91	117	237
3	107	212	173	370	185	805	472	198	394	91	110	217
4	100	196	168	365	180	762	441	183	399	93	104	200
5	96	172	162	340	180	737	441	172	385	95	97	189
6	94	195	161	320	175	696	495	191	355	108	96	191
7	93	224	153	300	175	662	560	207	322	113	100	207
8	103	195	155	290	170	640	634	205	289	111	103	211
9	113	166	151	280	165	626	666	196	271	110	103	221
10	115	194	148	265	165	626	637	188	251	104	100	218
11	113	273	152	260	160	643	599	180	239	96	97	203
12	109	315	156	255	160	660	544	176	244	89	92	184
13	106	325	168	250	160	662	492	175	239	87	88	167
14	103	314	178	243	165	657	444	174	227	94	86	151
15	104	313	185	242	175	640	430	175	213	116	102	138
16	108	326	186	240	185	607	432	183	217	145	133	127
17	110	318	186	235	185	575	428	192	227	151	151	119
18	111	311	184	235	185	536	420	194	251	145	162	112
19	111	291	182	230	185	503	408	191	248	136	192	110
20	110	276	178	225	185	478	393	187	238	133	216	107
21	124	272	175	220	180	451	377	187	220	131	219	103
22	140	265	197	220	180	430	361	187	200	125	209	100
23	142	262	204	215	235	413	342	184	182	114	192	97
24	137	239	208	215	355	411	324	180	165	105	187	107
25	131	212	195	215	500	409	312	177	153	101	211	110
26	128	191	190	215	699	399	264	173	144	118	237	114
27	126	177	180	215	852	395	227	185	135	132	268	114
28	124	178	190	210	910	413	225	213	124	135	286	110
29	122	182	205	210	---	456	223	224	114	134	287	106
30	133	181	245	205	---	490	221	223	103	129	280	104
31	139	---	280	205	---	523	---	267	---	126	269	---
TOTAL	3585	7087	5645	7940	7446	18076	12881	5996	7241	3553	5018	4628
MEAN	116	236	182	256	266	583	429	193	241	115	162	154
MAX	142	326	280	370	910	905	666	267	399	151	287	254
MIN	93	136	148	205	160	395	221	172	103	87	86	97
CFSM	.38	.77	.59	.83	.86	1.89	1.39	.63	.78	.37	.93	.50
IN.	.43	.86	.68	.96	.90	2.18	1.56	.72	.87	.43	.61	.56
CAL YR 1984	TOTAL	64043	MEAN 175	MAX 488	MIN 44	CFSM .57	IN 7.74					
WTR YR 1985	TOTAL	89096	MEAN 244	MAX 910	MIN 86	CFSM .79	IN 10.76					

STREAMS TRIBUTARY TO LAKE ERIE

247

04174050 HURON RIVER AT DELHI MILLS, MI

WATER-QUALITY RECORDS

LOCATION.--Lat 42°20'01", long 83°48'34", in SE1/4 sec.2, T.2 S., R.5 E., Washtenaw County, Hydrologic Unit 04090005, at bridge on Delhi Road, 5.0 mi northwest of Ann Arbor, 5.2 mi downstream from Mill Creek, 5.1 mi upstream from Barton Dam, and 60.0 mi upstream from mouth.

DRAINAGE AREA.--699 mi².

PERIOD OF RECORD.--Water years 1971-81, 1983 to current year.

REMARKS.--Bimonthly samples were collected at bridge.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPECIFIC CONDUCTANCE LAB (US/CM)	PH LAB (STANDARD UNITS)	TEMPERATURE (DEG C)	CARBON, ORGANIC TOTAL (MG/L AS C)	PER-THANE TOTAL (UG/L)	NAPHTHALENES, POLY-CHLOR. TOTAL (UG/L)	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)
NOV 02...	1400	--	--	9.0	6.5	< 1	< 10	< 1	< 010	< 1	< 010
JAN 03...	1500	--	--	1.0	--	--	--	--	--	--	--
MAR 05...	1500	555	7.8	1.5	7.5	< 1	< 10	< 1	< 010	< 1	< 010
MAY 09...	1400	586	7.9	18.0	7.6	< 1	< 10	< 1	< 010	< 1	< 010
JUL 11...	1500	577	8.0	23.5	--	< 1	< 10	< 1	< 010	< 1	< 010
SEP 04...	1430	573	8.0	24.0	6.6	< 1	< 10	< 1	< 010	< 1	< 010

DATE	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)	DI-ELDRIN, TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE, TOTAL (UG/L)	LINDANE, TOTAL (UG/L)	MALATHION, TOTAL (UG/L)
NOV 02...	< 010	< 010	< 01	< 010	< 010	< 010	< 01	< 010	< 010	< 010	< 01
JAN 03...	--	--	--	--	--	--	--	--	--	--	--
MAR 05...	< 010	< 010	< 01	< 010	< 010	< 010	< 01	< 010	< 010	< 010	< 01
MAY 09...	< 010	< 010	< 01	< 010	< 010	< 010	< 01	< 010	< 010	< 010	< 01
JUL 11...	< 010	< 010	< 01	< 010	< 010	< 010	< 01	< 010	< 010	< 010	< 01
SEP 04...	< 010	< 010	< 01	< 010	< 010	< 010	< 01	< 010	< 010	< 010	< 01

DATE	METH-OXY-CHLOR, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	PARA-THION, TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2,4-DP, TOTAL (UG/L)	2,4,5-T, TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
NOV 02...	< 01	< 01	< 01	< 01	< 01	< 1	< 01	--	--	--	--
JAN 03...	--	--	--	--	--	--	--	.02	< 01	< 01	< 01
MAR 05...	< 01	< 01	< 01	< 01	< 01	< 1	< 01	< 01	< 01	< 01	< 01
MAY 09...	< 01	< 01	< 01	< 01	< 01	< 1	< 01	.10	< 01	< 01	< 01
JUL 11...	< 01	< 01	< 01	< 01	< 01	< 1	< 01	.26	< 01	< 01	< 01
SEP 04...	< 01	< 01	< 01	< 01	< 01	< 1	< 01	.02	< 01	< 01	< 01

STREAMS TRIBUTARY TO LAKE ERIE

04174500 HURON RIVER AT ANN ARBOR, MI

LOCATION.--Lat 42°17'10", long 83°44'00", in NW1/4 sec.28, T.2 S., R.6 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 100 ft upstream from bridge on Wall Street in Ann Arbor, 0.7 mi downstream from Argo Dam, and 4.2 mi upstream from Geddes Dam.

DRAINAGE AREA.--729 mi².

PERIOD OF RECORD.--February 1904 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "at Geddes" February 1904 to December 1914 and as "at Barton" January 1914 to September 1940.

REVISED RECORDS.--WSP 874: 1938. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 744.81 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). February 1904 to December 1914 at Geddes Dam, 4.2 mi downstream, and January 1914 to September 1947 at Barton Dam, 2.6 mi upstream, flow computed from records of operation of powerplants and records of depth of flow over dam and/or flow through undersluices.

REMARKS.--No estimated daily discharges. Records good. Diversion upstream from station for Ann Arbor municipal supply had negligible effect on natural flow prior to 1955, figures of runoff adjusted since. Flow regulated by powerplants prior to May 1962. From June 1962 to 1975 occasional regulation for lake level control operations upstream from station. Since 1975 extensive regulation of flow exists due to automation of gates at dams upstream from station.

AVERAGE DISCHARGE.--81 years, 457 ft³/s, 8.51 in/yr, adjusted for diversion since 1955.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 5,840 ft³/s, Mar. 14, 1918; minimum daily, 4 ft³/s, Aug. 2, Sept. 11, 1931, plant leakage, but may be doubtful due to change in leakage.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,900 ft³/s, Feb. 24, gage height, 15.30 ft; minimum daily, 96 ft³/s, Aug. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	252	247	358	997	383	2310	1550	505	373	172	256	291
2	252	217	353	1230	383	2380	1570	511	394	193	260	383
3	188	252	363	1120	333	2100	1440	511	597	197	193	305
4	226	264	348	982	291	2040	1260	511	505	193	96	296
5	148	338	324	909	243	2080	1470	523	476	180	180	243
6	144	383	324	887	239	2010	1940	578	511	239	144	410
7	160	437	305	852	226	1840	1910	597	420	213	188	388
8	222	383	373	817	213	1830	1670	523	394	193	160	256
9	222	338	273	722	222	1930	1610	517	465	197	148	535
10	264	378	319	708	168	1760	1620	499	383	247	148	426
11	256	535	287	655	137	1830	1560	493	420	243	148	305
12	213	629	239	623	180	1790	1390	476	453	209	140	305
13	188	838	291	584	260	1740	1140	465	404	180	119	282
14	193	642	353	559	353	1640	1130	431	333	243	256	305
15	197	547	358	511	368	1560	1180	517	328	378	252	239
16	193	523	373	465	394	1470	1120	394	373	358	197	260
17	197	517	368	465	353	1380	997	399	394	226	176	226
18	247	511	368	453	343	1300	930	399	453	230	209	222
19	222	499	368	442	368	1190	930	388	404	230	269	164
20	213	499	353	388	358	1110	923	373	373	305	205	197
21	256	488	378	426	373	1000	923	363	378	247	213	197
22	193	465	415	420	442	975	859	338	287	235	235	197
23	235	363	442	420	1030	909	880	287	300	201	235	260
24	205	348	431	426	2320	960	810	264	291	160	287	222
25	209	358	383	426	2630	967	838	180	278	180	314	230
26	239	363	363	415	2420	945	735	172	260	247	378	264
27	252	363	399	420	2330	997	735	314	243	213	324	243
28	273	394	437	431	2470	1220	722	394	243	213	278	235
29	239	388	559	388	---	1560	623	363	226	193	333	176
30	209	394	662	394	---	1780	488	378	184	176	404	201
31	235	---	662	388	---	1610	---	358	---	205	388	---
TOTAL	6742	12901	11829	18923	19830	48233	34953	13021	11143	6876	7133	8263
MEAN	217	430	382	610	708	1556	1165	420	371	222	230	275
MAX	273	838	662	1230	2630	2380	1940	597	597	378	404	535
MIN	144	217	239	388	137	909	488	172	184	160	96	164
MEAN+	236	447	397	625	724	1572	1184	443	395	247	252	298
CFSM+	.32	.61	.54	.86	.99	2.16	1.62	.61	.54	.34	.35	.41
IN+	.37	.68	.63	.99	1.03	2.49	1.81	.70	.60	.39	.40	.46

CAL YR 1984 TOTAL 148930 MEAN 407 MAX 1620 MIN 58 MEAN+ 426 CFSM+ .58 IN+ 7.96
WTR YR 1985 TOTAL 199867 MEAN 348 MAX 2630 MIN 96 MEAN+ 567 CFSM+ .78 IN+ 10.56
+ Adjusted for diversion for municipal supply; record furnished by City of Ann Arbor.

STREAMS TRIBUTARY TO LAKE ERIE

249

04175600 RIVER RAISIN NEAR MANCHESTER, MI

LOCATION.--Lat 42°10'05", long 84°04'34", in NE1/4 SE1/4 sec.33, T.3 S., R.3 E., Washtenaw County, Hydrologic Unit 04100002, on left bank at downstream side of bridge on Sharon Valley Road, and 2.5 mi northwest of Manchester.

DRAINAGE AREA.--132 mi².

PERIOD OF RECORD.--January 1970 to September 1981, January to September 1985.

GAGE.--Water-stage recorder. Elevation of gage is 900 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to July 30, 1970, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 1-3, and Jan. 7 to Feb. 24. Records good except for estimated daily discharges, which are fair. Occasional regulation caused by many dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--11 years (water years 1971-81), 104 ft³/s, 10.70 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 869 ft³/s, Feb. 24, 1985, gage height, 7.21 ft; minimum, 4.5 ft³/s, Nov. 29, 1971; minimum gage height, 1.16 ft, Oct. 12, Nov. 4, 1978.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 280 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 3	2000	296	4.77	Mar. 29	1200	415	5.43
Feb. 24	1300	*869	*7.21	Apr. 6	0800	386	5.28
Feb. 25	2000	589	6.21	Apr. 19	1800	296	4.77
Mar. 6	1700	473	5.71				

Minimum discharge during period January to September, 16 ft³/s, May 26, 27, Aug. 6, 25; minimum gage height, 1.35 ft, May 27.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1				150	77	356	331	101	75	31	33	39
2				220	76	352	296	97	62	31	31	38
3				250	75	338	289	92	56	31	32	37
4				263	75	343	272	86	50	31	32	36
5				222	74	382	288	81	48	34	31	35
6				197	75	405	367	82	45	40	18	41
7				180	75	376	331	80	42	39	31	60
8				160	76	365	361	76	41	36	33	54
9				150	76	378	340	73	33	36	30	90
10				140	76	341	322	70	68	59	31	107
11				135	78	321	309	66	70	54	33	94
12				130	79	309	289	63	101	44	31	80
13				125	80	304	277	61	98	41	31	70
14				120	80	319	266	58	83	45	33	63
15				115	80	291	256	56	74	68	34	58
16				115	82	275	245	61	84	66	36	54
17				113	83	251	235	63	88	53	40	51
18				110	84	229	228	62	85	47	37	49
19				100	85	215	259	59	77	44	36	47
20				96	86	201	250	56	67	42	35	44
21				94	87	194	205	54	60	40	33	42
22				92	95	180	177	50	58	39	31	41
23				90	200	171	157	37	55	36	31	41
24				87	690	176	151	30	50	32	32	60
25				85	534	176	160	29	45	31	27	66
26				82	471	170	157	21	41	42	26	63
27				82	334	164	85	18	38	48	54	58
28				81	352	197	81	52	35	41	50	52
29				80	---	372	100	83	33	37	42	48
30				79	---	352	104	81	31	36	40	48
31				78	---	347	---	79	---	33	40	---
TOTAL	---	---	---	4021	4335	8850	7188	1977	1813	1287	1054	1666
MEAN	---	---	---	130	155	285	240	63.8	60.4	41.5	34.0	55.5
MAX	---	---	---	263	690	405	367	101	101	68	54	107
MIN	---	---	---	78	74	164	81	18	31	31	18	35
CFSM	---	---	---	.99	1.17	2.16	1.82	.48	.46	.31	.26	.42
IN.	---	---	---	1.13	1.22	2.49	2.03	.56	.51	.36	.30	.47

STREAMS TRIBUTARY TO LAKE ERIE

04176000 RIVER RAISIN NEAR ADRIAN, MI

LOCATION.--Lat 41°54'15", long 83°58'50", in NW1/4 sec.5, T.7 S., R.4 E., Lenawee County, Hydrologic Unit 04100002, on right bank at downstream side of bridge on Academy Road, 1.7 mi east of Adrian, and 2.6 mi downstream from South Branch River Raisin.

DRAINAGE AREA.--463 mi².

PERIOD OF RECORD.--October 1953 to September 1978, October 1978 to September 1984 (operated as a crest-stage partial-record station only), October 1984 to September 1985. Records for October 1930 to August 1931 and October 1932 to April 1938, published as "Raisin River" in WSP 714, 744, 759, 784, 804, 824, and 854, have been found to be unreliable and should not be used.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 693.2 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 26-28, Jan. 9 to Feb. 23, and Apr. 12 to May 22. Records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplant at Tecumseh, 11 mi upstream from station, prior to June 27, 1968. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--26 years (water years 1954-78, 1985), 316 ft³/s, 9.27 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,660 ft³/s, Mar. 15, 1982, gage height, 15.77 ft, from rating curve extended above 3,580 ft³/s; minimum, 18 ft³/s, Aug. 10, 1964, gage height, 1.33 ft; minimum daily, 25 ft³/s, Oct. 26, 1965.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,400 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 3	0500	2,180	11.80	Mar. 30	1000	2,000	11.51
Feb. 25	1100	*5,610	*15.62	Apr. 7	0600	2,180	11.80
Mar. 10	1400	1,790	10.73				

Minimum discharge, 88 ft³/s, Aug. 12, gage height, 2.88 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	112	154	238	1010	215	2020	1710	320	241	115	110	115
2	108	174	225	1820	210	1730	1590	300	222	115	102	112
3	103	168	232	2050	210	1530	1280	285	206	114	96	112
4	102	185	220	1510	210	1350	1090	280	184	112	93	110
5	101	182	214	1120	210	1470	1070	275	173	125	96	107
6	97	172	206	844	210	1640	1800	270	163	138	105	123
7	103	169	190	670	210	1670	2050	265	155	125	124	143
8	174	182	196	568	215	1430	1600	255	149	120	115	147
9	115	167	185	470	215	1550	1290	245	194	115	99	248
10	135	184	191	430	220	1770	1090	230	294	192	96	238
11	141	317	187	410	220	1630	932	220	281	193	94	241
12	137	491	191	385	225	1410	880	210	322	168	90	216
13	132	507	205	365	225	1330	800	195	268	143	92	186
14	132	416	240	340	225	1190	740	185	279	169	100	166
15	139	356	289	330	230	1010	700	180	256	215	264	154
16	169	336	320	315	230	906	650	175	260	244	217	145
17	162	321	303	305	230	848	620	170	258	200	159	137
18	176	300	284	295	235	775	590	170	383	164	134	132
19	150	275	270	280	235	700	560	170	344	143	124	127
20	146	253	257	270	240	642	520	175	274	132	117	122
21	216	237	257	265	245	596	490	175	226	126	111	119
22	269	221	370	260	250	531	470	175	202	120	107	116
23	276	213	472	250	850	529	450	169	185	113	104	118
24	222	208	415	245	3590	521	435	161	174	107	105	150
25	192	203	327	240	5350	509	425	145	162	102	112	135
26	180	200	280	235	4480	480	415	135	151	118	117	145
27	172	197	260	230	2990	478	400	165	142	118	135	149
28	165	217	300	225	2440	703	385	366	135	118	126	145
29	159	224	509	220	---	1480	365	334	128	114	129	138
30	153	236	778	220	---	1940	350	279	119	105	128	134
31	151	---	838	215	---	1750	---	266	---	106	122	---
TOTAL	4789	7465	9449	16392	24615	36118	25747	6945	6530	4289	3723	4430
MEAN	154	249	305	529	879	1165	858	224	218	138	120	148
MAX	276	507	838	2050	5350	2020	2050	366	383	244	264	248
MIN	97	154	185	215	210	478	350	135	119	102	90	107
CFSM	.33	.54	.66	1.14	1.90	2.52	1.85	.48	.47	.30	.26	.32
IN.	.38	.60	.76	1.32	1.98	2.90	2.07	.56	.52	.34	.30	.36
WTR YR 1985	TOTAL	150492	MEAN	412	MAX	5350	MIN	90	CFSM	.89	IN	12.09

04176500 RIVER RAISIN NEAR MONROE, MI
(National stream quality accounting network station)

LOCATION.--Lat 41°57'38", long 83°31'52", Monroe County, Hydrologic Unit 04100002, on left bank 0.8 mi downstream from bridge on Ida Maybee Road, 5.0 mi downstream from Saline River, and 7.5 mi west of Monroe.

DRAINAGE AREA.--1,042 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1937 to current year. Published as "Raisin River at Monroe" 1937-52 and as "River Raisin at Monroe" 1952-53.

REVISED RECORDS.--WSP 954: 1938-40(M), 1941. WSP 1437: 1939, 1948. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 616.26 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1953, at site 9 mi downstream at datum 46.26 ft lower.

REMARKS.--Estimated daily discharges: Dec. 2-5, 7, 8, and Jan. 9 to Feb. 25. Water-discharge records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplants upstream from station prior to June 27, 1968.

AVERAGE DISCHARGE.--48 years, 728 ft³/s, 9.49 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,300 ft³/s, Mar. 16, 1982, gage height, 10.4 ft; maximum gage height, 11.16 ft, Mar. 15, 1982, backwater from ice; minimum discharge, about 2 ft³/s, Sept. 4, 1938, Sept. 19, 20, 1941, site then in use.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Jan. 2	0800	7,700	8.70	Apr. 1	0300	6,230	7.77
Feb. 26	0100	*13,100	*10.06	Apr. 6	1300	4,900	6.97
Mar. 9	0300	4,190	6.56				

Minimum discharge, 127 ft³/s, Aug. 5, 6, 7, 12, 13, gage height, 2.13 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	181	227	360	3970	350	5870	5910	559	466	184	156	171
2	171	217	360	7010	350	4580	5190	504	406	185	148	163
3	158	219	355	5280	340	3620	4520	481	359	178	144	161
4	145	299	350	5950	340	2980	3610	478	332	165	136	152
5	141	318	340	5130	340	3660	2980	464	307	166	129	152
6	136	298	330	3720	340	3530	4480	456	280	164	129	148
7	139	287	320	2230	340	3600	4020	448	261	168	139	153
8	143	264	305	1090	340	3670	4000	440	242	186	160	171
9	156	257	279	900	350	3830	3830	428	259	184	166	196
10	196	257	318	800	350	3280	3280	404	279	228	166	253
11	212	383	292	750	350	3270	2560	373	328	253	145	327
12	193	856	287	700	360	3380	2040	350	576	282	130	316
13	196	1140	292	650	370	2960	1700	338	549	284	129	296
14	192	1310	340	610	380	2600	1500	311	498	267	132	263
15	190	1180	543	590	380	2220	1370	304	443	283	178	235
16	192	890	747	560	380	1890	1270	288	422	387	228	212
17	234	712	817	530	380	1620	1160	295	423	584	407	198
18	357	616	710	500	380	1440	1080	288	661	514	371	184
19	392	552	605	470	380	1300	1020	283	584	356	267	177
20	316	502	537	450	390	1200	956	279	561	266	219	171
21	269	445	509	440	400	1100	895	287	496	225	193	161
22	274	393	849	420	410	1010	859	285	403	204	176	155
23	363	363	1140	410	2200	971	842	285	335	193	162	155
24	511	339	1230	390	6060	979	804	260	294	181	153	167
25	445	323	1080	390	10700	997	761	245	271	172	150	170
26	348	317	797	380	12300	964	760	232	248	167	188	182
27	292	313	519	380	10300	934	747	236	228	158	270	177
28	261	318	596	370	7790	1280	707	659	214	156	216	171
29	247	324	1170	370	---	3850	666	687	200	157	205	170
30	244	345	1720	360	---	4400	624	711	190	158	188	173
31	232	---	1830	350	---	5310	---	592	---	158	176	---
TOTAL	7526	14264	19927	46150	57350	82295	64141	12250	11115	7213	5756	5780
MEAN	243	475	643	1489	2048	2655	2138	395	371	233	186	193
MAX	511	1310	1830	7010	12300	5870	5910	711	661	584	407	327
MIN	136	217	279	350	340	934	624	232	190	156	129	148
CFSM	.23	.46	.62	1.43	1.97	2.55	2.05	.38	.36	.22	.18	.19
IN.	.27	.51	.71	1.65	2.05	2.94	2.29	.44	.40	.26	.21	.21
CAL YR 1984 TOTAL	267579			MEAN 731	MAX 5300	MIN 93	CFSM .70	IN 9.55				
WTR YR 1985 TOTAL	333767			MEAN 914	MAX 12300	MIN 129	CFSM .88	IN 11.92				

STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-72, 1978 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April 1978 to July 1981.

WATER TEMPERATURE: March 1966 to September 1972, April 1978 to July 1981.

SUSPENDED SEDIMENT DISCHARGE: March 1966 to September 1972.

INSTRUMENTATION.--Water-quality monitor from Mar. 23, to July 13, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at gaging station or .8 mi upstream from gage at bridge on Ida Maybee Road.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1979-81): Maximum daily, 1,020 microsiemens, Feb. 16, 1979; minimum daily recorded (more than 20 percent missing record), 263 microsiemens, Jan. 25, 1981.

