



Water Resources Data Michigan Water Year 1986



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-86-1
Prepared in cooperation with the State of Michigan
and with other agencies

1985																									
OCTOBER							NOVEMBER							DECEMBER											
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by John B. Miller, James C. Failing, and Wallace W. Larson



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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
U.S. Geological Survey
6520 Mercantile Way, Suite 5
Lansing, Michigan 48911

1987

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	R.L. LeuVoy	C.E. Oberst
S.P. Blumer	G.C. Huffman	G. Lansky	M.F. Soper
D.V. Eagle	D.A. James	K.L. Maybee	T.J. Spicer
R.R. Eagle	P.J. Klimek	R.J. Minnerick	C.R. Whited
C.L. Ebsch	J.C. Knudsen	R.G. Nettleton	

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

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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 136 streamflow-gaging stations, 52 crest-stage partial-record stations, 33 low-flow partial-record stations, and 58 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 56 streamflow-gaging stations, 38 miscellaneous sites, 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 Books and Open-File Reports and Investigations, Geological Survey, Federal Center, Bldg. 41, Box 25425, Denver, CO 80225.

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-86-1." 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, G.E. Guyer, Director, through Land and Water Management Division, D.J. Hall, 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 12 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; Kalamazoo County; Wayne County; Huron-Clinton Metropolitan Authority; Cities of Ann Arbor, Cadillac, Clare, Coldwater, Flint, Imlay City, Kalamazoo, Lansing, Mason, Portage, and Ypsilanti; Allied Paper Inc.; American Aggregate Co.; Consumers Power Co.; Cleveland Cliffs Iron Co.; Fisher Body Division; Michigan Power Co.; Michigan Sugar Co.; Swift-Eckrich, Inc.; 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

In the Upper Peninsula, streamflow varied from excessive to deficient during the 1986 water year. At Sturgeon River near Sidnaw, monthly mean discharges for October and November were the highest, and the monthly mean discharge for May was the third lowest, in 46 years of continuous record.

In the Lower Peninsula, streamflow was above normal for the second consecutive year. Record or near record high monthly mean discharges occurred in October, November, January, and September at Muskegon River at Ewart, and in November at Red Cedar River at East Lansing. Of the two index stations in the Lower Peninsula, only the Red Cedar River during the month of April recorded deficient runoff. The monthly and annual mean discharge is compared with the median discharge during 1951-80 at the three index stations (fig. 1).

Torrential thunderstorms that commenced on September 10, 1986, resulted in unprecedented flooding in an east-west band across the central part of the Lower Peninsula. The storm claimed 6 lives, injured 89, contributed to the failure of 11 dams, threatened 19 additional dams, and caused basement flooding or structural damage to about 30,000 homes. Four primary road bridges and hundreds of secondary road bridges and culverts failed, rendering 3,600 miles of roadway impassible. Crop damages were severe. Of Michigan's 12 million acres of cultivated land, about 1.5 million acres were affected. The total extent of damage is in excess of \$400 million (Federal Emergency Management Agency; 1986a, 1986b).

Recorded rainfall amounts for the 48-hour period ending 8 a.m. September 12, ranged from 8 inches to more than 13 inches at Big Rapids (National Weather Service, 1986). The areal extent of significant precipitation was widespread. Records indicate that rain in excess of 10 inches fell over an area of 3,500 square miles; a 2-day total rainfall of approximately 5.5 inches could be expected to occur once in 100 years (Miller, 1964).

Subsequent rainfall in the last half of September magnified the effects of the original flooding and hindered recovery. The September 1986 rainfall exceeded the previous monthly high for any month by about 20 percent. The following table lists sites where record peak discharges occurred during the flood of September 1986.

Station No.	Station Name	Flood of September 1986		Previous maximum	
		Discharge (ft ³ /s)	Day	Discharge (ft ³ /s)	Date
04115000	Maple River at Maple Rapids	8,770	12	*6,500	03-20-48
04116500	Flat River at Smyrna	4,700	13	3,100	04-22-67
04120295	Black Creek near Muskegon	656	12	596	03-12-77
04121900	Little Muskegon River near Morley	2,300	12	1,390	07-18-82
04122000	Muskegon River at Nawaygo	23,200	12	*14,950	03-25-13
04122230	North Branch Pentwater River near Pentwater	2,860	11	346	09-01-75
04122500	Pere Marquette River at Scottville	6,440	13	2,970	07-01-69
04150500	Cass River at Cass City	12,500	12	8,650	04-06-85
04150800	Cass River at Wahjamega	20,000	12	12,000	04-06-85
04151500	Cass River at Frankenmuth	22,200	12	17,700	03-18-42
04154000	Chippewa River near Mount Pleasant	6,660	12	4,960	03-08-46
04155000	Pine River at Alma	5,160	12	4,400	03-19-48
04155500	Pine River near Midland	9,360	12	6,360	03-20-48
04156000	Tittabawassee River at Midland	38,700	13	34,000	03-21-48

*Maximum daily discharge.

Four major river basins discharging to the west into Lake Michigan were affected by the flooding. Two dam failures occurred in the upper part of the White River basin, contributing to the peak discharge of 4,990 ft³/s (cubic feet per second) at Whitehall--slightly less than the 5,400 ft³/s peak of record discharge. The Pere Marquette River at Scottville and Muskegon River at Nawaygo attained new maximum peak discharges of 6,440 and 23,200 ft³/s, respectively. One dam failed on a tributary to the Pere Marquette River; two dams failed on tributaries to the Muskegon River. Major flooding in the Grand River basin occurred along tributaries that drain from the north. Three dams failed on tributaries contributing to flooding in upstream areas; the Grand River itself was not as severely affected. Peak of record discharges for two of these tributaries--Maple River at Maple Rapids and Flat River at Smyrna, were 8,770 ft³/s and 4,700 ft³/s, respectively.

On the eastern side of the State, the Cass, Shiawassee, Flint, and Tittabawassee Rivers converge to form the Saginaw River, which drains northward into Saginaw Bay and Lake Huron. The Cass River, which crested about 11 feet above flood stage, inundated the main business district of the City of Vassar. Discharge of the Cass River at the downstream gaging station at Frankenmuth was 22,200 ft³/s. The new peak stage at Frankenmuth exceeded the previous peak stage by more than 4 feet. Although flooding occurred in the Shiawassee and Flint River basins, no new peaks of record were recorded. In fact, annual peak discharges for both rivers occurred as the result of a separate storm later in September. In the Tittabawassee River basin, tributaries Chippewa River near Mount Pleasant and Pine River near Midland attained new maximum peak discharges of 6,660 and 9,360 ft³/s, respectively. One dam failed in the headwaters of the Chippewa River. The Tittabawassee River at Midland peaked on September 13, at 38,700 ft³/s, exceeding the previous known maximum of 34,800 ft³/s on March 28, 1916. The river crested at 33.89 feet exceeding the record of 1916 by more than 4 feet. The Saginaw River peak discharge of 52,800 ft³/s on September 15 did not exceed the previous peak of 68,000 ft³/s recorded in 1904.

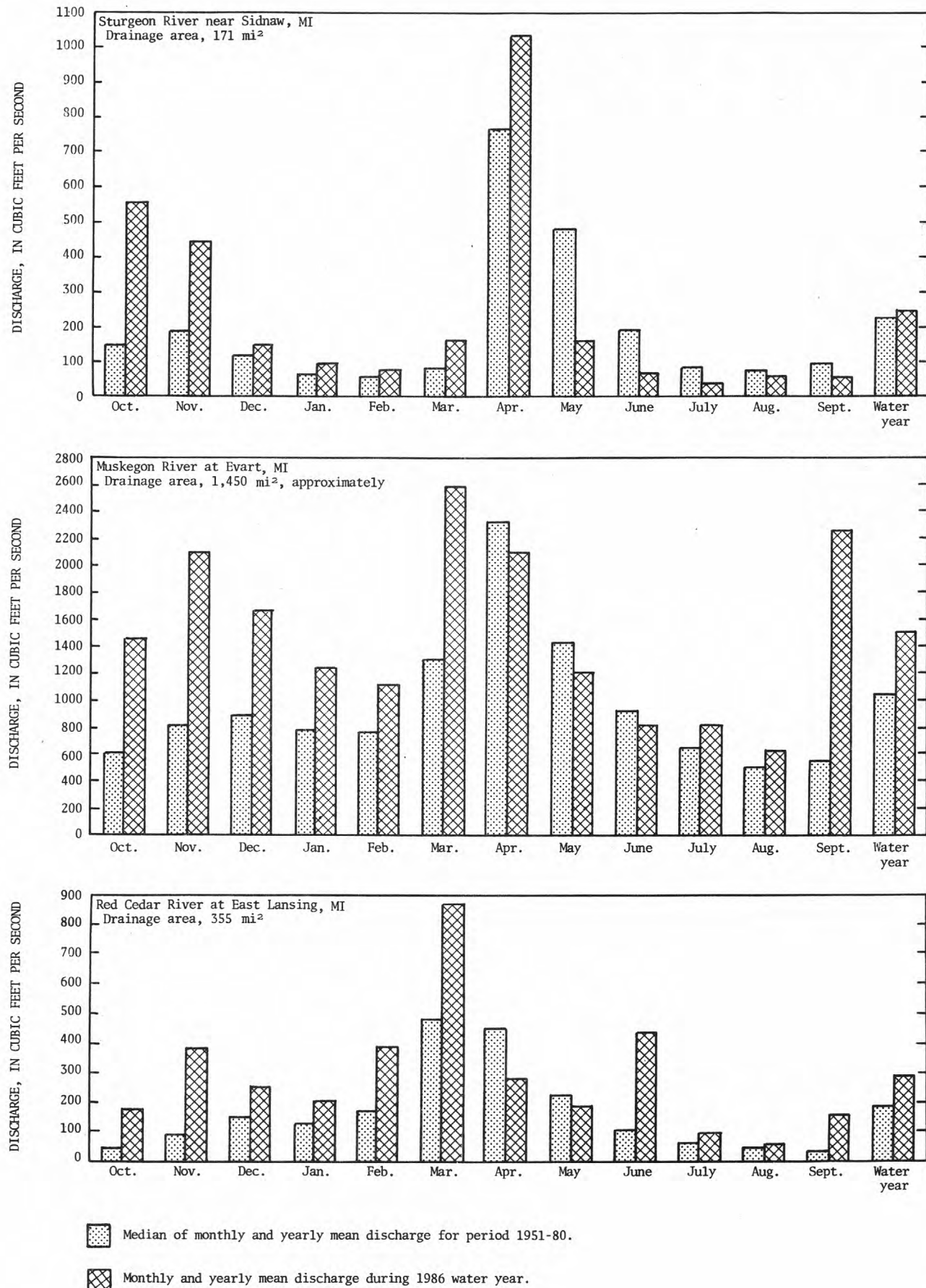


Figure 1.--Discharge during 1986 water year compared with median discharge for period 1951-80 for three representative stations.

The 1986 water year was a record breaker for all the Great Lakes bordering Michigan. For the second consecutive year, Lakes Michigan, Huron and St. Clair established new record high monthly mean water levels for every month of the year. In the few months during 1986 when record high water levels were not set at Lake Erie and Lake Superior, levels were very near record highs. These high lake levels are the result of above-normal precipitation in 13 of the past 15 years, combined with lower than normal evaporation because of cooler temperatures over the lakes. Because of the high lake levels, erosion continues to be a problem for shoreline-property owners.

Water Quality

The September floods, like many floods, affected stream-quality. During floods, water-treatment plants are sometimes unable to appropriately treat large volumes of water, and can become inundated because of their proximity to rivers. 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 as a result of contamination from treatment plants or other sources, such as agricultural areas, that can contribute nutrients and pesticides to runoff.

Samples collected during 1986 at the continuous stations in Michigan indicate that the dissolved and suspended substances generally fall within the range of concentrations previously sampled at each site. However, for several rivers sampled at high stages during the September flooding, new minimum concentrations, caused by dilution, were measured. In addition, high water levels in the Great Lakes probably affect the quality characteristics of water collected at stations near the mouths of rivers tributary to the Great Lakes.

Chemical and physical characteristics of precipitation also influence the quality of water in streams. (See Wagner precipitation gage data.) The release of materials from the earth's surface into the atmosphere from man-made and natural sources and their subsequent deposition by precipitation in other areas is another way in which surface water can be degraded.

The introduction of undesirable material might be of short duration during a flood; however, streams receive undesirable material of long-term duration from land-use practices. The Grand River, for example, has been identified as having increasing concentrations of nitrate from nitrogen fertilizer (Smith and others, 1987).

Ground Water

The principal aquifers in Michigan are glacial outwash deposits and sandstone, limestone, and dolomite 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 import- ant 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 Peninsula; water commonly hard.
Cambrian-Ordovician rocks: Sandstone, limestone, and dolomite.	25-150	200	10-100	500	Important aquifer in eastern Upper Peninsula; water com- monly very hard; salty in places and at depth.
Precambrian sandstone: Sandstone interbedded with siltstone.	25-400	500	5-50	100	Important aquifer in western 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. Poorly sorted, relatively impermeable mixtures of clay, silt, sand, and gravel, that form some till deposits tend to be 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 fresh water. Where deeply buried, however, these rocks commonly yield brackish or salty 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 112 wells during 1986. Of these, 53 were selected to a statewide network of observation wells (figure 10), which is 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 eastern Upper Peninsula remained near average throughout the water year. Elsewhere, levels were well above normal during the first half of the year but had declined to normal by year end. Wells in the central part of the Lower Peninsula rose sharply in September as a result of heavy rainfall.

Natural chemical characteristics of ground water in Michigan are determined primarily by the 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 elevated concentrations of iron [2.5-5.0 mg/L (milligrams per liter)]; 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, salty water underlies freshwater 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).

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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 nation-wide 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.

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 1986 water year that began October 1, 1985, and ended September 30, 1986. 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 4-10. 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 except some lakes and the "latitude-longitude" system is used for wells and lakes.

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 2.)

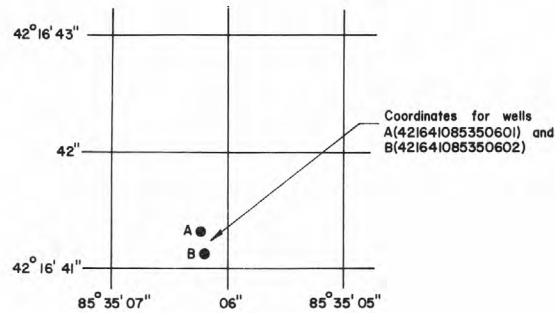


Figure 2. System for numbering wells (latitude and longitude).

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.

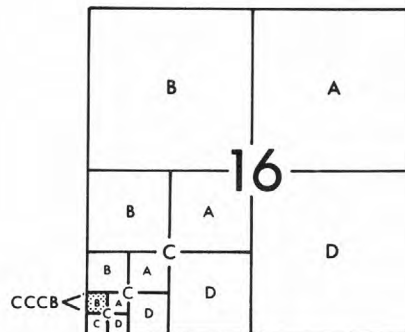


Figure 3. Local well numbering system in Michigan.

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-month 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 annual maximum stage and discharge at crest-stage partial-record stations, and the second is a table of discharge measurements at low-flow partial-record 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 6-8.

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 on site 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 on site 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 by Canton Analytical Laboratory in Ypsilanti, MI. 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
409 National Center
12201 Sunrise Valley Drive
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/m^3), and periphyton and benthic organisms in grams per square meter (g/m^2).

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 (ft^3/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 [$(\text{ft}^3/\text{s})/\text{d}$] 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 μm 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 (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.

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) of the amount of radioactivity represented by a curie (Ci). A curie is the amount of radioactivity that yields 3.7×10 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 [mg C/(m².time)] for periphyton and macrophytes and [mg C/(m³.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 [$\text{mgO}_2/(\text{m}^2 \cdot \text{time})$] for periphyton and macrophytes and [$\text{mgO}_2/(\text{m}^3 \cdot \text{time})$] 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 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 (ft^3/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
Genus.....	<u>Hexagenia</u>
Species.....	<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.

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, 1986, is called the "1986 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, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225 (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. Greeson, T. A. Ehlke, 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.

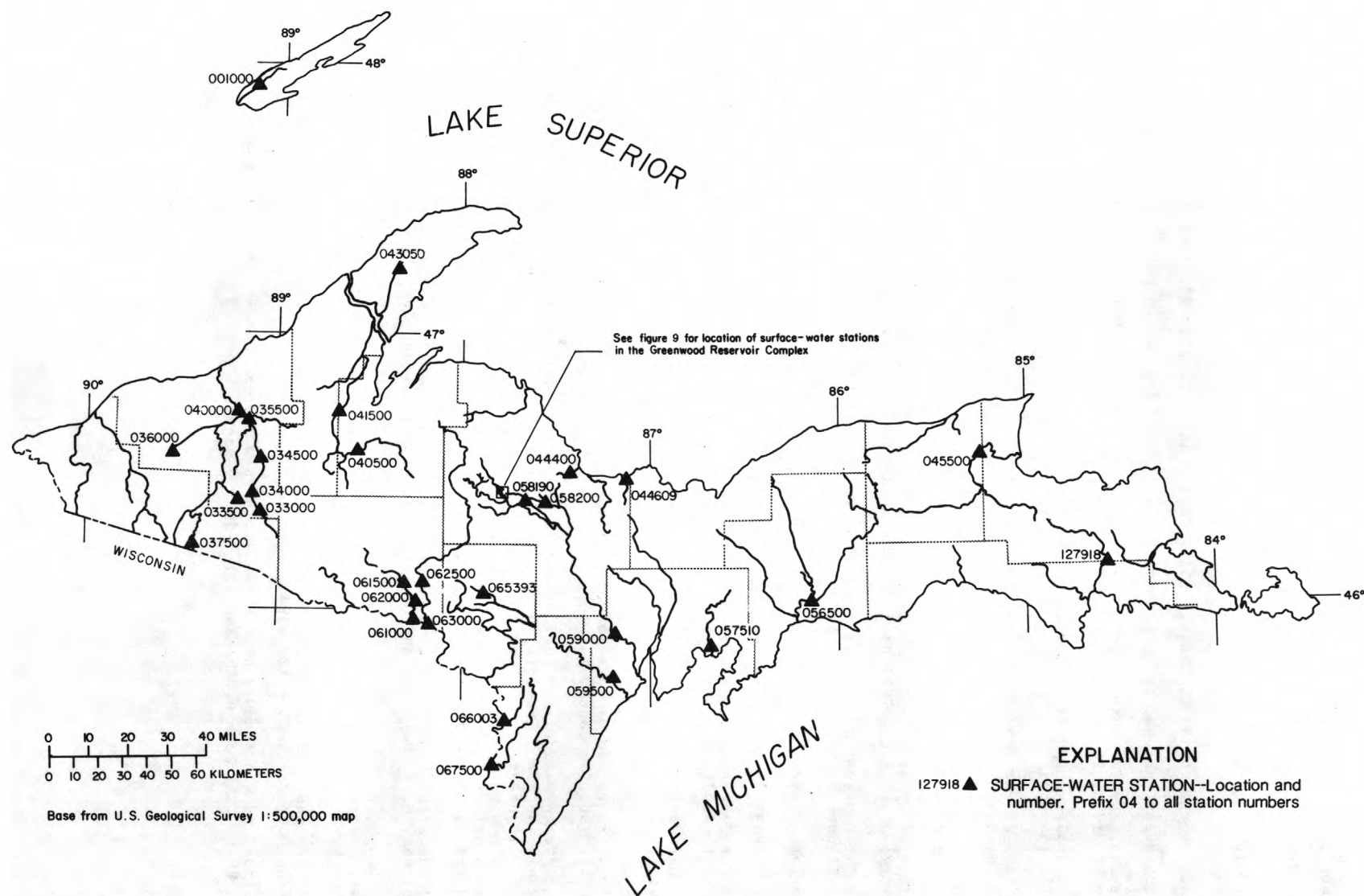


Figure 4.--Identification number and location of active surface-water gaging stations in the Upper Peninsula of Michigan.

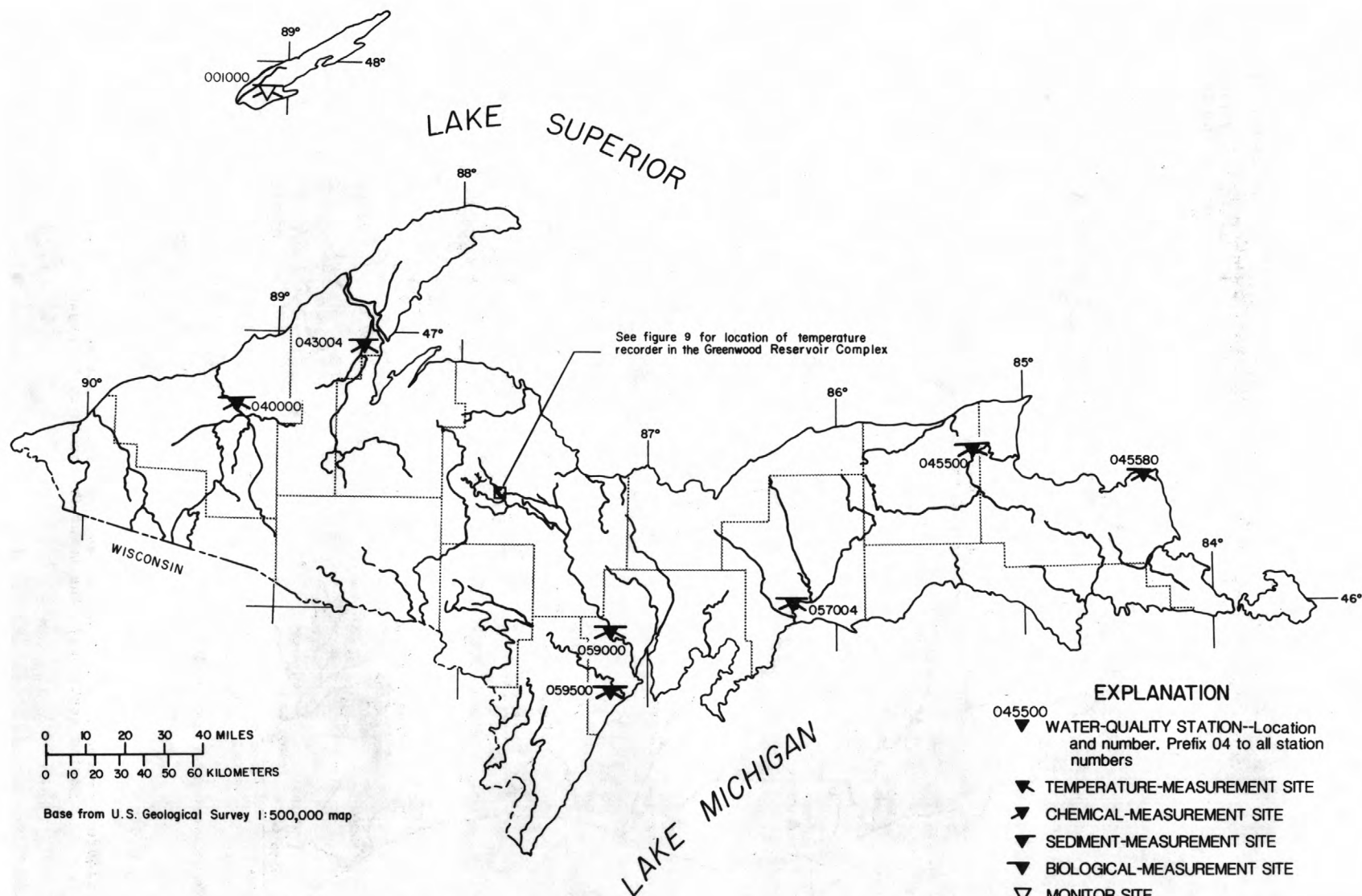


Figure 6.--Identification number and location of active surface-water-quality stations in the Upper Peninsula of Michigan.

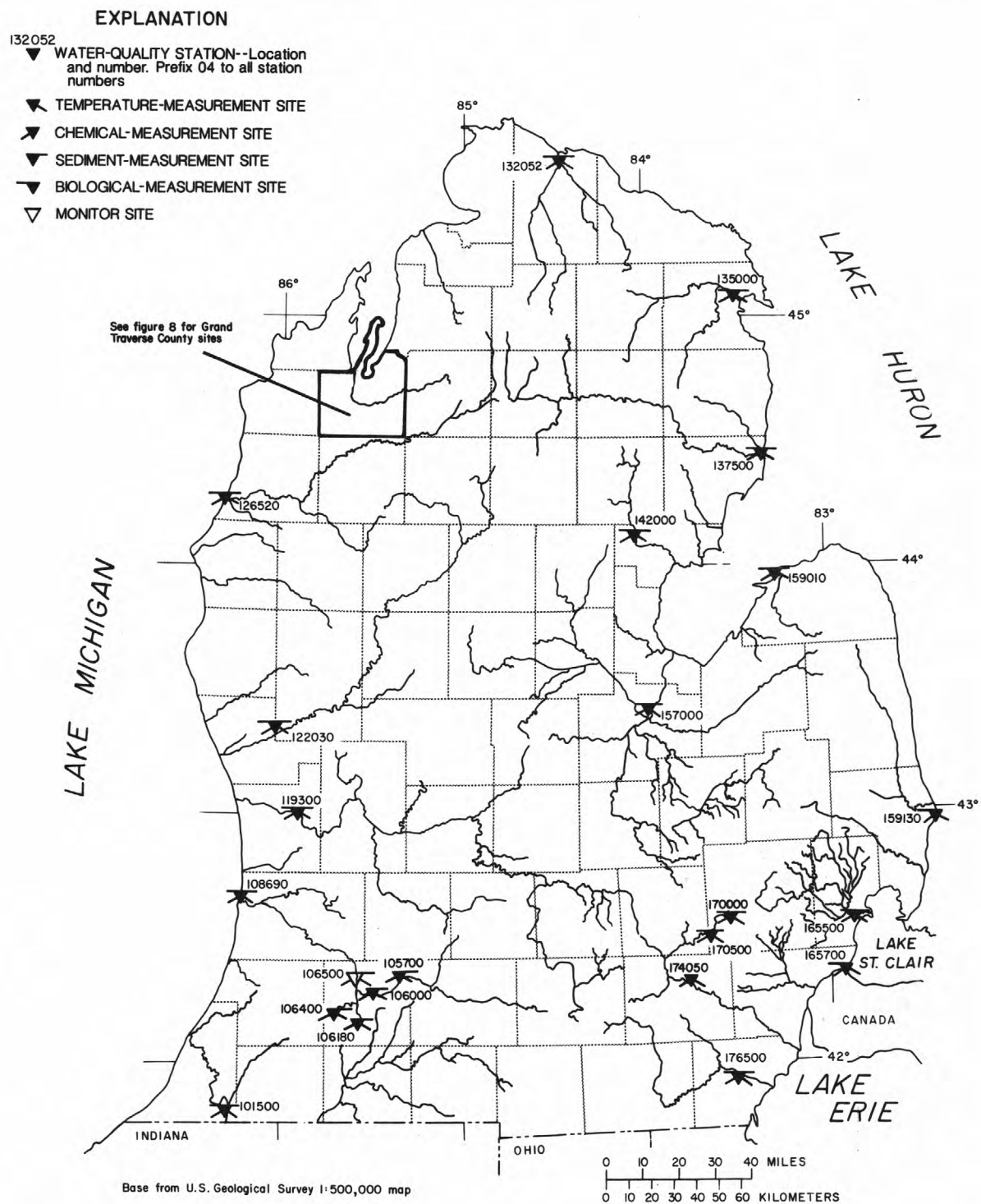


Figure 7.--Identification number and location of active surface-water-quality stations in the Lower Peninsula of Michigan.

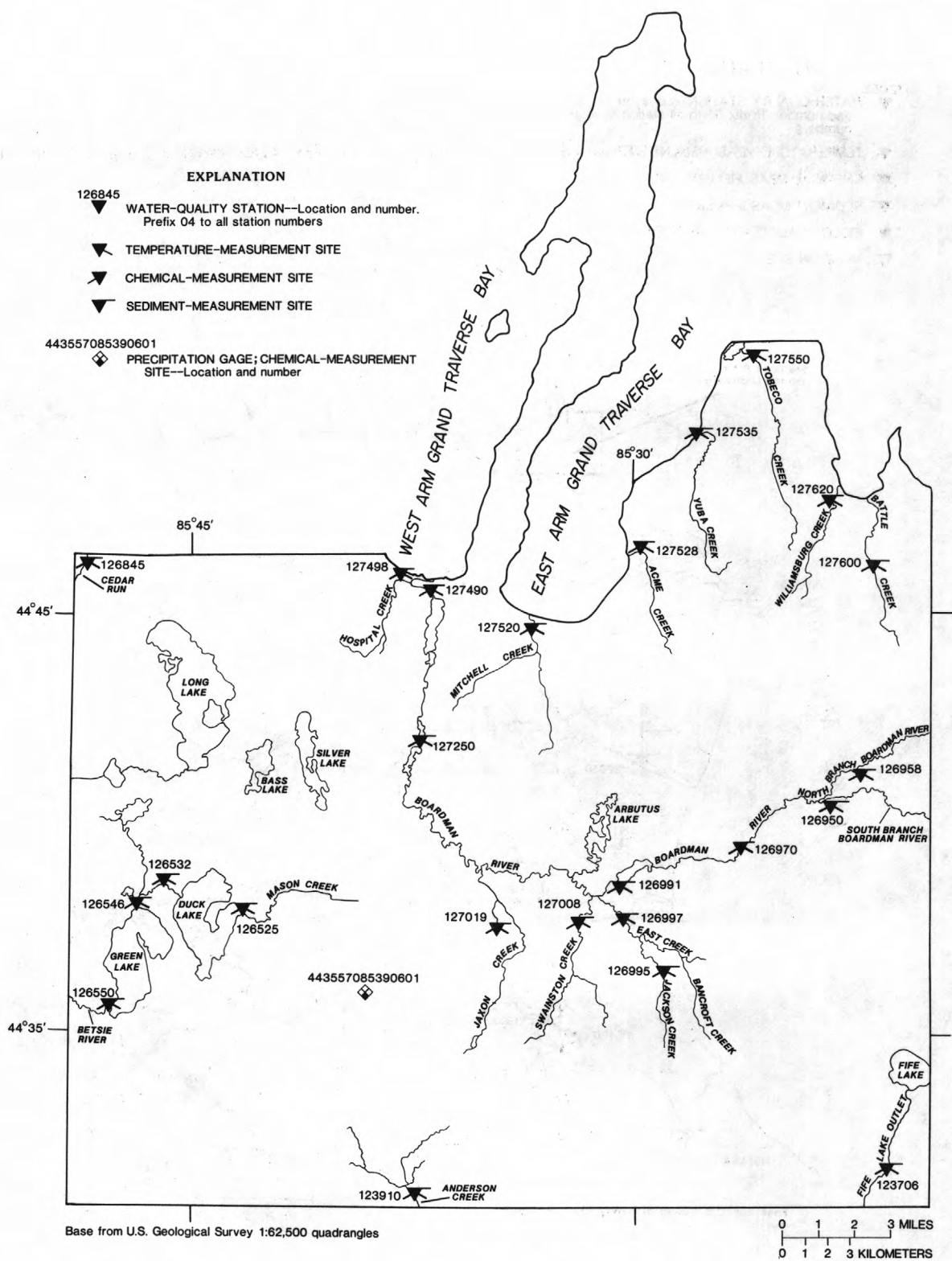


Figure 8.—Identification number and location of active surface-water-quality stations in Grand Traverse County.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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04001000 WASHINGTON CREEK AT WINDIGO, MI
(Hydrologic bench-mark station)

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.

DRAINAGE AREA.--13.2 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1964 to current year.

GAGE.--Water-stage recorder and concrete control. Elevation of gage is 605 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Nov. 24 to Dec. 8, Feb. 5-23, 25-27, and Mar. 14-25. Water-discharge records fair. Recording rain gage at station and capacity rain gage located near mouth.

AVERAGE DISCHARGE.--22 years, 17.5 ft³/s, 18.00 in/yr.

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.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 110 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Apr. 1	1700	*169	*5.19	Apr. 10	1200	125	4.75
Apr. 8	0100	143	4.93				

Minimum discharge, 1.4 ft³/s, July 11, gage height, 2.77 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	30	12	6.6	5.1	4.9	144	61	5.7	3.0	5.5	3.9
2	49	70	12	6.6	4.9	4.7	150	51	5.1	2.7	4.6	7.6
3	34	56	12	6.5	4.8	4.7	125	43	4.8	2.3	4.5	5.5
4	41	42	11	6.5	5.0	5.0	106	37	4.8	2.5	5.2	7.2
5	79	33	11	6.5	4.8	5.1	89	34	4.2	2.6	4.9	5.8
6	59	31	11	6.5	4.8	4.8	118	31	3.6	2.2	4.4	4.7
7	40	30	11	6.5	4.7	4.7	123	28	5.9	1.9	3.9	4.0
8	71	26	11	5.9	4.7	4.7	119	25	7.3	1.7	4.5	3.7
9	68	23	11	5.9	4.6	4.6	100	22	5.6	1.8	4.3	3.4
10	48	21	11	5.9	4.5	4.6	103	21	4.8	1.7	9.7	3.9
11	37	18	11	6.1	4.4	4.7	105	19	7.5	1.5	6.3	4.0
12	39	17	11	6.3	4.3	4.7	101	18	7.5	2.7	4.2	3.8
13	47	16	11	6.2	4.3	4.8	85	17	6.0	6.8	3.8	3.7
14	38	16	11	6.1	4.3	4.9	89	17	5.2	6.4	3.9	5.4
15	34	15	11	6.1	4.4	5.0	96	16	4.8	5.3	4.0	3.1
16	29	14	9.8	6.1	4.4	5.2	89	14	23	4.9	3.5	2.7
17	27	15	9.2	6.1	4.4	5.6	83	13	15	8.9	3.0	4.5
18	25	17	8.5	6.0	4.4	6.2	82	11	11	7.7	2.7	8.7
19	23	23	8.2	5.9	4.4	6.0	101	9.7	8.2	5.9	2.4	6.0
20	20	21	7.8	5.9	4.4	5.8	98	9.0	6.4	5.7	3.8	5.4
21	19	19	7.5	5.8	4.5	5.6	81	8.3	6.1	5.3	6.1	4.9
22	18	18	7.7	5.9	4.5	5.8	63	7.6	6.2	4.2	4.1	4.7
23	18	18	7.9	5.9	4.5	7.0	55	7.3	5.2	3.6	7.2	4.6
24	18	15	7.8	5.8	4.5	6.8	73	6.9	4.7	16	6.0	4.1
25	17	13	7.4	5.7	4.5	6.6	95	6.5	4.3	17	5.0	3.9
26	16	14	7.3	5.7	4.5	7.8	88	6.0	4.4	9.8	4.6	3.7
27	15	13	7.3	5.7	4.7	7.4	100	5.7	4.6	13	4.1	4.9
28	14	13	7.2	5.7	4.9	9.3	90	5.2	3.9	19	3.8	5.8
29	13	12	7.0	5.5	---	48	82	4.8	3.6	11	3.4	5.2
30	13	12	6.9	5.1	---	83	70	4.4	3.1	7.8	3.1	4.7
31	13	---	6.8	5.1	---	99	---	4.1	---	6.1	2.7	---
TOTAL	1049	681	292.3	186.1	128.2	387.0	2903	563.5	192.5	191.0	139.2	143.5
MEAN	33.8	22.7	9.43	6.00	4.58	12.5	96.8	18.2	6.42	6.16	4.49	4.78
MAX	79	70	12	6.6	5.1	99	150	61	23	19	9.7	8.7
MIN	13	12	6.8	5.1	4.3	4.6	55	4.1	3.1	1.5	2.4	2.7
CFSM	2.56	1.72	.71	.46	.35	.95	7.33	1.38	.49	.47	.34	.36
IN.	2.96	1.92	.82	.52	.36	1.09	8.18	1.59	.54	.54	.39	.40
CAL YR 1985	TOTAL	7034.5	MEAN	19.3	MAX	302	MIN	1.9	CFSM	1.46	IN	19.82
WTR YR 1986	TOTAL	6856.3	MEAN	18.8	MAX	150	MIN	1.5	CFSM	1.42	IN	19.32

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 at or near gage. 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, 21.0°C, July 5; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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- TOCOCCHI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT 16...	1630	26	70	7.60	5.0	1.5	11.9	96	43	35	42	6
FEB 11...	1500	4.4	134	7.50	.0	1.1	13.3	91	K3	K11	67	8
MAY 20...	1345	9.2	98	7.70	11.5	2.0	10.3	95	19	<1	52	6
AUG 05...	1300	5.1	146	7.80	15.0	--	9.2	92	135	56	--	--

DATE	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)	BICAR- BONATE WATER WHOLE IT-FLD (MG/L)	CAR- BONATE WATER WHOLE IT-FLD (MG/L)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 16...	11	3.4	1.9	9	.1	.40	40	0	33	1.7	--
FEB 11...	18	5.4	3.4	10	.2	.50	72	0	59	3.6	9.8
MAY 20...	14	4.1	2.4	9	.2	.70	54	0	44	1.7	9.9
AUG 05...	--	--	--	--	--	--	76	0	62	2.0	--

STREAMS TRIBUTARY TO LAKE SUPERIOR

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04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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...	1630	1.7	<.10	11	71	--	.10	5.0	<.10
FEB 11...	1500	3.9	<.10	16	96	93	.13	1.1	.11
MAY 20...	1345	1.9	<.10	9.6	82	71	.11	2.0	<.10
AUG 05...	1300	--	--	--	--	--	--	--	<.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 16...	<.010	.70	.060	.050	<.010	4	.28	60
FEB 11...	.030	.50	.010	<.010	<.010	4	.05	63
MAY 20...	.040	.50	.010	.010	<.010	5	.12	59
AUG 05...	.050	.60	.020	.010	<.010	3	.04	88

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...	60	<1	10	<.5	<1	7	<3	8	250	<5
FEB 11...	20	<1	10	<.5	<1	<1	<3	<1	350	<5
MAY 20...	30	<1	8	<.5	<1	<1	<3	3	190	6

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...	8	9	.1	<10	3	<1	<1	22	<6	7
FEB 11...	<4	15	<.1	<10	2	<1	<1	36	<6	12
MAY 20...	<4	10	<.1	<10	3	<1	<1	27	<6	59

DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT)	GROSS ALPHA, BETA, 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 YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS YT-90)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L)	URANIUM DIS- SOLVED, EXTRAC- TION (UG/L)
OCT 16...	1630	<.5	<.4	1.5	<.6	1.5	<.7	.02	<.15
MAY 20...	1345	<.5	<.4	1.5	<.6	1.4	<.6	.02	<.15

STREAMS TRIBUTARY TO LAKE SUPERIOR

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	6.5	6.0	6.0	5.5	3.5	5.0	.0	.0	.0	.0	.0	.0
2	7.0	5.0	6.0	5.5	5.0	5.5	.0	.0	.0	.0	.0	.0
3	8.0	7.0	7.5	5.0	3.5	4.0	.0	.0	.0	.0	.0	.0
4	8.5	8.0	8.0	3.5	3.0	3.5	.0	.0	.0	.0	.0	.0
5	8.0	7.5	8.0	3.5	2.5	3.0	.0	.0	.0	.0	.0	.0
6	7.5	7.0	7.5	3.5	2.5	3.0	.0	.0	.0	.0	.0	.0
7	6.5	5.0	6.0	2.5	2.0	2.0	.0	.0	.0	.0	.0	.0
8	8.0	6.0	7.0	2.0	.0	.5	.0	.0	.0	.0	.0	.0
9	7.5	6.5	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	6.5	5.0	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	5.5	3.5	4.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	6.5	5.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	7.5	6.5	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	7.0	6.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	7.0	6.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	6.0	5.0	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	6.5	4.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	6.5	5.0	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	5.5	4.0	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	4.5	2.5	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	5.0	3.0	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	6.0	3.5	4.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	8.0	6.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	7.0	6.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	6.5	5.0	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	7.5	6.5	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	6.5	4.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	5.0	3.5	4.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	6.0	4.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	5.0	3.0	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	4.0	2.0	3.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	8.5	2.0	6.0	5.5	.0	1.0	.0	.0	.0	.0	.0	.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH			APRIL			MAY		
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	7.0	5.0	6.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	7.0	3.5	5.0
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	7.5	4.0	5.5
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	10.0	5.5	7.5
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	10.5	9.0	9.5
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.0	7.0	8.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	7.0	8.5
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	8.5	7.0	7.5
9	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	7.0	8.5
10	.0	.0	.0	.0	.0	.0	1.0	.0	.0	12.5	8.0	10.0
11	.0	.0	.0	.0	.0	.0	1.5	.0	.5	11.0	9.0	10.0
12	.0	.0	.0	.0	.0	.0	1.0	.0	.0	14.0	9.5	11.5
13	.0	.0	.0	.0	.0	.0	2.0	.0	1.0	12.0	10.5	11.5
14	.0	.0	.0	.0	.0	.0	2.0	.0	1.0	14.5	10.0	12.0
15	.0	.0	.0	.0	.0	.0	2.0	.0	1.0	15.0	9.5	12.0
16	.0	.0	.0	.0	.0	.0	2.5	.0	1.5	14.0	11.0	12.5
17	.0	.0	.0	.0	.0	.0	3.5	.0	1.5	14.5	9.0	11.5
18	.0	.0	.0	.0	.0	.0	4.0	.5	2.5	13.0	9.0	11.0
19	.0	.0	.0	.0	.0	.0	3.5	1.5	2.5	13.0	7.5	10.0
20	.0	.0	.0	.0	.0	.0	2.5	1.0	2.0	13.5	7.0	10.0
21	.0	.0	.0	.0	.0	.0	2.0	.0	1.0	13.5	7.0	10.0
22	.0	.0	.0	.0	.0	.0	3.0	.0	1.5	12.0	8.0	10.0
23	.0	.0	.0	.0	.0	.0	4.0	2.0	3.0	16.0	9.0	12.0
24	.0	.0	.0	.0	.0	.0	5.0	3.5	4.0	13.0	10.5	12.0
25	.0	.0	.0	.0	.0	.0	5.5	2.0	3.5	17.0	10.5	13.5
26	.0	.0	.0	.0	.0	.0	5.5	4.0	5.0	17.5	11.0	14.0
27	.0	.0	.0	.0	.0	.0	7.0	4.5	5.5	17.5	12.0	14.5
28	.0	.0	.0	.0	.0	.0	7.5	5.5	6.5	18.0	12.5	15.0
29	---	---	---	.0	.0	.0	9.0	6.0	7.5	19.0	13.0	16.0
30	---	---	---	.0	.0	.0	8.0	6.5	7.0	19.5	14.5	16.5
31	---	---	---	.0	.0	.0	---	---	---	16.0	12.0	13.5
MONTH	.0	.0	.0	.0	.0	.0	9.0	.0	2.0	19.5	3.5	11.0

STREAMS TRIBUTARY TO LAKE SUPERIOR

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04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	14.5	10.5	12.0	15.5	12.5	14.0	18.0	15.5	17.0	15.0	13.5	14.5
2	13.0	8.0	10.5	18.0	12.5	14.5	17.5	14.5	16.0	13.5	12.5	13.0
3	13.0	10.0	11.0	16.5	11.0	14.0	16.5	14.0	15.0	14.5	13.0	13.5
4	16.0	11.0	13.0	18.0	13.5	15.5	16.5	14.0	15.5	15.0	13.5	14.0
5	15.0	9.0	12.0	21.0	14.5	17.5	17.0	14.5	15.5	14.0	12.5	13.5
6	15.5	9.0	12.0	20.5	16.0	18.0	18.5	14.0	16.0	12.0	10.5	11.0
7	14.0	12.0	12.5	20.0	14.0	16.5	16.5	14.0	15.5	11.5	8.0	9.5
8	15.5	10.5	12.5	16.0	14.5	15.5	19.0	15.0	16.5	13.0	10.0	11.0
9	16.5	10.0	13.0	19.0	13.0	15.5	18.5	14.5	16.5	12.5	9.5	11.0
10	15.5	11.5	13.5	16.5	14.5	15.5	17.5	15.5	16.5	12.0	11.0	11.5
11	13.0	10.0	11.5	15.0	13.5	14.5	17.0	14.0	15.5	11.5	11.0	11.5
12	14.5	9.5	12.0	13.5	13.0	13.5	16.5	12.0	14.5	11.0	8.5	10.0
13	16.0	11.0	13.0	13.0	12.5	13.0	18.0	13.5	15.5	10.5	8.5	10.0
14	16.5	12.0	13.5	15.0	11.5	13.0	17.0	16.0	16.0	9.5	8.0	9.0
15	15.0	10.5	13.0	17.0	12.0	14.5	17.5	15.0	16.0	10.0	7.5	8.5
16	15.0	12.5	13.5	17.0	14.5	15.5	20.0	15.0	17.0	9.0	6.0	7.5
17	14.5	10.5	12.5	17.0	15.0	16.0	18.5	15.0	16.5	9.5	8.0	8.5
18	16.0	11.5	13.5	19.5	15.5	17.5	17.5	13.0	15.0	10.5	9.5	10.0
19	18.5	13.5	15.5	20.0	17.5	18.5	17.0	12.0	14.5	10.0	8.0	9.0
20	17.0	13.0	15.0	18.0	16.0	17.0	15.5	15.0	15.0	11.0	9.5	10.0
21	15.5	14.0	14.5	18.5	14.5	16.0	15.5	12.5	14.0	10.5	9.5	10.0
22	17.0	14.5	15.5	20.0	15.0	17.0	13.5	12.0	12.5	12.5	10.5	11.5
23	16.0	13.0	14.5	19.5	16.0	18.0	15.0	12.0	13.0	12.0	9.5	10.5
24	15.0	11.0	13.0	18.5	17.5	18.0	14.5	11.5	13.0	12.0	9.0	10.5
25	13.0	9.5	11.5	19.5	16.0	17.5	15.0	13.5	14.0	12.0	10.5	11.0
26	16.0	11.5	13.5	19.5	15.5	17.5	14.5	13.0	13.5	12.0	11.5	11.5
27	17.5	13.5	15.5	17.0	16.0	16.5	13.0	10.5	11.5	13.0	11.0	12.0
28	17.5	12.5	15.0	18.5	15.0	16.5	13.0	9.0	11.0	12.5	11.5	12.0
29	17.5	13.0	15.0	19.5	15.5	17.5	13.5	10.0	11.5	12.0	11.5	11.5
30	17.5	11.5	14.5	19.0	16.0	17.5	14.5	10.0	12.0	12.0	10.0	11.0
31	---	---	---	20.5	17.0	18.0	15.5	13.5	14.5	---	---	---
MONTH	18.5	8.0	13.5	21.0	11.0	16.0	20.0	9.0	14.5	15.0	6.0	11.0

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. 22 to Mar. 28. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--44 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 floodmark; 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, 1,040 ft³/s, Apr. 2, gage height, 7.91 ft; minimum, 89 ft³/s, July 9, 10, 11, gage height, 3.70 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	540	225	160	145	140	135	737	255	98	104	104	97
2	512	469	160	145	140	135	992	243	97	102	108	107
3	431	561	160	145	140	135	1010	221	96	98	106	116
4	409	522	165	145	140	135	928	207	95	101	105	147
5	721	437	165	145	140	140	911	200	96	106	199	166
6	888	365	165	140	140	140	941	193	98	102	205	145
7	806	336	170	140	140	140	922	181	98	96	154	127
8	700	306	170	140	140	140	902	174	104	92	149	115
9	584	277	165	140	140	140	830	171	98	92	150	106
10	498	255	165	140	140	140	729	164	95	91	145	113
11	426	235	165	140	140	140	636	162	109	92	162	123
12	379	225	160	140	140	145	548	161	152	117	139	133
13	391	216	155	140	140	145	481	157	135	188	123	141
14	366	209	150	140	140	150	440	152	116	223	115	141
15	336	199	150	140	140	150	423	153	108	177	117	138
16	300	197	145	140	140	150	430	148	106	150	117	150
17	273	198	145	140	140	155	389	140	99	137	149	141
18	257	197	145	140	140	155	346	134	95	125	151	134
19	237	232	145	140	140	160	328	129	94	122	125	131
20	225	270	145	140	140	160	327	124	93	125	114	134
21	215	240	145	140	135	160	313	119	93	117	113	136
22	214	220	145	140	135	160	286	118	109	108	113	175
23	211	200	145	140	135	165	264	116	116	102	138	197
24	204	185	145	140	135	170	250	114	109	110	141	172
25	195	175	145	140	135	180	241	113	103	169	124	154
26	189	190	145	140	135	195	297	114	146	139	117	174
27	183	180	145	140	135	215	347	114	166	118	116	178
28	177	175	145	140	135	245	314	110	129	115	111	175
29	174	170	145	140	---	281	292	104	120	110	104	160
30	172	165	145	140	---	361	270	103	111	103	100	152
31	169	---	145	140	---	455	---	101	---	102	98	---
TOTAL	11382	7831	4745	4365	3880	5477	16124	4695	3284	3733	4012	4278
MEAN	367	261	153	141	139	177	537	151	109	120	129	143
MAX	888	561	170	145	140	455	1010	255	166	223	205	197
MIN	169	165	145	140	135	135	241	101	93	91	98	97
CFSM	2.24	1.59	.93	.86	.85	1.08	3.27	.92	.67	.73	.79	.87
IN.	2.58	1.78	1.08	.99	.88	1.24	3.66	1.06	.74	.85	.91	.97
CAL YR 1985	TOTAL	80614	MEAN	221	MAX	1370	MIN	98	CFSM	1.35	IN	18.29
WTR YR 1986	TOTAL	73806	MEAN	202	MAX	1010	MIN	91	CFSM	1.23	IN	16.74

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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: Dec. 23-27, 29, 30, Jan. 3-5, 26-28, 30, 31, Feb. 14-17, and Apr. 24-28. Records excellent except those below 5 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.--44 years, 144 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 368 ft³/s, May 5, 1960; no flow for several days in 1963-70, 1973-75, 1982.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	209	200	310	291	291	5.7	249	294	97	116	108
2	13	119	195	312	291	288	4.2	321	292	97	115	108
3	14	15	197	315	292	285	4.1	323	291	97	115	107
4	14	128	203	315	248	284	4.0	323	290	97	115	107
5	14	322	203	315	200	281	4.2	325	288	97	116	107
6	14	323	203	319	195	273	4.2	323	287	97	116	107
7	14	323	158	318	195	256	4.5	319	285	97	116	108
8	16	323	111	316	195	256	4.8	319	284	97	62	108
9	169	323	111	317	192	260	5.1	318	292	97	5.9	108
10	320	323	111	316	201	283	5.4	318	302	96	5.8	108
11	322	322	111	262	230	306	5.6	316	301	96	60	108
12	322	321	142	206	250	304	5.5	318	210	97	116	108
13	322	280	197	258	265	302	5.9	318	116	97	109	108
14	322	219	197	314	270	301	6.3	317	116	97	109	108
15	322	208	197	314	270	298	6.4	316	115	97	108	108
16	322	207	222	314	270	297	5.6	314	146	56	109	108
17	286	205	253	314	265	295	4.9	313	191	5.8	109	108
18	173	198	253	314	263	294	4.5	312	195	5.9	109	108
19	145	206	255	314	265	291	4.0	310	195	66	109	108
20	145	206	253	310	263	290	3.5	310	194	129	109	108
21	145	206	252	310	258	287	3.0	309	193	123	108	108
22	145	206	250	309	254	286	58	308	192	117	108	108
23	145	206	250	307	250	284	246	307	192	116	108	108
24	145	206	250	305	270	143	260	305	191	117	108	100
25	145	205	250	303	292	5.1	200	304	191	116	108	76
26	221	205	250	300	290	4.6	200	303	154	116	108	45
27	300	204	250	300	279	4.4	200	302	110	116	108	6.2
28	300	204	249	300	280	4.4	160	301	98	116	108	6.0
29	299	201	250	298	---	4.6	113	300	98	116	108	6.0
30	260	201	250	295	---	5.3	150	299	98	116	108	6.0
31	208	---	273	295	---	5.6	---	296	---	116	108	---
TOTAL	5596	6824	6546	9395	7084	6769.0	1688.4	9616	6201	3000.7	3117.7	2725.2
MEAN	181	227	211	303	253	218	56.3	310	207	96.8	101	90.8
MAX	322	323	273	319	292	306	260	325	302	129	116	108
MIN	13	15	111	206	192	4.4	3.0	249	98	5.8	5.8	6.0
CAL YR 1985	TOTAL	62708.60	MEAN	172	MAX	327	MIN	.10				
WTR YR 1986	TOTAL	68563.00	MEAN	188	MAX	325	MIN	3.0				

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 in 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 U.S. 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, 39,140 acre-ft, Nov. 6-8, May 1, gage height, 140.1 ft; minimum, 6,040 acre-ft, Mar. 24, gage height, 123.8 ft.

MONTHEND GAGE HEIGHT AND CONTENTS AT 1200, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre- feet)	Change in contents (equivalent in ft ³ /s)
Sept. 30	134.0	25,500	--	--
Oct. 31	138.6	35,680	+10,180	+166
Nov. 30	139.3	37,290	+1,610	+27.1
Dec. 31	137.4	32,920	-4,370	-71.1
CAL YR 1985	--	--	+17,410	+24.0
Jan. 31	132.1	21,700	-11,220	-182
Feb. 28	128.1	13,990	-7,710	-139
Mar. 31	126.0	10,000	-3,990	-64.9
Apr. 30	140.0	38,900	+28,900	+486
May 31	134.6	26,760	-12,140	-197
June 30	130.4	18,360	-8,400	-141
July 31	130.2	17,980	-380	-6.2
Aug. 31	130.1	17,790	-190	-3.1
Sept. 30	131.0	19,500	+1,710	+28.7
WTR YR 1986	--	--	-6,000	-8.3

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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: Nov. 25-28, 30, Dec. 3, 4, 12-19, 25, 28, Jan. 7, 8, 23, 24, 27-31, Feb. 10-13, 21, 24, 28, and Mar. 7, 20. 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.--44 years, 66.1 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, 213 ft³/s, Apr. 1, gage height, 2.41 ft; minimum daily, 37 ft³/s, Aug. 19.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	70	77	53	52	48	46	188	49	57	53	55	59
2	54	104	53	52	48	45	114	47	57	53	55	59
3	50	81	54	52	48	45	91	48	57	53	55	53
4	71	67	55	52	48	45	81	48	58	55	55	55
5	134	62	55	50	48	45	93	48	57	54	59	52
6	71	60	56	51	46	44	85	47	57	53	57	50
7	56	58	56	52	46	45	81	47	59	53	58	50
8	60	57	55	52	48	46	77	47	57	54	60	50
9	54	57	55	52	47	45	67	47	57	54	58	50
10	51	55	55	52	46	46	59	47	57	55	63	52
11	50	55	54	51	46	49	57	47	63	59	59	53
12	55	55	54	51	46	49	55	47	60	62	58	54
13	54	55	53	49	46	49	55	46	57	72	58	53
14	50	55	53	50	46	49	55	46	57	58	59	51
15	50	53	53	49	45	48	59	46	57	57	60	53
16	48	55	53	50	45	49	59	46	56	57	40	51
17	48	54	53	51	46	48	55	46	55	56	39	51
18	48	55	53	50	46	49	53	46	55	56	38	51
19	48	61	53	50	46	49	54	45	55	57	37	51
20	49	61	53	50	46	49	54	45	54	55	38	52
21	47	57	53	50	46	49	53	45	56	55	40	52
22	47	57	53	49	46	50	53	45	56	55	44	57
23	46	56	53	50	45	49	53	45	55	55	61	52
24	46	52	53	50	46	48	52	45	54	58	60	51
25	46	52	53	51	46	52	53	45	56	57	60	53
26	46	52	53	46	45	56	63	45	57	55	60	52
27	46	52	52	48	47	52	60	45	56	58	60	53
28	46	52	52	48	46	60	57	44	55	56	60	55
29	46	53	52	48	---	71	55	43	54	55	60	52
30	46	53	52	48	---	85	52	43	54	55	59	52
31	46	---	52	48	---	121	---	47	---	55	58	---
TOTAL	1679	1773	1657	1554	1298	1633	2043	1427	1695	1740	1683	1579
MEAN	54.2	59.1	53.5	50.1	46.4	52.7	68.1	46.0	56.5	56.1	54.3	52.6
MAX	134	104	56	52	48	121	188	49	63	72	63	59
MIN	46	52	52	46	45	44	52	43	54	53	37	50

CAL YR 1985 TOTAL 19759 MEAN 54.1 MAX 138 MIN 39
WTR YR 1986 TOTAL 19761 MEAN 54.1 MAX 188 MIN 37

STREAMS TRIBUTARY TO LAKE SUPERIOR

04035500 MIDDLE BRANCH ONTONAGON RIVER NEAR ROCKLAND, MI

LOCATION.--Lat 46°41'57", long 89°09'36", in SE1/4 sec.27, T.50 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 10 ft upstream from bridge on U.S. Highway 45, 700 ft downstream from East Branch, and 2.8 mi southeast of Rockland.

DRAINAGE AREA.--671 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 661.1 ft above National Geodetic Vertical Datum of 1929. Prior to Apr. 1, 1959, nonrecording gage at site 400 ft upstream at same datum. Apr. 1, 1959 to Oct. 21, 1968, nonrecording gage at present site and datum.

REMARKS.--Estimated daily discharges: Nov. 23 to Apr. 1, and Apr. 9-30. Records good except for estimated daily discharges, which are fair. Regulation by Bond Fall Reservoir (station 04034000) 30.0 mi upstream. Diversion to South Branch Ontonagon River by Bond Falls Canal (station 04033500) 31.0 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE--44 years, 534 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 27,000 ft³/s, Aug. 22, 1942, gage height, 21.2 ft, from floodmarks, from rating curve extended above 7,500 ft³/s, on basis of slope-area measurement of peak flow; minimum observed, 142 ft³/s, Dec. 3, 1963, discharge measurement; minimum daily, 145 ft³/s, Dec. 3, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 12,300 ft³/s, Apr. 1, gage height, 13.9 ft, from floodmarks; minimum, 185 ft³/s, July 8, 9, 10, gage height, 3.57 ft; minimum daily, 187 ft³/s, July 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3570	1670	380	330	290	270	12000	596	220	206	236	242
2	1590	4990	375	330	290	270	6450	541	222	204	225	230
3	969	3170	375	330	290	275	3700	464	227	199	230	228
4	1810	1920	380	320	290	280	2780	423	232	201	225	278
5	7170	1360	385	320	290	285	3530	401	236	210	460	295
6	2870	985	390	320	290	285	3210	367	232	209	310	265
7	1370	848	395	320	290	280	3180	327	246	194	270	240
8	1160	714	395	320	290	280	2900	311	282	187	926	226
9	999	616	395	315	285	285	1900	311	334	188	722	218
10	739	543	390	310	285	295	1750	299	247	189	682	231
11	594	490	385	310	285	310	1500	292	795	216	593	247
12	748	489	375	310	280	320	1350	301	1200	314	431	275
13	892	444	370	310	280	320	1100	306	583	591	346	299
14	682	428	365	310	280	320	950	313	404	502	291	297
15	568	390	360	305	280	320	1050	299	324	370	304	278
16	501	403	360	305	280	310	1000	279	286	320	291	276
17	459	381	360	305	280	310	870	263	256	324	260	264
18	433	380	360	305	280	310	750	253	245	291	357	254
19	415	692	360	305	275	310	650	261	238	268	291	252
20	394	992	350	300	275	320	580	264	230	248	248	268
21	373	739	350	300	275	330	560	258	234	228	244	272
22	368	672	350	300	275	335	540	260	261	221	238	331
23	383	600	350	300	275	350	525	260	253	218	273	360
24	379	500	350	300	270	370	485	260	237	239	281	330
25	362	420	350	300	270	400	440	260	211	277	263	294
26	356	450	340	300	270	600	760	259	237	289	253	291
27	341	430	340	300	270	1000	1100	253	408	423	247	287
28	335	410	340	300	270	1800	950	247	281	400	239	284
29	331	400	330	295	---	3200	800	239	233	328	234	278
30	329	385	330	295	---	5000	675	229	216	283	224	264
31	329	---	330	290	---	8000	---	220	---	284	241	---
TOTAL	31819	26911	11265	9560	7860	27340	58035	9616	9610	8621	10435	8154
MEAN	1026	897	363	308	281	882	1935	310	320	278	337	272
MAX	7170	4990	395	330	290	8000	12000	596	1200	591	926	360
MIN	329	380	330	290	270	270	440	220	211	187	224	218

CAL YR 1985 TOTAL 238720 MEAN 654 MAX 7170 MIN 190
WTR YR 1986 TOTAL 219226 MEAN 601 MAX 12000 MIN 187

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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.--44 years, 177 ft³/s, 14.84 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, 1,020 ft³/s, Oct. 8, gage height, 5.10 ft; minimum daily, 18 ft³/s, Aug. 30 to Sept. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	677	330	246	152	116	150	311	453	26	21	109	18
2	716	432	270	150	114	148	422	215	25	21	103	29
3	714	504	278	147	114	148	528	29	25	21	101	53
4	704	544	275	144	110	146	600	33	25	23	93	102
5	857	572	267	147	180	142	678	32	25	23	76	154
6	944	568	248	144	231	142	758	49	23	23	73	159
7	948	564	232	142	223	145	816	28	23	23	74	157
8	984	540	229	142	221	139	854	27	24	23	75	153
9	953	508	224	139	214	136	868	28	23	23	74	143
10	932	488	220	132	209	139	868	28	21	23	73	136
11	904	484	216	130	205	138	859	28	20	23	73	130
12	888	468	210	128	199	137	839	29	20	23	72	138
13	872	446	206	126	195	134	825	29	21	102	41	128
14	844	432	198	124	192	137	798	28	21	156	24	125
15	816	339	196	123	185	136	506	28	19	156	24	121
16	776	253	194	121	181	134	199	28	19	155	23	121
17	764	261	186	121	179	133	540	27	19	155	22	128
18	724	238	185	118	175	134	565	26	19	152	22	116
19	688	248	182	117	172	145	574	25	19	150	21	112
20	664	269	179	115	172	147	468	25	19	143	21	113
21	640	206	175	115	168	146	86	25	19	103	21	114
22	624	238	178	117	168	145	65	25	21	83	21	122
23	604	238	170	116	165	145	256	25	20	49	21	129
24	584	232	169	114	160	148	336	25	19	58	21	121
25	548	248	169	117	158	143	173	25	20	78	21	180
26	532	262	168	121	157	146	45	25	22	44	20	202
27	496	255	168	122	156	147	190	24	24	65	20	205
28	312	250	168	117	154	150	401	25	21	118	19	196
29	282	247	162	116	---	158	556	25	21	118	19	195
30	327	245	159	115	---	176	522	25	21	115	18	191
31	315	---	157	115	---	208	---	25	---	113	18	---
TOTAL	21633	10909	6284	3947	4873	4522	15506	1469	644	2383	1413	3991
MEAN	698	364	203	127	174	146	517	47.4	21.5	76.9	45.6	133
MAX	984	572	278	152	231	208	868	453	26	156	109	205
MIN	282	206	157	114	110	133	45	24	19	21	18	18

CAL YR 1985 TOTAL 95185 MEAN 261 MAX 984 MIN 10 CFSM 1.61 IN 21.86
WTR YR 1986 TOTAL 77574 MEAN 213 MAX 984 MIN 18 CFSM 1.32 IN 17.81

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.--No estimated daily discharges. 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.--42 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, 211 ft³/s, Oct. 8, gage height, 5.68 ft; minimum daily, 0.57 ft³/s, June 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	155	39	82	39	35	35	114	129	1.1	1.3	1.6	1.8
2	179	93	85	38	35	35	140	126	1.2	1.3	1.6	29
3	174	138	84	38	35	34	143	51	1.1	1.2	1.4	54
4	180	135	82	38	35	34	146	3.9	.59	1.2	1.4	75
5	203	136	82	39	35	35	151	3.4	.62	1.3	2.1	93
6	207	132	81	39	35	35	155	2.8	.57	1.0	2.1	65
7	205	128	80	38	35	35	156	2.3	.63	.99	2.4	46
8	206	124	79	39	35	35	144	1.9	.60	.96	27	27
9	199	95	61	38	35	34	135	1.7	.78	.92	55	1.7
10	196	35	35	37	35	36	132	1.6	.80	1.0	54	1.6
11	192	36	35	37	35	36	131	1.5	.85	1.3	53	1.6
12	193	36	36	38	35	36	130	1.5	26	17	52	1.7
13	187	36	36	39	35	36	124	1.5	53	33	52	1.8
14	183	36	36	39	35	37	52	1.6	51	123	24	1.9
15	175	36	37	39	35	36	4.1	1.6	51	177	1.4	28
16	130	37	37	39	34	36	3.6	1.5	22	145	1.4	52
17	86	39	37	48	34	36	2.9	1.3	.90	100	1.6	52
18	113	59	37	61	33	38	2.0	1.2	.90	43	1.6	50
19	138	84	37	60	33	43	1.9	1.2	1.1	2.9	1.6	50
20	135	87	37	59	35	43	2.0	1.2	1.3	2.6	1.6	50
21	132	87	37	58	35	87	1.9	1.2	1.3	2.6	1.6	50
22	130	86	38	59	35	125	2.7	1.2	1.9	2.4	1.9	51
23	128	86	38	58	35	122	30	1.3	29	2.4	1.8	50
24	120	85	38	58	35	119	50	1.3	53	2.2	2.0	50
25	118	83	39	58	35	90	56	1.4	54	14	2.0	52
26	114	82	39	58	35	56	91	1.4	89	54	1.9	52
27	109	81	39	58	35	56	107	1.3	122	75	1.8	52
28	107	80	39	57	35	56	120	1.3	53	71	1.7	51
29	103	80	39	46	---	57	136	1.3	1.6	50	1.8	50
30	100	80	39	34	---	59	137	1.3	1.6	25	1.8	50
31	79	---	39	34	---	75	---	1.3	---	13	1.9	---
TOTAL	4676	2371	1540	1420	974	1627	2601.1	352.0	622.44	967.57	359.0	1191.1
MEAN	151	79.0	49.7	45.8	34.8	52.5	86.7	11.4	20.7	31.2	11.6	39.7
MAX	207	138	85	61	35	125	156	129	122	177	55	93
MIN	79	35	35	34	33	34	1.9	1.2	.57	.92	1.4	1.6
CAL YR 1985	TOTAL	22496.21	MEAN	61.6	MAX	207	MIN	.37	CFSM	1.22	IN	16.51
WTR YR 1986	TOTAL	18701.21	MEAN	51.2	MAX	207	MIN	.57	CFSM	1.01	IN	13.72

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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: Nov. 26 to Mar. 30. 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.--44 years, 1,436 ft³/s, 14.55 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)
Oct. 5	1100	18,600	16.98	Apr. 1	2200	*26,400	*20.12
Nov. 2	1400	11,100	13.55				

Minimum daily discharge, 360 ft³/s, July 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9380	2730	1100	1000	1000	940	24000	2060	688	504	696	462
2	6520	10100	950	1050	980	950	21300	1860	693	570	616	455
3	4640	8570	1050	1100	960	1050	14700	1610	703	522	733	562
4	4240	6630	1200	1090	960	1100	9980	1250	677	436	620	609
5	16100	4470	1250	1050	960	1100	10200	1260	698	516	860	652
6	11600	3580	1300	1000	870	1050	9730	1360	730	360	561	974
7	8200	2980	1600	1000	980	1000	9410	1170	698	513	702	616
8	5840	2660	1300	1000	1050	980	9420	1020	761	377	1390	757
9	3800	2190	1250	1000	940	950	6640	897	687	485	1200	712
10	3540	2140	1250	1060	940	950	5540	916	699	484	928	692
11	3210	1840	1200	1030	940	1020	4780	837	1290	691	965	708
12	3110	1770	1000	1030	940	1050	4280	988	2120	815	757	737
13	3420	1650	1000	900	940	1050	3700	937	1540	1200	728	696
14	3230	1630	1020	850	940	1100	3260	925	874	1390	697	700
15	2910	1450	1080	950	940	1050	3270	891	778	1200	693	708
16	2530	1340	1100	1050	950	1050	2660	908	733	1060	629	686
17	2200	1290	1100	1030	970	1040	2310	865	629	1030	544	653
18	2210	1190	1100	1000	980	1040	2410	855	682	1000	576	694
19	2010	1540	1100	1050	980	1040	2320	708	638	988	643	752
20	1800	2170	1080	1000	980	1050	2250	842	623	888	433	781
21	1770	1810	1080	1030	920	1050	1910	714	510	819	524	727
22	1670	1560	1080	1000	900	1060	1420	791	657	603	516	865
23	1490	1680	1080	960	900	1100	1140	773	642	582	532	843
24	1630	1440	1100	900	900	1250	1530	694	633	570	520	972
25	1550	1400	1000	980	900	1450	1700	831	545	614	667	852
26	1470	1050	1020	1000	930	1700	1940	728	700	689	523	889
27	1460	1200	1070	1000	940	2300	2390	800	984	828	469	849
28	1470	1250	1090	920	940	3600	2510	742	871	1130	507	870
29	1400	1150	1020	950	---	6200	2530	681	582	955	558	790
30	1190	1050	1000	1000	---	10000	2090	699	646	903	429	777
31	1190	---	1000	980	---	13900	---	728	---	905	505	---
TOTAL	116780	75510	34570	30960	26530	64170	171320	30340	23711	23627	20721	22040
MEAN	3767	2517	1115	999	948	2070	5711	979	790	762	668	735
MAX	16100	10100	1600	1100	1050	13900	24000	2060	2120	1390	1390	974
MIN	1190	1050	950	850	870	940	1140	681	510	360	429	455

CAL YR 1985	TOTAL	701279	MEAN	1921	MAX	16100	MIN	380	CFSM	1.43	IN	19.47
WTR YR 1986	TOTAL	640279	MEAN	1754	MAX	24000	MIN	360	CFSM	1.31	IN	17.77

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 samples were collected at or near Victoria Road bridge. 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 recorded, 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 1985 TO SEPTEMBER 1986

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, (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT 22...	1430	1680	90	7.80	8.0	15	11.4	98	K8	K9	47	6
JAN 31...	1115	1070	130	7.70	.0	14	13.2	91	32	K12	62	5
APR 24...	1145	1590	100	7.70	11.0	40	10.8	101	K7	--	43	0
JUL 16...	1330	1070	139	8.20	20.0	--	9.0	101	120	75	--	--

DATE	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)	BICAR- BONATE WATER WHOLE IT-FLD (MG/L)	CAR- BONATE WATER WHOLE IT-FLD (MG/L)	ALKA- LITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 22...	13	3.4	1.9	8	.1	.70	50	0	41	1.3	6.7
JAN 31...	17	4.8	2.4	8	.1	1.0	65	0	53	2.2	9.2
APR 24...	12	3.1	1.7	8	.1	.90	51	0	42	1.6	9.5
JUL 16...	--	--	--	--	--	--	79	0	64	.8	--

STREAMS TRIBUTARY TO LAKE SUPERIOR

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04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

		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)	
DATE	TIME									
OCT 22...	1430	2.3	<.10	6.4	77	59	.10	349	<.10	
JAN 31...	1115	2.1	<.10	11	80	82	.11	231	.17	
APR 24...	1145	1.8	<.10	7.1	76	62	.10	326	<.10	
JUL 16...	1330	--	--	--	--	--	--	--	<.10	
		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	
OCT 22...	<.010	.50	.040	.010	<.010	30	136	91		
JAN 31...	.040	.40	.020	.010	<.010	--	--	--		
APR 24...	.050	.40	.050	.020	.010	71	305	99		
JUL 16...	.040	.40	.040	.020	.010	33	95	98		
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 22...	40	<1	26	<.5	<1	20	<3	2	180	<5
JAN 31...	80	<1	26	<.5	<1	<1	<3	1	210	<5
APR 24...	130	<1	24	<.5	<1	<1	<3	3	230	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 22...	<4	16	<.1	<10	<1	<1	<1	30	<6	3
JAN 31...	<4	8	<.1	<10	<1	<1	<1	39	<6	9
APR 24...	<4	13	<.1	<10	1	<1	<1	29	<6	5

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: Nov. 25 to Mar. 30. 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.--46 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, 2,170 ft³/s, Oct. 5, gage height, 8.63 ft; minimum, 13 ft³/s, July 10, gage height, 3.22 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	925	258	190	105	90	77	1540	519	35	21	16	26
2	825	1030	190	105	90	78	1800	467	31	19	19	23
3	664	1190	185	100	88	78	1670	416	30	18	21	22
4	666	1150	180	100	88	77	1450	362	29	18	26	31
5	1920	960	175	100	88	77	1520	317	27	21	76	39
6	2010	785	175	100	88	76	1530	284	25	20	93	39
7	1600	680	170	100	86	76	1510	237	27	18	70	41
8	1140	576	170	100	86	75	1670	203	42	15	71	36
9	865	491	165	100	84	75	1560	183	45	14	83	32
10	672	422	165	100	84	75	1350	169	41	16	110	32
11	544	359	160	100	82	77	1200	156	76	72	136	34
12	498	326	160	105	82	80	1110	154	335	71	105	39
13	498	296	155	105	82	84	1010	152	278	123	79	56
14	454	269	150	110	80	88	940	140	193	134	64	61
15	403	237	145	110	80	92	925	129	127	93	52	61
16	350	229	140	110	80	96	920	120	97	72	45	61
17	311	226	135	105	80	105	860	108	79	61	39	59
18	290	226	130	105	80	105	785	97	67	49	46	56
19	266	409	125	100	80	105	770	89	58	42	45	52
20	240	441	120	100	78	105	805	85	49	35	36	55
21	216	380	120	98	78	105	795	78	45	29	35	57
22	198	374	120	96	78	105	710	71	46	24	31	72
23	190	329	120	92	78	110	604	67	41	20	35	83
24	183	293	115	90	76	120	508	65	36	18	42	79
25	178	270	115	90	76	130	460	61	33	24	50	73
26	167	260	115	90	76	145	583	59	34	22	49	73
27	156	230	115	90	76	180	905	55	34	24	45	75
28	144	210	110	90	76	280	820	50	30	25	41	79
29	136	200	110	90	---	380	735	46	27	24	35	78
30	130	190	110	90	---	550	592	43	22	23	32	73
31	125	---	110	90	---	915	---	38	---	20	30	---
TOTAL	16964	13296	4445	3066	2290	4721	31637	5020	2039	1185	1657	1597
MEAN	547	443	143	98.9	81.8	152	1055	162	68.0	38.2	53.5	53.2
MAX	2010	1190	190	110	90	915	1800	519	335	134	136	83
MIN	125	190	110	90	76	75	460	38	22	14	16	22
CFSM	3.20	2.59	.84	.58	.48	.89	6.17	.95	.40	.22	.31	.31
IN.	3.69	2.89	.97	.67	.50	1.03	6.88	1.09	.44	.26	.36	.35

CAL YR 1985 TOTAL 109790 MEAN 301 MAX 4450 MIN 16 CFSM 1.76 IN 23.88
WTR YR 1986 TOTAL 87917 MEAN 241 MAX 2010 MIN 14 CFSM 1.41 IN 19.13

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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 U.S. Army 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.--52 years (water years 1933-40, 1943-86), 424 ft³/s, 16.64 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, 4,030 ft³/s, Apr. 1, gage height, 9.20 ft; minimum daily, 14 ft³/s, June 7, 8, 21, 22, 29, July 20, Aug. 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1820	374	261	289	245	224	3540	958	117	209	172	219
2	1440	1640	262	288	246	225	3140	781	217	211	15	219
3	679	2220	262	285	214	276	3140	762	180	222	14	218
4	605	1610	263	270	246	276	2190	620	168	222	171	220
5	1760	1800	261	270	245	277	2550	621	192	15	222	182
6	3390	1020	263	267	246	276	2610	621	192	15	223	15
7	3000	991	263	273	246	274	2570	620	14	172	223	15
8	2480	1380	312	273	245	273	2660	621	14	172	222	183
9	1410	606	313	269	248	301	2370	605	195	171	224	195
10	1030	606	400	263	248	299	2080	368	193	15	327	192
11	603	606	609	265	249	298	1820	317	182	15	251	189
12	606	604	522	266	212	347	1620	318	420	329	287	210
13	606	603	263	268	252	350	1370	317	274	15	324	207
14	612	604	262	264	253	349	1450	320	271	421	324	15
15	793	604	262	265	253	349	1230	320	272	289	222	179
16	732	601	263	263	253	348	1240	317	234	223	222	417
17	619	601	264	263	227	374	1140	317	333	223	15	113
18	620	600	264	268	227	354	1240	316	209	225	223	215
19	622	574	263	268	227	370	1210	268	210	15	144	186
20	623	599	289	266	200	377	1190	266	211	14	199	207
21	626	602	289	264	226	311	1200	116	14	224	223	15
22	622	600	289	265	224	400	977	248	14	224	222	170
23	622	601	289	269	199	404	816	268	209	172	15	205
24	621	600	290	268	224	401	766	266	210	173	15	180
25	620	585	288	267	226	409	776	218	209	94	222	407
26	617	308	289	266	227	576	1120	215	214	15	223	308
27	617	259	289	242	226	604	1620	216	214	15	222	208
28	614	260	290	215	224	608	1250	89	15	241	221	15
29	609	262	290	243	---	634	1170	193	14	273	222	227
30	275	263	291	243	---	1400	968	216	216	222	15	219
31	262	---	291	243	---	2250	---	218	---	222	15	---
TOTAL	30155	22583	9306	8188	6558	14214	51023	11916	5427	5068	5639	5550
MEAN	973	753	300	264	234	459	1701	384	181	163	182	185
MAX	3390	2220	609	289	253	2250	3540	958	420	421	327	417
MIN	262	259	261	215	199	224	766	89	14	14	14	15
CFSM	2.81	2.18	.87	.76	.68	1.33	4.92	1.11	.52	.47	.53	.54
IN.	3.24	2.43	1.00	.88	.71	1.53	5.49	1.28	.58	.54	.61	.60
CAL YR 1985	TOTAL	203255	MEAN	557	MAX	5750	MIN	14	CFSM	1.61	IN	21.85
WTR YR 1986	TOTAL	175627	MEAN	481	MAX	3540	MIN	14	CFSM	1.39	IN	18.88

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 1986 (discontinued).

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: March 1978 to September 1981.

WATER TEMPERATURE: March 1978 to September 1981.

REMARKS.--Quarterly samples were collected at bridge 2.2 mi downstream from gage, or in the winter through the ice near the gage. The high-flow samples in April 1979 and 1985 were collected from the U.S. Highway 41 main channel and slough bridges 5 mi downstream. Occasional and slight regulation of the stream is caused by the 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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT												
23...	1300	1000	80	7.60	9.0	3.5	10.4	93	K7	K9	43	6
JAN												
30...	1230	648	146	7.50	.0	15	11.0	76	K3	K7	69	6
APR												
23...	1100	2200	59	7.40	8.0	12	11.1	96	K10	--	29	3
JUL												
17...	1230	591	141	7.90	22.0	--	7.8	92	64	68	--	--

DATE	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)	BICAR- BONATE WATER WHOLE IT-FLD (MG/L)	CAR- BONATE WATER WHOLE IT-FLD (MG/L)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
23...	12	3.1	1.7	8	.1	.70	44	0	36	1.7	7.1
JAN											
30...	19	5.3	2.5	7	.1	1.0	77	0	63	3.9	8.9
APR											
23...	7.9	2.2	1.3	9	.1	.70	33	0	27	2.0	8.8
JUL											
17...	--	--	--	--	--	--	94	0	77	1.9	--

STREAMS TRIBUTARY TO LAKE SUPERIOR

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04043004 STURGEON RIVER NEAR CHASSELL, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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...	1300	2.2	<.10	7.5	70	57	.10	189	<.10
JAN 30...	1230	1.7	<.10	11	90	88	.12	157	.14
APR 23...	1100	1.4	<.10	6.3	57	47	.08	339	.10
JUL 17...	1230	--	--	--	--	--	--	--	<.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 23...	<.010	.60	.030	.010	<.010	12	32	78
JAN 30...	.060	.40	.020	.010	<.010	7	12	74
APR 23...	.050	.50	.020	.020	.010	27	160	86
JUL 17...	.040	.40	--	.030	<.010	3	4.8	90

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...	60	<1	26	<.5	<1	20	<3	2	390	<5
JAN 30...	30	<1	34	<.5	<1	6	<3	<1	340	<5
APR 23...	80	<1	19	<.5	<1	<1	<3	1	200	<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 23...	<4	22	<.1	<10	2	<1	<1	29	<6	<3
JAN 30...	<4	25	<.1	<10	<1	<1	<1	48	<6	7
APR 23...	<4	16	.4	<10	1	<1	<1	18	<6	5

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: Oct. 5-22, Nov. 24, 25, Dec. 2-7, 13, 14, 16-31, Jan. 12-14, Jan. 22 to Feb. 8, and Mar. 7, 9, 10, 20, 23, 24. Records good except those above 400 ft³/s and for periods with ice effect, Nov. 24, 25, Dec. 2-7, 13, 14, 16-31, Jan. 12-14, Jan. 22 to Feb. 8, Mar. 7, 9, 10, 20, 23, 24, which are fair and period of no gage-height record, Oct. 5-22, which is poor. Small diversions for sprinkler irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 47.0 ft³/s, 22.80 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)
Oct. 5	--	*630	unknown	Apr. 8	--	600	unknown
Nov. 2	1400	395	6.64	Apr. 27	0500	486	7.31
Apr. 1	2300	544	*8.15				

Minimum discharge, 12 ft³/s, Aug. 31, Sept. 8, 16, 17, gage height, 3.90 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	241	139	49	35	27	24	421	111	25	17	14	13
2	131	350	49	36	27	24	495	97	22	18	14	15
3	87	285	48	35	27	24	355	78	20	18	14	15
4	136	181	48	35	26	24	255	71	21	21	14	19
5	560	133	47	35	26	24	257	71	20	22	19	18
6	250	108	47	35	26	23	248	63	19	20	16	16
7	150	98	47	34	26	23	392	55	19	18	15	14
8	140	85	47	34	26	23	445	55	20	23	24	14
9	100	69	47	36	26	23	264	46	19	25	30	14
10	80	61	46	36	26	23	245	43	23	24	24	15
11	72	54	46	34	26	23	251	40	223	24	21	16
12	90	53	46	34	26	23	241	40	181	27	18	15
13	80	52	46	34	26	24	203	43	88	41	16	14
14	74	49	46	34	26	26	244	37	53	35	16	13
15	68	43	46	33	25	27	258	37	38	31	19	13
16	62	47	45	33	25	25	246	34	31	30	18	13
17	58	53	45	33	25	27	234	32	28	38	16	13
18	54	61	44	32	25	31	239	31	25	23	15	15
19	50	182	43	31	24	30	328	28	24	21	14	15
20	47	149	42	31	24	29	293	29	21	19	14	17
21	44	102	41	31	26	28	236	27	21	18	14	17
22	42	87	40	31	24	29	145	26	22	16	14	19
23	40	79	38	30	24	35	137	25	20	16	23	18
24	38	68	37	29	24	42	182	25	19	18	19	15
25	42	55	37	28	24	37	205	24	19	19	18	14
26	37	62	37	27	25	47	298	24	21	17	16	14
27	33	58	36	27	24	47	360	23	22	19	15	15
28	31	57	36	27	23	51	190	22	19	23	15	16
29	30	57	36	27	---	87	151	23	18	18	14	37
30	34	56	36	27	---	125	121	23	18	16	13	34
31	33	---	36	27	---	187	---	21	---	16	13	---
TOTAL	2934	2933	1334	991	709	1215	7939	1304	1119	691	525	496
MEAN	94.6	97.8	43.0	32.0	25.3	39.2	265	42.1	37.3	22.3	16.9	16.5
MAX	560	350	49	36	27	187	495	111	223	41	30	37
MIN	30	43	36	27	23	23	121	21	18	16	13	13
CFSM	3.38	3.49	1.54	1.14	.90	1.40	9.46	1.50	1.33	.80	.60	.59
IN.	3.90	3.90	1.77	1.32	.94	1.61	10.55	1.73	1.49	.92	.70	.66

CAL YR 1985	TOTAL	23285	MEAN	63.8	MAX	857	MIN	14	CFSM	2.28	IN	30.93
WTR YR 1986	TOTAL	22190	MEAN	60.8	MAX	560	MIN	13	CFSM	2.17	IN	29.48

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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, 2.0 mi northeast of Negaunee.

DRAINAGE AREA.--51.4 mi².

PERIOD OF RECORD.--July 1961 to November 1986 (discontinued).

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 bench mark). Prior to Aug. 24, 1961, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Oct. 1-16, Nov. 23-26, Dec. 1, 2, Dec. 5 to Mar. 22, June 5-25, July 1-3, 9, 10, and July 15 to Aug. 7. Records good except for periods with ice effect, Nov. 23-26, Dec. 1, 2, and Dec. 5 to Mar. 22, which are fair and periods of indefinite stage-discharge relation, Oct. 1-16, June 5-25, July 1-3, 9, 10, and July 15 to Aug. 7, 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 1984; natural streamflow since, except for some regulation during parts of April, May, and October 1985. The City of Ishpeming diverted an average of 1.8 ft³/s into basin as waste effluent (station 04058200). Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years, 63.2 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, 447 ft³/s, Oct. 5, gage height, 5.32 ft; minimum, 18 ft³/s, July 4, but may have been less during period of indefinite stage-discharge relation, gage height, 2.37 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	155	68	57	43	36	31	327	223	31	23	22	24
2	142	175	51	43	36	31	332	214	31	22	23	24
3	136	233	43	42	36	31	278	204	30	22	24	26
4	149	223	57	42	36	32	247	194	29	21	26	30
5	393	220	70	42	35	31	230	183	28	22	40	31
6	349	205	72	42	35	31	216	182	28	25	36	32
7	295	183	73	42	35	30	225	147	30	27	40	30
8	301	154	75	42	35	30	252	99	41	26	43	28
9	285	126	75	41	35	30	219	78	41	23	37	24
10	253	90	74	41	34	31	203	69	38	24	37	27
11	225	81	72	40	34	36	200	63	43	27	43	30
12	199	79	70	40	33	39	201	60	60	29	39	32
13	176	75	68	40	33	41	190	57	53	33	34	30
14	152	72	66	40	33	43	189	56	47	34	31	29
15	85	66	63	40	32	45	221	53	41	29	30	28
16	55	61	60	40	32	46	218	51	36	29	29	28
17	153	73	57	40	32	48	198	50	31	27	32	28
18	208	76	56	39	32	49	192	48	28	26	31	23
19	163	115	53	39	31	50	209	46	29	24	30	22
20	107	177	52	38	31	50	212	45	28	21	25	25
21	67	158	51	38	31	52	195	44	26	20	25	26
22	62	131	49	38	31	54	178	42	24	20	24	31
23	61	110	47	38	31	58	199	44	23	20	33	30
24	64	98	46	38	32	64	217	42	23	26	35	23
25	62	90	46	37	32	79	218	41	26	41	35	22
26	59	83	45	37	32	99	235	39	27	32	35	22
27	56	76	45	37	31	105	229	38	23	35	33	23
28	53	71	44	37	31	116	213	37	22	31	31	24
29	51	67	44	36	---	142	210	39	22	27	29	34
30	52	61	44	36	---	200	219	40	23	26	26	41
31	53	---	44	36	---	272	---	31	---	24	24	---
TOTAL	4621	3497	1769	1224	927	1996	6672	2559	962	816	982	827
MEAN	149	117	57.1	39.5	33.1	64.4	222	82.5	32.1	26.3	31.7	27.6
MAX	393	233	75	43	36	272	332	223	60	41	43	41
MIN	51	61	43	36	31	30	178	31	22	20	22	22
CAL YR 1985	TOTAL	32430	MEAN	88.8	MAX	853	MIN	19				
WTR YR 1986	TOTAL	26852	MEAN	73.6	MAX	393	MIN	20				

STREAMS TRIBUTARY TO LAKE SUPERIOR

04044400 CARP RIVER NEAR NEGAUNEE, MI--Continued

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

[illegible]

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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, 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 bench mark).

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, 10.55 ft, Nov. 3, 4; minimum, 6.40 ft, Apr. 11.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.35	9.45	8.05	7.48	7.47	7.40	9.13	8.31	8.65	8.30	8.15	8.48
2	8.54	9.79	8.03	7.48	7.46	7.40	9.17	8.24	8.63	8.27	8.12	8.48
3	8.66	10.47	7.99	7.47	7.46	7.40	8.47	8.19	8.62	8.25	8.10	8.48
4	8.73	10.48	7.97	7.47	7.46	7.41	7.66	8.14	8.57	8.26	8.09	8.48
5	8.99	10.32	7.96	7.47	7.46	7.42	7.38	8.14	8.54	8.27	8.20	8.48
6	9.33	10.21	7.95	7.47	7.46	7.42	7.66	8.28	8.51	8.26	8.28	8.46
7	9.57	10.12	7.93	7.46	7.45	7.41	7.94	8.38	8.51	8.23	8.33	8.45
8	9.70	10.03	7.91	7.45	7.44	7.40	7.81	8.46	8.51	8.21	8.35	8.44
9	9.69	9.96	7.90	7.47	7.44	7.41	7.24	8.55	8.49	8.18	8.36	8.43
10	9.69	9.91	7.87	7.48	7.43	7.42	6.66	8.63	8.47	8.16	8.40	8.45
11	9.68	9.88	7.85	7.48	7.42	7.44	6.93	8.68	8.46	8.14	8.45	8.45
12	9.69	9.85	7.82	7.49	7.41	7.50	8.26	8.72	8.51	8.14	8.47	8.47
13	9.68	9.84	7.80	7.48	7.39	7.57	8.68	8.77	8.58	8.19	8.49	8.48
14	9.66	9.81	7.75	7.48	7.39	7.62	8.77	8.79	8.61	8.21	8.49	8.48
15	9.65	9.79	7.72	7.48	7.39	7.68	8.84	8.82	8.63	8.22	8.49	8.48
16	9.61	9.77	7.68	7.49	7.39	7.72	8.73	8.83	8.63	8.21	8.51	8.48
17	9.60	9.78	7.64	7.50	7.39	7.76	8.52	8.83	8.61	8.21	8.55	8.50
18	9.58	9.79	7.61	7.50	7.39	7.81	8.27	8.83	8.60	8.19	8.56	8.50
19	9.56	9.76	7.58	7.50	7.39	7.87	8.06	8.83	8.58	8.17	8.57	8.50
20	9.54	9.24	7.56	7.50	7.40	7.87	7.87	8.83	8.56	8.16	8.57	8.50
21	9.52	8.96	7.54	7.50	7.40	7.88	7.67	8.83	8.54	8.13	8.56	8.51
22	9.50	8.77	7.53	7.51	7.40	7.91	7.45	8.83	8.51	8.11	8.55	8.55
23	9.51	8.61	7.53	7.49	7.40	7.95	7.20	8.82	8.49	8.09	8.58	8.57
24	9.51	8.47	7.53	7.49	7.39	7.97	6.94	8.82	8.47	8.11	8.58	8.59
25	9.51	8.37	7.52	7.50	7.39	8.01	6.89	8.81	8.46	8.18	8.58	8.60
26	9.50	8.30	7.52	7.50	7.40	8.10	7.61	8.80	8.46	8.19	8.56	8.62
27	9.48	8.23	7.52	7.48	7.41	8.19	8.11	8.78	8.43	8.19	8.54	8.63
28	9.46	8.16	7.50	7.48	7.40	8.31	8.31	8.77	8.40	8.20	8.52	8.64
29	9.45	8.11	7.50	7.48	---	8.48	8.37	8.75	8.37	8.20	8.52	8.67
30	9.45	8.06	7.49	7.47	---	8.90	8.38	8.73	8.33	8.18	8.51	8.68
31	9.43	---	7.48	7.47	---	9.37	---	8.69	---	8.16	8.50	---
MEAN	9.41	9.41	7.72	7.48	7.42	7.81	7.97	8.64	8.52	8.19	8.44	8.52
MAX	9.70	10.48	8.05	7.51	7.47	9.37	9.17	8.83	8.65	8.30	8.58	8.68
MIN	8.35	8.06	7.48	7.45	7.39	7.40	6.66	8.14	8.33	8.09	8.09	8.43

STREAMS TRIBUTARY TO LAKE SUPERIOR

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.

REMARKS.--No estimated daily discharges. Water-discharge records good.

AVERAGE DISCHARGE.--33 years, 940 ft³/s, 16.16 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, 5,360 ft³/s, Apr. 9, 10, gage height, 9.17 ft; minimum, 204 ft³/s, July 2, gage height, 3.01 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	885	560	699	510	476	433	2420	1200	277	238	324	314
2	907	604	613	510	475	429	3000	1080	297	218	309	308
3	903	850	564	510	471	427	3560	979	311	222	299	304
4	873	1000	565	512	468	431	4030	890	278	221	297	365
5	1030	1100	585	517	467	437	4430	766	271	236	330	520
6	1210	1140	600	513	468	443	4750	678	269	238	416	645
7	1320	1180	610	507	470	444	4990	598	263	243	481	700
8	1400	1220	615	502	470	445	5280	557	258	239	499	705
9	1380	1190	620	496	466	441	5330	522	280	229	520	678
10	1370	1160	620	488	464	444	5300	485	275	226	552	645
11	1350	1130	616	492	464	440	5180	454	274	220	726	675
12	1320	1060	614	493	465	434	5110	420	395	210	853	939
13	1290	988	607	494	461	432	4960	399	622	215	926	1110
14	1270	910	599	494	456	434	4800	374	735	236	937	1210
15	1220	844	587	495	455	437	4620	365	773	269	917	1240
16	1190	790	577	499	448	443	4420	358	740	274	886	1240
17	1150	785	569	497	445	458	4240	368	719	281	813	1210
18	1090	833	566	498	444	478	4040	403	677	320	736	1130
19	1020	982	559	498	440	534	3870	453	608	377	664	1050
20	963	1130	553	502	440	582	3600	463	547	465	597	956
21	895	1170	550	502	441	620	3240	452	483	490	513	870
22	828	1170	547	504	445	649	3030	437	416	459	464	785
23	736	1140	541	506	443	678	2810	416	373	418	429	719
24	669	1100	538	505	440	709	2560	409	333	371	431	654
25	656	1040	537	506	443	746	2270	384	326	351	431	609
26	664	1000	532	501	444	871	2070	363	308	348	403	564
27	636	947	528	498	443	1030	1870	344	275	344	381	534
28	628	884	525	498	440	1150	1690	326	270	331	375	527
29	612	817	524	492	---	1330	1510	310	254	341	366	533
30	588	752	516	488	---	1600	1360	296	247	354	346	526
31	572	---	512	480	---	1930	---	278	---	340	333	---
TOTAL	30625	29476	17788	15507	12752	20359	110340	15827	12154	9324	16554	22265
MEAN	988	983	574	500	455	657	3678	511	405	301	534	742
MAX	1400	1220	699	517	476	1930	5330	1200	773	490	937	1240
MIN	572	560	512	480	440	427	1360	278	247	210	297	304
CFSM	1.25	1.24	.73	.63	.58	.83	4.66	.65	.51	.38	.68	.94
IN.	1.44	1.39	.84	.73	.60	.96	5.20	.75	.57	.44	.78	1.05

CAL YR 1985 TOTAL 379829 MEAN 1041 MAX 6670 MIN 274 CFSM 1.32 IN 17.89
WTR YR 1986 TOTAL 312971 MEAN 857 MAX 5330 MIN 210 CFSM 1.09 IN 14.74

STREAMS TRIBUTARY TO LAKE SUPERIOR

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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 or by wading 600 ft downstream from gage. Samples for the analyses of stable hydrogen and oxygen isotopes were also collected; analytical results of these samples were not published.

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 1985 TO SEPTEMBER 1986

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- TOCOCCHI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT 16...	1355	1190	114	7.30	8.0	2.0	7.4	64	K9	>400	58	14
JAN 07...	1515	502	178	7.40	.0	2.2	12.5	87	55	25	79	11
APR 16...	1215	4400	53	7.20	6.5	2.0	9.0	75	<5	<5	27	9
JUL 15...	1245	269	193	8.10	22.0	-	7.6	90	K5	K2	--	--

DATE	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)	BICAR- BONATE WATER WHOLE IT-FLD (MG/L)	CAR- BONATE WATER WHOLE IT-FLD (MG/L)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 16...	16	4.4	1.7	6	.1	.80	54	0	44	4.3	9.2
JAN 07...	22	5.9	2.0	5	.1	.70	82	0	67	5.2	14
APR 16...	7.5	2.1	.90	6	.1	.70	18	0	15	2.2	10
JUL 15...	--	--	--	--	--	--	106	0	87	1.3	--

STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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...	1355	4.5	<.10	6.5	107	70	.15	344	<.10
JAN 07...	1515	2.9	<.10	9.6	112	99	.15	152	.13
APR 16...	1215	1.5	<.10	4.5	50	38	.07	594	<.10
JUL 15...	1245	--	--	--	--	--	--	--	<.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 16...	<.010	.80	.040	.030	<.010	6	19	85
JAN 07...	.080	.50	.020	.010	.010	3	4.1	44
APR 16...	.020	.50	.020	.010	<.010	3	36	75
JUL 15...	.040	.50	.030	<.010	<.010	4	2.9	15

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	23	.8	<1	20	<3	4	400	<5
JAN 07...	40	<1	23	<.5	<1	<1	<3	2	410	<5
APR 16...	80	<1	14	<.5	<1	<1	<3	3	210	<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 16...	<4	16	<.1	<10	3	<1	<1	39	<6	7
JAN 07...	<4	47	<.1	<10	1	<1	<1	50	<6	14
APR 16...	<4	5	<.1	<10	<1	<1	<1	16	<6	5

STREAMS TRIBUTARY TO ST. MARYS RIVER

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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 at the raw-water tap in Sault Ste. Marie municipal water plant at Big Point. Intake is 1,500 ft 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 these samples were not published. Since the 1983 water year, water temperature has been measured in the stream near the water plant. Before 1983, water temperature was measured at the raw-water tap.

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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT 17...	0900	122000	97	7.90	8.0	1.5	11.3	97	K4	K7	44	1
JAN 08...	0930	85500	97	7.70	.0	.40	14.0	97	<1	<1	47	1
APR 17...	0830	81200	85	7.50	1.5	1.0	13.4	98	<1	<1	44	4
JUL 16...	1400	111000	93	8.00	18.5	--	10.4	115	<2	<2	--	--

DATE	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)	BICAR- BONATE WATER WHOLE IT-FLD (MG/L)	CAR- BONATE WATER WHOLE IT-FLD (MG/L)	ALKA- LITY, CARBON- ATE IT-FLD (MG/L CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 17...	13	2.8	1.4	6	.1	.60	52	0	42	1.0	3.9
JAN 08...	14	2.9	1.4	6	.1	.80	55	0	45	1.8	5.0
APR 17...	13	2.8	1.3	6	.1	.50	49	0	40	2.4	4.1
JUL 16...	--	--	--	--	--	--	50	0	41	.8	--

STREAMS TRIBUTARY TO ST. MARYS RIVER

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)
OCT 17...	0900	2.3	<.10	2.2	60	52	.08
JAN 08...	0930	1.4	<.10	2.4	57	56	.08
APR 17...	0830	1.3	<.10	2.5	48	50	.07
JUL 16...	1400	--	--	--	--	--	--

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)
OCT 17...	19800	.29	<.010	.30	.020	--	.020
JAN 08...	13200	.32	.020	.20	<.010	<.010	--
APR 17...	10500	.31	.030	<.20	.020	.010	<.010
JUL 16...	--	.30	.020	.30	.100	<.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 17...	20	<1	17	<.5	<1	10	<3	5	10	<5
JAN 08...	<10	<1	15	<.5	<1	9	<3	3	6	<5
APR 17...	<10	<1	14	<.5	<1	<1	<3	4	10	<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 17...	<4	<1	<.1	<10	2	<1	<1	22	<6	51
JAN 08...	<4	<1	<.1	<10	<1	<1	<1	24	<6	71
APR 17...	<4	<1	<.1	<10	<1	<1	<1	19	<6	64

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 17...	0900	<.5	<.4	1.2	1.2	1.0	1.2	.03	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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. Prior to July 15, 1939, non-recording gage at site 1,600 ft upstream at different datum.

