

Water Resources Data Michigan Water Year 1999

Water-Data Report MI-99-1



U.S. Department of the Interior
U.S. Geological Survey



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

CALENDAR FOR WATER YEAR 1999

1998

OCTOBER							NOVEMBER							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
				1	2	3	1	2	4	4	5	6	7			1	2	3	4	5
4	5	6	7	8	9	10	8	9	10	11	12	13	14	6	7	8	9	10	11	12
11	12	13	14	15	16	17	15	16	17	18	19	20	21	13	14	15	15	17	18	19
18	19	20	21	22	23	24	22	23	24	25	26	27	28	20	21	22	23	24	25	26
25	26	27	28	29	30	31	29	30						27	28	29	30	31		

1999

JANUARY							FEBRUARY							MARCH						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
					1	2		1	2	3	4	5	6		1	2	3	4	5	6
3	4	5	6	7	8	9	7	8	9	10	11	12	13	7	8	9	10	11	12	13
10	11	12	13	14	15	16	14	15	16	17	18	19	20	14	15	16	17	18	19	20
17	18	19	20	21	22	23	21	22	23	24	25	26	27	21	22	23	24	25	26	27
24	25	26	27	28	29	30	28							28	29	30	31			
31																				
APRIL							MAY							JUNE						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
				1	2	3							1			1	2	3	4	5
4	5	6	7	8	9	10	2	3	4	5	6	7	8	6	7	8	9	10	11	12
11	12	13	14	15	16	17	9	10	11	12	13	14	15	13	14	15	16	17	18	19
18	19	20	21	22	23	24	16	17	18	19	20	21	22	20	21	22	23	24	25	26
25	26	27	28	29	30		23	24	25	26	27	28	29	27	28	29	30			
							30	31												
JULY							AUGUST							SEPTEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
				1	2	3	1	2	3	4	5	6	7				1	2	3	4
4	5	6	7	8	9	10	9	9	10	11	12	13	14	5	6	7	8	9	10	11
11	12	13	14	15	16	17	15	16	17	18	19	20	21	12	13	14	15	16	17	18
18	19	20	21	22	23	24	22	23	24	25	26	27	28	19	20	21	22	23	24	25
25	26	27	28	29	30	31	29	30	31					26	27	28	29	30		

Water Resources Data Michigan Water Year 1999

By S.P. Blumer, T.E. Behrendt, J.M. Ellis, R.J. Minnerick,
R.L. LeuVoy, and C.R. Whited

Water-Data Report MI-99-1



U.S. DEPARTMENT OF THE INTERIOR

BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY

Charles G. Groat, 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 48911-5991**

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. Baltusis
E.J. Carter
T.A. DeWitt
S.B. Horton

D.L. Hubbell
D.A. James
P.J. Klimek
J.C. Knudsen

G. Lansky
R.M. McGowan
R.G. Nettleton
J.L. Rodriguez

M.F. Soper
T.L. Weaver
D.G. Wydra

This report was prepared in cooperation with the State of Michigan and with other agencies under the general supervision of J. Nicholas, District Chief, Michigan, and W.J. Carswell, Regional Hydrologist, Northeastern Region.

REPORT DOCUMENTATION PAGEForm Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE March 2000	3. REPORT TYPE AND DATES COVERED Annual - Oct. 1, 1998 to Sept. 30, 1999
4. TITLE AND SUBTITLE Water Resources Data - Michigan, Water Year 1999			5. FUNDING NUMBERS
6. AUTHOR(S) S.P. Blumer, T.E. Behrendt, J.M. Ellis, R.J. Minnerick, R.L. LeuVoy, and C.R. Whited			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Geological Survey, Water Resources Division 6520 Mercantile Way, Suite 5 Lansing, Michigan 48911-5991			8. PERFORMING ORGANIZATION REPORT NUMBER USGS-WDR-MI-99-1
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Geological Survey, Water Resources Division 6520 Mercantile Way, Suite 5 Lansing, Michigan 48911-5991			10. SPONSORING / MONITORING AGENCY REPORT NUMBER USGS-WDR-MI-99-1
11. SUPPLEMENTARY NOTES Prepared in cooperation with the State of Michigan and with other agencies.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT No restriction on distribution. This report may be purchased from: National Technical Information Service, Springfield, VA 22161			12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 words) Water resources data for the 1999 water year for Michigan consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water wells. This report contains discharge records for 145 streamflow-gaging stations; stage only records for 2 stream-gaging stations and 25 lake-gaging stations; stage and contents for 1 reservoir; water-quality records for 26 streamflow-gaging stations and 1 lake-gaging station; and water-level records for 40 ground-water wells. Also included are 30 crest-stage partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program. Miscellaneous data were collected at 53 discharge measuring sites. 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.			
14. SUBJECT TERMS *Michigan, *Hydrologic data, *Surface water, *Ground water, *Water quality, Flow rate, Gaging stations, Lakes, Reservoirs, Chemical analyses, Sediments, Water temperatures, Sampling sites, Water levels, Water analyses.			15. NUMBER OF PAGES 384
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

CONTENTS

	Page
Preface	iii
List of surface-water stations, in downstream order, for which records are published in this volume	vi
List of ground-water wells, by county, for which records are published in this volume	ix
List of discontinued surface-water-discharge or stage-only stations	x
List of discontinued surface-water-quality stations	xvi
Introduction	1
Cooperation	1
Summary of hydrologic conditions	2
Surface water	2
Water quality	2
Ground water	2
Special networks and programs	5
Explanation of the records	5
Station identification numbers	5
Downstream order system	6
Latitude-longitude system	6
Local well numbering system	6
Records of stage and water discharge	7
Data collection and computation	7
Data presentation	8
Station manuscript	8
Data table of daily mean values	9
Statistics of monthly mean data	9
Summary statistics	9
Identifying estimated daily discharge	10
Accuracy of the records	10
Other records available	11
Records of surface-water quality	11
Classification of records	11
Arrangement of records	11
On-site measurements and sample collection	11
Water temperature	12
Sediment	12
Laboratory measurements	12
Data presentation	12
Remark codes	13
Records of ground-water levels	13
Data collection and computation	14
Data presentation	14
Access to USGS water data	15
Definition of terms	15
Publications on Techniques of Water-Resources Investigations	22
Station records, surface water	30
Discharge at partial-record stations and miscellaneous sites	306
Crest-stage partial-record stations	306
Miscellaneous sites	312
Station records, ground water	321
Index	361

ILLUSTRATIONS

Figure 1. Comparison of discharge at three long-term representative gaging stations during 1999 water year with median discharge for period 1961-90	3
2. System for numbering wells (latitude and longitude)	6
3. Local well numbering system in Michigan	6
4. Map showing identification number and location of active surface-water gaging stations in the Upper Peninsula of Michigan	27
5. Map showing identification number and location of active surface-water gaging stations in the Lower Peninsula of Michigan	28
6. Map showing identification number and location of active surface-water-quality stations in Michigan	29
7. Map showing identification number and location of active surface-water gaging stations in and around the Greenwood Reservoir complex	56
8. Map showing identification number and location of water-level station and surface-water-quality sampling sites in Higgins Lake	124
9. Map showing location of ground-water wells published in this report	320

SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME

Letters after station name designate type of data collected: (d) discharge, (b) biological, (c) chemical, (e) elevation, gage heights, or contents, (m) microbiological, (o) dissolved oxygen, (p) pesticide, (r) radio-chemical, (s) sediment, (t) water temperature.

	Station number	Page
ST. LAWRENCE RIVER BASIN		
STREAMS TRIBUTARY TO LAKE SUPERIOR		
Washington Creek at Windigo (d)	04001000	30
Bond Falls Reservoir:		
Bond Falls Canal near Paulding (d)	04033500	31
Bond Falls Reservoir near Paulding (e)	04034000	32
Middle Branch Ontonagon River near Trout Creek (d)	04034500	33
Middle Branch Ontonagon River near Rockland (d)	04035500	34
Lake Gogebic near Bergland (e)	04035995	35
West Branch Ontonagon River near Bergland (d)	04036000	36
South Branch Ontonagon River:		
Cisco Lake near Watersmeet (e)	04037400	37
Cisco Branch Ontonagon River at Cisco Lake Outlet (d)	04037500	38
Ontonagon River near Rockland (d)	04040000	39
Portage River (Portage Lake):		
Sturgeon River near Sidnaw (d)	04040500	40
Sturgeon River near Alston (d,t)	04041500	41
Trap Rock River near Lake Linden (d)	04043050	44
Dead River:		
McClure Storage Basin Release near Marquette (d)	04043800	45
Silver Lead Creek near Gwinn (d)	040445315	46
Sand River Wildlife Flooding at Sand River (e)	04044609	47
Au Train River at Forest Lake (d)	04044724	48
Grand Sable Lake near Grand Marais (e)	463910086014201	49
Muskallonge Lake near Deer Park (e)	04044796	50
Tahquamenon River near Paradise (d)	04045500	51
STREAMS TRIBUTARY TO LAKE MICHIGAN		
Black River near Garnet (d)	04046000	52
Manistique River near Manistique (d)	04056500	53
Sturgeon River near Nahma Junction (d)	04057510	54
Middle Branch Escanaba River at Humboldt (d)	04057800	55
Greenwood Reservoir near Greenwood (e)	04057811	57
Greenwood Afterbay near Greenwood (e)	04057812	58
Greenwood Diversion near Greenwood (d)	04057813	59
Greenwood Release (Middle Branch Escanaba River) near Greenwood (d)	04057814	60
Middle Branch Escanaba River near Princeton (d)	04058100	61
Schweitzer Creek (head of East Branch Escanaba River):		
Schweitzer Reservoir near Palmer (e)	04058190	62
Schweitzer Creek near Palmer (d)	04058200	63
Escanaba River near St. Nicholas (e)	04058940	64
Escanaba River at Cornell (d,t)	04059000	65
Ford River near Hyde (d)	04059500	68
Brule River near Florence, WI (d)	04060993	69
Paint River near Alpha (d)	04062000	70
Brule River near Commonwealth, WI (d)	04062011	71
Michigamme River near Crystal Falls (d)	04062500	72
Menominee River near Florence, WI (d)	04063000	73
Menominee River at Twin Falls near Iron Mountain (d)	04063500	74
Menominee River at Niagara, WI (d)	04065106	75
Menominee River near Vulcan (d)	04065722	76
Menominee River below Pemene Creek near Pembine, WI (d)	04066003	77
Menominee River at White Rapids Dam near Banat (d)	04066030	78
Menominee River at Koss (d)	04066800	79
Menominee River near McAllister, WI (d)	04067500	80
Galien River near Sawyer (d)	04096015	81
St. Joseph River at Burlington (d)	04096405	82
Coldwater River:		
South Branch Hog Creek near Allen (d)	04096515	83
Long Lake near Kalamazoo (e)	04097187	84
Austin Lake near Kalamazoo (e)	04097188	85
St. Joseph River at Three Rivers (d)	04097500	86
Prairie River near Nottawa (d)	04097540	87
St. Joseph River at Mottville (d)	04099000	88
St. Joseph River at Elkhart, IN (d)	04101000	89
St. Joseph River at Niles (d)	04101500	90
Dowagiac River at Sumnerville (d)	04101800	91
Paw Paw River at Riverside (d)	04102500	92
Black River:		
South Branch Black River near Bangor (d)	04102700	93
Middle Branch Black River near South Haven (d)	04102776	94

SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME--Continued

	Station number	Page
ST. LAWRENCE RIVER BASIN--Continued		
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued		
Kalamazoo River near Marengo (d)	04103010	95
Battle Creek:		
Wanadoga Creek near Battle Creek (d)	04104945	96
Battle Creek at Battle Creek (d)	04105000	97
Kalamazoo River near Battle Creek (d)	04105500	98
Augusta Creek near Augusta (d)	04105700	99
Kalamazoo River at Comstock (d)	04106000	100
Hampton Lake near Portage (e)	04106137	101
Portage Creek at Portage (d)	04106180	102
Portage Creek near Kalamazoo (d)	04106300	103
West Fork Portage Creek near Oshtemo (d)	04106320	104
Asylum Lake near Kalamazoo (e)	04106362	105
West Fork Portage Creek at Kalamazoo (d)	04106400	106
Rabbit River near Hopkins (d)	04108600	107
Macatawa River near Zeeland (d)	04108800	109
Grand River at Jackson (d)	04109000	109
Grand River near Eaton Rapids (d)	04111000	110
Red Cedar River:		
Deer Creek near Dansville (d)	04111500	111
Sloan Creek near Williamston (d)	04112000	112
Red Cedar River at East Lansing (d)	04112500	113
Grand River at Lansing (d)	04113000	114
Grand River at Portland (d)	04114000	115
Maple River at Maple Rapids (d)	04115000	116
Fish Creek near Crystal (d)	04115265	117
Grand River at Ionia (d)	04116000	119
Thornapple River:		
Quaker Brook near Nashville (d)	04117000	120
Thornapple River near Hastings (d)	04117500	121
Rogue River near Rockford (d)	04118500	122
Grand River at Grand Rapids (d)	04119000	123
Muskegon River:		
Higgins Lake near Roscommon (b,c,e,m,o,t)	442805084411001	125
Houghton Lake near Houghton Lake Heights (e)	442400084472801	126
Clam River:		
Lake Mitchell-Cadillac at Cadillac (e)	441508085244001	137
Clam River at Vogel Center (d)	04121300	138
Muskegon River at Evart (d)	04121500	139
Muskegon River at Big Rapids (t,o)	04121650	140
Muskegon River near Stanwood (t,o)	04121660	144
Muskegon River near Oxbow (t,o)	04121680	148
Little Muskegon River near Oak Grove (d,t,o)	04121944	152
Muskegon River near Croton (d,t,o)	04121970	157
Bear Creek near Muskegon (d)	04122100	162
White River near Whitehall (d)	04122200	163
Pere Marquette River at Scottville (d)	04122500	164
Bear Lake near Kalkaska (e)	444351084561801	165
Manistee River near Sherman (d,t,o)	04124000	166
Manistee River near Mesick (d,t,o)	04124200	171
Pine River:		
East Branch Pine River near Tustin (d)	04124500	176
Pine River near Hoxeyville (d,t,o)	04125460	177
Manistee River near Wellston (d,t,o)	04125550	180
Platte River at Honor (d)	04126740	187
Glen Lake near Glen Arbor (e)	445331085564501	188
Boardman River at Brown Bridge Road near Mayfield (d)	04126970	189
Arbutus Lake near Mayfield (e)	443903085312101	190
Jordan River near East Jordan (d)	04127800	191
Walloon Lake at Walloon Lake (e)	451540084560301	192
STREAMS TRIBUTARY TO LAKE HURON		
Pine River near Rudyard (d)	04127918	193
East Lake near Fibre (e)	04127937	194
Burt Lake (head of Cheboygan River):		
Crooked Lake near Conway (e)	452600084472001	195
Douglas Lake near Pellston (e)	453345084401501	196
Sturgeon River at Wolverine (d)	04127997	197
Pigeon River near Vanderbilt (d)	04128990	199
Cheboygan River (continuation of Indian River):		
Black River near Tower (d)	04130500	199
Au Sable River:		
South Branch Au Sable River:		
Lake St. Helen near St. Helen (e)	442409084274001	200
South Branch Au Sable River near Luzerne (d)	04135700	201

SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME--Continued

	Station number	Page
ST. LAWRENCE RIVER BASIN--Continued		
STREAMS TRIBUTARY TO LAKE HURON--Continued		
North Branch Au Sable River:		
Otsego Lake near Gaylord (e)	445512084415301	202
Au Sable River near Red Oak (d,t,o)	04136000	203
Au Sable River at Mio (d,t,o)	04136500	208
Au Sable River near McKinley (d,t,o)	04136900	213
Au Sable River near Curtisville (d,t,o)	04137005	218
Au Sable River near South Branch (t,o)	04137020	223
Au Sable River near Glennie (t,o)	04137025	227
Au Sable River near Sidtown (t,o)	04137030	231
Au Sable River near Au Sable (d,t,o)	04137500	235
Rifle River near Sterling (d)	04142000	240
Shiawassee River (head of Saginaw River) at Owosso (d)	04144500	241
Flint River:		
South Branch Flint River:		
Farmers Creek near Lapeer (d)	04146000	242
South Branch Flint River near Columbiaville (d)	04146063	243
Flint River near Otisville (d)	04147500	244
Kearsley Creek near Davison (d)	04148140	245
Flint River near Flint (d)	04148500	246
Cass River at Frankenmuth (d)	04151500	247
Tittabawassee River:		
South Branch Tobacco River near Beaverton (d)	04152238	248
Chippewa River near Mount Pleasant (d)	04154000	249
Pine River at Alma (d)	04155000	250
Tittabawassee River at Midland (d)	04156000	251
Saginaw River at Saginaw (d,c,m,s)	04157000	252
STREAMS TRIBUTARY TO ST. CLAIR RIVER		
Black River near Jeddo (d)	04159492	255
Mill Creek near Avoca (d)	04159900	256
Belle River:		
North Branch Belle River at Imlay City (d)	04160570	257
Belle River at Memphis (d)	04160600	258
STREAMS TRIBUTARY TO LAKE ST. CLAIR		
Clinton River:		
Sashabaw Creek near Drayton Plains (d)	04160800	259
Clinton River near Drayton Plains (d)	04160900	260
Paint Creek at Rochester (d)	04161540	261
Stony Creek near Romeo (d)	04161580	262
Stony Lake near Washington (e)	04161790	263
Stony Creek near Washington (d)	04161800	264
Clinton River near Fraser (d)	04164000	265
North Branch Clinton River:		
East Pond Creek at Romeo (d)	04164100	266
Coon Creek:		
East Branch Coon Creek at Armada (d)	04164300	267
North Branch Clinton River near Mount Clemens (d)	04164500	268
Clinton River at Mount Clemens (d)	04165500	269
STREAMS TRIBUTARY TO DETROIT RIVER		
River Rouge at Birmingham (d)	04166000	270
River Rouge at Southfield (d,t,o)	04166100	271
Evans Ditch at Southfield (d)	04166200	275
Upper River Rouge at Farmington (d)	04166300	276
Upper River Rouge at Detroit (d,t,o)	04166470	277
River Rouge at Detroit (d,t,o)	04166500	281
Middle River Rouge near Garden City (d)	04167000	285
Middle River Rouge at Dearborn Heights (d,t,o)	04167150	286
Lower River Rouge at Inkster (d)	04168000	290
Lower River Rouge at Dearborn (d,t,o)	04168400	291
STREAMS TRIBUTARY TO LAKE ERIE		
Huron River at Milford (d)	04170000	295
Kent Lake near New Hudson (e)	04170490	296
Huron River near New Hudson (d)	04170500	297
Huron River near Hamburg (d)	04172000	298
Mill Creek near Dexter (d)	04173500	299
Huron River at Ann Arbor (d)	04174500	300
Malletts Creek at Ann Arbor (d)	04174518	301
River Raisin near Manchester (d)	04175600	302
River Raisin near Adrian (d)	04176000	303
River Raisin near Monroe (d)	04176500	304
Otter Creek at La Salle (d)	04176605	305

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME

	Page
Branch	321
Calhoun	322
Cheboygan	323
Eaton	324
Huron	326
Ingham	330
Kalamazoo	335
Marquette	354
Monroe	356
Oakland	358
Washtenaw	359

DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS

The following continuous-record surface-water discharge or stage-only stations (gaging stations) in Michigan have been discontinued. Daily streamflow or stage records were collected and published for the period of record, expressed in water years, shown for each station. Those stations with an asterisk (*) after the station number have had previous or subsequent operation as a crest-stage partial-record station. Information regarding these stations may be obtained from the District Office at the address given on the back side of the title page of this report.

[Letters after station name designate type of data collected: (d) discharge, (e) elevation (stage only). Letter (a) before drainage area means approximately.]

Station name	Station number	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE SUPERIOR			
Montreal River at Ironwood, MI (d)	04028000	63.0	1918-22, 1924-26, 1949-54
Montreal River near Saxon, WI (d)	04030000	262	1938-70
Black River at Ramsay, MI (d)	04030500	a82	1924-25
Black River near Bessemer, MI (d)	04031000	200	1955-82
Presque Isle River at Marenisco, MI (d)	04031500	171	1945-82
Presque Isle River near Tula, MI (d)	04032000*	261	1945-73
Iron River near White Pine, MI (d)	04032500	98.1	1952-57
Middle Branch Ontonagon River near Paulding, MI (d)	04033000	164	1942-95
East Branch Ontonagon River near Mass, MI (d)	04035000	272	1942-79
Cisco Branch Ontonagon River near Watersmeet, MI (d)	04038000	62.2	1942-44
South Branch Ontonagon River at Ewen, MI (d)	04039500*	348	1942-71
Perch River near Sidnaw, MI (d)	04041000*	63.1	1913-15
Sturgeon River near Baraga, MI (d)	04042000	379	1927-31, 1943-47
Otter River near Elo, MI (d)	04042500*	162	1942-72
Sturgeon River near Arnheim, MI (d)	04043000	705	1942-74
Dead River near Negaunee, MI (d)	04043500	138	1902-03
Dead River at Forestville, MI (d)	04044000	158	1899-1902
Carp River near Negaunee, MI (d)	04044400	51.4	1961-87
Carp River near Marquette, MI (d)	04044500	a86	1902-04
Big Creek near Harvey, MI (d)	04044563	17.0	1979-81
Cedar Creek near Harvey, MI (d)	04044573	9.04	1979-81
Cherry Creek near Harvey, MI (d)	04044583	4.53	1965-70, 1979-81
Silver Creek at Harvey, MI (d)	04044595	8.58	1979-81
Tahquamenon River at Newberry, MI (d)	04045000	a200	1934-36
STREAMS TRIBUTARY TO LAKE MICHIGAN			
South Manistique Lake Outlet at Curtis, MI (d)	04046500	a44	1942-44
North Manistique Lake Outlet at Helmer, MI (d)	04047000	a15	1942-44
Manistique Lake near Curtis, MI (e)	04047200	118	1942-91
Manistique River near Germfask, MI (d)	04047500	a120	1942-50
Fox River at Seney, MI (d)	04048000	107	1942-44
East Branch Fox River near Germfask, MI (d)	04048500	104	1942-44
Holland Creek near Seney, MI (d)	04049000	a13	1938-42
Manistique River at Germfask, MI (d)	04049500*	341	1938-70
Goose Pen Outlet at Germfask, MI (d)	04050000	--	1939-41
Grays Creek near Germfask, MI (d)	04050500	a36	1938-40
Pine Creek near Germfask, MI (d)	04051000	a11	1938-40
Sand Creek near Germfask, MI (d)	04051500	a6	1938-40
Driggs River near Seney, MI (d)	04052000	a70	1938-42
Walsh Creek near Seney, MI (d)	04052500	a12	1938-42
Driggs River near Germfask, MI (d)	04053000	114	1938-41
Marsh Creek near Shingleton, MI (d)	04053500	a20	1938-42
Marsh Creek near Germfask, MI (d)	04054000	--	1938-41
Duck Creek near Blaney, MI (d)	04054500	a92	1938-54
Manistique River near Blaney, MI (d)	04055000*	704	1938-70
Creighton River near Shingleton, MI (d)	04055500	a35	1938-42

DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued			
West Branch Manistique River near Manistique, MI (d)	04056000	322	1938-56
Indian Lake near Manistique, MI (e)	04057000	302	1938-95
Indian River near Manistique, MI (d)	04057000*	302	1938-71, 1992-93
Manistique River above Manistique, MI (d)	04057004	a1,445	1994-96
Sturgeon River near St. Jacques, MI (d)	04057500	167	1950-52
Middle Branch Escanaba River near Greenwood, MI (d)	04057820*	73.3	1973-82
Black River near Republic, MI (d)	04057900*	34.4	1961-68
Middle Branch Escanaba River near Ishpeming, MI (d)	04058000	128	1954-75
Green Creek near Princeton, MI (d)	04058130	13.8	1977-82
Warner Creek near Palmer, MI (d)	04058300*	14.2	1961-68, 1972-78
Goose Lake Outlet near Sands Station, MI (d)	04058400*	37.5	1966-82
East Branch Escanaba River at Gwinn, MI (d)	04058500	124	1955-80
Tenmile Creek at Perronville, MI (d)	04059400*	38.4	1971-77
Iron River near Iron River, MI (d)	04060000	a65	1901-04
Iron River at Caspian, MI (d)	04060500	92.1	1948-80
Paint River at Crystal Falls, MI (d)	04061500*	597	1944-96
Peshekee River near Michigamme, MI (d)	04062100	66.5	1961-68, 1993-95
Peshekee River near Champion, MI (d)	04062200*	133	1961-78
Lake Michigamme near Champion, MI (e)	04062228	193	1942-91
Michigamme River near Michigamme, MI (d)	04062230	194	1969-82
Michigamme River near Champion, MI (d)	04062270	231	1964-69
Michigamme River at Republic, MI (d)	04062300*	240	1961-75
Michigamme River near Witch Lake, MI (d)	04062400*	316	1964-80
Menominee River near Iron Mountain, MI (d)	04065000	2,430	1898-99, 1903-14
West Branch Sturgeon River near Randville, MI (d)	04065300	56.1	1958-81
East Branch Sturgeon River below Skunk Creek near Felch, MI (d)	04065393	61.8	1974-84
East Branch Sturgeon River at Hardwood, MI (d)	04065397	90.8	1978-83
Sturgeon River near Foster City, MI (d)	04065500	237	1955-80
Pine Creek near Iron Mountain, MI (d)	04065600	16.8	1972-81
Menominee River below Koss, MI (d)	04067000	3,720	1907-09, 1913-81
Galien River near New Troy, MI (d)	04095500	a47	1945-47
East Branch Galien River near New Troy, MI (d)	04096000	19.2	1945-47
Beebe Creek near Hillsdale, MI (d)	04096272*	42.4	1974-78
Sand Creek at Litchfield, MI (d)	04096312*	20.6	1974-77
Soap Creek near Litchfield, MI (d)	04096325	10.9	1975-77
St. Joseph River at Clarendon, MI (d)	04096340*	144	1974-77
Sauk (East Branch Coldwater) River at Coldwater, MI (d)	04096500	--	1938-62
Coldwater River near Hodunk, MI (d)	04096600	293	1963-89
Nottawa Creek near Athens, MI (d)	04096900	162	1967-97
St. Joseph River at Mendon, MI (d)	04097000	918	1903-05
Little Portage Creek near Fulton, MI (d)	04097060*	27.0	1965-67
Portage River near Vicksburg, MI (d)	04097170*	68.2	1946-51, 1965-80
Gourdneck Canal near Schoolcraft, MI (d)	04097195	--	1966-73, 1983-92
Gourdneck Creek near Schoolcraft, MI (d)	04097200	7.29	1964-73
Fawn River near White Pigeon, MI (d)	04098500*	192	1903-04, 1958-75

DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued			
St. Joseph River at Berrien Springs, MI (d)	04102000*	4,081	1901-07, 1909-32, 1951-56
Paw Paw River near Paw Paw, MI (d)	04102320	195	1980-82
Paw Paw River near Hartford, MI (d)	04102420	311	1980-82
St. Joseph River at St. Joseph, MI (d)	04102533	4,670	1994-96
South Branch Kalamazoo River near Albion, MI (d)	04102850	146	1972-76
Reed's Springs near Albion, MI (d)	04103000	--	1905-06
Kalamazoo River at Marshall, MI (d)	04103500	449	1949-82
Battle Creek at Charlotte, MI (d)	04104000	a67	1948-54
Battle Creek at Bellevue, MI (d)	04104500	178	1948-53
Gull Creek near Galesburg, MI (d)	04105800*	38.1	1965-73
Portage Creek near Portage, MI (d)	04106190	18.6	1965-67
Portage Creek at Kalamazoo, MI (d)	04106500	46.8	1948-58, 1975-86
Gun River at dam near Shelbyville, MI (d)	04107000	a30	1946-47
Gun River near Martin, MI (d)	04107500	a35	1946-47
Kalamazoo River near Allegan, MI (d)	04108000	a1,470	1903-08
Kalamazoo River near Fennville, MI (d)	04108500	a 1,600	1929-36, 1938-93
Kalamazoo River at New Richmond, MI (d)	04108660	a1,980	1994-96
Portage River below Little Portage Lake near Munith, MI (d)	04109500	a55	1944-56
Orchard Creek at Munith, MI (d)	04110000	a49	1944-56
Portage River near Munith, MI (d)	04110500	118	1944-46
Red Cedar River near Williamston, MI (d)	04111379	163	1975-89
Sycamore Creek near Holt, MI (d)	04112850	80.6	1975-80, 1989-90, 1995-98
Mud Lake Drain at Lansing, MI (d)	04112904	4.28	1975-76
Carrier Creek near Lansing, MI (d)	04113097	12.1	1975-80
Sebewa Creek near Sunfield, MI (d)	04113500	24.1	1954-56
Looking Glass River near Eagle, MI (d)	04114500	281	1944-96
Fish Creek near Carson City, MI (d)	04115500	145	1936-38
Flat River at Smyrna, MI (d)	04116500*	528	1951-86
Thornapple River near Caledonia, MI (d)	04118000*	773	1931-38, 1952-82, 1984-94
Grand River at Eastmanville, MI (d)	04119300	a5,230	1976-77
Crockery Creek at Slocums Grove, MI (d)	04120000	--	1903
Grand River at Grand Haven, MI (d)	04120250	5,518	1994-96
Higgins Lake Outlet (head of Muskegon River) near Roscommon, MI (d)	04120500	49.2	1942-50
Muskegon River near Merritt, MI (d)	04121000*	355	1947-74
Little Muskegon River near Morley, MI (d)	04121900	121	1967-96
Muskegon River at Newaygo, MI (d)	04122000	a2,350	1908-20, 1931-93
Muskegon River at Muskegon, MI (d)	04122150	2,680	1994-96
Big Sable River near Freesoil, MI (d)	04123000*	115	1942-74
Manistee River near Grayling, MI (d)	04123500*	123	1943-74
Pine River near Le Roy, MI (d)	04125000*	128	1952-63
Manistee River near Manistee, MI (d)	04126000	1,677	1952-93
Little Manistee River near Freesoil, MI (d)	04126200*	178	1957-75
Little Manistee River near Stronach, MI (d)	04126500	a196	1931
Boardman River near Mayfield, MI (d)	04127000	182	1952-89
Boardman River at Traverse City, MI (d)	04127500	--	1903-04
Intermediate River at Bellaire, MI (d)	04127565	146	1991
Elk Lake near Elk Rapids, MI (e)	445256085240001	a410	1952-95

DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE HURON			
Burt Lake at Indian River, MI (e)	04128500	598	1942-88
Indian River at Indian River, MI (d)	04128500	598	1942-82
Pigeon River at Afton, MI (d)	04129500	139	1942-81
Cheboygan River near Cheboygan, MI (d)	04130000	889	1943-82
Mullett Lake near Cheboygan, MI (e)	04130000	889	1943-91
Rainy River near Onaway, MI (d)	04131000	75.7	1942-52
Rainy River near Oquesoc, MI (d)	04131500*	87.9	1953-79
Black River near Cheboygan, MI (d)	04132000*	558	1943-74
Cheboygan Pond at Cheboygan, MI (e)	04132052	a1,500	1943-91
Thunder Bay River near Hillman, MI (d)	04132500*	232	1945-73
Upper South Branch Thunder Bay River near Lachine, MI (d)	04133000	171	1945-54
Thunder Bay River near Bolton, MI (d)	04133500	588	1945-80
North Branch Thunder Bay River near Bolton, MI (d)	04134000	184	1945-80
Lower South Branch Thunder Bay River near Hubbard Lake, MI (d)	04134500	146	1945-54
Thunder Bay River near Alpena, MI (d)	04135000	1,238	1901-09 1980-93
Au Sable River at Grayling, MI (d)	04135500*	110	1943-93
East Branch Au Sable River at Grayling, MI (d)	04135600	76.0	1958-84
Au Sable River at Bamfield, MI (d)	04137000	a1,420	1902-14
East Branch Au Gres River at McIvor, MI (d)	04138000*	a84	1951-74
Au Gres River near National City, MI (d)	04138500	154	1951-81
Houghton Creek near Lupton, MI (d)	04139000*	29.7	1950-73
Rifle River at "The Ranch" near Lupton, MI (d)	04139500	56.8	1950-71
Prior Creek near Selkirk, MI (d)	04140000*	21.4	1950-73
Rifle River at Selkirk, MI (d)	04140500*	117	1950-82
South Branch Shepards Creek near Selkirk, MI (d)	04141000*	1.15	1952-78
West Branch Rifle River near Selkirk, MI (d)	04141500*	a52	1952-63
Rifle River at Omer, MI (d)	04143000	364	1902-04
North Branch Kawkawlin River near Kawkawlin, MI (d)	04143500	101	1951-82
Shiawassee River at Linden, MI (d)	04143900	83.7	1968-94
Shiawassee River at Byron, MI (d)	04144000	365	1948-83
Shiawassee River near Fergus, MI (d)	04145000	637	1940-84, 1989-94
Bad River near Brant, MI (d)	04145500*	a89	1949-59
Flint River at Columbiaville, MI (d)	04146500	470	1932-33, 1948-52
Holloway Reservoir near Otisville, MI (e)	04147000	526	1954-91
Butternut Creek near Genesee, MI (d)	04147900	34.7	1970-84
Flint River at Genesee, MI (d)	04148000	a593	1931-52
Gilkey Creek near Flint, MI (d)	04148160	6.43	1970-84
Swartz Creek near Holly, MI (d)	04148200*	12.1	1956-75
Swartz Creek at Flint, MI (d)	04148300*	115	1970-84
Thread Creek near Flint, MI (d)	04148440*	54.4	1970-84
Brent Run near Montrose, MI (d)	04148720	20.8	1970-84
Flint River near Fosters, MI (d)	04149000	1,188	1940-84, 1988-92
Flint River near Alicia, MI (e)	04149500	--	1949-84
South Branch Cass River near Cass City, MI (d)	04150000	238	1949-80
Cass River at Cass City, MI (d)	04150500	359	1948-97
Cass River at Wahjamega, MI (d)	04150800	645	1969-94
Cass River at Vassar, MI (d)	04151000*	710	1910-28, 1949-70
Tobacco River at Beaverton, MI (d)	04152500	487	1948-82
Kinney Creek near Clare, MI (d)	04153000	a9	1935-36
Salt River near North Bradley, MI (d)	04153500	138	1934-71

DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE HURON--Continued			
Chippewa River near Midland, MI (d)	04154500*	597	1948-73
Pine River near Midland, MI (d)	04155500	a390	1934-38, 1948-97
Tittabawassee River at Freeland, MI (d)	04156500	a2,530	1903-10, 1912-36
State Drain near Sebewaing, MI (d)	04157500	67.3	1940-54
Columbia Drain near Sebewaing, MI (d)	04158000	33.9	1940-54, 1988-90
Pigeon River near Owendale, MI (d)	04158500	53.2	1953-82
Pigeon River near Pigeon, MI (d)	04159000	93.3	1947-52
Pigeon River near Caseville, MI (d)	04159010	125	1987-93
STREAMS TRIBUTARY TO ST. CLAIR RIVER			
Silver Creek near Jeddo, MI (d)	04159488	20.6	1978-82
Mill Creek near Abbottsford, MI (d)	04160000*	185	1947-64
Black River near Port Huron, MI (d)	04160050	684	1931, 1933-44
STREAMS TRIBUTARY TO LAKE ST. CLAIR			
Clinton River at Auburn Heights, MI (d)	04161000*	123	1935-40, 1957-82
Galloway Creek near Auburn Heights, MI (d)	04161100	17.9	1960-91
Paint Creek near Lake Orion, MI (d)	04161500*	38.5	1955-75, 1989-91
Clinton River at Sterling Heights, MI (d)	04161820	309	1979-83 1996-98
Red Run near Warren, MI (d)	04162010	--	1980-88
Bear Creek at Warren, MI (d)	04162500	17.3	1954-57
Big Beaver Creek near Warren, MI (d)	04162900	--	1959-88
Big Beaver Creek at Warren, MI (d)	04163000	25.2	1954-58
Plum Brook at Utica, MI (d)	04163400	16.5	1965-98
Plum Brook near Utica, MI (d)	04163500	22.9	1954-66
Red Run near Cady, MI (e)	04163900	--	1980-82
North Branch Clinton River at Almont, MI (d)	04164010*	9.56	1963-68
North Branch Clinton River near Romeo, MI (d)	04164050*	49.7	1965-69
North Branch Clinton River near Meade, MI (d)	04164150*	89.6	1968-72
Coon Creek near Armada, MI (d)	04164200*	10.0	1966-70
Tupper Brook at Ray Center, MI (d)	04164250*	8.62	1960-64
Highbank Creek near Armada, MI (d)	04164350*	14.9	1965-70
East Branch Coon Creek near New Haven, MI (d)	04164360*	36.1	1968-72
Deer Creek near Meade, MI (d)	04164400*	12.7	1960-65
McBride Drain near Macomb, MI (d)	04164450*	5.79	1960-64
Middle Branch Clinton River near Macomb, MI (d)	04164600*	22.2	1965-69
Middle Branch Clinton River at Macomb, MI (d)	04164800*	41.0	1963-68, 1970-82
Middle Branch Clinton River near Mount Clemens, MI (d)	04165000	a51	1947-49
Gloede Ditch near Waldenburg, MI (d)	04165200*	16.0	1959-64
Clinton River By-Pass below weir at Mount Clemens, MI (e)	04165556	--	1980-83
Clinton River By-Pass at mouth at Mount Clemens, MI (e)	04165557	--	1980-83
STREAMS TRIBUTARY TO DETROIT RIVER			
Lower River Rouge at Dearborn, MI (d)	04168500	91.9	1931-33
STREAMS TRIBUTARY TO LAKE ERIE			
Hayes Creek at Commerce, MI (d)	04169000	a8	1946-51
Huron River at Commerce, MI (d)	04169500*	57.3	1946-75
Davis Creek near Whitmore Lake, MI (d)	04171000	65.8	1953-54
Ore Creek near Brighton, MI (d)	04171500	a31	1951-68
Portage River near Pinckney, MI (d)	04172500*	79.1	1945-71

DISCONTINUED SURFACE-WATER-DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Station number	Drainage area (mi ²)	Period of record
STREAMS TRIBUTARY TO LAKE ERIE--Continued			
Huron River near Dexter, MI (d)	04173000*	522	1904- 1946-72, 1976-77
Huron River at Dexter, MI (e)	04174000	--	1904-16
Huron River at Ypsilanti, MI (d)	04174800	807	1974-84, 1990-84
Willow Run near Rawsonville (d)	04174950	--	1986-87
Stony Creek at Oakville, MI (d)	04175340	68.0	1970-81
Huron River at Flat Rock, MI (d)	04175100	851	1904-11
Huron River at Flat Rock, MI (e)	04175100	851	1912-22
River Raisin near Tecumseh, MI (d)	04175700	267	1956-80
South Branch River Raisin at Adrian, MI (d)	04175957	164	1992-95
Saline River near Saline, MI (d)	04176400*	94.6	1966-77

DISCONTINUED SURFACE-WATER-QUALITY STATIONS

The following continuous-record surface-water-quality stations in Michigan have been discontinued. Daily records of temperature, specific conductance, or sediment were collected and published for the record shown for each station. Information regarding these stations may be obtained from the District office at the address given on the back side of the title page of this report.

[Type of record: Temp. (temperature), S.C. (specific conductance), Sed. (sediment). Letter (a) before drainage area means approximately.]

Station name	Station number	Drainage area (mi ²)	Type of record	Period of record
STREAMS TRIBUTARY TO LAKE SUPERIOR				
Washington Creek at Windigo, MI	04001000	13.2	Temp.	1965-91
Black River near Bessemer, MI	04031000	200	Temp.	1955-71
Ontonagon River near Rockland, MI	04040000	1,340	Temp., S.C.	1975-81
Sturgeon River near Chassell, MI	04043004	723	Temp., S.C.	1973-81
Trap Rock River near Lake Linden, MI	04043050	28.0	Temp.	1972-83
Salmon Trout River near Big Bay, MI	04043250	37.8	Temp.	1971-73
Tahquamenon River near Paradise, MI	04045500	790	Temp., S.C.	1975-81
STREAMS TRIBUTARY TO ST. MARYS RIVER				
St. Marys River above Sault Ste. Marie, MI	04045580	a80,900	Temp., S.C.	1974-81
STREAMS TRIBUTARY TO LAKE MICHIGAN				
Black River near Garnet, MI	04046000	a28	Temp.	1952-75 1977-78
Manistique River above Manistique, MI	04057004	a1,445	Temp., S.C.	1973-81
Manistique River at Manistique, MI	04057005	a1,450	Temp., S.C.	1975
Middle Branch Escanaba River at Humboldt, MI	04057800	46.0	Temp.	1973-78
Greenwood Afterbay near Greenwood, MI	04057812	67.4	Temp.	1973-86
Greenwood Diverson near Greenwood, MI	04057813	--	Temp.	1973-82
Greenwood Release near Greenwood, MI	04057814	67.4	Temp.	1973-82
Middle Branch Escanaba River near Greenwood, MI	04057820	73.3	Temp.	1973-78
Black River near Republic, MI	04057900	34.4	Sed.	1962-63, 1965, 1962-68
Middle Branch Escanaba River near Ishpeming, MI	04058000	128	Temp.	1962-75, 1977-82
Green Creek near Palmer, MI	04058120	8.42	Temp., Sed.	1965, 1973-80
Green Creek near Princeton, MI	04058130	13.8	Temp.	1977-81
Schweitzer Creek near Palmer, MI	04058200	23.6	Temp.	1962-71
Goose Lake Outlet near Sands Station, MI	04058400	37.5	Temp.	1977-81
East Branch Escanaba River at Gwinn, MI	04058500	124	Temp. Sed.	1955-64 1962-63
Ford River near Hyde, MI	04059500	450	Temp. S.C.	1953-81 1975-81
Paint River near Alpha, MI	04062000	631	Temp.	1953-54, 1953-57
Peshekee River near Champion, MI	04062200	133	Temp.	1962, 1964-78
Michigamme River near Witch Lake, MI	04062400	316	Temp., Sed.	1965-69
East Branch Sturgeon River at Hardwood, MI	04065397	90.8	Temp.	1973-83
Sturgeon River near Foster City, MI	04065500	237	Temp.	1957-80
Pine Creek near Iron Mountain, MI	04065600	16.8	Temp.	1972-81
Beebe Creek near Hillsdale, MI	04096272	42.4	Sed.	1975, 1973-77
Sand Creek at Litchfield, MI	04096312	20.6	Temp., Sed. Sed.	1975-76, 1977
Soap Creek near Litchfield, MI	04096325	10.9	Temp., Sed. Sed.	1975-76, 1977

DISCONTINUED SURFACE-WATER-QUALITY STATIONS--Continued

Station name	Station number	Drainage area (mi ²)	Type of record	Period of record
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued				
St. Joseph River at Clarendon, MI	04096340	144	Temp., Sed.	1975-76, 1977
St. Joseph River at Niles, MI	04101500	3,666	Temp., S.C.	1979-84
Paw Paw River near Paw Paw, MI	04102320	195	Temp., Sed.	1981-82
Paw Paw River near Hartford, MI	04102420	311	Sed.	1981-82
Black River near Bangor, MI	04102700	83.6	Temp., Sed.	1981-82
Kalamazoo River at Comstock, MI	04106000	a1,010	Temp.	1969-75
Portage Creek near Kalamazoo, MI	04106300	22.4	Temp., S.C.	1968-71
West Fork Portage Creek at Kalamazoo, MI	04106400	18.7	Temp., S.C.	1971, 1972-73
Portage Creek at Kalamazoo, MI	04106500	46.8	S.C. Temp., S.C.	1968, 1972-75, 1976-86
Kalamazoo River near Cooper Center, MI	04106770	1,248	Temp. Temp., S.C.	1968, 1970, 1969, 1971-75
Kalamazoo River at Saugatuck, MI	04108690	a2,020	S.C. Temp, S.C.	1974, 1975-81
Grand River near Eaton Rapids, MI	04111000	661	Temp.	1964-74, 1976-77
Grand River at Lansing, MI	04113000	a1,230	Temp.	1964, 1967-68, 1970-73
Grand River at Portland, MI	04114000	1,385	Temp.	1964-68
Grand River at Eastmanville, MI	04119300	a5,230	Temp., S.C.	1979-83
Muskegon River at Evart, MI	04121500	a1,450	Temp.	1957-83
Little Muskegon River near Morley, MI	04121900	138	Temp.	1967-83
Muskegon River near Bridgeton, MI	04122030	a2,420	Temp., S.C.	1975-81
Pere Marquette River near Scottville, MI	04122500	681	Temp.	1968-83
Manistee River near Grayling, MI	04123500	123	Temp.	1957-77
East Branch Pine River near Tustin, MI	04124500	60	Temp.	1952-63
Pine River near LeRoy, MI	04125000	128	Temp.	1953-63
Pine River near Luther, MI	04125200		Sed.	1967-70
Silver Creek near Luther, MI	04125210		Sed.	1969-70
Poplar Creek near Hoxeyville, MI	04125350		Sed.	1969-70
Pine River near Dublin, MI	04125450		Sed.	1968-70
Pine River near Hoxeyville, MI	04125500	251	Temp.	1952-63
Pine River near Wellston, MI	04125510		Sed.	1967-70
Little Manistee River near Freesoil, MI	04126200	178	Temp.	1957-77
Manistee River at Manistee	04126520	1,928	Temp., S.C.	1975-81
Boardman River at Brown Bridge Road nr Mayfield	04126970	141	Temp., S.C.	1998
Boardman River near Mayfield, MI	04127000	182	Temp.	1962-77
Boardman River at Traverse City	04127499	283	Temp., S.C.	1998
Jordan River near East Jordan, MI	04127800	67.9	Temp.	1967-83
STREAMS TRIBUTARY TO LAKE HURON				
Sturgeon River near Wolverine, MI	04128000	198	Temp.	1959-83
Pigeon River near Vanderbilt, MI	04129000	62.6	Temp.	1951-66
Cheboygan River at Cheboygan, MI	04132052	a1,500	Temp., S.C.	1975-81
Thunder Bay River near Alpena, MI	04135000	1,238	Temp., S.C.	1980-85
Thunder Bay River at Alpena, MI	04135020	a1,240	Temp., S.C.	1979

DISCONTINUED SURFACE-WATER-QUALITY STATIONS--Continued

Station name	Station number	Drainage area (mi ²)	Type of record	Period of record
STREAMS TRIBUTARY TO LAKE HURON--Continued				
Au Sable River at Grayling, MI	04135500	110	Temp.	1953-80
South Branch Au Sable River near Luzerne, MI	04135700	401	Temp.	1967-83
East Branch Au Gres River at McIvor, MI	04138000	a84	Temp.	1952-66
Au Gres River near National City, MI	04138500	154	Temp.	1952-59
Houghton Creek near Lupton, MI	04139000	29.7	Temp.	1950-68
Rifle River near Lupton, MI	04139500	56.8	Temp.	1950-71
Prior Creek near Selkirk, MI	04140000	21.4	Temp.	1951-68
Rifle River at Selkirk, MI	04140500	117	Temp.	1951-76
West Branch Rifle River near Selkirk, MI	04141500	a52	Temp.	1952-61
Rifle River near Sterling, MI	04142000	a320	Sed.	1936, 1970-72, 1975-81
Shiawassee River at Byron, MI	04144000	365	Temp.	1962-81
Shiawassee River at Owosso, MI	04144500	538	Sed.	1966-72
Cass River at Frankenmuth, MI	04151500	841	Sed.	1966-72
Pigeon River near Caseville	04159010	125	Temp., S.C.	1978-81
STREAMS TRIBUTARY TO ST. CLAIR RIVER				
St. Clair River at Port Huron, MI	04159130	a222,400	Temp., S.C.	1978-81
Black River near Jeddo, MI	04159492	464	Temp.	1937
Black River at Fargo, MI	04159500	480	Sed.	1936, 1979-82
STREAMS TRIBUTARY TO LAKE ST. CLAIR				
Clinton River near Drayton Plains, MI	04160900	79.2	Temp.	1962-74
Clinton River at Sterling Heights, MI	04161820	309	Temp.	1996-98
Clinton River near Fraser, MI	04164000	444	Sed.	1936
Clinton River at Mount Clemens, MI	04165500	734	Temp., S.C.	1975-81
STREAMS TRIBUTARY TO DETROIT RIVER				
Detroit River at Detroit, MI	04165700	a228,800	Temp., S.C.	1974-81
STREAMS TRIBUTARY TO LAKE ERIE				
River Raisin near Manchester, MI	04175600	132	Temp.	1937
River Raisin near Monroe, MI	04176500	1,042	Temp., Sed.	1966-72
			Temp., S.C.	1978-81

WATER RESOURCES DATA - MICHIGAN, 1999

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 145 streamflow-gaging stations, 30 crest-stage partial-record stations and 53 miscellaneous sites; (2) stage only records for 2 stream-gaging stations and 25 lake-gaging stations; (3) stage and content records for 1 reservoir; (4) water-quality records for 26 streamflow-gaging stations and 1 lake-gaging station; (5) water-level records for 40 ground-water 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 U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, 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-99-1." 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) 887-8903.

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 Environmental Quality, Russell Harding, Director, through Land and Water Management Division, Richard A. Powers, Chief.

Michigan Department of Natural Resources, K. L. Cool, Director.

Michigan Department of Transportation, James R. DeSana, Director.

Assistance with funds or services was given by the U.S. Army Corps of Engineers in collecting records for 6 gaging stations published in this report. Assistance was also furnished by the National Weather Service, National Oceanic Atmospheric Administration, and U.S. Department of Commerce.

The following organizations aided in collecting records:

Macomb County Board of Supervisors; Oakland County Drain Commission; Washtenaw County Drain Commission; Delta Township (Eaton County); Huron County; Otsego County; Wayne County; Huron-Clinton Metropolitan Authority; Ann Arbor, Battle Creek, Cadillac, Coldwater, Flint, Imlay City, Kalamazoo, Norway, Portage, and Sturgis; American Aggregates Co.; Consumers Energy; Cleveland Cliffs Iron Co.; Dow Chemical Co.; French Paper Co.; Lansing Board of Water and Light; Mead Corporation; Indiana Michigan Power Co.; Pharmacia & Upjohn; STS Hydropower, Ltd; Swift-Eckrich, Inc.; Upper Peninsula Power Co.; White's Bridge Hydro Co.; Wisconsin-Electric Power Co.; and Wolverine Power Supply Cooperative, Inc.

Organizations that supplied data are acknowledged in the station descriptions.

WATER RESOURCES DATA - MICHIGAN, 1999

SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

In the Upper Peninsula, streamflow of the Sturgeon River near Sidnaw (fig. 1) began the year below normal, equalling the 25th percentile in November and dipping below the 25th percentile in January. In February, streamflow was above normal, falling slightly below normal in March and April. Streamflow exceeded normal in June and August. Above normal precipitation in May and July resulted in flows that exceeded the 75th percentile during those months. Streamflow was below normal in September. The 1999 annual mean discharge of 209 ft³/s (cubic feet per second) was similar to the 1961-1990 annual mean discharge.

In the northern Lower Peninsula, streamflow of the Muskegon River at Evart (fig. 1) began the year below normal, continuing that trend from October through January. In February streamflow exceeded the 75th percentile. With the exception of June and July, below normal precipitation was noted throughout the rest of the water year. Streamflow was below the 25th percentile in March, April, and May, and near normal in June. Streamflow considerably exceeded the 75th percentile in July, equalled the 75th percentile in August, falling below the 25th percentile in September. The 1999 annual mean discharge of 843 ft³/s was less than the 1961-1990 annual mean discharge.

In the southern Lower Peninsula, streamflow of the Red Cedar River at East Lansing (fig. 1) was slightly above the 25th percentile in October, falling below the 25th percentile in November and December. In January, above normal precipitation resulted in streamflow that exceeded the 75th percentile. Streamflow fell below normal in February and fell below the 25th percentile in March. Streamflow at the 75th percentile occurred in April, fell below normal in May, and equalled the 25th percentile in June. Streamflow was normal in July, fell below normal in August, and fell below the 25th percentile in September. The 1999 annual mean discharge of 147 ft³/s was about 25 percent less than the 1961-1990 annual mean discharge.

Low- or extremely-low-flow conditions were noted at several partial-record stations in the southeastern Lower Peninsula during late-summer months. Period of record low streamflow occurred at two long-term gaging stations: South Branch Black River near Bangor and the Rabbit River near Hopkins; and a gaging station which has been operational since 1994, the Middle Branch Black River near South Haven. In addition, period of record low monthly-mean flows were recorded at several stations in the southwestern Lower Peninsula.

In spite of near-normal precipitation in much of the region in 1999, the entire Great Lakes-St. Lawrence River system continued near drought conditions, a trend begun in June 1998. With the exception of Lake Superior, water levels in 1999 continued to decline monthly in comparison with 1998 levels. Water levels in Lakes Superior and Ontario, while below average, paralleled long-term monthly averages. Lakes Michigan, Huron, St. Clair, and Erie continued a severe decline which began during the 1998 water year; the last time these lakes had water levels this low was 1966. At the end of September, water levels in Lakes Superior, St. Clair, Erie, and Ontario were about 0.50 ft below long-term average, while water level in Lakes Michigan and Huron were about 1.1 ft below long-term average. The water level in Lakes Michigan and Huron is about 3.8 ft lower than record high levels recorded in 1986. No new record high- or low-water levels on any of the Great Lakes were recorded during the year.

Water Quality

Surface-water-quality data were collected at a number of sites in 1999. Daily records of water temperature were collected at two stations in the Upper Peninsula. Daily records of one or more water-quality parameters including dissolved oxygen, specific conductance, and temperature were collected at 23 stations in the northern Lower Peninsula.

Ground Water

Pleistocene glacial deposits cover most of the State. Outwash sand and gravel in these deposits form the most productive aquifers, although lacustrine sand aquifers are also productive. Till deposits formed of poorly-sorted, relatively impermeable mixtures of clay, silt, sand, and gravel tend to be poor aquifers; clay deposits generally yield little or no water. In most areas, glacial deposits are less than 200 ft thick, although deposits greater than 800 ft thick are found in some areas of the northern Lower Peninsula.

Sandstone, limestone, and dolomite are the principal bedrock aquifers. Where bedrock aquifers are hydraulically connected to overlying freshwater-bearing units, they yield freshwater. However, when bedrock aquifers are isolated from freshwater-bearing units by impermeable deposits (confining units) such as till, clay, or shale, they typically yield brackish, saline, or briny water. Annual recharge to aquifers in Michigan ranges from 3 to 18 in. and is derived from precipitation, which averages 31 in. annually.

Ground-water levels were measured at 40 wells statewide during the 1999 water year (fig. 9). Distribution of the wells primarily defines localized ground-water conditions. Ground-water levels typically follow seasonal precipitation patterns with lows occurring during the mid- to late-summer months followed by recovery in late-winter and spring. The water level at a well in the central Lower Peninsula (Oakland County) fell from October 1 through September 30, with no notable spring recovery. The previously established period of record low for this well, which occurred in 1972, was not surpassed. Water levels measured in several wells in the east-central Lower Peninsula (Huron County) established period of record (1993-present) lows. In September, period of record low levels were measured in four long-term wells in the south-central Lower Peninsula (Kalamazoo County) and two long-term wells in the southeastern Lower Peninsula (Monroe County). In contrast, the water level at a well in the central Lower Peninsula (Ingham County) established a period of record (56 years) high. As noted in last years report, water levels in this well have historically reflected effects of large-scale municipal pumpage which has been decentralized somewhat over the period of record, and water levels continue to rise in the well.

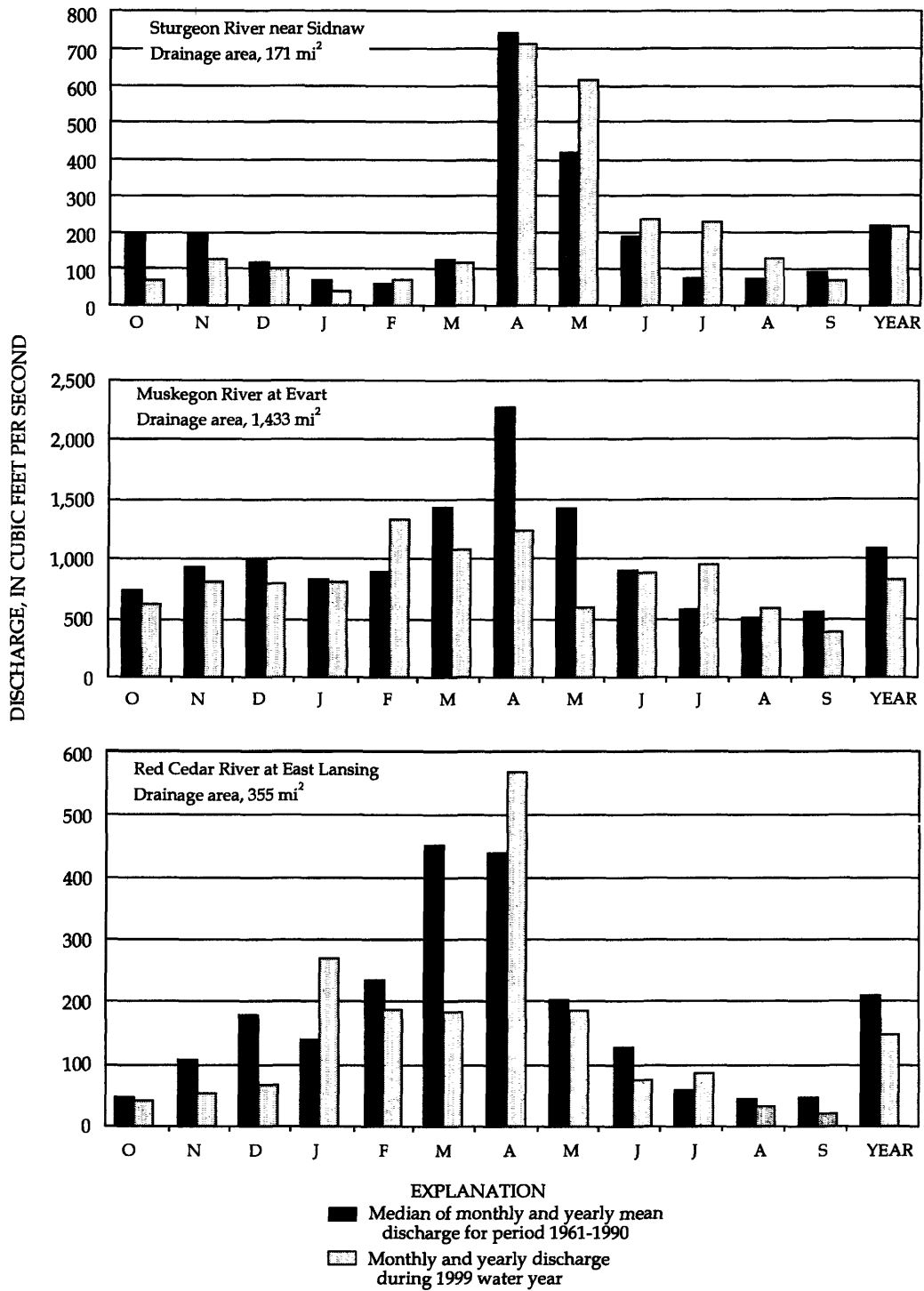


Figure 1. Discharge during 1999 water year compared with median discharge for period 1961-90 for three representative stations.

WATER RESOURCES DATA - MICHIGAN, 1999

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, in feet	Yield, in gallons per minute	
	Common range	Common range	
Glacial aquifers:			
Outwash: Mostly sand and gravel.	25-200	1-1,000	Water generally hard; iron concentrations common; deep wells may produce salty water in places.
Lacustrine sand: Mostly sand, some gravel.	25-100	80-500	Used for domestic supply 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	5-200	Primary source of domestic supply in western Upper Peninsula.
Bedrock aquifers:			
Saginaw Formation: Sandstone, siltstone, some shale, limestone, and coal	25-300	100-300	One of Michigan's most important bedrock aquifers; water generally hard; salty in places at depth.
Marshall Formation: Sandstone and siltstone.	25-200	100-500	Another of Michigan's important bedrock aquifers; salty in places and at depth.
Silurian-Devonian rocks: Limestone and dolomite; some shale and sandstone.	25-150	10-300	Important aquifer in parts of eastern Upper Peninsula; water commonly hard.
Cambrian-Ordovician rocks: Sandstone, limestone, and dolomite.	25-150	10-100	Important aquifer in eastern Upper Peninsula; water commonly very hard; salty in places and at depth.
Precambrian sandstone: Sandstone interbedded with siltstone.	25-400	5-50	Important aquifer in western Upper Peninsula; salty in places.

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 to 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 Formation in the Saginaw Bay-Thumb area commonly is highly mineralized (2,000 to 80,000 mg/L of dissolved solids). Throughout the State, salty water underlies and is in contact with freshwater at depths ranging from about 100 ft to about 900 ft. Average dissolved-solids concentration of water from bedrock (535 mg/L) is about twice as great as the average concentration from glacial deposits (241 mg/L) (Cummings, 1980).

REFERENCES CITED

Cummings, T.R., 1980, Chemical and physical characteristics of natural ground waters in Michigan--A preliminary report: U.S. Geological Survey Open-File Report 80-953, 34 p.

WATER RESOURCES DATA - MICHIGAN, 1999

SPECIAL NETWORKS AND PROGRAMS

Hydrologic Benchmark Network is a network of 50 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 human activities.

National Stream-Quality Accounting Network (NASQAN) monitors the water quality of large rivers within four of the Nation's largest river basins--the Mississippi, Columbia, Colorado, and Rio Grande. The network consists of 39 stations. Samples are collected with sufficient frequency that the flux of a wide range of constituents can be estimated. The objective of NASQAN is to characterize the water quality of these large rivers by measuring concentration and mass transport of a wide range of dissolved and suspended constituents, including nutrients, major ions, dissolved and sediment-bound heavy metals, common pesticides, and inorganic and organic forms of carbon. This information will be used (1) to describe the long-term trends and changes in concentration and transport of these constituents; (2) to test findings of the National Water-Quality Assessment Program (NAWQA); (3) to characterize processes unique to large-river systems such as storage and re-mobilization of sediments and associated contaminants; and (4) to refine existing estimates of off-continent transport of water, sediment, and chemicals for assessing human effects on the world's oceans and for determining global cycles of carbon, nutrients, and other chemicals.

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) provides continuous measurement and assessment of the chemical climate of precipitation throughout the United States. As the lead federal agency, the USGS works together with over 100 organizations to accomplish the following objectives; (1) Provide a long-term, spatial and temporal record of atmospheric deposition generated from a network of 191 precipitation chemistry monitoring sites. (2) Provide the mechanism to evaluate the effectiveness of the significant reduction in SO₂ emissions that began in 1995 as implementation of the Clean Air Act Amendments (CAAA) occurred. (3) Provide the scientific basis and nationwide evaluation mechanism for implementation of the Phase II CAAA emission reductions for SO₂ and NO_x scheduled to begin in 2000.

Data from the network, as well as information about individual sites, are available through the world wide web at:

<http://nadp.nrel.colostate.edu/NADP>

The National Water-Quality Assessment (NAWQA) Program of the U.S. Geological Survey is a long-term program with goals to describe the status and trends of water-quality conditions for a large, representative part of the Nation's ground- and surface-water resources; provide an improved understanding of the primary natural and human factors affecting these observed conditions and trends; and provide information that supports development and evaluation of management, regulatory, and monitoring decisions by other agencies.

Assessment activities are being conducted in 53 study units (major watersheds and aquifer systems) that represent a wide range of environmental settings nationwide and that account for a large percentage of the Nation's water use. A wide array of chemical constituents will be measured in ground water, surface water, streambed sediments, and fish tissues. The coordinated application of comparative hydrologic studies at a wide range of spatial and temporal scales will provide information for decision making by water-resources managers and a foundation for aggregation and comparison of findings to address water-quality issues of regional and national interest.

Communication and coordination between USGS personnel and other local, State, and federal interests are critical components of the NAWQA Program. Each study unit has a local liaison committee consisting of representatives from local, State, and federal water resources agencies, Indian nations, and universities in the study unit. Liaison committees typically meet semiannually to discuss their information needs, monitoring plans and progress, desired information products, and opportunities to collaborate efforts among the agencies.

Additional information about the NAWQA Program is available through the world wide web at:

http://www.rvares.er.usgs.gov/nawqa/nawqa_home.html

EXPLANATION OF THE RECORDS

The surface-water and ground-water records published in this report are for the 1999 water year that began October 1, 1998, and ended September 30, 1999. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, water-quality data for surface water, and ground-water level data. The locations of the stations and wells where the data were collected are shown in figures 4-9. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

Station Identification Numbers

Each data station, whether streamsite, lake, 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.

WATER RESOURCES DATA - MICHIGAN, 1999

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 indention in the "List of Stations" in the front of this report. Each indention represents one rank. This downstream order and system of indention 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.)

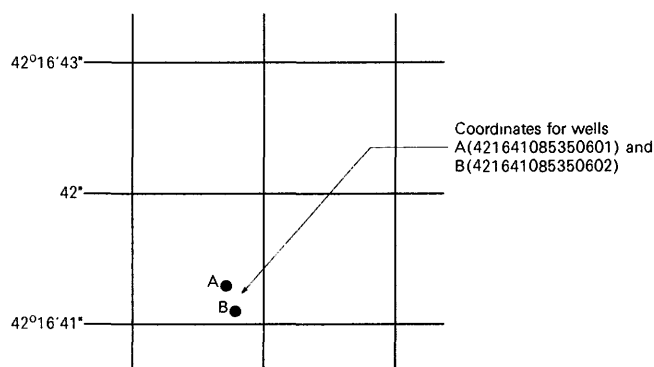


Figure 2.--System for numbering wells (latitude and longitude).

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.

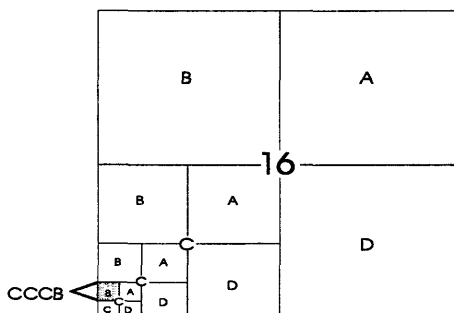


Figure 3.--Local well numbering system in Michigan.

WATER RESOURCES DATA - MICHIGAN, 1999

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 anytime, 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, with digital recorders that punch stage values on paper tapes at selected time intervals, or with electronic data loggers. 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 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.

Discharges are computed by applying the 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 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 gaging stations, acoustic velocity meter (AVM) systems are used to compute discharge. The AVM system measures the stream's velocity at one or more paths in the cross section. Coefficients are developed to relate this path velocity to the mean velocity in the cross section. Because the AVM sensors are fixed in position, the adjustment coefficients generally vary with stage. Cross-sectional area curves are developed to relate stage, recorded as noted above, to cross section area. Discharge is computed by multiplying path velocity by the appropriate stage related coefficient and area.

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.

WATER RESOURCES DATA - MICHIGAN, 1999

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 for various reasons fails to operate properly. 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 continuous-record surface-water discharge station (gaging station) consist of four parts, the manuscript or station description; the data table of daily mean values of discharge for the current water year with summary data; a tabular statistical summary of monthly mean flow data for a designated period, by water year; and a summary statistics table that includes statistical data of annual, daily, and instantaneous flows as well as data pertaining to annual runoff, 7-day low-flow minimums, and flow duration.

Station manuscripts

The manuscript provides, under various headings, descriptive information, such as station location; period of record; historical extremes outside the period of record; 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 gaging station 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 records have been published 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 flow at it can reasonably be considered equivalent to flow at the present station.

REVISED RECORDS.--Because of new information, published records 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 sea level (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 are flagged in the daily-discharge table. (See next section, "Identifying Estimated Daily Discharge".) The REMARKS paragraph is used to present information relative to the accuracy of the records, to special methods of computation, and to conditions that affect natural flow at the station. In addition, information may be presented pertaining to average discharge data for the period of record; to extremes data for the period of record and the current year; 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 U.S. Geological Survey by a cooperating organization are identified here.

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.

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

WATER RESOURCES DATA - MICHIGAN, 1999

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 District Office (address 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 for a discontinued station 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.

Headings for AVERAGE DISCHARGE, EXTREMES FOR PERIOD OF RECORD, AND EXTREMES FOR CURRENT YEAR are presented in the tabular summaries following the discharge table or in the REMARKS paragraph, as appropriate.

Data table of daily mean values

The daily table of discharge records for stream-gaging stations gives mean discharge for each day of the water year. In the monthly summary for the table, the line headed "TOTAL" gives the sum of the daily figures for each month; the line headed "MEAN" gives the average flow in cubic feet per second for the month; and the lines headed "MAX" and "MIN" give the maximum and minimum daily mean discharges, respectively, for 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 or in acre-feet may be omitted if there is extensive regulation or diversion or if the drainage area includes large noncontributing areas. At some stations monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversion data or reservoir contents are given. These figures are identified by a symbol and corresponding footnote.

Statistics of monthly mean data

A tabular summary of the mean (line headed "MEAN"), maximum (line headed "MAX"), and minimum (line headed "MIN") of monthly mean flows for each month for a designated period is provided below the mean values table. The water years of the first occurrence of the maximum and minimum monthly flows are provided immediately below those figures. The designated period will be expressed as "FOR WATER YEARS ____ - ____, BY WATER YEAR (WY)," and will list the first and last water years of the range of years selected from the PERIOD OF RECORD paragraph in the station manuscript. It will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript.

Summary statistics

A table titled "SUMMARY STATISTICS" follows the statistics of monthly mean data tabulation. This table consists of four columns, with the first column containing the line headings of the statistics being reported. The table provides a statistical summary of yearly, daily, and instantaneous flows, not only for the current water year but also for the previous calendar year and for a designated period, as appropriate. The designated period selected, "WATER YEARS ____ - ____, " will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript. All of the calculations for the statistical characteristics designated ANNUAL (See line headings below.), except for the "ANNUAL 7-DAY MINIMUM" statistic, are calculated for the designated period using complete water years. The other statistical characteristics may be calculated using partial water years.

The date or water year, as appropriate, of the first occurrence of each statistic reporting extreme values of discharge is provided adjacent to the statistic. Repeated occurrences may be noted with footnotes or in the REMARKS paragraph of the manuscript. Because the designated period may not be the same as the station period of record published in the manuscript, occasionally the dates of occurrence listed for the daily and instantaneous extremes in the designate-period column may not be within the selected water years listed in the heading. When this occurs, it will be noted in the REMARKS paragraph or in footnotes. Selected streamflow duration curve statistics and runoff data are also given. Runoff data may be omitted if there is extensive regulation or diversion of flow in the drainage basin.

The following summary statistics data, as appropriate, are provided with each continuous record of discharge. Comments to follow clarify information presented under the various line headings of the summary statistics table.

ANNUAL TOTAL.--The sum of the daily mean values of discharge for the year. At some stations the annual total discharge is adjusted for reservoir storage or diversion. The adjusted figures are identified by a symbol and corresponding footnotes.

ANNUAL MEAN.--The arithmetic mean of the individual daily mean discharges for the year noted or for the designated period. At some stations the yearly mean discharge is adjusted for reservoir storage or diversion. The adjusted figures are identified by a symbol and corresponding footnotes.

WATER RESOURCES DATA - MICHIGAN, 1999

HIGHEST ANNUAL MEAN.--The maximum annual mean discharge occurring for the designated period.

LOWEST ANNUAL MEAN.--The minimum annual mean discharge occurring for the designated period.

HIGHEST DAILY MEAN.--The maximum daily mean discharge for the year or for the designated period.

LOWEST DAILY MEAN.--The minimum daily mean discharge for the year or for the designated period.

ANNUAL 7-DAY MINIMUM.--The lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The data shown in the summary statistics table is the initial date of the 7-day period. (This value should not be confused with the 7-day 10-year low-flow statistic.)

INSTANTANEOUS PEAK FLOW.--The maximum instantaneous discharge occurring for the water year or for the designated period. Note that secondary instantaneous peak discharges above a selected base discharge are stored in District computer files for stations meeting certain criteria. Those discharge values may be obtained by writing to the District Office. (See address on back of title page of this report.)

INSTANTANEOUS PEAK STAGE.--The maximum instantaneous stage occurring for the water year or for the designated period. If the dates of occurrence for the instantaneous peak flow and instantaneous peak stage differ, the REMARKS paragraph in the manuscript or a footnote may be used to provide further information.

INSTANTANEOUS LOW FLOW.--The minimum instantaneous discharge occurring for the water year or for the designated period.

ANNUAL RUNOFF.--Indicates the total quantity of water in runoff for a drainage area for the year. Data reports may use any of the following units of measurement in presenting annual runoff data:

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

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 the runoff is distributed uniformly in time and area.

Inches (INCHES) indicates the depth to which the drainage area would be covered if all of the runoff for a given time period were uniformly distributed on it.

10 PERCENT EXCEEDS.--The discharge that has been exceeded 10 percent of the time for the designated period.

50 PERCENT EXCEEDS.--The discharge that has been exceeded 50 percent of the time for the designated period.

90 PERCENT EXCEEDS.--The discharge that has been exceeded 90 percent of the time for the designated period.

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 by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated".

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.

WATER RESOURCES DATA - MICHIGAN, 1999

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 figure 6.

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.

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 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.

WATER RESOURCES DATA - MICHIGAN, 1999

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 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 Louisville, Kentucky and Heidelberg College water quality laboratory in Tiffin, Ohio. All other samples were analyzed in the Geological Survey laboratories in Arvada, Colorado. 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. In March 1989 the National Water-Quality Laboratory discovered a bias in the turbidimetric method for sulfate analysis, indicating that values below 75 mg/L have a median positive bias of 2 mg/L above the true value for the period between 1982 and 1989.

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.

WATER RESOURCES DATA - MICHIGAN, 1999

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.
V	Analyte was detected in both the environmental sample and the associated blanks.

Dissolved Trace-Element Concentrations

NOTE: Traditionally, dissolved trace-element concentrations have been reported at the microgram per liter ($\mu\text{g/L}$) level. Recent evidence, mostly from large rivers, indicates that actual dissolved-phase concentrations for a number of trace elements are within the range of 10's to 100's of nanograms per liter (ng/L). Data above the $\mu\text{g/L}$ level should be viewed with caution. Such data may actually represent elevated environmental concentrations from natural or human causes; however, these data could reflect contamination introduced during sampling, processing, or analysis. To confidently produce dissolved trace-element data with insignificant contamination, the U.S. Geological Survey began using new trace-element protocols at some stations in water year 1994.

Change in National Trends Network Procedures

NOTE: Sample handling procedures at all National Trends Network stations were changed substantially on January 11, 1994, in order to reduce contamination from the sample shipping container. The data for samples before and after that date are different and not directly comparable. A tabular summary of the differences based on a special intercomparison study, is available from the NADP/NTN Coordination Office, Colorado State University, Fort Collins, Colorado, 80523 (Telephone: 303-491-5643).

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.

WATER RESOURCES DATA - MICHIGAN, 1999

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 at the top of the station description. 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, electric tape, or from electronic data loggers. 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, in feet above sea level, 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 three parts, the station description, the data table of water levels observed during the current water year, and a graph of the water levels for the current water year or other selected period. 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 of the well description.

LOCATION.--This paragraph follows the well-identification number and reports the latitude and longitude (given in degrees, minutes, and seconds); a landline location designation; 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 plywood instrument shelf, top of casing, top of shelter 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) sea level; 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; 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. A hydrograph for a selected period of record follows each water-level table.

WATER RESOURCES DATA - MICHIGAN, 1999

ACCESS TO USGS WATER DATA

The U.S. Geological Survey provides near real-time stage and discharge data for many of the gaging stations equipped with the necessary telemetry and historic daily-mean and peak-flow discharge data for most current or discontinued gaging stations through the world wide web (WWW). These data may be accessed at:

<http://water.usgs.gov>

Some water-quality and ground-water data also are available through the WWW. In addition, data can be provided in various machine-readable formats on magnetic tape or 3-1/2 inch floppy disk. Information about the availability of specific types of data or products, and user charges, can be obtained locally from each of the Water Resources Division District offices (see address on the back of the title page).

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.

WATER RESOURCES DATA - MICHIGAN, 1999

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 series 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.

Annual 7-Day minimum is the lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The date shown in the summary statistics table is the initial date of the 7-day period. (This value should not be confused with the 7-day 10-year low-flow statistic.)

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

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

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.

WATER RESOURCES DATA - MICHIGAN, 1999

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 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.

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's data system, National Water Information System (NWIS), to uniquely identify a specific constituent. The codes used in NWIS are the same as those used in the U.S. Environmental Protection Agency's data system, STORET.

WATER RESOURCES DATA - MICHIGAN, 1999

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER RESOURCES DATA - MICHIGAN, 1999

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

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

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

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

Sea level in this report refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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) \times discharge (ft^3/s) \times 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.

WATER RESOURCES DATA - MICHIGAN, 1999

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.

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.

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

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 planimeted. All areas shown are those for the stage when the planimeted 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	Hexagenia
Species	Hexagenia limbata

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.

WATER RESOURCES DATA - MICHIGAN, 1999

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, 1999, is called the "1999 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.

TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY

The U.S.G.S. 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.G.S., Information Services, Box 25286, Federal Center, Denver, Colorado 80225 (authorized agent of the Superintendent of Documents, Government Printing Office). Prepayment is required. Remittance should be made in the form of a 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 mention the "U.S. Geological Survey Techniques of Water-Resources Investigations."

Book 1. Collection of Water Data by Direct Measurement

Section D. Water Quality

- 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, chap. 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, chap. D2. 1976. 24 pages.

Book 2. Collection of Environmental Data

Section D. Surface Geophysical Methods

- 2-D1. *Application of surface geophysics to ground-water investigations*, by A.A. R. Zohdy, G.P. Eator, and D.R. Mabey: USGS-TWRI book 2, chap. D1. 1974. 116 pages.
- 2-D2. *Application of seismic-refraction techniques to hydrologic studies*, by F.P. Haeni: USGS-TWRI book 2, chap. D2. 1988. 86 pages.

Section E. Subsurface Geophysical Methods

- 2-E1. *Application of borehole geophysics to water-resources investigations*, by W.S. Keys and L.M. MacCary: USGS-TWRI book 2, chap. E1. 1971. 126 pages.
- 2-E2. *Borehole geophysics applied to ground-water investigations*, by W.S. Keys: USGS-TWRI book 2, chap. E2. 1990. 150 pages.

Section F. Drilling and Sampling Methods

- 2-F1. *Application of drilling, coring, and sampling techniques to test holes and wells*, by Eugene Shuter and W.E. Teasdale: USGS-TWRI book 2, chap. F1. 1989. 97 pages.

Book 3. Applications of Hydraulics

Section A. Surface-Water Techniques

- 3-A1. *General field and office procedures for indirect discharge measurements*, by M.A. Benson and Tate Dalrymple: USGS-TWRI book 3, chap. 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, chap. A2. 1967. 12 pages.
- 3-A3. *Measurement of peak discharge at culverts by indirect methods*, by G.L. Bodhaine: USGS-TWRI book 3, chap. A3. 1968. 60 pages.
- 3-A4. *Measurement of peak discharge at width contractions by indirect methods*, by H.F. Matthai: USGS-TWRI book 3, chap. A4. 1967. 44 pages.
- 3-A5. *Measurement of peak discharge at dams by indirect methods*, by Harry Hulsing: USGS-TWRI book 3, chap. A5. 1967. 29 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

- 3-A6. *General procedure for gaging streams*, by R.W. Carter and Jacob Davidian: USGS-TWRI book 3, chap. A6. 1968. 13 pages.
- 3-A7. *Stage measurement at gaging stations*, by T.J. Buchanan and W.P. Somers: USGS-TWRI book 3, chap. A7. 1968. 28 pages.
- 3-A8. *Discharge measurements at gaging stations*, by T.J. Buchanan and W.P. Somers: USGS-TWRI book 3, chap. A8. 1969. 65 pages.
- 3-A9. *Measurement of time of travel in streams by dye tracing*, by F.A. Kilpatrick and J.F. Wilson, Jr.: USGS-TWRI book 3, chap. A9. 1989. 27 pages.
- 3-A10. *Discharge ratings at gaging stations*, by E.J. Kennedy: USGS-TWRI book 3, chap. A10. 1984. 59 pages.
- 3-A11. *Measurement of discharge by the moving-boat method*, by G.F. Smoot and C.E. Novak: USGS-TWRI book 3, chap. A11. 1969. 22 pages.
- 3-A12. *Fluorometric procedures for dye tracing*, Revised, by J.F. Wilson, Jr., E.D. Cobb, and F.A. Kilpatrick: USGS-TWRI book 3, chap. A12. 1986. 34 pages.
- 3-A13. *Computation of continuous records of streamflow*, by E.J. Kennedy: USGS-TWRI book 3, chap. A13. 1983. 53 pages.
- 3-A14. *Use of flumes in measuring discharge*, by F.A. Kilpatrick and V.R. Schneider: USGS-TWRI book 3, chap. A14. 1983. 46 pages.
- 3-A15. *Computation of water-surface profiles in open channels*, by Jacob Davidian: USGS-TWRI book 3, chap. A15. 1984. 48 pages.
- 3-A16. *Measurement of discharge using tracers*, by F.A. Kilpatrick and E.D. Cobb: USGS-TWRI book 3, chap. A16. 1985. 52 pages.
- 3-A17. *Acoustic velocity meter systems*, by Antonius Laenen: USGS-TWRI book 3, chap. A17. 1985. 38 pages.
- 3-A18. *Determination of stream reaeration coefficients by use of tracers*, by F.A. Kilpatrick, R.E. Rathbun, Nobuhiro Yotsukura, G.W. Parker, and L.L. DeLong: USGS-TWRI book 3, chap. A18. 1989. 52 pages.
- 3-A19. *Levels at streamflow gaging stations*, by E.J. Kennedy: USGS-TWRI book 3, chap. A19. 1990. 31 pages.
- 3-A20. *Simulation of soluble waste transport and buildup in surface waters using tracers*, by F.A. Kilpatrick: USGS-TWRI book 3, chap. A20. 1993. 38 pages.
- 3-A21. *Stream-gaging cableways*, by C. Russell Wagner: USGS-TWRI book 3, chap. A21. 1995. 56 pages.

Section B. Ground-Water Techniques

- 3-B1. *Aquifer-test design, observation, and data analysis*, by R.W. Stallman: USGS-TWRI book 3, chap. B1. 1971. 26 pages.
- 3-B2. *Introduction to ground-water hydraulics, a programmed text for self-instruction*, by G.D. Bennett: USGS-TWRI book 3, chap. 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, chap. B3. 1980. 106 pages.
- 3-B4. *Regression modeling of ground-water flow*, by R.L. Cooley and R.L. Naff: USGS-TWRI book 3, chap. B4. 1990. 232 pages.
- 3-B4. *Supplement 1. Regression modeling of ground-water flow --Modifications to the computer code for nonlinear regression solution of steady-state ground-water flow problems*, by R.L. Cooley: USGS-TWRI book 3, chap. B4. 1993. 8 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

- 3-B5. *Definition of boundary and initial conditions in the analysis of saturated ground-water flow systems—An introduction*, by O.L. Franke, T.E. Reilly, and G.D. Bennett: USGS-TWRI book 3, chap. B5. 1987. 15 pages.
- 3-B6. *The principle of superposition and its application in ground-water hydraulics*, by T.E. Reilly, O.L. Franke, and G.D. Bennett: USGS-TWRI book 3, chap. B6. 1987. 28 pages.
- 3-B7. *Analytical solutions for one-, two-, and three-dimensional solute transport in ground-water systems with uniform flow*, by E.J. Wexler: USGS-TWRI book 3, chap. B7. 1992. 190 pages.

Section C. Sedimentation and Erosion Techniques

- 3-C1. *Fluvial sediment concepts*, by H.P. Guy: USGS-TWRI book 3, chap. 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, chap. C2. 1970. 59 pages.
- 3-C3. *Computation of fluvial-sediment discharge*, by George Porterfield: USGS-TWRI book 3, chap. C3. 1972. 66 pages.

Book 4. Hydrologic Analysis and Interpretation

Section A. Statistical Analysis

- 4-A1. *Some statistical tools in hydrology*, by H.C. Riggs: USGS-TWRI book 4, chap. A1. 1968. 39 pages.
- 4-A2. *Frequency curves*, by H.C. Riggs: USGS-TWRI book 4, chap. A2. 1968. 15 pages.

Section B. Surface Water

- 4-B1. *Low-flow investigations*, by H.C. Riggs: USGS-TWRI book 4, chap. B1. 1972. 18 pages.
- 4-B2. *Storage analyses for water supply*, by H.C. Riggs and C.H. Hardison: USGS-TWRI book 4, chap. B2. 1973. 20 pages.
- 4-B3. *Regional analyses of streamflow characteristics*, by H.C. Riggs: USGS-TWRI book 4, chap. B3. 1973. 15 pages.

Section D. Interrelated Phases of the Hydrologic Cycle

- 4-D1. *Computation of rate and volume of stream depletion by wells*, by C.T. Jenkins: USGS-TWRI book 4, chap. D1. 1970. 17 pages.

Book 5. Laboratory Analysis

Section A. Water Analysis

- 5-A1. *Methods for determination of inorganic substances in water and fluvial sediments*, by M.J. Fishman and L.C. Friedman, editors: USGS-TWRI book 5, chap. A1. 1989. 545 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, chap. A2. 1971. 31 pages.
- 5-A3. *Methods for the determination of organic substances in water and fluvial sediments*, edited by R.L. Wershaw, M.J. Fishman, R.R. Grabbe, and L.E. Lowe: USGS-TWRI book 5, chap. A3. 1987. 80 pages.
- 5-A4. *Methods for collection and analysis of aquatic biological and microbiological samples*, by L.J. Fritton and P.E. Greeson, editors: USGS-TWRI book 5, chap. A4. 1989. 363 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, chap. 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, chap. A6. 1982. 181 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

Section C. Sediment Analysis

- 5-C1. *Laboratory theory and methods for sediment analysis*, by H.P. Guy: USGS-TWRI book 5, chap. C1. 1969. 58 pages.

Book 6. Modeling Techniques

Section A. Ground Water

- 6-A1. *A modular three-dimensional finite-difference ground-water flow model*, by M.G. McDonald and A.W. Harbaugh: USGS-TWRI book 6, chap. A1. 1988. 586 pages.
- 6-A2. *Documentation of a computer program to simulate aquifer-system compaction using the modular finite-difference ground-water flow model*, by S.A. Leake and D.E. Prudic: USGS-TWRI book 6, chap. A2. 1991. 68 pages.
- 6-A3. *A modular finite-element model (MODFE) for areal and axisymmetric ground-water-flow problems, Part 1: Model Description and User's Manual*, by L.J. Torak: USGS-TWRI book 6, chap. A3. 1993. 136 pages.
- 6-A4. *A modular finite-element model (MODFE) for areal and axisymmetric ground-water-flow problems, Part 2: Derivation of finite-element equations and comparisons with analytical solutions*, by R.L. Cooley: USGS-TWRI book 6, chap. A4. 1992. 108 pages.
- 6-A5. *A modular finite-element model (MODFE) for areal and axisymmetric ground-water-flow problems, Part 3: Design philosophy and programming details*, by L.J. Torak: USGS-TWRI book 6, chap. A5. 1993. 243 pages.
- 6-A6. *A coupled surface-water and ground-water flow model (MODBRANCH) for simulation of stream-aquifer interaction*, by Eric D. Swain and Eliezer J. Wexler. 1996. 125 pages.

Book 7. Automated Data Processing and Computations

Section C. Computer Programs

- 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, chap. 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, chap. 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, chap. C3. 1981. 110 pages.

Book 8. Instrumentation

Section A. Instruments for Measurement of Water Level

- 8-A1. *Methods of measuring water levels in deep wells*, by M.S. Garber and F.C. Koopman: USGS-TWRI book 8, chap. A1. 1968. 23 pages.
- 8-A2. *Installation and service manual for U.S. Geological Survey manometers*, by J.D. Craig: USGS-TWRI book 8, chap. A2. 1983. 57 pages.

Section B. Instruments for Measurement of Discharge

- 8-B2. *Calibration and maintenance of vertical-axis type current meters*, by G.F. Smoot and C.E. Novak: USGS-TWRI book 8, chap. B2. 1968. 15 pages.

Book 9. Handbooks for Water-Resources Investigations

Section A. National Field Manual for the Collection of Water-Quality Data

- 9-A1. *National Field Manual for the Collection of Water-Quality Data: Preparations for Water Sampling*, by F.D. Wilde, D.B. Radtke, Jacob Gibbs, and R.T. Iwatsubo: USGS-TWRI book 9, chap. A1. 1998. 47 p.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

- 9-A2. *National Field Manual for the Collection of Water-Quality Data: Selection of Equipment for Water Sampling*, edited by F.D. Wilde, D.B. Radtke, Jacob Gibbs, and R.T. Iwatsubo: USGS-TWRI book 9, chap. A2. 1998. 94 p.
- 9-A3. *National Field Manual for the Collection of Water-Quality Data: Cleaning of Equipment for Water Sampling*, edited by F.D. Wilde, D.B. Radtke, Jacob Gibbs, and R.T. Iwatsubo: USGS-TWRI book 9, chap. A3. 1998. 75 p.
- 9-A4. *National Field Manual for the Collection of Water-Quality Data: Collection of Water Samples*, edited by F.D. Wilde, D.B. Radtke, Jacob Gibbs, and R.T. Iwatsubo: USGS-TWRI book 9, chap. A4. 1999. 156 p.
- 9-A5. *National Field Manual for the Collection of Water-Quality Data: Processing of Water Samples*, edited by F.D. Wilde, D.B. Radtke, Jacob Gibbs, and R.T. Iwatsubo: USGS-TWRI book 9, chap. A5. 1999. 149 p.
- 9-A6. *National Field Manual for the Collection of Water-Quality Data: Field Measurements*, edited by F.D. Wilde and D.B. Radtke: USGS-TWRI book 9, chap. A6. 1998. Variously paginated.
- 9-A7. *National Field Manual for the Collection of Water-Quality Data: Biological Indicators*, edited by D.N. Myers and F.D. Wilde: USGS-TWRI book 9, chap. A7. 1997 and 1999. Variously paginated.
- 9-A8. *National Field Manual for the Collection of Water-Quality Data: Bottom-material samples*, by D.B. Radtke: USGS-TWRI book 9, chap. A8. 1998. 48 pages.
- 9-A9. *National Field Manual for the Collection of Water-Quality Data: Safety in Field Activities*, by S.L. Lane and R.G. Fay: USGS-TWRI book 9, chap. A9. 1998. 60 pages.

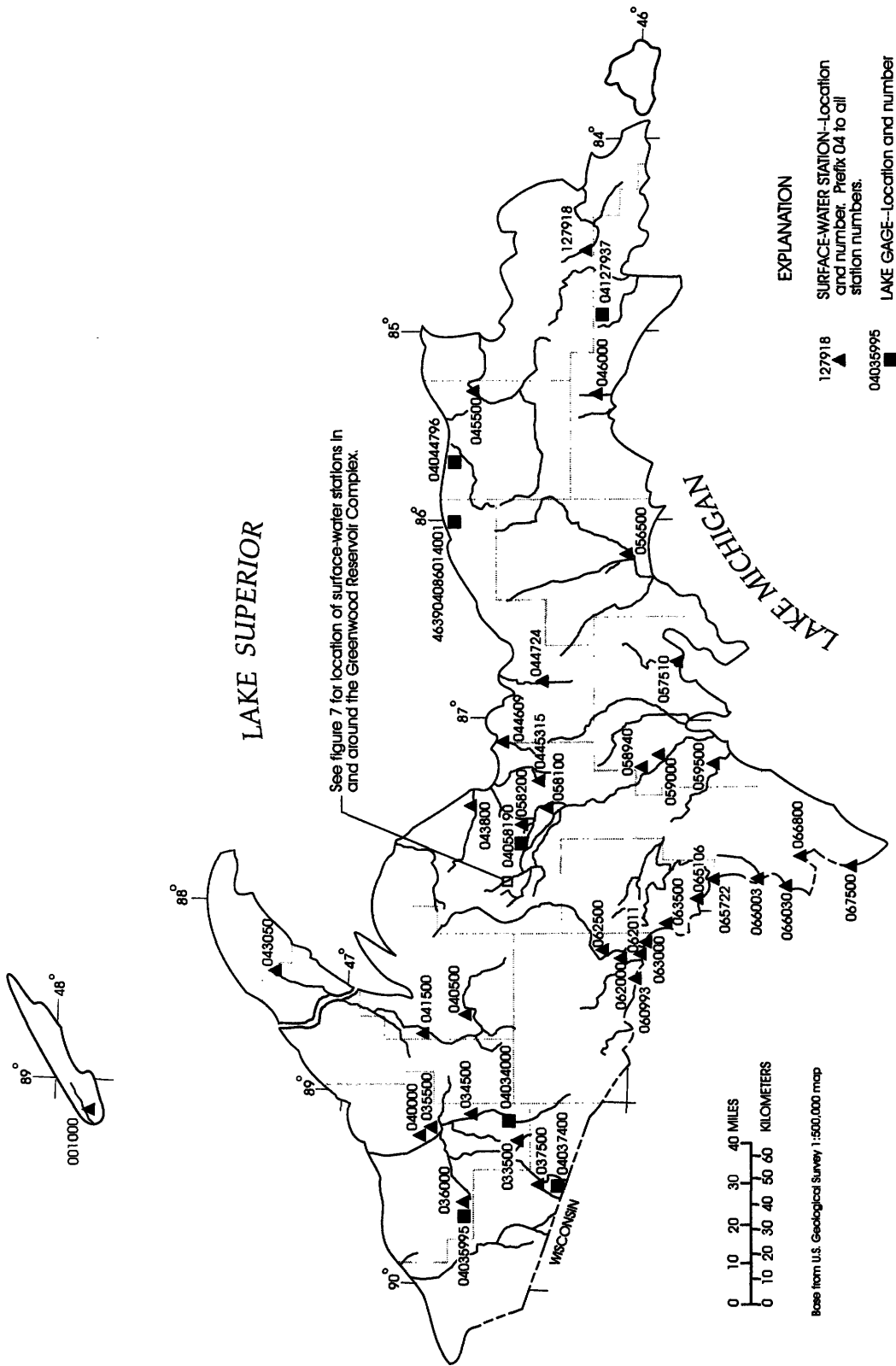


Figure 4. Identification number and location of active surface-water gaging stations in the Upper Peninsula of Michigan.

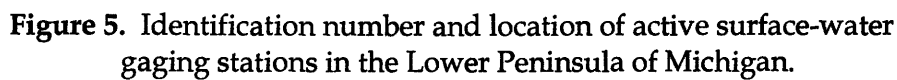




Figure 6. Identification number and location of active surface-water-quality stations in Michigan.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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.

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

GAGE.--Water-stage recorder, crest-stage gage, and concrete control. Elevation of gage is 605 ft above sea level, from topographic map.

REMARKS.--Records fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	3.5	12	e4.3	3.4	e6.6	92	25	23	6.4	11	6.7
2	1.7	3.3	11	4.1	3.7	e6.4	71	22	22	5.4	9.0	4.9
3	1.6	3.2	11	3.9	3.9	e6.2	61	19	19	4.8	7.2	4.8
4	1.6	3.0	9.6	3.8	4.1	e6.0	56	17	16	8.9	6.0	4.4
5	1.7	2.7	19	e3.7	4.1	e5.8	52	15	16	91	5.1	4.4
6	3.6	2.6	34	e3.7	4.1	e5.8	66	17	16	67	5.6	4.0
7	4.1	2.6	27	e3.6	4.0	e5.4	74	22	14	37	19	4.1
8	2.9	2.6	23	e3.5	4.0	e5.4	76	73	13	23	16	28
9	2.8	2.5	21	e3.4	3.9	e5.2	76	51	11	40	12	20
10	2.8	11	15	e3.4	3.8	e5.2	80	37	9.3	44	12	16
11	2.6	22	16	e3.3	4.7	5.4	84	29	10	32	9.2	14
12	2.9	17	12	e3.2	6.4	5.6	89	24	15	22	13	12
13	2.9	14	12	e3.1	6.6	5.9	102	20	12	19	34	12
14	2.7	16	18	e3.0	6.8	5.8	123	18	9.8	18	26	11
15	2.5	17	10	e3.0	7.1	5.6	144	16	8.7	17	18	9.7
16	3.8	14	9.3	3.0	e6.8	5.9	142	15	6.8	15	27	7.9
17	18	12	18	3.1	e6.6	8.7	126	17	5.8	13	21	6.8
18	35	11	25	3.3	e6.4	9.5	98	37	4.9	10	16	6.2
19	24	55	20	3.4	e6.0	8.8	86	35	4.3	8.4	12	12
20	17	51	13	3.4	e5.6	8.7	75	33	3.8	6.8	9.9	13
21	13	52	8.7	3.4	e5.4	8.0	71	44	3.5	5.9	8.7	9.2
22	10	32	6.8	3.4	e5.0	7.5	64	35	4.3	5.1	8.1	7.7
23	8.5	33	6.5	3.4	e5.0	7.2	54	43	8.0	44	7.9	6.8
24	7.1	32	6.0	3.4	e4.8	6.5	47	55	12	48	7.8	6.0
25	6.1	27	5.6	3.4	e4.8	6.3	44	48	8.3	27	7.3	5.4
26	5.5	23	5.4	3.4	e5.0	7.1	43	41	6.2	19	6.6	5.3
27	4.9	19	5.2	3.4	e5.8	9.9	40	32	6.2	15	6.0	6.4
28	4.3	17	5.1	3.4	e6.6	23	35	26	6.2	31	5.5	5.4
29	4.0	15	e4.8	3.4	---	58	31	21	8.7	19	4.2	4.9
30	3.8	14	e4.6	3.4	---	67	27	17	6.8	15	3.8	4.7
31	3.7	---	e4.5	3.4	---	75	---	20	---	13	7.4	---
TOTAL	206.8	530.0	399.1	106.6	144.4	403.4	2229	964	310.6	730.7	362.3	263.7
MEAN	6.67	17.7	12.9	3.44	5.16	13.0	74.3	31.1	10.4	23.6	11.7	8.79
MAX	35	55	34	4.3	7.1	75	144	73	23	91	34	28
MIN	1.6	2.5	4.5	3.0	3.4	5.2	27	15	3.5	4.8	3.8	4.0
CFSM	.51	1.34	.98	.26	.39	.99	5.63	2.36	.78	1.79	.89	.67
IN.	.58	1.49	1.12	.30	.41	1.14	6.28	2.72	.88	2.06	1.02	.74

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1999, BY WATER YEAR (WY)

	MEAN	11.7	14.8	7.46	4.23	3.83	12.4	68.0	39.5	13.1	7.39	4.39	7.31
MAX	33.8	47.2	18.3	18.1	13.0	58.7	154	108	34.2	23.6	14.0	55.1	
(WY)	1986	1992	1966	1966	1966	1966	1967	1996	1968	1999	1966	1977	
MIN	.76	.88	.63	.60	.61	1.10	20.3	4.87	2.47	.87	.65	.57	
(WY)	1977	1977	1977	1977	1977	1965	1987	1998	1998	1998	1998	1976	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1965 - 1999

ANNUAL TOTAL	3493.08	6650.6	
ANNUAL MEAN	9.57	18.2	16.2
HIGHEST ANNUAL MEAN			33.1
LOWEST ANNUAL MEAN			8.12
HIGHEST DAILY MEAN	180	Mar 30	439
LOWEST DAILY MEAN	.46	Aug 16	.44
ANNUAL SEVEN-DAY MINIMUM	.49	Aug 13	.47
INSTANTANEOUS PEAK FLOW		166	(a)657
INSTANTANEOUS PEAK STAGE		4.69	8.17
INSTANTANEOUS LOW FLOW			.43
ANNUAL RUNOFF (CFSM)	.73	1.38	1.23
ANNUAL RUNOFF (INCHES)	9.84	18.74	16.65
10 PERCENT EXCEEDS	22	48	39
50 PERCENT EXCEEDS	3.2	8.7	5.8
90 PERCENT EXCEEDS	.72	3.4	1.4

(a) From rating curve extended above 280 ft³/s.

(e) Estimated.

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 sea level.

REMARKS.--Reservoir is formed by earthfill and concrete dam with one taintor gate; dam completed in 1937. Capacity of reservoir, 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 observed, 38,900 acre-ft, May 11, 12, gage height, 140.0 ft; minimum observed, 8,740 acre-ft, Jan. 12-16, gage height, 125.3 ft.

MONTHEND GAGE HEIGHT AND CONTENTS AT 1030, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)	(equivalent in ft ³ /s)
Sept. 30	127.2	12,280		
Oct. 31	126.1	10,190	-2,090	-34.0
Nov. 30	127.0	11,900	+1,710	+28.7
Dec. 31	126.3	10,570	-1,330	-21.6
CAL YR 1998			-380	-0.5
Jan. 31	125.8	9,640	-930	-15.1
Feb. 28	127.9	13,610	+3,970	+71.5
Mar. 31	130.6	18,740	+5,130	+83.4
Apr. 30	138.2	34,760	+16,020	+269
May 31	139.4	37,520	+2,760	+44.9
June 30	138.0	34,300	-3,220	-54.1
July 31	138.3	34,990	+690	+11.2
Aug. 31	135.4	28,480	-6,510	-106
Sept. 30	131.0	19,500	-8,980	-151
WTR YR 1999			+7,220	+10.0

STREAMS TRIBUTARY TO LAKE SUPERIOR

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 sea level (levels by Michigan Department of Natural Resources). Prior to Nov. 4, 1942, nonrecording gage at same site and datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	45	45	e45	44	46	69	44	219	56	54	52
2	44	45	45	45	45	47	67	44	58	50	53	47
3	44	45	45	45	45	46	74	44	56	66	53	46
4	44	45	45	45	43	45	69	44	55	56	53	45
5	44	45	52	e45	43	47	64	44	56	55	53	46
6	45	45	49	45	45	46	71	48	56	54	54	46
7	45	45	47	e45	44	e46	66	67	55	51	53	45
8	44	45	47	e45	45	47	62	68	54	54	53	46
9	44	45	46	e45	45	47	55	55	54	68	53	46
10	44	48	47	e45	44	47	51	125	54	59	55	46
11	44	47	46	e45	51	46	50	295	56	53	53	45
12	44	45	47	e45	46	47	48	379	57	51	57	46
13	45	45	46	e45	46	47	48	392	55	51	67	46
14	44	46	46	e45	48	47	47	308	54	51	55	46
15	44	46	47	e45	47	47	47	211	54	51	54	45
16	44	46	47	e45	46	47	46	171	54	51	54	45
17	44	45	46	45	45	48	45	125	53	51	53	45
18	45	46	46	44	45	49	45	202	54	51	53	45
19	44	49	47	44	44	48	45	339	54	51	53	54
20	44	47	45	44	44	48	45	335	54	51	54	49
21	44	46	e45	44	e44	49	47	335	53	51	55	46
22	45	46	e45	44	e44	49	45	291	53	50	55	45
23	45	49	e45	44	e44	49	46	253	53	52	55	45
24	45	48	e45	44	e45	48	45	267	55	51	54	45
25	45	47	e45	44	e45	48	45	325	56	50	54	45
26	47	47	46	42	46	49	45	321	56	52	54	44
27	46	46	45	e43	46	51	44	315	56	50	53	44
28	45	46	45	e43	47	56	44	312	56	50	53	44
29	46	46	44	e43	---	57	44	311	54	50	53	44
30	46	46	e45	43	---	57	44	307	51	53	53	44
31	46	---	44	45	---	69	---	307	---	63	54	---
TOTAL	1385	1382	1425	1376	1266	1520	1563	6684	1805	1653	1680	1777
MEAN	44.7	46.1	46.0	44.4	45.2	49.0	52.1	216	60.2	53.3	54.2	45.9
MAX	47	49	52	45	51	69	74	392	219	68	67	54
MIN	44	45	44	42	43	45	44	44	51	50	53	44

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1999, BY WATER YEAR (WY)

	MEAN	54.7	55.9	48.2	46.9	46.4	50.6	86.9	122	96.1	69.8	57.7	53.2
MAX	221	239	102	84.7	76.8	118	297	745	461	253	105	216	
(WY)	1943	1943	1943	1943	1943	1943	1943	1996	1943	1953	1952	1942	
MIN	43.5	33.1	32.0	31.7	31.0	32.4	36.5	38.8	50.1	49.3	42.6	43.2	
(WY)	1944	1949	1949	1949	1949	1949	1949	1949	1998	1998	1944	1947	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1942 - 1999

ANNUAL TOTAL	17778		23116										
ANNUAL MEAN	48.7		63.3							65.3			
HIGHEST ANNUAL MEAN										187		1943	
LOWEST ANNUAL MEAN										42.4		1949	
HIGHEST DAILY MEAN	141			Apr 25		392		May 13	1550		May 2	1951	
LOWEST DAILY MEAN	41			Feb 3		42		Jan 26	30		Dec 1	1948	
ANNUAL SEVEN-DAY MINIMUM	42			May 20		43		Jan 24	31		Mar 6	1949	
INSTANTANEOUS PEAK FLOW						422		May 12	1750		Nov 7	1951	
INSTANTANEOUS PEAK STAGE						2.89		May 12	5.05		Nov 7	1951	
INSTANTANEOUS LOW FLOW						33		Feb 7	14			(a)	
10 PERCENT EXCEEDS	51					63			66				
50 PERCENT EXCEEDS	47					47			50				
90 PERCENT EXCEEDS	44					44			44				

(a) Sometime during period Jan. 23 to Feb. 13, 1947, result of ice jam upstream.

(e) Estimated.

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 and crest-stage gage. Datum of gage is 661.1 ft above sea level. 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.--Records fair. Regulation by Bond Falls 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	249	225	283	e230	e240	e370	4920	234	611	276	530	204
2	244	222	279	e230	e250	e360	2840	232	359	294	302	202
3	233	218	274	e230	e250	e340	3620	231	296	695	254	200
4	225	218	271	e230	e250	e330	3350	229	274	1270	239	199
5	222	215	468	e230	e250	e320	2930	228	273	986	234	200
6	228	215	805	e230	e250	e320	3240	243	314	1190	239	204
7	243	216	524	e230	e260	e310	3450	2110	346	558	235	202
8	243	215	376	e230	e260	e310	2880	4090	293	377	234	202
9	231	216	300	e225	e270	e310	1990	1730	264	956	232	204
10	224	231	317	e220	e270	e300	1390	901	273	1140	242	207
11	219	281	290	e220	e280	e290	1100	817	329	557	243	207
12	217	e300	288	e220	e300	e290	869	793	476	362	252	213
13	217	251	266	e210	e450	e280	716	774	381	293	861	218
14	e230	243	276	e210	e620	e280	629	613	299	266	656	218
15	e240	247	306	e210	e640	e280	568	481	261	252	395	216
16	e240	254	286	e210	e600	e280	490	384	250	244	321	209
17	e230	247	265	e210	e560	e350	421	398	250	238	283	207
18	e240	249	269	e210	e520	461	371	2590	244	234	256	205
19	e230	350	267	e210	e480	469	346	2080	237	232	243	224
20	226	390	254	e210	e450	454	331	1250	235	230	232	e328
21	225	291	235	e210	e430	429	332	1140	233	228	225	e290
22	221	290	e230	e220	e400	450	331	960	240	227	222	e250
23	219	491	e230	e220	e380	414	307	1210	249	228	221	229
24	216	622	e230	e220	e370	438	286	1610	251	237	219	219
25	215	437	e230	e220	e360	392	278	2260	243	233	217	212
26	215	361	e230	e220	e350	426	269	2030	233	231	215	207
27	216	325	e230	e230	e350	638	253	1270	231	228	211	206
28	216	303	e230	e230	e350	1360	247	908	236	226	208	209
29	214	293	e230	e230	---	2520	242	728	241	240	205	208
30	218	288	e230	e240	---	2860	237	618	237	254	204	205
31	222	---	e230	e240	---	4290	---	577	---	665	204	---
TOTAL	7028	8704	9199	6885	10440	20921	39233	33719	8659	13647	8834	6504
MEAN	227	290	297	222	373	675	1308	1088	289	440	285	217
MAX	249	622	805	240	640	4290	4920	4090	611	1270	861	328
MIN	214	215	230	210	240	280	237	228	231	226	204	199

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1999, BY WATER YEAR (WY)

MEAN	432	458	323	266	273	579	1545	774	537	364	328	350
MAX	1026	1145	618	378	634	1652	2919	1974	1396	1181	1091	1224
(WY)	1986	1989	1983	1946	1984	1973	1971	1996	1944	1948	1953	1942
MIN	191	214	209	193	187	183	385	227	189	182	173	175
(WY)	1949	1949	1990	1995	1949	1965	1987	1998	1992	1988	1976	1948

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1942 - 1999

ANNUAL TOTAL	128764	173773	517
ANNUAL MEAN	353	476	756
HIGHEST ANNUAL MEAN			331
LOWEST ANNUAL MEAN			1987
HIGHEST DAILY MEAN	5580	4920	16300
LOWEST DAILY MEAN	188	199	145
ANNUAL SEVEN-DAY MINIMUM	190	201	163
INSTANTANEOUS PEAK FLOW		6370	(a)27000
INSTANTANEOUS PEAK STAGE		10.05	Apr 1
INSTANTANEOUS LOW FLOW			(b)21.2
10 PERCENT EXCEEDS	473	864	(c)1010
50 PERCENT EXCEEDS	235	252	290
90 PERCENT EXCEEDS	206	215	210

(a) From rating curve extended above 7,500 ft³/s on basis of slope-area measurement of peak flow.

(b) From floodmark.

(c) Discharge measurement.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04035995 LAKE GOGEBIC NEAR BERGLAND, MI

LOCATION.--Lat 46°35'19", long 89°32'52", in SW1/4 NW1/4 sec.3, T.48 N., R.42 W., Ontonagon County, Hydrologic Unit 04020102, at upstream side of dam on lake outlet, 1.0 mi southeast of Bergland, and 4.3 mi east of Merriweather.

DRAINAGE AREA--162 mi².

PERIOD OF RECORD.--July 1958 to September 1959 (no winter record), February 1969 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,292.70 ft above sea level. July 1958 to September 1959, nonrecording gage at mouth of Merriweather Creek at different datum. February 1969 to September 1988, at datum 1.00 ft higher.

REMARKS.--Lake Gogebic is used as a storage reservoir (capacity 35,200 acre-ft) by Upper Peninsula Power Co. for power production at Victoria Dam near Rockland. Lake level is controlled at the outlet by a concrete and steel dam with removable flash boards. Major inlets to Lake Gogebic are Slate River, Trout Brook, and Merriweather Creek. Streamflow records are currently collected at the outlet, West Branch Ontonagon River (station 04036000). Surface area of lake is 14,780 acres. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 4.44 ft, present datum, May 9, 1996; minimum daily, 0.68 ft, present datum, Apr. 5, 6, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum daily gage height, 3.53 ft, May 9; minimum daily, 1.29 ft, Mar. 26, 27.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.22	--	2.63	--	1.90	1.59	1.58	2.83	3.20	2.88	2.90	2.78
2	2.19	--	2.60	--	1.89	1.59	1.73	2.83	3.19	2.87	2.88	2.75
3	2.18	--	2.60	--	1.86	1.57	1.92	2.85	3.18	3.07	2.87	2.74
4	2.18	--	2.57	--	1.84	1.57	2.13	2.84	3.21	3.23	2.83	2.75
5	2.19	--	2.64	2.49	1.80	1.55	2.32	2.83	3.19	3.27	2.83	2.74
6	2.23	2.30	2.69	2.48	1.78	1.54	2.57	2.87	3.23	3.33	2.83	2.72
7	2.25	2.30	2.68	2.47	1.76	1.52	2.78	3.10	3.27	3.24	2.82	2.70
8	2.22	2.30	2.70	2.44	1.75	1.51	2.93	3.37	3.21	3.21	2.78	2.72
9	2.24	2.30	2.66	2.43	1.73	1.50	3.00	3.53	3.21	3.25	2.80	2.69
10	2.21	2.33	2.66	2.42	1.70	1.48	3.05	3.52	3.21	3.28	2.81	2.67
11	2.22	2.53	2.67	2.41	1.71	1.47	3.04	3.50	3.19	3.26	2.80	2.62
12	2.28	2.40	2.64	2.40	1.76	1.46	3.03	3.45	3.21	3.22	2.81	2.64
13	2.21	2.35	2.62	2.34	1.74	1.45	3.00	3.39	3.19	3.17	2.83	2.68
14	2.21	2.35	2.65	2.28	1.74	1.43	2.96	3.36	3.12	3.11	2.89	2.66
15	2.24	2.36	2.61	2.25	1.72	1.43	2.91	3.34	3.12	3.05	2.92	2.61
16	2.25	2.36	2.60	2.23	1.72	1.40	2.84	3.32	3.08	3.02	2.97	2.58
17	2.30	2.36	2.56	2.20	1.72	1.38	2.80	3.31	3.07	2.92	2.90	2.58
18	2.40	2.40	2.60	2.19	1.71	1.38	2.76	3.39	3.06	2.91	2.90	2.60
19	2.38	2.50	2.56	2.17	1.70	1.37	2.79	3.41	3.03	2.89	2.89	2.62
20	2.30	2.48	2.58	2.14	1.69	1.37	2.81	3.45	3.03	2.91	2.90	2.61
21	2.27	2.53	2.58	2.10	1.67	1.35	2.82	3.38	3.02	2.91	2.89	2.65
22	2.31	2.53	2.58	2.09	1.65	1.34	2.80	3.33	3.03	2.90	2.90	2.64
23	2.31	2.58	2.58	2.10	1.64	1.33	2.81	3.37	3.05	2.91	2.90	2.60
24	2.30	2.56	2.57	2.08	1.63	1.32	2.85	3.33	3.04	2.94	2.88	2.60
25	2.28	2.61	2.55	2.05	1.62	1.30	2.86	3.36	3.01	2.90	2.88	2.62
26	2.30	2.60	2.54	2.03	1.60	1.29	2.83	3.37	3.01	2.94	2.89	2.64
27	2.30	2.59	2.54	2.00	1.60	1.29	2.83	3.35	2.95	2.89	2.88	2.60
28	2.31	2.59	--	2.00	1.59	1.32	2.82	3.31	2.91	2.86	2.85	2.56
29	2.33	2.61	--	1.98	--	1.34	2.82	3.30	2.91	2.83	2.79	2.56
30	--	2.64	--	1.94	--	1.35	2.83	3.30	2.90	2.81	2.81	2.61
31	--	--	--	1.92	--	1.45	--	3.23	--	2.95	2.80	--
MEAN	--	--	--	--	1.72	1.43	2.71	3.26	3.10	3.03	2.86	2.65
MAX	--	--	--	--	1.90	1.59	3.05	3.53	3.27	3.33	2.97	2.78
MIN	--	--	--	--	1.59	1.29	1.58	2.83	2.90	2.81	2.78	2.56

STREAMS TRIBUTARY TO LAKE SUPERIOR

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 Lake Gogebic, 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 sea level. Prior to Nov. 5, 1942, nonrecording gage 0.4 mi upstream at different datum.

REMARKS.--Records excellent except for daily discharges below 5.0 ft³/s, which are fair. Flow regulated by Lake Gogebic (station 04035995). Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.6	.78	105	154	192	e144	205	51	215	91	67	37
2	1.4	.79	101	150	191	143	237	35	143	64	68	38
3	1.2	.74	102	154	187	142	282	32	142	41	64	38
4	1.2	.70	99	156	185	140	337	30	144	206	61	38
5	1.4	.65	106	156	177	138	394	29	143	427	42	38
6	1.8	.63	111	155	174	137	478	30	150	483	29	38
7	1.9	.58	110	154	169	135	554	34	154	510	29	38
8	1.9	.60	112	148	168	133	617	37	144	494	28	38
9	1.7	.58	108	142	164	131	648	193	145	513	29	37
10	1.5	.89	109	140	158	130	664	532	144	524	30	37
11	1.3	.89	109	138	161	128	665	569	142	531	30	36
12	1.5	.70	106	136	185	127	660	539	146	547	31	35
13	1.5	.67	103	187	172	126	645	508	142	525	31	35
14	1.3	.63	107	229	165	124	628	492	134	498	32	34
15	1.2	.64	102	229	162	124	608	378	133	472	33	33
16	1.2	.62	101	232	162	146	577	293	128	460	34	32
17	1.3	.61	97	234	164	164	560	286	126	422	32	31
18	1.4	.64	101	236	163	164	546	324	125	270	32	31
19	1.2	.81	97	237	160	161	263	334	75	185	32	31
20	1.1	.68	99	238	158	161	95	440	36	107	32	30
21	1.1	.81	100	231	155	158	92	505	36	67	33	29
22	1.1	1.2	102	228	152	157	88	479	36	67	33	29
23	1.0	1.1	100	230	150	156	87	503	158	65	33	28
24	1.0	.87	99	227	150	153	88	479	155	58	33	28
25	1.0	.84	97	223	149	151	83	497	149	55	34	28
26	1.0	.82	96	231	147	150	77	504	149	80	35	28
27	.95	.82	95	213	e146	149	75	488	140	118	36	27
28	.89	.75	93	212	e145	154	63	470	109	86	37	25
29	.85	.73	95	208	---	158	57	345	94	66	37	24
30	.82	.68	143	202	---	161	57	277	93	65	37	e24
31	.74	---	160	197	---	178	---	252	---	72	37	---
TOTAL	39.05	89.77	3265	6007	4611	4523	10430	9965	3830	8169	1151	975
MEAN	1.26	2.99	105	194	165	146	348	321	128	264	37.1	32.5
MAX	1.9	.68	160	238	192	178	665	569	215	547	68	38
MIN	.74	.58	93	136	145	124	57	29	36	41	28	24

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1999, BY WATER YEAR (WY)

	MEAN	129	156	170	169	157	147	331	296	213	136	80.5	79.6
MAX	698	489	346	360	257	327	742	995	550	578	550	408	
(WY)	1986	1989	1968	1966	1969	1973	1943	1996	1954	1952	1972	1980	
MIN	.65	2.99	18.5	23.3	35.8	55.8	10.7	3.09	21.5	7.09	1.25	.88	
(WY)	1990	1999	1949	1949	1949	1949	1949	1987	1986	1988	1963	1963	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1942 - 1999

ANNUAL TOTAL	27567.72	53054.82	
ANNUAL MEAN	75.5	145	171
HIGHEST ANNUAL MEAN			288
LOWEST ANNUAL MEAN			70.1
HIGHEST DAILY MEAN	664	665	1380
LOWEST DAILY MEAN	.58	.58	.38
ANNUAL SEVEN-DAY MINIMUM	.64	.64	.39
INSTANTANEOUS PEAK FLOW		694	1400
INSTANTANEOUS PEAK STAGE		4.30	5.98
ANNUAL RUNOFF (CFSM)	.47	.90	1.06
ANNUAL RUNOFF (INCHES)	6.33	12.18	14.35
10 PERCENT EXCEEDS	144	464	364
50 PERCENT EXCEEDS	53	107	128
90 PERCENT EXCEEDS	1.1	1.1	8.2

(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04037400 CISCO LAKE NEAR WATERSMEET. MI

LOCATION.--Lat 46°15'10", long 89°27'07", in NE1/4 sec.32, T.45 N., R.41 W., Gogebic County, Hydrologic Unit 04020102, on right bank at outlet, 100 ft upstream from dam, 13 mi west of Watersmeet.

DRAINAGE AREA.--50.6 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 1,679.53 ft above sea level (levels by Michigan Department of Natural Resources). July 15, 1942, to Oct. 28, 1969, nonrecording gage, and Oct. 28, 1969, to Oct. 23, 1989, water-stage recorder at site 90 ft downstream at same datum.

REMARKS.--Cisco Lake (capacity 15,600 acre-ft) is the downstream lake in a chain of lakes used as storage reservoirs by Upper Peninsula Power Company for power production at Victoria Dam near Rockland. Lake level is controlled at the outlet by a concrete dam with two bays and removable flash boards. The major inlet to Cisco Lake is the combined outlet from Lindsley Lake and Thousand Island Lake. Streamflow records are currently collected at the outlet, Cisco Branch Ontonagon River (station 04037500). The lake level is maintained at an elevation of approximately 1,683.5 ft, above sea level, during winter months and 1,684.0 ft, above sea level, during summer months. Surface area of lake is 506 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 4.69 ft, July 19, 1942; minimum, 1.72 ft, Mar. 20-22, 1948.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 4.20 ft, July 3; minimum, 3.44 ft, Feb. 9.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.98	3.83	3.50	3.50	3.48	3.50	3.52	3.67	4.02	4.02	4.04	3.97
2	3.96	3.79	3.50	3.50	3.48	3.51	3.53	3.68	4.00	4.02	4.02	3.96
3	3.96	3.78	3.51	3.54	3.48	3.51	3.55	3.70	4.01	4.12	4.01	3.97
4	3.97	3.76	3.52	3.55	3.48	3.53	3.60	3.70	4.03	4.15	3.99	3.98
5	3.99	3.75	3.54	3.53	3.48	3.53	3.62	3.71	4.03	4.10	3.98	3.96
6	3.99	3.73	3.52	3.52	3.47	3.52	3.65	3.80	4.07	4.07	4.00	3.95
7	3.98	3.72	3.52	3.50	3.47	3.52	3.67	4.03	4.07	4.02	4.00	3.97
8	3.99	3.71	3.51	3.48	3.47	3.51	3.66	4.11	4.05	4.08	3.99	3.95
9	4.00	3.71	3.49	3.48	3.46	3.51	3.65	4.13	4.04	4.16	4.00	3.94
10	3.98	3.76	3.48	3.48	3.46	3.50	3.63	4.12	4.00	4.11	3.99	3.94
11	4.00	3.69	3.48	3.49	3.50	3.49	3.60	4.08	4.00	4.08	4.00	3.95
12	3.99	3.66	3.48	3.50	3.56	3.49	3.56	4.02	3.98	4.04	4.03	3.98
13	3.96	3.64	3.48	3.50	3.54	3.49	3.54	3.95	3.95	4.00	4.07	3.98
14	3.98	3.60	3.48	3.50	3.53	3.50	3.51	3.92	3.91	3.97	4.06	3.98
15	4.01	3.58	3.49	3.51	3.51	3.50	3.48	3.95	3.90	3.96	4.03	3.98
16	3.99	3.58	3.49	3.52	3.51	3.50	3.48	3.97	3.91	3.97	3.99	3.99
17	4.00	3.56	3.50	3.52	3.52	3.51	3.50	4.01	3.91	3.96	3.94	4.00
18	3.99	3.56	3.53	3.53	3.49	3.53	3.53	4.07	3.92	3.97	3.97	4.01
19	3.98	3.53	3.54	3.53	3.48	3.52	3.56	4.09	3.92	3.98	3.97	4.05
20	3.98	3.52	3.56	3.52	3.47	3.50	3.58	4.07	3.92	3.99	3.97	4.07
21	3.97	3.54	3.58	3.50	3.47	3.49	3.60	4.04	3.92	3.99	3.98	4.05
22	4.00	3.54	3.56	3.49	3.47	3.48	3.60	4.01	3.93	3.99	4.00	4.02
23	4.03	3.54	3.54	3.51	3.48	3.48	3.61	4.00	3.94	4.00	4.01	3.99
24	4.05	3.53	3.52	3.51	3.49	3.48	3.63	3.95	3.93	4.00	4.00	3.98
25	4.07	3.51	3.50	3.49	3.49	3.48	3.64	3.94	3.94	4.01	4.00	4.00
26	4.09	3.48	3.48	3.48	3.49	3.49	3.65	3.97	3.94	4.05	4.00	4.00
27	4.06	3.49	3.47	3.49	3.49	3.51	3.66	3.99	3.92	4.02	4.00	3.99
28	4.00	3.48	3.47	3.50	3.50	3.54	3.66	4.01	3.91	3.99	3.98	3.98
29	3.97	3.48	3.49	3.50	---	3.55	3.66	4.02	3.91	3.99	3.98	3.98
30	3.92	3.46	3.49	3.49	---	3.54	3.66	4.03	3.93	4.00	3.99	3.98
31	3.87	---	3.50	3.49	---	3.53	---	4.02	---	4.06	3.98	---
MEAN	3.99	3.62	3.51	3.50	3.49	3.51	3.59	3.96	3.96	4.03	4.00	3.99
MAX	4.09	3.83	3.58	3.55	3.56	3.55	3.67	4.13	4.07	4.16	4.07	4.07
MIN	3.87	3.46	3.47	3.48	3.46	3.48	3.48	3.67	3.90	3.96	3.94	3.94
CAL YR 1998	MEAN 3.77	MAX 4.16	MIN 3.46									
WTR YR 1999	MEAN 3.76	MAX 4.16	MIN 3.46									

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 sea level. Prior to Oct. 1, 1968, nonrecording gage at same site and at datum 4.00 ft higher.

REMARKS.--Records good except for daily discharges below 3.0 ft³/s, which are poor. Flow regulated by Cisco Lake (station 04037400). Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	75	103	4.5	19	40	20	81	.34	15	16	15	1.0
2	38	64	4.5	19	39	20	82	.33	24	25	36	1.0
3	16	34	4.7	21	40	21	83	.30	20	33	47	1.0
4	16	33	23	37	39	21	86	.30	21	121	47	.97
5	16	43	39	60	39	30	111	.33	26	174	29	.89
6	16	49	37	60	38	38	128	.59	29	173	14	.86
7	16	48	37	59	38	38	130	.42	49	102	14	.77
8	16	48	49	47	38	37	130	1.11	73	33	14	.70
9	16	47	58	27	28	36	128	1.34	89	87	14	.70
10	16	74	35	20	12	36	126	1.59	76	129	14	.70
11	17	92	19	20	6.8	35	123	1.71	61	125	14	.70
12	16	90	19	21	36	25	120	1.65	67	121	15	.70
13	16	89	19	21	62	19	117	1.59	65	117	49	.64
14	16	85	12	21	62	20	114	.63	39	87	70	.61
15	23	84	4.9	21	60	20	67	2.6	6.9	40	99	.61
16	28	84	4.9	21	60	20	19	1.9	2.4	6.3	119	.61
17	29	83	5.0	21	73	20	3.8	6.5	2.3	5.7	63	.65
18	28	84	5.8	32	80	43	3.3	47	2.0	5.5	12	.68
19	22	82	6.1	40	56	59	2.7	96	1.4	5.4	3.6	.96
20	16	51	6.6	50	35	58	1.9	128	1.1	5.1	3.6	.28
21	9.1	26	27	59	35	57	1.6	125	.92	4.9	3.6	.69
22	2.4	26	47	58	28	45	1.5	122	.71	4.5	3.0	.67
23	2.1	46	55	60	20	38	1.3	122	.62	3.5	17	.64
24	2.1	71	60	59	28	29	1.0	117	.61	3.0	21	.37
25	2.0	65	59	59	36	10	.76	65	.61	2.7	11	.13
26	33	44	57	48	26	3.3	.51	19	.56	27	4.0	.13
27	100	44	57	40	20	3.6	.40	3.5	.52	60	3.5	7.1
28	118	44	38	40	20	4.1	.41	2.6	.52	41	3.1	.80
29	116	44	19	40	---	31	.40	3.3	.52	18	2.7	.80
30	112	23	19	40	---	73	.37	4.7	.46	14	1.8	.80
31	107	---	19	40	---	82	---	1.4	---	15	1.2	---
TOTAL	1055.7	1800	851.0	1180	1094.8	992.0	1664.95	1873.69	676.15	1604.6	764.1	315.25
MEAN	34.1	60.0	27.5	38.1	39.1	32.0	55.5	60.4	22.5	51.8	24.6	10.5
MAX	118	103	60	60	80	82	130	171	89	174	119	69
MIN	2.0	23	4.5	19	6.8	3.3	.37	.30	.46	2.7	1.2	.61

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1999, BY WATER YEAR (WY)

	MEAN	68.9	67.4	48.1	39.4	34.9	43.6	61.1	47.0	45.1	32.3	25.7	37.6
MAX	151	116	84.1	62.6	81.0	92.1	117	160	123	113	99.7	104	
(WY)	1986	1968	1961	1983	1945	1973	1997	1996	1953	1953	1978	1977	
MIN	13.1	14.5	23.5	23.1	20.6	24.1	2.02	.17	.11	.25	.15	.23	
(WY)	1958	1945	1990	1959	1950	1956	1948	1977	1977	1977	1970	1976	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1945 - 1999

ANNUAL TOTAL	11022.52		13872.24										
ANNUAL MEAN	30.2		38.0							45.9			
HIGHEST ANNUAL MEAN										65.9		1973	
LOWEST ANNUAL MEAN										25.2		1949	
HIGHEST DAILY MEAN	144						174		Jul 5	288		May 1 1951	
LOWEST DAILY MEAN	.28			Apr 1			.30		May 3	.08		Jul 21 1988	
ANNUAL SEVEN-DAY MINIMUM	.29			May 23			.34		Apr 29	.09		Jul 28 1988	
INSTANTANEOUS PEAK FLOW							181		May 10	288		May 1 1951	
INSTANTANEOUS PEAK STAGE							5.60		May 10	(a)6.10		May 1 1951	
ANNUAL RUNOFF (CFSM)	.60						.75			.91			
ANNUAL RUNOFF (INCHES)	8.09						10.18			12.31			
10 PERCENT EXCEEDS	79						99			103			
50 PERCENT EXCEEDS	23						26			37			
90 PERCENT EXCEEDS	.37						.84			.92			

(a) Present datum.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI

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 150 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.

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

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

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 638.72 ft above sea level. 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.--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; Lake Gogebic (station 04035995) and Cisco Lake (station 04077400), in headwaters. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	652	577	537	e700	e730	e860	10300	477	e1400	712	1100	544
2	613	531	840	e700	e730	e840	7560	581	e1000	859	826	674
3	505	635	745	e700	e730	e840	8820	415	e840	1220	688	467
4	514	494	744	e700	e730	e820	8190	499	e700	3160	651	500
5	360	545	987	e700	e730	e800	8400	525	e730	3760	618	448
6	529	390	1590	e700	e740	e800	8280	444	e760	3820	499	439
7	476	383	1430	e700	e740	e790	8630	3610	e800	2560	566	640
8	553	460	1090	e700	e750	e780	8420	8630	e840	2140	603	578
9	526	420	718	e700	e760	e760	6220	6360	e900	2320	574	445
10	382	562	858	e700	e770	e760	4390	4460	972	3320	665	581
11	454	821	643	e700	e780	e740	3300	3070	967	2800	718	447
12	637	677	635	e700	e800	e740	2730	2460	1230	1820	675	505
13	523	672	618	e700	e1000	e720	2430	2030	1240	1370	1460	598
14	645	527	472	e700	e1700	e720	2220	1810	1050	1200	1460	589
15	614	618	716	e700	e1900	e720	1980	1570	1010	1180	1020	562
16	651	909	561	e720	e1600	e720	1930	1300	945	1160	797	577
17	428	826	570	e720	e1500	e740	1610	1160	820	1140	804	484
18	599	863	400	e720	e1400	e820	1310	3440	869	964	764	381
19	740	1040	417	e720	e1300	e1000	1280	3900	754	578	741	593
20	638	981	510	e720	e1200	e980	952	2730	554	783	725	885
21	591	865	e600	e690	e1100	e960	856	2620	409	840	588	792
22	596	713	e600	e700	e1000	e940	779	2190	333	725	610	631
23	503	1070	e610	e700	e960	e890	837	2750	392	726	581	656
24	e450	1350	e620	e700	e940	e840	732	3500	394	527	638	673
25	e370	1030	e630	e700	e900	e800	756	4480	376	684	534	620
26	e480	970	e640	e720	e840	e840	974	e5700	479	578	521	781
27	e455	681	e660	e720	e800	e1000	649	e5000	908	559	602	726
28	576	641	e680	e730	e810	e1800	418	e3600	856	588	527	747
29	e520	559	e700	e730	---	e3500	393	e3000	746	758	624	582
30	e480	719	e700	e730	---	5170	568	e2300	750	656	532	592
31	477	---	e700	e730	---	7450	---	e1700	---	1050	536	---
TOTAL	16537	21529	22221	21950	27940	40140	105914	86311	24024	44557	22247	17737
MEAN	533	718	717	708	998	1295	3530	2784	801	1437	718	591
MAX	740	1350	1590	730	1900	7450	10300	8630	1400	3820	1460	885
MIN	360	383	400	690	730	720	393	415	333	527	499	381

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1999, BY WATER YEAR (WY)

	MEAN	1129	1248	941	839	863	1541	4047	2060	1460	1009	807	873
MAX	3767	3232	1683	1473	1525	4355	6912	5257	3309	2879	2563	2779	
(WY)	1986	1989	1983	1969	1984	1973	1971	1996	1951	1952	1942	1942	
MIN	333	400	410	396	505	667	922	404	431	314	359	312	
(WY)	1949	1949	1949	1949	1949	1956	1987	1977	1988	1988	1976	1976	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1942 - 1999

ANNUAL TOTAL	336351						451107						
ANNUAL MEAN	922						1236			1393			
HIGHEST ANNUAL MEAN										1967		1996	
LOWEST ANNUAL MEAN										774		1948	
HIGHEST DAILY MEAN	13200				Mar 28		10300		Apr 1	31200		Aug 22	1942
LOWEST DAILY MEAN	296				Sep 6		333		Jun 22	170		(a)	
ANNUAL SEVEN-DAY MINIMUM	395				Sep 5		420		Jun 20	246		Jul 25	1963
INSTANTANEOUS PEAK FLOW							12200		Apr 1	(b)42000		Aug 22	1942
INSTANTANEOUS PEAK STAGE							14.44		Apr 1	(c)28.6		Aug 22	1942
ANNUAL RUNOFF (CFSM)	.69						.92			1.04			
ANNUAL RUNOFF (INCHES)	9.34						12.52			14.12			
10 PERCENT EXCEEDS	1340						2580			2760			
50 PERCENT EXCEEDS	660						730			880			
90 PERCENT EXCEEDS	429						490			523			

(a) Aug. 13, 14, 1991.

(b) From rating curve extended above 14,000 ft³/s on basis of slope-area measurement of peak flow.

(c) From floodmark.

(e) Estimated.

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.

REVISED RECORDS.--WSP 1507: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,214.40 ft above sea level. 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.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	78	72	174	e41	e43	e74	838	159	355	130	144	41
2	76	69	161	e41	e43	e74	840	141	303	146	121	38
3	68	64	147	e41	e43	e72	1090	124	263	260	90	47
4	62	60	135	e41	e43	e70	1110	110	221	444	73	39
5	54	56	162	e41	e44	e70	1090	97	204	437	62	36
6	53	53	212	e41	e44	e68	1190	119	238	590	60	38
7	80	51	205	e41	e45	e68	1170	492	232	448	58	34
8	90	50	174	e41	e45	e66	1200	901	194	370	56	33
9	87	50	146	e41	e45	e66	1240	914	170	506	52	32
10	76	55	133	e40	e48	e65	1190	744	162	573	72	33
11	87	88	118	e39	e56	e64	1080	569	190	503	90	36
12	64	104	111	e39	e78	e62	960	432	538	385	92	37
13	57	94	94	e38	e90	e62	855	333	605	288	392	38
14	66	87	85	e38	e98	e64	794	267	496	231	426	39
15	71	87	86	e38	e100	e68	763	219	352	196	372	40
16	69	86	82	e38	e98	e72	744	192	267	173	298	40
17	66	84	79	e37	e96	e84	708	194	235	153	233	38
18	69	85	e76	e38	e94	e92	639	603	199	131	194	39
19	70	137	e70	e39	e92	e96	546	619	167	117	164	78
20	71	183	e68	e40	e88	e100	465	571	144	102	140	184
21	74	159	e65	e40	e87	e100	415	493	126	91	118	185
22	76	162	e60	e40	e86	e100	382	410	120	89	107	150
23	74	222	e55	e40	e84	e105	353	471	141	89	94	114
24	69	318	e52	e40	e80	e110	318	728	207	90	86	91
25	64	299	e50	e40	e78	e110	288	1560	203	73	79	78
26	61	268	e47	e40	e76	e115	260	2650	160	65	73	68
27	62	235	e45	e40	e74	e125	240	1930	131	57	66	68
28	62	206	e44	e40	e74	e190	218	1180	126	51	60	82
29	60	184	e42	e42	---	e300	195	791	145	49	52	88
30	61	176	e41	e42	---	e360	176	581	126	51	46	83
31	67	---	e41	e43	---	e620	---	440	---	115	43	---
TOTAL	2144	3844	3060	1240	1972	3692	21357	19034	7020	7003	4013	1947
MEAN	69.2	128	98.7	40.0	70.4	119	712	614	234	226	129	64.9
MAX	90	318	212	43	100	620	1240	2650	605	590	426	185
MIN	53	50	41	37	43	62	176	97	120	49	43	32
CFSM	.40	.75	.58	.23	.41	.70	4.16	3.59	1.37	1.32	.76	.38
IN.	.47	.84	.67	.27	.43	.80	4.65	4.14	1.53	1.52	.87	.42

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1913 - 1999, BY WATER YEAR (WY)

MEAN	177	193	115	70.1	62.9	159	754	465	210	127	81.7	122
MAX	547	599	242	162	191	744	1321	1147	579	503	319	586
(WY)	1986	1989	1983	1969	1984	1973	1960	1965	1944	1968	1978	1968
MIN	11.5	17.3	16.0	15.5	15.4	39.8	266	33.8	24.4	8.00	7.86	4.63
(WY)	1977	1977	1977	1977	1977	1956	1946	1998	1988	1988	1976	1976

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1913 - 1999

ANNUAL TOTAL	40584.6	76326	210
ANNUAL MEAN	111	209	311
HIGHEST ANNUAL MEAN			99.9
LOWEST ANNUAL MEAN			1968
HIGHEST DAILY MEAN	1810	2650	4450
LOWEST DAILY MEAN	6.9	32	2.7
ANNUAL SEVEN-DAY MINIMUM	7.8	35	3.2
INSTANTANEOUS PEAK FLOW		2800	4630
INSTANTANEOUS PEAK STAGE		9.25	11.63
INSTANTANEOUS LOW FLOW		31	2.7
ANNUAL RUNOFF (CFSM)	.65	1.22	1.23
ANNUAL RUNOFF (INCHES)	8.83	16.60	16.72
10 PERCENT EXCEEDS	211	555	519
50 PERCENT EXCEEDS	56	90	100
90 PERCENT EXCEEDS	15	41	31

(a) Sept. 9, 10.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04041500 STURGEON RIVER NEAR ALSTON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: April 1998 to current year.

INSTRUMENTATION.--Water temperature recorder with telemetry since April 7, 1998.

REMARKS.--Records represent water temperature at sensor within 0.5°C, from April 1 to September 30.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 27.0°C, July 13, 15, 1998.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 26.5°C, July 30.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	--	--	--	--	--	--	2.5	2.0	2.0	12.5	10.0	11.0
2	--	--	--	--	--	--	2.5	1.5	2.0	16.5	10.5	13.5
3	--	--	--	--	--	--	2.0	1.0	1.5	17.0	15.0	15.5
4	--	--	--	--	--	--	2.0	1.0	1.5	17.0	15.0	16.0
5	--	--	--	--	--	--	2.0	1.0	1.5	16.5	14.5	16.0
6	--	--	--	--	--	--	2.0	1.0	1.5	16.5	15.0	15.5
7	--	--	--	--	--	--	2.0	1.0	1.5	15.5	14.0	15.0
8	--	--	--	--	--	--	2.5	1.5	2.0	14.5	13.5	14.0
9	--	--	--	--	--	--	2.5	1.5	2.0	14.5	12.5	13.5
10	--	--	--	--	--	--	2.5	1.5	2.0	13.0	11.0	12.0
11	--	--	--	--	--	--	3.5	2.0	2.5	12.5	11.5	12.0
12	--	--	--	--	--	--	4.0	2.5	3.5	12.5	11.0	11.5
13	--	--	--	--	--	--	5.0	3.5	4.0	12.5	11.5	12.0
14	--	--	--	--	--	--	6.0	4.0	5.0	13.5	12.0	12.5
15	--	--	--	--	--	--	6.5	5.0	5.5	15.5	12.5	13.5
16	--	--	--	--	--	--	6.5	5.0	6.0	16.0	14.5	15.0
17	--	--	--	--	--	--	7.0	6.0	6.5	15.5	14.5	15.0
18	--	--	--	--	--	--	7.5	6.5	7.0	15.5	14.5	15.0
19	--	--	--	--	--	--	8.0	7.0	7.5	15.0	14.0	14.5
20	--	--	--	--	--	--	8.5	7.0	7.5	15.5	13.5	14.5
21	--	--	--	--	--	--	8.0	7.0	7.5	15.5	14.5	15.0
22	--	--	--	--	--	--	7.5	6.5	7.0	15.0	13.5	14.0
23	--	--	--	--	--	--	7.5	7.0	7.0	14.5	14.0	14.0
24	--	--	--	--	--	--	9.0	7.0	7.5	14.5	13.0	13.5
25	--	--	--	--	--	--	9.5	7.0	8.5	13.5	13.0	13.0
26	--	--	--	--	--	--	9.5	7.5	8.5	14.0	12.0	13.0
27	--	--	--	--	--	--	9.0	7.5	8.5	13.5	11.0	12.0
28	--	--	--	--	--	--	9.5	7.0	8.5	15.0	11.0	13.0
29	--	--	--	--	--	--	9.5	8.0	9.0	17.5	13.5	15.0
30	--	--	--	--	--	--	11.0	9.5	10.0	19.0	16.0	17.5
31	--	--	--	--	--	--	--	--	--	18.0	15.0	17.0
MONTH	--	--	--	--	--	--	11.0	1.0	5.2	19.0	10.0	14.0

STREAMS TRIBUTARY TO LAKE SUPERIOR

04041500 STURGEON RIVER NEAR ALSTON, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MFAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	15.5	14.5	15.0	21.5	18.5	20.0	24.0	21.5	22.5	22.5	20.0	21.0
2	15.5	14.5	15.0	21.5	18.5	19.5	24.5	22.0	23.0	22.5	19.5	21.0
3	15.5	14.5	15.0	21.5	18.5	20.0	24.0	21.5	23.0	23.0	19.5	21.0
4	17.0	14.5	15.5	21.5	18.5	20.0	24.0	21.0	22.5	24.5	20.5	22.5
5	17.0	16.0	16.5	22.0	18.5	20.0	23.5	21.0	22.5	23.5	20.0	22.0
6	19.0	16.5	17.5	22.5	20.0	21.0	23.0	20.5	22.0	22.0	19.5	21.0
7	19.0	17.5	18.5	22.5	20.0	21.0	23.0	20.5	21.5	22.5	19.5	21.0
8	19.0	17.0	18.0	22.5	20.5	21.5	22.0	20.0	21.0	22.0	20.0	21.5
9	21.5	17.0	19.0	22.0	18.5	20.0	22.0	19.5	21.0	21.5	19.0	20.0
10	22.5	20.5	21.5	20.0	18.5	19.5	22.0	20.0	21.0	20.0	18.0	19.0
11	21.5	17.5	19.0	21.0	18.5	19.5	22.0	19.5	21.0	19.5	17.5	18.5
12	21.0	19.5	20.0	23.0	19.0	21.0	21.5	17.5	20.0	19.0	17.0	18.0
13	21.0	19.5	20.5	23.0	20.5	21.5	19.0	17.5	18.5	18.5	16.5	17.5
14	20.0	14.5	17.5	23.0	20.5	21.5	20.0	18.0	19.0	18.0	16.0	17.0
15	19.5	17.5	18.5	22.0	19.5	21.0	21.0	18.5	19.5	17.5	15.5	16.5
16	19.0	17.5	18.0	24.0	20.0	22.5	21.5	19.0	20.0	17.5	15.5	16.5
17	19.0	17.0	18.0	22.5	20.5	22.0	21.0	18.5	19.5	17.5	15.0	16.5
18	20.0	17.0	18.5	23.5	21.0	22.0	20.0	18.0	19.0	18.5	16.0	17.5
19	20.5	17.5	19.0	22.0	20.0	21.5	20.0	18.0	19.0	18.0	16.0	17.0
20	20.5	17.0	18.5	24.0	20.0	22.0	20.0	18.0	19.0	17.5	14.5	16.0
21	21.5	17.5	19.0	23.5	21.0	22.5	20.0	18.0	19.0	16.5	14.5	15.5
22	21.5	17.5	20.5	24.0	21.0	22.5	21.5	18.0	19.5	16.5	14.5	15.5
23	22.5	20.0	21.0	23.5	21.5	22.0	22.0	19.5	20.5	16.5	14.5	15.5
24	22.5	19.0	20.5	24.0	21.5	22.5	21.5	18.5	20.0	15.5	14.0	15.0
25	21.0	19.0	20.0	23.5	21.0	22.0	21.0	18.5	20.0	16.0	13.5	15.0
26	24.5	18.5	21.5	25.5	21.0	24.0	22.5	18.5	20.5	16.0	14.0	15.0
27	23.0	20.5	21.5	25.5	22.0	24.0	22.0	20.0	21.0	16.0	14.0	15.0
28	21.5	18.5	20.0	25.0	22.0	23.5	21.5	19.5	20.5	15.5	13.5	15.0
29	21.5	19.5	20.5	26.0	22.5	24.5	21.0	18.0	19.5	15.0	13.5	14.5
30	22.0	19.5	20.5	26.5	22.5	24.5	22.0	18.0	20.0	15.0	13.0	14.0
31	--	--	--	26.0	23.0	24.5	22.0	19.5	21.0	--	--	--
MONTH	24.5	14.5	18.8	26.5	18.5	21.7	24.5	17.5	20.5	24.5	13.0	17.7

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 sea level.

REMARKS.--Records good. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	11	21	e16	17	25	254	56	48	23	15	12
2	9.5	11	20	e16	18	24	207	46	44	24	14	12
3	8.8	10	19	e16	18	24	219	38	39	24	14	12
4	8.4	11	18	e16	18	24	183	37	33	28	13	12
5	8.1	11	33	e16	17	e22	195	40	37	80	13	12
6	9.0	11	66	e16	e17	e20	296	51	44	73	13	12
7	12	11	45	e16	17	e20	323	286	36	40	14	11
8	11	12	33	e16	18	e20	446	426	36	30	14	13
9	10	12	27	e16	19	e20	426	150	30	114	13	16
10	10	29	24	e16	20	20	335	91	28	98	15	27
11	9.7	50	22	e16	22	20	292	66	38	53	14	29
12	9.2	30	21	e16	28	20	288	55	152	36	15	26
13	9.8	22	20	e16	45	20	300	45	78	28	42	29
14	11	20	18	e16	44	21	325	41	50	25	32	33
15	11	24	19	e16	41	20	358	36	37	23	23	27
16	11	22	18	e16	36	22	310	37	31	21	30	21
17	13	20	18	e16	33	26	255	38	26	20	26	18
18	17	19	17	e16	31	28	163	102	24	19	22	16
19	15	71	18	e16	28	27	145	99	22	18	19	16
20	14	69	17	e16	26	29	125	67	23	18	17	20
21	13	40	17	17	25	31	123	67	22	17	15	19
22	12	31	15	17	25	29	132	55	27	17	14	16
23	11	82	e15	17	23	28	102	158	38	20	14	16
24	11	98	e15	17	23	27	88	315	51	18	14	15
25	10	56	e16	17	23	26	88	488	34	16	14	15
26	12	40	e16	17	22	28	95	331	25	15	13	14
27	11	32	e16	17	22	41	80	129	22	15	13	20
28	11	28	e16	17	25	64	67	83	20	15	12	20
29	11	25	e16	17	---	96	58	60	21	15	12	18
30	11	23	e16	17	---	135	53	47	19	15	12	16
31	11	---	e16	17	---	187	---	41	---	16	12	---
TOTAL	342.5	931	668	507	700	1144	6331	3581	1135	974	523	543
MEAN	11.0	31.0	21.5	16.4	25.0	36.9	211	116	37.8	31.4	16.9	18.1
MAX	17	98	66	17	45	187	446	488	152	114	42	33
MIN	8.1	10	15	16	17	20	53	36	19	15	12	11
CFSM	.39	1.11	.77	.58	.89	1.32	7.54	4.13	1.35	1.12	.60	.65
IN.	.46	1.24	.89	.67	.93	1.52	8.41	4.76	1.51	1.29	.69	.72

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1999, BY WATER YEAR (WY)

	MEAN	31.8	39.9	26.3	20.5	20.4	42.9	177	79.8	37.7	21.9	17.5	22.2
MAX	94.6	134	43.9	33.2	42.8	112	283	223	117	63.5	70.2	92.5	
(WY)	1986	1989	1988	1969	1964	1973	1976	1972	1968	1968	1988	1968	
MIN	8.71	9.66	9.28	9.03	9.00	16.1	63.5	16.5	11.7	11.4	9.46	7.84	
(WY)	1977	1977	1977	1977	1977	1972	1998	1998	1977	1967	1998	1998	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1937 - 1999

ANNUAL TOTAL	10250.5	17379.5	
ANNUAL MEAN	28.1	47.6	
HIGHEST ANNUAL MEAN			44.7
LOWEST ANNUAL MEAN			62.6
HIGHEST DAILY MEAN	834	488	1120
LOWEST DAILY MEAN	6.5	8.1	6.5
ANNUAL SEVEN-DAY MINIMUM	6.8	9.5	6.8
INSTANTANEOUS PEAK FLOW		636	1590
INSTANTANEOUS PEAK STAGE		8.59	10.72
INSTANTANEOUS LOW FLOW		7.8	(a)1.7
ANNUAL RUNOFF (CFSM)	1.00	1.70	1.60
ANNUAL RUNOFF (INCHES)	13.62	23.09	21.70
10 PERCENT EXCEEDS	45	100	91
50 PERCENT EXCEEDS	14	21	22
90 PERCENT EXCEEDS	8.7	12	12

(a) Result of ice jam upstream.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04043800 McCLURE STORAGE BASIN RELEASE NEAR MARQUETTE, MI

LOCATION.--Lat 46°34'19", long 87°28'35", in SW1/4 NE1/4 sec.7, T.48 N., R.25 W., Marquette County, Hydrologic Unit 04020105, on left bank in power house of Upper Peninsula Power Co., 600 ft upstream from Reany Creek, 2.5 mi downstream from McClure Dam, and 4.3 mi northwest of Marquette.

PERIOD OF RECORD.--April 1990 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 785 ft above sea level, from topographic map.

REMARKS.--Records good except for daily discharges below 10 ft³/s, which are poor. Flow completely regulated by powerplant at station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	117	64	93	78	186	112	e320	340	348	182	147	111
2	114	51	134	78	185	120	e320	339	348	181	127	110
3	106	4.5	140	78	186	123	e320	338	346	181	79	113
4	106	.00	108	79	185	119	e320	337	250	180	60	115
5	115	.00	96	79	187	115	e320	335	175	152	62	116
6	97	27	95	80	185	113	e320	338	185	148	64	117
7	91	71	96	80	185	113	e330	341	183	181	63	125
8	91	70	95	80	186	111	e330	340	179	182	63	141
9	91	72	96	79	185	111	e330	341	184	186	63	145
10	91	58	96	80	186	125	e330	340	183	184	64	139
11	91	84	96	79	180	136	e330	340	183	182	63	140
12	89	73	95	79	279	135	e330	338	184	181	62	139
13	77	65	95	79	328	136	348	340	183	181	109	136
14	65	65	92	80	327	136	347	339	184	180	148	129
15	65	65	87	81	327	147	348	338	184	180	147	119
16	65	66	85	82	326	153	349	337	183	179	146	105
17	64	65	86	81	326	154	347	338	181	180	145	87
18	63	66	85	103	327	161	347	345	180	180	142	86
19	65	70	84	167	326	165	346	342	180	180	130	87
20	64	71	84	193	326	166	344	337	179	180	118	92
21	64	69	84	189	327	168	344	336	179	180	112	107
22	65	69	85	187	328	171	344	338	179	179	112	104
23	65	72	87	185	289	177	343	e330	179	179	112	95
24	64	74	87	186	182	189	343	e330	180	178	112	101
25	64	77	87	187	105	219	342	e330	180	178	112	103
26	65	79	88	189	111	251	342	e330	179	177	111	85
27	65	79	88	188	111	262	343	e330	178	178	110	143
28	64	79	83	191	111	263	343	341	182	160	111	180
29	65	79	77	189	---	296	343	341	182	144	112	180
30	65	83	78	186	---	e315	342	340	182	144	114	181
31	64	---	78	185	---	e320	---	341	---	145	113	---
TOTAL	2437	1867.50	2860	3877	6492	5282	10105	10470	6002	5402	3233	3631
MEAN	78.6	62.2	92.3	125	232	170	337	338	200	174	104	121
MAX	117	84	140	193	328	320	349	345	348	186	148	181
MIN	63	.00	77	78	105	111	320	330	175	144	60	85

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1999, BY WATER YEAR (WY)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
MEAN	121	163	173	158	192	232	283	264	195	138
MAX	213	295	304	254	337	334	348	355	347	242
(WY)	1991	1991	1992	1997	1997	1998	1998	1996	1996	1997
MIN	78.6	62.2	89.2	83.2	110	170	195	160	73.7	14.9
(WY)	1999	1999	1998	1998	1995	1999	1995	1998	1991	1997

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1990 - 1999
ANNUAL TOTAL	49496.63	61658.50	
ANNUAL MEAN	136	169	177
HIGHEST ANNUAL MEAN			234
LOWEST ANNUAL MEAN			140
HIGHEST DAILY MEAN	355	349	370
LOWEST DAILY MEAN	.00	.00	.00
ANNUAL SEVEN-DAY MINIMUM	30	30	.11
10 PERCENT EXCEEDS	341	338	340
50 PERCENT EXCEEDS	86	145	170
90 PERCENT EXCEEDS	65	65	64

(a) On several days in water years 1992, 1994, 1998, 1999.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

040445315 SILVER LEAD CREEK NEAR GWINN, MI

LOCATION.--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, on left bank upstream from sewage treatment plant at former K.I. Sawyer Air Force Base, 4.7 mi northeast of Gwinn.

DRAINAGE AREA.--2.1 mi², approximately.

PERIOD OF RECORD.--February 1985 to March 1986 (discharge measurements only), June 1997 to September 1999 (discontinued).

GAGE.--Water-stage recorder. Datum of gage is 1,093.13 ft above sea level.

REMARKS.--Records fair. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.9	5.1	5.1	5.1	5.1	5.2	6.2	4.1	5.4	6.6	4.8	4.7
2	5.8	5.1	5.1	5.1	5.3	5.0	5.9	4.0	5.0	5.7	3.8	4.6
3	5.7	5.1	5.1	4.9	5.3	5.0	5.8	4.2	4.7	5.8	4.5	4.6
4	5.6	5.1	5.1	5.1	5.3	4.9	7.8	4.7	4.9	5.7	4.7	4.4
5	5.8	5.3	5.1	5.1	5.2	4.8	6.1	4.3	5.0	5.6	4.7	4.4
6	7.1	6.2	5.1	5.1	5.3	4.9	7.6	5.2	5.1	5.0	5.8	4.3
7	7.7	6.0	5.1	5.1	5.2	5.0	7.3	5.8	5.2	4.2	6.2	4.1
8	6.3	5.7	5.1	5.1	5.3	5.0	6.2	5.1	4.8	4.6	5.6	e8.5
9	6.0	5.1	5.1	5.1	5.2	5.0	5.4	4.5	4.7	7.0	5.0	5.0
10	5.8	6.3	5.1	5.1	5.2	5.0	5.3	4.4	5.1	5.5	6.6	4.3
11	5.6	5.9	5.1	5.1	6.3	5.0	5.2	4.3	7.4	4.4	5.4	4.0
12	5.7	5.2	5.1	5.1	7.6	4.9	4.8	4.1	5.3	4.3	5.5	4.0
13	5.9	5.1	5.1	5.1	6.1	4.9	4.8	4.1	4.8	4.1	1.7	4.0
14	6.1	5.2	5.1	5.1	5.8	4.9	4.9	4.2	4.4	4.1	7.4	3.9
15	5.8	5.2	5.1	5.0	5.6	4.7	4.9	4.3	3.9	4.1	6.0	3.9
16	5.6	5.4	5.1	5.1	5.4	4.8	4.7	4.4	3.9	4.7	7.2	3.9
17	5.6	5.5	5.1	5.0	6.0	5.1	4.9	5.4	4.1	5.2	6.2	3.9
18	5.9	6.9	5.1	5.1	5.5	5.3	4.7	9.3	4.2	4.4	5.6	3.8
19	5.5	7.0	5.1	5.1	5.4	5.3	4.8	5.9	4.3	4.1	5.2	4.4
20	5.3	6.0	5.1	5.1	5.3	5.3	4.5	5.4	4.2	4.0	5.3	5.3
21	5.2	5.5	5.1	5.1	5.2	5.4	5.0	5.4	4.1	4.0	5.1	4.7
22	5.2	5.3	5.1	5.1	5.3	5.3	4.8	5.0	4.2	3.9	5.0	4.1
23	5.2	5.6	5.1	5.2	5.1	5.1	4.7	7.3	4.6	4.1	5.0	4.0
24	5.2	5.4	5.1	5.2	5.1	5.0	4.7	7.8	6.0	3.5	5.1	4.0
25	5.2	5.2	5.1	5.1	5.2	4.9	4.2	8.0	4.3	3.9	5.1	4.0
26	6.3	5.1	5.1	5.1	4.9	4.8	3.9	6.8	4.3	4.5	5.4	4.2
27	5.7	5.1	5.1	5.2	5.0	5.2	3.8	5.7	4.5	3.7	5.6	5.5
28	5.2	5.1	5.1	5.4	5.2	5.7	3.9	5.0	4.4	3.8	5.4	5.7
29	5.1	5.1	5.1	5.3	---	6.1	4.6	4.9	4.6	7.2	5.1	5.3
30	5.1	5.1	5.1	5.2	---	5.9	4.2	4.8	4.6	5.6	5.1	e5.0
31	5.1	---	5.1	5.0	---	6.3	---	5.1	---	9.8	4.9	---
TOTAL	177.2	164.9	158.1	158.5	152.4	159.7	155.6	163.5	142.0	153.1	179.3	136.5
MEAN	5.72	5.50	5.10	5.11	5.44	5.15	5.19	5.27	4.73	4.94	5.78	4.55
MAX	7.7	7.0	5.1	5.4	7.6	6.3	7.8	9.3	7.4	9.8	17	8.5
MIN	5.1	5.1	5.1	4.9	4.9	4.7	3.8	4.0	3.9	3.5	3.8	3.8
CFSM	2.72	2.62	2.43	2.43	2.59	2.45	2.47	2.51	2.25	2.35	2.75	2.17
IN.	3.14	2.92	2.80	2.81	2.70	2.83	2.76	2.90	2.52	2.71	3.18	2.42

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1999, BY WATER YEAR (WY)

	MEAN	6.17	5.87	5.56	5.50	5.69	5.73	5.74	5.35	5.73	5.58	5.90	5.45
MAX	6.62	6.24	6.02	5.89	5.93	6.31	6.29	5.43	6.73	6.49	6.72	6.32	
(WY)	1998	1998	1998	1998	1998	1998	1998	1998	1997	1997	1997	1997	
MIN	5.72	5.50	5.10	5.11	5.44	5.15	5.19	5.27	4.73	4.94	5.20	4.55	
(WY)	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1998	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1997 - 1999

ANNUAL TOTAL	2064.0	1900.8	
ANNUAL MEAN	5.65	5.21	5.54
HIGHEST ANNUAL MEAN			5.87
LOWEST ANNUAL MEAN			5.21
HIGHEST DAILY MEAN	9.7	17	17
LOWEST DAILY MEAN	4.7	3.5	3.5
ANNUAL SEVEN-DAY MINIMUM	5.1	3.9	3.9
INSTANTANEOUS PEAK FLOW		25	(a)45
INSTANTANEOUS PEAK STAGE		.91	(a)1.28
INSTANTANEOUS LOW FLOW		(b)1.9	(b)1.9
ANNUAL RUNOFF (CFSM)	2.69	2.48	2.64
ANNUAL RUNOFF (INCHES)	36.56	33.67	35.84
10 PERCENT EXCEEDS	6.2	6.1	6.6
50 PERCENT EXCEEDS	5.6	5.1	5.6
90 PERCENT EXCEEDS	5.1	4.1	4.7

(a) Result of removal of culverts upstream.

(b) Result of temporary construction of rock dam upstream.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04044609 SAND RIVER WILDLIFE FLOODING AT SAND RIVER, MI

LOCATION.--Lat 46°29'14", long 87°07'30", in SW1/4 NE1/4 sec.12, T.47 N., R.23 W., Marquette County, Hydrologic Unit 04020201, on right bank at dam at Sand River, 1.2 mi 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 sea level (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, 11.84 ft, Nov. 6, 1988; minimum, 4.46 ft, Aug. 5, 1998.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 10.40 ft, May 26; minimum, 4.89 ft, Oct. 5.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.98	6.34	9.56	4.93	5.00	5.19	7.35	5.56	8.27	6.91	8.60	8.37
2	4.98	6.39	9.44	4.93	5.01	5.17	6.99	5.44	8.38	6.97	8.57	8.35
3	4.97	6.44	8.52	4.95	5.03	5.17	6.84	5.42	8.51	7.41	8.54	8.34
4	4.95	6.49	7.38	4.93	5.05	5.15	6.84	5.66	8.68	7.50	8.52	8.32
5	4.91	6.54	6.06	4.94	5.06	5.13	7.01	5.76	8.81	7.50	8.49	8.32
6	4.98	6.61	5.20	4.95	5.07	5.12	6.97	5.87	8.90	7.50	8.47	8.34
7	5.35	6.77	5.12	4.95	5.07	5.10	7.30	6.29	8.98	7.51	8.45	8.34
8	5.63	7.00	5.08	4.94	5.06	5.09	6.87	6.71	9.01	7.40	8.43	8.35
9	5.76	7.20	5.06	4.93	5.08	5.08	6.51	7.04	9.05	7.23	8.42	8.36
10	5.78	7.44	5.04	4.93	5.07	5.07	6.23	7.24	9.06	7.16	8.43	8.39
11	5.77	7.69	5.02	4.92	---	5.05	6.01	7.37	9.16	7.39	8.41	8.39
12	5.73	7.90	5.01	4.92	---	5.04	5.85	7.43	9.24	7.52	8.39	8.39
13	5.66	8.05	5.00	4.92	5.74	5.04	5.70	7.46	9.28	7.54	8.48	8.39
14	5.59	8.17	4.99	4.91	5.82	5.02	5.58	7.50	9.27	7.53	8.54	8.39
15	5.53	8.27	5.00	4.91	5.84	5.02	5.50	7.56	9.26	---	8.57	8.39
16	5.47	8.35	4.99	4.91	5.74	5.06	5.45	7.61	9.25	---	8.59	8.38
17	5.42	8.44	4.99	4.91	5.61	5.17	5.40	7.68	9.23	---	8.58	8.37
18	5.38	8.51	4.99	4.93	5.51	5.33	5.35	8.12	9.20	---	8.59	8.37
19	5.33	8.65	5.00	4.95	5.44	5.39	5.31	8.78	9.17	---	8.58	8.38
20	5.29	8.78	4.99	4.99	5.37	5.43	5.27	9.18	9.14	---	8.56	8.42
21	5.29	8.93	4.99	5.00	5.32	5.48	5.31	9.31	9.10	---	8.54	8.44
22	5.32	9.02	4.97	5.01	5.27	5.48	5.32	9.06	9.07	---	8.52	8.43
23	5.35	9.11	4.95	5.01	5.24	5.44	5.32	8.86	9.03	8.94	8.51	8.43
24	5.37	9.24	4.93	5.01	5.21	5.42	5.29	9.15	8.99	8.90	8.48	8.43
25	5.40	9.36	4.91	5.01	5.19	5.38	5.24	10.01	8.94	8.86	8.48	8.44
26	5.64	9.42	4.91	5.02	5.18	5.37	5.19	10.36	8.90	8.81	8.47	8.44
27	5.86	9.47	4.91	5.02	5.16	5.51	5.34	10.07	8.85	8.76	8.45	8.46
28	5.99	9.49	4.91	5.02	5.17	5.82	5.65	9.69	8.84	8.74	8.43	8.48
29	6.10	9.50	4.92	5.01	---	6.24	5.69	9.41	8.06	8.68	8.40	8.49
30	6.18	9.53	4.93	5.00	---	6.47	5.66	9.06	6.96	8.67	8.40	8.52
31	6.26	---	4.93	5.00	---	6.74	---	8.61	---	8.64	8.39	---
MEAN	5.49	8.10	5.51	4.96	---	5.36	5.94	7.85	8.89	---	8.49	8.40
MAX	6.26	9.53	9.56	5.02	---	6.74	7.35	10.36	9.28	---	8.60	8.52
MIN	4.91	6.34	4.91	4.91	---	5.02	5.19	5.42	6.96	---	8.39	8.32

STREAMS TRIBUTARY TO LAKE SUPERIOR

04044724 AU TRAIN RIVER AT FOREST LAKE, MI

LOCATION.--Lat 46°20'27", long 86°51'00", in SE1/4 NE1/4 sec.31, T.46N., R.20W., Alger County, Hydrologic Unit 04020201, on left bank 800 ft downstream from Upper Peninsula Power Co. powerhouse, 0.6 mi downstream from Au Train Dam, and 0.6 mi northwest of Forest Lake.

DRAINAGE AREA.--81 mi², approximately.

PERIOD OF RECORD.--October 1993 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 650 ft above sea level, from topographic map.

REMARKS.--Records good. Flow regulated by powerplant 800 ft upstream and by Au Train Basin, capacity 12,342 acre-ft, 0.6 mi upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	37	27	28	70	133	136	137	171	36	69	78
2	47	37	27	29	86	133	136	135	158	36	63	77
3	43	37	27	29	99	132	136	106	152	36	54	77
4	43	37	27	29	99	132	136	74	156	35	51	77
5	41	37	27	29	99	132	136	71	149	34	49	77
6	40	38	27	29	99	132	136	72	143	30	49	77
7	40	38	27	29	99	132	136	76	137	30	50	77
8	42	37	27	29	98	132	138	76	116	31	50	77
9	41	32	27	28	115	132	142	76	77	39	50	77
10	42	27	27	28	133	132	145	76	76	57	50	77
11	42	27	27	29	120	132	148	76	72	84	49	76
12	42	28	27	31	110	132	153	76	69	127	50	76
13	41	27	27	33	113	131	175	76	69	153	64	75
14	39	27	27	42	113	131	198	75	61	145	71	75
15	38	27	27	49	115	132	210	74	51	120	71	75
16	38	27	27	49	125	133	206	73	46	111	77	68
17	38	27	17	49	134	133	210	73	44	142	76	64
18	38	27	17	53	134	133	211	72	45	142	81	64
19	38	27	30	58	134	133	202	72	45	141	81	64
20	38	27	30	64	134	133	190	77	44	141	81	61
21	38	27	30	66	133	133	184	75	45	140	80	55
22	38	27	29	69	133	133	174	74	45	140	80	45
23	38	27	29	72	133	133	169	77	43	139	80	39
24	38	27	29	72	133	133	167	120	33	140	79	38
25	38	27	29	65	133	133	161	200	31	140	79	37
26	38	27	29	70	133	133	153	311	33	104	79	37
27	38	27	29	70	133	133	151	359	36	65	79	38
28	38	27	29	70	134	133	150	339	36	58	79	39
29	38	27	30	70	---	134	146	289	36	65	79	40
30	37	27	30	70	---	134	141	240	36	69	79	41
31	37	---	29	70	---	135	---	186	---	69	78	---
TOTAL	1239	898	848	1508	3294	4112	4876	3913	2255	2799	2107	1878
MEAN	40.0	29.9	27.4	48.6	118	133	163	126	75.2	90.3	68.0	62.6
MAX	52	38	30	72	134	135	211	359	171	153	81	78
MIN	37	27	17	28	70	131	136	71	31	30	49	37
CFSM	.49	.37	.34	.60	1.45	1.64	2.01	1.56	.93	1.11	.84	.77
IN.	.57	.41	.39	.69	1.51	1.89	2.24	1.80	1.04	1.29	.97	.86

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1994 - 1999, BY WATER YEAR (WY)

	1994	1995	1996	1997	1998	1999
MEAN	69.7	86.2	67.7	69.7	91.1	112
MAX	116	136	82.7	99.5	127	133
(WY)	1997	1994	1996	1997	1996	1999
MIN	35.0	25.4	27.4	48.6	57.8	84.4
(WY)	1995	1995	1999	1999	1995	1995

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1994 - 1999

ANNUAL TOTAL	25336	29727	90.4
ANNUAL MEAN	69.4	81.4	127
HIGHEST ANNUAL MEAN			65.8
LOWEST ANNUAL MEAN			1996
HIGHEST DAILY MEAN	182	Apr 13	670
LOWEST DAILY MEAN	16	Jul 15	16
ANNUAL SEVEN-DAY MINIMUM	22	Jul 14	22
INSTANTANEOUS PEAK FLOW			686
INSTANTANEOUS PEAK STAGE			6.08
ANNUAL RUNOFF (CFSM)	.86		1.12
ANNUAL RUNOFF (INCHES)	11.64		15.17
10 PERCENT EXCEEDS	134		140
50 PERCENT EXCEEDS	58		71
90 PERCENT EXCEEDS	27		37

[illegible]

STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAHQUAMENON RIVER NEAR PARADISE, MI

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 Falls (upper), 11.5 mi west of Paradise, and 19 mi northeast of Newberry.

DRAINAGE AREA.--790 mi².

PERIOD OF RECORD.--August 1953 to current year. Prior to October 1989, published as "near Tahquamenon Paradise".

GAGE.--Water-stage recorder. Datum of gage is 698.03 ft above sea level.

REMARKS.--Records fair. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	366	370	833	334	549	872	2420	488	618	244	270	264
2	357	363	900	330	551	885	2950	456	646	268	287	252
3	349	358	939	332	558	890	3330	423	811	288	292	245
4	339	353	955	332	582	884	3570	394	940	318	283	238
5	326	348	966	330	605	870	3770	370	1020	364	281	230
6	345	344	1010	333	627	851	3950	350	1040	409	267	221
7	435	345	1040	336	644	825	4150	359	1020	416	268	225
8	531	347	1060	332	660	788	4220	380	915	403	263	224
9	603	349	1040	333	671	747	4160	423	827	410	272	227
10	631	394	997	334	684	710	4120	455	711	572	266	230
11	638	572	941	335	710	675	3960	462	596	710	264	231
12	628	760	879	330	883	642	3810	436	501	767	262	236
13	592	868	803	328	1010	609	3620	416	440	769	311	244
14	560	926	749	329	1100	574	3400	398	390	722	410	243
15	537	997	679	328	1150	546	3170	373	365	632	479	246
16	503	1020	634	329	1190	528	2900	349	338	547	511	249
17	472	1040	595	321	1220	545	2640	343	317	469	519	251
18	446	1040	531	329	1220	618	2390	367	300	438	529	250
19	417	1030	488	343	1210	695	2150	383	288	408	515	242
20	406	1000	495	363	1200	766	1920	397	268	384	484	258
21	395	992	476	380	1170	815	1700	388	254	352	445	288
22	392	983	457	396	1140	850	1490	397	245	328	409	212
23	379	932	428	417	1090	874	1310	410	235	318	373	220
24	369	900	411	454	1030	893	1180	445	228	315	341	224
25	358	885	391	479	962	897	1040	542	234	304	315	225
26	361	839	372	505	904	893	881	772	243	298	304	214
27	371	809	356	525	852	921	770	875	226	279	293	226
28	372	758	344	539	857	1030	659	880	215	268	282	221
29	383	720	340	545	---	1260	578	851	222	264	281	463
30	382	729	341	545	---	1510	524	773	241	258	285	220
31	376	---	338	548	---	1870	---	674	---	253	277	---
TOTAL	13619	21371	20788	11994	25029	26333	76732	15029	14694	12775	10638	8589
MEAN	439	712	671	387	894	849	2558	485	490	412	343	280
MAX	638	1040	1060	548	1220	1870	4220	880	1040	769	529	220
MIN	326	344	338	321	549	528	524	343	215	244	262	221
CFSM	.56	.90	.85	.49	1.13	1.08	3.24	.61	.62	.52	.43	.35
IN.	.64	1.01	.98	.56	1.18	1.24	3.61	.71	.69	.60	.50	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1999, BY WATER YEAR (WY)

MEAN	852	1024	778	496	483	724	2720	1657	681	500	427	608
MAX	1768	2284	1756	983	894	1710	4575	4511	1736	1081	1126	1623
(WY)	1979	1989	1967	1983	1999	1973	1976	1960	1974	1956	1973	1970
MIN	256	420	339	303	279	335	1537	323	244	209	217	249
(WY)	1964	1977	1977	1963	1963	1956	1987	1998	1988	1963	1991	1955

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1953 - 1999

ANNUAL TOTAL	227276	257391	912
ANNUAL MEAN	623	705	1294
HIGHEST ANNUAL MEAN			600
LOWEST ANNUAL MEAN			1971
HIGHEST DAILY MEAN	3840	4220	6820
LOWEST DAILY MEAN	169	215	165
ANNUAL SEVEN-DAY MINIMUM	171	227	171
INSTANTANEOUS PEAK FLOW		4230	6990
INSTANTANEOUS PEAK STAGE		8.41	10.26
INSTANTANEOUS LOW FLOW		204	157
ANNUAL RUNOFF (CFSM)	.79	.89	1.15
ANNUAL RUNOFF (INCHES)	10.70	12.12	15.69
10 PERCENT EXCEEDS	1030	1090	1880
50 PERCENT EXCEEDS	405	463	578
90 PERCENT EXCEEDS	225	264	299

(a) July 26, 1955, July 8, 1988.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04046000 BLACK RIVER NEAR GARNET, MI

LOCATION.--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 20 ft upstream from footbridge, 15 ft downstream from Peters Creek, 3.5 mi upstream from mouth, and 3.7 mi southwest of Garnet.

DRAINAGE AREA.--28 mi², approximately.

PERIOD OF RECORD.--September 1951 to September 1978, October 1978 to September 1994 (operated as a crest-stage partial-record station), October 1994 to current year.

REVISED RECORDS.--WSP 1707: 1959.

GAGE.--Water-stage recorder. Datum of gage is 629.7 ft above sea level. Oct. 1, 1978 to Sept. 30, 1994, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e11	e7.3	e33	e8.2	11	22	103	14	21	10	19	9.0
2	e11	e7.3	e29	e8.2	11	22	108	14	26	10	15	9.0
3	e11	e7.6	e26	e8.0	13	19	104	13	33	11	13	8.6
4	e10	e7.6	e24	8.0	14	19	104	13	27	11	12	8.3
5	e13	e7.5	e25	8.0	15	e18	105	12	23	15	12	8.3
6	e32	e8.0	e31	7.7	15	e17	131	12	34	13	19	8.3
7	e34	e8.6	e27	e7.7	14	16	142	13	30	12	15	8.3
8	e29	e9.4	e24	e7.7	14	15	110	15	24	11	14	8.6
9	e23	e9.9	e21	7.7	14	13	89	15	20	16	13	8.6
10	e19	e18	e19	7.6	14	13	73	14	17	19	13	8.3
11	e16	e30	e17	e7.6	16	12	61	13	16	16	12	8.3
12	e14	e29	e16	e7.6	34	12	53	13	14	14	11	8.3
13	e12	e26	e15	e7.6	41	11	46	12	13	12	40	8.6
14	e10	e25	e13	e7.6	48	11	41	12	12	12	45	8.3
15	e8.6	e27	e13	e7.4	30	11	37	11	11	11	31	8.3
16	e7.4	e26	e13	7.5	28	11	34	11	11	11	26	8.0
17	e6.5	e25	12	7.3	29	13	31	14	11	14	23	8.0
18	e6.3	e23	12	9.3	36	18	29	15	11	13	20	8.0
19	e6.7	e25	12	11	33	18	27	13	10	12	19	8.6
20	e6.3	e26	11	10	26	19	26	13	9.8	11	18	11
21	e6.4	e23	11	9.7	24	20	24	15	9.7	10	16	9.3
22	e6.5	e21	e11	9.7	21	20	23	15	9.3	9.7	15	8.8
23	e6.5	e21	e10	11	19	20	21	15	9.3	9.4	14	8.6
24	e6.4	e19	e9.8	13	18	21	20	18	10	9.2	13	8.4
25	e6.8	e18	e9.0	13	17	19	19	19	9.7	8.8	13	8.2
26	e7.9	e16	8.7	12	15	19	18	21	9.1	8.6	12	8.0
27	e8.1	e15	8.3	12	16	21	17	18	9.0	8.2	11	14
28	e7.8	e15	8.3	12	22	27	16	16	9.3	8.5	11	17
29	e7.5	e14	8.4	11	---	40	15	15	11	8.8	10	18
30	e7.3	e26	8.3	13	---	48	15	14	9.7	8.3	9.7	16
31	e7.3	---	8.3	11	---	66	---	15	---	19	9.3	---
TOTAL	365.3	541.2	494.1	289.1	608	631	1642	443	469.9	362.5	524.0	287.0
MEAN	11.8	18.0	15.9	9.33	21.7	20.4	54.7	14.3	15.7	11.7	16.9	9.57
MAX	34	30	33	48	66	66	142	21	34	19	45	18
MIN	6.3	7.3	8.3	7.3	11	11	15	11	9.0	8.2	9.3	8.0
CFSM	.42	.64	.57	.33	.78	.73	1.95	.51	.56	.42	.60	.34
IN.	.49	.72	.66	.38	.81	.84	2.18	.59	.62	.48	.70	.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

	MEAN	23.8	30.4	24.0	15.4	13.5	21.4	88.1	46.8	24.4	17.8	14.3	19.1
MAX	68.0	69.9	60.0	26.0	24.7	61.7	168	141	75.3	38.6	38.7	65.5	65.5
(WY)	1960	1978	1971	1967	1966	1953	1971	1960	1974	1952	1973	1970	1970
MIN	6.06	7.12	7.75	7.09	7.09	7.43	42.9	11.2	12.0	7.64	6.57	6.44	6.44
(WY)	1964	1977	1977	1977	1995	1956	1998	1998	1964	1998	1995	1955	1955

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1952 - 1999

ANNUAL TOTAL	5491.9	6657.1	
ANNUAL MEAN	15.0	18.2	28.2
HIGHEST ANNUAL MEAN			49.9
LOWEST ANNUAL MEAN			14.2
HIGHEST DAILY MEAN	115	142	752
LOWEST DAILY MEAN	6.1	6.3	5.2
ANNUAL SEVEN-DAY MINIMUM	6.3	6.4	5.4
INSTANTANEOUS PEAK FLOW		160	(a)860
INSTANTANEOUS PEAK STAGE		4.64	8.55
INSTANTANEOUS LOW FLOW			4.9
ANNUAL RUNOFF (CFSM)	.54	.65	1.01
ANNUAL RUNOFF (INCHES)	7.30	8.84	13.70
10 PERCENT EXCEEDS	29	30	57
50 PERCENT EXCEEDS	10	13	17
90 PERCENT EXCEEDS	6.9	8.0	8.6

(a) From rating curve extended above 400 ft³/s.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04056500 MANISTIQUE RIVER NEAR MANISTIQUE, MI

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

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

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

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

GAGE.--Water-stage recorder. Datum of gage is 608.46 ft above sea level. Prior to July 15, 1939, non-recording gage at site 1,600 ft upstream at different datum.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	491	679	1010	e580	e900	e1300	3320	1320	1270	628	766	463
2	488	665	1080	e580	e920	e1300	3810	1260	1250	652	727	458
3	486	652	1130	e580	e940	e1300	4390	1200	1230	681	670	453
4	481	644	1110	e580	e960	e1350	5240	1150	1180	725	621	447
5	471	637	1090	e560	e980	e1350	6100	1100	1130	728	589	441
6	504	629	1130	e560	e1000	e1300	6840	1080	1080	731	569	442
7	622	628	1190	e560	e1050	e1300	7230	1120	1050	727	554	436
8	734	631	1210	e560	e1100	e1250	7500	1220	1000	699	556	433
9	807	646	1180	e560	e1150	e1200	7380	1310	962	688	557	437
10	829	693	1120	e560	e1200	e1150	6900	1330	912	770	583	446
11	794	882	1050	e560	e1250	e1150	6340	1280	870	874	595	473
12	729	1080	1020	e560	e1300	e1100	5750	1200	875	915	587	491
13	685	1180	980	e560	e1400	e1050	5210	1120	855	875	606	499
14	657	1230	934	e560	e1450	e1050	4780	1060	e820	790	655	497
15	632	1210	942	e560	e1500	e1000	4380	995	e780	731	701	491
16	614	1160	915	e560	e1550	e1000	4050	954	e760	687	758	483
17	600	1120	894	e560	e1700	e1100	3760	933	740	716	756	471
18	591	1100	814	e580	e1800	e1250	3410	937	722	752	730	461
19	575	1090	764	e600	e1800	e1300	3100	940	711	780	715	457
20	563	1090	e800	e620	e1700	e1400	2860	938	693	781	681	480
21	557	1090	e800	e640	e1700	e1500	2650	936	680	768	643	492
22	562	1080	e760	e660	e1600	e1500	2490	946	660	726	607	503
23	638	1070	e720	e700	e1500	e1550	2350	960	639	683	581	515
24	651	1040	e700	e720	e1500	e1550	2210	1010	640	662	557	503
25	642	1030	e680	e760	e1450	e1600	2010	1100	644	643	544	483
26	649	1030	e660	e800	e1350	e1600	1860	1220	637	619	533	470
27	678	1000	e640	e840	e1350	e1650	1720	1300	622	590	520	475
28	709	972	e620	e860	e1300	e1800	1600	1350	605	577	510	491
29	728	951	e600	e880	---	2000	1500	1390	614	610	494	511
30	712	954	e600	e900	---	2390	1390	1380	619	614	477	526
31	697	---	e580	e900	---	2850	---	1310	---	709	470	---
TOTAL	19576	27863	27723	20060	37400	44190	122130	35349	25250	22131	18912	14228
MEAN	631	929	894	647	1336	1425	4071	1140	842	714	610	474
MAX	829	1230	1210	900	1800	2850	7500	1390	1270	915	766	526
MIN	471	628	580	560	900	1000	1390	933	605	577	470	433
CFSM	.57	.84	.81	.59	1.21	1.30	3.70	1.04	.77	.65	.55	.43
IN.	.66	.94	.94	.68	1.26	1.49	4.13	1.20	.85	.75	.64	.48

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1938 - 1999, BY WATER YEAR (WY)

MEAN	1137	1513	1256	947	868	1308	4004	2335	1297	888	692	803
MAX	2720	3777	2569	1777	1516	3358	6401	6963	4531	1783	1733	2657
(WY)	1979	1989	1966	1966	1966	1946	1976	1960	1943	1993	1996	1978
MIN	386	606	480	469	480	547	1962	812	602	402	384	350
(WY)	1949	1977	1977	1977	1963	1963	1946	1998	1988	1955	1963	1948

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1938 - 1999

ANNUAL TOTAL	355160	414812	
ANNUAL MEAN	973	1136	
HIGHEST ANNUAL MEAN			1420
LOWEST ANNUAL MEAN			2229
HIGHEST DAILY MEAN	5610	7500	16500
LOWEST DAILY MEAN	378	433	290
ANNUAL SEVEN-DAY MINIMUM	387	440	294
INSTANTANEOUS PEAK FLOW		7610	16900
INSTANTANEOUS PEAK STAGE		11.04	12.85
INSTANTANEOUS LOW FLOW		432	288
ANNUAL RUNOFF (CFSM)	.88	1.03	1.29
ANNUAL RUNOFF (INCHES)	12.01	14.03	17.53
10 PERCENT EXCEEDS	1630	1670	2720
50 PERCENT EXCEEDS	750	800	1000
90 PERCENT EXCEEDS	417	508	560

(e) Estimated.

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 sea level.

REMARKS.--Records fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	81	77	164	e60	e64	e140	766	161	201	82	145	47
2	77	74	163	e58	e64	e140	845	155	206	108	106	45
3	72	72	154	e58	e64	e140	885	147	193	105	91	44
4	69	71	144	e58	e64	e140	1050	144	174	134	133	43
5	65	71	145	e58	e64	e130	1200	140	158	118	114	41
6	113	72	171	e58	e64	e130	1170	143	164	108	100	44
7	233	75	167	e58	e64	e130	1230	209	156	93	97	44
8	199	77	153	e58	e64	e130	1090	242	140	83	110	46
9	164	77	139	e58	e64	e120	966	242	143	112	95	47
10	140	145	132	e58	e70	e120	849	218	133	122	112	47
11	121	337	122	e58	e80	e120	737	193	121	114	112	50
12	108	295	124	e58	e120	e120	649	171	110	118	99	50
13	98	239	113	e58	e180	e120	582	154	104	110	156	50
14	90	204	117	e58	e190	e120	519	140	103	97	152	49
15	84	183	116	e58	e180	e130	460	130	93	92	124	48
16	81	171	105	e58	e175	e140	414	122	87	95	123	46
17	78	168	104	e58	e170	e150	373	124	84	243	119	44
18	76	167	93	e58	e170	e160	340	134	79	208	109	43
19	73	186	e90	e58	e160	e170	313	133	75	158	102	43
20	71	196	e94	e58	e160	e180	291	127	71	127	92	58
21	70	182	e82	e58	e160	e180	284	136	67	108	83	59
22	71	168	e80	e60	e150	e180	283	151	65	95	77	55
23	71	163	e76	e60	e150	e190	270	164	63	87	73	52
24	70	155	e72	e60	e150	e190	253	215	67	82	70	49
25	68	147	e68	e60	e140	e200	241	229	64	75	67	47
26	80	139	e66	e60	e140	e210	225	254	61	69	64	45
27	92	131	e64	e60	e140	e220	212	249	59	65	62	50
28	90	124	e62	e60	e140	e270	197	227	77	61	60	61
29	85	119	e62	e60	---	392	185	205	83	69	55	62
30	84	129	e60	e60	---	502	174	186	76	76	51	59
31	80	---	e60	e62	---	611	---	172	---	165	48	---
TOTAL	2954	4414	3352	1822	3401	5875	17053	5417	3277	3379	3001	1468
MEAN	95.3	147	108	58.8	121	190	568	175	109	109	96.8	48.9
MAX	233	337	171	62	190	611	1230	254	206	243	156	62
MIN	65	71	60	58	64	120	174	122	59	61	48	41
CFSM	.52	.80	.59	.32	.66	1.04	3.11	.95	.60	.60	.53	.27
IN.	.60	.90	.68	.37	.69	1.19	3.47	1.10	.67	.69	.61	.30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1999, BY WATER YEAR (WY)

MEAN	176	223	166	108	98.6	174	548	290	177	118	108	125
MAX	337	532	369	198	181	378	847	590	411	254	330	354
(WY)	1983	1978	1971	1997	1984	1973	1979	1996	1979	1968	1978	1978
MIN	55.5	64.4	49.8	50.0	54.2	72.6	271	88.4	50.3	45.7	48.1	40.7
(WY)	1977	1977	1977	1977	1977	1994	1987	1998	1988	1988	1976	1976

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1967 - 1999

ANNUAL TOTAL	45501	55413	193
ANNUAL MEAN	125	152	289
HIGHEST ANNUAL MEAN			121
LOWEST ANNUAL MEAN			1987
HIGHEST DAILY MEAN	1100	1230	2030
LOWEST DAILY MEAN	32	41	32
ANNUAL SEVEN-DAY MINIMUM	34	44	34
INSTANTANEOUS PEAK FLOW		1260	2120
INSTANTANEOUS PEAK STAGE		9.03	11.50
INSTANTANEOUS LOW FLOW		41	32
ANNUAL RUNOFF (CFSM)	.68	.83	1.05
ANNUAL RUNOFF (INCHES)	9.25	11.26	14.30
10 PERCENT EXCEEDS	206	240	393
50 PERCENT EXCEEDS	80	112	127
90 PERCENT EXCEEDS	47	58	65

(a) Sept. 4, 5, 19.

(b) July 8, 1988, Aug. 5-7, 1998.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057800 MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MI

LOCATION.--Lat 46°29'57", long 87°53'11", in SW1/4 sec.1, T.47 N., R.29 W., Marquette County, Hydrologic Unit 04030110, on left bank 15 ft upstream from county road FX, 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 sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Sept. 1, 1960, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.4	11	29	e12	e14	e23	163	55	80	44	52	11
2	9.4	10	27	e12	e14	23	199	50	72	60	39	11
3	9.2	10	25	e12	e14	23	245	46	65	74	32	11
4	7.8	11	23	e12	e14	23	281	42	57	145	27	11
5	8.1	11	24	e12	e14	23	301	39	57	119	24	11
6	11	10	31	e12	e14	22	305	65	69	147	22	13
7	16	9.7	28	e12	e14	22	344	158	64	125	22	12
8	15	9.4	24	e12	e14	21	364	239	55	91	23	17
9	13	9.7	22	e12	e14	20	376	234	52	166	19	16
10	11	14	19	e12	e15	19	352	161	47	247	38	15
11	11	26	18	e12	e15	19	311	113	48	193	31	15
12	11	22	17	e12	e16	18	267	89	109	120	30	14
13	10	17	17	e12	e22	18	240	73	121	88	107	13
14	11	17	15	e12	e28	17	235	61	91	72	86	13
15	10	17	16	e13	e30	17	243	53	70	61	62	13
16	10	17	15	e13	e31	19	250	52	59	53	69	11
17	10	18	e14	e13	e32	22	237	79	56	52	65	10
18	13	17	e14	e13	e31	24	209	196	49	45	53	9.6
19	17	44	e13	e13	e30	25	173	287	42	51	44	19
20	15	52	e13	e13	e30	26	146	225	38	40	31	40
21	13	42	e12	e13	e29	28	138	162	35	38	25	31
22	12	37	e12	e13	e28	29	132	128	32	31	22	24
23	12	43	e12	e13	e27	29	117	139	32	27	21	19
24	15	55	e12	e13	e26	29	102	202	66	26	20	17
25	13	49	e12	e13	e25	27	92	306	51	40	18	15
26	13	45	e12	e13	e23	28	85	446	42	36	16	14
27	13	39	e12	e14	e23	34	78	374	35	22	15	17
28	12	34	e12	e14	e23	45	72	240	32	18	14	21
29	11	31	e12	e14	---	61	65	162	33	57	12	19
30	11	31	e12	e14	---	77	60	118	29	54	11	16
31	11	---	e12	e14	---	105	---	93	---	69	11	---
TOTAL	363.9	758.8	536	394	610	916	6182	4687	1688	2411	1061	478.6
MEAN	11.7	25.3	17.3	12.7	21.8	29.5	206	151	56.3	77.8	34.2	16.0
MAX	17	55	31	14	32	105	376	446	121	247	107	40
MIN	7.8	9.4	12	12	14	17	60	39	29	18	11	9.6
CFSM	.26	.55	.38	.28	.47	.64	4.48	3.29	1.22	1.69	.74	.35
IN.	.29	.61	.43	.32	.49	.74	5.00	3.79	1.37	1.95	.86	.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1999, BY WATER YEAR (WY)

	MEAN	53.8	57.7	37.5	23.7	20.9	39.1	199	126	59.9	32.6	26.0	39.0
MAX	191	198	77.5	41.5	55.9	149	423	326	153	89.9	76.5	184	
(WY)	1986	1989	1992	1966	1984	1973	1985	1972	1989	1968	1978	1978	
MIN	5.87	5.97	5.57	5.30	6.00	11.5	74.9	21.1	13.3	7.57	5.80	4.91	
(WY)	1977	1977	1977	1977	1977	1964	1987	1998	1988	1988	1976	1976	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1959 - 1999
ANNUAL TOTAL	11139.1	20086.3	
ANNUAL MEAN	30.5	55.0	59.1
HIGHEST ANNUAL MEAN			95.3
LOWEST ANNUAL MEAN			30.7
HIGHEST DAILY MEAN	493	Mar 31	1830
LOWEST DAILY MEAN	4.9	Sep 12	4.2
ANNUAL SEVEN-DAY MINIMUM	5.4	Sep 6	4.5
INSTANTANEOUS PEAK FLOW		466	1930
INSTANTANEOUS PEAK STAGE		5.31	9.21
INSTANTANEOUS LOW FLOW		7.1	3.5
ANNUAL RUNOFF (CFSM)	.66	1.20	1.29
ANNUAL RUNOFF (INCHES)	9.01	16.24	17.46
10 PERCENT EXCEEDS	49	151	129
50 PERCENT EXCEEDS	14	24	31
90 PERCENT EXCEEDS	6.2	12	12

(e) Estimated.