WATER TEMPERATURE (water years 1967, 1970-72, 1979-80): Maximum daily recorded (more than 20 percent missing record), 32.0°C, July 18, 1972; minimum daily, 0.0°C on many days during winter.

SEDIMENT CONCENTRATION (water years 1967-72): Maximum daily mean, 1,430 mg/L, Dec. 22, 1967; minimum daily mean, 1 mg/L on several days in 1969 and 1970.

SEDIMENT LOAD: Maximum daily, 28,000 tons, Dec. 22, 1967; minimum daily, 0.29 ton, Aug. 31, 1971.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 200 microsiemens was measured Feb. 25, 1985.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS. PER 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)
DEC 11...	1300	285	743	8.3	1.0	.50	13.4	111	K110	K40
FEB 25...	1800	12100	200	7.8	.5	70	13.2	92	E800	E3800
JUN 17...	1200	400	627	8.2	19.0	6.7	8.7	97	210	420
AUG 26...	1200	186	622	8.5	23.0	6.0	11.3	134	K740	410

DATE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
DEC 11...	340	93	94	26	24	13	.6	2.8	2.4	81
FEB 25...	79	16	24	4.7	4.7	11	.2	3.3	1.9	17
JUN 17...	280	68	78	20	19	13	.5	2.8	2.5	61
AUG 26...	270	75	75	21	23	15	.6	7.6	1.2	75

STREAMS TRIBUTARY TO LAKE ERIE

253

04176500 RIVER RAISIN NEAR MONROE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
DEC 11...	1300	44	.20	5.9	442	430	.60	340	2.0
FEB 25...	1800	11	.20	3.4	115	110	.16	3760	2.3
JUN 17...	1200	36	.40	7.4	411	350	.56	444	4.5
AUG 26...	1200	40	.20	7.9	407	370	.55	204	1.4

DATE	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
DEC 11...	.120	.50	.110	--	.050	18	14	84
FEB 25...	.230	1.7	.260	.130	--	266	8690	75
JUN 17...	.080	.60	.130	.100	--	36	39	97
AUG 26...	.020	1.3	.150	.090	.060	23	12	91

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
DEC 11...	<10	<1	61	<.5	<1	<1	3	3	11	1
FEB 25...	60	<1	17	<.5	<1	<1	<3	2	110	<1
JUN 17...	60	1	52	<.5	<1	1	<3	2	<3	4
AUG 26...	20	1	62	<.5	<1	1	<3	3	6	<1

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
DEC 11...	5	17	.1	<10	5	<1	<1	450	<6	12
FEB 25...	<4	28	<.1	<10	<1	<1	1	76	<6	25
JUN 17...	13	6	<.1	<10	7	<1	<1	370	<6	3
AUG 26...	9	7	<.1	<10	6	<1	<1	530	<6	4

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

As the number of streams on which stream flow information is likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited stream flow data at sites other than stream-gaging stations. When limited stream flow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow or floodway analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in time of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations and the second is a table of annual maximum stage and discharge at crest-stage stations. Discharge measurements, when at miscellaneous sites for both low flow and high flow are given in a third table.

Low-flow partial-record stations

Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. These measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream where continuous records are available, will give a picture of the low-flow potentiality of a stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same, site.

Discharge measurements made at low-flow partial-record stations during water year 1985

Station No.	Station name	Location	Drainage area (mi ²)	Period of record	Measurements Date	Discharge (ft ³ /s)
Streams tributary to Lake Michigan						
04057580	Whitefish River near Rapid River, MI	Lat 45°57'56", long 86°55'15", in SE1/4 NW1/4 sec.10, T.41 N., R.21 W., Delta County, Hydrologic Unit 04030111, about 800 ft downstream from Chippeny Creek and 3.5 miles northeast of Rapid River.	284	1973-85	01-14-85 06-21-85 09-18-85	166 192 102
04058120	Green Creek near Palmer, MI	Lat 46°22'22", long 87°36'21", in NW1/4 sec.19, T.46 N., R.26 W., Marquette County, Hydrologic Unit 04030110, at County Highway 565, and 4.5 miles south of Palmer.	d8.42	1961-65, 1970-85	11-07-84 11-08-84 12-11-84 06-18-85 08-27-85	b1.20 b1.50 b6.17 b6.48 b11.9
04059034	Escanaba River near Wells, MI	Lat 45°48'22", long 87°05'51", in SW1/4 NW1/4 sec.1, T.39 N., R.23 W., Delta County, Hydrologic Unit 04030110, 600 ft downstream from Bichler Creek, 2.5 miles upstream from mouth and 2.0 miles northwest of Wells.	a920	1981-85	01-09-85 06-11-85 07-12-85 09-24-85	c476 c825 c550 c672
04096517	Hog Creek tributary near Allen, MI	Lat 41°57'33", long 84°49'33", in SW1/4 SW1/4 sec.7, T.6 S., R.4 W., Hillsdale County, Hydrologic Unit 04050001 at Squires Road, 0.3 mile upstream from mouth, and 3.0 miles west of Allen.	2.61	1969-85	10-29-84 05-28-85 07-08-85 08-12-85	0.80 1.16 0.87 0.97
04114594	Maple River near St. Johns, MI	Lat 43°02'43", long 84°28'11", in SE1/4 SE1/4 sec.30, T.8 N., R.1 W., Clinton County, Hydrologic Unit 04050005, at Colony Road, and 4.5 miles northeast of St. Johns.	--	1981-85	10-15-84 03-25-85	17.6 161
*04120295	Black Creek near Muskegon, MI	Lat 43°12'14", long 86°09'52", in NE1/4 NW1/4 sec.1, T.9 N., R.16 W., Muskegon County, Hydrologic Unit 04060101, at Mill Iron Road, 4.8 miles east of Muskegon, and 4.9 miles upstream from mouth.	a39	1974-85	10-02-84 03-12-85 05-29-85 07-10-85	22.9 b203 38.7 24.1
04123706	Fife Lake Outlet near Fife Lake, MI	Lat 44°31'36", long 85°21'27", in SE1/4 SE1/4 sec.26, T.25 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060103, at Ramsay Road, and 3.5 miles south of Fife Lake.	--	1984-85	10-10-84 02-12-85 06-04-85	9.20 22.3 19.4
04123910	Anderson Creek near Buckley, MI	Lat 44°30'44", long 85°37'19", in NW1/4 NE1/4 sec.3, T.24 N., R.11 W., Wexford County, Hydrologic Unit 04060103, at County Line Road, and 2.8 miles northeast of Buckley.	--	1984-85	10-10-84 11-08-84 12-04-84 01-09-85 02-12-85 03-26-85 04-24-85 06-04-85 07-16-85 08-20-85 09-24-85	6.86 8.27 6.77 9.49 6.91 b14.6 b21.1 10.2 8.46 b8.81 b12.9
04126525	Mason Creek near Grawn, MI	Lat 44°37'53", long 85°43'16", in SE1/4 SE1/4 sec.23, T.26 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at Lake Shore Road, and 2.8 miles southwest of Grawn.	--	1984-85	10-09-84 02-13-85 06-06-85	7.59 8.03 9.68
04126532	Duck Lake Outlet near Interlochen, MI	Lat 44°38'29", long 85°46'01", in NW1/4 NE1/4 sec.21, T.26 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at State Highway M-137, and 0.2 mile south of Interlochen.	--	1984-85	10-10-84 02-13-85 06-05-85	21.9 51.7 26.9

See footnotes at end of table.

Discharge measurements made at low-flow partial-record stations during water year 1985--Continued

Station No.	Station name	Location	Drainage area (mi ²)	Period of record	Measurements Discharge Date (ft ³ /s)
Streams tributary to Lake Michigan--Continued					
04126546	Green Lake Inlet near Interlochen, MI	Lat 44°37'59", long 85°46'55", in NE1/4 SE1/4 sec.20, T.26 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at Diamond Park Road, and 1.0 mile southwest of Interlochen.	--	1984-85	10-10-84 30.9 11-08-84 55.9 12-04-84 49.7 01-10-85 57.7 03-27-85 b90.8 04-24-85 b119 06-06-85 42.4 07-16-85 15.9 08-21-85 32.2 09-24-85 b95.6
04126550	Betsie River near Karlin, MI	Lat 44°35'35", long 85°47'48", in SW1/4 NW1/4 sec.5, T.25 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at Betsie River Road, and 1.2 miles northwest of Karlin.	59.6	1945-69, 1984-85	10-10-84 42.1 02-13-85 79.0 06-05-85 77.9
04126950	South Branch Boardman River near South Boardman, MI	Lat 44°40'32", long 85°23'12", in NE1/4 SW1/4 sec.3, T.26 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, 0.5 mile upstream from N. Br. Boardman River, and 5.8 miles northwest of South Boardman.	46.7	1949, 1971, 1975, 1984-85	10-09-84 37.5 02-14-85 39.5 06-05-85 54.8
04126958	North Branch Boardman River near South Boardman, MI	Lat 44°41'24", long 85°22'02", in NE1/4 SW1/4 sec.35, T.27 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at Broomhead Road, and 5.4 miles northwest of South Boardman.	--	1971, 1984-85	10-09-84 48.8 02-14-85 43.1 06-05-85 67.0
04126970	Boardman River at Brown Bridge Road near Mayfield, MI	Lat 44°39'24", long 85°26'12", in NE1/4 NE1/4 sec.18, T.26 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at County Road by Ranch Rudolph, and 5.1 miles northeast of Mayfield.	--	1949, 1984-85	10-09-84 110 11-07-84 140 12-03-84 114 01-10-85 126 02-14-85 109 03-27-85 b209 04-23-85 b242 06-05-85 141 07-17-85 110 08-21-85 112 09-25-85 b140
04126991	Boardman River below Brown Bridge Pond near Mayfield, MI	Lat 44°38'37", long 85°30'33", in SE1/4 SW1/4 sec.15, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at outlet of Brown Bridge Pond, and 1.6 miles northeast of Mayfield.	--	1984-85	10-09-84 157 11-07-84 167 12-03-84 164 01-09-85 161 02-13-85 163 03-26-85 159 04-23-85 b330 06-05-85 b254 07-17-85 161 08-20-85 b168 09-25-85 b183
04126995	Jackson Creek near Kingsley, MI	Lat 44°36'23", long 85°29'10", in SE1/4 NW1/4 sec.35, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at Voice Road, and 2.9 miles northeast of Kingsley.	--	1985	10-10-84 4.49 02-13-85 5.58 06-04-85 5.08
04126997	East Creek near Mayfield, MI	Lat 44°37'40", long 85°30'15", in NW1/4 NE1/4 sec.27, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at Green Road, and 1.3 miles east of Mayfield.	--	1984-85	10-10-84 19.9 11-07-84 25.9 12-03-84 28.0 01-09-85 25.2 02-13-85 20.0 03-26-85 b43.2 04-23-85 b42.8 06-05-85 25.7 07-16-85 19.8 08-20-85 b19.7 09-25-85 b33.8
04127008	Swainston Creek at Mayfield, MI	Lat 44°37'37", long 85°31'57", in NW1/4 NW1/4 sec.28, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, and at Mill Street in Mayfield.	--	1984-85	10-09-84 12.4 11-07-84 12.6 12-03-84 13.7 01-09-85 12.4 02-12-85 11.6 03-26-85 b17.1 04-23-85 b15.5 06-04-85 14.8 07-16-85 13.0 08-20-85 b13.3 09-25-85 b17.0

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1985--Continued

Station No.	Station name	Location	Drainage area (mi ²)	Period of record	Measurements Discharge Date (ft ³ /s)
Streams tributary to Lake Michigan--Continued					
04127019	West Branch Jaxon Creek near Mayfield, MI	Lat 44°37'41", long 85°34'38", in NE1/4 NE1/4 sec.25, T.26 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, at Mill Street Road, and 2.3 miles west of Mayfield.	--	1984-85	10-09-84 0.11 02-13-85 0.49 06-04-85 0.40
04127250	Boardman River near Traverse City, MI	Lat 44°41'54", long 85°37'14", in NE1/4 NE1/4 sec.34, T.27 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, at Boardman Dam on Cass Road, and 4.6 miles south of Traverse City.	--	1984-85	10-09-84 303 11-08-84 291 12-04-84 280 01-10-85 271 02-13-85 272 03-27-85 b523 04-24-85 b480 06-06-85 364 07-17-85 242 08-21-85 253 09-25-85 b335
04127490	Boardman River at Traverse City, MI	Lat 44°45'44", long 85°37'25", in SW1/4 SE1/4 sec.3, T.27 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, and at Union Street in Traverse City.	--	1984-85	10-09-84 295 11-08-84 271 12-04-84 300 01-09-85 292 02-14-85 314 03-27-85 b420 04-24-85 b469 06-05-85 308 07-17-85 255 08-21-85 233 09-25-85 b405
04127498	Hospital Creek at Traverse City, MI	Lat 44°45'54", long 85°37'59", in NW1/4 SW1/4 sec.3, T.27 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, and at Maple Street in Traverse City.	--	1984-85	10-09-84 10.1 11-08-84 12.4 12-04-84 10.8 01-09-85 11.1 02-14-85 10.8 03-27-85 b44.4 04-24-85 b17.6 06-05-85 12.0 07-17-85 8.50 08-21-85 10.4 09-25-85 b15.9
04127520	Mitchell Creek at Traverse City, MI	Lat 44°44'52", long 85°33'30", in SE1/4 SE1/4 sec.7, T.27 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at first bridge east of Three Mile Road, and south of U.S. Highway 31 in Traverse City.	--	1949, 1979, 1983-85	10-10-84 7.47 11-08-84 8.51 12-04-84 9.14 01-09-85 9.00 02-12-85 8.78 03-27-85 b27.5 04-24-85 b13.2 06-04-85 7.41 07-16-85 4.70 08-20-85 b6.80 09-25-85 b13.6
04127528	Acme Creek at Acme, MI	Lat 44°46'31", long 85°29'56", in SE1/4 SE1/4 sec.34, T.28 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, and at U.S. Highway 31 in Acme.	--	1984-85	10-10-84 15.0 11-07-84 15.5 12-03-84 17.8 01-09-85 15.3 02-12-85 15.3 03-26-85 b22.2 04-23-85 b16.8 06-04-85 15.2 07-16-85 14.2 08-20-85 b15.7 09-24-85 b17.7
04127535	Yuba Creek near Acme, MI	Lat 44°49'28", long 85°27'30", in SE1/4 NE1/4 sec.13, T.28 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at U.S. Highway 31, and 4.0 miles northeast of Acme.	--	1984-85	10-10-84 11.2 11-07-84 8.00 12-03-84 10.2 01-10-85 7.12 02-12-85 7.79 03-26-85 b16.0 04-23-85 b9.53 06-04-85 5.53 07-16-85 4.96 08-20-85 b6.37 09-24-85 b16.1

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

257

Discharge measurements made at low-flow partial-record stations during water year 1985--Continued

Station No.	Station name	Location	Drainage area (mi ²)	Period of record	Measurements	
					Date	Discharge (ft ³ /s)
Streams tributary to Lake Michigan--Continued						
04127550	Tobeco Creek near Elk Rapids, MI	Lat 44°51'14", long 85°25'55", in SW1/4 NW1/4 sec.5, T.28 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at U.S. Highway 31, and 3.0 miles south of Elk Rapids.	--	1949-59, 1984-85	10-10-84	4.46
					11-07-84	10.9
					12-03-84	7.09
					01-10-85	6.59
					02-12-85	5.43
					03-26-85	b18.6
					04-23-85	b11.3
					06-04-85	3.95
					07-16-85	0.61
					08-20-85	b1.47
					09-24-85	b6.80
04127600	Battle Creek near Williamsburg, MI	Lat 44°46'22", long 85°22'04", in NE1/4 NW1/4 sec.2, T.27 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at State Highway 72, and 1.8 miles east of Williamsburg.	--	1949, 1984-85	10-10-84	11.4
					11-07-84	10.5
					12-03-84	12.0
					01-10-85	10.9
					02-14-85	9.42
					03-26-85	b11.8
					04-23-85	b11.5
					06-04-85	12.2
					07-16-85	11.6
					08-20-85	b11.8
					09-24-85	b11.3
04127620	Williamsburg Creek near Williamsburg, MI	Lat 44°47'41", long 85°23'14", in SE1/4 NW1/4 sec.27, T.28 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, at Ayers Road, and 1.7 miles northeast of Williamsburg.	--	1981, 1984-85	10-10-84	12.5
					11-07-84	14.9
					12-03-84	15.4
					01-10-85	12.0
					02-12-85	12.3
					03-26-85	b14.9
					04-23-85	b14.1
					06-04-85	12.9
					07-16-85	13.4
					08-20-85	b13.0
					09-24-85	b16.6
Streams tributary to Lake Huron						
04146450	North Branch Flint River near Columbiaville, MI	Lat 43°11'18", long 83°22'03", in NW1/4 sec.24, T.9 N., R.9 E., Lapeer County, Hydrologic Unit 04080204, at Barnes Lake Road, and 2.5 miles northeast of Columbiaville.	223	1979-85	11-27-84	152
					05-13-85	88.8
					06-19-85	67.9
					07-30-85	21.6

* Also a crest-stage station.

a Approximately.

b Not base flow.

c Affected by diversion for industrial use.

d Since 1970, affected by diversion for industrial use.

Crest-stage partial-record stations

The following table contains annual maximum discharge for crest-stage stations. A crest-stage gage is a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain, but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information of some lower floods may have been obtained but is not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at crest-stage partial-record stations during water year 1985

Station No.	Station name	Location	Drainage area (mi ²)	Period of record	Annual maximum		
					Date	Gage height (feet)	Dis-charge (ft ³ /s)
Streams tributary to Lake Superior							
04041000	Perch River near Sidnaw, MI	Lat 46°31'06", long 88°39'48", in NE¼ sec.34, T.48 N., R.35 W., Baraga County, Hydrologic Unit 04020104, at State Highway 28, 2.5 miles east of Sidnaw.	63.1	1913-15†, 1957-85	04-20-85	10.85	940
04044200	Carp Creek at Ishpeming, MI	Lat 46°29'11", long 87°41'21", in NW¼ sec.9, T.47 N., R.27 W., Marquette County, Hydrologic Unit 04020105, at Highway 41A, at Ishpeming.	16.5	1970-85	04-20-85	111.32	403
04044813	Two Hearted River near Paradise, MI	Lat 46°41'57", long 85°25'19", in NW¼ SW¼ sec.27, T.50 N., R.9 W., Luce County, Hydrologic Unit 04020201, at foot bridge in State Forest Campground, 0.4 mile upstream from mouth, and 18 miles northwest of Paradise.	201	1973-85	04-25-85	8.42	3,210
04045538	West Branch Waiska River near Brimley, MI	Lat 46°21'18", long 84°35'35", in SW¼ NW¼ sec.29, T.46 N., R.2 W., Chippewa County, Hydrologic Unit 04020203, at county road, 3.2 miles upstream from mouth, and 3.5 miles south of Brimley.	40.7	1973-85	04-21-85	9.81	1,130
04045559	East Branch Waiska River near Brimley, MI	Lat 46°25'07", long 84°28'24", in NW¼ NE¼ sec.6, T.46 N., R.1 W., Chippewa County, Hydrologic Unit 04020203, at county road, 4.0 miles upstream from mouth, and 4.7 miles east of Brimley.	30.1	1973-85	04-21-85	13.86	1,380
Streams tributary to Lake Michigan							
04046000	Black River near Garnet, MI	Lat 46°07'05", long 85°21'55", in SE¼ sec.13, T.43 N., R.9 W., Mackinac County, Hydrologic Unit 04060107, on right bank 10 ft upstream from footbridge, 15 feet downstream from Peters Creek, 3.5 miles upstream from Lake Michigan and 4 miles southwest of Garnet.	28.0	1951-78†, 1979-85	04-21-85	6.98	430
04057900	Black River near Republic, MI	Lat 46°25'08", long 87°53'21", in NE¼ sec.2, T.46 N., R.29 W., Marquette County, Hydrologic Unit 04030110, at county road, 4.4 miles east of Republic.	34.4	1961-68†, 1970-85	04-20-85	6.32	1,160
04058400	Goose Lake Outlet near Sands Station, MI	Lat 46°23'36", long 87°29'40", in SE¼ SE¼ sec.12, T.46 N., R.26 W., Marquette County, Hydrologic Unit 04030110, on left bank, 0.8 mile upstream from mouth, and 3.0 miles west of Sands Station.	37.5	1965-82†, 1983-85	04-20-85	6.84	710
04059400	Tenmile Creek at Perronville, MI	Lat 45°48'38", long 87°22'00", in NW¼ NW¼ sec.2, T.39 N., R.25 W., Menominee County, Hydrologic Unit 04030109, 1 mile northwest of Perronville.	38.4	1971-77†, 1978-85	04-22-85	3.98	282
04062300	Michigamme River at Republic, MI	Lat 46°23'03", long 87°58'48", in SE¼ sec.18, T.46 N., R.29 W., Marquette County, Hydrologic Unit 04030107, on left bank 400 feet upstream from county highway, 0.3 mile upstream from Trout Falls Creek, and 0.6 mile south of Republic.	240	1961-75†, 1976-85	04-24-85	9.94	5,270
04096272	Beebe Creek near Hillsdale, MI	Lat 41°57'15", long 84°38'20", in NE¼ NE¼ sec.15, T.6 S., R.3 W., Hillsdale County, Hydrologic Unit 04050001, at Moore Road, 1.2 miles northwest of Hillsdale.	42.4	1975-78†, 1979-85	02-25-85	7.61	618
04096340	St. Joseph River at Clarendon, MI	Lat 42°07'51", long 84°51'56", in SW¼ SW¼ sec.11, T.4 S., R.5 W., Calhoun County, Hydrologic Unit 04050001, at 22 Mile Road at Clarendon.	144	1975-77†, 1978-85	02-27-85	7.92	950
04097170	Portage River near Vicksburg, MI	Lat 42°06'53", long 85°29'08", in SW¼ sec.16, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at W Ave., 2.4 miles east of Vicksburg.	68.2	1947-51†, 1965-79†, 1980-85	02-27-85	5.55	315

See footnotes at end of table.