REMARKS.--Estimated daily discharges: Nov. 26 to Apr. 2. 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.--48 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, 9,770 ft³/s, Apr. 8, gage height, 11.55 ft; minimum, 496 ft³/s, Sept. 3, gage height, 2.72 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1320	1080	1350	940	900	860	4000	2550	791	571	654	512
2	1460	1190	1200	940	880	860	5000	2420	774	558	623	505
3	1490	1520	1100	940	880	840	7050	2260	762	542	599	499
4	1490	1810	1100	940	880	840	8230	2120	753	541	581	511
5	1570	1940	1100	940	880	840	8750	2010	734	565	595	530
6	1730	1980	1150	960	880	840	9330	1900	721	589	641	546
7	1800	1990	1150	960	880	840	9670	1780	711	591	701	552
8	1820	1950	1200	960	880	860	9690	1670	713	575	700	541
9	1800	1850	1200	940	880	860	9410	1580	711	551	694	526
10	1760	1740	1200	920	880	860	8870	1510	707	541	694	527
11	1710	1620	1200	920	880	860	8120	1460	701	534	724	568
12	1650	1510	1200	920	880	860	7310	1400	721	524	758	698
13	1640	1430	1200	920	880	880	6560	1340	746	557	763	869
14	1640	1380	1200	920	880	860	5940	1250	779	615	708	890
15	1600	1340	1150	920	880	840	5560	1130	788	633	673	867
16	1530	1320	1150	920	860	860	5240	1090	762	630	656	832
17	1460	1380	1150	920	860	880	5010	1070	722	601	648	784
18	1410	1540	1100	920	860	920	4850	1090	693	576	639	747
19	1370	1760	1100	920	860	960	4720	1100	676	575	625	718
20	1310	2010	1100	920	860	1050	4450	1080	651	574	601	717
21	1260	2220	1050	920	860	1150	4190	1040	628	559	577	760
22	1210	2310	1050	920	860	1200	3970	999	618	577	551	762
23	1180	2280	1050	920	860	1300	3790	977	607	587	567	776
24	1180	2170	1000	940	860	1400	3600	955	603	534	591	779
25	1210	2040	1000	940	860	1500	3360	933	594	547	600	773
26	1260	1950	1000	940	860	1650	3170	911	592	634	601	757
27	1250	1850	980	940	860	1950	3030	890	612	708	581	752
28	1200	1750	980	940	860	2150	2900	885	616	741	564	782
29	1160	1600	960	940	---	2500	2780	873	606	736	552	835
30	1130	1500	960	920	---	2900	2670	835	587	723	537	869
31	1100	---	940	920	---	3600	---	811	---	687	522	---
TOTAL	44700	52010	34270	28880	24400	38770	171220	41919	20679	18476	19520	20784
MEAN	1442	1734	1105	932	871	1251	5707	1352	689	596	630	693
MAX	1820	2310	1350	960	900	3600	9690	2550	791	741	763	890
MIN	1100	1080	940	920	860	840	2670	811	587	524	522	499
CFSM	1.31	1.58	1.01	.85	.79	1.14	5.19	1.23	.63	.54	.57	.63
IN.	1.51	1.76	1.16	.98	.83	1.31	5.79	1.42	.70	.62	.66	.70
CAL YR 1985	TOTAL	607007	MEAN	1663	MAX	12900	MIN	590	CFSM	1.51	IN	20.53
WTR YR 1986	TOTAL	515628	MEAN	1413	MAX	9690	MIN	499	CFSM	1.29	IN	17.44

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 August 1986 (discontinued).

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 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. Before Oct. 1, 1975, water-quality data was collected 1.5 mi downstream and was published as "at Manistique" (station 04057005).

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 1985 TO SEPTEMBER 1986

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- TOCOCCHI KF AGAR (COLS. PER AS CAC03)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
NOV												
06...	1350	2480	158	7.80	6.5	4.9	11.3	96	K14	67	76	21
JAN												
16...	1200	E1300	183	7.60	.0	2.5	10.0	70	K2	<3	95	24
MAR												
04...	1300	1080	195	7.60	.0	2.6	9.6	68	<1	<2	93	20
APR												
29...	1240	4120	124	7.80	15.0	3.5	9.2	95	K1	<5	62	16
JUN												
24...	1245	898	186	8.00	17.5	3.7	8.5	91	32	K8	97	24
AUG												
12...	1130	1300	180	8.00	18.0	--	10.1	109	26	21	--	--

DATE	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)	BICAR- BONATE WATER WHOLE IT-FLD (MG/L)	CAR- BONATE WATER WHOLE IT-FLD (MG/L)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV											
06...	22	5.1	1.4	4	.1	.80	65	0	53	1.7	25
JAN											
16...	28	6.1	1.6	4	.1	.70	85	0	70	3.4	18
MAR											
04...	27	6.3	1.7	4	.1	.70	88	0	72	3.6	18
APR											
29...	18	4.1	1.1	4	.1	.60	56	0	46	1.4	16
JUN											
24...	29	5.9	1.5	3	.1	.80	87	0	71	1.4	24
AUG											
12...	--	--	--	--	--	--	89	0	73	1.4	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 06...	1350	2.1	<.10	5.7	96	96	.13	643	.10
JAN 16...	1200	1.6	<.10	7.2	121	110	.16	--	.10
MAR 04...	1300	1.6	<.10	7.5	119	110	.16	347	.13
APR 29...	1240	1.6	<.10	4.2	96	74	.13	1070	.10
JUN 24...	1245	1.5	<.10	4.9	118	110	.16	286	<.10
AUG 12...	1130	--	--	--	--	--	--	--	<.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- PENDEED (MG/L)	SEDI- MENT, CHARGE, SUS- PENDEED (T/DAY)	SED. SUSP. SIEVE DIAM. & FINER THAN .062 MM
NOV 06...	.030	.50	.020	.010	<.010	7	47	88
JAN 16...	.080	.40	<.010	<.010	--	3	--	58
MAR 04...	.090	.40	<.010	<.010	<.010	2	5.8	86
APR 29...	.030	.40	.020	<.010	<.010	6	67	95
JUN 24...	.010	.40	.020	.010	<.010	2	4.8	75
AUG 12...	.030	.50	.020	<.010	<.010	7	25	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)
NOV 06...	30	<1	17	<.5	<1	<1	<3	2	470	<5
JAN 16...	20	<1	20	<.5	<1	<1	<3	2	480	<5
APR 29...	30	<1	18	<.5	<1	<1	<3	2	310	<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)
NOV 06...	4	15	<.1	<10	<1	<1	<1	57	<6	38
JAN 16...	<4	25	.8	<10	<1	<1	<1	75	<6	<3
APR 29...	<4	10	<.1	<10	<1	1	<1	49	<6	9

STREAMS TRIBUTARY TO LAKE MICHIGAN

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. 25 to Mar. 31. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 210 ft³/s, 15.58 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, 1,770 ft³/s, Apr. 7, gage height, 10.43 ft; minimum, 60 ft³/s, July 3, 4, gage height, 3.82 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	334	207	240	136	116	98	856	274	85	63	108	76
2	309	823	235	134	115	100	1010	253	82	62	94	99
3	268	1180	230	132	114	102	1010	232	80	61	98	95
4	251	930	227	131	114	102	980	214	79	65	96	106
5	352	728	224	130	113	99	1150	201	78	81	154	118
6	393	627	220	128	113	96	1570	190	76	82	222	108
7	357	560	218	127	112	94	1730	176	76	73	204	106
8	329	483	216	127	111	92	1670	164	80	68	190	94
9	316	415	214	127	111	92	1480	156	78	67	211	85
10	303	362	210	128	110	99	1230	148	74	64	224	93
11	283	314	205	130	109	106	1020	141	78	61	312	161
12	266	283	200	134	107	115	860	135	95	62	264	269
13	278	265	197	136	106	126	739	132	102	70	201	256
14	258	250	192	136	106	135	645	127	94	96	163	208
15	236	237	185	136	105	138	677	124	89	90	156	178
16	214	233	179	135	104	143	712	123	85	83	142	161
17	195	285	175	134	104	147	648	122	81	79	142	139
18	185	306	165	132	103	156	585	133	76	76	132	128
19	176	415	160	129	103	160	538	128	76	90	117	120
20	167	461	155	126	102	162	496	119	73	84	108	117
21	157	413	150	122	101	163	456	114	70	74	102	116
22	150	364	149	120	101	166	410	112	70	68	95	138
23	151	326	146	117	100	170	377	109	70	66	107	165
24	228	302	145	117	99	190	346	106	86	64	108	144
25	235	250	144	117	98	225	317	104	76	96	99	129
26	216	270	143	118	98	270	335	100	74	117	94	124
27	198	265	142	118	97	325	337	98	78	112	92	147
28	179	260	140	118	96	400	316	94	75	108	88	313
29	165	250	139	118	---	470	315	91	69	115	84	326
30	157	245	138	117	---	580	290	88	66	106	81	264
31	150	---	137	116	---	720	---	86	---	104	78	---
TOTAL	7456	12309	5620	3926	2968	6041	23105	4394	2371	2507	4366	4583
MEAN	241	410	181	127	106	195	770	142	79.0	80.9	141	153
MAX	393	1180	240	136	116	720	1730	274	102	117	312	326
MIN	150	207	137	116	96	92	290	86	66	61	78	76
CFSM	1.32	2.24	.99	.69	.58	1.07	4.21	.78	.43	.44	.77	.84
IN.	1.52	2.50	1.14	.80	.60	1.23	4.70	.89	.48	.51	.89	.93

CAL YR 1985 TOTAL 85912 MEAN 235 MAX 2030 MIN 56 CFSM 1.28 IN 17.46
WTR YR 1986 TOTAL 79646 MEAN 218 MAX 1730 MIN 61 CFSM 1.19 IN 16.19

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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. bench mark). Prior to Sept. 1, 1960, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 1 to Jan. 15, Jan. 19 to Feb. 1, Feb. 7-17, 22-24, Feb. 27 to Mar. 1, Mar. 6-12, 19-23, and Sept. 11-30. Records good except for periods with ice effect, Dec. 1 to Jan. 15, Jan. 19 to Feb. 1, Feb. 7-17, 22-24, Feb. 27 to Mar. 1, Mar. 6-12, 19-23, which are fair and period of indefinite stage-discharge relation, Sept. 11-30, which is 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.--27 years, 62.6 ft³/s, 18.48 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, 1,140 ft³/s, Oct. 6, gage height, 7.88 ft; minimum, 5.3 ft³/s, Aug. 3, gage height, 1.58 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	306	77	69	37	34	25	249	138	18	11	7.2	8.7
2	277	221	67	37	34	26	383	119	17	11	7.2	7.6
3	196	362	65	37	33	26	488	101	16	11	6.8	8.3
4	182	274	63	36	32	26	419	89	16	11	7.6	16
5	532	209	62	36	32	25	383	82	16	12	20	17
6	988	179	61	35	31	25	414	76	15	11	18	15
7	534	160	60	34	30	24	476	66	21	9.6	14	13
8	331	136	58	34	29	24	573	59	33	10	16	13
9	260	114	57	35	29	25	536	54	23	10	19	12
10	219	99	56	36	29	27	424	52	19	9.8	20	13
11	191	89	55	36	29	28	362	50	31	9.6	34	15
12	174	84	53	36	28	30	335	49	70	12	28	24
13	180	82	53	35	28	30	303	47	53	18	20	28
14	159	77	53	35	28	30	276	44	39	17	16	25
15	131	70	53	36	28	29	294	41	31	14	14	26
16	111	67	51	37	28	29	345	39	26	12	13	21
17	101	75	49	37	28	29	313	37	23	11	31	18
18	104	76	48	36	28	30	274	34	20	10	22	15
19	96	137	45	36	27	31	274	33	18	9.5	15	13
20	86	192	44	35	27	31	321	31	16	8.9	12	14
21	80	192	42	34	27	32	305	29	15	8.3	12	16
22	78	156	41	34	27	32	250	28	16	7.9	11	19
23	77	125	41	33	26	34	199	28	16	7.6	28	22
24	82	112	40	33	26	35	167	26	15	8.0	26	19
25	80	102	40	33	26	37	158	25	14	14	18	17
26	71	88	40	33	26	50	201	24	15	12	15	16
27	67	81	39	32	26	50	276	23	15	11	14	15
28	61	75	39	32	25	58	262	22	13	11	12	16
29	58	74	38	31	---	83	209	21	12	9.6	12	17
30	55	71	38	32	---	118	165	19	12	8.4	11	18
31	55	---	37	33	---	170	---	18	---	8.0	9.5	---
TOTAL	5922	3856	1557	1076	801	1249	9634	1504	664	334.2	509.3	497.6
MEAN	191	129	50.2	34.7	28.6	40.3	321	48.5	22.1	10.8	16.4	16.6
MAX	988	362	69	37	34	170	573	138	70	18	34	28
MIN	55	67	37	31	25	24	158	18	12	7.6	6.8	7.6
CFSM	4.15	2.80	1.09	.75	.62	.88	6.98	1.05	.48	.24	.36	.36
IN.	4.79	3.12	1.26	.87	.65	1.01	7.79	1.22	.54	.27	.41	.40

CAL YR 1985 TOTAL 35936.0 MEAN 98.5 MAX 1830 MIN 12 CFSM 2.14 IN 29.06
WTR YR 1986 TOTAL 27604.1 MEAN 75.6 MAX 988 MIN 6.8 CFSM 1.64 IN 22.32

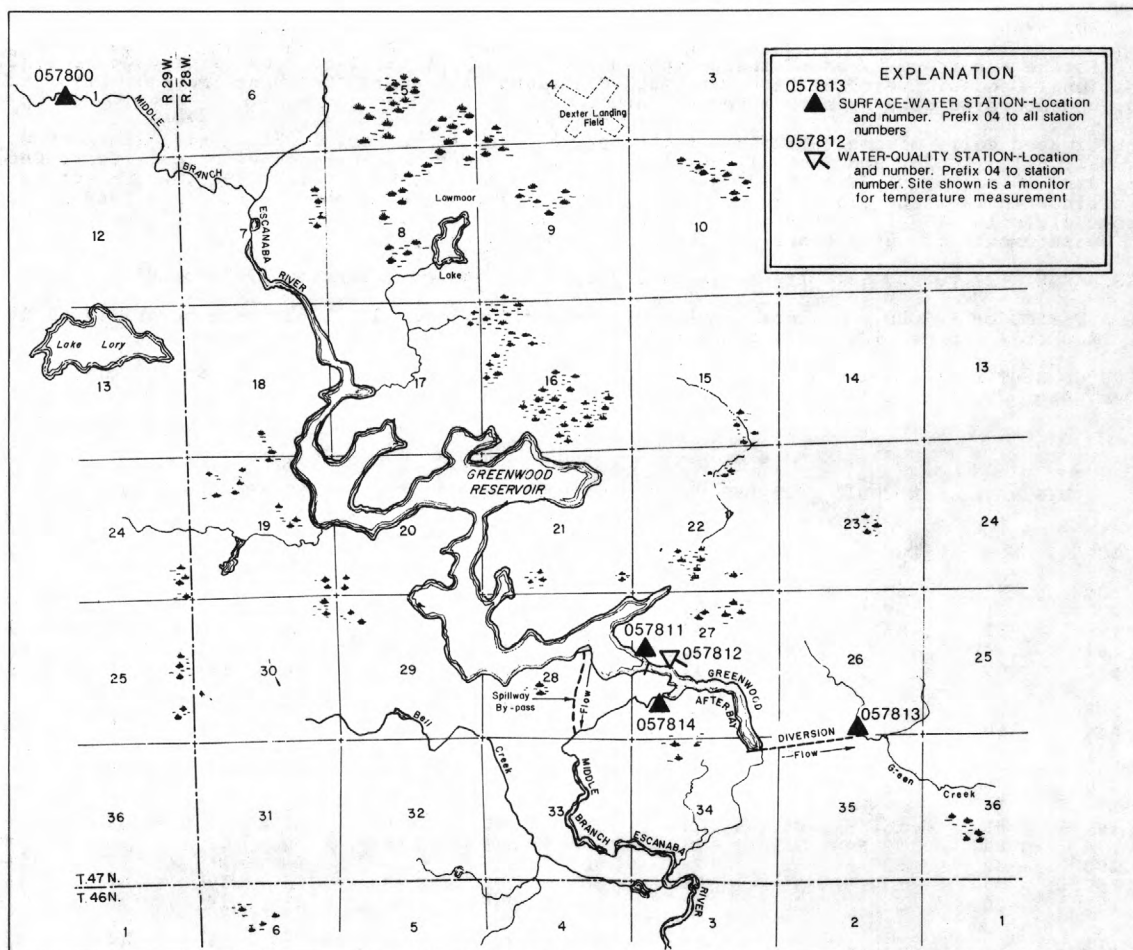


Figure 9.--Identification number and location of active surface-water temperature and gaging stations in and around the Greenwood Reservoir Complex.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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.

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 converted 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, 24,980 acre-ft, Oct. 6, 7, elevation, 1,516.2 ft; minimum, 16,880 acre-ft, Sept. 30, elevation, 1,509.8 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre- feet)	(equivalent in ft ³ /s)
Sept. 30	1,515.4	23,860	--	--
Oct. 31	1,515.1	23,440	-420	-6.8
Nov. 30	1,515.2	23,580	+140	+2.4
Dec. 31	1,515.1	23,440	-140	-2.3
CAL YR 1985	--	--	+2,220	+3.1
Jan. 31	1,515.0	23,300	-140	-2.3
Feb. 28	1,513.8	21,740	-1,560	-28.1
Mar. 31	1,513.2	20,960	-780	-12.7
Apr. 30	1,515.6	24,140	+3,180	+53.4
May 31	1,514.8	23,040	-1,100	-17.9
June 30	1,514.3	22,390	-650	-10.9
July 31	1,512.5	20,100	-2,290	-37.2
Aug. 31	1,511.3	18,660	-1,440	-23.4
Sept. 30	1,509.8	16,880	-1,780	-29.9
WTR YR 1986	--	--	-6,980	-9.6

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 November 1986 (discontinued).

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

REMARKS.--Water-temperature recorder clock stopped May 22 to June 23 (range in temperature 9.5 to 14.0°C). 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, 1985 to Nov. 30, 1986.

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. 3-13, 23, 24; minimum, 1.0°C, Nov. 24 to Dec. 14.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	12.5	12.0	7.5	7.5	1.0	1.0	1.5	1.5	2.0	2.0	2.5	2.0
2	12.0	11.5	7.5	7.5	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0
3	11.5	11.0	7.5	7.5	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0
4	11.0	11.0	7.5	7.0	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0
5	11.0	10.5	7.0	7.0	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0
6	10.5	10.0	7.0	6.5	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0
7	10.0	10.0	6.5	6.0	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0
8	10.0	9.5	6.0	5.5	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0
9	9.5	9.5	5.5	5.5	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0
10	9.5	9.5	5.5	5.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0
11	9.5	9.0	5.0	4.5	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0
12	9.0	9.0	4.5	4.5	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0
13	9.0	9.0	4.5	4.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0
14	9.0	8.5	4.0	4.0	1.5	1.0	2.0	2.0	2.0	2.0	2.0	2.0
15	8.5	8.5	4.0	3.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
16	8.5	8.5	3.5	3.5	1.5	1.5	2.0	2.0	2.0	2.0	2.5	2.0
17	8.5	8.5	3.5	3.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
18	8.5	8.0	3.0	3.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
19	8.0	8.0	3.0	3.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
20	8.0	8.0	3.0	2.0	1.5	1.5	2.0	2.0	2.0	2.0	2.5	2.0
21	8.0	8.0	2.0	2.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
22	8.0	8.0	2.0	2.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
23	8.0	8.0	2.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
24	8.0	8.0	1.5	1.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
25	8.0	8.0	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
26	8.0	8.0	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
27	8.0	8.0	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0	2.0	1.5
28	8.0	8.0	1.0	1.0	1.5	1.5	2.0	2.0	2.0	2.0	1.5	1.5
29	8.0	7.5	1.0	1.0	1.5	1.5	2.0	2.0	---	---	1.5	1.5
30	7.5	7.5	1.0	1.0	1.5	1.5	2.0	2.0	---	---	1.5	1.5
31	7.5	7.5	---	---	1.5	1.5	2.0	2.0	---	---	1.5	1.5
MONTH	12.5	7.5	7.5	1.0	1.5	1.0	2.0	1.5	2.0	2.0	2.5	1.5

04057812 GREENWOOD AFTERBAY NEAR GREENWOOD, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	1.5	1.5	8.0	7.5	---	---	14.0	14.0	16.5	16.5	16.0	16.0
2	1.5	1.5	8.5	8.0	---	---	14.0	14.0	17.0	16.5	16.0	16.0
3	1.5	1.5	8.0	8.0	---	---	14.0	14.0	17.5	17.0	16.0	16.0
4	1.5	1.5	8.0	8.0	---	---	14.5	14.0	17.5	17.5	16.0	16.0
5	1.5	1.5	8.0	8.0	---	---	14.5	14.5	17.5	17.5	16.5	16.0
6	1.5	1.5	9.5	8.0	---	---	14.5	14.5	17.5	17.5	16.5	16.0
7	2.0	1.5	10.0	9.0	---	---	14.5	14.5	17.5	17.0	16.0	15.5
8	2.0	2.0	9.5	9.0	---	---	14.5	14.5	17.5	17.0	15.5	15.5
9	2.0	2.0	9.5	9.0	---	---	15.0	14.5	17.5	17.5	15.5	15.5
10	2.0	2.0	9.5	9.0	---	---	15.0	15.0	17.5	17.0	15.5	15.5
11	2.0	1.5	9.5	9.0	---	---	15.0	15.0	17.5	17.5	15.5	15.0
12	1.5	1.5	9.5	9.0	---	---	15.0	15.0	17.5	17.5	15.0	14.5
13	2.0	1.5	9.5	9.5	---	---	15.0	15.0	17.5	17.0	14.5	14.5
14	2.0	2.0	9.5	9.0	---	---	15.5	15.0	17.0	17.0	14.5	14.5
15	2.0	2.0	9.5	9.5	---	---	16.0	15.5	17.0	17.0	15.0	14.5
16	2.5	2.0	9.5	9.5	---	---	16.0	16.0	17.0	17.0	15.0	14.5
17	2.5	2.5	10.0	9.5	---	---	16.0	16.0	17.0	17.0	14.5	14.0
18	3.0	2.5	10.0	10.0	---	---	16.0	15.5	17.0	17.0	14.0	14.0
19	3.5	3.0	10.5	10.0	---	---	16.0	16.0	17.0	17.0	14.0	14.0
20	4.0	3.5	10.5	10.0	---	---	16.0	16.0	17.0	17.0	14.0	14.0
21	4.0	4.0	10.5	10.0	---	---	16.0	16.0	17.0	17.0	14.0	13.5
22	4.0	4.0	---	---	---	---	16.0	16.0	17.0	17.0	13.5	13.5
23	4.0	4.0	---	---	---	---	16.0	16.0	17.5	17.0	13.5	13.5
24	5.0	4.0	---	---	14.0	14.0	16.5	16.0	17.5	17.0	13.5	13.5
25	5.0	5.0	---	---	14.0	14.0	16.5	16.5	17.0	17.0	13.5	13.5
26	5.5	5.0	---	---	14.0	14.0	16.5	16.5	17.0	17.0	13.5	13.5
27	6.5	5.5	---	---	14.0	13.5	16.5	16.5	17.0	17.0	14.0	13.5
28	6.0	6.0	---	---	13.5	13.5	16.5	16.5	17.0	16.5	14.0	14.0
29	8.0	6.0	---	---	14.0	13.5	16.5	16.5	16.5	16.5	14.0	14.0
30	7.5	7.5	---	---	14.0	14.0	16.5	16.5	16.5	16.5	14.0	14.0
31	---	---	---	---	---	---	16.5	16.5	16.5	16.0	---	---
MONTH	8.0	1.5	10.5	7.5	14.0	13.5	16.5	14.0	17.5	16.0	16.5	13.5

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	14.5	14.0	8.5	8.0								
2	14.5	14.5	8.0	7.5								
3	14.5	14.5	7.5	7.5								
4	14.5	14.5	7.5	7.5								
5	14.5	13.5	7.5	7.0								
6	13.5	13.0	7.0	7.0								
7	13.0	13.0	7.0	6.5								
8	13.0	13.0	6.5	6.0								
9	13.0	13.0	6.0	6.0								
10	13.0	12.0	6.0	5.0								
11	12.0	12.0	5.0	4.5								
12	12.0	11.5	4.5	3.5								
13	11.5	11.0	3.5	3.0								
14	11.0	11.0	3.0	2.0								
15	11.0	10.5	2.0	2.0								
16	10.5	10.5	2.0	2.0								
17	10.5	10.0	2.5	2.0								
18	10.0	9.5	2.5	2.5								
19	9.5	9.5	2.5	2.5								
20	9.5	9.5	2.5	2.5								
21	9.5	9.5	2.5	2.5								
22	10.0	9.5	2.5	2.5								
23	10.0	10.0	2.5	2.5								
24	10.0	9.5	2.5	2.5								
25	9.5	9.5	2.5	2.5								
26	9.5	9.0	2.5	2.5								
27	9.0	9.0	2.5	2.5								
28	9.0	9.0	2.5	2.5								
29	9.0	9.0	2.5	2.5								
30	9.0	8.5	2.5	2.5								
31	8.5	8.5	---	---								
MONTH	14.5	8.5	8.5	2.0								

STREAMS TRIBUTARY TO LAKE MICHIGAN

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. bench mark). Prior to Aug. 22, 1973, nonrecording gage at same site and datum.

REMARKS.--No estimated daily discharges. Records excellent. 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 measurements 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 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.7	8.4	8.1	7.9	24	25	2.9	9.3	6.5	16	25	19
2	8.5	8.5	8.1	7.9	24	25	3.0	9.1	6.5	21	25	19
3	8.4	8.5	8.0	7.9	24	25	3.0	8.9	6.5	24	25	20
4	8.4	8.5	8.1	7.9	24	25	3.0	8.7	6.6	24	25	22
5	8.5	8.5	8.1	7.9	17	25	3.0	8.6	6.6	24	25	24
6	8.5	8.5	7.9	7.9	11	25	3.0	8.3	6.6	24	25	24
7	8.5	8.5	8.0	7.9	11	25	2.9	8.1	6.8	24	25	24
8	8.4	8.4	8.0	7.9	11	25	2.7	8.0	6.8	24	24	24
9	8.4	8.4	7.9	7.9	11	25	2.6	7.9	6.8	24	24	24
10	8.4	8.4	8.0	7.8	11	25	2.6	7.9	6.8	24	25	24
11	8.4	8.4	7.9	7.8	13	25	2.7	7.8	6.8	24	24	24
12	8.4	8.4	7.9	7.8	21	25	2.7	7.8	6.9	24	24	24
13	8.2	8.3	8.0	7.8	24	15	2.7	7.8	6.9	24	24	24
14	8.2	8.2	7.9	8.4	25	8.9	2.7	7.8	6.9	25	24	24
15	8.2	8.2	7.9	9.7	25	9.0	2.8	7.8	6.9	25	21	24
16	8.2	8.2	7.8	9.7	25	9.0	2.8	8.2	6.9	25	19	24
17	8.2	8.2	7.9	9.7	25	9.0	2.8	9.1	6.9	24	19	24
18	8.2	8.2	7.9	9.7	25	8.4	2.8	9.7	6.9	24	19	24
19	8.2	8.2	7.9	9.7	25	8.2	2.6	8.5	6.9	24	19	24
20	8.2	8.3	7.9	9.7	25	8.1	2.5	7.0	6.9	24	19	24
21	8.2	8.2	7.9	12	25	8.1	2.5	6.9	6.9	24	19	24
22	8.2	8.2	7.9	20	25	8.1	2.5	6.8	6.9	24	19	24
23	8.2	8.2	7.9	24	25	8.1	2.5	6.7	7.0	24	19	24
24	8.2	8.2	7.9	24	25	5.6	2.5	6.6	7.0	24	19	24
25	8.2	8.2	7.9	24	25	3.6	2.5	6.6	9.2	25	19	24
26	8.3	8.2	7.9	24	25	3.1	2.6	6.5	12	25	18	24
27	8.2	8.1	7.9	24	25	2.8	2.9	6.5	14	25	18	24
28	8.2	8.1	7.8	24	25	2.8	2.9	6.5	14	25	18	24
29	8.2	8.1	7.9	24	---	2.9	2.9	6.5	14	25	18	24
30	8.2	8.1	7.8	24	---	2.9	7.7	6.5	14	25	19	24
31	8.2	---	7.9	24	---	2.9	---	6.5	---	25	19	---
TOTAL	257.4	248.8	245.9	416.9	601	426.5	87.3	238.9	240.4	743	665	704
MEAN	8.30	8.29	7.93	13.4	21.5	13.8	2.91	7.71	8.01	24.0	21.5	23.5
MAX	8.7	8.5	8.1	24	25	25	7.7	9.7	14	25	25	24
MIN	8.2	8.1	7.8	7.8	11	2.8	2.5	6.5	6.5	16	18	19
CAL YR 1985	TOTAL	4039.57	MEAN	11.1	MAX	23	MIN	.07				
WTR YR 1986	TOTAL	4875.10	MEAN	13.4	MAX	25	MIN	2.5				

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04057814 GREENWOOD RELEASE NEAR GREENWOOD, MI

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.

DRAINAGE AREA.--67.4 mi².

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. bench mark). Prior to Nov. 7, 1973, nonrecording gage at same site and different datum.

REMARKS.--Estimated daily discharges: Feb. 25 to Mar. 11. Records excellent except for estimated daily discharges, which are fair. 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 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	28	27	26	26	44	55	23	25	24	25	27
2	31	29	27	26	26	43	55	22	25	25	25	27
3	30	29	27	26	26	43	54	22	25	25	25	26
4	30	29	27	26	26	42	55	21	25	24	25	25
5	31	29	27	26	25	41	55	23	25	24	25	25
6	30	29	27	26	25	41	55	23	25	24	25	25
7	30	29	26	26	24	40	51	21	26	24	25	26
8	29	28	26	26	24	40	40	20	26	24	24	26
9	29	28	26	26	24	39	27	20	26	24	24	26
10	29	28	26	26	24	39	23	19	26	24	24	26
11	29	28	26	26	25	38	23	19	26	24	24	26
12	28	28	26	26	32	36	23	19	26	24	23	26
13	28	27	27	25	37	44	23	19	26	24	23	26
14	28	27	26	25	40	52	24	18	26	24	23	26
15	28	27	26	25	40	53	24	19	26	25	24	26
16	28	27	26	25	40	53	24	23	26	25	24	26
17	28	27	26	25	40	53	24	36	26	25	23	26
18	27	27	26	25	40	53	24	43	26	25	24	26
19	28	27	26	25	44	53	24	43	26	25	25	26
20	28	27	26	25	46	53	24	32	26	25	25	26
21	28	27	26	25	46	53	24	25	26	25	25	26
22	28	27	26	26	47	53	23	25	26	25	25	26
23	28	27	27	26	46	53	23	25	26	25	26	26
24	28	27	27	27	47	53	23	25	26	25	26	25
25	27	27	26	27	47	53	24	24	25	27	26	25
26	27	27	26	26	47	53	25	24	25	27	26	25
27	27	27	26	26	46	55	25	24	25	27	26	25
28	27	26	26	26	45	55	25	24	25	27	26	25
29	27	26	26	26	---	55	25	24	24	27	26	25
30	28	26	26	26	---	55	24	25	24	26	26	24
31	28	---	26	26	---	55	---	25	---	26	27	---
TOTAL	884	825	815	799	1005	1493	948	755	766	775	770	771
MEAN	28.5	27.5	26.3	25.8	35.9	48.2	31.6	24.4	25.5	25.0	24.8	25.7
MAX	32	29	27	27	47	55	55	43	26	27	27	27
MIN	27	26	26	25	24	36	23	18	24	24	23	24
CAL YR 1985	TOTAL	9572	MEAN	26.2	MAX	33	MIN	22				
WTR YR 1986	TOTAL	10606	MEAN	29.1	MAX	55	MIN	18				

STREAMS TRIBUTARY TO LAKE MICHIGAN

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, 3.0 mi southwest of Palmer.

DRAINAGE AREA.--23.1 mi².

PERIOD OF RECORD.--January 1963 to current year.

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 converted 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 1.8 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 24 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 13.4 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, 5,660 acre-ft, Oct. 5, elevation, 1,338.9 ft; minimum, 3,810 acre-ft, July 2-4, 8-12, elevation, 1,333.2 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre- feet)	(equivalent in ft ³ /s)
Sept. 30	1,337.9	5,260	--	--
Oct. 31	1,337.8	5,230	-30	-0.5
Nov. 30	1,338.1	5,340	+110	+1.8
Dec. 31	1,337.7	5,200	-140	-2.3
CAL YR 1985	--	--	+670	+0.9
Jan. 31	1,337.4	5,090	-110	-1.8
Feb. 28	1,336.9	4,920	-170	-3.1
Mar. 31	1,336.8	4,890	-30	-0.5
Apr. 30	1,338.2	5,380	+490	+8.2
May 31	1,336.2	4,710	-670	-10.9
June 30	1,333.4	3,870	-840	-14.1
July 31	1,333.8	3,990	+120	+2.0
Aug. 31	1,335.2	4,410	+420	+6.8
Sept. 30	1,335.3	4,440	+30	+0.5
WTR YR 1986	--	--	-820	-1.1

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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, 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. Prior to Aug. 21, 1961, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 2, 13-15, Jan. 7, 8, 27, 28, Feb. 10-15, 24, and Mar. 7, 8, 10. Records good. Since August 1962, flow completely regulated by Schweitzer Reservoir (station 04058190) 1.0 mi upstream. An average of 1.8 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 24 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, 335 ft³/s, Oct. 5, gage height, 5.10 ft; minimum daily, 4.4 ft³/s, Sept. 7-9, 21, 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	7.2	18	5.2	5.1	5.0	11	25	5.3	4.9	4.7	4.5
2	43	107	69	5.2	5.2	4.9	71	17	5.2	4.9	4.8	4.6
3	31	167	30	5.2	5.2	5.0	165	13	5.2	4.8	4.8	4.7
4	39	91	22	5.3	5.2	5.0	141	11	5.2	5.1	5.1	4.7
5	242	57	23	5.2	5.2	5.0	136	9.1	5.2	5.0	6.2	4.5
6	231	46	20	5.2	5.2	5.0	130	8.4	5.2	4.8	4.8	4.5
7	101	35	16	5.2	5.2	5.0	136	7.4	5.6	4.8	4.9	4.4
8	74	27	13	5.2	5.1	5.0	182	6.2	5.3	4.9	5.0	4.4
9	65	20	12	5.2	5.1	5.1	143	5.8	5.2	4.8	4.9	4.4
10	54	17	12	5.2	5.1	5.1	108	5.8	5.2	4.8	5.1	4.8
11	44	14	11	5.2	5.1	5.1	84	5.8	5.5	4.9	5.0	4.7
12	41	13	8.9	5.2	5.0	5.0	82	5.9	5.5	5.0	4.8	4.6
13	45	13	7.8	5.2	5.0	5.0	73	5.8	5.3	5.3	4.7	4.6
14	39	12	7.2	5.2	5.0	5.0	58	5.7	5.2	4.9	4.8	4.5
15	34	11	6.7	5.2	5.0	5.0	74	5.7	5.2	4.8	4.9	4.7
16	27	12	6.0	5.2	4.8	5.0	89	5.6	5.1	4.8	4.7	4.6
17	25	14	5.7	5.2	5.0	5.1	68	5.7	5.1	4.8	4.7	4.6
18	25	14	5.2	5.2	5.0	5.1	51	5.5	5.0	4.8	4.7	4.7
19	23	37	5.4	5.2	5.0	5.1	46	5.5	5.0	4.7	4.6	4.6
20	16	83	5.4	5.2	5.0	5.0	45	5.4	5.0	4.8	4.6	4.6
21	9.3	72	5.4	5.2	5.0	5.0	40	5.5	5.0	4.8	4.7	4.4
22	7.2	50	5.4	5.2	5.0	5.1	26	5.4	5.0	4.7	4.7	4.8
23	7.4	39	5.4	5.1	5.0	5.0	20	5.4	5.0	4.7	5.1	4.6
24	8.3	31	5.4	5.1	5.0	5.0	15	5.4	5.0	5.0	4.6	4.4
25	7.1	24	5.4	5.2	5.0	5.2	13	5.4	5.0	4.9	5.8	4.5
26	6.1	23	5.3	5.1	5.0	5.4	17	5.4	5.1	4.8	8.3	4.5
27	6.2	19	5.3	5.1	5.0	5.4	23	5.3	4.9	5.2	6.7	4.5
28	5.4	16	5.1	5.1	4.9	6.1	22	5.3	5.0	5.0	4.6	4.8
29	5.5	16	5.4	5.2	---	7.0	29	5.2	4.9	4.8	4.6	5.0
30	5.4	15	5.2	5.2	---	8.5	25	5.2	4.8	4.7	4.5	4.6
31	5.4	---	5.2	5.2	---	9.1	---	5.3	---	4.7	4.5	---
TOTAL	1297.3	1102.2	362.8	160.8	141.4	167.3	2123	224.1	154.2	150.9	155.9	137.8
MEAN	41.8	36.7	11.7	5.19	5.05	5.40	70.8	7.23	5.14	4.87	5.03	4.59
MAX	242	167	69	5.3	5.2	9.1	182	25	5.6	5.3	8.3	5.0
MIN	5.4	7.2	5.1	5.1	4.8	4.9	11	5.2	4.8	4.7	4.5	4.4
CAL YR 1985	TOTAL	7852.3	MEAN	21.5	MAX	699	MIN	4.6				
WTR YR 1986	TOTAL	6177.7	MEAN	16.9	MAX	242	MIN	4.4				

STREAMS TRIBUTARY TO LAKE MICHIGAN

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. 21 to Mar. 31. 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. Gage-height telemeter at station.

AVERAGE DISCHARGE.--45 years (water years 1904-12, 1951-86), 896 ft³/s, 13.99 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, 7,400 ft³/s, Apr. 8, gage height, 4.31 ft; maximum gage height, 5.61 ft, Mar. 31, backwater from ice; minimum daily discharge, 264 ft³/s, July 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2090	1100	800	520	490	410	4590	1480	337	298	283	289
2	2160	3560	620	520	490	410	5620	1370	337	287	277	336
3	2140	4790	700	520	490	430	5720	1160	329	289	287	348
4	2340	4700	800	520	490	440	5390	1100	325	292	293	357
5	3090	4140	880	510	480	440	5410	1000	322	304	341	418
6	3570	3390	890	510	480	430	6350	914	320	319	418	434
7	3820	2810	900	500	480	420	6770	843	322	297	482	396
8	3740	2360	900	500	480	430	7260	790	325	291	453	372
9	3290	1990	890	500	470	440	6710	690	333	280	480	326
10	2690	1730	880	500	460	450	5790	756	326	278	521	334
11	2260	1470	820	500	430	480	5100	725	326	275	543	444
12	1930	1390	740	500	400	520	4420	696	428	288	519	556
13	1830	1250	680	500	400	540	3820	590	461	338	454	553
14	1650	1100	650	510	400	560	3350	572	408	375	406	526
15	1520	1120	630	530	400	560	3230	556	377	343	415	516
16	1330	1030	620	510	400	560	3350	545	354	314	402	492
17	1140	1010	620	500	400	560	3300	548	338	326	384	471
18	1050	1180	620	490	400	560	3090	529	341	336	347	440
19	950	1830	620	490	400	560	2800	477	353	320	346	430
20	906	2430	610	490	400	560	2550	474	326	288	315	428
21	869	2250	600	490	420	560	2370	472	319	281	333	426
22	803	2000	600	490	470	560	2180	446	325	273	390	534
23	823	1800	600	490	470	600	1980	427	335	264	409	634
24	840	1600	590	490	460	640	1830	420	332	271	416	622
25	893	1450	580	490	420	700	1660	415	324	476	416	555
26	872	1300	570	490	410	760	1520	409	317	464	408	525
27	821	1200	560	490	410	840	1640	400	380	489	416	572
28	783	1100	550	490	410	1000	1690	395	345	389	378	579
29	766	980	530	490	---	1300	1690	375	328	401	351	646
30	659	900	520	490	---	2000	1580	351	308	382	335	688
31	763	---	520	490	---	3000	---	343	---	317	311	---
TOTAL	52388	58960	21090	15510	12310	21720	112760	20268	10301	10145	12129	14247
MEAN	1690	1965	680	500	440	701	3759	654	343	327	391	475
MAX	3820	4790	900	530	490	3000	7260	1480	461	489	543	688
MIN	659	900	520	490	400	410	1520	343	308	264	277	289
CFSM	1.94	2.26	.78	.58	.51	.81	4.32	.75	.39	.38	.45	.55
IN.	2.24	2.52	.90	.66	.53	.93	4.82	.87	.44	.43	.52	.61
CAL YR 1985	TOTAL	405633	MEAN	1111	MAX	10400	MIN	270	CFSM	1.28	IN	17.34
WTR YR 1986	TOTAL	361828	MEAN	991	MAX	7260	MIN	264	CFSM	1.14	IN	15.47

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
NOV 05...	1400	4320	115	7.80	5.0	2.6	12.3	100	41	100	54	8
JAN 15...	1330	535	242	7.90	.0	1.7	13.0	91	K9	<2	89	0
MAR 05...	1330	420	276	7.90	.0	1.5	11.6	83	K3	<1	90	0
APR 30...	1245	1590	132	8.10	12.5	1.5	10.4	102	K5	<7	58	0
JUN 23...	1315	323	256	8.80	23.0	2.0	9.0	109	<7	K4	96	0
AUG 13...	1200	425	189	8.50	23.0	--	9.6	115	54	K9	--	--

DATE	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)	BICAR- BONATE WATER WHOLE IT-FLD (MG/L)	CAR- BONATE WATER WHOLE IT-FLD (MG/L)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 05...	13	5.3	2.9	10	.2	.80	52	0	43	1.4	14
JAN 15...	21	8.9	18	30	.9	1.1	129	0	106	2.6	13
MAR 05...	21	9.0	27	39	1	1.1	143	0	117	2.9	15
APR 30...	14	5.7	5.6	17	.3	.80	69	0	57	.9	11
JUN 23...	23	9.3	19	30	.9	1.0	--	--	--	.4	17
AUG 13...	--	--	--	--	--	--	105	4	89	.5	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 05...	1400	2.8	<.10	6.2	82	73	.11	956	.14
JAN 15...	1330	5.6	.10	11	144	140	.20	208	.25
MAR 05...	1330	6.7	.20	11	166	160	.23	188	.20
APR 30...	1245	3.0	<.10	5.2	95	80	.13	408	.13
JUN 23...	1315	5.6	.10	6.8	157	150	.21	137	<.10
AUG 13...	1200	--	--	--	--	--	--	--	.12

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- PENDEED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
NOV 05...	.020	.70	.020	.010	.010	6	70	64
JAN 15...	.050	.40	.010	<.010	--	2	2.9	80
MAR 05...	.020	.20	.010	.010	<.010	5	5.7	86
APR 30...	.050	.40	.020	.010	<.010	3	13	86
JUN 23...	.020	.50	.020	.020	<.010	4	3.5	78
AUG 13...	<.010	.70	.020	.010	<.010	3	3.4	77

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 05...	40	3	11	<.5	<1	<1	<3	5	320	8
JAN 15...	40	2	10	<.5	<1	<1	<3	<1	390	<5
APR 30...	30	<1	12	<.5	<1	2	<3	2	290	<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)
NOV 05...	<4	13	<.1	<10	2	<1	<1	21	<6	7
JAN 15...	5	3	<.1	<10	2	<1	<1	43	<6	11
APR 30...	<4	13	<.1	<10	<1	<1	<1	31	<6	<3

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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. 2-4, and Nov. 22 to Mar. 30. Water-discharge records good except for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--32 years, 392 ft³/s, 11.83 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, 4,510 ft³/s, Apr. 4, gage height, 6.97 ft; minimum, 42 ft³/s, July 24, gage height, 1.55 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	776	564	500	200	160	140	3160	527	76	90	84	60
2	865	2770	480	200	160	140	3630	485	71	79	74	63
3	902	3420	470	195	160	140	3920	437	69	69	69	63
4	1060	2930	470	190	160	145	3910	392	66	65	63	73
5	1640	2650	470	190	160	140	3720	354	65	77	69	86
6	1680	2500	470	190	160	140	3880	318	62	75	71	109
7	1600	2230	460	190	160	135	4100	285	62	77	76	116
8	1520	1840	450	190	160	130	3970	255	64	71	116	108
9	1470	1510	440	190	155	135	3680	229	60	66	149	93
10	1380	1220	420	190	155	140	3310	206	60	60	221	106
11	1180	920	400	190	155	150	2800	189	67	56	224	135
12	1030	768	380	190	155	160	2270	181	77	56	243	199
13	935	686	350	185	150	175	1860	176	85	59	216	248
14	813	615	325	190	150	185	1580	167	103	66	178	255
15	712	557	310	190	150	200	1530	163	111	73	148	258
16	632	536	290	190	150	205	1460	162	100	79	133	264
17	556	572	275	190	150	210	1340	162	85	79	123	252
18	490	621	265	185	145	220	1240	169	76	86	106	240
19	441	1030	250	185	145	225	1160	154	72	80	96	213
20	399	1370	240	175	145	230	1070	147	67	66	92	196
21	360	1250	230	170	140	230	985	136	66	58	87	184
22	327	1100	225	170	140	235	881	129	68	52	77	196
23	313	980	220	165	140	245	791	123	69	48	80	271
24	352	880	215	165	140	275	711	116	72	46	73	344
25	408	780	210	165	140	320	641	110	68	55	76	352
26	403	720	210	165	140	380	624	105	69	88	85	324
27	385	660	210	165	140	460	608	100	76	153	84	331
28	357	600	205	165	140	600	589	95	78	194	77	346
29	329	560	205	165	---	820	596	89	106	148	71	378
30	309	530	205	165	---	1500	569	84	106	128	66	411
31	290	---	200	165	---	2140	---	78	---	105	62	---
TOTAL	23914	37369	10050	5620	4205	10550	60585	6323	2276	2504	3389	6274
MEAN	771	1246	324	181	150	340	2020	204	75.9	80.8	109	209
MAX	1680	3420	500	200	160	2140	4100	527	111	194	243	411
MIN	290	530	200	165	140	130	569	78	60	46	62	60
CFSM	1.71	2.77	.72	.40	.33	.76	4.49	.45	.17	.18	.24	.46
IN.	1.98	3.09	.83	.46	.35	.87	5.01	.52	.19	.21	.28	.52

CAL YR 1985 TOTAL 179558 MEAN 492 MAX 3420 MIN 41 CFSM 1.09 IN 14.84
WTR YR 1986 TOTAL 173059 MEAN 474 MAX 4100 MIN 46 CFSM 1.05 IN 14.31

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059500 FORD RIVER NEAR HYDE, MI--Continued

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 at or near bridge. 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 1985 TO SEPTEMBER 1986

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, (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT 25...	1000	410	260	8.20	7.0	.90	11.6	97	26	10	150	16
JAN 14...	1245	188	311	8.50	.0	2.1	10.2	71	K3	<1	180	17
APR 28...	1245	581	223	8.20	14.5	1.5	9.4	97	K9	K5	120	10
JUL 23...	1500	49	318	8.60	28.0	--	8.6	113	K15	K10	--	--

DATE	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)	BICAR- BONATE WATER WHOLE IT-FLD (MG/L)	CAR- BONATE WATER WHOLE IT-FLD (MG/L)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 25...	34	15	1.3	2	.1	.40	--	--	--	1.6	8.4
JAN 14...	43	18	1.5	2	.1	.80	190	6	160	1.0	11
APR 28...	30	12	1.1	2	.0	.60	135	0	111	1.4	9.8
JUL 23...	--	--	--	--	--	--	197	11	170	.8	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04059500 FORD RIVER NEAR HYDE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

		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)		
DATE	TIME										
OCT 25...	1000	2.6	<.10	6.6	176	150	.24	195	.10		
JAN 14...	1245	2.2	<.10	9.6	187	190	.25	95	.20		
APR 28...	1245	1.7	<.10	3.1	145	130	.20	227	<.10		
JUL 23...	1500	--	--	--	--	--	--	--	<.10		
		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, DIS- CHARGE, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM		
DATE											
OCT 25...		.040	.60	.020	.010	<.010	7	7.7	59		
JAN 14...		.030	.50	.020	.010	.010	2	1.0	45		
APR 28...		.060	.60	.030	.020	<.010	3	4.7	83		
JUL 23...		.020	.70	.020	.020	<.010	2	.26	83		
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 25...		<10	<1	12	.9	<1	3	<3	3	170	<5
JAN 14...		<10	<1	15	<.5	<1	<1	<3	2	130	<5
APR 28...		<10	<1	15	<.5	<1	<1	<3	2	62	<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 25...	8	6	<.1	<10	1	<1	<1	<1	42	<6	29
JAN 14...	<5	7	<.1	<10	2	<1	<1	<1	53	<6	15
APR 28...	<4	7	<.1	<10	<1	<1	<1	<1	37	<6	32

STREAMS TRIBUTARY TO LAKE MICHIGAN

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, WI, 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. 21 to Mar. 29. 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.--43 years (water years 1915, 1945-86), 365 ft³/s, 12.74 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, 2,260 ft³/s, Apr. 2, gage height, 4.59 ft; maximum gage height, 6.94 ft, Nov. 22, backwater from ice; minimum discharge, 233 ft³/s, July 10, 11, gage height, 2.04 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	982	463	430	390	350	305	1770	479	282	253	244	243
2	908	1150	400	385	350	310	2170	451	274	254	252	245
3	726	1400	430	385	350	310	2200	432	264	251	257	245
4	726	1280	460	380	350	310	1950	414	264	253	250	278
5	1090	976	490	375	350	315	1690	405	267	273	287	299
6	1310	784	510	365	345	320	1760	389	265	269	291	278
7	1260	675	510	360	340	315	1760	369	268	253	280	268
8	1010	595	470	360	330	300	1580	374	287	244	288	253
9	875	541	490	370	325	310	1320	380	277	244	302	248
10	767	497	500	370	320	330	1080	358	264	236	290	291
11	657	465	480	375	315	350	919	337	291	237	286	354
12	601	447	440	375	310	355	813	347	366	273	270	365
13	635	434	400	380	305	360	732	346	346	454	259	340
14	592	426	390	375	305	370	671	336	302	502	252	320
15	529	414	400	370	300	370	727	332	284	395	262	355
16	482	418	390	370	305	360	742	337	272	343	266	380
17	452	422	390	370	305	340	669	326	263	317	380	339
18	435	432	380	370	310	355	603	316	256	293	367	318
19	420	521	400	370	315	340	579	312	254	297	300	301
20	399	577	410	370	315	340	566	304	252	301	269	297
21	384	475	410	370	310	325	545	299	252	277	266	291
22	384	480	400	365	300	330	523	297	259	262	258	363
23	381	470	400	355	300	350	493	318	260	251	331	401
24	418	430	390	365	300	360	473	310	259	254	340	354
25	397	400	380	375	305	370	463	305	258	325	302	332
26	383	400	390	365	310	470	537	302	282	307	280	352
27	378	400	400	365	300	460	607	292	338	284	270	389
28	357	400	400	360	290	550	576	285	330	273	263	433
29	347	400	410	360	---	630	533	283	299	262	252	475
30	343	400	390	355	---	819	502	285	271	250	245	486
31	340	---	390	350	---	1160	---	289	---	252	244	---
TOTAL	18968	17172	13130	11450	8910	12489	29553	10609	8406	8939	8703	9893
MEAN	612	572	424	369	318	403	985	342	280	288	281	330
MAX	1310	1400	510	390	350	1160	2200	479	366	502	380	486
MIN	340	400	380	350	290	300	463	283	252	236	244	243
CFSM	1.57	1.47	1.09	.95	.82	1.04	2.53	.88	.72	.74	.72	.85
IN.	1.81	1.64	1.26	1.09	.85	1.19	2.83	1.01	.80	.85	.83	.95

CAL YR 1985 TOTAL 152031 MEAN 417 MAX 1400 MIN 216 CFSM 1.07 IN 14.54
WTR YR 1986 TOTAL 158222 MEAN 433 MAX 2200 MIN 236 CFSM 1.11 IN 15.13

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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, 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. bench mark).

REMARKS.--Estimated daily discharges: Oct. 6, 7. Records excellent except for estimated daily discharges, which are fair. 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.--42 years, 609 ft³/s, 13.85 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, 5,790 ft³/s, Apr. 2, gage height, 7.07 ft; minimum, 110 ft³/s, June 5, 6, July 31, Aug. 1, gage height, 1.65 ft; minimum daily, 198 ft³/s, Aug. 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2510	649	594	493	459	415	3470	1210	290	284	284	276
2	2470	2290	527	486	456	429	5120	1050	350	268	258	327
3	2060	3330	569	485	463	440	5100	927	293	288	198	387
4	1960	3210	645	482	465	439	4500	840	292	269	306	373
5	2900	2640	669	469	473	446	4100	769	281	275	289	411
6	3970	2230	667	478	464	459	4510	709	314	235	385	387
7	3910	1880	661	480	469	444	4470	628	298	301	355	309
8	3010	1630	646	469	453	420	4150	579	290	257	338	346
9	2560	1430	639	471	445	442	3800	556	384	260	468	298
10	2120	1230	630	471	459	469	3270	523	327	263	411	305
11	1770	1030	615	473	442	487	2760	488	343	269	449	332
12	1580	941	593	478	445	498	2400	499	432	277	426	388
13	1580	852	570	468	437	504	2140	516	503	392	394	407
14	1470	801	551	466	435	497	1870	511	455	515	374	381
15	1310	763	536	468	430	488	1800	505	407	448	366	427
16	1130	724	541	469	424	490	1860	484	381	402	329	440
17	997	738	528	468	444	480	1750	464	356	392	355	418
18	899	726	515	471	439	501	1600	425	340	367	415	404
19	864	805	517	460	441	479	1500	406	334	335	352	415
20	798	1000	521	471	433	483	1420	395	343	314	322	395
21	740	867	518	475	444	488	1330	380	321	335	325	368
22	699	854	507	462	425	505	1220	361	282	303	350	419
23	683	833	532	457	429	525	1120	375	373	278	377	543
24	691	706	519	454	428	532	1020	368	349	283	376	506
25	694	614	508	470	416	514	944	363	335	334	411	472
26	686	657	513	464	433	608	953	300	367	295	368	490
27	633	710	512	466	430	700	1210	393	367	280	353	491
28	601	665	503	458	422	874	1420	347	383	322	347	524
29	582	638	502	459	---	1170	1430	345	282	305	352	558
30	559	596	499	467	---	1890	1340	363	333	289	337	538
31	552	---	501	469	---	2310	---	287	---	277	329	---
TOTAL	46988	36039	17348	14577	12403	19426	73577	16366	10405	9712	10999	12335
MEAN	1516	1201	560	470	443	627	2453	528	347	313	355	411
MAX	3970	3330	669	493	473	2310	5120	1210	503	515	468	558
MIN	552	596	499	454	416	415	944	287	281	235	198	276
CFSM	2.54	2.01	.94	.79	.74	1.05	4.11	.88	.58	.52	.60	.69
IN.	2.93	2.25	1.08	.91	.77	1.21	4.58	1.02	.65	.61	.69	.77

CAL YR 1985 TOTAL 299738 MEAN 821 MAX 7050 MIN 191 CFSM 1.38 IN 18.68
WTR YR 1986 TOTAL 280175 MEAN 768 MAX 5120 MIN 198 CFSM 1.29 IN 17.46

STREAMS TRIBUTARY TO LAKE MICHIGAN

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.

REMARKS.--Estimated daily discharges: Nov. 22 to Mar. 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 measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 177 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, 4,140 ft³/s, Apr. 1, gage height, 8.74 ft; minimum daily, 86 ft³/s, Oct. 21, 22, Apr. 24, 25, May 8-23, Aug. 27, 28.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	460	91	90	95	87	90	1360	807	90	93	98	404
2	737	722	90	93	87	90	2230	791	88	93	98	404
3	707	1490	90	93	87	90	2870	789	89	93	98	404
4	694	1510	90	93	87	90	2630	780	90	95	98	261
5	759	1440	90	92	87	90	2330	564	90	95	133	95
6	1550	1140	90	92	88	90	2440	218	90	95	99	95
7	2050	919	90	90	88	90	2480	87	90	95	99	95
8	1740	593	90	90	88	90	2320	86	90	95	99	95
9	1140	214	90	90	88	90	2200	86	90	95	98	95
10	777	188	90	90	88	90	1610	86	93	95	98	96
11	983	116	90	90	90	90	1170	86	93	96	98	95
12	1130	91	90	90	90	90	601	86	93	98	98	96
13	1120	88	90	90	90	90	90	86	93	98	98	98
14	1110	88	90	90	90	90	96	86	93	98	98	98
15	821	88	90	90	90	90	90	86	94	98	98	98
16	91	89	92	90	90	90	90	86	152	98	99	99
17	88	88	92	88	90	90	89	86	197	99	98	99
18	88	88	92	88	90	90	88	86	195	99	99	100
19	88	89	92	88	90	90	88	86	195	99	100	99
20	87	90	92	88	90	90	88	86	195	98	100	98
21	86	89	92	88	90	90	87	86	192	105	100	98
22	86	88	95	88	90	90	88	86	191	94	100	99
23	88	88	95	88	90	90	87	86	150	96	99	99
24	88	88	95	88	90	90	86	88	90	98	98	98
25	87	88	95	88	90	90	86	88	92	98	93	99
26	90	88	95	88	90	95	87	87	93	98	87	99
27	88	88	95	88	90	100	88	88	93	98	86	100
28	88	88	95	88	90	105	318	88	93	98	86	96
29	89	88	95	88	---	110	723	88	93	98	266	98
30	88	88	95	88	---	109	815	90	93	98	408	95
31	88	---	95	87	---	386	---	90	---	98	408	---
TOTAL	17186	10103	2852	2777	2495	3155	27425	6119	3480	3004	3835	4005
MEAN	554	337	92.0	89.6	89.1	102	914	197	116	96.9	124	134
MAX	2050	1510	95	95	90	386	2870	807	197	105	408	404
MIN	86	88	90	87	87	90	86	86	88	93	86	95
CAL YR 1985	TOTAL	98640	MEAN	270	MAX	4460	MIN	85				
WTR YR 1986	TOTAL	86436	MEAN	237	MAX	2870	MIN	86				

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04062500 MICHIGAMME RIVER NEAR CRYSTAL FALLS, MI

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.

DRAINAGE AREA.--656 mi².

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

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,300 ft above National Geodetic Vertical Datum of 1929, from topographic map.

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.

AVERAGE DISCHARGE.--42 years, 719 ft³/s.

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, 2,280 ft³/s, Apr. 29, gage height, 6.43 ft; minimum daily, 120 ft³/s, July 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	224	981	1030	1090	998	1140	1570	2160	196	120	1010	1130
2	137	1510	1160	1080	1060	1170	1720	2140	463	274	1010	1110
3	238	2100	1160	1080	1110	1190	1770	2130	592	130	994	1100
4	217	2070	1340	1080	1100	1230	1820	2130	589	138	964	1080
5	422	2050	1610	1080	1100	897	1940	1930	588	149	963	1070
6	679	1860	1620	1070	1090	597	619	1710	588	148	970	848
7	946	1650	1620	1070	1090	537	568	1470	356	145	970	639
8	1480	1640	1610	1070	1080	537	1400	1200	208	146	582	374
9	1700	1610	1610	1060	1080	530	1970	1200	453	146	133	328
10	1720	1460	1450	1060	1080	538	1850	1200	590	146	132	524
11	1720	1180	1170	1060	1060	569	1610	1190	596	146	297	515
12	1960	1200	1160	1060	1130	573	1250	937	375	147	1010	514
13	2050	1200	1230	1050	1160	571	1130	678	178	150	838	511
14	1830	1190	1350	1050	1150	564	1130	676	178	149	837	510
15	1620	1180	1350	1050	1160	558	930	676	178	149	855	515
16	1420	1190	1350	1050	1160	551	708	676	178	149	839	510
17	1430	1180	1290	1040	997	548	709	673	176	149	813	510
18	1410	1190	1210	1040	1170	519	705	672	176	149	814	509
19	1330	1210	1200	1040	977	508	704	670	178	146	814	317
20	1230	1220	1200	1040	1180	535	696	670	176	146	692	197
21	946	1210	1200	1040	1180	565	695	670	178	145	767	148
22	664	1200	1190	1030	1170	573	692	669	180	239	780	153
23	682	1200	1090	1030	1170	589	953	668	178	584	453	151
24	884	1190	987	1030	994	592	1230	387	178	540	171	152
25	1070	1190	984	1020	995	588	1210	184	178	585	322	155
26	1070	1190	1040	1020	1150	689	1370	186	330	562	755	156
27	1060	1180	1090	1010	1130	731	1660	458	164	554	1200	161
28	1060	1060	1090	1010	1130	763	1890	595	164	538	1190	159
29	1040	921	1090	1000	---	903	2190	594	164	686	1170	169
30	952	923	1090	1010	---	1040	2160	593	164	843	1150	160
31	951	---	1090	1010	---	1300	---	354	---	975	1140	---
TOTAL	34142	40135	38661	32430	30851	22195	38849	30146	8890	9273	24635	14375
MEAN	1101	1338	1247	1046	1102	716	1295	972	296	299	795	479
MAX	2050	2100	1620	1090	1180	1300	2190	2160	596	975	1200	1130
MIN	137	921	984	1000	977	508	568	184	164	120	132	148
CAL YR 1985	TOTAL	357769	MEAN	980	MAX	5630	MIN	137				
WTR YR 1986	TOTAL	324582	MEAN	889	MAX	2190	MIN	120				

STREAMS TRIBUTARY TO LAKE MICHIGAN

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, WI, 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.--Estimated daily discharges: Oct. 6-10 and Nov. 2-5. Records excellent except for estimated daily discharges, which are fair. 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 U.S. Geological Survey. Flow regulated by powerplants, by Michigamme Reservoir, capacity, 119,950 acre-ft, by 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.--72 years, 1,829 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, 10,200 ft³/s, Apr. 7, 8, gage height, 9.79 ft; minimum, 273 ft³/s, July 22, gage height, 2.06 ft; minimum daily, 450 ft³/s, July 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3530	2680	2600	1990	2080	2700	5220	3850	919	889	1510	1800
2	3890	5000	2330	1970	2080	2620	7030	3720	969	971	1480	1760
3	3750	7900	2510	1970	2090	2510	8220	3600	1050	891	1620	1880
4	3910	7500	2990	2120	1980	2480	8560	3510	1200	904	1530	1930
5	4370	6900	3050	2120	1910	2110	8220	3500	1090	694	1580	1780
6	6200	5260	3040	2040	2060	1810	8820	3170	1330	741	1680	1650
7	6500	4350	3040	2040	1840	1790	9170	2880	1010	778	1600	1490
8	7200	3960	3100	2140	1820	1450	9930	2300	952	784	1360	1460
9	6800	3420	2930	2130	1950	1380	8690	2030	1170	993	1260	1190
10	4500	3310	2800	2050	2030	1410	6800	1690	1250	940	1410	1190
11	4030	2970	2810	2010	2380	1370	5050	1720	1260	450	1450	1220
12	4250	2910	3000	1850	2580	1450	3510	1850	1160	723	1460	1280
13	4540	3080	2730	2080	2610	1570	3240	1570	1100	734	1510	1330
14	4530	3060	2710	2040	2680	1940	3160	1610	1130	955	1510	1320
15	4090	3050	2640	2040	2740	1740	2480	1610	1150	822	1510	1390
16	3010	3140	2650	2070	2730	1610	2660	1630	1110	936	1670	1420
17	3000	3030	2510	2080	2740	1440	2850	1200	981	1040	1520	1440
18	2930	3220	2150	2050	2740	1620	3140	1130	1100	982	1510	1470
19	2910	3180	2240	1970	2630	1590	3130	1300	1110	973	1400	1500
20	2920	3080	2160	2070	2620	1580	2910	1550	1150	768	1480	1360
21	2320	2670	2340	2080	2570	1550	3090	1360	916	840	1530	1130
22	1830	2170	2030	1960	2670	1530	3100	1500	775	866	1450	1070
23	1720	2030	2080	2070	2530	1660	2970	1260	939	884	1340	1110
24	1770	2400	1780	2060	2710	1730	2450	979	1050	980	1430	1060
25	2090	2260	1830	2000	2560	1650	2550	899	868	1380	1350	1050
26	2170	2450	2100	2090	2650	2180	3090	601	980	1270	1320	903
27	2150	2070	1990	2160	2580	2140	3200	1190	1030	1270	1300	1150
28	2040	2210	1970	2040	2560	2330	3330	1340	872	1390	1570	1270
29	2260	2410	2070	2170	---	2610	3730	1200	618	1440	1780	1480
30	2220	2290	2050	2000	---	3320	3940	1050	954	1310	1720	1550
31	2220	---	2240	2100	---	3620	---	815	---	1260	1880	---
TOTAL	109650	103960	76470	63560	67120	60490	144240	57614	31093	29858	46720	41633
MEAN	3537	3465	2467	2050	2397	1951	4808	1859	1036	963	1507	1388
MAX	7200	7900	3100	2170	2740	3620	9930	3850	1330	1440	1880	1930
MIN	1720	2030	1780	1850	1820	1370	2450	601	618	450	1260	903
CAL YR 1985	TOTAL	891903	MEAN	2444	MAX	11700	MIN	890				
WTR YR 1986	TOTAL	832408	MEAN	2281	MAX	9930	MIN	450				

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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: Nov. 24 to Mar. 31. Records good except for estimated daily discharges, which are fair. Flow regulated by powerplants, by Michigamme Reservoir, capacity, 119,950 acre-ft, by Peavy Pond, capacity, 33,860 acre-ft, on the Michigamme River, and by many smaller reservoirs upstream from station.

AVERAGE DISCHARGE.--37 years, 3,038 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, 18,400 ft³/s, Apr. 7, gage height, 14.72 ft; maximum gage height, 18.94 ft, Dec. 17, backwater from ice; minimum daily discharge, 1,180 ft³/s, July 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6830	3550	4100	3100	3000	3900	10700	5680	1780	1630	1940	2270
2	6840	7030	4100	3100	3000	3900	14200	5100	1750	1900	2080	2190
3	6220	12100	4000	3200	3000	3800	15000	5200	2140	1620	2000	2370
4	6690	13300	4500	3100	3000	4000	15200	4730	1910	1330	2270	2510
5	8340	12000	5000	2900	3000	4000	15600	4490	1930	1360	2100	2590
6	9330	10100	5400	2900	3000	3500	16200	4640	1820	1350	2030	2340
7	10500	7860	5400	3100	3000	3000	18200	4290	1600	1310	2260	2150
8	10700	6960	5200	3100	2800	2500	17900	3650	1560	1370	2190	2010
9	10300	6310	5000	3000	2800	2400	16800	3180	1980	1390	1830	1740
10	8700	5160	4900	3100	2900	2300	13800	2800	1740	1420	2090	1780
11	6380	4820	4800	3100	3000	2300	11200	2740	1770	1360	2040	2030
12	6360	4610	4800	3100	3500	2300	8360	2650	2010	1210	1950	2350
13	6880	4670	4700	3100	3700	2400	7420	2750	2080	1180	1980	2650
14	6920	4550	4500	3100	3700	2500	6220	2700	1940	1310	1970	2490
15	6090	4320	4200	3100	3700	3000	5800	2630	2010	1970	1980	2410
16	4980	4250	4000	3100	3600	3000	5770	2740	1860	1890	1910	2780
17	4720	4400	3700	3100	3600	2700	5840	2380	1750	1770	2260	2660
18	4190	4460	3500	3000	3600	2500	5720	2200	1710	1760	2250	2710
19	4180	5030	3400	3000	3700	2800	5640	2140	1720	1830	1980	2630
20	4260	5690	3300	3000	3800	2500	5660	2390	1670	1810	1880	2580
21	4260	5570	3300	3000	3800	2800	5310	2240	1470	1790	1980	2210
22	3320	4670	3300	3000	3900	3100	5180	2510	1240	1900	1980	2290
23	2790	4160	3300	3000	3900	2900	4480	2310	1490	1740	1880	2440
24	2880	4000	3200	3000	3700	2900	4630	2100	1640	1680	1730	2430
25	3320	3800	2900	3000	3700	3200	4100	1820	1620	1660	1780	2420
26	3250	3700	2800	3000	3900	3500	4470	1830	1640	1800	1940	2310
27	3310	3900	2800	2800	3900	3700	4770	1750	1970	2030	1930	2550
28	3290	4100	3000	2800	3900	4000	5290	2070	2040	2240	2010	2340
29	3280	4000	3000	3000	---	4700	5310	2090	1950	2050	2110	3000
30	3210	3900	3000	3100	---	5600	5590	2170	1680	1980	2140	2820
31	3130	---	3000	3100	---	8000	---	1990	---	2080	2270	---
TOTAL	175450	172970	122100	94100	96100	103700	270360	91960	53470	51720	62740	72050
MEAN	5660	5766	3939	3035	3432	3345	9012	2966	1782	1668	2024	2402
MAX	10700	13300	5400	3200	3900	8000	18200	5680	2140	2240	2270	3000
MIN	2790	3550	2800	2800	2800	2300	4100	1750	1240	1180	1730	1740
CAL YR 1985	TOTAL	1382920	MEAN	3789	MAX	16100	MIN	1200				
WTR YR 1986	TOTAL	1366720	MEAN	3744	MAX	18200	MIN	1180				

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 annual maximums only); October 1979 to September 1986 (discontinued as a continuous-record station; converted to a crest-stage partial-record station).

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

AVERAGE DISCHARGE.--23 years (water years 1946-61, 1980-86), 3,577 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, 22,300 ft³/s, Apr. 8, gage height, 17.95 ft; minimum daily, 1,260 ft³/s, July 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5930	4210	4300	4300	3600	4300	12000	6060	1770	1930	2300	2250
2	8170	7230	4200	4000	3600	4200	14000	6730	1850	1880	2260	2580
3	8210	11500	4300	4200	3400	4100	18000	6010	1950	1880	2220	2320
4	7660	15200	4500	3900	3500	4100	19100	5660	1810	2040	2330	2630
5	8540	16500	5000	3700	3400	4200	18600	5460	2030	1550	2490	2770
6	10400	15200	5600	3800	3500	4100	19200	5200	1920	1540	2420	2820
7	11600	12400	5800	3900	3500	3500	20600	5090	1850	1680	2260	2440
8	12000	9970	6000	3700	3500	3000	22000	4950	1650	1720	2580	2390
9	12400	8560	6000	3500	3400	2700	21800	4100	1720	1550	2500	2140
10	11500	7750	6000	3600	3500	2600	20200	3700	1980	1370	2280	2150
11	9900	6520	5800	3700	3500	2600	16900	3170	2050	1550	2300	2140
12	7690	5930	5400	3700	3600	2500	13200	3060	2300	1630	2540	2440
13	7630	5890	5200	3600	4000	2600	10100	3370	2360	1270	2240	2810
14	8040	5950	4800	3700	4100	2800	9360	3180	2350	1260	2250	3040
15	7540	5540	4600	3600	4100	2900	7210	3260	2410	1760	2380	2910
16	7000	5740	4400	3600	4000	3100	7880	3110	2220	2590	2150	3010
17	5720	5660	4400	3600	3900	3000	7570	3190	2110	2100	2250	3230
18	5330	5800	4000	3800	4200	3100	7400	2940	2210	2130	2540	3160
19	4930	6050	4200	3600	4300	3200	7250	2740	1920	2060	2480	3160
20	4750	6970	4200	3700	4100	3500	7110	2820	1860	2130	2220	2960
21	4930	7440	4200	3700	4200	3300	6710	2910	1640	2120	2150	2960
22	4910	7390	4100	3600	4100	3500	6680	2330	1760	2150	2240	2780
23	3600	6170	4100	3600	4000	3600	6410	2780	1590	2090	2200	2970
24	3530	5960	4000	3800	3800	3600	5160	2740	1570	1940	2040	3250
25	3870	4930	3900	3500	4000	3600	5170	2170	1830	1990	1890	3080
26	3970	3100	3500	3500	4100	4000	5640	1940	1850	2040	1890	3120
27	4180	3700	3600	3500	4200	5000	5550	1960	2350	2090	2300	3230
28	3940	4000	3600	3300	4300	5400	5700	2050	2780	2550	2000	3890
29	3960	4300	3800	3400	---	7000	5940	2250	2630	2370	2160	4070
30	3750	4400	3900	3400	---	9000	6930	2230	2440	2520	2310	4970
31	3810	---	4000	3400	---	10000	---	2130	---	2390	2350	---
TOTAL	209390	219960	141400	113900	107400	124100	339370	109290	60760	59870	70520	87670
MEAN	6755	7332	4561	3674	3836	4003	11310	3525	2025	1931	2275	2922
MAX	12400	16500	6000	4300	4300	10000	22000	6730	2780	2590	2580	4970
MIN	3530	3100	3500	3300	3400	2500	5160	1940	1570	1260	1890	2140
CAL YR 1985	TOTAL	1654640	MEAN	4533	MAX	17300	MIN	1810				
WTR YR 1986	TOTAL	1643630	MEAN	4503	MAX	22000	MIN	1260				

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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. 12 to Mar. 10, and Apr. 5-20. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--24 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, 608 ft³/s, Mar. 19, gage height, 4.41 ft; minimum, 45 ft³/s, Oct. 2, 3, 4; minimum gage height, 1.68 ft, Oct. 1, 2, 3, 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	106	329	154	152	220	276	192	123	135	115	67
2	46	103	334	152	156	211	267	192	119	150	111	65
3	46	98	318	151	159	208	263	184	117	153	112	63
4	46	95	306	150	165	201	257	173	113	147	106	75
5	52	92	298	149	180	199	255	162	250	137	99	73
6	54	89	292	148	206	199	250	158	456	127	95	75
7	55	88	283	145	219	199	240	164	486	117	132	70
8	51	87	274	143	220	205	231	157	522	119	149	66
9	50	94	265	140	219	220	222	149	452	176	150	62
10	49	174	260	139	202	300	215	141	376	201	137	61
11	51	237	263	137	180	455	210	135	331	202	127	66
12	54	249	252	133	179	444	203	129	301	225	117	78
13	59	259	249	132	170	480	199	124	283	227	108	88
14	60	266	235	132	165	545	198	120	279	205	102	90
15	65	270	215	132	165	577	195	117	288	198	97	81
16	63	293	195	134	168	591	192	117	283	317	94	75
17	63	299	185	137	172	590	195	126	261	399	91	71
18	62	300	180	149	175	578	198	135	240	352	86	71
19	179	355	177	170	184	599	199	186	232	328	82	75
20	225	414	175	190	195	550	200	214	242	314	78	76
21	228	399	172	199	210	495	202	217	228	296	74	73
22	222	383	170	199	230	478	196	208	208	266	72	72
23	207	374	168	195	250	462	190	195	187	229	72	80
24	191	362	165	185	268	437	184	178	172	196	71	88
25	174	347	162	172	270	418	180	164	160	177	69	151
26	164	362	161	162	265	393	179	153	149	181	74	196
27	151	373	160	150	251	363	172	155	146	170	82	261
28	137	360	158	140	235	338	168	163	146	157	87	262
29	124	346	158	142	---	319	161	158	141	145	83	268
30	116	333	158	148	---	298	171	156	137	133	75	291
31	110	---	156	150	---	285	---	139	---	123	71	---
TOTAL	3201	7607	6873	4759	5610	11857	6268	4961	7428	6302	3018	3190
MEAN	103	254	222	154	200	382	209	160	248	203	97.4	106
MAX	228	414	334	199	270	599	276	217	522	399	150	291
MIN	46	87	156	132	152	199	161	117	113	117	69	61
CFSM	.51	1.26	1.10	.77	1.00	1.90	1.04	.80	1.23	1.01	.49	.53
IN.	.59	1.41	1.27	.88	1.04	2.19	1.16	.92	1.37	1.17	.56	.59
CAL YR 1985	TOTAL	78714	MEAN	216	MAX	1180	MIN	35	CFSM	1.08	IN	14.57
WTR YR 1986	TOTAL	71074	MEAN	195	MAX	599	MIN	46	CFSM	.97	IN	13.15

STREAMS TRIBUTARY TO LAKE MICHIGAN

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. 11 to Mar. 2, and Mar. 6-8. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--17 years, 43.5 ft³/s, 12.13 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, 190 ft³/s, Mar. 14, gage height, 4.06 ft; minimum, 4.8 ft³/s, Oct. 4; minimum gage height, 1.43 ft, Oct. 4, Aug. 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.9	16	93	32	30	55	62	47	28	24	9.9	7.0
2	5.8	16	95	31	30	54	61	42	24	27	9.5	6.5
3	5.2	16	96	30	31	53	58	36	21	28	9.2	6.2
4	5.2	15	91	30	35	51	58	33	19	25	8.9	7.0
5	8.5	14	85	29	42	52	61	31	40	23	8.2	7.2
6	7.7	14	79	28	51	53	60	31	75	21	8.2	6.4
7	6.5	14	75	27	49	55	58	35	63	19	15	6.2
8	5.7	13	70	27	46	57	55	31	49	18	18	6.3
9	5.9	14	68	27	43	61	51	28	39	23	13	6.8
10	6.1	59	66	27	41	81	48	26	33	24	12	6.9
11	6.7	96	66	27	39	145	44	24	45	18	19	7.8
12	8.2	104	68	26	37	181	42	22	84	20	15	20
13	15	100	66	26	36	187	40	22	106	40	11	16
14	13	95	62	25	35	189	39	21	99	39	9.7	11
15	12	91	56	25	35	185	50	20	86	23	9.8	9.6
16	12	98	51	25	34	171	53	22	77	45	9.6	8.4
17	9.8	108	50	25	34	151	54	22	68	67	9.0	7.9
18	11	112	48	30	36	133	51	30	57	54	8.5	8.9
19	48	117	46	37	44	140	47	48	50	35	7.9	9.8
20	63	135	45	43	63	158	45	48	52	27	7.6	9.2
21	50	145	43	42	72	153	48	43	45	22	7.3	9.4
22	35	137	42	40	78	133	45	40	39	19	6.6	8.9
23	28	123	41	39	84	118	41	38	34	17	6.4	14
24	27	110	40	37	78	106	39	35	30	16	6.3	15
25	26	99	38	36	72	95	37	32	26	16	5.9	24
26	23	95	37	34	68	89	36	30	22	17	7.4	35
27	22	99	36	33	63	87	34	31	22	14	14	46
28	20	100	35	33	58	81	32	42	23	13	12	51
29	18	99	34	32	---	75	32	44	21	12	9.3	48
30	17	96	33	31	---	70	36	38	21	11	8.3	59
31	16	---	32	30	---	66	---	33	---	10	7.5	---
TOTAL	544.2	2350	1787	964	1364	3285	1417	1025	1398	767	310.0	485.4
MEAN	17.6	78.3	57.6	31.1	48.7	106	47.2	33.1	46.6	24.7	10.0	16.2
MAX	63	145	96	43	84	189	62	48	106	67	19	59
MIN	5.2	13	32	25	30	51	32	20	19	10	5.9	6.2
CFSM	.36	1.61	1.18	.64	1.00	2.18	.97	.68	.96	.51	.21	.33
IN.	.42	1.80	1.36	.74	1.04	2.51	1.08	.78	1.07	.59	.24	.37

CAL YR 1985 TOTAL 19629.4 MEAN 53.8 MAX 629 MIN 4.4 CFSM 1.11 IN 14.99
WTR YR 1986 TOTAL 15696.6 MEAN 43.0 MAX 189 MIN 5.2 CFSM .88 IN 11.99

STREAMS TRIBUTARY TO LAKE MICHIGAN

83

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. Prior to July 26, 1963, nonrecording gage and crest-stage gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 16-23, Dec. 27 to Jan. 1, Jan. 8, 9, Feb. 13, and Mar. 6, 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.--24 years, 257 ft³/s, 11.91 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, 1,010 ft³/s, Mar. 14, gage height, 5.90 ft; minimum, 34 ft³/s, Oct. 9, 10, gage height, 2.62 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	127	182	541	255	236	437	456	163	161	173	99	65
2	122	179	550	248	238	436	445	224	154	187	97	63
3	117	175	548	245	242	429	432	310	151	188	95	62
4	114	171	528	244	264	405	418	283	148	180	96	70
5	115	167	513	241	352	403	409	244	215	169	94	76
6	113	167	497	232	407	400	396	155	403	160	94	71
7	81	164	480	227	389	405	380	155	442	150	112	67
8	37	162	464	225	347	415	356	154	466	160	123	65
9	35	163	452	220	352	436	333	150	481	222	118	63
10	34	208	471	215	335	510	316	146	385	210	112	62
11	35	306	513	211	317	700	301	143	346	184	112	66
12	36	394	520	207	303	821	294	140	367	222	110	72
13	39	394	514	203	295	882	282	139	400	208	136	80
14	41	392	488	201	284	985	278	137	397	196	160	79
15	43	387	370	200	278	981	286	135	392	179	118	76
16	41	403	439	197	271	920	294	135	369	302	88	82
17	42	425	420	200	270	855	296	145	336	434	85	80
18	43	441	410	249	271	803	283	159	310	490	80	83
19	131	497	390	323	314	809	248	270	302	389	77	84
20	349	576	380	351	449	839	246	392	325	328	74	83
21	336	617	360	343	580	809	252	369	346	289	73	81
22	317	618	350	325	608	766	250	347	320	264	71	82
23	294	604	340	314	679	727	224	329	297	247	69	94
24	277	579	320	293	650	679	116	310	275	231	68	95
25	267	551	300	289	581	636	111	294	259	221	67	122
26	262	551	285	279	551	600	122	278	245	201	71	142
27	253	560	285	270	517	571	123	241	221	188	75	169
28	243	573	280	256	462	551	124	208	171	170	77	175
29	233	557	270	253	---	524	123	179	168	128	74	269
30	216	542	265	250	---	497	143	157	167	102	70	400
31	185	---	260	235	---	477	---	167	---	100	67	---
TOTAL	4578	11705	12803	7801	10842	19708	8337	6658	9019	6872	2862	3078
MEAN	148	390	413	252	387	636	278	215	301	222	92.3	103
MAX	349	618	550	351	679	985	456	392	481	490	160	400
MIN	34	162	260	197	236	400	111	135	148	100	67	62
CFSM	.51	1.33	1.41	.86	1.32	2.17	.95	.73	1.03	.76	.32	.35
IN.	.58	1.49	1.63	.99	1.38	2.50	1.06	.85	1.15	.87	.36	.39

CAL YR 1985 TOTAL 129940 MEAN 356 MAX 2220 MIN 34 CFSM 1.22 IN 16.50
WTR YR 1986 TOTAL 104263 MEAN 286 MAX 985 MIN 34 CFSM .98 IN 13.24

STREAMS TRIBUTARY TO LAKE MICHIGAN

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.

REMARKS.--Estimated daily discharges: Dec. 12 to Apr. 21, and July 21 to Sept. 30. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 149 ft³/s, 12.49 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, 678 ft³/s, July 18, gage height, 4.77 ft; minimum, 51 ft³/s, Oct. 4, gage height, 0.72 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	91	258	106	119	180	260	191	148	141	130	77
2	58	92	270	105	122	170	255	200	132	146	130	75
3	55	97	267	104	128	165	250	187	121	141	130	74
4	54	94	256	103	135	162	240	165	114	135	120	83
5	62	88	247	102	150	160	235	148	231	131	115	86
6	67	85	231	101	165	160	230	141	447	127	110	84
7	65	85	217	100	175	160	225	164	583	124	150	80
8	60	84	208	100	175	165	220	181	595	123	170	76
9	59	88	202	100	170	200	210	170	530	141	175	72
10	62	152	200	99	160	275	200	153	438	163	160	70
11	62	207	211	98	150	350	198	138	359	180	130	74
12	64	228	210	98	140	500	192	127	325	235	115	84
13	74	228	205	98	135	520	190	122	299	402	105	100
14	76	216	190	98	132	540	187	118	269	523	100	100
15	74	199	175	98	132	550	185	115	245	540	98	94
16	68	196	160	99	135	560	185	122	230	578	94	87
17	64	209	149	100	140	560	185	146	217	647	92	82
18	66	212	142	115	145	550	187	204	199	664	90	80
19	151	240	138	135	150	530	189	249	190	586	88	85
20	203	312	135	155	155	510	191	307	214	478	86	86
21	231	367	130	160	170	480	197	329	219	400	85	85
22	236	375	125	160	185	460	204	309	204	320	83	84
23	224	356	122	155	205	430	194	274	189	260	81	90
24	202	320	121	149	210	410	177	235	174	225	80	100
25	174	279	119	140	215	390	164	201	160	205	80	150
26	148	256	117	130	210	370	182	176	150	200	84	210
27	129	262	115	135	200	350	182	166	146	190	94	280
28	114	274	113	128	190	320	170	177	147	180	100	300
29	103	274	111	113	---	305	158	184	144	160	94	315
30	97	266	110	115	---	280	164	176	142	150	90	325
31	93	---	108	118	---	270	---	163	---	140	82	---
TOTAL	3253	6232	5362	3617	4498	11032	6006	5738	7561	8635	3341	3588
MEAN	105	208	173	117	161	356	200	185	252	279	108	120
MAX	236	375	270	160	215	560	260	329	595	664	175	325
MIN	54	84	108	98	119	160	158	115	114	123	80	70
CFSM	.65	1.28	1.07	.72	.99	2.20	1.24	1.14	1.56	1.72	.67	.74
IN.	.75	1.43	1.23	.83	1.03	2.53	1.38	1.32	1.74	1.98	.77	.82
CAL YR 1985	TOTAL	69509	MEAN	190	MAX	1320	MIN	43	CFSM	1.17	IN	15.96
WTR YR 1986	TOTAL	68863	MEAN	189	MAX	664	MIN	54	CFSM	1.17	IN	15.81

STREAMS TRIBUTARY TO LAKE MICHIGAN

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.

REMARKS.--Estimated daily discharges: Dec. 12 to Jan. 22, Jan. 27, 28, Feb. 10-13, 21-23, 28, and Mar. 1, 7, 8. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--24 years, 95.6 ft³/s, 12.25 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, 400 ft³/s, July 17, gage height, 5.30 ft; minimum, 46 ft³/s, Oct. 3, 4; minimum gage height, 2.59 ft, Oct. 3, 4, Aug. 25, 26.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	50	99	219	118	106	160	145	113	94	83	90	73
2	49	99	222	116	109	142	143	117	89	92	82	68
3	47	97	218	114	110	137	140	112	83	92	75	64
4	48	95	210	111	119	134	140	104	78	87	71	64
5	53	93	204	111	145	135	142	99	90	79	68	65
6	54	91	199	111	164	148	141	97	101	73	66	63
7	53	90	192	111	173	157	138	99	113	69	80	61
8	52	89	186	111	166	160	134	102	121	67	89	58
9	51	90	181	110	155	160	130	100	118	96	88	56
10	51	128	180	109	153	168	125	95	116	103	86	55
11	52	164	184	108	152	187	122	88	117	100	91	58
12	56	186	185	105	152	202	118	84	124	98	89	66
13	60	201	180	104	130	227	115	82	132	100	83	70
14	63	214	175	103	107	242	113	78	125	99	77	71
15	69	212	170	102	107	245	117	78	121	94	72	69
16	71	215	160	102	106	244	125	80	120	244	70	67
17	72	214	155	104	112	233	129	87	116	363	67	65
18	74	217	150	109	117	222	128	96	108	387	64	67
19	108	242	145	140	134	222	123	114	104	342	61	67
20	139	271	140	145	167	219	120	131	110	281	56	66
21	153	277	135	147	200	216	124	143	112	227	52	64
22	153	274	132	148	220	211	122	143	112	186	50	62
23	146	268	129	145	220	199	117	136	108	158	49	70
24	139	252	125	136	208	190	111	126	101	138	49	74
25	132	235	124	130	195	181	107	118	94	127	48	83
26	125	229	122	125	179	174	109	111	87	125	55	95
27	119	222	122	118	169	171	106	109	84	119	81	113
28	113	220	123	105	165	167	102	108	85	114	98	123
29	108	221	125	99	---	160	97	107	82	111	100	134
30	104	220	124	104	---	156	104	104	82	106	90	139
31	101	---	121	105	---	150	---	99	---	98	81	---
TOTAL	2665	5525	5037	3606	4240	5719	3687	3260	3127	4458	2278	2250
MEAN	86.0	184	162	116	151	184	123	105	104	144	73.5	75.0
MAX	153	277	222	148	220	245	145	143	132	387	100	139
MIN	47	89	121	99	106	134	97	78	78	67	48	55
CFSM	.81	1.74	1.53	1.09	1.43	1.74	1.16	.99	.98	1.36	.69	.71
IN.	.94	1.94	1.77	1.27	1.49	2.01	1.29	1.14	1.10	1.56	.80	.79

CAL YR 1985 TOTAL 50020 MEAN 137 MAX 782 MIN 33 CFSM 1.29 IN 17.55
WTR YR 1986 TOTAL 45852 MEAN 126 MAX 387 MIN 47 CFSM 1.19 IN 16.09

STREAMS TRIBUTARY TO LAKE MICHIGAN

87

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, IN.

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

PERIOD OF RECORD.--October 1969 to September 1986 (discontinued).

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.--17 years, 8.06 ft³/s, 6.25 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, 36 ft³/s, July 17, gage height, 4.56 ft; minimum daily, 1.1 ft³/s, Apr. 14, caused by regulation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.3	6.2	20	13	8.0	12	17	10	7.7	7.5	11	2.6
2	2.2	6.0	20	12	8.0	12	17	8.5	6.5	8.3	9.6	2.5
3	2.1	5.7	20	12	7.8	12	16	7.3	5.8	7.6	8.4	2.4
4	2.2	5.4	20	12	8.4	12	17	6.8	5.6	7.0	7.2	3.7
5	2.2	5.1	20	12	8.8	12	17	6.1	7.3	6.3	6.6	3.9
6	2.1	5.1	20	11	8.8	13	16	6.2	8.4	6.1	6.2	3.5
7	2.1	5.0	20	11	9.4	13	16	6.6	8.5	5.8	6.2	3.2
8	1.9	4.8	19	11	9.6	13	15	6.1	8.9	5.6	6.0	2.9
9	1.8	5.0	18	10	9.6	13	15	5.6	8.2	7.0	5.5	2.7
10	1.9	7.4	19	10	9.6	13	14	5.3	7.9	6.5	5.7	2.6
11	2.0	8.0	20	9.9	9.6	14	13	4.9	9.1	6.5	5.7	3.5
12	2.3	8.1	20	9.7	9.5	14	13	4.4	8.9	6.4	5.4	4.8
13	2.5	8.3	19	9.6	9.4	15	7.6	4.0	8.2	6.9	5.1	4.4
14	7.5	8.4	18	9.5	9.3	15	1.1	3.8	7.7	6.3	4.8	4.1
15	15	8.5	19	9.3	9.3	15	1.8	3.8	8.5	6.3	4.7	3.8
16	13	9.4	18	9.1	9.3	15	2.4	3.8	8.2	22	4.7	3.3
17	12	9.4	17	9.0	9.6	15	3.1	5.1	7.3	31	4.6	3.1
18	12	9.9	17	9.0	9.6	16	3.9	7.5	6.8	32	4.1	3.1
19	14	12	16	9.0	9.9	19	4.6	9.6	7.2	29	3.8	3.1
20	12	13	16	9.0	10	19	5.2	8.9	8.3	26	3.5	3.1
21	11	14	15	9.0	12	20	5.8	8.3	7.8	24	3.2	3.0
22	11	14	15	8.8	12	20	5.9	8.1	7.7	22	3.0	3.0
23	10	15	15	8.7	12	20	6.6	8.0	7.9	20	2.8	3.6
24	9.9	15	15	8.5	12	20	7.2	7.7	6.8	11	2.5	3.7
25	9.4	15	14	8.5	12	20	7.4	7.6	6.2	6.6	2.4	4.5
26	8.9	17	14	8.4	12	20	7.9	7.4	5.8	7.1	3.1	4.7
27	8.3	17	14	8.4	12	19	8.2	8.1	6.0	8.3	3.9	5.5
28	7.7	18	13	8.3	12	19	8.8	9.6	7.4	9.6	3.4	5.4
29	7.1	19	13	8.2	---	19	8.4	9.4	6.8	9.9	3.1	5.5
30	6.6	19	13	8.2	---	18	9.9	9.0	7.3	10	2.9	6.7
31	6.3	---	13	8.2	---	17	---	8.5	---	11	2.8	---
TOTAL	209.3	313.7	530	300.3	279.5	494	291.8	216.0	224.7	379.6	151.9	111.9
MEAN	6.75	10.5	17.1	9.69	9.98	15.9	9.73	6.97	7.49	12.2	4.90	3.73
MAX	15	19	20	13	12	20	17	10	9.1	32	11	6.7
MIN	1.8	4.8	13	8.2	7.8	12	1.1	3.8	5.6	5.6	2.4	2.4
CFSM	.39	.60	.98	.55	.57	.91	.56	.40	.43	.70	.28	.21
IN.	.44	.67	1.13	.64	.59	1.05	.62	.46	.48	.81	.32	.24
CAL YR 1985	TOTAL	4947.1	MEAN	13.6	MAX	51	MIN	1.5	CFSM	.78	IN.	10.52
WTR YR 1986	TOTAL	3502.7	MEAN	9.60	MAX	32	MIN	1.1	CFSM	.55	IN.	7.45

STREAMS TRIBUTARY TO LAKE MICHIGAN

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: Dec. 16-19, and Dec. 25 to Jan. 3. 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.--63 years, 1,601 ft³/s, 11.65 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, 4,700 ft³/s, July 17, gage height, 6.36 ft; minimum daily, 595 ft³/s, Oct. 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	998	1500	3270	2000	1820	2640	2630	1760	1850	1690	1720	1130
2	976	1730	3180	2050	1830	2480	2600	1790	1740	1560	1830	1080
3	958	1230	3270	2080	1840	2430	2410	1880	1700	1620	1400	1100
4	706	1400	3190	2090	1870	2410	2420	1940	1510	1650	1170	1110
5	595	1460	3170	2050	2220	2300	2480	1890	1410	1650	1290	1100
6	735	1430	3110	2010	2380	2430	2400	1620	1850	1540	1080	1140
7	1180	1360	3040	1980	2610	2470	2310	1770	2520	1340	1110	1070
8	1040	1210	2880	1960	2560	2440	2380	1940	3260	1300	1520	951
9	913	1130	2840	1830	2570	2420	2230	1730	3240	1550	1340	1020
10	919	1780	2790	1720	2470	2490	2110	1630	3140	1570	1370	1090
11	982	1990	2810	1700	2130	2920	2100	1640	3110	1480	1590	1060
12	698	2010	2840	1690	2140	3400	2080	1630	3170	1860	1490	1200
13	764	2160	2820	1740	2070	3880	1930	1570	3180	1870	1280	1220
14	1040	2420	2790	1810	1910	4070	1900	1460	2980	2010	1280	925
15	1100	2420	2620	1670	2080	4240	2080	1260	2550	2090	1320	761
16	1100	2470	2350	1740	2040	4310	1990	1570	2490	3440	1330	1350
17	1010	2540	2200	1670	1940	4230	2020	1690	2540	4420	1310	1040
18	792	2650	2100	1790	2180	4060	2050	1660	2250	4210	1170	1010
19	788	2830	2050	2020	2180	4200	2060	1800	2420	4270	1170	923
20	1860	3220	2000	2310	2240	3990	2050	2140	2320	3930	973	1060
21	2100	3450	2010	2300	2530	3890	2090	2310	2350	3880	976	1000
22	2160	3580	2200	2330	2810	3700	2000	2380	2330	3620	596	1150
23	2120	3840	2130	2280	3100	3690	1970	2420	2290	3170	730	1320
24	2100	3620	2240	2280	3320	3420	1900	2390	2040	2890	1100	1500
25	2000	3480	2200	2080	3180	3270	1890	2330	1940	2570	1290	1410
26	1920	3270	1950	1980	3080	3170	1840	2100	1770	2480	880	1470
27	1800	3370	1820	1830	3030	3100	1850	2060	1790	2380	1150	2020
28	1810	3370	1800	1660	2640	3070	1750	2130	1880	1990	1250	2390
29	1760	3320	1800	1640	---	2870	1780	2090	1870	2230	1240	1940
30	1650	3280	1810	1720	---	2880	1800	1910	1780	2080	904	2850
31	1530	---	1940	1780	---	2960	---	1910	---	1840	1290	---
TOTAL	40104	73520	77220	59790	66770	99830	63100	58400	69270	74180	38149	38390
MEAN	1294	2451	2491	1929	2385	3220	2103	1884	2309	2393	1231	1280
MAX	2160	3840	3270	2330	3320	4310	2630	2420	3260	4420	1830	2850
MIN	595	1130	1800	1640	1820	2300	1750	1260	1410	1300	596	761
CFSM	.69	1.31	1.34	1.03	1.28	1.73	1.13	1.01	1.24	1.28	.66	.69
IN.	.80	1.47	1.54	1.19	1.33	1.99	1.26	1.16	1.38	1.48	.76	.77

CAL YR 1985 TOTAL 823510 MEAN 2256 MAX 9620 MIN 495 CFSM 1.21 IN 16.42
WTR YR 1986 TOTAL 758723 MEAN 2079 MAX 4420 MIN 595 CFSM 1.11 IN 15.13

STREAMS TRIBUTARY TO LAKE MICHIGAN

89

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, IN.

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. 16 to Jan. 20, Jan. 27 to Feb. 3, Feb. 9-18, and Mar. 7, 8. Records good except for estimated daily discharges, which are poor.

AVERAGE DISCHARGE.--18 years, 373 ft³/s, 14.03 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, 1,150 ft³/s, July 17, gage height, 5.54 ft; minimum daily, 133 ft³/s, Aug. 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	201	288	1020	320	300	704	543	348	392	316	279	236
2	175	291	1040	320	310	647	529	358	368	333	248	227
3	160	285	1040	310	320	607	505	325	343	334	237	221
4	168	274	998	310	396	569	484	308	324	295	221	232
5	200	262	963	300	558	553	481	299	339	274	205	248
6	199	256	928	300	604	604	482	303	391	261	193	236
7	181	252	881	290	590	600	467	396	391	247	224	224
8	168	247	830	280	591	610	447	396	424	238	198	214
9	163	251	784	280	570	602	425	364	445	288	195	206
10	164	467	757	270	540	669	409	344	416	386	197	205
11	165	748	788	260	520	797	394	326	431	348	229	220
12	168	784	879	260	500	865	378	309	448	333	209	341
13	202	674	905	260	460	911	367	297	423	334	190	300
14	209	665	855	250	420	994	358	285	399	314	181	233
15	225	688	767	250	380	1040	382	274	392	283	171	212
16	222	743	700	250	370	1030	408	275	382	671	168	197
17	200	806	650	250	350	1010	400	305	349	1050	156	187
18	202	826	580	270	350	987	384	389	320	1070	148	197
19	334	864	540	330	519	1000	369	448	311	894	135	206
20	453	997	500	390	710	1020	366	507	358	838	133	203
21	429	1040	470	432	836	978	395	520	360	809	142	195
22	400	1010	440	444	878	941	375	525	340	776	140	191
23	397	961	420	441	891	920	351	526	348	715	142	220
24	404	933	400	426	911	885	336	510	331	632	152	223
25	401	894	380	417	922	845	327	482	309	578	142	249
26	379	890	370	404	891	795	329	454	289	551	187	256
27	359	940	350	390	844	754	320	445	280	500	440	316
28	341	990	340	360	776	703	308	513	319	459	394	331
29	324	984	340	340	---	648	303	509	320	408	274	283
30	307	994	330	320	---	606	315	440	297	350	257	297
31	295	---	320	310	---	568	---	410	---	318	249	---
TOTAL	8195	20304	20565	10034	16307	24462	11937	12190	10839	15203	6436	7106
MEAN	264	677	663	324	582	789	398	393	361	490	208	237
MAX	453	1040	1040	444	922	1040	543	526	448	1070	440	341
MIN	160	247	320	250	300	553	303	274	280	238	133	187
CFSM	.73	1.88	1.84	.90	1.61	2.19	1.10	1.09	1.00	1.36	.58	.66
IN.	.84	2.09	2.12	1.03	1.68	2.52	1.23	1.26	1.12	1.57	.66	.73

CAL YR 1985	TOTAL	190539	MEAN	522	MAX	2080	MIN	137	CFSM	1.45	IN.	19.63
WTR YR 1986	TOTAL	163578	MEAN	448	MAX	1070	MIN	133	CFSM	1.24	IN.	16.86

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 at Cosperville, IN, 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, IN. 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: Dec. 17 to Jan. 2, Jan. 6-9, 13-15, Jan. 27 to Feb. 3, and Feb. 9 to Mar. 14. Records good except for estimated daily discharges, which are poor. Flow regulated at times by dam at Waldron Lake.