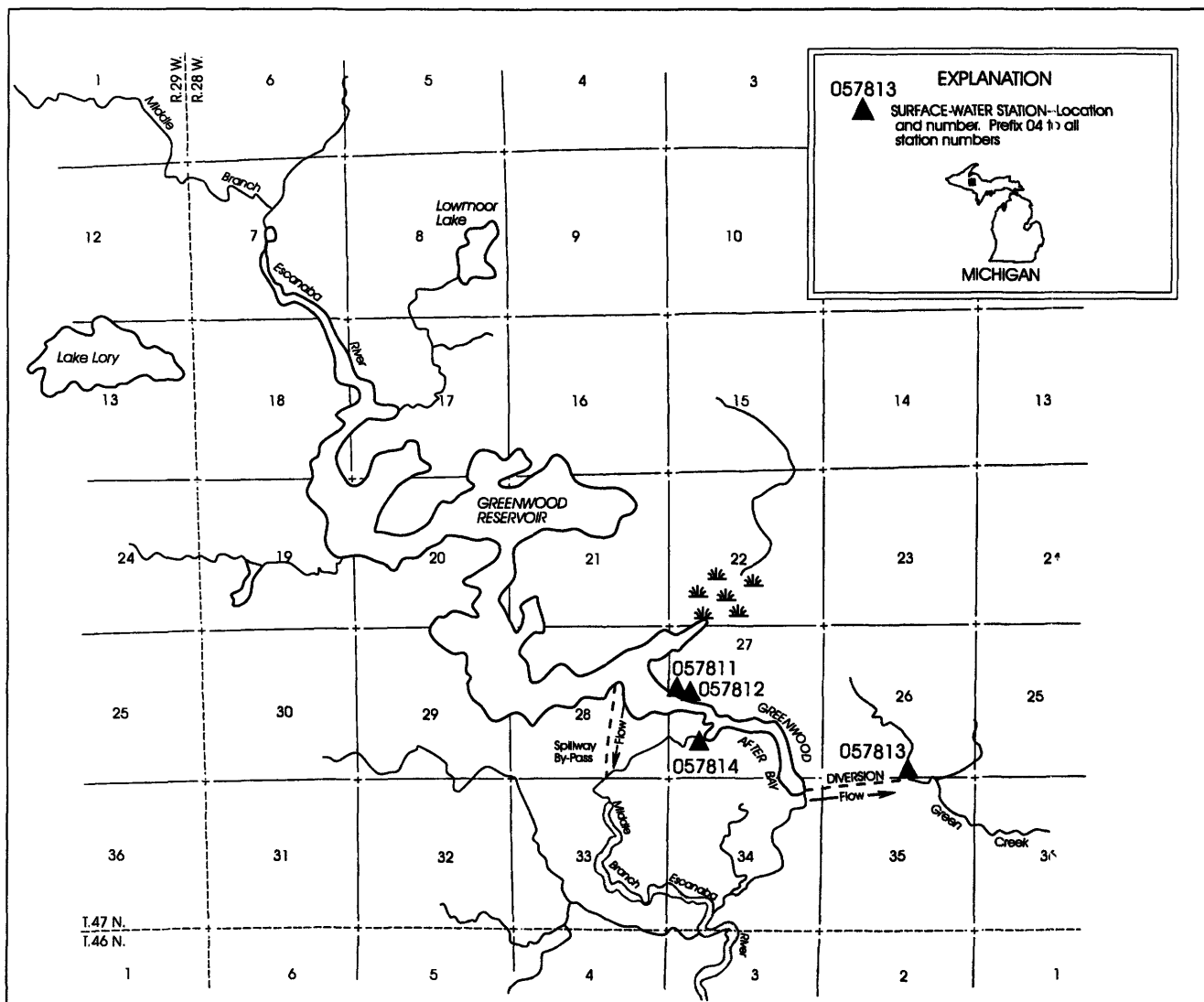


Figure 7. Identification number and location of active surface-water gaging stations in and around the Greenwood Reservoir Complex.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057811 GREENWOOD RESERVOIR NEAR GREENWOOD, MI

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

DRAINAGE AREA.--67.4 mi².

PERIOD OF RECORD.--December 1972 to current year. Prior to October 1997 monthend elevations and contents only.

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft above sea level (levels by Cleveland-Cliffs Iron Co.); EXTREMES reported below have been converted to sea level elevations. 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. Capacity of reservoir, 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 approximately 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 Greenwood Afterbay (station 04057812) 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 elevation, 1,517.3 ft, Apr. 21, 22, 23, 1985; minimum since first filling, 1,491.1 ft, Mar. 12, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,515.81 ft, May 27; minimum, 1,497.66 ft, Mar. 17, 18.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	103.04	100.62	101.03	100.77	98.54	98.14	99.34	114.07	115.34	115.01	115.11	114.84
2	102.93	100.54	101.06	100.72	98.48	98.12	99.99	114.13	115.29	115.03	115.07	114.81
3	102.82	100.53	101.09	100.74	98.42	98.12	100.76	114.17	115.25	115.08	115.04	114.79
4	102.70	100.51	101.11	100.71	98.37	98.09	101.63	114.20	115.21	115.17	115.02	114.76
5	102.59	100.43	101.14	100.65	98.30	98.07	102.55	114.23	115.22	115.23	115.00	114.73
6	102.57	100.33	101.19	100.60	98.23	98.05	103.51	114.32	115.24	115.25	114.99	114.71
7	102.57	100.23	101.23	100.52	98.16	98.01	104.48	114.56	115.23	115.24	114.98	114.68
8	102.55	100.14	101.26	100.44	98.09	97.98	105.48	114.90	115.21	115.22	114.97	114.70
9	102.52	100.04	101.28	100.35	98.04	97.95	106.50	115.22	115.22	115.30	114.94	114.67
10	102.48	100.02	101.29	100.26	97.98	97.91	107.44	115.38	115.19	115.36	114.98	114.65
11	102.44	100.02	101.27	100.17	97.95	97.87	108.25	115.38	115.17	115.39	115.00	114.62
12	102.39	100.04	101.25	100.08	98.00	97.83	108.93	115.34	115.18	115.34	115.01	114.59
13	102.33	100.08	101.22	99.98	98.03	97.79	109.49	115.29	115.23	115.28	115.16	114.56
14	102.24	100.07	101.19	99.88	98.05	97.75	109.99	115.25	115.24	115.23	115.18	114.54
15	102.13	100.06	101.17	99.79	98.07	97.71	110.47	115.21	115.21	115.19	115.17	114.52
16	102.02	100.05	101.14	99.71	98.12	97.68	110.95	115.20	115.19	115.16	115.18	114.48
17	101.92	100.11	101.12	99.61	98.17	97.67	111.41	115.23	115.16	115.13	115.18	114.45
18	101.85	100.12	101.00	99.56	98.19	97.69	111.82	115.38	115.13	115.10	115.15	114.42
19	101.75	100.05	101.10	99.50	98.21	97.69	112.17	115.50	115.10	115.09	115.14	114.45
20	101.66	100.10	--	99.40	98.23	97.71	112.46	115.58	115.08	115.07	115.12	114.50
21	101.57	100.18	--	99.31	98.24	97.74	112.72	115.54	115.07	115.05	115.10	114.51
22	101.48	100.28	--	99.24	98.23	97.77	112.96	115.46	115.05	115.03	115.08	114.53
23	101.39	100.38	101.05	99.19	98.22	97.81	113.16	115.44	115.04	115.02	115.07	114.52
24	101.29	100.48	101.02	99.13	98.21	97.84	113.33	115.48	115.10	115.00	115.06	114.48
25	101.20	100.60	100.99	99.04	98.20	97.88	113.49	115.56	115.11	114.97	115.05	114.44
26	101.13	100.72	100.95	98.95	98.18	97.91	113.62	115.69	115.09	114.97	115.03	114.40
27	101.05	100.80	100.93	98.89	98.16	97.95	113.74	115.79	115.06	114.94	115.01	114.39
28	100.96	100.87	100.89	98.83	98.15	98.04	113.84	115.74	115.04	114.91	114.98	114.39
29	100.88	100.93	100.88	98.75	--	98.21	113.93	115.62	115.02	114.98	114.94	114.38
30	100.79	100.99	100.85	98.68	--	98.44	114.01	115.51	114.99	115.04	114.90	114.35
31	100.71	--	100.82	98.61	--	98.77	--	115.42	--	115.14	114.87	--
MEAN	101.93	100.34	--	99.74	98.19	97.94	109.08	115.15	115.16	115.13	115.05	114.56
MAX	103.04	100.99	--	100.77	98.54	98.77	114.01	115.79	115.34	115.39	115.18	114.84
MIN	100.71	100.02	--	98.61	97.95	97.67	99.34	114.07	114.99	114.91	114.87	114.35

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 at downstream side of dam on the Middle Branch Escanaba River, 3.7 mi southwest of Greenwood.

DRAINAGE AREA.--67.4 mi².

PERIOD OF RECORD.--March to September 1999.

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft above sea level (levels by Cleveland-Cliffs Iron Co.).

EXTREMES FOR CURRENT YEAR.--Maximum elevation during period March to September, 80.98 ft, July 12; minimum, 79.42 ft, Sept. 21, 22, 23.

REMARKS.--Flow completely regulated by four valve outlet structure from Greenwood Reservoir (station 04057811) immediately upstream. Capacity of afterbay, 420 acre-ft at elevation 1,480 ft. Two outlet systems provide for diversion for use in iron ore processing and for 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).

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	79.54	79.95	80.58	80.58	79.99	80.49
2	---	---	---	---	---	---	79.48	79.92	80.58	80.56	80.01	80.41
3	---	---	---	---	---	---	79.46	79.91	80.57	80.57	80.00	80.33
4	---	---	---	---	---	---	79.52	80.00	80.57	80.59	80.01	80.23
5	---	---	---	---	---	---	79.69	80.07	80.69	80.60	80.07	80.16
6	---	---	---	---	---	---	79.89	80.14	80.82	80.60	80.21	80.10
7	---	---	---	---	---	---	79.95	80.16	80.86	80.59	80.32	80.07
8	---	---	---	---	---	---	79.99	80.00	80.87	80.60	80.42	80.15
9	---	---	---	---	---	---	80.01	79.80	80.85	80.72	80.50	80.19
10	---	---	---	---	---	---	79.95	79.81	80.77	80.83	80.60	80.23
11	---	---	---	---	---	---	79.94	80.00	80.69	80.90	80.50	80.27
12	---	---	---	---	---	---	79.94	80.06	80.50	80.94	80.42	80.30
13	---	---	---	---	---	---	79.94	80.08	80.34	80.91	80.48	80.32
14	---	---	---	---	---	---	80.02	80.12	80.21	80.87	80.39	80.35
15	---	---	---	---	---	---	80.04	80.18	80.15	80.80	80.30	80.37
16	---	---	---	---	---	---	80.05	80.22	80.09	80.73	80.28	80.38
17	---	---	---	---	---	---	80.06	80.24	80.02	80.67	80.23	80.38
18	---	---	---	---	---	---	80.08	80.08	80.25	80.60	80.19	80.38
19	---	---	---	---	---	---	80.09	79.87	80.42	80.56	80.17	80.45
20	---	---	---	---	---	---	80.09	79.69	80.54	80.52	80.18	80.42
21	---	---	---	---	---	---	80.09	79.62	80.56	80.49	80.18	79.80
22	---	---	---	---	---	---	80.04	79.74	80.50	80.46	80.18	79.42
23	---	---	---	---	---	---	79.98	79.92	80.80	80.44	80.19	79.42
24	---	---	---	---	---	---	79.95	80.12	80.85	80.40	80.28	79.43
25	---	---	---	---	---	---	79.94	80.41	80.63	80.36	80.37	79.50
26	---	---	---	---	---	79.55	79.92	80.62	80.43	80.28	80.45	79.76
27	---	---	---	---	---	79.54	79.93	80.62	80.48	80.03	80.53	80.01
28	---	---	---	---	---	79.60	79.95	80.61	80.53	79.86	80.53	80.07
29	---	---	---	---	---	79.60	79.97	80.60	80.56	79.87	80.54	80.10
30	---	---	---	---	---	79.64	79.97	80.59	80.55	79.86	80.56	80.11
31	---	---	---	---	---	79.65	---	80.58	---	79.98	80.57	---
MEAN	---	---	---	---	---	---	79.92	80.12	80.54	80.51	80.31	80.12
MAX	---	---	---	---	---	---	80.09	80.62	80.87	80.94	80.60	80.49
MIN	---	---	---	---	---	---	79.46	79.62	80.02	79.86	79.99	79.42

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.--January 1973 to current year.

GAGE.--Water-stage recorder and concrete flume. Datum of gage is 1,454.57 ft above sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Aug. 22, 1973, nonrecording gage at same site and datum.

REMARKS.--Records good except for daily discharges below 2.0 ft³/s, which are poor. Flow completely regulated; diversion began January 7, 1973. A pipeline, 0.7 mi long, diverts water from Greenwood Afterbay (station 04057812), which regulates released flow 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.9	19	4.9	14	15	6.1	.06	4.6	3.3	15	e15	5.8
2	6.5	19	5.0	14	15	6.1	.05	4.6	3.3	15	e15	5.9
3	6.9	16	5.0	14	14	6.1	.04	7.4	3.3	15	e15	6.1
4	7.1	16	5.0	15	12	6.1	.04	9.5	3.3	15	e12	6.2
5	7.2	21	5.0	17	12	6.1	.04	9.7	3.3	15	9.2	6.2
6	7.2	24	5.0	17	12	6.1	.04	11	3.3	15	8.3	6.2
7	7.1	24	6.5	19	12	6.1	.04	9.2	3.3	15	8.4	6.1
8	7.0	24	9.1	19	9.8	6.1	.04	7.2	3.3	15	8.4	6.2
9	6.9	25	11	19	7.7	6.1	.04	6.6	3.3	e14	6.9	6.2
10	6.8	25	12	19	7.7	6.1	.04	6.1	3.3	e12	6.0	6.2
11	6.7	25	12	19	e7.7	6.1	.04	6.1	4.1	e12	5.9	6.2
12	14	24	12	19	e6.7	6.2	.04	6.2	4.5	e10	5.9	6.2
13	18	19	12	19	e5.5	6.2	.04	6.2	4.4	e7.5	5.9	6.2
14	19	14	12	19	e5.5	6.2	.04	6.2	4.4	e7.5	5.8	6.2
15	23	12	13	19	e5.5	6.2	.04	6.2	4.4	e7.5	5.8	6.2
16	24	10	13	19	e5.5	5.9	.04	6.2	4.3	e7.4	5.7	6.2
17	24	9.9	14	19	e5.4	5.8	.04	5.6	4.3	7.2	5.7	6.2
18	25	9.8	14	19	5.5	5.8	.04	5.0	4.4	7.2	5.7	6.2
19	23	9.0	14	19	5.5	5.8	.04	4.0	4.4	7.5	5.7	6.2
20	21	7.4	14	19	5.9	5.8	.04	3.5	4.5	7.5	5.7	6.2
21	21	6.6	14	19	6.2	5.8	1.1	3.1	4.5	7.4	5.7	6.1
22	21	6.6	14	19	6.2	5.8	1.8	3.1	4.4	7.4	5.7	6.0
23	21	5.8	14	19	6.2	4.4	2.6	3.1	5.2	7.4	5.7	5.8
24	21	5.0	14	19	6.1	4.7	3.1	3.2	6.4	7.5	5.7	6.1
25	21	4.9	14	19	6.1	5.9	3.1	3.3	7.6	7.4	5.7	6.3
26	20	4.9	14	18	6.1	5.8	3.1	3.3	9.4	11	5.7	6.5
27	19	4.9	14	17	6.1	5.2	3.1	3.3	11	14	5.7	6.5
28	19	4.9	14	16	6.1	4.0	3.1	3.3	11	15	5.7	6.5
29	19	4.9	14	15	---	3.2	3.1	3.3	14	15	5.8	6.5
30	19	4.9	14	15	---	2.4	4.2	3.3	15	15	5.8	6.5
31	19	---	14	15	---	.90	---	3.3	---	e15	5.8	---
TOTAL	490.3	406.5	352.5	548	225.0	169.10	29.13	166.7	165.2	349.4	225.0	185.9
MEAN	15.8	13.6	11.4	17.7	8.04	5.45	.97	5.38	5.51	11.3	7.26	6.20
MAX	25	25	14	19	15	6.2	4.2	11	15	15	15	6.5
MIN	6.5	4.9	4.9	14	5.4	.90	.04	3.1	3.3	7.2	5.7	5.8

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 - 1999, BY WATER YEAR (WY)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
MEAN	14.7	12.4	14.4	18.0	17.3	13.4	6.65	9.44	12.4	17.5	17.3	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
MAX	26.5	26.4	25.5	26.0	26.0	25.8	17.2	24.2	26.0	26.1	28.5	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1
(WY)	1995	1995	1995	1994	1995	1982	1980	1998	1977	1988	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
MIN	.046	.37	.19	.19	.28	.31	.11	.22	.28	1.63	1.20	.39	.39	.39	.39	.39	.39	.39	.39	.39	.39	.39	.39	.39	.39	.39	.39
(WY)	1978	1974	1974	1974	1974	1974	1977	1973	1974	1982	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1973 - 1999

ANNUAL TOTAL	6074.64	3312.73	14.3	1995
ANNUAL MEAN	16.6	9.08	22.4	1974
HIGHEST ANNUAL MEAN			4.06	(a)
LOWEST ANNUAL MEAN			30	(b)
HIGHEST DAILY MEAN	26	Jan 1	.04	Apr 3
LOWEST DAILY MEAN	.00	Apr 8	.04	Apr 3
ANNUAL SEVEN-DAY MINIMUM	.00	Apr 7	.00	Apr 7 1998
10 PERCENT EXCEEDS	26	19	26	
50 PERCENT EXCEEDS	18	6.2	14	
90 PERCENT EXCEEDS	5.0	3.3	.93	

(a) June 25-28, 1977, Nov. 9, 1979.

(b) Minimum daily discharge since diversion began Jan. 7, 1973; result of shutdown of flume for maintenance.

(c) Apr. 8-13, 1998.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 0403011^a, 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 sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Nov. 7, 1973, nonrecording gage at same site and different datum.

REMARKS.--Records good 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 Greenwood Afterbay release structure (station 04057812) 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	28	13	e17	25	25	13	13	25	25	25	25
2	25	21	e13	e16	25	25	13	13	24	25	25	24
3	28	13	e13	e17	25	25	13	13	24	25	25	24
4	30	13	e13	e17	25	25	13	13	24	25	25	24
5	27	14	e13	e17	25	25	13	13	24	24	25	24
6	24	14	e13	e17	25	25	13	13	25	24	25	24
7	24	14	e13	e24	25	25	13	13	25	24	26	24
8	25	14	e13	e24	25	25	13	13	25	24	26	24
9	24	14	e13	e24	25	25	13	13	25	25	25	24
10	23	14	e13	e24	25	25	13	13	25	25	25	24
11	24	14	e13	e24	25	25	13	15	25	25	25	24
12	24	14	e13	e24	25	25	13	17	25	25	25	24
13	24	13	e13	e24	25	25	13	17	24	25	25	25
14	25	14	e13	e24	25	25	13	19	24	25	24	25
15	25	14	e13	e24	25	25	13	18	24	24	24	25
16	24	13	e13	e24	25	22	13	18	24	24	24	25
17	24	13	e13	e24	25	21	13	18	24	24	24	25
18	24	13	e13	e24	25	21	13	18	25	24	24	25
19	24	13	e13	e25	25	21	13	17	27	24	24	25
20	24	13	e13	e25	25	21	13	17	27	25	24	25
21	24	13	e13	25	25	22	13	17	27	24	24	24
22	25	13	e13	25	25	21	13	17	26	25	24	24
23	25	13	e13	25	25	21	13	18	26	25	24	25
24	25	13	e13	25	25	21	13	17	26	24	25	26
25	25	13	e13	25	25	21	13	17	25	24	25	27
26	25	13	e13	25	25	21	13	22	25	24	25	28
27	24	13	e13	25	25	21	13	25	25	24	25	26
28	24	13	e13	25	25	21	13	25	24	24	25	24
29	24	13	e13	25	---	21	13	25	24	25	25	24
30	24	13	e13	25	---	21	13	25	24	24	25	24
31	26	---	e13	25	---	21	---	25	---	25	25	---
TOTAL	758	423	403	714	700	713	390	537	747	759	767	741
MEAN	24.5	14.1	13.0	23.0	25.0	23.0	13.0	17.3	24.9	24.5	24.7	24.7
MAX	30	28	13	25	25	25	13	25	27	25	26	28
MIN	15	13	13	16	25	21	13	13	24	24	24	24

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 - 1999, BY WATER YEAR (WY)

	MEAN	29.9	29.1	25.8	25.5	26.4	28.7	27.7	26.9	27.1	26.4	25.7	25.7
MAX	141	122	35.6	32.6	35.9	56.3	44.9	40.3	42.2	42.2	30.6	30.2	30.2
(WY)	1973	1973	1974	1974	1986	1989	1989	1976	1975	1974	1997	1984	1984
MIN	21.7	14.1	13.0	18.9	22.0	22.0	12.1	17.3	21.7	20.3	21.8	22.0	22.0
(WY)	1996	1999	1999	1973	1973	1973	1998	1999	1995	1973	1995	1995	1995

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1973 - 1999

ANNUAL TOTAL	8180.00	7652	27.1
ANNUAL MEAN	22.4	21.0	44.8
HIGHEST ANNUAL MEAN			21.0
LOWEST ANNUAL MEAN			1973
HIGHEST DAILY MEAN	30	30	Oct 4
LOWEST DAILY MEAN	.00	13	Nov 3
ANNUAL SEVEN-DAY MINIMUM	.00	13	Nov 16
10 PERCENT EXCEEDS	27	25	.00
50 PERCENT EXCEEDS	25	24	.00
90 PERCENT EXCEEDS	13	13	24

(a) Prior to regulation; since regulation began, 63 ft³/s, July 10, 11, 1974.

(b) Apr. 15-29, 1998; result of shutdown of flume for maintenance.

(c) Estimated.

(a) Gage height 7.85 ft.

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. Prior to October 1997 monthend elevations and contents only.

GAGE.--Water-stage recorder. Datum of gage is 1,300.00 ft above sea level (Cleveland-Cliffs Iron Co. reference mark); EXTREMES^c reported below have been converted to sea level elevations. 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. Capacity of reservoir, 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 23 ft³/s (figure furnished by Cleveland Cliffs Iron Co.) 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 9.1 ft³/s for the year. Gage-height telemeter at station.

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

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,338.41 ft, Apr. 8, 9; minimum, 1,333.08 ft, Mar. 26.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36.77	36.41	36.94	36.29	36.98	36.35	34.72	37.56	37.87	36.58	---	36.64
2	36.74	36.37	36.90	36.27	37.00	36.21	35.28	37.49	37.79	36.62	---	36.57
3	36.65	36.34	36.86	36.33	37.00	36.09	35.80	37.41	37.72	36.67	---	36.49
4	36.55	36.28	36.79	36.33	36.98	35.95	36.37	37.32	37.64	36.83	---	36.42
5	36.44	36.25	36.73	36.31	36.93	35.81	36.95	37.25	37.65	36.94	36.70	36.37
6	36.41	36.26	36.68	36.31	36.93	35.68	37.49	37.26	37.86	37.07	36.68	36.32
7	36.44	36.28	36.61	36.29	36.91	35.54	38.11	37.44	38.06	37.09	36.68	36.25
8	36.40	36.31	36.57	36.28	36.89	35.37	38.37	37.74	38.08	37.08	36.67	36.24
9	36.34	36.33	36.53	36.28	36.85	35.24	38.40	37.94	38.09	37.29	36.63	36.20
10	36.25	36.40	36.53	36.32	36.79	35.09	38.33	38.01	38.05	37.63	36.65	36.14
11	36.14	36.56	36.52	36.34	36.81	34.93	38.26	37.98	37.99	37.76	36.65	36.08
12	36.03	36.68	36.52	36.38	36.95	34.74	38.22	37.92	37.95	37.78	36.65	36.02
13	35.99	36.76	36.52	36.41	37.01	34.57	38.17	37.86	37.90	37.74	36.94	35.97
14	35.97	36.78	36.48	36.44	37.03	34.42	38.15	37.79	37.83	37.68	37.18	35.93
15	35.95	36.83	36.44	36.45	37.06	34.27	38.14	37.70	37.73	37.62	37.27	35.94
16	35.98	36.85	36.41	36.49	37.08	34.12	38.13	37.61	37.65	37.55	37.34	35.96
17	36.08	36.83	36.42	36.53	37.12	33.98	38.11	37.60	37.56	37.48	37.43	36.00
18	36.23	36.81	36.45	36.59	37.11	33.88	38.08	37.87	37.47	37.40	37.44	36.05
19	36.31	36.92	36.47	36.66	37.09	33.76	38.04	38.13	37.37	37.33	37.44	36.12
20	36.34	37.05	36.46	36.69	37.06	33.66	38.00	38.14	37.27	37.23	37.42	36.27
21	36.37	37.10	36.46	36.72	37.02	33.59	38.00	38.09	37.17	37.11	37.38	36.35
22	36.40	37.12	36.44	36.74	37.00	33.50	38.01	38.04	37.07	36.99	37.34	36.42
23	36.42	37.15	36.43	36.79	36.97	33.44	38.00	38.07	36.97	---	37.30	36.48
24	36.43	37.17	36.43	36.86	36.92	33.33	37.98	38.20	36.91	36.75	37.25	36.53
25	36.43	37.16	36.41	36.91	36.87	33.21	37.96	38.34	36.83	36.61	37.19	36.57
26	36.47	37.14	36.39	36.93	36.73	33.12	37.92	38.34	36.73	36.48	37.12	36.61
27	36.49	37.11	36.38	36.96	36.60	33.17	37.84	38.25	36.67	36.37	37.05	36.70
28	36.49	37.06	36.36	36.97	36.48	33.29	37.77	38.14	36.62	36.30	36.97	36.80
29	36.45	37.02	36.37	36.97	---	33.52	37.71	38.06	36.59	36.36	36.87	36.86
30	36.43	36.99	36.35	36.97	---	33.80	37.63	37.99	36.55	36.49	36.78	36.92
31	36.43	---	36.33	36.98	---	34.13	---	37.94	---	---	36.71	---
MEAN	36.35	36.74	36.52	36.57	36.93	34.44	37.66	37.85	37.45	---	---	36.34
MAX	36.77	37.17	36.94	36.98	37.12	36.35	38.40	38.34	38.09	---	---	36.92
MIN	35.95	36.25	36.33	36.27	36.48	33.12	34.72	37.25	36.55	---	---	35.93

STREAMS TRIBUTARY TO LAKE MICHIGAN

04058200 SCHWEITZER CREEK NEAR PALMER, MI

LOCATION.--Lat 46°24'40", long 87°37'27", in SW1/4 sec.1, T.46 N., R.27 W., Marquette County, Hydrologic Unit 04030110, on right bank 10 ft upstream from highway bridge, 1.0 mi downstream from Schweitzer Reservoir, and 2.5 mi southwest of Palmer.

DRAINAGE AREA.--23.6 mi².

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

GAGE.--Water-stage recorder. Concrete control since Oct. 1, 1963. Datum of gage is 1,268.28 ft above sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Aug. 21, 1961, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Since August 1962, flow completely regulated by Schweitzer Reservoir (station 04058190) 1.0 mi upstream. Prior to June 1994, some diversion from headwaters of basin for municipal supply and the effluent discharged to the Carp River basin. An average of 23 ft³/s (figure furnished by Cleveland Cliffs Iron Co.) 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 (station 04057811) via Greenwood Diversion (station 04057813). Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.2	4.0	2.5	3.8	4.4	4.0	5.9	3.8	4.5	4.0	3.5	e3.8
2	4.2	4.0	2.5	3.9	4.4	4.0	5.0	3.8	4.2	3.6	3.4	e3.7
3	4.2	4.0	2.5	3.9	4.4	4.0	4.9	3.8	4.1	4.1	3.4	e3.6
4	4.2	3.8	2.5	4.0	4.3	4.0	5.9	3.7	3.9	3.9	3.4	e3.6
5	4.3	4.0	2.5	4.0	4.4	4.0	5.0	3.7	4.7	4.6	3.4	e3.7
6	4.8	4.0	2.0	4.0	4.4	3.9	6.6	4.6	4.5	4.1	3.4	e3.6
7	4.4	3.9	2.0	3.9	4.4	3.9	23	4.7	8.1	3.8	3.4	e3.5
8	4.2	4.0	2.1	3.9	4.2	e3.9	77	4.4	10	4.1	3.3	e3.7
9	4.2	3.9	2.2	3.9	4.0	3.9	86	4.4	12	5.3	3.4	e3.7
10	4.2	4.4	2.3	3.9	4.0	3.9	65	6.8	7.7	4.0	3.6	e3.6
11	4.2	3.9	2.6	3.9	5.0	3.9	49	5.3	4.5	3.9	3.3	e3.4
12	4.2	2.6	2.7	3.9	4.7	3.9	36	4.0	4.0	3.8	4.2	e3.4
13	4.2	2.2	2.8	e3.9	4.4	3.9	27	3.8	4.0	3.7	4.4	e3.4
14	4.2	3.8	2.7	e3.9	4.5	4.0	23	3.9	4.1	3.7	3.5	e3.4
15	4.2	3.6	2.7	e3.9	4.2	4.0	21	3.9	3.9	3.7	3.4	e3.4
16	4.2	2.4	2.9	e3.9	4.2	4.2	19	3.9	3.9	3.7	3.7	e3.4
17	4.2	2.2	2.9	3.9	4.2	4.4	16	4.7	3.8	3.6	3.5	e3.4
18	4.3	2.2	3.1	4.0	4.0	4.3	12	6.8	3.8	3.7	3.5	e3.4
19	4.2	2.7	3.2	4.0	4.1	4.3	83	24	3.6	3.6	3.4	e3.5
20	4.2	2.3	3.2	4.0	4.0	4.4	5.8	25	3.6	3.6	3.5	e4.0
21	4.3	2.2	3.1	3.9	4.1	4.3	5.8	19	3.5	3.5	3.5	e3.8
22	4.0	2.2	e3.2	3.9	e4.1	4.2	6.6	12	3.5	3.5	3.5	e3.5
23	4.0	2.3	e3.3	4.0	4.1	4.3	5.7	17	3.6	3.5	3.5	e3.4
24	4.0	2.2	e3.3	4.0	4.1	4.3	4.7	41	3.6	3.5	3.5	e3.4
25	4.1	2.2	e3.4	4.0	4.0	4.2	4.2	75	3.5	3.4	e3.5	e3.4
26	4.2	2.1	e3.5	4.0	4.0	4.4	3.9	68	3.5	3.2	e4.0	e3.4
27	4.0	2.1	e3.5	4.0	4.0	4.9	3.9	44	3.5	3.2	e4.7	e4.5
28	4.0	2.4	e3.6	4.2	4.1	5.2	3.9	25	3.6	3.2	e4.5	e4.6
29	4.0	2.5	e3.6	4.4	---	5.4	3.8	14	3.5	4.6	e4.3	e4.5
30	4.0	2.5	3.7	4.4	---	5.3	3.8	7.2	3.6	3.6	e4.1	e4.2
31	4.0	---	3.9	4.4	---	6.1	---	4.9	---	4.2	e4.0	---
TOTAL	129.6	90.6	90.0	123.7	118.7	133.4	547.7	456.1	138.3	117.9	113.7	109.9
MEAN	4.18	3.02	2.90	3.99	4.24	4.30	18.3	14.7	4.61	3.80	3.67	3.66
MAX	4.8	4.4	3.9	4.4	5.0	6.1	86	75	12	5.3	4.7	4.6
MIN	4.0	2.1	2.0	3.8	4.0	3.9	3.8	3.7	3.5	3.2	3.3	3.4

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1999, BY WATER YEAR (WY)

MEAN	10.6	11.6	7.62	5.64	5.09	7.45	46.9	27.8	15.0	8.16	6.92	8.88
MAX	41.8	41.3	24.0	13.5	9.98	35.3	115	98.1	55.8	24.2	28.9	56.5
(WY)	1986	1989	1966	1966	1961	1966	1985	1972	1968	1979	1973	1978
MIN	3.48	3.02	2.90	2.15	1.92	2.40	1.45	1.69	4.07	3.80	3.46	3.62
(WY)	1964	1999	1999	1963	1963	1963	1963	1963	1998	1999	1963	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1961 - 1999

ANNUAL TOTAL	2258.6	2169.6	13.5
ANNUAL MEAN	6.19	5.94	26.4
HIGHEST ANNUAL MEAN			4.64
LOWEST ANNUAL MEAN			699
HIGHEST DAILY MEAN	160	86	Apr 9
LOWEST DAILY MEAN	2.0	2.0	Dec 6
ANNUAL SEVEN-DAY MINIMUM	2.2	2.2	Nov 21
INSTANTANEOUS PEAK FLOW		94	Apr 9
INSTANTANEOUS PEAK STAGE		3.95	Apr 9
INSTANTANEOUS LOW FLOW			6.50
10 PERCENT EXCEEDS	5.1	5.8	.40
50 PERCENT EXCEEDS	4.1	4.0	29
90 PERCENT EXCEEDS	3.2	3.2	5.5
			3.9

(a) Apr. 9-18, May 5, 6, 1963.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04058940 ESCANABA RIVER NEAR ST. NICHOLAS, MI

LOCATION.--Lat 45°58'45", long 87°16'13", in SW1/4 NE1/4 sec.2, T.41 N., R.24 W., Delta County, Hydrologic Unit 04030110, on right bank 600 ft downstream from Boney Falls Dam, 2.1 mi west of St. Nicholas, and 23 mi upstream from mouth.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--December 1987 to current year (gage heights only).

GAGE.--Water-stage recorder. Datum of gage is 854.03 ft above sea level.

REMARKS.--Diurnal fluctuation caused by hydroelectric plant 600 ft upstream. Some regulation by Schweitzer Reservoir (station 04058190) approximately 40 mi upstream and Greenwood Reservoir (station 04057811) approximately 50 mi upstream. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 7.09 ft, Apr. 29, 1996, result of unusual regulation; minimum daily, 1.81 ft, July 26, 27, 1998.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 5.19 ft, Apr. 6; minimum daily, 1.88 ft, Dec. 23.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.15	2.14	--	2.06	2.08	2.33	4.04	2.43	2.99	2.37	3.29	2.13
2	2.14	2.11	--	2.05	2.08	2.33	4.17	2.39	2.86	2.65	3.04	2.11
3	2.09	2.10	--	2.05	2.09	2.33	4.25	2.37	2.69	2.63	2.75	2.10
4	2.05	2.09	2.26	2.05	2.08	2.31	4.42	2.34	2.52	2.88	2.52	2.08
5	2.02	2.08	2.27	2.05	2.08	2.29	4.57	2.29	2.56	2.95	2.53	2.07
6	2.11	2.09	2.31	2.05	2.08	2.31	4.69	2.37	2.59	3.09	2.49	2.06
7	2.25	2.07	2.32	2.05	2.08	2.29	4.95	2.75	2.69	3.04	2.49	2.07
8	2.40	2.08	2.28	2.05	2.09	2.27	4.81	3.21	2.64	2.89	2.53	2.18
9	2.33	2.08	2.19	2.04	2.09	2.28	4.61	3.39	2.75	3.00	2.49	2.27
10	2.27	2.15	2.20	2.04	2.10	2.27	4.38	3.39	2.56	--	2.47	2.21
11	2.20	2.37	2.13	2.03	2.15	2.26	--	3.27	2.59	3.16	2.52	2.18
12	2.19	2.48	2.16	2.03	2.33	2.24	3.99	3.01	2.62	3.07	2.50	2.15
13	2.15	2.49	2.14	2.02	2.44	2.24	3.79	2.85	2.64	2.96	3.18	2.13
14	2.13	2.36	2.08	2.01	2.48	2.23	3.63	2.72	2.59	2.77	3.66	2.10
15	2.08	2.32	2.16	2.02	2.47	2.25	3.47	2.45	2.48	2.67	3.66	2.11
16	2.07	2.33	2.13	2.00	2.48	2.29	3.38	2.50	2.46	2.52	3.55	2.08
17	2.09	2.32	2.07	2.00	2.43	2.39	3.30	2.50	2.44	2.65	3.23	2.06
18	2.07	2.33	1.89	2.01	2.42	2.50	3.23	3.31	2.38	2.61	3.07	2.04
19	2.11	2.47	2.12	2.01	2.43	2.49	3.12	3.77	2.34	2.55	2.83	2.07
20	2.12	2.69	2.12	2.02	2.43	2.55	2.87	3.73	2.31	2.44	2.70	2.12
21	2.09	2.75	2.07	2.02	2.42	2.58	2.91	3.71	2.28	2.31	2.62	2.47
22	2.07	2.64	1.93	2.05	2.41	2.59	2.99	3.57	2.18	2.30	2.55	2.15
23	2.08	--	1.88	2.04	2.39	2.60	2.92	3.54	2.17	--	2.53	2.09
24	2.07	--	2.01	2.03	2.36	2.64	2.85	3.80	2.21	--	2.43	2.06
25	2.05	--	2.05	2.05	2.35	2.69	2.80	3.99	2.21	2.17	2.37	2.04
26	2.12	--	2.07	2.05	2.34	2.67	2.74	4.06	2.21	2.20	2.34	2.03
27	2.23	--	2.06	2.05	2.32	2.75	2.57	3.92	2.21	2.10	2.33	2.07
28	2.27	--	2.05	2.04	2.32	2.97	2.53	3.73	2.27	2.12	2.27	2.16
29	2.19	--	2.06	2.05	--	3.24	2.49	3.51	2.28	2.20	2.21	2.27
30	2.15	--	2.07	2.06	--	3.46	2.45	3.25	2.27	2.37	2.19	2.21
31	2.14	--	2.07	2.08	--	3.68	--	3.08	--	2.86	2.15	--
MEAN	2.14	--	--	2.04	2.28	2.53	--	3.14	2.47	--	2.69	2.13
MAX	2.40	--	--	2.08	2.48	3.68	--	4.06	2.99	--	3.66	2.47
MIN	2.02	--	--	2.00	2.08	2.23	--	2.29	2.17	--	2.15	2.03

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI

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-85-1: 1970 (M).

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

REMARKS.--Records good except for estimated daily discharges, which are fair. Since 1950, diurnal fluctuation and slight regulation by Boney Falls powerplant 7 mi upstream. Since August 1962, some regulation by Schweitzer Reservoir (station 04058190) approximately 60 mi upstream. Since December 1972, some regulation by Greenwood Reservoir (station 04057811) approximately 60 mi upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	309	301	446	e200	e220	e370	2830	491	e1150	536	1370	322
2	294	287	436	e200	e220	e370	3020	474	1000	728	1120	316
3	274	277	418	e200	e220	e370	3140	453	816	796	796	308
4	246	272	398	e200	e220	e350	3580	429	651	1020	629	300
5	239	270	404	e200	e220	e350	3900	402	663	1070	613	285
6	386	265	426	e200	e220	e350	4110	496	687	1190	566	278
7	385	266	427	e200	e220	e340	4430	789	763	1110	560	286
8	e540	266	409	e200	e220	e330	4040	1300	738	952	590	314
9	e460	264	352	e200	e220	e330	3620	1490	790	1090	557	405
10	400	424	351	e190	e230	e320	3210	1500	639	1170	583	371
11	355	476	338	e190	e250	e310	2780	1360	639	1190	604	338
12	333	547	323	e190	e350	e310	2400	1080	687	1100	596	329
13	316	537	326	e180	e440	e310	2080	886	738	1020	1410	311
14	300	474	306	e180	e480	e310	1840	781	712	805	1960	303
15	276	428	320	e180	e470	e320	1660	548	604	721	1880	292
16	277	432	307	e180	e470	e350	1510	572	559	613	1730	283
17	280	425	294	e180	e430	e430	1390	576	520	702	1360	279
18	271	438	e280	e180	e430	e470	1290	1240	482	674	1140	266
19	279	575	e270	e180	e430	e480	1190	1900	441	624	931	274
20	295	721	e260	e180	e430	e520	920	1830	424	525	772	298
21	277	780	e250	e190	e430	e520	951	1860	407	465	696	495
22	258	683	e240	e200	e430	e520	1010	1720	349	419	645	372
23	270	637	e230	e190	e410	e520	949	1770	335	397	610	266
24	260	624	e230	e200	e380	e560	886	2110	352	382	552	273
25	257	611	e220	e200	e380	e560	824	2340	344	330	518	263
26	320	569	e210	e200	e360	e560	789	2430	347	349	473	270
27	347	528	e210	e200	e360	e680	634	2230	353	297	461	311
28	362	486	e210	e200	e360	e900	589	1940	389	314	428	e350
29	341	454	e210	e200	---	e1800	548	e1700	396	338	383	e400
30	316	464	e210	e210	---	2050	523	e1400	390	484	364	362
31	302	---	e210	e210	---	2310	---	e1200	---	917	337	---
TOTAL	9845	13781	9521	6010	9500	18070	60623	39297	17365	22328	25234	9340
MEAN	318	459	307	194	339	583	2021	1268	579	720	814	318
MAX	540	780	446	210	480	2310	4430	2430	1150	1190	1960	495
MIN	239	264	210	180	220	310	523	402	335	297	337	263
CFSM	.37	.53	.35	.22	.39	.67	2.32	1.46	.67	.83	.94	.37
IN.	.42	.59	.41	.26	.41	.77	2.59	1.68	.74	.95	1.08	.41

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1999, BY WATER YEAR (WY)

	MEAN	706	779	538	368	346	576	2558	1686	934	603	495	610
MAX	1690	2230	945	720	959	1663	4329	4388	2172	1859	2014	1874	
(WY)	1986	1989	1907	1969	1984	1973	1951	1907	1968	1951	1911	1978	
MIN	196	218	230	190	185	227	830	312	255	193	191	194	
(WY)	1964	1977	1977	1964	1959	1964	1990	1998	1988	1998	1998	1976	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1903 - 1999

ANNUAL TOTAL	179245		241114									
ANNUAL MEAN	491		661							(a)823		
HIGHEST ANNUAL MEAN										1385		1960
LOWEST ANNUAL MEAN										506		1963
HIGHEST DAILY MEAN	5490									10400		Apr 22 1985
LOWEST DAILY MEAN	113									(b)90		Jul 5 1910
ANNUAL SEVEN-DAY MINIMUM	131									131		Jul 23 1998
INSTANTANEOUS PEAK FLOW										4580		Apr 26 1979
INSTANTANEOUS PEAK STAGE										3.60		Apr 9 1971
INSTANTANEOUS LOW FLOW										139		Jul 5 1910
ANNUAL RUNOFF (CFSM)	.56									.76		
ANNUAL RUNOFF (INCHES)	7.66									10.31		
10 PERCENT EXCEEDS	765									1400		1850
50 PERCENT EXCEEDS	310									424		510
90 PERCENT EXCEEDS	175									210		254

(a) Does not include water years 1904-12.

(b) Observed; 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.

(c) Gage height 5.00 ft.

(d) Backwater from ice.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN
04059000 ESCANABA RIVER AT CORNELL, MI--Continued
WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1969-73, 75-94, 1998 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1975 to September 1981.

WATER TEMPERATURE: February 1975 to September 1981, April 1998 to current year.

INSTRUMENTATION.--Water-quality monitor from Oct. 15, 1975 to Sept. 30, 1981. Water-temperature recorder with telemetry since April 14, 1998.

REMARKS.--Records represent water temperature at sensor within 0.5°C, from April 1 to September 30.

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, 1998 to current year): 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.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 30.0°C, July 27, 28.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	--	--	--	--	--	--	4.0	1.5	2.5	19.0	9.0	13.5
2	--	--	--	--	--	--	4.0	2.5	3.5	19.5	9.5	14.0
3	--	--	--	--	--	--	3.5	3.0	3.5	20.0	10.0	14.5
4	--	--	--	--	--	--	3.0	1.5	2.0	20.5	11.0	15.0
5	--	--	--	--	--	--	2.5	1.5	2.0	15.0	12.5	14.0
6	--	--	--	--	--	--	3.0	2.0	2.5	14.5	12.0	13.5
7	--	--	--	--	--	--	4.0	2.0	2.5	12.0	11.0	11.5
8	--	--	--	--	--	--	5.5	3.0	4.5	12.5	10.5	11.5
9	--	--	--	--	--	--	6.5	4.5	5.5	13.5	9.0	11.0
10	--	--	--	--	--	--	6.5	4.0	5.0	14.5	10.5	12.0
11	--	--	--	--	--	--	6.0	4.5	5.0	15.5	11.5	13.0
12	--	--	--	--	--	--	7.0	4.0	5.5	16.5	11.5	13.5
13	--	--	--	--	--	--	8.0	4.5	6.0	17.5	10.5	13.5
14	--	--	--	--	--	--	9.5	5.5	7.5	19.0	10.5	14.0
15	--	--	--	--	--	--	9.0	7.0	8.0	19.5	11.0	15.0
16	--	--	--	--	--	--	10.5	7.0	8.0	18.0	13.5	15.5
17	--	--	--	--	--	--	7.5	6.0	7.0	20.0	14.5	16.5
18	--	--	--	--	--	--	6.5	5.5	6.0	16.5	15.0	15.5
19	--	--	--	--	--	--	8.5	4.5	6.5	17.0	14.0	15.0
20	--	--	--	--	--	--	8.5	5.0	6.5	16.5	14.0	15.0
21	--	--	--	--	--	--	8.0	6.5	7.0	15.5	14.5	15.0
22	--	--	--	--	--	--	7.5	5.0	6.0	17.5	13.5	15.0
23	--	--	--	--	--	--	10.0	4.5	6.5	14.5	12.0	13.5
24	--	--	--	--	--	--	11.5	4.5	7.5	12.0	10.0	11.0
25	--	--	--	--	--	--	13.5	5.5	9.0	10.0	9.5	10.0
26	--	--	--	--	--	--	15.0	7.5	10.5	13.0	9.0	11.0
27	--	--	--	--	--	--	15.0	7.5	10.5	15.5	11.0	13.5
28	--	--	--	--	--	--	15.5	7.5	11.0	18.0	13.5	16.0
29	--	--	--	--	--	--	17.0	7.5	11.5	--	--	--
30	--	--	--	--	--	--	19.0	8.0	13.0	--	--	--
31	--	--	--	--	--	--	--	--	--	--	--	--
MONTH	--	--	--	--	--	--	19.0	1.5	6.4	--	--	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	---	---	---	18.5	15.5	16.5	23.5	20.5	22.0	24.5	15.0	19.0
2	15.5	12.0	13.5	21.0	15.0	17.5	23.5	19.0	20.5	26.0	16.5	20.5
3	18.0	11.5	14.5	18.0	17.0	17.5	22.0	18.0	19.5	26.5	19.0	22.0
4	17.0	12.0	14.5	22.0	17.0	19.5	23.5	16.5	19.5	26.0	18.5	22.0
5	19.0	13.5	16.0	23.0	20.0	21.5	23.0	16.0	19.0	26.0	17.5	21.5
6	23.0	16.0	19.0	23.5	19.5	21.5	24.0	16.5	20.0	24.5	17.5	21.0
7	23.0	17.5	19.5	24.0	19.0	21.0	23.0	16.5	19.0	24.0	15.0	19.0
8	25.0	18.0	20.5	20.5	16.5	18.5	22.0	16.5	18.5	24.0	17.5	20.0
9	25.5	18.5	21.5	18.5	16.5	17.0	20.0	15.0	17.5	20.5	16.0	18.0
10	26.0	18.5	22.0	20.0	15.5	17.5	19.5	16.0	17.5	18.5	14.5	16.0
11	26.0	20.5	22.5	21.0	15.5	18.0	22.5	15.5	18.5	20.5	12.5	16.0
12	24.5	20.0	22.0	22.5	17.0	19.5	20.5	17.0	18.5	19.0	13.5	16.0
13	21.5	18.0	19.5	22.5	17.5	20.0	---	---	---	19.0	13.0	16.0
14	19.0	14.5	17.0	23.0	19.0	20.5	17.5	15.0	16.5	17.5	11.5	14.5
15	18.0	13.0	15.5	26.5	19.0	22.0	18.0	15.5	16.5	19.0	11.0	14.5
16	17.0	13.0	14.0	29.0	20.5	23.5	19.5	17.0	18.0	20.0	10.0	14.5
17	20.0	11.0	15.5	27.0	21.0	23.0	19.5	17.5	18.0	21.0	10.0	15.0
18	23.0	12.5	17.0	24.0	20.0	21.5	17.5	16.0	17.0	20.5	10.5	15.0
19	21.0	14.5	17.5	24.5	19.5	21.5	20.0	15.5	17.5	18.0	13.0	15.0
20	24.5	14.0	19.0	25.5	18.0	21.0	21.5	15.0	17.5	17.0	10.5	13.0
21	25.0	14.5	19.5	25.5	19.5	21.5	22.5	16.0	18.5	16.5	8.5	11.5
22	26.0	16.5	21.0	28.5	19.0	23.5	23.0	17.5	20.0	18.0	9.0	13.0
23	24.5	19.0	21.0	27.5	21.0	24.0	20.0	18.5	19.0	17.5	12.0	14.0
24	29.0	19.5	23.5	29.5	20.5	24.5	23.5	18.0	20.0	17.5	11.0	13.5
25	29.5	18.5	23.5	29.5	20.0	24.5	25.0	17.5	20.5	20.0	12.0	15.0
26	28.5	19.5	23.5	29.5	21.5	25.0	25.5	17.5	20.5	18.5	13.5	15.0
27	29.0	20.0	23.0	30.0	18.5	24.0	26.0	18.5	21.5	14.5	12.0	13.0
28	24.5	18.0	21.0	30.0	20.5	25.0	24.5	18.0	21.0	---	---	---
29	25.0	16.0	20.0	28.0	19.5	23.5	22.5	15.5	18.5	---	---	---
30	22.5	16.0	19.0	29.5	20.0	24.5	21.5	13.5	17.0	15.5	8.5	11.0
31	---	---	---	25.5	20.5	22.5	23.0	13.5	17.5	---	---	---
MONTH	---	---	---	30.0	15.0	21.3	---	---	---	---	---	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059500 FORD RIVER NEAR HYDE, MI

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.

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

GAGE.--Water-stage recorder. Datum of gage is 681.77 ft above sea level.

REMARKS.--Records fair. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	111	198	e50	e50	e180	1610	185	651	179	215	100
2	104	115	189	e50	e52	e180	1670	168	586	293	240	94
3	110	112	182	e50	e52	e180	1680	152	496	376	207	88
4	106	105	172	e50	e52	e180	1990	139	404	663	178	82
5	99	100	169	e50	e52	e180	2410	130	340	672	177	77
6	117	95	176	e50	e52	e170	2410	169	347	1000	163	73
7	126	91	177	e50	e52	e170	2480	380	350	793	148	68
8	123	89	175	e50	e52	e170	2360	733	335	591	142	68
9	153	87	160	e50	e52	e170	2130	892	358	847	137	69
10	165	130	124	e48	e68	e160	1910	955	304	844	160	91
11	156	169	121	e48	e80	e160	1680	1030	262	715	159	94
12	138	176	127	e46	e100	e160	1480	1020	306	613	180	93
13	120	214	125	e44	e110	e160	1280	882	384	486	516	93
14	108	234	118	e45	e120	e160	1080	689	463	386	794	91
15	102	215	118	e46	e150	e160	911	492	413	326	778	87
16	97	202	e110	e46	e170	e170	769	365	348	307	746	82
17	92	188	e90	e46	e200	e190	656	e350	297	438	748	77
18	89	184	e84	e46	e210	e210	579	e400	258	379	693	74
19	88	217	e82	e46	e220	e220	523	655	220	341	575	72
20	90	250	e78	e47	e230	e220	470	769	188	300	461	77
21	95	294	e76	e47	e220	e230	441	887	159	264	375	74
22	96	316	e72	e47	e210	e240	425	1010	139	234	300	78
23	92	312	e66	e48	e205	e240	402	1120	126	211	253	79
24	88	290	e64	e48	e200	e250	376	1280	122	189	225	78
25	86	267	e62	e48	e195	e250	343	1310	117	162	211	75
26	93	254	e58	e48	e190	e400	314	1260	111	149	201	73
27	91	238	e54	e48	e190	e600	279	1150	107	136	179	76
28	102	222	e52	e48	e180	873	252	1020	110	122	159	79
29	115	208	e50	e49	---	1080	227	849	110	119	140	84
30	121	200	e50	e49	---	1200	204	651	114	118	119	92
31	114	---	e50	e50	---	1350	---	524	---	173	108	---
TOTAL	3374	5685	3429	1488	3714	10263	33341	21616	8525	12436	9687	2438
MEAN	109	190	111	48.0	133	331	1111	697	284	401	312	81.3
MAX	165	316	198	50	230	1350	2480	1310	651	1000	794	100
MIN	86	87	50	44	50	160	204	130	107	118	108	68
CFSM	.24	.42	.25	.11	.29	.74	2.47	1.55	.63	.89	.69	.18
IN.	.28	.47	.28	.12	.31	.85	2.76	1.79	.70	1.03	.80	.20

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1955 - 1999, BY WATER YEAR (WY)

MEAN	301	382	204	115	104	259	1307	797	400	209	165	247
MAX	819	1246	589	346	493	1078	2353	2483	1006	793	713	1013
(WY)	1960	1986	1966	1966	1984	1973	1979	1960	1966	1968	1978	1978
MIN	39.9	42.5	27.7	26.5	29.6	48.5	345	99.7	52.4	34.7	38.8	26.2
(WY)	1977	1977	1977	1977	1977	1964	1990	1998	1988	1988	1970	1976

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1955 - 1999

ANNUAL TOTAL	84472	115996	
ANNUAL MEAN	231	318	
HIGHEST ANNUAL MEAN			374
LOWEST ANNUAL MEAN			640
HIGHEST DAILY MEAN			183
LOWEST DAILY MEAN			1960
ANNUAL SEVEN-DAY MINIMUM			1963
INSTANTANEOUS PEAK FLOW	3510	2480	6850
INSTANTANEOUS PEAK STAGE	20	44	19
INSTANTANEOUS LOW FLOW	22	46	22
ANNUAL RUNOFF (CFSM)			7590
ANNUAL RUNOFF (INCHES)			8.27
10 PERCENT EXCEEDS	492	814	922
50 PERCENT EXCEEDS	92	170	176
90 PERCENT EXCEEDS	38	52	54

(a) Aug. 30, 1976, July 7, 8, 1988.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04060993 BRULE RIVER NEAR FLORENCE, WI

LOCATION.--Lat 45°57'39", long 88°18'57", in NW1/4 SE1/4 sec.9, T.41 N., R.32 W., Michigan Meridian, Iron County, Hydrologic Unit 04730106, on left bank 30 ft upstream from bridge on U.S. Highway 2, 4.0 mi upstream from Paint River, 4.0 mi northwest of Florence, WI, and 8.0 mi upstream from confluence with Michigamme River.

DRAINAGE AREA.--366 mi², approximately.

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

REVISED RECORDS.--WSP 1387: 1914-16. WDR MI-92-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,240 ft above sea level, from topographic map. Prior to Aug. 29, 1944, nonrecording gage, and Aug. 29, 1944 to Apr. 4, 1994, water-stage recorder at site 3.0 mi downstream at different datum.

REMARKS.--Records fair. Discharge includes some mine pumpage prior to August 1977. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	218	212	242	e260	e220	e220	711	224	305	283	e350	229
2	209	203	238	e260	e220	e220	811	216	299	283	e350	223
3	213	198	233	e260	e220	e220	835	212	283	314	e300	221
4	214	193	230	e260	e220	e220	882	213	266	466	e300	221
5	201	192	227	e260	e220	e215	867	215	259	394	e290	222
6	221	209	236	e260	e220	e210	891	285	353	400	e290	240
7	233	216	234	e250	e230	e210	918	636	420	346	e290	245
8	216	206	222	e250	e230	e210	828	981	374	313	e290	229
9	198	203	220	e250	e230	e210	701	970	387	664	e290	228
10	197	239	241	e240	e230	e210	581	793	321	699	e290	222
11	193	350	236	e240	e240	e210	497	602	291	501	e290	221
12	191	306	250	e240	e250	e210	454	472	e350	374	e290	224
13	186	256	237	e240	e250	e220	408	397	e310	322	625	242
14	183	258	242	e230	e250	e220	376	349	e280	290	646	223
15	182	247	228	e230	e250	e230	358	320	e270	3170	466	224
16	182	251	218	e230	e250	e240	340	306	e260	2390	431	220
17	185	250	210	e230	e240	e240	324	345	e250	e1700	410	213
18	215	249	219	e230	e240	e240	315	620	e240	e1000	363	214
19	218	348	221	e230	e230	e240	301	794	e240	e850	344	226
20	202	366	e220	e230	e230	e240	290	645	e230	e800	324	260
21	193	297	e220	e230	e220	e240	294	661	e230	e600	303	229
22	189	283	e210	e230	e210	e250	297	628	e220	e500	294	229
23	188	283	e210	e230	e210	e250	287	608	220	e400	287	242
24	194	284	e220	e230	e210	e250	273	733	278	e440	288	229
25	198	276	e240	e220	e215	250	254	639	256	e440	288	226
26	247	266	e250	e220	e220	253	251	540	228	e400	273	221
27	232	256	e250	e220	e220	278	243	464	216	e370	262	242
28	212	248	e260	e220	e220	329	237	403	218	e330	255	229
29	209	244	e260	e220	---	364	238	361	268	e320	244	242
30	232	245	e260	e220	---	400	230	330	267	e340	235	231
31	225	---	e260	e220	---	464	---	306	---	e350	232	---
TOTAL	6376	7634	7244	7340	6395	7763	14292	15268	8389	20049	10190	7039
MEAN	206	254	234	237	228	250	476	493	280	647	329	235
MAX	247	366	260	260	250	464	918	981	420	3170	646	260
MIN	182	192	210	220	210	210	230	212	216	283	232	213
CFSM	.56	.70	.64	.65	.62	.68	1.30	1.35	.76	1.77	.90	.64
IN.	.65	.78	.74	.75	.65	.79	1.45	1.55	.85	2.04	1.04	.72

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1999, BY WATER YEAR (WY)

	326	336	277	251	244	320	650	501	394	339	290	317
MEAN	326	336	277	251	244	320	650	501	394	339	290	317
MAX	612	600	424	369	406	833	1235	1104	712	983	604	587
(WY)	1986	1916	1986	1986	1984	1973	1967	1965	1981	1953	1972	1957
MIN	179	202	175	156	163	178	235	242	194	185	186	187
(WY)	1949	1990	1990	1995	1995	1965	1990	1998	1988	1989	1948	1949

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1914 - 1997
ANNUAL TOTAL	99859	117979	
ANNUAL MEAN	274	323	352
HIGHEST ANNUAL MEAN			512
LOWEST ANNUAL MEAN			221
HIGHEST DAILY MEAN	1400	Mar 31	4420
LOWEST DAILY MEAN	160	Sep 12	130
ANNUAL SEVEN-DAY MINIMUM	169	Sep 6	140
INSTANTANEOUS PEAK FLOW			4310
INSTANTANEOUS PEAK STAGE		8.41	Jul 15
INSTANTANEOUS LOW FLOW		180	Jul 15
ANNUAL RUNOFF (CFSM)	.75	.88	(a)8.41
ANNUAL RUNOFF (INCHES)	10.15	11.99	(b)
10 PERCENT EXCEEDS	351	500	(c)118
50 PERCENT EXCEEDS	240	250	.96
90 PERCENT EXCEEDS	185	210	13.05

(a) Present site and datum; peak stage at previous site and datum, 8.60 ft, Dec. 20, 1983, backwater from ice.

(b) Oct. 15, 16, 17.

(c) Discharge measurement.

(e) Estimated.

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.

REVISED RECORDS.--WSP 1727: Drainage area, WDR MI-96-1: 1985 (M).

GAGE.--Water-stage recorder. Elevation of gage is 1,260 ft above sea level, from topographic map.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	81	81	e86	e94	e90	88	83	457	95	134	84
2	84	81	81	e87	e94	e88	89	83	200	94	118	85
3	85	81	81	e88	e94	e86	334	83	86	96	103	85
4	85	81	81	e89	e94	e85	561	83	85	96	102	85
5	85	81	81	e90	e94	e85	756	84	87	740	101	85
6	85	81	81	e90	e94	e85	1040	87	86	985	94	84
7	85	81	81	e90	e94	e85	1040	439	85	386	88	83
8	85	81	81	e90	e94	e85	1040	1250	85	93	87	83
9	85	81	81	e90	e94	e85	693	1280	85	682	88	83
10	85	109	81	e90	e94	e85	358	1260	85	615	87	82
11	85	126	81	e90	e95	e85	158	1190	87	94	86	81
12	85	106	81	e90	e96	e85	81	826	87	94	86	82
13	83	81	81	e90	e98	e85	97	462	87	93	87	83
14	83	81	81	e90	e100	e85	86	176	87	92	85	83
15	83	81	81	e90	e100	e88	85	86	87	96	85	83
16	83	81	81	e90	e100	e90	84	85	87	98	85	83
17	83	81	81	e92	e100	e90	85	87	87	95	85	83
18	83	81	82	e92	e100	e88	85	583	87	92	85	83
19	83	81	81	e92	e100	e86	85	1240	87	94	85	83
20	81	81	81	e92	e100	e83	85	945	87	93	83	81
21	81	81	e81	e92	e100	e84	85	979	87	94	84	81
22	81	81	e83	e92	e100	e86	85	832	86	92	84	81
23	81	81	e85	e92	e100	e88	86	1000	92	92	84	80
24	81	81	e85	e92	e100	e88	85	1210	92	92	85	79
25	81	81	e85	e92	e100	e88	85	853	92	92	85	79
26	81	81	e85	e92	e100	e88	84	648	92	90	85	79
27	81	81	e85	e92	e100	e86	84	974	93	89	85	79
28	81	81	e85	e92	e95	85	83	1010	94	89	83	79
29	81	81	e85	e92	---	96	83	1170	94	91	83	77
30	81	81	e85	e92	---	89	83	1390	95	91	83	76
31	81	---	e85	e92	---	87	---	984	---	133	83	---
TOTAL	2570	2528	2550	2810	2724	2689	7773	21462	3128	5868	2778	2454
MEAN	82.9	84.3	82.3	90.6	97.3	86.7	259	692	104	189	89.6	81.8
MAX	85	126	85	92	100	96	1040	1390	457	985	134	85
MIN	81	81	81	86	94	83	81	83	85	89	83	76

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

	MEAN	125	117	92.3	89.7	92.3	104	456	392	202	140	101	114
MAX	554	383	145	102	225	487	1389	1921	937	969	215	305	
(WY)	1986	1989	1983	1965	1984	1973	1954	1996	1983	1953	1978	1980	
MIN	82.9	82.0	82.3	71.4	84.0	84.0	81.4	83.5	85.4	82.0	86.4	66.8	
(WY)	1999	1992	1999	1955	1998	1956	1990	1992	1975	1998	1998	1962	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1952 - 1999

ANNUAL TOTAL	39188						59334						
ANNUAL MEAN	107						163				168		
HIGHEST ANNUAL MEAN											356		1996
LOWEST ANNUAL MEAN											91.4		1990
HIGHEST DAILY MEAN	2100						1390	May 30		7380		Apr 26	1960
LOWEST DAILY MEAN	75						76	Sep 30		62		Mar 22	1963
ANNUAL SEVEN-DAY MINIMUM	80						78	Sep 24		65		Jan 9	1955
INSTANTANEOUS PEAK FLOW							1420	May 29		8050		Jul 2	1953
INSTANTANEOUS PEAK STAGE							5.39	May 29		10.50		Jul 2	1953
10 PERCENT EXCEEDS	87						186			114			
50 PERCENT EXCEEDS	84						86			91			
90 PERCENT EXCEEDS	81						81			85			

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04062011 BRULE RIVER NEAR COMMONWEALTH, WI

LOCATION.--Lat 45°56'51", long 88°12'55", in NW1/4 sec. 14, T.40 N., R.18 E., Wisconsin Meridian, Florence County, Hydrologic Unit 04030106, on right bank 900 ft downstream from Brule Island Dam, 1.5 mi upstream from confluence with Michigamme River, and 2.8 mi north of Commonwealth, WI.

DRAINAGE AREA.--1,020 mi².

PERIOD OF RECORD.--October 1989 to current year.

REVISED RECORDS.--WDR MI-91-1: 1990(M).

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 1,130 ft above sea level, from topographic map.

REMARKS.--Records good. Flow regulated by powerplant 900 ft upstream and by Lower Paint Dam 8.2 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.

COOPERATION.--Gage-height record was provided by Wisconsin Electric Power Co., under general supervision of the Geological Survey.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	342	338	329	319	328	e350	832	351	849	392	523	343
2	334	325	361	295	333	353	869	325	597	420	499	331
3	300	319	314	351	322	337	1130	314	433	480	416	320
4	336	311	334	291	348	304	1410	309	369	581	e450	336
5	337	308	353	295	304	355	1520	324	430	1030	425	331
6	346	317	346	305	306	301	1820	486	501	1360	412	338
7	387	352	335	327	363	325	1830	1060	553	817	436	350
8	324	332	320	312	314	303	1740	2080	496	409	427	324
9	295	324	289	297	345	339	1340	2180	569	1240	415	348
10	321	449	334	313	323	340	990	1900	462	1330	442	343
11	316	478	311	299	380	318	710	1690	463	590	413	314
12	320	472	299	286	464	296	493	1340	617	488	454	318
13	322	310	313	315	401	339	527	940	436	435	762	371
14	289	404	268	301	368	329	488	596	408	386	749	314
15	312	334	347	298	393	310	452	408	396	3390	561	324
16	304	377	359	288	385	374	453	434	380	2570	541	326
17	290	353	322	302	355	371	425	481	390	1930	521	325
18	358	346	268	322	344	372	419	1140	344	1250	449	323
19	360	477	262	314	339	373	430	1920	364	1160	470	322
20	309	493	264	305	350	374	380	1600	339	899	414	372
21	297	383	280	314	335	408	401	1580	351	764	429	350
22	338	349	246	327	316	330	433	1470	315	695	394	320
23	302	441	187	319	337	380	387	1610	360	e540	397	351
24	300	359	294	329	353	385	374	1790	406	660	400	321
25	319	389	300	310	315	395	361	1500	406	606	409	331
26	387	378	295	315	e360	378	358	1250	316	571	363	330
27	371	362	300	314	e330	405	363	1390	374	560	382	338
28	338	345	300	339	e360	436	349	1380	331	459	374	338
29	326	349	308	311	---	461	327	1500	406	486	341	339
30	381	375	301	339	---	519	326	1650	377	478	337	341
31	343	---	314	312	---	548	---	1310	---	511	326	---
TOTAL	10204	11149	9453	9664	9771	11408	21937	36308	13038	27487	13931	10272
MEAN	329	372	305	312	349	368	731	1171	435	887	449	312
MAX	387	493	361	351	464	548	1830	2180	849	3390	762	324
MIN	289	308	187	286	304	296	326	309	315	386	326	314

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1999, BY WATER YEAR (WY)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
MEAN	422	402	345	331	337	427	985	900	484	462
MAX	712	571	416	424	410	634	2288	2757	730	887
(WY)	1991	1993	1992	1997	1997	1998	1996	1996	1996	1999
MIN	276	307	270	259	270	359	322	355	334	272
(WY)	1990	1990	1990	1991	1991	1994	1990	1998	1992	1990

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1990 - 1999

ANNUAL TOTAL	149018	184622	485
ANNUAL MEAN	408	506	810
HIGHEST ANNUAL MEAN			325
LOWEST ANNUAL MEAN			1990
HIGHEST DAILY MEAN	3620	Apr 1	3390
LOWEST DAILY MEAN	187	Dec 23	187
ANNUAL SEVEN-DAY MINIMUM	257	Dec 18	257
INSTANTANEOUS PEAK FLOW			5780
INSTANTANEOUS PEAK STAGE			11.93
10 PERCENT EXCEEDS	478		1010
50 PERCENT EXCEEDS	352		360
90 PERCENT EXCEEDS	278		304

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 sea level, from topographic map.

REMARKS.--Records good. Flow regulated by powerplant and by Michigamme Reservoir, capacity, 119,950 acre-ft, 5 mi upstream. Gage-height telemeter at station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	569	191	194	486	733	951	272	517	1980	579	641	636
2	567	190	194	430	767	869	260	485	1500	414	638	649
3	565	190	193	414	888	864	268	553	956	527	642	638
4	564	189	193	502	967	861	278	591	1350	660	642	635
5	677	188	194	582	732	857	275	594	1330	1250	662	634
6	764	188	194	628	499	853	282	599	1060	1670	660	604
7	763	188	332	698	451	850	278	1570	955	1240	668	615
8	793	189	381	729	591	845	265	2130	1050	863	659	631
9	814	188	379	727	988	842	253	1920	1240	1200	637	632
10	812	198	401	726	965	831	241	2190	1140	1150	587	610
11	808	233	368	754	905	844	233	2160	839	877	619	517
12	806	206	366	768	962	838	228	1420	748	708	638	518
13	740	199	391	767	957	833	224	718	749	659	440	477
14	666	190	406	753	955	829	218	900	746	750	244	453
15	608	188	434	748	1060	825	214	1000	718	789	213	453
16	457	191	434	709	1130	821	213	1000	688	806	209	452
17	298	189	393	712	1130	820	211	1020	690	834	201	479
18	210	189	372	707	1120	730	211	1330	707	717	531	492
19	225	219	354	688	1010	679	209	1800	690	549	642	495
20	224	217	372	687	815	678	210	1700	689	634	704	492
21	247	207	404	715	1020	677	213	1660	632	691	605	491
22	278	203	606	741	1100	588	213	1600	525	639	520	492
23	279	203	811	741	1090	735	211	1620	611	620	678	491
24	278	202	633	738	1090	674	212	1620	682	614	743	489
25	279	200	674	737	1080	670	210	1600	681	613	620	490
26	284	199	671	763	1080	584	209	1360	681	616	791	490
27	283	197	644	725	1070	451	208	1810	679	612	875	493
28	266	197	575	811	1060	462	208	2000	556	611	871	491
29	240	195	513	748	---	473	207	2170	465	597	869	490
30	244	196	495	708	---	328	476	1980	586	901	778	490
31	220	---	494	679	---	249	---	2000	---	698	663	---
TOTAL	14828	5919	13065	21321	26215	22411	7210	43617	25923	24088	18890	16019
MEAN	478	197	421	688	936	723	240	1407	864	777	609	534
MAX	814	233	811	811	1130	951	476	2190	1980	1670	875	649
MIN	210	188	193	414	451	249	207	485	465	414	201	452

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1999, BY WATER YEAR (WY)

	MEAN	504	554	791	868	827	532	644	1093	815	674	593	520
MAX	1220	1432	1427	1274	1252	819	1662	2865	1650	1461	1035	1325	
(WY)	1952	1989	1989	1983	1983	1971	1973	1960	1983	1953	1987	1968	
MIN	151	88.3	238	390	350	160	142	130	257	261	292	157	
(WY)	1970	1949	1949	1977	1948	1977	1987	1987	1987	1959	1977	1975	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1944 - 1999

ANNUAL TOTAL	161576						239506						
ANNUAL MEAN	443						656						
HIGHEST ANNUAL MEAN										701			
HIGHEST DAILY MEAN										1049			1960
LOWEST DAILY MEAN										382			1977
ANNUAL SEVEN-DAY MINIMUM										6940			Apr 27 1960
INSTANTANEOUS PEAK FLOW	1140					Mar 5	2190		May 10				Nov 26 1950
INSTANTANEOUS PEAK STAGE	146					Aug 13	188		Nov 5				Mar 21 1968
10 PERCENT EXCEEDS	168					Mar 19	189		Nov 3				Apr 28 1960
50 PERCENT EXCEEDS							2830		May 8				Apr 28 1960
90 PERCENT EXCEEDS							7.03		May 8				Apr 28 1960
										10.73			
										1180			
										648			
										171			

(e) Estimated.

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.--1,760 mi².

PERIOD OF RECORD.--January 1914 to current year. Published as "at Twin Falls near Iron Mountain, MI", January 1914 to June 19°0, October 1996 to September 1998. Records published for both sites July 1950 to September 1957, October 1989 to September 1996, October 1998 to September 1999.

REVISED RECORDS.--WSP 1707: 1953(M). WDR MI-92-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,119.23 ft above sea level (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.--Records good. 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; ratings 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1460	859	973	1060	1450	2020	1220	864	3140	1250	1510	1210
2	1120	965	915	1050	1390	1960	1200	980	2600	1540	1580	1300
3	1550	863	1000	1090	1470	2010	1430	1180	2130	1680	1550	1230
4	1260	944	995	1140	1690	2030	1460	1280	1980	2210	1320	795
5	947	887	842	e1200	1300	1970	2240	1130	2150	2860	1580	946
6	1410	859	904	e1250	1090	1980	2560	1390	2490	3260	1420	1070
7	1650	830	1180	e1250	975	2020	3190	2640	2120	2810	1190	1430
8	1750	873	1160	e1250	1230	2050	3420	5740	2370	2140	1180	1440
9	1270	938	1210	e1250	1760	1940	3330	5740	2500	3080	1490	1490
10	1210	795	1010	e1250	1700	2030	2830	6030	2370	3550	1800	1460
11	1340	775	1030	e1250	1720	1890	2240	4930	1970	2040	1670	935
12	1410	830	1010	e1250	1760	2000	2250	3590	2000	2270	1430	911
13	1390	1090	1010	e1250	1930	1980	2320	2790	1920	2180	2110	1010
14	1300	987	1060	e1250	1870	1990	1990	2230	2140	2050	1770	910
15	1300	1100	934	e1250	1770	1970	1720	1890	1680	4790	1670	1000
16	924	1110	999	e1250	1850	2030	1470	1830	1460	4750	1860	1160
17	990	1140	1010	e1220	1820	2080	1380	1950	1660	3270	1750	1370
18	879	936	1030	e1300	1780	1890	1370	3230	1670	2480	1790	1120
19	981	1040	1050	e1300	1900	1840	1560	5410	1400	2350	1650	740
20	865	1220	1120	1270	1780	1860	1440	4480	1550	2480	1410	934
21	941	1170	957	1370	1880	1800	1470	4130	1460	1840	876	1230
22	816	1280	1130	1320	1890	1850	1500	3900	1210	1720	1440	1220
23	974	1210	1120	1460	1840	1830	1180	4120	1400	1870	1690	1200
24	873	1190	984	1400	1840	1880	1120	4260	1340	1980	1480	1400
25	915	1140	1100	1320	1840	1940	1100	4090	1370	1800	1890	916
26	859	891	1120	1440	1860	1890	1260	3730	1650	1580	1820	756
27	882	1230	1040	1360	1840	1840	e1200	4240	1340	1310	1760	1170
28	848	1100	1040	1330	1790	1920	1190	4300	1590	1490	1310	1390
29	932	992	1010	1290	---	1630	1200	3890	1180	1700	1280	1260
30	818	996	1200	1500	---	1690	1230	4480	1420	1890	1490	1110
31	824	---	1080	1400	---	1320	---	3690	---	1600	1380	---
TOTAL	34688	30240	32223	39570	47015	59130	53070	104134	55260	71820	48146	34113
MEAN	1119	1008	1039	1276	1679	1907	1769	3359	1842	2317	1553	1137
MAX	1750	1280	1210	1500	1930	2080	3420	6030	3140	4790	2110	1490
MIN	816	775	842	1050	975	1320	1100	864	1180	1250	876	740

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1999, BY WATER YEAR (WY)

	MEAN	1470	1593	1453	1396	1377	1593	3159	3050	2127	1598	1296	1°97
	MAX	3537	3465	2640	2253	2514	3544	8159	6319	5035	4253	2359	3149
	(WY)	1986	1986	1984	1983	1984	1973	1916	1960	1916	1953	1972	1°68
	MIN	726	725	765	691	647	692	735	595	799	721	545	718
	(WY)	1949	1964	1925	1924	1926	1914	1990	1987	1988	1925	1925	1°25

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1914 - 1°99

ANNUAL TOTAL	457295	609409	
ANNUAL MEAN	1253	1670	
HIGHEST ANNUAL MEAN			1792
LOWEST ANNUAL MEAN			3069
HIGHEST DAILY MEAN	6190	Apr 1	1°16
LOWEST DAILY MEAN	659	May 25	1°25
ANNUAL SEVEN-DAY MINIMUM	710	May 24	18800
INSTANTANEOUS PEAK FLOW			Jul 2 1°53
INSTANTANEOUS PEAK STAGE			Sep 26 1°75
INSTANTANEOUS LOW FLOW			Oct 18 1°75
10 PERCENT EXCEEDS	1770		Apr 26 1°60
50 PERCENT EXCEEDS	1060		Apr 26 1°60
90 PERCENT EXCEEDS	799		(a)

(a) Aug. 21, 1962, Sept. 26, 1975.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04063500 MENOMINEE RIVER AT TWIN FALLS NEAR IRON MOUNTAIN, MI

LOCATION.--Lat 45°52'17", long 88°04'12", in NE1/4 SE1/4 sec. 12, T.40 N., R.31 W., Michigan Meridian, Dickinson County, Hydrologic Unit 04030108, on left bank 150 ft downstream from Wisconsin Electric Power Company powerhouse at Twin Falls Dam, 3.6 mi north of Iron Mountain, and at mile 106.6.

DRAINAGE AREA.--1,800 mi².

PERIOD OF RECORD.--January 1914 to current year. Published as "near Florence, WI", October 1957 to September 1989. Records published for both sites July 1950 to September 1957, October 1989 to September 1996, October 1998 to September 1999.

REVISED RECORDS.--WDR MI-91-1: 1990(M). WDR MI-92-1: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 1,062 ft above sea level (levels by Wisconsin Electric Power Co.). Prior to September 1957, headwater and tailwater gages and generation data entered hourly in daily log sheets by company employees. October 1957 to September 1989, water-stage recorder at site 10.4 mi upstream at different datum. November 1989 to July 1993, water-stage recorder at site 150 ft upstream at same datum.

REMARKS.--Records good. Prior to September 1957, discharge determined from powerplant records computed on basis of load-discharge rating of hydroelectric units and rating for tailwater gage during periods of spill; ratings 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1340	891	961	1050	1430	1900	1290	879	3140	1290	1520	1210
2	1290	919	1020	1050	1380	2000	1250	987	2410	1550	1560	1240
3	1540	939	1010	1050	1510	1980	1460	1200	2110	1720	1480	1320
4	1140	924	993	1160	1600	1980	1550	1250	1980	2150	1310	808
5	1050	909	891	1300	1160	1980	2200	1150	2040	2900	1520	914
6	1410	954	901	1240	1030	1980	2640	1480	2510	3340	1430	1110
7	1720	856	1160	1250	1030	1980	3330	2910	2120	2820	1200	1370
8	1690	883	1190	1240	1290	1670	3470	5800	2370	2260	1260	1400
9	1330	945	1210	1300	1630	1970	3330	5850	2560	2960	1490	1430
10	1270	931	1050	1280	1660	1970	2960	6110	2300	3710	1650	1470
11	1280	890	1040	1280	1670	1870	2320	4780	1960	2060	1630	1010
12	1490	865	1020	1280	1740	1950	2260	3530	1970	2160	1490	890
13	1400	1080	1020	1330	1800	1980	2350	2780	1970	2140	2090	941
14	1310	1050	1090	1290	1810	1970	1900	2190	2010	2030	1720	942
15	1310	1160	974	1280	1810	1980	1720	1810	1550	4900	1710	987
16	971	1140	965	1260	1790	2060	1540	1810	1470	4950	1810	1160
17	1020	1160	986	1200	1750	2020	1380	1940	1650	3520	1710	1350
18	998	948	1140	1330	1780	1860	1380	3300	1570	2300	1740	1270
19	961	1220	1060	1320	1810	1800	1650	5400	1440	2560	1610	658
20	902	1160	1080	1280	1800	1790	1410	4480	1570	2270	1430	925
21	940	1240	1060	1310	1810	1780	1470	4290	1370	1900	934	1180
22	926	1320	1080	1310	1800	1790	1470	3880	1210	1750	1400	1270
23	963	1170	1070	1430	1800	1790	1260	4230	1320	1940	1590	1110
24	914	1200	1070	1340	1800	1870	1180	4190	1360	1820	1470	1350
25	934	1220	1080	1290	1790	1920	1180	4060	1440	1720	1730	969
26	941	931	1080	1380	1790	1870	1190	3760	1560	1530	1830	820
27	894	1170	1030	1230	1800	1850	1260	4280	1370	1390	1720	1050
28	869	1150	1100	1270	1800	1910	1140	4210	1410	1500	1310	1430
29	955	984	1080	1350	---	1730	1190	3720	1280	1690	1180	1230
30	946	1030	1100	1390	---	1660	1190	4790	1380	1790	1360	1180
31	844	---	1040	1350	---	1450	---	3720	---	1570	1390	---
TOTAL	35548	31239	32551	39420	45870	58610	53920	104766	54400	72190	47274	33994
MEAN	1147	1041	1050	1272	1638	1891	1797	3380	1813	2329	1525	1133
MAX	1720	1320	1210	1430	1810	2060	3470	6110	3140	4950	2090	1470
MIN	844	856	891	1050	1030	1450	1140	879	1210	1290	934	658

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1999, BY WATER YEAR (WY)

	MEAN	1479	1605	1462	1405	1384	1606	3175	3061	2142	1611	1309	1409
MAX	3537	3465	2640	2253	2514	3544	8159	6319	5035	4309	2359	3149	
(WY)	1986	1986	1984	1983	1984	1973	1916	1960	1916	1953	1972	1968	
MIN	726	725	765	691	647	692	707	595	799	721	545	718	
(WY)	1949	1964	1925	1924	1926	1914	1990	1987	1988	1925	1925	1925	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1914 - 1999

ANNUAL TOTAL	459482	609782	1804
ANNUAL MEAN	1259	1671	3069
HIGHEST ANNUAL MEAN			922
LOWEST ANNUAL MEAN			1916
HIGHEST DAILY MEAN	6190	6110	18100
LOWEST DAILY MEAN	659	658	57
ANNUAL SEVEN-DAY MINIMUM	710	903	277
INSTANTANEOUS PEAK FLOW		7150	(a)19500
INSTANTANEOUS PEAK STAGE		10.44	(b)12.54
10 PERCENT EXCEEDS	1770	2560	3040
50 PERCENT EXCEEDS	1080	1400	1480
90 PERCENT EXCEEDS	806	955	855

(a) Gage height 14.15 ft, site and datum then in use.

(b) Present site and datum.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04065106 MENOMINEE RIVER AT NIAGARA, WI

LOCATION.--Lat 45°46'04", long 87°58'50", in NE 1/4 NE 1/4 sec.15, T.38 N., R.20 E., Wisconsin Meridian, Marinette County, Hydrologic Unit 04030108, on right bank 0.7 mi downstream from Little Quinnesec Falls Dam, at Niagara, WI.

DRAINAGE AREA.--2,470 mi².

PERIOD OF RECORD.--October 1992 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 880 ft above sea level, from topographic map.

REMARKS.--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 Michigamme River, and by smaller reservoirs upstream from gage. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1570	1110	1280	e1200	e1600	e2000	2370	1240	3690	1690	2130	1530
2	1530	1200	1340	e1200	e1600	e2100	2410	1250	2890	1840	1910	1480
3	1710	1180	1350	e1200	e1700	e2200	2370	1410	2470	e2100	2090	1580
4	1490	1130	1280	e1400	e1700	e2100	2810	1430	2310	e3300	1700	1230
5	1230	1140	1240	e1500	e1300	e2100	3330	1470	2280	e4300	2040	1160
6	1610	1140	1240	e1500	e1200	e2100	4050	1830	2860	e4900	1950	1420
7	2060	1120	1340	e1500	e1200	e2100	4570	3400	2860	4150	1690	1500
8	1950	1150	1450	e1500	e1400	e2100	4800	7000	2990	3410	1670	1520
9	1560	1150	1450	e1500	e1700	e2100	4590	7150	3260	4740	1900	1590
10	1460	1200	1380	e1500	e1800	e2100	4000	7710	3200	5890	2000	1570
11	1490	1360	1250	e1500	e1900	e2000	3410	6070	2860	4060	2290	1580
12	1680	1160	1260	e1500	e2100	e2000	2960	4560	2690	4000	1840	1570
13	1620	1490	1270	e1500	e2100	e2100	3210	3690	2800	3530	2790	1580
14	1550	1320	1270	e1500	e2100	e2100	2810	2870	3020	3200	2460	1570
15	1470	1490	1270	e1600	e2100	e2200	2280	2430	2400	7830	2450	1590
16	1200	1470	1270	e1500	e2100	e2300	2150	2330	1940	7810	2340	1530
17	1200	1470	1270	e1500	e2000	e2000	1860	2470	2350	5590	2320	1560
18	1250	1300	1290	e1500	e2000	2170	1840	3560	2170	3880	2360	1540
19	1240	1550	1260	e1500	e2000	2120	1960	6360	1970	3850	2230	1570
20	1110	1580	e1200	e1400	e2100	2180	1990	5390	1890	3550	1770	1550
21	1200	1640	e1200	e1500	e2100	2220	1860	5010	1860	2760	1540	1480
22	1180	1690	e1200	e1500	e2100	2130	1890	4970	1420	2670	1800	1570
23	1130	1630	e1200	e1600	e2000	2090	1680	4970	1570	2700	1970	1510
24	1170	1600	e1200	e1600	e2100	2190	1500	5550	1710	2480	1900	1470
25	1170	1550	e1200	e1500	e2100	2300	1540	5120	1730	2520	1980	1130
26	1130	1250	e1200	e1500	e2000	2290	1540	4620	1870	2260	2170	1160
27	1130	1550	e1200	e1500	e2000	2280	1560	4830	1720	1950	2290	1560
28	1190	1400	e1200	e1500	e2000	2300	1450	5110	1790	2130	1790	1590
29	1170	1260	e1200	e1600	---	2390	1480	4060	1610	2250	1630	1540
30	1160	1320	e1200	e1600	---	2340	1420	5240	1670	2470	1610	1510
31	1200	---	e1200	e1600	---	2290	---	4400	---	2160	1610	---
TOTAL	42810	40600	39140	46000	52000	67270	75690	127500	69850	109970	62220	43140
MEAN	1381	1353	1263	1484	1857	2170	2523	4113	2328	3547	2007	1438
MAX	2060	1690	1460	1600	2100	2390	4800	7710	3690	7830	2790	1500
MIN	1110	1110	1200	1200	1200	2000	1420	1240	1420	1690	1540	1130

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1993 - 1999, BY WATER YEAR (WY)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
MEAN	1814	1838	1819	1803	1949	2072	3542	3874	2639	2243	1678	1705
MAX	2810	2531	2458	2258	2286	2455	6167	7555	4184	3547	2290	2225
(WY)	1996	1993	1993	1993	1997	1998	1996	1996	1993	1999	1996	1994
MIN	1381	1283	1263	1369	1391	1764	1953	1175	1587	1264	1080	1248
(WY)	1999	1995	1999	1995	1995	1994	1994	1998	1998	1998	1998	1998

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1993 - 1999

ANNUAL TOTAL	595159	776190	2248
ANNUAL MEAN	1631	2127	3135
HIGHEST ANNUAL MEAN			1596
LOWEST ANNUAL MEAN			1707
HIGHEST DAILY MEAN	8960	Apr 1	16000
LOWEST DAILY MEAN	917	May 27	917
ANNUAL SEVEN-DAY MINIMUM	951	May 24	951
INSTANTANEOUS PEAK FLOW			1140
INSTANTANEOUS PEAK STAGE			10100
10 PERCENT EXCEEDS	2300	12.28	15.11
50 PERCENT EXCEEDS	1340	3690	3600
90 PERCENT EXCEEDS	1050	1710	1900
		1200	1230

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04065722 MENOMINEE RIVER NEAR VULCAN, MI

LOCATION.--Lat 45°44'12", long 87°51'48", sec.34, T.39 N., R.29 W., Michigan Meridian, Dickinson County, Hydrologic Unit 04030108, on left bank 0.35 mi downstream from Sturgeon Falls Dam, 3.0 mi south of Vulcan, and at mile 78.7.

DRAINAGE AREA.--2,900 mi².

PERIOD OF RECORD.--December 1987 to current year.

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 820 ft above sea level, from topographic map.

REMARKS.--Records good. 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 smaller reservoirs upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1770	1220	1420	1330	1720	2350	3440	1370	4480	1950	2410	1640
2	1690	1240	1420	1340	1800	2480	3640	1420	3640	2120	2070	1600
3	1740	1260	1520	1340	1870	2480	3630	1580	2970	2660	2330	1660
4	1630	1250	1450	1530	1930	2410	4200	1560	2830	4400	1870	1320
5	1280	1190	1380	1580	1520	2430	4850	1620	2700	4930	2060	1250
6	1570	1230	1370	1650	1340	2440	5760	2100	3230	6110	2130	1390
7	2260	1200	1510	1620	1390	2450	6390	4010	3450	5170	1810	2070
8	2130	1210	1550	1610	1610	2450	6500	8110	3410	4240	1820	1900
9	1700	1230	1640	1710	1970	2480	6290	8670	3990	5580	1940	1790
10	1510	1280	1470	1640	2100	2350	5460	9290	4070	7150	2200	1760
11	1590	1550	1410	1740	2080	2400	4620	7650	3700	5220	2500	1380
12	1710	1310	1380	1760	2390	2340	3910	5820	3680	4950	2020	1320
13	1780	1540	1370	1800	2300	2390	4210	4730	4070	4350	3220	1500
14	1600	1540	1370	1830	2390	2430	3610	3690	4310	3720	2960	1360
15	1540	1650	1370	1890	2410	2460	2960	2930	3460	7830	3120	1360
16	1290	1650	1370	1710	2580	2530	2690	2850	2510	9290	2930	1620
17	1280	1620	1370	1620	2430	2550	2370	2980	2810	6620	2920	1460
18	1310	1490	1370	1630	2310	2460	2200	4110	2670	4900	2880	1380
19	1350	1720	1370	1630	2320	2420	2320	7380	2350	4590	2750	1520
20	1170	1840	1290	1570	2470	2500	2400	6870	2230	4340	2090	1320
21	1240	1820	1340	1600	2380	2600	2200	6190	2220	3330	1810	1530
22	1240	2030	1280	1640	2390	2560	2260	6440	1650	3150	2010	1640
23	1200	1870	1320	1800	2240	2470	1990	6270	1780	3120	2320	1680
24	1200	1840	1350	1790	2360	2610	1780	7070	1920	2870	2160	1550
25	1220	1780	1360	1610	2380	2800	1790	6610	1890	2900	2160	1220
26	1220	1490	1340	1640	2320	2780	1850	6050	2210	2600	2380	1220
27	1170	1660	1330	1540	2190	2800	1820	6140	1920	2130	2480	1760
28	1210	1650	1330	1630	2310	2920	1650	6340	1960	2340	1990	1700
29	1250	1440	1330	1640	---	3130	1690	4900	1820	2420	1850	1490
30	1250	1470	1340	1770	---	3260	1590	6180	1850	2670	1780	1530
31	1290	---	1320	1690	---	3230	---	5360	---	2430	1680	---
TOTAL	45390	45270	43040	50880	59500	79960	100070	156290	85800	130080	70650	45920
MEAN	1464	1509	1388	1641	2125	2579	3336	5042	2860	4196	2279	1531
MAX	2260	2030	1640	1890	2580	3260	6500	9290	4480	9290	3220	2070
MIN	1170	1190	1280	1330	1340	2340	1590	1370	1650	1950	1680	1220

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1999, BY WATER YEAR (WY)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
MEAN	1998	2309	2183	2031	2050	2479	4293	3923	2892	2264	1704	1869
MAX	3401	4412	3008	2533	2548	3037	8159	8850	4832	4196	2598	2456
(WY)	1996	1989	1989	1993	1997	1998	1996	1996	1993	1999	1996	1994
MIN	1081	1382	1388	1489	1442	2028	1356	1344	1062	1100	1184	1223
(WY)	1990	1990	1999	1995	1995	1994	1990	1998	1988	1988	1998	1998

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1988 - 1999

ANNUAL TOTAL	695600	912850	
ANNUAL MEAN	1906	2501	
HIGHEST ANNUAL MEAN			2549
LOWEST ANNUAL MEAN			3781
HIGHEST DAILY MEAN	11300	9290	May 10
LOWEST DAILY MEAN	1040	1170	Oct 20
ANNUAL SEVEN-DAY MINIMUM	1040	1210	Oct 22
INSTANTANEOUS PEAK FLOW		10600	Jul 15
INSTANTANEOUS PEAK STAGE		12.39	Jul 15
INSTANTANEOUS LOW FLOW		1070	Sep 6
10 PERCENT EXCEEDS	2940	4660	
50 PERCENT EXCEEDS	1540	1930	
90 PERCENT EXCEEDS	1130	1320	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04066003 MENOMINEE RIVER BELOW PEMENE CREEK NEAR PEMBINE, WI

LOCATION.--Lat 45°34'46", long 87°47'13", in NE 1/4, 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 N-then, 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 (04066000) prior to August 1982. Monthly discharges for some periods published in WSP 1307.

GAGE.--Water-stage recorder. Elevation of gage is 740 ft above sea level, from topographic map. October 1949 to Oct. 27, 1972, water-stage recorder at site 1.0 mi upstream at elevation 745 ft, from river-profile map, and Oct. 28, 1972, to August 1982, water-stage recorder at site 1.5 mi upstream at elevation 770 ft, from river-profile map.

REMARKS.--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 Michigamme River, and by many smaller reservoirs upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1730	1330	1510	e1400	e1800	e2400	3780	1610	4690	2200	2780	1620
2	1690	1250	1490	e1400	e1800	e2500	3980	1500	4120	2320	2090	1640
3	1670	1330	1590	e1500	e1900	e2800	3980	1630	3170	2690	2530	1620
4	1950	1310	1530	e1500	e2000	e2500	4360	1650	3100	4510	2060	1550
5	1290	1270	1450	e1500	e1700	e2600	5030	1640	2880	5080	2080	1310
6	1460	1270	1460	e1600	e1600	e2500	5810	2060	3230	6410	2190	1270
7	2320	1260	1470	e1600	e1500	e2500	6700	3790	3730	5640	2010	1970
8	2210	1250	1600	e1600	e1700	e2500	6640	7620	3530	4610	1830	1980
9	1880	1290	1690	e1600	e1900	e2600	6700	9240	4050	5620	1960	1980
10	1540	1400	1640	e1700	e2100	e2600	5830	9760	4190	7740	2330	1880
11	1700	1620	1530	e1700	e2300	e2500	4930	8400	3870	6310	2600	1590
12	1650	1480	1430	e1800	e2800	2510	4160	6230	3830	5430	2140	1390
13	1890	1490	1450	e1800	e2500	2470	4240	4940	3990	4710	2910	1600
14	1670	1790	1460	e1700	e2500	2530	3890	4110	4460	4000	3410	1550
15	1650	1670	1430	e1800	e2500	2550	3260	3050	4060	6550	3390	1470
16	1450	1720	1430	e1700	e2700	2590	2950	3120	2560	10400	3130	1520
17	1280	1710	1440	e1600	e2600	2660	2630	3110	3020	7520	3090	1650
18	1330	1670	1440	e1700	e2600	2620	2390	3960	2940	6070	2940	1490
19	1360	1670	1470	e1700	e2500	2580	2410	6980	2550	5060	2910	1600
20	1340	1960	1390	e1700	e2500	2630	2560	7410	2380	4850	2220	1460
21	1230	2010	e1400	e1600	e2500	2750	2250	6290	2310	3900	1990	1520
22	1360	2200	e1400	e1700	e2600	2740	2430	6910	1880	3390	1920	1710
23	1310	1900	e1400	e1800	e2500	2650	2270	6220	1730	3410	2380	1880
24	1250	1950	e1400	e1900	e2400	2740	1980	7270	2010	3260	2140	1670
25	1300	1890	e1400	e1900	e2500	2930	1900	6730	2000	3080	2160	1480
26	1330	1690	e1400	e1800	e2600	2930	1910	6240	2380	2950	2410	1280
27	1250	1570	e1400	e1800	e2400	2990	1950	6190	2100	2280	2510	1710
28	1250	1820	e1400	e1700	e2500	3140	1770	6600	2010	2440	2050	1700
29	1290	1620	e1400	e1700	---	3370	1820	4890	2060	2610	1830	1790
30	1300	1560	e1400	e1800	---	3570	1640	5910	1910	2690	1790	1560
31	1310	---	e1400	e1800	---	3600	---	5570	---	2620	1750	---
TOTAL	47240	47950	45300	52100	63300	84350	106150	160630	90740	140350	73530	48430
MEAN	1524	1598	1461	1681	2261	2721	3538	5182	3025	4527	2372	1614
MAX	2320	2200	1690	1900	2700	3600	6700	9760	4690	10400	3410	1980
MIN	1230	1250	1390	1400	1500	2400	1640	1500	1730	2200	1750	1270

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 1999, BY WATER YEAR (WY)

MEAN	2485	2624	2302	2128	2107	2617	5574	4828	3389	2560	2094	2310
MAX	5660	5766	3939	3035	3810	7461	10000	12100	6118	6523	3505	5335
(WY)	1986	1986	1986	1986	1984	1973	1967	1960	1953	1953	1952	1968
MIN	1028	1043	1167	1080	1201	1461	1432	1341	1152	1201	1003	1009
(WY)	1977	1977	1977	1977	1964	1964	1990	1987	1988	1988	1977	1976

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1950 - 1999
ANNUAL TOTAL	705510	960070	
ANNUAL MEAN	1933	2630	
HIGHEST ANNUAL MEAN			2918
LOWEST ANNUAL MEAN			4318
HIGHEST DAILY MEAN	12600	10400	26700
LOWEST DAILY MEAN	1030	1230	840
ANNUAL SEVEN-DAY MINIMUM	1070	1280	914
INSTANTANEOUS PEAK FLOW		11000	(a)26900
INSTANTANEOUS PEAK STAGE		12.31	(b)18.94
10 PERCENT EXCEEDS	3000	4930	4950
50 PERCENT EXCEEDS	1550	2010	2300
90 PERCENT EXCEEDS	1130	1400	1450

(a) Gage height, 13.90 ft, site and datum then in use.
(b) Backwater from ice.
(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04066030 MENOMINEE RIVER AT WHITE RAPIDS DAM NEAR BANAT, MI

LOCATION.--Lat 45°28'55", long 87°48'08", in SE 1/4 SE 1/4, sec.30, T. 36 N., R.28 W., Michigan Meridian, Menominee County, Hydrologic Unit 04030108, on left bank at powerplant at White Rapids Dam, 5.7 mi southwest of Banat.

DRAINAGE AREA.--3,190 mi².

PERIOD OF RECORD.--October 1998 to September 1999.

GAGE.--Water-stage recorder. Datum of gage is 680.00 ft above sea level (levels by Wisconsin Electric Power Company).

REMARKS.--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 Michigamme River, and by many smaller reservoirs upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e1800	1460	1600	1430	1940	2420	3900	1690	4440	2120	2700	1660
2	e1600	1310	1670	1490	1860	2610	4100	1660	4490	2530	2430	1700
3	e1700	1260	1620	1570	2050	2660	4230	1420	3110	2810	2400	1680
4	e2100	1310	1530	1520	2140	2590	4340	1650	3180	4520	2580	1740
5	e1300	1370	1570	1700	2010	2640	5360	1750	2920	5070	2240	1440
6	e1400	1290	1640	1740	1610	2570	6020	2380	3160	6250	2280	1230
7	e2300	1260	1510	1810	1520	2570	6740	4040	3760	5390	2150	1670
8	e2200	1240	1700	1660	1480	2580	6910	7600	3740	5000	1980	2220
9	e1900	1320	1800	1740	2070	2690	6690	9380	3940	5470	2060	2140
10	1580	1580	1720	1870	2230	2560	5900	9660	4260	7650	2320	1970
11	1820	1740	1580	1710	2410	2520	5000	8400	4080	6690	2800	1650
12	1700	1560	1450	2000	2710	2520	4200	6260	3880	5200	2460	1230
13	1960	1440	1480	1900	2430	2480	4280	4970	4020	4770	2640	1340
14	1710	1830	1620	1770	2880	2580	3940	4310	4420	4050	3920	1620
15	1740	1620	1520	1870	2690	2630	3410	3270	4280	6100	3330	1600
16	1620	1960	1480	1940	2870	2590	2830	3170	2720	10600	3370	1510
17	1260	1790	1510	1650	2630	2760	2930	3170	2870	7280	3200	1550
18	1300	1670	1480	1820	2650	2620	2290	3950	3100	6460	3130	1480
19	1430	1710	1520	1730	2480	2640	2560	6720	2720	4680	2960	1840
20	1450	2100	1470	1740	2570	2740	2670	7820	2420	4980	2660	1260
21	1180	2100	1480	1740	2560	2790	2410	6290	2140	4060	2120	1410
22	1290	2250	1230	1710	2690	2760	2390	7030	2170	3480	1880	1650
23	1330	1930	1160	1940	2550	2830	2360	6190	1850	3370	2310	1700
24	1330	2040	1520	2020	2370	2760	1940	7160	2230	3820	2670	1780
25	1290	1950	1380	1880	2610	3040	2150	6780	2080	3200	2330	1700
26	1350	1880	1620	1780	2660	3060	1870	6340	2100	3010	2200	1320
27	1300	1570	1540	1900	2440	3010	2150	6270	2140	2770	2580	1330
28	1320	1910	1400	1690	2540	3270	1830	6540	2100	2460	2480	2020
29	1310	1720	1530	1850	---	3480	1790	4940	2080	2570	1890	1540
30	1430	1610	1290	1930	---	3680	1830	5760	2020	3080	1870	1490
31	1290	---	1560	1880	---	3740	---	5920	---	2660	1900	---
TOTAL	48290	49780	47180	54980	65650	86390	109020	162390	92420	142106	77840	48470
MEAN	1558	1659	1522	1774	2345	2787	3634	5238	3081	4584	2511	1616
MAX	2300	2250	1800	2020	2880	3740	6910	9560	4490	10600	3920	2220
MIN	1180	1240	1160	1430	1480	2420	1790	1420	1850	2120	1870	1230

SUMMARY STATISTICS

FOR 1999 WATER YEAR

ANNUAL TOTAL
ANNUAL MEAN
HIGHEST DAILY MEAN
LOWEST DAILY MEAN
ANNUAL SEVEN-DAY MINIMUM
INSTANTANEOUS PEAK FLOW
INSTANTANEOUS PEAK STAGE
10 PERCENT EXCEEDS
50 PERCENT EXCEEDS
90 PERCENT EXCEEDS

984510
2697
10600 Jul 16
1160 Dec 23
1290 Nov 2
12000 May 10
11.70 May 10
4990
2140
1430

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04066800 MENOMINEE RIVER AT KOSS, MI

LOCATION.--Lat 45°23'14", long 87°42'07", in SE 1/4 NE 1/4, sec.36, T.35 N., R.28 W., Michigan Meridian, Menominee County, Hydrologic Unit 04030108, on left upstream bank 30 ft from river and 18 ft west of County Trunk JJ (Koss) bridge, 0.3 mi southeast of Koss and 3.4 mi upstream of Grand Rapids Dam.

DRAINAGE AREA.--3,700 mi².

PERIOD OF RECORD.--July 1907 to March 1909 (published as "at Koss"), July 1913 to September 1981 (published as 04067000 Menominee River below Koss, MI), June 1998 to current year. Records prior to October 1913 published in WSP 244, 264, and 384.

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

GAGE.--Water-stage recorder. Elevation of gage is 665 ft above sea level, from topographic map. June 1913 to September 1981, headwater and tailwater gages and generation data entered hourly in daily log sheet by Wisconsin Public Service Corp. employees at powerplant 4 mi downstream. Records of daily discharge furnished by Wisconsin Public Service Corp. Prior to June 1913, chain gage on railroad bridge at Koss.

REMARKS.--Records good except for estimated daily discharges and discharges for Sept. 7-30, which are fair. 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. Gage height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1800	1590	1880	e1600	e2100	e3000	4490	2040	5710	2420	2780	1650
2	1950	1740	1770	e1700	e2200	e3100	4830	1960	4900	2680	3030	1650
3	1930	1670	1890	e1700	e2300	e3100	4930	1850	4170	2960	2410	1650
4	1970	1630	1890	e1800	e2300	e3100	5120	1730	3510	3810	2610	1670
5	2000	1690	1980	e1900	e2100	e3100	6020	1970	3240	5400	2600	1650
6	1610	1700	1860	e1900	e1900	e3000	6790	2160	3140	6170	2360	1490
7	2140	1600	1930	e1900	e1700	e3000	7630	3600	3820	6630	2170	1650
8	2580	1630	2340	e1900	e1700	e3000	8150	6620	4060	5820	2320	2150
9	2330	1630	2140	e1900	e2000	e3100	8020	9480	4110	5760	1870	2150
10	1890	1820	1950	e1900	e2500	e3000	7380	10500	4450	7540	2320	2150
11	1720	1950	1850	e1900	e2800	e2900	6440	10700	4750	8630	2590	1950
12	1870	2050	1670	e2000	e2900	e2900	5440	8900	4290	6950	2790	1520
13	1960	1790	1670	e2000	e3000	e2900	4770	6530	4370	6030	2450	1250
14	2000	1920	1650	e2000	e3100	e3000	4720	5340	4620	5190	3750	1450
15	1970	1910	1730	e2000	e3000	e3100	4220	4260	4840	4830	3700	1650
16	1880	2120	1680	e1900	e3100	e3100	3420	3400	3990	8390	3450	1570
17	1660	2010	1610	e1800	e3200	e3100	3400	3690	2990	9670	3350	1540
18	1510	1910	1660	e1900	e3000	e3100	2790	3890	3260	8340	3290	1570
19	1560	1860	1660	e1800	e2900	e3200	2730	5850	3080	6370	3140	1670
20	1720	2210	e1700	e1800	e3000	e3200	2900	8290	2670	5710	2990	1550
21	1610	2410	e1600	e1800	e3000	e3300	2830	7890	2460	5290	2410	1350
22	1540	2300	e1400	e1900	e3000	e3300	2610	7360	2330	4370	2000	1650
23	1670	2220	e1500	e2100	e3000	e3300	2640	7540	2060	3700	2060	1670
24	1580	2260	e1600	e2100	e2900	3380	2540	7540	2200	4150	2580	1750
25	1530	2160	e1700	e2000	e3000	3410	2230	8030	2420	3800	2520	1650
26	1590	2060	e1700	e2000	e3000	3770	2190	7480	2040	3410	2220	1550
27	1630	1660	e1700	e2000	e3000	3510	2340	6960	2400	3210	2360	1350
28	1600	1970	e1600	e2100	e2900	3690	2250	6820	2410	2770	2510	1740
29	1620	2060	e1600	e2100	---	3930	2090	6470	2360	2650	2240	1750
30	1700	1910	e1600	e2100	---	4250	2040	5470	2400	2950	1850	1610
31	1640	---	e1600	e2100	---	4390	---	6480	---	3140	2050	---
TOTAL	55760	57440	54110	59600	74600	101230	127950	180700	103050	158940	80770	49650
MEAN	1799	1915	1745	1923	2664	3265	4265	5829	3435	5127	2605	1653
MAX	2580	2410	2340	2100	3200	4390	8150	10700	5710	9870	3750	2150
MIN	1510	1590	1400	1600	1700	2900	2040	1730	2040	2420	1850	1250

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1913 - 1999, BY WATER YEAR (WY)

	MEAN	2568	2838	2203	1980	1872	2693	6619	5754	3893	2775	2160	2433
MAX	6178	5597	3588	3174	3176	7973	13650	13180	10780	6159	3800	5538	
(WY)	1929	1917	1919	1969	1969	1973	1916	1960	1916	1953	1972	1928	
MIN	1131	1170	1166	989	864	1199	2479	2220	1708	1111	731	1013	
(WY)	1977	1977	1931	1926	1926	1934	1964	1977	1977	1934	1934	1933	

SUMMARY STATISTICS

FOR 1999 WATER YEAR

WATER YEARS 1913 - 1999

ANNUAL TOTAL	1103750		
ANNUAL MEAN	3024		
HIGHEST ANNUAL MEAN		3155	
LOWEST ANNUAL MEAN		5262	1916
HIGHEST DAILY MEAN		1642	1931
LOWEST DAILY MEAN	10700	May 11	May 10 1950
ANNUAL SEVEN-DAY MINIMUM	1280	Sep 13	Sep 15 1931
INSTANTANEOUS PEAK FLOW	1510	Sep 12	Sep 9 1931
INSTANTANEOUS PEAK STAGE	11000	May 11	
10 PERCENT EXCEEDS	13.76	May 11	
50 PERCENT EXCEEDS	5780		5940
90 PERCENT EXCEEDS	2330		2340
	1630		1380

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04067500 MENOMINEE RIVER NEAR McALLISTER, WI

LOCATION.--Lat 45°19'33", long 87°39'48", in SW 1/4 SE 1/4 sec.17, T.33 N., R.23 E., Wisconsin Meridian, Marinette County, Hydrologic Unit 04030108, on right bank 85 ft downstream from bridge on County Highway JJ, 2.9 mi downstream from Grand Rapids Dam, 2.6 mi east of McAllister, WI, 1.9 mi downstream from Little Cedar River, and at mile 22.6.

DRAINAGE AREA.--3,930 mi².

PERIOD OF RECORD.--March 1945 to September 1961; October 1961 to September 1979, miscellaneous measurements and peaks only; October 1979 to September 1986; October 1986 to March 1987, crest-stage partial-record station; April 1988 to September 1993; April 1993 to September 1995; October 1997 to current year.

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

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 622.20 ft above sea level (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; October 1979 to September 1986, water-stage recorder at same site and datum; October 1986 to March 1987, crest-stage gage at same site and datum. April 1988 to September 1990, and April 1993 to September 1995, water-stage recorder at same site and datum.

REMARKS.--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 Michigamme River, and by many smaller reservoirs upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1770	1440	1770	e1600	e2000	e2800	4880	2010	5950	2320	2960	1840
2	1870	1540	1760	e1700	e2000	e2800	5200	1910	5070	2780	3130	1810
3	1860	1450	1830	e1600	e2000	e2900	5260	1810	4510	3050	2550	1810
4	1880	1410	1780	e1800	e2200	e3000	5500	1690	3690	3730	2730	1740
5	2030	1430	1880	e1700	e2300	e3000	6240	1920	3420	5490	2800	1780
6	1620	1490	1670	e1900	e2100	e3000	7090	2140	3350	6220	2500	1550
7	2030	1440	1700	e1900	e1900	e3000	7950	3670	3930	6880	2400	1620
8	2610	1400	1740	e1800	e2000	e3000	8440	6600	4190	6020	2400	2330
9	2400	1380	1990	e1800	e1900	e3000	8270	9230	4210	6060	2110	2230
10	2020	1590	1940	e1900	e2400	e3000	7670	10200	4490	7700	2360	2230
11	1700	1910	1830	e2000	e2500	e2900	6790	10500	4870	8800	2710	2010
12	1900	2070	1670	e1900	e2700	e3000	5800	8910	4450	7370	2950	1650
13	1870	1710	1620	e1900	e2900	e2900	5100	6780	4430	6320	2760	1360
14	2020	1870	1580	e2000	e2800	e3000	5080	5570	4640	5450	3860	1550
15	1810	1900	1720	e1900	e3200	e3000	4510	4600	4930	4980	4070	1690
16	1810	2060	1690	e2000	e3200	e3000	3690	3520	4220	7900	3800	1670
17	1630	2060	1600	e2000	e3200	e3100	3500	3930	2960	9750	3650	1610
18	1420	1890	1640	e1900	e3100	e3300	3140	4110	3390	8390	3470	1620
19	1450	1880	1600	e1900	e3000	e3300	2740	5690	3290	6740	3330	1740
20	1560	2270	1590	e2000	e2900	e3400	2970	8060	2810	5880	3160	1690
21	1520	2510	1560	e2000	e3000	e3600	2980	7930	2580	5630	2640	1430
22	1290	2390	e1200	e2000	e3000	e3800	2710	7300	2440	4680	2210	1620
23	1500	2330	e1500	e2100	e3000	e3700	2740	7600	2180	4110	2160	1750
24	1470	2300	e1600	e2100	e2900	3470	2660	7520	2210	4390	2700	1800
25	1420	2260	e1700	e2300	e2900	3490	2320	8080	2400	4170	2730	1810
26	1450	2140	e1700	e2100	e2900	3840	2260	7620	2080	3710	2380	1680
27	1460	1880	e1800	e2100	e3000	3650	2250	7000	2440	3420	2480	1470
28	1470	1830	e1800	e2000	e2900	3940	2290	6940	2380	3040	2740	1770
29	1440	1970	e1700	e1900	---	4140	2060	6760	2330	2820	2340	1870
30	1510	1900	e1700	e2000	---	4570	1990	5650	2310	3040	1920	1530
31	1570	---	e1600	e2100	---	4820	---	6560	---	3390	2140	---
TOTAL	53360	55700	52460	59900	73900	103420	134060	181810	106150	164230	86140	52260
MEAN	1721	1857	1692	1932	2639	3336	4469	5865	3538	5298	2779	1742
MAX	2610	2510	1990	2300	3200	4820	8440	10500	5950	9750	4070	2330
MIN	1290	1380	1200	1600	1900	2800	1990	1690	2080	2320	1920	1360

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1999, BY WATER YEAR (WY)

	MEAN	2960	3255	2600	2390	2402	3046	6518	5324	3934	3216	2381	2656
MAX	6755	7332	4561	3777	4710	5687	12800	15930	6958	7127	4056	5952	
(WY)	1986	1986	1986	1983	1984	1983	1951	1960	1993	1951	1952	1959	
MIN	1195	1753	1532	1621	1245	1897	1869	1636	1296	1374	1312	1390	
(WY)	1949	1990	1990	1949	1948	1956	1990	1998	1988	1988	1998	1989	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1945 - 1999

ANNUAL TOTAL	838020	1123390	
ANNUAL MEAN	2296	3078	
HIGHEST ANNUAL MEAN			3402
LOWEST ANNUAL MEAN			5496
HIGHEST DAILY MEAN	15200	Apr 3	10500
LOWEST DAILY MEAN	1040	Sep 7	810
ANNUAL SEVEN-DAY MINIMUM	1140	Aug 1	1430
INSTANTANEOUS PEAK FLOW			11000
INSTANTANEOUS PEAK STAGE			14.20
INSTANTANEOUS LOW FLOW			May 11
10 PERCENT EXCEEDS	3600		5980
50 PERCENT EXCEEDS	1830		2360
90 PERCENT EXCEEDS	1260		1600

(a) Ice affected.

(b) From graph based on gage readings.

(c) Observed.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096015 GALIEN RIVER NEAR SAWYER, MI

LOCATION.--Lat 41°52'25", long 86°34'30", in SE1/4 sec.12, T.7 S., R.20 W., Berrien County, Hydrologic Unit 04040001, on right bank 10 ft downstream from bridge on Minnich Road, 1.3 mi southeast of Sawyer.

DRAINAGE AREA.--80.7 mi².

PERIOD OF RECORD.--July 1995 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 610 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	36	31	e27	112	99	52	118	47	271	18	16
2	23	34	30	e24	119	80	51	103	57	349	18	15
3	27	33	31	e24	141	131	52	90	51	135	17	15
4	25	32	31	e24	108	95	101	81	44	84	17	14
5	24	31	30	e24	88	79	100	73	40	64	17	14
6	25	31	35	e23	91	e77	81	72	38	54	16	14
7	36	31	150	e23	89	e76	70	74	35	48	17	14
8	30	31	80	e23	88	e74	64	67	33	42	17	14
9	27	31	56	e23	97	e72	127	63	32	38	17	14
10	26	53	47	e23	85	71	139	58	32	35	17	13
11	25	68	43	e23	79	68	111	54	33	33	17	14
12	25	49	41	e23	113	65	94	52	42	31	17	14
13	24	43	39	e23	87	64	80	49	43	29	19	14
14	25	40	36	e25	75	61	71	47	59	28	17	14
15	24	38	35	e30	73	63	68	45	46	27	16	14
16	24	36	35	e40	72	83	290	43	40	26	16	14
17	24	36	35	e52	78	303	236	44	37	25	15	14
18	25	35	34	e230	71	323	150	47	34	26	15	14
19	27	34	34	373	66	167	129	43	32	26	18	14
20	26	34	35	205	62	122	108	40	31	25	18	13
21	27	33	35	118	57	102	100	38	29	24	16	14
22	34	31	34	611	54	88	144	39	28	24	16	14
23	31	31	e34	1200	52	80	1110	40	28	24	16	14
24	29	32	34	1000	50	79	823	47	31	22	17	13
25	29	32	33	539	51	71	428	41	34	22	24	14
26	29	30	33	353	53	66	281	38	30	21	23	13
27	29	29	34	264	71	64	208	36	131	21	20	13
28	31	30	33	233	94	61	249	34	86	20	17	14
29	32	30	33	183	—	59	203	36	116	20	17	18
30	39	30	e32	148	—	55	148	36	67	19	16	17
31	38	—	e30	126	—	53	—	33	—	18	16	—
TOTAL	864	1064	1253	6037	2276	2951	5868	1681	1386	1631	538	496
MEAN	27.9	35.5	40.4	195	81.3	95.2	196	54.2	46.2	52.6	17.4	14.2
MAX	39	68	150	1200	141	323	1110	118	131	349	24	18
MIN	23	29	30	23	50	53	51	33	28	18	15	13
CFSM	.35	.44	.50	2.41	1.01	1.18	2.42	.67	.57	.65	.22	.18
IN.	.40	.49	.58	2.78	1.05	1.36	2.70	.77	.64	.75	.25	.20

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1995 - 1999, BY WATER YEAR (WY)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
MEAN	40.0	92.4	90.3	164	143	139	140	166	100	58.5	38.7	27.0
MAX	62.0	134	174	229	292	228	196	449	213	127	51.5	38.5
(WY)	1997	1997	1997	1998	1997	1998	1999	1996	1996	1996	1995	1997
MIN	27.9	35.5	40.4	67.8	79.4	68.7	89.0	54.2	35.8	26.5	17.4	14.2
(WY)	1999	1999	1999	1996	1996	1996	1997	1999	1998	1998	1999	1999

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1995 - 1999
ANNUAL TOTAL	31877	25975	
ANNUAL MEAN	87.3	71.2	99.7
HIGHEST ANNUAL MEAN			119
LOWEST ANNUAL MEAN			71.2
HIGHEST DAILY MEAN	879	1200	2640
LOWEST DAILY MEAN	20	13	13
ANNUAL SEVEN-DAY MINIMUM	21	14	14
INSTANTANEOUS PEAK FLOW		1360	3440
INSTANTANEOUS PEAK STAGE		11.78	14.13
INSTANTANEOUS LOW FLOW		12	12
ANNUAL RUNOFF (CFSM)	1.08	.88	1.24
ANNUAL RUNOFF (INCHES)	14.69	11.97	16.78
10 PERCENT EXCEEDS	184	128	189
50 PERCENT EXCEEDS	38	35	54
90 PERCENT EXCEEDS	23	16	24

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096405 ST. JOSEPH RIVER AT BURLINGTON, MI

LOCATION.--Lat 42°06'11", long 85°04'48", in SE1/4 SE1/4 sec.23, T.4 S., R.7 W., Calhoun County, Hydrologic Unit 04050001, on right bank 10 ft downstream from bridge on Elevenmile Road in Burlington, 4.1 mi upstream from Burnett Creek, 6.7 mi downstream from Telonsha Creek, and at mile 161.

DRAINAGE AREA.--206 mi².

PERIOD OF RECORD.--October 1962 to current year. Published as "near Burlington" prior to October 1991.

GAGE.--Water-stage recorder. Elevation of gage is 905 ft above sea level, from topographic map. October 1962 to September 1990 water-stage recorder and October 1990 to September 1991 nonrecording gage at site 2.7 mi upstream at different datum (station 0409640C).

REMARKS.--Records good except for estimated daily discharges during the winter period, which are poor. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	81	89	e68	e380	190	159	399	171	189	51	36
2	55	77	90	e68	e370	193	156	358	172	251	47	33
3	58	72	98	e68	e360	206	154	315	174	212	44	30
4	59	69	104	e68	e350	207	180	273	169	190	48	27
5	60	69	108	e68	e340	204	214	243	163	165	45	26
6	64	69	118	e67	e330	205	211	220	155	143	43	26
7	105	68	167	e67	321	191	208	212	142	127	43	25
8	119	66	163	e67	306	178	207	209	130	115	47	24
9	119	62	155	e67	295	183	269	214	124	126	47	23
10	112	82	150	e67	295	177	310	209	120	138	46	23
11	104	114	144	e67	290	181	304	197	115	122	46	22
12	97	120	138	e67	285	187	305	186	114	108	46	21
13	89	120	130	e67	272	172	295	178	119	100	44	22
14	87	115	122	e70	258	165	290	173	135	92	42	22
15	84	109	115	e75	250	162	289	168	146	85	39	22
16	79	106	110	e85	248	164	306	166	147	79	38	21
17	74	100	107	e95	243	185	305	165	132	74	36	21
18	72	93	102	e110	233	226	286	187	121	75	34	21
19	71	90	100	e130	222	229	274	184	113	81	33	20
20	69	86	99	e130	212	229	269	186	106	74	36	20
21	73	82	100	e180	198	231	264	189	101	90	35	20
22	76	78	99	e240	182	232	273	187	96	84	31	20
23	73	76	e97	e300	177	234	404	183	91	81	33	20
24	73	75	e93	e380	172	232	534	199	92	73	39	20
25	70	74	e90	e410	168	222	476	199	96	76	e68	20
26	69	80	e86	e440	162	210	453	197	101	81	e64	20
27	66	82	e82	e450	165	198	451	194	108	73	59	20
28	68	87	e78	e460	179	188	450	191	111	68	58	19
29	74	87	e74	e450	---	179	446	180	146	63	49	37
30	89	87	e71	e420	---	169	431	166	137	59	43	44
31	88	---	e69	e400	---	163	---	168	---	56	38	---
TOTAL	2452	2576	3348	5721	7263	6092	9173	6495	3847	3350	1372	725
MEAN	79.1	85.9	108	185	259	197	306	210	128	108	44.3	24.2
MAX	119	120	167	460	380	234	534	399	174	251	68	44
MIN	55	62	69	67	162	162	154	165	91	56	31	19
CFSM	.38	.42	.52	.90	1.26	.95	1.48	1.02	.62	.52	.21	.12
IN.	.44	.47	.60	1.03	1.31	1.10	1.66	1.17	.69	.60	.25	.13

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1999, BY WATER YEAR (WY)

MEAN	100	138	179	188	208	311	311	226	186	113	85.7	83.9
MAX	357	378	308	508	428	668	567	426	640	308	270	237
(WY)	1987	1993	1983	1993	1968	1982	1982	1983	1989	1968	1981	1981
MIN	16.4	26.3	26.7	34.6	36.0	74.0	140	96.4	48.9	23.8	16.2	14.5
(WY)	1964	1965	1964	1977	1963	1964	1964	1971	1964	1988	1964	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1963 - 1999

ANNUAL TOTAL	74203	52414	
ANNUAL MEAN	203	144	
HIGHEST ANNUAL MEAN			177
LOWEST ANNUAL MEAN			270
HIGHEST DAILY MEAN	646	534	47.6
LOWEST DAILY MEAN	55	19	8.0
ANNUAL SEVEN-DAY MINIMUM	57	20	9.4
INSTANTANEOUS PEAK FLOW		(b)558	(c)1390
INSTANTANEOUS PEAK STAGE		(d)5.67	(f)6.21
INSTANTANEOUS LOW FLOW		18	8.0
ANNUAL RUNOFF (CFSM)	.99	.70	.86
ANNUAL RUNOFF (INCHES)	13.40	9.47	11.69
10 PERCENT EXCEEDS	451	292	350
50 PERCENT EXCEEDS	128	111	144
90 PERCENT EXCEEDS	67	38	45

(a) Mar. 21, 1982, June 1, 5, 1989.

(b) Gage height 5.47 ft.

(c) Gage height 5.82 ft, site and datum then in use.

(d) Backwater from ice.

(e) Estimated.

(f) Present site and datum.

(g) Aug. 9, 10, 11, 1964.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096515 SOUTH BRANCH 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. Prior to October 1987, published as Hog Creek near Allen.

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

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	26	37	e12	119	54	36	73	50	21	5.6	2.4
2	16	24	39	e12	104	54	36	67	54	33	4.8	2.2
3	19	23	38	e12	98	59	36	61	52	25	3.7	2.1
4	22	22	36	e12	92	63	46	56	48	20	3.6	1.9
5	21	19	34	e12	e83	63	61	51	43	17	3.8	1.8
6	22	19	32	e12	77	62	60	51	37	16	3.4	1.7
7	40	17	38	e12	73	e60	56	51	33	14	3.3	1.8
8	47	16	40	e12	70	e58	50	48	29	12	3.8	1.6
9	40	15	38	e12	69	e56	58	46	26	12	3.6	1.5
10	33	22	36	e12	70	e53	69	42	24	11	3.6	1.5
11	26	37	33	e12	69	e51	75	39	23	9.4	3.9	1.5
12	21	37	30	e12	70	e49	80	36	37	8.3	3.5	1.4
13	19	34	28	e12	e68	47	77	34	44	7.6	3.9	1.4
14	17	30	26	e13	e65	45	70	32	40	7.0	5.2	1.4
15	17	29	25	e15	62	45	64	30	32	6.2	4.3	1.4
16	16	27	24	e19	60	46	69	29	27	5.6	3.7	1.4
17	16	25	23	e23	59	56	78	28	25	6.6	3.4	1.5
18	16	23	22	e27	57	71	80	45	22	8.2	3.1	1.5
19	19	22	24	e32	53	77	74	53	20	7.1	3.3	1.5
20	17	21	24	e39	50	76	68	50	19	6.3	3.6	1.4
21	17	19	e22	e47	e47	71	63	45	17	8.4	3.1	1.4
22	21	18	e20	86	e44	66	62	50	16	9.9	2.9	1.5
23	19	17	e18	193	e41	62	109	61	14	9.0	2.9	1.5
24	17	17	e17	366	e39	57	213	68	16	13	3.1	1.5
25	16	17	e15	434	38	53	226	68	28	10	3.4	1.9
26	16	25	e14	397	38	50	192	61	23	8.2	4.3	1.9
27	17	31	e14	317	40	46	159	54	20	7.6	4.0	1.5
28	17	26	e14	247	49	43	129	47	18	6.6	3.8	1.6
29	16	24	e13	205	---	40	105	40	19	6.0	3.3	5.1
30	22	25	e13	171	---	38	85	35	16	5.6	3.2	7.0
31	30	---	e13	141	---	37	---	40	---	5.5	2.7	---
TOTAL	669	707	800	2928	1804	1708	2586	1491	872	343.1	113.8	57.8
MEAN	21.6	23.6	25.8	94.5	64.4	55.1	86.2	48.1	29.1	11.1	3.67	1.93
MAX	47	37	40	434	119	77	226	73	54	33	5.6	7.0
MIN	16	15	13	12	38	37	36	28	14	5.5	2.7	1.4
CFSM	.44	.48	.53	1.94	1.32	1.13	1.77	.99	.60	.23	.08	.04
IN.	.51	.54	.61	2.24	1.38	1.30	1.98	1.14	.67	.26	.09	.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1999, BY WATER YEAR (WY)

	MEAN	21.4	33.8	43.9	49.7	54.4	87.7	81.3	53.6	46.5	21.4	18.0	17.4
MAX	75.0	110	80.2	159	112	220	163	114	159	62.4	67.9	60.3	
(WY)	1987	1993	1991	1993	1976	1982	1978	1983	1989	1981	1981	1981	
MIN	5.97	6.20	8.77	7.11	13.5	47.3	34.3	20.1	4.18	1.55	1.86	1.53	
(WY)	1972	1972	1977	1977	1972	1983	1971	1971	1988	1988	1988	1989	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1970 - 1999

ANNUAL TOTAL	19183.5	14079.7	
ANNUAL MEAN	52.6	38.6	44.0
HIGHEST ANNUAL MEAN			67.4
LOWEST ANNUAL MEAN			23.8
HIGHEST DAILY MEAN	326	434	629
LOWEST DAILY MEAN	4.0	1.4	.58
ANNUAL SEVEN-DAY MINIMUM	4.5	1.4	.84
INSTANTANEOUS PEAK FLOW		439	(a)664
INSTANTANEOUS PEAK STAGE		5.40	6.20
INSTANTANEOUS LOW FLOW		1.2	.48
ANNUAL RUNOFF (CFSM)	1.08	.79	.90
ANNUAL RUNOFF (INCHES)	14.65	10.75	12.27
10 PERCENT EXCEEDS	119	70	94
50 PERCENT EXCEEDS	31	25	30
90 PERCENT EXCEEDS	14	3.3	7.0

(a) Gage height 6.0 ft. from floodmark.

(b) Sept. 10, 12, 16, 17.

(c) Estimated.

04097187 LONG LAKE NEAR KALAMAZOO, MI

DRAINAGE AREA--6.59 mi².

PERIOD OF RECORD. --April 1958 to March 1963, December 1963 to December 1970, September 1998 to September 1999.

GAGE.--Nonrecording gage. Datum of gage is 849.84 ft above sea level (City of Portage bench mark). Prior to September 1998, nonrecording gage at different datums.

REMARKS.--Staff gage read by observer. The channel connecting Long Lake and Austin Lake is both an inlet and an outlet, depending on relative lake levels. Under natural conditions with fairly high water levels, flow will be from Long to Austin Lake. In recent years, the levels of Austin and West Lakes have been raised by water diverted from Gourdneck Creek plus water piped to Austin Lake from the nearby Pharmacia & Upjohn recharge ponds. Under these conditions flow has been from Austin to Long Lake. During the drought years of 1963-64, the channel was dry.

EXTREMES FOR PERIOD OF RECORD.—Maximum gage height observed, 6.43 ft, June 13-15, 1969, present datum; minimum observed, 1.30 ft, Sept. 15, 1999.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 3.62 ft. Oct. 1; minimum observed, 1.30 ft. Sept. 15.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY INSTANTANEOUS VALUES

[illegible]

STREAMS TRIBUTARY TO LAKE MICHIGAN

04097500 ST. JOSEPH RIVER AT THREE RIVERS, MI

LOCATION.--Lat 41°56'25", long 85°37'58", in SW1/4 SE1/4 sec. 18, T.6 S., R.11 W., St. Joseph County, Hydrologic Unit 04050001, on right bank in Scidmore Park at Three Rivers, 250 ft downstream from Rocky River, and at mile 112.

DRAINAGE AREA.--1,350 mi².

PERIOD OF RECORD.--May 1953 to September 1983, October 1992 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 781.34 ft above sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good. Flow regulated by powerplant upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1918, 8,260 ft³/s, Apr. 27, 1950.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	457	603	532	568	2760	1320	1200	2470	1200	1220	374	356
2	461	715	531	571	2660	1500	1190	2310	1200	1420	370	324
3	469	685	479	669	2560	1500	1180	2160	1200	1570	348	279
4	464	407	553	580	2340	1520	1270	2170	1080	1690	341	277
5	447	445	631	509	2290	1550	1530	2030	1090	1500	344	210
6	470	607	505	454	2210	1630	1540	1790	997	1260	338	206
7	684	467	857	513	2190	1520	1570	1570	884	1180	339	313
8	771	477	1040	750	2040	1480	1560	1540	835	955	346	349
9	876	621	987	730	2010	1510	1640	1520	854	850	346	301
10	718	722	1070	642	2010	1390	1770	1540	809	906	332	275
11	910	705	1020	583	1970	1480	1960	1490	760	836	340	309
12	836	777	841	681	1890	1410	2080	1420	776	632	346	278
13	691	946	929	702	1910	1370	2100	1410	739	728	368	210
14	638	986	936	699	1950	1390	2100	1440	786	644	491	209
15	487	961	878	622	1860	1330	2160	1270	796	541	398	277
16	724	640	728	639	1610	1320	2210	1200	748	508	373	322
17	485	740	689	682	1670	1320	2190	1130	775	477	346	319
18	699	737	790	695	1640	1440	2160	1400	779	406	336	250
19	707	725	773	779	1710	1650	2160	1300	779	390	306	206
20	657	689	645	869	1640	1710	2050	1300	673	457	258	275
21	492	679	768	1000	1530	1720	2030	1320	558	445	204	255
22	617	599	725	1260	1460	1650	1920	1350	624	629	249	273
23	665	613	647	1530	1460	1650	2440	1250	449	616	378	319
24	602	635	633	2120	1340	1580	2900	1350	416	628	365	303
25	680	624	556	2830	1330	1560	3590	1350	614	611	427	201
26	716	620	662	3070	1350	1470	3710	1420	631	496	408	226
27	656	498	696	3210	1380	1450	3740	1380	855	385	438	311
28	692	420	674	3250	1300	1310	3550	1360	930	413	424	330
29	647	525	627	3210	--	1300	3280	1340	1060	410	375	400
30	716	525	490	3090	--	1350	3000	1190	998	406	379	485
31	602	--	500	2910	--	1220	--	1200	--	391	378	--
TOTAL	19736	19393	22392	40417	52070	45600	65780	46970	24895	23600	11065	8648
MEAN	637	646	722	1304	1860	1471	2193	1515	830	761	357	288
MAX	910	986	1070	3250	2760	1720	3740	2470	1200	1690	491	485
MIN	447	407	479	454	1300	1220	1180	1130	416	385	204	201
CFSM	.47	.48	.54	.97	1.38	1.09	1.62	1.12	.61	.56	.26	.21
IN.	.54	.53	.62	1.11	1.43	1.26	1.81	1.29	.69	.65	.30	.24

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1999, BY WATER YEAR (WY)

MEAN	731	926	1114	1226	1347	1975	2054	1604	1160	791	647	627
MAX	1865	2582	2053	3493	2716	3969	3320	2870	2587	1780	1639	1628
(WY)	1994	1993	1983	1993	1968	1982	1982	1983	1980	1978	1981	1980
MIN	218	294	288	328	328	488	793	650	286	243	187	199
(WY)	1964	1965	1964	1963	1963	1964	1964	1964	1964	1964	1964	1964

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1953 - 1999

ANNUAL TOTAL	495496						380566					
ANNUAL MEAN	1358						1043			1186		
HIGHEST ANNUAL MEAN										1850		1993
LOWEST ANNUAL MEAN										365		1964
HIGHEST DAILY MEAN	4270				Jan 11		3740		Apr 27	7810		Mar 21 1982
LOWEST DAILY MEAN	194				Aug 2		201		Sep 25	78		Sep 12 1964
ANNUAL SEVEN-DAY MINIMUM	343				Jul 13		256		Sep 13	126		Sep 2 1964
INSTANTANEOUS PEAK FLOW							3980		Apr 25	8180		Mar 21 1982
INSTANTANEOUS PEAK STAGE							7.32		Apr 25	10.69		Mar 21 1982
ANNUAL RUNOFF (CFSM)	1.01						.77			.88		
ANNUAL RUNOFF (INCHES)	13.65						10.49			11.94		
10 PERCENT EXCEEDS	2930						2040			2290		
50 PERCENT EXCEEDS	888						771			965		
90 PERCENT EXCEEDS	465						343			402		

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 sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Since 1987, some diversion by pumping for sprinkler irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	71	74	e76	190	134	114	196	112	139	39	39
2	45	70	76	e75	185	135	113	184	112	171	38	38
3	46	69	77	e74	185	138	115	173	111	167	35	38
4	47	68	78	e74	183	139	130	163	106	148	36	37
5	47	66	78	e74	176	139	147	157	100	129	38	36
6	51	64	83	e74	172	141	156	156	95	114	36	36
7	74	62	103	e74	170	139	154	153	91	101	36	36
8	85	62	103	e74	169	135	147	148	86	92	38	36
9	84	61	99	e74	166	133	161	143	83	87	37	35
10	78	70	93	e74	166	132	177	138	81	80	38	35
11	72	83	90	e74	168	128	192	132	77	74	35	34
12	67	86	87	e74	171	125	195	129	77	68	35	34
13	65	85	84	e75	169	123	194	130	78	64	39	34
14	62	83	82	e75	163	120	183	126	82	59	42	34
15	61	79	81	e76	157	119	173	120	82	53	43	34
16	60	76	80	e77	153	119	186	115	79	48	43	33
17	60	73	80	e78	152	126	195	114	76	46	41	33
18	63	71	80	e82	149	145	202	134	72	45	38	33
19	65	68	80	e88	144	162	194	137	70	45	37	33
20	64	67	81	e96	141	166	182	132	68	44	36	33
21	65	65	83	e110	136	160	172	123	65	49	36	32
22	66	64	84	124	131	154	169	123	59	56	34	32
23	66	62	78	171	126	148	216	131	53	62	33	32
24	65	64	75	251	123	142	286	142	58	63	34	32
25	64	63	77	334	123	136	352	146	74	59	46	33
26	63	67	79	323	121	132	326	145	80	54	47	33
27	64	70	79	282	122	128	283	138	139	50	49	33
28	65	70	78	254	129	125	252	128	145	45	48	35
29	66	69	79	235	---	122	229	119	137	41	46	44
30	71	71	e78	219	---	119	210	112	120	39	44	47
31	72	---	e77	203	---	116	---	112	---	39	41	---
TOTAL	1968	2099	2556	4044	4340	4180	5805	4299	2668	2331	1218	1054
MEAN	63.5	70.0	82.5	130	155	135	194	139	88.9	75.2	39.3	35.1
MAX	85	86	103	334	190	166	352	196	145	171	49	47
MIN	45	61	74	74	121	116	113	112	53	39	33	32
CFSM	.60	.66	.78	1.23	1.46	1.27	1.83	1.31	.84	.71	.37	.33
IN.	.69	.74	.90	1.42	1.52	1.47	2.04	1.51	.94	.82	.43	.37

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1999, BY WATER YEAR (WY)

MEAN	64.1	84.1	107	110	116	154	159	121	99.0	64.2	53.9	54.6
MAX	150	222	177	258	218	336	259	226	254	144	148	135
(WY)	1987	1993	1983	1993	1968	1982	1978	1983	1989	1986	1981	1977
MIN	17.2	22.9	25.2	29.7	29.1	47.2	75.6	58.7	32.9	13.3	15.8	14.1
(WY)	1965	1965	1964	1963	1963	1964	1964	1963	1964	1988	1964	1974

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1963 - 1979

ANNUAL TOTAL	41807											
ANNUAL MEAN	115						36562			98.8		
HIGHEST ANNUAL MEAN							100			153		1973
LOWEST ANNUAL MEAN										33.5		1974
HIGHEST DAILY MEAN	444						352	Apr 25		782		Feb 26 1975
LOWEST DAILY MEAN	16						32	Sep 21		5.7		Aug 5 1979
ANNUAL SEVEN-DAY MINIMUM	17						32	Sep 18		7.9		Jul 31 1978
INSTANTANEOUS PEAK FLOW							358	Apr 25		797		Feb 26 1975
INSTANTANEOUS PEAK STAGE							5.08	Apr 25		6.30		Feb 26 1975
INSTANTANEOUS LOW FLOW										5.4		(a)
ANNUAL RUNOFF (CFSM)	1.08						.94			.93		
ANNUAL RUNOFF (INCHES)	14.67						12.83			12.66		
10 PERCENT EXCEEDS	220						172			176		
50 PERCENT EXCEEDS	83						80			85		
90 PERCENT EXCEEDS	45						37			35		

(a) Aug. 4, 5, 1988.

(e) Estimated.

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., St. Joseph County, Hydrologic Unit 04050001, on right bank 575 ft upstream from bridge on U.S. Highway 12 in Mottville, 0.4 mi downstream from Indiana 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 above sea level (Indiana Michigan Power Co. bench mark). Prior to Oct. 1, 1951, at site 0.4 mi upstream at datum 4.2 ft higher.

REMARKS.--Records good. Flow regulated by powerplants upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	700	901	943	892	3710	1720	1690	3710	1800	1840	644	655
2	727	1020	995	822	3610	e2040	1720	3220	1750	2080	595	591
3	748	990	932	921	3480	e2030	1690	3040	1750	2100	594	522
4	740	811	983	e870	3310	2040	1830	2980	1640	2350	578	501
5	743	614	1070	e750	3080	2110	2090	2840	1640	2220	581	430
6	836	921	1000	e700	3020	2210	2090	2620	1560	2000	572	411
7	1070	790	1290	e800	3000	2100	2100	2230	1560	1810	563	536
8	1180	795	1420	e1050	2870	2020	2130	2200	1460	1510	586	572
9	1250	923	1290	e1100	2780	2080	2310	2130	1470	1330	574	530
10	1120	1020	1420	e950	2770	1940	2400	2180	1300	1310	607	450
11	1250	1130	1330	e900	2710	2030	2540	2110	965	1290	570	517
12	1200	1120	1180	e1000	2680	1950	2760	2000	1140	993	553	500
13	1050	1230	1270	e1020	2620	1930	2770	1970	1260	1100	659	405
14	1020	1280	1240	e1050	2630	1920	2780	2000	1210	1000	708	370
15	828	1280	1200	e950	2530	1830	2820	1850	1230	845	684	442
16	1060	1150	1070	e880	2290	1860	3070	1760	1200	804	620	519
17	793	1180	1020	e860	2240	1870	2990	1610	1180	788	581	522
18	983	1120	1110	e900	2310	2010	2910	1990	1180	703	565	421
19	990	1100	1140	e950	2320	2230	2950	1850	1160	638	559	382
20	908	1040	985	e1050	2270	2310	2820	1780	1090	720	499	446
21	826	1070	1110	e1200	2110	2350	2770	1770	955	768	453	430
22	895	963	1150	1630	2020	2230	2750	1890	975	907	424	438
23	958	1100	936	1900	1990	2240	3200	1820	856	939	632	516
24	930	1000	946	2490	1860	2170	3780	1860	743	937	632	478
25	1000	1010	877	3340	1810	2140	4280	1840	1020	907	766	382
26	1050	1030	980	3840	1820	2000	4720	2050	1100	808	747	344
27	983	901	1040	4020	1910	2030	4700	1990	1290	657	801	532
28	1040	814	1000	4200	1830	1820	4620	1980	1430	686	781	437
29	976	902	1010	4250	---	1790	4370	1940	1750	664	676	850
30	1050	982	784	4130	---	1830	4130	1750	1690	640	696	753
31	927	---	783	3930	---	1710	---	1790	---	667	654	---
TOTAL	29831	30187	33504	58345	71580	62540	87780	66750	39354	36011	19154	14882
MEAN	962	1006	1081	1721	2556	2017	2926	2153	1312	1162	618	496
MAX	1250	1280	1420	4250	3710	2350	4720	3710	1800	2350	801	850
MIN	700	614	783	700	1810	1710	1690	1610	743	638	424	344
CFSM	.52	.54	.58	.92	1.37	1.08	1.57	1.15	.70	.62	.33	.27
IN.	.59	.60	.67	1.06	1.43	1.25	1.75	1.33	.78	.72	.38	.30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1924 - 1999, BY WATER YEAR (WY)

	MEAN	1103	1341	1568	1753	1882	2568	2696	2130	1672	1164	954	955
MAX	3290	3378	4065	4589	3451	5335	7646	5009	5004	2953	2413	2286	
(WY)	1987	1993	1928	1993	1968	1982	1950	1943	1989	1937	1981	1980	
MIN	372	483	507	531	505	751	904	786	509	407	335	357	
(WY)	1964	1965	1964	1963	1963	1964	1931	1931	1964	1988	1964	1964	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1924 - 1999

ANNUAL TOTAL	678459	544918	(a)1650
ANNUAL MEAN	1859	1493	2856
HIGHEST ANNUAL MEAN			1950
LOWEST ANNUAL MEAN			580
HIGHEST DAILY MEAN	5370	4720	10700
LOWEST DAILY MEAN	402	344	39
ANNUAL SEVEN-DAY MINIMUM	539	433	278
INSTANTANEOUS PEAK FLOW		4760	(b)11400
INSTANTANEOUS PEAK STAGE		6.42	(c)10.76
ANNUAL RUNOFF (CFSM)	1.00	.80	.88
ANNUAL RUNOFF (INCHES)	13.53	10.86	12.01
10 PERCENT EXCEEDS	3830	2770	3010
50 PERCENT EXCEEDS	1280	1140	1390
90 PERCENT EXCEEDS	762	576	638

(a) Does not include water year 1924.

(b) Gage height 10.41 ft.

(c) Present datum.

(e) Estimated.

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 from the Indiana District Office.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 700.00 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are poor. Flow regulated by Elkhart Hydroelectric Plant.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1660	1810	2030	e1560	7050	3750	3260	7430	3420	3250	1390	1300
2	1600	1960	2070	e1550	6850	3840	3240	6590	3580	3810	1310	1220
3	1700	1950	2050	e1540	6670	4090	3190	6160	3530	3660	1260	1140
4	1660	1840	2000	e1540	6390	4210	3470	5810	3300	3560	1240	1140
5	1640	1560	2120	e1530	5920	4050	3870	5510	3210	3410	1230	1030
6	1720	1780	2110	e1520	5830	4420	3940	5160	3090	3140	1190	1020
7	2270	1770	2420	e1520	5640	4470	3910	4640	3020	2860	1190	1030
8	2670	1720	2610	e1510	5500	4160	3790	4510	2910	2640	1240	1140
9	2540	1750	2430	e1510	5500	4110	4160	4280	2770	2320	1210	1110
10	2450	2010	2540	e1500	5450	3950	4920	4210	2620	2340	1220	1010
11	2320	2250	2400	e1490	5150	4030	5250	4030	2380	2240	1220	1070
12	2400	2280	2220	e1490	5180	4000	5530	3870	2340	1940	1230	1060
13	2180	2280	2440	e1490	5040	3890	5380	3770	2690	2000	1260	978
14	2040	2340	2210	e1480	4890	3760	5180	3660	2630	1880	1430	927
15	1930	2300	2340	e1480	4790	3710	5100	3540	2660	1730	1370	967
16	1950	2140	2130	e1480	4570	3670	5750	3350	2520	1560	1290	1060
17	1910	2260	2110	e1490	4240	3920	6250	3280	2480	1560	1250	1050
18	1850	2150	2050	e1560	4380	4620	6070	3570	2440	1460	1180	1030
19	2080	2090	2300	e1760	4200	4620	5940	3510	2340	1410	1280	889
20	1960	2030	2000	e2150	4200	4440	5780	3500	2290	1490	1150	921
21	1810	2010	2210	e2700	3950	4400	5570	3360	2060	1500	1170	1060
22	1810	1870	2240	e3500	3800	4330	5750	3640	2070	1600	1080	884
23	1910	1980	1950	e5600	3680	4220	8000	3640	1930	1720	1220	1000
24	1900	2030	1800	7830	3550	4170	10000	4050	1770	1740	1300	1040
25	1890	1950	1880	8050	3430	4040	9350	4340	2030	1630	1460	911
26	2020	1990	1980	7910	3420	3910	9270	4180	2260	1560	1550	856
27	1910	1940	2140	7810	3480	3810	8930	3960	2360	1360	1630	959
28	1980	1770	2220	7990	3630	3640	8770	3810	2770	1370	1570	1050
29	1890	1800	2290	7980	---	3480	8540	3680	2950	1390	1430	1440
30	2050	1990	1890	7830	---	3450	8030	3490	3000	1400	1370	1380
31	2000	---	1570	7520	---	3360	---	3520	---	1320	1310	---
TOTAL	61700	59600	66750	105870	136380	124520	176190	132050	79420	64850	40230	31062
MEAN	1990	1987	2153	3415	4871	4017	5873	4260	2647	2092	1298	1055
MAX	2670	2340	2610	8050	7050	4620	10000	7430	3580	3810	1630	1440
MIN	1600	1560	1570	1480	3420	3360	3190	3280	1770	1320	1080	856
CFSM	.59	.59	.64	1.01	1.45	1.19	1.74	1.26	.79	.62	.39	.31
IN.	.68	.66	.74	1.17	1.51	1.37	1.94	1.46	.88	.72	.44	.35

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1999, BY WATER YEAR (WY)

	MEAN	2198	2643	3211	3649	3900	5134	5252	4124	3260	2379	1975	1894
MAX	5752	5883	5795	9270	7039	10760	12690	7725	7535	4409	4180	3045	
(WY)	1987	1993	1991	1993	1968	1982	1950	1956	1989	1968	1981	1981	
MIN	791	856	958	1127	1120	1679	2633	1911	1280	898	737	721	
(WY)	1964	1965	1964	1964	1963	1964	1958	1958	1988	1988	1964	1964	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1948 - 1999
ANNUAL TOTAL	1354390	1079222	
ANNUAL MEAN	3711	2957	3297
HIGHEST ANNUAL MEAN			5264
LOWEST ANNUAL MEAN			1283
HIGHEST DAILY MEAN	10900	10000	18500
LOWEST DAILY MEAN	1100	856	336
ANNUAL SEVEN-DAY MINIMUM	1320	953	561
INSTANTANEOUS PEAK FLOW		10200	18800
INSTANTANEOUS PEAK STAGE		23.60	27.91
ANNUAL RUNOFF (CFSM)	1.10	.88	.98
ANNUAL RUNOFF (INCHES)	14.95	11.91	13.29
10 PERCENT EXCEEDS	7230	5520	5860
50 PERCENT EXCEEDS	2610	2280	2810
90 PERCENT EXCEEDS	1720	1220	1390

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101500 ST. JOSEPH RIVER AT NILES, MI

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 in Niles, 0.6 mi downstream from dam at French Paper Co., 1.3 mi upstream from Dowagiac River, and at mile 44.

DRAINAGE AREA.--3,666 mi².

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 sea level. 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 sea level 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. Since Apr. 13, 1970, auxiliary water-stage recorder at sewage-treatment plant, 1.1 mi downstream from base gage at same datum.

REMARKS.--Records good. Flow regulated by powerplants upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2000	2380	2430	1980	7980	4480	3820	8630	4180	3840	1710	1480
2	1910	2400	2480	1940	7850	4490	3760	7750	4030	4570	1570	1530
3	2070	2340	2480	e1900	7680	4800	3750	7150	4170	4310	1560	1670
4	2040	2370	2460	e1900	7310	5080	4130	6770	3900	3920	1560	1350
5	2020	2080	2480	e1900	6830	4720	4600	6400	3700	3900	1540	1340
6	2130	2000	2650	e1900	6610	5160	4470	6030	3580	3630	1470	1290
7	2540	2370	2900	e1900	6440	5250	4510	5570	3400	3350	1490	1260
8	3150	2350	2820	e1900	6370	4960	4410	5200	3470	3020	1480	1290
9	2940	2240	2890	e1900	6620	4720	5260	5020	3330	2770	1490	1390
10	2950	2600	2910	e1950	6450	4690	6090	4880	3220	2640	1500	1350
11	2700	2640	2830	e1950	6240	4530	6310	4770	2960	2610	1510	1120
12	2850	2860	2780	e2000	5740	4590	6640	4610	2640	2430	1480	1470
13	2650	2750	2640	e2000	5750	4500	6120	4350	3600	2230	1610	1380
14	2490	2860	2850	e2100	5490	4400	6000	4310	3530	2250	1610	1050
15	2440	2840	2850	e2200	5520	4330	5850	4260	3330	2030	1690	1390
16	2230	2750	2620	e2300	5260	4280	6900	3980	3050	1840	1490	1320
17	2480	2670	2540	2460	4920	4550	7450	3850	2940	1800	1580	1220
18	2230	2730	2450	2790	5120	5660	7050	4040	3010	1850	1500	1360
19	2500	2540	2650	3010	4860	5400	e6760	4180	2810	1560	1620	1350
20	2400	2520	2500	3160	4860	5130	6470	4020	2740	1580	1500	1210
21	2360	2470	2530	3350	4560	5040	6250	3990	e2570	1670	1440	1220
22	2270	2410	2510	4450	4460	4950	6700	4020	e2480	1930	1340	1230
23	2260	2450	2580	7690	4290	4790	10100	4300	2300	2140	1510	1230
24	2360	2530	2110	10300	4140	4740	12400	4460	2170	1990	1630	1290
25	2330	2470	2180	9790	4040	4700	11000	4970	2310	1980	1930	1280
26	2440	2450	2250	9090	3910	4490	10400	4750	2690	1870	1810	1170
27	2360	2460	2470	8720	4040	4430	10000	4590	2950	1780	1940	962
28	2380	2230	2540	8860	4250	4220	10100	4320	3170	1630	1870	1310
29	2410	2210	2580	8780	---	4010	9840	4250	3330	1720	1780	1720
30	2670	2340	2430	8610	---	3950	9240	4160	3470	1670	1600	1700
31	2700	---	2070	8370	---	3940	---	3960	---	1660	1650	---
TOTAL	75260	74310	79460	131150	157590	144980	206380	153540	95030	76170	49460	39932
MEAN	2428	2477	2563	4231	5628	4677	6879	4953	3168	2457	1595	1331
MAX	3150	2860	2910	10300	7980	5660	12400	8630	4180	4570	1940	1720
MIN	1910	2000	2070	1900	3910	3940	3750	3850	2170	1560	1340	962
CFSM	.66	.68	.70	1.15	1.54	1.28	1.88	1.35	.86	.67	.44	.36
IN.	.76	.75	.81	1.33	1.60	1.47	2.09	1.56	.96	.77	.50	.41

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

	MEAN	2347	2755	3182	3641	3967	5283	5501	4425	3494	2542	2133	2056
MAX	6217	6564	6689	9810	7371	11560	13590	10760	8176	4989	4497	4103	
(WY)	1987	1993	1991	1993	1968	1982	1950	1943	1989	1981	1981	1981	
MIN	1056	932	1131	1239	1196	1857	2164	1579	1254	1033	828	885	
(WY)	1964	1965	1964	1964	1964	1964	1931	1931	1934	1934	1941	1941	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1931 - 1999

ANNUAL TOTAL	1545210		1283262										
ANNUAL MEAN	4233		3516										
HIGHEST ANNUAL MEAN										3440			
LOWEST ANNUAL MEAN										5718			1950
HIGHEST DAILY MEAN	12100									1464			1964
LOWEST DAILY MEAN	1320									19800			Mar 21 1982
ANNUAL SEVEN-DAY MINIMUM	1570									420			Aug 30 1931
INSTANTANEOUS PEAK FLOW										728			Aug 26 1941
INSTANTANEOUS PEAK STAGE										20200			Apr 5 1950
ANNUAL RUNOFF (CFSM)	1.15									(a)15.10			Apr 5 1950
ANNUAL RUNOFF (INCHES)	15.68									.94			
10 PERCENT EXCEEDS	8090									6170			
50 PERCENT EXCEEDS	3080									2850			
90 PERCENT EXCEEDS	2070									1490			

(a) Present datum.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101800 DOWAGIAC RIVER AT SUMNERVILLE, MI

LOCATION.--Lat 41°54'48", 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 sea level.

REMARKS.--Records good. Flow regulated by millpond and lake-level control dam upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	154	227	219	205	389	395	255	343	276	351	e103	137
2	151	217	214	155	428	373	257	326	291	372	e102	129
3	164	209	211	160	483	418	255	311	287	298	99	123
4	162	202	209	195	436	383	299	299	263	267	96	119
5	159	201	207	206	392	351	329	288	244	240	99	116
6	165	202	225	224	411	368	305	285	226	215	98	115
7	231	207	380	227	403	353	289	303	213	194	101	117
8	221	208	327	226	386	337	278	288	201	180	118	116
9	213	212	288	227	382	330	366	284	193	175	117	112
10	200	295	267	210	364	323	388	274	188	187	131	111
11	187	364	253	211	355	316	365	264	203	208	140	111
12	178	324	240	221	378	307	352	265	350	197	132	109
13	174	298	232	228	360	300	321	263	302	180	139	107
14	172	280	226	216	340	295	303	259	291	167	139	102
15	171	263	222	221	338	299	295	253	261	150	129	99
16	169	250	218	226	341	314	387	244	245	140	120	101
17	167	240	221	230	351	411	390	245	227	144	109	99
18	176	232	222	341	335	487	346	278	211	151	103	98
19	184	230	228	362	320	412	325	262	200	147	113	96
20	180	223	226	336	304	369	307	246	190	148	120	97
21	181	218	229	319	290	348	298	235	182	144	116	100
22	198	215	228	528	277	325	398	235	176	158	110	104
23	193	214	214	871	269	313	919	237	170	149	116	107
24	191	211	212	1070	262	302	952	259	191	143	128	107
25	189	210	208	887	269	286	683	254	229	141	168	109
26	188	210	206	660	273	280	531	244	202	e135	204	109
27	186	207	203	555	303	275	466	230	278	e131	186	109
28	198	206	205	566	336	270	421	220	255	e123	174	114
29	202	206	207	495	---	264	386	208	245	e115	161	137
30	238	209	206	443	---	253	362	200	226	e107	152	136
31	237	---	203	411	---	255	---	203	---	e104	144	---
TOTAL	5779	6990	7156	11432	9775	10317	11828	8105	7016	5561	3967	3346
MEAN	186	233	231	369	349	333	394	261	234	179	128	112
MAX	238	364	380	1070	483	487	952	343	350	372	204	137
MIN	151	201	203	155	262	255	255	200	170	104	96	96
CFSM	.73	.91	.91	1.45	1.37	1.31	1.55	1.03	.92	.70	.50	.44
IN.	.84	1.02	1.04	1.67	1.43	1.51	1.73	1.18	1.02	.81	.58	.49

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1999, BY WATER YEAR (WY)

	MEAN	258	309	331	320	338	410	405	332	271	219	195	210
MAX	530	490	513	548	508	629	552	490	414	333	326	401	
(WY)	1987	1991	1992	1993	1985	1985	1993	1981	1996	1978	1992	1993	
MIN	132	179	179	166	177	251	297	205	142	133	101	112	
(WY)	1964	1965	1964	1963	1963	1964	1971	1964	1964	1988	1964	1999	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1961 - 1999
ANNUAL TOTAL	105201	91272	
ANNUAL MEAN	288	250	300
HIGHEST ANNUAL MEAN			401
LOWEST ANNUAL MEAN			177
HIGHEST DAILY MEAN	835	Jan 9	1550
LOWEST DAILY MEAN	115	Aug 3	87
ANNUAL SEVEN-DAY MINIMUM	122	Jul 29	89
INSTANTANEOUS PEAK FLOW		1090	1590
INSTANTANEOUS PEAK STAGE		7.79	9.26
INSTANTANEOUS LOW FLOW		(a)70	(a)70
ANNUAL RUNOFF (CFSM)	1.13	.98	1.17
ANNUAL RUNOFF (INCHES)	15.35	13.31	15.96
10 PERCENT EXCEEDS	481	381	456
50 PERCENT EXCEEDS	232	226	278
90 PERCENT EXCEEDS	154	116	163

(a) Result of regulation.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04102500 PAW PAW RIVER AT RIVERSIDE, MI

LOCATION.--Lat 42°11'10", long 86°22'06", in SW1/4 SE1/4 sec.23, T.3 S., R.18 W., Berrien County, Hydrologic Unit 04050001, on left bank 40 ft upstream from bridge on Coloma Road, 0.8 mi east of Riverside.

DRAINAGE AREA.--390 mi².

PERIOD OF RECORD.--October 1951 to current year.

REVISED RECORDS.--WSP 1337: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 588.80 ft above sea level. May 10, 1966 to July 11, 1967, nonrecording gage at same site and datum.

REMARKS.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	210	277	283	e270	753	453	353	678	323	357	192	207
2	216	268	284	e270	708	488	355	578	340	409	188	203
3	220	253	296	e270	666	504	357	512	356	403	190	195
4	220	247	290	e270	640	524	383	466	366	399	189	186
5	219	244	279	e265	603	530	456	440	357	391	190	189
6	233	238	297	e265	579	529	493	427	327	353	188	191
7	253	229	334	e265	576	517	506	411	298	308	194	183
8	274	230	347	e265	572	495	513	402	281	272	208	172
9	279	235	349	e265	545	474	538	397	270	271	205	176
10	289	276	352	e265	518	456	590	388	260	271	219	182
11	280	318	357	e265	499	441	595	374	249	322	227	175
12	263	327	345	e265	495	429	580	364	288	338	225	174
13	236	340	327	e265	494	421	601	358	321	312	224	186
14	230	348	299	e270	480	415	618	349	368	272	218	179
15	233	356	299	e290	468	413	593	344	361	265	213	176
16	238	344	300	e320	466	417	557	338	326	245	212	177
17	271	332	291	365	470	447	533	335	303	224	205	180
18	301	310	290	415	470	520	502	357	282	223	192	184
19	303	295	283	483	460	566	481	365	265	231	195	180
20	292	290	306	508	452	541	474	381	258	231	201	178
21	291	282	316	518	442	530	470	379	254	232	199	178
22	299	276	310	618	427	525	538	354	250	251	196	178
23	278	271	295	812	405	497	942	333	245	273	196	178
24	264	266	275	1150	383	461	1320	339	249	301	197	178
25	266	265	301	1090	376	437	1150	335	259	277	207	179
26	263	265	316	930	379	414	1500	335	253	240	224	179
27	265	266	311	952	387	399	1500	337	308	216	236	177
28	271	266	297	1100	421	397	1210	321	319	224	254	182
29	268	267	283	1100	---	369	986	301	316	224	260	189
30	281	273	281	965	---	371	814	289	353	218	224	196
31	281	---	e275	827	---	374	---	284	---	205	208	---
TOTAL	8087	8454	9468	16178	14134	14344	20508	11871	9005	8759	6476	5487
MEAN	261	282	305	522	505	463	684	383	300	283	209	183
MAX	303	356	357	1150	753	566	1500	678	368	409	260	207
MIN	210	229	275	265	376	369	353	284	245	205	188	172
CFSM	.67	.72	.78	1.34	1.29	1.19	1.75	.98	.77	.72	.54	.47
IN.	.77	.81	.90	1.54	1.35	1.37	1.96	1.13	.86	.84	.62	.52

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

	MEAN	377	445	507	514	544	677	649	503	400	319	283	300
MAX	1217	826	906	1038	1004	1234	961	799	686	581	557	569	
(WY)	1987	1989	1991	1952	1997	1979	1985	1974	1969	1982	1980	1975	
MIN	178	223	232	226	256	390	361	287	200	180	163	158	
(WY)	1964	1954	1959	1959	1963	1957	1958	1958	1964	1963	1964	1963	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1952 - 1999
ANNUAL TOTAL	149483	132771	
ANNUAL MEAN	410	364	459
HIGHEST ANNUAL MEAN			606
LOWEST ANNUAL MEAN			273
HIGHEST DAILY MEAN	1210	1500	3460
LOWEST DAILY MEAN	202	172	120
ANNUAL SEVEN-DAY MINIMUM	212	178	134
INSTANTANEOUS PEAK FLOW		1620	3580
INSTANTANEOUS PEAK STAGE		9.18	10.90
INSTANTANEOUS LOW FLOW		170	99
ANNUAL RUNOFF (CFSM)	1.05	.93	1.18
ANNUAL RUNOFF (INCHES)	14.26	12.66	16.00
10 PERCENT EXCEEDS	731	550	753
50 PERCENT EXCEEDS	309	301	403
90 PERCENT EXCEEDS	227	196	230

(e) Estimated.

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-81-1: 1973-75(M), 1979(M).

GAGE.--Water-stage recorder. Elevation of gage is 610 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Occasional regulation caused by mills upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	38	41	e37	118	103	56	104	47	36	24	21
2	29	38	40	e37	115	109	55	89	48	38	22	20
3	30	37	39	e37	139	113	53	73	48	36	21	19
4	29	35	38	e37	137	113	62	67	46	34	20	19
5	38	35	39	e37	121	99	88	63	43	32	21	19
6	40	34	40	e36	114	94	85	63	40	32	20	20
7	44	34	53	e36	111	90	76	63	38	31	20	18
8	41	34	53	e36	103	e86	71	61	37	30	23	18
9	38	34	48	e36	96	82	140	60	35	37	21	19
10	35	45	45	e36	91	80	216	57	35	36	22	20
11	34	54	43	e36	87	78	179	54	35	33	22	19
12	33	48	41	e36	95	77	155	53	35	32	22	20
13	33	45	40	e36	100	75	132	55	35	31	26	20
14	32	43	39	e36	92	73	111	54	36	30	23	20
15	32	41	38	e38	88	74	97	51	34	29	22	18
16	32	40	38	e40	87	79	106	49	33	28	22	18
17	32	39	39	e45	90	121	118	50	33	28	21	18
18	36	38	39	e50	91	163	104	55	32	28	21	19
19	39	37	38	e60	86	134	92	56	31	27	23	20
20	38	36	38	e70	81	110	84	53	31	27	24	19
21	39	35	38	e80	75	98	79	50	30	35	27	18
22	42	35	39	e120	70	89	192	47	30	32	23	20
23	40	34	e39	e250	67	82	555	45	29	29	22	20
24	39	34	e40	419	64	76	741	48	29	28	23	21
25	38	34	40	331	64	71	495	49	30	28	24	22
26	37	34	39	249	64	68	369	46	28	28	25	22
27	35	34	39	214	68	67	284	42	33	28	25	22
28	35	33	39	215	76	64	217	41	32	28	24	24
29	37	34	36	196	---	61	166	41	31	27	23	25
30	38	35	37	161	---	59	125	40	31	26	22	26
31	39	---	e37	135	---	57	---	41	---	26	20	---
TOTAL	1112	1127	1252	3182	2590	2745	5303	1720	1055	950	698	604
MEAN	35.9	37.6	40.4	103	92.5	88.5	177	55.5	35.2	30.6	22.5	20.1
MAX	44	54	53	419	139	163	741	104	48	38	27	26
MIN	28	33	36	36	64	57	53	40	28	26	20	18
CFSM	.43	.45	.48	1.23	1.11	1.06	2.11	.66	.42	.37	.27	.24
IN.	.49	.50	.56	1.42	1.15	1.22	2.36	.77	.47	.42	.31	.27

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1999, BY WATER YEAR (WY)

	MEAN	66.9	95.1	130	125	143	186	166	102	86.6	59.0	44.9	57.6
MAX	362	282	272	244	377	389	327	182	261	181	141	329	
(WY)	1987	1991	1983	1973	1997	1979	1975	1975	1997	1986	1980	1986	
MIN	33.8	37.6	40.4	42.8	74.4	83.8	68.9	44.4	31.7	28.4	22.5	20.1	
(WY)	1975	1999	1999	1977	1987	1996	1971	1971	1971	1988	1999	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1966 - 1999

ANNUAL TOTAL	29577		22338										
ANNUAL MEAN	81.0		61.2										
HIGHEST ANNUAL MEAN										105			
LOWEST ANNUAL MEAN										134			1997
HIGHEST DAILY MEAN										61.2			1999
LOWEST DAILY MEAN													
ANNUAL SEVEN-DAY MINIMUM	664		Mar 19							1810			Feb 22 1997
INSTANTANEOUS PEAK FLOW	26		Jul 16							18			Sep 7 1999
INSTANTANEOUS PEAK STAGE	27		Jul 13							19			Sep 15 1999
INSTANTANEOUS LOW FLOW										(a)2390			Feb 21 1997
ANNUAL RUNOFF (CFSM)	.97									14.90			Feb 21 1997
ANNUAL RUNOFF (INCHES)	13.16									16			Sep 7 1999
10 PERCENT EXCEEDS	167									1.26			
50 PERCENT EXCEEDS	39									17.09			
90 PERCENT EXCEEDS	30									203			
										74			
										33			

(a) From rating curve extended above 1,800 ft³/s.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04102776 MIDDLE BRANCH BLACK RIVER NEAR SOUTH HAVEN, MI

LOCATION.--Lat 42°25'57", long 86°12'25", in NE1/4 NE1/4 sec.32, T.1 N., R.16 W., Allegan County, Hydrologic Unit 04050002, on left bank 10 ft downstream from bridge on 68th Street, 4.0 mi northeast of South Haven.

DRAINAGE AREA.--83.0 mi².

PERIOD OF RECORD.--October 1994 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 590 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	57	51	e41	131	102	63	105	50	38	24	19
2	27	54	51	e40	126	101	63	98	54	43	24	19
3	29	52	48	e40	142	113	62	92	55	38	22	17
4	31	50	47	e40	133	110	74	86	51	36	22	16
5	31	49	46	e40	125	101	86	81	48	33	22	17
6	40	48	47	e40	127	100	83	86	45	31	22	16
7	64	48	68	e39	126	91	81	86	43	29	23	17
8	51	49	71	e39	115	e90	77	80	40	28	26	16
9	43	50	63	e39	109	e88	107	78	39	31	25	16
10	40	63	58	e39	103	87	150	74	38	34	25	16
11	38	87	55	e39	99	85	135	70	37	31	27	16
12	37	74	52	e39	111	83	141	67	49	29	25	16
13	36	64	50	e39	106	82	127	66	47	28	27	18
14	35	59	48	e39	100	78	112	63	51	27	26	18
15	36	55	46	e41	98	80	102	61	46	26	23	18
16	35	52	46	e45	98	85	108	60	42	25	22	18
17	36	49	46	e50	101	100	113	68	40	24	20	17
18	44	47	47	e58	99	104	103	84	38	25	20	17
19	50	45	48	e70	94	98	96	77	36	24	23	17
20	46	43	48	e85	90	96	90	71	35	24	25	18
21	47	42	47	e100	85	92	85	65	35	52	23	17
22	54	41	48	e140	78	87	131	61	34	68	22	17
23	53	41	e47	e210	76	83	281	59	33	45	22	17
24	50	40	e46	325	72	79	380	66	32	38	24	17
25	49	39	e45	281	72	76	347	64	33	34	25	17
26	49	39	e44	239	74	73	336	59	32	32	27	17
27	49	39	e42	241	79	71	260	56	39	31	26	17
28	51	38	e41	221	86	69	192	53	40	28	24	19
29	51	38	e41	194	---	68	143	50	35	27	22	24
30	57	41	e41	165	---	66	118	48	34	27	21	25
31	61	---	e41	146	---	64	---	48	---	24	20	---
TOTAL	1347	1493	1519	3164	2855	2702	4246	2182	1231	1010	729	529
MEAN	43.5	49.8	49.0	102	102	87.2	142	70.4	41.0	32.6	23.5	17.6
MAX	64	87	71	325	142	113	380	105	55	68	27	25
MIN	27	38	41	39	72	64	62	48	32	24	20	16
CFSM	.52	.60	.59	1.23	1.23	1.05	1.71	.85	.49	.39	.28	.21
IN.	.60	.67	.68	1.42	1.28	1.21	1.90	.98	.55	.45	.33	.24

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1995 - 1999, BY WATER YEAR (WY)

	MEAN	46.0	95.4	93.0	135	150	141	132	101	138	48.0	35.9	32.8
MAX	53.9	155	122	167	317	200	162	122	397	90.5	58.3	60.1	
(WY)	1998	1995	1997	1997	1997	1998	1998	1995	1997	1997	1997	1997	
MIN	38.4	49.8	49.0	91.0	95.2	77.8	79.0	70.4	40.2	28.4	23.5	17.6	
(WY)	1997	1999	1999	1996	1996	1996	1996	1999	1998	1998	1999	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1995 - 1999

ANNUAL TOTAL	29934		23007										
ANNUAL MEAN	82.0		63.0										
HIGHEST ANNUAL MEAN										95.3			
LOWEST ANNUAL MEAN										145		1997	
HIGHEST DAILY MEAN	446		380							63.0		1999	
LOWEST DAILY MEAN	22		16							2980		Jun 22 1997	
ANNUAL SEVEN-DAY MINIMUM	23		16							16		Sep 4 1999	
INSTANTANEOUS PEAK FLOW			16							16		Sep 6 1999	
INSTANTANEOUS PEAK STAGE			409							(a)4340		Jun 21 1997	
INSTANTANEOUS LOW FLOW			7.16							12.85		Jun 21 1997	
ANNUAL RUNOFF (CFSM)	.99		.76							15		Sep 11 1999	
ANNUAL RUNOFF (INCHES)	13.42		10.31							1.15			
10 PERCENT EXCEEDS	171		109							161			
50 PERCENT EXCEEDS	49		48							75			
90 PERCENT EXCEEDS	27		22							29			

(a) From rating curve extended above 1,400 ft³/s.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04103010 KALAMAZOO RIVER NEAR MARENGO, MI

LOCATION.--Lat 42°15'42", long 84°51'21", in SW1/4 SE1/4 sec.26, T.2 S., R.5 W., Calhoun County, Hydrologic Unit 04050003, on right bank at upstream side of bridge on B Drive North, 0.8 mi south of Marengo, and 5.0 mi west of Albion.

DRAINAGE AREA.--267 mi².

PERIOD OF RECORD.--October 1986 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 910 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some diversion by pumping for irrigation. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	160	188	173	e125	333	241	204	268	223	297	139	117
2	157	183	175	e120	331	244	205	258	216	290	131	115
3	155	177	175	e115	333	251	209	250	211	248	125	114
4	158	172	171	e125	330	250	245	242	204	225	119	112
5	159	169	168	e150	310	247	279	236	197	200	126	111
6	164	167	183	e150	298	e240	282	242	191	184	125	111
7	295	164	234	e150	290	e220	258	237	186	173	130	111
8	242	162	223	e150	283	e220	243	239	178	163	134	109
9	230	162	206	e145	284	e220	307	238	181	202	130	109
10	218	212	192	e145	294	e215	335	230	186	192	138	107
11	204	225	181	e140	301	e215	340	223	170	183	134	106
12	193	220	174	e140	306	e215	333	216	176	175	130	107
13	184	216	168	e145	295	212	317	214	177	166	141	109
14	173	205	164	e150	277	209	287	208	182	159	148	109
15	175	190	160	e145	262	209	267	206	175	153	131	108
16	174	184	159	e150	255	213	279	202	174	149	127	107
17	172	180	159	e150	255	240	279	201	174	157	124	107
18	181	176	157	e190	249	309	271	228	171	161	120	106
19	180	174	158	e200	242	326	259	228	166	153	122	106
20	179	169	158	e205	232	308	251	230	164	148	123	105
21	189	169	162	e200	e210	282	241	220	158	147	122	105
22	188	166	162	e300	e200	263	357	213	156	146	119	105
23	185	163	e150	543	e195	251	528	215	154	157	120	106
24	181	159	e150	698	e195	240	591	240	158	152	124	106
25	177	162	e145	735	e190	232	580	268	161	142	125	105
26	175	175	e145	653	e200	225	495	263	165	138	127	106
27	172	178	e140	559	212	220	420	245	174	137	129	106
28	171	177	144	499	227	217	357	223	173	135	126	106
29	169	172	146	443	---	212	314	211	275	131	123	149
30	210	173	130	395	---	208	283	203	197	129	120	144
31	198	---	e130	359	---	207	---	217	---	142	119	---
TOTAL	5768	5389	5142	8374	7389	7361	9616	7114	5473	5334	3951	3324
MEAN	186	180	166	270	264	237	321	229	182	172	127	111
MAX	295	225	234	735	333	326	591	268	275	297	148	149
MIN	155	159	130	115	190	207	204	201	154	129	119	105
CFSM	.70	.67	.62	1.01	.99	.89	1.20	.86	.68	.64	.48	.41
IN.	.80	.75	.72	1.17	1.03	1.03	1.34	.99	.76	.74	.55	.46

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1999, BY WATER YEAR (WY)

	MEAN	214	247	234	268	259	312	324	255	240	186	172	176
MAX	349	383	356	466	340	445	468	386	530	274	226	272	
(WY)	1987	1989	1991	1993	1991	1990	1993	1990	1989	1993	1989	1993	
MIN	135	167	160	158	173	186	225	177	126	111	116	111	
(WY)	1997	1988	1996	1996	1996	1996	1987	1987	1988	1988	1996	1999	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1987 - 1999
ANNUAL TOTAL	98222	74235	
ANNUAL MEAN	269	203	240
HIGHEST ANNUAL MEAN			332
LOWEST ANNUAL MEAN			176
HIGHEST DAILY MEAN	683	735	1140
LOWEST DAILY MEAN	130	105	95
ANNUAL SEVEN-DAY MINIMUM	140	105	98
INSTANTANEOUS PEAK FLOW		742	1160
INSTANTANEOUS PEAK STAGE		8.87	10.18
INSTANTANEOUS LOW FLOW			88
ANNUAL RUNOFF (CFSM)	1.01	.76	.90
ANNUAL RUNOFF (INCHES)	13.68	10.34	12.23
10 PERCENT EXCEEDS	445	295	368
50 PERCENT EXCEEDS	237	181	218
90 PERCENT EXCEEDS	161	121	138

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04104945 WANADOGA CREEK NEAR BATTLE CREEK, MI

LOCATION.--Lat 42°23'47", long 85°07'54", in NW1/4 SE1/4 sec.9, T.1 S., R.7 W., Calhoun County, Hydrologic Unit 04050003, on right bank 30 ft upstream from bridge on State Highway 66, 5.0 mi north of Battle Creek.

DRAINAGE AREA.--48.3 mi².

PERIOD OF RECORD.--October 1994 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 830 ft above sea level, from topographic map.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e14	e17	23	15	59	38	26	56	25	69	9.3	8.9
2	e14	e17	23	e16	55	39	27	46	28	89	9.3	8.7
3	e14	e16	21	e15	58	41	27	38	32	88	9.4	8.6
4	e14	e16	20	e15	58	42	33	33	24	68	9.8	8.4
5	e14	e15	20	e14	54	40	47	30	20	47	10	8.2
6	18	e15	23	e16	50	e36	49	29	18	26	9.2	8.3
7	e26	e15	e33	e17	48	e33	44	29	16	17	9.5	8.6
8	e25	e15	e37	e17	44	e30	38	28	15	15	11	8.5
9	e24	e16	e37	e16	42	e30	49	28	14	22	11	8.0
10	e23	e22	32	e16	41	e30	77	26	14	28	12	7.9
11	21	e25	27	e16	40	e30	96	25	13	20	12	8.9
12	19	e27	24	e16	44	e29	106	23	14	16	11	8.9
13	17	e26	24	e16	44	29	91	23	14	14	11	8.9
14	17	e25	22	e16	38	28	72	22	15	13	11	8.7
15	16	e24	21	e16	36	28	58	21	14	12	10	8.6
16	15	e23	21	e16	36	31	53	20	13	12	10	8.6
17	e15	e21	20	e20	38	43	53	21	13	12	9.8	8.6
18	15	e20	19	e25	38	65	50	33	11	12	9.3	8.5
19	16	e19	19	e30	35	78	46	36	11	12	10	8.0
20	e16	e19	20	e29	32	84	41	30	11	13	11	8.0
21	e16	e18	20	e28	28	75	37	24	11	12	10	8.0
22	e16	e18	19	e38	62	54	21	11	11	13	9.6	8.1
23	e15	e18	e18	e75	e23	51	130	21	11	12	9.8	8.1
24	e15	e18	17	131	e22	42	336	26	13	11	11	8.2
25	e14	e17	16	208	e22	36	317	26	15	11	12	8.8
26	e14	e17	15	197	e22	32	211	22	13	11	14	8.8
27	e14	e17	16	147	27	30	149	20	20	11	14	8.6
28	e14	17	16	122	32	29	114	18	21	10	12	13
29	e15	17	e16	105	---	29	86	17	45	10	10	21
30	e17	19	e16	85	---	28	67	17	57	9.6	9.6	21
31	e18	---	16	71	---	27	---	20	---	9.5	9.1	---
TOTAL	521	569	671	1564	1090	1245	2584	829	552	725.1	326.7	283.4
MEAN	16.8	19.0	21.6	50.5	38.9	40.2	86.1	26.7	18.4	23.4	10.5	9.45
MAX	26	27	37	208	59	84	336	56	57	89	14	21
MIN	14	15	15	14	22	27	26	17	11	9.5	9.1	7.9
CFSM	.35	.39	.45	1.04	.81	.83	1.78	.55	.38	.48	.22	.20
IN.	.40	.44	.52	1.20	.84	.96	1.99	.64	.43	.56	.25	.22

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1995 - 1999, BY WATER YEAR (WY)

	1995	1996	1997	1998	1999
MEAN	22.7	37.4	37.6	50.3	56.6
MAX	35.0	69.0	60.0	66.1	94.8
(WY)	1995	1995	1995	1998	1997
MIN	16.8	19.0	21.6	33.4	32.7
(WY)	1999	1999	1999	1996	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1995 - 1999

ANNUAL TOTAL	15332	10960.2	38.4	
ANNUAL MEAN	42.0	30.0	44.3	1997
HIGHEST ANNUAL MEAN			30.0	1999
LOWEST ANNUAL MEAN			440	Feb 23 1997
HIGHEST DAILY MEAN	219	336	7.9	Sep 10 1999
LOWEST DAILY MEAN	13	7.9	8.1	Sep 18 1999
ANNUAL SEVEN-DAY MINIMUM	13	8.1	488	Feb 23 1997
INSTANTANEOUS PEAK FLOW		384	7.36	Feb 23 1997
INSTANTANEOUS PEAK STAGE		6.78	.79	
ANNUAL RUNOFF (CFSM)	.87	.62	10.80	
ANNUAL RUNOFF (INCHES)	11.81	8.44	73	
10 PERCENT EXCEEDS	102	56	29	
50 PERCENT EXCEEDS	24	20	13	
90 PERCENT EXCEEDS	14	9.6		

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105000 BATTLE CREEK AT BATTLE CREEK, MI

LOCATION.--Lat 42°19'55", long 85°09'15", in NW1/4 sec.5, T.2 S., R.7 W., Calhoun County, Hydrologic Unit 04050003, on right bank 350 ft upstream from bridge on Emmett Street 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 sea level (levels by Michigan Department of Natural Resources). Prior to May 14, 1951, nonrecording gage at same site and datum.

REMARKS.--Records good. Occasional slight regulation prior to November 1943. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	53	81	99	69	477	165	148	456	111	164	45	46
2	53	87	104	74	406	178	150	389	106	237	44	44
3	54	85	104	62	366	196	149	340	108	264	50	44
4	55	80	104	66	343	206	170	301	114	299	51	43
5	55	77	104	58	322	205	211	265	105	316	47	40
6	59	74	111	74	311	207	233	241	96	284	50	38
7	90	71	137	78	297	178	248	221	89	217	53	42
8	112	72	166	77	276	166	250	209	83	153	55	40
9	125	72	181	75	264	156	264	196	75	130	54	38
10	121	77	180	72	250	158	283	183	72	126	62	41
11	109	104	171	71	238	165	328	171	72	128	68	40
12	98	117	156	77	236	178	398	152	65	110	65	33
13	90	127	144	76	237	182	425	143	64	98	63	36
14	85	130	128	77	231	172	396	135	70	88	58	39
15	82	125	119	78	221	162	354	128	77	80	56	37
16	79	117	115	79	211	167	321	123	73	74	52	37
17	72	109	115	83	204	188	289	120	64	65	49	35
18	77	102	112	97	199	237	268	129	59	65	46	33
19	69	95	110	109	192	273	257	144	58	68	49	31
20	76	92	108	120	178	326	250	157	57	70	51	29
21	73	89	107	131	170	379	234	164	55	73	51	34
22	77	87	103	156	149	370	257	154	54	65	47	34
23	76	87	82	206	144	329	363	139	54	68	51	32
24	75	87	98	295	135	285	758	138	49	61	51	32
25	68	87	87	476	143	253	1370	140	55	62	55	32
26	71	85	84	923	135	223	1380	128	58	57	57	32
27	68	87	83	1040	136	200	1140	120	73	64	57	31
28	69	84	84	918	148	175	887	115	86	57	56	38
29	69	87	84	713	---	171	694	108	106	54	50	51
30	71	94	72	608	---	173	559	102	115	52	46	60
31	79	---	76	566	---	157	---	106	---	50	48	---
TOTAL	2410	2768	3528	7604	6619	6580	13034	5617	2323	3699	1637	1142
MEAN	77.7	92.3	114	245	236	212	434	181	77.4	119	52.8	38.1
MAX	125	130	181	1040	477	379	1380	456	115	316	68	60
MIN	53	71	72	58	135	156	148	102	49	50	44	29
CFSM	.32	.38	.47	1.02	.98	.88	1.80	.75	.32	.50	.22	.16
IN.	.37	.43	.54	1.17	1.02	1.02	2.01	.87	.36	.57	.25	.18

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

	MEAN	123	162	194	211	246	413	395	262	189	110	87.7	97.3
	MAX	673	474	468	591	593	936	1162	825	678	281	313	276
	(WY)	1987	1993	1991	1952	1943	1948	1947	1943	1943	1968	1994	1950
	MIN	32.4	46.1	46.8	57.5	61.5	87.6	93.7	69.6	49.2	34.3	27.8	30.6
	(WY)	1964	1964	1964	1964	1963	1931	1931	1931	1964	1936	1936	1963

SUMMARY STATISTICS FOR 1998 CALENDAR YEAR FOR 1999 WATER YEAR WATER YEARS 1931 - 1999

	ANNUAL TOTAL	88275	56961	
	ANNUAL MEAN	242	156	(a)211
	HIGHEST ANNUAL MEAN			394
	LOWEST ANNUAL MEAN			64.1
	HIGHEST DAILY MEAN	1140	1380	3560
	LOWEST DAILY MEAN	52	29	22
	ANNUAL SEVEN-DAY MINIMUM	53	32	25
	INSTANTANEOUS PEAK FLOW		1450	3640
	INSTANTANEOUS PEAK STAGE		2.63	(b)4.48
	INSTANTANEOUS LOW FLOW		28	(c)
	ANNUAL RUNOFF (CFSM)	1.00	.65	.87
	ANNUAL RUNOFF (INCHES)	13.63	8.79	11.88
	10 PERCENT EXCEEDS	587	300	422
	50 PERCENT EXCEEDS	116	103	136
	90 PERCENT EXCEEDS	71	49	60

(a) Does not include water year 1931.

(b) From floodmark.

(c) Sept. 20, 27.

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 sea level, 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.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	389	518	486	e350	1340	671	557	1260	577	1050	351	297
2	390	493	482	e350	1220	712	554	1110	602	1200	343	290
3	397	474	495	323	1220	745	555	981	570	1070	327	287
4	389	459	480	e370	1210	747	728	885	565	965	322	283
5	404	449	486	e400	1100	751	872	830	522	891	312	280
6	478	443	543	450	1030	736	869	801	494	792	314	277
7	717	433	726	466	994	675	866	769	472	665	333	276
8	739	438	752	452	947	641	799	749	463	565	350	285
9	643	434	715	443	899	643	1050	721	440	706	344	277
10	598	551	682	e435	905	617	1140	671	451	646	363	238
11	551	632	631	425	899	631	1200	630	449	574	366	274
12	505	657	603	434	905	630	1230	609	440	518	357	268
13	487	636	573	440	903	628	1250	599	437	475	359	274
14	464	608	532	e435	850	609	1140	601	484	449	362	282
15	459	564	513	438	802	586	1020	572	476	423	361	282
16	446	546	502	450	758	600	1020	548	468	408	332	280
17	427	521	503	464	773	687	969	569	444	388	314	277
18	434	505	498	569	749	893	918	724	438	422	316	274
19	433	487	490	604	725	1010	869	709	434	407	325	269
20	436	478	490	605	688	1030	818	664	421	408	323	265
21	463	479	497	627	650	1050	793	655	408	428	325	271
22	485	464	484	895	603	988	1290	632	402	400	311	271
23	460	445	386	1320	575	900	1910	642	406	405	321	263
24	443	452	437	1680	548	824	2310	683	425	426	324	261
25	437	452	440	1890	565	762	2810	698	470	391	339	307
26	433	462	451	2200	557	694	2770	670	424	373	348	232
27	432	476	446	2290	565	658	2390	635	588	375	339	263
28	429	474	445	2140	612	619	2000	572	639	361	334	310
29	432	469	455	1870	---	594	1680	542	847	355	321	393
30	516	484	379	1650	---	582	1450	525	779	345	309	410
31	536	---	e370	1540	---	578	---	570	---	339	300	---
TOTAL	14852	14983	15972	27005	23592	22491	37827	21826	15035	17220	10345	8516
MEAN	479	499	515	871	843	726	1261	704	501	555	334	284
MAX	739	657	752	2290	1340	1050	2810	1260	847	1200	366	410
MIN	389	433	370	323	548	578	554	525	402	339	300	232
CFSM	.58	.61	.63	1.06	1.02	.88	1.53	.85	.61	.67	.40	.34
IN.	.67	.68	.72	1.22	1.07	1.02	1.71	.99	.68	.78	.47	.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1999, BY WATER YEAR (WY)

	MEAN	492	587	652	684	773	1119	1107	843	677	491	421	431
MAX	1446	1284	1248	1557	1500	2183	2834	1998	1703	1000	899	855	855
(WY)	1987	1993	1991	1993	1976	1948	1947	1943	1943	1943	1994	1975	1975
MIN	173	204	215	229	218	317	441	336	238	186	189	167	167
(WY)	1964	1965	1964	1964	1964	1964	1946	1958	1964	1964	1964	1964	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1937 - 1999

ANNUAL TOTAL	300451												
ANNUAL MEAN	823												
HIGHEST ANNUAL MEAN										689			
LOWEST ANNUAL MEAN										1081			1943
HIGHEST DAILY MEAN	2420									250			1964
LOWEST DAILY MEAN	370									7130			Apr 7 1947
ANNUAL SEVEN-DAY MINIMUM	388									86			Aug 5 1964
INSTANTANEOUS PEAK FLOW										106			Aug 4 1964
INSTANTANEOUS PEAK STAGE										(a)7290			Apr 7 1947
INSTANTANEOUS LOW FLOW										(b)7.95			Feb 26 1985
ANNUAL RUNOFF (CFSM)	1.00									50			Sept 22 1939
ANNUAL RUNOFF (INCHES)	13.56									.84			
10 PERCENT EXCEEDS	1580									11.36			
50 PERCENT EXCEEDS	621									1230			
90 PERCENT EXCEEDS	419									553			
										297			

(a) Gage height 9.13 ft, site and datum then in use.