Annual maximum discharge at crest-stage partial-record stations during water year 1985--Continued

			Annual maximum				
Station No.	Station name	Location	Drainage area (mi ²)	Period of record	Date	Gage height (feet)	Dis-charge (ft ³ /s)
Stations tributary to Lake Michigan--Continued							
04108645	Rabbit River at Hamilton, MI	Lat 42°40'31", long 86°00'13", in NE¼ sec.6, T.3 N., R.14 W., Allegan County, Hydrologic Unit 04050003, at State Highway 40, at Hamilton.	274	1979-85	03-05-79 12-25-79 05-12-81 03-13-82 12-26-82 02-26-85	17.06 14.43 16.89 14.34 15.12 16.25	c3,490 c1,590 c3,340 c1,540 c1,990 2,790
04112700	Sycamore Creek near Mason, MI	Lat 42°36'38", long 84°27'58", in NE¼ NE¼ sec.31, T.3 N., R.1 W., Ingham County, Hydrologic Unit 04050004, at Harper Road, 0.7 mile downstream from Aurelius and Ve-Voy Drain, and 2.6 miles northwest of Mason.	39.5	1975-85	02-24-85	11.49	924
04113090	Carrier Creek near Grand Ledge, MI	Lat 42°43'36", long 84°39'16", in SE¼ SW¼ sec.15, T.4 N., R.3 W., Eaton County, Hydrologic Unit 04050004, at St. Joe Highway, 3.7 miles upstream from mouth, and 4.0 miles southeast of Grand Ledge.	7.18	1975-85	02-24-85	7.56	228
04117000	Quaker Brook near Nashville, MI	Lat 42°33'57", long 85°05'37", in NW¼ sec.13, T.2 N., R.7 W., Barry County, Hydrologic Unit 04050007, on left bank 150 feet upstream from culvert on county road, 500 feet upstream from small tributary, and 2.5 miles south of Nashville.	7.60	1955-75†, 1976-85	02-24-85	6.55	275
04119055	Plaster Creek at Grand Rapids, MI	Lat 42°54'46", long 85°39'02", in SE¼ sec.7, T.6 N., R.11 W., Kent County, Hydrologic Unit 04050006, at bridge on 28th Street, at Grand Rapids.	46.6	1974-85	02-24-85	10.21	1,050
04119160	Buck Creek at Grandville, MI	Lat 42°54'09", long 85°45'46", in SE¼ sec.18, T.6 N., R.12 W., Kent County, Hydrologic Unit 04050006, at Wilson Avenue, at Grandville.	50.5	1974-85	02-24-85	8.29	704
*04120295	Black Creek near Muskegon, MI	Lat 43°12'14", long 86°09'52", in NW¼ NW¼ sec.1, T.9 N., R.16 W., Muskegon County, Hydrologic Unit 04060101, at Mill Iron Road, 4.8 miles east of Muskegon, and 4.9 miles upstream from mouth.	a39	1974-85	02-25-85	3.57	232
04122230	North Branch Pentwater River near Pentwater, MI	Lat 43°47'42", long 86°21'30", in NE¼ SE¼ sec.8, T.16 N., R.17 W., Oceana County, Hydrologic Unit 04060101, at U.S. Highway 31, 3.5 miles northeast of Pentwater.	42.3	1975-85	02-25-85	2.95	251
04124500	East Branch Pine River near Tustin, MI	Lat 44°06'09", long 85°31'02", in NE¼ NW¼ sec.28, T.20 N., R.10 W., Osceola County, Hydrologic Unit 04060103, at highway bridge, 3.0 miles west of Tustin.	a63	1953-63†, 1964-85	09-10-85	5.89	906
04126600	Betsie River near Benzonia, MI	Lat 44°36'02", long 86°05'57", in NW¼ NW¼ sec.2, T.25 N., R.15 W., Benzie County, Hydrologic Unit 04060104, at U.S. Highway 31, 1.2 miles south of Benzonia.	a170	1975-85	03-29-85	d4.05	610
04127850	Boyne River near Boyne City, MI	Lat 45°11'48", long 84°57'26", in NW¼ SW¼ sec.5, T.32 N., R.5 W., Charlevoix County, Hydrologic Unit 04060105, at Dam Road, 0.3 mile downstream from nonoperative hydroelectric plant, 2.8 miles southeast of Boyne City.	64.2	1975-85	09-08-85	3.56	327
Streams tributary to Lake Huron							
04139000	Houghton Creek near Lupton, MI	Lat 44°23'45", long 84°02'50", in SE¼ SE¼ sec.10, T.23 N., R.5 E., Ogemaw County, Hydrologic Unit 04080101, 2.7 miles southwest of Lupton.	29.7	1950-72†, 1973-85	04-06-85	5.92	387
04040200	Klacking Creek near Selkirk, MI	Lat 44°20'05", long 84°08'46", in NE¼ NE¼ sec.2, T.22 N., R.2 E., Ogemaw County, Hydrologic Unit 04080101, at Campbell Road, 4.0 miles northwest of Selkirk.	7.51	1953-85	04-06-85	2.18	122
04140500	Rifle River at Selkirk, MI	Lat 44°18'48", long 84°04'10", in SE¼ NE¼ sec.9, T.22 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at State Road, at Selkirk.	117	1950-82†, 1983-85	04-06-85	4.14	1,090

See footnotes at end of table.

Annual maximum discharge at crest-stage partial-record stations during water year 1985--Continued

					Annual maximum		
Station No.	Station name	Location	Drainage area (mi²)	Period of record	Date	Gage height (feet)	Dis-charge (ft³/s)
Streams tributary to Lake Huron--Continued							
04141000	South Branch Shepards Creek near Selkirk, MI	Lat 44°18'28", long 84°05'13", in SE¼ SE¼ sec.8, T.22 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, on right bank 200 feet upstream from mouth, 600 feet west of Bedtelyon Road, and 1.1 miles southwest of Selkirk.	1.15	1951-78+, 1979-85	04-06-85	3.18	41
04146020	South Branch Flint River near Millville, MI	Lat 43°04'44", long 83°18'25", in SW¼ sec.29, T.8 N., R.10 E., Lapeer County, Hydrologic Unit 04080204, Saginaw Road, 1.6 miles north of Lapeer.	160	1974-85	05-17-74 04-20-75 03-23-78 06-02-82 03-22-84 09-09-85	8.53 9.65 8.22 8.69 7.45 10.33	c1,000 c1,820 c836 c1,100 c507 2,510
04148265	Kimball Drain near Swartz Creek, MI	Lat 42°55'15", long 83°49'51", in NE¼ sec.14, T.6 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Morrish Road, 2.4 miles south of Swartz Creek.	10.6	1970-85	02-24-85	8.19	369
04148610	Cole Creek near Flushing, MI	Lat 43°02'44", long 83°51'06", in SW¼ sec.35, T.8 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Potter Road, 1.2 miles south of Flushing.	8.51	1970-85	09-06-85	7.82	755
04148640	Armstrong Creek near Montrose, MI	Lat 43°08'04", long 83°50'03", in SE¼ sec.35, T.9 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Morrish Road, 4.1 miles southeast of Montrose.	11.9	1970-85	09-06-85	10.1	+
Streams tributary to St. Clair River							
04160350	Pine River near Rattle Run, MI	Lat 42°52'49", long 82°34'04", in NE¼ sec.9, T.5 N., R.16 E., St. Clair County, Hydrologic Unit 04090001, at Gratiot Road, 1.9 miles northeast of Rattle Run.	135	1974-85	04-06-85	e19.75	2,780
Streams tributary to Lake St. Clair							
04161000	Clinton River at Auburn Heights, MI	Lat 42°38'00", long 83°13'28", in NW¼ sec.36, T.3 N., R.10 E., Oakland County, Hydrologic Unit 04090003, at Auburn Road, at Auburn Heights.	123	1935-40, 1956-82+, 1984-85	08-24-85	5.38	1,730
04161500	Paint Creek near Lake Orion, MI	Lat 42°46'03", long 83°13'12", in NE¼ sec.13, T.4 N., R.10 E., Oakland County, Hydrologic Unit 04090003, on left bank 100 feet upstream from railroad bridge, 1.6 miles southeast of Lake Orion, and 2.8 miles upstream from Trout Creek.	38.5	1956-75+, 1976-85	02-24-85	f3.55	230
04161760	West Branch Stony Creek near Washington, MI	Lat 42°43'53", long 83°06'02", in SE¼ sec.25, T.4 N., R.11 E., Oakland County, Hydrologic Unit 04090003, at Huron-Clinton Metropolitan Park Road, and 3.4 miles west of Washington.	22.5	1965-85	02-24-85	f4.72	220
04164010	North Branch Clinton River at Almont, MI	Lat 42°54'59", long 83°02'42", in NE¼ sec.28, T.6 N., R.12 E., Lapeer County, Hydrologic Unit 04090003, at State Highway 53, at Almont.	9.56	1959-62, 1963-68+, 1969-85	09-06-85	8.60	818
04164050	North Branch Clinton River near Romeo, MI	Lat 42°49'11", long 82°58'35", in NW¼ sec.31, T.5 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 33 Mile Road, 2.2 miles northeast of Romeo.	49.7	1959-64, 1965-69+, 1970-85	02-24-85	5.47	1,780
04164150	North Branch Clinton River near Meade, MI	Lat 42°43'50", long 82°54'23", in NE¼ sec.34, T.4 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 27 Mile Road, 1.9 miles northwest of Meade.	89.6	1959-67, 1968-72+, 1973-85	02-25-85	f7.83	2,750
04164200	Coon Creek near Armada, MI	Lat 42°47'41", long 82°52'58", in SW¼ sec.1, T.4 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at North Road, 3.4 miles south of Armada.	10.0	1971-85	09-06-85	6.95	422
04164350	Highbank Creek near Armada, MI	Lat 42°28'24", long 82°51'08", in NW¼ sec.6, T.4 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 32 Mile Road, 3.0 miles southeast of Armada.	14.9	1959-65, 1966-70+, 1971-85	09-06-85	16.77	2,240
04164360	East Branch Coon Creek near New Haven, MI	Lat 42°45'46", long 82°50'57", in NW¼ sec.19, T.4 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 29 Mile Road, 3.4 miles northwest of New Haven.	36.1	1959-67, 1968-72+, 1973-85	09-06-85	9.48	4,140

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

261

Annual maximum discharge at crest-stage partial-record stations during water year 1985--Continued

						Annual maximum	
Station No.	Station name	Location	Drainage area (mi ²)	Period of record	Date	Gage height (feet)	Dis- charge (ft ³ /s)
Streams tributary to Lake St. Clair--Continued							
04164400	Deer Creek near Meade, MI	Lat 42°42'39", long 82°51'32", in NW¼ sec.6, T.3 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 2½ Mile Road, 0.9 mile southeast of Meade.	12.7	1959-60, 1961-65†, 1966-85	09-06-85	8.90	691
04164450	McBride Drain near Macomb, MI	Lat 42°41'14", long 82°55'14", in NE¼ NE¼ sec.16, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 24 Mile Road, 2.2 miles southeast of Macomb.	5.79	1960-64‡, 1965-85	02-24-85	9.07	212
04164600	Middle Branch Clinton River near Macomb, MI	Lat 42°42'03", long 82°59'44", in SE¼ sec.2, T.3 N., R.12 E., Macomb County, Hydrologic Unit 04090003, at Schoenherr Road, 2.0 miles west of Macomb.	22.2	1959-64, 1965-69‡, 1971-85	02-24-85	11.56	695
04164800	Middle Branch Clinton River at Macomb, MI	Lat 42°42'23", long 82°57'33", in SW¼ sec.5, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at Romeo Plank Road, 0.4 mi north of Macomb.	41.0	1959-62, 1963-68‡, 1969, 1970-82‡, 1983-85	02-24-85	14.50	1,350
04165200	Gloede Ditch near Waldenburg, MI	Lat 42°37'39", long 82°57'10", in SW¼ sec.32, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, 2.2 miles south of Waldenburg.	16.0	1959, 1960-64‡, 1965-85	02-24-85	17.67	492
Streams tributary to Detroit River							
04168660	Frank and Poet Drain at Trenton, MI	Lat 42°09'19", long 83°12'22", in NW¼ sec.13, T.4 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at King Road, at Trenton.	19.3	1972-85	02-23-85	9.01	493
Streams tributary to Lake Erie							
04168800	Huron River near Andersonville, MI	Lat 42°41'35", long 83°29'56", in NW¼ SE¼ sec.3, T.3 N., R.8 E., Oakland County, Hydrologic Unit 04090005, at White Lake Road, 2.5 miles south of Andersonville.	14.0	1974-85	02-28-85	2.78	80
04173250	Mill Creek near Lima Center, MI	Lat 42°15'56", long 83°56'45", in NE¼ sec.34, T.2 S., R.4 E., Washtenaw County, Hydrologic Unit 04090005, at Guenther Road, 2.0 miles upstream from North Fork Mill Creek, and 2.2 miles south of Lima Center.	47.3	1973-85	02-24-85	10.20	661
04175960	South Branch River Raisin near Adrian, MI	Lat 41°55'03", long 84°00'37", in SE¼ sec.25, T.6 S., R.3 E., Lenawee County, Hydrologic Unit 04100002, at Howell Highway, 2.0 miles northeast of Adrian.	165	1979-85	02-25-85	11.96	3,460
04176400	Saline River near Saline, MI	Lat 42°07'50", long 83°46'35", in SW¼ sec.18, T.4 S., R.5 E., Washtenaw County, Hydrologic Unit 04100002, at Maple Road, 2.8 miles south of Saline.	94.6	1966-77‡, 1978-85	02-24-85	11.85	1,480

† Not determined.

‡ Operated as a continuous-record gaging station.

* Also a low-flow partial-record station.

a Approximately.

b Backwater from beaver dam.

c Revised.

d Maximum gage height, 4.15 ft, Jan. 24, 1985, backwater from ice and cofferdam.

e Maximum gage height, 21.28 ft, Feb. 24, 1985, backwater from ice.

f Backwater from ice.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Measurements of streamflow at points other than gaging stations or partial-record stations are given in the following table. Those that are measurements of base flow are designated by an asterisk (*).

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING WATER YEAR 1985

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements Date	Discharge (ft ³ /s)
Streams tributary to Lake Superior							
04044211	Carp Creek	Deer Lake	Lat 87°40'58", long 46°29'54", in NW1/4 SE1/4, sec.04, T.47 N., R.27 W., Marquette County, Hydrologic Unit 04020105, at U.S. Hwy. 41, 0.5 mile northwest of Ishpeming, MI.	---	---	08-14-85	26.1
Streams tributary to Lake Michigan							
04067100	Little Cedar River	Menominee River	Lat 45°24'54", long 87°36'28", in SE1/4 NW1/4, sec.23, T.35 N., R.27 W., Menominee County, Hydrologic Unit 04030108, at Mill St., at Stephenson, MI.	180	1959 1963 1967 1969-70 1975	08-13-85	43.0
04096795	Swan Creek	St. Joseph River	Lat 85°18'53", long 41°57'52", in SE1/4 NE1/4, sec.11, T.06 S., R.09 W., St. Joseph County, Hydrologic Unit 04050001, 0.5 miles downstream of dam, 500 ft upstream of N.Y. Central Railroad, at Colon, MI.	---	---	05-16-85	88.8
04102589	Great Bear Lake Drain	South Branch Black River	Lat 42°22'08", long 86°00'01", in SW1/4 NE1/4 sec.24, T.01 S., R.15 W., Van Buren County, Hydrologic Unit 04050002, at 46 1/2 St., 2.0 miles southwest of Bloomingdale, MI.	12.3	1973 1980-82	12-13-84	a28.3
04112800	Mud Creek	Sycamore Creek	Lat 42°37'33", long 84°27'27", in NW1/4 sec.29, T.03 N., R.01 W., Ingham County, Hydrologic Unit 04050004, at Phillips Rd., 3.3 miles north of Mason, MI.	30.8	1955 1964-67	02-24-85	a271
04114340	Looking Glass River	Grand River	Lat 42°51'07", long 84°30'12", in NW1/4 NW1/4, sec.02, T.05 N., R.02 W., Clinton County, Hydrologic Unit 04050004, 2.0 miles east of U.S. Hwy. 27, 1.2 miles east of East DeWitt, MI.	---	1977	03-05-85	a1250
04115150	Fish Creek	Maple River	Lat 43°20'58", long 84°56'46", in NW1/4 NW1/4 sec.20, T.11 N., R.05 W., Montcalm County, Hydrologic Unit 04050005, at Pine Grove Rd., 5.0 miles east of McBride, MI.	---	---	10-04-84	*a3.28
04115165	Fish Creek	Maple River	Lat 43°19'15", long 84°58'20", in NW1/4 NE1/4, sec.25, T.11 N., R.06 W., Montcalm County, Hydrologic Unit 04050005, at extension of Briggs Rd., 4.0 miles southeast of McBride, MI.	---	---	10-04-84	*a5.20
04115170	Fish Creek	Maple River	Lat 43°18'28", long 84°58'15", in SW1/4 SE1/4, sec.25, T.11 N., R.06 W., Montcalm County, Hydrologic Unit 04050005, at Klees Rd., 4.0 miles southeast of McBride, MI.	---	---	10-04-84	*a7.95
04115200	Fish Creek	Maple River	Lat 43°16'31", long 84°54'30", in NE1/4 NE1/4, sec.11, T.10 N., R.06 W., Montcalm County, Hydrologic Unit 04050005, at Pakes Rd., 3.5 miles northwest of Crystal, MI.	27.8	---	10-04-84	*a10.2
04115265	Fish Creek	Maple River	Lat 43°14'59", long 84°58'52", in NW1/4 NE1/4, sec.23, T.10 N., R.06 W., Montcalm County, Hydrologic Unit 04050005, at Sidney Rd., 3.3 miles southwest of Crystal, MI.	---	1983	10-04-84	*a17.8
04115295	Fish Creek	Maple River	Lat 43°14'44", long 84°57'51", in SW1/4 NE1/4, sec.24, T.10 N., R.06 W., Montcalm County, Hydrologic Unit 04050005, at Vickeryville Rd., 2.7 miles southwest of Crystal, MI.	---	---	10-04-84	*a25.0
04115298	Fish Creek	Maple River	Lat 43°14'35", long 84°56'05", in SW1/4 SW1/4, sec.20, T.10 N., R.05 W., Montcalm County, Hydrologic Unit 04050005, at Sloan Rd., 1.5 miles southwest of Crystal, MI.	---	---	10-04-84	*a27.0

See footnotes at end of table.

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING WATER YEAR 1985--CONTINUED

Station No.	Stream	Tributary to	Location	Discharge area (mi ²)	Measured previously (water years)	Measurements Date	Discharge (ft ³ /s)
Streams tributary to Lake Michigan--continued							
04115315	Fish Creek	Maple River	Lat 43°13'03", long 84°53'09", in NW1/4 NE1/4, sec. 34, T.10 N., R.05 W., Montcalm County, Hydrologic Unit 04050005, at Bollinger Rd., 2.7 miles northwest of Carson City, MI.	---	1972 1983	10-04-84	*a28.0
04115450	Fish Creek	Maple River	Lat 43°10'40", long 84°51'24", in SW1/4 sec.12, T.09 N., R.05 W., Montcalm County, Hydrologic Unit 04050005, downstream of footbridge in park, 300 feet above State Hwy. M-57, at Carson City, MI.	126	1972 1974-81	10-04-84	*a32.1
04115500	Fish Creek	Maple River	Lat 43°09'43", long 84°51'34", in NE1/4 NE1/4 sec.23, T.09 N., R.05 W., Montcalm County, Hydrologic Unit 04050005, at former gaging station at Boyer Rd., 1.0 mile southwest of Carson City, MI.	---	1936-38	10-04-84	*a37.7
04116047	Leary Drain	Morrison Lake	Lat 42°52'14", long 85°10'24", in NW1/4 NW1/4 sec.32, T.06 N., R.07 W., Ionia County, Hydrologic Unit 04050006, at Bliss Rd., 3.5 miles northeast of Clarksville, MI.	---	1984	02-27-85	a36.8
04116049	Leary Drain	Morrison Lake	Lat 42°51'48", long 85°11'48", in NE1/4 SE1/4, sec.36, T.06 N., R.08 W., Ionia County, Hydrologic Unit 04050006, 200 feet upstream of Morrison Lake, 2.5 miles northeast of Clarksville, MI.	---	1984	02-27-85	a78.1
04116050	Lake Creek	Grand River	Lat 42°52'17", long 85°12'09", in NW1/4 NE1/4 sec.36, T.06 N., R.08 W., Ionia County, Hydrologic Unit 04050006, at Portland Rd., 2.5 miles northeast of Clarksville, MI.	---	1944-50 1984	02-27-85	a68.7
04122063	North Drain	Mosquito Creek	Lat 43°16'03", long 86°04'02", in SE1/4 SE1/4 sec.10, T.10 N., R.15 W., Muskegon County, Hydrologic Unit 04060102, at Maple Island Rd., 2.3 miles northeast of Wolf Lake, MI.	---	---	09-19-85	*a67.1
04122209	Silver Creek	White River	Lat 43°25'38", long 86°18'18", in SW1/4 SE1/4, sec.14, T.12 N., R.17 W., Muskegon County, Hydrologic Unit 04060101, 3400 ft upstream of mouth, 2.0 miles north-east of Whitehall, MI.	19.9	---	10-10-84	*a65.9
0412220910	Silver Creek Cut-off Channel	White River	Lat 43°25'37", long 86°18'21", in SW1/4 SE1/4 sec.14, T.12 N., R.17 W., Muskegon County, Hydrologic Unit 04060101, 2.0 miles northeast of Whitehall, MI.	---	---	10-10-84	*a11.3
0412220920	Silver Creek	White River	Lat 43°25'22", long 86°18'45", in SW1/4 NW1/4, sec.23, T.12 N., R.17 W., Muskegon County, Hydrologic Unit 04060101, 400 ft upstream of mouth, 1.8 miles north-east of Whitehall, MI.	23.1	---	10-10-84	*a55.2
Streams tributary to Lake Huron							
04143485	Hembling Drain	North Branch Kawkawlin River	Lat 43°40'23", long 84°02'17", in NW1/4 SE1/4 sec.30, T.15 N., R.04 E., Bay County, Hydrologic Unit 04080102, at Mosher Rd., 4.9 miles northwest of Kawkawlin, MI.	0.50	---	05-17-85	a0.21
04143491	Hembling Drain	North Branch Kawkawlin River	Lat 43°39'49", long 84°01'42", in SW1/4 NW1/4 sec.32, T.15 N., R.04 E., Bay County, Hydrologic Unit 04080102, at 7 Mile Rd., 4.3 miles northwest of Kawkawlin, MI.	3.00	---	05-17-85	a3.37
04143493	Hembling Drain	North Branch Kawkawlin River	Lat 43°39'36", long 84°00'31", in SW1/4 NW1/4 sec.33, T.15 N., R.04 E., Bay County Hydrologic Unit 04080102, at Fraser Rd., 3.3 miles west of Kawkawlin, MI.	4.00	---	05-17-85	a3.59
04143497	Hembling Drain	North Branch Kawkawlin River	Lat 43°40'05", long 83°58'15", in SE1/4 SE1/4, sec.28, T.15 N., R.04 E., Bay County, Hydrologic Unit 04080102, at Mackinaw Rd., 2.6 miles northwest of Kawkawlin, MI.	4.80	---	05-17-85	a5.84
04143500	North Branch Kawkawlin River	Kawkawlin River	Lat 48°40'05", long 83°58'15", in SE1/4 SE1/4, sec.27, T.15 N., R.04 E., Bay County, Hydrologic Unit 04080102, at former gaging station, at Beaver Rd., 1.7 miles northwest of Kawkawlin, MI.	101	1951-82	05-17-85	a33.1

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING WATER YEAR 1985--CONTINUED

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Discharge (ft ³ /s)
Streams tributary to Lake Huron--continued							
04144520	Shiawassee River	Saginaw River	Lat 43°05'06", long 84°11'04", in SW1/4 SW1/4, sec.13, T.08 N., R.02 E., Shiawassee County, Hydrologic Unit 04080203, at Henderson Rd., 0.6 mile east of Henderson, MI.	---	1984	10-18-84	*a77.9
04148138	Black Creek	Kearsley Creek	Lat 43°01'37", long 83°32'15", in NE1/4, sec.08, T.07 N., R.08 E., Genesee County, Hydrologic Unit 04080204, at Gale Rd., 1.0 mile west of Davison, MI.	---	1952-55 1974 1977	09-09-85	a253
04148440	Thread Creek	Flint River	Lat 42°58'30", long 83°38'09", in SE1/4 SE1/4, sec.28, T.07 N., R.07 E., Genesee County, Hydrologic Unit 04080204, at former gaging station, at Bristol Rd., 4.0 miles southeast of Flint, MI.	54.4	1970-84	09-09-85	a190
Streams tributary to Lake Erie							
04175577	Goose Creek	River Raisin	Lat 42°03'35", long 84°21'40", in SW1/4 SW1/4, sec.06, T.05 S., R.01 E., Lenawee County, Hydrologic Unit 04100002, at U.S. Hwy. 127, 1.5 miles west of Cement City, MI.	---	---	10-03-84	*a2.48
04175590	Stony Lake Outlet	River Raisin	Lat 42°09'19", long 84°13'15", in NW1/4 sec.05, T.04 S., R.02 E., Jackson County, Hydrologic Unit 04100002, at Wolf Lake Rd., near Napoleon, MI.	12.4	1970 1979	10-03-84	*a0.94
04175592	River Raisin	Lake Erie	Lat 42°09'20", long 84°10'52", in SE1/4 NW1/4, sec.03, T.04 S., R.02 E., Jackson County, Hydrologic Unit 04100002, at Mill Rd., at dam at Norvell, MI.	---	---	10-03-84	*a16.8
04175594	Unnamed Tributary	River Raisin	Lat 42°09'45", long 84°10'30", in SE1/4 SE1/4, sec.34, T.03 S., R.02 E., Jackson County, Hydrologic Unit 04100002, at Raby Rd., 0.6 mile northeast of Norvell, MI.	---	---	10-03-84	*a1.52
04175596	River Raisin	Lake Erie	Lat 42°09'22", long 84°08'31", in NE1/4 sec.01, T.04 S., R.02 E., Jackson County, Hydrologic Unit 04100002, at Pierce Rd., 2.0 miles east of Norvell, MI.	---	---	10-03-84	*a27.3
04175597	River Raisin	Lake Erie	Lat 42°10'04", long 84°07'21", in SW1/4 sec.31, T.03 S., R.03 E., Washtenaw County, Hydrologic Unit 04100002, at Sharon Valley Rd., 2.0 miles southwest of Sharon Hollow, MI.	121	1970-72	10-03-84	*a29.3
04175600	River Raisin	Lake Erie	Lat 42°10'05", long 84°04'34", in NE1/4 SE1/4, sec.33, T.03 S., R.03 E., Washtenaw County, Hydrologic Unit 04100002, at former gaging station at Sharon Valley Rd., 2.5 miles northwest of Manchester, MI.	132	1955 1963 1970-81† 1984	10-03-84	*a30.9
04175609	River Raisin	Lake Erie	Lat 42°09'02", long 84°01'26", in SE1/4 SW1/4, sec.01, T.04 S., R.03 E., Washtenaw County, Hydrologic Unit 04100002, above sewage treatment plant, 200 ft downstream of dam at Austin Rd., at Manchester, MI.	---	---	10-03-84	*a36.6
04175610	River Raisin	Lake Erie	Lat 42°08'52", long 84°00'56", in SE1/4 SE1/4, sec.01, T.04 S., R.03 E., Washtenaw County, Hydrologic Unit 04100002, at Austin Rd., 0.5 mile east of Manchester, MI.	148	1970-72 1979 1984	10-03-84	*a40.0

* Base flow.