AVERAGE DISCHARGE.--15 years, 143 ft³/s, 13.68 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, 507 ft³/s, Dec. 1, gage height, 6.23 ft; minimum daily, 7.3 ft³/s, Aug. 19, caused by regulation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	106	143	500	155	93	240	213	111	142	92	125	58
2	106	140	496	150	91	220	206	116	137	93	112	55
3	100	135	492	146	90	195	196	116	130	91	103	51
4	98	128	476	144	90	175	193	113	122	87	94	54
5	97	122	460	142	136	160	189	110	129	82	89	56
6	96	116	445	140	160	163	184	115	142	77	84	53
7	93	110	428	135	185	190	178	160	152	72	82	50
8	91	105	411	125	180	210	170	195	161	67	79	47
9	89	103	395	120	158	210	162	201	157	68	77	45
10	87	149	384	116	150	220	152	196	152	67	75	43
11	87	191	408	114	143	260	145	186	150	71	75	49
12	91	212	427	113	138	300	140	175	146	61	72	60
13	96	225	429	110	130	320	135	165	140	33	69	68
14	100	232	414	105	125	340	131	154	136	44	66	98
15	103	246	395	103	120	356	131	148	135	53	63	83
16	105	272	377	99	113	354	133	140	131	264	60	72
17	104	286	360	108	108	343	134	148	128	397	48	64
18	112	294	340	137	108	348	132	164	122	445	9.8	60
19	162	318	320	158	125	371	130	188	118	431	7.3	58
20	193	356	290	160	165	380	130	199	114	405	7.9	56
21	208	379	280	159	240	371	130	203	109	371	9.9	55
22	213	390	260	158	270	359	128	204	104	335	18	54
23	214	397	240	152	300	346	124	202	101	299	24	56
24	214	396	230	146	320	333	121	195	95	265	27	56
25	211	394	220	142	330	309	118	187	90	243	28	22
26	205	437	200	139	320	296	116	179	84	232	45	29
27	196	469	190	125	295	282	114	174	84	207	90	93
28	186	487	180	115	260	266	111	168	91	191	91	121
29	175	494	180	108	---	251	105	162	91	173	80	131
30	162	497	170	103	---	237	106	155	91	154	71	132
31	151	---	160	98	---	225	---	149	---	142	64	---
TOTAL	4251	8223	10557	4025	4943	8630	4357	5078	3684	5612	1945.9	1929
MEAN	137	274	341	130	177	278	145	164	123	181	62.8	64.3
MAX	214	497	500	160	330	380	213	204	161	445	125	132
MIN	87	103	160	98	90	160	105	110	84	33	7.3	22
CFSM	.96	1.93	2.40	.92	1.25	1.96	1.02	1.15	.87	1.27	.44	.45
IN.	1.11	2.15	2.77	1.05	1.29	2.26	1.14	1.33	.97	1.47	.51	.51
CAL YR 1985	TOTAL	83101	MEAN	228	MAX	831	MIN	15	CFSM	1.61	IN.	21.77
WTR YR 1986	TOTAL	63234.9	MEAN	173	MAX	500	MIN	7.3	CFSM	1.22	IN.	16.57

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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, IN, 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. 14 to Jan. 1, Jan. 6-10, 13-17, 27-29, Feb. 9-17, Feb. 21 to Mar. 2, and Mar. 7-9. Records good except for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--55 years, 523 ft³/s, 11.96 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)
Nov. 20	2400	1,800	5.36	Dec. 12	1700	*1,810	*5.37

Minimum daily discharge, 186 ft³/s, Aug. 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	280	554	1390	620	499	970	820	515	475	609	622	306
2	278	549	1510	614	593	950	803	534	445	594	558	294
3	273	525	1480	614	597	918	767	489	420	566	522	282
4	270	509	1310	602	672	889	770	466	403	526	468	277
5	278	494	1250	582	1110	930	747	449	551	497	430	267
6	280	477	1220	520	1200	1220	726	455	981	456	404	257
7	280	459	1160	510	989	1300	701	1030	1170	416	408	246
8	265	439	1130	500	835	1050	678	1270	1140	391	397	236
9	260	455	1100	490	780	1000	656	944	1170	400	369	230
10	257	742	1110	490	740	1120	616	787	1050	386	360	222
11	267	1080	1380	494	710	1290	573	717	1000	528	379	237
12	269	966	1760	492	680	1280	547	655	1030	707	349	294
13	294	860	1640	470	670	1270	529	608	1010	635	326	248
14	315	834	1250	450	660	1440	520	565	948	503	314	240
15	334	816	1100	440	640	1370	531	532	931	453	306	259
16	331	940	1050	430	640	1280	536	522	925	1070	287	254
17	318	1130	970	450	640	1230	537	527	871	1510	273	237
18	330	1060	940	715	658	1210	522	601	812	1250	258	248
19	610	1220	900	913	1030	1330	509	658	784	1090	228	238
20	872	1670	880	820	1490	1470	516	701	749	1070	204	222
21	772	1710	870	722	1500	1320	558	694	710	1070	195	221
22	706	1400	860	686	1450	1230	538	676	645	1060	188	216
23	681	1270	840	660	1250	1190	507	662	593	1040	186	240
24	687	1220	830	621	1200	1160	491	640	554	1000	188	249
25	680	1180	790	609	1200	1110	481	613	534	1050	188	275
26	676	1250	760	595	1170	1080	481	589	504	1320	245	289
27	659	1620	710	450	1120	1040	472	602	567	1120	429	335
28	661	1640	680	370	1030	990	465	579	794	932	402	431
29	619	1490	660	400	---	941	452	548	669	896	360	429
30	600	1420	640	483	---	895	453	566	586	776	330	521
31	579	---	630	486	---	855	---	511	---	688	318	---
TOTAL	13981	29979	32800	17298	25753	35328	17502	19705	23021	24609	10491	8300
MEAN	451	999	1058	558	920	1140	583	636	767	794	338	277
MAX	872	1710	1760	913	1500	1470	820	1270	1170	1510	622	521
MIN	257	439	630	370	499	855	452	449	403	386	186	216
CFSM	.76	1.68	1.78	.94	1.55	1.92	.98	1.07	1.29	1.34	.57	.47
IN.	.88	1.88	2.05	1.08	1.61	2.21	1.10	1.23	1.44	1.54	.66	.52

CAL YR 1985	TOTAL	316211	MEAN	866	MAX	6010	MIN	142	CFSM	1.46	IN.	19.80
WTR YR 1986	TOTAL	258767	MEAN	709	MAX	1760	MIN	186	CFSM	1.19	IN.	16.21

STREAMS TRIBUTARY TO LAKE MICHIGAN

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, IN, 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 mi downstream at different datum from September 1924 to March 1926 are available in the Indiana 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: Dec. 16 to Jan. 16, and Jan. 26 to Mar. 8. Records good except for estimated daily discharges, which are fair. Flow regulated by Elkhart Hydroelectric Plant.

AVERAGE DISCHARGE.--39 years, 3,220 ft³/s, 12.98 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, 8,640 ft³/s, July 17, gage height, 22.69 ft; minimum daily, 1,450 ft³/s, Oct. 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1970	2680	6380	3700	3200	5000	4910	3420	3390	3260	3340	2330
2	1740	2830	6640	3800	3300	4700	4810	3400	3170	3000	3360	2110
3	1770	2680	6600	3800	3400	4500	4550	3380	2970	3140	3030	2100
4	1550	2500	6290	3700	3500	4500	4450	3410	2890	3030	2460	2120
5	1450	2610	6170	3600	3800	4500	4540	3340	2800	2950	2600	2050
6	1460	2560	6050	3500	4200	4700	4410	3180	3710	2810	2490	2040
7	1920	2510	5880	3400	4600	5200	4270	3470	4550	2590	2280	2070
8	1990	2290	5680	3400	4700	4900	4210	4290	5220	2250	2240	1820
9	1700	2230	5510	3300	4500	4980	4190	3810	5640	2990	2560	1990
10	1720	3570	5500	3200	4200	5220	3900	3350	5290	2780	2600	1860
11	1710	4520	5930	3100	3900	5840	3810	3240	5260	2950	2710	2030
12	1480	4350	6540	3100	3800	6440	3760	3170	5470	3420	2870	2190
13	1590	4320	6290	3000	3700	7010	3600	3080	5320	3440	2380	2260
14	1830	4540	5670	3000	3600	7450	3430	2890	4910	3340	2380	2080
15	1960	4500	5020	2900	3600	7670	3710	2700	4930	3550	2380	1710
16	1900	4910	4500	2900	3600	7600	3700	2840	4380	5420	2370	2100
17	1920	5170	4300	2230	3700	7540	3650	3330	4270	7510	2310	2210
18	1670	5190	4100	3720	3800	7320	3680	3270	4200	7520	2200	1920
19	2040	5790	4000	4280	4100	7580	3660	3470	4070	7040	2060	1990
20	3080	7000	3900	4360	4400	7680	3650	3910	4010	6770	2060	1880
21	3710	7070	3900	4320	4700	7250	3780	4270	3990	6350	1730	2080
22	3730	6950	3900	4230	5200	6960	3680	4120	3970	6180	1610	1960
23	3600	6840	4000	4130	5500	6730	3500	4200	3860	5720	1540	2520
24	3500	6780	4200	4070	5800	6490	3440	4170	3670	5310	1830	2260
25	3500	6360	4100	3910	5900	6220	3370	4070	3030	4990	2140	2730
26	3350	6380	3500	3500	5800	6000	3310	3910	3420	5340	2270	2550
27	3250	6680	3400	3100	5700	5890	3270	3630	3100	4920	2260	3140
28	3160	6840	3400	2900	5400	5700	3220	3890	3710	4090	2710	3750
29	3090	6600	3400	2900	---	5510	3160	3910	3430	4060	2460	3290
30	2990	6440	3500	3000	---	5130	3310	3690	3300	4070	2140	4170
31	2780	---	3600	3100	---	5340	---	3380	---	3670	2210	---
TOTAL	73110	143690	151850	108150	121600	187550	114930	110190	121930	134460	73380	69310
MEAN	2358	4790	4898	3489	4343	6050	3831	3555	4064	4337	2367	2310
MAX	3730	7070	6640	4360	5900	7680	4910	4290	5640	7520	3360	4170
MIN	1450	2230	3400	2900	3200	4500	3160	2700	2800	2250	1540	1710
CFSM	.70	1.42	1.45	1.04	1.29	1.80	1.14	1.05	1.21	1.29	.70	.69
IN.	.81	1.59	1.68	1.19	1.34	2.07	1.27	1.22	1.35	1.48	.81	.77
CAL YR 1985	TOTAL	1613570	MEAN	4421	MAX	17900	MIN	1210	CFSM	1.31	IN.	17.81
WTR YR 1986	TOTAL	1410150	MEAN	3863	MAX	7680	MIN	1450	CFSM	1.15	IN.	15.57

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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: Dec. 17, 20-24, 27-30, Jan. 26 to Feb. 8, and Feb. 11 to Mar. 23. Water-discharge records good except for estimated daily discharges, which are fair. Flow regulated by powerplants upstream from station.

AVERAGE DISCHARGE.--56 years, 3,306 ft³/s, 12.25 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, 9,110 ft³/s, Nov. 21, gage height, 9.49 ft; minimum daily, 1,800 ft³/s, Aug. 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2510	3170	6430	4100	3600	5300	5470	3850	3820	3670	3850	2600
2	2230	3230	6870	4330	3650	5100	5290	3950	3620	3550	3510	2560
3	2110	3380	7080	4280	3700	4950	5120	3890	3390	3500	3500	2410
4	2220	2810	6940	4200	3850	4800	4990	3780	3330	3420	2950	2340
5	2010	3010	6430	4140	4300	4750	4950	3730	3470	3450	2830	2490
6	1860	3000	6420	4030	4700	4750	4930	3820	3820	3350	2900	2360
7	2040	3000	6330	3900	5100	4750	4710	3560	4590	3110	2700	2260
8	2320	2840	6170	3640	5200	4800	4690	4500	5760	2870	2830	2330
9	2230	2840	5840	3640	5300	5000	4700	4470	5960	3430	2610	2220
10	2130	3770	5890	3600	5060	5200	4420	3900	5790	3470	2870	2260
11	2300	5240	6450	3770	4500	5800	4270	3680	6020	3320	2940	2140
12	2610	5120	7280	3600	4250	6600	4240	3510	6030	3760	3090	2340
13	2100	4810	7030	3550	4150	7600	4240	3490	5830	4120	3030	2500
14	2100	4860	6500	3550	4100	8000	4080	3410	5650	3720	2640	2670
15	2610	5080	5460	3810	4050	8400	4130	3240	5670	3680	2710	2270
16	2480	5290	5000	3250	4050	8600	4240	3270	4980	5800	2670	1950
17	2500	6020	4700	3670	4100	8600	4190	4040	4820	8070	2670	2520
18	2490	5560	4430	4330	4200	8500	4190	3980	4760	8360	2590	2490
19	2700	6370	4430	5280	4400	8400	4080	4030	4320	7440	2420	2300
20	2910	7760	4300	4920	4700	8100	4110	4360	4470	7340	2340	2280
21	3770	8210	4210	5010	5200	7900	4290	4630	4330	6690	2120	2270
22	3680	7540	4200	4770	5700	7500	4210	4630	4380	6460	2150	2310
23	3870	7360	4400	4630	6200	7200	4040	4670	4260	6090	1890	2840
24	3840	7320	4700	4470	6600	6880	3990	4640	4210	5680	1800	3210
25	3880	6840	4500	4170	6500	6510	3780	4630	3800	5650	2240	2460
26	3750	6770	3760	3850	6200	6430	3940	4460	3360	5720	2830	2840
27	3660	6990	3700	3650	5900	6350	3710	4320	3760	5710	2700	3480
28	3570	7470	3700	3350	5500	6100	3600	4370	4460	4680	2810	4030
29	3600	7250	3700	3350	---	5980	3550	4300	4260	4550	2890	3930
30	3350	6990	3750	3400	---	5640	3800	4200	3590	4200	2730	4110
31	3310	---	3920	3500	---	5690	---	3890	---	4060	2390	---
TOTAL	86740	159900	164520	123740	134760	200180	129950	125200	136510	148920	84200	78770
MEAN	2798	5330	5307	3992	4813	6457	4332	4039	4550	4804	2716	2626
MAX	3880	8210	7280	5280	6600	8600	5470	4670	6030	8360	3850	4110
MIN	1860	2810	3700	3250	3600	4750	3550	3240	3330	2870	1800	1950
CFSM	.76	1.45	1.45	1.09	1.31	1.76	1.18	1.10	1.24	1.31	.74	.72
IN.	.88	1.62	1.67	1.26	1.37	2.03	1.32	1.27	1.39	1.51	.85	.80
CAL YR 1985	TOTAL	1791790	MEAN	4909	MAX	19300	MIN	1650	CFSM	1.34	IN	18.18
WTR YR 1986	TOTAL	1573390	MEAN	4311	MAX	8600	MIN	1800	CFSM	1.18	IN	15.97

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101500 ST. JOSEPH RIVER AT NILES, MI--Continued

WATER-QUALITY RECORDS

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 1985 TO SEPTEMBER 1986

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- TOCOCCHI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)
NOV 20...	1200	8170	526	7.90	8.5	15	9.6	83	4200	K11000	250
JAN 23...	0945	4760	573	8.10	1.5	1.8	13.8	99	4200	1700	270
MAR 25...	1100	6640	486	8.30	8.0	2.5	13.4	115	1200	--	250
MAY 28...	0900	4300	545	8.20	18.0	--	9.0	97	2000	1800	--
JUL 23...	1630	5830	458	8.30	27.0	9.0	8.3	106	560	1300	220
SEP 10...	1230	2300	515	8.50	21.0	2.0	9.0	104	K300	K95	270

DATE	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)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 20...	89	70	19	9.4	7	.3	2.7	186	4.0	52
JAN 23...	60	74	21	12	9	.3	2.0	202	3.1	51
MAR 25...	9	71	18	9.5	8	.3	1.9	--	2.4	49
MAY 28...	--	--	--	--	--	--	--	--	2.0	--
JUL 23...	0	61	17	8.4	8	.3	2.3	--	3.2	37
SEP 10...	61	72	21	13	10	.4	2.2	186	1.1	50

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04101500 ST. JOSEPH RIVER AT NILES, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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...	1200	21	.20	8.4	312	300	.42	6880	2.9
JAN 23...	0945	22	.10	8.1	322	330	.44	4140	2.6
MAR 25...	1100	18	.10	5.8	305	330	.41	5470	2.0
MAY 28...	0900	--	--	--	--	--	--	--	1.4
JUL 23...	1630	16	.20	10	277	360	.38	4360	.81
SEP 10...	1230	28	.20	4.7	365	320	.50	2270	1.1

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
NOV 20...	.180	1.2	.130	.100	.080	54	1190	69
JAN 23...	.280	1.1	.050	.030	.030	5	64	80
MAR 25...	.100	.90	--	.050	.040	13	233	77
MAY 28...	.120	.80	.090	.020	.020	17	197	89
JUL 23...	.080	.90	.110	.020	.010	23	362	86
SEP 10...	.080	1.0	.090	<.010	<.010	24	149	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)
NOV 20...	20	<1	51	.5	<1	<1	<3	2	26	7
MAR 25...	<10	<1	47	<.5	<1	<1	<3	1	16	<5
SEP 10...	<10	2	59	<.5	<1	1	<3	1	6	<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)
NOV 20...	<7	6	<.1	<10	4	<1	<1	130	<6	12
MAR 25...	8	16	.2	<10	<1	<1	1	130	<6	8
SEP 10...	8	1	<.1	<10	<1	<1	<1	130	<6	8

STREAMS TRIBUTARY TO LAKE MICHIGAN

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.--Estimated daily discharges: Feb. 22 to Mar. 24. Records good except for estimated daily discharges, which are fair. Flow regulated by millpond and lake-level control dam upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 289 ft³/s, 15.39 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, 1,030 ft³/s, Sept. 30, gage height, 7.30 ft; maximum gage height, 7.36 ft, Nov. 20; minimum discharge, 153 ft³/s, Aug. 26, gage height, 3.13 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	188	249	426	318	329	350	347	373	277	275	201	198
2	186	296	454	319	388	350	348	328	260	298	191	189
3	184	312	431	323	375	345	340	302	247	286	185	182
4	184	295	419	321	446	345	340	291	236	260	181	191
5	199	283	411	321	639	350	339	281	319	245	177	186
6	206	274	408	309	566	370	345	276	347	233	179	176
7	198	277	400	311	488	350	334	271	354	223	194	173
8	191	275	392	283	453	340	325	260	394	217	191	171
9	198	273	388	299	427	355	316	251	341	251	182	168
10	202	472	395	296	399	480	309	243	349	241	181	165
11	210	490	434	297	373	700	304	232	455	270	187	177
12	211	426	442	301	369	670	299	230	463	314	178	235
13	216	415	410	297	349	660	296	230	417	295	173	214
14	215	403	380	302	361	660	302	222	370	266	171	200
15	212	382	359	289	347	650	374	220	381	253	169	197
16	209	495	355	290	343	620	356	271	355	607	167	191
17	206	511	345	326	349	570	346	371	321	508	166	183
18	217	466	321	489	363	550	331	473	300	392	163	192
19	465	894	328	573	441	580	318	513	296	349	160	197
20	511	902	325	499	502	580	311	480	375	317	158	204
21	450	729	323	442	560	500	321	430	352	297	156	200
22	391	600	319	443	480	450	306	397	320	276	155	200
23	357	534	326	411	440	420	296	367	308	262	155	246
24	336	491	332	380	420	389	292	337	286	243	156	243
25	322	461	312	367	395	383	286	314	270	251	155	270
26	302	480	302	356	380	390	285	301	256	257	187	376
27	287	481	315	327	370	397	276	344	262	237	338	573
28	274	462	307	328	360	377	274	368	283	243	270	440
29	265	451	317	334	---	368	273	334	267	236	230	620
30	256	431	315	326	---	357	334	315	265	221	218	1000
31	251	---	324	320	---	350	---	294	---	213	207	---
TOTAL	8099	13510	11315	10797	11712	14256	9523	9919	9726	8836	5781	7957
MEAN	261	450	365	348	418	460	317	320	324	285	186	265
MAX	511	902	454	573	639	700	374	513	463	607	338	1000
MIN	184	249	302	283	329	340	273	220	236	213	155	165
CFSM	1.02	1.77	1.43	1.37	1.64	1.80	1.24	1.26	1.27	1.12	.73	1.04
IN.	1.18	1.97	1.65	1.58	1.71	2.08	1.39	1.45	1.42	1.29	.84	1.16
CAL YR 1985	TOTAL	127277	MEAN	349	MAX	1550	MIN	158	CFSM	1.37	IN	18.57
WTR YR 1986	TOTAL	121431	MEAN	333	MAX	1000	MIN	155	CFSM	1.31	IN	17.71

STREAMS TRIBUTARY TO LAKE MICHIGAN

97

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: Dec. 14 to Jan. 16, Jan. 22 to Feb. 4, Feb. 6-17, Feb. 24 to Mar. 2, and Mar. 6-8. 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.--35 years, 450 ft³/s, 15.67 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, 2,920 ft³/s, Sept. 30, stage rising, peak occurred Oct. 4, 1986; maximum peak discharge, 1,180 ft³/s, Nov. 20, gage height, 8.43 ft; minimum discharge, 258 ft³/s Aug. 23, gage height, 4.09 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	273	446	744	500	510	550	518	456	478	431	351	370
2	268	461	734	500	520	540	518	461	435	419	335	327
3	275	489	719	495	540	532	516	452	391	416	331	308
4	300	504	687	495	600	515	517	440	362	397	323	329
5	337	485	666	490	750	521	519	427	375	372	331	333
6	345	462	654	485	840	570	521	418	437	356	316	338
7	339	446	641	470	760	620	525	400	462	343	319	338
8	316	429	630	440	690	620	525	386	510	336	325	317
9	297	417	619	430	650	626	524	377	592	343	328	301
10	289	473	611	490	610	706	515	372	610	347	328	299
11	287	572	618	510	590	980	494	361	640	364	324	324
12	292	601	642	495	560	971	469	355	705	382	309	372
13	304	574	645	470	540	922	455	351	746	391	299	390
14	306	568	600	445	530	1040	448	347	735	396	296	394
15	308	578	560	435	520	1120	464	337	745	407	295	388
16	298	602	545	425	520	1120	489	351	775	482	289	372
17	293	649	520	467	530	1080	498	374	771	561	285	348
18	304	682	510	553	541	1020	502	457	731	609	283	326
19	416	768	500	733	549	981	504	529	676	635	280	320
20	558	1140	495	799	614	924	496	581	680	704	275	330
21	660	1050	495	725	710	847	483	580	697	821	272	339
22	607	934	495	700	743	783	463	554	611	830	266	349
23	575	979	490	660	719	745	446	545	547	729	259	393
24	577	1050	485	600	680	714	438	542	523	604	261	433
25	605	1010	485	570	650	676	431	523	508	515	264	510
26	619	999	490	550	620	640	412	487	473	455	295	692
27	598	949	490	530	600	602	414	469	435	417	389	1130
28	564	879	490	510	570	574	423	511	436	407	398	1290
29	533	813	490	500	---	552	422	559	439	400	397	1610
30	503	768	490	500	---	539	435	525	437	385	398	2620
31	472	---	490	500	---	529	---	500	---	369	393	---
TOTAL	12718	20777	17730	16472	17256	23159	14384	14027	16962	14623	9814	16190
MEAN	410	693	572	531	616	747	479	452	565	472	317	540
MAX	660	1140	744	799	840	1120	525	581	775	830	398	2620
MIN	268	417	485	425	510	515	412	337	362	336	259	299
CFSM	1.05	1.78	1.47	1.36	1.58	1.92	1.23	1.16	1.45	1.21	.81	1.39
IN.	1.21	1.98	1.69	1.57	1.65	2.21	1.37	1.34	1.62	1.39	.94	1.54
CAL YR 1985	TOTAL	209957	MEAN	575	MAX	2810	MIN	262	CFSM	1.47	IN	20.03
WTR YR 1986	TOTAL	194112	MEAN	532	MAX	2620	MIN	259	CFSM	1.36	IN	18.52

STREAMS TRIBUTARY TO LAKE MICHIGAN

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.

REMARKS.--Estimated daily discharges: Dec. 12 to Jan. 16, Jan. 26 to Mar. 8, and Mar. 16-26. Records good except for period of no gage-height record, Mar. 16-26, which is fair, and periods of ice effect, Dec. 12 to Jan. 16 and Jan. 26 to Mar. 8, which are poor. Occasional regulation caused by mills upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 107 ft³/s, 17.38 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,860 ft³/s, Sept. 30, 1986, gage height, 13.63 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)
Mar. 11	1600	716	9.78	Sept. 27	0700	1,800	13.48
July 13	1300	488	8.32	Sept. 30	0900	*1,860	*13.63
July 16	2200	955	10.78				

Minimum discharge, 31 ft³/s, Oct. 4; minimum gage height, 2.20 ft, Oct. 3, 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	41	101	65	88	89	87	82	71	63	69	47
2	34	63	115	64	100	88	89	74	63	63	64	45
3	32	73	113	64	115	88	86	66	57	60	60	44
4	32	64	105	64	145	90	105	62	52	54	56	93
5	40	58	101	65	330	96	126	60	83	50	54	79
6	40	53	100	66	250	105	123	57	127	46	52	66
7	37	53	97	66	190	111	119	55	107	44	57	57
8	34	53	97	67	130	107	105	53	153	53	56	52
9	35	51	100	68	105	136	94	51	136	61	53	48
10	36	75	105	69	92	284	87	49	101	57	51	46
11	37	86	122	70	82	651	82	47	112	64	51	59
12	37	76	115	71	88	590	78	45	180	172	48	116
13	40	71	100	72	90	463	75	44	230	444	46	106
14	39	71	84	74	90	446	74	43	174	270	45	81
15	38	69	79	76	90	394	106	43	189	173	44	83
16	38	87	76	78	90	340	115	51	233	620	43	69
17	37	111	74	83	90	280	103	58	169	781	42	60
18	37	100	72	186	90	240	90	126	121	487	41	59
19	71	231	70	347	110	220	84	171	102	315	40	59
20	80	345	69	310	170	190	79	190	107	257	38	58
21	70	319	69	221	200	170	79	140	99	218	37	58
22	60	230	68	193	180	150	78	117	86	169	37	61
23	53	174	68	174	150	135	73	100	78	121	40	95
24	53	137	68	143	130	125	71	87	70	95	43	116
25	53	116	68	124	115	115	68	77	64	160	41	1050
26	51	125	68	110	105	105	67	70	59	197	54	1460
27	48	143	67	100	96	107	73	82	68	143	99	1640
28	46	131	67	95	92	101	70	134	89	120	79	1100
29	44	116	66	90	---	97	68	125	78	102	64	1210
30	42	106	66	88	---	93	72	99	67	86	56	1740
31	41	---	65	86	---	89	---	83	---	76	51	---
TOTAL	1373	3428	2635	3449	3603	6295	2626	2541	3325	5621	1611	9857
MEAN	44.3	114	85.0	111	129	203	87.5	82.0	111	181	52.0	329
MAX	80	345	122	347	330	651	126	190	233	781	99	1740
MIN	32	41	65	64	82	88	67	43	52	44	37	44
CFSM	.53	1.36	1.02	1.33	1.54	2.43	1.05	.98	1.33	2.17	.62	3.94
IN.	.61	1.53	1.17	1.53	1.60	2.80	1.17	1.13	1.48	2.50	.72	4.39

CAL YR 1985 TOTAL 41525 MEAN 114 MAX 1210 MIN 29 CFSM 1.36 IN 18.48
WTR YR 1986 TOTAL 46364 MEAN 127 MAX 1740 MIN 32 CFSM 1.52 IN 20.63

STREAMS TRIBUTARY TO LAKE MICHIGAN

99

04105000 BATTLE CREEK AT BATTLE CREEK

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 in Battle Creek, 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: Oct. 7 to Nov. 6. 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.--53 years (water years 1931, 1935-86), 203 ft³/s, 11.44 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, 1,680 ft³/s, Mar. 13, gage height, 2.81 ft; minimum, 78 ft³/s, Aug. 21, 22; minimum gage height, 0.65 ft, Aug. 21, 22, 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	94	210	606	176	200	345	339	218	290	152	110	111
2	89	195	583	176	205	316	323	216	250	149	105	104
3	87	190	556	176	216	291	309	211	214	146	94	104
4	87	185	539	176	240	281	317	203	183	146	92	111
5	92	180	505	176	306	280	328	193	182	142	94	109
6	101	180	484	176	385	286	338	188	206	131	95	106
7	110	176	447	176	448	278	345	191	250	122	104	103
8	110	171	409	169	514	272	349	188	325	124	104	97
9	115	170	383	158	583	295	342	187	361	141	104	93
10	115	211	362	154	552	335	329	188	366	155	105	96
11	115	243	352	157	496	488	307	182	354	180	110	97
12	120	279	344	158	415	1030	288	171	348	246	111	110
13	120	349	334	158	348	1620	270	159	372	307	111	126
14	125	413	278	158	303	1650	258	154	483	329	108	130
15	125	430	275	157	280	1620	260	149	577	357	98	125
16	130	441	296	154	268	1460	286	146	558	412	94	108
17	125	440	272	156	240	1210	317	164	488	408	95	100
18	200	431	254	183	232	1030	344	195	426	377	94	101
19	260	457	249	243	245	935	363	238	384	351	92	101
20	340	562	233	300	288	894	371	283	336	327	86	101
21	450	753	220	397	322	869	363	314	289	293	83	101
22	500	913	209	524	356	773	339	342	257	247	81	101
23	470	890	197	445	435	663	315	359	239	206	84	131
24	420	774	194	452	537	580	300	357	208	172	87	165
25	380	666	194	446	586	511	290	335	182	155	87	274
26	350	621	191	362	540	466	275	305	159	151	110	413
27	320	594	178	257	453	441	255	286	152	139	159	651
28	300	596	170	249	389	416	239	284	154	129	171	818
29	270	646	167	232	---	394	225	288	154	125	172	838
30	250	645	172	211	---	375	214	297	154	121	155	861
31	230	---	176	204	---	356	---	300	---	114	129	---
TOTAL	6600	13011	9829	7316	10382	20760	9198	7291	8901	6554	3324	6486
MEAN	213	434	317	236	371	670	307	235	297	211	107	216
MAX	500	913	606	524	586	1650	371	359	577	412	172	861
MIN	87	170	167	154	200	272	214	146	152	114	81	93
CFSM	.88	1.80	1.32	.98	1.54	2.78	1.27	.98	1.23	.88	.44	.90
IN.	1.02	2.01	1.52	1.13	1.60	3.20	1.42	1.13	1.37	1.01	.51	1.00

CAL YR 1985 TOTAL 123991 MEAN 340 MAX 3010 MIN 68 CFSM 1.41 IN 19.14
WTR YR 1986 TOTAL 109652 MEAN 300 MAX 1650 MIN 81 CFSM 1.25 IN 16.93

STREAMS TRIBUTARY TO LAKE MICHIGAN

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. 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.--No estimated daily discharges. Records good. 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.--49 years, 668 ft³/s, 11.01 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, 2,990 ft³/s, Mar. 14, gage height, 5.93 ft; minimum, 344 ft³/s, Sept. 8, 9, gage height, 3.21 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	414	645	1370	600	679	840	912	725	785	541	452	436
2	404	656	1360	600	767	849	907	732	611	626	416	381
3	379	635	1310	603	759	816	915	712	615	597	422	365
4	390	619	1200	598	775	767	931	684	580	530	452	475
5	460	595	1090	598	1070	759	929	611	887	464	396	439
6	436	593	1190	589	1150	866	919	666	1140	532	417	403
7	437	588	1050	553	1160	816	913	835	1170	436	553	426
8	436	561	990	538	1190	866	932	696	1240	506	599	359
9	459	592	982	502	1210	791	876	671	1230	620	577	434
10	406	903	936	529	1140	1140	849	626	1150	637	550	375
11	448	891	936	668	1090	1530	825	611	1080	757	504	395
12	467	998	963	576	866	2020	775	598	1040	1100	485	435
13	485	1110	918	561	849	2830	789	576	961	1180	510	442
14	483	1160	816	505	775	2980	743	568	1050	1120	460	425
15	460	1170	824	481	767	2960	826	570	1170	955	441	448
16	446	1200	791	570	735	2750	889	578	1150	1510	479	402
17	458	1140	751	638	690	2380	935	620	982	1410	402	398
18	523	1200	660	751	720	2080	923	827	959	1280	428	391
19	990	1360	675	901	824	2010	946	983	918	1100	395	483
20	1150	1530	662	982	954	1960	946	1100	963	975	392	400
21	1180	1690	669	1010	1010	1860	945	1130	732	821	395	370
22	1270	1820	680	1140	1140	1710	897	1120	707	750	379	391
23	1270	1770	660	1030	1210	1520	848	1080	666	689	388	541
24	1220	1600	669	1020	1290	1400	777	956	604	567	359	528
25	1030	1460	645	936	1300	1290	816	884	562	568	416	1170
26	984	1440	613	856	1220	1240	796	833	536	539	604	1430
27	920	1400	538	711	1040	1200	698	894	548	559	658	1580
28	913	1390	544	661	991	1150	668	873	569	561	585	1720
29	829	1420	596	599	---	1100	700	862	529	516	493	1870
30	780	1410	596	623	---	1030	679	832	516	490	478	2000
31	671	---	612	660	---	979	---	766	---	480	443	---
TOTAL	21198	33546	26296	21589	27371	46489	25504	24219	25650	23416	14528	19912
MEAN	684	1118	848	696	978	1500	850	781	855	755	469	664
MAX	1270	1820	1370	1140	1300	2980	946	1130	1240	1510	658	2000
MIN	379	561	538	481	679	759	668	568	516	436	359	359
CFSM	.83	1.36	1.03	.85	1.19	1.82	1.03	.95	1.04	.92	.57	.81
IN.	.96	1.51	1.19	.97	1.24	2.10	1.15	1.09	1.16	1.06	.66	.90

CAL YR 1985 TOTAL 343550 MEAN 941 MAX 5510 MIN 281 CFSM 1.14 IN 15.51
WTR YR 1986 TOTAL 309718 MEAN 849 MAX 2980 MIN 359 CFSM 1.03 IN 13.98

STREAMS TRIBUTARY TO LAKE MICHIGAN

101

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, 1.3 mi north of Augusta.

DRAINAGE AREA.--38.9 mi².

WATER-DISCHARGE RECORDS

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, nonrecording gage at same site and datum.

REMARKS.--No estimated daily discharges. Water-discharge records good.

AVERAGE DISCHARGE.--22 years, 43.9 ft³/s, 15.33 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, 303 ft³/s, Sept. 25, gage height, 3.05 ft; minimum, 23 ft³/s, Jan. 27, gage height, 0.87 ft, caused by storage behind an ice jam upstream.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	42	70	48	47	50	58	52	44	36	38	45
2	36	50	75	48	54	52	58	47	41	40	37	42
3	35	50	72	48	51	51	56	44	39	35	36	40
4	36	48	69	48	59	51	69	43	38	33	34	50
5	46	45	65	48	76	53	68	41	67	34	34	48
6	45	43	63	47	72	57	67	41	72	36	35	45
7	41	43	62	43	59	53	64	40	68	35	45	42
8	38	43	61	52	61	51	60	39	66	42	43	40
9	42	45	60	47	59	56	56	38	57	47	41	38
10	42	70	61	46	51	75	53	37	52	47	40	38
11	43	69	63	46	47	108	50	36	52	48	41	45
12	43	63	62	47	49	103	49	37	65	70	39	55
13	45	62	59	45	46	100	50	42	69	78	38	56
14	43	61	53	46	45	103	51	43	62	68	37	54
15	45	58	54	40	45	100	59	44	65	60	37	49
16	43	63	54	46	45	94	63	54	73	94	36	46
17	41	63	52	48	48	87	63	60	64	90	36	43
18	45	64	49	62	53	84	58	69	58	75	34	46
19	87	101	51	71	63	92	54	78	66	64	34	46
20	97	123	49	66	71	90	52	79	71	59	33	46
21	94	114	49	61	74	81	52	76	63	52	32	45
22	81	98	49	61	69	76	49	69	55	47	32	46
23	69	84	50	57	66	72	48	64	50	43	37	65
24	68	76	51	53	61	69	46	59	46	40	41	62
25	66	70	45	51	56	67	47	54	49	48	39	169
26	61	76	48	48	57	68	58	51	50	51	64	231
27	54	77	50	40	55	69	46	57	52	47	81	185
28	48	76	47	47	52	67	46	65	50	47	73	132
29	45	72	47	45	---	64	48	60	41	44	63	118
30	43	69	48	40	---	62	52	54	39	42	55	154
31	43	---	48	42	---	59	---	47	---	40	49	---
TOTAL	1603	2018	1736	1537	1591	2264	1650	1620	1684	1592	1314	2121
MEAN	51.7	67.3	56.0	49.6	56.8	73.0	55.0	52.3	56.1	51.4	42.4	70.7
MAX	97	123	75	71	76	108	69	79	73	94	81	231
MIN	35	42	45	40	45	50	46	36	38	33	32	38
CFSM	1.33	1.73	1.44	1.28	1.46	1.88	1.41	1.34	1.44	1.32	1.09	1.82
IN.	1.53	1.93	1.66	1.47	1.52	2.17	1.58	1.55	1.61	1.52	1.26	2.03

CAL YR 1985 TOTAL 19602 MEAN 53.7 MAX 174 MIN 19 CFMS 1.38 IN 18.74
WTR YR 1986 TOTAL 20730 MEAN 56.8 MAX 231 MIN 32 CFMS 1.46 IN 19.82

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105700 AUGUSTA CREEK NEAR AUGUSTA, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965-66, 1986.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)
AUG 01...	0900	39	428	8.20	20.5	4.0	7.8	89	240	21	65	
		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)	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)	
	20	4.7	4	.80	2.7	18	7.7	.10	14	272	260	
		SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, 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)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)
	.37	29	<.010	.050	.55	1.6	.040	.010	1	<10	<10	
		COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	
	<50	<10	650	<100	100	.10	80	<10	35	3.7		

STREAMS TRIBUTARY TO LAKE MICHIGAN

103

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.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April to August 1931, October 1932 to December 1979, October 1984 to current year. 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: June 4 to July 16, and July 22 to Sept. 3. Water-discharge records good except for estimated daily discharges, which are poor. Flow regulated by powerplants upstream from station. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--49 years (water years 1933-79, 1985-86), 859 ft³/s, 11.55 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, 3,760 ft³/s, Mar. 15, gage height, 5.18 ft; minimum daily, 538 ft³/s, Oct. 18, 19.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	622	1080	1710	1120	1090	1220	1330	1060	1050	780	700	680
2	622	1050	1670	1010	1190	1170	1300	1110	1130	820	660	620
3	587	1050	1610	1070	1160	1120	1400	1130	1030	920	620	560
4	566	1040	1610	1060	1120	1100	1270	1010	850	880	640	680
5	601	967	1660	1040	1200	1140	1380	947	1060	800	660	768
6	665	921	1500	1010	1540	1130	1300	994	1390	720	600	762
7	697	857	1530	874	1520	1240	1350	965	1700	780	640	603
8	695	846	1530	775	1410	1240	1370	1030	1730	660	800	630
9	690	864	1450	757	1380	1210	1310	1010	1800	760	880	615
10	696	903	1420	898	1540	1280	1200	975	1800	920	860	661
11	698	1280	1420	970	1460	1660	1190	886	1700	960	800	599
12	698	1320	1440	1040	1200	1950	1190	790	1650	1150	760	632
13	632	1200	1400	986	1000	2270	1110	910	1650	1650	720	762
14	660	1420	1290	890	1120	3120	1130	876	1600	1750	760	719
15	747	1430	1200	870	1200	3500	1230	780	1550	1650	680	625
16	646	1430	1190	850	1150	3290	1210	938	1550	1450	660	754
17	563	1430	1170	931	1000	3250	1300	1020	1550	1940	700	591
18	538	1500	1030	999	1030	2900	1310	963	1500	1860	600	639
19	538	1660	951	1240	1130	2590	1230	1160	1400	1470	640	639
20	1220	1710	1000	1330	1350	2510	1280	1490		1410	600	630
21	1510	1740	1050	1370	1520	2250	1280	1500	1300	1230	580	663
22	1490	1910	1100	1380	1440	2270	1300	1350	1100	1150	580	656
23	1450	2010	1120	1430	1460	2150	1260	1550	1050	1050	560	745
24	1630	2050	1150	1470	1500	1830	1230	1480	980	980	560	923
25	1580	1850	1120	1450	1580	1740	1130	1290	900	920	540	1150
26	1380	1710	941	1260	1630	1630	1090	1190	840	880	620	1850
27	1240	1720	714	999	1550	1610	1180	1090	800	860	740	2110
28	1060	1620	748	779	1420	1690	1140	1300	820	840	940	1790
29	1030	1650	849	901	---	1500	999	1350	840	820	1030	2240
30	1050	1710	963	892	---	1430	958	1130	780	760	900	2630
31	1060	---	1150	941	---	1430	---	1100	---	720	780	---
TOTAL	27861	41928	38686	32592	36890	58420	36957	34374	38550	33540	21810	27926
MEAN	899	1398	1248	1051	1318	1885	1232	1109	1285	1082	704	931
MAX	1630	2050	1710	1470	1630	3500	1400	1550	1800	1940	1030	2630
MIN	538	846	714	757	1000	1100	958	780	780	660	540	560
CFSM	.89	1.38	1.24	1.04	1.31	1.87	1.22	1.10	1.27	1.07	.70	.92
IN.	1.03	1.54	1.42	1.20	1.36	2.15	1.36	1.27	1.42	1.24	.80	1.03

CAL YR 1985 TOTAL 470798 MEAN 1290 MAX 6330 MIN 519 CFSM 1.28 IN 17.34
WTR YR 1986 TOTAL 429534 MEAN 1177 MAX 3500 MIN 538 CFSM 1.17 IN 15.82

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106000 KALAMAZOO RIVER AT COMSTOCK, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965-66, 1969-75, 1986.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: December 1968 to September 1975.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: (water years 1969, 1972-73, 1975): Maximum, 33.0°C, July 30, 31, Aug. 1, 1975; minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)
JUL 31...	1120	778	542	8.40	26.0	2.5	9.9	126	270	42	75
		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)	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)
	21	15	11	1.7	1.8	36	31	.20	13	345	330
		SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE TOTAL (MG/L AS P)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)
	.47	.725	.58	.020	.060	.74	1.4	.060	.020	2	<10
		CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (MG/L T/DAY)
	<10	<50	<10	290	<100	70	.10	130	20	8	17

STREAMS TRIBUTARY TO LAKE MICHIGAN

105

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.

WATER-DISCHARGE RECORDS

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.--Estimated daily discharges: June 28 to July 8, and Sept. 12-22. Water-discharge records good except for estimated daily discharges, which are fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 63 ft³/s, July 16, 1986, gage height, 3.41 ft; maximum gage height, 3.52 ft, Oct. 19, 1985; minimum discharge, 11 ft³/s, Aug. 26, 1984; minimum gage height, 1.83 ft, Sept. 14, 1983.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 63 ft³/s, July 16, gage height, 3.41 ft; maximum gage height, 3.52 ft, Oct. 19; minimum daily discharge, 12 ft³/s, Sept. 20, 21; minimum gage height, 1.88 ft, May 14, June 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	16	22	17	18	20	21	21	17	17	17	15
2	15	18	23	16	18	20	21	19	17	17	17	14
3	14	17	21	17	18	20	21	18	16	17	17	14
4	15	17	20	16	22	20	21	18	17	16	17	16
5	16	16	20	17	24	21	21	18	21	14	17	15
6	15	16	20	16	21	23	21	18	20	14	17	15
7	14	16	19	16	20	22	21	18	21	15	18	14
8	15	16	19	16	19	21	20	17	21	19	18	14
9	16	18	19	16	18	22	20	17	19	22	17	14
10	15	27	19	16	18	29	20	17	19	21	17	14
11	16	22	20	16	18	35	20	17	22	24	18	19
12	16	20	20	16	17	29	19	17	21	31	17	18
13	16	20	19	16	17	32	19	17	20	26	17	16
14	16	20	18	16	17	31	21	16	19	23	17	14
15	16	19	18	16	17	29	22	18	20	24	17	13
16	16	23	18	16	17	26	22	19	20	51	16	13
17	16	21	18	17	17	24	22	23	19	38	16	13
18	18	23	18	20	17	25	21	23	19	29	16	15
19	41	39	18	22	20	28	20	25	23	25	16	14
20	28	35	17	19	22	25	20	23	24	21	16	12
21	22	25	17	19	25	23	20	21	21	19	16	12
22	19	22	17	19	23	22	19	20	20	19	15	14
23	17	21	17	19	22	22	19	20	19	19	15	25
24	18	20	17	18	22	22	19	19	19	18	15	21
25	17	20	17	18	21	22	19	18	19	19	16	37
26	16	23	17	17	21	23	19	18	19	18	20	30
27	16	22	17	17	21	23	19	20	20	18	19	29
28	16	21	17	17	21	22	19	20	18	18	17	24
29	16	21	17	17	---	22	19	19	17	18	16	34
30	16	20	17	16	---	22	21	19	18	17	16	42
31	16	---	17	16	---	21	---	18	---	17	15	---
TOTAL	538	634	573	530	551	746	606	591	585	664	518	560
MEAN	17.4	21.1	18.5	17.1	19.7	24.1	20.2	19.1	19.5	21.4	16.7	18.7
MAX	41	39	23	22	25	35	22	25	24	51	20	42
MIN	14	16	17	16	17	20	19	16	16	14	15	12
CFSM	1.06	1.28	1.12	1.04	1.19	1.46	1.22	1.16	1.18	1.30	1.01	1.13
IN.	1.21	1.43	1.29	1.19	1.24	1.68	1.37	1.33	1.32	1.50	1.17	1.26
CAL YR 1985	TOTAL	7261	MEAN	19.9	MAX	54	MIN	13	CFSM	1.21	IN	16.37
WTR YR 1986	TOTAL	7096	MEAN	19.4	MAX	51	MIN	12	CFSM	1.18	IN	16.00

STREAMS TRIBUTARY TO LAKE MICHIGAN
04106180 PORTAGE CREEK AT PORTAGE, MI--Continued
WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1964-66, 1986.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	HARD- NESS, (PER- CENT SATUR- ATION)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)
AUG 01...	0800	23	450	8.10	17.0	1.2	7.6	81	210	22	55
		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)	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)
	17	11	10	1.0	2.8	26	16	<.10	9.9	255	250
		SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE TOTAL (MG/L AS P)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)
	.35	16	.78	.020	.080	.42	1.3	.020	<.010	2	<10
		CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L) (T/DAY)
	<10	<50	<10	350	<100	50	.10	50	<10	4	.25

STREAMS TRIBUTARY TO LAKE MICHIGAN

107

04106300 PORTAGE CREEK NEAR KALAMAZOO, MI

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, 3.0 mi south of Kalamazoo.

DRAINAGE AREA.--22.4 mi².

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.--No estimated daily discharges. 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.--22 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 120 ft³/s (revised) and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Oct. 19	0600	166	2.08	Sept. 25	1100	162	2.13
Nov. 19	0200	160	2.01	Sept. 30	0100	137	1.99
July 16	0400	*196	*2.25				

Minimum discharge, 20 ft³/s, Sept. 20, 21; minimum gage height, 1.23 ft, May 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	32	50	37	41	39	45	39	26	30	30	26
2	30	36	52	40	35	39	44	35	26	32	28	28
3	31	29	51	43	36	42	44	31	25	32	28	30
4	35	30	50	40	59	44	49	30	28	27	28	46
5	36	31	48	39	52	44	48	34	59	26	28	33
6	30	32	47	42	42	49	45	34	39	26	32	28
7	30	35	46	42	37	40	41	33	41	29	36	27
8	31	35	45	40	33	37	37	32	40	40	32	29
9	34	43	48	41	33	43	37	32	36	44	30	30
10	31	64	50	39	36	73	37	28	37	35	29	30
11	32	44	51	37	34	72	37	27	45	47	30	43
12	32	40	50	35	34	57	34	29	40	71	30	35
13	27	44	46	36	32	67	34	30	37	42	32	28
14	30	40	39	38	33	63	45	30	34	38	32	25
15	32	41	38	38	30	57	49	32	38	40	29	25
16	30	53	41	37	29	51	48	41	37	146	25	25
17	30	42	42	42	38	50	44	47	35	71	26	25
18	42	54	42	47	44	54	40	40	34	45	30	28
19	119	113	42	46	54	65	38	53	62	36	30	25
20	53	79	40	43	54	51	37	42	49	41	29	22
21	41	54	39	42	53	48	40	38	33	36	29	21
22	36	49	37	43	45	46	38	35	31	32	30	24
23	34	45	39	41	44	45	38	31	31	32	29	52
24	36	41	36	39	45	47	39	29	32	30	28	29
25	33	45	33	41	44	46	37	27	36	39	30	103
26	29	57	37	38	44	49	37	28	33	30	65	53
27	28	46	37	38	43	46	32	42	38	29	42	46
28	30	45	36	36	41	45	36	36	31	38	32	31
29	33	44	36	35	---	46	34	34	31	32	27	70
30	32	42	39	35	---	43	47	31	33	28	24	91
31	31	---	40	34	---	47	---	27	---	29	23	---
TOTAL	1109	1385	1327	1224	1145	1545	1211	1057	1097	1253	953	1108
MEAN	35.8	46.2	42.8	39.5	40.9	49.8	40.4	34.1	36.6	40.4	30.7	36.9
MAX	119	113	52	47	59	73	49	53	62	146	65	103
MIN	27	29	33	34	29	37	32	27	25	26	23	21

CAL YR 1985 TOTAL 15692 MEAN 43.0 MAX 125 MIN 26
WTR YR 1986 TOTAL 14414 MEAN 39.5 MAX 146 MIN 21

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106320 WEST FORK PORTAGE CREEK NEAR OSHTIMO, 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 Oshtimo.

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.--Estimated daily discharges: Jan. 23 to Feb. 4 and Mar. 25 to Apr. 23. Records good except for estimated daily discharges, which are fair. At times, flow is affected by ground-water withdrawals. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--14 years, 6.86 ft³/s, 7.17 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, 20 ft³/s, Nov. 19, 20; maximum gage height, 1.90 ft, Nov. 19; minimum discharge, 2.1 ft³/s, June 3, 4; minimum gage height, 1.04 ft, May 13, June 3, 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.0	6.3	8.8	6.2	7.8	6.4	7.0	5.5	3.4	3.4	3.3	6.0
2	5.1	7.5	9.1	6.1	8.0	6.4	6.6	5.1	3.0	3.3	3.1	5.3
3	4.9	8.0	8.9	6.3	8.2	6.4	6.6	4.6	2.6	3.2	3.0	4.9
4	5.0	7.9	8.6	6.3	8.6	6.3	7.0	4.3	2.5	3.1	2.8	5.4
5	5.6	7.8	8.2	6.3	11	6.6	7.1	4.1	4.5	3.1	2.8	5.1
6	5.7	7.8	8.0	6.0	9.7	7.7	7.1	4.0	4.9	2.9	2.9	4.8
7	5.5	8.0	7.8	5.7	9.1	7.8	7.1	3.8	5.1	2.9	3.0	4.4
8	5.3	7.9	7.5	5.7	8.7	8.0	6.9	3.5	5.3	3.3	3.0	4.0
9	5.5	8.1	7.6	5.7	8.2	8.1	6.7	3.3	4.8	3.7	3.0	3.7
10	5.5	11	7.8	5.5	7.7	9.8	6.5	3.0	4.8	3.5	3.0	3.5
11	5.5	11	8.3	5.6	7.4	12	6.4	2.9	4.8	4.0	3.1	3.9
12	5.6	11	8.3	5.9	7.2	12	6.3	2.9	4.7	5.1	3.0	4.4
13	5.7	13	7.9	5.6	7.2	13	6.3	2.8	4.1	5.1	2.9	4.6
14	5.5	13	7.4	5.7	6.9	13	6.5	2.9	3.7	4.6	2.9	4.5
15	5.5	12	7.1	5.6	6.6	12	6.9	2.9	4.2	4.5	2.9	4.5
16	5.3	13	6.8	5.5	6.6	11	7.3	3.8	3.9	8.2	2.9	4.3
17	5.1	13	6.5	6.0	6.8	11	7.9	4.0	3.6	8.6	2.8	4.2
18	5.7	12	6.5	7.0	7.0	11	7.9	4.4	3.3	7.9	2.8	4.2
19	12	18	6.4	7.6	7.4	12	7.8	5.3	4.6	6.7	2.6	4.2
20	13	20	6.3	7.3	8.0	11	7.5	5.6	5.3	6.2	2.6	4.3
21	12	17	6.3	6.9	9.0	10	6.9	5.3	4.9	5.3	2.5	4.3
22	9.9	14	6.4	7.2	8.5	9.5	6.3	5.0	4.7	4.8	2.4	4.4
23	8.6	13	6.4	7.0	7.9	8.8	5.8	4.3	4.2	4.4	2.5	5.5
24	8.1	11	6.6	6.8	7.5	8.3	5.4	3.8	3.8	3.9	2.4	5.9
25	7.6	11	6.4	6.8	7.1	8.1	5.1	3.7	3.4	4.0	2.4	10
26	7.0	11	6.4	7.0	7.0	7.9	5.2	3.6	3.1	3.9	3.9	12
27	6.5	10	6.5	7.2	6.7	7.8	4.9	4.7	3.4	3.7	6.3	13
28	6.2	9.9	6.4	7.4	6.6	7.7	5.0	4.7	3.6	3.9	7.8	11
29	5.9	9.3	6.4	7.6	---	7.6	4.8	4.4	3.4	3.9	7.9	12
30	5.9	8.7	6.3	8.0	---	7.6	5.2	4.1	3.4	3.7	7.4	14
31	5.9	---	6.1	7.8	---	7.4	---	3.7	---	3.5	6.7	---
TOTAL	205.6	331.2	224.0	201.3	218.4	282.2	194.0	126.0	121.0	138.3	110.6	182.3
MEAN	6.63	11.0	7.23	6.49	7.80	9.10	6.47	4.06	4.03	4.46	3.57	6.08
MAX	13	20	9.1	8.0	11	13	7.9	5.6	5.3	8.6	7.9	14
MIN	4.9	6.3	6.1	5.5	6.6	6.3	4.8	2.8	2.5	2.9	2.4	3.5
CFSM	.51	.85	.56	.50	.60	.70	.50	.31	.31	.34	.28	.47
IN.	.59	.95	.64	.58	.62	.81	.56	.36	.35	.40	.32	.52
CAL YR 1985	TOTAL	2251.1	MEAN	6.17	MAX	20	MIN	3.2	CFSM	.48	IN	6.44
WTR YR 1986	TOTAL	2334.9	MEAN	6.40	MAX	20	MIN	2.4	CFSM	.49	IN	6.68

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04106400 WEST FORK PORTAGE CREEK AT KALAMAZOO, MI

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.

DRAINAGE AREA.--18.7 mi².

WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder and V-notch sharp-crested weir. Datum of gage is 858.09 ft above National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Estimated daily discharges: Nov. 15 to Dec. 19, Dec. 24 to Jan. 2, Jan. 30 to Feb. 1, Feb. 10-18, Aug. 24 to Sept. 2, and Sept. 23-30. Water-discharge records good except for estimated daily discharges, which are poor. At times, flow is affected by ground-water withdrawals.

AVERAGE DISCHARGE.--27 years, 9.91 ft³/s, 7.20 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 daily discharge, 33 ft³/s, Nov. 20; minimum daily, 4.7 ft³/s, Aug. 19-21, 23-25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.4	10	14	10	13	11	11	10	7.7	7.0	7.2	10
2	8.4	11	15	9.8	13	11	10	9.5	7.2	7.0	6.9	9.0
3	8.4	11	15	9.6	13	11	10	8.8	6.7	6.9	6.8	8.4
4	8.7	11	14	9.2	14	11	11	8.1	6.5	6.5	6.6	10
5	9.9	11	14	9.2	16	11	11	7.6	9.1	6.2	6.5	10
6	10	11	13	9.2	16	12	11	7.3	11	6.0	6.6	9.2
7	9.9	11	13	9.2	15	12	11	7.2	9.9	6.3	6.8	8.6
8	9.7	11	12	9.2	15	12	11	6.9	10	7.1	6.6	8.1
9	9.9	12	12	9.2	14	12	10	6.6	9.6	8.5	6.1	7.6
10	10	16	13	9.1	13	15	10	6.2	9.0	8.4	6.0	7.6
11	10	16	13	8.9	13	19	9.8	6.0	9.2	9.1	6.3	8.1
12	10	15	14	8.7	12	18	9.8	6.1	9.2	14	5.7	9.2
13	10	16	13	8.6	12	19	9.8	6.3	8.8	12	5.4	8.9
14	10	16	12	8.6	12	19	10	6.3	7.7	11	5.2	8.4
15	9.8	16	12	8.6	11	18	11	6.4	8.3	10	5.4	7.8
16	9.8	17	11	8.6	11	17	12	7.7	8.3	21	5.1	7.3
17	9.5	19	11	8.9	11	16	13	8.3	8.3	19	5.1	7.0
18	9.8	18	11	11	12	15	13	8.7	8.3	15	4.9	6.8
19	21	25	11	12	12	17	13	10	10	13	4.7	6.8
20	21	33	10	12	13	16	13	11	14	13	4.7	7.0
21	20	30	10	12	14	15	14	11	12	11	4.7	7.0
22	18	25	11	12	14	14	13	10	10	9.8	4.9	7.0
23	16	22	10	11	14	13	12	9.6	9.2	9.0	4.7	8.5
24	15	20	10	11	13	12	11	9.0	8.2	8.2	4.7	12
25	14	19	10	11	13	12	10	8.4	7.2	8.4	4.7	18
26	13	18	10	12	12	12	11	7.9	6.7	8.5	6.0	23
27	12	17	10	12	12	12	11	8.7	6.9	8.3	9.5	26
28	12	16	10	12	11	12	9.9	9.5	7.3	8.1	11	23
29	11	16	10	12	---	12	9.5	9.3	7.0	8.0	13	25
30	11	15	10	13	---	12	9.7	8.7	7.0	7.8	12	27
31	11	---	10	13	---	11	---	8.2	---	7.5	11	---
TOTAL	367.2	504	364	320.6	364	429	331.5	255.3	260.3	301.6	204.8	342.3
MEAN	11.8	16.8	11.7	10.3	13.0	13.8	11.1	8.24	8.68	9.73	6.61	11.4
MAX	21	33	15	13	16	19	14	11	14	21	13	27
MIN	8.4	10	10	8.6	11	11	9.5	6.0	6.5	6.0	4.7	6.8
CFSM	.63	.90	.63	.55	.70	.74	.59	.44	.46	.52	.35	.61
IN.	.73	1.00	.72	.64	.72	.85	.66	.51	.52	.60	.41	.68
CAL YR 1985	TOTAL	4017.4	MEAN	11.0	MAX	33	MIN	5.9	CFSM	.59	IN	7.99
WTR YR 1986	TOTAL	4044.6	MEAN	11.1	MAX	33	MIN	4.7	CFSM	.59	IN	8.05

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106400 WEST FORK PORTAGE CREEK AT KALAMAZOO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965, 1971-75, 1986.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April to June 1971.

WATER TEMPERATURE: April 1971 to April 1972.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum recorded (more than 20 percent missing record), 410 microsiemens, June 22, 23, 1971; minimum recorded, 310 microsiemens, May 24, 1971.

WATER TEMPERATURE (water year 1971): maximum, 34.0°C, June 28, 1971.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)
JUL 31...	1630	6.8	420	8.20	28.0	1.5	5.8		77	170	10	36
		MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	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)	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)	
		20	18	18	1.0	2.0	21	34	<.10	12	234	
		SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, TOTAL (MG/L AS P)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	
		240	.32	4.3	<.010	.030	.57	.020	<.010	<1	<10	
		CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	SEDI- MENT, SUS- PENDE (MG/L)	
		<10	<50	<10	20	<100	20	.10	40	<10	<1	

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04106500 PORTAGE CREEK AT KALAMAZOO, MI

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, 1.5 mi upstream from mouth.

DRAINAGE AREA.--46.8 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1947 to September 1958, June 1975 to September 1986 (discontinued). Monthly discharge only for some periods, published in WSP 1307.

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.

REMARKS.--No estimated daily discharges. Water-discharge records good. Some regulation by millponds upstream from station. Flow includes water which is pumped from ground-water sources by industry and discharged into stream 5.0 mi upstream from station.

AVERAGE DISCHARGE.--22 years, 53.9 ft³/s, 15.64 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, 261 ft³/s, Sept. 25, gage height, 4.25 ft; minimum, 4.2 ft³/s, Oct. 18, gage height, 1.47 ft; minimum daily, 31 ft³/s, Aug. 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	50	70	48	61	52	59	53	40	41	40	34
2	46	57	74	49	55	53	56	50	39	41	39	34
3	45	48	69	52	51	57	53	46	39	41	38	35
4	50	48	68	51	80	59	66	45	40	38	39	57
5	52	48	65	49	83	60	61	45	83	35	37	40
6	45	47	65	50	61	66	59	48	62	35	41	36
7	44	49	65	49	52	57	55	45	53	35	44	34
8	45	48	62	48	51	51	50	44	56	49	41	34
9	50	58	63	49	52	58	50	44	47	53	38	35
10	46	98	65	48	52	89	50	42	50	41	39	36
11	46	63	67	48	49	114	50	41	53	55	39	53
12	52	58	65	47	47	84	49	41	51	100	37	45
13	45	67	62	47	46	91	47	43	48	56	37	38
14	46	60	54	48	47	88	55	42	46	46	38	36
15	48	59	53	48	46	79	67	45	53	47	36	35
16	45	79	55	47	45	72	62	57	47	160	33	36
17	44	64	55	54	48	68	59	61	45	116	32	34
18	63	77	52	61	59	73	54	55	44	66	33	40
19	172	158	51	61	74	90	53	69	73	52	34	36
20	114	139	50	57	74	70	53	58	86	56	33	36
21	69	103	50	56	74	67	55	54	51	50	33	34
22	61	79	48	57	61	64	54	51	46	46	32	37
23	58	71	49	55	62	62	53	47	44	45	32	75
24	62	65	48	52	60	61	55	46	44	41	31	46
25	55	65	46	55	58	61	51	44	45	53	32	153
26	50	82	47	51	59	67	54	43	43	44	76	113
27	48	68	49	49	57	62	48	63	50	41	76	99
28	47	66	48	50	55	60	51	52	43	56	41	61
29	50	64	47	49	---	60	49	48	41	44	38	109
30	48	62	48	48	---	59	66	46	42	40	34	156
31	47	---	50	47	---	59	---	43	---	40	34	---
TOTAL	1740	2100	1760	1580	1619	2113	1644	1511	1504	1663	1207	1647
MEAN	56.1	70.0	56.8	51.0	57.8	68.2	54.8	48.7	50.1	53.6	38.9	54.9
MAX	172	158	74	61	83	114	67	69	86	160	76	156
MIN	44	47	46	47	45	51	47	41	39	35	31	34
CAL YR 1985	TOTAL	21268	MEAN	58.3	MAX	191	MIN	35				
WTR YR 1986	TOTAL	20088	MEAN	55.0	MAX	172	MIN	31				

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106500 PORTAGE CREEK AT KALAMAZOO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1968, 1971 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: May 1968 to September 1968, April 1972 to December 1974.

WATER TEMPERATURE: April 1972 to August 1974, August 1975 to September 1986.

INSTRUMENTATION.--Specific-conductance recorder from May 10, 1968 to Sept. 20, 1968. Water-quality monitor from Apr. 13, 1972 to Dec. 31, 1974, and from Aug. 6, 1975 to Sept. 30, 1986.

REMARKS.--Interruptions in the daily record were due to malfunctions of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1968, 1973): Maximum recorded (more than 20 percent missing record), 1450 microsiemens, June 12, 1968; minimum recorded (more than 20 percent missing record), 150 microsiemens, June 25, 1968.

WATER TEMPERATURE (water years 1973, 1977-81, 1985, 1986): Maximum, 32.5°C, Mar. 4, 1981; minimum, 0.0°C, Dec. 31, 1976, Jan. 1, 2, 1977, Feb. 7, 1986.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum recorded (more than 20 percent missing record), 29.5°C, July 18; minimum recorded (more than 20 percent missing record), 0.0°C, Feb. 7.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)
JUL 31...	1030	39	564	8.20	20.0	2.7	8.0	90	280	50	73
	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	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)	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)
	23	21	14	1.4	2.8	36	38	.10	12	331	340
	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, 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)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)
	.45	35	.48	.020	.140	.56	1.2	.040	.030	5	<10
	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
	<10	<50	<10	1300	<100	130	.10	80	30	38	4.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04106500 PORTAGE CREEK AT KALAMAZOO, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER			DECEMBER			JANUARY		
1	14.5	14.5	14.5	10.0	8.0	9.5	6.5	6.0	6.0	---	---	---
2	14.0	14.0	14.0	10.5	8.5	9.5	5.5	2.0	3.0	---	---	---
3	14.0	14.0	14.0	11.5	9.5	11.0	6.0	3.0	5.0	---	---	---
4	14.0	13.5	14.0	---	---	---	6.0	5.5	5.5	---	---	---
5	14.0	13.5	13.5	---	---	---	6.0	5.0	5.5	---	---	---
6	14.0	14.0	14.0	---	---	---	6.0	5.0	5.5	---	---	---
7	14.0	14.0	14.0	---	---	---	6.0	4.0	5.0	---	---	---
8	14.0	14.0	14.0	11.0	8.5	9.5	5.0	3.0	4.0	---	---	---
9	---	---	---	10.0	9.0	9.5	5.5	4.5	5.0	---	---	---
10	14.0	14.0	14.0	9.0	6.5	7.5	6.0	5.5	5.5	---	---	---
11	14.5	14.0	14.0	7.5	6.0	6.5	5.5	4.5	5.0	---	---	---
12	14.5	14.5	14.5	9.5	7.5	8.5	5.0	4.5	5.0	---	---	---
13	14.0	14.0	14.0	10.5	9.5	10.0	---	---	---	---	---	---
14	14.0	14.0	14.0	10.0	8.5	9.5	---	---	---	---	---	---
15	14.0	14.0	14.0	8.5	7.5	8.0	---	---	---	---	---	---
16	14.0	14.0	14.0	8.0	7.5	8.0	---	---	---	---	---	---
17	14.0	13.5	13.5	8.5	6.5	7.5	---	---	---	---	---	---
18	13.5	13.0	13.0	11.0	8.0	9.0	---	---	---	---	---	---
19	13.5	13.0	13.0	12.0	10.5	11.0	3.5	2.0	2.5	---	---	---
20	13.5	13.5	13.5	12.5	7.0	10.0	4.0	2.5	3.0	---	---	---
21	13.5	13.5	13.5	6.5	5.0	6.0	---	---	---	---	---	---
22	13.5	13.5	13.5	5.5	4.5	5.0	---	---	---	---	---	---
23	13.5	13.0	13.5	6.0	5.5	6.0	---	---	---	---	---	---
24	13.0	13.0	13.0	6.5	5.0	5.5	---	---	---	---	---	---
25	13.0	13.0	13.0	6.0	5.0	5.0	---	---	---	---	---	---
26	13.0	13.0	13.0	7.5	5.5	6.5	---	---	---	---	---	---
27	13.0	13.0	13.0	7.0	5.5	6.0	---	---	---	---	---	---
28	13.0	11.0	12.5	6.0	5.0	5.5	---	---	---	---	---	---
29	14.0	12.5	13.5	6.5	5.5	6.0	---	---	---	---	---	---
30	13.0	11.0	12.5	6.5	6.0	6.0	---	---	---	---	---	---
31	11.0	9.5	10.5	---	---	---	---	---	---	4.5	2.0	3.5
MONTH	14.5	9.5	13.5	12.5	4.5	8.0	6.5	2.0	4.5	4.5	2.0	3.5

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH			APRIL			MAY		
1	4.5	2.5	3.5	9.0	6.0	8.0	17.5	13.5	15.5	19.5	12.0	16.0
2	12.5	3.0	5.0	7.0	5.0	6.5	18.0	13.5	15.5	17.5	11.0	14.0
3	12.5	4.0	8.0	5.5	1.5	4.0	19.0	14.0	16.5	19.0	11.5	15.0
4	12.5	1.5	5.0	4.5	2.5	3.5	19.0	13.0	15.5	21.0	17.5	19.0
5	8.0	2.0	3.0	6.5	3.0	5.5	17.0	9.5	12.5	23.0	17.5	20.0
6	8.0	2.0	3.5	7.5	5.0	6.5	12.5	7.0	9.0	23.0	16.0	20.5
7	8.5	.0	2.5	8.5	5.5	7.0	13.5	9.0	11.5	22.5	16.5	19.0
8	3.5	1.5	2.5	---	---	---	15.0	10.0	13.0	23.0	17.0	20.0
9	3.5	1.5	2.0	---	---	---	16.0	11.5	13.5	23.0	14.5	17.5
10	2.5	1.0	2.0	---	---	---	18.0	11.0	14.0	19.5	12.5	15.0
11	2.0	1.0	1.5	---	---	---	13.5	9.5	11.5	20.0	15.0	17.5
12	3.5	1.5	2.5	---	---	---	10.5	9.0	9.5	21.0	16.0	18.5
13	4.0	2.0	2.5	---	---	---	15.0	9.5	11.0	21.0	17.5	19.0
14	3.0	1.0	2.0	11.5	7.5	9.0	17.5	12.0	15.0	20.0	17.0	18.5
15	6.0	3.0	5.0	10.0	8.0	9.0	18.5	14.0	16.5	23.0	17.5	19.0
16	11.5	5.0	6.5	9.5	7.0	8.0	18.5	13.0	15.5	23.5	18.5	21.0
17	6.0	5.0	5.5	10.0	7.5	9.0	13.5	11.0	12.0	26.0	19.5	22.0
18	5.0	2.0	3.5	11.0	9.5	10.5	12.0	7.0	9.0	26.5	20.0	23.0
19	5.0	2.5	3.5	9.5	5.0	7.5	---	---	---	27.0	21.0	24.0
20	6.0	4.0	4.5	10.0	5.5	7.5	---	---	---	26.0	17.5	21.0
21	7.0	4.0	5.5	11.5	6.5	9.5	---	---	---	23.0	15.5	19.5
22	7.5	4.0	6.0	14.0	8.5	11.5	---	---	---	---	---	---
23	6.5	5.0	5.5	16.0	10.0	12.5	---	---	---	---	---	---
24	6.5	4.5	5.5	15.0	9.5	12.5	18.5	11.5	15.0	---	---	---
25	6.5	3.0	5.0	15.5	11.0	13.0	22.5	15.0	18.5	---	---	---
26	6.0	3.5	5.0	19.0	13.0	16.0	24.0	18.0	21.0	---	---	---
27	6.0	5.0	5.5	19.5	14.5	17.0	23.5	18.0	21.0	---	---	---
28	7.5	6.0	7.0	19.0	13.5	16.0	21.5	15.0	18.5	---	---	---
29	---	---	---	15.5	11.0	13.5	21.0	14.0	18.0	---	---	---
30	---	---	---	16.5	11.5	14.0	18.5	15.5	17.5	---	---	---
31	---	---	---	16.5	12.5	13.5	---	---	---	---	---	---
MONTH	12.5	.0	4.5	19.5	1.5	10.0	24.0	7.0	14.5	27.0	11.0	19.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106500 PORTAGE CREEK AT KALAMAZOO, MI--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	---	---	---	20.0	15.5	18.0	25.0	20.5	23.0	22.0	17.0	19.5
2	---	---	---	23.0	18.0	20.0	23.5	19.0	21.5	22.5	17.0	20.0
3	---	---	---	23.5	17.0	20.0	22.5	18.5	20.5	22.5	18.0	20.5
4	---	---	---	23.5	17.5	20.5	23.0	18.0	20.5	23.0	19.5	21.0
5	22.5	19.5	20.0	27.0	20.0	23.5	22.5	18.5	20.5	21.0	17.5	19.5
6	19.5	18.0	18.5	27.5	22.0	25.0	21.5	19.0	20.0	18.0	16.0	17.5
7	21.5	18.0	19.5	26.5	22.5	24.5	22.0	18.0	20.0	17.5	14.0	15.5
8	25.0	19.0	21.5	24.5	21.5	23.0	23.5	18.0	20.5	17.0	12.5	15.0
9	24.5	18.0	21.5	26.0	21.5	23.5	23.5	18.5	21.5	18.0	13.5	16.0
10	22.0	18.5	19.5	24.0	20.5	22.0	22.0	19.0	20.0	19.0	16.0	17.5
11	24.5	18.5	21.0	21.5	19.0	19.5	21.5	17.0	19.0	19.5	18.5	19.0
12	22.5	18.0	20.0	22.5	19.0	20.5	21.5	15.5	19.0	19.0	16.5	17.5
13	23.0	17.0	19.5	25.5	19.5	22.0	22.0	16.5	19.5	18.0	14.5	16.0
14	20.5	17.5	18.5	26.0	19.5	22.0	20.5	18.0	19.5	18.0	13.5	16.0
15	22.0	17.0	19.0	---	---	---	22.5	19.0	20.5	17.5	15.0	16.5
16	25.5	19.5	22.0	---	---	---	23.0	19.0	21.0	19.0	13.5	16.0
17	23.5	18.0	21.0	27.5	22.5	24.5	24.5	19.5	22.5	17.5	13.0	15.5
18	23.5	17.0	20.0	29.5	23.0	26.0	24.0	20.0	22.0	17.5	15.0	16.5
19	22.0	18.5	20.0	28.0	23.5	25.5	24.0	18.5	21.5	17.5	15.5	16.5
20	25.0	19.0	21.5	27.5	22.0	25.0	24.0	19.0	22.0	18.5	16.0	17.5
21	26.0	19.0	22.5	26.0	21.0	23.5	24.0	19.0	21.5	19.0	16.5	18.0
22	25.0	22.0	23.5	24.5	20.0	22.0	24.0	19.5	22.0	19.5	16.5	18.0
23	26.5	20.5	23.5	26.0	19.5	22.5	22.5	20.5	21.5	22.0	18.0	20.5
24	23.0	19.0	21.5	26.0	20.5	23.5	22.0	17.0	19.5	20.5	18.0	19.0
25	23.5	16.0	20.0	24.5	21.5	22.5	21.5	18.5	20.0	20.0	17.5	19.0
26	24.0	18.0	20.5	26.0	19.5	22.5	20.0	18.0	19.0	21.5	20.0	21.0
27	24.5	20.5	22.0	26.5	20.0	23.5	19.5	16.5	18.0	22.0	20.0	21.0
28	23.5	20.5	22.0	26.0	21.0	23.5	18.5	13.0	16.0	22.0	19.5	20.5
29	25.0	19.0	22.0	25.0	19.5	22.5	19.0	13.5	16.5	22.5	19.5	21.0
30	22.5	17.5	19.0	25.0	19.0	22.0	20.5	14.0	17.0	21.5	20.5	21.0
31	---	---	---	26.0	20.0	23.0	21.5	15.5	19.0	---	---	---
MONTH	26.5	16.0	21.0	29.5	15.5	22.5	25.0	13.0	20.0	23.0	12.5	18.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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: Dec. 19, 20, Dec. 25 to Jan. 2, Jan. 4-10, 13, 16, Feb. 23, and Sept. 13, 14. Records good. 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.--56 years, 1,439 ft³/s, 12.21 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, 6,390 ft³/s, Sept. 26, gage height, 12.96 ft; minimum daily, 849 ft³/s, Sept. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1020	1670	2610	1500	1790	2250	2230	1590	1920	1550	1280	1360
2	989	1520	2540	1700	1740	2220	1990	1510	1900	1230	1270	1070
3	986	1820	2520	2240	1820	1970	1980	1720	1540	1520	1260	1070
4	1030	1650	2730	1700	1940	1770	1990	1750	1230	1440	1250	1090
5	1150	1350	2590	1600	2150	1740	1990	1360	1410	1420	1240	1100
6	1150	1700	2370	1500	2320	1800	2000	1020	2090	1210	1230	1130
7	1110	1170	2300	1300	2330	1870	2150	1400	1910	1200	1240	1500
8	1110	1480	2350	1000	2330	1890	2170	1800	2070	1450	1230	1600
9	1120	1780	2340	1250	2330	2000	2000	1790	2260	1880	1230	977
10	1170	1370	2340	1450	2290	2180	1980	1460	2270	1920	1220	849
11	1150	1350	2190	1870	2230	2910	1970	1170	2270	1790	1220	1470
12	1150	1850	1990	1370	2230	4610	1890	1470	2320	1550	1220	1840
13	1170	2060	2090	1200	2220	3640	1780	1520	2730	2540	1210	1400
14	1130	2270	2130	1850	2050	3740	1770	1060	2700	3050	1200	1250
15	1140	2160	1900	1610	1850	3970	1760	1020	2390	2140	1200	1210
16	1110	1980	1910	1100	1810	4300	1820	1450	2340	3170	1200	1370
17	1180	1970	1960	1720	1910	4520	1940	1620	2320	3900	1200	1210
18	1170	2130	1890	1410	1870	4320	1920	1540	2310	3850	1190	1530
19	1420	2610	1250	2100	1840	4300	1940	2050	2120	3440	1130	1480
20	2050	3640	1500	2310	1940	4170	2060	2250	2140	3020	1070	1140
21	2330	3660	1800	2300	2130	3860	1900	2220	2680	2370	1070	1120
22	2290	3630	1390	2280	2420	3490	1590	2220	2730	2340	1080	1250
23	2240	3120	1800	2260	2100	3170	1590	2120	2040	2290	1040	1400
24	2190	2810	1790	2210	2310	3190	1680	1880	1740	1820	1000	1770
25	2130	2990	1400	2100	2300	2980	1920	1930	1730	1660	935	2100
26	2340	2990	1800	2090	2260	2620	1840	1930	1740	2010	867	4190
27	2340	3020	1500	2060	2250	2390	1910	1940	1240	2030	1650	4790
28	2160	3080	1300	1530	2280	2360	1900	1940	1230	1930	1740	4300
29	1690	2720	1250	1270	---	2350	1900	1940	1580	1990	1730	4710
30	1250	2620	1260	1500	---	2350	1900	2050	1870	1840	1730	4810
31	1810	---	1280	1830	---	2330	---	1980	---	1310	1710	---
TOTAL	46275	68170	60070	53210	59040	91260	57460	52700	60820	64860	38842	56086
MEAN	1493	2272	1938	1716	2109	2944	1915	1700	2027	2092	1253	1870
MAX	2340	3660	2730	2310	2420	4610	2230	2250	2730	3900	1740	4810
MIN	986	1170	1250	1000	1740	1740	1590	1020	1230	1200	867	849
CFSM	.93	1.42	1.21	1.07	1.32	1.84	1.20	1.06	1.27	1.31	.78	1.17
IN.	1.08	1.58	1.40	1.24	1.37	2.12	1.34	1.23	1.41	1.51	.90	1.30

CAL YR 1985 TOTAL 744070 MEAN 2039 MAX 7640 MIN 801 CFSM 1.27 IN 17.30
WTR YR 1986 TOTAL 708793 MEAN 1942 MAX 4810 MIN 849 CFSM 1.21 IN 16.48

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.

REMARKS.--Estimated daily discharges: Nov. 22-26, Dec. 15 to Jan. 17, Jan. 25 to Feb. 3, Feb. 10-17, and Feb. 25 to Mar. 8. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 57.7 ft³/s, 10.97 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)
Mar. 11	0100	*675	*8.33	July 16	1400	537	7.99
June 12	0900	480	7.73	Sept.30	0900	372	7.42
June 15	2100	404	7.40				

Minimum discharge, 18 ft³/s, Oct. 4, gage height, 2.02 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	26	61	39	47	48	55	54	51	56	43	30
2	21	30	85	39	54	47	58	47	46	58	39	29
3	19	39	69	38	68	46	55	43	42	52	37	29
4	19	34	63	38	89	46	60	41	40	48	35	31
5	25	30	59	37	215	48	60	40	163	45	33	30
6	25	29	58	37	150	51	61	38	178	42	33	29
7	23	28	58	37	98	54	58	36	109	39	61	28
8	20	27	59	38	87	58	55	34	90	54	58	27
9	21	26	62	38	71	61	53	32	68	95	45	26
10	23	41	63	39	60	275	52	32	60	73	40	32
11	24	46	70	39	54	569	49	32	166	61	38	117
12	23	38	68	40	52	382	47	31	448	188	35	241
13	26	48	57	41	51	317	46	30	336	208	34	161
14	26	48	47	42	50	301	45	30	197	123	32	92
15	24	42	46	43	49	257	58	30	271	88	31	67
16	24	49	44	44	49	195	58	41	329	412	31	58
17	23	63	43	58	50	150	57	50	185	344	30	52
18	22	52	42	132	52	130	52	122	108	190	29	59
19	47	140	42	250	65	148	48	182	143	105	28	63
20	59	199	41	179	109	123	47	235	271	83	27	58
21	46	165	40	106	119	97	48	187	175	69	27	54
22	39	95	40	118	109	89	46	140	104	60	26	53
23	34	86	40	87	86	84	43	104	84	54	28	130
24	39	78	39	67	72	78	41	82	74	49	31	102
25	51	62	39	56	60	74	41	68	66	72	28	172
26	41	66	39	52	56	73	71	61	60	104	35	192
27	35	73	38	50	52	75	73	93	68	76	62	240
28	31	67	38	45	50	69	59	156	76	66	45	167
29	28	63	38	43	---	64	58	87	65	58	38	239
30	27	58	38	44	---	60	55	67	58	50	34	355
31	26	---	39	45	---	57	---	58	---	46	32	---
TOTAL	913	1848	1565	1961	2124	4126	1609	2283	4131	3068	1125	2963
MEAN	29.5	61.6	50.5	63.3	75.9	133	53.6	73.6	138	99.0	36.3	98.8
MAX	59	199	85	250	215	569	73	235	448	412	62	355
MIN	19	26	38	37	47	46	41	30	40	39	26	26
CFSM	.41	.86	.71	.89	1.06	1.86	.75	1.03	1.93	1.39	.51	1.38
IN.	.48	.96	.82	1.02	1.11	2.15	.84	1.19	2.15	1.60	.59	1.54
CAL YR 1985	TOTAL	23298	MEAN	63.8	MAX	700	MIN	16	CFSM	.89	IN	12.14
WTR YR 1986	TOTAL	27716	MEAN	75.9	MAX	569	MIN	19	CFSM	1.06	IN	14.44

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 1986 (discontinued).

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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)
OCT 30...	1130	1770	572	8.10	10.0	5.0	9.9	89	K100	E60	260
MAR 19...	1100	2840	401	8.00	4.5	12	12.0	96	K30	--	190
JUN 25...	1315	2900	494	8.00	20.5	--	--	--	200	930	--
SEP 11...	1030	1820	517	8.20	19.0	7.2	7.2	81	200	310	230

DATE	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)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 30...	56	70	21	17	12	.5	2.7	206	3.2	49
MAR 19...	69	52	14	10	10	.3	2.3	--	2.3	36
JUN 25...	--	--	--	--	--	--	--	--	4.1	--
SEP 11...	40	59	20	18	14	.5	2.3	180	2.2	43

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108690 KALAMAZOO RIVER AT SAUGATUCK, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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	31	.10	8.7	360	330	.49	1720	.98
MAR 19...	1100	19	.20	5.9	231	220	.31	1770	1.6
JUN 25...	1315	--	--	--	--	--	--	--	.88
SEP 11...	1030	34	.30	.9	324	290	.44	1590	.39

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...	.050	1.0	.080	.020	.020	11	53	91
MAR 19...	.090	1.1	.080	.030	.020	21	161	89
JUN 25...	.030	1.0	.110	.040	.020	13	102	93
SEP 11...	.060	1.0	.140	.030	.010	21	103	77

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	63	.8	<1	1	<3	3	40	<5
MAR 19...	10	<1	44	<.5	<1	<1	<3	1	55	<5
SEP 11...	<10	1	62	<.5	<1	<1	<3	3	12	<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 30...	8	22	.4	<10	4	<1	<1	150	<6	13
MAR 19...	6	14	<.1	<10	2	<1	<1	110	<6	17
SEP 11...	9	2	<.1	<10	<1	<1	<1	140	<6	7

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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. 14 to Jan. 16, Jan. 27 to Feb. 2, Feb. 10-17, and Feb. 25 to Mar. 8. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 67.6 ft³/s, 13.95 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)
Jan. 19	0600	1,650	11.52	July 16	1500	1,740	11.63
Mar. 10	2400	*3,050	*13.00	Sept. 27	0400	1,370	11.04
July 12	2200	970	10.05	Sept. 30	0700	1,840	11.75

Minimum discharge, 3.8 ft³/s, Oct. 4; minimum gage height, 1.75 ft, Oct. 3, 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.9	13	90	43	35	41	29	14	16	15	18	5.7
2	4.8	185	151	44	80	37	31	12	14	15	17	5.2
3	4.3	190	65	44	115	35	27	11	12	13	15	5.0
4	4.7	60	61	43	195	35	27	11	12	12	14	5.4
5	9.2	35	60	42	631	37	29	11	16	11	13	4.9
6	7.6	27	62	41	315	43	43	9.4	17	9.8	13	4.9
7	5.3	34	71	40	146	48	30	8.7	24	9.4	18	4.8
8	4.6	31	83	39	98	53	25	8.5	23	85	15	5.0
9	8.2	30	116	39	73	86	22	8.3	18	76	13	5.5
10	13	273	121	39	56	1150	21	7.7	17	33	13	31
11	11	129	145	40	47	2030	19	7.4	84	61	13	324
12	15	60	110	39	42	900	18	6.7	254	565	11	579
13	26	175	52	38	39	674	17	5.8	94	654	9.7	352
14	16	115	45	40	38	604	17	5.4	40	128	9.2	136
15	14	75	39	52	37	344	37	6.2	143	55	16	40
16	13	249	35	80	36	158	28	10	130	1140	12	28
17	11	303	34	138	37	116	23	10	40	788	9.6	24
18	12	118	33	651	39	105	19	13	26	332	8.3	27
19	122	546	33	1470	72	319	17	68	79	122	7.5	26
20	62	738	33	829	204	108	16	131	219	46	6.5	24
21	29	391	33	359	226	57	17	77	47	32	6.2	22
22	23	135	34	332	215	51	15	61	28	27	6.0	28
23	20	75	34	197	140	52	14	39	23	23	6.7	406
24	66	67	34	90	92	46	13	29	25	21	6.3	214
25	50	48	34	70	70	42	13	24	21	233	6.0	452
26	26	65	34	55	60	44	14	21	18	204	8.8	689
27	21	104	35	46	52	42	14	29	21	47	20	1150
28	17	64	36	40	46	36	13	41	23	36	12	564
29	15	68	37	35	---	33	13	26	18	29	8.2	894
30	14	50	39	31	---	30	14	21	16	22	7.1	1500
31	13	---	41	29	---	28	---	18	---	20	6.3	---
TOTAL	663.6	4453	1830	5075	3236	7384	635	751.1	1518	4864.2	345.4	7556.4
MEAN	21.4	148	59.0	164	116	238	21.2	24.2	50.6	157	11.1	252
MAX	122	738	151	1470	631	2030	43	131	254	1140	20	1500
MIN	4.3	13	33	29	35	28	13	5.4	12	9.4	6.0	4.8
CFSM	.33	2.25	.90	2.49	1.76	3.62	.32	.37	.77	2.39	.17	3.83
IN.	.38	2.52	1.03	2.87	1.83	4.17	.36	.42	.86	2.75	.20	4.27

CAL YR 1985	TOTAL	32817.4	MEAN	89.9	MAX	3440	MIN	1.7	CFSM	1.37	IN	18.55
WTR YR 1986	TOTAL	38311.7	MEAN	105	MAX	2030	MIN	4.3	CFSM	1.60	IN	21.66

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.--51 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, 691 ft³/s, Sept. 25, gage height, 14.2 ft, from graph based on gage readings; minimum, 35 ft³/s, Sept. 1, gage height, 8.41 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	114	152	235	67	93	175	248	165	84	86	58	40
2	113	109	228	73	96	174	236	161	82	98	54	46
3	105	82	175	73	94	169	227	118	78	73	49	47
4	63	82	145	73	158	164	226	101	121	61	51	71
5	65	79	176	71	181	163	202	114	159	62	51	56
6	54	76	195	73	191	138	190	164	166	58	53	47
7	55	77	190	80	194	107	187	165	174	63	96	45
8	63	73	184	78	187	137	154	161	164	90	67	46
9	69	83	183	77	205	185	130	149	165	86	89	46
10	68	181	183	78	183	220	123	126	162	74	65	44
11	68	191	190	113	156	282	118	115	125	91	55	72
12	115	203	182	129	151	310	112	112	123	128	53	122
13	113	215	177	129	144	342	110	81	161	103	66	64
14	116	228	106	129	150	353	120	75	137	92	71	45
15	126	229	96	123	139	360	181	78	129	92	65	50
16	108	245	103	130	133	364	189	84	134	132	49	50
17	63	232	103	140	128	368	189	85	149	154	44	50
18	62	239	102	102	153	372	189	129	108	156	45	52
19	214	260	101	102	216	407	186	146	115	142	46	52
20	178	254	98	115	209	390	185	184	105	85	47	49
21	185	249	87	166	163	381	191	183	124	79	48	46
22	189	247	84	176	187	369	186	186	121	78	49	85
23	190	240	90	169	222	358	183	189	122	75	49	96
24	194	234	135	165	216	348	183	184	84	71	42	96
25	192	232	142	169	207	319	191	173	75	73	45	261
26	190	250	136	160	213	312	186	114	72	94	90	234
27	188	240	141	129	203	305	176	128	75	80	64	242
28	188	239	133	151	193	291	174	166	86	82	51	236
29	182	229	128	99	---	280	113	167	84	122	48	286
30	174	226	122	84	---	268	126	158	86	113	44	273
31	162	---	77	84	---	259	---	105	---	66	42	---
TOTAL	3966	5676	4427	3507	4765	8670	5211	4266	3570	2859	1746	2949
MEAN	128	189	143	113	170	280	174	138	119	92.2	56.3	98.3
MAX	214	260	235	176	222	407	248	189	174	156	96	286
MIN	54	73	77	67	93	107	110	75	72	58	42	40
CFSM	.74	1.09	.82	.65	.98	1.61	1.00	.79	.68	.53	.32	.57
IN.	.85	1.21	.95	.75	1.02	1.85	1.11	.91	.76	.61	.37	.63
CAL YR 1985	TOTAL	56375	MEAN	154	MAX	494	MIN	38	CFSM	.89	IN	12.05
WTR YR 1986	TOTAL	51612	MEAN	141	MAX	407	MIN	40	CFSM	.81	IN	11.03

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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.

REMARKS.--Estimated daily discharges: Dec. 12 to Mar. 9. Records good. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--11 years, 106 ft³/s, 8.83 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 stage of 10.41 ft, Apr. 19, and a discharge of 2,640 ft³/s, Apr. 20.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 983 ft³/s, Mar. 14, gage height, 7.74 ft; minimum, 13 ft³/s, Sept. 8, 9; minimum gage height, 2.24 ft, Sept. 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	81	224	60	78	110	208	118	56	62	25	23
2	30	74	233	60	90	110	201	113	49	60	24	22
3	30	68	229	60	110	105	194	103	43	58	25	21
4	29	62	215	60	130	103	189	93	40	55	24	21
5	30	58	201	60	250	100	188	86	72	51	23	21
6	32	54	187	60	360	140	203	79	101	47	22	20
7	34	53	171	58	350	150	213	76	106	41	29	19
8	33	51	155	56	300	110	206	71	106	41	29	17
9	34	51	142	56	260	140	189	64	98	51	30	16
10	35	97	133	56	220	271	168	60	90	63	28	18
11	38	152	133	56	180	773	151	55	117	63	26	27
12	40	171	130	56	170	902	136	50	449	60	25	39
13	46	185	120	56	140	929	125	49	592	61	23	37
14	48	198	110	56	122	978	117	44	523	58	22	31
15	48	203	90	56	110	958	130	43	472	53	22	29
16	47	203	100	56	95	836	165	46	452	56	22	27
17	44	206	90	63	90	711	208	48	393	66	23	26
18	43	204	84	120	100	613	225	54	327	67	22	26
19	108	215	90	190	120	595	224	85	281	59	18	26
20	166	260	80	230	150	565	215	113	269	50	17	26
21	177	270	76	235	230	514	207	130	234	43	17	26
22	179	259	74	220	260	496	197	136	201	40	17	41
23	186	249	72	190	260	426	184	132	205	36	19	81
24	196	232	71	170	240	367	167	121	150	33	21	95
25	206	213	69	160	200	336	147	107	108	32	19	102
26	196	207	65	110	170	313	130	90	90	32	21	128
27	176	226	62	78	150	296	117	79	86	31	37	172
28	152	229	60	74	130	279	108	82	85	29	38	185
29	130	228	59	74	---	262	110	81	75	28	32	209
30	110	227	59	73	---	244	116	74	65	26	28	320
31	92	---	60	73	---	226	---	65	---	24	26	---
TOTAL	2745	4986	3644	2982	5065	12958	5138	2547	5935	1476	754	1851
MEAN	88.5	166	118	96.2	181	418	171	82.2	198	47.6	24.3	61.7
MAX	206	270	233	235	360	978	225	136	592	67	38	320
MIN	29	51	59	56	78	100	108	43	40	24	17	16
CFSM	.54	1.02	.72	.59	1.11	2.56	1.05	.50	1.22	.29	.15	.38
IN.	.63	1.14	.83	.68	1.16	2.96	1.17	.58	1.35	.34	.17	.42
CAL YR 1985	TOTAL	55957	MEAN	153	MAX	1700	MIN	10	CFSM	.94	IN	12.77
WTR YR 1986	TOTAL	50081	MEAN	137	MAX	978	MIN	16	CFSM	.84	IN	11.43

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: Dec. 25 to Jan. 17, Jan. 27, 28, and Feb. 13, 14, 17. Records good. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--32 years, 11.0 ft³/s, 9.16 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 962 ft³/s, Apr. 19, 1975, gage height, 12.18 ft, from floodmark, 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)
Oct. 19	1900	124	5.24	Mar. 10	2300	*381	*8.52
Nov. 20	0700	117	5.12	Mar. 13	1600	131	5.35
Feb. 5	0300	162	5.82				

Minimum discharge, 0.34 ft³/s, Aug. 21, 22, 23, gage height, 2.68 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	7.5	29	5.4	8.5	11	13	13	5.3	3.6	.87	.85
2	1.8	7.2	40	5.3	25	11	14	10	4.4	3.8	.97	.79
3	1.7	6.7	25	5.2	19	10	13	8.6	4.0	3.3	1.0	.68
4	1.6	6.3	20	5.1	41	12	14	7.9	3.7	2.8	.95	.80
5	2.0	6.1	17	5.0	121	20	15	7.4	6.5	2.5	.92	.81
6	2.2	5.7	16	4.9	55	23	18	6.8	7.5	2.1	1.0	.65
7	2.1	5.7	15	4.0	34	16	15	6.6	6.6	2.0	1.1	.63
8	1.8	5.7	14	3.5	26	15	13	6.0	6.0	2.7	1.0	.58
9	1.9	5.9	14	4.0	21	16	12	5.6	4.5	3.9	.98	.56
10	2.2	67	15	4.5	21	191	11	5.3	4.0	3.1	.86	.76
11	2.4	54	19	4.9	14	259	9.8	4.7	8.1	2.8	.84	1.7
12	2.6	30	21	5.2	11	113	8.7	4.5	53	3.8	.70	2.1
13	4.6	32	17	4.7	10	115	8.4	4.4	27	3.8	.63	1.5
14	4.3	38	14	4.4	9.5	122	8.1	4.1	16	2.8	.59	1.1
15	3.9	32	11	4.1	9.2	90	13	4.0	25	2.4	.68	.98
16	3.9	32	8.9	4.1	8.8	59	21	4.2	35	8.1	.77	.91
17	3.4	32	9.0	7.0	10	43	25	4.3	18	6.1	.62	.86
18	4.7	26	8.3	53	11	38	18	5.7	12	3.6	.53	1.0
19	92	60	8.3	58	25	82	15	23	17	2.8	.45	1.1
20	92	104	8.2	33	46	46	13	26	23	2.4	.43	1.1
21	50	57	7.8	25	54	30	18	21	14	2.0	.41	1.0
22	28	34	7.9	25	46	26	15	19	9.9	1.8	.37	2.2
23	21	28	7.7	20	26	24	13	17	7.7	1.6	.49	6.6
24	19	25	7.0	18	21	23	12	13	6.1	1.5	.49	5.4
25	19	21	6.2	13	21	21	11	11	5.1	1.6	.41	10
26	15	46	5.8	11	15	21	10	9.2	4.4	1.8	.86	13
27	13	61	5.8	10	14	21	9.1	9.4	5.0	1.4	2.9	27
28	11	38	5.7	9.0	13	17	9.5	13	4.5	1.2	1.7	18
29	9.6	32	5.6	8.7	---	16	13	10	3.6	1.1	1.2	40
30	8.7	29	5.6	7.7	---	14	13	8.0	3.4	.98	.99	83
31	7.8	---	5.5	6.9	---	13	---	6.4	---	.93	.88	---
TOTAL	435.0	934.8	400.3	379.6	736.0	1518	401.6	299.1	350.3	84.31	26.59	225.66
MEAN	14.0	31.2	12.9	12.2	26.3	49.0	13.4	9.65	11.7	2.72	.86	7.52
MAX	92	104	40	58	121	259	25	26	53	8.1	2.9	83
MIN	1.6	5.7	5.5	3.5	8.5	10	8.1	4.0	3.4	.93	.37	.56
CFSM	.86	1.91	.79	.75	1.61	3.01	.82	.59	.72	.17	.05	.46
IN.	.99	2.13	.91	.87	1.68	3.46	.92	.68	.80	.19	.06	.51

CAL YR 1985 TOTAL 7366.63 MEAN 20.2 MAX 452 MIN .40 CFSM 1.24 IN 16.81
WTR YR 1986 TOTAL 5791.26 MEAN 15.9 MAX 259 MIN .37 CFSM .98 IN 13.22

STREAMS TRIBUTARY TO LAKE MICHIGAN

123

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: Aug. 18 to Sept. 23. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--32 years, 5.82 ft³/s, 8.46 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)
Mar. 10	1800	*313	*5.18	June 12	0200	240	4.76

Minimum daily discharge, 0.16 ft³/s, Aug. 22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.47	3.6	16	2.0	3.4	4.1	4.4	5.1	2.0	2.1	.29	.37
2	.45	3.3	23	2.0	8.2	3.9	4.4	4.1	1.7	2.0	.30	.34
3	.40	3.0	12	2.1	5.8	3.8	4.2	3.5	1.5	1.6	.31	.31
4	.40	2.8	8.8	2.0	23	4.7	4.5	3.2	1.4	1.4	.30	.35
5	.53	2.7	7.7	2.0	53	9.0	5.2	3.1	11	1.2	.32	.34
6	.53	2.5	6.9	1.9	27	11	9.2	2.8	8.0	1.0	.33	.30
7	.48	2.5	6.5	1.6	18	7.2	7.4	2.6	5.6	.92	.39	.27
8	.46	2.3	6.4	1.4	13	5.8	5.8	2.3	4.6	1.3	.35	.26
9	.59	2.3	6.3	1.6	8.2	6.6	4.8	2.1	3.5	2.7	.46	.25
10	.67	29	7.0	1.9	6.5	161	4.3	2.0	2.9	1.7	.40	.35
11	.74	21	9.0	1.9	5.5	116	3.8	1.9	18	1.6	.38	.80
12	.66	13	9.6	2.1	4.6	58	3.4	1.8	129	1.7	.31	.90
13	1.1	15	7.8	1.8	4.1	69	3.2	1.7	44	1.5	.27	.65
14	1.3	15	5.8	1.7	3.7	61	3.1	1.6	27	1.2	.26	.45
15	1.3	12	4.8	1.6	3.4	43	4.2	1.5	20	.96	.28	.43
16	1.3	13	4.3	1.6	3.2	32	7.6	1.5	15	2.3	.26	.40
17	1.2	14	3.8	3.9	3.3	26	11	1.5	8.4	2.0	.25	.39
18	1.7	13	3.4	31	3.5	23	7.3	1.8	6.1	1.3	.23	.44
19	47	41	3.3	33	9.0	42	5.9	5.9	9.2	.96	.20	.49
20	32	73	3.1	19	20	24	5.4	8.2	12	.82	.19	.47
21	18	33	3.0	13	25	16	7.5	6.7	6.8	.68	.18	.45
22	11	23	3.0	13	18	12	6.4	5.9	5.4	.62	.16	2.5
23	7.1	17	3.0	8.8	13	10	5.2	5.4	5.0	.55	.21	14
24	24	14	2.8	6.5	8.3	8.4	4.5	4.5	3.9	.50	.21	5.0
25	22	10	2.3	5.6	6.7	7.7	4.2	3.7	3.2	.63	.18	13
26	12	30	2.2	4.6	6.0	7.3	3.8	3.2	2.8	.75	.40	11
27	7.5	34	2.4	3.9	4.9	7.0	3.5	3.2	3.9	.63	1.3	33
28	5.8	22	2.2	3.6	4.4	6.1	4.1	3.4	3.4	.58	.80	16
29	4.9	19	2.2	3.2	---	5.5	6.0	3.2	2.6	.55	.55	38
30	4.3	15	2.1	2.9	---	5.0	5.2	2.8	2.2	.36	.45	72
31	3.9	---	2.3	2.6	---	4.4	---	2.4	---	.31	.40	---
TOTAL	213.78	501.0	183.0	183.8	312.7	800.5	159.5	102.6	370.1	36.42	10.92	213.51
MEAN	6.90	16.7	5.90	5.93	11.2	25.8	5.32	3.31	12.3	1.17	.35	7.12
MAX	47	73	23	33	53	161	11	8.2	129	2.7	1.3	72
MIN	.40	2.3	2.1	1.4	3.2	3.8	3.1	1.5	1.4	.31	.16	.25
CFSM	.74	1.79	.63	.64	1.20	2.76	.57	.35	1.32	.13	.04	.76
IN.	.85	2.00	.73	.73	1.25	3.19	.64	.41	1.47	.15	.04	.85

CAL YR 1985 TOTAL 3587.11 MEAN 9.83 MAX 307 MIN .08 CFSM 1.05 IN 14.29
WTR YR 1986 TOTAL 3087.83 MEAN 8.46 MAX 161 MIN .16 CFSM .91 IN 12.30

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 the National Weather Service.