(b) Present site and datum.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04105700 AUGUSTA CREEK NEAR AUGUSTA, MI

LOCATION.--Lat 42°21'12", long 85°21'14", in SW1/4 sec.27, T.1 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 15 ft downstream from bridge on EF Road, 1.3 mi north of Augusta.

DRAINAGE AREA.--38.9 mi².

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

GAGE.--Water-stage recorder. Elevation of gage is 815 ft above sea level, from topographic map. Prior to June 15, 1965, nonrecording gage at same site and datum.

REMARKS.--Records good. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	35	37	28	47	47	31	40	36	52	18	18
2	24	33	35	24	50	46	32	38	36	61	17	17
3	25	31	34	31	55	50	33	36	34	52	16	17
4	24	30	34	32	53	47	53	35	32	43	16	17
5	25	29	34	e32	48	44	67	34	31	36	17	16
6	27	28	38	e32	47	44	58	34	30	31	16	16
7	43	28	53	e32	45	39	48	35	27	28	18	17
8	39	28	52	e32	43	40	43	35	26	26	21	16
9	34	28	48	e32	42	40	63	36	26	39	20	16
10	31	48	42	e32	41	38	74	34	27	38	21	16
11	30	61	39	e32	42	37	68	33	23	32	22	16
12	29	53	38	e32	48	37	62	32	27	30	21	16
13	28	44	36	e32	47	36	54	32	26	28	23	17
14	26	41	34	e32	43	35	47	31	31	26	22	16
15	26	39	34	e32	41	36	44	31	27	25	21	16
16	26	37	33	e32	41	39	48	31	25	23	20	16
17	26	36	33	e35	44	49	49	32	24	23	19	16
18	29	35	32	43	42	55	45	41	20	24	19	16
19	28	35	33	45	40	50	41	39	20	23	20	16
20	28	34	32	44	38	45	40	34	20	23	19	16
21	29	34	33	42	35	42	39	32	20	26	17	16
22	32	33	32	63	33	39	67	31	21	26	16	16
23	30	32	31	95	33	37	102	31	21	24	19	16
24	29	32	31	112	32	36	110	35	24	22	24	16
25	28	32	31	102	35	35	95	35	28	21	24	16
26	28	32	30	83	35	34	76	32	24	21	24	16
27	28	32	29	70	37	33	62	31	39	20	23	16
28	28	32	30	69	42	33	52	30	42	20	21	21
29	28	32	31	64	--	32	46	29	51	19	20	34
30	38	34	27	57	--	31	42	28	34	18	19	32
31	39	--	30	51	--	31	--	33	--	18	18	--
TOTAL	909	1058	1087	1474	1179	1237	1691	1040	852	898	611	525
MEAN	29.3	35.3	35.1	47.5	42.1	39.9	56.4	33.5	28.4	29.0	19.7	17.5
MAX	43	61	53	112	55	55	110	41	51	61	24	34
MIN	24	26	27	24	32	31	31	28	20	18	16	15
CFSM	.75	.91	.90	1.22	1.08	1.03	1.45	.86	.73	.74	.51	.45
IN.	.87	1.01	1.04	1.41	1.13	1.18	1.62	.99	.81	.86	.58	.50

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1999, BY WATER YEAR (WY)

	MEAN	40.3	46.2	47.7	44.2	46.4	57.0	59.4	47.2	42.7	35.6	33.6	36.0
MAX	85.2	67.3	65.3	66.3	66.3	81.3	86.9	86.9	81.8	73.2	51.4	53.8	70.7
(WY)	1987	1986	1992	1993	1976	1985	1975	1975	1978	1978	1986	1980	1986
MIN	18.9	23.4	31.9	26.9	30.1	39.2	41.2	30.0	23.9	17.4	17.9	17.5	17.5
(WY)	1965	1965	1965	1971	1970	1996	1971	1965	1988	1965	1984	1999	1999

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1965 - 1999
ANNUAL TOTAL	15136	12561	
ANNUAL MEAN	41.5	34.4	44.7
HIGHEST ANNUAL MEAN			57.5
LOWEST ANNUAL MEAN			30.3
HIGHEST DAILY MEAN	96	112	454
LOWEST DAILY MEAN	22	15	14
ANNUAL SEVEN-DAY MINIMUM	23	16	14
INSTANTANEOUS PEAK FLOW		114	560
INSTANTANEOUS PEAK STAGE		2.05	3.41
INSTANTANEOUS LOW FLOW		15	(b)8.9
ANNUAL RUNOFF (CFSM)	1.07	.88	1.15
ANNUAL RUNOFF (INCHES)	14.47	12.01	15.60
10 PERCENT EXCEEDS	66	50	67
50 PERCENT EXCEEDS	35	32	41
90 PERCENT EXCEEDS	25	18	27

(a) Aug. 22, Sept. 9, 12, 22, 23, 24.

(b) Result of freezeup.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106000 KALAMAZOO RIVER AT COMSTOCK, MI

LOCATION.--Lat 42°17'08", long 85°30'50", in NE1/4 sec.19, T.2 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank at downstream side of bridge on River Street in Comstock, 0.2 mi downstream from Comstock Creek.

DRAINAGE AREA.--1,010 mi², approximately.

PERIOD OF RECORD.--April to August 1931, October 1932 to December 1979, October 1984 to 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 756.12 ft above sea level. Prior to Oct. 1, 1987, at datum 3.00 ft higher. Prior to November 1945, nonrecording gage at same site and datum.

REMARKS.--Records good. Flow regulated by powerplant 1.2 mi upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	567	606	662	412	1710	827	809	1610	845	979	424	413
2	483	773	702	432	1490	860	616	1400	768	1280	430	420
3	488	721	628	334	1400	941	642	1260	702	1330	491	390
4	494	752	641	433	1440	948	872	1170	710	1160	366	360
5	500	562	658	501	1370	953	959	1080	708	1120	435	379
6	632	628	646	603	1320	959	982	1000	700	1020	412	357
7	705	626	879	665	1230	945	1000	993	613	971	429	440
8	865	564	947	712	1200	926	1070	977	626	851	494	335
9	920	642	934	574	1100	910	1120	961	606	874	414	283
10	759	639	857	648	1030	893	1310	941	492	932	437	433
11	697	872	854	590	1170	819	1350	920	644	786	504	338
12	694	830	771	555	1150	704	1350	829	641	716	485	382
13	560	756	794	565	1150	858	1350	769	492	711	517	279
14	638	969	705	643	1120	901	1400	824	633	705	423	431
15	616	851	639	580	1010	818	1290	708	616	631	491	355
16	627	753	650	619	997	696	1210	793	488	493	414	283
17	550	698	713	613	994	849	1130	699	631	495	413	432
18	584	701	635	732	991	927	1090	849	554	576	497	343
19	630	570	654	831	977	1020	1100	916	485	500	421	364
20	551	648	704	834	959	1200	1040	905	488	643	427	282
21	597	709	652	827	933	1160	989	816	493	632	418	430
22	601	640	557	878	904	1150	1170	840	493	507	429	337
23	637	628	586	1310	816	1110	2060	830	487	635	430	280
24	629	627	609	1780	692	1030	2420	702	499	556	436	426
25	557	666	567	1930	828	975	2540	859	643	499	519	339
26	624	503	554	2120	796	957	3030	911	656	504	641	413
27	616	651	633	2270	694	928	3270	819	597	633	429	331
28	555	632	559	2610	843	898	2810	702	729	562	312	404
29	557	643	642	2520	---	816	2230	839	887	357	512	484
30	638	627	602	2240	---	684	1980	719	962	400	421	579
31	711	---	444	1880	---	820	---	563	---	499	430	---
TOTAL	19283	20487	21078	32241	30314	28482	44189	28204	18888	22557	13901	11322
MEAN	622	683	680	1040	1083	919	1473	910	630	728	448	377
MAX	920	969	947	2610	1710	1200	3270	1610	962	1330	641	579
MIN	483	503	444	334	692	684	616	563	485	357	312	279
CFSM	.62	.68	.67	1.03	1.07	.91	1.46	.90	.62	.72	.44	.37
IN.	.71	.75	.78	1.19	1.12	1.05	1.63	1.04	.70	.83	.51	.42

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

	MEAN	680	798	860	925	988	1372	1359	1058	870	677	574	580
MAX	1990	1652	1674	1958	1758	2802	3018	2484	2063	1446	1217	1170	
(WY)	1987	1993	1991	1993	1976	1985	1950	1943	1989	1943	1994	1975	
MIN	268	285	347	371	370	461	617	405	302	269	235	278	
(WY)	1964	1964	1964	1964	1964	1964	1964	1931	1934	1934	1934	1963	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1931 - 1999

ANNUAL TOTAL	383750						290946						
ANNUAL MEAN	1051						797						
HIGHEST ANNUAL MEAN										895			
LOWEST ANNUAL MEAN										1387		1943	
HIGHEST DAILY MEAN										368		1964	
LOWEST DAILY MEAN										6830		Apr 8 1947	
ANNUAL SEVEN-DAY MINIMUM	2990					Jan 11	3270		Apr 27	185		Aug 7 1934	
INSTANTANEOUS PEAK FLOW	444					Dec 31	279		Sep 13	217		Aug 1 1934	
INSTANTANEOUS PEAK STAGE	497					Sep 27	351		Sep 19	6910		Apr 8 1947	
INSTANTANEOUS LOW FLOW							3360		Apr 26	(a)10.94		Apr 8 1947	
ANNUAL RUNOFF (CFSM)							7.60		Apr 26	119		May 29 1958	
ANNUAL RUNOFF (INCHES)	1.04						.79		(b)	.89			
10 PERCENT EXCEEDS	14.13						10.72			12.05			
50 PERCENT EXCEEDS	1960						1200			1530			
90 PERCENT EXCEEDS	781						694			750			
	557						424			410			

(a) Present datum.

(b) Sept. 15, 18, 22, 25, 27.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106137 HAMPTON LAKE NEAR PORTAGE, MI

LOCATION.--Lat 42°11'24", long 85°37'50", in SE1/4 sec. 19, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank at outlet of Hampton Lake (Portage Creek), 1.8 mi south of Portage.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--November 1998 to September 1999.

GAGE.--Water-stage recorder. Datum of gage is 855 ft above sea level, from topographic map.

REMARKS.--Records good.

EXTREMES FOR CURRENT YEAR.--Nov. 17 to Sept. 30, maximum gage height, 3.22 ft, Apr. 23; minimum, 1.99 ft, Sept. 26, 27.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	--	--	2.18	2.05	2.17	2.20	2.06	2.17	2.12	2.34	2.26	--
2	--	--	2.16	2.09	2.25	2.17	2.06	2.15	2.13	2.32	2.24	2.11
3	--	--	2.15	2.20	2.31	2.24	2.05	2.14	2.12	2.26	2.24	2.11
4	--	--	2.14	2.13	2.26	2.17	2.21	2.13	2.10	2.23	2.24	2.10
5	--	--	2.14	--	2.21	2.15	2.21	2.12	2.10	2.21	2.25	2.11
6	--	--	2.21	--	2.21	2.18	2.13	2.14	2.09	2.18	2.25	2.09
7	--	--	2.40	--	2.21	2.14	2.09	2.13	2.08	2.16	2.26	2.08
8	--	--	2.29	--	2.18	2.12	2.07	2.12	2.07	2.15	2.29	2.08
9	--	--	2.22	--	2.18	2.13	2.38	2.12	2.06	2.30	2.27	2.07
10	--	--	2.18	--	2.18	2.12	2.31	2.11	2.07	2.27	2.29	2.06
11	--	--	2.16	--	2.21	2.10	2.25	2.10	2.08	2.22	2.28	2.06
12	--	--	2.15	--	2.28	2.09	2.20	2.10	2.11	2.21	2.27	2.05
13	--	--	2.16	--	2.23	2.08	2.14	2.09	2.13	2.20	2.28	--
14	--	--	2.15	--	2.18	2.07	2.11	2.09	2.14	2.20	2.28	--
15	--	--	2.14	--	2.17	2.07	2.11	2.09	2.12	2.20	2.26	2.04
16	--	--	2.14	--	2.18	2.09	2.23	2.09	2.11	2.21	2.25	2.04
17	--	2.18	2.14	--	2.20	2.16	2.20	2.11	2.12	2.22	2.23	2.04
18	--	2.18	2.13	2.22	2.17	2.20	2.15	2.15	2.11	2.22	2.22	2.03
19	--	2.18	2.13	2.18	2.15	2.15	2.13	2.12	2.11	2.22	2.24	2.02
20	--	2.16	2.12	2.12	2.14	2.12	2.11	2.10	2.11	2.23	2.21	--
21	--	2.17	2.13	2.10	2.12	2.11	2.11	2.09	2.11	2.42	2.20	2.03
22	--	2.16	2.14	2.34	2.09	2.09	2.62	2.08	2.11	2.40	2.19	2.02
23	--	2.16	2.12	2.61	2.08	2.08	3.10	2.09	2.11	2.33	2.19	2.02
24	--	2.15	2.11	2.56	2.07	2.08	2.76	2.14	2.14	2.31	2.19	2.01
25	--	2.16	2.09	2.38	2.09	2.07	2.48	2.12	2.17	2.30	2.25	2.01
26	--	2.16	2.07	2.27	2.08	2.07	2.34	2.10	2.15	2.29	2.24	2.00
27	--	2.15	2.07	2.25	2.11	2.07	2.27	2.09	2.23	2.29	2.20	2.00
28	--	2.15	2.07	2.31	2.16	2.06	2.23	2.09	2.23	2.29	2.18	2.10
29	--	2.15	2.07	2.25	--	2.05	2.20	2.08	2.26	2.28	2.15	2.21
30	--	2.17	2.06	2.21	--	2.04	2.18	2.07	2.21	2.28	2.13	2.17
31	--	--	2.05	2.18	--	2.04	--	2.10	--	2.27	2.12	--
MEAN	--	--	2.14	--	2.17	2.11	2.25	2.11	2.13	2.26	2.23	--
MAX	--	--	2.40	--	2.31	2.24	3.10	2.17	2.26	2.42	2.29	--
MIN	--	--	2.05	--	2.07	2.04	2.05	2.07	2.06	2.15	2.12	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106180 PORTAGE CREEK AT PORTAGE, MI

LOCATION.--Lat 42°12'21", long 85°35'23", in SE1/4 sec.16, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank 750 ft upstream from bridge on Westnedge Avenue in Portage.

DRAINAGE AREA.--16.5 mi².

PERIOD OF RECORD.--October 1982 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above sea level, from topographic map.

REMARKS.--Records good. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	14	14	12	16	18	14	17	16	19	10	10
2	13	14	14	e12	20	17	14	16	17	17	10	10
3	14	14	14	e12	20	19	14	16	16	15	10	10
4	13	14	13	e13	19	17	20	16	15	14	10	10
5	14	14	13	e13	17	16	18	16	15	13	10	10
6	15	14	17	e14	17	16	16	16	14	12	10	10
7	16	13	21	14	17	15	15	16	14	12	11	10
8	14	13	16	14	16	15	14	16	14	12	11	9.9
9	14	13	14	14	17	15	29	16	13	18	11	10
10	13	21	14	e14	17	15	21	16	13	15	11	10
11	13	19	13	e13	17	15	19	15	16	13	11	10
12	13	17	13	e13	19	15	18	15	14	13	11	10
13	13	16	13	13	17	14	16	15	14	12	12	10
14	13	15	13	e13	16	14	16	15	14	12	11	10
15	13	15	13	13	16	15	16	15	13	12	11	10
16	13	14	12	13	17	15	20	15	13	11	11	10
17	13	14	12	13	17	18	18	16	13	11	10	10
18	13	14	12	19	16	18	16	16	12	11	10	10
19	13	13	12	16	15	16	16	15	12	11	11	10
20	13	13	12	15	15	16	15	15	12	11	11	10
21	15	13	13	15	14	15	15	15	12	19	11	9.9
22	14	13	13	25	14	15	41	15	12	15	10	10
23	14	13	12	34	14	15	58	15	11	12	11	10
24	14	13	12	30	14	15	35	16	12	12	11	9.8
25	14	13	12	22	14	14	24	16	12	11	14	9.9
26	13	13	12	19	14	14	21	15	12	11	14	9.8
27	13	13	12	19	15	14	19	15	14	11	12	10
28	14	13	12	21	17	14	18	15	14	11	12	15
29	14	13	12	19	---	14	17	15	14	11	11	20
30	17	13	12	17	---	14	17	15	12	10	11	17
31	15	---	12	17	---	14	---	14	---	10	11	---
TOTAL	426	424	409	511	457	477	610	479	405	397	341	321.3
MEAN	13.7	14.1	13.2	16.5	16.3	15.4	20.3	15.5	13.5	12.8	11.0	10.7
MAX	17	21	21	34	20	19	58	17	17	19	14	20
MIN	13	13	12	12	14	14	14	11	10	10	10	9.8
CFSM	.83	.86	.80	1.00	.99	.93	1.23	.94	.82	.78	.67	.65
IN.	.96	.96	.92	1.15	1.03	1.08	1.38	1.08	.91	.90	.77	.72

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1983 - 1999, BY WATER YEAR (WY)

	MEAN	17.8	19.6	18.8	18.4	18.5	20.5	21.0	19.4	17.8	16.3	15.8	15.9
MAX	25.7	25.5	23.6	21.4	21.5	28.1	26.6	24.1	24.9	21.4	19.2	20.3	
(WY)	1992	1991	1991	1992	1985	1985	1985	1983	1989	1986	1994	1993	
MIN	13.5	14.1	13.2	14.8	14.7	15.0	17.0	15.5	13.5	12.3	11.0	10.7	
(WY)	1996	1999	1999	1996	1996	1996	1996	1999	1999	1996	1999	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1983 - 1999

ANNUAL TOTAL	6104	5257.3	
ANNUAL MEAN	16.7	14.4	18.3
HIGHEST ANNUAL MEAN			21.2
LOWEST ANNUAL MEAN			14.4
HIGHEST DAILY MEAN	33	Jan 8	58
LOWEST DAILY MEAN	12	Aug 19	9.8
ANNUAL SEVEN-DAY MINIMUM	12	Dec 23	9.9
INSTANTANEOUS PEAK FLOW			(a)65
INSTANTANEOUS PEAK STAGE			(c)3.94
ANNUAL RUNOFF (CFSM)	1.01		.87
ANNUAL RUNOFF (INCHES)	13.76		11.85
10 PERCENT EXCEEDS	21		18
50 PERCENT EXCEEDS	16		14
90 PERCENT EXCEEDS	13		10

(a) Gage height 3.46 ft.

(b) Gage height 3.87 ft.

(c) Backwater from ice.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 sea level.

REMARKS.--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. Gage-height telemeter at station

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	32	34	27	37	38	32	38	39	48	32	18
2	25	31	30	27	43	38	30	40	42	34	32	22
3	27	32	29	30	43	41	32	39	36	30	32	27
4	24	31	30	36	40	36	49	38	34	30	31	26
5	28	26	32	32	37	35	39	38	26	30	32	26
6	35	30	44	34	40	36	36	41	25	30	31	27
7	43	31	46	30	38	35	34	38	28	27	33	25
8	31	31	34	31	38	34	33	36	31	29	33	25
9	29	31	34	30	38	35	69	38	30	56	29	25
10	30	57	34	30	35	33	45	38	31	32	33	25
11	30	45	31	28	36	32	44	36	40	31	31	25
12	30	40	29	26	39	33	40	35	36	30	31	25
13	29	37	27	29	37	32	40	38	27	30	32	27
14	30	34	28	28	34	32	40	37	29	32	28	25
15	27	34	27	31	34	33	40	37	30	33	29	25
16	27	32	28	32	36	34	44	39	32	31	29	25
17	29	34	25	e33	34	36	39	41	22	30	29	25
18	30	35	25	e45	31	37	37	41	22	28	29	25
19	32	33	27	e35	31	32	34	40	27	30	34	24
20	32	33	25	e35	31	31	35	38	28	30	30	24
21	38	32	26	e33	30	31	35	38	28	50	31	22
22	30	32	27	63	30	29	99	36	28	34	31	19
23	34	32	25	62	30	29	119	40	29	32	35	16
24	31	31	29	52	31	32	62	41	32	32	33	15
25	32	29	29	46	33	32	49	38	29	32	46	15
26	31	29	26	40	33	31	43	35	28	33	37	15
27	32	32	27	41	34	32	41	38	39	32	33	15
28	30	32	29	45	37	33	34	37	33	31	33	24
29	27	34	29	42	---	31	36	36	34	31	32	31
30	40	36	28	39	---	30	38	35	27	32	31	23
31	32	---	29	39	---	30	---	38	---	28	23	---
TOTAL	949	1008	923	1131	990	1033	1348	1178	922	1018	985	691
MEAN	30.6	33.6	29.8	36.5	35.4	33.3	44.9	38.0	30.7	32.8	31.8	23.0
MAX	43	57	46	63	43	41	119	41	42	56	46	31
MIN	24	26	25	26	30	29	30	35	22	27	23	15

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1999, BY WATER YEAR (WY)

	MEAN	37.2	39.2	39.7	39.6	41.7	46.8	48.9	44.4	41.6	39.0	37.3	33.5
MAX	56.0	56.4	53.5	48.9	53.0	61.4	63.3	57.5	55.3	54.0	50.3	51.9	
(WY)	1992	1991	1992	1988	1971	1985	1991	1991	1989	1991	1980	1992	
MIN	25.3	26.5	27.1	29.3	25.7	33.3	35.5	30.4	24.7	26.1	26.8	23.0	
(WY)	1965	1972	1977	1978	1972	1999	1977	1977	1988	1977	1977	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1965 - 1999

ANNUAL TOTAL	13731	12176	41.0	
ANNUAL MEAN	37.6	33.4	51.5	1991
HIGHEST ANNUAL MEAN			32.0	1977
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	79	Jul 21	257	May 31 1989
LOWEST DAILY MEAN	23	Jun 8	15	Sep 24 1999
ANNUAL SEVEN-DAY MINIMUM	25	Sep 28	17	Sep 21 1999
INSTANTANEOUS PEAK FLOW			152	Apr 23 1989
INSTANTANEOUS LOW FLOW			2.03	Apr 23 1978
10 PERCENT EXCEEDS	49		14	(a)407
50 PERCENT EXCEEDS	36		(b)	4.49
90 PERCENT EXCEEDS	28			(c)8.0
				Jan 19 1965

(a) Gage height 3.09 ft.

(b) Part of each day Sept. 23-27.

(c) Result of bridge construction upstream.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106320 WEST FORK PORTAGE CREEK NEAR OSHTEMO, MI

LOCATION.--Lat 42°14'07", long 85°38'54", in SE1/4 sec.1, T.3 S., R.12 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank at upstream side of culvert on 12th Street, 2.1 mi southeast of Oshtemo.

DRAINAGE AREA.--13.0 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 868.86 ft above sea level (Kalamazoo County Road Commission bench mark).

REMARKS.--Records good except those below 1.0 ft³/s, which are poor. At times, flow is affected by ground-water withdrawals. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.8	4.4	4.6	4.3	7.4	5.2	3.8	4.7	2.4	3.1	.76	2.2
2	2.7	4.4	4.6	4.7	7.8	5.2	3.8	4.3	2.8	3.6	.61	2.0
3	2.8	4.3	4.6	5.3	8.2	5.7	3.9	4.1	2.7	3.5	.58	1.9
4	2.8	4.5	4.6	5.3	8.0	5.6	5.1	3.9	2.6	3.3	.53	1.8
5	2.9	4.6	4.6	5.2	7.7	5.3	5.7	3.7	2.6	2.9	.49	1.7
6	3.7	4.7	5.0	5.6	7.7	5.7	5.6	3.8	2.6	2.4	.50	1.5
7	5.2	4.8	6.2	5.7	7.3	5.3	5.2	3.9	2.4	1.9	.54	1.4
8	5.5	4.9	6.2	e5.8	6.9	5.1	4.8	3.9	2.2	1.5	.61	1.3
9	5.3	5.1	5.9	e5.8	6.6	5.2	5.8	3.8	2.0	3.2	.69	1.3
10	4.9	7.5	5.6	e5.9	6.3	5.2	6.4	3.5	1.9	3.5	.95	1.2
11	4.6	8.6	5.3	e6.0	6.3	5.0	6.4	3.4	2.0	3.2	1.2	1.2
12	4.4	8.4	5.2	e6.0	7.2	4.9	6.2	3.4	2.3	2.8	1.2	1.2
13	4.1	8.1	4.9	e6.1	6.7	4.7	5.6	3.4	2.4	2.4	1.3	1.3
14	4.1	7.6	4.7	e6.1	6.3	4.6	5.0	3.2	2.6	2.2	1.3	1.2
15	3.8	6.8	4.6	e6.1	6.0	4.6	4.6	3.0	2.4	2.0	1.2	1.2
16	3.7	5.9	4.6	e6.1	5.8	4.6	5.1	2.8	2.3	1.7	1.2	1.0
17	3.7	5.4	4.6	e6.3	5.8	4.7	5.2	2.8	2.1	1.5	1.1	.96
18	4.0	5.2	4.5	e7.7	5.6	4.7	5.0	3.1	1.8	1.4	1.0	.94
19	3.9	5.2	4.5	e7.6	5.3	4.6	4.7	3.1	1.7	1.3	1.1	.93
20	3.6	5.0	4.3	e7.0	5.2	4.6	4.6	3.0	1.6	1.3	1.2	.87
21	3.7	4.9	4.5	e7.0	5.0	4.6	4.4	2.8	1.4	2.0	1.2	.77
22	3.8	4.8	4.3	9.7	4.8	4.6	8.7	2.6	1.3	2.4	1.2	.68
23	3.8	4.7	4.2	13	4.6	4.4	15	2.5	1.2	2.5	1.2	.61
24	3.8	4.5	4.1	13	4.6	4.2	15	2.9	1.3	2.5	1.3	.55
25	3.6	4.5	4.1	11	4.6	4.1	12	2.7	1.2	2.0	2.0	.44
26	3.6	4.5	4.2	9.8	4.6	4.1	9.7	2.4	1.2	1.7	3.1	.41
27	3.4	4.5	4.1	9.0	4.6	4.0	7.9	2.1	1.8	1.6	3.5	.38
28	3.6	4.3	4.1	8.8	5.0	4.3	6.4	2.0	2.1	1.4	3.5	.92
29	3.6	4.3	4.3	8.3	---	4.2	5.6	1.8	2.5	1.2	3.2	1.5
30	4.1	4.5	4.1	7.9	---	3.9	5.1	1.8	2.3	1.1	2.8	1.9
31	4.3	---	4.2	7.7	---	3.9	---	2.1	---	.92	2.5	---
TOTAL	119.8	160.9	145.3	223.8	171.9	146.8	192.3	96.5	61.7	68.02	43.56	35.26
MEAN	3.86	5.36	4.69	7.22	6.14	4.74	6.41	3.11	2.06	2.19	1.41	1.18
MAX	5.5	8.6	6.2	13	8.2	5.7	15	4.7	2.8	3.6	3.5	2.2
MIN	2.7	4.3	4.1	4.3	4.6	3.9	3.8	1.8	1.2	.92	.49	.38
CFSM	.30	.41	.36	.56	.47	.36	.49	.24	.16	.17	.11	.09
IN.	.34	.46	.42	.64	.49	.42	.55	.28	.18	.19	.12	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1999, BY WATER YEAR (WY)

	6.20	7.00	7.02	6.85	6.73	7.26	7.28	6.00	5.14	4.69	5.02	5.56
MEAN	6.20	7.00	7.02	6.85	6.73	7.26	7.28	6.00	5.14	4.69	5.02	5.56
MAX	9.74	11.0	11.8	9.79	9.63	10.4	11.2	12.5	11.4	10.7	11.8	12.6
(WY)	1976	1986	1976	1973	1976	1973	1973	1973	1973	1973	1975	1975
MIN	2.28	3.92	4.69	4.96	4.57	4.38	5.00	2.62	1.13	1.20	1.41	1.18
(WY)	1993	1993	1999	1981	1995	1996	1988	1988	1988	1988	1999	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1972 - 1999

ANNUAL TOTAL	1945.93	1465.84	
ANNUAL MEAN	5.33	4.02	6.19
HIGHEST ANNUAL MEAN			10.0
LOWEST ANNUAL MEAN			3.87
HIGHEST DAILY MEAN	15	Jan 8	15
LOWEST DAILY MEAN	.93	Jun 25	.38
ANNUAL SEVEN-DAY MINIMUM	1.2	Jun 19	.55
INSTANTANEOUS PEAK FLOW			16
INSTANTANEOUS PEAK STAGE			1.73
INSTANTANEOUS LOW FLOW			.20
ANNUAL RUNOFF (CFSM)	.41	.31	.48
ANNUAL RUNOFF (INCHES)	5.57	4.19	6.47
10 PERCENT EXCEEDS	8.6	6.6	9.6
50 PERCENT EXCEEDS	4.6	4.1	5.9
90 PERCENT EXCEEDS	2.1	1.2	3.0

(a) Dec. 6, 1992, Oct. 28, 1994.

(b) Dec. 5, 1992, Oct. 28, 1994, Apr. 16, 1995.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106362 ASYLUM LAKE NEAR KALAMAZOO, MI

LOCATION.--Lat 42°15'57", long 85°38'20", in NE1/4 SW1/4 sec. 30, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on south side of lake, 0.5 mi west of Kalamazoo.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--October 1998 to September 1999.

GAGE.--Water-stage recorder. Datum of gage is 863.69 ft above sea level (levels by City of Kalamazoo).

REMARKS.--Records good.

EXTREMES FOR CURRENT YEAR.--Oct. 22 to Sept. 30, maximum gage height, 5.11 ft, Apr. 23; minimum, 4.37 ft, Sept. 26, 27.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	--	4.70	4.77	4.74	4.73	4.71	4.61	4.76	4.74	4.84	4.60	4.64
2	--	4.69	4.77	4.76	4.75	4.70	4.61	4.75	4.76	4.85	4.57	4.62
3	--	4.68	4.76	4.83	4.76	4.72	4.61	4.74	4.75	4.82	4.55	4.61
4	--	4.67	4.76	4.84	4.75	4.70	4.68	4.72	4.73	4.79	4.53	4.59
5	--	4.66	4.76	4.84	4.74	4.70	4.69	4.71	4.71	4.76	4.54	4.58
6	--	4.66	4.79	4.84	4.74	4.73	4.68	4.72	4.70	4.74	4.53	4.57
7	--	4.65	4.86	4.83	4.72	4.72	4.67	4.73	4.69	4.70	4.53	4.56
8	--	4.65	4.84	4.82	4.71	4.71	4.66	4.73	4.67	4.68	4.55	4.55
9	--	4.65	4.83	4.82	4.70	4.71	4.80	4.72	4.66	4.83	4.54	4.53
10	--	4.77	4.81	4.82	4.70	4.71	4.80	4.71	4.65	4.82	4.55	4.51
11	--	4.79	4.80	4.82	4.71	4.71	4.79	4.70	4.69	4.79	4.55	4.50
12	--	4.79	4.79	4.82	4.74	4.69	4.77	4.71	4.80	4.76	4.54	4.49
13	--	4.78	4.78	4.82	4.74	4.69	4.75	4.70	4.79	4.73	4.55	4.49
14	--	4.78	4.77	4.80	4.72	4.67	4.73	4.70	4.79	4.71	4.53	4.48
15	--	4.77	4.76	4.80	4.71	4.67	4.72	4.69	4.75	4.69	4.52	4.47
16	--	4.76	4.76	4.79	4.71	4.66	4.76	4.69	4.72	4.67	4.51	4.45
17	--	4.76	4.76	4.78	4.71	4.67	4.74	4.70	4.70	4.66	4.51	4.45
18	--	4.75	4.75	4.85	4.70	4.66	4.72	4.74	4.68	4.66	4.50	4.44
19	--	4.75	4.75	4.83	4.69	4.65	4.71	4.74	4.66	4.65	4.51	4.43
20	--	4.74	4.74	4.81	4.68	4.65	4.70	4.72	4.65	4.63	4.51	4.42
21	--	4.74	4.75	4.79	4.67	4.64	4.69	4.71	4.64	4.78	4.51	4.41
22	4.71	4.74	4.76	4.88	4.66	4.63	4.92	4.70	4.63	4.82	4.50	4.40
23	4.70	4.73	4.75	4.94	4.65	4.63	5.08	4.71	4.62	4.79	4.51	4.39
24	4.69	4.73	4.75	4.91	4.65	4.63	5.03	4.73	4.63	4.76	4.51	4.39
25	4.68	4.73	4.74	4.88	4.66	4.62	4.97	4.71	4.64	4.73	4.63	4.38
26	4.68	4.73	4.73	4.84	4.66	4.61	4.92	4.69	4.63	4.70	4.79	4.38
27	4.67	4.73	4.73	4.82	4.67	4.61	4.87	4.68	4.74	4.68	4.77	4.37
28	4.68	4.73	4.73	4.80	4.69	4.61	4.83	4.67	4.76	4.66	4.74	4.46
29	4.67	4.73	4.74	4.78	--	4.61	4.80	4.67	4.81	4.65	4.71	4.55
30	4.71	4.76	4.73	4.76	--	4.60	4.78	4.66	4.77	4.63	4.68	4.56
31	4.71	--	4.73	4.74	--	4.60	--	4.70	--	4.62	4.66	--
MEAN	--	4.73	4.77	4.82	4.70	4.67	4.77	4.71	4.71	4.73	4.57	4.49
MAX	--	4.79	4.86	4.94	4.76	4.73	5.08	4.76	4.81	4.85	4.79	4.64
MIN	--	4.65	4.73	4.74	4.65	4.60	4.61	4.66	4.62	4.62	4.50	4.37

STREAMS TRIBUTARY TO LAKE MICHIGAN

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.

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 sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except for estimated daily discharges and those below 2.0 ft³/s, which are fair. At times, flow is affected by ground-water withdrawals. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.8	6.3	6.0	6.8	11	8.7	5.5	7.2	3.9	5.5	1.3	2.9
2	2.8	5.9	5.8	5.9	12	8.6	5.5	6.6	4.3	6.4	.89	2.6
3	3.2	5.8	5.7	e7.5	13	9.6	5.5	6.1	4.3	5.4	.68	2.4
4	3.2	5.8	5.9	e7.6	12	8.8	7.6	5.5	3.8	4.6	.65	2.1
5	3.4	5.8	7.3	e7.8	12	8.5	8.6	5.2	3.6	4.0	e.65	2.0
6	4.4	6.0	8.3	e8.0	12	9.3	8.4	5.4	3.4	3.5	e.65	1.9
7	6.9	6.0	10	e8.2	11	8.7	7.7	6.0	3.1	3.0	.94	1.7
8	6.9	6.2	9.7	e8.3	11	8.1	7.2	6.0	2.8	2.7	1.3	1.6
9	6.6	6.3	9.1	e8.4	10	8.1	12	6.0	2.7	7.4	1.3	1.5
10	6.4	9.1	8.7	e8.4	9.8	8.0	12	5.7	e2.6	8.1	1.5	1.4
11	6.1	10	8.3	e8.5	10	7.4	11	5.4	2.5	5.9	1.4	1.2
12	5.7	9.4	8.0	e8.5	12	7.1	10	5.8	2.8	4.6	1.4	1.2
13	5.4	9.4	7.6	e8.6	11	6.7	9.2	5.7	3.0	3.9	1.5	1.1
14	5.1	9.0	7.3	e8.6	10	6.5	8.3	5.3	3.5	3.4	1.4	1.1
15	4.9	8.4	7.1	e8.7	9.7	6.6	7.9	5.0	3.1	2.9	1.4	1.1
16	4.7	7.8	6.9	e9.0	9.6	6.5	8.8	4.7	2.8	2.6	1.3	.98
17	4.6	7.1	6.8	e10	9.8	6.8	8.4	4.7	2.7	2.5	1.3	1.1
18	5.1	6.5	6.6	e11	9.2	7.1	7.6	5.2	2.6	2.4	1.2	1.0
19	5.2	6.1	8.6	e10	8.6	6.6	7.2	5.1	2.4	2.2	1.3	1.0
20	4.9	5.9	6.3	e9.7	8.2	6.4	6.9	4.7	2.3	2.0	1.1	.89
21	5.3	5.6	6.6	9.4	7.8	6.3	6.5	4.4	2.1	5.4	1.1	.79
22	5.8	5.5	6.7	14	7.4	6.1	20	4.2	2.1	6.5	1.1	.69
23	5.6	5.5	6.8	20	7.3	6.0	30	4.2	2.0	4.7	1.3	.65
24	5.5	5.3	6.7	20	7.0	5.8	25	4.8	2.2	3.6	1.4	.59
25	5.3	5.3	e6.8	17	7.3	5.8	20	4.7	2.1	3.1	3.0	.47
26	5.2	5.3	e6.8	15	7.1	6.0	16	4.1	1.8	2.7	5.0	.45
27	5.1	5.3	6.8	14	7.3	5.9	13	3.7	3.5	2.5	4.3	.34
28	5.3	5.3	6.5	14	8.1	5.8	11	3.5	3.9	2.2	3.9	1.3
29	5.1	5.3	e6.5	13	---	5.9	9.2	3.3	4.5	2.0	3.8	1.8
30	6.1	5.8	e6.5	12	---	5.8	8.1	2.9	3.7	1.8	3.5	1.3
31	6.3	---	6.6	12	---	5.6	---	3.3	---	1.6	3.2	---
TOTAL	158.9	197.0	221.3	329.9	271.2	219.1	324.1	154.4	90.1	119.1	54.76	39.15
MEAN	5.13	6.57	7.14	10.6	9.69	7.07	10.8	4.98	3.00	3.84	1.77	1.31
MAX	6.9	10	10	20	13	9.6	30	7.2	4.5	8.1	5.0	2.9
MIN	2.8	5.3	5.7	5.9	7.0	5.6	5.5	2.9	1.8	1.6	.65	.34
CFSM	.27	.35	.38	.57	.52	.38	.58	.27	.16	.21	.09	.07
IN.	.32	.39	.44	.66	.54	.44	.64	.31	.18	.24	.11	.08

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1999, BY WATER YEAR (WY)

	MEAN	9.43	10.3	10.4	9.92	10.2	11.5	11.5	9.71	8.64	7.63	7.51	8.43
MAX	15.2	16.8	16.8	14.5	15.9	18.0	18.2	15.2	14.9	12.7	13.9	18.8	18.8
(WY)	1970	1986	1992	1993	1971	1971	1975	1975	1969	1970	1975	1975	1975
MIN	3.39	3.54	5.04	5.16	6.25	6.75	7.32	4.18	2.36	2.35	1.77	1.30	1.30
(WY)	1965	1965	1965	1965	1965	1996	1963	1965	1988	1964	1999	1999	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1959 - 1999

ANNUAL TOTAL	2959.9	2179.01	9.59
ANNUAL MEAN	8.11	5.97	14.1
HIGHEST ANNUAL MEAN			4.85
LOWEST ANNUAL MEAN			1975
HIGHEST DAILY MEAN	23	30	40
LOWEST DAILY MEAN	2.5	.34	.34
ANNUAL SEVEN-DAY MINIMUM	2.8	.57	.57
INSTANTANEOUS PEAK FLOW		32	46
INSTANTANEOUS PEAK STAGE		3.05	3.33
INSTANTANEOUS LOW FLOW		.29	.29
ANNUAL RUNOFF (CFSM)	.43	.32	.51
ANNUAL RUNOFF (INCHES)	5.89	4.33	6.97
10 PERCENT EXCEEDS	14	10	14
50 PERCENT EXCEEDS	6.5	5.8	9.2
90 PERCENT EXCEEDS	3.4	1.4	5.0

(a) Dec. 7, 1992, June 21, 1997.

(e) Estimated.

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 sea level, from topographic map.

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	21	22	18	61	60	39	63	31	59	13	9.5
2	15	21	21	19	66	52	38	58	34	66	12	9.7
3	14	20	19	16	89	64	40	54	33	46	12	9.3
4	13	19	18	e16	77	56	109	53	30	38	12	9.9
5	12	19	18	e16	64	48	118	50	29	33	12	8.8
6	13	18	18	e16	66	43	75	50	28	29	12	8.7
7	22	18	35	e16	65	e42	60	49	26	27	12	9.7
8	21	18	38	e16	57	e41	52	48	24	25	21	9.0
9	18	18	32	e16	54	e40	182	47	23	116	15	8.7
10	16	27	29	e16	52	e39	320	43	24	92	16	8.5
11	15	46	27	e16	50	e39	210	39	28	47	18	8.3
12	14	37	26	e16	64	38	134	39	26	37	15	7.9
13	15	31	25	e16	58	38	96	38	30	32	15	8.5
14	15	29	23	e16	52	36	76	37	133	29	15	8.9
15	16	27	22	e16	54	39	66	35	66	27	13	8.8
16	15	25	21	e17	56	48	74	34	42	25	12	9.0
17	14	23	21	e18	65	95	85	45	35	24	12	9.0
18	21	23	21	e20	59	109	69	42	31	25	11	8.9
19	25	22	21	e23	51	74	61	41	28	23	13	8.6
20	21	22	20	e28	46	61	57	37	27	23	13	8.3
21	20	20	20	e37	41	56	54	34	25	23	11	8.5
22	21	19	17	77	40	51	136	33	23	24	11	8.5
23	20	18	18	192	e39	48	540	34	21	21	12	8.6
24	20	17	20	446	e38	46	630	47	21	20	14	8.8
25	19	16	17	391	37	44	345	42	22	18	14	9.3
26	19	17	16	237	35	43	198	38	20	17	16	9.1
27	19	16	18	126	37	41	127	35	36	17	14	8.7
28	20	16	19	143	43	40	97	34	33	16	13	1.5
29	20	16	20	114	---	39	81	32	76	15	12	24
30	21	17	14	81	---	37	71	30	62	15	11	25
31	22	---	17	68	---	36	---	30	---	14	9.7	---
TOTAL	552	656	673	2263	1516	1543	4240	1291	1067	1023	411.7	303.2
MEAN	17.8	21.9	21.7	73.0	54.1	49.8	141	41.6	35.6	33.0	13.3	10.1
MAX	25	46	38	446	89	109	630	63	133	116	21	2.5
MIN	12	16	14	16	35	36	38	30	20	14	9.7	7.9
CFSM	.25	.31	.30	1.02	.76	.70	1.98	.58	.50	.46	.19	.14
IN.	.29	.34	.35	1.18	.79	.80	2.21	.67	.56	.53	.21	.17

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1999, BY WATER YEAR (WY)

	MEAN	40.0	58.0	71.1	68.1	77.6	108	96.0	61.6	57.6	33.8	27.9	32.5
MAX	119	171	131	146	192	227	227	152	124	183	99.0	86.8	12.3
(WY)	1987	1991	1976	1993	1997	1979	1993	1981	1997	1986	1994	1997	1977
MIN	15.0	19.1	21.7	19.8	25.7	46.1	49.4	25.1	16.4	13.6	12.5	10.1	10.1
(WY)	1969	1972	1999	1970	1970	1969	1968	1977	1987	1987	1970	1997	1997

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1966 - 1999
ANNUAL TOTAL	18213	15538.9	
ANNUAL MEAN	49.9	42.6	60.9
HIGHEST ANNUAL MEAN			89.3
LOWEST ANNUAL MEAN			32.5
HIGHEST DAILY MEAN	470	630	2320
LOWEST DAILY MEAN	12	7.9	7.9
ANNUAL SEVEN-DAY MINIMUM	14	8.5	8.5
INSTANTANEOUS PEAK FLOW		789	(a)3740
INSTANTANEOUS PEAK STAGE		8.21	11.11
ANNUAL RUNOFF (CFSM)	.70	.60	.85
ANNUAL RUNOFF (INCHES)	9.49	8.10	11.59
10 PERCENT EXCEEDS	110	74	114
50 PERCENT EXCEEDS	26	25	42
90 PERCENT EXCEEDS	15	12	19

(a) From rating curve extended above 1,200 ft³/s.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 sea level (levels by Gove Associates, Inc.).

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.8	7.3	27	e8.3	94	153	18	36	21	53	3.1	2.7
2	4.4	7.0	20	e8.2	132	79	17	32	30	34	2.9	2.4
3	4.1	6.6	15	e8.1	167	185	17	29	24	18	2.8	2.2
4	4.4	6.2	13	e8.0	112	85	29	26	18	13	2.8	2.2
5	7.5	6.0	12	e8.0	75	53	30	24	15	9.9	3.4	2.1
6	29	5.9	13	e8.0	85	40	24	23	13	8.3	2.9	2.1
7	63	5.8	126	e8.0	94	e32	22	21	12	6.9	4.3	2.2
8	23	5.9	61	e8.0	71	e28	19	20	10	6.1	5.2	2.1
9	13	5.9	33	e8.0	70	e25	179	20	9.5	124	3.4	2.2
10	9.6	59	24	e8.0	58	e25	196	17	9.2	42	4.6	2.0
11	8.1	114	20	e8.0	52	e26	93	16	58	17	4.0	2.1
12	7.2	47	17	e8.0	144	e28	90	17	56	12	3.3	2.1
13	6.6	28	16	e8.0	68	e32	51	16	19	9.3	3.5	3.3
14	6.5	22	14	e8.0	52	37	37	14	276	7.8	3.2	2.8
15	6.5	18	13	e10	57	52	32	12	62	6.9	2.7	2.3
16	6.4	15	13	e20	78	95	39	13	32	6.1	2.7	2.4
17	8.7	13	13	e35	95	191	44	92	23	5.9	2.6	2.3
18	38	11	12	80	67	110	32	157	18	6.3	2.6	2.4
19	32	11	12	184	50	49	26	75	15	5.9	2.9	2.3
20	18	10	11	194	41	37	24	42	12	5.8	2.9	2.5
21	13	9.5	11	174	33	33	22	29	10	6.9	2.6	2.7
22	10	8.9	e10	291	e26	27	276	23	9.1	6.4	2.5	2.6
23	9.2	8.6	e9.6	784	e23	23	1470	112	8.9	5.3	3.3	2.7
24	8.5	8.2	e9.4	1860	e22	22	1080	210	13	5.0	4.3	3.3
25	8.0	8.2	e9.2	1050	e22	20	445	73	10	4.6	7.7	3.3
26	7.6	8.5	e8.9	560	e23	19	224	41	7.9	4.2	7.3	2.9
27	7.2	7.9	e8.8	346	29	18	107	28	13	4.2	4.3	3.1
28	7.2	7.7	e8.7	479	52	18	81	22	11	3.7	3.5	6.2
29	6.8	7.7	e8.6	238	---	17	62	18	36	3.6	3.0	7.3
30	8.4	12	e8.5	137	---	16	42	16	12	3.5	2.8	5.7
31	7.9	---	e8.4	111	---	16	---	15	---	3.3	2.8	---
TOTAL	394.6	491.8	586.1	6665.6	1892	1591	4828	1289	863.6	448.9	109.9	86.5
MEAN	12.7	16.4	18.9	215	67.6	51.3	161	41.6	28.8	14.5	3.55	2.88
MAX	63	114	126	1860	167	191	1470	210	276	124	7.7	7.3
MIN	4.1	5.8	8.4	8.0	22	16	17	12	7.9	3.3	2.5	2.0
CFSM	.19	.25	.29	3.27	1.03	.78	2.45	.63	.44	.22	.05	.04
IN.	.22	.28	.33	3.77	1.07	.90	2.73	.73	.49	.25	.06	.05

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1999, BY WATER YEAR (WY)

	MEAN	29.6	75.8	97.0	88.1	116	169	106	58.8	47.3	22.1	16.8	30.9
MAX	152	333	328	278	408	499	206	288	295	185	122	252	252
(WY)	1987	1991	1983	1974	1997	1979	1993	1981	1997	1982	1994	1986	1986
MIN	2.56	2.98	3.99	2.89	6.71	37.6	21.2	8.89	3.10	1.94	2.03	2.09	2.09
(WY)	1964	1977	1977	1977	1963	1981	1986	1968	1987	1965	1962	1963	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1961 - 1999

ANNUAL TOTAL	20018.6	19247.0	71.1
ANNUAL MEAN	54.8	52.7	115
HIGHEST ANNUAL MEAN			24.6
LOWEST ANNUAL MEAN			1977
HIGHEST DAILY MEAN	1070	1860	5540
LOWEST DAILY MEAN	1.7	2.0	1.2
ANNUAL SEVEN-DAY MINIMUM	1.8	2.1	1.2
INSTANTANEOUS PEAK FLOW		2270	(a)8810
INSTANTANEOUS PEAK STAGE		12.46	(b)16.72
INSTANTANEOUS LOW FLOW		1.9	.83
ANNUAL RUNOFF (CFSM)	.83	.80	1.08
ANNUAL RUNOFF (INCHES)	11.32	10.88	14.69
10 PERCENT EXCEEDS	128	100	150
50 PERCENT EXCEEDS	11	13	20
90 PERCENT EXCEEDS	2.7	2.9	3.3

(a) From rating curve extended above 2,000 ft³/s.

(b) From floodmark.

(c) Estimated.

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 on grounds 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 above sea level (Fargo Engineering Co. bench mark). Prior to Sept. 24, 1935, nonrecording gage at same site and datum.

REMARKS.--Records good. Slight regulation by mills upstream from station. Flow includes about 20 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	70	121	63	309	111	131	251	97	156	66	43
2	52	74	92	57	300	115	128	232	98	151	62	45
3	53	72	84	59	286	124	126	210	90	134	59	44
4	51	70	85	72	274	120	162	177	88	127	59	42
5	53	69	84	73	258	122	165	163	85	117	62	40
6	71	68	114	72	274	125	167	171	79	89	63	41
7	129	118	128	74	276	123	164	157	80	83	70	42
8	80	131	107	74	269	171	163	149	86	81	61	40
9	74	130	105	73	228	212	213	140	81	176	e63	41
10	72	136	104	72	207	224	188	118	78	100	74	39
11	78	88	101	72	203	214	204	112	75	84	66	37
12	84	81	97	74	207	200	198	107	83	84	62	34
13	80	83	93	76	201	158	194	102	89	80	e61	32
14	75	85	92	72	191	122	191	99	92	77	e60	32
15	73	85	90	74	188	111	188	93	83	74	e59	32
16	71	89	95	77	171	114	200	89	85	71	e60	36
17	67	89	132	83	168	124	184	105	87	70	57	36
18	74	87	133	129	164	141	164	163	86	66	55	33
19	69	86	133	110	156	148	157	156	82	67	57	32
20	67	82	112	139	148	152	153	147	78	66	53	32
21	73	78	87	150	138	161	148	144	77	73	50	34
22	70	76	75	287	133	205	260	145	74	69	48	33
23	67	80	67	307	129	211	347	151	69	66	56	33
24	65	132	77	305	124	208	346	152	109	71	57	34
25	63	171	69	317	102	200	342	141	80	103	62	29
26	66	156	69	323	93	184	336	116	68	68	57	27
27	67	148	68	336	94	128	316	108	80	66	54	30
28	67	122	70	348	107	115	294	106	85	64	52	32
29	67	115	70	347	---	112	279	100	119	62	48	102
30	86	124	61	319	---	109	265	93	83	61	49	53
31	71	---	69	302	---	130	---	111	---	86	50	---
TOTAL	2191	2995	2884	4936	5398	4694	6373	4308	2546	2742	1812	1183
MEAN	70.7	99.8	93.0	159	193	151	212	139	84.9	88.5	58.5	39.4
MAX	129	171	133	348	309	224	347	251	119	176	74	102
MIN	51	68	61	57	93	109	126	89	68	61	48	27
CFSM	.41	.57	.53	.92	1.11	.87	1.22	.80	.49	.51	.34	.23
IN.	.47	.64	.62	1.06	1.15	1.00	1.36	.92	.54	.59	.39	.25

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1935 - 1999, BY WATER YEAR (WY)

	MEAN	79.6	107	115	126	147	224	227	166	129	84.7	67.3	66.4
MAX	214	305	210	343	301	501	589	484	433	349	193	222	222
(WY)	1991	1993	1993	1993	1976	1976	1950	1943	1943	1968	1995	1977	1977
MIN	23.4	25.5	27.7	27.2	31.5	73.2	64.3	54.7	34.3	19.5	15.1	25.2	25.2
(WY)	1964	1964	1964	1964	1964	1964	1935	1936	1936	1936	1936	1962	1962

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1935 - 1999
ANNUAL TOTAL	61241	42062	
ANNUAL MEAN	168	115	128
HIGHEST ANNUAL MEAN			216
LOWEST ANNUAL MEAN			44.3
HIGHEST DAILY MEAN	476	348	971
LOWEST DAILY MEAN	51	27	12
ANNUAL SEVEN-DAY MINIMUM	54	31	14
INSTANTANEOUS PEAK FLOW		479	(a) 1070
INSTANTANEOUS PEAK STAGE		12.66	15.44
INSTANTANEOUS LOW FLOW		20	9.2
ANNUAL RUNOFF (CFSM)	.96	.66	.74
ANNUAL RUNOFF (INCHES)	13.09	8.99	10.03
10 PERCENT EXCEEDS	372	209	258
50 PERCENT EXCEEDS	107	88	96
90 PERCENT EXCEEDS	64	53	39

(a) Gage height 13.50 ft.

(b) Sept. 26, 27.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04111000 GRAND RIVER NEAR EATON RAPIDS, MI

LOCATION.--Lat 42°32'05", long 84°37'23", in NE1/4 sec.26, T.2 N., R.3 W., Eaton County, Hydrologic Unit 04050004, on right bank 400 ft upstream from bridge on Petrieville Highway, 2 mi northeast of Eaton Rapids, 2.5 mi downstream from Spring Brook, 25 mi upstream from Red Cedar River, and at mile 178.

DRAINAGE AREA.--661 mi².

PERIOD OF RECORD.--October 1950 to September 1982, October 1995 to current year. Gage-height records collected in this vicinity 1905-28 (flood seasons only) are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 1707: 1951 (m).

GAGE.--Water-stage recorder. Datum of gage is 852.68 ft above sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated by powerplant at Smithville Dam and mills at Eaton Rapids. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 4, 1950, reached a stage of 8.15 ft, discharge, 3,860 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	193	267	321	e150	1070	472	478	935	149	504	173	135
2	118	233	318	e145	1110	510	540	984	420	660	181	141
3	135	164	317	e250	1070	504	430	1010	446	653	223	131
4	144	210	285	e160	1080	508	521	948	398	609	206	127
5	152	210	311	e140	1050	536	622	882	364	564	189	126
6	153	244	250	e230	1000	e500	622	847	272	469	152	116
7	267	178	384	e200	969	e450	625	799	269	418	154	107
8	349	198	453	e140	955	e470	586	750	264	380	184	107
9	346	253	460	e220	832	e460	711	711	267	349	184	78
10	341	285	424	e210	872	e490	753	703	269	307	179	80
11	181	361	379	e240	905	e510	788	697	265	325	178	81
12	261	354	378	e190	892	575	812	710	268	332	188	81
13	290	348	357	e200	866	511	795	620	266	295	182	83
14	169	310	328	e130	837	441	773	528	271	242	168	83
15	251	284	322	e270	792	531	736	517	257	154	165	83
16	237	286	288	e200	759	582	709	575	225	223	177	84
17	210	270	280	e290	743	640	713	557	278	231	180	84
18	207	239	318	e280	718	684	722	507	181	178	168	83
19	202	270	313	e350	e690	683	713	510	203	262	161	84
20	198	278	285	e370	e630	711	703	540	240	298	170	90
21	214	252	315	e390	e500	720	651	456	217	224	155	125
22	156	214	e300	e560	e540	696	808	466	210	220	153	122
23	237	256	e250	e1000	e520	666	1590	464	222	221	144	97
24	245	232	e210	e1600	e500	636	2140	468	195	240	125	81
25	201	257	e205	e1750	363	612	2290	472	235	182	139	81
26	142	262	e260	e1700	467	619	2040	470	219	225	139	81
27	152	288	e205	e1500	482	613	1520	376	245	299	148	80
28	238	352	e210	1470	444	594	1470	436	269	202	157	81
29	185	310	e200	1360	---	590	1250	425	282	202	151	101
30	201	314	e190	1260	---	514	1220	409	406	169	146	97
31	199	---	e230	1250	---	523	---	309	---	160	149	---
TOTAL	6574	7979	9346	18205	21656	17551	28331	19081	8072	9797	5168	2930
MEAN	212	266	301	587	773	566	944	616	269	316	167	97.7
MAX	349	361	460	1750	1110	720	2290	1010	446	660	223	141
MIN	118	164	190	130	363	441	430	309	149	154	125	78
CFSM	.32	.40	.46	.89	1.17	.86	1.43	.93	.41	.48	.25	.15
IN.	.37	.45	.53	1.02	1.22	.99	1.59	1.07	.45	.55	.29	.16

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 1999, BY WATER YEAR (WY)

	MEAN	241	339	427	477	579	938	947	652	404	269	191	191
	MAX	875	670	877	1406	1280	1932	1561	1848	1041	1234	579	800
	(WY)	1955	1952	1976	1952	1971	1974	1974	1956	1968	1968	1968	1975
	MIN	64.6	94.7	86.0	96.5	111	223	378	200	138	94.7	78.8	64.6
	(WY)	1964	1964	1964	1963	1964	1964	1964	1958	1964	1965	1963	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1951 - 1999

ANNUAL TOTAL	233502												
ANNUAL MEAN	640												
HIGHEST ANNUAL MEAN										471			
LOWEST ANNUAL MEAN										769			1974
HIGHEST DAILY MEAN	2120									147			1964
LOWEST DAILY MEAN	118					Jan 10	2290	Apr 25	3400			Fet 22	1971
ANNUAL SEVEN-DAY MINIMUM	155					Oct 2	78	Sep 9	21			Oct 12	1963
INSTANTANEOUS PEAK FLOW						Sep 29	81	Sep 9	52			Oct 10	1963
INSTANTANEOUS LOW FLOW							2390	Apr 24	(a)3500			Fet 21	1971
ANNUAL RUNOFF (CFSM)	.97						6.81	Apr 24	8.19			Jun 28	1968
ANNUAL RUNOFF (INCHES)	13.14						29	Nov 2	14			(b)	
10 PERCENT EXCEEDS	1430						.64		.71				
50 PERCENT EXCEEDS	367						8.71		9.67				
90 PERCENT EXCEEDS	181												

(a) Gage height 7.52 ft.

(b) Dec. 20, 1962, Oct. 14, 1966.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04111500 DEER CREEK NEAR DANSVILLE, MI

LOCATION.--Lat 42°36'30", long 84°19'15", in SE1/4 NE1/4 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 sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.61	1.3	2.0	1.8	16	8.1	6.5	15	5.6	24	1.2	.63
2	.64	1.3	2.0	e1.7	17	7.6	6.4	13	5.4	25	1.1	.57
3	.78	1.2	1.9	1.6	19	8.2	6.3	11	5.5	11	1.0	.53
4	.82	1.1	1.8	1.6	16	8.1	9.1	10	4.6	7.1	1.1	.58
5	.75	1.3	2.1	1.6	13	8.3	13	9.0	3.9	4.7	.99	.49
6	.83	1.2	2.5	e1.6	13	7.8	10	8.6	3.4	3.5	.88	.45
7	5.1	1.2	10	e1.6	13	8.2	8.9	7.9	3.0	2.7	1.1	.44
8	3.8	1.3	6.8	e1.6	11	7.9	8.1	6.9	2.6	2.1	1.7	.41
9	2.4	1.3	4.8	e1.6	12	7.0	20	6.4	2.4	2.7	1.2	.37
10	2.0	2.5	4.0	e1.6	12	7.5	26	5.9	2.3	2.2	1.1	.34
11	1.7	4.5	3.5	e1.6	12	7.1	20	5.5	2.1	1.8	1.1	.36
12	1.5	2.9	3.2	e1.6	12	6.6	19	5.8	2.4	1.7	.98	.33
13	1.4	2.4	2.9	e1.6	10	6.4	16	6.0	2.2	1.5	1.1	.37
14	1.3	2.2	2.7	e1.6	9.5	6.9	13	5.3	2.4	1.3	1.1	.39
15	1.3	2.0	2.6	e1.7	8.5	6.8	12	4.8	1.9	1.1	.88	.44
16	1.3	1.9	2.6	e1.9	8.7	8.5	16	4.6	1.8	1.0	.83	.37
17	1.2	1.8	2.5	e2.2	8.7	26	17	4.7	1.8	1.4	.76	.34
18	1.2	1.8	2.4	e6.0	7.8	40	15	9.8	1.6	2.1	.71	.36
19	1.3	1.8	2.4	e6.5	7.3	23	14	7.5	1.5	1.9	.84	.34
20	1.3	1.7	2.3	e6.0	6.5	18	13	5.9	1.4	2.3	.82	.29
21	1.2	1.7	2.4	e6.0	6.1	15	12	5.2	1.3	2.1	.78	.42
22	1.2	1.7	2.0	e35	5.1	13	66	5.1	1.3	2.2	.70	.47
23	1.2	1.7	1.7	e170	4.9	11	280	5.2	1.2	2.0	.82	.38
24	1.2	1.6	e1.7	153	4.7	10	196	5.8	1.4	4.1	1.0	.38
25	1.2	1.7	e1.8	80	4.9	9.1	99	5.2	2.1	2.4	1.4	.43
26	1.2	2.2	1.9	46	4.8	8.4	63	4.4	1.4	1.9	1.3	.36
27	1.1	2.1	1.9	35	5.6	7.9	38	3.8	1.8	2.6	1.1	.28
28	1.1	1.9	1.8	41	7.2	7.6	28	3.4	1.9	2.1	.93	.27
29	1.2	1.8	1.8	28	—	7.3	21	3.0	7.2	1.6	.78	1.1
30	1.3	1.9	1.5	22	—	6.7	18	2.8	3.9	1.4	.74	1.7
31	1.3	—	1.6	18	—	6.7	—	4.4	—	1.3	.68	—
TOTAL	44.43	55.0	85.1	681.0	276.3	330.7	1090.3	201.9	81.3	124.8	30.72	14.19
MEAN	1.43	1.83	2.75	22.0	9.87	10.7	36.3	6.51	2.71	4.03	.99	.47
MAX	5.1	4.5	10	170	19	40	280	15	7.2	25	1.7	1.7
MIN	.61	1.1	1.5	1.6	4.7	6.4	6.3	2.8	1.2	1.0	.68	.27
CFSM	.09	.11	.17	1.35	.61	.65	2.23	.40	.17	.25	.06	.03
IN.	.10	.13	.19	1.55	.63	.75	2.49	.46	.19	.28	.07	.03

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1999, BY WATER YEAR (WY)

	MEAN	5.42	9.20	12.1	11.9	17.1	29.7	24.5	12.4	8.50	4.02	2.48	2.99
MAX	33.8	45.1	32.7	40.1	52.3	70.6	64.8	57.2	43.3	30.5	17.1	20.6	
(WY)	1960	1993	1973	1974	1985	1982	1975	1956	1968	1957	1992	1592	
MIN	.35	.65	.48	.88	1.65	3.00	5.93	2.58	1.03	.39	.19	.25	
(WY)	1964	1964	1964	1977	1963	1964	1963	1958	1988	1965	1971	1579	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1954 - 1999

ANNUAL TOTAL	5661.16		3015.74										
ANNUAL MEAN	15.5		8.26										
HIGHEST ANNUAL MEAN										11.6			
LOWEST ANNUAL MEAN										22.8			1593
HIGHEST DAILY MEAN										1.86			1564
LOWEST DAILY MEAN	202									720			Apr 19 1575
ANNUAL SEVEN-DAY MINIMUM	.54									.05			Sep 9 1578
INSTANTANEOUS PEAK FLOW	.60									.09			Sep 5 1578
INSTANTANEOUS PEAK STAGE										(a)962			Apr 19 1575
INSTANTANEOUS LOW FLOW										(b)12.18			Apr 19 1575
ANNUAL RUNOFF (CFSM)	.95									.04			(d)
ANNUAL RUNOFF (INCHES)	12.92									.71			
10 PERCENT EXCEEDS	38									9.69			
50 PERCENT EXCEEDS	3.1									26			
90 PERCENT EXCEEDS	.84									4.7			
										.71			

(a) From rating curve extended above 610 ft³/s.

(b) From floodmark.

(c) Sept. 20, 27, 28, 29.

(d) Sept. 8, 9, 12, 1978.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except for most estimated daily discharges, which are fair. At times, low flow is affected by pumpage for irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e.10	e.20	e.29	.22	4.7	1.9	2.2	6.8	1.3	2.6	e.10	.05
2	.09	e.19	e.29	.19	5.1	1.8	2.1	5.6	2.0	3.5	e.09	.05
3	e.14	e.19	e.28	.20	5.7	2.0	2.0	4.7	3.0	1.8	.08	.05
4	e.14	e.20	e.28	.23	5.0	1.9	3.3	4.1	2.0	1.1	.10	.05
5	e.13	e.20	e.32	.22	3.9	2.0	5.0	3.5	1.7	.67	.08	.05
6	.16	e.22	e.37	.23	3.8	2.0	4.3	3.2	1.4	.45	.08	e.04
7	.63	e.20	e.29	.23	3.8	2.1	3.4	2.9	1.1	.32	.15	e.04
8	.29	e.22	e.61	.23	3.3	1.8	3.1	2.6	.94	.25	.18	e.03
9	.25	e.20	e.48	.24	3.3	2.0	16	2.4	.86	e.24	.13	e.03
10	.21	e.63	e.46	.23	3.2	2.0	18	2.2	.79	e.20	.13	.03
11	.20	e.65	e.44	.23	3.2	2.0	12	2.0	.68	e.22	.12	.04
12	.18	e.40	e.42	.24	3.4	1.9	11	1.9	.69	e.18	.10	.04
13	.17	e.35	e.39	.23	2.6	1.8	7.9	1.9	.68	e.16	.12	.04
14	e.18	e.32	e.37	.23	2.3	1.9	6.4	1.7	.71	e.15	.11	.04
15	e.17	e.30	e.37	.24	2.3	2.1	5.4	1.5	.57	.13	.09	.04
16	e.16	e.29	e.37	.26	2.3	2.9	7.7	1.5	.51	.11	.07	e.05
17	e.17	e.28	.36	.29	2.2	15	8.3	1.5	.50	.11	.09	e.04
18	.18	e.27	.34	.84	2.0	24	7.3	1.9	.45	.14	.09	e.05
19	.18	e.27	.33	.95	1.9	12	6.2	1.6	.42	e.18	.10	e.04
20	.17	e.26	.32	.85	1.7	7.9	5.5	1.4	.39	e.21	.08	.04
21	e.18	e.26	.34	.91	1.5	6.5	5.0	1.3	e.35	e.20	.07	.05
22	e.18	e.25	.31	10	1.4	5.0	70	1.3	.31	e.20	.06	.05
23	.18	e.25	.24	68	1.4	4.2	194	1.3	.27	e.19	.08	.04
24	.18	e.26	.23	40	1.3	3.8	77	1.4	.29	e.40	.11	.04
25	.18	e.27	.24	22	1.4	3.2	43	1.2	.34	e.25	.13	e.05
26	.17	e.28	.25	15	1.4	2.9	31	1.1	.27	e.18	.12	e.04
27	.18	e.29	.24	12	1.5	2.8	23	.91	.33	e.25	.12	e.04
28	.18	e.28	.25	16	1.8	2.7	17	.83	.36	e.20	.09	e.04
29	.18	e.27	.27	9.6	---	2.5	11	.77	.55	e.15	.08	.10
30	.21	e.28	.24	6.9	---	2.3	8.3	.70	.50	e.13	.08	.08
31	.19	---	.22	5.5	---	2.3	---	.89	---	e.11	.05	---
TOTAL	5.91	8.53	10.87	212.49	77.4	129.2	616.4	66.60	24.26	14.98	3.08	1.37
MEAN	.19	.28	.35	6.85	2.76	4.17	20.5	2.15	.81	.48	.099	.046
MAX	.63	.65	.95	68	5.7	24	194	6.8	3.0	3.5	.18	.10
MIN	.09	.19	.22	.19	1.3	1.8	2.0	.70	.27	.11	.05	.03
CFSM	.02	.03	.04	.73	.30	.45	2.20	.23	.09	.05	.01	.00
IN.	.02	.03	.04	.85	.31	.51	2.46	.27	.10	.06	.01	.01

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1999, BY WATER YEAR (WY)

	MEAN	2.67	4.18	5.81	5.50	8.39	16.4	13.0	5.91	4.45	1.89	1.11	1.39
MAX	20.9	21.9	24.9	21.4	28.4	39.9	47.2	37.6	35.3	26.5	8.15	7.19	
(WY)	1960	1993	1973	1974	1985	1982	1975	1956	1968	1957	1980	1993	
MIN	.087	.13	.11	.11	.12	.78	1.45	.94	.25	.074	.099	.046	
(WY)	1964	1964	1964	1963	1963	1964	1963	1955	1988	1988	1999	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1954 - 1999

ANNUAL TOTAL	2564.30												
ANNUAL MEAN	7.03												
HIGHEST ANNUAL MEAN										5.88			
LOWEST ANNUAL MEAN										10.5			(a)
HIGHEST DAILY MEAN	141									.72			1964
LOWEST DAILY MEAN	.07					Mar 9	194		Apr 23	536			Apr 19 1975
ANNUAL SEVEN-DAY MINIMUM	.09					Sep 28	.03		Sep 8	.02			Aug 3 1988
INSTANTANEOUS PEAK FLOW						Sep 26	.04		Sep 6	.03			Jul 29 1988
INSTANTANEOUS PEAK STAGE							294		Apr 23	(b)1290			Apr 18 1975
INSTANTANEOUS LOW FLOW							4.97		Apr 23	9.99			Apr 18 1975
ANNUAL RUNOFF (CFSM)	.75						.34			.01			(c)
ANNUAL RUNOFF (INCHES)	10.21						4.66			.63			
10 PERCENT EXCEEDS	19						5.5			14			
50 PERCENT EXCEEDS	.90						.34			1.7			
90 PERCENT EXCEEDS	.16						.08			.19			

(a) 1973, 1993.

(b) From rating curve extended above 660 ft³/s on basis of computation of peak flow through culvert and over road embankment.

(c) Sept. 11, 1954, Jan. 18, 1957, Aug. 3, 1988.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 sea level (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.--Records good. Large diurnal fluctuation at low and medium flow caused by powerplants upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	305	323	496	328	1880	672	741	2130	350	1440	203	160
2	247	351	444	222	1660	744	696	1460	441	1110	228	180
3	172	321	464	216	1750	784	764	1490	760	1160	262	229
4	176	222	488	344	1600	766	888	1480	558	939	312	156
5	267	336	393	240	1560	763	1070	1280	570	781	296	155
6	344	332	578	216	1520	813	1070	1240	509	667	231	231
7	603	318	606	335	1370	707	968	1180	368	574	356	162
8	518	272	772	299	1370	654	939	1080	367	505	375	155
9	537	271	692	216	1340	746	1280	1000	367	622	261	157
10	496	769	636	311	1130	687	1520	954	415	419	259	155
11	412	433	615	300	1240	722	1590	914	444	387	268	150
12	259	653	533	345	1290	763	1530	889	356	396	284	149
13	472	486	512	272	1220	844	1420	780	421	410	255	154
14	320	476	536	288	1120	611	1360	799	475	295	261	147
15	216	430	438	205	1100	706	1220	624	344	311	263	197
16	370	421	440	386	1070	797	1300	691	461	212	189	75
17	320	349	421	311	998	944	1250	795	316	372	275	104
18	343	368	427	451	1030	1350	1250	844	408	266	214	119
19	264	353	468	437	922	1430	1250	708	231	230	262	114
20	265	367	394	523	934	1360	1210	718	374	420	169	116
21	310	404	402	557	892	1270	1120	702	260	401	276	121
22	284	338	493	1070	670	1200	1900	589	347	288	167	132
23	194	335	287	1800	767	1080	4340	654	251	589	266	209
24	413	368	353	2980	720	1000	5690	606	540	545	192	177
25	259	304	301	3500	723	930	5960	630	298	488	275	155
26	289	434	296	3700	547	894	5340	599	354	267	281	140
27	192	348	376	3430	706	882	4260	587	540	426	170	146
28	273	423	309	3090	675	851	3110	506	413	398	244	172
29	330	511	315	2620	---	836	2660	575	513	222	213	313
30	302	452	284	2220	---	804	2090	535	522	306	168	250
31	284	---	278	2080	---	673	---	600	---	216	270	---
TOTAL	10036	11768	14047	33292	31804	27283	59786	27639	12573	15662	7745	4880
MEAN	324	392	453	1074	1136	880	1993	892	419	505	250	163
MAX	603	769	772	3700	1880	1430	5960	2130	760	1440	375	313
MIN	172	222	278	205	547	611	696	506	231	212	167	75
CFSM	.26	.32	.37	.87	.92	.72	1.62	.72	.34	.41	.20	.13
IN.	.30	.36	.42	1.01	.96	.83	1.81	.84	.38	.47	.23	.15

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1999, BY WATER YEAR (WY)

MEAN	461	624	738	836	1037	1923	1790	1126	827	485	355	357
MAX	1880	2559	1666	2669	2550	7242	5113	3815	2803	2204	1178	1277
(WY)	1987	1993	1976	1993	1976	1904	1947	1956	1905	1902	1992	1903
MIN	88.5	138	124	150	158	348	488	330	168	98.3	61.1	93.6
(WY)	1964	1965	1964	1963	1963	1964	1935	1958	1936	1936	1936	1963

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1901 - 1999
ANNUAL TOTAL	409768	256515	
ANNUAL MEAN	1123	703	878
HIGHEST ANNUAL MEAN			1638
LOWEST ANNUAL MEAN			232
HIGHEST DAILY MEAN	4840	5960	22700
LOWEST DAILY MEAN	167	75	20
ANNUAL SEVEN-DAY MINIMUM	218	112	44
INSTANTANEOUS PEAK FLOW		6090	(a)24500
INSTANTANEOUS PEAK STAGE		10.88	(b)15.43
INSTANTANEOUS LOW FLOW		13	2.8
ANNUAL RUNOFF (CFSM)	.91	.57	.71
ANNUAL RUNOFF (INCHES)	12.39	7.76	9.69
10 PERCENT EXCEEDS	2660	1360	1920
50 PERCENT EXCEEDS	604	441	550
90 PERCENT EXCEEDS	259	204	184

(a) From rating curve extended above 15,000 ft³/s; gage height, 18.60 ft, datum then in use.

(b) Present site and datum.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04114000 GRAND RIVER AT PORTLAND, MI

LOCATION.--Lat 42°51'23", long 84°54'44", in NW1/4 sec.4, T.5 N., R.5 W., Ionia County, Hydrologic Unit 04050004, on left bank at down stream side of bridge on Kent Street, 1.0 mi south of Portland, 1.9 mi upstream from Looking Glass River, and at mile 115.

DRAINAGE AREA.--1,385 mi².

PERIOD OF RECORD.--August 1952 to March 1982, June 1988 to current year. Gage-height records collected in this vicinity 1907-28 (flood seasons only) are contained in reports of the National Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 705.00 ft above sea level (levels by Michigan Department of Natural Resources). Prior to July 6, 1953, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Slight diurnal fluctuation caused by powerplants upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	265	361	528	e320	2000	788	762	2050	649	781	308	285
2	329	372	545	e380	1780	756	790	1830	423	1860	238	238
3	368	425	494	e270	1770	885	798	1640	521	1230	256	260
4	234	423	507	e260	1710	863	863	1540	765	1160	292	280
5	232	270	528	e400	1580	860	1080	1490	564	944	378	210
6	337	403	453	e290	1590	896	1140	1330	585	837	353	188
7	736	413	775	e260	1500	873	1100	1280	527	723	332	151
8	655	388	652	e390	1370	785	1000	1190	426	635	442	278
9	582	384	844	e350	1390	772	1180	1150	402	622	462	151
10	600	394	733	e260	1290	834	1720	1050	428	726	351	180
11	558	966	699	e360	1210	786	1680	1010	436	489	306	153
12	490	528	664	e350	1310	801	1750	984	474	472	326	187
13	316	715	582	e400	1270	858	1550	987	419	469	332	183
14	513	564	568	e320	1220	927	1470	839	525	477	291	181
15	406	538	597	e340	1150	644	1370	863	535	411	363	186
16	298	499	504	e250	1150	831	1320	694	410	336	276	217
17	407	490	504	e450	1120	962	1440	832	501	343	257	205
18	413	445	486	e360	1060	1360	1330	931	389	404	248	127
19	391	414	490	e520	1070	1590	1310	853	449	387	330	128
20	343	430	526	e500	980	1510	1310	773	309	291	251	149
21	331	418	465	e620	992	1390	1240	758	405	461	264	146
22	357	466	475	e1200	933	1300	1520	723	347	522	252	154
23	378	410	554	e2000	725	1230	4430	666	364	336	269	151
24	263	401	e350	3020	879	1110	6580	750	357	717	249	186
25	444	433	e410	3540	824	1060	6600	667	649	654	346	261
26	339	395	e350	3650	739	990	6320	676	401	578	332	200
27	376	465	e340	3680	673	970	5360	652	445	375	409	164
28	272	424	e440	3380	786	956	4200	602	642	483	243	178
29	315	482	e360	2910	—	908	3270	559	696	480	228	272
30	409	574	e370	2450	—	918	2730	597	649	294	329	435
31	399	—	e340	2160	—	856	—	587	—	327	214	—
TOTAL	12356	13890	16133	35640	34071	30269	67213	30523	14692	18824	9527	6173
MEAN	399	463	520	1150	1217	976	2240	985	490	607	307	206
MAX	736	966	844	3680	2000	1590	6600	2050	765	1860	462	435
MIN	232	270	340	250	673	644	762	559	309	291	214	127
CFSM	.29	.33	.38	.83	.88	.70	1.62	.71	.35	.44	.22	.15
IN.	.33	.37	.43	.96	.92	.81	1.81	.82	.39	.51	.26	.17

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

	MEAN	550	788	913	984	1161	2049	1979	1295	845	567	439	420
MAX	1766	2743	1975	2989	2947	4202	3936	4676	2587	2268	1297	1430	1970
(WY)	1982	1993	1976	1993	1976	1974	1975	1956	1989	1968	1992	1970	1970
MIN	132	174	161	184	186	382	683	373	258	155	166	130	130
(WY)	1964	1965	1964	1963	1963	1964	1964	1958	1988	1965	1965	1965	1960

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1952 - 1999

ANNUAL TOTAL	454504						289311						
ANNUAL MEAN	1245						793			996			
HIGHEST ANNUAL MEAN										1830		1993	
LOWEST ANNUAL MEAN										282		1964	
HIGHEST DAILY MEAN													
LOWEST DAILY MEAN	5300				Mar 11		6600		Apr 25	12200		Apr 21 1970	
ANNUAL SEVEN-DAY MINIMUM	216				Aug 5		127		Sep 18	58		Oct 9 1963	
INSTANTANEOUS PEAK FLOW	283				Jul 30		149		Sep 18	85		Aug 18 1960	
INSTANTANEOUS PEAK STAGE							6810		Apr 24	12400		Apr 21 1970	
INSTANTANEOUS LOW FLOW							10.49		Apr 24	12.98		Apr 21 1970	
ANNUAL RUNOFF (CFSM)	.90						101		(a)	38		Oct 10 1960	
ANNUAL RUNOFF (INCHES)	12.21						.57			.72			
10 PERCENT EXCEEDS	2910						7.77			9.77			
50 PERCENT EXCEEDS	698						1490			2150			
90 PERCENT EXCEEDS	330						520			643			
							257			238			

(a) Sept. 18, 19.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 2.3 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 sea level (levels by Michigan Department of Natural Resources). Prior to Oct. 4, 1968, nonrecording gage at same site and datum.

REMARKS.--Records poor. At times, water is pumped from the river about 8 mi upstream to fill the wetlands in the Maple River State Game Area. Some of the water is returned to the river at a later date, when water levels in the wetlands are lowered. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e8.7	42	41	30	613	119	153	831	118	131	29	13
2	e8.7	51	41	29	544	121	143	675	111	167	27	13
3	e10	53	41	e31	496	124	132	564	107	184	26	12
4	13	63	42	e31	464	125	134	481	102	185	25	13
5	14	60	43	e30	435	129	145	420	97	177	24	13
6	16	55	43	e30	406	122	141	375	93	162	22	13
7	36	49	52	e30	377	117	149	340	88	146	22	13
8	42	45	59	e30	350	109	153	313	84	133	23	13
9	34	41	60	e30	326	108	165	289	82	125	24	13
10	27	47	60	e29	309	110	187	267	78	116	22	13
11	22	62	58	e29	291	114	196	245	75	103	23	13
12	21	66	54	e29	278	113	223	230	72	93	23	13
13	22	66	52	e29	273	113	e246	216	69	84	23	13
14	24	68	49	e29	261	113	e256	201	79	76	23	12
15	24	63	46	e29	247	114	259	188	85	66	23	12
16	23	59	45	e29	233	120	260	178	83	57	22	12
17	25	54	44	e31	220	148	262	178	80	53	22	12
18	27	49	42	e35	208	201	261	183	74	55	21	12
19	30	49	41	e39	e197	255	257	185	69	53	20	12
20	30	48	41	e44	184	282	249	179	63	51	20	12
21	31	46	40	e48	172	290	240	170	57	48	19	11
22	30	43	38	e58	157	287	263	163	50	46	18	9.8
23	30	41	36	168	142	278	730	160	44	41	18	9.1
24	31	43	34	368	127	267	1910	170	39	38	18	9.4
25	33	43	34	545	125	253	2310	173	38	37	18	9.4
26	35	42	33	708	121	235	2250	174	36	36	18	9.3
27	37	41	32	771	117	219	1980	166	46	35	17	9.0
28	39	39	32	784	115	202	1660	156	54	33	17	9.7
29	40	38	32	791	---	185	1340	145	94	33	16	11
30	42	38	e32	762	---	172	1060	133	120	32	16	12
31	42	---	31	698	---	162	---	124	---	30	14	---
TOTAL	847.4	1504	1328	6324	7788	5307	17714	8272	2287	2626	653	351.7
MEAN	27.3	50.1	42.8	204	278	171	590	267	76.2	84.7	21.1	11.7
MAX	42	68	60	791	613	290	2310	831	120	185	29	13
MIN	8.7	38	31	29	115	108	132	124	36	30	14	9.0
CFSM	.06	.12	.10	.47	.64	.39	1.36	.61	.18	.20	.05	.03
IN.	.07	.13	.11	.54	.67	.45	1.52	.71	.20	.23	.06	.03

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1999, BY WATER YEAR (WY)

	MEAN	149	188	254	261	311	712	630	363	197	114	60.2	127
MAX	1461	837	813	1035	1133	2049	1582	1812	937	1243	361	1634	
(WY)	1987	1991	1991	1973	1997	1985	1947	1956	1996	1994	1994	1986	
MIN	9.77	21.8	20.9	17.3	16.9	103	139	74.1	24.6	10.6	8.47	11.4	
(WY)	1967	1963	1963	1963	1963	1964	1945	1977	1977	1965	1965	1962	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1944 - 1999

ANNUAL TOTAL	95616.9			55002.1								
ANNUAL MEAN	262			151								
HIGHEST ANNUAL MEAN										281		
LOWEST ANNUAL MEAN										501		1976
HIGHEST DAILY MEAN	1980	Feb 20		2310	Apr 25					65.1		1963
LOWEST DAILY MEAN	4.2	Sep 11		8.7	Oct 1					4.2		Sep 11 1998
ANNUAL SEVEN-DAY MINIMUM	8.3	Sep 9		9.4	Sep 22					5.6		Sep 20 1979
INSTANTANEOUS PEAK FLOW				2360	Apr 25					(a)8770		Sep 12 1986
INSTANTANEOUS PEAK STAGE				9.04	Apr 25					(b)12.33		Sep 12 1986
ANNUAL RUNOFF (CFSM)	.60			.35						.65		
ANNUAL RUNOFF (INCHES)	8.20			4.71						8.78		
10 PERCENT EXCEEDS	756			289						670		
50 PERCENT EXCEEDS	56			55						121		
90 PERCENT EXCEEDS	16			15						23		

(a) Result of dam failure on Rainbow Lake (Pine Creek).

(b) From floodmark.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04115265 FISH CREEK NEAR CRYSTAL, MI

LOCATION.--Lat 43°14'59", long 84°58'52", in NW1/4 NE1/4 sec.23, T.10 N., R.6 W., Montcalm County, Hydrologic Unit 04050005, on 1-ft bank 10 ft downstream from bridge on Sidney Road, 3.5 mi southwest of Crystal.

DRAINAGE AREA.--39.7 mi².

PERIOD OF RECORD.--October 1987 to current year.

REVISED RECORDS.--WDR MI-92-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 795 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges and those below 10 ft³/s, which are fair. At times, low flow is affected by pumpage for irrigation. Several measurements of water temperature were made during the year.

REVISIONS.--Revised maximum discharges for water years 1988-91, and revised daily, monthly, and annual discharges (in cubic feet per second) for water years 1988-90 are given below. These figures supersede those published in the reports for 1988-91.

Instantaneous peak discharges:

WATER YEAR	DATE	DISCHARGE (ft ³ /s)	GAGE HEIGHT (ft)	WATER YEAR	DATE	DISCHARGE (ft ³ /s)	GAGE HEIGHT (ft)
1988	Feb. 1, 1988	302	4.94	1990	Mar. 12, 1990	558	5.83
1989	Mar. 15, 1989	502	5.42	1991	Nov. 28, 1990	227	4.85

Daily discharges:

Jan. 31, 1988	168	Mar. 15, 1989	365	Mar. 11, 1990	211
Feb. 1	248	Mar. 16	334	Mar. 12	450
		May 31	224	Mar. 13	349
		June 1	166	Mar. 14	190

Monthly and annual discharges:

MONTH/YEAR	TOTAL	MEAN	MAX	MIN	CFSM	IN.
January 1988	1061	34.2	168	25	.86	.99
February 1988	1140	39.3	248	26	.99	1.07
Water Year 1988	10897.2	29.8	248	8.1	.75	10.21
March 1989	2123	68.5	365	21	1.73	1.99
May 1989	1047	33.8	224	20	.85	.98
June 1989	1168	38.9	166	22	.98	1.09
Calendar Year 1988	10905.2	29.8	248	8.1	.75	10.22
Water year 1989	12067	33.1	365	11	.83	11.31
March 1990	2352	75.9	450	22	1.91	2.20
Calendar Year 1989	11128	30.5	365	11	.77	10.43
Water Year 1990	11016	30.2	450	12	.76	10.32
Calendar Year 1990	12715	34.8	450	12	.88	11.91

STREAMS TRIBUTARY TO LAKE MICHIGAN

04115265 FISH CREEK NEAR CRYSTAL, MI--Continued

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	20	29	15	27	28	23	28	25	34	6.9	11
2	15	19	24	15	30	26	23	27	24	33	5.6	11
3	15	18	22	e16	39	26	23	26	23	24	6.3	9.8
4	15	17	21	e17	36	25	31	25	21	21	15	9.0
5	15	17	29	e17	31	26	38	25	19	18	15	8.3
6	26	17	28	e17	29	25	28	26	18	16	13	8.5
7	60	17	54	e16	29	e24	27	27	17	13	14	9.4
8	30	17	36	e16	27	e23	26	26	16	11	22	8.3
9	22	17	28	e16	29	e22	31	27	16	23	16	8.5
10	19	47	26	e16	35	e22	31	25	16	20	15	9.1
11	18	66	24	e16	38	23	32	24	20	16	15	8.8
12	17	35	23	e16	71	23	36	25	23	14	12	8.4
13	17	27	22	e16	42	23	30	28	21	12	36	9.5
14	17	25	21	e16	33	23	27	24	26	9.8	26	9.5
15	17	23	21	e16	31	23	26	23	21	9.0	19	9.2
16	16	23	20	e17	31	26	27	23	19	7.1	16	9.1
17	17	22	19	e20	33	36	29	46	17	11	15	8.5
18	28	22	19	e40	30	52	27	45	16	27	14	7.5
19	24	21	20	30	28	39	26	35	16	23	14	6.7
20	20	21	19	23	26	32	25	28	15	21	13	6.4
21	19	20	20	20	24	31	24	25	13	19	11	7.8
22	18	19	18	30	e23	29	43	23	13	19	8.2	8.8
23	17	19	18	51	e22	27	113	25	14	18	10	8.5
24	17	e19	16	66	e21	26	125	32	16	24	13	13
25	17	e20	16	46	22	26	62	27	16	18	15	12
26	17	e20	16	38	22	24	44	24	13	16	24	10
27	17	e19	16	35	23	24	37	22	33	15	21	9.5
28	18	e19	16	40	26	24	34	21	27	14	16	54
29	19	19	16	36	—	23	31	20	31	13	14	67
30	20	21	e16	31	—	23	29	19	22	11	12	45
31	20	—	16	29	—	23	—	19	—	8.7	12	—
TOTAL	622	686	689	793	858	827	1108	820	587	538.6	465.0	412.1
MEAN	20.1	22.9	22.2	25.6	30.6	26.7	36.9	26.5	19.6	17.4	15.0	13.7
MAX	60	66	54	66	71	52	125	46	33	34	36	67
MIN	15	17	16	15	21	22	23	19	13	7.1	5.6	6.4
CFSM	.51	.58	.56	.64	.77	.67	.93	.67	.49	.44	.38	.35
IN.	.58	.64	.65	.74	.80	.77	1.04	.77	.55	.50	.44	.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1999, BY WATER YEAR (WY)

MEAN	29.8	39.2	33.3	34.0	37.8	51.9	45.9	36.0	30.3	23.1	23.0	22.1
MAX	39.2	59.5	46.1	48.9	61.2	75.9	66.6	45.9	44.3	50.9	41.7	33.8
(WY)	1992	1995	1992	1993	1997	1990	1991	1997	1994	1994	1994	1993
MIN	20.1	22.9	19.8	24.5	25.7	26.7	35.2	26.5	15.3	11.6	11.4	13.7
(WY)	1999	1999	1990	1994	1989	1999	1996	1999	1988	1998	1998	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1988 - 1999

ANNUAL TOTAL	9781.3	8405.7	
ANNUAL MEAN	26.8	23.0	(a)33.8
HIGHEST ANNUAL MEAN			40.7
LOWEST ANNUAL MEAN			23.0
HIGHEST DAILY MEAN	100	125	(a)450
LOWEST DAILY MEAN	6.3	5.6	5.6
ANNUAL SEVEN-DAY MINIMUM	7.7	7.7	7.7
INSTANTANEOUS PEAK FLOW		173	(a)558
INSTANTANEOUS PEAK STAGE		4.47	5.53
INSTANTANEOUS LOW FLOW			3.8
ANNUAL RUNOFF (CFSM)	.68	.58	.85
ANNUAL RUNOFF (INCHES)	9.17	7.88	11.58
10 PERCENT EXCEEDS	50	35	53
50 PERCENT EXCEEDS	22	21	29
90 PERCENT EXCEEDS	11	11	17

(a) Revised.

(b) Aug. 27, 28, 1998.

(c) Estimated.

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 1951 to current year. Gage-height records collected in this vicinity 1907-28 (flood seasons only) are contained in reports of the National Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 615.38 ft above sea level. Mar. 19 to Sept. 24, 1931, nonrecording gage at site 1.5 mi upstream at different datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Diurnal fluctuation below approximately 5,000 ft³/s caused by powerplants upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	452	530	952	e550	3770	1420	1510	5460	1140	1450	514	479
2	449	655	712	e540	3750	1350	1450	4830	1060	2510	504	379
3	450	555	812	e600	3420	1340	1450	4010	862	2510	491	467
4	454	688	762	e500	3400	1510	1540	3650	1100	2090	407	330
5	449	600	758	e450	3190	1490	1830	3380	1230	1910	430	377
6	423	577	774	e560	3030	1450	1950	3090	1010	1570	578	344
7	597	610	925	e600	3000	1490	1930	2880	886	1380	522	355
8	1160	666	1360	e450	2730	1310	1810	2690	825	1230	635	376
9	956	639	870	e540	2630	1260	1990	2440	637	1260	619	349
10	855	794	1150	e600	2580	1340	2710	2270	737	1170	679	349
11	849	1040	1110	e450	2370	1340	2900	2130	710	991	564	349
12	731	1190	1030	e550	2410	1340	2880	2010	801	850	506	292
13	646	1070	995	e560	2460	1370	2870	1920	767	697	574	392
14	617	863	705	e600	2220	1450	2600	1850	947	797	522	348
15	610	851	920	e550	2220	1420	2520	1670	957	711	532	348
16	601	864	811	e470	2110	1190	2470	1550	865	620	527	355
17	498	759	778	e500	2070	1580	2570	1460	707	612	514	334
18	689	831	821	e600	2000	2570	2630	1660	773	653	497	329
19	605	768	706	e700	1940	2890	2610	1690	632	739	401	288
20	609	519	637	e800	1870	2750	2500	1500	690	674	498	296
21	558	728	794	e1000	1680	2590	2430	1490	584	662	489	315
22	481	619	665	e1500	1670	2430	2760	1460	630	714	342	308
23	630	705	e700	e2600	1500	2310	6130	1400	646	637	401	307
24	495	761	e740	e5500	1230	2190	11000	1660	582	740	497	323
25	599	659	e650	e6000	1510	2030	13100	1560	709	1030	578	268
26	487	630	e610	e6400	1380	1950	12500	1380	967	751	561	250
27	693	654	e600	e6600	1200	1870	11000	1340	627	833	604	308
28	512	654	e590	e6200	1280	1830	9310	1300	851	553	571	431
29	409	671	e660	e5500	---	1770	7460	1180	1410	731	466	639
30	656	727	e580	4870	---	1640	6350	1100	1640	645	381	753
31	643	---	e560	4230	---	1660	---	1280	---	612	488	---
TOTAL	18863	21877	24737	61570	64620	54130	126760	67290	25982	32332	15892	10968
MEAN	608	729	798	1986	2308	1746	4225	2171	866	1043	513	366
MAX	1160	1190	1360	6600	3770	2890	13100	5460	1640	2510	679	753
MIN	409	519	560	450	1200	1190	1450	1100	582	553	342	250
CFSM	.21	.26	.28	.70	.81	.61	1.49	.76	.30	.37	.18	.13
IN.	.25	.29	.32	.81	.85	.71	1.66	.88	.34	.42	.21	.14

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

	MEAN	1220	1614	1934	2032	2432	4390	4097	2563	1603	1071	778	918
MAX	7613	4931	4672	5715	6170	9398	7492	9715	4963	4468	2416	4613	4613
(WY)	1987	1993	1991	1993	1976	1985	1993	1956	1989	1994	1994	1975	1975
MIN	254	380	346	375	377	802	702	567	464	287	310	360	360
(WY)	1964	1965	1964	1963	1963	1964	1931	1931	1988	1965	1965	1963	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1931 - 1999

ANNUAL TOTAL	802847												
ANNUAL MEAN	2200												
HIGHEST ANNUAL MEAN													
LOWEST ANNUAL MEAN													
HIGHEST DAILY MEAN	10100												
LOWEST DAILY MEAN	295												
ANNUAL SEVEN-DAY MINIMUM	427												
INSTANTANEOUS PEAK FLOW													
INSTANTANEOUS PEAK STAGE													
INSTANTANEOUS LOW FLOW													
ANNUAL RUNOFF (CFSM)	.77												
ANNUAL RUNOFF (INCHES)	10.52												
10 PERCENT EXCEEDS	5600												
50 PERCENT EXCEEDS	1040												
90 PERCENT EXCEEDS	494												

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04117000 QUAKER BROOK NEAR NASHVILLE, MI

LOCATION.--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 Clark Road, 500 ft upstream from unnamed tributary, and 2.5 mi south of Nashville.

DRAINAGE AREA.--7.60 mi².

PERIOD OF RECORD.--August 1954 to September 1975, October 1975 to September 1994 (operated as a crest-stage partial-record station), October 1994 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 821.89 ft above sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	4.8	6.1	3.5	6.7	8.1	5.1	6.1	5.5	16	2.4	2.0
2	3.2	4.4	5.1	3.0	9.5	6.6	5.2	5.8	6.7	17	2.1	2.0
3	3.5	4.2	4.8	3.4	11	8.5	5.1	5.5	6.1	6.5	2.1	1.9
4	3.5	4.2	4.7	4.2	8.6	7.0	11	5.2	4.3	4.6	2.1	1.8
5	3.5	4.0	4.7	4.3	6.8	6.3	14	5.1	3.8	3.7	2.0	1.8
6	5.1	3.9	6.0	4.4	7.4	e6.7	7.2	5.4	3.5	3.2	2.0	1.9
7	18	4.0	12	4.6	6.9	5.8	5.9	5.5	3.3	2.9	2.5	2.0
8	9.0	4.2	7.0	4.5	6.1	5.2	5.5	5.3	3.0	2.8	3.0	1.8
9	5.4	4.2	5.6	4.5	6.4	5.4	19	5.5	3.0	8.3	2.4	1.8
10	4.6	11	5.1	4.2	6.4	5.7	21	4.9	3.0	5.1	3.5	1.8
11	4.3	12	4.9	4.2	7.0	5.3	12	4.6	2.9	3.5	3.0	1.9
12	4.2	7.0	4.8	4.4	9.6	5.3	10	4.5	4.3	3.0	2.6	1.9
13	4.0	5.7	4.5	4.3	6.7	5.3	7.5	4.7	3.5	2.9	2.7	2.0
14	4.0	5.4	4.4	4.4	6.1	5.3	6.3	4.4	5.1	2.7	2.5	2.0
15	3.9	5.0	4.6	4.4	5.9	5.6	5.9	4.3	3.7	2.7	2.3	2.0
16	3.7	4.8	4.6	4.6	6.4	7.5	11	4.2	3.3	2.5	2.2	2.0
17	3.9	4.7	4.6	4.8	7.6	14	9.0	5.3	3.2	2.5	2.1	2.0
18	4.4	4.5	4.4	e8.6	6.0	19	6.8	14	3.0	2.6	2.1	2.0
19	4.4	4.5	4.7	e8.0	5.6	9.7	6.1	7.6	2.9	2.9	2.7	1.9
20	4.1	4.5	4.5	6.5	5.1	7.8	6.2	5.2	2.8	2.8	2.6	1.9
21	4.2	4.6	4.8	5.9	4.6	7.2	6.0	4.5	2.7	3.3	2.3	1.9
22	4.1	4.4	4.3	14	4.3	6.3	26	4.5	2.7	3.0	2.1	2.0
23	4.0	4.4	4.0	45	4.0	5.9	74	5.1	2.6	2.8	2.7	1.9
24	3.9	4.3	3.5	37	4.1	5.7	29	6.2	3.3	2.6	2.8	2.1
25	3.9	4.3	3.3	17	4.4	5.5	16	5.2	3.6	3.0	3.1	2.1
26	3.9	4.4	3.6	11	4.7	5.2	11	4.4	2.9	2.6	3.5	2.0
27	4.0	4.2	3.8	11	5.4	5.2	9.1	4.0	6.4	2.5	2.7	1.9
28	4.3	4.3	4.0	14	7.6	5.1	7.7	3.7	5.0	2.3	2.4	3.3
29	4.1	4.4	4.1	9.8	—	5.0	6.8	3.5	16	2.2	2.2	7.0
30	6.5	5.1	3.6	7.8	—	4.9	6.3	3.4	6.1	2.1	2.1	4.9
31	5.7	—	3.6	7.1	—	5.0	—	6.3	—	2.3	2.1	—
TOTAL	148.8	151.4	149.7	274.4	180.9	211.1	371.7	163.9	128.2	126.9	76.9	67.5
MEAN	4.80	5.05	4.83	8.85	6.46	6.81	12.4	5.29	4.27	4.09	2.48	2.25
MAX	18	12	12	45	11	19	74	14	16	17	3.5	7.0
MIN	3.2	3.9	3.3	3.0	4.0	4.9	5.1	3.4	2.6	2.1	2.0	1.8
CFSM	.63	.66	.64	1.16	.85	.90	1.63	.70	.56	.54	.33	.30
IN.	.73	.74	.73	1.34	.89	1.03	1.82	.80	.63	.62	.38	.33

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1999, BY WATER YEAR (WY)

	MEAN	4.90	6.42	6.91	6.85	8.21	11.5	10.4	7.93	5.82	3.73	3.56	3.42
MAX	14.2	14.3	14.9	15.6	17.2	25.0	23.7	15.3	12.8	7.78	13.5	8.17	
(WY)	1955	1995	1973	1974	1971	1974	1975	1973	1973	1969	1972	1972	
MIN	1.59	2.33	2.11	2.78	2.36	4.23	4.07	2.97	2.05	1.22	1.36	1.52	
(WY)	1964	1964	1964	1964	1964	1964	1963	1958	1959	1964	1964	1963	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1954 - 1999

	ANNUAL TOTAL	2637.9	ANNUAL MEAN	7.23	HIGHEST ANNUAL MEAN	2051.4	5.62	LOWEST ANNUAL MEAN	6.59	HIGHEST DAILY MEAN	11.1	1974
LOWEST ANNUAL MEAN									2.73			1964
HIGHEST DAILY MEAN									2.11			Apr 19 1975
LOWEST DAILY MEAN									.70			Jul 29 1964
ANNUAL SEVEN-DAY MINIMUM									.73			Aug 4 1964
INSTANTANEOUS PEAK FLOW									470			Apr 19 1975
INSTANTANEOUS PEAK STAGE									9.45			Apr 19 1975
INSTANTANEOUS LOW FLOW									(a).44			Nov 3 1966
ANNUAL RUNOFF (CFSM)		.95				.74			.87			
ANNUAL RUNOFF (INCHES)		12.91				10.04			11.79			
10 PERCENT EXCEEDS		13				9.0			12			
50 PERCENT EXCEEDS		4.9				4.5			4.6			
90 PERCENT EXCEEDS		3.2				2.1			2.2			

(a) Result of freezeup.

(e) Estimated.

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 100 ft upstream from 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 sea level (levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1965, nonrecording gage at same site and datum.

REMARKS.--Records good. Several measurements of water temperature were made during the year. Gage-height telemeter at station

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	86	127	135	108	587	213	195	848	189	228	84	79
2	86	126	138	108	487	228	191	661	206	313	81	76
3	87	121	137	102	448	237	190	516	211	366	79	74
4	87	116	136	101	420	251	209	424	193	356	78	73
5	88	115	134	103	394	255	275	365	171	294	77	72
6	91	114	133	106	366	251	308	328	155	230	76	70
7	129	114	158	110	347	224	319	309	142	182	80	70
8	165	115	180	112	324	211	301	295	133	154	89	68
9	167	117	189	111	302	218	331	285	123	167	90	66
10	152	138	181	111	291	214	484	271	117	173	95	65
11	137	177	169	112	278	210	620	256	111	154	99	64
12	126	201	160	110	286	205	691	249	112	137	98	63
13	117	201	152	e105	290	204	699	244	112	125	94	62
14	111	182	145	e105	271	203	645	241	131	117	92	62
15	107	166	139	105	252	201	551	237	140	111	87	61
16	106	156	137	106	243	202	479	231	129	105	83	61
17	106	147	134	111	247	238	451	228	117	100	81	61
18	109	142	133	126	250	389	441	229	108	100	81	61
19	113	135	129	148	240	532	420	238	102	103	82	61
20	111	133	130	164	227	587	387	232	97	105	81	61
21	109	131	129	172	211	567	357	214	93	109	78	61
22	106	129	127	197	192	496	398	197	90	114	76	62
23	104	125	115	314	182	415	767	185	88	111	82	62
24	105	125	114	612	171	350	1570	185	91	110	88	65
25	106	125	115	862	172	303	2220	183	98	110	92	67
26	106	122	113	969	173	270	2330	177	98	107	97	68
27	110	122	112	1080	176	246	2070	165	121	103	99	69
28	111	121	113	1120	189	229	1690	153	135	98	98	79
29	110	122	115	1030	---	216	1340	146	172	94	94	94
30	117	124	106	878	---	207	1060	138	205	91	88	101
31	124	---	107	728	---	199	---	151	---	87	83	---
TOTAL	3489	4089	4215	10226	8016	8771	21989	8581	3990	4754	2682	2758
MEAN	113	136	136	330	286	283	733	277	133	153	86.5	88.6
MAX	167	201	189	1120	587	587	2330	848	211	366	99	101
MIN	86	114	106	101	171	199	190	138	88	87	76	61
CFSM	.29	.35	.35	.86	.74	.73	1.90	.72	.35	.40	.22	.18
IN.	.34	.40	.41	.99	.77	.85	2.12	.83	.39	.46	.26	.20

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1999, BY WATER YEAR (WY)

	MEAN	201	264	323	353	401	687	644	394	272	163	130	145
MAX	1072	939	895	1049	959	1506	1914	1391	1011	410	385	358	358
(WY)	1987	1991	1991	1973	1976	1948	1947	1956	1989	1968	1980	1992	1992
MIN	54.5	73.6	75.2	90.4	87.5	129	176	111	87.0	56.0	50.2	54.4	54.4
(WY)	1964	1964	1964	1964	1963	1964	1946	1958	1964	1964	1946	1963	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1945 - 1999

ANNUAL TOTAL	120118	82860	331
ANNUAL MEAN	329	227	534
HIGHEST ANNUAL MEAN			99.2
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	1590	2330	6590
LOWEST DAILY MEAN	85	61	35
ANNUAL SEVEN-DAY MINIMUM	86	61	36
INSTANTANEOUS PEAK FLOW		2380	6810
INSTANTANEOUS PEAK STAGE		7.16	(a)10.20
INSTANTANEOUS LOW FLOW		59	33
ANNUAL RUNOFF (CFSM)	.85	.59	.86
ANNUAL RUNOFF (INCHES)	11.61	8.01	11.68
10 PERCENT EXCEEDS	857	422	688
50 PERCENT EXCEEDS	166	135	200
90 PERCENT EXCEEDS	106	81	90

(a) From graph based on gage readings.

(b) Part of each day Sept. 13-20, 23.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04118500 ROGUE RIVER NEAR ROCKFORD, MI

LOCATION.--Lat 43°04'56", long 85°35'27", in NE1/4 sec.15, T.8 N., R.11 W., Kent County, Hydrologic Unit 04050006, on left bank at downstream side of bridge on Packer Drive, 2.2 mi upstream from mouth, and 3.0 mi southwest of Rockford.

DRAINAGE AREA.--234 mi².

PERIOD OF RECORD.--February 1952 to September 1982, October 1987 to current year.

GAGE.--Water-stage recorder. Datum of gage is 624.80 ft above sea level (levels by Johnson and Anderson, Inc.). Prior to Aug. 31, 1952, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some regulation caused by dam 2 mi upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Sept. 12, 1986, reached a stage of 11.35 ft, from floodmark, and discharge of approximately 6,000 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	106	148	197	e145	360	241	176	282	359	419	127	120
2	105	145	193	e150	362	244	176	256	399	349	123	118
3	109	139	198	e150	362	262	176	236	352	304	121	116
4	107	135	193	e150	374	258	219	225	346	271	136	114
5	118	131	195	e145	332	252	257	214	316	234	145	113
6	155	128	205	e145	362	241	276	213	277	207	142	112
7	202	127	275	e145	336	208	280	211	232	184	148	113
8	196	126	254	e140	315	227	270	210	200	171	157	115
9	202	127	259	e140	303	212	331	208	183	218	154	113
10	200	252	254	e140	288	218	329	201	190	223	160	113
11	174	268	244	e140	289	210	355	194	213	229	153	112
12	146	250	227	e140	350	229	353	237	266	208	146	111
13	132	257	204	e140	336	216	346	265	309	179	228	127
14	126	261	187	e140	315	203	323	274	782	163	275	121
15	124	248	179	e140	340	205	302	272	724	154	261	121
16	122	225	172	e145	333	217	286	247	608	148	202	120
17	155	198	167	e150	316	245	263	e340	457	155	167	118
18	215	181	163	e160	291	273	249	e450	366	185	153	116
19	197	172	161	e170	278	286	237	e560	295	196	148	116
20	198	165	157	e180	267	284	232	e540	242	199	142	118
21	200	160	156	e200	246	274	223	492	215	209	136	120
22	188	156	150	e230	219	255	345	424	197	207	131	119
23	172	153	139	e270	210	236	752	390	188	200	132	118
24	156	149	e155	e390	207	222	1020	367	213	184	137	122
25	147	149	e150	e505	221	208	1000	349	240	169	146	122
26	141	149	e145	567	213	198	763	328	250	158	155	123
27	138	146	e140	584	204	192	562	304	322	150	149	118
28	141	146	e140	565	226	190	450	276	474	143	143	202
29	138	147	e140	500	---	184	371	243	588	137	134	214
30	153	176	e140	455	---	179	319	217	462	134	127	206
31	149	---	e140	398	---	177	---	214	---	131	123	---
TOTAL	4812	5214	5679	7619	8255	7046	11241	9239	10265	6218	4801	3791
MEAN	155	174	183	246	295	227	375	298	342	201	155	126
MAX	215	268	275	584	374	286	1020	560	782	419	275	214
MIN	105	126	139	140	204	177	176	194	183	131	121	111
CFSM	.66	.74	.78	1.05	1.26	.97	1.60	1.27	1.46	.86	.66	.54
IN.	.76	.83	.90	1.21	1.31	1.12	1.79	1.47	1.63	.99	.76	.60

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

	MEAN	186	239	246	236	254	397	391	290	214	156	151	158
MAX	528	525	557	512	567	944	836	620	457	362	317	556	
(WY)	1982	1991	1992	1973	1976	1976	1967	1966	1989	1994	1994	1975	
MIN	100	118	126	116	107	223	175	122	108	83.8	83.2	93.7	
(WY)	1965	1965	1963	1970	1963	1964	1958	1958	1964	1964	1971	1966	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1952 - 1999

ANNUAL TOTAL	78721	84180	243
ANNUAL MEAN	216	231	360
HIGHEST ANNUAL MEAN			155
LOWEST ANNUAL MEAN			360 (a)
HIGHEST DAILY MEAN	838	1020	3290
LOWEST DAILY MEAN	77	105	49
ANNUAL SEVEN-DAY MINIMUM	80	113	58
INSTANTANEOUS PEAK FLOW		(b)1230	3540
INSTANTANEOUS PEAK STAGE		7.79	9.29
INSTANTANEOUS LOW FLOW		103	28
ANNUAL RUNOFF (CFSM)	.92	.99	1.04
ANNUAL RUNOFF (INCHES)	12.51	13.38	14.09
10 PERCENT EXCEEDS	383	361	421
50 PERCENT EXCEEDS	175	200	192
90 PERCENT EXCEEDS	99	125	110

(a) 1976, 1991.

(b) Result of momentary release of water by dam 2 mi upstream from station.

(c) Estimated.

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 in Grand Rapids, 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 sea level (levels by City of Grand Rapids). March 1901 to August 1918, nonrecording gage at Fulton Street Bridge 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.--Records good except for estimated daily discharges, which are fair. Moderate diurnal fluctuation at low and medium flow caused by powerplants upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1060	1670	1960	e1200	7780	3040	3030	11800	3140	3760	1460	1150
2	1120	1410	2140	e1400	6980	3230	2920	10100	3130	3960	1280	1070
3	1090	1570	1940	e1300	6820	3260	2900	8310	3150	4650	1130	1040
4	1110	1500	2000	e1400	6420	3210	3110	6960	2930	4500	1460	1100
5	1210	1520	2010	e1300	6280	3350	3360	6200	3080	3920	1190	944
6	1450	1500	2090	e1200	6050	3320	3750	5730	3120	3540	1180	853
7	1760	1370	2430	e1300	5640	3160	3870	5190	2800	3040	1380	875
8	1930	1440	2610	e1400	5490	3100	3920	4890	2500	2850	1500	946
9	2770	1450	2930	e1200	5180	2940	4750	4670	2370	2960	1660	872
10	2450	2000	2540	e1300	4980	2800	5550	4320	2110	2820	1560	841
11	1990	2510	2570	e1400	4900	2820	5830	4080	2350	2700	1730	875
12	1670	2690	2550	e1250	4990	2930	5530	4010	2350	2470	1500	867
13	1440	2650	2440	e1350	4950	2920	5790	3780	2460	2190	1350	916
14	1380	2480	2140	e1400	4920	2870	5630	3580	3670	1930	1580	936
15	1490	2280	1870	e1450	4710	2890	5310	3590	3520	1930	1610	960
16	1470	2100	2030	e1300	4510	2890	5090	3300	3340	1750	1610	907
17	1630	2080	1940	e1300	4330	2840	4990	3680	3060	1730	1460	920
18	1810	1890	1870	e1300	4240	3710	4990	4010	2630	1840	1310	869
19	1820	1850	1890	e1500	4230	5030	4960	4220	2350	1940	1290	846
20	1740	1840	1810	e1700	4060	5390	4690	4190	2090	1980	1150	835
21	1680	1510	1670	e2000	3590	5140	4580	3860	2030	1910	1140	763
22	1640	1690	1720	e3000	3270	4910	5500	3660	1780	2000	1260	789
23	1420	1630	1310	e4250	3230	4760	9660	3680	1790	1990	1020	837
24	1550	1610	1740	e5800	2890	4430	12600	3880	1910	1790	1100	841
25	1300	1720	e1500	e7100	2750	4160	13800	3780	1850	1920	1620	840
26	1420	1650	1450	7900	2940	3910	15800	3550	2020	2130	1870	828
27	1460	1570	1400	8420	2980	3680	17000	3300	2540	1840	1600	787
28	1580	1640	1520	9200	2720	3280	16800	3120	2460	1910	1360	1360
29	1470	1610	e1500	9840	---	3270	15400	2860	3420	1590	1500	1840
30	1400	1720	e1450	10400	---	3280	13500	2810	4090	1660	1290	1920
31	1560	---	e1350	9360	---	3030	---	2750	---	1610	987	---
TOTAL	48870	54150	60370	104220	131780	109550	214610	143860	80040	76810	43137	27427
MEAN	1576	1805	1947	3362	4706	3534	7154	4641	2668	2478	1392	981
MAX	2770	2690	2930	10400	7780	5390	17000	11800	4090	4650	1870	1920
MIN	1060	1370	1310	1200	2720	2800	2900	2750	1780	1590	987	763
CFSM	.32	.37	.40	.69	.96	.72	1.46	.95	.54	.51	.28	.20
IN.	.37	.41	.46	.79	1.00	.83	1.63	1.09	.61	.58	.33	.22

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1999, BY WATER YEAR (WY)

	MEAN	2409	2930	3379	3744	4345	7658	7053	4713	3361	2187	1726	1955
MAX	13630	7966	8794	12020	14720	21580	17900	15650	15670	7885	5225	7600	
(WY)	1987	1991	1991	1973	1938	1904	1947	1956	1905	1994	1994	1975	
MIN	906	1004	1080	1069	1079	1858	1759	1459	930	650	617	949	
(WY)	1965	1931	1964	1963	1963	1931	1931	1931	1934	1934	1934	1964	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1901 - 1999

ANNUAL TOTAL	1453157	1096824	
ANNUAL MEAN	3981	3005	
HIGHEST ANNUAL MEAN		3783	
LOWEST ANNUAL MEAN		6314	1943
HIGHEST DAILY MEAN	14300	17000	53300
LOWEST DAILY MEAN	968	763	381
ANNUAL SEVEN-DAY MINIMUM	1040	812	438
INSTANTANEOUS PEAK FLOW		17200	54000
INSTANTANEOUS PEAK STAGE		15.15	(a)22.49
INSTANTANEOUS LOW FLOW		679	
ANNUAL RUNOFF (CFSM)	.81	.61	.77
ANNUAL RUNOFF (INCHES)	11.03	8.33	10.49
10 PERCENT EXCEEDS	9390	5430	7660
50 PERCENT EXCEEDS	2240	2110	2580
90 PERCENT EXCEEDS	1200	1150	1190

(a) Present datum; from graph based on gage readings.

(e) Estimated.

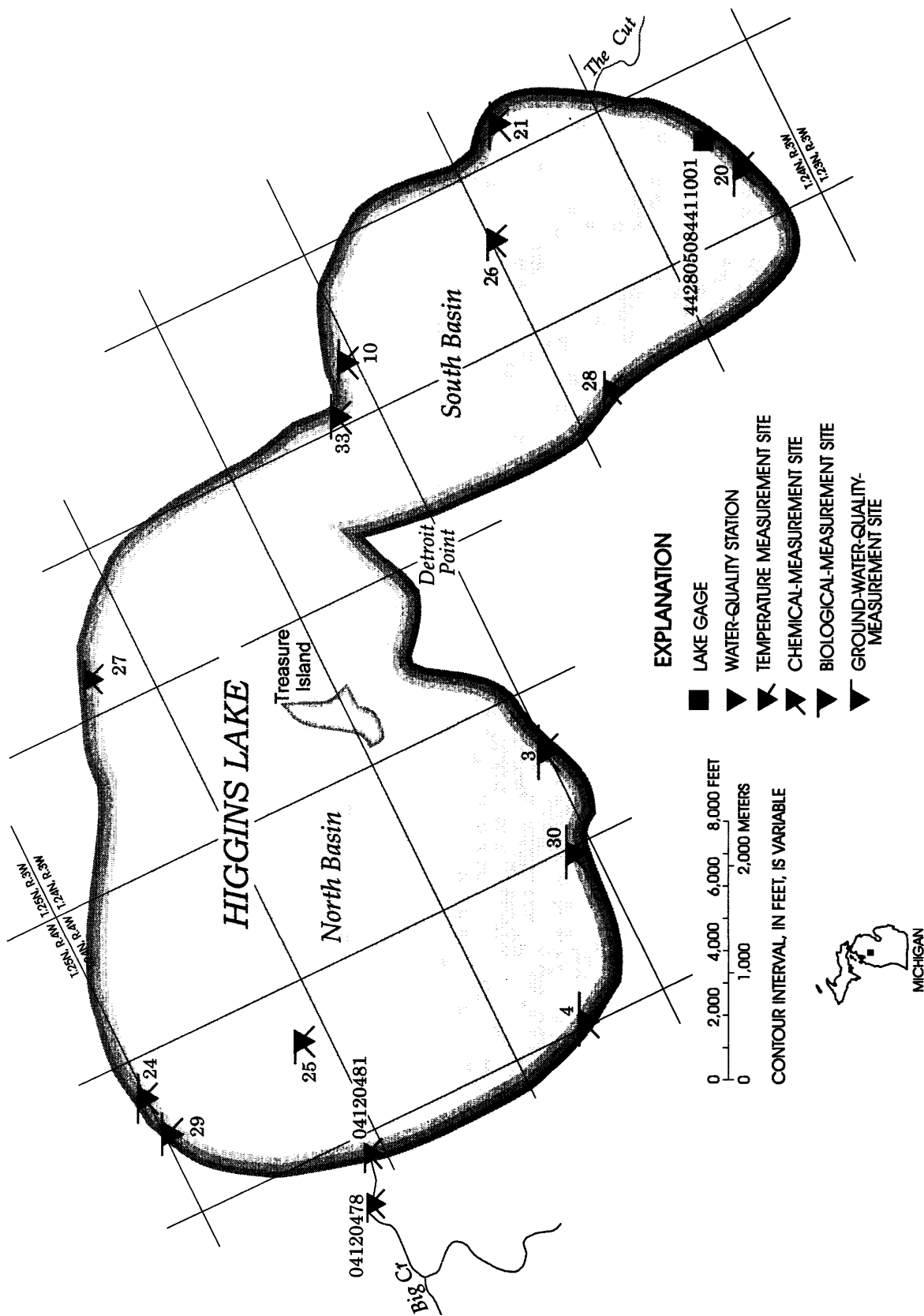


Figure 8. Identification number and location of water-level station and surface-water-sampling sites in Higgins Lake.

STREAMS TRIBUTARY TO LAKE MICHIGAN

442805084411001 HIGGINS LAKE NEAR ROSCOMMON, MI

LOCATION.--Lat 44°25'35", long 84°40'55", in NW1/4 SW1/4 sec.33, T.24 N., R.3 W., Roscommon County, Hydrologic Unit 04060102, at South Higgins Lake State Park, 6.7 mi southwest of Roscommon.

DRAINAGE AREA.--58 mi², approximately.

WATER-LEVEL RECORDS

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

GAGE.--Water-stage recorder. Datum of gage is 1,148.74 ft above sea level. Sept. 1, 1942 to Nov. 27, 1942, nonrecording gage at different datum. Nov. 27, 1942 to June 9, 1988, water-stage recorder at same datum. June 9, 1988 to Nov. 6, 1998, nonrecording gage at same datum.

REMARKS.--Once daily readings, Oct. 1 to Nov. 6. Inlets are Big Creek and Little Creek. The outlet is "The Cut". Lake elevation controlled by dam. Established legal level; summer, 1,154.11 ft, winter, 1,153.61 ft, above sea level. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 6.23 ft, June 26, 1954; minimum 4.32 ft, Oct. 3, 4, 1955.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 5.72 ft, June 14; minimum, 4.81 ft, Jan. 2.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SF ²
1	4.94	5.00	4.98	4.84	5.00	---	4.94	5.13	5.41	5.42	5.31	5.09
2	4.92	5.00	4.98	4.84	4.99	---	4.93	5.13	5.47	5.42	5.28	5.09
3	4.89	4.99	4.98	4.89	4.99	---	4.92	5.13	5.47	5.41	5.26	5.08
4	4.87	4.96	4.97	4.90	4.99	---	4.93	5.13	5.45	5.40	5.27	5.08
5	4.85	4.96	4.97	4.90	4.98	---	4.95	5.13	5.44	5.41	5.26	5.08
6	---	4.92	4.99	4.90	4.98	---	4.98	5.15	5.45	5.48	5.23	5.08
7	5.17	4.92	5.04	4.91	4.98	---	5.02	5.17	5.46	5.45	5.21	5.07
8	5.17	4.91	5.01	4.91	---	---	5.03	5.20	5.46	5.43	5.23	5.06
9	5.15	4.90	5.00	4.91	---	---	5.05	5.21	5.45	5.51	5.20	5.05
10	5.15	4.96	4.99	4.91	---	---	5.03	5.21	5.45	5.49	5.22	5.03
11	5.14	5.02	4.97	4.91	---	---	5.10	5.20	5.47	5.45	5.21	5.02
12	5.14	5.01	4.96	4.92	---	---	5.15	5.20	5.48	5.43	5.20	5.01
13	5.12	4.98	4.96	4.94	---	---	5.14	5.20	5.52	5.41	5.22	5.03
14	5.14	4.98	4.94	4.93	---	---	5.11	5.19	5.64	5.38	5.21	5.01
15	5.10	4.98	4.94	4.93	---	---	5.10	5.19	5.60	5.37	5.19	5.00
16	5.06	4.99	4.93	4.93	---	---	5.07	5.19	5.57	5.35	5.18	5.00
17	---	5.01	4.93	4.93	---	---	5.08	5.22	5.55	5.36	5.19	4.98
18	5.14	5.00	4.91	4.96	---	---	5.08	5.26	5.52	5.37	5.18	4.97
19	5.11	5.00	4.92	4.97	---	---	5.08	5.26	5.50	5.38	5.17	4.96
20	5.09	4.99	4.90	4.97	---	---	5.09	5.26	5.48	5.36	5.17	5.00
21	5.13	4.98	4.91	4.96	---	---	5.09	5.26	5.47	5.35	5.16	4.98
22	5.09	4.96	4.91	4.97	---	---	5.10	5.27	5.45	5.36	5.15	4.97
23	5.07	4.97	4.88	5.00	---	---	5.12	5.29	5.43	5.39	5.15	4.96
24	5.05	4.95	4.88	5.01	---	4.97	5.12	5.33	5.46	5.42	5.15	4.96
25	5.03	4.94	4.86	5.01	---	4.96	5.13	5.33	5.45	5.40	5.15	4.94
26	5.00	4.95	4.87	5.01	---	4.95	5.13	5.33	5.44	5.38	5.15	4.93
27	5.04	4.94	4.86	5.01	---	4.95	5.12	5.32	5.46	5.37	5.15	4.94
28	5.04	4.93	4.85	5.01	---	4.96	5.12	5.32	5.46	5.34	5.15	5.04
29	5.00	4.93	4.91	5.01	---	4.95	5.12	5.32	5.49	5.33	5.14	5.10
30	5.00	4.97	4.85	5.00	---	4.96	5.13	5.32	5.43	5.32	5.11	5.08
31	5.00	---	4.85	5.00	---	4.94	---	5.33	---	5.32	5.10	---
MEAN	---	---	4.93	4.94	---	---	5.07	5.23	5.48	5.40	5.19	5.02
MAX	---	---	5.04	5.01	---	---	5.15	5.33	5.64	5.51	5.31	5.10
MIN	---	---	4.85	4.84	---	---	4.92	5.13	5.41	5.32	5.10	4.93

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--May 1995 to current year.

REMARKS.--Samples for water analysis were collected from a pump sampler except those from Big Creek which were grab samples. All field parameters were measured on site with a water-quality multiprobe meter.

WATER-QUALITY DATA

04120478 BIG CREEK NEAR ROSCOMMON, MI (LAT 44 29 49N LONG 084 47 14W)

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	
MAY 1999	17...	1030	.23	73	6.8	15.0	1.0	6.2	63	150	.91
AUG 03...	1030		.14	124	7.5	11.5	.65	5.1	49	E1400	.44
DATE		SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS-SOLVED (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	
MAY 1999	17...	103	19	.004	.049	.016	<.10	.027	.015	.002	
AUG 03...		119	28	.002	.169	.004	.57	.014	.013	.006	

04120481 BIG CREEK AT MOUTH NEAR ROSCOMMON, MI (LAT 44 29 48N LONG 084 46 33W)

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
MAY 1999										
17...	1200	3.0	260	7.5	13.5	1.2	9.0	89	66	10
AUG										
03...	1215	2.0	282	7.7	10.5	1.0	9.1	85	E700	10
DATE		SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC DIS-SOLVED (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
MAY 1999										
17...		153	E14	.001	.028	.005	<.10	.011	.007	.002
AUG										
03...		173	E11	.001	.036	<.002	.14	.009	.006	.006

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	TURBIDITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATURATION) (00301)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG C, TOTAL (MG/L) (00500)
442748084444501 HIGGINS LAKE, SITE 3, NEAR ROSCOMMON, MI (LAT 44 27 48N LONG 084 44 45W)									
MAY 1999 18...	1020	257	8.2	12.5	1.5	11.0	106	8.6	146
AUG 09...	1500	249	8.1	22.5	.29	8.8	104	8.9	147
442803084461201 HIGGINS LAKE, SITE 4, NEAR ROSCOMMON, MI (LAT 44 28 03N LONG 084 46 12W)									
MAY 1999 17...	1435	256	8.0	13.5	1.5	11.2	110	9.5	156
AUG 09...	1315	251	8.1	22.5	.25	9.1	107	9.1	145
442803084411601 HIGGINS LAKE, SITE 10, NEAR ROSCOMMON, MI (LAT 44 28 03N LONG 084 41 16W)									
MAY 1999 19...	1200	248	8.0	12.5	1.8	10.8	103	8.0	152
AUG 11...	1230	244	8.0	23.0	.28	8.5	102	8.3	137
442533084410601 HIGGINS LAKE, SITE 20, NEAR ROSCOMMON, MI (LAT 44 25 33N LONG 084 41 06W)									
MAY 1999 18...	1325	253	8.2	12.0	1.6	11.2	107	8.0	148
AUG 11...	1000	243	8.0	20.5	.22	8.4	96	8.7	145
442640084400001 HIGGINS LAKE, SITE 21, NEAR ROSCOMMON, MI (LAT 44 26 40N LONG 084 40 00W)									
MAY 1999 19...	1255	247	8.0	14.0	2.6	10.6	105	8.5	153
AUG 11...	1115	241	8.0	19.0	.40	8.3	92	8.9	138
DATE		BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AMMONIA + ORGANIC DIS-SOLVED (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)
442748084444501 HIGGINS LAKE, SITE 3, NEAR ROSCOMMON, MI (LAT 44 27 48N LONG 084 44 45W)									
MAY 1999 18...		E9.5	<.001	.010	.025	.17	.004	.012	.005
AUG 09...		22	.001	.011	.004	.12	.004	<.004	.001
442803084461201 HIGGINS LAKE, SITE 4, NEAR ROSCOMMON, MI (LAT 44 28 03N LONG 084 46 12W)									
MAY 1999 17...		E15	.001	.019	.011	<.10	.007	<.004	.002
AUG 09...		22	.001	.008	<.002	.20	.006	.004	.001
442803084411601 HIGGINS LAKE, SITE 10, NEAR ROSCOMMON, MI (LAT 44 28 03N LONG 084 41 16W)									
MAY 1999 19...		E8.5	.001	.007	.005	.10	.017	<.004	.003
AUG 11...		E14	-	-	-	-	-	-	-
442533084410601 HIGGINS LAKE, SITE 20, NEAR ROSCOMMON, MI (LAT 44 25 33N LONG 084 41 06W)									
MAY 1999 18...		<16	.001	.007	.012	.11	.011	<.004	.002
AUG 11...		20	<.001	<.005	.006	.28	<.004	<.004	.001
442640084400001 HIGGINS LAKE, SITE 21, NEAR ROSCOMMON, MI (LAT 44 26 40N LONG 084 40 00W)									
MAY 1999 19...		E13	<.001	.005	.004	.15	.018	<.004	.002
AUG 11...		17	.001	<.005	.006	.11	.004	<.004	.001

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
443027084460601 HIGGINS LAKE, SITE 24, NEAR ROSCOMMON, MI (LAT 44 30 27N LONG 084 46 06W)									
MAY 1999									
17...	1040	308	8.2	18.0	1.5	8.9	98	17	186
AUG 09...	1100	251	8.0	20.5	.28	8.7	98	9.6	147
442940084414901 HIGGINS LAKE, SITE 27, NEAR ROSCOMMON, MI (LAT 44 29 40N LONG 084 41 49W)									
MAY 1999									
19...	0930	253	8.0	13.5	1.9	9.3	91	7.8	152
AUG 11...	1500	244	8.0	23.0	.45	8.7	104	9.3	147
442629084421701 HIGGINS LAKE, SITE 28, NEAR ROSCOMMON, MI (LAT 44 26 29N LONG 084 42 17W)									
MAY 1999									
18...	1220	255	8.1	13.0	1.5	11.0	107	8.4	138
443019084461301 HIGGINS LAKE, SITE 29, NEAR ROSCOMMON, MI (LAT 44 30 19N LONG 084 46 13W)									
MAY 1999									
17...	1240	296	8.2	20.5	2.0	9.8	114	14	173
AUG 09...	1200	250	8.1	21.0	.35	9.0	103	9.8	148
442748084450601 HIGGINS LAKE, SITE 30, NEAR ROSCOMMON, MI (LAT 44 27 48N LONG 084 45 06W)									
MAY 1999									
18...	0920	255	8.1	12.0	1.8	10.8	103	8.4	147
AUG 09...	1400	244	8.1	22.5	.35	9.1	107	8.4	143
442815084412901 HIGGINS LAKE, SITE 33, NEAR ROSCOMMON, MI (LAT 44 28 15N LONG 084 41 29W)									
MAY 1999									
19...	1030	256	8.0	12.5	2.1	10.1	96	8.6	157
AUG 11...	1345	246	8.0	21.5	.40	8.8	102	9.1	145
DATE		BORON, DIS- SOLVED (UG/L AS B) (01020)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N) (00623)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
443027084460601 HIGGINS LAKE, SITE 24, NEAR ROSCOMMON, MI (LAT 44 30 27N LONG 084 46 06W)									
MAY 1999									
17...		E9.3	.002	.025	.005	<.10	.047	<.004	.001
AUG 09...		24	.001	.015	.007	.16	.004	<.004	.001
442940084414901 HIGGINS LAKE, SITE 27, NEAR ROSCOMMON, MI (LAT 44 29 40N LONG 084 41 49W)									
MAY 1999									
19...		E12	<.001	.005	.004	.18	.012	<.004	.002
AUG 11...		E7.7	.001	.008	.005	.11	.009	<.004	.001
442629084421701 HIGGINS LAKE, SITE 28, NEAR ROSCOMMON, MI (LAT 44 26 29N LONG 084 42 17W)									
MAY 1999									
18...		E9.5	.001	.017	.012	.14	.006	<.004	.002
443019084461301 HIGGINS LAKE, SITE 29, NEAR ROSCOMMON, MI (LAT 44 30 19N LONG 084 46 13W)									
MAY 1999									
17...		E12	.002	.018	.006	<.10	.022	.005	.001
AUG 09...		20	.001	<.005	.003	.11	.004	.004	.003
442748084450601 HIGGINS LAKE, SITE 30, NEAR ROSCOMMON, MI (LAT 44 27 48N LONG 084 45 06W)									
MAY 1999									
18...		E7.5	.001	.029	.005	.46	.007	.006	.001
AUG 09...		17	.001	.009	.007	.11	.004	.004	.001
442815084412901 HIGGINS LAKE, SITE 33, NEAR ROSCOMMON, MI (LAT 44 28 15N LONG 084 41 29W)									
MAY 1999									
19...		E13	.001	.013	.004	.18	.020	<.004	.002
AUG 11...		20	.001	<.005	.006	E.10	<.004	<.004	.001

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	OXYGEN, DIS- SOLVED (MG/L) (00300)	E. COLI WATER WHOLE TOTAL UREASE (COL/ 100 ML) (31633)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	
442748084444504		SITE 3, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 48N LONG 084 44 45W)							
MAY 1999									
18...	1040	877	7.2	13.0	7.3	<1	77	539	
AUG 09...	1515	550	7.4	19.0	7.8	K14	43	366	
442803084461204		SITE 4, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 03N LONG 084 46 12W)							
MAY 1999									
17...	1455	639	7.5	14.5	3.7	K1	63	374	
AUG 09...	1315	730	7.4	19.5	4.9	K14	110	456	
442803084411604		SITE 10, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 03N LONG 084 41 16W)							
MAY 1999									
19...	1210	267	7.7	13.0	3.3	<1	8.7	164	
AUG 11...	1245	268	7.4	21.5	.4	36	8.9	158	
442533084410604		SITE 20, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 25 33N LONG 084 41 06W)							
MAY 1999									
18...	1345	660	6.9	12.5	1.0	<1	3.4	367	
AUG 11...	1015	581	7.1	20.5	.4	K10	3.9	346	
442640084400004		SITE 21, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 40N LONG 084 40 00W)							
MAY 1999									
19...	1315	688	7.1	14.0	1.1	<1	53	435	
AUG 11...	1100	695	7.5	19.5	8.6	K2	79	387	
DATE		BORON, DIS- SOLVED (UG/L AS B) (01020)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC DIS- (MG/L AS N) (00623)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
442748084444504		SITE 3, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 48N LONG 084 44 45W)							
MAY 1999									
18...		65	.006	7.73	.022	.15	.034	.005	.001
AUG 09...		26	.001	.365	.006	<.10	.012	.005	.004
442803084461204		SITE 4, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 03N LONG 084 46 12W)							
MAY 1999									
17...		109	.001	3.32	.014	<.10	.040	.005	.006
AUG 09...		35	.003	1.09	.006	E.10	.013	.008	<.001
442803084411604		SITE 10, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 03N LONG 084 41 16W)							
MAY 1999									
19...		E8.6	<.001	.032	.003	E.10	.018	.004	.004
AUG 11...		17	.014	.010	.013	.22	.017	<.004	.002
442533084410604		SITE 20, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 25 33N LONG 084 41 06W)							
MAY 1999									
18...		28	<.001	<.005	.102	.30	.018	.012	.004
AUG 11...		20	<.001	<.005	.021	.18	.008	<.004	.001
442640084400004		SITE 21, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 40N LONG 084 40 00W)							
MAY 1999									
19...		150	<.001	<.005	5.09	5.0	.447	.210	.206
AUG 11...		155	.001	<.005	.006	E.10	.024	.010	.006

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	E. COLI WATER WHOLE TOTAL UREASE (COL / 100 ML) (31633)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	
443027084460604		SITE 24, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 30 27N LONG 084 46 06W)							
MAY 1999									
17...	1110	523	7.9	14.5	3.5	K3	69	308	
AUG 09...	1115	362	7.6	17.5	.5	K16	31	221	
442940084414904		SITE 27, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 29 40N LONG 084 41 49W)							
MAY 1999									
19...	0950	295	7.0	12.5	1.4	K27	19	296	
AUG 11...	1515	252	6.3	20.0	.7	K20	25	211	
442629084421704		SITE 28, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 29N LONG 084 42 17W)							
MAY 1999									
18...	1240	790	7.3	13.0	7.6	K2	51	679	
443019084461304		SITE 29, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 30 19N LONG 084 46 13W)							
MAY 1999									
17...	1305	303	6.9	19.5	1.3	K8	38	226	
AUG 09...	1215	613	7.3	20.0	.4	K3	79	360	
442748084450604		SITE 30, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 48N LONG 084 45 06W)							
MAY 1999									
18...	0945	563	7.5	13.5	3.2	<1	52	410	
AUG 09...	1415	810	7.3	21.0	4.8	K2	86	471	
442815084412904		SITE 33, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 15N LONG 084 41 29W)							
MAY 1999									
19...	1045	91	6.2	12.5	1.2	K920	5.7	132	
AUG 11...	1400	242	5.8	20.5	.5	K50	18	180	
DATE		BORON, DIS-SOLVED (UG/L AS B) (01020)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC DIS-SOLVED (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
443027084460604		SITE 24, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 30 27N LONG 084 46 06W)							
MAY 1999									
17...	18	.001	.578	.006	<.10	.012	<.004	.003	
AUG 09...	17	.002	.039	.004	<.10	.035	.007	.006	
442940084414904		SITE 27, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 29 40N LONG 084 41 49W)							
MAY 1999									
19...	E14	.001	.153	.092	.25	.066	.004	.005	
AUG 11...	333	<.001	<.005	6.38	5.0	.101	.019	.010	
442629084421704		SITE 28, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 26 29N LONG 084 42 17W)							
MAY 1999									
18...	E10	.009	3.92	.025	.14	.100	.005	.005	
443019084461304		SITE 29, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 30 19N LONG 084 46 13W)							
MAY 1999									
17...	42	.032	2.07	.006	<.10	.038	.004	.002	
AUG 09...	61	.001	.006	.033	E.10	.011	.007	.003	
442748084450604		SITE 30, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 27 48N LONG 084 45 06W)							
MAY 1999									
18...	E10	.002	1.29	.020	<.10	.033	<.004	.001	
AUG 09...	44	.001	1.87	.010	<.10	.031	.006	.004	
442815084412904		SITE 33, WATER TABLE 2 FEET BELOW LAND-SURFACE (LAT 44 28 15N LONG 084 41 29W)							
MAY 1999									
19...	28	.001	.006	.582	.95	.194	.028	.022	
AUG 11...	58	<.001	<.005	1.67	2.9	.116	.051	.025	

STREAMS TRIBUTARY TO LAKE MICHIGAN

HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442955084453001 - HIGGINS LAKE, SITE 25, NEAR ROSCOMMON, MI (LAT 44 29 55N LONG 084 45 30W)

TOTAL WATER COLUMN (COMPOSITE SAMPLE)

DATE	TIME	TUR- BID- ITY (NTU) (00076)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DIS- SOLVED (UG/L AS B) (01020)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)
MAY 1999 03...	1245	1.4	17.2	9.8	151	E12	.001
DATE		NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N) (00623)	PHOS- PHORUS TOTAL (MG/L AS P) (00666)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
MAY 03...		.014	.009	.16	<.004	.004	.002

442955084453005 - HIGGINS LAKE, SITE 25, NEAR ROSCOMMON, MI (LAT 44 29 55N LONG 084 45 30W)

EPIILMNION (COMPOSITE SAMPLE)

DATE	TIME	TUR- BID- ITY (NTU) (00076)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DIS- SOLVED (UG/L AS B) (01020)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)
AUG 1999 04...	1100	1.0	4.7	4.8	149	20	.001
DATE		NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N) (00623)	PHOS- PHORUS TOTAL (MG/L AS P) (00666)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
AUG 04...		<.005	.003	.14	.004	<.004	.001

HYPOLIMNION (COMPOSITE SAMPLE)

DATE	TIME	TUR- BID- ITY (NTU) (00076)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	BORON, DIS- SOLVED (UG/L AS B) (01020)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N) (00623)	PHOS- PHORUS TOTAL (MG/L AS P) (00666)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
AUG 1999 04...	1030	.91	4.7	148	E11	.003	.021	.008	E.10	.005	<.004	.002

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442658084404401 - HIGGINS LAKE, SITE 26, NEAR ROSCOMMON, MI (LAT 44 26 58N LONG 084 40 44W)

TOTAL WATER COLUMN (COMPOSITE SAMPLE)

DATE	TIME	TUR- BID- ITY (NTU) (00076)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C. TOTAL (MG/L) (00500)	BORON, DIS- SOLVED (UG/L AS B) (01020)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)
APR 1999 28...	1030	1.0	10.1	8.1	153	17	<.001
DATE		NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N) (00623)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
APR 28...		.013	.010	.17	.005	<.004	.002

442658084404405 - HIGGINS LAKE, SITE 26, NEAR ROSCOMMON, MI (LAT 44 26 58N LONG 084 40 44W)

EPILIMNION (COMPOSITE SAMPLE)

DATE	TIME	TUR- BID- ITY (NTU) (00076)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C. TOTAL (MG/L) (00500)	BORON, DIS- SOLVED (UG/L AS B) (01020)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)
AUG 1999 03...	1045	.76	6.0	4.9	147	18	<.001
DATE		NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N) (00623)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
AUG 03...		<.005	<.002	.17	.006	<.004	.001

HYPOLIMNION (COMPOSITE SAMPLE)

DATE	TIME	TUR- BID- ITY (NTU) (00076)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 105 DEG. C. TOTAL (MG/L) (00500)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N) (00623)	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
AUG 1999 03...	1030	1.1	4.8	155	.001	<.005	<.002	.16	<.004	.001

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442955084453003 - HIGGINS LAKE, SITE 25, NEAR ROSCOMMON, MI (LAT 44 29 55N LONG 084 45 30W)

PHOTIC ZONE

DATE	TIME	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 1999			
03...	1245	E.110	<.100
AUG			
04...	1100	.510	<.100

442658084404403 - HIGGINS LAKE, SITE 26, NEAR ROSCOMMON, MI (LAT 44 26 58N LONG 084 40 44W)

PHOTIC ZONE

DATE	TIME	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
APR 1999			
28...	1030	.210	<.100
AUG			
03...	1045	.370	<.100

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued
WATER-QUALITY DATA

442955084453001 HIGGINS LAKE, SITE 25, NEAR ROSCOMMON, MI (LAT 44 29 55N LONG 084 45 30W)

DATE	DEPTH AT SAMPLE LOC- ATION, TOTAL (FEET) (81903)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	OXYGEN, DIS- SOLVED (MGL) (00300)
MAY 1999					
03...	1.00	235	8.0	11.0	10.4
03...	10.0	233	8.1	9.5	10.6
03...	20.0	232	8.2	7.5	10.8
03...	30.0	230	8.2	7.0	10.9
03...	40.0	230	8.2	6.5	10.9
03...	50.0	230	8.2	6.5	11.0
03...	60.0	230	8.2	6.0	11.1
03...	70.0	230	8.2	6.0	11.0
03...	80.0	230	8.2	6.0	11.0
03...	90.0	230	8.2	6.0	11.1
03...	100.0	231	8.2	6.0	11.0
03...	110.0	231	8.2	6.0	10.8
03...	120.0	232	8.2	6.0	10.7
03...	125.0	232	8.2	5.5	10.6
AUG					
04...	1.00	246	7.9	22.5	8.1
04...	10.0	246	8.1	22.5	7.9
04...	20.0	246	8.0	22.5	8.1
04...	30.0	246	8.0	21.5	9.1
04...	35.0	246	8.0	20.0	9.5
04...	40.0	246	8.0	18.0	10.1
04...	45.0	248	8.1	16.5	10.7
04...	50.0	250	8.1	12.5	10.5
04...	60.0	250	8.1	11.0	10.1
04...	70.0	250	8.0	9.5	9.2
04...	80.0	255	8.0	8.5	8.6
04...	90.0	255	8.0	8.0	8.2
04...	100.0	255	7.9	7.5	8.2
04...	110.0	255	7.9	7.5	7.3
04...	120.0	270	7.8	7.0	3.3
04...	123.0	272	7.8	7.0	2.7

STREAMS TRIBUTARY TO LAKE MICHIGAN
HIGGINS LAKE NEAR ROSCOMMON, MI--Continued

WATER-QUALITY DATA

442658084404401 HIGGINS LAKE, SITE 26, NEAR ROSCOMMON, MI (LAT 44 26 58N LONG 084 40 44W)

DATE	DEPTH AT SAMPLE LOC- ATION, TOTAL (FEET) (81903)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	OXYGEN, DIS- SOLVED (MG/L) (00300)
APR 1999					
28...	1.00	231	8.1	6.5	11.8
28...	10.0	234	8.1	6.5	11.8
28...	20.0	230	8.2	6.5	11.9
28...	30.0	230	8.2	5.5	11.9
28...	40.0	228	8.2	5.5	12.1
28...	50.0	230	8.2	5.0	12.0
28...	60.0	230	8.2	5.0	12.0
28...	70.0	230	8.2	5.0	12.0
28...	80.0	233	8.2	5.0	11.9
28...	90.0	235	8.2	5.0	11.8
AUG					
03...	50	243	7.5	23.5	8.1
03...	10.0	244	7.6	23.5	8.1
03...	20.0	244	7.7	23.5	8.1
03...	30.0	244	7.7	23.5	8.1
03...	35.0	244	7.8	23.5	8.1
03...	40.0	245	8.0	15.0	10.9
03...	45.0	245	8.0	14.0	10.9
03...	50.0	250	8.0	12.5	10.1
03...	60.0	250	8.0	11.5	9.6
03...	70.0	250	7.9	10.5	8.7
03...	80.0	250	7.8	10.5	7.9
03...	90.0	255	7.8	10.0	4.8

STREAMS TRIBUTARY TO LAKE MICHIGAN

442400084472801 HOUGHTON LAKE NEAR HOUGHTON LAKE HEIGHTS, MI

LOCATION.--Lat 44°24'16", long 84°47'28", in NW1/4 NW1/4 sec.10, T.23 N., R.4 W., Roscommon County, Hydrologic Unit 04060102, on right bank of Muskegon River at upstream side of bridge on Old U.S. Highway 27, 0.4 mi downstream from Houghton Lake, and 5.2 mi north of Houghton Lake Heights.

DRAINAGE AREA.--222 mi².

PERIOD OF RECORD.--June 1942 to September 1991, September 1993 to current year, except winter period of 1942-43.

GAGE.--Water-stage recorder. Datum of gage is 1,130.00 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Sept. 28, 1960, nonrecording gage at datum 6.21 ft higher. Water-stage recorder Sept. 28, 1960 to Sept. 30, 1991. September 1993 to Nov. 26, 1996, nonrecording gage.

REMARKS.--Backus Creek and "The Cut" from Higgins Lake, join about 1 mi upstream from Houghton Lake and become the major inlet. There are also many small tributaries which feed the lake. The outlet is Muskegon River. Houghton Lake is the largest inland lake in Michigan. Established legal level, summer, 1,138.1 ft, minimum winter, 1,137.6 ft, above sea level. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 10.18 ft, Apr. 23, 1985; minimum observed, 6.95 ft, Sept. 3, 5, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 9.17 ft, July 9; minimum, 7.33 ft, Nov. 23.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.77	7.66	7.70	7.63	7.76	7.83	7.90	8.34	8.36	8.71	8.56	8.38
2	7.79	7.63	7.71	7.63	7.76	7.84	7.93	8.35	8.34	8.66	8.54	8.37
3	7.81	7.57	7.71	7.67	7.77	7.85	7.94	8.37	8.34	8.70	8.60	8.38
4	7.83	7.58	7.70	7.68	7.76	7.85	8.04	8.37	8.44	8.70	8.65	8.37
5	7.91	7.58	7.73	7.67	7.75	7.85	8.07	8.41	8.45	8.68	8.65	8.37
6	8.04	7.56	7.70	7.68	7.75	7.84	8.05	8.44	8.40	8.65	8.61	8.31
7	8.01	7.56	7.71	7.67	7.74	7.85	8.04	8.47	8.38	8.62	8.62	8.31
8	7.96	7.58	7.76	7.66	7.75	7.84	8.07	8.31	8.33	8.69	8.52	8.31
9	7.97	7.59	7.76	7.66	7.74	7.84	8.11	8.27	8.40	8.76	8.59	8.29
10	7.97	7.91	7.74	7.66	7.74	7.82	8.17	8.34	8.39	8.71	8.60	8.26
11	7.98	7.68	7.75	7.65	7.74	7.82	8.17	8.34	8.45	8.75	8.57	8.24
12	7.98	7.67	7.74	7.65	7.81	7.81	8.16	8.35	8.46	8.73	8.61	8.27
13	7.89	7.71	7.74	7.65	7.82	7.80	8.20	8.30	8.45	8.72	8.55	8.27
14	7.84	7.68	7.75	7.66	7.83	7.79	8.20	8.31	8.44	8.72	8.53	8.25
15	7.92	7.65	7.72	7.65	7.83	7.79	8.26	8.31	8.52	8.68	8.56	8.22
16	7.93	7.74	7.71	7.65	7.84	7.79	8.25	8.31	8.56	8.67	8.56	8.19
17	7.92	7.72	7.69	7.64	7.86	7.79	8.21	8.34	8.55	8.66	8.47	8.16
18	7.85	7.78	7.81	7.66	7.86	7.78	8.22	8.31	8.58	8.66	8.52	8.11
19	7.82	7.73	7.68	7.67	7.86	7.78	8.26	8.28	8.62	8.66	8.52	8.11
20	7.78	7.68	7.71	7.66	7.85	7.79	8.28	8.34	8.62	8.66	8.49	8.05
21	7.77	7.71	7.70	7.66	7.84	7.79	8.30	8.33	8.64	8.69	8.50	8.06
22	7.78	7.79	7.71	7.66	7.84	7.79	8.31	8.31	8.66	8.66	8.50	8.06
23	7.76	7.63	7.71	7.69	7.83	7.80	8.31	8.35	8.66	8.70	8.51	8.03
24	7.76	7.68	7.71	7.73	7.82	7.78	8.34	8.22	8.66	8.70	8.50	8.02
25	7.76	7.74	7.70	7.75	7.82	7.79	8.32	8.14	8.65	8.68	8.47	8.06
26	7.76	7.65	7.68	7.77	7.82	7.80	8.34	8.22	8.68	8.70	8.46	8.07
27	7.75	7.68	7.68	7.77	7.82	7.80	8.40	8.28	8.70	8.67	8.45	7.99
28	7.70	7.68	7.66	7.78	7.82	7.81	8.39	8.29	8.68	8.66	8.40	8.05
29	7.75	7.69	7.65	7.78	---	7.76	8.32	8.30	8.58	8.65	8.37	8.05
30	7.74	7.68	7.65	7.76	---	7.87	8.34	8.32	8.70	8.67	8.43	8.10
31	7.67	---	7.64	7.76	---	7.92	---	8.36	---	8.61	8.41	---
MEAN	7.84	7.67	7.71	7.69	7.80	7.81	8.20	8.32	8.52	8.68	8.53	8.19
MAX	8.04	7.91	7.81	7.78	7.86	7.92	8.40	8.47	8.70	8.76	8.65	8.38
MIN	7.67	7.56	7.64	7.63	7.74	7.76	7.90	8.14	8.33	8.61	8.37	7.99

STREAMS TRIBUTARY TO LAKE MICHIGAN

441508085244001 LAKE MITCHELL-CADILLAC AT CADILLAC, MI

LOCATION.--Lat 44°14'21", long 85°27'17", in SW1/4 SW1/4 sec.6, T.21 N., R.9 W., Wexford County, Hydrologic Unit 04060102, on right bank of channel between lakes, at William Mitchell State Park, at Cadillac.

DRAINAGE AREA.--46.6 mi².

PERIOD OF RECORD.--August 1942 to December 1959, July 1960 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Datum of gage is 1,283.41 ft above sea level (levels by Michigan Department of Natural Resources).

REMARKS.--The major inlet is Mitchell Creek. The outlet is Clam River. Lake elevation controlled by dam. Established legal levels; annual maximum level, 1,290.0 ft, minimum winter level, 1,288.9 ft, summer minimum level, 1,289.7 ft above sea level..

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 7.86 ft, Sept. 6, 1975; minimum observed, 4.62 ft, Oct. 4, 1955.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 6.85 ft, July 22, 24; minimum observed, 5.27 ft, Oct. 3, 4.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.29	5.53	6.01	6.09	6.17	6.21	6.37	6.73	6.75	6.75	6.57	6.37
2	5.29	5.53	6.03	6.09	6.17	6.21	6.43	6.73	6.75	6.81	6.53	6.35
3	5.27	5.53	6.03	6.13	6.17	6.21	6.47	6.71	6.75	6.81	6.55	6.33
4	5.27	5.53	6.03	6.17	6.15	6.21	6.51	6.71	6.75	6.81	6.61	6.31
5	5.33	5.53	6.05	6.19	6.15	6.19	6.55	6.71	6.75	6.79	6.57	6.29
6	5.53	5.51	6.05	6.23	6.13	6.19	6.59	6.73	6.75	6.75	6.53	6.29
7	5.53	5.51	6.07	6.23	6.13	6.19	6.63	6.73	6.77	6.73	6.55	6.29
8	5.55	5.51	6.07	6.23	6.13	6.17	6.67	6.73	6.77	6.73	6.57	6.27
9	5.55	5.50	6.05	6.21	6.13	6.17	6.71	6.71	6.75	6.81	6.59	6.27
10	5.55	5.51	6.07	6.21	6.13	6.15	6.73	6.71	6.73	6.81	6.59	6.27
11	5.55	5.75	6.09	6.21	6.15	6.15	6.71	6.69	6.71	6.77	6.59	6.25
12	5.53	5.77	6.07	6.19	6.19	6.13	6.83	6.69	6.71	6.73	6.61	6.25
13	5.53	5.79	6.07	6.19	6.19	6.11	6.81	6.71	6.73	6.73	6.61	6.23
14	5.53	5.79	6.07	6.19	6.21	6.11	6.81	6.71	6.78	6.71	6.61	6.19
15	5.53	5.81	6.05	6.19	6.21	6.09	6.81	6.71	6.79	6.69	6.61	6.17
16	5.53	5.81	6.05	6.19	6.23	6.11	6.81	6.69	6.77	6.69	6.59	6.17
17	5.53	5.83	6.05	6.19	6.23	5.97	6.77	6.69	6.75	6.67	6.57	6.17
18	5.53	5.83	6.05	6.19	6.23	6.13	6.75	6.73	6.71	6.67	6.50	6.17
19	5.55	5.83	6.05	6.19	6.23	6.13	6.73	6.75	6.69	6.65	6.51	6.17
20	5.55	5.85	6.05	6.19	6.23	6.15	6.73	6.73	6.67	6.69	6.47	6.17
21	5.55	5.85	6.07	6.19	6.23	6.15	6.75	6.73	6.67	6.81	6.45	6.19
22	5.55	5.85	6.09	6.19	6.23	6.17	6.77	6.73	6.67	6.85	6.45	6.17
23	5.53	5.85	6.09	6.19	6.21	6.19	6.81	6.75	6.67	6.81	6.45	6.15
24	5.53	5.89	6.09	6.19	6.19	6.21	6.81	6.75	6.67	6.85	6.45	6.15
25	5.53	5.95	6.09	6.21	6.17	6.23	6.79	6.75	6.67	6.83	6.45	6.15
26	5.53	5.95	6.09	6.21	6.15	6.25	6.79	6.75	6.67	6.79	6.45	6.15
27	5.53	5.97	6.09	6.21	6.15	6.25	6.77	6.75	6.67	6.75	6.45	6.13
28	5.53	5.99	6.09	6.21	6.19	6.27	6.77	6.75	6.67	6.73	6.45	6.25
29	5.53	5.99	6.09	6.21	---	6.29	6.75	6.75	6.67	6.69	6.43	6.29
30	5.53	6.01	6.09	6.19	---	6.31	6.75	6.75	6.67	6.65	6.41	6.31
31	5.53	---	6.09	6.19	---	6.33	---	6.75	---	6.61	6.39	---
MEAN	5.50	5.75	6.07	6.19	6.18	6.18	6.71	6.73	6.72	6.75	6.52	6.23
MAX	5.55	6.01	6.09	6.23	6.23	6.33	6.83	6.75	6.79	6.85	6.61	6.37
MIN	5.27	5.50	6.01	6.09	6.13	5.97	6.37	6.69	6.67	6.61	6.39	6.13

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some regulation at low flow by dams upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e64	67	90	71	117	122	108	e86	83	81	105	59
2	e60	66	90	72	121	119	106	e84	92	80	100	59
3	e55	65	84	71	119	122	104	e82	88	77	97	58
4	e55	66	82	73	121	116	115	80	81	75	94	59
5	e60	67	82	75	115	116	142	80	76	71	90	65
6	e120	67	84	79	118	111	130	84	75	75	81	61
7	e200	67	102	e80	114	104	124	93	73	80	75	58
8	e150	67	109	e80	111	105	117	90	70	84	75	57
9	e90	67	96	e80	111	119	112	90	69	131	72	57
10	e80	94	89	e80	118	111	118	85	70	155	72	58
11	e75	168	85	e85	129	106	115	81	81	135	74	58
12	e70	138	83	e85	198	105	134	82	83	117	72	58
13	e65	102	82	e85	223	104	194	86	84	110	80	60
14	e65	90	79	e85	228	103	233	83	181	108	80	61
15	e65	87	80	e85	179	104	213	80	201	98	79	59
16	e65	86	80	e85	156	106	181	79	148	79	88	62
17	e65	88	79	e85	152	123	165	83	110	77	90	61
18	e75	94	77	e90	144	174	155	86	93	76	84	58
19	e75	92	78	96	133	170	145	87	84	77	72	58
20	e70	87	75	102	127	159	122	85	78	76	69	61
21	e65	84	77	105	114	156	106	80	75	85	67	64
22	e65	82	61	111	106	135	104	79	73	128	65	62
23	e65	81	69	126	113	119	118	81	72	117	63	60
24	e60	78	75	159	113	121	115	91	76	118	63	61
25	e60	77	72	168	118	118	104	95	79	119	63	61
26	e60	77	71	150	110	110	99	96	72	114	63	59
27	e60	76	71	141	109	109	94	92	75	111	63	59
28	e68	75	70	138	117	112	91	83	81	110	62	74
29	67	75	69	131	---	115	e90	78	85	117	60	103
30	67	78	66	125	---	112	e88	76	89	113	59	96
31	67	---	70	120	---	110	---	75	---	108	59	---
TOTAL	2328	2508	2477	3118	3734	3716	3842	2612	2697	3102	2336	1886
MEAN	75.1	83.6	79.9	101	133	120	128	84.3	89.9	100	75.4	62.9
MAX	200	168	109	168	228	174	233	96	201	155	105	103
MIN	55	65	61	71	106	103	88	75	69	71	59	57
CFSM	.31	.34	.33	.41	.55	.49	.53	.35	.37	.41	.31	.26
IN.	.36	.38	.38	.48	.57	.57	.59	.40	.41	.47	.36	.29

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1999, BY WATER YEAR (WY)

	MEAN	116	135	136	123	123	192	239	152	113	90.9	84.5	99.0
MAX	275	248	259	187	194	389	396	245	218	238	185	281	281
(WY)	1987	1986	1992	1993	1988	1976	1976	1976	1996	1969	1969	1985	1985
MIN	62.3	70.3	64.5	62.7	63.5	100	109	67.9	57.0	53.0	58.1	59.9	59.9
(WY)	1967	1977	1977	1977	1977	1978	1987	1977	1977	1977	1978	1981	1981

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1966 - 1999

ANNUAL TOTAL	38268		34356										
ANNUAL MEAN	105		94.1										
HIGHEST ANNUAL MEAN										134			
LOWEST ANNUAL MEAN										185			1992
HIGHEST DAILY MEAN										81.2			1977
LOWEST DAILY MEAN	700						233		Apr 14	1680			Mar 29 1989
LOWEST SEVEN-DAY MINIMUM	55				Apr 2		55		Oct 3	47			Jul 31 1966
INSTANTANEOUS PEAK FLOW	58				Oct 3		58		Sep 7	50			Jul 19 1966
INSTANTANEOUS PEAK STAGE					Aug 25		258		Feb 13	1710			Mar 29 1989
INSTANTANEOUS LOW FLOW							3.76		Feb 13	7.31			Mar 29 1989
ANNUAL RUNOFF (CFSM)	.43						(a)45		Dec 22	(a)29			Nov 3 1969
ANNUAL RUNOFF (INCHES)	5.86						.39			.55			
10 PERCENT EXCEEDS	175						5.26			7.49			
50 PERCENT EXCEEDS	83						132			222			
90 PERCENT EXCEEDS	60						84			110			
							62			66			

(a) Result of freezeup.

(e) Estimated.

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.--1,433 mi².

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), WDR MI-96-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 977.72 ft above sea level. Prior to Nov. 7, 1956, nonrecording gages at sites 400 ft and 500 ft upstream at present datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some regulation at low flow by dams upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	406	610	841	e600	e1200	1050	1120	698	528	738	813	382
2	376	605	872	e600	1160	1030	1120	670	595	774	768	375
3	362	592	867	593	1180	1030	1100	630	646	773	733	367
4	352	590	849	598	e1150	1000	1240	597	631	764	750	361
5	363	582	872	e600	e1100	979	1450	575	654	742	781	352
6	599	580	894	e600	1100	955	1430	581	661	768	741	363
7	1000	578	1070	e600	1120	887	1400	629	642	719	702	362
8	988	575	1130	e600	1090	868	1320	627	602	689	674	342
9	931	575	1110	e600	1120	e850	1290	623	560	909	625	342
10	789	747	1060	e600	1140	e850	1310	606	527	1050	641	342
11	704	1040	1020	e600	1250	e850	1430	590	525	1040	654	342
12	683	1120	987	e600	2020	e850	1700	595	534	975	633	341
13	684	1080	958	e600	e2000	e850	1700	663	579	900	681	362
14	668	1000	919	e600	e1900	836	1740	622	2030	842	696	372
15	651	968	902	e600	e1800	826	1660	581	1980	799	657	362
16	634	964	885	e600	e1750	849	1550	566	1640	755	624	352
17	641	982	866	e650	1720	994	1450	580	1470	731	611	342
18	683	972	831	e700	1670	1320	1380	660	1290	748	594	345
19	698	977	816	e700	1560	1460	1310	657	1180	821	588	345
20	686	963	798	e750	e1350	1430	1240	619	1110	966	562	364
21	663	936	e775	793	e1250	1430	1120	585	1040	1060	537	364
22	653	908	e640	822	e1150	1410	1050	557	936	1360	511	362
23	640	890	e510	928	e1100	1350	1060	557	821	1480	490	362
24	629	870	e350	1130	e1050	1320	1030	626	885	1770	476	372
25	616	842	e400	1240	1060	1290	985	631	836	1440	466	382
26	609	834	e490	1310	1020	1250	935	615	731	1270	472	401
27	600	821	e520	1310	973	1200	871	593	754	1150	457	427
28	598	806	e580	1320	983	1180	816	571	779	1040	439	532
29	598	799	e590	e1350	---	1160	769	554	750	968	416	672
30	608	803	e600	e1300	---	1150	731	532	732	912	397	752
31	612	---	e620	e1250	---	1130	---	511	---	858	388	---
TOTAL	19724	24609	24622	25144	36966	33634	37307	18701	26648	29811	18577	11793
MEAN	636	820	794	811	1320	1085	1244	603	888	962	599	392
MAX	1000	1120	1130	1350	2020	1460	1740	698	2030	1770	813	752
MIN	352	575	350	593	973	826	731	511	525	689	388	341
CFSM	.44	.57	.55	.57	.92	.76	.87	.42	.62	.67	.42	.27
IN.	.51	.64	.64	.65	.96	.87	.97	.49	.69	.77	.48	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

MEAN	779	1003	979	879	907	1585	2231	1348	975	686	552	636
MAX	2402	2656	2270	1700	2353	4115	3869	2709	2945	2901	1243	2269
(WY)	1987	1992	1992	1973	1938	1976	1971	1947	1945	1957	1969	1975
MIN	374	433	499	418	327	594	934	548	409	327	316	326
(WY)	1949	1950	1977	1936	1936	1940	1945	1977	1988	1934	1941	1948

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1931 - 1999
ANNUAL TOTAL	329984	307536	
ANNUAL MEAN	904	843	(a)1055
HIGHEST ANNUAL MEAN			1532
LOWEST ANNUAL MEAN			1932
HIGHEST DAILY MEAN	5230	2030	(b)613
LOWEST DAILY MEAN	287	341	8770
ANNUAL SEVEN-DAY MINIMUM	291	349	252
INSTANTANEOUS PEAK FLOW		2390	274
INSTANTANEOUS PEAK STAGE		9.29	9040
INSTANTANEOUS LOW FLOW		(c)246	14.99
ANNUAL RUNOFF (CFSM)	.63	.59	(c)164
ANNUAL RUNOFF (INCHES)	8.57	7.98	.74
10 PERCENT EXCEEDS	1610	1320	10.00
50 PERCENT EXCEEDS	745	768	1960
90 PERCENT EXCEEDS	326	423	806
			445

(a) Does not include water years 1931, 1934.

(b) Estimated 584 ft³/s, water year 1931.

(c) Result of freezeup.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121650 MUSKEGON RIVER AT BIG RAPIDS, MI

LOCATION.--Lat 43°41'37", long 85°28'03", in SE1/4 NE1/4 sec.14, T.15 N., R.10 W., Mecosta County, Hydrologic Unit 04060102, on right bank at sewage treatment plant in Big Rapids.

DRAINAGE AREA.--1,751 mi².

PERIOD OF RECORD.--October 1998 to September 1999.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1998 to September 1999.

DISSOLVED OXYGEN: October 1998 to September 1999.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 28.0°C, July 5; minimum, -0.5°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum recorded (more than 20 percent missing record), 13.2 mg/L, Dec. 20, Mar. 26; minimum recorded (more than 20 percent missing record), 5.4 mg/L, June 14.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER			DECEMBER			JANUARY*		
1	---	---	---	10.5	9.5	10.5	8.5	7.0	7.5	-5	-5	-5
2	---	---	---	9.5	7.5	8.5	8.0	6.5	7.0	-5	-5	-5
3	---	---	---	7.5	6.0	6.5	9.0	7.5	8.0	-5	-5	-5
4	---	---	---	6.0	5.0	5.5	8.5	8.0	8.5	-5	-5	-5
5	---	---	---	5.0	4.5	5.0	8.5	8.0	8.5	.0	-5	-5
6	---	---	---	5.5	4.0	4.5	9.5	8.5	9.0	-5	-5	-5
7	---	---	---	6.0	5.0	5.5	8.5	6.5	7.5	-5	-5	-5
8	---	---	---	6.5	6.0	6.0	6.5	4.5	5.5	-5	-5	-5
9	---	---	---	6.5	6.0	6.0	4.5	3.5	4.0	-5	-5	-5
10	---	---	---	7.5	6.0	6.5	4.0	2.5	3.5	-5	-5	-5
11	---	---	---	6.5	4.5	5.5	3.0	1.5	2.5	-5	-5	-5
12	---	---	---	5.0	4.0	4.5	3.0	2.0	2.5	-5	-5	-5
13	---	---	---	4.0	3.0	3.5	3.0	1.5	2.0	-5	-5	-5
14	---	---	---	5.0	4.0	4.5	2.0	1.0	1.5	-5	-5	-5
15	---	---	---	5.5	4.5	5.0	3.0	1.5	2.0	-5	-5	-5
16	---	---	---	4.5	4.5	4.5	2.5	2.0	2.0	-5	-5	-5
17	---	---	---	5.5	4.0	4.5	2.5	1.0	2.0	-5	-5	-5
18	---	---	---	6.0	4.5	5.0	1.5	.5	1.0	-5	-5	-5
19	---	---	---	5.5	4.5	5.5	2.0	1.0	1.5	-5	-5	-5
20	---	---	---	4.5	3.5	4.0	1.0	.5	1.0	-5	-5	-5
21	10.0	8.5	9.0	4.5	3.0	3.5	1.0	.5	1.0	-5	-5	-5
22	9.5	7.5	8.5	4.5	3.0	3.5	.5	-5	.0	-5	-5	-5
23	10.0	7.0	8.5	5.5	4.0	5.0	-5	-5	-5	.0	-5	.0
24	11.0	8.5	9.5	5.5	4.0	4.5	-5	-5	-5	.0	-5	.0
25	11.0	9.5	10.0	4.5	4.0	4.0	-5	-5	-5	.0	-5	.0
26	12.0	10.0	10.5	4.5	3.5	4.0	.0	-5	.0	.5	-5	.0
27	11.0	9.5	10.5	4.0	2.5	3.0	.5	-5	.0	.5	-5	.0
28	13.0	11.0	12.0	4.5	3.0	3.5	.0	.0	.0	1.0	.5	.5
29	11.5	9.5	10.5	7.5	4.5	6.0	.0	-5	.0	1.0	.0	.5
30	11.0	10.0	10.5	9.5	7.5	8.5	.0	-5	-5	1.0	-5	.0
31	11.0	10.5	10.5	---	---	---	-5	-5	-5	1.0	-5	.5
MONTH	---	---	---	10.5	2.5	5.2	9.5	-5	2.8	1.0	-5	-3

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121650 MUSKEGON RIVER AT BIG RAPIDS, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MFAN
FEBRUARY				MARCH			APRIL			MAY		
1	.5	.0	.0	2.5	1.5	2.0	11.0	10.5	11.0	17.5	13.0	15.5
2	1.5	.5	1.0	1.5	1.0	1.0	13.5	10.5	12.0	18.0	14.0	16.0
3	1.5	.5	1.0	2.0	1.0	1.5	15.0	12.0	13.5	18.5	14.5	16.5
4	1.5	.0	1.0	3.0	.0	1.5	15.0	10.0	12.0	19.5	15.0	17.5
5	.0	-.5	.0	2.0	.5	1.5	10.5	9.0	10.0	18.0	16.0	17.0
6	2.5	.0	1.0	1.5	-.5	.5	10.0	8.5	9.0	17.5	15.0	16.5
7	1.5	.5	1.0	1.0	-.5	.0	10.5	7.5	9.0	15.5	14.0	14.5
8	1.5	.5	1.0	.0	-.5	.0	12.5	9.0	10.5	14.5	13.5	14.0
9	3.0	1.5	2.0	.0	-.5	.0	11.5	9.5	10.0	17.0	12.0	14.0
10	3.0	1.0	2.0	2.0	-.5	.5	11.0	8.0	9.5	18.0	13.0	15.5
11	4.5	2.5	3.5	3.0	-.5	1.0	10.0	6.5	8.0	--	--	--
12	4.5	1.0	2.0	3.0	.0	1.5	9.0	6.0	7.5	--	--	--
13	1.0	-.5	.5	3.0	.5	2.0	10.0	6.5	8.0	--	--	--
14	.5	-.5	.0	4.0	.5	2.5	11.5	7.5	9.5	--	--	--
15	1.5	.0	.5	5.0	1.5	3.0	10.5	9.0	10.0	17.5	14.5	16.0
16	1.5	.5	1.0	6.0	2.5	4.0	10.0	9.0	9.5	19.0	15.0	17.0
17	2.0	1.0	1.5	7.0	4.0	5.5	10.0	8.0	9.0	21.5	17.0	19.0
18	1.5	.5	1.0	5.5	3.5	4.5	9.5	8.0	9.0	19.5	17.0	18.0
19	1.0	.0	.5	5.5	3.0	4.0	9.0	8.0	8.5	19.5	15.5	17.5
20	1.0	-.5	.5	5.5	3.0	4.5	10.0	7.5	9.0	--	--	--
21	.5	-.5	.0	5.0	4.0	4.5	10.0	9.0	9.5	20.0	17.0	18.5
22	.0	-.5	-.5	4.5	3.0	3.5	9.5	9.0	9.5	20.5	17.5	19.0
23	.0	-.5	.0	5.5	2.5	4.0	10.5	8.0	9.0	--	--	--
24	.5	-.5	.0	6.0	3.5	5.0	12.0	8.0	10.0	--	--	--
25	2.0	.0	1.0	6.0	4.0	5.0	13.5	9.0	11.0	--	--	--
26	2.5	.0	1.5	6.5	3.5	5.0	14.5	10.5	12.5	16.0	10.5	13.0
27	3.0	2.0	2.5	7.5	4.5	6.0	15.0	12.0	13.0	18.5	12.5	15.5
28	2.5	2.0	2.5	8.0	5.0	6.5	15.0	11.5	13.0	21.0	15.5	18.0
29	--	--	--	9.0	6.0	7.5	16.0	11.5	13.5	22.5	17.0	19.5
30	--	--	--	10.0	6.5	8.0	17.0	12.0	14.5	23.0	18.5	21.0
31	--	--	--	11.5	8.0	10.0	--	--	--	22.0	19.5	21.0
MONTH	4.5	-.5	1.0	11.5	-.5	3.4	17.0	6.0	10.3	--	--	--

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MFAN
JUNE				JULY			AUGUST			SEPTEMBER		
1	23.0	19.5	21.0	20.5	19.0	19.5	25.0	22.5	23.5	20.5	17.5	19.0
2	21.5	19.0	20.5	21.5	18.0	19.5	23.5	21.0	22.0	20.5	18.0	19.5
3	21.5	16.5	19.0	23.0	19.5	21.0	22.0	19.5	21.0	21.5	18.5	20.0
4	21.0	17.5	19.5	26.5	21.5	23.5	23.5	20.0	21.5	22.0	19.0	20.5
5	23.0	18.5	20.5	28.0	23.5	25.5	22.5	19.5	21.0	22.0	19.0	20.5
6	--	--	--	26.5	24.5	25.5	23.0	19.5	21.0	21.0	19.0	20.0
7	--	--	--	25.5	22.0	24.0	21.5	19.0	20.0	20.0	16.5	18.5
8	--	--	--	24.5	21.5	23.0	21.0	18.0	19.5	19.0	17.0	18.0
9	--	--	--	23.5	21.0	22.0	19.5	17.0	18.5	18.5	16.0	17.0
10	--	--	--	22.5	20.0	21.0	19.5	17.0	18.5	16.5	15.0	15.5
11	26.5	23.0	24.5	23.0	19.0	21.0	22.0	17.5	19.5	17.5	14.5	16.0
12	25.0	23.0	24.0	23.5	19.5	21.5	22.0	19.0	20.5	17.5	15.0	16.0
13	23.5	20.0	22.0	23.0	19.5	21.5	22.0	19.5	20.5	18.0	16.0	17.0
14	20.5	18.0	19.5	22.5	20.0	21.5	21.0	18.0	19.5	17.0	15.5	16.0
15	18.5	16.0	17.5	25.0	20.5	22.5	22.0	18.0	20.0	16.0	13.0	15.0
16	17.5	16.0	17.0	26.0	22.0	24.0	21.0	19.0	20.0	15.5	12.5	14.0
17	18.0	15.0	16.5	25.0	23.0	23.5	22.5	19.0	20.5	16.5	12.0	14.0
18	19.0	15.0	17.0	25.5	21.5	23.5	21.0	19.5	20.0	16.5	13.0	14.5
19	19.5	16.5	18.0	24.0	22.0	22.5	20.5	18.5	19.5	17.0	13.0	15.0
20	21.0	17.0	19.0	24.0	20.5	22.5	21.0	18.0	19.5	16.0	14.5	15.5
21	22.0	18.0	20.0	23.0	21.5	22.0	21.5	18.5	20.0	15.5	12.0	13.5
22	23.0	19.5	21.0	24.5	21.0	22.5	21.0	19.0	20.0	15.5	11.0	13.0
23	23.0	20.0	21.5	24.0	22.5	23.0	20.5	19.5	20.0	17.5	13.0	15.0
24	24.5	21.0	22.5	25.0	22.0	23.5	20.5	19.0	19.5	16.0	13.5	14.5
25	25.0	21.0	23.0	25.5	22.0	24.0	20.0	19.0	19.0	16.0	12.0	13.5
26	25.0	21.5	23.0	24.0	22.0	23.0	21.0	18.5	19.5	17.5	13.0	15.0
27	24.5	22.5	23.5	25.0	21.5	23.0	22.0	19.5	20.5	16.0	15.0	15.5
28	25.5	22.5	24.0	25.0	21.0	23.0	23.0	20.5	21.5	15.5	14.5	15.0
29	24.0	21.0	22.0	25.5	22.0	23.5	22.0	19.5	20.5	14.5	12.5	14.0
30	22.0	19.5	21.0	27.0	23.0	25.0	20.0	17.5	18.5	13.5	11.5	12.5
31	--	--	--	26.0	24.0	25.0	20.0	16.5	18.5	--	--	--
MONTH	--	--	--	28.0	18.0	22.8	25.0	16.5	20.1	22.0	11.0	16.1

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121650 MUSKEGON RIVER AT BIG RAPIDS, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
OCTOBER				NOVEMBER				DECEMBER				JANUARY*	
1	--	--	--	10.6	9.4	9.9	11.3	9.9	10.7	11.6	9.5	10.2	
2	--	--	--	11.4	10.1	10.8	11.1	10.5	10.9	11.2	10.1	10.8	
3	--	--	--	11.9	10.9	11.4	10.6	10.0	10.3	10.9	9.9	10.5	
4	--	--	--	12.2	11.3	11.7	10.4	9.8	10.1	10.8	10.4	10.6	
5	--	--	--	12.2	11.6	11.8	10.2	9.8	10.0	10.8	10.2	10.5	
6	--	--	--	12.5	11.7	12.0	9.9	9.6	9.7	11.0	10.0	10.5	
7	--	--	--	12.3	11.6	11.9	10.7	9.7	10.2	10.6	9.6	10.2	
8	--	--	--	12.2	11.3	11.7	11.2	10.5	10.8	10.4	9.2	10.1	
9	--	--	--	12.0	11.3	11.6	11.7	11.0	11.4	10.2	9.1	9.9	
10	--	--	--	11.5	10.9	11.1	11.9	11.5	11.7	10.0	9.6	9.8	
11	--	--	--	11.8	11.0	11.4	12.3	11.8	12.0	9.9	8.6	9.5	
12	--	--	--	12.3	11.8	12.1	12.4	11.9	12.1	9.6	8.9	9.3	
13	--	--	--	12.8	11.9	12.4	12.5	12.0	12.2	9.5	9.1	9.3	
14	--	--	--	12.4	11.9	12.1	12.8	12.2	12.4	9.4	8.9	9.1	
15	--	--	--	12.4	11.7	12.1	12.6	12.2	12.4	9.2	8.7	8.9	
16	--	--	--	12.1	11.7	12.0	12.5	12.1	12.3	9.0	8.6	8.8	
17	--	--	--	12.5	11.9	12.2	12.6	12.1	12.3	9.3	8.8	9.0	
18	--	--	--	12.5	11.9	12.2	12.8	12.1	12.5	9.4	9.0	9.2	
19	--	--	--	12.1	11.5	11.8	12.8	12.1	12.5	9.8	9.2	9.5	
20	--	--	--	12.4	11.9	12.1	13.2	12.3	12.8	10.0	9.6	9.8	
21	10.8	9.9	10.3	13.1	12.4	12.7	12.8	12.1	12.6	10.3	9.8	10.0	
22	11.1	10.1	10.6	13.1	12.3	12.8	12.2	11.2	11.6	10.5	10.2	10.3	
23	10.9	10.0	10.5	12.5	12.0	12.2	12.3	9.3	11.1	10.4	10.2	10.3	
24	10.5	9.7	10.1	12.8	12.0	12.3	10.5	9.6	10.3	10.8	10.3	10.5	
25	10.6	9.4	10.0	12.2	12.0	12.1	10.2	8.6	9.5	11.0	10.5	10.7	
26	10.4	9.4	9.8	12.6	11.9	12.2	9.7	8.2	9.2	11.5	10.6	10.9	
27	10.3	9.3	9.8	12.8	12.2	12.4	10.2	8.2	9.3	11.2	10.7	10.9	
28	10.3	9.0	9.6	12.7	11.9	12.3	10.4	9.0	9.7	11.7	11.2	11.4	
29	10.7	9.4	10.0	11.9	10.8	11.4	10.4	9.7	10.1	12.3	10.9	11.5	
30	10.4	9.4	9.9	10.8	9.9	10.1	10.2	9.1	9.8	12.4	10.5	11.4	
31	10.2	9.4	9.7	--	--	--	10.2	9.6	9.8	12.4	11.0	11.5	
MONTH	--	--	--	13.1	9.4	11.8	13.2	8.2	11.0	12.4	8.6	10.2	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	11.8	11.0	11.4	--	--	--	11.0	10.4	10.7	11.2	9.3	10.2	
2	11.8	11.6	11.7	--	--	--	11.4	10.3	10.8	10.9	9.3	9.9	
3	12.1	11.2	11.7	--	--	--	11.2	9.9	10.5	10.9	8.6	9.7	
4	12.0	11.0	11.6	--	--	--	10.7	9.8	10.2	10.6	8.5	9.4	
5	11.4	10.6	11.1	--	--	--	11.6	10.6	11.2	9.4	8.1	8.8	
6	12.1	11.2	11.7	--	--	--	11.3	11.0	11.1	8.8	7.7	8.2	
7	12.1	11.5	11.8	--	--	--	11.1	10.2	10.8	9.5	8.0	8.7	
8	12.2	11.4	11.8	--	--	--	10.7	9.9	10.3	9.1	8.1	8.6	
9	11.9	11.6	11.7	--	--	--	10.6	9.8	10.1	9.6	8.3	8.9	
10	12.1	11.4	11.8	--	--	--	11.0	10.2	10.6	9.3	8.0	8.6	
11	--	--	--	--	--	--	10.9	10.1	10.5	--	--	--	
12	--	--	--	--	--	--	11.5	10.9	11.1	--	--	--	
13	--	--	--	--	--	--	11.4	10.6	11.0	--	--	--	
14	--	--	--	--	--	--	11.0	10.2	10.7	--	--	--	
15	--	--	--	--	--	--	10.6	10.1	10.3	11.6	10.2	10.8	
16	--	--	--	--	--	--	10.5	10.0	10.2	11.0	9.5	10.2	
17	--	--	--	--	--	--	10.8	10.2	10.5	10.1	8.3	9.2	
18	--	--	--	12.3	11.5	11.9	11.3	10.5	10.9	8.8	7.7	8.3	
19	--	--	--	12.8	12.0	12.3	11.2	10.6	10.9	9.5	8.2	8.8	
20	--	--	--	12.8	11.8	12.3	11.4	10.7	11.1	--	--	--	
21	--	--	--	12.5	11.7	12.1	11.2	10.5	10.8	9.4	8.1	8.6	
22	--	--	--	13.0	12.0	12.5	10.9	10.4	10.7	9.3	7.9	8.4	
23	--	--	--	13.0	12.0	12.6	11.6	10.6	11.1	--	--	--	
24	--	--	--	12.9	12.0	12.4	11.8	10.7	11.2	--	--	--	
25	--	--	--	13.1	12.0	12.4	11.4	10.4	10.9	--	--	--	
26	--	--	--	13.2	12.1	12.6	11.2	10.1	10.6	10.3	9.0	9.7	
27	--	--	--	13.1	11.8	12.4	11.2	9.9	10.5	9.9	8.4	9.2	
28	--	--	--	12.8	11.6	12.1	11.0	9.8	10.3	9.5	8.0	8.7	
29	--	--	--	12.4	11.4	11.8	10.7	9.5	10.1	9.2	7.5	8.3	
30	--	--	--	12.5	11.2	11.8	11.3	9.3	10.3	9.0	7.1	7.9	
31	--	--	--	12.1	10.8	11.4	--	--	--	8.0	6.8	7.3	
MONTH	--	--	--	--	--	--	11.8	9.3	10.7	--	--	--	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121650 MUSKEGON RIVER AT BIG RAPIDS, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.0	6.6	7.2	8.6	7.5	8.0	8.4	6.9	7.6	--	--	--
2	7.6	6.2	6.9	9.0	7.9	8.4	8.6	7.2	7.9	--	--	--
3	8.4	6.7	7.6	8.6	7.6	8.0	8.8	7.5	8.1	--	--	--
4	8.9	7.1	7.9	8.6	7.3	7.9	8.8	7.6	8.1	--	--	--
5	9.1	7.4	8.2	8.3	6.9	7.5	9.0	7.5	8.3	--	--	--
6	--	--	--	8.3	6.5	7.6	9.2	7.8	8.5	--	--	--
7	--	--	--	8.6	6.9	7.7	8.6	7.6	8.1	--	--	--
8	--	--	--	8.6	6.8	7.6	9.3	7.8	8.6	--	--	--
9	--	--	--	8.2	6.8	7.4	9.4	8.3	8.8	--	--	--
10	--	--	--	8.3	7.0	7.6	9.3	8.2	8.7	--	--	--
11	8.5	6.4	7.3	8.7	7.3	7.9	9.5	8.2	8.8	--	--	--
12	8.4	6.5	7.4	8.4	7.2	7.7	9.2	7.9	8.5	--	--	--
13	7.5	6.6	7.0	8.3	7.0	7.7	8.7	7.8	8.2	--	--	--
14	7.2	5.4	6.6	8.5	7.0	7.8	9.4	8.2	8.8	--	--	--
15	6.8	6.2	6.6	8.6	7.1	7.8	9.6	8.4	9.0	--	--	--
16	7.5	6.4	7.0	8.4	6.9	7.6	9.4	8.3	8.9	--	--	--
17	8.0	7.2	7.6	7.9	6.5	7.1	9.3	8.2	8.7	--	--	--
18	8.0	7.5	7.8	6.3	6.9	7.6	--	--	--	--	--	--
19	8.2	7.5	7.8	7.9	6.9	7.3	--	--	--	--	--	--
20	8.2	7.3	7.6	8.6	7.3	7.9	--	--	--	--	--	--
21	8.1	7.2	7.6	7.7	7.0	7.4	--	--	--	--	--	--
22	7.8	7.0	7.4	7.9	7.1	7.6	--	--	--	10.7	9.4	9.9
23	7.7	6.6	7.1	7.7	7.0	7.3	--	--	--	10.4	8.8	9.6
24	7.6	6.6	7.1	7.4	7.0	7.2	--	--	--	10.4	8.8	9.5
25	8.0	6.8	7.4	7.6	6.9	7.2	--	--	--	10.6	9.4	9.9
26	8.0	6.8	7.3	7.6	6.5	7.0	--	--	--	10.6	9.2	9.8
27	7.8	6.7	7.2	8.0	7.2	7.5	--	--	--	9.8	8.8	9.2
28	7.6	6.7	7.1	7.9	7.0	7.4	--	--	--	9.8	8.9	9.3
29	8.2	6.7	7.4	7.9	6.7	7.2	--	--	--	9.9	9.1	9.4
30	8.4	6.9	7.7	8.0	6.6	7.2	--	--	--	9.7	8.9	9.3
31	--	--	--	7.8	6.5	7.1	--	--	--	--	--	--
MONTH	--	--	--	9.0	6.5	7.6	--	--	--	--	--	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121660 MUSKEGON RIVER NEAR STANWOOD, MI

LOCATION.--Lat 43°36'47", long 85°28'40", in SE1/4 SW1/4 sec.11, T.14 N., R.10 W., Mecosta County, Hydrologic Unit 04060102, on left bank downstream from Rogers Dam, 2.8 mi northwest of Stanwood.

DRAINAGE AREA.--1,834 mi².

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1995 to current year.

DISSOLVED OXYGEN: October 1995 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 26.5°C, June 27, 1998; minimum, -0.5°C, Feb. 25, 26, Mar. 10-12, 1999.

DISSOLVED OXYGEN: Maximum, 14.2 mg/L, Feb. 24, 1999; minimum, 4.9 mg/L, June 13, 14, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 26.0°C, July 6, 7; minimum, -0.5°C, Feb. 25, 26, Mar. 10-12.