† Operated as a continuous-record gaging station.

a Discharge measurement made by employees of Michigan Department of Natural Resources.

Water-quality partial-record stations and miscellaneous sites are locations where chemical-quality, biological and/or sediment data are collected once only, intermittently, or systematically, but on limited frequency over a period of years for use in hydrologic analyses.

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	TEMPER- ATURE (DEG C)	PH (STAND- ARD UNITS)	OXYGEN, DIS- SOLVED (MG/L)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	PHOS- PHORUS, TOTAL (MG/L AS P)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)
04126993 - Bancroft Creek near Kingsley, MI (LAT 44 36 24 LONG 085 28 08)												
JUN , 1984												
19...	1100	3.7	312	14.0	7.6	9.2	.230	.90	.070	<.010	.79	.005

CHEMICAL QUALITY OF PRECIPITATION

LAKE MICHIGAN BASIN

443557085390601 WAGNER PRECIPITATION GAGE NEAR KINGSLEY, MI

LOCATION.--Lat 44°35'57", long 85°39'06", in NW1/4 NW1/4 sec.4, T.25 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105 at Larry Wagner farm, .2 mi east of intersection of M-37 and Clous Road, and 5.9 mi northwest of Kingsley.

PERIOD OF RECORD.--October 1984 to current year.

EQUIPMENT.--The sample collector is a straight-sided polyethylene vessel and has a collection diameter of 11.2 in. and a capacity of 13 liters. An automatic sensor detects occurrences of precipitation, activating a motor that removes a cover from the collection vessel. The cover is returned when precipitation ceases.

REMARKS.--Inches of precipitation were obtained from an on-site recording weighing-bucket gage.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

PERIOD OF COLLECTION	PRECIP- ITATION INCHES	SNOW, WATER CONTENT (IN)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	SULFATE DIS- SOLVED (MG/L AS SO ₄)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)
84/10/30 TO 84/11/02	1.6	--	18	4.4	1.9	1.3	.84	.260	.020	.18	--	.020
84/11/09 TO 84/11/11	.77	--	20	4.5	2.0	1.3	.54	.460	<.010	--	--	.010
84/11/21 TO 84/11/28	.30	--	18	4.4	--	.90	.23	.270	.010	.39	<.010	<.010
84/11/30 TO 84/12/04	.50	--	13	4.8	--	--	--	--	--	--	--	--
84/12/11 TO 84/12/13	--	.40	31	4.4	1.8	1.2	.06	.640	<.010	--	--	.030
84/12/14 TO 84/12/17	--	.30	32	4.8	--	--	--	--	--	--	--	--
84/12/21 TO 84/12/24	--	.80	18	4.7	1.2	.80	.29	.310	<.010	--	--	.040
84/12/27 TO 84/12/28	1.1	--	12	4.9	2.6	1.0	.04	.760	<.010	--	<.010	<.010
84/12/31 TO 85/01/02	--	.71	5	5.2	--	--	--	--	--	--	--	--
85/01/16 TO 85/01/23	--	.95	14	4.6	1.2	1.1	.40	.400	<.010	--	--	.010
85/02/10 TO 85/02/14	--	1.10	63	4.9	.7	6.5	1.4	3.10	<.010	--	<.010	<.010
85/02/14 TO 85/02/19	--	.21	12	4.7	--	1.6	.87	.330	.020	.38	--	--
85/02/21 TO 85/02/26	--	1.14	22	4.4	1.6	.60	.06	.360	.040	.26	.020	.010
85/03/09 TO 85/03/26	--	.84	14	4.6	--	--	--	--	--	--	--	--
85/03/26 TO 85/04/02	--	.50	28	4.3	4.2	1.7	.36	.840	<.010	--	.080	.010
85/04/04 TO 85/04/09	--	1.90	18	4.8	3.2	1.5	.19	.910	<.010	--	--	.030
85/04/19 TO 85/04/20	--	.45	19	6.3	--	--	--	--	--	--	--	--
85/04/24 TO 85/04/25	.75	--	24	4.4	2.8	.90	.13	.470	<.010	--	<.010	<.010
85/05/10 TO 85/05/10	.20	--	28	6.2	4.2	2.3	.30	1.30	.020	.68	.070	<.010
85/05/12 TO 85/05/13	.20	--	32	4.2	3.5	1.7	.46	.740	.020	.48	.030	.010
85/05/15 TO 85/05/15	.35	--	28	4.2	2.0	1.0	.12	.480	<.010	--	<.010	<.010
85/05/20 TO 85/05/20	.16	--	34	6.2	--	--	--	--	--	--	--	--
85/05/25 TO 85/05/27	1.9	--	27	4.3	3.7	1.6	.00	1.00	<.010	--	<.010	<.010
85/06/08 TO 85/06/09	.35	--	15	5.9	2.3	1.4	.11	.790	.010	.49	.010	<.010
85/06/15 TO 85/06/17	.51	--	11	4.4	1.6	.90	.32	.480	<.010	--	.030	<.010
85/06/22 TO 85/06/23	.23	--	10	6.0	3.2	2.2	1.2	.680	<.010	--	.030	.020
85/07/07 TO 85/07/08	.15	--	11	5.0	--	--	--	--	--	--	--	--
85/07/25 TO 85/07/25	1.8	--	51	3.8	5.3	--	.08	.520	<.010	--	<.010	<.010
85/07/28 TO 85/07/29	.38	--	15	4.8	1.9	1.1	.13	.670	.020	.28	<.010	<.010
85/08/05 TO 85/08/06	1.1	--	17	4.5	--	.70	.02	.380	<.010	--	<.010	<.010
85/08/12 TO 85/08/18	.76	--	37	4.0	4.4	.90	.00	.500	<.010	--	.020	.020
85/08/23 TO 85/08/27	2.3	--	27	4.1	--	--	--	--	--	--	--	--
85/08/28 TO 85/08/30	.85	--	27	4.1	--	--	--	--	--	--	--	--
85/09/03 TO 85/09/04	.90	--	17	4.8	3.1	--	--	.510	<.010	--	.020	.020

CHEMICAL QUALITY OF PRECIPITATION

LAKE MICHIGAN BASIN

443557085390601 WAGNER PRECIPITATION GAGE NEAR KINGSLEY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

PERIOD OF COLLECTION	PRECIP- ITATION INCHES	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	SULFATE DIS- SOLVED (MG/L AS SO4)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)
85/09/05 TO 85/09/06	2.3	14	4.6	1.5	.70	.24	.160	<.010	.030	.010
85/09/07 TO 85/09/09	2.5	13	4.6	1.7	.70	.03	.370	<.010	--	.020
85/09/18 TO 85/09/18	1.7	31	4.3	3.4	1.6	.69	.510	<.010	.020	<.010
85/09/21 TO 85/09/25	9.0	18	4.6	--	--	--	--	--	--	--

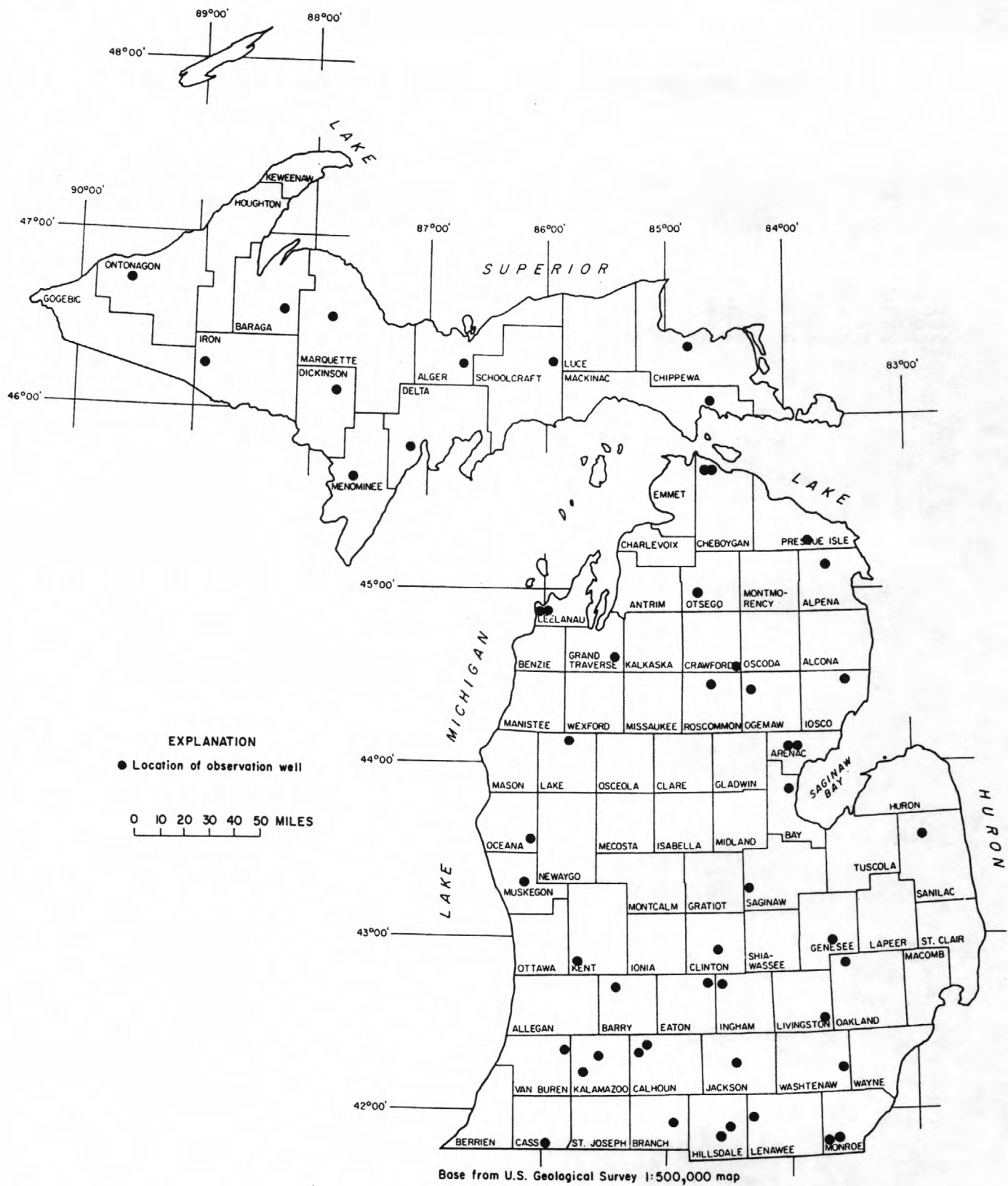


FIGURE 9.--Map showing location of observation wells published in this report.

269

461608086373801. Local number, 45N 19W 25BDDb.
LOCATION.--Lat 46°16'08", long 086°37'38", Hydrologic Unit 04060106, 250 ft northwest of highway M-44, 0.2 mi northeast of Kentucky.
Owner: U.S. Forest Service.
AQUIFER.--Glacial deposits of Pleistocene age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 66 ft.
INSTRUMENTATION.--Quarterly measurement.
DATUM.--Elevation of land-surface datum is 850 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 3.6 ft above land-surface datum.
PERIOD OF RECORD.--June 1959 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 6.35 ft below land-surface datum, June 29, 1960; lowest measured, 14.19 ft below land-surface datum, Apr. 3, 1964.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 5	11.28	JAN 14	11.32	MAY 3	9.90	SEP 26	10.42

450850083393401. Local number, 32N 6E 23DDDA.
LOCATION.--Lat 45°08'50", long 083°39'34", Hydrologic Unit 04070006, on Graham Road, 3 mi east and 1.5 mi north of Long Rapids.
Owner: U.S. Geological Survey.
AQUIFER.--Sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled water table observation well, diameter 6 in., depth 88 ft, screened 79 to 88 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 713 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.7 ft above land-surface datum.
REMARKS.--Bottom of hole near top of bedrock.
PERIOD OF RECORD.--November 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 13.61 ft below land-surface datum, May 22, 1983; lowest recorded, 30.01 ft below land-surface datum, Mar. 27, 1982.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	19.61	19.15	19.10	18.47	18.96	18.26	--	--	17.06	18.22	19.91	21.15
10	19.63	18.99	19.06	18.69	19.04	17.84	14.67	--	17.36	18.32	20.33	21.04
15	19.62	18.73	19.00	18.81	19.02	17.19	14.52	--	17.42	18.57	20.76	21.06
20	19.80	19.11	18.88	18.66	19.14	16.77	14.41	--	17.68	18.82	21.07	21.33
25	19.73	18.94	19.04	18.94	18.71	--	--	--	17.93	19.19	21.19	21.60
EOM	19.58	18.90	18.69	18.89	18.40	--	--	16.59	18.14	19.50	21.11	21.81

ARENAC COUNTY

440342083542801. Local number, 19N SE 7DABA1.
LOCATION.--Lat 44°03'42", long 083°54'28", Hydrologic Unit 04080101, 3 mi northeast of Omer.
Owner: U.S. Geological Survey.
AQUIFER.--Saginaw Formation of Pennsylvanian age.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 185 ft, screened 180 to 185 ft.
INSTRUMENTATION.--Monthly measurement.
DATUM.--Elevation of land-surface datum is 667 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 8.28 ft below land-surface datum, July 15, 1980; lowest measured, 10.90 ft below land-surface datum, Nov. 19, 1984.

[illegible]

GROUND-WATER LEVELS

ARENAC COUNTY

440342083542801. Local number, 19N 5E 7DABA2.

LOCATION.--Lat 44°03'42", long 083°54'28", Hydrologic Unit 04080101, 3 mi northeast of Omer.

Owner: U.S. Geological Survey.

AQUIFER.--Lake bed sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 6 in., depth 21 ft, screened 16 to 21 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 667 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 2.20 ft above land-surface datum.

PERIOD OF RECORD.--June 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 2.35 ft below land-surface datum, Apr. 29, 1985; lowest measured, 6.95 ft below land-surface datum, Aug. 21, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	6.69	DEC 20	5.66	APR 29	2.35	JUN 19	3.08	JUL 29	4.90	AUG 6	5.22
NOV 19	5.91										

BARAGA COUNTY

463353088144301. Local number, 48N 32W 12DDCC.

LOCATION.--Lat 46°33'53", long 088°14'43", Hydrologic Unit 04030107, 95 ft north of U.S. Highway 41 and 0.5 mi southeast of Nestoria Road.

Owner: Michigan State Highway Department.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1½ in., depth 10 ft, screened 7 to 10 ft.

INSTRUMENTATION.--Monthly measurement by observer.

DATUM.--Elevation of land-surface datum is 1,630 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 4.78 ft above land-surface datum.

PERIOD OF RECORD.--September 1948 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.27 ft below land-surface datum, Apr. 30, 1965; lowest measured, 8.09 ft below land-surface datum, Sept. 2, 1960.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	6.28	DEC 31	6.69	MAR 31	6.41	MAY 31	6.33	JUN 30	6.69	AUG 31	6.88
NOV 5	6.47	JAN 31	7.15	APR 30	5.72	JUN 25	6.78	JUL 31	7.15	SEP 30	6.34
30	6.59	FEB 28	7.24								

BARRY COUNTY

424540085232001. Local number, 4N 9W 5DAAA.

LOCATION.--Lat 42°45'40", long 085°23'20", Hydrologic Unit 04050007, on Soloman Road 4 mi east and 3.5 mi north of Middleville.

Owner: State Department of Natural Resources.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 2 in., depth 131 ft.

INSTRUMENTATION.--Quarterly measurement.

DATUM.--Elevation of land-surface datum is 860 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 2 ft above land-surface datum.

PERIOD OF RECORD.--December 1964 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 111.5 ft below land-surface datum, Mar. 20, 1978; lowest measured, 122.0 ft below land-surface datum, Mar. 5, 1965.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 18	117.0	JAN 9	117.4	MAY 9	115.7	AUG 1	115.9

GROUND-WATER LEVELS

271

BAY COUNTY

435128083582401. Local number, 17N 4E 22DCAA.

LOCATION.--Lat 43°51'28", long 083°58'24", Hydrologic Unit 04080102, at end of Second Street, Pinconning.

Owner: Pinconning Township.

AQUIFER.--Saginaw Formation of Pennsylvanian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 110 ft, cased to 60 ft, open end.

INSTRUMENTATION.--Monthly measurement. Water-level recorder from Aug. 1962 to Oct. 1979.

DATUM.--Elevation of land-surface datum is 620 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Plywood shelter base, 2.00 ft above land-surface datum.

REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--August 1962 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 0.05 ft below land-surface datum, Mar. 5, 1976; lowest recorded, 10.53 ft below land-surface datum, Aug. 8, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	3.98	DEC 5	2.73	FEB 7	1.82	APR 1	1.42	APR 28	1.95	JUN 19	2.47
NOV 19	3.26										

BRANCH COUNTY

415602084593701. Local number, 6S 6W 22CABA.

LOCATION.--Lat 41°56'02", long 084°59'37", Hydrologic Unit 04050001, at Bennett and Tibbits Streets, Coldwater.

Owner: City of Coldwater.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 113 ft, screened 73 to 113 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 970 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Plywood shelter base, 2.50 ft above land-surface datum.

REMARKS.--Water levels affected by nearby pumping.

PERIOD OF RECORD.--January 1964 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.0 ft below land-surface datum, May 6, 1975; lowest recorded, 25.9 ft below land-surface datum, May 25, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.4	17.8	21.7	12.5	21.8	18.7	13.1	19.7	21.3	22.4	21.8	22.5
10	22.2	13.9	22.4	20.5	20.8	18.8	20.6	20.2	22.1	23.4	14.2	23.1
15	23.0	21.6	13.9	21.6	21.4	18.9	19.9	20.6	21.2	22.1	23.4	14.4
20	14.0	22.3	21.8	14.2	19.9	19.1	19.1	20.4	22.0	13.9	21.8	22.7
25	21.3	13.9	13.6	19.0	19.6	19.3	19.2	19.9	21.6	22.0	14.2	23.8
HOM	22.4	21.6	13.3	13.7	20.2	18.8	19.3	22.0	21.7	21.7	22.1	24.5

WTR YEAR 1985 MAX 9.6 APR 7, 1985 MIN 24.5 SEP 30, 1985

CALHOUN COUNTY

422422085071501. Local number, 1S 7W 10BBAB.

LOCATION.--Lat 42°24'22", long 085°07'15", Hydrologic Unit 04050003, at highways M-78 and M-66, 5 mi north of Battle Creek.

Owner: Rilla Sabin.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Dug water-table well, diameter 15 in., depth 12 ft, open tile bottom.

INSTRUMENTATION.--Weekly measurement by observer.

DATUM.--Elevation of land-surface datum is 907.99 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.50 ft above land-surface datum.

PERIOD OF RECORD.--September 1946 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 0.89 ft below land-surface datum, Mar. 28, 1950; lowest, dry, July 29, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 3	4.66	DEC 5	4.10	FEB 6	3.60	APR 10	2.22	JUN 5	2.90	AUG 7	3.70
10	4.64	12	4.30	13	3.40	17	2.05	12	2.86	14	3.78
17	4.66	18	4.44	20	2.10	24	1.90	19	3.10	21	3.90
24	4.70	25	4.58	27	1.38	MAY 1	2.50	26	3.32	28	4.02
31	4.75	JAN 2	4.45	MAR 6	1.50	8	2.72	JUL 3	3.50	SEP 4	4.06
NOV 7	4.54	9	4.30	13	1.70	15	3.00	10	3.58	11	4.10
14	4.48	16	4.10	20	2.00	22	2.93	17	3.70	18	4.14
21	4.09	23	3.94	27	2.40	29	2.82	24	3.66	25	4.20
28	4.00	30	3.78	APR 3	2.30						

GROUND-WATER LEVELS

CALHOUN COUNTY

422025085084001. Local number, 1S 7W 32DABA.

LOCATION.--Lat 42°20'25", long 085°08'40", Hydrologic Unit 04050003, at Verona well field, Battle Creek.

Owner: City of Battle Creek.

AQUIFER.--Marshall Formation of Mississippian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in., depth 127 ft, cased to 103 ft.

INSTRUMENTATION.--Daily measurement by observer.

DATUM.--Elevation of land-surface datum is 830.79 ft above National Geodetic Vertical Datum of 1929. Measuring point: Recorder base, 2.10 ft above land-surface datum.

REMARKS.--Water levels affected by nearby municipal pumping.

PERIOD OF RECORD.--October 1939 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 0.7 ft below land-surface datum, Apr. 26-27, 1950; lowest measured, 16.75 ft below land-surface datum, July 16, 1959.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	9.40	9.00	8.90	8.40	8.40	7.00	5.70	6.10	7.00	7.85	8.35	8.70
10	9.40	8.60	7.80	8.10	8.10	6.40	5.50	6.30	7.50	8.60	8.30	8.70
15	9.10	8.50	8.80	8.20	--	6.20	5.50	7.40	7.30	8.40	8.00	7.60
20	9.40	8.50	9.00	8.00	9.10	6.50	5.80	7.10	7.80	8.00	8.60	8.50
25	9.80	8.30	8.40	9.00	7.40	6.50	5.80	7.10	7.80	8.80	7.70	8.20
EOM	9.00	8.90	8.30	8.70	7.27	5.95	6.20	7.22	7.80	8.40	8.10	8.20

CASS COUNTY

414651085575601. Local number, 8S 14W 17BAAA.

LOCATION.--Lat 41°46'51", long 085°57'56", Hydrologic Unit 04050001, 2 mi east of Adamsville on U.S. Highway 112.