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.--No estimated daily discharges. Records good. 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.--56 years, 208 ft³/s, 7.96 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, 2,250 ft³/s, Mar. 12, gage height, 7.43 ft; minimum, 32 ft³/s, Aug. 21, 22, 23, gage height, 3.17 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	53	172	464	128	153	237	334	230	134	134	44	46
2	50	159	496	125	184	259	330	223	116	128	44	42
3	50	150	478	128	220	251	314	207	104	119	44	40
4	53	143	438	128	270	240	306	191	96	110	42	44
5	59	137	389	128	577	282	310	181	381	102	42	38
6	53	131	355	128	763	351	360	184	381	93	44	38
7	53	128	330	125	763	318	360	184	286	82	53	36
8	55	125	310	119	646	227	330	168	251	96	53	34
9	59	134	294	113	567	339	302	159	217	102	50	34
10	59	217	286	110	478	588	278	153	191	107	53	36
11	62	355	290	110	381	1580	251	143	340	116	48	62
12	72	376	306	116	364	2160	227	134	1330	122	44	64
13	72	385	310	119	326	2200	214	125	1510	116	42	67
14	74	389	255	119	270	2110	200	116	1210	107	40	62
15	80	398	191	116	233	2040	220	110	908	99	42	55
16	72	402	220	116	207	1860	251	113	779	125	40	50
17	72	415	197	122	184	1570	318	116	716	128	38	48
18	85	411	175	207	200	1300	360	131	567	125	38	55
19	248	483	191	420	237	1220	360	200	492	110	38	50
20	451	727	178	492	364	1210	334	274	501	93	34	48
21	456	779	165	496	515	1070	339	298	442	82	32	46
22	411	696	156	464	553	880	343	294	355	74	32	95
23	351	572	156	411	558	752	318	282	330	69	52	233
24	360	492	156	347	510	660	286	259	298	64	48	244
25	411	433	146	339	415	582	263	233	230	67	44	270
26	351	438	134	290	385	539	244	207	194	62	106	343
27	310	543	131	165	330	510	223	188	194	59	128	429
28	274	562	128	156	270	464	217	184	194	55	93	429
29	240	534	128	197	---	429	227	178	168	53	77	558
30	217	487	125	168	---	394	230	165	150	50	59	963
31	194	---	125	153	---	360	---	153	---	48	53	---
TOTAL	5407	11373	7703	6355	10923	26982	8649	5783	13065	2897	1597	4559
MEAN	174	379	248	205	390	870	288	187	436	93.5	51.5	152
MAX	456	779	496	496	763	2200	360	298	1510	134	128	963
MIN	50	125	125	110	153	227	200	110	96	48	32	34
CFSM	.49	1.07	.70	.58	1.10	2.45	.81	.53	1.23	.26	.15	.43
IN.	.57	1.19	.81	.67	1.14	2.83	.91	.61	1.37	.30	.17	.48
CAL YR 1985	TOTAL	122357	MEAN	335	MAX	3790	MIN	24	CFSM	.94	IN	12.82
WTR YR 1986	TOTAL	105293	MEAN	288	MAX	2200	MIN	32	CFSM	.81	IN	11.03

STREAMS TRIBUTARY TO LAKE MICHIGAN

125

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), and since 1931 are contained in reports of the National Weather Service.

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.--57 years, 844 ft³/s, 9.32 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, 5,960 ft³/s, Mar. 13, gage height, 10.66 ft; minimum daily, 155 ft³/s, Aug. 22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	284	871	1840	627	881	1140	1880	1110	918	565	396	279
2	295	826	1990	598	871	1210	1720	915	713	572	370	254
3	293	753	1790	610	988	1210	1740	906	669	516	296	229
4	360	767	1730	571	1170	1140	1680	923	708	570	253	232
5	408	657	1530	553	1960	1180	1730	882	1440	548	279	229
6	329	670	1490	550	2400	1300	1780	886	1030	428	263	226
7	312	627	1390	560	2210	1270	1780	1030	1300	534	402	170
8	276	555	1300	459	1830	1040	1600	777	1250	469	424	272
9	349	618	1290	471	1740	1260	1510	846	1120	608	523	176
10	298	939	1240	481	1640	2120	1410	811	1130	750	368	237
11	331	1260	1270	537	1330	4790	1360	681	1850	782	336	499
12	384	1380	1310	520	1250	5580	1240	666	4510	888	270	252
13	367	1450	1290	517	1170	5790	1200	650	3050	939	278	305
14	356	1540	1210	541	1080	5740	1170	630	2420	958	346	349
15	532	1440	834	515	1030	5570	1270	527	2040	922	303	320
16	402	1610	924	545	969	5080	1360	452	1750	1170	299	232
17	417	1570	729	588	895	4490	1440	657	1610	944	267	251
18	477	1590	830	900	905	3940	1490	643	1340	994	255	265
19	1270	1870	815	1340	1110	3860	1400	865	1290	848	254	270
20	1580	2520	765	1600	1400	3810	1430	1060	1280	768	246	185
21	1690	2760	776	1570	1760	3580	1440	1350	1170	777	232	279
22	1590	2450	748	1600	2010	3220	1420	1350	978	709	155	494
23	1470	2150	818	1410	1920	2890	1390	1420	901	522	289	968
24	1540	1930	725	1320	1910	2580	1290	1310	877	508	275	654
25	1450	1710	621	1280	1640	2500	1260	1250	757	496	195	1040
26	1400	1770	614	1140	1570	2400	1130	1130	648	485	576	1420
27	1240	2020	638	752	1450	2300	1090	1110	725	440	566	1570
28	1120	2180	567	626	1230	2210	1070	1180	711	381	475	1520
29	1020	2020	516	812	---	2070	1100	1060	559	416	371	2360
30	976	1920	644	773	---	2000	1090	995	551	355	349	3340
31	902	---	678	757	---	1850	---	830	---	332	244	---
TOTAL	23718	44423	32912	25123	40319	89120	42470	28902	39295	20194	10155	18877
MEAN	765	1481	1062	810	1440	2875	1416	932	1310	651	328	629
MAX	1690	2760	1990	1600	2400	5790	1880	1420	4510	1170	576	3340
MIN	276	555	516	459	871	1040	1070	452	551	332	155	170
CFSM	.62	1.20	.86	.66	1.17	2.34	1.15	.76	1.07	.53	.27	.51
IN.	.72	1.34	1.00	.76	1.22	2.70	1.28	.87	1.19	.61	.31	.57

CAL YR 1985 TOTAL 472662 MEAN 1295 MAX 9040 MIN 176 CFSM 1.05 IN 14.30
WTR YR 1986 TOTAL 415508 MEAN 1138 MAX 5790 MIN 155 CFSM .93 IN 12.57

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. 16 to Mar. 10. 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.--42 years, 176 ft³/s, 8.51 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 floodmark, backwater from ice; minimum discharge, 10 ft³/s, July 28, 1965, gage height, 1.01 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,830 ft³/s, Mar. 10, gage height, 6.26 ft; minimum, 38 ft³/s, Aug. 21, 22, gage height, 1.39 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	147	351	110	130	210	480	189	129	347	50	52
2	64	140	403	110	160	190	441	177	113	315	49	48
3	64	131	361	105	190	190	400	172	100	273	48	45
4	64	123	330	105	240	180	375	167	90	240	46	45
5	67	117	319	105	350	180	352	161	161	209	47	44
6	65	111	311	100	440	180	339	150	170	179	48	42
7	67	108	304	100	400	190	322	142	140	152	68	41
8	65	106	296	100	360	200	305	135	139	141	58	40
9	67	109	288	100	330	270	295	128	149	131	55	39
10	67	142	280	100	310	750	290	123	151	118	54	43
11	70	147	279	100	280	1320	288	119	368	114	53	82
12	72	144	272	100	250	816	284	113	1570	113	50	112
13	78	166	257	100	220	933	277	107	1220	109	47	93
14	79	185	235	100	200	920	265	103	860	102	48	81
15	84	192	205	100	180	881	269	102	803	96	46	75
16	84	206	190	100	170	895	261	102	737	118	46	68
17	84	217	180	100	160	969	252	99	662	110	45	61
18	85	226	170	200	180	1060	242	108	647	105	43	63
19	176	432	160	250	200	1230	237	124	702	101	42	63
20	202	471	150	280	250	1210	239	147	765	95	41	63
21	180	379	140	310	300	1180	244	158	751	85	40	63
22	168	329	130	300	370	1130	238	171	721	77	39	65
23	172	319	125	280	360	1070	230	186	688	70	45	120
24	198	322	120	260	340	1000	228	196	654	66	48	132
25	207	323	120	230	310	941	227	203	609	64	52	198
26	198	359	115	200	280	874	229	205	568	62	58	370
27	187	397	115	180	250	801	223	204	547	59	74	456
28	178	377	115	160	230	725	215	198	500	57	72	330
29	170	360	110	150	---	650	208	181	441	55	64	642
30	162	343	110	140	---	585	199	162	388	53	61	998
31	155	---	110	130	---	523	---	145	---	51	56	---
TOTAL	3646	7128	6651	4805	7440	22253	8454	4677	15543	3867	1593	4574
MEAN	118	238	215	155	266	718	282	151	518	125	51.4	152
MAX	207	471	403	310	440	1320	480	205	1570	347	74	998
MIN	64	106	110	100	130	180	199	99	90	51	39	39
CFSM	.42	.85	.77	.55	.95	2.56	1.00	.54	1.84	.45	.18	.54
IN.	.48	.94	.88	.64	.98	2.95	1.12	.62	2.06	.51	.21	.61
CAL YR 1985	TOTAL	106055	MEAN	291	MAX	1830	MIN	34	CFSM	1.04	IN	14.04
WTR YR 1986	TOTAL	90631	MEAN	248	MAX	1570	MIN	39	CFSM	.88	IN	12.00

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04115000 MAPLE RIVER AT MAPLE RAPIDS, MI

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 in Maple Rapids, 50 ft upstream from Pine Creek, and 0.8 mi upstream from Hayworth Creek. Records include flow of Pine Creek.

DRAINAGE AREA.--434 mi².

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

REVISED RECORDS.--WSP 1707: 1956.

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.

REMARKS.--No estimated daily discharges. Records good except those for period Sept. 11-30, which are poor.

AVERAGE DISCHARGE.--42 years, 267 ft³/s, 8.35 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,770 ft³/s, Sept. 12, 1986, gage height, 12.33 ft, from floodmark, caused by dam failure on Rainbow Lake (Pine Creek); minimum, 4.4 ft³/s, Aug. 13, 1965, gage height, 1.62 ft.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in March 1904 reached a stage of 13.8 ft, from information by local resident.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 8,770 ft³/s, Sept. 12, gage height, 12.33 ft, from floodmark, caused by dam failure on Rainbow Lake (Pine Creek); minimum, 18 ft³/s, Sept. 8, gage height, 1.79 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	211	394	832	130	256	227	528	140	267	459	38	54
2	194	364	867	121	230	202	489	139	237	406	35	49
3	177	338	908	112	209	190	447	129	207	365	34	42
4	158	325	876	113	202	183	411	116	183	322	34	34
5	146	317	818	115	272	197	381	106	163	283	35	29
6	142	288	754	115	304	224	359	99	136	248	36	31
7	137	262	689	122	335	256	347	95	117	218	37	26
8	130	244	634	117	357	268	342	90	114	197	38	20
9	129	234	585	113	363	251	332	86	103	172	40	24
10	132	259	555	110	362	330	317	81	91	145	39	73
11	136	318	537	108	348	944	298	76	109	128	38	1050
12	146	358	520	108	316	1620	282	72	325	117	36	5190
13	198	399	508	113	286	2410	263	69	478	106	36	3890
14	236	453	479	114	261	3270	247	65	551	98	33	3120
15	255	505	442	116	237	3620	238	65	610	89	26	2660
16	264	542	408	114	216	3240	233	70	666	126	26	2180
17	260	582	379	112	202	2780	235	83	682	150	30	1840
18	253	624	354	147	196	2360	232	197	663	142	32	1520
19	283	881	324	272	193	2130	225	338	678	131	31	1280
20	363	1320	296	326	208	2080	221	500	851	119	30	1120
21	412	1610	273	384	235	1880	216	581	894	109	28	995
22	462	1590	254	447	258	1390	209	617	874	94	25	971
23	488	1440	236	488	263	1190	203	612	821	83	24	2640
24	504	1280	222	496	267	1070	196	588	757	71	26	2790
25	530	1150	214	479	275	946	189	552	680	65	27	2400
26	543	1040	200	450	260	870	182	509	607	62	32	2500
27	533	979	181	426	253	812	173	455	595	60	44	2680
28	523	943	166	413	239	742	160	401	601	55	59	2370
29	505	905	155	375	---	689	147	367	565	51	77	3120
30	465	868	144	311	---	631	148	332	515	43	71	4310
31	427	---	135	285	---	579	---	299	---	38	62	---
TOTAL	9342	20812	13945	7252	7403	37581	8250	7929	14140	4752	1159	49008
MEAN	301	694	450	234	264	1212	275	256	471	153	37.4	1634
MAX	543	1610	908	496	363	3620	528	617	894	459	77	5190
MIN	129	234	135	108	193	183	147	65	91	38	24	20
CFSM	.69	1.60	1.04	.54	.61	2.79	.63	.59	1.09	.35	.09	3.77
IN.	.80	1.78	1.20	.62	.63	3.22	.71	.68	1.21	.41	.10	4.20

CAL YR 1985 TOTAL 205595 MEAN 563 MAX 4080 MIN 23 CFSM 1.30 IN 17.62
WTR YR 1986 TOTAL 181573 MEAN 497 MAX 5190 MIN 20 CFSM 1.15 IN 15.56

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 in 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 the National Weather Service.

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. 15 to Jan. 17, Jan. 27 to Feb. 3, and Apr. 26 to May 21. Records good. Diurnal fluctuation below about 5,000 ft³/s caused by powerplants upstream from station. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--35 years (water years 1952-86), 1,951 ft³/s, 9.33 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, 15,700 ft³/s, Mar. 15, gage height, 21.63 ft; maximum gage height, 21.92 ft, Sept. 30, stage rising, peak occurred Oct. 3, 1986; minimum discharge, 312 ft³/s, Aug. 22, gage height, 7.03 ft; minimum daily, 450 ft³/s, Aug. 22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1210	2000	4450	2000	2300	2270	3920	2100	1960	2060	532	568
2	873	2010	4830	1900	2900	2120	3840	2100	1570	2020	806	544
3	1140	1930	4990	1800	2600	2220	3640	1800	1590	1960	536	604
4	810	1750	4760	1900	2880	2200	3420	1800	1530	1780	826	610
5	1130	1650	4440	1600	4210	2210	3410	2000	1780	1660	529	784
6	1010	1700	4040	1700	5040	2330	3430	1800	2610	1570	795	471
7	847	1600	3830	1400	5010	2400	3430	1700	2360	1420	526	530
8	1060	1510	3600	1200	4830	2260	3300	2100	1970	1390	831	489
9	1080	1480	3350	1500	4560	2300	3180	1400	2190	1420	833	492
10	776	1650	3300	1500	3740	3070	2950	1500	1890	1370	818	649
11	1080	2190	3260	1700	3630	8160	2860	1700	1920	1430	837	2560
12	816	2370	3270	1700	3080	12200	2700	1400	5310	1710	798	6210
13	1220	2940	3300	1600	3190	13700	2530	1200	8520	1380	790	9040
14	1240	2820	2800	1600	2980	15100	2380	1400	7870	1790	496	9750
15	1240	3000	2600	1500	2940	15600	2430	1300	6540	1400	515	8650
16	1260	3200	2300	1600	2740	14900	2500	1200	5930	1770	800	7370
17	1280	3260	1900	1700	2670	13400	2520	1100	5090	2150	540	6160
18	1270	3480	1700	2160	2600	11900	2610	1500	4240	1950	768	4950
19	1520	4740	1400	3220	2600	10800	2690	2000	3890	1630	474	4080
20	2640	6490	2000	4240	2870	10600	2660	2000	3970	1650	464	3050
21	3030	7550	2400	4090	3540	9780	2240	2940	3860	1350	751	2740
22	2970	7680	1800	4160	3780	8920	2570	2780	3630	1300	450	2290
23	2820	7140	2300	4070	4110	8020	2390	3450	3450	1260	462	3530
24	2770	6360	2200	3890	3770	7180	2340	3120	3210	1030	506	5560
25	2850	5570	2100	3490	3340	6470	2380	3220	2880	1040	705	6370
26	2990	5000	1200	3070	2860	5920	2400	2740	2740	946	599	7260
27	2630	4840	1200	2000	2640	5540	2300	2650	2900	1110	1210	8780
28	2660	4920	2000	1300	2560	5170	2200	2580	2510	762	1480	9650
29	2400	5090	1300	1700	---	4810	2200	2530	2700	887	630	9790
30	2160	4690	1600	2200	---	4490	2200	2350	2430	848	888	12400
31	2290	---	1900	2800	---	4230	---	2330	---	813	867	---
TOTAL	53072	110610	86120	70290	93970	220270	83620	63790	103040	44856	22062	135931
MEAN	1712	3687	2778	2267	3356	7105	2787	2058	3435	1447	712	4531
MAX	3030	7680	4990	4240	5040	15600	3920	3450	8520	2150	1480	12400
MIN	776	1480	1200	1200	2300	2120	2200	1100	1530	762	450	471
CFSM	.60	1.30	.98	.80	1.18	2.50	.98	.73	1.21	.51	.25	1.60
IN.	.70	1.45	1.13	.92	1.23	2.89	1.10	.84	1.35	.59	.29	1.78

CAL YR 1985 TOTAL 1150595 MEAN 3152 MAX 20100 MIN 367 CFSM 1.11 IN 15.07
WTR YR 1986 TOTAL 1087631 MEAN 2980 MAX 15600 MIN 450 CFSM 1.05 IN 14.25

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04116500 FLAT RIVER AT SMYRNA, MI

LOCATION.--Lat 43°03'10", long 85°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, 0.5 mi south of Smyrna.

DRAINAGE AREA.--528 mi².

PERIOD OF RECORD.--October 1950 to September 1986 (discontinued). 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. 16 to Jan. 18, Jan. 28 to Feb. 4, and Feb. 12-22. 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. Gage-height telemeter at station.

AVERAGE DISCHARGE.--36 years, 440 ft³/s, 11.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,700 ft³/s, Sept. 13, 1986, gage height, 9.05 ft; minimum, 7.4 ft³/s, Sept. 9, 1953; minimum daily, 70 ft³/s, Sept. 6, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,700 ft³/s, Sept. 13, gage height, 9.05 ft; minimum, 115 ft³/s, Aug. 22, gage height, 3.35 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	348	425	798	390	370	411	827	550	455	451	249	267
2	341	430	848	390	400	448	815	509	395	394	248	251
3	335	443	824	390	430	444	779	402	327	332	242	195
4	338	466	839	390	480	428	724	396	312	335	244	156
5	362	470	852	390	548	437	697	430	368	325	264	183
6	357	465	818	390	568	454	719	426	400	317	164	207
7	362	479	787	380	570	431	746	407	315	312	204	247
8	410	459	756	380	560	323	755	374	298	312	276	174
9	411	476	732	380	547	492	799	335	314	307	282	172
10	413	577	678	380	496	609	747	335	316	270	268	552
11	425	591	711	390	412	870	699	332	387	299	247	2010
12	471	609	698	390	400	961	647	328	503	333	244	3010
13	539	645	670	390	370	1200	590	362	472	389	237	4440
14	540	648	515	390	340	1210	582	406	403	375	228	4590
15	532	651	475	390	330	1370	593	364	381	368	174	4230
16	524	683	470	400	320	1500	598	429	382	476	167	3600
17	558	745	450	450	320	1540	598	432	364	458	194	2920
18	467	796	440	520	320	1600	570	545	382	440	287	2450
19	537	915	440	594	330	1650	546	745	388	420	231	2070
20	529	1030	430	622	340	1650	534	797	371	424	219	1780
21	544	1180	425	625	370	1580	531	867	364	407	206	1580
22	551	1170	420	627	400	1550	524	926	393	367	143	1500
23	516	1150	410	608	495	1430	506	869	356	260	182	1440
24	553	1170	410	597	494	1270	480	886	290	255	190	1460
25	525	1060	410	616	459	1190	452	865	291	265	190	1690
26	524	992	400	571	460	1120	540	762	353	302	231	1710
27	517	911	400	446	453	1080	535	681	594	318	317	1700
28	496	894	400	410	420	1020	565	663	509	316	388	1710
29	476	836	390	380	---	978	608	590	498	308	353	2050
30	456	775	390	370	---	931	586	454	476	289	244	2300
31	435	---	390	370	---	883	---	457	---	253	244	---
TOTAL	14392	22141	17676	14016	12002	31060	18892	16924	11657	10677	7357	50644
MEAN	464	738	570	452	429	1002	630	546	389	344	237	1688
MAX	558	1180	852	627	570	1650	827	926	594	476	388	4590
MIN	335	425	390	370	320	323	452	328	290	253	143	156
CFSM	.88	1.40	1.08	.86	.81	1.90	1.19	1.03	.74	.65	.45	3.20
IN.	1.01	1.56	1.25	.99	.85	2.19	1.33	1.19	.82	.75	.52	3.57
CAL YR 1985	TOTAL	211164	MEAN	579	MAX	1680	MIN	188	CFSM	1.10	IN	14.88
WTR YR 1986	TOTAL	227438	MEAN	623	MAX	4590	MIN	143	CFSM	1.18	IN	16.02

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 right bank at downstream side of bridge on McKeown Road, 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.--No estimated daily discharges. Records good. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--42 years, 320 ft³/s, 11.29 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, 3,160 ft³/s, Mar. 14, gage height, 7.98 ft; minimum, 121 ft³/s, Aug. 23; minimum gage height, 3.04 ft, Oct. 2, 3, 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	127	250	683	222	263	393	400	282	448	318	171	182
2	127	242	693	222	283	383	384	272	365	296	164	169
3	125	241	712	222	320	367	367	252	293	289	166	159
4	125	236	699	221	372	346	373	236	251	274	161	179
5	136	228	656	222	577	346	386	226	280	253	154	186
6	146	220	596	217	789	373	408	220	371	233	151	172
7	146	215	534	197	834	396	426	218	454	217	155	158
8	141	212	480	196	794	358	427	215	481	226	180	148
9	143	213	446	196	832	375	406	211	444	307	218	142
10	149	249	427	201	773	467	372	203	397	368	214	144
11	153	302	424	209	654	1230	337	197	377	374	197	169
12	156	338	428	213	532	2290	316	190	647	403	181	244
13	159	361	430	212	449	2970	304	188	1120	480	168	285
14	161	370	404	209	399	3150	294	183	1920	519	157	269
15	163	368	339	197	365	3080	315	182	2450	498	150	231
16	163	366	311	200	339	2780	368	206	2420	533	148	201
17	161	381	301	213	313	2350	426	233	2170	572	145	182
18	159	398	277	255	315	1940	458	261	1840	580	140	179
19	226	571	265	417	344	1650	457	308	1540	534	135	185
20	347	831	265	594	427	1470	433	381	1340	444	130	183
21	427	1050	262	705	527	1300	400	436	1150	360	128	179
22	463	1120	255	746	594	1130	370	461	975	295	125	183
23	460	1100	250	697	688	986	342	454	819	256	131	222
24	441	1030	252	609	720	857	317	428	671	232	149	280
25	424	937	235	528	672	732	300	393	537	228	149	386
26	408	836	221	449	609	648	326	350	440	245	162	525
27	392	764	224	323	526	597	348	334	394	243	241	655
28	372	730	226	263	446	549	317	399	395	224	275	746
29	337	715	222	252	---	506	296	470	381	208	267	815
30	300	701	220	259	---	467	290	516	352	193	232	1120
31	270	---	221	262	---	435	---	510	---	181	202	---
TOTAL	7507	15575	11958	9928	14756	34921	10963	9415	25722	10383	5346	8878
MEAN	242	519	386	320	527	1126	365	304	857	335	172	296
MAX	463	1120	712	746	834	3150	458	516	2450	580	275	1120
MIN	125	212	220	196	263	346	290	182	251	181	125	142
CFSM	.63	1.35	1.00	.83	1.37	2.93	.95	.79	2.23	.87	.45	.77
IN.	.73	1.50	1.16	.96	1.43	3.37	1.06	.91	2.49	1.00	.52	.86

CAL YR 1985 TOTAL 179385 MEAN 491 MAX 5030 MIN 100 CFSM 1.28 IN 17.33
WTR YR 1986 TOTAL 165352 MEAN 453 MAX 3150 MIN 125 CFSM 1.18 IN 15.98

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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: Mar. 21 to Apr. 9. Records good. 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.--41 years (water years 1931-38, 1952-81, 1984-86), 592 ft³/s, 10.40 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, 5,080 ft³/s, Mar. 15, gage height, 9.87 ft; minimum daily, 235 ft³/s, Aug. 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	310	524	1120	494	551	785	800	550	773	730	400	332
2	381	436	1210	464	637	697	770	577	702	711	434	356
3	316	552	1210	454	653	726	750	532	614	555	375	316
4	320	540	1170	456	671	668	760	484	535	554	343	325
5	338	472	1110	457	1380	609	780	476	648	595	357	363
6	302	454	1100	456	1520	674	820	449	821	520	365	346
7	338	471	974	425	1520	699	860	451	876	486	430	329
8	350	435	929	355	1540	630	860	419	941	493	458	301
9	327	439	890	488	1540	648	804	416	911	572	448	288
10	354	512	844	411	1430	1020	743	395	837	685	448	321
11	354	522	829	459	1190	2730	709	384	1240	739	479	575
12	373	613	825	457	1090	3220	678	389	2320	852	350	1020
13	354	626	798	470	981	3880	653	394	2520	1020	446	880
14	392	672	756	416	884	4680	604	375	2580	1030	379	782
15	346	672	693	427	771	4970	629	379	3320	978	368	665
16	373	678	677	450	717	4830	675	386	3850	1180	373	525
17	346	718	660	461	646	4350	716	510	3810	1270	271	455
18	335	743	482	526	663	3600	764	539	3390	1210	347	453
19	506	1230	560	1020	709	3250	778	638	3010	1100	313	488
20	703	1600	552	1200	738	2980	766	772	2610	991	293	424
21	692	1820	541	1290	830	2700	745	919	2390	838	342	439
22	714	1780	508	1440	1020	2300	698	971	1890	746	261	433
23	737	1720	526	1230	1180	2000	679	944	1740	613	235	547
24	737	1660	519	1260	1210	1700	644	879	1400	513	306	646
25	756	1570	406	1140	1180	1500	539	802	1180	656	378	875
26	724	1260	520	909	1160	1300	592	731	981	739	339	1490
27	679	1400	456	617	1030	1200	662	701	886	564	489	1820
28	660	1290	452	596	902	1100	693	769	859	598	498	1880
29	533	1210	435	577	---	1000	668	803	808	529	485	2070
30	611	1150	458	529	---	950	595	806	724	483	465	3020
31	558	---	492	550	---	870	---	807	---	457	428	---
TOTAL	14819	27769	22702	20484	28343	62266	21434	18647	49166	23007	11903	22764
MEAN	478	926	732	661	1012	2009	714	602	1639	742	384	759
MAX	756	1820	1210	1440	1540	4970	860	971	3850	1270	498	3020
MIN	302	435	406	355	551	609	539	375	535	457	235	288
CFSM	.62	1.20	.95	.86	1.31	2.60	.92	.78	2.12	.96	.50	.98
IN.	.71	1.34	1.09	.99	1.36	3.00	1.03	.90	2.37	1.11	.57	1.10

CAL YR 1985 TOTAL 334161 MEAN 916 MAX 6490 MIN 221 CFSM 1.19 IN 16.08
WTR YR 1986 TOTAL 323304 MEAN 886 MAX 4970 MIN 235 CFSM 1.15 IN 15.56

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 the National Weather Service.

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: Dec. 16 to Jan. 19, Jan. 25 to Feb. 2, Feb. 23 to Mar. 8, June 20 to July 3, and Aug. 15 to Sept. 24. 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.--60 years, 3,617 ft³/s, 10.02 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, 22,300 ft³/s, Mar. 17, gage height, 17.42 ft; minimum daily, 1,200 ft³/s, Aug. 21, 23, 24, Sept. 7, 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2060	4070	7660	3500	4700	4500	6900	4270	4180	4500	1800	1850
2	2150	4290	7810	3500	5000	4300	6420	4410	3770	4100	1580	1450
3	2070	4070	7970	3400	5360	4200	6240	3940	3230	3800	1760	1300
4	2140	4080	7950	3300	5550	4200	6050	3320	2880	3260	1390	1400
5	2070	3830	7700	3200	6150	4100	5910	2430	3050	3100	1660	1450
6	2270	3690	7450	3100	6890	4100	5920	2430	3790	2910	1550	1650
7	2170	3510	6970	3000	7200	4100	5890	2570	4500	2590	1800	1200
8	2100	3370	6540	2900	7320	4100	5830	2730	4300	2620	1610	1300
9	2280	3380	6300	3000	7220	4260	5690	2890	3790	2840	1820	1200
10	2440	4100	6030	3000	6880	5160	5530	2660	3960	2680	1900	1300
11	2230	4110	5930	3000	6150	9170	5330	2380	4470	3000	1740	3000
12	2590	4660	5850	3000	5680	11800	5150	2490	6690	3300	1870	6000
13	2690	5010	5800	3000	5370	14400	4880	2310	8400	3710	1700	10400
14	3020	5410	5570	3000	5350	17700	4680	2290	9610	3350	1690	10400
15	3020	5420	5040	3000	5330	20500	4580	2410	10700	3770	1450	10300
16	2850	5650	4600	3100	5150	21900	4700	2470	11100	4500	1500	10100
17	2780	6030	4200	3300	5010	22100	4760	2790	10700	4620	1700	9000
18	2920	6050	4000	3800	4970	21200	4750	3290	9790	4510	1450	7400
19	3380	7200	3800	5600	5000	19700	4820	4020	8830	4120	1600	6000
20	3940	9430	3700	6700	5090	17900	4830	5010	8200	3670	1400	4700
21	4820	10200	3700	7040	5160	16500	4760	5470	7600	3310	1200	4000
22	5100	10800	3600	7130	5570	15400	4450	5900	7200	2810	1600	3400
23	5150	11200	3500	7160	5700	14300	4590	5930	6800	2630	1200	5000
24	5410	11100	3400	6940	5800	13100	4480	6120	6500	2340	1200	8100
25	5730	10500	3300	6400	5730	11900	4340	5820	6100	2270	1300	9430
26	5200	9760	3200	5300	5500	10800	4350	5610	5900	2330	1500	11700
27	5090	8850	3100	4000	5200	9870	4320	5180	5800	2270	1400	13200
28	4660	8250	3000	3500	4800	9100	4200	4920	5700	2140	2000	13800
29	4110	8090	3000	3500	---	8450	4140	4800	5400	1990	2000	15900
30	4100	7990	3100	3800	---	7810	4200	4760	5000	1960	1600	18000
31	4170	---	3300	4400	---	7240	---	4350	---	1830	1900	---
TOTAL	104710	194100	157070	128570	158830	343860	152690	119970	187940	96830	49870	193930
MEAN	3378	6470	5067	4147	5673	11090	5090	3870	6265	3124	1609	6464
MAX	5730	11200	7970	7160	7320	22100	6900	6120	11100	4620	2000	18000
MIN	2060	3370	3000	2900	4700	4100	4140	2290	2880	1830	1200	1200
CFSM	.69	1.32	1.03	.85	1.16	2.26	1.04	.79	1.28	.64	.33	1.32
IN.	.79	1.47	1.19	.98	1.21	2.61	1.16	.91	1.43	.74	.38	1.47

CAL YR 1985 TOTAL 1987340 MEAN 5445 MAX 29500 MIN 1380 CFSM 1.11 IN 15.09
WTR YR 1986 TOTAL 1888370 MEAN 5174 MAX 22100 MIN 1200 CFSM 1.06 IN 14.34

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)
OCT 29...	1230	4550	644	8.10	11.5	5.0	10.0	92	880	130	300
JAN 22...	1200	7200	636	8.10	1.5	6.5	13.6	98	1500	4000	280
MAR 18...	1330	24200	350	7.90	3.5	13	13.1	102	--	--	160
MAY 27...	1300	5800	575	8.20	17.0	--	9.1	96	K220	120	--
JUN 26...	1045	5500	555	8.30	20.0	14	8.7	97	230	300	270
SEP 24...	1030	8320	472	8.00	18.0	30	7.5	81	1800	6800	220

DATE	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)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 29...	84	81	24	17	11	.4	3.9	216	3.3	59
JAN 22...	85	74	23	24	16	.6	3.2	196	3.0	55
MAR 18...	66	43	12	8.7	10	.3	3.7	--	2.2	--
MAY 27...	--	--	--	--	--	--	--	--	2.7	--
JUN 26...	58	74	20	17	12	.5	3.3	210	2.0	46
SEP 24...	60	60	17	13	11	.4	3.9	168	3.2	46

STREAMS TRIBUTARY TO LAKE MICHIGAN

04119300 GRAND RIVER AT EASTMANVILLE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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...	1230	35	.20	9.6	443	370	.60	5440	2.0
JAN 22...	1200	44	.20	8.2	369	360	.50	7170	2.2
MAR 18...	1330	19	.10	5.1	212	180	.29	13900	2.0
MAY 27...	1300	--	--	--	--	--	--	--	2.1
JUN 26...	1045	34	.20	7.6	355	340	.48	5270	1.8
SEP 24...	1030	27	.20	8.7	388	280	.53	8790	1.1

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...	.280	1.2	.080	.030	.020	16	197	88
JAN 22...	.370	1.1	.110	.060	.050	14	272	82
MAR 18...	.330	1.4	.100	.070	.060	12	784	59
MAY 27...	--	1.2	.100	.020	.010	24	376	92
JUN 26...	.060	1.3	.130	.030	<.010	27	401	89
SEP 24...	.100	.80	.190	.050	.040	--	--	--

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	54	.8	<1	2	<3	3	37	6
MAR 18...	20	<1	30	<.5	<1	<1	<3	6	78	<5
SEP 24...	10	1	38	<.5	<1	<1	<3	3	49	<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 29...	9	10	<.1	<10	8	<1	<1	250	<6	15
MAR 18...	6	13	<.1	<10	2	<1	<1	110	<6	24
SEP 24...	<4	10	<.1	<10	3	<1	<1	190	<6	5

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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. 16-18, 24-26, 28-30, Jan. 1, 4, 6, 7, 9, 13, 15, 23, 24, 26, 27, 29-31, Feb. 1, 2, 4-7, 10, 11, 14, 15, 19-22, 24, 25, 27, and Mar. 8. 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.--20 years, 129 ft³/s, 7.21 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)
Nov. 21	0700	374	4.22	Sept. 13	0900	409	4.45
Mar. 27	1300	*730	*5.47	Sept. 30	1800	381	4.35

Minimum discharge, 63 ft³/s, Sept. 3, gage height, 2.61 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	208	166	229	192	151	146	313	187	86	159	91	69
2	205	171	246	191	153	140	288	179	85	154	85	67
3	199	188	245	188	155	146	278	173	84	148	85	67
4	191	197	291	183	159	149	284	170	82	148	85	74
5	192	196	286	181	160	150	293	166	81	147	83	87
6	195	188	272	181	165	144	303	164	81	137	83	83
7	189	192	269	181	170	115	305	159	81	130	86	74
8	184	197	259	184	178	125	287	154	84	123	89	69
9	182	197	251	184	177	140	269	139	82	110	88	68
10	206	198	248	183	168	158	259	116	81	99	87	111
11	223	198	245	184	160	185	251	108	85	93	85	262
12	233	200	242	185	158	202	243	102	105	99	85	377
13	268	219	223	182	161	206	235	98	116	124	82	403
14	295	260	206	181	160	221	228	103	101	126	81	348
15	282	298	200	178	157	237	231	121	90	109	81	262
16	250	303	200	172	154	243	234	135	86	105	78	227
17	229	317	200	177	154	264	239	132	84	108	79	215
18	218	336	204	186	153	294	237	194	82	103	79	208
19	208	351	209	197	152	358	225	238	106	101	78	203
20	202	369	208	198	150	370	216	206	165	99	75	213
21	197	371	209	197	150	395	210	180	165	93	74	212
22	190	340	205	193	150	347	205	179	133	90	72	258
23	184	297	201	183	153	342	200	162	116	89	72	310
24	182	271	200	173	152	376	196	143	115	87	72	347
25	179	247	199	169	151	439	191	132	113	97	71	325
26	178	247	198	158	150	549	201	120	107	105	72	294
27	179	236	198	150	149	711	211	109	138	103	74	293
28	178	235	198	146	148	661	201	103	177	94	74	291
29	173	230	196	148	---	509	194	97	175	94	71	299
30	168	224	194	150	---	427	189	91	168	94	70	349
31	166	---	193	151	---	365	---	88	---	93	70	---
TOTAL	6333	7439	6924	5506	4398	9114	7216	4448	3254	3461	2457	6465
MEAN	204	248	223	178	157	294	241	143	108	112	79.3	216
MAX	295	371	291	198	178	711	313	238	177	159	91	403
MIN	166	166	193	146	148	115	189	88	81	87	70	67
CFSM	.84	1.02	.92	.73	.65	1.21	.99	.59	.44	.46	.33	.89
IN.	.97	1.14	1.06	.84	.67	1.40	1.10	.68	.50	.53	.38	.99

CAL YR 1985	TOTAL	71252	MEAN	195	MAX	726	MIN	64	CFSM	.80	IN	10.91
WTR YR 1986	TOTAL	67015	MEAN	184	MAX	711	MIN	67	CFSM	.76	IN	10.26

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 Evart, 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: Dec. 6, Dec. 21 to Jan. 18, Jan. 23, 24, 27, 28, 30, 31, Feb. 5-7, 9-15, 21, 22, 24, 25, 27, 28, and Mar. 1, 7, 8. 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.--54 years, 1,014 ft³/s, 9.50 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, 5,420 ft³/s, Mar. 29, gage height, 12.15 ft; minimum, 388 ft³/s, Sept. 9; minimum gage height, 6.93 ft, Sept. 3, 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1330	1110	2010	1290	1040	1030	3930	1300	747	1110	702	472
2	1320	1140	2330	1290	1010	1020	3580	1250	686	1070	689	456
3	1260	1230	2280	1290	1060	1050	3240	1200	642	1030	685	436
4	1210	1230	2240	1290	1090	1030	3020	1150	610	996	684	437
5	1220	1230	2230	1290	1200	1050	2930	1120	578	966	673	436
6	1230	1210	2160	1280	1210	1050	2940	1090	554	901	668	434
7	1200	1240	2110	1280	1250	1020	2850	1050	539	850	685	424
8	1150	1270	2080	1280	1320	1000	2730	1010	539	799	679	407
9	1160	1280	2060	1280	1260	912	2570	982	530	763	672	395
10	1350	1340	2040	1270	1240	1080	2390	961	531	728	678	691
11	1440	1370	2010	1270	1200	1310	2240	922	544	694	687	3700
12	1530	1400	1970	1270	1180	1530	2110	886	673	703	675	4270
13	1880	1590	1860	1260	1130	1630	1990	844	723	897	656	3960
14	1900	1940	1700	1250	1130	1870	1890	826	714	894	638	3630
15	1890	2290	1570	1250	1130	2170	1870	871	697	857	632	3290
16	1850	2460	1470	1240	1100	2490	1810	938	689	911	623	2960
17	1770	2770	1420	1230	1080	2750	1740	967	666	856	626	2410
18	1690	2820	1350	1220	1060	2990	1690	1570	642	803	664	2080
19	1790	3190	1270	1270	1060	3410	1650	1720	814	775	649	1900
20	1820	3510	1260	1300	1100	3510	1610	1820	1080	751	623	1890
21	1730	3530	1230	1320	1100	3430	1590	1860	1080	720	596	1910
22	1630	3490	1270	1360	1110	3460	1570	1940	1090	689	582	2490
23	1530	3360	1300	1310	1130	3530	1530	1840	1070	670	572	3040
24	1450	3090	1350	1250	1120	3590	1480	1650	1050	658	567	3100
25	1380	2820	1340	1250	1100	3740	1430	1500	1030	704	561	3020
26	1310	2620	1340	1250	1100	4280	1480	1380	1040	872	552	3350
27	1240	2460	1330	1150	1100	4680	1470	1260	1260	882	555	3970
28	1210	2310	1320	1100	1050	5170	1410	1160	1300	817	548	3940
29	1190	2190	1310	1080	---	5380	1380	1050	1190	764	533	3920
30	1170	2070	1300	1050	---	5050	1340	923	1140	746	510	4440
31	1130	---	1300	1050	---	4450	---	818	---	729	486	---
TOTAL	44960	63560	51810	38570	31660	80662	63460	37858	24448	25605	19350	67858
MEAN	1450	2119	1671	1244	1131	2602	2115	1221	815	826	624	2262
MAX	1900	3530	2330	1360	1320	5380	3930	1940	1300	1110	702	4440
MIN	1130	1110	1230	1050	1010	912	1340	818	530	658	486	395
CFSM	1.00	1.46	1.15	.86	.78	1.79	1.46	.84	.56	.57	.43	1.56
IN.	1.15	1.63	1.33	.99	.81	2.07	1.63	.97	.63	.66	.50	1.74

CAL YR 1985 TOTAL 569853 MEAN 1561 MAX 5080 MIN 389 CFSM 1.08 IN 14.62
WTR YR 1986 TOTAL 549801 MEAN 1506 MAX 5380 MIN 395 CFSM 1.04 IN 14.11

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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. 15-23, Dec. 25 to Jan. 2, Jan. 4-12, 14-16, 18-24, Jan. 26 to Feb. 3, Feb. 5-8, 11-13, 19-24, 28, and Mar. 8. 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.--20 years, 130 ft³/s, 12.79 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,300 ft³/s, Sept. 12, 1986, gage height, 8.57 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)
Oct. 13	0930	409	3.43	May 20	0200	630	4.32
Nov. 20	1230	612	4.28	Sept. 12	1130	*2,300	*8.57
Mar. 19	1930	541	4.08	Sept. 30	0730	904	5.44

Minimum discharge, 54 ft³/s, Aug. 22, 23, 25, 26, Sept. 8, 9, gage height, 1.74 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	123	233	152	130	129	174	127	125	151	64	60
2	103	163	336	150	130	124	169	118	108	123	62	57
3	96	190	315	146	135	125	156	111	103	112	64	56
4	97	170	266	148	141	128	157	110	99	105	59	62
5	124	149	236	148	145	131	231	110	97	106	59	62
6	117	135	227	148	148	136	295	109	97	102	67	60
7	105	141	222	148	150	133	276	101	96	97	76	56
8	105	136	216	148	150	135	218	97	99	103	76	56
9	128	146	213	150	155	136	182	95	93	93	70	54
10	173	172	213	150	153	146	165	93	92	86	65	164
11	165	191	216	150	150	240	156	91	111	85	65	1270
12	180	199	212	150	145	274	146	89	260	93	64	2190
13	388	248	199	152	140	292	140	88	294	139	62	1620
14	399	326	198	152	140	342	140	88	214	122	62	949
15	345	353	175	150	129	395	172	96	141	106	62	646
16	261	363	165	142	125	383	165	139	131	151	62	508
17	210	419	150	139	125	395	157	134	118	141	60	426
18	180	413	150	140	127	393	147	395	113	113	59	391
19	262	487	155	140	127	494	140	544	148	106	56	363
20	287	587	158	140	128	465	137	609	237	101	57	337
21	255	554	158	140	130	387	141	550	293	90	56	315
22	200	439	160	140	130	321	136	524	203	84	54	323
23	178	350	160	142	130	301	118	447	151	80	57	355
24	174	299	162	142	130	306	114	351	171	76	57	367
25	180	261	160	143	133	298	113	280	160	97	56	381
26	171	251	160	125	131	315	205	245	177	104	67	393
27	158	258	160	118	133	329	211	209	282	89	105	414
28	151	242	160	118	130	302	157	191	281	83	75	357
29	141	233	160	120	---	250	144	173	232	84	68	487
30	131	216	160	122	---	214	133	152	174	72	64	868
31	126	---	155	125	---	186	---	130	---	67	62	---
TOTAL	5700	8214	6010	4378	3820	8205	4995	6596	4900	3161	1992	13647
MEAN	184	274	194	141	136	265	167	213	163	102	64.3	455
MAX	399	587	336	152	155	494	295	609	294	151	105	2190
MIN	96	123	150	118	125	124	113	88	92	67	54	54
CFSM	1.33	1.99	1.41	1.02	.99	1.92	1.21	1.54	1.18	.74	.47	3.30
IN.	1.54	2.21	1.62	1.18	1.03	2.21	1.35	1.78	1.32	.85	.54	3.68

CAL YR 1985	TOTAL	61817	MEAN	169	MAX	594	MIN	50	CFSM	1.23	IN	16.66
WTR YR 1986	TOTAL	71618	MEAN	196	MAX	2190	MIN	54	CFSM	1.42	IN	19.31

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 in 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: Dec. 26-30 and Sept. 12, 13. 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.--64 years (water years 1910-14, 1917-19, 1931-86), 1,998 ft³/s, 11.55 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 23,200 ft³/s, Sept. 12, 1986, gage height, 19.54 ft, from floodmark; 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, 23,200 ft³/s, Sept. 12, gage height, 19.54 ft, from floodmark; minimum, 947 ft³/s, Sept. 5, 6, 7, 8; minimum gage height, 6.72 ft, Aug. 19, 20, 22, 23, 24, 25, 26, 31, Sept. 5, 6, 7; minimum daily, 976 ft³/s, Aug. 31, Sept. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2400	2570	3700	2200	1690	2180	5030	2220	2170	2200	1540	976
2	2420	2860	4110	2560	2080	2160	4150	2110	1740	2190	1740	1210
3	2240	3640	4550	3140	2520	2030	3680	2120	1730	1710	1220	1460
4	2420	3460	4220	3420	2550	2160	3680	1800	1590	1660	1380	1380
5	2620	2940	4250	3410	2550	2170	3600	1810	1530	2160	1310	1100
6	2400	2270	4240	3410	2760	2180	3490	2090	1490	1800	1390	1220
7	2210	2250	4470	3410	2870	2180	3490	1930	1440	1800	1320	1280
8	2160	2810	4030	3380	2690	2010	3560	1930	1420	2180	1400	1050
9	2580	3250	3790	3390	2680	1720	3660	1930	1500	1600	1510	1060
10	2820	3280	3430	3410	2760	2280	3650	1810	1350	1850	1660	1510
11	3080	3020	3440	3400	2930	3190	3660	1800	1150	1410	1150	9320
12	3200	3080	3150	3400	2650	3530	3650	1560	2160	1520	1370	20500
13	4230	3760	2050	3400	2740	3710	3490	1290	2040	1560	1360	16900
14	4810	4040	2470	3390	2920	3700	2870	1540	2100	1580	1370	11000
15	3750	4720	2330	3290	2670	3890	2920	1800	1810	1720	1090	9270
16	3690	4930	2220	2960	2650	4450	2830	2020	2080	1940	1140	7320
17	3520	4920	2720	3200	2510	4850	2930	2270	1660	2230	1290	5560
18	3400	5080	2460	3480	2100	5040	2820	2940	1690	2660	1360	5420
19	3290	5420	2060	3480	2650	5430	2510	4080	1710	2030	1320	4110
20	3990	6520	1790	3470	3380	5930	2170	5290	2350	1430	1280	3060
21	4170	7030	2080	3480	3180	6030	2440	5220	2580	1640	1300	4620
22	3650	6650	2450	3540	2610	5820	2370	4440	2520	1610	1290	5330
23	3510	5760	2580	3600	2190	5590	2660	4430	2670	1440	991	5580
24	2520	4980	2700	3520	2490	5600	2190	4010	2470	1090	987	5750
25	2550	4590	2750	3400	2990	5530	2070	3100	1720	1660	987	5830
26	2750	4620	2600	3390	2990	5540	1750	3400	1700	1770	1280	6180
27	2770	3710	2550	3580	2760	5870	1880	2780	2790	1620	1530	6600
28	2540	4070	2300	3180	2420	6350	2400	2580	2930	1610	1750	6580
29	2200	4230	2200	2950	---	6310	2450	2760	3390	1670	1520	6660
30	2180	3800	2150	2760	---	6220	2360	2380	2790	1580	1140	7890
31	2440	---	1870	2460	---	5880	---	2180	---	1550	976	---
TOTAL	92510	124260	91710	101060	73980	129530	90410	81620	60270	54470	40951	165726
MEAN	2984	4142	2958	3260	2642	4178	3014	2633	2009	1757	1321	5524
MAX	4810	7030	4550	3600	3380	6350	5030	5290	3390	2660	1750	20500
MIN	2160	2250	1790	2200	1690	1720	1750	1290	1150	1090	976	976
CFSM	1.27	1.76	1.26	1.39	1.12	1.78	1.28	1.12	.86	.75	.56	2.35
IN.	1.46	1.97	1.45	1.60	1.17	2.05	1.43	1.29	.95	.86	.65	2.62
CAL YR 1985	TOTAL	1079600	MEAN	2958	MAX	7030	MIN	880	CFSM	1.26	IN	17.09
WTR YR 1986	TOTAL	1106497	MEAN	3031	MAX	20500	MIN	976	CFSM	1.29	IN	17.52

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 upst 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.--Cross-sectional samples were collected at or near Maple Island Road bridge. Water-discharge measurements were made at time of sampling. Some regulation by upstream dams.

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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)
NOV											
05...	1030	3090	345	8.10	10.5	2.6	8.1	74	K13	K67	160
MAR											
18...	1430	5070	357	8.10	3.0	3.9	12.5	96	K10	K26	160
MAY											
14...	1030	1330	355	8.40	17.0	1.5	8.8	93	33	K18	150
SEP											
11...	1230	7040	313	8.10	18.5	140	8.2	90	2400	9900	120
12...	1530	20200	360	8.10	19.0	45	7.5	82	K860	2700	160

DATE	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)	BICAR- BONATE IT-FLD (MG/L AS HCO3)	CAR- BONATE IT-FLD (MG/L AS CO3)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
NOV										
05...	43	13	7.9	10	.3	1.5	170	0	136	2.1
MAR										
18...	43	13	9.8	12	.3	1.5	154	0	126	1.9
MAY										
14...	41	12	9.1	11	.3	1.2	137	0	112	.9
SEP										
11...	33	10	7.2	11	.3	1.5	117	0	96	1.5
12...	41	13	9.1	11	.3	1.4	187	0	154	2.4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 05...	1030	14	.10	8.1	196	190	.27	1640	.32
MAR 18...	1430	19	.10	7.8	201	190	.27	2750	.51
MAY 14...	1030	7.8	<.10	4.2	192	160	.26	689	.25
SEP 11...	1230	12	.10	4.4	198	140	.27	3760	.28
12...	1530	13	.20	5.5	195	190	.27	10600	.23

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
NOV 05...	.030	.50	.060	.040	.020	23	192	44
MAR 18...	.070	.60	.030	.020	.020	33	452	20
MAY 14...	.030	.40	.020	<.010	<.010	13	47	47
SEP 11...	.040	.90	.220	.030	<.010	312	5930	89
12...	.040	.70	.080	.020	.020	196	10700	51

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 05...	10	1	23	<.5	1	<1	<3	9	96	<5
MAR 18...	40	<1	23	<.5	1	<1	<3	6	67	<5
MAY 14...	<10	<1	21	<.5	<1	<1	<3	9	23	<5
SEP 12...	20	2	26	.8	<1	<1	<3	3	28	<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)
NOV 05...	10	7	<.1	<10	1	<1	<1	120	<6	15
MAR 18...	<4	10	<.1	<10	<1	<1	<1	150	<6	12
MAY 14...	6	5	<.1	<10	<1	<1	<1	120	<6	4
SEP 12...	6	10	<.1	<10	<1	<1	<1	140	<6	28

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 19 (Michigan Department of Natural Resources benchmark). Prior to Mar. 17, 1978, at different datum.

REMARKS.--Estimated daily discharges: Dec. 14, 16-20, 24-31, Jan. 3, 6-8, 15, 27-31, Feb. 2, 4-9, 11 19-24, and Mar. 1, 2, 8, 9, 11. Records good except for estimated daily discharges, which are poor. Some regulation during low flow by dams and irrigation upstream from station. Several measurement water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 17.1 ft³/s, 15.69 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)
Oct. 13	1000	110	14.02	Sept. 11	2230	220	15.04
Nov. 2	1930	184	14.86	Sept. 27	0330	101	13.80
Nov. 20	0730	177	14.75	Sept. 30	0500	*299	*15.50
Mar. 10	2400	284	15.38				

Minimum discharge, 2.3 ft³/s, Sept. 8, 9; minimum gage height, 10.33 ft, Aug. 22, 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986 MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	18	39	28	24	19	26	16	10	9.6	5.2	4.0
2	12	105	70	28	24	18	27	15	9.8	8.9	5.7	3.6
3	9.9	103	48	28	24	18	25	14	9.4	7.8	5.3	3.5
4	14	50	42	28	24	19	25	13	9.1	8.4	5.3	3.8
5	22	37	39	28	24	22	29	13	9.1	8.0	5.1	3.0
6	17	32	38	27	25	23	29	13	8.5	6.5	8.3	2.9
7	14	38	36	27	25	23	26	12	9.0	9.4	8.4	2.9
8	18	33	37	26	26	23	24	12	8.7	8.2	6.4	2.7
9	32	36	39	26	26	24	22	11	7.6	7.7	5.7	2.6
10	43	74	39	26	26	98	22	11	8.9	6.5	7.1	30
11	33	54	39	26	25	128	21	10	11	10	6.5	171
12	39	43	36	27	24	89	20	10	9.8	13	5.3	152
13	88	59	32	27	23	76	19	11	8.9	11	5.1	53
14	46	63	31	27	22	84	20	11	8.7	9.5	5.5	32
15	34	51	30	26	21	68	29	12	9.4	9.6	5.7	28
16	30	55	28	26	21	55	25	16	9.0	18	5.5	24
17	26	71	27	30	21	51	23	16	7.3	13	5.1	21
18	26	60	27	42	21	48	20	27	7.1	10	4.6	24
19	46	117	27	68	21	62	19	25	11	9.4	4.4	22
20	47	138	27	55	21	49	18	29	10	8.6	4.0	21
21	33	69	28	46	22	37	18	25	8.3	7.8	4.2	20
22	28	49	28	56	22	36	17	24	7.6	7.3	3.9	25
23	25	45	28	45	22	36	16	21	7.7	6.3	4.8	34
24	30	42	28	34	22	32	16	18	11	6.2	4.6	30
25	27	37	28	32	22	32	16	16	8.6	9.8	4.3	43
26	23	38	28	29	21	35	18	15	8.6	8.7	13	56
27	21	38	28	19	20	35	18	14	13	7.4	12	77
28	19	35	28	19	19	31	17	15	12	6.5	7.0	46
29	18	34	28	20	---	29	17	13	9.8	6.5	5.6	112
30	18	32	28	21	---	28	16	12	9.7	5.5	4.9	241
31	17	---	28	23	---	26	---	11	---	5.4	4.5	---
TOTAL	870.9	1656	1039	970	638	1354	638	481	278.6	270.5	183.0	1291.0
MEAN	28.1	55.2	33.5	31.3	22.8	43.7	21.3	15.5	9.29	8.73	5.90	43.0
MAX	88	138	70	68	26	128	29	29	13	18	13	241
MIN	9.9	18	27	19	19	18	16	10	7.1	5.4	3.9	2.6
CFSM	1.90	3.73	2.26	2.12	1.54	2.95	1.44	1.05	.63	.59	.40	2.91
IN.	2.19	4.16	2.61	2.44	1.60	3.40	1.60	1.21	.70	.68	.46	3.24
CAL YR 1985	TOTAL	8793.2	MEAN	24.1	MAX	140	MIN	3.1	CFSM	1.63	IN	22.10
WTR YR 1986	TOTAL	9670.0	MEAN	26.5	MAX	241	MIN	2.6	CFSM	1.79	IN	24.30

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: Dec. 18 to Jan. 21, Jan. 27 to Feb. 24, and Mar. 2, 3, 6, 7. 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.--29 years, 445 ft³/s, 14.88 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, 4,990 ft³/s, Sept. 13, gage height, 7.33 ft; minimum, 229 ft³/s, Sept. 9; minimum gage height, 1.54 ft, Aug. 22, 23, 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	364	446	715	600	480	470	752	477	393	643	338	275
2	375	549	750	600	500	470	707	463	377	583	329	265
3	356	740	985	600	520	470	681	446	363	476	325	257
4	353	1220	947	600	550	483	660	434	352	436	317	261
5	392	1030	851	600	570	481	651	423	344	416	308	266
6	427	886	816	600	590	470	660	415	342	396	319	249
7	411	845	780	600	600	460	673	418	339	385	343	241
8	402	797	746	600	590	431	661	419	340	391	337	236
9	444	765	719	600	580	489	643	410	333	384	325	231
10	521	719	707	590	550	604	620	399	325	374	314	381
11	574	694	699	590	540	990	592	390	343	382	312	969
12	614	700	693	590	530	1660	569	383	364	406	306	4220
13	632	706	681	590	520	1340	552	381	412	419	296	4600
14	735	762	665	580	520	1240	540	383	443	421	292	3400
15	804	934	666	580	510	1340	553	398	473	415	299	2200
16	744	1040	661	580	500	1270	594	431	484	479	294	1650
17	709	1050	671	590	490	1190	604	454	415	510	285	1340
18	708	1200	640	600	490	1220	584	539	380	481	278	1140
19	696	1160	620	610	500	1270	555	609	377	436	271	986
20	692	1360	610	620	510	1510	530	648	390	397	265	878
21	753	1450	610	640	520	1270	515	682	395	374	262	796
22	720	1250	620	698	520	1090	509	733	394	360	254	745
23	662	1090	620	687	520	1030	500	719	380	350	255	727
24	636	1000	620	666	520	1000	485	680	383	335	256	737
25	597	923	620	610	520	979	474	623	383	390	254	762
26	558	849	620	569	505	944	469	547	415	503	298	769
27	519	790	620	510	504	994	457	488	553	506	406	839
28	488	768	615	500	492	1030	455	467	689	440	400	822
29	466	746	610	480	---	927	469	455	765	397	347	830
30	456	719	605	480	---	864	479	433	686	370	309	1070
31	448	---	600	480	---	809	---	410	---	352	289	---
TOTAL	17256	27188	21382	18240	14741	28795	17193	15157	12632	13207	9483	32142
MEAN	557	906	690	588	526	929	573	489	421	426	306	1071
MAX	804	1450	985	698	600	1660	752	733	765	643	406	4600
MIN	353	446	600	480	480	431	455	381	325	335	254	231
CFSM	1.37	2.23	1.70	1.45	1.30	2.29	1.41	1.20	1.04	1.05	.75	2.64
IN.	1.58	2.49	1.96	1.67	1.35	2.64	1.58	1.39	1.16	1.21	.87	2.95
CAL YR 1985	TOTAL	217381	MEAN	596	MAX	1990	MIN	223	CFSM	1.47	IN	19.92
WTR YR 1986	TOTAL	227416	MEAN	623	MAX	4600	MIN	231	CFSM	1.53	IN	20.84

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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. 15 to Jan. 20, Jan. 28 to Feb. 8, and Feb. 14-17. 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.--47 years, 686 ft³/s, 13.68 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,440 ft³/s, Sept. 13, 1986, gage height, 8.07 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, 6,440 ft³/s, Sept. 13, gage height, 8.07 ft; minimum, 483 ft³/s, Sept. 3, gage height, 2.04 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	760	877	1270	1070	920	807	1300	873	709	1200	633	501
2	781	1010	1350	1060	930	819	1220	851	696	1070	624	490
3	802	1190	1500	1050	940	826	1170	823	684	977	603	485
4	796	1480	1530	1050	980	832	1140	801	673	895	589	516
5	792	1690	1510	1050	1000	822	1120	782	661	830	576	542
6	810	1720	1460	1050	1050	832	1120	775	654	796	572	543
7	845	1560	1410	1040	1100	830	1150	764	647	764	582	515
8	854	1420	1360	1040	1100	770	1140	753	646	727	586	500
9	838	1390	1320	1040	1100	830	1110	742	642	709	591	492
10	874	1360	1290	1030	1090	928	1060	730	646	694	592	788
11	952	1300	1270	1030	1050	1140	1020	724	664	668	593	2300
12	1070	1290	1240	1030	1020	1390	990	718	767	685	575	4400
13	1180	1340	1220	1030	1020	1590	964	714	878	705	557	6020
14	1220	1410	1260	1030	960	1770	947	719	876	737	547	5470
15	1230	1450	1200	1020	930	2050	947	730	844	777	548	4070
16	1290	1580	1150	1020	900	2040	959	764	763	803	544	3220
17	1270	1710	1100	1040	900	1990	979	785	718	831	556	2640
18	1210	1790	1050	1060	895	1980	977	858	693	858	552	2340
19	1190	1920	1050	1080	888	2100	957	942	695	818	552	2080
20	1190	2020	1050	1100	900	2150	931	982	730	728	548	1850
21	1240	2050	1070	1170	909	2090	909	1010	791	692	522	1690
22	1270	2040	1100	1160	889	1950	892	1040	851	662	505	1680
23	1240	1910	1100	1140	900	1790	876	1040	821	640	502	1650
24	1180	1720	1100	1080	906	1690	856	1020	771	631	501	1590
25	1120	1590	1100	1060	893	1630	841	977	742	792	496	1600
26	1080	1500	1100	1030	876	1660	835	918	797	842	511	1640
27	1050	1420	1100	1050	871	1610	835	861	965	844	553	1680
28	1010	1360	1100	1020	844	1610	844	809	1090	844	566	1750
29	966	1310	1080	980	---	1620	851	767	1190	772	551	1680
30	926	1270	1080	960	---	1500	863	745	1250	703	525	1670
31	896	---	1080	930	---	1380	---	726	---	663	511	---
TOTAL	31932	45677	37600	32500	26761	45026	29803	25743	23554	24357	17263	56392
MEAN	1030	1523	1213	1048	956	1452	993	830	785	786	557	1880
MAX	1290	2050	1530	1170	1100	2150	1300	1040	1250	1200	633	6020
MIN	760	877	1050	930	844	770	835	714	642	631	496	485
CFSM	1.51	2.24	1.78	1.54	1.40	2.13	1.46	1.22	1.15	1.15	.82	2.76
IN.	1.74	2.50	2.05	1.78	1.46	2.46	1.63	1.41	1.29	1.33	.94	3.08

CAL YR 1985 TOTAL 391956 MEAN 1074 MAX 2110 MIN 475 CFSM 1.58 IN 21.41
WTR YR 1986 TOTAL 396608 MEAN 1087 MAX 6020 MIN 485 CFSM 1.60 IN 21.66

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 June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected at upstream side of bridge.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)
OCT 29...	1030	12	241	7.70	8.0	9.4	81	--	--
FEB 19...	1040	16	283	7.80	1.0	10.2	74	.05	--
JUN 06...	1230	14	245	7.90	19.5	8.4	94	--	.00

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 29...	.003	--	<.10	--	.040	--	.36	--	.40
FEB 19...	.012	--	.07	--	.140	--	.16	--	.30
JUN 06...	<.010	<.010	<.01	--	.040	.020	.56	.38	.60

DATE	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, 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)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDEED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY)
OCT 29...	--	--	.010	--	--	.010	1	.03
FEB 19...	--	.37	<.010	--	--	<.010	2	.09
JUN 06...	.40	--	.020	.020	<.010	<.010	4	.15

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected near bridge. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 29...	1245	8.4	435	7.80	7.5	--	--	9.0	77
DEC 10...	1130	13	396	7.80	2.5	--	--	9.6	72
JAN 15...	1115	9.6	427	7.80	1.0	--	--	9.9	72
FEB 19...	1315	11	484	8.10	3.5	--	--	9.9	77
APR 02...	1045	25	307	7.80	8.5	40	.50	8.0	70
MAY 06...	1045	12	422	7.90	15.0	--	--	7.8	80
JUN 05...	1000	10	460	7.80	15.0	20	1.5	8.2	84
AUG 27...	1030	6.6	461	7.90	14.0	--	--	6.3	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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 02...	150	17	45	9.6	4.3	.2	6	1.0	4.1
JUN 05...	230	24	68	14	6.1	.2	5	1.2	6.2

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 02...	11	12	<.10	3.7	185	170	.25	12
JUN 05...	18	21	<.10	4.4	271	260	.37	7.3

STREAMS TRIBUTARY TO LAKE MICHIGAN

04123910 ANDERSON CREEK NEAR BUCKLEY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 29...	1245	.79	--	.005	--	.79	--	.050	--	.55
DEC 10...	1130	.99	--	.010	--	1.0	--	.050	--	.55
JAN 15...	1115	1.1	--	.011	--	1.1	--	.070	--	.33
FEB 19...	1315	1.3	--	.016	--	1.3	--	.060	--	.34
APR 02...	1045	.50	.50	<.010	<.010	--	.51	.040	--	.36
MAY 06...	1045	.73	.71	<.010	<.010	.74	.71	--	.040	--
JUN 05...	1000	.69	.68	<.010	<.010	.70	.69	.050	.040	.35
AUG 27...	1030	.63	.63	<.010	<.010	.64	.64	.060	.040	.24

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 29...	--	.60	--	1.4	.010	--	<.010	--	4	.09
DEC 10...	--	.60	--	1.6	<.010	--	<.010	--	1	.04
JAN 15...	--	.40	--	1.5	.010	--	.010	--	1	.03
FEB 19...	--	.40	--	1.7	<.010	--	<.010	--	8	.24
APR 02...	.38	.40	.40	--	.010	<.010	<.010	<.010	5	.34
MAY 06...	.46	--	.50	--	.080	.010	<.010	<.010	5	.16
JUN 05...	.26	.40	.30	1.1	.010	.010	<.010	<.010	1	.03
AUG 27...	--	.30	--	.94	.010	<.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 02...	1045	20	<1	<100	<10	<1	<10	<1	2
JUN 05...	1000	<10	<1	<100	<10	<1	<10	<1	2

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04123910 ANDERSON CREEK NEAR BUCKLEY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 02...	110	72	<5	<4	20	13	<.10	<1
JUN 05...	70	47	<5	8	--	18	<.10	26

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 02...	<1	--	50	41	30	7.4	<.010	3
JUN 05...	<1	<1	--	65	10	7.1	<.010	<1

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. 8, 9, 15, 16, 27, Dec. 12-15, Dec. 17 to Jan. 8, Jan. 10-14, 18-20, Jan. 27 to Feb. 10, Feb. 13-17, Mar. 8-11, Apr. 21, 22, and June 15. Records fair except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--66 years (water years 1904-15, 1931, 1934-86), 1,059 ft³/s, 15.98 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, 2,640 ft³/s, Mar. 29, gage height, 15.09 ft; minimum observed, 821 ft³/s, Sept. 3, gage height, 11.07 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1030	978	1300	1050	920	966	2220	1190	1010	1290	950	830
2	1030	962	1440	1040	920	966	2140	1160	1010	1230	918	827
3	1010	994	1480	1030	950	962	2090	1130	998	1130	926	821
4	1000	1090	1460	1020	960	966	2020	1130	970	1180	942	863
5	1030	1240	1430	1020	1000	958	1980	1110	954	1240	914	1000
6	1010	1240	1420	1020	1020	970	1930	1090	962	1190	906	1010
7	990	1200	1400	1030	1040	974	1860	1090	970	1190	890	986
8	1050	1180	1370	1040	1050	1020	1740	1070	954	1120	942	910
9	1080	1160	1320	1060	1050	1120	1670	1050	942	1080	962	872
10	1110	1150	1270	1050	1050	1250	1590	1040	990	1040	1030	1000
11	1240	1170	1230	1040	1050	1300	1500	1030	1030	1000	1020	1420
12	1480	1180	1220	1030	1060	1370	1480	1010	1420	1160	966	2060
13	1640	1190	1210	1030	1050	1390	1450	1000	1430	1200	930	1920
14	1660	1210	1200	1030	1030	1480	1430	1050	1370	1130	910	1890
15	1620	1260	1150	1030	1030	1500	1430	1110	1300	1080	970	2040
16	1550	1430	1120	1030	1030	1470	1440	1240	1230	1040	986	2080
17	1400	1590	1060	1060	1030	1480	1450	1390	1150	1060	958	1830
18	1370	1620	1040	1060	1030	1540	1410	1430	1060	1000	946	1620
19	1220	1670	1020	1080	1030	1580	1360	1460	1080	986	922	1570
20	1180	1690	1020	1100	1030	1600	1320	1430	1780	962	906	1780
21	1150	1710	1050	1160	1010	1550	1300	1380	1480	942	890	1690
22	1120	1720	1080	1140	998	1500	1280	1330	1330	918	860	2060
23	1090	1700	1090	1110	978	1510	1250	1300	1310	898	866	2280
24	1100	1580	1090	1090	966	1640	1230	1280	1260	890	857	2050
25	1090	1460	1100	1070	954	1880	1230	1260	1230	1120	845	1860
26	1070	1350	1120	1060	946	1960	1230	1220	1370	1140	854	2000
27	1060	1240	1100	1020	950	2560	1350	1170	1890	1080	854	2180
28	1050	1230	1090	1000	958	2610	1330	1100	1940	1020	860	2060
29	1030	1220	1080	970	---	2640	1270	1050	1740	1050	851	2240
30	1010	1230	1060	950	---	2560	1220	1040	1440	1050	842	2560
31	994	---	1060	930	---	2440	---	1020	---	998	836	---
TOTAL	36464	39644	37080	32350	28090	47712	46200	36360	37600	33414	28309	48309
MEAN	1176	1321	1196	1044	1003	1539	1540	1173	1253	1078	913	1610
MAX	1660	1720	1480	1160	1060	2640	2220	1460	1940	1290	1030	2560
MIN	990	962	1020	930	920	958	1220	1000	942	890	836	821
CFSM	1.31	1.47	1.33	1.16	1.11	1.71	1.71	1.30	1.39	1.20	1.01	1.79
IN.	1.51	1.64	1.53	1.34	1.16	1.97	1.91	1.50	1.55	1.38	1.17	2.00
CAL YR 1985	TOTAL	435251	MEAN	1192	MAX	2450	MIN	776	CFSM	1.32	IN	17.99
WTR YR 1986	TOTAL	451532	MEAN	1237	MAX	2640	MIN	821	CFSM	1.37	IN	18.66

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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: Dec. 18-21, Dec. 25 to Jan. 16, and Jan. 27 to Feb. 3. 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.--35 years, 2,030 ft³/s, 15.49 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,120 ft³/s, Mar. 30, 1976, gage height, 8.37 ft; maximum gage height, 9.25 ft, Dec. 28, 1985, backwater from ice; minimum daily discharge, 570 ft³/s, June 18, 1980.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,910 ft³/s, Sept.12, 13, gage height, 8.36 ft; maximum gage height, 9.25 ft, Dec. 28, backwater from ice; minimum discharge, 1,040 ft³/s, Aug. 5, gage height, 4.59 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2140	2230	2780	2550	2350	1950	4440	2760	1820	3010	2000	1420
2	2190	2340	2960	2600	2350	1590	4200	2310	1580	2400	2150	1540
3	2690	2480	3160	2600	2000	1970	4140	2170	2050	2160	1830	1690
4	2100	2660	3310	2600	2800	2060	4050	2120	1870	2460	1930	1810
5	2180	2780	3220	2150	2860	1940	3970	2110	1860	2160	1240	2080
6	1910	2790	3130	1850	2920	2240	3630	2270	1860	2200	2000	1870
7	2120	2630	3120	2600	2690	2130	3510	2180	1980	2040	1860	1470
8	2110	2690	2780	2150	2290	2300	3780	2250	1560	2180	1670	1720
9	2430	2470	2870	2300	2750	1770	3680	2500	1600	2310	1750	1760
10	2330	2540	2910	2400	1850	1890	3580	2130	1970	1580	1690	2090
11	2820	2490	2630	2450	2100	3440	3220	1530	2190	1990	1740	3440
12	2710	2340	2790	2300	2110	3020	3220	1770	2510	2360	1890	5320
13	3010	2390	2830	2500	1990	2990	2800	2190	2780	1990	2170	6660
14	3280	2650	2640	2450	2100	3590	2510	2070	3020	2300	1840	6360
15	3530	2820	2310	2450	2150	3600	2870	2060	2790	2150	1830	5920
16	3610	3050	2130	2400	2240	3420	3010	2740	2100	2110	1750	4940
17	3580	3270	2530	2380	2050	3160	3020	2730	1960	2380	1830	4170
18	2840	3340	2150	2290	2410	3320	2940	2440	2220	1910	1760	3880
19	2700	3350	2200	2160	2150	3730	2970	3050	2160	1750	1740	3760
20	2410	3690	2200	2570	2220	4090	2640	3050	2220	1760	1850	3210
21	2090	3980	2250	2670	2180	4410	2260	3220	2450	1850	1710	3210
22	2330	3830	2250	2560	2240	4240	2560	3170	2870	1800	2000	3880
23	2400	3300	2300	2350	2000	4000	2670	2710	2580	1790	1710	4140
24	2280	3090	2740	2210	2110	3360	2570	2460	2420	1800	1270	4560
25	2360	3110	2550	2060	2070	3700	2540	2390	2540	2020	1390	4660
26	2390	2840	2350	2110	2080	4240	2450	2280	2330	2510	1810	5130
27	1870	2960	2200	1950	2090	4590	2430	2260	3010	2840	1660	4920
28	1750	2940	2250	1900	2060	5070	1960	2240	3540	2030	1830	4660
29	1990	2520	1800	1750	---	5280	2890	2210	4140	2210	1620	4910
30	2080	1900	2000	2200	---	5060	2910	1970	4250	1880	1560	4690
31	1950	---	2450	1750	---	4820	---	2130	---	2010	1500	---
TOTAL	76180	85470	79790	71260	63210	102970	93420	73470	72230	65940	54580	109870
MEAN	2457	2849	2574	2299	2258	3322	3114	2370	2408	2127	1761	3662
MAX	3610	3980	3310	2670	2920	5280	4440	3220	4250	3010	2170	6660
MIN	1750	1900	1800	1750	1850	1590	1960	1530	1560	1580	1240	1420
CFSM	1.38	1.60	1.45	1.29	1.27	1.87	1.75	1.33	1.35	1.20	.99	2.06
IN.	1.59	1.79	1.67	1.49	1.32	2.15	1.95	1.54	1.51	1.38	1.14	2.30
CAL YR 1985	TOTAL	900520	MEAN	2467	MAX	6300	MIN	1090	CFSM	1.39	IN	18.82
WTR YR 1986	TOTAL	948390	MEAN	2598	MAX	6660	MIN	1240	CFSM	1.46	IN	19.82

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 time 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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
NOV 06...	0930	2490	423	8.00	10.0	4.1	9.3	85	220	K58	170	42
JAN 08...	0930	2400	430	7.80	.5	2.6	11.1	76	K19	K11	180	48
MAR 19...	1400	2530	375	8.00	2.0	5.8	11.5	85	260	89	160	33
MAY 15...	0930	3810	--	8.10	17.0	2.5	9.0	94	K39	K10	190	59
JUL 17...	1000	1610	368	7.70	23.5	3.5	7.5	89	130	67	160	31
SEP 18...	1030	4720	377	7.90	14.5	6.0	7.4	74	210	K110	160	40

DATE	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)	BICAR- BONATE IT-FLD (MG/L AS HCO3)	CAR- BONATE IT-FLD (MG/L AS CO3)	ALKA- LITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 06...	48	12	16	17	.6	1.4	156	0	128	2.5	16
JAN 08...	51	12	14	15	.5	1.1	157	0	129	4.0	8.6
MAR 19...	44	11	13	15	.5	1.1	150	0	123	2.4	12
MAY 15...	56	12	10	10	.3	1.3	160	0	131	2.0	13
JUL 17...	46	12	8.7	10	.3	1.0	163	0	134	5.2	12
SEP 18...	47	10	7.8	10	.3	1.4	145	0	119	2.9	14

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04126520 MANISTEE RIVER AT MANISTEE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 06...	0930	39	.10	8.5	229	220	.31	1540	.14
JAN 08...	0930	30	.10	8.8	218	200	.30	1410	.27
MAR 19...	1400	32	.10	7.5	198	190	.27	1350	.25
MAY 15...	0930	33	<.10	6.3	231	210	.31	2380	.12
JUL 17...	1000	21	.10	7.4	209	190	.28	909	.12
SEP 18...	1030	28	.10	7.4	212	190	.29	2700	<.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
NOV 06...	.050	.40	.030	.010	<.010	14	94	97
JAN 08...	.040	.40	.020	--	.010	7	45	50
MAR 19...	.030	.40	.020	.010	<.010	7	48	97
MAY 15...	.040	.50	.020	.010	<.010	6	62	86
JUL 17...	.040	.50	.030	.010	<.010	3	13	100
SEP 18...	.040	.60	.040	.010	<.010	13	166	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)
NOV 06...	20	<1	20	<.5	5	<1	<3	3	92	<5
MAR 19...	10	<1	19	<.5	<1	<1	<3	3	70	<5
MAY 15...	10	<1	21	<.5	2	<1	<3	8	28	<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)
NOV 06...	11	9	<.1	<10	<1	<1	<1	210	<6	13
MAR 19...	7	18	<.1	<10	1	<1	<1	190	<6	21
MAY 15...	17	6	.5	<10	2	<1	1	310	<6	5

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken upstream from culvert.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)
OCT 30...	1015	12	448	8.00	7.0	10.2	86	.65	--
FEB 20...	1100	13	423	8.00	4.0	11.7	92	.72	--
JUN 04...	1700	9.4	472	8.30	18.0	8.9	97	.90	.90

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 30...	.004	--	.65	--	.050	--	.35	--	.40
FEB 20...	.010	--	.73	--	.060	--	.24	--	.30
JUN 04...	<.010	<.010	.90	.90	.030	.010	.37	.19	.40

DATE	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHORUS, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDEDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY)
OCT 30...	--	1.1	<.010	--	--	<.010	5	.16
FEB 20...	--	1.0	.020	--	--	<.010	10	.35
JUN 04...	.20	1.3	.010	.010	<.010	<.010	1	.03

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken near bridge, 0.7 mi downstream from Duck Lake.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)
OCT 30...	0915	41	300	8.10	10.0	9.7	88	.06	--
FEB 20...	1515	42	316	8.00	.5	12.4	89	.14	--
JUN 04...	1330	23	296	8.30	21.5	10.0	117	.05	.03

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 30...	.005	--	.06	--	.060	--	.34	--	.40
FEB 20...	.010	--	.15	--	.040	--	.26	--	.30
JUN 04...	--	.030	.06	.06	.060	.030	.34	.27	.40

DATE	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, 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)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
OCT 30...	--	.46	<.010	--	--	<.010	4	.44
FEB 20...	--	.45	.010	--	--	<.010	3	.34
JUN 04...	.30	.46	.010	<.010	<.010	<.010	2	.12

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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken about 300 ft upstream from inlet to Green Lake. A grab sample was taken Jan. 16, because of ice. Streamflow affected by Green Lake. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 29...	1530	56	303	8.00	10.5	--	--	9.2	84
DEC 10...	1330	82	306	8.00	1.5	--	--	11.4	83
JAN 16...	1300	--	306	7.80	.5	--	--	11.0	78
FEB 20...	1430	58	318	8.10	1.5	--	--	11.2	82
APR 03...	1100	132	273	7.90	7.5	25	1.4	10.6	90
MAY 07...	1400	66	326	8.30	18.0	--	--	9.7	105
JUN 03...	1645	41	296	8.40	20.5	5	1.2	9.4	107
AUG 27...	1215	34	293	8.00	17.0	--	--	8.0	85

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 03...	140	8	41	9.9	3.0	.1	4	.80	3.3
JUN 03...	160	11	45	11	4.0	.1	5	.80	1.1

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 03...	10	5.4	.20	7.2	165	160	.22	59
JUN 03...	11	6.5	.20	6.6	181	170	.25	20

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04126546 GREEN LAKE INLET NEAR INTERLOCHEN, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 29...	1530	.09	--	.004	--	.09	--	.070	--	.43
DEC 10...	1330	.14	--	.010	--	.15	--	.080	--	.42
JAN 16...	1300	.17	--	.009	--	.18	--	.090	--	.41
FEB 20...	1430	.20	--	.007	--	.20	--	.090	--	.21
APR 03...	1100	.17	.17	<.010	<.010	.18	.17	.030	.030	.87
MAY 07...	1400	.13	.12	<.010	<.010	.14	.13	.040	.040	.36
JUN 03...	1645	.08	.08	<.010	<.010	.09	.09	.060	--	.44
AUG 27...	1215	.04	.04	<.010	<.010	--	.05	.060	.050	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHORUS, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 29...	--	.50	--	.59	<.010	--	<.010	--	2	.30
DEC 10...	--	.50	--	.65	<.010	--	<.010	--	1	.22
JAN 16...	--	.50	--	.68	.010	--	.010	--	2	--
FEB 20...	--	.30	--	.50	.020	--	<.010	--	5	.78
APR 03...	.37	.90	.40	1.1	.020	<.010	<.010	<.010	2	.71
MAY 07...	.36	.40	.40	.54	.020	<.010	<.010	<.010	3	.53
JUN 03...	.23	.50	.30	.59	.010	.010	<.010	<.010	2	.22
AUG 27...	.35	--	.40	--	.030	<.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 03...	1100	<10	<1	<100	<10	<1	<10	<1	3
JUN 03...	1645	<10	<1	<100	<10	<1	<10	<1	7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126546 GREEN LAKE INLET NEAR INTERLOCHEN, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 03...	100	38	<5	5	10	4	<.10	<1
JUN 03...	90	22	<5	5	10	9	<.10	2

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 03...	<1	60	58	<10	5.9	<.010	2
JUN 03...	<1	--	69	20	8.6	<.010	1

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken about 300 ft downstream from outlet of Green Lake near bridge.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)
OCT 29...	1415	90	284	8.20	12.0	9.6	91	.04	--
FEB 20...	1330	93	303	8.10	1.0	11.7	85	.12	--
JUN 04...	1530	70	278	8.60	18.0	10.8	118	--	.00

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 29...	.004	--	.05	--	.030	--	.37	--	.40
FEB 20...	.007	--	.13	--	.040	--	.26	--	.30
JUN 04...	<.010	<.010	--	.01	.030	.010	.37	.29	.40

DATE	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, 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)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 29...	--	.45	<.010	--	--	<.010	1	.24
FEB 20...	--	.43	.010	--	--	<.010	2	.50
JUN 04...	.30	--	.010	<.010	<.010	<.010	1	.19

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126845 CEDAR RUN NEAR CEDAR, MI

LOCATION.--Lat 44°45'46", long 85°48'57", in SW1/4 SW1/4 sec.6, T.27 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at culvert on Cedar Run Road, and 5.9 mi south of Cedar.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--October 1985 to June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected near culvert.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)
OCT 31...	1315	8.3	329	8.20	8.5	11.4	100	.17	--
FEB 21...	0945	10	314	8.10	1.0	12.5	89	1.3	--
JUN 03...	1415	9.9	306	8.20	14.0	11.1	110	.15	.15
DATE	TIME	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N)
OCT 31...		.002	--	.17	--	.030	--	.27	.30
FEB 21...		.016	--	1.3	--	.060	--	.14	.20
JUN 03...		<.010	<.010	.16	.16	.020	<.010	.28	.30
DATE	TIME	NITRO- GEN, 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)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	
OCT 31...		.47	<.010	--	--	<.010	2	.04	
FEB 21...		1.5	<.010	--	--	<.010	2	.05	
JUN 03...		.46	.010	.010	<.010	<.010	11	.29	

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected downstream from culverts.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)
OCT 29...	1300	47	322	8.40	8.0	11.6	100	.43
FEB 20...	1030	46	326	8.20	5.5	11.4	93	.47
JUN 03...	1330	51	294	8.30	12.5	10.2	98	.38

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 29...	.004	--	.44	.040	--	.16	--	.20
FEB 20...	.010	--	.48	.040	--	.26	--	.30
JUN 03...	<.010	<.010	--	--	.020	--	.28	--

DATE	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, 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)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY)
OCT 29...	--	.64	<.010	--	--	<.010	9	1.1
FEB 20...	--	.78	<.010	--	--	<.010	6	.75
JUN 03...	.30	--	.010	<.010	<.010	<.010	6	.83

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126958 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 culvert on Broomhead Road, 5.5 mi northwest of South Boardman.

DRAINAGE AREA.--69.2 mi².

PERIOD OF RECORD.--Water years 1971, 1984 to June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected downstream from culvert.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)
OCT 29...	1145	64	336	8.30	7.0	11.0	92	.31	--
FEB 20...	0930	66	334	8.10	4.0	11.8	92	.47	--
JUN 03...	1130	65	309	8.20	12.5	9.7	93	--	.31

DATE	TIME	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 29...	.003	--	--	.31	--	.030	--	.27	--	.30
FEB 20...	.007	--	--	.47	--	.040	--	.16	--	.20
JUN 03...	<.010	<.010	--	.31	--	.030	.28	.22	--	.30

DATE	TIME	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, 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)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY)
OCT 29...	--	--	.61	<.010	--	--	<.010	2	.35
FEB 20...	--	--	.67	<.010	--	--	<.010	17	3.0
JUN 03...	.25	--	.010	<.010	<.010	<.010	<.010	4	.70

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected near bridge. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 31...	1115	132	313	8.20	7.0	--	--	11.2	95
DEC 11...	1430	163	296	8.30	4.5	--	--	11.8	93
JAN 16...	0915	140	310	8.10	3.0	--	--	11.9	90
FEB 20...	1145	134	339	8.30	5.0	--	--	11.6	93
APR 03...	0800	338	232	8.00	7.0	35	1.8	10.6	89
MAY 07...	1230	163	300	8.40	13.5	--	--	9.7	95
JUN 04...	0930	143	321	8.20	12.0	10	1.2	10.1	96
AUG 28...	0945	128	349	8.30	9.0	--	--	10.4	91

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 03...	120	9	34	7.5	3.2	.1	6	.80	2.1
JUN 04...	160	7	46	10	3.8	.1	5	.60	1.8

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 03...	12	7.1	<.10	6.0	137	140	.19	125
JUN 04...	8.8	8.6	<.10	7.3	180	180	.24	69

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126970 BOARDMAN RIVER AT BROWN BRIDGE ROAD NEAR MAYFIELD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 31...	1115	.31	--	.003	--	.31	--	.030	--	.27
DEC 11...	1430	.34	--	.007	--	.35	--	.040	--	.36
JAN 16...	0915	.40	--	.004	--	.40	--	.050	--	.25
FEB 20...	1145	.39	--	.007	--	.39	--	.040	--	.16
APR 03...	0800	--	.20	--	<.010	.20	.20	--	.020	.39
MAY 07...	1230	.27	.25	<.010	<.010	.27	.26	<.010	<.010	--
JUN 04...	0930	.28	.28	<.010	<.010	--	.29	<.010	<.010	--
AUG 28...	0945	.27	.26	<.010	<.010	.27	.27	.040	.020	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHORUS, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 31...	--	.30	--	.61	<.010	--	<.010	--	5	1.8
DEC 11...	--	.40	--	.75	<.010	--	<.010	--	--	--
JAN 16...	--	.30	--	.70	.010	--	.010	--	7	2.6
FEB 20...	--	.20	--	.59	.010	--	<.010	--	7	2.5
APR 03...	.38	.40	.40	.60	.010	<.010	<.010	<.010	15	14
MAY 07...	--	--	.40	--	.010	.010	<.010	<.010	15	6.6
JUN 04...	--	.30	.20	--	.010	<.010	<.010	<.010	7	2.7
AUG 28...	.38	--	.40	--	.020	.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 03...	0800	60	<1	<100	<10	<1	<10	<1	6
JUN 04...	0930	10	1	<100	<10	<1	<10	<1	6

04126970 BOARDMAN RIVER AT BROWN BRIDGE ROAD NEAR MAYFIELD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 03...	200	55	6	<4	30	11	<.10	<1
JUN 04...	180	38	<5	4	40	10	<.10	2

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 03...	<1	50	45	<10	7.2	<.010	2
JUN 04...	<1	--	66	<10	4.0	<.010	5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126991 BOARDMAN RIVER BELOW BROWN BRIDGE POND NEAR MAYFIELD, MI

LOCATION.--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, 1.6 mi northeast of Mayfield.

DRAINAGE AREA.--150 mi².

PERIOD OF RECORD.--Water years 1984 to August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected downstream from Brown Bridge Dam. Dissolved oxygen and water temperature were measured in pond. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 31...	1000	160	319	8.20	9.0	--	--	10.2	90
DEC 11...	1300	175	299	8.20	2.0	--	--	9.2	68
JAN 16...	1045	260	308	8.10	.0	--	--	12.1	85
FEB 20...	1345	179	352	8.20	1.5	--	--	10.2	74
APR 02...	1645	393	206	7.90	12.0	40	1.5	9.8	93
MAY 07...	0915	253	290	8.30	14.5	--	--	9.6	97
JUN 04...	1100	158	318	8.40	15.5	15	1.5	10.0	103
AUG 28...	1100	165	352	8.20	14.0	--	--	9.8	96

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 02...	100	8	30	6.5	2.9	.1	6	.80	2.3
JUN 04...	150	8	45	10	3.9	.1	5	.70	1.1

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 02...	12	6.4	<.10	5.9	128	120	.17	136
JUN 04...	8.5	8.1	<.10	7.0	174	170	.24	74

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04126991 BOARDMAN RIVER BELOW BROWN BRIDGE POND NEAR MAYFIELD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 31...	1000	.21	--	.003	--	.21	--	.020	--	.38
DEC 11...	1300	.28	--	.008	--	.29	--	.050	--	.25
JAN 16...	1045	.32	--	.004	--	.32	--	.040	--	.26
FEB 20...	1345	.31	--	.008	--	.32	--	.050	--	.05
APR 02...	1645	--	.17	<.010	<.010	--	.18	.020	.020	.38
MAY 07...	0915	.21	.20	<.010	<.010	.21	.20	<.010	<.010	--
JUN 04...	1100	.18	.18	<.010	<.010	--	.19	.030	<.010	.37
AUG 28...	1100	.16	.16	<.010	<.010	.17	.17	.050	.030	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (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)
OCT 31...	--	.40	--	.61	<.010	--	<.010	--	2	.86
DEC 11...	--	.30	--	.59	<.010	--	<.010	--	1	.47
JAN 16...	--	.30	--	.62	.010	--	<.010	--	2	1.4
FEB 20...	--	.10	--	.42	<.010	--	<.010	--	2	.97
APR 02...	.38	.40	.40	--	.010	<.010	<.010	<.010	4	4.2
MAY 07...	--	.30	.30	.51	.010	<.010	<.010	<.010	2	1.4
JUN 04...	--	.40	.30	--	.010	.010	<.010	<.010	1	.43
AUG 28...	.17	.20	.20	--	.020	<.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 02...	1645	170	<1	<100	<10	<1	<10	<1	3
JUN 04...	1100	10	1	<100	<10	<1	<10	<1	5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126991 BOARDMAN RIVER BELOW BROWN BRIDGE POND NEAR MAYFIELD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 04...	110	23	<5	5	20	6	.50	1
JUN 05...	150	13	<5	5	10	<10	<.10	1

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 02...	<1	40	40	<10	6.9	<.010	1
JUN 04...	<1	80	66	<10	4.6	<.010	2

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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, at culvert on Voice Road, 2.9 mi northeast of Kingsley.

DRAINAGE AREA.--9.1 mi².

PERIOD OF RECORD.--Water years 1984 to June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken upstream from culvert.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)
OCT 30...	1245	6.6	313	8.10	7.5	11.0	94	.35	--
FEB 21...	1300	11	306	8.00	1.0	13.6	96	.38	--
JUN 03...	1530	5.1	310	8.40	14.0	9.4	94	--	.43
DATE	AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)
OCT 30...	.003	--	.35	--	.040	--	.26	--	.30
FEB 21...	.006	--	.38	--	.040	--	.36	--	.40
JUN 03...	<.010	<.010	--	.43	--	.030	.29	.37	--
DATE	AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTH- THO, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTH- THO, TOTAL (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 30...	--	.65	<.010	--	--	<.010	3	.05	
FEB 21...	--	.78	.010	--	--	<.010	10	.30	
JUN 03...	.40	--	<.010	<.010	<.010	<.010	4	.06	

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected near bridge. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 30...	1345	28	317	8.20	7.5	--	--	10.9	93
DEC 11...	1130	37	282	8.10	4.0	--	--	11.8	92
JAN 15...	1400	32	313	7.80	1.5	--	--	13.0	95
FEB 19...	1530	28	340	8.30	4.5	--	--	12.3	97
APR 02...	1500	55	229	8.00	8.0	32	1.4	11.0	95
MAY 06...	1330	32	308	8.30	15.0	--	--	9.6	98
JUN 04...	1400	24	318	8.30	13.0	10	1.4	10.3	100
AUG 27...	1330	24	336	8.30	12.0	--	--	10.0	95

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 02...	110	8	33	7.8	2.9	.1	5	.90	2.1
JUN 04...	170	14	48	12	4.3	.1	5	.90	1.5

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 02...	10	6.1	<.10	7.0	139	130	.19	21
JUN 04...	11	8.2	.10	8.0	195	190	.27	13

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04126997 EAST CREEK NEAR MAYFIELD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 30...	1345	.67	--	.002	--	.67	--	.030	--	.27
DEC 11...	1130	.58	--	.008	--	.59	--	.040	--	.36
JAN 15...	1400	.72	--	.004	--	.73	--	.060	--	.24
FEB 19...	1530	.70	--	.008	--	.71	--	.040	--	.16
APR 02...	1500	--	.42	<.010	<.010	--	.42	--	.010	--
MAY 06...	1330	.64	.61	<.010	<.010	.64	.61	<.010	<.010	--
JUN 04...	1400	.77	.76	<.010	<.010	.77	.76	.010	<.010	.29
AUG 27...	1330	.77	.77	<.010	<.010	.77	.77	.040	.020	.16

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOD, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOD, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 30...	--	.30	--	.97	<.010	--	<.010	--	6	.45
DEC 11...	--	.40	--	.99	.010	--	<.010	--	5	.50
JAN 15...	--	.30	--	1.0	.010	--	.010	--	2	.17
FEB 19...	--	.20	--	.91	<.010	--	<.010	--	3	.23
APR 02...	.29	.40	.30	--	.020	<.010	<.010	<.010	10	1.5
MAY 06...	--	--	.40	--	.040	<.010	<.010	<.010	4	.35
JUN 04...	--	.30	.30	1.1	.010	.010	<.010	<.010	6	.39
AUG 27...	.18	.20	.20	.97	<.010	<.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 02...	1500	70	<1	<100	<10	<1	<10	<1	4
JUN 04...	1400	10	<1	100	<10	<1	<10	<1	4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126997 EAST CREEK NEAR MAYFIELD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 02...	190	57	<5	<4	20	5	<.10	<1
JUN 04...	60	18	<5	4	10	6	<.10	2

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 02...	<1	60	47	<10	6.3	<.010	1
JUN 04...	<1	80	70	<10	7.4	<.010	<1

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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.

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. Records good. Flow regulated by hydroelectric powerplant 0.9 mi upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 195 ft³/s, 14.55 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, 959 ft³/s, Sept. 29, gage height, 6.33 ft; minimum, 90 ft³/s, Oct. 6, gage height, 3.07 ft; minimum daily, 132 ft³/s, Mar. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	238	199	279	233	226	203	465	244	229	270	227	201
2	194	276	364	231	256	203	419	270	177	222	232	201
3	192	325	351	222	220	201	392	266	209	240	248	204
4	264	293	319	221	192	200	351	248	174	234	215	263
5	223	258	199	224	223	199	359	245	231	297	225	241
6	182	245	283	231	214	197	430	233	203	266	223	244
7	204	278	307	230	207	189	365	269	173	234	220	231
8	258	259	214	228	249	132	343	278	173	223	236	204
9	223	306	269	239	236	197	299	240	173	228	224	204
10	224	222	304	223	208	280	312	235	235	219	290	281
11	260	292	243	204	201	215	317	236	282	213	265	519
12	265	214	212	205	201	220	286	235	472	235	222	713
13	326	295	266	204	198	249	269	225	459	216	223	524
14	378	288	256	206	196	274	270	229	369	260	254	508
15	308	289	209	225	198	278	326	295	320	229	237	490
16	233	334	256	275	227	244	318	300	207	216	231	390
17	300	353	228	244	224	258	239	280	208	194	260	345
18	219	353	217	200	200	236	298	381	227	223	223	340
19	202	383	227	213	220	309	331	363	565	218	219	331
20	244	385	249	294	210	259	233	343	492	201	216	402
21	232	364	282	230	209	254	241	305	299	241	214	359
22	196	319	196	206	209	259	278	286	270	212	214	502
23	200	306	188	203	209	288	277	282	231	202	214	464
24	260	231	220	203	207	308	253	247	312	201	214	384
25	222	308	243	246	207	345	252	215	273	363	214	380
26	200	262	248	239	210	572	336	277	370	457	197	375
27	200	246	243	192	207	592	330	222	574	350	218	438
28	201	292	245	206	207	571	311	228	439	288	214	324
29	200	255	213	200	---	586	289	203	325	232	202	735
30	200	198	211	222	---	536	241	230	289	244	227	751
31	199	---	227	200	---	492	---	193	---	268	201	---
TOTAL	7247	8628	7768	6899	5971	9346	9430	8103	8960	7696	7019	11548
MEAN	234	288	251	223	213	301	314	261	299	248	226	385
MAX	378	385	364	294	256	592	465	381	574	457	290	751
MIN	182	198	188	192	192	132	233	193	173	194	197	201
CFSM	1.29	1.58	1.38	1.23	1.17	1.65	1.73	1.43	1.64	1.36	1.24	2.12
IN.	1.48	1.76	1.59	1.41	1.22	1.91	1.93	1.66	1.83	1.57	1.43	2.36
CAL YR 1985	TOTAL	90386	MEAN	248	MAX	682	MIN	139	CFSM	1.36	IN	18.47
WTR YR 1986	TOTAL	98615	MEAN	270	MAX	751	MIN	132	CFSM	1.48	IN	20.16

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127008 SWAINSTON CREEK AT MAYFIELD, MI

LOCATION.--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, at bridge on Mill Street in Mayfield.

DRAINAGE AREA.--10.0 mi².

PERIOD OF RECORD.--Water years 1984 to August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made downstream from dam at time of sampling. Cross-sectional samples were collected from crest of dam in spillway of Mayfield Pond. Dissolved oxygen and water temperature measured in pond. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 31...	0900	15	374	8.10	6.5	--	--	10.6	88
DEC 11...	1030	16	366	8.10	5.0	--	--	11.1	89
JAN 15...	1515	15	373	8.10	3.0	--	--	12.1	92
FEB 21...	1100	15	411	8.10	2.5	--	--	12.8	94
APR 02...	1330	19	338	8.20	9.0	10	1.9	11.2	99
MAY 06...	1515	17	364	8.40	15.5	--	--	9.9	103
JUN 04...	1300	14	395	8.40	13.5	5	2.1	10.5	103
AUG 27...	1430	14	382	8.30	12.0	--	--	10.0	95

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 02...	170	14	50	11	5.8	.2	7	1.2	1.9
JUN 04...	190	18	58	12	5.5	.2	6	.90	1.3

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 02...	11	9.4	.10	7.8	197	190	.27	10
JUN 04...	16	11	.10	8.5	220	220	.30	8.3

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127008 SWAINSTON CREEK AT MAYFIELD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 31...	0900	.30	.003	--	.30	--	.030	--	.17
DEC 11...	1030	.33	.006	--	.33	--	.040	--	.36
JAN 15...	1515	.37	.003	--	.37	--	.040	--	.26
FEB 21...	1100	.36	.009	--	.37	--	.040	--	.36
APR 02...	1330	.29	<.010	<.010	--	.31	.030	.020	.37
MAY 06...	1515	.25	<.010	<.010	.25	.24	--	.020	--
JUN 04...	1300	.26	<.010	<.010	--	.27	.010	<.010	.29
AUG 27...	1430	.29	<.010	<.010	--	.30	.020	.020	.18

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (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)
OCT 31...	--	.20	--	.50	<.010	--	<.010	--	5	.20
DEC 11...	--	.40	--	.73	.020	--	<.010	--	31	1.3
JAN 15...	--	.30	--	.67	.010	--	.010	--	6	.24
FEB 21...	--	.40	--	.77	.010	--	<.010	--	60	2.4
APR 02...	.28	.40	.30	--	.010	<.010	<.010	<.010	19	.97
MAY 06...	.28	.30	.30	.55	.010	<.010	<.010	<.010	10	.46
JUN 04...	--	.30	.20	--	.010	.010	<.010	<.010	12	.45
AUG 27...	.18	.20	.20	--	.010	.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 02...	1330	70	<1	<100	<10	<1	<10	<1	1
JUN 04...	1300	170	<1	<100	<10	<1	<10	<1	6

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127008 SWAINSTON CREEK AT MAYFIELD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 02...	310	36	<5	5	40	11	<.10	2
JUN 04...	540	32	<5	5	70	9	<.10	3

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 02...	<1	70	55	20	3.8	<.010	1
JUN 04...	<1	110	65	<10	14	<.010	4

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 Hoosier Valley Road, 2.3 mi west of Mayfield.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--Water years 1984 to June 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were collected near culvert.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)
OCT 30...	1500	.64	307	7.70	7.5	7.7	66	.00	--
FEB 21...	0930	.62	310	8.00	2.0	10.2	74	.06	--
JUN 04...	0945	.32	340	8.00	11.0	7.3	68	.07	.07

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 30...	.004	--	.01	--	.060	--	.44	--	.50
FEB 21...	.010	--	.07	--	.070	--	.23	--	.30
JUN 04...	<.010	<.010	.08	.08	--	.050	.36	.35	.40

DATE	NITRO- GEN,AM- MONIA + ORGANIC DIS- (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOS, TOTAL (MG/L AS P)	SEDI- MENT, SUS- PENDEED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY)
OCT 30...	--	.51	.010	--	--	<.010	1	.00
FEB 21...	--	.37	.010	--	--	<.010	4	.00
JUN 04...	.40	.48	.020	.010	<.010	<.010	6	.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 dam on Cass Road, 4.6 mi south of Traverse City.

DRAINAGE AREA.--266 mi².