DISSOLVED OXYGEN: Maximum, 14.2 mg/L, Feb. 24; minimum, 4.9 mg/L, June 13, 14.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER			DECEMBER			JANUARY		
1	17.0	16.0	16.5	11.0	10.5	11.0	7.5	6.5	7.5	.0	.0	.0
2	16.0	15.0	15.5	10.5	10.0	10.5	7.5	7.5	7.5	.0	.0	.0
3	15.0	14.0	14.5	10.0	9.0	9.5	7.5	7.5	7.5	.0	.0	.0
4	14.0	13.0	13.5	9.0	7.0	8.0	8.5	7.5	8.0	.0	.0	.0
5	13.5	12.5	13.0	7.0	6.0	6.5	8.5	8.0	8.5	.0	.0	.0
6	13.0	12.0	12.5	6.0	5.5	6.0	9.0	8.5	8.5	.0	.0	.0
7	13.5	12.5	13.0	5.5	5.0	5.0	8.5	8.5	8.5	.0	.0	.0
8	13.5	13.0	13.5	5.0	5.0	5.0	8.5	6.5	7.5	.0	.0	.0
9	13.0	12.0	12.5	5.5	5.0	5.5	6.5	5.0	6.0	.0	.0	.0
10	12.5	11.5	12.0	6.5	5.5	6.0	5.0	4.0	4.5	.0	.0	.0
11	12.5	11.5	12.5	6.0	5.5	6.0	4.0	3.0	3.5	.0	.0	.0
12	12.5	12.0	12.5	5.5	5.0	5.5	3.0	2.5	3.0	.0	.0	.0
13	13.0	12.5	12.5	5.0	4.5	4.5	2.5	2.5	2.5	.0	.0	.0
14	12.5	11.5	12.0	4.5	4.0	4.0	2.5	2.5	2.5	.0	.0	.0
15	11.5	11.0	11.0	4.5	4.0	4.5	2.5	2.0	2.0	.0	.0	.0
16	11.5	11.0	11.0	5.0	4.5	5.0	2.5	2.0	2.0	.0	.0	.0
17	12.5	11.0	11.5	5.0	4.5	4.5	2.5	2.0	2.0	.0	.0	.0
18	13.0	12.0	12.5	5.0	4.5	5.0	2.0	2.0	2.0	.0	.0	.0
19	13.0	12.5	13.0	5.0	5.0	5.0	2.0	1.5	1.5	.0	.0	.0
20	12.5	11.5	12.0	5.5	4.5	5.0	1.5	1.5	1.5	.0	.0	.0
21	11.5	10.5	11.0	4.5	4.0	4.5	1.5	1.0	1.5	.0	.0	.0
22	10.5	9.5	10.0	4.0	4.0	4.0	1.0	.5	1.0	.0	.0	.0
23	9.5	9.0	9.0	4.5	4.0	4.0	.5	.5	.5	.0	.0	.0
24	9.5	9.0	9.0	4.5	4.0	4.5	.5	.0	.0	.0	.0	.0
25	10.0	9.5	9.5	4.5	4.5	4.5	.5	.0	.0	.0	.0	.0
26	10.5	10.0	10.5	4.5	4.0	4.5	.5	.5	.5	.0	.0	.0
27	11.0	10.5	10.5	4.0	4.0	4.0	.5	.0	.0	.0	.0	.0
28	11.5	10.5	11.0	4.0	3.5	4.0	.0	.0	.0	.0	.0	.0
29	12.0	11.0	11.0	4.5	3.5	4.0	.0	.0	.0	.0	.0	.0
30	11.5	11.0	11.5	6.5	4.5	5.5	.0	.0	.0	.0	.0	.0
31	11.5	11.0	11.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	17.0	9.0	12.0	11.0	3.5	5.5	9.0	.0	3.2	.0	.0	.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121660 MUSKEGON RIVER NEAR STANWOOD, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	.0	.0	.0	2.0	2.0	2.0	10.5	9.5	10.0	15.5	14.0	14.5	
2	.0	.0	.0	2.0	1.5	1.5	11.5	10.5	11.0	16.0	15.0	15.5	
3	.0	.0	.0	1.5	1.0	1.0	13.5	11.5	12.0	16.5	15.5	15.0	
4	.5	.0	.5	1.0	1.0	1.0	13.5	12.5	13.0	17.5	16.0	17.0	
5	1.0	.5	.5	1.5	1.0	1.0	12.5	10.0	11.5	17.5	17.0	17.0	
6	.5	.0	.0	1.5	.5	1.0	10.0	9.5	10.0	17.5	17.0	17.0	
7	1.0	.0	.5	.5	.5	.5	9.5	8.5	9.0	17.0	15.5	15.0	
8	1.0	1.0	1.0	.5	.0	.5	10.5	9.0	10.0	15.5	14.5	15.0	
9	1.0	.5	1.0	.0	.0	.0	10.5	10.0	10.5	15.0	14.0	14.5	
10	2.0	1.0	1.5	.0	-.5	.0	10.5	9.5	10.0	16.0	14.0	15.0	
11	2.5	2.0	2.0	.0	-.5	-.5	9.5	8.5	9.0	16.5	15.0	15.5	
12	3.5	2.5	3.0	.0	-.5	-.5	8.5	7.0	7.5	16.0	15.0	15.5	
13	2.5	.5	1.5	1.0	.0	.5	8.5	7.0	8.0	15.0	14.5	15.0	
14	.5	.0	.5	1.5	1.0	1.0	9.5	8.0	9.0	15.5	14.0	14.5	
15	.0	.0	.0	2.0	1.5	1.5	10.5	9.5	10.0	16.0	14.5	15.0	
16	1.0	.0	.5	3.0	2.0	2.5	10.0	9.0	9.5	16.5	15.5	15.0	
17	1.5	1.0	1.0	3.5	3.0	3.0	9.0	8.5	9.0	18.5	16.5	17.5	
18	1.5	1.0	1.5	4.5	3.5	4.0	9.0	8.5	9.0	19.0	18.0	17.5	
19	1.0	1.0	1.0	4.5	3.5	4.0	9.0	8.5	8.5	18.5	18.0	17.0	
20	1.0	.5	.5	4.5	3.5	4.0	8.5	8.0	8.5	18.0	17.5	17.0	
21	1.0	.5	.5	4.5	4.0	4.5	9.5	8.5	9.0	19.0	18.0	17.5	
22	.5	.5	.5	4.5	3.5	4.0	9.5	9.0	9.0	19.5	19.0	17.0	
23	.5	.5	.5	4.0	3.5	3.5	9.0	8.5	9.0	19.5	18.5	17.0	
24	.5	.0	.0	4.5	3.5	4.0	10.0	8.5	9.0	18.5	15.5	17.0	
25	.0	-.5	.0	5.5	4.5	4.5	10.5	9.0	10.0	15.5	13.5	14.5	
26	.0	-.5	.0	5.0	4.5	5.0	12.5	10.5	11.5	14.0	12.5	13.5	
27	1.0	.0	.5	6.0	4.5	5.0	13.0	12.0	12.5	14.5	13.0	13.5	
28	2.0	1.0	1.5	6.5	5.5	6.0	13.0	12.0	12.5	16.5	14.5	15.0	
29	---	---	---	7.5	6.5	7.0	14.0	12.5	13.5	18.5	16.5	17.0	
30	---	---	---	8.0	7.0	7.5	15.0	13.0	14.0	20.0	18.0	17.5	
31	---	---	---	9.5	8.0	8.5	---	---	---	20.5	19.5	20.0	
MONTH	3.5	-.5	.7	9.5	-.5	2.8	15.0	7.0	10.2	20.5	12.5	15.3	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY				AUGUST		SEPTEMBER		
1	21.0	20.5	20.5	22.5	20.5	21.5	25.5	25.0	25.5	20.5	19.5	20.0
2	21.5	21.0	21.0	21.0	20.0	20.5	25.0	23.5	24.5	20.5	20.0	21.0
3	21.0	19.5	20.5	21.5	20.5	21.0	23.5	22.5	23.0	21.0	20.0	21.5
4	20.5	19.5	19.5	23.5	21.5	22.0	22.5	22.0	22.5	21.5	20.5	21.0
5	20.5	19.5	20.0	25.5	23.5	24.0	22.5	21.5	22.5	21.5	21.5	21.5
6	22.5	20.5	21.0	26.0	25.0	25.5	22.5	21.5	22.0	22.0	21.5	21.5
7	24.0	22.0	23.0	26.0	24.5	25.0	22.0	21.0	21.5	21.5	20.0	21.0
8	24.5	23.5	24.0	25.0	23.5	24.5	21.5	20.5	21.0	20.0	19.5	20.0
9	24.5	23.5	24.0	25.0	23.0	23.5	20.5	19.5	20.0	20.0	19.0	19.5
10	25.0	23.5	24.0	23.5	22.0	23.0	20.0	19.5	19.5	19.0	18.0	17.5
11	25.0	24.5	24.5	22.0	21.0	21.5	20.0	19.5	19.5	18.0	17.5	17.5
12	25.0	24.5	25.0	22.0	21.0	22.0	20.5	20.0	20.0	17.5	16.5	17.0
13	25.0	24.0	24.5	22.5	21.0	22.0	21.0	20.5	21.0	17.5	17.0	17.0
14	24.0	21.0	22.5	22.5	21.5	22.0	21.0	20.5	21.0	17.5	17.0	17.5
15	21.0	18.0	19.0	23.0	21.5	22.0	20.5	19.5	20.0	17.0	16.0	17.0
16	18.5	17.5	18.0	24.5	22.5	23.0	21.0	20.0	20.5	16.5	16.0	15.5
17	17.5	17.0	17.5	24.5	24.0	24.0	21.0	20.5	20.5	16.0	15.0	15.5
18	18.0	16.5	17.0	24.5	23.5	24.0	21.0	21.0	21.0	15.5	15.0	15.5
19	18.5	17.5	18.0	24.5	23.5	24.0	21.0	20.5	21.0	16.0	15.0	15.5
20	19.0	18.5	18.5	23.5	23.0	23.5	21.0	20.0	20.5	16.5	15.5	15.0
21	20.5	19.0	19.5	23.5	22.5	23.0	21.0	20.0	20.5	16.0	15.5	15.0
22	21.5	20.0	20.5	23.5	22.5	22.5	21.0	20.0	20.5	15.5	14.5	15.0
23	21.5	21.0	21.0	24.5	23.0	23.5	21.0	21.0	21.0	15.5	14.5	14.5
24	22.5	21.5	22.0	24.5	23.5	23.5	21.5	20.5	21.0	15.5	15.0	15.5
25	23.5	22.0	22.5	24.5	24.0	24.0	21.0	20.5	20.5	15.5	14.5	15.0
26	24.0	22.5	23.0	24.5	23.5	24.0	21.0	20.0	20.5	15.5	14.5	15.0
27	24.0	23.5	23.5	23.5	23.0	23.5	21.0	20.5	20.5	16.0	15.5	15.5
28	24.5	23.5	24.0	24.0	22.5	23.5	22.0	21.0	21.5	16.0	15.5	15.0
29	25.0	23.0	24.0	24.5	23.5	24.0	22.5	21.5	22.0	16.0	15.0	15.5
30	23.0	22.0	22.5	25.5	24.0	24.5	21.5	20.5	21.0	15.0	13.0	14.0
31	---	---	---	25.5	25.0	25.5	20.5	19.5	20.0	---	---	---
MONTH	25.0	16.5	21.5	26.0	20.0	23.2	25.5	19.5	21.2	22.0	13.0	17.4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121660 MUSKEGON RIVER NEAR STANWOOD, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	9.4	8.4	8.9	10.4	10.1	10.2	10.4	9.6	10.0	13.2	12.8	13.1
2	9.8	8.7	9.2	10.4	10.0	10.1	9.7	9.1	9.5	13.7	12.7	13.2
3	9.9	9.1	9.5	10.5	9.9	10.2	9.6	9.2	9.4	13.4	12.9	13.1
4	10.1	9.6	9.9	10.8	10.3	10.5	9.5	9.1	9.3	13.4	13.0	13.1
5	10.1	9.6	9.9	11.0	10.6	10.8	9.4	9.0	9.2	13.1	12.4	12.8
6	10.1	9.7	9.9	11.5	10.9	11.2	9.4	8.9	9.1	13.4	12.6	12.8
7	10.1	9.0	9.6	11.6	11.3	11.5	9.3	8.7	8.9	12.8	12.5	12.7
8	10.6	9.0	9.8	12.0	11.5	11.7	9.5	8.6	9.1	12.7	12.3	12.5
9	9.9	9.7	9.8	12.2	11.6	11.8	9.9	9.4	9.7	12.6	11.9	12.3
10	10.4	9.9	10.1	11.8	11.4	11.6	10.6	9.9	10.2	12.5	11.8	12.2
11	10.5	9.9	10.3	11.5	10.8	11.1	11.1	10.3	10.6	12.2	11.5	12.0
12	10.5	10.2	10.4	11.3	11.0	11.2	11.4	10.6	11.0	11.9	11.6	11.7
13	10.7	10.2	10.4	11.8	11.3	11.6	11.5	10.9	11.2	11.8	10.9	11.5
14	10.6	10.0	10.3	12.2	11.5	12.0	11.7	11.1	11.4	11.5	11.2	11.3
15	10.5	10.2	10.3	12.3	11.9	12.1	11.9	11.1	11.6	11.6	11.1	11.2
16	10.8	10.3	10.5	12.1	11.7	11.9	12.1	11.3	11.7	11.1	10.6	10.9
17	10.8	10.6	10.7	12.1	11.8	11.9	12.1	11.3	11.6	11.0	10.6	10.7
18	10.7	10.2	10.4	12.4	11.6	12.0	11.9	11.2	11.6	11.0	10.4	10.6
19	10.2	9.8	10.0	12.4	11.9	12.2	12.1	11.6	11.8	10.8	10.3	10.6
20	10.1	9.8	9.9	12.2	11.3	11.8	12.2	11.6	11.9	11.3	10.5	10.9
21	10.4	9.8	10.2	11.9	11.3	11.5	12.8	11.8	12.3	11.8	10.9	11.3
22	11.1	10.3	10.5	11.9	11.4	11.7	12.7	12.5	12.6	12.1	11.3	11.6
23	11.2	10.5	10.8	12.4	11.7	11.9	13.3	12.6	12.8	12.0	11.6	11.8
24	11.2	10.8	11.0	12.1	11.5	11.7	13.5	12.8	13.1	12.3	11.7	12.1
25	11.3	11.0	11.1	11.5	11.3	11.4	13.6	12.8	13.1	12.5	11.8	12.2
26	11.3	10.7	10.9	11.5	11.0	11.2	13.5	12.8	13.1	12.5	12.2	12.4
27	10.8	10.3	10.7	11.5	10.8	11.1	13.3	12.6	12.9	12.5	11.9	12.3
28	10.9	10.4	10.7	11.5	11.0	11.2	13.2	12.5	12.8	12.0	11.6	11.9
29	10.8	10.3	10.5	11.6	11.1	11.3	13.0	12.5	12.8	12.0	11.6	11.8
30	10.6	10.1	10.3	11.4	10.4	10.9	13.0	12.4	12.8	12.4	12.0	12.3
31	10.5	9.9	10.2	--	--	--	13.1	12.6	12.9	12.7	12.3	12.5
MONTH	11.3	8.4	10.2	12.4	9.9	11.4	13.6	8.6	11.3	13.7	10.3	12.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	12.8	12.6	12.7	12.4	11.6	12.0	11.0	9.8	10.7	9.7	8.8	9.1
2	12.8	12.5	12.6	12.7	11.6	12.3	10.3	9.9	10.1	9.9	8.8	9.2
3	12.5	12.2	12.3	12.8	11.9	12.4	10.1	9.6	10.0	9.5	8.6	9.0
4	12.9	12.4	12.7	12.8	12.0	12.4	10.1	9.2	9.7	10.6	9.0	9.9
5	13.0	12.4	12.7	13.0	12.0	12.4	10.2	9.2	9.6	10.0	9.0	9.4
6	13.1	12.5	13.0	13.0	12.1	12.6	10.5	10.0	10.2	9.4	8.2	8.6
7	13.3	12.5	13.0	12.9	12.3	12.6	10.1	10.0	10.0	8.3	7.6	8.0
8	13.2	12.7	12.9	13.4	12.6	12.9	10.4	10.0	10.2	8.7	7.9	8.4
9	13.4	13.0	13.2	13.5	12.9	13.1	10.1	9.7	9.9	8.0	8.3	8.7
10	13.2	12.9	13.1	13.6	12.3	12.9	10.3	9.6	9.9	10.3	8.7	9.6
11	13.1	12.8	13.0	13.2	12.6	12.8	10.3	10.1	10.2	10.2	9.3	9.7
12	13.0	12.2	12.6	12.9	12.3	12.5	10.8	10.1	10.4	9.8	8.9	9.2
13	13.1	12.4	12.7	12.8	12.1	12.3	11.0	10.7	10.9	9.1	7.8	8.7
14	13.4	13.1	13.3	12.4	11.9	12.2	10.9	10.4	10.7	9.6	7.8	9.0
15	13.3	13.1	13.2	12.7	11.9	12.3	10.6	10.0	10.4	9.7	9.0	9.2
16	13.6	13.3	13.5	12.5	11.5	11.8	10.0	9.8	9.9	9.1	8.9	9.0
17	13.3	13.1	13.2	12.8	11.5	12.3	10.0	9.8	9.9	8.9	8.4	8.7
18	13.2	13.1	13.1	12.4	11.6	12.0	10.3	9.9	10.2	8.8	7.3	8.2
19	13.5	13.1	13.4	11.9	11.5	11.7	10.5	10.2	10.4	7.7	6.8	7.3
20	13.7	13.3	13.6	12.4	11.8	12.1	10.7	10.3	10.5	8.0	7.3	7.7
21	14.1	13.6	13.8	12.1	11.6	12.0	10.8	10.6	10.7	8.6	7.6	8.1
22	14.1	13.7	13.9	12.1	11.6	11.9	10.6	10.2	10.3	9.0	7.9	8.4
23	14.1	13.8	14.0	12.5	11.9	12.2	10.3	10.1	10.2	8.1	6.3	7.3
24	14.2	13.5	13.9	12.5	12.1	12.4	10.9	10.2	10.5	6.7	5.8	6.3
25	14.0	13.3	13.6	12.4	12.0	12.2	10.9	10.4	10.6	7.6	6.1	6.9
26	13.4	12.6	13.0	12.4	11.9	12.2	10.7	10.3	10.5	8.0	6.9	7.5
27	13.2	12.3	12.8	12.6	12.1	12.3	10.3	9.9	10.2	8.6	7.7	8.2
28	12.4	12.0	12.2	12.3	11.9	12.1	9.9	9.6	9.8	9.1	8.0	8.5
29	--	--	--	11.9	11.4	11.7	10.0	9.1	9.5	9.2	7.9	8.5
30	--	--	--	11.5	11.1	11.3	9.8	8.9	9.2	8.7	7.5	8.3
31	--	--	--	11.4	10.9	11.2	--	--	--	8.1	6.1	7.4
MONTH	14.2	12.0	13.1	13.6	10.9	12.2	11.0	8.9	10.2	10.6	5.8	8.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121660 MUSKEGON RIVER NEAR STANWOOD, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	6.9	6.1	6.6	7.7	6.9	7.3	7.1	6.2	6.8	8.2	7.3	7.5
2	7.4	6.0	6.6	8.3	6.9	7.4	7.1	6.2	6.7	8.2	7.8	8.0
3	6.6	5.8	6.3	8.4	7.8	8.1	7.3	5.7	6.7	8.4	8.0	8.2
4	7.5	6.1	6.9	8.4	7.9	8.2	7.8	6.5	7.2	8.7	8.0	8.2
5	8.0	7.1	7.6	8.2	7.1	7.9	8.0	6.7	7.4	8.3	7.8	8.1
6	8.2	7.5	7.8	8.0	6.7	7.6	7.9	6.5	7.4	8.0	7.4	7.8
7	7.9	6.9	7.3	7.8	5.9	6.9	7.8	6.6	7.4	7.5	6.1	6.9
8	7.6	6.7	7.2	7.5	5.9	6.7	7.5	7.0	7.2	7.5	6.4	6.8
9	7.2	5.9	6.8	7.5	6.0	6.6	7.6	6.9	7.2	7.5	6.9	7.2
10	7.1	5.5	6.5	7.1	6.3	6.6	7.9	7.1	7.5	7.2	6.1	6.8
11	6.8	5.9	6.4	7.4	6.3	6.8	8.2	7.5	7.8	7.9	7.2	7.5
12	7.0	5.0	5.9	7.5	6.5	7.2	8.3	7.9	8.1	8.4	7.7	8.0
13	6.6	4.9	5.7	8.1	6.1	7.0	8.3	7.6	7.8	8.5	8.1	8.3
14	7.0	4.9	6.1	8.1	6.0	6.7	7.9	7.0	7.6	8.5	7.9	8.3
15	7.0	6.3	6.7	7.4	6.0	6.7	8.0	7.2	7.6	8.2	7.0	7.8
16	7.2	6.6	6.9	7.3	6.1	6.6	8.4	7.7	8.1	8.5	7.4	8.0
17	7.6	7.1	7.3	7.6	6.2	7.0	8.6	8.0	8.2	8.6	8.0	8.4
18	8.1	7.4	7.7	6.9	6.2	6.6	8.6	7.6	8.2	9.0	8.4	8.8
19	8.2	7.8	8.0	7.2	6.3	6.9	8.0	7.0	7.5	9.3	8.8	9.1
20	8.1	7.7	7.9	6.7	5.7	6.3	7.8	6.6	7.3	9.7	8.9	9.3
21	8.5	7.7	8.0	6.9	6.2	6.6	8.1	7.3	7.7	9.3	8.5	9.1
22	8.1	7.2	7.7	7.1	6.1	6.4	8.2	7.6	8.0	8.9	8.1	8.4
23	8.1	6.9	7.5	7.0	6.3	6.8	8.3	7.4	7.8	9.4	8.6	9.0
24	8.0	6.8	7.5	6.6	6.0	6.3	8.0	6.8	7.5	10.2	9.2	9.7
25	8.4	6.6	7.5	6.5	6.1	6.3	7.5	6.6	7.0	9.9	8.7	9.4
26	8.1	6.6	7.3	6.6	5.5	6.1	7.2	6.2	6.8	9.5	8.6	9.0
27	7.7	6.3	7.0	7.0	5.8	6.3	7.9	6.8	7.3	10.2	9.2	9.8
28	7.6	5.9	6.8	7.3	6.1	6.8	8.2	7.5	7.8	9.9	8.6	9.1
29	7.8	6.0	7.0	7.4	6.1	6.9	8.2	7.6	7.9	9.0	8.5	8.8
30	7.2	6.1	6.8	8.1	6.5	7.2	7.7	6.5	7.2	8.7	7.8	8.4
31	--	--	--	8.1	6.6	7.1	7.5	5.9	6.9	--	--	--
MONTH	8.5	4.9	7.0	8.4	5.5	6.9	8.6	5.7	7.5	10.2	6.1	8.3

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121680 MUSKEGON RIVER NEAR OXBOW, MI

LOCATION.--Lat 43°29'09", long 85°37'50", in SW1/4 SE1/4 sec.28, T.13 N., R.11 W., Newaygo County, Hydrologic Unit 04060102. on right bank downstream from Hardy Dam, 0.6 mi northwest of Oxbow.

DRAINAGE AREA.--1,931 mi².

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1995 to current year.

DISSOLVED OXYGEN: October 1995 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 22.0°C, on several days during summer periods, 1996, 1999; minimum, 0.5°C, on many days during winter periods, 1996, 1997.

DISSOLVED OXYGEN: Maximum, 14.6 mg/L, Feb. 22-24, 1999; minimum, 0.5 mg/L, Sept. 4, 5, 1998.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 22.0°C, on several days during summer period; minimum, 1.0°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 14.6 mg/L, Feb. 22-24; minimum, 0.6 mg/L, Aug. 26.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER			DECEMBER			JANUARY		
1	19.0	16.5	18.0	13.5	12.5	13.0	7.5	7.0	7.0	3.5	2.5	3.0
2	19.0	16.5	18.0	13.0	12.0	13.0	7.0	7.0	7.0	3.0	1.5	2.0
3	19.0	16.5	18.0	13.0	12.0	12.5	7.5	7.0	7.5	2.0	1.5	1.5
4	19.0	16.5	18.0	12.5	12.0	12.5	7.5	7.5	7.5	2.0	1.5	1.5
5	18.5	16.5	18.0	12.5	12.0	12.0	7.5	7.5	7.5	2.0	1.5	1.5
6	18.5	17.0	18.0	12.0	11.5	12.0	7.5	7.5	7.5	2.0	1.5	1.5
7	18.5	17.5	18.5	12.0	11.5	12.0	7.5	7.5	7.5	2.0	1.0	1.5
8	18.5	18.0	18.0	12.0	11.5	12.0	7.5	7.5	7.5	2.0	1.0	1.5
9	18.0	18.0	18.0	12.0	11.5	12.0	7.5	7.0	7.5	2.0	1.0	1.5
10	18.0	17.0	17.5	11.5	11.5	11.5	7.5	7.0	7.0	2.0	1.0	1.5
11	17.5	16.5	17.0	11.5	11.0	11.0	7.0	7.0	7.0	2.0	1.0	1.5
12	17.0	16.0	16.5	11.0	10.5	11.0	7.0	7.0	7.0	2.0	1.0	1.5
13	16.5	15.5	16.0	10.5	10.5	10.5	7.0	7.0	7.0	2.0	1.0	1.5
14	16.0	15.0	15.5	10.5	10.0	10.5	7.0	6.5	7.0	2.0	1.0	1.5
15	16.0	15.0	15.5	10.5	10.0	10.0	6.5	6.5	6.5	2.0	1.0	1.5
16	16.0	15.0	15.5	10.0	9.5	10.0	6.5	6.5	6.5	2.5	1.0	1.5
17	15.5	15.0	15.5	9.5	9.5	9.5	6.5	6.5	6.5	2.5	1.0	1.5
18	15.5	15.0	15.5	9.5	9.0	9.0	6.5	6.0	6.0	2.5	1.0	1.5
19	15.5	14.5	15.0	9.0	8.5	8.5	6.5	6.0	6.0	2.0	1.0	1.5
20	15.0	14.0	15.0	8.5	8.5	8.5	6.0	6.0	6.0	2.5	1.5	1.5
21	15.0	14.0	14.5	8.5	8.0	8.5	6.0	5.5	6.0	2.5	1.5	1.5
22	14.5	14.0	14.5	8.0	8.0	8.0	5.5	5.0	5.5	2.5	1.5	1.5
23	14.5	14.0	14.5	8.0	8.0	8.0	5.5	5.0	5.0	2.5	1.5	1.5
24	14.5	14.0	14.5	8.0	8.0	8.0	5.0	4.5	5.0	2.5	1.5	1.5
25	14.5	14.0	14.0	8.0	8.0	8.0	5.0	4.5	4.5	2.5	1.5	1.5
26	14.5	14.0	14.0	8.0	8.0	8.0	4.5	4.0	4.5	2.0	1.0	1.5
27	14.0	14.0	14.0	8.0	7.5	8.0	4.5	4.0	4.0	2.5	1.0	1.5
28	14.0	13.5	14.0	8.0	7.5	8.0	4.0	4.0	4.0	2.0	1.0	1.5
29	14.0	13.5	14.0	8.0	7.5	7.5	4.0	3.5	3.5	1.5	1.0	1.0
30	13.5	13.0	13.5	7.5	7.0	7.5	3.5	3.0	3.0	1.5	1.0	1.0
31	13.5	13.0	13.5	---	---	---	3.5	3.0	3.0	1.5	1.0	1.0
MONTH	19.0	13.0	15.9	13.5	7.0	10.0	7.5	3.0	6.0	3.5	1.0	1.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121680 MUSKEGON RIVER NEAR OXBOW, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH			APRIL			MAY		
1	1.5	1.0	1.0	2.5	1.5	1.5	3.5	3.5	3.5	10.0	7.5	9.0
2	2.0	1.0	1.0	2.5	1.5	1.5	3.5	3.5	3.5	10.5	8.0	9.0
3	2.0	1.0	1.5	2.5	1.5	2.0	4.0	3.5	4.0	10.5	8.0	9.0
4	2.0	1.0	1.0	2.5	1.5	2.0	5.5	3.5	4.5	10.5	8.0	9.0
5	2.0	1.0	1.0	2.5	1.5	2.0	5.5	4.5	5.0	11.0	8.0	9.5
6	2.0	1.0	1.5	2.5	1.5	2.0	5.5	4.5	5.0	11.0	8.5	9.5
7	2.0	1.0	1.5	2.0	1.5	1.5	5.5	5.0	5.0	9.0	8.0	8.5
8	2.0	1.0	1.5	2.5	1.5	1.5	6.5	5.0	5.5	9.5	8.5	9.0
9	2.0	1.0	1.5	2.5	1.5	1.5	7.5	5.5	7.0	11.0	8.5	10.0
10	2.0	1.0	1.5	2.5	1.5	2.0	7.0	5.5	6.5	11.5	9.0	10.0
11	2.0	1.0	1.5	2.5	1.5	2.0	7.0	6.0	6.5	12.0	8.5	10.5
12	2.0	1.0	1.5	2.5	1.5	2.0	7.0	6.0	6.5	12.0	9.0	11.0
13	2.0	1.0	1.5	2.5	1.5	2.0	7.0	6.0	6.5	12.0	9.0	11.5
14	1.5	1.0	1.0	2.5	1.5	2.0	7.5	6.0	7.0	12.0	9.0	11.0
15	1.5	1.0	1.0	2.5	1.5	2.0	8.0	6.5	7.5	12.0	9.5	11.0
16	1.5	1.0	1.0	2.5	1.5	2.0	8.5	7.0	7.5	12.0	9.5	10.5
17	1.5	1.0	1.5	2.5	1.5	2.0	8.0	6.5	7.5	11.5	9.0	10.5
18	1.5	1.0	1.0	2.5	1.5	2.0	8.0	7.0	7.5	12.0	9.0	11.0
19	1.5	1.0	1.0	2.5	1.5	2.0	7.5	6.5	7.5	12.5	9.0	11.5
20	2.0	1.0	1.5	2.5	2.0	2.0	7.5	6.5	7.5	12.5	9.5	11.5
21	1.5	1.5	1.5	2.5	2.0	2.0	8.0	6.5	7.5	12.5	9.5	11.0
22	2.0	1.5	1.5	2.5	2.0	2.0	8.5	7.0	8.0	13.5	9.5	11.5
23	2.0	1.5	1.5	2.5	2.0	2.0	8.5	7.0	8.0	13.5	9.0	11.5
24	2.0	1.5	1.5	2.5	2.0	2.0	8.5	7.0	8.0	13.0	10.0	11.5
25	2.0	1.5	1.5	2.5	2.0	2.5	8.0	7.0	8.0	12.0	9.5	11.0
26	2.0	1.5	1.5	2.5	2.5	2.5	8.5	7.0	8.0	13.0	9.5	11.5
27	2.0	1.5	1.5	2.5	2.5	2.5	9.0	7.0	8.5	13.0	9.5	11.5
28	2.0	1.5	1.5	3.0	2.5	2.5	9.5	7.0	8.5	13.0	9.5	11.5
29	---	---	---	3.0	2.5	3.0	9.5	7.5	8.5	13.5	9.5	11.5
30	---	---	---	3.0	3.0	3.0	9.5	8.0	8.5	13.5	9.5	11.5
31	---	---	---	3.5	3.0	3.0	---	---	---	13.0	9.5	12.0
MONTH	2.0	1.0	1.3	3.5	1.5	2.1	9.5	3.5	6.8	13.5	7.5	10.6

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY			AUGUST			SEPTEMBER		
1	13.5	10.0	12.5	18.5	11.5	16.0	22.0	15.0	19.5	21.5	18.0	20.0
2	14.0	10.0	12.5	18.0	11.5	15.5	22.0	15.0	19.5	21.5	18.5	20.5
3	15.0	10.0	13.0	18.0	11.5	15.5	21.5	15.0	19.0	22.0	18.5	20.5
4	14.5	9.5	12.5	18.0	11.5	15.5	22.0	15.0	19.5	22.0	18.5	20.5
5	14.5	10.0	12.5	18.0	11.5	16.0	22.0	15.0	19.5	22.0	18.5	20.5
6	14.0	10.0	12.0	19.0	11.5	16.0	22.0	15.5	19.5	22.0	19.0	20.5
7	14.5	10.0	12.0	19.0	12.0	17.0	21.5	15.5	19.5	22.0	18.5	20.5
8	16.0	9.5	13.0	19.5	12.0	17.0	21.5	15.5	19.5	21.5	19.0	20.5
9	16.0	10.0	13.0	19.5	12.5	17.5	21.5	15.5	19.5	21.5	19.0	20.5
10	16.0	10.0	13.5	20.0	12.0	17.5	21.5	16.0	19.0	21.0	19.0	20.0
11	16.5	10.0	13.5	19.5	12.5	17.0	21.5	16.0	19.5	21.0	19.0	20.0
12	16.0	10.0	13.5	19.5	12.5	17.0	21.5	16.0	19.5	21.0	19.0	20.0
13	16.5	10.0	14.0	19.5	12.5	17.5	21.5	16.0	20.0	21.0	19.0	20.0
14	17.0	11.0	16.0	19.5	12.5	17.0	21.5	16.5	20.0	20.5	19.5	20.0
15	17.0	16.5	16.5	19.5	12.5	16.5	21.5	16.5	19.5	20.5	19.0	20.0
16	17.0	16.5	16.5	19.5	13.0	17.0	21.0	16.5	19.5	20.5	19.0	20.0
17	17.5	15.0	17.0	20.0	12.5	17.5	21.5	16.5	19.5	20.5	19.0	20.0
18	16.5	11.0	15.5	20.5	12.5	18.0	21.5	16.5	19.5	20.5	19.5	20.0
19	16.5	11.0	15.5	20.5	13.0	18.0	21.5	17.0	20.0	20.5	19.5	20.0
20	17.0	11.0	15.5	20.5	13.0	18.0	22.0	17.0	20.0	20.0	19.0	20.0
21	17.0	11.0	15.5	20.5	13.5	18.5	21.5	17.0	19.5	20.0	19.0	19.5
22	17.0	11.0	15.0	20.5	13.5	18.5	21.5	17.0	19.5	19.5	18.5	19.0
23	17.0	11.0	15.5	21.0	14.0	19.5	21.0	17.0	20.0	19.5	18.5	19.0
24	17.5	12.5	16.5	21.0	15.0	20.0	21.5	17.5	20.0	19.5	18.0	19.0
25	18.0	11.0	15.5	21.5	20.5	21.0	21.5	18.0	20.5	19.0	18.0	18.5
26	17.5	11.0	15.5	21.5	16.0	20.5	21.5	17.5	20.0	19.0	18.0	18.5
27	18.0	11.0	15.5	21.5	14.5	19.0	21.5	18.0	20.0	19.0	18.0	18.5
28	18.0	11.0	16.0	21.0	14.5	19.0	21.5	18.0	20.0	19.0	18.0	18.5
29	18.5	11.0	16.0	21.5	14.0	19.0	22.0	18.0	20.0	18.5	17.5	18.5
30	18.0	11.0	15.5	22.0	14.5	19.5	21.5	18.0	20.5	18.0	17.5	18.0
31	---	---	---	21.5	15.0	19.5	21.5	18.0	20.0	---	---	---
MONTH	18.5	9.5	14.6	22.0	11.5	17.8	22.0	15.0	19.7	22.0	17.5	19.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121680 MUSKEGON RIVER NEAR OXBOW, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	3.7	1.4	2.7	8.7	7.9	8.5	10.1	7.2	9.1	12.2	9.2	11.4			
2	4.0	1.5	2.9	8.9	7.9	8.6	9.7	7.0	8.9	12.5	9.3	11.3			
3	4.4	1.6	3.2	9.1	8.0	8.8	9.9	6.8	8.7	12.8	9.6	11.7			
4	5.3	1.7	3.7	9.1	8.1	8.6	9.8	6.8	8.9	12.7	9.7	11.4			
5	5.8	1.8	4.1	8.7	7.3	8.3	9.9	7.0	9.1	12.8	9.5	11.5			
6	6.1	1.9	4.9	8.7	7.2	8.3	9.8	7.1	9.1	12.0	9.9	11.3			
7	6.2	2.9	5.5	9.0	7.3	8.5	10.1	7.1	9.5	11.6	11.0	11.4			
8	6.4	5.9	6.2	8.9	7.3	8.4	10.0	7.4	9.4	11.7	11.0	11.5			
9	6.5	6.0	6.4	8.9	7.4	8.6	10.1	7.3	9.5	11.8	11.2	11.6			
10	6.2	4.9	5.8	9.1	8.5	8.7	10.0	7.3	9.3	11.7	11.3	11.6			
11	6.4	5.1	5.9	9.3	8.8	9.1	10.1	7.9	9.9	11.8	11.4	11.6			
12	6.5	6.1	6.3	9.6	9.2	9.3	10.3	7.9	9.7	11.9	11.1	11.6			
13	6.8	6.3	6.6	9.6	9.2	9.5	10.2	7.8	9.7	11.9	11.1	11.7			
14	7.1	6.5	6.8	9.7	9.3	9.5	10.4	7.8	9.8	11.9	11.0	11.6			
15	7.2	6.6	7.0	9.9	9.4	9.7	10.3	8.8	9.8	11.9	11.1	11.7			
16	7.3	6.7	7.0	10.0	9.6	9.8	10.5	8.1	9.8	11.9	11.0	11.6			
17	7.2	6.6	7.0	10.1	9.7	10.0	10.5	8.4	9.8	12.0	11.0	11.7			
18	7.1	6.6	6.8	10.2	9.9	10.0	10.7	8.2	10.1	12.1	11.0	11.7			
19	7.2	6.4	6.9	10.5	7.2	10.0	10.8	8.3	9.9	12.1	10.8	11.8			
20	7.4	6.3	7.0	9.8	6.8	8.7	10.9	8.0	10.1	12.1	8.8	11.1			
21	7.9	6.1	7.1	9.9	6.5	8.6	10.9	9.3	10.2	12.3	8.8	11.3			
22	7.7	6.4	7.3	9.8	6.8	8.6	11.1	9.0	10.4	12.4	10.9	12.0			
23	7.8	6.8	7.5	9.8	7.2	8.9	11.1	9.6	10.5	12.4	10.7	11.9			
24	7.9	6.7	7.5	11.1	7.1	9.7	11.3	8.6	10.6	12.5	10.8	12.1			
25	7.9	6.6	7.5	9.9	7.1	9.2	11.4	9.2	10.6	12.5	10.6	12.2			
26	7.9	6.8	7.5	10.1	7.1	9.0	11.5	8.8	10.7	12.6	11.5	12.4			
27	7.9	7.1	7.7	9.9	7.0	8.7	11.6	9.1	10.7	12.6	11.2	12.4			
28	8.5	7.5	8.1	10.1	7.0	8.8	11.7	8.9	11.0	12.8	11.6	12.6			
29	8.5	8.1	8.4	9.8	7.0	8.7	12.0	9.1	11.1	12.8	12.6	12.7			
30	8.6	8.0	8.4	9.8	7.2	8.8	12.0	9.3	11.1	12.7	12.5	12.6			
31	8.7	7.9	8.4	—	—	—	12.0	9.4	11.3	12.7	12.5	12.6			
MONTH	8.7	1.4	6.4	11.1	6.5	9.0	12.0	6.8	9.9	12.8	8.8	11.8			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	12.9	12.6	12.7	13.5	10.0	12.7	12.0	8.8	10.7	10.8	6.4	8.8	
2	12.8	12.0	12.7	13.3	9.8	12.6	11.6	8.6	10.4	10.7	6.4	8.4	
3	12.8	11.5	12.6	13.4	10.4	12.7	12.0	8.8	10.7	10.4	6.5	8.5	
4	12.7	11.5	12.5	13.3	10.2	12.5	12.2	8.8	11.0	10.8	6.8	8.7	
5	12.8	11.6	12.6	13.3	9.7	12.4	12.6	8.5	11.1	10.5	6.7	8.8	
6	12.9	11.7	12.6	13.3	10.3	12.6	12.3	8.8	10.9	10.0	6.4	8.3	
7	13.0	11.5	12.7	13.1	10.5	12.2	11.8	8.8	10.8	9.5	6.4	8.1	
8	13.2	11.6	12.9	13.2	9.7	12.3	11.4	8.4	10.7	9.9	6.0	7.9	
9	13.4	11.6	13.0	13.0	9.6	12.1	11.1	7.9	10.4	9.8	5.9	7.5	
10	13.5	11.7	13.1	13.0	9.5	12.1	11.4	7.9	10.5	9.8	6.0	7.7	
11	13.6	11.8	13.2	12.9	9.2	11.9	11.1	7.9	10.2	9.8	5.9	7.8	
12	13.7	12.0	13.3	13.0	9.6	12.2	11.4	7.7	10.2	9.3	5.9	8.0	
13	13.8	11.8	13.4	12.9	9.6	12.0	11.5	7.7	10.4	9.7	5.8	8.1	
14	13.8	12.8	13.7	12.9	9.4	11.9	11.6	8.1	10.5	9.4	6.1	8.1	
15	13.9	13.1	13.7	12.9	9.1	11.7	11.7	7.8	10.6	9.5	5.9	7.8	
16	14.0	13.7	13.9	12.8	8.8	11.3	11.5	8.4	10.5	9.4	5.8	7.6	
17	14.0	13.8	13.9	11.2	8.2	9.9	11.7	8.1	10.7	9.1	5.8	7.8	
18	14.1	13.8	13.9	11.4	7.6	10.1	11.5	8.0	11.1	8.8	5.7	7.5	
19	14.3	13.9	14.1	11.4	4.2	9.4	11.3	8.0	10.2	9.0	5.7	8.0	
20	14.4	12.9	14.1	11.6	5.9	10.0	11.3	7.8	10.2	8.6	5.4	7.7	
21	14.5	14.1	14.3	11.5	6.3	10.0	11.3	7.8	9.9	8.6	5.1	7.2	
22	14.6	12.4	14.2	11.4	6.6	10.1	11.6	7.8	10.3	8.6	5.1	6.9	
23	14.6	12.2	14.0	11.5	7.5	10.3	11.4	8.1	10.2	8.4	5.1	6.8	
24	14.6	12.0	13.6	11.2	7.3	10.0	11.5	8.0	10.3	8.3	5.1	7.0	
25	13.8	10.9	13.0	11.4	7.8	10.2	11.5	7.8	10.1	8.2	4.5	6.8	
26	13.7	10.6	12.9	11.7	7.4	10.3	11.6	8.0	10.1	8.4	4.9	6.8	
27	13.6	10.8	12.9	11.5	8.5	10.6	12.0	8.2	10.1	8.5	4.9	6.9	
28	13.5	10.7	12.8	11.8	8.5	10.4	11.1	6.9	9.7	8.3	4.8	6.8	
29	--	--	--	11.8	8.7	10.7	11.0	6.7	9.2	8.5	4.6	6.7	
30	--	--	--	11.6	7.7	10.1	10.6	6.6	8.9	8.5	4.6	6.6	
31	--	--	--	11.8	8.3	10.3	--	--	--	8.3	4.5	6.9	
MONTH	14.6	10.6	13.3	13.5	4.2	11.2	12.6	6.6	10.4	10.8	4.5	7.6	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121680 MUSKEGON RIVER NEAR OXBOW, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.2	4.5	6.7	5.0	1.2	3.6	4.7	1.4	3.3	4.1	.9	2.6
2	8.3	4.6	6.8	4.9	.9	3.0	4.5	1.5	3.2	4.5	1.0	2.9
3	8.3	4.9	6.8	4.9	.9	2.9	3.9	1.4	2.8	4.2	1.0	2.8
4	8.3	4.4	6.4	4.2	.9	2.8	4.1	1.4	2.9	3.9	1.1	2.7
5	8.2	4.4	6.3	4.6	1.0	2.9	4.4	1.4	3.2	4.0	1.2	2.7
6	8.1	4.2	6.2	7.1	1.0	4.0	4.2	1.4	3.2	4.6	1.2	3.0
7	7.9	4.0	6.0	4.9	3.8	4.3	4.1	1.4	2.9	4.0	1.3	2.7
8	8.3	3.8	6.3	5.1	1.8	4.0	4.5	1.3	3.3	3.8	1.3	2.6
9	8.2	4.2	6.6	5.5	1.7	3.9	4.2	1.4	3.2	3.7	1.4	2.6
10	7.3	3.6	6.1	5.4	1.6	4.2	3.8	1.4	2.8	3.4	1.5	2.3
11	7.1	3.2	5.7	5.2	1.8	4.0	3.9	1.4	2.9	3.7	1.5	2.5
12	7.0	3.7	5.8	5.1	1.6	4.0	3.9	1.3	2.8	3.7	1.6	2.7
13	6.9	3.5	5.4	5.1	1.6	3.9	3.8	1.3	2.9	4.0	1.7	2.8
14	6.8	3.6	6.4	4.9	1.7	3.7	4.2	1.5	3.3	4.3	1.8	3.1
15	6.5	5.9	6.2	4.4	1.6	3.2	4.1	1.5	3.2	4.7	1.5	3.1
16	6.3	5.7	6.1	4.4	1.7	3.5	3.9	1.5	2.8	5.0	1.1	3.2
17	6.3	3.9	5.9	4.9	1.6	3.9	3.8	1.6	2.9	5.0	1.5	3.5
18	6.1	3.0	5.0	5.1	1.7	4.0	4.2	1.0	3.1	4.6	1.3	3.1
19	6.0	2.5	5.1	4.9	1.6	3.7	4.3	.9	3.1	4.9	1.5	3.8
20	5.9	2.5	4.8	5.0	1.8	3.9	4.3	1.0	2.9	4.8	2.8	4.1
21	5.9	2.5	4.6	4.6	1.7	3.7	4.0	.9	2.6	5.6	2.4	4.5
22	5.5	2.0	4.3	4.6	1.6	3.7	3.9	.8	2.4	5.1	3.2	4.3
23	5.4	1.9	4.4	4.8	2.0	4.1	3.0	.8	2.0	5.0	3.3	4.3
24	5.4	2.6	4.4	4.6	2.3	4.1	3.6	.7	2.7	5.8	3.2	4.9
25	5.5	1.8	3.9	4.6	4.0	4.2	4.2	.9	2.9	5.7	3.8	4.9
26	5.3	1.1	3.7	4.5	2.2	4.1	3.6	.6	2.5	5.5	4.1	4.8
27	5.4	1.1	3.9	4.3	1.7	3.4	3.6	.7	2.3	5.5	4.1	4.9
28	5.4	1.1	3.7	4.1	1.2	3.0	3.7	.7	2.3	6.1	4.1	5.5
29	5.2	.8	3.5	3.5	1.2	2.6	4.3	.7	2.5	6.3	4.9	5.9
30	5.1	.9	3.6	3.9	1.3	3.0	4.2	.8	2.7	6.3	5.2	5.9
31	---	---	---	3.9	1.4	3.0	3.7	.9	2.3	---	---	---
MONTH	8.3	.8	5.4	7.1	.9	3.6	4.7	.6	2.8	6.3	.9	3.6

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI

LOCATION.--Lat 43°25'51", long 85°35'44", in NE1/4 SW1/4 sec.14, T.13 N., R.11 W., Newaygo County, Hydrologic Unit 0406010², on left bank 1.6 mi downstream from Tamarack Creek, 3.2 mi east of Croton.

DRAINAGE AREA.--345 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1995 to current year.

REVISED RECORDS.--WDR MI-98-1: 1996-97.

GAGE.--Water-stage recorder. Elevation of gage is 750 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	163	193	244	e210	293	299	230	286	386	293	220	167
2	166	188	247	e210	288	295	230	272	481	312	209	165
3	164	186	231	e210	319	268	237	261	475	298	198	160
4	161	186	220	e220	342	251	314	248	378	318	214	159
5	e165	183	224	e220	328	252	442	233	309	291	224	156
6	e250	180	240	e230	311	243	437	238	276	252	224	157
7	e320	183	309	e240	298	244	393	245	256	235	218	154
8	290	183	340	e240	285	e240	339	249	242	230	234	151
9	238	184	297	e240	280	e240	344	250	230	280	226	152
10	207	240	261	e240	303	e250	370	242	226	310	218	152
11	198	387	245	e240	325	e250	373	226	231	276	214	152
12	192	355	236	e240	509	255	446	245	239	242	209	150
13	183	292	230	e240	529	250	442	315	247	220	224	155
14	183	250	221	e250	431	247	390	282	685	207	237	156
15	183	229	217	e260	394	246	339	249	753	200	223	154
16	181	218	215	e260	346	254	312	237	507	194	211	152
17	185	218	213	e270	336	292	301	348	366	237	204	151
18	228	214	209	e280	325	378	289	570	308	316	198	150
19	245	212	207	e290	303	379	277	605	275	317	199	150
20	230	208	205	e290	285	336	268	485	257	327	194	153
21	214	205	204	e290	261	316	262	392	239	279	187	155
22	203	202	202	e300	e250	304	293	332	230	265	184	154
23	198	201	e180	e320	249	286	568	313	224	e300	181	153
24	193	200	e180	e340	250	272	738	390	252	e540	183	155
25	187	199	e180	e400	240	264	605	374	265	e450	188	158
26	187	202	e180	e400	234	256	504	337	242	e410	192	159
27	186	200	e180	392	237	250	417	299	351	330	193	158
28	192	196	e190	372	259	244	364	272	467	276	189	183
29	193	192	e190	361	---	240	328	245	420	249	181	279
30	194	208	e190	329	---	236	302	235	332	235	179	322
31	196	---	e200	311	---	231	---	243	---	224	172	---
TOTAL	6275	6494	6887	8695	8810	8368	11154	9518	10149	8913	6327	4972
MEAN	202	216	222	280	315	270	372	307	338	288	204	166
MAX	320	387	340	400	529	379	738	605	753	540	237	322
MIN	161	180	180	210	234	231	230	226	224	194	172	150
CFSM	.59	.63	.64	.81	.91	.78	1.08	.89	.98	.83	.59	.48
IN.	.68	.70	.74	.94	.95	.90	1.20	1.03	1.09	.96	.68	.54

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1996 - 1999, BY WATER YEAR (WY)

	1996	1997	1998	1999	1996	1997	1998	1999	1996	1997	1998	1999
MEAN	226	285	276	339	392	447	422	349	301	213	201	186
MAX	275	393	371	443	491	628	441	425	411	288	272	220
(WY)	1997	1996	1997	1997	1997	1997	1996	1996	1996	1999	1996	1996
MIN	190	216	204	280	315	270	372	256	183	131	133	152
(WY)	1998	1999	1998	1999	1999	1999	1999	1998	1998	1998	1998	1998

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1996 - 1999

ANNUAL TOTAL	92782		96562									
ANNUAL MEAN	254		265							302		
HIGHEST ANNUAL MEAN										352		1997
LOWEST ANNUAL MEAN										252		1998
HIGHEST DAILY MEAN	955		Apr 2		753		Jun 15		1080		Feb 23 1997	
LOWEST DAILY MEAN	113		Aug 1		150		Sep 12		113		Aug 1 1998	
ANNUAL SEVEN-DAY MINIMUM	116		Jul 28		152		Sep 15		116		Jul 28 1998	
INSTANTANEOUS PEAK FLOW					869		Jun 15		1160		Feb 23 1997	
INSTANTANEOUS PEAK STAGE					5.41		Jun 15		6.28		Feb 23 1997	
INSTANTANEOUS LOW FLOW					147		(a)		105		Jul 19 1998	
ANNUAL RUNOFF (CFSM)	.74				.77				.88			
ANNUAL RUNOFF (INCHES)	10.00				10.41				11.91			
10 PERCENT EXCEEDS	413				378				489			
50 PERCENT EXCEEDS	209				242				262			
90 PERCENT EXCEEDS	130				180				169			

(a) Sept. 12, 19.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1995 to current year.

DISSOLVED OXYGEN: October 1995 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 25.0°C, June 26, 1998, July 6, 1999; minimum, -0.5°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum recorded (more than 20 percent missing record), 16.5 mg/L, Dec. 7, 1995; minimum, 6.1 mg/L, June 22, 1997.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 25.0°C, July 6; minimum, -0.5°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum 16.1 mg/L, Feb. 21, 22; minimum, 6.5 mg/L, June 27.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER				DECEMBER			JANUARY	
1	14.0	12.0	13.0	11.0	10.0	10.5	9.0	7.5	8.0	-5	-5	-5
2	12.0	10.5	11.5	10.0	7.5	9.0	8.0	7.0	7.5	-5	-5	-5
3	12.0	11.0	11.5	7.5	6.0	6.5	9.0	8.0	8.5	-5	-5	-5
4	11.5	10.0	11.0	6.0	5.0	5.5	9.0	8.5	8.5	-5	-5	-5
5	---	---	---	5.5	5.0	5.5	9.5	9.0	9.0	-5	-5	-5
6	---	---	---	5.5	4.5	5.0	10.0	9.0	9.5	-5	-5	-5
7	---	---	---	6.0	5.0	5.5	9.0	6.5	8.0	-5	-5	-5
8	13.0	12.0	12.5	6.5	6.0	6.0	6.5	4.5	5.5	-5	-5	-5
9	12.0	10.5	11.5	6.5	6.0	6.5	4.5	3.5	4.0	-5	-5	-5
10	11.0	9.5	10.5	7.5	6.5	7.0	3.5	3.0	3.0	-5	-5	-5
11	12.0	10.5	11.0	7.0	5.5	6.0	3.0	2.0	2.5	-5	-5	-5
12	12.5	10.5	11.5	5.5	4.5	5.0	3.0	2.0	2.5	-5	-5	-5
13	12.0	10.5	11.0	4.5	3.0	3.5	2.5	2.0	2.0	-5	-5	-5
14	10.5	9.5	10.0	5.5	3.5	4.5	2.0	1.0	1.5	-5	-5	-5
15	10.5	9.0	10.0	6.0	5.0	5.5	3.0	2.0	2.5	-5	-5	-5
16	11.5	9.5	10.5	5.5	5.0	5.0	3.0	2.5	2.5	-5	-5	-5
17	13.5	11.5	12.5	6.0	5.5	5.5	2.5	1.5	2.0	-5	-5	-5
18	13.5	12.5	13.0	6.0	5.0	5.5	2.5	1.5	1.5	-5	-5	-5
19	12.5	11.0	11.5	6.5	5.5	6.0	3.0	2.5	3.0	-5	-5	-5
20	11.0	9.5	10.5	5.5	4.5	5.0	2.5	1.5	2.0	-5	-5	-5
21	9.5	8.5	9.0	4.5	4.0	4.0	2.0	1.5	2.0	-5	-5	-5
22	8.5	7.5	8.0	5.0	3.5	4.0	1.5	-5	.0	-5	-5	-5
23	9.0	7.0	8.0	6.0	5.0	5.5	-5	-5	-5	.5	-5	.0
24	10.0	8.5	9.0	5.5	4.5	5.0	-5	-5	-5	.5	.0	.0
25	10.5	9.0	10.0	5.0	4.0	4.5	-5	-5	-5	.5	.0	.0
26	11.0	10.0	10.5	4.5	4.0	4.5	-5	-5	-5	.5	.0	.0
27	10.5	9.5	10.0	4.0	3.0	3.5	-5	-5	-5	1.0	.0	.5
28	12.0	10.5	11.5	5.0	3.0	4.0	-5	-5	-5	1.5	1.0	1.5
29	11.0	9.0	10.0	8.5	5.0	7.0	-5	-5	-5	1.5	1.0	1.5
30	11.0	10.0	10.5	10.0	8.5	9.5	-5	-5	-5	1.5	.0	.5
31	11.0	10.5	11.0	---	---	---	-5	-5	-5	1.0	.5	1.0
MONTH	---	---	---	11.0	3.0	5.7	10.0	-5	2.9	1.5	-5	-2

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	2.0	.5	1.0	3.0	2.5	2.5	11.5	11.0	11.5	15.0	12.5	14.0	
2	2.5	2.0	2.0	2.5	1.5	2.0	13.0	11.0	12.0	16.0	13.0	14.5	
3	2.5	1.5	2.0	2.5	2.0	2.5	15.0	12.5	14.0	16.5	14.0	15.5	
4	2.5	1.0	2.0	2.5	1.5	2.0	14.5	10.0	12.5	17.5	14.5	16.0	
5	1.0	.5	.5	2.5	.0	1.5	10.5	9.0	10.0	16.5	15.5	16.0	
6	2.0	1.0	1.5	1.5	.0	.5	10.0	8.5	9.0	16.0	14.5	15.5	
7	2.0	1.5	1.5	.0	-.5	.0	10.0	7.0	8.5	14.5	13.5	14.0	
8	2.5	1.5	1.5	-.5	-.5	-.5	12.0	9.0	10.5	14.0	12.5	13.0	
9	3.5	2.5	3.0	-.5	-.5	-.5	11.5	9.0	10.0	15.5	11.5	13.5	
10	3.5	2.0	2.5	1.0	-.5	.0	9.5	7.5	8.5	16.0	12.5	14.5	
11	5.5	3.5	4.0	1.5	-.5	.5	9.5	7.0	8.0	16.0	13.5	15.0	
12	5.5	2.0	3.5	2.0	.0	1.0	8.5	5.5	7.0	15.0	12.0	13.5	
13	2.0	.5	1.0	2.0	.5	1.5	10.0	6.5	8.5	14.5	11.5	13.0	
14	1.0	-.5	.0	3.0	1.0	2.0	11.0	8.0	10.0	15.0	12.0	13.5	
15	2.0	.5	1.0	3.5	1.5	2.5	11.0	9.5	10.0	15.5	14.5	15.0	
16	2.5	1.5	2.0	5.0	3.0	4.0	10.0	8.0	9.0	17.5	15.0	16.0	
17	3.0	2.0	2.5	6.0	4.0	5.0	8.0	7.5	8.0	19.0	17.0	18.0	
18	2.0	1.5	2.0	6.0	3.5	4.5	8.5	7.5	8.0	18.5	16.5	17.5	
19	2.0	1.0	1.5	5.0	2.5	3.5	8.0	7.0	7.5	17.0	15.0	16.0	
20	1.5	.5	1.0	5.5	3.0	4.5	9.5	7.0	8.5	17.0	14.5	16.0	
21	1.0	-.5	.0	5.5	4.0	5.0	10.5	9.0	9.5	17.5	16.0	17.0	
22	.0	-.5	-.5	4.5	3.5	4.0	10.5	8.5	9.5	18.5	16.5	17.5	
23	.0	-.5	.0	5.5	3.0	4.0	8.5	7.5	8.0	17.5	15.0	16.0	
24	.5	-.5	.0	6.0	4.5	5.0	9.5	6.5	8.0	15.0	12.0	13.5	
25	2.5	.5	1.5	6.0	4.5	5.0	11.5	8.5	10.0	12.0	11.0	11.5	
26	2.5	1.0	2.0	6.0	3.5	5.0	13.0	9.5	11.5	14.0	10.5	12.0	
27	3.5	2.0	3.0	7.0	4.5	6.0	13.5	11.5	12.5	15.0	12.0	13.5	
28	4.0	3.0	3.5	8.0	5.5	7.0	13.5	11.0	12.5	17.5	14.5	16.0	
29	---	---	---	9.0	7.0	8.0	14.0	11.0	12.5	19.0	16.0	17.5	
30	---	---	---	9.5	6.5	8.0	14.5	11.5	13.0	20.0	17.0	18.5	
31	---	---	---	11.5	9.0	10.0	---	---	---	19.5	18.5	18.5	
MONTH	5.5	-.5	1.6	11.5	-.5	3.4	15.0	5.5	9.9	20.0	10.5	15.2	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	19.5	18.0	19.0	19.0	18.0	18.5	23.0	21.0	22.0	18.0	15.0	16.5
2	19.5	17.5	18.5	19.5	17.5	18.5	21.0	19.0	20.0	18.5	15.5	17.0
3	18.0	16.0	17.0	20.5	19.0	19.5	20.5	17.5	19.0	19.5	16.5	18.0
4	18.0	16.0	17.5	23.0	20.5	21.5	21.0	18.5	20.0	19.5	17.0	18.0
5	19.5	17.0	18.5	24.5	22.5	23.5	20.0	18.5	19.0	19.5	17.0	18.5
6	22.0	19.5	21.0	25.0	22.5	24.0	20.5	17.5	19.0	18.5	17.0	18.0
7	23.0	21.0	22.0	23.0	20.5	22.0	19.0	18.0	18.5	17.5	15.0	16.5
8	23.0	20.5	21.5	22.0	20.0	21.0	19.5	17.5	18.0	17.0	15.0	16.0
9	22.0	20.5	21.0	22.0	20.5	21.0	18.0	16.0	17.0	16.0	15.0	15.5
10	23.0	20.0	21.5	21.5	19.5	20.5	18.0	16.5	17.0	15.0	14.0	14.5
11	23.0	21.0	22.0	20.0	18.0	19.0	19.5	16.5	18.0	15.5	13.5	14.5
12	22.0	20.5	21.0	20.5	18.0	19.0	19.0	17.5	18.5	15.5	13.5	14.5
13	21.0	19.0	20.5	20.5	18.0	19.5	20.5	18.0	19.0	16.5	15.0	15.5
14	19.5	18.5	19.0	20.5	18.5	19.5	19.5	18.0	19.0	15.5	14.0	15.0
15	18.5	16.5	17.0	22.5	19.0	20.5	19.5	17.0	18.0	14.0	12.5	13.5
16	16.5	15.5	16.0	23.5	20.0	22.0	18.5	18.0	18.0	13.5	11.5	12.5
17	16.5	15.0	16.0	22.0	20.5	21.5	20.0	17.5	18.5	13.5	11.0	12.5
18	17.0	14.5	16.0	22.0	20.5	21.5	18.5	18.0	18.5	14.0	11.5	13.0
19	17.0	15.5	16.5	21.5	20.5	21.0	18.5	17.0	18.0	14.5	12.0	13.0
20	18.0	16.0	17.0	21.5	20.0	20.5	18.5	15.5	17.0	15.0	13.5	14.0
21	19.5	17.0	18.0	21.0	20.0	20.5	19.0	16.0	17.5	13.5	11.5	12.5
22	20.0	18.0	19.0	21.5	19.5	20.5	19.0	16.5	18.0	12.5	10.0	11.5
23	20.5	19.0	19.5	---	---	---	18.0	17.0	17.5	14.5	12.0	13.0
24	21.5	19.5	20.5	---	---	---	18.0	17.0	17.5	14.0	12.5	13.0
25	21.5	19.0	20.5	---	---	---	18.0	17.5	17.5	13.0	11.0	12.0
26	22.0	20.0	21.0	---	---	---	19.0	17.0	18.0	14.5	12.0	13.5
27	22.0	21.0	21.5	22.5	20.5	21.0	20.0	17.5	19.0	15.5	14.0	15.0
28	23.0	21.0	22.0	21.5	19.5	21.0	21.0	18.5	20.0	15.0	14.5	15.0
29	22.5	20.0	21.0	22.5	20.5	21.5	19.5	17.0	18.5	14.5	13.0	14.0
30	20.0	18.5	19.5	24.0	21.5	22.5	17.5	15.5	16.5	13.0	12.0	12.5
31	---	---	---	24.0	22.5	23.0	17.5	14.5	16.0	---	---	---
MONTH	23.0	14.5	19.4	---	---	---	23.0	14.5	18.3	19.5	10.0	14.6

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	11.3	8.9	9.9	11.2	10.0	10.5	11.6	10.1	10.9	14.4	13.8	14.0
2	11.9	9.6	10.5	12.1	10.4	11.1	11.7	10.7	11.1	14.0	13.5	13.9
3	11.7	9.7	10.4	12.6	11.0	11.7	11.4	10.4	10.7	13.5	13.2	13.3
4	11.8	9.9	10.5	13.0	11.5	12.1	11.2	10.3	10.6	13.6	13.1	13.4
5	—	—	—	12.8	11.8	12.1	10.9	10.2	10.4	13.7	13.3	13.5
6	—	—	—	13.4	11.8	12.4	11.0	10.1	10.4	13.5	13.3	13.4
7	—	—	—	13.5	11.8	12.4	11.4	10.2	10.8	13.7	13.2	13.4
8	9.3	8.5	8.9	13.2	11.6	12.2	11.9	11.1	11.5	13.6	13.4	13.5
9	9.9	8.9	9.3	12.5	11.3	11.8	12.7	11.7	12.2	13.5	13.2	13.3
10	10.3	9.3	9.7	11.3	10.3	10.8	12.8	12.1	12.4	13.5	13.2	13.3
11	10.4	9.2	9.7	10.9	10.1	10.5	13.2	12.4	12.8	13.6	13.2	13.3
12	10.4	9.1	9.6	11.6	10.4	11.0	13.2	12.5	12.8	13.5	13.0	13.2
13	10.3	9.1	9.6	12.6	11.6	12.2	13.5	12.5	12.9	13.7	13.2	13.4
14	10.6	9.4	9.9	12.2	11.2	11.8	13.6	12.9	13.1	13.6	13.2	13.4
15	11.0	9.6	10.1	12.2	10.9	11.5	13.2	12.3	12.8	13.3	12.9	13.1
16	11.1	9.4	10.1	11.7	11.0	11.3	13.2	12.3	12.7	13.1	12.8	13.0
17	10.3	8.8	9.4	12.5	11.0	11.6	13.3	12.4	12.8	13.7	13.1	13.4
18	9.4	8.5	8.9	13.5	12.0	12.6	13.7	12.6	13.0	13.5	13.2	13.4
19	10.0	9.0	9.5	12.0	11.2	11.6	13.2	12.4	12.7	14.1	13.4	13.8
20	10.6	9.3	9.9	12.2	11.2	11.7	14.0	12.7	13.3	14.3	14.0	14.1
21	10.8	9.7	10.2	13.1	11.8	12.3	13.4	12.9	13.1	14.3	13.9	14.1
22	11.6	10.1	10.8	13.3	11.8	12.4	14.7	13.1	13.9	14.1	13.8	13.9
23	11.4	10.2	10.7	12.6	11.5	11.8	14.4	13.8	14.0	14.2	13.9	14.0
24	11.0	9.9	10.3	12.9	11.5	12.0	14.3	13.7	14.0	14.4	13.9	14.3
25	11.1	9.7	10.2	12.2	11.6	11.8	14.1	13.5	13.9	14.7	14.3	14.6
26	11.1	9.7	10.2	12.8	11.6	12.1	13.8	13.3	13.5	14.9	14.5	14.7
27	10.7	9.6	10.0	13.2	12.0	12.5	13.8	13.4	13.6	14.7	14.1	14.3
28	10.7	9.4	9.9	13.1	11.7	12.4	14.1	13.4	13.7	14.3	13.9	14.1
29	11.5	9.7	10.5	12.0	10.6	11.4	14.0	13.4	13.7	14.8	14.2	14.5
30	11.6	10.1	10.6	10.6	10.0	10.2	14.3	13.7	14.0	15.3	14.4	14.9
31	11.1	9.9	10.4	—	—	—	14.2	13.7	13.9	15.5	14.7	15.0
MONTH	—	—	—	13.5	10.0	11.7	14.7	10.1	12.6	15.5	12.8	13.8

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	15.1	14.3	14.8	13.6	12.3	12.9	12.1	10.9	11.4	11.1	9.1	9.9
2	14.3	13.9	14.1	13.9	12.7	13.3	12.6	10.7	11.6	11.0	8.8	9.7
3	14.7	13.8	14.2	13.9	12.8	13.3	12.6	10.3	11.3	11.0	8.7	9.6
4	14.4	13.6	13.9	14.5	13.0	13.7	11.7	10.1	10.9	10.9	8.5	9.5
5	14.9	14.0	14.5	15.1	13.3	14.2	12.6	11.5	12.0	10.0	8.3	9.0
6	14.4	13.9	14.1	15.8	14.3	15.0	12.5	11.8	12.1	9.4	8.2	8.8
7	14.5	13.7	14.0	15.9	12.0	14.3	13.6	11.9	12.8	10.6	8.7	9.5
8	14.5	13.7	14.1	15.7	12.8	14.2	13.1	11.2	12.2	10.3	9.0	9.5
9	14.3	13.4	13.8	15.5	14.1	14.9	12.5	10.9	11.6	11.3	9.1	10.1
10	14.8	13.5	14.0	15.7	10.8	14.3	13.5	11.9	12.6	11.3	9.0	9.9
11	13.6	12.3	13.1	15.8	14.6	15.0	12.7	11.6	12.2	11.3	8.9	9.8
12	14.0	12.2	13.1	15.8	14.6	15.0	13.8	12.3	13.0	10.3	8.7	9.5
13	15.1	14.0	14.7	15.9	14.4	15.1	13.3	11.6	12.5	11.1	9.3	10.0
14	15.8	14.9	15.3	15.7	14.2	14.9	12.9	11.0	12.0	11.3	9.0	10.0
15	15.4	14.4	15.0	15.6	14.0	14.6	12.2	10.7	11.4	10.8	8.6	9.5
16	14.9	13.8	14.4	15.2	13.2	14.2	12.1	10.8	11.5	10.7	8.3	9.4
17	14.8	13.9	14.3	14.7	12.5	13.5	12.9	11.5	12.2	9.2	7.9	8.4
18	15.2	14.2	14.6	13.9	12.3	13.2	13.3	11.7	12.4	—	—	—
19	15.4	14.3	14.7	14.8	13.4	14.1	13.0	11.7	12.3	—	—	—
20	15.7	14.4	15.1	14.8	12.9	13.9	13.2	11.3	12.2	—	—	—
21	16.1	14.8	15.4	14.2	12.7	13.4	12.5	10.7	11.4	—	—	—
22	16.1	12.8	14.5	14.7	13.3	13.9	11.3	10.4	10.9	—	—	—
23	15.5	13.0	14.2	14.8	13.0	14.0	11.5	11.0	11.2	—	—	—
24	14.5	11.7	13.3	14.5	12.9	13.5	11.6	10.6	11.2	—	—	—
25	14.1	13.1	13.6	14.7	13.0	13.7	11.0	10.1	10.7	—	—	—
26	14.4	13.0	13.6	14.7	12.9	13.7	10.7	9.6	10.1	10.3	9.0	9.7
27	13.6	12.4	13.0	14.5	12.7	13.4	10.7	9.3	9.9	10.2	8.7	9.4
28	13.2	12.0	12.5	14.2	12.3	13.1	11.0	9.4	10.1	9.9	8.2	8.9
29	—	—	—	13.8	12.0	12.7	11.1	9.4	10.1	9.9	8.1	8.7
30	—	—	—	14.2	11.9	13.0	11.2	9.3	10.1	10.0	7.8	8.6
31	—	—	—	13.5	11.2	12.3	—	—	—	9.0	7.6	8.2
MONTH	16.1	11.7	14.1	15.9	10.8	13.9	13.8	9.3	11.5	—	—	—

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121944 LITTLE MUSKEGON RIVER NEAR OAK GROVE, MI-Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.2	7.4	7.8	8.6	7.9	8.2	9.4	7.7	8.4	11.9	8.3	9.5
2	7.8	7.4	7.6	8.9	8.0	8.4	9.7	7.9	8.7	11.8	8.2	9.4
3	8.5	7.7	8.1	8.7	7.7	8.2	10.0	8.2	8.9	12.0	8.0	9.4
4	8.8	7.9	8.2	8.4	7.3	7.8	9.5	7.9	8.5	11.4	7.9	9.1
5	9.1	7.7	8.3	8.4	7.1	7.6	9.6	7.9	8.5	11.2	7.8	8.9
6	8.9	7.3	8.0	8.5	7.0	7.5	10.0	8.0	8.7	9.2	7.6	8.3
7	8.8	7.2	7.8	8.9	7.0	7.8	9.3	7.9	8.4	10.7	8.1	9.0
8	8.6	6.9	7.6	9.2	7.3	8.0	9.8	8.0	8.7	10.7	8.3	9.2
9	8.4	6.8	7.4	8.6	7.2	7.7	10.1	8.2	9.0	10.3	8.3	9.0
10	8.6	6.9	7.6	8.7	7.2	7.9	9.8	8.4	8.9	10.7	8.3	9.3
11	8.5	6.8	7.4	9.3	7.7	8.3	10.6	8.2	9.1	10.8	8.7	9.5
12	8.5	6.9	7.5	9.4	7.7	8.4	10.4	8.1	9.0	10.8	8.6	9.4
13	7.8	7.0	7.4	9.6	7.7	8.4	9.8	7.9	8.6	10.1	8.4	9.0
14	7.3	6.9	7.0	9.8	7.7	8.5	10.0	7.9	8.7	11.2	8.3	9.5
15	7.9	7.1	7.6	9.9	7.4	8.4	10.7	8.2	9.1	11.4	9.6	10.3
16	8.3	7.9	8.1	10.0	7.2	8.2	10.0	8.1	9.0	11.7	9.9	10.6
17	8.7	8.1	8.4	8.2	7.1	7.5	11.3	8.4	9.3	11.7	9.8	10.6
18	9.2	8.2	8.6	7.8	7.2	7.5	10.6	8.3	9.2	11.4	9.7	10.4
19	9.2	8.1	8.6	8.0	7.1	7.5	11.4	8.4	9.4	11.5	9.4	10.3
20	9.2	7.9	8.4	8.3	7.4	7.8	11.7	8.4	9.6	10.9	9.2	9.8
21	9.2	7.7	8.4	8.0	7.4	7.7	11.9	8.4	9.6	11.0	9.3	10.1
22	9.2	7.5	8.2	8.8	7.6	8.0	12.1	8.3	9.6	11.3	9.6	10.3
23	8.8	7.3	7.9	—	—	—	10.8	8.2	9.1	10.9	9.0	9.8
24	8.7	7.2	7.7	—	—	—	10.6	8.2	9.1	10.6	8.9	9.5
25	8.4	7.0	7.6	—	—	—	9.8	8.2	8.8	10.8	9.2	9.8
26	8.5	6.9	7.5	—	—	—	11.0	8.1	9.1	10.4	8.6	9.4
27	7.3	6.5	6.9	9.0	8.0	8.4	11.4	7.9	9.2	10.0	8.4	8.9
28	7.2	6.6	6.9	9.4	8.1	8.6	11.2	7.8	8.9	8.8	8.2	8.5
29	7.8	6.8	7.3	9.3	7.8	8.4	11.8	8.1	9.4	8.6	7.9	8.3
30	8.5	7.7	8.1	9.3	7.6	8.3	11.9	8.6	9.7	9.1	8.3	8.7
31	—	—	—	8.9	7.5	8.1	11.9	8.4	9.7	—	—	—
MONTH	9.2	6.5	7.8	—	—	—	12.1	7.7	9.0	12.0	7.6	9.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI

LOCATION.--Lat 43°26'05", long 85°39'55", in SE1/4 NE1/4 sec. 18, T.12 N., R.11 W., Newaygo County, Hydrologic Unit 04060102, on right bank 75 ft downstream from Croton Drive, 0.4 mi southwest of Croton.

DRAINAGE AREA.--2,313 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1995 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 690 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good. Flow completely regulated by Croton Dam 1,000 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	889	1120	1430	1330	2520	2020	1560	1330	1410	1500	1250	927
2	900	1120	1490	1300	2400	2070	1540	1310	1640	1450	1240	928
3	902	1130	1480	1340	2260	2020	1530	1310	1600	1400	1190	929
4	875	1120	1510	1340	2260	2010	1740	1350	1480	1380	1160	929
5	890	1110	1530	1380	2300	1960	1820	1340	1360	1340	1300	930
6	1230	1120	1510	1470	2310	1940	1930	1340	1250	1370	1340	929
7	1840	1110	1700	1500	2300	1850	1980	1320	1190	1380	1310	929
8	2000	1070	1840	1500	2280	1600	1980	1180	1110	1390	1330	924
9	1800	1050	1840	1500	2180	1590	2080	1130	1090	1760	1320	876
10	1450	1430	1830	1490	2130	1680	2120	1130	1150	1750	1200	848
11	1280	2000	1810	1490	2240	1790	2140	1130	1200	1640	1160	844
12	1240	1970	1660	1490	2540	1800	2460	1400	1340	1560	1280	830
13	1150	1820	1540	1490	2660	1730	2530	1560	1220	1490	1510	899
14	1020	1730	1440	1510	2620	1600	2470	1560	2560	1420	1470	919
15	1010	1670	1410	1530	2630	1510	2460	1510	3640	1280	1330	846
16	1040	1570	1420	1580	2610	1520	2460	1350	3370	1270	1190	804
17	1220	1530	1420	1630	2600	1580	2240	1470	2710	1460	1140	797
18	1540	1510	1420	1760	2610	1740	2110	1650	1890	1610	1140	801
19	1450	1510	1420	1800	2550	1850	1970	1880	1600	1670	1140	819
20	1290	1470	1410	1780	2400	1930	1930	1720	1670	1610	1140	868
21	1250	1450	1390	1770	2250	1940	1930	1530	1660	1600	1050	885
22	1160	1430	1170	1870	2100	1910	2040	1410	1660	1660	1000	881
23	1040	1320	968	2000	1950	1910	2230	1320	1660	2080	988	878
24	1030	1220	956	2110	1840	1910	2290	1400	1670	2570	978	872
25	1050	1350	953	2500	1810	1860	2180	1440	1640	2650	989	872
26	1140	1480	977	2510	2010	1820	1980	1410	1420	2490	1000	877
27	1180	1410	1030	2430	1960	1810	1660	1350	1690	1850	988	917
28	1190	1350	1060	2540	1890	1750	1540	1310	1740	1710	963	1270
29	1140	1320	1070	2600	---	1590	1430	1250	1550	1760	881	1600
30	1120	1300	1070	2610	---	1550	1340	1110	1480	1680	853	1580
31	1110	---	1250	2590	---	1560	---	1060	---	1380	942	---
TOTAL	37426	41790	43004	55740	64210	55400	59670	42560	50650	51160	35772	28208
MEAN	1207	1393	1387	1798	2293	1787	1989	1373	1688	1650	1154	940
MAX	2000	2000	1840	2610	2660	2070	2530	1880	3640	2650	1510	1600
MIN	875	1050	953	1300	1810	1510	1340	1060	1090	1270	853	797
CFSM	.52	.60	.60	.78	.99	.77	.86	.59	.73	.71	.50	.41
IN.	.60	.67	.69	.90	1.03	.89	.96	.68	.81	.82	.58	.45

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1996 - 1999, BY WATER YEAR (WY)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
MEAN	1432	1797	1703	2297	2568	2846	2730	2208	1863	1331	1176	1089
MAX	1702	2136	2231	2919	3046	3864	3322	2929	2946	1650	1382	1301
(WY)	1997	1996	1997	1997	1997	1997	1998	1997	1996	1999	1996	1997
MIN	1207	1393	1387	1798	2293	1787	1989	1373	1060	848	836	817
(WY)	1999	1999	1999	1999	1999	1999	1999	1999	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1996 - 1999
ANNUAL TOTAL	598874	565590	1916
ANNUAL MEAN	1641	1550	2288
HIGHEST ANNUAL MEAN			1550
LOWEST ANNUAL MEAN			7010
HIGHEST DAILY MEAN	7010	Apr 3	7010
LOWEST DAILY MEAN	720	Sep 11	720
ANNUAL SEVEN-DAY MINIMUM	723	Sep 7	723
INSTANTANEOUS PEAK FLOW			4150
INSTANTANEOUS PEAK STAGE			7.56
INSTANTANEOUS LOW FLOW			755
ANNUAL RUNOFF (CFSM)	.71	.67	.83
ANNUAL RUNOFF (INCHES)	9.63	9.10	11.25
10 PERCENT EXCEEDS	2930	2260	3100
50 PERCENT EXCEEDS	1350	1480	1690
90 PERCENT EXCEEDS	799	955	999

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1995 to current year.

DISSOLVED OXYGEN: October 1995 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 24.5°C, July 28, 1997, Aug. 1, 1999; minimum recorded, 0.5°C, on many days during winter periods, but may have been lower during instrument malfunction Jan. 3-29, Feb. 19, 1996.

DISSOLVED OXYGEN: Maximum, 14.4 mg/L, Mar. 12, 1998; minimum, 3.3 mg/L, Aug. 23, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 24.5°C, Aug. 1; minimum, 0.5°C, on several days during winter period.

DISSOLVED OXYGEN: Maximum, 14.0 mg/L, Apr. 5; minimum, 3.3 mg/L, Aug. 23.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER				DECEMBER			JANUAFY	
1	19.0	18.5	18.5	13.5	13.0	13.0	8.0	7.5	8.0	2.0	1.5	1.5
2	18.5	18.0	18.0	13.0	12.0	12.5	8.0	7.5	8.0	1.5	1.0	1.5
3	18.0	17.5	17.5	12.0	11.5	12.0	8.0	8.0	8.0	1.5	1.0	1.5
4	17.5	17.0	17.0	11.5	11.0	11.0	8.5	8.0	8.0	1.5	1.0	1.5
5	17.0	16.5	16.5	11.0	10.5	10.5	8.5	8.0	8.0	1.5	1.0	1.5
6	16.5	16.5	16.5	10.5	10.0	10.5	8.0	8.0	8.0	1.5	1.0	1.0
7	16.5	16.5	16.5	10.5	10.0	10.5	8.0	8.0	8.0	1.5	1.0	1.0
8	16.5	16.0	16.5	10.5	10.0	10.0	8.0	7.5	8.0	1.5	1.0	1.0
9	17.0	16.0	16.5	10.0	10.0	10.0	7.5	7.5	7.5	1.5	1.0	1.0
10	17.0	16.0	16.5	10.0	9.0	9.5	7.5	7.0	7.0	1.0	1.0	1.0
11	17.0	16.0	16.5	9.0	9.0	9.0	7.0	6.5	6.5	1.0	1.0	1.0
12	17.0	16.0	16.5	9.0	8.5	9.0	6.5	6.0	6.5	1.0	1.0	1.0
13	16.5	15.5	16.0	8.5	8.0	8.5	6.5	6.0	6.0	1.0	.5	1.0
14	15.5	15.0	15.5	9.0	8.0	8.5	6.0	5.5	6.0	1.0	.5	1.0
15	15.5	15.0	15.0	9.0	8.5	8.5	6.0	5.5	6.0	1.0	.5	1.0
16	15.0	15.0	15.0	9.0	8.0	8.5	6.0	5.5	5.5	1.0	.5	1.0
17	15.0	15.0	15.0	9.0	8.5	8.5	5.5	5.0	5.5	1.0	.5	1.0
18	15.0	14.5	15.0	8.5	8.0	8.5	5.0	5.0	5.0	1.0	.5	1.0
19	15.0	14.5	15.0	8.5	8.0	8.0	5.5	5.0	5.0	1.0	.5	1.0
20	14.5	14.0	14.5	6.0	8.0	8.0	5.0	4.5	4.5	1.0	.5	1.0
21	14.0	13.5	14.0	8.0	7.5	8.0	4.5	4.0	4.5	1.0	1.0	1.0
22	13.5	13.5	13.5	7.5	7.0	7.5	4.0	3.5	4.0	1.0	1.0	1.0
23	13.5	13.0	13.5	7.5	7.0	7.5	3.5	3.0	3.5	1.5	1.0	1.0
24	13.5	13.0	13.0	7.5	7.0	7.5	3.5	2.5	3.0	1.5	1.0	1.0
25	13.5	13.0	13.0	7.5	7.0	7.0	3.0	2.5	2.5	1.5	1.0	1.0
26	13.5	13.0	13.5	7.0	7.0	7.0	3.0	2.0	2.5	1.5	1.0	1.0
27	13.5	13.0	13.5	7.0	6.5	7.0	2.5	2.0	2.5	1.5	1.0	1.0
28	14.0	13.5	14.0	7.0	6.5	7.0	2.5	2.0	2.0	1.5	1.0	1.0
29	14.0	13.0	13.5	7.0	7.0	7.0	2.0	1.5	2.0	1.5	1.0	1.0
30	13.5	13.5	13.5	8.0	6.5	7.0	1.5	1.5	1.5	1.5	1.0	1.0
31	13.5	13.5	13.5	—	—	—	2.0	1.5	1.5	1.5	1.0	1.0
MONTH	19.0	13.0	15.2	13.5	6.5	8.9	8.5	1.5	5.3	2.0	.5	1.1

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	1.0	1.0	1.0	2.0	1.5	2.0	6.0	5.0	5.5	12.0	10.5	11.0	
2	1.5	1.0	1.0	2.0	1.5	2.0	6.5	5.5	6.0	12.5	10.5	11.5	
3	1.5	1.0	1.0	2.0	1.5	1.5	6.5	5.5	6.0	13.0	10.5	12.0	
4	1.5	1.0	1.5	2.0	1.5	1.5	7.5	6.5	7.0	14.0	10.5	12.0	
5	1.5	1.0	1.5	1.5	1.5	1.5	7.5	7.0	7.5	14.0	12.0	13.0	
6	1.5	1.0	1.5	1.5	1.0	1.0	7.5	6.5	7.0	14.0	10.5	12.0	
7	1.5	1.0	1.0	1.5	1.0	1.5	7.0	6.0	6.5	13.0	11.0	12.0	
8	1.5	1.0	1.0	1.5	1.0	1.5	7.5	7.0	7.0	13.0	12.5	13.0	
9	1.5	1.0	1.5	1.5	1.0	1.5	8.0	7.0	7.5	14.0	12.5	13.5	
10	1.5	1.0	1.5	1.5	1.0	1.5	7.5	7.0	7.5	13.5	12.0	13.0	
11	1.5	1.5	1.5	2.0	1.5	1.5	7.5	7.0	7.5	14.0	13.5	14.0	
12	1.5	1.5	1.5	1.5	1.0	1.5	7.5	7.0	7.5	14.5	13.5	14.0	
13	2.0	1.5	1.5	2.0	1.5	1.5	7.5	7.0	7.5	13.5	13.0	13.5	
14	1.5	1.0	1.5	2.0	1.5	1.5	8.0	7.0	7.5	13.5	13.0	13.5	
15	1.5	1.0	1.0	2.0	1.5	2.0	8.5	7.5	8.0	13.5	13.0	13.5	
16	1.5	1.0	1.5	2.5	1.5	2.0	8.5	7.5	8.0	14.5	13.0	13.5	
17	1.5	1.5	1.5	2.5	2.0	2.0	8.0	7.5	8.0	14.5	12.5	13.5	
18	1.5	1.5	1.5	2.5	2.0	2.0	8.0	7.5	8.0	15.5	13.0	14.5	
19	1.5	1.0	1.5	2.5	2.0	2.5	8.0	7.5	8.0	16.0	14.0	15.0	
20	1.5	1.0	1.5	3.0	2.5	2.5	8.0	7.5	8.0	15.0	13.5	14.5	
21	1.5	1.0	1.5	3.0	2.5	2.5	8.5	8.0	8.0	15.5	13.5	14.5	
22	1.5	1.5	1.5	2.5	2.5	2.5	9.0	8.5	8.5	17.0	15.0	16.5	
23	1.5	1.5	1.5	3.0	2.5	2.5	8.5	8.0	8.5	16.5	15.0	15.5	
24	2.0	1.5	1.5	3.0	2.5	3.0	9.0	8.5	8.5	15.5	14.5	15.0	
25	2.0	1.5	2.0	3.0	2.5	3.0	9.0	8.0	8.5	14.5	13.5	14.0	
26	2.0	1.5	1.5	3.5	3.0	3.0	10.0	8.5	9.0	14.5	13.5	14.0	
27	2.0	1.5	2.0	3.5	3.0	3.5	10.0	9.0	10.0	15.0	13.5	14.0	
28	2.0	2.0	2.0	4.0	3.5	4.0	10.5	10.0	10.0	15.5	13.5	14.5	
29	---	---	---	4.5	4.0	4.5	10.5	10.0	10.5	16.0	14.0	15.0	
30	---	---	---	5.0	4.5	4.5	12.0	10.5	11.0	16.5	14.5	15.5	
31	---	---	---	5.0	5.0	5.0	---	---	---	16.5	14.5	15.5	
MONTH	2.0	1.0	1.4	5.0	1.0	2.3	12.0	5.0	7.9	17.0	10.5	13.8	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
		JUNE				JULY		AUGUST				SEPTEMBER	
1	17.5	15.5	16.5	20.0	19.0	19.5	24.5	22.5	23.5	21.5	21.0	21.0	
2	17.5	15.5	16.5	19.5	19.0	19.5	24.0	22.5	23.0	22.0	21.0	21.5	
3	17.5	16.0	17.0	20.0	18.5	19.5	23.0	22.0	22.5	22.5	21.5	21.5	
4	17.5	15.0	16.0	21.0	19.0	19.5	24.0	22.0	23.0	22.5	21.5	22.0	
5	17.5	15.5	16.5	21.5	19.5	20.5	23.5	22.0	23.0	22.5	21.5	22.0	
6	18.5	16.0	16.5	23.0	21.0	22.0	23.5	22.0	22.5	23.0	21.5	22.5	
7	18.5	16.0	17.5	22.5	19.5	21.5	22.5	21.5	22.0	22.0	21.5	21.5	
8	20.0	18.0	19.0	22.0	21.0	21.5	22.5	22.0	22.0	21.5	21.0	21.0	
9	19.5	18.5	19.0	22.0	20.0	21.0	22.0	21.5	21.5	21.0	20.5	21.0	
10	20.0	18.5	19.0	22.0	20.5	21.5	22.0	21.0	21.5	20.5	20.0	20.5	
11	20.0	18.5	19.0	21.0	20.0	20.5	22.5	21.0	21.5	20.5	20.0	20.0	
12	19.5	18.5	19.0	21.5	20.0	20.5	21.5	21.0	21.5	20.5	19.5	19.5	
13	21.0	19.0	19.5	21.0	20.0	20.5	22.0	21.5	21.5	20.0	19.5	19.5	
14	21.5	18.5	20.0	21.0	19.5	20.5	22.0	21.5	21.5	19.5	19.0	19.5	
15	18.5	17.5	18.0	21.0	20.0	20.5	22.0	21.0	21.5	19.5	19.0	19.0	
16	18.0	17.5	17.5	22.0	20.5	21.0	21.5	21.0	21.0	19.0	18.5	19.0	
17	18.0	17.0	17.5	22.5	22.0	22.0	22.5	21.0	22.0	19.5	18.5	19.0	
18	17.5	16.5	17.0	23.0	21.0	22.0	22.0	21.5	22.0	19.0	18.5	19.0	
19	18.0	17.0	17.5	23.0	21.0	22.0	22.0	21.5	22.0	19.0	18.5	18.5	
20	18.5	17.5	18.0	22.5	21.5	22.0	22.5	21.5	22.0	19.0	18.5	18.5	
21	19.0	18.0	18.5	22.0	21.0	21.5	22.0	21.0	21.5	19.0	18.0	18.5	
22	19.0	17.5	18.0	22.0	21.0	21.5	22.0	21.5	21.5	18.5	18.0	18.0	
23	19.0	17.5	18.0	23.0	21.0	22.0	21.5	21.0	21.5	18.0	17.5	18.0	
24	20.0	18.0	19.0	22.5	21.0	21.5	22.0	21.5	22.0	18.5	17.5	18.0	
25	20.0	18.0	19.0	23.5	21.5	22.5	22.0	21.5	21.5	18.0	17.5	18.0	
26	20.0	18.5	19.0	22.5	21.5	22.0	22.0	21.5	21.5	18.0	17.5	18.0	
27	20.5	18.5	19.5	23.5	21.5	22.0	22.0	21.0	21.5	18.5	18.0	18.0	
28	20.5	19.0	19.5	22.5	21.5	22.0	23.0	21.0	22.0	18.5	18.0	18.0	
29	21.5	19.0	21.0	23.0	21.5	22.5	22.5	21.5	22.0	18.0	17.5	17.5	
30	20.0	18.5	19.5	23.5	22.5	23.0	22.0	21.0	21.5	17.5	16.5	17.0	
31	---	---	---	23.5	23.0	23.0	21.5	21.0	21.5	---	---	---	
MONTH	21.5	15.0	18.2	23.5	18.5	21.3	24.5	21.0	21.9	23.0	16.5	19.5	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	8.6	7.6	8.0	8.8	8.2	8.5	11.1	10.4	10.8	11.8	10.7	11.2			
2	8.4	7.2	7.8	9.0	8.5	8.8	11.2	10.7	10.9	11.5	10.5	10.9			
3	7.6	6.8	7.2	9.4	8.7	9.1	11.0	10.6	10.8	12.2	10.6	11.3			
4	7.3	6.8	7.0	9.3	8.7	9.0	10.8	10.6	10.7	11.5	10.7	11.1			
5	7.5	6.8	7.2	8.9	8.7	8.8	10.9	10.6	10.7	11.9	10.8	11.3			
6	7.2	6.5	6.8	9.1	8.8	8.9	10.8	10.4	10.6	11.9	10.6	11.3			
7	6.9	6.4	6.7	9.0	8.3	8.7	10.7	10.3	10.5	10.9	10.5	10.7			
8	7.0	6.5	6.7	8.6	7.7	8.1	10.8	10.2	10.5	10.8	10.0	10.4			
9	7.0	6.4	6.7	8.6	7.8	8.2	10.7	10.2	10.4	10.7	10.1	10.4			
10	6.9	6.5	6.7	10.0	8.6	9.6	10.5	10.2	10.4	10.9	10.2	10.5			
11	7.2	6.4	6.7	10.3	10.0	10.2	10.8	10.2	10.5	10.7	10.0	10.4			
12	7.7	6.2	7.0	10.4	10.1	10.3	11.3	10.4	10.7	10.5	9.7	10.2			
13	7.2	6.6	6.8	10.6	10.1	10.4	11.0	10.4	10.7	10.3	9.6	10.0			
14	6.9	6.1	6.5	10.5	10.2	10.4	11.0	10.4	10.7	10.4	9.8	10.1			
15	7.3	6.2	6.7	10.6	10.1	10.4	11.1	10.5	10.7	10.5	9.9	10.3			
16	7.4	6.5	6.8	10.4	9.8	10.1	11.0	10.4	10.7	10.9	10.1	10.5			
17	7.4	6.3	6.8	10.3	9.8	10.1	11.2	10.5	10.8	10.7	10.1	10.3			
18	8.3	6.6	7.5	10.4	10.1	10.2	11.3	10.5	10.9	10.9	10.2	10.6			
19	8.3	7.3	7.8	10.8	10.4	10.7	11.0	10.5	10.8	10.9	10.4	10.7			
20	7.9	7.2	7.6	10.8	10.3	10.5	11.1	10.5	10.8	10.9	10.5	10.7			
21	7.9	7.3	7.6	10.8	10.5	10.6	11.1	10.4	10.7	10.8	10.1	10.5			
22	8.1	7.5	7.8	11.1	10.6	10.8	11.4	10.4	10.9	10.9	10.1	10.5			
23	8.4	7.6	8.0	11.0	10.5	10.8	11.5	10.6	11.0	11.0	10.5	10.8			
24	8.3	7.6	7.9	11.0	10.3	10.7	11.4	10.7	11.0	11.2	10.8	11.0			
25	8.4	7.7	8.1	11.1	10.6	10.8	11.7	10.7	11.1	11.1	10.6	10.9			
26	8.9	8.2	8.6	11.2	10.8	10.9	11.4	10.6	11.0	11.2	10.8	11.1			
27	9.0	8.5	8.8	11.0	10.7	10.9	11.5	10.5	10.9	11.2	10.8	11.1			
28	9.3	8.6	8.9	11.0	10.5	10.8	11.2	10.6	11.0	11.2	10.9	11.1			
29	9.3	8.5	8.9	10.7	10.4	10.6	11.5	10.7	11.0	11.2	10.9	11.1			
30	8.8	8.5	8.7	10.8	10.4	10.6	11.5	10.8	11.1	11.3	11.0	11.1			
31	8.6	8.1	8.4	—	—	—	11.7	10.9	11.3	11.5	11.0	11.2			
MONTH	9.3	6.1	7.5	11.2	7.7	9.9	11.7	10.2	10.8	12.2	9.6	10.8			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	11.4	11.0	11.2	12.0	11.6	11.8	13.6	13.2	13.4	11.1	9.9	10.4	
2	11.4	11.1	11.3	12.0	11.6	11.8	13.9	13.2	13.5	10.8	9.9	10.3	
3	11.6	11.0	11.3	12.1	11.6	11.9	13.8	13.3	13.6	11.2	10.0	10.5	
4	11.5	11.1	11.3	12.2	11.7	12.0	13.6	13.2	13.4	11.1	9.4	10.3	
5	11.6	11.0	11.3	12.2	11.8	12.1	14.0	13.2	13.6	10.7	9.4	10.1	
6	11.5	11.0	11.3	12.5	11.9	12.2	13.8	13.4	13.6	10.1	9.1	9.6	
7	11.4	10.9	11.3	12.4	12.1	12.2	13.9	12.9	13.5	9.6	8.8	9.2	
8	11.5	10.9	11.3	12.5	12.2	12.3	13.3	12.6	13.0	9.2	8.1	8.6	
9	11.7	10.9	11.3	12.6	12.2	12.4	13.0	11.7	12.6	9.8	8.2	8.9	
10	11.5	10.8	11.2	12.6	12.2	12.4	12.7	12.1	12.5	9.6	8.3	9.1	
11	11.6	11.1	11.4	12.7	12.3	12.5	12.5	12.1	12.3	9.9	8.9	9.3	
12	11.7	11.1	11.5	12.7	12.3	12.5	12.8	11.9	12.4	9.9	8.9	9.4	
13	11.8	11.1	11.5	12.7	12.2	12.5	12.6	11.9	12.3	9.9	9.1	9.5	
14	11.9	11.4	11.7	12.8	12.3	12.5	12.7	11.9	12.4	9.9	9.2	9.6	
15	12.1	11.6	11.8	12.8	12.4	12.5	12.6	12.1	12.4	9.8	9.1	9.4	
16	12.0	11.5	11.7	12.9	12.0	12.5	12.2	11.8	12.0	9.6	8.9	9.3	
17	12.0	11.6	11.8	12.6	11.9	12.2	12.0	11.6	11.8	9.3	8.6	9.0	
18	11.9	11.6	11.8	12.3	11.9	12.2	12.1	11.5	11.7	9.6	8.4	9.1	
19	12.2	11.7	11.9	12.5	12.0	12.2	11.9	11.3	11.7	9.1	7.8	8.8	
20	12.1	11.7	11.9	12.5	12.2	12.4	11.9	11.2	11.6	8.8	7.7	8.3	
21	12.2	11.6	11.9	12.6	12.3	12.5	11.9	11.2	11.6	8.6	7.7	8.2	
22	12.2	11.7	11.9	12.7	12.5	12.6	11.8	11.2	11.6	9.5	8.2	8.8	
23	12.3	11.4	11.8	12.9	12.5	12.7	11.5	11.0	11.3	8.8	7.9	8.5	
24	12.0	11.5	11.7	13.0	12.6	12.8	11.5	11.1	11.3	8.8	7.5	8.1	
25	12.0	11.5	11.8	13.2	12.8	12.9	11.7	11.0	11.3	8.4	7.5	8.0	
26	12.0	11.5	11.8	13.3	12.8	13.0	12.0	11.0	11.4	8.6	7.7	8.2	
27	11.9	11.5	11.7	13.3	12.9	13.1	12.2	10.8	11.4	8.6	7.7	8.1	
28	11.9	11.5	11.7	13.4	12.9	13.1	11.6	10.7	11.2	8.9	7.8	8.4	
29	---	---	---	13.4	12.9	13.1	11.3	10.4	10.9	9.3	8.2	8.8	
30	---	---	---	13.6	13.0	13.3	11.1	10.1	10.6	9.3	8.6	9.0	
31	---	---	---	13.6	13.1	13.4	---	---	---	9.2	8.4	8.8	
MONTH	12.3	10.8	11.6	13.6	11.6	12.5	14.0	10.1	12.2	11.2	7.5	9.1	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121970 MUSKEGON RIVER NEAR CROTON, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.9	7.8	8.4	7.3	5.4	6.2	7.3	4.7	6.3	9.4	6.6	8.3
2	8.5	7.3	7.9	6.3	5.4	5.9	7.1	4.6	5.7	9.1	7.6	8.5
3	8.5	7.1	7.8	6.1	4.8	5.6	5.6	3.7	4.5	9.0	7.4	8.4
4	7.9	7.0	7.5	6.0	5.1	5.5	7.3	4.0	5.8	8.8	7.3	8.1
5	7.9	7.2	7.6	6.5	5.3	5.9	7.6	5.0	6.4	8.3	6.1	7.4
6	8.0	7.0	7.5	7.4	5.8	6.5	7.3	4.6	5.8	8.7	6.7	7.7
7	8.0	7.3	7.7	6.9	4.9	6.2	6.2	4.1	5.2	7.9	5.8	7.1
8	8.4	7.5	8.0	6.8	5.8	6.3	7.1	5.4	6.6	7.5	4.6	6.2
9	8.7	7.9	8.3	7.0	5.0	6.0	6.6	5.1	6.1	6.0	4.6	5.3
10	9.8	8.1	8.9	7.4	5.3	6.7	6.2	5.5	5.8	8.2	4.3	5.1
11	9.3	8.2	8.7	6.4	4.9	5.7	6.2	5.5	5.8	5.6	4.4	4.9
12	9.0	8.1	8.5	7.0	5.3	6.1	6.1	4.7	5.7	5.4	4.8	5.2
13	8.5	7.7	8.1	6.8	5.8	6.2	7.3	5.7	6.6	5.9	5.1	5.4
14	8.2	6.9	7.7	6.8	5.1	6.0	7.2	6.5	6.9	5.6	4.9	5.2
15	9.2	6.7	8.0	6.7	5.3	6.1	7.6	6.2	7.1	5.9	5.1	5.5
16	8.2	7.2	7.5	7.0	5.6	6.3	7.4	4.9	6.1	6.4	5.6	6.0
17	8.1	6.8	7.5	7.2	6.5	6.9	8.2	6.0	7.3	6.9	6.0	6.4
18	7.4	6.5	7.0	7.2	5.1	6.4	9.3	7.2	8.0	6.7	6.1	6.4
19	8.0	7.0	7.5	7.4	5.1	6.1	10.1	9.0	9.5	6.7	6.1	6.4
20	8.0	7.5	7.7	6.3	5.3	5.9	10.0	8.4	9.5	7.3	6.4	6.8
21	7.9	7.4	7.6	5.7	4.8	5.4	8.7	6.9	7.6	7.5	6.8	7.1
22	7.8	6.6	7.1	5.6	4.8	5.3	8.0	6.2	7.1	7.2	6.7	6.9
23	7.5	6.1	6.8	6.6	5.1	5.6	8.0	3.3	5.2	7.1	5.1	6.3
24	7.2	6.2	6.9	6.1	4.7	5.2	9.1	6.0	8.3	7.6	5.7	6.8
25	7.5	6.2	6.9	6.4	4.6	5.5	8.9	7.6	8.6	6.5	5.5	6.0
26	7.9	6.7	7.3	6.0	4.7	5.4	9.2	7.6	8.2	6.5	5.7	6.1
27	7.7	6.6	7.1	6.4	4.5	5.3	7.9	4.3	6.7	7.0	5.6	6.3
28	7.2	6.1	6.7	6.1	4.7	5.2	8.3	4.3	6.6	7.2	6.2	6.8
29	7.8	5.8	7.1	5.9	4.2	5.2	9.8	6.0	8.5	7.3	6.5	7.0
30	6.8	5.8	6.2	6.0	5.0	5.5	9.2	8.0	8.5	7.2	6.7	7.0
31	---	---	---	5.9	4.9	5.5	9.3	7.9	8.7	---	---	---
MONTH	9.8	5.8	7.6	7.4	4.2	5.9	10.1	3.3	6.9	9.4	4.3	6.6

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.--16.7 mi².

PERIOD OF RECORD.--October 1965 to current year.

REVISED RECORDS.--WDR MI-80-1: 1976(M), 1978(M), 1979(P). WDR MI-97-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 590.00 ft above sea level (Michigan Department of Natural Resources bench mark). Prior to Mar. 17, 1978, at different datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some regulation during low flow by dams and irrigation upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.5	7.0	11	e6.5	16	17	8.1	18	14	8.8	3.9	3.3
2	3.9	6.4	9.5	e6.5	23	13	8.1	17	17	8.2	3.5	3.0
3	4.1	6.1	9.1	e6.5	31	15	8.2	16	14	7.7	3.6	3.1
4	4.0	5.8	9.0	e6.5	29	13	10	15	12	6.9	7.9	3.0
5	5.1	5.7	9.4	e6.5	22	12	10	15	10	6.0	6.7	2.9
6	15	5.8	11	e6.5	19	11	10	16	9.4	5.6	5.1	2.4
7	8.3	5.7	21	e6.5	18	e10	9.5	17	8.9	5.2	6.3	3.1
8	6.4	6.0	14	e6.5	15	e9.5	9.1	16	8.3	5.0	6.9	2.9
9	5.7	6.4	12	e6.5	16	9.3	27	16	8.0	16	5.6	2.8
10	5.4	30	11	e6.5	14	8.4	22	14	7.6	9.4	6.3	3.0
11	5.1	22	10	e6.5	16	8.2	28	13	8.7	7.8	5.0	2.8
12	5.0	13	10	e6.5	22	8.0	32	26	7.4	6.8	4.8	3.3
13	5.0	11	9.4	e6.5	16	7.9	21	26	8.6	6.0	7.1	4.6
14	5.1	10	9.1	e6.5	14	8.0	17	19	11	5.7	6.0	3.8
15	5.1	9.7	9.0	e6.5	14	8.5	15	16	8.5	5.2	5.0	3.3
16	4.9	9.3	8.7	e6.5	14	11	15	15	7.9	4.9	4.4	3.0
17	7.2	8.7	8.4	e7.5	13	16	14	27	7.3	9.0	4.6	2.9
18	21	8.6	8.3	e9.0	11	16	13	24	6.8	7.0	4.3	2.8
19	11	8.4	8.0	e10	9.6	12	12	24	6.6	7.1	4.8	2.9
20	8.5	8.1	7.8	e12	8.6	10	12	19	6.5	6.7	4.6	4.8
21	7.9	8.2	e7.0	e14	7.8	10	11	16	e6.1	10	3.9	3.9
22	7.6	8.0	e7.0	19	e7.0	9.3	24	15	e5.8	8.8	3.8	3.6
23	7.5	8.0	e7.0	35	6.5	8.9	90	16	e5.4	7.3	4.2	3.0
24	7.3	7.8	e6.5	53	e6.5	8.7	83	18	15	6.8	5.2	3.4
25	7.1	7.8	e6.5	34	6.5	8.4	40	16	8.5	6.1	5.5	3.4
26	7.1	7.9	e6.5	25	6.7	8.2	31	14	7.1	5.3	5.1	3.1
27	7.2	7.6	e6.5	24	7.2	8.2	26	12	11	4.9	4.9	3.5
28	8.9	7.7	e6.5	37	12	8.1	23	11	9.6	4.7	4.1	7.7
29	7.4	7.9	e6.5	27	—	8.1	21	10	10	4.5	4.1	9.0
30	8.4	10	e6.5	21	—	8.0	19	9.7	8.0	3.9	3.4	6.1
31	7.5	—	e6.5	18	—	7.9	—	11	—	4.1	3.5	—
TOTAL	224.2	274.6	278.7	449.5	401.4	317.6	669.0	517.7	275.0	211.4	154.1	110.4
MEAN	7.23	9.15	8.99	14.5	14.3	10.2	22.3	16.7	9.17	6.82	4.97	3.68
MAX	21	30	21	53	31	17	90	27	17	16	7.9	9.0
MIN	3.9	5.7	6.5	6.5	6.5	7.9	8.1	9.7	5.4	3.9	3.4	2.4
CFSM	.43	.55	.54	.87	.86	.61	1.34	1.00	.55	.41	.30	.22
IN.	.50	.61	.62	1.00	.89	.71	1.49	1.15	.61	.47	.34	.25

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1999, BY WATER YEAR (WY)

	MEAN	13.5	18.3	20.2	18.6	21.0	30.1	27.6	18.4	11.9	6.98	8.11	8.60
MAX	45.2	55.2	40.5	31.3	47.8	87.9	50.6	45.2	23.6	17.6	30.2	43.0	
(WY)	1967	1986	1992	1986	1976	1976	1982	1974	1993	1994	1980	1986	
MIN	3.48	4.54	4.98	6.15	7.43	10.2	14.5	6.84	4.32	3.17	2.29	3.09	
(WY)	1972	1972	1977	1977	1977	1999	1968	1977	1977	1971	1971	1971	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1966 - 1999

ANNUAL TOTAL	4038.5	3883.6	
ANNUAL MEAN	11.1	10.6	16.9
HIGHEST ANNUAL MEAN			27.4
LOWEST ANNUAL MEAN			8.36
HIGHEST DAILY MEAN	78	90	720
LOWEST DAILY MEAN	1.6	2.4	1.6
ANNUAL SEVEN-DAY MINIMUM	2.1	2.8	2.0
INSTANTANEOUS PEAK FLOW		172	(b)930
INSTANTANEOUS PEAK STAGE		14.51	(c)16.61
INSTANTANEOUS LOW FLOW		2.1	1.0
ANNUAL RUNOFF (CFSM)	.66	.64	1.01
ANNUAL RUNOFF (INCHES)	9.00	8.65	13.75
10 PERCENT EXCEEDS	21	19	32
50 PERCENT EXCEEDS	8.3	8.1	13
90 PERCENT EXCEEDS	3.6	4.1	4.5

(a) Aug. 5, 1971, Aug. 2, 1998.

(b) Gage height 11.00 ft, datum then in use.

(c) Present datum; backwater from ice.

(d) Aug. 5, 17, 22, 1971.

(e) Estimated.

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-83-1. Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 594.10 ft above sea level. Nov. 18, 1957 to Oct. 22, 1958, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	243	307	361	e300	481	474	352	384	335	324	253	247
2	238	300	378	e300	468	501	350	373	392	315	249	243
3	230	293	365	e300	514	484	348	365	448	309	246	239
4	229	291	349	e300	562	455	358	357	431	303	248	236
5	233	290	341	e300	581	437	411	357	376	291	252	232
6	351	286	347	e300	542	429	454	355	349	281	254	229
7	465	284	402	e300	494	398	448	361	333	274	254	228
8	475	284	465	e300	466	388	418	366	321	266	257	228
9	426	287	442	e300	454	e380	434	369	307	344	260	227
10	356	396	407	e300	471	e380	505	362	296	393	261	227
11	320	544	377	e300	497	e380	533	361	305	351	259	227
12	303	640	360	e300	612	381	569	361	302	320	254	226
13	295	561	348	e300	864	378	632	389	306	296	266	228
14	287	480	342	e300	870	374	580	390	336	283	355	233
15	284	414	336	e300	722	375	502	369	345	274	346	233
16	280	383	330	e310	654	385	443	350	356	262	320	233
17	285	368	326	e350	594	425	417	356	338	260	291	232
18	372	358	325	e380	551	516	408	405	315	306	281	231
19	449	350	322	e450	513	576	397	459	302	353	277	229
20	430	342	318	e500	476	535	396	474	292	343	274	230
21	386	337	316	e550	444	496	388	445	300	347	272	239
22	347	332	305	e600	408	468	397	407	289	342	269	244
23	328	326	296	e650	e400	443	504	379	279	325	264	240
24	316	320	e300	e680	e400	422	651	407	300	305	262	235
25	307	315	e300	e700	e390	406	735	452	323	292	262	235
26	302	312	e300	e700	382	393	654	444	316	286	264	232
27	299	309	e300	e680	383	384	533	413	318	283	264	229
28	300	307	e300	e650	409	375	456	381	372	277	264	246
29	297	309	e300	629	---	368	420	358	375	268	261	323
30	303	319	e300	573	---	361	399	342	345	262	256	344
31	311	---	e300	520	---	356	---	330	---	256	251	---
TOTAL	10047	10644	10558	13422	14602	13123	14092	11921	10002	9391	8346	7205
MEAN	324	355	341	433	522	423	470	385	333	303	269	240
MAX	475	640	465	700	870	576	735	474	448	393	355	344
MIN	229	284	296	300	382	356	348	330	279	256	246	226
CFSM	.80	.87	.84	1.07	1.28	1.04	1.16	.95	.82	.75	.66	.59
IN.	.92	.98	.97	1.23	1.34	1.20	1.29	1.09	.92	.86	.76	.66

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1957 - 1999, BY WATER YEAR (WY)

	MEAN	382	459	480	456	467	642	663	494	408	311	303	345
MAX	912	906	896	641	760	1449	1224	936	747	523	484	1071	
(WY)	1987	1986	1992	1973	1985	1976	1967	1974	1989	1982	1982	1986	
MIN	226	269	286	252	240	382	315	259	230	202	186	212	
(WY)	1972	1972	1959	1959	1959	1964	1958	1958	1958	1964	1958	1957	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1957 - 1999
ANNUAL TOTAL	136239	133353	
ANNUAL MEAN	373	365	451
HIGHEST ANNUAL MEAN			635
LOWEST ANNUAL MEAN			288
HIGHEST DAILY MEAN	1510	Apr 2	870
LOWEST DAILY MEAN	200	Aug 2	226
ANNUAL SEVEN-DAY MINIMUM	204	Jul 28	227
INSTANTANEOUS PEAK FLOW		(a)956	5400
INSTANTANEOUS PEAK STAGE		(b)4.92	7.46
INSTANTANEOUS LOW FLOW		225	163
ANNUAL RUNOFF (CFSM)	.92	.90	1.11
ANNUAL RUNOFF (INCHES)	12.48	12.22	15.09
10 PERCENT EXCEEDS	568	513	700
50 PERCENT EXCEEDS	335	344	396
90 PERCENT EXCEEDS	220	250	252

(a) Gage height 4.30 ft.

(b) Backwater from ice.

(c) Oct. 5, Sept. 12.

(d) Aug. 18, 19, 1958.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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-81-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 597.66 ft above sea level. Prior to June 12, 1943, nonrecording gage at bridge 4.5 mi upstream at different datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	388	506	587	e520	916	753	631	572	566	474	392	364
2	391	495	615	e520	887	780	627	564	641	464	383	360
3	395	482	633	e530	900	790	623	556	671	465	377	355
4	387	474	606	e540	949	756	648	550	663	458	377	353
5	393	468	590	e560	970	730	703	540	619	446	381	348
6	468	466	594	e580	942	713	824	546	575	481	393	345
7	607	466	678	e590	884	674	896	559	554	511	401	346
8	685	471	719	e590	850	620	858	583	538	547	396	348
9	674	472	754	e600	828	e620	833	580	523	600	396	348
10	573	600	720	e600	820	e630	837	574	507	602	404	352
11	518	719	664	e600	849	652	874	555	501	638	405	356
12	490	818	630	e600	967	643	928	562	501	570	410	355
13	472	894	606	e600	1080	643	993	577	607	506	482	374
14	470	846	590	e600	1230	634	1060	593	687	479	609	388
15	462	726	579	e620	1290	635	1000	582	659	464	708	387
16	457	669	568	e640	1190	651	893	554	636	451	666	371
17	454	652	567	e660	1130	709	795	553	579	459	621	365
18	477	641	562	e680	1080	804	735	586	546	482	467	364
19	506	634	559	e700	1020	894	702	640	525	603	449	362
20	562	612	552	e700	946	950	679	651	508	638	437	381
21	550	596	549	e720	840	936	667	627	494	628	427	382
22	519	583	543	e760	751	898	664	583	485	595	412	387
23	498	573	e540	e800	e700	861	676	583	476	557	401	380
24	487	561	e540	e900	e650	806	702	649	481	520	395	376
25	477	554	e550	e1000	e650	762	723	722	479	486	393	379
26	471	547	e550	e1050	672	732	699	754	486	475	413	380
27	469	540	e550	e1050	668	703	659	701	474	456	406	383
28	468	535	e550	e1050	692	683	627	642	469	437	399	461
29	466	534	e550	e1000	---	667	603	596	510	417	386	523
30	497	555	e550	e1000	---	651	585	562	494	406	375	573
31	496	---	e520	978	---	641	---	545	---	398	367	---
TOTAL	15227	17689	18365	22338	25351	22611	22744	18441	16454	15713	13418	11446
MEAN	491	590	592	721	905	729	758	595	548	507	433	382
MAX	685	894	754	1050	1290	950	1060	754	687	638	708	573
MIN	387	466	520	520	650	620	585	540	469	398	367	345
CFSM	.72	.87	.87	1.06	1.33	1.07	1.11	.87	.81	.74	.64	.56
IN.	.83	.97	1.00	1.22	1.38	1.24	1.24	1.01	.90	.86	.73	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 1999, BY WATER YEAR (WY)

	MEAN	604	710	733	709	723	975	1038	784	676	534	495	548
MAX	1507	1523	1311	1129	1301	1779	1732	1161	1296	1232	826	1880	
(WY)	1987	1986	1992	1985	1984	1976	1993	1974	1993	1969	1994	1986	
MIN	379	439	449	427	440	526	550	425	408	368	354	369	
(WY)	1957	1945	1945	1945	1958	1940	1945	1958	1964	1963	1941	1948	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1939 - 1999

ANNUAL TOTAL	231672		219797		710	
ANNUAL MEAN	635		602		1087	1986
HIGHEST ANNUAL MEAN					472	1958
LOWEST ANNUAL MEAN					6020	Sep 13 1986
HIGHEST DAILY MEAN	2200	Apr 3	1290	Feb 15	310	Aug 9 1941
LOWEST DAILY MEAN	353	Sep 14	345	Sep 6	322	Aug 5 1941
ANNUAL SEVEN-DAY MINIMUM	362	Sep 8	349	Sep 4	6440	Sep 13 1986
INSTANTANEOUS PEAK FLOW			(a)1310	Feb 15	8.07	Sep 13 1986
INSTANTANEOUS PEAK STAGE			(b)4.75	Jan 25	209	Dec 11 1962
INSTANTANEOUS LOW FLOW			343	Sep 6	1.04	
ANNUAL RUNOFF (CFSM)	.93		.88		14.17	
ANNUAL RUNOFF (INCHES)	12.66		12.01		1070	
10 PERCENT EXCEEDS	950		866		632	
50 PERCENT EXCEEDS	561		575		428	
90 PERCENT EXCEEDS	382		390			

(a) Gage height 3.85 ft.

(b) Backwater from ice.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

444351084561801 BEAR LAKE NEAR KALKASKA, MI

LOCATION.--Lat 44°43'51", long 84°56'18", in NW1/4 SE1/4 sec. 17, T.27 N., R.5 W., Kalkaska County, Hydrologic Unit 04060103, on east shore of Bear Lake, 11.7 mi east of Kalkaska.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--August 1994 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Elevation of gage is 1,180 ft above sea level, from topographic map. August 1994 to Sept. 30, 1997, at same site at datum 1.00 ft lower.

REMARKS.--No inlets or outlets.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 2.68 ft, Aug. 26, 28, 1994, present datum; minimum observed, 0.22 ft, Sept. 25, 1999.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 0.98 ft, July 9; minimum observed, 0.22 ft, Sept. 25.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	.73	.74	---	---	---	---	.67	---	.84	---	---
2	---	.71	.73	---	---	---	---	.67	.86	.83	---	---
3	---	.68	.72	---	---	---	---	.67	.85	---	---	---
4	.82	---	---	---	---	---	---	.66	---	---	---	.60
5	---	---	---	---	---	---	---	---	---	---	---	---
6	.97	---	---	---	---	---	---	---	---	---	---	.58
7	---	.65	---	---	---	---	---	---	---	---	---	---
8	---	.66	---	---	---	---	---	---	.86	---	.85	---
9	.94	---	---	---	---	---	---	.69	---	.98	---	---
10	---	---	.77	---	---	---	---	---	.82	---	---	---
11	.92	---	.76	---	---	---	---	---	---	---	.82	.38
12	.91	.72	.70	---	---	---	---	.62	.80	---	---	---
13	---	---	---	---	---	---	---	.62	.90	.89	---	.41
14	.89	.72	---	---	---	---	---	.62	---	---	.79	---
15	---	.72	---	---	---	---	---	---	---	---	.79	.38
16	.87	---	.64	---	---	---	---	---	.87	.88	---	---
17	---	.75	---	---	---	---	---	.70	.86	---	---	---
18	.86	---	---	---	---	---	---	.69	.86	---	---	.34
19	---	.73	---	---	---	---	---	.68	.85	---	---	---
20	.85	---	---	---	---	---	---	.68	.84	.93	.74	---
21	.85	---	---	---	---	---	---	.68	---	.93	.74	.28
22	---	.71	---	---	---	---	---	---	.86	.92	---	---
23	.83	.70	---	---	---	---	.76	.69	.78	---	---	.26
24	---	.68	---	---	---	---	---	---	.86	---	.66	---
25	.80	---	---	---	---	---	.74	---	---	---	---	.22
26	---	---	---	---	---	---	.73	---	---	---	---	---
27	.78	.67	---	---	---	---	.74	.74	.79	---	.64	---
28	.76	---	---	---	---	---	---	---	---	---	---	---
29	---	.67	---	---	---	---	.69	---	---	---	---	---
30	---	---	---	---	---	---	---	---	.82	---	---	.30
31	---	---	---	---	---	---	---	.76	---	---	---	---

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 right bank 50 ft downstream from bridge on State Highway 37, 200 ft upstream from Wheeler Creek, 0.9 mi north of Sherman, and at mile 60.8.

DRAINAGE AREA.--857 mi².

WATER-DISCHARGE RECORDS

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. WDR MI-88-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 804.24 ft above sea level. Prior to Apr. 13, 1934, at various datums. Apr. 14, 1934 to Oct. 25, 1990, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	811	797	1020	e750	986	988	1220	885	846	894	950	706
2	795	794	1060	e700	976	974	1230	879	860	871	920	703
3	786	790	1060	e650	979	966	1230	869	964	839	881	701
4	778	788	1040	e700	1010	958	1390	858	1240	831	877	697
5	783	788	1000	e750	993	938	1540	853	1230	817	875	690
6	886	789	987	e900	967	922	1460	862	1160	1130	853	685
7	1060	793	1070	e850	957	872	1390	885	1030	1280	837	685
8	1230	797	1110	e800	942	852	1350	908	916	1150	844	691
9	1230	798	1090	e850	941	902	1320	902	859	1360	843	700
10	1140	933	1050	e900	962	901	1280	885	837	1450	854	707
11	1010	1160	1020	e900	1030	872	1300	866	825	1360	853	701
12	921	1180	995	e850	1370	863	1380	853	821	1240	852	699
13	882	1130	982	e850	1470	860	1460	847	860	1100	861	742
14	865	1070	976	e850	1340	858	1490	834	1020	996	860	745
15	849	1010	962	e900	1260	858	1460	823	1140	935	867	735
16	840	998	952	e900	1240	867	1370	819	1180	903	846	720
17	835	1010	954	e950	1220	917	1250	840	1110	906	822	706
18	846	1030	954	e1000	1170	1110	1170	865	1000	915	805	700
19	835	1040	947	e1050	1100	1150	1110	886	909	919	806	700
20	827	1040	943	e1050	1040	1130	1060	862	861	921	794	748
21	817	1020	935	e1100	973	1140	1040	835	837	982	782	755
22	815	996	926	1110	e850	1140	1040	820	818	1000	774	741
23	818	970	e750	1190	e850	1100	1070	831	805	1020	764	738
24	814	946	e750	1360	e850	1090	1040	885	810	1090	760	733
25	808	927	e750	1300	e900	1080	998	930	832	1180	760	721
26	804	912	e800	1200	934	1040	972	1040	826	1090	780	715
27	799	900	e900	1140	907	1020	951	1090	801	1020	763	740
28	804	894	e950	1110	949	1040	923	1050	809	963	753	878
29	801	890	e1000	1080	---	1090	900	995	889	918	737	1010
30	803	924	e950	1050	---	1140	892	903	888	896	721	998
31	799	---	e850	1020	---	1180	---	852	---	935	711	---
TOTAL	27091	28114	29733	29810	29166	30818	36286	27512	27983	31911	25405	22190
MEAN	874	937	959	962	1042	994	1210	887	933	1029	820	740
MAX	1230	1180	1110	1360	1470	1180	1540	1090	1240	1450	950	1010
MIN	778	788	750	650	850	852	892	819	801	817	711	685
CFSM	1.02	1.09	1.12	1.12	1.22	1.16	1.41	1.04	1.09	1.20	.96	.86
IN.	1.18	1.22	1.29	1.29	1.27	1.34	1.58	1.19	1.21	1.39	1.10	.96

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1999, BY WATER YEAR (WY)

MEAN	976	1054	1038	1003	988	1203	1537	1204	1054	941	887	916
MAX	1803	1597	1417	1224	1458	1811	2198	1742	1603	1336	1200	1610
(WY)	1987	1989	1912	1916	1938	1913	1916	1904	1954	1994	1903	1986
MIN	773	780	848	754	604	808	1058	834	802	740	722	717
(WY)	1965	1982	1979	1936	1936	1940	1987	1958	1958	1936	1964	1966

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1903 - 1999

ANNUAL TOTAL	364664	346019	
ANNUAL MEAN	999	948	(a)1066
HIGHEST ANNUAL MEAN			1261
LOWEST ANNUAL MEAN			888
HIGHEST DAILY MEAN	2610	1540	3500
LOWEST DAILY MEAN	750	650	540
ANNUAL SEVEN-DAY MINIMUM	758	693	549
INSTANTANEOUS PEAK FLOW		(b)1560	(c)3570
INSTANTANEOUS PEAK STAGE		(d)13.57	(f)15.25
ANNUAL RUNOFF (CFSM)	1.17	1.11	1.24
ANNUAL RUNOFF (INCHES)	15.83	15.02	16.89
10 PERCENT EXCEEDS	1230	1180	1420
50 PERCENT EXCEEDS	944	906	983
90 PERCENT EXCEEDS	784	750	820

(a) Does not include water years 1931, 1934.

(b) Gage height 13.05 ft.

(c) Gage height 7.1 ft, from graph based on gage readings, datum then in use.

(d) Backwater from ice.

(e) Estimated.

(f) Does not include water years 1903-1990.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1996 to current year.

DISSOLVED OXYGEN: October 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 23.5°C, July 5, 6, 1999; minimum, -0.5°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum, 15.3 mg/L, Nov. 15, 1996; minimum, 5.4 mg/L, Oct. 30, 1996.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 23.5°C, July 5, 6; minimum, -0.5°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum recorded, 14.9 mg/L, Jan. 30, 31; minimum recorded, 6.6 mg/L, July 6, 7.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	12.0	11.0	11.5	9.5	8.5	9.0	8.0	7.0	7.5	-5	-5	-5
2	11.0	10.0	10.5	8.5	7.0	8.0	7.5	7.0	7.0	-5	-5	-5
3	10.5	9.5	10.0	7.0	5.5	6.0	8.0	7.0	7.5	-5	-5	-5
4	10.0	8.5	9.5	5.5	5.0	5.0	7.5	7.0	7.5	-5	-5	-5
5	10.0	9.0	9.5	6.0	4.5	4.5	8.0	7.5	7.5	-5	-5	-5
6	11.5	10.0	10.5	5.0	4.0	4.5	8.5	7.5	8.0	-5	-5	-5
7	11.5	11.0	11.0	5.5	5.0	5.0	7.5	6.0	6.5	-5	-5	-5
8	11.5	10.5	11.0	5.5	5.0	5.0	6.0	4.5	5.0	-5	-5	-5
9	11.0	10.0	10.5	6.0	5.5	5.5	4.5	3.5	3.5	-5	-5	-5
10	10.5	9.0	10.0	6.5	6.0	6.0	3.5	2.5	3.0	-5	-5	-5
11	10.5	9.0	10.0	6.0	5.0	5.5	2.5	2.0	2.5	-5	-5	-5
12	11.0	9.5	10.5	5.0	4.0	4.5	3.0	2.5	2.5	-5	-5	-5
13	10.5	10.0	10.5	4.0	3.0	3.5	2.5	2.0	2.5	-5	-5	-5
14	10.0	9.5	9.5	4.5	3.5	4.0	2.5	1.5	2.0	-5	-5	-5
15	9.5	8.5	9.0	5.0	4.5	4.5	3.0	2.5	2.5	-5	-5	-5
16	10.5	8.5	9.5	4.5	3.5	4.0	3.5	2.5	3.0	.0	-5	-5
17	12.0	10.0	11.0	4.5	3.5	4.0	3.0	2.0	3.0	.0	-5	-5
18	12.5	11.0	12.0	5.0	4.5	4.5	2.0	1.5	2.0	.0	-5	-5
19	11.5	10.5	11.0	5.5	5.0	5.0	2.5	2.0	2.0	.0	-5	-5
20	10.5	9.0	9.5	5.0	4.0	4.5	2.0	1.5	1.5	.0	-5	-5
21	9.0	8.0	8.5	4.0	3.5	4.0	1.5	1.0	1.5	.0	-5	-5
22	8.5	7.5	8.0	4.5	3.5	4.0	1.0	-5	.0	.0	-5	.0
23	8.5	7.0	8.0	5.5	4.5	5.0	-5	-5	-5	.5	.0	.0
24	9.0	7.5	8.5	5.0	4.5	5.0	-5	-5	-5	.5	.0	.0
25	9.0	8.5	9.0	5.0	4.5	4.5	-5	-5	-5	1.5	.0	1.0
26	10.0	9.0	9.5	4.5	4.0	4.0	-5	-5	-5	1.5	1.0	1.5
27	10.0	8.5	9.5	4.0	3.0	3.5	-5	-5	-5	1.5	1.5	1.5
28	11.0	10.0	10.5	4.5	3.0	3.5	-5	-5	-5	2.0	1.5	2.0
29	10.0	8.5	9.0	7.0	4.5	5.5	-5	-5	-5	2.0	1.5	1.5
30	9.5	9.0	9.0	8.5	7.0	8.0	-5	-5	-5	1.5	1.0	1.0
31	9.0	9.0	9.0	---	---	---	-5	-5	-5	1.5	.5	1.0
MONTH	12.5	7.0	9.8	9.5	3.0	5.0	8.5	-5	2.7	2.0	-5	.0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	1.0	.5	.5	2.5	1.5	2.0	10.0	9.0	9.5	14.5	11.5	13.0	
2	2.0	1.0	1.5	2.0	1.0	1.5	11.5	9.5	10.5	15.5	12.0	13.5	
3	3.0	2.0	2.0	2.0	1.5	2.0	12.5	10.5	11.5	16.0	13.0	14.5	
4	3.0	2.0	2.5	2.5	1.5	2.0	12.0	9.5	10.5	17.0	13.5	15.5	
5	2.0	1.0	1.5	2.0	1.5	2.0	9.5	8.5	9.0	16.0	14.5	15.5	
6	2.0	1.5	1.5	1.5	.5	1.0	9.0	8.0	8.0	15.5	14.5	15.0	
7	2.0	1.5	1.5	.5	-.5	.0	8.5	7.0	8.0	14.5	13.5	13.5	
8	2.5	1.5	2.0	.5	-.5	.0	9.5	7.5	8.5	13.5	12.0	12.5	
9	3.0	2.5	2.5	1.0	.0	.5	9.5	8.5	9.0	13.5	11.0	12.5	
10	3.5	2.0	2.5	1.5	.0	.5	9.5	8.0	8.5	14.5	11.0	12.5	
11	4.5	3.0	4.0	2.0	.0	1.0	9.0	6.0	7.5	14.5	12.0	13.5	
12	4.5	2.0	3.0	2.5	.5	1.5	6.5	5.0	6.0	14.0	12.0	12.5	
13	2.0	1.0	1.5	2.5	.5	1.5	7.5	5.0	6.5	14.0	10.5	12.0	
14	1.0	.0	.5	3.5	1.0	2.5	9.0	6.5	7.5	15.0	11.0	13.0	
15	2.0	.5	1.0	4.0	2.0	3.0	9.0	8.0	8.5	15.5	13.0	14.0	
16	2.5	1.5	2.0	5.5	3.0	4.0	9.5	8.5	9.0	17.0	14.0	15.5	
17	2.5	2.0	2.5	6.5	4.0	5.0	9.5	8.5	9.0	18.5	15.5	17.0	
18	2.5	2.0	2.0	6.0	4.5	5.0	9.5	8.5	9.0	17.5	15.5	16.5	
19	2.0	1.5	1.5	5.5	4.0	4.5	8.5	8.0	8.5	15.5	14.5	15.0	
20	1.5	.5	1.0	5.0	3.5	4.5	8.5	7.5	8.0	16.5	13.5	15.0	
21	.5	-.5	.0	5.0	4.0	4.5	9.0	8.0	8.5	16.0	15.0	15.5	
22	.0	-.5	-.5	4.0	3.5	4.0	9.0	8.5	9.0	17.0	14.5	16.0	
23	.0	-.5	-.5	4.5	2.5	3.5	9.5	8.0	9.0	15.5	13.5	14.0	
24	.0	-.5	.0	4.5	3.5	4.0	10.5	8.0	9.0	13.5	11.0	12.0	
25	1.0	.0	.5	4.0	3.0	3.5	11.0	8.5	10.0	11.0	9.5	10.0	
26	2.0	.0	1.0	5.0	2.5	3.5	12.5	9.5	11.0	12.5	9.0	11.0	
27	3.0	1.5	2.5	6.0	3.5	4.5	12.5	10.5	11.5	14.5	10.5	12.5	
28	3.0	2.0	2.5	7.0	5.0	6.0	13.0	11.0	12.0	16.5	13.0	15.0	
29	---	---	---	7.5	6.5	6.5	13.5	11.0	12.5	18.5	14.5	16.5	
30	---	---	---	8.0	6.5	7.5	14.0	10.5	12.5	19.0	16.5	17.5	
31	---	---	---	9.5	7.5	8.5	---	---	---	19.0	17.5	18.0	
MONTH	4.5	-.5	1.5	9.5	-.5	3.2	14.0	5.0	9.2	19.0	9.0	14.2	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	19.0	17.5	18.0	18.0	16.5	17.0	21.5	19.5	20.5	17.5	15.0	16.5
2	18.5	16.0	17.0	18.5	15.5	17.0	20.5	18.5	19.5	18.0	15.0	16.5
3	17.5	15.0	16.0	18.5	17.0	17.5	19.0	17.0	18.0	18.5	16.0	17.0
4	17.0	15.0	16.0	21.5	17.5	19.5	19.0	16.5	18.0	19.0	16.5	18.0
5	18.5	15.5	17.0	23.5	20.5	22.0	19.0	16.5	18.0	19.0	16.5	18.0
6	21.0	18.0	19.5	23.5	21.5	22.5	19.5	16.5	18.0	18.5	16.5	17.5
7	22.0	19.5	21.0	22.5	20.5	21.5	18.5	16.5	17.0	17.0	14.5	16.0
8	22.5	19.5	21.0	21.5	19.0	20.0	18.0	16.0	17.0	16.5	14.5	15.5
9	22.0	20.0	21.0	19.0	17.5	18.0	17.0	15.0	16.0	15.5	14.0	14.5
10	22.0	19.5	21.0	19.0	16.5	17.5	16.0	15.5	16.0	14.0	13.0	14.0
11	22.5	20.5	21.5	19.0	16.0	17.5	18.0	15.0	16.5	15.0	12.5	14.0
12	22.5	20.5	21.5	19.5	16.5	18.0	18.5	16.5	17.5	14.5	12.5	13.5
13	21.5	18.5	20.0	19.5	17.0	18.5	18.0	17.0	17.5	15.0	13.5	14.0
14	18.5	16.5	18.0	19.5	18.0	18.5	18.5	15.5	17.0	14.5	13.5	14.0
15	16.5	14.5	16.0	21.0	18.0	19.5	18.5	15.5	17.0	14.0	12.5	13.0
16	16.0	14.5	15.0	22.5	19.5	21.0	18.0	16.5	17.5	13.0	11.5	12.0
17	15.5	13.0	14.0	22.0	20.5	21.0	18.5	17.0	17.5	13.0	10.5	11.5
18	17.0	13.5	15.0	21.5	19.5	20.5	17.5	17.0	17.0	13.0	10.5	12.0
19	17.0	14.5	16.0	21.0	20.0	20.0	19.0	16.5	17.5	13.5	11.0	12.5
20	18.0	15.0	16.5	21.0	18.5	19.5	18.5	16.0	17.5	13.5	12.5	13.0
21	19.0	16.0	17.5	20.0	18.5	19.0	18.5	16.0	17.5	13.0	11.5	12.0
22	20.0	17.0	18.5	21.5	18.0	19.5	18.5	16.0	17.5	12.0	10.0	11.0
23	20.5	18.0	19.5	20.5	19.5	20.0	18.0	16.5	17.0	12.5	11.0	12.0
24	21.5	19.0	20.0	22.5	19.5	20.5	18.5	16.5	17.5	12.0	11.0	11.5
25	22.0	19.0	20.5	22.5	20.0	21.0	18.0	17.0	17.5	12.0	10.0	11.0
26	22.0	19.0	20.5	21.5	20.0	21.0	18.5	17.0	18.0	13.5	11.0	12.5
27	22.5	20.0	21.0	22.0	19.5	21.0	19.5	17.0	18.5	13.5	13.0	13.0
28	21.5	20.0	21.0	21.5	19.0	20.5	20.0	18.0	19.0	13.0	12.5	12.5
29	20.5	18.5	19.5	22.0	19.5	20.5	19.0	17.0	18.0	12.5	11.5	12.0
30	19.0	17.0	18.0	23.0	19.5	21.5	17.5	15.0	16.5	11.5	10.5	11.0
31	---	---	---	22.0	21.0	21.5	17.0	14.5	16.0	---	---	---
MONTH	22.5	13.0	18.6	23.5	15.5	19.8	21.5	14.5	17.5	19.0	10.0	13.7

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI--Continued

OXYGEN DISSOLVED (MGL), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	10.6	9.4	10.0	11.1	10.3	10.7	10.4	9.9	10.2	13.5	13.1	13.3			
2	11.2	10.4	10.7	11.3	10.8	11.1	10.5	10.1	10.3	13.2	12.9	13.0			
3	11.6	10.8	11.2	12.0	11.2	11.7	10.2	10.1	10.2	12.9	12.6	12.7			
4	11.3	10.3	10.8	12.3	11.8	12.0	10.3	10.0	10.1	12.6	12.4	12.5			
5	10.9	10.1	10.5	12.9	12.1	12.4	10.2	9.9	10.1	12.6	12.1	12.4			
6	10.8	9.9	10.5	12.9	12.5	12.7	9.9	9.7	9.8	12.5	12.1	12.4			
7	11.2	9.9	10.8	12.8	12.4	12.6	10.6	9.8	10.2	12.5	12.3	12.4			
8	12.2	10.7	11.3	12.6	12.4	12.5	11.1	10.6	10.9	12.4	12.2	12.3			
9	11.3	10.7	10.9	12.4	12.2	12.3	11.6	11.1	11.4	12.5	12.2	12.4			
10	11.0	10.4	10.7	12.2	11.6	11.9	11.8	11.5	11.6	12.5	12.2	12.3			
11	11.8	10.9	11.5	12.1	11.6	11.8	12.0	11.7	11.8	12.2	11.8	12.0			
12	11.5	10.7	11.1	12.6	12.1	12.4	11.8	11.6	11.8	12.1	11.7	11.9			
13	11.4	10.6	11.1	12.9	12.3	12.7	11.7	11.6	11.6	12.3	12.0	12.1			
14	11.1	10.0	10.5	12.8	11.9	12.3	11.8	11.5	11.7	12.3	12.0	12.1			
15	10.2	9.6	9.8	12.1	11.8	11.9	12.1	11.5	11.7	12.4	12.0	12.3			
16	11.3	10.0	10.6	12.1	11.7	11.9	11.9	11.6	11.7	12.3	11.6	11.8			
17	11.2	9.7	10.5	12.1	11.7	12.0	12.3	11.7	11.9	11.8	11.2	11.5			
18	10.0	9.4	9.7	12.5	11.6	11.8	12.6	12.2	12.4	11.9	11.3	11.7			
19	10.5	8.8	9.7	11.6	11.1	11.3	13.0	12.4	12.7	12.9	11.8	12.3			
20	10.7	9.4	10.2	11.3	11.0	11.1	13.6	13.0	13.3	12.8	12.2	12.6			
21	12.1	10.2	11.5	11.8	11.0	11.5	13.9	13.5	13.6	12.8	12.4	12.7			
22	12.4	11.5	12.1	12.0	11.5	11.8	13.9	12.7	13.3	13.1	12.5	12.7			
23	11.8	10.9	11.4	11.6	11.3	11.4	14.0	12.7	13.5	13.8	12.9	13.3			
24	12.0	10.7	11.4	12.0	11.3	11.7	13.9	13.6	13.8	13.9	13.3	13.6			
25	11.9	10.9	11.3	11.5	11.2	11.3	13.7	13.5	13.5	14.7	13.9	14.4			
26	11.3	10.9	11.1	11.6	11.2	11.4	13.5	13.2	13.3	14.7	14.3	14.6			
27	11.2	10.4	11.0	11.8	11.4	11.6	13.5	12.8	13.2	14.7	14.0	14.4			
28	11.0	10.2	10.7	11.8	11.4	11.6	13.1	12.8	12.9	14.1	13.7	13.9			
29	11.0	10.6	10.8	11.4	10.6	11.1	13.4	12.8	13.1	14.3	13.2	13.6			
30	11.1	10.6	10.8	10.6	9.9	10.1	13.6	13.4	13.5	14.9	13.9	14.6			
31	11.0	10.7	10.8	—	—	—	13.6	13.3	13.5	14.9	14.4	14.7			
MONTH	12.4	8.8	10.8	12.9	9.9	11.8	14.0	9.7	12.0	14.9	11.2	12.9			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH				APRIL				MAY
1	14.6	13.9	14.2	--	--	--	--	--	--	10.1	9.2	9.7
2	13.9	12.8	13.3	--	--	--	--	--	--	10.0	9.3	9.7
3	13.2	12.4	12.9	--	--	--	--	--	--	9.9	9.2	9.6
4	12.9	12.2	12.5	--	--	--	--	--	--	9.6	8.8	9.2
5	13.0	12.6	12.8	--	--	--	--	--	--	9.2	8.5	8.9
6	13.0	12.7	12.8	--	--	--	--	--	--	9.1	8.3	8.8
7	12.8	12.7	12.7	--	--	--	--	--	--	9.6	8.9	9.3
8	12.8	12.4	12.6	--	--	--	--	--	--	9.8	9.2	9.5
9	12.4	12.2	12.4	--	--	--	--	--	--	10.3	9.4	9.8
10	12.6	12.2	12.4	--	--	--	--	--	--	10.2	9.6	9.9
11	12.3	11.5	12.0	--	--	--	--	--	--	10.0	9.4	9.7
12	12.0	11.5	11.8	--	--	--	--	--	--	10.0	9.1	9.5
13	12.7	11.8	12.4	--	--	--	--	--	--	10.2	9.5	9.8
14	12.7	11.5	12.2	--	--	--	--	--	--	10.0	9.4	9.7
15	13.4	12.4	12.8	--	--	--	--	--	--	9.9	8.9	9.4
16	12.9	11.9	12.6	12.9	11.7	12.6	--	--	--	9.6	8.9	9.3
17	12.7	11.6	12.3	11.9	10.9	11.5	--	--	--	8.9	7.5	8.0
18	12.6	11.9	12.3	11.5	10.8	11.2	--	--	--	8.7	7.6	8.3
19	13.0	12.0	12.6	11.8	11.4	11.7	--	--	--	9.5	8.3	8.9
20	13.3	12.4	12.9	12.0	11.4	11.7	--	--	--	9.4	8.4	9.0
21	13.5	11.9	12.8	11.5	11.1	11.3	--	--	--	9.6	8.8	9.3
22	13.1	10.8	12.3	12.1	11.3	11.7	--	--	--	10.1	9.2	9.6
23	13.8	12.1	13.2	12.2	11.6	12.0	--	--	--	9.7	9.2	9.5
24	14.0	12.8	13.5	12.0	11.5	11.8	--	--	--	10.2	9.4	9.7
25	14.0	13.2	13.6	12.0	10.4	11.4	--	--	--	10.4	9.4	10.0
26	14.1	13.0	13.5	--	--	--	--	--	--	10.1	9.3	9.8
27	--	--	--	--	--	--	--	--	--	9.4	8.7	9.2
28	--	--	--	--	--	--	--	--	--	8.9	8.3	8.7
29	--	--	--	--	--	--	--	--	--	8.5	8.0	8.3
30	--	--	--	--	--	--	10.0	9.2	9.6	8.2	7.7	8.0
31	--	--	--	--	--	--	--	--	--	8.1	7.5	7.8
MONTH	--	--	--	--	--	--	--	--	--	10.4	7.5	9.2

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124000 MANISTEE RIVER NEAR SHERMAN, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.2	7.5	7.8	7.4	6.7	6.9	8.5	7.5	8.0	9.1	8.4	8.7
2	8.0	7.6	7.8	7.4	6.8	7.0	8.6	7.6	8.1	9.1	8.3	8.7
3	8.6	8.0	8.3	7.9	7.1	7.6	8.5	7.8	8.2	9.0	8.3	8.6
4	8.3	8.0	8.1	8.4	7.6	8.0	8.8	8.1	8.4	8.9	8.2	8.5
5	8.1	7.7	8.0	8.1	7.6	7.8	8.6	7.9	8.3	8.7	8.1	8.4
6	7.8	7.4	7.6	7.7	6.6	7.3	8.8	8.0	8.4	8.6	8.0	8.3
7	7.8	7.3	7.5	7.4	6.6	7.1	8.8	8.1	8.4	9.0	8.4	8.7
8	8.0	7.2	7.6	7.6	7.0	7.3	9.1	8.3	8.7	8.9	8.2	8.5
9	7.9	7.2	7.6	7.7	7.4	7.5	9.5	8.7	9.1	8.9	8.3	8.6
10	8.1	7.4	7.7	8.0	7.6	7.8	9.0	8.5	8.8	9.2	8.5	8.8
11	8.1	7.3	7.6	8.1	7.8	8.0	9.2	8.6	8.9	9.3	8.6	8.9
12	8.0	7.3	7.7	8.3	7.8	8.0	9.2	8.4	8.8	9.3	8.8	9.0
13	7.7	7.4	7.6	8.2	7.6	7.8	8.6	8.0	8.3	9.2	8.6	8.9
14	8.2	7.7	7.9	—	—	—	9.0	8.3	8.6	8.8	8.1	8.4
15	8.8	8.2	8.5	—	—	—	9.1	8.4	8.8	8.5	7.8	8.2
16	8.7	8.4	8.5	—	—	—	8.9	8.3	8.5	8.8	8.1	8.3
17	9.3	8.5	9.0	—	—	—	8.7	8.2	8.4	9.5	8.8	9.3
18	9.3	8.7	9.0	—	—	—	8.6	8.0	8.3	10.0	9.4	9.7
19	9.2	8.5	8.9	8.1	7.4	7.7	8.9	8.1	8.4	9.8	8.9	9.6
20	8.9	8.1	8.5	8.2	7.5	7.8	8.8	8.1	8.4	9.6	9.1	9.3
21	8.6	7.8	8.2	7.7	7.3	7.5	8.8	8.1	8.4	10.1	9.4	9.7
22	9.3	7.7	8.6	—	—	—	8.8	8.0	8.4	10.2	9.7	9.9
23	8.9	8.0	8.4	—	—	—	8.6	8.0	8.3	9.8	9.4	9.6
24	8.3	7.7	8.0	7.8	7.4	7.7	8.8	8.1	8.4	9.8	9.3	9.5
25	8.1	7.4	7.8	7.9	7.2	7.5	8.7	8.0	8.3	10.1	9.4	9.7
26	9.7	7.6	8.8	8.0	7.2	7.6	8.6	8.0	8.3	9.5	9.1	9.4
27	8.8	7.9	8.4	8.0	7.4	7.7	8.7	8.0	8.3	9.2	8.8	9.0
28	9.1	7.7	8.3	8.2	7.4	7.8	8.5	7.8	8.1	9.3	8.9	9.1
29	9.1	7.7	8.3	8.3	7.4	7.8	8.8	7.9	8.3	9.1	8.1	8.7
30	7.9	7.3	7.6	8.3	7.4	7.8	9.1	8.3	8.7	8.2	7.9	8.1
31	—	—	—	8.0	7.3	7.6	9.2	8.5	8.8	—	—	—
MONTH	9.7	7.2	8.1	—	—	—	9.5	7.5	8.5	10.2	7.8	8.9

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: December 1996 to current year.

DISSOLVED OXYGEN: December 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 23.0°C, July 31, 1999, Aug. 1, 2, 1999; minimum, 0.0°C, Feb. 10-13, 1997.

DISSOLVED OXYGEN: Maximum, 15.3 mg/L, Mar. 15, 1999; minimum, 6.4 mg/L, July 9, 10, 1998.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 23.0°C, July 31, Aug. 1, 2; minimum, 0.5°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 15.3 mg/L, Mar. 15; minimum, 6.6 mg/L, July 31.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER			DECEMBER			JANUARY		
1	17.0	16.5	16.5	11.0	10.5	11.0	5.0	5.0	5.0	.5	.5	.5
2	16.5	16.5	16.5	10.5	10.5	10.5	5.0	5.0	5.0	.5	.5	.5
3	16.5	16.0	16.0	10.5	10.0	10.5	5.0	5.0	5.0	.5	.5	.5
4	16.0	16.0	16.0	10.0	10.0	10.0	5.5	5.0	5.5	.5	.5	.5
5	16.0	15.5	16.0	10.0	9.5	9.5	5.5	5.5	5.5	.5	.5	.5
6	15.5	15.5	15.5	9.5	9.0	9.5	6.0	5.5	5.5	.5	.5	.5
7	15.5	15.0	15.0	9.0	9.0	9.0	6.0	6.0	6.0	.5	.5	.5
8	15.0	14.0	14.5	9.0	8.5	9.0	6.0	6.0	6.0	.5	.5	.5
9	14.0	13.5	14.0	8.5	8.5	8.5	6.0	5.5	5.5	.5	.5	.5
10	13.5	13.0	13.5	8.5	8.0	8.0	5.5	5.5	5.5	.5	.5	.5
11	13.0	13.0	13.0	8.0	7.5	8.0	5.5	5.5	5.5	.5	.5	.5
12	13.0	12.5	12.5	7.5	7.0	7.5	5.5	5.5	5.5	.5	.5	.5
13	12.5	12.5	12.5	7.0	6.5	7.0	5.5	5.5	5.5	.5	.5	.5
14	12.5	12.5	12.5	6.5	6.0	6.5	5.5	5.5	5.5	.5	.5	.5
15	12.5	12.0	12.0	6.0	6.0	6.0	5.5	5.5	5.5	.5	.5	.5
16	12.0	12.0	12.0	6.0	6.0	6.0	5.5	5.0	5.5	.5	.5	.5
17	12.0	12.0	12.0	6.0	5.5	5.5	5.0	5.0	5.0	.5	.5	.5
18	12.0	12.0	12.0	5.5	5.5	5.5	5.0	4.5	5.0	.5	.5	.5
19	12.0	12.0	12.0	5.5	5.0	5.5	4.5	4.5	4.5	.5	.5	.5
20	12.0	12.0	12.0	5.5	5.0	5.0	4.5	4.0	4.0	.5	.5	.5
21	12.0	11.5	12.0	5.0	5.0	5.0	4.0	3.5	4.0	.5	.5	.5
22	11.5	11.5	11.5	5.0	4.5	4.5	3.5	2.5	3.0	.5	.5	.5
23	11.5	11.5	11.5	5.0	4.5	4.5	3.0	2.5	3.0	.5	.5	.5
24	11.5	11.5	11.5	4.5	4.5	4.5	2.5	1.5	2.0	.5	.5	.5
25	11.5	11.5	11.5	4.5	4.5	4.5	2.0	1.5	1.5	.5	.5	.5
26	11.5	11.5	11.5	4.5	4.5	4.5	1.5	1.0	1.5	.5	.5	.5
27	11.5	11.0	11.0	4.5	4.5	4.5	1.0	1.0	1.0	.5	.5	.5
28	11.5	11.0	11.0	4.5	4.0	4.5	1.0	1.0	1.0	.5	.5	.5
29	11.0	11.0	11.0	4.5	4.5	4.5	1.0	1.0	1.0	.5	.5	.5
30	11.0	11.0	11.0	5.0	4.5	4.5	1.0	.5	1.0	.5	.5	.5
31	11.0	11.0	11.0	—	—	—	1.0	.5	.5	.5	.5	.5
MONTH	17.0	11.0	12.9	11.0	4.0	6.8	6.0	.5	4.0	.5	.5	.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH				APRIL				MAY
1	1.0	.5	.5	2.0	2.0	2.0	4.5	4.0	4.5	12.0	11.0	11.5
2	1.0	.5	1.0	2.0	1.5	1.5	5.0	4.5	4.5	12.0	11.0	11.5
3	1.0	1.0	1.0	1.5	1.5	1.5	7.0	5.0	5.5	12.0	11.5	11.5
4	1.0	1.0	1.0	1.5	1.5	1.5	7.5	6.0	7.0	12.5	11.5	12.0
5	1.0	1.0	1.0	2.0	1.5	1.5	8.0	7.5	8.0	13.0	12.5	12.5
6	1.0	1.0	1.0	2.0	1.5	1.5	8.5	8.0	8.0	13.0	12.0	12.5
7	1.5	1.0	1.0	2.0	1.5	2.0	8.5	7.5	8.0	12.5	11.5	12.0
8	1.5	1.0	1.5	2.0	1.5	2.0	9.0	8.0	8.5	12.5	12.5	12.5
9	1.5	1.5	1.5	2.0	1.5	2.0	9.0	8.5	9.0	13.0	12.5	13.0
10	1.5	1.5	1.5	2.0	2.0	2.0	9.0	8.5	9.0	13.5	13.0	13.5
11	1.5	1.5	1.5	2.0	1.5	2.0	9.0	8.5	8.5	14.0	13.5	14.0
12	1.5	1.5	1.5	2.0	1.5	2.0	9.0	8.5	8.5	14.0	14.0	14.0
13	1.5	1.5	1.5	2.0	1.5	1.5	9.0	8.5	9.0	14.5	14.0	14.0
14	1.5	1.5	1.5	1.5	1.5	1.5	9.5	9.0	9.0	14.5	14.0	14.0
15	2.0	1.5	1.5	2.0	1.5	1.5	9.5	9.0	9.0	14.5	14.0	14.5
16	2.0	2.0	2.0	2.0	1.5	1.5	9.5	9.5	9.5	14.5	14.0	14.5
17	2.0	2.0	2.0	2.0	1.5	2.0	9.5	9.0	9.5	14.5	14.0	14.5
18	2.0	2.0	2.0	2.0	1.5	2.0	9.5	9.0	9.0	14.5	14.0	14.5
19	2.0	2.0	2.0	2.0	2.0	2.0	9.0	9.0	9.0	15.0	14.5	15.0
20	2.0	2.0	2.0	2.0	2.0	2.0	9.0	9.0	9.0	15.0	15.0	15.0
21	2.0	2.0	2.0	2.0	2.0	2.0	9.0	9.0	9.0	15.5	15.0	15.0
22	2.0	2.0	2.0	2.5	2.0	2.5	9.5	9.0	9.0	16.0	15.0	15.5
23	2.0	2.0	2.0	2.5	2.5	2.5	9.0	8.5	9.0	16.0	15.5	15.5
24	2.0	2.0	2.0	2.5	2.5	2.5	9.5	9.0	9.0	15.5	15.0	15.5
25	2.0	2.0	2.0	3.0	2.5	3.0	9.0	9.0	9.0	15.0	15.0	15.0
26	2.0	2.0	2.0	3.0	3.0	3.0	10.0	9.0	9.0	15.5	14.5	15.0
27	2.0	2.0	2.0	3.5	3.0	3.5	10.0	9.5	9.5	15.5	15.0	15.0
28	2.0	2.0	2.0	4.0	3.5	3.5	10.5	10.0	10.0	15.5	15.0	15.5
29	---	---	---	4.0	3.5	4.0	11.0	10.0	10.5	15.0	15.0	15.0
30	---	---	---	4.0	4.0	4.0	11.5	10.5	11.0	15.5	15.0	15.0
31	---	---	---	4.0	3.5	4.0	---	---	---	15.5	15.0	15.0
MONTH	2.0	.5	1.6	4.0	1.5	2.3	11.5	4.0	8.6	16.0	11.0	14.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY				AUGUST			SEPTEMBER	
1	16.0	15.0	15.5	20.5	20.0	20.0	23.0	22.5	22.5	19.5	19.5	19.5
2	16.5	16.0	16.0	20.0	20.0	20.0	23.0	22.5	22.5	19.5	19.5	19.5
3	16.5	16.0	16.5	20.5	20.0	20.0	22.5	22.0	22.0	19.5	19.0	19.5
4	16.5	16.0	16.5	20.5	19.5	20.0	22.0	22.0	22.0	19.5	19.5	19.5
5	17.0	16.0	16.5	20.5	19.5	20.0	22.0	22.0	22.0	19.5	19.5	19.5
6	17.0	16.5	16.5	21.0	19.5	20.5	22.0	21.5	22.0	19.5	19.5	19.5
7	17.5	16.5	17.0	21.5	21.0	21.0	22.0	21.5	21.5	19.5	19.0	19.5
8	18.5	17.5	18.0	22.0	21.5	21.5	22.0	21.5	21.5	19.0	18.5	19.0
9	19.0	18.5	19.0	21.5	21.5	21.5	21.5	21.0	21.0	19.0	18.5	19.0
10	19.5	19.0	19.0	22.0	21.5	21.5	21.0	20.5	20.5	18.5	18.0	18.5
11	19.5	19.5	19.5	22.0	21.5	21.5	20.5	20.5	20.5	18.5	18.0	18.5
12	20.0	19.5	19.5	21.5	21.5	21.5	20.5	20.0	20.0	18.5	18.0	18.5
13	21.0	20.0	20.5	21.5	21.0	21.0	20.0	19.5	20.0	18.5	18.0	18.0
14	21.0	20.5	20.5	21.0	20.5	20.5	20.0	19.5	19.5	18.0	17.5	18.0
15	20.5	20.0	20.0	20.5	20.5	20.5	19.5	19.5	19.5	18.0	17.5	17.5
16	20.0	20.0	20.0	21.0	20.5	20.5	19.5	19.0	19.0	18.0	17.5	17.5
17	20.0	19.5	20.0	21.5	20.5	21.0	19.5	19.0	19.0	17.5	17.5	17.5
18	20.0	19.5	19.5	21.5	21.0	21.5	19.5	19.0	19.5	17.5	17.0	17.0
19	19.5	19.0	19.5	22.0	21.5	21.5	20.0	19.5	19.5	17.0	16.5	17.0
20	19.5	19.0	19.0	22.0	21.5	21.5	20.0	19.5	19.5	17.0	16.5	17.0
21	19.0	19.0	19.0	21.5	21.5	21.5	20.0	19.5	19.5	16.5	16.0	16.5
22	19.0	18.5	18.5	22.0	21.5	21.5	19.5	19.5	19.5	16.0	15.5	16.0
23	18.5	18.0	18.5	21.5	21.0	21.5	19.5	19.0	19.5	16.0	15.5	15.5
24	19.0	18.5	19.0	22.0	21.5	21.5	20.0	19.5	19.5	15.5	15.5	15.5
25	19.0	19.0	19.0	22.5	21.5	22.0	20.5	19.0	20.0	15.5	15.0	15.5
26	19.5	19.0	19.5	22.0	22.0	22.0	20.0	19.5	20.0	15.5	14.5	15.0
27	20.0	19.5	20.0	22.0	22.0	22.0	19.5	19.5	19.5	15.5	15.0	15.0
28	21.5	20.0	20.5	22.0	22.0	22.0	20.0	19.5	19.5	15.5	15.0	15.0
29	20.5	20.0	20.5	22.0	21.5	22.0	20.0	19.5	20.0	15.5	15.0	15.0
30	20.5	20.0	20.5	22.5	22.0	22.5	20.0	19.5	19.5	15.0	14.5	15.0
31	---	---	---	23.0	22.0	22.5	19.5	19.5	19.5	---	---	---
MONTH	21.5	15.0	18.8	23.0	19.5	21.2	23.0	19.0	20.3	19.5	14.5	17.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI--Continued

OXYGEN DISSOLVED (MGL), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	9.0	8.8	8.9	9.3	9.1	9.2	11.2	11.0	11.1	13.1	12.9	13.0			
2	9.1	9.0	9.1	9.4	8.4	9.3	11.1	11.0	11.0	13.5	13.0	13.2			
3	9.2	9.0	9.1	9.6	9.2	9.5	11.1	10.9	11.0	13.3	13.2	13.3			
4	9.3	9.2	9.3	9.6	9.5	9.6	11.1	11.0	11.1	13.4	13.0	13.1			
5	9.3	9.0	9.2	9.6	9.5	9.6	11.2	11.0	11.1	13.0	12.6	12.8			
6	9.0	8.6	8.7	10.1	9.4	9.7	11.2	11.0	11.1	12.6	12.4	12.5			
7	8.8	8.7	8.7	9.9	9.7	9.8	11.2	11.1	11.1	12.7	12.5	12.6			
8	8.9	8.7	8.8	10.3	9.8	10.0	11.3	11.1	11.2	12.6	12.4	12.5			
9	9.0	8.9	9.0	10.3	9.8	10.0	11.4	11.2	11.3	12.5	12.4	12.4			
10	9.0	8.5	9.0	9.8	9.4	9.6	11.3	11.2	11.2	12.4	12.2	12.3			
11	9.3	9.0	9.2	9.9	9.6	9.8	11.4	11.3	11.3	12.2	12.0	12.1			
12	9.6	9.3	9.5	10.2	9.9	10.0	11.5	11.3	11.4	12.1	12.0	12.1			
13	9.5	9.3	9.4	10.3	10.1	10.2	11.6	11.4	11.5	12.2	12.1	12.1			
14	9.5	9.3	9.3	10.4	10.2	10.3	11.6	11.5	11.6	12.1	11.8	12.0			
15	9.4	9.3	9.3	10.7	10.4	10.5	11.8	11.6	11.7	12.1	12.0	12.0			
16	9.5	9.3	9.4	10.7	10.6	10.6	11.8	11.6	11.7	12.0	11.7	11.8			
17	9.3	8.4	9.1	10.8	10.6	10.7	11.7	11.6	11.7	11.8	11.7	11.8			
18	9.2	9.0	9.1	10.9	10.7	10.8	11.7	11.5	11.6	11.8	11.6	11.7			
19	9.3	9.2	9.3	10.9	10.8	10.9	11.8	11.6	11.7	11.8	11.7	11.7			
20	9.4	9.3	9.3	11.1	10.9	10.9	12.0	11.7	11.9	11.8	11.7	11.8			
21	9.5	9.4	9.5	11.1	11.0	11.1	12.0	11.8	11.8	13.6	11.6	11.9			
22	9.6	9.5	9.5	11.3	11.1	11.2	12.4	11.9	12.2	11.8	11.6	11.7			
23	9.6	9.4	9.5	11.4	11.2	11.3	13.1	12.3	12.8	11.7	11.6	11.6			
24	9.5	9.3	9.4	11.4	11.0	11.3	13.3	12.7	12.9	11.9	11.7	11.7			
25	9.5	8.3	9.4	11.1	10.9	11.0	12.9	12.8	12.8	11.9	11.8	11.9			
26	9.4	9.2	9.4	11.1	10.9	11.0	13.0	12.8	12.9	12.1	11.9	12.0			
27	9.3	9.2	9.2	11.2	11.1	11.1	12.9	12.7	12.8	12.1	12.0	12.1			
28	9.2	9.0	9.1	11.2	11.1	11.2	12.8	12.7	12.7	12.3	12.1	12.2			
29	9.1	9.0	9.1	11.2	11.1	11.2	12.8	12.7	12.7	12.5	12.3	12.3			
30	9.1	9.1	9.1	11.5	11.0	11.1	12.9	12.7	12.8	12.5	12.4	12.5			
31	9.2	9.1	9.1	—	—	—	13.0	12.8	12.9	12.6	12.5	12.6			
MONTH	9.6	8.3	9.2	11.5	8.4	10.4	13.3	10.9	11.8	13.6	11.6	12.2			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	12.6	12.5	12.6	14.0	13.9	14.0	12.9	12.8	12.9	11.1	10.9	11.0	
2	12.7	12.5	12.6	14.1	13.9	14.0	12.9	12.8	12.8	11.0	10.8	11.0	
3	12.9	12.6	12.7	14.3	14.0	14.2	12.8	12.6	12.7	10.9	10.7	10.8	
4	12.9	12.2	12.6	14.3	14.3	14.3	12.7	12.3	12.5	10.8	10.6	10.7	
5	12.5	12.2	12.4	14.4	14.3	14.3	12.4	12.1	12.2	10.6	10.4	10.5	
6	12.6	12.4	12.5	14.5	14.3	14.4	12.2	12.0	12.1	10.4	10.2	10.3	
7	12.6	12.5	12.5	14.7	14.5	14.6	12.1	11.9	12.0	10.4	10.1	10.3	
8	12.7	12.6	12.6	14.9	14.6	14.7	11.9	11.8	11.9	10.2	10.1	10.1	
9	12.8	12.6	12.7	14.7	14.6	14.6	11.9	11.7	11.8	10.2	10.1	10.1	
10	12.7	12.6	12.6	14.7	14.6	14.7	11.8	11.7	11.8	10.1	10.0	10.1	
11	12.7	12.4	12.5	14.8	14.7	14.7	11.9	11.5	11.8	10.1	10.0	10.0	
12	12.5	12.3	12.4	15.0	14.7	14.9	11.9	11.7	11.8	10.0	9.9	10.0	
13	12.5	12.3	12.4	15.1	14.9	15.0	11.8	11.7	11.7	10.0	9.9	9.9	
14	12.6	12.5	12.5	15.2	15.0	15.1	11.8	11.7	11.7	10.0	9.9	10.0	
15	12.6	12.5	12.5	15.3	15.1	15.2	11.7	11.5	11.7	10.0	9.9	10.0	
16	12.6	12.5	12.6	15.2	14.9	15.1	11.7	11.6	11.6	10.0	9.8	9.9	
17	12.7	12.5	12.6	14.9	14.7	14.8	11.7	11.6	11.6	9.8	9.6	9.7	
18	12.8	12.7	12.7	14.8	14.4	14.6	11.7	11.4	11.6	9.7	9.6	9.6	
19	12.9	12.7	12.8	14.5	14.3	14.4	11.8	11.7	11.7	9.7	9.6	9.7	
20	13.2	12.9	13.0	14.4	14.3	14.3	11.8	11.7	11.8	9.8	9.7	9.8	
21	13.6	13.1	13.3	14.4	14.0	14.2	11.8	11.7	11.7	9.7	9.6	9.7	
22	13.8	13.5	13.7	14.0	13.8	13.9	11.8	11.7	11.8	9.6	9.4	9.6	
23	13.8	13.6	13.7	13.9	13.7	13.8	11.9	11.7	11.8	9.6	9.4	9.5	
24	13.7	13.4	13.6	13.8	13.6	13.7	11.8	11.5	11.6	9.4	9.3	9.4	
25	13.5	13.2	13.3	13.7	13.6	13.7	11.7	11.6	11.6	9.3	9.1	9.2	
26	13.6	13.4	13.5	13.9	13.6	13.7	11.7	11.5	11.6	9.2	8.6	8.9	
27	13.8	13.5	13.7	13.7	13.4	13.5	11.7	11.6	11.6	8.7	8.4	8.5	
28	14.0	13.8	13.8	13.4	13.1	13.2	11.7	11.6	11.6	8.9	8.4	8.7	
29	--	--	--	13.2	13.0	13.1	11.6	11.4	11.5	8.8	8.6	8.8	
30	--	--	--	13.1	12.8	13.0	11.4	10.8	11.3	8.8	8.6	8.7	
31	--	--	--	13.1	12.9	13.0	--	--	--	8.8	8.6	8.7	
MONTH	14.0	12.2	12.9	15.3	12.6	14.2	12.9	10.8	11.9	11.1	8.4	9.8	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124200 MANISTEE RIVER NEAR MESICK, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.8	8.6	8.7	8.3	8.0	8.1	7.4	6.8	7.2	8.3	8.0	8.2
2	8.8	8.6	8.7	8.2	8.0	8.1	8.0	7.3	7.7	8.3	8.1	8.2
3	8.8	8.6	8.7	8.5	8.0	8.2	8.0	7.1	7.5	8.2	7.7	8.1
4	8.8	8.4	8.6	8.5	7.9	8.2	7.2	6.9	7.1	8.3	8.2	8.2
5	8.5	8.4	8.4	8.0	7.8	7.9	7.4	6.9	7.1	8.3	8.1	8.2
6	8.5	8.3	8.4	7.9	7.1	7.4	7.3	6.9	7.1	8.3	8.1	8.2
7	8.5	8.3	8.4	8.0	7.5	7.8	7.1	6.7	6.9	8.5	8.3	8.4
8	8.5	8.4	8.4	8.0	7.6	7.9	7.2	6.8	7.1	8.9	8.4	8.6
9	8.5	8.3	8.4	7.7	7.6	7.6	7.2	6.9	7.0	9.0	8.5	8.9
10	8.4	8.2	8.3	7.8	7.6	7.7	7.0	6.8	6.9	9.0	8.3	8.6
11	8.4	8.2	8.3	7.8	7.7	7.7	7.1	6.8	7.0	9.2	9.0	9.1
12	8.3	8.1	8.3	7.8	7.6	7.7	7.1	6.9	7.0	9.2	9.0	9.1
13	8.2	7.7	8.0	7.7	7.4	7.5	7.2	7.0	7.1	9.2	8.1	8.6
14	8.0	7.7	7.9	7.7	7.4	7.6	7.5	7.2	7.4	9.1	8.3	8.8
15	8.2	8.0	8.1	7.9	7.6	7.8	7.5	7.4	7.5	9.4	9.1	9.2
16	8.0	7.5	7.8	8.0	7.8	7.9	7.5	7.2	7.4	9.4	9.3	9.4
17	7.7	7.4	7.5	8.0	7.8	7.9	7.6	7.5	7.6	9.5	9.4	9.4
18	7.6	7.4	7.5	8.1	7.8	8.0	7.6	7.5	7.6	9.5	9.3	9.5
19	7.8	7.5	7.6	8.0	7.7	7.8	8.2	7.6	7.9	9.6	9.4	9.5
20	7.9	7.7	7.8	7.9	7.8	7.9	8.2	7.6	8.0	9.7	9.5	9.6
21	8.1	7.9	8.0	7.9	7.1	7.5	8.2	7.6	7.9	9.8	9.7	9.7
22	8.1	8.0	8.1	7.8	7.1	7.5	8.2	7.7	7.9	9.7	9.6	9.7
23	8.6	8.0	8.3	7.7	6.8	7.3	7.7	7.6	7.7	9.8	9.6	9.7
24	8.6	8.0	8.3	7.4	6.8	7.1	8.2	7.6	7.9	9.9	9.5	9.8
25	8.2	8.1	8.2	7.4	7.2	7.3	8.3	8.1	8.2	9.9	9.8	9.9
26	8.3	8.1	8.2	7.4	7.1	7.2	8.2	7.6	7.9	9.9	9.8	9.8
27	8.3	8.2	8.2	7.6	7.2	7.4	7.6	7.7	7.7	9.8	9.4	9.6
28	8.3	8.1	8.3	7.5	7.3	7.4	8.2	7.7	7.9	9.4	9.1	9.3
29	8.3	8.1	8.2	7.7	6.8	7.3	8.2	8.1	8.2	9.5	9.1	9.3
30	8.3	8.2	8.3	7.5	6.8	7.3	8.3	7.9	8.2	9.3	9.2	9.3
31	—	—	—	7.5	6.6	7.0	8.3	8.1	8.2	—	—	—
MONTH	8.8	7.4	8.2	8.5	6.6	7.6	8.3	6.7	7.5	9.9	7.7	9.1

STREAMS TRIBUTARY TO LAKE MICHIGAN

04124500 EAST BRANCH PINE RIVER NEAR TUSTIN, MI

LOCATION.--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, on left bank 75 ft downstream from bridge on Marion Road, 3.0 mi west of Tustin.

DRAINAGE AREA.--60.0 mi².

PERIOD OF RECORD.--July 1952 to September 1963, October 1963 to September 1991 (operated as a crest-stage partial-record station), October 1991 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,077.65 ft above sea level (levels by Michigan Department of Natural Resources).

REMARKS.--Records good.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	16	38	12	34	32	49	17	13	12	23	8.2
2	12	15	32	11	34	31	48	16	17	13	20	11
3	11	14	28	11	37	34	45	14	16	11	17	13
4	9.6	13	25	11	38	30	58	13	12	9.8	47	8.2
5	10	13	24	12	34	30	63	13	11	8.6	43	7.7
6	59	13	25	12	36	26	55	19	11	17	33	7.5
7	99	12	49	12	32	25	52	21	9.7	14	23	7.8
8	62	12	43	12	30	25	46	20	8.6	9.9	23	7.7
9	48	12	36	12	33	25	55	19	7.8	60	20	7.8
10	34	66	29	12	39	24	56	17	7.7	51	27	8.1
11	26	86	24	13	57	22	75	15	13	34	23	8.0
12	21	64	22	13	165	22	89	19	14	24	20	7.8
13	19	47	20	13	102	22	71	26	28	17	63	11
14	18	37	18	13	88	21	61	21	82	13	67	9.7
15	16	31	18	13	73	22	53	16	60	11	47	8.7
16	14	28	17	13	59	27	45	14	44	9.2	33	8.3
17	14	34	17	13	55	47	39	26	35	13	23	8.2
18	19	36	15	19	48	77	35	27	26	18	21	8.1
19	21	32	16	21	40	63	31	26	21	85	20	8.2
20	18	29	14	22	36	66	30	20	14	81	13	14
21	17	26	15	23	30	66	28	15	12	98	14	12
22	16	24	11	24	27	56	30	14	10	96	13	10
23	15	22	13	23	23	49	37	20	12	144	12	9.6
24	14	21	12	66	21	52	32	35	17	187	11	11
25	14	20	11	61	21	49	29	31	14	109	12	10
26	13	19	11	51	22	45	26	31	9.8	74	13	9.4
27	13	18	11	45	23	46	24	24	19	54	15	9.3
28	14	17	12	42	31	49	23	19	18	40	11	32
29	14	18	12	39	---	52	22	14	17	32	9.9	43
30	17	24	12	36	---	51	20	12	14	27	8.9	35
31	17	---	12	35	---	50	---	11	---	24	8.4	---
TOTAL	707.6	819	642	731	1268	1236	1327	605	593.6	1396.5	751.2	360.3
MEAN	22.8	27.3	20.7	23.6	45.3	39.9	44.2	19.5	19.8	45.0	24.2	12.0
MAX	99	86	49	66	165	77	89	35	82	187	67	43
MIN	9.6	12	11	11	21	20	11	7.7	8.6	8.4	7.5	7.5
CFSM	.38	.45	.35	.39	.75	.66	.74	.33	.33	.75	.40	.20
IN.	.44	.51	.40	.45	.79	.77	.82	.38	.37	.87	.47	.22

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

	MEAN	25.9	33.2	25.7	23.4	26.2	55.1	81.3	36.7	23.8	18.1	18.4	15.2
MAX	99.9	90.8	83.8	48.4	54.4	93.6	190	75.4	70.4	45.1	68.5	44.2	44.2
(WY)	1992	1993	1992	1997	1994	1992	1959	1960	1993	1994	1956	1993	1993
MIN	9.54	12.3	12.4	10.1	9.39	18.7	41.7	10.7	8.90	7.22	6.29	6.82	6.82
(WY)	1956	1954	1956	1956	1963	1956	1958	1958	1959	1959	1957	1955	1955

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1952 - 1999

ANNUAL TOTAL	10745.0	10437.2	
ANNUAL MEAN	29.4	28.6	31.9
HIGHEST ANNUAL MEAN			54.5
LOWEST ANNUAL MEAN			16.0
HIGHEST DAILY MEAN	332	187	753
LOWEST DAILY MEAN	7.8	7.5	5.3
ANNUAL SEVEN-DAY MINIMUM	8.0	7.8	5.5
INSTANTANEOUS PEAK FLOW		267	(a)1410
INSTANTANEOUS PEAK STAGE		4.14	6.23
INSTANTANEOUS LOW FLOW		6.1	(b)4.1
ANNUAL RUNOFF (CFSM)	.49	.48	.53
ANNUAL RUNOFF (INCHES)	6.66	6.47	7.21
10 PERCENT EXCEEDS	59	57	67
50 PERCENT EXCEEDS	19	21	19
90 PERCENT EXCEEDS	9.0	11	8.5

(a) From rating curve extended above 450 ft³/s.

(b) Result of freezeup.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI

LOCATION.--Lat 44°11'36", long 85°46'11", in NW1/4 NE1/4 sec.28, T.21 N., R.12 W., Wexford County, Hydrologic Unit 04060103, on right bank 75 ft downstream from High School Bridge on S 5 1/2 Road, 2.5 mi west of Hoxeyville.

DRAINAGE AREA.--245 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1952 to September 1982, October 1996 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above sea level, from topographic map. July 1952 to September 1982 water-stage recorder at site 3.5 mi downstream at different datum (station 04125500).

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	214	224	275	223	256	266	307	221	220	208	230	213
2	208	218	281	221	257	260	307	219	224	209	225	211
3	205	215	265	231	266	255	301	218	226	208	222	208
4	203	215	254	233	279	253	351	217	220	205	264	204
5	204	213	248	229	272	246	388	217	213	203	311	197
6	278	213	252	226	264	243	349	222	211	221	274	196
7	458	213	290	225	259	224	326	223	210	228	249	196
8	427	213	319	222	251	230	307	234	208	211	240	196
9	314	214	284	230	252	245	324	232	205	290	235	196
10	272	289	266	226	269	231	352	227	204	362	241	197
11	247	476	e255	230	306	227	362	220	207	280	253	196
12	234	434	e250	232	541	226	466	223	218	241	236	197
13	227	332	e245	236	570	228	407	248	246	222	263	207
14	222	287	e240	238	402	226	346	241	324	213	364	209
15	221	268	e235	238	385	227	314	225	332	209	293	203
16	218	262	237	232	343	232	291	219	273	206	258	200
17	216	268	236	228	322	226	274	229	251	209	239	199
18	225	281	234	248	305	381	263	258	236	227	228	200
19	237	278	233	253	284	370	255	247	224	297	227	201
20	231	264	232	247	269	337	251	235	216	393	225	214
21	223	255	231	244	248	343	248	223	211	343	217	221
22	220	249	230	245	236	328	247	218	208	429	211	211
23	216	244	217	286	243	298	263	228	205	e660	210	207
24	215	241	231	387	233	297	266	269	216	e800	211	209
25	214	237	228	393	232	296	251	276	220	e550	213	211
26	212	235	237	339	231	284	242	268	211	e360	217	207
27	211	233	225	306	234	278	235	258	210	326	218	209
28	213	232	228	294	250	287	230	235	228	282	219	250
29	214	232	228	281	---	301	227	223	222	257	216	317
30	223	242	225	269	---	308	223	217	215	243	215	301
31	229	---	221	261	---	305	---	214	---	238	213	---
TOTAL	7451	7777	7632	7953	8259	8500	8973	7216	6814	9330	7437	6383
MEAN	240	259	246	257	295	274	299	233	227	301	240	213
MAX	458	476	319	393	570	381	466	276	332	800	364	317
MIN	203	213	217	221	231	224	223	214	204	203	210	196
CFSM	.98	1.06	1.00	1.05	1.20	1.12	1.22	.95	.93	1.23	.98	.87
IN.	1.13	1.18	1.16	1.21	1.25	1.29	1.36	1.10	1.03	1.42	1.13	.97

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

MEAN	263	277	274	257	265	348	437	312	275	248	243	247
MAX	373	339	408	350	361	629	670	436	391	427	393	504
(WY)	1955	1976	1966	1973	1976	1976	1959	1960	1974	1969	1956	1975
MIN	219	227	223	205	208	254	286	222	206	196	197	203
(WY)	1964	1954	1964	1961	1959	1978	1958	1958	1964	1966	1998	1955

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1952 - 1999
ANNUAL TOTAL	95662	93725	
ANNUAL MEAN	262	257	286
HIGHEST ANNUAL MEAN			356
LOWEST ANNUAL MEAN			233
HIGHEST DAILY MEAN	1040	800	1830
LOWEST DAILY MEAN	186	196	170
ANNUAL SEVEN-DAY MINIMUM	190	196	180
INSTANTANEOUS PEAK FLOW		(a)	(b)2440
INSTANTANEOUS PEAK STAGE		(a)	(c)6.85
INSTANTANEOUS LOW FLOW		195	161
ANNUAL RUNOFF (CFSM)	1.07	1.05	1.17
ANNUAL RUNOFF (INCHES)	14.53	14.23	15.89
10 PERCENT EXCEEDS	333	327	388
50 PERCENT EXCEEDS	239	235	253
90 PERCENT EXCEEDS	197	209	214

(a) Not determined.

(b) From rating curve extended above 1,000 ft³/s; gage height 6.82 ft, site and datum then in use.

(c) Present site and datum.

(d) Part of each day Sept. 5-11.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: December 1996 to current year.

DISSOLVED OXYGEN: December 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum recorded, 21.0°C, July 25, 1999, but may have been higher during instrument malfunction July 23, 24, 1999; minimum, -0.5°C, on several days during winter periods.

DISSOLVED OXYGEN: Maximum, 15.6 mg/L, Mar. 23, 1999; minimum recorded, 7.0 mg/L, June 30, 1998, July 25, 1999, but may have been lower during instrument malfunction July 21-30, 1998, July 23, 24, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum recorded, 21.0°C, July 25, but may have been higher during instrument malfunction July 23, 24; minimum, -0.5°C, on several days during winter period.

DISSOLVED OXYGEN: Maximum, 15.6 mg/L, Mar. 23; minimum recorded, 7.0 mg/L, July 25, but may have been lower during instrument malfunction July 23, 24.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER			DECEMBER			JANUARY		
1	11.0	10.0	10.5	9.5	8.5	9.0	9.0	7.5	8.0	.0	-.5	-.5
2	10.0	8.5	9.5	8.5	7.0	7.5	7.5	7.0	7.5	-.5	-.5	-.5
3	9.5	9.0	9.5	7.0	5.5	6.0	8.5	7.5	8.0	.0	-.5	.0
4	9.5	8.5	9.0	5.5	5.0	5.5	8.5	8.0	8.0	.5	-.5	.0
5	10.0	9.0	9.5	5.5	5.5	5.5	8.5	8.0	8.5	.5	.0	.0
6	11.5	10.0	10.5	6.0	5.0	5.5	9.0	8.0	8.5	.5	-.5	.0
7	12.0	11.0	11.5	6.5	5.5	6.0	8.0	6.0	7.0	.0	-.5	-.5
8	12.0	10.5	11.5	6.5	6.0	6.5	6.0	4.5	5.0	.5	-.5	.0
9	10.5	9.5	10.0	6.5	6.5	6.5	4.5	3.5	4.0	.5	.0	.0
10	9.5	8.5	9.0	7.5	6.5	7.0	4.0	3.5	3.5	.0	-.5	.0
11	10.0	9.0	9.5	6.5	5.5	6.0	---	---	---	-.5	-.5	-.5
12	10.5	9.5	10.0	5.5	4.0	4.5	---	---	---	.5	-.5	.0
13	10.0	9.0	10.0	4.0	3.5	3.5	---	---	---	.0	-.5	-.5
14	9.0	8.5	9.0	5.5	4.0	5.0	---	---	---	-.5	-.5	-.5
15	9.0	8.0	8.5	6.0	5.5	5.5	---	---	---	.0	-.5	.0
16	10.0	8.5	9.0	5.5	4.5	5.0	4.0	4.0	4.0	1.5	.0	1.0
17	12.0	10.0	11.0	5.5	4.5	5.0	4.0	3.0	4.0	2.0	.5	1.0
18	12.0	10.5	11.5	6.5	5.5	6.0	3.5	2.5	3.0	2.0	1.5	1.5
19	10.5	9.5	10.0	6.5	6.0	6.5	4.0	3.5	3.5	2.0	1.5	2.0
20	9.5	8.5	9.0	6.0	5.0	5.0	3.5	3.0	3.0	2.5	1.5	2.0
21	8.5	7.5	7.5	5.0	4.5	4.5	3.0	2.5	3.0	3.5	2.5	3.0
22	7.5	7.0	7.5	5.5	4.0	5.0	2.5	.0	1.0	4.0	3.5	3.5
23	8.0	6.0	7.0	6.5	5.5	6.0	1.0	-.5	.0	4.0	3.5	4.0
24	8.5	7.0	8.0	6.0	5.5	5.5	.5	-.5	.0	3.5	2.0	3.0
25	9.0	8.0	8.5	5.5	5.0	5.5	1.0	-.5	.0	2.0	1.5	2.0
26	10.0	9.0	9.5	5.0	4.5	5.0	1.0	.0	.5	2.5	1.5	2.0
27	10.0	9.0	9.5	4.5	3.5	4.0	1.5	.0	1.0	3.0	2.0	2.5
28	10.5	9.5	10.0	5.5	4.0	4.5	2.0	1.5	1.5	3.5	3.0	3.0
29	9.5	8.0	8.5	8.0	5.5	6.5	2.0	1.0	2.0	3.0	2.5	2.5
30	9.0	8.5	8.5	9.5	8.0	9.0	1.0	.5	.5	2.5	1.5	2.0
31	9.5	9.0	9.0	---	---	---	.5	.0	.5	2.5	1.5	2.0
MONTH	12.0	6.0	9.4	9.5	3.5	5.8	---	---	---	4.0	-.5	1.1

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	3.0	2.0	2.5	3.0	2.5	3.0	10.0	9.5	9.5	13.5	10.0	12.0	
2	3.5	3.0	3.5	3.0	2.0	2.5	11.5	9.0	10.0	14.0	11.0	12.5	
3	4.0	3.5	3.5	3.0	2.5	3.0	12.0	10.0	11.0	14.5	11.5	13.0	
4	4.0	2.5	3.5	3.5	2.0	3.0	12.0	8.5	10.5	15.0	12.0	13.5	
5	2.5	2.0	2.0	3.0	2.5	2.5	9.0	8.0	8.5	14.5	13.0	13.5	
6	3.5	2.5	3.0	2.5	1.5	2.0	8.5	7.5	8.0	13.5	12.5	13.0	
7	3.5	3.0	3.0	2.0	-.5	1.0	9.0	6.5	8.0	12.5	11.5	12.0	
8	4.0	3.0	3.5	2.0	.0	1.0	10.0	7.5	9.0	11.5	11.0	11.5	
9	4.5	3.5	4.0	2.0	1.0	1.5	9.5	8.0	9.0	12.5	9.5	11.0	
10	4.0	3.0	4.0	3.0	1.5	2.0	9.0	7.0	8.0	13.5	10.0	12.0	
11	4.5	4.0	4.5	3.5	1.5	2.5	8.5	6.0	7.0	13.5	11.0	12.5	
12	4.0	.5	3.0	3.5	1.5	2.5	7.5	5.5	6.5	13.0	10.0	11.5	
13	1.0	.0	.5	3.5	2.0	3.0	8.0	5.5	7.0	12.5	9.0	11.0	
14	1.5	.0	1.0	4.0	2.5	3.0	9.5	7.0	8.5	13.5	10.5	12.0	
15	2.5	1.5	2.0	4.5	2.5	3.5	9.5	8.5	9.0	13.5	12.0	13.0	
16	3.5	2.5	3.0	6.0	3.5	4.5	9.5	8.5	9.0	15.0	12.5	13.5	
17	3.5	2.5	3.0	6.0	4.5	5.5	9.0	8.0	8.5	16.5	14.0	15.0	
18	2.5	2.0	2.5	5.5	3.5	4.5	8.0	7.0	7.5	16.0	13.5	14.5	
19	2.0	1.5	2.0	4.5	2.5	3.5	7.5	7.0	7.0	14.5	12.5	13.5	
20	2.0	1.0	1.5	5.0	3.5	4.0	8.5	6.0	7.5	14.5	12.0	13.5	
21	1.5	.5	1.0	5.0	3.5	4.5	9.5	7.5	8.5	14.5	13.5	14.0	
22	1.5	-.5	.5	4.0	3.0	3.5	9.0	8.0	8.5	15.5	13.5	14.5	
23	1.5	.0	1.0	5.0	3.0	4.0	9.0	7.5	8.0	14.5	12.0	13.0	
24	2.0	.5	1.5	5.5	4.0	5.0	10.0	7.0	8.5	12.0	10.0	11.0	
25	3.5	2.0	2.5	5.0	4.5	4.5	11.0	7.5	9.0	10.0	9.5	9.5	
26	4.0	2.5	3.5	5.5	3.5	4.5	11.5	8.0	10.0	12.5	9.0	13.5	
27	4.5	3.5	4.0	6.5	4.0	5.5	12.5	9.5	11.0	13.5	10.5	12.0	
28	4.5	3.0	4.0	7.0	5.0	6.0	12.5	9.5	11.0	15.5	12.0	13.5	
29	---	---	---	7.5	5.5	6.5	12.5	9.5	11.0	16.0	13.0	15.0	
30	---	---	---	8.0	5.5	7.0	13.0	9.5	11.5	17.0	14.0	15.5	
31	---	---	---	9.5	7.0	8.0	---	---	---	16.0	15.0	15.5	
MONTH	4.5	-.5	2.6	9.5	-.5	3.8	13.0	5.5	8.9	17.0	9.0	12.8	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	15.5	14.5	15.0	15.5	14.0	14.5	17.5	16.0	17.0	14.5	12.5	13.5
2	15.5	13.0	14.5	15.0	13.0	14.0	16.5	15.0	16.0	15.0	13.0	14.0
3	15.0	12.0	13.5	15.5	14.0	14.5	15.5	14.0	14.5	15.0	13.0	14.0
4	15.0	12.5	14.0	19.0	15.0	17.0	16.5	14.0	15.0	15.5	13.5	14.5
5	16.5	14.0	15.0	20.0	17.5	19.0	16.5	15.0	15.5	15.5	13.5	14.5
6	18.5	15.5	17.0	20.5	18.5	19.5	17.0	15.0	16.0	15.0	13.5	14.5
7	19.5	17.0	18.0	19.0	17.0	18.0	16.0	14.5	15.0	13.5	12.0	13.0
8	19.0	16.5	17.5	18.0	16.0	16.5	15.5	14.0	14.5	13.5	12.0	13.0
9	18.0	16.5	17.0	17.0	15.5	16.0	14.5	13.0	13.5	13.0	12.0	13.0
10	18.5	15.5	17.0	17.5	15.5	16.5	14.0	13.0	13.5	12.5	11.0	12.0
11	19.0	16.5	18.0	17.0	14.5	16.0	15.5	13.0	14.5	12.5	11.0	13.0
12	18.5	17.0	18.0	17.0	14.5	16.0	16.0	14.5	15.0	12.0	11.0	11.5
13	17.5	15.5	16.5	17.0	14.5	16.0	15.5	15.0	15.5	13.0	12.0	13.5
14	16.0	14.5	15.0	16.5	15.0	15.5	16.0	14.5	15.5	12.5	11.5	12.0
15	15.0	13.0	14.0	17.5	15.0	16.5	16.0	14.0	15.0	12.0	10.5	11.5
16	14.0	13.0	13.5	19.0	16.0	17.5	15.5	14.5	15.0	11.0	9.5	13.5
17	13.5	11.5	12.5	18.0	17.0	17.0	16.0	14.5	15.0	11.0	9.0	13.0
18	14.0	11.5	13.0	18.0	16.0	17.0	15.5	14.5	15.0	11.0	9.5	13.5
19	15.0	12.5	14.0	17.0	16.5	16.5	16.0	14.0	15.0	12.0	10.0	11.0
20	16.0	13.5	14.5	18.5	16.0	17.0	15.5	13.5	14.5	12.0	11.0	11.5
21	16.0	14.0	15.0	18.0	16.5	17.0	15.5	13.5	14.5	11.0	9.5	13.0
22	16.5	14.5	15.5	19.0	16.5	17.5	15.5	13.5	14.5	10.0	8.5	9.5
23	17.0	15.0	16.0	—	—	—	15.0	14.0	14.5	11.5	10.0	13.5
24	18.5	15.5	17.0	—	—	—	15.5	14.0	14.5	11.0	10.0	13.5
25	18.5	15.5	17.0	21.0	19.5	20.5	15.0	14.0	14.5	10.5	9.0	13.0
26	18.5	15.5	17.0	20.0	18.0	18.5	15.5	14.0	14.5	12.5	10.0	11.0
27	18.0	16.5	17.5	18.5	17.0	18.0	16.0	14.5	15.0	12.5	11.5	13.0
28	17.5	16.5	17.0	18.0	16.0	17.5	17.0	15.0	16.0	11.5	11.5	11.5
29	16.5	15.0	16.0	18.5	16.5	17.5	16.0	14.0	15.0	11.5	11.0	11.5
30	16.0	14.0	15.0	19.0	16.5	18.0	14.0	12.5	13.5	11.0	10.0	13.5
31	—	—	—	18.5	17.5	18.0	14.0	12.0	13.5	—	—	—
MONTH	19.5	11.5	15.7	—	—	—	17.5	12.0	14.9	15.5	8.5	11.8

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER				DECEMBER			JANUARY*	
1	10.6	9.4	9.9	10.6	9.9	10.2	11.9	10.9	11.5	14.6	11.6	13.5
2	10.9	9.7	10.2	11.4	10.2	10.8	11.9	11.2	11.6	14.5	11.3	12.9
3	11.0	9.9	10.3	12.0	10.8	11.4	11.6	11.2	11.4	14.3	11.6	13.5
4	11.0	9.9	10.4	12.1	11.2	11.5	11.8	11.3	11.4	14.6	13.9	14.4
5	10.6	9.8	10.1	11.8	11.3	11.5	11.6	11.2	11.3	14.7	14.3	14.5
6	9.8	9.2	9.4	12.2	11.3	11.6	11.4	11.1	11.3	14.5	13.6	14.3
7	9.4	9.0	9.2	12.1	11.1	11.5	12.4	11.4	12.0	14.5	12.4	13.2
8	9.6	9.0	9.3	11.8	11.0	11.3	12.7	12.3	12.5	13.8	12.3	12.6
9	10.3	9.5	10.0	11.5	11.0	11.2	13.2	12.6	12.9	12.9	12.6	12.8
10	10.8	10.0	10.4	11.1	10.5	10.8	13.2	12.2	12.7	12.9	11.3	12.7
11	10.9	10.3	10.5	11.3	10.5	11.0	---	---	---	13.2	10.0	10.9
12	11.4	10.3	10.6	11.8	11.3	11.6	---	---	---	13.2	10.0	12.3
13	11.1	10.3	10.6	12.3	11.8	12.1	---	---	---	13.5	13.1	13.3
14	11.3	10.7	11.0	11.8	11.2	11.5	---	---	---	13.6	13.1	13.3
15	11.9	11.0	11.4	11.7	11.2	11.4	---	---	---	13.4	10.5	12.2
16	12.0	11.1	11.5	11.7	11.3	11.5	12.5	12.1	12.3	12.9	12.3	12.7
17	11.4	10.6	11.0	11.9	11.5	11.7	12.6	12.0	12.3	13.3	12.1	13.0
18	11.1	9.8	10.7	11.9	11.3	11.6	13.2	12.6	12.9	12.6	12.1	12.5
19	10.4	9.6	10.0	11.5	11.0	11.2	12.9	12.5	12.7	12.7	12.4	12.5
20	10.9	9.9	10.5	12.7	11.4	11.9	13.5	12.9	13.1	13.0	12.4	12.7
21	11.3	10.5	10.9	13.2	12.2	12.5	13.2	12.9	13.1	12.5	12.0	12.3
22	11.5	10.8	11.2	12.8	11.8	12.3	14.4	13.1	13.9	12.0	11.8	11.9
23	11.7	10.9	11.2	13.0	11.5	11.9	14.5	14.2	14.4	12.0	11.6	11.8
24	11.4	10.7	11.0	13.0	11.7	12.4	14.6	14.2	14.4	12.7	11.6	12.2
25	11.4	10.6	10.9	12.4	12.1	12.2	14.6	14.0	14.4	13.0	12.6	12.8
26	11.3	10.5	10.8	12.7	11.9	12.3	14.3	13.8	14.1	13.0	12.6	12.8
27	11.5	10.5	11.0	13.2	12.1	12.7	14.1	13.7	13.9	12.6	12.0	12.4
28	11.2	10.0	10.6	13.0	12.3	12.7	14.0	13.4	13.8	12.3	12.0	12.1
29	11.3	10.0	10.5	12.3	11.0	11.9	14.0	13.4	13.7	13.0	12.2	12.8
30	10.8	10.0	10.3	11.1	10.6	10.8	14.5	14.0	14.3	13.4	12.6	13.0
31	10.4	10.0	10.1	---	---	---	14.7	14.4	14.6	13.1	12.6	12.8
MONTH	12.0	9.0	10.5	13.2	9.9	11.6	---	---	---	14.7	10.0	12.8

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	12.8	12.2	12.6	13.4	13.0	13.2	11.1	10.7	10.9	10.7	9.3	10.0	
2	12.2	11.7	11.9	13.7	13.2	13.5	11.1	10.3	10.8	10.6	9.0	9.8	
3	12.1	11.5	11.8	13.5	13.2	13.4	10.8	10.0	10.4	10.4	9.0	9.7	
4	12.0	11.4	11.7	13.8	13.4	13.6	10.8	9.9	10.3	10.1	8.6	9.3	
5	12.6	12.0	12.3	14.0	13.5	13.7	11.2	10.8	11.0	9.4	8.5	8.9	
6	12.2	11.9	12.1	14.3	13.7	14.1	11.0	10.8	10.9	9.1	8.5	8.8	
7	12.1	11.8	11.9	14.9	14.2	14.6	11.5	10.7	11.2	9.6	8.7	9.2	
8	12.1	11.7	11.9	14.9	14.3	14.7	11.1	10.4	10.8	9.7	8.9	9.2	
9	11.9	11.6	11.7	14.5	14.1	14.4	10.9	10.3	10.6	10.3	9.0	9.6	
10	12.3	11.8	12.0	14.4	14.0	14.2	11.2	10.6	10.9	10.1	8.7	9.4	
11	11.8	11.7	11.8	14.5	13.9	14.2	11.4	10.6	11.0	9.9	8.7	9.2	
12	13.1	11.8	12.3	14.5	13.9	14.2	11.7	11.3	11.5	9.6	8.6	9.1	
13	13.4	13.0	13.3	14.5	13.9	14.2	11.7	10.7	11.4	10.1	8.9	9.5	
14	13.4	12.8	13.1	14.3	13.7	14.0	11.1	10.2	10.7	9.8	8.5	9.2	
15	13.0	12.6	12.8	14.3	13.6	14.0	10.6	10.1	10.3	9.6	8.5	8.9	
16	12.6	12.2	12.4	14.0	13.2	13.6	10.4	9.6	10.2	9.4	8.2	8.7	
17	12.5	12.2	12.4	13.8	13.2	13.4	10.7	9.6	10.3	9.4	7.8	8.4	
18	13.0	12.5	12.8	14.6	13.3	13.9	11.2	10.3	10.8	8.5	7.7	8.1	
19	13.2	12.8	13.0	15.0	14.4	14.7	10.8	10.2	10.6	9.4	8.4	8.8	
20	13.5	13.1	13.2	15.0	14.3	14.6	11.1	10.2	10.8	9.5	8.3	8.8	
21	13.8	13.2	13.6	14.8	14.1	14.5	10.6	9.9	10.3	8.8	8.0	8.4	
22	14.0	13.5	13.8	15.3	14.8	15.0	10.4	9.8	10.1	9.2	8.2	8.6	
23	13.9	13.6	13.8	15.6	14.6	15.1	10.9	10.2	10.5	8.8	8.1	8.5	
24	13.9	13.2	13.7	15.1	14.6	14.9	10.9	9.7	10.4	9.3	8.5	9.0	
25	13.4	13.0	13.2	15.0	13.4	14.4	10.6	9.6	10.1	9.8	9.3	9.6	
26	13.2	12.7	13.0	15.2	13.5	14.3	10.6	9.2	9.9	10.0	8.8	9.6	
27	12.9	12.4	12.7	14.2	12.9	13.7	10.2	9.2	9.7	9.6	8.5	9.1	
28	13.0	12.3	12.6	13.4	12.3	13.0	10.4	9.2	9.8	9.3	8.3	8.8	
29	—	—	—	13.3	12.3	12.7	10.5	9.2	9.8	9.2	8.2	8.6	
30	—	—	—	13.2	11.7	12.7	10.9	9.2	10.0	9.1	8.1	8.5	
31	—	—	—	12.0	10.9	11.6	—	—	—	8.8	8.0	8.3	
MONTH	14.0	11.4	12.6	15.6	10.9	13.9	11.7	9.2	10.5	10.7	7.7	9.0	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125460 PINE RIVER NEAR HOXEYVILLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	9.1	8.1	8.5	10.0	9.1	9.5	9.3	8.4	8.8	10.4	8.9	9.7
2	8.9	8.2	8.6	10.6	9.5	10.0	9.6	8.6	9.1	10.5	9.0	9.6
3	9.8	8.7	9.2	10.3	9.5	9.9	9.7	8.9	9.4	10.6	8.9	9.7
4	9.7	8.6	9.1	10.4	8.9	9.6	9.6	8.9	9.2	10.3	9.0	9.6
5	9.6	8.4	9.0	10.1	8.1	9.2	9.5	8.9	9.1	9.8	8.7	9.2
6	9.3	8.2	8.7	9.8	8.0	8.8	9.6	8.8	9.1	9.5	8.4	8.9
7	9.1	8.1	8.5	9.3	7.9	8.5	9.3	8.8	9.1	10.1	9.0	9.4
8	9.4	8.1	8.7	9.5	7.8	8.6	10.0	9.1	9.5	10.3	8.9	9.5
9	9.4	8.0	8.7	8.9	8.4	8.5	10.3	9.2	9.7	10.5	8.6	9.7
10	9.6	8.4	8.8	8.7	8.3	8.5	10.1	9.4	9.7	10.9	9.5	10.1
11	9.4	8.3	8.8	9.3	8.3	8.8	10.3	9.1	9.7	11.0	8.6	9.8
12	9.8	8.3	9.0	9.5	8.4	8.8	10.2	9.0	9.5	9.7	8.1	9.1
13	9.2	8.6	9.0	9.4	8.2	8.8	9.4	8.8	9.1	9.1	7.8	8.5
14	9.6	8.6	9.1	9.4	8.2	8.7	9.4	9.1	9.2	9.5	8.0	8.7
15	9.4	8.6	9.1	9.4	8.0	8.6	9.9	9.0	9.4	9.6	8.3	8.9
16	9.7	9.0	9.3	9.2	7.6	8.3	9.9	8.9	9.3	9.8	8.5	9.1
17	10.2	9.4	9.7	9.0	7.3	8.2	9.8	8.7	9.3	9.6	8.5	9.0
18	10.3	9.3	9.7	9.3	8.0	8.6	9.8	8.6	9.1	9.6	8.4	8.9
19	10.3	9.2	9.6	8.3	8.0	8.1	10.2	8.8	9.3	9.8	8.4	8.9
20	10.2	8.7	9.4	8.4	7.8	8.1	10.4	8.7	9.4	10.1	8.4	9.2
21	10.1	8.5	9.4	8.1	7.8	8.0	10.5	8.9	9.5	10.7	9.3	9.9
22	10.1	8.9	9.4	8.2	7.5	7.9	10.4	8.7	9.4	10.7	9.1	9.9
23	10.0	8.1	9.2	—	—	—	10.1	8.6	9.3	10.1	8.9	9.3
24	9.6	7.9	8.7	—	—	—	10.4	8.7	9.4	10.3	9.0	9.6
25	10.0	8.6	9.1	7.5	7.0	7.3	10.2	8.7	9.3	10.8	9.3	10.0
26	9.9	8.4	9.1	8.2	7.4	7.9	10.5	8.9	9.6	10.4	9.3	9.7
27	9.6	8.5	9.0	8.7	8.1	8.4	10.5	8.9	9.5	9.5	9.0	9.2
28	9.7	8.7	9.1	8.8	8.3	8.5	10.2	8.7	9.3	9.4	8.9	9.2
29	10.1	8.8	9.3	8.8	8.3	8.5	10.2	8.6	9.3	10.9	9.2	9.9
30	10.2	8.9	9.5	9.0	8.1	8.5	10.5	9.0	9.6	10.7	9.5	10.0
31	—	—	—	8.8	8.1	8.4	10.4	9.1	9.6	—	—	—
MONTH	10.3	7.9	9.1	—	—	—	10.5	8.4	9.3	11.0	7.8	9.4

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI

LOCATION.--Lat 44°15'34", long 85°56'30", in NE1/4 SE1/4 sec.36, T.22 N., R.14 W., Manistee County, Hydrologic Unit 04060103, on right bank 700 ft downstream from Tippy Dam, at public access site, 3.2 mi north of Wellston, and 5.0 mi southeast of Brethren.