Owner: Ted Little.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Dug water-table well, diameter 28 in., depth 55 ft, cribbed with brick to open bottom.

INSTRUMENTATION.--Monthly measurement by observer.

DATUM.--Elevation of land-surface datum is 840 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of wooden platform, 1.00 ft above land-surface datum.

REMARKS.--Measured by observer.

PERIOD OF RECORD.--September 1945 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 46.20 ft below land-surface datum, July 16, 1950; lowest measured, dry, Mar. 10, 1947.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 25	49.75	DEC 22	49.60	FEB 25	49.30	APR 26	47.60	JUN 25	47.25	AUG 23	47.30
NOV 26	49.60	JAN 23	49.45	MAR 27	49.20	MAY 24	47.35	JUL 24	47.25	SEP 24	47.90

CHEBOYGAN COUNTY

454427084424001. Local number, 39N 3W 29CBCB1.

LOCATION.--Lat 45°44'27", long 084°42'40", Hydrologic Unit 04070003, on Stimpson Rd. 3 mi southeast of Mackinaw City.

Owner: U.S. Geological Survey.

AQUIFER.--Dundee Formation of Devonian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 121 ft cased to 104 ft, open end.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 705 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 2 ft above land-surface datum.

PERIOD OF RECORD.--January 1979 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 5.25 ft below land-surface datum, May 12, 1979; lowest measured, 11.68 ft below land-surface datum, Feb. 11, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	9.21	DEC 11	6.64	MAR 20	6.07	JUN 11	7.02	JUL 25	8.27	SEP 17	8.54
NOV 13	6.43	FEB 6	6.95	MAY 6	5.31						

GROUND-WATER LEVELS

273

CHEBOYGAN COUNTY

454427084424002. Local number, 39N 3W 29CBCB2.

LOCATION.--Lat 45°44'27", long 084°42'40", Hydrologic Unit 04070003, on Stimpson Rd. 3 mi southeast of Mackinaw City.

Owner: U.S. Geological Survey.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 6 in., depth 55 ft screened 40 to 55 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 705 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--February 1979 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 2.03 ft below land-surface datum, Apr. 4, 1984; lowest measured, 6.47 ft below land-surface datum, Feb. 11, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	4.83	DEC 11	2.79	MAR 20	2.21	JUN 11	3.06	JUL 25	3.97	SEP 17	2.92
NOV 13	2.90	FEB 6	2.91	MAY 6	2.19						

CHIPPENAW COUNTY

462159084442201. Local number, 46N 4W 24DADA.

LOCATION.--Lat 46°21'59", long 084°44'22", Hydrologic Unit 04020203, on trail 0.2 mi south of highway M-28 and 1 mi west of Raco.

Owner: U.S. Forest Service.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 54 ft

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 850 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of shelter base, 3.07 ft above land-surface datum.

PERIOD OF RECORD.--June 1952 to April 1965. November 1969 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 18.40 ft below land-surface datum, June 7, 1971; lowest, 28.43 ft below land-surface datum, Apr. 14, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	25.95	25.96	25.31	25.12	25.13	25.58	25.92	22.42	21.49	21.90	22.45	22.98
10	25.95	25.77	25.29	25.09	25.19	25.62	25.91	21.93	21.54	22.01	22.58	23.07
15	25.94	25.60	25.30	25.06	25.24	25.72	25.86	21.67	21.56	22.11	22.66	23.13
20	25.98	25.51	25.28	25.01	25.34	25.79	25.78	21.53	21.65	22.19	22.75	23.21
25	26.01	25.40	25.25	25.04	25.42	25.84	25.00	21.44	21.76	22.28	22.84	23.27
EOM	26.03	25.33	25.19	25.08	25.45	25.90	23.47	21.43	21.85	22.39	22.92	23.33

WTR YEAR 1985 MAX 21.33 MAY 31, 1985 MIN 26.03 OCT 30, 1984

CLINTON COUNTY

425410084323501. Local number, 6N 2W 16DDAD.

LOCATION.--Lat 42°54'10", long 084°32'35", Hydrologic Unit 04050005, at U.S. Highway 27, 6 mi south of St. Johns.

Owner: State Highway Department.

AQUIFER.--Gravel of Pleistocene age.

WELL CHARACTERISTICS.--Driven observation water-table well, diameter 2 in., depth 26 ft, screened 23 to 26 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land surface datum is 803.32 ft above National Geodetic Datum of 1929. Measuring point: Top of casing, 1.30 ft above land-surface datum.

REMARKS.--Federal key well.

PERIOD OF RECORD.--August 1948 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 13.84 ft below land-surface datum, Apr. 30, 1974; lowest measured, 19.93 ft below land-surface datum, Feb. 27, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 26	18.36	DEC 20	18.46	FEB 25	17.48	APR 25	15.22	JUN 27	17.10	AUG 23	17.96
NOV 26	18.42	JAN 22	17.79	MAR 22	16.15	MAY 28	16.40	JUL 25	17.65	SEP 25	17.42

GROUND-WATER LEVELS

CRAWFORD COUNTY

443308084245001. Local number, 25N 1W 15DDCD.

LOCATION.--Lat 44°33'08", long 084°24'50", Hydrologic Unit 04070007, 2.6 mi south of Eldorado on Highway M-18.

Owner: U.S. Forest Service.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 56 ft, cased.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 1,190 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of shelter base, 2.95 ft above land-surface datum.

PERIOD OF RECORD.--November 1948 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 25.71 ft below land-surface datum, May 10, 1976; lowest recorded, 35.97 ft below land-surface datum Apr. 4-6, 1951.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	28.96	29.12	29.39	29.50	29.32	29.22	29.12	27.52	26.91	27.10	27.44	27.75
10	29.01	29.17	29.41	29.55	29.28	29.20	29.04	27.30	26.89	27.17	27.49	27.81
15	29.02	29.20	29.45	29.49	29.20	29.21	28.80	27.13	26.92	27.22	27.54	27.86
20	29.05	29.32	29.46	29.44	29.21	29.23	28.56	27.00	26.95	27.29	27.60	27.82
25	29.10	29.32	29.50	29.40	29.19	29.25	28.21	26.93	27.04	27.32	27.64	27.79
BOM	29.12	29.34	29.52	29.36	29.17	29.22	27.87	26.87	27.10	27.40	27.71	27.78

WTR YEAR 1985 MAX 26.84 MAY 31, 1985 MIN 29.55 JAN 9, 1985

DELTA COUNTY

454446087090401. Local number, 39N 23 W 28ACC.

LOCATION.--Lat 45°44'46", long 087°09'04", Hydrologic Unit 04030111, 3.5 mi west of Escanaba.

Owner: M. Blake.

AQUIFER.--Munising Sandstone of Cambrian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 5 in., depth 530 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 680 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of shelter base, 3.39 ft above land-surface datum.

PERIOD OF RECORD.--July 1968 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 1.5 ft below land-surface datum, May 6, 1960; lowest recorded, 8.9 ft below land-surface datum, Feb. 6, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.55	5.22	5.22	5.36	5.69	5.72	5.11	5.33	5.65	6.12	7.14	6.72
10	5.58	5.21	5.25	5.43	5.72	5.55	5.12	5.20	5.72	6.42	6.94	6.51
15	5.57	5.18	5.27	5.45	5.71	5.45	5.07	5.23	5.86	6.70	7.07	6.65
20	5.51	5.45	5.28	5.43	5.79	5.47	5.07	5.37	5.82	6.88	7.06	6.74
25	5.43	5.40	5.35	5.47	5.71	5.46	5.12	5.43	5.91	6.69	6.68	6.54
BOM	5.36	5.17	5.30	5.58	5.64	5.25	5.25	5.40	6.16	7.00	6.75	6.43

WTR YEAR 1985 MAX 4.95 APR 6, 1985 MIN 7.20 AUG 3, 1985

DICKINSON COUNTY

460458087493901. Local number, 43N 28W 32ADAB.

LOCATION.--Lat 46°04'58", long 087°49'39", Hydrologic Unit 04030109, 6.25 mi north of Felch.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Augered water-table well, diameter, 1½ in., depth 31 ft screened, 29 to 31 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 1,160 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Hole in top of cap, 4.00 ft above land-surface datum.

PERIOD OF RECORD.--October 1966 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 13.10 ft below land-surface datum, May 17, 1972; lowest measured, 16.50 ft below land-surface datum, Mar. 2, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 31	14.73	DEC 28	14.64	FEB 28	15.17	APR 30	13.52	JUN 28	13.97	JUL 16	14.21
NOV 30	14.51	JAN 31	14.80	MAR 29	14.74	MAY 31	13.50				

GROUND-WATER LEVELS

275

EATON COUNTY

424435084365001. Local number, 4N 3W 12CDAD.

LOCATION.--Lat 42°44'35", long 084°36'50", Hydrologic Unit 04050004, north of M-43, 0.5 mi west of Lansing.

Owner: F. Wheeler.

AQUIFER.--Saginaw Formation of Pennsylvanian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 381 ft, cased to 140 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface is 862.91 ft above National Geodetic datum of 1929. Measuring point: Plywood instrument shelf, 1.00 ft above land-surface datum.

REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--October 1953 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 67.5 ft below land-surface datum, Nov. 23, 1953; lowest recorded, 103.6 ft below land-surface datum, Aug. 28, 1969.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	80.54	77.85	--	--	--	--	--	80.76	82.30	90.40	88.26	83.82
10	78.47	76.82	--	--	75.11	71.50	77.40	80.65	87.30	93.30	88.27	80.63
15	78.70	75.43	--	--	74.00	72.19	76.89	81.76	83.72	92.89	88.53	77.57
20	82.00	76.40	--	--	--	71.53	78.05	81.99	83.71	91.51	86.26	79.88
25	82.53	75.26	--	--	--	72.15	79.60	83.43	83.54	91.56	86.33	77.54
DOM	79.58	73.20	72.16	75.10	--	75.07	79.93	81.14	89.40	89.66	85.66	75.56

WTR YEAR 1985 MAX 71.20 MAR 11, 1985 MIN 93.83 JUL 11, 1985.

GENESEE COUNTY

425552083382801. Local number, 6N 7E 9DCCC.

LOCATION.--Lat 42°55'52", long 083°38'28", Hydrologic Unit 04080204, at Fisher Body Plant, Grand Blanc.

Owner: General Motors Corporation.

AQUIFER.--Saginaw Formation of Pennsylvanian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 10 in., depth 385 ft, cased to 150 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 837.0 ft above National Geodetic Datum of 1929. Measuring point: Instrument shelf, 1.50 ft above land-surface datum.

REMARKS.--Water levels affected by nearby pumping. Measurements made by Plant Water Department.

PERIOD OF RECORD.--January 1974 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 52.3 ft below land-surface datum, Dec. 29, 1975; lowest recorded, 87.0 ft below land-surface datum, June 29, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	63.49	62.99	62.51	61.88	61.92	60.76	--	59.54	67.01	71.01	72.87	64.07
10	65.70	61.49	60.35	60.38	62.70	60.15	--	60.21	68.72	71.02	74.46	63.81
15	66.71	59.39	64.88	61.39	60.96	59.50	--	65.18	64.80	71.48	73.86	64.34
20	66.46	61.26	64.09	61.64	61.07	60.04	--	62.94	65.23	--	69.95	65.86
25	67.79	59.60	62.14	61.94	60.96	60.20	--	62.27	71.33	--	66.61	63.18
DOM	66.62	60.10	63.94	60.94	62.40	62.70	62.02	63.58	--	--	67.28	62.48

WTR YEAR 1985 MAX 56.56 NOV 24, 1985 MIN 74.70 AUG 12, 1985

GRAND TRAVERSE COUNTY

443921085213501. Local number, 26N 9W 14ABAA.

LOCATION.--Lat 44°39'21", long 085°21'35", Hydrologic Unit 04060105, 5.5 mi north of Fife Lake.

Owner: U.S. Geological Survey.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 80 ft, PVC pipe and screen.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 960 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.85 ft above land-surface datum.

PERIOD OF RECORD.--June 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 22.97 ft below land-surface datum, May 31, 1985; lowest recorded, 28.05 ft below land-surface datum, Apr. 3, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	25.66	25.93	25.86	25.93	25.55	25.63	25.43	23.30	23.11	23.42	23.82	24.26
10	25.71	25.91	25.86	25.90	25.53	25.63	25.16	23.17	23.16	23.48	23.90	24.32
15	25.75	25.87	25.88	25.82	25.51	25.67	24.84	23.07	23.18	23.55	23.97	24.26
20	25.81	25.88	25.89	25.72	25.54	25.69	24.45	23.04	23.26	23.61	24.04	24.18
25	25.85	25.84	25.92	25.64	25.56	25.70	23.91	23.01	23.32	23.67	24.11	24.16
DOM	25.90	25.83	25.94	25.58	25.57	25.64	23.54	23.03	23.38	23.76	24.20	24.14

WTR YEAR 1985 MAX 22.97 MAY 31, 1985 MIN 25.95 JAN 2, 1985

GROUND-WATER LEVELS

HILLSDALE COUNTY

415154084315401. Local number, 7S 2W 15BCBA1.

LOCATION.--Lat 41°51'54", long 084°31'54", Hydrologic Unit 04100003, at Trail and Bird Lake Roads 7 mi southeast of Hillsdale.

Owner: U.S. Geological Survey.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 150 ft, screened 135 to 150 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 1,092 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--November 1978 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 46.14 ft below land-surface datum, Apr. 13, 1982; lowest measured, 49.00 ft below land-surface datum, Mar. 15, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	48.27	JAN 22	48.15	APR 15	47.13	JUL 8	47.59	AUG 12	47.99	SEP 24	48.10
DEC 10	48.20	MAR 5	47.83	MAY 28	47.19						

HILLSDALE COUNTY

415236084313701. Local number, 7S 2W 10BDDD.

LOCATION.--Lat 41°52'36", long 084°31'37", Hydrologic Unit 04100003, 2.5 mi west of Pittsford on M-43.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Augered water-table well, diameter 1½ in., depth 20 ft, screened 17 to 20 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 1,070 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 4.00 ft above land-surface datum.

PERIOD OF RECORD.--December 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 5.79 ft below land-surface datum, Apr. 13, 1982; lowest measured, 11.1 ft below land-surface datum, Sept. 21, 1967.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	8.42	JAN 22	7.64	APR 15	6.57	JUL 8	8.18	AUG 12	8.54	SEP 24	8.65
DEC 10	8.45	MAR 5	6.86	MAY 28	7.65						

INGHAM COUNTY

424424084340301. Local number, 4N 2W 17ABAA.

LOCATION.--Lat 42°44'24", long 084°34'03", Hydrologic Unit 04050004, at Kirby and Logan Streets, Lansing.

Owner: City of Lansing.

AQUIFER.--Saginaw Formation of Pennsylvanian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 20 in., depth 424 ft.

INSTRUMENTATION.--Water-level recorder. Monthly measurement prior to Aug. 1960.

DATUM.--Elevation of land-surface datum is 858.72 ft above National Geodetic Datum of 1929. Measuring point: Plywood shelter base, 0.5 ft above land-surface datum.

REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--December 1929 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 34.3 ft below land-surface datum, Dec. 1929; lowest recorded, 168.3 ft below land-surface datum, May 7, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	91.1	89.4	90.0	90.2	86.4	85.5	84.6	84.7	84.5	87.5	88.8	88.0
10	90.7	89.3	90.0	90.9	85.9	84.5	84.4	85.0	85.0	87.7	89.0	88.0
15	89.8	89.7	90.5	89.5	85.2	84.5	84.8	85.3	85.5	88.1	88.8	88.4
20	89.7	90.3	90.4	88.0	85.3	84.8	84.5	85.3	86.0	88.5	88.6	88.7
25	89.9	89.3	90.5	86.5	85.3	84.8	84.3	85.1	86.5	88.8	88.4	88.1
EOM	89.8	89.2	90.6	86.6	85.7	83.9	84.0	84.6	87.0	88.5	88.2	86.5

WTR YEAR 1985 MAX 83.2 APR , 1985 MIN 91.4 OCT 1, 1984

GROUND-WATER LEVELS

277

IOSCO COUNTY

442839083312301. Local number, 24N 7E 13ADAD1.

LOCATION.--Lat 44°28'39", long 083°31'23", Hydrologic Unit 04070007, 10 mi west of Oscoda.

Owner: U.S. Geological Survey.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 6 in., depth 69 ft, screened 54 to 69 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 760 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--June 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 28.27 ft below land-surface datum, July 11, 1985; lowest measured, 32.71 ft below land-surface datum, Mar. 23, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 31	30.37	DEC 13	30.74	FEB 28	31.01	MAY 9	28.38	JUL 11	28.27	SEP 19	28.78
NOV 26	30.61	JAN 16	30.95	APR 11	30.25	JUN 28	28.32	AUG 23	28.80		

IRON COUNTY

461257088542001. Local number, 44N 37W 14BBCA.

LOCATION.--Lat 46°12'57", long 088°54'20", Hydrologic Unit 04030106, 0.5 mi south of Elmwood on FHH 16.

Owner: State Highway Department.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Driven water-table well, diameter 6 in., depth 102 ft.

INSTRUMENTATION.--Quarterly measurement.

DATUM.--Elevation of land-surface datum is 1,730 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of plywood shelter base, 4.21 ft above land-surface datum.

PERIOD OF RECORD.--October 1959 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 91.27 ft below land-surface datum, June 27, 1984; lowest measured, 97.11 ft below land-surface datum, Aug. 16, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 27	91.36	MAR 28	91.41	JUN 11	91.59	SEP 25	91.27

JACKSON COUNTY

421346084230801. Local number, 3S 1W 11AADD1.

LOCATION.--Lat 42°13'46", long 084°23'08", Hydrologic Unit 04050004, at Belden and Mansion Street, Jackson.

Owner: City of Jackson.

AQUIFER.--Saginaw Formation of Pennsylvanian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 16 in., depth 360 ft, open bottom.

INSTRUMENTATION.--Daily measurement by observer; lowest monthly reading shown.

DATUM.--Elevation of land-surface datum is 935 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Plywood recorder shelf, 5.50 ft above land-surface datum.

REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--June 1957 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 18.6 ft below land-surface datum, Jan. 2, 1961; lowest measured, 119.1 ft below land-surface datum, June 30, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	67.0	JAN 11	63.8	MAR 6	65.0	MAY 16	83.2	JUL 28	82.0	AUG 9	71.0
NOV 1	63.2	FEB 8	72.0	APR 22	75.0						

GROUND-WATER LEVELS

KALAMAZOO COUNTY

421641085530601. Local number, 2S 11W 22CDBB.

LOCATION.--Lat 42°16'41", long 085°35'06", Hydrologic Unit 04050003, at southwest corner Crosstown Parkway and Stockbridge Avenue, Kalamazoo.

Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 4 in., depth 137 ft, screened 134 to 137 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 764.7 ft above National Geodetic Datum of 1929. Measuring point: Top of casing, 2.00 ft above land-surface datum.

REMARKS.--Water levels affected by nearby pumping.

PERIOD OF RECORD.--August 1960 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.81 ft below land-surface datum, Feb. 5, 1975; lowest recorded, 31.08 ft below land-surface datum, Aug. 19, 1961.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.03	9.88	9.59	9.27	9.01	8.67	8.18	7.88	7.87	8.00	8.36	8.62
10	10.02	9.86	9.51	9.23	8.96	8.56	8.12	7.84	7.89	8.04	8.43	8.67
15	10.02	9.85	9.47	9.20	8.92	8.48	8.07	7.83	7.91	8.10	8.48	8.71
20	9.98	9.82	9.43	9.17	8.90	8.40	8.00	7.84	7.92	8.17	8.52	8.75
25	9.94	9.74	9.38	9.12	8.83	8.33	7.96	7.85	7.93	8.23	8.54	8.79
BOM	9.90	9.66	9.33	9.05	8.79	8.25	7.93	7.85	7.97	8.30	8.57	8.83

WTR YEAR 1985 MAX 7.83 MAY 10, 1985 MIN 10.03 OCT 1, 1984

KALAMAZOO COUNTY

421325085404801. Local number, 3S 12W 11BDAD.

LOCATION.--Lat 42°13'25", long 085°04'48", Hydrologic Unit 04050003, at Kalamazoo Community College.

Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 3 in., depth 248 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 880 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of shelter base, 4.0 ft above land-surface datum.

PERIOD OF RECORD.--March 1961 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, +2.98 ft above land-surface datum, Sept. 4, 1969; lowest recorded, 1.04 ft below land-surface datum, Aug. 4, 1977.

WATER LEVEL, IN FEET ABOVE AND BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	-0.60	-0.80	-0.25	-0.24	-0.04	+0.18	+0.56	+0.34	+0.25	+0.14	+0.07	+0.19
10	-0.80	-0.80	-0.23	-0.21	-0.02	+0.18	+0.62	+0.36	+0.31	+0.22	+0.11	+0.19
15	-0.82	-0.84	-0.29	-0.15	-0.01	+0.25	+0.66	+0.33	+0.51	+0.17	+0.05	+0.14
20	-0.83	-0.85	-0.32	-0.08	+0.01	+0.30	+0.51	+0.23	+0.46	+0.15	+0.07	+0.09
25	-0.85	-0.40	-0.30	-0.07	+0.15	+0.35	+0.36	+0.23	+0.30	+0.11	+0.03	+0.06
BOM	-0.87	-0.30	-0.27	-0.05	+0.15	+0.49	+0.30	+0.23	+0.26	+0.07	+0.16	+0.03

WTR YEAR 1985 MAX +0.82 JUN 15, 1985 MIN -0.87 OCT 31, 1984

KENT COUNTY

425030085434901. Local number, 5N 12W 4DCCD.

LOCATION.--Lat 42°50'30", long 085°43'49", Hydrologic Unit 04050006, 2.1 mi north of Byron Center and 0.4 mi west of Byron Center Road.

Owner: City of Wyoming.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 86 ft.

INSTRUMENTATION.--Monthly measurement. Water-level recorder Oct., 1962 to July, 1978.

DATUM.--Elevation of land-surface datum is 685.97 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of shelter base, 2.50 ft above land-surface datum.

REMARKS.--Monthly measurements begun August 1978.

PERIOD OF RECORD.--October 1962 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 8.28 ft below land-surface datum, Apr. 14, 1974; lowest recorded, 12.91 ft below land-surface datum, Aug. 19, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	11.26	JAN 9	10.40	MAY 9	9.70	JUN 20	10.62	AUG 1	11.35	SEP 13	10.75
NOV 27	10.99	MAR 27	9.10								

GROUND-WATER LEVELS

279

LAKE COUNTY

440737085483701. Local number, 20N 13W 13ACAC1.

LOCATION.--Lat 44°07'37", long 085°48'37", Hydrologic Unit 04060103, 5 mi east of Irons.

Owner: U.S. Geological Survey

AQUIFER.--Outwash deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 6 in., depth 57 ft, screened 42 to 57 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 945 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing 2.0 ft above land-surface datum.

PERIOD OF RECORD.--March 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 12.85 ft below land-surface datum, May 30, 1985; lowest measured, 17.71 ft below land-surface datum, Mar. 14, 1980

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 3	16.04	DEC 12	15.79	MAR 12	15.50	MAY 30	12.85	AUG 1	13.71	AUG 29	13.95
NOV 7	16.21	JAN 31	15.19	APR 17	13.18	JUL 11	13.34				

LEELANAU COUNTY

445020086012201. Local number, 28N 14W 8DDCA1.

LOCATION.--Lat 44°50'20", long 086°01'22", Hydrologic Unit 04060104, 2.5 mi northeast of Empire.

Owner: U.S. Geological Survey

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 6 in., depth 138 ft, screened 123 to 138 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 750 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing 2.0 ft above land surface datum.