PERIOD OF RECORD.--Water years 1984 to August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling near Beitner Road upstream from pond. All samples were taken from pond at dam. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 30...	1500	273	363	8.30	10.5	--	--	10.6	96
DEC 10...	1600	396	326	8.00	4.0	--	--	11.2	87
JAN 16...	1300	392	363	8.20	2.5	--	--	--	--
FEB 20...	1520	292	375	8.40	3.5	--	--	11.8	90
APR 03...	1230	539	246	8.00	10.0	30	2.0	10.2	92
MAY 07...	1300	353	341	8.20	15.5	--	--	10.2	104
JUN 04...	1530	257	352	8.30	18.5	10	3.0	9.7	105
AUG 28...	1230	271	382	8.30	15.0	--	--	9.0	90

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 03...	120	9	36	7.8	3.4	.1	6	.90	2.2
JUN 04...	180	19	52	12	4.8	.2	5	.90	1.5

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 03...	15	7.6	<.10	6.4	149	150	.20	217
JUN 04...	10	8.8	.10	7.6	199	190	.27	138

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127250 BOARDMAN RIVER NEAR TRAVERSE CITY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 30...	1500	.27	--	.003	--	.28	--	.050	--	.25
DEC 10...	1600	.32	--	.008	--	.33	--	.050	--	.25
JAN 16...	1300	.36	--	.003	--	.36	--	.040	--	.26
FEB 20...	1520	.36	--	.011	--	.37	--	.050	--	.15
APR 03...	1230	--	.22	--	<.010	.22	.22	--	.030	.38
MAY 07...	1300	.26	.24	<.010	<.010	.26	.24	--	.040	.29
JUN 04...	1530	.23	--	<.010	<.010	--	.26	.020	.010	.48
AUG 28...	1230	.23	.23	<.010	<.010	--	.24	.040	.030	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTH- THO, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTH- THO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)
OCT 30...	--	.30	--	.58	<.010	--	.010	--	2	1.5
DEC 10...	--	.30	--	.63	.010	--	<.010	--	2	2.1
JAN 16...	--	.30	--	.66	<.010	--	--	--	1	1.1
FEB 20...	--	.20	--	.57	<.010	--	<.010	--	3	2.4
APR 03...	.37	.40	.40	.62	.010	<.010	<.010	<.010	4	5.8
MAY 07...	.26	.30	.30	.56	.010	<.010	<.010	<.010	2	1.9
JUN 04...	.19	.50	.20	--	.020	<.010	<.010	<.010	20	14
AUG 28...	.17	--	.20	--	.020	<.010	.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 03...	1230	30	<1	<100	<10	<1	<10	<1	5
JUN 04...	1530	90	<1	<100	<10	<1	10	<1	2

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127250 BOARDMAN RIVER NEAR TRAVERSE CITY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 03...	280	68	<5	5	30	15	<.10	<1
JUN 04...	350	12	<5	6	110	4	<.10	5

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 03...	<1	--	51	<10	6.9	<.010	2
JUN 04...	<1	80	77	<10	4.3	<.010	<1

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127490 BOARDMAN RIVER AT TRAVERSE CITY, MI

LOCATION.--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, at bridge on Union Street in Traverse City.

DRAINAGE AREA.--275 mi².

PERIOD OF RECORD.--Water years 1984 to August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken from downstream side of bridge. Station located 300 ft downstream from dam. Streamflow affected by Lake Michigan. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 31...	0915	306	380	8.30	10.5	--	--	12.0	109
DEC 11...	0930	432	359	8.10	2.0	--	--	13.0	95
JAN 16...	0915	304	376	8.20	2.0	--	--	--	--
FEB 20...	0900	356	351	8.00	2.5	--	--	12.5	94
APR 03...	1000	577	294	8.10	8.0	35	1.0	10.8	91
MAY 07...	0900	330	355	8.40	14.0	--	--	10.3	101
JUN 04...	0930	320	339	8.30	17.0	20	1.2	9.2	97
AUG 28...	1330	284	408	8.30	16.5	--	--	8.6	88

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 03...	130	10	39	8.5	5.2	.2	8	1.0	1.9
JUN 04...	180	14	52	11	6.7	.2	8	1.0	1.5

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 03...	13	9.8	.10	6.6	160	160	.22	249
JUN 04...	11	12	.10	7.4	206	200	.28	178

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127490 BOARDMAN RIVER AT TRAVERSE CITY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 31...	0915	.45	--	.013	--	.46	--	.050	--	.85
DEC 11...	0930	.46	--	.017	--	.47	--	.060	--	.34
JAN 16...	0915	.46	--	.007	--	.47	--	.050	--	.35
FEB 20...	0900	.52	--	.010	--	.53	--	.060	--	.34
APR 03...	1000	.34	.34	<.010	<.010	.35	.35	.040	.040	--
MAY 07...	0900	.36	.36	<.010	<.010	.37	.36	.060	.040	--
JUN 04...	0930	.29	.29	<.010	<.010	.30	.29	.060	.020	.34
AUG 28...	1330	--	.38	<.010	<.010	.38	.38	.060	.030	.24

DATE	TIME	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDEDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY)
OCT 31...	--	--	.90	--	1.4	.030	--	.020	--	1	.83
DEC 11...	--	--	.40	--	.87	.020	--	<.010	--	2	2.3
JAN 16...	--	--	.40	--	.87	.020	--	.010	--	2	1.6
FEB 20...	--	--	.40	--	.93	.010	--	<.010	--	5	4.8
APR 03...	.46	--	--	.50	--	.020	.010	<.010	<.010	5	7.8
MAY 07...	.46	--	--	.50	--	--	.030	.030	.020	2	1.8
JUN 04...	.18	.40	.40	.20	.70	.020	.010	<.010	<.010	3	2.6
AUG 28...	.17	.30	.30	.20	.68	.030	.010	.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 03...	1000	40	<1	<100	<10	<1	<10	<1	3
JUN 04...	0930	<10	<1	<100	100	<1	<10	<1	4

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127490 BOARDMAN RIVER AT TRAVERSE CITY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 03...	190	65	<5	<4	30	22	<.10	<1
JUN 04...	110	9	<5	6	20	6	<.10	2

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 03...	<1	70	60	10	3.4	<.010	<1
JUN 04...	<1	--	79	<10	5.3	<.010	1

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 year 1984 to August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken downstream from bridge. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 31...	1045	13	584	8.30	7.5	--	--	11.0	93
DEC 11...	1045	13	655	8.20	4.5	--	--	11.7	91
JAN 16...	1100	13	575	8.20	4.0	--	--	--	--
FEB 21...	1100	15	605	8.10	.5	--	--	13.3	93
APR 03...	1315	16	556	8.10	8.0	27	2.6	12.4	105
MAY 07...	1045	12	570	8.20	11.0	--	--	10.4	95
JUN 05...	0845	10	549	8.20	11.5	8	3.0	9.9	92
AUG 29...	1130	11	532	8.20	12.0	--	--	9.6	90

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 03...	260	27	76	17	14	.4	10	1.5	3.6
JUN 05...	250	18	74	17	12	.3	9	1.2	2.9

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 03...	18	23	.40	9.6	308	300	.42	13
JUN 05...	23	18	.40	9.9	297	300	.40	8.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127498 HOSPITAL CREEK AT TRAVERSE CITY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 31...	1045	.48	--	.008	--	.49	--	.060	--	.34
DEC 11...	1045	.51	--	.012	--	.52	--	.060	--	.34
JAN 16...	1100	.52	--	.005	--	.53	--	.070	--	.43
FEB 21...	1100	.49	--	.009	--	.50	--	.070	--	.43
APR 03...	1315	--	.52	--	<.010	.52	.52	.060	.050	.34
MAY 07...	1045	.46	.45	<.010	<.010	.47	.46	.100	.100	.30
JUN 05...	0845	--	.46	<.010	<.010	--	.47	.040	.040	.36
AUG 29...	1130	--	.44	.010	<.010	--	.45	.070	.070	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (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)
OCT 31...	--	.40	--	.89	.020	--	<.010	--	30	1.1
DEC 11...	--	.40	--	.92	.020	--	<.010	--	18	.63
JAN 16...	--	.50	--	1.0	.030	--	.020	--	3	.11
FEB 21...	--	.50	--	1.0	.030	--	<.010	--	41	1.7
APR 03...	.25	.40	.30	.92	.030	.010	.010	<.010	56	2.4
MAY 07...	--	.40	--	.87	.010	.010	<.010	<.010	21	.68
JUN 05...	.26	.40	.30	--	.030	<.010	<.010	<.010	40	1.1
AUG 29...	.43	--	.50	--	.020	.010	.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 03...	1315	70	<1	<100	<10	<1	<10	<1	5
JUN 05...	0845	100	<1	<100	<10	<1	<10	<1	4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127498 HOSPITAL CREEK AT TRAVERSE CITY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 03...	710	79	<5	7	40	29	<.10	<1
JUN 05...	960	42	<5	8	40	14	<.10	1

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 03...	<1	110	110	<10	4.4	<.010	<1
JUN 05...	<1	--	110	40	3.4	<.010	<1

STREAMS TRIBUTARY TO LAKE MICHIGAN

185

04127520 MITCHELL CREEK AT TRAVERSE CITY, MI

LOCATION.--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 bridge on private drive, 250 ft 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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken near bridge on private drive and 100 ft upstream from inflow of unnamed tributary.
One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 30...	1315	8.1	470	8.30	9.0	--	--	11.6	102
DEC 11...	1500	11	436	8.20	3.0	--	--	12.6	95
JAN 16...	1430	9.5	445	8.30	3.5	--	--	--	--
FEB 21...	1145	12	438	8.00	1.0	--	--	13.5	96
APR 03...	1430	12	413	8.40	9.0	10	.90	11.9	103
MAY 06...	1545	8.3	427	8.50	19.5	--	--	9.5	106
JUN 05...	1045	6.7	436	8.40	11.5	5	2.5	10.5	97
AUG 27...	1630	8.2	463	8.40	13.5	--	--	--	--

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 03...	200	12	59	13	5.2	.2	5	1.2	1.4
JUN 05...	210	8	62	14	4.7	.1	5	.90	1.6

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 03...	12	8.7	.20	7.2	227	220	.31	7.4
JUN 05...	14	7.0	.20	8.4	255	240	.35	4.6

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127520 MITCHELL CREEK AT TRAVERSE CITY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 30...	1315	.65	--	.004	--	.65	--	.040	--	.46
DEC 11...	1500	.53	--	.007	--	.54	--	.040	--	.46
JAN 16...	1430	.65	--	.003	--	.65	--	.040	--	.36
FEB 21...	1145	.64	--	.008	--	.65	--	.030	--	.27
APR 03...	1430	--	.48	<.010	<.010	--	.49	.040	.030	.36
MAY 06...	1545	.60	.58	<.010	<.010	.61	.59	.050	.040	--
JUN 05...	1045	--	.78	<.010	<.010	--	.79	.030	.030	.37
AUG 27...	1630	--	.68	<.010	<.010	.68	.68	.040	.020	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODIS- SOLVED (MG/L AS P)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 30...	--	.50	--	1.2	.020	--	.010	--	14	.31
DEC 11...	--	.50	--	1.0	.020	--	.010	--	8	.24
JAN 16...	--	.40	--	1.1	.010	--	.010	--	6	.15
FEB 21...	--	.30	--	.95	.020	--	<.010	--	24	.78
APR 03...	.27	.40	.30	--	.010	.010	<.010	<.010	11	.36
MAY 06...	.26	--	.30	--	.010	<.010	<.010	<.010	13	.29
JUN 05...	.17	.40	.20	--	.030	.010	<.010	<.010	22	.40
AUG 27...	.28	--	.30	--	.020	.010	.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 03...	1430	20	<1	<100	<10	<1	<10	<1	5
JUN 05...	1045	80	<1	<100	<10	<1	<10	<1	3

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127520 MITCHELL CREEK AT TRAVERSE CITY, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 03...	110	36	<5	5	20	19	<.10	<1
JUN 05...	280	17	<5	6	40	13	<.10	<1

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 03...	<1	70	70	10	4.6	<.010	2
JUN 05...	<1	80	72	<10	3.3	<.010	<1

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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken near bridge. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 30...	1130	16	346	8.40	8.5	--	--	11.8	102
DEC 11...	1615	18	337	8.20	5.5	--	--	12.0	96
JAN 15...	1600	16	337	8.30	4.5	--	--	--	--
FEB 19...	1515	16	323	8.40	7.0	--	--	11.7	99
APR 04...	1115	20	330	8.30	7.0	12	1.2	12.2	100
MAY 06...	1445	17	380	8.40	15.0	--	--	10.2	104
JUN 05...	1330	16	337	8.30	11.5	3	1.2	10.9	101
AUG 27...	1530	18	315	8.40	11.5	--	--	--	--

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 04...	160	8	47	11	3.2	.1	4	.90	1.5
JUN 05...	160	2	47	11	2.8	.1	4	.70	1.5

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 04...	12	4.6	<.10	8.2	179	180	.24	9.7
JUN 05...	12	3.4	.10	8.2	179	180	.24	7.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

189

04127528 ACME CREEK AT ACME, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 30...	1130	.15	--	.003	--	.15	--	.020	--	.28
DEC 11...	1615	.17	--	.006	--	.18	--	.030	--	.17
JAN 15...	1600	.17	--	.002	--	.17	--	.020	--	.28
FEB 19...	1515	.15	--	.007	--	.16	--	.020	--	.18
APR 04...	1115	.16	--	<.010	<.010	.16	--	--	.020	--
MAY 06...	1445	.13	--	<.010	<.010	.13	.13	--	.030	--
JUN 05...	1330	.14	.13	<.010	<.010	.14	.13	.020	.010	.18
AUG 27...	1530	.15	.15	<.010	<.010	--	.16	.030	.010	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTH- THO, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTH- THO, DIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 30...	--	.30	--	.45	<.010	--	<.010	--	--	--
DEC 11...	--	.20	--	.38	.020	--	.010	--	7	.34
JAN 15...	--	.30	--	.47	.010	--	.010	--	6	.26
FEB 19...	--	.20	--	.36	<.010	--	<.010	--	7	.30
APR 04...	.28	.30	.30	.46	.020	.010	<.010	<.010	10	.54
MAY 06...	.27	.30	.30	.43	.020	.010	<.010	<.010	7	.32
JUN 05...	.19	.20	.20	.34	.010	<.010	.010	<.010	9	.39
AUG 27...	.19	--	.20	--	<.010	<.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 04...	1115	30	<1	<100	<10	<1	<10	<1	2
JUN 05...	1330	30	<1	<100	<10	<1	<10	<1	4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127528 ACME CREEK AT ACME, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR								
04...	110	23	<5	5	20	6	.50	1
JUN								
05...	150	13	<5	5	10	4	<.10	1

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR							
04...	<1	60	51	20	3.8	<.010	3
JUN							
05...	<1	60	50	20	5.0	<.010	10

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken downstream from culvert. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 30...	1015	8.5	459	8.00	7.5	--	--	9.0	76
DEC 10...	1530	13	427	7.90	1.0	--	--	11.3	80
JAN 15...	1500	10	441	7.90	1.0	--	--	--	--
FEB 19...	1200	9.3	404	7.80	2.0	--	--	10.9	81
APR 04...	0930	15	372	7.90	6.5	20	1.2	10.3	84
MAY 06...	1400	8.0	433	8.20	19.0	--	--	8.4	93
JUN 03...	1600	5.3	450	8.00	17.0	35	1.2	7.8	81
AUG 27...	1400	9.0	458	8.00	15.5	--	--	--	--

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 04...	180	15	53	12	2.7	.1	3	1.2	4.1
JUN 03...	230	18	66	16	3.2	.1	3	1.2	4.1

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 04...	14	5.6	.10	3.0	200	200	.27	8.1
JUN 03...	16	5.3	.10	5.4	262	240	.36	3.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127535 YUBA CREEK NEAR ACME, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 30...	1015	1.1	--	.008	--	1.1	--	.070	--	.63
DEC 10...	1530	--	--	--	--	--	--	--	--	--
JAN 15...	1500	1.5	--	.009	--	1.5	--	.040	--	.36
FEB 19...	1200	1.5	--	.010	--	1.5	--	.050	--	.35
APR 04...	0930	.85	.83	<.010	<.010	.86	.84	.060	.040	.54
MAY 06...	1400	1.1	--	<.010	--	1.1	--	.070	--	.53
JUN 03...	1600	1.4	.17	<.010	--	1.4	.18	--	.050	.56
AUG 27...	1400	.84	.84	<.010	<.010	--	.85	.030	.020	.47

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (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)
OCT 30...	--	.70	--	1.8	.020	--	.010	--	2	.05
DEC 10...	--	--	--	--	--	--	--	--	5	.18
JAN 15...	--	.40	--	1.9	.020	--	.010	--	2	.05
FEB 19...	--	.40	--	1.9	.020	--	.010	--	26	.65
APR 04...	.46	.60	.50	1.5	.030	.020	.010	.010	5	.20
MAY 06...	--	.60	--	1.7	.010	--	.010	--	35	.76
JUN 03...	.45	.60	.50	2.0	.060	.040	.030	.030	10	.14
AUG 27...	.38	.50	.40	--	.030	.030	.020	.020	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 04...	0930	20	<1	<100	<10	<1	<10	1	3
JUN 03...	1600	20	1	100	<10	<1	<10	<1	5

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127535 YUBA CREEK NEAR ACME, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 04...	80	36	<5	6	30	11	<.10	4
JUN 03...	150	45	<5	6	50	23	<.10	3

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 04...	<1	70	55	20	3.7	<.010	<1
JUN 03...	<1	80	70	20	10	<.010	<1

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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken upstream from culvert and approximately 400 ft downstream from dam in wildlife-flooding area. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 30...	0930	4.9	457	8.10	8.5	--	--	9.6	83
DEC 10...	1430	9.0	460	7.60	1.5	--	--	6.8	49
JAN 15...	1415	6.2	521	7.40	1.0	--	--	--	--
FEB 19...	1300	5.6	490	7.20	1.0	--	--	4.7	34
APR 02...	1600	19	277	8.00	14.0	23	.40	9.4	91
MAY 06...	1300	5.1	437	8.20	19.5	--	--	8.2	92
JUN 03...	1500	2.7	444	7.90	18.0	50	2.0	7.9	84
AUG 27...	1330	4.9	471	7.90	16.5	--	--	--	--

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 02...	130	4	38	7.9	1.9	.1	3	1.8	2.4
JUN 03...	230	4	68	15	3.3	.1	3	1.2	5.5

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 02...	12	4.7	<.10	3.8	148	140	.20	7.6
JUN 03...	12	6.1	.20	4.9	276	250	.38	2.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127550 TOBECO CREEK NEAR ELK RAPIDS, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 30...	0930	--	--	.003	--	<.10	--	.040	--	.36
DEC 10...	1430	.11	--	.009	--	.11	--	.040	--	.46
JAN 15...	1415	.00	--	.004	--	.01	--	.100	--	.50
FEB 19...	1300	.00	--	.012	--	.02	--	.120	--	.38
APR 02...	1600	.04	.04	<.010	<.010	.05	.05	.030	.020	.47
MAY 06...	1300	.02	--	<.010	<.010	.02	<.01	.060	.060	.64
JUN 03...	1500	.00	--	<.010	<.010	.01	<.01	.040	.040	.66
AUG 27...	1330	--	--	<.010	<.010	<.01	<.01	.040	.020	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (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)
OCT 30...	--	.40	--	--	.010	--	<.010	--	1	.01
DEC 10...	--	.50	--	.61	.010	--	<.010	--	--	--
JAN 15...	--	.60	--	.61	<.010	--	.010	--	1	.02
FEB 19...	--	.50	--	.52	<.010	--	<.010	--	2	.03
APR 02...	.38	.50	.40	.55	.010	.010	<.010	<.010	12	.62
MAY 06...	.64	.70	.70	.72	.010	<.010	<.010	<.010	3	.04
JUN 03...	--	.70	--	.71	.020	<.010	<.010	<.010	3	.02
AUG 27...	.68	--	.70	--	.010	<.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 02...	1600	<10	<1	<100	<10	<1	<10	<1	2
JUN 03...	1500	<10	<1	<100	<10	<1	<10	<1	2

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127550 TOBECO CREEK NEAR ELK RAPIDS, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 02...	20	19	<5	<4	<10	5	<.10	<1
JUN 03...	60	41	<5	7	<10	7	<.10	1

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 02...	<1	50	44	<10	5.9	<.010	2
JUN 03...	<1	--	85	<10	19	<.010	<1

STREAMS TRIBUTARY TO LAKE MICHIGAN

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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, at culvert on State Highway 72, 1.8 mi east of Williamsburg.

DRAINAGE AREA.--8.7 mi².

PERIOD OF RECORD.--Water years 1984 to August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at times of sampling. Cross-sectional samples were taken near culvert. Stream has inflow from a spring, which is near left bank on north side of highway. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 29...	1015	12	343	8.30	8.0	--	--	11.2	95
DEC 10...	1030	13	346	8.20	6.0	--	--	11.0	89
JAN 15...	1030	12	332	8.30	3.5	--	--	--	--
FEB 19...	1015	13	320	8.20	6.0	--	--	11.3	93
APR 02...	1100	13	332	8.30	7.5	5	1.7	11.8	99
MAY 06...	1000	13	332	8.30	11.5	--	--	10.2	96
JUN 03...	1030	12	333	8.20	9.5	2	1.2	11.1	98
AUG 27...	1000	13	360	8.40	10.5	--	--	--	--

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 02...	160	1	46	11	3.3	.1	4	.70	1.5
JUN 03...	160	0	47	11	3.2	.1	4	.60	2.0

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 02...	9.4	4.0	<.10	8.5	176	180	.24	6.2
JUN 03...	8.6	3.8	.20	8.7	184	180	.25	6.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127600 BATTLE CREEK NEAR WILLIAMSBURG, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 29...	1015	.18	--	.002	--	.18	--	.020	--	.18
DEC 10...	1030	.19	--	.005	--	.20	--	.030	--	.47
JAN 15...	1030	.21	--	.002	--	.21	--	.030	--	--
FEB 19...	1015	.21	--	.005	--	.22	--	.030	--	.27
APR 02...	1100	.19	.19	<.010	<.010	.20	.20	.020	.020	.28
MAY 06...	1000	.18	.17	<.010	<.010	.18	.17	<.010	<.010	--
JUN 03...	1030	.19	.19	<.010	<.010	.19	.19	.010	.010	--
AUG 27...	1000	--	.19	<.010	<.010	--	.20	.030	.010	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 29...	--	.20	--	.38	.010	--	<.010	--	3	.10
DEC 10...	--	.50	--	.70	.020	--	<.010	--	8	.28
JAN 15...	--	<.20	--	--	.010	--	.010	--	3	.10
FEB 19...	--	.30	--	.52	.010	--	<.010	--	13	.46
APR 02...	.28	.30	.30	.50	.020	.010	<.010	<.010	9	.32
MAY 06...	--	.30	.20	.48	.020	<.010	<.010	<.010	7	.25
JUN 03...	--	<.20	<.20	--	.010	<.010	<.010	<.010	13	.42
AUG 27...	--	--	<.20	--	--	.020	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 02...	1100	40	1	<100	<10	<1	<10	<1	4
JUN 03...	1030	<10	<1	<100	<10	<1	<10	<1	3

STREAMS TRIBUTARY TO LAKE MICHIGAN

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04127600 BATTLE CREEK NEAR WILLIAMSBURG, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 02...	330	19	<5	<4	30	4	<.10	<1
JUN 03...	170	15	<5	5	20	5	<.10	1

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 02...	<1	80	68	<10	2.8	<.010	<1
JUN 03...	<1	--	69	<10	2.7	<.010	<1

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 August 1986 (discontinued).

REMARKS.--Water-discharge measurements were made at time of sampling. Cross-sectional samples were taken downstream from culvert. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT 29...	1500	13	352	8.30	9.0	--	--	11.8	103
DEC 10...	1315	15	359	8.20	3.5	--	--	13.0	98
JAN 15...	1230	14	364	8.20	1.5	--	--	--	--
FEB 19...	1400	14	331	8.20	4.0	--	--	12.4	97
APR 02...	1400	16	328	8.30	10.5	12	.80	10.8	97
MAY 06...	1115	14	349	8.30	14.5	--	--	9.6	97
JUN 03...	1300	14	340	8.20	14.5	5	1.5	10.2	101
AUG 27...	1130	15	369	8.20	12.5	--	--	--	--

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)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
APR 02...	160	2	46	11	3.5	.1	5	.80	1.5
JUN 03...	160	2	46	12	3.3	.1	4	.70	2.0

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
APR 02...	10	5.2	.10	8.0	184	180	.25	7.9
JUN 03...	10	4.2	.10	7.8	186	180	.25	7.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127620 WILLIAMSBURG CREEK NEAR WILLIAMSBURG, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT 29...	1500	.16	--	.002	--	.16	--	.030	--	.27
DEC 10...	1315	.26	--	.009	--	.27	--	.030	--	.17
JAN 15...	1230	.29	--	.006	--	.30	--	.040	--	.16
FEB 19...	1400	.26	--	.009	--	.27	--	.030	--	.07
APR 02...	1400	.20	.20	<.010	<.010	.20	.20	.030	.030	.27
MAY 06...	1115	.14	.13	<.010	<.010	.14	.13	.060	.040	.24
JUN 03...	1300	.12	.12	<.010	<.010	.13	.12	--	.030	.18
AUG 27...	1130	.13	.13	<.010	<.010	.13	.13	.040	.010	--

DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHODIS- SOLVED (MG/L AS P)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
OCT 29...	--	.30	--	.46	<.010	--	<.010	--	1	.04
DEC 10...	--	.20	--	.47	<.010	--	<.010	--	7	.28
JAN 15...	--	.20	--	.50	.010	--	.010	--	6	.23
FEB 19...	--	.10	--	.37	<.010	--	<.010	--	3	.11
APR 02...	.27	.30	.30	.50	.020	--	<.010	--	8	.35
MAY 06...	--	.30	--	.44	.020	<.010	.010	<.010	19	.72
JUN 03...	.17	.20	.20	.33	.010	<.010	<.010	<.010	4	.15
AUG 27...	.19	--	.20	--	.020	<.010	<.010	<.010	--	--

DATE	TIME	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)
APR 02...	1400	30	<1	<100	--	<1	<10	<1	3
JUN 03...	1300	<10	<1	<100	<10	<1	<10	<1	4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04127620 WILLIAMSBURG CREEK NEAR WILLIAMSBURG, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)
APR 02...	130	38	<5	<4	40	23	<.10	<1
JUN 03...	110	29	<5	5	40	23	<.10	2

DATE	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
APR 02...	<1	60	58	<10	3.8	<.010	<1
JUN 03...	<1	60	60	<10	3.8	<.010	<1

STREAMS TRIBUTARY TO LAKE MICHIGAN

203

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. 1-3, 18, 19, 25-29, Jan. 14, 15, Jan. 28 to Feb. 2, Feb. 11-14, 22, and Mar. 6. 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.--20 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)
Oct. 12	2200	404	4.70	June 27	1400	481	4.87
Nov. 2	2200	433	4.83	Sept. 12	0300	580	5.11
Mar. 26	1300	*750	*5.46	Sept. 22	1600	481	4.87
June 12	1300	598	5.15	Sept. 29	1700	507	4.94

Minimum discharge, 112 ft³/s, Feb. 11, result of freezeup; minimum gage height, 2.92 ft, Jan. 27.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	184	167	180	191	170	177	298	192	178	172	166	162
2	172	271	182	190	180	180	258	188	177	171	166	162
3	168	265	185	192	185	180	229	187	172	169	184	169
4	171	194	189	190	186	180	264	188	170	197	177	311
5	184	182	189	192	187	182	245	186	175	189	167	190
6	185	177	189	191	184	178	271	187	174	172	208	174
7	177	219	189	190	184	173	241	182	172	170	236	171
8	170	187	189	188	183	186	220	183	178	168	181	168
9	169	179	190	190	183	204	222	182	170	166	177	166
10	182	181	191	190	182	213	216	181	174	165	246	213
11	175	174	190	191	150	242	211	180	240	165	245	334
12	264	177	190	194	155	204	205	180	444	181	177	378
13	300	199	189	185	160	213	201	179	234	178	169	203
14	195	191	187	190	170	229	199	197	188	171	169	183
15	192	180	189	192	179	225	229	207	180	167	186	207
16	191	208	190	193	179	208	227	230	179	166	171	203
17	183	221	191	192	180	218	207	206	174	166	170	183
18	179	234	191	199	182	230	199	314	173	164	170	183
19	178	298	192	204	184	317	196	210	193	166	166	186
20	175	259	192	196	189	244	194	194	180	166	164	288
21	171	201	190	193	184	219	198	202	172	164	164	201
22	173	192	192	193	183	213	198	202	174	163	163	342
23	172	189	195	188	182	269	194	192	180	161	169	240
24	181	186	194	186	179	259	192	188	189	161	166	199
25	172	180	194	188	176	365	190	186	173	194	164	215
26	169	184	193	188	181	726	213	182	205	187	170	241
27	168	184	193	151	177	447	197	178	344	169	175	227
28	166	180	193	152	179	292	188	177	210	170	168	198
29	167	180	193	158	---	375	190	174	181	171	167	350
30	167	179	193	160	---	375	192	173	174	165	164	255
31	167	---	193	165	---	297	---	173	---	167	163	---
TOTAL	5667	6018	5897	5762	4993	8020	6484	5980	5927	5301	5528	6702
MEAN	183	201	190	186	178	259	216	193	198	171	178	223
MAX	300	298	195	204	189	726	298	314	444	197	246	378
MIN	166	167	180	151	150	173	188	173	170	161	163	162
CFSM	2.70	2.96	2.80	2.74	2.62	3.81	3.18	2.84	2.92	2.52	2.62	3.28
IN.	3.10	3.30	3.23	3.16	2.74	4.39	3.55	3.28	3.25	2.90	3.03	3.67

CAL YR 1985	TOTAL	71908	MEAN	197	MAX	750	MIN	153	CFSM	2.90	IN	39.40
WTR YR 1986	TOTAL	72279	MEAN	198	MAX	726	MIN	150	CFSM	2.92	IN	39.60

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. Prior to Aug. 4, 1972, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 23 to Mar. 27. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--14 years, 241 ft³/s, 17.79 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,500 ft³/s, Mar. 30, 1986, gage height, 18.44 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)
Mar. 30	2400	*4,500	*18.44	June 12	1800	2,260	10.68
Apr. 6	1100	2,530	11.66				

Minimum discharge, 58 ft³/s, Sept. 2, 3, gage height, 2.11 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	166	144	175	110	105	94	3750	225	96	75	75	60
2	177	224	170	110	105	94	2720	216	112	71	72	59
3	160	492	170	110	105	94	2160	190	102	67	69	64
4	158	348	170	110	105	94	1860	172	96	68	69	239
5	398	287	165	110	105	94	1600	162	94	82	77	399
6	351	241	165	110	100	95	2250	154	95	89	85	275
7	290	346	160	110	100	95	1860	145	89	80	82	210
8	249	339	160	113	100	95	1680	137	89	72	89	169
9	228	264	155	115	100	95	1320	130	89	68	156	141
10	236	217	150	110	100	96	932	123	81	67	164	136
11	242	211	150	110	100	98	698	118	87	61	358	272
12	244	195	145	110	100	100	564	114	1250	63	282	717
13	430	159	145	110	98	105	468	110	1500	90	205	468
14	337	162	140	110	98	115	411	104	724	111	161	297
15	279	152	140	110	98	125	390	107	374	95	146	229
16	248	143	135	110	96	135	392	110	276	84	136	194
17	222	264	130	110	96	145	364	110	239	90	120	166
18	206	404	125	110	96	150	333	209	182	151	111	148
19	193	662	120	110	96	155	309	184	150	162	99	138
20	176	688	115	110	96	170	290	148	131	130	88	127
21	165	388	115	110	96	190	271	127	116	108	83	120
22	158	284	110	110	95	220	245	122	102	94	78	116
23	153	270	105	110	95	235	227	118	109	84	77	124
24	161	260	100	110	95	250	213	113	101	78	86	120
25	171	250	96	110	95	300	203	108	95	77	81	109
26	161	235	100	110	94	500	192	104	91	78	76	99
27	175	220	105	110	94	1000	186	97	90	76	74	99
28	163	205	105	105	94	1620	179	95	93	80	73	166
29	153	195	110	105	---	2370	173	91	85	101	69	199
30	151	185	110	105	---	3440	171	86	77	90	64	175
31	141	---	110	105	---	3920	---	83	---	78	61	---
TOTAL	6742	8434	4151	3398	2757	16289	26411	4112	6815	2720	3466	5835
MEAN	217	281	134	110	98.5	525	880	133	227	87.7	112	195
MAX	430	688	175	115	105	3920	3750	225	1500	162	358	717
MIN	141	143	96	105	94	94	171	83	77	61	61	59
CFSM	1.18	1.53	.73	.60	.54	2.85	4.78	.72	1.23	.48	.61	1.06
IN.	1.36	1.71	.84	.69	.56	3.29	5.34	.83	1.38	.55	.70	1.18

CAL YR 1985	TOTAL	113068	MEAN	310	MAX	4050	MIN	70	CFSM	1.69	IN	22.86
WTR YR 1986	TOTAL	91130	MEAN	250	MAX	3920	MIN	59	CFSM	1.36	IN	18.42

STREAMS TRIBUTARY TO LAKE HURON

205

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. 2-5, 16, 17, 19-21, 26-31, Jan. 4-10, 13-17, Jan. 28 to Feb. 3, Feb. 7, 8, 11-17, 23, 24, 26, 28, and Mar. 1, 2, 6, 8, 9. Records good except for estimated daily discharges, which are poor. 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.--44 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, 775 ft³/s, Mar. 26, gage height, 3.08 ft; minimum, 130 ft³/s, Feb. 22, gage height, 1.45 ft, result of freezeup.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	245	218	252	233	192	194	572	247	217	204	185	172
2	233	285	250	231	198	195	508	240	228	203	194	169
3	220	384	250	233	202	199	417	237	214	198	213	193
4	215	295	250	232	215	196	411	239	205	202	203	437
5	232	267	250	232	214	198	392	237	209	275	193	326
6	234	255	250	232	208	190	397	234	209	224	217	233
7	237	282	248	232	208	183	388	224	205	205	271	216
8	226	282	248	232	208	190	358	222	208	196	223	203
9	220	258	248	232	207	210	344	222	201	198	217	194
10	226	255	249	232	199	242	332	221	199	194	255	257
11	237	260	251	236	170	277	317	221	316	192	276	444
12	293	243	251	231	175	245	299	218	553	235	218	525
13	417	271	248	232	180	237	284	215	522	260	201	352
14	314	283	252	232	185	241	275	214	331	244	196	266
15	272	268	259	235	190	251	374	240	285	216	211	301
16	269	277	250	240	198	239	394	277	263	204	203	312
17	255	337	250	240	205	239	342	274	241	199	192	256
18	245	341	250	241	208	252	311	429	226	195	192	243
19	240	421	250	246	206	302	298	345	272	193	186	241
20	232	375	250	237	207	281	296	282	288	189	179	299
21	227	313	250	228	208	260	294	308	238	184	177	270
22	227	280	254	223	201	270	288	350	227	181	176	345
23	224	277	245	215	198	289	276	308	228	183	184	358
24	233	266	242	214	195	297	268	284	262	178	182	287
25	231	256	244	215	195	336	261	265	233	192	178	266
26	225	251	240	213	194	625	265	252	217	216	182	301
27	242	251	240	174	193	670	268	239	259	192	190	327
28	224	250	240	178	194	514	256	227	263	192	182	279
29	219	248	242	181	---	593	245	216	226	205	180	307
30	217	248	242	186	---	666	244	211	211	189	177	328
31	218	---	240	190	---	648	---	209	---	183	175	---
TOTAL	7549	8497	7685	6908	5553	9729	9974	7907	7756	6321	6208	8707
MEAN	244	283	248	223	198	314	332	255	2595	204	200	290
MAX	417	421	259	246	215	670	572	429	553	275	276	525
MIN	215	218	240	174	170	183	244	209	199	178	175	169
CFSM	1.23	1.43	1.25	1.13	1.00	1.59	1.68	1.29	1.31	1.03	1.01	1.47
IN.	1.42	1.60	1.44	1.30	1.04	1.83	1.87	1.49	1.46	1.19	1.17	1.64

CAL YR 1985 TOTAL 93950 MEAN 257 MAX 515 MIN 169 CFSM 1.30 IN 17.65
WTR YR 1986 TOTAL 92794 MEAN 254 MAX 670 MIN 169 CFSM 1.28 IN 17.43

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: Dec. 3, 4, 16, 17, 19-22, Dec. 26 to Jan. 5, Jan. 7-14, 16-19, 21, 22, 24, 26, Jan. 28 to Feb. 5, Feb. 7, 8, 12-17, 22-26, 28, and Mar. 1, 3, 5, 6, 9. Records good except for estimated daily discharges, which are poor. 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.--36 years, 78.6 ft³/s, 17.05 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, 418 ft³/s, Sept. 12, gage height, 5.10 ft; minimum, 41 ft³/s, Mar. 8, Sept. 2, gage height, 2.04 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	90	74	88	74	70	71	212	75	74	70	59	55
2	82	87	87	74	72	72	192	74	71	67	71	61
3	73	130	85	74	73	71	156	73	64	61	62	55
4	73	98	85	74	74	71	141	77	65	59	70	156
5	82	91	86	74	74	70	146	72	62	86	61	119
6	79	83	73	74	74	70	137	76	68	69	56	61
7	75	99	86	74	74	72	151	68	67	54	59	66
8	77	98	85	74	74	75	135	58	64	58	62	75
9	71	84	86	74	74	80	109	68	65	61	64	61
10	83	89	87	74	75	86	113	65	61	60	71	72
11	83	85	87	75	69	113	94	66	110	58	104	139
12	120	83	84	75	60	94	93	68	212	61	71	300
13	228	99	82	76	62	90	87	66	180	89	63	202
14	135	104	80	76	64	88	91	67	99	88	62	97
15	101	101	79	77	66	92	127	73	80	62	66	94
16	93	100	78	77	68	89	155	90	73	64	69	116
17	78	129	77	77	70	89	117	99	74	63	59	91
18	84	122	76	78	73	94	108	156	70	61	56	82
19	80	161	78	78	76	118	99	134	76	60	65	70
20	79	143	78	79	75	110	80	102	93	57	57	142
21	79	124	79	78	71	104	87	90	71	56	56	130
22	72	115	80	76	71	90	88	122	72	57	56	149
23	75	94	81	75	71	103	93	100	69	56	57	182
24	81	71	78	75	70	124	90	87	65	57	57	105
25	72	68	79	77	70	110	74	93	65	54	57	95
26	77	83	77	74	70	270	87	69	64	80	58	151
27	77	80	76	70	71	320	86	73	87	67	58	196
28	73	83	76	66	71	186	71	69	85	68	61	119
29	75	83	75	66	---	226	69	73	69	94	59	123
30	75	77	75	67	---	292	73	61	71	66	52	144
31	70	---	74	68	---	308	---	61	---	66	54	---
TOTAL	2692	2938	2497	2300	1982	3848	3361	2525	2446	2029	1932	3508
MEAN	86.8	97.9	80.5	74.2	70.8	124	112	81.5	81.5	65.5	62.3	117
MAX	228	161	88	79	76	320	212	156	212	94	104	300
MIN	70	68	73	66	60	70	69	58	61	54	52	55
CFSM	1.39	1.56	1.29	1.19	1.13	1.98	1.79	1.30	1.30	1.05	1.00	1.87
IN.	1.60	1.75	1.48	1.37	1.18	2.29	2.00	1.50	1.45	1.21	1.15	2.08
CAL YR 1985	TOTAL	32907	MEAN	90.2	MAX	228	MIN	54	CFSM	1.44	IN	19.55
WTR YR 1986	TOTAL	32058	MEAN	87.8	MAX	320	MIN	52	CFSM	1.40	IN	19.05

STREAMS TRIBUTARY TO LAKE HURON

207

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.--44 years, 274 ft³/s, 11.96 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, 1,420 ft³/s, Mar. 27, gage height, 5.54 ft; minimum, 17 ft³/s, Mar. 10, gage height, 1.29 ft; minimum daily, 146 ft³/s, Aug. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	261	200	315	243	236	187	1290	255	243	222	256	150
2	257	279	254	213	255	190	1220	192	217	225	146	149
3	214	239	195	301	201	204	1120	217	185	190	188	150
4	234	288	164	218	282	234	875	235	225	190	221	303
5	232	329	180	212	257	235	745	351	227	233	179	247
6	236	324	308	226	198	318	715	260	223	260	190	196
7	229	313	383	286	206	233	595	222	223	341	218	242
8	224	261	396	185	311	179	624	220	177	230	219	239
9	223	250	403	194	239	179	638	227	160	173	209	239
10	173	305	399	229	236	215	587	228	196	194	205	188
11	151	305	253	255	180	262	515	235	232	194	207	326
12	178	304	291	335	205	262	492	231	355	216	194	341
13	401	241	332	246	193	350	386	221	502	228	217	430
14	407	304	247	219	274	338	459	176	499	232	214	553
15	424	308	183	220	187	262	424	204	499	261	181	569
16	502	386	182	286	198	420	463	315	479	256	188	584
17	372	393	160	216	303	432	590	257	253	214	192	505
18	398	394	265	223	235	420	559	301	202	171	191	346
19	335	440	248	222	206	451	521	406	248	172	186	353
20	267	576	198	312	199	352	497	476	241	175	182	349
21	264	563	285	323	323	438	475	392	229	219	165	350
22	249	534	331	236	236	433	391	386	242	177	147	323
23	217	479	252	312	196	405	387	343	234	150	149	386
24	290	401	332	253	182	512	405	397	229	151	149	564
25	244	401	244	229	298	597	265	461	235	151	189	513
26	240	256	216	228	198	907	267	327	224	154	182	403
27	204	315	178	232	236	1190	306	246	233	173	186	413
28	235	324	197	239	231	1120	345	246	231	195	187	474
29	241	324	300	234	---	1280	349	246	227	198	187	497
30	243	313	244	192	---	1300	260	246	238	192	174	569
31	228	---	297	196	---	1330	---	247	---	311	152	---
TOTAL	8373	10349	8232	7515	6501	15235	16765	8766	7908	6448	5850	10951
MEAN	270	345	266	242	232	491	559	283	264	208	189	365
MAX	502	576	403	335	323	1330	1290	476	502	341	256	584
MIN	151	200	160	185	180	179	260	176	160	150	146	149
CFSM	.87	1.11	.86	.78	.75	1.58	1.80	.91	.85	.67	.61	1.17
IN.	1.00	1.24	.98	.90	.78	1.82	2.01	1.05	.95	.77	.70	1.31
CAL YR 1985	TOTAL	127472	MEAN	349	MAX	1080	MIN	146	CFSM	1.12	IN	15.25
WTR YR 1986	TOTAL	112893	MEAN	309	MAX	1330	MIN	146	CFSM	.99	IN	13.50

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 1986 (discontinued).

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 time of sampling. Flow affected by lock and 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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
NOV 20...	1430	1920	319	8.40	5.5	3.6	12.7	102	E950	K520	170	20
JAN 22...	1130	1300	360	8.20	.5	1.1	13.5	95	K12	K13	170	19
MAR 11...	1030	1130	350	8.20	1.0	.80	14.4	103	K2	--	180	22
MAY 01...	1100	2050	334	8.30	11.5	2.1	10.7	101	K4	K13	160	25
JUL 09...	1200	1180	324	8.40	23.5	1.2	7.5	89	K21	42	160	13
SEP 23...	1300	1740	316	8.30	15.0	1.2	11.7	119	46	35	160	17

DATE	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)	BICAR- BONATE IT-FLD (MG/L AS HCO3)	CAR- BONATE IT-FLD (MG/L AS CO3)	ALKA- LITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 20...	45	13	3.9	5	.1	.80	--	--	--	1.1	12
JAN 22...	46	14	4.0	5	.1	1.0	188	0	154	1.9	11
MAR 11...	47	14	4.2	5	.1	.90	187	0	154	1.9	16
MAY 01...	43	12	3.5	5	.1	.80	161	0	132	1.3	11
JUL 09...	42	13	3.8	5	.1	.90	177	0	145	1.1	11
SEP 23...	43	12	3.7	5	.1	1.0	171	0	140	1.4	11

STREAMS TRIBUTARY TO LAKE HURON

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04132052 CHEBOYGAN RIVER AT CHEBOYGAN, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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...	1430	5.5	.20	8.1	177	180	.24	918	<.10
JAN 22...	1130	5.5	.10	8.5	184	180	.25	646	<.10
MAR 11...	1030	5.8	.30	9.0	191	190	.26	583	<.10
MAY 01...	1100	4.8	.20	6.9	179	160	.24	991	<.10
JUL 09...	1200	5.2	.20	6.5	178	170	.24	567	<.10
SEP 23...	1300	4.8	.20	7.9	177	170	.24	832	<.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
NOV 20...	.020	.40	.050	.030	.010	8	41	83
JAN 22...	.030	.60	.010	<.010	<.010	1	3.5	50
MAR 11...	.030	<.20	<.010	<.010	<.010	3	9.2	57
MAY 01...	.040	.60	.020	<.010	<.010	5	28	56
JUL 09...	.030	.40	.020	<.010	<.010	1	3.2	100
SEP 23...	.020	.50	.020	<.010	<.010	4	19	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)
NOV 20...	<10	<1	16	<.5	<1	<1	<3	2	11	<5
MAR 11...	10	<1	17	<.5	<1	<1	<3	<1	12	<5
SEP 23...	<10	<1	13	<.5	1	<1	<3	4	6	<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)
NOV 20...	<4	3	<.1	<10	<1	<1	<1	92	<6	9
MAR 11...	<4	<1	<.1	<10	<1	<1	1	110	<6	<3
SEP 23...	6	<1	<.1	<10	<1	<1	<1	89	<6	14

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 discharge measurements, 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: Oct. 1 to Nov. 21, Nov. 24-26, Dec. 3-16, and Mar. 11 to Apr. 28. 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.--7 years, 916 ft³/s, 10.05 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 12,100 ft³/s, Mar. 28, 1986; minimum daily, 33 ft³/s, Oct. 4, 1980, June 25, 1983.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 12,100 ft³/s, Mar. 28; minimum daily, 124 ft³/s, Oct. 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	889	870	1090	1170	771	513	3000	793	447	870	1040	425
2	819	569	1250	1150	678	547	2800	753	698	987	898	768
3	778	808	1460	1220	815	901	2300	450	744	1220	587	829
4	1120	1110	1790	1040	981	764	2000	443	782	506	911	850
5	124	1150	1810	920	1070	776	2000	723	749	853	979	826
6	711	1160	1820	1030	950	844	1460	699	805	1190	786	520
7	891	1170	1820	1080	961	802	1440	742	450	1210	811	506
8	755	990	1780	1020	867	387	1570	770	367	1130	1070	976
9	696	849	1630	1070	772	374	1470	840	700	826	742	884
10	654	1010	1570	1050	961	871	1360	374	602	890	543	954
11	755	1210	1540	872	689	764	1330	383	870	864	869	1050
12	1010	1230	1540	885	377	859	1320	740	1180	524	934	1210
13	1220	1240	1540	1080	435	1270	1090	699	1180	478	869	1140
14	818	1240	1450	1070	432	1220	926	690	1170	1140	889	677
15	1540	1240	1410	1120	482	1210	1080	719	1160	847	887	1010
16	1500	1250	1270	1140	503	1400	1200	717	1150	796	464	1230
17	1480	1450	1180	1080	633	1420	1560	437	1160	790	526	1200
18	1470	1560	962	1170	676	1420	1610	450	1170	842	722	1190
19	1110	1580	1220	926	852	1430	1660	901	1180	499	697	1190
20	1010	1770	1220	1000	1010	1460	1730	1210	839	492	734	1180
21	951	1750	1040	1080	717	2370	1570	1360	490	903	646	1200
22	1090	1850	895	1060	349	2460	1260	1460	450	966	517	1320
23	1160	1830	1130	1220	396	2550	1200	1480	781	1090	266	1460
24	1050	1630	1230	1220	576	2770	1200	1510	810	754	214	1570
25	860	1540	1230	862	653	4180	1220	1480	746	955	608	1710
26	608	1430	1180	787	675	6550	741	1420	729	817	728	1910
27	811	1250	1210	1000	717	10200	666	1350	839	508	534	2160
28	967	1250	1030	1080	702	12100	1000	1190	596	1070	674	2390
29	1130	1230	975	923	---	11100	797	1000	933	948	852	2330
30	1010	1230	1060	913	---	9550	801	719	966	946	488	2260
31	1010	---	1210	933	---	5120	---	479	---	1120	429	---
TOTAL	29997	38446	41542	32171	19700	88182	43361	26981	24743	27031	21914	36925
MEAN	968	1282	1340	1038	704	2845	1445	870	825	872	707	1231
MAX	1540	1850	1820	1220	1070	12100	3000	1510	1180	1220	1070	2390
MIN	124	569	895	787	349	374	666	374	367	478	214	425
CFSM	.78	1.04	1.08	.84	.57	2.30	1.17	.70	.67	.70	.57	.99
IN.	.90	1.16	1.25	.97	.59	2.65	1.30	.81	.74	.81	.66	1.11

CAL YR 1985 TOTAL 427932 MEAN 1172 MAX 5530 MIN 53 CFSM .95 IN 12.86
WTR YR 1986 TOTAL 430993 MEAN 1181 MAX 12100 MIN 124 CFSM .95 IN 12.95

STREAMS TRIBUTARY TO LAKE HURON

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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.

WATER TEMPERATURE: October 1979 to September 1985.

INSTRUMENTATION.--Water-quality monitor from Oct. 9, 1980 to Sept. 30, 1985.

REMARKS.--Bimonthly cross-sectional samples were collected near the gage; the November sample was collected at Bagley Street bridge, 2.5 mi downstream from gage. Water-discharge measurements were made at time of sampling. From February 1979 to September 1979, samples were collected 6.9 mi downstream from gage (station number 04135020).

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.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
NOV 21...	1530	1820	379	7.90	5.0	4.1	12.8	100	35	48	200	22
JAN 23...	1400	1200	428	8.00	1.0	1.5	11.6	81	K4	K3	210	18
MAR 12...	1400	1350	430	7.90	.5	1.1	10.8	76	K1	--	220	23
APR 28...	1400	1250	347	8.20	13.5	1.6	10.6	104	<1	<1	170	28
JUL 10...	1300	1210	345	8.20	23.5	3.5	7.7	92	K11	63	--	--
SEP 24...	1300	1610	369	8.20	15.5	2.5	9.7	99	51	49	190	30

DATE	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)	BICAR- BONATE IT-FLD (MG/L AS HCO3)	CAR- BONATE IT-FLD (MG/L AS CO3)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 21...	56	14	5.1	5	.2	1.0	215	0	176	4.3	19
JAN 23...	57	16	5.3	5	.2	1.0	232	0	190	3.7	12
MAR 12...	60	16	5.6	5	.2	1.0	235	0	193	4.7	12
APR 28...	49	12	3.9	5	.1	.90	176	0	144	1.8	11
JUL 10...	--	--	4.1	18	.3	1.0	185	0	152	1.9	14
SEP 24...	53	14	4.5	5	.1	1.0	196	0	161	2.0	14

STREAMS TRIBUTARY TO LAKE HURON

04135000 THUNDER BAY RIVER NEAR ALPENA, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 21...	1530	6.7	.20	9.3	207	220	.28	1020	<.10
JAN 23...	1400	5.9	.10	11	234	220	.32	758	.12
MAR 12...	1400	6.2	.30	12	235	230	.32	857	.14
APR 28...	1400	5.1	.20	4.1	187	170	.25	631	<.10
JUL 10...	1300	5.0	.10	11	201	140	.27	657	<.10
SEP 24...	1300	5.8	.20	8.9	216	200	.29	939	<.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
NOV 21...	.040	.60	.070	.040	.010	11	54	66
JAN 23...	.070	.60	.010	<.010	<.010	1	3.2	87
MAR 12...	.080	.20	<.010	<.010	<.010	3	11	81
APR 28...	.040	.80	.020	.010	<.010	4	14	74
JUL 10...	.040	.80	.020	.010	<.010	3	9.8	100
SEP 24...	.040	.80	--	.020	<.010	5	22	73

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	23	<.5	<1	<1	<3	2	34	<5
MAR 12...	<10	<1	26	.6	<1	<1	<3	<1	37	<5
SEP 24...	<10	<1	21	<.5	1	<1	<3	4	50	<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)
NOV 21...	6	4	<.1	<10	2	<1	<1	110	<6	8
MAR 12...	5	17	<.1	<10	<1	<1	<1	120	<6	13
SEP 24...	7	5	<.1	<10	<1	<1	<1	100	<6	14

STREAMS TRIBUTARY TO LAKE HURON

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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: Jan. 25-27, Jan. 29 to Feb. 2, Feb. 8-10, 12-14, and Feb. 21-27. Records good 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.--44 years, 75.3 ft³/s, 9.30 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, 216 ft³/s, Sept. 30, stage rising, peak occurred Oct. 1, 1986, maximum peak discharge, 212 ft³/s, Mar. 27, gage height, 2.48 ft; minimum discharge, 68 ft³/s, Jan. 28, Mar. 7, 8, gage height, 1.32 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	93	82	99	96	82	77	192	98	86	95	89	71
2	95	86	115	96	83	83	177	98	86	90	83	70
3	90	97	114	95	89	82	161	100	86	88	81	69
4	84	103	121	91	90	81	152	98	85	95	82	77
5	85	100	116	89	94	81	149	95	86	112	81	94
6	89	96	108	87	94	81	148	95	85	110	80	103
7	89	97	107	82	87	73	147	94	86	101	83	93
8	87	97	113	82	84	71	146	93	85	93	89	84
9	87	97	114	85	81	80	142	91	83	88	95	79
10	97	95	111	87	79	89	139	89	83	86	98	88
11	104	94	107	88	76	101	134	88	103	83	95	117
12	114	94	101	89	76	104	126	88	148	85	90	165
13	137	97	97	88	79	104	119	87	167	88	85	184
14	147	102	91	83	80	108	116	88	154	89	84	177
15	137	105	87	81	82	109	123	96	129	87	90	155
16	124	108	90	83	82	105	131	107	112	82	91	146
17	111	116	93	88	83	101	131	113	103	81	95	138
18	102	125	90	91	84	103	126	134	98	81	91	127
19	98	131	89	95	86	111	119	146	99	79	86	118
20	97	140	91	96	87	113	113	134	111	77	83	125
21	96	134	90	92	78	105	109	126	110	75	80	131
22	95	124	90	89	72	110	108	129	101	75	74	146
23	92	114	89	87	72	108	110	128	95	74	74	152
24	90	109	89	80	73	112	110	120	100	72	72	148
25	90	102	84	83	74	118	108	111	105	79	70	138
26	93	101	82	91	75	160	108	106	103	94	73	143
27	91	99	85	78	76	206	109	101	106	98	74	171
28	90	97	87	73	77	203	106	96	118	104	75	175
29	90	96	88	85	---	192	101	93	120	112	75	195
30	88	95	90	90	---	199	100	90	105	109	74	209
31	85	---	94	88	---	203	---	87	---	97	73	---
TOTAL	3067	3133	3022	2708	2275	3573	3860	3219	3138	2779	2565	3888
MEAN	98.9	104	97.5	87.4	81.3	115	129	104	105	89.6	82.7	130
MAX	147	140	121	96	94	206	192	146	167	112	98	209
MIN	84	82	82	73	72	71	100	87	83	72	70	69
CFSM	.90	.95	.89	.80	.74	1.05	1.17	.95	.96	.82	.75	1.18
IN.	1.04	1.06	1.02	.92	.77	1.21	1.31	1.09	1.06	.94	.87	1.31

CAL YR 1985 TOTAL 34406 MEAN 94.3 MAX 209 MIN 56 CFSM .86 IN 11.64
WTR YR 1986 TOTAL 37227 MEAN 102 MAX 209 MIN 69 CFSM .93 IN 12.59

STREAMS TRIBUTARY TO LAKE HURON

04135700 SOUTH BRANCH AU SABLE RIVER NEAR LUZERNE, MI

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.

DRAINAGE AREA.--401 mi².

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1951-66. October 1966 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

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.

REMARKS.--Estimated daily discharges: Dec. 15-30, Jan. 4-11, 14-18, Jan. 26 to Feb. 6, Feb. 9-14, 22, 23, 26, and Mar. 8. Records good except for estimated daily discharges, which are fair. Occasional regulation by dams upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 226 ft³/s, 7.65 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,120 ft³/s, Mar. 28, 1976, gage height, 7.30 ft; maximum gage height, 7.75 ft, Jan. 28, 1986, backwater from ice; minimum discharge, 78 ft³/s, Feb. 12, 1981, gage height, 3.98 ft, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 750 ft³/s, Mar. 29, gage height, 6.35 ft; maximum gage height, 7.75 ft, Jan. 28, backwater from ice; minimum discharge, 134 ft³/s, Sept. 9, gage height, 4.31 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	250	221	315	245	200	194	585	244	254	198	175	152
2	243	229	373	245	200	198	549	236	237	189	178	149
3	240	248	345	244	205	194	506	230	226	182	178	148
4	237	249	362	235	205	196	487	224	226	191	184	187
5	239	250	382	230	205	201	475	221	216	216	182	180
6	243	246	379	225	205	199	470	216	213	214	198	168
7	240	249	367	215	207	189	456	212	210	205	212	158
8	237	245	356	205	213	190	442	205	214	187	202	146
9	237	246	348	215	205	196	424	198	209	177	199	139
10	264	248	340	220	200	205	408	181	206	169	192	175
11	269	245	333	225	195	243	391	172	228	165	189	302
12	289	245	328	236	195	241	371	166	258	173	185	409
13	356	265	313	232	195	253	355	164	253	196	179	387
14	366	282	290	220	195	279	341	170	234	209	175	366
15	363	294	270	210	197	295	361	190	215	205	180	372
16	351	314	260	215	197	301	374	215	199	193	175	375
17	328	346	250	220	196	327	380	221	186	184	171	354
18	308	357	245	225	196	362	386	298	177	189	169	336
19	294	384	240	240	198	408	388	332	205	176	166	334
20	279	429	235	245	205	369	353	334	236	171	163	379
21	267	428	230	248	199	355	338	368	224	164	161	382
22	259	417	225	249	200	383	327	374	208	160	157	416
23	252	404	220	243	200	383	319	352	197	155	160	452
24	248	383	215	240	199	397	312	343	210	158	159	459
25	245	345	210	241	197	462	301	327	212	179	155	445
26	240	333	205	220	195	611	294	307	206	202	154	442
27	236	326	210	205	194	708	288	298	250	185	154	465
28	231	317	220	190	196	735	279	287	260	192	157	438
29	227	310	230	195	---	717	267	275	241	194	159	554
30	225	302	235	195	---	658	249	258	217	186	157	658
31	222	---	248	200	---	620	---	248	---	175	154	---
TOTAL	8285	9157	8779	6973	5594	11069	11476	7866	6627	5739	5379	9927
MEAN	267	305	283	225	200	357	383	254	221	185	174	331
MAX	366	429	382	249	213	735	585	374	260	216	212	658
MIN	222	221	205	190	194	189	249	164	177	155	154	139
CFSM	.67	.76	.71	.56	.50	.89	.96	.63	.55	.46	.43	.83
IN.	.77	.85	.81	.65	.52	1.03	1.06	.73	.61	.53	.50	.92
CAL YR 1985	TOTAL	100713	MEAN	276	MAX	742	MIN	121	CFSM	.69	IN	9.34
WTR YR 1986	TOTAL	96871	MEAN	265	MAX	735	MIN	139	CFSM	.66	IN	8.99

STREAMS TRIBUTARY TO LAKE HURON

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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.--No estimated daily discharges. Records good. Flow regulated by Mio Dam 500 ft upstream. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 997 ft³/s, 12.31 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,380 ft³/s, Sept. 30, 1986, gage height, 6.16 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, 4,380 ft³/s, Sept. 30, gage height, 6.16 ft; minimum daily, 586 ft³/s, Jan. 28.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1110	992	1230	1130	1030	930	2410	1140	1040	1070	1000	915
2	1110	1050	1710	1070	958	944	2200	1100	1030	1010	978	892
3	1080	1160	1580	1090	1020	955	2030	1060	1030	942	963	869
4	1060	1200	1390	1110	1140	954	1900	1070	975	983	976	1020
5	1100	1120	1370	1040	1110	955	1850	1080	989	1090	980	1090
6	1110	1100	1380	1000	1030	977	1840	1060	1010	1130	974	1040
7	1070	1120	1340	926	981	850	1760	1030	987	1060	1010	961
8	1060	1130	1290	856	987	765	1720	1030	994	1020	1010	930
9	1040	1110	1290	1140	1000	1050	1630	986	995	1060	1020	933
10	1180	1100	1290	1130	980	1150	1560	985	945	1010	1070	1060
11	1220	1070	1240	1000	762	1230	1560	977	1140	902	1080	1580
12	1280	1070	1220	1070	838	1270	1430	956	1720	954	1020	1940
13	1880	1060	1220	1050	955	1230	1310	955	1560	1000	955	2060
14	1610	1340	1130	946	1070	1270	1410	942	1380	1050	955	1760
15	1690	1250	998	930	973	1300	1480	1020	1250	1010	1010	1610
16	1340	1270	1120	1030	962	1300	1670	1080	1260	965	1050	1720
17	1370	1410	1050	1130	981	1400	1660	1220	1060	937	996	1630
18	1300	1460	968	1150	1030	1450	1470	1500	915	919	971	1500
19	1230	1530	995	1100	1030	1580	1470	1680	1090	948	975	1380
20	1210	1800	1080	1070	996	1670	1430	1510	1200	910	924	1590
21	1130	1690	1110	1070	999	1500	1390	1410	1140	856	909	1720
22	1130	1440	1040	1070	855	1390	1380	1500	1070	858	942	1770
23	1150	1340	1110	1030	923	1510	1330	1480	1010	868	951	1910
24	1170	1410	1170	975	970	1680	1250	1380	1160	862	901	1900
25	1130	1320	845	983	943	1710	1240	1330	1110	863	881	1750
26	1080	1240	879	1020	956	2300	1270	1200	1070	1190	888	1710
27	1050	1200	1090	766	936	3170	1240	1190	1250	1090	910	2210
28	1040	1210	1120	586	924	2780	1210	1160	1540	1140	918	2480
29	1060	1210	1090	865	---	2580	1170	1120	1250	1330	894	2390
30	1030	1180	1080	1070	---	2810	1150	1060	1160	1220	900	2940
31	1000	---	1090	1020	---	2590	---	1040	---	1070	911	---
TOTAL	37020	37582	36515	31423	27339	47250	46420	36251	34330	31317	29922	47260
MEAN	1194	1253	1178	1014	976	1524	1547	1169	1144	1010	965	1575
MAX	1880	1800	1710	1150	1140	3170	2410	1680	1720	1330	1080	2940
MIN	1000	992	845	586	762	765	1150	942	915	856	881	869
CFSM	1.09	1.14	1.07	.92	.89	1.39	1.41	1.06	1.04	.92	.88	1.43
IN.	1.25	1.27	1.23	1.06	.92	1.60	1.57	1.23	1.16	1.06	1.01	1.60
CAL YR 1985	TOTAL	432983	MEAN	1186	MAX	2560	MIN	712	CFSM	1.08	IN	14.64
WTR YR 1986	TOTAL	442629	MEAN	1213	MAX	3170	MIN	586	CFSM	1.10	IN	14.97

STREAMS TRIBUTARY TO LAKE HURON

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 time 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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
NOV												
22...	1130	3100	304	7.90	5.5	1.4	11.5	93	K1	160	160	22
JAN												
24...	1045	2290	325	8.00	1.0	1.5	11.6	81	<1	<1	160	20
MAR												
13...	1015	2340	330	8.00	.0	1.6	12.7	89	<1	--	160	23
APR												
29...	1030	2650	256	8.30	12.0	1.7	10.8	102	<1	<1	130	22
JUL												
11...	1030	2160	306	8.20	22.0	1.0	7.9	91	K3	49	150	9
SEP												
25...	1130	2990	306	8.20	16.5	.60	9.4	98	K1	K6	150	12

DATE	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)	BICAR- BONATE IT-FLD (MG/L AS HCO3)	CAR- BONATE IT-FLD (MG/L AS CO3)	ALKA- LITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV											
22...	45	11	4.2	5	.2	.60	166	0	136	3.3	9.4
JAN											
24...	45	11	4.3	6	.2	.80	168	0	138	2.7	11
MAR											
13...	46	11	4.4	6	.2	.60	167	0	154	2.7	18
APR											
29...	37	8.0	3.3	5	.1	.60	126	0	103	1.0	11
JUL											
11...	43	10	4.0	6	.1	.60	170	0	139	1.7	11
SEP											
25...	43	11	4.3	6	.2	.70	172	0	141	1.7	9.7

STREAMS TRIBUTARY TO LAKE HURON

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04137500 AU SABLE RIVER NEAR AU SABLE, MI-Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 22...	1130	5.2	.10	8.3	163	170	.22	1360	<.10
JAN 24...	1045	5.8	<.10	9.3	174	170	.24	1080	.13
MAR 13...	1015	5.5	.20	9.4	174	180	.24	1100	.13
APR 29...	1030	4.1	<.10	6.4	147	130	.20	1050	<.10
JUL 11...	1030	4.9	<.10	7.9	172	170	.23	1000	<.10
SEP 25...	1130	4.8	<.10	8.5	176	170	.24	1420	<.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. DIS- SIEVE DIAM. % FINER THAN .062 MM
NOV 22...	.030	.40	.040	.030	.010	9	75	33
JAN 24...	.030	.40	<.010	<.010	<.010	5	31	66
MAR 13...	.030	<.20	.020	.010	<.010	17	107	20
APR 29...	.030	.60	.020	.010	<.010	3	21	20
JUL 11...	.030	.40	.010	<.010	<.010	4	23	39
SEP 25...	.020	.40	.020	--	.010	5	40	68

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 22...	<10	1	20	<.5	<1	<1	<3	3	16	<5
MAR 13...	<10	1	21	<.5	<1	<1	<3	<1	22	<5
SEP 25...	<10	1	20	<.5	<1	<1	<3	2	5	<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)
NOV 22...	<4	4	.4	<10	<1	<1	<1	66	<6	13
MAR 13...	<4	12	<.1	<10	<1	<1	1	74	<6	6
SEP 25...	7	1	<.1	<10	<1	<1	<1	72	<6	7

STREAMS TRIBUTARY TO LAKE HURON

04142000 RIFLE RIVER NEAR STERLING, MI
(National stream-quality accounting network station)

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.

DRAINAGE AREA.--320 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--November 1905 to December 1908 (gage heights and discharge measurements only), October 1936 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as Rifle River at Michigan Highway 70 near Sterling 1936-61.

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, 1937, to Jan. 10, 1939, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 14 to Mar. 17 and Mar. 20. Water-discharge records good except for estimated daily discharges, which are poor. Occasional regulation by dams upstream from station.

AVERAGE DISCHARGE.--50 years, 314 ft³/s, 13.32 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)
Nov. 20	2400	2,330	8.04	Sept. 12	0600	1,720	6.56
Mar. 19	2100	2,070	7.43	Sept. 23	0400	1,720	6.54
Mar. 26	2100	1,980	7.19	Sept. 30	2000	*3,160	*9.80

Minimum discharge, 140 ft³/s, Sept. 9, gage height, 1.40 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	251	300	547	380	320	295	774	297	284	196	189	157
2	240	332	1330	390	330	295	687	276	276	191	182	153
3	228	472	1140	380	345	295	582	263	270	192	186	146
4	225	436	919	370	360	295	570	256	247	198	188	145
5	247	377	697	360	370	300	595	259	251	236	177	151
6	264	359	622	350	365	305	655	256	254	222	173	148
7	258	362	562	340	355	310	627	245	238	197	182	143
8	242	356	529	330	340	315	535	236	241	183	191	145
9	240	353	508	340	325	320	475	232	226	175	203	143
10	320	416	498	350	310	330	440	231	211	168	189	283
11	362	402	493	355	300	340	429	230	226	166	192	925
12	460	401	476	360	310	360	402	227	357	201	181	1570
13	943	679	444	355	315	390	374	227	415	337	170	1030
14	769	982	360	345	320	450	375	239	318	297	167	624
15	601	1010	350	335	325	620	507	422	271	250	168	525
16	506	846	340	325	330	880	650	375	258	219	165	709
17	449	1030	345	340	335	1200	611	335	236	203	169	554
18	404	894	350	355	340	1610	534	848	220	192	159	481
19	430	1260	355	370	345	1940	466	1060	251	242	153	499
20	418	2090	360	385	335	1650	419	1080	330	301	147	704
21	372	1990	360	375	320	1380	426	1230	270	238	144	771
22	342	1270	360	360	305	1190	420	1250	246	205	142	1130
23	330	939	355	345	300	1220	392	934	228	191	146	1560
24	319	784	350	330	295	1550	357	779	250	179	150	1100
25	322	665	340	320	295	1540	340	662	260	183	144	776
26	316	609	330	310	295	1850	324	533	231	315	148	750
27	309	595	335	300	295	1920	327	439	255	287	175	916
28	289	553	340	295	295	1540	320	397	280	243	177	834
29	274	519	350	300	---	1230	293	359	235	234	176	1360
30	269	488	360	305	---	1090	293	326	206	206	167	2920
31	283	---	370	310	---	922	---	297	---	192	161	---
TOTAL	11282	21769	15075	10665	9075	27932	14199	14800	7841	6839	5261	21352
MEAN	364	726	486	344	324	901	473	477	261	221	170	712
MAX	943	2090	1330	390	370	1940	774	1250	415	337	203	2920
MIN	225	300	330	295	295	295	293	227	206	166	142	143
CFSM	1.14	2.27	1.52	1.08	1.01	2.82	1.48	1.49	.82	.69	.53	2.23
IN.	1.31	2.53	1.75	1.24	1.05	3.25	1.65	1.72	.91	.80	.61	2.48

CAL YR 1985 TOTAL 165198 MEAN 453 MAX 2490 MIN 129 CFSM 1.42 IN 19.20
WTR YR 1986 TOTAL 166090 MEAN 455 MAX 2920 MIN 142 CFSM 1.42 IN 19.31

STREAMS TRIBUTARY TO LAKE HURON

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04142000 RIFLE RIVER NEAR STERLING, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-72, 1974 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 time 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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CACO3)
OCT 03...	1000	233	477	8.40	7.0	1.0	13.1	110	K20	K42	210	22
MAR 27...	1030	1930	265	7.90	4.5	30	11.8	92	K150	K130	120	25
MAY 20...	1130	1090	358	8.10	11.0	18	10.4	96	--	3200	170	43
JUL 24...	1130	184	421	8.40	23.0	3.5	8.2	97	72	K42	200	18

DATE	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)	BICAR- BONATE IT-FLD (MG/L AS HCO3)	CAR- BONATE IT-FLD (MG/L AS CO3)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 03...	59	16	11	10	.3	1.0	234	0	192	1.5	28
MAR 27...	34	8.6	4.4	7	.2	1.7	116	0	95	2.3	12
MAY 20...	48	12	7.2	8	.2	1.5	155	0	127	2.0	20
JUL 24...	56	15	9.3	9	.3	1.0	208	8.0	185	1.3	28

STREAMS TRIBUTARY TO LAKE HURON

04142000 RIFLE RIVER NEAR STERLING, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

		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)		
DATE	TIME										
OCT 03...	1000	16	.10	8.0	265	250	.36	167	.15		
MAR 27...	1030	6.7	.10	6.0	154	130	.21	802	.35		
MAY 20...	1130	12	.10	6.8	217	190	.30	639	.33		
JUL 24...	1130	12	.10	7.0	248	250	.34	123	<.10		
		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		
DATE											
OCT 03...		.030	.30	.030	.030	--	5	3.1	31		
MAR 27...		.060	.80	.070	.050	--	194	1010	49		
MAY 20...		.040	1.0	.080	.080	<.010	107	315	51		
JUL 24...		.020	.40	.030	.010	<.010	19	9.4	75		
		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)
DATE											
OCT 03...	20	1	50	1.5	<1	<1	<3		3	51	10
MAR 27...	50	1	27	<.5	<1	<1	<3		7	97	<5
MAY 20...	20	1	38	<.5	<1	<1	<3		2	110	<5
		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)
DATE											
OCT 03...	<4	9	<.1	<10	8	<1	<1		250	<6	8
MAR 27...	<4	11	<.1	<10	2	<1	1		99	<6	9
MAY 20...	5	6	<.1	<10	<1	<1	<1		160	<6	6

STREAMS TRIBUTARY TO LAKE HURON

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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. 15-24, Dec. 27 to Jan. 19, Jan. 26 to Feb. 25, and Feb. 27 to Mar. 8. Records good except for estimated daily discharges, which are fair. Flow regulated by dam at Linden since 1967. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 60.8 ft³/s, 10.17 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, 216 ft³/s, Mar. 20, gage height, 6.12 ft; minimum, 5.9 ft³/s, May 10, gage height, 3.13 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	39	92	101	44	60	70	119	88	55	73	24	28
2	36	78	89	45	57	68	117	79	45	71	24	28
3	35	85	84	45	56	68	112	77	35	67	24	28
4	38	78	82	45	60	72	104	76	34	37	25	27
5	47	69	88	45	78	75	96	70	36	32	24	26
6	53	61	93	45	81	77	98	49	35	44	24	26
7	51	55	85	46	82	78	103	44	35	49	25	26
8	49	67	88	46	81	78	105	43	35	45	25	26
9	55	78	94	46	79	78	105	31	36	43	25	25
10	56	74	84	47	78	96	100	6.9	37	38	25	25
11	53	65	86	47	76	128	95	11	41	36	25	27
12	48	78	98	48	74	122	88	25	74	34	24	29
13	57	97	99	50	70	133	81	40	98	38	24	29
14	52	98	91	51	66	159	75	40	138	36	24	29
15	58	82	80	55	63	185	76	40	145	37	24	29
16	56	89	72	60	62	193	79	40	169	46	24	28
17	45	109	66	65	62	198	82	39	173	50	24	28
18	58	123	63	73	63	197	84	41	189	49	24	29
19	77	116	60	82	66	202	90	46	183	43	24	37
20	85	110	57	91	72	206	93	47	190	41	24	46
21	81	105	55	96	78	196	94	48	168	38	24	50
22	75	102	53	92	80	188	89	50	157	33	24	52
23	89	106	50	87	79	186	81	51	148	31	25	55
24	108	97	45	87	78	180	81	56	146	30	25	61
25	120	99	40	85	78	174	87	66	134	27	25	63
26	116	102	40	80	78	166	90	73	116	26	26	74
27	105	94	43	75	78	167	90	74	100	26	27	97
28	101	104	43	71	75	161	91	68	90	26	27	96
29	98	106	44	68	---	136	91	63	81	25	27	108
30	93	106	44	65	---	131	90	59	76	25	27	138
31	95	---	44	61	---	125	---	58	---	24	27	---
TOTAL	2129	2725	2161	1943	2010	4293	2786	1598.9	2999	1220	770	1370
MEAN	68.7	90.8	69.7	62.7	71.8	138	92.9	51.6	100	39.4	24.8	45.7
MAX	120	123	101	96	82	206	119	88	190	73	27	138
MIN	35	55	40	44	56	68	75	6.9	34	24	24	25
CFSM	.85	1.12	.86	.77	.88	1.70	1.14	.64	1.23	.49	.31	.56
IN.	.98	1.25	.99	.89	.92	1.97	1.28	.73	1.37	.56	.35	.63
CAL YR 1985	TOTAL	28635.0	MEAN	78.5	MAX	288	MIN	22	CFSM	.97	IN	13.12
WTR YR 1986	TOTAL	26004.9	MEAN	71.2	MAX	206	MIN	6.9	CFSM	.88	IN	11.91

STREAMS TRIBUTARY TO LAKE HURON

04144500 SHIAWASSEE RIVER AT OWOSSO, MI

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.

DRAINAGE AREA.--538 mi².

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 the National Weather Service.

REVISED RECORDS.--WSP 1307: 1949(M). WSP 1337: 1932, 1934, 1936-38, 1944.

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.

REMARKS.--Estimated daily discharges: Dec. 26 to Jan. 18 and Jan. 22 to Mar. 10. Records good except for estimated daily discharges, which are fair. Flow regulated below about 800 ft³/s by powerplant at Shiawassee town prior to February 1953; occasional regulation at low stages since. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--55 years, 338 ft³/s, 8.53 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)
Mar. 15	0300	3,030	7.54	Sept. 23	0800	1,750	5.97
June 16	1200	1,820	6.15	Sept. 27	1300	1,660	5.79
June 20	0100	1,690	5.97	Sept. 30	1900	*3,040	*7.61

Minimum discharge, 70 ft³/s, Aug. 21; minimum gage height, 2.42 ft, Sept. 9, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	166	383	653	245	330	420	576	434	280	320	121	136
2	161	354	730	240	325	400	556	455	248	300	115	125
3	161	332	649	235	320	390	530	447	231	292	98	117
4	161	324	578	235	380	400	518	422	224	271	104	117
5	162	330	546	230	500	440	531	394	223	251	104	117
6	155	333	521	230	550	490	624	378	227	231	102	117
7	152	326	505	230	530	530	666	377	250	212	112	114
8	140	308	489	230	520	510	645	353	285	202	107	110
9	144	288	476	230	500	500	623	316	284	196	109	98
10	149	325	469	230	490	1000	617	282	269	193	121	116
11	156	370	481	230	470	2520	599	268	280	204	118	290
12	180	384	509	230	430	2400	570	245	991	214	105	329
13	205	494	525	230	400	2420	513	221	1310	211	94	241
14	207	587	469	230	380	2810	453	200	1290	202	87	213
15	218	640	384	233	360	2910	447	188	1570	193	83	205
16	221	660	367	240	350	2500	448	201	1810	236	92	199
17	221	704	369	280	340	2140	480	201	1740	211	89	180
18	228	670	323	500	350	1890	484	215	1490	205	85	180
19	444	783	307	759	370	2060	458	246	1430	198	80	186
20	686	1300	326	781	410	1830	464	286	1500	187	74	179
21	612	1050	314	743	460	1550	503	333	1100	177	72	178
22	615	821	299	700	500	1380	525	370	869	169	74	385
23	651	726	290	720	560	1290	517	406	745	162	89	1550
24	716	665	283	660	580	1200	492	364	682	158	93	885
25	753	603	273	600	550	1090	462	344	658	157	87	773
26	676	618	265	570	522	934	436	321	570	151	133	1110
27	627	740	260	500	480	813	417	300	480	142	290	1600
28	588	714	260	420	450	718	407	287	430	136	183	1280
29	517	679	260	380	---	688	399	299	390	129	172	1650
30	469	658	255	360	---	651	404	340	350	125	157	2860
31	421	---	250	340	---	610	---	321	---	124	144	---
TOTAL	10962	17169	12685	12041	12407	39484	15364	9814	22206	6159	3494	15640
MEAN	354	572	409	388	443	1274	512	317	740	199	113	521
MAX	753	1300	730	781	580	2910	666	455	1810	320	290	2860
MIN	140	288	250	230	320	390	399	188	223	124	72	98
CFSM	.66	1.06	.76	.72	.82	2.37	.95	.59	1.38	.37	.21	.97
IN.	.76	1.19	.88	.83	.86	2.73	1.06	.68	1.54	.43	.24	1.08

CAL YR 1985	TOTAL	204364	MEAN	560	MAX	4050	MIN	49	CFSM	1.04	IN	14.13
WTR YR 1986	TOTAL	177425	MEAN	486	MAX	2910	MIN	72	CFSM	.90	IN	12.27

STREAMS TRIBUTARY TO LAKE HURON

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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. 13 to Jan. 19, Jan. 28 to Feb. 21, and Feb. 26 to Mar. 8. 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.--54 years, 31.5 ft³/s, 7.74 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)
Mar. 14	0500	*259	*17.45	No other peak greater than base discharge.			
Minimum discharge, 4.8 ft ³ /s, May 18, gage height, 15.18 ft.							

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	75	94	32	37	47	65	41	19	21	9.5	16
2	34	75	93	32	36	44	63	22	17	20	8.8	14
3	34	88	87	32	35	43	60	15	14	18	11	12
4	32	89	85	33	38	42	59	12	12	17	12	11
5	29	79	80	33	42	41	61	13	12	16	13	9.6
6	29	74	76	32	50	40	64	14	13	15	12	8.4
7	28	75	76	32	55	46	63	9.4	13	13	14	7.4
8	27	75	73	32	55	46	63	8.3	13	13	16	6.5
9	28	75	75	30	53	44	64	7.8	13	14	16	5.8
10	28	88	73	30	51	86	61	7.3	12	14	14	8.3
11	28	86	66	29	49	132	58	6.7	21	14	11	54
12	31	97	62	29	47	171	54	6.2	33	15	9.5	58
13	34	130	60	29	45	239	50	5.9	35	18	8.5	69
14	38	142	59	29	43	251	47	5.7	49	17	8.0	78
15	41	147	57	29	41	208	46	5.5	67	15	8.0	78
16	42	151	54	29	39	190	46	5.2	65	15	11	63
17	42	147	50	32	38	199	48	5.2	45	16	14	56
18	43	138	47	40	36	189	49	6.9	31	15	15	54
19	69	133	44	52	37	177	50	15	45	15	13	49
20	73	124	43	66	40	153	51	22	56	25	11	43
21	92	112	43	74	50	150	57	27	65	25	9.5	38
22	117	108	41	86	68	145	61	32	87	23	8.4	42
23	117	104	39	77	82	140	65	41	92	22	8.7	52
24	107	96	38	78	77	141	70	47	80	24	9.9	60
25	96	88	36	71	66	129	72	35	67	24	9.6	87
26	84	90	35	65	60	112	68	28	57	23	12	109
27	79	88	34	58	55	99	62	27	51	20	19	113
28	77	86	34	54	50	89	57	26	44	18	22	112
29	87	90	33	45	---	82	52	26	31	15	24	151
30	96	93	33	42	---	76	47	24	25	13	22	219
31	87	---	32	39	---	69	---	21	---	11	19	---
TOTAL	1785	3043	1752	1371	1375	3620	1733	568.1	1184	544	399.4	1684.0
MEAN	57.6	101	56.5	44.2	49.1	117	57.8	18.3	39.5	17.5	12.9	56.1
MAX	117	151	94	86	82	251	72	47	92	25	24	219
MIN	27	74	32	29	35	40	46	5.2	12	11	8.0	5.8
CFSM	1.04	1.83	1.02	.80	.89	2.12	1.05	.33	.71	.32	.23	1.01
IN.	1.20	2.05	1.18	.92	.92	2.44	1.17	.38	.80	.37	.27	1.13
CAL YR 1985	TOTAL	28898.7	MEAN	79.2	MAX	1300	MIN	3.1	CFSM	1.43	IN	19.44
WTR YR 1986	TOTAL	19058.5	MEAN	52.2	MAX	251	MIN	5.2	CFSM	.94	IN	12.82

STREAMS TRIBUTARY TO LAKE HURON

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. 16 to Mar. 11. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

AVERAGE DISCHARGE.--6 years, 204 ft³/s, 12.54 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, 1,910 ft³/s, Mar. 12, gage height, 7.29 ft; minimum, 53 ft³/s, Sept. 7, 8, 9, gage height, 1.55 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	164	267	464	150	170	160	241	172	96	121	76	95
2	161	247	468	150	170	160	245	155	86	113	72	88
3	154	251	472	155	170	160	243	133	80	107	77	76
4	148	340	437	155	175	170	234	125	76	98	84	70
5	150	390	402	155	200	180	240	121	76	92	87	66
6	151	389	373	155	260	210	303	119	82	87	79	61
7	150	379	352	150	250	230	317	116	81	81	82	55
8	147	379	339	145	240	220	292	108	90	77	94	55
9	145	360	323	145	230	250	274	103	84	83	94	54
10	152	399	321	140	225	400	257	98	81	84	85	66
11	150	527	318	140	220	1150	240	95	99	82	80	412
12	150	515	320	140	210	1870	232	90	426	93	76	872
13	207	525	313	140	200	1370	213	98	492	169	70	794
14	220	644	271	145	190	1140	198	97	376	130	66	431
15	213	726	248	145	185	1180	197	92	362	110	65	366
16	219	680	240	145	180	1040	204	88	363	108	68	523
17	210	616	220	145	170	881	230	85	266	107	88	411
18	199	580	210	180	170	785	232	89	186	124	94	294
19	313	573	210	250	175	749	223	114	196	115	83	241
20	501	577	200	370	190	785	211	146	471	289	74	215
21	508	558	200	350	270	671	236	176	450	314	66	192
22	460	492	190	330	360	588	311	189	346	186	60	341
23	444	458	180	310	360	550	324	188	407	145	62	642
24	418	454	175	290	320	487	307	187	373	129	74	690
25	428	421	170	270	280	448	287	177	285	121	65	553
26	400	401	165	260	220	412	256	150	231	129	87	581
27	348	533	160	240	190	382	231	135	204	117	182	656
28	314	552	155	220	170	347	210	122	185	104	149	664
29	293	497	155	210	---	317	190	120	160	94	136	674
30	290	483	150	190	---	293	177	112	135	87	122	1200
31	286	---	150	180	---	263	---	103	---	80	109	---
TOTAL	8093	14213	8351	6150	6150	17848	7355	3903	6845	3776	2706	11438
MEAN	261	474	269	198	220	576	245	126	228	122	87.3	381
MAX	508	726	472	370	360	1870	324	189	492	314	182	1200
MIN	145	247	150	140	170	160	177	85	76	77	60	54
CFSM	1.18	2.15	1.22	.90	1.00	2.61	1.11	.57	1.03	.55	.40	1.72
IN.	1.36	2.39	1.41	1.04	1.04	3.00	1.24	.66	1.15	.64	.46	1.93

CAL YR 1985 TOTAL 122197 MEAN 335 MAX 2950 MIN 20 CFSM 1.52 IN 20.57
WTR YR 1986 TOTAL 96828 MEAN 265 MAX 1870 MIN 54 CFSM 1.20 IN 16.30

STREAMS TRIBUTARY TO LAKE HURON

225

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 ft³ 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 ft³, 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, 958,000,000 ft³, Sept. 13, elevation, 757.02 ft; minimum, 484,400,000 ft³, Nov. 27, elevation, 751.19 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

Date	Elevation (feet)	Contents (millions of cubic feet)	Change in contents (millions of cubic feet)	(equivalent in ft ³ /s)
Sept. 30	753.72	665	--	--
Oct. 31	755.39	805	+140	+52.3
Nov. 30	751.86	527	-278	-107.0
Dec. 31	751.27	489	-38	-14.2
CAL YR 1985	--	--	-79	-2.5
Jan. 31	751.41	498	+9	+3.4
Feb. 28	751.47	501	+3	+1.2
Mar. 31	751.84	526	+25	+9.3
Apr. 30	755.35	802	+276	+106.0
May 31	755.28	795	-7	+2.6
June 30	755.37	803	+8	+3.1
July 31	755.20	788	-15	-5.6
Aug. 31	755.30	797	+9	+3.4
Sept. 30	755.65	828	+31	+12.0
WTR YR 1986	--	--	+163	+5.2

STREAMS TRIBUTARY TO LAKE HURON

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 Powers-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.--34 years, 321 ft³/s, 8.22 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, 4,390 ft³/s, Sept. 13, gage height, 13.78 ft; minimum, 84 ft³/s, Sept. 8, 9; minimum gage height, 2.56 ft, May 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	134	400	808	263	316	354	679	319	191	235	128	170
2	134	342	784	265	295	341	367	314	172	205	120	154
3	134	319	836	269	287	340	140	283	149	190	120	140
4	134	370	790	271	301	341	138	252	140	174	130	123
5	134	441	750	277	346	368	139	237	153	171	132	113
6	134	473	711	274	404	427	142	235	148	170	137	107
7	134	502	662	265	437	434	139	240	143	163	138	98
8	134	524	628	258	445	396	143	234	150	157	135	89
9	134	553	594	248	449	430	245	220	155	155	141	89
10	134	623	574	239	437	783	400	205	152	145	143	228
11	134	869	573	241	407	1280	470	200	199	154	135	1390
12	136	1070	580	246	381	1770	455	194	515	168	129	2450
13	137	1090	589	249	360	2500	432	147	697	209	124	4130
14	136	1220	545	255	341	2780	432	125	721	215	116	4090
15	137	1190	457	252	319	2810	406	151	688	198	111	3700
16	137	1200	411	249	310	2690	422	160	646	195	113	2740
17	140	1160	388	253	306	2420	438	172	596	179	116	2020
18	161	1160	367	288	293	2170	443	190	468	172	122	1690
19	323	1190	359	409	303	2030	430	209	499	215	119	1470
20	514	1240	365	542	338	1970	436	232	666	397	111	1200
21	639	1240	340	620	395	1920	455	274	699	445	105	1180
22	668	1320	324	661	422	1770	518	325	635	375	98	1230
23	652	1370	315	669	445	1570	568	339	626	307	100	1480
24	640	1350	314	635	455	1390	589	351	615	244	111	1940
25	618	1340	301	603	444	1230	596	346	533	216	107	2420
26	584	1320	289	558	432	1130	555	322	443	219	129	2440
27	547	769	282	480	414	1060	502	283	392	201	219	2250
28	506	575	272	383	381	787	447	257	361	177	225	1920
29	453	770	267	352	---	637	397	234	315	161	217	1960
30	417	820	263	344	---	725	373	212	279	149	206	2200
31	404	---	262	320	---	734	---	201	---	138	190	---
TOTAL	9423	26810	15000	11238	10463	39587	11896	7463	12146	6499	4227	45211
MEAN	304	894	484	363	374	1277	397	241	405	210	136	1507
MAX	668	1370	836	669	455	2810	679	351	721	445	225	4130
MIN	134	319	262	239	287	340	138	125	140	138	98	89
MEAN+	356	787	470	366	375	1286	503	243	408	204	140	1519
CFSM+	.67	1.48	.89	.69	.71	2.43	.95	.46	.77	.38	.26	2.87
IN+	.77	1.66	1.02	.80	.74	2.80	1.06	.53	.86	.44	.30	3.20

CAL YR 1985 TOTAL 244737 MEAN 671 MAX 5430 MIN 41 MEAN+ 668 CFSM+ 1.26 IN+ 17.11
WTR YR 1986 TOTAL 199963 MEAN 548 MAX 4130 MIN 89 MEAN+ 553 CFSM+ 1.04 IN+ 14.17

+ Adjusted for change in contents in Holloway Reservoir.

STREAMS TRIBUTARY TO LAKE HURON

227

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, 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. WDR MI-85: 1968(M), 1973(M), 1975, 1982(P).

GAGE.--Water-stage recorder. Datum of gage is 747.39 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 14 to Mar. 9. 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.--21 years, 73.6 ft³/s, 10.06 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)
Nov. 14	2200	371	7.47	Sept. 27	0700	401	7.73
Mar. 11	0300	845	10.25	Sept. 30	1100	*927	*10.49
Sept. 11	2200	427	7.95				

Minimum discharge, 11 ft³/s, Sept. 9, gage height, 2.96 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	73	185	52	62	85	113	74	29	49	15	22
2	41	67	211	51	60	82	114	79	27	40	19	19
3	38	65	175	51	60	82	104	66	24	37	22	17
4	37	75	146	50	70	82	102	53	22	36	20	16
5	41	74	136	50	120	82	113	49	23	33	18	15
6	40	83	130	49	115	83	158	44	22	29	17	14
7	39	95	122	49	110	88	128	44	24	27	20	13
8	38	97	117	48	100	92	121	39	37	27	21	13
9	43	96	114	48	97	130	114	38	25	23	23	12
10	42	194	113	47	95	357	105	37	28	23	22	25
11	40	193	118	46	90	705	98	37	103	27	20	317
12	50	181	130	45	84	516	88	35	268	37	18	296
13	65	265	118	44	77	580	79	32	129	38	17	120
14	61	317	110	44	73	634	75	28	148	33	15	80
15	68	353	95	44	69	589	84	26	192	31	15	188
16	75	317	85	48	65	440	88	25	197	36	17	187
17	74	290	80	55	64	366	99	26	165	32	18	147
18	79	252	75	70	68	325	115	33	118	32	18	73
19	266	253	70	190	75	363	111	38	201	32	17	52
20	249	285	68	170	95	310	98	48	238	81	18	47
21	220	216	65	160	120	290	125	58	147	40	18	44
22	244	170	64	150	160	284	143	65	146	41	14	125
23	229	158	62	140	160	253	192	65	177	68	21	276
24	228	147	60	125	150	225	139	61	127	36	16	222
25	205	133	59	115	130	205	122	56	107	33	15	228
26	173	173	58	105	115	181	86	51	85	28	49	294
27	123	216	56	90	100	169	81	46	79	24	101	390
28	109	197	55	80	90	158	80	43	67	22	46	258
29	99	197	54	70	---	133	76	39	57	19	38	378
30	89	189	53	67	---	122	72	36	55	18	31	833
31	80	---	52	65	---	113	---	33	---	16	25	---
TOTAL	3230	5421	3036	2418	2674	8124	3223	1404	3067	1048	744	4721
MEAN	104	181	97.9	78.0	95.5	262	107	45.3	102	33.8	24.0	157
MAX	266	353	211	190	160	705	192	79	268	81	101	833
MIN	37	65	52	44	60	82	72	25	22	16	14	12
CFSM	1.05	1.82	.99	.79	.96	2.64	1.08	.46	1.03	.34	.24	1.58
IN.	1.21	2.03	1.14	.90	1.00	3.04	1.21	.53	1.15	.39	.28	1.77

CAL YR 1985	TOTAL	50930.3	MEAN	140	MAX	1370	MIN	6.6	CFSM	1.41	IN	19.06
WTR YR 1986	TOTAL	39110.0	MEAN	107	MAX	833	MIN	12	CFSM	1.08	IN	14.64

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 Pirnie 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 the National Weather Service.

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 the National Weather Service 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.--54 years, 611 ft³/s, 8.68 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, 8,260 ft³/s, Sept. 30, gage height, 14.06 ft; minimum, 122 ft³/s, Oct. 8, gage height, 2.98 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	357	739	1600	475	589	748	1350	738	371	523	251	321
2	338	695	1750	480	598	704	1350	708	337	475	272	300
3	328	625	1550	494	555	696	1040	658	296	412	248	284
4	358	595	1440	484	629	701	809	590	273	340	241	250
5	445	695	1350	497	939	770	734	568	336	340	246	235
6	548	764	1300	508	979	882	931	567	285	341	249	213
7	398	844	1200	486	940	943	963	691	311	347	325	190
8	178	861	1120	472	909	909	834	593	404	408	337	180
9	344	937	1110	477	902	868	768	531	286	348	301	182
10	297	1480	1100	464	875	1120	831	489	318	301	277	503
11	293	1630	1150	465	838	3830	922	459	1020	299	265	4000
12	433	1610	1200	475	776	4570	979	435	2750	503	241	4020
13	479	1830	1160	479	721	4510	964	402	1680	528	233	4250
14	452	2050	1000	485	683	5080	924	300	1310	432	221	4980
15	483	2230	869	478	648	5490	988	300	1310	396	223	4890
16	459	2140	798	476	615	5350	936	341	1280	578	238	4410
17	428	2080	711	539	602	5040	995	343	1220	401	214	3260
18	488	2020	684	767	608	4610	983	440	977	352	217	2510
19	1680	2270	651	1310	658	4470	972	531	1410	517	211	2070
20	1890	2750	678	1320	715	4220	979	598	1970	1570	216	1600
21	1530	2310	647	1220	815	3810	1170	546	1410	943	200	1490
22	1440	2100	617	1230	885	3520	1290	686	1260	766	186	2170
23	1380	2050	612	1280	916	3260	1290	664	1320	732	392	3610
24	1490	2030	602	1160	926	2960	1270	630	1240	525	242	2880
25	1400	1900	543	1050	910	2660	1210	625	1060	442	214	3500
26	1210	2070	506	1020	881	2390	1130	596	901	445	894	5160
27	1120	2110	544	855	850	2210	1010	547	824	391	1180	5490
28	980	1370	531	731	804	1990	911	496	738	355	536	3590
29	906	1500	515	661	---	1690	866	445	683	322	453	4610
30	849	1550	520	622	---	1500	823	407	602	293	388	7910
31	763	---	505	591	---	1410	---	390	---	266	353	---
TOTAL	23744	47835	28563	22051	21766	82911	30222	16314	28182	14891	10064	79058
MEAN	766	1595	921	711	777	2675	1007	526	939	480	325	2635
MAX	1890	2750	1750	1320	979	5490	1350	738	2750	1570	1180	7910
MIN	178	595	505	464	555	696	734	300	273	266	186	180
MEAN+	818	1488	907	715	779	2684	1113	529	942	475	328	2647
CFSM+	.86	1.56	.95	.75	.81	2.81	1.16	.55	.99	.50	.34	2.77
IN+	.99	1.74	1.09	.86	.85	3.24	1.30	.64	1.10	.57	.40	3.09

CAL YR 1985 TOTAL 491989 MEAN 1348 MAX 8900 MIN 146 MEAN+ 1345 CFSM+ 1.41 IN+ 19.10
WTR YR 1986 TOTAL 405601 MEAN 1111 MAX 7910 MIN 178 MEAN+ 1117 CFSM+ 1.17 IN+ 15.86

+ Adjusted for change in contents in Holloway Reservoir.