DRAINAGE AREA.--1,451 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1996 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 640 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good. Flow completely regulated by Tippy Dam 700 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1450	1530	1620	1270	1610	1630	1920	1410	1560	1520	1520	1210
2	1510	1470	1620	1200	1600	1610	1800	1450	1550	1510	1350	1190
3	1380	1410	1620	1130	1620	1610	1890	1450	1520	1380	1330	1220
4	1310	1370	1620	1190	1630	1610	2230	1440	1590	1320	1480	1210
5	1410	1380	1600	1340	1630	1580	2380	1440	1700	1380	1550	1240
6	1780	1430	1580	1450	1590	1580	2320	1520	1630	1870	1520	1250
7	1960	1440	1690	1440	1600	1540	2250	1550	1530	1810	1450	1190
8	2150	1410	1690	1390	1580	1470	2040	1580	1510	1540	1400	1110
9	1940	1430	1660	1400	1580	1500	2070	1530	1500	2220	1380	1090
10	1720	1910	1620	1450	1610	1570	2070	1480	1420	2160	1450	1300
11	1680	2180	1600	1450	1630	1560	2130	1530	1420	1770	1460	1190
12	1560	2110	1550	1390	2320	1530	2230	1510	1430	1650	1420	e1180
13	1540	1720	1530	1440	2600	1490	2310	1500	1610	1590	1440	e1390
14	1590	1660	1560	1450	2380	1510	2210	1500	1710	1550	1520	1310
15	1520	1650	1550	1450	2090	1510	2130	1450	1600	1480	1500	1220
16	1520	1650	1510	1490	1890	1510	2110	1390	1640	1390	1510	1220
17	1540	1670	1540	1550	2000	1540	1910	1470	1630	1420	1400	1270
18	1560	1640	1550	1650	1950	1880	1680	1560	1590	1450	1360	1270
19	1550	1630	1550	1670	1770	2040	1640	1570	1580	1590	1390	1190
20	1530	1620	1550	1620	1660	1840	1640	1550	1500	1590	1300	1230
21	1540	1630	1520	1640	1610	1770	1620	1440	1390	1760	1350	1260
22	1480	1610	1480	1670	1470	1860	1600	1420	1370	1820	1270	1270
23	1440	1580	1320	1890	1420	1810	1660	1540	1360	1920	1300	1260
24	1450	1580	1140	2190	1520	1730	1620	1510	1280	2440	1320	1270
25	1500	1570	1270	2150	1630	1730	1580	1560	1380	2320	1230	1260
26	1520	1530	1320	1990	1630	1690	1600	1620	1420	1820	1240	1240
27	1490	1460	1420	1740	1540	1650	1560	1630	1390	1590	1380	1280
28	1490	1520	1540	1700	1590	1650	1530	1410	1380	1550	1340	1540
29	1480	1540	1600	1680	---	1670	1510	1470	1550	1510	1090	1640
30	1510	1560	1540	1640	---	1840	1460	1580	1340	1540	1170	1530
31	1550	---	1360	1620	---	1980	---	1550	---	1480	1230	---
TOTAL	48650	47890	47320	48330	48750	51490	56700	46610	45080	51940	42650	38030
MEAN	1569	1596	1526	1559	1741	1661	1890	1504	1503	1675	1376	1268
MAX	2150	2180	1690	2190	2600	2040	2380	1630	1710	2440	1550	

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1999, BY WATER YEAR (WY)

MEAN	1554	1613	1590	1660	1732	1846	2213	1766	1513	1463	1372	1338
MAX	1579	1691	1722	1823	1856	1999	2512	2150	1548	1675	1453	1409
(WY)	1997	1997	1997	1997	1997	1997	1997	1997	1997	1999	1997	1997
MIN	1513	1552	1521	1559	1597	1661	1890	1504	1487	1347	1288	1268
(WY)	1998	1998	1998	1999	1998	1999	1999	1999	1998	1998	1998	1998

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1997 - 1999

ANNUAL TOTAL	580760		573440			
ANNUAL MEAN	1591		1571		1637	
HIGHEST ANNUAL MEAN					1758	1997
LOWEST ANNUAL MEAN					1571	1999
HIGHEST DAILY MEAN	4240	Apr 2	2600	Feb 13	4240	Apr 2 1998
LOWEST DAILY MEAN	1140	Dec 24	1090	Aug 29	1090	Aug 29 1999
ANNUAL SEVEN-DAY MINIMUM	1220	Jul 30	1190	Sep 3	1190	Sep 3 1999
INSTANTANEOUS PEAK FLOW			3560	Jun 29	6130	Mar 31 1998
INSTANTANEOUS PEAK STAGE			9.76	Jun 29	10.91	Mar 31 1998
INSTANTANEOUS LOW FLOW			578	Jun 29	83	Mar 31 1998
ANNUAL RUNOFF (CFSM)	1.10		1.08		1.13	
ANNUAL RUNOFF (INCHES)	14.89		14.70		15.33	
10 PERCENT EXCEEDS	1880		1910		2060	
50 PERCENT EXCEEDS	1540		1540		1560	
90 PERCENT EXCEEDS	1270		1280		1300	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1996 to current year.

DISSOLVED OXYGEN: October 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 23.5°C, July 30, 1999; minimum, 0.0°C, on several days during winter periods.

DISSOLVED OXYGEN: Maximum, 16.0 mg/L, Mar. 11, 12, 1997; minimum recorded, 6.5 mg/L, June 2, July 18, 19, 1999, but may have been lower during instrument malfunction July 30, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 23.5°C, July 30; minimum, 0.0°C, on several days during winter period.

DISSOLVED OXYGEN: Maximum, 15.6 mg/L, Mar. 30; minimum recorded, 6.5 mg/L, June 2, July 18, 19, but may have been lower during instrument malfunction July 30.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER				DECEMBER			JANUARY	
1	17.0	16.0	16.5	11.0	10.5	11.0	5.5	5.5	5.5	1.0	1.0	1.0
2	16.5	16.0	16.0	11.0	10.5	10.5	5.5	5.5	5.5	1.0	1.0	1.0
3	16.0	16.0	16.0	10.5	10.0	10.0	6.0	5.5	5.5	1.0	1.0	1.0
4	16.0	15.5	15.5	10.0	9.5	10.0	6.5	6.0	6.0	1.0	.5	1.0
5	15.5	15.0	15.0	9.5	9.5	9.5	6.5	6.5	6.5	1.0	.5	.5
6	15.0	14.5	15.0	9.5	9.0	9.5	6.5	6.5	6.5	.5	.5	.5
7	14.5	14.5	14.5	9.0	9.0	9.0	6.5	6.0	6.5	.5	.5	.5
8	14.5	14.0	14.5	9.0	8.5	8.5	6.0	6.0	6.0	.5	.5	.5
9	14.5	14.0	14.0	8.5	8.0	6.5	6.0	6.0	6.0	.5	.0	.5
10	14.0	14.0	14.0	8.5	8.0	8.0	6.0	5.5	6.0	.5	.0	.0
11	14.0	13.5	14.0	8.0	7.5	7.5	5.5	5.5	5.5	.0	.0	.0
12	14.0	13.5	14.0	7.5	7.5	7.5	5.5	5.0	5.5	.0	.0	.0
13	13.5	13.0	13.5	7.5	7.0	7.0	5.0	5.0	5.0	.0	.0	.0
14	13.0	13.0	13.0	7.0	7.0	7.0	5.0	4.5	5.0	.0	.0	.0
15	13.0	12.5	13.0	7.0	7.0	7.0	4.5	4.5	4.5	.0	.0	.0
16	13.0	12.5	13.0	7.0	6.5	6.5	4.5	4.5	4.5	.0	.0	.0
17	13.0	12.5	13.0	6.5	6.0	6.5	4.5	4.0	4.5	.0	.0	.0
18	13.5	12.5	13.0	6.5	6.5	6.5	4.0	4.0	4.0	.0	.0	.0
19	12.5	12.5	12.5	6.5	6.0	6.0	4.0	4.0	4.0	.0	.0	.0
20	12.5	12.0	12.0	6.0	6.0	6.0	4.0	3.5	3.5	.5	.0	.5
21	12.0	12.0	12.0	6.0	5.5	5.5	3.5	3.5	3.5	.5	.5	.5
22	12.0	11.5	11.5	5.5	5.5	5.5	3.5	3.0	3.0	.5	.5	.5
23	11.5	11.5	11.5	5.5	5.5	5.5	3.0	2.5	3.0	1.0	.5	.5
24	11.5	11.5	11.5	5.5	5.5	5.5	2.5	2.0	2.5	1.0	.5	1.0
25	11.5	11.5	11.5	5.5	5.0	5.5	2.5	2.0	2.0	1.0	1.0	1.0
26	11.5	11.0	11.0	5.0	5.0	5.0	2.0	2.0	2.0	1.0	1.0	1.0
27	11.5	11.0	11.5	5.0	5.0	5.0	2.0	1.5	2.0	1.0	1.0	1.0
28	11.5	11.0	11.0	5.0	5.0	5.0	1.5	1.5	1.5	1.0	1.0	1.0
29	11.5	11.0	11.0	5.0	5.0	5.0	1.5	1.5	1.5	1.0	1.0	1.0
30	11.5	11.0	11.0	5.5	5.0	5.0	1.5	1.5	1.5	1.0	1.0	1.0
31	11.0	11.0	11.0	---	---	---	1.5	1.0	1.0	1.0	1.0	1.0
MONTH	17.0	11.0	13.1	11.0	5.0	7.2	6.5	1.0	4.2	1.0	.0	.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	1.0	1.0	1.0	2.0	2.0	2.0	6.0	5.0	5.5	12.0	10.5	11.5
2	1.0	1.0	1.0	2.0	2.0	2.0	7.5	6.0	6.5	12.5	11.0	12.0
3	1.5	1.0	1.0	2.0	2.0	2.0	7.5	6.5	7.0	13.5	12.0	13.0
4	1.5	1.0	1.0	2.0	2.0	2.0	8.0	7.0	7.5	15.0	12.5	14.0
5	1.5	1.0	1.5	2.0	2.0	2.0	8.0	7.5	7.5	15.0	14.0	14.5
6	1.5	1.5	1.5	2.0	2.0	2.0	7.5	7.5	7.5	14.5	14.0	14.0
7	1.5	1.5	1.5	2.0	1.5	2.0	7.5	7.0	7.5	14.0	13.5	14.0
8	1.5	1.5	1.5	2.0	2.0	2.0	8.5	7.5	8.0	13.5	12.5	13.0
9	1.5	1.5	1.5	2.0	1.5	2.0	8.5	8.0	8.0	13.0	12.5	13.0
10	1.5	1.5	1.5	2.0	1.5	2.0	8.5	8.0	8.0	14.0	12.5	13.5
11	2.0	1.5	1.5	2.0	1.5	2.0	8.5	8.0	8.0	14.5	14.0	14.5
12	2.0	1.5	2.0	2.0	1.5	2.0	8.5	8.0	8.0	14.5	13.5	14.0
13	2.0	2.0	2.0	2.0	1.5	2.0	9.0	8.0	8.5	14.5	13.5	14.0
14	2.0	2.0	2.0	2.0	2.0	2.0	9.0	8.5	8.5	14.5	13.5	14.0
15	2.0	1.5	1.5	2.0	2.0	2.0	9.5	8.5	9.0	15.0	14.0	14.5
16	1.5	1.5	1.5	2.5	2.0	2.0	10.0	9.5	9.5	15.0	14.0	14.5
17	1.5	1.5	1.5	2.5	2.5	2.5	9.5	9.0	9.0	15.0	14.5	15.0
18	2.0	1.5	1.5	2.5	2.5	2.5	9.0	9.0	9.0	15.0	14.5	14.5
19	2.0	1.5	2.0	3.0	2.5	2.5	9.0	9.0	9.0	15.0	14.5	15.0
20	2.0	2.0	2.0	3.0	2.5	3.0	9.0	9.0	9.0	15.5	15.0	15.5
21	2.0	2.0	2.0	3.0	3.0	3.0	10.0	9.0	9.5	15.5	15.5	15.5
22	2.0	2.0	2.0	3.0	3.0	3.0	9.5	9.0	9.5	16.0	15.5	16.0
23	2.0	2.0	2.0	3.5	3.0	3.0	9.5	9.0	9.0	16.5	15.5	16.0
24	2.0	2.0	2.0	3.5	3.0	3.0	9.5	9.0	9.0	15.5	14.0	14.5
25	2.0	2.0	2.0	3.0	3.0	3.0	9.5	9.0	9.0	14.0	14.0	14.0
26	2.0	1.5	2.0	3.5	3.0	3.5	11.0	9.5	10.0	14.5	14.0	14.5
27	2.0	1.5	2.0	3.5	3.5	3.5	11.0	10.0	10.5	14.5	14.5	14.5
28	2.0	1.5	2.0	3.5	3.5	3.5	11.5	10.5	11.0	15.5	14.5	15.0
29	---	---	---	4.0	3.5	4.0	12.0	10.5	11.0	15.5	15.0	15.5
30	---	---	---	4.5	4.0	4.0	11.5	10.5	11.0	16.5	15.5	16.0
31	---	---	---	5.0	4.0	4.5	---	---	---	17.5	16.5	17.0
MONTH	2.0	1.0	1.7	5.0	1.5	2.6	12.0	5.0	8.7	17.5	10.5	14.4

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	17.0	16.5	16.5	21.5	20.5	21.0	23.0	22.0	22.5	20.0	20.0	20.0
2	17.5	16.0	17.0	20.5	20.5	20.5	23.0	22.0	22.5	20.0	20.0	20.0
3	17.0	16.5	16.5	20.5	20.5	20.5	22.5	22.0	22.5	20.5	20.0	20.0
4	18.0	17.0	17.5	21.0	20.0	20.5	22.0	21.5	22.0	20.5	20.0	20.0
5	18.0	16.5	17.0	21.5	20.5	21.0	22.0	21.5	21.5	20.5	20.0	20.5
6	18.0	17.0	17.5	21.5	20.0	20.5	22.0	21.5	22.0	20.0	19.5	20.0
7	18.5	17.5	18.0	22.0	21.0	21.5	22.0	21.5	22.0	20.0	19.5	20.0
8	19.0	18.5	18.5	22.5	22.0	22.0	21.5	21.0	21.0	20.0	19.5	19.5
9	19.5	19.0	19.5	22.5	20.5	21.5	21.0	21.0	21.0	19.5	19.0	19.0
10	20.0	19.5	20.0	21.0	20.5	21.0	21.0	20.5	20.5	19.0	18.5	19.0
11	20.5	20.0	20.5	21.5	21.0	21.0	20.5	20.0	20.5	19.0	18.5	18.5
12	21.0	20.5	20.5	21.5	21.0	21.0	21.0	20.5	20.5	---	---	---
13	21.0	19.5	20.5	21.5	21.0	21.5	21.0	20.0	20.5	---	---	---
14	20.5	19.0	19.5	22.0	21.5	21.5	20.5	20.0	20.0	18.0	17.5	18.0
15	20.0	19.0	19.5	22.0	21.5	21.5	20.5	20.0	20.0	18.0	17.5	17.5
16	19.5	19.0	19.5	22.0	21.5	21.5	20.5	20.0	20.0	17.5	17.0	17.5
17	19.0	18.5	19.0	22.0	21.5	21.5	20.5	19.5	20.0	17.5	17.0	17.0
18	19.0	18.5	19.0	22.0	21.5	22.0	20.0	20.0	20.0	17.0	17.0	17.0
19	19.5	19.0	19.0	22.0	21.5	22.0	20.5	20.0	20.0	17.0	17.0	17.0
20	19.5	19.0	19.0	22.5	21.5	22.0	20.5	19.5	20.0	17.0	16.0	16.5
21	19.5	19.0	19.5	22.0	21.5	22.0	20.5	19.5	20.0	16.5	16.0	16.5
22	20.0	19.0	19.5	22.5	21.5	21.5	20.0	20.0	20.0	16.0	16.0	16.0
23	20.5	19.5	20.0	22.0	21.5	21.5	20.5	20.0	20.0	16.0	16.0	16.0
24	20.5	19.5	20.0	21.5	21.5	21.5	20.5	20.0	20.0	16.0	15.5	16.0
25	20.5	19.5	20.0	22.0	21.5	22.0	20.0	20.0	20.0	16.0	15.5	16.0
26	21.0	20.5	20.5	22.5	22.0	22.5	20.5	20.0	20.0	16.5	16.0	16.0
27	21.0	20.5	21.0	22.5	22.0	22.0	20.5	20.0	20.0	16.0	15.5	15.5
28	21.5	20.5	21.0	22.5	22.0	22.5	20.5	19.5	20.0	15.5	15.0	15.5
29	21.0	20.0	20.0	23.0	22.0	22.5	20.5	19.5	20.0	15.0	14.5	15.0
30	21.0	21.0	21.0	23.5	22.5	22.5	20.5	20.0	20.0	15.0	14.5	14.5
31	---	---	---	23.0	22.0	22.5	20.5	20.0	20.0	---	---	---
MONTH	21.5	16.0	19.2	23.5	20.0	21.6	23.0	19.5	20.6	---	---	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	8.4	8.2	8.3	9.8	9.6	9.7	11.1	10.9	11.0	13.1	13.0	13.1
2	8.6	8.3	8.4	9.9	9.7	9.8	11.1	11.0	11.0	13.1	12.9	13.0
3	8.8	8.2	8.6	9.9	9.6	9.8	11.1	11.0	11.1	13.0	12.8	12.9
4	8.8	8.4	8.6	9.9	9.5	9.7	11.2	11.0	11.1	13.3	13.0	13.2
5	8.7	8.5	8.6	9.5	9.3	9.4	11.1	11.0	11.0	13.4	13.2	13.3
6	8.6	8.0	8.4	9.6	9.3	9.5	11.1	11.0	11.0	13.5	13.2	13.3
7	8.7	8.5	8.6	9.8	9.5	9.7	11.3	11.0	11.1	13.4	13.3	13.4
8	8.9	8.6	8.8	9.8	9.7	9.8	11.2	11.0	11.1	13.6	13.3	13.5
9	9.1	8.8	8.9	9.9	9.6	9.8	11.3	11.2	11.2	13.6	13.4	13.4
10	9.1	8.8	9.0	9.9	9.7	9.8	11.4	11.2	11.3	13.5	13.4	13.4
11	9.2	8.8	9.0	10.2	9.9	10.0	11.5	11.4	11.4	13.6	13.4	13.5
12	9.3	8.8	9.0	10.4	10.0	10.2	11.7	11.5	11.6	14.2	13.4	13.6
13	9.1	8.8	8.9	10.3	10.1	10.2	11.9	11.6	11.8	13.8	13.6	13.7
14	9.4	9.0	9.2	10.2	10.0	10.1	12.0	11.7	11.9	13.8	13.6	13.7
15	9.8	9.1	9.5	10.4	10.1	10.2	12.1	11.7	11.9	13.6	13.5	13.7
16	9.9	9.6	9.7	10.4	10.2	10.3	12.0	11.9	11.9	13.7	13.5	13.6
17	9.9	9.7	9.8	10.5	10.3	10.4	12.2	11.7	12.0	13.8	13.5	13.6
18	9.9	9.3	9.7	10.5	10.2	10.4	12.0	11.7	11.8	13.6	13.4	13.5
19	10.0	9.7	9.8	10.5	10.2	10.4	12.2	12.0	12.1	13.5	13.4	13.5
20	10.0	9.7	9.9	10.7	10.3	10.5	12.2	11.9	12.1	13.5	13.3	13.4
21	10.2	9.9	10.0	10.8	10.5	10.7	12.2	12.0	12.0	13.4	13.2	13.3
22	10.1	9.7	9.9	10.8	10.5	10.6	12.4	12.1	12.3	13.3	13.1	13.2
23	10.0	9.5	9.8	10.8	10.5	10.7	12.3	12.1	12.2	13.2	12.9	13.1
24	9.9	9.7	9.8	10.9	10.5	10.7	12.4	12.1	12.3	13.1	12.9	13.0
25	10.2	9.8	10.1	10.8	10.5	10.7	12.5	12.3	12.4	13.2	13.0	13.0
26	10.4	10.1	10.2	11.0	10.7	10.9	12.7	12.3	12.5	13.1	13.0	13.0
27	10.3	10.0	10.1	10.9	10.8	10.9	12.7	12.5	12.6	13.0	12.9	13.0
28	10.2	9.5	9.9	11.0	10.8	10.9	12.8	12.6	12.7	13.1	13.0	13.0
29	9.8	9.5	9.7	11.0	10.9	10.9	13.1	12.6	12.8	13.2	13.0	13.1
30	9.8	9.7	9.7	11.1	10.9	11.0	13.1	12.7	12.9	13.2	13.1	13.1
31	9.7	9.6	9.7	--	--	--	13.1	12.9	13.0	13.2	13.0	13.1
MONTH	10.4	8.0	9.3	11.1	9.3	10.3	13.1	10.9	11.8	14.2	12.8	13.3

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	13.1	13.0	13.0	13.8	13.6	13.7	15.0	14.5	14.7	10.4	9.3	9.8
2	13.1	12.9	13.0	13.8	13.5	13.7	14.7	13.8	14.4	10.5	9.3	9.9
3	13.4	13.0	13.1	13.8	13.6	13.7	14.0	13.8	13.9	10.2	9.4	9.7
4	13.1	12.8	13.0	13.9	13.6	13.8	13.8	13.4	13.6	10.6	10.0	13.3
5	12.9	12.7	12.8	14.0	13.8	13.9	13.6	13.4	13.5	10.7	10.2	13.4
6	12.8	12.7	12.7	14.2	13.9	14.0	13.4	13.1	13.2	10.7	10.1	13.3
7	12.8	12.7	12.8	14.2	14.0	14.1	13.3	12.9	13.2	10.5	9.8	13.2
8	12.8	12.7	12.7	14.3	14.1	14.2	13.0	12.6	12.9	10.4	9.8	13.2
9	12.9	12.7	12.8	14.4	14.1	14.2	12.9	12.6	12.7	10.4	10.0	13.2
10	12.9	12.8	12.8	14.4	14.2	14.3	12.8	12.5	12.6	10.4	10.1	13.2
11	12.9	12.8	12.8	14.5	14.3	14.4	12.6	12.3	12.4	10.4	10.0	13.2
12	12.9	12.6	12.7	14.6	14.4	14.4	12.5	12.1	12.3	10.4	9.8	13.1
13	12.8	12.6	12.7	14.6	14.4	14.5	12.3	12.0	12.2	10.3	8.8	13.0
14	13.1	12.7	12.9	14.5	14.4	14.5	12.1	11.7	12.0	10.4	9.9	13.1
15	13.0	12.9	13.0	14.6	14.3	14.5	11.9	11.6	11.7	10.4	9.8	13.1
16	13.1	13.0	13.1	14.5	14.3	14.4	11.8	11.5	11.6	10.3	8.7	13.0
17	13.2	13.0	13.1	14.4	14.2	14.4	11.6	11.4	11.5	10.6	9.8	13.1
18	13.3	13.1	13.2	14.4	14.3	14.4	11.6	11.3	11.4	10.0	9.1	9.5
19	13.3	13.1	13.2	14.5	14.2	14.4	11.5	11.2	11.3	9.7	9.0	9.4
20	13.4	13.2	13.3	14.6	14.4	14.4	11.4	11.0	11.2	9.7	8.5	9.1
21	13.5	13.3	13.4	15.2	14.3	14.4	11.2	10.8	11.0	9.1	8.3	8.8
22	13.6	13.4	13.5	14.6	14.2	14.4	11.0	10.7	10.9	9.6	7.4	8.7
23	13.6	13.4	13.5	14.8	14.4	14.6	10.9	10.5	10.7	9.3	7.4	8.9
24	13.6	13.4	13.5	14.9	14.6	14.8	10.7	10.1	10.5	9.0	8.4	8.7
25	13.7	13.5	13.6	15.1	14.8	15.0	10.7	10.0	10.3	9.1	8.5	8.9
26	13.7	13.5	13.6	15.2	15.0	15.1	10.5	10.0	10.2	9.9	8.6	9.1
27	13.9	13.6	13.7	15.3	15.0	15.1	10.4	9.7	10.2	9.0	8.1	8.4
28	13.8	13.6	13.7	15.3	15.0	15.1	10.4	9.6	10.1	8.6	8.3	8.5
29	--	--	--	15.3	15.1	15.2	10.1	9.4	9.8	8.9	8.3	8.7
30	--	--	--	15.6	15.1	15.3	10.1	9.4	9.7	9.0	8.7	8.9
31	--	--	--	15.4	15.1	15.3	--	--	--	9.1	8.4	8.8
MONTH	13.9	12.6	13.1	15.6	13.5	14.5	15.0	9.4	11.9	10.7	7.4	9.6

STREAMS TRIBUTARY TO LAKE MICHIGAN

04125550 MANISTEE RIVER NEAR WELLSTON, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

[illegible]

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126740 PLATTE RIVER AT HONOR, MI

LOCATION.--Lat 44°40'05", long 86°02'05", in SW1/4 NW1/4 sec.8, T.26 N., R.14 W., Benzie County, Hydrologic Unit 04060104, on right bank 20 ft downstream from bridge on U.S. Highway 31, 1.0 mi west of Honor.

DRAINAGE AREA.--118 mi².

PERIOD OF RECORD.--April 1990 to current year.

GAGE.--Water-stage recorder. Datum of gage is 589.73 ft above sea level (Michigan Department of Transportation bench mark).

REMARKS.--Records good except for estimated daily discharges, which are fair. Some diversion for fish hatchery 6 mi upstream from station.
Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	104	125	e104	104	113	117	103	105	98	105	96
2	106	104	114	e105	109	108	115	102	132	96	102	97
3	104	104	111	e105	111	106	115	102	114	96	103	96
4	103	105	109	e105	119	105	127	101	106	95	106	96
5	115	104	112	106	108	103	120	102	104	95	104	95
6	165	106	115	106	106	102	118	108	102	203	100	96
7	130	107	127	e105	104	101	117	106	110	116	105	96
8	119	105	113	105	104	100	118	118	104	120	105	96
9	114	105	110	104	108	100	114	109	102	162	101	97
10	112	166	108	e105	106	99	114	106	101	122	109	99
11	110	136	107	e105	136	98	137	104	100	114	104	97
12	110	120	106	107	152	98	131	104	99	110	102	100
13	111	115	105	104	118	98	122	102	108	107	117	119
14	113	114	104	e104	113	98	118	100	106	107	109	103
15	109	112	104	e104	112	100	117	99	101	104	105	99
16	107	123	103	103	112	103	115	100	99	102	102	98
17	109	123	104	102	113	112	113	113	98	110	101	97
18	118	117	104	123	108	118	112	113	98	105	100	95
19	111	118	105	113	107	113	111	111	97	114	101	95
20	109	115	103	107	105	113	110	107	94	108	100	98
21	109	116	103	105	105	116	110	104	94	114	99	96
22	106	114	102	116	e103	114	109	103	94	110	100	95
23	104	112	103	142	102	115	109	117	95	116	102	96
24	104	109	103	136	101	116	107	118	95	112	103	95
25	103	108	101	119	102	112	107	131	93	107	101	95
26	102	107	103	113	101	112	106	120	93	108	102	94
27	103	105	102	111	103	114	105	110	92	104	100	96
28	103	105	102	110	117	117	104	108	95	101	99	134
29	102	105	104	108	---	118	104	105	99	102	96	120
30	110	134	103	106	---	117	103	102	94	100	97	103
31	105	---	103	104	---	119	---	104	---	110	97	---
TOTAL	3436	3418	3318	3392	3089	3358	3425	3332	3024	3468	3179	2789
MEAN	111	114	107	109	110	108	114	107	101	112	103	99.6
MAX	165	166	127	142	152	119	137	131	132	203	117	134
MIN	102	104	101	102	101	98	103	99	92	95	97	94
CFSM	.94	.97	.91	.93	.93	.92	.97	.91	.85	.95	.87	.84
IN.	1.08	1.08	1.05	1.07	.97	1.06	1.08	1.05	.95	1.09	1.00	.94

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1999, BY WATER YEAR (WY)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
MEAN	127	131	128	130	127	136	146	135	131	126
MAX	148	150	151	147	144	164	169	155	165	152
(WY)	1992	1993	1992	1992	1992	1992	1992	1997	1993	1993
MIN	111	114	107	109	109	108	114	107	101	97.5
(WY)	1999	1999	1999	1999	1996	1999	1999	1999	1999	1998

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1990 - 1999
ANNUAL TOTAL	40735	39428	
ANNUAL MEAN	112	108	130
HIGHEST ANNUAL MEAN			147
LOWEST ANNUAL MEAN			108
HIGHEST DAILY MEAN	261	203	386
LOWEST DAILY MEAN	89	92	89
ANNUAL SEVEN-DAY MINIMUM	89	94	89
INSTANTANEOUS PEAK FLOW		326	516
INSTANTANEOUS PEAK STAGE		2.52	4.04
INSTANTANEOUS LOW FLOW		89	76
ANNUAL RUNOFF (CFSM)	.95	.92	1.10
ANNUAL RUNOFF (INCHES)	12.84	12.43	14.92
10 PERCENT EXCEEDS	127	118	155
50 PERCENT EXCEEDS	110	105	129
90 PERCENT EXCEEDS	95	97	105

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

445331085564501 GLEN LAKE NEAR GLEN ARBOR, MI

LOCATION.--Lat 44°51'31", long 85°59'46", in SW1/4 NW1/4 sec. 3, T.28 N., R.14 W., Leelanau County, Hydrologic Unit 04060104, at bridge on State Highway 22, 2.6 mi south of Glen Arbor.

DRAINAGE AREA.--30.8 mi².

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

GAGE.--Non recording gage. Once daily reading by observer. Datum of gage is 596.00 ft above sea level.

REMARKS.--There is one small inlet on the south side near Burdickville. The outlet is the Crystal River. Lake elevation controlled by dam. Established legal level 596.75 ft above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 1.90 ft, June 23, 1943; minimum observed, 0.38 ft, Sept. 30, Oct. 1-4, 23-25, 29-31, 1976, Jan. 1, 1995, Sept. 20, 1999.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 1.08 ft, June 2, 4, 8, 10; minimum observed, 0.38 ft, Sept. 20.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.70	--	--	--	--	--	.74	.94	--	--	1.00	--
2	.66	--	.68	--	--	--	.74	.94	1.08	.78	.88	.54
3	--	--	--	--	--	--	.74	--	--	.76	.88	--
4	--	.58	--	--	--	--	.74	--	1.08	.74	.88	.54
5	--	--	--	--	--	--	--	--	--	.74	--	.52
6	--	.58	--	--	--	--	--	.98	--	.88	--	--
7	.80	.58	--	--	--	--	.86	--	--	.88	--	.50
8	.78	--	.76	--	--	--	--	1.00	1.08	.86	--	--
9	.74	--	.76	--	--	--	--	--	--	.86	.80	--
10	.72	--	.72	--	--	--	.88	--	1.08	--	.80	--
11	.72	.64	--	--	--	--	--	--	1.08	.93	.78	.46
12	.74	--	--	--	--	--	.98	--	--	.94	.78	--
13	.72	--	.70	--	--	--	.98	--	--	--	--	--
14	.72	.62	--	--	--	--	1.00	.98	--	--	--	--
15	.70	.62	--	--	--	.78	1.00	--	--	--	.76	.45
16	.68	--	--	--	--	.78	--	--	.96	--	--	.44
17	.68	--	--	--	--	.78	--	--	.94	.90	--	--
18	--	--	--	--	--	.78	--	--	--	--	--	.42
19	--	--	--	--	--	.76	.96	1.06	.92	.96	--	--
20	--	--	--	--	--	.74	.96	--	.90	.96	.70	.38
21	--	--	--	--	--	.74	.98	1.02	.86	1.00	.70	--
22	.69	--	--	--	--	--	--	--	--	1.00	--	--
23	--	--	--	--	--	.74	--	--	--	.98	.68	--
24	.64	.62	--	--	--	.74	.98	--	.84	--	--	--
25	.64	--	--	--	--	.74	--	--	.84	1.00	.68	.44
26	.64	--	--	--	--	.74	.98	1.06	--	.96	.66	--
27	.64	.60	--	--	--	.76	--	--	.82	.96	--	.46
28	.64	.60	.60	--	--	.76	--	1.04	--	--	.64	--
29	.64	.62	--	--	--	.76	.96	--	.78	.94	--	--
30	--	.66	--	--	--	.76	.94	--	--	--	--	.54
31	.62	--	--	--	--	.76	--	--	--	--	.56	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126970 BOARDMAN RIVER AT BROWN BRIDGE ROAD NEAR MAYFIELD, MI

LOCATION.--Lat 44°39'24", long 85°26'12", in NE1/4 NE1/4 sec.18, T.26 N., R.9 W., Grand Traverse County, Hydrologic Unit 04060105, on right bank 200 ft upstream from Brown Bridge Road, 5.1 mi northeast of Mayfield.

DRAINAGE AREA.--141 mi².

PERIOD OF RECORD.--October 1997 to September 1999 (discontinued).

GAGE.--Water-stage recorder. Elevation of gage is 830 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	94	87	120	91	105	120	172	104	108	106	e103	84
2	91	86	119	97	105	118	172	104	123	106	e104	84
3	89	85	116	99	107	117	e163	105	144	102	103	82
4	87	85	110	96	109	114	e175	108	151	100	103	82
5	88	86	107	96	107	112	e171	106	134	97	102	81
6	119	88	106	96	106	110	e169	108	121	186	97	81
7	126	93	115	93	106	107	160	111	114	148	97	81
8	118	91	112	98	105	106	157	111	109	141	97	80
9	110	90	109	97	106	109	148	109	106	183	e95	81
10	101	122	107	95	106	106	138	107	106	175	e97	81
11	97	131	105	99	115	104	140	104	105	158	e99	82
12	95	125	104	97	156	104	148	103	104	132	97	e81
13	94	116	104	93	145	104	163	102	113	118	106	e88
14	94	109	103	99	141	104	170	100	124	112	106	86
15	93	106	103	94	146	105	162	99	122	107	104	84
16	92	110	102	95	139	107	148	99	119	104	99	83
17	91	114	104	96	137	115	137	104	112	106	96	81
18	91	111	102	104	130	128	128	106	107	105	94	81
19	91	111	101	100	125	129	124	106	104	114	94	81
20	90	109	100	97	117	131	121	103	103	113	92	86
21	91	107	100	97	110	136	119	101	101	117	90	85
22	92	105	94	100	110	133	117	100	98	116	89	84
23	91	104	97	111	113	129	115	105	97	124	89	83
24	90	102	98	124	111	130	112	102	97	134	89	82
25	89	101	96	121	110	127	111	132	96	124	89	81
26	89	100	99	120	109	125	110	159	95	116	93	80
27	88	100	97	118	109	126	109	161	93	110	90	82
28	88	100	96	114	118	134	108	140	95	105	88	99
29	87	100	98	111	---	148	106	121	107	104	86	107
30	88	108	95	109	---	159	105	112	103	e102	85	99
31	87	---	96	107	---	166	---	107	---	e103	85	---
TOTAL	2931	3082	3215	3164	3303	3763	4178	3449	3311	3768	2958	2532
MEAN	94.5	103	104	102	118	121	139	111	110	122	95.4	84.4
MAX	126	131	120	124	156	166	175	161	151	186	106	107
MIN	87	85	94	91	105	104	105	99	93	97	85	80
CFSM	.67	.73	.74	.72	.84	.86	.99	.79	.78	.86	.68	.60
IN.	.77	.81	.85	.83	.87	.99	1.10	.91	.87	.99	.78	.67

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1998 - 1999, BY WATER YEAR (WY)

	1998	1998	1998	1998	1999	1998	1998	1998	1999	1999	1999	1999
MEAN	102	108	106	108	113	126	159	117	110	107	88.6	84.0
MAX	110	114	107	113	118	130	179	122	110	122	95.4	84.4
(WY)	1998	1998	1998	1998	1999	1998	1998	1998	1999	1999	1999	1999
MIN	94.5	103	104	102	109	121	139	111	109	92.6	81.9	83.7
(WY)	1999	1999	1999	1999	1998	1999	1999	1999	1998	1998	1998	1998

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1998 - 1999
ANNUAL TOTAL	40157	39654	
ANNUAL MEAN	110	109	111
HIGHEST ANNUAL MEAN			113
LOWEST ANNUAL MEAN			109
HIGHEST DAILY MEAN	423	Apr 2	423
LOWEST DAILY MEAN	78	Sep 12	78
ANNUAL SEVEN-DAY MINIMUM	79	Sep 19	79
INSTANTANEOUS PEAK FLOW		232	449
INSTANTANEOUS LOW FLOW		4.12	5.44
ANNUAL RUNOFF (CFSM)	.78	.77	.78
ANNUAL RUNOFF (INCHES)	10.59	10.46	10.66
10 PERCENT EXCEEDS	137	137	137
50 PERCENT EXCEEDS	105	105	106
90 PERCENT EXCEEDS	81	87	83

(a) Sept. 26, 27.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

443903085312101 ARBUTUS LAKE NEAR MAYFIELD, MI

LOCATION.--Lat 44°39'03", long 85°31'21", in SW1/4 NE1/4 sec. 16, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04090105, on south side of lake at Pine Hurst Trail, 1.8 mi north of Mayfield.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--August 1994 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Elevation of gage is 794 ft above sea level, from topographic map.

REMARKS.--No inlets or outlets.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 5.07 ft, Feb. 13, 1995; minimum observed, 3.27 ft, Sept. 23, 1999.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 4.10 ft, Mar. 31, April 1; minimum observed, 3.27 ft, Sept. 23.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.70	--	--	--	--	--	4.10	--	--	3.60	3.74	3.45
2	3.70	--	3.95	--	--	--	--	--	--	3.59	3.76	3.44
3	3.70	--	--	--	--	--	3.88	--	--	3.58	3.70	3.43
4	3.70	--	--	--	--	--	--	--	--	3.57	3.69	3.42
5	3.70	--	--	--	--	--	--	--	--	3.56	3.68	3.41
6	3.70	--	--	--	--	--	--	3.76	--	3.78	3.67	3.40
7	--	--	--	--	--	--	--	--	--	3.72	3.66	3.38
8	--	--	--	--	--	--	--	--	--	3.71	3.65	3.36
9	--	--	--	--	--	--	--	--	--	3.70	3.65	3.34
10	--	--	--	--	--	--	--	--	--	3.69	3.64	--
11	--	--	--	--	--	--	--	--	--	3.68	3.63	--
12	--	--	--	--	--	--	--	--	--	3.90	3.62	--
13	--	--	--	--	--	--	--	--	--	3.88	3.62	3.34
14	--	--	--	--	--	--	--	--	--	3.86	3.61	--
15	--	--	--	--	--	--	--	--	--	3.84	3.61	--
16	--	--	--	--	--	--	--	--	--	3.82	3.60	--
17	--	--	--	--	--	--	--	--	--	3.82	3.61	--
18	3.84	--	--	--	--	--	--	--	--	3.80	3.60	--
19	3.82	--	--	--	--	--	4.00	--	--	3.78	3.59	--
20	--	--	--	--	--	--	--	--	--	3.76	3.58	3.30
21	3.80	--	--	--	--	--	--	--	3.64	3.74	3.58	--
22	3.86	--	--	--	--	--	3.98	--	--	3.72	3.57	--
23	--	--	--	--	--	--	--	--	--	3.74	3.56	3.27
24	--	--	--	--	--	--	--	--	--	3.72	3.56	--
25	--	--	--	--	--	--	--	--	--	3.74	3.55	--
26	--	--	--	--	--	--	--	--	--	3.76	3.54	--
27	--	--	--	--	--	--	--	--	--	3.78	3.52	--
28	--	--	--	--	--	--	--	--	--	3.78	3.50	--
29	--	--	--	--	--	--	--	--	--	3.76	3.48	3.32
30	--	--	--	--	--	--	--	--	--	3.76	3.47	3.34
31	--	--	--	--	--	4.10	--	--	--	3.75	3.46	--

STREAMS TRIBUTARY TO LAKE MICHIGAN

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 300 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-83-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 596.43 ft above sea level (Antrim County Road Commission bench mark). Nov. 19, 1959 to Sept. 30, 1966, nonrecording gage at site 600 ft upstream at same datum.

REMARKS.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	175	159	258	e165	168	180	210	156	188	173	160	148
2	164	159	182	e165	173	172	194	156	440	190	154	148
3	161	159	174	e165	180	169	184	154	379	169	157	147
4	159	158	170	e165	186	167	214	154	190	182	164	147
5	162	159	171	e165	178	164	224	153	177	162	157	146
6	265	159	174	e165	177	160	196	166	172	268	158	147
7	236	161	204	e165	172	e162	213	179	173	169	158	148
8	177	160	179	e165	171	e160	212	175	163	166	163	149
9	167	159	173	e165	180	e159	181	168	169	239	155	152
10	164	250	170	e165	177	158	173	160	168	176	170	158
11	163	224	169	e165	210	158	175	156	167	162	163	166
12	162	177	168	e165	346	158	185	155	218	159	157	158
13	177	168	166	e165	210	158	179	154	212	156	184	181
14	182	167	166	e165	185	159	171	154	215	157	172	159
15	167	167	167	e165	181	160	168	153	176	159	157	162
16	163	194	166	e170	184	169	166	154	168	154	154	157
17	162	202	169	173	184	202	165	159	169	176	153	154
18	165	177	167	188	177	233	164	164	162	172	153	153
19	162	181	169	190	173	199	165	160	160	208	152	153
20	161	176	166	178	e166	192	164	155	159	173	151	170
21	177	176	166	177	e157	200	164	154	157	165	150	159
22	166	176	158	180	e150	188	164	155	156	165	149	156
23	162	174	e165	206	e141	184	162	173	156	163	150	155
24	161	168	e165	242	e131	189	160	191	169	161	152	154
25	159	166	165	197	131	174	160	253	157	155	150	155
26	159	165	167	186	132	176	159	222	154	155	151	152
27	159	164	166	182	136	186	158	168	154	154	152	157
28	164	164	166	180	176	202	157	159	158	152	149	191
29	160	164	168	176	---	225	156	155	214	157	148	191
30	159	223	167	173	---	208	156	152	163	156	148	170
31	159	---	e165	169	---	212	---	159	---	172	148	---
TOTAL	5279	5256	5346	5442	4932	5583	5299	5126	5663	5325	4639	4743
MEAN	170	175	172	176	176	180	177	165	189	172	156	158
MAX	265	250	258	242	346	233	224	253	440	268	184	191
MIN	159	158	158	165	131	158	156	152	154	152	148	146
CFSM	2.51	2.58	2.54	2.59	2.59	2.65	2.60	2.44	2.78	2.53	2.30	2.33
IN.	2.89	2.88	2.93	2.98	2.70	3.06	2.90	2.81	3.10	2.92	2.65	2.60

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1999, BY WATER YEAR (WY)

	MEAN	186	191	187	181	181	210	223	193	182	174	172	180
MAX	235	226	217	202	209	281	273	237	230	210	203	223	
(WY)	1987	1993	1983	1997	1984	1979	1979	1983	1969	1975	1972	1986	
MIN	167	163	163	157	157	174	177	164	160	151	150	150	
(WY)	1967	1982	1982	1971	1982	1972	1999	1982	1982	1981	1981	1981	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1967 - 1999

ANNUAL TOTAL	64300	62833	
ANNUAL MEAN	176	172	188
HIGHEST ANNUAL MEAN			204
LOWEST ANNUAL MEAN			171
HIGHEST DAILY MEAN	538	Mar 31	840
LOWEST DAILY MEAN	147	Aug 1	130
ANNUAL SEVEN-DAY MINIMUM	148	Jul 28	140
INSTANTANEOUS PEAK FLOW			813
INSTANTANEOUS PEAK STAGE			5.73
INSTANTANEOUS LOW FLOW			128
ANNUAL RUNOFF (CFSM)	2.59	2.54	(a)91
ANNUAL RUNOFF (INCHES)	35.23	34.42	2.77
10 PERCENT EXCEEDS	198	199	222
50 PERCENT EXCEEDS	168	165	179
90 PERCENT EXCEEDS	153	153	160

(a) Result of freezeup.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

451540084560301 WALLOON LAKE AT WALLOON LAKE, MI

LOCATION.--Lat 45°15'40", long 84°56'03", in NW1/4 NW1/4 sec.16, T.33 N., R.5 W., Charlevoix County, Hydrologic Unit 04060105, on left upstream wingwall of dam at outlet of Walloon Lake (Bear River), 0.1 mi south of Walloon Lake.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--July 1942 to September 1950, September 1995 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Elevation of gage is 687 ft above sea level, from topographic map. Prior to September 30, 1950, nonrecording gage at approximately same elevation.

REMARKS.--Lake level maintained by a fix-crest concrete dam. Crest of dam is divided into two parts. The right sill is about 22 ft wide and has its crest at elevation 2.64 ft, gage datum. The left sill, 13 ft wide, is at elevation 1.93 ft, gage datum. There is a steel grate on top of weir to prevent migration of fish into lake. Established legal level is the top of right sill of the dam at lake outlet.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 3.47 ft, Apr. 3, 1998; minimum observed, 2.14 ft, Sept. 10, 1947, Oct. 7, 1948.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 3.20 ft, Jan. 19, 26, Apr. 9, 11; minimum observed, 2.40 ft, Sept. 22.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	3.00	---	---	---	2.98	---	3.00	2.82	2.71	---
2	---	---	---	---	3.13	3.09	---	2.94	3.02	---	---	2.49
3	2.71	---	3.05	---	3.13	---	2.99	---	---	---	2.68	---
4	2.74	2.75	3.00	---	---	---	---	---	---	2.82	2.70	2.48
5	---	---	---	---	3.10	---	3.11	2.84	---	---	---	---
6	---	2.76	---	---	---	3.05	---	2.86	3.08	---	---	---
7	---	---	3.04	---	---	---	---	---	---	2.82	2.60	2.49
8	---	---	---	---	3.07	---	---	---	---	---	2.60	---
9	2.81	---	---	---	---	3.03	3.20	---	3.08	---	---	2.42
10	---	---	---	---	---	---	---	2.88	---	2.76	2.60	2.44
11	2.78	---	3.00	---	3.09	---	3.20	---	3.04	---	---	---
12	---	---	---	---	---	3.01	---	---	---	2.74	---	2.49
13	---	2.93	2.99	---	---	---	---	2.83	---	---	2.69	---
14	---	---	---	---	---	---	---	---	3.00	---	---	---
15	2.82	---	---	---	---	---	---	---	2.96	---	---	2.49
16	---	2.93	3.01	---	3.10	---	3.16	2.80	2.90	2.74	---	---
17	---	---	---	---	---	---	---	---	2.90	---	2.64	---
18	---	---	2.97	---	3.10	---	---	---	---	---	---	2.50
19	---	3.00	---	3.20	---	---	3.10	---	2.87	---	---	2.44
20	---	---	---	3.18	---	---	---	2.78	---	2.75	---	---
21	2.82	---	---	---	---	---	3.09	---	2.87	---	---	2.45
22	---	---	---	3.18	3.06	---	---	2.80	---	---	---	2.40
23	---	---	---	---	---	---	---	---	---	---	2.60	---
24	2.79	---	---	---	---	---	---	---	---	2.70	---	2.44
25	---	---	---	---	3.04	2.99	3.03	---	---	---	---	2.44
26	2.80	---	---	3.20	---	---	---	---	---	---	---	---
27	---	---	---	---	---	2.97	3.01	2.93	2.87	2.69	2.60	2.44
28	---	---	---	---	---	---	---	---	---	2.68	---	---
29	2.80	---	---	3.16	---	---	2.97	---	---	---	---	---
30	---	---	---	---	---	2.99	---	---	2.81	---	2.51	---
31	---	---	---	---	---	---	---	---	---	2.69	2.50	---

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 bridge on Mackinac Trail, 3.2 mi south of Rudyard.

DRAINAGE AREA.--184 mi².

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

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 601.50 ft above sea level. Prior to Aug. 4, 1972, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Gage-height telemeter at station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	76	76	534	e100	e150	e140	e1000	100	140	75	210	66
2	75	75	380	e100	e150	e140	e1100	94	1080	100	141	65
3	72	72	297	e100	e160	e140	998	88	1170	118	108	63
4	68	71	249	e100	e160	e135	865	84	553	167	120	62
5	66	76	232	e100	e170	e130	1060	81	350	198	104	61
6	112	83	354	e100	e170	e130	1590	79	260	220	90	60
7	324	99	301	e100	e170	e125	1670	95	211	160	85	60
8	247	104	243	e100	e170	e120	1200	107	165	119	99	60
9	196	100	205	e100	e170	e120	810	108	134	315	98	64
10	164	226	184	e100	e180	e120	595	98	115	663	84	71
11	142	722	152	e100	e200	e120	484	91	98	427	82	71
12	128	537	157	e100	e250	e120	412	85	89	272	77	68
13	114	391	147	e100	e400	e125	349	81	85	193	321	98
14	107	315	137	e100	e380	e130	302	77	87	147	553	127
15	102	408	136	e100	e320	e135	268	73	83	121	378	104
16	93	343	132	e100	e260	e140	239	73	76	106	252	90
17	91	312	127	e105	e230	e160	218	90	72	168	204	81
18	88	268	111	e105	e200	e180	200	120	70	183	164	75
19	98	296	e105	e110	e170	e190	187	e107	69	147	134	70
20	93	324	e100	e115	e150	e200	174	95	67	124	130	77
21	91	279	e100	e120	e140	e220	163	94	65	107	109	88
22	90	245	e100	e130	e130	e230	155	110	63	97	101	77
23	87	227	e100	e140	e120	e230	147	104	64	e89	94	72
24	85	213	e100	e160	e115	e240	137	183	70	e85	92	70
25	82	191	e100	e190	e110	e250	131	245	78	78	87	67
26	81	176	e100	e190	e110	e260	125	326	70	72	83	65
27	82	165	e100	e190	e110	e270	118	e243	64	73	81	66
28	84	154	e100	e180	e120	e290	111	185	63	74	82	76
29	81	147	e100	e170	---	e320	107	146	72	82	75	95
30	77	312	e100	e160	---	e400	112	124	81	72	69	97
31	76	---	e100	e150	---	e500	---	107	---	178	67	---
TOTAL	3372	7007	5383	3815	5165	6010	15027	3693	5664	5030	4374	2286
MEAN	109	234	174	123	184	194	501	119	189	162	141	75.5
MAX	324	722	534	190	400	500	1670	326	1170	663	553	127
MIN	66	71	100	100	110	120	107	73	63	72	67	60
CFSM	.59	1.27	.94	.67	1.00	1.05	2.72	.65	1.03	.88	.77	.41
IN.	.68	1.42	1.09	.77	1.04	1.22	3.04	.75	1.15	1.02	.88	.46

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1999, BY WATER YEAR (WY)

	MEAN	221	283	179	121	111	264	815	263	174	111	105	148
MAX	452	807	328	248	217	544	1589	633	432	261	349	383	
(WY)	1997	1989	1983	1980	1984	1973	1985	1972	1974	1979	1973	1996	
MIN	71.5	72.7	63.0	60.3	65.9	90.7	281	93.5	76.8	60.3	58.5	67.3	
(WY)	1998	1977	1977	1977	1979	1978	1987	1998	1988	1988	1991	1976	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1972 - 1999
ANNUAL TOTAL	57504	66806	
ANNUAL MEAN	158	183	231
HIGHEST ANNUAL MEAN			344
LOWEST ANNUAL MEAN			138
HIGHEST DAILY MEAN	1880	1670	4050
LOWEST DAILY MEAN	53	60	45
ANNUAL SEVEN-DAY MINIMUM	54	61	50
INSTANTANEOUS PEAK FLOW		(a)2490	4500
INSTANTANEOUS PEAK STAGE		(b)11.97	18.44
INSTANTANEOUS LOW FLOW		59	(d)33
ANNUAL RUNOFF (CFSM)	.86	.99	1.26
ANNUAL RUNOFF (INCHES)	11.63	13.51	17.06
10 PERCENT EXCEEDS	312	322	464
50 PERCENT EXCEEDS	83	118	125
90 PERCENT EXCEEDS	60	72	70

(a) Gage height 11.80 ft.

(b) Backwater from ice.

(c) Sept. 5, 6, 7, 8.

(d) Result of freezeup.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04127937 EAST LAKE NEAR FIBRE, MI

LOCATION.--Lat 46°07'56", long 84°47'31", in SE1/4 SW1/4 sec.10, T.43 N., R.4 W., Mackinac County, Hydrologic Unit 04070002, 5.9 mi southwest of Fibre.

DRAINAGE AREA.--5.87 mi².

PERIOD OF RECORD.--July 1967 to September 1971, June 1990 to current year.

REVISED RECORDS.--WDR MI-96-1: 1991 (M).

GAGE.--Nonrecording gage. Elevation of gage is 805 ft above sea level, from topographic map. July 12, 1967 to Sept. 1, 1971, nonrecording gage at different datum.

REMARKS.--Staff gage read by observer. The inlet to East Lake is a small unnamed stream draining a marsh at the north end of the lake. The outlet is the East Lake Branch of the Carp River. Surface area of lake is 995 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 5.62 ft, Dec. 2, 1991; minimum observed, 3.46 ft, datum then in use, Sept. 14-16, 1969.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 4.55 ft, Apr. 19-21; minimum observed, 3.50 ft, Sept. 7.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.00	4.06	---	---	---	---	---	4.41	4.28	3.92	3.76	3.58
2	4.00	4.06	---	---	---	---	---	4.37	4.30	3.92	3.76	3.58
3	3.98	4.06	---	---	---	---	---	4.35	4.38	4.00	3.76	3.58
4	3.98	4.02	---	---	---	---	---	4.33	4.36	4.00	3.74	3.58
5	3.98	---	---	---	---	---	---	4.27	4.32	4.02	3.70	3.56
6	3.96	---	---	---	---	---	---	4.27	4.32	4.00	3.70	3.54
7	3.96	---	---	---	---	---	---	4.27	4.30	3.98	3.70	3.50
8	3.96	---	---	---	---	---	---	4.33	4.30	3.96	3.70	3.52
9	3.98	---	---	---	---	---	---	4.31	4.28	3.96	3.70	3.52
10	3.98	---	---	---	---	---	---	4.31	4.26	4.00	3.68	3.54
11	4.00	---	---	---	---	---	---	4.27	4.26	3.98	3.66	3.54
12	4.00	---	---	---	---	---	---	4.25	4.20	3.98	3.66	3.56
13	4.10	---	---	---	---	---	---	4.25	4.20	3.98	3.70	3.60
14	4.10	---	---	---	---	---	---	4.25	4.18	3.96	3.70	3.62
15	4.10	---	---	---	---	---	---	4.23	4.12	3.94	3.70	3.64
16	4.10	---	4.40	---	---	---	---	4.23	4.12	3.92	3.78	3.62
17	4.10	---	---	---	---	---	---	4.30	4.10	3.90	3.78	3.62
18	4.10	---	---	---	---	4.39	---	4.30	4.08	3.88	3.74	3.60
19	4.10	---	---	---	---	---	4.55	4.28	4.08	3.88	3.74	3.60
20	4.10	---	---	---	---	---	4.55	4.28	4.06	3.86	3.72	3.61
21	4.10	---	---	---	---	---	4.55	4.28	4.06	3.84	3.72	3.60
22	4.10	---	---	---	---	---	4.53	4.26	4.00	3.84	3.70	3.59
23	4.08	---	---	---	---	---	4.53	4.24	4.00	3.82	3.70	3.58
24	4.08	3.74	---	---	---	---	4.53	4.28	4.00	3.80	3.70	3.58
25	4.08	3.74	---	---	---	---	4.45	4.28	4.00	3.80	3.70	3.58
26	4.08	3.76	---	---	---	---	4.45	4.34	4.00	3.78	3.70	3.58
27	4.08	3.76	---	---	---	---	4.45	4.32	3.98	3.78	3.68	3.59
28	4.08	3.76	---	4.48	---	---	4.43	4.32	3.96	3.78	3.68	3.59
29	4.08	3.76	---	---	---	---	4.43	4.32	3.94	3.78	3.66	3.60
30	4.08	---	---	---	---	---	4.41	4.30	3.90	3.78	3.60	3.60
31	4.08	---	---	---	---	---	---	4.28	---	3.78	3.60	---

STREAMS TRIBUTARY TO LAKE HURON

452600084472001 CROOKED LAKE NEAR CONWAY, MI

LOCATION.--Lat 45°23'52", long 84°49'22", in NE1/4 SW1/4 sec.29, T.35 N., R.4 W., Emmet County, Hydrologic Unit 04070004, at Minnehaha Creek Inlet on Channel Road, 2.5 mi southeast of Conway.

DRAINAGE AREA.--101 mi².

PERIOD OF RECORD.--June 1942 to July 1945 (summer months only), August 1945 to current year.

GAGE.--Water-stage recorder. Datum of gage is 593.38 ft above sea level. Prior to June 13, 1960, nonrecording gage at datum 1.00 ft higher. June 13, 1960 to June 29, 1964, nonrecording gage at same datum.

REMARKS.--Crooked Lake is the upstream end of the navigable inland water route. Major inlets are Minnehaha Creek, Round Lake Outlet, and Pickerel Lake Outlet. The outlet is Crooked River. Lake elevation controlled by dam and boat lock at Alanson. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 3.60 ft, Apr. 12, 1948, present datum; minimum, 0.54 ft, Mar. 30, 1982, possibly affected by ice in well.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 2.49 ft, Oct. 7, June 3; minimum, 1.24 ft, Nov. 30.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.41	2.27	1.33	2.06	1.65	1.77	1.87	1.99	2.39	2.27	2.13	2.07
2	2.39	2.27	1.32	2.04	1.63	1.76	1.86	2.01	2.43	2.31	2.10	2.07
3	2.37	2.20	1.32	2.06	1.63	1.75	1.85	2.03	2.47	2.32	---	2.07
4	2.36	2.09	1.31	2.06	1.66	1.73	1.91	2.04	2.47	2.32	2.10	2.07
5	2.35	1.98	1.31	2.03	1.68	1.71	1.96	2.06	2.44	2.30	2.10	2.05
6	2.42	1.89	1.31	1.99	1.71	1.69	1.96	2.10	2.41	2.30	2.11	2.04
7	2.46	1.81	1.32	1.98	1.73	1.67	1.97	2.13	2.41	2.28	2.10	2.03
8	2.47	1.73	1.29	1.96	1.74	1.65	2.00	2.16	2.40	2.26	2.10	2.03
9	2.45	1.66	1.28	1.94	1.76	1.62	2.00	2.17	2.39	2.28	2.07	2.05
10	2.43	1.67	1.32	1.93	1.77	1.60	1.97	2.19	2.37	2.28	2.11	2.10
11	2.42	1.63	1.36	1.92	1.80	1.58	1.94	2.19	2.35	2.26	2.10	2.11
12	2.39	1.61	1.40	1.92	1.92	1.56	1.88	2.20	2.33	2.25	2.11	2.12
13	2.39	1.59	1.45	1.92	2.01	1.58	1.84	2.20	2.32	2.24	2.23	2.15
14	2.40	1.55	1.49	1.92	1.98	1.60	1.80	2.20	2.33	2.22	2.28	2.15
15	2.38	1.50	1.51	1.92	1.98	1.62	1.77	2.19	2.29	2.22	2.26	2.17
16	2.37	1.49	1.57	1.86	1.99	1.64	1.75	2.19	2.28	2.21	2.23	2.18
17	2.35	1.49	1.62	1.65	1.99	1.68	1.71	2.21	2.26	2.20	2.23	2.17
18	2.31	1.47	1.67	1.65	1.97	1.77	1.66	2.23	2.24	2.20	2.22	2.17
19	2.30	1.45	1.72	1.65	1.95	1.82	1.65	2.24	2.23	2.22	2.21	2.17
20	2.30	1.45	1.76	1.62	1.92	1.86	1.69	2.24	2.22	2.21	2.19	2.20
21	2.30	1.44	1.81	1.60	1.89	1.91	1.73	2.25	2.21	2.21	2.18	2.20
22	2.28	1.40	1.85	1.60	1.86	1.95	1.78	2.26	2.19	2.21	2.16	2.19
23	2.27	1.36	1.88	1.63	1.83	1.98	1.81	2.27	2.19	2.20	2.16	2.19
24	2.26	1.34	1.92	1.69	1.80	1.99	1.83	2.28	2.22	2.18	2.16	2.20
25	2.27	1.33	1.95	1.69	1.78	1.99	1.85	2.32	2.22	2.17	2.15	2.19
26	2.27	1.32	2.01	1.69	1.76	1.98	1.88	2.34	2.20	2.16	2.15	2.19
27	2.27	1.29	2.05	1.69	1.74	1.94	1.92	2.34	2.18	2.14	2.14	2.20
28	2.28	1.28	2.08	1.69	1.76	1.91	1.94	2.33	2.18	2.12	2.13	2.25
29	2.28	1.27	2.11	1.69	---	1.90	1.95	2.32	2.26	2.12	2.11	2.28
30	2.28	1.28	2.10	1.67	---	1.88	1.97	2.29	2.25	2.12	2.09	2.28
31	2.27	---	2.09	1.66	---	1.88	---	2.30	---	2.14	2.08	---
MEAN	2.35	1.60	1.63	1.82	1.82	1.77	1.86	2.20	2.30	2.22	---	2.14
MAX	2.47	2.27	2.11	2.06	2.01	1.99	2.00	2.34	2.47	2.32	---	2.28
MIN	2.26	1.27	1.28	1.60	1.63	1.56	1.65	1.99	2.18	2.12	---	2.03

STREAMS TRIBUTARY TO LAKE HURON

453345084401501 DOUGLAS LAKE NEAR PELLSTON, MI

LOCATION.--Lat 45°33'45", long 84°40'15", in NW1/4 NE1/4 sec. 33, T.37N., R.3W., Cheboygan County, Hydrologic Unit 04070004, in boat well in Laboratory building at University of Michigan Biological Station.

DRAINAGE AREA.--26.5 mi² at outlet.

PERIOD OF RECORD.--June 1942 to December 1959, October 1994 to current year.

GAGE.--Nonrecording gage. Once daily reading by observer. Datum of gage is 710.00 ft above sea level (Doyle Civil Engineers bench mark). June 1942 to December 1959 at same site at datum 2.34 ft higher.

REMARKS.--Beavertail Creek flows into the lake from the northeast and Lancaster Creek flows into the lake from the northwest. East Branch Maple River flows from the southwest side of lake into Maple River, then into Burt Lake.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 4.68 ft, May 7, 1959, from floodmark, present datum; minimum observed, 0.78 ft, Oct. 15, 1955, present datum.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 3.76 ft, Apr. 12; minimum observed, 1.86 ft, Nov. 8.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	--	--	--	--	2.80	--	--	--	--	3.18	--	2.84
2	--	--	--	--	--	--	--	--	--	--	--	--
3	--	--	2.20	--	--	--	--	3.48	--	--	3.12	2.80
4	1.98	--	--	2.50	--	3.12	--	--	--	--	--	--
5	--	--	--	--	--	--	3.56	3.44	--	3.35	--	--
6	--	--	--	--	--	--	3.61	--	3.44	--	--	--
7	--	--	--	--	--	--	--	--	--	--	3.14	--
8	--	1.86	2.26	--	--	--	--	--	--	3.46	--	--
9	2.06	--	2.26	--	--	--	--	--	--	--	--	2.72
10	--	--	--	--	--	--	--	--	--	--	--	--
11	--	--	--	2.52	2.90	--	--	--	3.52	--	--	--
12	--	--	2.28	--	--	--	3.76	--	--	--	3.08	--
13	--	1.98	--	--	--	--	--	--	--	--	--	--
14	--	1.98	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	3.74	--	3.42	--	--	--
16	--	--	2.28	--	--	3.06	--	3.27	--	3.38	--	--
17	2.04	2.00	--	2.54	--	--	--	--	--	--	--	2.75
18	--	--	--	--	--	--	--	--	3.36	--	3.08	2.72
19	--	--	--	--	2.92	3.08	3.70	--	--	--	--	--
20	--	--	--	--	--	--	--	3.26	--	3.32	--	--
21	--	--	--	2.60	--	--	--	--	--	--	--	--
22	1.98	--	--	--	--	--	--	--	--	3.28	3.01	--
23	--	--	2.32	--	--	--	--	--	3.24	--	--	--
24	--	--	--	--	--	3.14	--	--	--	--	--	--
25	--	2.06	--	--	3.05	--	3.64	--	--	--	--	--
26	--	--	--	--	--	--	3.62	--	--	--	2.96	--
27	1.94	--	--	--	--	--	--	--	3.22	--	--	2.64
28	--	--	2.40	2.76	--	--	--	3.34	--	--	--	--
29	--	2.08	--	--	--	3.24	--	--	--	--	--	--
30	--	--	--	--	--	--	3.54	--	--	3.16	--	2.66
31	1.92	--	2.42	--	--	--	--	3.32	--	--	--	--

STREAMS TRIBUTARY TO LAKE HURON

04127997 STURGEON RIVER AT WOLVERINE, MI

LOCATION.--Lat 45°16'28", long 84°36'00", in SE1/4 SW1/4 sec.6, T.33 N., R.2 W., Cheboygan County, Hydrologic Unit 04070004, on right bank at Cedar Street in Wolverine, 0.2 mi downstream from West Branch, and 11.7 mi upstream from mouth.

DRAINAGE AREA.--192 mi².

PERIOD OF RECORD.--April 1942 to current year. Published as "near Wolverine" prior to October 1994.

REVISED RECORDS.--WSP 1307: 1944(M), 1948(M). WSP 1727: 1951(M). WDR MI-83-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 770 ft above sea level, from topographic map. Prior to June 15, 1942, nonrecording gage at site 1.7 mi downstream and June 16, 1942 to Sept. 30, 1958, at site 2.0 mi downstream at different datums. Oct. 1, 1958 to Sept. 30, 1994, water-stage recorder at site 2.7 mi downstream at different datum (Station 04128000).

REMARKS.--Records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	200	166	289	e180	194	205	364	170	301	217	163	141
2	191	165	222	e180	191	192	323	166	407	255	154	140
3	183	164	200	e180	201	192	296	162	491	204	185	139
4	180	164	196	e180	200	187	304	162	274	308	193	138
5	183	164	198	e180	191	182	343	162	234	221	177	138
6	331	165	196	e180	192	e182	307	175	213	236	162	137
7	400	171	224	e180	186	181	333	207	198	215	166	139
8	260	179	206	e180	184	e180	328	194	189	183	172	140
9	212	177	196	e180	191	e175	267	193	186	236	161	142
10	200	280	192	e180	192	174	239	178	191	213	184	147
11	194	345	187	e180	217	178	225	175	340	182	187	155
12	187	235	187	e180	384	181	216	176	680	172	167	151
13	197	202	184	e180	275	178	202	177	454	168	279	176
14	209	196	181	e180	250	171	195	174	538	167	237	166
15	195	191	182	e180	222	172	190	163	355	163	188	157
16	184	196	182	e180	212	180	186	162	252	159	173	152
17	178	221	184	e190	208	209	191	177	245	160	171	150
18	179	227	183	211	201	270	188	180	217	197	165	149
19	176	231	184	216	194	242	184	175	197	211	157	147
20	e180	234	179	200	e190	228	183	167	191	211	153	173
21	e183	224	178	196	e190	229	183	165	184	180	151	165
22	179	200	e180	197	e190	223	184	167	175	181	149	157
23	175	194	e180	230	e190	218	180	173	170	173	148	156
24	172	188	e180	298	e190	228	176	210	191	170	151	151
25	171	187	e180	236	187	209	176	263	175	161	150	150
26	172	190	185	213	183	207	177	303	165	157	148	149
27	173	183	180	205	181	222	170	203	160	158	148	153
28	174	179	181	201	198	252	169	180	179	153	146	200
29	172	178	179	192	---	308	168	177	320	155	141	250
30	168	215	e180	193	---	305	167	170	215	158	142	221
31	167	---	e180	187	---	323	---	194	---	166	143	---
TOTAL	6115	6011	5935	6045	5784	6583	6814	5700	8087	5890	5211	4729
MEAN	197	200	191	195	207	212	227	184	270	190	168	158
MAX	400	345	289	298	384	323	364	303	680	308	279	250
MIN	167	164	178	180	181	171	167	162	160	153	141	137
CFSM	1.03	1.04	1.00	1.02	1.08	1.11	1.18	.96	1.40	.99	.88	.82
IN.	1.18	1.16	1.15	1.17	1.12	1.28	1.32	1.10	1.57	1.14	1.01	.92

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1999, BY WATER YEAR (WY)

	MEAN	214	225	213	201	199	246	311	239	209	186	181	202
MAX	326	301	306	295	275	354	431	353	272	255	301	290	
(WY)	1984	1993	1972	1973	1984	1976	1971	1983	1969	1994	1972	1986	
MIN	153	164	157	133	130	172	198	154	149	130	134	141	
(WY)	1957	1950	1949	1957	1957	1954	1958	1958	1958	1981	1944	1948	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1942 - 1999
ANNUAL TOTAL	75573	72904	
ANNUAL MEAN	207	200	219
HIGHEST ANNUAL MEAN			268
LOWEST ANNUAL MEAN			167
HIGHEST DAILY MEAN	850	680	1080
LOWEST DAILY MEAN	142	137	113
ANNUAL SEVEN-DAY MINIMUM	145	139	118
INSTANTANEOUS PEAK FLOW		(a)863	(b)1290
INSTANTANEOUS PEAK STAGE		(c)6.42	(d)
INSTANTANEOUS LOW FLOW		136	93
ANNUAL RUNOFF (CFSM)	1.08	1.04	1.14
ANNUAL RUNOFF (INCHES)	14.64	14.13	15.49
10 PERCENT EXCEEDS	257	253	293
50 PERCENT EXCEEDS	192	183	203
90 PERCENT EXCEEDS	159	157	159

(a) Gage height 5.07 ft.

(b) Site then in use.

(c) From floodmark; backwater from ice.

(d) Date unknown, occurred during period of no gage height record Jan. 4-14, 1999.

(e) Estimated.

(f) From floodmark, backwater from ice, peak stage at previous site and datum, 4.48 ft., Sept. 14, 1961.

STREAMS TRIBUTARY TO LAKE HURON

04128990 PIGEON RIVER NEAR VANDERBILT, MI

LOCATION.--Lat 45°09'24", long 84°28'00", in NW1/4 NW1/4 sec.20, T.32 N., R.1 W., Otsego County, Hydrologic Unit 04070004, on left bank at Sturgeon Valley Road, 9.7 mi east of Vanderbilt, 1.0 mi downstream from Lansing Club Dam, and 28.5 mi upstream from Mullett Lake.

DRAINAGE AREA.--57.7 mi².

PERIOD OF RECORD.--September 1950 to current year.

GAGE.--Water-stage recorder. Datum of gage is 909.03 ft above sea level (Wade-Trim Inc. bench mark). September 1950 to October 1990, water-stage recorder at site 2.5 mi downstream at different datum (Station 04129000).

REMARKS.--Records good except for estimated daily discharges, which are fair. Prior to May 16, 1957, and since Apr. 22, 1958, regulation by Lansing Club Dam 1.0 mi upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	72	64	129	56	65	77	144	57	61	63	51	37
2	66	66	99	54	69	68	123	57	115	84	51	51
3	67	60	64	e60	72	73	113	58	129	71	51	45
4	62	63	79	e60	74	68	109	63	71	181	45	43
5	60	63	70	e60	68	66	142	55	65	85	54	46
6	143	64	69	e60	69	67	124	59	58	110	52	40
7	219	64	94	e60	68	58	125	79	54	75	52	42
8	116	62	79	e60	66	e65	121	74	51	62	52	45
9	80	67	73	58	69	65	84	64	50	84	52	45
10	75	125	74	e60	66	63	e71	70	57	82	55	47
11	73	161	68	e60	82	61	e71	56	88	57	62	55
12	68	100	71	e60	169	61	e75	58	129	56	56	53
13	72	79	68	e60	121	61	72	58	96	52	69	61
14	85	75	69	52	100	59	68	59	204	53	73	59
15	73	71	66	e60	73	59	67	56	118	53	57	50
16	68	77	73	e60	80	66	70	55	77	52	56	50
17	67	89	70	62	74	74	86	55	73	52	59	55
18	67	95	67	73	74	105	68	55	69	70	53	49
19	72	106	69	94	69	97	64	58	56	74	54	55
20	58	83	67	75	73	88	64	57	56	72	53	65
21	67	79	64	73	51	83	68	55	54	60	53	51
22	65	80	45	68	66	87	67	56	53	61	46	54
23	66	77	54	85	71	77	68	58	54	56	46	53
24	65	67	76	140	71	87	66	73	55	56	44	53
25	67	71	72	94	63	75	60	90	57	54	45	53
26	62	70	70	83	65	74	60	84	54	52	53	51
27	64	69	64	75	63	86	60	66	51	50	49	50
28	65	69	60	74	70	94	61	58	53	52	48	83
29	62	68	64	71	---	133	61	62	105	52	50	127
30	66	86	68	70	---	124	59	55	75	52	42	84
31	68	---	65	69	---	120	---	54	---	55	50	---
TOTAL	2380	2370	2220	2146	2121	2441	2471	1914	2288	2088	1633	1652
MEAN	76.8	79.0	71.6	69.2	75.8	78.7	82.4	61.7	76.3	67.4	52.7	55.1
MAX	219	161	129	140	169	133	144	90	204	181	73	127
MIN	58	60	45	52	51	58	59	54	50	50	42	37
CFSM	1.33	1.37	1.24	1.20	1.31	1.36	1.43	1.07	1.32	1.17	.91	.95
IN.	1.53	1.53	1.43	1.38	1.37	1.57	1.59	1.23	1.48	1.35	1.05	1.07

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 1999, BY WATER YEAR (WY)

MEAN	78.4	82.7	76.5	71.3	70.8	88.9	119	87.1	71.4	65.7	64.3	72.8
MAX	112	112	105	94.9	90.1	136	164	142	94.5	106	116	120
(WY)	1987	1989	1972	1973	1984	1976	1960	1983	1993	1994	1995	1961
MIN	56.6	64.9	61.1	55.1	55.7	65.0	81.3	54.4	50.7	47.5	42.6	53.2
(WY)	1964	1963	1959	1959	1957	1958	1987	1958	1958	1965	1958	1966

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1951 - 1999

ANNUAL TOTAL	28236	25724	79.1	
ANNUAL MEAN	77.4	70.5	90.7	1985
HIGHEST ANNUAL MEAN			62.3	1958
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	447	219	829	Aug 18 1995
LOWEST DAILY MEAN	41	37	24	Jan 8 1957
ANNUAL SEVEN-DAY MINIMUM	50	43	38	Aug 2 1958
INSTANTANEOUS PEAK FLOW		383	(a)1500	May 15 1957
INSTANTANEOUS PEAK STAGE		4.31	(b)6.49	Aug 18 1995
INSTANTANEOUS LOW FLOW		21	(c)8.4	Feb 17 1993
ANNUAL RUNOFF (CFSM)	1.34	1.22	1.37	
ANNUAL RUNOFF (INCHES)	18.20	16.58	18.62	
10 PERCENT EXCEEDS	100	95	110	
50 PERCENT EXCEEDS	70	66	71	
90 PERCENT EXCEEDS	54	52	55	

(a) From rating curve extended above 500 ft³/s, result of failure of Lansing Club Dam; gage height 6.80 ft, from floodmark, site and datum then in use.

(b) Present site and datum.

(c) Result of freezeup.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

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.

REVISED RECORDS.--WSP 1307: 1942. WDR MI-83-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 658.00 ft above sea level (Stanley Engineering Co. bench mark). Prior to Aug. 1, 1949, at site 1 mi upstream at different datum.

REMARKS.--Records good. Flow completely regulated by Kleber Dam 400 ft upstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	233	189	293	174	271	248	443	162	254	323	140	108
2	243	188	348	169	276	261	472	176	306	312	127	107
3	232	174	327	176	258	301	472	182	311	311	127	107
4	164	167	315	182	277	248	471	170	310	282	127	114
5	156	167	292	173	296	248	469	159	303	259	160	117
6	295	176	230	179	267	248	475	155	251	351	177	113
7	423	186	229	182	246	198	479	196	186	315	163	108
8	528	186	336	181	248	187	547	181	187	315	157	108
9	566	186	316	210	248	200	538	173	163	247	156	108
10	568	223	293	200	266	215	492	187	136	195	156	108
11	476	311	253	184	287	233	413	182	162	222	156	113
12	404	359	238	183	448	231	333	182	228	233	156	113
13	284	374	238	184	462	231	287	154	178	213	222	145
14	291	395	238	175	426	231	274	140	374	198	251	156
15	320	350	238	191	425	227	300	140	480	176	251	156
16	257	279	238	192	460	215	262	151	533	159	224	133
17	230	261	225	180	453	235	248	158	477	144	163	108
18	243	293	216	195	292	405	201	190	456	171	148	114
19	236	321	232	204	244	405	228	191	297	248	156	124
20	230	309	218	228	301	415	218	161	223	235	165	125
21	207	306	212	229	200	417	213	146	196	220	140	131
22	201	321	190	232	201	417	239	146	209	204	115	137
23	195	287	109	233	232	334	215	154	174	187	142	159
24	182	248	118	326	245	351	198	176	238	161	163	151
25	192	241	149	320	245	379	203	231	237	160	156	121
26	187	242	174	319	246	377	187	245	196	161	137	107
27	183	214	188	370	232	308	223	248	176	160	129	117
28	189	202	224	362	235	332	248	221	158	157	129	151
29	185	216	237	322	---	404	186	165	220	125	129	254
30	188	239	234	278	---	450	165	172	347	125	117	251
31	189	---	207	252	---	450	---	187	---	164	108	---
TOTAL	8477	7610	7355	6995	8287	9401	9699	5481	7966	6733	4847	3950
MEAN	273	254	237	226	296	303	323	177	266	217	156	133
MAX	568	395	348	370	462	450	547	248	533	351	251	251
MIN	156	167	109	169	200	187	165	140	136	125	108	107
CFSM	.88	.82	.76	.73	.95	.98	1.04	.57	.85	.70	.50	.43
IN.	1.01	.91	.88	.84	.99	1.12	1.16	.66	.95	.81	.58	.48

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1999, BY WATER YEAR (WY)

	MEAN	245	270	249	222	220	339	540	345	249	204	184	217
MAX	459	489	409	433	398	594	882	638	405	408	351	367	
(WY)	1984	1946	1972	1973	1984	1976	1960	1983	1976	1974	1972	1984	
MIN	138	130	163	150	138	188	297	177	140	112	86.1	116	
(WY)	1957	1950	1990	1948	1948	1956	1987	1999	1958	1966	1949	1949	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1943 - 1999
ANNUAL TOTAL	98838	86831	
ANNUAL MEAN	271	238	274
HIGHEST ANNUAL MEAN			350
LOWEST ANNUAL MEAN			188
HIGHEST DAILY MEAN	1830	568	1860
LOWEST DAILY MEAN	101	107	4.0
ANNUAL SEVEN-DAY MINIMUM	126	111	50
INSTANTANEOUS PEAK FLOW		756	2340
INSTANTANEOUS PEAK STAGE		4.26	7.13
INSTANTANEOUS LOW FLOW		5.5	.60
ANNUAL RUNOFF (CFSM)	.87	.76	.88
ANNUAL RUNOFF (INCHES)	11.82	10.39	11.95
10 PERCENT EXCEEDS	390	385	466
50 PERCENT EXCEEDS	228	220	229
90 PERCENT EXCEEDS	148	137	145

STREAMS TRIBUTARY TO LAKE HURON

442409084274001 LAKE ST. HELEN AT ST. HELEN, MI

LOCATION.--Lat 44°22'27", long 84°25'17", in SE1/4 NW1/4 sec.22, T.23 N., R.1 W., Roscommon County, Hydrologic Unit 0407007, at Marina, at end of Monroe Street, in St. Helen.

DRAINAGE AREA.--72.2 mi² at outlet.

PERIOD OF RECORD.--June 1942 to December 1959, August 1993 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,149.01 ft above sea level. June 18, 1942 to May 21, 1947, nonrecording gage at Artesia Beach at same datum. May 22, 1947 to Dec. 31, 1959, and Aug. 17, 1993 to May 21, 1998, nonrecording gage at outlet at same datum.

REMARKS.--Inlets are Marsh Creek, Russell Creek and Cameron Creek. The outlet is South Branch of the Au Sable River. Lake elevation controlled by dam. Established legal level; 1,155.25 ft, minimum winter level, 1,154.75 ft, above sea level. Prior to May 5, 1998, established legal level; 1,154.15 ft., minimum winter level 1,153.65 ft., above sea level. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 7.26 ft, Apr. 1, 1949; minimum observed, 4.64 ft, Jan. 21, 1954.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 7.09 ft, June 28; minimum, 5.47 ft, Oct. 5.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.59	5.72	6.03	5.80	5.87	5.93	6.06	6.70	6.71	6.93	6.54	6.31
2	5.57	5.70	6.02	5.79	5.88	5.92	6.10	6.69	6.75	6.94	6.51	6.30
3	5.54	5.70	6.01	5.83	5.88	5.93	6.12	6.68	6.75	6.93	6.50	6.28
4	5.54	5.70	6.00	5.82	5.88	5.92	6.13	6.67	6.73	6.93	6.68	6.26
5	5.53	5.69	6.01	5.80	5.88	5.91	6.20	6.65	6.72	6.92	6.70	6.24
6	5.69	5.70	6.03	5.79	5.88	5.91	6.30	6.67	6.73	6.92	6.68	6.23
7	5.87	5.69	6.09	5.78	5.87	5.90	6.31	6.73	6.74	6.88	6.67	6.21
8	5.87	5.68	6.09	5.77	5.86	5.88	6.33	6.74	6.69	6.83	6.67	6.19
9	5.88	5.68	6.09	5.76	5.86	5.86	6.32	6.74	6.64	6.95	6.65	6.19
10	5.88	5.78	6.08	5.75	5.85	5.85	6.35	6.71	6.64	6.92	6.65	6.17
11	5.88	5.93	6.07	5.75	5.86	5.84	6.38	6.70	6.64	6.89	6.64	6.14
12	5.90	5.86	6.06	5.74	5.93	5.83	6.49	6.68	6.64	6.87	6.62	6.12
13	5.91	5.85	6.03	5.74	5.96	5.81	6.52	6.68	6.63	6.85	6.64	6.17
14	5.88	5.88	6.02	5.73	5.96	5.80	6.56	6.67	6.92	6.84	6.60	6.16
15	5.86	5.89	6.04	5.73	5.98	5.79	6.57	6.68	6.94	6.82	6.59	6.13
16	5.85	5.89	5.99	5.73	5.99	5.78	6.57	6.68	6.97	6.78	6.58	6.12
17	5.86	5.92	5.99	5.72	6.02	5.78	6.63	6.70	7.01	6.75	6.56	6.12
18	5.92	5.92	5.98	5.74	6.02	5.80	6.66	6.74	7.02	6.72	6.53	6.11
19	5.88	5.99	5.97	5.75	6.02	5.80	6.67	6.73	7.01	6.69	6.51	6.11
20	5.84	5.97	5.95	5.74	6.01	5.81	6.68	6.71	6.98	6.67	6.50	6.11
21	5.81	5.96	5.95	5.73	6.01	5.83	6.68	6.71	6.96	6.66	6.48	6.10
22	5.80	5.97	5.94	5.74	6.00	5.84	6.68	6.69	6.94	6.66	6.46	6.11
23	5.81	6.01	5.92	5.78	5.98	5.85	6.69	6.68	6.91	6.68	6.44	6.11
24	5.80	5.96	5.90	5.81	5.96	5.87	6.73	6.76	6.94	6.71	6.41	6.10
25	5.77	5.94	5.88	5.83	5.96	5.88	6.75	6.79	6.92	6.68	6.40	6.10
26	5.76	5.97	5.87	5.84	5.94	5.91	6.73	6.75	6.88	6.65	6.39	6.10
27	5.76	5.96	5.86	5.85	5.93	5.93	6.70	6.73	6.90	6.63	6.40	6.10
28	5.76	5.95	5.84	5.87	5.93	5.97	6.68	6.72	6.92	6.62	6.40	6.19
29	5.73	5.95	5.84	5.87	---	6.03	6.70	6.71	6.97	6.60	6.36	6.32
30	5.73	6.01	5.83	5.87	---	6.02	6.70	6.70	6.92	6.58	6.34	6.37
31	5.73	---	5.81	5.87	---	6.07	---	6.69	---	6.57	6.33	---
MEAN	5.78	5.86	5.97	5.78	5.93	5.88	6.50	6.71	6.84	6.78	6.53	6.18
MAX	5.92	6.01	6.09	5.87	6.02	6.07	6.75	6.79	7.02	6.95	6.70	6.37
MIN	5.53	5.68	5.81	5.72	5.85	5.78	6.06	6.65	6.63	6.57	6.33	6.10

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 September 1989, October 1990 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,070 ft above sea level, from topographic map. Apr. 19, 1951 to Nov. 14, 1966, non-recording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Occasional regulation by dam upstream from station.
Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	125	139	191	e140	185	186	209	160	159	209	149	102
2	121	140	195	e135	187	182	216	151	163	205	144	107
3	121	139	198	e140	185	182	217	143	175	195	140	111
4	118	137	193	152	188	176	224	139	168	186	136	109
5	116	136	189	154	178	178	254	137	154	177	134	107
6	179	136	190	157	184	173	265	142	147	196	134	110
7	280	136	219	e150	177	164	263	154	140	192	134	112
8	265	142	226	e145	180	160	253	161	133	181	138	112
9	254	139	230	e150	178	177	239	161	128	244	138	110
10	242	161	227	e155	173	172	221	151	125	246	145	110
11	200	207	220	e150	194	164	209	142	124	230	148	109
12	180	213	215	e145	266	167	208	136	126	224	145	108
13	170	210	210	e145	256	176	236	133	132	211	145	117
14	161	199	201	e145	236	165	254	130	220	194	144	120
15	157	185	196	e150	269	164	256	127	241	181	141	113
16	155	181	193	e155	268	167	240	125	233	173	139	103
17	150	184	190	159	264	182	220	130	233	169	136	101
18	157	195	185	158	245	215	204	148	221	169	133	98
19	162	207	180	159	226	223	195	161	204	181	132	96
20	158	211	175	156	201	223	189	150	187	179	130	102
21	155	210	179	156	e180	227	187	141	175	174	128	104
22	151	205	168	161	e160	229	183	137	166	175	125	105
23	148	192	e145	178	e175	226	186	e140	161	190	124	109
24	145	184	e140	210	182	224	188	e150	163	203	123	103
25	145	179	e135	213	187	219	183	e155	165	188	123	100
26	145	176	e145	210	178	201	176	e160	162	180	123	99
27	144	173	e155	212	185	193	171	156	165	176	124	99
28	142	173	157	208	185	191	166	150	169	170	121	127
29	140	174	156	193	---	198	162	142	229	166	112	160
30	140	178	e150	196	---	202	165	135	216	160	103	168
31	139	---	e145	182	---	204	---	136	---	152	102	---
TOTAL	5065	5241	5698	5119	5672	5910	6339	4483	5184	5876	4093	3331
MEAN	163	175	184	165	203	191	211	145	173	190	132	111
MAX	280	213	230	213	269	229	265	161	241	246	149	168
MIN	116	136	135	135	160	160	162	125	124	152	102	96
CFSM	.41	.44	.46	.41	.51	.48	.53	.36	.43	.47	.33	.28
IN.	.47	.49	.53	.47	.53	.55	.59	.42	.48	.55	.38	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1999, BY WATER YEAR (WY)

	MEAN	211	239	234	199	187	260	400	284	208	167	150	173
MAX	456	444	373	275	251	508	596	398	307	251	255	379	
(WY)	1987	1992	1992	1973	1984	1976	1985	1983	1993	1969	1994	1975	
MIN	120	163	148	132	141	159	209	145	124	107	111	111	
(WY)	1967	1977	1977	1977	1978	1978	1987	1999	1977	1977	1998	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1967 - 1999

ANNUAL TOTAL	69621	62011	
ANNUAL MEAN	191	170	226
HIGHEST ANNUAL MEAN			280
LOWEST ANNUAL MEAN			158
HIGHEST DAILY MEAN	905	280	1110
LOWEST DAILY MEAN	105	96	96
ANNUAL SEVEN-DAY MINIMUM	106	101	101
INSTANTANEOUS PEAK FLOW		285	(a)1120
INSTANTANEOUS PEAK STAGE		4.96	Oct 7
INSTANTANEOUS LOW FLOW		96	Oct 7
ANNUAL RUNOFF (CFSM)	.48	.42	(b)7.75
ANNUAL RUNOFF (INCHES)	6.46	5.75	(c)78
10 PERCENT EXCEEDS	282	224	354
50 PERCENT EXCEEDS	170	166	200
90 PERCENT EXCEEDS	109	123	135

(a) Gage height 7.30 ft.

(b) Backwater from ice.

(c) Result of freezeup.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

445512084415301 OTSEGO LAKE NEAR GAYLORD, MI

LOCATION.--Lat 44°55'52", long 84°41'33", in SW1/4 SE1/4 sec.5, T.29 N., R.3 W., Otsego County, Hydrologic Unit 04070007, at Otsego Lake State Park, 200 ft northwest of boat ramp, 6.7 mi south of Gaylord.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--August 1942 to current year, except for winter months 1942-43, 1943-44, 1977-78.

GAGE.--Water-stage recorder. Datum of gage is 1,270.03 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Aug. 18, 1958, nonrecording gage at datum 2.00 ft higher.

REMARKS.--Otsego Lake has no natural inlets or outlets. In December 1972 an outlet tube and pump system was installed connecting the lake with the North Branch Au Sable River to lower lake levels. Established legal level; maximum, 1,273.5 ft, minimum, 1,272.0 ft, above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 5.10 ft, May 6, 7, 1972; minimum, 0.96 ft, Aug. 14, 1959.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 3.40 ft, April 9; minimum, 2.01 ft, Sept. 26.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.58	2.62	2.79	2.91	3.16	3.27	3.22	3.10	---	2.80	2.72	2.34
2	2.57	2.62	2.79	2.92	3.17	3.27	3.22	3.09	---	2.82	2.68	2.34
3	2.56	2.61	2.79	2.97	3.18	3.28	3.22	3.07	---	2.82	2.66	2.33
4	2.54	2.59	2.80	2.98	3.17	3.28	3.25	3.05	---	2.84	2.66	2.31
5	2.53	2.58	2.79	2.98	3.18	3.28	3.28	---	---	2.83	2.64	2.29
6	2.61	2.57	2.80	2.99	3.19	3.28	3.29	---	---	2.89	2.63	2.29
7	2.70	2.58	2.85	3.00	3.19	3.27	3.31	---	---	2.86	2.61	2.27
8	2.71	2.57	2.82	3.00	3.18	3.27	3.33	---	---	2.84	2.62	2.25
9	2.69	2.56	2.82	3.01	3.18	3.26	3.34	---	---	2.88	2.59	2.22
10	2.69	2.58	2.82	3.01	3.18	3.26	3.32	---	---	2.88	2.59	2.21
11	2.68	2.66	2.81	3.03	3.18	3.25	3.31	---	---	2.85	2.59	2.22
12	2.67	2.68	2.80	3.03	3.21	3.25	3.31	---	---	2.83	2.58	2.20
13	2.69	2.67	2.81	3.03	3.23	3.24	3.30	---	---	2.82	2.62	2.23
14	2.71	2.67	2.79	3.03	3.23	3.24	3.29	---	---	2.78	2.63	2.21
15	2.70	2.68	2.79	3.03	3.22	3.24	3.29	---	---	2.78	2.60	2.21
16	2.67	2.70	2.80	3.03	3.22	3.22	3.28	---	---	2.77	2.57	2.20
17	2.67	2.73	2.81	3.03	3.23	3.22	3.27	---	---	2.78	2.58	2.19
18	2.67	2.72	2.82	3.05	3.23	3.23	3.25	---	2.94	2.79	2.57	2.18
19	2.68	2.72	2.82	3.08	3.23	3.23	3.24	---	2.92	2.85	2.55	2.16
20	2.67	2.74	2.82	3.09	3.23	3.23	3.23	---	2.91	2.86	2.54	2.21
21	2.68	2.74	2.82	3.09	3.22	3.23	3.23	---	2.89	2.84	2.53	2.18
22	2.66	2.71	2.84	3.10	3.22	3.24	3.23	---	2.86	2.84	2.51	2.16
23	2.64	2.73	2.85	3.13	3.22	3.23	3.22	---	2.84	2.83	2.49	2.16
24	2.63	2.74	2.86	3.15	3.21	3.23	3.20	---	2.86	2.82	2.48	2.15
25	2.63	2.73	2.86	3.16	3.22	3.22	3.18	---	2.85	2.81	2.47	2.13
26	2.63	2.74	2.86	3.15	3.21	3.22	3.17	---	2.82	2.78	2.46	2.10
27	2.62	2.73	2.87	3.16	3.21	3.22	3.16	---	2.81	2.77	2.45	2.13
28	2.64	2.73	2.87	3.17	3.24	3.22	3.14	---	2.81	2.73	2.44	2.19
29	2.63	2.72	2.88	3.17	---	3.21	3.13	---	2.86	2.72	2.42	2.23
30	2.62	2.75	2.88	3.17	---	3.21	3.11	---	2.81	2.71	2.38	2.21
31	2.62	---	2.89	3.17	---	3.21	---	---	---	2.73	2.36	---
MEAN	2.64	2.67	2.83	3.06	3.20	3.24	3.24	---	---	2.81	2.56	2.22
MAX	2.71	2.75	2.89	3.17	3.24	3.28	3.34	---	---	2.89	2.72	2.34
MIN	2.53	2.56	2.79	2.91	3.16	3.21	3.11	---	---	2.71	2.36	2.10

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI

LOCATION.--Lat 44°40'37", long 84°17'33", in SE1/4 NE1/4 sec.3, T.26 N., R.1 E., Oscoda County, Hydrologic Unit 04070007, at Parmalee Bridge Campground, 4.5 mi northwest of Luzerne, on County Road 489, and 85.0 mi upstream from mouth.

DRAINAGE AREA.--1,108 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1908 to May 1916, December 1930 to June 1931, October 1995 to current year. Prior to October 1914, published as "near Lovells".

REVISED RECORDS.--WDR MI-96-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 1,000 ft above sea level, from topographic map. October 1908 to May 1916, nonrecording gage at site 5 mi upstream, datum of gage 1,004.69 ft above sea level (levels by Fargo Engineering Co.). December 1930 to June 1931, nonrecording gage at present site at different datum.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	590	620	830	e640	735	770	923	666	698	778	615	501
2	568	620	823	e580	769	755	915	659	722	809	601	500
3	552	620	791	e640	764	762	907	646	787	785	585	501
4	543	610	758	e680	763	743	924	644	756	733	584	493
5	538	605	741	e700	738	734	1100	634	703	701	577	482
6	906	605	736	e700	749	e680	1080	642	668	728	576	481
7	1550	605	858	e680	737	e640	1080	694	645	726	574	487
8	1420	614	864	e660	733	e680	1090	705	640	693	572	487
9	1210	609	828	e700	733	721	1030	711	631	846	567	491
10	1010	740	806	e700	732	704	940	690	615	893	576	497
11	871	987	784	e680	745	685	872	667	659	835	593	506
12	791	942	774	e660	1050	685	848	648	725	762	583	505
13	760	858	760	e680	1070	689	862	642	738	713	592	533
14	744	811	740	e660	935	685	874	631	1230	671	599	535
15	728	767	728	e700	966	686	854	628	1230	644	589	526
16	710	758	730	e720	938	694	824	625	1050	628	574	515
17	690	788	723	e700	922	739	792	640	924	622	560	510
18	693	824	714	e800	889	852	769	675	850	630	555	504
19	688	850	703	e780	851	872	754	690	787	748	554	499
20	681	839	699	e760	e760	865	748	672	741	795	546	581
21	674	802	687	e760	e720	871	744	651	705	733	536	561
22	665	779	671	e780	e660	866	734	647	680	744	532	535
23	658	753	e580	788	e720	847	727	651	665	728	526	522
24	645	734	e600	934	e750	850	727	713	680	756	524	524
25	631	719	e580	912	758	835	723	732	679	705	520	515
26	626	712	e760	870	737	805	702	752	665	665	525	506
27	616	698	e680	842	733	794	686	726	686	641	526	506
28	618	691	e700	830	755	804	675	694	705	620	520	625
29	612	689	e740	787	---	838	667	657	817	609	512	741
30	606	702	e660	777	---	863	667	635	806	605	505	759
31	609	---	e640	740	---	888	---	635	---	600	505	---
TOTAL	23203	21951	22688	22840	22412	23902	25238	20702	22887	22146	17303	15928
MEAN	748	732	732	737	800	771	841	668	763	714	558	531
MAX	1550	987	864	934	1070	888	1100	752	1230	893	615	759
MIN	538	605	580	580	660	640	667	625	615	600	505	481
CFSM	.68	.66	.66	.66	.72	.70	.76	.60	.69	.64	.50	.48
IN.	.78	.74	.76	.77	.75	.80	.85	.70	.77	.74	.58	.53

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1999, BY WATER YEAR (WY)

	MEAN	800	875	868	787	762	919	1386	1137	911	752	718	732
MAX	1156	1289	1336	1004	900	1349	1747	1592	1380	1093	1129	1223	
(WY)	1912	1912	1912	1912	1912	1912	1913	1912	1912	1912	1912	1912	1912
MIN	629	677	689	675	682	722	841	668	693	610	558	531	
(WY)	1909	1909	1909	1911	1914	1909	1999	1999	1998	1998	1999	1999	1999

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1909 - 1999
ANNUAL TOTAL	281632	261200	
ANNUAL MEAN	772	716	887
HIGHEST ANNUAL MEAN			1207
LOWEST ANNUAL MEAN			716
HIGHEST DAILY MEAN	3220	1550	3220
LOWEST DAILY MEAN	509	481	481
ANNUAL SEVEN-DAY MINIMUM	515	488	488
INSTANTANEOUS PEAK FLOW		(a)1610	(b)3300
INSTANTANEOUS PEAK STAGE		(c)5.26	(d)6.85
INSTANTANEOUS LOW FLOW		476	476
ANNUAL RUNOFF (CFSM)	.70	.65	.80
ANNUAL RUNOFF (INCHES)	9.46	8.77	10.88
10 PERCENT EXCEEDS	1050	871	1290
50 PERCENT EXCEEDS	696	702	780
90 PERCENT EXCEEDS	546	537	633

(a) Gage height 4.35 ft.

(b) Does not include water years 1909 to 1916, 1931.

(c) Backwater from ice.

(d) Backwater from ice; does not include water years 1909 to 1916, 1931.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: July 1996 to current year.

DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 24.5°C, July 5, 1999; minimum, -0.5°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum, 14.4 mg/L, Jan. 29, 31, 1999; minimum recorded, 6.5 mg/L, July 15, 1998, July 17, 1999, but may have been lower during instrument malfunction July 21-23, 1998.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 24.5°C, July 5; minimum, -0.5°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 14.4 mg/L, Jan. 29, 31; minimum, 6.5 mg/L, July 17.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER			DECEMBER			JANUARY		
1	10.5	9.5	10.0	9.0	8.0	9.0	9.0	6.0	7.0	-5	-5	-5
2	10.0	9.0	9.5	8.0	5.5	7.0	6.5	5.5	6.0	-5	-5	-5
3	9.5	9.0	9.0	5.5	5.0	5.0	7.0	6.5	7.0	-5	-5	-5
4	9.0	7.5	8.5	5.0	4.0	4.0	7.0	6.0	6.5	-5	-5	-5
5	9.5	8.0	8.5	4.5	4.0	4.0	7.0	6.0	6.5	-5	-5	-5
6	11.5	9.5	10.5	5.0	4.0	4.5	8.5	7.0	8.0	-5	-5	-5
7	12.0	11.5	11.5	6.0	5.0	5.5	7.5	4.5	5.5	-5	-5	-5
8	11.5	10.0	11.0	6.0	5.5	6.0	4.5	3.5	4.0	-5	-5	-5
9	10.0	8.5	9.5	6.0	5.5	6.0	3.5	2.5	2.5	-5	-5	-5
10	10.0	8.5	9.0	6.5	6.0	6.0	2.5	2.5	2.5	-5	-5	-5
11	10.5	9.0	10.0	6.5	4.5	5.5	2.5	2.0	2.0	-5	-5	-5
12	12.0	10.5	11.0	4.5	3.5	3.5	3.0	2.0	2.5	-5	-5	-5
13	11.5	9.5	11.0	3.5	2.0	2.5	2.5	2.0	2.0	-5	-5	-5
14	9.5	8.5	9.0	5.0	3.0	4.0	2.0	1.5	2.0	-5	-5	-5
15	9.5	8.0	8.5	5.0	4.5	4.5	3.0	2.0	2.5	-5	-5	-5
16	10.0	8.5	9.0	4.5	3.0	3.5	3.5	3.0	3.0	-5	-5	-5
17	12.5	10.0	11.0	4.0	3.0	3.5	3.0	2.0	3.0	-5	-5	-5
18	13.0	11.5	12.5	5.0	4.0	4.5	2.0	.5	1.0	-5	-5	-5
19	11.5	10.0	10.5	5.0	5.0	5.0	2.0	1.0	1.5	-5	-5	-5
20	10.0	8.5	9.0	5.0	3.5	4.0	2.0	1.0	1.0	-5	-5	-5
21	8.5	7.5	8.0	3.5	3.0	3.0	1.5	1.0	1.0	-5	-5	-5
22	7.5	6.0	6.5	4.0	2.5	3.0	1.5	-5	.0	1.0	-5	.5
23	8.0	6.0	7.0	5.5	4.0	4.5	-5	-5	-5	3.0	1.0	2.0
24	9.0	7.5	8.5	5.0	4.5	4.5	-5	-5	-5	3.0	1.5	2.5
25	9.0	8.0	8.5	4.5	4.0	4.0	-5	-5	-5	1.5	1.0	1.5
26	10.0	9.0	9.5	4.0	4.0	4.0	-5	-5	-5	1.5	1.0	1.5
27	10.0	9.0	9.5	4.5	4.0	4.0	-5	-5	-5	1.5	1.0	1.5
28	11.5	10.0	10.5	4.5	3.5	4.0	.0	-5	-5	1.5	1.0	1.5
29	10.0	7.5	8.5	7.0	4.5	5.5	.0	-5	.0	1.0	.0	.5
30	8.0	7.0	7.5	9.5	7.0	8.5	-5	-5	-5	1.0	.5	.5
31	9.0	8.0	8.5	---	---	---	-5	-5	-5	1.0	-5	.5
MONTH	13.0	6.0	9.4	9.5	2.0	4.8	9.0	-5	2.4	3.0	-5	.1

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH			APRIL			MAY		
1	.5	-.5	.0	2.5	2.0	2.5	10.0	9.0	9.5	14.5	12.0	13.5
2	2.5	.5	2.0	2.0	1.0	1.5	10.5	9.0	9.5	15.0	12.5	14.0
3	2.5	2.0	2.5	2.5	1.5	2.0	12.5	10.0	11.0	16.0	13.0	14.5
4	2.5	1.5	2.5	2.0	1.0	2.0	12.0	6.5	9.5	16.5	14.0	15.0
5	1.5	.5	.5	2.0	1.0	1.5	8.0	6.0	7.0	16.0	14.5	15.5
6	2.0	.5	1.5	1.0	.0	.5	8.0	7.0	7.5	16.0	15.0	15.5
7	2.0	1.5	1.5	.5	-.5	.0	8.5	6.0	7.5	15.0	13.5	14.0
8	2.5	1.0	1.5	.0	-.5	.0	10.5	7.5	9.0	13.5	12.0	13.0
9	3.5	2.5	3.0	1.0	.0	.5	10.5	8.0	9.0	13.5	10.5	12.0
10	3.0	1.5	2.5	2.0	.0	1.0	9.0	6.5	8.0	14.5	11.5	13.0
11	5.0	2.5	3.5	2.5	.5	1.5	9.0	5.0	7.0	14.5	12.5	13.5
12	5.0	1.5	3.5	2.5	1.0	2.0	8.0	4.0	6.0	13.5	11.5	12.5
13	1.5	.0	.5	2.5	1.0	2.0	9.5	6.5	8.0	13.0	9.5	11.5
14	.5	-.5	.0	3.5	1.5	2.5	10.5	8.0	9.5	14.5	11.5	13.0
15	2.5	.5	1.5	4.0	2.0	3.0	10.5	9.0	9.5	16.0	13.0	14.5
16	3.0	2.5	2.5	6.0	3.5	5.0	9.5	8.0	8.5	17.5	15.0	16.0
17	3.0	2.0	2.5	7.0	5.0	6.0	9.0	7.5	8.5	19.5	16.5	18.0
18	2.0	1.0	1.5	6.5	5.0	5.5	9.0	7.5	8.5	19.0	17.5	17.5
19	1.0	.5	1.0	5.5	4.0	5.0	8.5	7.5	8.0	15.0	13.0	14.5
20	.5	-.5	.0	5.5	3.5	4.5	8.0	6.5	7.5	16.0	13.5	15.0
21	.0	-.5	.0	5.5	5.0	5.0	8.5	7.5	8.0	16.0	15.5	15.5
22	.0	-.5	-.5	5.0	3.5	4.0	8.0	8.0	8.0	15.5	14.5	15.0
23	.0	-.5	-.5	5.0	3.0	4.0	8.5	7.0	8.0	15.0	12.0	13.0
24	.0	-.5	.0	5.5	4.0	5.0	10.0	7.0	8.5	12.0	10.5	11.5
25	1.5	.0	1.0	5.0	3.5	4.5	11.5	8.5	10.0	10.5	9.5	9.5
26	2.5	1.5	2.0	6.0	3.5	4.5	13.0	10.0	11.5	14.0	9.0	11.5
27	3.0	2.5	3.0	7.0	4.5	5.5	13.0	11.0	12.0	15.5	12.0	14.0
28	3.0	2.5	3.0	8.0	5.5	7.0	12.5	10.5	11.5	18.0	14.5	16.0
29	---	---	---	8.0	7.0	7.5	12.5	10.0	11.5	18.5	16.0	17.5
30	---	---	---	8.0	5.5	7.0	14.0	11.0	12.5	19.5	17.0	18.0
31	---	---	---	10.0	7.5	8.5	---	---	---	19.0	18.0	18.5
MONTH	5.0	-.5	1.5	10.0	-.5	3.6	14.0	4.0	9.0	19.5	9.0	14.4

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY			AUGUST			SEPTEMBER		
1	18.5	17.5	18.0	18.0	15.5	16.5	21.0	19.0	20.0	17.0	14.5	16.0
2	18.0	15.5	16.5	18.5	15.0	16.0	19.5	17.5	18.0	17.5	15.0	16.5
3	16.5	14.0	15.0	19.5	18.0	18.5	17.5	15.5	16.0	18.0	15.5	17.0
4	17.0	14.5	16.0	22.5	19.0	20.5	18.5	15.0	16.5	18.5	16.5	17.5
5	19.5	16.5	18.0	24.5	22.0	23.0	18.5	17.0	17.5	18.5	16.0	17.5
6	22.5	19.0	20.5	24.0	22.5	23.5	19.0	16.5	18.0	18.0	16.5	17.5
7	23.0	21.0	22.0	22.5	20.0	21.0	18.5	16.0	16.5	16.5	14.5	15.5
8	22.5	20.0	21.5	21.0	17.5	19.0	17.5	16.0	16.5	16.0	14.5	15.0
9	21.5	19.5	20.0	17.5	16.5	17.0	16.5	14.5	15.5	14.5	13.5	14.0
10	22.0	18.5	20.0	18.0	16.0	17.0	16.0	15.0	15.5	13.5	12.5	13.0
11	22.5	20.5	21.5	19.0	16.0	17.5	18.0	14.5	16.0	14.0	12.0	13.0
12	22.5	21.0	21.5	20.0	17.5	18.5	19.0	17.5	18.0	14.0	12.0	13.0
13	21.5	17.5	19.5	20.5	18.0	19.0	19.0	17.5	18.5	15.5	14.0	14.5
14	17.5	16.0	16.5	20.5	18.5	19.5	17.5	16.0	16.5	14.5	13.0	13.5
15	16.0	14.0	14.5	22.5	19.0	20.5	18.0	15.0	16.5	13.0	11.5	12.0
16	15.0	14.0	14.5	23.0	21.0	22.0	18.0	17.0	17.5	12.5	10.5	11.5
17	15.5	13.5	14.5	22.5	20.5	21.5	18.5	17.0	18.0	13.0	10.5	12.0
18	16.5	13.5	15.0	21.5	18.5	20.0	18.5	17.0	18.0	13.0	11.0	12.0
19	17.5	15.5	16.5	21.0	18.5	19.5	18.0	16.0	17.0	14.0	11.5	12.5
20	19.0	16.0	17.5	20.0	17.5	18.5	17.5	14.5	16.5	13.5	12.0	13.0
21	19.5	17.0	18.0	20.0	18.5	19.0	18.5	16.0	17.0	12.0	10.5	11.0
22	19.5	17.0	18.5	22.0	18.0	19.5	18.5	16.5	17.5	11.5	9.0	10.5
23	21.0	18.5	19.5	21.5	20.0	20.5	18.0	16.0	17.0	12.5	11.0	11.5
24	21.5	19.5	20.5	22.5	19.0	20.5	19.0	16.5	17.5	12.0	11.0	11.5
25	21.5	19.0	20.5	23.0	20.5	22.0	18.5	17.0	17.5	11.0	9.5	10.5
26	22.0	19.0	20.5	22.0	20.0	20.5	18.5	17.0	17.5	14.0	10.5	12.0
27	21.5	20.5	21.0	21.5	19.0	20.0	20.0	17.0	18.5	14.0	13.0	13.5
28	21.5	19.5	20.5	21.5	19.0	20.0	20.0	18.5	19.0	13.0	12.0	12.5
29	20.5	18.5	19.0	21.0	19.0	20.0	18.5	16.0	17.0	12.0	10.5	11.5
30	18.5	16.0	17.5	22.5	19.0	21.0	16.0	14.0	15.0	10.5	9.5	10.0
31	---	---	---	22.0	21.0	21.5	16.5	14.0	15.0	---	---	---
MONTH	23.0	13.5	18.5	24.5	15.0	19.8	21.0	14.0	17.1	18.5	9.0	13.4

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	11.2	9.9	10.6	11.1	10.3	10.7	11.5	10.1	10.8	13.4	13.2	13.3
2	11.3	10.1	10.7	11.9	10.7	11.3	11.7	11.1	11.4	13.5	13.2	13.3
3	11.4	10.1	10.7	12.4	11.5	11.9	11.3	10.7	11.1	13.2	12.5	12.8
4	11.6	10.4	11.0	12.7	11.7	12.2	11.5	10.6	11.0	12.8	12.5	12.6
5	11.4	10.4	10.8	12.4	11.8	12.1	11.1	10.6	10.9	13.0	12.6	12.8
6	10.6	9.4	10.0	12.6	11.9	12.2	10.6	10.1	10.4	13.1	12.8	12.9
7	9.4	8.9	9.1	12.1	11.5	11.8	11.8	10.3	11.1	13.0	12.8	12.9
8	10.0	9.2	9.6	11.9	11.3	11.6	12.0	11.4	11.7	13.1	12.7	12.9
9	10.8	9.9	10.3	12.1	11.4	11.7	12.5	11.8	12.1	12.8	12.4	12.6
10	11.1	10.2	10.6	11.6	10.7	11.2	12.4	12.0	12.2	12.8	12.6	12.7
11	11.1	10.1	10.6	11.6	10.6	11.0	12.7	12.0	12.3	12.7	12.5	12.6
12	10.8	10.0	10.4	12.5	11.5	12.1	12.6	12.1	12.4	12.8	12.4	12.6
13	10.6	9.4	10.1	13.1	12.2	12.6	12.8	12.1	12.5	12.8	12.5	12.6
14	10.9	10.3	10.5	12.6	11.6	12.0	13.0	12.3	12.6	13.0	12.8	12.9
15	11.2	10.2	10.7	12.1	11.4	11.7	12.7	12.1	12.3	12.9	12.6	12.7
16	11.1	10.2	10.6	12.2	11.6	11.9	12.2	11.7	12.0	12.8	12.4	12.6
17	10.3	9.5	10.0	12.4	12.0	12.2	12.3	11.7	12.0	13.0	12.4	12.6
18	9.8	8.9	9.3	12.2	11.6	11.9	12.3	11.9	12.1	13.0	12.3	12.6
19	10.7	9.6	10.1	11.9	11.3	11.4	12.6	12.2	12.5	13.0	12.4	12.6
20	11.1	9.9	10.5	12.0	11.3	11.7	12.8	12.2	12.5	13.5	13.0	13.2
21	11.3	10.2	10.7	12.6	11.9	12.2	12.8	12.3	12.5	13.5	13.0	13.2
22	11.9	10.8	11.4	12.7	12.1	12.4	13.7	12.4	13.1	13.5	13.0	13.2
23	11.7	10.8	11.2	12.1	11.5	11.7	13.6	13.2	13.4	13.3	12.7	13.1
24	11.2	10.2	10.7	12.2	11.4	11.8	13.3	13.0	13.2	13.5	12.6	13.0
25	11.3	10.1	10.7	12.1	11.7	11.9	13.3	13.0	13.2	14.0	13.5	13.7
26	10.9	10.0	10.4	12.2	11.6	11.9	13.1	12.7	12.9	14.0	13.6	13.8
27	10.9	9.8	10.3	12.4	11.8	12.0	13.1	12.9	13.1	13.8	13.3	13.5
28	10.7	9.7	10.2	12.6	11.7	12.1	13.2	12.7	12.9	13.7	13.2	13.4
29	11.6	10.0	10.8	12.1	11.0	11.6	13.2	12.7	12.9	14.4	13.6	14.0
30	11.6	10.6	11.1	11.0	10.1	10.4	13.6	13.0	13.4	14.2	13.8	14.0
31	11.4	10.5	10.9	—	—	—	13.5	13.2	13.3	14.4	13.9	14.1
MONTH	11.9	8.9	10.5	13.1	10.1	11.8	13.7	10.1	12.3	14.4	12.3	13.1

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	14.2	13.7	14.0	13.0	12.1	12.5	10.9	9.9	10.4	11.0	9.0	10.0
2	13.9	12.8	13.2	13.3	12.5	12.8	11.0	10.0	10.5	10.6	8.8	9.7
3	13.4	12.8	13.1	13.0	12.4	12.7	10.8	9.8	10.2	10.5	8.7	9.5
4	13.4	12.6	12.9	13.4	12.5	13.0	11.1	9.3	10.1	10.3	8.5	9.3
5	14.3	13.3	13.9	13.9	12.9	13.4	11.7	11.0	11.3	10.0	8.4	9.1
6	13.8	13.0	13.4	14.1	13.3	13.6	11.0	10.5	10.7	9.5	8.3	8.9
7	13.2	12.8	13.0	14.3	13.3	13.8	11.5	10.7	11.1	9.9	8.5	9.2
8	13.5	12.9	13.1	14.2	13.4	13.8	11.3	10.3	10.7	10.1	8.9	9.4
9	12.9	12.3	12.6	13.8	13.2	13.5	11.0	9.8	10.4	10.8	9.4	10.0
10	13.6	12.6	13.1	13.7	13.0	13.3	11.6	10.6	11.1	10.9	9.1	9.9
11	13.1	11.8	12.5	13.8	12.7	13.2	11.5	10.2	10.8	10.5	8.8	9.7
12	12.9	11.6	12.2	13.7	12.7	13.2	12.4	11.4	11.8	10.7	9.0	9.8
13	13.8	12.9	13.4	13.8	12.8	13.2	11.7	10.7	11.2	11.0	9.6	10.2
14	13.8	13.5	13.7	13.5	12.7	13.0	11.4	10.3	10.8	10.4	9.0	9.7
15	13.5	12.8	13.2	13.3	12.2	12.7	11.3	9.8	10.5	10.1	8.7	9.3
16	12.8	12.2	12.4	12.7	11.7	12.2	11.2	10.1	10.6	9.8	8.2	8.9
17	12.9	12.1	12.4	12.4	11.3	11.7	11.3	10.0	10.9	9.5	7.9	8.6
18	13.5	12.6	13.0	12.4	10.9	11.6	11.6	10.4	11.0	9.3	7.9	8.6
19	13.8	12.9	13.3	12.9	11.8	12.3	11.6	10.6	11.0	10.8	8.9	9.8
20	14.0	13.2	13.6	13.0	11.8	12.3	11.8	10.8	11.3	10.9	9.1	9.9
21	14.0	13.2	13.6	12.4	11.4	11.9	11.6	10.8	11.1	10.0	8.4	9.3
22	14.1	13.3	13.7	12.9	11.7	12.3	11.5	10.6	11.1	10.4	8.9	9.6
23	14.1	13.3	13.6	13.1	12.2	12.6	12.0	10.8	11.3	10.3	9.1	9.7
24	14.1	13.1	13.6	12.8	11.7	12.2	12.1	10.7	11.4	10.7	9.5	10.1
25	13.6	13.0	13.2	13.0	11.8	12.3	11.5	10.3	10.8	11.3	10.1	10.6
26	13.3	12.7	13.0	13.0	11.9	12.4	11.1	9.7	10.3	11.4	10.0	10.8
27	12.8	12.2	12.5	12.8	11.6	12.1	11.3	9.6	10.4	11.0	9.4	10.1
28	12.4	11.9	12.1	12.4	11.2	11.7	11.3	9.8	10.5	10.6	8.7	9.6
29	—	—	—	11.9	10.4	11.2	11.4	9.9	10.6	10.3	8.7	9.4
30	—	—	—	12.3	11.0	11.6	11.3	9.7	10.4	10.2	8.2	9.2
31	—	—	—	11.8	10.5	11.1	—	—	—	9.8	8.3	9.0
MONTH	14.3	11.6	13.1	14.3	10.4	12.6	12.4	9.3	10.8	11.4	7.9	9.6

STREAMS TRIBUTARY TO LAKE HURON

04136000 AU SABLE RIVER NEAR RED OAK, MI--Continued

OXYGEN DISSOLVED (MGL), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
		JUNE				JULY		AUGUST				SEPTEMBER	
1	9.8	8.2	8.9	9.6	8.5	9.0	9.2	7.2	8.2	10.0	8.2	9.0	
2	9.6	8.4	9.0	10.6	9.0	9.7	9.5	7.5	8.5	9.4	7.7	8.5	
3	10.5	8.9	9.6	9.8	8.4	9.0	9.4	7.9	8.7	9.4	7.6	8.4	
4	10.5	8.8	9.6	9.7	8.0	8.7	9.7	8.3	9.0	9.2	7.4	8.3	
5	10.1	8.3	9.1	9.0	7.2	8.1	9.6	7.7	8.6	9.1	7.3	8.2	
6	9.6	7.8	8.6	9.1	6.9	8.1	9.6	7.7	8.6	8.7	7.3	7.9	
7	9.4	7.4	8.3	9.7	7.4	8.5	9.5	7.9	8.7	9.7	8.0	8.8	
8	9.6	7.5	8.5	9.2	7.4	8.3	9.7	7.9	8.7	9.5	7.9	8.7	
9	9.5	7.4	8.4	8.7	7.6	8.1	10.2	8.3	9.1	9.8	8.0	8.9	
10	10.1	8.0	8.9	9.4	7.9	8.6	9.2	8.2	8.7	9.7	8.5	9.1	
11	9.4	7.4	8.3	9.8	7.9	8.8	10.1	8.6	9.2	10.2	8.6	9.4	
12	9.1	7.2	8.1	9.5	7.5	8.5	9.6	7.9	8.7	10.3	8.9	9.4	
13	8.1	7.2	7.7	9.5	7.5	8.5	8.9	7.6	8.2	10.0	8.5	9.2	
14	8.6	7.9	8.2	9.3	7.4	8.3	9.9	8.0	8.9	10.4	8.5	9.4	
15	9.4	8.5	8.9	9.4	7.4	8.3	10.0	8.2	9.0	10.5	9.0	9.8	
16	9.4	8.4	8.9	9.0	6.8	7.8	9.6	7.8	8.7	10.8	9.5	10.1	
17	9.9	8.7	9.3	8.2	6.5	7.4	9.6	8.2	8.8	10.7	9.3	9.9	
18	10.1	8.7	9.3	9.0	7.2	8.0	9.7	8.0	8.8	10.6	9.0	9.7	
19	9.9	8.2	9.1	8.3	6.9	7.6	9.8	7.9	8.8	10.4	8.7	9.5	
20	9.5	8.0	8.8	9.2	7.7	8.4	10.2	8.5	9.3	9.6	8.3	9.1	
21	9.7	7.6	8.6	8.4	7.2	7.9	10.1	8.3	9.1	10.8	9.1	10.0	
22	9.6	7.7	8.6	9.4	7.6	8.4	9.7	8.1	8.8	11.0	9.4	10.1	
23	9.3	7.2	8.2	8.6	7.2	7.9	9.8	8.0	8.9	10.2	9.0	9.5	
24	8.9	7.0	7.9	9.0	7.5	8.2	9.9	8.1	8.9	10.4	8.8	9.6	
25	9.4	7.2	8.3	9.0	7.0	7.9	9.4	7.9	8.6	10.9	9.1	10.0	
26	9.9	7.3	8.6	9.1	6.9	8.0	9.6	7.6	8.5	10.4	8.8	9.5	
27	9.2	7.4	8.3	9.5	7.5	8.5	9.6	7.6	8.5	9.4	8.2	8.9	
28	9.2	7.5	8.3	9.5	7.6	8.5	9.2	7.3	8.2	9.7	8.8	9.2	
29	10.0	7.4	8.6	9.2	7.4	8.2	9.7	7.6	8.6	9.7	9.0	9.3	
30	10.2	8.3	9.3	9.3	7.4	8.3	10.2	8.4	9.2	9.9	8.7	9.4	
31	---	---	---	8.5	6.9	7.7	10.2	8.1	9.1	---	---	---	
MONTH	10.5	7.0	8.7	10.6	6.5	8.3	10.2	7.2	8.8	11.0	7.3	9.2	

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI

LOCATION.--Lat 44°39'36", long 84°07'52", in SE1/4 NE1/4 sec.12, T.26 N., R.2 E., Oscoda County, Hydrologic Unit 04070007, on right bank 150 ft upstream from bridge on State Highway 33 in Mio, 500 ft downstream from Mio hydroelectric plant, 9.5 mi downstream from Pig Creek, and 73.0 mi upstream from mouth.

DRAINAGE AREA.--1,361 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1952 to current year.

REVISED RECORDS.--WDR MI-96-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 929.60 ft above sea level.

REMARKS.--Water-discharge records good. Flow regulated by Mio Dam 500 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	794	776	1010	785	920	917	1120	806	834	919	740	649
2	768	779	1030	714	945	897	1120	815	860	898	723	657
3	739	773	991	799	975	927	1110	820	905	916	707	627
4	717	773	953	849	936	910	1100	785	859	860	709	624
5	724	756	918	879	915	875	1240	769	821	815	715	625
6	1030	752	904	873	925	867	1300	796	793	877	737	616
7	1750	763	1120	850	921	791	1250	895	751	873	742	617
8	1500	770	1040	818	888	830	1220	839	723	838	719	618
9	1260	785	1000	885	907	894	1180	832	727	931	708	616
10	1090	934	1020	870	922	876	1110	831	738	985	719	639
11	1020	1140	980	838	935	840	1020	793	753	938	738	647
12	943	1090	944	831	1250	832	1020	761	882	879	747	638
13	934	1010	952	847	1260	837	1030	772	869	854	748	650
14	883	962	944	833	1040	854	1030	767	1400	807	749	694
15	848	937	908	892	1100	857	1040	765	1330	755	730	672
16	872	930	914	894	1130	858	986	764	1160	742	718	653
17	866	964	930	880	1080	918	945	769	1040	761	719	627
18	867	992	935	997	1000	1050	925	814	957	770	709	617
19	833	1010	916	983	969	1070	912	805	916	897	706	628
20	799	1020	885	950	891	1020	919	796	881	935	701	675
21	797	972	878	969	865	1040	911	792	844	886	685	689
22	804	942	897	1040	799	1040	899	769	832	865	670	663
23	806	938	732	1070	871	1000	888	782	788	882	659	678
24	783	921	752	1160	943	1040	874	864	828	925	657	659
25	763	887	738	1200	931	1040	879	880	819	860	657	650
26	777	878	953	1130	885	986	867	847	785	780	666	637
27	771	875	852	1060	868	972	847	833	789	771	666	634
28	764	865	894	1060	916	983	836	815	856	766	664	640
29	757	867	919	1010	---	1060	817	783	1020	790	645	910
30	751	885	814	979	---	1070	801	760	926	783	614	876
31	752	---	785	966	---	1060	---	756	---	721	620	---
TOTAL	27762	26946	28508	28911	26987	29211	30196	24875	26686	26279	21687	20025
MEAN	896	898	920	933	964	942	1007	802	890	848	700	668
MAX	1750	1140	1120	1200	1260	1070	1300	895	1400	985	749	910
MIN	717	752	732	714	799	791	801	756	723	721	614	616
CFSM	.66	.66	.68	.69	.71	.69	.74	.59	.65	.62	.51	.49
IN.	.76	.74	.78	.79	.74	.80	.83	.68	.73	.72	.59	.55

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

MEAN	947	1002	973	905	890	1097	1475	1163	992	878	829	878
MAX	1779	1430	1303	1321	1152	1813	2241	1636	1422	1520	1195	1575
(WY)	1987	1992	1967	1973	1973	1976	1971	1983	1954	1994	1994	1986
MIN	685	738	711	697	660	733	977	723	683	655	578	661
(WY)	1965	1964	1964	1965	1958	1956	1958	1958	1958	1958	1958	1958

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1952 - 1999

ANNUAL TOTAL	345005	318073	1002
ANNUAL MEAN	945	871	1213
HIGHEST ANNUAL MEAN			746
LOWEST ANNUAL MEAN			1958
HIGHEST DAILY MEAN	4230	1750	4230
LOWEST DAILY MEAN	630	614	21
ANNUAL SEVEN-DAY MINIMUM	641	620	420
INSTANTANEOUS PEAK FLOW		2170	4380
INSTANTANEOUS PEAK STAGE		4.61	6.37
INSTANTANEOUS LOW FLOW		604	7.0
ANNUAL RUNOFF (CFSM)	.69	.64	.74
ANNUAL RUNOFF (INCHES)	9.43	8.69	10.00
10 PERCENT EXCEEDS	1200	1040	1360
50 PERCENT EXCEEDS	878	866	930
90 PERCENT EXCEEDS	678	687	721

(a) Sept. 30, 1986, Apr. 1, 1998.

(b) Aug. 30, 31, Sept. 6, 7.

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER NEAR MIO, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: July 1996 to current year.

DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in the water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 24.0°C, July 21, 1998, July 28, 1999; minimum, 0.0°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum, 14.3 mg/L, Feb. 23-25, 1999; minimum, 6.0 mg/L, Aug. 22, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 24.0°C, July 28; minimum, 0.0°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 14.3 mg/L, Feb. 23-25; minimum, 6.0 mg/L, Aug. 22.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			MEAN
1	14.5	13.5	14.0	10.0	9.0	9.5	6.0	5.5	5.5	.5	.0	.5
2	13.5	12.0	13.0	9.0	8.5	9.0	7.0	6.0	6.5	.5	.0	.5
3	12.0	11.0	11.5	8.5	7.5	8.0	7.5	7.0	7.5	.5	.0	.5
4	11.0	11.0	11.0	7.5	6.5	7.0	7.5	7.0	7.0	.5	.0	.5
5	11.0	10.5	10.5	6.5	6.0	6.5	7.0	7.0	7.0	.5	.0	.0
6	11.0	10.5	10.5	6.0	5.0	5.5	7.5	7.0	7.0	.5	.0	.5
7	11.0	10.5	11.0	5.0	4.5	4.5	7.0	6.5	7.0	.5	.0	.0
8	11.5	11.0	11.0	4.5	4.5	4.5	6.5	6.5	6.5	1.0	.0	.5
9	11.5	11.0	11.5	5.0	4.5	4.5	6.5	5.5	6.0	1.0	.0	.0
10	11.5	10.5	11.0	5.5	5.0	5.0	5.5	4.5	4.5	.5	.0	.0
11	10.5	10.0	10.5	5.5	5.0	5.5	4.5	3.0	3.5	.5	.0	.0
12	11.5	10.0	11.0	5.0	4.5	5.0	3.0	2.5	2.5	.5	.0	.0
13	11.0	10.5	11.0	4.5	4.0	4.5	2.5	2.0	2.5	.5	.0	.0
14	10.5	10.5	10.5	4.0	4.0	4.0	2.5	2.5	2.5	.5	.0	.0
15	11.0	10.5	10.5	4.0	3.5	3.5	2.5	2.5	2.5	.5	.0	.0
16	10.5	10.0	10.5	3.5	3.5	3.5	2.5	2.0	2.5	.5	.0	.0
17	11.5	10.0	10.5	4.0	3.5	3.5	2.0	2.0	2.0	.5	.0	.0
18	11.0	10.5	11.0	4.0	4.0	4.0	2.5	2.0	2.0	.5	.0	.0
19	11.0	10.5	11.0	4.0	4.0	4.0	2.5	2.0	2.0	.5	.0	.0
20	11.0	11.0	11.0	4.0	3.5	4.0	2.0	1.5	2.0	.5	.0	.0
21	11.0	10.5	11.0	4.0	3.5	4.0	1.5	1.5	1.5	.5	.0	.5
22	10.5	10.0	10.5	4.0	3.5	4.0	1.5	1.0	1.5	.5	.0	.5
23	10.0	9.0	9.5	4.0	4.0	4.0	1.5	1.0	1.0	.5	.0	.5
24	9.0	8.5	9.0	4.0	3.5	4.0	1.5	.5	1.0	.5	.0	.0
25	9.0	8.0	8.5	4.0	3.5	4.0	1.0	.5	.5	1.0	.0	.5
26	9.0	8.0	8.5	4.0	4.0	4.0	1.0	.5	.5	1.0	1.0	1.0
27	9.5	9.0	9.5	4.5	4.0	4.0	1.0	.5	.5	1.5	1.0	1.0
28	10.5	9.5	10.0	4.0	4.0	4.0	1.0	.5	.5	1.0	1.0	1.0
29	10.0	10.0	10.0	5.0	4.0	4.5	.5	.5	.5	1.5	1.0	1.0
30	10.0	10.0	10.0	6.0	5.0	5.5	1.0	.5	.5	1.0	1.0	1.0
31	10.0	10.0	10.0	—	—	—	.5	.0	.5	1.5	.5	1.0
MONTH	14.5	8.0	10.6	10.0	3.5	4.9	7.5	.0	3.1	1.5	.0	.4

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI--Continued

WATER-QUALITY RECORDS

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	1.0	.5	.5	1.5	.5	1.0	9.0	8.5	8.5	13.5	12.5	13.0
2	1.0	.5	.5	2.0	1.5	2.0	10.0	8.5	9.0	13.5	13.0	13.5
3	.5	.5	.5	2.0	2.0	2.0	11.0	9.5	10.0	14.5	13.5	14.0
4	1.0	.5	1.0	2.0	1.5	2.0	10.5	10.0	10.0	15.5	14.5	15.0
5	1.5	1.0	1.5	2.0	1.5	1.5	10.0	9.5	9.5	16.0	15.0	15.5
6	2.0	1.5	2.0	2.0	1.5	1.5	9.5	8.5	9.0	16.5	16.0	16.0
7	2.0	1.0	1.5	1.5	1.5	1.5	8.5	8.0	8.0	16.5	16.0	16.5
8	1.5	1.0	1.0	1.5	1.0	1.0	9.0	8.0	8.5	16.0	15.5	16.0
9	1.5	1.0	1.0	1.0	1.0	1.0	9.0	8.5	8.5	16.0	15.0	15.5
10	1.5	1.5	1.5	1.0	.5	1.0	9.5	8.5	9.0	15.0	14.0	14.5
11	2.0	1.5	2.0	1.0	.5	.5	9.0	8.5	9.0	14.0	14.0	14.0
12	2.5	2.0	2.0	1.0	.5	1.0	8.5	8.5	8.5	14.5	14.0	14.0
13	2.5	2.0	2.5	1.5	1.0	1.5	8.5	7.5	8.0	14.0	13.5	14.0
14	2.0	2.0	2.0	2.0	1.5	1.5	9.0	8.0	8.5	14.0	13.5	14.0
15	2.0	1.0	1.5	2.0	2.0	2.0	9.0	8.5	8.5	14.5	14.0	14.0
16	1.0	1.0	1.0	2.5	2.0	2.5	9.5	9.0	9.0	15.5	14.0	14.5
17	1.5	1.0	1.0	3.0	2.5	3.0	9.5	9.0	9.5	17.5	15.0	16.5
18	2.0	1.5	2.0	3.5	3.0	3.5	9.5	9.0	9.5	17.5	16.5	17.0
19	2.0	2.0	2.0	4.0	3.5	4.0	9.0	8.5	9.0	17.5	16.5	17.0
20	2.0	1.5	2.0	4.5	4.0	4.0	9.0	8.5	9.0	18.0	16.5	17.0
21	1.5	1.5	1.5	4.5	4.0	4.5	9.0	8.5	8.5	17.5	17.0	17.0
22	1.5	1.0	1.5	4.5	4.0	4.5	8.5	8.5	8.5	17.0	16.0	16.5
23	1.0	1.0	1.0	4.0	4.0	4.0	8.5	8.0	8.0	16.0	16.0	16.0
24	1.0	1.0	1.0	4.0	3.5	4.0	8.0	7.5	8.0	16.0	15.0	15.5
25	1.0	.5	1.0	4.0	4.0	4.0	10.0	8.0	9.0	15.0	13.5	14.0
26	.5	.5	.5	4.5	4.0	4.5	10.0	9.0	9.5	14.0	13.0	13.5
27	.5	.5	.5	5.0	4.5	4.5	11.0	9.5	10.5	14.0	12.5	13.0
28	.5	.5	.5	6.0	5.0	5.5	12.0	11.0	11.5	15.5	13.0	14.0
29	---	---	---	6.5	5.5	6.0	12.5	11.5	12.0	17.0	14.5	15.5
30	---	---	---	7.5	6.5	7.0	14.0	12.5	13.0	17.5	16.0	16.5
31	---	---	---	8.5	7.5	8.0	---	---	---	18.5	16.5	17.5
MONTH	2.5	.5	1.3	8.5	.5	3.0	14.0	7.5	9.2	18.5	12.5	15.2

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	18.5	18.0	18.0	20.5	20.0	20.0	23.0	22.5	22.5	19.0	18.0	18.5
2	19.5	18.5	19.0	20.5	19.5	20.0	23.0	22.0	22.5	19.0	18.0	18.5
3	19.0	18.0	18.5	20.5	18.5	19.5	22.0	21.5	22.0	18.5	18.0	18.0
4	18.5	17.5	18.0	21.5	18.5	20.5	21.5	20.5	21.0	19.0	18.0	18.5
5	19.0	17.0	18.0	23.0	20.5	22.0	21.0	20.0	20.5	19.5	18.0	18.5
6	21.0	18.5	19.5	23.5	22.0	23.0	20.0	19.5	20.0	19.5	18.5	19.0
7	22.0	19.5	20.5	23.5	22.5	23.0	20.0	19.0	19.5	19.5	19.0	19.5
8	22.0	20.5	21.5	23.0	22.0	22.5	19.5	19.0	19.0	20.0	19.0	19.5
9	22.0	21.5	22.0	22.0	21.5	22.0	19.5	18.5	19.0	19.5	19.0	19.0
10	22.0	21.5	21.5	21.5	19.5	20.5	19.0	18.0	18.5	19.0	18.0	18.5
11	22.5	21.5	22.0	19.5	19.0	19.5	19.5	18.0	18.5	18.0	17.0	17.5
12	23.5	21.5	22.5	19.0	18.5	18.5	18.5	17.5	18.0	17.5	16.5	16.5
13	22.5	21.5	22.0	20.5	18.5	19.5	19.5	17.5	18.5	17.0	16.0	16.5
14	22.0	20.5	21.5	21.5	19.0	20.5	18.5	18.0	18.5	16.0	15.0	15.5
15	20.5	18.0	19.5	22.0	20.0	21.0	19.5	18.5	19.0	15.5	15.0	15.0
16	18.0	16.0	17.0	23.0	21.0	22.0	20.0	18.5	19.0	15.0	14.5	15.0
17	16.5	16.0	16.5	22.5	21.5	22.0	19.5	18.5	19.0	15.5	14.5	15.0
18	17.0	16.0	16.5	23.0	22.0	22.5	19.5	18.5	19.0	15.5	14.5	15.0
19	17.0	16.0	16.5	22.5	21.5	22.0	19.0	18.5	18.5	15.5	14.0	14.5
20	17.5	15.5	16.5	22.0	21.0	22.0	19.0	18.5	18.5	15.0	14.0	14.0
21	17.5	16.5	17.5	21.5	20.5	21.0	19.5	18.0	19.0	14.5	13.5	14.0
22	19.5	17.5	18.5	21.5	20.5	21.0	20.0	18.0	18.5	14.0	13.5	14.0
23	20.5	18.5	19.5	21.5	21.0	21.0	19.5	18.0	18.5	14.0	13.5	14.0
24	21.0	19.5	20.5	23.5	20.5	22.0	19.0	18.0	18.5	13.5	13.0	13.5
25	22.5	21.0	21.5	22.5	22.0	22.0	19.5	18.5	19.0	13.0	12.5	13.0
26	23.0	21.5	22.0	23.0	22.0	22.5	19.5	19.0	19.5	14.0	12.5	13.0
27	22.5	21.5	22.0	23.0	22.0	22.5	20.5	19.5	20.0	13.5	13.0	13.5
28	23.0	21.5	22.0	24.0	22.0	23.0	22.0	20.0	20.5	13.5	13.0	13.0
29	22.5	21.5	22.0	23.0	22.0	22.5	20.5	19.5	20.0	13.5	13.0	13.5
30	21.5	20.5	21.0	23.5	22.0	22.5	19.5	19.0	19.5	13.0	13.0	13.0
31	---	---	---	23.5	22.0	22.5	19.5	18.5	19.0	---	---	---
MONTH	23.5	15.5	19.8	24.0	18.5	21.5	23.0	17.5	19.5	20.0	12.5	15.9

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	8.5	8.1	8.3	10.0	9.7	9.8	12.2	11.7	12.0	12.6	12.4	12.5			
2	8.8	8.4	8.6	10.3	9.9	10.2	11.9	11.1	11.6	12.6	12.1	12.5			
3	9.2	8.7	9.0	10.6	10.3	10.5	11.2	10.7	10.9	12.7	12.1	12.5			
4	9.5	9.1	9.4	10.7	10.3	10.5	10.7	10.6	10.7	12.9	12.3	12.6			
5	9.8	9.5	9.6	11.1	10.5	10.8	10.7	10.6	10.7	12.9	12.4	12.8			
6	10.3	9.8	10.0	11.5	11.0	11.2	10.7	10.6	10.6	12.7	12.1	12.4			
7	10.3	9.9	10.2	11.8	11.4	11.6	10.7	10.6	10.7	12.3	12.0	12.2			
8	9.9	8.9	9.4	11.9	11.7	11.8	10.7	10.6	10.7	12.3	11.7	12.1			
9	8.9	8.7	8.8	11.9	11.7	11.8	10.8	10.6	10.7	12.2	11.7	12.1			
10	8.9	8.7	8.8	11.9	11.5	11.7	11.3	10.8	11.1	12.2	12.0	12.2			
11	9.2	8.9	9.0	11.7	11.5	11.6	11.9	11.2	11.7	12.3	11.9	12.2			
12	9.4	9.2	9.3	11.8	11.6	11.7	12.2	11.9	12.1	12.1	11.8	12.1			
13	9.6	9.4	9.5	11.8	11.4	11.6	12.3	12.1	12.3	12.1	11.9	12.0			
14	9.6	9.5	9.5	11.8	11.3	11.6	12.4	12.3	12.3	12.1	11.8	12.0			
15	9.5	9.4	9.4	12.2	11.6	12.0	12.5	12.4	12.5	12.0	11.8	11.9			
16	9.5	9.3	9.4	12.3	12.0	12.2	12.5	12.4	12.5	12.0	11.6	11.9			
17	9.9	9.5	9.7	12.2	11.7	12.0	12.5	12.4	12.5	12.1	11.5	12.0			
18	10.0	9.8	9.9	11.9	11.4	11.7	12.5	12.2	12.3	12.0	11.7	11.9			
19	10.0	9.9	9.9	12.2	11.5	11.9	12.2	12.0	12.1	11.9	11.6	11.8			
20	10.0	9.7	9.8	12.2	11.8	12.0	12.3	12.1	12.2	11.9	11.5	11.8			
21	9.7	9.5	9.6	12.3	11.8	12.0	12.5	12.3	12.4	11.9	11.5	11.7			
22	9.7	9.5	9.6	12.1	11.8	11.9	12.7	12.3	12.5	12.1	11.7	11.9			
23	10.2	9.7	9.9	12.3	11.8	12.1	12.8	12.4	12.7	12.2	11.8	12.1			
24	10.4	10.1	10.3	12.4	12.1	12.3	13.0	12.2	12.8	12.3	11.9	12.2			
25	10.6	10.4	10.5	12.4	12.0	12.3	13.1	12.6	12.9	12.2	11.9	12.1			
26	10.6	10.5	10.6	12.4	11.8	12.1	13.3	12.9	13.1	12.2	11.9	12.0			
27	10.5	10.3	10.4	12.2	11.6	11.9	13.2	12.8	13.1	12.5	12.2	12.3			
28	10.4	10.1	10.2	12.2	11.6	12.0	13.2	12.8	13.0	12.9	12.5	12.7			
29	10.2	10.0	10.1	12.1	11.7	11.9	13.0	12.5	12.8	12.9	12.6	12.8			
30	10.1	9.8	10.0	12.1	11.5	11.9	12.8	12.2	12.6	12.7	12.5	12.7			
31	10.0	9.8	9.9	—	—	—	12.8	12.3	12.5	13.1	12.6	12.9			
MONTH	10.6	8.1	9.6	12.4	9.7	11.6	13.3	10.6	12.0	13.1	11.5	12.2			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	13.3	12.9	13.2	13.2	12.5	13.0	10.9	10.6	10.8	10.4	10.0	10.2	
2	13.5	13.2	13.4	12.8	12.3	12.6	10.7	10.3	10.5	10.4	10.2	10.3	
3	13.6	13.4	13.5	12.6	12.4	12.5	10.3	9.9	10.1	10.3	9.8	10.0	
4	13.5	13.1	13.4	12.8	12.6	12.7	9.9	9.8	9.8	9.8	9.4	9.6	
5	13.2	12.7	12.9	13.0	12.8	12.9	9.9	9.7	9.8	9.7	9.3	9.5	
6	13.0	12.8	12.9	12.8	12.7	12.8	10.3	9.7	10.0	9.5	9.0	9.2	
7	13.2	12.8	13.0	13.1	12.8	12.9	10.5	10.3	10.4	9.3	8.9	9.1	
8	13.4	13.1	13.3	13.2	13.0	13.1	10.6	10.3	10.5	9.0	8.8	8.8	
9	13.4	13.2	13.3	13.6	13.2	13.4	10.5	10.3	10.4	9.1	8.7	8.9	
10	13.3	13.1	13.2	13.6	13.4	13.5	10.4	10.2	10.3	9.2	8.8	9.0	
11	13.4	13.1	13.3	13.6	13.0	13.3	10.2	10.1	10.2	9.8	9.2	9.5	
12	13.3	13.1	13.2	13.1	12.5	12.9	10.3	10.1	10.2	10.2	9.8	10.0	
13	13.3	13.0	13.2	13.0	12.8	12.8	10.5	10.3	10.5	10.2	10.0	10.1	
14	13.1	13.0	13.1	12.9	12.7	12.8	11.0	10.5	10.8	10.1	9.9	10.0	
15	13.6	13.1	13.4	12.8	12.6	12.7	11.1	10.8	10.9	10.3	10.0	10.1	
16	14.0	13.6	13.9	12.7	12.5	12.6	10.8	10.3	10.6	10.3	9.9	10.1	
17	14.0	13.7	13.9	12.6	12.4	12.5	10.3	10.2	10.2	10.0	9.3	9.8	
18	13.8	13.4	13.6	12.4	11.8	12.2	10.2	10.1	10.1	9.3	8.9	9.1	
19	13.5	13.4	13.5	11.9	11.4	11.7	10.2	10.1	10.2	8.9	8.4	8.7	
20	13.5	13.3	13.4	11.5	11.4	11.4	10.3	10.1	10.2	8.4	7.9	8.2	
21	13.7	13.4	13.6	11.7	11.4	11.5	10.4	10.2	10.3	8.1	7.6	7.9	
22	14.0	13.7	13.9	11.8	11.6	11.7	10.5	10.3	10.4	8.1	7.7	7.9	
23	14.3	14.0	14.1	11.8	11.6	11.7	10.6	10.4	10.5	8.3	8.1	8.2	
24	14.3	14.2	14.3	11.9	11.6	11.8	10.7	10.5	10.6	8.6	8.1	8.5	
25	14.3	14.2	14.3	12.1	11.8	11.9	10.9	10.6	10.8	8.8	8.4	8.6	
26	14.2	14.0	14.2	12.0	11.8	11.9	11.0	10.8	10.9	9.1	8.7	8.9	
27	14.1	13.5	13.8	11.9	11.7	11.8	10.8	10.5	10.7	9.6	8.9	9.3	
28	13.6	13.2	13.4	11.9	11.6	11.8	10.6	10.3	10.5	9.9	9.5	9.7	
29	--	--	--	11.8	11.5	11.6	10.3	10.1	10.2	9.9	9.5	9.7	
30	--	--	--	11.5	10.9	11.2	10.4	10.0	10.2	9.9	9.6	9.7	
31	--	--	--	11.2	10.7	10.9	--	--	--	9.6	9.1	9.4	
MONTH	14.3	12.7	13.5	13.6	10.7	12.3	11.1	9.7	10.4	10.4	7.6	9.3	

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	9.2	8.4	8.9	7.4	7.0	7.1	7.5	6.9	7.1	7.6	6.9	7.3
2	8.5	8.0	8.2	7.8	7.4	7.6	7.4	6.9	7.2	7.6	7.2	7.5
3	8.3	7.5	7.9	7.9	7.4	7.6	7.1	6.2	6.8	8.1	7.5	7.8
4	7.7	7.0	7.4	8.3	7.4	7.9	7.0	6.1	6.5	8.3	7.8	8.0
5	8.2	7.1	7.7	8.2	7.7	8.1	7.3	6.6	6.9	8.1	7.7	7.9
6	8.5	7.7	8.1	8.0	7.6	7.8	7.5	7.1	7.3	7.9	7.6	7.8
7	8.5	7.9	8.2	7.9	7.5	7.6	8.0	7.5	7.7	7.9	7.5	7.7
8	8.5	7.9	8.2	7.6	7.2	7.4	7.8	7.5	7.6	7.9	7.1	7.5
9	8.4	7.6	8.1	7.3	6.9	7.1	8.0	7.6	7.8	7.8	7.1	7.4
10	8.0	7.1	7.6	7.3	6.9	7.1	7.8	7.2	7.5	7.5	7.2	7.3
11	7.6	6.9	7.3	7.6	7.2	7.4	8.0	7.5	7.8	7.5	7.2	7.4
12	8.3	6.9	7.7	8.1	7.5	7.8	7.9	7.3	7.7	7.8	7.3	7.5
13	7.6	6.9	7.3	8.3	7.8	8.0	8.3	7.3	7.8	8.3	7.6	8.0
14	7.4	6.8	7.1	8.4	7.9	8.1	8.3	7.6	7.9	8.5	8.0	8.3
15	7.8	6.8	7.3	8.0	7.4	7.8	8.5	8.1	8.3	8.6	8.2	8.5
16	7.9	7.8	7.8	7.7	7.2	7.5	8.7	7.5	8.1	8.5	8.3	8.4
17	8.2	7.8	8.1	7.4	7.1	7.2	8.2	7.5	7.8	8.5	8.1	8.4
18	8.6	8.1	8.3	7.3	7.0	7.1	8.7	7.5	7.8	8.4	8.1	8.3
19	8.5	8.2	8.3	7.2	6.4	6.7	8.0	7.2	7.7	8.8	8.2	8.6
20	8.8	8.2	8.5	7.2	6.5	6.9	8.4	7.7	8.0	8.8	8.6	8.7
21	9.0	8.6	8.8	7.2	6.6	6.9	8.2	6.7	7.6	8.9	8.7	8.8
22	9.1	8.5	8.8	7.3	6.6	7.1	8.0	6.0	7.6	9.0	8.6	8.8
23	8.9	8.1	8.5	7.4	7.0	7.2	8.4	7.5	7.9	8.7	8.6	8.6
24	8.2	7.9	8.1	7.8	7.1	7.4	8.1	7.7	7.9	8.6	8.5	8.5
25	8.0	7.1	7.8	7.6	7.0	7.3	8.0	7.3	7.7	8.7	8.5	8.6
26	7.4	6.8	7.1	7.5	7.0	7.2	7.7	7.4	7.5	8.8	8.6	8.7
27	7.2	6.8	7.0	7.4	6.9	7.1	7.7	7.4	7.5	8.8	8.5	8.7
28	7.4	6.8	7.1	7.9	6.8	7.2	8.1	7.4	7.6	8.7	8.6	8.6
29	7.7	7.3	7.5	7.6	6.7	7.0	7.6	7.3	7.5	--	--	--
30	7.3	7.1	7.2	7.4	6.6	7.0	7.6	6.9	7.2	--	--	--
31	--	--	--	7.8	6.7	7.1	7.4	6.9	7.2	--	--	--
MONTH	9.2	6.8	7.9	8.4	6.4	7.4	8.7	6.0	7.6	--	--	--

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI

LOCATION.--Lat 44°36'46", long 83°50'16", in SE1/4 SW1/4 sec.28, T.26 N., R.5 E., Alcona County, Hydrologic Unit 04070007, on right bank, upstream side of U.S. Forest Service 4001 bridge on Au Sable River Road, 5.5 mi southeast of McKinley.

DRAINAGE AREA.--1,513 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1996 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 830 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	912	904	1140	e880	1100	1090	1250	941	986	1100	870	768
2	879	922	1210	e790	1070	1050	1300	957	1070	1110	873	791
3	854	909	1170	e820	1130	1060	1270	974	1080	1080	856	770
4	830	911	1120	e900	1110	1070	1290	950	1090	1070	859	750
5	825	905	1080	e980	1100	1030	1410	917	1000	977	852	752
6	1140	890	1060	e970	1070	1010	1510	937	980	1030	859	743
7	1960	903	1250	e950	1080	983	1500	1020	934	1050	885	736
8	1810	916	1270	e920	1060	926	1430	1050	897	1020	868	744
9	1540	922	1150	e930	1050	1020	1420	982	892	1070	849	743
10	1310	1060	1170	e940	1080	1020	1300	996	909	1160	857	750
11	1180	1350	1150	e940	1100	987	1220	969	931	1130	874	770
12	1130	1300	1090	e920	1450	970	1160	921	1010	1060	887	766
13	1060	1210	1080	e940	1580	977	1200	912	1070	1020	900	777
14	1090	1140	1090	e920	1330	988	1200	934	1630	992	891	738
15	983	1110	1050	e950	1240	1000	1200	916	1720	927	875	815
16	1020	1100	1030	e1020	1330	994	1180	924	1400	895	855	774
17	1030	1130	1060	e1020	1310	1060	1100	937	1270	904	853	762
18	1020	1160	1060	e1100	1210	1200	1090	981	1150	933	843	739
19	1000	1180	1050	e1050	1150	1270	1070	994	1100	1030	833	748
20	953	1190	1010	e1050	1100	1210	1070	973	1060	1140	832	731
21	941	1150	996	e1100	1020	1190	1070	959	1030	1090	823	828
22	956	1110	1030	e1220	1000	1220	1060	942	997	1040	807	796
23	956	1090	e880	e1280	955	1170	1040	934	974	1050	798	738
24	945	1090	e820	e1300	1100	1160	1020	1000	969	1090	798	800
25	918	1060	e840	e1320	1090	1200	1010	1060	1010	1060	797	777
26	930	1030	e1000	e1300	1050	1140	1020	1040	956	962	802	772
27	925	1040	e1020	1250	1010	1110	984	1010	953	920	809	762
28	912	1020	e1060	1210	1060	1120	976	999	999	928	801	939
29	908	1010	e1050	1200	---	1170	958	969	1200	924	790	1150
30	896	1030	e940	1130	---	1240	946	939	1160	943	760	1060
31	898	---	e860	1120	---	1210	---	926	---	904	752	---
TOTAL	32711	31742	32766	32420	31935	33845	35254	29963	32427	31609	26008	23969
MEAN	1055	1058	1057	1046	1141	1092	1175	967	1081	1020	839	799
MAX	1960	1350	1270	1320	1580	1270	1510	1060	1720	1160	900	1150
MIN	825	890	820	790	955	926	946	912	892	895	752	736
CFSM	.70	.70	.70	.69	.75	.72	.78	.64	.71	.67	.55	.53
IN.	.80	.78	.81	.80	.79	.83	.87	.74	.80	.78	.64	.59

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1999, BY WATER YEAR (WY)

	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
MEAN	1040	1080	1097	1088	1119	1239	1775	1297	1095	996	909	890
MAX	1074	1098	1229	1179	1162	1380	2300	1662	1117	1020	1020	1022
(WY)	1997	1997	1997	1997	1997	1998	1997	1997	1997	1999	1997	1997
MIN	990	1058	1005	1040	1053	1092	1175	967	1081	954	839	799
(WY)	1998	1999	1998	1998	1998	1999	1999	1999	1999	1998	1999	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1997 - 1999

ANNUAL TOTAL	410846	374649	1135
ANNUAL MEAN	1126	1026	1260
HIGHEST ANNUAL MEAN			1997
LOWEST ANNUAL MEAN			1026
HIGHEST DAILY MEAN	4790	1960	4790
LOWEST DAILY MEAN	790	736	736
ANNUAL SEVEN-DAY MINIMUM	803	745	745
INSTANTANEOUS PEAK FLOW		(a)2200	(b)4990
INSTANTANEOUS PEAK STAGE		(c)14.40	(c)14.40
INSTANTANEOUS LOW FLOW		727	716
ANNUAL RUNOFF (CFSM)	.74	.68	.75
ANNUAL RUNOFF (INCHES)	10.10	9.21	10.19
10 PERCENT EXCEEDS	1430	1220	1410
50 PERCENT EXCEEDS	1040	1010	1060
90 PERCENT EXCEEDS	833	813	865

(a) Gage height 8.87 ft.

(b) Gage height 10.73 ft.

(c) Backwater from ice.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1996 to current year.

DISSOLVED OXYGEN: October 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 25.0°C, July 5, 1999; minimum, -0.5°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum recorded, 13.9 mg/L, Jan. 18, 1998, but may have been higher during instrument malfunction Dec. 24, 1997 to Jan. 8, 1998; minimum, 5.2 mg/L, Aug. 28, 1998, July 28, 31, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 25.0°C, July 5; minimum, -0.5°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 13.6 mg/L, on several days during winter period; minimum, 5.2 mg/L, July 28, 31.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	13.5	11.5	12.5	10.0	8.0	9.5	6.5	5.0	5.5	-5	-5	-5
2	12.5	11.0	12.0	8.0	7.0	7.5	6.5	5.0	6.0	-5	-5	-5
3	12.0	10.0	11.0	7.0	6.5	7.0	8.0	6.0	7.0	-5	-5	-5
4	11.0	8.5	10.0	6.5	5.5	6.0	7.5	6.5	7.0	-5	-5	-5
5	11.0	8.5	10.0	6.5	5.5	6.0	7.5	6.5	7.0	-5	-5	-5
6	12.0	10.5	11.5	6.0	5.0	5.5	8.0	7.0	7.5	-5	-5	-5
7	12.0	10.5	11.0	6.0	5.0	5.5	7.0	5.5	6.0	-5	-5	-5
8	11.0	10.0	10.5	5.5	4.5	5.0	6.0	5.0	5.5	-5	-5	-5
9	12.0	9.5	10.5	5.5	4.0	5.0	5.0	4.0	4.5	-5	-5	-5
10	12.0	9.5	10.5	6.5	5.0	5.5	5.0	4.0	4.5	-5	-5	-5
11	11.5	9.5	10.5	6.0	4.5	5.0	4.0	3.0	3.5	-5	-5	-5
12	12.0	9.5	11.0	5.0	4.0	4.5	3.5	3.0	3.0	-5	-5	-5
13	11.5	10.0	10.5	4.5	3.0	4.0	3.0	1.5	2.5	-5	-5	-5
14	10.0	9.0	9.5	5.0	4.0	4.5	---	---	---	-5	-5	-5
15	11.0	9.0	10.0	5.0	4.0	4.5	---	---	---	.0	-5	-5
16	11.5	8.5	10.0	4.0	2.5	3.0	---	---	---	.0	-5	.0
17	12.5	10.0	11.0	4.0	3.0	3.5	2.5	1.5	2.0	.0	-5	.0
18	12.5	10.5	11.5	4.5	3.5	4.0	2.0	.5	1.0	.0	.0	.0
19	11.5	9.5	10.5	4.5	4.0	4.5	2.5	2.0	2.5	.0	-5	.0
20	10.5	8.5	9.5	4.0	3.5	3.5	2.0	1.0	1.5	.0	.0	.0
21	10.0	9.0	9.5	4.0	3.0	3.5	1.5	1.0	1.5	.0	-5	.0
22	9.5	7.5	8.5	4.5	3.0	3.5	1.0	-5	.0	.0	.0	.0
23	10.0	8.0	9.0	5.0	4.0	4.5	-5	-5	-5	.0	.0	.0
24	10.0	8.0	9.5	4.5	3.5	4.0	-5	-5	-5	.5	.0	.5
25	9.5	8.0	9.0	4.0	3.0	3.5	-5	-5	-5	1.0	.5	.5
26	9.5	8.5	9.0	4.0	3.5	4.0	.0	-5	-5	1.5	.5	1.0
27	10.5	7.5	9.0	4.5	3.5	4.0	.5	-5	.0	1.5	1.0	1.0
28	10.5	9.5	10.0	5.0	3.5	4.0	.5	.0	.0	1.5	.5	1.0
29	9.5	7.5	8.5	6.5	4.5	5.0	.5	-5	.0	1.0	-5	.5
30	9.5	7.5	8.5	7.5	6.5	7.0	-5	-5	-5	1.5	.0	.5
31	10.0	8.0	9.0	---	---	---	-5	-5	-5	1.0	-5	.5
MONTH	13.5	7.5	10.1	10.0	2.5	4.9	---	---	---	1.5	-5	-1

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH				APRIL				MAY
1	1.5	-5	.5	1.5	.5	1.0	9.5	8.0	9.0	15.5	10.5	13.5
2	2.0	1.5	1.5	2.5	.0	1.5	10.5	8.5	9.5	15.5	11.0	13.5
3	2.0	.5	1.5	2.5	1.5	2.0	12.5	9.0	11.0	16.0	11.5	14.0
4	2.0	.0	1.0	2.5	1.0	2.0	11.5	8.0	8.5	17.0	12.0	15.0
5	1.0	-5	.5	2.5	.5	1.5	10.5	8.0	9.0	17.0	13.0	15.5
6	2.5	1.0	2.0	1.5	.0	1.0	9.5	8.0	9.0	17.0	14.5	15.5
7	2.0	1.5	1.5	1.5	.5	.5	10.5	7.0	9.0	16.5	13.5	15.5
8	2.5	1.0	1.5	2.0	-5	.5	11.0	7.5	9.0	15.5	14.5	15.0
9	2.5	1.5	2.5	2.0	.5	1.0	9.5	7.5	8.5	16.5	12.5	14.5
10	2.5	.5	1.5	2.0	.0	1.0	10.5	6.5	8.5	16.5	12.5	15.0
11	4.5	2.0	3.0	2.5	-5	1.0	9.5	7.0	7.5	15.5	11.5	14.0
12	4.5	1.5	2.5	2.5	-5	1.5	10.5	6.5	8.5	14.5	11.5	12.5
13	2.0	.5	1.5	2.5	-5	1.5	10.5	6.5	9.0	15.0	10.5	13.0
14	2.5	.5	1.5	3.5	.0	2.0	11.0	6.5	9.0	16.0	11.0	14.0
15	3.0	1.0	2.5	4.0	.5	2.5	10.5	7.0	9.0	16.0	12.0	14.5
16	2.5	1.5	2.0	5.0	2.0	4.0	9.0	7.0	8.5	17.5	13.5	15.5
17	2.0	1.5	1.5	6.0	2.0	4.0	10.0	7.5	9.0	18.5	15.0	17.0
18	2.0	.5	1.5	5.5	3.0	4.0	10.0	8.0	9.5	18.0	15.5	16.5
19	2.0	.5	1.5	5.5	2.5	4.5	9.5	8.0	9.0	17.5	14.0	16.0
20	1.5	.0	1.0	6.0	2.5	4.5	10.0	7.0	9.0	18.0	14.0	16.0
21	1.5	-5	.5	5.5	4.0	4.5	9.5	8.0	9.0	17.5	15.5	16.5
22	1.0	-5	.5	5.0	3.0	4.0	9.0	7.5	8.5	17.0	15.5	16.0
23	1.0	-5	.5	5.5	2.5	4.5	9.0	7.0	8.0	15.5	13.5	14.5
24	2.0	-5	.5	5.5	3.0	4.5	10.5	6.0	8.5	14.5	13.5	14.0
25	2.0	.5	1.5	4.5	3.0	4.0	11.5	6.5	9.5	13.5	12.0	12.5
26	2.0	.0	1.0	6.5	2.5	4.5	13.0	8.5	11.0	16.5	12.0	14.0
27	2.0	.5	1.5	7.0	3.0	5.5	12.5	8.0	10.5	16.5	11.5	14.5
28	2.0	1.0	1.5	8.0	3.5	6.0	13.0	8.5	11.0	17.5	13.0	15.5
29	---	---	---	7.5	5.0	6.5	13.5	9.0	11.5	18.5	13.5	16.0
30	---	---	---	9.0	4.5	7.0	15.0	9.5	12.5	19.0	15.5	17.5
31	---	---	---	12.5	6.5	8.5	---	---	---	19.5	16.0	18.0
MONTH	4.5	-5	1.4	12.5	-5	3.3	15.0	6.0	9.3	19.5	10.5	15.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY				AUGUST				SEPTEMBER
1	19.0	17.5	18.0	21.0	18.0	18.5	22.5	20.5	21.5	19.0	16.5	18.0
2	17.5	16.5	17.0	22.0	17.5	20.0	22.0	19.0	20.5	19.5	16.5	18.5
3	19.0	15.5	17.5	21.0	18.5	20.0	20.5	18.5	19.0	19.5	16.5	18.5
4	20.0	15.0	18.0	23.5	19.5	21.5	22.0	19.0	20.5	19.5	16.5	18.5
5	20.5	16.5	18.5	25.0	21.0	23.0	21.0	18.5	19.5	20.0	16.5	18.5
6	23.0	18.0	20.5	24.0	21.5	23.0	21.0	18.0	20.0	19.5	18.0	19.0
7	23.0	19.5	21.5	23.0	20.0	22.0	20.0	16.5	18.5	19.5	16.5	18.0
8	23.5	19.0	21.5	22.0	19.5	21.0	19.5	17.5	18.5	19.0	16.5	18.0
9	22.0	19.5	20.5	21.0	19.5	20.5	19.5	15.5	18.0	18.0	16.0	17.0
10	23.5	19.5	21.5	21.5	19.0	20.5	19.0	17.0	17.5	17.0	15.5	16.5
11	24.5	20.5	22.5	22.0	17.5	20.0	20.5	16.5	18.5	17.5	15.0	16.5
12	24.0	21.0	22.5	21.5	17.5	20.0	20.5	17.5	19.0	17.0	14.0	16.0
13	23.0	19.5	21.0	21.5	17.5	19.5	19.5	17.5	18.5	17.5	15.5	16.5
14	21.0	18.5	19.5	21.5	18.5	20.0	19.0	16.5	18.0	16.0	14.0	15.0
15	20.0	18.0	19.0	23.5	19.5	21.5	20.0	15.5	18.0	15.0	13.0	14.0
16	18.5	16.0	17.0	24.0	21.0	23.0	20.0	17.5	18.5	15.0	12.5	14.0
17	18.0	14.5	16.5	24.0	21.0	22.0	20.5	18.0	19.0	15.5	12.0	14.0
18	18.5	14.0	16.5	24.0	20.0	22.0	20.5	18.0	19.5	15.5	12.5	14.0
19	18.5	15.0	17.0	23.0	20.0	21.5	19.5	17.5	18.0	15.5	12.5	14.5
20	19.5	15.0	17.5	23.5	19.5	22.0	20.0	16.0	18.0	15.5	13.5	14.5
21	20.0	15.5	18.0	23.0	20.0	21.0	20.0	16.5	18.5	13.5	11.0	12.5
22	20.5	16.0	18.5	24.0	19.5	21.5	19.5	17.0	18.5	14.0	10.5	12.5
23	21.5	18.0	20.0	23.0	20.0	21.5	20.0	17.0	19.0	14.0	12.5	13.5
24	21.5	19.0	20.5	24.0	20.0	22.0	20.5	18.0	19.5	13.5	12.0	13.0
25	23.0	19.0	21.0	24.0	21.0	23.0	20.0	17.0	18.5	13.0	10.5	12.0
26	23.5	19.5	21.5	23.0	20.0	21.5	19.5	18.0	19.0	15.0	12.0	13.5
27	23.0	20.5	21.5	24.0	20.5	22.5	21.0	17.5	19.5	14.5	13.0	14.0
28	23.5	20.5	22.0	23.5	19.5	22.0	21.0	18.5	20.0	13.5	13.0	13.0
29	22.0	19.0	20.5	23.0	20.5	21.5	19.5	17.0	18.0	13.0	12.0	12.5
30	21.5	18.0	20.0	24.5	21.0	23.0	18.0	15.5	17.0	13.0	11.0	12.0
31	---	---	---	24.5	21.5	22.5	19.0	15.5	17.5	---	---	---
MONTH	24.5	14.0	19.6	25.0	17.5	21.4	22.5	15.5	18.8	20.0	10.5	15.3

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	10.7	8.8	9.6	10.1	8.9	9.5	11.5	10.2	11.0	12.6	12.0	12.3			
2	10.6	9.0	9.7	11.2	9.7	10.4	11.3	10.6	10.9	12.8	12.4	12.6			
3	10.8	9.1	9.9	11.3	10.1	10.7	10.9	10.1	10.5	12.7	12.3	12.5			
4	11.2	9.7	10.3	11.7	10.3	10.9	10.8	9.9	10.3	13.0	12.5	12.7			
5	11.2	9.5	10.2	11.6	10.3	10.8	10.3	9.8	10.1	13.0	12.5	12.7			
6	10.4	9.1	9.7	11.8	10.4	11.0	10.2	9.6	9.9	12.6	11.5	12.1			
7	9.7	9.0	9.4	11.7	10.5	11.0	10.8	9.8	10.3	11.8	11.3	11.5			
8	10.2	9.4	9.7	11.6	10.6	11.1	10.8	10.1	10.5	11.5	11.2	11.3			
9	9.9	9.1	9.5	11.8	10.7	11.2	11.1	10.4	10.7	11.3	10.9	11.1			
10	9.8	9.0	9.3	10.7	9.5	10.0	11.0	10.5	10.7	11.2	11.0	11.1			
11	10.3	8.9	9.6	10.7	9.6	10.2	11.5	10.8	11.2	11.1	10.8	10.9			
12	10.5	9.3	9.8	11.3	10.6	10.9	11.5	11.0	11.2	10.9	10.6	10.7			
13	10.1	9.1	9.6	11.4	10.6	10.9	11.9	11.3	11.6	10.8	10.6	10.7			
14	10.6	9.4	9.9	10.6	10.1	10.3	---	---	---	10.9	9.3	10.6			
15	10.9	9.6	10.1	11.0	10.1	10.5	---	---	---	10.8	10.6	10.7			
16	10.4	8.9	9.7	10.9	10.4	10.7	---	---	---	10.7	10.5	10.6			
17	10.7	8.7	9.5	10.9	10.2	10.6	12.1	11.5	11.8	10.9	10.5	10.7			
18	10.5	8.9	9.6	10.9	10.3	10.7	12.5	11.8	12.1	10.9	10.6	10.8			
19	10.9	9.4	10.1	10.5	9.9	10.2	12.3	11.6	11.9	11.1	10.8	11.0			
20	11.0	9.6	10.2	11.0	10.3	10.7	12.9	12.1	12.4	11.5	11.0	11.2			
21	10.7	9.2	9.9	11.3	10.7	11.0	12.6	12.1	12.4	11.5	11.3	11.4			
22	11.2	9.1	10.2	11.3	10.5	10.9	12.5	11.0	11.8	11.7	11.3	11.4			
23	11.0	9.7	10.2	10.8	10.2	10.5	12.7	12.3	12.5	11.6	11.0	11.3			
24	11.2	9.6	10.3	11.3	10.4	10.9	12.9	12.3	12.6	13.1	11.0	12.4			
25	11.6	8.9	10.5	11.3	10.6	10.9	12.9	12.5	12.7	13.1	12.5	12.9			
26	11.3	8.9	10.4	11.5	10.5	11.0	13.4	12.1	12.7	13.1	12.4	12.8			
27	11.5	9.6	10.5	11.7	11.0	11.3	13.4	11.6	12.5	12.7	12.5	12.6			
28	10.9	9.1	10.0	11.8	11.0	11.4	13.6	12.8	13.1	13.0	12.5	12.8			
29	11.6	9.6	10.5	11.4	10.3	10.9	13.3	11.7	12.7	13.5	10.6	12.7			
30	11.2	9.7	10.4	10.6	9.9	10.3	12.7	11.4	11.9	13.6	12.3	13.1			
31	11.1	9.3	10.0	---	---	---	12.7	10.2	11.8	13.6	11.7	13.0			
MONTH	11.6	8.7	9.9	11.8	8.9	10.7	---	---	---	13.6	9.3	11.7			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	13.5	10.3	12.6	13.0	12.1	12.5	11.6	10.5	11.0	10.6	8.8	9.7	
2	13.0	12.6	12.8	13.0	11.9	12.5	11.0	10.0	10.6	10.5	8.5	9.6	
3	13.3	12.7	13.0	12.8	12.1	12.4	10.8	9.8	10.2	10.1	8.3	9.2	
4	13.0	12.4	12.7	13.2	12.3	12.8	11.1	9.7	10.5	9.9	8.2	9.0	
5	13.3	10.8	12.3	13.3	12.5	12.9	11.6	10.5	11.0	9.6	7.7	8.6	
6	12.3	11.8	11.9	13.5	12.2	12.9	11.0	10.6	10.8	9.1	7.5	8.3	
7	12.2	11.7	11.9	13.4	10.7	12.5	11.5	10.4	11.0	9.4	7.5	8.5	
8	12.5	11.8	12.2	13.6	10.8	12.6	11.3	10.0	10.8	9.0	7.8	8.4	
9	12.3	11.8	12.0	13.4	12.5	12.9	11.2	10.1	10.7	9.7	8.0	8.8	
10	12.9	12.2	12.5	13.4	11.9	12.8	11.0	9.9	10.6	9.6	7.9	8.7	
11	12.4	11.5	12.1	13.6	10.2	12.6	10.1	9.7	9.9	9.5	7.9	8.8	
12	13.5	11.3	12.5	13.4	11.2	12.7	10.7	9.5	10.1	9.9	8.2	9.0	
13	13.6	12.9	13.4	13.5	10.3	12.6	11.7	9.4	10.6	9.1	7.7	8.6	
14	12.9	12.2	12.7	13.2	12.0	12.6	10.9	9.7	10.4	8.8	7.5	8.2	
15	12.5	12.1	12.3	13.1	11.9	12.5	11.3	9.6	10.5	8.8	7.4	8.1	
16	13.1	12.1	12.7	12.8	11.6	12.2	11.3	10.2	10.9	9.2	7.4	8.4	
17	13.6	12.4	12.9	12.8	11.5	12.2	11.3	10.3	10.8	9.2	7.6	8.3	
18	13.4	12.9	13.1	12.8	11.4	12.2	11.1	10.2	10.7	8.7	7.5	8.2	
19	13.3	12.7	13.0	12.8	11.8	12.3	11.2	10.0	10.6	9.6	7.9	8.8	
20	13.2	11.8	12.7	12.8	11.7	12.2	11.1	10.0	10.6	9.6	7.9	8.8	
21	13.3	10.7	12.4	12.6	11.3	11.9	11.2	10.0	10.6	8.9	7.5	8.2	
22	13.2	9.3	11.9	12.8	11.8	12.2	10.8	9.9	10.4	9.2	7.6	8.3	
23	13.1	10.4	12.1	12.6	11.7	12.2	11.4	9.8	10.5	9.3	7.9	8.5	
24	---	---	---	12.6	11.6	12.1	11.1	9.6	10.5	9.4	7.7	8.6	
25	13.1	12.6	12.8	12.9	11.9	12.3	11.0	9.2	10.2	9.5	8.1	8.8	
26	13.2	12.3	12.8	12.8	11.8	12.4	10.7	9.0	10.0	9.8	8.4	9.1	
27	13.0	12.4	12.7	12.7	11.7	12.2	11.1	9.1	10.1	9.9	8.4	9.1	
28	12.7	12.2	12.4	12.6	11.3	12.0	11.3	9.5	10.5	9.8	8.2	9.0	
29	---	---	---	12.3	11.3	11.8	11.1	9.5	10.3	9.7	8.0	8.9	
30	---	---	---	12.2	11.0	11.7	11.0	9.0	10.2	9.4	7.4	8.4	
31	---	---	---	12.2	10.9	11.5	---	---	---	8.8	7.2	8.0	
MONTH	---	---	---	13.6	10.2	12.4	11.7	9.0	10.5	10.6	7.2	8.7	

STREAMS TRIBUTARY TO LAKE HURON

04136900 AU SABLE RIVER NEAR MC KINLEY, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.1	6.8	7.5	8.5	7.1	7.7	7.5	5.5	6.5	9.6	8.0	8.8
2	8.2	7.1	7.6	9.3	7.5	8.4	7.6	5.8	6.7	9.3	8.1	8.7
3	9.5	7.3	8.3	9.2	7.3	8.3	7.4	5.9	6.6	9.0	7.9	8.4
4	9.5	7.5	8.4	9.8	7.6	8.5	7.7	6.0	6.8	9.4	7.9	8.6
5	8.9	7.1	8.0	9.5	7.2	8.3	7.8	6.0	6.9	9.3	7.9	8.5
6	8.7	7.0	7.8	9.3	7.0	8.2	7.9	6.1	7.0	8.5	7.5	8.0
7	8.3	6.5	7.4	9.3	7.3	8.2	8.0	6.3	7.0	8.9	7.6	8.3
8	8.9	6.5	7.4	8.6	6.3	7.5	8.1	6.1	7.1	9.0	7.9	8.4
9	8.6	6.6	7.6	7.5	5.9	6.6	8.4	6.7	7.4	9.0	7.1	8.4
10	8.5	6.7	7.6	7.7	6.2	7.0	7.5	6.4	7.0	9.3	8.0	8.6
11	8.4	6.5	7.3	8.2	6.2	7.1	8.3	6.6	7.4	9.4	6.9	8.7
12	8.5	6.2	7.4	8.1	6.2	7.1	8.4	6.5	7.4	9.4	8.4	8.8
13	7.3	6.4	6.9	8.0	6.2	7.1	8.0	6.4	7.1	9.0	8.0	8.4
14	8.2	6.8	7.6	7.7	6.0	6.8	8.4	6.7	7.5	9.6	8.3	8.9
15	8.9	7.5	8.2	7.5	5.7	6.6	8.5	6.8	7.7	9.6	8.2	9.0
16	8.9	7.9	8.4	7.4	5.4	6.4	8.4	6.6	7.4	9.4	7.7	8.8
17	9.7	8.0	8.8	7.0	5.4	6.1	8.4	6.7	7.5	9.1	7.6	8.3
18	9.7	8.1	8.9	8.0	5.7	6.8	8.5	6.7	7.6	9.1	7.5	8.3
19	10.0	7.9	8.9	7.5	6.0	6.7	8.3	6.8	7.6	9.2	7.6	8.3
20	10.2	8.0	9.0	8.1	6.3	7.2	8.7	7.1	7.8	9.0	7.4	8.3
21	10.1	8.0	9.0	7.6	6.1	6.8	8.6	7.0	7.7	9.5	8.1	8.8
22	10.2	7.9	9.0	8.3	6.3	7.2	8.6	6.8	7.7	9.5	8.2	8.8
23	9.9	7.5	8.7	7.7	6.2	6.9	8.8	7.0	7.8	9.3	7.9	8.5
24	9.2	7.1	8.1	8.1	6.2	7.1	8.8	7.0	7.9	9.6	8.0	8.8
25	9.4	7.2	8.3	8.0	6.0	7.0	8.7	7.1	7.9	9.9	8.5	9.1
26	9.2	7.1	8.1	8.1	6.1	7.1	9.3	7.2	8.2	9.8	8.4	9.0
27	8.9	6.8	7.8	8.3	5.4	7.2	9.5	7.8	8.5	9.6	8.2	8.9
28	9.2	6.9	8.0	8.0	5.2	6.3	8.7	7.4	8.1	9.3	8.5	8.8
29	9.2	6.9	8.2	7.9	5.8	6.7	9.3	7.8	8.5	9.2	8.6	8.9
30	9.2	7.3	8.2	7.5	5.3	6.3	9.6	8.2	8.8	9.9	8.6	9.3
31	---	---	---	7.0	5.2	6.1	9.6	8.2	8.9	---	---	---
MONTH	10.2	6.2	8.1	9.8	5.2	7.1	9.6	5.5	7.5	9.9	6.9	8.6

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI

LOCATION.--Lat 44°33'39", long 83°48'10", in SW1/4 NW1/4 sec.14, T.25 N., R.5 E., Alcona County, Hydrologic Unit 04070007, on left bank 200 ft upstream from Bamfield Road, 3.2 mi east of Curtisville.