PERIOD OF RECORD.--February 1978 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 112.18 ft below land-surface datum, Aug. 29, 1985; lowest measured, 114.49 ft below land-surface datum, June 21, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	114.20	DEC 27	114.22	APR 3	114.13	JUN 24	113.48	AUG 6	113.82	AUG 29	112.18
NOV 13	114.28	FEB 20	114.24	MAY 22	113.82						

LEELANAU COUNTY

445011086031401. Local number, 28N 14W 18BABBL.

LOCATION.--Lat 44°50'11", long 086°03'14", Hydrologic Unit 04060104, 2 mi north of Empire.

Owner: U.S. Geological Survey

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 6 in., depth 60 ft, screened 45 to 60 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 625 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing 2.0 ft above land-surface datum.

PERIOD OF RECORD.--November 1979 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 21.85 ft below land-surface datum, Apr. 25, 1985; lowest recorded, 24.76 ft below land-surface datum, Sept. 29, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	24.20	--	23.61	23.42	23.45	23.29	22.02	21.99	22.50	22.85	23.16	23.39
10	24.22	--	23.63	23.17	23.51	23.23	22.10	22.09	22.57	22.89	23.21	23.35
15	24.04	23.54	23.63	23.13	23.55	23.15	22.06	22.18	22.62	22.96	23.25	23.25
20	24.22	23.51	23.57	23.09	23.64	22.92	21.94	22.27	22.68	23.01	23.29	23.12
25	24.12	23.49	23.54	23.34	23.44	22.69	21.85	22.34	22.75	23.07	23.32	23.09
EOB	--	23.52	23.49	23.39	23.33	22.20	21.90	22.42	22.81	23.13	23.39	23.09

WTR YEAR 1985 MAX 21.85 APR 25, 1985 MIN 24.23 OCT 19, 1984

GROUND-WATER LEVELS

LENAWEE COUNTY

420246084150601. Local number, 5S 1E 12DDBD.

LOCATION.--Lat 42°02'46", long 084°15'06", Hydrologic Unit 04100002, 2 mi west of Cambridge Junction on the Onsted State Game Area.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1½ in., depth 39 ft, screened 36 to 39 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 1,000 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 3.00 ft above land-surface datum.

PERIOD OF RECORD.--December 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 15.89 ft below land-surface datum, Mar. 26, 1982; lowest measured, 19.33 ft below land-surface datum, Sept. 2, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 25	17.32	MAR 6	16.17	MAR 24	17.01	JUN 28	17.22	AUG 7	17.31	SEP 9	17.07
DEC 6	17.16	APR 12	16.14								

LIVINGSTON COUNTY

422853083402801. Local number, 1N 6E 13DBAB.

LOCATION.--Lat 42°28'53", long 083°40'28", Hydrologic Unit 04090005, 2 mi northwest of South Lyon on Twelve Mile Road.

Owner: American Aggregate Corporation.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 2 in., depth 29 ft, 1½ in diameter screen.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 930 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Plywood instrument shelf, 2.50 ft above land-surface datum.

PERIOD OF RECORD.--April 1970 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 12.1 ft below land-surface datum, Apr. 22, 1974; lowest recorded, 21.58 ft below land-surface datum, Oct. 30, 31, Nov. 1, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	16.73	16.85	16.93	16.83	16.74	15.55	14.63	13.94	14.06	14.47	14.76	15.05
10	16.77	16.82	16.96	16.82	16.75	15.38	14.32	14.01	14.14	14.54	14.79	15.07
15	16.78	16.81	16.91	16.79	16.71	15.17	14.07	14.06	14.12	14.52	14.80	15.12
20	16.79	16.86	16.94	16.76	16.75	15.06	13.97	14.15	14.22	14.43	14.90	15.16
25	16.85	16.90	17.01	16.75	15.68	15.00	13.93	14.18	14.38	14.60	14.91	15.26
ECM	16.85	16.89	17.02	16.76	15.63	14.83	13.96	14.13	14.37	14.69	14.97	15.30

WTR YEAR 1985 MAX 13.93 APR 25, 1985 MIN 17.04 DEC 26, 1984

MACKINAC COUNTY

460321084354801. Local number, 42N 2W 7AABB.

LOCATION.--Lat 46°03'21", long 084°35'48", Hydrologic Unit 04070002, 2 mi north of Pontchartrain Shores at Pontchartrain and St. Ignace Roads.

Owner: U.S. Forest Service.

AQUIFER.--Manistique Dolomite of Silurian age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 102 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 650 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of shelter floor, 2.3 ft above land-surface datum.

PERIOD OF RECORD.--June 1956 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 12.49 ft below land-surface datum, Apr. 21, 1985; lowest recorded, 32.3 ft below land-surface datum, Feb. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	27.79	20.15	22.45	21.98	25.23	24.68	20.25	17.73	22.29	24.65	26.10	25.83
10	27.74	21.81	22.88	23.00	25.57	24.77	20.48	18.60	22.82	25.01	26.39	26.28
15	27.58	22.12	22.68	23.60	25.74	23.19	18.16	19.51	23.25	25.26	26.61	26.63
20	23.48	23.12	22.48	23.90	26.05	23.78	13.64	20.25	23.69	25.57	26.78	26.73
25	23.76	23.47	23.01	24.42	25.26	23.84	14.23	20.91	23.97	25.83	26.91	26.63
ECM	23.57	23.74	20.98	24.89	24.93	19.38	16.28	21.58	24.40	25.85	27.06	26.42

WTR YEAR 1985 MAX 12.49 APR 21, 1985 MIN 27.82 OCT 6, 1984

GROUND-WATER LEVELS

281

MARQUETTE COUNTY

462938087475901. Local number, 47N 28W 30CDC.

LOCATION.--Lat 46°29'38", long 087°47'59", Hydrologic Unit 04020105, 4.8 mi west of Ishpeming on U.S. Highway 41 and M-28.

Owner: Ely Township.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in., depth 72 ft, screened 68 to 72 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 1,571.99 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder base, 3.0 ft above land-surface datum.

REMARKS.--Federal key well.

PERIOD OF RECORD.--August 1961 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.41 ft below land-surface datum, Apr. 21, 1985; lowest, 19.26 ft below land-surface datum, Apr. 10-11, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.22	14.13	14.38	14.47	15.05	15.57	15.07	10.38	10.95	11.63	12.48	12.54
10	14.31	14.13	14.41	14.60	15.17	15.60	15.10	10.50	11.08	11.69	12.47	12.54
15	14.36	14.16	14.47	14.68	15.24	15.67	14.63	10.60	11.19	11.86	12.47	12.64
20	14.42	14.36	14.29	14.74	15.35	15.73	10.41	10.74	11.34	12.00	12.61	12.79
25	14.45	14.39	14.30	14.87	15.43	15.75	9.93	10.82	11.51	12.16	12.64	12.83
BOM	14.37	14.38	14.41	14.98	15.45	15.16	10.22	10.87	11.70	12.73	12.68	12.83

WTR YEAR 1985 MAX 9.41 APR 21, 1985 MIN 15.75 MAR 24, 1985

MENOMINEE COUNTY

453504087331301. Local number, 37N 26W 19DADA.

LOCATION.--Lat 45°35'04", long 087°33'13", Hydrologic Unit 04030108, on Highway U.S. 41 at Carney.

Owner: State Highway Department.

AQUIFER.--Trenton Limestone and Black River Formation of Middle Ordovician age.

WELL CHARACTERISTICS.--Water-table well, diameter 4 in., depth 17 ft, cased.

INSTRUMENTATION.--Quarterly measurement.

DATUM.--Elevation of land-surface datum is 800 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of 2 in. reducing nipple, 1.26 ft above land-surface datum.

PERIOD OF RECORD.--September 1959 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.47 ft below land-surface datum, Apr. 12, 1979; lowest measured, 8.62 ft below land-surface datum, Jan. 17, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 30	4.17	FEB 27	4.79	JUN 28	5.22	SEP 27	4.61

MONROE COUNTY

415206083414401. Local number, 7S 6E 15ACAA.

LOCATION.--Lat 41°52'06", long 083°41'44", Hydrologic Unit 04100002, on Teal Road 2 mi southeast of Petersburg.

Owner: U.S. Geological Survey.

AQUIFER.--Detroit River Group of Devonian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 72 ft, cased to 53 ft, open end.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 680 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--November 1978 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 32.30 ft below land-surface datum, Mar. 26, 1982; lowest measured, 43.12 ft below land-surface datum, Sept. 9, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 25	39.39	JAN 24	37.02	APR 11	34.04	JUN 27	39.11	AUG 6	42.39	SEP 9	43.12
DEC 6	38.46	FEB 25	37.09	MAY 11	37.54						

GROUND-WATER LEVELS

MONROE COUNTY

415235083414001. Local number, 7S 6E 15ADBB.

LOCATION.--Lat 41°52'35", long 083°41'50", Hydrologic Unit 04100002, 1.5 mi southeast of Petersburg on Teal Road.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1½ in., depth 17 ft, screened 14 to 17 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 675 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 4.00 ft above land-surface datum.

PERIOD OF RECORD.--December 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.00 ft below land-surface datum, Feb. 14, 1966; lowest measured, 7.15 ft below land-surface datum, Sept. 9, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 25	6.02	JAN 24	4.97	APR 11	4.66	JUN 27	6.27	AUG 6	6.79	SEP 9	7.15
DEC 6	5.52	FEB 25	5.63	MAY 23	5.68						

MUSKEGON COUNTY

431806086044401. Local number, 11N 15W 34ADDD.

LOCATION.--Lat 43°18'06", long 086°04'44", Hydrologic Unit 04060102, 8 mi northeast of Holton on Holton-Duck Lake Road.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 1½ in., depth 31 ft, screened 28 to 31 ft.

INSTRUMENTATION.--Quarterly measurement.

DATUM.--Elevation of land-surface datum is 595 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 4.00 ft above land-surface datum.

PERIOD OF RECORD.--November 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, +0.16 ft above land-surface datum, May 22, 1974; lowest measured, 4.74 ft below land-surface datum, Sept. 5, 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	2.94	DEC 10	1.14	APR 15	0.18	JUL 9	3.42

OAKLAND COUNTY

425116083321501. Local number, 5N 8E 8ACAC.

LOCATION.--Lat 42°51'16", long 083°32'15", Hydrologic Unit 04080204, 6 mi northeast of Holly on Van Road.

Owner: State Department of Natural Resources.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 1½ in., depth 42 ft, screened 39 to 42 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 930 ft above National Geodetic Datum of 1929, from topographic map. Measuring point: Top of casing, 3.00 ft above land-surface datum.

PERIOD OF RECORD.--November 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 22.30 ft below land-surface datum, Apr. 24, 1974; lowest measured, 26.48 ft below land-surface datum, Sept. 9, 1966.

WATER LEVEL IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 18	25.98	JAN 10	25.12	APR 1	24.27	JUN 19	24.93	JUL 30	25.49	SEP 10	25.11
NOV 27	25.66	FEB 19	25.32	MAY 13	24.62						

GROUND-WATER LEVELS

283

OCEANA COUNTY

433133086082601. Local number, 13N 15W 18AAAA.

LOCATION.--Lat 43°31'33", long 086°08'26", Hydrologic Unit 04060101, approximately 6 mi southwest of Hesperia.

Owner: U.S. Geological Survey.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 6 in., depth 79 ft, screened 69 to 79 ft.

INSTRUMENTATION.--Water-level recorder. Monthly measurement Aug. 1977 to July 1979.

DATUM.--Elevation of land-surface datum is 703 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--August 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 36.10 ft below land-surface datum, May 25, 1978; lowest 40.99 ft below land-surface datum, Mar. 28, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	39.25	39.61	39.96	--	--	--	39.62	37.90	37.30	37.34	37.34	38.09
10	39.31	39.67	40.02	--	--	--	39.25	37.75	37.30	37.44	37.81	38.18
15	39.35	39.72	40.08	--	--	--	38.88	37.62	37.25	37.51	37.86	38.24
20	39.41	39.81	40.12	--	--	40.05	38.59	37.51	37.26	37.56	37.92	38.31
25	39.48	39.84	40.19	--	--	40.00	38.32	37.44	37.30	37.62	37.98	38.38
EOY	39.55	39.89	40.24	--	--	39.88	38.10	37.34	37.34	37.70	38.05	38.43

WTR YEAR 1985 MAX 37.22 JUN 22, 1985 MIN 40.24 DEC 24, 1984

OGEMAW COUNTY

442514084164702. Local number, 23N 1E 2BAAA.

LOCATION.--Lat 44°25'14", long 084°16'47", Hydrologic Unit 04070007, 8 mi west of Rose City on south side of Rose City Road.

Owner: Ogemaw County Road Commission.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1½ in., depth 20 ft.

INSTRUMENTATION.--Quarterly measurement.

DATUM.--Elevation of land-surface datum is 1,265 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 2.30 ft above land-surface datum.

PERIOD OF RECORD.--November 1968 to October 1971. April 1974 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 7.62 ft below land-surface datum, Apr. 13, 1976; lowest measured, 13.6 ft below land-surface datum, December 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 18	10.85	JAN 18	10.65	JUL 19	9.45

ONTONAGON COUNTY

465002089321601. Local number, 51N 41W 8BDBC.

LOCATION.--Lat 46°50'02", long 089°32'16", Hydrologic Unit 04020101, 325 ft south of M-64, 1.5 mi east of Silver City.

Owner: State Corrections Department.

AQUIFER.--Freda Sandstone of Keweenaw age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 100 ft, cased to 32 ft.

INSTRUMENTATION.--Quarterly measurement.

DATUM.--Elevation of land-surface datum is 620 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Plywood instrument shelf, 3.50 ft above land-surface datum.

PERIOD OF RECORD.--October 1958 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 8.20 ft below land-surface datum, Apr. 15, 1959; lowest measured, 21.82 ft below land-surface datum, Dec. 15, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 27	13.36	MAR 28	9.61	JUN 12	10.95	SEP 25	12.52

GROUND-WATER LEVELS

OTSEGO COUNTY

445920084425801. Local number, 30N 3W 19ABBB.

LOCATION.--Lat 44°59'20", long 084°42'58", Hydrologic Unit 04070007, on Old Alba Road 3 mi southwest of Gaylord.

Owner: U.S. Geological Survey.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 87 ft, screened 72 to 87 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 1,307 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--January 1979 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured 30.69 ft below land-surface datum, July 24, 1979; lowest measured, 35.82 ft below land-surface datum, Apr. 1, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	33.40	DEC 6	33.97	MAR 19	33.76	MAY 6	31.99	JUN 10	31.32	SEP 11	32.21
NOV 14	33.76	FEB 6	33.79								

PRESQUE ISLE

451634083441801. Local number, 33N 6E 8BBBB.

LOCATION.--Lat 45°16'34", long 083°44'18", Hydrologic Unit 04070006, south side of Grand Lake Highway, 2 mi west and 1 mi north of Posen.

Owner: A. Styma.

AQUIFER.--Traverse Group.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 61 ft.

INSTRUMENTATION.--Quarterly measurement.

DATUM.--Elevation of land-surface datum is 815 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 0.5 ft above land-surface datum.

PERIOD OF RECORD.--December 1959 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 5.10 ft below land-surface datum, Mar. 2, 1979; lowest measured, 16.83 ft below land-surface datum, Mar. 5, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 30	11.00	DEC 12	9.99	APR 9	5.18	JUL 10	12.11

ROSCOMMON COUNTY

442722084350701. Local number, 24N 2W 20BABA.

LOCATION.--Lat 44°27'22", long 084°35'07", Hydrologic Unit 04070007, 2 mi south of Roscommon and 0.5 mi east of highway M-18 on highway M-103.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Jetted water-table well, diameter 8 in., depth 14 ft, open bottom.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 1,145.30 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.50 ft above land-surface datum.

REMARKS.--Federal key well.

PERIOD OF RECORD.--December 1934 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 2.29 ft below land-surface datum, Apr. 19, 1985; lowest recorded, 6.23 ft below land-surface datum, Dec. 6-11, 1949.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	4.77	4.44	4.40	3.96	4.22	4.25	3.01	2.74	3.35	3.91	4.51	4.62
10	4.76	4.42	4.42	3.98	4.29	4.23	2.71	2.86	3.46	4.00	4.53	3.69
15	4.76	4.38	4.40	4.01	4.33	3.90	2.39	2.97	3.56	4.13	4.61	3.80
20	4.79	4.37	4.34	4.01	4.39	3.83	2.29	3.10	3.62	4.27	4.62	3.90
25	4.77	4.38	4.34	4.09	4.25	3.78	2.40	3.20	3.70	4.37	4.66	3.96
EOY	4.54	4.39	4.06	4.17	4.23	3.20	2.60	3.24	3.80	4.43	4.56	3.98

WTR YEAR 1985 MAX 2.29 APR 19, 1985 MIN 4.79 OCT 20, 1984

GROUND-WATER LEVELS

285

SAGINAW COUNTY

431457084194401. Local number, 10N 1E 22DADA1.

LOCATION.--Lat 43°14'57", long 084°19'44", Hydrologic Unit 04080203, west side of Merrill Road 0.35 mi north of Marion Springs.

Owner: U.S. Geological Survey.

AQUIFER.--Saginaw Formation of Pennsylvanian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 210 ft, cased to 170 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 657 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Plywood instrument shelf, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--December 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 7.93 ft below land-surface datum, Feb. 10, 1981; lowest recorded 10.26 ft below land-surface datum, Oct. 6, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.25	9.91	9.94	9.44	9.35	9.26	8.75	8.82	9.18	9.34	9.73	9.82
10	10.21	9.79	9.82	9.54	9.38	9.14	8.96	8.89	9.19	9.42	9.75	9.75
15	10.07	9.82	9.83	9.44	9.18	9.19	8.81	8.96	9.19	9.51	9.81	9.87
20	10.06	10.05	9.77	9.25	9.28	9.19	8.81	8.96	9.22	9.61	9.89	9.72
25	10.12	9.89	9.78	9.29	9.19	9.14	8.95	8.98	9.34	9.65	9.79	9.69
DOM	10.12	9.93	9.62	9.34	9.29	8.98	8.95	8.95	9.52	9.69	9.87	9.64

WTR YEAR 1985 MAX 8.54 APR 5, 1985 MIN 10.26 OCT 6, 1984

SANILAC COUNTY

433439082523601. Local number, 13N 13E 12ADAA.

LOCATION.--Lat 43°34'39", long 082°52'36", Hydrologic Unit 04090001, on Wheatland Road 3 mi east and .75 mi north of Argyle.

Owner: U.S. Geological Survey.

AQUIFER.--Marshall Formation of Mississippian age.

WELL CHARACTERISTICS.--Drilled artesian observation well, diameter 6 in., depth 130 ft, cased with plastic pipe to 48 ft, open bottom.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 805 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Plywood instrument shelf, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--October 15, 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 15.54 ft below land-surface datum, Apr. 6, 1985; lowest recorded, 22.71 ft below land-surface datum, Nov. 20, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	19.43	18.59	17.87	17.35	17.77	16.82	15.91	16.33	17.18	18.39	19.43	19.60
10	19.20	18.47	18.02	17.48	17.84	16.61	15.83	16.57	17.50	18.43	19.68	18.81
15	19.16	17.96	17.71	17.65	17.78	16.49	15.83	16.87	17.62	18.71	19.83	18.87
20	19.21	17.98	17.83	17.64	17.77	16.44	15.93	17.12	17.64	18.91	19.92	18.96
25	18.88	18.01	17.67	17.73	16.88	16.39	15.97	17.30	17.92	19.18	19.67	18.90
DOM	18.78	17.84	17.17	17.71	16.73	16.06	16.18	16.68	18.23	19.26	19.58	18.95

WTR YEAR 1985 MAX 15.54 APR 6, 1985 MIN 19.98 AUG 23, 1985

SCHOOLCRAFT COUNTY

461720085565201. Local number, 45N 13W 16CCCB.

LOCATION.--Lat 46°17'20", long 085°56'52", Hydrologic Unit 04060106, at headquarters building Seney Wildlife refuge.

Owner: U.S. Fish and Wildlife Service.

AQUIFER.--Limestones of Upper Ordovician age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 151 ft, cased to 65 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 710 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 3.60 ft below land-surface datum.

PERIOD OF RECORD.--June 1952 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.64 ft below land-surface datum, Apr. 13, 1971; lowest recorded, 6.50 ft below land-surface datum, Oct. 23, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.78	5.56	5.52	5.38	5.30	5.16	5.09	5.31	5.50	5.65	5.82	5.78
10	5.77	5.55	5.52	5.41	5.29	5.11	5.13	5.32	5.56	5.70	5.85	5.79
15	5.74	5.55	5.51	5.38	5.19	5.11	5.03	5.36	5.62	5.73	5.87	5.84
20	5.66	5.66	5.49	5.31	5.21	5.13	5.07	5.39	5.62	5.79	5.90	5.84
25	5.70	5.61	5.52	5.29	5.18	5.16	5.34	5.46	5.58	5.81	5.84	5.75
DOM	5.65	5.49	5.43	5.27	5.16	5.10	5.35	5.42	5.66	5.78	5.85	5.71

WTR YEAR 1985 MAX 4.97 APR 6, 1985 MIN 5.92 AUG 22, 1985

GROUND-WATER LEVELS

VAN BUREN COUNTY

421945085481502. Local number, 2S 13W 2BNCB2.

LOCATION.--Lat 42°19'45", long 085°48'15", Hydrologic Unit 04050001, 16 mi east of Bangor on Fish Lake Road, 2.5 mi north of M-43.

Owner: Van Buren County Road Commission

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 40 ft, screened 36 to 40 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 737 ft above National Geodetic Datum of 1929, from topographic map. Measuring point:

Top of casing, 1.00 ft above land-surface datum.

PERIOD OF RECORD.--May 1981 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 9.04 ft below land-surface datum, Mar. 20, 1982; lowest measured, 12.58 ft below land-surface datum, Sept. 19, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 31	11.62	JAN 24	10.52	APR 17	9.75	JUL 10	11.94	AUG 14	12.35	SEP 26	12.28
DEC 12	11.18	MAR 7	9.15	MAY 30	11.02						

WASHTEENAW COUNTY

421228083331601. Local number, 3S 7E 24CADB.

LOCATION.--Lat 42°12'28", long 083°33'16", Hydrologic Unit 04090005, at Ypsilanti Township waterworks on Bridge Street.

Owner: Ypsilanti Township.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 4 in., depth 80 ft, screened 77 to 80 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 665.65 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of coupling, 3.00 ft above land-surface datum.

REMARKS.--Water level affected by nearby pumping.

PERIOD OF RECORD.--July 1943 to June 1945, December 1949 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 5.79 ft below land-surface datum, Jan. 5, 1950; lowest recorded, 22.66 ft below land-surface datum, Feb. 13, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.97	13.44	15.64	14.96	15.84	14.77	13.77	14.28	13.67	13.61	14.12	14.07
10	14.11	14.52	15.54	15.16	15.86	14.40	13.78	14.27	13.80	13.56	14.22	14.12
15	13.72	14.61	15.50	15.39	15.95	14.52	14.15	14.19	13.89	14.02	14.10	14.20
20	13.70	15.16	15.30	15.60	16.15	14.80	14.37	14.13	13.72	14.13	14.03	14.24
25	13.65	15.45	15.35	15.83	15.18	14.72	14.73	14.04	13.89	14.18	14.00	14.20
EOM	13.59	15.58	14.99	15.90	14.81	14.08	14.66	13.78	13.82	14.17	14.13	14.19

WTR YEAR 1985 MAX 13.28 NOV 4, 1984 MIN 16.16 FEB 21, 1985

Temperatures of ground water are measured as part of a state-wide water resource investigation in cooperation with Michigan Department of Natural Resources. The purpose of these measurements is to determine the natural ground-water temperature of selected points throughout the State. These data can be used to estimate ground-water temperatures in many areas in the State. Measurements of temperature were made by means of "lazy" thermometers (Heath, 1964).