STREAMS TRIBUTARY TO LAKE HURON

229

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. 15 to Mar. 12, and Sept. 11-13. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--39 years, 220 ft³/s, 8.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,500 ft³/s, Sept. 12, 1986, gage height, 19.82 ft, from floodmarks; minimum, 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)
Mar. 15	1700	4,300	12.00	Sept. 23	2200	3,610	11.73
Mar. 19	2300	4,480	12.18	Sept. 27	2000	2,140	9.73
Sept. 12	Unknown	*12,500	*19.82	Sept. 30	1500	4,850	13.13

Minimum discharge, 5.9 ft³/s, Sept. 7, gage height, 4.49 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	72	530	105	140	120	331	111	71	40	32	20
2	25	72	895	105	135	115	355	100	66	35	29	17
3	24	68	767	105	135	115	348	91	61	33	24	15
4	23	166	558	105	145	120	301	81	57	31	22	13
5	25	276	419	105	160	130	278	75	46	34	22	13
6	25	283	346	105	190	140	562	74	42	35	21	11
7	26	251	309	105	205	145	610	74	40	30	25	9.7
8	24	254	292	105	205	150	423	73	39	26	28	8.5
9	24	248	287	105	200	160	319	69	40	23	38	7.7
10	26	814	308	105	190	300	263	65	35	22	38	242
11	27	896	369	105	180	700	237	61	65	21	29	6490
12	31	609	420	105	165	1500	219	58	441	21	25	11800
13	87	691	392	105	155	2540	194	57	587	24	21	10100
14	111	950	293	105	145	3050	176	57	587	26	19	5770
15	85	1090	180	105	135	4130	176	66	449	25	17	3350
16	92	769	155	110	130	3580	191	76	290	24	16	2710
17	84	589	145	120	125	2740	245	88	189	23	15	1950
18	70	474	135	180	125	2330	239	113	136	23	14	1280
19	132	640	130	280	130	3410	215	138	117	25	13	890
20	278	1120	125	400	145	3390	192	182	126	26	11	665
21	206	964	120	430	165	1960	242	283	123	38	9.9	541
22	149	679	115	400	185	1200	385	307	98	38	9.2	1230
23	119	527	110	360	180	956	406	275	80	39	8.9	3280
24	125	429	110	320	165	940	313	238	86	31	9.0	3230
25	251	352	110	280	150	780	241	201	90	23	8.8	2030
26	204	347	105	240	140	800	202	169	82	22	13	1290
27	178	703	105	210	130	850	177	141	77	21	29	1700
28	140	769	105	190	125	684	149	123	71	21	36	1840
29	106	613	105	170	---	564	133	110	60	20	30	2040
30	89	522	105	155	---	482	121	95	49	18	28	4630
31	77	---	105	145	---	397	---	83	---	18	23	---
TOTAL	2890	16237	8250	5565	4380	38478	8243	3734	4300	836	663.8	67172.9
MEAN	93.2	541	266	180	156	1241	275	120	143	27.0	21.4	2239
MAX	278	1120	895	430	205	4130	610	307	587	40	38	11800
MIN	23	68	105	105	125	115	121	57	35	18	8.8	7.7
CFSM	.26	1.51	.74	.50	.44	3.46	.77	.33	.40	.08	.06	6.24
IN.	.30	1.68	.85	.58	.45	3.99	.85	.39	.45	.09	.07	6.96
CAL YR 1985	TOTAL	162921.2	MEAN	446	MAX	8080	MIN	7.5	CFSM	1.24	IN	16.88
WTR YR 1986	TOTAL	160749.7	MEAN	440	MAX	11800	MIN	7.7	CFSM	1.23	IN	16.66

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. 16 to Jan. 16, Jan. 28 to Feb. 3, Feb. 10-17, Feb. 24 to Mar. 2, Mar. 7-13, and Sept. 15. 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.--18 years, 462 ft³/s, 9.73 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 20,000 ft³/s, Sept. 12, 1986, gage height, 26.66 ft, from floodmarks; 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)
Mar. 15	2200	6,820	15.57	Sept. 24	0200	6,220	15.93
Mar. 20	0800	6,570	15.29	Sept. 30	2200	8,280	17.93
Sept. 12	Unknown	*20,000	*26.66				

Minimum discharge, 35 ft³/s, Aug. 22, 23, Sept. 8, 9; minimum gage height, 2.97 ft, Aug. 22, 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	89	185	867	190	250	210	598	278	162	123	58	59
2	83	172	1270	190	245	205	602	253	141	112	68	53
3	79	174	1310	190	245	203	633	231	126	100	83	48
4	78	228	935	190	241	210	556	212	119	98	76	45
5	84	416	729	190	305	244	519	202	111	110	66	41
6	85	462	621	190	351	270	788	195	101	103	62	39
7	83	447	560	190	383	275	1130	209	93	95	77	37
8	79	432	530	190	394	280	823	197	97	86	81	36
9	80	454	519	190	371	250	630	186	87	79	79	36
10	89	1100	545	190	340	400	521	173	85	74	85	284
11	94	1540	613	190	310	800	471	163	118	66	83	9390
12	109	1110	687	190	290	2000	434	151	636	67	69	19500
13	204	1020	667	190	270	3000	395	143	955	75	60	18200
14	249	1430	438	190	255	4740	362	139	789	73	56	12100
15	234	1710	336	190	240	6270	361	148	653	68	54	6450
16	220	1390	290	195	230	6280	388	162	508	66	53	4370
17	221	1020	260	208	225	4710	472	172	376	62	50	3320
18	198	849	240	288	225	3860	480	235	289	59	46	2160
19	268	1030	225	561	229	4570	433	318	281	90	41	1570
20	468	1960	215	770	250	6050	401	389	360	104	39	1250
21	467	1790	205	776	284	3400	460	560	321	82	37	1040
22	353	1220	200	738	332	2150	757	596	262	81	36	2100
23	299	945	195	653	328	1560	850	538	217	78	37	5390
24	319	800	190	569	290	1500	689	474	218	74	38	5860
25	487	687	190	509	270	1300	547	421	237	67	37	3910
26	448	651	190	446	250	1240	458	360	217	65	50	2360
27	368	1040	190	382	235	1330	400	307	201	61	92	2310
28	312	1300	190	320	220	1170	353	273	191	57	90	2720
29	259	1080	190	290	---	943	318	250	169	56	83	3160
30	223	896	190	270	---	820	292	217	142	52	71	7180
31	200	---	190	260	---	695	---	187	---	49	66	---
TOTAL	6829	27538	13977	10085	7858	60935	16121	8339	8262	2432	1923	115018
MEAN	220	918	451	325	281	1966	537	269	275	78.5	62.0	3834
MAX	487	1960	1310	776	394	6280	1130	596	955	123	92	19500
MIN	78	172	190	190	220	203	292	139	85	49	36	36
CFSM	.34	1.42	.70	.50	.44	3.05	.83	.42	.43	.12	.10	5.94
IN.	.39	1.59	.81	.58	.45	3.51	.93	.48	.48	.14	.11	6.63

CAL YR 1985	TOTAL	281842	MEAN	772	MAX	11000	MIN	32	CFSM	1.20	IN	16.26
WTR YR 1986	TOTAL	279317	MEAN	765	MAX	19500	MIN	36	CFSM	1.19	IN	16.11

STREAMS TRIBUTARY TO LAKE HURON

231

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. 16 to Jan. 17, Jan. 27 to Feb. 4, Feb. 10-20, Feb. 23 to Mar. 13, and Sept. 11. Records good except for estimated daily discharges, which are poor. 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.--48 years, 513 ft³/s, 8.28 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,200 ft³/s, Sept. 12, 1986, gage height, 27.52 ft; minimum daily, 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)
Mar. 15	0400	7,630	18.26	Sept. 12	2000	*22,200	*27.52
Mar. 20	2000	6,970	17.65	Sept. 24	0500	8,950	19.39

Minimum discharge, 54 ft³/s, Aug. 23, 26, gage height, 3.40 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	140	266	1170	270	360	300	810	376	229	194	84	104
2	134	249	1520	270	355	295	781	349	203	178	86	95
3	119	245	1740	270	350	295	796	314	179	163	102	85
4	114	269	1350	270	360	300	744	290	167	166	127	79
5	126	403	1060	270	491	340	677	269	160	173	117	78
6	140	542	893	270	604	380	858	269	157	167	104	71
7	134	551	797	270	649	400	1310	288	146	151	120	66
8	123	531	753	270	642	390	1180	282	147	143	131	62
9	124	547	736	270	619	385	878	262	141	128	126	60
10	143	994	753	270	480	900	714	239	133	116	121	222
11	163	1760	819	270	420	1500	632	220	164	110	124	3500
12	176	1520	904	270	380	2500	582	205	837	114	118	21700
13	299	1270	913	270	360	4000	533	193	1370	116	102	21500
14	365	1590	709	270	350	6530	492	187	1060	119	92	18000
15	362	1940	494	270	340	7090	493	195	867	109	89	12200
16	329	1820	400	280	330	7460	519	207	765	109	86	7910
17	314	1430	360	320	320	6280	611	225	591	104	81	5500
18	293	1170	330	474	320	4800	651	262	442	102	75	3480
19	387	1370	310	924	330	4940	590	388	468	244	69	2360
20	574	2390	300	1320	350	6510	538	529	788	418	66	1820
21	656	2590	290	1310	472	5230	582	685	630	319	61	1490
22	534	1870	285	1220	491	2970	832	804	476	206	57	2450
23	432	1410	280	1070	450	2100	1060	751	393	170	58	7470
24	428	1180	275	895	410	1860	942	660	362	146	61	8780
25	569	1000	270	797	380	1720	756	581	373	130	58	7150
26	621	971	270	690	350	1530	626	503	346	134	68	4160
27	515	1290	270	520	330	1590	539	430	313	126	121	2990
28	438	1660	270	450	310	1530	480	383	298	112	144	3410
29	382	1540	270	420	---	1270	432	344	264	104	131	4460
30	328	1270	270	390	---	1080	402	306	227	97	116	8760
31	295	---	270	370	---	938	---	264	---	89	106	---
TOTAL	9757	35638	19331	15500	11603	77413	21040	11260	12696	4757	3001	150012
MEAN	315	1188	624	500	414	2497	701	363	423	153	96.8	5000
MAX	656	2590	1740	1320	649	7460	1310	804	1370	418	144	21700
MIN	114	245	270	270	310	295	402	187	133	89	57	60
CFSM	.38	1.41	.74	.60	.49	2.97	.83	.43	.50	.18	.12	5.95
IN.	.43	1.58	.86	.69	.51	3.42	.93	.50	.56	.21	.13	6.64

CAL YR 1985	TOTAL	373449	MEAN	1023	MAX	12500	MIN	46	CFSM	1.22	IN	16.52
WTR YR 1986	TOTAL	372008	MEAN	1019	MAX	21700	MIN	57	CFSM	1.21	IN	16.46

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 National Weather Service.

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. 14 to Mar. 12, and Sept. 12, 13. 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.--55 years, 315 ft³/s, 10.28 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,660 ft³/s, Sept. 12, 1986, gage height, 15.58 ft, from floodmarks; minimum, 12 ft³/s, Aug. 18, 1945; minimum gage height, 2.70 ft, Oct. 8, 1966; minimum daily discharge, 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)
Oct. 14	0500	1,210	6.29	Apr. 6	2100	1,050	5.84
Nov. 21	0200	2,070	8.46	May 22	0800	1,150	6.10
Dec. 2	2100	1,150	6.12	Sept. 12	Unknown	*6,660	*15.58
Mar. 15	1400	1,570	7.24	Sept. 23	1100	1,580	7.59
Mar. 20	0400	1,890	8.04				

Minimum discharge, 194 ft³/s, Aug. 25; minimum gage height, 2.95 ft, Aug. 25, Sept. 8, 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	295	398	677	250	250	280	764	359	391	422	228	211
2	295	406	980	250	255	275	708	338	368	373	219	209
3	289	434	953	250	270	280	669	315	345	344	219	208
4	281	462	805	250	300	300	640	311	332	322	214	209
5	293	444	758	250	350	310	659	305	313	317	211	209
6	302	429	714	250	380	305	920	291	300	305	213	206
7	312	425	667	250	390	290	928	289	290	295	221	202
8	302	423	630	250	395	270	788	285	283	276	224	201
9	313	430	600	250	390	250	696	278	279	264	222	203
10	358	457	585	250	370	265	627	269	276	248	219	304
11	418	474	580	250	350	380	570	269	281	248	218	2830
12	450	498	568	250	330	700	528	267	314	245	211	6210
13	834	603	539	250	310	870	489	262	426	257	207	6140
14	1160	815	480	250	290	1070	468	266	444	259	205	5310
15	994	1000	440	250	280	1450	482	274	407	290	205	3830
16	871	973	400	255	275	1320	475	316	375	373	204	2620
17	758	1200	370	270	270	1410	473	351	347	422	202	2060
18	667	1160	340	320	275	1370	450	372	318	410	201	1810
19	710	1300	320	400	285	1580	429	633	391	355	198	1460
20	816	1780	300	520	300	1740	406	966	590	331	196	1310
21	716	1920	280	540	315	1380	402	1090	673	292	196	1180
22	663	1540	270	430	325	1230	388	1140	665	270	195	1210
23	605	1340	260	390	330	1180	371	1050	521	261	196	1520
24	576	1170	255	360	325	1160	357	940	476	256	196	1540
25	562	1020	250	330	315	1070	352	821	435	247	195	1540
26	508	912	250	310	305	1090	355	718	430	248	212	1460
27	476	856	250	290	295	1150	351	627	470	249	243	1540
28	447	789	250	270	285	1090	379	569	525	251	233	1350
29	447	728	250	260	---	961	387	522	528	246	222	1310
30	425	685	250	255	---	856	365	479	489	237	218	2070
31	404	---	250	250	---	824	---	438	---	233	214	---
TOTAL	16547	25071	14521	9200	8810	26706	15876	15410	12282	9146	6557	50462
MEAN	534	836	468	297	315	861	529	497	409	295	212	1682
MAX	1160	1920	980	540	395	1740	928	1140	673	422	243	6210
MIN	281	398	250	250	250	250	351	262	276	233	195	201
CFSM	1.28	2.01	1.13	.71	.76	2.07	1.27	1.20	.98	.71	.51	4.04
IN.	1.48	2.24	1.30	.82	.79	2.39	1.42	1.38	1.10	.82	.59	4.51

CAL YR 1985 TOTAL 177421 MEAN 486 MAX 1920 MIN 147 CFSM 1.17 IN 15.87
WTR YR 1986 TOTAL 210588 MEAN 577 MAX 6210 MIN 195 CFSM 1.39 IN 18.83

STREAMS TRIBUTARY TO LAKE HURON

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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 National Weather Service.

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: Dec. 14 to Jan.20, Jan. 26 to Mar.12, and Sept. 11, 12. 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 3.9 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.--56 years, 220 ft³/s, 10.37 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,160 ft³/s, Sept. 12, 1986, gage height, 12.82 ft, from floodmarks; minimum daily, 0.40 ft³/s, Sept. 6, 1964, caused by closing dam during construction of waterworks.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,160 ft³/s, Sept. 12, gage height, 12.82 ft, from floodmarks; minimum, 44 ft³/s, Sept. 4; minimum gage height, 0.80 ft, Aug. 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	168	255	512	160	155	195	476	248	230	259	115	132
2	206	253	627	160	160	190	441	219	204	196	76	129
3	196	236	523	160	170	195	406	195	175	162	82	74
4	201	258	546	160	185	205	387	196	143	136	91	60
5	194	262	572	160	260	215	427	193	172	136	102	49
6	196	257	552	160	275	225	585	194	173	165	114	53
7	235	245	492	160	280	215	554	188	140	146	137	55
8	213	232	427	160	275	200	592	197	181	122	138	58
9	218	241	390	160	270	185	579	158	146	119	135	58
10	237	296	385	160	260	200	510	176	122	107	155	199
11	256	320	386	160	245	220	442	191	167	115	92	3390
12	289	373	378	160	230	540	380	179	191	150	57	4960
13	327	462	354	160	210	1120	334	160	179	194	59	4730
14	321	516	270	160	200	1590	315	153	162	168	60	3990
15	341	495	250	160	195	1780	301	174	150	154	63	2910
16	357	547	235	160	190	1450	296	191	191	194	66	2130
17	325	630	220	160	185	1440	326	231	172	195	70	1560
18	349	660	210	170	190	1370	329	423	146	207	77	1280
19	387	861	200	210	195	1560	313	563	183	179	78	1130
20	391	1110	190	300	200	1330	291	621	190	145	80	1000
21	368	941	180	358	210	1160	276	621	257	136	79	896
22	398	950	175	393	220	1160	251	647	285	137	79	1020
23	403	975	170	409	225	988	244	625	241	125	91	1360
24	423	817	165	368	230	859	239	570	202	114	98	1250
25	371	710	160	316	225	771	238	518	222	111	105	1150
26	352	635	160	270	220	749	224	466	200	111	131	1190
27	332	595	160	230	215	723	224	392	265	128	118	1250
28	327	538	160	200	205	638	231	327	297	143	155	1090
29	281	524	160	170	---	606	232	295	300	134	172	1570
30	292	488	160	160	---	578	239	264	307	137	99	2210
31	259	---	160	155	---	513	---	225	---	139	106	---
TOTAL	9213	15682	9529	6429	6080	23170	10682	9800	5993	4664	3080	40933
MEAN	297	523	307	207	217	747	356	316	200	150	99.4	1364
MAX	423	1110	627	409	280	1780	592	647	307	259	172	4960
MIN	168	232	160	155	155	185	224	153	122	107	57	49
CFSM	1.03	1.82	1.07	.72	.75	2.59	1.24	1.10	.69	.52	.35	4.74
IN.	1.19	2.03	1.23	.83	.79	2.99	1.38	1.27	.77	.60	.40	5.29

CAL YR 1985 TOTAL 130909 MEAN 359 MAX 1830 MIN 35 CFSM 1.25 IN 16.91
WTR YR 1986 TOTAL 145255 MEAN 398 MAX 4960 MIN 49 CFSM 1.38 IN 18.76

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: Oct. 1-15, Dec. 13, 14, and Dec.16 to Mar. 17. 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.--42 years, 307 ft³/s, 10.69 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,360 ft³/s, Sept. 12, 1986, gage height, 11.74 ft; 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)
Nov. 20	1600	2,030	5.86	Sept. 12	0400	*9,360	*11.74
Nov. 24	0600	1,280	4.93	Sept. 23	1500	2,250	6.01
Mar. 16	---	3,400	ice jam	Sept. 30	1500	3,480	7.38
May 21	1000	1,400	5.08				

Minimum discharge, 24 ft³/s, Aug. 14, 15; minimum gage height, 1.82 ft, Aug. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	220	280	547	220	220	260	559	230	202	362	69	69
2	300	272	918	220	225	255	547	284	266	335	215	70
3	260	326	747	220	230	270	515	292	258	260	75	184
4	300	221	593	220	250	280	490	186	374	306	75	126
5	260	284	614	220	270	295	504	184	89	135	73	142
6	280	306	603	220	300	300	745	201	151	85	74	82
7	320	297	593	220	330	290	815	213	299	148	80	83
8	270	289	585	220	350	260	692	157	90	202	81	83
9	300	296	520	220	355	250	731	294	198	126	139	83
10	320	282	491	220	350	260	637	158	273	147	73	142
11	350	464	434	220	330	350	532	101	81	150	150	4670
12	380	420	491	220	300	1050	494	186	163	93	281	8750
13	410	661	440	220	280	1700	440	173	272	97	78	6820
14	440	804	350	220	260	2200	365	190	283	203	29	5660
15	470	810	317	220	255	2800	405	151	267	211	60	4520
16	371	670	300	220	250	3300	441	201	116	180	71	3340
17	502	839	280	220	250	3100	308	252	186	214	72	2360
18	239	780	260	250	255	2290	392	429	288	250	75	1820
19	507	1250	250	330	260	1960	411	832	96	251	73	1750
20	621	1760	240	430	270	1820	384	1110	456	230	71	1410
21	540	1410	235	480	280	1370	338	1150	248	175	72	1340
22	430	1170	230	510	300	1140	362	911	326	141	71	1250
23	489	975	225	520	305	1210	291	915	446	142	76	2050
24	431	1170	220	470	310	936	265	858	396	143	76	2000
25	502	721	220	420	305	901	256	618	101	138	75	1780
26	372	905	220	360	300	853	304	555	366	140	84	1670
27	431	654	220	310	290	764	262	542	234	108	169	1890
28	310	770	220	260	275	844	249	484	385	76	149	1650
29	439	562	220	235	---	671	261	382	467	152	80	1980
30	239	701	220	225	---	638	236	364	322	77	294	3250
31	372	---	220	220	---	680	---	366	---	111	105	---
TOTAL	11675	20349	12023	8760	7955	33297	13231	12969	7699	5388	3165	61024
MEAN	377	678	388	283	284	1074	441	418	257	174	102	2034
MAX	621	1760	918	520	355	3300	815	1150	467	362	294	8750
MIN	220	221	220	220	220	250	236	101	81	76	29	69
CFSM	.97	1.74	1.00	.73	.73	2.75	1.13	1.07	.66	.45	.26	5.22
IN.	1.11	1.94	1.15	.84	.76	3.18	1.26	1.24	.73	.51	.30	5.82

CAL YR 1985	TOTAL	168829	MEAN	463	MAX	3240	MIN	51	CFSM	1.19	IN	16.10
WTR YR 1986	TOTAL	197535	MEAN	541	MAX	8750	MIN	29	CFSM	1.39	IN	18.84

04156000 TITABAWASSEE 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 National Weather Service.

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: Dec. 15 to Jan. 23, Jan. 26 to Mar. 13, and Sept. 12-17. 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.--50 years, 1,736 ft³/s, 9.82 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 38,700 ft³/s, Sept. 13, 1986, gage height, 33.89 ft, from floodmarks; minimum, 39 ft³/s, Oct. 1, 1942; minimum gage height, 8.98 ft, Aug. 26, 27, 1984; minimum daily discharge, 111 ft³/s, Aug. 21, 1949.

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)
Oct. 14	1330	9,740	18.18	Mar. 26	2030	8,010	18.58
Nov. 21	1600	18,700	24.25	May 22	1800	7,790	18.49
Dec. 3	0030	7,840	18.15	Sept. 13	Unknown	*38,700	*33.89
Mar. 20	0700	17,900	24.43	Sept. 24	0800	18,000	25.45

Minimum discharge, 329 ft³/s, Aug. 24, 25, gage height, 9.22 ft; minimum daily, 348 ft³/s, Aug. 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1000	2470	3350	1450	1400	1000	3770	1360	882	1800	620	444
2	1680	1820	5760	1750	1200	700	3710	1440	1430	1610	542	744
3	1870	1520	7020	2250	1400	1000	3590	996	1400	972	396	806
4	1600	2120	5360	1650	2200	1300	3450	850	1260	794	527	678
5	1290	2430	4470	1050	2300	1350	3490	1140	972	687	543	625
6	941	3290	4180	1550	2200	1300	4950	1300	858	566	682	464
7	1540	3270	3920	2200	2000	1200	6480	1090	716	934	744	429
8	1690	3290	3800	2100	1600	950	4910	1200	610	1110	734	706
9	1840	1940	3750	1800	1200	800	4240	1220	778	857	550	573
10	1900	1790	3660	1500	1500	1000	3800	803	988	788	452	1610
11	2100	2890	3440	1300	1800	1700	3440	595	899	843	712	14000
12	2190	4060	3640	1100	2100	3000	2010	1090	1240	525	762	31200
13	5270	4930	3320	1300	1700	5400	1520	994	1630	508	633	36200
14	7620	6760	2150	1600	1400	9390	2010	1140	1180	1260	663	26200
15	6480	9560	1200	1900	1150	12500	3090	1030	800	1630	679	20100
16	4490	8990	1650	1700	1000	14500	3210	1380	1280	1640	463	16000
17	4170	9050	2100	1400	900	14300	2560	2470	1210	1550	410	12200
18	3740	9310	1150	1250	1200	14700	2480	1560	1200	1100	678	8770
19	3870	10200	1550	1150	1600	16300	1710	4870	1100	812	549	7250
20	4970	14600	1950	1400	2100	17800	1330	7370	1950	726	521	6350
21	4790	18300	1300	1900	1200	14100	1830	6960	2230	964	519	5820
22	4100	15700	1200	2200	900	7650	2130	7450	1660	887	532	8500
23	3700	9110	1650	2700	850	7640	2710	6170	1810	734	448	16000
24	3530	6470	2000	2970	1000	7960	2520	4990	1730	988	348	17700
25	3050	5410	1400	2070	1400	6120	1920	4130	1360	1120	396	14800
26	2270	5180	1650	1100	1500	7110	1290	3560	1360	693	601	11800
27	1710	4810	2050	1400	1450	7480	1050	3270	1610	482	799	12600
28	2010	4870	1750	1900	1300	6330	1350	3070	1460	870	1040	10800
29	2310	4450	1250	1600	---	4890	1410	2060	1210	854	657	9740
30	2550	4320	1650	1650	---	4410	1450	1810	1440	919	636	16000
31	2460	---	2150	1700	---	4050	---	1130	---	947	555	---
TOTAL	92731	182910	85470	52590	41550	197930	83410	78498	38253	30170	18391	309109
MEAN	2991	6097	2757	1696	1484	6385	2780	2532	1275	973	593	10300
MAX	7620	18300	7020	2970	2300	17800	6480	7450	2230	1800	1040	36200
MIN	941	1520	1150	1050	850	700	1050	595	610	482	348	429
MEAN+	3004	6113	2773	1707	1496	6400	2794	2543	1291	987	608	10314
CFSM+	1.25	2.55	1.16	.71	.62	2.67	1.16	1.06	.54	.41	.25	4.30
IN+	1.44	2.84	1.33	.82	.65	3.07	1.30	1.22	.60	.47	.29	4.79

CAL YR 1985 TOTAL 1165334 MEAN 3193 MAX 18300 MIN 337 MEAN+ 3207 CFSM+ 1.34 IN+ 18.12
WTR YR 1986 TOTAL 1211012 MEAN 3318 MAX 36200 MIN 348 MEAN+ 3332 CFSM+ 1.39 IN+ 18.82
+ Adjusted for diversion; records furnished by Dow Chemical Co.

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.

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 National Weather Service.

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 National Oceanic and Atmospheric Administration.

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, 52,800 ft³/s, Sept. 15; maximum daily gage height, 24.11 ft, Sept. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	13000			---		---				---
2	---	---	13800			---		---				---
3	---	---	13600			---		---				---
4	---	---	13900			---		---				---
5	---	---	11400			---		---				---
6	---	---	10600			---		---				---
7	---	---	10200			---		---				---
8	---	---	---			---		---				---
9	---	---	---			---		---				---
10	---	10200	---			---		---				---
11	---	10600	---			15800		---				18300
12	---	11200	---			21400		---				31800
13	---	10400	---			27600		---				43800
14	---	12500	---			31100		---				51500
15	10200	13200	---			32700		---				52800
16	---	18300	---			33900		---				50900
17	---	14900	---			34800		---				45100
18	---	15200	---			34400		---				38500
19	---	17700	---			34200		---				33600
20	10500	21900	---			33300		15200				30400
21	11000	21900	---			33100		13700				25800
22	---	25900	---			30100		12800				23800
23	---	24200	---			24200		12400				24700
24	---	19400	---			19500		10900				29800
25	---	15000	---			17300		---				31500
26	---	14900	---			15000		---				30800
27	---	12500	---			14700		---				30100
28	---	14100	---			15000		---				29600
29	---	12100	---			12900		---				28900
30	---	12600	---			11900		---				29200
31	---	---	---			10700		---				---

STREAMS TRIBUTARY TO LAKE HURON

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04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1975 to 1986 (discontinued).

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.--Cross-sectional samples were collected at Rust Ave. bridge. Water-discharge measurements were made at time 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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)
OCT 02...	1130	<100	809	8.20	14.5	7.0	8.0	79	160	120	290	73
MAR 25...	1400	18100	420	8.00	6.5	15	11.0	91	K7000	K1200	170	54
MAY 22...	1000	12500	553	8.00	13.5	15	8.2	80	--	310	240	65
JUL 22...	1430	3380	597	8.10	26.0	22	7.0	87	K300	K62	220	51
SEP 14...	1300	528000	226	7.70	17.5	37	5.4	57	1200	1700	96	26

DATE	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)	BICAR- BONATE IT-FLD (MG/L AS HCO3)	CAR- BONATE IT-FLD (MG/L AS CO3)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 02...	77	23	50	27	1	3.4	262	0	215	2.6	53
MAR 25...	48	13	12	13	.4	2.8	146	0	120	2.3	29
MAY 22...	67	18	17	13	.5	2.6	--	--	--	3.4	38
JUL 22...	58	19	35	25	1	3.0	210	0	172	2.7	39
SEP 14...	28	6.2	3.8	8	.2	4.0	85	0	70	2.7	18

STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 02...	1130	97	--	7.0	486	440	.66	--	1.2
MAR 25...	1400	27	.20	6.0	247	220	.34	12100	1.3
MAY 22...	1000	36	.20	6.0	313	310	.43	10600	3.2
JUL 22...	1430	65	.20	3.9	364	330	.50	3320	.70
SEP 14...	1300	15	.10	4.2	126	130	.17	180000	1.0

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- PENDEDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 02...	.210	1.0	.090	.050	.040	28	--	93
MAR 25...	.140	.80	.070	.040	.020	29	1420	80
MAY 22...	.200	1.4	.110	.040	.030	38	1280	92
JUL 22...	.060	1.3	.110	.030	<.010	38	347	96
SEP 14...	--	.90	.170	.060	.050	63	89800	67

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 02...	<10	1	53	2.0	<1	<1	<3	6	13	9
MAR 25...	50	<1	30	<.5	1	<1	<3	6	120	<5
MAY 22...	20	1	42	<.5	<1	<1	<3	4	72	<5
SEP 14...	50	2	25	<.5	<1	1	<3	3	110	<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 02...	<4	20	<.1	<10	10	<1	<1	380	<6	10
MAR 25...	5	17	<.1	<10	1	<1	<1	140	<6	10
MAY 22...	9	17	<.1	<10	<1	<1	<1	230	<6	6
SEP 14...	5	7	.1	<10	<1	<1	<1	170	<6	9

STREAMS TRIBUTARY TO LAKE HURON

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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 time 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 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT 01...	1345	14	854	8.50	13.5	3.5	--	--	230	270	420	130
MAR 26...	1130	221	593	8.00	6.0	10	10.6	87	2400	4000	280	120
MAY 21...	1345	503	825	8.00	10.5	4.0	9.4	86	--	K12000	420	220
JUL 23...	1130	82	655	8.20	22.5	30	7.0	81	1500	K800	310	100

DATE	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)	BICAR- BONATE IT-FLD (MG/L AS HCO3)	CAR- BONATE IT-FLD (MG/L AS CO3)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT 01...	110	34	21	10	.5	4.7	333	5.4	282	1.7	110
MAR 26...	81	20	8.1	6	.2	3.1	202	0	166	3.2	55
MAY 21...	120	29	12	6	.3	4.3	244	0	200	3.9	67
JUL 23...	89	21	8.9	6	.2	4.7	250	0	205	2.5	60

STREAMS TRIBUTARY TO LAKE HURON

04159010 PIGEON RIVER NEAR CASEVILLE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 01...	1345	52	.20	5.5	536	510	.73	20	3.6
MAR 26...	1130	28	.20	5.3	340	320	.46	203	4.3
MAY 21...	1345	47	.20	7.8	502	430	.68	682	19
JUL 23...	1130	30	.30	8.5	431	390	.59	95	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 01...	<.010	.60	.080	.060	.060	42	1.6	61
MAR 26...	.180	1.0	.150	.080	.060	35	21	82
MAY 21...	.200	1.4	.200	.140	.120	27	37	89
JUL 23...	.080	1.2	.220	.130	.110	65	14	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)
OCT 01...	10	1	60	1.0	1	<1	<3	1	6	11
MAR 26...	10	<1	32	<.5	<1	<1	<3	5	12	<5
MAY 21...	10	<1	43	<.5	<1	<1	<3	3	16	<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 01...	5	8	<.1	<10	7	<1	<1	380	<6	7
MAR 26...	6	16	<.1	<10	3	1	<1	160	<6	11
MAY 21...	11	8	<.1	<10	1	2	<1	230	<6	6

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DATE	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)	ALKA- LILITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
NOV 27...	18	27	7.3	3.4	7	.2	1.1	82	1.3	21
DEC 11...	18	27	7.3	4.0	8	.2	.90	78	1.2	13
MAR 25...	20	29	7.7	3.7	7	.2	.90	76	1.2	14
MAY 29...	13	27	7.5	3.8	8	.2	1.0	80	.8	16
JUN 25...	18	28	7.2	3.6	7	.2	.90	74	.6	16
SEP 17...	--	--	--	--	--	--	--	78	.6	--

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159130 ST. CLAIR RIVER AT PORT HURON, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

		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 27...	1130	6.1	.10	1.5	115	120	.16
DEC 11...	1600	6.2	.10	2.0	104	110	.14
MAR 25...	1630	6.0	.10	1.5	129	110	.18
MAY 29...	1030	7.1	<.10	1.0	125	120	.17
JUN 25...	1430	6.3	.10	.8	111	110	.15
SEP 17...	1445	--	--	--	--	--	--

		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 27...	72000	.31	.020	.40	.010	.010	.010	
DEC 11...	64000	.32	.010	.30	--	.020	.010	
MAR 25...	66900	.33	<.010	.30	<.010	<.010	<.010	
MAY 29...	77300	.31	<.010	.30	.040	.010	.010	
JUN 25...	69200	.28	<.010	.20	.010	<.010	<.010	
SEP 17...	--	.28	.020	<.20	.020	<.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)
NOV 27...	<10	<1	16	<.5	<1	<1	<3	<1	<3	<5
MAR 25...	<10	<1	17	<.5	<1	<1	<3	1	<3	<5
MAY 29...	10	<1	20	<.5	<1	<1	<3	<1	7	<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)
NOV 27...	5	<1	<.1	<10	1	<1	<1	100	<6	13
MAR 25...	4	<1	<.1	<10	1	<1	<1	110	<6	24
MAY 29...	<4	<1	<.1	<10	<1	<1	<1	96	<6	24

STREAMS TRIBUTARY TO ST. CLAIR RIVER

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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: Dec. 15 to Mar. 13. Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--42 years, 300 ft³/s, 8.49 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)
Mar. 11	--	5,100	ice jam	Sept. 12	0600	*6,460	*13.41
Mar. 15	0900	5,660	12.06	Sept. 23	1900	5,370	12.37
Mar. 19	2200	5,070	11.47				

Minimum discharge, 18 ft³/s, Aug. 25-27, gage height, 1.85 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	59	608	65	73	120	343	120	68	43	24	34
2	30	55	1160	64	75	100	373	108	61	38	25	29
3	30	70	1160	62	79	90	437	89	56	38	26	27
4	30	328	581	61	90	80	353	84	54	37	26	25
5	29	547	376	60	120	95	302	88	51	38	26	24
6	28	535	306	59	150	125	496	82	48	37	24	24
7	26	389	280	58	200	175	828	76	46	37	24	23
8	25	341	272	57	250	215	526	75	51	38	25	22
9	24	295	270	56	220	170	361	71	59	35	26	21
10	26	677	305	56	180	400	285	66	58	33	31	20
11	25	1100	403	55	140	4020	246	67	59	31	32	3180
12	28	751	591	55	100	4340	227	63	464	31	30	6120
13	42	924	593	55	98	4260	205	61	487	32	30	5010
14	40	1320	390	55	88	5220	180	59	325	31	28	4640
15	72	1390	300	55	83	5430	167	59	198	31	27	4700
16	68	1030	200	55	82	4740	184	58	139	31	28	4860
17	67	726	140	55	82	4110	245	60	123	31	25	3700
18	72	537	110	75	85	3590	280	70	98	29	24	2440
19	132	532	100	250	100	4330	232	85	86	28	22	1160
20	276	910	90	950	120	4420	203	101	84	27	21	664
21	263	981	85	700	150	3230	334	165	91	26	20	541
22	173	576	80	500	170	1610	792	214	94	25	22	1840
23	124	382	78	400	220	898	668	204	87	26	21	4860
24	131	345	75	300	220	976	419	175	78	28	20	4570
25	203	312	74	220	200	851	301	148	72	35	19	3630
26	228	419	73	160	170	809	236	126	67	35	18	3060
27	163	990	72	120	143	1020	195	112	61	33	23	2480
28	115	1190	71	100	135	881	167	98	57	36	32	2170
29	90	867	69	80	---	607	145	88	52	38	40	2230
30	75	633	68	74	---	518	131	81	48	30	43	5020
31	65	---	66	72	---	429	---	74	---	24	41	---
TOTAL	2733	19211	9046	4984	3823	57859	9861	3027	3322	1012	823	67124
MEAN	88.2	640	292	161	137	1866	329	97.6	111	32.6	26.5	2237
MAX	276	1390	1160	950	250	5430	828	214	487	43	43	6120
MIN	24	55	66	55	73	80	131	58	46	24	18	20
CFSM	.18	1.33	.61	.34	.29	3.89	.69	.20	.23	.07	.06	4.66
IN.	.21	1.49	.70	.39	.30	4.48	.76	.23	.26	.08	.06	5.20

CAL YR 1985 TOTAL 232466 MEAN 637 MAX 8320 MIN 16 CFSM 1.33 IN 18.02
WTR YR 1986 TOTAL 182825 MEAN 501 MAX 6120 MIN 18 CFSM 1.04 IN 14.17

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04160570 NORTH BRANCH BELLE RIVER AT IMLAY CITY, MI

LOCATION.--Lat 43°01'49", long 83°04'02", in SW1/4 NW1/4 sec.16, T.7 N., R.12 E., Lapeer County, Hydrologic Unit 04090001, on left bank 12 ft upstream from bridge on State Highway 21, and 0.6 mi northeast of Imlay City.

DRAINAGE AREA.--18.0 mi².

PERIOD OF RECORD.--August 1965 to current year.

GAGE.--Water-stage recorder. Concrete weir Aug. 20, 1965, to Nov. 2, 1981. Datum of gage is 789.69 ft above National Geodetic Vertical Datum of 1929 (levels by Boldt, McLeod, and Johnson, Inc.). Prior to Feb. 24, 1985, at datum 2.00 ft higher.

REMARKS.--Estimated daily discharges: Dec. 14 to Jan. 18, Jan. 27 to Feb. 4, Feb. 7-17, 24, 25, Feb. 27 to Mar. 1, and Mar. 7-9. Records good except for estimated daily discharges, which are fair. Some diversion by pumping for sprinkler irrigation. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 12.2 ft³/s, 9.17 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 354 ft³/s, June 12, 1986, gage height, 6.66 ft, from rating curve extended above 100 ft³/s; maximum gage height, 9.33 ft, Apr. 19, 1975, datum then in use; no flow for part of each day June 27, 28, 1977, June 26-28, 1979, caused by irrigation pumpage.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 60 ft³/s and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Mar. 11	0200	266	5.64	June 19	1700	72	3.52
Mar. 14	2200	116	3.70	Sept. 11	1100	82	3.60
Mar. 19	0900	126	3.91	Sept. 23	0900	83	3.61
June 12	0500	*354	*6.66	Sept. 29	2200	304	6.16

Minimum daily discharge, 3.3 ft³/s, Aug. 19-21.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.2	9.5	33	8.5	12	11	22	11	7.4	8.2	4.7	3.5
2	7.0	9.5	46	8.4	12	11	24	11	6.3	7.9	4.3	3.6
3	6.9	14	32	8.4	13	11	20	11	6.1	8.4	4.5	3.8
4	6.8	32	24	8.4	15	13	20	11	6.0	7.3	4.6	3.8
5	7.3	32	22	8.4	33	17	21	11	6.2	6.6	4.7	3.7
6	6.9	27	23	8.4	24	19	30	10	6.1	6.3	4.7	3.6
7	6.6	25	21	8.4	18	19	22	10	5.6	5.8	6.4	3.5
8	6.5	23	20	8.4	16	19	19	10	5.5	6.4	5.1	3.4
9	7.4	20	20	8.4	14	20	18	9.6	5.5	6.4	4.5	3.4
10	7.4	47	22	8.5	14	77	16	9.2	5.4	5.6	4.0	6.2
11	7.1	41	24	8.6	14	202	16	9.5	51	5.3	3.9	70
12	9.7	31	27	8.7	14	103	15	12	238	6.1	3.7	55
13	13	49	21	9.0	13	100	14	12	71	6.4	3.8	39
14	11	49	17	9.4	13	103	13	11	44	5.4	3.8	28
15	12	43	13	9.8	13	93	15	9.0	36	5.1	5.5	45
16	12	37	11	11	13	75	16	7.5	31	6.4	5.8	45
17	10	35	11	13	13	65	17	7.4	22	5.6	4.1	32
18	11	30	11	17	13	63	15	9.9	17	5.0	3.5	25
19	40	33	11	34	14	109	13	15	41	4.7	3.3	21
20	38	40	10	30	17	63	14	17	46	15	3.3	19
21	28	30	10	22	20	51	28	20	30	8.4	3.3	17
22	21	24	9.8	19	30	45	30	16	28	6.8	3.5	49
23	17	23	9.6	18	18	43	22	16	44	6.0	4.0	74
24	18	23	9.4	15	17	39	19	14	27	5.4	4.0	51
25	21	19	9.2	13	15	36	16	12	20	5.0	3.7	43
26	17	36	9.0	12	13	37	15	11	15	6.9	4.7	44
27	14	48	9.0	12	12	36	16	13	13	5.7	7.8	46
28	12	37	8.8	12	11	30	14	13	12	4.6	5.8	44
29	11	32	8.8	12	---	27	11	11	9.9	4.6	4.9	126
30	10	31	8.7	12	---	26	11	8.9	9.0	4.6	4.0	241
31	9.7	---	8.7	12	---	23	---	7.9	---	4.4	3.7	---
TOTAL	412.5	930.0	520.0	393.7	444	1586	542	356.9	865.0	196.3	137.6	1152.5
MEAN	13.3	31.0	16.8	12.7	15.9	51.2	18.1	11.5	28.8	6.33	4.44	38.4
MAX	40	49	46	34	33	202	30	20	238	15	7.8	241
MIN	6.5	9.5	8.7	8.4	11	11	11	7.4	5.4	4.4	3.3	3.4
CFSM	.74	1.72	.93	.71	.88	2.84	1.01	.64	1.60	.35	.25	2.13
IN.	.85	1.92	1.07	.81	.92	3.28	1.12	.74	1.79	.41	.28	2.38
CAL YR 1985	TOTAL	7636.4	MEAN	20.9	MAX	200	MIN	1.8	CFSM	1.16	IN	15.78
WTR YR 1986	TOTAL	7536.5	MEAN	20.6	MAX	241	MIN	3.3	CFSM	1.14	IN	15.57

STREAMS TRIBUTARY TO ST. CLAIR RIVER

245

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. 15, to Jan. 16, Jan. 23 to Feb. 1, Feb. 9-27, and Mar. 6-10. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--24 years, 92.4 ft³/s, 8.31 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)
Oct. 20	1200	662	4.89	Mar. 11	1700	*2,250	*7.80
Nov. 11	0600	903	5.43	Mar. 15	0900	1,480	6.88
Nov. 14	1000	638	4.56	Mar. 19	2000	1,530	6.96
Nov. 27	2200	641	4.57	Sept. 30	2100	1,260	6.51
Dec. 2	2300	641	4.57				

Minimum discharge, 16 ft³/s, Aug. 1, 2, 3, 7, 13, 14, 15; minimum gage height, 1.52 ft, Aug. 1, 13, 14, 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43	52	336	51	64	92	110	65	32	43	18	26
2	43	50	515	50	66	82	130	64	28	37	17	25
3	41	113	510	50	69	59	130	57	26	36	17	24
4	38	349	304	50	73	64	114	54	24	36	18	26
5	37	448	231	50	178	125	109	54	25	33	18	29
6	39	388	201	49	230	150	228	55	25	30	18	27
7	39	288	186	49	221	180	237	58	26	28	18	25
8	36	250	176	49	160	150	162	61	25	27	23	24
9	34	201	170	48	130	150	122	62	24	29	23	24
10	36	623	183	48	115	260	104	63	24	31	20	26
11	35	814	231	48	100	1690	95	63	28	27	19	40
12	38	521	306	48	90	1820	87	64	162	29	18	141
13	41	465	287	48	82	1140	77	64	515	32	17	130
14	56	614	177	48	78	1250	72	66	350	30	16	81
15	50	551	150	49	74	1340	71	56	197	26	17	66
16	54	471	130	53	73	924	82	45	134	26	52	146
17	52	435	110	58	72	611	106	40	101	27	59	119
18	47	352	95	79	74	522	109	44	79	26	38	81
19	347	338	85	290	85	1160	92	61	72	24	26	62
20	597	401	75	500	120	1020	83	85	289	25	22	52
21	390	367	70	382	170	459	167	95	325	44	19	47
22	223	269	66	294	210	296	357	100	179	35	18	55
23	146	226	63	200	190	262	298	89	154	28	18	200
24	169	224	61	160	160	262	194	82	147	24	18	313
25	323	209	59	120	140	224	141	73	112	22	19	239
26	242	319	57	100	120	208	114	62	87	21	19	231
27	139	571	55	80	100	210	96	54	68	22	22	241
28	96	559	54	73	94	189	87	51	61	21	34	319
29	76	417	53	67	---	159	76	49	54	19	29	361
30	64	352	52	64	---	140	66	42	47	18	24	893
31	57	---	51	63	---	121	---	37	---	18	23	---
TOTAL	3628	11237	5099	3318	3338	15319	3916	1915	3420	874	717	4073
MEAN	117	375	164	107	119	494	131	61.8	114	28.2	23.1	136
MAX	597	814	515	500	230	1820	357	100	515	44	59	893
MIN	34	50	51	48	64	59	66	37	24	18	16	24
CFSM	.78	2.48	1.09	.71	.79	3.27	.87	.41	.76	.19	.15	.90
IN.	.89	2.77	1.26	.82	.82	3.77	.96	.47	.84	.22	.18	1.00

CAL YR 1985 TOTAL 71927.3 MEAN 197 MAX 2410 MIN 7.9 CFSM 1.31 IN 17.72
WTR YR 1986 TOTAL 56854.0 MEAN 156 MAX 1820 MIN 16 CFSM 1.03 IN 14.01

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.

REMARKS.--Estimated daily discharges: Dec. 17 to Jan. 10, Jan. 22-24, 27, Feb. 2, 10-14, Feb. 21 to Mar. 3, and Mar. 7, 8. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 12.7 ft³/s, 8.25 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 55 ft³/s (revised) and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Oct. 19	1900	64	3.47	Mar. 19	1300	80	3.68
Nov. 10	1400	62	3.43	June 12	1000	*81	*3.69
Mar. 11	1600	73	3.58				

Minimum discharge, 1.4 ft³/s, Sept. 9, 10, gage height, 1.89 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.8	21	39	15	16	16	36	20	6.9	14	2.8	2.8
2	9.2	21	45	15	17	14	39	17	6.5	14	2.6	2.5
3	8.6	24	40	15	18	15	36	15	6.1	12	2.7	2.3
4	8.4	33	37	15	20	15	36	14	5.8	11	2.7	2.3
5	9.2	32	34	15	34	18	38	13	7.5	9.5	2.5	2.1
6	8.8	30	33	15	31	23	41	12	8.5	8.7	2.4	1.9
7	8.4	30	33	14	29	22	38	12	7.8	7.5	5.8	1.8
8	7.9	28	32	14	29	21	34	12	7.9	7.7	5.5	1.7
9	8.1	27	31	14	25	20	31	11	6.9	12	6.1	1.5
10	8.4	56	31	14	23	31	29	9.8	6.5	12	4.8	1.9
11	8.9	52	32	14	21	67	27	9.2	22	10	4.3	4.8
12	11	47	33	14	19	57	26	8.6	71	13	3.6	7.4
13	14	46	32	13	18	57	24	8.1	54	12	3.2	5.4
14	12	46	32	14	17	63	23	7.6	44	9.3	3.0	4.4
15	13	44	26	14	16	67	25	7.5	36	7.9	3.1	5.0
16	13	43	23	14	15	59	28	7.5	30	9.1	3.4	5.5
17	11	43	22	15	16	54	31	7.4	24	8.1	3.2	4.9
18	13	40	21	20	18	52	27	9.9	20	7.0	2.8	4.8
19	51	45	20	31	20	74	25	20	27	6.2	2.4	4.4
20	50	45	20	29	23	67	24	18	41	5.8	2.2	4.3
21	42	40	19	25	26	59	35	19	33	6.7	2.1	4.0
22	36	39	18	23	28	50	36	18	29	5.6	2.0	8.9
23	30	39	18	22	23	48	32	17	26	5.2	2.4	28
24	30	38	17	19	21	47	28	14	24	4.9	2.5	20
25	32	36	16	17	19	46	26	13	21	4.5	2.2	18
26	27	39	16	16	18	48	24	12	18	4.6	2.9	20
27	25	43	15	16	18	48	21	11	18	4.1	7.1	26
28	23	41	15	15	17	44	20	9.9	17	3.6	4.8	24
29	24	39	15	15	---	42	19	9.0	15	3.3	3.9	40
30	23	39	15	14	---	40	19	8.2	16	3.2	3.4	52
31	22	---	15	14	---	37	---	7.4	---	3.0	3.0	---
TOTAL	597.7	1146	795	520	595	1321	878	378.1	656.4	245.5	105.4	312.6
MEAN	19.3	38.2	25.6	16.8	21.3	42.6	29.3	12.2	21.9	7.92	3.40	10.4
MAX	51	56	45	31	34	74	41	20	71	14	7.1	52
MIN	7.9	21	15	13	15	14	19	7.4	5.8	3.0	2.0	1.5
CFSM	.92	1.83	1.23	.80	1.02	2.04	1.40	.58	1.05	.38	.16	.50
IN.	1.06	2.04	1.41	.93	1.06	2.35	1.56	.67	1.17	.44	.19	.56
CAL YR 1985	TOTAL	8085.5	MEAN	22.2	MAX	81	MIN	1.5	CFSM	1.06	IN	14.39
WTR YR 1986	TOTAL	7550.7	MEAN	20.7	MAX	74	MIN	1.5	CFSM	.99	IN	13.44

STREAMS TRIBUTARY TO LAKE ST. CLAIR

247

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. 16-22, 25, 26, Jan. 13-15, 27, 28, and Mar. 7, 8. 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.--27 years, 50.9 ft³/s, 8.73 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, 164 ft³/s, June 16, 19, gage height, 4.32 ft; minimum daily, 9.7 ft³/s, Aug. 5, 13, minimum gage height, 2.17 ft Aug. 5, 6, 12, 13, 14, 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	92	128	73	69	83	141	39	35	53	11	22
2	68	88	130	71	70	80	134	65	35	35	10	21
3	63	85	132	67	69	79	124	100	29	38	10	20
4	52	88	133	66	74	76	114	67	21	31	9.9	20
5	31	90	133	66	83	76	109	37	24	21	9.7	19
6	30	89	134	66	80	81	108	39	23	22	10	16
7	30	90	133	67	81	80	107	41	23	23	11	11
8	29	88	130	67	84	78	107	41	24	28	10	11
9	30	90	129	65	85	73	107	40	23	47	10	11
10	31	104	128	58	86	84	104	38	23	50	10	11
11	32	101	126	55	87	92	101	37	46	25	9.9	13
12	37	100	124	54	87	97	100	35	95	24	9.8	26
13	39	104	122	54	87	110	98	28	118	24	9.7	32
14	40	109	119	52	86	117	95	13	133	25	9.8	22
15	44	110	115	52	83	124	86	13	145	26	9.9	25
16	47	115	110	52	82	129	61	12	155	29	10	26
17	49	118	110	52	82	133	60	12	156	29	10	26
18	55	116	105	53	79	136	59	15	146	28	10	26
19	92	114	100	59	81	146	59	16	151	28	10	26
20	99	115	95	61	87	149	62	39	148	31	10	25
21	102	121	92	63	93	151	78	60	140	30	10	25
22	106	125	90	66	93	150	106	58	127	31	10	50
23	112	124	88	69	93	147	110	57	110	31	11	72
24	123	120	86	72	92	143	106	55	99	23	10	66
25	119	117	86	76	91	138	102	54	97	21	10	81
26	112	119	88	77	90	137	100	32	81	20	12	95
27	106	117	87	78	89	138	99	21	67	17	12	104
28	101	121	87	75	86	138	90	27	67	15	12	101
29	96	123	86	73	---	146	59	36	66	14	12	114
30	97	125	86	71	---	150	32	56	64	14	12	119
31	95	---	78	69	---	147	---	48	---	12	18	---
TOTAL	2122	3218	3390	1999	2349	3608	2818	1231	2471	845	329.7	1236
MEAN	68.5	107	109	64.5	83.9	116	93.9	39.7	82.4	27.3	10.6	41.2
MAX	123	125	134	78	93	151	141	100	156	53	18	119
MIN	29	85	78	52	69	73	32	12	21	12	9.7	11
CFSM	.87	1.35	1.38	.81	1.06	1.47	1.19	.50	1.04	.35	.13	.52
IN.	1.00	1.51	1.59	.94	1.10	1.69	1.32	.58	1.16	.40	.15	.58

CAL YR 1985 TOTAL 28127.8 MEAN 77.1 MAX 183 MIN 9.8 CFSM .97 IN 13.21
WTR YR 1986 TOTAL 25616.7 MEAN 70.2 MAX 156 MIN 9.7 CFSM .89 IN 12.03

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 and Anderson, Inc.).

REMARKS.--Estimated daily discharges: Dec. 8-18, Dec. 23 to Jan. 15, Jan. 18-28, and Feb. 8-14. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 10.6 ft³/s, 8.04 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)
Oct. 19	0900	217	4.86	June 19	1600	128	4.27
Nov. 10	0600	157	4.60	July 9	0400	98	3.72
Jan. 19	unknown	91	3.60	Sept. 23	0400	148	4.52
Mar. 10	2200	256	4.99	Sept. 26	2200	214	4.86
Mar. 13	0900	110	3.95	Sept. 29	0700	103	3.83
Mar. 19	0500	126	4.24	Sept. 30	0200	107	3.91
June 12	0400	*340	*5.22				

Minimum discharge, 0.99 ft³/s, Aug. 1, 2, 4, 5, 6, Sept. 3, 5, 6, 7, 8, 9, 10, gage height, 1.44 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	9.8	27	7.4	7.7	11	19	13	3.4	4.3	1.1	1.2
2	2.3	10	59	7.4	11	11	22	10	3.3	4.1	1.1	1.1
3	2.2	23	42	7.3	11	13	19	8.8	2.5	3.5	1.2	1.1
4	2.3	37	31	7.2	21	14	19	7.9	2.3	2.9	1.1	1.1
5	3.2	32	27	7.1	62	18	21	7.2	13	2.5	1.0	1.1
6	3.0	26	25	7.0	36	21	24	8.0	7.4	2.3	1.1	1.0
7	2.4	25	23	7.0	25	16	20	9.2	5.4	2.1	7.9	1.1
8	2.2	21	21	6.9	19	15	17	7.7	6.1	4.5	9.0	1.0
9	2.3	24	20	6.8	16	16	16	8.7	3.7	52	8.5	1.0
10	2.7	130	20	6.8	14	109	14	7.8	3.1	16	4.4	3.2
11	4.0	82	25	6.8	12	174	13	7.3	72	8.6	3.2	22
12	13	48	43	6.7	11	99	12	6.8	213	9.8	2.0	24
13	12	45	33	6.7	11	99	11	5.8	86	6.9	2.0	9.2
14	8.1	48	25	6.6	10	91	10	4.9	42	4.5	1.8	4.9
15	9.3	38	19	6.7	10	76	16	4.9	29	3.4	2.1	4.9
16	6.9	42	15	7.1	10	51	23	5.8	22	8.4	3.5	3.6
17	5.5	37	12	7.5	10	37	23	5.0	15	5.3	2.0	2.6
18	13	32	10	22	12	33	18	29	11	3.6	1.6	2.8
19	144	37	9.7	65	19	103	15	35	53	2.7	1.3	2.5
20	92	41	8.8	55	28	55	15	25	51	2.3	1.3	2.2
21	47	30	8.5	33	31	33	34	21	27	3.1	1.2	2.0
22	32	26	8.2	23	26	28	32	18	21	2.1	1.2	17
23	25	26	8.0	18	22	26	25	15	20	1.9	1.4	89
24	38	25	8.0	16	18	24	21	11	14	1.6	1.3	27
25	30	22	8.0	12	15	23	18	9.4	10	1.6	1.2	23
26	23	29	7.8	11	15	23	15	7.8	7.9	1.7	3.7	62
27	18	41	7.7	9.5	13	23	14	7.0	7.4	1.5	8.2	76
28	15	33	7.6	8.8	12	21	12	6.4	6.2	1.3	3.5	27
29	13	30	7.5	8.8	---	19	11	5.5	5.2	1.3	2.0	67
30	12	29	7.5	7.8	---	18	12	4.4	4.5	1.2	1.5	77
31	11	---	7.4	7.3	---	17	---	3.5	---	1.2	1.3	---
TOTAL	597.3	1078.8	581.7	416.2	507.7	1317	541	326.8	767.4	168.2	83.7	558.6
MEAN	19.3	36.0	18.8	13.4	18.1	42.5	18.0	10.5	25.6	5.43	2.70	18.6
MAX	144	130	59	65	62	174	34	35	213	52	9.0	89
MIN	2.2	9.8	7.4	6.6	7.7	11	10	3.5	2.3	1.2	1.0	1.0
CFSM	1.08	2.01	1.05	.75	1.01	2.37	1.01	.59	1.43	.30	.15	1.04
IN.	1.24	2.24	1.21	.86	1.06	2.74	1.12	.68	1.59	.35	.17	1.16
CAL YR 1985	TOTAL	7702.32	MEAN	21.1	MAX	386	MIN	.91	CFSM	1.18	IN	16.01
WTR YR 1986	TOTAL	6944.40	MEAN	19.0	MAX	213	MIN	1.0	CFSM	1.06	IN	14.43

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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04161540 PAINT CREEK AT ROCHESTER, MI

LOCATION.--Lat 42°41'18", long 83°08'35", in NW1/4 SE1/4 sec.10, T.3 N., R.11 E., Oakland County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on Ludlow Street in Rochester, and 1.5 mi upstream from mouth.

DRAINAGE AREA.--70.9 mi².

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

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 755.11 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 15 to Jan. 17, Jan. 25 to Feb. 4, Feb. 11-15, and Mar. 8. Records good except for estimated daily discharges, which are fair. Occasional regulation by Lake Orion. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 52.6 ft³/s, 10.07 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 918 ft³/s, Feb. 1, 1968; maximum gage height, 5.95 ft, Feb. 10, 1965, backwater from ice; minimum discharge, 1.2 ft³/s, Aug. 19, 1974, caused by regulation due to bridge construction; minimum gage height, 1.26 ft, Sept. 16, 1960.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 300 ft³/s (revised) and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Oct. 19	0700	399	3.60	June 11	2300	493	3.87
Nov. 10	0700	338	3.41	June 19	1200	320	3.35
Mar. 11	0100	*561	*4.05	Sept. 26	2000	373	3.52
Mar. 19	1100	363	3.49				

Minimum discharge, 19 ft³/s, Sept. 10, gage height, 1.63 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	60	122	50	49	46	104	66	36	59	23	38
2	30	60	159	50	50	46	108	59	34	54	23	36
3	30	83	121	50	52	47	95	54	31	46	25	29
4	34	106	117	50	70	49	63	53	30	31	23	29
5	37	93	110	50	134	63	76	51	40	31	23	25
6	36	84	106	50	93	67	84	52	37	29	23	23
7	35	86	102	49	82	61	75	52	37	29	30	24
8	35	83	99	49	79	60	73	48	36	38	34	24
9	36	95	97	48	74	63	76	45	33	51	33	23
10	37	282	98	48	72	191	81	44	31	40	27	34
11	45	164	102	48	68	344	78	42	131	40	29	53
12	60	127	107	48	64	172	71	40	283	48	27	46
13	59	140	96	47	62	222	64	40	154	48	25	28
14	50	152	92	47	60	256	61	39	147	43	25	24
15	53	140	88	47	58	260	73	39	144	39	27	30
16	49	149	84	47	59	236	82	39	132	45	32	26
17	46	137	78	47	62	220	83	37	108	39	27	24
18	59	122	75	75	64	210	73	84	89	40	25	25
19	283	133	72	139	73	325	69	89	165	37	23	25
20	132	132	69	101	81	233	71	65	146	33	23	25
21	88	123	65	77	87	186	108	61	102	33	23	26
22	81	115	61	72	82	169	103	61	96	31	22	55
23	79	115	58	66	73	157	94	59	98	35	23	131
24	105	108	56	62	69	146	87	57	93	30	24	54
25	94	101	54	61	61	137	84	54	83	29	23	53
26	85	123	53	55	55	135	80	51	72	28	30	129
27	79	134	52	50	50	128	75	53	63	26	40	119
28	74	120	51	47	47	118	71	52	59	25	30	72
29	70	113	51	46	---	114	66	47	52	25	29	147
30	66	110	51	46	---	109	65	42	51	24	41	184
31	63	---	51	47	---	102	---	40	---	24	39	---
TOTAL	2063	3590	2597	1769	1930	4672	2393	1615	2613	1130	851	1561
MEAN	66.5	120	83.8	57.1	68.9	151	79.8	52.1	87.1	36.5	27.5	52.0
MAX	283	282	159	139	134	344	108	89	283	59	41	184
MIN	30	60	51	46	47	46	61	37	30	24	22	23
CFSM	.94	1.69	1.18	.81	.97	2.13	1.13	.74	1.23	.52	.39	.73
IN.	1.08	1.88	1.36	.93	1.01	2.45	1.26	.85	1.37	.59	.45	.82

CAL YR 1985	TOTAL	29063	MEAN	79.6	MAX	642	MIN	17	CFSM	1.12	IN	15.25
WTR YR 1986	TOTAL	26784	MEAN	73.4	MAX	344	MIN	22	CFSM	1.04	IN	14.05

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: Dec. 18-31, Jan. 4-12, 22-24, Jan. 27 to Feb. 3, Feb. 8 to Mar. 1, and Mar. 7, 8. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--22 years, 17.6 ft³/s, 9.34 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)
Mar. 10	2400	*111	*3.62	Mar. 20	1300	107	3.58
Mar. 14	2300	101	3.52				

Minimum discharge, 3.7 ft³/s, July 31, Aug. 1; minimum gage height, 1.56 ft, Aug. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.0	20	47	18	18	22	40	19	7.4	8.2	4.0	6.0
2	7.3	20	54	18	18	20	35	17	6.7	7.6	4.5	5.5
3	6.7	28	45	18	20	20	28	15	6.1	6.9	5.0	5.1
4	7.2	37	36	18	25	20	25	14	6.0	6.4	4.8	5.2
5	11	37	32	18	37	21	26	13	9.1	5.9	4.4	5.1
6	11	33	32	18	33	23	32	13	10	5.9	5.1	4.9
7	9.3	32	40	18	34	24	29	15	8.2	6.1	7.4	4.9
8	8.7	29	42	18	32	22	26	13	11	7.5	6.7	4.6
9	9.1	34	40	18	30	23	25	12	8.4	9.1	6.5	4.5
10	9.5	66	39	18	29	45	23	12	7.0	7.4	5.8	4.8
11	9.3	67	40	18	26	73	23	11	14	6.5	5.9	7.9
12	14	62	40	18	24	64	22	10	52	11	5.3	13
13	18	61	37	17	22	78	20	9.7	57	10	5.1	19
14	12	61	34	18	22	89	19	9.5	60	7.6	4.9	17
15	13	55	30	17	21	100	27	9.8	51	6.7	6.7	19
16	12	53	27	17	21	91	29	9.8	43	11	7.7	18
17	9.8	51	25	19	21	75	31	9.7	36	14	5.9	14
18	12	48	24	25	21	68	29	16	20	12	5.1	13
19	48	52	22	38	22	99	26	30	29	10	5.9	11
20	53	52	21	37	25	97	26	24	42	11	5.5	11
21	49	46	21	35	27	78	38	31	37	8.6	4.7	10
22	43	43	20	34	30	64	42	32	31	10	4.3	16
23	40	53	20	30	28	60	39	31	30	11	5.9	27
24	46	55	20	28	27	57	35	37	40	9.4	6.4	24
25	43	49	19	26	25	52	32	34	38	8.3	5.5	22
26	38	49	19	25	23	51	32	29	21	5.8	7.2	23
27	33	51	19	23	23	48	30	22	13	4.6	14	27
28	26	49	18	20	23	45	27	12	12	4.3	7.7	23
29	20	47	18	19	---	47	18	9.8	11	4.3	8.2	30
30	18	45	18	18	---	46	18	8.9	9.2	4.2	7.4	39
31	20	---	18	18	---	43	---	8.0	---	4.0	6.4	---
TOTAL	664.9	1385	917	680	707	1665	852	537.2	726.1	245.3	189.9	434.5
MEAN	21.4	46.2	29.6	21.9	25.3	53.7	28.4	17.3	24.2	7.91	6.13	14.5
MAX	53	67	54	38	37	100	42	37	60	14	14	39
MIN	6.7	20	18	17	18	20	18	8.0	6.0	4.0	4.0	4.5
CFM	.84	1.81	1.16	.86	.99	2.10	1.11	.68	.95	.31	.24	.57
IN.	.97	2.01	1.33	.99	1.03	2.42	1.24	.78	1.06	.36	.28	.63

CAL YR 1985	TOTAL	9878.2	MEAN	27.1	MAX	160	MIN	3.0	CFM	1.06	IN	14.35
WTR YR 1986	TOTAL	9003.9	MEAN	24.7	MAX	100	MIN	4.0	CFM	.97	IN	13.08

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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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, 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, 5,117 acre-ft, Nov. 10, elevation, 802.90 ft; minimum, 3,956 acre-ft, Jan. 16, 17, elevation, 800.59 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Change in contents (equivalent in ft ³ /s)
Sept. 30	802.2	4,753	--	--
Oct. 31	802.4	4,857	+104	+1.7
Nov. 30	802.7	5,013	+156	+2.6
Dec. 31	800.6	3,961	-1052	-17.1
CAL YR 1985	--	--	-144	-0.2
Jan. 31	800.7	4,009	+48	+0.8
Feb. 28	800.8	4,057	+48	+0.9
Mar. 31	801.6	4,449	+392	+6.4
Apr. 30	802.0	4,649	+200	+3.4
May 31	802.2	4,753	+104	+1.7
June 30	802.3	4,805	+52	+0.9
July 31	802.1	4,701	-104	-1.7
Aug. 31	802.2	4,753	+52	+0.8
Sept. 30	802.6	4,961	+208	+3.5
WTR YR 1986	--	--	+208	+0.3

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 (levels by Huron-Clinton Metropolitan Authority).

REMARKS.--Estimated daily discharges: Feb. 18-24. 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.--28 years, 43.0 ft³/s, 8.56 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, 263 ft³/s, Mar. 16, gage height, 4.75 ft; minimum, 10 ft³/s, Sept. 8, 9, gage height, 2.20 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	55	102	51	51	64	94	57	35	32	13	20
2	26	57	115	50	51	64	97	51	27	31	14	18
3	26	68	111	51	52	60	86	47	19	28	18	17
4	27	85	103	51	59	56	81	44	19	24	17	16
5	29	97	94	52	82	56	79	41	25	23	16	16
6	28	90	89	51	86	67	83	42	26	21	16	14
7	29	89	84	50	82	61	57	32	27	20	20	13
8	29	84	83	48	77	59	56	31	33	20	22	11
9	31	85	99	48	75	61	48	32	29	25	27	11
10	32	138	110	48	69	70	50	34	26	24	25	13
11	33	151	119	48	65	175	47	35	51	25	22	30
12	37	148	122	50	63	208	44	35	160	29	20	39
13	44	144	121	49	60	213	51	31	150	30	19	36
14	44	138	115	49	59	225	52	30	126	29	18	34
15	45	132	103	48	57	242	58	31	115	26	18	39
16	43	128	95	47	59	250	70	33	107	29	22	38
17	40	123	105	47	57	220	78	34	88	29	25	34
18	43	116	102	51	57	194	72	52	70	30	23	33
19	116	116	104	75	58	230	70	52	84	30	19	31
20	134	102	72	89	64	240	70	57	117	29	17	30
21	125	97	64	90	74	207	80	65	107	25	17	28
22	113	96	61	87	80	174	90	69	92	22	15	37
23	102	96	56	79	77	154	90	69	80	23	16	65
24	104	97	56	70	74	143	88	67	69	22	16	61
25	100	96	54	68	72	87	83	65	62	22	15	59
26	94	100	52	64	69	80	78	64	60	22	18	75
27	88	106	52	58	71	76	73	60	55	21	25	102
28	81	110	52	52	69	84	69	56	49	18	24	81
29	72	104	52	51	---	95	63	48	42	16	23	86
30	66	100	51	49	---	98	59	41	36	14	22	102
31	58	---	51	48	---	95	---	37	---	13	21	---
TOTAL	1867	3148	2649	1769	1869	4108	2116	1442	1986	752	603	1189
MEAN	60.2	105	85.5	57.1	66.8	133	70.5	46.5	66.2	24.3	19.5	39.6
MAX	134	151	122	90	86	250	97	69	160	32	27	102
MIN	26	55	51	47	51	56	44	30	19	13	13	11
MEAN+	61.9	108	68.4	57.9	67.6	139	73.9	48.2	67.1	22.6	20.3	43.1
CFSM+	.91	1.58	1.00	.85	.99	2.04	1.08	.71	.98	.33	.30	.63
IN+	1.05	1.76	1.16	.98	1.03	2.35	1.21	.82	1.10	.38	.34	.71

CAL YR 1985 TOTAL 24727.6 MEAN 67.7 MAX 347 MIN 8.7 MEAN+ 67.6 CFSM+ .99 IN+ 13.45
WTR YR 1986 TOTAL 23498.0 MEAN 64.4 MAX 250 MIN 11 MEAN+ 64.7 CFSM+ .95 IN+ 12.87

+ Adjusted for change in contents in Stony Lake.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

253

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, 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. 16 to Jan. 15, Jan. 25 to Feb. 2, Feb. 7 to Mar. 4, June 11 to July 24, and Sept. 12-16. Records poor. 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.--7 years, 31.1 ft³/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,940 ft³/s, Oct. 1, 1981, gage height, 30.2 ft, from floodmark, from rating curve extended above 1,500 ft³/s; 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)
Oct. 19	0515	1,860	20.55	June 11	unknown	*1,900	unknown
Nov. 10	0445	1,220	15.86	July 9	unknown	1,500	unknown
Feb. 4	2045	1,260	16.12	Sept. 22	0715	1,670	19.18
Mar. 10	1930	1,470	17.60	Sept. 23	0415	1,230	16.00
June 5	0815	1,280	16.26	Sept. 26	2200	1,440	17.40

Minimum daily discharge, 2.5 ft³/s, Oct. 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.4	4.4	90	4.5	5.5	13	40	7.7	5.2	3.4	3.7	2.8
2	2.9	6.2	56	4.4	7.0	16	15	5.4	3.8	3.4	9.1	3.0
3	2.5	114	18	4.3	8.4	22	7.4	5.0	3.8	3.4	4.9	3.4
4	6.5	45	15	4.2	278	37	12	4.7	3.8	3.4	4.3	7.6
5	7.5	25	13	4.2	200	37	35	5.1	236	3.4	3.2	4.3
6	3.6	9.3	18	4.1	42	59	17	50	8.3	3.5	17	3.4
7	2.9	23	14	4.0	40	27	8.9	30	6.0	4.5	69	2.8
8	3.0	8.4	12	3.8	30	12	7.1	7.3	10	180	6.6	3.0
9	11	49	11	3.8	21	41	5.6	6.9	5.6	380	5.3	3.0
10	15	524	23	4.0	18	511	5.2	5.9	16	60	4.1	3.2
11	8.5	46	41	4.0	15	258	5.6	5.5	780	17	4.2	101
12	98	21	60	4.0	13	59	4.5	5.7	300	15	3.3	40
13	18	41	19	4.0	12	147	4.1	5.5	70	12	3.5	9.0
14	5.5	68	11	4.2	11	85	5.1	5.6	40	8.0	3.4	4.0
15	25	21	8.1	4.3	11	53	33	5.5	25	5.5	3.9	3.5
16	5.3	113	7.5	4.8	10	28	61	6.1	15	20	93	3.3
17	3.8	33	7.0	67	13	18	14	4.6	10	9.0	14	3.0
18	34	52	6.4	109	35	27	7.8	63	5.0	5.0	3.6	5.8
19	555	66	6.0	194	120	327	6.4	22	200	4.0	3.5	3.8
20	31	55	5.5	49	110	33	33	9.8	30	3.5	3.6	4.0
21	11	16	5.2	21	80	13	101	8.0	25	3.5	3.1	2.7
22	8.3	32	5.0	17	55	11	39	6.7	20	3.5	2.9	312
23	6.9	27	5.0	11	35	11	17	5.2	12	3.5	13	367
24	16	17	5.0	8.0	26	9.3	12	4.7	11	3.5	4.8	14
25	6.9	12	5.0	8.0	21	8.8	9.4	4.3	6.0	8.9	3.4	68
26	6.1	195	4.8	8.0	17	11	8.0	4.1	4.0	4.7	64	272
27	5.0	45	4.8	8.1	15	9.6	7.1	11	3.5	3.6	28	262
28	5.3	48	4.8	4.5	13	7.3	6.6	5.2	3.5	3.8	4.9	24
29	4.7	31	4.7	4.0	---	6.7	6.1	4.4	3.4	4.1	3.7	144
30	4.9	29	4.7	4.0	---	6.3	18	4.4	3.4	4.1	3.8	106
31	4.5	---	4.6	4.5	---	5.8	---	4.4	---	3.8	2.8	---
TOTAL	924.0	1776.3	495.1	583.7	1261.9	1909.8	551.9	323.7	1865.3	791.0	397.6	1785.6
MEAN	29.8	59.2	16.0	18.8	45.1	61.6	18.4	10.4	62.2	25.5	12.8	59.5
MAX	555	524	90	194	278	511	101	63	780	380	93	367
MIN	2.5	4.4	4.6	3.8	5.5	5.8	4.1	4.1	3.4	3.4	2.8	2.7
CAL YR 1985	TOTAL	14572.9	MEAN	39.9	MAX	1300	MIN	2.2				
WTR YR 1986	TOTAL	12665.9	MEAN	34.7	MAX	780	MIN	2.5				

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: Dec. 15 to Jan. 15, Jan. 25 to Feb. 2, Feb. 9-16, and May 4-28. 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.

AVERAGE DISCHARGE.--18 years (water years 1959-1976), 13.9 ft³/s; 10 years (water years 1977-1986), 4.74 ft³/s.

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, 318 ft³/s, June 11, gage height, 8.97 ft; minimum daily, 0.06 ft³/s, Aug. 15; minimum gage height, 4.71 ft, Aug. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.50	.72	8.2	.45	.45	1.4	4.9	2.0	.38	.22	.10	.12
2	.33	.85	7.7	.45	.55	1.7	4.9	1.2	.36	.26	.27	.16
3	.29	11	3.0	.45	1.1	2.8	2.5	1.1	.29	.23	.52	.32
4	.34	6.2	2.4	.45	29	4.3	3.4	1.1	.32	.15	.16	.36
5	.73	3.9	2.2	.45	32	6.3	5.0	1.1	17	.11	.08	.22
6	.64	1.8	2.4	.45	7.7	8.1	5.0	1.6	1.6	.07	.68	.16
7	.61	2.5	2.3	.45	4.3	4.8	3.0	4.5	.63	.07	5.7	.20
8	.40	1.7	1.8	.45	2.7	2.3	4.0	2.5	.94	19	1.7	.31
9	.74	4.3	1.6	.44	2.0	4.6	2.2	1.6	.66	41	.47	.29
10	1.1	53	2.4	.43	1.6	78	2.0	1.3	1.2	5.8	.23	.26
11	1.3	7.5	4.1	.43	1.3	39	1.8	1.2	86	1.6	.24	3.3
12	7.6	2.9	6.8	.43	1.2	14	1.8	1.1	33	1.4	.14	4.1
13	3.0	3.7	3.1	.43	1.1	22	1.6	1.1	7.4	1.1	.09	.59
14	.70	5.5	1.7	.43	1.0	14	1.7	1.1	4.0	.63	.07	.26
15	1.5	3.3	1.2	.43	1.0	11	5.6	1.2	2.7	.48	.06	.20
16	.94	12	.90	.45	1.0	7.0	9.6	1.3	1.5	1.9	32	.19
17	.53	5.4	.70	8.1	1.2	5.4	5.6	1.5	.98	.67	13	.32
18	.67	4.8	.64	11	3.5	5.5	3.1	3.5	.56	.42	.71	.70
19	66	6.9	.60	21	14	42	2.4	10	22	.35	.50	.54
20	7.4	6.1	.57	7.0	13	9.6	4.5	4.0	3.3	.29	.37	.32
21	2.0	2.9	.55	2.6	9.4	5.4	16	2.5	2.5	.33	.34	.27
22	1.5	3.5	.53	1.8	5.7	3.8	7.3	1.8	2.1	.29	.31	14
23	1.3	3.8	.52	1.3	3.5	3.5	4.2	1.3	1.2	.25	.62	28
24	1.5	2.7	.50	.93	2.7	2.9	3.1	1.0	1.1	.24	.64	3.2
25	1.5	2.1	.49	.75	2.3	2.7	2.5	.80	.53	.99	.29	6.1
26	1.0	20	.48	.55	1.9	3.0	2.2	.70	.37	.76	3.2	41
27	.84	6.4	.48	.47	1.6	2.9	1.9	.75	.32	.25	3.2	25
28	.76	5.2	.47	.42	1.4	2.3	1.6	.83	.27	.13	.52	5.0
29	.87	4.5	.47	.40	---	2.2	1.5	.49	.25	.20	.26	16
30	.73	4.2	.46	.40	---	2.1	2.5	.37	.22	.09	.18	12
31	.74	---	.46	.42	---	1.9	---	.34	---	.08	.15	---
TOTAL	108.06	199.37	59.72	64.21	148.20	316.5	117.4	54.88	193.68	79.36	66.80	163.49
MEAN	3.49	6.65	1.93	2.07	5.29	10.2	3.91	1.77	6.46	2.56	2.15	5.45
MAX	66	53	8.2	21	32	78	16	10	86	41	32	41
MIN	.29	.72	.46	.40	.45	1.4	1.5	.34	.22	.07	.06	.12
CAL YR 1985	TOTAL	1638.43	MEAN	4.49	MAX	150	MIN	.13				
WTR YR 1986	TOTAL	1571.67	MEAN	4.31	MAX	86	MIN	.06				

STREAMS TRIBUTARY TO LAKE ST. CLAIR

255

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 and Anderson, Inc.).

REMARKS.--Estimated daily discharges: Dec. 16 to Jan. 18, Jan. 20 to Mar. 4, Mar. 7, 8. 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.--21 years, 13.5 ft³/s, 11.11 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)
Oct. 19	1200	259	6.90	June 12	0200	236	6.59
Nov. 10	1000	232	6.68	July 9	0800	200	6.15
Mar. 11	0100	*369	*7.92	Sept. 27	0500	256	6.90
Mar. 19	0800	224	6.41				

Minimum daily discharge, 0.80 ft³/s, Sept. 10; minimum gage height, 1.66 ft, June 4, 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.8	1.8	44	5.3	6.4	9.3	9.7	13	5.0	3.8	.98	1.0
2	1.8	3.7	73	5.3	7.0	9.0	18	9.3	4.0	3.6	1.0	1.0
3	1.7	18	45	5.3	8.0	9.0	13	8.7	2.7	2.8	2.0	1.9
4	5.7	42	27	5.2	20	10	12	7.9	.87	2.4	2.4	2.4
5	7.3	23	21	5.2	138	29	13	6.4	2.5	2.1	1.8	1.6
6	6.0	11	19	5.2	60	34	19	6.9	6.2	1.9	1.6	1.2
7	2.1	12	17	5.2	30	25	12	13	4.3	2.1	8.0	1.2
8	2.8	8.6	16	5.1	20	18	9.0	7.2	14	5.3	4.9	1.4
9	3.2	13	15	5.1	13	15	7.4	5.8	7.5	128	3.7	1.0
10	3.0	163	21	5.1	10	117	6.5	4.9	4.0	30	2.4	.80
11	4.7	68	28	5.1	9.5	237	7.2	4.7	52	11	2.2	5.1
12	22	40	43	5.1	9.0	98	5.4	5.3	149	8.6	1.8	17
13	13	42	26	5.0	8.5	116	4.8	4.3	42	7.1	1.3	5.6
14	7.7	64	16	5.0	8.0	110	4.9	4.2	14	6.3	1.2	2.5
15	8.6	36	11	5.0	8.0	92	12	5.0	8.9	6.5	1.5	1.7
16	5.9	56	10	7.0	8.0	61	21	5.8	8.2	8.2	1.6	1.7
17	3.7	55	9.0	20	8.5	51	25	4.7	5.6	5.9	1.5	1.4
18	9.4	36	8.0	60	13	43	9.6	13	3.7	3.6	1.5	1.4
19	170	53	7.0	144	20	155	7.5	41	65	2.9	1.6	1.9
20	53	61	6.5	65	50	62	7.4	14	62	2.7	1.3	1.9
21	34	34	6.2	30	55	29	48	9.7	14	3.2	1.1	1.7
22	24	25	6.0	20	30	21	41	8.0	7.7	2.5	1.4	14
23	14	27	5.9	15	21	19	22	6.6	11	2.0	2.4	69
24	26	26	5.8	12	16	17	18	5.7	9.9	2.0	2.6	19
25	15	20	5.7	9.5	14	16	15	5.0	5.3	2.0	1.9	17
26	9.3	74	5.6	8.0	12	13	10	4.2	3.5	2.8	3.4	44
27	6.3	69	5.5	7.0	10	14	8.8	4.0	3.1	2.3	9.0	146
28	7.1	41	5.4	6.4	9.6	12	11	5.4	3.5	2.0	3.8	38
29	4.2	37	5.4	6.1	---	10	11	4.6	2.2	2.1	2.0	87
30	1.6	35	5.4	6.0	---	9.1	12	5.2	3.3	2.0	1.4	70
31	1.4	---	5.3	6.0	---	8.5	---	6.4	---	1.4	1.2	---
TOTAL	478.3	1195.1	524.7	499.2	622.5	1468.9	421.2	249.9	524.97	269.1	74.48	559.40
MEAN	15.4	39.8	16.9	16.1	22.2	47.4	14.0	8.06	17.5	8.68	2.40	18.6
MAX	170	163	73	144	138	237	48	41	149	128	9.0	146
MIN	1.4	1.8	5.3	5.0	6.4	8.5	4.8	4.0	.87	1.4	.98	.80
CFSM	.93	2.41	1.02	.98	1.35	2.87	.85	.49	1.06	.53	.15	1.13
IN.	1.08	2.69	1.18	1.13	1.40	3.31	.95	.56	1.18	.61	.17	1.26
CAL YR 1985	TOTAL	7671.14	MEAN	21.0	MAX	440	MIN	.71	CFSM	1.27	IN	17.29
WTR YR 1986	TOTAL	6887.75	MEAN	18.9	MAX	237	MIN	.80	CFSM	1.15	IN	15.53

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: Dec. 23 to Jan. 7, Jan. 10-14, and Jan. 25 to Feb. 3. Records good except for estimated daily discharges, which are fair. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--39 years, 381 ft³/s, 11.65 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)
Oct. 19	1000	3,320	14.99	June 11	2000	*4,340	*16.10
Nov. 10	0800	2,870	14.42	June 19	1900	2,080	13.15
Feb. 5	0200	2,510	13.92	July 9	0200	3,460	15.15
Mar. 10	2400	3,660	15.38	Sept. 23	0900	2,040	13.07
Mar. 19	0700	2,360	13.67	Sept. 27	0100	3,260	14.92

Minimum daily discharge, 139 ft³/s, Sept. 8; minimum gage height, 5.35 ft, Sept. 7, 8, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	237	396	731	330	330	418	607	461	272	386	165	158
2	196	407	1010	330	340	421	772	391	280	435	161	164
3	185	722	801	330	380	462	620	357	219	341	197	164
4	196	853	660	330	673	493	592	328	208	267	166	179
5	256	700	624	330	1800	544	595	310	971	220	163	176
6	264	581	625	320	897	661	725	389	428	199	168	158
7	235	572	613	320	618	569	585	448	274	201	628	142
8	224	533	577	314	549	457	515	276	353	376	255	139
9	241	532	561	317	495	500	489	241	266	2390	297	142
10	240	2200	619	315	463	1480	470	230	246	801	207	140
11	296	1550	737	310	440	2730	472	221	1470	441	197	422
12	475	961	844	310	422	1770	448	217	2610	480	179	627
13	525	827	695	305	406	1450	423	216	1770	425	169	298
14	300	926	581	300	402	1410	417	215	986	358	168	200
15	392	829	448	301	397	1340	558	230	717	325	178	186
16	322	997	493	309	383	1210	592	233	670	470	313	203
17	267	945	486	471	390	1060	573	227	568	334	516	179
18	290	770	480	644	463	977	498	366	606	269	181	191
19	2190	872	482	1050	773	1950	454	792	1080	249	168	191
20	1550	902	515	882	849	1500	448	434	1370	226	159	179
21	912	747	407	588	847	1110	865	387	829	234	154	169
22	672	726	397	530	630	942	727	373	635	217	153	938
23	538	738	380	479	553	809	580	357	677	199	173	1470
24	734	674	370	450	501	762	510	346	596	193	177	703
25	707	609	350	400	482	729	483	317	538	262	146	608
26	503	1130	340	370	475	673	469	295	501	269	260	939
27	511	972	340	340	448	682	458	331	480	193	457	2240
28	490	825	340	320	432	629	446	339	447	183	213	1290
29	553	780	340	310	---	614	440	318	398	185	177	1250
30	445	733	340	310	---	601	521	289	375	178	165	1220
31	410	---	340	310	---	579	---	263	---	172	166	---
TOTAL	15356	25009	16526	12525	15838	29532	16352	10197	20840	11478	6876	15065
MEAN	495	834	533	404	566	953	545	329	695	370	222	502
MAX	2190	2200	1010	1050	1800	2730	865	792	2610	2390	628	2240
MIN	185	396	340	300	330	418	417	215	208	172	146	139
CFSM	1.12	1.88	1.20	.91	1.28	2.15	1.23	.74	1.57	.83	.50	1.13
IN.	1.29	2.10	1.38	1.05	1.33	2.47	1.37	.85	1.75	.96	.58	1.26

CAL YR 1985 TOTAL 205545 MEAN 563 MAX 4550 MIN 135 CFSM 1.27 IN 17.22
WTR YR 1986 TOTAL 195594 MEAN 536 MAX 2730 MIN 139 CFSM 1.21 IN 16.39

STREAMS TRIBUTARY TO LAKE ST. CLAIR

257

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.

REMARKS.--Estimated daily discharges: Dec. 17 to Jan. 5, Jan. 9 to Feb. 2, Feb. 10 to Mar. 1, Mar. 7, 8, and Aug. 20 to Sept. 16. Records good except for estimated daily discharges, which are fair. Occasional regulation by lakes upstream from station. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 16.1 ft³/s, 10.03 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)
Oct. 19	1200	81	2.11	Mar. 14	2200	111	2.42
Nov. 10	0700	94	2.27	Mar. 19	0600	119	2.51
Mar. 11	1300	*139	*2.74	June 12	0600	107	2.41

Minimum discharge, 5.3 ft³/s, Sept. 20, gage height, 1.02 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	20	46	17	18	21	35	24	12	16	6.6	13
2	12	20	57	17	19	19	39	22	11	16	6.4	12
3	9.3	27	44	17	20	18	35	20	11	16	7.1	11
4	10	36	45	17	23	19	33	18	9.0	14	7.4	10
5	12	37	40	17	38	20	33	17	11	13	7.0	9.0
6	11	33	38	17	33	23	39	17	13	12	6.8	8.5
7	11	33	36	17	30	23	37	18	12	10	9.0	8.3
8	12	31	34	17	27	22	34	16	16	9.6	8.8	8.0
9	11	34	32	17	26	21	32	15	13	11	8.7	8.2
10	11	88	32	17	26	47	30	14	11	11	8.3	10
11	12	72	33	17	24	125	30	13	19	11	8.1	18
12	15	58	34	17	23	93	28	13	90	14	7.5	15
13	18	58	31	17	22	93	27	8.7	65	15	6.9	10
14	16	60	30	17	21	102	22	10	45	14	6.7	8.5
15	17	58	30	17	20	106	31	12	41	13	9.2	9.5
16	16	59	24	17	20	91	31	13	37	14	21	11
17	14	58	25	19	20	80	31	13	30	14	18	13
18	16	51	22	25	20	74	29	19	26	13	10	15
19	64	53	21	42	20	111	27	28	41	12	9.3	28
20	54	53	20	35	25	89	27	29	51	15	9.0	6.3
21	36	44	19	34	27	75	38	23	40	12	8.7	8.3
22	31	42	19	34	34	68	40	21	33	11	8.5	16
23	28	41	19	32	24	65	36	21	33	11	8.4	25
24	34	39	19	29	24	60	34	21	34	11	8.5	23
25	35	34	18	25	24	55	32	21	33	11	8.7	27
26	31	40	18	23	21	53	30	20	28	11	9.5	32
27	28	45	18	21	21	45	28	16	26	8.7	13	41
28	25	42	18	19	21	42	27	18	23	7.9	12	39
29	23	42	17	18	---	42	24	19	20	8.0	10	47
30	22	42	17	17	---	39	24	16	19	8.4	12	61
31	21	---	17	17	---	36	---	14	---	7.4	14	---
TOTAL	667.3	1350	873	662	671	1777	943	549.7	853.0	371.0	295.1	551.6
MEAN	21.5	45.0	28.2	21.4	24.0	57.3	31.4	17.7	28.4	12.0	9.52	18.4
MAX	64	88	57	42	38	125	40	29	90	16	21	61
MIN	9.3	20	17	17	18	18	22	8.7	9.0	7.4	6.4	6.3
CFSM	.99	2.06	1.29	.98	1.10	2.63	1.44	.81	1.30	.55	.44	.84
IN.	1.14	2.30	1.49	1.13	1.14	3.03	1.61	.94	1.46	.63	.50	.94

CAL YR 1985 TOTAL 10806.4 MEAN 29.6 MAX 225 MIN 3.0 CFSM 1.36 IN 18.44
WTR YR 1986 TOTAL 9563.7 MEAN 26.2 MAX 125 MIN 6.3 CFSM 1.20 IN 16.32

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. 17-19, Dec. 23 to Jan. 16, Jan. 27, 28, 30, Feb. 2, 6-21, Feb. 27 to Mar. 1. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 7.27 ft³/s, 7.59 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)
Oct. 19	1700	172	3.45	Mar. 13	2200	190	3.57
Nov. 4	0600	106	2.90	Mar. 14	2300	224	3.80
Nov. 10	0700	355	4.58	Mar. 19	0600	394	4.77
Nov. 26	2400	148	3.26	June 19	2400	151	3.27
Dec. 2	0300	142	3.21	Sept.30	0200	196	3.62
Mar. 11	0300	*398	*4.79				

Minimum discharge, 0.08 ft³/s, Aug. 4, 5, 6, 18, 19, 20, 25, 26, gage height, 1.61 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	3.1	33	1.1	1.8	2.5	4.3	2.3	1.0	1.2	.21	.12
2	1.1	2.9	81	1.0	2.0	2.3	6.7	2.0	.93	1.1	.30	.13
3	1.0	25	25	.95	2.3	2.6	5.0	1.7	.81	.90	.36	.13
4	1.1	82	11	.95	5.3	4.5	4.4	1.5	.71	.66	.15	.18
5	1.3	74	7.7	.95	35	13	4.5	1.2	1.0	.57	.10	.29
6	1.4	40	7.2	.90	16	15	23	1.2	.85	.46	.13	.26
7	1.3	27	6.8	.90	9.0	13	18	1.2	1.1	.44	.21	.26
8	1.3	20	7.2	.85	7.0	11	8.3	1.0	2.2	.80	.49	.29
9	1.3	22	7.4	.85	5.0	11	5.4	.94	1.7	.80	.23	.28
10	1.4	230	9.8	.85	4.0	85	4.5	.91	1.2	.55	.18	.44
11	1.6	72	19	.85	3.3	246	4.1	.91	8.0	.49	.17	1.1
12	2.3	42	33	.85	2.7	124	3.7	.78	71	.67	.17	.88
13	2.2	52	20	.85	2.3	135	3.1	.74	20	1.2	.16	.50
14	1.9	54	8.6	.90	2.0	164	2.6	.81	8.6	1.0	.17	.37
15	2.2	41	5.2	.90	1.8	155	2.8	.78	4.7	.58	.62	2.6
16	2.0	40	3.7	.95	1.6	98	3.8	.82	3.6	.81	.46	1.5
17	1.6	46	3.2	1.5	1.6	66	5.2	.82	2.7	.55	.18	1.2
18	2.5	24	2.7	5.5	1.6	61	4.1	6.7	1.8	.45	.15	.78
19	101	35	2.3	59	2.5	257	3.3	8.1	56	.37	.09	.60
20	68	44	1.8	52	6.0	71	3.2	5.9	66	1.4	.11	.58
21	32	21	1.7	30	10	33	23	5.4	23	.52	.15	.58
22	22	11	1.6	21	19	17	39	4.6	11	.40	.18	1.6
23	12	10	1.5	14	14	18	19	6.9	11	.32	.34	6.2
24	21	12	1.4	10	9.1	17	9.0	5.1	9.0	.24	.16	5.6
25	34	9.2	1.3	6.8	6.8	12	5.8	4.0	5.5	.22	.11	3.1
26	20	49	1.2	5.2	5.2	14	4.6	3.1	3.3	.21	.68	5.6
27	10	99	1.2	4.5	4.0	13	3.8	2.5	2.5	.19	.47	24
28	6.2	46	1.1	3.6	3.3	8.3	3.1	2.1	2.1	.18	.24	18
29	4.5	37	1.1	2.2	---	6.5	2.7	1.7	1.7	.15	.35	55
30	3.8	29	1.1	2.0	---	5.3	2.4	1.4	1.4	.16	.29	149
31	3.3	---	1.1	2.0	---	4.4	---	1.2	---	.16	.19	---
TOTAL	366.6	1299.2	309.9	233.90	184.2	1685.4	232.4	78.31	324.40	17.75	7.80	281.17
MEAN	11.8	43.3	10.0	7.55	6.58	54.4	7.75	2.53	10.8	.57	.25	9.37
MAX	101	230	81	59	35	257	39	8.1	71	1.4	.68	149
MIN	1.0	2.9	1.1	.85	1.6	2.3	2.4	.74	.71	.15	.09	.12
CFSM	.91	3.33	.77	.58	.51	4.19	.60	.20	.83	.04	.02	.72
IN.	1.05	3.72	.89	.67	.53	4.82	.66	.22	.93	.05	.02	.80

CAL YR 1985 TOTAL 6590.50 MEAN 18.1 MAX 304 MIN .01 CFSM 1.39 IN 18.86
WTR YR 1986 TOTAL 5021.03 MEAN 13.8 MAX 257 MIN .09 CFSM 1.06 IN 14.37

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. 16 to Jan. 15, Jan. 26-31, and Feb. 7 to Mar. 10. Records good except for estimated daily discharges, which are fair. Some regulation at times by mill upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--39 years, 127 ft³/s, 8.67 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)
Oct. 20	1500	2,220	13.73	Mar. 20	0800	2,160	13.65
Nov. 11	1200	2,300	13.83	June 13	0200	1,370	12.55
Mar. 11	2400	*3,450	*15.23				

Minimum discharge, 10 ft³/s, Sept. 10, gage height, 4.19 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	102	450	66	76	100	134	89	42	57	13	24
2	41	96	511	66	78	100	159	86	37	50	13	21
3	40	143	650	65	97	100	190	77	31	44	15	18
4	36	577	520	65	128	108	154	69	29	40	18	16
5	34	884	309	65	429	180	139	64	29	38	17	17
6	37	805	240	64	587	210	211	63	33	34	16	15
7	38	618	232	64	500	240	325	64	38	30	19	13
8	37	450	231	63	350	190	252	62	37	28	22	13
9	36	354	225	62	250	180	168	56	44	48	28	13
10	35	686	224	62	170	290	137	51	38	36	25	10
11	37	2030	281	62	140	1850	125	48	143	33	21	14
12	41	1270	403	62	125	3030	117	45	909	31	20	30
13	72	733	484	62	110	1980	107	42	1140	39	17	49
14	106	683	337	62	100	1580	97	38	675	49	15	40
15	89	688	258	64	95	1710	92	37	289	39	15	31
16	82	649	170	69	95	1390	112	39	152	34	22	41
17	83	669	100	80	95	930	154	42	121	35	56	60
18	70	676	90	150	100	711	161	43	92	34	49	45
19	406	553	88	442	110	995	124	152	165	28	29	38
20	1770	574	85	748	150	1930	107	261	584	26	21	43
21	1230	608	84	856	200	946	196	194	679	31	18	32
22	651	451	80	692	280	520	473	165	442	36	15	27
23	356	312	77	501	270	354	529	127	186	27	14	55
24	258	312	75	343	240	317	334	119	165	23	16	102
25	438	299	72	249	200	292	197	110	131	21	18	105
26	518	289	70	170	170	257	150	93	103	22	20	133
27	360	489	69	124	140	258	125	80	85	22	21	464
28	218	691	69	98	120	239	108	71	80	19	39	428
29	155	643	68	90	---	196	98	67	73	15	44	441
30	127	522	68	84	---	171	90	60	63	15	31	522
31	112	---	67	78	---	151	---	50	---	14	27	---
TOTAL	7554	17856	6687	5728	5405	21505	5365	2564	6635	998	714	2860
MEAN	244	595	216	185	193	694	179	82.7	221	32.2	23.0	95.3
MAX	1770	2030	650	856	587	3030	529	261	1140	57	56	522
MIN	34	96	67	62	76	100	90	37	29	14	13	10
CFSM	1.23	2.99	1.09	.93	.97	3.49	.90	.42	1.11	.16	.12	.48
IN.	1.41	3.34	1.25	1.07	1.01	4.02	1.00	.48	1.24	.19	.13	.53

CAL YR 1985	TOTAL	102919.0	MEAN 282	MAX 4800	MIN 2.2	CFSM 1.42	IN 19.24
WTR YR 1986	TOTAL	83871.0	MEAN 230	MAX 3030	MIN 10	CFSM 1.16	IN 15.68

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. 1-11, 15-18, Dec. 15-20, Dec. 26 to Feb. 2, Feb. 9-19, Feb. 24 to Mar. 4, Mar. 15 to Apr. 20, Apr. 24 to May 17, May 20 to June 4, June 7-10, 17, 18, June 23 to July 8, and July 11 to Sept. 21. Water-discharge records fair. National Weather Service gage-height telemeter at station.

AVERAGE DISCHARGE.--52 years, 542 ft³/s, 10.03 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)
Oct. 20	1500	3,690	10.51	Mar. 20	unknown	3,580	unknown
Nov. 11	1100	3,830	10.79	June 12	0300	4,610	11.83
Mar. 11	2200	*5,310	*12.48	Sept. 27	0700	3,280	10.38

Minimum daily discharge, 170 ft³/s, Sept. 8, 10; minimum gage height, 5.96 ft, Oct. 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	300	508	1180	440	430	580	740	600	350	450	200	210
2	260	514	1700	440	420	580	1000	550	350	480	200	210
3	250	960	1460	440	416	600	900	480	300	420	240	210
4	260	1620	1170	440	774	650	840	450	270	340	210	220
5	320	1720	948	440	2380	779	820	430	970	290	200	220
6	340	1420	882	440	1510	998	1000	500	405	260	210	200
7	310	1220	864	430	1080	893	1000	580	350	260	730	180
8	300	1000	827	420	857	668	850	400	440	600	300	170
9	310	888	795	420	800	659	750	330	350	2350	370	180
10	310	3020	865	420	700	1800	680	320	330	945	260	170
11	370	3650	1030	410	660	5030	660	300	1510	540	250	500
12	535	2400	1300	410	620	4500	640	290	4140	580	230	740
13	640	1660	1190	410	580	3430	600	280	3080	500	210	400
14	378	1720	905	410	560	3130	540	280	1630	450	210	270
15	540	1590	800	410	540	3100	750	300	972	410	220	250
16	450	1730	750	410	540	2700	800	300	754	580	400	280
17	400	1780	660	510	540	2000	800	300	760	400	650	280
18	400	1470	640	850	580	1700	750	407	760	340	260	270
19	2660	1500	640	1500	700	2800	650	954	1290	310	220	260
20	3510	1580	680	1700	1040	3400	620	750	2200	290	210	250
21	2340	1350	543	1400	1170	2100	1110	680	1420	290	200	230
22	1370	1180	487	1300	982	1500	1220	600	990	280	190	960
23	925	1100	499	960	866	1300	1040	550	940	250	210	1490
24	1080	1030	490	750	850	1100	850	500	850	240	220	882
25	1220	919	461	640	790	1000	770	470	750	330	180	691
26	1010	1480	450	580	750	950	700	450	680	330	340	1090
27	864	1560	450	500	700	900	650	450	640	240	540	2770
28	717	1490	450	470	620	850	620	450	590	230	290	1770
29	742	1430	450	460	---	800	600	430	520	220	250	1730
30	587	1260	450	440	---	780	680	400	480	210	220	1760
31	530	---	450	440	---	740	---	350	---	210	220	---
TOTAL	24228	44749	24466	19290	22455	52017	23630	14131	29071	13625	8640	18843
MEAN	782	1492	789	622	802	1678	788	456	969	440	279	628
MAX	3510	3650	1700	1700	2380	5030	1220	954	4140	2350	730	2770
MIN	250	508	450	410	416	580	540	280	270	210	180	170
CFSM	1.07	2.03	1.08	.85	1.09	2.29	1.07	.62	1.32	.60	.38	.86
IN.	1.23	2.27	1.24	.98	1.14	2.64	1.20	.72	1.47	.69	.44	.95

CAL YR 1985 TOTAL 342379 MEAN 938 MAX 9200 MIN 145 CFSM 1.28 IN 17.35
WTR YR 1986 TOTAL 295145 MEAN 809 MAX 5030 MIN 170 CFSM 1.10 IN 14.96

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--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. Daily-mean discharges are reported at sample times.

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 1985 TO SEPTEMBER 1986

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 SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)
DEC 12...	1000	1300	963	8.10	3.5	21	13.2	102	1100	1800	290
MAR 26...	1030	950	732	8.20	9.5	7.4	10.4	93	K1200	--	280
JUN 26...	1000	680	650	8.30	20.0	--	7.6	85	560	540	--
SEP 18...	0930	270	732	8.20	16.0	6.7	8.9	92	K640	420	240

DATE	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)	ALKA- LITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
DEC 12...	87	80	22	88	39	2	3.8	189	2.9	58
MAR 26...	74	79	21	49	27	1	3.4	190	2.3	52
JUN 26...	--	--	--	--	--	--	--	188	1.8	--
SEP 18...	55	65	20	52	31	1	5.0	200	2.4	54

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 12...	1000	160	.30	6.8	524	550	.71	1840	1.9
MAR 26...	1030	85	.30	5.1	442	430	.60	1130	1.7
JUN 26...	1000	--	--	--	--	--	--	--	1.6
SEP 18...	0930	86	.40	6.1	473	420	.64	345	2.7

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 12...	.140	.80	.140	.060	.060	28	98	98
MAR 26...	.090	.80	.080	.050	.030	27	69	81
JUN 26...	.100	1.0	.170	.070	.050	45	83	96
SEP 18...	.090	.70	.150	.110	.100	23	17	94

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	48	<.5	<1	<1	<3	2	17	<5
MAR 26...	<10	1	46	<.5	<1	<1	<3	2	12	<5
SEP 18...	20	2	50	<.5	<1	<1	<3	3	17	<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)
DEC 12...	8	34	.2	<10	5	<1	<1	230	<6	22
MAR 26...	10	44	<.1	<10	3	<1	<1	200	<6	22
SEP 18...	12	21	<.1	<10	12	<1	<1	190	<6	15

STREAMS TRIBUTARY TO DETROIT RIVER

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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 September 1986 (discontinued).

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1974 to September 1981.

WATER TEMPERATURE: October 1973 to September 1981.