DRAINAGE AREA.--1,598 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1996 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 800 ft above sea level, from topographic map.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are fair. Flow completely regulated by Alcona Dam 300 ft upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	971	948	1240	936	1110	1210	1340	981	1020	1150	878	809
2	974	952	1270	840	1200	1160	1360	993	1090	1110	856	835
3	947	955	1200	870	1250	1170	1350	1000	1140	1110	862	811
4	924	955	1170	994	1170	1160	1340	974	1070	1070	871	806
5	921	942	1170	1070	1110	1120	1600	952	1030	1030	870	813
6	1220	930	1110	1060	1100	1100	1550	997	1030	1060	880	807
7	2060	929	1260	1010	1150	1030	1510	1100	995	1030	875	806
8	1900	941	1330	966	1170	1060	1530	1110	948	1020	e870	811
9	1600	964	1250	1000	1120	1160	1570	1040	926	1150	e870	780
10	1400	1150	1220	1030	1110	1110	1370	958	942	1180	869	818
11	1280	1430	1160	1030	1170	1050	1260	946	953	1110	888	818
12	1180	1390	1120	997	1550	1060	1230	973	1060	1070	910	790
13	1140	1230	1120	1020	1640	1080	1270	979	1150	1030	907	816
14	1130	1150	1150	1010	1420	1080	1240	945	1840	986	897	844
15	1040	1150	1120	1030	1350	1100	1230	927	1810	943	900	821
16	1060	1160	1090	1100	1390	1090	1210	936	1490	932	880	796
17	1070	1200	1090	1300	1380	1120	1160	954	1360	935	866	782
18	1090	1200	1100	1230	1280	1330	1150	1010	1220	933	868	780
19	1050	1210	1120	1130	1250	1360	1110	1010	1120	1090	845	799
20	1020	1240	1140	1150	1220	1270	1120	1000	1090	1140	850	859
21	1010	1210	1110	1210	1150	1260	1140	987	1070	1060	845	881
22	1000	1170	1100	1330	1060	1310	1100	958	1010	1080	819	851
23	1000	1140	912	1410	1090	1280	1070	938	988	1060	810	845
24	984	1130	885	1430	1180	1270	1050	1040	1030	1080	827	837
25	943	1100	892	1440	1180	1260	1060	1070	1010	1040	833	804
26	958	1050	1080	1430	1130	1200	1070	1050	1000	987	833	810
27	987	1050	1100	1310	1100	1180	1070	1040	1000	940	837	811
28	965	1050	1120	1280	1160	1190	1040	1020	e1050	906	850	1010
29	948	1060	1160	1270	---	1260	994	989	e1300	951	840	1260
30	943	1100	982	1190	---	1280	980	948	1210	945	784	1140
31	951	---	909	1160	---	1260	---	945	---	881	764	---
TOTAL	34666	33086	34680	35233	34190	36570	37074	30770	33952	32009	26554	25450
MEAN	1118	1103	1119	1137	1221	1180	1236	993	1132	1033	857	848
MAX	2060	1430	1330	1440	1640	1360	1600	1110	1840	1180	910	1260
MIN	921	929	885	840	1060	1030	980	927	926	881	764	780
CFSM	.70	.69	.70	.71	.76	.74	.77	.62	.71	.65	.54	.53
IN.	.81	.77	.81	.82	.80	.85	.86	.72	.79	.75	.62	.59

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1997 - 1999, BY WATER YEAR (WY)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
MEAN	1091	1122	1144	1171	1198	1326	1851	1366	1154	1034	948	948	948
MAX	1118	1153	1227	1236	1235	1474	2390	1786	1225	1083	1054	1098	1098
(WY)	1999	1998	1997	1997	1997	1998	1997	1997	1997	1997	1997	1997	1997
MIN	1072	1103	1087	1137	1137	1180	1236	993	1106	987	857	848	848
(WY)	1998	1999	1998	1999	1998	1999	1999	1999	1998	1998	1999	1999	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1997 - 1999

ANNUAL TOTAL	433560	394234	1195
ANNUAL MEAN	1188	1080	1320
HIGHEST ANNUAL MEAN			1080
LOWEST ANNUAL MEAN			1080
HIGHEST DAILY MEAN	5410	2060	5410
LOWEST DAILY MEAN	811	764	764
ANNUAL SEVEN-DAY MINIMUM	836	803	803
INSTANTANEOUS PEAK FLOW		2300	5520
INSTANTANEOUS PEAK STAGE		10.32	13.56
INSTANTANEOUS LOW FLOW		699	626
ANNUAL RUNOFF (CFSM)	.74	.68	.75
ANNUAL RUNOFF (INCHES)	10.09	9.18	10.16
10 PERCENT EXCEEDS	1490	1300	1500
50 PERCENT EXCEEDS	1100	1060	1110
90 PERCENT EXCEEDS	892	848	909

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1997 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1996 to current year.

DISSOLVED OXYGEN: October 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 25.0°C, July 7, 1999; minimum, 0.0°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum recorded, 13.3 mg/L, Jan. 17, 1998, but may have been higher during instrument malfunction Jan. 30 to Feb. 10, 1998; minimum, 5.5 mg/L, July 28, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 25.0°C, July 7; minimum, 0.0°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 13.2 mg/L, Dec. 26, Mar. 11; minimum, 5.5 mg/L, July 28.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER				DECEMBER			JANUARY	
1	15.5	14.5	15.0	10.0	9.5	10.0	5.0	5.0	5.0	.5	.5	.5
2	14.5	14.0	14.5	9.5	9.0	9.0	5.5	5.0	5.5	.5	.5	.5
3	14.0	13.5	14.0	9.0	8.0	8.5	6.0	5.5	6.0	.5	.5	.5
4	13.5	13.0	13.5	8.0	7.5	8.0	6.0	6.0	6.0	.5	.5	.5
5	13.0	12.5	12.5	7.5	7.5	7.5	6.0	6.0	6.0	.5	.0	.5
6	12.5	12.0	12.5	7.5	7.0	7.0	7.0	6.0	6.5	.0	.0	.0
7	12.5	12.5	12.5	7.0	6.5	7.0	7.0	6.5	6.5	.0	.0	.0
8	12.5	12.0	12.5	6.5	6.0	6.5	6.5	6.0	6.5	.0	.0	.0
9	12.0	11.5	11.5	6.0	6.0	6.0	6.0	6.0	6.0	.0	.0	.0
10	11.5	11.0	11.5	6.0	6.0	6.0	6.0	5.5	5.5	.0	.0	.0
11	11.5	11.0	11.5	6.0	5.5	6.0	5.5	4.5	5.0	.0	.0	.0
12	12.0	11.0	11.0	5.5	5.0	5.0	5.0	4.5	4.5	.0	.0	.0
13	12.0	12.0	12.0	5.0	4.5	4.5	4.5	4.0	4.0	.0	.0	.0
14	12.0	11.0	11.5	4.5	4.5	4.5	4.0	3.5	4.0	.0	.0	.0
15	11.0	10.5	11.0	4.5	4.0	4.5	3.5	3.5	3.5	.0	.0	.0
16	11.0	10.5	11.0	4.0	4.0	4.0	3.5	2.5	3.0	.0	.0	.0
17	11.0	10.5	10.5	4.0	4.0	4.0	2.5	2.0	2.5	.0	.0	.0
18	12.0	11.0	11.5	4.0	4.0	4.0	2.5	2.0	2.0	.0	.0	.0
19	12.0	11.5	11.5	4.0	4.0	4.0	2.5	2.0	2.0	.0	.0	.0
20	11.5	11.0	11.5	4.0	3.5	4.0	2.0	1.0	1.5	.0	.0	.0
21	11.0	10.5	11.0	3.5	3.5	3.5	2.0	1.0	1.5	.0	.0	.0
22	10.5	10.0	10.5	3.5	3.5	3.5	1.0	.5	1.0	.0	.0	.0
23	10.5	10.0	10.5	4.0	3.5	3.5	1.5	1.0	1.0	.0	.0	.0
24	10.0	10.0	10.0	4.0	3.5	3.5	1.0	1.0	1.0	.0	.0	.0
25	10.0	10.0	10.0	3.5	3.5	3.5	1.0	1.0	1.0	.0	.0	.0
26	10.0	10.0	10.0	3.5	3.5	3.5	1.0	.5	1.0	.0	.0	.0
27	10.0	9.5	10.0	4.0	3.5	3.5	.5	.5	.5	.0	.0	.0
28	11.5	10.0	11.0	4.0	3.5	4.0	.5	.5	.5	.0	.0	.0
29	11.0	10.0	10.5	4.0	4.0	4.0	.5	.5	.5	.0	.0	.0
30	10.0	10.0	10.0	5.5	4.0	4.5	.5	.5	.5	.5	.0	.0
31	10.0	9.5	10.0	—	—	—	.5	.5	.5	.5	.5	.5
MONTH	15.5	9.5	11.5	10.0	3.5	5.2	7.0	.5	3.2	.5	.0	.1

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	.5	.5	.5	1.5	1.0	1.0	6.5	5.5	6.0	12.5	11.5	12.0	
2	.5	.5	.5	1.5	1.5	1.5	8.0	6.0	6.5	13.0	12.0	12.5	
3	.5	.5	.5	1.5	1.5	1.5	10.5	7.0	8.5	13.5	12.5	13.0	
4	.5	.5	.5	1.5	1.0	1.5	10.0	8.0	8.5	13.5	13.0	13.5	
5	1.0	.5	1.0	1.5	1.0	1.5	8.5	8.0	8.5	14.5	13.5	14.0	
6	1.0	1.0	1.0	1.5	1.5	1.5	9.0	8.0	8.5	15.5	13.5	14.5	
7	1.0	1.0	1.0	1.5	1.5	1.5	9.0	8.5	8.5	16.0	14.0	15.0	
8	1.0	1.0	1.0	1.5	1.0	1.0	10.5	9.0	9.5	16.0	16.0	16.0	
9	1.0	1.0	1.0	1.0	1.0	1.0	9.5	9.5	9.5	16.5	15.0	15.5	
10	1.5	1.0	1.0	1.0	1.0	1.0	9.5	9.0	9.0	15.5	15.0	15.5	
11	1.5	1.5	1.5	1.0	1.0	1.0	9.0	8.5	9.0	15.0	15.0	15.0	
12	1.5	1.5	1.5	1.0	1.0	1.0	9.5	8.5	9.0	15.0	15.0	15.0	
13	2.0	1.5	2.0	1.0	1.0	1.0	9.5	8.5	9.0	15.5	14.5	15.0	
14	2.0	2.0	2.0	1.5	1.0	1.5	10.0	8.5	9.5	15.0	14.5	14.5	
15	2.0	2.0	2.0	1.5	1.5	1.5	9.5	9.0	9.5	15.0	14.5	14.5	
16	2.0	2.0	2.0	1.5	1.5	1.5	9.5	9.0	9.0	15.5	14.5	15.0	
17	2.0	2.0	2.0	2.0	1.5	2.0	9.5	9.0	9.0	17.0	15.0	16.0	
18	2.5	2.0	2.0	2.5	2.0	2.5	9.5	9.0	9.5	17.5	16.0	16.5	
19	2.0	2.0	2.0	3.0	2.5	3.0	9.5	9.0	9.0	17.5	16.5	17.0	
20	2.0	1.5	2.0	3.5	3.0	3.5	9.5	9.0	9.0	17.0	16.5	16.5	
21	1.5	1.5	1.5	3.5	3.5	3.5	9.0	9.0	9.0	17.5	16.0	16.5	
22	1.5	1.5	1.5	3.5	3.5	3.5	9.5	9.0	9.0	17.5	16.5	17.0	
23	1.5	1.5	1.5	4.0	3.5	3.5	9.0	8.5	9.0	17.0	16.5	16.5	
24	1.5	1.5	1.5	4.0	3.5	3.5	9.5	8.5	9.0	16.5	16.0	16.5	
25	1.5	1.0	1.0	4.0	3.5	3.5	10.0	8.5	9.0	16.0	14.5	15.0	
26	1.0	1.0	1.0	4.0	4.0	4.0	11.5	9.5	10.0	15.5	14.5	15.0	
27	1.0	1.0	1.0	4.0	4.0	4.0	10.5	9.5	10.0	16.0	14.5	15.0	
28	1.0	1.0	1.0	4.5	4.0	4.0	11.0	10.0	10.5	16.0	15.0	15.5	
29	---	---	---	4.5	4.0	4.5	12.0	10.5	11.0	16.5	15.0	15.5	
30	---	---	---	5.0	4.5	4.5	12.0	11.0	11.5	16.5	15.5	16.0	
31	---	---	---	6.0	4.5	5.0	---	---	---	17.0	16.0	16.5	
MONTH	2.5	.5	1.3	6.0	1.0	2.4	12.0	5.5	9.1	17.5	11.5	15.2	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE		JULY				AUGUST		SEPTEMBER		
1	17.5	17.0	17.0	21.5	20.5	21.0	24.5	23.5	24.0	19.5	19.0	19.0
2	19.0	17.5	18.0	21.0	20.5	21.0	23.5	23.0	23.5	19.5	19.0	19.5
3	19.0	17.5	18.5	21.0	20.0	20.5	23.0	22.5	22.5	20.0	19.0	19.5
4	18.0	17.5	18.0	21.5	20.0	21.0	22.5	22.0	22.0	20.0	19.5	19.5
5	19.0	17.5	18.0	23.0	21.5	22.0	22.0	21.5	21.5	20.0	19.5	20.0
6	20.0	18.5	19.0	24.5	22.0	23.0	22.5	21.0	21.5	21.5	20.0	20.5
7	21.5	19.0	20.0	25.0	22.5	23.5	21.5	21.0	21.0	21.0	20.0	20.5
8	22.5	20.5	21.5	23.5	22.0	23.0	---	---	---	20.5	20.0	20.0
9	21.5	21.0	21.0	23.0	22.0	22.5	---	---	---	20.5	19.5	20.0
10	22.0	21.0	21.5	23.0	21.5	22.5	20.5	20.0	20.0	20.0	19.5	19.5
11	22.5	21.5	22.0	22.0	21.5	21.5	20.5	19.5	20.0	19.5	18.5	19.0
12	23.5	22.0	22.5	21.5	21.0	21.0	20.0	19.5	19.5	18.5	18.0	18.5
13	23.5	23.0	23.0	22.0	21.0	21.0	21.5	19.0	20.0	18.5	18.0	18.0
14	23.5	22.0	23.0	21.5	20.5	21.0	21.0	19.5	20.0	18.0	17.5	18.0
15	22.0	20.5	21.0	22.0	21.0	21.5	20.0	19.5	20.0	18.0	17.5	17.5
16	20.5	19.5	20.0	23.0	21.5	22.0	20.0	19.0	19.5	17.5	16.5	17.0
17	20.0	18.5	19.5	22.5	22.0	22.5	21.0	19.5	20.0	17.0	16.5	16.5
18	20.0	18.5	19.0	23.5	22.5	23.0	20.0	20.0	20.0	16.5	16.0	16.5
19	19.0	17.5	18.5	23.0	22.5	22.5	20.5	20.0	20.0	16.5	15.5	16.0
20	19.5	17.5	18.5	23.0	22.5	22.5	20.5	20.0	20.0	17.0	16.0	16.5
21	20.0	17.5	18.5	22.5	22.0	22.5	20.5	19.5	20.0	16.0	15.5	15.5
22	20.5	18.0	19.0	23.0	22.0	22.5	20.0	19.5	19.5	16.0	15.0	15.5
23	21.0	18.5	19.5	22.5	22.0	22.5	20.0	19.5	19.5	15.5	15.0	15.0
24	21.5	19.0	20.0	24.5	22.5	23.0	20.5	19.5	20.0	15.5	14.0	15.0
25	23.0	19.5	21.0	24.5	23.0	23.5	20.5	20.0	20.5	14.5	14.0	14.0
26	23.0	20.5	21.5	23.0	23.0	23.0	20.5	20.0	20.5	15.0	14.0	14.5
27	23.0	20.5	21.5	24.0	23.0	23.5	21.0	20.0	20.5	15.5	14.5	14.5
28	---	---	---	24.5	23.0	23.5	22.0	20.5	21.0	15.0	14.5	15.0
29	---	---	---	23.5	23.0	23.0	21.5	20.0	21.0	15.0	14.5	15.0
30	22.0	21.5	21.5	23.5	23.0	23.0	20.5	20.0	20.0	14.5	13.5	14.0
31	---	---	---	24.5	23.0	23.5	20.0	19.0	19.5	---	---	---
MONTH	---	---	---	25.0	20.0	22.3	---	---	---	21.5	13.5	17.3

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	8.8	8.2	8.5	10.4	10.1	10.3	11.9	11.8	11.9	12.9	12.8	12.8			
2	9.0	8.6	8.8	10.4	10.1	10.2	11.8	11.7	11.8	13.0	12.9	12.9			
3	8.7	8.5	8.6	10.7	10.2	10.5	11.7	11.5	11.6	12.9	12.8	12.9			
4	8.6	8.5	8.5	10.9	10.5	10.7	11.6	11.3	11.4	12.8	12.7	12.8			
5	8.8	8.6	8.7	11.0	10.8	10.9	11.3	11.3	11.3	13.1	12.7	12.9			
6	9.2	8.7	9.0	11.1	10.9	11.0	11.3	11.0	11.1	13.0	12.8	12.9			
7	9.5	9.2	9.3	11.3	11.0	11.1	11.1	10.9	11.0	12.8	12.7	12.8			
8	9.6	9.3	9.5	11.3	11.2	11.3	11.1	10.9	11.0	12.8	12.7	12.7			
9	9.5	9.1	9.3	11.4	11.3	11.4	10.9	10.8	10.9	12.7	12.6	12.7			
10	9.3	9.1	9.2	11.5	11.4	11.4	11.0	10.8	10.9	12.6	12.5	12.6			
11	9.4	9.1	9.3	11.7	11.5	11.6	11.1	11.0	11.1	12.5	12.3	12.4			
12	9.3	8.9	9.1	11.8	11.7	11.8	11.2	11.1	11.2	12.3	12.2	12.3			
13	9.4	9.1	9.3	11.7	11.6	11.6	11.6	11.2	11.4	12.2	12.1	12.2			
14	9.3	9.2	9.2	11.6	11.6	11.6	11.6	11.4	11.4	12.1	12.0	12.0			
15	9.3	8.7	9.0	11.8	11.6	11.6	11.8	11.5	11.6	12.0	11.8	11.9			
16	8.9	8.6	8.8	11.9	11.7	11.8	12.1	11.8	11.9	11.8	11.7	11.8			
17	9.0	8.7	8.8	11.8	11.7	11.8	12.3	12.1	12.2	11.7	11.6	11.7			
18	9.3	9.0	9.1	11.7	11.6	11.7	12.2	12.0	12.1	11.6	11.5	11.6			
19	9.4	9.3	9.4	11.7	11.6	11.7	12.3	12.0	12.1	11.5	11.4	11.5			
20	9.6	9.4	9.5	11.9	11.7	11.8	12.5	12.2	12.4	11.5	11.4	11.4			
21	9.6	9.4	9.5	12.0	11.9	11.9	12.5	12.2	12.4	11.5	11.4	11.4			
22	9.6	9.5	9.6	11.9	11.8	11.9	12.8	12.5	12.6	11.5	11.4	11.5			
23	9.8	9.5	9.7	12.1	11.9	12.0	12.6	12.5	12.5	11.7	11.5	11.6			
24	9.9	9.8	9.9	12.2	12.1	12.2	12.8	12.6	12.7	11.8	11.7	11.8			
25	10.0	9.8	9.9	12.2	12.1	12.1	13.1	12.8	12.9	11.9	11.8	11.9			
26	10.0	9.9	9.9	12.1	12.1	12.1	13.2	13.0	13.1	11.9	11.7	11.8			
27	10.3	10.0	10.1	12.1	12.0	12.1	13.1	13.0	13.0	12.2	11.9	12.1			
28	10.7	10.1	10.4	12.0	11.9	12.0	13.1	12.9	13.0	12.3	12.2	12.3			
29	10.5	10.1	10.3	11.9	11.8	11.9	12.9	12.8	12.9	12.4	12.2	12.3			
30	10.3	10.1	10.2	11.9	11.7	11.8	12.9	12.8	12.9	12.3	12.2	12.2			
31	10.5	10.2	10.3	—	—	—	12.9	12.8	12.8	12.4	12.2	12.3			
MONTH	10.7	8.2	9.4	12.2	10.1	11.5	13.2	10.8	12.0	13.1	11.4	12.2			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	12.6	12.4	12.5	12.7	12.5	12.6	11.6	11.4	11.5	11.2	10.2	10.9	
2	12.7	12.6	12.6	12.6	12.5	12.6	11.4	10.8	11.2	11.2	9.7	10.8	
3	12.8	12.7	12.8	12.7	12.6	12.6	11.0	10.5	10.8	11.0	10.3	10.6	
4	12.8	12.6	12.8	12.7	12.5	12.6	10.6	10.4	10.5	10.6	9.4	10.2	
5	12.6	12.5	12.6	12.6	12.5	12.5	---	---	---	10.1	8.9	9.6	
6	12.5	12.5	12.5	12.5	12.4	12.4	---	---	---	9.5	8.7	9.2	
7	12.8	12.5	12.7	12.5	12.4	12.5	---	---	---	9.1	8.5	8.8	
8	12.8	12.7	12.8	12.6	12.5	12.5	---	---	---	8.9	8.2	8.6	
9	12.7	12.5	12.7	12.7	12.6	12.6	---	---	---	9.2	8.0	8.5	
10	12.6	12.5	12.6	12.8	12.7	12.8	---	---	---	8.8	8.2	8.4	
11	12.6	12.4	12.6	13.2	12.7	12.8	---	---	---	8.5	8.0	8.2	
12	12.5	12.3	12.4	12.7	12.5	12.6	---	---	---	8.2	7.9	8.1	
13	12.6	12.5	12.5	12.6	12.4	12.5	---	---	---	8.0	7.5	7.8	
14	12.6	12.4	12.5	12.5	12.4	12.4	---	---	---	7.7	7.1	7.5	
15	12.7	12.6	12.7	12.5	12.4	12.5	---	---	---	7.7	7.1	7.4	
16	12.8	12.6	12.7	12.5	12.4	12.5	---	---	---	7.8	7.3	7.5	
17	12.7	12.5	12.6	12.6	12.4	12.5	---	---	---	8.2	7.4	7.8	
18	12.5	12.4	12.5	12.4	12.2	12.4	---	---	---	8.4	7.7	8.0	
19	12.5	12.4	12.5	12.3	12.1	12.2	---	---	---	8.5	7.7	8.0	
20	12.6	12.5	12.6	12.1	11.9	12.0	---	---	---	7.9	7.6	7.8	
21	12.6	12.5	12.6	12.0	11.9	11.9	---	---	---	8.0	7.4	7.7	
22	12.7	12.6	12.6	11.9	11.8	11.9	---	---	---	8.0	7.4	7.8	
23	12.8	12.6	12.7	11.9	11.6	11.7	---	---	---	7.6	7.4	7.5	
24	12.9	12.7	12.8	11.9	11.6	11.7	---	---	---	7.8	7.6	7.7	
25	13.0	12.9	12.9	11.8	11.8	11.8	---	---	---	7.8	7.6	7.7	
26	13.0	12.9	12.9	11.8	11.7	11.7	---	---	---	8.2	7.7	7.9	
27	12.9	12.8	12.9	11.8	11.7	11.8	---	---	---	8.1	7.5	7.8	
28	12.8	12.6	12.7	11.9	11.8	11.9	---	---	---	8.2	7.6	8.0	
29	---	---	---	11.8	11.7	11.8	---	---	---	8.6	8.1	8.3	
30	---	---	---	11.8	11.5	11.6	---	---	---	8.5	8.2	8.4	
31	---	---	---	11.7	11.5	11.6	---	---	---	8.4	8.1	8.2	
MONTH	13.0	12.3	12.7	13.2	11.5	12.2	---	---	---	11.2	7.1	8.4	

STREAMS TRIBUTARY TO LAKE HURON

04137005 AU SABLE RIVER NEAR CURTISVILLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.1	7.8	8.0	6.9	6.4	6.6	6.6	6.1	6.3	7.6	7.1	7.3
2	7.9	7.6	7.7	7.1	6.6	6.9	6.6	6.1	6.4	7.9	7.4	7.6
3	7.9	7.6	7.7	7.1	6.4	6.8	6.2	5.9	6.1	8.4	7.7	8.1
4	7.6	7.2	7.4	7.3	6.9	7.1	6.5	5.7	6.2	8.4	8.0	8.1
5	7.8	7.2	7.4	7.6	7.3	7.4	6.9	6.4	6.7	8.3	8.0	8.1
6	7.8	7.5	7.7	7.6	7.2	7.4	7.5	6.6	7.1	8.2	7.8	8.0
7	7.8	7.4	7.6	7.8	7.2	7.5	7.3	6.8	7.0	8.0	7.6	7.8
8	7.7	7.2	7.4	7.6	7.0	7.4	---	---	---	8.0	7.4	7.7
9	7.3	6.9	7.1	7.2	6.6	6.9	---	---	---	7.9	7.2	7.5
10	7.2	6.9	7.1	7.3	6.6	7.0	7.6	6.8	7.2	7.8	7.3	7.6
11	7.0	6.6	6.8	6.8	6.3	6.6	7.7	7.3	7.5	8.0	7.2	7.7
12	7.0	6.6	6.8	7.3	6.5	6.8	7.9	7.6	7.8	7.6	6.9	7.3
13	6.7	6.4	6.6	7.3	6.7	7.0	8.5	7.5	7.9	7.8	6.7	7.2
14	7.1	6.5	6.9	7.2	6.8	6.9	8.6	7.7	8.0	8.2	7.4	7.7
15	6.9	6.5	6.7	7.0	6.6	6.8	8.2	7.8	8.1	8.5	8.2	8.3
16	7.7	6.3	6.8	7.2	6.6	6.9	8.1	7.1	7.7	8.7	7.9	8.3
17	7.8	7.2	7.6	7.1	6.6	6.9	8.8	7.9	8.2	8.0	7.8	7.9
18	8.1	7.0	7.6	7.0	6.6	6.9	8.3	7.9	8.1	8.5	7.9	8.2
19	8.7	7.0	7.9	6.7	6.2	6.5	8.5	8.1	8.3	8.8	8.1	8.4
20	9.0	6.8	7.9	6.6	6.1	6.4	8.4	8.0	8.2	9.0	8.6	8.8
21	9.0	6.0	7.9	6.4	5.7	6.0	8.2	7.5	7.9	9.0	8.9	8.9
22	9.0	6.2	7.8	6.5	5.9	6.2	8.0	7.5	7.7	9.0	8.8	8.9
23	8.8	6.3	7.8	6.6	6.1	6.4	8.4	7.6	8.0	9.0	8.1	8.7
24	8.6	6.2	7.8	6.9	6.1	6.4	8.3	7.8	8.1	9.3	8.9	9.0
25	8.4	6.8	7.7	6.8	6.0	6.4	8.3	8.0	8.1	9.1	8.8	9.0
26	8.4	6.9	7.7	6.6	6.1	6.4	8.1	7.6	8.0	9.3	8.6	9.0
27	8.2	7.4	7.9	6.4	6.0	6.3	7.9	7.4	7.7	9.4	8.8	9.1
28	---	---	---	6.4	5.5	6.0	8.1	7.4	7.8	9.4	8.9	9.1
29	---	---	---	6.6	5.7	6.1	8.3	7.6	7.9	9.4	9.2	9.3
30	7.4	6.3	6.9	6.6	6.1	6.3	8.1	7.6	7.9	9.3	8.9	9.1
31	---	---	---	6.6	6.0	6.2	7.8	6.8	7.4	---	---	---
MONTH	---	---	---	7.8	5.5	6.7	---	---	---	9.4	6.7	8.3

STREAMS TRIBUTARY TO LAKE HURON

04137020 AU SABLE RIVER NEAR SOUTH BRANCH, MI

LOCATION.--Lat 44°27'48", long 83°43'17", in SW1/4 NW1/4 sec.21, T.24 N., R.6 E., Iosco County, Hydrologic Unit 04070007, on right bank 75 ft downstream from Loud Dam, 8.4 mi east of South Branch.

DRAINAGE AREA.--1,689 mi².

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: July 1996 to current year.

DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 25.5°C, July 24, July 30 to Aug. 1, 1999; minimum, 0.0°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum, 14.1 mg/L, Dec. 27, 1998, Jan. 4, 1999; minimum, 4.0 mg/L, July 22, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 25.5°C, July 24, July 30 to Aug. 1; minimum, 0.0°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 14.1 mg/L, Dec. 27, Jan. 4; minimum, 4.0 mg/L, July 22.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER				DECEMBER			JANUARY	
1	16.5	15.0	15.5	10.0	9.5	10.0	5.5	5.0	5.5	.0	.0	.0
2	15.0	14.5	15.0	9.5	9.0	9.5	5.5	5.5	5.5	.0	.0	.0
3	14.5	14.0	14.0	9.0	8.5	9.0	5.5	5.5	5.5	.0	.0	.0
4	14.0	13.5	13.5	8.5	8.0	8.0	6.0	5.5	6.0	.0	.0	.0
5	13.5	13.0	13.0	8.0	7.0	7.5	6.0	6.0	6.0	.0	.0	.0
6	13.5	13.0	13.0	7.0	6.5	7.0	6.5	6.0	6.5	.0	.0	.0
7	13.5	13.5	13.5	6.5	6.5	6.5	6.5	6.5	6.5	.0	.0	.0
8	13.5	12.5	13.0	6.5	6.5	6.5	6.5	5.5	6.0	.0	.0	.0
9	12.5	12.0	12.5	7.0	6.5	6.5	5.5	5.0	5.5	.0	.0	.0
10	12.5	12.0	12.0	7.0	6.5	6.5	5.0	5.0	5.0	.0	.0	.0
11	12.0	12.0	12.0	6.5	6.0	6.0	5.0	4.5	4.5	.0	.0	.0
12	12.5	12.0	12.5	6.0	5.0	5.5	4.5	4.0	4.5	.0	.0	.0
13	12.5	12.0	12.5	5.0	4.5	5.0	4.0	4.0	4.0	.0	.0	.0
14	12.0	11.5	11.5	4.5	4.5	4.5	4.0	3.5	4.0	.0	.0	.0
15	11.5	11.0	11.0	4.5	4.5	4.5	3.5	3.5	3.5	.0	.0	.0
16	11.5	11.0	11.0	4.5	4.5	4.5	3.5	3.0	3.5	.0	.0	.0
17	12.0	11.5	11.5	4.5	4.0	4.5	3.5	3.0	3.0	.0	.0	.0
18	12.5	12.0	12.0	4.0	4.0	4.0	3.0	2.5	2.5	.0	.0	.0
19	12.0	12.0	12.0	4.5	4.0	4.5	2.5	1.5	2.0	.0	.0	.0
20	12.0	11.5	11.5	4.5	4.0	4.0	2.0	1.5	1.5	.0	.0	.0
21	11.5	10.5	11.0	4.0	3.5	4.0	1.5	1.0	1.5	.0	.0	.0
22	10.5	10.0	10.5	3.5	3.5	3.5	1.0	.0	.5	.0	.0	.0
23	10.0	10.0	10.0	4.0	3.5	3.5	.5	.0	.5	.0	.0	.0
24	10.5	9.5	10.0	4.0	3.5	4.0	.5	.5	.5	.0	.0	.0
25	10.5	10.0	10.0	4.0	4.0	4.0	.5	.5	.5	.0	.0	.0
26	10.5	10.5	10.5	4.0	3.5	4.0	.5	.5	.5	.0	.0	.0
27	11.0	10.5	11.0	4.0	3.5	3.5	.5	.5	.5	.0	.0	.0
28	11.5	11.0	11.0	4.0	3.5	3.5	.5	.0	.5	.0	.0	.0
29	11.0	10.5	11.0	4.0	4.0	4.0	.5	.0	.5	.0	.0	.0
30	10.5	10.5	10.5	5.0	4.0	5.0	.5	.0	.0	.0	.0	.0
31	10.5	10.0	10.5	---	---	---	.5	.0	.0	.0	.0	.0
MONTH	16.5	9.5	11.9	10.0	3.5	5.4	6.5	.0	3.1	.0	.0	.0

STREAMS TRIBUTARY TO LAKE HURON

04137020 AU SABLE RIVER NEAR SOUTH BRANCH, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	.0	.0	.0	1.5	1.0	1.5	7.0	6.5	7.0	13.5	12.5	12.5	
2	.0	.0	.0	1.5	1.0	1.0	7.5	7.0	7.5	14.0	12.5	13.0	
3	.0	.0	.0	1.0	1.0	1.0	9.5	7.5	8.0	14.5	13.5	14.0	
4	.5	.0	.0	1.0	1.0	1.0	8.5	8.0	8.0	15.0	13.5	14.5	
5	.5	.5	.5	1.0	1.0	1.0	8.5	8.0	8.0	15.5	14.0	15.0	
6	.5	.5	.5	1.0	1.0	1.0	8.5	8.0	8.0	16.0	14.5	15.5	
7	.5	.0	.5	1.0	.5	1.0	9.0	8.0	8.5	16.0	15.5	16.0	
8	.5	.5	.5	.5	.5	.5	9.5	8.5	9.0	16.0	15.5	15.5	
9	.5	.5	.5	1.0	.5	1.0	10.0	9.5	9.5	16.0	15.0	15.5	
10	1.0	.5	.5	1.0	.5	1.0	10.0	9.5	9.5	15.5	15.0	15.0	
11	1.0	1.0	1.0	1.0	.5	1.0	9.5	9.0	9.0	16.0	15.5	15.5	
12	1.5	1.0	1.0	1.0	1.0	1.0	9.0	8.0	8.5	15.5	15.5	15.5	
13	1.5	1.5	1.5	1.0	1.0	1.0	9.0	8.0	8.5	15.5	15.0	15.0	
14	1.5	1.0	1.0	1.5	1.0	1.5	10.5	9.0	10.0	15.0	14.5	15.0	
15	1.5	1.0	1.0	1.5	1.5	1.5	10.5	9.5	10.0	16.0	15.0	15.0	
16	2.0	1.5	1.5	1.5	1.5	1.5	10.5	9.5	10.0	17.0	15.5	16.0	
17	2.0	2.0	2.0	2.5	1.5	2.0	10.0	9.5	9.5	18.0	16.5	17.5	
18	2.0	2.0	2.0	3.0	2.5	2.5	9.5	9.0	9.0	18.5	17.0	18.0	
19	2.0	1.5	1.5	3.0	2.5	3.0	9.5	9.0	9.5	18.0	17.0	17.5	
20	1.5	1.5	1.5	3.5	3.0	3.0	9.5	9.0	9.5	17.5	17.0	17.0	
21	1.5	1.5	1.5	3.5	3.5	3.5	9.5	9.5	9.5	18.0	17.0	17.5	
22	1.5	1.0	1.0	3.5	3.5	3.5	9.5	9.5	9.5	17.5	17.5	17.5	
23	1.0	1.0	1.0	3.5	3.0	3.5	9.5	9.0	9.0	17.5	17.0	17.0	
24	1.0	1.0	1.0	4.0	3.0	3.5	9.0	8.5	9.0	17.0	16.0	16.5	
25	1.0	1.0	1.0	4.0	3.5	3.5	10.5	9.0	9.5	16.0	14.5	15.5	
26	1.0	1.0	1.0	4.0	3.5	4.0	11.0	9.5	10.0	15.0	14.5	15.0	
27	1.0	1.0	1.0	4.5	4.0	4.0	11.5	10.5	11.0	16.5	14.5	15.0	
28	1.0	1.0	1.0	5.0	4.5	4.5	12.0	11.0	11.5	17.0	15.0	16.0	
29	---	---	---	6.0	5.0	5.5	12.0	11.5	12.0	18.5	15.5	17.0	
30	---	---	---	6.0	5.5	5.5	12.5	11.5	12.0	19.0	18.0	18.5	
31	---	---	---	7.0	6.0	6.0	---	---	---	19.5	18.5	19.0	
MONTH	2.0	.0	.9	7.0	.5	2.4	12.5	6.5	9.3	19.5	12.5	15.9	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY				AUGUST			SEPTEMBER	
1	20.0	18.5	19.0	22.0	21.5	21.5	25.5	24.5	25.0	21.5	20.0	20.5
2	19.0	18.0	18.5	22.0	21.0	21.5	24.5	24.0	24.0	21.5	20.0	20.5
3	18.5	17.5	18.0	22.5	21.0	21.5	24.0	23.0	23.5	21.5	20.5	21.0
4	19.0	17.5	18.0	23.5	22.0	22.5	23.5	23.0	23.0	21.5	20.5	21.0
5	20.0	18.0	19.0	24.5	23.0	24.0	23.0	22.5	22.5	22.0	20.5	21.0
6	21.5	19.5	20.5	25.0	24.0	24.5	23.0	22.0	22.5	22.0	21.0	21.5
7	22.5	21.0	22.0	24.5	23.5	24.0	22.5	22.0	22.0	22.0	21.0	21.5
8	23.0	21.0	22.0	24.0	23.5	24.0	22.0	22.0	22.0	21.5	21.0	21.5
9	22.5	21.5	22.0	23.5	23.0	23.0	22.0	21.5	21.5	21.5	20.5	21.0
10	23.5	22.0	22.5	23.0	22.0	22.5	21.5	21.0	21.0	20.5	20.0	20.5
11	24.5	22.0	23.0	23.0	22.0	22.0	21.5	20.5	21.0	20.0	19.0	19.5
12	25.0	22.0	23.5	23.0	22.5	22.5	21.0	20.5	21.0	19.5	19.0	19.0
13	24.5	23.5	24.0	23.5	22.0	23.0	22.5	21.0	21.5	19.5	19.0	19.0
14	23.5	22.0	23.0	23.0	22.5	23.0	22.0	21.0	21.5	19.0	18.5	18.5
15	22.0	20.5	21.0	24.0	22.5	23.0	21.5	20.5	21.0	18.5	18.0	18.0
16	20.5	20.0	20.5	24.5	23.0	23.5	21.0	21.0	21.0	18.0	17.5	17.5
17	20.5	19.5	20.0	24.5	24.0	24.0	21.5	20.5	21.0	17.5	17.0	17.0
18	20.5	19.5	20.0	24.5	23.5	24.0	21.5	20.5	21.0	17.5	16.5	17.0
19	20.5	19.5	19.5	24.0	23.5	24.0	21.0	20.5	21.0	17.5	17.0	17.0
20	20.0	19.5	20.0	23.5	23.0	23.5	21.5	20.5	21.0	17.5	17.0	17.0
21	20.5	19.5	20.0	24.0	23.0	23.5	21.0	20.5	20.5	17.0	16.5	16.5
22	21.5	19.5	20.5	24.5	23.0	23.5	22.0	20.5	21.0	16.5	16.0	16.0
23	21.5	19.5	21.0	24.5	23.0	24.0	22.0	21.0	21.5	16.0	15.5	16.0
24	22.0	20.0	21.0	25.5	23.0	24.0	21.5	21.5	21.5	16.0	15.5	15.5
25	23.0	20.0	21.5	25.0	24.0	24.5	21.5	21.5	21.5	15.5	15.0	15.0
26	23.0	20.5	22.0	25.0	24.0	24.5	21.5	21.5	21.5	16.0	15.0	15.5
27	23.0	22.0	22.5	25.0	24.0	24.5	22.5	21.0	21.5	16.0	15.5	16.0
28	23.5	22.0	23.0	25.0	24.0	24.5	23.0	21.5	22.0	16.0	15.5	15.5
29	23.5	22.0	23.0	25.0	24.0	24.5	22.0	21.5	21.5	16.0	15.0	15.5
30	22.5	22.0	22.0	25.5	24.5	25.0	21.5	21.0	21.0	15.0	14.5	14.5
31	---	---	---	25.5	24.5	25.0	21.0	20.5	20.5	---	---	---
MONTH	25.0	17.5	21.1	25.5	21.0	23.5	25.5	20.5	21.7	22.0	14.5	18.2

STREAMS TRIBUTARY TO LAKE HURON

04137020 AU SABLE RIVER NEAR SOUTH BRANCH, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	8.4	7.9	8.2	10.6	10.4	10.5	12.0	11.3	11.8	13.9	13.5	13.7			
2	8.8	6.0	8.3	10.7	10.2	10.5	12.0	11.4	11.8	14.0	13.0	13.6			
3	9.1	7.7	8.7	10.7	10.4	10.6	11.9	9.2	11.3	14.0	12.8	13.7			
4	9.5	9.1	9.3	10.9	10.5	10.7	11.9	10.0	11.3	14.1	12.1	13.5			
5	9.9	9.4	9.6	11.1	10.7	10.9	11.7	11.2	11.5	13.6	12.4	13.0			
6	9.9	9.7	9.8	11.2	11.0	11.1	11.6	11.4	11.5	13.4	11.9	12.7			
7	9.7	9.4	9.6	11.2	11.1	11.2	11.4	11.2	11.3	13.5	12.1	13.0			
8	9.7	9.4	9.6	11.2	11.1	11.2	11.5	10.9	11.3	13.7	13.0	13.4			
9	9.9	9.5	9.7	11.2	11.1	11.2	11.7	11.0	11.4	13.7	12.4	13.2			
10	10.2	8.9	9.9	11.2	10.9	11.2	11.9	11.4	11.6	13.4	12.4	13.2			
11	10.2	9.9	10.1	11.3	11.2	11.2	11.9	11.5	11.7	13.3	12.0	12.6			
12	10.3	6.8	9.5	11.5	11.2	11.3	12.0	11.0	11.7	13.4	10.7	12.7			
13	10.2	7.1	9.2	12.2	11.5	11.9	12.0	11.9	12.0	13.1	11.3	12.7			
14	9.8	6.9	8.7	12.2	9.7	11.6	12.2	12.0	12.1	13.4	10.1	12.6			
15	10.1	7.1	9.2	12.1	11.6	12.0	12.5	11.9	12.3	13.2	12.6	12.9			
16	10.2	7.4	8.9	12.0	9.8	11.7	12.6	12.0	12.4	13.0	11.4	12.6			
17	9.8	8.0	8.9	12.1	10.1	11.4	12.7	12.0	12.4	12.7	12.4	12.6			
18	9.3	7.8	8.6	12.2	10.1	11.4	12.7	12.0	12.5	12.4	11.2	12.2			
19	10.2	7.4	9.2	12.3	10.3	11.5	12.8	12.4	12.6	12.4	10.6	11.8			
20	10.2	7.1	9.4	12.2	10.3	11.6	13.0	12.7	12.9	12.2	11.3	12.0			
21	10.5	7.5	9.5	12.2	9.7	11.7	13.1	11.3	12.8	12.6	10.1	11.9			
22	10.7	7.5	9.7	12.3	11.7	12.1	13.9	11.8	12.9	12.5	10.4	11.8			
23	11.1	8.1	10.0	12.7	12.0	12.4	13.9	11.4	13.3	12.6	10.8	12.1			
24	10.8	9.6	10.2	12.7	10.5	11.9	13.9	13.4	13.7	12.6	12.5	12.5			
25	10.7	10.0	10.4	12.2	10.3	11.5	13.9	13.5	13.7	12.7	12.4	12.5			
26	10.7	10.0	10.4	12.2	10.9	11.8	14.0	13.6	13.8	12.8	12.3	12.6			
27	10.7	10.0	10.4	12.1	10.9	11.6	14.1	13.8	13.9	12.9	11.4	12.3			
28	10.4	10.0	10.3	12.2	11.0	11.7	14.0	13.7	13.8	12.9	11.8	12.5			
29	10.4	10.2	10.3	12.3	11.2	11.8	13.9	13.0	13.3	13.0	11.2	12.3			
30	10.4	10.2	10.3	12.2	11.1	11.9	13.9	12.5	13.7	13.1	11.6	12.7			
31	10.5	10.3	10.4	—	—	—	13.8	12.5	13.4	13.2	13.1	12.2			
MONTH	11.1	6.0	9.6	12.7	9.7	11.4	14.1	9.2	12.4	14.1	10.1	12.7			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	13.4	13.0	13.3	12.8	12.5	12.6	12.4	12.1	12.2	11.2	10.8	11.0	
2	13.4	11.0	12.9	12.7	12.5	12.6	12.1	11.7	11.8	11.0	9.2	10.4	
3	13.4	11.3	12.8	12.9	12.4	12.6	11.7	10.8	11.5	10.6	6.6	9.8	
4	13.3	11.8	12.8	12.9	12.5	12.7	11.5	11.2	11.4	10.4	6.6	9.9	
5	13.3	11.1	12.7	12.9	12.4	12.7	11.2	10.8	11.0	10.0	6.3	9.5	
6	13.5	11.0	12.8	13.0	12.6	12.8	11.0	10.4	10.9	9.7	6.5	8.3	
7	13.6	13.3	13.4	13.1	12.8	13.0	10.9	10.4	10.8	9.5	7.1	8.3	
8	13.5	12.0	13.1	13.1	13.0	13.1	11.0	10.2	10.8	8.2	6.7	7.5	
9	13.4	11.6	12.7	13.3	12.7	13.1	10.9	10.5	10.8	8.3	6.9	7.5	
10	13.6	12.1	13.2	13.3	12.8	13.1	10.8	10.5	10.6	9.1	6.2	8.2	
11	13.7	13.0	13.4	13.3	12.6	13.1	10.8	10.7	10.7	9.2	5.9	8.2	
12	13.5	11.3	13.1	13.3	12.5	13.1	10.8	10.6	10.7	9.2	6.3	7.9	
13	13.4	12.7	13.3	13.4	12.5	13.2	11.1	10.7	10.9	9.4	6.6	8.4	
14	13.6	13.2	13.4	13.4	13.3	13.3	11.3	10.9	11.1	9.5	6.7	8.6	
15	13.6	13.5	13.5	13.4	12.9	13.4	11.1	10.5	11.0	9.6	7.1	8.9	
16	13.5	12.1	13.1	13.4	12.9	13.2	11.0	10.7	10.8	9.5	9.2	9.3	
17	13.5	12.0	13.1	13.3	12.7	13.2	10.9	10.7	10.8	9.3	5.4	8.4	
18	13.4	11.7	12.8	13.2	12.7	13.0	11.0	10.7	10.8	8.9	5.5	7.6	
19	13.3	11.4	12.3	13.1	12.8	12.9	11.1	10.8	10.9	8.7	5.8	7.4	
20	12.6	12.0	12.3	13.1	12.6	13.0	11.1	10.8	10.9	8.4	5.6	7.2	
21	12.3	12.2	12.3	13.0	12.8	13.0	11.0	10.5	10.8	8.8	5.4	7.9	
22	12.5	12.1	12.4	12.8	12.7	12.8	11.0	10.6	10.9	8.9	7.7	8.5	
23	12.8	12.1	12.6	12.8	12.6	12.7	11.1	10.7	10.9	8.7	8.3	8.5	
24	12.9	12.4	12.8	12.8	12.6	12.7	11.1	10.9	11.0	8.7	6.4	8.4	
25	13.1	12.6	12.9	12.9	12.6	12.7	11.4	11.1	11.3	8.8	6.9	8.2	
26	13.1	12.3	12.8	12.8	12.6	12.7	11.4	11.1	11.2	8.9	7.4	8.3	
27	12.9	12.5	12.7	12.9	12.7	12.8	11.3	11.0	11.1	9.2	5.5	8.1	
28	12.7	12.6	12.7	12.8	12.6	12.7	11.0	10.7	10.9	9.4	5.5	7.9	
29	---	---	---	12.6	12.4	12.5	11.3	10.6	10.9	8.9	5.8	7.8	
30	---	---	---	12.6	12.3	12.5	11.2	10.8	11.1	8.6	7.5	8.1	
31	---	---	---	12.5	12.1	12.4	---	---	---	8.4	6.7	7.6	
MONTH	13.7	11.0	12.9	13.4	12.1	12.9	12.4	10.2	11.0	11.2	5.4	8.4	

STREAMS TRIBUTARY TO LAKE HURON

04137020 AU SABLE RIVER NEAR SOUTH BRANCH, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.8	5.2	8.0	7.2	6.9	7.1	7.2	6.6	6.9	8.0	4.7	6.6
2	8.5	5.7	7.4	7.3	6.7	7.0	6.9	6.6	6.7	8.2	4.3	6.6
3	8.5	6.4	7.9	7.4	6.5	6.9	6.8	6.2	6.6	8.2	4.7	6.7
4	9.0	8.1	8.5	7.6	7.1	7.3	7.3	6.4	6.8	8.2	4.4	6.4
5	8.9	8.3	8.6	7.7	7.2	7.4	7.3	6.3	6.8	8.3	4.6	6.8
6	8.7	8.1	8.4	8.1	7.3	7.7	7.4	6.8	7.1	8.1	4.6	6.6
7	8.8	7.8	8.5	7.8	6.9	7.5	7.3	6.7	7.0	8.1	4.4	6.8
8	8.6	7.7	8.1	7.7	7.3	7.4	7.5	7.1	7.3	7.9	5.4	6.8
9	8.4	7.5	7.9	7.5	6.2	7.2	7.6	7.1	7.2	7.9	5.1	6.7
10	8.4	7.1	7.9	7.4	5.6	6.6	7.4	7.0	7.2	7.4	4.8	6.3
11	8.0	6.8	7.5	7.3	6.3	6.7	7.8	7.0	7.4	7.9	5.7	6.9
12	7.7	6.6	7.3	8.1	5.0	7.4	7.7	6.5	7.1	7.9	5.7	6.8
13	7.5	7.2	7.3	8.2	4.4	6.9	8.1	7.0	7.5	8.1	5.7	7.0
14	7.6	7.0	7.3	8.0	4.7	6.9	7.9	7.4	7.6	8.3	5.5	7.1
15	7.3	6.7	7.0	7.9	5.4	7.2	7.7	7.4	7.6	8.3	5.0	7.3
16	7.6	6.7	7.1	7.8	4.3	6.9	8.2	7.6	7.8	8.4	6.2	7.2
17	7.8	6.0	7.4	7.5	5.8	7.2	8.4	7.5	7.9	8.3	6.0	7.6
18	8.1	7.1	7.6	7.4	6.6	7.0	8.2	7.5	7.7	8.5	7.9	8.2
19	8.4	7.2	7.8	7.2	6.3	6.8	8.3	7.7	8.0	8.7	6.4	8.1
20	8.1	7.8	7.9	7.1	4.5	6.1	8.3	7.7	8.0	8.6	6.6	7.9
21	8.3	7.4	8.0	7.1	4.5	6.3	8.2	7.5	7.9	8.5	5.4	7.8
22	8.5	7.3	8.0	7.1	4.0	5.9	8.6	7.8	8.2	8.7	7.0	7.9
23	8.3	7.2	7.9	7.3	4.1	6.3	8.5	7.6	8.1	8.7	6.9	7.9
24	8.1	7.0	7.6	6.8	5.0	5.9	8.2	7.7	8.0	8.9	7.1	8.0
25	7.9	7.0	7.5	6.7	5.2	6.1	8.2	5.0	7.5	8.9	6.0	7.9
26	7.9	6.8	7.5	7.4	5.9	7.0	7.7	4.9	7.3	9.0	6.9	8.0
27	7.6	7.3	7.4	7.4	5.9	6.9	8.1	6.7	7.6	9.2	6.8	8.2
28	7.5	5.9	7.2	7.6	5.9	6.8	8.3	4.7	7.1	9.3	6.9	8.3
29	7.4	6.2	7.0	7.5	6.3	6.9	8.1	4.8	7.1	9.2	8.8	9.0
30	7.2	6.7	6.9	7.5	6.4	6.9	7.6	4.8	6.5	8.9	8.3	8.6
31	--	--	--	7.3	6.1	6.8	7.8	4.7	6.5	--	--	--
MONTH	9.0	5.2	7.7	8.2	4.0	6.9	8.6	4.7	7.4	9.3	4.3	7.4

STREAMS TRIBUTARY TO LAKE HURON

04137025 AU SABLE RIVER NEAR GLENNIE, MI

LOCATION.--Lat 44°27'15", long 83°40'28", in SW1/4 SE1/4 sec.23, T.24 N., R.6 E., Iosco County, Hydrologic Unit 04070007, center of bridge on State Highway 65, 400 ft downstream from Five-Channels Dam, 7.6 mi southeast of Glennie.

DRAINAGE AREA.--1,696 mi².

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: July 1996 to current year.

DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

REMARKS.--Interruptions in water-quality record were due to malfunction of the instrument, except for May 12 to June 23, when equipment was removed for bridge construction.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 25.5°C, July 31, Aug. 1, 1999; minimum, 0.0°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum, 13.6 mg/L, Jan. 7, 8, 1998; minimum, 3.0 mg/L, June 16, 17, 1998.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 25.5°C, July 31, Aug. 1; minimum, 0.0°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 13.5 mg/L, Mar. 2; minimum, 5.4 mg/L, July 20, 28.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	---	---	---	10.5	10.0	10.5	5.0	4.5	5.0	.0	.0	.0			
2	---	---	---	10.0	9.5	10.0	5.5	5.0	5.0	.0	.0	.0			
3	---	---	---	9.5	9.0	9.0	5.5	5.5	5.5	.0	.0	.0			
4	---	---	---	9.0	8.5	8.5	5.5	5.5	5.5	.0	.0	.0			
5	---	---	---	8.5	8.0	8.0	6.0	5.5	5.5	.0	.0	.0			
6	---	---	---	8.0	7.0	7.5	6.5	6.0	6.0	.0	.0	.0			
7	13.5	13.5	13.5	7.5	7.0	7.0	6.5	6.0	6.0	.0	.0	.0			
8	13.5	13.0	13.5	7.0	6.5	6.5	6.0	6.0	6.0	.0	.0	.0			
9	13.0	12.5	13.0	6.5	6.5	6.5	6.0	5.5	6.0	.0	.0	.0			
10	12.5	12.5	12.5	6.5	6.5	6.5	5.5	5.0	5.0	.0	.0	.0			
11	12.5	12.0	12.0	6.5	6.0	6.5	5.0	4.5	5.0	.0	.0	.0			
12	12.5	12.5	12.5	6.0	5.5	6.0	4.5	4.5	4.5	.0	.0	.0			
13	12.5	12.0	12.5	5.5	5.0	5.5	4.5	4.0	4.0	.0	.0	.0			
14	12.0	12.0	12.0	5.0	5.0	5.0	4.0	3.5	4.0	.0	.0	.0			
15	12.0	11.5	11.5	5.0	4.5	4.5	4.0	3.5	3.5	.0	.0	.0			
16	11.5	11.0	11.5	4.5	4.5	4.5	3.5	3.5	3.5	.0	.0	.0			
17	11.5	11.0	11.5	4.5	4.5	4.5	3.5	3.0	3.0	.0	.0	.0			
18	12.0	11.5	12.0	4.5	4.0	4.5	3.0	2.5	3.0	.0	.0	.0			
19	12.0	11.5	12.0	4.5	4.0	4.5	2.5	2.5	2.5	.0	.0	.0			
20	12.0	11.5	11.5	4.0	4.0	4.0	2.5	2.0	2.0	.0	.0	.0			
21	11.5	11.0	11.5	4.0	4.0	4.0	2.0	1.5	1.5	.0	.0	.0			
22	11.0	10.5	11.0	4.0	3.5	4.0	1.5	.5	1.0	.0	.0	.0			
23	10.5	10.0	10.5	4.0	3.5	3.5	.5	.5	.5	.0	.0	.0			
24	10.5	10.0	10.5	3.5	3.5	3.5	.5	.5	.5	.0	.0	.0			
25	10.5	10.0	10.0	4.0	3.5	3.5	.5	.5	.5	.0	.0	.0			
26	10.5	10.0	10.5	4.0	3.5	4.0	.5	.5	.5	.0	.0	.0			
27	11.0	10.5	10.5	4.0	3.5	3.5	.5	.0	.5	.0	.0	.0			
28	11.0	11.0	11.0	4.0	3.5	3.5	.5	.0	.0	.0	.0	.0			
29	11.0	10.5	11.0	4.0	3.5	4.0	.0	.0	.0	.0	.0	.0			
30	11.0	10.5	10.5	4.5	4.0	4.5	.0	.0	.0	.0	.0	.0			
31	10.5	10.0	10.5	---	---	---	.0	.0	.0	.0	.0	.0			
MONTH	---	---	---	10.5	3.5	5.6	6.5	.0	3.1	.0	.0	.0			

STREAMS TRIBUTARY TO LAKE HURON

04137025 AU SABLE RIVER NEAR GLENNIE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	.0	.0	.0	1.0	1.0	1.0	—	—	—	12.5	11.5	12.0	
2	.0	.0	.0	1.0	1.0	1.0	7.0	6.5	7.0	13.0	12.5	12.5	
3	.0	.0	.0	1.0	1.0	1.0	8.0	7.0	7.5	13.5	13.0	13.5	
4	.0	.0	.0	1.0	.5	1.0	8.0	7.5	8.0	14.0	13.5	14.0	
5	.0	.0	.0	1.0	.5	1.0	8.0	7.5	8.0	15.0	14.0	14.5	
6	.0	.0	.0	1.0	1.0	1.0	8.5	8.0	8.0	15.5	14.5	15.0	
7	.5	.0	.5	1.0	.5	1.0	8.5	7.5	8.0	15.5	15.0	15.5	
8	.5	.0	.0	1.0	.5	1.0	9.0	8.0	8.5	15.5	15.5	15.5	
9	.5	.0	.0	.5	.5	.5	9.0	9.0	9.0	15.5	15.0	15.5	
10	.5	.0	.5	.5	.5	.5	9.5	9.0	9.0	15.0	15.0	15.0	
11	.5	.5	.5	1.0	.5	.5	9.5	9.0	9.5	15.0	14.5	15.0	
12	1.0	.5	1.0	1.0	.5	1.0	9.0	8.5	8.5	—	—	—	
13	1.0	1.0	1.0	1.0	1.0	1.0	9.0	8.5	9.0	—	—	—	
14	1.0	1.0	1.0	1.0	1.0	1.0	9.5	8.5	9.0	—	—	—	
15	1.0	1.0	1.0	1.5	1.0	1.5	10.0	9.0	9.5	—	—	—	
16	1.5	1.0	1.0	1.5	1.5	1.5	10.0	9.5	9.5	—	—	—	
17	1.5	1.0	1.5	2.0	1.5	1.5	9.5	9.5	9.5	—	—	—	
18	1.5	1.5	1.5	2.5	2.0	2.0	10.0	9.5	9.5	—	—	—	
19	1.5	1.5	1.5	2.5	2.0	2.5	9.5	9.0	9.5	—	—	—	
20	1.5	1.0	1.5	3.0	2.5	3.0	9.5	9.0	9.0	—	—	—	
21	1.5	1.0	1.5	3.0	3.0	3.0	9.5	9.0	9.5	—	—	—	
22	1.5	1.0	1.0	3.5	3.0	3.0	9.5	9.0	9.5	—	—	—	
23	1.0	1.0	1.0	3.5	3.0	3.5	9.0	9.0	9.0	—	—	—	
24	1.0	1.0	1.0	3.5	3.0	3.5	9.0	8.5	9.0	—	—	—	
25	1.0	1.0	1.0	3.5	3.5	3.5	10.5	9.0	9.5	—	—	—	
26	1.0	.5	.5	4.0	3.0	3.5	10.0	9.5	9.5	—	—	—	
27	1.0	.5	.5	4.5	4.0	4.0	10.5	10.0	10.0	—	—	—	
28	1.0	1.0	1.0	5.0	4.0	4.5	11.0	10.5	10.5	—	—	—	
29	—	—	—	5.5	4.5	5.0	11.5	11.0	11.0	—	—	—	
30	—	—	—	6.0	5.0	5.5	12.0	11.5	11.5	—	—	—	
31	—	—	—	—	—	—	—	—	—	—	—	—	
MONTH	1.5	.0	.7	—	—	—	—	—	—	—	—	—	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY			AUGUST			SEPTEMBER		
1	--	--	--	22.0	21.5	22.0	25.5	25.0	25.0	21.5	20.5	21.0
2	--	--	--	22.0	21.0	21.5	25.0	24.5	24.5	21.5	20.5	21.0
3	--	--	--	22.0	21.5	22.0	24.5	23.5	24.0	21.5	20.5	21.0
4	--	--	--	23.5	22.0	22.5	24.0	23.5	23.5	21.0	20.5	21.0
5	--	--	--	24.0	23.0	23.5	23.5	23.0	23.5	21.5	21.0	21.5
6	--	--	--	24.5	24.0	24.0	23.0	22.5	23.0	22.0	21.0	21.5
7	--	--	--	24.5	24.0	24.5	22.5	22.5	22.5	21.5	21.0	21.5
8	--	--	--	24.5	23.5	24.0	22.5	22.0	22.5	22.0	21.0	21.5
9	--	--	--	24.0	23.5	23.5	22.0	21.5	22.0	21.5	21.0	21.0
10	--	--	--	23.5	22.5	23.0	21.5	21.5	21.5	21.0	20.5	20.5
11	---	---	---	23.0	22.5	22.5	22.0	21.0	21.5	20.5	20.0	20.0
12	---	---	---	22.5	22.5	22.5	21.5	21.0	21.5	20.0	19.5	19.5
13	---	---	---	23.5	22.0	23.0	22.0	21.5	21.5	19.5	19.5	19.5
14	---	---	---	23.5	22.5	23.0	21.5	21.0	21.5	19.5	19.0	19.0
15	---	---	---	24.0	23.0	23.5	21.5	21.5	21.5	19.0	18.0	18.5
16	--	--	--	24.0	23.0	23.5	21.5	21.0	21.5	18.0	17.5	18.0
17	--	--	--	24.0	23.5	24.0	21.5	21.0	21.5	18.0	17.5	18.0
18	--	--	--	24.5	24.0	24.0	21.5	21.0	21.0	18.0	17.5	17.5
19	--	--	--	24.5	23.5	24.0	21.0	21.0	21.0	17.5	17.0	17.5
20	--	--	--	24.0	23.5	23.5	21.0	20.5	21.0	17.5	17.0	17.5
21	--	--	--	24.0	23.5	23.5	21.0	20.5	21.0	17.0	16.5	17.0
22	--	--	--	24.5	23.5	23.5	21.5	20.5	21.0	17.0	16.5	16.5
23	--	--	--	24.0	23.5	24.0	21.5	20.5	21.0	16.5	16.5	16.5
24	21.5	21.0	21.5	25.0	23.5	24.5	21.5	21.0	21.5	16.5	16.0	16.0
25	22.5	21.0	22.0	25.0	24.5	24.5	22.0	21.5	21.5	16.0	15.5	15.5
26	22.0	21.5	22.0	24.5	24.5	24.5	21.5	21.5	21.5	16.0	15.0	15.5
27	22.5	22.0	22.5	25.0	24.0	24.5	22.5	21.5	22.0	16.0	15.5	16.0
28	23.0	22.5	22.5	25.0	24.0	24.5	22.5	21.5	22.0	16.0	16.0	16.0
29	23.0	22.0	22.5	25.0	24.5	24.5	22.0	21.5	22.0	16.0	15.5	15.5
30	22.5	22.0	22.5	25.0	24.5	25.0	21.5	21.0	21.5	15.5	15.0	15.0
31	--	--	--	25.5	25.0	25.0	21.0	20.5	21.0	--	--	--
MONTH	--	--	--	25.5	21.0	23.6	25.5	20.5	22.0	22.0	15.0	18.5

STREAMS TRIBUTARY TO LAKE HURON

04137025 AU SABLE RIVER NEAR GLENNIE, MI-Continued

OXYGEN DISSOLVED (MGL), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	6.9	5.6	6.6	7.7	7.3	7.5	7.7	6.5	7.2
2	---	---	---	7.1	5.7	6.7	7.9	6.7	7.4	7.8	6.6	7.2
3	---	---	---	7.3	6.3	6.9	7.4	6.0	6.8	8.0	6.8	7.4
4	---	---	---	7.6	7.0	7.3	7.2	6.2	6.8	8.1	6.8	7.5
5	---	---	---	7.6	7.4	7.5	7.4	6.1	6.9	8.2	6.9	7.6
6	---	---	---	7.7	6.7	7.5	7.5	6.2	7.0	8.2	6.9	7.7
7	---	---	---	7.6	5.8	7.0	7.6	6.2	7.1	8.2	6.8	7.5
8	---	---	---	7.5	5.8	6.9	7.7	7.4	7.6	8.3	6.9	7.6
9	---	---	---	7.5	5.7	7.0	7.8	6.5	7.4	8.1	7.1	7.6
10	---	---	---	7.4	5.9	7.0	7.7	6.7	7.3	7.8	6.7	7.3
11	---	---	---	7.5	7.2	7.3	7.8	6.7	7.3	7.9	6.6	7.4
12	---	---	---	7.5	6.7	7.3	7.8	6.5	7.3	7.9	6.9	7.4
13	---	---	---	7.8	5.8	7.1	7.9	6.7	7.5	8.1	7.1	7.6
14	---	---	---	7.7	5.7	7.1	7.8	6.5	7.4	8.3	7.1	7.7
15	---	---	---	7.7	5.8	7.1	7.8	7.5	7.7	8.9	7.2	7.8
16	---	---	---	7.6	6.5	7.2	7.7	6.4	7.4	8.3	7.5	8.0
17	---	---	---	7.5	6.1	7.2	7.7	6.6	7.3	8.2	7.3	7.8
18	---	---	---	7.5	7.3	7.4	7.7	6.5	7.2	8.3	7.2	7.9
19	---	---	---	7.4	6.5	7.1	7.7	6.5	7.3	8.4	7.2	7.9
20	---	---	---	7.2	5.4	6.7	7.7	6.7	7.2	8.6	7.5	8.1
21	---	---	---	7.1	5.5	6.7	8.0	6.6	7.5	8.7	7.8	8.3
22	---	---	---	7.1	5.9	6.6	8.0	6.8	7.6	8.7	7.8	8.3
23	---	---	---	7.0	5.9	6.7	8.0	6.6	7.4	8.8	7.9	8.4
24	7.9	6.7	7.5	7.2	5.7	6.7	7.9	6.7	7.6	8.7	7.9	8.4
25	7.8	6.5	7.4	7.1	6.9	7.0	8.0	6.7	7.5	8.9	7.9	8.4
26	7.7	6.2	7.3	7.2	6.1	6.9	7.7	6.5	7.4	9.0	8.2	8.7
27	7.7	7.3	7.5	7.4	5.5	6.8	8.3	6.5	7.4	9.1	8.4	8.8
28	7.4	6.4	7.3	7.5	5.4	6.8	8.0	6.6	7.4	9.1	8.2	8.7
29	7.3	6.1	7.0	7.3	5.9	6.9	7.9	6.5	7.3	9.0	8.8	8.9
30	7.2	5.8	6.8	7.8	5.9	7.0	8.0	6.5	7.3	9.0	8.8	8.9
31	---	---	---	7.9	6.8	7.4	7.9	6.5	7.3	---	---	---
MONTH	---	---	---	7.9	5.4	7.0	8.3	6.0	7.3	9.1	6.5	7.9

STREAMS TRIBUTARY TO LAKE HURON

04137030 AU SABLE RIVER NEAR SIDTOWN, MI

LOCATION.--Lat 44°28'22", long 83°34'16", in NW1/4 SE1/4 sec.15, T.24 N., R.7 E., Iosco County, Hydrologic Unit 04070007, on right bank 100 ft downstream from Cooke Dam, 2 mi northeast of Sidtown.

DRAINAGE AREA.--1,718 mi².

PERIOD OF RECORD.--Water years 1996 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: July 1996 to current year.

DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter, set for one hour measurement intervals.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 26.5°C, July 24, 31, 1999; minimum, 0.0°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum, 14.8 mg/L, Mar. 31, Apr. 1, 1999; minimum, 4.9 mg/L, Sept. 20, 1999.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 26.5°C, July 24, 31; minimum, 0.0°C, on many days during winter period.

DISSOLVED OXYGEN: Maximum, 14.8 mg/L, Mar. 31, Apr. 1; minimum, 4.9 mg/L, Sept. 20.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	18.5	18.0	18.0	11.0	11.0	11.0	5.0	4.5	4.5	1.0	.5	1.0
2	18.0	17.5	17.5	11.0	10.5	10.5	5.0	4.5	5.0	1.0	.5	1.0
3	17.5	17.0	17.5	10.5	10.0	10.5	5.5	5.0	5.0	1.0	.5	.5
4	17.0	16.5	17.0	10.0	10.0	10.0	5.5	5.0	5.5	.5	.5	.5
5	16.5	16.0	16.5	10.0	9.5	9.5	5.5	5.5	5.5	.5	.5	.5
6	16.5	16.0	16.0	9.5	9.5	9.5	6.0	5.5	5.5	.5	.5	.5
7	16.5	16.0	16.0	9.5	9.0	9.0	6.0	5.5	5.5	.5	.5	.5
8	16.0	15.0	15.5	9.0	9.0	9.0	5.5	5.5	5.5	.5	.5	.5
9	15.0	14.5	15.0	9.0	8.5	9.0	5.5	5.5	5.5	.5	.5	.5
10	14.5	14.5	14.5	9.0	8.0	8.5	5.5	5.5	5.5	.5	.5	.5
11	14.5	14.0	14.0	8.5	7.5	8.0	5.5	5.0	5.5	.5	.5	.5
12	14.5	14.0	14.0	7.5	7.0	7.5	5.0	5.0	5.0	.5	.0	.5
13	14.5	14.0	14.0	7.0	6.5	7.0	5.0	5.0	5.0	.5	.0	.5
14	14.0	13.5	13.5	7.0	6.5	6.5	5.0	4.5	4.5	.5	.0	.5
15	13.5	13.5	13.5	6.5	6.0	6.5	4.5	4.5	4.5	.5	.0	.0
16	13.5	13.0	13.0	6.0	6.0	6.0	4.5	4.0	4.5	.5	.0	.0
17	13.5	13.0	13.0	6.0	5.5	6.0	4.0	4.0	4.0	.5	.0	.0
18	14.0	13.5	13.5	5.5	5.5	5.5	4.0	3.5	3.5	.0	.0	.0
19	13.5	13.0	13.0	5.5	5.0	5.5	3.5	3.5	3.5	.0	.0	.0
20	13.0	12.5	13.0	5.0	5.0	5.0	3.5	3.0	3.0	.0	.0	.0
21	12.5	12.0	12.5	5.0	5.0	5.0	3.0	2.5	3.0	.0	.0	.0
22	12.5	12.0	12.0	5.0	4.5	5.0	2.5	2.0	2.0	.0	.0	.0
23	12.0	12.0	12.0	5.0	4.5	4.5	2.0	1.5	2.0	.0	.0	.0
24	12.0	12.0	12.0	4.5	4.5	4.5	1.5	1.0	1.5	.0	.0	.0
25	12.0	11.5	11.5	4.5	4.5	4.5	1.0	1.0	1.0	.0	.0	.0
26	11.5	11.5	11.5	4.5	4.5	4.5	1.0	1.0	1.0	.0	.0	.0
27	12.0	11.5	11.5	4.5	4.0	4.0	1.0	1.0	1.0	.5	.0	.0
28	12.0	11.5	12.0	4.0	4.0	4.0	1.0	1.0	1.0	.0	.0	.0
29	11.5	11.5	11.5	4.5	4.0	4.0	1.0	.5	1.0	.0	.0	.0
30	11.5	11.0	11.0	5.0	4.5	4.5	1.0	.5	1.0	.0	.0	.0
31	11.5	11.0	11.0	--	--	--	1.0	.5	1.0	.0	.0	.0
MONTH	18.5	11.0	13.8	11.0	4.0	6.8	6.0	.5	3.6	1.0	.0	.3

STREAMS TRIBUTARY TO LAKE HURON

04137030 AU SABLE RIVER NEAR SIDTOWN, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	.0	.0	.0	1.0	1.0	1.0	5.5	5.0	5.0	12.0	11.5	11.5	
2	.0	.0	.0	1.0	1.0	1.0	6.5	5.0	5.5	12.5	11.5	12.0	
3	.0	.0	.0	1.0	1.0	1.0	7.5	6.0	6.5	13.0	12.0	12.5	
4	.0	.0	.0	1.0	1.0	1.0	6.5	5.5	6.0	13.0	12.5	12.5	
5	.5	.0	.0	1.0	1.0	1.0	7.0	6.0	6.5	14.5	12.5	13.5	
6	.5	.0	.0	1.0	1.0	1.0	7.5	7.0	7.0	15.5	12.5	13.5	
7	.5	.0	.0	1.0	1.0	1.0	8.0	7.5	7.5	16.0	13.0	14.5	
8	.5	.0	.5	1.0	1.0	1.0	9.0	8.0	8.5	15.5	15.0	15.5	
9	.5	.5	.5	1.0	1.0	1.0	8.5	8.0	8.5	15.5	15.0	15.0	
10	.5	.5	.5	1.0	1.0	1.0	8.5	8.0	8.5	15.0	15.0	15.0	
11	.5	.5	.5	1.0	1.0	1.0	8.5	8.5	8.5	15.0	15.0	15.0	
12	.5	.5	.5	1.0	1.0	1.0	9.0	8.5	8.5	15.5	15.0	15.0	
13	.5	.5	.5	1.0	1.0	1.0	9.5	8.5	9.0	15.0	14.5	15.0	
14	.5	.5	.5	1.0	1.0	1.0	10.0	9.0	9.5	15.0	14.5	15.0	
15	1.0	.5	.5	1.0	1.0	1.0	9.5	9.0	9.5	15.5	15.0	15.0	
16	1.0	.5	1.0	1.0	1.0	1.0	9.5	9.0	9.0	16.5	15.5	15.5	
17	1.0	1.0	1.0	1.5	1.0	1.0	9.5	9.0	9.5	17.5	16.0	16.5	
18	1.0	1.0	1.0	1.5	1.5	1.5	10.0	9.5	9.5	17.5	16.0	17.0	
19	1.0	1.0	1.0	2.0	1.5	1.5	10.0	9.5	10.0	17.5	16.5	17.0	
20	1.0	1.0	1.0	2.0	1.5	2.0	10.0	9.5	9.5	17.0	16.5	17.0	
21	1.0	1.0	1.0	2.0	2.0	2.0	10.0	9.5	10.0	18.0	17.0	17.5	
22	1.0	1.0	1.0	2.5	2.0	2.5	10.0	9.5	10.0	18.0	17.5	17.5	
23	1.5	1.0	1.0	2.5	2.5	2.5	9.5	9.5	9.5	17.5	17.0	17.0	
24	1.5	1.0	1.5	3.0	2.5	2.5	10.0	9.5	9.5	17.0	17.0	17.0	
25	1.5	1.5	1.5	3.0	2.5	3.0	11.0	9.5	10.0	17.0	16.0	16.5	
26	1.5	1.0	1.5	3.5	3.0	3.0	10.5	10.0	10.0	16.5	16.0	16.0	
27	1.5	1.0	1.0	3.5	3.5	3.5	10.5	10.0	10.0	17.5	16.0	16.5	
28	1.5	1.0	1.0	4.0	3.5	3.5	11.0	10.5	10.5	17.0	16.0	16.5	
29	---	---	---	4.0	4.0	4.0	11.0	10.5	11.0	18.0	16.5	17.0	
30	---	---	---	4.5	4.0	4.0	11.5	11.0	11.0	18.0	17.0	18.0	
31	---	---	---	5.0	4.5	4.5	---	---	---	19.5	18.0	18.5	
MONTH	1.5	.0	.7	5.0	1.0	1.8	11.5	5.0	8.8	19.5	11.5	15.5	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	19.5	18.5	19.0	23.0	22.5	22.5	26.0	25.5	26.0	22.5	21.5	22.0
2	19.5	17.5	18.5	23.5	22.5	23.0	25.5	25.0	25.5	22.5	22.0	22.5
3	19.0	18.5	18.5	23.5	22.5	23.0	25.5	24.5	25.0	22.5	22.0	22.5
4	19.0	18.0	18.5	24.5	23.0	23.5	25.0	24.5	25.0	22.5	22.0	22.5
5	20.0	18.5	19.0	25.5	23.5	24.5	25.0	24.5	24.5	22.5	22.5	22.5
6	21.0	19.5	20.0	25.5	23.5	24.5	24.5	24.0	24.5	23.0	22.5	23.0
7	22.5	20.0	21.0	25.0	23.5	24.5	24.5	24.0	24.0	23.0	22.5	22.5
8	22.0	20.0	21.0	24.5	24.0	24.0	24.0	23.5	24.0	23.0	22.0	22.5
9	21.5	20.5	21.0	24.5	23.5	24.0	23.5	23.0	23.5	22.5	22.0	22.5
10	22.0	21.0	21.5	24.0	23.5	23.5	23.0	23.0	23.0	22.0	21.5	22.0
11	23.0	20.5	22.0	24.0	23.5	23.5	23.5	23.0	23.0	21.5	21.5	21.5
12	23.5	21.0	22.5	23.5	23.5	23.5	23.0	22.5	23.0	21.5	21.5	21.5
13	23.5	23.0	23.0	24.5	23.5	24.0	23.5	22.5	23.0	21.5	21.0	21.5
14	24.0	23.0	23.5	24.5	23.5	24.0	23.0	22.5	23.0	21.0	20.5	21.0
15	23.0	22.0	22.5	25.0	24.0	24.5	23.0	22.5	22.5	20.5	20.5	20.5
16	22.0	22.0	22.0	25.0	24.0	24.5	22.5	22.5	22.5	20.5	20.0	20.0
17	22.0	21.5	21.5	25.0	24.0	24.5	23.0	22.5	22.5	20.0	19.5	19.5
18	22.0	21.0	21.5	25.5	24.5	24.5	22.5	22.0	22.5	20.0	19.5	19.5
19	21.5	21.0	21.5	24.5	24.5	24.5	22.0	22.0	22.0	20.0	19.5	19.5
20	21.5	21.0	21.5	24.5	24.0	24.5	22.0	21.5	22.0	19.5	19.0	19.5
21	21.5	21.0	21.5	25.0	24.5	24.5	22.0	21.5	22.0	19.0	18.5	19.0
22	22.0	21.0	21.5	25.5	24.5	25.0	22.0	22.0	22.0	18.5	18.5	18.5
23	22.5	21.0	22.0	25.5	24.5	25.0	22.5	22.0	22.5	18.5	18.0	18.5
24	23.0	21.5	22.5	26.5	24.5	25.5	22.5	22.0	22.5	18.0	17.5	18.0
25	23.5	21.5	22.5	26.0	25.0	25.5	22.5	22.0	22.5	17.5	17.5	17.5
26	23.0	22.0	22.5	25.5	25.0	25.5	22.5	22.5	22.5	18.0	17.5	17.5
27	23.5	23.0	23.0	26.0	25.0	25.5	22.5	22.5	22.5	18.0	17.5	17.5
28	23.5	22.5	23.0	26.0	25.0	25.5	23.5	22.5	23.0	17.5	17.5	17.5
29	24.0	23.0	23.5	26.0	25.5	25.5	23.0	22.5	22.5	17.5	17.0	17.0
30	23.0	22.5	23.0	26.0	25.5	26.0	22.5	22.0	22.0	17.0	16.5	16.5
31	---	---	---	26.5	25.5	26.0	22.0	21.5	22.0	---	---	---
MONTH	24.0	17.5	21.5	26.5	22.5	24.5	26.0	21.5	23.1	23.0	16.5	20.2

STREAMS TRIBUTARY TO LAKE HURON

04137030 AU SABLE RIVER NEAR SIDTOWN, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
OCTOBER				NOVEMBER				DECEMBER				JANUARY			
1	7.9	7.4	7.7	10.1	10.0	10.0	12.1	12.0	12.1	13.5	13.3	13.4			
2	7.8	7.1	7.5	10.3	9.9	10.1	12.1	12.0	12.1	13.5	13.2	13.3			
3	7.5	7.0	7.3	10.3	9.9	10.1	12.1	11.5	11.9	13.5	13.2	13.4			
4	7.5	7.2	7.4	10.4	10.2	10.3	12.2	11.3	11.7	13.5	13.3	13.4			
5	7.6	7.2	7.5	10.6	10.0	10.3	11.7	11.4	11.6	13.9	13.3	13.6			
6	7.9	7.2	7.7	10.6	10.1	10.4	11.6	11.5	11.6	13.9	13.6	13.8			
7	8.4	7.8	8.1	10.6	10.2	10.4	11.7	11.5	11.6	13.9	13.6	13.7			
8	8.5	8.3	8.4	10.7	10.5	10.6	11.7	11.1	11.5	13.7	13.4	13.5			
9	8.7	8.4	8.5	10.9	10.5	10.7	11.6	11.0	11.4	13.7	13.3	13.4			
10	8.8	8.5	8.7	11.0	10.2	10.8	11.6	11.2	11.4	13.4	13.2	13.4			
11	8.9	8.6	8.8	11.4	10.9	11.2	11.5	11.2	11.4	13.4	13.2	13.3			
12	9.0	8.7	8.9	11.9	10.9	11.3	11.6	11.1	11.4	13.3	13.1	13.2			
13	9.2	8.6	9.0	11.0	10.8	10.9	11.7	11.4	11.6	13.3	12.9	13.2			
14	9.2	8.8	9.0	11.0	10.6	10.9	11.7	11.5	11.6	13.3	12.9	13.1			
15	9.2	8.3	9.0	11.2	11.0	11.1	11.8	11.4	11.6	13.2	12.8	13.0			
16	9.3	8.6	9.0	11.2	11.0	11.1	11.9	11.5	11.6	13.1	12.7	13.0			
17	9.4	8.9	9.2	11.3	10.8	11.1	11.9	11.6	11.8	13.1	12.8	13.0			
18	9.5	9.3	9.4	11.5	11.1	11.3	12.0	11.6	11.8	12.9	12.7	12.8			
19	9.6	9.1	9.4	11.6	11.1	11.4	12.1	11.7	11.9	12.8	12.5	12.6			
20	9.7	9.1	9.4	11.6	11.3	11.5	12.2	12.0	12.1	12.8	12.4	12.6			
21	9.8	9.2	9.6	11.7	11.3	11.5	12.3	12.0	12.1	12.7	12.3	12.6			
22	9.9	8.7	9.6	11.7	11.6	11.7	12.5	12.0	12.3	12.7	12.3	12.5			
23	9.9	8.8	9.6	11.9	11.7	11.8	12.6	12.2	12.4	12.6	12.3	12.5			
24	9.9	8.8	9.6	12.0	11.5	11.8	12.9	12.6	12.8	12.5	12.1	12.3			
25	9.9	9.5	9.8	12.0	11.6	11.8	13.0	12.7	12.8	12.3	12.1	12.2			
26	10.1	9.6	9.8	12.0	11.8	11.9	13.1	12.8	12.9	12.6	12.0	12.2			
27	10.4	9.6	10.0	12.1	11.9	12.1	13.3	13.0	13.1	12.5	11.8	12.2			
28	10.6	9.8	10.3	12.2	11.9	12.1	13.3	13.1	13.2	12.5	11.8	12.3			
29	10.3	9.9	10.1	12.2	12.1	12.2	13.4	13.1	13.2	12.5	11.9	12.3			
30	10.0	9.2	9.8	12.2	12.0	12.1	13.4	13.0	13.2	12.4	11.7	12.2			
31	10.1	9.6	9.9	—	—	—	13.5	13.1	13.3	12.4	12.3	12.4			
MONTH	10.6	7.0	9.0	12.2	9.9	11.1	13.5	11.0	12.1	13.9	11.7	12.9			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	12.4	12.2	12.3	12.1	11.9	12.0	14.8	14.0	14.4	10.3	9.9	10.1	
2	12.4	11.7	12.2	12.1	11.9	12.0	14.0	13.6	13.9	10.2	9.9	10.1	
3	12.3	11.8	12.2	12.2	11.9	12.0	13.9	13.5	13.8	10.1	9.6	10.0	
4	12.3	11.6	12.1	12.3	12.0	12.1	13.9	13.6	13.8	10.0	9.4	9.7	
5	12.3	11.6	12.1	12.3	12.0	12.2	13.6	13.2	13.5	9.9	9.2	9.6	
6	12.4	11.6	12.1	12.3	12.1	12.2	13.4	12.7	13.2	9.7	8.9	9.4	
7	12.4	12.3	12.3	12.5	12.2	12.4	12.9	12.6	12.8	9.7	8.9	9.4	
8	12.4	12.2	12.3	12.5	12.3	12.4	12.8	12.6	12.7	9.4	8.6	9.2	
9	12.3	11.6	12.1	12.6	12.3	12.4	12.6	12.2	12.4	9.3	9.1	9.2	
10	12.3	11.5	12.0	12.6	12.4	12.5	12.5	12.3	12.4	9.4	8.6	9.1	
11	12.3	11.5	12.1	12.7	12.4	12.5	12.3	12.0	12.2	9.3	8.4	9.0	
12	12.3	11.8	12.1	12.7	12.5	12.6	12.1	11.9	12.0	9.2	8.3	8.8	
13	12.3	12.1	12.2	12.9	12.5	12.7	12.1	11.8	12.0	9.0	8.3	8.7	
14	12.3	12.2	12.3	13.1	12.9	13.0	12.1	11.8	11.9	9.1	8.3	8.8	
15	12.2	12.0	12.2	13.2	13.0	13.1	11.9	11.5	11.7	9.1	8.6	8.9	
16	12.3	11.4	12.0	13.3	13.0	13.2	11.7	11.4	11.5	9.1	8.9	9.1	
17	12.2	11.7	12.1	13.5	13.1	13.3	11.6	11.3	11.5	9.3	8.3	9.0	
18	12.2	11.3	12.0	13.6	13.3	13.5	11.5	11.3	11.4	9.2	8.3	8.9	
19	12.2	11.0	11.9	13.7	13.4	13.6	11.4	11.0	11.2	9.2	8.5	8.9	
20	12.2	11.3	11.9	13.8	13.5	13.7	11.2	10.8	11.0	9.1	8.4	8.9	
21	12.2	12.0	12.1	14.0	13.8	13.9	11.1	10.7	10.9	9.0	8.2	8.8	
22	12.1	11.9	12.1	14.0	13.8	13.9	11.0	10.6	10.8	8.5	8.0	8.3	
23	12.1	11.0	11.8	14.1	13.7	13.9	10.9	10.4	10.7	8.4	8.3	8.4	
24	12.0	10.9	11.6	14.2	13.7	14.0	10.8	10.3	10.5	8.4	8.0	8.3	
25	12.1	11.8	11.9	14.2	13.8	14.0	10.8	10.4	10.6	8.2	7.8	8.1	
26	12.1	11.7	12.0	14.3	14.0	14.1	10.7	10.1	10.6	8.3	7.7	8.0	
27	12.1	11.7	11.9	14.4	14.1	14.3	10.7	10.1	10.4	8.3	7.6	8.1	
28	12.1	12.0	12.1	14.6	14.3	14.4	10.6	10.0	10.3	8.2	7.3	7.9	
29	—	—	—	14.6	14.3	14.4	10.7	9.9	10.3	8.1	7.6	7.9	
30	—	—	—	14.7	14.1	14.4	10.2	9.9	10.1	8.0	7.7	7.9	
31	—	—	—	14.8	14.3	14.5	—	—	—	8.2	7.6	7.8	
MONTH	12.4	10.9	12.1	14.8	11.9	13.2	14.8	9.9	11.8	10.3	7.3	8.8	

STREAMS TRIBUTARY TO LAKE HURON

04137030 AU SABLE RIVER NEAR SIDTOWN, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.1	7.3	7.8	7.5	7.1	7.3	7.2	6.8	7.0	7.9	7.1	7.5
2	8.1	6.8	7.7	7.6	7.1	7.4	6.9	6.7	6.8	8.1	6.8	7.6
3	8.2	6.9	7.9	7.5	7.1	7.2	6.9	6.4	6.7	8.0	6.8	7.5
4	8.2	7.2	7.9	7.4	6.9	7.2	6.9	6.2	6.6	7.8	6.8	7.4
5	8.3	7.5	8.0	7.7	7.0	7.3	7.1	6.2	6.6	7.8	6.6	7.3
6	8.3	7.7	8.1	7.5	6.6	7.2	7.2	6.2	6.7	8.0	6.7	7.4
7	8.4	6.8	8.0	7.7	6.6	7.2	6.9	6.4	6.6	8.0	6.8	7.5
8	8.3	6.4	7.5	7.3	6.2	7.1	6.9	6.6	6.7	8.1	6.9	7.5
9	8.1	6.8	7.5	7.5	6.2	7.1	6.8	6.0	6.5	8.1	7.0	7.6
10	8.0	6.7	7.6	7.4	6.7	7.2	6.9	6.1	6.5	7.8	7.1	7.4
11	8.3	7.0	7.8	7.4	7.1	7.2	7.2	6.0	6.7	7.8	6.6	7.5
12	8.2	7.1	7.9	7.4	6.2	7.2	6.9	5.9	6.4	7.7	6.8	7.3
13	8.2	7.8	8.0	7.6	6.2	7.1	7.6	6.1	6.9	7.8	6.9	7.4
14	7.9	7.3	7.7	7.6	6.2	7.0	7.2	6.5	7.0	7.8	6.9	7.4
15	7.8	7.3	7.6	7.6	5.8	7.0	7.4	6.9	7.1	8.0	6.9	7.4
16	7.7	7.2	7.5	7.5	6.2	7.0	7.4	6.8	7.2	7.9	7.0	7.5
17	7.6	7.0	7.3	7.4	6.2	7.0	7.8	7.0	7.4	7.9	5.0	7.1
18	7.6	6.8	7.3	7.4	7.0	7.2	7.5	6.7	7.2	7.8	5.0	6.4
19	7.5	6.6	7.2	7.3	6.9	7.1	7.5	6.9	7.2	8.0	5.3	6.6
20	7.6	7.3	7.4	7.4	6.8	7.1	7.6	6.9	7.3	8.0	4.9	7.2
21	7.6	7.0	7.3	7.4	6.3	7.1	7.8	6.9	7.3	8.0	5.3	6.7
22	7.6	6.7	7.2	7.4	6.6	7.1	7.8	6.8	7.3	8.2	5.6	7.0
23	7.7	6.5	7.4	7.4	6.7	7.1	7.8	6.8	7.3	8.3	5.5	6.8
24	7.7	6.5	7.2	7.8	6.3	7.0	7.7	6.7	7.3	8.2	5.6	7.2
25	7.6	6.7	7.2	7.4	6.9	7.1	7.8	6.9	7.4	8.3	5.8	7.2
26	7.7	6.6	7.3	7.3	6.7	7.1	7.8	7.0	7.5	8.4	5.9	7.2
27	7.5	7.1	7.3	7.4	5.2	6.9	8.0	7.3	7.7	8.7	5.4	7.7
28	7.4	7.2	7.3	7.3	5.9	6.8	8.3	6.8	7.6	8.9	6.1	7.8
29	7.6	7.1	7.4	7.2	6.2	6.8	8.2	6.9	7.6	8.9	8.7	8.8
30	7.5	6.9	7.2	7.3	6.3	6.8	7.7	7.1	7.4	8.7	7.6	8.5
31	—	—	—	7.5	6.4	6.9	7.7	6.8	7.3	—	—	—
MONTH	8.4	6.4	7.6	7.8	5.2	7.1	8.3	5.9	7.1	8.9	4.9	7.4

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI

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.--1,739 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1987 to current year. Records for July 1939 to September 1940, published in WSP 874, 894, and 1307, have been found to be unreliable and should not be used.

REVISED RECORDS.--WDR MI-96-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 583.93 ft above sea level.

REMARKS.--Water-discharge records good. Flow regulated by Foote Dam 0.6 mi upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1030	1050	1590	1030	1300	1380	1530	1060	1120	1470	1150	857
2	1090	1080	1630	865	1230	1310	1590	1030	1320	1530	1020	895
3	1100	1080	1550	894	1200	1260	1600	1080	1470	1410	936	894
4	1110	1070	1300	1050	1260	1270	1580	1110	1370	1320	914	853
5	1090	1020	1170	1110	1340	1250	1610	1110	1230	1270	916	876
6	1330	968	1170	1110	1310	1200	1880	1060	1100	1270	916	879
7	2750	968	1480	1120	1310	1140	1940	1080	1070	1140	1080	879
8	2770	1010	1680	1050	1360	1110	1950	1140	1070	894	1130	877
9	2300	1070	1630	1070	1310	1230	1980	1180	1030	1290	1070	879
10	1810	1520	1470	1170	1290	1340	1770	1190	1000	1560	1040	870
11	1350	2080	1230	1030	1290	1270	1570	1190	1010	1380	952	876
12	1340	1800	1170	845	1460	1160	1520	1160	1110	1200	956	879
13	1640	1570	1170	928	1770	1150	1450	1100	1200	1130	1030	974
14	1170	1300	1180	1090	1870	1200	1400	1040	1960	1070	1170	1070
15	995	1190	1180	1230	1700	1230	1350	994	2380	1010	1180	977
16	1080	1310	1180	1430	1570	1230	1340	974	2190	989	1090	973
17	1150	1530	1180	1430	1570	1180	1390	979	1790	1090	1010	970
18	1460	1540	1190	1480	1510	1290	1420	1010	1580	1120	955	976
19	1420	1490	1180	1350	1390	1520	1410	1020	1410	1180	944	878
20	1060	1410	1370	1180	1390	1580	1310	1080	1310	1260	941	877
21	1070	1410	1530	1370	1330	1610	1270	1150	1290	1250	943	912
22	1140	1400	1280	1450	1240	1670	1250	1180	1240	1340	918	1070
23	1140	1390	1040	1580	1180	1680	1200	1140	1070	1380	887	1050
24	1120	1410	958	1770	1190	1540	1080	1160	986	1380	919	978
25	1080	1250	938	1830	1260	1380	1080	1180	1020	1400	1040	879
26	1070	1100	1050	1730	1240	1370	1110	1300	1030	1190	1070	879
27	1080	1100	1170	1590	1240	1350	1090	1310	1130	909	988	877
28	1020	1130	1160	1560	1310	1310	1170	1180	1130	978	883	1320
29	1040	1150	1180	1460	---	1360	1180	1110	1260	1130	851	2000
30	1040	1320	1050	1400	---	1460	1130	1090	1420	961	855	1770
31	1040	---	1060	1380	---	1500	---	1050	---	1090	859	---
TOTAL	40885	38716	39116	39562	38420	41530	43150	34437	39296	37591	30613	29654
MEAN	1319	1291	1262	1277	1372	1340	1438	1111	1310	1213	988	978
MAX	2770	2080	1680	1830	1870	1680	1980	1310	2380	1560	1180	2000
MIN	995	968	938	845	1180	1110	1080	974	986	894	851	877
CFSM	.76	.74	.73	.73	.79	.77	.83	.64	.75	.70	.57	.57
IN.	.87	.83	.84	.85	.82	.89	.92	.74	.84	.80	.65	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1999, BY WATER YEAR (WY)

MEAN	1415	1564	1468	1407	1360	1698	2121	1629	1420	1333	1295	1256
MAX	1770	1944	1870	1596	1618	2097	2749	2084	1952	2205	1834	1605
(WY)	1992	1992	1992	1997	1997	1990	1997	1997	1993	1994	1994	1994
MIN	1152	1100	1132	1259	1224	1340	1438	1111	1104	1056	988	988
(WY)	1990	1990	1990	1991	1989	1999	1999	1999	1988	1989	1999	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1987 - 1999

ANNUAL TOTAL	491527		452990		1495	
ANNUAL MEAN	1347		1241		1640	1994
HIGHEST ANNUAL MEAN					1241	1999
LOWEST ANNUAL MEAN					5740	Apr 1 1998
HIGHEST DAILY MEAN	5740	Apr 1	2770	Oct 8	455	Oct 29 1993
LOWEST DAILY MEAN	591	Jul 28	845	Jan 12	656	Jun 7 1988
ANNUAL SEVEN-DAY MINIMUM	875	Jul 27	861	Aug 29	5850	Mar 28 1991
INSTANTANEOUS PEAK FLOW			3120	Oct 7	16.27	Mar 28 1991
INSTANTANEOUS PEAK STAGE			12.16	Oct 7	135	Aug 27 1993
INSTANTANEOUS LOW FLOW			707	Jun 11		
ANNUAL RUNOFF (CFSM)	.77		.71		.86	
ANNUAL RUNOFF (INCHES)	10.51		9.69		11.68	
10 PERCENT EXCEEDS	1730		1580		2020	
50 PERCENT EXCEEDS	1200		1180		1400	
90 PERCENT EXCEEDS	971		937		1050	

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1978-94, 1996 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April 1978 to September 1981.

WATER TEMPERATURE: April 1978 to September 1981, July 1996 to current year.

DISSOLVED OXYGEN: July 1996 to current year.

INSTRUMENTATION.--Water-quality monitor telemeter from July 11, 1996, set for one hour measurement intervals.

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, 1996-99): Maximum measured, 28.0°C, Aug. 8, 1979; minimum, 0.0°C, on many days during winter periods.

DISSOLVED OXYGEN: Maximum, 13.6 mg/L, on several days during December and January 1998; minimum, 5.8 mg/L, Aug. 13, 1999.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--Specific conductance of 354 microsiemens was measured Feb. 3, 1988.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 26.0°C, July 24, 25, July 27 to Aug. 1; minimum, 0.0°C, Jan. 20.

DISSOLVED OXYGEN: Maximum, 13.4 mg/L, Mar. 30; minimum, 5.8 mg/L, Aug. 13.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER			DECEMBER			JANUARY		
1	19.0	18.0	18.5	12.0	11.5	12.0	5.5	5.5	5.5	1.0	1.0	1.0
2	18.0	17.5	18.0	11.5	11.0	11.5	5.5	5.5	5.5	1.0	1.0	1.0
3	17.5	17.0	17.5	11.0	10.5	11.0	6.0	5.5	5.5	1.0	1.0	1.0
4	17.0	17.0	17.0	10.5	10.5	10.5	6.0	5.5	5.5	1.0	1.0	1.0
5	17.0	16.5	16.5	10.5	10.0	10.0	6.0	5.5	5.5	1.0	1.0	1.0
6	16.5	16.5	16.5	10.0	9.5	9.5	6.0	6.0	6.0	1.0	.5	1.0
7	16.5	16.5	16.5	9.5	9.5	9.5	6.0	5.5	5.5	1.0	.5	.5
8	16.5	16.0	16.0	9.5	9.0	9.5	5.5	5.5	5.5	.5	.5	.5
9	16.0	15.5	15.5	9.5	9.0	9.0	5.5	5.0	5.5	.5	.5	.5
10	16.0	15.5	15.5	9.0	9.0	9.0	5.0	5.0	5.0	.5	.5	.5
11	15.5	15.5	15.5	9.0	8.0	8.5	5.0	5.0	5.0	.5	.5	.5
12	16.0	15.5	15.5	8.0	7.5	8.0	5.0	4.5	5.0	.5	.5	.5
13	15.5	15.0	15.0	7.5	7.5	7.5	4.5	4.5	4.5	.5	.5	.5
14	15.0	14.5	14.5	7.5	7.0	7.5	4.5	4.5	4.5	.5	.5	.5
15	14.5	14.0	14.5	7.0	7.0	7.0	4.5	4.0	4.5	.5	.5	.5
16	14.5	14.0	14.0	7.0	7.0	7.0	4.5	4.0	4.0	.5	.5	.5
17	14.5	14.0	14.5	7.0	6.5	7.0	4.0	4.0	4.0	.5	.5	.5
18	14.5	14.0	14.5	6.5	6.5	6.5	4.0	3.5	3.5	.5	.5	.5
19	14.5	14.0	14.0	6.5	6.5	6.5	3.5	3.5	3.5	.5	.5	.5
20	14.0	13.5	14.0	6.5	6.0	6.5	3.5	3.0	3.5	.5	.0	.5
21	13.5	13.0	13.5	6.0	6.0	6.0	3.0	3.0	3.0	.5	.5	.5
22	13.0	12.5	13.0	6.0	5.5	6.0	3.0	2.0	2.5	.5	.5	.5
23	13.0	12.5	12.5	6.0	5.5	5.5	2.0	1.5	1.5	.5	.5	.5
24	13.0	12.5	12.5	5.5	5.5	5.5	1.5	1.0	1.0	.5	.5	.5
25	12.5	12.0	12.5	5.5	5.5	5.5	1.5	.5	1.0	.5	.5	.5
26	12.5	12.5	12.5	5.5	5.0	5.5	1.0	.5	.5	.5	.5	.5
27	13.0	12.5	12.5	5.0	5.0	5.0	1.0	.5	1.0	.5	.5	.5
28	13.0	12.5	12.5	5.0	5.0	5.0	1.0	1.0	1.0	.5	.5	.5
29	12.5	12.0	12.5	5.5	5.0	5.0	1.0	1.0	1.0	.5	.5	.5
30	12.5	12.0	12.0	5.5	5.5	5.5	1.0	1.0	1.0	.5	.5	.5
31	12.0	12.0	12.0	---	---	---	1.0	1.0	1.0	.5	.5	.5
MONTH	19.0	12.0	14.6	12.0	5.0	7.6	6.0	.5	3.6	1.0	.0	.6

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH			APRIL			MAY		
1	.5	.5	.5	1.0	1.0	1.0	4.5	4.0	4.0	11.5	11.0	11.0
2	.5	.5	.5	1.0	1.0	1.0	4.5	4.0	4.0	12.0	11.5	11.5
3	.5	.5	.5	1.0	1.0	1.0	5.5	4.0	5.0	12.5	11.5	12.0
4	.5	.5	.5	1.5	1.0	1.0	5.0	4.0	5.0	13.0	12.0	12.5
5	.5	.5	.5	1.0	1.0	1.0	5.5	5.0	5.0	13.0	12.0	12.5
6	.5	.5	.5	1.0	1.0	1.0	5.5	5.0	5.5	13.0	12.0	12.5
7	.5	.5	.5	1.5	1.0	1.0	6.5	5.5	6.0	14.0	12.5	13.0
8	.5	.5	.5	1.5	1.0	1.0	7.5	6.0	6.5	14.5	13.5	14.0
9	.5	.5	.5	1.0	1.0	1.0	7.0	6.5	7.0	15.0	14.0	14.5
10	1.0	.5	.5	1.5	1.0	1.0	7.5	7.0	7.0	14.5	14.0	14.5
11	1.0	.5	.5	1.5	1.0	1.0	7.0	7.0	7.0	14.5	14.0	14.0
12	1.0	.5	.5	1.5	1.0	1.0	7.5	7.0	7.0	14.0	13.5	14.0
13	1.0	.5	1.0	1.0	1.0	1.0	8.0	7.5	7.5	14.0	13.5	14.0
14	1.0	.5	1.0	1.5	1.0	1.0	8.5	7.5	8.0	14.5	13.5	14.0
15	1.0	1.0	1.0	1.5	1.0	1.0	8.5	8.0	8.0	14.5	14.0	14.5
16	1.0	1.0	1.0	1.5	1.0	1.0	8.5	8.0	8.0	15.5	14.5	14.5
17	1.0	1.0	1.0	1.5	1.0	1.0	8.5	8.0	8.0	16.0	15.0	15.5
18	1.0	1.0	1.0	1.5	1.0	1.5	8.5	8.0	8.5	16.5	15.5	16.0
19	1.0	1.0	1.0	2.0	1.5	1.5	9.0	8.5	8.5	16.5	16.0	16.5
20	1.0	1.0	1.0	2.0	1.5	2.0	9.0	8.5	9.0	16.5	16.0	16.5
21	1.0	1.0	1.0	2.0	2.0	2.0	9.5	9.0	9.0	17.0	16.0	16.5
22	1.0	1.0	1.0	2.5	2.0	2.0	9.0	9.0	9.0	17.0	16.5	16.5
23	1.0	1.0	1.0	2.5	2.0	2.5	9.0	8.5	9.0	16.5	16.0	16.5
24	1.0	1.0	1.0	3.0	2.5	2.5	9.0	8.5	9.0	16.5	16.0	16.5
25	1.0	1.0	1.0	3.0	2.5	3.0	10.0	9.0	9.5	16.0	15.0	15.5
26	1.0	1.0	1.0	3.5	3.0	3.0	10.0	9.5	9.5	15.5	15.0	15.5
27	1.0	1.0	1.0	3.5	3.0	3.0	10.0	10.0	10.0	16.5	15.5	16.0
28	1.0	1.0	1.0	4.0	3.0	3.5	10.5	10.0	10.0	16.5	16.0	16.0
29	---	---	---	4.0	3.5	3.5	11.0	10.5	10.5	17.0	16.0	16.5
30	---	---	---	4.0	3.5	4.0	11.0	10.5	11.0	18.5	16.5	17.5
31	---	---	---	4.0	4.0	4.0	---	---	---	18.5	17.5	18.0
MONTH	1.0	.5	.8	4.0	1.0	1.8	11.0	4.0	7.7	18.5	11.0	14.8

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY			AUGUST			SEPTEMBER		
1	18.5	17.5	18.0	23.0	22.5	22.5	26.0	25.5	25.5	22.5	22.0	22.0
2	19.0	18.0	18.5	23.0	22.5	22.5	25.5	25.0	25.0	22.5	22.0	22.0
3	19.0	18.5	18.5	23.5	22.5	23.0	25.0	24.5	24.5	23.0	22.0	22.5
4	18.5	18.0	18.0	24.0	23.0	23.5	25.0	24.5	24.5	23.0	22.0	22.5
5	18.5	18.0	18.5	25.0	24.0	24.5	24.5	24.0	24.5	23.0	22.5	22.5
6	20.5	18.5	19.5	25.5	24.5	25.0	24.5	24.0	24.0	23.0	22.5	23.0
7	21.5	20.0	20.5	25.0	24.5	25.0	24.5	24.0	24.0	23.5	22.5	23.0
8	22.0	21.0	21.5	25.0	24.0	24.5	24.0	23.5	23.5	23.0	22.5	22.5
9	21.0	20.5	21.0	24.5	23.5	24.0	23.5	23.0	23.0	22.5	22.0	22.5
10	22.0	20.5	21.0	23.5	23.0	23.5	23.0	23.0	23.0	22.0	21.5	22.0
11	22.5	21.0	22.0	24.0	23.0	23.5	23.5	22.5	23.0	22.0	21.5	21.5
12	23.5	21.5	22.5	24.0	23.0	23.5	23.5	23.0	23.0	21.5	21.0	21.5
13	23.0	22.0	22.5	24.0	23.0	23.5	23.5	23.0	23.0	22.0	21.0	21.5
14	23.0	22.0	22.5	24.0	23.5	23.5	23.0	22.5	23.0	21.0	20.5	21.0
15	22.5	21.5	22.0	24.5	23.5	24.0	23.0	22.5	23.0	21.0	20.5	20.5
16	21.5	21.0	21.0	25.0	24.0	24.5	23.0	22.5	22.5	20.5	20.0	20.5
17	21.0	20.5	21.0	25.0	24.5	24.5	23.0	22.5	22.5	20.5	20.0	20.0
18	21.0	20.5	20.5	25.5	24.5	24.5	23.0	22.5	22.5	20.5	19.5	20.0
19	21.0	20.5	21.0	24.5	24.5	24.5	22.5	22.0	22.5	20.5	19.5	20.0
20	21.0	20.5	21.0	25.0	24.5	24.5	22.5	22.0	22.0	20.0	19.5	19.5
21	21.5	21.0	21.0	24.5	24.5	24.5	22.5	22.0	22.0	19.5	19.0	19.0
22	22.0	21.0	21.5	25.5	24.5	25.0	22.5	22.0	22.5	19.0	18.5	19.0
23	22.5	21.5	22.0	25.0	25.0	25.0	23.0	22.0	22.5	19.0	18.5	18.5
24	23.0	22.0	22.5	26.0	25.0	25.5	22.5	22.0	22.5	18.5	18.0	18.5
25	23.5	22.5	23.0	26.0	25.5	25.5	22.5	22.5	22.5	18.5	18.0	18.0
26	23.5	23.0	23.0	25.5	25.5	25.5	23.0	22.5	22.5	18.5	18.0	18.0
27	23.5	23.0	23.0	26.0	25.0	25.5	23.5	22.5	23.0	18.5	18.0	18.0
28	24.0	23.0	23.5	26.0	25.5	25.5	24.0	23.0	23.5	18.0	18.0	18.0
29	24.0	23.0	23.5	26.0	25.5	25.5	23.0	22.5	23.0	18.0	17.5	18.0
30	23.5	23.0	23.0	26.0	25.5	25.5	22.5	22.0	22.5	17.5	17.0	17.0
31	---	---	---	26.0	25.5	25.5	22.5	22.0	22.0	---	---	---
MONTH	24.0	17.5	21.2	26.0	22.5	24.4	26.0	22.0	23.1	23.5	17.0	20.4

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER				NOVEMBER				DECEMBER			JANUARY	
1	8.3	7.8	8.0	10.0	9.8	9.9	11.7	11.5	11.6	13.0	12.8	12.9
2	8.2	7.9	8.0	10.2	9.8	10.0	11.8	11.6	11.6	13.0	12.8	12.9
3	8.0	7.9	7.9	10.3	9.9	10.1	11.7	11.6	11.6	13.0	12.7	12.8
4	8.2	7.9	8.0	10.6	10.1	10.3	12.1	11.6	11.9	12.9	12.7	12.8
5	8.3	7.9	8.0	10.7	10.1	10.3	12.0	11.8	11.9	13.2	12.8	13.0
6	8.3	8.0	8.1	10.5	10.2	10.3	12.0	11.8	11.9	13.1	13.0	13.0
7	8.4	8.1	8.3	10.8	10.2	10.4	12.0	11.8	11.9	13.2	13.0	13.1
8	8.4	8.2	8.3	10.5	10.1	10.3	12.0	11.9	11.9	13.1	12.9	13.0
9	8.5	8.4	8.4	10.5	10.1	10.3	12.1	11.8	11.9	13.1	12.9	12.9
10	8.7	8.4	8.5	10.9	10.0	10.2	12.0	11.9	11.9	13.0	12.8	12.9
11	8.7	8.4	8.5	10.6	10.2	10.4	12.1	11.9	12.0	13.0	12.7	12.9
12	8.9	8.5	8.7	11.0	10.5	10.7	12.2	11.9	12.0	13.0	12.7	12.9
13	8.7	8.5	8.6	11.0	10.8	10.9	12.2	11.9	12.0	13.0	12.7	12.9
14	9.1	8.6	8.8	11.0	10.8	10.9	12.2	12.0	12.1	12.9	12.7	12.8
15	9.2	8.9	9.0	11.1	10.9	11.0	12.3	12.0	12.1	12.9	12.5	12.7
16	9.2	8.9	9.0	11.0	10.8	10.9	12.2	12.0	12.1	12.7	12.5	12.6
17	9.3	9.0	9.1	11.0	10.8	10.9	12.2	12.0	12.1	12.7	12.4	12.6
18	9.2	9.0	9.1	10.9	10.7	10.8	12.4	12.1	12.2	12.6	12.4	12.4
19	9.4	9.1	9.2	11.0	10.8	10.8	12.4	12.2	12.3	12.7	12.3	12.5
20	9.5	9.2	9.3	11.1	10.9	11.0	12.3	12.1	12.3	12.7	12.4	12.5
21	9.6	9.3	9.4	11.2	11.0	11.1	12.3	12.1	12.2	13.1	12.3	12.5
22	9.8	9.4	9.6	11.4	11.1	11.2	12.7	12.2	12.5	12.4	12.3	12.4
23	9.7	9.4	9.5	11.4	11.3	11.4	12.8	12.6	12.7	12.9	12.2	12.3
24	9.8	9.4	9.6	11.6	11.4	11.5	13.0	12.7	12.8	12.3	12.1	12.2
25	9.7	9.4	9.5	11.7	11.4	11.5	13.0	12.8	12.9	12.3	12.1	12.2
26	10.0	9.4	9.6	11.7	11.5	11.6	13.1	12.9	13.0	12.2	12.0	12.2
27	10.0	9.6	9.8	11.8	11.6	11.7	13.1	12.9	13.0	12.1	11.9	12.0
28	10.0	9.6	9.8	11.8	11.6	11.7	13.1	12.9	13.0	12.0	11.9	12.0
29	10.0	9.7	9.9	11.7	11.5	11.6	13.0	12.8	12.9	12.1	11.9	12.0
30	10.0	9.7	9.8	11.7	11.5	11.6	13.1	12.8	12.9	12.2	11.9	12.1
31	10.0	9.7	9.9	--	--	--	12.9	12.7	12.8	12.3	12.0	12.1
MONTH	10.0	7.8	8.9	11.8	9.8	10.8	13.1	11.5	12.3	13.2	11.9	12.6

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	12.2	12.0	12.1	13.0	12.7	12.8	13.3	12.8	13.1	10.7	10.5	10.6	
2	12.2	12.0	12.1	13.0	12.7	12.8	12.8	12.5	12.7	10.6	10.4	10.5	
3	12.3	12.0	12.1	12.9	12.7	12.8	12.6	12.4	12.5	10.6	10.3	10.4	
4	12.2	12.0	12.1	13.0	12.7	12.8	12.6	12.3	12.4	10.5	10.1	10.4	
5	12.3	12.0	12.1	13.1	12.7	12.9	12.4	12.2	12.3	10.4	10.0	10.1	
6	12.2	11.9	12.0	13.1	12.8	12.9	12.3	12.1	12.2	10.0	9.7	9.9	
7	12.2	11.9	12.1	13.1	12.8	12.9	12.1	11.9	12.0	9.8	9.5	9.7	
8	12.2	11.9	12.1	13.0	12.7	12.9	11.9	11.8	11.9	9.6	9.4	9.5	
9	12.4	11.9	12.1	13.0	12.6	12.8	11.9	11.7	11.8	9.6	9.4	9.5	
10	12.3	12.0	12.2	12.9	12.6	12.7	11.8	11.6	11.7	9.7	9.5	9.6	
11	12.2	11.9	12.1	13.0	12.6	12.8	11.6	11.4	11.5	9.6	9.4	9.5	
12	12.2	11.9	12.1	13.1	12.5	12.8	11.6	11.4	11.5	9.5	9.3	9.4	
13	12.3	12.1	12.1	12.8	12.5	12.7	11.6	11.4	11.5	9.4	9.0	9.1	
14	12.3	12.0	12.1	12.8	12.5	12.6	11.5	11.3	11.4	9.3	9.0	9.1	
15	12.8	11.9	12.2	12.8	12.5	12.6	11.4	11.2	11.3	9.3	9.0	9.2	
16	12.5	12.1	12.3	12.8	12.4	12.6	11.2	11.1	11.2	9.3	9.0	9.1	
17	12.5	12.3	12.3	12.9	12.5	12.7	11.2	11.0	11.1	9.1	8.8	9.0	
18	12.7	12.3	12.5	12.8	12.4	12.6	11.2	11.0	11.1	9.0	8.7	8.8	
19	12.8	12.5	12.6	12.7	12.4	12.6	11.1	10.9	11.0	8.9	8.7	8.8	
20	12.9	12.6	12.7	12.7	12.4	12.5	11.2	10.9	11.0	8.9	8.7	8.8	
21	13.0	12.6	12.8	12.7	12.4	12.5	10.9	10.4	10.7	8.7	8.3	8.5	
22	13.0	12.7	12.9	12.7	12.4	12.6	10.8	10.5	10.6	8.4	8.3	8.3	
23	13.0	12.8	12.9	12.8	12.5	12.6	10.8	10.6	10.7	8.5	8.2	8.3	
24	13.0	12.8	12.9	13.0	12.5	12.8	10.9	10.7	10.8	8.4	8.1	8.3	
25	12.9	12.7	12.8	13.0	12.7	12.8	10.8	10.5	10.7	8.4	8.1	8.2	
26	13.0	12.8	12.9	13.0	12.8	12.9	10.7	10.5	10.6	8.5	8.1	8.3	
27	13.0	12.7	12.8	13.2	12.8	13.0	10.8	10.5	10.6	8.5	8.1	8.3	
28	12.9	12.7	12.8	13.2	12.9	13.0	10.6	10.5	10.6	8.8	8.1	8.4	
29	--	--	--	13.3	13.0	13.1	10.7	10.4	10.6	8.8	8.5	8.6	
30	--	--	--	13.4	13.0	13.2	10.7	10.5	10.6	8.8	8.4	8.6	
31	--	--	--	13.3	13.1	13.2	--	--	--	8.7	8.3	8.5	
MONTH	13.0	11.9	12.4	13.4	12.4	12.8	13.3	10.4	11.4	10.7	8.1	9.1	

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI-Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	8.5	8.3	8.4	6.8	6.1	6.6	7.3	6.1	6.8	7.3	6.5	6.9
2	8.3	8.1	8.2	7.1	6.5	6.7	7.2	6.5	6.9	7.7	6.9	7.2
3	8.4	8.1	8.2	7.0	6.5	6.8	7.0	6.6	6.8	7.7	6.9	7.2
4	8.3	7.8	8.1	7.2	6.5	6.8	7.3	6.4	6.8	7.8	7.0	7.3
5	8.0	7.6	7.8	7.2	6.4	6.9	7.5	6.6	6.9	7.7	7.0	7.2
6	8.2	7.7	7.9	7.4	6.6	6.9	7.7	6.7	7.1	7.5	6.9	7.2
7	8.1	7.7	7.9	7.3	6.8	7.0	7.2	6.6	6.8	7.7	7.0	7.3
8	8.0	7.7	7.9	7.5	6.8	7.1	7.3	6.5	6.8	7.6	6.7	7.1
9	8.0	7.5	7.8	7.3	6.7	6.9	7.4	6.5	6.9	7.7	6.8	7.2
10	7.9	7.5	7.7	7.1	6.5	6.8	7.1	6.3	6.7	7.4	6.8	7.0
11	8.0	7.3	7.7	7.1	6.5	6.8	7.0	6.3	6.6	7.5	6.8	7.1
12	8.0	7.4	7.8	7.4	6.5	6.9	7.1	6.1	6.6	7.4	6.8	7.0
13	7.8	7.4	7.6	7.2	6.5	6.8	7.1	5.8	6.5	7.7	6.9	7.3
14	7.9	7.4	7.7	7.2	6.5	6.8	6.9	6.1	6.5	7.6	7.0	7.3
15	7.9	7.6	7.8	7.3	6.4	6.8	7.3	6.2	6.7	7.6	7.0	7.3
16	7.7	7.1	7.4	7.2	6.5	6.8	7.1	6.2	6.6	7.7	7.1	7.4
17	7.5	7.1	7.3	6.8	6.2	6.6	7.1	6.3	6.8	7.8	7.1	7.4
18	7.6	7.0	7.3	6.9	6.4	6.7	7.3	6.1	6.8	7.8	7.1	7.3
19	7.7	7.2	7.4	6.8	6.3	6.5	7.4	6.5	6.9	7.8	7.1	7.3
20	7.6	7.0	7.4	7.3	6.4	6.8	7.5	6.8	7.1	7.8	6.9	7.4
21	7.8	7.3	7.5	6.9	6.5	6.6	7.7	6.4	7.1	7.9	7.3	7.6
22	7.9	7.4	7.7	7.1	6.5	6.7	7.8	6.7	7.1	7.9	7.3	7.5
23	8.0	7.3	7.6	7.0	6.4	6.6	7.9	6.4	7.2	7.7	7.3	7.4
24	7.8	7.1	7.5	7.2	6.4	6.8	7.8	6.7	7.2	7.9	7.2	7.5
25	7.6	6.7	7.3	7.2	6.5	6.8	7.5	6.8	7.1	8.1	7.5	7.7
26	7.4	6.7	7.0	7.2	6.2	6.7	7.5	6.6	7.0	8.2	7.5	7.7
27	7.2	6.6	6.9	7.3	6.4	6.8	7.6	6.3	7.0	8.2	7.5	7.7
28	7.3	6.0	6.8	7.0	6.2	6.6	7.5	6.5	7.0	8.0	7.5	7.7
29	7.3	6.4	6.9	6.8	6.1	6.4	7.9	6.7	7.3	7.9	7.6	7.7
30	7.2	6.5	6.8	7.1	6.0	6.5	7.7	7.0	7.2	7.9	7.8	7.8
31	—	—	—	7.0	6.1	6.5	7.7	6.6	7.0	—	—	—
MONTH	8.5	6.0	7.6	7.5	6.0	6.7	7.9	5.8	6.9	8.2	6.5	7.4

STREAMS TRIBUTARY TO LAKE HURON

04142000 RIFLE RIVER NEAR STERLING, MI

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 Melita Road, 2.8 mi north of Sterling, and 20 mi upstream from mouth.

DRAINAGE AREA.--320 mi², approximately.

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 sea level. 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.--Records good except for estimated daily discharges, which are poor. Occasional regulation by dams upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	158	180	301	e195	e350	292	269	217	237	282	159	131
2	155	185	292	e195	e340	260	272	211	265	339	154	130
3	151	193	253	e195	e390	256	278	205	298	285	150	130
4	151	187	245	e195	e440	242	287	199	237	243	210	127
5	158	190	236	e195	e430	238	435	195	204	216	270	128
6	350	192	248	e195	e410	e210	405	197	191	211	196	129
7	902	184	434	e190	e400	e160	357	242	178	205	172	129
8	721	182	499	e190	e390	e200	335	233	167	185	170	129
9	376	218	356	e190	377	e230	314	224	162	396	167	129
10	267	338	283	e190	365	e210	282	211	161	400	169	129
11	230	649	245	e190	391	e200	278	198	178	271	181	130
12	214	487	236	e190	1200	e205	327	194	245	220	166	131
13	200	313	221	e190	1080	e210	521	194	236	200	172	140
14	194	262	215	e190	686	215	556	191	877	187	193	145
15	192	257	210	e190	550	222	424	187	1400	177	169	139
16	189	294	210	e190	473	256	389	184	955	170	161	135
17	187	355	209	e200	496	357	350	188	555	174	155	153
18	195	370	209	e250	450	484	310	230	442	204	150	154
19	195	331	209	e370	e350	453	290	232	330	191	145	152
20	187	292	213	e350	e300	397	272	207	271	197	150	155
21	185	259	212	e330	e260	382	260	196	238	183	145	161
22	186	240	e160	e320	e240	370	263	189	216	184	139	160
23	182	229	e180	e450	e220	335	298	189	203	221	137	161
24	181	218	e220	e600	e210	318	285	239	201	281	137	e159
25	179	215	e210	e700	e200	305	260	253	207	222	137	154
26	178	228	e200	e620	e210	288	249	253	193	187	142	144
27	177	231	e200	e560	e220	276	258	222	208	177	145	142
28	181	220	e195	e500	257	276	251	198	240	167	139	196
29	178	215	e195	e450	---	285	235	182	395	162	132	344
30	176	219	e195	e410	---	280	221	173	385	175	129	332
31	176	---	e195	e370	---	264	---	174	---	166	129	---
TOTAL	7351	7933	7486	9550	11685	8676	9531	6407	10075	6878	4970	4678
MEAN	237	264	241	308	417	280	318	207	336	222	160	156
MAX	902	649	499	700	1200	484	556	253	1400	400	270	344
MIN	151	180	160	190	200	160	221	173	161	162	129	127
CFSM	.74	.83	.75	.96	1.30	.87	.99	.65	1.05	.69	.50	.49
IN.	.85	.92	.87	1.11	1.36	1.01	1.11	.74	1.17	.80	.58	.54

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1999, BY WATER YEAR (WY)

	MEAN	241	293	287	254	289	561	639	391	288	195	181	205
MAX	741	826	579	538	741	1035	1160	859	842	335	339	712	
(WY)	1987	1993	1992	1973	1938	1991	1959	1983	1945	1969	1995	1986	
MIN	142	160	156	152	150	206	262	175	124	126	122	124	
(WY)	1964	1964	1964	1956	1956	1964	1945	1977	1964	1966	1964	1948	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1937 - 1999
ANNUAL TOTAL	107153	95220	
ANNUAL MEAN	294	261	(a)319
HIGHEST ANNUAL MEAN			501
LOWEST ANNUAL MEAN			166
HIGHEST DAILY MEAN	2340	1400	4500
LOWEST DAILY MEAN	129	127	98
ANNUAL SEVEN-DAY MINIMUM	130	129	105
INSTANTANEOUS PEAK FLOW		1520	(b)5340
INSTANTANEOUS PEAK STAGE		5.71	13.74
INSTANTANEOUS LOW FLOW		(c)101	(c)75
ANNUAL RUNOFF (CFSM)	.92	.82	1.00
ANNUAL RUNOFF (INCHES)	12.46	11.07	13.55
10 PERCENT EXCEEDS	565	402	561
50 PERCENT EXCEEDS	209	211	230
90 PERCENT EXCEEDS	139	153	150

(a) Does not include water year 1937.

(b) From rating curve extended above 3,800 ft³/s.

(c) Result of freezeup.

(e) Estimated.

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. Gage-height records 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 sea level. Prior to Oct. 15, 1933, at site 1.5 mi upstream at datum 5.46 ft higher.

REMARKS.--Records good except for estimated daily discharges, which are poor. Flow regulated below approximately 800 ft³/s by powerplant at Shiawassee town prior to February 1953; occasional regulation at low stages since. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	98	141	e98	548	233	244	945	108	346	112	94
2	26	129	172	e96	453	254	235	762	118	339	94	91
3	25	132	209	e100	474	267	240	632	123	408	80	84
4	25	137	196	e110	445	246	250	520	128	448	69	76
5	36	133	157	e105	397	243	243	484	130	401	59	69
6	62	108	171	e100	391	240	246	442	123	346	53	59
7	117	92	202	e100	375	194	259	394	113	316	66	57
8	91	87	189	e100	358	185	245	351	104	222	59	54
9	98	85	211	e100	344	240	304	324	96	228	49	52
10	103	135	223	e100	332	248	352	294	87	247	53	51
11	98	107	220	e105	324	239	397	230	87	236	53	51
12	93	147	205	e110	314	231	455	207	98	209	45	51
13	88	196	193	e110	300	230	424	228	88	161	62	50
14	84	179	182	e110	298	236	402	237	126	111	48	48
15	86	155	165	e110	286	228	381	232	170	95	45	44
16	85	125	159	e110	273	226	400	215	183	94	61	40
17	84	106	164	e150	255	260	420	202	164	90	77	37
18	83	83	177	e270	e240	473	441	207	130	82	86	36
19	79	99	183	e190	e220	502	438	210	113	113	79	35
20	78	110	185	e150	e180	495	e400	231	103	115	70	34
21	76	118	180	e200	e160	475	369	205	95	100	65	35
22	79	132	141	404	e160	427	727	161	89	102	62	33
23	72	140	115	983	e160	384	2200	197	83	125	64	33
24	66	145	e110	1370	e170	354	2260	169	111	235	68	34
25	70	144	e110	1090	e170	331	1830	152	79	313	75	30
26	78	141	e110	893	e170	314	1800	150	76	277	95	29
27	71	134	e105	908	e180	298	1910	139	117	240	97	28
28	61	134	e100	1040	217	281	1790	128	72	219	88	30
29	57	140	98	1020	---	268	1460	115	92	201	91	64
30	56	144	e100	869	---	260	1170	104	128	174	91	47
31	55	---	e100	666	---	251	---	112	---	138	92	---
TOTAL	2211	3815	4973	11867	8194	9113	22292	8979	3334	6731	2208	1476
MEAN	71.3	127	160	383	293	294	743	290	111	217	71.2	49.2
MAX	117	196	223	1370	548	502	2260	945	183	448	112	94
MIN	25	83	98	96	160	185	235	104	72	82	45	28
CFSM	.13	.24	.30	.71	.54	.55	1.38	.54	.21	.40	.13	.09
IN.	.15	.26	.34	.82	.57	.63	1.54	.62	.23	.47	.15	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

	195	263	318	356	456	765	725	455	275	167	121	143
MEAN	1442	985	922	1066	1728	1682	2060	1950	1051	868	578	922
MAX (WY)	1982	1993	1976	1993	1938	1948	1947	1956	1989	1994	1992	1975
MIN (WY)	32.6	52.1	56.6	66.9	65.5	119	162	119	34.0	24.0	13.2	25.0
	1964	1964	1964	1940	1940	1964	1931	1958	1934	1934	1931	1931

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1931 - 1999
ANNUAL TOTAL	126526	85193	
ANNUAL MEAN	347	233	355
HIGHEST ANNUAL MEAN			629
LOWEST ANNUAL MEAN			97.7
HIGHEST DAILY MEAN	2070	2260	5920
LOWEST DAILY MEAN	22	25	2.0
ANNUAL SEVEN-DAY MINIMUM	25	31	7.7
INSTANTANEOUS PEAK FLOW		2600	6240
INSTANTANEOUS PEAK STAGE		6.88	10.35
INSTANTANEOUS LOW FLOW			.20
ANNUAL RUNOFF (CFSM)	.64	.43	.66
ANNUAL RUNOFF (INCHES)	8.75	5.89	8.97
10 PERCENT EXCEEDS	974	431	800
50 PERCENT EXCEEDS	141	141	200
90 PERCENT EXCEEDS	51	57	65

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04146000 FARMERS CREEK NEAR LAPEER, MI

LOCATION.--Lat 43°02'41", long 83°20'14", in sec.6, T.7 N., R.10 E., Lapeer County, Hydrologic Unit 04080204, on left bank on grounds of Oakdale Regional Center for Developmental Disabilities, 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-78-1: Drainage area.

GAGE.--Water-stage recorder. Concrete control since Oct. 12, 1938. Datum of gage is 805.79 ft above sea level. Prior to May 25, 1954, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Prior to 1941, occasional regulation caused by dam upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.5	17	11	e8.6	42	22	19	53	7.1	27	4.8	2.8
2	2.8	16	12	e8.4	e38	24	19	46	7.4	34	4.0	2.7
3	14	15	13	e8.2	e32	28	18	31	7.8	40	3.1	2.6
4	11	41	12	e8.4	e28	30	18	18	8.7	41	2.6	3.2
5	4.2	25	12	e8.7	e27	27	20	14	8.1	35	2.3	2.8
6	1.9	17	12	8.6	e26	e25	21	14	7.2	27	2.2	2.1
7	2.1	13	21	e8.7	e25	e23	21	15	6.7	20	2.0	2.2
8	1.9	10	34	e8.7	e24	e21	21	14	5.7	14	2.5	2.2
9	1.7	7.8	28	e8.6	e23	e19	20	20	5.3	10	2.1	2.1
10	2.8	7.4	27	e8.6	e22	e19	20	20	5.1	8.9	2.4	2.0
11	2.8	8.4	24	8.7	e22	e19	22	15	5.2	8.0	2.4	2.1
12	2.7	12	22	e9.0	e22	e19	25	14	4.4	6.9	2.1	1.9
13	2.7	12	19	e9.0	e22	e18	26	13	4.2	5.6	3.4	1.9
14	3.1	14	17	e9.0	e21	e18	26	12	6.0	5.4	3.5	1.6
15	18	13	16	e9.0	e21	18	25	11	8.9	5.2	3.7	1.4
16	25	11	14	e9.2	e20	19	26	9.5	9.9	5.4	3.2	1.8
17	21	10	11	e9.4	e19	22	27	9.4	12	3.9	3.0	1.4
18	20	10	11	e10	e19	28	28	11	14	3.9	2.8	1.2
19	17	11	11	e17	e18	33	27	14	8.9	3.5	2.8	1.2
20	24	9.9	11	e15	e17	36	26	15	6.3	3.4	2.8	1.1
21	27	9.3	e11	e14	e16	37	25	15	5.0	3.2	2.9	1.1
22	25	9.2	e11	e20	e15	38	35	14	4.4	3.6	2.7	.97
23	30	17	e10	49	e15	36	69	16	3.9	4.5	2.5	.95
24	32	9.8	e9.6	67	e15	33	82	18	3.3	11	2.7	1.4
25	28	8.7	e9.2	99	e15	31	113	16	12	9.4	3.0	1.3
26	25	10	e9.0	141	e16	28	149	14	6.0	8.3	3.7	1.1
27	25	10	e9.4	130	e17	26	134	13	6.7	8.1	3.5	1.2
28	27	12	e9.2	104	19	24	97	12	8.1	7.1	2.9	1.3
29	21	12	e9.2	77	---	22	78	12	13	6.7	3.1	3.2
30	19	11	e9.2	59	---	21	64	9.6	16	6.4	3.2	4.6
31	18	---	e9.0	49	---	20	---	8.1	---	5.7	2.9	---
TOTAL	458.2	389.5	443.8	999.8	616	784	1301	516.6	227.3	382.1	90.8	57.42
MEAN	14.8	13.0	14.3	32.3	22.0	25.3	43.4	16.7	7.58	12.3	2.93	1.91
MAX	32	41	34	141	42	38	149	53	16	41	4.8	4.6
MIN	1.7	7.4	9.0	8.2	15	18	18	8.1	3.3	3.2	2.0	.95
CFSM	.27	.23	.26	.58	.40	.46	.78	.30	.14	.22	.05	.03
IN.	.31	.26	.30	.67	.41	.53	.88	.35	.15	.26	.06	.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1933 - 1999, BY WATER YEAR (WY)

	MEAN	19.1	25.6	29.2	32.6	42.8	73.9	69.6	39.1	22.8	11.0	9.09	15.2
MAX	134	101	93.3	132	174	154	226	226	188	127	48.8	49.8	226
(WY)	1987	1986	1951	1973	1938	1948	1947	1956	1943	1994	1937	1985	
MIN	2.36	3.84	3.99	3.58	5.62	14.2	19.2	7.49	2.12	1.60	1.48	.89	
(WY)	1939	1939	1964	1940	1940	1964	1946	1988	1988	1941	1944	1941	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1933 - 1999

ANNUAL TOTAL	11457.8	6266.52	
ANNUAL MEAN	31.4	17.2	(a)32.4
HIGHEST ANNUAL MEAN			71.7
LOWEST ANNUAL MEAN			9.05
HIGHEST DAILY MEAN	235	149	1300
LOWEST DAILY MEAN	1.6	.95	.26
ANNUAL SEVEN-DAY MINIMUM	2.1	1.1	.50
INSTANTANEOUS PEAK FLOW		159	1380
INSTANTANEOUS PEAK STAGE		16.77	(b)20.95
INSTANTANEOUS LOW FLOW		(c).71	.14
ANNUAL RUNOFF (CFSM)	.57	.31	.59
ANNUAL RUNOFF (INCHES)	7.71	4.22	7.96
10 PERCENT EXCEEDS	83	31	74
50 PERCENT EXCEEDS	12	12	17
90 PERCENT EXCEEDS	2.9	2.5	3.8

(a) Does not include water year 1933.

(b) From floodmark.

(c) Result of freezeup.

(d) Jan. 1, 2.

(e) Estimated.

(f) Sept. 16, 18, 1970.

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 sea level, from topographic map. Jan. 9, 1996 to Jan. 15, 1997, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	45	67	e48	283	128	88	170	51	110	34	16
2	34	44	66	e48	237	133	87	151	54	198	27	14
3	34	42	67	e48	171	127	90	135	54	179	25	13
4	43	41	62	e48	171	130	94	114	50	163	25	13
5	37	69	58	e50	157	119	113	99	49	149	21	12
6	34	51	61	e52	154	109	118	90	45	113	17	13
7	37	42	107	e54	147	e105	109	90	35	82	26	47
8	37	39	128	e52	139	e100	97	85	36	67	43	57
9	40	37	122	e50	132	e98	93	83	36	62	36	42
10	39	41	104	e50	131	e94	94	87	41	56	39	34
11	37	60	87	e50	132	e92	102	78	36	53	37	27
12	34	65	77	e52	e130	e90	140	74	35	49	30	22
13	33	64	70	e54	e130	e90	143	71	38	46	33	24
14	33	58	65	e54	129	89	132	68	68	40	49	26
15	35	54	59	e54	123	89	114	65	68	38	43	22
16	46	49	56	e54	115	91	110	61	63	37	40	20
17	46	46	55	e54	115	112	121	58	52	37	33	18
18	43	45	52	e58	114	159	124	71	51	52	26	18
19	44	44	52	e120	109	179	119	76	45	35	21	16
20	44	45	52	e100	98	177	111	76	39	33	19	15
21	61	46	53	e90	92	164	101	70	34	34	17	17
22	60	43	52	e80	e88	150	128	63	28	36	17	20
23	52	43	e50	e200	e88	140	333	64	22	36	17	21
24	57	52	e50	455	e86	129	530	86	21	73	19	27
25	61	44	e50	541	e87	120	574	81	34	83	34	24
26	56	51	e50	e450	89	113	530	82	43	67	40	25
27	53	64	e52	e340	93	106	478	73	38	60	42	25
28	54	69	e53	e470	99	101	366	64	71	55	36	29
29	56	66	e54	e350	---	97	251	60	75	50	26	44
30	49	65	e52	e360	---	93	200	57	78	44	22	71
31	46	---	e49	324	---	91	---	52	---	40	19	---
TOTAL	1370	1524	2032	4810	3639	3615	5690	2554	1390	2177	913	772
MEAN	44.2	50.8	65.5	155	130	117	190	82.4	46.3	70.2	29.5	25.7
MAX	61	69	128	541	283	179	574	170	78	198	49	71
MIN	33	37	49	48	86	89	87	52	21	33	17	12
CFSM	.20	.23	.30	.70	.59	.53	.86	.37	.21	.32	.13	.12
IN.	.23	.26	.34	.81	.61	.61	.96	.43	.23	.37	.15	.13

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1980 - 1999, BY WATER YEAR (WY)

MEAN	150	183	181	183	224	345	320	167	128	78.5	66.8	127
MAX	583	474	349	354	485	712	630	327	325	206	166	635
(WY)	1987	1986	1988	1993	1985	1985	1985	1996	1996	1994	1992	1985
MIN	44.2	50.8	65.5	73.1	89.4	117	190	82.4	31.2	39.1	29.5	25.7
(WY)	1999	1999	1999	1981	1982	1999	1999	1999	1988	1988	1999	1999

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1980 - 1999
ANNUAL TOTAL	52064	30486	178
ANNUAL MEAN	143	83.5	295
HIGHEST ANNUAL MEAN			83.5
LOWEST ANNUAL MEAN			1999
HIGHEST DAILY MEAN	1060	574	2950
LOWEST DAILY MEAN	24	12	12
ANNUAL SEVEN-DAY MINIMUM	25	14	14
INSTANTANEOUS PEAK FLOW		592	(a)3090
INSTANTANEOUS PEAK STAGE		3.98	(b)9.61
INSTANTANEOUS LOW FLOW		11	11
ANNUAL RUNOFF (CFSM)	.65	.38	.81
ANNUAL RUNOFF (INCHES)	8.76	5.13	10.96
10 PERCENT EXCEEDS	358	141	362
50 PERCENT EXCEEDS	61	56	120
90 PERCENT EXCEEDS	32	26	46

(a) Gage height 9.60 ft.

(b) Backwater from ice.

(c) Sept. 2, 4, 5, 6, 1999.

(e) Estimated.

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 September 1989, October 1990 to current year.

REVISED RECORDS.--WDR MI-78-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 721.39 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated by Holloway Reservoir, 1.5 mi upstream from station. From 1954 to 1991 annual mean discharge and runoff figures adjusted for change in contents in Holloway Reservoir. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	63	e83	90	87	507	187	166	98	117	118	69	62
2	49	e82	87	87	462	213	181	61	117	152	61	61
3	30	e84	88	91	433	239	93	61	117	190	56	60
4	30	e86	88	87	416	245	95	62	116	212	55	60
5	30	88	88	87	399	251	96	62	109	210	53	59
6	32	88	89	87	385	254	224	63	102	190	52	58
7	34	89	92	86	353	210	546	66	96	157	53	69
8	30	91	90	86	282	193	542	67	91	138	54	77
9	19	90	70	85	285	204	393	68	95	120	52	77
10	19	92	49	85	281	204	159	57	110	112	53	80
11	20	93	50	85	278	193	161	25	106	100	52	79
12	20	106	52	87	284	189	235	25	105	94	51	78
13	71	136	68	90	288	187	454	29	106	86	53	77
14	154	174	84	89	288	184	509	29	106	79	57	77
15	172	172	91	88	282	179	235	28	104	73	55	77
16	160	162	123	90	273	180	85	26	104	68	53	77
17	118	151	132	90	266	193	87	26	104	68	52	78
18	118	150	130	98	224	238	88	27	99	71	52	78
19	108	127	122	107	114	312	90	28	98	68	51	78
20	96	109	128	113	138	366	91	29	93	67	49	77
21	98	109	119	120	147	392	92	31	88	66	49	78
22	89	109	105	142	142	391	96	41	82	64	47	78
23	e80	109	104	190	143	372	384	46	78	67	45	77
24	e78	109	102	291	147	348	1080	69	74	74	48	77
25	e78	104	102	513	154	320	1080	86	72	83	48	77
26	e79	95	99	671	153	291	1130	111	72	86	48	77
27	e80	95	96	649	151	267	1350	126	73	87	49	78
28	e86	95	93	678	166	244	1360	134	77	83	51	76
29	e82	95	93	686	---	219	1180	136	87	79	51	76
30	e82	95	93	642	---	209	557	132	94	75	58	75
31	e82	---	90	576	---	172	---	122	---	71	62	---
TOTAL	2287	3270	2907	6963	7441	7646	12839	1971	2892	3208	1639	2208
MEAN	73.8	109	93.8	225	266	247	428	63.6	96.4	103	52.9	73.6
MAX	172	174	132	688	507	392	1360	136	117	212	69	80
MIN	19	82	49	85	114	172	85	25	72	64	45	58

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1999, BY WATER YEAR (WY)

	MEAN	217	279	309	305	391	802	653	377	258	167	131	214
MAX	1688	911	900	1153	1123	1984	1549	1789	1668	839	369	1507	
(WY)	1987	1993	1988	1973	1968	1976	1960	1956	1996	1994	1994	1986	
MIN	59.4	19.1	14.0	49.7	66.4	76.5	175	43.6	20.3	47.4	36.3	42.3	
(WY)	1966	1972	1972	1961	1964	1964	1964	1977	1977	1977	1977	1954	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1953 - 1999

ANNUAL TOTAL	127816		55271										
ANNUAL MEAN	350		151										
HIGHEST ANNUAL MEAN										342			
LOWEST ANNUAL MEAN										638			1985
HIGHEST DAILY MEAN										82.7			1964
LOWEST DAILY MEAN	2300						1360		Apr 28	7240		Jun 24	1996
ANNUAL SEVEN-DAY MINIMUM	19						19		Oct 9	2.1		Oct 11	1971
INSTANTANEOUS PEAK FLOW	25						25		Oct 6	3.6		Dec 1	1971
INSTANTANEOUS PEAK STAGE							1450		Apr 27	7470		Jun 24	1996
INSTANTANEOUS LOW FLOW							8.86		Apr 27	15.73		Jun 24	1996
10 PERCENT EXCEEDS	1010						19		(a)	2.1		(b)	
50 PERCENT EXCEEDS	116						289			789			
90 PERCENT EXCEEDS	69						91			180			
							51			65			

(a) Oct. 8-10.

(b) Oct. 11, 12, 1971.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04148140 KEARSLEY CREEK NEAR DAVISON, MI

LOCATION.--Lat 43°02'01", long 83°34'53", in NE1/4 sec.12, T.7 N., R.7 E., Genesee County, Hydrologic Unit 04080204, on right bank 10 ft upstream from bridge on Davison Road, 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-78-1: Drainage area. WDR MI-85-1: 1968(M), 1973(M), 1975, 1982(P).

GAGE.--Water-stage recorder. Datum of gage is 747.39 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are poor. Some diurnal fluctuation caused by small dams, and occasional diversion for irrigation upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.3	7.3	16	9.7	e72	43	37	79	14	126	14	£.1
2	3.5	8.6	11	9.4	e66	43	35	62	26	165	12	7.2
3	3.6	7.0	12	e9.9	e62	50	35	54	25	169	11	£.5
4	3.5	11	13	e10	e58	49	41	49	21	138	11	£.9
5	3.5	17	14	e9.9	e56	48	42	44	17	108	10	£.5
6	3.5	15	22	e9.6	e52	40	42	42	15	75	9.0	£.4
7	26	13	40	e9.6	e48	e38	46	41	12	53	12	£.5
8	8.1	11	29	e9.6	e45	e38	46	42	11	31	16	£.1
9	7.5	9.3	37	e9.4	e44	e39	47	41	14	30	12	4.8
10	8.9	20	38	e9.4	e44	e39	43	38	18	27	13	4.7
11	7.9	15	33	e10	e43	e37	46	34	11	25	13	4.5
12	6.6	16	29	e10	e42	e36	53	26	9.0	26	12	4.1
13	5.6	26	26	e11	e41	e35	53	24	28	23	18	4.8
14	5.2	27	20	e10	e41	e36	54	23	39	18	17	4.9
15	4.5	24	15	e10	e40	e37	49	21	32	14	22	4.4
16	4.2	19	12	e11	e40	e42	51	21	33	8.9	25	4.2
17	5.8	16	9.6	e16	e38	65	49	21	32	13	21	4.1
18	11	13	8.9	e25	e28	84	50	25	24	11	16	£.7
19	9.1	11	8.7	e18	e24	80	48	17	17	9.0	13	£.8
20	9.8	10	9.6	e15	e24	81	46	26	14	9.1	12	£.6
21	9.9	9.6	13	e30	e24	76	44	40	12	9.7	9.8	£.7
22	11	9.2	14	e60	e24	72	e128	33	9.6	15	8.4	13
23	11	9.3	11	e140	e25	67	e336	28	8.3	29	8.3	17
24	10	10	e11	e110	e26	62	e350	40	7.3	56	9.9	10
25	9.3	11	e10	e100	e26	57	318	26	7.1	46	11	£.2
26	8.8	14	e10	e100	e26	50	323	26	6.6	44	13	£.3
27	9.8	9.5	9.9	e100	31	45	264	24	14	39	16	£.6
28	11	14	9.5	e100	46	42	178	21	15	30	20	£.7
29	9.6	16	8.9	e96	—	40	142	18	43	26	16	18
30	8.5	15	8.0	e88	—	38	118	15	42	23	12	13
31	7.3	—	7.1	e80	—	37	—	14	—	18	9.7	—
TOTAL	248.3	413.8	516.2	1236.5	1136	1546	3114	1015	576.9	1414.7	423.1	19C.3
MEAN	8.01	13.8	16.7	39.9	40.6	49.9	104	32.7	19.2	45.6	13.6	6.34
MAX	26	27	40	140	72	84	350	79	43	169	25	18
MIN	3.5	7.0	7.1	9.4	24	35	35	14	6.6	8.9	8.3	£.6
CFSM	.08	.14	.17	.40	.41	.50	1.04	.33	.19	.46	.14	.06
IN.	.09	.15	.19	.46	.43	.58	1.17	.38	.22	.53	.16	.07

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1999, BY WATER YEAR (WY)

	MEAN	42.7	61.7	74.9	72.9	95.3	167	157	77.8	48.9	28.0	21.2	43.2
MAX	236	181	213	192	294	317	350	200	159	93.2	107	314	
(WY)	1982	1986	1976	1973	1976	1973	1975	1974	1996	1994	1975	1985	
MIN	8.01	13.8	16.7	15.6	24.3	49.9	80.9	24.7	7.39	5.48	5.83	6.34	
(WY)	1999	1999	1999	1970	1970	1999	1966	1977	1988	1966	1966	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1966 - 1999

ANNUAL TOTAL	22066.8	11830.8	74.1	
ANNUAL MEAN	60.5	32.4		
HIGHEST ANNUAL MEAN			122	1985
LOWEST ANNUAL MEAN			32.4	1979
HIGHEST DAILY MEAN	493	350	1370	Sep 9 1985
LOWEST DAILY MEAN	3.1	2.6	2.1	Jul 7 1988
ANNUAL SEVEN-DAY MINIMUM	3.4	3.9	2.3	Jul 5 1988
INSTANTANEOUS PEAK FLOW		(a)	1500	Sep 9 1985
INSTANTANEOUS PEAK STAGE		(a)	(b)11.85	Sep 9 1985
INSTANTANEOUS LOW FLOW		2.2	1.6	Jul 9 1985
ANNUAL RUNOFF (CFSM)	.61	.33	.75	
ANNUAL RUNOFF (INCHES)	8.26	4.43	10.12	
10 PERCENT EXCEEDS	187	62	170	
50 PERCENT EXCEEDS	16	18	40	
90 PERCENT EXCEEDS	5.5	6.8	11	

(a) Not determined.

(b) From floodmark.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04148500 FLINT RIVER NEAR FLINT, MI

LOCATION.—Lat 43°02'20", long 83°46'18", 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 from 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-78-1: Drainage area.

GAGE.—Water-stage recorder. Datum of gage is 678.80 ft above sea level (levels by the National Weather Service and City of Flint).

REMARKS.—Records good except for estimated daily discharges, which are fair. Some regulation by small reservoirs upstream from station and by Holloway Reservoir. From 1954 to 1991 annual mean discharge and runoff figures adjusted for change in contents in Holloway Reservoir. Occasional diversion for industrial use. Since Dec. 17, 1967, flow contains up to 50 ft³/s as sewage effluent which originates outside the basin. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	104	130	211	152	794	385	309	586	388	894	143	102
2	97	132	172	140	783	376	e280	403	583	e700	138	103
3	86	138	167	180	744	455	e270	345	317	527	125	103
4	78	122	169	171	690	437	e250	317	250	529	128	100
5	78	122	198	159	634	448	e240	284	218	492	112	94
6	89	129	297	159	610	455	e257	290	197	431	107	92
7	582	130	518	157	570	389	447	265	184	344	164	96
8	155	135	246	155	493	367	691	241	173	292	202	100
9	112	133	204	159	471	369	817	232	e240	363	120	120
10	89	320	187	159	472	376	624	228	345	276	126	170
11	78	263	165	155	466	368	445	205	222	212	115	170
12	77	196	153	168	457	361	483	185	241	192	114	169
13	79	192	156	175	456	347	537	177	391	173	220	164
14	102	222	157	167	439	350	699	157	450	161	149	126
15	197	251	158	166	444	354	718	135	285	148	120	110
16	216	258	181	169	440	373	490	126	247	140	119	132
17	192	240	213	182	434	461	376	e115	232	349	123	106
18	187	227	214	412	421	648	394	e105	205	253	119	103
19	179	216	205	274	312	640	340	e100	187	171	114	102
20	151	191	205	245	256	659	314	e100	174	149	109	105
21	145	180	219	249	263	677	296	113	165	160	102	109
22	132	171	198	277	263	664	1270	132	158	163	93	103
23	121	167	188	1560	266	622	3220	209	144	466	109	e105
24	121	182	174	1380	262	600	3220	325	152	844	135	e110
25	121	200	172	1010	287	538	2550	208	159	340	157	111
26	126	225	170	1150	284	486	2040	214	134	254	137	101
27	125	173	169	1080	279	446	2110	216	213	213	126	106
28	134	164	167	1110	402	413	2130	224	193	196	114	172
29	129	164	172	1100	—	380	1790	221	388	181	111	548
30	133	175	163	993	—	366	1370	204	240	170	102	253
31	133	—	158	887	—	341	—	230	—	154	101	—
TOTAL	4348	5548	6126	15100	12692	14151	28967	6892	7475	9937	3954	4085
MEAN	140	185	198	487	453	456	966	222	249	321	128	136
MAX	582	320	518	1560	794	677	3220	586	583	894	220	548
MIN	77	122	153	140	256	341	240	100	134	140	93	92

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 1999, BY WATER YEAR (WY)

MEAN	348	471	551	601	790	1512	1317	758	486	274	234	344
MAX	2764	1734	1739	2008	2867	3514	4209	3575	2512	1294	868	2635
(WY)	1987	1993	1976	1973	1938	1985	1947	1956	1996	1994	1975	1986
MIN	60.6	69.9	70.8	84.8	87.6	187	335	110	81.3	56.1	31.3	45.9
(WY)	1936	1965	1964	1940	1940	1964	1946	1958	1934	1936	1936	1941

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1932 - 1999

ANNUAL TOTAL	233696					119275				639		
ANNUAL MEAN	640					327				1258		1985
HIGHEST ANNUAL MEAN										153		1964
LOWEST ANNUAL MEAN												
HIGHEST DAILY MEAN	4350				Jan 9	3220		Apr 23	14500		Aug 6 1947	
LOWEST DAILY MEAN	77				Oct 12	77		Oct 12	14		Aug 7 1934	
ANNUAL SEVEN-DAY MINIMUM	90				Sep 30	98		Sep 2	23		Aug 14 1936	
INSTANTANEOUS PEAK FLOW						3870		Apr 23	14900		Aug 6 1947	
INSTANTANEOUS PEAK STAGE						9.36		Apr 23	16.95		Sep 6 1985	
INSTANTANEOUS LOW FLOW						68		Oct 11	9.0		Aug 7 1934	
10 PERCENT EXCEEDS	1910					628			1490			
50 PERCENT EXCEEDS	213					204			339			
90 PERCENT EXCEEDS	130					109			101			

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

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-78-1: Drainage area.

GAGE.—Water-stage recorder. Datum of gage is 583.96 ft above sea level (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 Sept. 11, 1935, nonrecording gage, Sept. 12, 1935 to Sept. 30, 1936, and June 20, 1939 to Sept. 30, 1949, water-stage recorder, at site 3,600 ft downstream at datum 0.04 ft higher.

REMARKS.—Records good except for estimated daily discharges, which are fair. Occasional regulation by dams upstream from station. Prior to 1950, regulation at low and medium flows by mill upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	44	49	76	e50	450	281	205	410	168	189	163	41
2	56	49	79	e45	412	348	199	360	165	349	127	3
3	50	50	77	e40	422	353	198	320	209	365	94	37
4	46	54	78	e45	471	368	197	250	260	494	80	3
5	44	52	82	e50	499	324	217	267	210	608	69	3
6	46	49	91	e52	498	e250	240	251	170	377	63	31
7	66	49	131	e54	434	e180	253	251	145	258	61	3
8	65	50	154	e55	378	e180	241	234	123	182	66	2
9	56	52	144	e55	350	e150	236	222	106	155	59	27
10	57	66	137	e55	342	e150	230	206	97	143	60	27
11	59	88	121	e55	361	e155	231	190	90	121	60	27
12	60	106	108	e55	404	e160	309	180	85	104	58	27
13	61	96	97	e55	e370	e170	363	174	103	90	60	2
14	58	86	90	e55	e350	e190	360	165	127	76	59	2
15	53	81	84	e55	312	222	329	154	126	68	54	2
16	51	79	81	e60	333	245	319	147	112	63	51	2
17	51	75	81	e65	306	345	368	182	120	71	50	27
18	51	72	81	107	282	652	379	272	110	75	48	27
19	49	68	80	117	259	960	364	302	94	70	46	2
20	49	73	80	127	e200	738	342	301	83	71	44	2
21	48	77	81	129	e140	561	314	261	75	73	42	3
22	47	71	e70	159	e110	471	429	217	68	77	40	41
23	47	68	e50	466	e100	411	1990	199	63	111	39	3
24	47	68	e54	1100	e110	374	3240	262	75	170	40	3
25	47	67	e55	1580	e120	338	2060	275	99	149	49	3
26	47	69	e56	1490	e140	304	1370	312	83	105	72	3
27	48	69	e58	1030	153	277	1000	335	99	68	60	3
28	47	68	e57	878	189	256	755	296	98	71	51	4
29	46	68	e56	771	—	242	586	252	104	66	47	8
30	48	71	e55	644	—	228	479	212	87	96	44	10
31	48	—	e53	537	—	215	—	185	—	240	43	—
TOTAL	1592	2040	2597	10036	8495	10078	17803	7684	3554	5155	1899	108
MEAN	51.4	68.0	83.8	324	303	325	593	248	118	166	61.3	36.3
MAX	66	106	154	1580	499	960	3240	410	260	608	163	10
MIN	44	49	50	40	100	150	197	147	63	39	39	2
CFSM	.06	.08	.10	.38	.36	.39	.71	.29	.14	.20	.07	.0
IN.	.07	.09	.11	.44	.38	.45	.79	.34	.16	.23	.08	.0

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1908 - 1999, BY WATER YEAR (WY)

MEAN	227	335	428	461	653	1658	1171	655	378	191	104	23
MAX	2637	1374	1335	2185	2657	4943	3122	2715	3217	1884	523	500
(WY)	1987	1993	1985	1973	1997	1976	1947	1996	1996	1994	1953	198
MIN	31.7	43.1	50.7	45.1	55.6	179	202	104	60.4	20.4	20.1	23.5
(WY)	1947	1965	1940	1959	1959	1964	1946	1941	1964	1936	1944	1941

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1908 - 199

ANNUAL TOTAL	209197	72021	537
ANNUAL MEAN	573	197	1063
HIGHEST ANNUAL MEAN			96.6
LOWEST ANNUAL MEAN			21700
HIGHEST DAILY MEAN	9030	3240	(a)1.5
LOWEST DAILY MEAN	28	24	4.4
ANNUAL SEVEN-DAY MINIMUM	31	27	22200
INSTANTANEOUS PEAK FLOW		3500	27.52
INSTANTANEOUS LOW FLOW		13.74	
ANNUAL RUNOFF (CFSM)	.68	.23	.64
ANNUAL RUNOFF (INCHES)	9.25	3.19	8.67
10 PERCENT EXCEEDS	1430	378	1260
50 PERCENT EXCEEDS	108	96	188
90 PERCENT EXCEEDS	41	44	48

(a) Approximately.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04152238 SOUTH BRANCH TOBACCO RIVER NEAR BEAVERTON, MI

LOCATION.--Lat 43°52'01", long 84°32'43", in SE1/4 NE1/4 sec.16, T.17 N., R.2 W., Gladwin County, Hydrologic Unit 04080201, on left bank 40 ft upstream from bridge on Grout Road, 3.0 mi upstream from Ross Lake, and 3.2 mi southwest of Beaverton.

DRAINAGE AREA.--160 mi².

PERIOD OF RECORD.--January 1987 to current year.

GAGE.--Water-stage recorder. Datum of gage is 709.92 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	89	91	e70	e125	126	97	74	288	68	54	39
2	59	84	98	e70	e120	130	97	71	260	80	54	38
3	55	78	91	e68	e135	122	97	69	190	74	58	38
4	54	72	86	e68	e150	116	97	67	129	68	58	38
5	55	72	89	e68	e145	113	171	65	99	64	58	39
6	89	70	105	e65	e140	e110	193	65	84	61	55	38
7	245	66	149	e65	e135	e105	160	74	75	61	52	37
8	188	63	204	e65	e130	e100	133	75	68	56	51	36
9	122	63	152	e65	e140	e95	125	75	63	78	51	36
10	86	78	122	e65	180	e90	142	72	60	110	51	36
11	79	285	108	e65	194	e85	148	66	e75	92	66	36
12	75	240	100	e63	405	e80	317	66	e150	73	55	36
13	74	152	95	e63	511	e80	305	79	e250	68	58	37
14	70	115	91	e63	290	e85	223	82	e450	58	76	40
15	67	99	87	e62	217	96	171	72	493	54	63	39
16	66	96	92	e62	184	105	145	68	253	53	56	38
17	66	103	87	e70	184	139	130	72	167	53	53	37
18	74	106	84	e75	179	189	123	109	130	58	52	38
19	90	99	82	e105	156	182	114	126	101	57	53	38
20	86	94	82	e130	e135	154	109	107	87	61	52	40
21	80	89	80	e125	e125	146	105	86	80	62	49	43
22	76	85	e80	e125	e115	139	107	75	71	103	47	43
23	73	83	e77	e150	e110	127	134	72	64	100	45	42
24	72	81	e75	e210	e105	119	136	92	64	104	47	44
25	70	78	e75	e240	e100	114	117	94	66	87	49	46
26	69	78	e75	e230	e100	110	104	89	63	79	51	45
27	68	79	e73	e215	e100	104	95	80	69	79	48	44
28	67	76	e73	e200	102	103	88	71	87	59	41	59
29	69	74	e70	e180	---	102	83	67	77	57	38	140
30	75	76	e70	e160	---	101	78	61	71	69	38	231
31	85	---	e70	e130	---	98	---	64	---	59	38	---
TOTAL	2562	2923	2913	3392	4712	3564	4144	2405	4184	2205	1617	1491
MEAN	82.6	97.4	94.0	109	168	115	138	77.6	139	71.1	52.2	49.7
MAX	245	285	204	240	511	189	317	126	493	110	76	231
MIN	54	63	70	62	100	80	78	61	60	53	38	36
CFSM	.52	.61	.69	.68	1.05	.72	.86	.48	.87	.44	.33	.31
IN.	.60	.68	.68	.79	1.10	.83	.96	.56	.97	.51	.38	.35

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1999, BY WATER YEAR (WY)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
MEAN	108	155	129	113	127	218	229	134	122	73.0	73.9	73.6	73.6
MAX	202	364	253	176	190	296	478	219	282	92.3	86.6	127	127
(WY)	1991	1993	1992	1993	1998	1991	1991	1996	1996	1992	1996	1992	1992
MIN	67.6	82.3	61.2	67.6	74.4	115	115	77.6	57.2	49.5	52.2	49.7	49.7
(WY)	1995	1990	1990	1994	1993	1999	1987	1999	1988	1988	1999	1999	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1987 - 1999

ANNUAL TOTAL	42629	36112	131
ANNUAL MEAN	117	98.9	98.9
HIGHEST ANNUAL MEAN			184
LOWEST ANNUAL MEAN			184
HIGHEST DAILY MEAN	984	511	1340
LOWEST DAILY MEAN	37	36	36
ANNUAL SEVEN-DAY MINIMUM	39	36	36
INSTANTANEOUS PEAK FLOW		550	(a)1450
INSTANTANEOUS PEAK STAGE		7.80	(b)11.06
INSTANTANEOUS LOW FLOW		36	36
ANNUAL RUNOFF (CFSM)	.73	.62	.82
ANNUAL RUNOFF (INCHES)	9.91	8.40	11.15
10 PERCENT EXCEEDS	235	169	231
50 PERCENT EXCEEDS	80	80	92
90 PERCENT EXCEEDS	47	49	60

(a) Gage height 10.74 ft.

(b) Backwater from ice.

(c) Sept. 8-12.

(d) Aug. 3, 1998, Sept. 8-12, 1999.

(e) Estimated.

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. 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 710.88 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Oct. 21, 1938, nonrecording gage at site 30 ft upstream at present datum.

REMARKS.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	141	196	233	e180	306	275	248	266	482	247	e190	127
2	137	194	239	e180	305	289	245	255	546	241	e180	125
3	132	188	237	e180	364	301	245	247	518	248	e170	122
4	132	182	234	e180	362	293	279	239	492	251	e165	118
5	141	181	242	e180	363	284	395	236	446	227	165	118
6	241	179	246	e170	324	275	447	244	398	219	159	117
7	367	178	352	e170	323	268	454	262	354	213	157	116
8	336	178	373	e170	306	259	428	265	311	206	166	114
9	306	179	361	e170	313	249	415	269	263	263	161	112
10	260	253	331	e170	391	255	406	260	245	265	175	112
11	229	371	301	e165	382	247	462	249	302	262	177	112
12	210	400	284	e165	549	238	652	247	250	240	174	108
13	200	378	266	e160	592	234	620	259	262	217	180	122
14	188	331	254	e160	568	234	576	260	531	199	192	119
15	181	292	245	e160	515	236	517	264	526	188	195	118
16	176	266	231	e160	472	243	460	259	625	178	191	116
17	180	255	227	e180	453	303	421	316	648	170	181	113
18	206	243	226	e210	425	385	389	370	562	194	167	112
19	208	239	225	e270	391	379	366	398	461	202	162	111
20	200	240	219	e340	359	375	344	402	393	201	160	114
21	195	230	215	e330	325	367	322	378	335	196	153	116
22	186	225	e210	e320	298	355	359	349	282	197	146	110
23	180	220	e200	e400	270	331	503	335	248	e448	144	112
24	176	215	e200	e540	267	311	517	350	235	e370	143	126
25	172	208	e200	e650	260	294	446	354	238	e390	150	124
26	170	208	e190	e600	252	277	404	350	227	e350	188	137
27	170	207	e190	e550	245	267	365	326	269	e310	166	146
28	172	205	e190	e450	253	262	331	305	290	e280	158	118
29	175	204	e190	380	---	256	299	283	292	e250	151	321
30	184	215	e180	351	---	255	280	267	251	e220	139	373
31	190	---	e180	326	---	251	---	266	---	e200	131	---
TOTAL	6141	7060	7471	8617	10233	8848	12195	9130	11282	7642	5136	4109
MEAN	198	235	241	278	365	285	406	295	376	247	166	137
MAX	367	400	373	650	592	385	652	402	648	448	195	373
MIN	132	178	180	160	245	234	245	236	227	170	131	108
CFSM	.48	.57	.58	.67	.88	.69	.98	.71	.90	.59	.40	.33
IN.	.55	.63	.67	.77	.92	.79	1.09	.82	1.01	.68	.46	.37

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

	MEAN	251	305	303	281	334	572	587	384	284	195	174	225
MAX	1058	836	627	655	1401	1709	1204	934	711	694	585	1682	
(WY)	1987	1986	1992	1973	1938	1976	1967	1974	1943	1969	1972	1986	
MIN	117	151	144	112	124	204	231	175	117	77.3	70.6	97.7	
(WY)	1947	1939	1931	1945	1940	1937	1945	1977	1941	1936	1931	1931	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1931 - 1999

ANNUAL TOTAL	109053		97864		324	
ANNUAL MEAN	299		268		585	1976
HIGHEST ANNUAL MEAN					163	1931
LOWEST ANNUAL MEAN					6210	Sep 12 1986
HIGHEST DAILY MEAN	1340	Apr 2	652	Apr 12	19	Aug 16 1986
LOWEST DAILY MEAN	88	Aug 1	108	Sep 12	49	Aug 10 1986
ANNUAL SEVEN-DAY MINIMUM	91	Jul 29	113	Sep 17	6660	Sep 12 1986
INSTANTANEOUS PEAK FLOW			(a)674	Apr 12	(c)15.58	Sep 12 1986
INSTANTANEOUS PEAK STAGE			(b)5.70	Jan 25	12	Aug 18 1945
INSTANTANEOUS LOW FLOW			106	(d)	.78	
ANNUAL RUNOFF (CFSM)	.72		.64		10.59	
ANNUAL RUNOFF (INCHES)	9.75		8.75			
10 PERCENT EXCEEDS	555		423		588	
50 PERCENT EXCEEDS	229		247		245	
90 PERCENT EXCEEDS	115		146		132	

(a) Gage height 4.75 ft.

(b) Backwater from ice.

(c) From floodmark.

(d) Sept. 12, 22.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04156000 TITTABAWASSEE RIVER AT MIDLAND, MI

LOCATION.--Lat 43°35'43", long 84°14'08", in NW1/4 NE1/4 sec.28, T.14 N., R.2 E., Midland County, Hydrologic Unit 04080201, on right bank 2,000 ft downstream from dam at Dow Chemical Co. 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, are contained in reports of National Weather Service.

REVISED RECORDS.--WSP 1045: 1945. WSP 1144: 1948.

GAGE.--Water-stage recorder. Datum of gage is 580.08 ft above sea level (levels by Wade-Trim Assoc.). Prior to Sept. 30, 1955, at datum 10.20 ft higher, Oct. 1, 1955 to Sept. 30, 1993, at datum 0.20 ft higher.

REMARKS.--Records good except for estimated daily discharges, which are poor. Approximately 8.0 ft³/s diverted upstream from station for industrial use, flow partially returned to river 0.25 mi downstream from station, remainder returned 1 mi downstream. Prior to 1922 water year, diversion was used in computing annual mean discharge and runoff figures, extremes and daily discharge were 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	415	362	955	e340	1930	1340	978	1030	1230	1110	330	382
2	604	663	1020	e440	2190	1480	812	836	1750	1230	607	343
3	270	669	996	e700	2260	1430	569	1250	1750	1020	805	356
4	199	767	1420	e1300	2480	1590	609	1290	1810	809	649	222
5	393	732	850	e1250	2430	1370	883	1110	1060	852	472	176
6	1120	703	472	e1350	1690	837	1810	1220	639	980	592	172
7	2620	353	1510	e1450	1240	578	2070	1240	1060	817	327	506
8	1750	312	2160	e1350	1780	1120	2040	731	783	827	267	519
9	1300	649	1570	e590	2100	1100	2000	651	895	1350	467	509
10	853	1220	1360	e320	2240	1160	1570	949	617	1280	912	541
11	570	2100	1240	e770	2440	1230	1130	1360	1280	661	751	429
12	811	1640	696	e1070	3460	1220	2530	1040	1210	895	477	160
13	972	1590	565	e1300	3780	683	3420	1080	652	881	647	602
14	803	1080	1010	e1450	3440	608	3650	847	3140	973	375	431
15	700	556	905	e1450	3360	1310	3290	584	5840	734	346	359
16	583	1230	1130	e630	3160	1510	3220	533	4110	630	656	507
17	320	832	1300	e310	2910	1780	1910	1440	2050	517	717	530
18	351	969	1530	e430	2990	2240	1120	2150	2250	469	514	226
19	698	879	824	e1150	2840	2420	1500	1590	2160	536	487	159
20	928	1200	432	1640	e900	1920	1830	1620	1320	954	762	282
21	771	677	755	1870	e600	1190	1610	1440	992	827	325	372
22	745	435	1040	2480	e1400	1770	1860	973	819	940	235	381
23	599	708	1230	3960	e1300	1640	3240	740	881	976	494	345
24	377	951	1020	3290	1540	1440	3990	988	702	1370	444	377
25	336	1130	535	4720	1690	1490	2850	1230	962	1360	417	239
26	637	574	382	4460	1560	1240	2630	1130	514	1210	620	177
27	940	969	394	3850	906	737	2780	1240	424	1060	611	344
28	562	532	e650	2720	745	877	2160	1360	894	1220	378	1010
29	452	381	e1190	2620	---	1060	1870	798	1160	1190	294	1410
30	781	734	e1700	1850	---	1070	1370	496	1140	913	627	1290
31	381	---	e1290	1370	---	960	---	468	---	521	472	---
TOTAL	22841	25607	32131	52480	59361	40200	61301	33414	44094	29112	16077	13356
MEAN	737	854	1036	1693	2120	1297	2043	1078	1470	939	519	445
MAX	2620	2100	2160	4720	3780	2420	3990	2150	5840	1370	912	1410
MIN	199	312	382	310	600	578	569	468	424	469	235	159
CFSM	.31	.36	.43	.71	.88	.54	.85	.45	.61	.39	.22	.19
IN.	.35	.40	.50	.81	.92	.62	.95	.52	.68	.45	.25	.21

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1936 - 1999, BY WATER YEAR (WY)

	MEAN	1067	1474	1534	1427	1775	3912	3694	2129	1398	737	598	908
MAX	6318	6097	3907	5564	6455	10660	8096	5573	5270	4492	2236	10700	
(WY)	1987	1986	1992	1973	1938	1976	1967	1956	1945	1957	1972	1986	
MIN	344	493	462	388	466	1027	969	567	355	234	217	750	
(WY)	1949	1950	1964	1945	1963	1964	1945	1977	1964	1941	1936	1948	

SUMMARY STATISTICS FOR 1998 CALENDAR YEAR FOR 1999 WATER YEAR WATER YEARS 1936 - 1999

	582553	429974	1726
ANNUAL TOTAL	1596	1178	3318
ANNUAL MEAN			699
HIGHEST ANNUAL MEAN			36200
LOWEST ANNUAL MEAN			111
HIGHEST DAILY MEAN	14100	5840	126
LOWEST DAILY MEAN	165	159	38700
ANNUAL SEVEN-DAY MINIMUM	260	303	(a)33.89
INSTANTANEOUS PEAK FLOW		6270	39
INSTANTANEOUS PEAK STAGE		16.48	(b)
INSTANTANEOUS LOW FLOW		155	.72
ANNUAL RUNOFF (CFSM)	.67	.49	9.77
ANNUAL RUNOFF (INCHES)	9.03	6.66	
10 PERCENT EXCEEDS	3920	2240	3950
50 PERCENT EXCEEDS	851	972	953
90 PERCENT EXCEEDS	344	378	375

(a) From floodmark.

(b) Sept. 12, 19.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI

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 Tittabawassee 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 September 1991 and October 1994 to September 1996, daily discharges greater than 10,000 ft³/s only; no daily discharges greater than 10,000 ft³/s water years 1944, 1949, 1953, 1955, 1958, 1961, 1963, 1964, 1966. Continuous-record station October 1991 to July 1994, and October 1996 to current year. Gage-height records for flood seasons 1910-20 are contained in reports of National Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 565.05 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 Alpin Beach.

REMARKS.--Water-discharge records fair. Minimum flows affected by wind direction and seiche on Saginaw Bay, 20.3 mi downstream. Considerable diversion through metropolitan area of Saginaw. Gage-height telemeter at station.

COOPERATION.--Auxiliary gage-height record at Alpin Beach furnished by National Oceanic Atmospheric Administration.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e1180	e1270	e2740	e1270	e7390	3690	1990	5100	946	2820	729	913
2	e1550	e1930	e2860	e1430	e7620	3470	2100	4110	2850	3010	1650	938
3	e856	e1960	e2880	e2030	e7740	4130	910	3730	3590	3080	1340	1050
4	e691	e2140	e3690	e3240	e8120	3960	4230	3550	3040	1750	985	1510
5	e1090	e2060	e2560	e3100	e7860	4390	2500	2960	1860	811	1370	978
6	e2620	e1960	e2040	e3300	e6330	6590	1960	2520	108	2100	874	505
7	e6710	e1240	e4690	e3490	e5200	4930	1740	359	212	1380	1000	1760
8	e4090	e1160	e5460	e3300	e5980	3370	3520	1680	1700	2010	1290	341
9	e3120	e1820	e4230	e1790	e6470	3780	5270	2140	2230	1670	545	e500
10	e2180	e3450	e3790	e1260	e6730	3880	4490	3180	2020	2380	367	e800
11	e1600	e5080	e3470	e2140	e7130	3600	4360	3260	1590	2080	986	514
12	e2060	e4150	e2300	e2780	3760	3550	4130	3520	1870	1390	325	289
13	e2380	e4110	e2010	e2610	5140	3820	5080	3820	1260	1390	e900	e900
14	e2080	e3120	e2860	e3530	4810	4100	5000	3900	2980	239	2900	e750
15	e2060	e2060	e2600	e3530	4450	2720	5320	2250	5220	293	693	587
16	e1860	e3360	e3080	e1920	4580	2260	5680	1340	5040	e400	160	2480
17	e1280	e2480	e3490	e1400	4100	2780	e4000	1090	e3500	599	648	1100
18	e1330	e2720	e3970	e2420	4730	4040	e2700	2110	e2500	1470	1450	1070
19	e1990	e2500	e2560	e3430	5310	5470	e2000	3560	e2700	1890	2040	e800
20	e2400	e3120	e1790	e4290	5240	4660	e2500	2890	e2000	1400	2220	590
21	e2060	e2080	e2460	e4860	4160	4000	3290	1830	e1500	1380	2030	2340
22	e1990	e1590	e2880	e7780	4580	4220	4710	3400	e1200	1480	1000	325
23	e1670	e2140	e3140	e13800	5150	3170	9920	2410	e1000	1640	425	e600
24	e1210	e2680	e2700	e14200	4220	3800	13400	1940	816	1040	2210	e500
25	e1140	e3060	e1730	e16700	4560	4040	14300	657	1350	2120	1900	e420
26	e1760	e2010	e1430	e15900	3350	3440	12200	649	1360	1260	2250	e370
27	e2340	e2660	e1440	e13600	3640	3150	10400	3160	1150	544	1090	e600
28	e1600	e1780	e1930	e11400	4380	4020	9120	3400	1150	3070	293	e1200
29	e1360	e1490	e3020	e10900	---	3350	7900	2960	e1400	2550	1080	2980
30	e2030	e2220	e4010	e8640	---	e1300	6320	2520	e1800	2950	2720	3210
31	e1220	---	e3180	e6870	---	e1500	---	451	---	1730	696	---
TOTAL	61507	73400	90990	177560	152730	115180	161040	80446	59942	51926	38166	30920
MEAN	1984	2447	2935	5728	5455	3715	5368	2595	1998	1675	1231	1031
MAX	6710	5080	5460	16700	8120	6590	14300	5100	5220	3080	2900	3210
MIN	691	1160	1430	1260	3350	1300	910	359	108	239	160	289
CFSM	.33	.40	.48	.95	.90	.61	.89	.43	.33	.28	.20	.17
IN.	.38	.45	.56	1.09	.94	.71	.99	.49	.37	.32	.23	.19

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1992 - 1999, BY WATER YEAR (WY)

	MEAN	3234	4880	4582	6094	6903	9990	9840	4876	3399	3344	2363	2712
MAX	4471	11430	7638	10950	12550	14310	16440	6192	5792	7758	4133	5202	
(WY)	1994	1993	1992	1993	1997	1997	1993	1993	1993	1994	1992	1992	
MIN	1984	2447	2522	2087	3311	3715	5368	2595	1998	1675	1231	1031	
(WY)	1999	1999	1998	1994	1993	1999	1999	1999	1999	1999	1999	1999	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 199? - 1999

ANNUAL TOTAL	1615844	1093807		
ANNUAL MEAN	4427	2997		
HIGHEST ANNUAL MEAN			(a)5224	
LOWEST ANNUAL MEAN			6769	1993
HIGHEST DAILY MEAN	24200	Mar 22	2997	1999
LOWEST DAILY MEAN	25	Sep 6	(b)67800	Mar 29 1904
ANNUAL SEVEN-DAY MINIMUM	624	Sep 24	-1980	Jun 19 1992
INSTANTANEOUS PEAK FLOW			574	Sep 22 1999
INSTANTANEOUS PEAK STAGE			(b)68000	Mar 29 1904
ANNUAL RUNOFF (CFSM)	.73		(b)24.90	Mar 29 1904
ANNUAL RUNOFF (INCHES)	9.92		.86	
10 PERCENT EXCEEDS	9850		11.71	
50 PERCENT EXCEEDS	3000			
90 PERCENT EXCEEDS	1230			

(a) Does not include water years 1995, 1996.

(b) Includes water years 1904-1991.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1975-86, 1989 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to September 1981.

WATER TEMPERATURE: November 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Nov. 6, 1976 to Sept. 30, 1981.

REMARKS.--Cross-sectional samples were collected at Rust Avenue bridge.

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 TEMPERATURE (water years 1975-77, 1979): Maximum, 30.0°C, July 10, 14, 20, 1977; minimum, 0.0°C, on many days during winter periods.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS/ 100 ML) (31625)	STREP- TOCOCCI FECAL, K ¹ AGAR (COLS. PER 100 ML) (31673)
OCT 29...	1000	1230	744	8.0	12.5	16	7.8	75	K38	K25
APR 14...	1130	6530	596	8.2	10.5	29	10.4	96	89	K45
JUN 02...	1130	4630	736	8.3	23.0	100	6.8	80	120	130
AUG 25...	1130	2080	868	8.0	22.5	8.5	7.2	84	K37	K9

DATE	HARD- NESS TOTAL (MG/L AS CaCO ₃) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CaCO ₃ (MG/L) (00904)	CALCIUM DIS- SOLVED (MG/L AS Ca) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS- SOLVED (MG/L AS Na) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO ₃ (00453)	ALKA- LINITY WAT DIS TOT IT FIELD MG/L AS CaCO ₃ (39086)	SULFATE DIS- SOLVED (MG/L AS SO ₄) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS Cl) (00940)
OCT 29...	240	67	64	19	54	3.2	212	174	44	100
APR 14...	230	77	63	18	27	2.6	187	153	57	58
JUN 02...	260	93	69	22	49	3.3	205	168	54	93
AUG 25...	250	110	67	19	84	3.5	171	140	37	170

DATE	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO ₂) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N) (00613)	NITRO- GEN, NO ₂ +NO ₃ DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)
OCT 29...	.27	4.4	422	.57	1400	.054	.422	.129	.75	.058
APR 14...	.19	3.7	379	.52	6680	.019	2.39	.025	1.0	.162
JUN 02...	.38	2.2	-	.55	5020	.042	1.87	<.020	1.1	.148
AUG 25...	.40	3.7	478	.65	2680	.016	.568	.062	.77	.066

STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	PHOS- PHORUS DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)
OCT 29...	<.050	.017	11	36	<7.0	14	5	6.6	<50
APR 14...	.056	.048	15	38	<7.0	26	E4	13	<50
JUN 02...	<.050	.018	28	46	<7.0	15	E5	E1.7	<50
AUG 25...	<.050	.010	15	43	<13	E5.4	11	2.6	<34

DATE	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	SEDI- MENT, SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 29...	<1.0	<1	<1.0	326	<10	75	249	86
APR 14...	1.3	<1	<1.0	277	<10	48	846	90
JUN 02...	3.0	<1	<1.0	316	<10	34	425	88
AUG 25...	1.9	<1	<1.0	334	<10	-	-	-

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159492 BLACK RIVER NEAR JEDDO, MI

LOCATION.—Lat 43°09'09", long 82°37'27", in SE1/4 SE1/4 sec.6, T.8 N., R.16 E., St. Clair County, Hydrologic Unit 04090001, on right bank 650 ft upstream from bridge on Jeddo Road, 0.4 mi downstream from Silver Creek, and 2.2 mi west of Jeddo.

DRAINAGE AREA.—464 mi².

PERIOD OF RECORD.—February 1944 to current year. Published as "near Fargo" prior to October 1991.

REVISED RECORDS.—WSP 1307: 1950(M). WSP 1627: 1956-58. WSP 2112: Drainage area.

GAGE.—Water-stage recorder. Elevation of gage is 655 ft above sea level, from topographic map. Prior to July 9, 1954, nonrecording gage and July 10, 1954 to September 1991 water-stage recorder, at site 7.6 mi downstream, at different datum (station 04159500).

REMARKS.—Records good except for estimated daily discharges, which are poor. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	14	14	e12	180	179	81	115	55	172	172	20
2	16	13	14	e12	145	159	79	104	82	446	74	21
3	18	14	14	e12	e140	142	79	95	188	263	47	21
4	18	14	14	e12	e135	133	75	87	120	145	37	24
5	17	14	17	e12	e130	109	85	81	83	86	31	23
6	16	14	18	e12	e125	84	105	76	66	59	27	24
7	23	18	38	e13	e120	73	113	73	55	44	27	26
8	22	19	62	e13	e115	75	97	71	48	37	27	26
9	23	17	48	e12	e110	73	80	68	43	35	27	44
10	25	19	36	e12	e110	70	76	63	41	32	26	38
11	23	20	33	e12	e105	71	78	57	45	31	26	34
12	20	18	30	e12	e105	77	123	55	102	28	25	31
13	19	18	28	e12	e100	83	145	54	106	27	25	29
14	18	19	27	e13	e96	79	125	54	127	25	26	29
15	18	18	26	e13	e92	84	107	51	118	23	25	28
16	16	16	26	e13	e88	106	104	51	74	22	24	28
17	15	15	26	e13	e80	298	121	49	57	22	22	28
18	15	15	27	e14	e74	959	120	174	49	28	22	29
19	14	15	27	e16	e66	653	109	325	43	26	21	30
20	13	15	27	e15	e60	391	105	215	38	24	19	29
21	13	15	27	e13	e56	290	95	125	35	25	20	35
22	12	15	27	34	e54	231	195	95	33	25	19	33
23	12	14	e22	141	e52	183	1330	79	30	25	19	30
24	13	12	e19	1060	e52	155	1210	74	35	29	20	32
25	13	13	e14	1260	e50	137	586	90	77	28	24	36
26	12	16	e13	587	e50	119	365	95	41	25	28	37
27	13	18	e12	387	50	104	257	94	37	24	29	37
28	13	17	e12	333	68	97	191	83	e100	35	29	39
29	13	17	e12	330	—	93	151	74	e200	629	26	55
30	13	15	e11	287	—	90	130	66	e160	555	22	77
31	14	—	e10	228	—	87	—	60	—	253	21	—
TOTAL	506	477	731	4915	2608	5484	6517	2853	2288	3228	987	973
MEAN	16.3	15.9	23.6	159	93.1	177	217	92.0	76.3	104	31.8	37.4
MAX	25	20	62	1260	180	959	1330	325	200	629	172	77
MIN	12	12	10	12	50	70	75	49	30	22	19	20
CFSM	.04	.03	.05	.34	.20	.38	.47	.20	.16	.22	.07	.07
IN.	.04	.04	.06	.39	.21	.44	.52	.23	.18	.26	.08	.08

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1999, BY WATER YEAR (WY)

MEAN	114	173	255	270	437	1007	649	303	183	79.8	58.9	115
MAX	1316	972	1031	1315	1855	3218	2102	1511	1625	517	559	2737
(WY)	1987	1993	1951	1952	1954	1985	1947	1956	1996	1994	1953	1996
MIN	7.62	10.5	10.3	8.37	15.8	48.9	54.2	40.4	22.4	13.1	8.34	5.53
(WY)	1964	1945	1959	1945	1959	1964	1946	1958	1949	1966	1948	1998

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1944 - 1999

ANNUAL TOTAL	110996		31567	
ANNUAL MEAN	304		86.5	
HIGHEST ANNUAL MEAN				304
LOWEST ANNUAL MEAN				705
HIGHEST DAILY MEAN	5760	Mar 19	1330	Apr 23
LOWEST DAILY MEAN	10	Dec 31	10	Dec 31
ANNUAL SEVEN-DAY MINIMUM	12	Dec 25	12	Dec 27
INSTANTANEOUS PEAK FLOW			1860	Jan 25
INSTANTANEOUS PEAK STAGE			8.10	Jan 25
INSTANTANEOUS LOW FLOW				(a)14400
ANNUAL RUNOFF (CFSM)	.66		.19	(b)16.72
ANNUAL RUNOFF (INCHES)	8.90		2.53	(c)1.8
10 PERCENT EXCEEDS	651		165	.66
50 PERCENT EXCEEDS	37		35	8.91
90 PERCENT EXCEEDS	14		13	16

(a) From rating curve extended above 9,500 ft³/s.

(b) Present site and datum; peak stage observed at previous site and datum, 18.05 ft, Feb. 20, 1951, backwater from ice.

(c) Observed; site then in use.

(d) Sept. 18, 19, 1946.

(e) Estimated.

STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159900 MILL CREEK NEAR AVOCA, MI

LOCATION.--Lat 43°03'16", long 82°44'05", in NW1/4 sec.8, T.7 N., R.15 E., St. Clair County, Hydrologic Unit 04090001, on left bank at downstream side of bridge on Bricker Road, 0.2 mi upstream from Gleason Drain, and 2.3 mi west of Avoca.

DRAINAGE AREA.--169 mi².

PERIOD OF RECORD.--April 1963 to September 1975, October 1975 to September 1979 (operated as a crest-stage partial-record station), October 1987 to current year. Also operated as a low-flow partial-record station in water year 1979.

GAGE.--Water-stage recorder. Datum of gage is 711.31 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	17	11	e9.6	e64	28	25	68	19	56	6.2	8.4
2	1.7	16	11	e9.6	e52	35	25	54	20	95	4.1	8.1
3	2.0	16	10	e9.6	e48	32	25	46	19	112	3.0	7.4
4	3.4	16	10	e9.6	e45	31	26	41	17	91	2.4	6.5
5	3.3	18	14	e9.6	e43	27	27	38	15	62	2.2	5.7
6	3.2	19	13	e10	e40	e25	29	35	14	42	2.2	6.1
7	6.9	20	20	e10	e38	e24	29	32	12	30	2.1	9.9
8	5.0	15	22	e10	e37	e24	27	30	12	22	3.0	9.1
9	3.6	5.4	22	e10	e36	e24	25	28	11	17	2.8	6.7
10	3.6	6.6	18	e10	e35	e23	25	27	11	13	2.6	9.8
11	3.0	7.6	15	e10	e34	23	32	25	53	11	2.5	10
12	2.8	7.7	15	e10	e33	24	44	22	88	10	2.5	9.9
13	2.6	9.7	20	e10	e32	26	56	20	63	9.4	3.2	8.7
14	3.0	9.8	15	e10	e30	24	49	19	52	8.5	3.3	6.9
15	3.2	9.3	13	e10	e29	23	41	20	53	7.0	3.4	7.2
16	3.2	8.8	12	e11	e28	25	38	20	65	6.2	3.1	5.7
17	3.2	7.7	12	e11	e26	35	38	20	45	5.4	3.4	4.9
18	3.6	7.5	12	e12	25	113	40	33	33	5.1	3.2	4.7
19	6.0	7.4	12	e14	24	145	39	47	26	5.3	4.3	4.2
20	3.9	7.3	11	e12	e21	113	40	50	20	5.4	5.6	3.8
21	3.6	7.4	12	e11	e20	87	37	39	17	6.5	5.1	4.4
22	4.1	7.5	e12	e27	e19	72	60	31	16	5.8	5.4	4.8
23	4.9	7.7	e11	e35	e18	60	377	24	14	5.7	6.5	4.1
24	6.0	7.6	e11	e100	e18	50	545	24	16	6.0	7.3	4.1
25	7.1	8.4	e11	e120	e18	43	433	28	14	5.1	9.8	4.2
26	9.1	11	e10	e90	18	38	324	34	12	12	11	4.7
27	10	10	e9.4	e80	19	34	248	32	17	14	9.1	3.6
28	7.5	11	e9.4	e70	24	31	185	29	15	8.7	7.3	2.2
29	8.6	11	e9.6	e80	---	28	128	26	15	15	6.5	5.5
30	9.2	11	e8.8	e76	---	27	88	22	19	7.6	6.8	13
31	13	---	e9.2	e74	---	25	---	19	---	4.4	8.7	---
TOTAL	152.1	324.4	401.4	971.0	874	1319	3105	983	803	704.1	148.6	194.3
MEAN	4.91	10.8	12.9	31.3	31.2	42.5	104	31.7	26.8	22.7	4.79	6.48
MAX	13	20	22	120	64	145	545	68	88	112	11	13
MIN	1.7	5.4	8.8	9.6	18	23	25	19	11	4.4	2.1	2.2
CFSM	.03	.06	.08	.19	.18	.25	.61	.19	.16	.13	.03	.04
IN.	.03	.07	.09	.21	.19	.29	.68	.22	.18	.15	.03	.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1999, BY WATER YEAR (WY)

	MEAN	19.7	57.1	87.8	114	147	281	233	97.1	75.9	22.4	14.1	15.1
MAX	67.4	261	266	404	423	664	715	328	659	78.1	57.3	95.9	
(WY)	1991	1993	1988	1974	1997	1973	1975	1974	1996	1996	1973	1992	
MIN	2.76	5.25	3.72	6.03	6.21	11.2	26.1	16.2	5.91	2.36	3.17	2.39	
(WY)	1964	1965	1964	1964	1964	1964	1964	1964	1964	1963	1964	1963	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1963 - 1999

ANNUAL TOTAL	36836.4		9979.9		98.0	
ANNUAL MEAN	101		27.3		174	1974
HIGHEST ANNUAL MEAN					7.84	1964
LOWEST ANNUAL MEAN					3940	Apr 1 ^a 1975
HIGHEST DAILY MEAN	1270	Jan 9	545	Apr 24	1.2	Jul 6 1963
LOWEST DAILY MEAN	1.7	Oct 2	1.7	Oct 2	4570	Apr 1 ^a 1975
ANNUAL SEVEN-DAY MINIMUM	2.0	Sep 27	2.5	Apr 24	8.87	Apr 1 ^a 1975
INSTANTANEOUS PEAK FLOW			562	Apr 24	.80	(a)
INSTANTANEOUS PEAK STAGE			4.53		.58	
INSTANTANEOUS LOW FLOW					7.88	
ANNUAL RUNOFF (CFSM)	.60		.16		237	
ANNUAL RUNOFF (INCHES)	8.11		2.20		27	
10 PERCENT EXCEEDS	278		53		5.2	
50 PERCENT EXCEEDS	13		14			
90 PERCENT EXCEEDS	3.6		3.9			

(a) Aug. 9, 10, 11, 1964.

(e) Estimated.

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, 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 control Aug. 20, 1965 to Nov. 2, 1981. Datum of gage is 789.69 ft above sea level (levels by Boldt, McLeod, and Johnson, Inc.). Prior to Feb. 24, 1985, at datum 2.00 ft higher.