TEMPERATURE (°C) OF GROUND WATER AT INDICATED DEPTH

DATE	WATER TEMPER- ATURE (°C)	DATE	WATER TEMPER- ATURE (°C)	DATE	WATER TEMPER- ATURE (°C)
ALGER COUNTY, 45N 19W 25BDCD1 (LAT 46°16'08", LONG 86°37'38") DEPTH 66 FT					
OCT 5, 1984	7.5	MAY 3 . . .	7.0	SEP 26 . . .	7.5
JAN 14, 1985	7.0				
DICKINSON COUNTY, 43N 28W 32ADAB1 (LAT 46°04'59", LONG 87°49'37") DEPTH 31 FT					
OCT 31, 1984	8.0	JAN 31, 1985	7.5	JUN 28 . . .	6.0
NOV 30 . . .	8.5	FEB 28 . . .	7.0	JUL 16 . . .	6.0
DEC 28 . . .	8.0	MAY 31 . . .	5.5		
LENAWEE COUNTY, 5S 1E 12DDBD1 (LAT 42°02'46", LONG 84°15'06") DEPTH 39 FT					
OCT 25, 1984	9.5	APR 12 . . .	9.0	AUG 7 . . .	9.0
DEC 6 . . .	10.0	MAY 24 . . .	9.0	SEP 9 . . .	9.5
MAR 6, 1985	9.5	JUN 28 . . .	9.0		
MENOMINEE COUNTY, 37N 26W 19DADA1 (LAT 45°35'00", LONG 87°33'15") DEPTH 17 FT					
NOV 30, 1984	10.0	JUN 28 . . .	8.0	SEP 27 . . .	12.5
FEB 27, 1985	6.0				
MUSKEGON COUNTY, 11N 15W 34ADDD1 (LAT 43°18'06", LONG 86°04'44") DEPTH 31 FT					
OCT 2, 1984	10.5	APR 15, 1985	8.5	JUL 9 . . .	8.5
DEC 10 . . .	9.5				
OAKLAND COUNTY, 5N 8E 8ACAC1 (LAT 42°51'16", LONG 83°32'15") DEPTH 42 FT					
OCT 18, 1984	9.0	FEB 19 . . .	8.0	JUN 19 . . .	8.5
NOV 27 . . .	9.0	APR 1 . . .	8.0	JUL 30 . . .	9.0
JAN 10, 1985	9.0	MAY 13 . . .	8.5		

DISCONTINUED GAGING STATIONS

The following continuous-record streamflow or stage stations in Michigan have been discontinued or converted to partial-record stations. Daily streamflow or stage records were collected and published for the period of record shown for each station.

Station number	Station name	Drainage area (mi ²)	Period of record
Streams Tributary to Lake Superior			
04028000	Montreal River at Ironwood, MI	63.0	1918-22, 1924-25, 1949-54
04030000	Montreal River near Saxon, WI	262	1938-70
04030500	Black River at Ramsay, MI	a82	1924-25
04031000	Black River near Bessemer, MI	200	1954-82
04031500	Presque Isle River at Marenisco, MI	171	1945-82
04032000	Presque Isle River near Tula, MI	261	*1945-73
04032500	Iron River near White Pine, MI	98.1	1952-57
04035000	East Branch Ontonagon River near Mass, MI	272	1942-79
04038000	Cisco Branch Ontonagon River near Watersmeet, MI	62.2	1942-44
04039500	South Branch Ontonagon River at Ewen, MI	348	*1942-71
04041000	Perch River near Sidnaw, MI	63.1	*1912-15
04042000	Sturgeon River near Baraga, MI	379	1927-31, 1942-47
04042500	Otter River near Elo, MI	162	*1942-72
04043000	Sturgeon River near Arnheim, MI	705	1942-74
04043500	Dead River near Negaunee, MI	138	1902-03
04044000	Dead River at Forestville, MI	158	1898-1902
04044500	Carp River near Marquette, MI	a86	1902-03
04044563	Big Creek near Harvey, MI	17.0	1979-81
04044573	Cedar Creek near Harvey, MI	9.04	1979-81
04044583	Cherry Creek near Harvey, MI	4.53	1965-70, 1979-81
04044595	Silver Creek at Harvey, MI	8.58	1979-81
04045000	Tahquamenon River at Newberry, MI	200	1934-36
Streams Tributary to Lake Michigan			
04046000	Black River near Garnet, MI	a28	*1951-78
04046500	South Manistique Lake Outlet at Curtis, MI	a44	1942-44
04047000	North Manistique Lake Outlet at Helmer, MI	a15	1942-44
04047500	Manistique River near Germfask, MI	a120	1942-50
04048000	Fox River at Seney, MI	107	1942-44
04048500	East Branch Fox River near Germfask, MI	104	1942-44
04049000	Holland Creek near Seney, MI	a13	1938-42
04049500	Manistique River at Germfask, MI	341	*1938-70
04050000	Goose Pen Outlet at Germfask, MI	--	1939-41
04050500	Grays Creek near Germfask, MI	a36	1938-40
04051000	Pine Creek near Germfask, MI	a11	1938-40
04051500	Sand Creek near Germfask, MI	a6	1938-40
04052000	Driggs River near Seney, MI	a70	1938-42
04052500	Walsh Creek near Seney, MI	a12	1938-42
04053000	Driggs River near Germfask, MI	114	1938-41
04053500	Marsh Creek near Shingleton, MI	a20	1938-42
04054000	Marsh Creek near Germfask, MI	a15	1938-41
04054500	Duck Creek near Blaney, MI	a92	1938-54
04055000	Manistique River near Blaney, MI	704	*1938-70
04055500	Creighton River near Shingleton, MI	a35	1938-42
04056000	West Branch Manistique River near Manistique, MI	322	1938-56
04057000	Indian River near Manistique, MI	302	*1938-71
04057500	Sturgeon River near St. Jacques, MI	167	1950-51
04057820	Middle Branch Escanaba River near Greenwood, MI	73.3	*1972-82
04057900	Black River near Republic, MI	34.4	*1961-68
04058000	Middle Branch Escanaba River near Ishpeming, MI	128	1954-75
04058100	Middle Branch Escanaba River near Princeton, MI	210	1961-82
04058130	Green Creek near Princeton, MI	13.8	1976-82
04058300	Warner Creek near Palmer, MI	14.2	*1961-68, 1972-78
04058400	Goose Lake Outlet near Sands Station, MI	37.5	*1965-82
04058500	East Branch Escanaba River at Gwinn, MI	124	1954-80
04059400	Tenmile Creek at Perronville, MI	38.4	*1971-77
04060000	Iron River near Iron River, MI	a65	1900-05
04060500	Iron River at Caspian, MI	92.1	1948-80
04062100	Peshekee River near Michigamme, MI	66.5	*1961-68
04062200	Peshekee River near Champion, MI	133	*1961-78
04062230	Michigamme River near Michigamme, MI	194	1968-82
04062270	Michigamme River near Champion, MI	231	1964-69
04062300	Michigamme River at Republic, MI	240	*1961-75
04062400	Michigamme River near Witch Lake, MI	316	1964-80

See footnotes at end of table.

DISCONTINUED GAGING STATIONS--CONTINUED

289

Station number	Station name	Drainage area (mi ²)	Period of record
Streams Tributary to Lake Michigan--Continued			
04065000	Menominee River near Iron Mountain, MI (at Lower Quinnesec Falls)	a2,420	1898-99, 1902-14
04065300	West Branch Sturgeon River near Randville, MI	56.1	1958-81
04065393	East Branch Sturgeon River below Skunk Creek near Felch, MI	61.8	1973-84
04065397	East Branch Sturgeon River near Hardwood, MI	90.8	1977-83
04065500	Sturgeon River near Foster City, MI	237	1954-80
04065600	Pine Creek near Iron Mountain, MI	16.8	1971-81
04067000	Menominee River below Koss, MI	3,730	1907-09, 1913-81
04095500	Galien River near New Troy, MI	a47	1945-47
04096000	East Branch Galien River near New Troy, MI	19.2	1945-47
04096272	Beebe Creek near Hillsdale, MI	42.4	*1974-78
04096312	Sand Creek at Litchfield, MI	20.6	*1974-77
04096325	Soap Creek near Litchfield, MI	10.9	1974-77
04096340	St. Joseph River at Clarendon, MI	144	*1974-77
04096500	Sauk (East Branch Coldwater) River at Coldwater, MI	--	1937-62
04097000	St. Joseph River at Mendon, MI	918	1902-05
04097060	Little Portage Creek near Fulton, MI	27.0	*1964-67
04097170	Portage River near Vicksburg, MI	68.2	*1946-51, 1964-79
04097200	Gourdneck Creek near Schoolcraft, MI	7.29	1964-72
04097500	St. Joseph River at Three Rivers, MI	1,350	1953-83
04098500	Fawn River near White Pigeon, MI	192	*1903-04, 1957-75
04102000	St. Joseph River at Berrien Springs (at and near Buchanan), MI	4,081	1901-06, 1909-31, 1951-58
04102320	Paw Paw River near Paw Paw, MI	195	1980-82
04102420	Paw Paw River near Hartford, MI	311	1980-82
04102850	South Branch Kalamazoo River near Albion, MI	146	1971-76
04103000	Reed's Springs near Albion, MI	--	1904-06
04103500	Kalamazoo River at Marshall, MI	449	1948-82
04104000	Battle Creek at Charlotte, MI	a67	1948-54
04104500	Battle Creek at Bellevue, MI	178	1948-53
04105800	Gull Creek near Galesburg, MI	38.1	*1964-73
04106190	Portage Creek near Portage, MI	18.6	1964-67
04107000	Gun River at dam, near Shelbyville, MI	a30	1946-47
04107500	Gun River near Martin, MI	a35	1946-47
04108000	Kalamazoo River near Allegan, MI	a1,470	1903-07
04109500	Portage River below Little Portage Lake, near Munith, MI	a55	1944-56
04110000	Orchard Creek at Munith, MI	a49	1944-56
04110500	Portage River near Munith, MI	118	1944-46
04111000	Grand River near Eaton Rapids, MI	661	1950-82
04112850	Sycamore Creek near Holt, MI	80.6	1975-80
04112904	Mud Lake Drain at Lansing, MI	4.28	1975-76
04113097	Carrier Creek near Lansing, MI	12.1	1975-80
04113500	Sebewa Creek near Sunfield, MI	24.1	1954-56
04114000	Grand River at Portland, MI	1,385	1952-82
04115500	Fish Creek near Carson City, MI	145	1936-38
04117000	Quaker Brook near Nashville, MI	7.60	*1955-75
04118500	Rogue River near Rockford, MI	234	1952-82
04119300	Grand River at Eastmanville, MI	5,230	1976-77
04120000	Crockery Creek at Slocums Grove, MI	--	1902-03
04120500	Higgins Lake Outlet (head of Muskegon River) near Roscommon, MI	a58	1942-50
04121000	Muskegon River near Merritt, MI	355	*1946-73
04123000	Big Sable River near Freesoil, MI	127	*1942-73
04123500	Manistee River near Grayling, MI	131	*1942-73
04124500	East Branch Pine River near Tustin, MI	a63	*1952-63
04125000	Pine River near LeRoy, MI	118	*1953-63
04125500	Pine River near Hoxeyville, MI	251	1952-82
04126200	Little Manistee River near Freesoil, MI	200	*1956-75
04126500	Little Manistee River near Stronach, MI	233	1930-31
04127500	Boardman River at Traverse City, MI	--	1903-04
Streams Tributary to Lake Huron			
04128500	Indian River at Indian River, MI	583	1942-82
04129500	Pigeon River at Afton, MI	159	1942-81
04130000	Cheboygan River near Cheboygan, MI	865	1942-82
04131000	Rainy River near Onoway, MI	a79	1942-52
04131500	Rainy River near Ocqueoc, MI	85	*1952-79

See footnotes at end of table.

Station number	Station name	Drainage area (mi ²)	Period of record
Streams Tributary to Lake Huron--Continued			
04132000	Black River near Cheboygan, MI	597	*1942-74
04132500	Thunder Bay River near Hillman, MI	232	*1945-72
04133000	Upper South Branch Thunder Bay River near Lachine, MI	171	1945-53
04133500	Thunder Bay River near Bolton, MI	588	1945-80
04134000	North Branch Thunder Bay River near Bolton, MI	184	1945-80
04134500	Lower South Branch Thunder Bay near Hubbard Lake, MI	146	1945-53
04135000	Thunder Bay River near Alpena, MI	a1,260	1901-08
04135600	East Branch AuSable River at Grayling, MI	76.0	1958-84
04136000	Au Sable River near Red Oak (Lovells), MI	a1,000	1908-16, 1930-31
04137000	Au Sable River at Bamfield, MI	a1,420	1902-13
04137500	Au Sable River near Au Sable, MI	a1,540	1939-40
04138000	East Branch Au Gres River at McIvor, MI	84	*1950-73
04138500	Au Gres River near National City, MI	169	1950-81
04139000	Houghton Creek near Lupton, MI	29.7	*1950-72
04139500	Rifle River at "The Ranch" near Lupton, MI	56.8	1950-71
04140000	Prior Creek near Selkirk, MI	21.4	*1950-72
04140500	Rifle River at Selkirk, MI	117	*1950-82
04141000	South Branch Shephards Creek near Selkirk, MI	1.15	*1951-78
04141500	West Branch Rifle River near Selkirk, MI	a52	*1951-63
04143000	Rifle River at Omer, MI	364	1902-03
04143500	North Branch Kawkawlin River near Kawkawlin, MI	101	1951-82
04144000	Shiawassee River at Byron, MI	368	1947-83
04145000	Shiawassee River near Fergus, MI	637	1939-84
04145500	Bad River near Brant, MI	a89	*1948-59
04146500	Flint River at Columbiaville, MI	486	1932-33, 1948-52
04147990	Butternut Creek near Genesee, MI	34.7	1970-84
04148000	Flint River at Genesee, MI	593	1930-52
04148160	Gilkey Creek near Flint, MI	6.43	1970-84
04148200	Swartz Creek near Holly, MI	11.9	*1956-75
04148300	Swartz Creek at Flint, MI	115	1970-84
04148440	Thread Creek near Flint, MI	54.4	1970-84
04148720	Brent River near Montose, MI	20.8	1970-84
04149000	Flint River near Posters, MI	1,188	1939-84
04149500	Flint River near Alicia, MI	--	+1948-84
04150000	South Branch Cass River near Cass City, MI	238	1948-80
04151000	Cass River at Vassar, MI	a700	1910-28, 1948-70
04152500	Tobacco River at Beaverton, MI	487	1948-82
04153000	Kinney Creek near Clare, MI	a9	1935-36
04153500	Salt River near North Bradley, MI	138	1934-71
04154500	Chippewa River near Midland, MI	597	*1947-72
04156500	Tittabawassee River at Freeland, MI	a2,530	1903-09, 1912-36
04157500	Sebewaing River (State drain) near Sebewaing, MI	a62	1939-54
04158000	East Fork Sebewaing River (Columbia drain) near Sebewaing, MI	a38	1940-54
04158500	Pigeon River near Owendale, MI	53.2	1952-82
04159000	Pigeon River near Pigeon, MI	a86	1946-52
Streams Tributary to St. Clair River			
04159488	Silver Creek near Jeddo, MI	20.6	1978-82
04159900	Mill Creek near Avoca, MI	169	*1963-75
04160000	Mill Creek near Abbottsford, MI	208	*1947-64
04160500	Black River near Port Huron, MI	634	1931, 1932-43
Streams Tributary to Lake St. Clair			
04161000	Clinton River at Auburn Heights, MI	123	*1935-40, 1956-82
04161500	Paint Creek near Lake Orion, MI	38.5	*1955-75
04161820	Clinton River at Sterling Heights, MI	309	1978-83
04162000	Red Run near Royal Oak, MI	36.5	1953-68
04162500	Bear Creek at Warren, MI	17.3	1954-57
04163000	Big Beaver Creek at Warren, MI	25.2	1954-58
04163500	Plum Brook near Utica, MI	22.9	1954-66
04163900	Red Run near Cady, MI	--	+1979-82
04164010	North Branch Clinton River at Almont, MI	9.56	*1962-68
04164050	North Branch Clinton River near Romeo, MI	49.7	*1964-69
04164150	North Branch Clinton River near Meade, MI	89.6	*1967-72
04164200	Coon Creek near Armada, MI	10.0	*1965-70
04164250	Tupper Brook at Ray Center, MI	8.62	*1959-64
04164350	Highbank Creek near Armada, MI	14.9	*1965-70
04164360	East Branch Coon Creek near New Haven, MI	36.1	*1967-72

See footnotes at end of table.

DISCONTINUED GAGING STATIONS--CONTINUED

291

Station number	Station name	Drainage area (mi ²)	Period of record
Streams tributary to Lake Erie--Continued			
04164400	Deer Creek near Meade, MI	12.7	*1960-65
04164450	McBride Drain near Macomb, MI	5.79	*1959-64
04164600	Middle Branch Clinton River near Macomb, MI	22.2	*1964-69
04164800	Middle Branch Clinton River at Macomb, MI	41.0	*1962-68, 1969-82
04165000	Middle Branch Clinton River near Mount Clemens, MI	a51	1947-49
04165200	Gloede Ditch near Waldenburg, MI	16.0	*1959-64
04165556	Clinton River By-Pass below weir at Mount Clemens, MI	--	†1979-83
04165557	Clinton River By-Pass at mouth at Mount Clemens, MI	--	†1979-83
Streams Tributary to Detroit River			
04168500	Lower River Rouge at Dearborn, MI	a96	1930-33
Streams Tributary to Lake Erie			
04169000	Hayes Creek at Commerce, MI	a8	1946-51
04169500	Huron River at Commerce, MI	57.3	*1946-75
04171000	Davis Creek near Whitmore Lake, MI	a70	1952-54
04171500	Ore Creek near Brighton, MI	a31	1951-68
04172500	Portage River near Pinckney, MI	79.1	*1944-71
04173000	Huron River near Dexter, MI	522	*1904, 1946-72, 1975-77
04173500	Mill Creek near Dexter, MI	128	1952-83
04174000	Huron River at Dexter, MI	--	1904-16
04174800	Huron River at Ypsilanti, MI	807	1974-84
04175340	Stony Creek at Oakville, MI	68.0	1970-81
04175500	Huron River at Flat Rock, MI	851	1904-11, †1912-22
04175700	River Raisin near Tecumseh, MI	267	*1956-80
04176400	Saline River near Saline, MI	94.6	*1965-77

a Approximately.

* Previous or subsequent operation as a crest-stage partial-record station.

† Stage record only.

INDEX

	Page		Page
Access to WATSTORE data	13	Black River (tributary to Lake Michigan)	
Acme, Acme Creek at	162,256	near Garnet	258
Yuba Creek near	163,256	Black River (tributary to Middle Branch	
Acme Creek at Acme	162,256	Escanaba River) near Republic	258
Acre-foot, definition of	13	Black River (tributary to St. Clair	
Adenosine triphosphate, definition of	13	River) near Fargo	211
Adrian, River Raisin near	250	Blue-green algae, definition of	16
South Branch River Raisin near	261	Boardman River, at Traverse City	159,256
Algae, definition of	13	near Mayfield	150,154,255
Algal growth potential, definition of	13	near Traverse City	158,256
Alger County, ground-water levels	269	North Branch, near South Boardman	149,255
ground-water temperatures	287	South Branch, near South Boardman	148,255
Allen, Hog Creek near	81	Bond Falls Canal near Paulding	33
Hog Creek Tributary near	254	Bond Falls Reservoir near Paulding	34
Alma, Pine River (tributary to Chippewa		Bottom material, definition of	14
River) at	201	Boyne River near Boyne City	259
Almont, North Branch Clinton River at	260	Branch County, ground-water levels	271
Alpena, Thunder Bay River near	174-179	Bridgeton, Muskegon River near	133-134
Alpena County, ground-water levels	269	Brimley, East Branch Waikwa River near	258
Alpha, Paint River near	75	West Branch Waikwa River near	258
Alston, Sturgeon River (tributary to Lake		Brule River near Florence, WI	73
Superior) near	43	Buck Creek at Grandville	259
Analyses of samples collected at water-		Buckley, Anderson Creek near	139,254
quality miscellaneous sites	265	Burlington, St. Joseph River (tributary	
Anderson Creek near Buckley	139,254	to Lake Michigan) near	80
Andersonville, Huron River near	261	Caledonia, Thornapple River near	125
Ann Arbor, Huron River at	248	Calhoun County, ground-water levels	271,272
Aquifer, definition of	13	Carp Creek at Ishpeming	258,262
Arenac County, ground-water levels	269,270	Carp River near Negaunee	47
Armada, Coon Creek near	260	Carrier Creek near Grand Ledge	259
East Branch Coon Creek at	226	Caseville, Pigeon River near	207-208
Highbank Creek near	260	Cass County, ground-water levels	272
Armstrong Creek near Montrose	260	Cass River, at Cass City	197
Artesian, definition of	13	at Frankenmuth	199
Artificial substrate, definition of	17	at Wahjamega	198
Ash mass, definition of	14	Cells/volume, definition of	14
Athens, Nottawa Creek near	83	Chassell, Sturgeon River (tributary to	
Auburn Heights, Clinton River at	260	Lake Superior) near	44-45
Galloway Creek near	216	Cheboygan County, ground-water levels	272,273
Augusta Creek near Augusta	100	Cheboygan River at Cheboygan	172-173
Au Sable, Au Sable River near	183-184	Chemical oxygen demand, definition of	14
Au Sable River, at Grayling	180	Chippewa County, ground-water levels	273
at Mio	182	Chippewa River near Mount Pleasant	200
near Au Sable	183-184	Chlorophyll, definition of	14
South Branch, near Luzerne	181	Cisco Branch Ontonagon River at Cisco	
Bacteria, definition of	13	Lake Outlet	38
Bancroft Creek near Kingsley	265	Clam River at Vogel Center	129
Bangor, South Branch Black River		Clarendon, St. Joseph River (tributary to	
(tributary to Lake Michigan) near	97	Lake Michigan) at	258
Baraga County, ground-water levels	270	Clinton County, ground-water levels	273
Barry County, ground-water levels	270	Clinton River, at Auburn Heights	260
Battle Creek, Battle Creek at	98	at Mount Clemens	228-230
Kalamazoo River near	99	near Drayton Plains	215
Battle Creek (tributary to Grand Traverse		near Fraser	224
Bay) near Williamsburg	165,257	Middle Branch, at Macomb	261
Battle Creek (tributary to Kalamazoo		near Macomb	261
River) at Battle Creek	98	North Branch, at Almont	260
Bay County, ground-water levels	271	near Meade	260
Beaer Creek (tributary to Lake Michigan)		near Mount Clemens	227
near Muskegon	135	near Romeo	260
Bed load, definition of	17	Coldwater River (tributary to St. Joseph	
discharge, definition of	17	River) near Modunk	82
Bed material, definition of	13	Cole Creek near Flushing	260
Beebe Creek near Hillsdale	258	Color unit, definition of	14
Belle River, at Memphis	213	Columbiaville, North Branch Flint River	
North Branch, at Imlay City	212	near	257
Benzonia, Betsie River near	259	South Branch Flint River near	191
Bergland, West Branch Ontonagon River		Comstock, Kalamazoo River at	101
near	37	Contents, definition of	14
Betsie River, near Benzonia	259	Control, definition of	14
near Karlin	147,255	Control structure, definition of	14
Big Beaver Creek near Warren	222	Coon Creek, near Armada	260
Biochemical oxygen demand, definition of	13	East Branch, at Armada	226
Biomass, definition of	13	near New Haven	260
Birmingham, River Rouge at	233	Cooperation	1
Black Creek (tributary to Kearsley Creek)		Cornell, Escanaba River at	67-69
near Davison	264	Cosperville, IN, North Branch Elkhart	
Black Creek (tributary to Lake Michigan)		River at	89
near Muskegon	254,259	Crawford County, ground-water levels	274
Black River (tributary to Cheboygan		Crest-stage partial-record stations	258-261
River) near Tower	171	Crystal Falls, Michigamme River near	76
Black River (tributary to Lake Michigan)		Paint River at	74
South Branch, near Bangor	97	Cubic feet per second per square mile,	
		definition of	14