REMARKS.--Quarterly 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 at sample 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 1985 TO SEPTEMBER 1986

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 SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)
DEC 11...	1100	224000	217	8.10	4.0	1.7	--	--	K5	K6	100
MAR 25...	1100	223000	211	8.00	2.0	7.0	13.4	98	<1	--	100
JUN 25...	0930	227000	214	8.30	18.5	--	9.7	104	<1	K7	--
SEP 17...	0930	232000	206	8.30	16.5	9.2	9.5	97	--	--	97

DATE	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)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
DEC 11...	15	28	7.4	3.7	7	.2	1.1	--	1.3	14
MAR 25...	18	29	7.7	4.7	9	.2	1.1	88	1.7	15
JUN 25...	--	--	--	--	--	--	--	--	.8	--
SEP 17...	17	27	7.2	3.9	8	.2	1.2	84	.8	15

STREAMS TRIBUTARY TO DETROIT RIVER

04165700 DETROIT RIVER AT DETROIT, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)
DEC 11...	1100	7.4	<.10	1.6	113	110	.15
MAR 25...	1100	8.0	.10	1.7	122	120	.17
JUN 25...	0930	--	--	--	--	--	--
SEP 17...	0930	6.9	.10	1.3	130	110	.18

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 11...	68300	.36	.020	.20	.010	<.010	<.010
MAR 25...	73500	.50	.040	.40	.020	<.010	<.010
JUN 25...	--	.33	.010	.40	.010	<.010	<.010
SEP 17...	81400	.30	.020	.20	.020	.010	.010

DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIIUM, 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	16	<.5	<1	<1	<3	<1	<3	<5
MAR 25...	<10	<1	17	<.5	<1	<1	<3	2	11	<5
SEP 17...	10	<1	16	<.5	<1	<1	<3	1	3	<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)
DEC 11...	<4	<1	<.1	<10	1	<1	<1	99	<6	11
MAR 25...	5	2	<.1	<10	<1	<1	<1	110	<6	38
SEP 17...	5	<1	<.1	<10	1	<1	<1	97	<6	4

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: Dec. 18 to Jan. 6, Jan. 9-14, Jan. 25 to Feb. 2, Feb. 8-15, Feb. 25 to Mar. 4, and June 23 to July 7. Records good except for estimated daily discharges, which are fair. 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; 16 years (water years 1971-86), 23.1 ft³/s, 9.42 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)
Oct. 19	1000	303	3.93	June 19	1700	196	3.31
Nov. 10	0800	252	3.64	July 9	0500	321	4.12
Feb. 5	0100	213	3.41	Sept. 23	1000	269	3.74
Mar. 10	2400	458	4.69	Sept. 27	0300	*531	*5.01
Mar. 19	0900	223	3.47	Sept. 29	1000	183	3.23
June 11	2000	381	4.34				

Minimum discharge, 5.0 ft³/s, Sept. 10, gage height, 1.65 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.6	16	47	16	19	20	29	25	13	15	8.2	7.6
2	7.0	16	66	16	20	21	35	22	12	15	11	7.2
3	6.5	35	38	16	22	22	27	21	11	14	17	8.5
4	6.8	54	31	16	57	24	26	20	11	14	9.8	9.5
5	8.7	36	30	16	123	32	31	17	41	13	8.2	8.9
6	7.3	28	30	16	47	39	35	34	25	13	11	7.5
7	6.4	27	29	16	36	29	27	32	18	12	39	7.5
8	6.4	24	28	16	32	25	23	20	57	49	19	6.8
9	8.0	28	27	16	29	29	21	16	29	217	19	7.1
10	8.6	183	30	16	26	163	20	14	23	52	13	5.7
11	10	72	36	16	24	251	20	14	157	34	11	22
12	28	46	43	16	23	92	20	12	225	32	10	38
13	25	48	33	16	22	114	20	11	75	28	9.8	15
14	13	60	26	16	21	101	20	11	46	22	9.2	9.1
15	18	42	23	16	21	90	33	12	38	21	9.5	9.1
16	14	60	22	17	22	68	40	13	32	30	8.9	9.1
17	11	50	21	25	22	55	40	14	27	21	8.5	7.0
18	17	41	20	51	25	50	28	62	24	17	8.0	6.8
19	202	54	20	104	43	168	25	75	95	17	7.5	6.7
20	61	60	19	63	51	72	28	39	73	17	7.4	6.3
21	32	38	19	44	52	48	64	32	38	22	7.7	5.6
22	29	35	18	38	35	43	50	29	30	17	6.4	55
23	22	36	18	32	30	41	37	28	28	16	8.8	177
24	39	33	18	28	26	38	34	26	25	15	10	48
25	32	28	17	26	24	36	29	23	22	15	8.7	47
26	23	71	16	24	23	37	27	19	20	17	16	81
27	20	60	16	22	22	40	26	19	19	14	27	347
28	17	44	16	21	21	33	24	22	18	12	12	80
29	17	40	16	20	---	31	22	20	17	10	8.6	132
30	17	38	16	19	---	27	25	18	16	10	8.1	91
31	16	---	16	18	---	25	---	15	---	8.8	7.9	---
TOTAL	736.3	1403	805	792	917	1864	886	735	1265	809.8	366.2	1269.0
MEAN	23.8	46.8	26.0	25.5	32.8	60.1	29.5	23.7	42.2	26.1	11.8	42.3
MAX	202	183	66	104	123	251	64	75	225	217	39	347
MIN	6.4	16	16	16	19	20	20	11	11	8.8	6.4	5.6
CFSM	.72	1.41	.78	.77	.99	1.81	.89	.71	1.27	.78	.35	1.27
IN.	.82	1.57	.90	.88	1.02	2.08	.99	.82	1.41	.90	.41	1.42

CAL YR 1985	TOTAL	11091.1	MEAN	30.4	MAX	401	MIN	4.8	CFSM	.91	IN	12.39
WTR YR 1986	TOTAL	11848.3	MEAN	32.5	MAX	347	MIN	5.6	CFSM	.98	IN	13.24

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, 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. 17 to Jan. 18, Jan. 25 to Feb. 3, Feb. 8 to Mar. 9, and Aug. 3-11. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 62.5 ft³/s, 9.66 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 700 ft³/s (revised) and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Oct. 19	1700	1,060	10.59	June 12	0500	1,090	10.69
Nov. 10	1700	938	10.15	July 9	0900	1,170	10.94
Feb. 5	1100	838	9.77	Sept. 23	1200	*1,180	*10.99
Mar. 11	0900	1,150	10.88	Sept. 27	0900	1,160	10.93

Minimum discharge, 15 ft³/s, Aug. 22, 23, Sept. 9, 11; minimum gage height, 2.74 ft, Aug. 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	39	120	43	50	55	81	68	33	36	19	18
2	21	46	213	43	55	56	96	54	34	50	19	17
3	20	77	108	43	68	60	75	49	29	35	45	17
4	20	161	88	42	145	70	76	48	28	31	28	26
5	29	99	81	42	678	80	89	46	121	31	21	26
6	26	73	84	42	189	105	105	64	75	30	50	19
7	23	69	81	41	115	80	77	89	49	28	150	17
8	21	61	76	41	100	70	70	53	80	54	70	16
9	26	56	72	41	88	85	64	44	64	862	40	16
10	27	598	84	41	80	291	62	40	47	189	30	16
11	35	295	103	41	72	934	60	37	223	91	27	67
12	68	124	142	41	67	289	56	35	776	87	23	103
13	80	110	99	41	63	330	54	33	178	71	21	43
14	37	133	70	42	60	292	54	33	105	55	21	27
15	45	117	66	43	58	247	89	33	86	47	21	23
16	39	147	57	46	58	176	121	34	75	77	24	24
17	31	152	53	55	60	141	105	35	62	56	20	21
18	34	114	52	160	70	126	76	101	53	42	18	21
19	615	161	50	465	90	482	67	190	202	36	17	21
20	292	195	50	261	160	221	74	95	211	35	16	20
21	97	107	49	132	160	128	156	84	85	59	16	20
22	73	97	48	104	100	113	110	72	68	39	16	309
23	60	106	47	89	80	107	86	65	67	32	20	833
24	79	94	46	81	70	98	76	60	61	30	26	188
25	87	76	45	74	64	94	70	53	52	30	19	223
26	59	289	45	66	60	94	65	48	45	32	42	183
27	52	188	45	60	57	94	61	53	44	29	102	1000
28	45	126	44	56	55	84	58	55	43	25	33	316
29	42	115	44	53	---	79	57	47	39	23	23	472
30	42	106	44	51	---	75	68	43	37	23	20	311
31	40	---	44	49	---	70	---	37	---	21	19	---
TOTAL	2190	4131	2250	2429	2972	5226	2358	1798	3072	2286	1016	4413
MEAN	70.6	138	72.6	78.4	106	169	78.6	58.0	102	73.7	32.8	147
MAX	615	598	213	465	678	934	156	190	776	862	150	1000
MIN	20	39	44	41	50	55	54	33	28	21	16	16
CFSM	.80	1.57	.83	.89	1.21	1.92	.89	.66	1.16	.84	.37	1.67
IN.	.93	1.75	.95	1.03	1.26	2.21	1.00	.76	1.30	.97	.43	1.87
CAL YR 1985	TOTAL	35718	MEAN	97.9	MAX	1670	MIN	16	CFSM	1.11	IN	15.12
WTR YR 1986	TOTAL	34141	MEAN	93.5	MAX	1000	MIN	16	CFSM	1.06	IN	14.45

STREAMS TRIBUTARY TO DETROIT RIVER

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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 70 ft (revised) 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: Dec. 22-24, Dec. 27 to Jan. 15, Jan. 25-27, 29, Feb. 1-3, 9-12, 14, 15, 24-27, and June 12-16. Records good except for periods with ice effect, Dec. 22-24, Dec. 27 to Jan. 15, Jan. 25-27, 29, Feb. 1-3, 9-12, 14, 15, 24-27, which are fair and period of estimated daily record, June 12-16, which is poor. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 8.48 ft³/s, 12.13 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 June 13-15, 1986, caused by unnatural regulation of unknown source.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 330 ft³/s (revised) and maximum (*):

Date	Time	Discharge (ft ³ /s)	Gage height (ft)	Date	Time	Discharge (ft ³ /s)	Gage height (ft)
Oct. 19	0800	511	10.20	Sept. 22	0930	494	10.09
June 11	1800	460	9.89	Sept. 23	0730	348	9.09
July 8	2330	*580	*10.64	Sept. 26	2400	356	9.15

No flow June 13-15, caused by unnatural regulation of unknown source.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.0	4.0	29	3.1	3.8	5.1	17	4.2	3.7	2.6	1.8	1.5
2	1.7	6.9	16	3.0	4.0	5.9	8.0	3.4	2.3	10	2.5	1.3
3	1.7	39	9.4	3.0	4.3	8.6	5.4	3.1	1.6	2.4	2.2	1.4
4	2.5	22	8.2	2.9	76	9.9	7.0	3.1	2.1	2.1	1.7	5.9
5	5.2	13	8.4	2.8	47	14	11	2.9	57	1.9	1.7	1.9
6	1.6	6.2	11	2.8	12	21	8.6	13	4.7	1.8	8.7	1.2
7	1.3	10	8.8	2.7	8.0	9.4	5.0	5.3	3.1	2.1	44	1.1
8	1.2	5.5	7.7	2.7	6.7	6.3	4.5	3.1	4.4	78	3.0	1.1
9	3.5	11	7.4	2.7	5.8	16	4.5	3.1	2.1	119	2.6	1.2
10	3.6	133	12	2.7	5.0	107	4.3	2.5	4.3	6.7	2.3	1.1
11	4.1	18	19	2.7	4.5	47	4.2	2.6	99	4.4	2.1	23
12	34	9.7	22	2.7	4.2	16	3.6	2.4	16	4.9	1.8	5.0
13	5.7	10	10	2.7	3.9	43	3.5	2.6	.00	3.8	1.8	1.5
14	2.3	14	7.2	2.7	3.9	23	3.5	2.9	.00	3.4	2.0	1.3
15	9.0	6.7	6.1	2.8	3.8	18	14	2.5	.00	2.9	1.8	1.3
16	2.5	33	5.7	3.1	3.8	12	23	2.5	1.2	15	2.0	1.7
17	1.8	10	4.8	18	4.9	10	7.6	2.1	3.2	3.1	1.8	1.4
18	7.5	20	4.5	29	13	12	5.0	15	2.9	3.0	1.7	2.5
19	147	24	4.3	59	50	79	4.5	5.1	73	2.6	1.7	1.8
20	12	17	4.1	15	31	13	12	5.4	7.1	5.2	1.7	1.8
21	7.6	8.0	4.0	9.5	28	9.4	21	4.1	3.6	10	1.9	1.8
22	6.8	14	3.9	8.2	13	8.5	8.2	3.0	4.8	2.5	1.9	114
23	5.3	11	3.8	6.4	9.2	8.3	5.2	2.5	4.0	2.3	4.1	113
24	16	8.0	3.7	5.4	7.5	7.3	4.7	2.4	4.5	2.2	1.7	7.1
25	7.0	6.4	3.6	5.0	6.6	7.4	4.5	2.5	2.9	4.0	1.3	43
26	5.6	69	3.5	4.7	6.0	8.8	4.1	2.5	3.2	2.7	23	86
27	5.0	16	3.4	4.3	5.6	7.0	3.8	7.5	3.2	2.0	11	60
28	4.8	18	3.3	4.0	5.2	6.2	3.7	3.0	3.7	2.0	1.6	9.9
29	4.7	13	3.3	3.9	---	6.1	4.0	2.4	2.7	1.9	1.3	64
30	4.5	12	3.2	3.8	---	5.7	8.7	2.0	2.7	1.9	1.3	42
31	4.1	---	3.1	3.7	---	5.1	---	2.0	---	1.7	1.4	---
TOTAL	322.6	588.4	244.4	225.0	376.7	556.0	224.1	120.7	323.00	308.1	139.4	599.8
MEAN	10.4	19.6	7.88	7.26	13.5	17.9	7.47	3.89	10.8	9.94	4.50	20.0
MAX	147	133	29	59	76	107	23	15	99	119	44	114
MIN	1.2	4.0	3.1	2.7	3.8	5.1	3.5	2.0	.00	1.7	1.3	1.1
CFSM	1.10	2.07	.83	.77	1.42	1.89	.79	.41	1.14	1.05	.47	2.11
IN.	1.26	2.31	.96	.88	1.48	2.18	.88	.47	1.27	1.21	.55	2.35

CAL YR 1985	TOTAL	4598.30	MEAN	12.6	MAX	324	MIN	1.0	CFSM	1.33	IN	18.02
WTR YR 1986	TOTAL	4028.20	MEAN	11.0	MAX	147	MIN	.00	CFSM	1.16	IN	15.79

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: Dec. 18 to Jan. 18, Jan. 24, Jan. 27 to Feb. 4, Feb. 8, 9, 11-26, Feb. 28 to Mar. 2, and Mar. 4-8. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 12.1 ft³/s, 9.39 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)
Oct. 19	0900	183	4.45	Mar. 10	2300	258	4.84
Nov. 10	0700	145	4.22	Mar. 19	0600	132	4.13
Jan. 19	1100	172	4.38	July 9	0200	*281	4.95
Feb. 4	2100	ice jam	*5.10	Sept. 23	0800	161	4.29
Feb. 5	0100	140	4.18	Sept. 27	0200	145	4.20

Minimum discharge, 2.1 ft³/s, Aug. 19, 20, 21, 22, gage height, 2.83 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	5.4	31	8.5	10	11	15	12	5.7	5.8	3.2	3.0
2	2.6	7.0	50	8.4	11	11	18	9.7	5.1	7.4	3.3	2.9
3	2.5	19	28	8.3	13	11	15	8.9	4.9	5.9	3.8	2.6
4	2.7	28	21	8.3	39	12	15	8.5	4.6	4.8	3.4	3.9
5	3.3	16	18	8.3	88	14	18	8.3	24	4.5	3.0	4.2
6	2.8	12	17	8.2	37	20	21	11	19	4.1	3.5	3.5
7	2.6	11	16	8.1	26	16	16	13	11	3.7	11	2.9
8	2.8	9.3	15	8.1	20	14	14	11	13	25	6.3	2.8
9	3.5	10	15	8.1	15	19	12	8.8	8.7	182	4.3	2.7
10	3.9	107	18	8.1	13	113	12	8.3	7.0	58	3.8	2.6
11	5.0	48	24	8.1	12	156	11	7.8	46	27	4.0	11
12	18	26	29	8.1	12	70	10	7.4	56	21	3.5	12
13	12	25	20	8.2	12	81	9.7	6.9	29	14	3.0	6.6
14	6.9	36	16	8.6	11	74	9.3	6.8	17	10	2.9	4.7
15	7.0	28	13	9.2	11	63	16	6.8	13	8.4	3.1	3.9
16	5.2	33	12	10	11	44	24	6.7	11	16	4.0	3.7
17	4.3	27	10	13	12	33	23	6.8	9.6	11	3.5	3.2
18	5.0	24	9.8	34	15	29	16	33	7.8	7.3	2.9	3.3
19	112	35	9.8	109	23	106	13	50	35	6.5	2.5	3.5
20	39	40	9.8	45	32	53	14	26	35	5.8	2.3	3.3
21	16	22	9.7	26	26	31	30	24	16	7.0	2.3	3.1
22	10	20	9.6	21	20	26	23	20	11	4.9	2.3	54
23	8.3	21	9.4	18	16	23	17	15	8.9	4.3	3.2	112
24	20	18	9.2	15	13	21	14	12	8.3	4.0	3.6	30
25	15	14	9.0	14	12	19	13	10	7.5	4.1	2.8	47
26	9.7	56	9.0	12	11	20	12	9.1	6.8	4.0	9.2	37
27	7.8	44	8.9	11	11	19	11	10	6.4	3.6	16	107
28	7.0	30	8.8	11	11	16	10	11	5.9	3.4	6.8	42
29	6.5	26	8.8	10	---	15	9.7	9.3	5.6	3.4	4.6	76
30	6.1	23	8.8	9.8	---	15	12	7.6	5.6	3.2	3.4	53
31	5.9	---	8.7	9.6	---	13	---	6.4	---	3.1	3.3	---
TOTAL	356.3	820.7	482.3	493.0	543	1168	453.7	392.1	444.4	473.2	134.8	647.4
MEAN	11.5	27.4	15.6	15.9	19.4	37.7	15.1	12.6	14.8	15.3	4.35	21.6
MAX	112	107	50	109	88	156	30	50	56	182	16	112
MIN	2.5	5.4	8.7	8.1	10	11	9.3	6.4	4.6	3.1	2.3	2.6
CFSM	.66	1.57	.89	.91	1.11	2.15	.86	.72	.85	.87	.25	1.23
IN.	.76	1.74	1.03	1.05	1.15	2.48	.96	.83	.94	1.01	.29	1.38
CAL YR 1985	TOTAL	6014.9	MEAN	16.5	MAX	240	MIN	2.4	CFSM	.94	IN	12.79
WTR YR 1986	TOTAL	6408.9	MEAN	17.6	MAX	182	MIN	2.3	CFSM	1.01	IN	13.62

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: Dec. 15 to Jan. 17, Jan. 25 to Feb. 3, Feb. 8-15, and Feb. 26 to Mar. 3. 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.--56 years, 117 ft³/s, 8.50 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)
Oct. 19	2400	1,530	12.76	June 12	1100	1,250	11.88
Nov. 10	2300	1,570	12.86	July 9	2400	1,440	12.54
Feb. 5	1300	1,330	12.15	Sept. 23	1900	1,540	12.80
Mar. 11	1700	*1,700	*13.24	Sept. 28	0300	1,310	12.07
Mar. 19	1600	1,200	11.66				

Minimum discharge, 23 ft³/s, Sept. 10, 11, gage height, 4.10 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	65	226	79	90	94	126	131	56	56	32	30
2	39	78	423	78	100	100	204	93	58	168	33	29
3	36	208	220	78	120	115	131	81	47	70	48	28
4	34	391	168	77	305	134	129	76	47	52	42	54
5	55	212	155	76	1170	184	141	75	285	47	33	64
6	48	139	159	76	420	262	231	95	194	45	92	33
7	41	132	156	76	190	176	146	185	107	43	325	29
8	38	117	143	76	150	138	123	96	135	103	87	27
9	39	110	132	76	135	166	109	76	111	995	61	25
10	55	1160	151	76	120	455	107	67	79	749	49	25
11	75	924	213	76	115	1550	104	65	339	181	45	120
12	153	270	310	76	110	792	96	61	1120	158	39	230
13	244	212	210	77	105	560	93	61	410	136	34	75
14	88	267	134	77	100	553	90	57	180	95	34	46
15	96	254	120	78	98	455	176	59	136	83	34	36
16	86	314	110	82	98	336	241	58	117	196	48	35
17	59	357	100	120	99	266	253	58	96	113	87	32
18	59	226	95	342	128	227	152	108	81	83	32	31
19	1150	341	94	744	412	866	121	366	271	71	27	36
20	883	408	92	520	510	572	125	182	461	68	27	34
21	205	221	90	242	424	246	318	143	149	102	26	33
22	141	200	89	186	250	203	223	127	107	62	26	484
23	116	228	88	153	194	185	159	106	111	53	30	1290
24	123	190	87	123	152	171	129	94	95	48	46	708
25	179	152	86	115	124	155	117	84	78	54	32	544
26	113	558	85	110	110	155	106	76	64	55	151	353
27	95	481	84	105	98	164	99	97	62	48	385	916
28	83	269	82	100	92	143	96	112	62	43	69	854
29	76	244	81	95	---	131	91	78	60	37	43	662
30	72	214	80	92	---	124	126	69	58	36	35	562
31	68	---	80	90	---	113	---	62	---	34	32	---
TOTAL	4595	8942	4343	4371	6019	9791	4362	3098	5176	4084	2084	7425
MEAN	148	298	140	141	215	316	145	99.9	173	132	67.2	248
MAX	1150	1160	423	744	1170	1550	318	366	1120	995	385	1290
MIN	34	65	80	76	90	94	90	57	47	34	26	25
CFSM	.79	1.59	.75	.75	1.15	1.69	.78	.53	.93	.71	.36	1.33
IN.	.91	1.78	.86	.87	1.20	1.95	.87	.62	1.03	.81	.41	1.48

CAL YR 1985	TOTAL	71984	MEAN	197	MAX	3200	MIN	27	CFSM	1.05	IN	14.32
WTR YR 1986	TOTAL	64290	MEAN	176	MAX	1550	MIN	25	CFSM	.94	IN	12.79

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: Nov. 11 to Dec. 14, Dec. 18 to Jan. 15, Jan. 25-29, Feb. 1, 2, 11-13, Mar. 10-14, 19, 20, and June 5. Records good except for estimated daily discharges, which are fair. 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.--36 years, 71.2 ft³/s, 9.68 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)
Oct. 19	0600	715	8.25	Mar. 19	unknown	710	unknown
Mar. 11	unknown	*1,150	unknown				

Minimum discharge, 18 ft³/s, Aug. 26, gage height, 1.73 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	41	150	48	53	61	102	93	33	31	23	22
2	29	49	190	48	57	61	116	70	31	133	22	22
3	27	146	150	48	62	77	90	57	30	53	23	22
4	28	167	110	47	210	93	92	52	29	33	25	31
5	45	111	95	47	512	139	104	50	205	30	22	31
6	32	76	95	47	318	197	154	65	99	27	41	25
7	28	72	95	46	178	139	108	77	85	28	143	22
8	27	61	90	46	123	95	92	54	119	79	58	21
9	30	69	85	46	103	99	79	46	47	204	32	21
10	38	569	90	45	92	250	73	43	41	146	27	20
11	48	450	120	45	85	800	70	41	202	84	27	101
12	108	190	160	45	75	450	65	40	269	123	24	124
13	105	130	130	45	68	330	61	40	138	74	22	42
14	58	150	100	45	59	300	59	41	82	44	22	28
15	67	140	85	45	56	291	127	41	65	36	23	25
16	48	170	74	45	54	263	181	38	54	174	27	28
17	37	160	67	87	58	201	170	39	45	63	29	24
18	43	130	65	177	77	175	127	75	39	41	22	24
19	577	170	62	343	239	450	97	132	152	34	21	24
20	409	220	59	294	368	330	97	108	135	30	20	24
21	185	150	56	186	338	233	190	76	71	30	20	24
22	111	120	55	133	223	164	139	65	52	28	20	268
23	81	120	55	108	165	143	109	58	60	25	22	537
24	81	110	54	86	122	128	91	52	44	24	23	238
25	89	90	53	80	97	118	79	46	35	30	20	436
26	79	300	52	75	86	118	72	41	32	32	104	277
27	63	220	51	70	78	116	66	78	33	25	168	265
28	54	160	50	65	67	104	62	70	32	24	49	220
29	49	140	50	58	---	96	68	49	31	23	30	329
30	45	120	49	54	---	91	105	40	32	22	24	269
31	43	---	49	49	---	84	---	37	---	23	22	---
TOTAL	2696	4801	2646	2603	4023	6196	3045	1814	2322	1753	1155	3544
MEAN	87.0	160	85.4	84.0	144	200	102	58.5	77.4	56.5	37.3	118
MAX	577	569	190	343	512	800	190	132	269	204	168	537
MIN	27	41	49	45	53	61	59	37	29	22	20	20
CFSM	.87	1.60	.86	.84	1.44	2.00	1.02	.59	.78	.57	.37	1.18
IN.	1.00	1.79	.99	.97	1.50	2.31	1.13	.68	.86	.65	.43	1.32
CAL YR 1985	TOTAL	42520	MEAN	116	MAX	1550	MIN	18	CFSM	1.16	IN	15.83
WTR YR 1986	TOTAL	36598	MEAN	100	MAX	800	MIN	20	CFSM	1.00	IN	13.63

STREAMS TRIBUTARY TO DETROIT RIVER

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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. 14 to Jan. 18, Jan. 22 to Feb. 3, Feb. 7-15, and Feb. 26 to Mar. 1. Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--39 years, 53.4 ft³/s, 8.72 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)
Mar. 11	1700	*1,160	*10.14	Mar. 20	0100	917	9.17

Minimum discharge, 0.82 ft³/s, Sept. 2; minimum gage height, 2.57 ft, Aug. 24, 25, Sept. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.9	15	133	22	27	39	52	47	6.9	5.5	2.8	1.3
2	6.9	22	244	22	32	37	57	34	6.7	29	2.9	.93
3	6.3	66	109	22	40	49	42	26	4.8	12	9.9	1.0
4	6.6	100	70	22	185	90	42	23	3.9	6.3	9.1	2.8
5	9.4	70	61	22	582	217	59	21	176	4.1	4.2	2.7
6	14	45	60	21	225	253	100	30	105	3.2	16	1.3
7	8.6	40	56	21	88	137	73	25	104	3.0	62	1.0
8	12	33	52	21	60	81	53	20	250	43	14	.99
9	6.0	41	52	21	37	87	43	17	74	80	8.6	1.1
10	6.6	571	70	21	33	370	35	18	38	35	7.6	1.5
11	13	693	123	21	31	988	32	13	65	19	5.4	75
12	37	237	176	21	29	349	26	12	94	53	2.9	91
13	33	157	120	22	28	402	25	11	45	44	2.7	26
14	17	169	54	22	26	390	25	11	31	21	2.2	10
15	21	162	37	23	25	308	65	11	21	13	7.6	4.8
16	13	235	32	25	25	196	114	11	17	74	9.6	4.2
17	9.9	311	28	43	30	140	144	13	14	30	6.7	2.9
18	23	153	25	136	42	122	83	38	10	14	2.0	3.0
19	554	220	24	433	224	719	54	38	77	10	1.4	2.5
20	377	287	24	324	558	434	53	25	46	10	1.4	2.2
21	121	149	23	150	392	141	138	23	18	9.1	1.3	1.9
22	70	124	23	80	209	98	106	21	12	7.5	1.4	144
23	48	155	23	55	149	85	66	17	9.1	6.3	2.8	203
24	42	111	23	43	95	74	49	20	9.9	14	2.0	66
25	37	76	23	36	73	64	42	13	7.3	6.3	1.2	305
26	30	241	23	32	60	62	45	14	5.2	7.2	36	245
27	24	353	22	29	48	60	31	25	8.4	5.8	31	197
28	20	171	22	27	42	52	28	24	4.6	4.8	7.8	141
29	18	144	22	26	---	48	30	15	4.2	4.1	3.0	131
30	17	135	22	25	---	43	49	11	5.3	4.0	11	141
31	15	---	22	25	---	38	---	8.7	---	3.5	4.4	---
TOTAL	1625.2	5286	1798	1813	3395	6173	1761	635.7	1273.3	581.7	280.9	1811.12
MEAN	52.4	176	58.0	58.5	121	199	58.7	20.5	42.4	18.8	9.06	60.4
MAX	554	693	244	433	582	988	144	47	250	80	62	305
MIN	6.0	15	22	21	25	37	25	8.7	3.9	3.0	1.2	.93
CFSM	.63	2.12	.70	.70	1.45	2.39	.71	.25	.51	.23	.11	.73
IN.	.73	2.36	.80	.81	1.52	2.76	.79	.28	.57	.26	.13	.81
CAL YR 1985	TOTAL	31552.90	MEAN	86.4	MAX	1900	MIN	3.6	CFSM	1.04	IN	14.11
WTR YR 1986	TOTAL	26433.92	MEAN	72.4	MAX	988	MIN	.93	CFSM	.87	IN	11.82

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.--No estimated daily discharges. 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.--38 years, 98.2 ft³/s, 10.10 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, 307 ft³/s, Mar. 20, gage height, 6.84 ft; minimum, 36 ft³/s, Aug. 26, gage height, 4.35 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	61	126	196	128	111	123	175	103	61	126	46	45
2	61	121	198	127	120	122	180	101	55	117	47	42
3	60	122	202	128	118	121	171	96	53	110	56	43
4	59	134	193	128	130	122	158	95	51	104	56	45
5	61	137	185	127	180	129	151	92	91	96	45	45
6	61	129	184	121	182	140	148	89	108	90	44	43
7	61	120	185	117	163	137	144	88	106	85	57	40
8	59	117	186	115	166	134	135	85	94	93	55	40
9	58	116	185	115	157	133	131	79	84	180	52	39
10	54	179	188	113	147	175	128	75	75	211	51	39
11	53	214	192	112	142	251	125	71	107	201	54	48
12	61	212	195	112	136	276	125	68	188	169	49	72
13	79	202	192	108	130	276	120	66	222	137	49	69
14	81	198	181	108	126	280	118	65	226	115	44	63
15	80	192	173	102	123	288	129	64	219	102	49	60
16	80	190	168	103	123	281	141	63	211	101	51	57
17	78	189	161	106	126	263	154	64	200	101	44	58
18	87	187	156	118	127	248	150	70	180	92	43	63
19	179	196	159	139	135	280	141	86	178	82	43	67
20	222	197	151	146	148	305	137	92	185	77	41	68
21	216	195	148	141	155	285	153	93	197	73	42	70
22	184	190	145	135	150	260	159	94	199	65	42	107
23	162	189	147	133	145	243	147	90	203	60	43	159
24	158	182	147	128	141	242	138	86	187	57	41	173
25	168	178	137	124	136	233	130	95	168	58	37	176
26	159	191	135	122	135	229	126	101	156	60	44	180
27	147	208	140	114	131	228	122	99	147	60	62	209
28	149	212	137	115	127	221	117	102	141	59	60	220
29	146	203	134	112	---	209	106	97	137	53	53	244
30	138	196	131	109	---	192	104	89	133	50	49	257
31	132	---	130	106	---	183	---	76	---	48	47	---
TOTAL	3354	5222	5161	3712	3910	6609	4163	2634	4362	3032	1496	2841
MEAN	108	174	166	120	140	213	139	85.0	145	97.8	48.3	94.7
MAX	222	214	202	146	182	305	180	103	226	211	62	257
MIN	53	116	130	102	111	121	104	63	51	48	37	39
CFSM	.82	1.32	1.26	.91	1.06	1.61	1.05	.64	1.10	.74	.37	.72
IN.	.95	1.47	1.45	1.05	1.10	1.86	1.17	.74	1.23	.85	.42	.80
CAL YR 1985	TOTAL	46028	MEAN	126	MAX	367	MIN	33	CFSM	.96	IN	12.97
WTR YR 1986	TOTAL	46496	MEAN	127	MAX	305	MIN	37	CFSM	.96	IN	13.10

STREAMS TRIBUTARY TO LAKE ERIE

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04170000 HURON RIVER AT MILFORD, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1970-75, 1984 to September 1986 (discontinued).

COOPERATION.--Biochemical-oxygen-demand samples were collected by U.S. Geological Survey and were analyzed by Canton Analytical Laboratory.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
OCT											
10...	1230	55	660	8.10	13.5	2.0	9.0	89	4.0	K170	K8
NOV											
12...	1230	211	574	7.90	6.5	7.0	9.6	80	<1.0	E3600	E210
DEC											
05...	1230	185	588	8.20	2.0	1.4	13.0	97	6.1	K7800	K840
JAN											
09...	1200	114	662	8.00	.5	1.2	15.2	109	2.9	K7500	K600
FEB											
11...	1230	139	648	8.00	1.0	1.3	14.6	106	2.2	K8600	--
MAR											
12...	1230	277	604	7.90	1.5	5.0	13.3	98	2.5	>800	K780
APR											
14...	1250	119	592	8.30	12.0	1.6	11.8	113	1.2	K5200	K1500
MAY											
13...	1200	67	622	8.40	22.0	4.0	9.5	112	2.5	>320	>240
JUN											
30...	1230	134	555	8.00	22.5	1.5	7.9	94	2.0	K4600	32
JUL											
29...	1100	53	614	8.10	25.0	1.9	6.3	79	1.9	670	K32
AUG											
28...	1330	60	638	8.10	20.0	.60	8.3	93	6.4	1200	K19
SEP											
25...	1300	179	546	8.10	20.0	3.2	8.4	96	1.3	2300	74

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)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
OCT										
10...	240	22	62	21	41	2.6	--	3.4	29	71
NOV										
12...	230	42	61	18	28	2.3	182	4.4	27	49
DEC										
05...	240	43	65	19	31	1.9	216	2.6	33	58
JAN										
09...	260	48	69	21	35	2.1	204	3.9	26	62
FEB										
11...	250	44	69	20	36	2.1	200	3.9	25	64
MAR										
12...	210	36	58	16	37	1.9	--	4.3	21	66
APR										
14...	240	39	66	18	32	1.9	--	1.9	27	61
MAY										
13...	240	50	64	19	32	1.4	--	1.4	32	52
JUN										
30...	230	33	59	19	33	1.7	186	3.6	23	57
JUL										
29...	240	40	61	21	38	2.1	194	3.0	24	63
AUG										
28...	240	42	61	21	44	2.3	200	3.1	29	77
SEP										
25...	220	44	59	18	32	2.3	176	2.7	31	58

STREAMS TRIBUTARY TO LAKE ERIE

04170000 HURON RIVER AT MILFORD, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 10...	1230	.20	8.9	426	370	.37	.030	.40	.150	.95
NOV 12...	1230	.20	7.9	323	300	.18	.020	.20	.130	.57
DEC 05...	1230	.20	7.8	332	330	.19	.010	.20	.180	.52
JAN 09...	1200	.20	8.1	355	350	.28	.020	.30	.270	.33
FEB 11...	1230	.20	7.9	365	350	.29	.010	.30	.310	.59
MAR 12...	1230	.20	7.0	331	310	.38	.020	.40	.230	.47
APR 14...	1250	.30	5.4	344	330	.19	.010	.20	.270	.53
MAY 13...	1200	.20	.6	327	310	--	<.010	<.10	.030	.77
JUN 30...	1230	.20	6.2	340	310	--	.010	<.10	.190	.81
JUL 29...	1100	.20	9.3	353	340	.06	.040	.10	.220	.78
AUG 28...	1330	.30	9.0	356	360	.17	.030	.20	.260	.54
SEP 25...	1300	.20	8.1	360	320	.08	.020	.10	.130	.87

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- PENDE (MG/L)
OCT 10...	1.1	1.5	.050	.020	3	--	--	--	--	24
NOV 12...	.70	.90	.060	.030	<1	--	--	--	--	2
DEC 05...	.70	.90	.030	.010	2	--	--	--	--	25
JAN 09...	.60	.90	.060	.050	2	--	--	--	--	2
FEB 11...	.90	1.2	.030	.030	3	--	--	--	--	2
MAR 12...	.70	1.1	.050	.040	2	--	--	--	--	10
APR 14...	.80	1.0	.060	.020	2	.03	<.01	<.01	.01	2
MAY 13...	.80	--	.040	.020	2	.53	<.01	<.01	<.01	5
JUN 30...	1.0	--	.070	.030	3	.25	<.01	<.01	<.01	4
JUL 29...	1.0	1.1	.120	.060	4	.13	<.01	<.01	<.01	7
AUG 28...	.80	1.0	.050	.020	4	--	--	--	--	6
SEP 25...	1.0	1.1	.060	.050	3	--	--	--	--	--

STREAMS TRIBUTARY TO LAKE ERIE

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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.--Estimated daily discharges: Feb. 21 to Mar. 2. Water-discharge records good. Occasional regulation by Kent Lake.

AVERAGE DISCHARGE.--38 years, 112 ft³/s, 10.28 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, 354 ft³/s, Dec. 1, gage height, 2.95 ft; maximum gage height, 3.01 ft, Nov. 13; minimum daily discharge, 39 ft³/s, Sept 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	62	124	288	150	136	155	197	110	95	139	45	57
2	65	123	296	149	139	152	197	108	81	134	41	52
3	67	128	265	148	140	152	176	103	69	123	47	47
4	68	178	240	148	149	151	165	98	64	110	52	50
5	70	185	224	149	178	153	163	98	107	105	51	52
6	71	207	217	147	190	168	161	103	121	101	54	48
7	71	193	208	141	190	167	130	105	121	95	76	43
8	69	219	206	138	186	164	127	102	120	109	72	42
9	74	206	204	137	182	163	105	96	110	218	69	41
10	75	211	205	135	176	176	103	91	100	222	65	39
11	74	204	209	135	169	232	80	88	109	215	66	47
12	78	200	211	135	163	264	84	86	156	207	60	72
13	85	257	209	133	157	287	104	84	193	191	57	74
14	89	256	202	133	154	295	78	82	220	164	53	72
15	90	237	196	130	151	301	83	83	226	140	57	67
16	88	225	191	128	150	301	93	80	193	138	62	63
17	85	221	184	128	154	293	110	81	186	122	62	60
18	89	267	181	133	152	282	85	92	185	115	55	63
19	157	284	178	147	157	298	88	103	194	105	48	68
20	190	280	175	156	165	306	63	101	207	99	46	71
21	189	271	171	158	176	302	76	103	196	93	46	73
22	183	277	169	158	180	290	63	106	199	80	43	100
23	172	262	168	155	185	278	68	105	208	69	45	137
24	168	235	169	158	185	265	96	102	205	62	48	154
25	167	261	162	155	180	255	76	101	186	60	42	187
26	156	272	158	152	175	250	73	105	171	63	51	189
27	149	286	159	148	165	247	94	111	166	60	77	198
28	142	286	158	146	160	235	105	113	160	56	72	203
29	138	254	156	138	---	229	110	111	152	52	66	233
30	136	237	154	135	---	219	112	108	141	51	63	252
31	128	---	152	132	---	207	---	101	---	46	60	---
TOTAL	3445	6846	6065	4435	4644	7237	3265	3060	4641	3544	1751	2854
MEAN	111	228	196	143	166	233	109	98.7	155	114	56.5	95.1
MAX	190	286	296	158	190	306	197	113	226	222	77	252
MIN	62	123	152	128	136	151	63	80	64	46	41	39
CFSM	.75	1.54	1.32	.97	1.12	1.57	.74	.67	1.05	.77	.38	.64
IN.	.87	1.72	1.52	1.11	1.17	1.82	.82	.77	1.17	.89	.44	.72

CAL YR 1985 TOTAL 50362 MEAN 138 MAX 322 MIN 30 CFSM .93 IN 12.66
WTR YR 1986 TOTAL 51787 MEAN 142 MAX 306 MIN 39 CFSM .96 IN 13.02

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 September 1986 (discontinued).

COOPERATION.--Biochemical-oxygen-demand samples were collected by U.S. Geological Survey and were analyzed by Canton Analytical Laboratory.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
OCT 10...	0930	72	569	8.30	14.0	1.5	9.6	96	5.7	--	K1
NOV 12...	0900	200	596	8.20	7.0	1.0	12.2	103	<1.0	E240	E22
DEC 05...	0930	224	583	8.10	2.0	2.0	10.8	81	8.8	270	82
JAN 09...	0900	138	655	8.10	1.5	1.0	13.1	96	2.4	>800	K430
FEB 11...	0930	167	670	8.00	2.0	1.6	14.4	107	2.1	K1200	--
MAR 12...	0930	262	681	8.10	2.5	2.0	15.3	116	2.4	630	K6
APR 14...	0930	111	558	8.60	10.0	3.1	11.9	109	2.8	K19	<1
MAY 13...	0900	84	575	8.40	18.0	2.5	8.5	93	1.6	K13	K4
JUN 30...	0930	145	560	8.20	24.0	1.2	8.1	99	2.5	K8	K3
JUL 29...	0830	51	520	8.30	27.0	3.5	5.8	75	1.7	K11	<1
AUG 28...	1000	73	494	8.50	21.5	2.1	8.2	95	1.9	K320	K3
SEP 25...	0930	197	527	8.70	20.0	2.3	9.8	111	1.6	K6	K4

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)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LINITY, CARBON- ATE IT-FLD (MG/L - CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
OCT 10...	200	23	50	19	33	2.1	--	1.7	29	62
NOV 12...	230	40	60	20	30	2.2	179	2.2	28	52
DEC 05...	240	46	64	20	29	1.8	206	3.1	31	56
JAN 09...	260	40	68	21	31	2.1	204	3.1	24	58
FEB 11...	250	43	69	20	39	2.1	--	4.1	22	69
MAR 12...	260	--	69	21	37	1.9	194	3.0	44	64
APR 14...	220	32	61	17	27	1.7	--	.9	25	55
MAY 13...	240	60	63	20	36	1.9	--	1.4	29	61
JUN 30...	220	36	56	19	31	1.8	180	2.2	27	55
JUL 29...	200	32	50	19	30	2.0	170	1.6	23	52
AUG 28...	190	31	44	19	31	1.9	140	.8	24	57
SEP 25...	200	44	47	20	35	1.9	160	.6	26	61

STREAMS TRIBUTARY TO LAKE ERIE

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04170500 HURON RIVER NEAR NEW HUDSON, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 10...	0930	.20	2.6	357	310	--	<.010	<.10	.020	1.3
NOV 12...	0900	.20	4.9	319	310	--	.010	<.10	.170	.73
DEC 05...	0930	.20	6.9	327	330	.19	.010	.20	.170	.53
JAN 09...	0900	.20	8.1	348	340	.29	.010	.30	.290	.41
FEB 11...	0930	.20	6.9	373	360	.38	.020	.40	.250	.55
MAR 12...	0930	.20	7.0	371	--	.38	.020	.40	.180	.42
APR 14...	0930	.20	2.4	317	300	--	<.010	<.10	.020	.78
MAY 13...	0900	.20	4.3	355	320	--	.010	<.10	.200	.70
JUN 30...	0930	.20	4.6	315	300	--	<.010	<.10	.030	.87
JUL 29...	0830	.20	7.7	309	290	--	<.010	<.10	.050	.85
AUG 28...	1000	.30	7.8	293	280	--	<.010	<.10	.060	.74
SEP 25...	0930	.20	7.3	316	290	--	<.010	<.10	.020	.88

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 10...	1.3	--	.040	<.010	4	--	--	--	--	1
NOV 12...	.90	--	.040	.010	<1	--	--	--	--	2
DEC 05...	.70	.90	.030	.020	4	--	--	--	--	2
JAN 09...	.70	1.0	.020	.020	3	--	--	--	--	1
FEB 11...	.80	1.2	.020	.010	5	--	--	--	--	2
MAR 12...	.60	1.0	.050	.020	4	--	--	--	--	3
APR 14...	.80	--	.040	.010	2	.02	<.01	<.01	<.01	6
MAY 13...	.90	--	.070	.030	4	.66	<.01	<.01	.01	4
JUN 30...	.90	--	.050	<.010	2	.46	<.01	<.01	<.01	4
JUL 29...	.90	--	.070	.030	3	.27	<.01	<.01	<.01	5
AUG 28...	.80	--	.050	.010	3	--	--	--	--	5
SEP 25...	.90	--	.050	.020	3	--	--	--	--	--

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. 15 to Jan. 19, Jan. 27 to Feb. 3, Feb. 7-17, and Mar. 6-9. 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.--35 years, 213 ft³/s, 9.39 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, 730 ft³/s, Mar. 16, gage height, 6.34 ft; minimum, 85 ft³/s, Aug. 26; minimum gage height, 3.81 ft, Oct. 1, 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	107	250	459	270	250	280	412	257	207	227	105	112
2	108	244	459	270	250	272	399	251	193	220	102	107
3	111	244	477	265	250	264	386	240	175	206	101	102
4	114	247	468	265	260	258	374	229	161	189	104	102
5	120	264	447	260	304	259	356	221	191	174	104	104
6	124	288	424	260	344	260	348	219	250	162	104	101
7	125	299	401	255	350	270	337	226	266	151	114	97
8	125	311	383	250	350	270	309	221	262	173	125	92
9	128	315	367	250	350	280	285	212	248	251	125	89
10	132	377	356	250	340	298	256	200	232	308	123	88
11	134	402	355	245	320	383	241	187	221	329	121	91
12	137	412	359	240	310	481	212	178	237	320	117	116
13	151	418	360	240	300	598	206	170	276	301	112	137
14	158	431	354	240	290	673	212	164	310	274	109	141
15	165	450	330	240	280	714	211	161	334	251	111	140
16	166	446	315	235	280	729	229	162	348	242	113	133
17	163	435	315	235	290	721	247	160	345	220	116	127
18	162	418	310	235	301	695	258	170	326	200	113	126
19	230	428	305	280	289	696	242	204	320	180	107	129
20	299	463	300	288	297	694	242	223	332	160	101	134
21	342	472	300	296	319	691	234	228	337	150	97	137
22	369	473	295	306	336	676	240	231	334	140	92	164
23	373	463	290	310	347	649	225	232	328	130	91	222
24	368	454	290	305	345	608	223	228	321	125	90	273
25	354	431	290	299	332	575	238	221	305	120	88	315
26	339	432	285	292	321	550	222	215	290	125	91	343
27	321	456	280	280	310	525	215	217	276	125	118	371
28	300	472	280	270	295	505	224	225	264	118	129	383
29	282	489	275	260	---	486	242	225	250	113	127	402
30	269	480	275	260	---	461	248	223	240	110	122	437
31	259	---	270	250	---	432	---	216	---	107	116	---
TOTAL	6535	11764	10674	8201	8610	15253	8073	6516	8179	5901	3388	5315
MEAN	211	392	344	265	308	492	269	210	273	190	109	177
MAX	373	489	477	310	350	729	412	257	348	329	129	437
MIN	107	244	270	235	250	258	206	160	161	107	88	88
CFSM	.69	1.27	1.12	.86	1.00	1.60	.87	.68	.89	.62	.35	.58
IN.	.79	1.42	1.29	.99	1.04	1.84	.98	.79	.99	.71	.41	.64

CAL YR 1985 TOTAL 101752 MEAN 279 MAX 910 MIN 86 CFSM .91 IN 12.29
WTR YR 1986 TOTAL 98409 MEAN 270 MAX 729 MIN 88 CFSM .88 IN 11.89

STREAMS TRIBUTARY TO LAKE ERIE

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04174050 HURON RIVER AT DELHI MILLS, MI

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 East Delhi Road (revised), 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.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPECIFIC CONDUCTANCE LAB (US/CM)	PH LAB (STANDARD UNITS)	TEMPERATURE (DEG C)	CARBON, ORGANIC TOTAL (MG/L AS C)	PERTHANE TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)
NOV 12...	1530	631	8.20	8.0	9.8	<.1	<.10	<.1	<.010	<.1	<.010
JAN 09...	1430	696	8.00	.5	7.3	<.1	<.10	<.1	<.010	<.1	<.010
MAR 27...	1630	543	8.00	5.5	7.3	<.1	<.10	<.1	<.010	<.1	<.010
MAY 13...	1430	627	8.30	19.0	9.5	<.1	<.10	<.1	<.010	<.1	<.010
JUL 29...	1300	579	8.20	25.0	6.9	<.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)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE, TOTAL (UG/L)	LINDANE, TOTAL (UG/L)	MALATHION, TOTAL (UG/L)
NOV 12...	<.010	<.010	<.01	<.010	<.010	<.010	<.01	<.010	<.010	<.010	<.01
JAN 09...	<.010	<.010	<.01	<.010	<.010	<.010	<.01	<.010	<.010	<.010	<.01
MAR 27...	<.010	<.010	<.01	<.010	<.010	<.010	<.01	<.010	<.010	<.010	<.01
MAY 13...	<.010	<.010	<.01	<.010	<.010	<.010	<.01	<.010	<.010	<.010	<.01
JUL 29...	<.010	<.010	<.01	<.010	<.010	<.010	<.01	<.010	<.010	<.010	<.01

DATE	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	METHYL TRIETHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRIETHION (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 12...	<.01	<.01	<.01	<.01	<.01	<.1	<.01	.07	<.01	<.01	<.01
JAN 09...	<.01	<.01	<.01	<.01	<.01	<.1	<.01	.04	<.01	<.01	<.01
MAR 27...	<.01	<.01	<.01	<.01	<.01	<.1	<.01	.02	<.01	<.01	<.01
MAY 13...	<.01	<.01	<.01	<.01	<.01	<.1	<.01	.34	<.01	<.01	<.01
JUL 29...	<.01	<.01	<.01	<.01	<.01	<.1	<.01	.15	<.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. Several measurements of water temperature were made during the year.

AVERAGE DISCHARGE.--82 years, 459 ft³/s, 8.55 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, 2,660 ft³/s, Mar. 18, gage height, 15.10 ft; minimum daily, 129 ft³/s, Aug. 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	206	383	1020	433	512	661	1050	643	363	377	176	175
2	207	529	991	428	519	649	1020	616	412	450	168	167
3	194	528	922	419	469	632	897	599	271	406	173	168
4	196	515	871	419	570	624	948	523	318	374	180	173
5	286	660	854	415	848	660	886	508	484	346	167	176
6	245	633	832	407	868	732	872	492	583	322	255	162
7	240	603	782	425	797	680	781	495	577	216	252	158
8	192	475	769	496	842	614	758	398	501	303	327	154
9	201	428	734	375	819	669	730	442	551	548	201	140
10	220	636	714	371	764	1030	737	464	480	511	212	140
11	275	802	652	372	741	1900	714	434	524	424	200	206
12	290	883	736	377	725	1840	651	416	561	544	190	298
13	258	852	727	385	685	1830	495	296	538	609	210	173
14	261	969	675	373	632	2070	452	240	488	605	135	170
15	272	911	638	413	612	2020	529	289	451	512	154	153
16	347	945	589	386	589	1980	606	352	582	576	161	164
17	318	916	552	400	580	1750	669	408	500	580	174	168
18	283	899	510	445	599	1790	754	444	535	495	176	167
19	719	931	646	627	743	2160	700	503	594	414	166	189
20	771	954	625	699	1080	2150	740	536	665	356	163	220
21	796	830	495	659	1100	1870	780	502	562	331	145	205
22	614	693	466	654	963	1710	759	503	532	268	143	445
23	665	772	516	630	896	1620	672	383	539	272	148	590
24	737	829	503	640	830	1560	584	456	522	270	129	481
25	677	784	496	641	785	1450	559	457	418	293	131	716
26	674	878	504	615	771	1410	562	463	440	340	187	1020
27	671	982	437	536	742	1340	552	541	448	281	198	1060
28	420	938	441	548	699	1270	562	433	440	159	180	779
29	491	978	411	518	---	1120	702	502	430	160	177	924
30	499	1040	400	504	---	1110	614	409	415	174	173	1060
31	466	---	424	487	---	1100	---	350	---	176	171	---
TOTAL	12691	23176	19932	15097	20780	42001	21335	14097	14724	11692	5622	10801
MEAN	409	773	643	487	742	1355	711	455	491	377	181	360
MAX	796	1040	1020	699	1100	2160	1050	643	665	609	327	1060
MIN	192	383	400	371	469	614	452	240	271	159	129	140
MEAN+	430	792	660	505	759	1373	732	479	512	401	205	383
CFSM+	.59	1.09	.91	.69	1.04	1.88	1.00	.66	.70	.55	.28	.53
IN+	.68	1.21	1.04	.80	1.08	2.17	1.12	.76	.78	.63	.32	.59

CAL YR 1985 TOTAL 224194 MEAN 614 MAX 2630 MIN 96 MEAN+ 634 CFSM+ .87 IN+ 11.81
WTR YR 1986 TOTAL 211948 MEAN 581 MAX 2160 MIN 129 MEAN+ 601 CFSM+ .82 IN+ 11.20

+ Adjusted for diversion for municipal supply; record furnished by City of Ann Arbor.

STREAMS TRIBUTARY TO LAKE ERIE

281

04174950 WILLOW RUN NEAR RAWSONVILLE, MI

LOCATION.--Lat 42°13'09", long 83°32'13", in SW1/4 sec.18, T.3 S., R.8 E., Wayne County, Hydrologic Unit 04090005, on right bank 30 ft upstream from culverts on North I-94 Service Road, 0.7 mi upstream from mouth, and 0.8 mi northeast of Rawsonville.

DRAINAGE AREA.--Indeterminate.

PERIOD OF RECORD.--April to September 1986 (seasonal records only).

GAGE.--Water-stage recorder. Elevation of gage is 670 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--No estimated daily discharges. Records good. Actual surface drainage area is 6.28 mi². Flow contains effluent from sewage-treatment plant, about 1 mi upstream from station. Some of this flow originates from ground-water sources and other sources outside the basin.

EXTREME FOR CURRENT YEAR.--Maximum discharge during period April to September, 418 ft³/s, Sept. 25, gage height, 8.49 ft, from rating curve extended above 100 ft³/s; minimum, 8.7 ft³/s, Sept. 8; minimum gage height, 5.60 ft, July 7, Sept. 1, 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							42	33	30	29	29	21
2							36	33	31	34	31	23
3							33	32	30	30	26	28
4							35	28	29	28	26	25
5							49	33	101	44	30	24
6							37	34	48	26	33	28
7							38	35	49	25	37	24
8							38	32	50	38	29	23
9							34	31	35	49	30	24
10							35	30	38	28	30	28
11							33	27	42	31	27	51
12							34	31	39	39	28	46
13							32	33	35	30	28	28
14							31	30	32	27	27	25
15							40	29	31	30	30	26
16							43	30	31	53	27	24
17							43	42	33	32	27	22
18							37	42	32	31	30	21
19							34	37	51	34	27	25
20							34	32	36	31	27	26
21							46	31	32	32	28	24
22							35	33	29	33	28	78
23							36	31	29	32	29	64
24							36	25	31	32	25	32
25							34	27	32	34	26	97
26							33	25	30	33	38	70
27							32	38	31	30	32	56
28							33	33	31	29	28	40
29							36	32	28	31	28	39
30							41	33	29	29	25	43
31							---	31	---	30	21	---
TOTAL							1100	993	1105	994	887	1085
MEAN							36.7	32.0	36.8	32.1	28.6	36.2
MAX							49	42	101	53	38	97
MIN							31	25	28	24	21	21

STREAMS TRIBUTARY TO LAKE ERIE

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 1985 to current year.

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: Nov. 23 to Jan. 18, Jan. 27 to Feb. 3, Feb. 11-17, and Feb. 27 to Mar. 4. 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.--12 years (water years 1971-81, 1986), 105 ft³/s, 10.80 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)
Nov. 28	unknown	330	unknown	Mar. 19	2000	*413	*5.42
Mar. 11	0800	380	5.25				

Minimum discharge, 11 ft³/s, Sept. 1, 2; minimum gage height, 1.37 ft, Sept. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	49	81	220	84	85	120	194	161	90	51	38	19
2	48	83	240	82	90	120	195	152	80	59	34	12
3	40	95	250	80	95	125	184	131	71	61	32	15
4	32	88	200	78	110	135	177	116	63	51	30	18
5	44	81	170	76	183	147	177	108	87	47	28	21
6	52	76	140	75	175	161	189	101	129	44	28	20
7	46	78	125	74	148	157	181	104	124	40	29	18
8	39	79	120	74	151	150	169	100	151	40	31	17
9	39	77	115	73	147	145	156	94	142	78	35	17
10	44	153	110	71	133	219	144	88	122	79	35	16
11	39	233	140	70	120	370	133	82	117	75	35	19
12	46	230	170	70	110	343	126	75	123	82	33	32
13	57	218	190	70	100	332	118	70	137	83	30	30
14	60	209	150	70	95	345	115	66	137	74	28	25
15	54	207	130	70	90	351	146	65	132	65	28	23
16	55	218	125	70	90	332	169	67	128	85	27	23
17	52	245	125	70	90	312	171	72	117	94	27	21
18	56	230	125	110	118	301	161	99	107	85	20	21
19	161	244	125	175	163	382	147	141	104	75	13	23
20	238	269	121	170	234	385	141	152	113	67	16	23
21	206	250	115	142	242	346	156	144	107	60	17	23
22	183	237	110	134	236	315	157	138	101	54	18	24
23	161	220	110	134	207	299	148	137	92	49	17	39
24	148	190	105	127	182	282	136	129	82	44	18	55
25	141	170	100	106	181	266	127	118	71	44	17	113
26	129	200	98	104	169	263	118	109	63	58	22	184
27	120	250	94	95	140	256	111	108	60	67	32	182
28	111	310	92	85	120	242	107	119	59	62	31	174
29	101	250	90	82	---	232	123	116	55	55	27	172
30	94	220	88	80	---	220	138	109	51	47	25	179
31	86	---	86	82	---	205	---	99	---	42	25	---
TOTAL	2731	5491	4179	2883	4004	7858	4514	3370	3015	1917	826	1558
MEAN	88.1	183	135	93.0	143	253	150	109	101	61.8	26.6	51.9
MAX	238	310	250	175	242	385	195	161	151	94	38	184
MIN	32	76	86	70	85	120	107	65	51	40	13	12
CFSM	.67	1.39	1.02	.71	1.08	1.92	1.14	.83	.77	.47	.20	.39
IN.	.77	1.55	1.18	.81	1.13	2.21	1.27	.95	.85	.54	.23	.44

CAL YR 1985 TOTAL 44592 MEAN 122 MAX 690 MIN 18 CFSM .92 IN 12.57
WTR YR 1986 TOTAL 42346 MEAN 116 MAX 385 MIN 12 CFSM .88 IN 11.93

STREAMS TRIBUTARY TO LAKE ERIE

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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 current year. 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: Nov. 1-8, Dec. 17 to Jan. 20, Jan. 28 to Feb. 4, Feb. 12-18, and Feb. 20 to Mar. 26. 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.--27 years (water years 1954-78, 1985-86), 322 ft³/s, 9.44 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,660 ft³/s, Mar. 15, 1982, gage height, 15.77 ft; 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)
Feb. 21	1700	2,110	11.37	Mar. 13	unknown	*3,100	unknown

Minimum discharge, 68 ft³/s, Aug. 22, 24, 25; minimum gage height, 2.53 ft, Aug. 22, 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	135	190	920	245	280	430	635	470	283	196	114	80
2	128	190	1000	240	290	410	631	497	262	200	109	78
3	126	190	1090	235	320	450	606	463	245	189	106	76
4	124	195	880	230	390	600	606	416	232	185	101	74
5	128	200	665	225	835	920	606	398	234	171	97	75
6	122	200	590	220	1020	1100	609	385	309	158	96	73
7	122	200	538	220	943	1000	605	371	372	149	159	73
8	147	190	504	215	675	880	583	344	385	142	134	73
9	172	172	481	210	566	1200	549	326	348	174	124	72
10	120	440	476	210	473	2500	512	317	343	184	113	71
11	119	789	551	210	418	2600	487	312	470	210	116	86
12	129	1000	733	205	390	2700	439	299	851	208	106	115
13	143	986	792	200	350	3000	439	286	774	210	100	110
14	149	821	628	200	320	2900	426	276	533	196	96	105
15	165	737	435	200	310	2700	510	269	457	180	95	100
16	184	803	415	200	300	2300	556	269	410	240	98	93
17	152	999	390	200	300	2000	574	267	367	252	92	88
18	144	1110	370	200	350	2500	565	278	328	249	87	90
19	266	1080	350	650	592	2400	526	345	321	207	82	91
20	419	1220	345	870	1200	2200	496	376	334	181	80	89
21	505	1330	340	961	2080	2100	518	393	310	162	74	89
22	459	1150	335	744	1700	1900	535	389	286	152	70	142
23	389	933	330	593	1460	1500	518	375	270	140	70	126
24	366	847	315	498	1300	1200	478	362	249	131	70	129
25	316	724	300	447	1100	950	449	343	231	132	69	263
26	282	792	295	415	750	860	423	325	213	143	87	361
27	260	1070	285	355	600	825	401	344	196	136	108	562
28	239	1340	280	330	500	788	382	348	202	135	91	587
29	222	1150	270	300	---	744	369	339	201	142	90	540
30	210	967	260	280	---	705	411	325	184	127	88	447
31	212	---	250	280	---	663	---	304	---	107	82	---
TOTAL	6654	22015	15413	10688	19812	47025	15444	10811	10200	5388	3004	4958
MEAN	215	734	497	345	708	1517	515	349	340	174	96.9	165
MAX	505	1340	1090	961	2080	3000	635	497	851	252	159	587
MIN	119	172	250	200	280	410	369	267	184	107	69	71
CFSM	.46	1.59	1.07	.75	1.53	3.28	1.11	.75	.73	.38	.21	.36
IN.	.53	1.77	1.24	.86	1.59	3.78	1.24	.87	.82	.43	.24	.40
CAL YR 1985	TOTAL	172871	MEAN	474	MAX	5350	MIN	90	CFSM	1.02	IN	13.89
WTR YR 1986	TOTAL	171412	MEAN	470	MAX	3000	MIN	69	CFSM	1.02	IN	13.77

STREAMS TRIBUTARY TO LAKE ERIE

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. 15 to Jan. 24, Jan. 27 to Feb. 16, and Feb. 22 to Mar. 2. 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.--49 years, 731 ft³/s, 9.53 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)
Feb. 22	0800	3,650	6.31	Mar. 19	1900	5,280	7.39
Mar. 14	0600	*5,350	*7.43	June 12	1200	3,530	6.22

Minimum discharge, 98 ft³/s, Sept. 11, gage height, 2.06 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	174	291	2580	375	400	850	896	609	420	286	203	150
2	165	290	2530	370	430	730	871	657	385	282	170	138
3	162	291	2160	360	450	706	849	685	358	285	160	136
4	160	305	1970	355	550	738	823	674	335	291	158	129
5	164	311	1770	350	1300	1050	818	616	364	288	150	121
6	159	312	1440	340	1500	1680	861	618	412	266	155	115
7	158	301	1150	335	1550	1940	914	1230	724	247	198	113
8	165	279	999	330	1600	1800	889	1100	1240	229	227	118
9	163	270	912	320	1400	1460	823	862	1330	230	258	117
10	171	779	879	315	1150	1940	745	677	1140	228	230	108
11	193	1620	1070	310	880	4720	681	569	1660	237	211	107
12	196	1630	1740	305	660	4460	629	506	3340	252	188	118
13	176	1780	1970	305	570	4770	580	465	3030	279	188	127
14	178	1730	1920	305	500	5260	536	441	2650	286	185	148
15	200	1670	1400	300	480	5110	589	411	1980	284	174	165
16	199	1760	920	300	460	4710	689	387	1290	304	168	159
17	202	2180	650	300	462	4090	823	374	1020	305	164	146
18	222	1990	530	380	448	3380	865	380	832	373	164	138
19	326	2420	506	720	643	4510	833	414	680	383	164	130
20	540	2620	500	1000	2340	4210	785	454	614	336	158	123
21	603	2460	500	1250	3210	3870	858	486	590	287	148	123
22	714	2340	500	1350	3360	3690	977	502	537	253	137	182
23	683	2270	500	1400	3200	3160	987	506	478	228	131	270
24	595	2040	485	1300	3000	2470	875	490	433	212	120	311
25	507	1710	470	1010	2500	1910	777	464	390	220	118	661
26	465	1830	450	814	1900	1580	697	439	356	252	140	1110
27	417	2650	440	670	1300	1390	645	426	329	240	171	2040
28	377	2550	430	540	1050	1260	607	435	306	229	164	1640
29	352	2680	410	440	---	1150	587	505	289	214	211	1510
30	330	2760	390	390	---	1060	586	493	289	204	207	1550
31	310	---	380	380	---	985	---	455	---	203	172	---
TOTAL	9426	46119	32551	17219	37293	80639	23095	17330	27801	8213	5392	12003
MEAN	304	1537	1050	555	1332	2601	770	559	927	265	174	400
MAX	714	2760	2580	1400	3360	5260	987	1230	3340	383	258	2040
MIN	158	270	380	300	400	706	536	374	289	203	118	107
CFSM	.29	1.48	1.01	.53	1.28	2.50	.74	.54	.89	.25	.17	.38
IN.	.34	1.65	1.16	.61	1.33	2.88	.82	.62	.99	.29	.19	.43
CAL YR 1985	TOTAL	380146	MEAN	1041	MAX	12300	MIN	129	CFSM	1.00	IN	13.57
WTR YR 1986	TOTAL	317081	MEAN	869	MAX	5260	MIN	107	CFSM	.83	IN	11.32

WATER-QUALITY RECORDS

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CAC03)
DEC 10...	1400	877	687	8.10	3.0	6.8	13.0	98	K100	190	330
MAR 27...	1000	1400	548	8.20	7.0	24	12.2	102	K20	--	270
JUN 24...	1230	430	728	8.40	24.0	27	9.0	109	280	310	340
SEP 16...	1300	158	695	8.40	19.5	--	11.5	126	E130	680	--

[illegible]

STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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 10...	1400	43	.20	8.5	416	410	.57	985	4.3
MAR 27...	1000	23	.20	5.9	337	330	.46	1270	3.6
JUN 24...	1230	52	.30	7.7	499	460	.68	579	3.8
SEP 16...	1300	--	--	--	--	--	--	--	.90

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- PENDEDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
DEC 10...	.220	.80	.080	.050	.040	9	21	72
MAR 27...	.140	1.2	.080	.050	.030	30	113	93
JUN 24...	.040	1.0	.170	.090	.040	37	43	98
SEP 16...	.030	.70	.090	.090	.020	32	14	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)
DEC 10...	<10	<1	51	<.5	<1	<1	<3	1	11	<5
MAR 27...	<10	<1	42	<.5	<1	<1	<3	2	13	<5
JUN 24...	<10	1	62	<.5	<1	<1	<3	3	4	<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)
DEC 10...	9	36	<.1	20	3	1	<1	310	<6	11
MAR 27...	4	21	<.1	<10	2	<1	<1	250	<6	--
JUN 24...	14	9	<.1	<10	9	<1	<1	590	<6	15

As the number of streams on which streamflow 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 streamflow data at sites other than stream-gaging stations. When limited streamflow 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 floodflow 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 annual maximum stage and discharge at crest-stage partial-record stations and the second is a table of discharge measurements at low-flow partial-record stations. Discharge measurements at miscellaneous sites are given in a third table.

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 on 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 1986

Station No.	Station Name	Location	Drainage area (mi ²)	Period of record	Annual Maximum		
					Date	Gage height (ft)	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 NE1/4 sec.34, T.48 N., R.35 W., Baraga County, Hydrologic Unit 04020104, at State Highway 28, 2.5 mi east of Sidnaw.	63.1	1913-15†, 1957-86	04-02-86	a9.66	511
04044200	Carp Creek at Ishpeming, MI	Lat 46°29'11", long 87°41'21", in NW1/4 sec.9, T.47 N., R.27 W., Marquette County, Hydrologic Unit 04020105, at Highway 41A in Ishpeming.	16.5	1970-86	10-05-85	9.92	283
04044813	Two Hearted River near Paradise, MI	Lat 46°41'57", long 85°25'19", in NW1/4 SW1/4 sec.27, T.50 N., R.9 W., Luce County, Hydro-logic Unit 04020201, at footbridge in State Forest Campground, 0.4 mi upstream from mouth, and 18 mi northwest of Paradise.	201	1973-86	04-09-86	7.72	2,480
04045538	West Branch Waiska River near Brimley, MI	Lat 46°21'18", long 84°35'35", in SW1/4 NW1/4 sec.29, T.46 N., R.2 W., Chippewa County, Hydrologic Unit 04020203, at county road, 3.2 mi upstream from mouth, and 3.5 mi south of Brimley.	40.7	1973-86	04-05-86	7.86	558
04045559	East Branch Waiska River near Brimley, MI	Lat 46°25'07", long 84°28'24", in NW1/4 NE1/4 sec.6, T.46 N., R.1 W., Chippewa County, Hydro-logic Unit 04020203, at county road, 4.0 mi upstream from mouth, and 4.7 mi east of Brimley.	30.1	1973-86	04-02-86	b14.82	740
STREAMS TRIBUTARY TO LAKE MICHIGAN							
04046000	Black River near Garnet, MI	Lat 46°07'05", long 85°21'55", in SE1/4 sec.13, T.43 N., R.9 W., Mackinac County, Hydrologic Unit 04060107, on right bank 10 ft upstream from footbridge, 15 ft downstream from Peters Creek, 3.5 mi upstream from Lake Michigan, and 4 mi southwest of Garnet.	c28	1951-78†, 1979-86	04-02-86	5.30	253
04057900	Black River near Republic, MI	Lat 42°25'08", long 87°53'21", in NE1/4 sec.2, T.46 N., R.29 W., Marquette County, Hydro-logic Unit 04030110, at county road, 4.4 mi east of Republic.	34.4	1961-68†, 1970-86	04-06-86	4.30	384
04058400	Goose Lake Outlet near Sands Station, MI	Lat 46°23'36", long 87°29'40", in SE1/4 SE1/4 sec.12, T.46 N., R.26 W., Marquette County, Hydrologic Unit 04030110, on left bank 0.8 mi upstream from mouth, and 3.0 mi west of Sands Station.	37.5	1966-82†, 1983-86	04-06-86	5.23	360

See footnotes at end of table.

Annual maximum discharge at crest-stage partial-record stations during water year 1986--Continued

Station No.	Station Name	Location	Drainage area (mi ²)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Dis-charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04059400	Tenmile Creek at Perronville, MI	Lat 45°48'38", long 87°22'00", in NW1/4 NW1/4 sec.2, T.39 N., R.25 W., Menominee County, Hydrologic Unit 04030109, 1 mi northwest of Perronville.	38.4	1971-77†, 1978-86	04-04-86	5.76	800
04062300	Michigamme River near Republic, MI	Lat 46°23'03", long 87°58'48", in SE1/4 sec.18, T.46 N., R.29 W., Marquette County, Hydrologic Unit 04030107, on left bank 400 ft upstream from county highway, 0.3 mi upstream from Trout Falls Creek, and 0.6 mi south of Republic.	240	1961-75†, 1976-86	04-08-86	8.06	3,870
04096272	Beebe Creek near Hillsdale, MI	Lat 41°57'15", long 84°38'20", in NE1/4 NE1/4 sec.15, T.6 S., R.3 W., Hillsdale County, Hydrologic Unit 04050001, at Moore Road, 1.2 mi northwest of Hillsdale.	42.4	1974-78†, 1979-86	03-14-86	5.73	226
04096340	St. Joseph River at Clarendon, MI	Lat 42°07'51", long 84°51'56", in SW1/4 SW1/4 sec.11, T.4 S., R.5 W., Calhoun County, Hydrologic Unit 04050001, at 22 Mile Road in Clarendon.	144	1974-77†, 1978-86	03-19-86	6.74	452
04097170	Portage River near Vicksburg, MI	Lat 42°06'53", long 85°29'08", in SW1/4 sec.16, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at W Avenue, 2.4 mi east of Vicksburg.	68.2	1946-51†, 1965-80†, 1980-86	07-17-86	4.69	134
04108645	Rabbit River at Hamilton, MI	Lat 42°40'31", long 86°00'13", in NE1/4 sec.6, T.3 N., R.14 W., Allegan County, Hydrologic Unit 04050003, at State Highway 40 in Hamilton.	274	1979-86	03-12-86	15.73	2,400
04112700	Sycamore Creek near Mason, MI	Lat 42°36'38", long 84°27'58", in NE1/4 NE1/4 sec.31, T.3 N., R.1 W., Ingham County, Hydrologic Unit 04050004, at Harper Road, 0.7 mi downstream from Aurelius and Vevay Drain, and 2.6 mi northwest of Mason.	39.5	1975-86	03-10-86	10.33	512
04113090	Carrier Creek near Grand Ledge, MI	Lat 42°43'36", long 84°39'16", in SE1/4 SW1/4 sec.15, T.4 N., R.3 W., Eaton County, Hydrologic Unit 04050004, at St. Joe Highway, 3.7 mi upstream from mouth, and 4.0 mi south-east of Grand Ledge.	7.18	1975-86	06-12-86	10.01	465
04117000	Quaker Brook near Nashville, MI	Lat 42°33'57", long 85°05'37", in NW1/4 sec.13, T.2 N., R.7 W., Barry County, Hydrologic Unit 04050007, on left bank 150 ft upstream from culvert on county road, 500 ft upstream from small tributary, and 2.5 mi south of Nashville.	7.60	1954-75†, 1976-86	03-10-86	6.23	256
04119055	Plaster Creek at Grand Rapids, MI	Lat 42°54'46", long 85°39'02", in SE1/4 sec.7, T.6 N., R.11 W., Kent County, Hydrologic Unit 04050006, at bridge on 28th Street in Grand Rapids.	46.6	1974-86	03-11-86 09-12-86	10.81 10.79	1,200 1,200
04119160	Buck Creek at Grandville, MI	Lat 42°54'09", long 85°45'46", in SE1/4 sec.18, T.6 N., R.12 W., Kent county, Hydrologic Unit 04050006, at Wilson Avenue in Grandville.	50.5	1974-86	06-12-86	8.98	950
*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 mi east of Muskegon, and 4.9 mi upstream from mouth.	c39	d1975, 1977, 1979-86	08-31-75 03-12-77 03-08-79 08-21-80 02-19-81 04-17-82 12-03-82 02-14-84 02-25-85 09-12-86	3.92 4.37 3.52 3.20 3.32 3.44 4.01 3.84 3.57 4.47	e362 e596 e253 e210 e225 e242 e399 e330 e261 656
04122230	North Branch Pentwater River near Pentwater, MI	Lat 43°47'42", long 86°21'30", in NE1/4 SE1/4 sec.8, T.16 N., R.17 W., Oceana County, Hydrologic Unit 04060101, at U.S. Highway 31, 3.5 mi northeast of Pentwater.	42.3	1975-86	09-11-86	6.33	2,860

See footnotes at end of table.

Annual maximum discharge at crest-stage partial-record stations during water year 1986--Continued

Station No.	Station Name	Location	Drainage area (mi ²)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Dis-charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04124500	East Branch Pine River near Tustin, MI	Lat 44°06'09", long 85°31'02", in NE1/4 NW1/4 sec.28, T.20 N., R.10 W., Osceola County, Hydrologic Unit 04060103, at highway bridge, 3.0 mi west of Tustin.	c63	1952-63†, 1964-86	09-11-86	5.78	720
04126600	Betsie River near Benzonia, MI	Lat 44°36'02", long 86°05'57", in NW1/4 NW1/4 sec.2, T.25 N., R.15 W., Benzie County, Hydrologic Unit 04060104, at U.S. Highway 31, 1.2 mi south of Benzonia.	c170	1975-86	03-26-86	5.21	941
04127850	Boyne River near Boyne City, MI	Lat 45°11'48", long 84°57'26", in NW1/4 SW1/4 sec.5, T.32 N., R.5 W., Charlevoix County, Hydrologic Unit 04060105, at Dam Road, 0.3 mi downstream from nonoperative hydroelectric plant, and 2.8 mi southeast of Boyne City.	64.2	1975-86	03-26-86	3.80	363
STREAMS TRIBUTARY TO LAKE HURON							
04139000	Houghton Creek near Lupton, MI	Lat 44°23'45", long 84°02'50", in SE1/4 SE1/4 sec.10, T.23 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, 2.7 mi southwest of Lupton.	29.7	1950-73†, 1973-86	09-30-86	6.30	510
04140200	Klack Creek near Selkirk, MI	Lat 44°20'05", long 84°08'46", in NE1/4 NE1/4 sec.2, T.22 N., R.2 E., Ogemaw County, Hydrologic Unit 04080101, at Campbell Road, 4.0 mi northwest of Selkirk.	7.51	1953-86	09-30-86	2.41	141
04140500	Rifle River at Selkirk, MI	Lat 44°18'48", long 84°04'10", in SE1/4 NE1/4 sec.9, T.22 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, at State Road in Selkirk.	117	1950-82†, 1983-86	09-30-86	4.30	1,180
04141000	South Branch Shepards Creek near Selkirk, MI	Lat 44°18'28", long 84°05'13", in SE1/4 SE1/4 sec.8, T.22 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, on right bank 200 ft upstream from mouth, 600 ft west of Bedtelyon Road, and 1.1 mi southwest of Selkirk.	1.15	1952-78†, 1979-86	09-30-86	4.29	166
04146020	South Branch Flint River near Millville, MI	Lat 43°04'44", long 83°18'25", in SE1/4 sec. 29, T.8 N., R.10 E., Lapeer County, Hydrologic Unit 04080204, at Saginaw Road, 1.6 mi north of Lapeer.	160	1974-86	e03-14-82 ef8.56 e1,020 03-14-86 8.19 821		
04148265	Kimball Drain near Swartz Creek, MI	Lat 42°55'15", long 83°49'51", in NE1/4 sec.14, T.6 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Morrish Road, 2.4 mi south of Swartz Creek.	10.6	1970-86	09-30-86	7.21	282
04148610	Cole Creek near Flushing, MI	Lat 43°02'44", long 83°51'06", in SW1/4 sec.35, T.8 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Potter Road, 1.2 mi south of Flushing.	8.51	1970-86	03-11-86	6.73	364
04148640	Armstrong Creek near Montrose, MI	Lat 43°08'04", long 83°50'03", in SE1/4 sec.35, T.9 N., R.5 E., Genesee County, Hydrologic Unit 04080204, at Morrish Road, 4.1 mi southeast of Montrose.	11.9	1970-86	09-30-86	6.99	288
STREAMS TRIBUTARY TO ST. CLAIR RIVER							
04160350	Pine River near Rattle Run, MI	Lat 42°52'49", long 82°34'04", in NE1/4 sec.9, T.5 N., R.16 E., St. Clair County, Hydrologic Unit 04090001, at Gratiot Road, 1.9 mi northeast of Rattle Run.	135	1974-86	03-11-86	18.74	2,300
STREAMS TRIBUTARY TO LAKE ST. CLAIR							
04161000	Clinton River at Auburn Heights, MI	Lat 42°38'00", long 83°13'28", in NW1/4 sec. 36, T.3 N., R.10 E., Oakland County, Hydrologic Unit 04090003, at Auburn Road in Auburn Heights.	123	1935-40†, 1957-82†, 1983-86	09-27-86	5.33	1,690

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at crest-stage partial-record stations during water year 1986--Continued

Station No.	Station Name	Location	Drainage area (mi ²)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Dis-charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE ST. CLAIR--Continued							
04161500	Paint Creek near Lake Orion, MI	Lat 42°46'03", long 83°13'12", in NE1/4 sec.13, T.4 N., R.10 E., Oakland County, Hydrologic Unit 04090003, on left bank 100 ft upstream from railroad bridge, 1.6 mi southeast of Lake Orion, and 2.8 mi upstream from Trout Creek.	38.5	1955-75†, 1976-86	03-10-86	3.37	209
04161760	West Branch Stony Creek near Washington, MI	Lat 42°43'53", long 83°06'02", in SE1/4 sec.25, T.4 N., R.11 E., Oakland County, Hydrologic Unit 04090003, at Huron-Clinton Metropolitan Park Road, 3.4 mi west of Washington.	22.5	1965-86	03-11-86	b3.92	150
04164010	North Branch Clinton River at Almont, MI	Lat 42°54'59", long 83°02'42", in NE1/4 sec.28, T.6 N., R.12 E., Lapeer County, Hydrologic Unit 04090003, at State Highway 53 in Almont.	9.56	1959-62, 1963-68†, 1969-86	03-11-86	5.19	297
04164050	North Branch Clinton River near Romeo, MI	Lat 42°49'11", long 82°58'35", in NW1/4 sec.31, T.5 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 33 Mile Road, 2.2 mi north-east of Romeo.	49.7	1959-64, 1965-69†, 1970-86	03-11-86	4.41	1,080
04164150	North Branch Clinton River near Meade, MI	Lat 42°43'50", long 82°54'23", in NE1/4 sec.34, T.4 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 27 Mile Road, 1.9 mi northwest of Meade.	89.6	1959-67, 1968-72†, 1973-86	03-11-86	b7.32	1,750
04164200	Coon Creek near Armada, MI	Lat 42°47'41", long 82°52'58", in SW1/4 sec.1, T.4 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at North Road, 3.4 mi south of Armada.	10.0	1959-65, 1966-70†, 1971-86	10-19-85	6.59	351
04164350	Highbank Creek near Armada, MI	Lat 42°28'24", long 82°51'08", in NW1/4 sec.6, T.4 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 32 Mile Road, 3.0 mi south-east of Armada.	14.9	1959-65, 1965-70†, 1971-86	10-19-85	15.48	792
04164360	East Branch Coon Creek near New Haven, MI	Lat 42°45'46", long 82°50'57", in NW1/4 sec.19, T.4 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 29 Mile Road, 3.4 mi north-west of New Haven.	36.1	1959-67, 1968-72†, 1973-86	03-11-86	8.34	1,200
04164400	Deer Creek near Meade, MI	Lat 42°42'39", long 82°51'32", in NW1/4 sec.6, T.3 N., R.14 E., Macomb County, Hydrologic Unit 04090003, at 25 1/2 Mile Road, 0.9 mi southeast of Meade.	12.7	1959-60, 1960-65†, 1966-86	03-11-86	7.58	491
04164450	McBride Drain near Macomb, MI	Lat 42°41'14", long 82°55'14", in NE1/4 NE1/4 sec.16, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, at 24 Mile Road, 2.2 mi southeast of Macomb.	5.79	1960-64†, 1965-86	03-11-86	b9.13	165
04164600	Middle Branch Clinton River near Macomb, MI	Lat 42°42'03", long 82°59'44", in SE1/4 sec.2, T.3 N., R.12 E., Macomb County, Hydrologic Unit 04090003, at Schoenherr Road, 2.0 mi west of Macomb.	22.2	1959-64, 1965-69†, 1971-86	03-11-86	10.21	522
04164800	Middle Branch Clinton River at Macomb, MI	Lat 42°42'23", long 82°57'33", in SW1/4 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†, 1983-86	03-11-86	12.99	1,010
04165200	Gloede Ditch near Waldenburg, MI	Lat 42°37'39", long 82°57'10", in SW1/4 sec.32, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, 2.2 mi south of Waldenburg.	16.0	1959, 1959-64†, 1965-86	03-11-86	16.49	376
STREAMS TRIBUTARY TO DETROIT RIVER							
04168660	Frank and Poet Drain at Trenton, MI	Lat 42°09'19", long 83°12'22", in NW1/4 sec.13, T.4 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at King Road in Trenton.	19.3	1972-86	03-11-86	8.24	298

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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Annual maximum discharge at crest-stage partial-record stations during water year 1986--Continued

Station No.	Station Name	Location	Drainage area (mi ²)	Period of record	Annual Maximum		
					Date	Gage height (ft)	Dis-charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE ERIE							
04168800	Huron River near Andersonville, MI	Lat 42°41'35", long 83°29'56", in NW1/4 SE1/4 sec.3, T.3 N., R.8 E., Oakland County, Hydrologic Unit 04090005, at White Lake Road, 2.5 mi south of Andersonville.	14.0	1974-86	06-12-86	3.05	102
04173250	Mill Creek near Lima Center, MI	Lat 42°15'56", long 83°56'45", in NE1/4 sec.34, T.2 S., R.4 E., Washtenaw County, Hydrologic Unit 04090005, at Guenther Road, 2.0 mi upstream from North Fork Mill Creek, and 2.2 mi south of Lima Center.	47.3	1973-86	03-11-86	8.98	454
04175960	South Branch River Raisin near Adrian, MI	Lat 41°55'03", long 84°00'37", in SE1/4 sec.25, T.6 S., R.3 E., Lenawee County, Hydrologic Unit 04100002, at Howell Highway, 2.0 mi northeast of Adrian.	165	1979-86	03-13-86	10.29	1,640
04176400	Saline River near Saline, MI	Lat 42°07'50", long 83°46'35", in SW1/4 sec.18, T.4 S., R.6 E., Washtenaw County, Hydrologic Unit 04100002, at Maple Road, 2.8 mi south of Saline.	94.6	1966-77†, 1978-86	03-11-86	11.30	1,430

† Operated as a continuous-record gaging station.

* Also a low-flow partial-record station.

a Maximum gage height, 9.77 ft, sometime during the winter period, backwater from ice.

b Backwater from ice.

c Approximately.

d Peak discharge for water years 1974 and 1978 have been found to be unreliable and should not be used.

e Revised.

f Maximum gage height, 8.69 ft, June 2, 1982.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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 1986

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, 3.5 mi northeast of Rapid River.	284	1973-86	01-16-86 05-09-86 08-19-86 09-09-86	174 282 184 121
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, 4.5 mi south of Palmer.	8.42	1961-65, b1970-86	01-28-86 05-21-86 08-06-86 08-13-86 09-17-86 09-17-86 09-17-86	c2.59 c6.19 c1.56 c9.99 c2.07 c12.1 c1.22
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 mi upstream from mouth, and 2.0 mi northwest of Wells.	a920	d1981-86	02-18-86 06-04-86 08-19-86 09-19-86	c451 c411 c327 c493
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 mi upstream from mouth, and 3.0 mi west of Allen.	2.61	1969-86	11-05-85 06-02-86 07-14-86 08-26-86	0.96 0.83 1.28 0.93
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, 4.5 mi northeast of St. Johns.	--	1981-86	10-21-85 04-07-86 07-01-86 08-14-86 08-15-86 09-22-86	c302 c163 70.0 20.2 22.5 c141
*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 mi east of Muskegon, and 4.9 mi upstream from mouth.	a39	1974-86	04-22-86 06-10-86 07-15-86 08-25-86 09-12-86 09-16-86	48.4 35.6 31.0 26.2 c628 c275
04121239	Clam River at Cadillac, MI	Lat 44°15'49", long 85°24'04", in NE1/4 NE1/4 sec.33, T.22 N., R.9 W., Wexford County, Hydrologic Unit 04060102, at Smith Street in Cadillac.	a48	1983-84, 1986	10-15-85 11-27-85 01-23-86 02-13-86 03-26-86 04-17-86 05-21-86 07-02-86 08-11-86 09-22-86	82.5 92.7 57.7 46.4 c64.0 82.8 c1.62 71.0 4.99 c96.4
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, 3.5 mi south of Fife Lake.	23.6	1984-86	10-29-85 02-19-86 06-06-86	12.5 16.0 14.0
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, 2.8 mi northeast of Buckley.	32.3	1984-86	10-29-85 12-10-85 01-15-86 02-19-86 04-02-86 05-06-86 06-05-86 08-27-86	8.39 13.4 9.64 10.5 24.8 12.2 10.2 6.64

See footnotes at end of table.

Discharge measurements made at low-flow partial-record stations during water year 1986--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						
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 East Duck Lake Road, 2.8 mi southwest of Grawn.	16.9	1984-86	10-30-85	11.7
					02-20-86	13.2
					06-04-86	9.37
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 137, 0.2 mi south of Interlochen.	39.6	1984-86	10-30-85	41.3
					02-20-86	42.3
					06-04-86	22.9
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, 1.0 mi southwest of Interlochen.	47.0	1984-86	10-29-85	56.0
					12-10-85	82.1
					02-20-86	57.7
					04-03-86	132
					05-07-86	65.8
					06-03-86	41.3
08-27-86	34.1					
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, 1.2 mi northwest of Karlin.	59.6	1945-69, 1984-86	10-29-85	89.8
					02-20-86	92.6
					06-04-86	69.6
04126845	Cedar Run near Cedar, MI	Lat 44°45'46", long 85°48'57", in SW1/4 SW1/4 sec.6, T.27 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, at Cedar Run Road, 5.9 mi south of Cedar.	--	1986	10-31-85	8.34
					02-21-86	10.2
					06-03-86	9.85
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, at Broomhead Road, 5.8 mi northwest of South Boardman.	46.7	1949, 1971, 1975, 1984-86	10-29-85	46.6
					02-20-86	46.2
					06-03-86	51.0
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, 5.5 mi northwest of South Boardman.	69.2	1971, 1984-86	10-29-85	63.9
					02-20-86	66.3
					06-03-86	65.2
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 near Ranch Rudolph, 5.1 mi northeast of Mayfield.	141	1949, 1984-86	10-31-85	132
					12-11-85	163
					01-16-86	140
					02-20-86	134
					04-03-86	338
					05-07-86	163
					06-04-86	143
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, 1.6 mi northeast of Mayfield.	150	1984-86	10-31-85	160
					12-11-85	175
					01-16-86	260
					02-20-86	179
					04-02-86	393
					05-07-86	253
					06-04-86	158
					08-28-86	165
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, 2.9 mi northeast of Kingsley.	9.1	1985-86	10-30-85	6.61
					02-21-86	10.9
					06-03-86	5.12
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, 1.3 mi east of Mayfield.	31.5	1984-86	10-30-85	27.9
					12-11-85	37.2
					01-15-86	32.3
					02-19-86	28.3
					03-27-86	c115
					04-02-86	55.2
					05-06-86	31.6
					06-04-86	23.9
					08-27-86	24.2

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 1986--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						
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, at Mill Street in Mayfield.	10.0	1984-86	10-31-85	15.3
					12-11-85	16.4
					01-15-86	14.8
					02-21-86	15.4
					04-02-86	19.2
					05-06-86	17.0
					06-04-86	14.4
					08-27-86	14.4
04127017	Jaxon Creek near Mayfield, MI	Lat 44°37'42", long 85°34'09", in SE1/4 SW1/4 sec.19, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, at Hoosier Valley Road, 1.9 mi west of Mayfield.	--	1984-86	06-18-84	0.21
					10-09-84	0.00
					02-13-85	0.00
					06-04-85	0.63
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 Hoosier Valley Road, 2.3 mi west of Mayfield.	--	1984-86	10-30-85	0.64
					02-21-86	0.62
					06-04-86	0.32
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 Dam on Cass Road, 4.6 mi south of Traverse City.	266	1984-86	10-30-85	273
					12-10-85	396
					01-16-86	392
					02-20-86	292
					04-03-86	539
					05-07-86	353
					06-04-86	257
					08-28-86	271
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, at Union Street in Traverse City.	275	1984-86	10-31-85	306
					12-11-85	432
					01-16-86	304
					02-20-86	356
					04-03-86	577
					05-07-86	330
					06-04-86	320
					08-28-86	284
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, at Maple Street in Traverse City.	7.7	1984-86	10-31-85	12.8
					12-11-85	13.3
					01-16-86	13.4
					02-21-86	15.2
					04-03-86	15.6
					05-07-86	11.8
					06-05-86	10.0
					08-29-86	10.6
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.	14.6	1949, 1979, 1983-86	10-30-85	8.10
					12-11-85	11.4
					01-16-86	9.53
					02-21-86	12.5
					04-03-86	12.2
					05-06-86	8.35
					06-05-86	6.70
					08-27-86	8.18
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, at U.S. Highway 31 in Acme.	12.9	1984-86	10-30-85	16.0
					12-11-85	18.2
					01-15-86	15.8
					02-19-86	15.9
					04-04-86	20.2
					05-06-86	17.2
					06-05-86	16.3
					08-27-86	18.4
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, 4.0 mi northeast of Acme.	8.4	1984-86	10-30-85	8.49
					12-10-85	12.8
					01-15-86	10.3
					02-19-86	9.32
					04-04-86	14.6
					05-06-86	7.99
					06-03-86	5.28
					08-27-86	9.03

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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Discharge measurements made at low-flow partial-record stations during water year 1986--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, 3.0 mi south of Elk Rapids.	10.8	1949-59, 1984-86	10-30-85	4.88
					12-10-85	9.02
					01-15-86	6.24
					02-19-86	5.63
					04-02-86	19.0
					05-06-86	5.09
					06-03-86	2.70
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, 1.8 mi east of Williamsburg.	8.7	1949, 1984-86	10-29-85	11.9
					12-10-85	13.1
					01-15-86	12.3
					02-19-86	12.5
					04-02-86	13.1
					05-06-86	12.7
					06-03-86	12.4
08-27-86	12.5					
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, 1.7 mi northeast of Williamsburg.	8.0	1981, 1984-86	10-29-85	13.2
					12-10-85	14.9
					01-15-86	13.8
					02-19-86	14.2
					04-02-86	16.5
					05-06-86	13.8
					06-03-86	13.5
08-27-86	14.8					
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, 2.5 mi northeast of Columbiaville.	223	1979-86	04-08-86	c270
					05-20-86	89.1
					07-01-86	60.3
					08-11-86	49.8

* Also a crest-stage partial-record station.

a Approximately.

b Since 1970, affected by diversion for industrial use.

c Not base flow.

d Affected by diversion for industrial use.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Special study and miscellaneous sites

Discharge measurements in the following table were made at special study and miscellaneous sites throughout the State.

Discharge measurements made at special study and miscellaneous sites during water year 1986

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							
04044210	Carp Creek	Carp River	Lat 46°29'54", long 87°40'59", in NW1/4 SE1/4 sec.4, T.47 N., R.27 W., Marquette County, Hydrologic Unit 04020105, at U.S. Highway 41, 0.7 mi west of Ishpeming.	b18	1961, 1985a	08-14-85	*26.1
04044525	Silver Lead Creek	West Branch Chocolay River	Lat 46°19'19", long 87°23'20", in SE1/4 SE1/4 sec.2, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04020201, above K.I. Sawyer Air Force Base, at culvert 0.1 mi downstream from Stump Lake, 3.7 mi northeast of Gwinn.	b1.0	1985	02-07-85	*2.63
						05-02-85	*2.01
						05-30-85	*5.42
						06-25-85	*2.45
						07-24-85	*1.81
						08-28-85	*2.27
						09-19-85	*2.41
						11-19-85	4.61
						12-17-85	*2.31
						01-29-86	*2.49
03-03-86	*2.06						
04044531	Silver Lead Creek	West Branch Chocolay River	Lat 46°19'43", long 87°22'50", in NE1/4 NW1/4 sec.1, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04020201, above treatment plant at K.I. Sawyer Air Force Base.	1.87	1965, 1970, 1985	05-02-85	*9.66
						05-30-85	*14.3
						06-25-85	*5.61
						07-24-85	*4.85
						08-28-85	*5.74
						09-19-85	*5.58
						11-19-85	8.61
						12-17-85	*6.10
						01-29-86	*6.32
						03-03-86	*5.32
040445315	Silver Lead Creek	West Branch Chocolay River	Lat 46°19'57", long 87°22'40", in NE1/4 NW1/4 sec.1, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04020201, above treatment plant at K.I. Sawyer Air Force Base.	b2.1	1985	02-07-85	*6.72
						05-02-85	*7.86
						05-30-85	*11.6
						06-25-85	*8.17
						07-24-85	*5.97
						08-28-85	*7.72
						11-19-85	9.64
						12-17-85	*7.92
						01-29-86	*7.99
						03-03-86	*7.35
04044532	Silver Lead Creek	West Branch Chocolay River	Lat 46°20'04", long 87°22'21", in SW1/4 SE1/4 sec.36, T.46 N., R.25 W., Marquette County, Hydrologic Unit 04020201, at Voo Doo Avenue, at K.I. Sawyer Air Force Base.	b2.7	1963-64c, 1985	05-02-85	*11.0
						05-30-85	*15.0
						06-25-85	*11.0
						07-24-85	*8.26
						08-28-85	*12.2
						09-19-85	*9.87
						11-19-85	15.4
						12-17-85	*11.4
						01-29-86	*10.7
						03-03-86	*9.73
04044533	Silver Lead Creek	West Branch Chocolay River	Lat 46°20'36", long 87°21'48", in SW1/4 NW1/4 sec.31, T.46 N., R.24 W., Marquette County, Hydrologic Unit 04020201, below irrigation dam, below K.I. Sawyer Air Force Base, 4.0 mi north of Little Lake.	b3.2	1985	02-07-85	*10.1
						05-02-85	d12.3
						05-30-85	*16.6
						06-25-85	d11.3
						07-24-85	*9.35
						08-28-85	*12.1
						09-19-85	*11.9
						11-19-85	15.7
						12-17-85	*12.2
						01-29-86	*12.1
03-03-86	*12.4						
04044588	Chocolay River	Lake Superior	Lat 46°29'21", long 87°19'43", in NE1/4 sec.8, T.47 N., R.24 W., Marquette County, Hydrologic Unit 04020201, at State Highway 28, 1.5 mi southeast of Harvey.	149	1948, 1963-64, 1985	04-24-85	1,090

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1986--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 MICHIGAN							
04057000	Indian River	Manistique River	Lat 45°59'30", long 86°17'15", in NE1/4 sec.34, T.42 N., R.16 W., Schoolcraft County, Hydrologic Unit 04060106, at outlet of Indian Lake, 2.3 mi northwest of Manistique.	302	1938-71†, 1972-82e	04-23-85	963
04067085	Little Cedar River	Menominee River	Lat 45°29'33", long 87°36'16", in S1/2 sec.23, T.36 N., R.27 W., Menominee County, Hydrologic Unit 04030108, at county highway, 2.0 mi north of Daggett.	6130	--	04-12-85	244
04096950	Bear Creek	Mottawa Creek	Lat 42°04'32", long 85°19'58", in SW1/4 sec.35, T.4 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050001, at 44th Street, 3.0 mi south of Fulton.	10.8	1964-67	07-15-86	30.7
04097040	Little Portage Creek	St. Joseph River	Lat 42°09'51", long 85°20'18", in NE1/4 sec.34, T.3 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050001, at TS Avenue, 5.0 mi south of Climax.	10.1	1964-67	07-15-86	11.4
04097060	Little Portage Creek	St. Joseph River	Lat 42°05'19", long 85°23'29", in SW1/4 sec.29, T.4 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050001, at 38th Street, 2.8 mi southwest of Fulton.	27.0	1964, 1965-67†, 1972-79e	07-15-86	28.3
04097120	Portage River	St. Joseph River	Lat 42°10'21", long 85°28'19", in SE1/4 Sec.28, T.3 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at S Avenue, 2.7 mi southwest of Scotts.	32.8	1964-67	07-15-86	37.3
04097205	Gourdneck Creek	Portage Creek	Lat 42°08'58", long 85°32'24", in SW1/4 sec.1, T.4 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050001, at 23rd Street, 2.0 mi north of Vicksburg.	13.1	1964-69	07-15-86	16.0
04097207	Austin Lake Outlet	Gourdneck Creek	Lat 42°09'03", long 85°31'59", in SE1/4 sec.1, T.4 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050001, at TU Avenue, 2.0 mi north of Vicksburg.	15.6	1964, 1966-67	07-15-86	1.43
04097210	Portage Creek	Portage River	Lat 42°06'52", long 85°32'05", in NE1/4 sec.24, T.4 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050001, at W Avenue, at Vicksburg.	35.2	1964, 1966-67	07-29-86	28.2
04097240	Portage Creek	Portage River	Lat 42°04'25", long 85°30'55", in SW1/4 sec.32, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at Z Avenue, 3.4 mi southeast of Vicksburg.	57.7	1964, 1966-67	07-30-86	64.2
04097330	Bear Creek	Portage River	Lat 42°04'42", long 85°28'07", in SW1/4 NW1/4 sec.34, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, at YZ Avenue, 4.2 mi southeast of Vicksburg.	13.1	1964-67f	07-15-86	11.7
04097370	Flowerfield Creek	Rocky River	Lat 42°03'50", long 85°39'44", in SW1/4 sec.1, T.5 S., R.12 W., St. Joseph County, Hydrologic Unit 04050001, at Flowerfield Road in Flowerfield.	42.6	1964-79e	07-29-86	24.1
04097380	Spring Creek	Flowerfield Creek	Lat 42°03'50", long 85°36'25", in NW1/4 sec.4, T.5 S., R.11 W., St. Joseph County, Hydrologic Unit 04050001, at Muskrat Road, 2.5 mi east of Flowerfield.	10.9	1964, 1966-67, 1977	07-29-86	7.75
04103975	Battle Creek	Kalamazoo River	Lat 42°31'43", long 84°47'51", in SW1/4 sec.29, T.2 N., R.4 W., Eaton County, Hydrologic Unit 04050003, at Brookfield Road, 2.5 mi southeast of Charlotte.	--	--	08-18-86	*g8.14

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1986--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 MICHIGAN--Continued							
04104000	Battle Creek	Kalamazoo River	Lat 42°32'20", long 84°50'55", in SW1/4 sec.24, T.2 N., R.5 W., Eaton County, Hydrologic Unit 04050003, at Kalamo Road, 1.2 mi southwest of Charlotte.	667	1948-54†, 1955, 1963-64, 1971, 1979	08-18-86	*g11.4
04104293	Battle Creek	Kalamazoo River	Lat 42°28'28", long 84°56'06", in NW1/4 sec.17, T.1 N., R.5 W., Eaton County, Hydrologic Unit 04050003, at Ainger Road, 2.0 mi north of Olivet.	--	--	08-19-86	*g14.4
04104497	Battle Creek	Kalamazoo River	Lat 42°26'49", long 85°05'05", in NE1/4 sec.28, T.1 S., R.6 W., Eaton County, Hydrologic Unit 04050003, at Main Street in Bellevue.	--	--	08-19-86	*g29.7
04104800	Battle Creek	Kalamazoo River	Lat 42°21'51", long 85°07'21", in SE1/4 sec.21, T.1 S., R.7 W., Calhoun County, Hydrologic Unit 04050003, at 9 Mile Road, 1.0 mi southwest of Pennfield.	--	--	08-19-86	*g52.2
04105671	Eagle Lake Drain	Kalamazoo River	Lat 42°20'13", long 85°20'10", in SW1/4 sec.35, T.1 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050003, at River Road, 0.8 mi east of Augusta.	7.26	--	08-01-86	7.47
04105800	Gull Creek	Kalamazoo River	Lat 42°18'54", long 85°24'04", in NE1/4 sec.7, T.2 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050003, at 37th Street, 2.0 mi northeast of Galesburg.	38.1	1965-73†, 1973-74e	07-31-86	47.4
04105990	Comstock Creek	Kalamazoo River	Lat 42°18'10", long 85°30'16", in NW1/4 sec.17, T.2 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050003, at E. Main Street, 4.3 mi east of Kalamazoo.	18.3	1964-71	07-31-86	7.59
04106050	Davis Creek	Kalamazoo River	Lat 42°16'27", long 85°32'17", in SE1/4 sec.24, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Olmstead Road in Kalamazoo.	15.2	1964-67h	07-31-86	6.37
04106512	Portage Creek	Kalamazoo River	Lat 42°17'40", long 85°34'25", in SE1/4 sec.15, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Kalamazoo Avenue in Kalamazoo.	51.4	1946-48, 1968, 1970, 1972, 1976	08-01-86	44.4
04106513	Arcadia Creek	Kalamazoo River	Lat 42°17'40", long 85°35'28", in SE1/4 sec.16, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at Kalamazoo Avenue in Kalamazoo.	20.0	--	07-31-86	3.77
04106750	Spring Brook	Kalamazoo River	Lat 42°21'24", long 85°33'05", in NW1/4 sec.25, T.1 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at River-view Drive, 0.6 mi north of East Cooper.	31.1	1942, 1964-71, 1984	07-15-86	20.4
04106770	Kalamazoo River	Lake Michigan	Lat 42°22'35", long 85°34'47", in SE1/4 sec.15, T.1 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, at D Avenue, 1.5 mi east of Cooper Center.	1,250	1965-66, 1968-71	07-15-86	1,420
04107215	Gun River	Kalamazoo River	Lat 42°32'17", long 85°33'47", in SE1/4 sec.23, T.2 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 116th Avenue, 4.0 mi east of Martin.	73.3	1963, 1965	05-28-86	g90.4
04107220	Gun River	Kalamazoo River	Lat 42°30'56", long 85°33'46", in NW1/4 SW1/4 sec.36, T.2 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 2nd Street, 0.5 mi north of Hooper.	--	--	08-25-86	g57.4

See footnotes at end of table.