REMARKS.--Records good except for estimated daily discharges, which are poor. Some diversion by pumping for sprinkler irrigation.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	S ⁷ P
1	1.2	2.4	4.6	e2.5	e17	e8.0	6.2	6.2	4.2	23	1.2	.80
2	1.2	2.2	4.0	e2.5	e14	e11	6.1	5.6	3.6	23	1.1	.86
3	1.2	2.4	3.7	e2.5	e12	e9.0	6.1	5.2	3.1	9.2	.89	.79
4	1.0	2.4	3.6	e2.5	e12	8.4	6.7	4.8	3.2	6.0	.90	.71
5	1.1	2.5	4.3	e2.5	e11	7.8	7.6	4.4	3.1	4.0	2.1	.68
6	1.2	2.5	7.1	e2.6	e11	e6.6	6.8	4.2	2.1	2.9	.86	1.9
7	4.1	2.2	17	e2.7	e10	e6.0	6.2	4.2	2.3	1.6	.87	4.5
8	3.8	2.3	10	e2.7	e10	e6.0	5.9	3.7	2.1	1.5	1.5	2.6
9	3.3	2.5	8.7	e2.6	e10	e5.8	6.4	3.6	1.9	2.0	1.0	1.8
10	2.8	5.0	7.2	e2.5	e9.4	e5.6	6.2	3.3	1.9	1.7	1.5	1.5
11	2.5	5.8	6.3	e2.5	e9.2	e6.0	7.3	2.9	1.6	1.4	1.4	1.4
12	2.4	4.5	5.7	e2.6	e9.0	e6.4	9.5	2.8	1.3	1.1	1.1	1.1
13	2.9	4.0	5.2	e2.7	e8.6	e6.4	8.1	2.8	7.0	1.0	2.3	1.3
14	2.1	3.8	5.3	e2.7	e8.4	e6.4	7.0	2.4	12	.80	2.0	1.2
15	2.2	3.6	5.2	e2.8	e7.8	e7.0	6.4	2.2	5.8	.68	1.2	1.1
16	2.0	3.4	5.2	e2.7	e7.4	8.1	7.4	2.0	2.8	.61	1.1	1.1
17	2.1	3.4	5.3	e2.7	e6.8	13	7.8	3.7	1.9	.65	.98	1.1
18	2.0	3.1	5.2	e3.2	e6.0	18	7.4	8.1	1.5	.83	.92	1.1
19	2.2	3.2	5.4	e3.6	e5.6	13	7.1	5.3	1.1	.87	.92	.96
20	2.1	3.0	5.2	e3.3	e5.0	11	6.6	4.0	.85	1.1	.84	1.0
21	1.9	2.8	e3.8	e3.0	e4.7	10	6.2	3.1	.68	1.2	.73	1.0
22	1.9	2.7	e3.2	e2.8	e4.5	9.4	26	2.4	.65	1.4	.62	1.0
23	1.9	2.7	e2.8	e2.0	e4.3	8.7	93	4.1	.51	2.8	.80	.91
24	1.9	2.7	e2.8	e7.0	e4.2	8.1	50	7.9	.80	7.4	1.4	1.4
25	1.8	3.7	e2.7	e5.0	e4.2	7.6	29	7.0	.70	5.1	1.6	1.1
26	1.8	7.1	e2.6	e3.6	e4.2	7.1	19	7.3	.58	3.1	1.9	1.1
27	2.1	5.1	e2.5	e3.2	e5.0	6.9	14	4.6	3.5	2.8	1.5	1.0
28	2.2	4.4	e2.2	e2.8	e6.4	6.8	10	2.9	2.6	2.2	1.3	1.4
29	2.0	4.1	e2.3	e3.2	---	6.7	7.8	2.4	3.6	1.8	1.0	6.3
30	2.2	4.1	e2.3	e3.0	---	6.5	6.9	2.2	2.7	1.7	.90	7.9
31	2.5	---	e2.1	e2.1	---	6.2	---	2.8	---	1.3	.84	---
TOTAL	65.6	103.6	153.5	379.2	227.7	253.5	400.7	128.1	79.67	114.74	37.27	50.61
MEAN	2.12	3.45	4.95	12.2	8.13	8.18	13.4	4.13	2.66	3.70	1.20	1.69
MAX	4.1	7.1	17	70	17	18	93	8.1	12	23	2.3	7.9
MIN	1.0	2.2	2.1	2.5	4.2	5.6	5.9	2.0	.51	.61	.62	.68
CFSM	.12	.19	.28	.68	.45	.45	.74	.23	.15	.21	.07	.09
IN.	.14	.21	.32	.78	.47	.52	.83	.26	.16	.24	.08	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1999, BY WATER YEAR (WY)

	MEAN	7.49	10.4	11.9	11.5	16.8	29.4	23.5	11.9	10.5	4.91	3.57	6.06
MAX	36.8	31.0	28.2	32.9	46.6	60.5	59.6	32.3	59.4	12.5	10.1	3.4	3.4
(WY)	1987	1986	1988	1973	1976	1973	1975	1974	1996	1980	1980	1986	1986
MIN	.82	2.49	2.71	2.64	3.24	8.18	9.15	2.76	1.21	.41	.57	.64	.64
(WY)	1967	1966	1977	1977	1980	1999	1966	1977	1988	1966	1966	1985	1985

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1965 - 1999

ANNUAL TOTAL	4273.54	1994.19	
ANNUAL MEAN	11.7	5.46	
HIGHEST ANNUAL MEAN			12.3
LOWEST ANNUAL MEAN			20.6
HIGHEST DAILY MEAN			5.13
LOWEST DAILY MEAN	160	93	307
ANNUAL SEVEN-DAY MINIMUM	.67	.51	.01
INSTANTANEOUS PEAK FLOW	.91	.68	.14
INSTANTANEOUS LOW FLOW		126	(a)354
ANNUAL RUNOFF (CFSM)	.65	.30	(b)7.33
ANNUAL RUNOFF (INCHES)	8.83	4.12	.00
10 PERCENT EXCEEDS	26	9.7	.68
50 PERCENT EXCEEDS	4.5	3.1	9.28
90 PERCENT EXCEEDS	1.5	1.0	28
			6.2
			1.8

(a) From rating curve extended above 100 ft³/s.

(b) Present datum.

(c) Part of each day June 27, 28, 1977, June 26-28, 1979, June 30, 1988, caused by irrigation pumpage.

(e) Estimated.

STREAMS TRIBUTARY TO ST. CLAIR RIVER

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, or 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. Datum of gage is 705.41 ft above sea level (Michigan Department of Transportation bench mark).

REMARKS.--Records good except for estimated daily discharges, which are poor.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1947 reached a stage of about 9 ft, from information by local residents.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.4	e10	31	e10	88	46	33	68	20	305	12	7.4
2	8.0	e11	26	e10	53	58	33	59	20	510	10	6.9
3	9.0	e11	15	e10	e50	42	33	54	20	255	9.2	6.5
4	8.8	10	12	e10	e47	e38	33	51	20	120	8.6	6.4
5	8.9	11	11	e10	e45	e33	37	46	19	70	9.6	5.9
6	8.7	12	13	e11	e43	e27	41	44	17	47	9.2	7.1
7	14	12	18	e11	e41	e24	39	42	15	33	9.7	13
8	15	12	36	e11	e41	e24	34	42	16	26	12	14
9	17	11	26	e10	e39	e24	34	40	15	22	11	18
10	14	12	32	e10	e38	e23	39	39	14	21	13	14
11	12	16	28	e10	e36	24	43	37	13	20	12	11
12	10	24	18	e10	e35	e25	67	37	21	18	13	8.9
13	9.8	18	12	e10	e35	e27	76	41	41	16	14	7.9
14	10	16	11	e11	34	e25	62	41	93	14	12	7.4
15	11	14	11	e11	e33	29	50	40	70	13	14	7.1
16	11	14	11	e11	e30	32	44	37	41	13	12	8.0
17	11	12	11	e11	e28	77	54	35	29	12	10	7.7
18	10	13	11	e11	e25	224	57	37	23	13	9.3	7.8
19	9.8	12	10	e14	e23	204	52	51	19	12	9.0	7.6
20	10	12	10	e13	e21	135	45	42	17	12	8.2	7.7
21	e10	12	11	e12	19	104	41	33	16	12	7.4	7.8
22	e10	12	10	e11	e19	88	129	29	15	12	7.1	7.6
23	e9.0	11	8.7	e90	e18	72	682	26	13	13	7.0	7.7
24	e9.0	11	8.9	e300	e17	57	1040	26	14	21	7.1	7.9
25	e9.0	12	9.0	e200	e17	54	564	31	15	33	7.9	8.1
26	e9.0	14	8.1	e150	e17	47	307	30	13	25	11	9.9
27	e8.6	31	8.6	140	17	42	196	30	16	18	13	7.7
28	e8.8	21	9.8	113	24	40	138	28	29	15	12	7.5
29	e10	16	9.9	133	--	38	103	25	246	14	10	12
30	e10	15	10	143	--	36	81	22	111	12	8.8	23
31	e9.4	--	8.1	107	--	34	--	21	--	13	8.3	--
TOTAL	318.2	418	455.1	1614	933	1753	4187	1184	1031	1740	317.4	279.5
MEAN	10.3	13.9	14.7	52.1	33.3	56.5	140	38.2	34.4	56.1	10.2	9.32
MAX	17	31	36	300	88	224	1040	68	246	510	14	23
MIN	7.4	10	8.1	10	17	23	33	21	13	12	7.0	5.9
CFSM	.07	.09	.10	.34	.22	.37	.92	.25	.23	.37	.07	.06
IN.	.08	.10	.11	.40	.23	.43	1.03	.29	.25	.43	.08	.07

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1999, BY WATER YEAR (WY)

	MEAN	41.0	67.9	92.2	89.4	141	260	204	89.8	57.7	27.0	19.2	31.0
MAX	330	375	247	315	528	595	617	270	300	82.3	91.3	256	
(WY)	1982	1986	1988	1973	1976	1973	1975	1974	1996	1967	1992	1985	
MIN	5.00	7.62	5.50	8.92	8.00	15.8	25.9	20.9	6.44	5.21	5.08	5.54	
(WY)	1964	1965	1964	1964	1963	1964	1964	1977	1964	1965	1963	1979	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1963 - 1999

ANNUAL TOTAL	31252.9						14230.2				92.9		
ANNUAL MEAN	85.6						39.0						
HIGHEST ANNUAL MEAN											168		1985
LOWEST ANNUAL MEAN											11.3		1964
HIGHEST DAILY MEAN	1300				Feb 19		1040		Apr 24		3320		Apr 19 1978
LOWEST DAILY MEAN	6.1				Aug 4		5.9		Sep 5		2.4		Sep 6 1975
ANNUAL SEVEN-DAY MINIMUM	7.8				Jul 30		6.9		Aug 31		2.6		Sep 5 1978
INSTANTANEOUS PEAK FLOW							1150		Apr 24		4520		Apr 19 1975
INSTANTANEOUS PEAK STAGE							5.90		Apr 24		8.96		Apr 19 1975
INSTANTANEOUS LOW FLOW							5.6		(a)		2.3		(b)
ANNUAL RUNOFF (CFSM)	.57						.26				.62		
ANNUAL RUNOFF (INCHES)	7.70						3.51				8.36		
10 PERCENT EXCEEDS	210						69				221		
50 PERCENT EXCEEDS	18						16				31		
90 PERCENT EXCEEDS	9.1						8.7				9.2		

(a) Sept. 5, 6.

(b) Sept. 6, 10, 1978.

(c) Estimated.

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 sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.0	3.4	4.2	2.8	13	15	11	18	5.3	24	2.7	2.7
2	.98	3.0	3.9	3.1	14	13	11	15	5.6	33	2.3	2.4
3	1.1	2.9	3.6	e3.1	16	13	11	15	5.9	24	2.0	2.3
4	1.2	2.9	3.3	e3.1	16	13	11	14	4.8	18	2.0	2.1
5	1.2	2.7	3.6	e3.1	15	12	12	13	4.1	15	1.9	1.9
6	1.2	2.5	4.5	e3.1	14	e13	10	13	3.7	13	1.8	2.1
7	3.2	2.5	8.0	e3.0	14	e12	9.5	13	3.3	11	2.2	2.7
8	3.6	2.5	6.4	e3.0	13	e11	9.3	11	2.8	9.4	4.2	2.4
9	2.7	2.5	5.4	e3.0	13	e10	11	11	2.7	10	3.5	2.4
10	2.2	3.9	4.8	e3.0	13	e9.7	11	9.7	2.5	9.9	2.8	2.2
11	2.0	5.5	4.3	e3.0	14	e9.4	13	9.0	2.3	8.7	2.6	1.9
12	1.8	4.2	4.1	e3.0	17	e9.2	14	8.8	2.3	7.6	2.4	1.6
13	1.7	3.5	3.8	e3.0	16	e9.1	13	8.5	2.9	6.7	3.9	1.7
14	1.7	3.4	3.6	e3.0	e14	9.0	11	7.9	6.3	6.0	5.0	1.6
15	1.7	3.1	3.4	e3.0	13	9.0	10	7.4	5.5	5.5	3.5	1.7
16	1.6	2.8	3.5	e3.2	12	10	13	6.9	4.8	4.7	2.8	1.6
17	1.8	2.7	3.6	e6.0	13	14	13	7.0	4.3	4.6	2.6	1.5
18	2.6	2.5	3.7	e15	12	20	12	12	3.5	4.8	2.4	1.5
19	3.2	2.5	3.9	16	12	19	11	10	3.1	4.6	2.2	1.5
20	2.9	2.5	3.6	11	11	18	11	8.0	3.0	4.4	2.1	1.5
21	3.0	2.5	4.0	8.4	11	17	10	7.1	2.8	3.7	2.0	1.5
22	3.1	2.3	3.9	16	e11	16	23	7.2	2.6	3.6	1.9	1.5
23	3.3	2.3	3.3	26	9.8	14	55	7.1	2.3	4.2	1.9	1.9
24	3.7	2.1	3.3	31	e8.5	13	50	7.6	2.3	6.8	2.3	1.9
25	4.0	2.6	3.0	24	7.6	13	38	7.1	2.2	6.5	5.9	2.2
26	3.6	6.3	2.8	20	7.5	12	30	6.4	2.0	4.8	10	1.9
27	3.1	4.6	2.8	19	7.8	12	25	5.9	3.7	4.0	6.7	2.1
28	3.4	3.9	2.9	20	14	11	21	5.3	5.9	3.4	5.2	2.2
29	3.3	3.5	2.7	18	---	12	19	4.7	21	3.1	4.0	5.1
30	2.9	3.5	2.6	16	---	11	18	4.4	13	2.7	3.4	9.3
31	3.2	---	2.9	14	---	11	---	4.5	---	2.7	3.0	---
TOTAL	75.98	95.1	119.4	308.9	352.2	390.4	516.8	285.5	136.5	270.4	101.2	68.9
MEAN	2.45	3.17	3.85	9.96	12.6	12.6	17.2	9.21	4.55	8.72	3.26	2.30
MAX	4.0	6.3	8.0	31	17	20	55	18	21	33	10	9.3
MIN	.98	2.1	2.6	2.8	7.5	9.0	9.3	4.4	2.0	2.7	1.8	1.5
CFSM	.12	.15	.18	.48	.60	.60	.82	.44	.22	.42	.16	.11
IN.	.14	.17	.21	.55	.63	.69	.92	.51	.24	.48	.18	.12

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1999, BY WATER YEAR (WY)

	MEAN	6.70	10.5	12.8	12.9	14.9	26.4	28.7	18.1	11.2	5.93	4.45	5.54
MAX	38.4	38.2	28.2	36.5	39.1	61.2	45.5	41.6	28.5	14.8	19.5	31.9	
(WY)	1982	1986	1988	1993	1976	1976	1975	1974	1996	1989	1975	1975	
MIN	.37	1.02	.95	1.46	2.15	6.28	13.0	8.03	1.58	.74	.30	.41	
(WY)	1964	1965	1964	1961	1964	1964	1964	1988	1988	1965	1964	1963	

SUMMARY STATISTICS FOR 1998 CALENDAR YEAR FOR 1999 WATER YEAR WATER YEARS 1960 - 1999

	ANNUAL TOTAL	4182.50	2721.28	
ANNUAL MEAN	11.5	7.46	13.2	
HIGHEST ANNUAL MEAN			21.5	1975
LOWEST ANNUAL MEAN			4.12	1964
HIGHEST DAILY MEAN	94	Feb 18	55	Apr 23
LOWEST DAILY MEAN	.61	Aug 1	.98	Oct 2
ANNUAL SEVEN-DAY MINIMUM	.67	Sep 22	1.4	Oct 1
INSTANTANEOUS PEAK FLOW			66	Apr 23
INSTANTANEOUS PEAK STAGE			3.55	Apr 23
INSTANTANEOUS LOW FLOW				
ANNUAL RUNOFF (CFSM)	.55	.36	.63	
ANNUAL RUNOFF (INCHES)	7.44	4.84	8.56	
10 PERCENT EXCEEDS	32	15	30	
50 PERCENT EXCEEDS	3.8	4.4	9.4	
90 PERCENT EXCEEDS	1.1	2.0	1.7	

(a) July 9, 16, 1988.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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, 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 sea level, from topographic map. Jan. 29 to July 9, 1964, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.2	20	26	e31	90	41	23	105	12	77	21	5.9
2	4.0	40	25	31	90	42	23	95	13	107	18	5.7
3	4.2	33	21	e32	87	48	23	60	15	120	18	5.8
4	3.9	16	21	e31	85	51	31	28	15	126	16	5.6
5	3.8	17	21	e31	81	59	44	28	17	125	6.4	5.7
6	3.8	17	23	e30	78	71	44	29	17	111	5.6	7.3
7	6.1	17	22	e30	76	62	36	31	19	73	7.0	8.4
8	3.6	17	21	e29	73	55	20	32	22	59	6.8	7.7
9	3.7	17	22	e29	71	55	22	31	17	49	6.0	7.1
10	3.5	18	22	e29	69	61	21	27	14	47	6.5	6.7
11	3.5	18	23	e28	69	66	28	25	13	48	6.3	6.3
12	3.7	18	24	e28	68	67	41	26	12	41	6.3	6.3
13	3.8	18	24	e28	66	66	40	27	12	19	18	6.3
14	3.8	19	27	e28	65	63	40	26	20	19	28	6.2
15	3.8	25	30	e28	63	61	40	24	22	17	16	5.9
16	3.8	28	30	e27	62	58	41	24	22	14	8.4	5.7
17	4.1	24	30	e27	61	57	39	18	16	15	8.7	5.9
18	4.4	22	34	e27	60	55	37	19	11	14	9.0	5.9
19	4.2	22	40	27	58	57	38	26	9.7	14	12	6.3
20	4.2	22	39	27	57	59	38	27	9.5	11	11	6.4
21	4.2	22	40	27	56	61	38	27	8.6	6.9	9.0	6.0
22	4.0	22	40	34	51	61	56	27	6.0	6.9	8.4	5.6
23	3.8	22	40	46	46	63	99	27	5.6	11	9.2	6.3
24	3.8	22	38	55	42	63	114	27	5.1	10	11	6.4
25	3.8	24	38	75	41	62	123	26	4.9	8.9	24	5.6
26	6.1	28	38	78	40	60	130	25	4.8	18	36	5.6
27	6.2	28	37	82	39	58	135	20	7.5	34	32	5.6
28	3.9	27	35	84	43	52	134	13	6.2	33	32	5.9
29	3.6	28	34	84	—	44	126	12	27	33	31	11
30	3.6	28	e32	87	—	36	115	12	42	19	21	22
31	3.5	—	31	93	—	23	—	13	—	12	6.3	—
TOTAL	126.6	679	928	1323	1787	1737	1739	937	425.9	1298.7	454.9	207.1
MEAN	4.08	22.6	29.9	42.7	63.8	56.0	58.0	30.2	14.2	41.9	14.7	6.90
MAX	6.2	40	40	93	90	71	135	105	42	126	36	22
MIN	3.5	16	21	27	39	23	20	12	4.8	6.9	5.6	5.6
CFSM	.05	.29	.38	.54	.81	.71	.73	.38	.18	.53	.19	.09
IN.	.06	.32	.44	.62	.84	.82	.82	.44	.20	.61	.21	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1999, BY WATER YEAR (WY)

	MEAN	37.2	51.5	60.6	57.4	59.1	83.8	92.2	61.6	44.6	29.6	24.8	29.2
MAX	114	107	109	114	115	188	168	137	115	82.0	68.5	129	129
(WY)	1982	1986	1986	1973	1974	1976	1974	1974	1996	1968	1968	1975	1975
MIN	4.08	7.90	15.6	15.5	16.6	28.8	52.5	22.9	6.47	5.79	6.39	4.80	4.80
(WY)	1999	1965	1964	1964	1964	1964	1987	1988	1988	1988	1963	1963	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1960 - 1999

ANNUAL TOTAL	16029.8		11643.2									
ANNUAL MEAN	43.9		31.9									
HIGHEST ANNUAL MEAN										52.6		
LOWEST ANNUAL MEAN										87.9		1974
HIGHEST DAILY MEAN	139	Mar 24	135	Apr 27	274	Mar 1 ^o	1974			20.0		1964
LOWEST DAILY MEAN	3.5	Oct 10	3.5	Oct 10	3.1	Sep 1 ^o	1963					
ANNUAL SEVEN-DAY MINIMUM	3.7	Oct 8	3.7	Oct 8	3.5	Sep 1 ^o	1963					
INSTANTANEOUS PEAK FLOW			136	Apr 27	276	Mar 1 ^o	1974					
INSTANTANEOUS PEAK STAGE			3.78	Apr 27	4.95	Mar 1 ^o	1974					
INSTANTANEOUS LOW FLOW			3.5	(a)	2.4	May 31	1961					
ANNUAL RUNOFF (CFSM)	.55		.40		.66							
ANNUAL RUNOFF (INCHES)	7.53		5.47		9.02							
10 PERCENT EXCEEDS	127		68		103							
50 PERCENT EXCEEDS	22		25		46							
90 PERCENT EXCEEDS	4.5		5.6		11							

(a) Part or all of each day Oct. 8-12, Oct. 29 to Nov. 1.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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, 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 sea level.

REMARKS.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	20	25	e23	48	48	34	59	33	273	e21	11
2	14	20	24	e23	55	40	33	50	31	230	e19	10
3	15	19	24	e22	64	43	33	44	28	119	e18	10
4	15	19	24	e22	58	40	38	37	25	90	18	9.6
5	15	19	26	e22	52	38	41	36	23	69	19	9.3
6	15	19	55	e22	50	39	35	36	21	55	18	e15
7	76	18	66	e22	50	e38	32	36	20	44	27	e45
8	29	18	36	e21	48	e37	32	35	15	36	35	e35
9	20	19	31	e21	48	36	43	35	13	40	22	e25
10	18	31	30	e21	49	37	39	33	13	35	20	e17
11	18	33	30	e21	49	37	49	32	12	29	15	e14
12	19	21	31	e20	62	38	49	30	14	24	13	e12
13	18	19	31	e20	49	38	42	31	45	22	51	e11
14	18	19	31	e20	44	38	39	29	120	22	34	e12
15	18	19	31	e20	42	38	38	28	46	19	20	11
16	17	19	31	e22	42	42	49	26	29	21	16	11
17	17	20	32	e30	43	67	44	e30	21	19	13	10
18	19	20	31	e70	40	92	42	e80	19	20	12	10
19	18	20	32	e45	39	59	40	e55	16	24	12	9.7
20	18	19	31	e36	36	50	38	e40	15	24	12	9.7
21	30	19	32	e36	35	49	34	34	14	21	11	10
22	28	19	31	e90	e34	45	119	33	13	21	11	11
23	26	19	e30	e140	e32	42	285	34	12	32	12	9.7
24	25	18	e30	154	e31	41	180	42	14	38	20	15
25	24	23	e29	80	31	40	124	35	16	33	31	12
26	23	32	e28	67	31	38	118	31	12	25	28	10
27	22	24	e27	65	31	37	112	28	30	22	19	9.8
28	21	21	e26	77	59	37	99	26	39	20	16	11
29	20	21	e25	67	---	36	87	24	233	23	13	32
30	20	21	e24	58	---	35	73	22	85	20	12	48
31	20	---	e23	52	---	34	---	34	---	e19	11	---
TOTAL	670	628	957	1409	1252	1329	2021	1125	1027	1489	599	465.8
MEAN	21.6	20.9	30.9	45.5	44.7	42.9	67.4	36.3	34.2	48.0	19.3	15.5
MAX	76	33	66	154	64	92	285	80	233	273	51	48
MIN	14	18	23	20	31	34	32	22	12	19	11	9.3
CFSM	.30	.30	.44	.64	.63	.60	.95	.51	.48	.68	.27	.22
IN.	.35	.33	.50	.74	.66	.70	1.06	.59	.54	.78	.31	.24

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1999, BY WATER YEAR (WY)

	MEAN	38.4	45.5	51.4	51.7	60.6	96.2	98.3	62.9	46.6	29.4	25.6	33.9
MAX	123	120	103	127	160	204	194	146	125	58.0	66.7	104	104
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1996	1992	1975	1975	1975
MIN	8.50	11.0	14.5	14.9	15.4	25.9	37.2	28.5	13.5	11.7	12.0	12.2	12.2
(WY)	1964	1964	1965	1964	1963	1964	1964	1977	1988	1963	1965	1963	1963

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1960 - 1999
ANNUAL TOTAL	18126	12971.8	
ANNUAL MEAN	49.7	35.5	53.3
HIGHEST ANNUAL MEAN			86.7
LOWEST ANNUAL MEAN			20.4
HIGHEST DAILY MEAN	511	Feb 18	660
LOWEST DAILY MEAN	12	Aug 1	6.8
ANNUAL SEVEN-DAY MINIMUM	13	Jul 29	7.9
INSTANTANEOUS PEAK FLOW		557	(a)918
INSTANTANEOUS PEAK STAGE		4.06	(b)5.95
INSTANTANEOUS LOW FLOW			(c)1.2
ANNUAL RUNOFF (CFSM)	.70	.50	.75
ANNUAL RUNOFF (INCHES)	9.51	6.81	10.21
10 PERCENT EXCEEDS	114	58	104
50 PERCENT EXCEEDS	28	29	40
90 PERCENT EXCEEDS	15	13	16

(a) Gage height 5.22 ft.

(b) Backwater from ice.

(c) Result of regulation due to bridge construction.

(e) Estimated.

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 culvert on Romeo Road, 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 sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.6	3.5	8.1	6.5	13	15	9.0	19	7.5	41	2.5	1.8
2	4.4	3.8	6.9	e7.3	14	13	9.1	16	6.6	48	2.0	1.8
3	4.4	4.9	6.6	e7.2	16	15	8.6	14	6.5	37	1.7	1.8
4	4.3	3.8	8.2	e7.1	15	14	10	9.7	5.5	27	1.7	1.7
5	3.9	3.5	17	e7.0	14	14	13	8.8	4.8	21	2.0	1.7
6	4.0	4.6	18	e6.9	13	e14	9.9	8.7	4.5	16	2.0	2.6
7	9.4	10	21	e6.9	14	e14	8.5	8.8	4.1	14	2.1	5.2
8	6.7	8.9	17	e6.9	13	e13	7.0	8.6	3.9	11	3.4	2.0
9	5.2	8.4	15	e6.8	14	13	9.1	8.6	3.6	9.9	2.9	1.7
10	7.7	12	14	e6.8	15	13	9.3	7.5	3.4	5.7	2.1	1.7
11	5.8	12	13	e6.8	16	12	11	6.6	3.2	4.3	2.3	1.7
12	5.3	7.9	12	e6.7	24	12	14	6.4	3.7	3.7	2.1	1.7
13	5.3	7.7	12	e6.7	17	12	10	6.6	10	3.5	3.3	1.8
14	5.0	11	11	e6.7	15	11	9.1	5.7	25	3.3	3.1	1.8
15	4.7	11	11	e6.7	12	12	7.8	5.1	12	3.1	2.4	1.8
16	4.7	9.4	10	e7.0	13	13	9.8	5.0	8.2	3.0	2.2	1.7
17	4.7	10	10	e7.7	14	18	9.7	5.3	7.7	2.9	2.0	1.7
18	4.8	8.4	9.7	e10	12	26	8.6	16	6.0	2.9	1.9	1.7
19	4.9	9.2	9.8	e10	12	21	7.5	12	5.0	3.0	2.0	1.7
20	4.7	8.1	9.4	e9.3	11	19	6.6	9.3	4.5	2.9	2.0	1.7
21	4.5	8.1	9.7	e9.3	12	19	6.2	7.7	4.0	2.8	1.8	1.9
22	3.6	7.3	8.6	e13	11	16	24	7.2	3.8	3.0	1.8	1.9
23	3.2	6.8	8.8	e22	10	14	63	6.9	3.6	2.8	1.8	1.8
24	3.2	6.0	8.0	29	9.1	14	66	7.3	3.6	3.3	2.2	2.2
25	3.1	6.1	7.7	19	9.7	12	50	6.4	5.2	3.3	2.4	2.1
26	3.3	12	7.8	16	9.7	10	39	6.2	4.2	2.8	2.5	1.9
27	5.8	8.2	7.5	16	9.8	9.9	35	5.5	7.2	2.4	2.3	1.9
28	6.0	7.1	7.4	18	16	9.6	31	4.9	10	2.2	2.1	2.0
29	3.6	6.7	7.3	16	—	9.8	26	4.6	35	2.3	2.0	4.5
30	3.6	6.8	6.4	15	—	9.0	22	4.2	19	2.3	1.9	6.5
31	3.9	—	7.1	14	—	8.8	—	6.9	—	2.2	1.8	—
TOTAL	148.3	233.2	326.0	334.3	374.3	426.1	549.8	255.5	231.3	292.6	68.3	66.0
MEAN	4.78	7.77	10.5	10.8	13.4	13.7	18.3	8.24	7.71	9.44	2.20	2.20
MAX	9.4	12	21	29	24	26	66	19	35	48	3.4	6.5
MIN	3.1	3.5	6.4	6.5	9.1	8.8	6.2	4.2	3.2	2.2	1.7	1.7
CFSM	.19	.30	.41	.42	.52	.54	.72	.32	.30	.37	.09	.09
IN.	.22	.34	.47	.49	.54	.62	.80	.37	.34	.43	.10	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1999, BY WATER YEAR (WY)

MEAN	10.4	15.6	17.6	16.8	21.0	35.3	34.6	18.6	13.8	8.20	6.80	8.46
MAX	25.1	46.2	41.3	47.7	62.9	79.7	75.1	57.1	49.5	20.0	48.5	41.2
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1996	1969	1975	1975
MIN	1.79	2.06	3.56	5.26	7.22	13.7	18.2	5.82	2.67	1.47	1.63	1.52
(WY)	1967	1965	1965	1965	1979	1999	1966	1977	1988	1965	1965	1966

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1965 - 1999

ANNUAL TOTAL	5615.1			3305.7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
--------------	--------	--	--	--------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

(a) Result of regulation from unknown source.

(e) Estimated.

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 sea level (levels by Huron-Clinton Metropolitan Authority).

REMARKS.--Records good. Occasional diurnal fluctuation caused by mills upstream from station prior to February 1963; occasional regulation by Stony Lake since (see preceding page). From 1963 to 1991 annual mean discharge and runoff figures adjusted for change in contents in Stony Lake. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	9.9	6.5	8.2	41	40	21	52	18	74	9.0	5.7
2	9.4	9.9	4.4	8.3	42	39	22	42	20	131	7.4	5.7
3	8.3	9.8	4.6	8.5	44	41	24	39	21	127	6.2	5.7
4	8.3	9.9	4.7	8.6	43	38	28	39	19	103	6.4	5.7
5	8.2	9.9	4.5	8.6	39	38	21	33	17	78	6.6	5.7
6	8.3	9.9	4.8	8.6	39	41	15	30	16	60	6.5	6.1
7	29	9.9	5.1	8.6	38	36	15	27	14	47	6.3	7.1
8	45	9.8	5.4	8.6	37	35	16	26	13	37	8.9	5.7
9	30	9.9	5.5	8.6	35	35	18	25	11	34	6.5	5.8
10	18	10	5.0	8.6	36	35	15	23	11	30	6.3	5.6
11	15	18	2.6	8.6	38	33	16	21	10	22	6.6	5.7
12	13	27	2.0	8.6	44	33	17	21	10	18	6.2	5.4
13	11	29	1.6	8.9	45	33	17	20	15	15	10	5.4
14	11	29	4.6	8.9	42	33	17	16	42	13	16	5.3
15	11	29	8.0	8.9	39	23	18	15	50	11	9.4	5.5
16	11	23	5.2	8.8	37	17	23	14	42	10	8.0	7.2
17	10	20	5.0	8.7	36	16	30	16	34	9.9	8.2	5.0
18	11	19	5.6	8.9	35	23	33	33	26	9.5	8.2	4.6
19	11	18	6.0	8.9	33	34	28	37	21	9.5	7.4	4.7
20	15	17	6.1	8.9	30	34	26	34	19	8.9	8.0	5.7
21	20	17	5.7	8.9	27	44	27	29	16	8.4	7.4	4.9
22	21	17	5.6	27	24	30	49	28	13	8.9	6.2	4.6
23	16	17	4.3	15	22	16	107	24	11	9.8	6.2	4.7
24	14	15	4.0	34	21	18	141	28	11	12	6.6	6.2
25	14	10	3.9	58	25	23	135	24	12	11	6.8	2.9
26	14	8.6	3.6	57	24	27	115	22	10	9.2	7.4	3.0
27	14	8.3	3.8	51	24	31	93	20	14	8.9	6.6	4.9
28	14	8.3	4.1	51	32	32	82	19	18	8.2	6.7	3.7
29	12	8.4	6.7	51	---	32	71	18	49	7.5	9.4	2.1
30	9.9	9.0	8.5	49	---	23	60	16	55	7.3	6.4	2.1
31	9.9	---	8.3	45	---	19	---	16	---	7.6	5.8	---
TOTAL	454.3	446.5	155.7	620.2	972	952	1300	807	638	946.6	233.6	320.7
MEAN	14.7	14.9	5.02	20.0	34.7	30.7	43.3	26.0	21.3	30.5	7.54	10.7
MAX	45	29	8.5	58	45	44	141	52	55	131	16	4.9
MIN	8.2	8.3	1.6	8.2	21	16	15	14	10	7.3	5.8	4.6

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1999, BY WATER YEAR (WY)

	MEAN	30.7	42.8	45.2	42.0	49.2	77.2	77.3	49.9	36.2	21.6	18.9	24.2
MAX	85.8	105	94.0	115	144	199	142	132	120	50.7	76.0	97.7	
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1989	1969	1975	1975	
MIN	10.3	10.2	5.02	10.7	9.79	5.14	10.0	17.2	6.93	4.41	4.00	4.72	
(WY)	1963	1964	1999	1963	1963	1964	1963	1963	1964	1988	1964	1964	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1958 - 1999

ANNUAL TOTAL	13378.7							7846.6					
ANNUAL MEAN	36.7							21.5					
HIGHEST ANNUAL MEAN										42.9			
LOWEST ANNUAL MEAN										79.1			1976
HIGHEST DAILY MEAN	177				Feb 21			141	Apr 24	12.0			1963
LOWEST DAILY MEAN	1.6				Dec 13			1.6	Dec 13	407			Feb 2 1968
ANNUAL SEVEN-DAY MINIMUM	3.8				Dec 8			3.8	Dec 8	1.3			Jul 31 1964
INSTANTANEOUS PEAK FLOW								276	Jan 22	2.2			Jul 31 1964
INSTANTANEOUS PEAK STAGE								4.81	Jan 22	(a)552			Jun 10 1988
INSTANTANEOUS LOW FLOW								1.3	Dec 14	(b)6.71			Mar 6 1959
10 PERCENT EXCEEDS	86							42		.90			Jul 10 1963
50 PERCENT EXCEEDS	20							15					
90 PERCENT EXCEEDS	5.9							5.7					

(a) From rating curve extended above 380 ft³/s; result of momentary release of water from Stony Lake; gage height 6.44 ft.

(b) Backwater from ice.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164000 CLINTON RIVER NEAR FRASER, MI

LOCATION.--Lat 42°34'38", long 82°57'05", in SE1/4 NE1/4 sec.19, T.2 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on right bank 50 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 sea level (Macomb County bench mark). Prior to Nov. 17, 1949, and from May 29 to July 31, 1990, nonrecording gage at same site and datum. Nov. 17, 1949 to Apr. 5, 1990, water-stage recorder at site 800 ft downstream at same datum.

REMARKS.--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.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20 ft, from floodmark, and discharge of approximately 9,000 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	139	107	179	126	453	529	208	420	325	1120	304	106
2	95	158	141	126	584	381	203	422	273	1520	186	105
3	143	205	140	e130	642	563	189	391	305	1320	145	116
4	132	213	145	e130	525	444	360	377	188	805	151	110
5	93	215	219	e135	431	371	402	306	155	616	186	96
6	87	190	283	e135	404	369	239	270	133	515	130	319
7	1160	147	795	e135	399	313	201	247	129	371	199	1290
8	623	125	312	e135	430	325	191	217	131	311	443	297
9	249	149	208	e130	462	323	612	209	132	495	188	181
10	172	394	193	e125	426	323	424	182	126	366	155	141
11	139	469	182	e120	396	341	512	173	117	273	164	121
12	128	229	174	e120	608	359	454	172	e210	224	144	107
13	126	197	163	e120	428	363	287	179	e450	204	471	125
14	147	185	150	e120	363	349	235	163	e1000	191	775	113
15	157	179	136	e120	332	361	212	154	e550	181	242	103
16	154	178	141	e125	329	406	567	152	344	172	168	99
17	130	165	187	e155	359	541	420	162	213	177	156	96
18	121	146	144	713	317	598	483	1270	189	202	146	93
19	125	133	183	457	293	449	323	558	174	184	142	87
20	114	131	158	294	238	375	260	363	160	180	133	88
21	120	139	229	265	218	347	231	258	153	149	119	223
22	130	143	252	1230	229	326	984	353	130	184	105	122
23	130	144	169	1860	233	279	e3000	263	107	e300	108	105
24	119	143	152	1900	232	268	e1850	579	105	e640	145	138
25	116	146	126	1100	261	254	e1200	289	206	e320	245	120
26	116	425	119	682	279	249	e880	230	118	e200	361	119
27	120	173	118	587	267	233	744	198	677	188	241	115
28	120	139	131	688	768	224	660	176	616	199	167	146
29	118	129	137	585	---	226	581	151	2280	202	147	675
30	115	129	137	509	---	226	449	138	1240	157	144	768
31	112	---	132	478	---	209	---	238	---	155	127	---
TOTAL	5550	5625	5935	13535	10906	10924	17361	9260	10936	12121	6537	6324
MEAN	179	188	191	437	390	352	579	299	365	391	211	211
MAX	1160	469	795	1900	768	598	3000	1270	2280	1520	775	1290
MIN	87	107	118	120	218	209	189	138	105	149	105	87
CFSM	.40	.42	.43	.98	.88	.79	1.30	.67	.82	.88	.47	.47
IN.	.47	.47	.50	1.13	.91	.92	1.45	.78	.92	1.02	.55	.53

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1999, BY WATER YEAR (WY)

	MEAN	267	333	387	389	461	669	654	460	358	266	225	239
MAX	1021	834	837	975	1119	1313	1237	1382	942	664	480	758	
(WY)	1982	1986	1968	1950	1976	1976	1950	1956	1996	1957	1980	1975	
MIN	72.3	78.2	93.1	91.8	112	217	259	127	120	87.1	69.5	73.3	
(WY)	1954	1954	1959	1961	1963	1964	1958	1958	1949	1955	1954	1954	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1947 - 1999
ANNUAL TOTAL	147856	115014	
ANNUAL MEAN	405	315	391
HIGHEST ANNUAL MEAN			595
LOWEST ANNUAL MEAN			189
HIGHEST DAILY MEAN	4760	3000	6930
LOWEST DAILY MEAN	83	87	49
ANNUAL SEVEN-DAY MINIMUM	89	97	59
INSTANTANEOUS PEAK FLOW		4190	8840
INSTANTANEOUS PEAK STAGE		16.33	19.56
INSTANTANEOUS LOW FLOW		74	47
ANNUAL RUNOFF (CFSM)	.91	.71	.88
ANNUAL RUNOFF (INCHES)	12.39	9.64	11.97
10 PERCENT EXCEEDS	906	610	750
50 PERCENT EXCEEDS	208	201	281
90 PERCENT EXCEEDS	119	120	117

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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 Van Dyke Road, 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 sea level, from topographic map.

REMARKS.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.0	7.0	8.1	e6.5	18	18	11	24	6.5	71	3.0	2.9
2	4.5	7.3	7.0	e6.5	19	13	10	20	7.4	110	2.9	2.8
3	4.7	6.9	6.5	e6.5	21	13	10	17	7.7	40	2.8	2.7
4	4.8	6.6	6.3	e6.5	20	12	12	13	7.5	23	2.9	2.6
5	4.9	6.3	8.3	e6.5	18	12	16	12	6.2	19	2.9	2.6
6	5.0	6.4	12	e6.4	17	e12	17	11	5.6	17	2.8	7.2
7	10	6.5	19	e6.4	17	e12	21	10	5.4	16	3.1	11
8	8.6	6.7	19	e6.4	16	e12	24	9.2	5.4	14	3.9	7.9
9	7.5	7.0	18	e6.3	16	e11	25	8.6	5.0	13	3.8	5.5
10	6.6	8.9	16	e6.3	17	e11	23	7.9	4.8	11	3.4	4.6
11	6.2	11	12	e6.2	17	e11	21	7.0	4.6	9.6	3.4	4.1
12	6.1	8.3	9.7	e6.2	21	e11	20	6.7	4.3	7.5	3.3	3.8
13	6.0	7.9	8.3	e6.1	17	e11	18	6.9	5.4	6.6	4.4	3.7
14	5.6	7.1	9.8	e6.0	15	11	15	6.5	17	6.0	4.3	3.5
15	5.6	6.8	11	e6.0	14	11	14	5.9	15	5.6	4.0	3.4
16	5.6	7.1	10	e7.0	13	13	15	5.7	9.2	5.0	3.7	3.3
17	5.5	10	9.5	e9.0	14	18	13	5.8	7.1	4.8	3.4	3.3
18	5.5	9.6	8.2	e20	13	23	13	14	6.0	4.6	3.2	3.2
19	5.5	8.8	7.6	e36	12	20	12	13	5.5	4.5	3.1	3.2
20	5.6	7.4	6.8	e23	11	19	10	10	4.9	4.4	3.1	3.1
21	5.6	6.6	7.1	e18	e10	18	8.4	10	4.4	4.3	3.0	3.4
22	5.7	6.3	7.4	e28	e9.5	20	23	11	4.2	4.2	2.9	3.4
23	5.6	6.6	7.2	e50	e9.0	19	73	11	3.8	4.0	3.0	3.3
24	5.6	6.5	6.1	75	e8.8	18	76	11	3.7	4.4	3.3	3.5
25	5.6	6.7	6.1	30	8.8	15	50	9.6	3.9	4.3	3.7	3.6
26	5.7	10	6.0	23	8.7	12	45	8.6	3.9	4.3	3.9	3.5
27	5.7	8.4	6.0	22	8.6	10	38	7.5	5.1	4.1	3.9	3.5
28	6.0	7.6	5.9	25	18	12	32	6.7	5.9	3.8	3.8	3.6
29	6.0	7.1	6.2	24	--	11	30	5.9	4.9	3.5	3.3	6.2
30	6.2	8.3	e6.6	21	--	12	27	5.5	33	3.3	3.2	7.9
31	6.6	--	e6.6	19	--	12	--	5.6	--	3.3	3.1	--
TOTAL	183.1	227.7	284.3	524.8	407.4	433	722.4	306.6	257.3	436.1	104.5	126.3
MEAN	5.91	7.59	9.17	16.9	14.6	14.0	24.1	9.89	8.58	14.1	3.37	4.21
MAX	10	11	19	75	21	23	76	24	49	110	4.4	11
MIN	4.5	6.3	5.9	6.0	8.6	10	8.4	5.5	3.7	3.3	2.8	2.6
CFSM	.27	.35	.42	.78	.67	.64	1.10	.45	.39	.65	.15	.19
IN.	.31	.39	.49	.90	.70	.74	1.23	.52	.44	.74	.18	.22

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1999, BY WATER YEAR (WY)

	MEAN	10.1	13.9	15.2	15.0	19.0	32.2	31.2	19.1	14.0	9.05	7.06	8.60
MAX	35.1	45.0	35.7	42.6	54.0	67.9	71.4	52.2	52.9	22.9	35.0	52.3	
(WY)	1987	1986	1988	1973	1968	1976	1975	1974	1989	1969	1975	1985	
MIN	1.92	2.32	1.64	2.89	2.93	7.81	13.1	7.77	2.76	2.07	1.30	2.02	
(WY)	1964	1964	1964	1959	1964	1964	1963	1977	1963	1964	1965	1966	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1958 - 1999

ANNUAL TOTAL	4782.8		4013.5		16.2	
ANNUAL MEAN	13.1		11.0		29.0	1975
HIGHEST ANNUAL MEAN					4.99	1964
LOWEST ANNUAL MEAN					302	Feb 1 1968
HIGHEST DAILY MEAN	111	Feb 18	110	Jul 2	.90	Jul 29 1964
LOWEST DAILY MEAN	2.5	Aug 3	2.6	Sep 4	.99	Jul 27 1964
ANNUAL SEVEN-DAY MINIMUM	2.8	Jul 29	2.8	Aug 30	(a)358	Feb 10 1965
INSTANTANEOUS PEAK FLOW			149	Jul 1	(b)4.56	Mar 12 1962
INSTANTANEOUS PEAK STAGE			3.03	Jul 1	.80	(d)
INSTANTANEOUS LOW FLOW			2.4	(c)	.74	
ANNUAL RUNOFF (CFSM)	.60		.50		10.09	
ANNUAL RUNOFF (INCHES)	8.16		6.85		33	
10 PERCENT EXCEEDS	27		20		11	
50 PERCENT EXCEEDS	7.9		7.1		3.4	
90 PERCENT EXCEEDS	4.7		3.4			

(a) Gage height 4.48 ft.

(b) Backwater from ice.

(c) Aug. 29, Sept. 4.

(d) July 30, 31, 1964, Aug. 6, 7, 1965.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

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 at upstream side of 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 sea level (levels by Michigan Department of Natural Resources). Prior to Nov. 15, 1949 and Oct. 3, 1997 to Apr. 22, 1998, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Some regulation at times by mill upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20.0 ft, from floodmark.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.6	12	e21	12	165	103	54	105	24	339	7.7	4.2
2	6.5	12	e20	e12	131	110	53	93	28	324	8.6	2.0
3	5.5	11	18	e12	174	103	51	84	28	680	7.1	1.3
4	8.0	13	17	e11	213	103	52	74	27	669	5.9	1.7
5	7.9	13	16	e11	214	105	73	64	24	265	5.6	3.0
6	7.9	14	19	e11	156	82	90	60	22	111	4.7	2.1
7	13	13	32	e11	117	92	81	58	19	80	6.9	4.0
8	29	13	57	e11	105	79	75	55	15	58	11	27
9	24	13	50	e11	96	76	79	50	13	47	15	22
10	18	15	38	e11	103	67	99	45	11	45	14	15
11	13	16	31	e11	103	61	100	41	10	38	13	11
12	12	30	26	e11	107	61	181	37	11	31	12	8.0
13	10	26	23	e11	120	66	172	34	24	25	17	6.4
14	9.3	20	e20	e11	93	73	110	35	86	22	23	5.7
15	11	17	e19	e11	80	79	88	33	225	19	23	5.6
16	9.8	16	e19	e11	73	78	84	30	172	16	20	4.3
17	9.1	16	e20	e12	70	140	105	28	82	15	18	2.7
18	8.9	16	e20	e16	70	285	114	37	59	15	15	3.4
19	7.0	18	19	e15	66	353	104	66	42	14	12	2.5
20	8.2	19	18	e14	58	275	89	63	32	14	10	2.8
21	9.3	e18	18	e25	45	173	79	47	26	14	9.5	4.3
22	8.7	e17	18	57	43	125	162	41	21	13	8.8	3.5
23	8.2	e16	15	153	44	107	858	40	17	e14	8.0	3.9
24	7.6	e17	14	353	41	94	1870	44	14	e20	8.2	3.8
25	8.5	e16	14	416	41	85	1380	51	14	e30	7.2	5.0
26	9.7	e17	12	466	38	78	647	45	31	e20	12	5.8
27	10	e19	12	402	39	68	358	39	37	15	16	5.2
28	9.6	e26	12	315	58	62	225	34	51	11	14	3.6
29	10	e26	13	307	---	61	162	28	217	8.6	11	6.9
30	11	e23	13	284	---	59	122	25	323	6.3	8.6	13
31	12	---	11	229	---	56	---	23	---	4.9	5.8	---
TOTAL	328.3	518	655	3243	2663	3359	7717	1509	1705	2983.8	358.6	189.7
MEAN	10.6	17.3	21.1	105	95.1	108	257	48.7	56.8	96.3	11.6	6.32
MAX	29	30	57	466	214	353	1870	105	323	680	23	27
MIN	5.5	11	11	11	38	56	51	23	10	4.9	4.7	1.3
CFSM	.05	.09	.11	.53	.48	.54	1.29	.24	.29	.48	.06	.03
IN.	.06	.10	.12	.61	.50	.63	1.44	.28	.32	.56	.07	.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1999, BY WATER YEAR (WY)

MEAN	49.7	90.0	134	132	203	357	269	138	79.9	34.1	24.6	38.2
MAX	479	595	460	507	766	928	560	790	448	127	247	484
(WY)	1982	1986	1968	1974	1976	1982	1975	1956	1996	1992	1975	1985
MIN	3.71	7.12	5.63	5.55	8.77	29.6	72.6	25.9	7.08	3.44	2.14	3.12
(WY)	1964	1964	1959	1961	1963	1964	1963	1958	1988	1955	1955	1963

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1947 - 1999

ANNUAL TOTAL	39514.26	25229.4	128
ANNUAL MEAN	108	69.1	230
HIGHEST ANNUAL MEAN			25.4
LOWEST ANNUAL MEAN			1986
HIGHEST DAILY MEAN	2700	1870	5040
LOWEST DAILY MEAN	.21	1.3	.09
ANNUAL SEVEN-DAY MINIMUM	.37	2.6	.10
INSTANTANEOUS PEAK FLOW		2000	6700
INSTANTANEOUS PEAK STAGE		13.51	18.62
INSTANTANEOUS LOW FLOW		1.0	.08
ANNUAL RUNOFF (CFSM)	.54	.35	.65
ANNUAL RUNOFF (INCHES)	7.39	4.72	8.77
10 PERCENT EXCEEDS	250	154	308
50 PERCENT EXCEEDS	20	22	41
90 PERCENT EXCEEDS	6.5	7.2	7.4

(a) Part of each day July 4-10, 14, 15, 1988.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI

LOCATION.--Lat 42°35'45", long 82°54'35", Macomb County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on I⁴oravian Drive, 0.2 mi downstream from North Branch, and 0.5 mi west of Mount Clemens.

DRAINAGE AREA.--734 mi².

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 sea level. 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.--Records good except for estimated daily discharges, which are fair. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	166	160	217	175	847	864	337	656	396	1910	387	159
2	142	183	183	168	1030	660	325	629	332	2260	220	153
3	150	235	174	e170	1280	798	301	566	391	2030	193	155
4	191	230	178	e180	1080	731	480	536	254	1440	194	156
5	154	254	278	e185	896	633	641	461	218	911	233	148
6	163	234	324	e190	793	567	465	419	188	697	182	215
7	1370	205	1000	e190	736	495	379	395	182	534	257	1380
8	1080	172	499	e190	753	539	344	331	174	417	623	469
9	356	192	323	e185	821	540	808	308	179	576	245	258
10	266	370	273	e180	788	527	721	278	174	489	208	194
11	219	687	255	e175	726	546	791	265	171	371	210	170
12	208	340	232	e175	1040	560	835	256	280	289	196	159
13	197	277	207	e175	784	564	649	257	463	259	522	170
14	190	262	190	e175	643	547	503	238	1340	244	843	160
15	224	222	174	e175	567	585	425	228	833	224	325	148
16	224	242	167	e190	537	686	766	225	602	213	225	138
17	206	216	247	e220	560	903	705	225	389	203	202	137
18	189	218	200	1090	508	1100	754	1820	319	258	190	149
19	186	196	228	662	473	954	605	815	282	230	185	141
20	170	174	213	451	388	813	498	522	257	251	179	130
21	172	175	276	394	317	693	435	394	240	204	170	289
22	172	202	333	1600	336	628	1580	467	213	203	167	170
23	185	182	220	3170	357	550	5520	386	188	375	161	145
24	181	167	205	3640	352	502	6070	725	192	875	186	167
25	168	181	175	2280	379	469	3960	447	295	435	287	175
26	167	553	159	1610	423	438	2350	333	220	247	410	162
27	166	264	154	1340	420	398	1660	285	927	213	302	155
28	166	195	158	1480	1150	377	1240	259	980	219	208	170
29	167	174	153	1260	---	363	1010	226	3830	230	186	689
30	167	170	172	1080	---	367	770	202	1870	202	185	110
31	156	---	179	974	---	344	---	297	---	192	172	---
TOTAL	7918	7332	7746	24129	18984	18741	35927	13451	16379	17243	8253	7921
MEAN	255	244	250	778	678	605	1198	434	546	556	266	264
MAX	1370	687	1000	3640	1280	1100	6070	1820	3830	2260	843	1380
MIN	142	160	153	168	317	344	301	202	171	192	161	130
CFSM	.35	.33	.34	1.06	.92	.82	1.63	.59	.74	.76	.36	.36
IN.	.40	.37	.39	1.22	.96	.95	1.82	.68	.83	.87	.42	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1934 - 1999, BY WATER YEAR (WY)

MEAN	312	419	535	561	758	1145	1058	687	480	299	249	269
MAX	1550	1492	1615	1739	2407	2255	3090	2747	1543	865	744	1144
(WY)	1982	1986	1968	1993	1938	1982	1947	1943	1989	1969	1975	1975
MIN	64.1	79.0	84.3	93.9	118	263	249	164	52.9	50.9	51.7	52.5
(WY)	1935	1945	1945	1945	1940	1964	1946	1958	1934	1934	1934	1941

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1934 - 1999
ANNUAL TOTAL	227623	184024	
ANNUAL MEAN	624	504	565
HIGHEST ANNUAL MEAN			929
LOWEST ANNUAL MEAN			230
HIGHEST DAILY MEAN	8480	Feb 18	19200
LOWEST DAILY MEAN	105	Aug 2	25
ANNUAL SEVEN-DAY MINIMUM	112	Jul 29	143
INSTANTANEOUS PEAK FLOW			7160
INSTANTANEOUS PEAK STAGE			13.06
ANNUAL RUNOFF (CFSM)	.85		.69
ANNUAL RUNOFF (INCHES)	11.54		9.33
10 PERCENT EXCEEDS	1340		1000
50 PERCENT EXCEEDS	255		276
90 PERCENT EXCEEDS	158		167

(a) From floodmark.
(e) Estimated.

(e) **Estimated**

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 in Southfield, 4.2 mi east of Farmington.

DRAINAGE AREA.--87.9 mi².

WATER-DISCHARGE RECORDS

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 above sea level (City of Southfield bench mark). Prior to Sept. 30, 1958, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	21	33	22	79	126	38	69	66	347	31	19
2	18	21	27	e22	114	88	39	64	81	492	23	18
3	26	20	24	e22	138	113	38	60	86	178	19	17
4	27	20	24	e23	110	97	70	56	45	121	30	17
5	19	20	36	e23	89	82	76	53	37	91	30	16
6	18	20	72	e23	85	79	51	51	33	75	23	26
7	446	20	143	e22	86	e75	e42	47	30	62	32	56
8	145	20	60	e22	84	e71	e40	44	27	53	74	33
9	62	20	38	e23	86	70	112	43	25	91	35	22
10	40	e80	31	e23	90	68	95	40	24	66	30	18
11	32	e90	28	e23	84	70	95	37	e60	47	26	17
12	28	e40	26	e23	117	68	95	37	e80	41	23	16
13	26	27	25	e23	85	65	67	36	e190	38	89	18
14	25	25	24	e23	67	61	53	32	e200	35	142	24
15	24	23	23	e23	63	67	48	30	e100	31	46	19
16	23	22	26	e25	64	82	e140	29	e70	29	30	15
17	23	22	34	e40	66	120	107	48	53	45	26	15
18	24	21	26	e130	58	146	133	601	45	45	23	15
19	25	22	34	e90	53	93	92	140	40	54	22	15
20	23	21	33	e60	48	76	77	79	36	39	21	14
21	21	21	49	e50	e45	69	67	60	34	31	20	28
22	21	20	50	e170	e43	62	225	66	32	54	19	22
23	21	20	41	e550	e42	56	1060	62	29	137	19	18
24	22	20	30	837	41	52	583	115	30	150	47	19
25	21	22	25	210	47	49	188	66	41	62	74	20
26	20	69	25	131	50	46	139	49	31	40	44	18
27	20	43	24	112	54	44	111	41	410	34	46	16
28	22	29	25	147	167	44	96	37	210	29	28	28
29	21	25	26	120	---	42	85	33	693	26	23	169
30	21	24	26	96	---	41	76	31	158	23	20	136
31	21	---	25	85	---	40	---	47	---	25	19	---
TOTAL	1307	888	1113	3194	2155	2262	4138	2203	2996	2591	1134	884
MEAN	42.2	29.6	35.9	103	77.0	73.0	138	71.1	99.9	83.6	36.6	29.5
MAX	446	90	143	837	167	146	1060	601	693	492	142	169
MIN	18	20	23	22	41	40	38	29	24	23	19	14
CFSM	.48	.34	.41	1.17	.88	.83	1.57	.81	1.14	.95	.42	.34
IN.	.55	.38	.47	1.35	.91	.96	1.75	.93	1.27	1.10	.48	.37

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1999, BY WATER YEAR (WY)

	MEAN	42.7	58.2	67.9	66.0	82.4	133	118	79.2	66.6	40.8	37.8	38.4
MAX	207	164	178	203	254	327	225	191	241	118	142	147	147
(WY)	1982	1993	1988	1993	1976	1982	1977	1983	1989	1968	1995	1986	1986
MIN	4.08	7.24	6.92	8.95	9.14	38.9	38.5	19.6	13.7	5.52	3.77	3.37	3.37
(WY)	1964	1964	1964	1961	1963	1964	1963	1958	1971	1964	1963	1963	1963

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1958 - 1999
ANNUAL TOTAL	29148	24865	69.6
ANNUAL MEAN	79.9	68.1	105
HIGHEST ANNUAL MEAN			20.4
LOWEST ANNUAL MEAN			1996
HIGHEST DAILY MEAN	1530	1060	3210
LOWEST DAILY MEAN	12	14	.30
ANNUAL SEVEN-DAY MINIMUM	13	17	.66
INSTANTANEOUS PEAK FLOW		1400	4900
INSTANTANEOUS PEAK STAGE		11.96	19.04
INSTANTANEOUS LOW FLOW			.10
ANNUAL RUNOFF (CFSM)	.91	.78	.79
ANNUAL RUNOFF (INCHES)	12.34	10.52	10.76
10 PERCENT EXCEEDS	159	128	135
50 PERCENT EXCEEDS	36	40	39
90 PERCENT EXCEEDS	19	20	11

(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04166100 RIVER ROUGE AT SOUTHFIELD, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--April to September 1999.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: April to September 1999.

DISSOLVED OXYGEN: April to September 1999.

INSTRUMENTATION.--Water-quality monitor telemeter, set for 15 minute measurement intervals.

REMARKS.--Interruptions in water-quality record were due to instrument malfunctions.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 26.0°C, July 30, 31; minimum, 7.0°C, April 24.

DISSOLVED OXYGEN: Maximum, 12.9 mg/L, April 14; minimum recorded, 4.4 mg/L, July 4.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	---	---	---	---	---	---	---	---	---	16.0	13.0	14.5
2	---	---	---	---	---	---	---	---	---	17.0	13.5	15.0
3	---	---	---	---	---	---	---	---	---	17.0	14.5	16.0
4	---	---	---	---	---	---	---	---	---	18.0	14.5	16.0
5	---	---	---	---	---	---	---	---	---	17.0	15.5	16.5
6	---	---	---	---	---	---	---	---	---	17.5	16.0	17.0
7	---	---	---	---	---	---	---	---	---	17.5	15.0	16.0
8	---	---	---	---	---	---	---	---	---	16.5	14.5	15.5
9	---	---	---	---	---	---	---	---	---	16.5	13.5	15.0
10	---	---	---	---	---	---	---	---	---	16.5	13.5	15.0
11	---	---	---	---	---	---	---	---	---	16.5	13.5	15.0
12	---	---	---	---	---	---	---	---	---	16.0	14.0	14.5
13	---	---	---	---	---	---	---	---	---	14.5	13.0	14.0
14	---	---	---	---	---	---	13.0	9.0	11.0	15.5	12.5	14.0
15	---	---	---	---	---	---	12.0	10.5	11.5	17.0	14.5	15.5
16	---	---	---	---	---	---	---	---	---	18.0	15.5	16.5
17	---	---	---	---	---	---	11.0	9.0	10.0	20.0	17.0	18.5
18	---	---	---	---	---	---	10.5	9.0	10.0	19.5	16.5	19.0
19	---	---	---	---	---	---	10.0	8.5	9.5	18.5	16.5	17.5
20	---	---	---	---	---	---	11.0	9.0	10.0	17.5	16.0	16.5
21	---	---	---	---	---	---	11.5	10.0	10.5	18.0	15.5	17.0
22	---	---	---	---	---	---	11.5	10.0	10.5	18.0	17.0	17.0
23	---	---	---	---	---	---	10.0	8.5	9.0	17.0	15.5	16.0
24	---	---	---	---	---	---	10.5	7.0	8.5	16.5	14.0	15.5
25	---	---	---	---	---	---	12.0	8.5	10.5	14.0	12.5	13.0
26	---	---	---	---	---	---	13.5	10.0	12.0	14.0	12.0	13.0
27	---	---	---	---	---	---	14.0	11.5	13.0	15.5	12.5	14.0
28	---	---	---	---	---	---	14.5	11.5	13.0	17.5	14.0	16.0
29	---	---	---	---	---	---	15.0	12.0	13.5	19.5	16.5	18.0
30	---	---	---	---	---	---	15.5	12.5	14.0	20.5	18.0	19.5
31	---	---	---	---	---	---	---	---	---	20.0	18.5	19.5
MONTH	---	---	---	---	---	---	---	---	---	20.5	12.0	16.0

STREAMS TRIBUTARY TO DETROIT RIVER

04166100 RIVER ROUGE AT SOUTHFIELD, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	19.5	18.5	19.0	20.0	18.5	19.5	25.0	23.0	24.0	19.0	16.5	17.5
2	20.0	19.0	19.5	21.5	20.0	20.5	23.0	21.5	22.0	19.5	17.0	18.0
3	19.5	17.0	18.0	22.5	21.0	21.5	22.0	19.5	21.0	20.0	17.5	19.0
4	17.5	15.5	16.5	25.0	22.5	23.5	21.5	20.0	20.5	20.5	18.0	19.0
5	19.0	16.0	17.5	26.0	24.5	25.0	21.0	19.5	20.5	21.0	18.5	19.5
6	21.5	18.5	20.0	26.0	24.5	25.5	20.5	18.5	19.5	23.0	20.0	20.5
7	23.5	21.0	22.0	24.5	22.5	23.5	21.0	19.0	20.0	21.5	20.0	21.0
8	23.5	21.5	22.5	23.0	21.5	22.5	21.0	20.0	20.5	21.0	19.5	20.5
9	22.5	21.0	22.0	22.5	21.5	22.0	20.0	18.5	19.0	20.5	19.0	20.0
10	23.5	21.5	22.5	22.0	20.5	21.5	19.5	18.5	19.0	19.0	17.0	18.0
11	--	--	--	21.0	19.0	20.0	21.0	19.0	20.0	18.0	16.0	17.0
12	--	--	--	21.5	19.0	20.0	21.0	20.0	20.5	18.5	16.0	17.5
13	--	--	--	21.5	19.5	20.5	23.5	20.5	21.5	19.0	18.0	18.5
14	--	--	--	22.5	20.5	21.5	23.0	20.0	21.5	18.0	15.5	16.5
15	--	--	--	23.0	21.0	22.0	20.0	18.5	19.5	15.5	14.0	15.0
16	--	--	--	24.0	22.0	23.0	20.0	18.5	19.5	15.5	14.0	14.5
17	17.5	16.0	16.5	24.0	23.0	23.5	22.0	19.5	20.5	15.5	13.5	14.5
18	17.5	15.0	16.5	24.0	22.5	23.0	21.0	20.0	20.5	15.5	13.5	14.5
19	18.0	16.0	17.0	23.0	22.0	22.5	20.0	18.5	19.5	16.0	13.5	15.0
20	19.0	17.0	18.0	23.5	21.5	22.5	19.5	17.5	18.5	16.0	15.0	15.0
21	20.0	17.5	19.0	23.0	21.5	22.5	19.5	17.5	18.5	16.0	13.5	14.5
22	20.5	18.0	19.5	24.0	22.5	23.0	20.0	18.0	19.0	13.5	11.5	12.5
23	21.5	18.5	20.0	25.0	22.5	23.5	19.0	18.0	18.5	14.5	12.0	13.0
24	22.0	20.5	21.0	24.5	23.0	24.0	21.0	18.5	19.0	15.5	14.0	14.5
25	23.0	21.0	22.0	25.0	23.5	24.0	21.0	19.5	20.0	14.5	13.0	14.0
26	23.0	20.5	22.0	24.0	22.5	23.0	21.0	19.5	20.0	16.0	13.5	14.5
27	22.5	21.0	22.0	24.0	22.0	23.0	21.0	20.0	20.5	17.0	14.5	15.5
28	24.0	22.0	22.5	24.5	22.0	23.5	22.5	20.5	21.5	20.0	16.5	17.5
29	23.5	21.5	22.0	25.0	23.0	24.0	21.5	18.5	20.0	21.0	16.0	19.0
30	21.5	20.0	20.5	26.0	23.5	24.5	18.5	17.0	18.0	16.0	14.5	15.0
31	--	--	--	26.0	24.5	25.0	19.0	16.5	17.5	--	--	--
MONTH	--	--	--	26.0	18.5	22.7	25.0	16.5	20.0	23.0	11.5	16.7

STREAMS TRIBUTARY TO DETROIT RIVER

04166100 RIVER ROUGE AT SOUTHFIELD, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH				APRIL			MAY	
1	--	--	--	--	--	--	--	--	--	11.4	8.2	9.5
2	--	--	--	--	--	--	--	--	--	10.8	8.0	9.1
3	--	--	--	--	--	--	--	--	--	10.0	7.8	8.7
4	--	--	--	--	--	--	--	--	--	9.5	7.8	8.5
5	--	--	--	--	--	--	--	--	--	8.5	7.5	8.0
6	--	--	--	--	--	--	--	--	--	8.1	7.4	7.7
7	--	--	--	--	--	--	--	--	--	8.6	7.5	8.0
8	--	--	--	--	--	--	--	--	--	8.2	7.4	7.8
9	--	--	--	--	--	--	--	--	--	9.0	7.9	8.3
10	--	--	--	--	--	--	--	--	--	9.0	7.9	8.3
11	--	--	--	--	--	--	--	--	--	9.2	7.8	8.4
12	--	--	--	--	--	--	--	--	--	9.1	7.6	8.3
13	--	--	--	--	--	--	--	--	--	9.9	8.0	8.8
14	--	--	--	--	--	--	12.9	8.8	10.5	9.4	8.1	8.7
15	--	--	--	--	--	--	12.3	9.0	10.3	9.5	7.9	8.5
16	--	--	--	--	--	--	--	--	--	9.3	7.5	8.2
17	--	--	--	--	--	--	11.1	9.1	9.9	8.8	5.8	7.5
18	--	--	--	--	--	--	10.9	9.0	9.9	7.1	5.6	6.3
19	--	--	--	--	--	--	11.9	9.2	10.4	7.8	7.1	7.6
20	--	--	--	--	--	--	12.4	9.1	10.6	8.4	7.7	8.0
21	--	--	--	--	--	--	11.6	8.9	10.1	8.3	7.6	8.0
22	--	--	--	--	--	--	9.6	8.9	9.1	7.8	7.0	7.4
23	--	--	--	--	--	--	9.7	9.0	9.4	8.1	7.2	7.8
24	--	--	--	--	--	--	10.1	9.4	9.8	8.2	7.2	7.8
25	--	--	--	--	--	--	10.2	9.1	9.7	9.0	8.2	8.7
26	--	--	--	--	--	--	10.2	8.8	9.4	9.3	8.6	8.9
27	--	--	--	--	--	--	11.0	8.8	9.7	9.0	8.1	8.7
28	--	--	--	--	--	--	11.4	8.9	9.9	8.5	7.6	8.2
29	--	--	--	--	--	--	11.6	8.3	9.7	7.8	7.1	7.5
30	--	--	--	--	--	--	11.7	8.3	9.6	7.4	6.7	7.1
31	--	--	--	--	--	--	--	--	--	6.8	6.2	6.5
MONTH	--	--	--	--	--	--	--	--	--	11.4	5.6	8.1

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY			AUGUST			SEPTEMBER		
1	6.8	6.5	6.6	—	—	—	7.3	5.4	6.6	8.7	7.6	8.2
2	6.9	6.5	6.6	—	—	—	8.0	6.8	7.4	8.7	7.6	8.1
3	7.6	6.5	7.2	—	—	—	8.4	7.2	7.8	8.8	7.5	8.0
4	8.2	7.6	7.9	—	4.4	—	7.7	6.8	7.4	8.9	7.4	8.0
5	8.0	7.3	7.7	6.8	5.5	6.4	8.3	6.8	7.5	8.7	7.4	7.9
6	7.5	6.8	7.2	6.5	6.3	6.4	8.6	7.3	8.0	8.8	7.1	7.6
7	7.0	6.3	6.7	7.1	6.4	6.9	8.5	7.1	8.0	7.4	5.9	6.6
8	6.9	6.3	6.5	7.4	6.9	7.2	8.2	6.8	7.5	8.0	7.0	7.4
9	7.0	6.3	6.7	7.8	6.8	7.3	9.2	7.6	8.4	8.2	6.9	7.5
10	6.9	6.4	6.6	7.8	7.0	7.5	8.3	7.7	8.0	8.8	6.9	7.8
11	—	—	—	8.4	7.7	8.0	8.9	7.5	8.1	9.1	7.4	8.3
12	—	—	—	8.4	7.8	8.1	8.9	7.5	8.1	9.2	7.5	8.3
13	—	—	—	8.4	7.6	8.0	7.8	6.7	7.4	8.9	7.5	8.1
14	—	—	—	8.5	7.5	7.9	7.5	6.8	7.2	8.8	7.3	8.3
15	—	—	—	8.2	7.3	7.7	8.2	7.3	7.8	—	—	—
16	—	—	—	7.9	7.1	7.4	8.4	7.5	7.9	9.6	6.1	8.6
17	—	—	—	7.6	6.2	7.1	7.9	6.7	7.6	—	—	—
18	—	—	—	7.2	5.6	6.5	8.0	7.4	7.7	10.0	7.0	9.2
19	8.0	5.9	7.5	7.6	6.4	6.9	8.3	7.5	7.9	10.1	8.1	9.3
20	8.1	6.6	7.7	7.7	6.4	7.1	8.7	7.4	8.0	10.1	8.9	9.4
21	8.0	6.9	7.7	7.8	6.7	7.2	8.6	7.4	8.0	9.6	7.8	8.5
22	8.1	6.7	7.7	7.3	6.2	6.8	8.6	7.4	7.9	—	—	—
23	8.2	7.0	7.7	7.5	6.2	6.8	7.9	7.1	7.6	—	—	—
24	7.6	6.9	7.3	7.0	4.9	6.3	8.7	6.6	7.6	10.5	9.3	9.8
25	6.9	5.1	6.1	7.0	6.2	6.6	7.6	6.6	7.3	10.9	7.7	9.8
26	7.1	6.3	6.7	7.2	6.7	7.0	8.2	7.3	7.7	11.2	8.5	10.1
27	—	—	—	7.3	6.7	7.0	8.3	7.3	7.8	11.2	9.5	10.1
28	—	—	—	7.5	6.9	7.2	7.9	6.9	7.5	10.4	8.6	9.5
29	7.2	6.7	6.9	7.5	6.9	7.1	8.5	7.2	7.9	8.7	8.0	8.4
30	8.0	7.0	7.5	7.4	6.8	7.0	8.4	7.1	7.9	—	—	—
31	—	—	—	7.2	6.5	6.8	8.6	7.5	8.1	—	—	—
MONTH	—	—	—	—	—	—	9.2	5.4	7.7	—	—	—

STREAMS TRIBUTARY TO DETROIT RIVER

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 upstream from bridge on Nine Mile Road in 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.

REVISED RECORDS.--WSP 1912: 1963.

GAGE.--Water-stage recorder. Datum of gage is 615.07 ft above sea level (City of Southfield bench mark).

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.8	e1.4	2.3	1.3	8.8	10	3.1	4.0	17	84	2.7	1.2
2	1.3	e1.4	1.3	1.3	19	6.4	3.0	3.8	16	10	1.8	1.4
3	11	e1.3	1.2	e1.3	11	21	2.8	3.7	4.0	23	1.7	1.2
4	1.8	e1.3	1.4	e1.3	9.9	7.9	19	3.4	2.6	7.4	7.2	1.3
5	1.2	e1.5	4.0	e1.4	5.9	7.9	4.5	4.3	2.1	4.4	3.6	1.3
6	1.3	e1.4	51	e1.4	7.2	6.4	4.5	3.2	1.9	3.6	1.7	25
7	145	e1.3	14	e1.4	6.5	6.9	2.8	3.2	1.9	3.1	20	e1.1
8	3.6	e1.4	2.3	e1.4	9.0	5.8	2.8	2.9	2.0	2.9	4.1	1.5
9	1.9	e1.3	1.6	e1.4	9.1	5.4	40	2.8	2.1	21	1.9	1.4
10	1.6	e2.2	1.5	e1.3	7.0	6.8	7.0	2.5	2.1	3.6	2.1	1.5
11	1.3	2.9	1.5	e1.3	7.5	7.2	17	2.6	2.2	3.0	1.7	1.6
12	1.3	1.4	1.4	e1.3	11	7.1	7.1	2.8	55	2.8	1.6	1.4
13	1.3	1.3	1.4	e1.3	5.0	6.2	4.0	2.7	73	2.6	55	2.3
14	e1.3	1.3	1.3	e1.3	4.2	6.1	3.7	2.6	42	2.1	5.3	1.5
15	e1.3	1.3	1.3	e1.3	4.1	7.4	4.6	2.4	4.7	1.9	2.2	1.5
16	e1.2	1.2	3.3	e1.5	4.3	11	39	2.3	3.2	1.8	1.9	1.4
17	e1.2	1.3	3.0	e3.0	5.4	15	12	32	2.9	4.8	1.7	1.2
18	2.3	1.2	1.9	e3.8	3.8	10	25	76	2.5	2.4	1.6	1.2
19	.95	1.3	4.7	e6.7	3.5	6.2	7.4	4.1	2.3	8.7	1.6	1.1
20	.91	1.3	2.2	e3.4	3.3	5.3	6.0	3.1	2.7	2.4	1.6	1.1
21	.97	1.4	8.4	e3.6	2.9	5.0	4.4	2.6	2.1	4.3	1.5	11
22	.94	1.3	4.5	130	2.9	4.4	89	13	2.2	19	1.5	1.3
23	1.0	1.3	1.9	139	2.8	4.0	209	20	3.1	109	2.1	1.2
24	1.0	1.4	1.6	45	2.7	4.0	26	14	13	14	14	1.7
25	.99	10	1.5	18	5.2	3.6	13	3.8	8.2	4.4	4.7	1.1
26	.91	8.6	1.5	11	5.0	3.4	9.3	3.1	2.2	2.9	2.6	1.1
27	1.0	1.5	1.4	13	4.5	3.3	6.9	2.5	108	2.5	1.8	1.2
28	1.2	1.3	1.6	18	35	3.3	5.9	2.3	69	2.3	1.4	e1.4
29	1.3	1.2	2.0	9.7	---	3.2	5.3	2.2	159	3.3	1.3	e4.5
30	1.4	1.2	2.1	7.3	---	3.0	5.0	2.1	7.1	2.3	1.2	7.8
31	1.4	---	1.5	6.1	---	2.9	---	12	---	8.8	1.3	---
TOTAL	196.67	78.0	130.6	473.3	206.5	206.1	589.1	242.0	616.1	368.3	154.4	125.0
MEAN	6.34	2.60	4.21	15.3	7.38	6.65	19.6	7.81	20.5	11.9	4.98	4.30
MAX	145	22	51	139	35	21	209	76	159	109	55	45
MIN	.91	1.2	1.2	1.3	2.7	2.9	2.8	2.1	1.9	1.8	1.2	1.1
CFSM	.67	.27	.44	1.61	.78	.70	2.07	.82	2.16	1.25	.52	.45
IN.	.77	.31	.51	1.86	.81	.81	2.31	.95	2.42	1.44	.61	.51

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1999, BY WATER YEAR (WY)

	MEAN	5.95	7.71	8.75	7.61	9.85	14.3	13.5	9.33	9.73	7.16	7.06	6.38
MAX	23.3	19.8	25.4	26.7	32.1	32.6	27.4	27.1	30.5	23.7	22.4	20.0	
(WY)	1982	1993	1968	1974	1971	1974	1977	1968	1968	1992	1995	1966	
MIN	.44	1.13	.71	.49	.79	5.28	3.27	2.35	1.68	.73	1.35	.58	
(WY)	1964	1964	1964	1963	1963	1964	1971	1962	1959	1962	1960	1965	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1958 - 1999

ANNUAL TOTAL	3866.98		3390.07		8.94								
ANNUAL MEAN	10.6		9.29		16.9								1968
HIGHEST ANNUAL MEAN					3.12								1963
LOWEST ANNUAL MEAN													1961
HIGHEST DAILY MEAN	264				209		Apr 23		442		Oct 1		1961
LOWEST DAILY MEAN	.91				.91		Oct 20		.00				(a)
ANNUAL SEVEN-DAY MINIMUM	.96				.96		Oct 20		.27		Dec 15		1963
INSTANTANEOUS PEAK FLOW					650		(b)		(c)1200		Oct 1		1961
INSTANTANEOUS PEAK STAGE					11.07		(b)		(d)15.03		Oct 1		1961
ANNUAL RUNOFF (CFSM)	1.12				.98				.94				
ANNUAL RUNOFF (INCHES)	15.16				13.29				12.80				
10 PERCENT EXCEEDS	22				18				18				
50 PERCENT EXCEEDS	2.9				2.8				3.4				
90 PERCENT EXCEEDS	1.2				1.3				1.1				

(a) June 13-15, 1986, result of regulation from unknown source.

(b) June 29, July 23.

(c) From rating curve extended above 410 ft³/s.

(d) From floodmark.

(e) Estimated.

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 in 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 sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.1	4.6	8.7	e5.2	19	36	9.6	13	16	120	12	e4.5
2	4.2	4.4	7.4	e5.2	30	22	9.7	12	23	115	6.7	e4.0
3	6.7	4.3	6.6	e5.2	37	27	9.7	12	20	61	4.9	e3.6
4	6.6	4.2	6.4	e5.3	30	21	20	11	14	40	8.3	e3.5
5	5.2	4.5	8.3	e5.4	24	19	19	11	11	25	6.8	e3.4
6	5.0	4.3	13	e5.3	23	15	13	11	9.7	20	5.4	e15
7	94	4.1	25	e5.2	23	e17	11	11	8.6	16	8.5	e12
8	37	3.9	14	e5.2	21	15	9.9	10	7.5	13	13	e5.0
9	17	4.0	9.5	e5.2	23	15	28	9.4	6.9	19	7.1	e4.0
10	11	16	7.8	e5.2	27	15	22	8.6	6.5	15	6.0	e3.7
11	8.3	12	6.8	e5.2	27	15	26	8.9	8.1	11	5.5	e3.5
12	7.4	7.6	6.3	e5.2	44	14	24	8.7	7.1	8.5	5.2	e3.3
13	6.8	6.4	5.7	e5.2	27	14	16	9.3	14	7.9	27	e3.4
14	6.0	5.5	5.7	e5.2	19	13	13	7.7	37	7.5	25	e3.2
15	5.4	5.0	5.6	e5.2	17	15	12	7.6	25	6.9	12	e3.1
16	5.3	4.8	6.0	e5.8	16	20	35	7.2	14	6.2	8.0	3.0
17	5.3	4.7	6.9	e6.6	17	36	29	17	10	11	6.9	3.0
18	5.5	4.5	6.0	e5.0	15	44	37	121	8.6	14	5.5	e3.3
19	5.5	4.5	7.7	e25	14	27	25	37	7.1	14	4.9	e3.3
20	5.0	4.2	7.3	e12	12	21	20	21	5.9	15	4.9	3.1
21	4.7	4.2	11	e12	11	19	17	16	5.5	11	4.3	5.2
22	4.7	4.2	9.0	e75	10	16	66	16	6.2	9.0	4.4	4.6
23	4.5	4.2	7.4	e230	9.7	14	258	17	5.3	23	4.4	4.0
24	4.6	4.2	5.8	145	9.3	13	129	27	4.9	29	6.0	4.1
25	4.6	6.4	5.8	57	11	12	56	18	6.9	17	13	4.2
26	4.5	18	5.7	36	11	11	36	14	5.6	12	12	3.8
27	4.7	9.3	5.5	29	11	11	25	12	111	9.9	16	3.4
28	4.9	7.4	5.3	40	54	11	20	10	56	8.0	10	5.1
29	4.7	6.6	e5.6	32	---	10	17	9.5	91	6.6	7.6	33
30	4.7	6.3	e5.4	24	---	9.6	15	8.4	35	5.6	6.2	29
31	4.6	---	e5.2	20	---	9.5	---	14	---	7.4	5.4	---
TOTAL	303.5	184.3	242.4	877.8	592.0	557.1	1027.9	516.3	587.4	684.5	272.9	187.3
MEAN	9.79	6.14	7.82	28.3	21.1	18.0	34.3	16.7	19.6	22.1	8.80	6.24
MAX	94	18	25	230	54	44	258	121	111	120	27	33
MIN	4.2	3.9	5.2	5.2	9.3	9.5	9.6	7.2	4.9	5.6	4.3	3.0
CFSM	.56	.35	.45	1.62	1.21	1.03	1.96	.95	1.12	1.26	.50	.36
IN.	.65	.39	.52	1.87	1.26	1.18	2.19	1.10	1.25	1.46	.58	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1999, BY WATER YEAR (WY)

	MEAN	8.06	11.2	12.6	13.3	17.1	27.3	24.1	16.2	13.4	7.96	7.49	7.44
MAX	42.2	31.3	29.0	39.8	51.6	63.6	42.3	38.7	63.9	24.8	32.2	26.5	26.5
(WY)	1982	1993	1991	1974	1976	1982	1977	1983	1989	1992	1998	1975	1975
MIN	1.10	1.69	1.70	2.06	2.20	6.81	9.10	3.46	2.13	1.00	.97	1.00	1.00
(WY)	1965	1965	1964	1961	1963	1964	1971	1971	1971	1964	1963	1964	1964

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1978 - 1999

ANNUAL TOTAL	6537.9	6033.4	
ANNUAL MEAN	17.9	16.5	
HIGHEST ANNUAL MEAN			13.9
LOWEST ANNUAL MEAN			22.6
HIGHEST DAILY MEAN	291	258	4.54
LOWEST DAILY MEAN	3.0	3.0	653
ANNUAL SEVEN-DAY MINIMUM	3.6	3.1	.32
INSTANTANEOUS PEAK FLOW		(a)345	.61
INSTANTANEOUS PEAK STAGE		(b)5.41	1500
INSTANTANEOUS LOW FLOW		(c)2.0	8.70
ANNUAL RUNOFF (CFSM)	1.02	.94	(d).07
ANNUAL RUNOFF (INCHES)	13.90	12.83	.79
10 PERCENT EXCEEDS	36	30	10.80
50 PERCENT EXCEEDS	9.0	9.5	29
90 PERCENT EXCEEDS	4.4	4.4	7.6
			2.3

- (a) Gage height 5.17 ft.
(b) Backwater from ice.
(c) Result of freezeup.
(d) Result of regulation.
(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04166470 UPPER RIVER ROUGE AT DETROIT, MI

LOCATION.--Lat 42°23'38", long 83°16'35", in SW1/4 NE1/4 sec.20, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, on left bank 1,000 ft upstream from bridge on Telegraph Road in Detroit.

DRAINAGE AREA.--67.3 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1997 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 605 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	13	23	e14	57	91	23	35	55	204	e30	11
2	12	11	19	e14	85	61	23	32	49	332	e20	10
3	21	11	16	e14	100	89	23	30	52	122	e17	10
4	22	11	17	e15	75	69	78	31	29	73	e24	9.7
5	12	13	28	e15	59	56	72	32	25	40	e23	9.6
6	9.8	11	56	e15	58	e50	36	31	22	30	18	51
7	467	11	144	e15	58	e46	28	27	20	25	25	41
8	166	12	36	e14	59	e45	25	25	19	22	49	13
9	38	11	25	e14	62	e43	144	25	17	60	25	11
10	24	58	20	e14	64	e43	79	22	16	33	20	11
11	19	67	19	e14	57	e43	87	21	16	23	19	11
12	17	23	17	e14	82	71	20	20	165	19	17	10
13	15	18	16	e14	56	e42	45	20	187	18	51	12
14	14	16	16	e14	43	41	34	19	172	17	128	13
15	12	15	15	e14	39	47	30	18	58	16	30	10
16	12	15	18	e15	39	58	141	18	31	15	22	10
17	11	14	24	e17	42	84	89	27	25	20	17	11
18	12	14	18	e130	36	96	123	513	21	50	15	11
19	17	14	25	e73	33	62	67	116	19	52	13	11
20	12	14	24	e30	30	51	53	51	18	39	13	11
21	11	15	38	e25	25	46	43	36	16	23	13	24
22	11	15	e38	e250	e24	40	245	52	17	21	12	18
23	11	15	e21	e500	e22	35	757	47	16	159	12	13
24	11	15	e17	648	e21	33	646	99	36	210	15	12
25	11	27	15	203	30	30	149	47	45	59	39	13
26	11	71	15	95	32	28	87	33	18	30	33	10
27	11	26	16	78	32	28	64	28	384	26	28	9.5
28	11	19	e15	110	144	29	54	25	245	23	19	13
29	11	16	16	85	---	27	45	23	468	19	15	222
30	12	17	e15	66	---	24	38	21	103	17	13	138
31	12	---	e14	58	---	23	---	52	---	e20	12	---
TOTAL	1051.8	608	796	2597	1464	1504	3399	1576	2364	1817	787	759.8
MEAN	33.9	20.3	25.7	83.8	52.3	48.5	113	50.8	78.8	58.6	25.4	25.3
MAX	467	71	144	648	144	96	757	513	468	332	128	222
MIN	9.8	11	14	14	21	23	23	18	16	15	12	9.5
CFSM	.50	.30	.38	1.24	.78	.72	1.68	.76	1.17	.87	.38	.38
IN.	.58	.34	.44	1.44	.81	.83	1.88	.87	1.31	1.00	.44	.42

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1998 - 1999, BY WATER YEAR (WY)

	MEAN	31.4	26.5	32.6	77.7	87.3	90.2	103	48.3	54.5	39.8	71.8	20.6
MAX	33.9	32.7	39.5	83.8	122	132	113	50.8	78.8	58.6	118	27.3	
(WY)	1999	1998	1998	1999	1998	1998	1999	1999	1999	1999	1998	1999	
MIN	28.8	20.3	25.7	71.6	52.3	48.5	91.7	45.8	30.3	20.9	25.4	15.8	
(WY)	1998	1999	1999	1998	1999	1999	1998	1998	1998	1998	1999	1998	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1998 - 1999
ANNUAL TOTAL	22057.2	18723.6	
ANNUAL MEAN	60.4	51.3	56.7
HIGHEST ANNUAL MEAN			62.2
LOWEST ANNUAL MEAN			51.3
HIGHEST DAILY MEAN	1180	Feb 18	1180
LOWEST DAILY MEAN	6.2	Aug 3	6.2
ANNUAL SEVEN-DAY MINIMUM	7.1	Jul 29	7.1
INSTANTANEOUS PEAK FLOW		998	1490
INSTANTANEOUS PEAK STAGE		10.08	13.08
ANNUAL RUNOFF (CFSM)	.90	.76	.84
ANNUAL RUNOFF (INCHES)	12.19	10.35	11.46
10 PERCENT EXCEEDS	136	97	123
50 PERCENT EXCEEDS	25	24	28
90 PERCENT EXCEEDS	11	12	12

(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04166470 UPPER RIVER ROUGE AT DETROIT, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--April to September 1999.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: April to September 1999.

DISSOLVED OXYGEN: April to September 1999.

INSTRUMENTATION.--Water-quality monitor telemeter, set for 15 minute measurement intervals.

REMARKS.--Interruptions in water-quality record were due to instrument malfunctions.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum recorded, 27.0°C, July 30; minimum, 7.0°C, April 24.

DISSOLVED OXYGEN: Maximum, 12.6 mg/L, April 14; minimum recorded, 1.6 mg/L, July 26, 27.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	---	---	---	---	---	---	---	---	---	16.0	12.0	14.0
2	---	---	---	---	---	---	---	---	---	16.5	12.5	14.5
3	---	---	---	---	---	---	---	---	---	17.0	13.5	15.5
4	---	---	---	---	---	---	---	---	---	17.5	14.0	15.5
5	---	---	---	---	---	---	---	---	---	17.0	15.0	16.0
6	---	---	---	---	---	---	---	---	---	17.5	15.5	16.5
7	---	---	---	---	---	---	---	---	---	17.5	14.5	16.0
8	---	---	---	---	---	---	---	---	---	16.0	14.5	15.0
9	---	---	---	---	---	---	---	---	---	16.5	13.5	15.0
10	---	---	---	---	---	---	---	---	---	16.5	13.0	15.0
11	---	---	---	---	---	---	---	---	---	17.0	13.0	15.0
12	---	---	---	---	---	---	---	---	---	15.5	13.5	14.5
13	---	---	---	---	---	---	---	---	---	14.0	12.5	13.5
14	---	---	---	---	---	---	13.0	9.0	11.0	15.5	12.0	13.5
15	---	---	---	---	---	---	12.5	10.5	11.5	17.0	14.0	15.5
16	---	---	---	---	---	---	11.0	9.0	9.5	18.0	15.0	16.0
17	---	---	---	---	---	---	10.5	8.5	9.5	20.0	16.5	18.0
18	---	---	---	---	---	---	10.0	9.0	9.5	19.5	18.0	19.0
19	---	---	---	---	---	---	10.5	8.5	9.5	18.0	16.5	17.5
20	---	---	---	---	---	---	11.0	9.0	10.0	17.5	15.5	16.5
21	---	---	---	---	---	---	11.0	9.5	10.5	18.0	15.5	16.5
22	---	---	---	---	---	---	10.5	9.5	10.0	17.0	15.5	16.5
23	---	---	---	---	---	---	9.5	8.0	9.0	16.5	15.0	16.0
24	---	---	---	---	---	---	10.0	7.0	8.5	16.0	13.5	15.5
25	---	---	---	---	---	---	12.0	8.5	10.0	13.5	12.5	13.0
26	---	---	---	---	---	---	13.5	10.0	11.5	14.0	12.0	13.0
27	---	---	---	---	---	---	14.0	11.0	12.5	16.0	12.0	14.0
28	---	---	---	---	---	---	14.5	10.5	12.5	18.0	14.0	16.0
29	---	---	---	---	---	---	14.5	11.0	13.0	20.0	16.0	18.0
30	---	---	---	---	---	---	15.5	11.5	13.5	21.0	17.5	19.5
31	---	---	---	---	---	---	---	---	---	20.0	17.5	19.0
MONTH	---	---	---	---	---	---	---	---	---	21.0	12.0	15.8

STREAMS TRIBUTARY TO DETROIT RIVER

04166470 UPPER RIVER ROUGE AT DETROIT, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	M ³ /AN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	19.5	18.0	19.0	20.0	19.0	19.5	--	--	--	20.5	17.0	18.5
2	20.0	18.5	19.0	21.0	20.0	20.5	--	--	--	21.0	17.5	19.0
3	18.5	17.0	18.0	22.0	20.5	21.0	--	--	--	21.5	18.0	20.0
4	18.0	15.5	17.0	24.5	22.0	23.0	--	--	--	22.0	18.5	20.0
5	19.5	16.0	17.5	25.5	23.5	24.5	--	--	--	23.0	19.0	21.0
6	22.5	18.0	20.0	25.5	23.5	24.5	22.0	19.0	20.5	25.0	20.5	22.0
7	24.0	20.5	22.0	24.0	22.0	23.0	22.0	19.5	20.5	22.5	21.0	22.0
8	24.5	21.0	22.5	23.5	21.0	22.0	21.5	20.0	21.0	22.5	19.5	21.0
9	24.0	21.0	22.5	22.0	20.5	21.5	20.5	18.5	19.5	22.0	20.0	20.5
10	24.5	21.5	23.0	21.5	20.0	21.0	20.0	18.5	19.5	20.0	17.5	18.0
11	25.0	22.0	23.5	21.5	18.5	20.0	22.5	18.5	20.5	19.0	16.5	18.0
12	25.0	20.5	23.0	22.0	19.0	20.5	22.0	20.0	21.0	20.5	17.0	18.5
13	22.0	21.0	21.5	22.0	19.5	20.5	23.0	21.0	21.5	20.0	19.0	19.5
14	21.0	20.0	20.5	23.0	20.0	21.5	23.0	20.0	21.5	19.0	16.5	17.0
15	20.0	17.5	18.5	24.0	20.5	22.5	20.5	18.5	19.5	17.0	14.5	16.0
16	17.5	16.5	17.0	25.0	21.5	23.5	21.0	18.5	20.0	16.5	14.5	15.5
17	17.5	15.5	16.5	25.0	22.5	23.5	23.0	19.5	21.0	16.5	14.0	15.5
18	18.5	14.5	16.5	23.5	22.5	23.0	22.0	20.0	21.0	17.0	14.0	15.5
19	18.0	15.5	17.0	23.0	22.0	22.5	20.5	19.0	19.5	17.5	14.5	16.0
20	20.0	16.5	18.0	24.0	22.0	23.0	20.5	18.0	19.0	17.0	15.5	16.0
21	21.0	17.0	19.0	23.0	22.0	22.5	21.0	18.0	19.5	16.5	14.0	15.0
22	21.5	17.5	19.5	25.0	22.0	23.5	21.5	18.0	20.0	15.0	12.0	13.5
23	22.5	18.5	20.0	25.5	22.5	23.5	20.5	18.5	19.5	16.0	13.0	14.5
24	22.5	20.5	21.5	25.0	23.0	24.0	20.5	19.0	19.5	16.5	14.5	15.5
25	24.0	21.0	22.5	25.0	23.5	24.0	20.5	19.5	20.0	16.0	13.5	15.0
26	24.0	21.0	22.5	24.0	22.5	23.0	21.5	19.5	20.5	17.5	14.0	15.5
27	23.0	21.5	22.0	25.0	22.0	23.5	21.5	20.0	20.5	18.5	15.5	17.0
28	23.5	22.0	22.5	25.5	22.0	24.0	23.5	20.5	21.5	21.0	18.0	18.5
29	23.0	20.5	22.0	26.0	23.0	24.5	22.0	19.0	20.5	20.5	16.5	19.0
30	20.5	19.5	20.0	27.0	24.0	25.5	19.5	17.0	18.5	16.5	14.5	15.5
31	--	--	--	--	--	--	20.5	17.0	18.5	--	--	--
MONTH	25.0	14.5	20.1	--	--	--	--	--	--	25.0	12.0	17.6

STREAMS TRIBUTARY TO DETROIT RIVER

04166470 UPPER RIVER ROUGE AT DETROIT, MI-Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	--	--	--	--	--	--	--	--	--	11.5	8.1	9.5	
2	--	--	--	--	--	--	--	--	--	11.2	7.7	9.1	
3	--	--	--	--	--	--	--	--	--	10.3	7.2	8.5	
4	--	--	--	--	--	--	--	--	--	9.9	6.9	8.2	
5	--	--	--	--	--	--	--	--	--	8.5	6.6	7.5	
6	--	--	--	--	--	--	--	--	--	7.9	6.2	7.0	
7	--	--	--	--	--	--	--	--	--	8.6	6.3	7.2	
8	--	--	--	--	--	--	--	--	--	7.4	6.1	6.8	
9	--	--	--	--	--	--	--	--	--	8.6	6.3	7.3	
10	--	--	--	--	--	--	--	--	--	8.8	6.5	7.5	
11	--	--	--	--	--	--	--	--	--	9.0	6.6	7.6	
12	--	--	--	--	--	--	--	--	--	8.2	6.3	7.2	
13	--	--	--	--	--	--	--	--	--	8.4	6.8	7.5	
14	--	--	--	--	--	--	12.6	8.6	10.1	8.7	7.0	7.9	
15	--	--	--	--	--	--	11.9	8.3	9.6	8.6	6.7	7.6	
16	--	--	--	--	--	--	9.0	8.6	8.8	8.2	6.4	7.3	
17	--	--	--	--	--	--	10.0	8.9	9.3	7.8	5.8	6.9	
18	--	--	--	--	--	--	9.9	8.9	9.4	--	--	--	
19	--	--	--	--	--	--	10.9	9.3	10.0	7.4	6.6	7.1	
20	--	--	--	--	--	--	11.3	9.3	10.2	7.9	6.7	7.5	
21	--	--	--	--	--	--	11.2	9.1	10.0	7.2	5.1	6.5	
22	--	--	--	--	--	--	9.5	8.6	9.1	6.7	2.4	5.2	
23	--	--	--	--	--	--	9.3	8.7	9.1	7.1	5.1	6.0	
24	--	--	--	--	--	--	9.8	9.2	9.6	7.7	4.3	5.8	
25	--	--	--	--	--	--	10.2	9.4	9.8	7.8	3.8	7.0	
26	--	--	--	--	--	--	10.6	9.1	9.8	8.0	5.3	6.9	
27	--	--	--	--	--	--	10.9	8.9	9.8	7.3	6.8	7.1	
28	--	--	--	--	--	--	11.1	9.1	9.9	7.1	6.4	6.8	
29	--	--	--	--	--	--	11.5	8.4	9.7	6.6	6.0	6.3	
30	--	--	--	--	--	--	11.8	8.3	9.7	6.2	5.7	5.9	
31	--	--	--	--	--	--	--	--	--	6.2	4.3	5.5	
MONTH	--	--	--	--	--	--	--	--	--	--	--	--	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
JUNE				JULY				AUGUST			SEPTEMBER		
1	6.1	4.2	5.3	---	---	---	---	---	---	6.0	5.3	5.7	
2	6.8	5.5	6.1	---	---	---	---	---	---	5.9	5.3	5.6	
3	7.0	6.3	6.7	---	---	---	---	---	---	5.7	5.1	5.4	
4	7.2	6.7	6.9	5.7	4.6	5.3	---	---	---	5.7	4.9	5.3	
5	7.0	6.2	6.7	5.1	4.4	4.8	---	---	---	5.6	4.9	5.2	
6	6.3	5.3	5.9	4.8	4.4	4.6	4.2	2.8	3.8	5.7	3.2	4.9	
7	5.4	4.6	5.1	5.2	4.7	4.9	4.1	2.4	3.0	5.2	2.7	4.2	
8	4.9	4.3	4.6	5.2	4.8	5.0	4.8	3.3	4.2	4.3	3.3	4.1	
9	4.7	4.2	4.5	5.3	4.7	5.0	4.6	4.0	4.3	4.5	2.0	3.9	
10	4.7	4.1	4.4	5.3	4.8	5.1	4.8	3.8	4.4	5.0	4.3	4.6	
11	4.8	4.3	4.5	5.3	5.0	5.2	5.2	3.1	4.7	5.2	4.8	5.0	
12	6.4	2.5	4.6	5.3	4.9	5.1	5.0	4.2	4.7	5.4	4.3	5.0	
13	5.2	3.5	4.2	5.2	4.9	5.1	4.9	4.1	4.6	5.7	4.4	5.1	
14	6.1	4.9	5.6	5.1	4.5	4.9	5.6	4.4	5.3	5.7	4.2	5.4	
15	6.5	5.6	6.1	5.0	4.2	4.7	5.9	5.6	5.7	6.2	5.5	5.8	
16	6.7	6.1	6.4	4.8	4.3	4.6	6.0	5.5	5.7	6.5	5.8	6.1	
17	6.8	6.3	6.5	5.2	4.3	4.6	---	---	---	6.7	6.0	6.4	
18	7.0	5.8	6.6	5.2	4.1	4.6	---	---	---	6.5	5.8	6.2	
19	6.6	5.9	6.4	5.2	3.6	4.6	---	---	---	6.4	5.5	6.1	
20	6.5	5.5	6.1	5.1	4.5	4.8	---	---	---	6.5	5.2	5.7	
21	6.3	5.1	5.8	5.0	4.5	4.8	---	---	---	7.2	4.6	6.6	
22	6.4	5.4	5.9	5.0	4.5	4.7	---	---	---	6.9	6.0	6.5	
23	6.3	5.4	5.8	5.3	4.0	4.6	---	---	---	6.6	5.6	6.3	
24	5.7	4.7	5.3	5.1	2.1	4.1	---	---	---	6.3	5.2	5.7	
25	5.5	2.9	4.5	---	---	---	5.1	4.3	4.7	6.3	5.7	6.0	
26	3.7	3.0	3.4	4.9	1.6	3.7	5.0	4.7	4.9	6.1	5.3	5.7	
27	6.1	3.3	4.8	5.2	1.6	4.2	5.4	4.7	5.2	5.9	4.3	5.3	
28	5.8	5.0	5.4	5.0	4.4	4.8	5.4	4.8	5.1	7.0	4.6	5.5	
29	5.8	4.6	5.0	4.7	2.5	4.4	5.5	4.8	5.2	7.1	5.3	6.3	
30	5.8	4.5	5.4	4.7	4.0	4.4	6.0	5.3	5.7	8.1	7.1	7.9	
31	---	---	---	---	---	---	6.1	5.3	5.6	---	---	---	
MONTH	7.2	2.5	5.5	---	---	---	---	---	---	8.1	2.0	5.6	

STREAMS TRIBUTARY TO DETROIT RIVER

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 in Detroit, 4 mi upstream from Middle River Rouge.

DRAINAGE AREA.--187 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1930 to current year.

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 sea level. Prior to Oct. 16, 1948, nonrecording gage at site 1 mi downstream at datum 4.6 ft lower.

REMARKS.--Records good except for estimated daily discharges, which are fair. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	37	65	41	146	299	75	125	152	425	93	32
2	44	37	61	38	203	178	74	116	128	838	52	31
3	60	37	50	e45	311	236	73	112	194	426	41	29
4	105	e37	47	e44	218	218	141	102	100	275	66	29
5	46	e40	89	e45	172	152	204	100	77	162	70	30
6	40	e37	103	e45	151	153	104	98	66	124	50	70
7	763	e37	412	e44	159	130	89	90	62	102	50	172
8	572	e37	148	e43	156	148	75	85	55	87	150	63
9	155	e36	83	e43	160	136	294	83	52	168	77	41
10	96	115	62	e43	173	134	237	77	48	137	53	32
11	69	275	55	e43	149	131	197	70	76	83	51	30
12	59	100	49	e43	227	136	209	67	249	71	43	28
13	54	61	47	e43	167	133	133	69	626	65	93	30
14	49	52	44	e43	124	119	105	63	532	61	396	33
15	45	47	44	e43	115	129	92	59	237	56	107	35
16	e42	44	46	e47	112	149	294	55	125	51	63	28
17	e41	42	74	e70	117	229	271	58	96	49	49	26
18	e45	42	54	e340	108	305	312	881	80	132	43	26
19	e48	42	66	e170	97	195	202	417	70	112	39	26
20	e40	42	81	e110	89	145	152	161	65	119	37	25
21	37	40	86	e110	78	130	128	117	58	66	37	61
22	34	39	135	e550	74	120	453	144	56	95	34	52
23	36	40	59	e1100	e73	113	1380	128	53	e450	34	35
24	33	39	58	1410	e73	100	1640	284	71	e420	41	31
25	36	49	47	635	e80	95	515	149	155	e150	150	36
26	34	222	42	311	96	89	289	106	58	e90	105	31
27	33	110	44	229	98	85	211	87	585	70	86	28
28	36	65	43	305	344	85	173	76	672	62	59	29
29	41	51	43	267	---	81	151	69	1130	52	44	477
30	36	47	50	190	---	78	136	63	426	48	36	422
31	36	---	45	160	---	76	---	116	---	58	34	---
TOTAL	2812	1899	2332	6650	4070	4507	8409	4227	6354	5104	2283	1998
MEAN	90.7	63.3	75.2	215	145	145	280	136	212	165	73.6	66.6
MAX	763	275	412	1410	344	305	1640	881	1130	838	396	477
MIN	33	36	42	38	73	76	73	55	48	48	34	25
CFSM	.49	.34	.40	1.15	.78	.78	1.50	.73	1.13	.88	.39	.36
IN.	.56	.38	.46	1.32	.81	.90	1.67	.84	1.26	1.02	.45	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

	MEAN	67.8	91.4	114	122	169	237	232	168	115	71.0	61.7	50.5
MAX	450	322	321	456	519	488	965	683	478	385	280	274	274
(WY)	1982	1993	1968	1950	1938	1950	1947	1943	1968	1957	1998	1975	1975
MIN	8.35	16.3	16.6	13.6	18.2	59.5	49.3	23.9	7.92	6.46	5.58	7.03	7.03
(WY)	1964	1954	1940	1961	1963	1931	1931	1934	1934	1934	1931	1971	1971

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1931 - 1979

ANNUAL TOTAL	60314	50645	125
ANNUAL MEAN	165	139	222
HIGHEST ANNUAL MEAN			25.7
LOWEST ANNUAL MEAN			7380
HIGHEST DAILY MEAN	2930	Feb 18	Apr 6 1977
LOWEST DAILY MEAN	23	Aug 3	Aug 1 1974
ANNUAL SEVEN-DAY MINIMUM	25	Jul 29	Aug 2 1973
INSTANTANEOUS PEAK FLOW		2190	Apr 5 1977
INSTANTANEOUS PEAK STAGE		15.18	Jun 26 1974
INSTANTANEOUS LOW FLOW			1.8
ANNUAL RUNOFF (CFSM)	.88	.74	.67
ANNUAL RUNOFF (INCHES)	12.00	10.07	9.11
10 PERCENT EXCEEDS	367	294	268
50 PERCENT EXCEEDS	83	76	63
90 PERCENT EXCEEDS	36	37	16

(a) Aug. 1, 2, 1964.

(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

WATER-QUALITY RECORDS

PERIOD OF RECORD.--April to September 1999.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: April to September 1999.

DISSOLVED OXYGEN: April to September 1999.

INSTRUMENTATION.--Water-quality monitor telemeter, set for 15 minute measurement intervals.

REMARKS.--Interruptions in water-quality record due to instrument malfunctions.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 26.0°C, July 30, 31; minimum, 7.5°C, April 24.

DISSOLVED OXYGEN: Maximum recorded, 12.2 mg/L, May 1; minimum, 1.2 mg/L, June 14, 25.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

[illegible]

STREAMS TRIBUTARY TO DETROIT RIVER

04166500 RIVER ROUGE AT DETROIT, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY			AUGUST			SEPTEMBER		
1	19.5	18.5	19.0	20.0	19.0	19.5	25.5	24.0	24.5	19.0	18.0	18.5
2	20.0	18.5	19.5	21.0	20.0	20.5	24.5	22.0	23.0	19.5	18.0	19.0
3	19.0	17.5	18.5	22.0	20.5	21.5	22.5	21.5	22.0	20.0	18.5	19.5
4	18.0	16.5	17.5	24.0	21.5	23.0	23.0	19.5	21.5	20.5	19.0	19.5
5	19.0	16.5	17.5	25.5	23.5	24.5	21.5	20.5	21.0	20.5	19.0	20.0
6	21.5	18.0	19.5	25.5	23.5	25.0	21.0	19.5	20.5	22.5	20.5	21.5
7	23.0	19.5	21.5	25.0	22.5	24.0	21.0	19.0	20.5	23.0	21.0	21.5
8	23.0	20.0	22.5	23.5	21.5	22.5	21.0	20.5	21.0	21.0	20.0	21.0
9	23.0	19.5	22.0	22.5	20.5	22.0	20.5	19.0	19.5	21.0	20.0	20.5
10	23.5	22.0	23.0	21.5	20.5	21.5	20.0	19.5	19.5	20.0	18.0	19.0
11	24.0	22.0	23.5	21.0	19.0	20.5	21.0	19.0	20.0	18.5	17.5	18.0
12	24.0	21.0	23.0	21.0	19.0	20.5	21.0	20.0	21.0	19.0	17.5	18.0
13	22.0	21.0	22.0	21.5	19.5	20.5	22.5	21.0	21.5	19.5	18.5	19.0
14	21.5	20.5	21.0	22.0	20.5	21.5	23.0	21.0	22.0	18.5	16.5	17.5
15	20.5	18.5	19.5	23.0	21.5	22.0	21.0	19.5	20.0	16.5	16.0	16.0
16	18.5	17.0	17.5	24.0	22.5	23.0	20.5	19.0	20.0	16.0	15.0	15.5
17	17.0	16.5	16.5	24.5	22.5	24.0	21.5	20.0	21.0	16.0	14.5	15.0
18	17.5	15.5	16.5	24.0	21.0	23.0	21.5	20.0	21.0	16.0	14.5	15.0
19	17.5	16.5	17.0	23.5	22.0	23.0	20.5	19.0	20.0	16.5	15.0	15.5
20	18.5	17.0	17.5	23.5	22.0	23.0	19.5	18.5	19.0	16.5	15.5	16.0
21	19.5	17.5	18.5	23.5	22.0	22.5	19.5	19.0	19.0	15.5	15.0	15.0
22	20.0	18.0	19.5	24.0	21.5	23.0	20.0	18.5	19.5	15.0	13.0	13.5
23	21.0	18.5	20.0	--	--	--	19.5	19.0	19.5	15.0	13.5	14.0
24	22.0	19.5	21.0	--	--	--	20.0	19.0	19.5	15.5	14.5	15.0
25	23.0	21.5	22.0	--	--	--	20.5	19.0	20.0	15.0	14.0	14.5
26	23.0	22.0	22.5	--	--	--	21.0	20.0	20.5	16.0	14.5	15.0
27	23.0	21.5	22.0	24.5	23.0	23.5	21.0	20.0	20.5	17.0	15.5	16.5
28	23.0	22.0	22.5	24.5	22.0	24.0	22.0	20.5	21.5	19.5	17.0	18.0
29	23.0	22.0	22.5	25.0	22.5	24.5	22.0	19.0	21.0	20.0	18.0	19.5
30	22.0	20.0	21.0	26.0	23.5	25.0	19.5	18.5	19.0	18.0	15.0	16.0
31	--	--	--	26.0	24.5	25.5	19.0	18.0	18.5	--	--	--
MONTH	24.0	15.5	20.2	--	--	--	25.5	18.0	20.5	23.0	13.0	17.4

STREAMS TRIBUTARY TO DETROIT RIVER

04166500 RIVER ROUGE AT DETROIT, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH			APRIL			MAY		
1	---	---	---	---	---	---	---	---	---	12.2	8.5	10.1
2	---	---	---	---	---	---	---	---	---	12.1	8.8	10.1
3	---	---	---	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---	8.9	5.4	7.0
11	---	---	---	---	---	---	---	---	---	9.2	3.2	7.6
12	---	---	---	---	---	---	---	---	---	8.8	7.1	7.8
13	---	---	---	---	---	---	---	---	---	8.9	7.4	8.1
14	---	---	---	---	---	---	---	---	---	8.8	7.6	8.2
15	---	---	---	---	---	---	---	---	---	8.5	7.3	7.9
16	---	---	---	---	---	---	10.0	8.6	9.0	8.2	6.9	7.5
17	---	---	---	---	---	---	9.9	9.0	9.4	7.6	6.0	7.0
18	---	---	---	---	---	---	9.7	9.0	9.4	6.8	2.3	4.5
19	---	---	---	---	---	---	10.5	9.6	10.0	6.8	5.4	6.2
20	---	---	---	---	---	---	11.6	9.7	10.4	7.4	6.8	7.1
21	---	---	---	---	---	---	10.6	9.3	9.9	7.7	7.0	7.2
22	---	---	---	---	---	---	9.6	7.5	8.8	7.2	5.5	6.5
23	---	---	---	---	---	---	9.1	8.7	8.9	6.7	6.0	6.2
24	---	---	---	---	---	---	9.6	8.9	9.3	7.3	6.2	6.8
25	---	---	---	---	---	---	9.4	9.1	9.3	7.9	7.0	7.5
26	---	---	---	---	---	---	9.4	8.9	9.2	---	---	---
27	---	---	---	---	---	---	9.8	8.6	9.2	8.7	8.1	8.3
28	---	---	---	---	---	---	10.1	8.7	9.2	8.8	7.8	8.2
29	---	---	---	---	---	---	10.7	8.1	9.2	8.5	7.3	7.7
30	---	---	---	---	---	---	11.5	8.1	9.5	8.1	7.0	7.3
31	---	---	---	---	---	---	---	---	---	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE				JULY			AUGUST			SEPTEMBER		
1	---	---	---	---	---	---	3.5	1.6	2.8	6.8	5.8	6.2
2	8.2	4.9	6.3	6.2	4.5	5.7	4.5	3.0	3.6	6.3	5.9	6.2
3	6.9	5.9	6.3	6.7	5.6	6.0	5.3	3.5	4.2	6.6	5.9	6.1
4	7.1	6.0	6.4	6.0	5.3	5.7	6.3	3.8	4.6	6.6	5.8	6.0
5	7.4	6.2	6.6	5.8	5.1	5.3	5.3	4.4	5.0	6.6	5.6	6.0
6	7.2	5.3	6.1	5.6	5.0	5.1	5.1	4.2	4.6	6.5	3.8	5.5
7	6.3	4.5	5.2	5.9	4.8	5.2	6.2	4.1	4.6	5.6	3.4	4.6
8	5.8	4.1	4.6	5.7	4.9	5.2	5.9	4.4	5.3	5.4	4.3	4.8
9	6.1	4.0	4.5	6.3	4.0	5.2	6.4	5.5	6.0	5.3	3.6	4.4
10	5.2	4.0	4.2	5.6	4.8	5.3	5.8	5.6	5.7	4.4	3.6	4.0
11	5.6	3.8	4.3	6.4	5.5	5.8	6.1	5.4	5.8	5.5	4.1	4.6
12	6.0	1.9	4.3	6.8	5.9	6.1	5.9	5.0	5.3	5.2	4.3	4.8
13	4.1	1.9	3.0	6.9	5.9	6.2	5.8	3.5	4.9	5.1	4.3	4.6
14	5.7	1.2	4.7	6.2	4.2	5.3	5.8	3.3	5.1	5.4	4.5	5.0
15	6.2	5.5	5.7	5.1	4.1	4.4	6.3	5.1	5.9	5.9	4.9	5.4
16	6.9	5.7	6.1	5.0	4.0	4.4	6.4	5.8	6.1	5.9	5.2	5.6
17	6.8	6.0	6.2	4.9	4.0	4.3	6.2	5.3	5.7	5.9	5.6	5.7
18	6.8	6.0	6.3	5.1	3.5	4.0	5.6	4.2	5.3	6.3	5.6	5.9
19	6.5	5.8	6.2	4.8	3.2	3.9	6.0	5.3	5.6	6.0	5.5	5.7
20	7.0	5.7	6.1	4.9	4.0	4.4	6.3	5.7	6.0	6.0	5.4	5.7
21	6.4	5.3	5.7	5.4	4.2	4.6	6.4	5.7	6.0	6.7	4.3	5.7
22	6.1	5.2	5.6	6.1	4.7	5.1	6.3	5.9	6.1	5.7	4.5	5.3
23	5.9	5.1	5.4	---	---	---	6.3	5.8	5.9	6.3	5.0	5.3
24	6.1	4.1	5.0	---	---	---	6.2	5.5	5.8	6.3	5.1	5.5
25	5.2	1.2	2.9	---	---	---	6.1	4.5	5.2	6.3	5.3	5.8
26	3.5	2.3	2.9	---	---	---	5.4	4.9	5.2	6.2	5.6	5.9
27	5.6	2.8	4.1	4.4	3.9	4.1	6.1	5.3	5.7	6.5	5.5	5.8
28	6.1	4.2	4.6	4.6	3.9	4.2	6.3	5.2	5.7	6.0	5.0	5.3
29	6.4	2.2	4.8	4.7	3.8	4.1	6.3	5.1	5.4	6.3	4.4	5.1
30	5.7	4.4	5.3	4.9	3.7	4.0	6.3	5.5	5.8	7.6	6.1	7.1
31	---	---	---	5.0	3.2	3.8	6.7	5.9	6.2	---	---	---
MONTH	---	---	---	---	---	---	6.7	1.6	5.3	7.6	3.4	5.5

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 1977 to September 1983 (operated as a crest-stage partial-record station), October 1983 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 600.95 ft above sea level. 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.--Records good except for estimated daily discharges, which are fair. Regulation by storm water retention structures; and occasional regulation by reservoirs upstream from station since 1956. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	22	44	e26	99	166	47	84	65	206	40	22
2	12	22	38	e25	132	117	48	75	65	265	36	21
3	27	22	e35	e25	158	156	47	67	61	303	29	21
4	27	21	e33	e26	137	133	125	63	50	147	47	21
5	13	21	e60	e26	107	106	115	61	41	91	40	20
6	14	22	e55	e26	95	108	78	62	38	67	30	e30
7	368	21	e215	e26	93	92	60	57	35	57	42	e115
8	164	21	81	e25	100	89	53	54	32	50	61	28
9	88	22	53	e25	101	83	223	54	31	79	43	25
10	56	91	42	e25	107	84	148	51	30	61	38	20
11	42	113	36	e25	100	88	157	48	29	45	32	19
12	37	61	34	e25	142	90	133	45	164	37	29	19
13	32	44	32	e25	110	84	101	45	321	33	52	22
14	29	37	32	e25	78	77	81	44	329	31	78	19
15	27	33	31	e25	68	78	71	41	142	29	e60	18
16	26	31	38	e27	64	90	180	40	76	27	41	18
17	27	30	43	e37	68	130	159	51	53	28	31	18
18	29	30	34	e180	62	172	149	450	44	73	27	16
19	29	29	54	142	56	156	113	200	38	132	25	16
20	25	29	46	83	52	113	103	98	35	99	24	15
21	23	27	67	68	47	89	84	68	33	56	23	32
22	22	27	72	393	e46	78	319	100	31	52	22	23
23	22	27	50	614	e45	69	649	83	29	e150	22	20
24	20	28	45	650	e44	64	723	174	72	e400	27	21
25	20	56	37	385	50	61	377	84	135	e120	72	19
26	20	116	29	206	52	56	207	61	42	e70	60	18
27	21	62	29	159	49	53	156	52	378	50	38	17
28	22	43	28	174	183	51	126	47	220	42	35	34
29	22	35	29	160	---	49	107	44	340	37	29	37a
30	22	35	e29	129	---	48	93	41	118	34	23	210
31	22	---	e27	105	---	47	---	83	---	39	22	---
TOTAL	1325	1178	1478	3892	2445	2877	5032	2527	3077	2910	1178	1236
MEAN	42.7	39.3	47.7	126	87.3	92.8	168	81.5	103	93.9	38.0	41.2
MAX	368	116	215	650	183	172	723	450	378	400	78	37a
MIN	12	21	27	25	44	47	47	40	29	27	22	15
CFSM	.43	.39	.48	1.26	.87	.93	1.68	.82	1.03	.94	.38	.41
IN.	.49	.44	.55	1.45	.91	1.07	1.87	.94	1.15	1.08	.44	.46

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1999, BY WATER YEAR (WY)

	MEAN	40.8	58.2	74.4	83.0	108	149	135	93.6	66.9	45.2	38.6	47.2
MAX	124	178	177	269	324	313	313	310	225	179	144	171	171
(WY)	1955	1993	1988	1952	1976	1976	1950	1956	1968	1957	1998	1975	1975
MIN	7.83	9.46	10.4	9.65	14.2	42.3	32.6	21.9	17.8	8.85	5.64	4.97	4.97
(WY)	1932	1965	1964	1961	1963	1931	1931	1958	1959	1931	1931	1971	1971

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1931 - 1976

ANNUAL TOTAL	37139	29155	77.6	1976
ANNUAL MEAN	102	79.9	133	1971
HIGHEST ANNUAL MEAN			20.8	1971
LOWEST ANNUAL MEAN			2060	Jun 26 1978
HIGHEST DAILY MEAN	1270	Feb 18	12	Oct 2
LOWEST DAILY MEAN	11	Sep 23	17	Sep 14
ANNUAL SEVEN-DAY MINIMUM	11	Sep 23	1060	Apr 23
INSTANTANEOUS PEAK FLOW			8.86	Apr 23
INSTANTANEOUS PEAK STAGE			10	Oct 3
INSTANTANEOUS LOW FLOW			.80	
ANNUAL RUNOFF (CFSM)	1.02		10.86	
ANNUAL RUNOFF (INCHES)	13.83		165	
10 PERCENT EXCEEDS	242		43	
50 PERCENT EXCEEDS	55		22	
90 PERCENT EXCEEDS	22			

(a) Gage height 9.96 ft.

(b) From floodmark.

(c) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04167150 MIDDLE RIVER ROUGE AT DEARBORN HEIGHTS, MI

LOCATION.--Lat 42°19'50", long 83°14'53", in SW1/4 sec.10, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank at downstream side of bridge on Hines Drive in Dearborn Heights.

DRAINAGE AREA.--110 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1997 to current year.

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 585 ft above sea level, from topographic map.

REMARKS.--Records fair. Regulation by storm water retention structures and occasional regulation by reservoirs upstream from station. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	23	41	e29	110	172	47	94	88	203	50	23
2	e14	23	39	e28	128	127	48	83	78	387	33	22
3	e30	23	35	e28	162	142	47	73	102	289	27	22
4	e35	23	33	e29	136	137	95	69	62	179	42	22
5	e15	23	68	e29	118	111	139	66	44	119	42	21
6	e16	23	61	e29	106	111	95	66	39	92	29	e32
7	282	23	236	e29	106	99	75	60	36	70	32	e125
8	257	23	107	e28	109	100	58	53	32	55	86	35
9	e100	24	56	e28	110	97	186	54	30	92	48	27
10	e70	68	41	e28	114	94	163	49	29	91	35	22
11	e50	169	35	e28	107	97	142	45	32	51	31	20
12	e40	85	33	e28	137	100	142	42	141	40	27	19
13	e35	51	31	e28	119	97	111	41	382	34	45	21
14	e32	42	32	e28	94	90	92	41	319	31	152	19
15	e30	37	33	e28	81	92	75	38	163	29	87	19
16	29	36	36	e30	76	101	162	37	99	27	43	18
17	30	35	49	e45	80	130	170	39	66	26	31	18
18	30	34	34	e200	74	163	164	390	50	79	27	17
19	33	33	51	e150	63	142	131	267	42	103	25	17
20	27	33	56	e85	58	115	112	117	38	114	24	17
21	25	32	59	e66	50	100	96	83	35	55	23	29
22	24	31	88	e380	e50	91	260	102	32	48	22	27
23	23	32	57	687	e49	82	597	93	30	174	22	19
24	22	31	48	712	e48	74	855	164	51	437	26	21
25	22	38	38	442	57	69	418	107	142	139	85	18
26	22	136	32	199	65	67	201	73	46	80	93	18
27	22	74	33	152	62	58	154	56	295	53	51	16
28	22	45	33	167	164	56	129	48	378	42	38	26
29	23	36	32	161	---	53	115	43	612	35	31	234
30	23	35	e32	133	---	51	104	39	232	32	25	228
31	23	---	e30	116	---	48	---	81	---	31	23	---
TOTAL	1425	1321	1589	4150	2633	3066	5183	2613	3725	3237	1355	1172
MEAN	46.0	44.0	51.3	134	94.0	98.9	173	84.3	124	104	43.7	39.1
MAX	282	169	236	712	164	172	855	390	612	437	152	234
MIN	14	23	30	28	48	48	47	37	29	26	22	16
CFSM	.42	.40	.47	1.22	.85	.90	1.57	.77	1.13	.95	.40	.36
IN.	.48	.45	.54	1.40	.89	1.04	1.75	.88	1.26	1.09	.46	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1998 - 1999, BY WATER YEAR (WY)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
MEAN	48.1	52.4	71.4	137	161	170	171	85.0	94.7	75.7	102	37.1
MAX	50.2	60.7	91.5	141	229	242	173	85.7	124	104	160	39.1
(WY)	1998	1998	1998	1998	1998	1998	1999	1998	1999	1999	1998	1999
MIN	46.0	44.0	51.3	134	94.0	98.9	168	84.3	65.3	47.0	43.7	35.1
(WY)	1999	1999	1999	1999	1999	1999	1998	1999	1998	1998	1999	1998

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1998 - 1999

ANNUAL TOTAL	39721	31469	100
ANNUAL MEAN	109	86.2	114
HIGHEST ANNUAL MEAN			86.2
LOWEST ANNUAL MEAN			1998
HIGHEST DAILY MEAN	1390	855	1390
LOWEST DAILY MEAN	14	14	14
ANNUAL SEVEN-DAY MINIMUM	16	18	16
INSTANTANEOUS PEAK FLOW		926	1670
INSTANTANEOUS PEAK STAGE		10.10	12.24
ANNUAL RUNOFF (CFSM)	.99	.78	.91
ANNUAL RUNOFF (INCHES)	13.43	10.64	12.36
10 PERCENT EXCEEDS	255	164	203
50 PERCENT EXCEEDS	59	50	61
90 PERCENT EXCEEDS	23	23	25

(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04167150 MIDDLE RIVER ROUGE AT DEARBORN HEIGHTS, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--April to September 1999.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: April to September 1999.

DISSOLVED OXYGEN: April to September 1999.

INSTRUMENTATION.--Water-quality monitor telemeter, set for 15 minute measurement intervals.

REMARKS.--Interruptions in water-quality record due to instrument malfunctions.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 27.0°C, July 30, 31; minimum, 8.0°C, April 24.

DISSOLVED OXYGEN: Maximum, 11.8 mg/L, April 19; minimum, 2.5 mg/L, June 26, July 9.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	--	--	--	--	--	--	--	--	--	15.5	13.0	14.5
2	--	--	--	--	--	--	--	--	--	17.0	13.5	15.0
3	--	--	--	--	--	--	--	--	--	18.0	14.0	16.0
4	--	--	--	--	--	--	--	--	--	19.0	14.5	17.0
5	--	--	--	--	--	--	--	--	--	18.5	15.5	17.0
6	--	--	--	--	--	--	--	--	--	18.5	16.5	17.0
7	--	--	--	--	--	--	--	--	--	18.0	15.5	17.0
8	--	--	--	--	--	--	--	--	--	17.0	15.5	16.5
9	--	--	--	--	--	--	--	--	--	17.0	14.5	16.0
10	--	--	--	--	--	--	--	--	--	18.0	14.5	16.0
11	--	--	--	--	--	--	--	--	--	18.5	14.5	16.5
12	--	--	--	--	--	--	--	--	--	17.0	15.0	15.5
13	--	--	--	--	--	--	--	--	--	15.0	13.5	14.5
14	--	--	--	--	--	--	--	--	--	16.0	13.0	14.5
15	--	--	--	--	--	--	13.5	11.5	12.5	18.0	14.5	16.0
16	--	--	--	--	--	--	12.0	9.5	10.5	19.0	16.0	17.5
17	--	--	--	--	--	--	11.0	9.5	10.5	20.5	17.5	19.0
18	--	--	--	--	--	--	11.0	10.0	10.5	20.0	19.0	19.5
19	--	--	--	--	--	--	11.0	10.5	11.0	19.0	18.0	18.5
20	--	--	--	--	--	--	11.5	10.5	11.0	19.0	18.0	18.5
21	--	--	--	--	--	--	12.0	11.0	11.5	20.0	18.0	19.0
22	--	--	--	--	--	--	11.5	10.0	10.5	18.5	17.5	18.0
23	--	--	--	--	--	--	10.0	9.0	10.0	18.0	16.5	17.5
24	--	--	--	--	--	--	11.0	8.0	9.5	17.5	15.5	16.5
25	--	--	--	--	--	--	11.5	9.0	10.0	15.5	14.0	15.0
26	--	--	--	--	--	--	12.5	10.5	11.5	15.5	14.0	14.5
27	--	--	--	--	--	--	12.5	11.5	12.0	18.0	13.5	15.5
28	--	--	--	--	--	--	13.0	11.0	12.0	20.0	15.0	17.5
29	--	--	--	--	--	--	13.5	12.5	13.0	21.5	17.5	19.5
30	--	--	--	--	--	--	14.5	12.5	13.5	23.0	19.0	21.0
31	--	--	--	--	--	--	--	--	--	22.0	19.5	20.5
MONTH	--	--	--	--	--	--	--	--	--	23.0	13.0	17.0

STREAMS TRIBUTARY TO DETROIT RIVER

04167150 MIDDLE RIVER ROUGE AT DEARBORN HEIGHTS, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	21.0	19.5	20.0	21.5	20.5	21.0	26.5	24.5	25.5	20.5	18.0	19.0
2	22.0	20.5	21.0	23.0	21.0	22.0	24.5	22.5	23.5	21.0	18.5	20.0
3	20.5	18.5	19.5	23.5	22.0	23.0	23.5	21.0	22.5	21.5	19.5	20.5
4	20.5	17.0	18.5	25.0	23.5	24.0	23.0	22.0	22.5	22.0	19.5	20.5
5	21.5	17.5	19.5	26.5	24.5	26.0	23.0	21.0	22.0	22.5	20.0	21.5
6	23.5	19.5	21.5	27.0	25.0	26.0	22.0	20.0	21.0	---	---	---
7	25.0	22.0	23.5	25.5	23.5	24.5	22.0	21.0	21.5	---	---	---
8	25.0	22.5	24.0	25.0	22.5	23.5	22.5	21.0	22.0	22.0	20.5	21.5
9	25.0	22.5	24.0	23.5	22.0	23.0	22.0	19.5	21.0	22.0	20.5	21.0
10	25.5	23.0	24.5	23.0	21.5	22.0	21.5	20.0	20.5	20.5	18.5	19.0
11	26.0	24.0	25.0	23.0	20.0	21.5	22.5	20.0	21.5	19.0	17.5	18.5
12	26.0	16.5	23.5	23.0	20.0	21.5	22.5	21.0	22.0	20.0	17.5	18.5
13	23.0	21.5	22.5	23.0	21.0	22.0	23.5	22.0	22.5	20.0	19.0	19.5
14	22.5	21.5	22.0	24.0	21.5	23.0	23.0	21.0	21.5	19.0	17.0	18.0
15	22.0	20.0	21.0	24.5	22.0	23.5	21.5	21.0	21.0	17.0	15.5	16.5
16	20.0	18.5	19.5	25.5	23.5	24.5	23.0	20.0	21.5	16.5	15.5	16.0
17	19.0	18.0	18.5	26.0	24.0	25.0	23.5	21.0	22.0	16.5	15.0	15.5
18	20.0	16.5	18.0	25.0	23.5	24.5	23.0	21.5	22.0	16.5	14.5	15.5
19	20.0	17.0	18.5	24.5	24.0	24.0	21.5	20.0	20.5	17.0	15.0	16.0
20	21.0	18.0	19.5	25.0	24.0	24.5	20.5	19.0	20.0	17.0	16.5	16.5
21	21.5	19.0	20.0	25.0	24.0	24.0	21.0	19.0	20.0	16.5	15.0	15.5
22	22.0	19.5	20.5	25.5	23.0	24.5	21.5	19.5	20.5	15.0	13.5	14.0
23	22.5	20.5	21.5	26.5	23.5	24.5	20.5	20.0	20.5	15.5	13.5	14.5
24	23.0	22.0	22.5	25.5	24.5	25.0	21.5	20.0	20.5	16.5	15.0	16.0
25	24.0	22.5	23.5	26.0	25.0	25.5	21.5	20.5	21.0	16.0	14.5	15.5
26	25.0	22.0	23.5	25.0	24.0	24.5	22.0	21.0	21.0	17.0	15.0	16.0
27	24.0	22.5	23.0	26.0	23.5	24.5	22.5	21.0	21.5	18.5	16.0	17.0
28	24.5	23.5	24.0	26.5	23.5	25.0	24.0	21.5	22.5	21.0	18.0	19.0
29	23.5	22.5	23.0	26.5	24.0	25.5	23.5	20.5	21.5	21.0	17.5	20.0
30	22.5	21.5	22.0	27.0	25.0	26.0	20.5	18.5	19.0	17.5	16.0	16.5
31	---	---	---	27.0	26.0	26.5	20.0	18.0	19.0	---	---	---
MONTH	26.0	16.5	21.6	27.0	20.0	24.0	26.5	18.0	21.4	---	---	---

STREAMS TRIBUTARY TO DETROIT RIVER

04167150 MIDDLE RIVER ROUGE AT DEARBORN HEIGHTS, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	--	--	--	--	--	--	--	--	--	11.6	8.3	9.8	
2	--	--	--	--	--	--	--	--	--	11.6	8.1	9.6	
3	--	--	--	--	--	--	--	--	--	11.2	7.9	9.3	
4	--	--	--	--	--	--	--	--	--	10.2	7.7	8.7	
5	--	--	--	--	--	--	--	--	--	9.1	7.2	8.0	
6	--	--	--	--	--	--	--	--	--	8.3	6.4	7.3	
7	--	--	--	--	--	--	--	--	--	8.9	6.4	7.6	
8	--	--	--	--	--	--	--	--	--	8.1	7.0	7.6	
9	--	--	--	--	--	--	--	--	--	9.1	7.3	8.1	
10	--	--	--	--	--	--	--	--	--	8.8	7.3	7.9	
11	--	--	--	--	--	--	--	--	--	8.9	7.4	8.0	
12	--	--	--	--	--	--	--	--	--	8.6	7.3	7.8	
13	--	--	--	--	--	--	--	--	--	9.3	7.7	8.4	
14	--	--	--	--	--	--	--	--	--	9.7	8.1	8.8	
15	--	--	--	--	--	--	--	--	--	9.7	7.6	8.5	
16	--	--	--	--	--	--	9.6	8.6	9.1	9.2	7.2	8.0	
17	--	--	--	--	--	--	10.6	9.2	9.8	8.7	5.9	7.5	
18	--	--	--	--	--	--	10.8	9.2	9.9	7.1	2.6	5.0	
19	--	--	--	--	--	--	11.8	9.3	10.5	6.9	5.2	6.3	
20	--	--	--	--	--	--	11.7	9.1	10.3	7.5	6.5	7.0	
21	--	--	--	--	--	--	11.2	8.9	9.9	7.6	6.3	6.9	
22	--	--	--	--	--	--	9.4	8.6	9.0	6.4	3.7	5.5	
23	--	--	--	--	--	--	9.6	9.0	9.3	6.8	5.7	6.2	
24	--	--	--	--	--	--	9.7	9.0	9.3	6.9	5.7	6.4	
25	--	--	--	--	--	--	9.7	9.1	9.5	7.9	6.4	7.4	
26	--	--	--	--	--	--	9.6	8.9	9.3	8.3	7.6	7.9	
27	--	--	--	--	--	--	9.8	8.8	9.3	7.8	6.9	7.6	
28	--	--	--	--	--	--	9.8	9.0	9.4	7.5	6.4	7.1	
29	--	--	--	--	--	--	10.2	8.5	9.3	7.1	6.0	6.6	
30	--	--	--	--	--	--	10.8	8.4	9.5	7.0	5.7	6.3	
31	--	--	--	--	--	--	--	--	--	5.7	3.2	4.6	
MONTH	--	--	--	--	--	--	--	--	--	11.6	2.6	7.5	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
JUNE				JULY				AUGUST			SEPTEMBER		
1	5.3	3.6	4.7	6.2	5.0	5.6	5.4	4.1	5.0	6.9	6.2	6.6	
2	5.8	4.8	5.5	6.4	5.6	6.1	6.1	5.0	5.6	7.0	6.4	6.7	
3	6.5	5.7	6.2	6.6	5.3	6.0	6.5	5.8	6.2	7.0	6.3	6.6	
4	7.1	6.3	6.8	5.8	5.2	5.5	6.2	3.8	5.5	6.9	6.2	6.5	
5	7.2	6.2	6.8	5.7	5.1	5.4	5.9	3.3	5.1	6.7	6.1	6.3	
6	7.2	5.8	6.5	5.3	3.9	4.8	---	---	---	---	---	---	
7	6.8	5.4	6.0	5.5	4.5	5.2	---	---	---	---	---	---	
8	6.5	5.3	5.8	5.3	4.5	5.1	---	---	---	5.6	4.4	5.0	
9	6.6	5.1	5.7	5.4	2.5	4.6	---	---	---	5.8	5.2	5.5	
10	6.4	5.1	5.6	5.4	4.3	4.9	---	---	---	6.2	5.3	5.7	
11	6.6	5.0	5.6	6.1	5.4	5.7	6.7	5.8	6.2	6.6	5.8	6.3	
12	8.2	4.8	5.8	6.2	5.5	5.8	6.8	5.7	6.2	6.8	6.1	6.5	
13	5.3	3.1	3.8	6.4	5.8	6.1	6.2	4.4	5.5	6.5	5.8	6.2	
14	5.7	4.9	5.4	6.5	5.8	6.1	6.2	3.8	5.1	6.5	5.6	6.1	
15	6.2	5.3	5.9	6.5	5.6	6.0	7.1	6.2	6.6	7.2	6.2	6.7	
16	6.3	5.7	6.0	6.6	5.6	6.0	7.0	6.1	6.6	7.5	6.7	7.1	
17	6.4	5.8	6.1	6.5	5.5	5.9	6.6	5.7	6.2	7.7	7.2	7.4	
18	6.6	5.8	6.2	6.2	4.0	5.5	6.6	5.7	6.1	7.8	7.2	7.4	
19	6.8	5.6	6.1	5.4	3.2	4.7	6.8	5.8	6.3	7.8	7.1	7.4	
20	6.6	5.5	6.0	5.6	4.5	5.1	7.2	5.5	6.6	7.9	7.0	7.4	
21	6.7	5.4	5.9	5.8	5.5	5.7	7.5	6.4	6.9	7.5	5.9	6.9	
22	6.6	5.2	5.8	5.6	5.3	5.5	7.5	6.4	6.8	7.7	6.4	7.2	
23	6.5	5.0	5.7	6.9	4.4	5.4	7.1	6.4	6.7	7.8	7.2	7.5	
24	7.0	4.3	5.3	4.9	4.1	4.5	7.4	5.5	6.7	7.6	6.6	7.2	
25	5.2	3.3	3.9	5.1	4.6	5.0	6.3	5.0	5.9	7.7	7.0	7.4	
26	4.7	2.5	4.0	5.4	5.0	5.3	6.8	5.2	5.7	8.1	7.3	7.7	
27	7.2	3.5	4.8	5.8	5.2	5.5	6.1	5.5	5.8	8.0	7.4	7.7	
28	6.5	3.5	4.3	5.7	5.2	5.5	6.5	5.7	6.0	7.9	3.9	7.4	
29	6.3	4.3	4.7	5.9	5.1	5.5	6.6	5.7	6.2	7.5	5.0	6.1	
30	5.1	4.4	4.9	5.8	5.1	5.4	6.9	6.1	6.6	7.8	7.1	7.5	
31	---	---	---	5.8	5.1	5.3	7.0	6.4	6.7	---	---	---	
MONTH	8.2	2.5	5.5	6.9	2.5	5.4	---	---	---	---	---	---	

STREAMS TRIBUTARY TO DETROIT RIVER

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 sea level. Prior to Oct. 20, 1948, nonrecording gage at same site and datum.

REMARKS.--Records fair. Since 1995, flow contains effluent from sewage-treatment plant which originates outside the basin. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e35	30	50	e22	98	154	52	73	64	182	48	41
2	e32	35	e39	e40	144	95	51	71	53	154	47	37
3	e41	37	e38	44	242	172	54	65	51	153	45	40
4	e44	38	e38	46	161	161	139	62	46	101	59	36
5	e35	36	45	36	104	104	136	60	44	67	56	32
6	e34	34	54	42	89	81	88	59	41	60	47	91
7	e330	37	118	48	90	75	70	53	40	56	54	53
8	e140	38	67	45	90	70	67	51	38	50	56	41
9	e80	30	51	46	95	65	e270	53	40	70	45	38
10	e55	66	42	41	145	64	e240	48	38	60	47	38
11	e43	73	37	44	106	75	e220	47	36	46	44	36
12	e42	e45	38	e43	184	78	e220	49	99	43	43	36
13	e39	e40	38	e50	111	74	163	45	371	43	66	37
14	e38	e38	33	e40	e75	72	111	43	544	42	56	34
15	e37	e37	31	e65	e69	77	86	47	236	39	45	32
16	e36	e36	35	e75	e68	124	e200	44	114	44	41	34
17	e37	e35	42	e75	e67	262	e240	47	81	39	41	33
18	e38	e35	34	163	e60	340	e200	217	69	40	39	32
19	e37	e34	53	119	e56	153	154	84	58	102	39	29
20	e36	e35	50	e70	e52	e110	117	59	52	92	41	33
21	e32	e33	60	e65	e48	e85	98	51	49	56	40	47
22	e34	e33	69	437	e45	e75	309	91	47	61	43	35
23	e34	e37	48	757	e43	e65	809	74	47	145	38	33
24	e33	e35	40	982	e40	e60	990	144	105	486	42	38
25	e32	e50	29	634	e43	e57	324	92	225	126	75	37
26	e31	97	23	288	e45	e55	195	62	79	71	103	32
27	e30	46	e27	198	e45	e53	135	53	270	62	91	31
28	31	32	e27	273	184	e53	106	48	205	53	51	42
29	36	33	e29	227	---	52	92	46	455	50	45	228
30	40	39	e28	146	---	48	82	44	126	33	43	153
31	39	---	e25	112	---	51	---	75	---	51	42	---
TOTAL	1581	1224	1338	5273	2599	3060	6018	2057	3723	2677	1572	1459
MEAN	51.0	40.8	43.2	170	92.8	98.7	201	66.4	124	86.4	50.7	48.6
MAX	330	97	118	982	242	340	990	217	544	486	103	228
MIN	30	30	23	22	40	48	51	43	36	33	38	29

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1999, BY WATER YEAR (WY)

	MEAN	22.3	38.6	61.5	61.6	92.1	136	115	60.7	39.3	23.0	17.8	22.1
MAX	110	176	179	294	307	301	280	183	221	95.8	104	99.5	
(WY)	1982	1986	1968	1952	1976	1982	1950	1983	1968	1969	1998	1975	
MIN	2.11	3.23	2.32	1.86	4.18	19.4	22.2	4.47	2.75	2.26	.83	1.86	
(WY)	1949	1964	1964	1961	1964	1964	1958	1958	1949	1948	1950	1952	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1947 - 1999

ANNUAL TOTAL	38451	32581	
ANNUAL MEAN	105	89.3	(a)57.3
HIGHEST ANNUAL MEAN			107
LOWEST ANNUAL MEAN			15.9
HIGHEST DAILY MEAN	1850	990	2520
LOWEST DAILY MEAN	23	22	30
ANNUAL SEVEN-DAY MINIMUM	27	26	.53
INSTANTANEOUS PEAK FLOW		(b)1220	3600
INSTANTANEOUS PEAK STAGE		10.82	13.62
INSTANTANEOUS LOW FLOW			.20
10 PERCENT EXCEEDS	203	183	127
50 PERCENT EXCEEDS	53	51	19
90 PERCENT EXCEEDS	33	34	2.8

(a) Annual mean, water years 1948-95, 54.1 ft³/s, 8.83 in/yr; water years 1996-99, 96.0 ft³/s.

(b) Gage height 10.26 ft.

(c) Sept. 13, 1955, Jan. 23, 1961.

(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04168400 LOWER RIVER ROUGE AT DEARBORN, MI

LOCATION.--Lat 42°18'31", long 83°15'10", in NE1/4 sec.22, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 100 ft upstream from bridge on Military Road in Dearborn.

DRAINAGE AREA.--91 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1997 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 585 ft above sea level, from topographic map.

REMARKS.--Records good. Flow contains effluent from sewage-treatment plant, which originates outside the basin. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	32	47	23	109	149	53	71	58	174	43	38
2	33	34	40	40	151	94	53	69	49	147	42	34
3	43	34	40	52	235	158	56	65	47	143	40	36
4	45	34	40	44	175	156	127	62	42	93	51	34
5	37	32	45	34	118	101	115	60	40	61	52	28
6	35	32	63	40	98	83	77	60	39	54	42	116
7	331	33	121	47	98	76	66	54	36	51	48	58
8	185	36	67	44	98	74	62	51	35	45	52	37
9	74	32	48	45	102	69	281	53	37	63	41	34
10	55	75	41	42	151	67	249	47	35	56	42	33
11	45	73	36	45	122	75	226	48	34	43	39	33
12	44	44	38	45	192	78	226	50	266	40	40	33
13	40	40	37	57	122	75	146	47	455	40	61	34
14	39	39	34	38	79	72	102	46	498	40	51	33
15	39	38	33	69	71	75	84	48	244	37	40	31
16	37	37	35	77	70	109	212	48	104	40	36	32
17	38	36	40	77	70	225	243	58	70	36	35	31
18	39	36	34	169	63	311	208	226	60	37	35	32
19	38	35	51	111	58	176	155	87	51	91	35	30
20	38	36	47	71	53	108	126	59	45	80	36	34
21	33	34	57	67	49	84	105	52	43	50	34	45
22	35	34	65	384	47	74	276	97	42	54	37	37
23	35	38	46	666	45	67	776	73	43	302	34	33
24	34	36	37	903	42	62	1040	144	116	533	37	38
25	33	49	30	638	45	59	338	89	227	133	73	39
26	32	97	26	e275	47	57	211	59	75	66	97	33
27	31	45	28	199	47	55	140	49	303	56	89	32
28	32	33	28	251	167	54	104	45	204	48	46	51
29	33	34	30	228	---	52	88	43	528	45	40	239
30	35	38	29	162	---	50	79	41	128	31	38	166
31	35	---	26	124	---	52	---	67	---	45	37	---
TOTAL	1640	1226	1339	5067	2724	2997	6024	2068	3954	2734	1423	1484
MEAN	52.9	40.9	43.2	163	97.3	96.7	201	66.7	132	88.2	45.9	49.5
MAX	331	97	121	903	235	311	1040	226	528	533	97	239
MIN	31	32	26	23	42	50	53	41	34	31	34	28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1998 - 1999, BY WATER YEAR (WY)

	MEAN	49.8	46.0	59.1	147	177	191	201	71.3	97.6	78.0	74.3	46.2
MAX	52.9	51.0	75.1	163	256	285	201	75.8	132	88.2	103	49.5	
(WY)	1999	1998	1998	1999	1998	1998	1999	1998	1999	1999	1998	1999	
MIN	46.7	40.9	43.2	130	97.3	96.7	201	66.7	63.4	67.8	45.9	43.0	
(WY)	1998	1999	1999	1998	1999	1999	1998	1999	1998	1998	1999	1998	

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1998 - 1999
ANNUAL TOTAL	41074	32680	
ANNUAL MEAN	113	89.5	103
HIGHEST ANNUAL MEAN			116
LOWEST ANNUAL MEAN			89.5
HIGHEST DAILY MEAN	1620	1040	1620
LOWEST DAILY MEAN	26	23	23
ANNUAL SEVEN-DAY MINIMUM	28	27	27
INSTANTANEOUS PEAK FLOW		1150	1970
INSTANTANEOUS PEAK STAGE		8.10	10.28
10 PERCENT EXCEEDS	231	195	212
50 PERCENT EXCEEDS	54	49	54
90 PERCENT EXCEEDS	34	34	35

(e) Estimated.

STREAMS TRIBUTARY TO DETROIT RIVER

04168400 LOWER RIVER ROUGE AT DEARBORN, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--April to September 1999.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: April to September 1999.

DISSOLVED OXYGEN: April to September 1999.

INSTRUMENTATION.--Water-quality monitor telemeter, set for 15 minute measurement intervals.

REMARKS.--Interruptions in water-quality record due to instrument malfunctions.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 26.0°C, July 5, 30, 31; minimum, 7.5°C, April 24.

DISSOLVED OXYGEN: Maximum, 11.2 mg/L, April 15; minimum, 1.9 mg/L, July 19.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

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

STREAMS TRIBUTARY TO DETROIT RIVER

04168400 LOWER RIVER ROUGE AT DEARBORN, MI--Continued

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	20.0	18.5	19.5	20.5	19.5	20.5	25.5	24.0	24.5	20.5	18.5	19.5
2	20.0	19.0	19.5	22.0	20.5	21.0	24.5	22.0	23.0	20.5	19.0	20.0
3	19.5	17.5	18.5	23.0	20.0	22.0	22.5	20.5	21.5	21.5	19.5	20.5
4	18.5	16.5	17.5	25.0	22.5	23.5	22.5	21.0	21.5	21.5	20.0	21.0
5	20.0	17.0	18.5	26.0	23.5	24.5	22.0	21.0	21.5	22.0	20.5	21.0
6	22.5	19.5	20.5	25.5	24.0	24.5	21.5	20.0	20.5	24.0	21.5	22.5
7	23.5	21.5	22.5	24.0	22.0	23.0	22.0	20.5	21.0	23.0	21.5	22.0
8	23.5	21.5	22.5	23.0	21.0	22.0	22.0	21.0	21.5	22.0	20.5	21.5
9	23.0	21.0	22.0	22.5	21.0	22.0	21.0	19.5	20.0	22.0	20.5	21.0
10	24.0	21.5	22.5	22.0	20.5	21.0	20.5	19.5	20.0	20.5	18.5	19.0
11	24.0	22.5	23.5	21.5	19.5	20.5	22.0	20.0	20.5	18.5	17.5	18.0
12	24.0	20.5	23.0	21.5	19.5	20.5	22.0	21.0	21.5	20.0	18.0	19.0
13	23.0	21.0	22.0	22.0	20.5	21.0	23.0	21.5	22.0	20.5	19.5	20.0
14	21.5	20.5	21.0	23.0	21.0	22.0	22.5	20.5	21.5	19.5	18.0	18.5
15	20.5	18.0	19.5	23.5	21.5	22.5	21.0	19.0	20.0	18.0	16.5	17.0
16	18.0	17.5	17.5	24.5	22.5	23.5	21.5	19.5	20.5	17.0	16.5	16.5
17	18.0	17.0	17.5	24.5	23.5	24.0	22.5	21.0	21.5	17.0	16.0	16.5
18	19.0	16.0	17.5	24.0	22.5	23.0	22.5	21.0	21.5	17.0	16.0	16.5
19	19.0	17.0	18.0	23.5	22.5	23.0	21.0	19.5	20.0	18.0	16.5	17.0
20	20.0	17.5	19.0	24.0	22.5	23.0	20.5	19.0	19.5	18.0	17.5	18.0
21	21.0	18.5	19.5	23.5	22.0	22.5	20.5	19.0	20.0	17.5	16.0	16.5
22	21.0	19.0	20.0	24.0	22.0	23.0	21.5	19.5	20.5	16.0	14.0	15.0
23	22.0	19.5	20.5	25.0	23.0	24.0	21.5	20.0	20.5	16.5	15.0	15.5
24	23.0	21.0	21.5	24.5	23.5	24.0	21.0	20.5	20.5	17.0	16.5	16.5
25	23.5	22.0	22.5	25.5	24.0	24.5	21.5	20.5	21.0	17.0	15.5	16.5
26	23.5	22.0	22.5	24.5	23.0	23.5	21.5	20.5	21.0	18.0	16.5	17.0
27	23.5	21.0	22.5	24.5	22.5	23.5	22.5	21.0	22.0	19.5	17.5	18.5
28	24.0	21.5	23.5	25.0	22.5	24.0	23.5	21.5	22.5	21.0	19.5	20.0
29	23.0	21.5	22.5	25.0	23.0	24.0	23.5	20.5	21.5	21.0	17.5	20.0
30	21.5	20.5	21.0	26.0	24.0	25.0	20.5	18.5	19.5	17.5	16.0	16.5
31	--	--	--	26.0	25.0	25.5	20.0	18.5	19.0	--	--	--
MONTH	24.0	16.0	20.6	26.0	19.5	22.9	25.5	18.5	21.0	24.0	14.0	18.6

STREAMS TRIBUTARY TO DETROIT RIVER

04168400 LOWER RIVER ROUGE AT DEARBORN, MI--Continued

OXYGEN DISSOLVED (MG/L), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	
FEBRUARY				MARCH				APRIL				MAY	
1	--	--	--	--	--	--	--	--	--	10.2	7.8	9.0	
2	--	--	--	--	--	--	--	--	--	10.5	7.7	9.0	
3	--	--	--	--	--	--	--	--	--	10.5	7.2	8.8	
4	--	--	--	--	--	--	--	--	--	9.8	7.0	8.4	
5	--	--	--	--	--	--	--	--	--	8.5	6.6	7.6	
6	--	--	--	--	--	--	--	--	--	7.7	5.6	6.3	
7	--	--	--	--	--	--	--	--	--	7.4	5.5	6.3	
8	--	--	--	--	--	--	--	--	--	6.8	5.9	6.3	
9	--	--	--	--	--	--	--	--	--	7.8	6.3	6.9	
10	--	--	--	--	--	--	--	--	--	7.9	6.6	7.2	
11	--	--	--	--	--	--	--	--	--	8.2	7.0	7.5	
12	--	--	--	--	--	--	--	--	--	7.9	6.9	7.4	
13	--	--	--	--	--	--	--	--	--	8.4	7.0	7.7	
14	--	--	--	--	--	--	--	--	--	8.9	7.2	8.0	
15	--	--	--	--	--	--	11.2	8.6	9.9	8.5	7.0	7.7	
16	--	--	--	--	--	--	9.9	8.4	9.1	7.9	6.7	7.2	
17	--	--	--	--	--	--	10.5	9.6	10.1	7.3	4.4	6.6	
18	--	--	--	--	--	--	10.5	9.6	10.1	6.0	2.3	4.7	
19	--	--	--	--	--	--	10.9	9.4	10.1	6.5	6.0	6.3	
20	--	--	--	--	--	--	10.6	8.5	9.4	7.1	6.3	6.7	
21	--	--	--	--	--	--	11.0	8.3	8.7	7.0	6.2	6.6	
22	--	--	--	--	--	--	8.8	7.6	8.3	6.3	5.4	5.9	
23	--	--	--	--	--	--	9.5	8.7	9.1	6.8	5.8	6.5	
24	--	--	--	--	--	--	9.7	9.3	9.5	7.6	5.5	6.9	
25	--	--	--	--	--	--	9.4	9.0	9.2	8.2	7.6	8.0	
26	--	--	--	--	--	--	9.0	8.5	8.9	8.3	7.2	7.9	
27	--	--	--	--	--	--	9.5	8.1	8.7	7.6	6.7	7.3	
28	--	--	--	--	--	--	9.7	8.5	9.0	7.1	6.0	6.7	
29	--	--	--	--	--	--	9.9	8.4	9.0	6.4	5.5	6.1	
30	--	--	--	--	--	--	10.1	8.1	9.0	6.1	5.4	5.7	
31	--	--	--	--	--	--	--	--	--	5.8	3.2	4.6	
MONTH	--	--	--	--	--	--	--	--	--	10.5	2.3	7.0	

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN			
JUNE				JULY				AUGUST				SEPTEMBER			
1	5.6	3.9	5.2	5.8	3.3	4.8	5.2	4.0	4.7	6.4	4.8	6.0			
2	5.6	5.3	5.5	6.1	4.5	5.5	5.9	4.2	5.2	6.2	5.5	5.8			
3	6.5	5.5	6.0	6.0	4.2	5.2	6.3	5.0	5.6	6.2	5.5	5.9			
4	6.5	5.7	6.2	5.7	4.0	5.3	6.1	3.6	5.6	6.0	5.4	5.8			
5	6.4	5.6	6.1	4.9	2.7	4.2	5.8	4.4	5.1	5.8	5.2	5.5			
6	6.0	5.0	5.6	4.1	2.3	3.2	6.0	4.7	5.3	6.6	2.6	5.5			
7	5.4	4.8	5.1	10.7	2.3	5.6	6.3	4.2	5.4	4.8	3.6	4.2			
8	5.3	4.7	5.1	8.9	4.6	5.8	6.0	3.4	5.2	5.8	4.8	5.5			
9	5.5	4.8	5.3	7.6	3.6	4.7	6.3	4.7	5.4	5.6	5.2	5.4			
10	5.2	4.6	4.9	5.4	3.3	4.6	6.0	4.6	5.4	6.2	5.3	5.8			
11	5.1	4.1	4.7	5.6	3.9	4.9	6.0	4.2	5.0	6.4	6.1	6.3			
12	6.6	4.2	5.1	5.6	3.9	4.8	5.8	4.3	4.9	6.5	6.0	6.2			
13	5.9	3.7	5.0	5.3	3.2	4.4	5.2	2.1	4.2	6.2	5.4	5.9			
14	6.2	5.3	5.9	5.9	3.5	5.2	5.7	3.5	4.8	6.5	5.8	6.2			
15	6.6	6.2	6.3	5.8	4.8	5.3	6.3	4.2	5.1	7.1	6.3	6.7			
16	---	---	---	6.0	4.7	5.4	6.3	4.0	5.0	7.2	6.8	7.0			
17	6.7	5.8	6.3	5.8	4.7	5.3	5.3	3.9	4.5	7.3	6.9	7.1			
18	6.7	5.3	6.1	5.9	4.5	5.2	5.4	3.7	4.4	7.1	6.6	7.0			
19	6.5	4.3	5.7	5.6	1.9	4.6	5.5	4.2	4.7	7.1	6.7	6.9			
20	6.0	3.8	5.0	5.7	2.0	5.1	5.6	4.2	4.8	6.9	6.6	6.8			
21	5.6	3.4	4.3	5.8	4.7	5.2	5.8	4.4	5.0	7.1	6.1	6.6			
22	5.4	3.3	4.2	5.6	4.7	5.1	6.0	4.3	5.1	7.4	6.1	6.9			
23	5.1	3.2	4.1	6.0	4.0	5.0	5.7	4.2	4.8	7.3	6.8	7.1			
24	5.3	2.7	3.7	5.3	4.6	5.0	5.1	3.8	4.4	6.8	6.0	6.3			
25	5.2	3.2	4.7	5.5	5.0	5.2	4.9	2.9	4.0	6.9	5.8	6.4			
26	5.1	3.3	4.6	5.8	5.0	5.4	5.5	2.9	4.6	7.0	6.3	6.7			
27	6.3	3.3	5.0	5.7	4.6	5.4	5.7	4.8	5.4	6.4	6.0	6.2			
28	6.5	4.1	5.1	5.5	4.2	4.9	5.2	3.7	4.7	6.0	3.5	5.7			
29	6.5	4.5	4.9	5.5	4.3	4.9	5.5	3.7	4.6	6.2	3.6	5.0			
30	5.8	4.4	5.1	4.8	4.1	4.3	5.9	3.9	4.8	7.0	6.2	6.8			
31	---	---	---	5.3	4.0	4.7	6.2	4.6	5.2	---	---	---			
MONTH	---	---	---	10.7	1.9	5.0	6.3	2.1	4.9	7.4	2.6	6.2			

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.

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 sea level. Prior to Apr. 1, 1970, at site 240 ft upstream at same datum.

REMARKS.--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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	57	116	51	118	118	77	136	56	152	61	47
2	32	53	98	49	121	109	74	129	58	188	48	46
3	34	56	84	62	131	111	71	121	68	201	37	43
4	38	55	86	57	123	110	79	112	63	183	36	40
5	37	55	90	53	117	111	96	103	57	159	36	32
6	38	54	95	56	112	112	79	97	52	138	34	22
7	73	53	136	55	111	106	74	90	47	124	39	25
8	88	54	125	54	108	102	69	79	42	116	51	33
9	71	54	106	55	102	99	79	74	39	111	56	38
10	60	67	96	55	102	95	84	69	32	100	62	34
11	57	80	91	55	100	91	81	62	30	85	60	30
12	55	65	86	55	113	89	84	59	30	74	51	29
13	53	57	82	57	105	87	78	55	64	66	55	30
14	52	55	79	57	98	84	71	45	81	57	71	34
15	51	53	78	57	92	85	64	35	96	48	63	33
16	51	55	79	57	91	89	76	33	74	43	49	27
17	50	56	79	58	95	104	84	37	55	40	47	30
18	52	61	78	78	98	120	79	82	50	45	46	29
19	52	62	76	81	100	118	73	97	48	49	41	28
20	50	65	77	78	100	111	68	77	45	52	47	27
21	50	68	78	75	99	105	66	61	44	47	59	30
22	48	70	74	108	98	100	100	57	39	47	58	31
23	47	69	69	159	95	96	190	56	36	47	51	29
24	48	73	62	180	92	91	228	66	35	54	49	29
25	50	81	59	178	93	89	216	63	38	56	58	28
26	56	105	58	150	90	84	185	61	34	56	54	26
27	61	95	58	137	89	82	167	58	62	55	58	25
28	63	87	57	139	116	79	156	55	83	56	52	28
29	65	84	57	137	---	76	148	54	112	57	46	64
30	62	109	56	130	---	77	142	51	119	56	43	89
31	58	---	53	123	---	77	---	53	---	54	45	---
TOTAL	1636	2008	2518	2696	2909	3007	3138	2227	1689	2616	1563	1036
MEAN	52.8	66.9	81.2	87.0	104	97.0	105	71.8	56.3	84.4	50.4	34.5
MAX	88	109	136	180	131	120	228	136	119	201	71	89
MIN	32	53	53	49	89	76	64	33	30	40	34	22
CFSM	.40	.51	.62	.66	.79	.73	.79	.54	.43	.64	.38	.26
IN.	.46	.57	.71	.76	.82	.85	.88	.63	.48	.74	.44	.29

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1999, BY WATER YEAR (WY)

MEAN	80.5	97.2	109	107	114	156	162	116	88.0	67.1	54.3	64.6
MAX	283	179	218	211	226	337	389	340	197	233	142	247
(WY)	1982	1993	1951	1993	1951	1976	1950	1956	1996	1968	1968	1975
MIN	32.6	34.0	35.8	42.5	42.0	66.9	79.4	51.8	28.8	19.3	26.5	27.2
(WY)	1965	1964	1964	1964	1963	1964	1963	1988	1988	1988	1971	1974

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1948 - 1999
ANNUAL TOTAL	37072	27043	
ANNUAL MEAN	102	74.1	101
HIGHEST ANNUAL MEAN			157
LOWEST ANNUAL MEAN			44.6
HIGHEST DAILY MEAN	392	Feb 20	632
LOWEST DAILY MEAN	29	Aug 24	5.2
ANNUAL SEVEN-DAY MINIMUM	31	Sep 24	11
INSTANTANEOUS PEAK FLOW			(a)648
INSTANTANEOUS PEAK STAGE			8.26
ANNUAL RUNOFF (CFSM)	.77		.77
ANNUAL RUNOFF (INCHES)	10.45		10.42
10 PERCENT EXCEEDS	207	118	185
50 PERCENT EXCEEDS	73	63	86
90 PERCENT EXCEEDS	35	36	38

(a) Gage height 7.87 ft.

STREAMS TRIBUTARY TO LAKE ERIE

04170490 KENT LAKE NEAR NEW HUDSON, MI

LOCATION.--Lat 42°30'45", long 83°40'34", in sec.1, T.1 N., R.6 E., Livingston County, Hydrologic Unit 04090005, at Kent Lake Dam, 2 mi upstream from Woodruff Creek, and 3 mi west of New Hudson.

DRAINAGE AREA.--148 mi².

PERIOD OF RECORD.--April 1949 to current year.

GAGE.--Water-stage recorder. Datum of gage is 868.00 ft above sea level (Huron-Clinton Metropolitan Authority bench mark).

REMARKS.--Records good. The inlet and outlet is the Huron River which enters the northeast end of the lake and leaves the south west end of the lake. Streamflow records are currently collected on the Huron River at sites about 1 mi upstream (04170000) and 150 ft downstream (04170500) from Kent Lake. Maximum depth, 38 ft, surface area, 1,200 acres. A concrete dam with steel drum spillway is used to control the lake level.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 16.68 ft, Apr. 6, 1950; minimum observed, 9.46 ft, Jan. 9, 1996, due to construction, but may have been lower during period of no gage-height record Dec. 30, 1995 to Jan. 20, 1996.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 15.76 ft, July 3; minimum, 12.45 ft, Nov. 23, but may have been lower during period of no gage-height record Dec. 4 to Jan. 7.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15.29	15.40	12.64	--	12.71	12.69	13.55	15.45	15.33	15.59	15.34	15.33
2	15.28	15.33	12.64	--	12.71	12.68	13.66	15.45	15.34	15.69	15.32	15.33
3	15.30	15.10	12.61	--	12.72	12.68	13.74	15.44	15.37	15.74	15.28	15.33
4	15.31	14.91	--	--	12.72	12.67	13.82	15.42	15.37	15.74	15.27	15.32
5	15.31	14.61	--	--	12.71	12.67	13.89	15.40	15.35	15.71	15.26	15.31
6	15.31	14.45	--	--	12.70	12.70	13.90	15.36	15.34	15.65	15.24	15.31
7	15.39	14.28	--	--	12.69	12.67	13.95	15.35	15.32	15.57	15.24	15.30
8	15.45	13.98	--	12.46	12.68	12.65	14.05	15.36	15.31	15.54	15.28	15.28
9	15.45	13.85	--	12.46	12.66	12.65	14.14	15.36	15.29	15.55	15.28	15.28
10	15.43	13.61	--	12.46	12.65	12.63	14.20	15.34	15.27	15.49	15.31	15.28
11	15.42	13.46	--	12.47	12.64	12.61	14.25	15.32	15.25	15.44	15.32	15.27
12	15.40	13.28	--	12.48	12.65	12.60	14.28	15.31	15.25	15.44	15.33	15.27
13	15.39	13.11	--	12.51	12.66	12.59	14.31	15.29	15.31	15.39	15.36	15.28
14	15.38	12.91	--	12.53	12.64	12.59	14.37	15.26	15.38	15.38	15.41	15.27
15	15.38	12.79	--	12.52	12.62	12.57	14.41	15.24	15.40	15.35	15.39	15.28
16	15.37	12.73	--	12.50	12.61	12.57	14.45	15.22	15.41	15.31	15.36	15.28
17	15.37	12.69	--	12.50	12.61	12.59	14.50	15.22	15.38	15.27	15.35	15.27
18	15.38	12.60	--	12.53	12.61	12.60	14.52	15.31	15.35	15.26	15.33	15.26
19	15.38	12.54	--	12.54	12.61	12.64	14.54	15.38	15.32	15.27	15.33	15.26
20	15.38	12.52	--	12.55	12.61	12.73	14.63	15.39	15.31	15.27	15.32	15.27
21	15.38	12.51	--	12.54	12.61	12.78	14.69	15.37	15.29	15.29	15.32	15.27
22	15.37	12.50	--	12.61	12.61	12.81	14.82	15.37	15.28	15.29	15.33	15.26
23	15.35	12.49	--	12.73	12.61	12.93	15.13	15.34	15.26	15.27	15.34	15.25
24	15.36	12.51	--	12.83	12.60	13.04	15.40	15.36	15.24	15.28	15.36	15.28
25	15.36	12.53	--	12.88	12.61	13.17	15.54	15.34	15.24	15.29	15.38	15.27
26	15.37	12.60	--	12.86	12.60	13.25	15.59	15.34	15.23	15.25	15.41	15.26
27	15.38	12.61	--	12.82	12.60	13.30	15.56	15.33	15.28	15.26	15.44	15.26
28	15.40	12.59	--	12.79	12.64	13.32	15.52	15.32	15.26	15.27	15.41	15.27
29	15.41	12.58	--	12.78	--	13.34	15.48	15.32	15.45	15.24	15.39	15.36
30	15.41	12.58	--	12.76	--	13.36	15.46	15.31	15.48	15.27	15.35	15.41
31	15.40	--	--	12.74	--	13.41	--	15.31	--	15.31	15.33	--
MEAN	15.37	13.32	--	--	12.65	12.82	14.55	15.34	15.33	15.41	15.33	15.29
MAX	15.45	15.40	--	--	12.72	13.41	15.59	15.45	15.48	15.74	15.44	15.41
MIN	15.28	12.49	--	--	12.60	12.57	13.55	15.22	15.23	15.24	15.24	15.25

STREAMS TRIBUTARY TO LAKE ERIE

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.

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 sea level (Huron-Clinton Metropolitan Authority bench mark).

REMARKS.--Records good. Occasional regulation by Kent Lake (see preceding page). Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	59	114	64	138	128	15	146	61	142	61	45
2	30	138	113	66	138	125	30	141	63	174	55	46
3	35	148	107	74	140	127	43	133	67	190	47	45
4	37	179	102	72	141	123	64	127	65	192	46	42
5	37	171	100	68	136	124	60	119	62	182	43	40
6	36	112	106	66	133	132	36	111	59	169	40	38
7	61	186	132	65	131	122	33	103	56	150	41	35
8	79	149	132	64	127	117	36	100	54	137	49	32
9	79	151	123	65	122	116	47	96	50	131	44	34
10	72	161	114	65	118	111	54	90	46	125	45	33
11	67	158	107	65	115	106	66	82	44	109	49	33
12	62	160	101	66	119	102	73	78	44	97	50	32
13	59	157	97	69	121	99	57	72	59	84	59	33
14	56	139	92	69	115	97	46	62	77	74	75	33
15	54	106	88	69	110	93	52	53	82	64	66	35
16	53	88	90	67	106	93	62	47	83	56	57	34
17	49	105	89	66	104	99	74	46	77	52	52	31
18	50	103	87	80	106	116	80	63	67	53	49	30
19	52	84	88	87	106	92	61	81	61	55	46	30
20	50	79	90	88	106	84	47	84	58	58	44	31
21	51	77	91	87	106	98	53	76	53	55	45	33
22	49	73	87	108	104	68	55	75	49	54	48	31
23	46	72	87	143	104	45	84	69	46	52	51	30
24	46	76	81	173	102	40	117	72	42	55	56	35
25	47	81	74	188	105	36	162	67	43	55	62	33
26	49	101	71	183	102	52	179	69	41	53	71	31
27	53	104	68	169	100	64	180	65	53	53	83	30
28	58	101	67	161	115	69	171	62	70	51	74	33
29	60	96	68	156	---	70	158	61	98	52	65	56
30	61	96	68	151	---	54	152	59	107	53	54	71
31	59	---	68	145	---	33	---	56	---	55	47	---
TOTAL	1629	3510	2902	3059	3270	2835	2347	2565	1837	2882	1674	1095
MEAN	52.5	117	93.6	98.7	117	91.5	78.2	82.7	61.2	93.0	54.0	36.5
MAX	79	186	132	188	141	132	180	146	107	192	83	71
MIN	30	59	67	64	100	33	15	46	41	51	40	30

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1999, BY WATER YEAR (WY)

	MEAN	95.9	152	135	124	131	165	142	123	102	75.2	63.6	74.9
	MAX	262	234	248	236	252	315	357	379	228	219	147	231
	(WY)	1982	1995	1951	1951	1951	1974	1950	1956	1996	1957	1968	1975
	MIN	35.1	70.1	63.2	53.8	53.7	61.7	42.9	34.5	33.6	21.6	27.9	31.5
	(WY)	1964	1964	1961	1964	1964	1964	1966	1988	1988	1988	1963	1966

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR	FOR 1999 WATER YEAR	WATER YEARS 1948 - 1999
ANNUAL TOTAL	40294	29605	
ANNUAL MEAN	110	81.1	115
HIGHEST ANNUAL MEAN			181
LOWEST ANNUAL MEAN			52.3
HIGHEST DAILY MEAN	326	Feb 21	582
LOWEST DAILY MEAN	30	Oct 2	6.4
ANNUAL SEVEN-DAY MINIMUM	32	Sep 26	12
INSTANTANEOUS PEAK FLOW			279
INSTANTANEOUS PEAK STAGE			2.53
INSTANTANEOUS LOW FLOW			10
10 PERCENT EXCEEDS	203		203
50 PERCENT EXCEEDS	90		102
90 PERCENT EXCEEDS	40		43

(a) From rating curve extended above 600 ft³/s.

(b) Mar. 31, Apr. 6.

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 sea level (levels by Michigan Department of Natural Resources). Prior to Aug. 12, 1953, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Occasional regulation by Kent Lake (station 04170490) 11 mi upstream from station. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59	102	172	e120	325	223	141	394	140	164	110	100
2	58	102	177	e120	310	232	131	357	144	210	109	93
3	60	138	181	e130	305	239	135	325	149	243	104	89
4	63	166	177	e130	303	238	151	298	148	263	99	84
5	64	185	173	e125	295	235	181	276	145	273	95	80
6	65	208	174	e120	287	244	182	259	139	271	89	77
7	77	177	197	e120	279	e240	168	244	133	258	86	75
8	92	190	216	e115	271	232	160	229	125	237	89	72
9	103	205	223	e115	263	227	166	217	118	220	90	68
10	105	204	217	e115	256	222	175	204	112	207	89	65
11	102	230	203	e115	251	213	187	192	106	192	87	63
12	97	224	191	e115	257	206	203	181	101	174	88	61
13	94	229	182	e115	258	200	207	173	101	157	94	61
14	90	221	173	e120	250	195	190	163	118	143	113	60
15	88	209	165	e120	240	191	177	153	129	131	122	59
16	87	177	159	e120	231	189	183	143	134	120	120	59
17	87	154	157	e120	226	196	194	138	135	112	113	57
18	87	155	153	e140	220	220	201	152	130	112	106	56
19	89	153	152	e160	215	237	203	169	120	114	101	55
20	89	142	152	e160	211	229	190	179	111	119	97	55
21	89	135	155	e160	206	224	176	181	104	121	93	55
22	89	129	154	e200	199	225	190	177	97	122	90	54
23	88	127	147	e270	194	201	269	172	91	121	90	52
24	88	125	e140	e320	190	184	353	173	85	121	95	52
25	88	129	e135	365	192	168	415	172	81	120	102	51
26	89	152	e130	386	191	161	477	166	77	117	110	50
27	91	166	e125	397	189	164	510	158	79	115	132	48
28	94	173	e125	397	202	169	509	152	91	113	146	48
29	97	173	e125	385	---	172	481	147	117	110	139	59
30	100	170	e125	367	---	170	438	142	137	108	124	76
31	101	---	e120	345	---	158	---	138	---	107	110	---
TOTAL	2670	5050	5075	6087	6816	6404	7343	6224	3497	4995	3232	1934
MEAN	86.1	168	164	196	243	207	245	201	117	161	104	64.5
MAX	105	230	223	397	325	244	510	394	149	273	146	100
MIN	58	102	120	115	189	158	131	138	77	107	86	48
CFSM	.28	.55	.53	.64	.79	.67	.79	.65	.38	.52	.34	.21
IN.	.32	.61	.61	.74	.82	.77	.89	.75	.42	.60	.39	.23

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

	MEAN	161	241	230	227	241	350	333	266	203	153	126	132
MAX	490	425	355	499	457	705	626	895	406	534	297	424	
(WY)	1982	1993	1976	1993	1968	1974	1974	1956	1989	1968	1968	1975	
MIN	52.0	100	102	84.5	89.5	122	144	92.3	82.0	41.9	49.6	53.8	
(WY)	1965	1964	1961	1961	1964	1964	1964	1958	1965	1965	1965	1964	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1952 - 1999

ANNUAL TOTAL	85121	59327	
ANNUAL MEAN	233	163	
HIGHEST ANNUAL MEAN		222	
LOWEST ANNUAL MEAN		337	1974
HIGHEST DAILY MEAN		97.2	1964
LOWEST DAILY MEAN	819	Feb 22	1560
ANNUAL SEVEN-DAY MINIMUM	58	Oct 2	27
INSTANTANEOUS PEAK FLOW	60	Sep 27	51
INSTANTANEOUS PEAK STAGE		515	Sep 22
INSTANTANEOUS LOW FLOW		5.68	Apr 27
ANNUAL RUNOFF (CFSM)	.76	.53	(a)1560
ANNUAL RUNOFF (INCHES)	10.28	7.17	8.46
10 PERCENT EXCEEDS	500	258	26
50 PERCENT EXCEEDS	163	148	.72
90 PERCENT EXCEEDS	82	83	9.78

(a) Gage height 8.35 ft.

(b) July 15, 16, 1988.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04173500 MILL CREEK NEAR DEXTER, MI

LOCATION.--Lat 42°18'00", long 83°53'55", in SW1/4 sec.18, T.2 S., R.5 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 12 ft downstream from bridge on Parker Road, 2.5 mi south of Dexter, and 4 mi upstream from mouth.

DRAINAGE AREA.--128 mi².

PERIOD OF RECORD.--February 1952 to December 1982, October 1994 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above sea level, from topographic map. Prior to May 23, 1958, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	31	49	e34	143	121	74	117	45	e100	22	18
2	23	30	47	e34	140	105	74	106	44	e140	20	17
3	23	29	44	e35	165	114	73	96	42	e130	19	17
4	24	29	41	e36	155	108	86	87	39	e90	19	17
5	24	29	39	e36	133	105	115	80	36	e60	20	16
6	23	29	40	e36	126	95	98	77	35	e45	20	16
7	42	29	91	e35	126	e91	86	73	33	e35	20	16
8	49	29	86	e35	117	e87	77	67	32	e28	22	16
9	38	28	65	e35	119	e84	124	65	30	e30	20	16
10	33	35	53	e35	140	e82	182	61	34	34	20	15
11	30	72	48	e35	136	e80	168	57	31	29	20	15
12	28	55	44	e35	171	e78	170	55	29	27	19	15
13	28	45	41	e35	146	77	136	55	30	26	19	15
14	28	41	38	e35	119	76	112	52	66	24	20	15
15	28	38	37	e35	110	77	99	49	e52	24	19	15
16	27	36	37	e37	106	87	119	46	e45	23	18	15
17	27	35	36	e45	106	147	138	46	e40	23	18	15
18	27	34	34	e76	99	282	120	89	e35	32	17	15
19	30	34	36	e80	91	224	106	89	e30	31	17	15
20	29	33	40	e70	82	176	101	68	e28	31	17	14
21	29	33	42	e64	e75	147	96	54	e27	29	17	15
22	30	32	e49	e120	e66	126	186	51	e27	31	17	16
23	29	31	e45	e420	e62	111	515	53	e27	28	17	15
24	29	30	e41	564	e60	103	698	65	e28	26	19	15
25	28	31	e39	439	e59	95	523	60	e29	25	22	15
26	27	72	e37	342	59	88	395	52	e31	24	25	15
27	27	64	e36	276	64	84	298	46	e33	24	33	14
28	28	50	e36	268	100	81	204	42	e35	22	23	15
29	28	45	e35	232	---	79	158	40	e40	21	20	27
30	30	43	e35	190	---	77	134	38	e60	20	19	34
31	33	---	e34	164	---	74	---	39	---	20	18	---
TOTAL	902	1152	1375	3913	3075	3361	5465	1975	1093	1232	616	494
MEAN	29.1	38.4	44.4	126	110	108	182	63.7	36.4	39.7	19.9	16.5
MAX	49	72	91	564	171	282	698	117	66	140	33	34
MIN	23	28	34	34	59	74	73	38	27	20	17	14
CFSM	.23	.30	.35	.99	.86	.85	1.42	.50	.28	.31	.16	.13
IN.	.26	.33	.40	1.14	.89	.98	1.59	.57	.32	.36	.18	.14

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1999, BY WATER YEAR (WY)

	MEAN	40.8	60.2	82.0	77.7	106	182	158	99.6	64.8	40.9	34.8	33.8
MAX	193	122	192	251	337	423	271	265	256	165	146	190	190
(WY)	1955	1996	1958	1974	1976	1982	1969	1956	1968	1968	1995	1975	1975
MIN	11.0	14.6	13.8	18.8	18.4	47.7	73.8	29.7	20.9	16.0	12.9	11.0	11.0
(WY)	1964	1964	1964	1964	1964	1964	1963	1958	1958	1965	1963	1973	1973

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1952 - 1979

ANNUAL TOTAL	36519		24653		81.2	
ANNUAL MEAN	100		67.5		142	1974
HIGHEST ANNUAL MEAN					29.9	1974
LOWEST ANNUAL MEAN						
HIGHEST DAILY MEAN	679	Feb 19	698	Apr 24	1380	Jun 27 1978
LOWEST DAILY MEAN	23	Sep 28	14	Sep 20	9.5	Oct 7 1933
ANNUAL SEVEN-DAY MINIMUM	23	Sep 27	15	Sep 14	9.9	Oct 5 1973
INSTANTANEOUS PEAK FLOW			732	Apr 24	1500	Jun 26 1978
INSTANTANEOUS PEAK STAGE			10.53	Apr 24	12.95	Jun 26 1978
INSTANTANEOUS LOW FLOW					7.3	Dec 13 1933
ANNUAL RUNOFF (CFSM)	.78		.53		.63	
ANNUAL RUNOFF (INCHES)	10.61		7.16		8.62	
10 PERCENT EXCEEDS	257		135		174	
50 PERCENT EXCEEDS	51		38		48	
90 PERCENT EXCEEDS	28		18		19	

(e) Estimated.

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 February 1904 to September 1914 and October 1947 to July 1948, 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 sea level (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.--Records good. Prior to 1955, diversion upstream from station for Ann Arbor municipal supply had negligible effect on natural flow; annual mean discharge and runoff figures adjusted for diversion from 1955 to 1991. 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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	115	194	298	184	799	486	278	797	210	314	144	192
2	112	195	296	164	775	473	307	793	289	338	138	180
3	125	193	296	188	777	500	342	786	268	349	129	173
4	123	195	297	201	700	495	410	757	196	323	146	161
5	115	213	296	205	671	506	447	724	185	380	126	150
6	117	234	347	198	664	516	438	640	184	353	125	166
7	316	258	377	194	666	480	414	500	188	371	142	118
8	212	273	378	179	644	475	393	488	172	334	141	122
9	197	408	368	152	627	489	510	490	171	338	115	110
10	192	526	357	171	604	471	557	462	170	321	115	102
11	194	651	354	173	619	464	493	442	152	292	118	95
12	256	575	355	150	601	460	347	333	181	249	112	96
13	241	485	348	149	587	439	358	340	191	178	124	76
14	219	437	339	209	558	432	430	335	261	180	127	80
15	204	406	329	162	546	424	433	327	166	169	134	81
16	201	379	324	140	525	430	546	298	160	151	128	77
17	148	302	313	135	500	498	602	356	149	181	133	e72
18	126	262	322	e200	495	644	566	362	147	174	135	e68
19	127	269	382	e250	482	645	506	345	142	232	148	e65
20	139	206	357	e300	462	605	520	314	142	194	156	62
21	145	215	356	319	440	580	506	293	136	199	141	54
22	148	223	330	519	417	551	e520	297	123	191	134	72
23	152	225	220	859	408	527	e1200	247	114	219	136	62
24	150	219	242	1150	389	512	1640	283	131	176	167	55
25	148	255	232	1060	393	489	1670	352	126	159	261	59
26	143	296	167	949	382	466	1370	340	106	168	234	59
27	146	360	173	907	385	439	1300	300	151	158	259	57
28	154	329	188	906	473	426	1200	269	129	159	224	100
29	161	308	202	896	---	409	1120	144	172	141	212	146
30	180	312	169	996	---	365	1080	159	142	129	212	131
31	187	---	205	934	---	248	---	187	---	137	208	---
TOTAL	5193	9403	9217	13199	15589	14944	20503	12760	5054	7257	4824	3041
MEAN	168	313	297	426	557	482	683	412	168	234	156	101
MAX	316	651	382	1150	799	645	1670	797	289	380	261	192
MIN	112	193	167	135	382	248	278	144	106	129	112	54

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1915 - 1999, BY WATER YEAR (WY)

	MEAN	268	388	425	454	549	866	866	605	399	242	183	214
MAX	904	1018	1080	1257	1431	2308	2647	2085	1341	1130	584	919	
(WY)	1982	1993	1951	1950	1976	1918	1947	1943	1943	1968	1995	1975	
MIN	71.6	109	123	131	145	189	274	187	72.0	31.5	21.1	55.8	
(WY)	1935	1935	1935	1925	1934	1934	1931	1925	1934	1934	1934	1934	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1915 - 1999

ANNUAL TOTAL	199902												
ANNUAL MEAN	548												
HIGHEST ANNUAL MEAN										(a)454			
LOWEST ANNUAL MEAN										824			1974
HIGHEST DAILY MEAN	1930									171			1931
LOWEST DAILY MEAN	90									5840			Mar 14 1918
ANNUAL SEVEN-DAY MINIMUM	107									(b)4.0			(c)
INSTANTANEOUS PEAK FLOW										13			Jul 28 1934
INSTANTANEOUS PEAK STAGE										14.60			May 17
10 PERCENT EXCEEDS	1330									932			(d)17.50
50 PERCENT EXCEEDS	325									331			Jun 26 1968
90 PERCENT EXCEEDS	146									120			

(a) Does not include water year 1948.

(b) Plant leakage, but doubtful due to possible change in leakage.

(c) Aug. 2, Sept. 11, 1931.

(d) Present site and datum.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04174518 MALLETTS CREEK AT ANN ARBOR, MI

LOCATION.--Lat 42°15'53", long 83°41'18", in SE1/4 sec.35, T.2 S., R.6 E., Washtenaw County, Hydrologic Unit 04090005, on right bank 250 ft upstream from bridge on Chalmers Drive in Ann Arbor.

DRAINAGE AREA.--10.9 mi².

PERIOD OF RECORD.--October 1973 to August 1975 (operated as a crest-stage partial-record station), April to September 1999. Prior to August 1975, published as Pittsfield-Ann Arbor Drain at Ann Arbor.

GAGE.--Water-stage recorder. Elevation of gage is 760 ft above sea level, from topographic map.

REMARKS.--Records good. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 630 ft³/s, May 18, 1999, gage height, 6.42 ft, from rating curve extended above 300 ft³/s; minimum (April to September 1999), 1.1 ft³/s, Sept. 26, 27.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	--	--	--	--	--	--	3.7	3.7	7.6	47	6.2	2.1
2	--	--	--	--	--	--	3.7	3.5	9.2	9.1	2.8	2.0
3	--	--	--	--	--	--	3.5	3.3	5.1	14	2.5	1.9
4	--	--	--	--	--	--	34	3.3	3.0	4.1	3.8	1.8
5	--	--	--	--	--	--	11	3.3	2.6	2.6	3.2	2.3
6	--	--	--	--	--	--	6.0	3.3	2.3	2.2	2.5	1.6
7	--	--	--	--	--	--	4.5	3.3	2.2	2.0	5.6	1.9
8	--	--	--	--	--	--	3.9	3.4	2.0	1.9	5.0	1.7
9	--	--	--	--	--	--	53	3.3	2.1	13	2.9	1.7
10	--	--	--	--	--	--	16	3.1	2.5	3.9	5.6	1.9
11	--	--	--	--	--	--	29	2.9	2.1	2.3	3.5	1.7
12	--	--	--	--	--	--	13	3.7	57	2.0	2.6	1.6
13	--	--	--	--	--	--	7.3	3.1	48	1.8	7.1	2.2
14	--	--	--	--	--	--	5.6	3.1	45	1.8	4.7	1.7
15	--	--	--	--	--	--	4.7	2.8	7.8	1.7	2.6	1.7
16	--	--	--	--	--	--	46	2.7	4.9	1.7	2.0	1.6
17	--	--	--	--	--	--	15	19	4.0	11	1.7	1.8
18	--	--	--	--	--	--	8.3	88	3.2	2.3	1.7	1.6
19	--	--	--	--	--	--	6.8	7.4	2.9	25	1.8	1.6
20	--	--	--	--	--	--	9.1	4.2	2.8	8.6	1.6	1.5
21	--	--	--	--	--	--	5.6	3.3	2.8	9.9	1.6	3.9
22	--	--	--	--	--	--	39	10	2.7	15	1.5	1.9
23	--	--	--	--	--	--	148	24	2.7	41	1.7	1.6
24	--	--	--	--	--	--	31	18	3.5	18	3.5	2.9
25	--	--	--	--	--	--	12	5.7	4.5	5.1	27	1.6
26	--	--	--	--	--	--	8.3	3.7	2.9	9.1	25	1.4
27	--	--	--	--	--	--	6.3	3.6	36	5.9	20	1.3
28	--	--	--	--	--	--	5.1	2.9	8.4	3.9	4.2	23
29	--	--	--	--	--	--	4.4	2.6	5.3	4.6	2.9	72
30	--	--	--	--	--	--	4.0	2.4	3.1	2.8	2.6	17
31	--	--	--	--	--	--	--	9.2	--	9.3	2.1	--
TOTAL	--	--	--	--	--	--	547.8	255.8	288.2	282.6	161.5	162.5
MEAN	--	--	--	--	--	--	18.3	8.25	9.61	9.12	5.21	5.42
MAX	--	--	--	--	--	--	148	88	57	47	27	72
MIN	--	--	--	--	--	--	3.5	2.4	2.0	1.7	1.5	1.3
CFSM	--	--	--	--	--	--	1.68	.76	.88	.84	.48	.50
IN.	--	--	--	--	--	--	1.87	.87	.98	.96	.55	.55

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, 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 sea level, from topographic map. Prior to July 30, 1970, nonrecording gage at same site and datum.

REMARKS.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	60	89	e60	236	134	111	168	91	67	35	15
2	30	62	86	e60	237	129	109	158	94	109	30	15
3	27	56	79	e60	245	101	107	149	96	93	25	14
4	30	52	74	e60	239	107	121	140	83	79	23	13
5	31	49	73	e60	221	117	153	129	75	69	23	13
6	31	46	74	e60	212	121	147	124	70	61	23	13
7	66	44	97	e59	207	e120	137	121	65	51	24	13
8	92	42	103	e59	198	e115	124	115	61	42	26	13
9	83	42	94	e59	195	e105	141	106	55	66	24	13
10	74	57	87	e58	202	117	181	97	51	80	24	12
11	70	94	82	e58	196	126	190	91	51	61	25	12
12	63	95	78	e58	213	126	198	87	50	48	22	11
13	60	81	74	e58	194	120	181	85	54	40	22	12
14	58	70	70	e58	e175	115	164	76	79	37	22	11
15	54	66	68	e58	160	113	152	76	85	33	20	11
16	50	63	68	e60	89	115	156	74	76	30	19	11
17	48	60	e67	e65	118	137	166	76	63	29	18	11
18	49	58	e65	e85	133	186	165	109	60	33	17	10
19	54	58	67	e110	133	173	153	124	56	33	17	10
20	52	57	70	e100	118	163	148	109	53	32	16	9.4
21	49	54	69	e95	e115	156	141	97	50	31	15	9.4
22	54	50	73	e115	e110	148	148	97	46	33	15	9.1
23	51	53	60	e230	107	141	252	107	37	32	15	9.0
24	46	51	e67	376	102	137	332	128	58	32	16	8.8
25	43	50	e66	338	101	133	306	136	62	54	17	8.7
26	40	82	e65	288	100	129	272	119	53	64	19	8.5
27	39	84	e61	271	103	126	237	101	54	54	20	8.3
28	40	76	e60	283	126	123	207	91	55	45	17	9.1
29	40	73	e61	270	---	121	192	85	68	40	16	24
30	47	74	e62	260	---	116	179	81	40	35	15	42
31	57	---	e61	246	---	111	---	83	---	33	15	---
TOTAL	1562	1859	2270	4077	4585	3981	5270	3339	1891	1546	635	379.3
MEAN	50.4	62.0	73.2	132	164	128	176	108	63.0	49.9	20.5	12.6
MAX	92	95	103	376	245	186	332	168	96	109	35	42
MIN	27	42	60	58	89	101	107	74	37	29	15	8.3
CFSM	.38	.47	.55	1.00	1.24	.97	1.33	.82	.48	.38	.16	.10
IN.	.44	.52	.64	1.15	1.29	1.12	1.49	.94	.53	.44	.18	.11

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1999, BY WATER YEAR (WY)

	MEAN	64.7	93.5	109	115	127	202	190	123	90.8	54.4	48.0	53.9
MAX	169	212	160	280	241	356	275	191	249	114	116	142	142
(WY)	1987	1993	1991	1993	1976	1976	1978	1974	1989	1981	1981	1981	1981
MIN	24.8	25.1	30.7	27.6	45.0	123	116	52.7	13.9	10.4	12.4	12.6	12.6
(WY)	1980	1972	1977	1977	1972	1987	1987	1971	1988	1988	1971	1999	1999

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1970 - 1999

ANNUAL TOTAL	45634	31394.3	106
ANNUAL MEAN	125	86.0	155
HIGHEST ANNUAL MEAN			1993
LOWEST ANNUAL MEAN			1977
HIGHEST DAILY MEAN	381	Mar 10	690
LOWEST DAILY MEAN	27	Aug 2	5.7
ANNUAL SEVEN-DAY MINIMUM	31	Jul 30	6.1
INSTANTANEOUS PEAK FLOW			869
INSTANTANEOUS PEAK STAGE			7.21
INSTANTANEOUS LOW FLOW			4.5
ANNUAL RUNOFF (CFSM)	.95		.81
ANNUAL RUNOFF (INCHES)	12.86		10.94
10 PERCENT EXCEEDS	277	174	212
50 PERCENT EXCEEDS	84	67	86
90 PERCENT EXCEEDS	42	17	26

(a) Sept. 27, 28.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04176000 RIVER RAISIN NEAR ADRIAN, MI

LOCATION.--Lat 41°54'15", long 83°58'50", in NW1/4 sec.5, T.7 S., R.4 E., Lenawee County, Hydrologic Unit 04100002, on right bank at downstream side of bridge on Academy Road, 1.7 mi east of Adrian, and 2.6 mi downstream from South Branch.