	Page		Page
Cubic foot per second, definition of	14	Gaging station, definition of	14
Cubic foot per second-day, definition of ...	14	discontinued	288-291
Dansville, Deer Creek (tributary to Red Cedar River) near	116	Galloway Creek near Auburn Heights	216
Davison, Kearsley Creek near	194	Garden City, Middle River Rouge near	238
Deer Creek (tributary to Red Cedar River) near Dansville	116	Garnet, Black River (tributary to Lake Michigan) near	258
Deer Creek (tributary to North Branch Clinton River) near Meade	261	Genesee County, ground-water levels	275
Definition of terms	13-19	Gloede Ditch near Waldenburg	261
Delhi Mills, Huron River at	247	Goose Creek near Cement City	264
Delta County, ground-water levels	274	Goose Lake Outlet near Sands Station	258
Detroit, Detroit River at	231-232	Goshen, IN, Elkhart River at	90
River Rouge at	237	Gourdneck Canal near Schoolcraft	84
Detroit River at Detroit	231-232	Grand Ledge, Carrier Creek near	259
Detroit River, streams tributary to, crest-stage partial-record stations ...	261	Grand Rapids, Grand River at	126
gaging-station records	231-239	Plaster Creek at	259
Diatoms, definition of	16	Grand River, at Eastmanville	127-128
Dickinson County, ground-water levels	274	at Grand Rapids	126
ground-water temperatures	287	at Ionia	122
Discharge, definition of	14	at Jackson	114
Discontinued gaging stations	288-291	at Lansing	119
Dissolved, definition of	14	Grand Traverse County, ground-water levels	275
Dissolved-solids concentration, definition of	14	Grandville, Buck Creek at	259
Dowagiac River at Summerville	95	Grawn, Mason Creek near	144,254
Drainage area, definition of	14	Grayling, Au Sable River at	180
Drainage basin, definition of	14	Great Bear Lake Drain near Bloomingdale	262
Drayton Plains, Clinton River near	215	Green algae, definition of	16
Sashabaw Creek near	214	Green Creek near Palmer	254
Dry mass, definition of	14	Green Lake Inlet near Interlochen	146,255
Duck Lake Outlet near Interlochen	145,254	Greenwood Afterbay near Greenwood	61-62
Eagle, Looking Glass River near	120	Greenwood Diversion near Greenwood	63
East Creek near Mayfield	153,255	Greenwood Release (Middle Branch Escanaba River) near Greenwood	64
East Jordan, Jordan River near	167	Greenwood Reservoir near Greenwood	60
East Lansing, Red Cedar River at	118	Ground-water level records by county	269-286
Eastmanville, Grand River at	127-128	Ground-water temperatures by county	287
East Pond Creek at Romeo	225	Hamburg, Huron River near	246
Eaton County, ground-water levels	275	Hamilton, Rabbit River at	259
Elkhart, IN, St. Joseph River (tributary to Lake Michigan) at	91	Hardness, definition of	15
Elkhart River, at Goshen, IN	90	Hastings, Thornapple River near	124
North Branch, at Cosperville, IN	89	Hembling Drain near Kawkawlin	263
Elk Rapids, Tobeco Creek near	164,257	Highbank Creek near Armada	260
Escanaba River, at Cornell	67-69	Hillsdale, Beebe Creek near	258
Middle Branch, at Humboldt	58	Hillsdale County, ground-water levels	276
near Wells	254	Hodunk, Coldwater River (tributary to St. Joseph River) near	82
Evans Ditch at Southfield	235	Hog Creek, near Allen	81
Evart, Muskegon River at	130	Tributary near Allen	254
Explanation of the records	5-12	Holloway Reservoir near Otisville	192
Factors for converting English Units to International System (SI) Units		Hopkins, Rabbit River near	110
Inside back cover		Hospital Creek at Traverse City	160,256
Fargo, Black River (tributary to St. Clair River) near	211	Houghton Creek near Lupton	259
Farmers Creek near Lapeer	190	Humboldt, Middle Branch Escanaba River at	58
Farmington, Upper River Rouge at	236	Huron River, at Ann Arbor	248
Fecal coliform bacteria, definition of	13	at Delhi Mills	247
Fecal streptococcal bacteria, definition of	13	at Milford	240-242
Fennville, Kalamazoo River near	109	near Andersonville	261
Fife Lake Outlet near Fife Lake	138,254	near Hamburg	246
Fish Creek, near Carson City	263	near New Hudson	243-245
near Crystal	262	Hyde, Ford River near	70-72
near McBride	262	Hydrologic Bench-Mark Network, definition of	15
Flat River at Smyrna	123	Hydrologic conditions, summary of	2-5
Flint, Flint River near	196	graph of	3
Flint River, near Flint	196	Hydrologic unit, definition of	15
near Otisville	193	Imlay City, North Branch Belle River at	212
North Branch, near Columbiaville	257	Ingham County, ground-water levels	276
South Branch, near Columbiaville	191	Inkster, Lower River Rouge at	239
near Millville	260	Instantaneous discharge, definition of	14
Florence, WI, Brule River near	73	Interlochen, Duck Lake Outlet near	145,254
Menominee River near	77	Green Lake Inlet near	146,255
Flushing, Cole Creek near	260	Introduction	1
Ford River near Hyde	70-72	Ionia, Grand River at	122
Frank and Poet Drain at Trenton	261	Iosco County, ground-water levels	277
Frankenmuth, Cass River at	199	Iron County, ground-water levels	277
Fraser, Clinton River near	224	Ishpeming, Carp Creek at	258
Gage height, definition of	14	Jackson County, ground-water levels	277
		Jackson Creek near Kingsley	152,255
		Jackson, Grand River at	114
		Jaxon Creek, West Branch, near Mayfield	157,256
		Jordan River near East Jordan	167

	Page		Page
Kalamazoo County, ground-water levels	278	Manistee River near Sherman	140
Kalamazoo, Portage Creek (tributary to Kalamazoo River) at	106-108	Manistique River, above Manistique	55-56
Portage Creek near	103	near Manistique	54
West Fork Portage Creek at	105	Maple River, at Maple Rapids	121
Kalamazoo River, at Comstock	101	near St. Johns	254
at Saugatuck	111-112	Map of Michigan, water-discharge stations ..	22-23
near Battle Creek	99	water-quality stations	24-25
near Fennville	109	ground-water observation wells	268
Karlin, Betsie River near	147,255	Marquette County, ground-water levels	281
Kawkawlin River, North Branch, near Kawkawlin	263	Mason, Sycamore Creek near	259
Kearsley Creek near Davison	194	Mason Creek near Grawn	144,254
Kent County, ground-water levels	278	Mayfield, Boardman River near	150,154,255
Kimball Drain near Swartz Creek	260	East Creek near	153,255
Kingsley, Jackson Creek near	152,255	Swainston Creek at	156,255
Klackung Creek near Selkirk	259	West Branch Jaxon Creek near	157,256
		McAllistor, WI, Menominee River near	79
Lake County, ground-water levels	279	McBride Drain near Macomb	261
Lake Creek near Clarksville	263	Meade, Deer Creek (tributary to North Branch Clinton River) near	261
Lake Erie, streams tributary to, crest- stage partial-record stations	261	North Branch Clinton River near	260
gaging-station records	240-253	Mean concentration, definition of	17
measurements at miscellaneous sites	264	Mean discharge, definition of	14
Lake Huron, streams tributary to, crest-stage partial-record stations ...	259-260	Measuring point, definition of	15
gaging-station records	168-213	Memphis, Belle River at	213
low-flow partial-record stations	257	Menominee County, ground-water levels	281
measurements at miscellaneous sites	263-264	ground-water temperatures	287
Lake Linden, Trap Rock River near	46	Menominee River, near Florence, WI	77
Lake Michigan, streams tributary to, crest-stage partial-record stations ...	258-259	near McAllistor, WI	79
gaging-station records	54-167	near Pembine, WI	78
low-flow partial-record stations	254-257	Metamorphic stage, definition of	15
measurements at miscellaneous sites	262-263	Methylene blue active substance, definition of	15
Lake Orion, Paint Creek (tributary to Clinton River) near	260	Michigan River, at Republic	258
Lake St. Clair, streams tributary to, crest-stage partial-record stations ...	260-261	near Crystal Falls	76
gaging-station records	214-230	Micrograms per gram, definition of	15
Lake Superior, streams tributary to, crest-stage partial-record stations ...	258	Micrograms per liter, definition of	15
gaging-station records	27-53	Middle River Rouge near Garden City	238
measurements at miscellaneous sites	262	Midland, Pine River near	202
Lakes and Reservoirs:		Tittabawassee River at	203
Bond Falls Reservoir near Paulding	34	Milford, Huron River at	240-242
Greenwood Reservoir near Greenwood	60	Mill Creek (tributary to Huron River) near Lima Center	261
Holloway Reservoir near Otisville	192	Milligrams per liter, definition of	15
Schweitzer Reservoir near Palmer	65	Millville, South Branch Flint River near ...	260
Stony Lake near Washington	219	Mio, Au Sable River at	182
Land-surface datum, definition of	15	Miscellaneous sites, discharge measure- ments at	262-264
Lansing, Grand River at	119	Mitchell Creek at Traverse City	161,256
Lapeer, Farmers Creek near	190	Monroe County, ground-water levels	281,282
Leary Drain near Clarksville	263	Monroe, River Raisin near	251-253
Leelenau County, ground-water levels	279	Montrose, Armstrong Creek near	260
Lenawee County, ground-water levels	280	Morley, Little Muskegon River near	131
ground-water temperatures	287	Mottville, St. Joseph River (tributary to Lake Michigan) at	87
Lima Center, Mill Creek (tributary to Huron River) near	261	Mount Clemens, Clinton River at	228-230
Lime Lake Outlet at Panama, IN	86	North Branch Clinton River near	227
Linden, Shiawassee River at	188	Mount Pleasant, Chippewa River near	200
List of gaging stations, in downstream order, for which records are published	vi	Mud Creek near Mason	262
List of counties for which water-level records are published	ix	Muskegon, Bear Creek (tributary to Lake Michigan) near	135
Little Cedar River at Stephenson	262	Black Creek (tributary to lake Michigan) near	254,259
Little Muskegon River near Morley	131	Muskegon County, ground-water levels	282
Livingston County, ground-water levels	280	ground-water temperatures	287
Looking Glass River, near Eagle	120	Muskegon River, at Evart	130
near East DeWitt	262	at Newaygo	132
Lower River Rouge at Inkster	239	near Bridgeton	133-134
Low-flow partial-record stations	254-257		
Lupton, Houghton Creek near	259	Nahma Junction, Sturgeon River (tributary to Lake Michigan) near	57
Luzerne, South Branch Au Sable River near	181	Nashville, Quaker Brook near	259
		National Geodetic Vertical Datum of 1929, definition of	15
Macatawa River near Zeeland	113	National Stream-Quality Accounting Network, definition of	15
Mackinac County, ground-water levels	280	National Trends Network, definition of	15
Macomb, McBride Drain near	261	Natural substrate, definition of	17
Middle Branch Clinton River at	261	Negaunee, Carp River near	47
Middle Branch Clinton River near	261	Newaygo, Muskegon River at	132
Manchester, River Raisin near	249	New Haven, East Branch Coon Creek near	260
Manistee River, at Manistee	142-143	New Hudson, Huron River near	243-245
near Manistee	141	Niles, St. Joseph River (tributary to Lake Michigan) at	92-94
		Nottawa Creek near Athens	83
		Nottawa, Prairie River near	85

	Page		Page
Oakland County, ground-water levels	282	Quaker Brook near Nashville	259
ground-water temperatures	287		
Oceana County, ground-water levels	283	Rabbit River, at Hamilton	259
Ogemaw County, ground-water levels	283	near Hopkins	110
Ontonagon County, ground-water levels	283	Radiochemical Program, definition of	16
Ontonagon River, Cisco Branch, at Cisco		Rapid River, Whitefish River near	254
Lake Outlet	38	Rattle Run, Pine River (tributary to	
Middle Branch, near Paulding	32	St. Clair River) near	260
near Rockland	36	Recoverable from bottom material,	
near Trout Creek	35	definition of	17
near Rockland	39-41	Red Cedar River, at East Lansing	118
West Branch, near Bergland	37	near Williamston	115
Organic mass, definition of	14	Red Run near Warren	221
Organism, definition of	15	Republic, Black River (tributary to	
count/area, definition of	15	Middle Branch Escanaba River), near ...	258
count/volume, definition of	15	Michigamme River at	258
Oshemo, West Fork Portage Creek near	104	Reservoir (see lakes and reservoirs)	
Otisville, Flint River near	193	Return period, definition of	17
Holloway Reservoir near	192	Rifle River, at Selkirk	259
Otsego County, ground-water levels	284	near Sterling	185-187
Owosso, Shiawassee River at	189	River Raisin, near Adrian	250
		near Manchester	249,264
Paint Creek (tributary to Clinton River),		near Monroe	251-253
at Rochester	217	near Norvell	264
near Lake Orion	260	near Sharon Hollow	264
Paint River, at Crystal Falls	74	South Branch, near Adrian	261
near Alpha	75	River Rouge, at Birmingham	233
Palmer, Green Creek near	254	at Detroit	237
Schweitzer Creek near	66	at Southfield	234
Schweitzer Reservoir near	65	Riverside, Paw Paw River at	96
Panama, IN, Lime Lake Outlet at	86	Rochester, Paint Creek (tributary to	
Paradise, Two Hearted River near	258	Clinton River) at	217
Parameter code, definition of	15	Rockland, Middle Branch Ontonagon River	
Partial-record station, definition of	15	near	36
Partical-size, definition of	16	Ontonagon River near	39-41
Partical-size classification, definition		Romeo, East Pond Creek at	225
of	16	North Branch Clinton River near	260
Paulding, Bond Falls Canal near	33	Stony Creek (tributary to Clinton	
Bond Falls Reservoir near	34	River) near	218
Middle Branch Ontonagon River near	32	Roscommon County, ground-water levels	284
Paw Paw River at Riverside	96	Rudyard, Pine River (tributary to Lake	
Pemba, WI, Menominee River near	78	Huron) near	168
Pentwater, North Branch Pentwater River		Runoff in inches, definition of	17
near	259		
Percent composition, definition of	16	Saginaw County, ground-water levels	285
Perch River near Sidnaw	258	Saginaw River at Saginaw	204-206
Pere Marquette River at Scottville	137	Saline River near Saline	261
Periphyton, definition of	16	Sand River Wildlife Flooding at Sand	
Perronville, Tenmile Creek at	258	River	48
Pesticides, definition of	16	Sands Station, Goose Lake Outlet near	258
Phytoplankton, definition of	16	Sanilac County, ground-water levels	285
Picocurie, definition of	16	Sashabaw Creek near Drayton Plains	214
Pigeon River (tributary to Lake Huron)		Saugatuck, Kalamazoo River at	111-112
near Caseville	207-208	Sault Ste. Marie, St. Marys River above ...	52-53
Pigeon River (tributary to St. Joseph		Schoolcraft County, ground-water levels ...	285
River) near Scott, IN	88	Schoolcraft, Gourdneck Canal near	84
Pigeon River (tributary to Indian		Schweitzer Creek near Palmer	66
River) near Vanderbilt	170	Schweitzer Reservoir near Palmer	65
Pine River (tributary to Chippewa River),		Scott, IN, Pigeon River (tributary to	
at Alma	201	St. Joseph River) near	88
near Midland	202	Scottville, Pere Marquette River at	137
Pine River (tributary to Lake Huron)		Sediment, definition of	17
near Rudyard	168	Selkirk, Klack Creek near	259
Pine River (tributary to Manistee River),		Rifle River at	259
East Branch, near Tustin	259	South Branch Shepards Creek near	260
Pine River (tributary to St. Clair River)		Seven-day 10-year low flow, definition of ..	17
near Rattle Run	260	Shepards Creek, South Branch, near	
Plankton, definition of	16	Selkirk	260
Plaster Creek at Grand Rapids	259	Sherman, Manistee River near	140
Plum Brook at Utica	223	Shiawassee River, at Henderson	264
Polychlorinated biphenyls, definition of ...	16	at Linden	188
Port Huron, St. Clair River at	209-210	at Owosso	189
Portage Creek (tributary to Kalamazoo		Sidnaw, Perch River near	258
River), at Kalamazoo	106-108	Sturgeon River (tributary to Lake	
at Portage	102	Superior) near	42
near Kalamazoo	103	Silver Creek, near Whitehall	263
West Fork, at Kalamazoo	105	Cut-off channel near Whitehall	263
near Oshemo	104	Sloan Creek near Williamston	117
Portage River (tributary to St. Joseph		Smyrna, Flat River at	123
River) near Vicksburg	258	Sodium-adsorption-ratio, definition of	17
Prairie River near Nottawa	85	Solute, definition of	17
Precipitation site (Wagner)	266-267	South Boardman, North Branch Boardman	
Presque Isle County, ground-water levels ...	284	River near	149,255
Primary productivity, definition of	16	South Branch Boardman River near	148,255
Publications on Techniques of Water-		Southfield, Evans Ditch at	235
Resources Investigations	20-21	River Rouge at	234

INDEX

297

	Page		Page
Special Networks and Programs	5	Total coliform bacteria, definition of	13
Specific conductance, definition of	17	Total discharge, definition of	18
Stage-discharge relation, definition of	17	Total organism count, definition of	15
St. Clair River at Port Huron	209-210	Total recoverable, definition of	18
St. Clair River, streams tributary to, crest-stage partial-record stations ...	260	Total-sediment discharge, definition of	17
gaging-station records	209-213	Total-sediment load, definition of	17
Sterling, Rifle River near	185-187	Tower, Black River (tributary to Cheboygan River) near	171
St. Johns, Maple River near	254	Trap Rock River near Lake Linden	46
St. Joseph River (tributary to Lake Michigan), at Clarendon	258	Traverse City, Boardman River at	159,256
at Elkhart, IN	91	Boardman River near	158,256
at Mottville	87	Hospital Creek at	160,256
at Niles	92-94	Mitchell Creek at	161,256
near Burlington	80	Trenton, Frank and Poet Drain at	261
St. Marys River above Sault Ste. Marie	52-53	Tritium Network, definition of	18
Stony Creek (tributary to Clinton River), near Romeo	218	Trout Creek, Middle Branch Ontonagon River near	35
near Washington	220	Tustin, East Branch Pine River (tributary to Manistee River) near	259
West Branch, near Washington	260	Two Hearted River near Paradise	258
Stony Lake near Washington	219	Upper River Rouge at Farmington	236
Stony Lake Outlet (tributary to River Raisin) near Napoleon	264	Utica, Plum Brook at	223
Streamflow, definition of	17	Van Buren County, ground-water levels	286
Sturgeon River (tributary to Burt Lake) near Wolverine	169	Vanderbilt, Pigeon River (tributary to Indian River) near	170
Sturgeon River (tributary to Lake Michigan) near Nahma Junction	57	Vicksburg, Portage River (tributary to St. Joseph River) near	258
Sturgeon River (tributary to Lake Superior), near Alston	43	Vogel Center, Clam River at	129
near Chassell	44-45	Wahjamega, Cass River at	198
near Sidnaw	42	Waika River, East Branch, near Brimley ...	258
Substrate, definition of	17	West Branch, near Brimley	258
Sumnerville, Dowagiac River at	95	Waldenburg, Gloede Ditch near	261
Surface area, definition of	18	Warren, Big Beaver Creek near	222
Surficial bed material, definition of	18	Red Run near	221
Suspended, definition of	18	Washington Creek at Windigo	27-31
Suspended recoverable, definition of	18	Washington, Stony Creek (tributary to Clinton River), near	219
Suspended sediment, definition of	17	Stony Lake near	220
Suspended-sediment concentration, definition of	17	West Branch Stony Creek near	260
Suspended-sediment discharge, definition of	17	Washtenaw County, ground-water levels	286
Suspended-sediment load, definition of	17	Water year, definition of	19
Suspended total, definition of	18	WDR, definition of	19
Swainston Creek at Mayfield	156,255	Weighted average, definition of	19
Swan Creek at Colon	262	Wells, Escanaba River near	254
Swartz Creek, Kimball Drain near	260	Wet mass, definition of	14
Sycamore Creek near Mason	259	Whitefish River near Rapid River	254
Tahquamenon River near Tahquamenon Paradise	49-51	White River near Whitehall	136
Taxonomy, definition of	18	Williamsburg, Battle Creek (tributary to Grand Traverse Bay) near	165,257
Tenmile Creek at Perronville	258	Williamsburg Creek near Williamsburg	166,257
Thermograph, definition of	18	Williamston, Red Cedar River near	115
Thornapple River, near Caledonia	125	Sloan Creek near	117
near Hastings	124	Windigo, Washington Creek at	27-31
Thread Creek near Flint	264	Wolverine, Sturgeon River (tributary to Burt Lake) near	169
Thunder Bay River near Alpena	174-179	WSP, definition of	19
Time-weighted average, definition of	18	Yuba Creek near Acme	163,256
Tittabawassee River at Midland	203	Zeeland, Macatawa River near	113
Tobeco Creek near Elk Rapids	164,257	Zooplankton, definition of	16
Tons per acre-foot, definition of	18		
Tons per day, definition of	18		
Total, definition of	18		

October 1, 1978

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). This report contains both the inch-pound and SI unit equivalents in the station manuscript descriptions.

Multiply inch-pound units	By	To obtain SI units
<i>Length</i>		
inches (in)	2.54×10^1 2.54×10^{-2}	millimeters (mm) meters (m)
feet (ft)	3.048×10^{-1}	meters (m)
miles (mi)	1.609×10^0	kilometers (km)
<i>Area</i>		
acres	4.047×10^3 4.047×10^{-1} 4.047×10^{-3}	square meters (m ²) square hectometers (hm ²) square kilometers (km ²)
square miles (mi ²)	2.590×10^0	square kilometers (km ²)
<i>Volume</i>		
gallons (gal)	3.785×10^0 3.785×10^0 3.785×10^{-3}	liters (L) cubic decimeters (dm ³) cubic meters (m ³)
million gallons	3.785×10^3 3.785×10^{-3}	cubic meters (m ³) cubic hectometers (hm ³)
cubic feet (ft ³)	2.832×10^1 2.832×10^{-2}	cubic decimeters (dm ³) cubic meters (m ³)
acre-feet (acre-ft)	1.233×10^3 1.233×10^{-3} 1.233×10^{-6}	cubic meters (m ³) cubic hectometers (hm ³) cubic kilometers (km ³)
<i>Flow</i>		
cubic feet per second (ft ³ /s)	2.832×10^1 2.832×10^1 2.832×10^{-2}	liters per second (L/s) cubic decimeters per second (dm ³ /s) cubic meters per second (m ³ /s)
gallons per minute (gal/min)	6.309×10^{-2} 6.309×10^{-2} 6.309×10^{-5}	liters per second (L/s) cubic decimeters per second (dm ³ /s) cubic meters per second (m ³ /s)
million gallons per day	4.381×10^1 4.381×10^{-2}	cubic decimeters per second (dm ³ /s) cubic meters per second (m ³ /s)
<i>Mass</i>		
tons (short)	9.072×10^{-1}	megagrams (Mg) or metric tons

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