Discharge measurements made at special study and miscellaneous sites during water year 1986--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 MICHIGAN--Continued							
04107223	Gun River	Kalamazoo River	Lat 42°30'34", long 85°33'36", in SW1/4 SW1/4 sec.36, T.2 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 112th Avenue in Hooper.	--	--	05-28-86	g117
04107225	Gun River	Kalamazoo River	Lat 42°29'38", long 85°35'03", in SE1/4 sec.3, T.1 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 110th Avenue, 5.0 mi northeast of Plainwell.	--	--	05-28-86	g119
04107228	Gun River	Kalamazoo River	Lat 42°28'40", long 85°36'44", in NW1/4 NE1/4 sec.16, T.1 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 7th Street, 3.0 mi northeast of Plainwell.	--	--	05-28-86	g134
04107233	Gun River	Kalamazoo River	Lat 42°28'18", long 85°39'03", in SW1/4 NE1/4 sec.18, T.1 N., R.11 W., Allegan County, Hydrologic Unit 04050003, at 107th Avenue, 2.0 mi north of Plainwell.	--	--	05-28-86	g140
04107710	Sand Creek	Pine Creek	Lat 42°21'02", long 85°44'43", in SW1/4 sec.29, T.1 S., R.12 W., Kalamazoo County, Hydrologic Unit 04050003, at 2nd Street, 2.0 mi southwest of Alamo.	21.2	1964, 1966-67	07-15-86	15.7
04107750	Rupert Lake Outlet	Pine Creek	Lat 42°24'53", long 85°44'17", in NE1/4 sec.5, T.1 S., R.12 W., Kalamazoo County, Hydrologic Unit 04050003, at AB Avenue, 5.5 mi southwest of Plainwell.	5.27	1964-67	07-15-86	14.7
04113140	Miller Creek	Grand River	Lat 42°44'27", long 84°41'39", in NE1/4 NW1/4 sec.17, T.4 N., R.3 W., Eaton County, Hydrologic Unit 04050004, at Saginaw Highway, 2.4 mi east of Grand Ledge.	--	--	06-12-86	g172
04116517	Flat River	Grand River	Lat 42°57'56", long 85°21'04", in SW1/4 NW1/4 sec.26, T.7 N., R.9 W., Kent County, Hydrologic Unit 04050006, at Burroughs Road, 1.5 mi north of Lowell.	--	--	06-10-86	g138
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 Road, 2.3 mi northeast of Wolf Lake.	--	1985	02-06-86	*g33.8
04122064	North Drain	Mosquito Creek	Lat 43°16'37", long 86°04'13", in NE1/4 NE1/4 sec.10, T.10 N., R.15 W., Muskegon County, Hydrologic Unit 04060102, at the outfall, 2.8 mi northeast of Wolf Lake.	--	--	02-06-86	*g27.5
04122335	Danaher Creek	Danaher Lake	Lat 43°51'02", long 85°53'04", in SE1/4 NE1/4 sec.20, T.17 N., R.13 W., Lake County, Hydrologic Unit 04060101, at Star Lake Road, 3.6 mi southwest of Baldwin.	--	--	09-09-86	*g6.76
04127025	Jaxon Creek	Boardman River	Lat 44°38'14", long 85°34'40", in SE1/4 NE1/4 sec.24, T.26 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, at foot bridge below confluence of branches, 2.5 mi northwest of Mayfield.	--	--	06-04-86	*3.57
STREAMS TRIBUTARY TO DETROIT RIVER							
04165992	River Rouge	Detroit River	Lat 42°33'31", long 83°13'00", in NE1/4 NW1/4 sec.25, T.2 N., R.10 E., Oakland County, Hydrologic Unit 04090004, at Redding Street in Birmingham.	--	--	07-01-86	*g5.36

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1986--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Discharge (ft ³ /s)
STREAMS TRIBUTARY TO DETROIT RIVER--Continued							
04166350	Upper River Rouge	River Rouge	Lat 42°23'59", long 83°17'11", in NW1/4 sec.20, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at 5 Mile Road in Redford.	22.2	1967-68, 1976-77	07-01-86	*g5.89
04166450	Bell Branch	Upper River Rouge	Lat 42°23'32", long 83°17'45", in SW1/4 sec.20, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Beech Daly Road in Redford.	40.8	1967-68, 1976-77	07-01-86	*g5.05
04166700	Johnson Drain	Middle River Rouge	Lat 42°25'33", long 83°28'43", in SE1/4 sec.3, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at 7 Mile Road in Northville.	26.1	1967-68, 1976-77	07-01-86	*g7.74
04166730	Middle River Rouge	River Rouge	Lat 42°24'02", long 83°28'08", in SW1/4 sec.14, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Northville Road, 1.5 mi north of Plymouth.	--	1974	07-01-86	*g18.1
04166900	Tonquish Creek	Middle River Rouge	Lat 42°21'07", long 83°23'10", in NW1/4 sec.4, T.2 S., R.9 E., Wayne County, Hydrologic Unit 04090004, at Wayne Road, 0.7 mi west of Nankin Mills.	24.2	1967-68, 1976-77	07-01-86	*g4.87
04167495	Lower River Rouge	River Rouge	Lat 42°16'46", long 83°27'24", in SW1/4 SE1/4 sec.26, T.2 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Lilley Road, 3.7 mi west of Wayne.	--	--	07-01-86	*g1.55
04167650	Lower River Rouge	River Rouge	Lat 42°16'57", long 83°24'25", in SE1/4 SE1/4 sec.30, T.2 S., R.9 E., Wayne County, Hydrologic Unit 04090004, at Newburgh Road in Wayne.	--	--	07-01-86	*g2.98
04168587	Ecorse River	Detroit River	Lat 42°15'53", long 83°10'32", in NE1/4 SE1/4 sec.6, T.3 S., R.11 E., in Private Claim 37, Wayne County, Hydrologic Unit 04090004, at John Papalos Drive in Lincoln Park.	--	--	07-29-86 08-04-86	*g0.80 *g2.59
04168590	Ecorse River	Detroit River	Lat 42°15'23", long 83°09'59", Wayne County, Hydrologic Unit 04090004, at Austin Avenue in Lincoln Park.	--	--	04-24-86	*g8.25
04168594	South Branch Ecorse River	Ecorse River	Lat 42°13'41", long 83°12'26", in NW1/4 NW1/4 sec.24, T.3 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Moran Avenue in Lincoln Park.	11.0	1973-74	07-29-86	*g0.92

* Base flow.

† Operated as a continuous-record gaging station.

a Revised; published as Station No. 04044211 in WDR MI-85.

b Approximately.

c Published as Station No. 04044531.

d Affected by diversion for sprinkler irrigation.

e Operated as a crest-stage partial-record station.

f Previously published as Brown Creek.

g Discharge measurement made by employees of Michigan Department of Natural Resources.

h Previously published as Allen Creek.

Water-quality partial-record stations are particular sites where chemical-quality, biological and/or sediment data are collected systematically over a period of years for use in hydrologic analyses. These data are collected usually less than quarterly. Samples collected at sites other than gaging stations and partial-record stations to give better areal coverage in a river basin are referred to as miscellaneous sites.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

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)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L AS CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)
		04096950	- BEAR CREEK AT 44TH ST NR FULTON, MI					(LAT 42 04 32 LONG 085 19 58)			
JUL 15...	1200	31	323	7.50	22.5	2.0	3.8	45	180	11	51
		04097060	- L PORTAGE C AT 38TH ST NR FULTON, MI					(LAT 42 05 19 LONG 085 23 29)			
JUL 15...	1400	28	491	8.00	19.0	2.5	7.9	87	280	65	79
		04097120	- PORTAGE R AT S AVENUE NR SCOTTS, MI					(LAT 42 10 21 LONG 085 28 19)			
JUL 15...	1115	37	431	8.00	19.0	2.0	6.0	66	250	51	68
		04097170	- PORTAGE RIVER NEAR VICKSBURG, MI					(LAT 42 06 53 LONG 085 29 08)			
JUL 30...	1355	63	377	7.80	25.0	2.3	5.8	72	200	35	54
		04097205	- GOORDNECK CREEK NR VICKSBURG, MI					(LAT 42 08 58 LONG 085 32 24)			
JUL 15...	1400	16	360	7.70	25.0	8.0	4.5	56	180	18	43
		04097207	- AUSTIN LK OUTLET AT TU AVE NR VICKSBURG, MI					(LAT 42 09 03 LONG 085 31 59)			
JUL 15...	1600	1.4	483	8.00	19.5	1.6	5.7	64	240	35	64
		04097210	- PORTAGE CREEK AT W AVENUE NR VICKSBURG, MI					(LAT 42 06 52 LONG 085 32 05)			
JUL 29...	1700	28	370	8.00	27.0	1.5	7.3	95	180	12	46
		04097240	- PORTAGE CREEK NEAR MENDON, MI					(LAT 42 04 25 LONG 085 30 55)			
JUL 30...	1140	64	365	7.90	25.0	1.7	6.1	76	190	29	47
		04097330	- BEAR CREEK NR VICKSBURG, MI					(LAT 42 04 42 LONG 085 28 07)			
JUL 15...	1530	12	485	7.90	21.0	3.5	6.6	76	290	63	82
		04097370	- FLOWERFIELD CREEK AT FLOWERFIELD, MI					(LAT 42 03 50 LONG 085 39 44)			
JUL 29...	1200	24	488	8.00	20.0	1.5	8.2	93	260	24	68
		04097380	- SPRING CREEK NR FLOWERFIELD, MI					(LAT 42 03 50 LONG 085 36 25)			
JUL 29...	1435	7.8	426	7.80	22.0	2.5	8.4	99	230	45	62
		04105671	- EAGLE LAKE DRAIN NEAR AUGUSTA, MI					(LAT 42 20 13 LONG 085 20 10)			
AUG 01...	1030	7.5	373	8.00	23.0	4.0	6.1	73	210	19	56

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986--Continued

DATE	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	PERCENT SODIUM	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)	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)
	04096950	- BEAR CREEK AT 44TH ST NR FULTON, MI						(LAT 42 04 32 LONG 085 19 58)			
JUL 15...	13	2.9	3	1.3	10	12	7.2	.10	17	234	210
	04097060	- L PORTAGE C AT 38TH ST NR FULTON, MI						(LAT 42 05 19 LONG 085 23 29)			
JUL 15...	20	4.7	4	1.4	4.1	52	12	.10	12	348	310
	04097120	- PORTAGE R AT S AVENUE NR SCOTTS, MI						(LAT 42 10 21 LONG 085 28 19)			
JUL 15...	19	4.2	4	1.6	3.8	43	9.8	.20	12	297	280
	04097170	- PORTAGE RIVER NEAR VICKSBURG, MI						(LAT 42 06 53 LONG 085 29 08)			
JUL 30...	17	4.7	5	1.3	5.2	34	11	.10	7.2	247	230
	04097205	- GOURDNECK CREEK NR VICKSBURG, MI						(LAT 42 08 58 LONG 085 32 24)			
JUL 15...	18	7.9	9	.70	6.3	20	12	.20	9.3	212	210
	04097207	- AUSTIN LK OUTLET AT TU AVE NR VICKSBURG, MI						(LAT 42 09 03 LONG 085 31 59)			
JUL 15...	19	8.2	7	1.6	3.9	35	18	.10	10	288	280
	04097210	- PORTAGE CREEK AT W AVENUE NR VICKSBURG, MI						(LAT 42 06 52 LONG 085 32 05)			
JUL 29...	16	6.5	7	1.1	3.3	15	14	.10	14	223	210
	04097240	- PORTAGE CREEK NEAR MENDON, MI						(LAT 42 04 25 LONG 085 30 55)			
JUL 30...	17	6.9	7	.90	3.9	27	14	.10	6.6	220	210
	04097330	- BEAR CREEK NR VICKSBURG, MI						(LAT 42 04 42 LONG 085 28 07)			
JUL 15...	20	6.4	5	2.0	5.5	39	16	.20	14	343	310
	04097370	- FLOWERFIELD CREEK AT FLOWERFIELD, MI						(LAT 42 03 50 LONG 085 39 44)			
JUL 29...	23	3.7	3	.90	4.6	22	9.9	.20	15	301	290
	04097380	- SPRING CREEK NR FLOWERFIELD, MI						(LAT 42 03 50 LONG 085 36 25)			
JUL 29...	18	5.9	5	1.4	5.6	31	16	.20	12	266	260
	04105671	- EAGLE LAKE DRAIN NEAR AUGUSTA, MI						(LAT 42 20 13 LONG 085 20 10)			
AUG 01...	17	4.1	4	.60	3.7	19	6.8	.10	6.8	225	220

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986--Continued

DATE	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, 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)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)
04096950											
JUL 15...	.32	20	--	<.010	.050	1.2	--	.100	.080	4	<10
04097060											
JUL 15...	.47	26	2.5	.020	.080	1.0	3.6	.070	.050	3	<10
04097120											
JUL 15...	.40	30	.57	.030	.130	.97	1.7	.060	.020	6	<10
04097170											
JUL 30...	.34	42	--	<.010	.040	.56	.80	.020	.010	2	<10
04097205											
JUL 15...	.29	9.2	--	<.010	.030	.97	--	.030	.020	1	<10
04097207											
JUL 15...	.39	1.1	.46	.040	.170	.53	1.2	.050	.020	2	<10
04097210											
JUL 29...	.30	17	--	<.010	.030	.57	--	.020	<.010	2	<10
04097240											
JUL 30...	.30	38	.58	.020	.050	.45	1.1	.020	.010	2	<10
04097330											
JUL 15...	.47	11	1.6	.020	.080	1.2	2.9	.080	.050	3	<10
04097370											
JUL 29...	.41	20	1.4	.020	.040	.76	2.2	.040	.030	2	<10
04097380											
JUL 29...	.36	5.6	1.3	.020	.060	.94	2.3	.030	.010	1	<10
04105671											
AUG 01...	.31	4.6	--	<.010	.100	.70	--	.040	.010	2	<10

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986--Continued

DATE	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR)	COBALT, TOTAL RECOVERABLE (UG/L AS CO)	COPPER, TOTAL RECOVERABLE (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	STRONTIUM, TOTAL RECOVERABLE (UG/L AS SR)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	SEDIMENT, DISCHARGE, SUSPENDED (MG/L) (T/DAY)
04096950	- BEAR CREEK AT 44TH ST NR FULTON, MI (LAT 42 04 32 LONG 085 19 58)									
JUL 15...	<10	<50	10	960	<100	120	<.10	80	20	2 .17
04097060	- L PORTAGE C AT 38TH ST NR FULTON, MI (LAT 42 05 19 LONG 085 23 29)									
JUL 15...	<10	<50	10	860	<100	100	<.10	110	10	8 .60
04097120	- PORTAGE R AT S AVENUE NR SCOTTS, MI (LAT 42 10 21 LONG 085 28 19)									
JUL 15...	<10	<50	10	1200	<100	160	<.10	80	10	17 1.7
04097170	- PORTAGE RIVER NEAR VICKSBURG, MI (LAT 42 06 53 LONG 085 29 08)									
JUL 30...	<10	<50	<10	400	<100	80	.10	60	10	-- --
04097205	- GOURDNECK CREEK NR VICKSBURG, MI (LAT 42 08 58 LONG 085 32 24)									
JUL 15...	<10	<50	10	400	<100	40	<.10	60	20	1 .04
04097207	- AUSTIN LK OUTLET AT TU AVE NR VICKSBURG, MI (LAT 42 09 03 LONG 085 31 59)									
JUL 15...	<10	<50	<10	1500	<100	100	<.10	50	10	12 .05
04097210	- PORTAGE CREEK AT W AVENUE NR VICKSBURG, MI (LAT 42 06 52 LONG 085 32 05)									
JUL 29...	<10	<50	<10	90	<100	50	.10	40	<10	3 .23
04097240	- PORTAGE CREEK NEAR MENDON, MI (LAT 42 04 25 LONG 085 30 55)									
JUL 30...	<10	<50	<10	200	<100	40	.10	50	30	4 .69
04097330	- BEAR CREEK NR VICKSBURG, MI (LAT 42 04 42 LONG 085 28 07)									
JUL 15...	<10	<50	10	1200	<100	130	.10	100	10	8 .26
04097370	- FLOWERFIELD CREEK AT FLOWERFIELD, MI (LAT 42 03 50 LONG 085 39 44)									
JUL 29...	<10	<50	<10	690	<100	180	.10	60	20	12 .78
04097380	- SPRING CREEK NR FLOWERFIELD, MI (LAT 42 03 50 LONG 085 36 25)									
JUL 29...	<10	<50	<10	840	<100	60	.10	60	90	6 .13
04105671	- EAGLE LAKE DRAIN NEAR AUGUSTA, MI (LAT 42 20 13 LONG 085 20 10)									
AUG 01...	<10	<50	<10	460	<100	90	.10	60	<10	15 .30

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986--Continued

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)	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)
	04105800	- GULL CREEK NEAR GALESBURG, MI						(LAT 42 18 54 LONG 085 24 04)			
JUL 31...	1300	47	354	8.20	27.0	1.7	8.4	109	190	23	43
	04105990	- COMSTOCK CREEK NR KALAMAZOO, MI						(LAT 42 18 10 LONG 085 30 16)			
JUL 31...	1100	7.6	343	8.20	25.5	1.0	9.1	115	190	29	43
	04106050	- DAVIS CREEK AT OLMSTEAD RD AT KALAMAZOO, MI						(LAT 42 16 27 LONG 085 32 17)			
JUL 31...	1400	6.4	588	8.10	20.5	3.5	9.4	108	270	37	77
	04106512	- PORTAGE CREEK AT MICHIGAN AVE AT KALAMAZOO, MI (LAT 42 17 40 LONG 085 34 25)									
AUG 01...	1230	44	637	8.10	22.5	8.0	7.6	90	290	50	77
	04106513	- ARCADIA CREEK AT KALAMAZOO, MI						(LAT 42 17 40 LONG 085 35 28)			
JUL 31...	0900	3.8	774	8.10	19.0	1.0	8.6	96	330	54	83
	04106750	- SPRING BROOK NR EAST COOPER, MI						(LAT 42 21 24 LONG 085 33 05)			
JUL 15...	1915	20	550	8.30	18.0	2.2	8.9	97	260	32	67
	04106770	- KALAMAZOO RIVER NR COOPER CENTER, MI						(LAT 42 22 35 LONG 085 34 47)			
JUL 15...	1700	1420	566	8.30	26.5	5.0	9.4	120	270	57	72
	04107710	- SAND CREEK NR ALAMO, MI						(LAT 42 21 02 LONG 085 44 43)			
JUL 15...	1315	16	494	8.00	16.5	1.5	8.8	92	280	45	71
	04107750	- RUPERT LAKE OUTLET NR PLAINWELL, MI						(LAT 42 24 53 LONG 085 44 17)			
JUL 15...	1100	15	480	8.20	22.5	2.5	8.2	97	280	55	70
	04127017	- JAXON CREEK NEAR MAYFIELD, MI						(LAT 44 37 42 LONG 085 34 09)			
FEB 21...	1030	2.0	459	7.60	1.0	--	7.8	55	--	--	--
	04127025	- JAXON C BELOW W BR JAXON C NR MAYFIELD MI						(LAT 44 38 14 LONG 085 34 40)			
JUN 04...	1115	3.6	326	8.10	11.0	--	9.4	88	--	--	--

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986--Continued

[illegible]

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986--Continued

DATE	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, 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)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)
04105800	- GULL CREEK NEAR GALESBURG, MI (LAT 42 18 54 LONG 085 24 04)										
JUL 31...	.29	27	--	<.010	.040	.46	--	.020	<.010	4	<10
04105990	- COMSTOCK CREEK NR KALAMAZOO, MI (LAT 42 18 10 LONG 085 30 16)										
JUL 31...	.30	4.6	--	<.010	.040	.56	.70	.010	<.010	<1	<10
04106050	- DAVIS CREEK AT OLMSTEAD RD AT KALAMAZOO, MI (LAT 42 16 27 LONG 085 32 17)										
JUL 31...	.49	6.3	.83	.070	.360	.44	1.7	.110	.080	5	<10
04106512	- PORTAGE CREEK AT MICHIGAN AVE AT KALAMAZOO, MI (LAT 42 17 40 LONG 085 34 25)										
AUG 01...	.52	45	.58	.020	.100	.40	1.1	.090	.030	4	<10
04106513	- ARCADIA CREEK AT KALAMAZOO, MI (LAT 42 17 40 LONG 085 35 28)										
JUL 31...	.58	4.4	1.1	.010	.080	.22	1.4	.080	.050	1	<10
04106750	- SPRING BROOK NR EAST COOPER, MI (LAT 42 21 24 LONG 085 33 05)										
JUL 15...	.38	15	--	<.010	.030	.87	2.6	.030	.010	<1	<10
04106770	- KALAMAZOO RIVER NR COOPER CENTER, MI (LAT 42 22 35 LONG 085 34 47)										
JUL 15...	.46	1300	1.1	.020	.050	.95	2.1	.090	.030	2	<10
04107710	- SAND CREEK NR ALAMO, MI (LAT 42 21 02 LONG 085 44 43)										
JUL 15...	.41	13	.29	.010	.050	.45	.80	.020	<.010	3	<10
04107750	- RUPERT LAKE OUTLET NR PLAINWELL, MI (LAT 42 24 53 LONG 085 44 17)										
JUL 15...	.43	13	.29	.010	.090	.51	.90	.020	<.010	3	<10
04127017	- JAXON CREEK NEAR MAYFIELD, MI (LAT 44 37 42 LONG 085 34 09)										
FEB 21...	--	--	.33	.013	.070	.13	.55	<.010	<.010	--	--
04127025	- JAXON C BELOW W BR JAXON C NR MAYFIELD MI (LAT 44 38 14 LONG 085 34 40)										
JUN 04...	--	--	.05	.006	.010	.39	.45	--	<.010	--	--

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986--Continued

[illegible]

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

309

443244085410401 FISH LAKE NEAR BUCKLEY, MI

LOCATION.--Lat 44°32'44", long 85°41'04", in sec.19, T.25 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060103, 3.0 mi northwest of Buckley.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	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)
SEP 03...	1500	155	7.40	20.0	8.4	95	80	11	24	4.9	1.1

DATE	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)	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)	
SEP 03...	.1	3	.80	5.3	7.5	4.7	<.10	.7	97	85	.13

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)
SEP 03...	<.010	<.010	<.01	<.01	.020	.020	.58	.48

DATE	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	LITHIUM DIS- SOLVED (UG/L AS LI)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)
SEP 03...	.60	.50	.010	<.010	<.010	<.010	5	24

310 ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

443332085204201 FIFE LAKE AT FIFE LAKE, MI

LOCATION.--Lat 44°33'32", long 85°20'42", in many sections, T.25 N., Rs.8 and 9 W., Grand Traverse and Kalkaska Counties, Hydrologic Unit 04060103, at Fife Lake.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Samples were collected 10 feet below water surface. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (MG/L)	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)
AUG 28...	1500	248	8.20	19.5	5	1.1	8.2	92	130	15	40	7.7
SEP 05...	1330	260	--	19.0	--	--	--	--	--	--	--	--

DATE	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	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)	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)
AUG 28...	3.3	.1	5	1.1	1.4	9.8	5.8	<.10	8.2	144	150	.20

DATE	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	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, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOSOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOSOLVED (MG/L AS P)
AUG 28...	--	<.010	<.010	.02	.080	--	.40	.42	.020	.010	<.010	<.010

DATE	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)
AUG 28...	150	<1	<100	50	<1	<10	<1	4	50	7	<5

DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
AUG 28...	4	40	<1	3	<1	50	49	40	5.6	<.010	2

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

311

443452085351801 BREWSTER LAKE NEAR KINGSLEY, MI

LOCATION.--Lat 44°34'52", long 85°35'18", in sec.12, T.25 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060105, 2.6 mi southwest of Kingsley.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

OXYGEN, DIS-SOLVED												
DATE	TIME	SPECIFIC CONDUCTANCE (US/CM)	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	COLOR (PLATINUM-COBALT UNITS)	TURBIDITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED SATURATION	HARDNESS (MG/L AS CaCO3)	HARDNESS, NONCARBONATE (MG/L AS CaCO3)	CALCIUM DIS-SOLVED (MG/L AS Ca)	MAGNESIUM, DIS-SOLVED (MG/L AS Mg)
SEP 04...	1530	341	8.40	17.5	15	.60	8.3	90	160	17	45	11
DATE	SODIUM, DIS-SOLVED (MG/L AS Na)	SODIUM ADSORPTION RATIO	PERCENT SODIUM	POTASSIUM, DIS-SOLVED (MG/L AS K)	CARBON DIOXIDE, DIS-SOLVED (MG/L AS CO2)	SULFATE, DIS-SOLVED (MG/L AS SO4)	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)
SEP 04...	2.4	.1	3	.90	1.1	18	8.7	.10	2.8	178	170	.24
DATE		NITROGEN, NITRATE TOTAL (MG/L AS N)	NITROGEN, NITRITE TOTAL (MG/L AS N)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN, ORGANIC DIS-SOLVED (MG/L AS N)			
SEP 04...		<.01	<.010	<.010	.01	<.01	.020	.48	.35			
DATE		NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC DIS-SOLVED (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DIS-SOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P)				
SEP 04...		.50	.40	.51	.030	.020	.010	<.010				
DATE	ALUMINUM, TOTAL RECOVERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA)	BORON, TOTAL RECOVERABLE (UG/L AS B)	CADMIUM, TOTAL RECOVERABLE (UG/L AS CD)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR)	COBALT, TOTAL RECOVERABLE (UG/L AS CO)	COPPER, TOTAL RECOVERABLE (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)	LITHIUM, DIS-SOLVED (UG/L AS LI)
SEP 04...	<10	<1	<100	<10	<1	<10	<1	<1	<10	5	<5	13
DATE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DIS-SOLVED (UG/L AS MN)	MERCURY, TOTAL RECOVERABLE (UG/L AS HG)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI)	SELENIUM, TOTAL (UG/L AS SE)	STRONTIUM, TOTAL RECOVERABLE (UG/L AS SR)	STRONTIUM, DIS-SOLVED (UG/L AS SR)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)	
SEP 04...	20	<1	1.10	1	<1	80	57	<10	6.2	<.010	3	

312 ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

443532085474001 GREEN LAKE NEAR INTERLOCHEN, MI

LOCATION.--Lat 44°35'32", long 85°47'40", in many sections, Tps.25 and 26 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, 3.8 mi south of Interlochen.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	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)
SEP 03...	1400	279	8.50	20.0	9.2	104	140	9	38	11	4.1

DATE	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	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)	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)
SEP 03...	.2	6	.80	.8	10	6.5	.20	5.2	172	150	.23

DATE	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)
SEP 03...	.00	<.010	<.010	<.01	.010	.010	.49	.49

DATE	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	LITHIUM DIS- SOLVED (UG/L AS LI)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)
SEP 03...	.50	.50	.010	<.010	<.010	<.010	7	84

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

313

443812085452501 DUCK LAKE NEAR INTERLOCHEN, MI

LOCATION.--Lat 44°38'12", long 85°45'25", in many sections, T.26 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, 0.8 mi southeast of Interlochen.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM)	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED SATURATION (%)	HARDNESS (MG/L AS CaCO3)	HARDNESS, NONCARBONATE (MG/L AS CaCO3)	CALCIUM DIS-SOLVED (MG/L AS Ca)	MAGNESIUM, DIS-SOLVED (MG/L AS Mg)	SODIUM, DIS-SOLVED (MG/L AS Na)
SEP 03...	1230	300	8.60	19.5	9.4	105	150	12	41	12	3.0

DATE	SODIUM ADSORPTION RATIO	POTASSIUM, DIS-SOLVED (MG/L AS K)	CARBON DIOXIDE, DIS-SOLVED (MG/L AS CO2)	SULFATE, DIS-SOLVED (MG/L AS SO4)	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 (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	
SEP 03...	.1	4	.80	.7	14	5.2	.20	6.6	184	170	.25

DATE	NITROGEN, NITRATE DIS-SOLVED (MG/L AS N)	NITROGEN, NITRITE TOTAL (MG/L AS N)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, PHOSPHATE TOTAL (MG/L AS P)	PHOSPHORUS, DIS-SOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
SEP 03...	.01	<.010	<.010	.01	.010	.50	<.010	<.010	<.010	<.010

DATE	BARIUM, TOTAL RECOVERABLE (UG/L AS Ba)	BORON, TOTAL RECOVERABLE (UG/L AS B)	IRON, DIS-SOLVED (UG/L AS Fe)	LITHIUM, DIS-SOLVED (UG/L AS Li)	MANGANESE, DIS-SOLVED (UG/L AS Mn)	STRONTIUM, DIS-SOLVED (UG/L AS Sr)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
SEP 03...	200	<10	30	<10	<10	110	7.6	.030	<1

314 ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

443902085312301 ARBUTUS LAKE NEAR MAYFIELD, MI

LOCATION.--Lat 44°39'02", long 85°31'23", in many sections, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, 1.7 mi north of Mayfield.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	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)
SEP 03...	1830	251	8.40	20.0	9.2	104	140	10	38	10	4.8

DATE	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)	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)	
SEP 03...	.2	7	.80	1.0	6.3	10	<.10	6.7	164	150	.22

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
SEP 03...	<.010	<.010	<.01	<.01	.010	.49	.50

DATE	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE, DIS- SOLVED (MG/L AS P)	LITHIUM DIS- SOLVED (UG/L AS LI)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)
SEP 03...	.010	<.010	<.010	<.010	6	63

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

315

443948085274001 RENNIE LAKE NEAR MAYFIELD, MI

LOCATION.--Lat 44°39'48", long 85°27'40", in many sections, T.26 N., Rs.9 and 10 W., Grand Traverse County, Hydrologic Unit 04060105, 4.2 mi northeast of Mayfield.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	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)
SEP 03...	1130	202	8.60	19.0	9.0	100	99	17	29	6.5	3.6

DATE	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)	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)	
SEP 03...	.2	7	.80	.4	7.1	13	<.10	.9	134	110	.18

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)
SEP 03...	<.010	<.010	<.01	<.01	.020	.010	.48	.39

DATE	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE, DIS- SOLVED (MG/L AS P)	LITHIUM DIS- SOLVED (UG/L AS LI)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)
SEP 03...	.50	.40	<.010	<.010	<.010	<.010	5	61

444012085294501 SPIDER LAKE NEAR MAYFIELD, MI

LOCATION.--Lat 44°40'12", long 85°29'45", in many sections, Tps.26 and 27 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, 3.2 mi northeast of Mayfield.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM)	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	COLOR (PLATINUM-COBALT UNITS)	TURBIDITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED SATURATION (%)	HARDNESS (MG/L AS CaCO3)	HARDNESS, NONCARBONATE (MG/L AS CaCO3)	CALCIUM DIS-SOLVED (MG/L AS Ca)	MAGNESIUM, DIS-SOLVED (MG/L AS Mg)
SEP 03...	1500	198	8.50	20.5	5	.50	10.0	115	98	7	29	6.1

DATE	SODIUM, DIS-SOLVED (MG/L AS Na)	SODIUM ADSORPTION RATIO	POTASSIUM, DIS-SOLVED (MG/L AS K)	CARBON DIOXIDE, DIS-SOLVED (MG/L AS CO2)	SULFATE, DIS-SOLVED (MG/L AS SO4)	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)	
SEP 03...	3.6	.2	7	.80	.5	6.8	7.3	<.10	.5	117	110	.16

DATE	NITROGEN, NITRITE TOTAL (MG/L AS N)	NITROGEN, NITRATE DIS-SOLVED (MG/L AS N)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITROGEN, ORGANIC DIS-SOLVED (MG/L AS N)
SEP 03...	<.010	<.010	.01	.020	.020	.58

DATE	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC DIS-SOLVED (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DIS-SOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
SEP 03...	.60	.40	.61	<.010	<.010	<.010	<.010

DATE	ARSENIC TOTAL (UG/L AS AS)	BORON, TOTAL RECOVERABLE (UG/L AS B)	CADMIUM, TOTAL RECOVERABLE (UG/L AS CD)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR)	COBALT, TOTAL RECOVERABLE (UG/L AS CO)	COPPER, TOTAL RECOVERABLE (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)
SEP 03...	<1	<10	<1	<10	2	2	80	5	<5

DATE	LITHIUM, DIS-SOLVED (UG/L AS LI)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DIS-SOLVED (UG/L AS MN)	MERCURY, TOTAL RECOVERABLE (UG/L AS HG)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI)	SELENIUM, TOTAL RECOVERABLE (UG/L AS SE)	STRONTIUM, DIS-SOLVED (UG/L AS SR)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)
SEP 03...	4	20	1	.30	5	<1	32	30

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

317

444018085403501 SILVER LAKE NEAR GRAWN, MI

LOCATION.--Lat 44°40'18", long 85°40'35", in many sections, Tps.26 and 27 N., R.11 W., Grand Traverse County, Hydrologic Unit 04060104, 0.8 mi northeast of Grawn.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	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)
SEP 03...	1030	229	8.40	20.5	8.5	97	100	9	29	7.4	5.7

DATE	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	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)	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)
SEP 03...	.3	11	1.2	.7	7.5	10	.10	6.6	129	120	.18

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)
SEP 03...	<.010	<.010	<.01	<.01	.020	.020	.38	.28

DATE	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE, DIS- SOLVED (MG/L AS P)	LITHIUM DIS- SOLVED (UG/L AS LI)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)
SEP 03...	.40	.30	.010	<.010	<.010	<.010	7	32

318 ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

444032085271301 GRASS LAKE NEAR MAYFIELD, MI

LOCATION.--Lat 44°40'32", long 85°27'13", in sec.6, T.26 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, 5.1 mi northeast of Mayfield.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 2 feet below water surface.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	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)
SEP 04...	1330	228	7.70	21.0	120	13	38	5.8	<.20

DATE	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)	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, DIS- SOLVED (TONS PER AC-FT)
SEP 04...	.80	4.1	11	5.3	<.10	1.2	138	.19

DATE	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
SEP 04...	.01	.01	<.010	<.010	.020	.010	.88

DATE	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	LITHIUM DIS- SOLVED (UG/L AS LI)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	PHENOLS TOTAL (UG/L)
SEP 04...	.90	.010	.010	<.010	13	46	2

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

319

444042085430801 BASS LAKE NEAR GRAWN, MI

LOCATION.--Lat 44°40'42", long 85°43'08", in many sections, Tps.26 and 27 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, 1.6 mi northwest of Grawn.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	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)
SEP 03...	0900	85	8.20	20.0	8.0	90	42	7	13	2.4	.70

DATE	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)	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)	
SEP 03...	.1	3	.60	.4	6.9	1.9	<.10	.2	72	47	.10

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)
SEP 03...	<.010	<.010	<.01	<.01	.030	.020	.57

DATE	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHORUS, DIS- SOLVED (MG/L AS P)	LITHIUM DIS- SOLVED (UG/L AS LI)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)
SEP 03...	.60	.50	.020	<.010	<.010	<.010	4	18

320 ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

44411985451501 LONG LAKE NEAR INTERLOCHEN, MI

LOCATION.--Lat 44°41'19", long 85°45'15", in many sections, Tps.26 and 27 N., R.12 W., Grand Traverse County, Hydrologic Unit 04060104, 3.0 mi north of Interlochen.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (MG/L)	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)
SEP 02...	1500	154	8.20	20.5	5	.50	10.4	118	75	6	23	4.2
DATE	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	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)	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)
SEP 02...	1.2	.1	3	.70	.8	9.7	2.0	.20	.2	99	83	.13
DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (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)	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, ORTHOS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOS, DIS- SOLVED (MG/L AS P)
SEP 02...	<.010	<.010	<.01	.010	.29	.30	.010	<.010	<.010	<.010	<.010	<.010
DATE	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	
SEP 02...	<10	<1	<100	<10	<1	<10	3	1	<10	<3	<5	
DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)	
SEP 02...	4	10	2	.40	4	<1	21	<10	4.1	<.010	3	

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

321

444258085212501 SAND LAKE NO. 1 NEAR WILLIAMSBURG, MI

LOCATION.--Lat 44°42'58", long 85°21'25", in sec.23, T.27 N., R.9 W., Grand Traverse County,
Hydrologic Unit 04060105, 4.5 mi southeast of Williamsburg.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)		
SEP 04...	1100	220	8.70	20.0	5	2.0	10.0	113	110	6	39		
DATE		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)	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, DIS- SOLVED (TONS PER AC-FT)		
SEP 04...		3.8	<.20	.50	.4	8.6	.70	<.10	.9	128	.17		
DATE			NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (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)						
SEP 04...			<.010	<.010	<.01	.020	.78						
DATE			NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTH- THO, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTH- THO, DIS- SOLVED (MG/L AS P)				
SEP 04...			.57	.80	.60	.010	.010	<.010	<.010				
DATE		ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)
SEP 04..	20	1	<100	<10	<1	<10	<1	<1	<1	70	7	<5	11
DATE		MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)	
SEP 04...		<10	<1	.40	2	<1	50	23	10	6.6	<.010	2	

322 ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

445312085241401 ELK LAKE IN NORTHEAST GRAND TRAVERSE COUNTY, MI

LOCATION.--Lat 44°53'12", long 85°24'14", in many sections, Tps.28 and 29 N., R.9 W., Grand Traverse and Antrim Counties, Hydrologic Unit 04060105, 0.8 mi east of Elk Rapids.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 10 feet below water surface. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, (PER- CENT SATUR- ATION)	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)
SEP 02...	1200	274	8.40	19.5	3	1.5	8.5	94	140	10	37	11

DATE	TIME	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	CARBON DIOXIDE SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)	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)
SEP 02...	3.9	.1	6	.90	1.0	11	5.9	.10	6.6	180	150	.24

DATE	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
SEP 02...	.17	<.010	<.010	.18	.18	.020	.28

DATE	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOR- THO, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTHOR- THO, DIS- SOLVED (MG/L AS P)
SEP 02...	.30	<.20	.48	<.010	<.010	<.010	<.010

DATE	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)
SEP 02...	<10	<1	<100	<10	<1	10	<1	2	20	3	<5	<4

DATE	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)
SEP 02...	10	<1	.40	2	<1	60	58	10	2.7	<.010	2

445746085294001 PRESCOTT LAKE NEAR OLD MISSION, MI

LOCATION.--Lat 44°57'46", long 85°29'40", in many sections, T.30 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, 0.5 mi west of Old Mission.

PERIOD OF RECORD.--Water year 1986.

REMARKS.--Sample was collected 3 feet below water surface. One sample for pesticide analysis was collected; results are available in District files.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	SPE- CIFIC CON- DUC- TANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION)	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)
AUG 29...	1345	176	8.00	17.0	10	1.6	5.7	59	95	15	29	5.4
DATE	SODIUM, DIS- SOLVED (MG/L AS NA)	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)	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)	
AUG 29...	1.8	.1	4	.70	1.5	8.5	3.7	.20	1.7	99	100	.13
DATE	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)				
AUG 29...	.01	.01	<.010	<.010	.01	.420	.410	.78				
DATE	NITRO- GEN, ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, PHOS- PHORUS, TOTAL (MG/L AS N)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	PHOS- PHORUS, ORTH- TOTAL (MG/L AS P)	PHOS- PHORUS, ORTH- DIS- SOLVED (MG/L AS P)				
AUG 29...	.19	1.2	.60	1.2	.020	<.010	<.010	<.010				
DATE	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)
AUG 29...	<10	3	<100	<10	<1	<10	<1	1	10	7	<5	<4
DATE	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)	SELE- NIUM, TOTAL (UG/L AS SE)	STRON- TIUM, TOTAL RECOV- ERABLE (UG/L AS SR)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS TOTAL (UG/L)	
AUG 29...	30	<1	.10	3	<1	40	27	20	9.4	<.010	5	

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, 0.2 mi east of intersection of State Highway 37 and Clous Road, and 5.9 mi northwest of Kingsley.

PERIOD OF RECORD.--October 1984 to September 1986 (discontinued).

INSTRUMENTATION.--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. Some rainfall and snowfall events were not recorded because of instrumentation malfunction.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	PRECIP- ITATION DAILY (IN)	SNOW, WATER CONTENT (IN)	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)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)
10-04 to 10-07	.380	--	25	4.20	--	--	--	--	--	--	--	--
10-09 to 10-10	.600	--	15	4.30	--	--	--	--	--	--	--	--
10-12 to 10-13	1.25	--	14	4.40	1.4	.60	.14	.260	<.010	--	.020	.040
10-23 to 10-24	.200	--	--	--	--	--	--	--	--	--	--	--
11-02 to 11-05	1.40	--	16	4.50	1.1	.50	.07	.130	.010	.29	.020	.010
11-06 to 11-07	--	.33	--	--	--	--	--	--	--	--	--	--
11-13 to 11-13	--	.54	23	5.30	--	--	--	--	--	--	--	--
11-16 to 11-19	1.50	--	14	4.30	--	1.5	1.1	.190	<.010	--	.010	.010
11-19 to 11-20	.400	--	10	4.60	--	--	--	--	--	--	--	--
12-01 to 12-11	--	--	20	4.30	--	--	--	--	--	--	--	--
12-22 to 12-24	--	--	38	5.40	1.4	1.0	.57	.330	<.010	--	.020	<.010
01-02 to 01-07	--	--	19	4.60	1.8	1.6	.05	.850	<.010	--	.010	.010
03-25 to 03-26	.500	--	25	5.80	12	1.7	.44	.860	.020	.38	.040	.030
04-01 to 04-01	.320	--	--	--	--	--	--	--	--	--	--	--
04-03 to 04-04	.250	--	--	--	--	--	--	--	--	--	--	--
04-04 to 04-07	.520	--	39	4.20	30	3.2	2.3	.260	<.010	--	.560	.320
04-08 to 04-09	.060	--	--	--	--	--	--	--	--	--	--	--
04-14 to 04-15	.250	--	--	--	--	--	--	--	--	--	--	--
04-15 to 04-16	.180	--	--	--	--	--	--	--	--	--	--	--
04-26 to 04-26	.200	--	58	4.00	--	--	--	--	--	--	--	--
05-15 to 05-16	.950	--	23	4.10	--	--	--	--	--	--	--	--
05-16 to 05-19	.750	--	--	--	--	--	--	--	--	--	--	--
06-04 to 06-05	--	--	29	4.00	--	--	--	--	--	--	--	--
06-11 to 06-12	.450	--	--	--	--	--	--	--	--	--	--	--
06-12 to 06-13	.550	--	--	--	--	--	--	--	--	--	--	--
06-19 to 06-19	.230	--	24	4.10	--	--	--	--	--	--	--	--
06-24 to 06-24	.750	--	7	5.10	--	--	--	--	--	--	--	--
06-26 to 06-26	1.18	--	16	4.30	--	--	--	--	--	--	--	--
06-26 to 06-27	1.10	--	--	--	--	--	--	--	--	--	--	--
07-12 to 07-13	.230	--	15	4.20	--	--	--	--	--	--	--	--
07-15 to 07-18	.250	--	24	4.00	--	--	--	--	--	--	--	--
07-24 to 07-25	2.83	--	--	--	--	--	--	--	--	--	--	--
08-09 to 08-09	.840	--	24	4.10	--	--	--	--	--	--	--	--
08-14 to 08-15	--	--	14	4.30	--	--	--	--	--	--	--	--
09-03 to 09-04	1.10	--	56	3.70	--	--	--	--	--	--	--	--
09-09 to 09-12	3.45	--	9	4.80	--	--	--	--	--	--	--	--
09-14 to 09-22	3.05	--	20	4.40	--	--	--	--	--	--	--	--
09-25 to 09-26	1.55	--	--	--	--	--	--	--	--	--	--	--
09-28 to 09-29	3.30	--	16	4.50	--	--	--	--	--	--	--	--

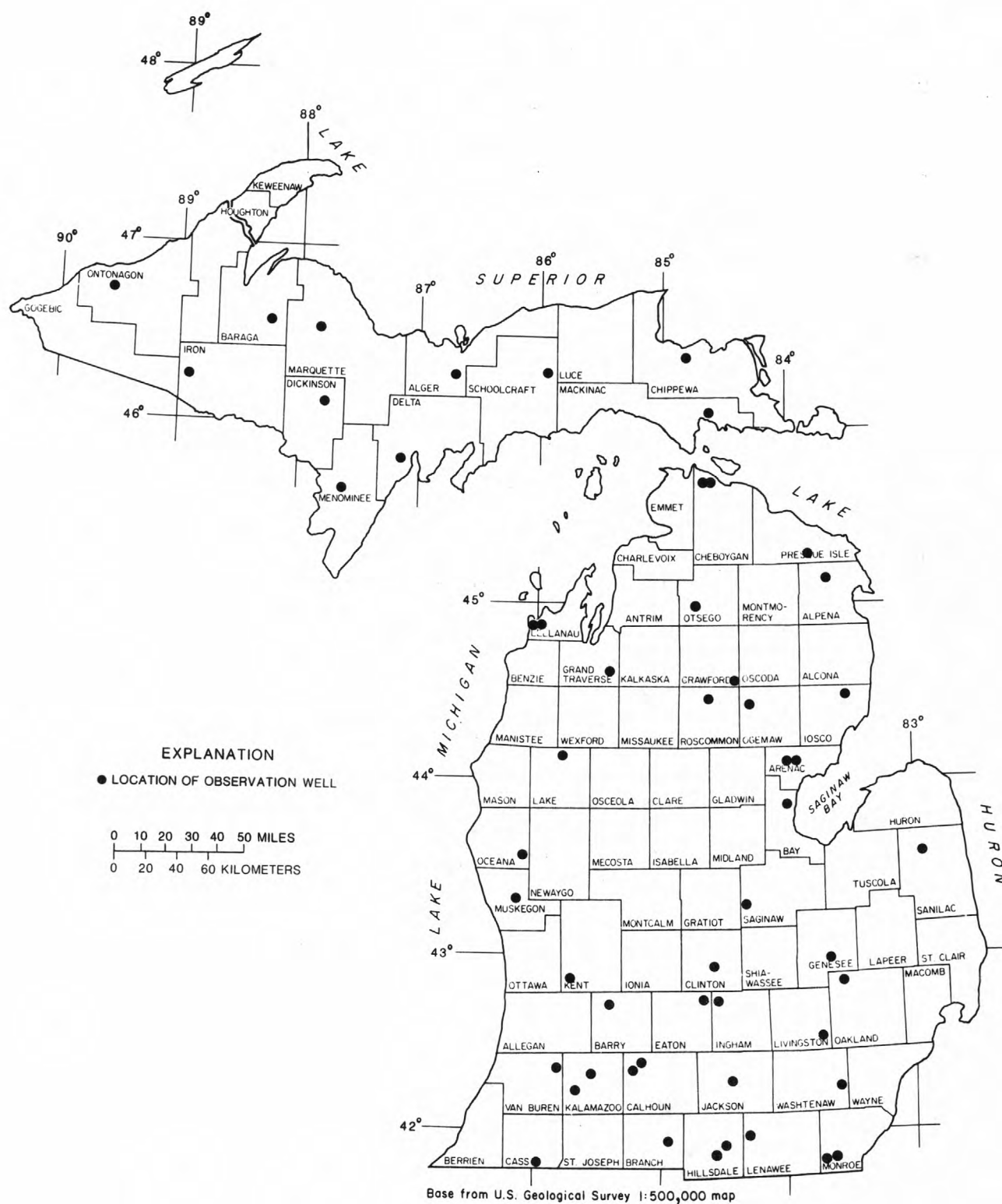


Figure 10.--Location of observation wells published in this report.

GROUND-WATER LEVELS

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ARENAC COUNTY--Continued

440342083542801. Local number, 19N 5E 7DABA2.

LOCATION.--Lat 44°03'42", long 83°54'28", Hydrologic Unit 04080101, and 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 Vertical 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	4.11	DEC 17	3.07	APR 29	2.84	JUN 11	3.39	JUL 24	4.60	SEP 9	6.01
NOV 15	3.70										

BARAGA COUNTY

463353088144301. Local number, 48N 32W 12DDCC.

LOCATION.--Lat 46°33'53", long 88°14'43", Hydrologic Unit 04030107, 95 ft north of U.S. Highway 41, and 0.5 mi southeast of Nestoria Road. Owner: Michigan Department of State Highways.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.5 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 Vertical 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 31	6.91	JAN 31	7.13	MAR 27	7.04	MAY 29	7.16	JUL 31	7.79	SEP 12	7.80
NOV 26	6.46	FEB 27	7.32	APR 30	5.75	JUL 1	7.58	AUG 28	7.69	30	7.75
DEC 31	7.03										

BARRY COUNTY

424540085232001. Local number, 4N 9W 5DAAA.

LOCATION.--Lat 42°45'40", long 85°23'20", Hydrologic Unit 04050007, on Soloman Road, 4 mi east and 3.5 mi north of Middleville. Owner: Michigan 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 Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 24	115.6	JAN 16	116.5	APR 9	116.0	JUL 2	115.6

GROUND-WATER LEVELS

BAY COUNTY

435128083582401. Local number, 17N 4E 22DCAA.

LOCATION.--Lat 43°51'28", long 83°58'24", Hydrologic Unit 04080102, at end of Second Street in 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 bottom.

INSTRUMENTATION.--Monthly measurement. Water-level recorder from August 1962 to October 1979.

DATUM.--Elevation of land-surface datum is 620 ft above National Geodetic Vertical 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	3.09	DEC 17	1.77	MAR 19	1.31	JUN 11	3.01	JUL 24	3.55	SEP 9	1.93
NOV 15	2.35	FEB 7	1.47	APR 29	2.05						

BRANCH COUNTY

415602084593701. Local number, 6S 6W 22CABA.

LOCATION.--Lat 41°56'02", long 84°59'37", Hydrologic Unit 04050001, at Bennett and Tibbits Streets in

Coldwater. Owner: City of Coldwater.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 113 ft, screened 108 to 113 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 970 ft above National Geodetic Vertical 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.88	22.82	21.93	12.72	20.81	20.41	---	21.46	22.84	21.76	16.54	22.09
10	22.71	16.91	21.29	14.02	20.58	20.43	---	12.79	21.29	16.67	16.50	14.03
15	22.34	21.85	12.60	21.41	13.04	11.98	---	16.39	12.45	16.17	22.23	16.24
20	14.38	21.01	20.36	21.47	20.59	20.52	---	15.94	21.38	12.78	22.87	17.33
25	21.94	21.55	12.57	13.62	21.48	19.21	15.54	14.51	16.79	17.93	21.92	19.77
EOM	15.43	20.36	13.19	16.52	12.52	11.55	21.12	12.91	17.61	16.40	13.67	20.14

WTR YR 1986 HIGHEST 10.99 MAR 23, 1986 LOWEST 23.19 OCT 24, 1985

CALHOUN COUNTY

422422085071501. Local number, 1S 7W 10BBAB.

LOCATION.--Lat 42°24'22", long 85°07'15", Hydrologic Unit 04050003, at State Highways 78 and 66, and 5 mi

north of Battle Creek. Owner: Rilla Sabin.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Dug water-table well, diameter 1.25 in., depth 12 ft, screened 9 to 12 feet.

INSTRUMENTATION.--Weekly measurement by observer.

DATUM.--Elevation of land-surface datum is 970.99 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	4.18	DEC 4	3.45	FEB 5	3.60	APR 16	3.20	JUN 11	3.54	AUG 6	3.96
8	4.14	11	3.50	12	3.40	23	3.24	18	3.60	13	4.02
15	4.10	18	3.57	19	3.32	30	3.28	25	3.64	20	4.10
22	4.02	24	3.64	26	3.16	MAY 7	3.30	JUL 2	3.66	27	4.14
29	4.00	JAN 1	3.68	MAR 5	2.90	14	3.36	9	3.63	SEP 3	4.16
NOV 6	3.90	8	3.70	12	2.64	21	3.48	16	3.78	10	4.14
13	3.69	15	3.86	19	2.42	28	3.50	23	3.82	17	4.10
20	3.56	22	3.80	APR 2	3.14	JUN 4	3.50	30	3.90	24	4.06
27	3.39	29	3.80	9	3.20						

GROUND-WATER LEVELS

329

CALHOUN COUNTY--Continued

422025085084001. Local number, 1S 7W 32DABA.

LOCATION.--Lat 42°20'25", long 85°08'40", Hydrologic Unit 04050003, at Verona well field in 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 1985 TO SEPTEMBER 1986

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	8.20	7.00	5.70	6.50	7.00	7.00	6.60	7.40	8.00	7.40	9.30	8.80
10	8.60	6.50	5.90	7.40	7.50	7.50	7.30	7.75	7.90	7.80	8.65	9.50
15	8.10	6.70	5.60	7.40	7.20	6.30	7.20	8.00	7.40	8.80	9.30	9.10
20	7.30	6.60	6.40	7.10	7.40	6.75	6.70	7.65	8.30	7.45	9.80	9.25
25	7.60	6.10	6.00	6.90	7.30	6.70	7.75	7.10	8.10	8.10	9.40	9.45
EOM	6.50	5.70	6.30	7.65	7.60	6.50	7.50	7.40	8.10	8.55	8.90	9.00

CASS COUNTY

414651085575601. Local number, 8S 14W 17BAAA.

LOCATION.--Lat 41°46'51", long 85°57'56", Hydrologic Unit 04050001, at U.S. Highway 112, and 2 mi east of

Adamsville. 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 Vertical Datum of 1929, from topographic map. Measuring point: Top of wooden platform, 1.00 ft above land-surface datum.

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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 24	48.10	DEC 27	48.45	FEB 22	49.70	APR 24	49.50	JUN 25	49.40	AUG 25	49.55
NOV 25	48.45	JAN 22	50.00	MAR 22	49.40	MAY 26	49.35	JUL 25	49.30	SEP 26	50.10

CHEBOYGAN COUNTY

454427084424001. Local number, 39N 3W 29CBCB1.

LOCATION.--Lat 45°44'27", long 84°42'40", Hydrologic Unit 04070003, at Stimpson Road, and 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 bottom.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 705 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.

PERIOD OF RECORD.--January 1979 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 4.71 ft below land-surface datum, Apr. 8, 1986;
lowest measured, 11.68 ft below land-surface datum, Feb. 11, 1981.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	6.03	DEC 31	6.38	APR 8	4.71	JUL 1	7.27	AUG 4	8.65	SEP 23	8.73
NOV 20	5.74	FEB 12	7.03	MAY 13	6.57						

GROUND-WATER LEVELS

CHEBOYGAN COUNTY--Continued

454427084424002. Local number, 39N 3W 29C8CB2.
 LOCATION.-- Lat 45°44'27", long 84°42'40", Hydrologic Unit 04070003, at Stimpson Road, and 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 Vertical 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, 1.80 ft below land-surface datum, Apr. 8, 1986; lowest measured, 6.47 ft below land-surface datum, Feb. 11, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	2.92	DEC 31	2.47	APR 8	1.80	JUL 1	3.32	AUG 4	4.49	SEP 23	4.37
NOV 20	1.96	FEB 12	2.86	MAY 13	2.80						

CHIPPEWA COUNTY

462159084442201. Local number, 46N 4W 24DADA.
 LOCATION.--Lat 46°21'59", long 84°44'22", Hydrologic Unit 04020203, on trail 0.2 mi south of State Highway 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 Vertical 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 recorded, 28.43 ft below land-surface datum, Apr. 14, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	23.41	23.79	23.93	24.17	24.58	24.95	25.25	22.73	22.72	22.84	23.34	23.63
10	23.49	23.87	23.97	24.25	24.64	25.02	24.91	22.64	22.78	22.94	23.41	23.65
15	23.56	23.92	24.00	24.31	24.71	25.10	24.29	22.56	22.84	23.02	23.45	23.67
20	23.63	23.95	24.04	24.37	24.78	25.19	23.76	22.55	22.81	23.12	23.51	23.60
25	23.68	23.98	24.08	24.40	24.83	25.23	23.29	22.57	22.75	23.19	23.53	23.54
EOM	23.73	23.96	24.15	24.52	24.88	25.30	22.96	22.61	22.77	23.26	23.59	23.57

WTR YR 1986 HIGHEST 22.52 MAY 17, 1986 LOWEST 25.31 APR 1, 1986

CLINTON COUNTY

425410084323501. Local number, 6N 2W 16DDAD.
 LOCATION.--Lat 42°54'10", long 84°32'35", Hydrologic Unit 04050005, at U.S. Highway 27, and 6 mi south of St. Johns. Owner: Michigan Department of State Highways.
 AQUIFER.--Gravel of Pleistocene age.
 WELL CHARACTERISTICS.--Driven 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 Vertical Datum of 1929. Measuring point: Top of casing, 0.10 ft below land-surface datum.
 REMARKS.--Federal key well. Measuring point changed from 1.30 ft above land-surface datum to 0.10 ft below land-surface datum on Sept. 23, 1980.
 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 21	17.25	DEC 23	16.02	FEB 25	16.37	APR 28	16.00	JUN 25	16.84	AUG 22	17.71
NOV 26	16.32	JAN 27	16.30	MAR 25	15.63	MAY 27	16.63	JUL 28	17.24	SEP 26	17.38

GROUND-WATER LEVELS

331

CRAWFORD COUNTY

443308084245001. Local number, 25N 1W 15DDCD.
 LOCATION.--Lat 44°33'08", long 84°24'50", Hydrologic Unit 04070007, at State Highway 18, and 2.6 mi south of Eldorado. 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 Vertical 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 1985 TO SEPTEMBER 1986
 LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	27.69	27.76	27.87	27.66	27.61	27.82	27.85	26.76	26.70	26.80	26.89	27.04
10	27.74	27.81	27.87	27.62	27.65	27.85	27.60	26.75	26.72	26.83	26.90	27.05
15	27.71	27.85	27.81	27.62	27.67	27.90	27.40	26.68	26.73	26.84	26.90	27.11
20	27.75	27.84	27.81	27.58	27.69	27.95	27.20	26.68	26.76	26.84	26.97	27.13
25	27.73	27.87	27.73	27.62	27.77	27.98	27.03	26.68	26.79	26.85	26.97	27.09
EOM	27.76	27.87	27.68	27.62	27.78	27.95	26.88	26.65	26.80	26.86	27.03	27.07

WTR YR 1986 HIGHEST 26.64 JUN 1, 1986 LOWEST 27.99 MAR 24, 1986

DELTA COUNTY

45446087090401. Local number, 39N 23W 28ACCC.
 LOCATION.--Lat 45°44'46", long 87°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 Vertical 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 1985 TO SEPTEMBER 1986
 LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	6.09	5.46	5.44	5.79	6.14	6.13	5.43	5.51	6.32	6.85	6.73	6.70
10	6.19	5.66	5.61	5.91	6.13	6.15	5.38	5.73	6.42	7.16	6.43	6.74
15	6.11	5.68	5.59	5.89	6.10	6.16	5.33	5.83	6.39	7.05	6.38	6.40
20	6.13	5.46	5.71	5.92	6.21	6.01	5.34	5.76	6.72	6.77	6.54	6.38
25	6.04	5.52	5.76	5.95	6.20	5.90	5.51	6.01	6.74	6.83	6.55	6.23
EOM	6.15	5.53	5.77	6.08	6.15	5.44	5.46	6.05	6.81	6.66	6.73	5.94

WTR YR 1986 HIGHEST 5.16 APR 6, 1986 LOWEST 7.16 JUL 10, 1986

DICKINSON COUNTY

460458087493901. Local number, 43N 28W 32ADAB.
 LOCATION.--Lat 46°04'58", long 87°49'39", Hydrologic Unit 04030109, 6.25 mi north of Felch.
 Owner: Michigan Department of Natural Resources.
 AQUIFER.--Sand of Pleistocene age.
 WELL CHARACTERISTICS.--Augered water-table well, diameter 1.25 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 Vertical 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, 12.95 ft below land-surface datum, Apr. 9, 1986; lowest measured, 16.50 ft below land-surface datum, Mar. 2, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	14.32	NOV 29	13.55	FEB 3	14.19	APR 9	12.95	JUN 17	14.02	JUL 29	14.55
31	14.06	DEC 31	13.85	MAR 12	14.32	MAY 2	13.02	25	14.11	SEP 18	14.60

GROUND-WATER LEVELS

EATON COUNTY

424435084365001. Local number, 4N 3W 12CDAD.
 LOCATION.--Lat 42°44'35", long 84°36'50", Hydrologic Unit 04050004, at Robins Road, in Delta Township, and 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 datum is 862.91 ft above National Geodetic Vertical 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 1985 TO SEPTEMBER 1986
 LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	75.71	---	77.50	77.13	76.40	80.53	81.54	86.02	87.82	83.57	89.84	78.96
10	---	---	78.00	78.83	77.17	75.89	80.36	88.02	87.49	84.87	88.69	77.87
15	---	---	78.06	78.34	80.19	75.35	80.64	88.78	87.51	81.17	86.14	80.70
20	---	---	75.38	78.11	81.32	79.21	80.67	86.47	87.21	84.15	91.16	82.97
25	---	72.71	77.70	79.42	81.39	81.94	81.40	---	84.30	88.10	90.16	83.32
EOM	---	75.69	77.18	78.80	81.80	82.60	83.84	87.51	83.95	89.59	82.39	79.74

WTR YR 1986 HIGHEST 72.64 NOV 25, 1985 LOWEST 91.71 AUG 23, 1986

GENESEE COUNTY

425552083382801. Local number, 6N 7E 9DCCC.
 LOCATION.--Lat 42°55'52", long 83°38'28", Hydrologic Unit 04080204, at Fisher Body Plant in 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 Vertical 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 1985 TO SEPTEMBER 1986
 LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	60.34	59.11	59.53	59.44	58.41	59.79	59.93	62.96	63.82	66.41	74.10	70.62
10	63.49	58.84	60.04	62.56	60.46	61.24	59.73	60.76	67.33	65.34	71.60	65.38
15	---	61.60	60.12	61.29	60.08	60.23	59.11	61.21	63.52	67.62	71.38	64.81
20	---	58.58	61.37	57.46	58.84	61.92	61.08	61.03	67.40	67.81	70.44	67.80
25	60.43	57.81	58.70	56.52	62.05	59.49	---	61.62	64.75	68.88	71.23	66.90
EOM	59.52	59.45	59.08	63.06	60.35	58.20	---	62.19	---	70.82	66.57	65.62

WTR YR 1986 HIGHEST 55.77 JAN 26, 1986 LOWEST 74.63 AUG 7, 1986

GRAND TRAVERSE COUNTY

443921085213501. Local number, 26N 9W 14ABAA.
 LOCATION.--Lat 44°39'21", long 85°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 Vertical 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, 21.89 ft below land-surface datum, July 24, 1986; lowest recorded, 28.05 ft below land-surface datum, Apr. 3, 1982

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
 LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	24.17	24.37	24.22	23.95	24.25	24.47	23.85	22.67	23.04	22.41	22.09	22.53
10	24.24	24.40	24.11	24.01	24.29	24.51	23.22	22.77	23.08	22.16	22.17	22.57
15	24.28	24.42	24.01	24.07	24.33	24.57	22.92	22.79	23.13	21.98	22.23	22.69
20	24.33	24.44	23.98	24.09	24.37	24.63	22.79	22.86	23.17	21.91	22.32	22.74
25	24.34	24.45	23.95	24.11	24.41	24.63	22.72	22.92	23.00	21.93	22.38	22.77
EOM	24.35	24.35	23.96	24.22	24.44	24.46	22.70	22.96	22.66	21.99	22.46	22.74

WTR YR 1986 HIGHEST 21.89 JUL 24, 1986 LOWEST 24.66 MAR 26, 1986

GROUND-WATER LEVELS

333

HILLSDALE COUNTY

415154084315401. Local number, 7S 2W 15BCBA1.

LOCATION.--LAT 41°51'54", Long 84°31'54", Hydrologic Unit 04100003, on Trail Road, and 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 Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 5	48.21	JAN 28	47.77	APR 21	47.10	JUN 2	47.41	JUL 14	47.62	AUG 26	47.97
DEC 16	47.89	MAR 11	47.62								

415236084313701. Local number, 7S 2W 10BDDD.

LOCATION.--Lat 41°52'36", Long 84°31'37", Hydrologic Unit 04100003, at State Highway 34, and 2.5 mi west of Pittsford. Owner: Michigan Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Augered water-table well, diameter 1.25 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 Vertical 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 5	8.41	JAN 28	8.05	APR 21	7.43	JUN 2	7.89	JUL 14	8.12	AUG 26	8.56
DEC 16	7.53	MAR 11	7.39								

INGHAM COUNTY

424424084340301. Local number, 4N 2W 17ABAA.

LOCATION.--Lat 42°44'24", Long 84°34'03", Hydrologic Unit 04050004, at Kirby and Logan Streets in 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 August 1960.

DATUM.--Elevation of land-surface datum is 858.72 ft above National Geodetic Vertical 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, December 1929; lowest recorded, 168.3 ft below land-surface datum, May 7, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	---	80.60	78.49	---	77.69	---	78.03	79.98	80.81	80.85	80.66
10	---	---	80.43	78.66	---	---	77.20	78.78	80.24	80.73	81.00	80.50
15	---	---	80.01	78.57	---	---	77.09	78.87	80.32	80.48	80.77	80.55
20	---	---	80.15	78.04	---	---	77.44	79.08	80.55	80.43	81.11	80.20
25	---	---	79.41	78.03	---	---	77.71	79.46	80.73	80.63	81.12	79.65
EOM	---	80.77	78.88	---	78.20	77.70	78.05	79.44	80.64	80.62	81.20	79.54
WTR YR 1986	HIGHEST		76.91	APR 11, 1986		LOWEST		85.87	OCT 9, 1985			

GROUND-WATER LEVELS

335

KALAMAZOO COUNTY

421641085350601. Local number, 2S 11W 22C088.

LOCATION.--Lat 42°16'41", Long 85°35'06", Hydrologic Unit 04050003, at southwest corner Crosstown Parkway and Stockbridge Avenue in 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 Vertical 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	8.83	8.87	8.68	8.33	8.29	8.25	6.79	6.07	6.36	6.73	7.07	7.62
10	8.84	8.86	8.62	8.30	8.27	8.24	6.60	6.09	6.44	6.80	7.16	7.70
15	8.85	8.83	8.54	8.29	8.25	7.98	6.42	6.14	6.53	6.78	7.24	7.76
20	8.87	8.80	8.46	8.29	8.25	7.68	6.31	6.18	6.60	6.80	7.34	7.81
25	8.87	8.76	8.42	8.28	8.25	7.37	6.33	6.23	6.66	6.89	7.44	7.85
EOM	8.87	8.72	8.38	8.29	8.25	7.03	6.19	6.30	6.68	6.98	7.54	7.89

WTR YR 1986 HIGHEST 6.04 MAY 5, 1986 LOWEST 8.88 OCT 23, 1985

421325085404801. Local number, 3S 12W 11BDAD.

LOCATION.--Lat 42°13'25", Long 85°04'48", Hydrologic Unit 04050003, at Kalamazoo Valley 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 Vertical Datum of 1929, from topographic map. Measuring point: Top of shelter base, 4.00 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	+0.02	+1.21	+0.94	+0.81	+0.63	+0.62	+0.63	0.15	0.32	0.43	0.39	0.49
10	0.01	+1.27	+0.93	+0.77	+0.61	+0.99	+0.59	0.20	0.29	0.40	0.44	0.51
15	0.04	+1.38	+0.92	+0.75	+0.58	+0.72	+0.57	0.23	0.26	0.37	0.48	0.50
20	+0.44	+1.16	+0.88	+0.73	+0.55	+0.64	+0.18	0.25	0.27	0.27	0.49	0.31
25	+0.62	+1.01	+0.88	+0.71	+0.55	+0.64	0.01	0.27	0.38	0.17	0.49	0.14
EOM	+0.78	+0.97	+0.85	+0.67	+0.57	+0.63	0.10	0.29	0.43	0.26	0.48	+0.01

WTR YR 1986 HIGHEST +1.45 NOV 17, 1985 LOWEST 0.51 SEP 10, 1986

KENT COUNTY

425030085434901. Local number, 5N 12W 40CCD.

LOCATION.--Lat 42°50'30", Long 85°43'49", Hydrologic Unit 04050006, 0.4 mi west of Byron Center Road, and 2.1 mi north of Byron Center. 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 October 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.

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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 24	10.70	JAN 15	10.14	APR 9	9.33	JUL 2	9.97	AUG 13	10.16	SEP 28	9.50
DEC 3	9.79	FEB 26	9.75	MAY 21	9.71						

GROUND-WATER LEVELS

LAKE COUNTY

440737085483701. Local number, 20N 13W 13ACAC1.

LOCATION.--Lat 44°07'37", long 85°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 Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.

PERIOD OF RECORD.--March 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 10.31 ft below land-surface datum, Apr. 23, 1986; lowest measured, 17.71 ft below land-surface datum, Mar. 14, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 3	12.61	NOV 6	12.07	JAN 29	11.57	APR 23	10.31	JUL 17	10.48	AUG 27	11.18
22	11.32	DEC 19	11.13	MAR 12	11.97	JUL 11	10.58	AUG 7	10.78		

LEELANAU COUNTY

445020086012201. Local number, 28N 14W 800CA1.

LOCATION.--Lat 44°50'20", long 86°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 Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.

PERIOD OF RECORD.--February 1978 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 111.85 ft below land-surface datum, Sept. 11, 1986; lowest measured, 114.49 ft below land-surface datum, June 21, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 23	112.38	JAN 3	112.32	MAR 20	112.45	JUN 19	112.09	JUL 29	112.01	SEP 11	111.85
NOV 25	112.37	FEB 14	112.24	MAY 8	112.29						

445011086031401. Local number, 28N 14W 18BABB1.

LOCATION.--Lat 44°50'11", long 86°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 Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.00 ft above land-surface datum.

PERIOD OF RECORD.--November 1979 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 21.18 ft below land-surface datum, Apr. 3, 1986; lowest recorded, 24.76 ft below land-surface datum, Sept. 29, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	23.07	23.16	22.53	22.61	22.76	22.85	21.20	21.89	22.34	22.55	22.67	22.74
10	23.08	23.11	22.48	22.67	22.77	22.84	21.40	21.99	22.39	22.58	22.69	22.74
15	23.10	23.06	22.48	22.72	22.78	22.81	21.59	22.06	22.43	22.60	22.67	22.60
20	23.14	22.98	22.52	22.69	22.82	22.74	21.68	22.13	22.47	22.62	22.74	22.19
25	23.17	22.86	22.55	22.67	22.83	22.45	21.78	22.21	22.52	22.65	22.74	22.02
EOM	23.17	22.65	22.61	22.75	22.84	21.40	21.84	22.26	22.53	22.65	22.74	21.84
WTR YR 1986	HIGHEST	21.18	APR 3, 1986	LOWEST	23.19	OCT 28, 1985						

GROUND-WATER LEVELS

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LENAWEE COUNTY

420246084150601. Local number, 5S 1E 12DDBD.

LOCATION.--Lat 42°02'46", Long 84°15'06", Hydrologic Unit 04100002, in the Onsted State Game Area 2 mi west of Cambridge Junction. Owner: Michigan Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 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 Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 3.00 ft above land-surface datum.

REMARKS.--Water temperature also measured.

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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 18	17.23	DEC 20	16.74	FEB 21	16.48	MAY 9	16.59	AUG 1	17.20	SEP 11	17.64
NOV 21	16.56	JAN 30	16.69	MAR 28	16.29	JUN 20	16.75				

LIVINGSTON COUNTY

422853083402801. Local number, 1N 6E 13DBAB.

LOCATION.--Lat 42°28'53", Long 83°40'28", Hydrologic Unit 04090005, at Twelve Mile Road, and 2 mi northwest of South Lyon. Owner: American Aggregate Corporation.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 2 in., depth 29 ft, 1.25 in. diameter screen.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 930 ft above National Geodetic Vertical 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	15.31	15.44	15.36	15.32	15.71	15.44	14.51	14.52	14.89	15.20	15.38	15.73
10	15.40	15.45	15.27	15.35	15.57	15.37	14.44	14.58	14.93	15.21	15.37	15.83
15	15.44	15.39	15.21	---	15.58	14.96	14.47	14.62	14.87	15.22	15.42	15.87
20	15.39	15.36	15.27	---	15.56	14.79	14.43	14.63	14.93	15.14	15.52	15.90
25	15.36	15.34	15.29	15.75	15.46	14.72	14.44	14.71	14.99	15.18	15.59	15.83
EOM	15.39	15.30	15.31	15.77	15.44	14.53	14.49	14.75	15.06	15.26	15.67	15.73

WTR YR 1986 HIGHEST 14.40 APR 20, 1986 LOWEST 15.92 SEP 22, 1986

MACKINAC COUNTY

460321084354801. Local number, 42N 2W 7AABB.

LOCATION.--Lat 46°03'21", Long 84°35'48", Hydrologic Unit 04070002, at Pontchartrain and St. Ignace Roads, and 2 mi north of Pontchartrain Shores. 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 Vertical Datum of 1929, from topographic map. Measuring point: Top of shelter floor, 2.30 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	25.60	23.10	23.50	24.97	26.29	26.98	15.90	22.05	24.72	24.38	25.09	26.11
10	25.29	23.61	23.89	25.33	26.46	27.02	16.53	22.72	25.03	21.52	25.19	26.05
15	23.77	24.03	23.90	25.57	26.57	27.02	18.47	23.19	23.83	21.40	24.82	23.69
20	24.22	21.86	24.18	25.72	26.77	24.35	19.78	23.42	24.56	21.68	25.36	24.62
25	24.78	22.07	24.39	25.84	26.88	24.26	20.81	23.84	24.93	23.15	25.67	24.92
EOM	25.14	22.99	24.77	26.14	26.89	16.58	21.43	24.25	25.21	24.38	26.12	24.14

WTR YR 1986 HIGHEST 15.20 APR 2, 1986 LOWEST 27.15 MAR 7, 1986

GROUND-WATER LEVELS

MARQUETTE COUNTY

462938087475901. Local number, 47N 28W 3CCDC.

LOCATION.--Lat 46°29'38", long 87°47'59", Hydrologic Unit 04020105, on U.S Highway 41 and State Highway 28, and 4.8 mi west of Ishpeming. 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, 3.00 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 recorded, 19.26 ft below land-surface datum, Apr. 10, 11, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	12.05	10.91	11.11	11.90	12.65	13.25	10.96	10.60	11.63	12.45	---	13.88
10	11.04	11.06	11.26	12.05	12.76	13.36	10.50	10.79	11.72	12.64	13.35	13.97
15	11.21	11.17	11.35	12.18	12.86	13.46	10.72	10.89	11.79	12.77	13.43	14.10
20	11.37	11.07	11.51	12.26	13.00	13.55	10.61	11.07	11.97	12.94	13.56	14.19
25	11.46	10.82	11.62	12.36	13.08	13.54	10.69	11.25	12.12	13.06	13.62	14.22
EOM	11.56	10.98	11.80	12.55	13.15	12.82	10.61	11.41	12.29	13.21	13.77	14.30

WTR YR 1986 HIGHEST 10.40 APR 9, 1986 LOWEST 14.30 SEP 30, 1986

MENOMINEE COUNTY

453504087331301. Local number, 37N 26W 19DADA.

LOCATION.--Lat 45°35'04", long 87°33'13", Hydrologic Unit 04030108, at U.S. Highway 41 at Carney. Owner: Michigan Department of State Highways.

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 Vertical Datum of 1929, from topographic map. Measuring point: Top of 2 in. reducing nipple, 1.26 ft above land-surface datum.

REMARKS.--Water temperature also measured.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.32 ft below land-surface datum, Mar. 31, 1986; lowest measured, 8.62 ft below land-surface datum, Jan. 17, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 31	4.88	MAR 31	3.32	JUN 25	5.38	SEP 18	4.82

MONROE COUNTY

415206083414401. Local number, 7S 6E 15ACAA.

LOCATION.--Lat 41°52'06", long 83°41'44", Hydrologic Unit 04100002, at Teal Road, and 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 bottom.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 680 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 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, 43.25 ft below land-surface datum, Oct. 18, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 18	43.25	DEC 19	38.39	FEB 21	37.99	MAY 8	37.26	JUL 31	41.20	SEP 10	41.89
NOV 21	42.64	JAN 24	40.71	MAR 26	38.39	JUN 6	37.26				

GROUND-WATER LEVELS

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MONROE COUNTY--Continued

415235083414001. Local number, 7S 6E 15ADBB.
 LOCATION.--Lat 41°52'35", long 83°41'40", Hydrologic Unit 04100002, at Teal Road, and 1.5 mi southeast of Petersburg. Owner: Michigan Department of Natural Resources.
 AQUIFER.--Sand of Pleistocene age.
 WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 in., depth 17 ft, screened 14 to 17 ft.
 INSTRUMENTATION.--Monthly measurement.
 DATUM.--Elevation of land-surface datum is 675 ft above National Geodetic Vertical 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, 7.40 ft below land-surface datum, Oct. 18, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 18	7.40	DEC 19	6.46	FEB 21	6.76	MAY 8	5.88	JUL 31	6.09	SEP 10	6.72
NOV 21	7.16	JAN 24	6.77	MAR 26	5.98	JUN 16	5.62				

MUSKEGON COUNTY

431806086044401. Local number, 11N 15W 34A000.
 LOCATION.--Lat 43°18'06", long 86°04'44", Hydrologic Unit 04060102, at Holton-Duck Lake Road, and 8 mi northeast of Holton. Owner: Michigan Department of Natural Resources.
 AQUIFER.--Sand of Pleistocene age.
 WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 in., depth 31 ft, screened 28 to 31 ft.
 INSTRUMENTATION.--Quarterly measurement.
 DATUM.--Elevation of land-surface datum is 595 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 4.00 ft above land-surface datum.
 REMARKS.--Water temperature also measured.
 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	0.76	DEC 17	0.60	APR 21	0.76	JUL 15	2.37

OAKLAND COUNTY

425116083321501. Local number, 5N 8E 8ACAC.
 LOCATION.--Lat 42°51'16", long 83°32'15", Hydrologic Unit 04080204, at Van Road, and 6 mi northeast of Holly. Owner: Michigan Department of Natural Resources.
 AQUIFER.--Sand and gravel of Pleistocene age.
 WELL CHARACTERISTICS.--Drilled artesian well, diameter 1.25 in., depth 42 ft, screened 39 to 42 ft.
 INSTRUMENTATION.--Monthly measurement.
 DATUM.--Elevation of land-surface datum is 930 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 3.00 ft above land-surface datum.
 REMARKS.--Water temperature also measured.
 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 21	24.97	JAN 13	24.78	APR 8	24.13	JUL 1	24.23	AUG 11	25.33	SEP 23	25.42
DEC 2	24.54	FEB 26	24.53	MAY 20	24.42						

GROUND-WATER LEVELS

OCEANA COUNTY

433133086082601. Local number, 13N 15W 18AAAA.

LOCATION.--Lat 43°31'33", long 86°08'26", Hydrologic Unit 04060101, 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 measurements August 1977 to July 1979.

DATUM.--Elevation of land-surface datum is 703 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 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 recorded, 40.99 ft below land-surface datum, Mar. 28, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	38.51	38.89	38.60	37.99	37.86	38.04	37.85	37.01	36.85	37.06	37.32	37.66
10	38.59	38.96	38.47	37.96	37.87	38.09	37.67	36.97	36.87	37.10	37.37	37.71
15	38.66	38.98	38.30	37.94	37.88	38.15	37.47	36.91	36.90	37.14	37.42	37.52
20	38.72	39.00	38.24	37.87	37.93	38.21	37.32	36.88	36.95	37.19	37.48	37.17
25	38.77	38.98	38.16	37.84	37.98	38.14	37.20	36.86	37.00	37.23	37.54	36.97
EOM	38.83	38.76	38.06	37.88	38.01	38.04	37.10	36.83	37.02	37.27	37.61	36.83

WTR YR 1986 HIGHEST 36.81 JUN 11, 1986 LOWEST 39.01 NOV 21, 1985

OGEMAW COUNTY

442514084164702. Local number, 23N 1E 2BAAA.

LOCATION.--Lat 44°25'14", long 84°16'47", Hydrologic Unit 04070007, at south side of Rose City Road, and 8 mi west of Rose City. Owner: Ogemaw County Road Commission.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1.25 in., depth 20 ft.

INSTRUMENTATION.--Quarterly measurement.

DATUM.--Elevation of land-surface datum is 1,265 ft above National Geodetic Vertical 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 21	10.53	JAN 17	10.33	APR 25	9.07	AUG 12	9.80

ONTONAGON COUNTY

465002089321601. Local number, 51N 41W 8BDBC.

LOCATION.--Lat 46°50'02", long 89°32'16", Hydrologic Unit 04020101, 325 ft south of State Highway 64, and 1.5 mi east of Silver City. Owner: Michigan Department of Corrections.

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 Vertical 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 20	9.71	FEB 20	10.20	MAY 13	9.63	SEP 23	13.40

GROUND-WATER LEVELS

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OTSEGO COUNTY

445920084425801. Local number, 30N 3W 19ABBB.

LOCATION.--Lat 44°59'20", Long 84°42'58", Hydrologic Unit 04070007, at Old Alba Road, and 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 Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 2.50 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 15	32.45	DEC 30	32.70	MAR 31	32.91	JUN 23	30.86	AUG 4	31.22	SEP 23	31.60
NOV 21	32.71	FEB 11	32.81	MAY 12	30.82						

PRESQUE ISLE COUNTY

451634083441801. Local number, 33N 6E 88BBB.

LOCATION.--Lat 45°16'34", Long 83°44'18", Hydrologic Unit 04070006, at south side of Grand Lake Highway, and 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 Vertical Datum of 1929, from topographic map. Measuring point: Top of casing, 0.50 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 21	11.41	APR 28	7.71	JUL 10	12.64

ROSCOMMON COUNTY

442722084350701. Local number, 24N 2W 20BABA.

LOCATION.--Lat 44°27'22", Long 84°35'07", Hydrologic Unit 04070007, at State Highway 103, and 2 mi south of Roscommon. Owner: Michigan 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	4.00	4.17	3.66	3.92	4.20	4.37	3.02	3.49	3.81	4.04	4.43	4.92
10	4.01	4.21	3.64	3.99	4.23	4.40	3.03	3.59	3.87	4.13	4.46	4.97
15	3.93	4.19	3.65	4.04	4.26	4.21	3.13	3.66	3.90	4.15	4.54	4.38
20	3.99	3.97	3.71	4.06	4.29	4.06	3.18	3.49	3.90	4.24	4.65	4.24
25	4.04	3.74	3.76	4.10	4.33	3.87	3.33	3.56	3.98	4.34	4.75	4.02
EOM	4.12	3.74	3.85	4.15	4.34	3.07	3.41	3.69	3.99	4.36	4.84	3.37

WTR YR 1986 HIGHEST 3.02 APR 5, 1986 LOWEST 4.97 SEP 9, 1986

GROUND-WATER LEVELS

SAGINAW COUNTY

431457084194401. Local number, 10N 1E 22DADA1.

LOCATION.--Lat 43°14'57", long 84°19'44", Hydrologic Unit 04080203, at west side of Merrill Road, and 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 Vertical Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.50 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	9.49	9.26	8.93	---	---	---	---	8.89	9.11	9.18	---	9.83
10	9.59	9.30	8.90	---	---	---	8.80	9.07	9.18	9.21	---	9.89
15	9.48	9.28	8.75	8.86	---	---	8.84	9.03	9.15	9.24	9.50	9.59
20	9.54	9.12	---	8.82	---	---	8.88	8.94	9.20	9.28	9.68	9.49
25	9.44	9.12	---	8.88	---	---	8.93	9.04	9.19	---	9.73	9.24
EOM	9.38	9.01	---	9.04	---	---	8.91	8.98	9.14	---	9.81	9.16

WTR YR 1986 HIGHEST 8.65 DEC 1, 1985 LOWEST 9.92 SEP 8, 1986

SANILAC COUNTY

433439082523601. Local number, 13N 13E 12ADAA.

LOCATION.--Lat 43°34'39", long 82°52'36", Hydrologic Unit 04090001, at Wheatland Road, and 3 mi east and 0.75 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 Vertical Datum of 1929, from topographic map. Measuring point: Plywood instrument shelf, 2.50 ft above land-surface datum.

PERIOD OF RECORD.--October 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	19.10	18.09	17.38	17.84	17.75	17.93	16.94	17.21	17.95	18.46	19.63	20.34
10	19.17	17.77	17.49	17.94	17.77	17.82	16.86	17.43	18.19	18.72	19.51	20.47
15	18.75	17.54	17.57	18.01	17.89	17.02	16.92	17.63	17.50	18.86	19.69	17.80
20	18.47	17.45	17.71	17.55	17.84	16.84	16.86	17.22	17.73	19.09	19.93	17.61
25	18.37	17.54	17.81	17.63	17.84	16.80	16.85	17.18	17.89	19.28	20.11	17.23
EOM	18.48	17.38	17.89	17.96	17.90	17.00	17.07	17.63	18.23	19.48	20.14	16.84

WTR YR 1986 HIGHEST 16.59 MAR 19, 1986 LOWEST 20.47 SEP 10, 1986

SCHOOLCRAFT COUNTY

461720085565201. Local number, 45N 13W 16CCCB.

LOCATION.--Lat 46°17'20", long 85°56'52", Hydrologic Unit 04060106, at headquarters building of 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 Vertical 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.63	5.68	5.44	5.26	5.28	5.30	5.12	5.53	5.79	5.92	5.90	5.95
10	5.69	5.73	5.45	5.27	5.27	5.22	5.27	5.63	5.79	6.00	5.86	5.97
15	5.71	5.74	5.40	5.29	5.28	5.21	5.39	5.64	5.75	5.97	5.84	5.88
20	5.77	5.59	5.39	5.28	5.30	5.20	5.42	5.65	5.85	5.97	5.91	5.91
25	5.74	5.60	5.31	5.25	5.31	5.17	5.52	5.69	5.89	5.88	5.90	5.89
EOM	5.77	5.59	5.28	5.27	5.28	5.19	5.52	5.72	5.92	5.88	5.97	5.88

WTR YR 1986 HIGHEST 5.03 APR 6, 1986 LOWEST 6.02 JUL 23, 1986

GROUND-WATER LEVELS

343

VAN BUREN COUNTY

421945085481502. Local number, 2S 13W 28BCB2.

LOCATION.--Lat 42°19'45", long 85°48'15", Hydrologic Unit 04050001, at Fish Lake Road, 2.5 mi north of State Highway 43, and 16 mi east of Bangor. 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 Vertical 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 1985 TO SEPTEMBER 1986

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 7	11.54	JAN 29	10.46	APR 23	10.69	JUN 4	10.96	JUL 16	10.04	AUG 28	11.03
DEC 18	10.58	MAR 13	9.99								

WASHTENAW COUNTY

421228083331601. Local number, 3S 7E 24CADB.

LOCATION.--Lat 42°12'28", long 83°33'16", Hydrologic Unit 04090005, at Bridge Street, and at Ypsilanti Township Waterworks. 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 1985 TO SEPTEMBER 1986
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.20	13.98	15.27	15.91	15.17	15.93	14.71	14.98	14.28	14.07	14.40	14.33
10	14.26	14.49	15.41	15.99	15.43	15.97	15.07	14.67	14.26	13.98	14.35	14.33
15	14.10	14.79	15.55	15.81	15.56	15.40	15.48	14.41	14.30	14.04	14.28	14.34
20	13.99	15.02	15.88	15.33	15.62	15.03	15.67	14.32	14.30	14.14	14.41	14.34
25	14.15	15.27	15.94	15.12	15.70	14.71	15.77	14.37	14.27	14.33	14.52	14.20
EOM	13.84	15.05	15.89	15.54	15.82	14.64	15.66	14.24	14.18	14.31	14.51	14.14

WTR YR 1986 HIGHEST 13.71 NOV 2, 1985 LOWEST 16.08 MAR 8, 1986

TEMPERATURE OF GROUND WATER

Temperatures of ground water are measured as part of a state-wide water resource investigation in cooperation with the 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

(°C)	DATE	WATER TEMPER- ATURE (°C)	DATE	WATER TEMPER- ATURE (°C)	DATE	WATER TEMPER- ATURE
ALGER COUNTY, 45N 19W 25BDCD (LAT 46°16'08", LONG 86°37'38") DEPTH 66 FT						
	NOV 6, 1985	8.5	MAY 8 . . .	6.5	AUG 19 . . .	8.5
	JAN 16, 1986	7.5				
DICKINSON COUNTY, 43N 28W 32ADAB (LAT 46°04'58", LONG 87°49'39") DEPTH 31 FT						
	OCT 1, 1985	7.5	FEB 3, 1986	7.0	JUN 17 . . .	5.5
	31 . . .	7.5	MAR 12 . . .	6.5	25 . . .	6.0
	NOV 29 . . .	8.0	APR 9 . . .	6.0	JUL 29 . . .	6.5
	DEC 31 . . .	7.5	MAY 2 . . .	5.5	SEP 18 . . .	7.5
LENAWEE COUNTY, 5S 1E 12DDBD (LAT 42°02'46", LONG 84°15'06") DEPTH 39 FT						
	OCT 18, 1985	10.0	FEB 21 . . .	10.0	JUN 20 . . .	9.0
	NOV 21 . . .	10.0	MAR 28 . . .	9.5	AUG 1 . . .	9.0
	DEC 20 . . .	10.5	MAY 9 . . .	9.0	SEP 11 . . .	9.5
	JAN 30, 1986	10.0				
MENOMINEE COUNTY, 37N 26W 19DADA (LAT 45°35'04", LONG 87°33'13") DEPTH 17 FT						
	DEC 31, 1985	8.5	JUN 25 . . .	8.0	SEP 18 . . .	12.0
	MAR 31, 1986	6.0				
MUSKEGON COUNTY, 11N 15W 34ADDD (LAT 43°18'06", LONG 86°04'44") DEPTH 31 FT						
	OCT 1, 1985	10.5	APR 21, 1986	8.0	JUL 15 . . .	8.5
	DEC 17 . . .	9.5				
OAKLAND COUNTY, 5N 8E 8ACAC (LAT 42°51'16", LONG 83°32'15") DEPTH 42 FT						
	OCT 21, 1985	9.0	FEB 26 . . .	8.5	JUL 1 . . .	9.0
	DEC 2 . . .	9.0	APR 8 . . .	8.5	AUG 11 . . .	9.0
	JAN 13, 1986	9.0	MAY 20 . . .	8.5	SEP 23 . . .	9.0

DISCONTINUED GAGING STATIONS

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The following continuous-record streamflow or stage stations in Michigan have been discontinued or converted to partial-record stations. The column headed "Period of record" shows the water years in which daily streamflow or stage records were collected and published.

Station No.	Station Name	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE SUPERIOR			
04028000	Montreal River at Ironwood, MI	63.0	1918-22, 1924-26, 1949-54
04030000	Montreal River near Saxon, MI	262	1938-70
04030500	Black River at Ramsay, MI	a82	1924-25
04031000	Black River near Bessemer, MI	200	1955-82
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	*1913-15
04042000	Sturgeon River near Baraga, MI	379	1927-31, 1943-47
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	1899-1902
04044500	Carp River near Marquette, MI	a86	1902-04
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	a200	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	--	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	1950-52
04057820	Middle Branch Escanaba River near Greenwood, MI	73.3	*1973-82
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	1977-82
04058300	Warner Creek near Palmer, MI	14.2	*1961-68, 1972-78
04058400	Goose Lake Outlet near Sands Station, MI	37.5	*1966-82

See footnotes at end of table.

DISCONTINUED GAGING STATIONS

Station No.	Station Name	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued			
04058500	East Branch Escanaba River at Gwinn, MI	124	1955-80
04059400	Tenmile Creek at Perronville, MI	38.4	*1971-77
04060000	Iron River near Iron River, MI	a65	1901-04
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	1969-82
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
04065000	Menominee River near Iron Mountain, MI	a2,420	1898-99, 1903-14
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	1974-84
04065397	East Branch Sturgeon River at Hardwood, MI	90.8	1978-83
04065500	Sturgeon River near Foster City, MI	237	1955-80
04065600	Pine Creek near Iron Mountain, MI	16.8	1972-81
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	1975-77
04096340	St. Joseph River at Clarendon, MI	144	*1974-77
04096500	Sauk (East Branch Coldwater) River at Coldwater, MI	--	1938-62
04097000	St. Joseph River at Mendon, MI	918	1903-05
04097060	Little Portage Creek near Fulton, MI	27.0	*1965-67
04097170	Portage River near Vicksburg, MI	68.2	*1946-51, 1965-80
04097200	Gourdneck Creek near Schoolcraft, MI	7.29	1964-73
04097500	St. Joseph River at Three Rivers, MI	1,350	1953-83
04098500	Fawn River near White Pigeon, MI	192	*1903-04, 1958-75
04102000	St. Joseph River at Berrien Springs, MI	4,081	*1901-07, 1909-32, 1951-56
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	1972-76
04103000	Reed's Springs near Albion, MI	--	1905-06
04103500	Kalamazoo River at Marshall, MI	449	1949-82
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	*1965-73
04106190	Portage Creek near Portage, MI	18.6	1965-67
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	1903-08
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	1951-82
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	*1954-75
04118500	Rogue River near Rockford, MI	234	1952-82
04119300	Grand River at Eastmanville, MI	a5,230	1976-77
04120000	Crockery Creek at Slocums Grove, MI	--	1903
04120500	Higgins Lake Outlet (head of Muskegon River) near Roscommon, MI	a58	1942-50
04121000	Muskegon River near Merritt, MI	355	*1947-74
04123000	Big Sable River near Freesoil, MI	127	*1942-74

See footnotes at end of table.

DISCONTINUED GAGING STATIONS

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Station No.	Station Name	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued			
04123500	Manistee River near Grayling, MI	131	*1943-74
04124500	East Branch Pine River near Tustin, MI	a63	*1952-63
04125000	Pine River near Le Roy, MI	118	*1952-63
04125500	Pine River near Hoxeyville, MI	251	1952-82
04126200	Little Manistee River near Freesoil, MI	200	*1957-75
04126500	Little Manistee River near Stronach, MI	233	1931
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	1943-82
04131000	Rainy River near Onaway, MI	a79	1942-52
04131500	Rainy River near Ocqueoc, MI	a85	*1953-79
04132000	Black River near Cheboygan, MI	597	*1943-74
04132500	Thunder Bay River near Hillman, MI	232	*1945-73
04133000	Upper South Branch Thunder Bay River near Lachine, MI	171	1945-54
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 River near Hubbard Lake, MI	146	1945-54
04135000	Thunder Bay River near Alpena, MI	a1,260	1901-09
04135600	East Branch Au Sable River at Grayling, MI	76.0	1958-84
04136000	Au Sable River near Red Oak, MI	a1,000	1909-16, 1931
04137000	Au Sable River at Bamfield, MI	a1,420	1902-14
04137500	Au Sable River near Au Sable, MI	a1,540	1939-40
04138000	East Branch Au Gres River at McIvor, MI	a84	*1951-74
04138500	Au Gres River near National City, MI	169	1951-81
04139000	Houghton Creek near Lupton, MI	29.7	*1950-73
04139500	Rifle River at "The Ranch" near Lupton, MI	56.8	1950-71
04140000	Prior Creek near Selkirk, MI	21.4	*1950-73
04140500	Rifle River at Selkirk, MI	117	*1950-82
04141000	South Branch Shepards Creek near Selkirk, MI	1.15	*1952-78
04141500	West Branch Rifle River near Selkirk, MI	a52	*1952-63
04143000	Rifle River at Omer, MI	364	1902-04
04143500	North Branch Kawkawlin River near Kawkawlin, MI	101	1951-82
04144000	Shiawassee River at Byron, MI	368	1948-83
04145000	Shiawassee River near Fergus, MI	637	1940-84
04145500	Bad River near Brant, MI	a89	*1949-59
04146500	Flint River at Columbiaville, MI	470	1932-33, 1948-52
04147990	Butternut Creek near Genesee, MI	34.7	1970-84
04148000	Flint River at Genesee, MI	a593	1931-52
04148160	Gilkey Creek near Flint, MI	6.43	1970-84
04148200	Swartz Creek near Holly, MI	12.1	*1956-75
04148300	Swartz Creek at Flint, MI	115	1970-84
04148440	Thread Creek near Flint, MI	54.4	1970-84
04148720	Brent Run near Montrose, MI	20.8	1970-84
04149000	Flint River near Fosters, MI	b1,188	1940-84
04149500	Flint River near Alicia, MI	--	†1949-84
04150000	South Branch Cass River near Cass City, MI	238	1949-80
04151000	Cass River at Vassar, MI	710	*1910-28, 1949-70
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	*1948-73
04156500	Tittabawassee River at Freeland, MI	a2,530	1903-10, 1912-36
04157500	Sebewaing River (State Drain) near Sebewaing, MI	a62	1940-54
04158000	East Fork Sebewaing River (Columbia Drain) near Sebewaing, MI	a38	1940-54
04158500	Pigeon River near Owendale, MI	53.2	1953-82
04159000	Pigeon River near Pigeon, MI	a86	1947-52

See footnotes at end of table.

DISCONTINUED GAGING STATIONS

Station No.	Station Name	Drainage area (mi ²)	Period of record
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, 1933-44
STREAMS TRIBUTARY TO LAKE ST. CLAIR			
04161000	Clinton River at Auburn Heights, MI	123	*1935-40, 1957-82
04161500	Paint Creek near Lake Orion, MI	38.5	*1955-75
04161820	Clinton River at Sterling Heights, MI	309	1979-83
04162000	Red Run near Royal Oak, MI	36.5	c1953-68
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	--	†1980-82
04164010	North Branch Clinton River at Almont, MI	9.56	*1963-68
04164050	North Branch Clinton River near Romeo, MI	49.7	*1965-69
04164150	North Branch Clinton River near Meade, MI	89.6	*1968-72
04164200	Coon Creek near Armada, MI	10.0	*1966-70
04164250	Tupper Brook at Ray Center, MI	8.62	*1960-64
04164350	Highbank Creek near Armada, MI	14.9	*1965-70
04164360	East Branch Coon Creek near New Haven, MI	36.1	*1968-72
04164400	Deer Creek near Meade, MI	12.7	*1960-65
04164450	McBride Drain near Macomb, MI	5.79	*1960-64
04164600	Middle Branch Clinton River near Macomb, MI	22.2	*1965-69
04164800	Middle Branch Clinton River at Macomb, MI	41.0	*1963-68, 1970-82
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	--	†1980-83
04165557	Clinton River By-Pass at mouth at Mount Clemens, MI	--	†1980-83
STREAMS TRIBUTARY TO DETROIT RIVER			
04168500	Lower River Rouge at Dearborn, MI	a96	1931-33
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	1953-54
04171500	Ore Creek near Brighton, MI	a31	1951-68
04172500	Portage River near Pinckney, MI	79.1	*1945-71
04173000	Huron River near Dexter, MI	522	*1904, 1946-72, 1976-77
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	*1966-77

* Previous or subsequent operation as a crest-stage partial-record station.

† Stage record only.

a Approximately.

b Includes drainage area of Birch Run above State Highway 13.

c Records available in District Office only.

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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	millimeters (mm)
	2.54×10^{-2}	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	square meters (m ²)
	4.047×10^{-1}	square hectometers (hm ²)
	4.047×10^{-3}	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	liters (L)
	3.785×10^0	cubic decimeters (dm ³)
	3.785×10^{-3}	cubic meters (m ³)
million gallons	3.785×10^3	cubic meters (m ³)
	3.785×10^{-3}	cubic hectometers (hm ³)
cubic feet (ft ³)	2.832×10^1	cubic decimeters (dm ³)
	2.832×10^{-2}	cubic meters (m ³)
cfs-days	2.447×10^3	cubic meters (m ³)
	2.447×10^{-3}	cubic hectometers (hm ³)
acre-feet (acre-ft)	1.233×10^3	cubic meters (m ³)
	1.233×10^{-3}	cubic hectometers (hm ³)
	1.233×10^{-6}	cubic kilometers (km ³)
<i>Flow</i>		
cubic feet per second (ft ³ /s)	2.832×10^1	liters per second (L/s)
	2.832×10^1	cubic decimeters per second (dm ³ /s)
	2.832×10^{-2}	cubic meters per second (m ³ /s)
gallons per minute (gal/min)	6.309×10^{-2}	liters per second (L/s)
	6.309×10^{-2}	cubic decimeters per second (dm ³ /s)
	6.309×10^{-5}	cubic meters per second (m ³ /s)
million gallons per day	4.381×10^1	cubic decimeters per second (dm ³ /s)
	4.381×10^{-2}	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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