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), 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 sea level.

REMARKS.--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. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	126	203	248	e160	915	e400	359	511	e280	184	107	65
2	119	204	260	e155	825	e550	352	476	269	179	101	63
3	123	202	271	e155	882	e670	353	443	253	206	95	60
4	132	199	256	e155	953	742	415	414	255	217	98	58
5	126	194	241	e155	892	624	526	393	237	193	105	57
6	125	186	230	e155	801	540	587	406	216	173	88	60
7	282	182	249	e155	757	449	518	377	201	156	87	74
8	467	179	297	e155	740	460	452	348	189	142	91	68
9	410	175	308	e150	694	468	634	334	178	146	96	64
10	316	202	284	e150	e730	444	922	317	181	154	92	59
11	259	260	303	e150	e720	419	1070	273	161	178	86	57
12	274	277	290	e150	766	426	1090	191	169	167	85	55
13	229	287	248	e150	810	425	998	248	285	147	85	55
14	182	273	227	e150	712	414	795	262	507	132	82	57
15	183	251	214	e150	565	400	658	241	394	120	78	55
16	177	232	206	e150	438	400	727	236	305	112	76	55
17	172	219	201	e160	462	505	858	233	260	120	74	54
18	174	210	196	e180	404	996	854	251	228	125	61	53
19	180	203	198	e200	391	1550	660	259	205	121	63	52
20	275	197	198	e240	378	1260	570	278	190	115	64	51
21	144	193	213	e350	345	945	517	271	178	117	64	51
22	179	188	225	e500	318	746	497	295	167	117	63	51
23	177	186	169	e900	302	613	814	302	158	132	63	51
24	177	181	e220	2710	291	553	1680	337	150	188	68	54
25	174	182	e200	e3930	287	492	1840	334	150	196	72	52
26	169	224	e180	e2620	e285	464	1290	321	175	149	87	49
27	166	218	e170	1820	e300	435	968	302	189	147	86	48
28	165	240	e165	1510	e350	414	816	268	182	145	90	48
29	164	239	e160	1420	---	398	676	242	176	142	85	113
30	188	229	e160	1250	---	366	574	e230	166	121	74	124
31	198	---	e160	1030	---	365	---	e250	---	110	66	---
TOTAL	6222	6415	6947	21265	16313	17933	23070	9643	6654	4651	2532	1813
MEAN	201	214	224	686	583	578	769	311	222	150	81.7	60.4
MAX	457	287	308	3930	953	1550	1840	511	507	217	107	124
MIN	119	175	160	150	285	365	352	191	150	110	61	48
CFSM	.43	.46	.48	1.48	1.26	1.25	1.66	.67	.48	.32	.18	.13
IN.	.50	.52	.56	1.71	1.31	1.44	1.85	.77	.53	.37	.20	.15

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1999, BY WATER YEAR (WY)

MEAN	183	283	363	398	487	725	624	382	282	175	141	134
MAX	576	941	871	1271	1176	1517	1115	939	1025	609	520	420
(WY)	1991	1993	1988	1993	1976	1986	1978	1956	1989	1968	1995	1932
MIN	52.1	57.9	66.6	65.6	74.1	179	239	144	69.7	46.1	47.5	46.0
(WY)	1964	1965	1964	1963	1964	1964	1963	1964	1988	1988	1963	1935

SUMMARY STATISTICS FOR 1998 CALENDAR YEAR FOR 1999 WATER YEAR WATER YEARS 1954 - 1999

ANNUAL TOTAL	163665		123458			
ANNUAL MEAN	448		338		347	
HIGHEST ANNUAL MEAN					605	1933
LOWEST ANNUAL MEAN					99.8	1934
HIGHEST DAILY MEAN	3080	Feb 19	3930	Jan 25	5350	Feb 25 1935
LOWEST DAILY MEAN	84	Aug 3	48	Sep 27	25	Oct 26 1934
ANNUAL SEVEN-DAY MINIMUM	94	Jul 30	50	Sep 22	27	Oct 25 1934
INSTANTANEOUS PEAK FLOW			4220	Jan 25	6660	Mar 15 1933
INSTANTANEOUS PEAK STAGE			13.79	Jan 25	15.77	Mar 15 1933
INSTANTANEOUS LOW FLOW					18	Aug 10 1934
ANNUAL RUNOFF (CFSM)	.97		.73		.75	
ANNUAL RUNOFF (INCHES)	13.15		9.92		10.19	
10 PERCENT EXCEEDS	945		744		740	
50 PERCENT EXCEEDS	265		210		224	
90 PERCENT EXCEEDS	157		73		77	

(e) **Estimated.**

STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI

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.

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 sea level. Prior to Oct. 1, 1953, at site 9 mi downstream at datum 46.26 ft lower.

REMARKS.--Records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplants upstream from station prior to June 27, 1968. At times, flow is affected by irrigation pumpage. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	192	220	332	e230	2600	788	610	1190	456	411	158	110
2	183	243	333	e230	2200	942	599	1010	613	365	139	99
3	173	248	338	e225	2120	1250	584	904	704	356	128	84
4	162	248	343	e225	1910	1500	611	828	659	329	123	79
5	163	245	350	e220	1810	1480	955	763	547	310	119	78
6	173	243	345	e220	1700	1410	1100	713	478	298	118	76
7	198	234	339	e220	1600	1120	1100	665	429	262	127	74
8	458	228	341	e215	1430	967	1010	631	377	227	125	75
9	588	224	368	e215	1350	851	1490	584	342	222	112	75
10	688	248	387	e215	1500	802	2590	533	363	199	108	83
11	586	261	393	e210	1490	794	3130	503	355	189	112	81
12	463	309	373	e210	1750	777	3550	463	353	184	114	78
13	375	389	369	e210	1700	732	3250	421	1540	200	116	73
14	346	399	365	e210	1590	728	2850	357	3580	199	108	68
15	328	386	341	e210	1480	716	2310	367	3450	179	103	64
16	267	365	320	e210	1290	735	1950	374	2560	155	101	63
17	246	343	304	e210	1100	1070	2140	365	1900	135	104	62
18	239	318	290	e250	983	2640	2180	376	1170	129	98	60
19	234	299	283	e290	918	2630	2130	458	782	133	91	62
20	221	282	274	e330	827	2770	1810	467	587	151	91	56
21	224	271	280	e420	750	2720	1410	434	474	157	89	58
22	273	264	284	e700	689	2450	1200	434	400	166	83	58
23	249	259	e260	e2600	628	1920	2180	525	348	172	85	56
24	216	255	e250	e3650	583	1390	3800	869	321	186	88	57
25	217	253	e245	e5300	574	1110	3670	1020	442	214	90	62
26	215	260	e245	7590	541	949	3890	970	386	243	109	61
27	219	270	e270	7370	526	852	3570	785	378	249	119	58
28	208	299	e290	6560	579	785	2890	603	707	217	134	65
29	200	307	e270	5000	---	732	2130	506	751	188	137	82
30	204	325	e250	3820	---	682	1540	441	549	177	125	83
31	209	---	e240	3120	---	635	---	419	---	166	118	---
TOTAL	8717	8495	9672	50685	36218	38927	62229	18978	26001	6768	3472	2140
MEAN	281	283	312	1635	1294	1256	2074	612	867	218	112	71.3
MAX	688	399	393	7590	2600	2770	3890	1190	3580	411	158	110
MIN	162	220	240	210	526	635	584	357	321	129	83	56
CFSM	.27	.27	.30	1.57	1.24	1.21	1.99	.59	.83	.21	.11	.07
IN.	.31	.30	.35	1.81	1.29	1.39	2.22	.68	.93	.24	.12	.08

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1999, BY WATER YEAR (WY)

	MEAN	297	493	736	830	1101	1693	1477	923	634	348	232	241
MAX	1678	2267	2618	3058	3296	4440	4055	4678	2770	1453	1161	2666	
(WY)	1982	1993	1968	1952	1976	1982	1947	1943	1989	1951	1980	1981	
MIN	57.2	74.6	87.5	106	107	343	313	248	99.2	60.3	40.3	45.2	
(WY)	1964	1965	1964	1964	1963	1964	1946	1941	1988	1988	1941	1963	

SUMMARY STATISTICS

FOR 1998 CALENDAR YEAR

FOR 1999 WATER YEAR

WATER YEARS 1937 - 1999

ANNUAL TOTAL	343156						272302						
ANNUAL MEAN	940						746						
HIGHEST ANNUAL MEAN										748			
LOWEST ANNUAL MEAN										1374			1943
HIGHEST DAILY MEAN										178			1964
LOWEST DAILY MEAN										14600		Mar 16	1982
ANNUAL SEVEN-DAY MINIMUM	7310				Feb 21		7590		Jan 26				
INSTANTANEOUS PEAK FLOW	111				Aug 4		56		Sep 20	9.0		Sep 30	1941
INSTANTANEOUS PEAK STAGE	119				Jul 30		58		Sep 18	18		Sep 26	1941
INSTANTANEOUS LOW FLOW							7870		Jan 26	(a)15300		Mar 16	1982
ANNUAL RUNOFF (CFSM)							8.79		Jan 26	(b)11.16		Mar 15	1982
ANNUAL RUNOFF (INCHES)										(c)2.0		(d)	
10 PERCENT EXCEEDS		.90					.72			.72			
50 PERCENT EXCEEDS	2330	12.25					9.72			9.76			
90 PERCENT EXCEEDS	386						2020			1850			
	205						343			364			
							99			106			

(a) Gage height 10.4 ft.

(b) Backwater from ice.

(c) Approximately, site then in use.

(d) Sept. 4, 1938, Sept. 19, 20, 1941.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04176605 OTTER CREEK AT LA SALLE, MI

LOCATION.--Lat 41°52'01", long 83°27'13", in NW1/4 NW1/4 sec.23 (private claim 47), T.7 S., R.8 E., Monroe County, Hydrologic Unit 04100001, on right bank 150 ft upstream from bridge on State Highway 125 in La Salle, 2.3 mi downstream from South Branch, and 4.6 mi southwest of Monroe.

DRAINAGE AREA.--51.0 mi².

PERIOD OF RECORD.--October 1987 to current year.

GAGE.--Water-stage recorder. Datum of gage is 571.07 ft above sea level.

REMARKS.--Records good except for estimated daily discharges and discharges below 1.0 ft³/s, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	6.8	4.9	1.0	67	87	27	40	31	6.1	.46	.14
2	1.5	4.2	4.8	.70	85	65	29	36	39	5.2	.42	.12
3	1.8	2.9	4.7	e.70	98	164	27	35	29	4.1	.32	.10
4	2.9	2.3	4.4	e.62	77	120	41	35	21	3.3	.36	.10
5	3.2	2.1	4.2	e.56	58	77	81	33	18	2.6	1.4	.11
6	3.1	1.9	4.2	e.54	58	58	60	32	15	2.1	.68	.12
7	3.6	1.8	4.5	e.52	57	e56	45	29	13	1.6	.43	.12
8	5.3	1.7	4.4	e.51	52	e54	38	26	11	1.5	.52	.14
9	5.5	1.7	3.9	e.50	73	e51	200	24	9.6	1.5	.55	.17
10	4.9	2.5	3.4	e.48	91	e49	286	20	8.9	1.5	.45	.29
11	4.2	7.5	3.1	e.46	71	e47	379	18	8.0	1.2	.34	.24
12	3.6	8.4	2.8	e.45	79	e45	323	17	7.5	1.0	.31	.24
13	3.2	6.4	2.5	e.43	66	43	156	17	86	.93	.26	.27
14	2.7	5.4	2.7	e.42	48	40	105	16	178	.88	.22	.27
15	2.7	4.9	2.5	e.41	43	39	82	14	130	.78	.20	.28
16	2.6	4.3	3.1	e.41	42	52	218	13	60	.60	.19	.30
17	2.4	4.0	2.7	e.50	43	258	192	13	38	.58	.19	.22
18	2.2	3.5	2.2	e.70	39	500	126	21	26	1.3	.21	.20
19	2.8	3.3	3.0	e2.0	35	191	95	19	20	1.4	.22	.19
20	2.8	3.3	2.7	e5.4	30	122	77	15	16	1.3	.20	.19
21	2.6	3.1	3.1	e7.0	28	93	66	13	13	1.2	.16	.20
22	2.9	2.9	3.4	e100	26	70	78	24	11	2.3	.14	.22
23	2.8	2.7	3.5	e850	24	56	511	48	8.9	1.4	.14	.24
24	2.5	2.7	1.8	991	23	48	456	84	9.3	.94	.14	.30
25	2.3	2.9	1.2	447	23	42	188	58	16	.79	.14	.30
26	2.1	4.8	1.0	260	21	38	122	36	9.9	.60	.15	.29
27	4.1	5.6	1.1	188	25	34	86	25	8.9	.49	.14	.31
28	4.9	5.0	1.3	186	75	32	68	20	17	.52	.36	.32
29	4.1	4.7	1.6	128	---	30	56	17	12	1.2	.27	.49
30	5.2	4.6	e1.6	95	---	27	46	15	8.8	.76	.18	.43
31	7.9	---	1.2	77	---	25	---	17	---	.53	.15	---
TOTAL	104.2	117.9	91.5	3346.31	1457	2613	4264	830	879.8	50.20	9.90	6.91
MEAN	3.36	3.93	2.95	108	52.0	84.3	142	26.8	29.3	1.62	.32	.23
MAX	7.9	8.4	4.9	991	98	500	511	84	178	6.1	1.4	.49
MIN	1.5	1.7	1.0	.41	21	25	27	13	7.5	.49	.14	.10
CFSM	.07	.08	.06	2.12	1.02	1.65	2.79	.52	.58	.03	.01	.00
IN.	.08	.09	.07	2.44	1.06	1.91	3.11	.61	.64	.04	.01	.01

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1999, BY WATER YEAR (WY)

	MEAN	13.8	34.2	49.4	68.7	78.5	97.7	98.4	52.2	56.2	11.1	7.60	7.47
MAX	53.3	144	168	181	217	199	152	130	234	55.1	26.1	46.2	
(WY)	1993	1993	1991	1993	1998	1993	1993	1991	1997	1989	1998	1992	
MIN	.33	3.14	2.95	17.6	16.6	24.7	35.4	9.47	.58	.17	.15	.14	
(WY)	1995	1995	1999	1994	1989	1989	1997	1988	1988	1988	1988	1991	

SUMMARY STATISTICS FOR 1998 CALENDAR YEAR FOR 1999 WATER YEAR WATER YEARS 1988 - 1999

	ANNUAL TOTAL	21803.13	13770.72	
ANNUAL MEAN	59.7		37.7	47.7
HIGHEST ANNUAL MEAN				74.9
LOWEST ANNUAL MEAN				27.5
HIGHEST DAILY MEAN	1850	Feb 18	991	2330
LOWEST DAILY MEAN	.36	Aug 4	.10	.00
ANNUAL SEVEN-DAY MINIMUM	.53	Jul 30	.12	.00
INSTANTANEOUS PEAK FLOW			(b)1280	(c)3010
INSTANTANEOUS PEAK STAGE			(d)9.90	11.60
ANNUAL RUNOFF (CFSM)	1.17		.74	.94
ANNUAL RUNOFF (INCHES)	15.90		10.04	12.71
10 PERCENT EXCEEDS	133		86	108
50 PERCENT EXCEEDS	8.9		4.7	18
90 PERCENT EXCEEDS	2.2		.27	.70

(a) On several days in water years 1988, 1991, 1992, 1994, 1996.

(b) Gage height 9.68 ft.

(c) From rating curve extended above 1,000 ft³/s.

(d) Backwater from ice.

(e) Estimated.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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 crest-stage partial-record stations are presented in the following table. Discharge measurements made at miscellaneous sites and for special studies are given in separate tables.

Crest-stage partial-record stations

The following table contains annual maximum discharges 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.

Maximum discharge at crest-stage partial-record stations

Station name and number	Location and drainage area	Period of record	Date	Water year 1999 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft ³ /s)	Date	Gage height (ft)	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE SUPERIOR								
Two Hearted River near Paradise, MI (04044813)	Lat 46°41'15", long 85°26'26", in SE1/4 NW1/4 sec.33, T.50 N., R.9 W., Luce County, Hydrologic Unit 04020201, on right bank 300 ft down- stream from end of Trail Road, 3.2 mi upstream from mouth, and 20 mi northwest of Paradise. Drainage area is 200 mi ² .	1973-99	04-06-99	10.44	1,190	04-25-85	a8.42	3,210
West Branch Waika River near Brimley, MI (04045538) (locally known as Waishkey River)	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 Tilson Road, 3.2 mi upstream from mouth, and 3.5 mi south of Brimley. Drainage area is 40.7 mi ² .	1973-99	04-06-99	7.74	533	04-18-74	b9.19	1,200
STREAMS TRIBUTARY TO LAKE MICHIGAN								
Tenmile Creek at Perronville, MI (04059400)	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, at county road, 1.0 mi northwest of Perron- ville, and 11.5 mi upstream from Ford River. Drainage area is 38.4 mi ² .	1971-77†, 1978-99	04-06-99	c4.24	280	04-24-75	d5.42	810

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1999 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft ³ /s)	Date	Gage height (ft)	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN—Continued								
Portage River near Vicksburg, MI (04097170)	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. Datum of gage is 839.94 ft above sea level. Drainage area is 68.2 mi ² .	1946-51†, 1965-80†, 1980-99	01-24-99	4.76	137	06-02-89	f5.81	416
Rabbit River at Hamilton, MI (04108645)	Lat 42°40'31", long 86°00'13", in NE1/4 sec.6, T.3 N., R.14 W., Allegan County, Hydro- logic Unit 04050003, at State Highway 40 in Hamil- ton. Drainage area is 274 mi ² .	1979-99	04-24-99	15.57	2,380	06-21-97	g21.60	12,000
SycamoreCreek near Mason, MI (04112700)	Lat 42°36'40", 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. Drain- age area is 39.5 mi ² .	1975-99	04-23-99	10.85	505	04-19-75	12.53	1,080
Flat River at Smyrna, MI (04116500)	Lat 43°03'10", long 85°15'53", in NW1/4 sec.28, T.8 N., R.8 W., Ionia County, Hydrologic Unit 04050006, on right bank at downstream side of bridge on Ingalls Road, 0.5 mi south of Smyrna. Datum of gage is 729.53 ft above sea level. Drainage area is 528 mi ² .	1951-86†, 1993-99	04-25-99	h5.43	1,250	09-13-86	9.05	4,700
Thornapple River near Caledonia, MI (04118000)	Lat 42°48'40", long 85°29'00", in NW1/4 sec.22, T.5 N., R.10 W., Kent County, Hy- drologic Unit 04050007, on right bank 200 ft down- stream from LaBarge power- plant, 200 ft upstream from 84th Street, 2.3 mi northeast of Caledonia, and 3.3 mi downstream from Coldwater River. Datum of gage is 676.31 ft above sea level. Drainage area is 773 mi ² .	1931-38†, 1952-82†, 1984-94†, 1995-99	04-24-99	8.58	3,900	02-27-85	11.43	6,700

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1999 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft ³ /s)	Date	Gage height (ft)	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued								
Grand River at Ada, MI (04118105)	Lat 42°57'19", Long 85°28'35", in NE1/4 sec.34, T.7 N., R.10 W., Kent County, Hydrologic Unit 04050006, on left bank at downstream side of bridge on State Highway 21 in Ada, 0.15 mi downstream from Thornapple River, and at mile 62. Datum of gage is 603.95 ft above sea level. Drainage area is 4,473 mi ² .	1999	04-27-99	17.65	e16,000	--	--	--
Plaster Creek at Grand Rapids, MI (04119055)	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 28th Street in Grand Rapids. Drainage area is 46.6 mi ² .	1974-99	04-23-99	10.97	1,420	02-22-97	13.43	2,300
Buck Creek at Grandville, MI (04119160)	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. Drainage area is 50.5 mi ² .	1974-99	04-23-99	9.21	1,120	05-12-81	10.30	1,580
North Branch Pentwater River near Pentwater, MI (04122230)	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 Oceana Drive, 3.5 mi northeast of Pentwater. Drainage area is 42.3 mi ² .	1975-99	02-13-99	2.56	171	09-11-86	6.33	2,860
Betsie River near Benzonia, MI (04126600)	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. Datum of gage is 602.15 ft above sea level. Drainage area is approximately 170 mi ² .	1975-99	07-06-99	i	e260	03-28-89	5.46	993
STREAMS TRIBUTARY TO LAKE HURON								
Rifle River at Selkirk, MI (04140500)	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. Datum of gage is 828.47 ft above sea level. Drainage area is 117 mi ² .	1950-82†, 1983-99	06-15-99	3.03	621	05-20-59	6.76	2,760

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1999 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft ³ /s)	Date	Gage height (ft)	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE HURON--Continued								
North Branch Flint River near Columbiaville, MI (04146450)	Lat 43°11'18", long 83°22'03", in NW1/4 sec. 24, T.9 N., R.9 E., Lapeer County, Hydro- logic Unit 04080204, at Barnes Lake Road, 2.9 mi northeast of Columbiaville. Drainage area is 223 mi ² .	1987-99	04-24-99	i	e610	06-21-96	20.25	4,800
Swartz Creek at Flint, MI (04148300)	Lat 42°59'16", long 83°43'57", in NW1/4 sec. 26, T.7 N., R.6 E., Genesee County, Hydro- logic Unit 04080204, at South Ballenger Highway in Flint, 3.6 mi upstream from mouth. Datum of gage is 727.05 ft above sea level. Drainage area is 115 mi ² .	1970-84†, 1991-99	04-23-99	7.53	1,460	04-19-75	9.02	3,160
Thread Creek near Flint, MI (04148440)	Lat 42°58'30", long 83°38'09", in SE1/4 SE1/4 sec. 28, T.7 N., R.7 E., Genesee County, Hydrologic Unit 04080204, at Bristol Road, 4.0 mi southeast of Flint, and 6.0 mi upstream from mouth. Datum of gage is 764.36 ft above sea level. Drainage area is 54.4 mi ² .	1970-84†, 1991-99	04-23-99	5.58	394	04-19-75	g7.65	1,260
STREAMS TRIBUTARY TO ST. CLAIR RIVER								
Pine River near Rattle Run, MI (04160350)	Lat 42°52'49", long 82°34'04", in NE1/4 sec.9, T.5 N., R.16 E., St. Clair County, Hydro- logic Unit 04090001, at Gratiot Road, 1.9 mi north- east of Rattle Run. Drainage area is 135 mi ² .	1974-99	04-24-99	15.59	1,390	06-22-96	24.24	5,730
STREAMS TRIBUTARY TO LAKE ST. CLAIR								
West Branch Stony Creek near Washington, MI (04161760)	Lat 42°43'53", long 83°06'02", in SE1/4 sec.25, T.4 N., R.11 E., Oakland County, Hydro- logic Unit 04090003, at Huron-Clinton Metropoli- tan Park Road, 3.4 mi west of Washington. Drainage area is 22.5 mi ² .	1965-99	07-01-99	j2.97	106	04-19-75	k4.42	470

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1999 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft ³ /s)	Date	Gage height (ft)	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE ST. CLAIR--Continued								
North Branch Clinton River at Almont, MI (04164010)	Lat 42°54'59", long 83°02'42", in NE1/4 sec.28, T.6 N., R.12 E., Lapeer County, Hydro- logic Unit 04090003, at State Highway 53 in Al- mont. Drainage area is 9.56 mi ² .	1959-62, 1963-68†, 1969-99	07-01-99	i	e280	09-06-85	m8.60	818
North Branch Clinton River near Romeo, MI (04164050)	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 northeast of Romeo. Drain- age area is 49.7 mi ² .	1959-64, 1965-69†, 1970-99	07-02-99	3.98	840	04-19-75	n5.44	3,500
North Branch Clinton River near Meade, MI (04164150)	Lat 42°43'50", long 82°54'23", in NE1/4 sec.34, T.4 N., R.13 E., Macomb County, Hydro- logic Unit 04090003, at 27 Mile Road, 1.9 mi northwest of Meade. Drainage area is 89.6 mi ² .	1959-67, 1968-72†, 1973-99	04-23-99	6.69	852	04-19-75	o7.76	4,500
Coon Creek near Armada, MI (04164200)	Lat 42°47'41", long 82°52'58", in SW1/4 sec.1, T.4 N., R.13 E., Macomb County, Hydro- logic Unit 04090003, at North Road, 3.4 mi south of Armada. Drainage area is 10.0 mi ² .	1959-65, 1966-70†, 1971-99	04-23-99	5.37	111	04-19-75	p6.25	480
Highbank Creek near Armada, MI (04164350)	Lat 42°48'24", long 82°51'08", in NW1/4 sec.6, T.4 N., R.14 E., Macomb County, Hydro- logic Unit 04090003, at 32 Mile Road, 3.0 mi southeast of Armada. Drainage area is 14.9 mi ² .	1959-65, 1965-70†, 1971-99	04-23-99	15.48	485	09-06-85	16.77	2,240
East Branch Coon Creek near New Haven, MI (04164360)	Lat 42°45'46", long 82°50'57", in SW1/4 sec.18, T.4 N., R.14 E., Macomb County, Hydro- logic Unit 04090003, at 29 Mile Road, 3.4 mi northwest of New Haven. Drainage area is 36.1 mi ² .	1959-67, 1968-72†, 1973-99	04-23-99	7.60	680	04-19-75	q8.95	2,700
Deer Creek near Meade, MI (04164400)	Lat 42°42'39", long 82°51'32", in NW1/4 sec.6, T.3 N., R.14 E., Macomb County, Hydro- logic Unit 04090003, at 25 1/2 Mile Road, 0.9 mi southeast of Meade. Drain- age area is 12.7 mi ² .	1959-60, 1960-65†, 1966-99	04-23-99	6.99	405	09-06-85	8.90	691

See footnotes at end of table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Maximum discharge at crest-stage partial-record stations--Continued

Station name and number	Location and drainage area	Period of record	Date	Water year 1999 maximum		Period of record maximum		
				Gage height (ft)	Dis- charge (ft ³ /s)	Date	Gage height (ft)	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE ST. CLAIR--Continued								
McBride Drain near Macomb, MI (04164450)	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. Drainage area is 5.79 mi ² .	1960-64†, 1965-99	04-23-99	6.83	90	02-10-65	r8.82	220
Middle Branch Clinton River near Macomb, MI (04164600)	Lat 42°42'03", long 82°59'44", in SE1/4 sec.2, T.3 N., R.12 E., Macomb County, Hydro- logic Unit 04090003, at Schoenherr Road, 2.0 mi west of Macomb. Drainage area is 22.2 mi ² .	1959-64, 1965-69†, 1971-99	04-23-99	9.88	482	06-26-68	s12.17	1,400
STREAMS TRIBUTARY TO DETROIT RIVER								
Frank and Poet Drain at Trenton, MI (04168660)	Lat 42°09'19", long 83°12'22", in NW1/4 sec.13, T.4 S., R.10 E., Wayne County, Hydro- logic Unit 04090004, at King Road in Trenton. Drainage area is 19.3 mi ² .	1972-99	04-24-99	7.79	220	09-07-90	9.55	655
STREAMS TRIBUTARY TO LAKE ERIE								
Saline River near Saline, MI (04176400)	Lat 42°07'50", long 83°46'35", in SW1/4 sec.18, T.4 S., R.6 E., Washtenaw County, Hydrologic Unit 04100002, 50 ft upstream from Maple Road, 2.8 mi south of Saline. Drainage area is 94.6 mi ² .	1966-77†, 1978-99	01-24-99	11.39	1,580	06-26-68	13.37	3,990

‡ Operated as a continuous-record gaging station.

a Maximum gage height, 12.36 ft, Apr. 9, 1991, present site and datum.

b Maximum gage height, 9.84 ft, Apr. 6, 1988.

c Maximum gage height, 4.57 ft, Mar. 30, backwater from ice.

d Maximum gage height, 8.94 ft, Mar. 30, 1977, backwater from ice.

e Estimated.

f Maximum gage height, 5.86 ft, Dec. 31, 1988, backwater from ice.

g From floodmark.

h Maximum gage height, 5.94 ft, Jan. 3, backwater from ice.

i Not determined.

j Maximum gage height, 2.99 ft, Jan. 22, backwater from ice.

k Maximum gage height, 5.93 ft, Jan. 27, 1974, backwater from ice.

m Maximum gage height, 8.62 ft, Apr. 19, 1975.

n Maximum gage height, 7.1 ft, Mar. 12 or 13, 1962, backwater from ice, site and datum then in use.

o Maximum gage height, 7.85 ft, Mar. 12, 1962, backwater from ice.

p Maximum gage height, 6.95 ft, Sept. 6, 1985.

q Maximum gage height, 9.48 ft, Sept. 6, 1985.

r Maximum gage height, 9.55 ft, June 26, 1968.

s Maximum gage height, 15.89 ft, Mar. 14, 1972, backwater from ice.

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 1999

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Dis-charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE SUPERIOR							
04034100	Bond Falls Lower By-Pass	Middle Branch Ontonagon River	Lat 46°24'27", long 89°07'44", in SE1/4 SW1/4 sec.1, T.46 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, at Bond Falls Road, 2.2 mi west of Calderwood.	--	1942,1945, 1963-64, 1967,1969, 1971-72, 1974, 1979-81, 1983-84, 1987-98	07-21-99	a43.5
04044400	Carp River	Lake Superior	Lat 46°31'29", long 87°34'25", in SE1/4 sec.29, T.48 N., R.26 W., Marquette County, Hydrologic Unit 04020105, at U.S. Highway 41, 2.0 mi northeast of Negaunee.	51.4	1961-86†, 1987-92†, 1993-98	06-24-99 07-29-99 08-20-99 09-15-99	a48.2 a36.5 a37.7 a21.5
04044528	Silver Lead Creek	West Branch Chocolay River	Lat 46°19'36", long 87°23'02", in SW1/4 NW1/4 sec.1, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04020201, 20 ft downstream from outlet of Little Trout Lake, 4.2 mi northeast of Gwinn.	--	1997-98	10-20-98 12-04-98 12-28-98 01-15-99 02-17-99 03-23-99 04-21-99 05-25-99 06-22-99 07-29-99 08-30-99	3.48 *3.83 *3.73 *3.39 *3.99 *3.73 3.87 6.17 *2.55 7.96 *3.41
04044531	Silver Lead Creek	West Branch Chocolay River	Lat 46°19'47", long 87°22'52", in NE1/4 NW1/4 sec.1, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04020201, upstream from sewage treatment plant, at abandoned crossing on unnamed road, 4.5 mi north-east of Gwinn.	1.87	1965, 1970, 1985-86, 1997-98	10-20-98 12-04-98 12-28-98 01-15-99 02-17-99 03-23-99 04-21-99 05-25-99 06-22-99 07-29-99 08-30-99	4.21 *4.55 *4.72 *4.57 *4.89 *4.91 5.03 6.31 *3.40 10.4 *3.93

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 1999--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN							
04052500	Walsh Creek	Walsh Ditch	Lat 46°20'44", long 86°10'37", in NW1/4 NW1/4 sec.34, T.46 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at State Highway 28, 11.1 mi west of Seney.	b12	1938-42†, 1943-45, 1947-48, 1950, 1998	10-28-98	*6.01
							*13.3
							197
							66.0
							*13.4
							19.2
							*2.91
							*2.18
04052700	Sweeney Creek	Driggs River	Lat 46°18'02", long 86°07'18", in NW1/4 NE1/4 sec.13, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at outlet of C3 Pool, at Seney Wildlife Ref- uge, 9.0 mi southwest of Seney.	--	1998	10-27-98	a0.32
							a26.7
							a195
							a54.4
							a19.0
							a14.9
							a1.24
							ae0.80
04053500	Marsh Creek	Manistique River	Lat 46°20'45", long 86°14'09", in NW1/4 NW1/4 sec.31, T.46 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at State Highway 28, 14.0 mi west of Seney.	b20	1938-42†, 1943-45, 1947-48, 1950, 1998	10-28-98	*0.00
							*2.55
							18.4
							11.0
							*2.72
							0.85
							*0.00
							*0.00
04053520	Ducey Creek	Marsh Creek	Lat 46°20'44", long 86°13'31", in NW1/4 NE1/4 sec.31, T.46 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at railroad bridge 150 ft downstream from State Highway 28, 13.5 mi west of Seney.	--	1998	09-16-98	*0.00
							*8.08
							92.1
							41.4
							*5.38
							10.3
							*0.00
							*0.00
04053600	Marsh Creek	Manistique River	Lat 46°17'22", long 86°08'38", in SW1/4 SE1/4 sec.14, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at outlet of C3 Pool at Seney Wildlife Refuge, 10.3 mi southwest of Seney.	--	--	07-06-99	a19.1
							a26.5
							a28.5
							a31.0
							a2.72
04054420	Walsh Ditch	Duck Creek	Lat 46°17'36", long 86°09'30", in NE1/4 SE1/4 sec.15, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, 0.5 mi upstream from C3 Pool at Seney Wild- life Refuge, 10.7 mi southwest of Seney.	--	1998	10-27-98	*11.3
							*28.2
							305
							147
							*32.4
							32.5
							*8.12
							*7.56
							*0.00

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 1999--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04054425	Walsh Ditch	Duck Creek	Lat 46°17'20", long 86°09'10", in SW1/4 SW1/4 sec.14, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at outlet of C3 Pool at Seney Wildlife Refuge, 10.6 mi southwest of Seney.	--	1998	10-27-98	a0.15
						12-10-98	a0.07
						04-06-98	a300
						04-14-98	a98.0
						06-03-98	a10.2
						06-30-98	a0.02
						08-24-98	a0.04
09-20-98	a0.03						
04054428	Walsh Ditch	Duck Creek	Lat 46°16'37", long 86°09'27", in SW1/4 SW1/4 sec.23, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, 1.0 mi downstream from C3 Pool at Seney Wild- life Refuge, 11.3 mi southwest of Seney.	--	--	06-03-98	a9.10
04054434	Walsh Ditch	Duck Creek	Lat 46°14'43", long 86°07'01", in SE1/4 SE1/4 sec.36, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, immediately upstream from confluence with Marsh Creek, 8.8 mi west of Germfask.	--	--	07-12-98	ac12.1
04054435	Walsh Ditch	Duck Creek	Lat 46°14'43", long 86°06'58", in SE1/4 SE1/4 sec.36, T.45 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, immediately down- stream from confluence with Marsh Creek, 8.8 mi west of Germfask.	--	--	07-12-98	ac10.1
04054440	Walsh Ditch	Duck Creek	Lat 46°11'05", long 86°06'59", in NE1/4 sec.25, T.44 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, at Seney Wildlife Refuge, 9.5 mi southwest of Germfask.	--	--	07-06-98	a13.4
04058120	Green Creek	Middle Branch Escanaba River	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, 1970-92†, 1993-98	06-22-98 07-29-98 08-19-98 09-15-98	a7.86 a7.02 a11.5 a3.20
04059034	Escanaba River	Lake Michigan	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.	b920	1981-92†, 1993-98	05-05-98 06-25-98 07-23-98 08-09-98 09-07-98	a476 a386 a454 a652 a321

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 1999--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04061500	Paint River	Brule River	Lat 46°06'21", long 88°20'05", in SE1/4 sec.20, T.43 N., R.32 W., Iron County, Hydrologic Unit 04030106, downstream from City of Crystal Falls powerplant, 0.9 mi upstream from State Highway 69 in Crystal Falls.	597	1944-96†, 1997-98d	11-18-98 03-31-99 04-02-99 08-10-99	a349 a754 a1,980 a399
04062400	Michigamme River	Menominee River	Lat 46°14'48", long 88°00'45", in NW1/4 NW1/4 sec.1, T.44 N., R.30 W., Dickinson County, Hydrologic Unit 04030107, on left bank 20 ft upstream from bridge on unnamed county road, 800 ft downstream from State High- way 95, and 2.0 mi south of Witch Lake.	316	1964-80†, 1997-98d	10-05-98 04-15-99 06-28-99 09-10-99	a101 a1,470 a311 a91.4
04096517	South Branch Hog Creek Tributary	South Branch Hog Creek	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	1969-98	11-24-98 12-30-98 04-01-99 07-29-99	*0.81 *0.76 *7.36 *1.37
04102064	Hickory Creek	St. Joseph River	Lat 41°56'00", long 86°28'29", in NW1/4 SW1/4 sec.24, T.6 S., R.19 W., Berrien County, Hydrologic Unit 04050001, at Spitzke Road, 1.8 mi south- east of Baroda.	--	--	05-20-99 06-15-99 06-29-99 07-22-99 08-03-99 08-18-99 09-01-99 09-22-99	f9.15 f9.09 f22.1 f6.14 *f5.10 *f4.39 *f4.82 *f4.23
04102065	Hickory Creek	St. Joseph River	Lat 41°58'19", long 86°29'34", in NW1/4 NW1/4 sec.11, T.6 S., R.19 W., Berrien County, Hydrologic Unit 04050001, at Hinchman Road, 1.0 mi north of Baroda.	--	--	05-20-99 06-15-99 06-29-99 07-22-99 08-03-99 08-18-99 09-01-99 09-22-99	f22.1 f20.8 f46.2 f13.7 *f10.5 *f9.82 *f10.5 *f8.69
04102067	Hickory Creek	St. Joseph River	Lat 42°00'51", long 86°31'00", in NE1/4 NE1/4 sec.28, T.5 S., R.19 W., Berrien County, Hydrologic Unit 04050001, at John Beers Road in Stevens- ville.	--	--	05-20-99 06-15-99 06-29-99 07-22-99 08-03-99 08-18-99 09-01-99 09-22-99	f24.4 f24.1 f58.5 f16.3 *f12.3 *f11.7 *f12.0 *f10.3

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 1999--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04102068	Hickory Creek	St. Joseph River	Lat 42°01'43, long 86°30'02", in NW1/4 NE1/4 sec.22, T.5 S., R.19 W., Berrien County, Hydrologic Unit 04050001, at Marquette Woods Road, 1.5 mi northeast of Stevens- ville.	--	--	05-20-99	f30.0
						06-15-99	f27.3
						06-29-99	f59.9
						07-22-99	f18.4
						08-03-99	*f14.1
						08-18-99	*f13.3
						09-01-99	*f14.6
09-22-99	*f11.4						
04102069	Hickory Creek	St. Joseph River	Lat 42°03'02", long 86°30'19", in NE1/4 SW1/4 sec.10, T.5 S., R.19 W., Berrien County, Hydrologic Unit 04050001, at Maiden Lane, 0.5 mi north of Glenlord.	--	--	05-20-99	f30.3
						06-15-99	f28.3
						06-29-99	f64.7
						07-22-99	f19.0
						08-03-99	*f15.8
						08-18-99	*f14.4
						09-01-99	*f15.4
09-22-99	*f12.4						
04104700	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, Hydro- logic Unit 04050003, at 9 Mile Road, 1.0 mi southwest of Pennfield.	--	1986, 1989-90	08-03-99	*46.0
						08-03-99	*46.8
04104950	Wanadoga Creek	Battle Creek	Lat 42°22'12", long 85°07'44", in NW1/4 SE1/4 sec.21, T.1 S., R.7 W., Calhoun County, Hydrologic Unit 04050003, at Q Drive North, 1.3 mi west of Pennfield.	--	1965, 1983, 1989-90	08-03-99	*10.4
						08-03-99	*10.2
04108847	Unnamed Tributary	Blendon and Olive Drain	Lat 42°54'00", long 85°59'26", in SW1/4 SE1/4 sec.17, T.6 N., R.14 W., Ottawa County, Hydrologic Unit 04050002, at Tyler Street, 2.5 mi southwest of North Blendon.	--	1998	03-24-99	*f2.72
						04-12-99	f10.6
						05-05-99	*f2.39
04108850	Unnamed Tributary	Blendon and Olive Drain	Lat 42°54'23", long 86°01'20", in NW1/4 SW1/4 sec.18, T.6 N., R.14 W., Ottawa County, Hydrologic Unit 04050002, at 96th Avenue, 1.5 mi north of Borculo.	--	1998	04-12-99	f4.92
						05-05-99	*f0.57
04108854	Blendon and Olive Drain	Pigeon River	Lat 42°55'36", long 86°01'20", in NE1/4 NE1/4 sec.12, T.6 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at 96th Avenue, 2.9 mi north of Borculo.	--	1998	03-24-99	*f6.70
						04-12-99	f26.4
						05-05-99	*f6.36
04108857	Pigeon River	Lake Michigan	Lat 42°55'43", long 86°02'33", in SE1/4 SE1/4 sec.2, T.6 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at 104th Avenue, 3.2 mi north- west of Borculo.	--	1998	03-24-99	*f8.83
						04-12-99	f28.0
						05-05-99	*f8.67

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 1999--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Dis- charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04108867	Sawyer Creek	Pigeon River	Lat 42°55'17", long 86°05'03", in SE1/4 NE1/4 sec.9, T.6 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at Croswell Street, 0.7 mi north of Olive Center.	--	1998	03-24-99 04-12-99 05-05-99	*f3.45 f13.0 *f3.30
04108870	Pigeon River	Lake Michigan	Lat 42°55'31", long 86°06'07", in NE1/4 NE1/4 sec.8, T.6 N., R.15 W., Ottawa County, Hydrologic Unit 04050002, at 128th Avenue, 1.4 mi north- west of Olive Center.	--	1998	03-24-99 04-12-99 05-05-99	*f19.0 f64.9 *f29.0
04108872	Pigeon River	Lake Michigan	Lat 42°54'58", long 86°08'47", in SE1/4 SE1/4 sec.12, T.6 N., R.16 W., Ottawa County, Hydrologic Unit 04050002, at West Olive Road, 3.0 mi northeast of Port Sheldon.	--	1998	03-24-99 04-12-99 05-05-99	*f28.1 f77.3 *f33.2
04119280	Deer Creek	Grand River	Lat 43°03'35", long 85°55'41", in SE1/4 SE1/4 sec.23, T.8 N., R.14 W., Ottawa County, Hydrologic Unit 04050006, at Arthur Street in Coopersville.	--	--	08-04-99 08-20-99 08-26-99 08-31-99 09-15-99 09-23-99	f3.34 *f1.82 f2.33 *f1.10 *f0.93 *f1.11
04119290	Deer Creek	Grand River	Lat 43°01'44", long 85°55'17", in NW1/4 NW1/4 sec.1, T.7 N., R.14 W., Ottawa County, Hydrologic Unit 04050006, at Mill Road, 2.3 mi south of Coopersville.	--	--	06-24-99 07-21-99 08-04-99 08-20-99 08-26-99 08-31-99 09-15-99 09-23-99	f4.84 f17.1 f13.2 *f2.51 f4.22 *f1.50 *f1.35 *f1.31
04120030	Crockery Creek	Grand River	Lat 43°09'44", long 85°57'47", in SW1/4 SW1/4 sec.15, T.9 N., R.14 W., Muskegon County, Hydrologic Unit 04050006, at Ellis Road, 2.0 mi southwest of Ravenna.	--	1971	09-15-99 09-23-99	f22.2 *f19.0
04120040	Crockery Creek	Grand River	Lat 43°08'38", long 85°57'58", in NW1/4 NW1/4 sec.27, T.9 N., R.14 W., Muskegon County, Hydrologic Unit 04050006, at Patterson Road, 3.0 mi southwest of Ravenna.	--	--	09-15-99 09-23-99	f24.9 *f20.0
04120478	Big Creek	Higgins Lake	Lat 44°29'49", long 84°47'14", in SE1/4 SW1/4 sec.3, T.24 N., R.4 W., Roscommon County, Hydrologic Unit 04060102, at Deadstream Road, 2.0 mi northwest of Higgins Lake.	10.3	1998	05-17-99 08-03-99	0.23 0.14

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 1999--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Dis-charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued							
04120481	Big Creek	Higgins Lake	Lat 44°29'48", long 84°46'33", in SE1/4 SE1/4 sec.3, T.24 N., R.4 W., Roscommon County, Hydrologic Unit 04060102, at mouth, 1.9 mi northwest of Higgins Lake.	10.4	1998	05-17-99 08-03-99	2.97 1.98
04121239	Clam River	Muskegon River	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, 1.0 mi downstream from dam at outlet of Lake Cadillac, at Smith Street in Cadillac.	b48	1983-84†, 1986-92†, 1993-98	12-10-98 03-17-99 06-14-99 08-18-99	a9.42 a36.1 a9.25 a5.62
STREAMS TRIBUTARY TO LAKE HURON							
04153770	Coldwater River	Chippewa River	Lat 43°45'19", long 84°56'38", in SW1/4 SW1/4 sec.20, T.16 N., R.5 W., Isabella County, Hydrologic Unit 04080202, at Coleman Road, 2.8 mi west of Woods.	--	--	05-26-99 06-23-99 07-29-99 08-11-99 08-25-99 09-16-99	f12.8 *f8.59 f13.4 f9.34 *f7.90 *f6.69
04153772	Coldwater River	Chippewa River	Lat 43°44'26", long 84°57'08", in SE1/4 SE1/4 sec.30, T.16 N., R.5 W., Isabella County, Hydrologic Unit 04080202, at Battle Road, 3.5 mi north of Weidman.	--	--	05-26-99 06-23-99	f14.1 *f10.2
04153777	Walker Creek	Coldwater River	Lat 43°43'34", long 84°58'01", in SW1/4 SW1/4 sec.31, T.16 N., R.5 W., Isabella County, Hydrologic Unit 04080202, at Vernon Road, 2.5 mi north of Weidman.	--	--	05-26-99 06-23-99 07-08-99 07-29-99 08-11-99 08-25-99 09-16-99	f5.52 *f3.09 *f2.43 f5.35 f3.95 *f2.23 *f2.67
04153778	Coldwater River	Chippewa River	Lat 43°42'42", long 84°58'01", in SW1/4 SW1/4 sec.6, T.15 N., R.5 W., Isabella County, Hydrologic Unit 04080202, at Denver Road, 1.5 mi north of Weidman.	--	--	05-13-99 06-23-99 07-08-99 07-29-99 08-11-99 09-16-99	f15.1 *f14.0 *f15.3 f16.4 f14.8 *f11.4
04153788	Coldwater River	Chippewa River	Lat 43°41'01", long 84°57'57", in SW1/4 SW1/4 sec.18, T.15 N., R.5 W., Isabella County, Hydrologic Unit 04080202, at Weidman Road, 0.3 mi south of Weidman.	--	--	05-26-99 06-23-99 07-08-99 07-29-99 08-11-99 09-16-99	f31.7 *f21.2 *f22.5 f34.3 f23.5 *f15.2
04153793	Coldwater River	Chippewa River	Lat 43°39'14", long 84°57'37", in SE1/4 SW1/4 sec.30, T.15 N., R.5 W., Isabella County, Hydrologic Unit 04080202, at Jordan Road, 2.3 mi south of Weidman.	--	--	05-13-99 06-23-99 07-08-99 07-29-99 08-11-99 09-16-99	f41.8 *f32.9 *f30.8 f52.5 f29.6 *f15.6

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 1999--Continued

Station No.	Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements	
						Date	Dis-charge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE HURON--Continued							
04153794	Coldwater River	Chippewa River	Lat 43°38'21", long 84°57'20", in SW1/4 SE1/4 sec.31, T.15 N., R.5 W., Isabella County, Hydrologic Unit 04080202, at Baseline Road, 3.3 mi south of Weidman.	--	--	05-13-99	f40.1
						06-23-99	*f34.0
						07-08-99	*f32.6
						07-29-99	f46.4
						08-11-99	f30.5
						09-16-99	*f19.0
04156010	Lingle Drain	Tittabawassee River	Lat 43°35'09", long 84°12'26", in SW1/4 SW1/4 sec.26, T.14 N., R.2 E., Midland County, Hydrologic Unit 04080201, at Saginaw Road in Midland.	--	1974, 1982	05-26-99	f10.9
STREAMS TRIBUTARY TO DETROIT RIVER							
04166020	River Rouge	Detroit River	Lat 42°30'36", long 83°15'45", in SW1/4 NW1/4 sec.10, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, at Lahser Road in Beverly Hills.	--	1994-98	10-08-98	56.6
						07-06-99	37.8
						07-15-99	*16.3
						08-13-99	*9.79
						09-07-99	51.0
04166350	Upper River Rouge	River Rouge	Lat 42°23'59", long 83°17'11", in NE1/4 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, 1986-88, 1998	10-08-98	52.9
						07-06-99	17.5
						07-15-99	*7.99
						09-29-99	38.5
04166598	Walled Lake Branch	Middle River Rouge	Lat 42°27'08", long 83°27'37", in NW1/4 NE1/4 sec.35, T.1 N., R.8 E., Oakland County, Hydrologic Unit 04090004, at 9 Mile Road in Novi.	--	1994-98	10-08-98	25.8
04166700	Johnson Creek	Middle River Rouge	Lat 42°25'33", long 83°28'52", in SW1/4 SE1/4 sec.3, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Hines Drive, 0.1 mi upstream from confluence with Walled Lake Branch in Northville.	26.1	1994-98	10-08-98	15.4

* Base flow.

† Operated as a low-flow partial-record station.

‡ Operated as a continuous-record gaging station.

a Affected by regulation and/or diversion.

b Approximately.

c Discharge measurement made by employees of U.S. Geological Survey, Biological Resources Division.

d Operated as a crest-stage partial-record station.

e Estimated.

f Discharge measurement made by employees of Michigan Department of Environmental Quality.



Figure 9. Location of ground-water wells published in this report.

GROUND-WATER LEVELS

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 ft to 113 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 970 ft above sea level, from topographic map. Measuring point: Plywood shelter base, 2.5 ft above land-surface datum.

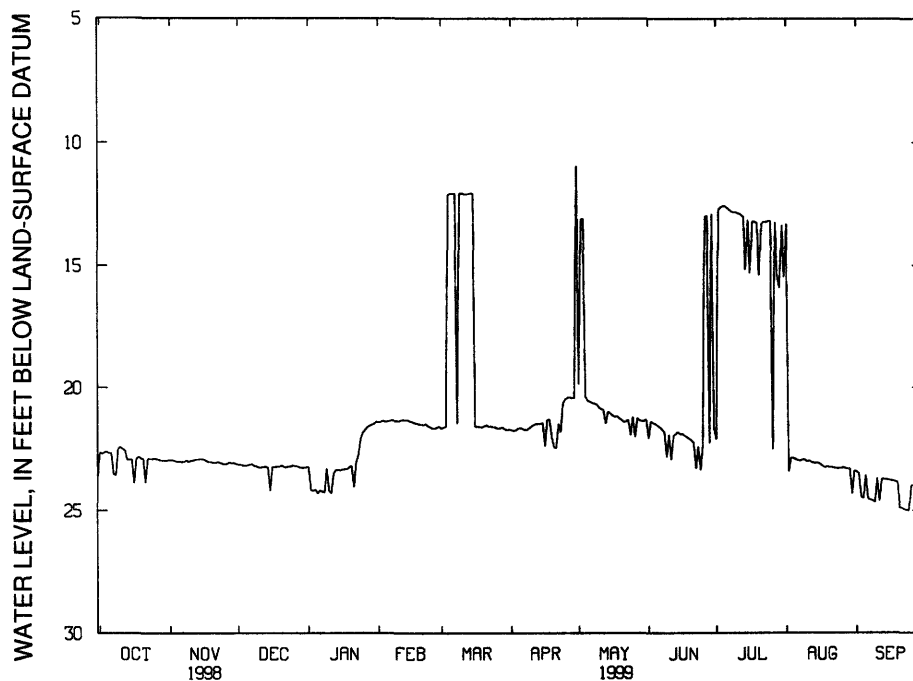
REMARKS.--Water levels affected by nearby pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 8.77 ft below land-surface datum, June 4, 1989; lowest recorded, 25.9 ft below land-surface datum, May 25, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	22.67	23.01	23.17	24.30	21.39	12.07	21.65	20.54	21.55	12.58	22.92	23.57
10	22.42	22.98	23.25	24.20	21.37	12.06	21.58	20.80	21.92	12.85	23.01	23.70
15	22.92	22.91	24.18	23.37	21.38	12.08	21.44	21.05	21.90	13.14	23.07	23.75
20	22.88	23.06	23.17	23.19	21.52	21.57	22.42	21.32	22.15	15.39	23.24	24.88
25	22.88	23.13	23.17	21.83	21.66	21.62	20.47	21.20	22.38	13.19	23.27	23.99
EOM	22.95	23.11	23.25	21.40	21.59	21.71	10.95	21.30	21.63	15.47	23.39	23.92
WTR YR 1999	HIGHEST			10.33	APR 26, 28			LOWEST	25.01	SEP 24		



GROUND-WATER LEVELS

CALHOUN COUNTY

422032085091801. Local number, 1S 7W 32BDCC1.

LOCATION.--Lat 42°20'32", long 85°09'18", Hydrologic Unit 04050003, at Hopkins Street and State Highway 66 in Battle Creek. Owner: Pennfield Township.

AQUIFER.--Marshall Formation.

WELL CHARACTERISTICS.--Drilled well, diameter 6 in., depth 95 ft, cased to about 40 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 845 ft above sea level, from topographic map. Measuring point: Top of shelter base, 1.0 ft above land-surface datum.

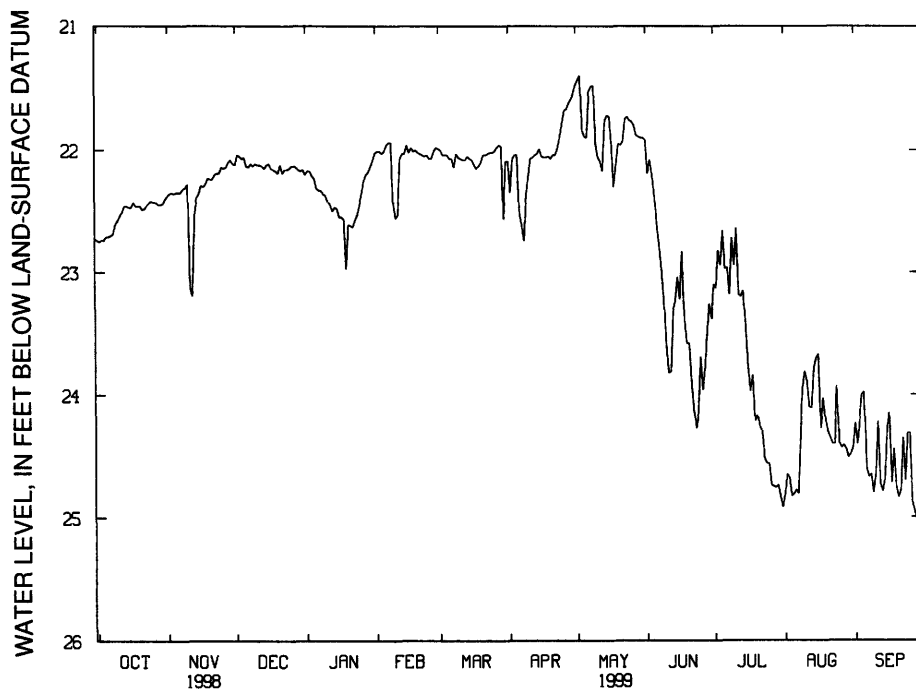
REMARKS.--Water levels affected by nearby pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 15.6 ft below land-surface datum, April 1974; lowest recorded, 27.0 ft below land-surface datum, August 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	22.71	22.35	22.06	22.23	22.01	22.04	22.04	21.89	22.36	22.66	24.81	23.98
10	22.58	22.28	22.11	22.37	22.56	22.06	22.23	21.95	23.62	22.94	23.81	24.65
15	22.47	22.36	22.12	22.48	21.96	22.07	21.99	21.72	23.04	23.46	23.70	24.27
20	22.46	22.24	22.19	22.61	22.02	22.10	22.07	21.95	23.58	24.17	24.30	24.84
25	22.42	22.14	22.15	22.45	22.07	22.02	21.79	21.76	23.69	24.56	24.39	24.31
EOM	22.41	22.11	22.16	22.08	21.98	22.09	21.55	21.90	23.38	24.92	24.43	24.50
WTR YR 1999	HIGHEST			21.34	MAY 3			LOWEST	25.02	SEP 28		



GROUND-WATER LEVELS

CHEBOYGAN COUNTY

454427084424001. Local number, 39N 3W 29CBCB1

LOCATION.--Lat 45°44'27", long 84°42'40", Hydrologic Unit 04070003, at Stimpson Road, 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 sea level, from topographic map. **Measuring point:** Top of casing, 2.0 ft above land-surface datum.

PERIOD OF RECORD.--January 1979 to May 1992, December 1997 to current year. Records for the 1992 water year are unpublished and available in files of the Geological Survey.

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 1998 TO SEPTEMBER 1999

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 20	8.41	JAN 20	6.57	MAY 4	5.46	JUN 14	5.19	AUG 4	6.65	SEP 30	8.19
DEC 3	6.73	MAR 25	5.19								

454427084424002. Local number, 39N 3W 29CBCB2.

LOCATION.--Lat 45°44'27", long 84°42'40", Hydrologic Unit 04070003, at Stimpson Road, 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 sea level, from topographic map. **Measuring point:** Top of casing, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--February 1979 to May 1992, December 1997 to current year. Records for the 1992 water year are unpublished and available in files of the Geological Survey.

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, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 20	5.25	JAN 20	4.09	MAY 4	3.06	JUN 14	2.86	AUG 4	4.16	SEP 30	5.42
DEC 3	4.17	MAR 25	2.82								

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, 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 861.91 ft above sea level. Measuring point: Plywood instrument shelf, 1.0 ft above land-surface datum.

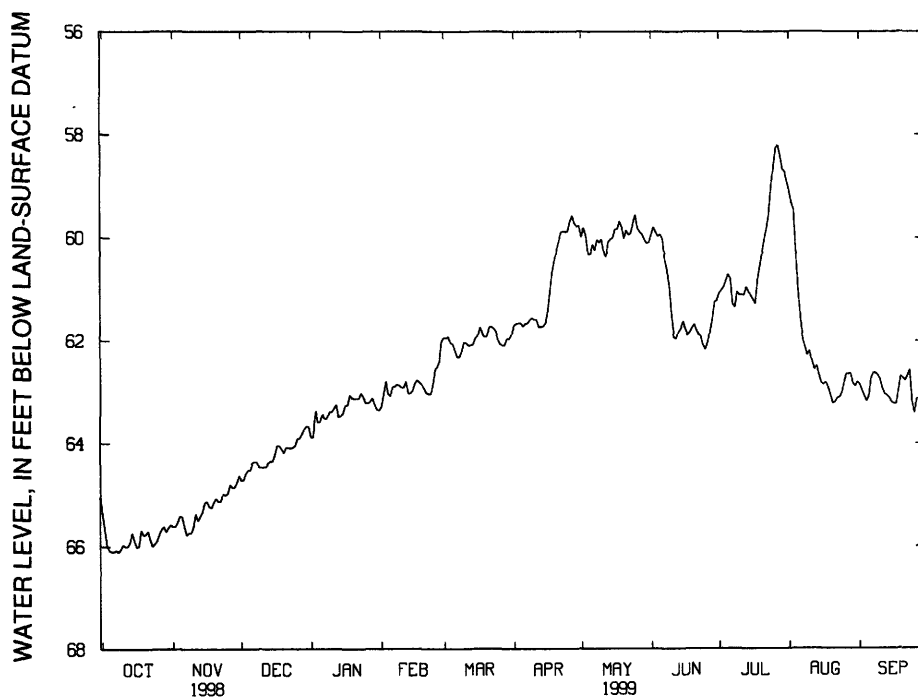
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 55.19 ft below land-surface datum, June 24, 25, 26, 1996; lowest recorded, 103.6 ft below land-surface datum, Aug. 28, 1969.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	66.10	65.42	64.52	63.59	63.08	62.06	61.72	60.32	59.94	60.72	61.07	63.08
10	65.97	65.62	64.47	63.39	62.92	62.03	61.59	60.03	61.51	61.12	62.20	62.76
15	65.89	65.15	64.35	63.41	62.97	61.95	61.66	60.00	61.62	61.12	62.83	63.20
20	65.77	65.07	64.19	63.13	62.93	61.92	60.25	60.01	61.68	60.31	63.22	62.73
25	65.89	64.97	64.05	63.22	62.56	61.98	59.88	59.56	62.17	58.64	62.82	63.41
EOM	65.59	64.63	63.68	63.36	62.01	61.89	59.78	60.09	61.22	58.90	62.81	62.87
WTR YR 1999	HIGHEST			57.94	JUL 27			LOWEST	66.11	OCT 8		



GROUND-WATER LEVELS

HURON COUNTY

434103083130301. Local number, 15N 11E 32BBCB.

LOCATION.--Lat 43°41'03", long 83°13'03", Hydrologic Unit 04080103, 2 mi northeast of Gagetown at Gagetown State Game Area. Owner: Huron County.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 91 ft, screened 87 ft to 91 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 746 ft above sea level, from topographic map. Measuring point: Top of casing, 1.6 ft. above land-surface datum.

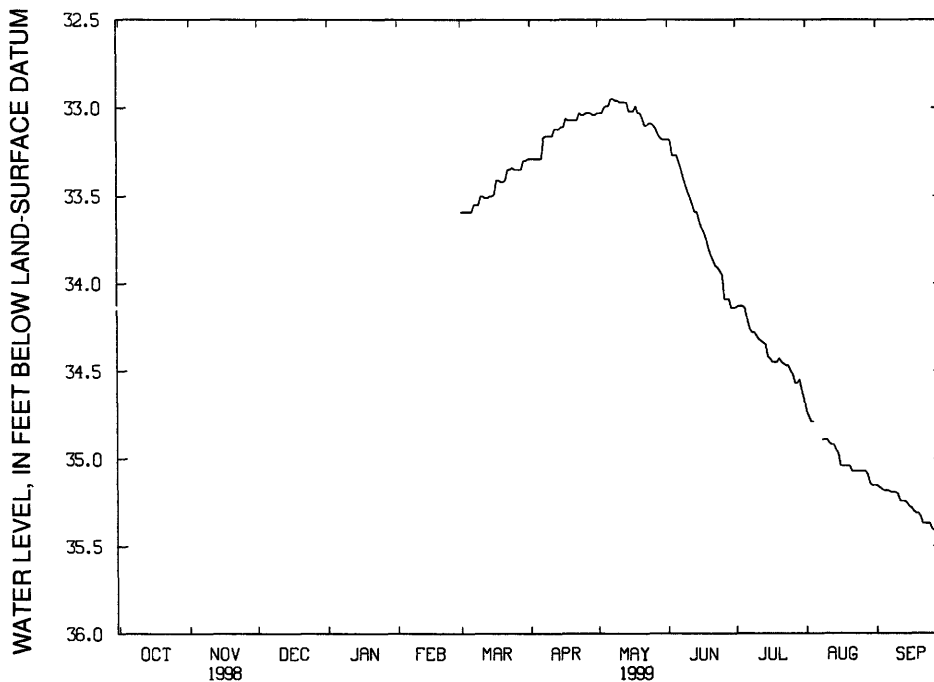
PERIOD OF RECORD.--February 1991 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 30.38 ft below land-surface datum, May 6, 1991; lowest recorded, 35.42 ft below land-surface datum, Sept. 27-29, 1999.

EXTREMES OUTSIDE PERIOD OF RECORD.--Lowest water level measured, 35.60 ft below land-surface datum, June 2, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	---	---	---	---	33.59	33.29	32.99	33.27	34.14	---	35.18
10	---	---	---	---	---	33.50	33.16	32.96	33.48	34.30	34.89	35.20
15	---	---	---	---	---	33.50	33.11	33.02	33.64	34.42	34.97	35.27
20	---	---	---	---	---	33.42	33.07	33.03	33.84	34.43	35.04	35.33
25	---	---	---	---	---	33.35	33.04	33.09	33.95	34.50	35.07	35.40
EOM	---	---	---	---	---	33.29	33.04	33.18	34.14	34.66	35.15	35.41
WTR YR 1999	HIGHEST		32.95	MAY 6-9		LOWEST		35.42	SEP 27-29			



GROUND-WATER LEVELS

HURON COUNTY

434323082561901. Local number, 15N 13E 22BBCC.

LOCATION.--Lat. 43°43'23", long 82°56'19", Hydrologic Unit 04080205, on State Highway 19, 1 mi north of Ubyly. Owner: Huron County.

AQUIFER.--Napoleon Sandstone Member of Marshall Formation.

WELL CHARACTERISTICS.--Rotary drilled observation well, diameter 4 in., depth 70 ft, cased to top of Napoleon Sandstone.

INSTRUMENTATION.--Water-level recorder.

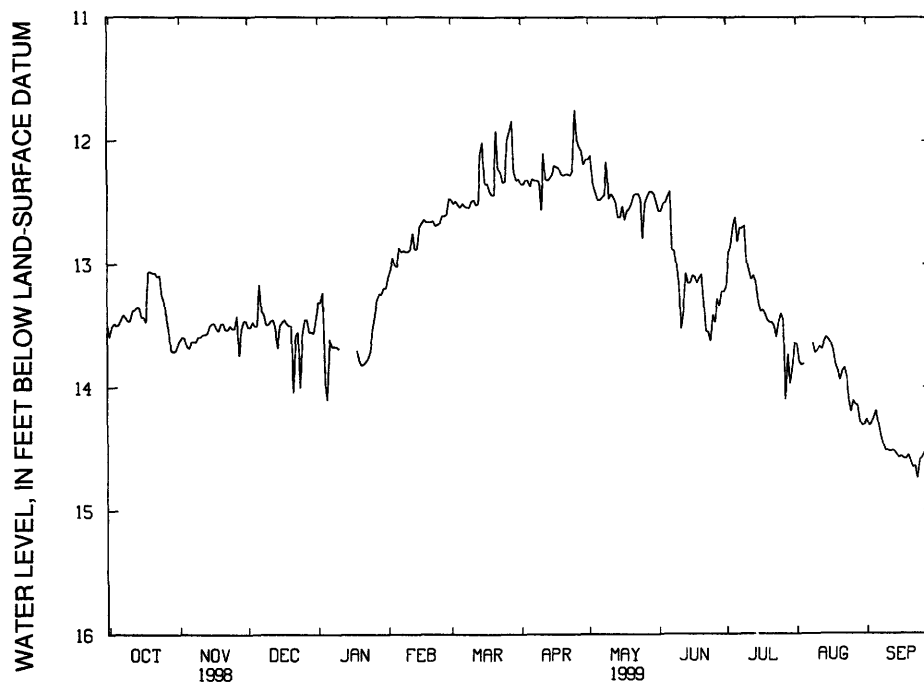
DATUM.--Elevation of land-surface datum is 795 ft above sea level, from topographic map. Measuring point: Top of casing, 2.81 ft above land-surface datum.

PERIOD OF RECORD.--December 1988 to September 1989, December 1992 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 8.92 ft below land-surface datum, June 23, 1996; lowest recorded, 16.38 ft below land-surface datum, July 26, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.49	13.68	13.50	14.10	13.02	12.54	12.37	12.48	12.45	12.62	---	14.19
10	13.46	13.59	13.49	13.69	12.90	12.49	12.56	12.47	13.16	12.97	13.70	14.51
15	13.43	13.48	13.50	---	12.70	12.01	12.27	12.62	13.15	13.28	13.61	14.57
20	13.07	13.48	13.50	13.82	12.66	12.44	12.28	12.51	13.08	13.47	13.94	14.60
25	13.30	13.52	13.57	13.52	12.61	12.33	11.75	12.79	13.41	13.40	14.20	14.57
EOM	13.65	13.46	13.44	13.19	12.47	12.31	12.15	12.50	13.22	13.64	14.30	14.28
WTR YR 1999	HIGHEST			11.58	APR 25			LOWEST	14.74	SEP 23		



GROUND-WATER LEVELS

HURON COUNTY

434947083233301. Local number, 16N 9E 2CDCA.

LOCATION.--Lat 43°49'47", long 83°23'33", Hydrologic Unit 04080103, 6 mi west of Pigeon at Wildfowl Bay State Wildlife Area. Owner: Huron County.

AQUIFER.--Saginaw, Marshall Formation (Pennsylvanian, Mississippian age).

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 180 ft, cased to 147 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 582 ft above sea level, from topographic map. Measuring point: Top of casing, 2.2 ft above land-surface datum.

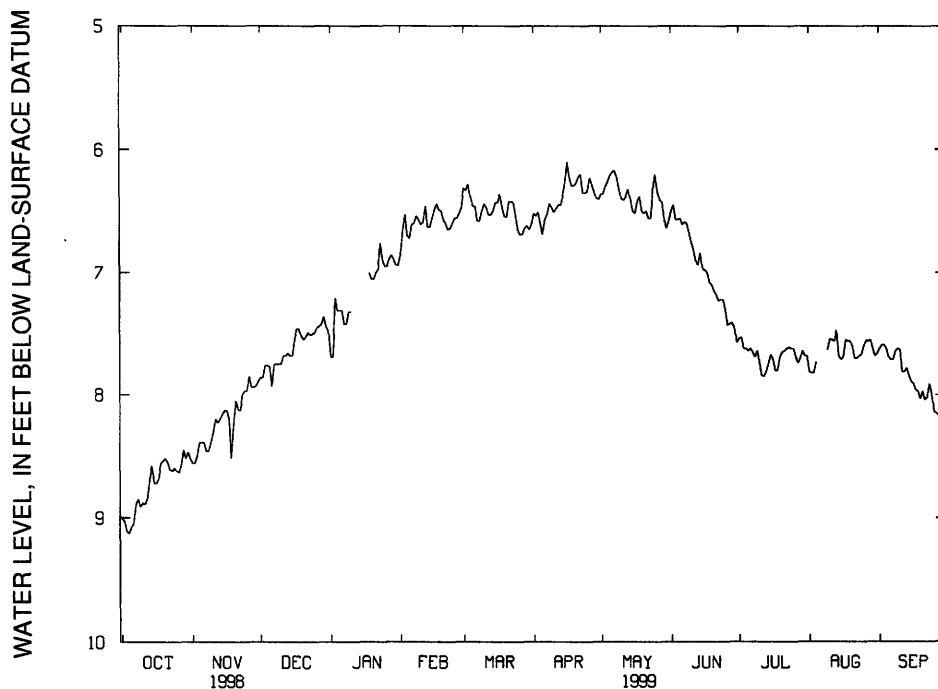
PERIOD OF RECORD.--February 1991 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 3.12 ft below land-surface datum, Apr. 20, 1993; lowest recorded, 9.21 ft below land-surface datum, Aug. 4, 1998.

EXTREMES OUTSIDE PERIOD OF RECORD.--Lowest water level measured, 12.30 ft below land-surface datum, June 2, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	9.08	8.39	7.77	7.31	6.72	6.46	6.69	6.21	6.56	7.64	---	7.69
10	8.88	8.31	7.75	7.32	6.61	6.44	6.51	6.40	6.75	7.73	7.54	7.63
15	8.72	8.13	7.68	---	6.56	6.43	6.27	6.50	6.97	7.67	7.71	7.89
20	8.52	8.05	7.55	7.05	6.57	6.55	6.27	6.52	7.15	7.65	7.60	7.97
25	8.62	7.97	7.49	6.95	6.56	6.65	6.34	6.20	7.30	7.62	7.60	8.14
EOM	8.52	7.89	7.48	6.94	6.47	6.61	6.40	6.58	7.57	7.68	7.66	8.00
WTR YR 1999	HIGHEST			6.02	APR 16			LOWEST			9.13	OCT 4



GROUND-WATER LEVELS

HURON COUNTY

435736083094801. Local number, 18N 11E 27AADD.

LOCATION.--Lat 43°57'36", long 83°09'48", Hydrologic Unit 04080103, 6 mi northeast of Caseville at Rush Lake State Game Area. Owner: Huron County.

AQUIFER.--Marshall Sandstone.

WELL CHARACTERISTICS.--Rotary drilled observation well, diameter 4 in., depth 200 ft, cased to 178 ft.

INSTRUMENTATION.--Water-level recorder.

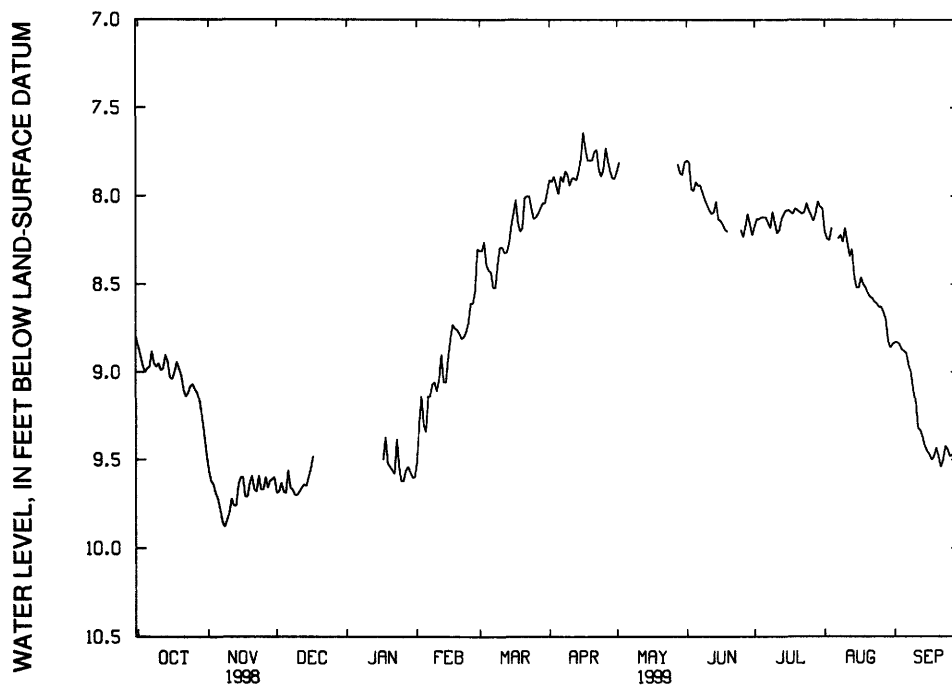
DATUM.--Elevation of land-surface datum is 600 ft above sea level, from topographic map. Measuring Point: Top of casing, 4.03 ft above land-surface datum.

PERIOD OF RECORD.--October 1988 to August 1989, December 1992 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.71 ft below land-surface datum, Mar. 21, 1997; lowest recorded, 9.88 ft below land-surface datum, Nov. 8, 1998.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	8.98	9.72	9.69	---	9.34	8.42	7.99	---	7.92	8.12	---	8.88
10	8.95	9.80	9.70	---	9.11	8.29	7.94	---	8.05	8.15	8.18	8.17
15	9.03	9.60	9.60	---	8.92	8.17	7.79	---	8.13	8.08	8.52	8.45
20	9.02	9.59	---	9.54	8.78	8.18	7.80	---	---	8.08	8.55	8.48
25	9.07	9.67	---	9.62	8.61	8.13	7.85	---	8.19	8.08	8.63	8.48
EOM	9.47	9.60	---	9.60	8.30	7.98	7.90	7.81	8.22	8.07	8.84	8.34
WTR YR 1999	HIGHEST			7.56	APR 16			LOWEST	9.88	NOV 8		



GROUND-WATER LEVELS

INGHAM COUNTY

423127084321901. Local number, 4N 2W 16DAAA.

LOCATION.--Lat 42°43'57", long 84°32'51", Hydrologic Unit 04050004, between Cedar Street and Museum Drive, Lansing Township in Lansing.

Owner: City of Lansing.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 12 in., depth 417 ft, cased.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 829.10 ft above sea level. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

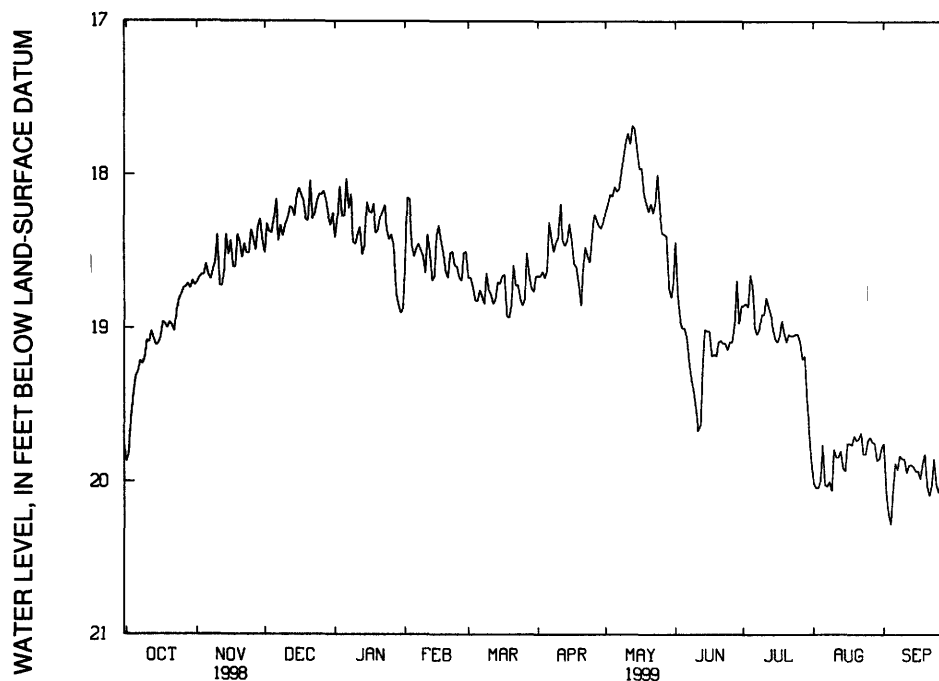
REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--September 1945 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 17.59 ft below land-surface datum, May 13, 1999; lowest recorded, 67.0 ft below land-surface datum, August 1949.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	19.31	18.58	18.29	18.27	18.53	18.82	18.62	18.08	19.00	18.73	19.76	20.05
10	19.08	18.39	18.33	18.45	18.64	18.75	18.41	17.79	19.53	18.91	19.79	19.85
15	19.10	18.52	18.14	18.18	18.40	18.71	18.32	17.84	19.02	19.07	19.93	19.93
20	18.96	18.44	18.30	18.36	18.67	18.85	18.85	18.24	19.09	19.09	19.73	20.03
25	18.78	18.36	18.13	18.42	18.67	18.85	18.41	18.23	19.09	19.04	19.73	20.07
EOM	18.72	18.43	18.25	18.87	18.50	18.66	18.31	18.70	18.86	19.87	19.78	19.96
WTR YR 1999	HIGHEST			17.59	MAY 13			LOWEST	20.28	SEP 4		



GROUND-WATER LEVELS

INGHAM COUNTY

423805084311801. Local number, 3N 2W 23BCBD.

LOCATION.--Lat 42°38'05", long 84°31'18", Hydrologic Unit 04050004, at Holt High School, at Sycamore Street, Delhi Township in Holt. Owner: Holt High School.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in., depth 188 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 895 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

REMARKS.--Water levels affected by regional pumping.

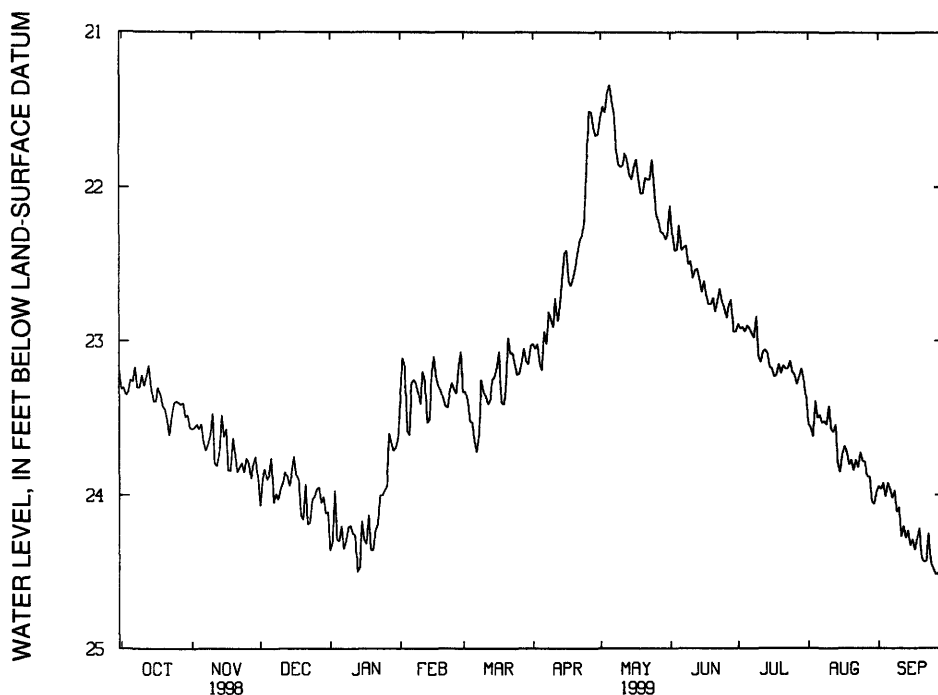
PERIOD OF RECORD.--March 1982 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 18.3 ft below land-surface datum, May 1983; lowest recorded, 26.34 ft below land-surface datum, June 5, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	23.25	23.54	23.87	24.30	23.61	23.53	23.19	21.34	22.25	22.90	23.50	23.92
10	23.22	23.47	23.96	24.20	23.41	23.32	22.91	21.87	22.48	23.10	23.42	24.08
15	23.39	23.62	23.85	24.17	23.22	23.23	22.43	21.95	22.68	23.17	23.85	24.33
20	23.44	23.73	24.16	24.36	23.37	23.31	22.52	22.04	22.72	23.21	23.77	24.42
25	23.39	23.76	24.01	23.97	23.31	23.22	21.87	22.00	22.78	23.20	23.78	24.48
EOM	23.56	23.89	24.11	23.63	23.07	23.03	21.66	22.30	22.94	23.37	23.98	24.55

WTR YR 1999 HIGHEST 21.20 MAY 6 LOWEST 24.55 SEP 28, 30



GROUND-WATER LEVELS

INGHAM COUNTY

424235084311201. Local number, 4N 2W 27BB.

LOCATION.--Lat 42°42'35", long 84°31'12", Hydrologic Unit 04050004, at Fenner Arboretum in Lansing. Owner: U.S. Geological Survey.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 215 ft, cased to 51 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 835 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.7 ft above land-surface datum.

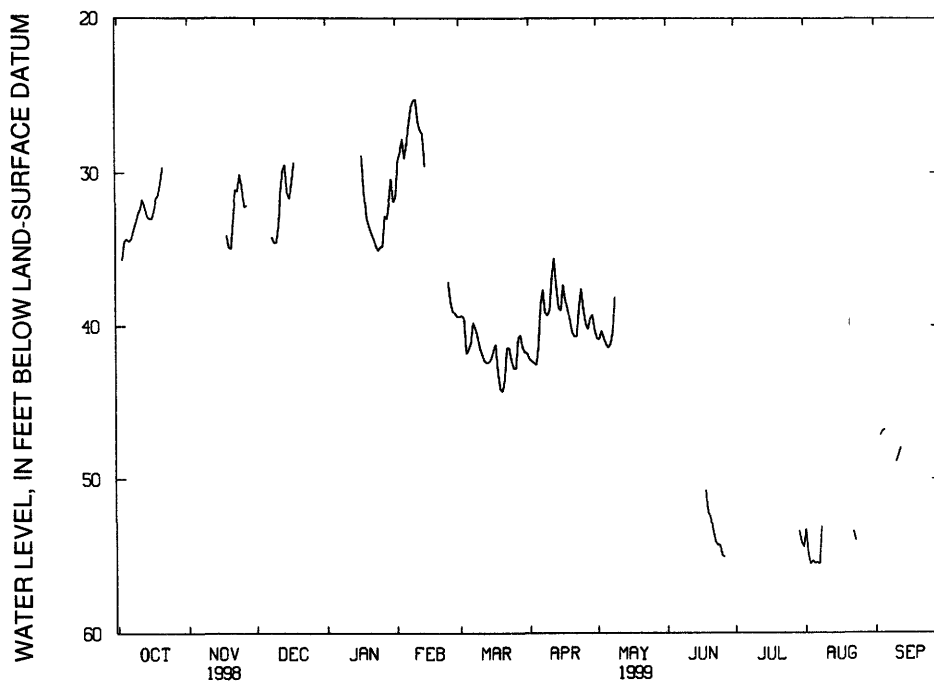
REMARKS.--Water levels affected by regional pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 20.24 ft below land-surface datum, Dec. 29, 1993; lowest recorded, 89.5 ft below land-surface datum, October 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	34.31	---	---	---	29.06	41.50	41.38	41.18	---	---	55.45	46.77
10	32.68	---	34.57	---	25.24	41.43	38.96	---	---	---	---	48.89
15	32.96	---	31.26	---	---	42.10	38.98	---	---	---	---	---
20	30.67	34.95	---	33.44	---	44.28	40.41	---	52.49	---	---	---
25	---	30.83	---	34.84	38.38	42.75	38.86	---	54.94	---	---	---
EOM	---	---	---	31.90	39.38	41.78	40.25	---	---	54.42	---	---
WTR YR 1999	HIGHEST			24.73	FEB 9	LOWEST			55.49	AUG 3, 7		



GROUND-WATER LEVELS

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 measurements prior to August 1960.

DATUM.--Elevation of land-surface datum is 858.72 ft above sea level. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

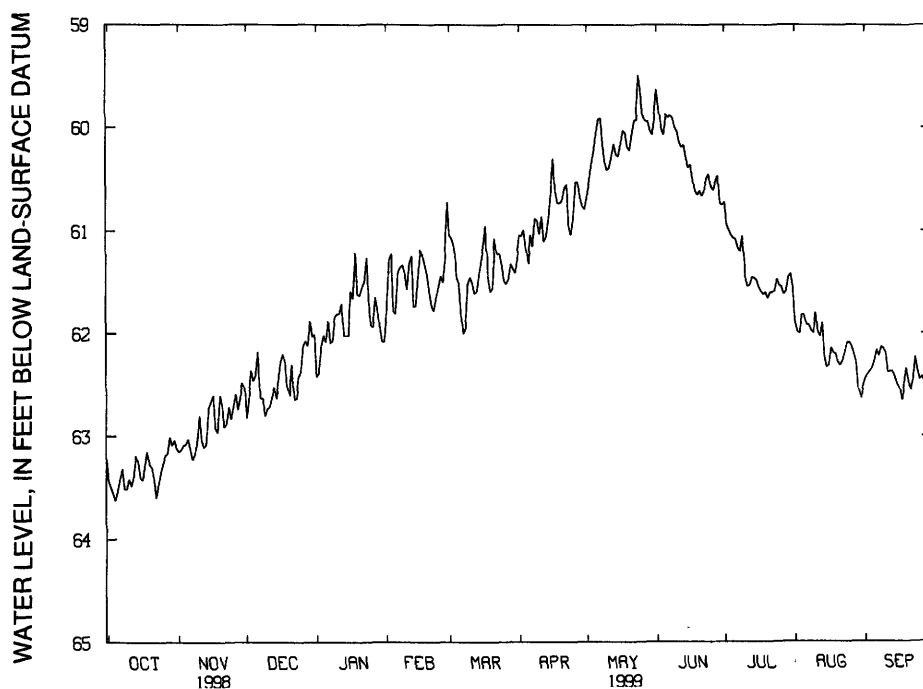
REMARKS.--Water levels affected by regional pumping.

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 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	63.54	63.03	62.41	62.08	61.81	61.51	61.32	60.06	59.87	61.07	61.82	62.27
10	63.42	62.80	62.73	61.81	61.57	61.45	61.03	60.41	60.04	61.45	61.80	62.19
15	63.41	62.66	62.47	62.02	61.41	61.27	60.63	60.28	60.39	61.48	62.33	62.49
20	63.31	62.70	62.60	61.63	61.60	61.56	60.70	60.22	60.61	61.66	62.28	62.46
25	63.26	62.71	62.38	61.93	61.44	61.48	60.88	59.65	60.57	61.53	62.09	62.45
EOM	63.12	62.52	62.01	62.08	60.72	61.24	60.79	59.90	60.75	61.55	62.52	62.40
WTR YR 1999	HIGHEST		59.40	MAY 24		LOWEST		63.63	OCT 4			



GROUND-WATER LEVELS

INGHAM COUNTY

424502084331301. Local number, 4N 2W 9BDAD.

LOCATION.--Lat 42°45'02", 84°33'13", Hydrologic Unit 04050004, at North Grand River Avenue, Lansing Township in Lansing. Owner: City of Lansing.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 14 in., depth 401 ft, cased to 49 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 828.81 ft above sea level. Measuring point: Plywood instrument shelf, 4.0 ft above land-surface datum.

REMARKS.--Water levels affected by regional pumping.

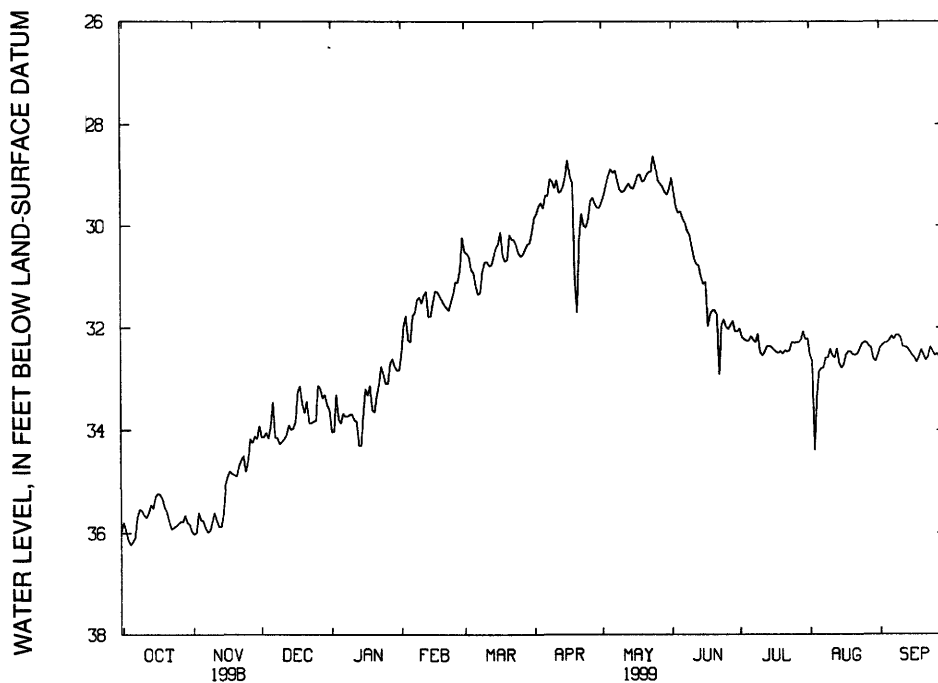
PERIOD OF RECORD.--1929 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 15.6 ft below land-surface datum, March 1931; lowest recorded, 179.4 ft below land-surface datum, April 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	36.17	35.76	33.92	33.87	32.27	30.92	29.65	28.88	29.71	32.25	32.85	32.24
10	35.65	35.60	34.22	33.69	31.52	30.71	29.25	29.33	30.42	32.46	32.41	32.19
15	35.29	35.07	33.96	33.69	31.51	30.43	28.98	29.26	31.14	32.37	32.78	32.53
20	35.59	34.90	33.66	33.65	31.55	30.66	31.70	29.10	31.66	32.50	32.52	32.52
25	35.82	34.60	33.82	33.08	31.10	30.53	29.87	28.83	31.98	32.29	32.28	32.54
EOM	35.97	33.91	33.60	32.82	30.22	30.13	29.64	29.27	32.07	32.21	32.53	32.50
WTR YR 1999	HIGHEST		28.36	APR 16		LOWEST		36.23	OCT 4			



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421127085321701. Local number, 3S 11W 24DBCA.

LOCATION.--Lat 42°11'27", long 85°32'17", Hydrologic Unit 04050003, in Ramona Park in Portage. Owner: City of Portage.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 183 ft, screened 178 ft to 183 ft.

INSTRUMENTATION.--Weekly measurement.

DATUM.--Elevation of land-surface datum is 861.77 ft above sea level (levels by City of Portage). Measuring point: Top of casing, 0.3 ft below land-surface datum.

REMARKS.--Water level measurements provided by City of Portage.

PERIOD OF RECORD.--March 1999 to September 1999.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 12.35 ft below land-surface datum, May 14, 1999; lowest measured, 14.37 ft below land-surface datum, Sept. 24, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 3	12.50	APR 16	12.80	MAY 27	12.52	JUL 8	13.02	AUG 13	13.82	SEP 9	13.93
MAR 17	12.60	APR 21	13.15	JUN 4	12.68	JUL 16	13.20	AUG 20	14.21	SEP 16	13.96
MAR 25	12.75	APR 30	12.57	JUN 11	12.75	JUL 23	13.51	AUG 27	13.85	SEP 24	14.37
APR 2	13.22	MAY 14	12.35	JUN 24	12.70	JUL 30	13.38	SEP 2	13.77	SEP 30	13.95
APR 9	13.11	MAY 20	12.45	JUL 1	12.61	AUG 6	13.85	SEP 8	13.86		

GROUND-WATER LEVELS

KALAMAZOO COUNTY

421150085383901. Local number, 3S 11W 19BDD1.

LOCATION.--Lat 42°11'50", long 85°38'39", Hydrologic Unit 04050003, in Gourdneck State Game Area, near intersection of Angling Road and Centre Avenue, 1.5 mi southwest of Portage. Owner: Pharmacia & Upjohn.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 65 ft, screened 63 ft to 65 ft.

INSTRUMENTATION.--Water-level recorder.

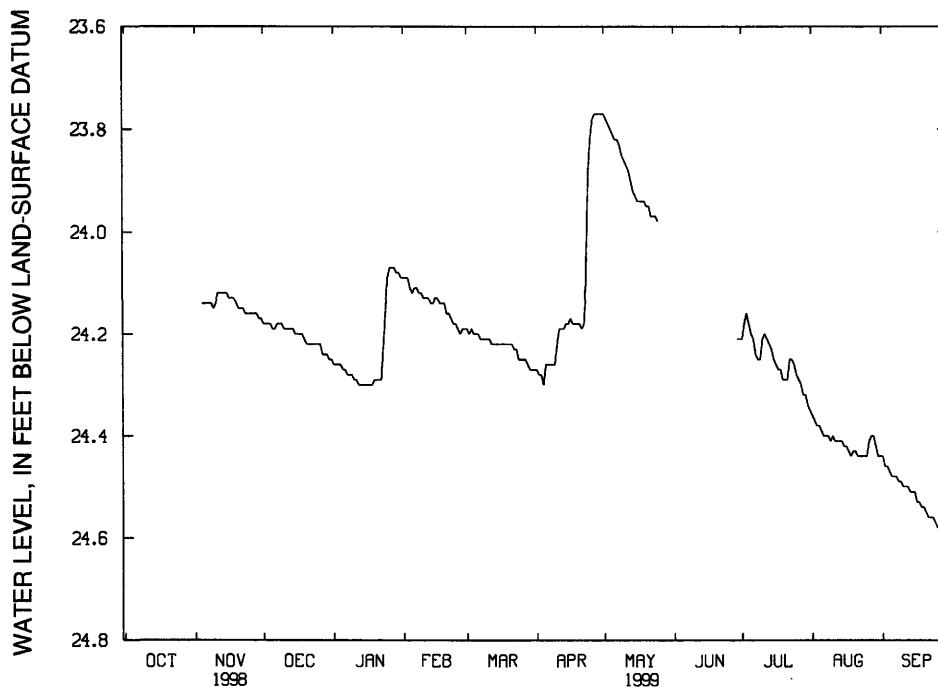
DATUM.--Elevation of land-surface datum is 890.18 ft above sea level. Measuring point: Plywood shelter base, 2.8 ft above land-surface datum.

PERIOD OF RECORD.--November 1998 to September 1999.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 23.76 ft below land-surface datum, Apr. 28, 29, 1999; lowest recorded, 24.59 ft below land-surface datum, Sept. 27, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	24.14	24.19	24.27	24.12	24.20	24.26	23.81	---	24.20	24.39	24.48
10	---	24.14	24.19	24.29	24.13	24.21	24.22	23.86	---	24.21	24.40	24.50
15	---	24.12	24.20	24.30	24.13	24.22	24.18	23.93	---	24.25	24.42	24.51
20	---	24.15	24.22	24.29	24.16	24.22	24.18	23.95	---	24.29	24.43	24.55
25	---	24.16	24.22	24.09	24.19	24.25	23.82	23.98	---	24.28	24.44	24.58
EOM	---	24.17	24.25	24.09	24.19	24.27	23.77	---	24.21	24.35	24.44	24.52
WTR YR 1999	HIGHEST			23.76	APR 28, 29			LOWEST	24.59	SEP 27		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421150085383902. Local number, 3S 11W 19BDD2.

LOCATION.--Lat 42°11'50", long 85°38'39", Hydrologic Unit 04050003, in Gourdneck State Game Area, near intersection of Angling Road and Centre Avenue, 1.5 mi southwest of Portage. Owner: Pharmacia & Upjohn.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 177 ft, screened 175 ft to 177 ft.

INSTRUMENTATION.--Water-level recorder.

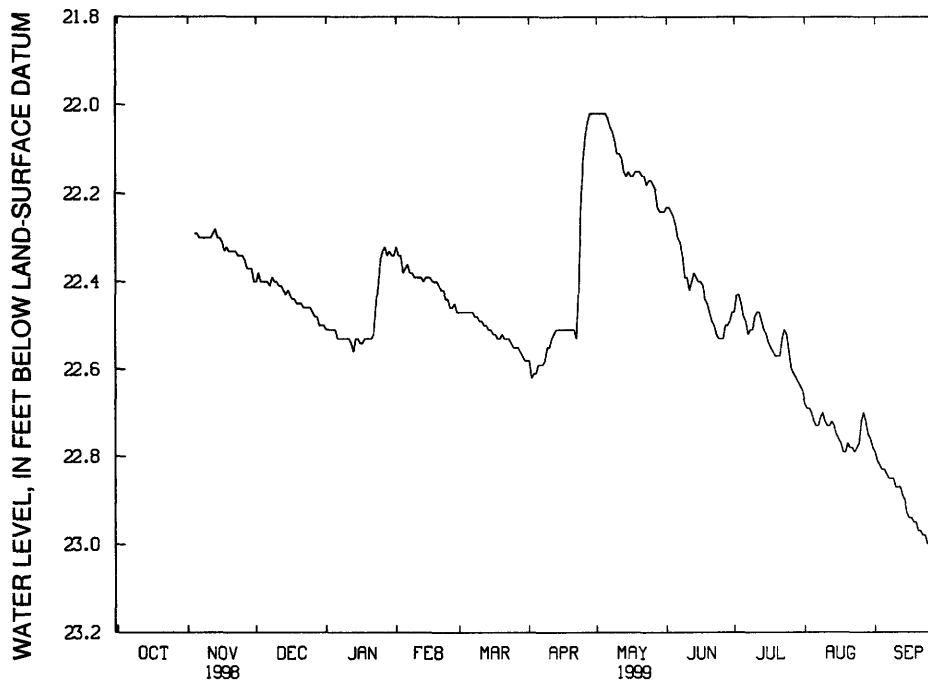
DATUM.--Elevation of land-surface datum is 889.90 ft above sea level. Measuring point: Plywood shelter base, 3.0 ft above land-surface datum.

PERIOD OF RECORD.--November 1998 to September 1999.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 22.00 ft below land-surface datum, Apr. 30 - May 3, 1999; lowest recorded, 23.01 ft below land-surface datum, Sept. 27, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	--	22.29	22.40	22.51	22.37	22.47	22.59	22.02	22.27	22.48	22.72	22.83
10	--	22.30	22.40	22.53	22.39	22.49	22.55	22.11	22.39	22.48	22.72	22.87
15	--	22.30	22.42	22.53	22.39	22.51	22.51	22.15	22.40	22.52	22.75	22.93
20	--	22.33	22.45	22.53	22.41	22.52	22.51	22.15	22.47	22.57	22.77	22.97
25	--	22.34	22.46	22.35	22.46	22.55	22.12	22.17	22.53	22.56	22.77	22.00
EOM	--	22.40	22.50	22.34	22.47	22.58	22.02	22.24	22.47	22.65	22.78	22.91
WTR YR 1999		HIGHEST	22.00	APR 30 - MAY 3	LOWEST	23.01	SEP 27					



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421151085351601. Local number, 3S 11W 22BBCD.

LOCATION.--Lat 42°11'51", long 85°35'16", Hydrologic Unit 04050003, at Portage Central High School, Kalamazoo Township in Portage.

Owner: Portage Public Schools.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 12 in., depth 102 ft, screened 87 ft to 102 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 877 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.0 ft above land-surface datum.

REMARKS.--Water levels affected by pumping.

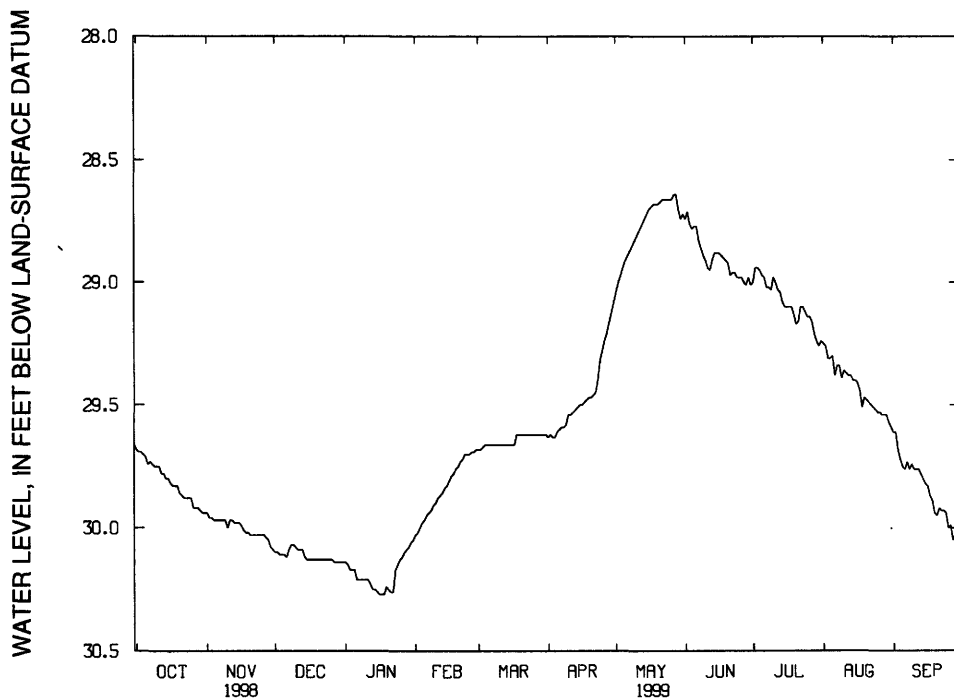
PERIOD OF RECORD.--June 1982 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 24.8 ft below land-surface datum, April 1985; lowest recorded, 30.27 ft below land-surface datum, Jan. 16-18, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	29.71	29.97	30.11	30.17	29.97	29.66	29.61	28.92	28.77	28.97	29.30	29.75
10	29.75	30.00	30.08	30.21	29.90	29.66	29.54	28.82	28.91	28.98	29.36	29.76
15	29.80	29.98	30.13	30.26	29.83	29.66	29.50	28.72	28.88	29.10	29.40	29.82
20	29.86	30.03	30.13	30.25	29.75	29.62	29.47	28.68	28.92	29.17	29.48	29.95
25	29.88	30.03	30.13	30.13	29.70	29.62	29.28	28.66	28.98	29.14	29.53	30.00
EOM	29.94	30.09	30.14	30.05	29.68	29.62	29.09	28.72	29.01	29.24	29.59	29.99

WTR YR 1999 HIGHEST 28.61 MAY 26 LOWEST 30.27 JAN 16-18



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421325085404801. Local number, 3S 12W 11BDAD.

LOCATION.--Lat 42°13'25", long 85°40'48", 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, screened 245 ft to 248 ft.

INSTRUMENTATION.--Water-level recorder.

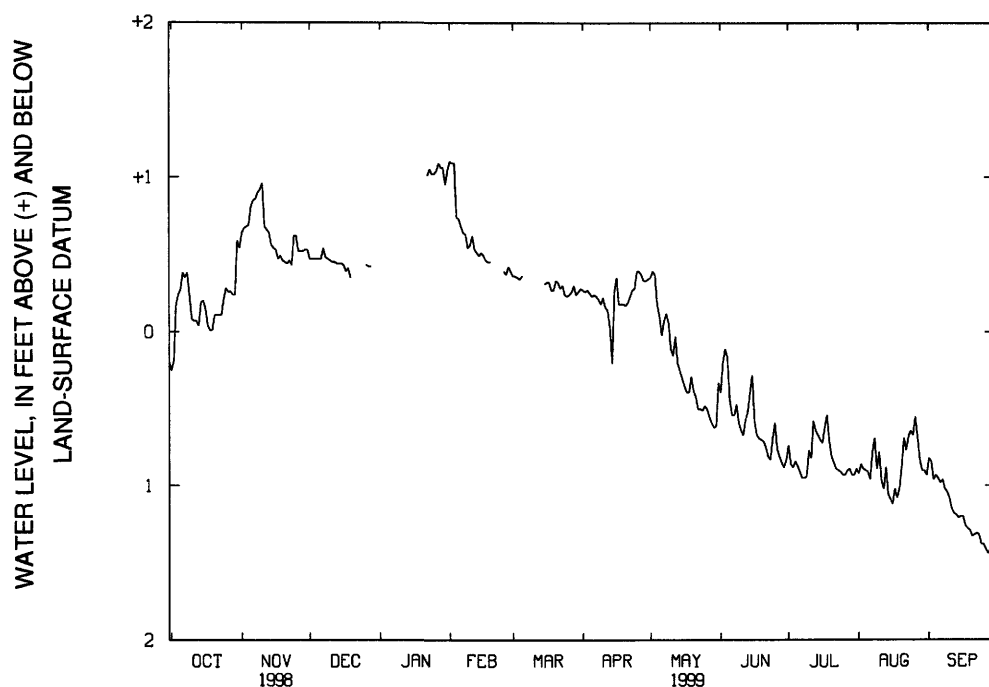
DATUM.--Elevation of land-surface datum is 880 ft above sea level, from topographic map. Measuring point: Top of shelter base, 3.5 ft above land-surface datum.

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, 1.44 ft below land-surface datum, Sept. 27, 1999.

WATER LEVEL, IN FEET ABOVE (+) AND BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	+.27	+.81	+.47	---	+.73	+.36	+.23	+.10	.44	.87	.91	.95
10	+.08	+.96	+.46	---	+.56	---	+.22	.11	.64	.77	.78	1.08
15	+.20	+.54	+.44	---	+.51	+.31	+.26	.30	.28	.70	1.09	1.20
20	+.11	+.45	---	---	---	+.33	+.17	.38	.71	.81	.88	1.33
25	+.28	+.62	---	+1.02	+.39	+.23	+.39	.48	.59	.93	.67	1.38
EOM	+.54	+.53	---	+1.04	+.39	+.28	+.34	.33	.83	.89	.93	1.14
WTR YR 1999	HIGHEST			+1.13	FEB 2			LOWEST	1.44	SEP 27		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421332085401901. Local number, 3S 12W 11AD1.

LOCATION.--Lat 42°13'32", long 85°40'19", Hydrologic Unit 04050003, at Al Sabo Land Preserve, Texas Township, 3.0 mi west of Portage. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 300 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 877 ft above sea level. Measuring point: Plywood instrument shelf, 2.5 ft above land-surface datum.

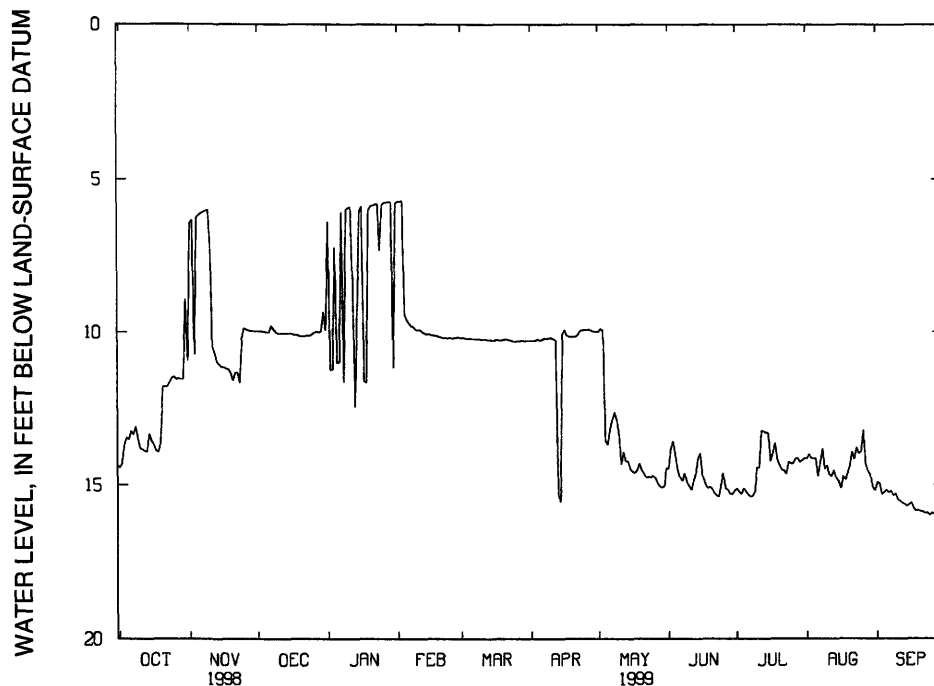
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.5 ft below land-surface datum, July 1973; lowest recorded, 17.09 ft below land-surface datum, July 20, 1994.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.52	6.18	10.01	11.02	9.60	10.21	10.28	13.69	14.51	15.21	14.14	15.17
10	13.81	7.15	10.05	5.94	9.94	10.25	10.19	13.39	15.05	14.44	14.37	15.48
15	13.56	11.15	10.05	6.04	10.07	10.27	10.08	14.48	13.97	13.31	14.89	15.65
20	11.78	11.59	10.14	5.88	10.17	10.25	10.15	14.52	15.12	14.36	14.40	15.87
25	11.46	9.87	10.07	5.83	10.20	10.31	9.93	14.71	14.62	14.31	13.92	15.92
EOM	10.94	9.97	9.94	5.79	10.17	10.29	9.99	14.46	15.19	14.14	15.19	15.37
WTR YR 1999		HIGHEST	5.71	FEB 2-4		LOWEST	16.05	SEP 27				



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421332085401902. Local number, 3S 12W 22AD2.

LOCATION.--Lat 42°13'32", long 85°40'19", Hydrologic Unit 04050003, at Al Sabo Land Preserve, Texas Township, 3.0 mi west of Portage. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 38 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 877 ft above sea level. Measuring point: Plywood instrument shelf, 2.5 ft above land-surface datum.

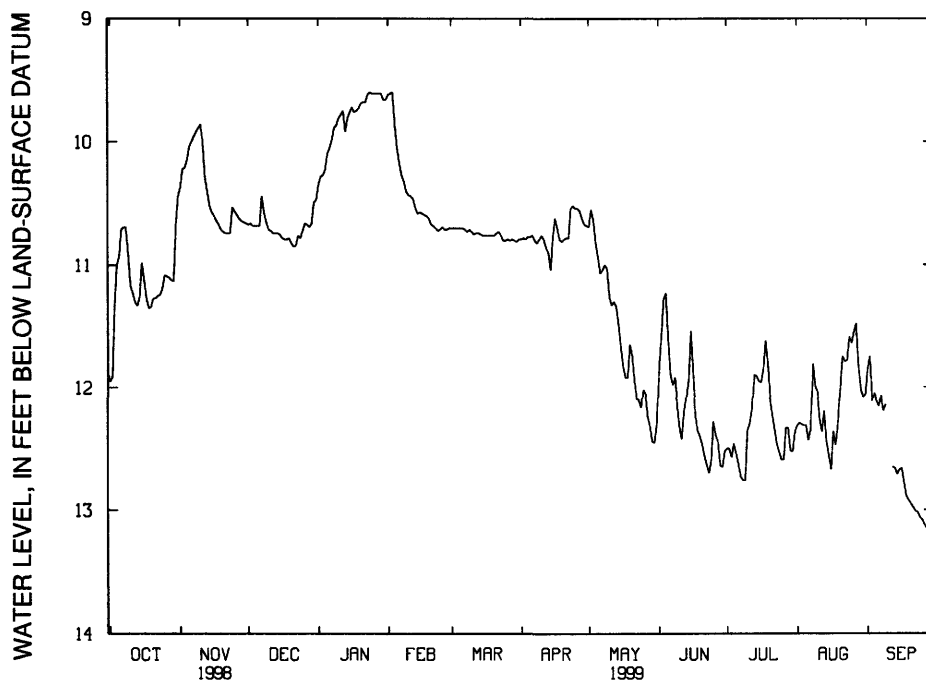
REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--January 1973 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.1 ft below land-surface datum, August 1975; lowest recorded, 13.15 ft below land-surface datum, Sept. 27, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.93	10.04	10.68	10.10	10.05	10.70	10.77	10.94	11.61	12.54	12.31	12.11
10	11.17	9.86	10.71	9.81	10.43	10.73	10.76	11.26	12.32	12.35	12.04	---
15	10.98	10.57	10.75	9.76	10.57	10.76	10.78	11.67	11.54	11.95	12.56	12.67
20	11.27	10.73	10.82	9.69	10.67	10.76	10.79	11.74	12.46	12.09	12.00	12.95
25	11.08	10.56	10.72	9.61	10.69	10.80	10.54	12.02	12.28	12.59	11.64	13.08
EOM	10.44	10.66	10.47	9.66	10.70	10.79	10.68	12.30	12.52	12.36	12.06	12.53
WTR YR 1999	HIGHEST		9.59	JAN 23, 24, FEB 3, 4			LOWEST	13.15	SEP 27			



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421358085322401. Local number, 3S 11W 1DCBB.

LOCATION.--Lat 42°13'58", long 85°32'24", Hydrologic Unit 04050003, near intersection of Sprinkle Road and Winthrop Avenue in Portage.

Owner: City of Portage.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 2 in., depth 179 ft, screened 134 ft to 179 ft.

INSTRUMENTATION.--Weekly measurement.

DATUM.--Elevation of land-surface datum is 856.64 ft above sea level (levels by City of Portage). Measuring point: Top of casing, 2.0 ft above land-surface datum.

REMARKS.--Water level measurements provided by City of Portage.

PERIOD OF RECORD.--March 1999 to September 1999.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 15.62 ft below land-surface datum, May 14, 1999; lowest measured, 17.78 ft below land-surface datum, Apr. 2, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 3	17.27	APR 9	17.70	MAY 20	15.72	JUL 1	16.35	AUG 6	17.01	SEP 8	17.34
MAR 12	17.45	APR 16	17.50	MAY 27	15.85	JUL 8	16.65	AUG 13	17.11	SEP 9	17.37
MAR 17	17.50	APR 21	17.42	JUN 4	15.98	JUL 16	16.65	AUG 20	17.23	SEP 16	17.50
MAR 25	17.54	APR 29	16.24	JUN 11	16.30	JUL 23	16.71	AUG 27	17.25	SEP 24	17.68
APR 2	17.78	MAY 14	15.62	JUN 24	16.38	JUL 30	16.72	SEP 2	17.22	SEP 30	17.67

GROUND-WATER LEVELS

KALAMAZOO COUNTY

421435085353701. Local number, 3S 11W 4BAD1.

LOCATION.--Lat 42°14'35", long 85°35'37", Hydrologic Unit 04050003, at Kilgore Road pump station No. 9 in Kalamazoo. Owner: C'ty of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 36 ft, screened 33 ft to 36 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 860 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

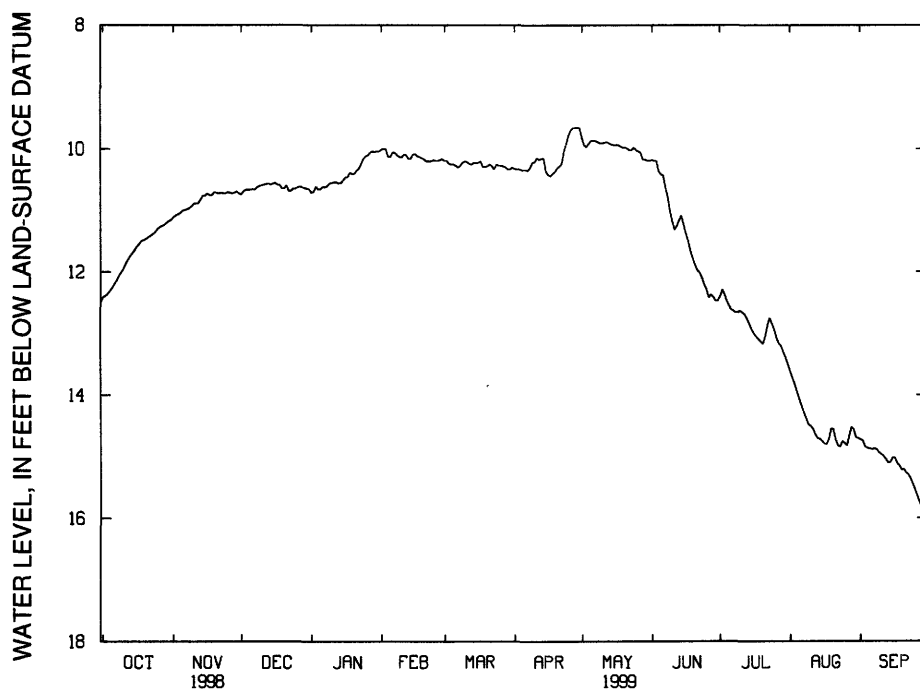
REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--September 1987 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.17 ft below land-surface datum, Apr. 27, 1993; lowest recorded, 17.27 ft below land-surface datum, Sept. 27, 1996.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	12.26	11.00	10.66	10.65	10.13	10.25	10.34	9.87	10.41	12.55	14.07	14.87
10	11.95	10.89	10.59	10.55	10.14	10.20	10.21	9.91	11.18	12.63	14.50	14.96
15	11.64	10.76	10.56	10.51	10.09	10.23	10.36	9.94	11.22	12.93	14.75	15.02
20	11.46	10.71	10.64	10.40	10.17	10.28	10.31	9.98	11.88	13.17	14.55	15.21
25	11.30	10.70	10.64	10.12	10.19	10.27	9.79	10.02	12.28	12.93	14.78	15.56
EOM	11.15	10.72	10.65	10.04	10.16	10.30	9.66	10.19	12.47	13.50	14.70	15.96
WTR YR 1999	HIGHEST		9.64	APR 27, 28		LOWEST		15.96	SEP 30			



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421435085353702. Local number, 3S 11W 4BAD2.

LOCATION.--Lat 42°14'35", long 85°35'37", Hydrologic Unit 04050003, at Kilgore Road pump station No. 9 in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 148 ft, screened 145 ft to 148 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 860 ft above sea level, from topographic map. Measuring point: Plywood instrument staff, 3.0 ft above land-surface datum.

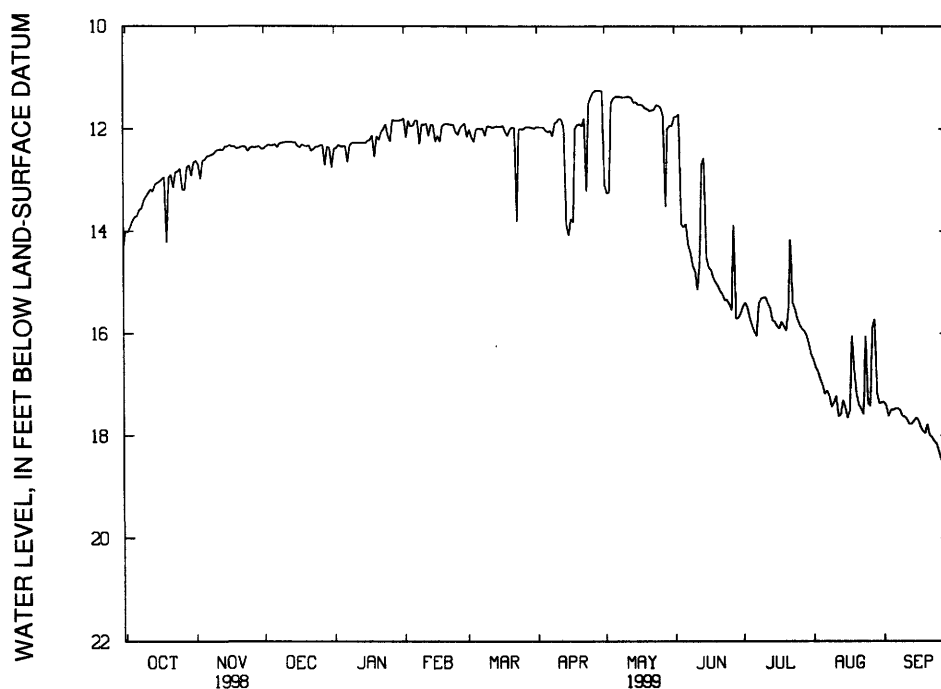
REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--September 1987 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 10.73 ft below land-surface datum, May 4, 5, 1993; lowest recorded, 20.08 ft below land-surface datum, Sept. 20, 1996.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.72	12.60	12.32	12.34	11.94	12.01	12.03	11.41	13.92	15.84	17.01	17.50
10	13.32	12.42	12.26	12.27	11.92	11.95	11.86	11.39	14.79	15.30	17.35	17.63
15	13.05	12.34	12.26	12.27	12.24	11.96	14.08	11.48	14.52	15.77	17.45	17.65
20	12.95	12.37	12.34	12.14	11.90	12.01	11.91	11.61	15.07	15.94	17.20	17.78
25	12.77	12.37	12.35	12.13	12.11	12.00	11.39	11.55	15.43	15.72	17.37	18.30
EOM	12.65	12.39	12.75	11.83	11.89	11.99	11.27	11.94	15.61	16.41	17.35	18.72
WTR YR 1999	HIGHEST			11.26	APR 26 - MAY 1			LOWEST	19.38	SEP 29		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421448085383601. Local number, 2S 11W 31CD.

LOCATION.--Lat 42°14'48", long 85°38'36", Hydrologic Unit 04050003, at city well field, 1,000 ft from U.S. Highway 131 in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 226 ft, screened 216 ft to 226 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 910 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

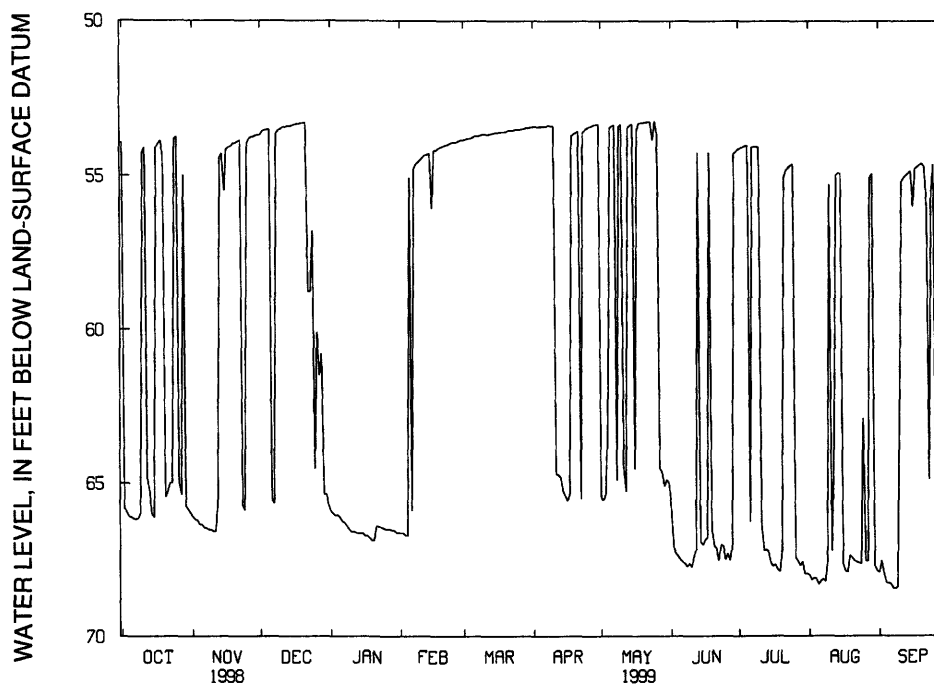
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 41.39 ft below land-surface datum, Sept. 12, 1982; lowest recorded, 71.75 ft below land-surface datum, May 22, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	66.10	66.35	53.51	66.12	55.07	53.78	53.42	53.47	67.49	54.04	68.31	68.26
10	54.27	66.57	53.51	66.59	54.50	53.68	53.40	53.35	67.73	54.09	55.29	62.42
15	66.11	55.48	53.40	66.63	56.06	53.62	65.43	53.35	67.01	67.59	54.92	54.86
20	65.45	53.96	53.32	66.86	54.06	53.59	53.62	53.29	67.06	67.26	67.43	54.62
25	53.76	53.97	64.53	66.50	53.93	53.52	53.48	53.24	67.49	54.64	62.89	54.65
EOM	65.97	53.70	65.70	66.62	53.86	53.44	53.34	65.01	54.24	67.96	67.87	54.53
WTR YR 1999	HIGHEST			53.23	MAY 23-26			LOWEST	68.45	SEP 8		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421457085325801. Local number, 2S 11W 36CB.

LOCATION.--Lat 42°14'57", long 85°32'58", Hydrologic Unit 04050003, in city well field, 500 ft from Emerald Street in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 226 ft, screened 216 ft to 226 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 860 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.5 ft above land-surface datum.

REMARKS.--Water levels affected by pumping.

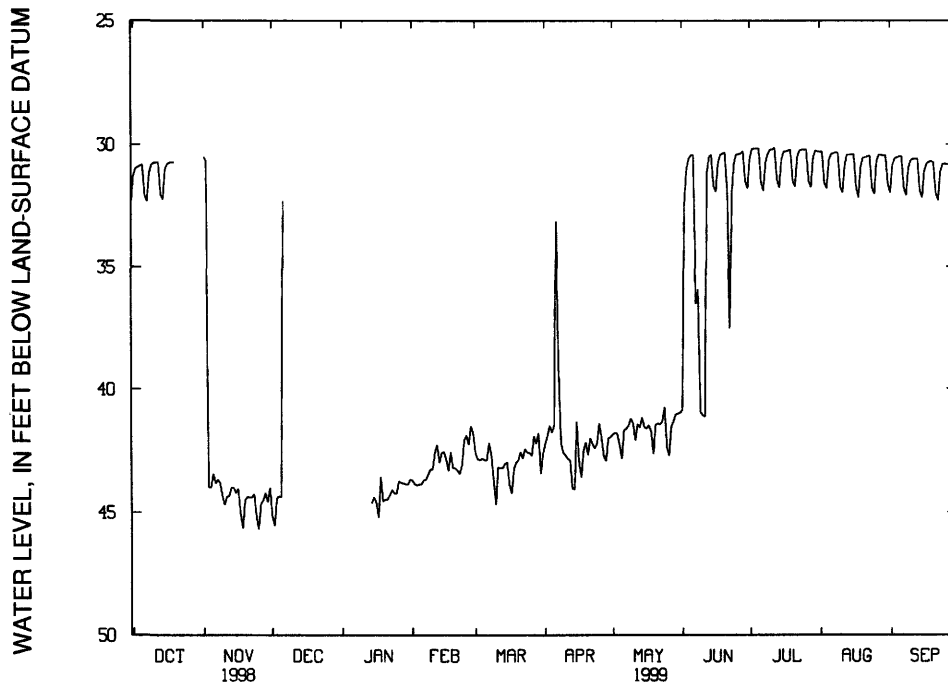
PERIOD OF RECORD.--August 1969 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 25.35 ft below land-surface datum, April 1985; lowest recorded, 50.4 ft below land-surface datum, June 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	30.82	43.45	44.37	---	43.87	42.89	41.49	42.83	30.45	30.17	30.66	30.50
10	30.73	44.69	---	---	43.26	44.67	42.69	41.38	41.09	30.22	31.74	30.66
15	30.98	44.20	---	44.38	42.56	42.99	41.33	41.55	31.70	30.63	30.42	32.18
20	---	44.37	---	44.47	43.22	42.89	42.68	41.45	30.33	31.52	30.55	30.74
25	---	45.69	---	44.23	41.89	42.60	41.39	42.39	30.42	30.23	32.02	30.79
EOM	---	44.01	---	43.68	41.81	42.63	41.96	40.96	31.80	30.30	31.63	31.48

WTR YR 1999 HIGHEST 30.12 JUL 12 LOWEST 45.69 NOV 25



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421552085384001. Local number, 2S 11W 30CBDC1.

LOCATION.--Lat 42°15'52", long 85°38'40", Hydrologic Unit 04050003, at Western Michigan University Baker Farm in Kalamazoo. Owner: Western Michigan University.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 5 in., depth 240 ft, screened 215 ft to 240 ft.

INSTRUMENTATION.--Water-level recorder.

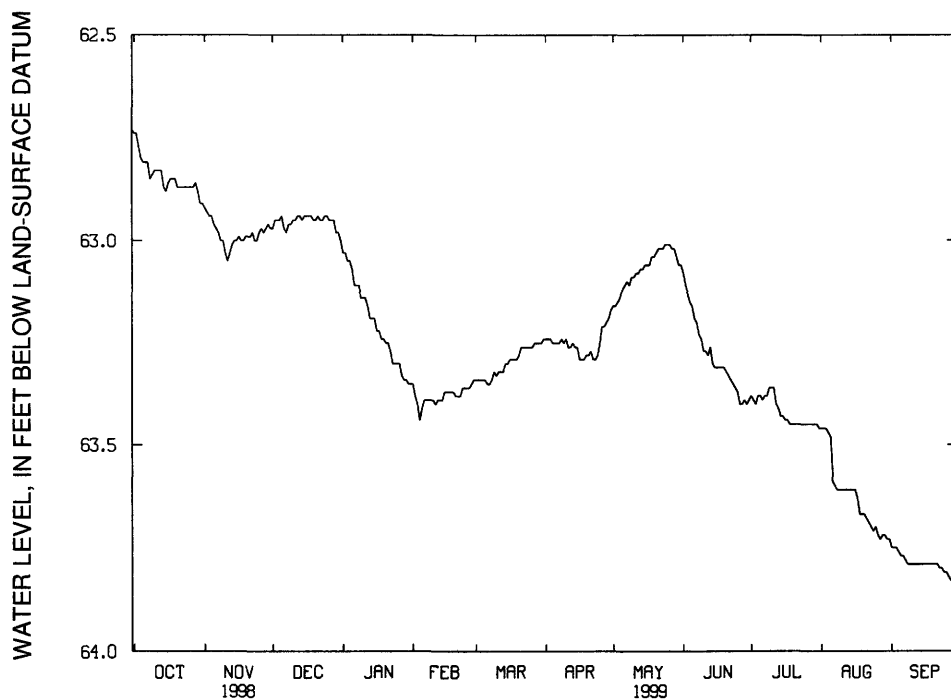
DATUM.--Elevation of land-surface datum is 936.01 ft above sea level (levels by City of Kalamazoo). Measuring point: Plywood shelter base, 1.6 ft above land-surface datum.

PERIOD OF RECORD.--October 1998 to September 1999.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 62.72 ft below land-surface datum, Oct. 1, 1998; lowest recorded, 63.83 ft below land-surface datum, Sept. 27-30, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	62.81	62.96	62.94	63.07	63.41	63.34	63.25	63.12	63.16	63.38	63.48	63.77
10	62.83	63.03	62.95	63.14	63.39	63.33	63.24	63.09	63.27	63.36	63.61	63.79
15	62.88	63.00	62.94	63.19	63.37	63.30	63.26	63.06	63.31	63.43	63.61	63.79
20	62.87	62.99	62.95	63.25	63.38	63.28	63.28	63.03	63.32	63.45	63.67	63.79
25	62.87	62.98	62.94	63.30	63.36	63.26	63.25	63.01	63.37	63.45	63.70	63.81
EOM	62.91	62.97	63.00	63.35	63.34	63.24	63.17	63.06	63.39	63.46	63.73	63.83
WTR YR 1999	HIGHEST		62.72	OCT 1		LOWEST		63.83	SEP 27-30			



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421552085384002. Local number, 2S 11W 30CBDC2.

LOCATION.--Lat 42°15'52", long 85°38'40", Hydrologic Unit 04050003, at Western Michigan University Baker Farm in Kalamazoo. Owner: Western Michigan University.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 89 ft, screened 74 ft to 89 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 936.84 ft above sea level (levels by City of Kalamazoo). Measuring point: Plywood shelter base, 3.0 ft above land-surface datum.

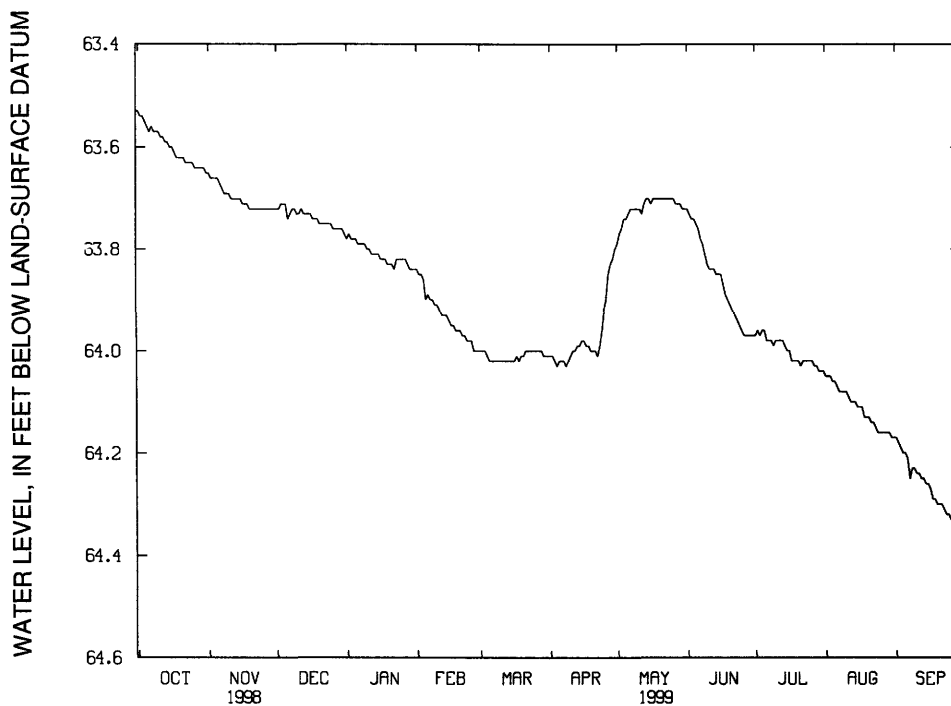
PERIOD OF RECORD.--October 1998 to September 1999.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 63.52 ft below land-surface datum, Oct. 1, 1998; lowest recorded, 64.35 ft below land-surface datum, Sept. 28, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	63.56	63.66	63.71	63.78	63.90	64.02	64.02	63.74	63.75	63.96	64.06	64.20
10	63.57	63.69	63.73	63.80	63.91	64.02	64.01	63.72	63.83	63.98	64.08	64.24
15	63.60	63.70	63.73	63.81	63.94	64.02	63.98	63.70	63.85	64.00	64.11	64.26
20	63.62	63.72	63.75	63.83	63.96	64.01	64.00	63.70	63.91	64.02	64.13	64.30
25	63.63	63.72	63.75	63.82	63.98	64.00	63.92	63.70	63.96	64.02	64.16	64.33
EOM	63.65	63.72	63.77	63.84	64.00	64.01	63.80	63.72	63.97	64.04	64.17	64.34

WTR YR 1999 HIGHEST 63.52 OCT 1 LOWEST 64.35 SEP 28, 29



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421614085270801. Local number, 2S 10W 26BBCC.

LOCATION.--Lat 42°16'14", long 85°27'08", Hydrologic Unit 04050003, at end of Miller Road by Morrow Lake, Comstock Township, 4 mi east of Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 27 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 790 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.5 ft above land-surface datum.

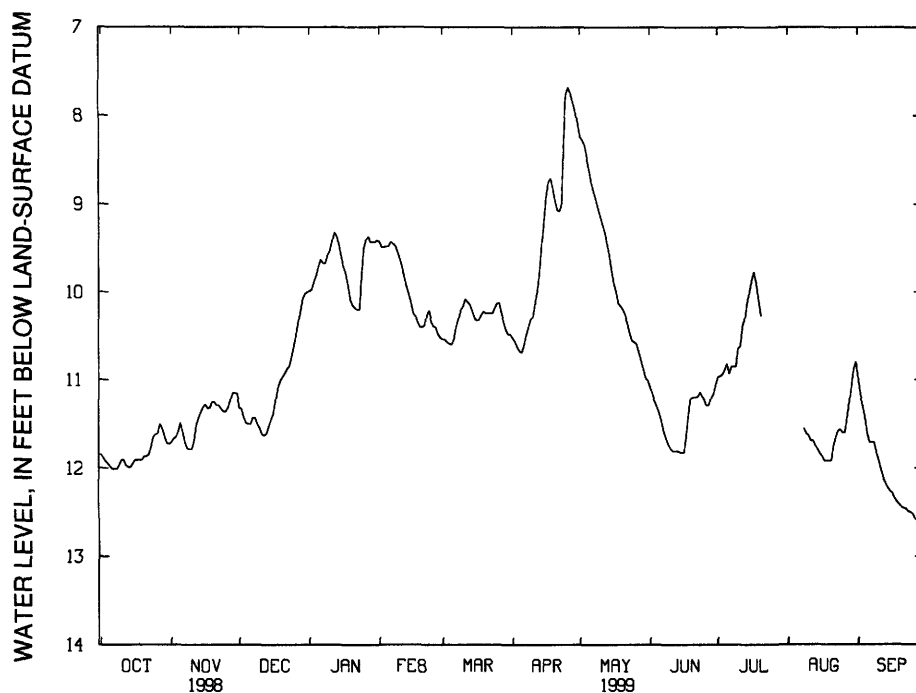
REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--February 1987 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 5.88 ft below land-surface datum, Apr. 7-11, 1988; lowest recorded, 13.14 ft below land-surface datum, Sept. 13-15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.98	11.49	11.50	9.71	9.48	10.60	10.69	8.60	11.37	10.82	---	11.61
10	11.91	11.79	11.55	9.53	9.62	10.16	10.28	9.14	11.78	10.64	11.63	11.92
15	11.95	11.31	11.45	9.58	10.13	10.29	9.18	9.74	11.83	10.00	11.84	12.26
20	11.87	11.25	10.97	10.15	10.40	10.24	8.96	10.20	11.20	10.27	11.92	12.44
25	11.62	11.36	10.63	9.51	10.39	10.13	7.76	10.57	11.22	---	11.60	12.52
EOM	11.73	11.16	10.00	9.41	10.52	10.48	8.08	11.01	11.06	---	10.80	12.29
WTR YR 1999	HIGHEST 7.68			APR 25-27			LOWEST 12.58		SEP 26, 27			



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421614085354001. Local number, 2S 11W 28AA.

LOCATION.--Lat 42°16'14", long 85°35'40", Hydrologic Unit 04050003, near intersection of Peeler Street and Crosstown Parkway in Kalamazoo.

Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 245 ft, screened 235 ft to 245 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 820 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 4.0 ft above land-surface datum.

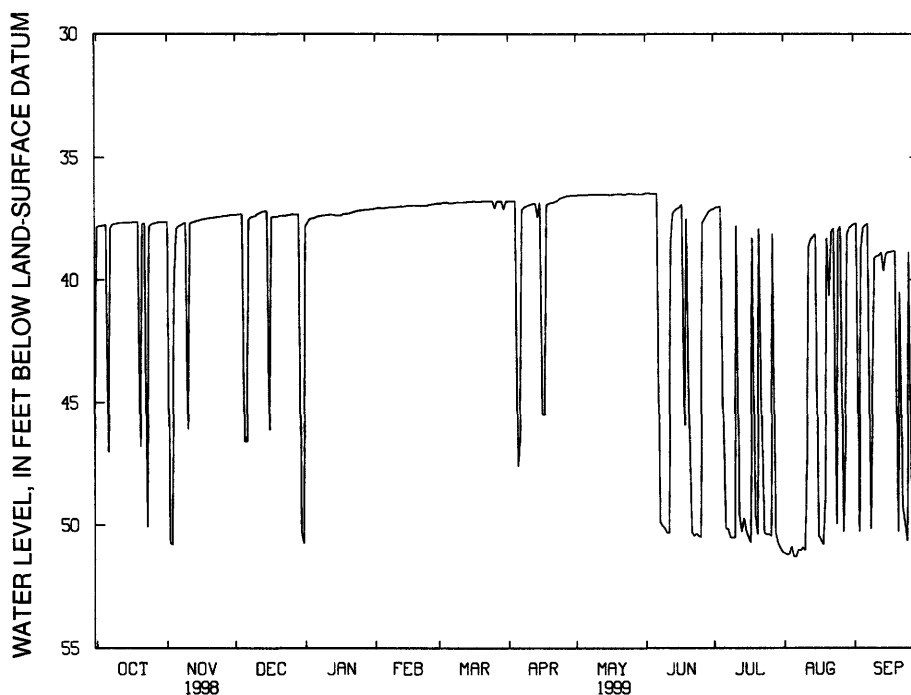
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 29.0 ft below land-surface datum, May 1988; lowest recorded, 64.63 ft below land-surface datum, July 15, 1986.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	37.75	37.90	46.57	37.47	37.06	36.83	47.58	36.52	36.48	45.60	51.28	37.88
10	37.69	46.07	37.38	37.35	37.02	36.82	36.94	36.49	50.31	50.51	51.04	39.10
15	37.65	37.57	37.18	37.35	36.96	36.79	36.82	36.50	37.10	50.25	38.14	38.94
20	46.78	37.46	37.41	37.28	36.96	36.79	36.84	36.48	45.93	50.37	38.31	50.26
25	37.72	37.40	37.35	37.16	36.91	36.78	36.63	36.46	50.49	50.37	38.00	38.86
EOM	37.63	37.34	50.75	37.10	36.87	36.78	36.54	36.48	37.14	51.11	37.80	37.96
WTR YR 1999	HIGHEST		36.43	JUN 2	LOWEST		51.30	AUG 6				



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421641085350601. Local number, 2S 11W 22CD.

LOCATION.--Lat 42°16'41", long 85°35'06", Hydrologic Unit 04050003, at intersection of Crosstown Parkway and Stockbridge Avenue in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 137 ft, screened 134 ft to 137 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 764.7 ft above sea level. Measuring point: Plywood instrument shelf, 2.6 ft above land-surface datum.

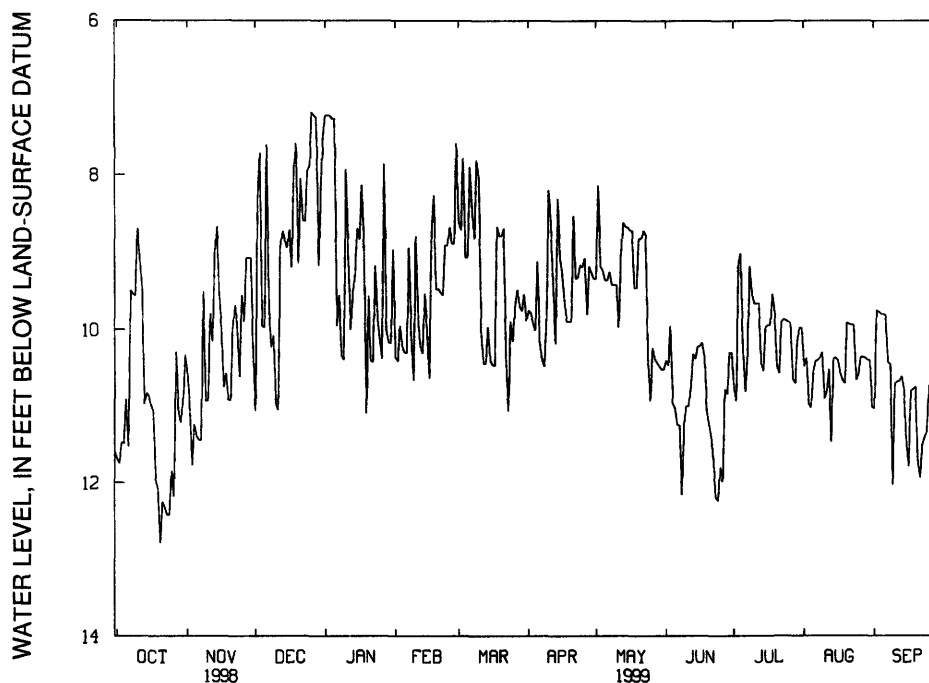
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 3.60 ft below land-surface datum, May 5, 6, 1995; lowest recorded, 31.1 ft below land surface datum, August 1961.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.91	11.39	9.97	7.27	10.30	9.06	9.11	9.36	11.02	10.24	10.54	9.80
10	8.69	10.93	10.95	7.93	8.79	8.04	8.20	9.42	11.00	9.66	10.90	10.70
15	10.88	9.53	8.94	8.69	10.01	10.40	9.05	8.68	10.22	9.97	10.37	11.46
20	12.79	10.92	9.14	9.56	9.47	8.79	9.89	8.82	11.24	10.49	9.91	11.72
25	11.85	9.55	7.89	10.10	8.68	10.15	9.19	10.93	11.80	9.90	10.58	10.74
EOM	10.33	10.29	7.49	8.96	7.59	9.88	9.34	10.52	10.30	9.98	11.01	9.44
WTR YR 1999	HIGHEST			4.33	MAR 7			LOWEST	12.79	OCT 20		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421716085373702. Local number, 2S 11W 20BB2.

LOCATION.--Lat 42°17'16", long 85°37'37", Hydrologic Unit 04050003, at intersection of Howard Street and Kendall Street in Kalamazoo Township, in Kalamazoo. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 106 ft, screened 103 ft to 106 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 880 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.3 ft above land-surface datum.

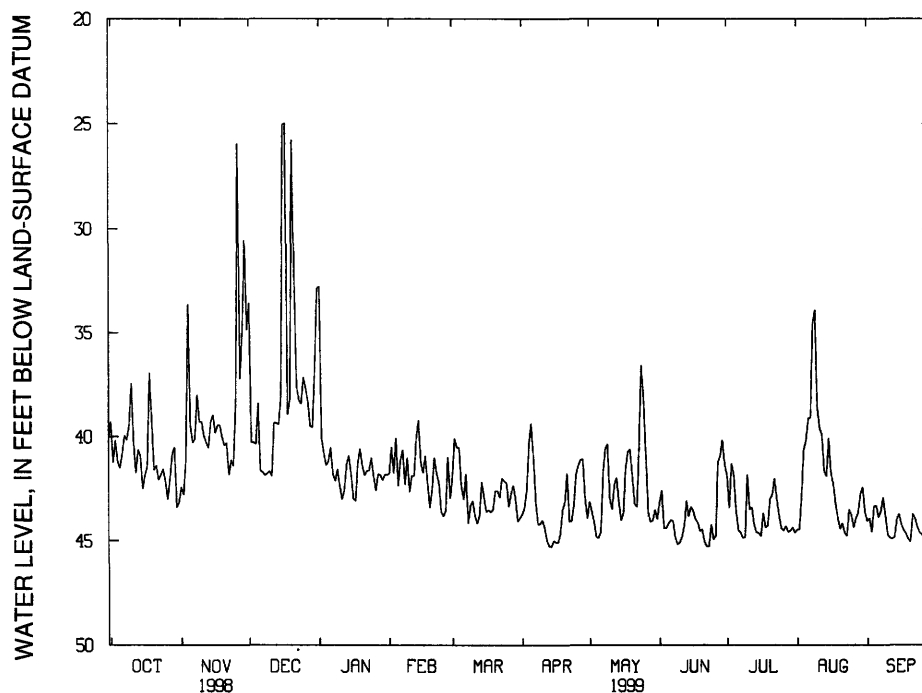
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 12.5 ft below land-surface datum, February 1976; lowest recorded, 48.4 ft below land-surface datum, June 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	41.49	39.44	38.41	41.17	42.35	42.40	39.37	44.89	44.17	43.57	40.20	43.32
10	37.46	39.29	41.63	42.35	42.65	43.08	44.02	42.99	45.09	41.82	38.61	44.71
15	42.49	38.97	38.27	41.74	41.22	42.89	45.01	44.03	43.38	44.64	40.09	43.74
20	41.58	40.42	25.78	41.36	42.52	42.59	43.14	41.91	44.47	43.01	44.45	45.08
25	42.12	38.52	37.16	41.88	43.83	42.21	41.79	38.12	44.95	44.41	43.77	44.72
EOM	43.14	34.86	32.88	41.83	42.96	43.91	43.93	43.97	41.32	44.62	43.62	43.82
WTR YR 1999	HIGHEST			21.78	AUG 8			LOWEST	45.30	APR 14		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421918085283801. Local number, 2S 10W 4D.

LOCATION.--Lat 42°19'18", long 85°28'38", Hydrologic Unit 04050003, at Campbell well field near Campbell Lake, 2 mi east of Eastwood. Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 13 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 836.50 ft above sea level. Measuring point: Plywood instrument shelf, 1.0 ft above land-surface datum.

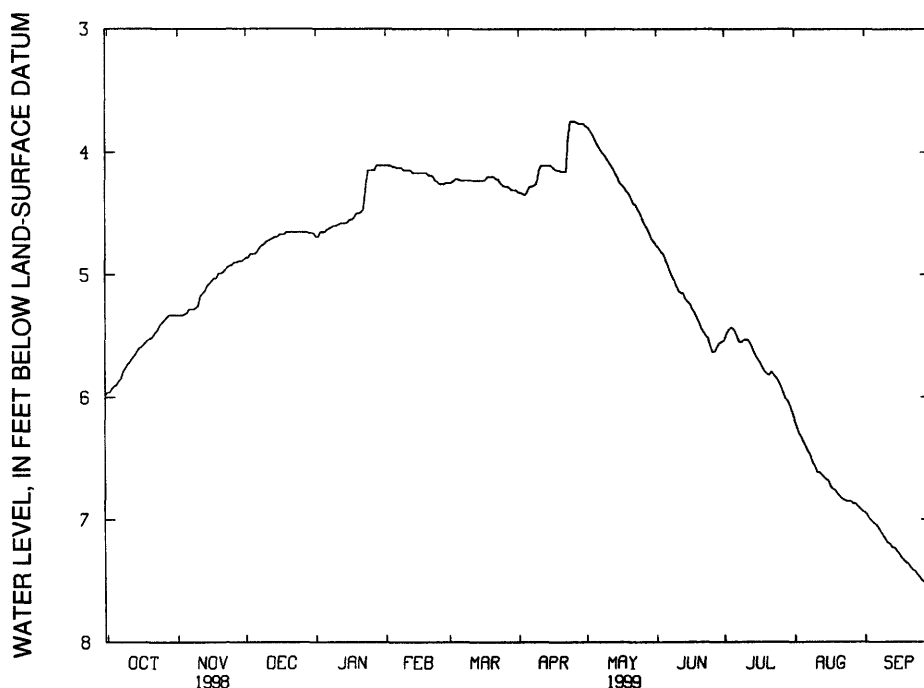
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 1.9 ft below land-surface datum, April 1974; lowest recorded, 7.51 ft below land-surface datum, Sept. 27-30, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.90	5.31	4.83	4.65	4.12	4.22	4.32	3.90	4.87	5.44	6.36	7.03
10	5.73	5.25	4.73	4.60	4.15	4.23	4.15	4.05	5.09	5.53	6.56	7.16
15	5.60	5.07	4.69	4.57	4.17	4.23	4.11	4.21	5.22	5.66	6.67	7.26
20	5.52	4.99	4.65	4.50	4.19	4.20	4.16	4.34	5.39	5.81	6.79	7.36
25	5.39	4.92	4.65	4.15	4.26	4.27	3.75	4.50	5.58	5.87	6.85	7.47
EOM	5.33	4.88	4.66	4.11	4.25	4.31	3.77	4.73	5.55	6.12	6.93	7.51
WTR YR 1999	HIGHEST 3.73			APR 23, 24			LOWEST 7.51		SEP 27-30			



GROUND-WATER LEVELS

MARQUETTE COUNTY

461946087230702. Local number, 45N 25W 01BBCD

LOCATION.--Lat 46°19'46", long 87°23'07", Hydrologic Unit 04030110, near Red Fox Inn at former K.I. Sawyer Air Force Base, 5.3 mi northeast of Gwinn. Owner: Air Force Base Conversion Agency.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 110 ft, screened 105 ft to 110 ft.

INSTRUMENTATION.--Water-level recorder.

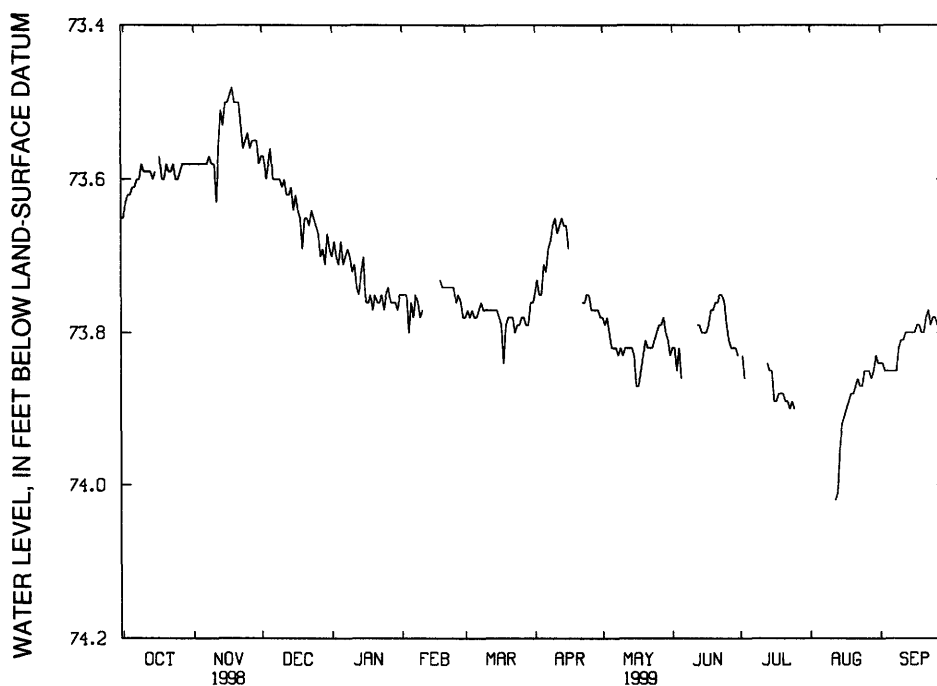
DATUM.--Elevation of land-surface datum is 1,174.29 ft above sea level. Measuring point: Top of casing, 2.8 ft above land-surface datum.

PERIOD OF RECORD.--October 1997 to September 1999 (discontinued).

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 73.17 ft below land-surface datum, Nov. 27, 1997; lowest recorded, 74.02 ft below land-surface datum, Aug. 12, 1999, but may have been lower during period of missing record, July 26 to Aug. 11, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	73.61	73.58	73.56	73.68	73.76	73.78	73.71	73.82	73.86	---	---	73.85
10	73.59	73.58	73.61	73.72	73.77	73.77	73.65	73.83	---	---	---	73.81
15	73.59	73.50	73.64	73.70	---	73.77	73.66	73.83	73.80	73.85	73.92	73.80
20	73.58	73.50	73.65	73.75	73.74	73.78	---	73.81	73.76	73.88	73.88	73.80
25	73.60	73.54	73.66	73.75	73.76	73.79	73.75	73.80	73.79	73.90	73.85	73.78
EOM	73.58	73.58	73.69	73.75	73.78	73.76	73.78	73.83	73.83	---	73.84	---
WTR YR 1999	HIGHEST			73.42	NOV 18, 19			LOWEST	74.02	AUG 12		



GROUND-WATER LEVELS

MARQUETTE COUNTY

461947087210901. Local number, 45N 24W 06ABCA.

LOCATION.--Lat 46°19'47", long 87°21'09", Hydrologic Unit 04030110, near McDonald School at former K.I. Sawyer Air Force Base, 5.3 mi northeast of Gwinn. Owner: Air Force Base Conversion Agency.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 6 in., depth 180 ft, screened 160 ft to 180 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 1,170.38 ft above sea level. Measuring point: Top of casing, 3.0 ft above land-surface datum.

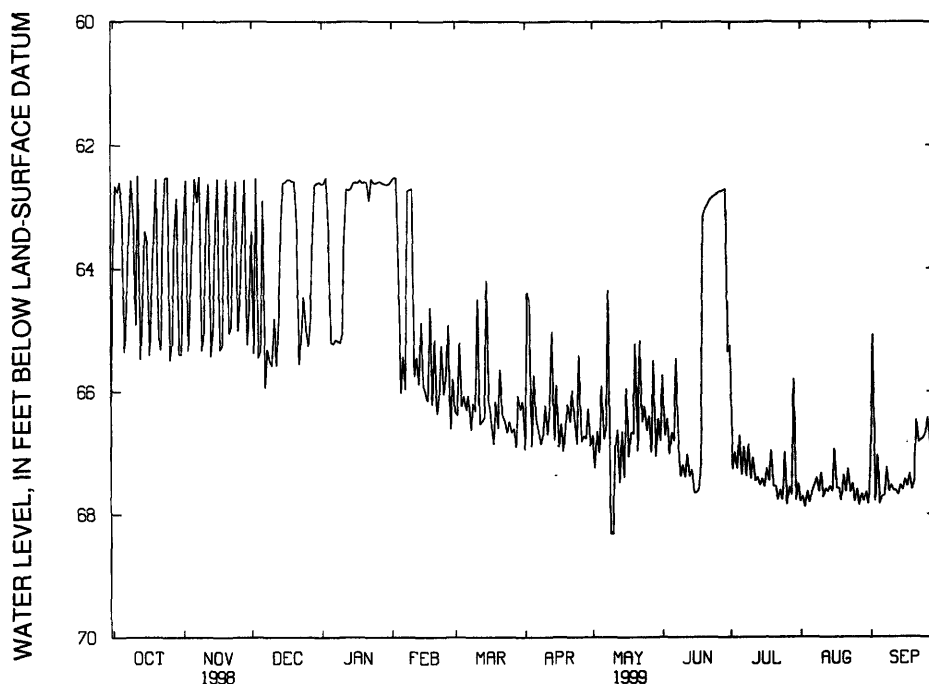
REMARKS.--Water levels affected by nearby pumping.

PERIOD OF RECORD.--August 1994 to September 1999 (discontinued).

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 61.70 ft below land-surface datum, July 2, 1997; lowest recorded, 74.56 ft below land-surface datum, Aug. 26, 1994.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	63.14	63.44	65.34	65.20	66.02	66.07	65.73	65.90	66.66	66.70	67.81	67.83
10	63.19	65.00	65.58	65.05	62.71	66.31	66.22	68.32	67.19	67.41	67.32	67.52
15	63.39	63.33	62.62	62.61	65.91	64.19	65.89	67.39	67.64	67.41	67.62	67.60
20	62.55	62.55	62.59	62.60	65.15	66.59	66.21	65.22	63.03	67.54	67.35	67.47
25	62.52	65.01	64.99	62.62	65.74	66.48	65.41	66.63	62.80	66.98	67.79	66.66
EOM	65.40	64.63	62.60	62.63	65.79	66.16	66.88	66.80	65.35	67.50	67.83	---
WTR YR 1999	HIGHEST			62.46	OCT 17, NOV 25			LOWEST	68.32	MAY 9		



GROUND-WATER LEVELS

MONROE COUNTY

415206083414401. Local number, 7S 6E 15ACAA.

LOCATION.--Lat 41°52'06", long 83°41'44", Hydrologic Unit 04100002, at Teal Road, 2 mi southeast of Petersburg. Owner: U.S. Geological Survey.

AQUIFER.--Detroit River Group of Devonian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 72 ft, cased to 53 ft, open bottom.

INSTRUMENTATION.--Water-level recorder.

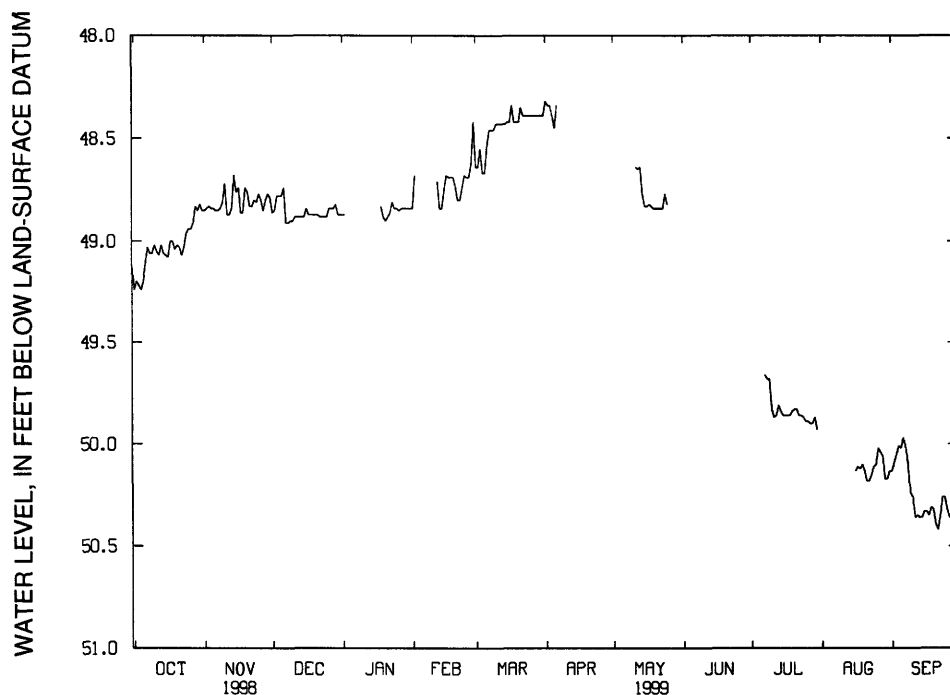
DATUM.--Elevation of land-surface datum is 680 ft above sea level, from topographic map. Measuring point: Top of casing, 2.5 ft above land-surface datum.

PERIOD OF RECORD.--November 1978 to September 1988, December 1997 to September 1998 (monthly measurement), October 1998 to September 1999, October 1998 to September 1999 (water-level recorder).

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 32.30 ft below land-surface datum, Mar. 26, 1982; lowest recorded, 50.42 ft below land-surface datum, Sept. 21, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	49.20	48.84	48.78	---	---	48.67	48.45	---	---	---	---	50.02
10	49.02	48.72	48.90	---	---	48.43	---	---	---	49.83	---	50.26
15	49.07	48.76	48.88	---	48.75	48.42	48.22	48.83	---	49.86	---	50.33
20	49.02	48.76	48.87	48.90	48.73	48.42	---	48.84	---	49.83	50.13	50.39
25	48.94	48.77	48.88	48.84	48.69	48.39	---	48.82	---	49.89	50.10	50.32
EOM	48.85	48.79	48.87	48.84	48.42	48.39	---	---	---	---	50.13	50.37
WTR YR 1999	HIGHEST			47.93	APR 16			LOWEST	50.42	SEP 21		



GROUND-WATER LEVELS

MONROE COUNTY

415235083414001. Local number, 7S 6E 15ADB.

LOCATION.--Lat 41°52'35", long 83°41'40", Hydrologic Unit 04100002, at Teal Road, 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 sea level, from topographic map. Measuring point: Top of casing, 4.0 ft above land-surface datum.

PERIOD OF RECORD.--December 1965 to September 1991, February 1998 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.00 ft below land-surface datum, Feb. 14, 1966; lowest measured, 8.17 ft below land-surface datum, Sept. 28, 1999.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	7.62	JAN 20	7.97	APR 14	6.87	JUL 7	7.14	AUG 16	7.81	SEP 28	8.17
DEC 8	7.78	MAR 3	7.23	MAY 18	6.63						

GROUND-WATER LEVELS

OAKLAND COUNTY

424109083384301. Local number, 3N 7E 5BA.

LOCATION.--Lat 42°41'09", long 83°38'43", Hydrologic Unit 04080203, 150 ft west of Fish Lake Road, 1.2 mi east of Clyde. Owner: American Aggregates Company.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled observation well, diameter 2 in., depth 49 ft.

INSTRUMENTATION.--Water-level recorder.

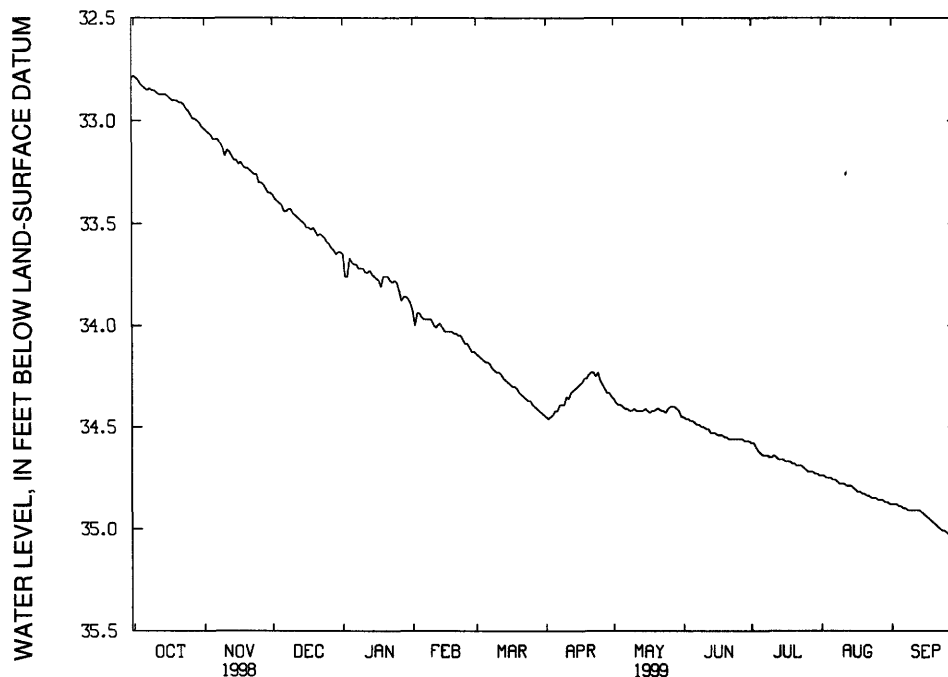
DATUM.--Elevation of land-surface datum is 1,055 ft above sea level, from topographic map. Measuring point: Top of flange, 3.0 ft above land-surface datum.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 29.5 ft below land-surface datum, June 1976; lowest recorded, 38.7 ft below land-surface datum, December 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	32.83	33.09	33.41	33.69	33.96	34.18	34.42	34.40	34.47	34.63	34.75	34.89
10	32.85	33.17	33.45	33.72	33.99	34.23	34.35	34.41	34.50	34.65	34.78	34.91
15	32.87	33.19	33.50	33.76	34.03	34.28	34.30	34.41	34.53	34.66	34.80	34.93
20	32.90	33.23	33.54	33.76	34.04	34.33	34.24	34.41	34.55	34.68	34.83	34.98
25	32.95	33.30	33.59	33.79	34.09	34.37	34.27	34.41	34.56	34.71	34.85	35.02
EOM	33.03	33.35	33.64	33.89	34.13	34.44	34.35	34.45	34.57	34.74	34.88	35.06
WTR YR 1999	HIGHEST		32.76	OCT 1		LOWEST		35.06	SEP 30			



GROUND-WATER LEVELS

WASHTENAW COUNTY

421322083441301. Local number, 3S 6E 16BCCD.

LOCATION.--Lat 42°13'22", long 83°44'13", Hydrologic Unit 04090005, at Ann Arbor Municipal Airport. Owner: City of Ann Arbor.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 10 in., depth 55 ft, screened 35 ft to 55 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 821.50 ft above sea level. Measuring point: Plywood instrument shelf, 2.5 ft above land-surface datum.

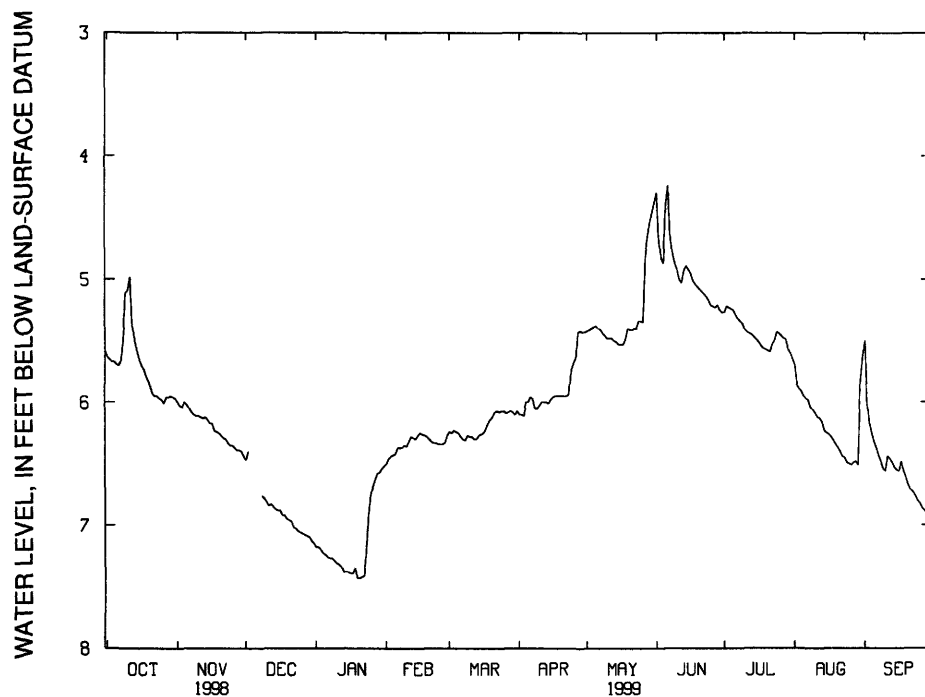
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 0.69 ft below land-surface datum, Mar. 10, 1974; lowest recorded, 15.86 ft below land-surface datum, Oct. 18, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.69	6.02	---	7.24	6.42	6.25	6.00	5.38	4.41	5.25	5.95	6.32
10	5.09	6.11	6.81	7.31	6.36	6.28	6.03	5.48	4.92	5.41	6.09	6.56
15	5.65	6.17	6.88	7.38	6.27	6.26	5.98	5.53	4.92	5.49	6.25	6.55
20	5.87	6.27	6.96	7.43	6.30	6.12	5.95	5.41	5.08	5.58	6.37	6.67
25	5.98	6.35	7.06	6.74	6.34	6.07	5.68	5.34	5.21	5.44	6.50	6.82
EOM	5.97	6.44	7.15	6.52	6.27	6.07	5.43	4.38	5.27	5.65	5.62	6.81
WTR YR 1999	HIGHEST			4.11	JUN 7			LOWEST	7.43	JAN 19, 20		



	Page		Page
Access to USGS water data.....	15	Blendon and Olive Drain near Borculo	316
Ada, Grand River at	308	Boardman River near Mayfield	189
Adrian, River Raisin near	303	Bond Falls Canal near Paulding	31
Allen, South Branch Hog Creek near	83	Bond Falls Lower By-Pass near Calderwood	312
Alma, Pine River (tributary to Chippewa River) at.....	250	Bond Falls Reservoir near Paulding	32
Almont, North Branch Clinton River at.....	310	Branch County, ground-water levels	321
Alpha, Paint River near	70	Brimley, West Branch Waiska River near.....	306
Alston, Sturgeon River (tributary to Lake Superior) near	41-43	Brule River, near Commonwealth, WI	71
Ann Arbor, Huron River at.....	300	near Florence, WI.....	69
Malletts Creek at.....	301	Buck Creek at Grandville	308
Arbutus Lake near Mayfield	190	Burlington, St. Joseph River (tributary to Lake Michigan) at	82
Armada, Coon Creek near	310		
East Branch Coon Creek at	267		
Highbank Creek near	310		
Asylum Lake near Kalamazoo	105		
Au Sable River, at Mio.....	208-212	Cadillac, Lake Mitchell-Cadillac at.....	137
near Au Sable	235-239	Caledonia, Thornapple River near	307
near Curtisville.....	218-222	Calhoun County, ground-water levels	322
near Glennie	227-230	Carp River near Negaunee	312
near McKinley	213-217	Cass River at Frankenmuth	247
near Red Oak	203-207	Cheboygan County, ground-water levels.....	323
near Sidtown.....	231-234	Chippewa River near Mount Pleasant.....	249
near South Branch	223-226	Cisco Branch Ontonagon River at Cisco Lake Outlet	38
South Branch, near Luzerne.....	201	Cisco Lake near Watersmeet	37
Au Train River at Forest Lake.....	48	Clam River, at Cadillac	318
Augusta Creek near Augusta.....	99	at Vogel Center	138
Austin Lake near Kalamazoo.....	85	Clinton River, at Mount Clemens.....	269
Avoca, Mill Creek (tributary to St. Clair River) near	256	near Drayton Plains	260
		near Fraser	265
		Middle Branch, near Macomb	311
		North Branch, at Almont.....	310
		near Meade.....	310
		near Mount Clemens	268
		near Romeo.....	310
Banat, Menominee River near	78	Coldwater River, near Weidman.....	318, 319
Bangor, South Branch Black River (tributary to Lake Michigan) near.....	93	near Woods	318
Battle Creek, Battle Creek at	97	Columbiaville, North Branch Flint River near.....	309
Kalamazoo River near	98	South Branch Flint River near.....	243
Wanadoga Creek near	96	Commonwealth, WI, Brule River near.....	71
Battle Creek, at Battle Creek	97	Comstock, Kalamazoo River at.....	100
near Pennfield.....	316	Conway, Crooked Lake near	195
Bear Creek (tributary to Lake Michigan) near Muskegon	162	Coon Creek, near Armada	310
Bear Lake near Kalkaska	165	East Branch, at Armada	267
Beaverton, South Branch Tobacco River near ...	248	near New Haven	310
Belle River, at Memphis	258	Cooperation.....	1
North Branch, at Imlay City.....	257	Cornell, Escanaba River at	65-67
Benzonia, Betsie River near.....	308	Crest-stage partial-record stations.....	306-311
Bergland, Lake Gogebic near	35	Crockery Creek near Ravenna.....	317
West Branch Ontonagon River near.....	36	Crooked Lake near Conway	195
Betsie River near Benzonia.....	308	Croton, Muskegon River near.....	157-161
Big Creek near Higgins Lake.....	317, 318	Crystal, Fish Creek near.....	117-118
Big Rapids, Muskegon River at	140-143	Crystal Falls, Michigamme River near	72
Birmingham, River Rouge at	270	Curtisville, AuSable River near.....	218-222
Black River (tributary to Cheboygan River) near Tower.....	199		
Black River (tributary to Lake Michigan), Middle Branch, near South Haven	94	Dansville, Deer Creek (tributary to Red Cedar River) near	111
South Branch, near Bangor	93	Davison, Kearsley Creek near	245
Black River (tributary to Lake Michigan) near Garnet.....	52	Dearborn, Lower River Rouge at.....	291-294
Black River (tributary to St. Clair River) near Jeddo.....	255	Dearborn Heights, Middle River Rouge at.....	286-289
		Deer Creek (tributary to Grand River) near Coopersville	317

	Page		Page
Jackson, Grand River at.....	109	Macatawa River near Zeeland.....	108
Jeddo, Black River near.....	255	Macomb, McBride Drain near.....	311
Johnson Creek at Northville.....	319	Middle Branch Clinton River near.....	311
Jordan River near East Jordan.....	191	Malletts Creek at Ann Arbor.....	301
		Manchester, River Raisin near.....	302
Kalamazoo, Asylum Lake near.....	105	Manistee River, near Mesick.....	171-175
Austin Lake near.....	85	near Sherman.....	166-170
Long Lake near.....	84	near Wellston.....	182-186
Portage Creek (tributary to		Manistique River near Manistique.....	53
Kalamazoo River) near.....	103	Maple River at Maple Rapids.....	116
West Fork Portage Creek at.....	106	Map of Michigan, water-discharge stations.....	27-28
Kalamazoo County, ground-water levels.....	335-353	water-quality stations.....	29
Kalamazoo River, at Comstock.....	100	ground-water wells.....	320
near Battle Creek.....	98	Marengo, Kalamazoo River near.....	95
near Marengo.....	95	Marquette, McClure Storage Basin Release	
Kalkaska, Bear Lake near.....	165	near.....	45
Kearsley Creek near Davison.....	245	Marquette County, ground-water levels.....	354-355
Kent Lake near New Hudson.....	296	Marsh Creek near Seney.....	313
Koss, Menominee River at.....	79	Mason, Sycamore Creek near.....	307
		Mayfield, Arbutus Lake near.....	190
Lake Gogebic near Bergland.....	35	Boardman River near.....	189
Lake Linden, Trap Rock River near.....	44	McAllister, WI, Menominee River near.....	80
Lake Mitchell-Cadillac at Cadillac.....	137	McBride Drain near Macomb.....	311
Lake St. Helen near St. Helen.....	200	McClure Storage Basin Release near	
Lakes and Reservoirs:		Marquette.....	45
Arbutus Lake near Mayfield.....	190	McKinley, Au Sable River near.....	213-217
Asylum Lake near Kalamazoo.....	105	Meade, Deer Creek (tributary to North Branch	
Austin Lake near Kalamazoo.....	85	Clinton River) near.....	310
Bear Lake near Kalkaska.....	165	North Branch Clinton River near.....	310
Bond Falls Reservoir near Paulding.....	32	Memphis, Belle River at.....	258
Cisco Lake near Watersmeet.....	37	Menominee River, at Koss.....	79
Crooked Lake near Conway.....	195	at Niagara, WI.....	75
Douglas Lake near Pellston.....	196	near Banat.....	78
East Lake near Fibre.....	194	near Florence, WI.....	73
Glen Lake near Glen Arbor.....	188	near Iron Mountain.....	74
Grand Sable Lake near Grand Marais.....	49	near McAllister, WI.....	80
Greenwood Reservoir near Greenwood.....	57	near Pembine, WI.....	77
Hampton Lake near Portage.....	101	near Vulcan.....	76
Higgins Lake near Roscommon.....	125-135	Mesick, Manistee River near.....	171-175
Houghton Lake near Houghton Lake		Michigamme River, near Crystal Falls.....	72
Heights.....	136	near Witch Lake.....	315
Kent Lake near New Hudson.....	296	Middle River Rouge, at Dearborn Heights.....	286-289
Lake Gogebic near Bergland.....	35	near Garden City.....	285
Lake Mitchell-Cadillac at Cadillac.....	137	Midland, Tittabawassee River at.....	251
Lake St. Helen near St. Helen.....	200	Milford, Huron River at.....	295
Long Lake near Kalamazoo.....	84	Mill Creek (tributary to Huron River)	
Muskallonge Lake near Deer Park.....	50	near Dexter.....	299
Otsego Lake near Gaylord.....	202	Mill Creek (tributary to St. Clair River) near	
Schweitzer Reservoir near Palmer.....	62	Avoca.....	256
Stony Lake near Washington.....	263	Mio, Au Sable River at.....	208-212
Walloon Lake at Walloon Lake.....	192	Miscellaneous sites, discharge measurements	
Lansing, Grand River at.....	114	at.....	312-319
Lapeer, Farmers Creek near.....	242	Monroe, River Raisin near.....	304
La Salle, Otter Creek at.....	305	Monroe County, ground-water levels.....	356-357
Lingle Drain at Midland.....	319	Mottville, St. Joseph River (tributary to	
Little Muskegon River near Oak Grove.....	152-156	Lake Michigan) at.....	88
Long Lake near Kalamazoo.....	84	Mount Clemens, Clinton River at.....	269
Lower River Rouge, at Dearborn.....	291-294	North Branch Clinton River near.....	268
at Inkster.....	290	Mount Pleasant, Chippewa River near.....	249
Luzerne, South Branch Au Sable River near....	201	Muskallonge Lake near Deer Park.....	50
		Muskegon, Bear Creek (tributary to Lake	
		Michigan) near.....	162

	Page		Page
Muskegon River, at Big Rapids.....	140-143	Pigeon River (tributary to Indian River) near Vanderbilt.....	198
at Ewart.....	139	Pine River (tributary to Chippewa River) at Alma.....	250
near Croton.....	157-161	Pine River (tributary to Lake Huron) near Rudyard.....	193
near Oxbow.....	148-151	Pine River (tributary to Manistee River) near Hoxeyville.....	177-181
near Stanwood.....	144-147	East Branch, near Tustin.....	176
Nahma Junction, Sturgeon River (tributary to Lake Michigan) near.....	54	Pine River (tributary to St. Clair River) near Rattle Run.....	309
Nashville, Quaker Brook near.....	120	Platte River at Honor.....	187
National Stream Quality Accounting Network, definition of.....	5	Plaster Creek at Grand Rapids.....	308
National Water-Quality Assessment Program, definition of.....	5	Portage, Hampton Lake near.....	101
New Haven, East Branch Coon Creek near.....	310	Portage Creek at.....	102
New Hudson, Huron River near.....	297	Portage Creek (tributary to Kalamazoo River), at Portage.....	102
Kent Lake near.....	296	near Kalamazoo.....	103
Niagara, WI, Menominee River at.....	75	West Fork, at Kalamazoo.....	106
Niles, St. Joseph River (tributary to Lake Michigan) at.....	90	near Oshtemo.....	104
Nottawa, Prairie River near.....	87	Portage River (tributary to St. Joseph River) near Vicksburg.....	307
Oak Grove, Little Muskegon River near.....	152-156	Portland, Grand River at.....	115
Oakland County, ground-water levels.....	358	Prairie River near Nottawa.....	87
Ontonagon River, near Rockland.....	39	Princeton, Middle Branch Escanaba River near.....	61
Cisco Branch, at Cisco Lake Outlet.....	38	Publications on Techniques of Water-Resources Investigations.....	22-26
Middle Branch, near Rockland.....	34		
near Trout Creek.....	33	Quaker Brook near Nashville.....	120
West Branch, near Bergland.....	36		
Oshtemo, West Fork Portage Creek near.....	104	Rabbit River, at Hamilton.....	307
Otisville, Flint River near.....	244	near Hopkins.....	107
Otsego Lake near Gaylord.....	202	Rattle Run, Pine River (tributary to St. Clair River) near.....	309
Otter Creek at La Salle.....	305	Red Cedar River at East Lansing.....	113
Owosso, Shiawassee River at.....	241	Red Oak, Au Sable River near.....	203-207
Oxbow, Muskegon River near.....	148-151	Reservoir (see Lakes and Reservoirs)	
Paint Creek (tributary to Clinton River) at Rochester.....	261	Rifle River, at Selkirk.....	308
Paint River, at Crystal Falls.....	315	near Sterling.....	240
near Alpha.....	70	River Raisin, near Adrian.....	303
Palmer, Schweitzer Creek near.....	63	near Manchester.....	302
Schweitzer Reservoir near.....	62	near Monroe.....	304
Paradise, Tahquamenon River near.....	51	River Rouge, at Beverly Hills.....	319
Two Hearted River near.....	306	at Birmingham.....	270
Paulding, Bond Falls Canal near.....	31	at Detroit.....	281-284
Bond Falls Reservoir near.....	32	at Southfield.....	271-274
Paw Paw River at Riverside.....	92	Riverside, Paw Paw River at.....	92
Pellston, Douglas Lake near.....	196	Rochester, Paint Creek at.....	261
Pembine, WI, Menominee River near.....	77	Rockford, Rogue River near.....	122
Pentwater River, North Branch, near Pentwater.....	308	Rockland, Middle Branch Ontonagon River near.....	34
Pere Marquette River at Scottville.....	164	Ontonagon River near.....	39
Perronville, Tenmile Creek at.....	306	Rogue River near Rockford.....	122
Pigeon River (tributary to Lake Michigan) near Borculo.....	316	Romeo, East Pond Creek at.....	266
near Olive Center.....	317	North Branch Clinton River near.....	310
near Port Sheldon.....	317	Stony Creek (tributary to Clinton River) near.....	262

	Page		Page
Roscommon, Higgins Lake near	125-135	Tenmile Creek at Perronville.....	306
Rudyard, Pine River (tributary to Lake Huron)		Thornapple River, near Caledonia.....	307
near	193	near Hastings	121
Saginaw River at Saginaw	252-254	Thread Creek near Flint	309
Saline River near Saline	311	Three Rivers, St. Joseph River at.....	86
Sand River Wildlife Flooding at Sand River	47	Tittabawassee River at Midland	251
Sashabaw Creek near Drayton Plains	259	Tobacco River, South Branch, near Beaverton ..	248
Sawyer, Galien River near	81	Tower, Black River (tributary to Cheboygan	
Sawyer Creek near Olive Center	317	River) near	199
Schweitzer Creek near Palmer	63	Trap Rock River near Lake Linden	44
Schweitzer Reservoir near Palmer	62	Trenton, Frank and Poet Drain at.....	311
Scottville, Pere Marquette River at.....	164	Trout Creek, Middle Branch Ontonagon River	
Selkirk, Rifle River at	308	near.....	33
Sherman, Manistee River near.....	166-170	Tustin, East Branch Pine River (tributary to	
Shiawassee River at Owosso.....	241	Manistee River) near	176
Sidnaw, Sturgeon River (tributary to Lake		Two Hearted River near Paradise	306
Superior) near	40		
Sidtown, Au Sable River near	231-234	Upper River Rouge, at Detroit.....	277-280
Silver Lead Creek near Gwinn	46, 312	at Farmington	276
Sloan Creek near Williamston	112	at Redford	319
Smyrna, Flat River at.....	307		
South Branch, Au Sable River near	223-226	Vanderbilt, Pigeon River (tributary to Indian	
South Haven, Middle Branch Black River		River) near	198
(tributary to Lake Michigan) near	94	Vicksburg, Portage River (tributary to St.	
Southfield, Evans Ditch at	275	Joseph River) near	307
River Rouge at	271-274	Vogel Center, Clam River at	138
Stanwood, Muskegon River near	144-147	Vulcan, Menominee River near	76
St. Helen, Lake St. Helen near	200		
St. Joseph River (tributary to Lake Michigan),			
at Burlington.....	82	Waika River, West Branch, near Brimley.....	306
at Elkhart, IN	89	Walker Creek near Weidman.....	318
at Mottville	88	Walled Lake Branch at Novi.....	319
at Niles.....	90	Walloon Lake at Walloon Lake	192
at Three Rivers	86	Walsh Creek near Seney	313
St. Nicholas, Escanaba River near	64	Walsh Ditch, near Seney	313, 314
Sterling, Rifle River near	240	near Germfask.....	314
Stony Creek (tributary to Clinton River), near		Wanadoga Creek, near Battle Creek.....	96
Romeo	262	near Pennfield	316
near Washington.....	264	Washington Creek at Windigo	30
West Branch, near Washington	309	Washington, Stony Creek (tributary to Clinton	
Stony Lake near Washington.....	263	River) near	264
Sturgeon River (tributary to Burt Lake) at		Stony Lake near	263
Wolverine.....	197	West Branch Stony Creek near	309
Sturgeon River (tributary to Lake Michigan)		Washtenaw County, ground-water levels.....	359
near Nahma Junction	54	Watersmeet, Cisco Lake near	37
Sturgeon River (tributary to Lake Superior),		Wellston, Manistee River near	182-186
near Alston	41-43	White River near Whitehall.....	163
near Sidnaw.....	40	Williamston, Sloan Creek near	112
Sumnerville, Dowagiac River at	91	Windigo, Washington Creek at	30
Swartz Creek at Flint.....	309	Wolverine, Sturgeon River (tributary to Burt	
Sweeney Creek near Seney	313	Lake) at	197
Sycamore Creek near Mason	307		
Tahquamenon River near Paradise	51	Zeeland, Macatawa River near.....	108

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
<i>Length</i>		
inch (in.)	2.54×10^1	millimeter
	2.54×10^{-2}	meter
foot (ft)	3.048×10^{-1}	meter
mile (mi)	1.609×10^0	kilometer
<i>Area</i>		
acre	4.047×10^{-3}	square meter
	4.047×10^{-1}	square hectometer
	4.047×10^{-3}	square kilometer
square mile (mi ²)	2.590×10^0	square kilometer
<i>Volume</i>		
gallon (gal)	3.785×10^0	liter
	3.785×10^0	cubic decimeter
	3.785×10^{-3}	cubic meter
million gallons (Mgal)	3.785×10^{-3}	cubic meter
	3.785×10^{-3}	cubic hectometer
cubic foot (ft ³)	2.832×10^1	cubic decimeter
	2.832×10^{-2}	cubic meter
cubic-foot-per-second day [(ft ³ /s) d]	2.447×10^3	cubic meter
	2.447×10^{-3}	cubic hectometer
acre-foot (acre-ft)	1.233×10^3	cubic meter
	1.233×10^{-3}	cubic hectometer
	1.233×10^{-6}	cubic kilometer
<i>Flow</i>		
cubic foot per second (ft ³ /s)	2.832×10^1	liter per second
	2.832×10^1	cubic decimeter per second
	2.832×10^{-2}	cubic meter per second
gallon per minute (gal/min)	6.309×10^{-2}	liter per second
	6.309×10^{-2}	cubic decimeter per second
	6.309×10^{-5}	cubic meter per second
million gallons per day (Mgal/d)	4.381×10^1	cubic decimeter per second
	4.381×10^{-2}	cubic meter per second
<i>Mass</i>		
ton (short)	9.072×10^{-1}	megagram or metric ton

Sea level: In this report “sea level” refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment for the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
6520 Mercantile Way, Suite 5
Lansing, MI 48911



Printed on recycled paper